MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH14A	1	20.50	As Received	A	83.17	76.38	55.09	14.25	2.44	2.96
BH14A	3	26.50	As Received	D	83.03	83.03	83.03	16.97	2.46	3.09

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	2.96
Mean Is(50) - Diametrical tests	3.09
Ia(50)	0.96

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH16	1	11.50	As Received	A	83.10	58.64	32.50	12.26	3.57	3.83

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	3.83
Mean Is(50) - Diametrical tests	-
Ia(50)	-

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH17B	1	11.80	As Received	D	83.18	83.18	83.18	23.39	3.38	4.25

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	-
Mean Is(50) - Diametrical tests	4.25
Ia(50)	-

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH21	1	16.00	As Received	D	83.33	83.33	83.33	21.75	3.13	3.94

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	-
Mean Is(50) - Diametrical tests	3.94
Ia(50)	-

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
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BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH24	1	9.80	As Received	A	77.80	70.07	49.56	26.84	5.47	6.36

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	6.36
Mean Is(50) - Diametrical tests	-
Ia(50)	-

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH28	2	11.05	As Received	D	101.60	101.60	101.60	10.89	1.05	1.45
BH28	3	11.60	As Received	A	101.29	83.27	53.76	12.84	1.85	2.33
BH28	4	11.70	As Received	A	101.33	81.28	51.20	8.10	1.23	1.53
BH28	5	11.75	As Received	A	101.98	78.21	47.11	13.78	2.25	2.76
BH28	6	11.85	As Received	A	101.37	88.21	60.29	20.81	2.67	3.45
BH28	7	12.00	As Received	A	100.28	85.34	57.04	10.01	1.37	1.75
BH28	8	12.15	As Received	D	101.73	101.73	101.73	9.72	0.94	1.29
BH28	9	12.25	As Received	A	101.39	89.59	62.18	14.24	1.77	2.31
BH28	10	12.30	As Received	A	101.27	77.62	46.73	9.71	1.61	1.96
BH28	11	12.35	As Received	I	99.18	82.53	53.94	6.25	0.92	1.15
BH28	12	14.30	As Received	A	101.26	90.94	64.15	12.94	1.56	2.05
BH28	13	17.00	As Received	A	101.93	85.43	56.23	15.68	2.15	2.73
BH28	14	21.50	As Received	D	101.62	101.62	101.62	22.87	2.21	3.05

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	2.32
Mean Is(50) - Diametrical tests	1.93
Ia(50)	1.20

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
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BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH29	2	14.00	As Received	A	100.86	77.93	47.29	11.09	1.83	2.23
BH29	3	14.20	As Received	D	101.91	101.91	101.91	7.58	0.73	1.01
BH29	4	14.30	As Received	A	101.13	107.31	89.43	10.74	0.93	1.32
BH29	5	14.45	As Received	D	101.15	101.15	101.15	17.22	1.68	2.31
BH29	6	14.53	As Received	A	100.96	81.13	51.20	7.29	1.11	1.38
BH29	7	14.55	As Received	D	101.05	101.05	101.05	8.16	0.80	1.10
BH29	8	15.00	As Received	A	100.92	85.52	56.92	7.22	0.99	1.26
BH29	9	15.20	As Received	D	101.54	101.54	101.54	12.12	1.18	1.62
BH29	10	15.35	As Received	A	101.69	82.11	52.07	13.25	1.97	2.46
BH29	11	15.37	As Received	D	101.44	101.44	101.44	15.30	1.49	2.04
BH29	13	20.20	As Received	D	101.77	101.77	101.77	31.75	3.07	4.22
BH29	14	32.00	As Received	A	101.32	85.53	56.70	4.79	0.65	0.83

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	1.58
Mean Is(50) - Diametrical tests	2.05
Ia(50)	0.77

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
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BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH32	1	5.33	As Received	A	101.97	83.72	53.98	34.41	4.91	6.19
BH32	3	8.05	As Received	D	101.13	101.13	101.13	11.38	1.11	1.53
BH32	4	8.15	As Received	D	101.51	101.51	101.51	9.17	0.89	1.22
BH32	5	8.20	As Received	D	101.50	101.50	101.50	6.19	0.60	0.83
BH32	6	8.20	As Received	A	101.12	92.27	66.12	2.74	0.32	0.42
BH32	7	8.30	As Received	A	100.16	87.41	59.91	8.14	1.07	1.37
BH32	8	8.50	As Received	A	101.32	91.83	65.37	16.98	2.01	2.65
BH32	9	8.70	As Received	A	100.42	78.84	48.61	7.16	1.15	1.41
BH32	10	8.80	As Received	A	101.52	80.21	49.77	13.01	2.02	2.50
BH32	11	9.00	As Received	D	101.32	101.32	101.32	4.41	0.43	0.59
BH32	12	9.15	As Received	D	101.16	101.16	101.16	9.81	0.96	1.32
BH32	13	10.73	As Received	A	101.20	88.90	61.33	18.21	2.30	2.99

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	2.50
Mean Is(50) - Diametrical tests	1.10
Ia(50)	2.28

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
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BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH33	1	5.40	As Received	A	101.18	90.00	62.87	37.30	4.61	6.00
BH33	3	7.23	As Received	D	101.62	101.62	101.62	22.11	2.14	2.95
BH33	4	14.50	As Received	A	101.45	85.26	56.28	5.13	0.71	0.90

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	3.45
Mean Is(50) - Diametrical tests	2.95
Ia(50)	1.17

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH34	1	6.65	As Received	D	102.68	102.68	102.68	22.03	2.09	2.89
BH34	2	7.85	As Received	D	101.48	101.48	101.48	20.38	1.98	2.72
BH34	3	8.10	As Received	D	100.96	100.96	100.96	14.59	1.43	1.96
BH34	4	8.85	As Received	A	101.54	87.61	59.37	0.41	0.05	0.07
BH34	5	8.60	As Received	D	101.39	101.39	101.39	6.30	0.61	0.84
				A	101.39	83.74	54.32	10.31	1.47	1.85
BH34	6	8.30	As Received	D	101.15	101.15	101.15	5.64	0.55	0.76
				A	101.15	102.10	80.94	6.34	0.61	0.84
				A	101.15	98.60	75.49	5.68	0.58	0.79
				D	101.47	101.47	101.47	3.99	0.39	0.53
				D	101.89	101.89	101.89	4.62	0.45	0.61
				A	101.89	68.47	36.14	3.18	0.68	0.78
BH34	8	10.85	As Received	A	101.32	89.77	62.46	2.59	0.32	0.42
BH34	9	16.75	As Received	D	101.73	101.73	101.73	14.22	1.37	1.89
BH34	10	22.85	As Received	A	100.31	81.52	52.03	7.26	1.09	1.36

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	0.87
Mean Is(50) - Diametrical tests	1.53
Ia(50)	0.57

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH35	2	11.25	As Received	A	101.97	91.86	64.99	19.65	2.33	3.06
BH35	3	13.75	As Received	A	101.52	79.76	49.21	3.39	0.53	0.66
BH35	4	13.90	As Received	D	101.32	101.32	101.32	8.10	0.79	1.08
BH35	5	14.00	As Received	A	87.35	69.12	42.96	19.21	4.02	4.65
BH35	6	14.10	As Received	I	99.14	84.78	56.94	22.75	3.17	4.01
BH35	7	14.30	As Received	A	101.58	86.63	58.03	4.80	0.64	0.82
BH35	9	14.80	As Received	D	102.40	102.40	102.40	11.30	1.08	1.49
BH35	10	15.00	As Received	A	101.68	71.21	39.17	12.41	2.45	2.87
BH35	11	15.10	As Received	D	101.48	101.48	101.48	9.64	0.94	1.29
BH35	12	15.15	As Received	I	100.17	101.41	80.63	4.50	0.44	0.60
BH35	13	15.30	As Received	D	83.11	83.11	83.11	3.78	0.55	0.69
BH35	14	17.25	As Received	D	101.69	101.69	101.69	15.77	1.53	2.10
BH35	15	21.00	As Received	D	101.03	101.03	101.03	6.73	0.66	0.90
BH35	16	24.25	As Received	A	101.53	87.42	59.12	10.95	1.43	1.84

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	2.32
Mean Is(50) - Diametrical tests	1.26
Ia(50)	1.84

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH36	2	10.00	As Received	A	83.20	66.49	41.73	2.27	0.51	0.58

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	0.58
Mean Is(50) - Diametrical tests	-
Ia(50)	-

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH37	1	16.90	As Received	A	83.37	65.58	40.51	3.10	0.72	0.81

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	0.81
Mean Is(50) - Diametrical tests	-
Ia(50)	-

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

LABORATORY TEST CERTIFICATE

MATtest Limited
materials testing & consultancy

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Queenslie Industrial Estate
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Tel: 0141 774 4032
Fax: 0141 774 3552

email: info@mattest.org
Website: www.mattest.org

Certificate No : **17/384 - 02**

To : **Stephen Watson**

Client : **Causeway Geotech Limited**
8 Drumahiskey Road
Ballymoney
Co. Antrim
BT53 7QL

Dear Sirs,

LABORATORY TESTING OF ROCK

Introduction

We refer to samples taken from A4 Enniskillen Southern Bypass and delivered to our laboratory on 10th April 2017.

Material & Source

Sample Reference	:	See Report Plates
Sampled By	:	Client
Sampling Certificate	:	Not Supplied
Location	:	See Report Plates
Description	:	Rock Core
Date Sampled	:	Not Supplied
Date Tested	:	10th April 2017 Onwards
Source	:	16-1088 - A4 Enniskillen Southern Bypass

Test Results;

As Detailed On Page 2 to Page 6 inclusive

Comments;

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
All remaining samples for this project will be disposed of 28 days after issue of this test certificate

Remarks;

Approved for Issue

T McLelland (Director)

Date 08/05/2017

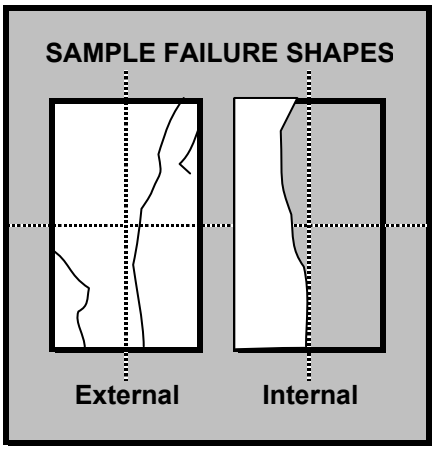
UKAS TESTING
2643

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	BULK DENSITY (Mg/m^3)	DRY DENSITY (Mg/m^3)
BH30	C1	6.35	1.1	-	-
BH31	C1	6.30	0.6	-	-
BH31	C15	21.13	0.9	-	-

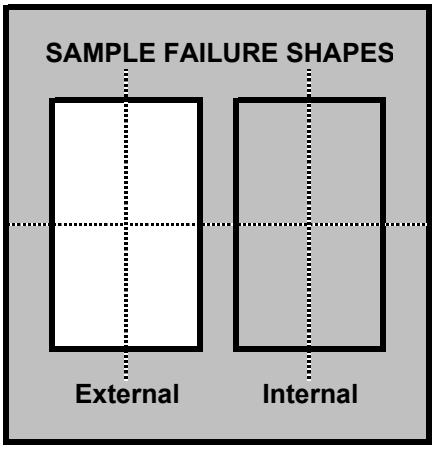
Tested in accordance with "ISRM Suggested Methods"

SUMMARY OF MOISTURE CONTENT AND DENSITY TEST RESULTS

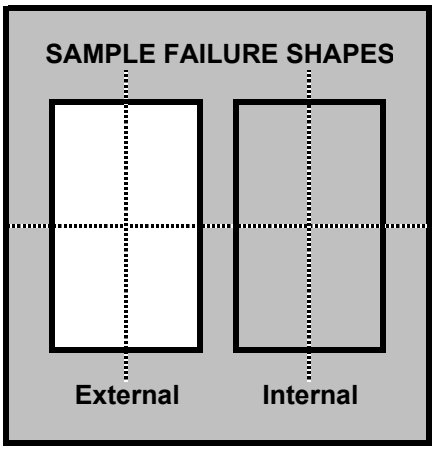
BOREHOLE		**BH30**
SAMPLE		**C1**
DEPTH	m	**6.35**
SAMPLE DIAMETER	mm	**101.65**
SAMPLE HEIGHT	mm	**203.28**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.8**
TEST DURATION	min.sec	**6.04**
DATE OF TESTING		**03/05/2017**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**276.9**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**34.1**
WATER CONTENT (ISRM Suggested Methods)	%	**1.1**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.60**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.58**



BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	



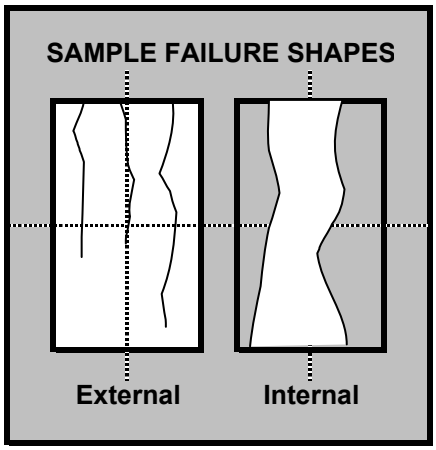
BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	



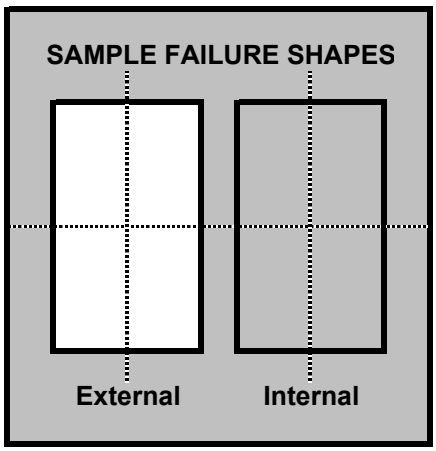
Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

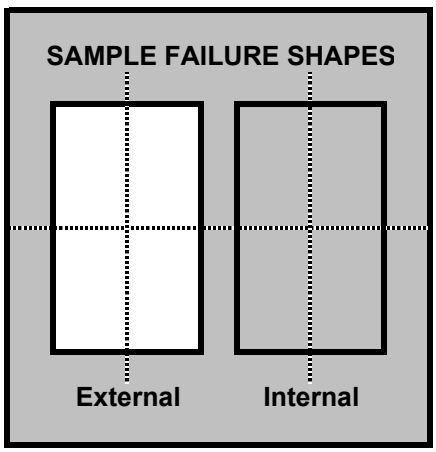
BOREHOLE		**BH31**
SAMPLE		**C1**
DEPTH	m	**6.30**
SAMPLE DIAMETER	mm	**101.34**
SAMPLE HEIGHT	mm	**203.50**
TEST CONDITION		**As Received**
RATE OF LOADING	kN/s	**0.9**
TEST DURATION	min.sec	**4.40**
DATE OF TESTING		**03/05/2017**
LOAD FRAME USED		**2000kN**
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		**Unknown**
FAILURE LOAD	kN	**244.9**
UNCONFINED COMPRESSIVE STRENGTH	MPa	**30.4**
WATER CONTENT (ISRM Suggested Methods)	%	**0.6**
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.68**
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	**2.66**



BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	



BOREHOLE		
SAMPLE		
DEPTH	m	
SAMPLE DIAMETER	mm	
SAMPLE HEIGHT	mm	
TEST CONDITION		
RATE OF LOADING	kN/s	
TEST DURATION	min.sec	
DATE OF TESTING		
LOAD FRAME USED		
LOAD DIRECTION WITH RESPECT TO LITHOLOGY		
FAILURE LOAD	kN	
UNCONFINED COMPRESSIVE STRENGTH	MPa	
WATER CONTENT (ISRM Suggested Methods)	%	
BULK DENSITY (ISRM Suggested Methods)	Mg/m^3	
DRY DENSITY (ISRM Suggested Methods)	Mg/m^3	



Tested in accordance with ASTM D7012 - 14

SUMMARY OF UNCONFINED COMPRESSIVE STRENGTH

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH30	C2	9.80	As Received	D	101.47	101.47	101.47	7.08	0.69	0.95
	C3	15.20	As Received	A	101.18	85.39	56.60	7.63	1.05	1.33
	C4	21.40	As Received	A	101.20	72.29	40.56	10.83	2.07	2.45

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	1.89
Mean Is(50) - Diametrical tests	0.95
Ia(50)	2.00

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

MATtest Limited
materials testing & consultancy

BOREHOLE	SAMPLE	DEPTH (m)	MOISTURE CONTENT (%)	TYPE OF TEST * (see below)	CORE DIAMETER (mm)	EQUIVALENT DIAMETER (mm)	PLATEN SEPARATION (mm)	FAILURE LOAD (kN)	Is (MPa)	Is(50) (MPa)
BH31	C2	6.13	As Received	A	101.57	55.60	23.90	2.40	0.78	0.81
	C3	6.57	As Received	D	101.69	101.69	101.69	8.51	0.82	1.13
	C4	6.62	As Received	A	101.30	67.15	34.96	7.98	1.77	2.02
	C5	6.67	As Received	D	101.83	101.83	101.83	27.03	2.61	3.59
	C6	6.78	As Received	A	101.37	69.38	37.29	10.01	2.08	2.41
	C7	7.00	As Received	D	101.72	101.72	101.72	13.82	1.34	1.84
	C8	7.25	As Received	A	101.28	49.60	19.08	6.31	2.56	2.56
	C9	7.40	As Received	D	101.57	101.57	101.57	1.83	0.18	0.24
	C10	7.50	As Received	A	101.29	70.13	38.14	9.02	1.83	2.14
	C11	7.56	As Received	D	101.74	101.74	101.74	3.48	0.34	0.46
	C13	10.40	As Received	A	101.52	68.41	36.21	7.32	1.56	1.80
	C14	16.40	As Received	D	101.60	101.60	101.60	24.58	2.38	3.28
	C15	21.13	As Received	A	101.32	67.87	35.71	11.23	2.44	2.80

NOTE: N/M - Not measured
NOTE: A dash (-) signifies that scale did not register a reading

* I = IRREGULAR TEST
D = DIAMETRAL TEST
A = AXIAL TEST

Mean Is(50) - Axial tests	2.08
Mean Is(50) - Diametrical tests	1.76
Ia(50)	1.18

Tested in accordance with ISRM Standard, "Suggested Method for determining Point Load Strength"

SUMMARY OF POINT LOAD TEST RESULTS

Certificate of Analysis

Certificate Number 17-97370

24-Apr-17

Client MATTest Ltd.
10 Queenslie Point
120 Stepps Road
Glasgow
G33 3NQ

Our Reference 17-97370

Client Reference 17/384

Order No MATSC1228

Contract Title A4 - Enniskillen Southern Bypass

Description 10 Soil samples.

Date Received Wednesday, April 19, 2017

Date Started Wednesday, April 19, 2017

Date Completed Monday, April 24, 2017

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 17-97370
Client Ref 17/384
Contract Title A4 - Enniskillen Southern Bypass

			Lab No	1160420	1160421	1160422	1160423	1160424	1160425	1160426	1160427	1160428	1160429
			Sample ID	BH02	BH03	BH03	BH04	BH05	BH28	BH29	BH33	BH34	BH35
			Depth	11.30	16.60	20.50	12.60	17.00	5.00	9.20	17.73	7.85	8.35
			Other ID										
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	30-Mar-17	30-Mar-17	30-Mar-17	30-Mar-17	30-Mar-17	30-Mar-17	30-Mar-17	30-Mar-17	30-Mar-17	30-Mar-17
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**										
Inorganics													
pH	DETSC 2008#			9.8	9.3	9.1	9.1	9.0	9.0	8.2	8.7	8.7	8.2
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	130	81	340	81	86	110	48	78	96	68
Sulphur as S, Total	DETSC 2320	0.01	%	1.2	0.11	0.96	0.48	0.79	0.29	0.16	0.73	0.37	0.36
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.14	2.0	0.18	0.07	0.10	0.14	0.07	0.13	0.14	0.10

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-97370
Client Ref 17/384
Contract A4 - Enniskillen Southern Bypass

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1160420	BH02 11.30 SOIL	30-03-17	PT 1L	pH + Conductivity (7 days)	
1160421	BH03 16.60 SOIL	30-03-17	PT 1L	pH + Conductivity (7 days)	
1160422	BH03 20.50 SOIL	30-03-17	PT 1L	pH + Conductivity (7 days)	
1160423	BH04 12.60 SOIL	30-03-17	PT 1L	pH + Conductivity (7 days)	
1160424	BH05 17.00 SOIL	30-03-17	PT 1L	pH + Conductivity (7 days)	
1160425	BH28 5.00 SOIL	30-03-17	PT 1L	pH + Conductivity (7 days)	
1160426	BH29 9.20 SOIL	30-03-17	PT 1L	pH + Conductivity (7 days)	
1160427	BH33 17.73 SOIL	30-03-17	PT 1L	pH + Conductivity (7 days)	
1160428	BH34 7.85 SOIL	30-03-17	PT 1L	pH + Conductivity (7 days)	
1160429	BH35 8.35 SOIL	30-03-17	PT 1L	pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Certificate of Analysis

Certificate Number 17-98175

03-May-17

Client MATTest Ltd.
10 Queenslie Point
120 Stepps Road
Glasgow
G33 3NQ

Our Reference 17-98175

Client Reference 17/384-02

Order No MATS1239

Contract Title A4 - Enniskillen Southern Bypass

Description One Soil sample.

Date Received Thursday, April 27, 2017

Date Started Thursday, April 27, 2017

Date Completed Wednesday, May 3, 2017

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Adam Fenwick
Contracts Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 17-98175
Client Ref 17/384-02
Contract Title A4 - Enniskillen Southern Bypass

Lab No	1164767
Sample ID	BH31
Depth	7.63
Other ID	12
Sample Type	C
Sampling Date	n/s
Sampling Time	n/s

Test	Method	LOD	Units	
Inorganics				
pH	DETSC 2008#			8.8
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	120
Sulphur as S, Total	DETSC 2320	0.01	%	0.70
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.15

Key: # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Information in Support of the Analytical Results

Our Ref 17-98175
Client Ref 17/384-02
Contract A4 - Enniskillen Southern Bypass

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1164767	BH31 7.63 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Appendix G
Environmental laboratory test results

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

Final Report

Report No.: 16-26853-1

Initial Date of Issue: 18-Nov-2016

Client Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Andy Garne
Brian Mooney
Colm Hurley
Darren O'Mahony
Ian Holley
Lucy Peaker
Mark Nyhan
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Franey
Stephen Watson

Project 16-1088 - A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	04-Nov-2016
Order No.:		**Date Instructed:**	14-Nov-2016
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	18-Nov-2016
Date Approved:	18-Nov-2016		

Approved By:

Details: Robert Monk, Technical Development Chemist

Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd				**Chemtest Job No.:**	16-26853
Quotation No.: Q16-07870				**Chemtest Sample ID.:**	374455
Order No.:				Client Location ID.:	BH04
				Client Sample Ref.:	ES2
				Sample Type:	SOIL
				Top Depth (m):	1.00
				Date Sampled:	02-Nov-2016
				Asbestos Lab:	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type	U	2192		N/A	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected
Moisture	N	2030	%	0.020	35
pH	U	2010		N/A	7.3
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50
Iron (Total)	N	2430	mg/kg	100	23000
Arsenic	U	2450	mg/kg	1.0	11
Cadmium	U	2450	mg/kg	0.10	0.60
Chromium	U	2450	mg/kg	1.0	36
Copper	U	2450	mg/kg	0.50	13
Mercury	U	2450	mg/kg	0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	40
Lead	U	2450	mg/kg	0.50	19
Selenium	U	2450	mg/kg	0.20	1.2
Vanadium	U	2450	mg/kg	5.0	34
Zinc	U	2450	mg/kg	0.50	65
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50
Organic Matter	U	2625	%	0.40	2.2
Naphthalene	N	2700	mg/kg	0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20	< 0.20

Chemtest
The right chemistry to deliver results

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

Final Report

Report No.: 16-27167-1

Initial Date of Issue: 18-Nov-2016

Client Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Andy Garne
Brian Mooney
Colm Hurley
Darren O'Mahony
Ian Holley
Lucy Peaker
Mark Nyhan
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Franey
Stephen Watson

Project 16-1088 - A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	08-Nov-2016
Order No.:		**Date Instructed:**	14-Nov-2016
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	18-Nov-2016
Date Approved:	18-Nov-2016		

Approved By:

Details: Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd		**Chemtest Job No.:**			16-27167	16-27167
Quotation No.: Q16-07870		**Chemtest Sample ID.:**			375753	375760
Order No.:		Client Location ID.:			BH07	BH09
		Client Sample Ref.:			ES11	ES7
		Sample Type:			SOIL	SOIL
		Top Depth (m):			3.20	2.20
		Date Sampled:			03-Nov-2016	03-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
pH	U	1010		N/A	7.4	8.5
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	< 1.0	1.7
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	2.2	1.9
Copper (Dissolved)	U	1450	µg/l	1.0	< 1.0	1.9
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50	0.79
Nickel (Dissolved)	U	1450	µg/l	1.0	< 1.0	2.3
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0	5.5
Vanadium (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Zinc (Dissolved)	U	1450	µg/l	1.0	9.3	6.9
Iron (Dissolved)	N	1450	µg/l	20	69	120
Chromium (Hexavalent)	U	1490	µg/l	20	[B] < 20	[B] < 20
Total Organic Carbon	U	1610	mg/l	2.0	8.9	15
Naphthalene	N	1700	µg/l	0.010	< 0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-27167	16-27167	16-27167
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	375753	375757	375760
Order No.:					Client Location ID.:	BH07	BH08	BH09
					Client Sample Ref.:	ES11	ES3	ES7
					Sample Type:	SOIL	SOIL	SOIL
					Top Depth (m):	3.20	1.00	2.20
					Date Sampled:	03-Nov-2016	03-Nov-2016	03-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A		-	-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020		41	34	17
pH	U	2010		N/A		8.3	7.8	8.5
Cyanide (Free)	U	2300	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Iron (Total)	N	2430	mg/kg	100		15000	20000	13000
Arsenic	U	2450	mg/kg	1.0		19	12	19
Cadmium	U	2450	mg/kg	0.10		0.79	0.68	0.27
Chromium	U	2450	mg/kg	1.0		33	45	24
Copper	U	2450	mg/kg	0.50		29	33	17
Mercury	U	2450	mg/kg	0.10		< 0.10	0.10	< 0.10
Nickel	U	2450	mg/kg	0.50		61	69	38
Lead	U	2450	mg/kg	0.50		19	20	11
Selenium	U	2450	mg/kg	0.20		0.86	0.59	< 0.20
Vanadium	U	2450	mg/kg	5.0		34	38	22
Zinc	U	2450	mg/kg	0.50		62	71	36
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40		4.0	2.9	3.1
Naphthalene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20		< 0.20	< 0.20	< 0.20

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample ID:	Sample Location ID:	Sample Ref:	Sampled Date:	Deviation Code(s):	Containers Received:
375753	BH07	ES11	03-Nov-2016	B	Amber Glass 250ml
375753	BH07	ES11	03-Nov-2016	B	Amber Glass 60ml
375753	BH07	ES11	03-Nov-2016	B	Plastic Tub 500g
375760	BH09	ES7	03-Nov-2016	B	Amber Glass 250ml
375760	BH09	ES7	03-Nov-2016	B	Amber Glass 60ml
375760	BH09	ES7	03-Nov-2016	B	Plastic Tub 500g

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
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CB8 0AL
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UKAS TESTING
2183

Final Report

Report No.: 16-27286-1

Initial Date of Issue: 18-Nov-2016

Client Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Andy Garne
Brian Mooney
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Lucy Peaker
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Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Franey
Stephen Watson

Project 16-1088 - A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	09-Nov-2016
Order No.:		**Date Instructed:**	14-Nov-2016
No. of Samples:	2		
Turnaround (Wkdays):	5	**Results Due:**	18-Nov-2016
Date Approved:	18-Nov-2016		

Approved By:

Details: Martin Dyer, Laboratory Manager

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Results - Leachate

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd		**Chemtest Job No.:**			16-27286	16-27286
Quotation No.: Q16-07870		**Chemtest Sample ID.:**			376289	376291
Order No.:		Client Location ID.:			BH16	BH18
		Client Sample Ref.:			ES7	ES2
		Sample Type:			SOIL	SOIL
		Top Depth (m):			3.20	0.50
		Date Sampled:			07-Nov-2016	07-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
pH	U	1010		N/A	8.6	8.0
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	9.4	1.3
Cadmium (Dissolved)	U	1450	µg/l	0.080	0.87	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	4.5	1.6
Copper (Dissolved)	U	1450	µg/l	1.0	28	1.7
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	3.6	1.1
Lead (Dissolved)	U	1450	µg/l	1.0	76	1.2
Selenium (Dissolved)	U	1450	µg/l	1.0	1.1	2.1
Vanadium (Dissolved)	U	1450	µg/l	1.0	6.3	1.1
Zinc (Dissolved)	U	1450	µg/l	1.0	670	5.5
Iron (Dissolved)	N	1450	µg/l	20	1500	75
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	39	16
Naphthalene	N	1700	µg/l	0.010	< 0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20	< 0.20

Chemtest
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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27286	16-27286
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		376289	376291
Order No.:			Client Location ID.:		BH16	BH18
			Client Sample Ref.:		ES7	ES2
			Sample Type:		SOIL	SOIL
			Top Depth (m):		3.20	0.50
			Date Sampled:		07-Nov-2016	07-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	11	52
pH	U	2010		N/A	8.7	7.4
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	U	2325	mg/kg	0.50	15	3.7
Iron (Total)	N	2430	mg/kg	100	14000	18000
Sulphate (Total)	U	2430	mg/kg	100	13000	5000
Arsenic	U	2450	mg/kg	1.0	19	10
Cadmium	U	2450	mg/kg	0.10	0.22	0.96
Chromium	U	2450	mg/kg	1.0	28	42
Copper	U	2450	mg/kg	0.50	25	42
Mercury	U	2450	mg/kg	0.10	< 0.10	0.17
Nickel	U	2450	mg/kg	0.50	48	48
Lead	U	2450	mg/kg	0.50	17	36
Selenium	U	2450	mg/kg	0.20	< 0.20	2.7
Vanadium	U	2450	mg/kg	5.0	26	46
Zinc	U	2450	mg/kg	0.50	43	71
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	1.6	14
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	< 1.0

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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-27286	16-27286
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	376289	376291
Order No.:					Client Location ID.:	BH16	BH18
					Client Sample Ref.:	ES7	ES2
					Sample Type:	SOIL	SOIL
					Top Depth (m):	3.20	0.50
					Date Sampled:	07-Nov-2016	07-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10		< 10	< 10
Naphthalene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20		< 0.20	< 0.20
Dichlorodifluoromethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
Chloromethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
Vinyl Chloride	U	2760	µg/kg	1.0		< 1.0	< 1.0
Bromomethane	U	2760	µg/kg	20		< 20	< 20
Chloroethane	U	2760	µg/kg	2.0		< 2.0	< 2.0
Trichlorofluoromethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
1,1-Dichloroethene	U	2760	µg/kg	1.0		< 1.0	< 1.0
Trans 1,2-Dichloroethene	U	2760	µg/kg	1.0		< 1.0	< 1.0
1,1-Dichloroethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
cis 1,2-Dichloroethene	U	2760	µg/kg	1.0		< 1.0	< 1.0
Bromochloromethane	U	2760	µg/kg	5.0		< 5.0	< 5.0
Trichloromethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
1,1,1-Trichloroethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
Tetrachloromethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
1,1-Dichloropropene	U	2760	µg/kg	1.0		< 1.0	< 1.0
Benzene	U	2760	µg/kg	1.0		< 1.0	< 1.0
1,2-Dichloroethane	U	2760	µg/kg	2.0		< 2.0	< 2.0
Trichloroethene	N	2760	µg/kg	1.0		< 1.0	< 1.0

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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27286	16-27286
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		376289	376291
Order No.:			Client Location ID.:		BH16	BH18
			Client Sample Ref.:		ES7	ES2
			Sample Type:		SOIL	SOIL
			Top Depth (m):		3.20	0.50
			Date Sampled:		07-Nov-2016	07-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
1,2-Dichloropropane	U	2760	µg/kg	1.0	< 1.0	< 1.0
Dibromomethane	U	2760	µg/kg	1.0	< 1.0	< 1.0
Bromodichloromethane	U	2760	µg/kg	5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10	< 10
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10	< 10
1,1,2-Trichloroethane	U	2760	µg/kg	10	< 10	< 10
Tetrachloroethene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0	< 2.0
Dibromochloromethane	U	2760	µg/kg	10	< 10	< 10
1,2-Dibromoethane	U	2760	µg/kg	5.0	< 5.0	< 5.0
Chlorobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	U	2760	µg/kg	2.0	< 2.0	< 2.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Styrene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Tribromomethane	U	2760	µg/kg	1.0	< 1.0	< 1.0
Isopropylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Bromobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50	< 50
N-Propylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
2-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Sec-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
N-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50	< 50
1,2,4-Trichlorobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Hexachlorobutadiene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0

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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-27286	16-27286
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	376289	376291
Order No.:					Client Location ID.:	BH16	BH18
					Client Sample Ref.:	ES7	ES2
					Sample Type:	SOIL	SOIL
					Top Depth (m):	3.20	0.50
					Date Sampled:	07-Nov-2016	07-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
N-Nitrosodimethylamine	N	2790	mg/kg	0.50		< 0.50	< 0.50
Phenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Chlorophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.50		< 0.50	< 0.50
1,3-Dichlorobenzene	N	2790	mg/kg	0.50		< 0.50	< 0.50
1,4-Dichlorobenzene	N	2790	mg/kg	0.50		< 0.50	< 0.50
1,2-Dichlorobenzene	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Methylphenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.50		< 0.50	< 0.50
Hexachloroethane	N	2790	mg/kg	0.50		< 0.50	< 0.50
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.50		< 0.50	< 0.50
4-Methylphenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
Nitrobenzene	N	2790	mg/kg	0.50		< 0.50	< 0.50
Isophorone	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Nitrophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,4-Dimethylphenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,4-Dichlorophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.50		< 0.50	< 0.50
Naphthalene	N	2790	mg/kg	0.50		< 0.50	< 0.50
4-Chloroaniline	N	2790	mg/kg	0.50		< 0.50	< 0.50
Hexachlorobutadiene	N	2790	mg/kg	0.50		< 0.50	< 0.50
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Methylnaphthalene	N	2790	mg/kg	0.50		< 0.50	< 0.50
4-Nitrophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,4,6-Trichlorophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,4,5-Trichlorophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Chloronaphthalene	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Nitroaniline	N	2790	mg/kg	0.50		< 0.50	< 0.50
Acenaphthylene	N	2790	mg/kg	0.50		< 0.50	< 0.50
Dimethylphthalate	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,6-Dinitrotoluene	N	2790	mg/kg	0.50		< 0.50	< 0.50
Acenaphthene	N	2790	mg/kg	0.50		< 0.50	< 0.50
3-Nitroaniline	N	2790	mg/kg	0.50		< 0.50	< 0.50
Dibenzofuran	N	2790	mg/kg	0.50		< 0.50	< 0.50
4-Chlorophenylphenylether	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,4-Dinitrotoluene	N	2790	mg/kg	0.50		< 0.50	< 0.50

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27286	16-27286
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		376289	376291
Order No.:			Client Location ID.:		BH16	BH18
			Client Sample Ref.:		ES7	ES2
			Sample Type:		SOIL	SOIL
			Top Depth (m):		3.20	0.50
			Date Sampled:		07-Nov-2016	07-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Fluorene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Diethyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Nitroaniline	N	2790	mg/kg	0.50	< 0.50	< 0.50
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Azobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.50	< 0.50	< 0.50
Hexachlorobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Phenanthrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Anthracene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Carbazole	N	2790	mg/kg	0.50	< 0.50	< 0.50
Di-N-Butyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Fluoranthene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Pyrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Butylbenzyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[a]anthracene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Chrysene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Di-N-Octyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[b]fluoranthene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[k]fluoranthene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[a]pyrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[g,h,i]perylene	N	2790	mg/kg	0.50	< 0.50	< 0.50
PCB 101	U	2815	mg/kg	0.010	< 0.010	< 0.010

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

Final Report

Report No.: 16-27404-1

Initial Date of Issue: 18-Nov-2016

Client Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Andy Garne
Brian Mooney
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Lucy Peaker
Mark Nyhan
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Franey
Stephen Watson

Project 16-1088 - A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	10-Nov-2016
Order No.:		**Date Instructed:**	14-Nov-2016
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	18-Nov-2016
Date Approved:	18-Nov-2016		

Approved By:

Details: Martin Dyer, Laboratory Manager

Chemtest
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Results - Leachate

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-27404	16-27404	16-27404
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	376840	376843	376844
Order No.:					Client Location ID.:	BH14	BH15	BH19
					Client Sample Ref.:	ES1	ES3	ES1
					Sample Type:	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.60	0.50
					Date Sampled:	08-Nov-2016	08-Nov-2016	08-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
pH	U	1010		N/A		7.8	8.6	8.1
Cyanide (Total)	U	1300	mg/l	0.050		< 0.050	< 0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050		< 0.050	< 0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0		4.9	1.7	< 1.0
Cadmium (Dissolved)	U	1450	µg/l	0.080		< 0.080	0.35	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0		7.3	< 1.0	< 1.0
Copper (Dissolved)	U	1450	µg/l	1.0		8.4	2.2	2.1
Mercury (Dissolved)	U	1450	µg/l	0.50		< 0.50	0.79	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0		9.8	< 1.0	< 1.0
Lead (Dissolved)	U	1450	µg/l	1.0		2.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0		1.8	5.2	1.9
Vanadium (Dissolved)	U	1450	µg/l	1.0		11	< 1.0	< 1.0
Zinc (Dissolved)	U	1450	µg/l	1.0		17	1.1	< 1.0
Iron (Dissolved)	N	1450	µg/l	20		180	310	300
Chromium (Hexavalent)	U	1490	µg/l	20		< 20	< 20	< 20
Total Organic Carbon	U	1610	mg/l	2.0		54	16	11
Naphthalene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Fluorene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Anthracene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Pyrene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Chrysene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010		< 0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20		< 0.20	< 0.20	< 0.20

Chemtest
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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-27404	16-27404	16-27404
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	376840	376843	376844
Order No.:					Client Location ID.:	BH14	BH15	BH19
					Client Sample Ref.:	ES1	ES3	ES1
					Sample Type:	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.60	0.50
					Date Sampled:	08-Nov-2016	08-Nov-2016	08-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A		-	-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020		13	14	20
pH	U	2010		N/A		8.5	8.5	8.2
Cyanide (Free)	U	2300	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	U	2325	mg/kg	0.50		7.1		11
Iron (Total)	N	2430	mg/kg	100		9500	14000	16000
Sulphate (Total)	U	2430	mg/kg	100		1000		860
Arsenic	U	2450	mg/kg	1.0		15	17	14
Cadmium	U	2450	mg/kg	0.10		0.16	0.21	0.31
Chromium	U	2450	mg/kg	1.0		13	26	33
Copper	U	2450	mg/kg	0.50		9.8	18	20
Mercury	U	2450	mg/kg	0.10		< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50		24	42	51
Lead	U	2450	mg/kg	0.50		8.2	12	20
Selenium	U	2450	mg/kg	0.20		< 0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0		11	20	27
Zinc	U	2450	mg/kg	0.50		23	36	51
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40		1.4	3.5	1.2
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		< 1.0		< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		< 1.0		< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0		< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0		< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0		< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0		< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0		< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0		< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0		< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		< 1.0		< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		< 1.0		< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0		< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0		< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0		< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0		< 1.0
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0		< 1.0		< 1.0

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-27404	16-27404	16-27404
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	376840	376843	376844
Order No.:					Client Location ID.:	BH14	BH15	BH19
					Client Sample Ref.:	ES1	ES3	ES1
					Sample Type:	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	1.60	0.50
					Date Sampled:	08-Nov-2016	08-Nov-2016	08-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0		< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0		< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10		< 10		< 10
Naphthalene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010		< 0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20		< 0.20	< 0.20	< 0.20
Dichlorodifluoromethane	U	2760	µg/kg	1.0		< 1.0		< 1.0
Chloromethane	U	2760	µg/kg	1.0		< 1.0		< 1.0
Vinyl Chloride	U	2760	µg/kg	1.0		< 1.0		< 1.0
Bromomethane	U	2760	µg/kg	20		< 20		< 20
Chloroethane	U	2760	µg/kg	2.0		< 2.0		< 2.0
Trichlorofluoromethane	U	2760	µg/kg	1.0		< 1.0		< 1.0
1,1-Dichloroethene	U	2760	µg/kg	1.0		< 1.0		< 1.0
Trans 1,2-Dichloroethene	U	2760	µg/kg	1.0		< 1.0		< 1.0
1,1-Dichloroethane	U	2760	µg/kg	1.0		< 1.0		< 1.0
cis 1,2-Dichloroethene	U	2760	µg/kg	1.0		< 1.0		< 1.0
Bromochloromethane	U	2760	µg/kg	5.0		< 5.0		< 5.0
Trichloromethane	U	2760	µg/kg	1.0		< 1.0		< 1.0
1,1,1-Trichloroethane	U	2760	µg/kg	1.0		< 1.0		< 1.0
Tetrachloromethane	U	2760	µg/kg	1.0		< 1.0		< 1.0
1,1-Dichloropropene	U	2760	µg/kg	1.0		< 1.0		< 1.0
Benzene	U	2760	µg/kg	1.0		< 1.0		< 1.0
1,2-Dichloroethane	U	2760	µg/kg	2.0		< 2.0		< 2.0
Trichloroethene	N	2760	µg/kg	1.0		< 1.0		< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27404	16-27404	16-27404
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		376840	376843	376844
Order No.:			Client Location ID.:		BH14	BH15	BH19
			Client Sample Ref.:		ES1	ES3	ES1
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.50	1.60	0.50
			Date Sampled:		08-Nov-2016	08-Nov-2016	08-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
1,2-Dichloropropane	U	2760	µg/kg	1.0	< 1.0		< 1.0
Dibromomethane	U	2760	µg/kg	1.0	< 1.0		< 1.0
Bromodichloromethane	U	2760	µg/kg	5.0	< 5.0		< 5.0
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10		< 10
Toluene	U	2760	µg/kg	1.0	< 1.0		< 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10		< 10
1,1,2-Trichloroethane	U	2760	µg/kg	10	< 10		< 10
Tetrachloroethene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0		< 2.0
Dibromochloromethane	U	2760	µg/kg	10	< 10		< 10
1,2-Dibromoethane	U	2760	µg/kg	5.0	< 5.0		< 5.0
Chlorobenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,1,1,2-Tetrachloroethane	U	2760	µg/kg	2.0	< 2.0		< 2.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0		< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0		< 1.0
Styrene	U	2760	µg/kg	1.0	< 1.0		< 1.0
Tribromomethane	U	2760	µg/kg	1.0	< 1.0		< 1.0
Isopropylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
Bromobenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50		< 50
N-Propylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
2-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,3,5-Trimethylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0		< 1.0
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,2,4-Trimethylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
Sec-Butylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,3-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,4-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
N-Butylbenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,2-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50		< 50
1,2,4-Trichlorobenzene	U	2760	µg/kg	1.0	< 1.0		< 1.0
Hexachlorobutadiene	U	2760	µg/kg	1.0	< 1.0		< 1.0
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0		< 2.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0		< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27404	16-27404	16-27404
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		376840	376843	376844
Order No.:			Client Location ID.:		BH14	BH15	BH19
			Client Sample Ref.:		ES1	ES3	ES1
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.50	1.60	0.50
			Date Sampled:		08-Nov-2016	08-Nov-2016	08-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
N-Nitrosodimethylamine	N	2790	mg/kg	0.50	< 0.50		< 0.50
Phenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
2-Chlorophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.50	< 0.50		< 0.50
1,3-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50		< 0.50
1,4-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50		< 0.50
1,2-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50		< 0.50
2-Methylphenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.50	< 0.50		< 0.50
Hexachloroethane	N	2790	mg/kg	0.50	< 0.50		< 0.50
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.50	< 0.50		< 0.50
4-Methylphenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Nitrobenzene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Isophorone	N	2790	mg/kg	0.50	< 0.50		< 0.50
2-Nitrophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
2,4-Dimethylphenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.50	< 0.50		< 0.50
2,4-Dichlorophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Naphthalene	N	2790	mg/kg	0.50	< 0.50		< 0.50
4-Chloroaniline	N	2790	mg/kg	0.50	< 0.50		< 0.50
Hexachlorobutadiene	N	2790	mg/kg	0.50	< 0.50		< 0.50
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
2-Methylnaphthalene	N	2790	mg/kg	0.50	< 0.50		< 0.50
4-Nitrophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50	< 0.50		< 0.50
2,4,6-Trichlorophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
2,4,5-Trichlorophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
2-Chloronaphthalene	N	2790	mg/kg	0.50	< 0.50		< 0.50
2-Nitroaniline	N	2790	mg/kg	0.50	< 0.50		< 0.50
Acenaphthylene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Dimethylphthalate	N	2790	mg/kg	0.50	< 0.50		< 0.50
2,6-Dinitrotoluene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Acenaphthene	N	2790	mg/kg	0.50	< 0.50		< 0.50
3-Nitroaniline	N	2790	mg/kg	0.50	< 0.50		< 0.50
Dibenzofuran	N	2790	mg/kg	0.50	< 0.50		< 0.50
4-Chlorophenylphenylether	N	2790	mg/kg	0.50	< 0.50		< 0.50
2,4-Dinitrotoluene	N	2790	mg/kg	0.50	< 0.50		< 0.50

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27404	16-27404	16-27404
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		376840	376843	376844
Order No.:			Client Location ID.:		BH14	BH15	BH19
			Client Sample Ref.:		ES1	ES3	ES1
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.50	1.60	0.50
			Date Sampled:		08-Nov-2016	08-Nov-2016	08-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Fluorene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Diethyl Phthalate	N	2790	mg/kg	0.50	< 0.50		< 0.50
4-Nitroaniline	N	2790	mg/kg	0.50	< 0.50		< 0.50
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Azobenzene	N	2790	mg/kg	0.50	< 0.50		< 0.50
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.50	< 0.50		< 0.50
Hexachlorobenzene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50		< 0.50
Phenanthrene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Anthracene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Carbazole	N	2790	mg/kg	0.50	< 0.50		< 0.50
Di-N-Butyl Phthalate	N	2790	mg/kg	0.50	< 0.50		< 0.50
Fluoranthene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Pyrene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Butylbenzyl Phthalate	N	2790	mg/kg	0.50	< 0.50		< 0.50
Benzo[a]anthracene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Chrysene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50		< 0.50
Di-N-Octyl Phthalate	N	2790	mg/kg	0.50	< 0.50		< 0.50
Benzo[b]fluoranthene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Benzo[k]fluoranthene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Benzo[a]pyrene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.50	< 0.50		< 0.50
Benzo[g,h,i]perylene	N	2790	mg/kg	0.50	< 0.50		< 0.50
PCB 101	U	2815	mg/kg	0.010	< 0.010		< 0.010

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
The right chemistry to deliver results
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Email: info@chemtest.co.uk

UKAS TESTING
2183

Final Report

Report No.: 16-27560-1

Initial Date of Issue: 18-Nov-2016

Client Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Andy Garne
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Stephen Franey
Stephen Watson

Project 16-1088 - A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	11-Nov-2016
Order No.:		**Date Instructed:**	14-Nov-2016
No. of Samples:	2		
Turnaround (Wkdays):	5	**Results Due:**	18-Nov-2016
Date Approved:	18-Nov-2016		

Approved By:

Details: Keith Jones, Technical Manager

Chemtest
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Results - Leachate

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd		**Chemtest Job No.:**			16-27560	16-27560
Quotation No.: Q16-07870		**Chemtest Sample ID.:**			377584	377586
Order No.:		Client Location ID.:			BH12	BH20
		Client Sample Ref.:			ES1	ES6
		Sample Type:			SOIL	SOIL
		Top Depth (m):			0.50	2.50
		Date Sampled:			09-Nov-2016	09-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
pH	U	1010		N/A	8.4	8.7
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	< 1.0	5.0
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	1.2	< 1.0
Copper (Dissolved)	U	1450	µg/l	1.0	1.6	2.9
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	< 1.0	1.8
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	1.4	3.9
Vanadium (Dissolved)	U	1450	µg/l	1.0	< 1.0	2.4
Zinc (Dissolved)	U	1450	µg/l	1.0	1.2	1.2
Iron (Dissolved)	N	1450	µg/l	20	240	100
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	17	30
Naphthalene	N	1700	µg/l	0.010	< 0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd				**Chemtest Job No.:**	16-27560	16-27560
Quotation No.: Q16-07870				**Chemtest Sample ID.:**	377584	377586
Order No.:				Client Location ID.:	BH12	BH20
				Client Sample Ref.:	ES1	ES6
				Sample Type:	SOIL	SOIL
				Top Depth (m):	0.50	2.50
				Date Sampled:	09-Nov-2016	09-Nov-2016
				Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	16	11
pH	U	2010		N/A	8.5	8.5
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	U	2325	mg/kg	0.50	9.4	36
Iron (Total)	N	2430	mg/kg	100	7000	13000
Sulphate (Total)	U	2430	mg/kg	100	1000	14000
Arsenic	U	2450	mg/kg	1.0	19	18
Cadmium	U	2450	mg/kg	0.10	0.34	0.23
Chromium	U	2450	mg/kg	1.0	9.6	29
Copper	U	2450	mg/kg	0.50	6.8	20
Mercury	U	2450	mg/kg	0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	14	42
Lead	U	2450	mg/kg	0.50	5.3	30
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	6.0	19
Zinc	U	2450	mg/kg	0.50	19	43
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	1.9	2.8
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	4.2	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	20	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	24	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0	24	< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-27560	16-27560
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	377584	377586
Order No.:					Client Location ID.:	BH12	BH20
					Client Sample Ref.:	ES1	ES6
					Sample Type:	SOIL	SOIL
					Top Depth (m):	0.50	2.50
					Date Sampled:	09-Nov-2016	09-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		24	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10		47	< 10
Naphthalene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20		< 0.20	< 0.20
Dichlorodifluoromethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
Chloromethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
Vinyl Chloride	U	2760	µg/kg	1.0		< 1.0	< 1.0
Bromomethane	U	2760	µg/kg	20		< 20	< 20
Chloroethane	U	2760	µg/kg	2.0		< 2.0	< 2.0
Trichlorofluoromethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
1,1-Dichloroethene	U	2760	µg/kg	1.0		< 1.0	< 1.0
Trans 1,2-Dichloroethene	U	2760	µg/kg	1.0		< 1.0	< 1.0
1,1-Dichloroethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
cis 1,2-Dichloroethene	U	2760	µg/kg	1.0		< 1.0	< 1.0
Bromochloromethane	U	2760	µg/kg	5.0		< 5.0	< 5.0
Trichloromethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
1,1,1-Trichloroethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
Tetrachloromethane	U	2760	µg/kg	1.0		< 1.0	< 1.0
1,1-Dichloropropene	U	2760	µg/kg	1.0		< 1.0	< 1.0
Benzene	U	2760	µg/kg	1.0		< 1.0	< 1.0
1,2-Dichloroethane	U	2760	µg/kg	2.0		< 2.0	< 2.0
Trichloroethene	N	2760	µg/kg	1.0		< 1.0	< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27560	16-27560
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		377584	377586
Order No.:			Client Location ID.:		BH12	BH20
			Client Sample Ref.:		ES1	ES6
			Sample Type:		SOIL	SOIL
			Top Depth (m):		0.50	2.50
			Date Sampled:		09-Nov-2016	09-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
1,2-Dichloropropane	U	2760	µg/kg	1.0	< 1.0	< 1.0
Dibromomethane	U	2760	µg/kg	1.0	< 1.0	< 1.0
Bromodichloromethane	U	2760	µg/kg	5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10	< 10
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10	< 10
1,1,2-Trichloroethane	U	2760	µg/kg	10	< 10	< 10
Tetrachloroethene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0	< 2.0
Dibromochloromethane	U	2760	µg/kg	10	< 10	< 10
1,2-Dibromoethane	U	2760	µg/kg	5.0	< 5.0	< 5.0
Chlorobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	U	2760	µg/kg	2.0	< 2.0	< 2.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	1.4
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Styrene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Tribromomethane	U	2760	µg/kg	1.0	< 1.0	< 1.0
Isopropylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Bromobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50	< 50
N-Propylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
2-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Sec-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
N-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50	< 50
1,2,4-Trichlorobenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Hexachlorobutadiene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-27560	16-27560
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	377584	377586
Order No.:					Client Location ID.:	BH12	BH20
					Client Sample Ref.:	ES1	ES6
					Sample Type:	SOIL	SOIL
					Top Depth (m):	0.50	2.50
					Date Sampled:	09-Nov-2016	09-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
N-Nitrosodimethylamine	N	2790	mg/kg	0.50		< 0.50	< 0.50
Phenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Chlorophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.50		< 0.50	< 0.50
1,3-Dichlorobenzene	N	2790	mg/kg	0.50		< 0.50	< 0.50
1,4-Dichlorobenzene	N	2790	mg/kg	0.50		< 0.50	< 0.50
1,2-Dichlorobenzene	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Methylphenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.50		< 0.50	< 0.50
Hexachloroethane	N	2790	mg/kg	0.50		< 0.50	< 0.50
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.50		< 0.50	< 0.50
4-Methylphenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
Nitrobenzene	N	2790	mg/kg	0.50		< 0.50	< 0.50
Isophorone	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Nitrophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,4-Dimethylphenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,4-Dichlorophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.50		< 0.50	< 0.50
Naphthalene	N	2790	mg/kg	0.50		< 0.50	< 0.50
4-Chloroaniline	N	2790	mg/kg	0.50		< 0.50	< 0.50
Hexachlorobutadiene	N	2790	mg/kg	0.50		< 0.50	< 0.50
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Methylnaphthalene	N	2790	mg/kg	0.50		< 0.50	< 0.50
4-Nitrophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,4,6-Trichlorophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,4,5-Trichlorophenol	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Chloronaphthalene	N	2790	mg/kg	0.50		< 0.50	< 0.50
2-Nitroaniline	N	2790	mg/kg	0.50		< 0.50	< 0.50
Acenaphthylene	N	2790	mg/kg	0.50		< 0.50	< 0.50
Dimethylphthalate	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,6-Dinitrotoluene	N	2790	mg/kg	0.50		< 0.50	< 0.50
Acenaphthene	N	2790	mg/kg	0.50		< 0.50	< 0.50
3-Nitroaniline	N	2790	mg/kg	0.50		< 0.50	< 0.50
Dibenzofuran	N	2790	mg/kg	0.50		< 0.50	< 0.50
4-Chlorophenylphenylether	N	2790	mg/kg	0.50		< 0.50	< 0.50
2,4-Dinitrotoluene	N	2790	mg/kg	0.50		< 0.50	< 0.50

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27560	16-27560
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		377584	377586
Order No.:			Client Location ID.:		BH12	BH20
			Client Sample Ref.:		ES1	ES6
			Sample Type:		SOIL	SOIL
			Top Depth (m):		0.50	2.50
			Date Sampled:		09-Nov-2016	09-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Fluorene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Diethyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Nitroaniline	N	2790	mg/kg	0.50	< 0.50	< 0.50
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Azobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.50	< 0.50	< 0.50
Hexachlorobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Phenanthrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Anthracene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Carbazole	N	2790	mg/kg	0.50	< 0.50	< 0.50
Di-N-Butyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Fluoranthene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Pyrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Butylbenzyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[a]anthracene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Chrysene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Di-N-Octyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[b]fluoranthene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[k]fluoranthene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[a]pyrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[g,h,i]perylene	N	2790	mg/kg	0.50	< 0.50	< 0.50
PCB 101	U	2815	mg/kg	0.010	< 0.010	< 0.010

Report Information

Key

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SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

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The right chemistry to deliver results
Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

Final Report

Report No.: 16-27795-1

Initial Date of Issue: 21-Nov-2016

Client Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Andy Garne
Brian Mooney
Colm Hurley
Darren O'Mahony
Ian Holley
Lucy Peaker
Mark Nyhan
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Franey
Stephen Watson

Project 16-1088 A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	15-Nov-2016
Order No.:		**Date Instructed:**	15-Nov-2016
No. of Samples:	3		
Turnaround (Wkdays):	5	**Results Due:**	21-Nov-2016
Date Approved:	21-Nov-2016		

Approved By:

Details: Martin Dyer, Laboratory Manager

Chemtest
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Results - Leachate

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27795
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		378495
Order No.:			Client Location ID.:		BH23
			Client Sample Ref.:		ES1
			Sample Type:		SOIL
			Top Depth (m):		0.5
			Date Sampled:		10-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
pH	U	1010		N/A	11.0
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	< 1.0
Cadmium (Dissolved)	U	1450	µg/l	0.080	0.083
Chromium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Copper (Dissolved)	U	1450	µg/l	1.0	1.2
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	< 1.0
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Vanadium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Zinc (Dissolved)	U	1450	µg/l	1.0	2.7
Iron (Dissolved)	N	1450	µg/l	20	160
Chromium (Hexavalent)	U	1490	µg/l	20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	13
Naphthalene	N	1700	µg/l	0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd				**Chemtest Job No.:**	16-27795	16-27795	16-27795
Quotation No.: Q16-07870				**Chemtest Sample ID.:**	378495	378497	378502
Order No.:				Client Location ID.:	BH23	BH39	BH26
				Client Sample Ref.:	ES1	ES1	ES1
				Sample Type:	SOIL	SOIL	SOIL
				Top Depth (m):	0.5	0.5	0.5
				Date Sampled:	10-Nov-2016	12-Nov-2016	13-Nov-2016
				Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	17	24	18
pH	U	2010		N/A	8.8	8.0	8.2
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Iron (Total)	N	2430	mg/kg	100	18000	22000	18000
Arsenic	U	2450	mg/kg	1.0	13	12	12
Cadmium	U	2450	mg/kg	0.10	0.22	0.56	0.24
Chromium	U	2450	mg/kg	1.0	36	50	42
Copper	U	2450	mg/kg	0.50	20	36	25
Mercury	U	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	49	85	62
Lead	U	2450	mg/kg	0.50	20	22	19
Selenium	U	2450	mg/kg	0.20	< 0.20	0.26	< 0.20
Vanadium	U	2450	mg/kg	5.0	31	43	37
Zinc	U	2450	mg/kg	0.50	52	78	56
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	1.3	0.97	1.3
Naphthalene	N	2700	mg/kg	0.010	0.61	2.6	1.9
Acenaphthylene	N	2700	mg/kg	0.010	0.050	0.19	0.11
Acenaphthene	N	2700	mg/kg	0.010	0.050	0.19	0.15
Fluorene	N	2700	mg/kg	0.010	0.040	0.24	0.13
Phenanthrene	N	2700	mg/kg	0.010	0.41	0.33	< 0.010
Anthracene	N	2700	mg/kg	0.010	0.070	0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010	0.64	< 0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010	0.75	< 0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010	0.12	< 0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010	0.19	< 0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20	2.9	3.6	2.3

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Report Information

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I/S	Insufficient Sample
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Sample Deviation Codes

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B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

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customerservices@chemtest.co.uk

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Chemtest Ltd.
Depot Road
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CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

UKAS TESTING
2183

Final Report

Report No.: 16-27855-1

Initial Date of Issue: 22-Nov-2016

Client Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Andy Garne
Brian Mooney
Colm Hurley
Darren O'Mahony
Ian Holley
Lucy Peaker
Mark Nyhan
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Franey
Stephen Watson

Project 16-1088 - A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	16-Nov-2016
Order No.:		**Date Instructed:**	16-Nov-2016
No. of Samples:	2		
Turnaround (Wkdays):	5	**Results Due:**	22-Nov-2016
Date Approved:	22-Nov-2016		

Approved By:

Details: Martin Dyer, Laboratory Manager

Chemtest
The right chemistry to deliver results

Results - Leachate

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27855
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		378873
Order No.:			Client Location ID.:		BH25
			Client Sample Ref.:		ES3
			Sample Type:		SOIL
			Top Depth (m):		1.0
			Date Sampled:		14-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
pH	U	1010		N/A	7.9
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	< 1.0
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	1.6
Copper (Dissolved)	U	1450	µg/l	1.0	1.8
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	1.0
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Vanadium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Zinc (Dissolved)	U	1450	µg/l	1.0	< 1.0
Iron (Dissolved)	N	1450	µg/l	20	260
Chromium (Hexavalent)	U	1490	µg/l	20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	12
Naphthalene	N	1700	µg/l	0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20

Chemtest
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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd				**Chemtest Job No.:**	16-27855	16-27855
Quotation No.: Q16-07870				**Chemtest Sample ID.:**	378873	378874
Order No.:				Client Location ID.:	BH25	BH25A
				Client Sample Ref.:	ES3	ES1
				Sample Type:	SOIL	SOIL
				Top Depth (m):	1.0	3.0
				Date Sampled:	14-Nov-2016	14-Nov-2016
				Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	24	15
pH	U	2010		N/A	7.6	8.0
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	U	2325	mg/kg	0.50	3.7	
Iron (Total)	N	2430	mg/kg	100	21000	17000
Sulphate (Total)	U	2430	mg/kg	100	1000	
Arsenic	U	2450	mg/kg	1.0	11	10
Cadmium	U	2450	mg/kg	0.10	0.34	0.25
Chromium	U	2450	mg/kg	1.0	56	48
Copper	U	2450	mg/kg	0.50	35	30
Mercury	U	2450	mg/kg	0.10	0.11	< 0.10
Nickel	U	2450	mg/kg	0.50	79	76
Lead	U	2450	mg/kg	0.50	21	18
Selenium	U	2450	mg/kg	0.20	0.44	0.23
Vanadium	U	2450	mg/kg	5.0	49	41
Zinc	U	2450	mg/kg	0.50	95	67
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	1.9	1.9
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C21-C35	N	2680	mg/kg	1.0	< 1.0	

Chemtest
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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27855	16-27855
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		378873	378874
Order No.:			Client Location ID.:		BH25	BH25A
			Client Sample Ref.:		ES3	ES1
			Sample Type:		SOIL	SOIL
			Top Depth (m):		1.0	3.0
			Date Sampled:		14-Nov-2016	14-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10	< 10	
Naphthalene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20	< 0.20	< 0.20
Dichlorodifluoromethane	U	2760	µg/kg	1.0	< 1.0	
Chloromethane	U	2760	µg/kg	1.0	< 1.0	
Vinyl Chloride	U	2760	µg/kg	1.0	< 1.0	
Bromomethane	U	2760	µg/kg	20	< 20	
Chloroethane	U	2760	µg/kg	2.0	< 2.0	
Trichlorofluoromethane	U	2760	µg/kg	1.0	< 1.0	
1,1-Dichloroethene	U	2760	µg/kg	1.0	< 1.0	
Trans 1,2-Dichloroethene	U	2760	µg/kg	1.0	< 1.0	
1,1-Dichloroethane	U	2760	µg/kg	1.0	< 1.0	
cis 1,2-Dichloroethene	U	2760	µg/kg	1.0	< 1.0	
Bromochloromethane	U	2760	µg/kg	5.0	< 5.0	
Trichloromethane	U	2760	µg/kg	1.0	< 1.0	
1,1,1-Trichloroethane	U	2760	µg/kg	1.0	< 1.0	
Tetrachloromethane	U	2760	µg/kg	1.0	< 1.0	
1,1-Dichloropropene	U	2760	µg/kg	1.0	< 1.0	
Benzene	U	2760	µg/kg	1.0	< 1.0	
1,2-Dichloroethane	U	2760	µg/kg	2.0	< 2.0	
Trichloroethene	N	2760	µg/kg	1.0	< 1.0	

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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27855	16-27855
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		378873	378874
Order No.:			Client Location ID.:		BH25	BH25A
			Client Sample Ref.:		ES3	ES1
			Sample Type:		SOIL	SOIL
			Top Depth (m):		1.0	3.0
			Date Sampled:		14-Nov-2016	14-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
1,2-Dichloropropane	U	2760	µg/kg	1.0	< 1.0	
Dibromomethane	U	2760	µg/kg	1.0	< 1.0	
Bromodichloromethane	U	2760	µg/kg	5.0	< 5.0	
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10	
Toluene	U	2760	µg/kg	1.0	< 1.0	
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10	
1,1,2-Trichloroethane	U	2760	µg/kg	10	< 10	
Tetrachloroethene	U	2760	µg/kg	1.0	< 1.0	
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0	
Dibromochloromethane	U	2760	µg/kg	10	< 10	
1,2-Dibromoethane	U	2760	µg/kg	5.0	< 5.0	
Chlorobenzene	U	2760	µg/kg	1.0	< 1.0	
1,1,1,2-Tetrachloroethane	U	2760	µg/kg	2.0	< 2.0	
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	
o-Xylene	U	2760	µg/kg	1.0	< 1.0	
Styrene	U	2760	µg/kg	1.0	< 1.0	
Tribromomethane	U	2760	µg/kg	1.0	< 1.0	
Isopropylbenzene	U	2760	µg/kg	1.0	< 1.0	
Bromobenzene	U	2760	µg/kg	1.0	< 1.0	
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50	
N-Propylbenzene	U	2760	µg/kg	1.0	< 1.0	
2-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0	
1,3,5-Trimethylbenzene	U	2760	µg/kg	1.0	< 1.0	
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0	
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	
1,2,4-Trimethylbenzene	U	2760	µg/kg	1.0	< 1.0	
Sec-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	
1,3-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0	
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0	
1,4-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0	
N-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	
1,2-Dichlorobenzene	U	2760	µg/kg	1.0	< 1.0	
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50	
1,2,4-Trichlorobenzene	U	2760	µg/kg	1.0	< 1.0	
Hexachlorobutadiene	U	2760	µg/kg	1.0	< 1.0	
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0	
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	

Chemtest
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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-27855	16-27855
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	378873	378874
Order No.:					Client Location ID.:	BH25	BH25A
					Client Sample Ref.:	ES3	ES1
					Sample Type:	SOIL	SOIL
					Top Depth (m):	1.0	3.0
					Date Sampled:	14-Nov-2016	14-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
N-Nitrosodimethylamine	N	2790	mg/kg	0.50		< 0.50	
Phenol	N	2790	mg/kg	0.50		< 0.50	
2-Chlorophenol	N	2790	mg/kg	0.50		< 0.50	
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.50		< 0.50	
1,3-Dichlorobenzene	N	2790	mg/kg	0.50		< 0.50	
1,4-Dichlorobenzene	N	2790	mg/kg	0.50		< 0.50	
1,2-Dichlorobenzene	N	2790	mg/kg	0.50		< 0.50	
2-Methylphenol	N	2790	mg/kg	0.50		< 0.50	
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.50		< 0.50	
Hexachloroethane	N	2790	mg/kg	0.50		< 0.50	
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.50		< 0.50	
4-Methylphenol	N	2790	mg/kg	0.50		< 0.50	
Nitrobenzene	N	2790	mg/kg	0.50		< 0.50	
Isophorone	N	2790	mg/kg	0.50		< 0.50	
2-Nitrophenol	N	2790	mg/kg	0.50		< 0.50	
2,4-Dimethylphenol	N	2790	mg/kg	0.50		< 0.50	
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.50		< 0.50	
2,4-Dichlorophenol	N	2790	mg/kg	0.50		< 0.50	
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.50		< 0.50	
Naphthalene	N	2790	mg/kg	0.50		< 0.50	
4-Chloroaniline	N	2790	mg/kg	0.50		< 0.50	
Hexachlorobutadiene	N	2790	mg/kg	0.50		< 0.50	
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.50		< 0.50	
2-Methylnaphthalene	N	2790	mg/kg	0.50		< 0.50	
4-Nitrophenol	N	2790	mg/kg	0.50		< 0.50	
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50		< 0.50	
2,4,6-Trichlorophenol	N	2790	mg/kg	0.50		< 0.50	
2,4,5-Trichlorophenol	N	2790	mg/kg	0.50		< 0.50	
2-Chloronaphthalene	N	2790	mg/kg	0.50		< 0.50	
2-Nitroaniline	N	2790	mg/kg	0.50		< 0.50	
Acenaphthylene	N	2790	mg/kg	0.50		< 0.50	
Dimethylphthalate	N	2790	mg/kg	0.50		< 0.50	
2,6-Dinitrotoluene	N	2790	mg/kg	0.50		< 0.50	
Acenaphthene	N	2790	mg/kg	0.50		< 0.50	
3-Nitroaniline	N	2790	mg/kg	0.50		< 0.50	
Dibenzofuran	N	2790	mg/kg	0.50		< 0.50	
4-Chlorophenylphenylether	N	2790	mg/kg	0.50		< 0.50	
2,4-Dinitrotoluene	N	2790	mg/kg	0.50		< 0.50	

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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-27855	16-27855
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		378873	378874
Order No.:			Client Location ID.:		BH25	BH25A
			Client Sample Ref.:		ES3	ES1
			Sample Type:		SOIL	SOIL
			Top Depth (m):		1.0	3.0
			Date Sampled:		14-Nov-2016	14-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Fluorene	N	2790	mg/kg	0.50	< 0.50	
Diethyl Phthalate	N	2790	mg/kg	0.50	< 0.50	
4-Nitroaniline	N	2790	mg/kg	0.50	< 0.50	
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50	
Azobenzene	N	2790	mg/kg	0.50	< 0.50	
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.50	< 0.50	
Hexachlorobenzene	N	2790	mg/kg	0.50	< 0.50	
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50	
Phenanthrene	N	2790	mg/kg	0.50	< 0.50	
Anthracene	N	2790	mg/kg	0.50	< 0.50	
Carbazole	N	2790	mg/kg	0.50	< 0.50	
Di-N-Butyl Phthalate	N	2790	mg/kg	0.50	< 0.50	
Fluoranthene	N	2790	mg/kg	0.50	< 0.50	
Pyrene	N	2790	mg/kg	0.50	< 0.50	
Butylbenzyl Phthalate	N	2790	mg/kg	0.50	< 0.50	
Benzo[a]anthracene	N	2790	mg/kg	0.50	< 0.50	
Chrysene	N	2790	mg/kg	0.50	< 0.50	
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50	
Di-N-Octyl Phthalate	N	2790	mg/kg	0.50	< 0.50	
Benzo[b]fluoranthene	N	2790	mg/kg	0.50	< 0.50	
Benzo[k]fluoranthene	N	2790	mg/kg	0.50	< 0.50	
Benzo[a]pyrene	N	2790	mg/kg	0.50	< 0.50	
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.50	< 0.50	
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.50	< 0.50	
Benzo[g,h,i]perylene	N	2790	mg/kg	0.50	< 0.50	
PCB 101	U	2815	mg/kg	0.010	< 0.010	

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
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Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.: 16-28230-1

Initial Date of Issue: 24-Nov-2016

Client Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balnamore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Andy Garne
Brian Mooney
Colm Hurley
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Ian Holley
Lucy Peaker
Mark Nyhan
Matthew Gilbert
Neil Haggan
Paul Dunlop
Paul McNamara
Stephen Franey
Stephen Watson

Project 16-1088 - A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	18-Nov-2016
Order No.:		**Date Instructed:**	18-Nov-2016
No. of Samples:	2		
Turnaround (Wkdays):	5	**Results Due:**	24-Nov-2016
Date Approved:	24-Nov-2016		

Approved By:

Details: Glynn Harvey, Laboratory Manager

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Results - Leachate

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd				**Chemtest Job No.:**	16-28230	16-28230
Quotation No.: Q16-07870				**Chemtest Sample ID.:**	380241	380242
Order No.:				Client Location ID.:	BH28	BH29
				Client Sample Ref.:	ES5	ES1
				Sample Type:	SOIL	SOIL
				Top Depth (m):	2.80	0.50
				Date Sampled:	16-Nov-2016	16-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
pH	U	1010		N/A	8.7	8.1
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Copper (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Vanadium (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Zinc (Dissolved)	U	1450	µg/l	1.0	< 1.0	< 1.0
Iron (Dissolved)	N	1450	µg/l	20	21	110
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	9.4	32
Naphthalene	N	1700	µg/l	0.010	< 0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20	< 0.20

Chemtest
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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd				**Chemtest Job No.:**	16-28230	16-28230
Quotation No.: Q16-07870				**Chemtest Sample ID.:**	380241	380242
Order No.:				Client Location ID.:	BH28	BH29
				Client Sample Ref.:	ES5	ES1
				Sample Type:	SOIL	SOIL
				Top Depth (m):	2.80	0.50
				Date Sampled:	16-Nov-2016	16-Nov-2016
				Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	14	29
Soil Colour	N	2040		N/A	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay
pH	M	2010		N/A	9.0	7.9
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.50	21	17
Iron (Total)	N	2430	mg/kg	100	14000	20000
Sulphate (Total)	M	2430	mg/kg	100	1100	960
Arsenic	M	2450	mg/kg	1.0	20	21
Cadmium	M	2450	mg/kg	0.10	0.41	0.93
Chromium	M	2450	mg/kg	1.0	27	80
Copper	M	2450	mg/kg	0.50	20	52
Mercury	M	2450	mg/kg	0.10	< 0.10	0.15
Nickel	M	2450	mg/kg	0.50	48	120
Lead	M	2450	mg/kg	0.50	9.9	50
Selenium	M	2450	mg/kg	0.20	< 0.20	0.72
Vanadium	U	2450	mg/kg	5.0	21	69
Zinc	M	2450	mg/kg	0.50	66	190
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	1.2	2.2
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28230	16-28230
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		380241	380242
Order No.:			Client Location ID.:		BH28	BH29
			Client Sample Ref.:		ES5	ES1
			Sample Type:		SOIL	SOIL
			Top Depth (m):		2.80	0.50
			Date Sampled:		16-Nov-2016	16-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10	< 10	< 10
Naphthalene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20	< 0.20	< 0.20
Dichlorodifluoromethane	U	2760	µg/kg	1.0	< 1.0	< 1.0
Chloromethane	M	2760	µg/kg	1.0	< 1.0	< 1.0
Vinyl Chloride	M	2760	µg/kg	1.0	< 1.0	< 1.0
Bromomethane	M	2760	µg/kg	20	< 20	< 20
Chloroethane	U	2760	µg/kg	2.0	< 2.0	< 2.0
Trichlorofluoromethane	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,1-Dichloroethene	M	2760	µg/kg	1.0	< 1.0	< 1.0
Trans 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,1-Dichloroethane	M	2760	µg/kg	1.0	< 1.0	< 1.0
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0	< 1.0
Bromochloromethane	U	2760	µg/kg	5.0	< 5.0	< 5.0
Trichloromethane	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,1,1-Trichloroethane	M	2760	µg/kg	1.0	< 1.0	< 1.0
Tetrachloromethane	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,1-Dichloropropene	U	2760	µg/kg	1.0	< 1.0	< 1.0

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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28230	16-28230
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		380241	380242
Order No.:			Client Location ID.:		BH28	BH29
			Client Sample Ref.:		ES5	ES1
			Sample Type:		SOIL	SOIL
			Top Depth (m):		2.80	0.50
			Date Sampled:		16-Nov-2016	16-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Benzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dichloroethane	M	2760	µg/kg	2.0	< 2.0	< 2.0
Trichloroethene	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dichloropropane	M	2760	µg/kg	1.0	< 1.0	< 1.0
Dibromomethane	M	2760	µg/kg	1.0	< 1.0	< 1.0
Bromodichloromethane	M	2760	µg/kg	5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10	< 10
Toluene	M	2760	µg/kg	1.0	5.7	< 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10	< 10
1,1,2-Trichloroethane	M	2760	µg/kg	10	< 10	< 10
Tetrachloroethene	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0	< 2.0
Dibromochloromethane	U	2760	µg/kg	10	< 10	< 10
1,2-Dibromoethane	M	2760	µg/kg	5.0	< 5.0	< 5.0
Chlorobenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0	< 2.0	< 2.0
Ethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1.0	2.3	2.6
o-Xylene	M	2760	µg/kg	1.0	2.4	< 1.0
Styrene	M	2760	µg/kg	1.0	< 1.0	< 1.0
Tribromomethane	U	2760	µg/kg	1.0	< 1.0	< 1.0
Isopropylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
Bromobenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50	< 50
N-Propylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
2-Chlorotoluene	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
Sec-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,3-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,4-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
N-Butylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50	< 50
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0	< 1.0	< 1.0

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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28230	16-28230
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		380241	380242
Order No.:			Client Location ID.:		BH28	BH29
			Client Sample Ref.:		ES5	ES1
			Sample Type:		SOIL	SOIL
			Top Depth (m):		2.80	0.50
			Date Sampled:		16-Nov-2016	16-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Hexachlorobutadiene	U	2760	µg/kg	1.0	< 1.0	< 1.0
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0	< 2.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	< 1.0
N-Nitrosodimethylamine	N	2790	mg/kg	0.50	< 0.50	< 0.50
Phenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
2-Chlorophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.50	< 0.50	< 0.50
1,3-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
1,4-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
1,2-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
2-Methylphenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.50	< 0.50	< 0.50
Hexachloroethane	N	2790	mg/kg	0.50	< 0.50	< 0.50
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Methylphenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Nitrobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Isophorone	N	2790	mg/kg	0.50	< 0.50	< 0.50
2-Nitrophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
2,4-Dimethylphenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.50	< 0.50	< 0.50
2,4-Dichlorophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Naphthalene	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Chloroaniline	N	2790	mg/kg	0.50	< 0.50	< 0.50
Hexachlorobutadiene	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
2-Methylnaphthalene	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Nitrophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50	< 0.50	< 0.50
2,4,6-Trichlorophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
2,4,5-Trichlorophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
2-Chloronaphthalene	N	2790	mg/kg	0.50	< 0.50	< 0.50
2-Nitroaniline	N	2790	mg/kg	0.50	< 0.50	< 0.50
Acenaphthylene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Dimethylphthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
2,6-Dinitrotoluene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Acenaphthene	N	2790	mg/kg	0.50	< 0.50	< 0.50
3-Nitroaniline	N	2790	mg/kg	0.50	< 0.50	< 0.50

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Results - Soil

Project: 16-1088 - A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28230	16-28230
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		380241	380242
Order No.:			Client Location ID.:		BH28	BH29
			Client Sample Ref.:		ES5	ES1
			Sample Type:		SOIL	SOIL
			Top Depth (m):		2.80	0.50
			Date Sampled:		16-Nov-2016	16-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Dibenzofuran	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Chlorophenylphenylether	N	2790	mg/kg	0.50	< 0.50	< 0.50
2,4-Dinitrotoluene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Fluorene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Diethyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Nitroaniline	N	2790	mg/kg	0.50	< 0.50	< 0.50
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Azobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.50	< 0.50	< 0.50
Hexachlorobenzene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50	< 0.50
Phenanthrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Anthracene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Carbazole	N	2790	mg/kg	0.50	< 0.50	< 0.50
Di-N-Butyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Fluoranthene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Pyrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Butylbenzyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[a]anthracene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Chrysene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Di-N-Octyl Phthalate	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[b]fluoranthene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[k]fluoranthene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[a]pyrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.50	< 0.50	< 0.50
Benzo[g,h,i]perylene	N	2790	mg/kg	0.50	< 0.50	< 0.50
PCB 101	M	2815	mg/kg	0.010	< 0.010	< 0.010

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

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Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-28722-1
Initial Date of Issue:	28-Nov-2016
Client	Causeway Geotech Ltd
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL
Contact(s):	Andy Garne Brian Mooney Colm Hurley Darren O'Mahony Lucy Peaker Mark Nyhan Matthew Gilbert Neil Haggan Paul Dunlop Paul McNamara Stephen Franey Stephen Watson
Project	16-1088 A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	24-Nov-2016
Order No.:		**Date Instructed:**	24-Nov-2016
No. of Samples:	2		
Turnaround (Wkdays):	3	**Results Due:**	28-Nov-2016
Date Approved:	28-Nov-2016		

Approved By:

Details: Martin Dyer, Laboratory Manager

Chemtest
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Results - Leachate

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28722
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		382189
Order No.:			Client Location ID.:		BH36
			Client Sample Ref.:		ES1
			Sample Type:		SOIL
			Top Depth (m):		0.5
			Date Sampled:		22-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
pH	U	1010		N/A	8.6
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	1.4
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Copper (Dissolved)	U	1450	µg/l	1.0	< 1.0
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	< 1.0
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	1.5
Vanadium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Zinc (Dissolved)	U	1450	µg/l	1.0	2.3
Iron (Dissolved)	N	1450	µg/l	20	65
Chromium (Hexavalent)	U	1490	µg/l	20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	8.9
Naphthalene	N	1700	µg/l	0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20

Chemtest
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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-28722	16-28722
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	382187	382189
Order No.:					Client Location ID.:	BH34	BH36
					Client Sample Ref.:	ES1	ES1
					Sample Type:	SOIL	SOIL
					Top Depth (m):	0.5	0.5
					Date Sampled:	22-Nov-2016	22-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A		-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020		26	8.8
Soil Colour	N	2040		N/A		Black	Brown
Other Material	N	2040		N/A		Stones, Wood	Stones
Soil Texture	N	2040		N/A		Loam	Clay
pH	M	2010		N/A		8.2	8.4
Cyanide (Free)	M	2300	mg/kg	0.50		< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50		< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.50			13
Iron (Total)	N	2430	mg/kg	100		16000	14000
Sulphate (Total)	M	2430	mg/kg	100			9200
Arsenic	M	2450	mg/kg	1.0		18	14
Cadmium	M	2450	mg/kg	0.10		0.31	0.14
Chromium	M	2450	mg/kg	1.0		45	36
Copper	M	2450	mg/kg	0.50		31	19
Mercury	M	2450	mg/kg	0.10		< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50		68	53
Lead	M	2450	mg/kg	0.50		46	12
Selenium	M	2450	mg/kg	0.20		< 0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0		42	30
Zinc	M	2450	mg/kg	0.50		92	46
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50
Organic Matter	M	2625	%	0.40		8.1	0.97
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0			< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0			< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0			< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0			< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0			< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0			< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0			< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0			< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0			< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0			< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0			< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0			< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0			< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-28722	16-28722
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	382187	382189
Order No.:					Client Location ID.:	BH34	BH36
					Client Sample Ref.:	ES1	ES1
					Sample Type:	SOIL	SOIL
					Top Depth (m):	0.5	0.5
					Date Sampled:	22-Nov-2016	22-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0			< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0			< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0			< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0			< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0			< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10			< 10
Naphthalene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010		0.21	< 0.010
Pyrene	N	2700	mg/kg	0.010		0.30	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010		< 0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20		0.51	< 0.20
Dichlorodifluoromethane	U	2760	µg/kg	1.0			< 1.0
Chloromethane	M	2760	µg/kg	1.0			< 1.0
Vinyl Chloride	M	2760	µg/kg	1.0			< 1.0
Bromomethane	M	2760	µg/kg	20			< 20
Chloroethane	U	2760	µg/kg	2.0			< 2.0
Trichlorofluoromethane	M	2760	µg/kg	1.0			< 1.0
1,1-Dichloroethene	M	2760	µg/kg	1.0			< 1.0
Trans 1,2-Dichloroethene	M	2760	µg/kg	1.0			< 1.0
1,1-Dichloroethane	M	2760	µg/kg	1.0			< 1.0
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0			< 1.0
Bromochloromethane	U	2760	µg/kg	5.0			< 5.0
Trichloromethane	M	2760	µg/kg	1.0			< 1.0
1,1,1-Trichloroethane	M	2760	µg/kg	1.0			< 1.0
Tetrachloromethane	M	2760	µg/kg	1.0			< 1.0
1,1-Dichloropropene	U	2760	µg/kg	1.0			< 1.0

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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-28722	16-28722
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	382187	382189
Order No.:					Client Location ID.:	BH34	BH36
					Client Sample Ref.:	ES1	ES1
					Sample Type:	SOIL	SOIL
					Top Depth (m):	0.5	0.5
					Date Sampled:	22-Nov-2016	22-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Benzene	M	2760	µg/kg	1.0			< 1.0
1,2-Dichloroethane	M	2760	µg/kg	2.0			< 2.0
Trichloroethene	M	2760	µg/kg	1.0			< 1.0
1,2-Dichloropropane	M	2760	µg/kg	1.0			< 1.0
Dibromomethane	M	2760	µg/kg	1.0			< 1.0
Bromodichloromethane	M	2760	µg/kg	5.0			< 5.0
cis-1,3-Dichloropropene	N	2760	µg/kg	10			< 10
Toluene	M	2760	µg/kg	1.0			< 1.0
Trans-1,3-Dichloropropene	N	2760	µg/kg	10			< 10
1,1,2-Trichloroethane	M	2760	µg/kg	10			< 10
Tetrachloroethene	M	2760	µg/kg	1.0			< 1.0
1,3-Dichloropropane	U	2760	µg/kg	2.0			< 2.0
Dibromochloromethane	U	2760	µg/kg	10			< 10
1,2-Dibromoethane	M	2760	µg/kg	5.0			< 5.0
Chlorobenzene	M	2760	µg/kg	1.0			< 1.0
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0			< 2.0
Ethylbenzene	M	2760	µg/kg	1.0			< 1.0
m & p-Xylene	M	2760	µg/kg	1.0			< 1.0
o-Xylene	M	2760	µg/kg	1.0			< 1.0
Styrene	M	2760	µg/kg	1.0			< 1.0
Tribromomethane	U	2760	µg/kg	1.0			< 1.0
Isopropylbenzene	M	2760	µg/kg	1.0			< 1.0
Bromobenzene	M	2760	µg/kg	1.0			< 1.0
1,2,3-Trichloropropane	N	2760	µg/kg	50			< 50
N-Propylbenzene	U	2760	µg/kg	1.0			< 1.0
2-Chlorotoluene	M	2760	µg/kg	1.0			< 1.0
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0			< 1.0
4-Chlorotoluene	U	2760	µg/kg	1.0			< 1.0
Tert-Butylbenzene	U	2760	µg/kg	1.0			< 1.0
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0			< 1.0
Sec-Butylbenzene	U	2760	µg/kg	1.0			< 1.0
1,3-Dichlorobenzene	M	2760	µg/kg	1.0			< 1.0
4-Isopropyltoluene	U	2760	µg/kg	1.0			< 1.0
1,4-Dichlorobenzene	M	2760	µg/kg	1.0			< 1.0
N-Butylbenzene	U	2760	µg/kg	1.0			< 1.0
1,2-Dichlorobenzene	M	2760	µg/kg	1.0			< 1.0
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50			< 50
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0			< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-28722	16-28722
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	382187	382189
Order No.:					Client Location ID.:	BH34	BH36
					Client Sample Ref.:	ES1	ES1
					Sample Type:	SOIL	SOIL
					Top Depth (m):	0.5	0.5
					Date Sampled:	22-Nov-2016	22-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Hexachlorobutadiene	U	2760	µg/kg	1.0			< 1.0
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0			< 2.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0			< 1.0
N-Nitrosodimethylamine	N	2790	mg/kg	0.50			< 0.50
Phenol	N	2790	mg/kg	0.50			< 0.50
2-Chlorophenol	N	2790	mg/kg	0.50			< 0.50
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.50			< 0.50
1,3-Dichlorobenzene	N	2790	mg/kg	0.50			< 0.50
1,4-Dichlorobenzene	N	2790	mg/kg	0.50			< 0.50
1,2-Dichlorobenzene	N	2790	mg/kg	0.50			< 0.50
2-Methylphenol	N	2790	mg/kg	0.50			< 0.50
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.50			< 0.50
Hexachloroethane	N	2790	mg/kg	0.50			< 0.50
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.50			< 0.50
4-Methylphenol	N	2790	mg/kg	0.50			< 0.50
Nitrobenzene	N	2790	mg/kg	0.50			< 0.50
Isophorone	N	2790	mg/kg	0.50			< 0.50
2-Nitrophenol	N	2790	mg/kg	0.50			< 0.50
2,4-Dimethylphenol	N	2790	mg/kg	0.50			< 0.50
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.50			< 0.50
2,4-Dichlorophenol	N	2790	mg/kg	0.50			< 0.50
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.50			< 0.50
Naphthalene	N	2790	mg/kg	0.50			< 0.50
4-Chloroaniline	N	2790	mg/kg	0.50			< 0.50
Hexachlorobutadiene	N	2790	mg/kg	0.50			< 0.50
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.50			< 0.50
2-Methylnaphthalene	N	2790	mg/kg	0.50			< 0.50
4-Nitrophenol	N	2790	mg/kg	0.50			< 0.50
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50			< 0.50
2,4,6-Trichlorophenol	N	2790	mg/kg	0.50			< 0.50
2,4,5-Trichlorophenol	N	2790	mg/kg	0.50			< 0.50
2-Chloronaphthalene	N	2790	mg/kg	0.50			< 0.50
2-Nitroaniline	N	2790	mg/kg	0.50			< 0.50
Acenaphthylene	N	2790	mg/kg	0.50			< 0.50
Dimethylphthalate	N	2790	mg/kg	0.50			< 0.50
2,6-Dinitrotoluene	N	2790	mg/kg	0.50			< 0.50
Acenaphthene	N	2790	mg/kg	0.50			< 0.50
3-Nitroaniline	N	2790	mg/kg	0.50			< 0.50

Chemtest
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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28722	16-28722
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		382187	382189
Order No.:			Client Location ID.:		BH34	BH36
			Client Sample Ref.:		ES1	ES1
			Sample Type:		SOIL	SOIL
			Top Depth (m):		0.5	0.5
			Date Sampled:		22-Nov-2016	22-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Dibenzofuran	N	2790	mg/kg	0.50		< 0.50
4-Chlorophenylphenylether	N	2790	mg/kg	0.50		< 0.50
2,4-Dinitrotoluene	N	2790	mg/kg	0.50		< 0.50
Fluorene	N	2790	mg/kg	0.50		< 0.50
Diethyl Phthalate	N	2790	mg/kg	0.50		< 0.50
4-Nitroaniline	N	2790	mg/kg	0.50		< 0.50
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50		< 0.50
Azobenzene	N	2790	mg/kg	0.50		< 0.50
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.50		< 0.50
Hexachlorobenzene	N	2790	mg/kg	0.50		< 0.50
Pentachlorophenol	N	2790	mg/kg	0.50		< 0.50
Phenanthrene	N	2790	mg/kg	0.50		< 0.50
Anthracene	N	2790	mg/kg	0.50		< 0.50
Carbazole	N	2790	mg/kg	0.50		< 0.50
Di-N-Butyl Phthalate	N	2790	mg/kg	0.50		< 0.50
Fluoranthene	N	2790	mg/kg	0.50		< 0.50
Pyrene	N	2790	mg/kg	0.50		< 0.50
Butylbenzyl Phthalate	N	2790	mg/kg	0.50		< 0.50
Benzo[a]anthracene	N	2790	mg/kg	0.50		< 0.50
Chrysene	N	2790	mg/kg	0.50		< 0.50
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50		< 0.50
Di-N-Octyl Phthalate	N	2790	mg/kg	0.50		< 0.50
Benzo[b]fluoranthene	N	2790	mg/kg	0.50		< 0.50
Benzo[k]fluoranthene	N	2790	mg/kg	0.50		< 0.50
Benzo[a]pyrene	N	2790	mg/kg	0.50		< 0.50
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.50		< 0.50
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.50		< 0.50
Benzo[g,h,i]perylene	N	2790	mg/kg	0.50		< 0.50
PCB 101	M	2815	mg/kg	0.010		< 0.010

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
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Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-28729-1
Initial Date of Issue:	28-Nov-2016
Client	Causeway Geotech Ltd
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL
Contact(s):	Andy Garne Brian Mooney Colm Hurley Darren O'Mahony Lucy Peaker Mark Nyhan Matthew Gilbert Neil Haggan Paul Dunlop Paul McNamara Stephen Franey Stephen Watson
Project	16-1088 A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	24-Nov-2016
Order No.:		**Date Instructed:**	24-Nov-2016
No. of Samples:	2		
Turnaround (Wkdays):	3	**Results Due:**	28-Nov-2016
Date Approved:	28-Nov-2016		

Approved By:

Details: Martin Dyer, Laboratory Manager

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Results - Leachate

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28729
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		382212
Order No.:			Client Location ID.:		TP21
			Client Sample Ref.:		ES3
			Sample Type:		SOIL
			Top Depth (m):		1.2
			Date Sampled:		21-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
pH	U	1010		N/A	6.8
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	1.0
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Copper (Dissolved)	U	1450	µg/l	1.0	2.0
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	1.7
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	< 1.0
Vanadium (Dissolved)	U	1450	µg/l	1.0	1.7
Zinc (Dissolved)	U	1450	µg/l	1.0	3.7
Iron (Dissolved)	N	1450	µg/l	20	380
Chromium (Hexavalent)	U	1490	µg/l	20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	220
Naphthalene	N	1700	µg/l	0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd				**Chemtest Job No.:**	16-28729	16-28729
Quotation No.: Q16-07870				**Chemtest Sample ID.:**	382212	382214
Order No.:				Client Location ID.:	TP21	TP22
				Client Sample Ref.:	ES3	ES3
				Sample Type:	SOIL	SOIL
				Top Depth (m):	1.2	0.75
				Date Sampled:	21-Nov-2016	21-Nov-2016
				Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	36	47
Soil Colour	N	2040		N/A	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay
pH	M	2010		N/A	5.7	5.5
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.50	5.7	
Iron (Total)	N	2430	mg/kg	100	17000	17000
Sulphate (Total)	M	2430	mg/kg	100	870	
Arsenic	M	2450	mg/kg	1.0	5.5	8.1
Cadmium	M	2450	mg/kg	0.10	0.27	1.1
Chromium	M	2450	mg/kg	1.0	39	35
Copper	M	2450	mg/kg	0.50	23	20
Mercury	M	2450	mg/kg	0.10	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	40	48
Lead	M	2450	mg/kg	0.50	21	18
Selenium	M	2450	mg/kg	0.20	1.0	1.4
Vanadium	U	2450	mg/kg	5.0	39	34
Zinc	M	2450	mg/kg	0.50	79	120
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	2.1	8.5
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	

Chemtest
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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28729	16-28729
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		382212	382214
Order No.:			Client Location ID.:		TP21	TP22
			Client Sample Ref.:		ES3	ES3
			Sample Type:		SOIL	SOIL
			Top Depth (m):		1.2	0.75
			Date Sampled:		21-Nov-2016	21-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10	< 10	
Naphthalene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20	< 0.20	< 0.20
Dichlorodifluoromethane	U	2760	µg/kg	1.0	< 1.0	
Chloromethane	M	2760	µg/kg	1.0	< 1.0	
Vinyl Chloride	M	2760	µg/kg	1.0	< 1.0	
Bromomethane	M	2760	µg/kg	20	< 20	
Chloroethane	U	2760	µg/kg	2.0	< 2.0	
Trichlorofluoromethane	M	2760	µg/kg	1.0	< 1.0	
1,1-Dichloroethene	M	2760	µg/kg	1.0	< 1.0	
Trans 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0	
1,1-Dichloroethane	M	2760	µg/kg	1.0	< 1.0	
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0	
Bromochloromethane	U	2760	µg/kg	5.0	< 5.0	
Trichloromethane	M	2760	µg/kg	1.0	< 1.0	
1,1,1-Trichloroethane	M	2760	µg/kg	1.0	< 1.0	
Tetrachloromethane	M	2760	µg/kg	1.0	< 1.0	
1,1-Dichloropropene	U	2760	µg/kg	1.0	< 1.0	

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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	16-28729	16-28729
Quotation No.: Q16-07870					**Chemtest Sample ID.:**	382212	382214
Order No.:					Client Location ID.:	TP21	TP22
					Client Sample Ref.:	ES3	ES3
					Sample Type:	SOIL	SOIL
					Top Depth (m):	1.2	0.75
					Date Sampled:	21-Nov-2016	21-Nov-2016
					Asbestos Lab:	COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Benzene	M	2760	µg/kg	1.0		< 1.0	
1,2-Dichloroethane	M	2760	µg/kg	2.0		< 2.0	
Trichloroethene	M	2760	µg/kg	1.0		< 1.0	
1,2-Dichloropropane	M	2760	µg/kg	1.0		< 1.0	
Dibromomethane	M	2760	µg/kg	1.0		< 1.0	
Bromodichloromethane	M	2760	µg/kg	5.0		< 5.0	
cis-1,3-Dichloropropene	N	2760	µg/kg	10		< 10	
Toluene	M	2760	µg/kg	1.0		< 1.0	
Trans-1,3-Dichloropropene	N	2760	µg/kg	10		< 10	
1,1,2-Trichloroethane	M	2760	µg/kg	10		< 10	
Tetrachloroethene	M	2760	µg/kg	1.0		< 1.0	
1,3-Dichloropropane	U	2760	µg/kg	2.0		< 2.0	
Dibromochloromethane	U	2760	µg/kg	10		< 10	
1,2-Dibromoethane	M	2760	µg/kg	5.0		< 5.0	
Chlorobenzene	M	2760	µg/kg	1.0		< 1.0	
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0		< 2.0	
Ethylbenzene	M	2760	µg/kg	1.0		< 1.0	
m & p-Xylene	M	2760	µg/kg	1.0		< 1.0	
o-Xylene	M	2760	µg/kg	1.0		< 1.0	
Styrene	M	2760	µg/kg	1.0		< 1.0	
Tribromomethane	U	2760	µg/kg	1.0		< 1.0	
Isopropylbenzene	M	2760	µg/kg	1.0		< 1.0	
Bromobenzene	M	2760	µg/kg	1.0		< 1.0	
1,2,3-Trichloropropane	N	2760	µg/kg	50		< 50	
N-Propylbenzene	U	2760	µg/kg	1.0		< 1.0	
2-Chlorotoluene	M	2760	µg/kg	1.0		< 1.0	
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0		< 1.0	
4-Chlorotoluene	U	2760	µg/kg	1.0		< 1.0	
Tert-Butylbenzene	U	2760	µg/kg	1.0		< 1.0	
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0		< 1.0	
Sec-Butylbenzene	U	2760	µg/kg	1.0		< 1.0	
1,3-Dichlorobenzene	M	2760	µg/kg	1.0		< 1.0	
4-Isopropyltoluene	U	2760	µg/kg	1.0		< 1.0	
1,4-Dichlorobenzene	M	2760	µg/kg	1.0		< 1.0	
N-Butylbenzene	U	2760	µg/kg	1.0		< 1.0	
1,2-Dichlorobenzene	M	2760	µg/kg	1.0		< 1.0	
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50		< 50	
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0		< 1.0	

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28729	16-28729
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		382212	382214
Order No.:			Client Location ID.:		TP21	TP22
			Client Sample Ref.:		ES3	ES3
			Sample Type:		SOIL	SOIL
			Top Depth (m):		1.2	0.75
			Date Sampled:		21-Nov-2016	21-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Hexachlorobutadiene	U	2760	µg/kg	1.0	< 1.0	
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0	
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0	
N-Nitrosodimethylamine	N	2790	mg/kg	0.50	< 0.50	
Phenol	N	2790	mg/kg	0.50	< 0.50	
2-Chlorophenol	N	2790	mg/kg	0.50	< 0.50	
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.50	< 0.50	
1,3-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50	
1,4-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50	
1,2-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50	
2-Methylphenol	N	2790	mg/kg	0.50	< 0.50	
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.50	< 0.50	
Hexachloroethane	N	2790	mg/kg	0.50	< 0.50	
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.50	< 0.50	
4-Methylphenol	N	2790	mg/kg	0.50	< 0.50	
Nitrobenzene	N	2790	mg/kg	0.50	< 0.50	
Isophorone	N	2790	mg/kg	0.50	< 0.50	
2-Nitrophenol	N	2790	mg/kg	0.50	< 0.50	
2,4-Dimethylphenol	N	2790	mg/kg	0.50	< 0.50	
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.50	< 0.50	
2,4-Dichlorophenol	N	2790	mg/kg	0.50	< 0.50	
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.50	< 0.50	
Naphthalene	N	2790	mg/kg	0.50	< 0.50	
4-Chloroaniline	N	2790	mg/kg	0.50	< 0.50	
Hexachlorobutadiene	N	2790	mg/kg	0.50	< 0.50	
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.50	< 0.50	
2-Methylnaphthalene	N	2790	mg/kg	0.50	< 0.50	
4-Nitrophenol	N	2790	mg/kg	0.50	< 0.50	
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50	< 0.50	
2,4,6-Trichlorophenol	N	2790	mg/kg	0.50	< 0.50	
2,4,5-Trichlorophenol	N	2790	mg/kg	0.50	< 0.50	
2-Chloronaphthalene	N	2790	mg/kg	0.50	< 0.50	
2-Nitroaniline	N	2790	mg/kg	0.50	< 0.50	
Acenaphthylene	N	2790	mg/kg	0.50	< 0.50	
Dimethylphthalate	N	2790	mg/kg	0.50	< 0.50	
2,6-Dinitrotoluene	N	2790	mg/kg	0.50	< 0.50	
Acenaphthene	N	2790	mg/kg	0.50	< 0.50	
3-Nitroaniline	N	2790	mg/kg	0.50	< 0.50	

Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28729	16-28729
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		382212	382214
Order No.:			Client Location ID.:		TP21	TP22
			Client Sample Ref.:		ES3	ES3
			Sample Type:		SOIL	SOIL
			Top Depth (m):		1.2	0.75
			Date Sampled:		21-Nov-2016	21-Nov-2016
			Asbestos Lab:		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Dibenzofuran	N	2790	mg/kg	0.50	< 0.50	
4-Chlorophenylphenylether	N	2790	mg/kg	0.50	< 0.50	
2,4-Dinitrotoluene	N	2790	mg/kg	0.50	< 0.50	
Fluorene	N	2790	mg/kg	0.50	< 0.50	
Diethyl Phthalate	N	2790	mg/kg	0.50	< 0.50	
4-Nitroaniline	N	2790	mg/kg	0.50	< 0.50	
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50	
Azobenzene	N	2790	mg/kg	0.50	< 0.50	
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.50	< 0.50	
Hexachlorobenzene	N	2790	mg/kg	0.50	< 0.50	
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50	
Phenanthrene	N	2790	mg/kg	0.50	< 0.50	
Anthracene	N	2790	mg/kg	0.50	< 0.50	
Carbazole	N	2790	mg/kg	0.50	< 0.50	
Di-N-Butyl Phthalate	N	2790	mg/kg	0.50	< 0.50	
Fluoranthene	N	2790	mg/kg	0.50	< 0.50	
Pyrene	N	2790	mg/kg	0.50	< 0.50	
Butylbenzyl Phthalate	N	2790	mg/kg	0.50	< 0.50	
Benzo[a]anthracene	N	2790	mg/kg	0.50	< 0.50	
Chrysene	N	2790	mg/kg	0.50	< 0.50	
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50	
Di-N-Octyl Phthalate	N	2790	mg/kg	0.50	< 0.50	
Benzo[b]fluoranthene	N	2790	mg/kg	0.50	< 0.50	
Benzo[k]fluoranthene	N	2790	mg/kg	0.50	< 0.50	
Benzo[a]pyrene	N	2790	mg/kg	0.50	< 0.50	
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.50	< 0.50	
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.50	< 0.50	
Benzo[g,h,i]perylene	N	2790	mg/kg	0.50	< 0.50	
PCB 101	M	2815	mg/kg	0.010	< 0.010	

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

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Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-28989-1
Initial Date of Issue:	01-Dec-2016
Client	Causeway Geotech Ltd
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL
Contact(s):	Andy Garne Brian Mooney Colm Hurley Darren O'Mahony Lucy Peaker Mark Nyhan Matthew Gilbert Neil Haggan Paul Dunlop Paul McNamara Stephen Franey Stephen Watson
Project	16-1088 - A4 Enniskillen GI

Quotation No.:	Q16-07870	**Date Received:**	25-Nov-2016
Order No.:		**Date Instructed:**	25-Nov-2016
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	01-Dec-2016
Date Approved:	01-Dec-2016		

Approved By:

Details: Glynn Harvey, Laboratory Manager

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Results - Soil

Project: 16-1088 - A4 Enniskillen GI

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28989
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		383277
Order No.:			Client Location ID.:		TP2
			Client Sample Ref.:		ES2
			Sample Type:		SOIL
			Top Depth (m):		0.80
			Date Sampled:		23-Nov-2016
			Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type	U	2192		N/A	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected
Moisture	N	2030	%	0.020	36
Soil Colour	N	2040		N/A	Brown
Other Material	N	2040		N/A	NONE
Soil Texture	N	2040		N/A	Clay
pH	M	2010		N/A	8.3
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50
Iron (Total)	N	2430	mg/kg	100	19000
Arsenic	M	2450	mg/kg	1.0	6.4
Cadmium	M	2450	mg/kg	0.10	0.46
Chromium	M	2450	mg/kg	1.0	45
Copper	M	2450	mg/kg	0.50	37
Mercury	M	2450	mg/kg	0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	68
Lead	M	2450	mg/kg	0.50	20
Selenium	M	2450	mg/kg	0.20	0.24
Vanadium	U	2450	mg/kg	5.0	44
Zinc	M	2450	mg/kg	0.50	71
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50
Organic Matter	M	2625	%	0.40	2.1
Naphthalene	N	2700	mg/kg	0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010	< 0.010

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Results - Soil

Project: 16-1088 - A4 Enniskillen GI

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-28989
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		383277
Order No.:			Client Location ID.:		TP2
			Client Sample Ref.:		ES2
			Sample Type:		SOIL
			Top Depth (m):		0.80
			Date Sampled:		23-Nov-2016
			Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20	< 0.20

Chemtest
The right chemistry to deliver results

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
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Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-29142-1
Initial Date of Issue:	30-Nov-2016
Client	Causeway Geotech Ltd
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL
Contact(s):	Andy Garne Brian Mooney Colm Hurley Darren O'Mahony Lucy Peaker Mark Nyhan Matthew Gilbert Neil Haggan Paul Dunlop Paul McNamara Stephen Franey Stephen Watson
Project	16-1088 A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	28-Nov-2016
Order No.:		**Date Instructed:**	28-Nov-2016
No. of Samples:	1		
Turnaround (Wkdays):	3	**Results Due:**	30-Nov-2016
Date Approved:	30-Nov-2016		

Approved By:

Details: Keith Jones, Technical Manager

Chemtest
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Results - Leachate

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29142
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		383997
Order No.:			Client Location ID.:		BH38
			Client Sample Ref.:		ES3
			Sample Type:		SOIL
			Top Depth (m):		1.0
			Date Sampled:		24-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
pH	U	1010		N/A	10.7
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	1.4
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	4.1
Copper (Dissolved)	U	1450	µg/l	1.0	8.1
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	5.1
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	27
Vanadium (Dissolved)	U	1450	µg/l	1.0	15
Zinc (Dissolved)	U	1450	µg/l	1.0	1.8
Iron (Dissolved)	N	1450	µg/l	20	130
Chromium (Hexavalent)	U	1490	µg/l	20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	13
Naphthalene	N	1700	µg/l	0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20

Chemtest
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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29142
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		383997
Order No.:			Client Location ID.:		BH38
			Client Sample Ref.:		ES3
			Sample Type:		SOIL
			Top Depth (m):		1.0
			Date Sampled:		24-Nov-2016
			Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type	U	2192		N/A	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected
Moisture	N	2030	%	0.020	12
Soil Colour	N	2040		N/A	Brown
Other Material	N	2040		N/A	Stones
Soil Texture	N	2040		N/A	Sand
pH	M	2010		N/A	10.2
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.50	9.8
Iron (Total)	N	2430	mg/kg	100	11000
Sulphate (Total)	M	2430	mg/kg	100	11000
Arsenic	M	2450	mg/kg	1.0	16
Cadmium	M	2450	mg/kg	0.10	0.17
Chromium	M	2450	mg/kg	1.0	22
Copper	M	2450	mg/kg	0.50	13
Mercury	M	2450	mg/kg	0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	32
Lead	M	2450	mg/kg	0.50	11
Selenium	M	2450	mg/kg	0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	18
Zinc	M	2450	mg/kg	0.50	27
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50
Organic Matter	M	2625	%	0.40	1.9
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0

Chemtest
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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29142
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		383997
Order No.:			Client Location ID.:		BH38
			Client Sample Ref.:		ES3
			Sample Type:		SOIL
			Top Depth (m):		1.0
			Date Sampled:		24-Nov-2016
			Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10	< 10
Naphthalene	N	2700	mg/kg	0.010	< 0.010
Acenaphthylene	N	2700	mg/kg	0.010	< 0.010
Acenaphthene	N	2700	mg/kg	0.010	< 0.010
Fluorene	N	2700	mg/kg	0.010	< 0.010
Phenanthrene	N	2700	mg/kg	0.010	< 0.010
Anthracene	N	2700	mg/kg	0.010	< 0.010
Fluoranthene	N	2700	mg/kg	0.010	< 0.010
Pyrene	N	2700	mg/kg	0.010	< 0.010
Benzo[a]anthracene	N	2700	mg/kg	0.010	< 0.010
Chrysene	N	2700	mg/kg	0.010	< 0.010
Benzo[b]fluoranthene	N	2700	mg/kg	0.010	< 0.010
Benzo[k]fluoranthene	N	2700	mg/kg	0.010	< 0.010
Benzo[a]pyrene	N	2700	mg/kg	0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20	< 0.20
Dichlorodifluoromethane	U	2760	µg/kg	1.0	< 1.0
Chloromethane	M	2760	µg/kg	1.0	< 1.0
Vinyl Chloride	M	2760	µg/kg	1.0	< 1.0
Bromomethane	M	2760	µg/kg	20	< 20
Chloroethane	U	2760	µg/kg	2.0	< 2.0
Trichlorofluoromethane	M	2760	µg/kg	1.0	< 1.0
1,1-Dichloroethene	M	2760	µg/kg	1.0	< 1.0
Trans 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0
1,1-Dichloroethane	M	2760	µg/kg	1.0	< 1.0
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0
Bromochloromethane	U	2760	µg/kg	5.0	< 5.0
Trichloromethane	M	2760	µg/kg	1.0	< 1.0
1,1,1-Trichloroethane	M	2760	µg/kg	1.0	< 1.0
Tetrachloromethane	M	2760	µg/kg	1.0	< 1.0
1,1-Dichloropropene	U	2760	µg/kg	1.0	< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29142
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		383997
Order No.:			Client Location ID.:		BH38
			Client Sample Ref.:		ES3
			Sample Type:		SOIL
			Top Depth (m):		1.0
			Date Sampled:		24-Nov-2016
			Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Benzene	M	2760	µg/kg	1.0	3.4
1,2-Dichloroethane	M	2760	µg/kg	2.0	< 2.0
Trichloroethene	M	2760	µg/kg	1.0	< 1.0
1,2-Dichloropropane	M	2760	µg/kg	1.0	< 1.0
Dibromomethane	M	2760	µg/kg	1.0	< 1.0
Bromodichloromethane	M	2760	µg/kg	5.0	< 5.0
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10
Toluene	M	2760	µg/kg	1.0	9.9
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10
1,1,2-Trichloroethane	M	2760	µg/kg	10	< 10
Tetrachloroethene	M	2760	µg/kg	1.0	< 1.0
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0
Dibromochloromethane	U	2760	µg/kg	10	< 10
1,2-Dibromoethane	M	2760	µg/kg	5.0	< 5.0
Chlorobenzene	M	2760	µg/kg	1.0	< 1.0
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0	< 2.0
Ethylbenzene	M	2760	µg/kg	1.0	7.0
m & p-Xylene	M	2760	µg/kg	1.0	6.9
o-Xylene	M	2760	µg/kg	1.0	3.8
Styrene	M	2760	µg/kg	1.0	< 1.0
Tribromomethane	U	2760	µg/kg	1.0	< 1.0
Isopropylbenzene	M	2760	µg/kg	1.0	1.5
Bromobenzene	M	2760	µg/kg	1.0	< 1.0
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50
N-Propylbenzene	U	2760	µg/kg	1.0	2.6
2-Chlorotoluene	M	2760	µg/kg	1.0	< 1.0
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0	< 1.0
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0	2.5
Sec-Butylbenzene	U	2760	µg/kg	1.0	1.6
1,3-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0
1,4-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0
N-Butylbenzene	U	2760	µg/kg	1.0	< 1.0
1,2-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0	< 1.0

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29142
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		383997
Order No.:			Client Location ID.:		BH38
			Client Sample Ref.:		ES3
			Sample Type:		SOIL
			Top Depth (m):		1.0
			Date Sampled:		24-Nov-2016
			Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Hexachlorobutadiene	U	2760	µg/kg	1.0	< 1.0
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0
N-Nitrosodimethylamine	N	2790	mg/kg	0.50	< 0.50
Phenol	N	2790	mg/kg	0.50	< 0.50
2-Chlorophenol	N	2790	mg/kg	0.50	< 0.50
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.50	< 0.50
1,3-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50
1,4-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50
1,2-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50
2-Methylphenol	N	2790	mg/kg	0.50	< 0.50
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.50	< 0.50
Hexachloroethane	N	2790	mg/kg	0.50	< 0.50
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.50	< 0.50
4-Methylphenol	N	2790	mg/kg	0.50	< 0.50
Nitrobenzene	N	2790	mg/kg	0.50	< 0.50
Isophorone	N	2790	mg/kg	0.50	< 0.50
2-Nitrophenol	N	2790	mg/kg	0.50	< 0.50
2,4-Dimethylphenol	N	2790	mg/kg	0.50	< 0.50
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.50	< 0.50
2,4-Dichlorophenol	N	2790	mg/kg	0.50	< 0.50
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.50	< 0.50
Naphthalene	N	2790	mg/kg	0.50	< 0.50
4-Chloroaniline	N	2790	mg/kg	0.50	< 0.50
Hexachlorobutadiene	N	2790	mg/kg	0.50	< 0.50
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.50	< 0.50
2-Methylnaphthalene	N	2790	mg/kg	0.50	< 0.50
4-Nitrophenol	N	2790	mg/kg	0.50	< 0.50
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50	< 0.50
2,4,6-Trichlorophenol	N	2790	mg/kg	0.50	< 0.50
2,4,5-Trichlorophenol	N	2790	mg/kg	0.50	< 0.50
2-Chloronaphthalene	N	2790	mg/kg	0.50	< 0.50
2-Nitroaniline	N	2790	mg/kg	0.50	< 0.50
Acenaphthylene	N	2790	mg/kg	0.50	< 0.50
Dimethylphthalate	N	2790	mg/kg	0.50	< 0.50
2,6-Dinitrotoluene	N	2790	mg/kg	0.50	< 0.50
Acenaphthene	N	2790	mg/kg	0.50	< 0.50
3-Nitroaniline	N	2790	mg/kg	0.50	< 0.50

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29142
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		383997
Order No.:			Client Location ID.:		BH38
			Client Sample Ref.:		ES3
			Sample Type:		SOIL
			Top Depth (m):		1.0
			Date Sampled:		24-Nov-2016
			Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Dibenzofuran	N	2790	mg/kg	0.50	< 0.50
4-Chlorophenylphenylether	N	2790	mg/kg	0.50	< 0.50
2,4-Dinitrotoluene	N	2790	mg/kg	0.50	< 0.50
Fluorene	N	2790	mg/kg	0.50	< 0.50
Diethyl Phthalate	N	2790	mg/kg	0.50	< 0.50
4-Nitroaniline	N	2790	mg/kg	0.50	< 0.50
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50
Azobenzene	N	2790	mg/kg	0.50	< 0.50
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.50	< 0.50
Hexachlorobenzene	N	2790	mg/kg	0.50	< 0.50
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50
Phenanthrene	N	2790	mg/kg	0.50	< 0.50
Anthracene	N	2790	mg/kg	0.50	< 0.50
Carbazole	N	2790	mg/kg	0.50	< 0.50
Di-N-Butyl Phthalate	N	2790	mg/kg	0.50	< 0.50
Fluoranthene	N	2790	mg/kg	0.50	< 0.50
Pyrene	N	2790	mg/kg	0.50	< 0.50
Butylbenzyl Phthalate	N	2790	mg/kg	0.50	< 0.50
Benzo[a]anthracene	N	2790	mg/kg	0.50	< 0.50
Chrysene	N	2790	mg/kg	0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50
Di-N-Octyl Phthalate	N	2790	mg/kg	0.50	< 0.50
Benzo[b]fluoranthene	N	2790	mg/kg	0.50	< 0.50
Benzo[k]fluoranthene	N	2790	mg/kg	0.50	< 0.50
Benzo[a]pyrene	N	2790	mg/kg	0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.50	< 0.50
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.50	< 0.50
Benzo[g,h,i]perylene	N	2790	mg/kg	0.50	< 0.50
PCB 101	M	2815	mg/kg	0.010	< 0.010

Report Information

Key

U	UKAS accredited
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SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

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None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Chemtest
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Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.co.uk

Final Report

Report No.:	16-29192-1
Initial Date of Issue:	05-Dec-2016
Client	Causeway Geotech Ltd
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL
Contact(s):	Andy Garne Brian Mooney Colm Hurley Darren O'Mahony Lucy Peaker Mark Nyhan Matthew Gilbert Neil Haggan Paul Dunlop Paul McNamara Stephen Franey Stephen Watson
Project	16-1088 A4 Enniskillen Southern Bypass

Quotation No.:	Q16-07870	**Date Received:**	29-Nov-2016
Order No.:		**Date Instructed:**	29-Nov-2016
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	05-Dec-2016
Date Approved:	05-Dec-2016		

Approved By:

Details: Martin Dyer, Laboratory Manager

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Results - Leachate

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29192
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		384208
Order No.:			Client Location ID.:		BH37
			Client Sample Ref.:		ES1
			Sample Type:		SOIL
			Top Depth (m):		0.5
			Date Sampled:		25-Nov-2016
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
pH	U	1010		N/A	10.8
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050
Arsenic (Dissolved)	U	1450	µg/l	1.0	< 1.0
Cadmium (Dissolved)	U	1450	µg/l	0.080	< 0.080
Chromium (Dissolved)	U	1450	µg/l	1.0	5.2
Copper (Dissolved)	U	1450	µg/l	1.0	2.9
Mercury (Dissolved)	U	1450	µg/l	0.50	< 0.50
Nickel (Dissolved)	U	1450	µg/l	1.0	1.1
Lead (Dissolved)	U	1450	µg/l	1.0	< 1.0
Selenium (Dissolved)	U	1450	µg/l	1.0	3.3
Vanadium (Dissolved)	U	1450	µg/l	1.0	4.6
Zinc (Dissolved)	U	1450	µg/l	1.0	8.6
Iron (Dissolved)	N	1450	µg/l	20	140
Chromium (Hexavalent)	U	1490	µg/l	20	< 20
Total Organic Carbon	U	1610	mg/l	2.0	3.6
Naphthalene	N	1700	µg/l	0.010	< 0.010
Acenaphthylene	N	1700	µg/l	0.010	< 0.010
Acenaphthene	N	1700	µg/l	0.010	< 0.010
Fluorene	N	1700	µg/l	0.010	< 0.010
Phenanthrene	N	1700	µg/l	0.010	< 0.010
Anthracene	N	1700	µg/l	0.010	< 0.010
Fluoranthene	N	1700	µg/l	0.010	< 0.010
Pyrene	N	1700	µg/l	0.010	< 0.010
Benzo[a]anthracene	N	1700	µg/l	0.010	< 0.010
Chrysene	N	1700	µg/l	0.010	< 0.010
Benzo[b]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[k]fluoranthene	N	1700	µg/l	0.010	< 0.010
Benzo[a]pyrene	N	1700	µg/l	0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1700	µg/l	0.010	< 0.010
Dibenz(a,h)Anthracene	N	1700	µg/l	0.010	< 0.010
Benzo[g,h,i]perylene	N	1700	µg/l	0.010	< 0.010
Total Of 16 PAH's	N	1700	µg/l	0.20	< 0.20

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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29192
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		384208
Order No.:			Client Location ID.:		BH37
			Client Sample Ref.:		ES1
			Sample Type:		SOIL
			Top Depth (m):		0.5
			Date Sampled:		25-Nov-2016
			Asbestos Lab:		LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type	U	2192		N/A	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected
Moisture	N	2030	%	0.020	6.2
Soil Colour	N	2040		N/A	Brown
Other Material	N	2040		N/A	Stones
Soil Texture	N	2040		N/A	Sand
pH	M	2010		N/A	9.9
Cyanide (Free)	M	2300	mg/kg	0.50	< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50	0.80
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.50	4.4
Iron (Total)	N	2430	mg/kg	100	4700
Sulphate (Total)	M	2430	mg/kg	100	7500
Arsenic	M	2450	mg/kg	1.0	27
Cadmium	M	2450	mg/kg	0.10	0.36
Chromium	M	2450	mg/kg	1.0	9.7
Copper	M	2450	mg/kg	0.50	6.7
Mercury	M	2450	mg/kg	0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	17
Lead	M	2450	mg/kg	0.50	6.3
Selenium	M	2450	mg/kg	0.20	< 0.20
Vanadium	U	2450	mg/kg	5.0	13
Zinc	M	2450	mg/kg	0.50	19
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50
Organic Matter	M	2625	%	0.40	6.4
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0

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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29192
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		384208
Order No.:			Client Location ID.:		BH37
			Client Sample Ref.:		ES1
			Sample Type:		SOIL
			Top Depth (m):		0.5
			Date Sampled:		25-Nov-2016
			Asbestos Lab:		LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10	< 10
Naphthalene	N	2700	mg/kg	0.010	0.24
Acenaphthylene	N	2700	mg/kg	0.010	0.060
Acenaphthene	N	2700	mg/kg	0.010	0.18
Fluorene	N	2700	mg/kg	0.010	0.11
Phenanthrene	N	2700	mg/kg	0.010	0.39
Anthracene	N	2700	mg/kg	0.010	0.040
Fluoranthene	N	2700	mg/kg	0.010	0.51
Pyrene	N	2700	mg/kg	0.010	0.41
Benzo[a]anthracene	N	2700	mg/kg	0.010	0.17
Chrysene	N	2700	mg/kg	0.010	0.17
Benzo[b]fluoranthene	N	2700	mg/kg	0.010	0.18
Benzo[k]fluoranthene	N	2700	mg/kg	0.010	0.030
Benzo[a]pyrene	N	2700	mg/kg	0.010	0.17
Indeno(1,2,3-c,d)Pyrene	N	2700	mg/kg	0.010	< 0.010
Dibenz(a,h)Anthracene	N	2700	mg/kg	0.010	< 0.010
Benzo[g,h,i]perylene	N	2700	mg/kg	0.010	< 0.010
Total Of 16 PAH's	N	2700	mg/kg	0.20	2.7
Dichlorodifluoromethane	U	2760	µg/kg	1.0	< 1.0
Chloromethane	M	2760	µg/kg	1.0	< 1.0
Vinyl Chloride	M	2760	µg/kg	1.0	< 1.0
Bromomethane	M	2760	µg/kg	20	< 20
Chloroethane	U	2760	µg/kg	2.0	< 2.0
Trichlorofluoromethane	M	2760	µg/kg	1.0	< 1.0
1,1-Dichloroethene	M	2760	µg/kg	1.0	< 1.0
Trans 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0
1,1-Dichloroethane	M	2760	µg/kg	1.0	< 1.0
cis 1,2-Dichloroethene	M	2760	µg/kg	1.0	< 1.0
Bromochloromethane	U	2760	µg/kg	5.0	< 5.0
Trichloromethane	M	2760	µg/kg	1.0	< 1.0
1,1,1-Trichloroethane	M	2760	µg/kg	1.0	< 1.0
Tetrachloromethane	M	2760	µg/kg	1.0	< 1.0
1,1-Dichloropropene	U	2760	µg/kg	1.0	< 1.0

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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29192
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		384208
Order No.:			Client Location ID.:		BH37
			Client Sample Ref.:		ES1
			Sample Type:		SOIL
			Top Depth (m):		0.5
			Date Sampled:		25-Nov-2016
			Asbestos Lab:		LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Benzene	M	2760	µg/kg	1.0	2.9
1,2-Dichloroethane	M	2760	µg/kg	2.0	< 2.0
Trichloroethene	M	2760	µg/kg	1.0	< 1.0
1,2-Dichloropropane	M	2760	µg/kg	1.0	< 1.0
Dibromomethane	M	2760	µg/kg	1.0	< 1.0
Bromodichloromethane	M	2760	µg/kg	5.0	< 5.0
cis-1,3-Dichloropropene	N	2760	µg/kg	10	< 10
Toluene	M	2760	µg/kg	1.0	9.1
Trans-1,3-Dichloropropene	N	2760	µg/kg	10	< 10
1,1,2-Trichloroethane	M	2760	µg/kg	10	< 10
Tetrachloroethene	M	2760	µg/kg	1.0	< 1.0
1,3-Dichloropropane	U	2760	µg/kg	2.0	< 2.0
Dibromochloromethane	U	2760	µg/kg	10	< 10
1,2-Dibromoethane	M	2760	µg/kg	5.0	< 5.0
Chlorobenzene	M	2760	µg/kg	1.0	< 1.0
1,1,1,2-Tetrachloroethane	M	2760	µg/kg	2.0	< 2.0
Ethylbenzene	M	2760	µg/kg	1.0	9.3
m & p-Xylene	M	2760	µg/kg	1.0	6.2
o-Xylene	M	2760	µg/kg	1.0	2.8
Styrene	M	2760	µg/kg	1.0	< 1.0
Tribromomethane	U	2760	µg/kg	1.0	1.7
Isopropylbenzene	M	2760	µg/kg	1.0	1.8
Bromobenzene	M	2760	µg/kg	1.0	< 1.0
1,2,3-Trichloropropane	N	2760	µg/kg	50	< 50
N-Propylbenzene	U	2760	µg/kg	1.0	2.9
2-Chlorotoluene	M	2760	µg/kg	1.0	< 1.0
1,3,5-Trimethylbenzene	M	2760	µg/kg	1.0	< 1.0
4-Chlorotoluene	U	2760	µg/kg	1.0	< 1.0
Tert-Butylbenzene	U	2760	µg/kg	1.0	< 1.0
1,2,4-Trimethylbenzene	M	2760	µg/kg	1.0	3.0
Sec-Butylbenzene	U	2760	µg/kg	1.0	1.5
1,3-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0
4-Isopropyltoluene	U	2760	µg/kg	1.0	< 1.0
1,4-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0
N-Butylbenzene	U	2760	µg/kg	1.0	1.2
1,2-Dichlorobenzene	M	2760	µg/kg	1.0	< 1.0
1,2-Dibromo-3-Chloropropane	U	2760	µg/kg	50	< 50
1,2,4-Trichlorobenzene	M	2760	µg/kg	1.0	< 1.0

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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29192
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		384208
Order No.:			Client Location ID.:		BH37
			Client Sample Ref.:		ES1
			Sample Type:		SOIL
			Top Depth (m):		0.5
			Date Sampled:		25-Nov-2016
			Asbestos Lab:		LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Hexachlorobutadiene	U	2760	µg/kg	1.0	< 1.0
1,2,3-Trichlorobenzene	U	2760	µg/kg	2.0	< 2.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0	< 1.0
N-Nitrosodimethylamine	N	2790	mg/kg	0.50	< 0.50
Phenol	N	2790	mg/kg	0.50	< 0.50
2-Chlorophenol	N	2790	mg/kg	0.50	< 0.50
Bis-(2-Chloroethyl)Ether	N	2790	mg/kg	0.50	< 0.50
1,3-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50
1,4-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50
1,2-Dichlorobenzene	N	2790	mg/kg	0.50	< 0.50
2-Methylphenol	N	2790	mg/kg	0.50	< 0.50
Bis(2-Chloroisopropyl)Ether	N	2790	mg/kg	0.50	< 0.50
Hexachloroethane	N	2790	mg/kg	0.50	< 0.50
N-Nitrosodi-n-propylamine	N	2790	mg/kg	0.50	< 0.50
4-Methylphenol	N	2790	mg/kg	0.50	< 0.50
Nitrobenzene	N	2790	mg/kg	0.50	< 0.50
Isophorone	N	2790	mg/kg	0.50	< 0.50
2-Nitrophenol	N	2790	mg/kg	0.50	< 0.50
2,4-Dimethylphenol	N	2790	mg/kg	0.50	< 0.50
Bis(2-Chloroethoxy)Methane	N	2790	mg/kg	0.50	< 0.50
2,4-Dichlorophenol	N	2790	mg/kg	0.50	< 0.50
1,2,4-Trichlorobenzene	N	2790	mg/kg	0.50	< 0.50
Naphthalene	N	2790	mg/kg	0.50	< 0.50
4-Chloroaniline	N	2790	mg/kg	0.50	< 0.50
Hexachlorobutadiene	N	2790	mg/kg	0.50	< 0.50
4-Chloro-3-Methylphenol	N	2790	mg/kg	0.50	< 0.50
2-Methylnaphthalene	N	2790	mg/kg	0.50	< 0.50
4-Nitrophenol	N	2790	mg/kg	0.50	< 0.50
Hexachlorocyclopentadiene	N	2790	mg/kg	0.50	< 0.50
2,4,6-Trichlorophenol	N	2790	mg/kg	0.50	< 0.50
2,4,5-Trichlorophenol	N	2790	mg/kg	0.50	< 0.50
2-Chloronaphthalene	N	2790	mg/kg	0.50	< 0.50
2-Nitroaniline	N	2790	mg/kg	0.50	< 0.50
Acenaphthylene	N	2790	mg/kg	0.50	< 0.50
Dimethylphthalate	N	2790	mg/kg	0.50	< 0.50
2,6-Dinitrotoluene	N	2790	mg/kg	0.50	< 0.50
Acenaphthene	N	2790	mg/kg	0.50	< 0.50
3-Nitroaniline	N	2790	mg/kg	0.50	< 0.50

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Results - Soil

Project: 16-1088 A4 Enniskillen Southern Bypass

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		16-29192
Quotation No.: Q16-07870			**Chemtest Sample ID.:**		384208
Order No.:			Client Location ID.:		BH37
			Client Sample Ref.:		ES1
			Sample Type:		SOIL
			Top Depth (m):		0.5
			Date Sampled:		25-Nov-2016
			Asbestos Lab:		LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Dibenzofuran	N	2790	mg/kg	0.50	< 0.50
4-Chlorophenylphenylether	N	2790	mg/kg	0.50	< 0.50
2,4-Dinitrotoluene	N	2790	mg/kg	0.50	< 0.50
Fluorene	N	2790	mg/kg	0.50	< 0.50
Diethyl Phthalate	N	2790	mg/kg	0.50	< 0.50
4-Nitroaniline	N	2790	mg/kg	0.50	< 0.50
2-Methyl-4,6-Dinitrophenol	N	2790	mg/kg	0.50	< 0.50
Azobenzene	N	2790	mg/kg	0.50	< 0.50
4-Bromophenylphenyl Ether	N	2790	mg/kg	0.50	< 0.50
Hexachlorobenzene	N	2790	mg/kg	0.50	< 0.50
Pentachlorophenol	N	2790	mg/kg	0.50	< 0.50
Phenanthrene	N	2790	mg/kg	0.50	< 0.50
Anthracene	N	2790	mg/kg	0.50	< 0.50
Carbazole	N	2790	mg/kg	0.50	< 0.50
Di-N-Butyl Phthalate	N	2790	mg/kg	0.50	< 0.50
Fluoranthene	N	2790	mg/kg	0.50	< 0.50
Pyrene	N	2790	mg/kg	0.50	< 0.50
Butylbenzyl Phthalate	N	2790	mg/kg	0.50	< 0.50
Benzo[a]anthracene	N	2790	mg/kg	0.50	< 0.50
Chrysene	N	2790	mg/kg	0.50	< 0.50
Bis(2-Ethylhexyl)Phthalate	N	2790	mg/kg	0.50	< 0.50
Di-N-Octyl Phthalate	N	2790	mg/kg	0.50	< 0.50
Benzo[b]fluoranthene	N	2790	mg/kg	0.50	< 0.50
Benzo[k]fluoranthene	N	2790	mg/kg	0.50	< 0.50
Benzo[a]pyrene	N	2790	mg/kg	0.50	< 0.50
Indeno(1,2,3-c,d)Pyrene	N	2790	mg/kg	0.50	< 0.50
Dibenz(a,h)Anthracene	N	2790	mg/kg	0.50	< 0.50
Benzo[g,h,i]perylene	N	2790	mg/kg	0.50	< 0.50
PCB 101	M	2815	mg/kg	0.010	< 0.010

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Appendix H
Groundwater monitoring results

Borehole	Water level (GL)			
	19.01.17	30.01.17	20.02.17	03.03.17
BH03A	2.10	2.25	2.40	2.06
BH04	1.50	0.40	1.65	1.35
BH06	1.25	0.82	1.22	0.90
BH12	0.70	0.70	0.70	No Access
BH14	16.25	16.33	16.45	16.05
BH14A	0.80	1.09	1.10	0.40
BH17	1.15	1.25	1.20	0.95
BH18	0.80	0.45	0.40	0.10
BH20	0.62	0.65	0.65	0.25
BH22A	0.62	0.60	0.60	0.40
BH23A	0.50	0.49	0.45	0.05
BH25A	0.95	1.08	1.05	0.62
BH26	1.60	1.95	2.00	1.35
BH27	1.05	1.50	1.60	0.70
BH28	Dry	Dry	Dry	Dry
BH29B	5.25	5.30	5.50	4.75
BH34A	3.25	3.15	3.28	2.95
BH36A	3.05	3.00	3.11	2.85
BH38	2.95	3.00	3.00	1.65

Appendix I
SPT hammer energy measurement report

SPT Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

ARCHWAY ENGINEERING (UK) LTD
AINLEYS INDUSTRIAL ESTATE
ELLAND
WEST YORKSHIRE
HX5 9JP

SPT Hammer Ref:	AR804
Test Date:	21/10/2015
Report Date:	10/21/2015
File Name:	AR804.spt
Test Operator:	SH

Instrumented Rod Data

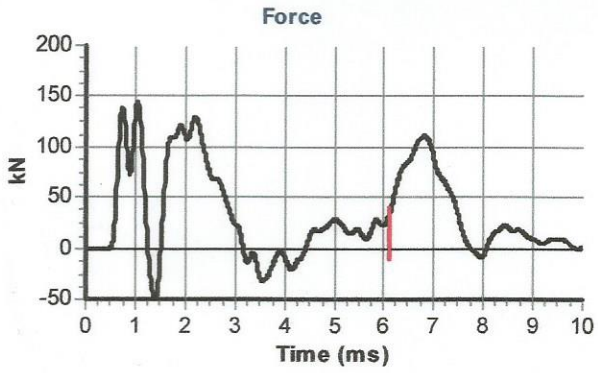
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.1
Assumed Modulus E_a (GPa):	200
Accelerometer No.1:	7079
Accelerometer No.2:	7080

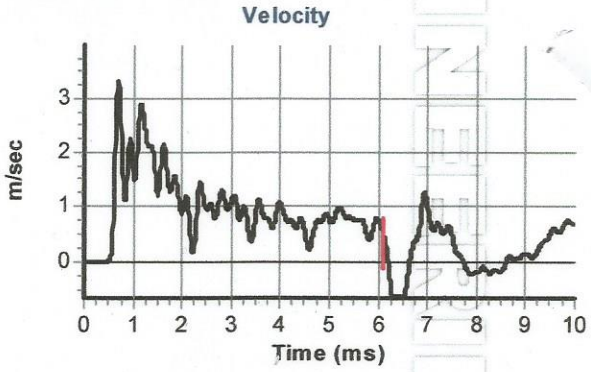
SPT Hammer Information

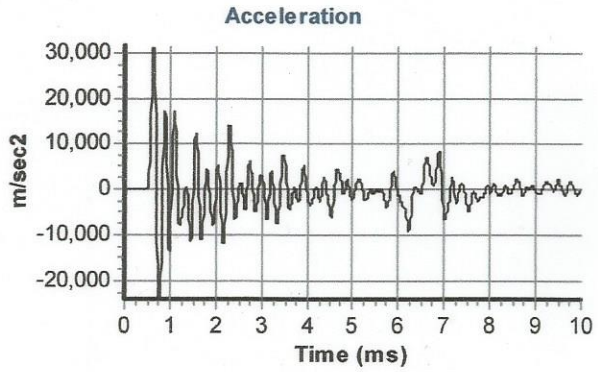
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
SPT String Length L (m):	13.0

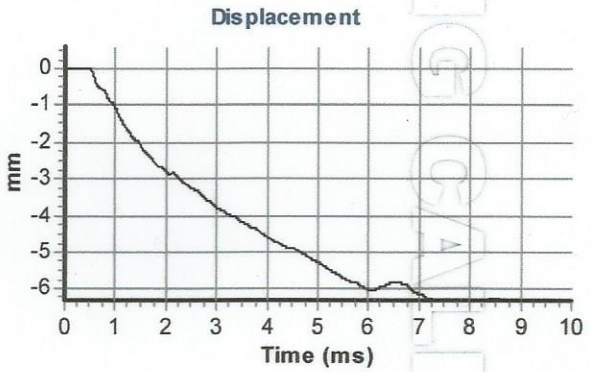
Comments / Location

CALIBRATION









Calculations

Area of Rod A (mm2):	918
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	286

Energy Ratio E_r (%): **61**

Signed: M.GARDNER

Title: FITTER

The recommended calibration interval is 12 months

Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic sampling uk ltd
6-8 victory parkway
victory road
Derby
DE24 8ZF

Hammer Ref:	DC01
Test Date:	04/12/2015
Report Date:	
File Name:	DC01.spt
Test Operator:	TP

Instrumented Rod Data

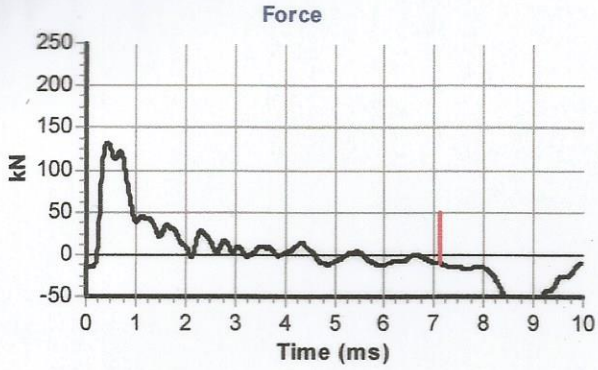
Diameter d_r (mm):	54
Wall Thickness t_r (mm):	6.9
Assumed Modulus E_a (GPa):	208
Accelerometer No.1:	6455
Accelerometer No.2:	6457

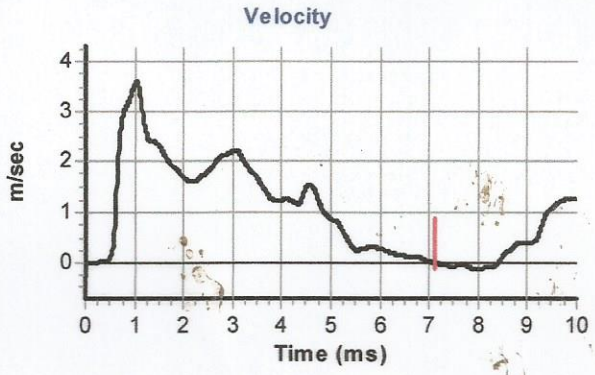
Hammer Information

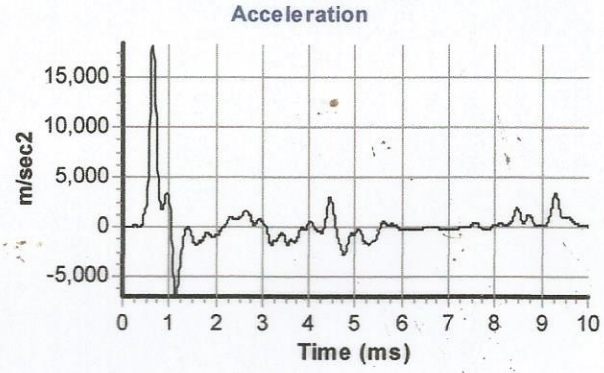
Hammer Mass m (kg):	63.5
Falling Height h (mm):	760
String Length L (m):	15.0

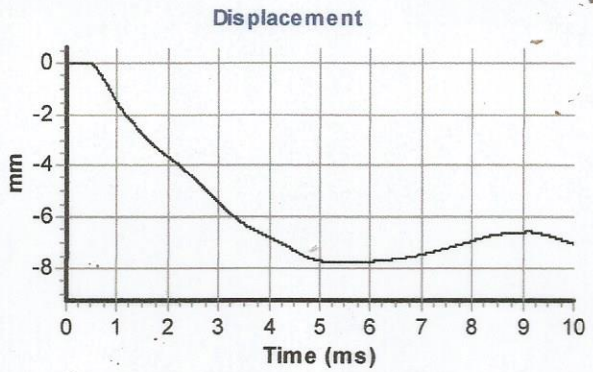
Comments / Location

Drillcore hammer tested at Dynamic samplings yard.









Calculations

Area of Rod A (mm2):	1021
Theoretical Energy E_{theor} (J):	473
Measured Energy E_{meas} (J):	249

Energy Ratio E_r (%): **53**

The recommended calibration interval is 12 months

Signed: A.parker

Title: Manager

SPT Calibration Report

www.equipegroup.com

Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	CAUSEWAY GEOTECH
Test No	EQU1434
Test Depth (m)	8.50
Date of Test	**09 January 2016**
Valid until	**08 January 2017**
Hammer ID	**405**

Mass of the hammer m = 63.5kg
Falling height h = 0.76m
E_{theor} = $m \times g \times h$ = 473J

Characteristics of the instrumented rod

Diameter	d_r = 0.052 m
Length of the instrumented rod	0.558 m
Area	A = 11.61 cm^2
Modulus	E_a = 206843 MPa

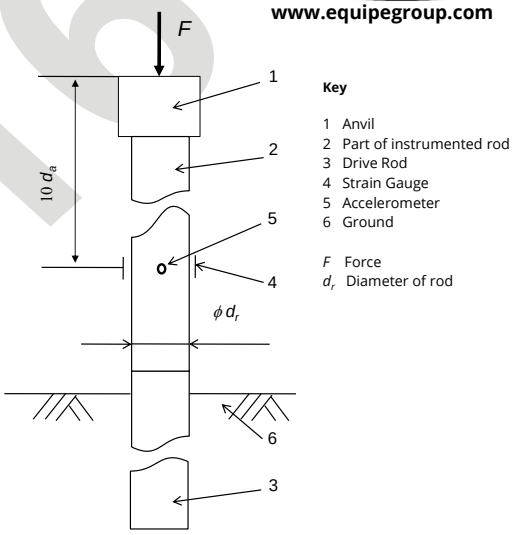
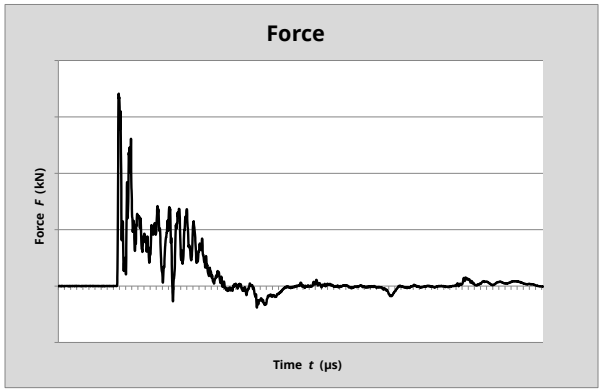
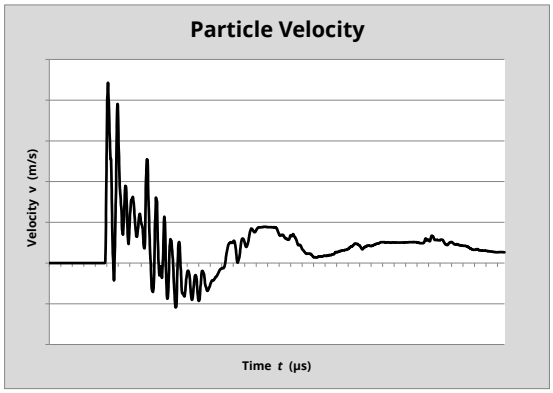
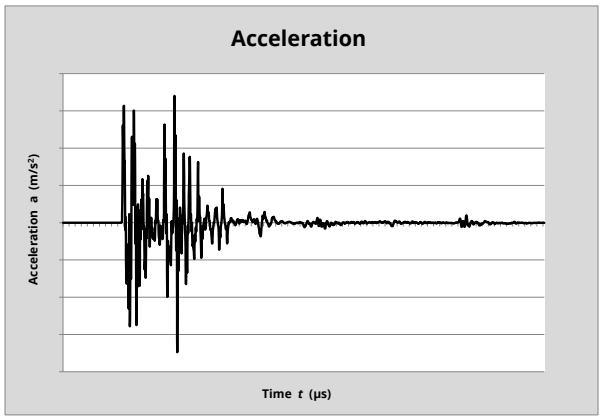
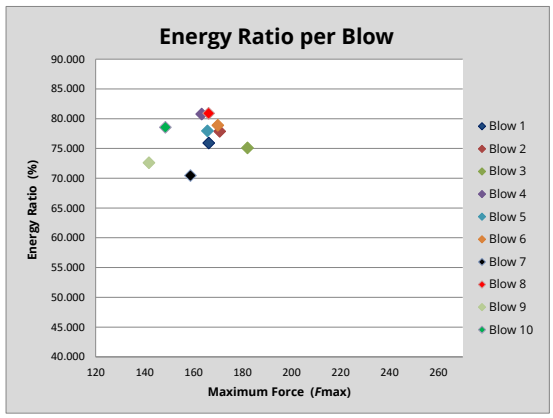


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

E_{meas} = **0.365** kN-m

E_{theor} = **0.473** kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$: **77.17%**

Equipe SPT Analyzer Operators: MH

Prepared by:		**Checked by:**	**Date**	**15/01/2016**

Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

SPT Calibration Report

www.equipegroup.com

Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	CAUSEWAY GEOTECH
Test No	EQU1436
Test Depth (m)	8.60
Date of Test	**09 January 2016**
Valid until	**08 January 2017**
Hammer ID	**CC**

Mass of the hammer m = 63.5kg
Falling height h = 0.76m
E_{theor} = $m \times g \times h$ = 473J

Characteristics of the instrumented rod

Diameter d_r = 0.052 m
Length of the instrumented rod 0.558 m
Area A = 11.61 cm^2
Modulus E_a = 206843 MPa

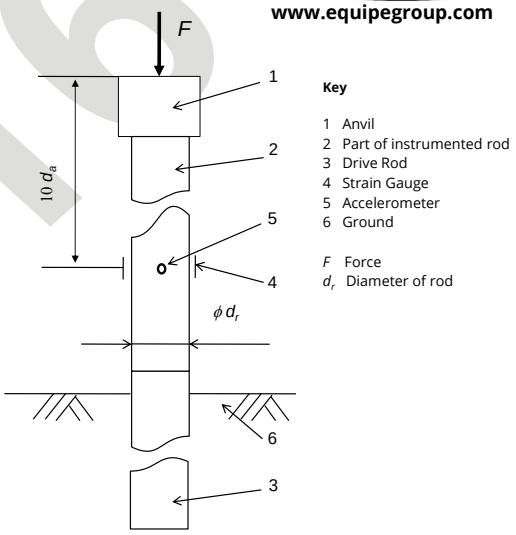
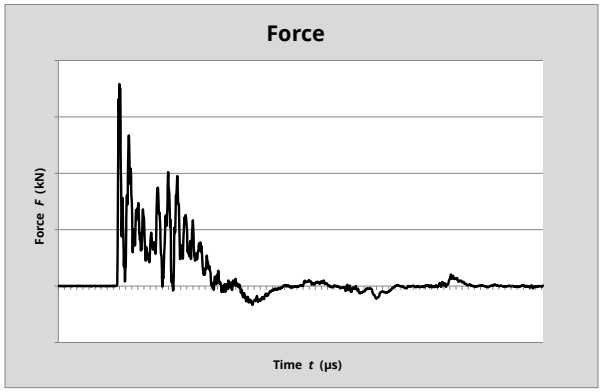
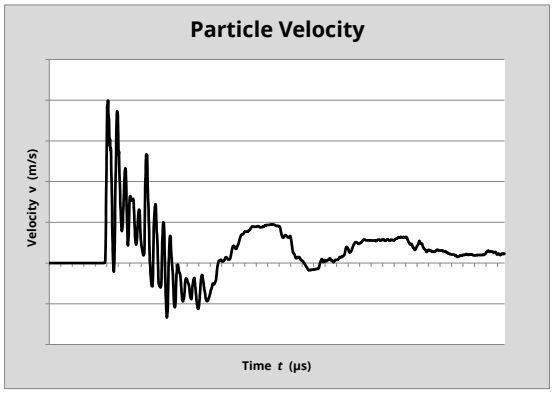
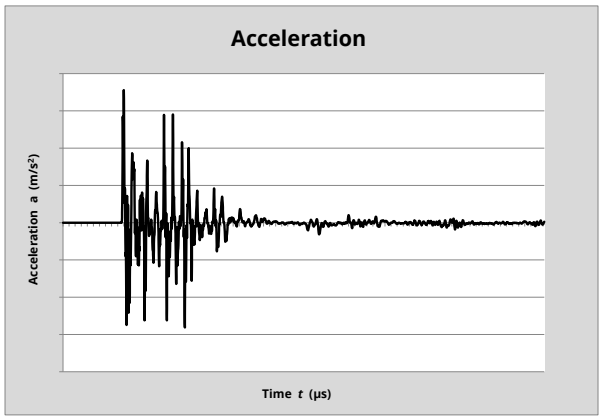
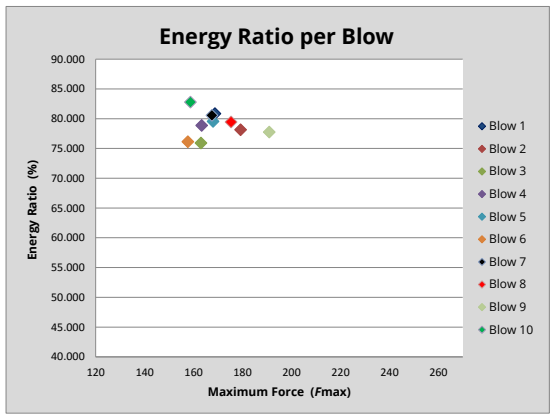


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

E_{meas} = **0.375** kN-m

E_{theor} = **0.473** kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$: **79.27%**

Equipe SPT Analyzer Operators: MH

Prepared by:	**Checked by:**	**Date**	**15/01/2016**

SPT Calibration Report

www.equipegroup.com

Hammer Energy Measurement Report

Type of Hammer	SPT HAMMER
Client	CAUSEWAY GEOTECH
Test No	EQU1433
Test Depth (m)	8.50
Date of Test	09 January 2016
Valid until	08 January 2017
Hammer ID	NI2

Mass of the hammer m = 63.5kg
Falling height h = 0.76m
E_{theor} = $m \times g \times h$ = 473J

Characteristics of the instrumented rod

Diameter d_r = 0.052 m
Length of the instrumented rod 0.558 m
Area A = 11.61 cm^2
Modulus E_a = 206843 MPa

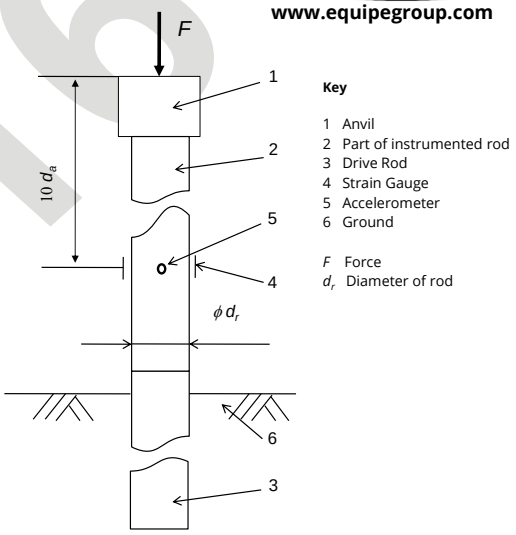
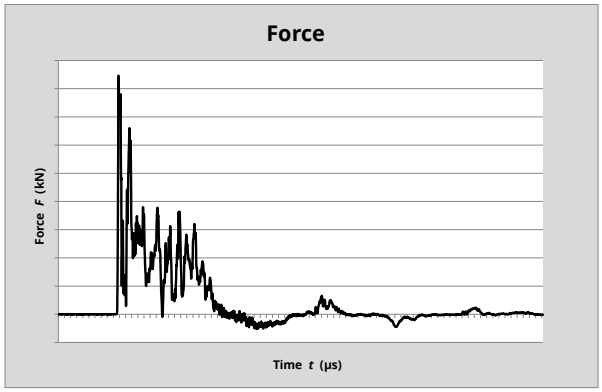
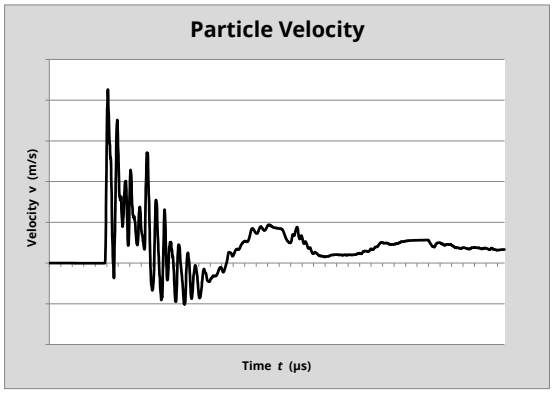
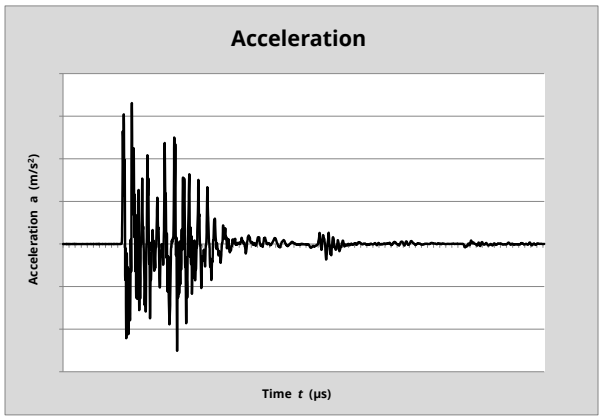
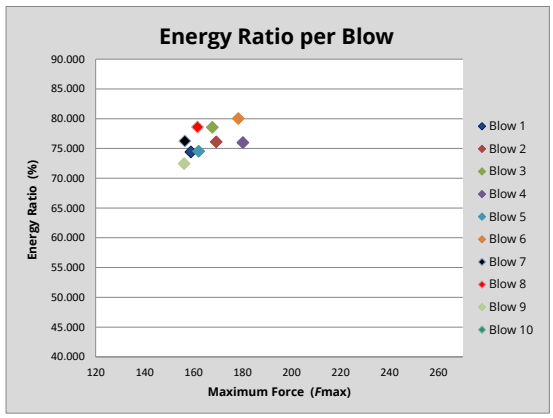


Fig. B.1 and B.2 BS EN ISO 22476-3 : 2005 + A1 : 2011









Observations:
1.

E_{meas} = **0.362** kN-m

E_{theor} = **0.473** kN-m

Energy Ratio (E_r) = $\frac{E_{meas}}{E_{theor}}$: **76.59%**

Equipe SPT Analyzer Operators: MH

Prepared by:		**Checked by:**	**Date**	**15/01/2016**

 Equipe Group, The Paddocks, Home Farm Offices, The Upton Estate, Banbury, Oxfordshire, OX15 6HU
Tel: +44 (0)1295 670990 Fax: +44 (0)1295 678232 Email: info@equipegroup.com

AGL16161_01

REPORT ON THE GEOPHYSICAL SURVEY AT ENNISKILLEN RELIEF ROAD, NORTHERN IRELAND FOR IGSL

30TH AUGUST 2016

APEX Geoservices Limited
Unit 6 Knockmullen Business Pk.,
Gorey,
Co. Wexford, Ireland

T: 0402 21842
F: 0402 21843
E: info@apexgeoservices.ie
W: www.apexgeoservices.com

PRIVATE AND CONFIDENTIAL

THE FINDINGS OF THIS REPORT ARE THE RESULT OF A GEOPHYSICAL SURVEY USING NON-INVASIVE SURVEY TECHNIQUES CARRIED OUT AT THE GROUND SURFACE. INTERPRETATIONS CONTAINED IN THIS REPORT ARE DERIVED FROM KNOWLEDGE OF THE GROUND CONDITIONS, THE GEOPHYSICAL RESPONSES OF GROUND MATERIALS AND THE EXPERIENCE OF THE AUTHOR. APEX GEOSERVICES LTD. HAS PREPARED THIS REPORT IN LINE WITH BEST CURRENT PRACTICE AND WITH ALL REASONABLE SKILL, CARE AND DILIGENCE IN CONSIDERATION OF THE LIMITS IMPOSED BY THE SURVEY TECHNIQUES USED AND THE RESOURCES DEVOTED TO IT BY AGREEMENT WITH THE CLIENT. THE INTERPRETATIVE BASIS OF THE CONCLUSIONS CONTAINED IN THIS REPORT SHOULD BE TAKEN INTO ACCOUNT IN ANY FUTURE USE OF THIS REPORT.

PROJECT NUMBER	AGL16161 Enniskillen Relief Road		
AUTHOR	**CHECKED**	**REPORT STATUS**	**DATE**
MONIKA NAWROCKA-OKON M.SC (GEOLOGY)	PETER O'CONNOR PGeo M.Sc. Dip. EIA Mgt.	V.01	AUGUST 30TH 2016

CONTENTS

1. EXECUTIVE SUMMARY

APEX Geoservices Limited was commissioned by IGSL, to carry out a geophysical investigation at a survey proposed route of A4 Enniskillen Relief Road, Northern Ireland.

The geophysical investigation is a part of ground investigation prior to construction of the Enniskillen relief road.

The site is located approximately 1.5 km south of Enniskillen, Co. Fermanagh, Northern Ireland and comprises c. 2.1 km long section of proposed bypass. The bypass will connect the A4 to the A509.

The objectives of the geophysical survey are to provide information on the possibility of karst features in the bedrock, depth to bedrock and nature and thickness of the soils along the route.

The bedrock geology map indicates the site is underlain by the Ballyshannon Limestone Formation, The superficial geology map indicates that predominant soil type within the site is diamicton till. The mapshows lacustrine sediments in the east and west of the site.

Silty gravelly clay (boulder clay) is the predominant soil type along the route of the proposed road. The thickness of this layer ranges from 2.5 m to 29 m (12m in average). The thickest boulder clay deposits occur with the drumlins at ch 630 – 880 m (boulder clay thickness up to 21m) and ch. 1820 – 2065 (boulder clay thickness up to 29 m).

A number of soft alluvial sediments zones have been interpreted across the site. For those zones soft ground

Bedrock resistivity values are lower than normally expected for the purer limestones. This indicates either a higher than expected argillaceous content or significant weathering of the limestones. The top of weathered limestone ranges from 34.9 to 47.7 mOD with an average of 42 mOD. The top of fresh limestone ranges from 17.5 to 44.1 m OD with an average of 36 mOD.

Possible areas of karst have been interpreted at ch. 700 – 800 m and ch. 400 - 460 m.

In addition to soft ground probes a number of trial pits, boreholes and rotary cores have been recommended.

ID	Easting	Northing	Depth (m bgl)
TP1	224213.2	342628.9	5
TP2	224283.5	342693.3	5
BH1	222563.5	342247.5	10
BH2	222688.4	342249.8	10
BH3	223577.7	342427.1	10
BH4	223670.4	342406.1	10
BH5	223993.8	342540.4	10
RC1	223269.8	342366.7	45
RC2	222975.1	342290.2	35

The geophysical interpretation should be reviewed following any further direct investigation.

2. INTRODUCTION

APEX Geoservices Limited was commissioned by IGSL, to carry out a geophysical investigation at a survey proposed route of A4 Enniskillen Relief Road, Northern Ireland. The geophysical investigation is a part of ground investigation prior to construction of the Enniskillen relief road.

2.1 Survey Objectives

The objectives of the geophysical survey are to provide information on the following:

- the possibility of karst features in the bedrock.
- the depth to bedrock
- the nature and thickness of the soils along the route

2.2 Site Background

2.2.1 Location

The site is located approximately 1.5 km south of Enniskillen, Co. Fermanagh, Northern Ireland and comprises c. 2.1 km long section of proposed bypass. The bypass will connect the A4 to the A509.

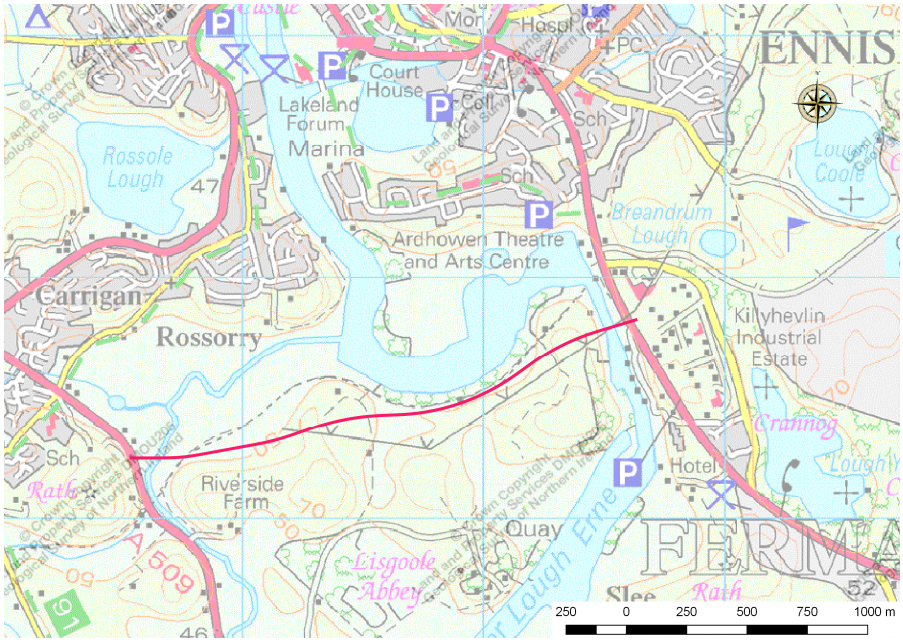


Fig.2.1 Location map showing the proposed relief road (marked in red).

2.2.2 Bedrock and soils

The bedrock and superficial geology maps for the area are shown in Fig. 2.2 and Fig.2.3, respectively. The bedrock geology map indicates the site is underlain by rocks of the Ballyshannon Limestone Formation, described as limestone, dark blue-grey, bioclastic, argillaceous packstones, interbedded with dark grey, silty shale; rarely with chert nodules in upper part; named members include sandstones. The superficial geology map indicates that predominant soil type within the site is diamicton till. The map shows lacustrine sediments in the east and west of the site.

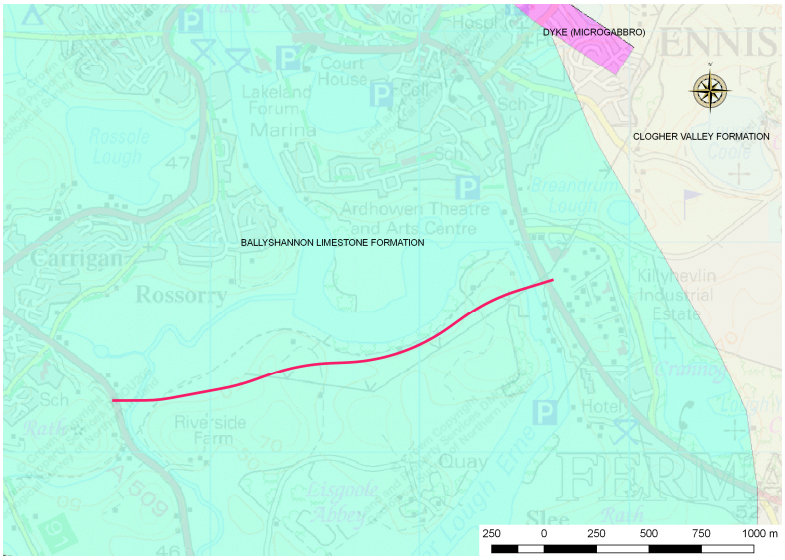


Fig.2.2. GSNI bedrock geology 1:250,000 map (proposed relief road shown in red).

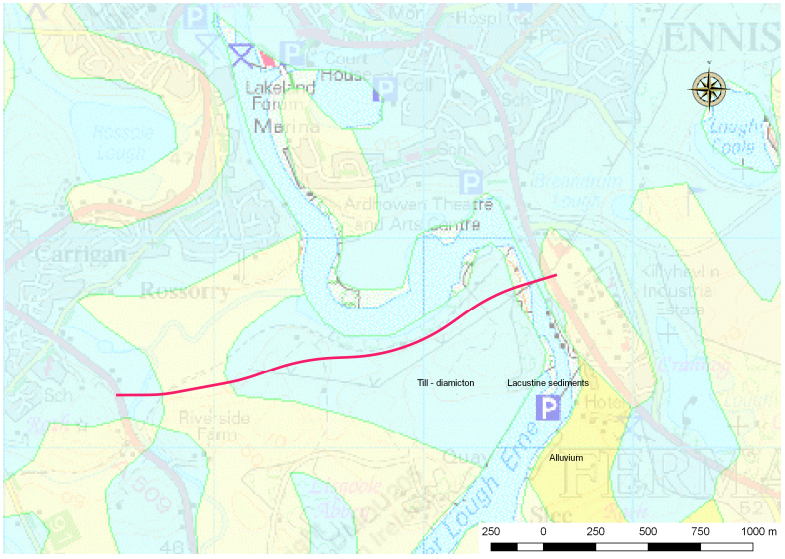


Fig.2 3. GSNI superficial geology 1:250,000 map (proposed relief road shown in red).

2.2.3 Site Investigation

There was no ground investigation data available at the time of writing the report.

2.3 Survey Rationale

This geophysical investigation comprised of EM ground conductivity mapping and electrical resistivity tomography (ERT).

EM Ground Conductivity Mapping is an electromagnetic technique that determines the apparent conductivity of the ground material from 0-6m below ground level (bgl). Ground Conductivity Mapping provides information on variations in overburden material and shallow rock.

ERT soundings image the resistivity of the materials in the subsurface along a profile, providing information on variations in overburden material and rock type.

By combining a number of techniques it is possible to provide a higher quality interpretation and reduce any ambiguities which may otherwise exist. Further information on the detailed methodology of each geophysical method employed in this investigation is given in **APPENDIX B: DETAILED GEOPHYSICAL METHODOLOGY**.

3. GEOPHYSICAL RESULTS AND INTERPRETATION

The survey locations are indicated on Drawing AGL16161_02 - AGL16161_09.

3.1 Ground Conductivity Mapping (EM31)

The EM ground conductivities are plotted on Drawings AGL16161_02 – AGL16161_05. The conductivity values are indicative of the bulk conductivity of the ground materials from 0 to 6 m bgl. Low conductivities are typically indicative of sands and gravels or shallow bedrock. Higher conductivities indicate an increase in the peat, silt, clay or moisture content in the soils. Very high values are typically indicative of made ground or interference from cultural interference such as metal fences and underground services.

The recorded conductivity values ranged from 10 – 56 mS/m. These conductivity values have been interpreted on the following basis:

Conductivity (mS/m)	Interpretation
10-26	Silty gravelly CLAY (boulder clay)
26-56	Soft CLAY/SILT

3.2 Electrical Resistivity Tomography (ERT)

The ERT profiles are plotted on Drawings AGL1661_06 – AGL16161_09. Resistivity values recorded across the site ranged from 16 to 1050 Ohm-m. These values have been interpreted as follows:

Resistivity (Ohm-m)	Interpretation
<40	Soft SILT/CLAY
40 – 100	Silty gravelly CLAY (BOULDER CLAY)
100 – 200	Weathered LIMESTONE
200 – 1050	LIMESTONE

4. DISCUSSION

OVERBURDEN

Silty gravelly clay (boulder clay) is characterised by conductivities from 10 to 26 mS/m and resistivities in the range from 40 – 100 Ohm.m, is the predominant soil type along the route of the proposed road. The thickness of this layer ranges from 2.5 m to 29 m (12m in average). The thickest boulder clay deposits occur with the drumlins at ch 630 – 880 m (boulder clay thickness up to 21m) and ch. 1820 – 2065 (boulder clay thickness up to 29 m).

The soft alluvial sediments are characterized by high conductivities (26– 56 mS/m) and low resistivities (16 – 40 Ohm-m).

Chainage 22 – 75 m and 95 – 207 m – a zone of thick alluvial deposits (clays/silts) has been interpreted at this location. The thickness of these silts/clays is up to 10 m bgl in the west of ERT profile R1. Two boreholes are recommended to investigate the nature and thickness of the soft ground material at this zone – BH1 at 25 m and BH 2 at 150 m chainage. The recommended BH depth is 12m.

There is a band of lower conductivity material at chainage 75 – 95 m, associated either with a topography ridge or/and increased content of sandy gravelly material.

Chainage 574 – 625 m – a zone of soft deposits was interpreted at this location with thickness up to 5.0 m bgl on R3. Probing is recommended at this location to further investigate the soft sediments. The recommended probe depth is 5 m bgl. This zone is not as extensive on the ERT data as on the EM as the thickest deposits occurs to the north of the centreline/ERT profile.

Chainage 847 – 877 m – a zone of soft deposits was interpreted at this location with thickness up to 4.7 m bgl. Those deposits are possibly associated with solifluction of the material from the slopes of drumlin Probing is recommended at this location to further investigate soft sediments. The recommended probe depth is 5 m bgl.

Chainage 1025 – 1180 m - a zone of thick alluvial deposits (clays/silts) has been interpreted at this location. The thickness of the soft deposits is up to 10 m bgl on ERT profile R5. Two boreholes are recommended to investigate the nature and thickness of the soft ground material at this zone – BH3 at ch. 1060 m and BH 4 at ch. 1150 m - 25 m to the south of proposed road centreline. The recommended BH depth is 10m.

Chainage 1250 – 1265 m - a lens of soft silt/clay has been interpreted at this location.

Chainage 1455 – 1597 m – the zone of soft ground has been interpreted running from centre of the road towards the north. Borehole (BH5) is recommended at ch. 1500 m and 25 m to the north of proposed centreline. The recommended BH depth is 10m. This zone has been interpreted on the EM only as it occurs to the north of the centreline/ERT profile and is associated with the vicinity of the river.

Chainage 1730 – 1850 m – a zone of soft alluvial deposits was interpreted at this location with thicknesses up to 3.7 m bgl. Two trial pits are recommended at this location: TP1 at ch. 1742 - 17 m to

the south of proposed road centreline and TP2 at 1830 m at the road centreline. The recommended trial pit depth is 5 m bgl.

Chainage 1955 – 1973 and 2015 – 2035m - zones of soft silt clay associated with possible solifluction of material from the slope of the drumlin

Thick (up to 10.5 m) soft alluvial silt/clays have been interpreted along ERT profile R10. There is possibility that there is some interference from underground services, as profile R10 was acquired along the existing road.

BEDROCK

Recorded bedrock resistivities range from 100 – 1050 ohm-m. Material with resistivities from 100 – 200 Ohm-m has been interpreted as weathered limestone and material of resistivities from 200 – 1050 ohm-m has been interpreted as fresh limestone.

Overall bedrock resistivity values are lower than normally expected for the purer limestones. This indicates either a higher than expected argillaceous content or significant weathering of the limestones.

The top of weathered limestone ranges from 34.9 to 47.7 mOD with an average of 42 mOD.

The top of fresh limestone ranges from 17.5 to 44.1 m OD with an average of 36 mOD.

Possible areas of karst have been interpreted at ch. 700 – 800 m and ch. 400 - 460 m. Two rotary core holes are recommended in these areas, starting with ch. 700 – 800 m. The recommended depth of the rotary core holes is 45 m bgl, while rock is expected at 15 -20 m bgl. RC 2 is proposed at ch. 440m with a recommended depth of 35 m bgl.

5. RECOMMENDATIONS

Soft ground probes are recommended is soft clay/silt areas as well as following trial pits, boreholes and rotary cores.

ID	Easting	Northing	Depth (m bgl)
TP1	224213.2	342628.9	5
TP2	224283.5	342693.3	5
BH1	222563.5	342247.5	10
BH2	222688.4	342249.8	10
BH3	223577.7	342427.1	10
BH4	223670.4	342406.1	10
BH5	223993.8	342540.4	10
RC1	223269.8	342366.7	45
RC2	222975.1	342290.2	35

The geophysical interpretation should be reviewed following any further direct investigation.

6. REFERENCES

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'Engineering Geology', Blackwell Scientific Press.

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'RES2DINV Users Manual', Malaysia.

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'Seismic refraction exploration for engineering site investigations', NTIS, U.S. Dept. of Commerce

SeisImager, 2009;
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Soske, J.L., 1959;
'The blind zone problem in engineering geophysics', Geophysics, 24, pp 359-365.

APPENDIX A: DRAWINGS

The information derived from the geophysical investigation as well as correlation with the available direct investigation is presented in the following drawings:

AGL16161_01	Index map	Scale 1:5000
AGL16161_02	Fig.1 Geophysical locations	Scale 1:2000
	Fig.2 EM Ground Conductivity Contours (mS/m)	Scale 1:2000
	Fig.3 EM Interpretation	Scale 1:2000
AGL16161_03	Fig.1 Geophysical locations	Scale 1:2000
	Fig.2 EM Ground Conductivity Contours (mS/m)	Scale 1:2000
	Fig.3 EM Interpretation	Scale 1:2000
AGL16161_04	Fig.1 Geophysical locations	Scale 1:2000
	Fig.2 EM Ground Conductivity Contours (mS/m)	Scale 1:2000
	Fig.3 EM Interpretation	Scale 1:2000
AGL16161_05	Fig.1 Geophysical locations	Scale 1:2000
	Fig.2 EM Ground Conductivity Contours (mS/m)	Scale 1:2000
	Fig.3 EM Interpretation	Scale 1:2000
AGL16161_06	Fig.1 Geophysical locations	Scale 1:2000
	Fig.2 Interpreted ERT profiles	Scale 1:2000
AGL16161_07	Fig.1 Geophysical locations	Scale 1:2000
	Fig.2 Interpreted ERT profiles	Scale 1:2000
AGL16161_08	Fig.1 Geophysical locations	Scale 1:2000
	Fig.2 Interpreted ERT profiles	Scale 1:2000
AGL16161_09	Fig.1 Geophysical locations	Scale 1:2000
	Fig.2 Interpreted ERT profiles	Scale 1:2000

FIGURE 1: INDEX MAP

SCALE 1:2000

INDEX MAP:

LEGEND:

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PROJECT:	ENNISKILLEN RELIEF ROAD GEOPHYSICAL SURVEY
CLIENT:	IGSL
DRAWING NO:	AGL16161_01
SCALE:	AS INDICATED @ A3
DATE:	30/08/2016

Version:	Date:	Drawn By:	Checked:
01	30/08/2016	MN	POC

FIGURE 1: GEOPHYSICAL LOCATIONS

SCALE 1:2000

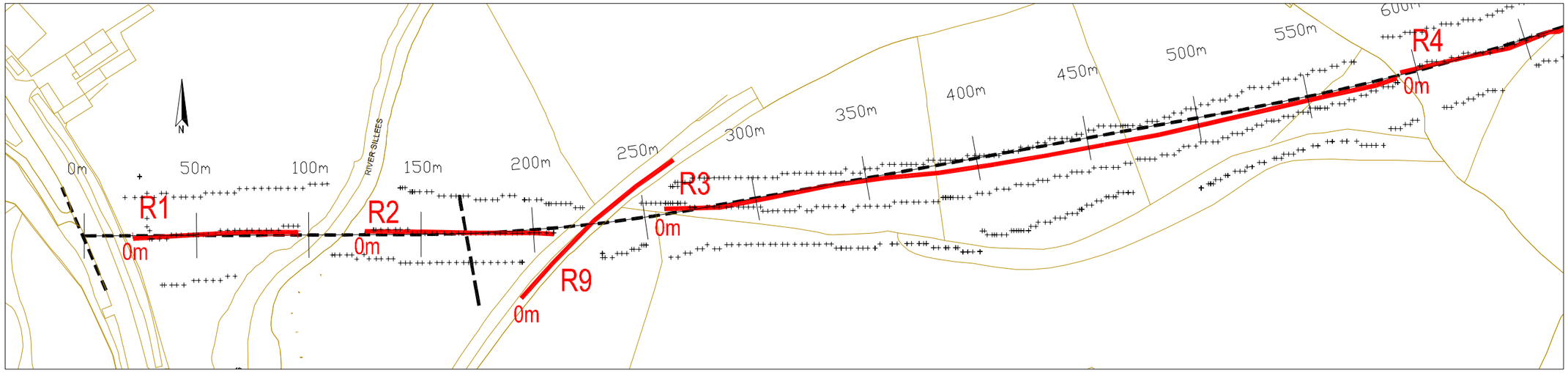


FIGURE 2: GROUND CONDUCTIVITY RESULTS

SCALE 1:2000

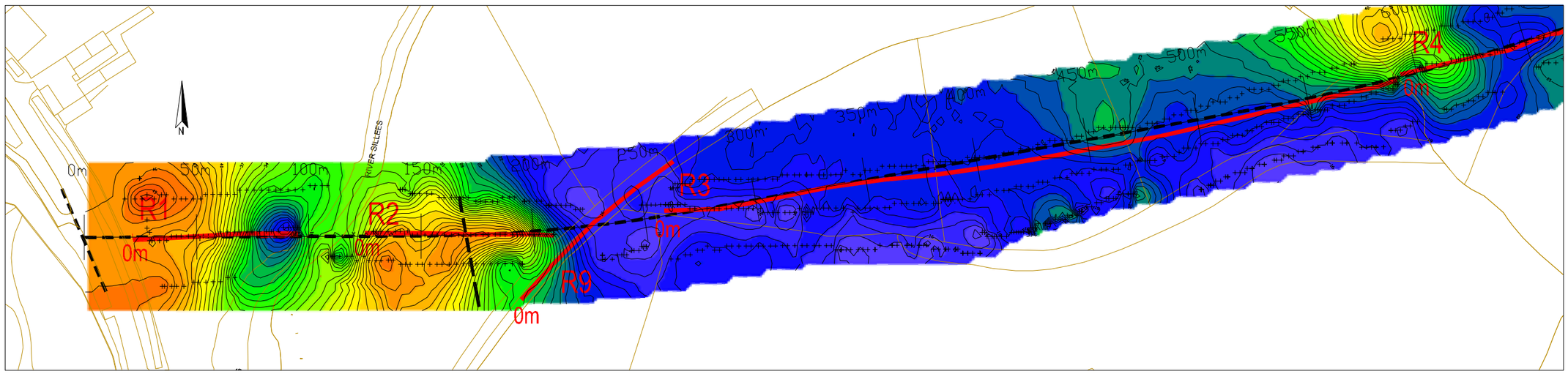
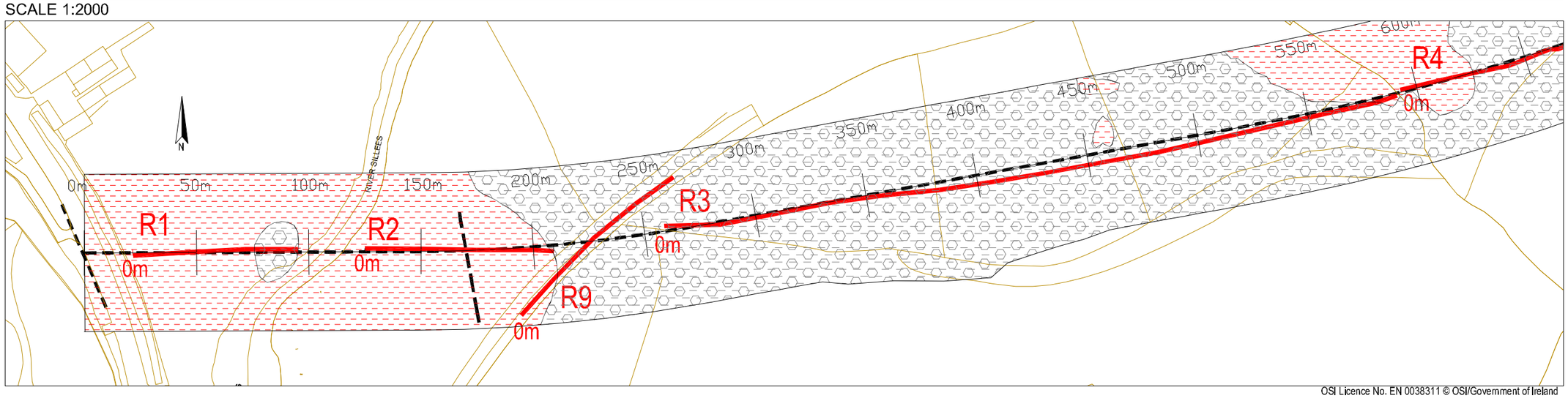


FIGURE 3: EM INTERPRETATION

SCALE 1:2000



INDEX MAP:

LEGEND:

- EM conductivity station
- R1 — 2D resistivity profile

Conductivity (mS/m): 56, 54, 52, 50, 48, 46, 44, 42, 40, 38, 36, 34, 32, 30, 28, 26, 24, 22, 20, 18, 16, 14, 12, 10

- Soft SILT/CLAY
- Silty gravelly CLAY (BOULDER CLAY)

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CLIENT:	IGSL
DRAWING NO:	AGL16161_02
SCALE:	AS INDICATED @ A3
DATE:	30/08/2016

Version:	Date:	Drawn By:	Checked:
01	30/08/2016	MN	POC

FIGURE 1: GEOPHYSICAL LOCATIONS

SCALE 1:2000

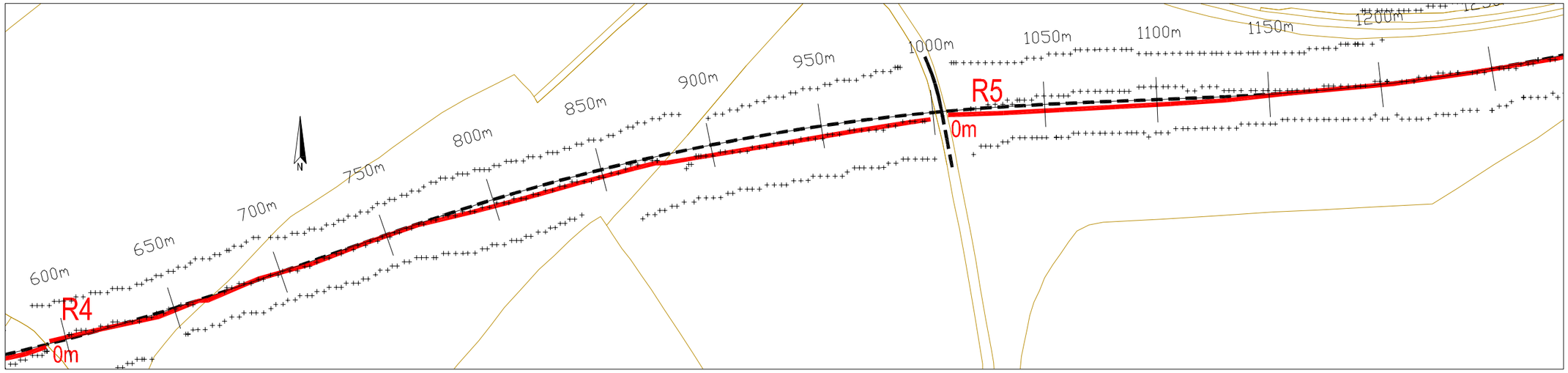


FIGURE 2: GROUND CONDUCTIVITY RESULTS

SCALE 1:2000

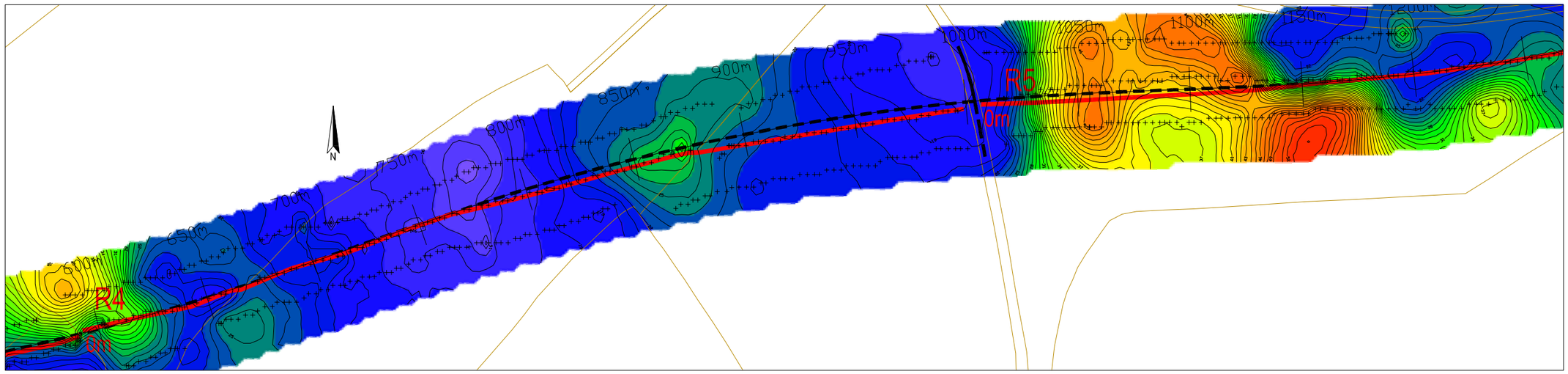
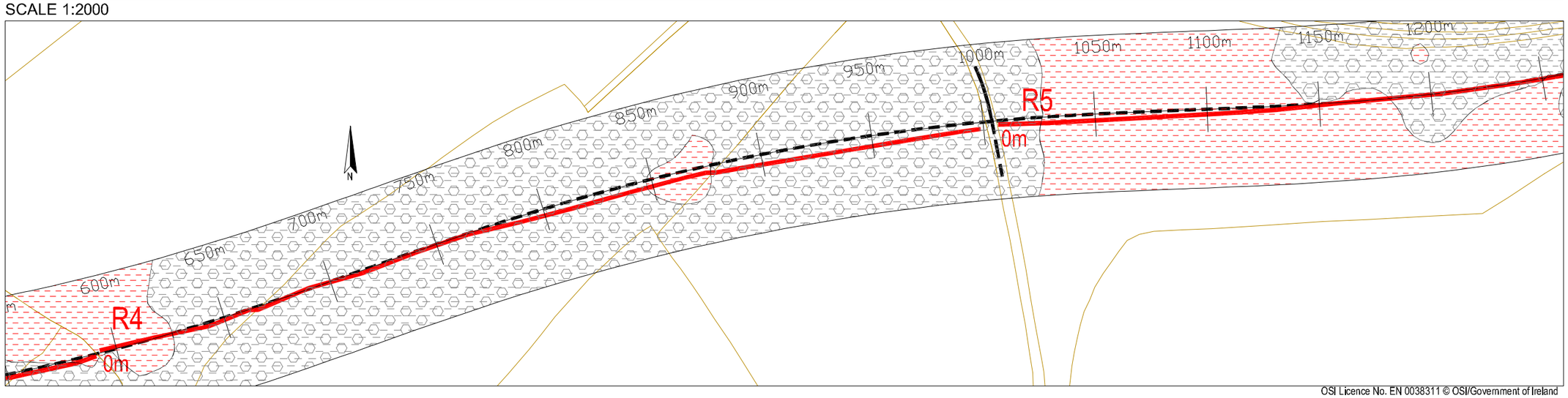


FIGURE 3: EM INTERPRETATION

SCALE 1:2000



INDEX MAP:

LEGEND:

EM conductivity station

R1 2D resistivity profile

Conductivity (mS/m)

56
54
52
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Soft SILT/CLAY

Silty gravelly CLAY (BOULDER CLAY)

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PROJECT:	ENNISKILLEN RELIEF ROAD GEOPHYSICAL SURVEY
CLIENT:	IGSL
DRAWING NO:	AGL16161_03
SCALE:	AS INDICATED @ A3
DATE:	30/08/2016

Version:	Date:	Drawn By:	Checked:
01	30/08/2016	MN	POC

FIGURE 1: GEOPHYSICAL LOCATIONS

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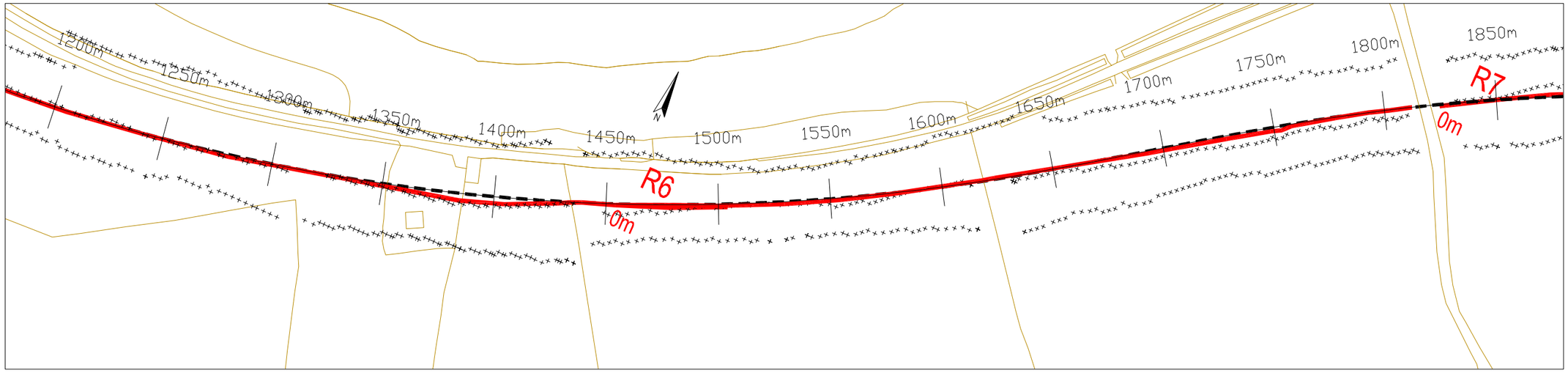


FIGURE 2: GROUND CONDUCTIVITY RESULTS

SCALE 1:2000

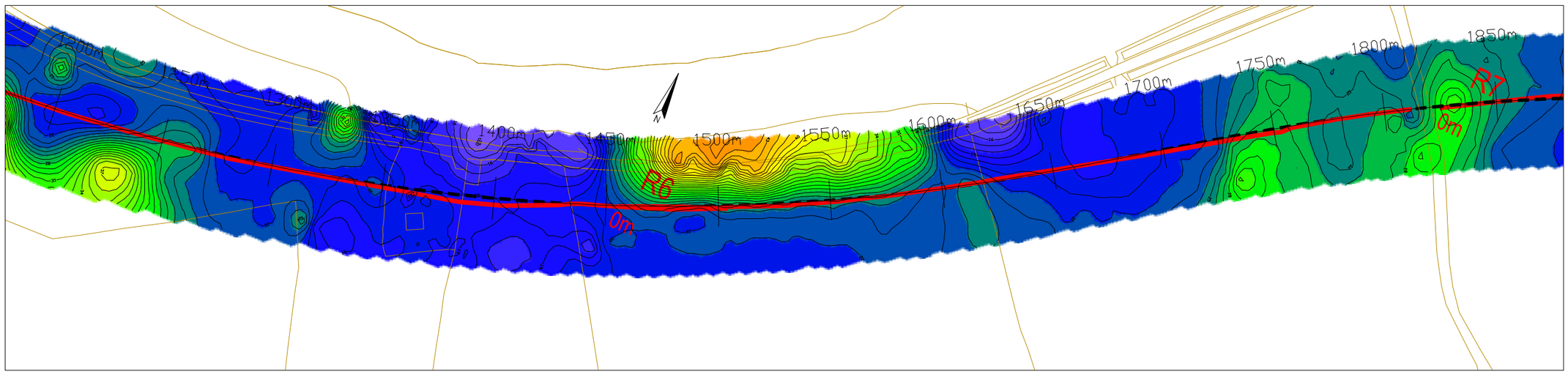
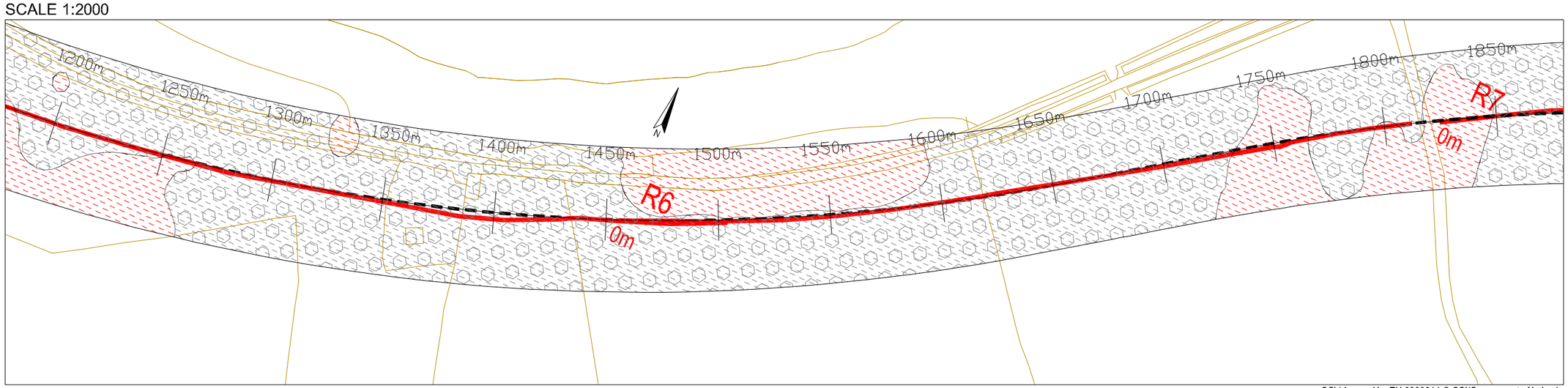


FIGURE 3: EM INTERPRETATION

SCALE 1:2000



INDEX MAP:

LEGEND:

EM conductivity station

2D resistivity profile

Conductivity (mS/m)

56
54
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Soft SILT/CLAY

Silty gravelly CLAY (BOULDER CLAY)

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CLIENT:	IGSL
DRAWING NO:	AGL16161_04
SCALE:	AS INDICATED @ A3
DATE:	30/08/2016

Version:	Date:	Drawn By:	Checked:
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FIGURE 1: GEOPHYSICAL LOCATIONS

SCALE 1:2000

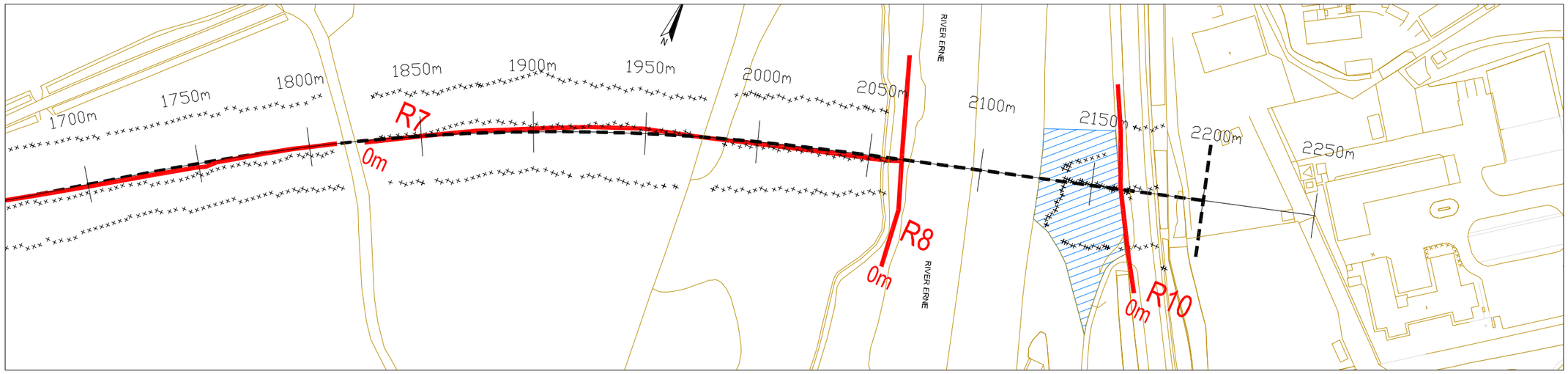

FIGURE 2: GROUND CONDUCTIVITY RESULTS

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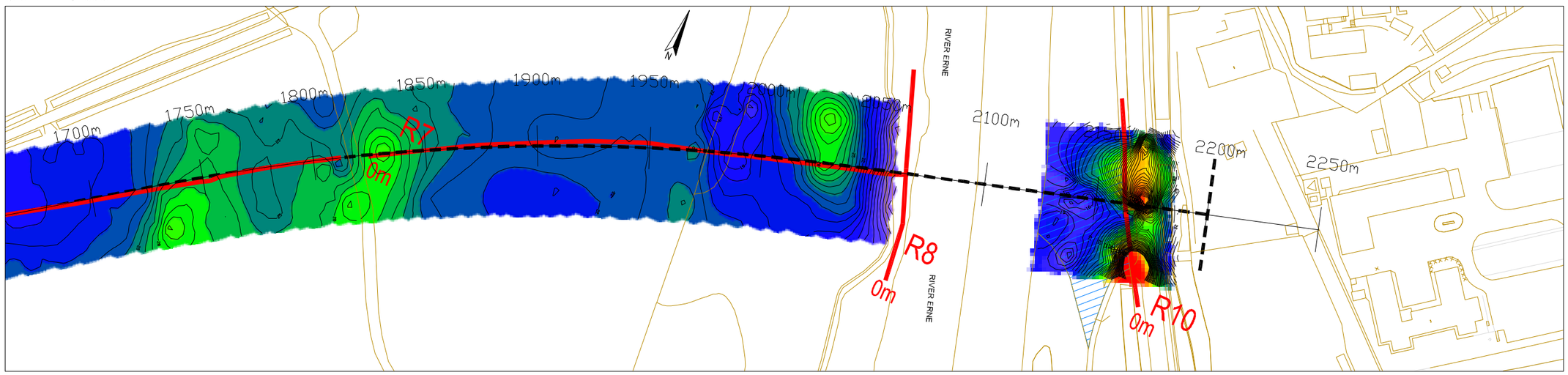

FIGURE 3: EM INTERPRETATION

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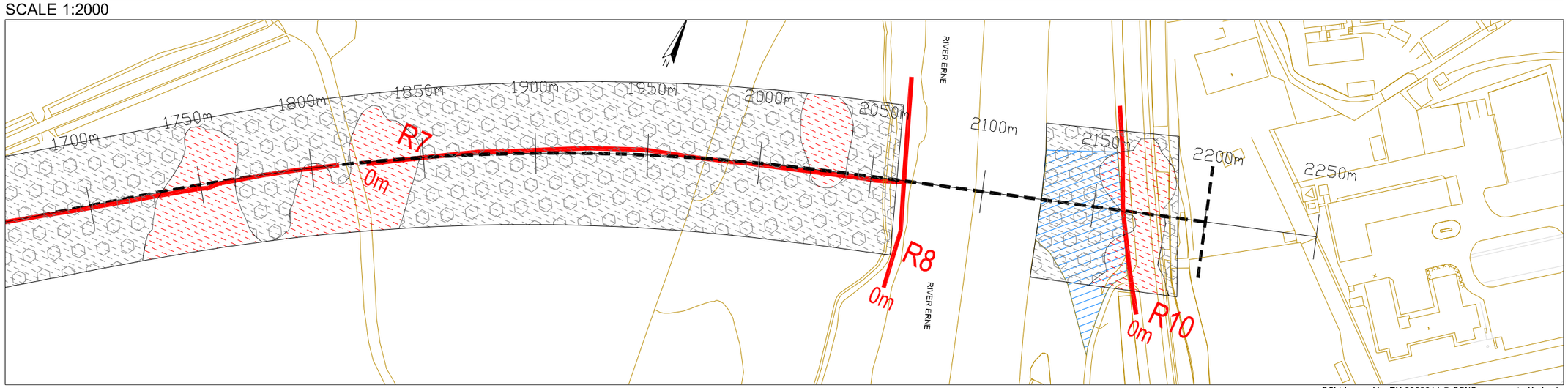

INDEX MAP:

LEGEND:

EM conductivity station

2D resistivity profile

Conductivity (mS/m)

56
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52
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48
46
44
42
40
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36
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28
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22
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18
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10

Soft SILT/CLAY

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CLIENT:	IGSL
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SCALE:	AS INDICATED @ A3
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Version:	Date:	Drawn By:	Checked:
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FIGURE 1: GEOPHYSICAL LOCATIONS

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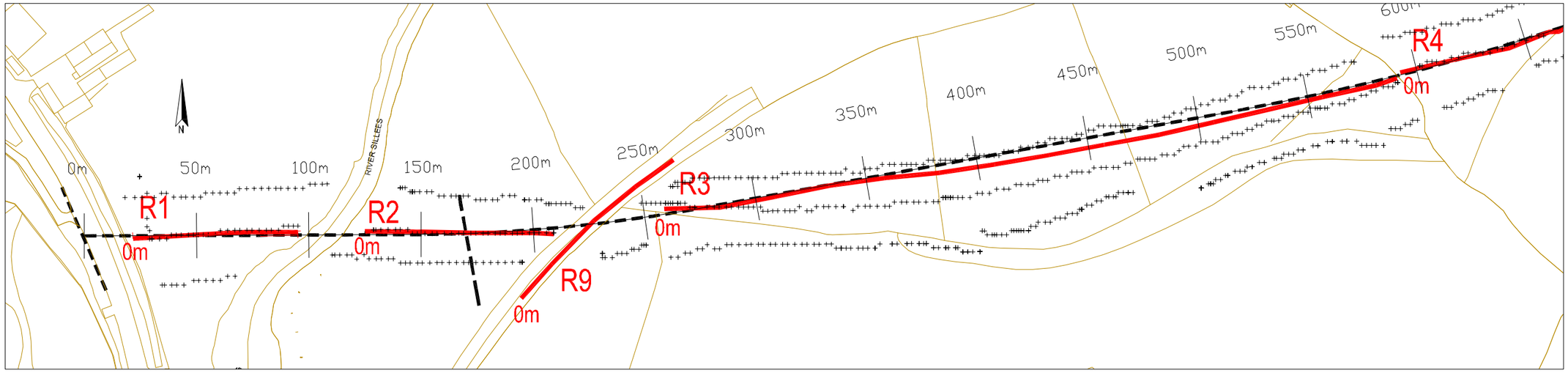

FIGURE 2: INTERPRETED ERT SECTIONS

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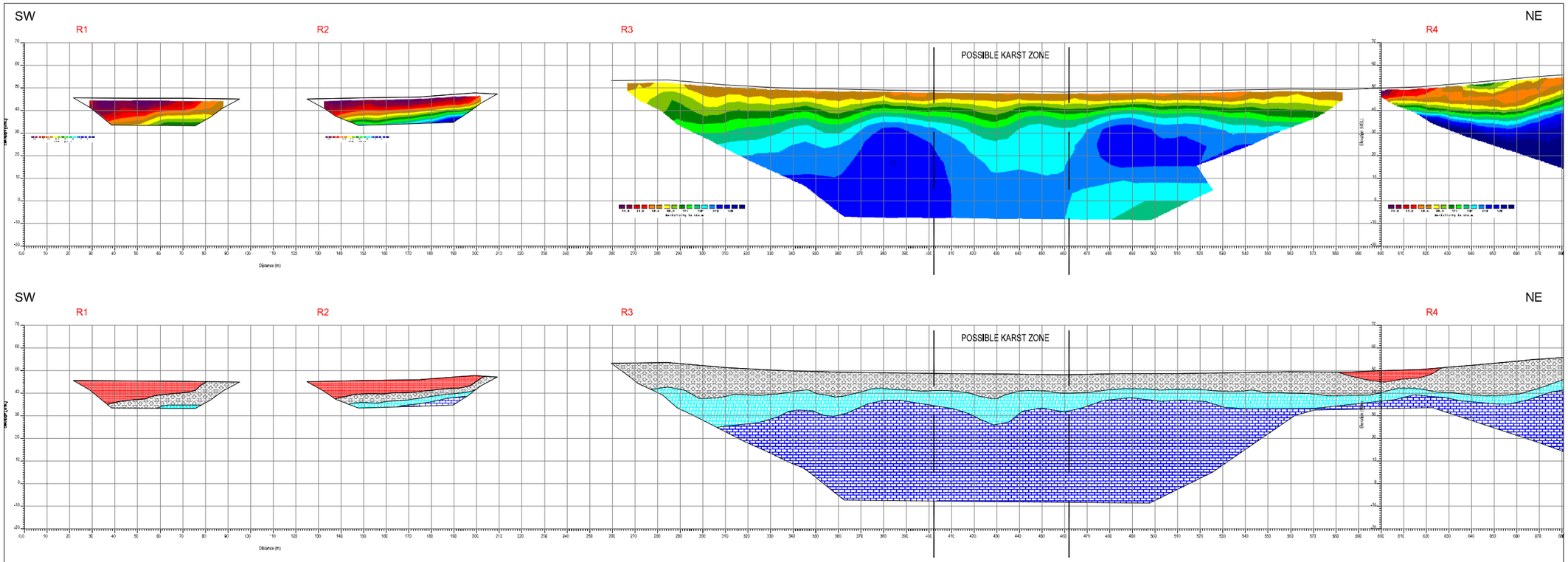

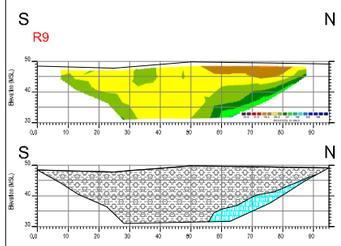

INDEX MAP:

LEGEND:

- EM conductivity station
- R1 — 2D resistivity profile
- Soft SILT/CLAY
- Silty gravelly CLAY (BOULDER CLAY)
- Weathered LIMESTONE
- LIMESTONE

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SCALE:	AS INDICATED @ A3
DATE:	30/08/2016

Version:	Date:	Drawn By:	Checked:
01	30/08/2016	MN	POC

FIGURE 1: GEOPHYSICAL LOCATIONS

SCALE 1:2000

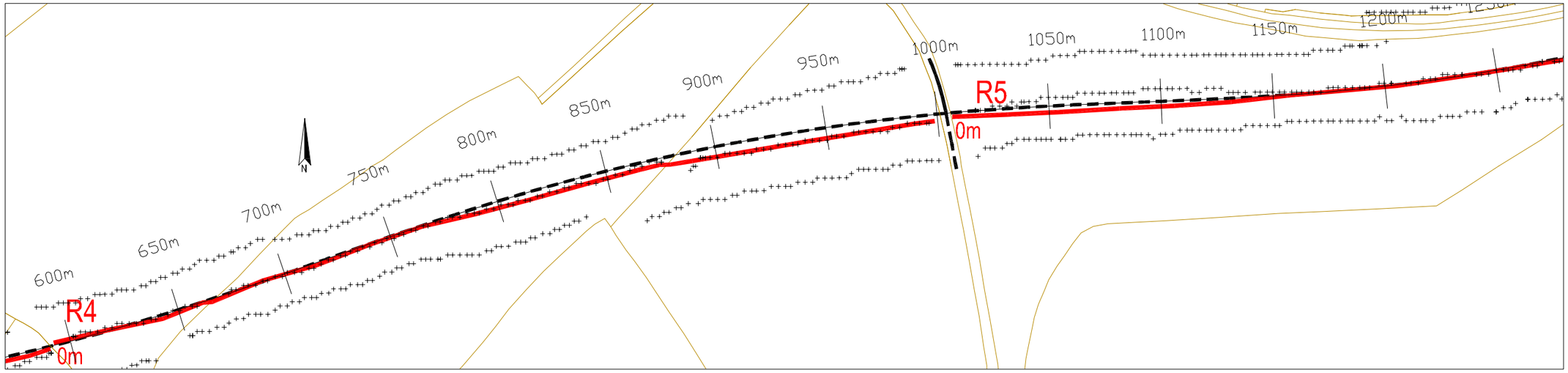
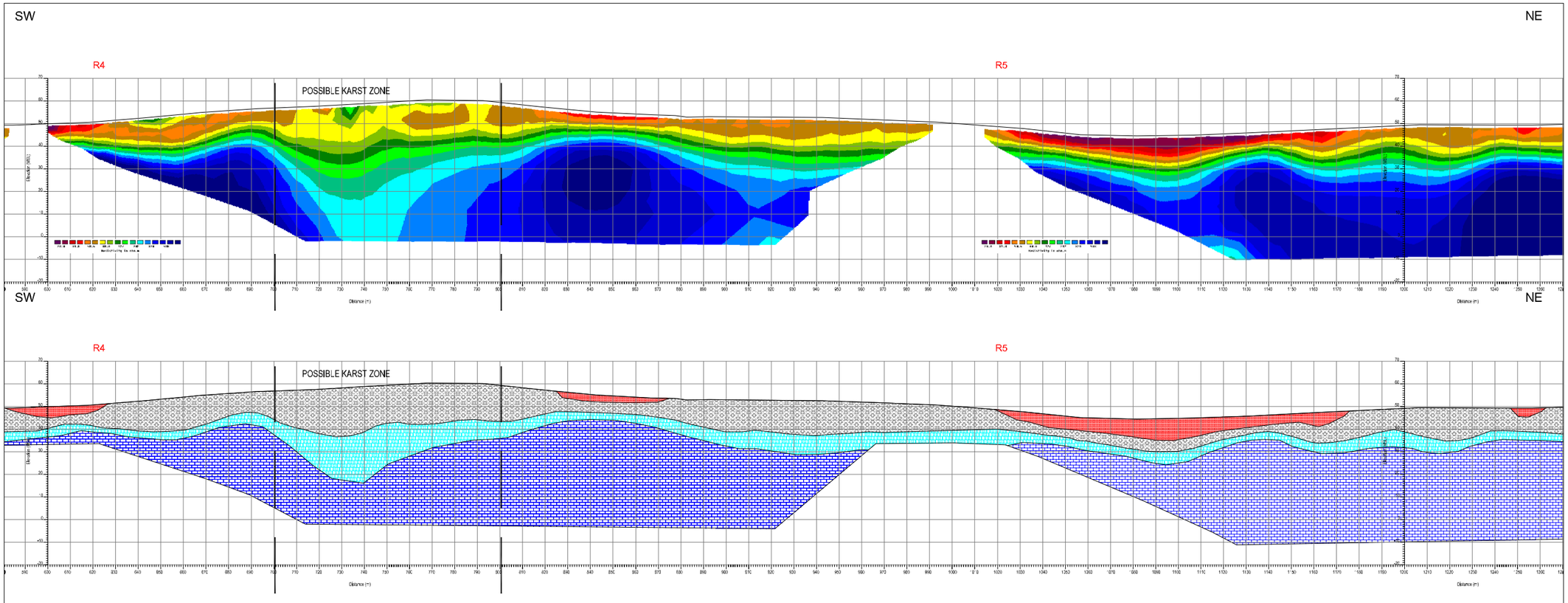


FIGURE 2: INTERPRETED ERT SECTIONS

SCALE 1:2000



INDEX MAP:

LEGEND:

- EM conductivity station
- R1 — 2D resistivity profile
- Soft SILT/CLAY
- Silty gravelly CLAY (BOULDER CLAY)
- Weathered LIMESTONE
- LIMESTONE

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SCALE:	AS INDICATED @ A3
DATE:	30/08/2016

Version:	Date:	Drawn By:	Checked:
01	30/08/2016	MN	POC

FIGURE 1: GEOPHYSICAL LOCATIONS

SCALE 1:2000

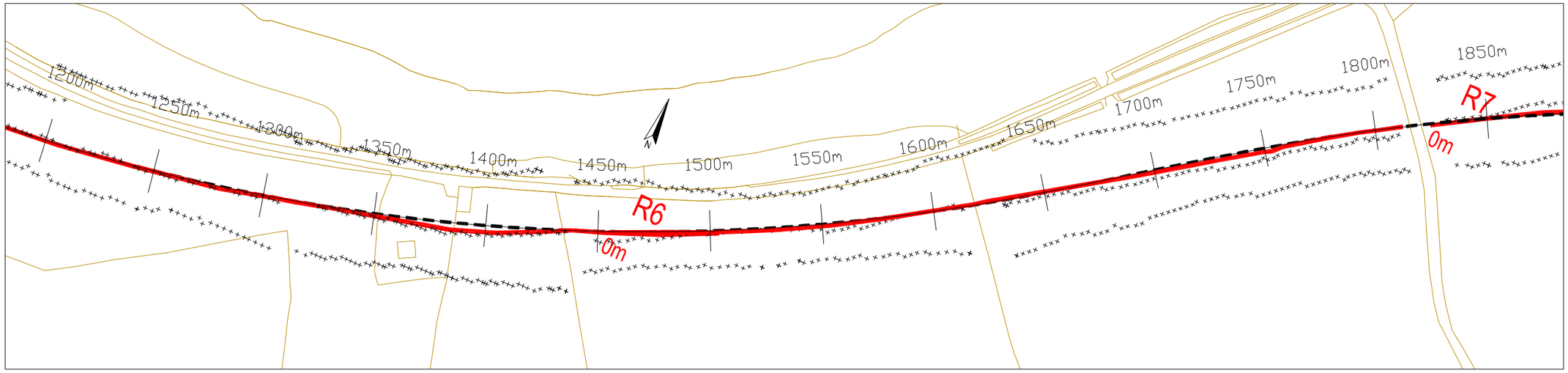

FIGURE 2: INTERPRETED ERT SECTIONS

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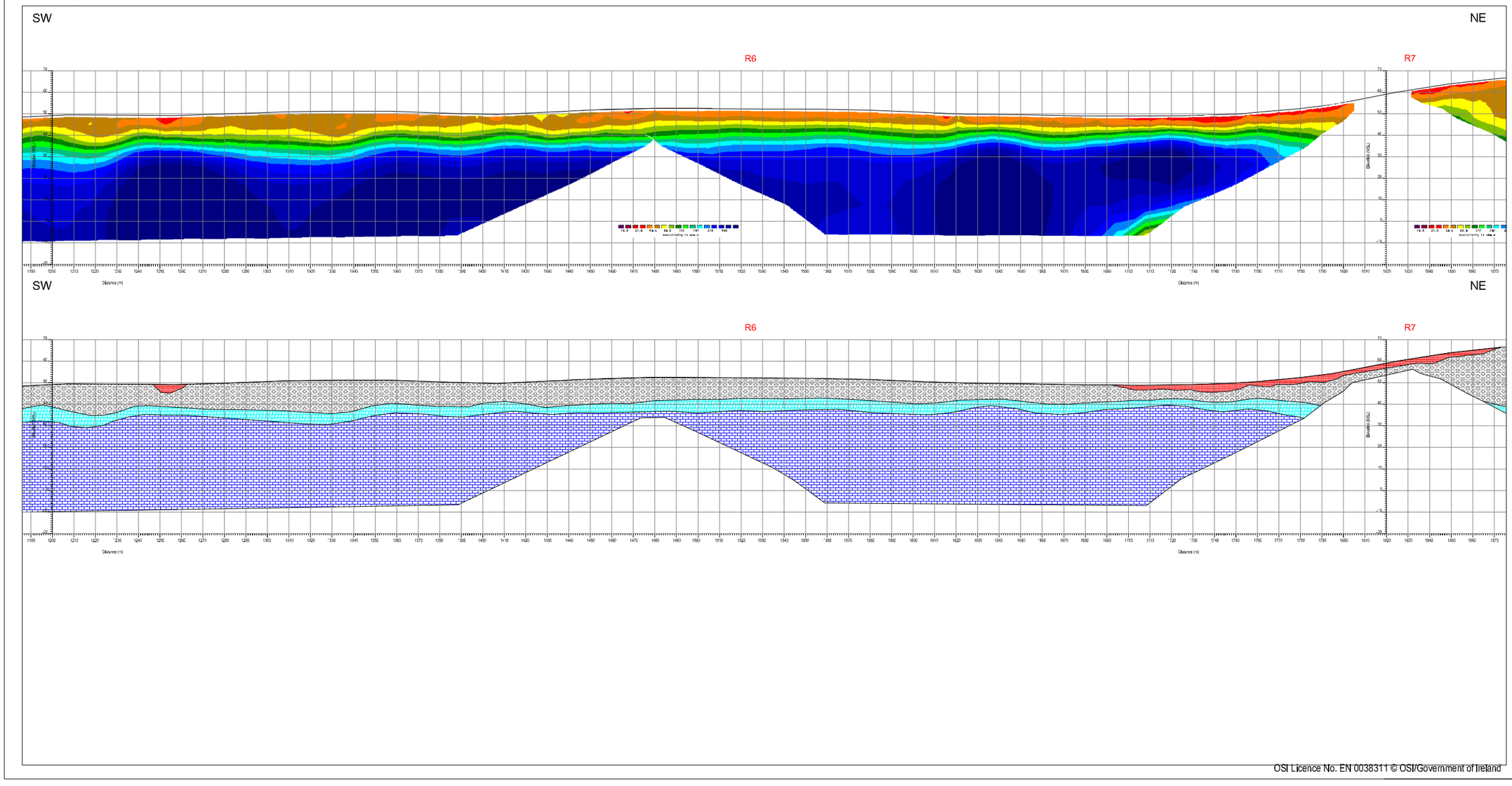

INDEX MAP:

LEGEND:

- EM conductivity station
- R1 — 2D resistivity profile
- Soft SILT/CLAY
- Silty gravelly CLAY (BOULDER CLAY)
- Weathered LIMESTONE
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PROJECT:	ENNISKILLEN RELIEF ROAD GEOPHYSICAL SURVEY
CLIENT:	IGSL
DRAWING NO:	AGL16161_08
SCALE:	AS INDICATED @ A3
DATE:	30/08/2016

Version:	Date:	Drawn By:	Checked:
01	30/08/2016	MN	POC

FIGURE 1: GEOPHYSICAL LOCATIONS

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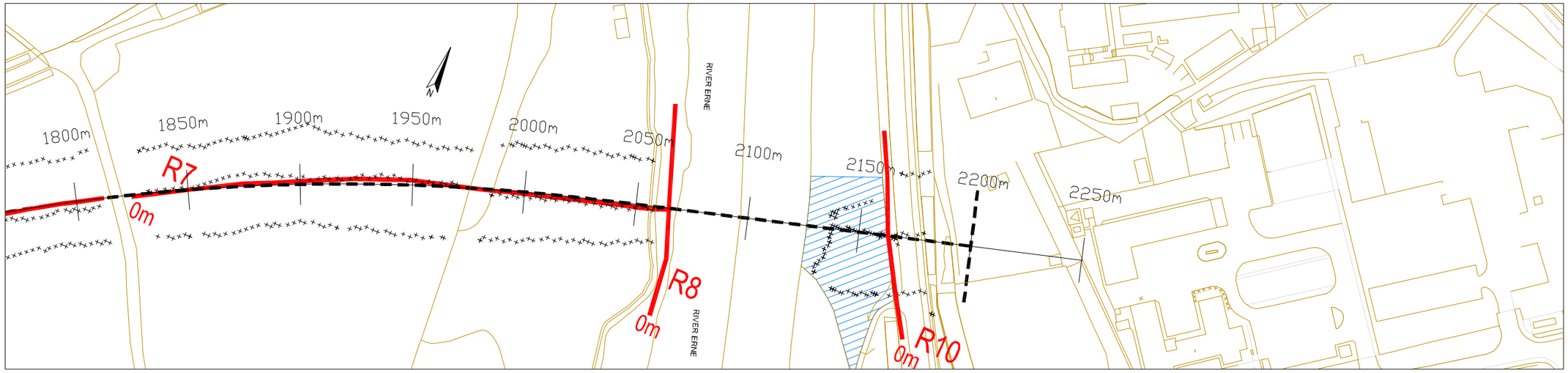
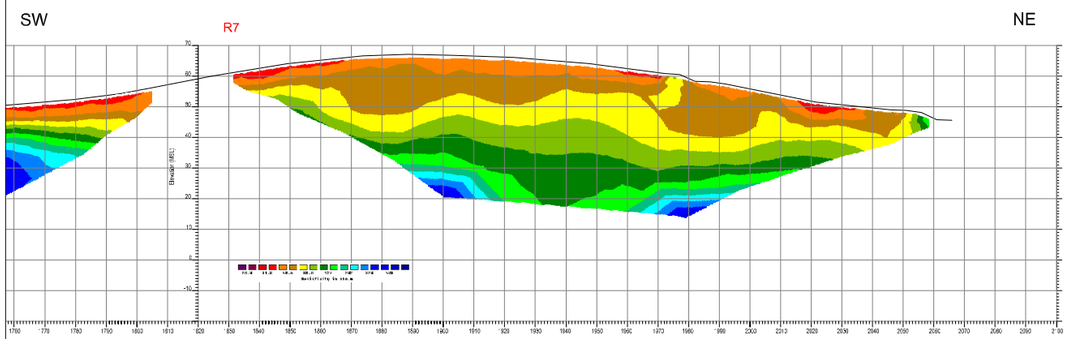
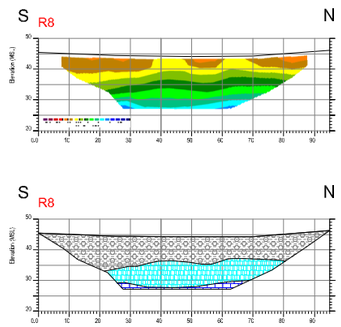
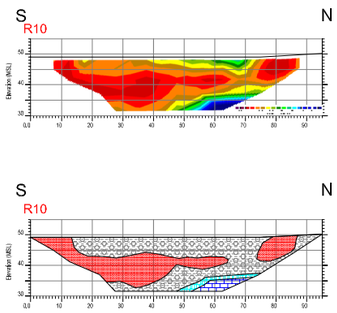


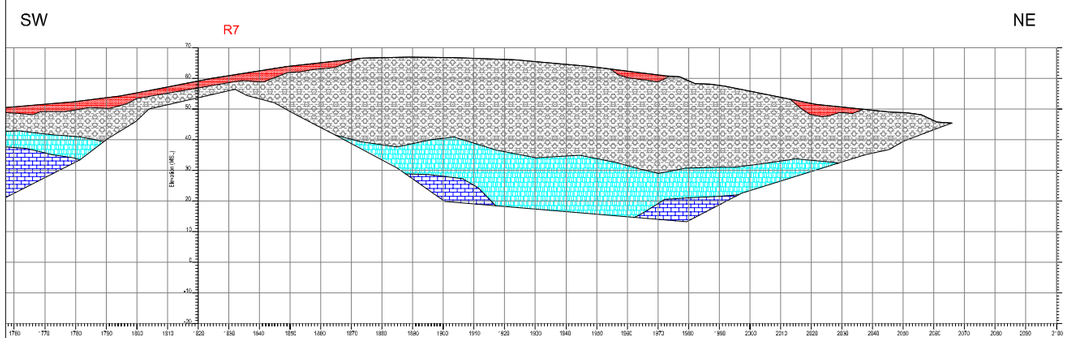
FIGURE 2: INTERPRETED ERT SECTIONS

SCALE 1:2000

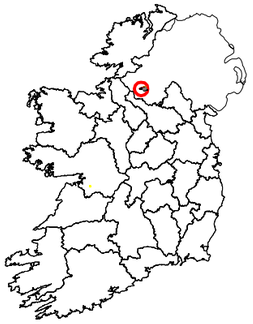








INDEX MAP:



LEGEND:

- EM conductivity station
- R1 — 2D resistivity profile
- Soft SILT/CLAY
- Silty gravelly CLAY (BOULDER CLAY)
- Weathered LIMESTONE
- LIMESTONE

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PROJECT:	ENNISKILLEN RELIEF ROAD GEOPHYSICAL SURVEY
CLIENT:	IGSL
DRAWING NO:	AGL16161_09
SCALE:	AS INDICATED @ A3
DATE:	30/08/2016

Version:	Date:	Drawn By:	Checked:
01	30/08/2016	MN	POC

APPENDIX B: DETAILED METHODOLOGY

B.1 Ground conductivity mapping (EM31)

This is an electromagnetic technique used to investigate lateral variations in overburden material.

Principles

This method operates on the principle of inducing currents in conductive substrata and measuring the resultant secondary electro-magnetic field. The strength of this secondary EM field is calibrated to give apparent ground conductivity in milliSiemens/metre (mS/m). Depending on the dipole mode used, the measured conductivity is a function of the different overburden layers and/or rock from 0 to 6m below ground level.

Readings over material such as peat, silt and clay give high conductivity values while readings over dry materials with low clay mineral content such as gravels, limestone or quartzite give low readings.

Data collection

The EM equipment used was a GF CMD-4 conductivity meter equipped with data logger. This instrument features a real time graphic display of the previous 20 measurement points to monitor data quality and results. Conductivity and inphase values were recorded across the site. Local conditions and variations were recorded.

Data processing

The conductivity and inphase field readings were downloaded, contoured and plotted using the SURFER 9 program (Golden Software, 2009). An assessment of the data and possible anomaly sources was carried out, with cross-reference to other data.

Relocation

All data were referenced using a Garmin handheld system with sub 3m accuracy. All positions are given in Irish National Grid coordinates.

B.2 Electrical Resistivity Tomography (ERT)

Principles

This surveying technique makes use of the Wenner resistivity array. The 2D-resistivity profiling method records a large number of resistivity readings in order to map lateral and vertical changes in material types. The 2D-resistivity profiling method involves the use of up 64 electrodes connected to a resistivity meter, using computer software to control the process of data collection and storage.

Data Collection

Profiles were recorded using a Tigre resistivity meter, imaging software, a 32 takeout multicore cable and up to 29 stainless steel electrodes. Saline solution was used where required at the electrode/ground interface in order to gain a good electrical contact required for the technique to work effectively. The recorded data were processed and viewed immediately after survey.

Data Processing

The field readings were stored in computer files and inverted using the RES2DINV package (Campus Geophysical Instruments, 1997) with up to 5 iterations of the measured data carried out for each profile to obtain a 2D-depth model of the resistivities.

The inverted 2D-resistivity models and corresponding interpreted geology are displayed on the accompanying drawings. Distance is indicated along the horizontal axis of the profiles. Profiles have been contoured using the same contour intervals and colour codes.

Relocation

Data locations were recorded using a high accuracy GNSS Trimble Geo7x unit. All positions are given in Irish National Grid coordinates.

PROJECT: ENNISKILLEN

STATIC CONE PENETRATION TESTING

FACTUAL REPORT

CLIENT: IGSL

CONTRACT No.: 9753




Issue	Date	Description	Prepared	Checked	Approved
01	20/10/16	Final	CR	CD	DW

Date: 20 October 2016
Our Ref: 1160372

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Email: mail@insitusi.com
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Attention: Mr Ciaran Killaly

Dear Mr Ciaran,

STATIC CONE PENETRATION TESTING
AT ENNISKILLEN

We have pleasure in providing a digital copy of our report and data in AGS format for the above project.

We hope that you are satisfied with the performance of our staff, equipment and reporting on this project. If you should have any queries about any aspect of the works carried out, please do not hesitate to contact us. We look forward to being of service to you in the future.

Yours faithfully,
In Situ Site Investigation Limited

Darren Ward
Director

Contents

1.0 INTRODUCTION

At the request of IGSL (The Client), In Situ Site Investigation Limited (In Situ S.I.) carried out a soils investigation at Enniskillen.

The investigation consisted of performing Static Cone Penetration Tests (CPTs). All tests were performed at locations set out by the Client.

The fieldwork details are shown below in figure 1.1 and figure 1.2.

Fieldwork Summary	
CPT Rig Used	3.5 Tonne mini CPT rig CPT 003
Operators	Ben Carter and Paul Burt
Date Started	17/10/2016
Date Finished	18/10/2016
In Situ S.I. Project Manager	Darren Ward
Main Contractor's Site Manager	Andrejz

Figure 1.1: Table showing the fieldwork summary details.

Completed Fieldwork Summary
13 Static Cone Penetration Tests (CPTs) to a maximum depth of 10.97m or refusal. Each test measured Cone Resistance (q_c), Sleeve fiction (f_s), Measured Pore Pressure in the shoulder position (u_2), inclination in X and Y planes.
Provision of factual report with estimated soil type, geotechnical parameters and AGS data.

Figure 1.2: Table showing the completed fieldwork summary details.

2.0 FIELDWORK

2.1 CPT RIG

All works were performed with a 3.5 tonne track mounted CPT Rig. A full data sheet for the rig is presented in Appendix A.

2.2 CPTU CONE

The following electric CPTU cone was used S15-CFIIP.1459 a type conforming to the requirements of Application Class 2 of ISO/ FDIS 22476-1 (2012). The cones measured parameters are shown in figure 1.2. The cone had a cross-sectional area of 15cm^2. The piezo filter was mounted in the shoulder (u_2) position (see figure 3.2). A full datasheet of the cone used is shown in Appendix A.

2.3 TEST PROCEDURE

The tests are carried out in accordance with the International Standard for electrical cone and piezocone penetration test (ISO/FDIS 22476-1 2012).

The final depths of the tests were determined by either completion to the specified test depth or when the maximum safe capacity of the equipment was reached. A schedule of the tests performed is shown in Appendix A which has been compiled from the operator's daily progress reports.

The data is transmitted from the digital CPTU through an umbilical cable that runs through the push rods to the data acquisition system.

The rate of penetration is kept constant at 2cm/s ±10% except when penetrating very dense or hard strata. A copy of the depth encoder calibration certificate is shown in Appendix A. Results are displayed instantaneously on the computer logging screen. The results are recorded on the computer hard disc.

Before each test is carried out zero values are taken of the cone to check to see if it is within calibration. At the end of each test, zero values are taken again to see if there has been any drift during the test. These values are inspected during the post processing stage. This is a quality check on the data and the testing procedure. Individual test zero values are shown on their corresponding test results on form CPT0001 in Appendix B.

2.4 POSITIONING

All positions were set out by the Client on site.

3.0 CONE PENETRATION TEST RESULTS

All tests carried with the CPTU cone are shown in Appendix B and displays all results as described in section 3.1 and 3.2. Two graphs are shown for each test. The first graph (form CPT0001 Estimated Soil Behaviour Type Plot) shows the measured readings from the cone and the estimated soil description, these are plotted at a 0-20MPa scale for the cone resistance. The second graph (form CPT0002 Measured Pore Pressure Plot) shows derived and corrected values along with the pore pressure results; these are plotted at a 0-80MPa scale for the cone resistance.

3.1 ESTIMATED SOIL BEHAVIOUR TYPE PLOT (FORM CPT0001)

The estimated soil behaviour type plot presented in Appendix B details the following:

- Measured cone end resistance (q_c) and sleeve friction (f_s);
- Friction ratio (R_f);
- Inclination, X and Y axis;
- Estimated behaviour soil type log (Robertson *et.al* 1986, friction ratio chart)
- Legend indicating soil log (BS5930:1999 legend)

3.1.1 Estimated Soil Behaviour Type

The estimation of soil behaviour type using measurements of cone and friction is based upon the variation of the friction ratio in respect to the cone resistance. The friction ratio varies depending upon whether the soil is cohesive or granular. The cone resistance varies depending on the strength and densities of the soil.

The interpretation is based on Robertson *et. al.* (1986) (Friction ratio chart) which is shown below (figure 3.1).

The density and stiffness values descriptions are based on derived N60 (Robertson *et. al.* (1986)) and S_u (Lunne and Kleven (1981)) values from the cone resistance in accordance to BS5930:1999. A list of these values are presented in Appendix A.

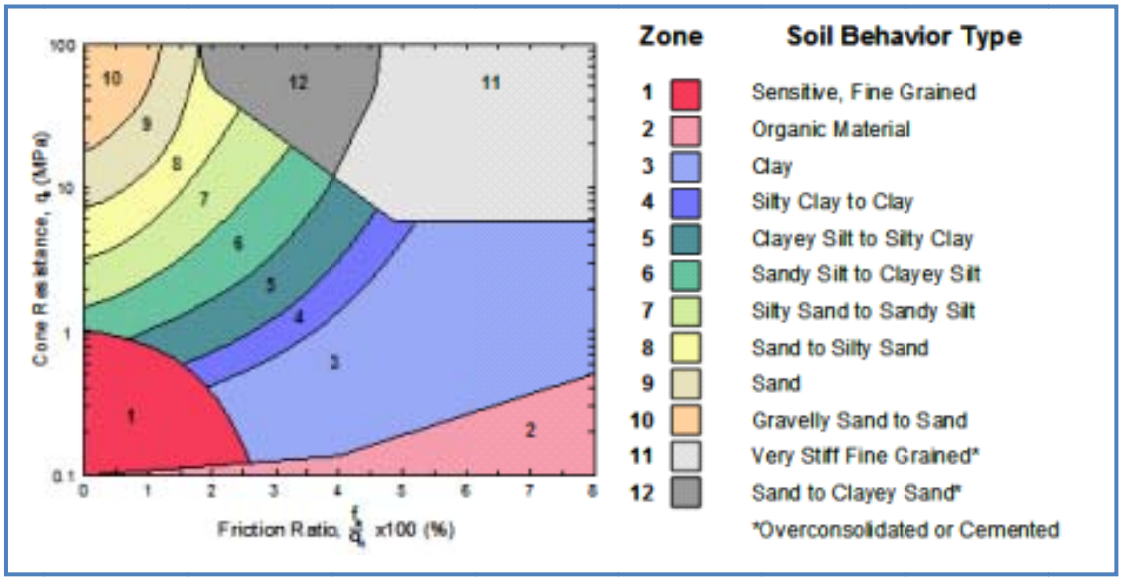

Figure 3.1: Robertson *et al.*, 1986 soil behaviour type chart.

3.1.2 Friction Ratio (R_f)

The friction ratio (R_f) is the ratio between the sleeve friction and the cone resistance. This is a very useful parameter for carrying out soil interpretation

$$\boldsymbol{Fricton\ Ratio}\ (\boldsymbol{R_f}) = \left(\frac{\boldsymbol{Sleeve\ Friction}\ (\boldsymbol{f_s})}{\boldsymbol{Tip\ Resistance}\ (\boldsymbol{q_c})}\right) \times \mathbf{100}$$ (Lunne *et al.*, 1997)

3.1.3 Depth Correction

All tests in the report have been corrected for depth difference caused by inclination. This has been calculated using the method described in the International Reference Test Procedure (2001).

To calculate the corrected depth the following formula is used:

$$z = \int_0^l C_h \cdot dl$$

where:

z = penetration depth, in m;
l = penetration length, in m;
C_h = correction factor for the effect of the inclination of the CPTU relative to the vertical axis.

The equation for calculating the correction factor for the influence of the inclination for a bi-axial inclinometer is:

$$C_h = (1 + tan^2 \propto + tan^2 \beta)^{-1/2}$$

3.2 MEASURED PORE PRESSURE PLOT (CPT0002)

Behind each estimated soil type plots in Appendix B is a second plot showing the pore pressure results as well as corrected and derived parameters. These logs detail the following:

- Measured Pore pressure (u_2),
- Corrected cone resistance (q_t);
- Pore pressure ratio (B_q)
- Sleeve friction (f_s)

3.2.1 Pore Pressure Results (u_2)

The CPTU measured the pore pressure during penetration. If the material is free draining and saturation is maintained it will normally measure hydrostatic pore pressure. In material that is not free draining it will record the total pore pressure (hydrostatic plus any excess pore pressures generated) created by the cone penetrating through this material

The filter element can be mounted in one of three positions. For the tests carried out in this report the filter was mounted in the u_2, or shoulder position (see figure 3.2)

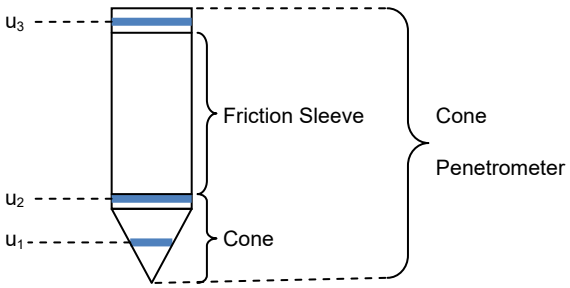

Figure 3.2: Diagram showing pore pressure filter locations (after Lunne *et al.*, 1997)

3.2.2 Corrected Cone Resistance (q_t)

For each penetration test, the measured Cone Resistance, q_c, can be corrected for the 'unequal area effect' due to the influence of the ambient pore water pressure acting on the cone.

The corrections have been applied using the following equation:

$$q_t = q_c + [u_2.(1 - \alpha)]$$ (Lunne *et al.*, 1997)

Where α is the cone area ratio, which is **0.869** for the cone used on this project (This value is geometrically measured).

3.2.3 Pore Pressure Ratio (B_q)

Pore pressure ratio is the ratio between the measured pore pressure generated during penetration and the corrected cone resistance minus the total overburden stress.

Pore pressure ratio as defined by Senneset and Janbu (1985) is defined as:

$$B_q = \frac{u_2 - u_0}{q_t - \sigma_{vo}}$$

where:

u_2 = pore pressure measured between the cone and the friction sleeve
u_0 = equilibrium pore pressure
σ_{vo} = total overburden stress
q_t = cone resistance corrected for unequal end area effects

3.2.4 Soil Unit Weight

For calculations involving the total overburden stress, an estimate of the soil unit weight has to be made. For all calculations in this report, an approximate unit weight is assigned to each soil classification zone from the Robertson *et al.*, 1986 chart.

Figure 3.3 below lists the approximate unit weight for each zone from Lunne *et al*., 1997.

Zone	Approximate unit weight (kN/m^3)
1	17.5
2	12.5
3	17.5
4	18
5	18
6	18
7	18.5
8	19
9	19.5
10	20
11	20.5
12	19

Figure 3.3: Estimate of unit weights based on the Robertson *et al*.,(1986) friction ratio chart (Lunne *et al*., 1997).

3.2.5 In Situ Pore Pressure

On the pore pressure plot is a second line (in red) showing the inferred in situ or hydrostatic pore pressure, u_0. This is calculated from a known or estimated water table level.

In the report, the water table has been inferred at 2m below ground level.

4.0 GEOTECHNICAL PARAMETERS

A number of empirical correlations can be carried out to derive geotechnical parameters from CPT data. This report includes a number of these parameters which are described in this section. For the CPT data only soil behaviour type, SPT values, shear strength and relative density are derived and are shown in Appendix C. For the CPTU data all the derived parameters described in the section are derived and displayed in Appendix C.

Please note that a number of the correlations are derived for a certain type of soil, and may not be appropriate for all the soil types encountered on this project.

4.1 SOIL BEHAVIOUR TYPE INDEX

The soil behaviour type index was derived by Jefferies and Davies (1991). It was created to allow a continuous variation of $(q_c/p_a)/N_{60}$ with soil type, which was an improvement on the discontinuous nature of an earlier conversion by Robertson *et al.* (1986).

This approach has been modified for use with the Robertson (1990) normalised CPT soil classification chart. The boundaries between soil behaviour type zones (2 to 7) can be approximated as concentric circles, and the radius of each circle can be used as a soil behaviour type index (Lunne *et al.,* 1997).

The soil behaviour type index, I_c, can then be defined as:

$$\boldsymbol{I_c = ((3.47 - logQ_t)^2 + (logF_r + 1.22)^2)^{0.5}}$$

The boundaries of soil behaviour type are then given in terms of the index, I_c. See figure 4.1 for the table of soil behaviour types.

Soil Behaviour Type Index, I_c	Zone (from Robertson 1990 normalised chart)	Soil Behaviour Type
I_c < 1.31	7	Gravelly sand to dense sand
1.31 < I_c < 2.05	6	Sands – clean sand to silty sand
2.05 < I_c < 2.60	5	Sand mixtures – silty sand to sandy silts
2.60 < I_c < 2.95	4	Silt mixtures – clayey silt to silty clay
2.95 < I_c < 3.60	3	Clays: silty clay to clay
I_c > 3.60	2	Organic soils - peats

Figure 4.1: Boundaries of soil behaviour type index, I_c.

4.2 STANDARD PENETRATION TEST (SPT) N VALUE

The SPT N value can be derived using differing ratios of the relationship between q_c and N_{60}. These ratios were suggested by Robertson *et al.* (1986) and are shown in figure 4.2.

Zone	Soil Behaviour Type	$(q_c/p_a)/N_{60}$
1	Sensitive fine grained	2
2	Organic material	1
3	CLAY	1
4	Silty CLAY to CLAY	1.5
5	Clayey SILT to silty CLAY	2
6	Sandy SILT to clayey SILT	2.5
7	Silty SAND to sandy SILT	3
8	SAND to silty SAND	4
9	SAND	5
10	Gravely SAND to SAND	6
11	Very stiff fine grained	1
12	SAND to clayey SAND	2

Figure 4.2: SPT N value ratios from Robertson *et al.*, 1986.

For the best results for the calculation of N_{60} it is recommended to use the soil behaviour type index, I_c. This is the method used in this report.

The relationship between N_{60} and I_c is defined as:

$$\frac{\left(\frac{q_c}{p_a}\right)}{N_{60}} = 8.5\left(1 - \frac{I_c}{4.6}\right)$$ (Lunne *et al.*, 1997)

It is suggested (Jefferies and Davies, 1991) that this method provides a better estimate of the SPT N values than the actual SPT test due to poor repeatability of the SPT.

4.3 SHEAR STRENGTH

Estimation of s_u from CPTUs using corrected cone resistance is made from the following equation:

$$s_u = \frac{(q_t - \sigma_{vo})}{N_{kt}}$$ (Lunne *et al.*, 1981)

where:

N_{kt} = empirical cone factor
σ_{vo} = total overburden stress.

Research has shown that the cone factor N_{kt} varies between 11 and 30 with an average value of 15. We present an upper bound s_u value with an N_{kt} value of 15 and a lower bound s_u value with an N_{kt} value of 20. This report only presents this data on soils with a soil behaviour type index (I_c) of greater than 2.60.

4.4 RELATIVE DENSITY (D_r)

Relative density has been derived using a method by Jamiolkowski *et al.*, 1985 (see figure 4.3). This correlation was derived from five predominantly silica sands under controlled laboratory conditions. The sands were normally consolidated, un-cemented, un-aged and predominantly quartz. It is noted that field cases are likely to show more variability than that demonstrated in figure 4.3.

The correlation in this report is calculated on soil with a soil behaviour type index (I_r) of less than 2.60. The formula for calculating relative density (D_r) is:

$$D_r = -98 + 66\, log_{10} \frac{q_c}{[\sigma'_{vo}]^{0.5}}$$

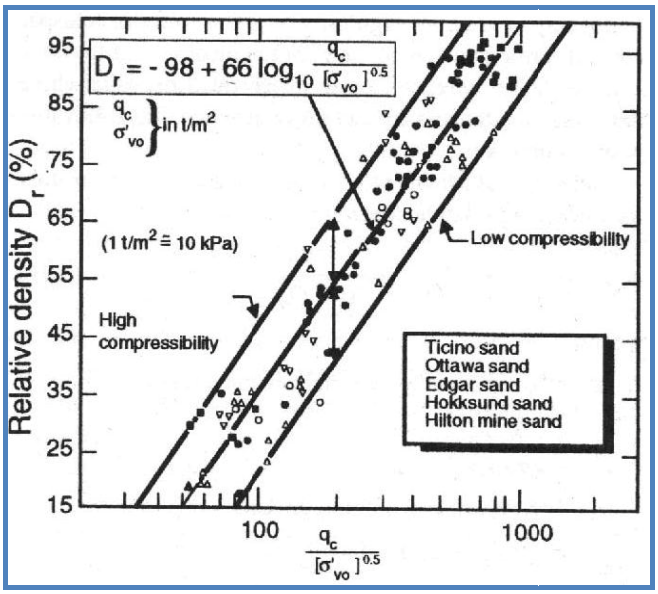

Figure 4.3: Correlation between q_c and relative density (after Jamiolkowski *et al*., 1985)

4.5 FRICTION ANGLE

Friction angle is derived using the Robertson and Campanella (1983) method from their work looking at calibration test data (see figure 4.6). The correlation is based on un-aged un-cemented quartz sand. The formula for peak *Φ'* from CPTU is:

$$\Phi' = arctan\left[0.1 + 0.38 \log\left(\frac{q_t}{\sigma_{vo}'}\right)\right]$$

The correlation in this report is calculated on soil with a soil behaviour type index (I_c) of less than 2.60.

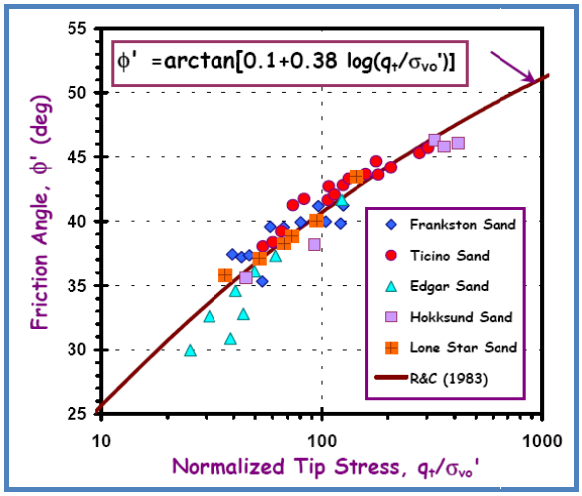

Figure 4.6: Peak friction angle of clean quartz sands from CPTU (after Robertson & Campanella, 1983).

4.6 FINES CONTENT (*FC*)

It is possible to estimate fines content from the friction ratio of sandy soils. Suzuki *et al*., (1995) demonstrated how friction ratio (R_f) varies with fines content (*FC*) (see figure 4.7)

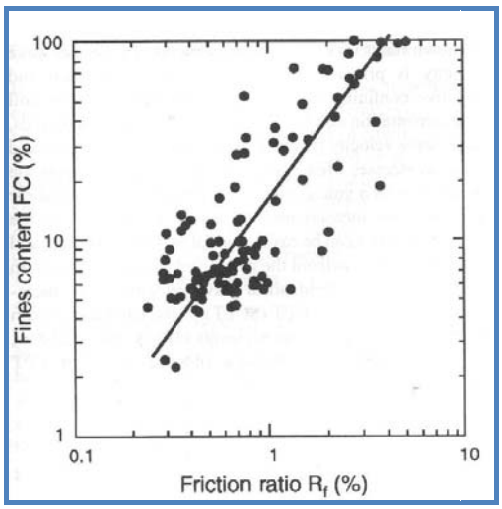

Figure 4.7: Variation of fines content with friction ratio (Suzuki *et al*., 1995)

Robertson and Fear (1995) used this relationship and integrated it with the soil behaviour type index (I_c), this was later updated in 1998. This relationship is shown below:

$$\boldsymbol{if\ I_c} < 1.26\ apparent\ fines\ content\ FC\ (\%) = \mathbf{0}$$

$$\boldsymbol{if\ 1.26 \leq I_c\ \leq 3.5\ apparent\ fines\ content\ FC}\ (\%) = \mathbf{1.75\ I_c^3 - 3.7}$$

$$\boldsymbol{if\ I_c} > 3.5\ apparent\ fines\ content\ FC\ (\%) = \mathbf{100}$$

5.0 DISSIPATION TESTS

At locations instructed by the Client's representative on site, porewater dissipation tests were performed. These tests measure the dissipation of excess pore water pressure at specific soil horizons, after the advancement of the cone is temporarily stopped.

The rate of dissipation depends upon the coefficient of consolidation, which, in turn, depends on the compressibility, and permeability of soil (Lunne *et. al.*, 1997).

The results of these tests are presented in Appendix D.

The coefficient of horizontal consolidation interpretation is calculated using the Houlsby and Teh (1998) method. The interpretation is based on the results of large strain finite element analysis of the penetration pore pressures, and a finite difference analysis of the dissipation pore pressure (Lunne *et. al.*, 1997). The formula is defined as follows:

$$T^* = \frac{c_h \, . \, t}{r^2 \sqrt{I_r}}$$

where:

T^* = dimensionless time factor (for T50 this value is 0.245 using a u_2 filter)
r^2 = diameter of cone
c_h = coefficient of consolidation
t = time to the T50 value
I_r = rigidity index

The values are typically calculated using the T50 value which is the time taken to reach 50% dissipation. In situations where T50 is not reached it is possible to other values of T^* as described by Houlsby and Teh (1998).

The c_h values are calculated for two different rigidity index values 50 and 500. The rigidity index is given in the formula below:

$$Ir = Gu/Su$$

where:

G_u = Shear modulus of the soil

S_u = Undrained shear strength of the soil

The level of groundwater for the calculations has been stated at 2m below ground level.

6.0 REFERENCES

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APPENDIX A

GENERAL INFORMATION

LIST OF FIGURES

Description	Pages Included
Cone Datasheet	1
Cone Calibration Certificate S15-CFIIP.1459	1
CPT Project Summary Sheet	1
3.5 Tonne Track Mounted Data Sheet	1
CPT Soil Description Table	1
Explanation of Symbols	1

CONE DATASHEET

GeoPoint Systems bv
Rijksstraatweg 22F
2171 AL Sassenheim
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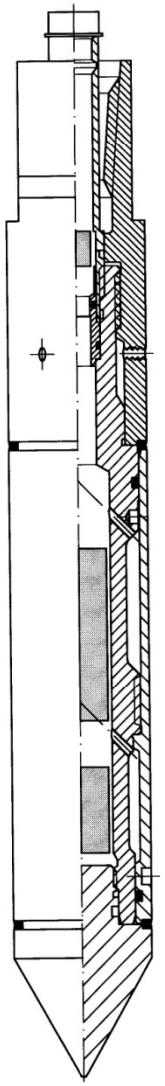
ING bank : 68.23.01.396
Postbank : 5226758
BTW nr. : NL806331677B01



SPECIFICATIONS S15 SERIES ELECTRICAL CONES

The electronic subtraction cones have been developed to address the durability problems inherent in other cone designs. The unit consists of a single element temperature compensated strain gauge transducer for measuring both cone resistance and local sleeve friction. This design is therefore more robust than a compression type cone. The cone support electronics package is located directly behind the transducer. The precision strain gauge amplifiers and power supply eliminate the effects of cable resistance on the measurements. A standard subtraction cone is capable of measuring simultaneously the following channels: Tip, Local friction, Pore pressure, Temperature and Inclination.

GENERAL SPECIFICATIONS

Cone Tip Section Area	1,500 mm2
Friction Sleeve Surface	22,500 mm2
Total Length	325 mm
Weight	4200 g
Power Supply	± 15 VDC, 100 mA.
Output	0 – 10 VDC*
Working Temperature	0 - 60˚C
Storage Temperature	- 40 to + 85˚C
Connector	Lemo 10 pins (others on request)

TIP RESISTANCE

Range	100/150* kN
Accuracy	0.25 % FS
Maximum Load	150 % of range
Cone Area Ratio	0.75

LOCAL SLEEVE FRICTION

Range	100/150* kN
Accuracy	0.50 % FS
Maximum Load	150 %
Sleeve Area Ratio	1.0 (EA)

PORE PRESSURE

Range	1/2/5/10* MPa
Accuracy	0.5 % FS
Maximum Load	150 % of range

INCLINATION

Range	25 ˚ (biaxial)
Accuracy	< 2 ˚

All our equipment complies with the ISSMGE, ASTM, DIN and NEN Standards.

**Other output and voltage ranges available on request. Loadcells may be calibrated for lower ranges.*

CONE CALIBRATION CERTIFICATE S15-CFIIP.1459

Sondeerapparatuur Waterspanningsmeters Hellingmeters Veldmeet-apparatuur

GeoPoint Systems bv

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E-mail : info@geopoint.nl
BTW : NL814690178.B01
IBAN : NL28 INGB0682301396
BIC : INGBNL2A

Cone Calibration Certificate

Certificate:	**GS-1459-001**	
Instrument Type:	Electric Subtraction Cone	
Model:	S15-CFIIP	
Serial number:	1459	
Calibration date:	18-08-2016	
Client:	Insitu	
Calibrated by:	W. Volgering	
Calibration instruments		
Manufacturer:	Hottinger Baldwin Messtechnik GmbH	
HBM certificate no. :	49046	
Calibration conditions		
Ambient temperature:	21.3	°C
Atmospheric pressure:	1011	mBar
Cone specifications		
Cone base area:	1500	mm2
Load tip resistance (nom.):	100	kN
Friction sleeve area:	22500	mm2
Load tip + local friction (nom.):	100	kN
Load friction sleeve (nom.):	22.5	kN
Load pore pressure (nom.):	2	MPa
Inclination (nom.):	+/- 20	°
Temperature compensation (all channels):	0...+40	°C
Maximum overload capacity (all channels):	100	%
Cone area ratio (a):	0.79	
Max. Inaccuracy, relative to measurement value:	1.0	%

	Tip:		Sleeve:		Pore Pressure:		Inclinometer:		
	qc in kN	mV	fs in kN	mV	MPa	mV	Degrees	X (mV)	Y (mV)
Zero points:		0267		0257		0257			
	0	0	0	0	0	0	0	2448	2541
	5	0304	5	0312	0.4	1488	-20	0391	0544
	10	0607	10	0625	0.8	2969	20	4558	4639
	15	0911	15	0938	1.2	4448			
	20	1216	20	1251	1.6	5922			
	25	1522	25	1565	2.0	7390			
	30	1828	30	1879					
	35	2134	35	2194					
	40	2439	40	2508					
	45	2743	45	2820					
	50	3047	50	3132					
	75	4557	75	4684					
	100	6064	100	6232					

Max. eror, abs. qc: 35 kPa
Max. error, abs. fs: 2 kPa
Max. error, abs. u2: 10 kPa
Max. error, abs. I: 1 °

This calibration is compliant with GeoPoint Systems internal quality system, internal calibration procedures and meets the requirements of NEN2649, NEN-EN-ISO 22476-1, NORSOK G-001, ISSMFE and ASTM using calibration equipment traceable to (Inter-) National Standards.

Approved by: B. van Eijk
Date: 18-08-2016

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CPT PROJECT SUMMARY SHEET

HOLE	Final Depth of Test (m)	Date of Test	Cone Used	Test Remarks
CPT 01	10.97	18/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 02	7.83	17/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 03	1.00	17/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 03A	1.04	17/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 03B	1.08	17/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 03C	1.68	17/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 04	1.37	18/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 04A	0.93	18/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 04B	1.66	18/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 07	8.84	18/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 08	1.84	18/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 08A	1.75	18/10/2016	S15CFIP.1459	Test refused on total pressure.
CPT 08B	1.26	18/10/2016	S15CFIP.1459	Test refused on total pressure.

3.5 TONNE TRACK MOUNTED CPT RIG DATA SHEET

RIGS

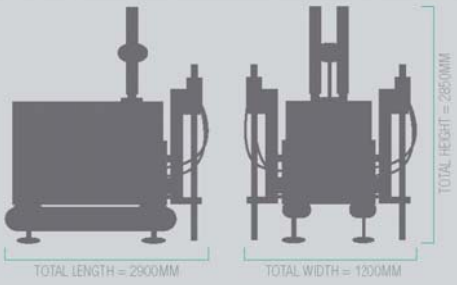
3.5 TONNE CPT TRACK MOUNTED RIG (CPT003)

In Situ has a wide range of rigs which meet the clients varied CPT requirements often in difficult terrains. Projects may require CPT testing in areas which range from motorways to rugged mountainous terrain, to offshore work; the access to the projects may often be restricted for manoeuvring.

In Situ has rigs to meet all clients needs and situations .

CPT RIG DETAILS	
DRIVE SYSTEM	SMALL TRACKED SYSTEM
TOTAL WEIGHT	3.5 TONNES
ADDITIONAL REACTION WEIGHT	4 HYDRAULICALLY DRIVEN SCREW ANCHORS
CPT RAM THRUST CAPACITY	20 TONNES
MAXIMUM PENETRATION	10-30M DEPENDING ON THE GROUND CONDITIONS AND REACTION FROM SCREW ANCHORS.
PERFORMANCE RATES	50-100M OF TESTING IN A DAY DEPENDING ON ACCESS TO POSITIONS.
TYPICAL SITES FOR THIS RIG	SPECIALISES ON SOFT GROUND SITES. CAN BE MOUNTED ON MARINE JACK-UPS AND RAIL TRAILERS.

CPT RIG DIMENSIONS



IN SITU SITE INVESTIGATION INSITUSI.COM

SOIL DESCRIPTION TABLES

GRANULAR SOILS (Sands and Gravels)

Description	Cone Resistance (*qc*) (MPa)
Very Loose	0 – 2
Loose	2 – 4
Medium Dense	4 – 12
Dense	12 – 20
Very Dense	>20

COHESIVE SOILS (Clays)

Description	Cone Resistance (q_c) (MPa)	Equivalent S_u value from q_c (kPa)
Very Soft	0 – 0.3	0 –20
Soft	0.3 – 0.5	20 – 40
Firm	0.5 – 1.0	40 – 75
Stiff	1.0 – 2.0	75 – 150
Very stiff	2.0-4.0	150-300
Hard	>4.0	>300

(from Waltham, 2002)

EXPLANATION OF SYMBOLS

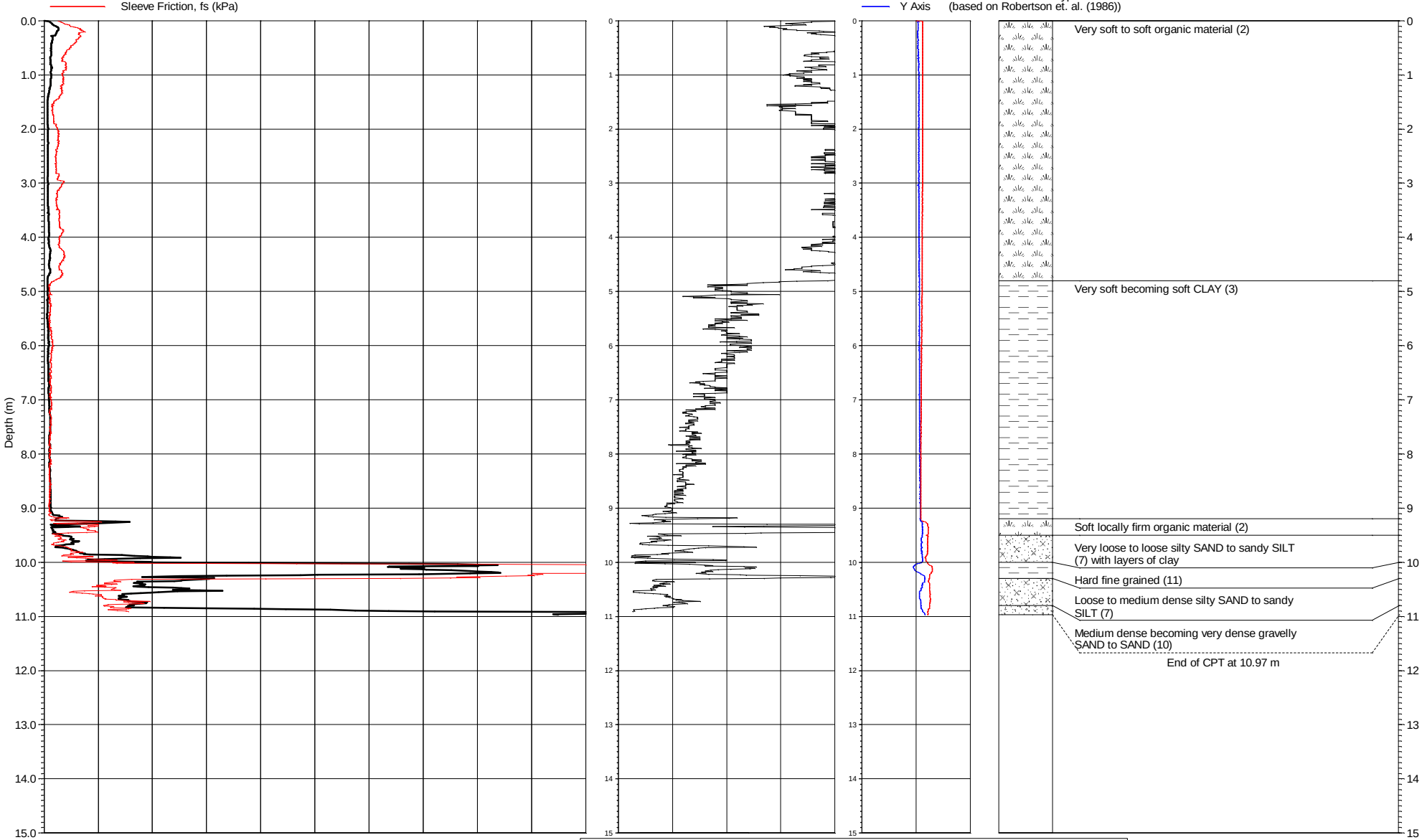
a (α) = area ratio of the cone ($=A_n/A_c$)
A_c = projected area of the cone
A_n = cross-sectional area of shaft
B_q = pore pressure parameter ($=(u_2-u_0)/(q_t-\sigma_{vo})$)
c_h = horizontal coefficient of consolidation
Dr = relative density $\left(D_r = \frac{e_{max} - e}{e_{max} - e_{min}} \times 100\%\right)$
e = void ratio
e_o = initial void ratio
e_{max} = maximum void ratio
e_{min} = minimum void ratio
f_s = unit sleeve friction
FC = fines content
I_c = soil behaviour type index
I_r = rigidity index = G/s_u
m_v = coefficient of volume change
M = constrained deformation modulus
N = no. Of blows in the SPT
N_k or N_{kt} cone factor
N_{60} = SPT energy ratio
q_c = measured cone resistance
q_e = effective cone resistance = (q_t-u_2)
q_n = net cone resistance = (q_t-σ_{vo})
q_t = corrected cone resistance = q_c+(1-a)u_2
Q_t = normalised cone resistance = (q_t-σ_{vo})/σ'_{vo}
R_f = friction ratio ($=(f_s/q_c)\times 100\%$)
s_u = undrained shear strength
t_{50} = time for 50% dissipation of measured pore pressure
u_0 = in situ pore pressure
u_1 = pore pressure measured on the cone
u_2 = pore pressure measured behind the cone
Δu = measured pore water pressure
φ = total friction ratio

APPENDIX B

CPT RESULTS

LIST OF FIGURES

Description	Pages Included
CPT 01 – CPT 08B (Printed on Form CPT0001) Estimated Soil Behaviour Type Plot	13
CPT 01 – CPT 08B (Printed on Form CPT0002) Measured Pore Pressure Plot	13



IN SITU
SITE INVESTIGATION

Client: IGSL
Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 01
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

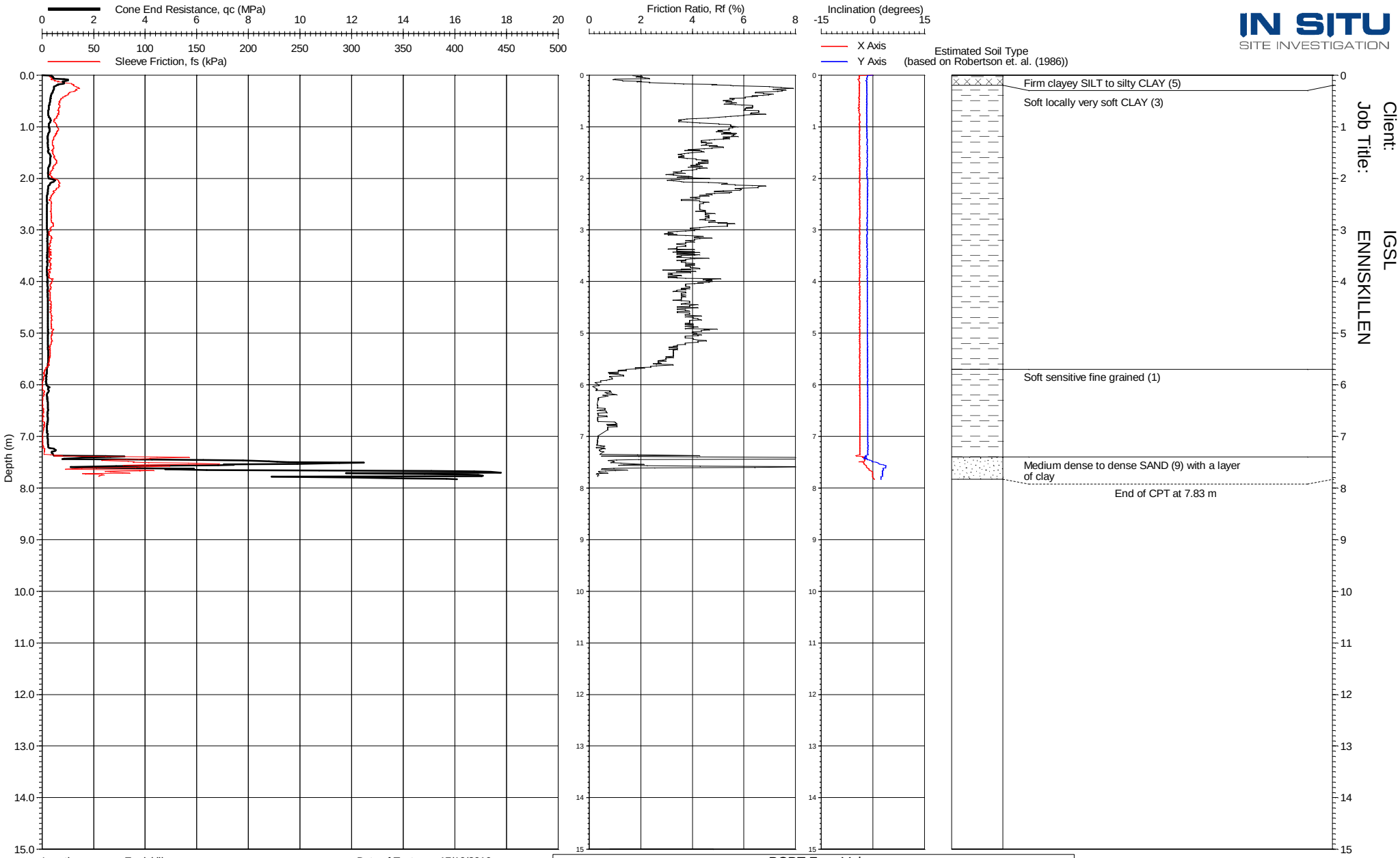
Tip Zero Pre:	260 mV	Tip Zero Post:	260 mV	Tip Zero Difference:	0 %
Sleeve Zero Pre:	236 mV	Sleeve Zero Post:	239 mV	Sleeve Zero Difference:	-1 %
Pore Pressure Zero Pre:	274 mV	Pore Pressure Zero Post:	271 mV	Pore Pressure Difference:	1 %
X Inclinometer Zero Pre:	2685 mV	X Inclinometer Zero Post:	2642 mV	X Inclinometer Difference:	2 %
Y Inclinometer Zero Pre:	2685 mV	Y Inclinometer Zero Post:	2642 mV	Y Inclinometer Difference:	2 %

PIEZO CONE PENETRATION TEST

CPT 01

insitusi.com

Form: CPT0001



IN SITU
SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	17/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 02
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

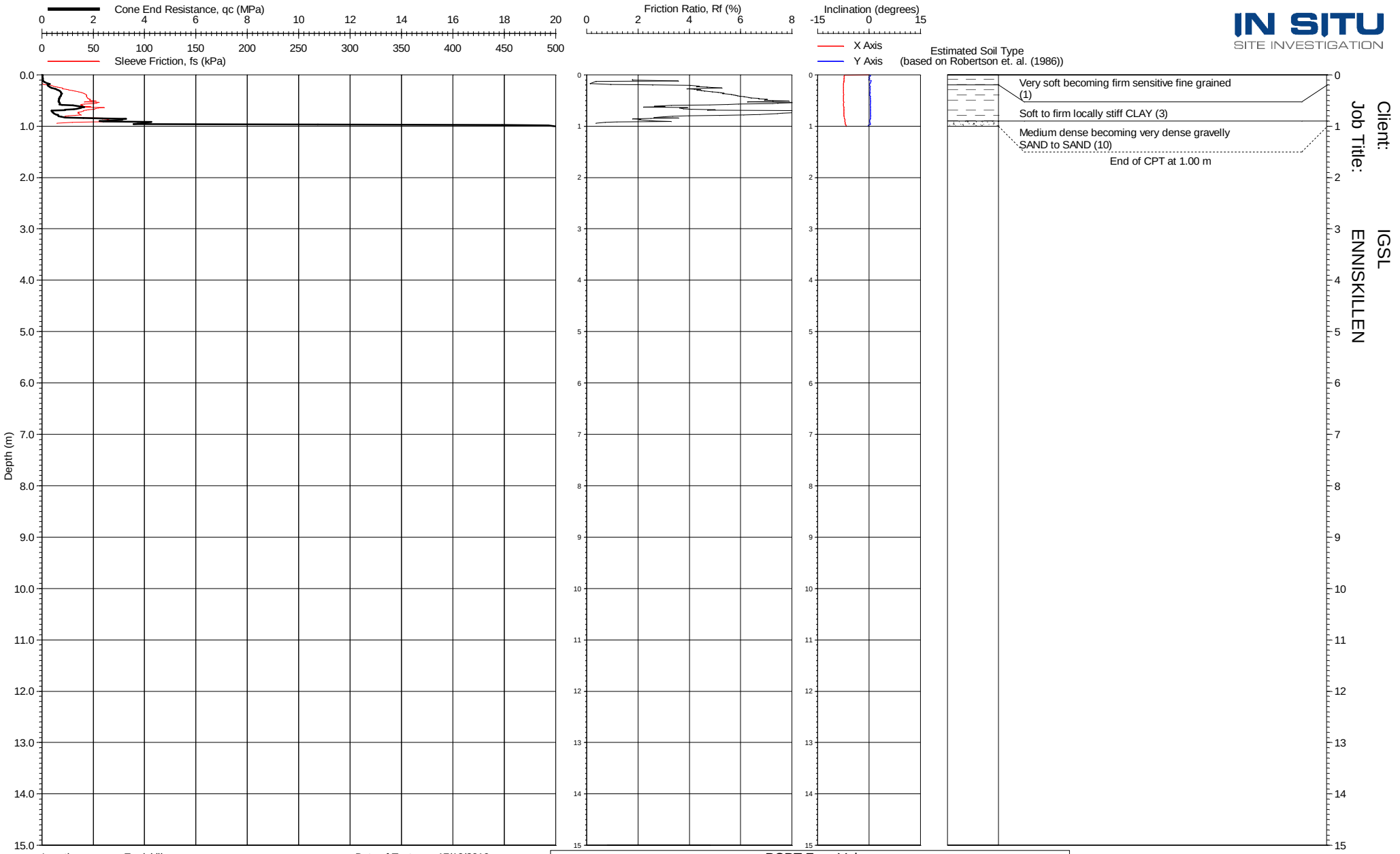
Tip Zero Pre:	256 mV	Tip Zero Post:	258 mV	Tip Zero Difference:	-1 %
Sleeve Zero Pre:	230 mV	Sleeve Zero Post:	235 mV	Sleeve Zero Difference:	-2 %
Pore Pressure Zero Pre:	266 mV	Pore Pressure Zero Post:	271 mV	Pore Pressure Difference:	-2 %
X Inclinometer Zero Pre:	2056 mV	X Inclinometer Zero Post:	2400 mV	X Inclinometer Difference:	-14 %
Y Inclinometer Zero Pre:	2056 mV	Y Inclinometer Zero Post:	2400 mV	Y Inclinometer Difference:	-14 %

PIEZO CONE PENETRATION TEST

CPT 02

insitusi.com

Form: CPT0001



IN SITU
SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	17/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 03
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

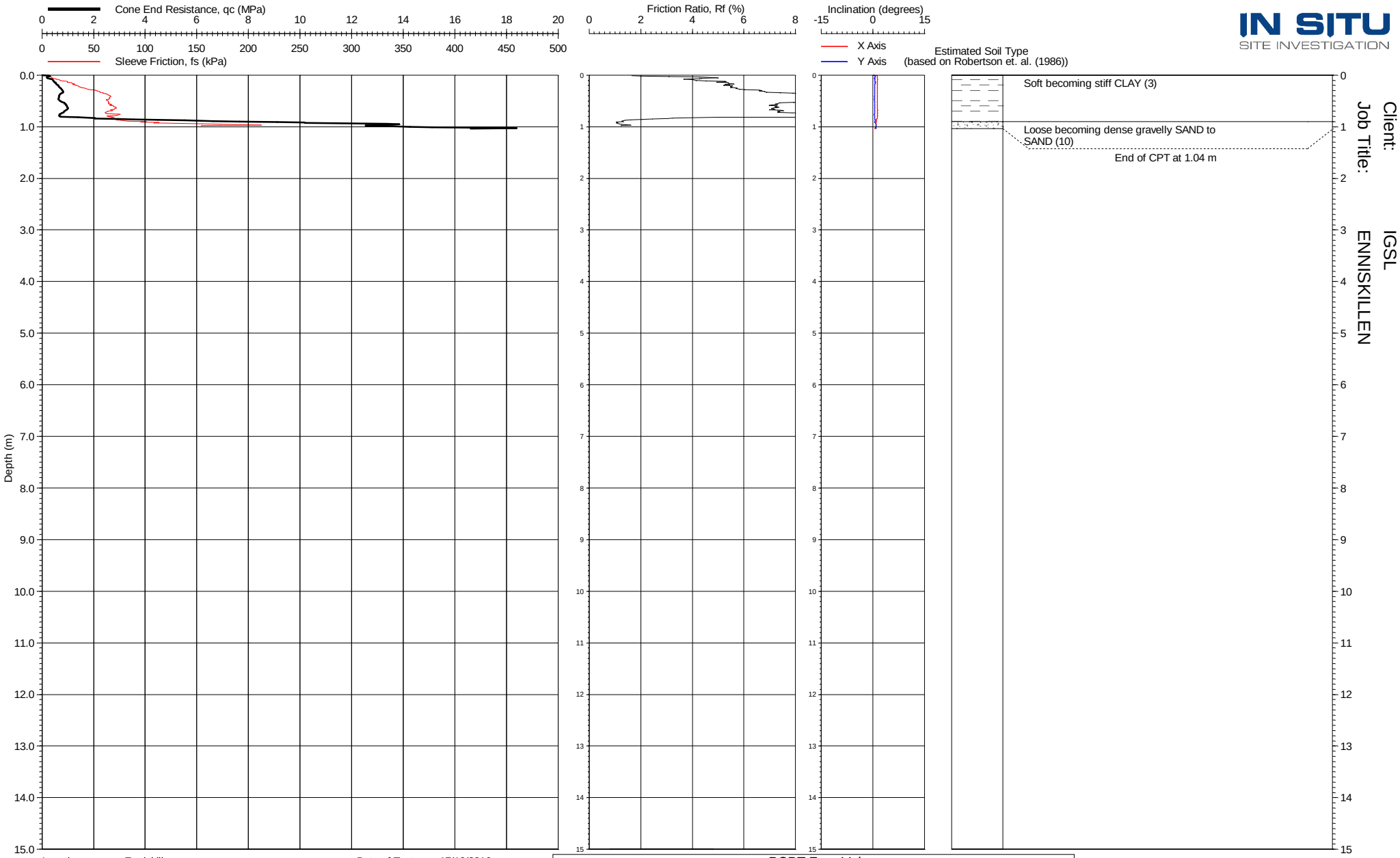
Tip Zero Pre:	261 mV	Tip Zero Post:	260 mV	Tip Zero Difference:	0 %
Sleeve Zero Pre:	238 mV	Sleeve Zero Post:	238 mV	Sleeve Zero Difference:	0 %
Pore Pressure Zero Pre:	264 mV	Pore Pressure Zero Post:	270 mV	Pore Pressure Difference:	-2 %
X Inclinometer Zero Pre:	1730 mV	X Inclinometer Zero Post:	2591 mV	X Inclinometer Difference:	-33 %
Y Inclinometer Zero Pre:	1730 mV	Y Inclinometer Zero Post:	2591 mV	Y Inclinometer Difference:	-33 %

PIEZO CONE PENETRATION TEST

CPT 03

insitusi.com

Form: CPT0001



IN SITU SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	17/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 03A
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

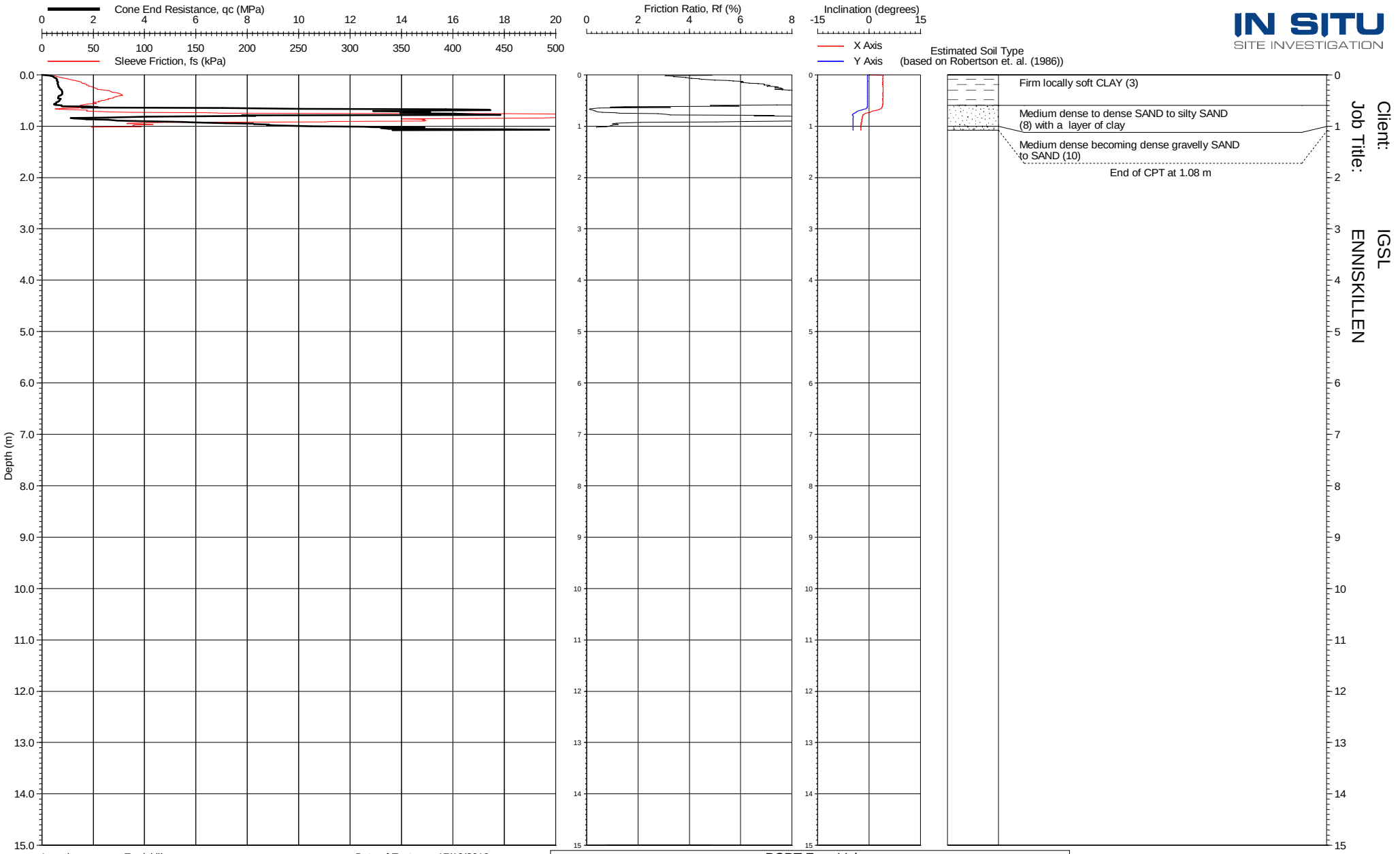
Tip Zero Pre:	260 mV	Tip Zero Post:	260 mV	Tip Zero Difference:	0 %
Sleeve Zero Pre:	238 mV	Sleeve Zero Post:	237 mV	Sleeve Zero Difference:	0 %
Pore Pressure Zero Pre:	269 mV	Pore Pressure Zero Post:	262 mV	Pore Pressure Difference:	3 %
X Inclinometer Zero Pre:	2569 mV	X Inclinometer Zero Post:	2737 mV	X Inclinometer Difference:	-6 %
Y Inclinometer Zero Pre:	2569 mV	Y Inclinometer Zero Post:	2737 mV	Y Inclinometer Difference:	-6 %

PIEZO CONE PENETRATION TEST

CPT 03A

insitusi.com

Form: CPT0001



IN SITU
SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	17/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 03B
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

Tip Zero Pre:	261 mV	Tip Zero Post:	258 mV	Tip Zero Difference:	1 %
Sleeve Zero Pre:	238 mV	Sleeve Zero Post:	235 mV	Sleeve Zero Difference:	1 %
Pore Pressure Zero Pre:	254 mV	Pore Pressure Zero Post:	252 mV	Pore Pressure Difference:	1 %
X Inclinometer Zero Pre:	2824 mV	X Inclinometer Zero Post:	2809 mV	X Inclinometer Difference:	1 %
Y Inclinometer Zero Pre:	2824 mV	Y Inclinometer Zero Post:	2809 mV	Y Inclinometer Difference:	1 %

PIEZO CONE PENETRATION TEST

CPT 03B

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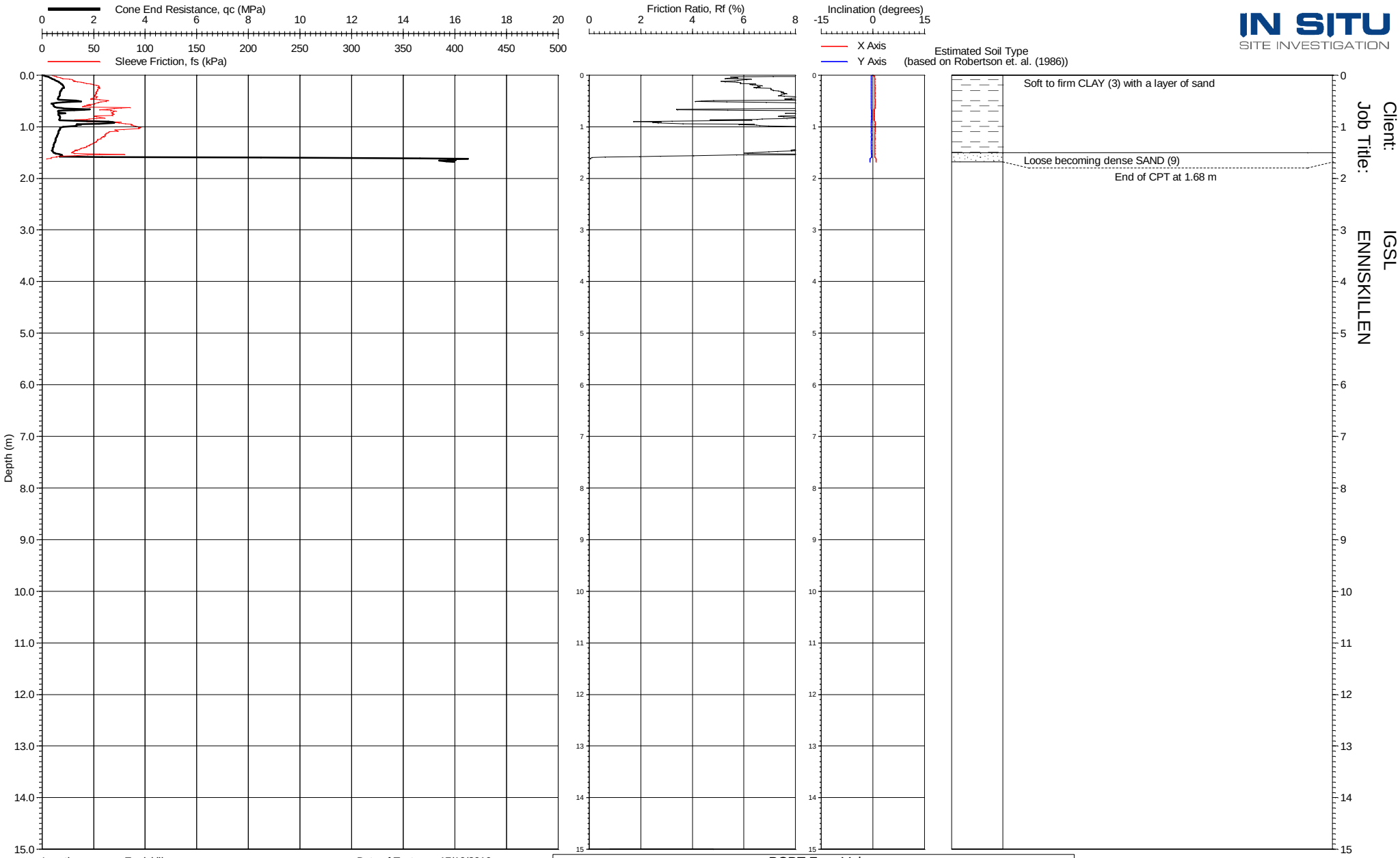
Form: CPT0001



IN SITU
SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	17/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 03C
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

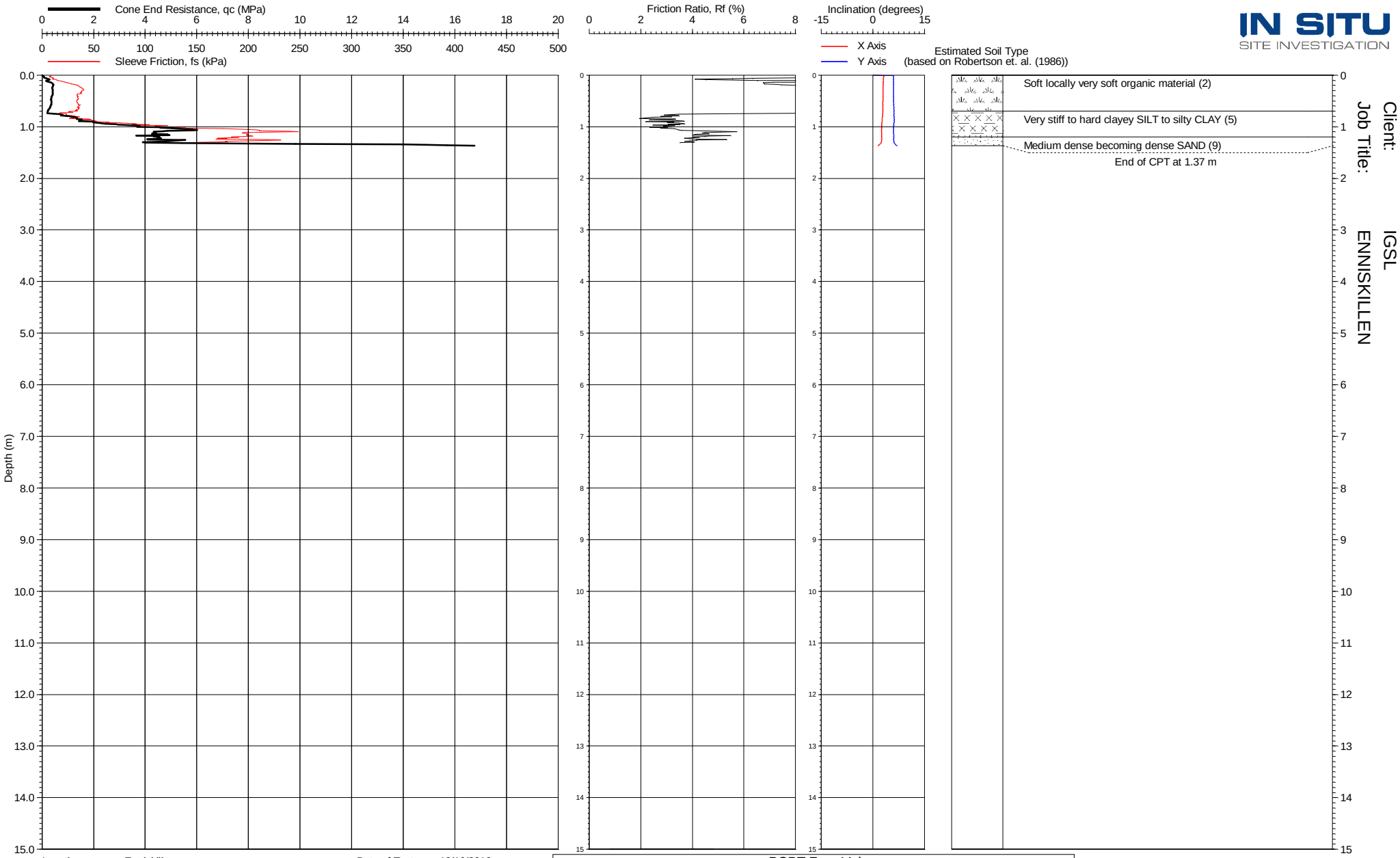
Tip Zero Pre:	261 mV	Tip Zero Post:	260 mV	Tip Zero Difference:	0 %
Sleeve Zero Pre:	238 mV	Sleeve Zero Post:	237 mV	Sleeve Zero Difference:	0 %
Pore Pressure Zero Pre:	254 mV	Pore Pressure Zero Post:	265 mV	Pore Pressure Difference:	-4 %
X Inclinometer Zero Pre:	2476 mV	X Inclinometer Zero Post:	2296 mV	X Inclinometer Difference:	8 %
Y Inclinometer Zero Pre:	2476 mV	Y Inclinometer Zero Post:	2296 mV	Y Inclinometer Difference:	8 %

PIEZO CONE PENETRATION TEST

CPT 03C

insitusi.com

Form: CPT0001



IN SITU
SITE INVESTIGATION

Client: IGSL
Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 04
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

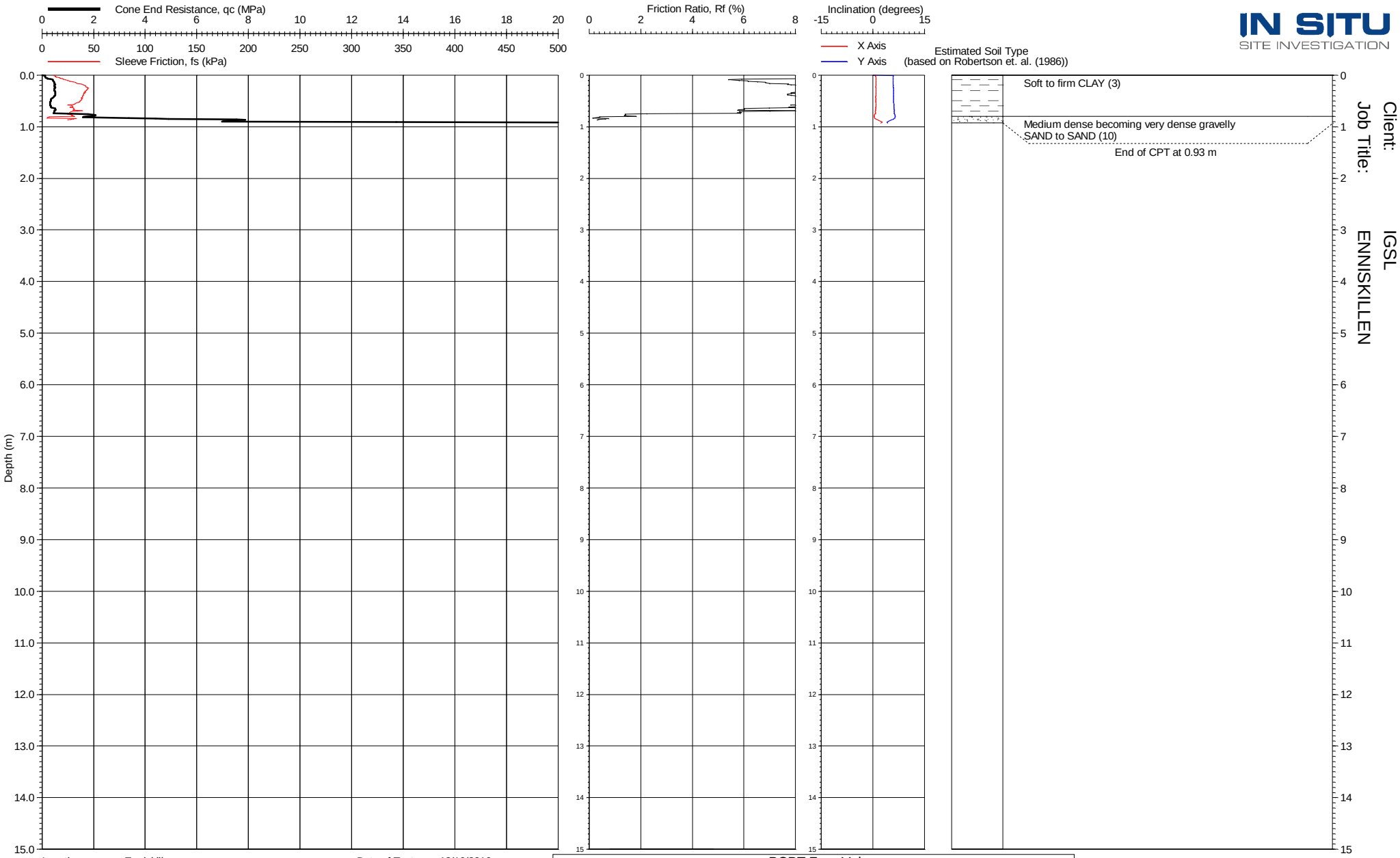
Tip Zero Pre:	261 mV	Tip Zero Post:	260 mV	Tip Zero Difference:	0 %
Sleeve Zero Pre:	239 mV	Sleeve Zero Post:	239 mV	Sleeve Zero Difference:	0 %
Pore Pressure Zero Pre:	268 mV	Pore Pressure Zero Post:	249 mV	Pore Pressure Difference:	8 %
X Inclinometer Zero Pre:	2882 mV	X Inclinometer Zero Post:	2673 mV	X Inclinometer Difference:	8 %
Y Inclinometer Zero Pre:	2882 mV	Y Inclinometer Zero Post:	2673 mV	Y Inclinometer Difference:	8 %

PIEZO CONE PENETRATION TEST

CPT 04

insitusi.com

Form: CPT0001



IN SITU
SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 04A
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

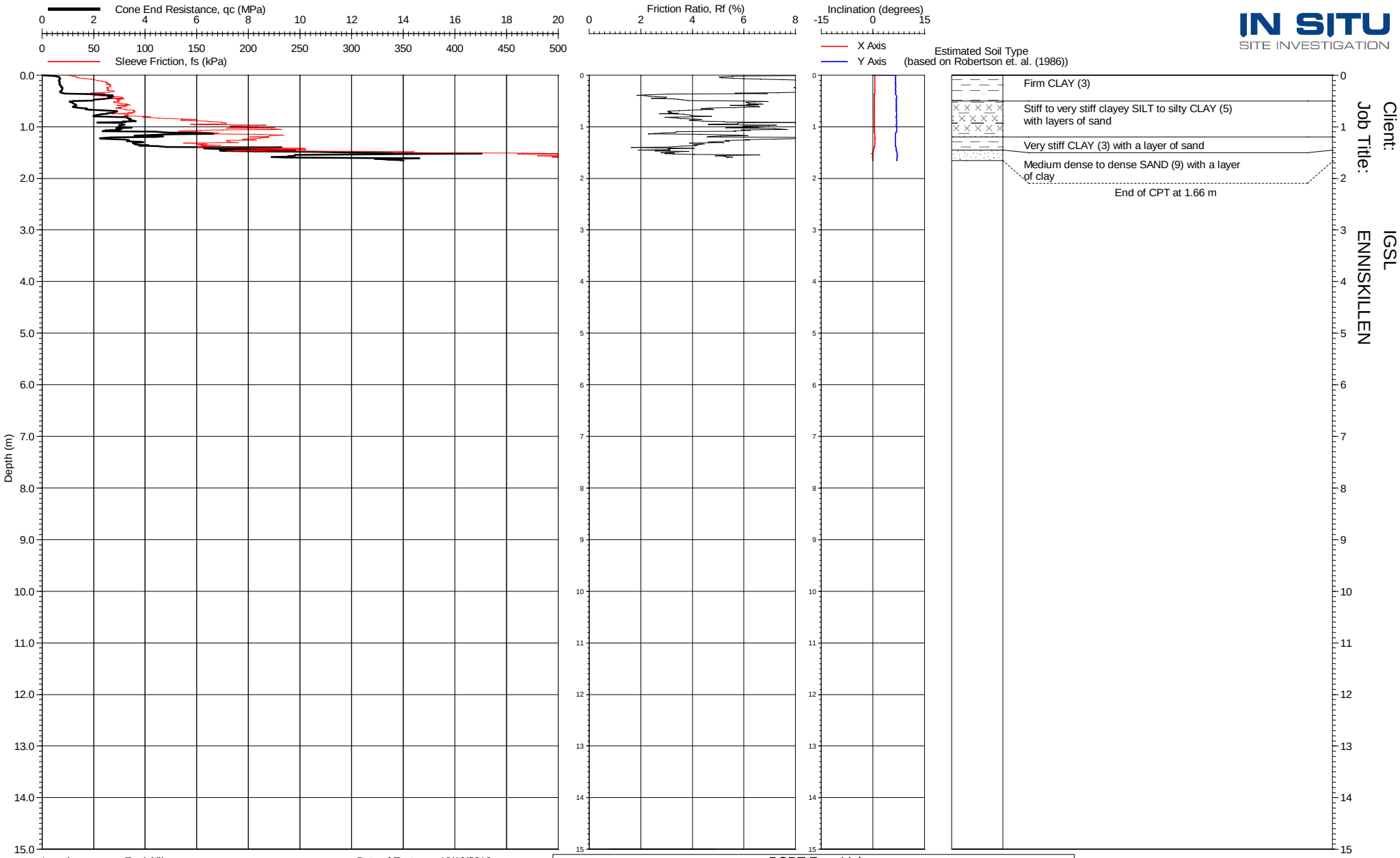
Tip Zero Pre:	260 mV	Tip Zero Post:	261 mV	Tip Zero Difference:	0 %
Sleeve Zero Pre:	239 mV	Sleeve Zero Post:	239 mV	Sleeve Zero Difference:	0 %
Pore Pressure Zero Pre:	261 mV	Pore Pressure Zero Post:	263 mV	Pore Pressure Difference:	-1 %
X Inclinometer Zero Pre:	2570 mV	X Inclinometer Zero Post:	2467 mV	X Inclinometer Difference:	4 %
Y Inclinometer Zero Pre:	2570 mV	Y Inclinometer Zero Post:	2467 mV	Y Inclinometer Difference:	4 %

PIEZO CONE PENETRATION TEST

CPT 04A

insitusi.com

Form: CPT0001



IN SITU
SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 04B
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

Tip Zero Pre:	261 mV	Tip Zero Post:	259 mV	Tip Zero Difference:	1 %
Sleeve Zero Pre:	240 mV	Sleeve Zero Post:	240 mV	Sleeve Zero Difference:	0 %
Pore Pressure Zero Pre:	256 mV	Pore Pressure Zero Post:	162 mV	Pore Pressure Difference:	58 %
X Inclinometer Zero Pre:	2441 mV	X Inclinometer Zero Post:	2489 mV	X Inclinometer Difference:	-2 %
Y Inclinometer Zero Pre:	2441 mV	Y Inclinometer Zero Post:	2489 mV	Y Inclinometer Difference:	-2 %

PIEZO CONE PENETRATION TEST

CPT 04B

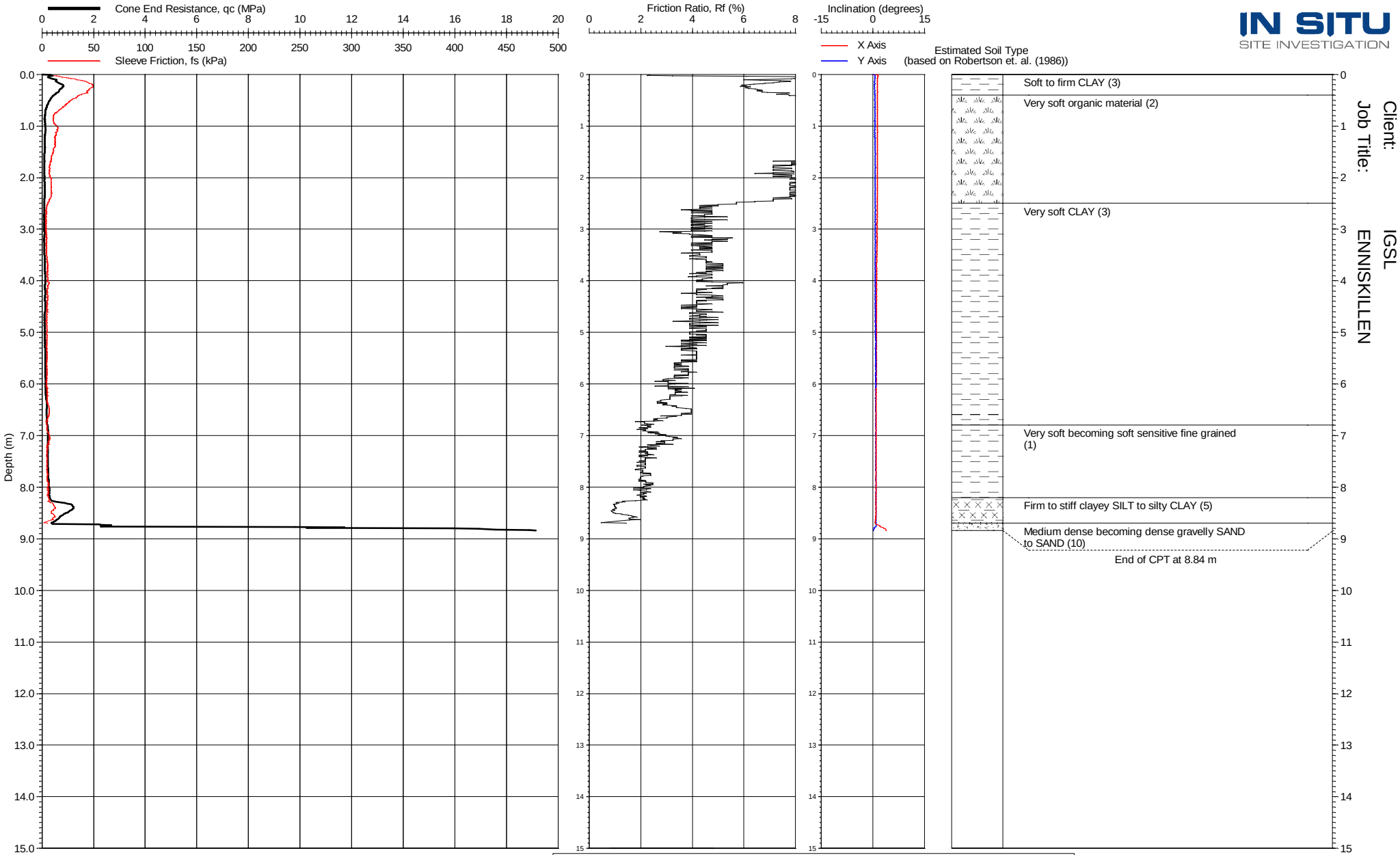
insitusi.com

Form: CPT0001

IN SITU
SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN



Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 07
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

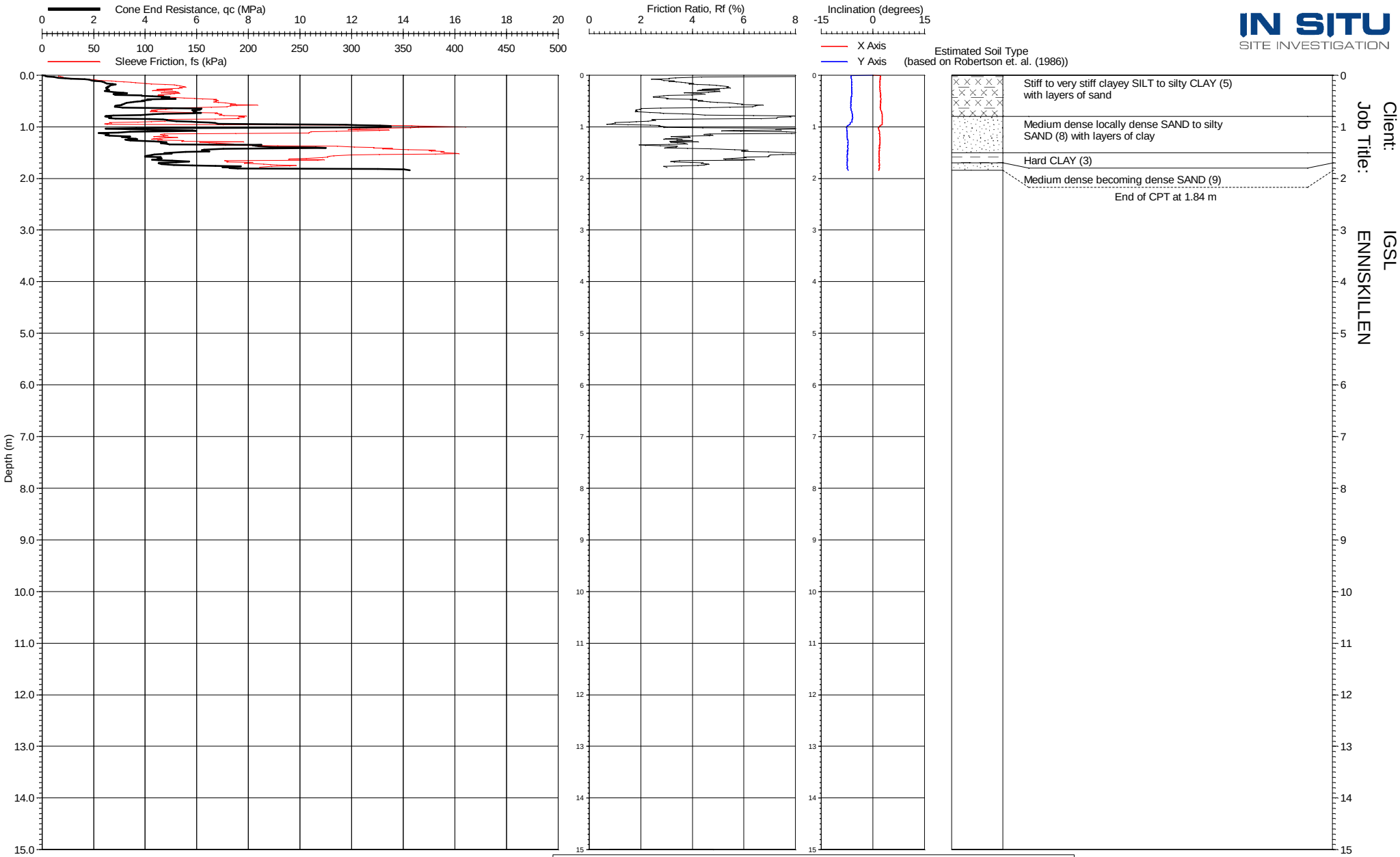
Tip Zero Pre:	260 mV	Tip Zero Post:	261 mV	Tip Zero Difference:	0 %
Sleeve Zero Pre:	234 mV	Sleeve Zero Post:	235 mV	Sleeve Zero Difference:	0 %
Pore Pressure Zero Pre:	287 mV	Pore Pressure Zero Post:	286 mV	Pore Pressure Difference:	0 %
X Inclinometer Zero Pre:	2590 mV	X Inclinometer Zero Post:	2528 mV	X Inclinometer Difference:	2 %
Y Inclinometer Zero Pre:	2590 mV	Y Inclinometer Zero Post:	2528 mV	Y Inclinometer Difference:	2 %

PIEZO CONE PENETRATION TEST

CPT 07

insitusi.com

Form: CPT0001



IN SITU
SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 08
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

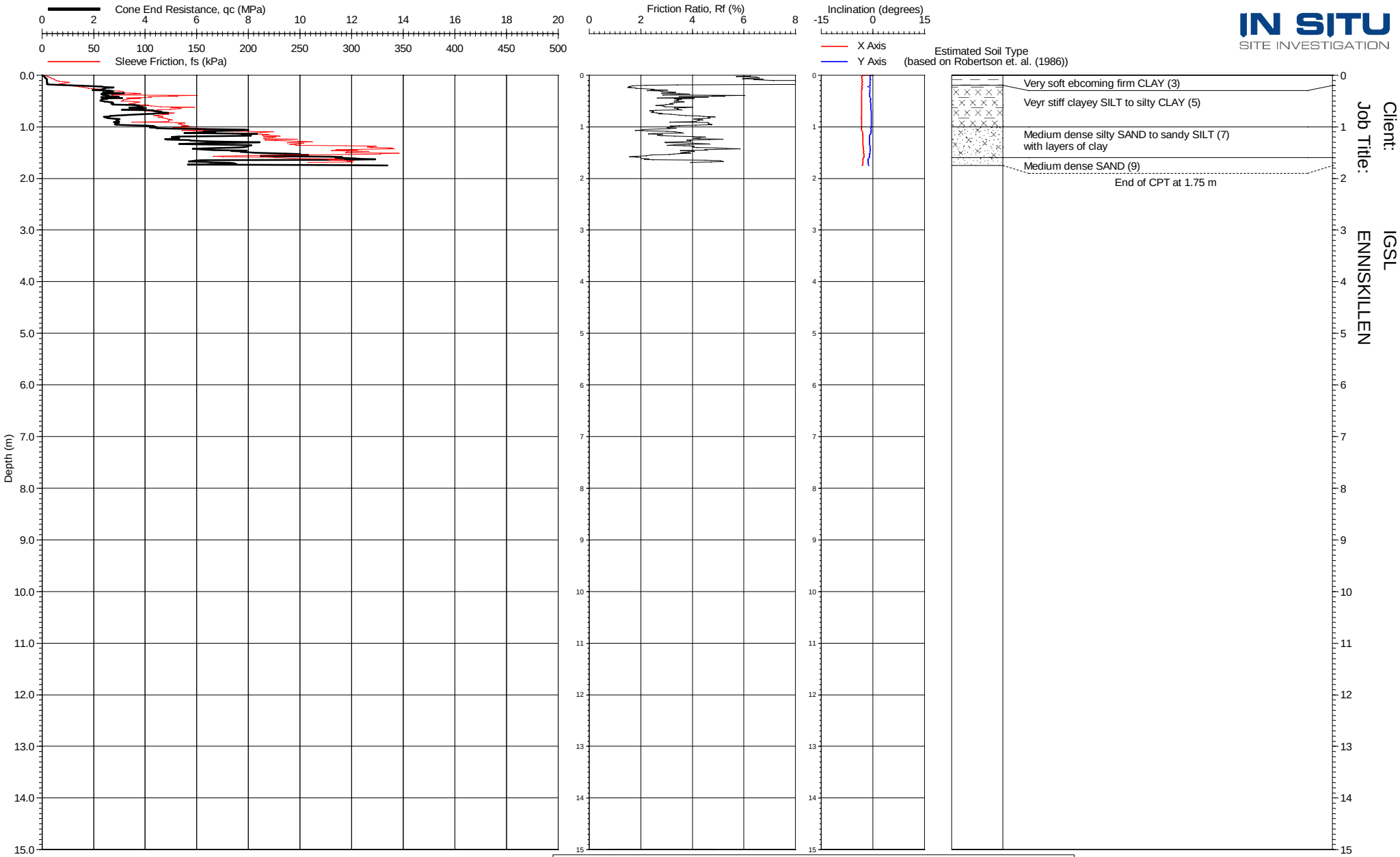
Tip Zero Pre:	260 mV	Tip Zero Post:	264 mV	Tip Zero Difference:	-2 %
Sleeve Zero Pre:	237 mV	Sleeve Zero Post:	239 mV	Sleeve Zero Difference:	-1 %
Pore Pressure Zero Pre:	267 mV	Pore Pressure Zero Post:	255 mV	Pore Pressure Difference:	5 %
X Inclinometer Zero Pre:	2557 mV	X Inclinometer Zero Post:	2668 mV	X Inclinometer Difference:	-4 %
Y Inclinometer Zero Pre:	2557 mV	Y Inclinometer Zero Post:	2668 mV	Y Inclinometer Difference:	-4 %

PIEZO CONE PENETRATION TEST

CPT 08

insitusi.com

Form: CPT0001



IN SITU
SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 08A
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

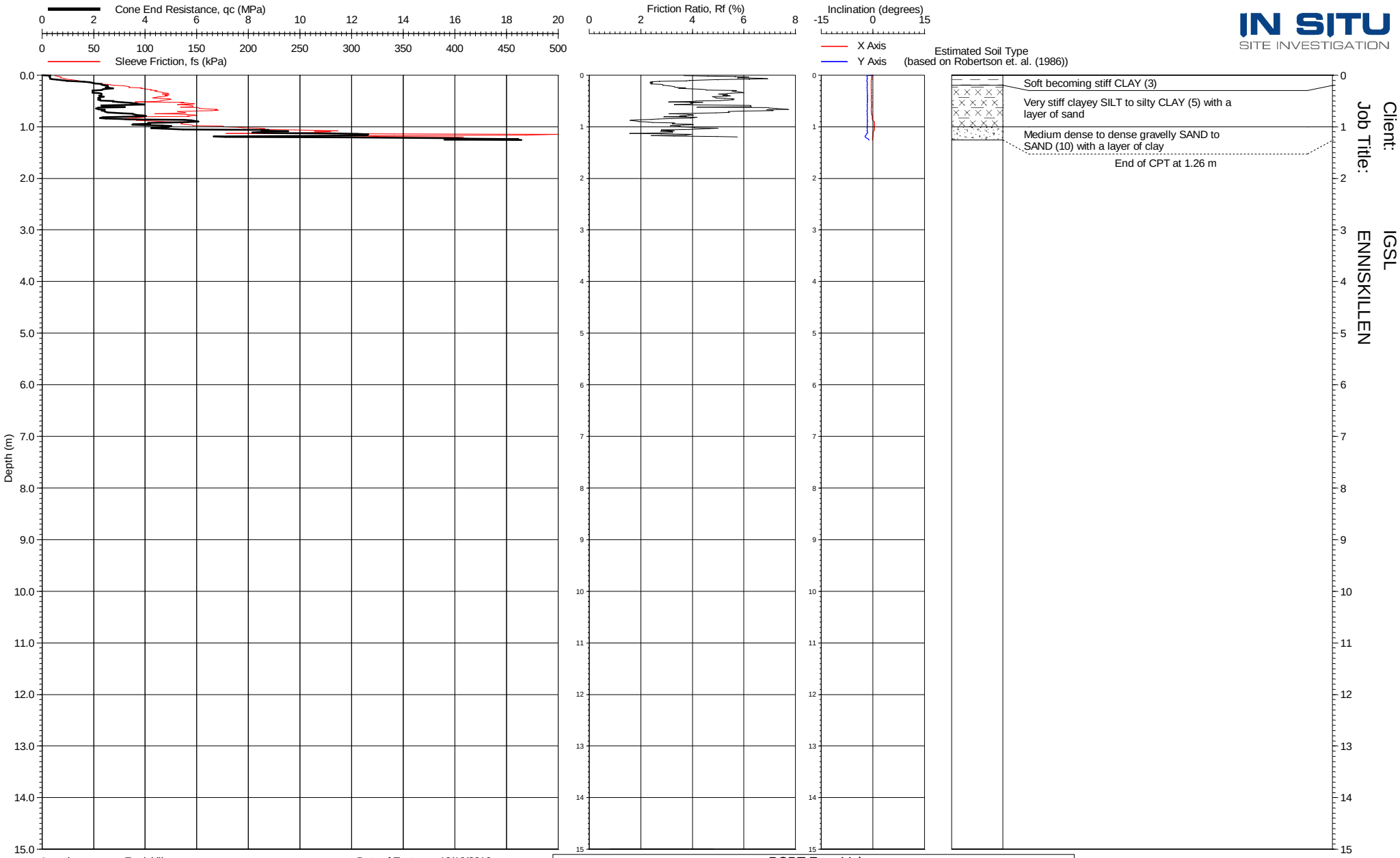
Tip Zero Pre:	260 mV	Tip Zero Post:	261 mV	Tip Zero Difference:	0 %
Sleeve Zero Pre:	236 mV	Sleeve Zero Post:	239 mV	Sleeve Zero Difference:	-1 %
Pore Pressure Zero Pre:	288 mV	Pore Pressure Zero Post:	260 mV	Pore Pressure Difference:	11 %
X Inclinometer Zero Pre:	2123 mV	X Inclinometer Zero Post:	2084 mV	X Inclinometer Difference:	2 %
Y Inclinometer Zero Pre:	2123 mV	Y Inclinometer Zero Post:	2084 mV	Y Inclinometer Difference:	2 %

PIEZO CONE PENETRATION TEST

CPT 08A

insitusi.com

Form: CPT0001



IN SITU
SITE INVESTIGATION

Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 08B
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

PCPT Zero Values

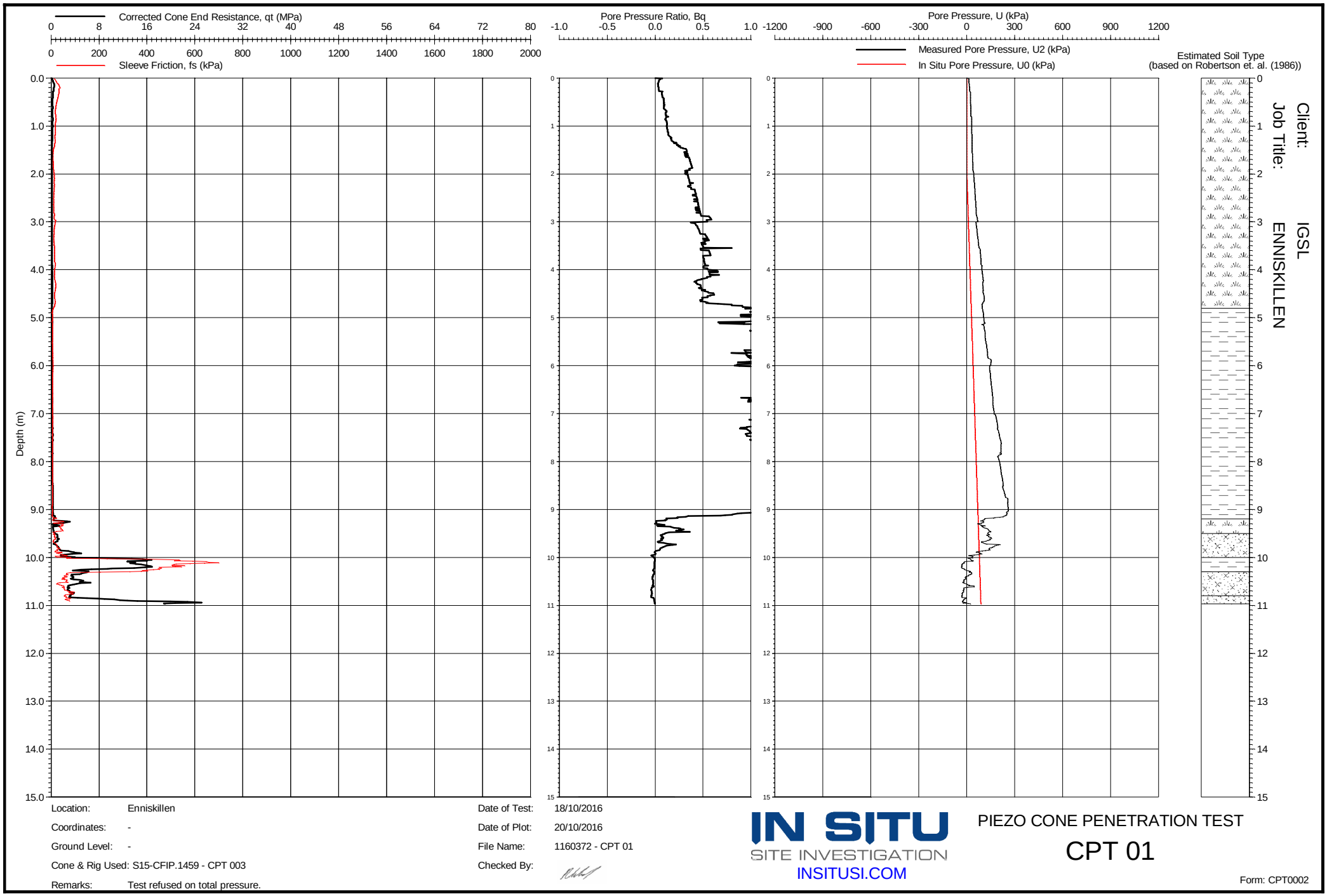
Tip Zero Pre:	259 mV	Tip Zero Post:	260 mV	Tip Zero Difference:	0 %
Sleeve Zero Pre:	237 mV	Sleeve Zero Post:	237 mV	Sleeve Zero Difference:	0 %
Pore Pressure Zero Pre:	268 mV	Pore Pressure Zero Post:	253 mV	Pore Pressure Difference:	6 %
X Inclinometer Zero Pre:	2432 mV	X Inclinometer Zero Post:	2389 mV	X Inclinometer Difference:	2 %
Y Inclinometer Zero Pre:	2432 mV	Y Inclinometer Zero Post:	2389 mV	Y Inclinometer Difference:	2 %

PIEZO CONE PENETRATION TEST

CPT 08B

insitusi.com

Form: CPT0001



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 01

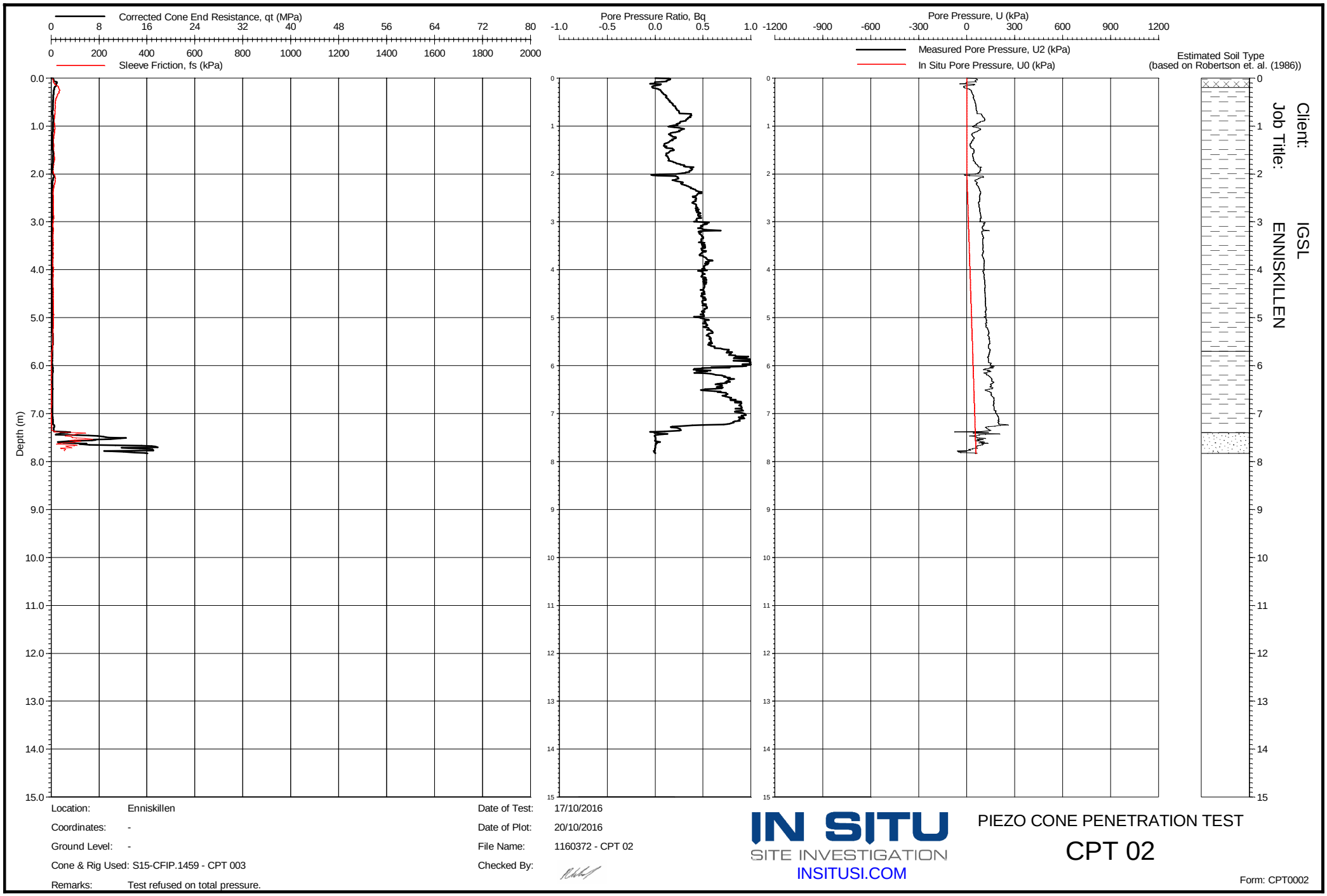
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 01

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 02

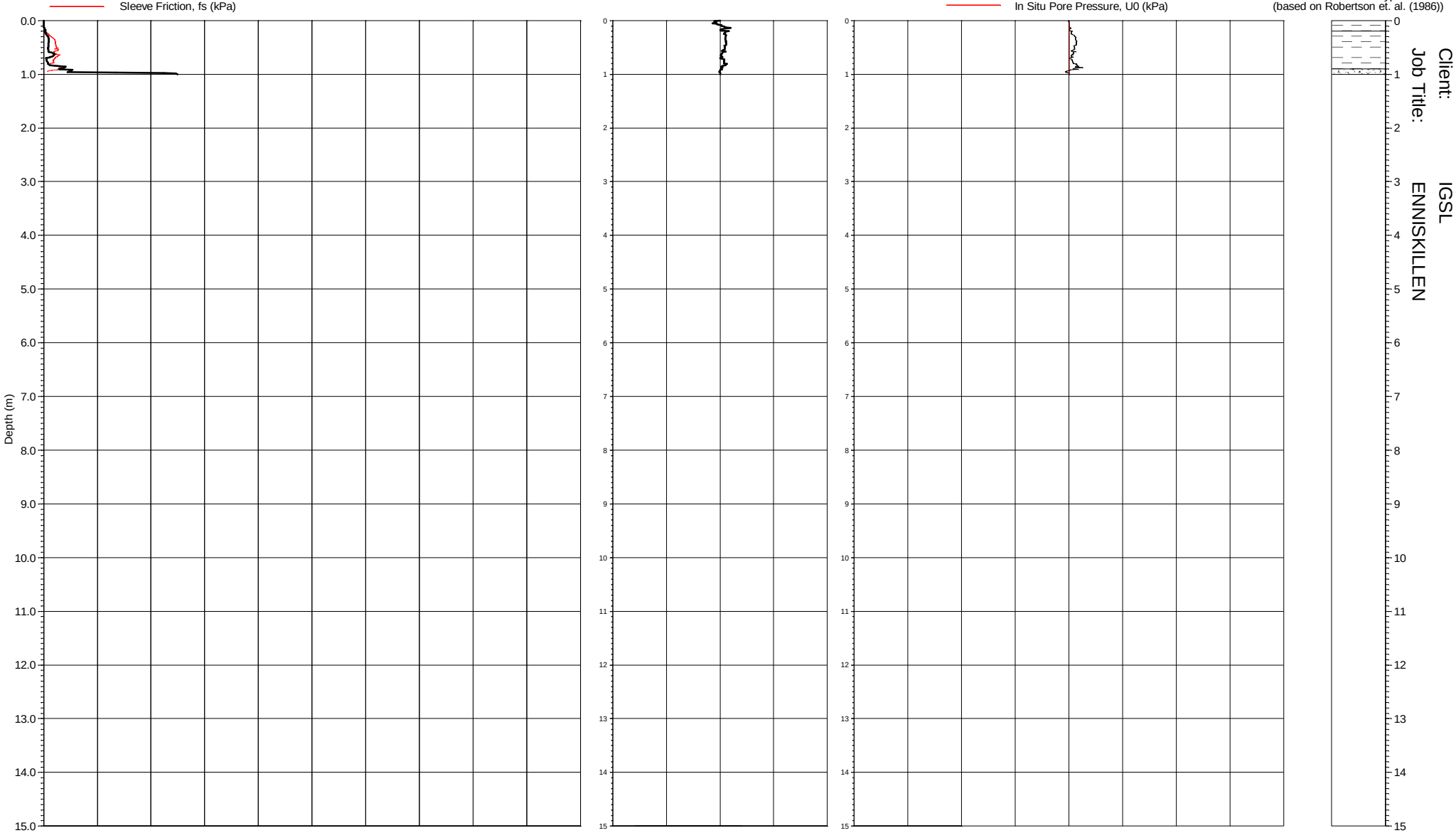
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 02

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03

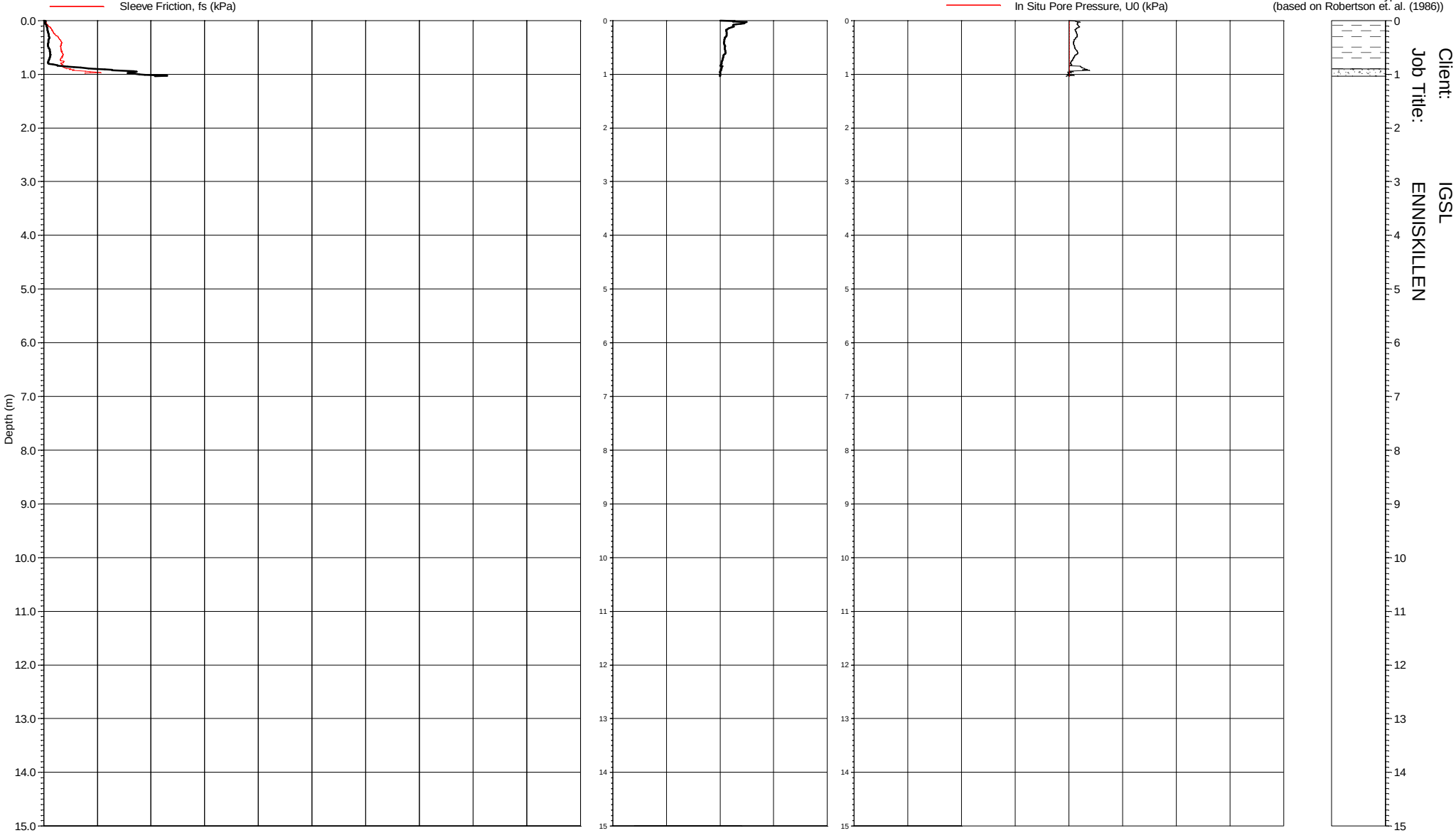
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 03

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03A

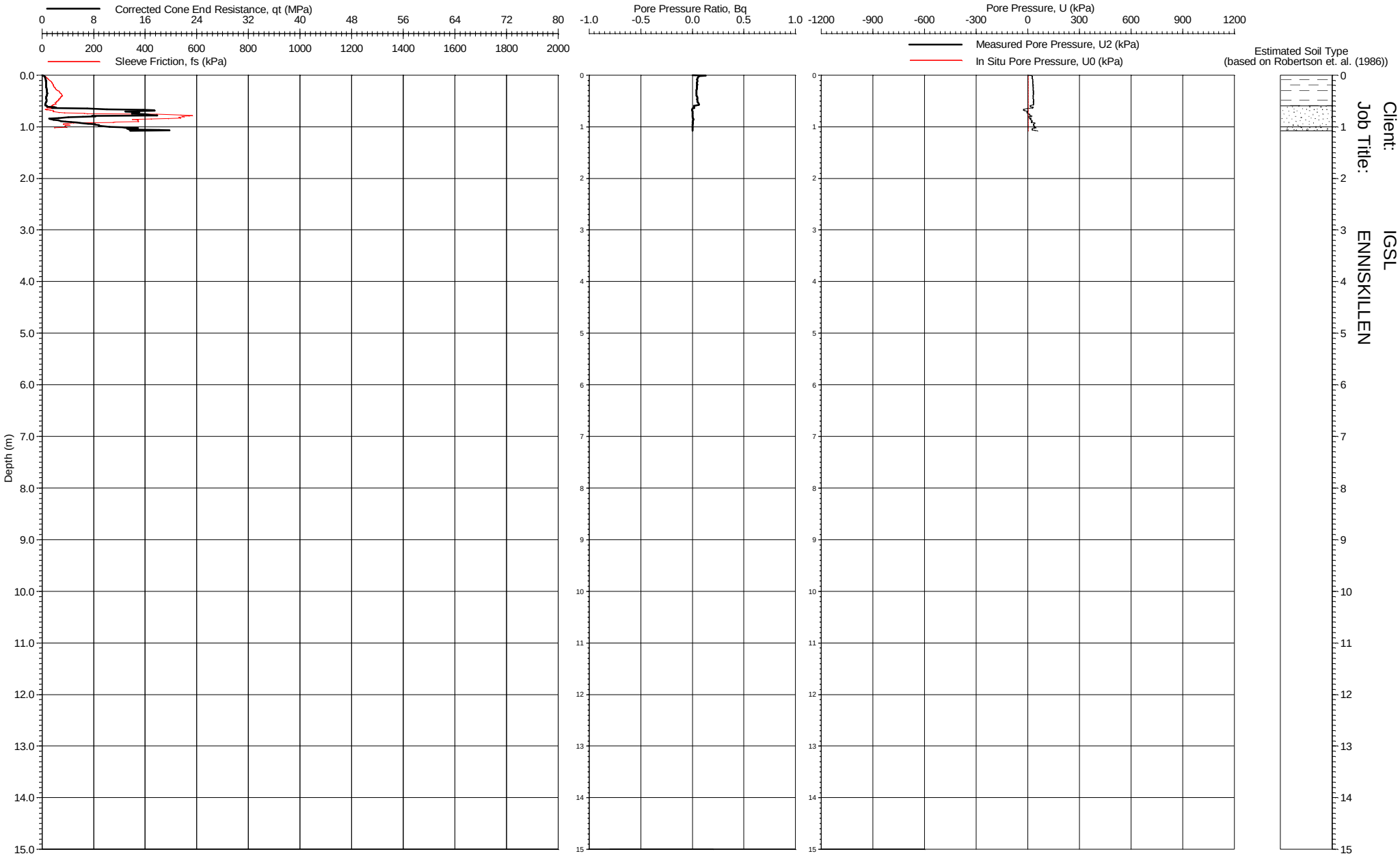
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 03A

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03B

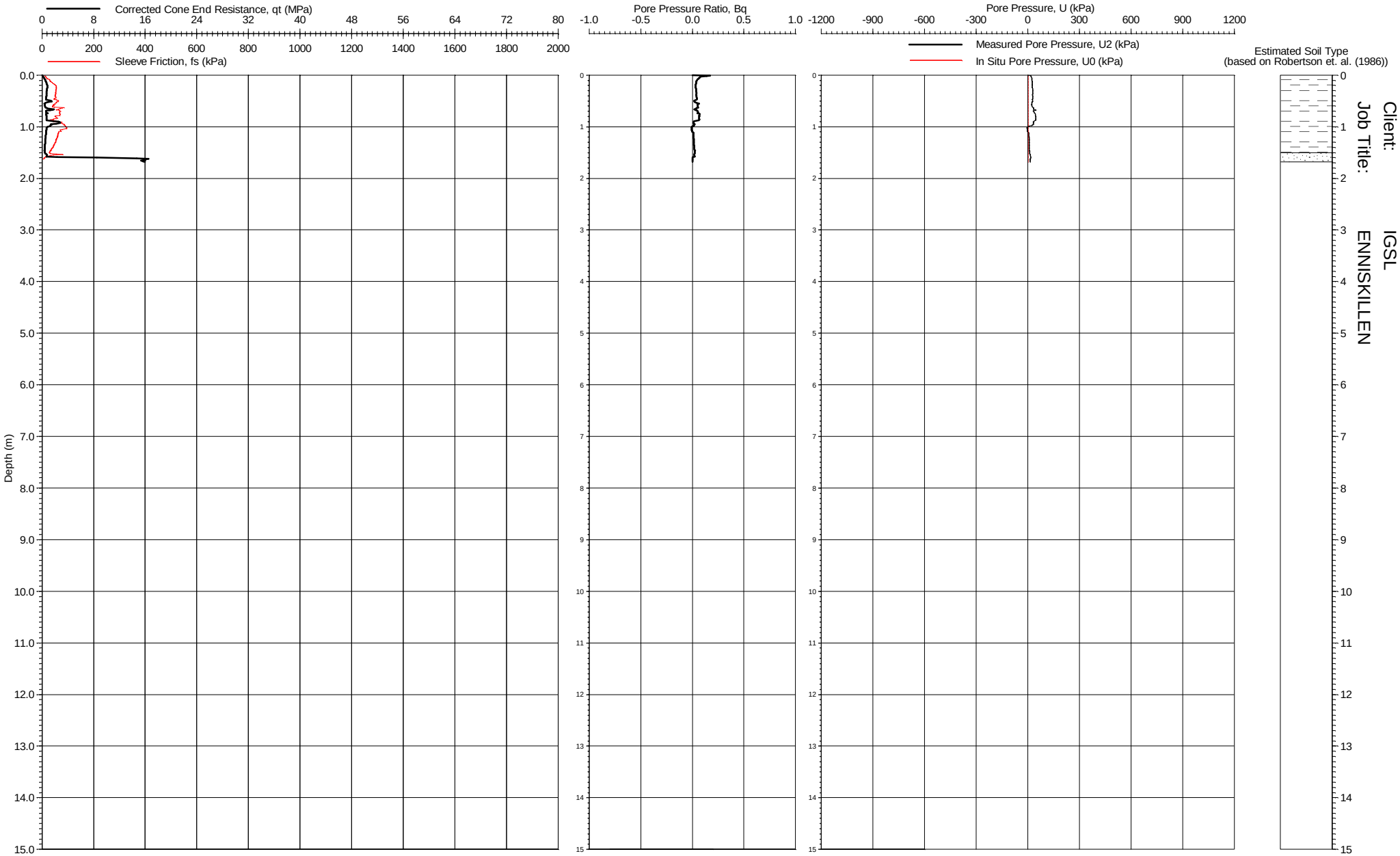
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 03B

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03C

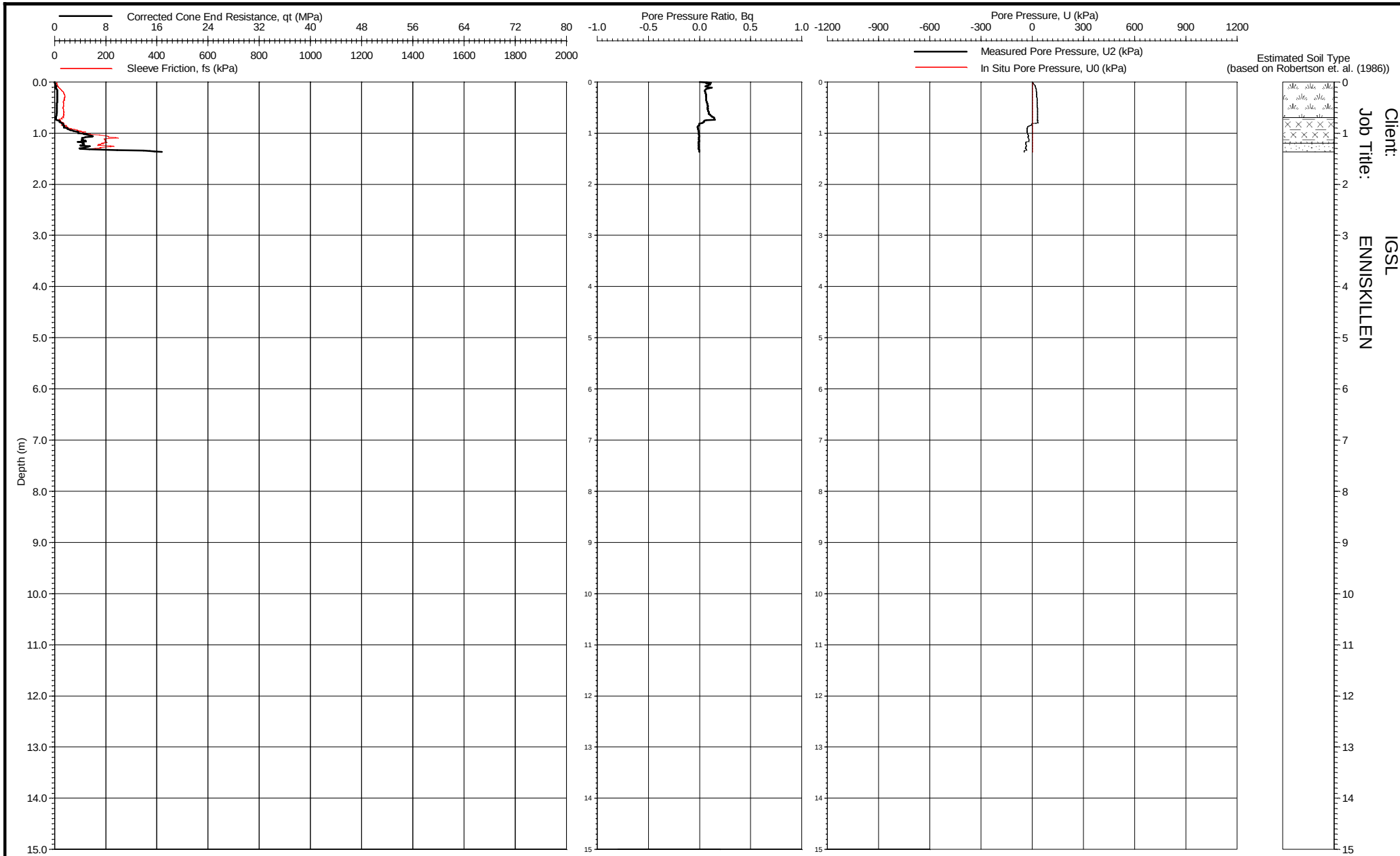
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 03C

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 04

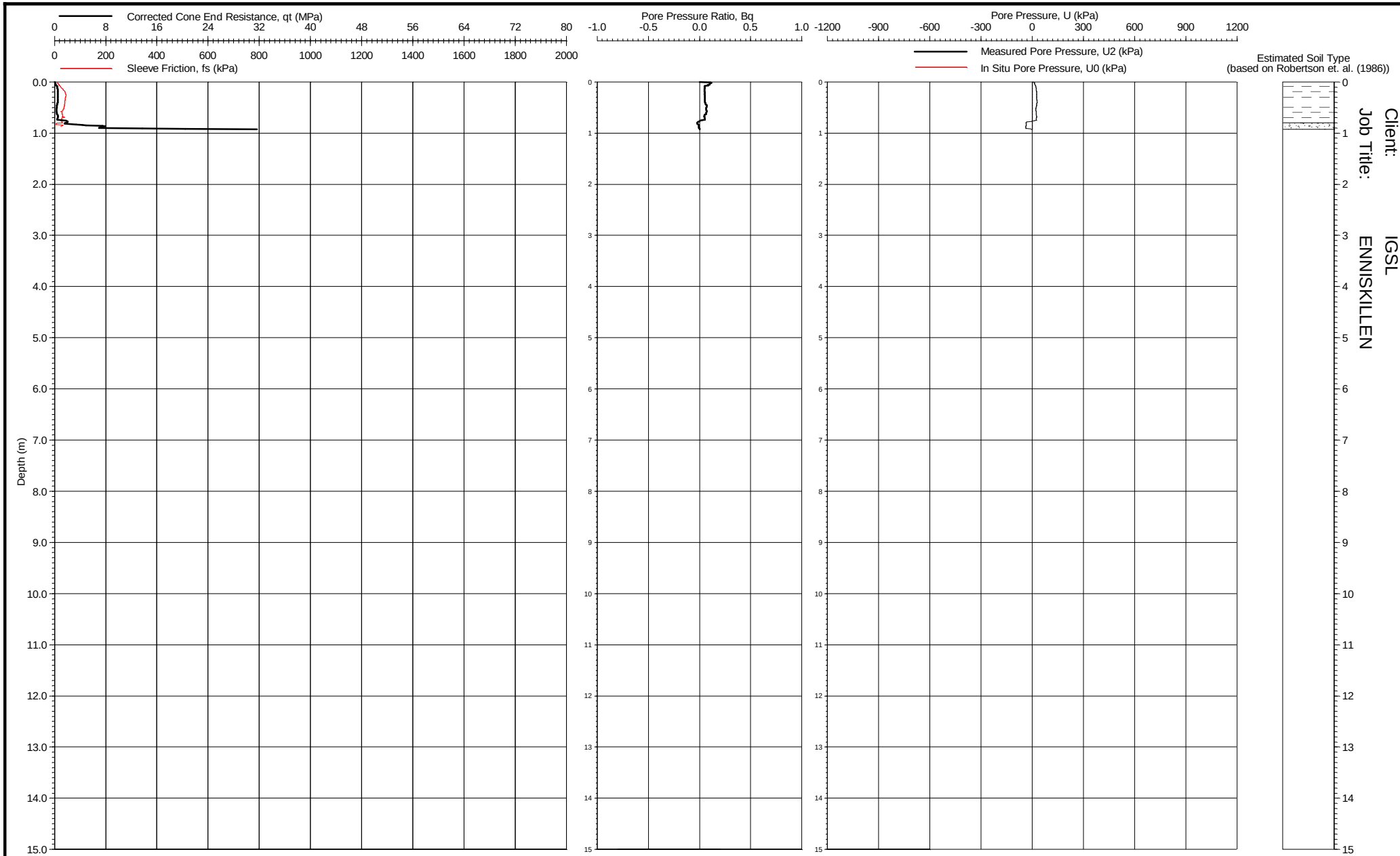
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 04

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 04A

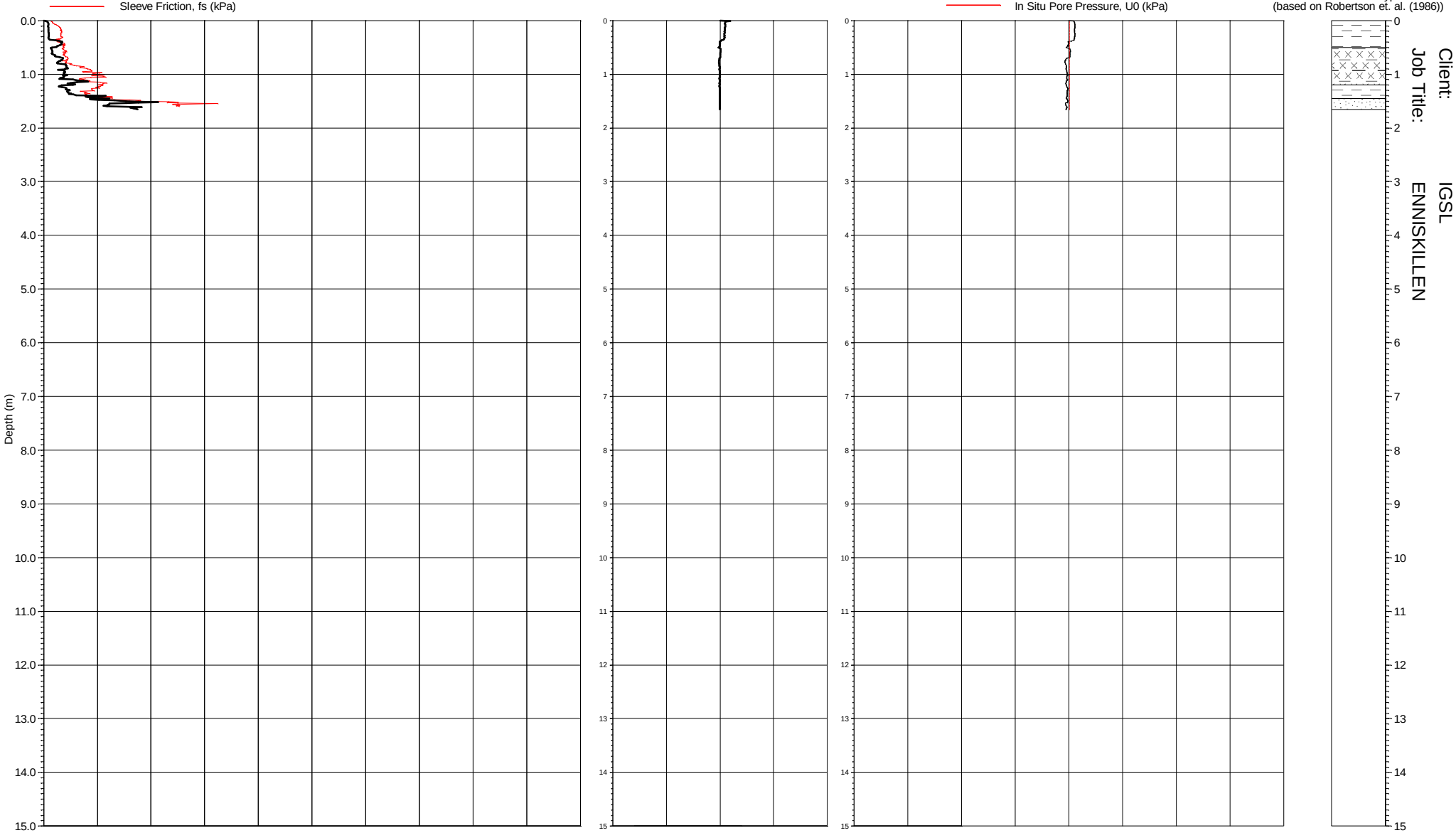
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 04A

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 04B

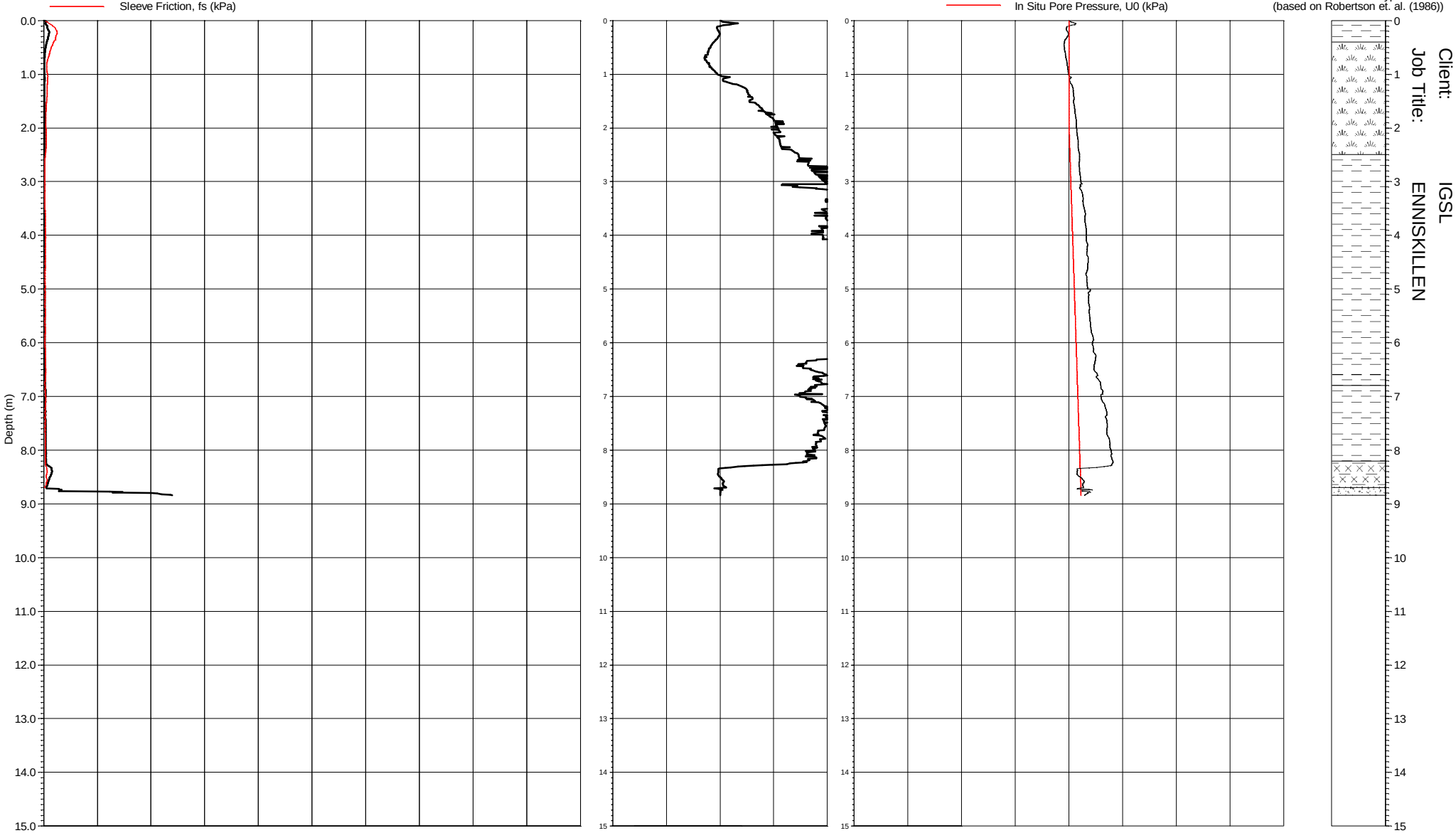
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 04B

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 07

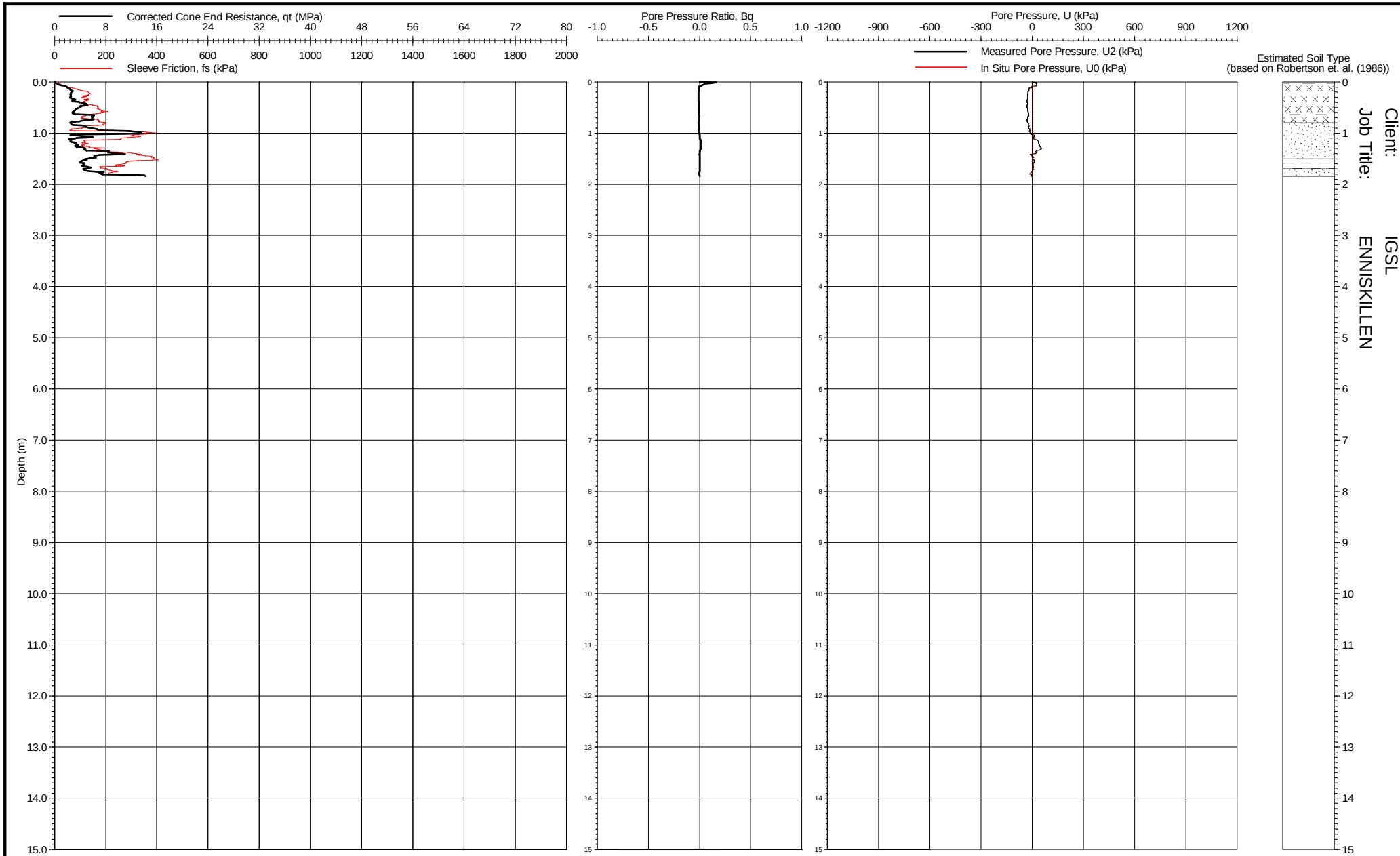
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 07

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 08

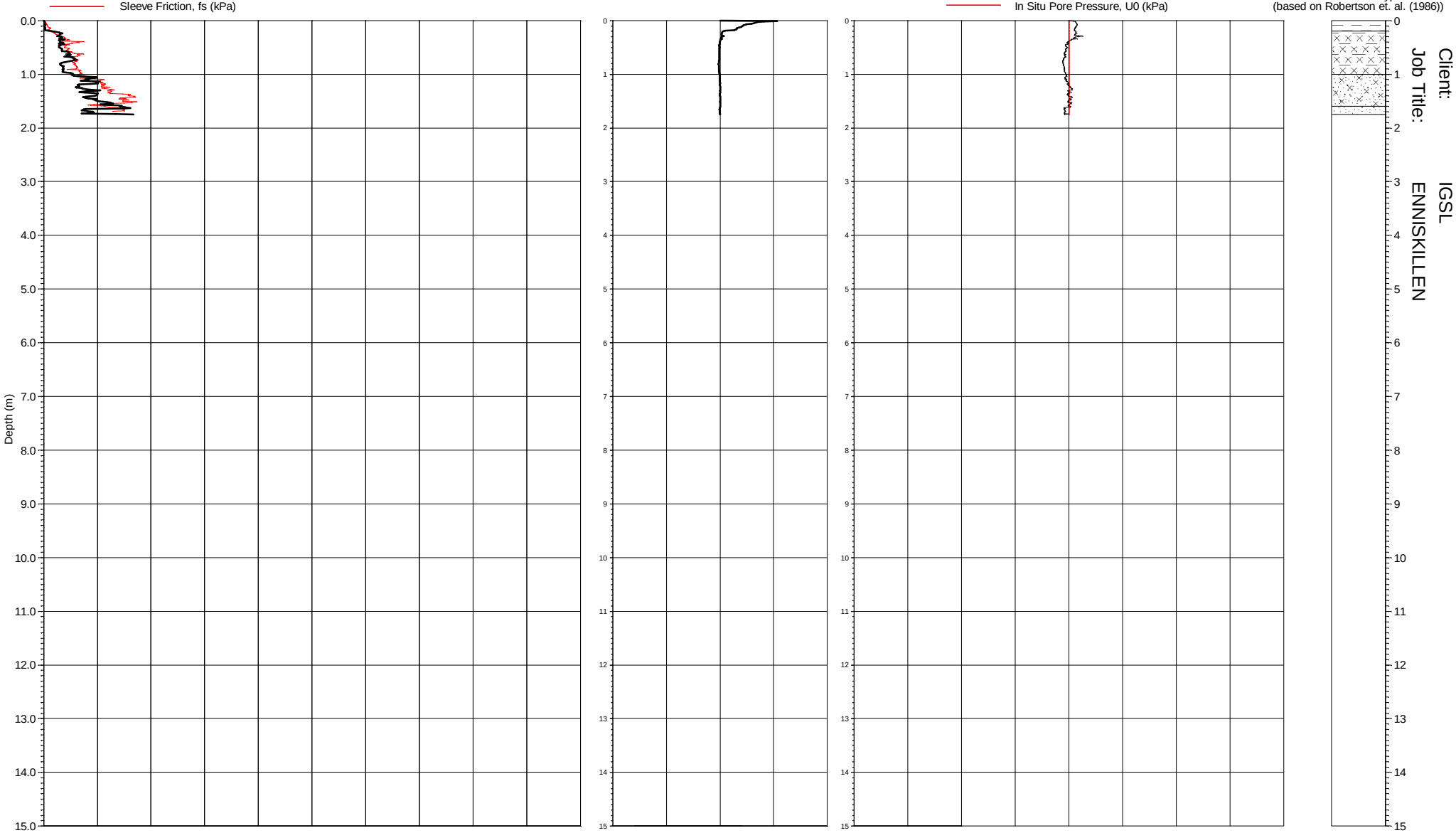
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 08

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 08A

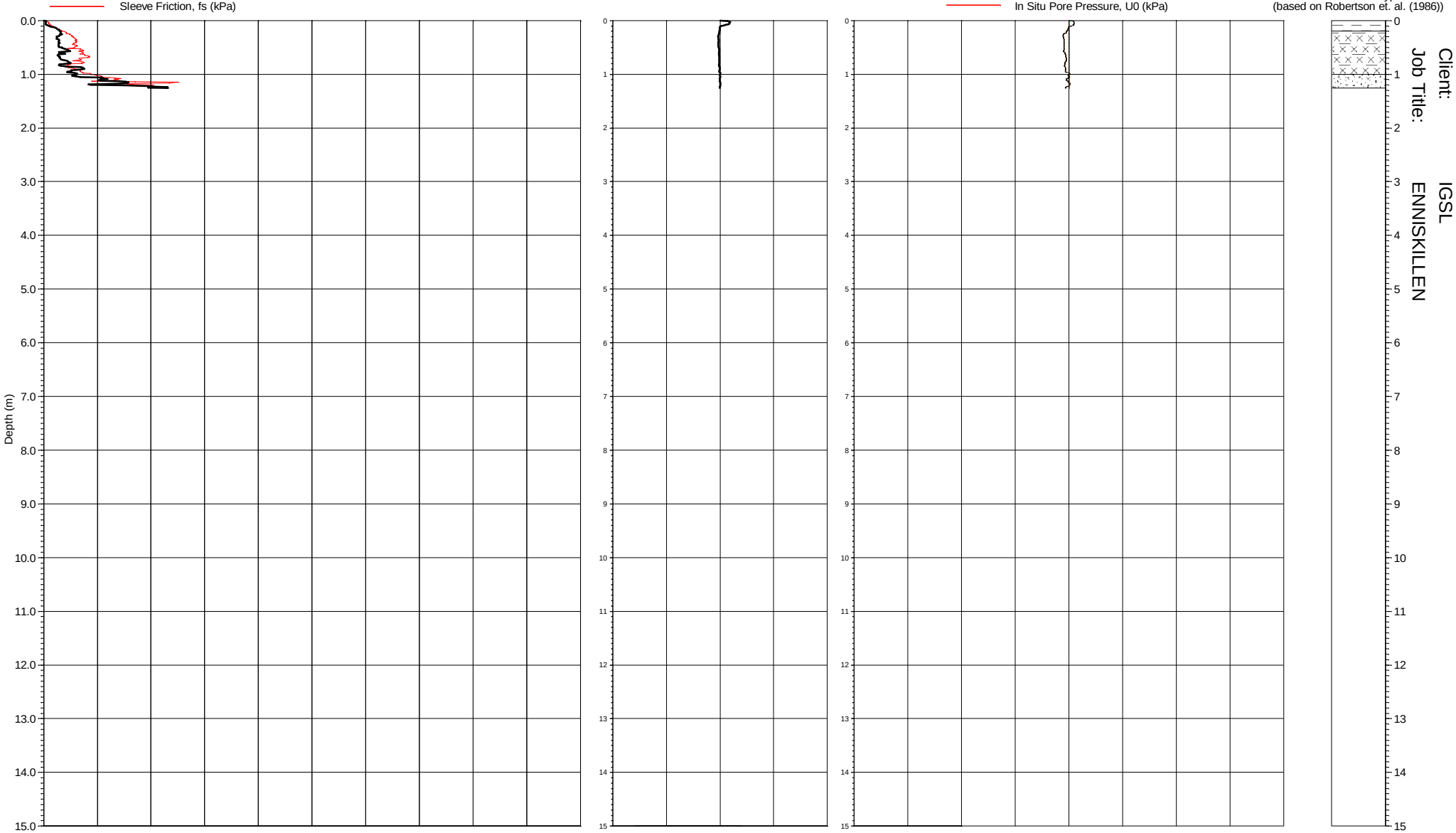
Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

CPT 08A

Form: CPT0002



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 08B

Checked By:

IN SITU
SITE INVESTIGATION
INSITUSI.COM

PIEZO CONE PENETRATION TEST

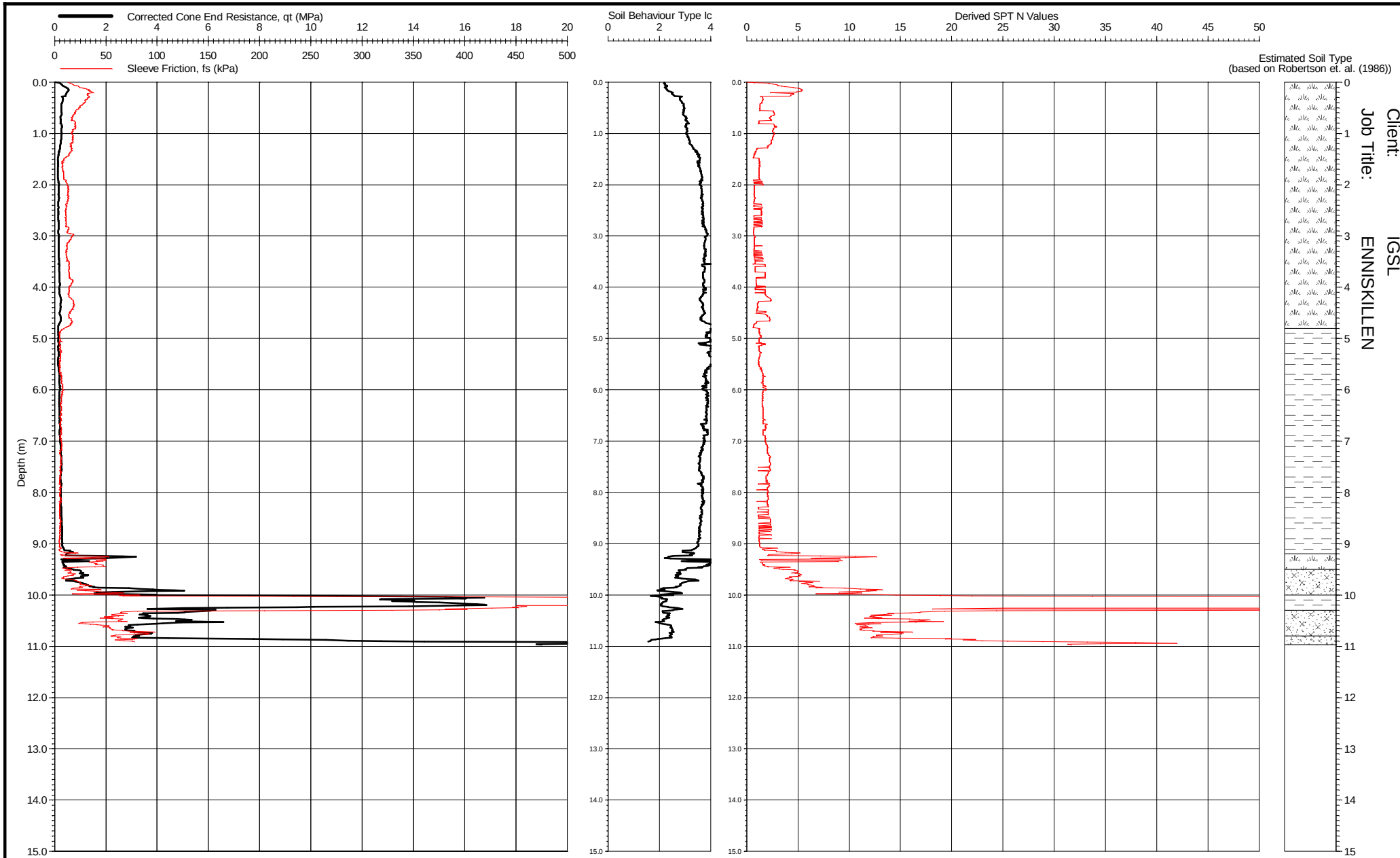
CPT 08B

Form: CPT0002

APPENDIX C

CPT DERIVED GEOTECHNICAL PARAMETERS

LIST OF FIGURES



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Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 01

Checked By:

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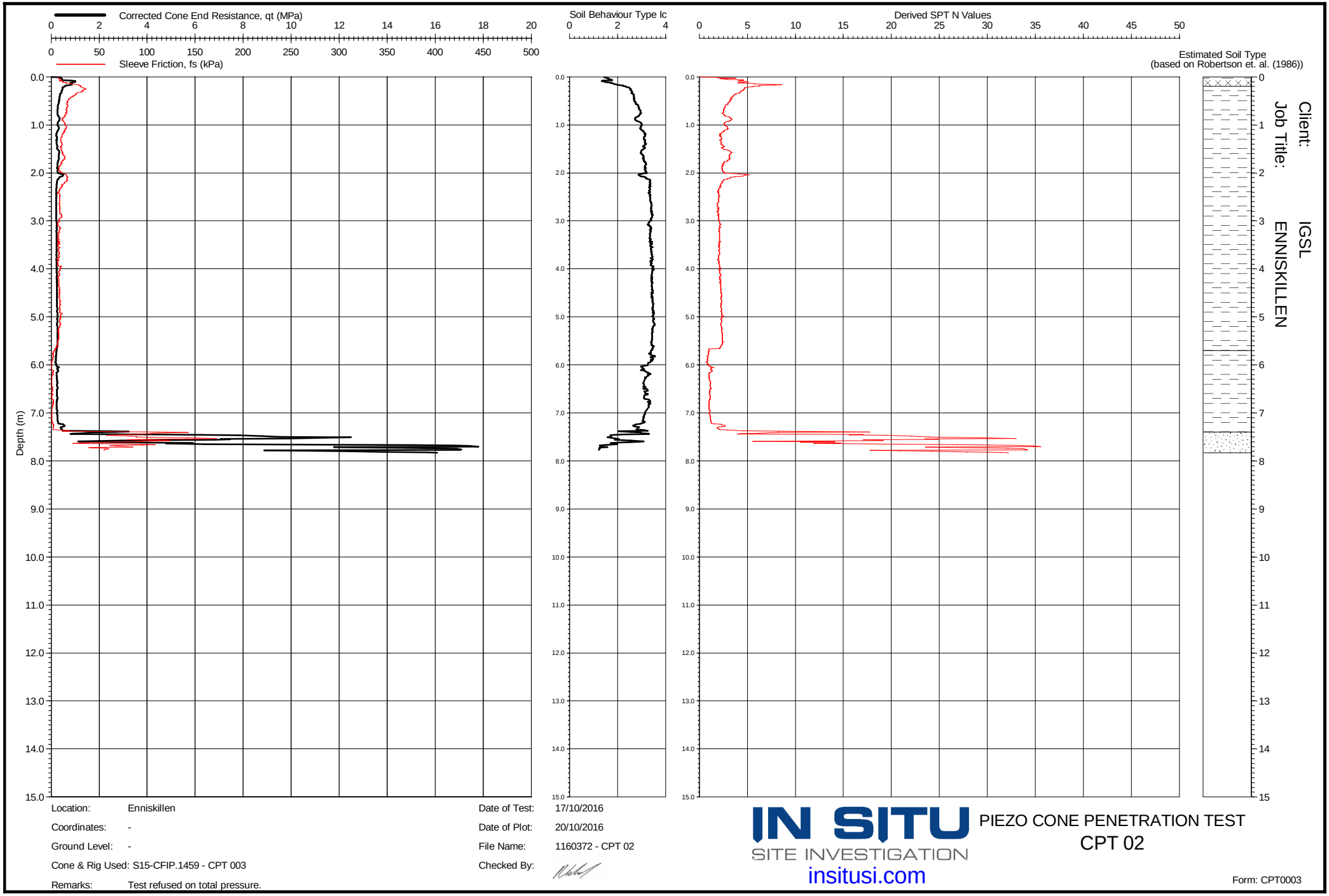
PIEZO CONE PENETRATION TEST

CPT 01

Form: CPT0003



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Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 02

Checked By:

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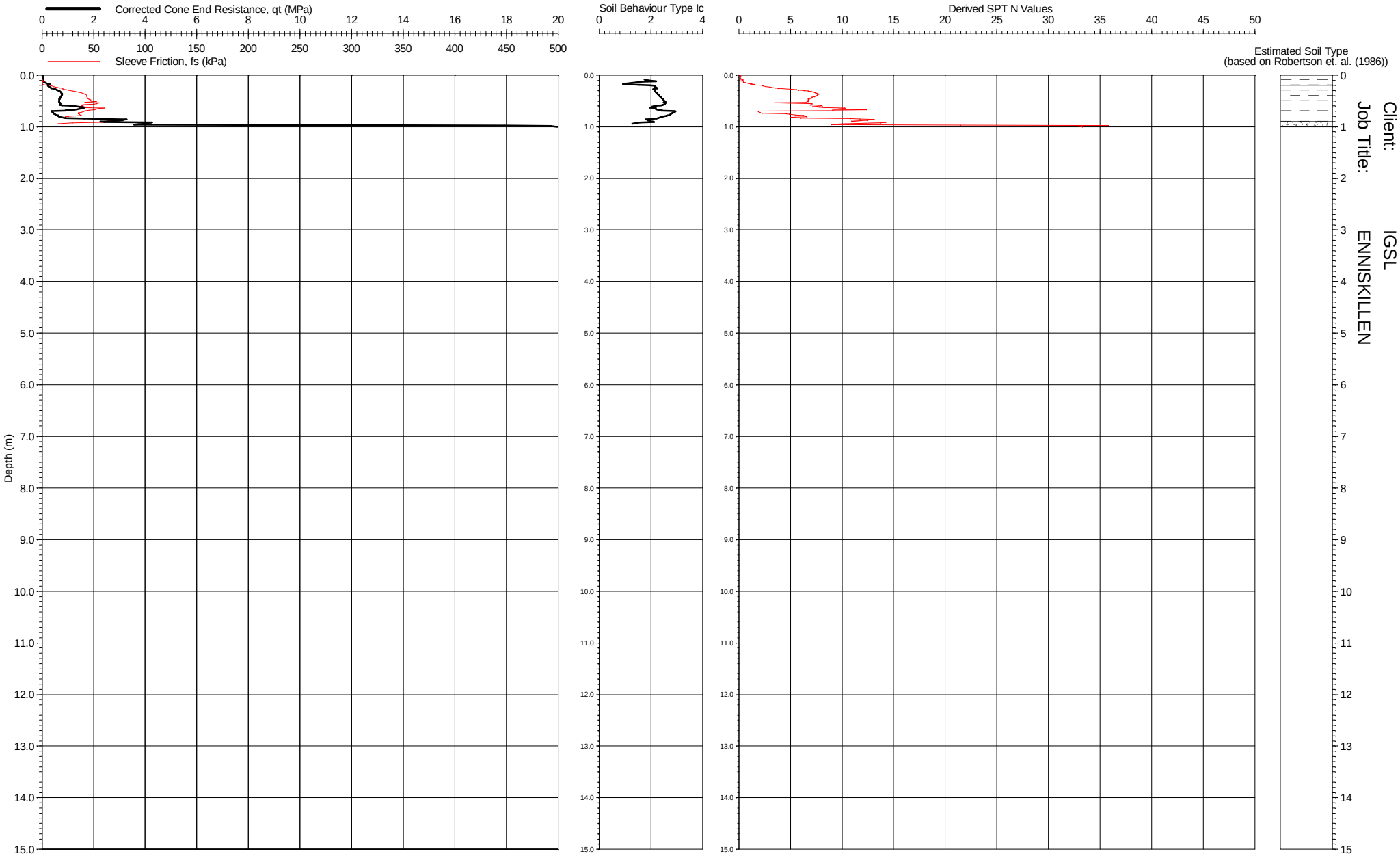
PIEZO CONE PENETRATION TEST

CPT 02

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03

Checked By:

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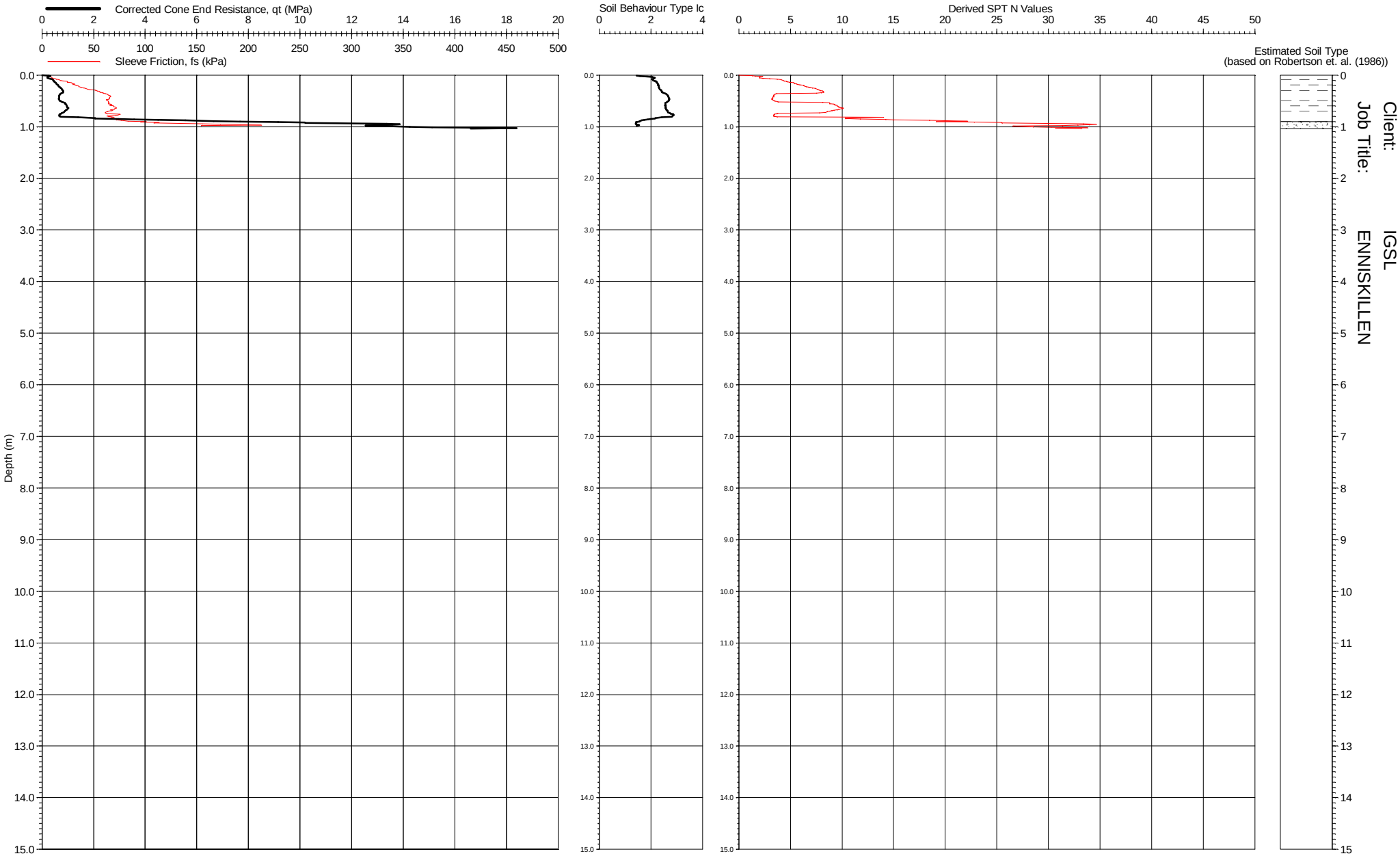
PIEZO CONE PENETRATION TEST

CPT 03

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03A

Checked By:

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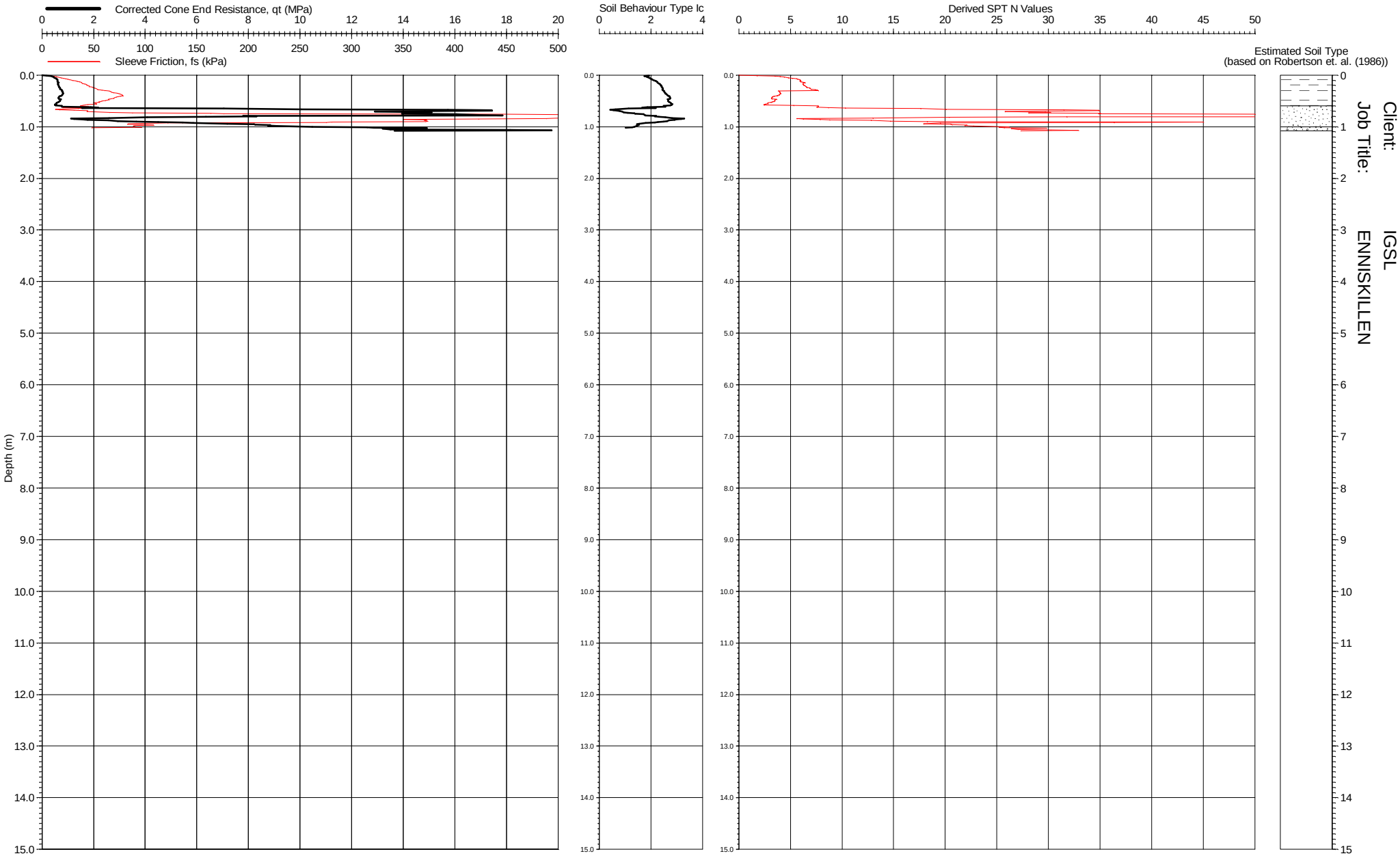
PIEZO CONE PENETRATION TEST

CPT 03A

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03B

Checked By:

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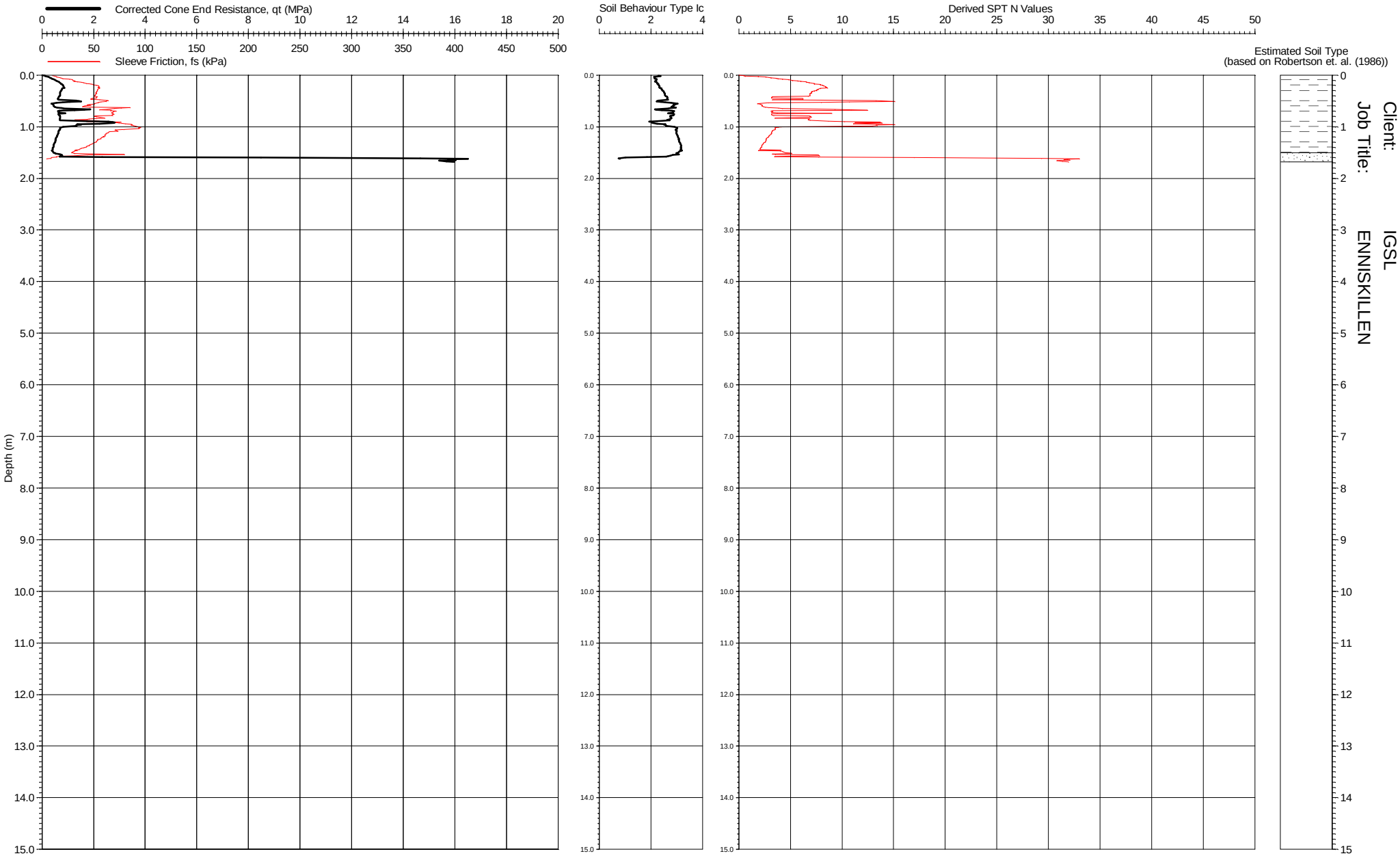
PIEZO CONE PENETRATION TEST

CPT 03B

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03C

Checked By:

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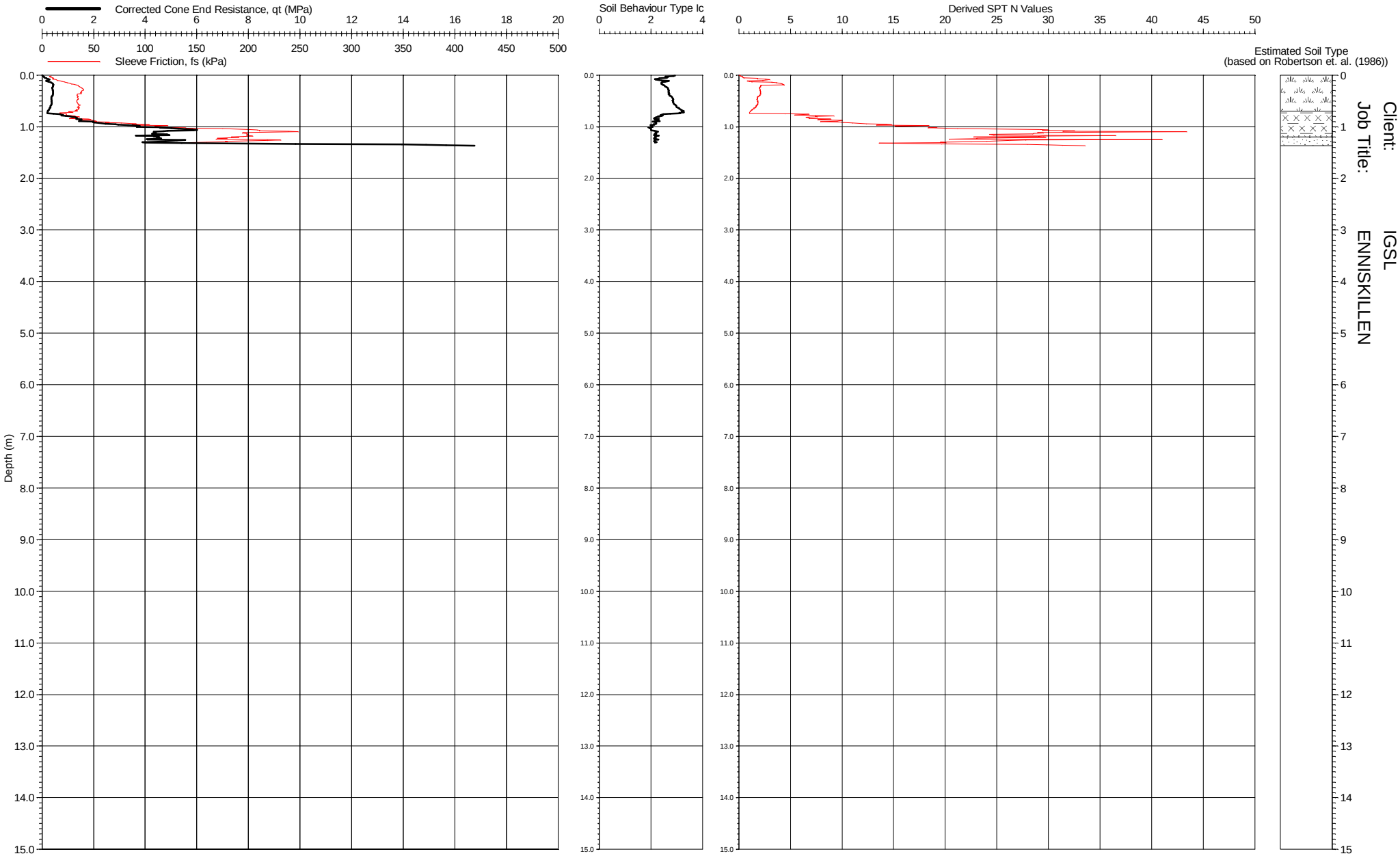
PIEZO CONE PENETRATION TEST

CPT 03C

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 04

Checked By:

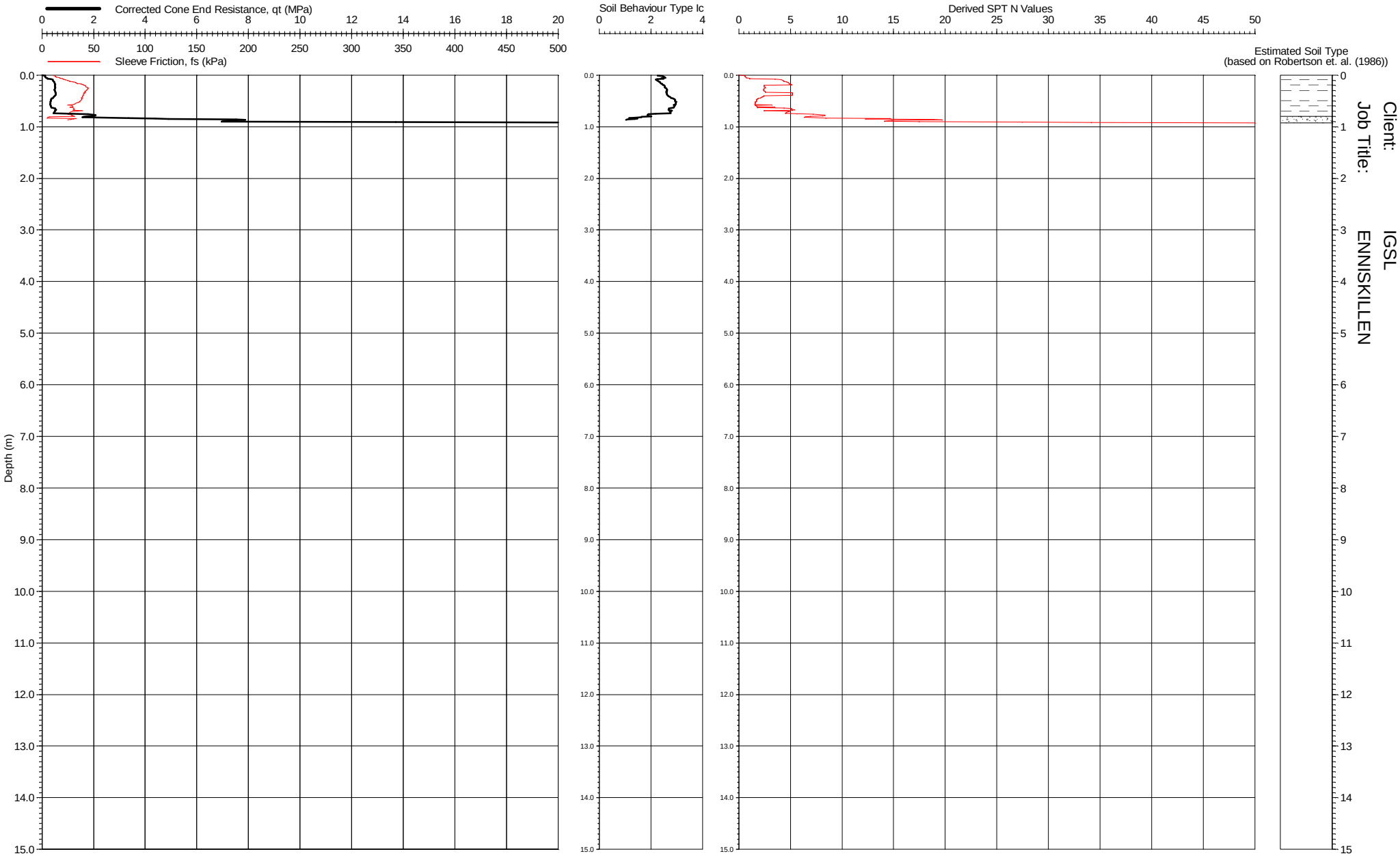
IN SITU SITE INVESTIGATION

insitusi.com

PIEZO CONE PENETRATION TEST

CPT 04

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 04A

Checked By:

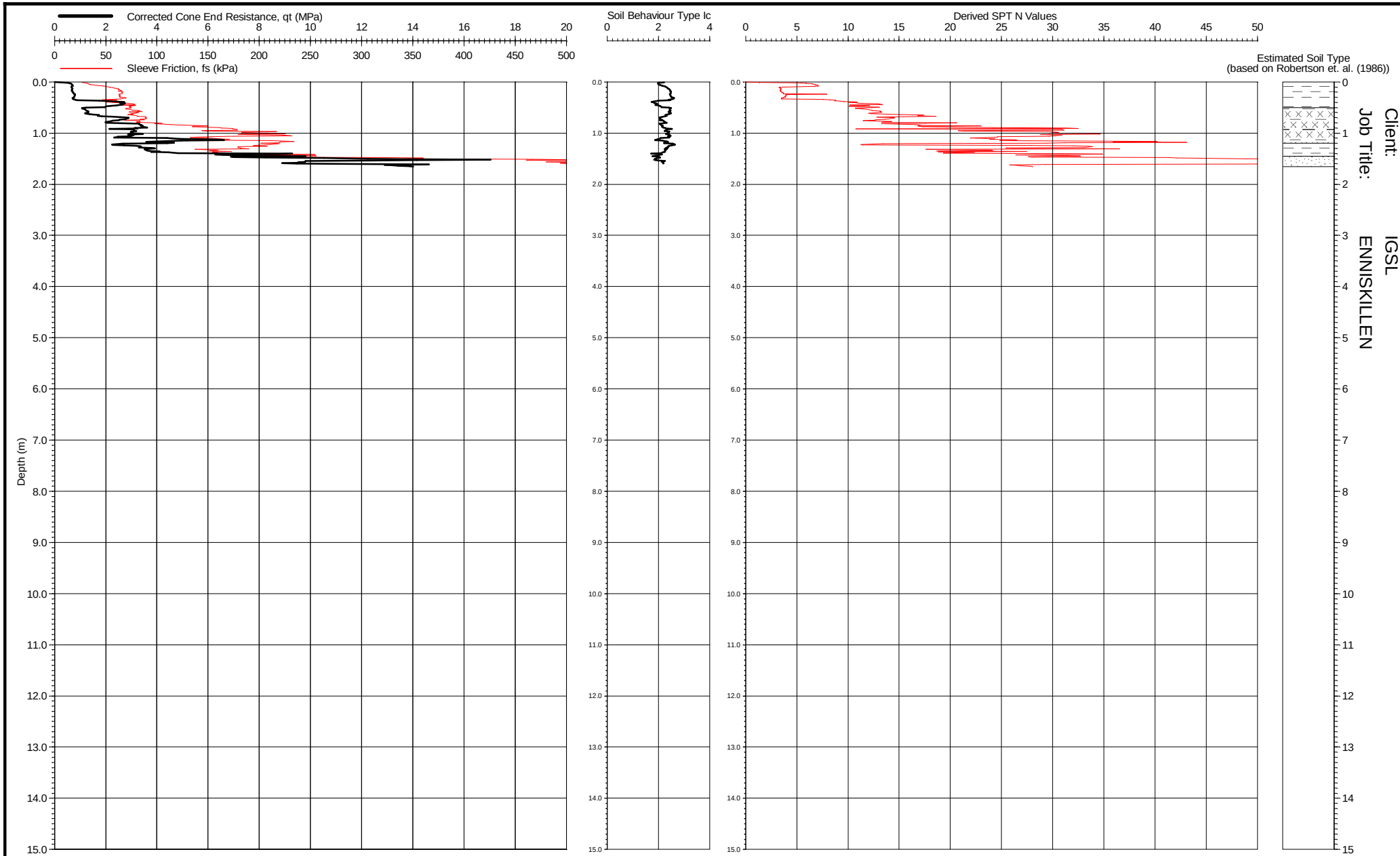
IN SITU SITE INVESTIGATION

insitusi.com

PIEZO CONE PENETRATION TEST

CPT 04A

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 04B

Checked By:

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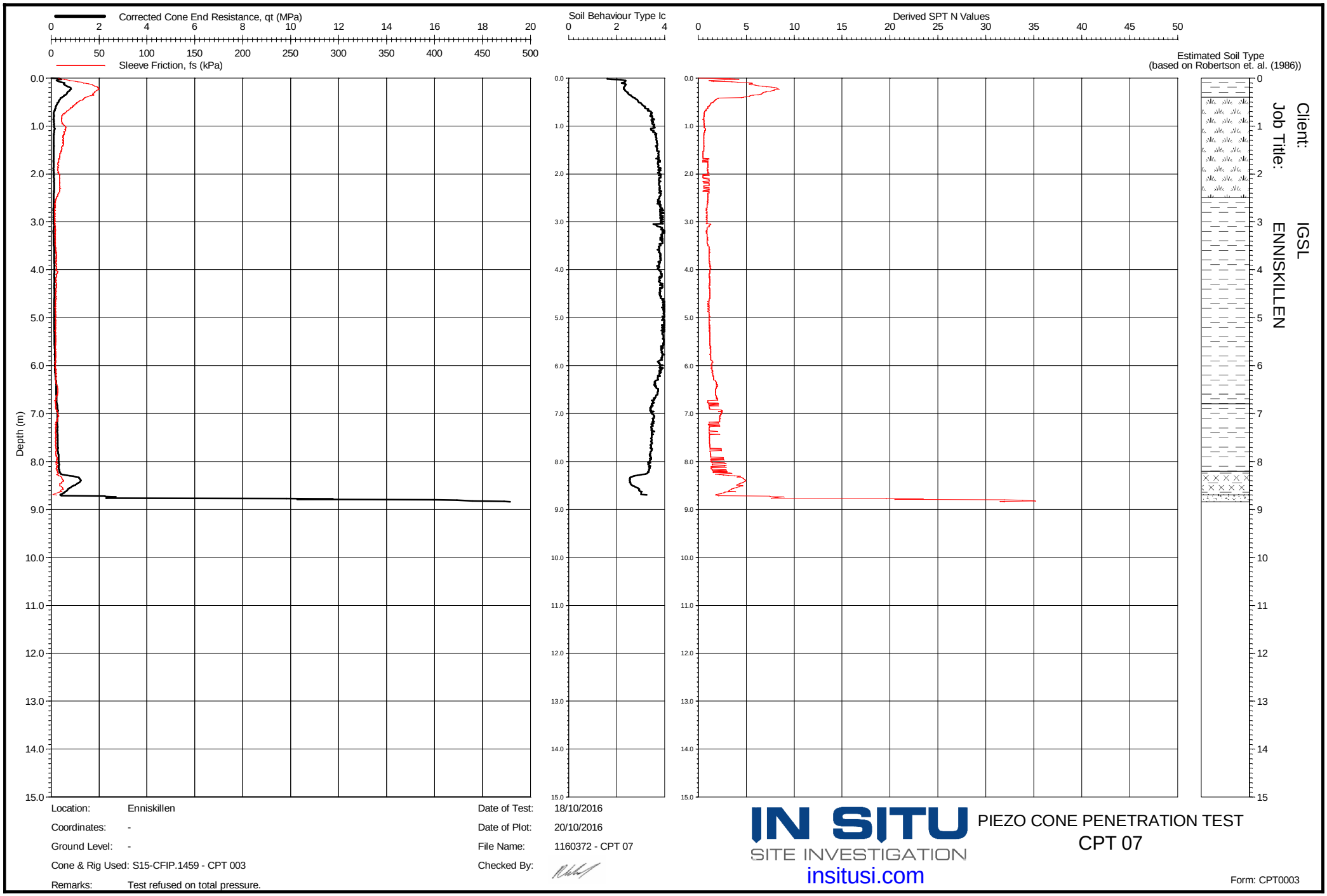
PIEZO CONE PENETRATION TEST

CPT 04B

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 07

Checked By:

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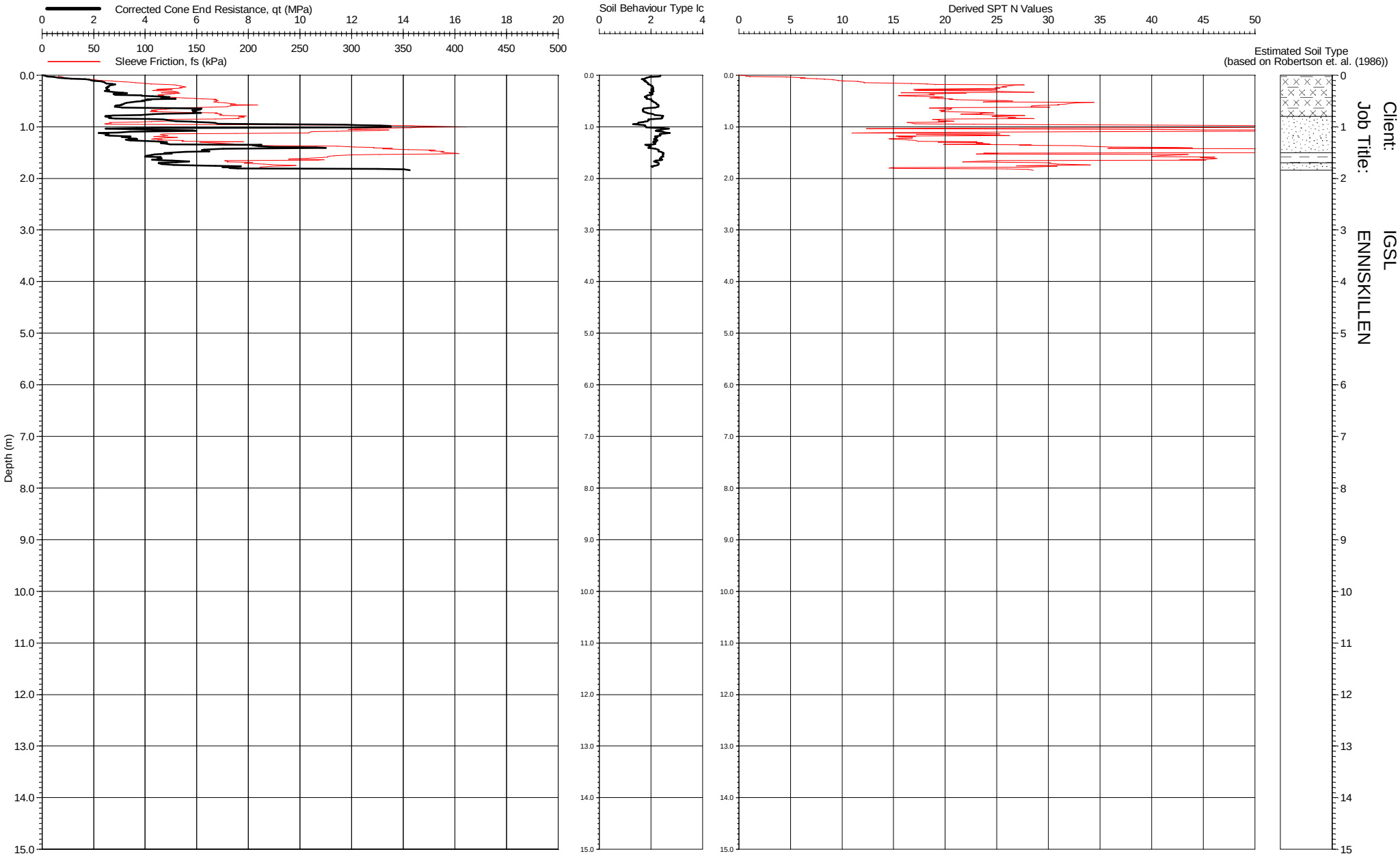
PIEZO CONE PENETRATION TEST

CPT 07

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 08

Checked By:

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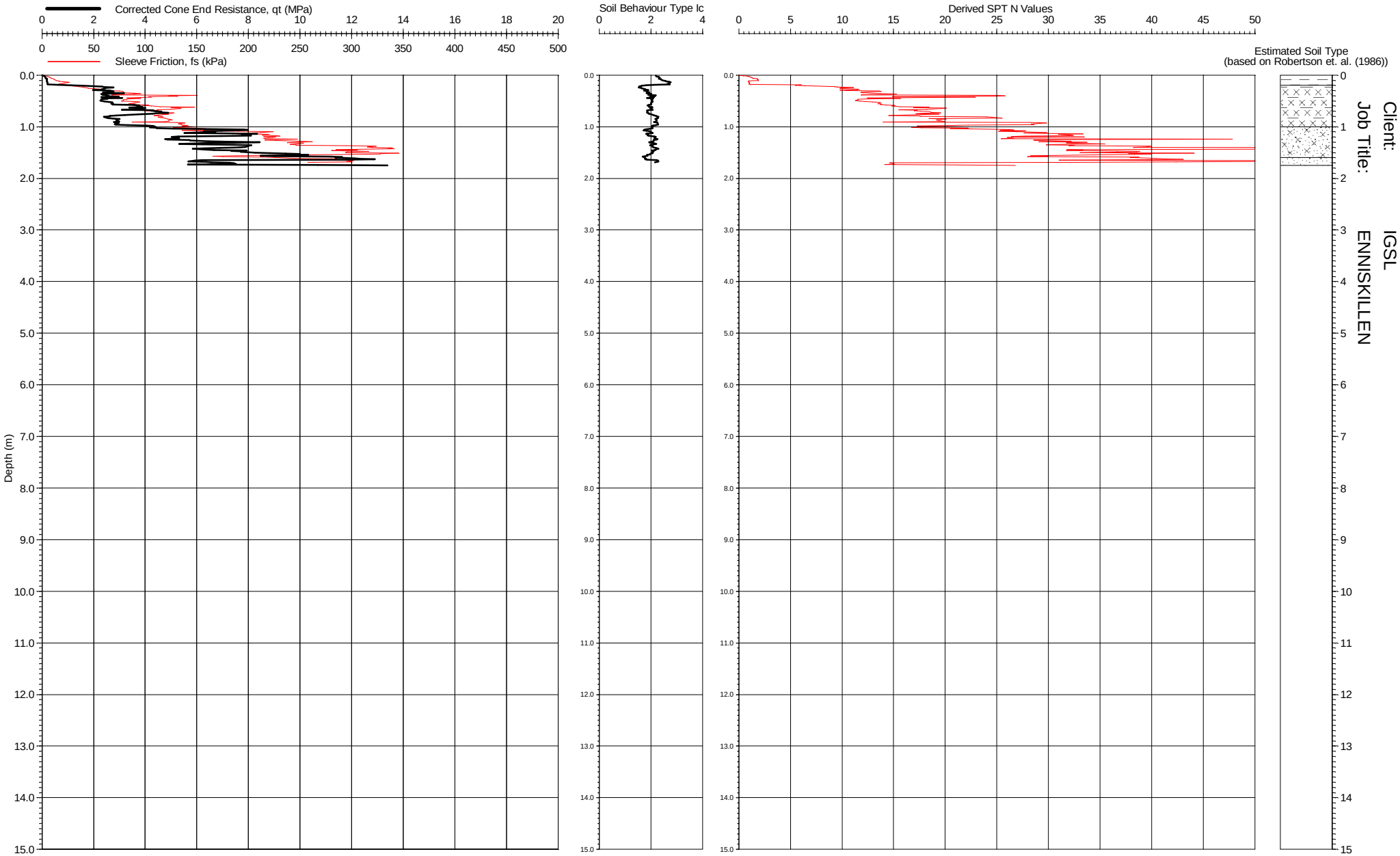
PIEZO CONE PENETRATION TEST

CPT 08

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 08A
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

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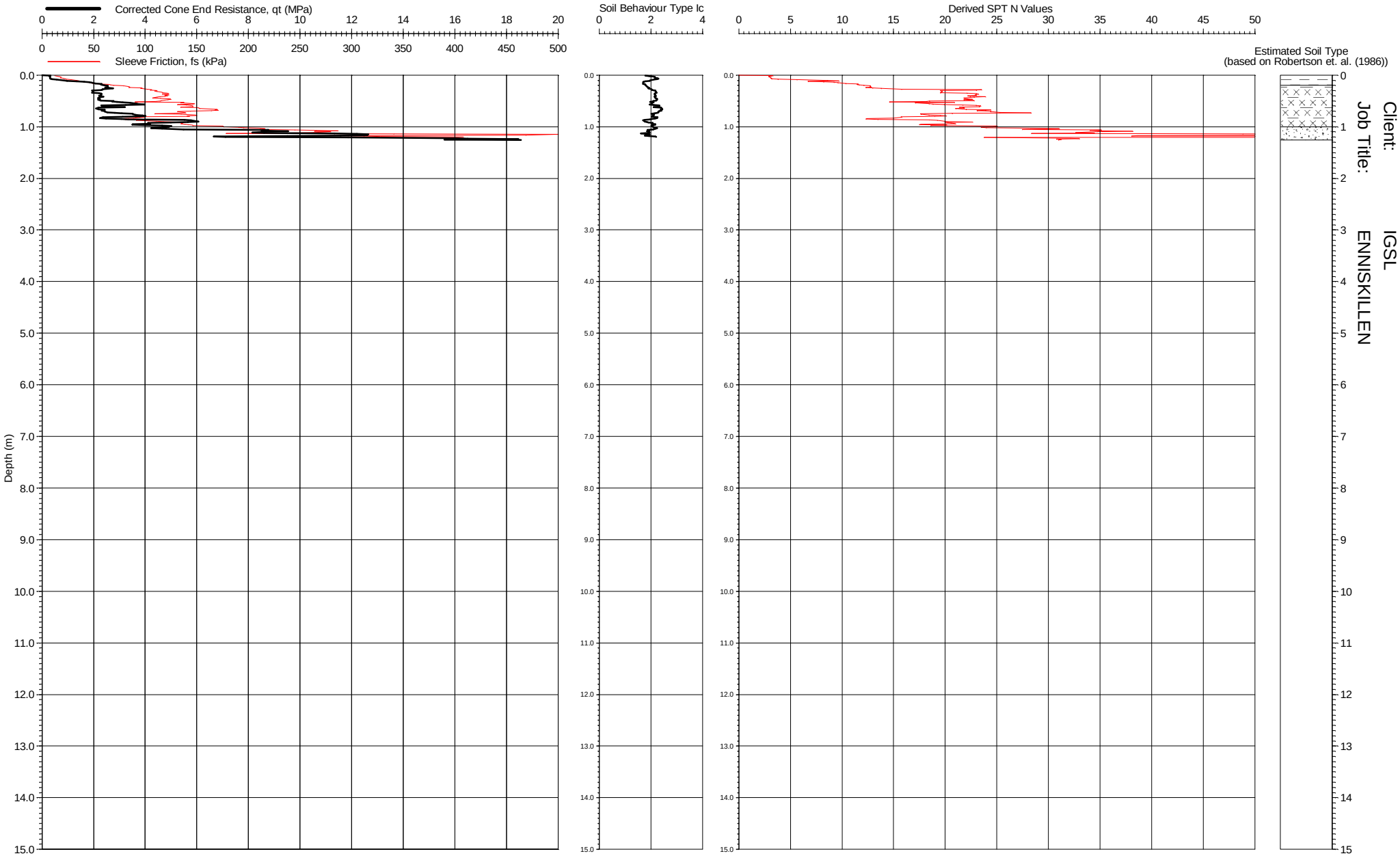
PIEZO CONE PENETRATION TEST

CPT 08A

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 08B

Checked By:

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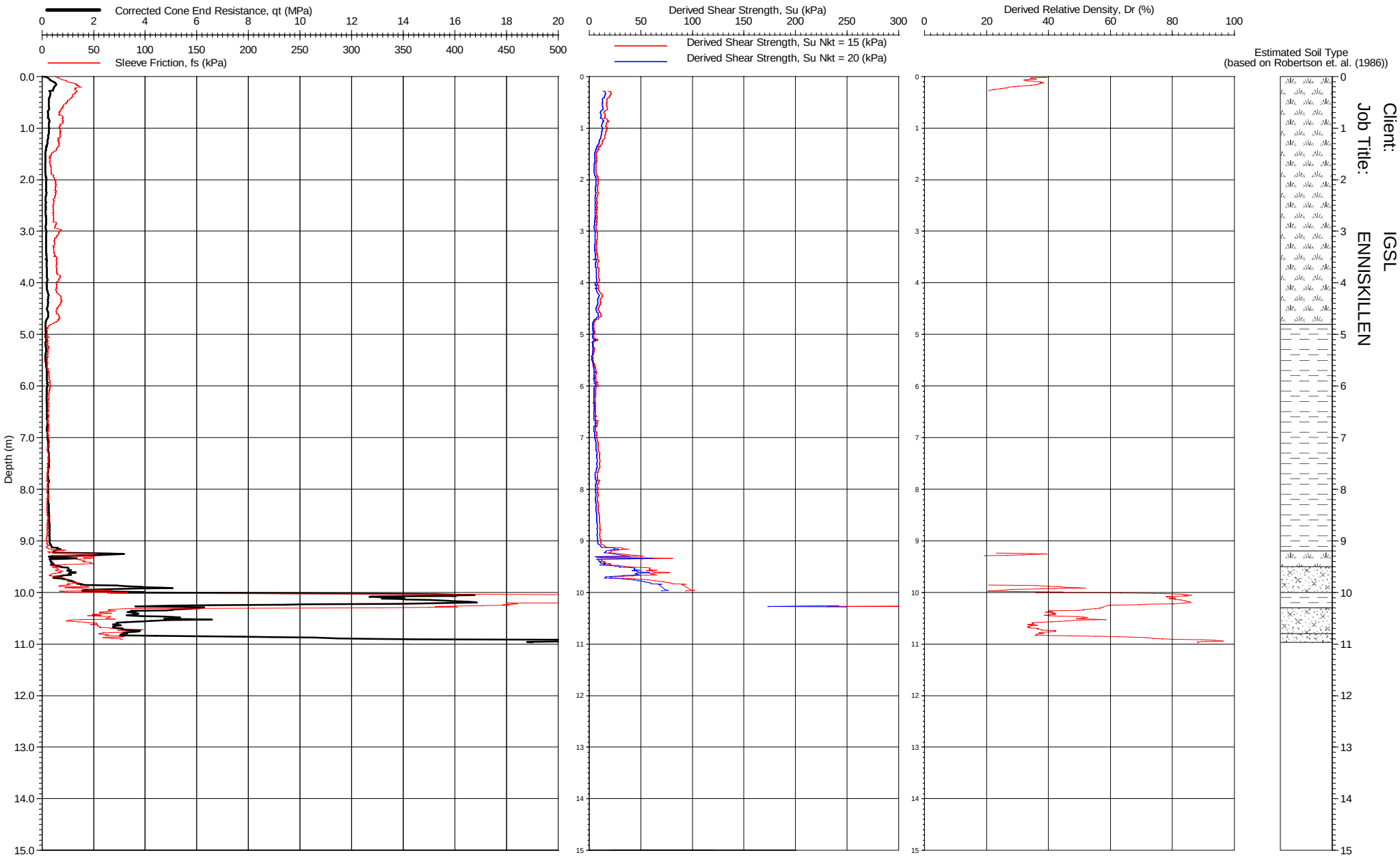
insitusi.com

PIEZO CONE PENETRATION TEST

CPT 08B

Form: CPT0003



Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 01
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

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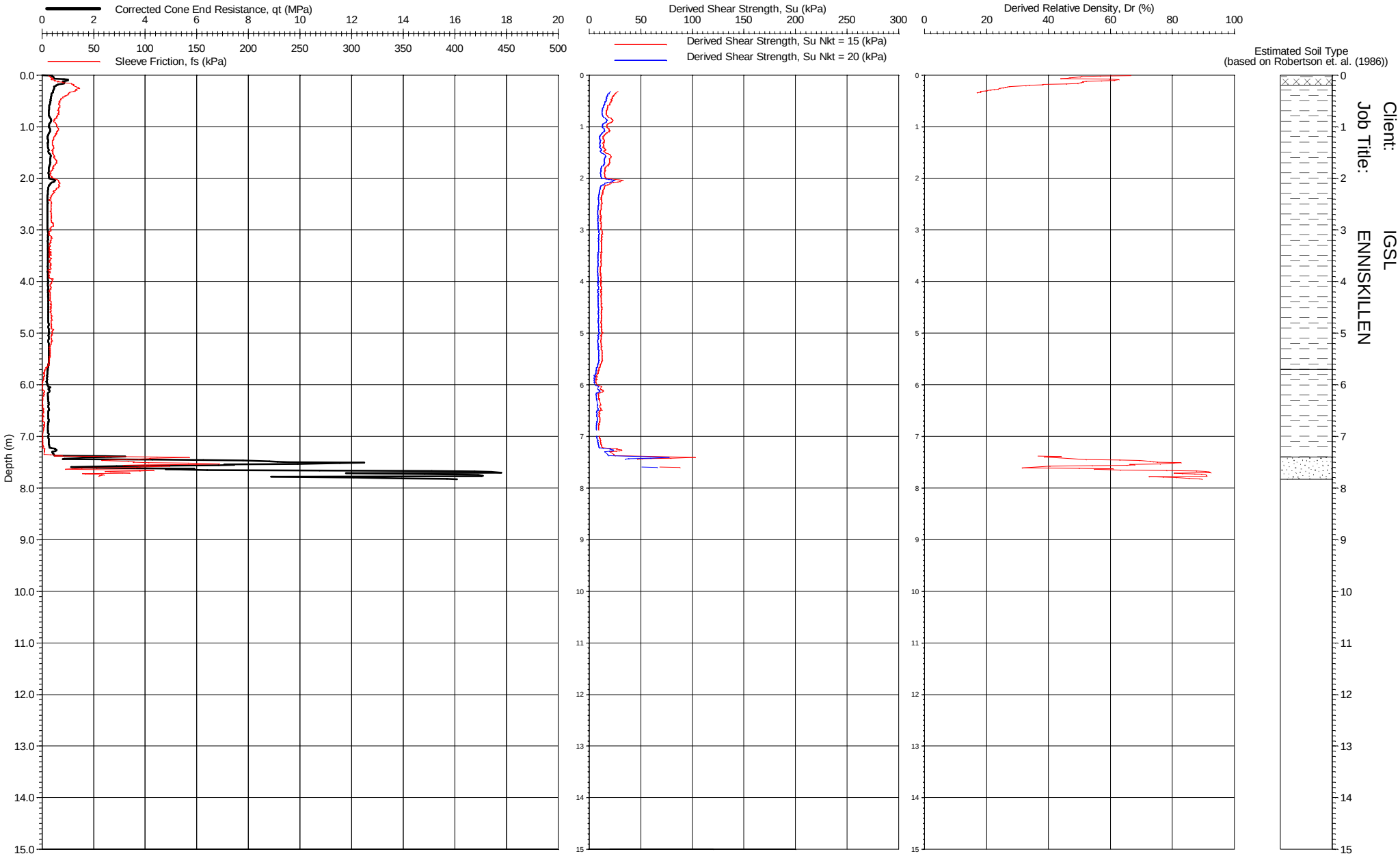
PIEZO CONE PENETRATION TEST

CPT 01

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	17/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 02
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

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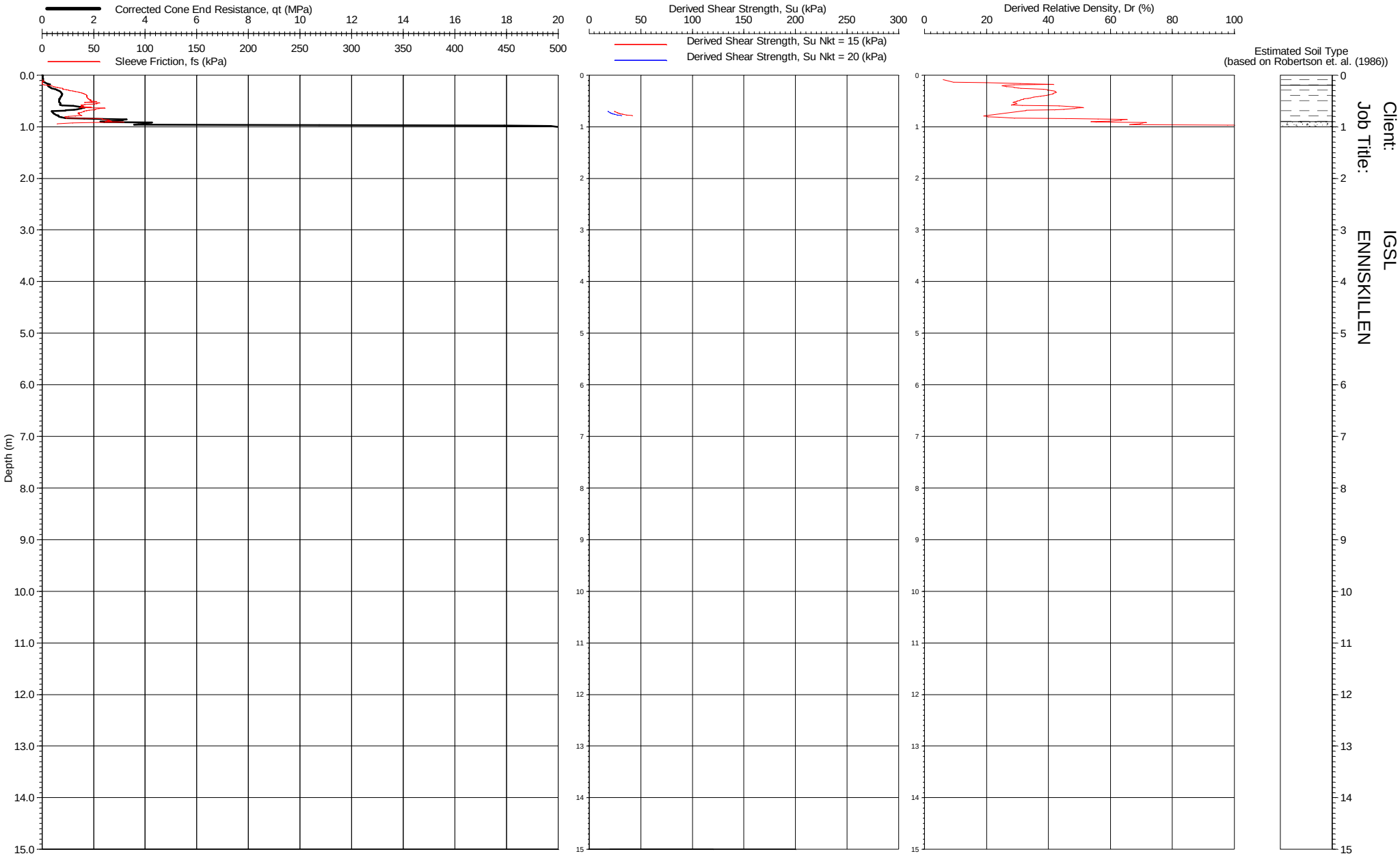
PIEZO CONE PENETRATION TEST
CPT 02

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03

Checked By:

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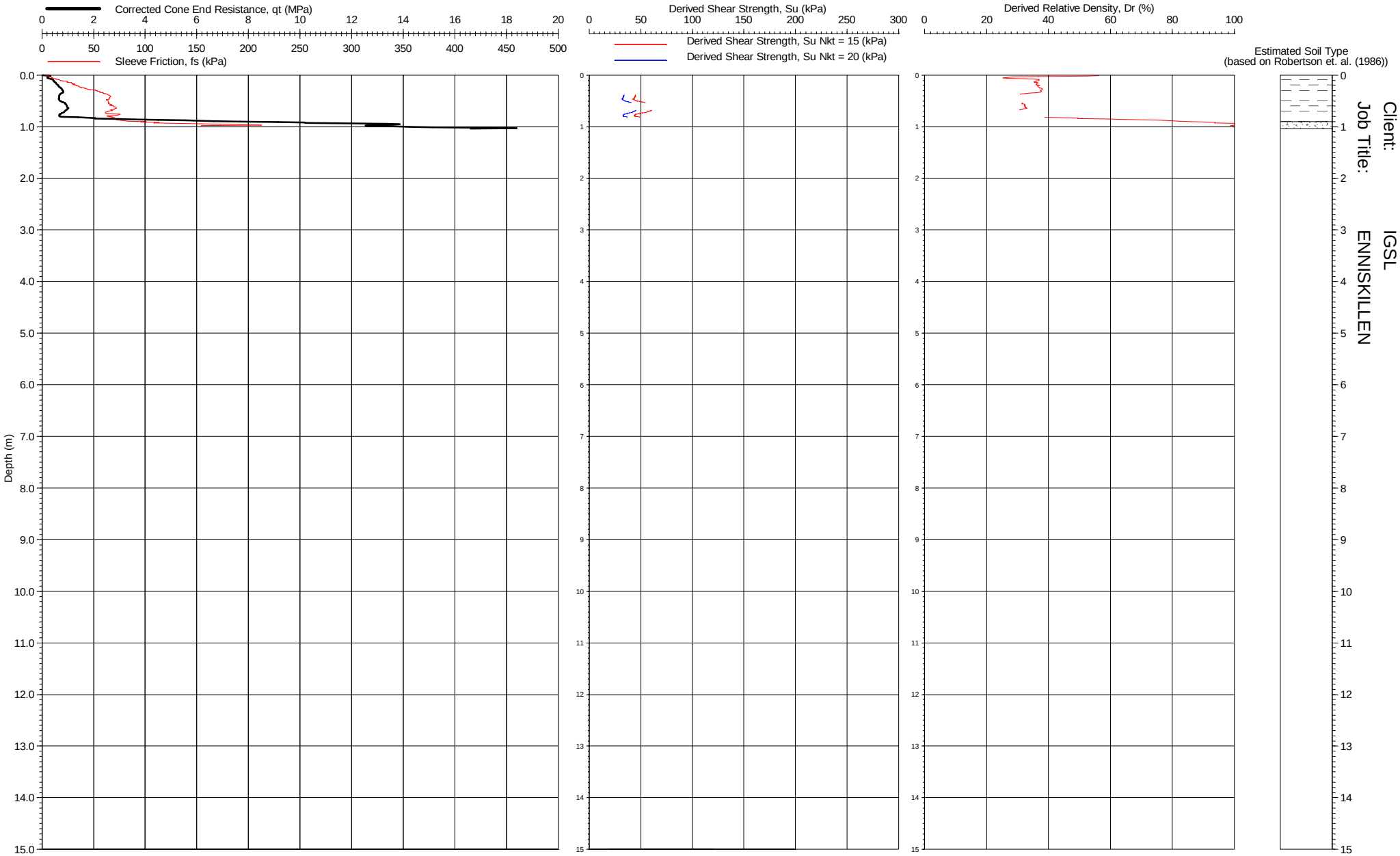
PIEZO CONE PENETRATION TEST

CPT 03

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03A

Checked By:

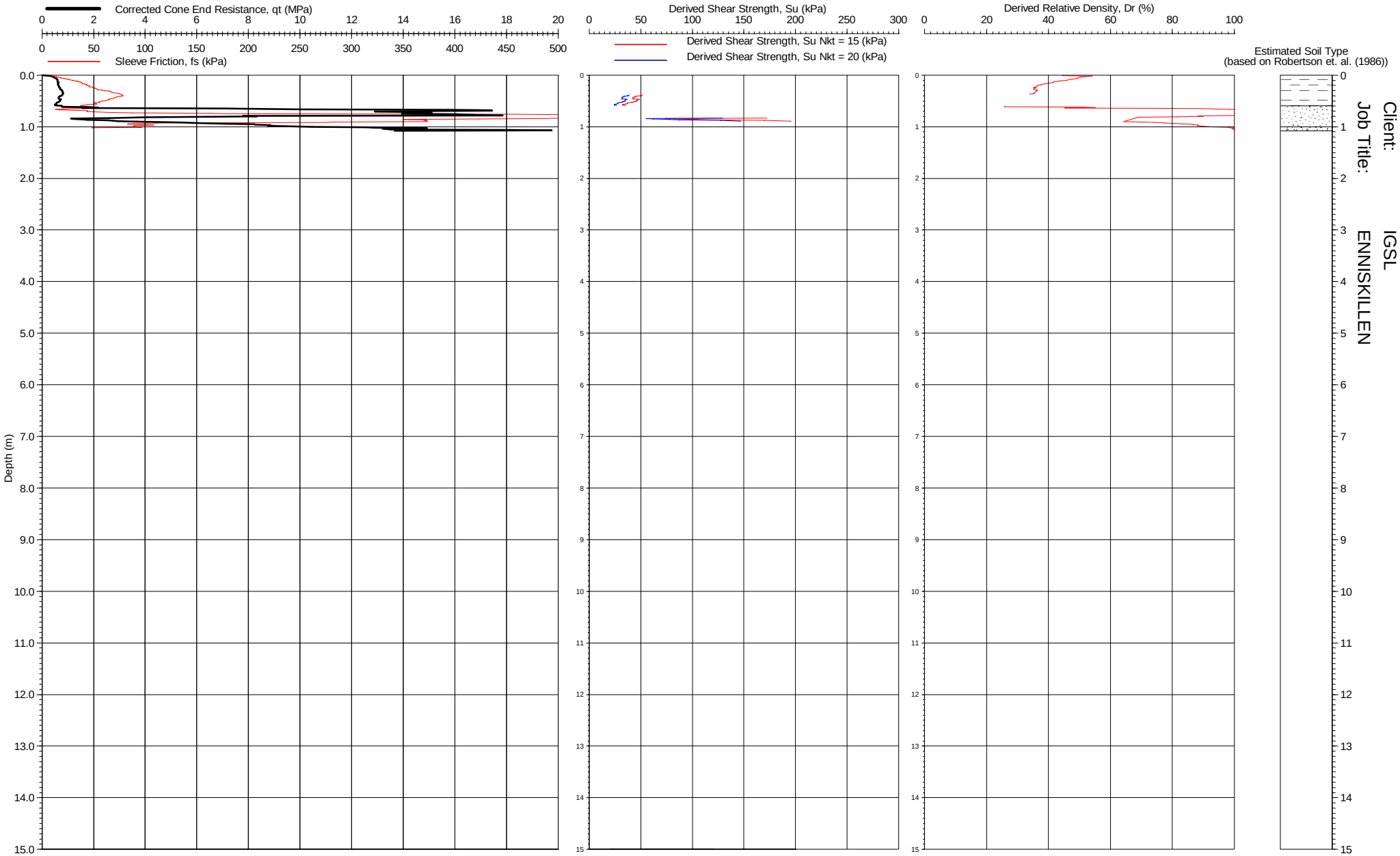
IN SITU SITE INVESTIGATION

insitusi.com

PIEZO CONE PENETRATION TEST

CPT 03A

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	17/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 03B
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

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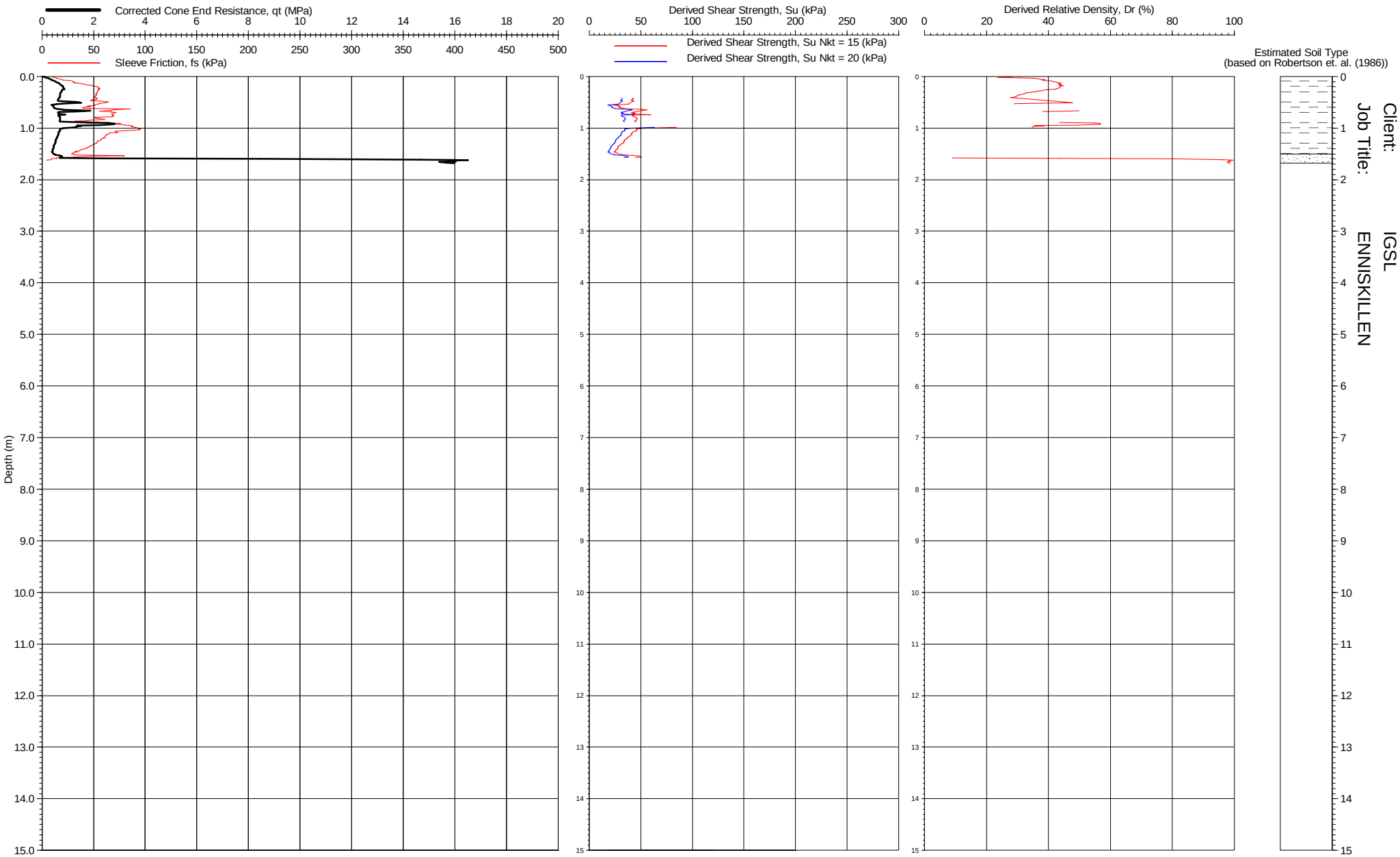
PIEZO CONE PENETRATION TEST
CPT 03B

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	17/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 03C
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

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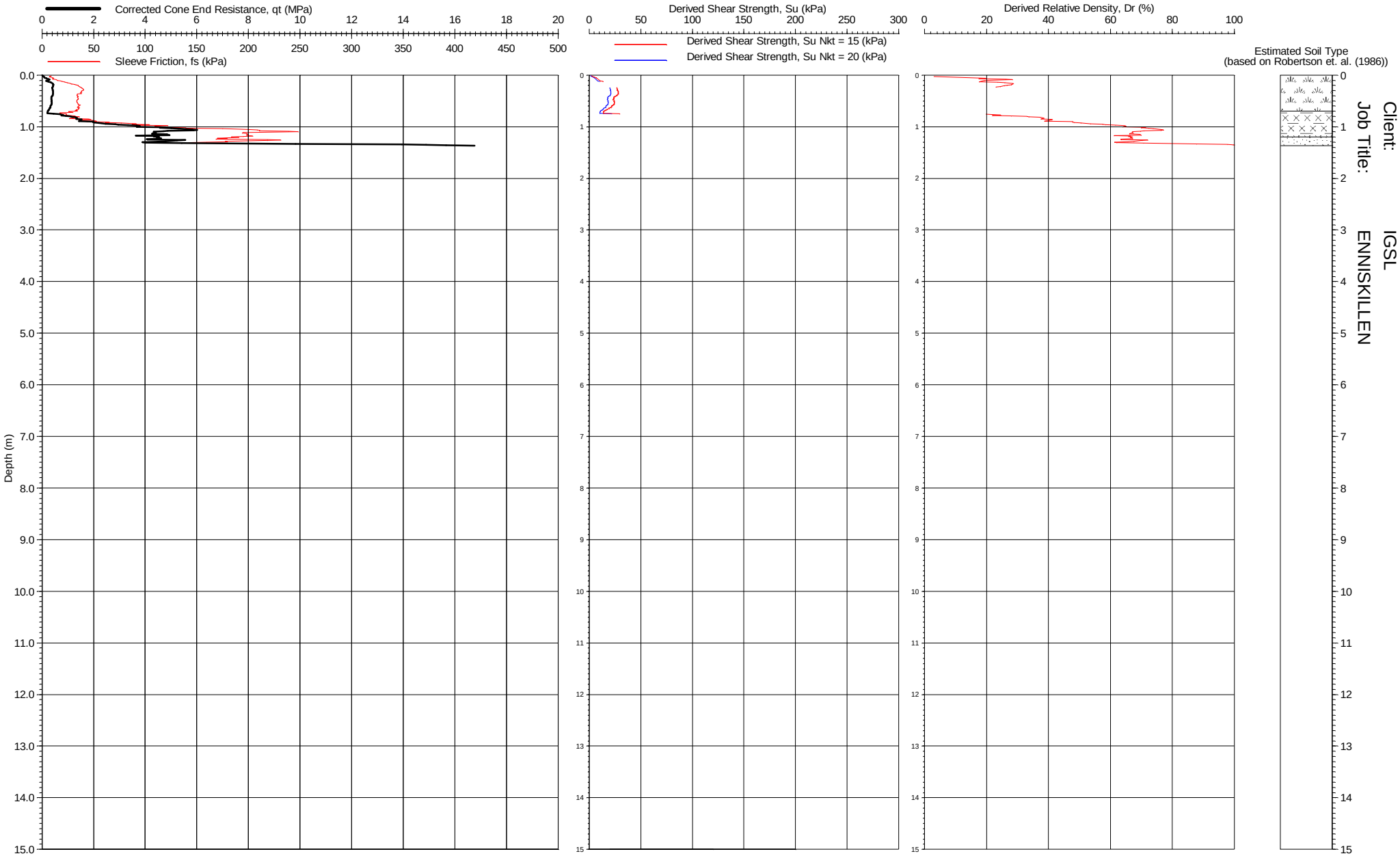
PIEZO CONE PENETRATION TEST
CPT 03C

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 04
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

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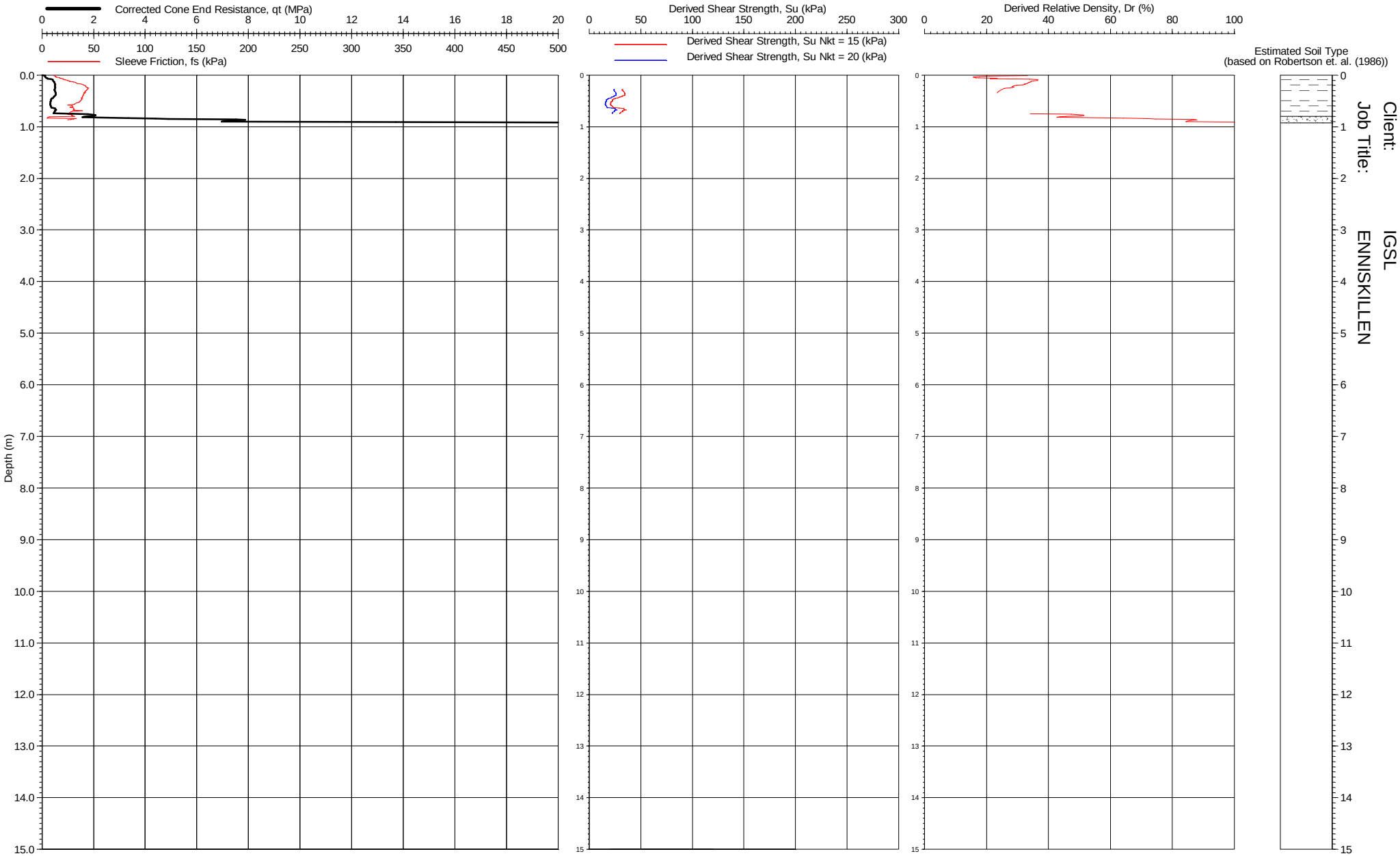
PIEZO CONE PENETRATION TEST
CPT 04

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 04A

Checked By:

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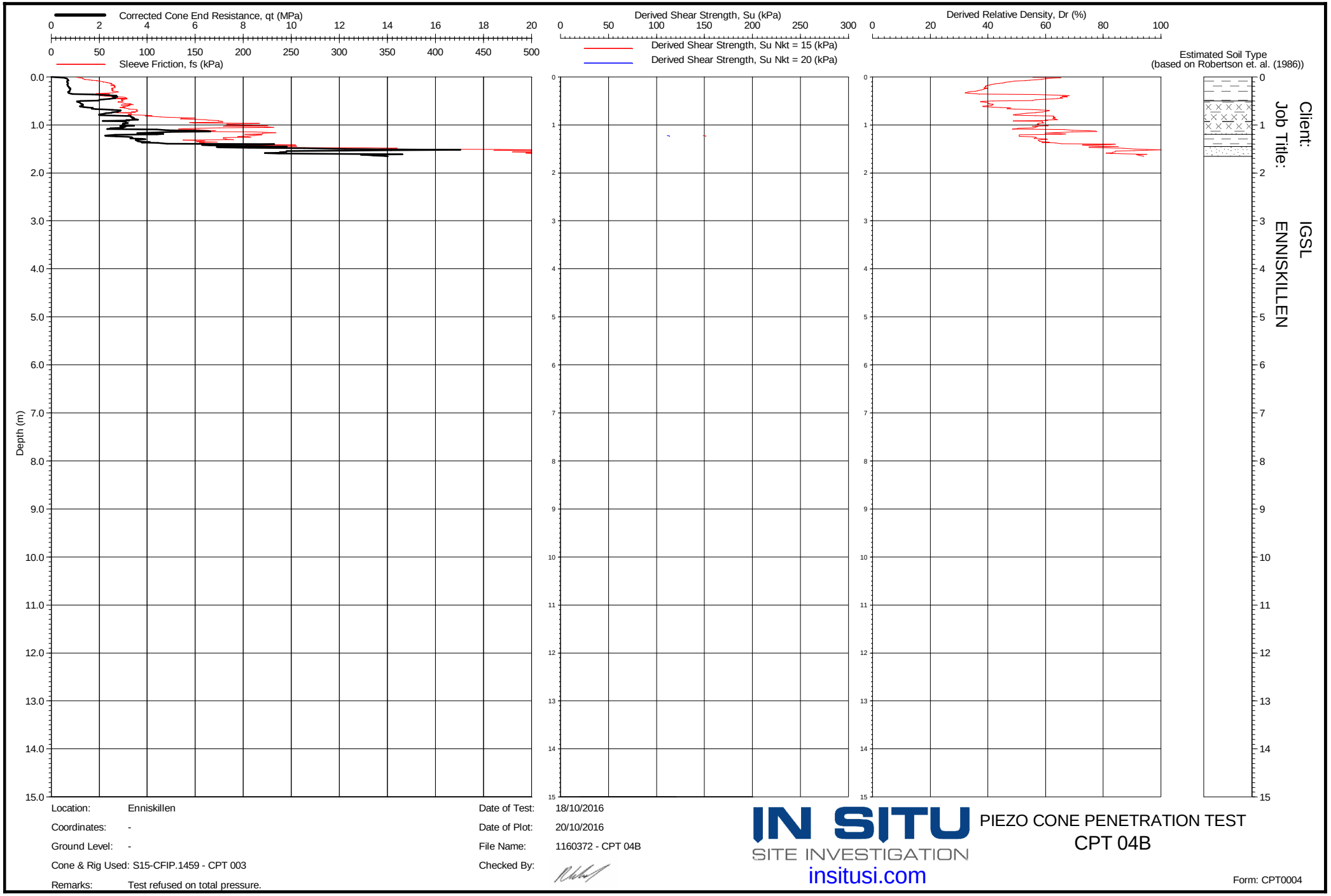
PIEZO CONE PENETRATION TEST

CPT 04A

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 04B

Checked By:

IN SITU SITE INVESTIGATION

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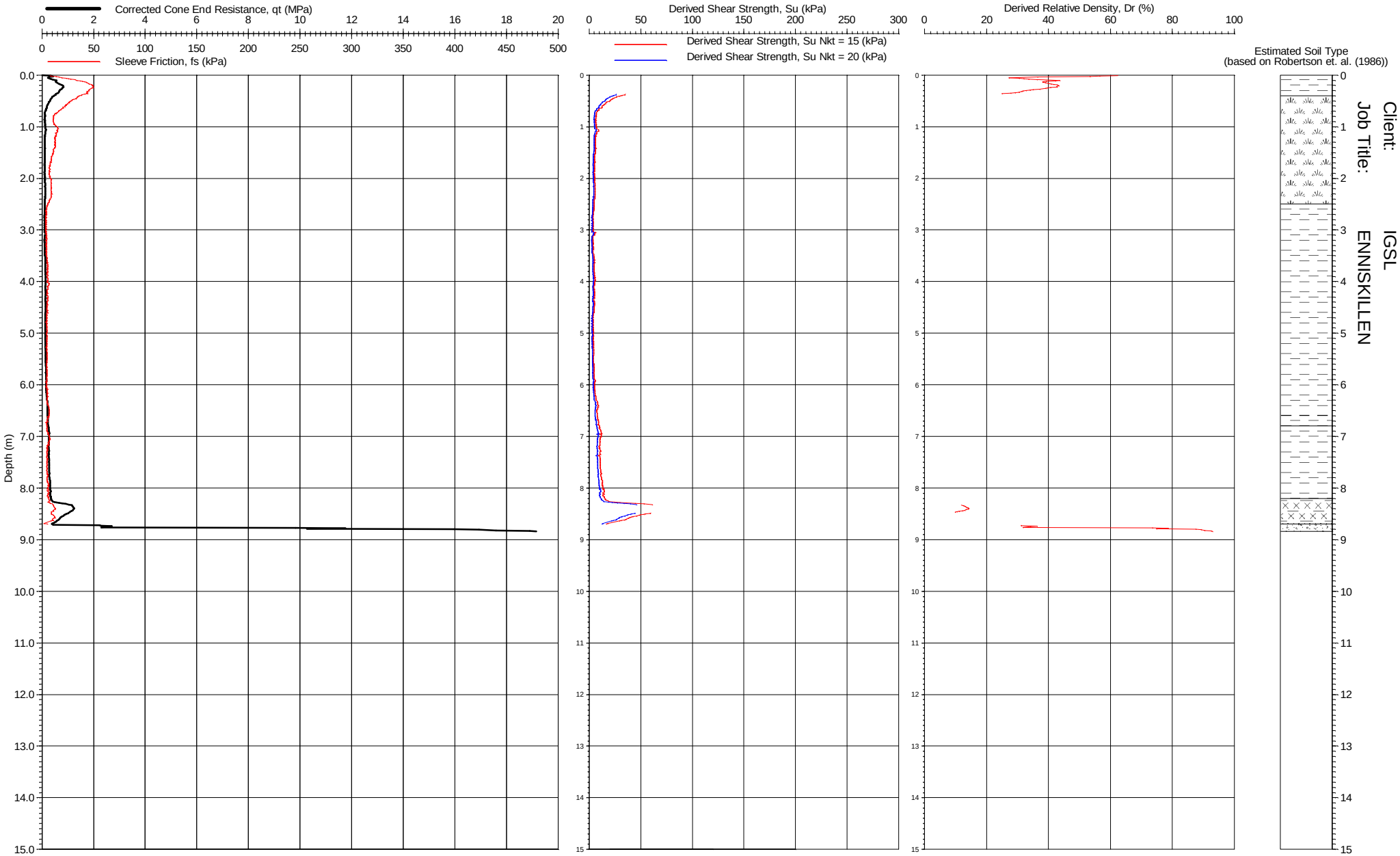
PIEZO CONE PENETRATION TEST

CPT 04B

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 07

Checked By:

IN SITU SITE INVESTIGATION

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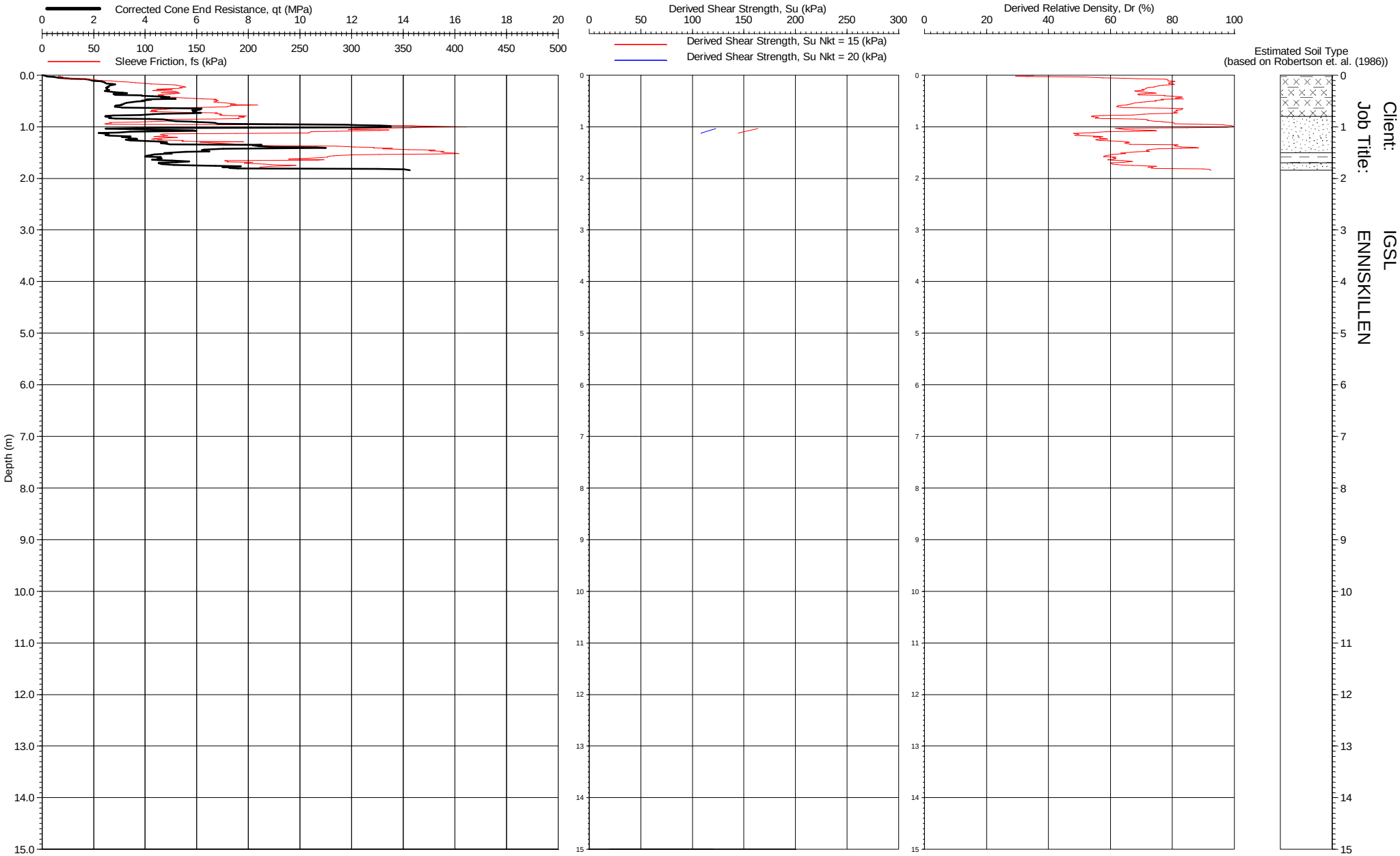
PIEZO CONE PENETRATION TEST

CPT 07

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 08

Checked By:

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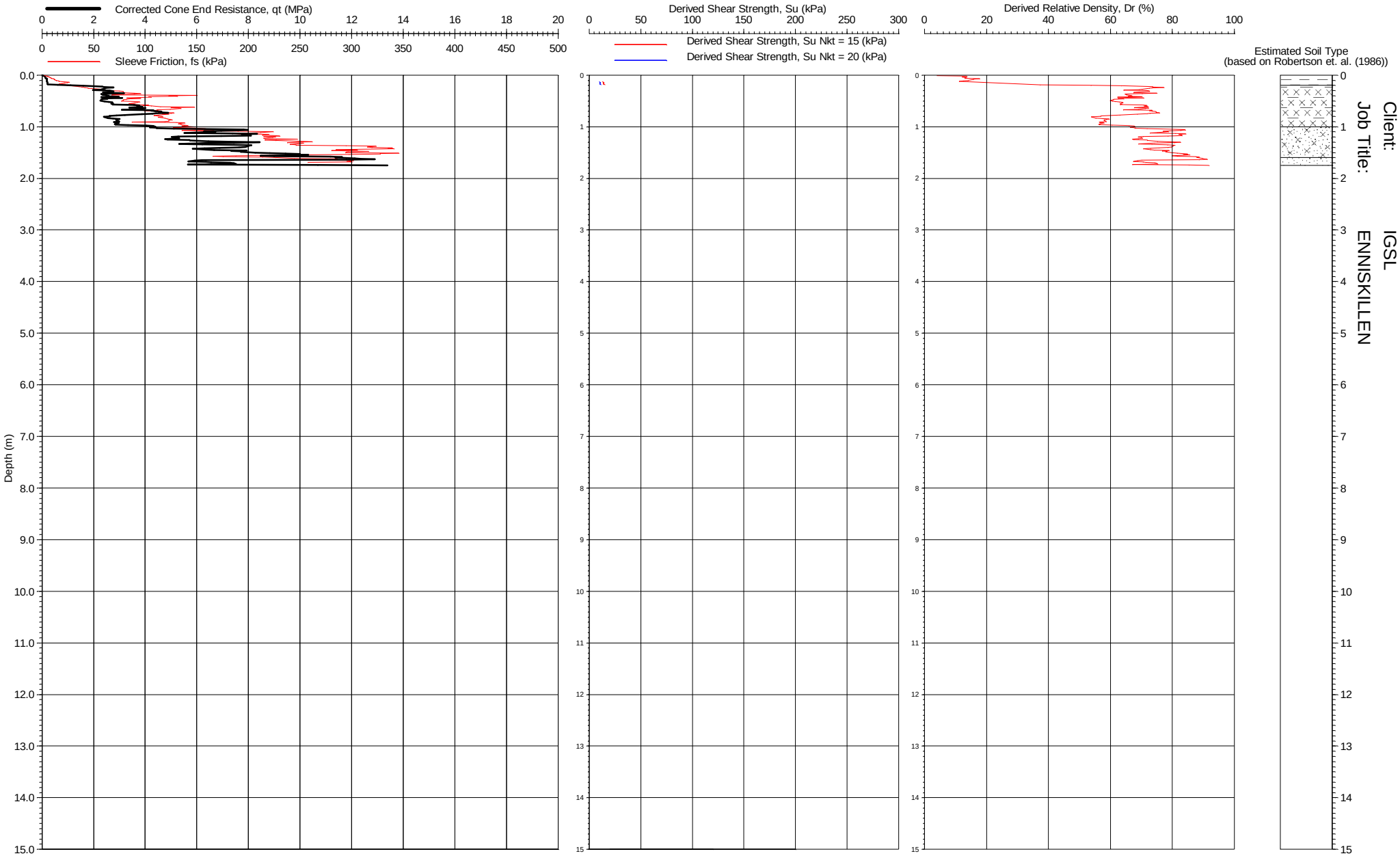
PIEZO CONE PENETRATION TEST

CPT 08

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 08A
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

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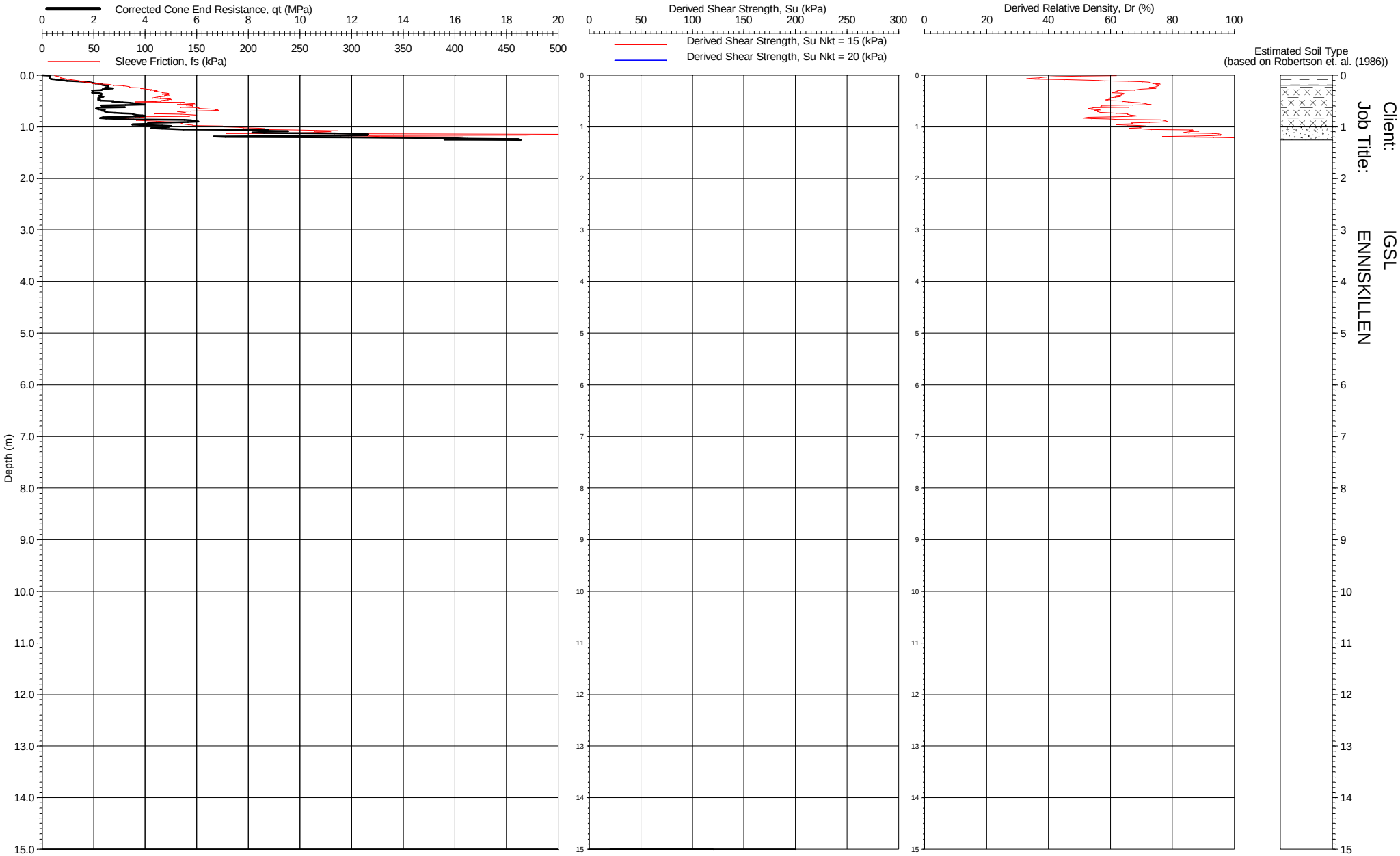
PIEZO CONE PENETRATION TEST
CPT 08A

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 08B

Checked By:

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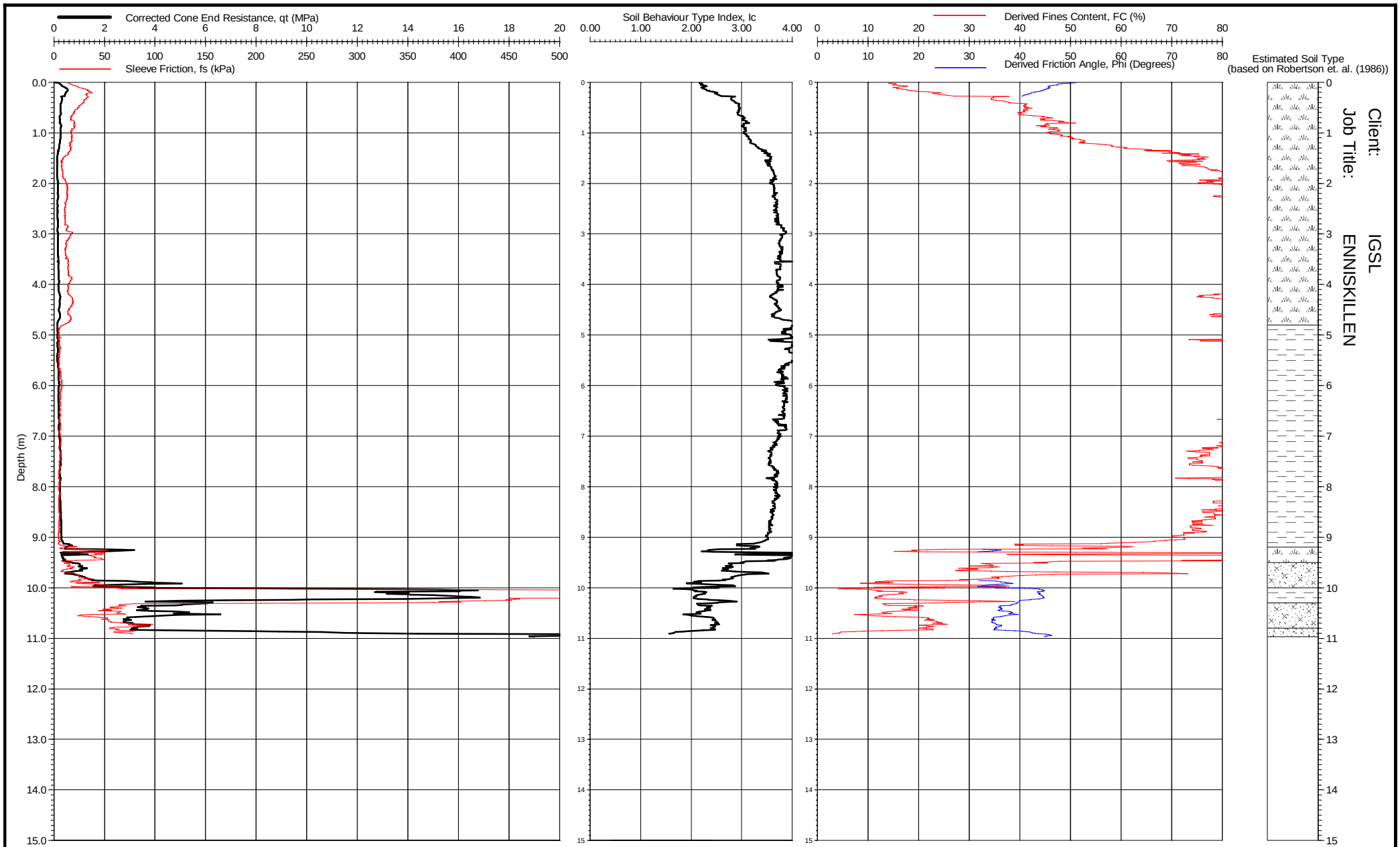
PIEZO CONE PENETRATION TEST

CPT 08B

Form: CPT0004



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 01

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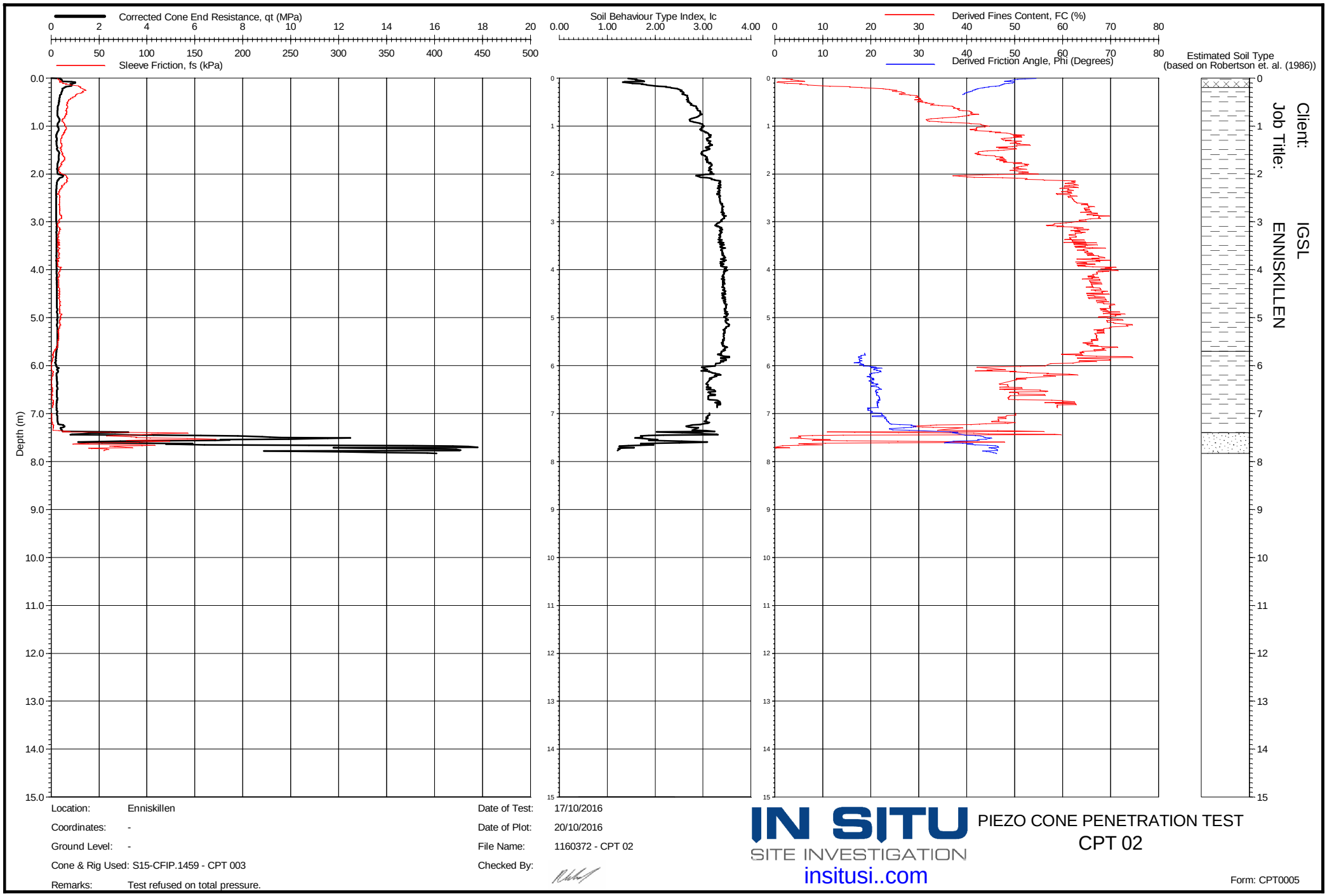
PIEZO CONE PENETRATION TEST

CPT 01

Form: CPT0005



Location: Enniskillen
Coordinates: -
Ground Level: -
Cone & Rig Used: S15-CFIP.1459 - CPT 003
Remarks: Test refused on total pressure.

Date of Test: 17/10/2016
Date of Plot: 20/10/2016
File Name: 1160372 - CPT 02
Checked By:

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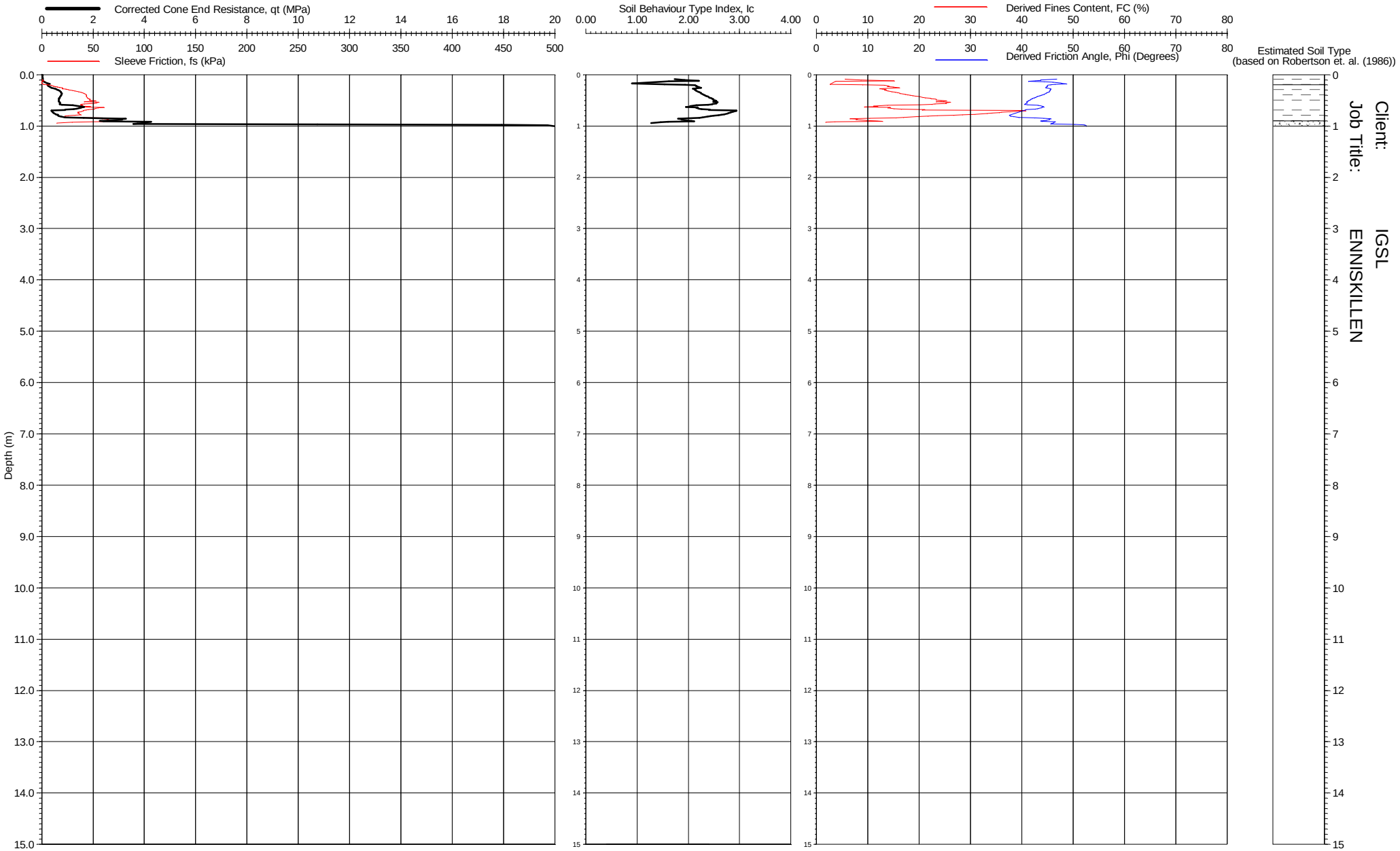
PIEZO CONE PENETRATION TEST
CPT 02

Form: CPT0005



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03

Checked By:

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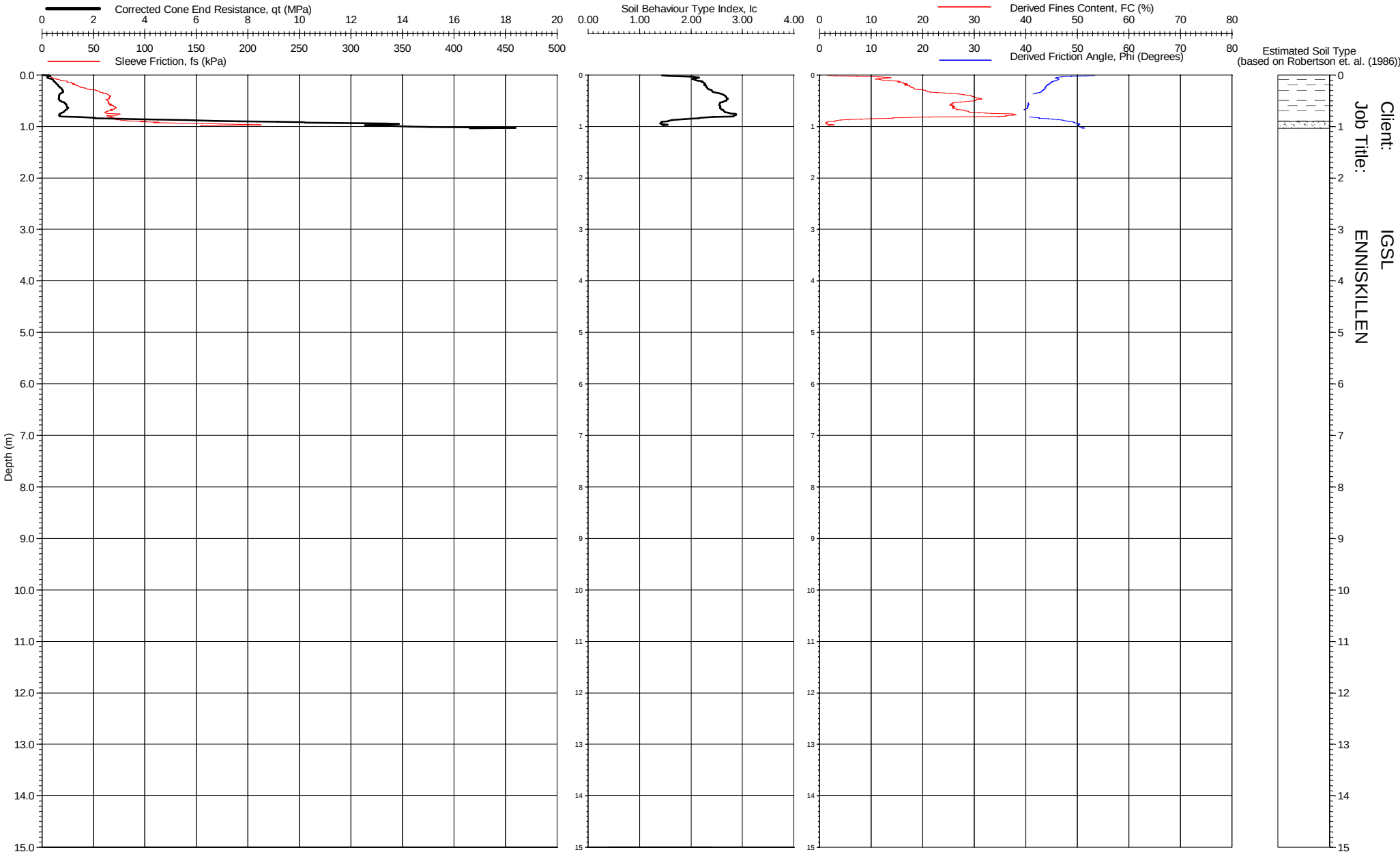
PIEZO CONE PENETRATION TEST

CPT 03

Form: CPT0005



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03A

Checked By:

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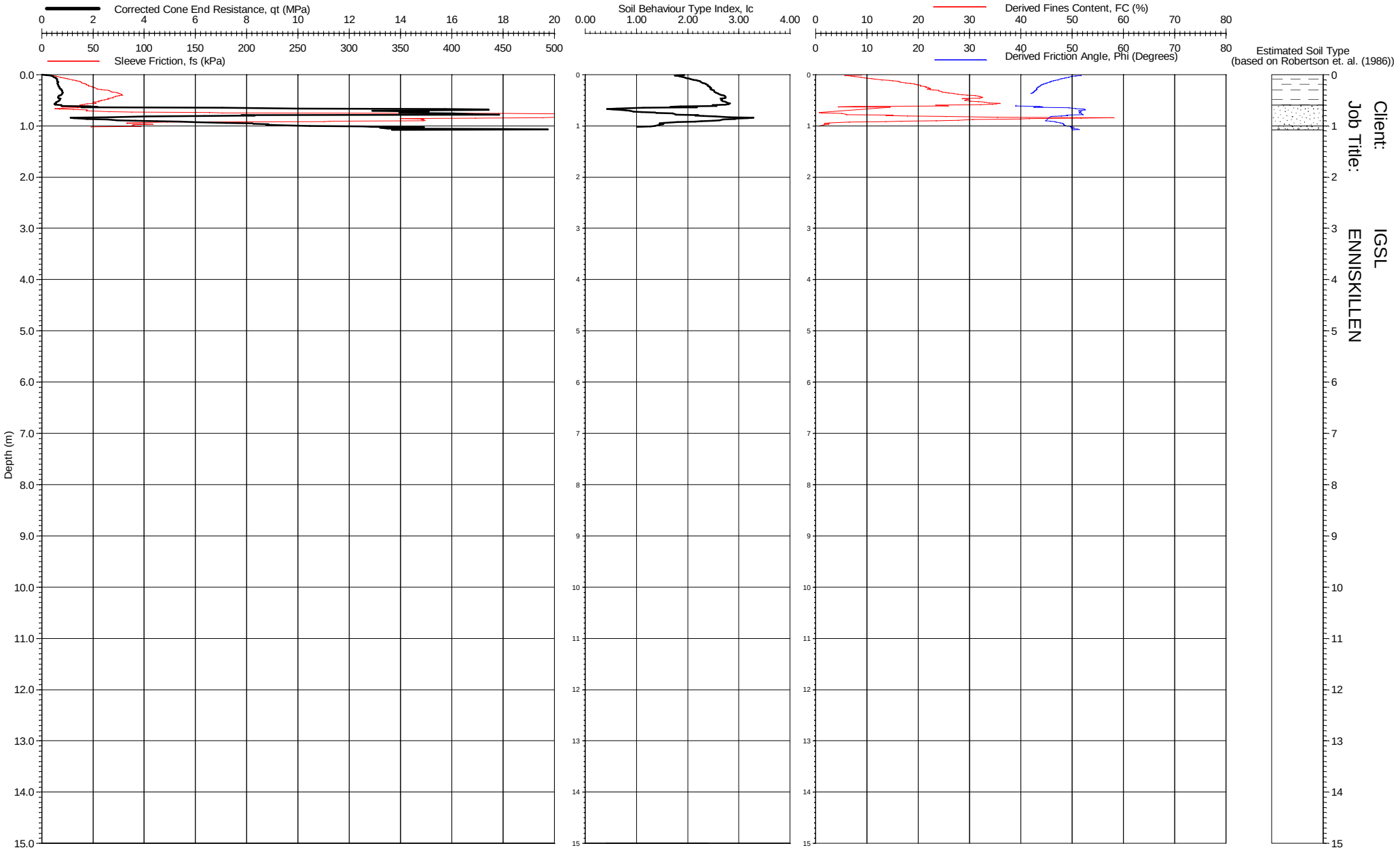
PIEZO CONE PENETRATION TEST

CPT 03A

Form: CPT0005



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03B

Checked By:

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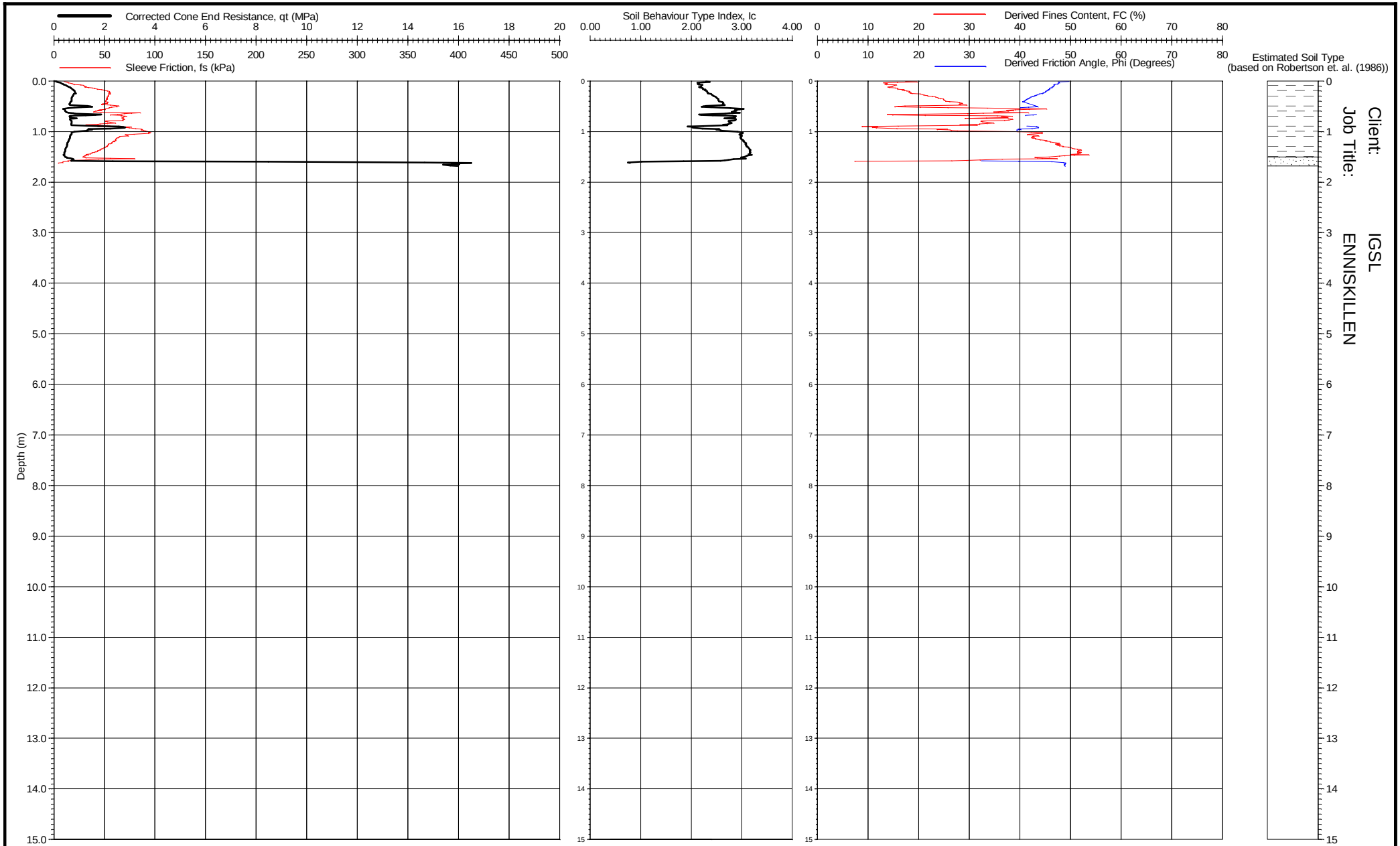
PIEZO CONE PENETRATION TEST

CPT 03B

Form: CPT0005



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 17/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 03C

Checked By:

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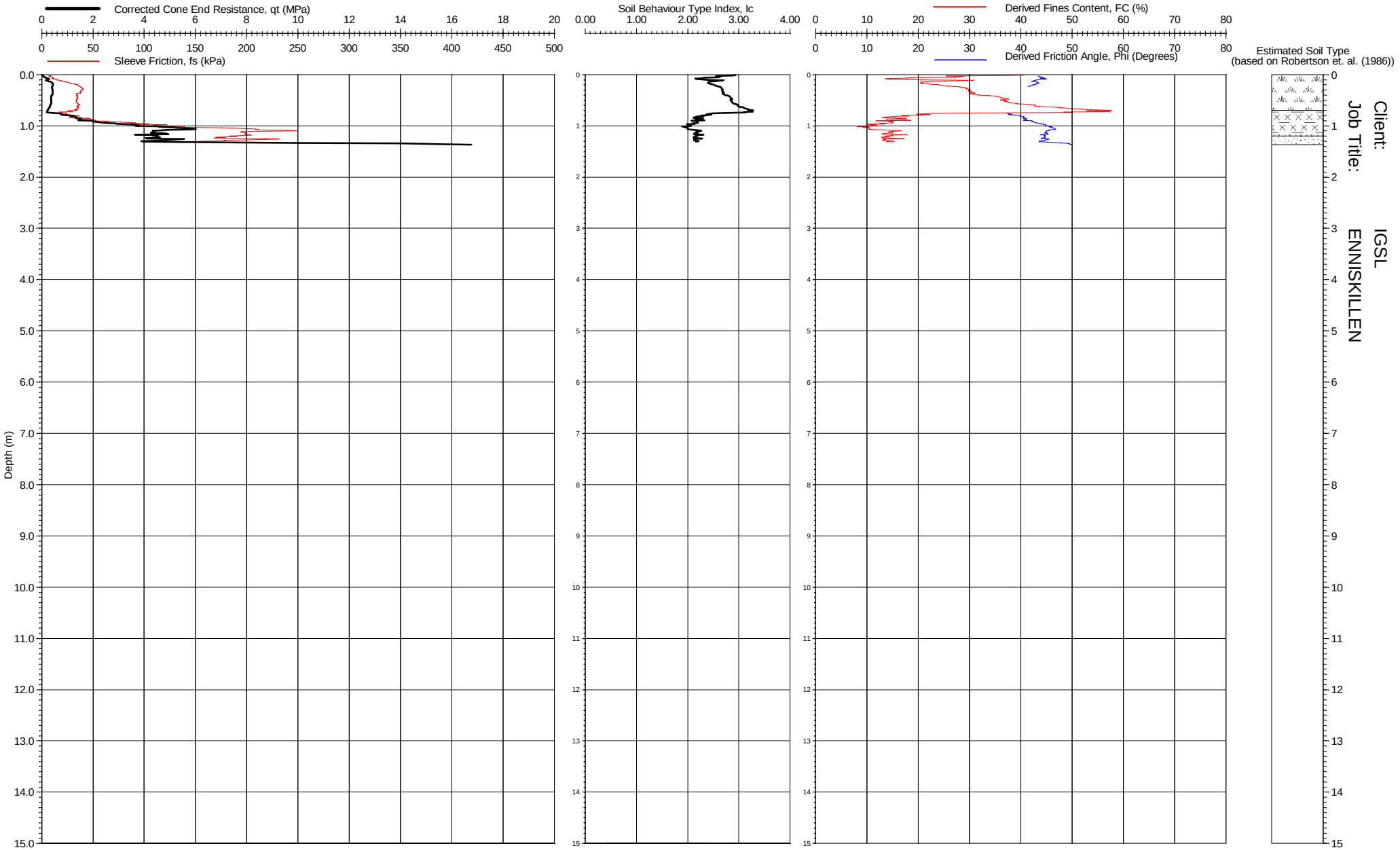
PIEZO CONE PENETRATION TEST

CPT 03C

Form: CPT0005



Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 04
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

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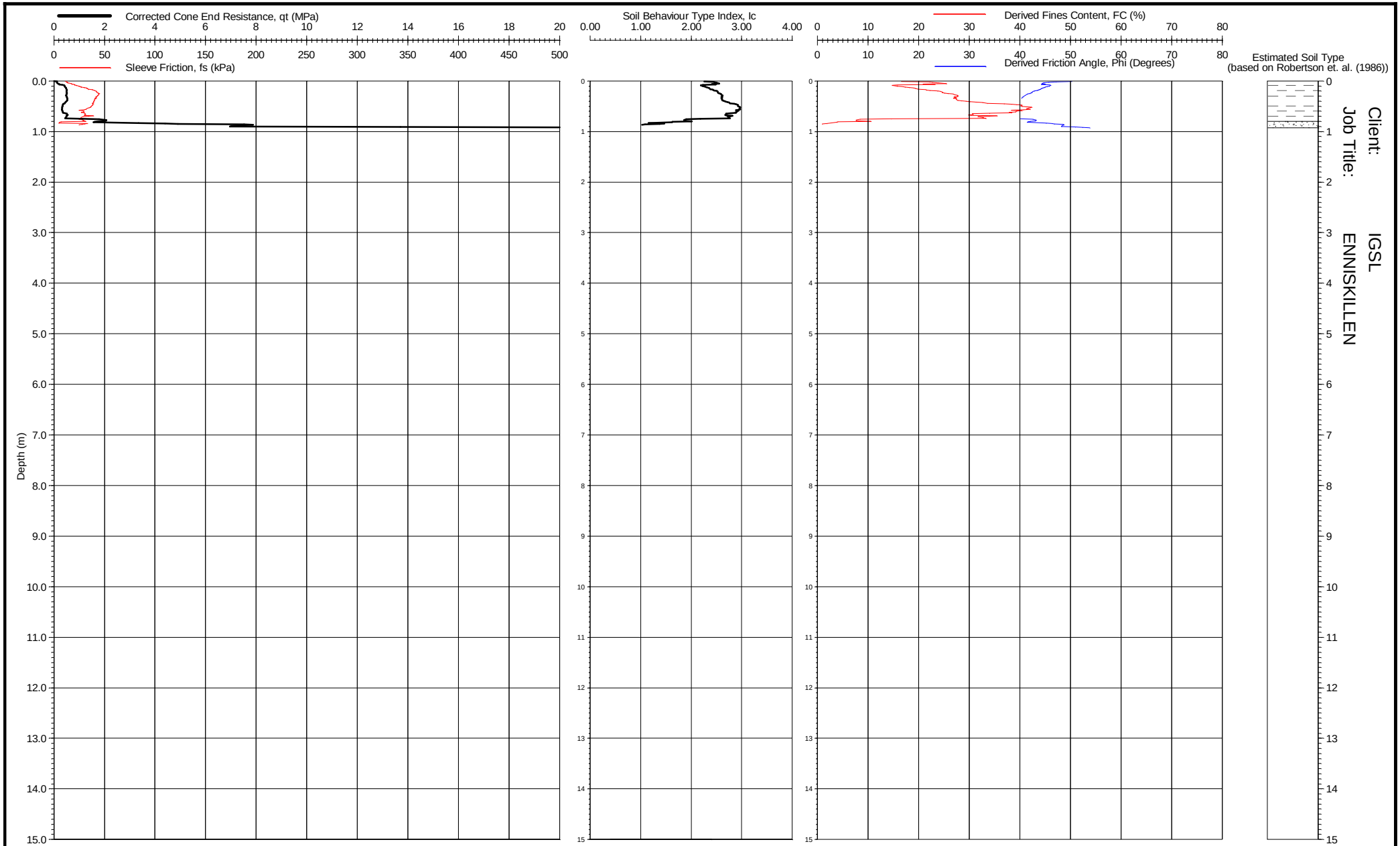
PIEZO CONE PENETRATION TEST

CPT 04

Form: CPT0005



Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 04A

Checked By:

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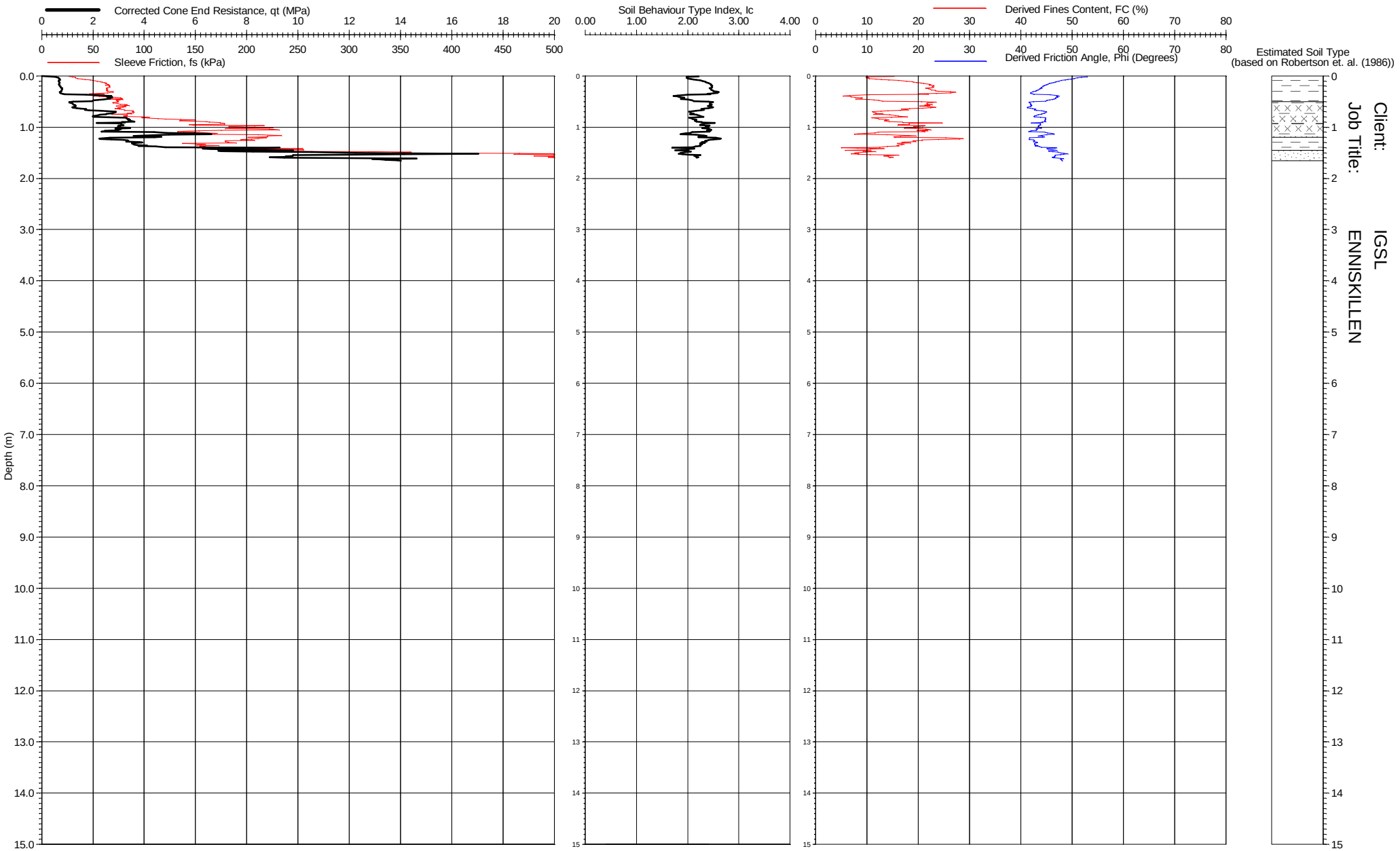
PIEZO CONE PENETRATION TEST

CPT 04A

Form: CPT0005



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 04B

Checked By:

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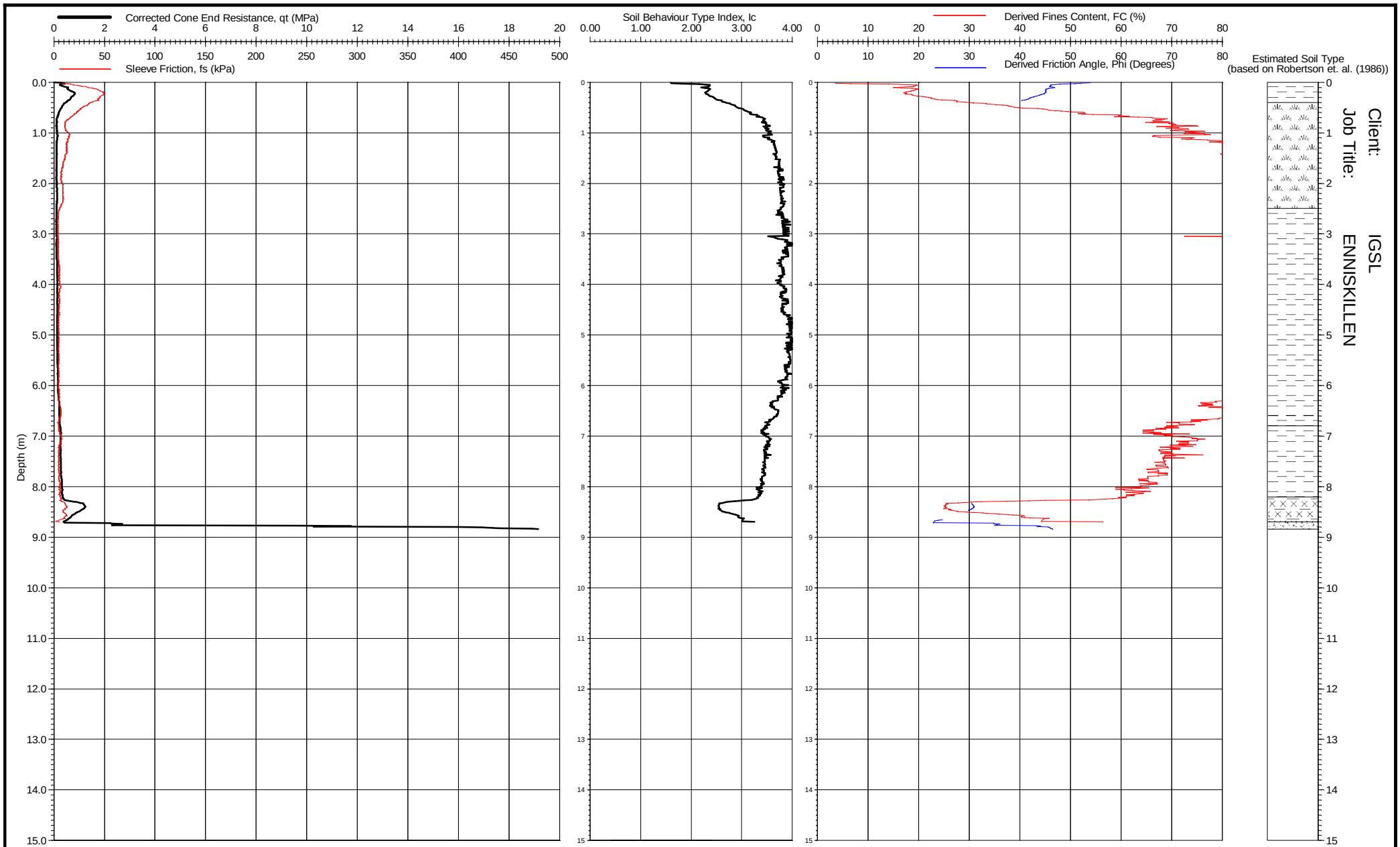
PIEZO CONE PENETRATION TEST

CPT 04B

Form: CPT0005



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 07

Checked By:

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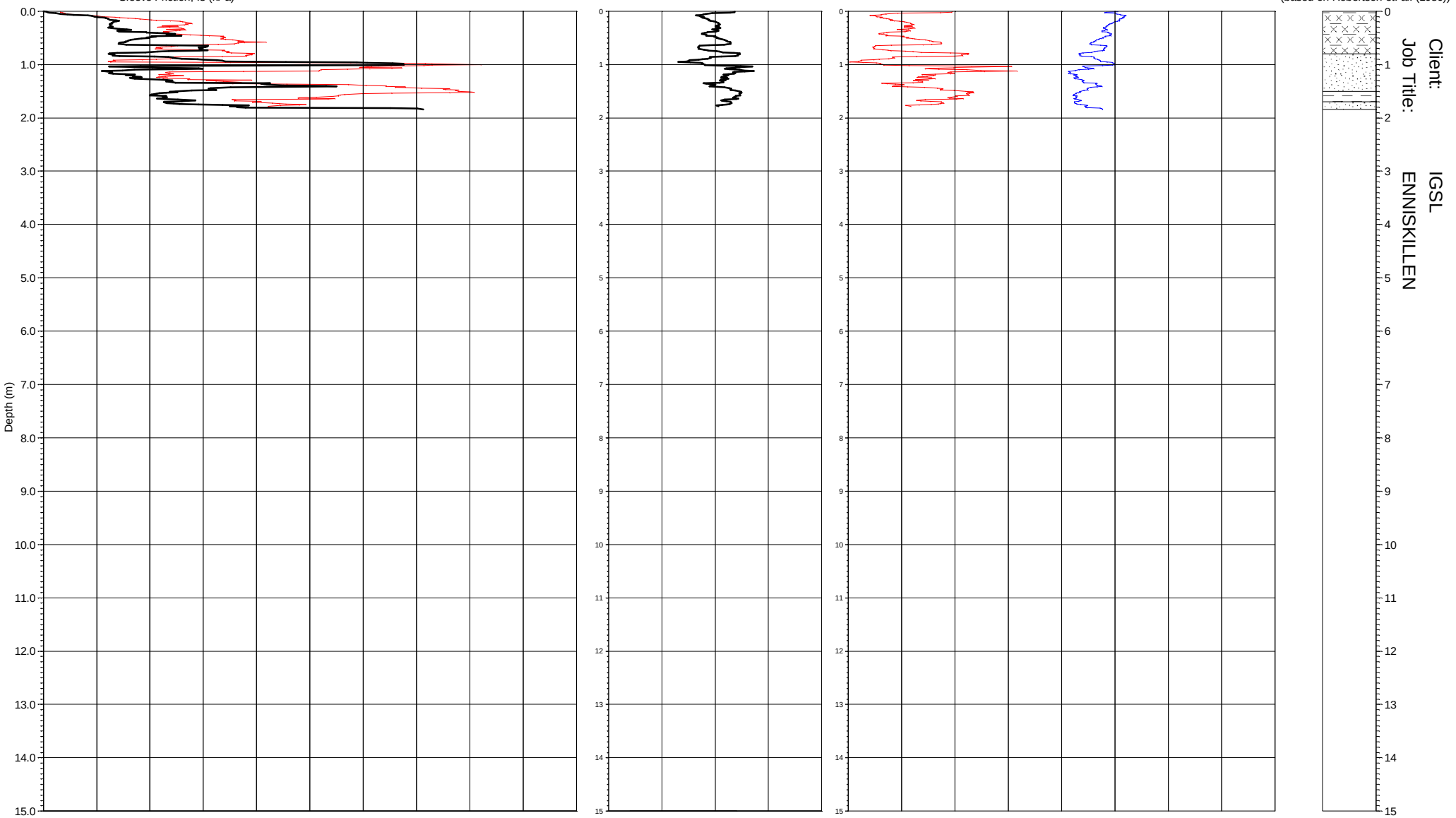
PIEZO CONE PENETRATION TEST

CPT 07

Form: CPT0005



Client: IGSL

Job Title: ENNISKILLEN

Location:	Enniskillen	Date of Test:	18/10/2016
Coordinates:	-	Date of Plot:	20/10/2016
Ground Level:	-	File Name:	1160372 - CPT 08
Cone & Rig Used:	S15-CFIP.1459 - CPT 003	Checked By:	
Remarks:	Test refused on total pressure.		

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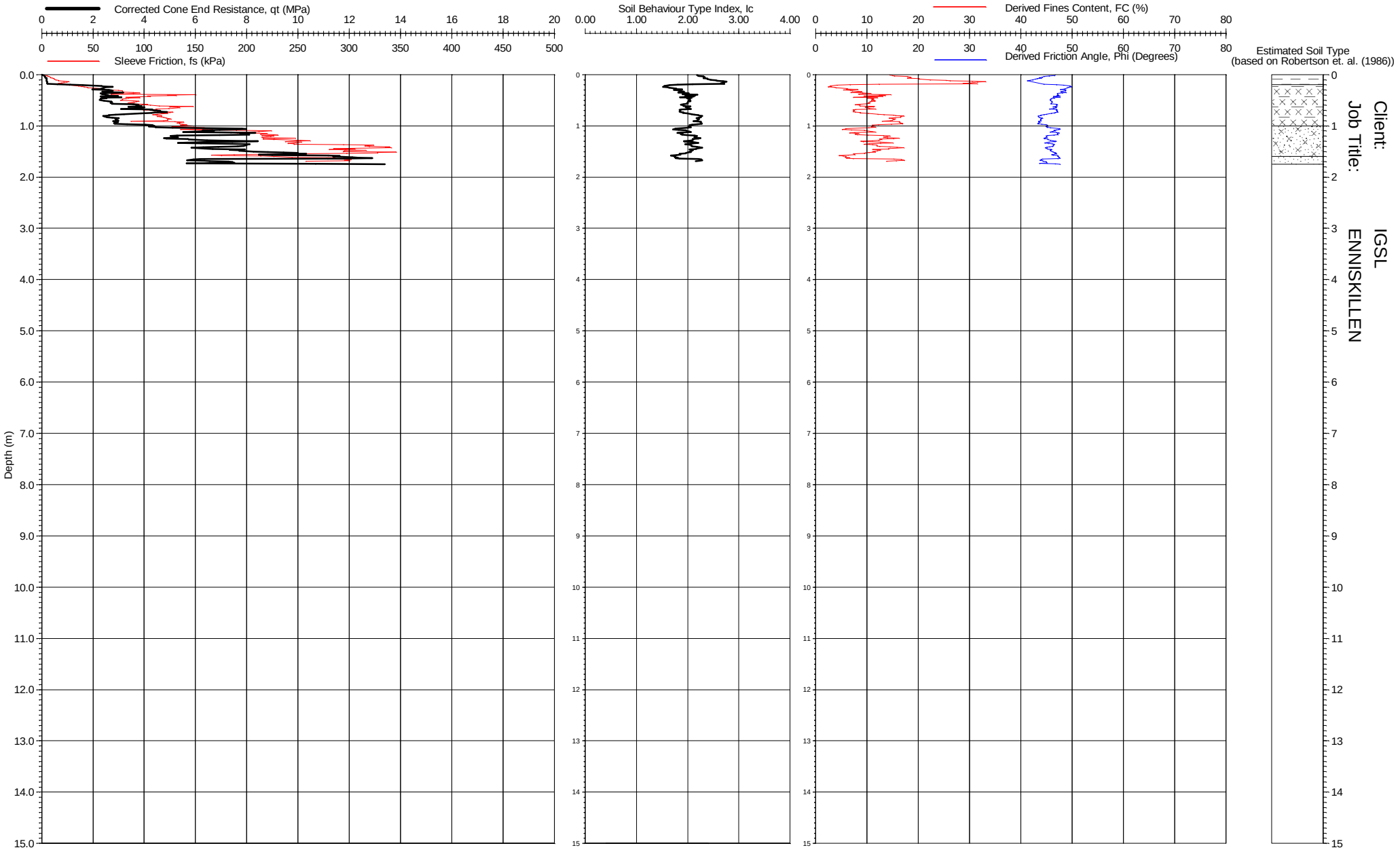
PIEZO CONE PENETRATION TEST

CPT 08

Form: CPT0005



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 08A

Checked By:

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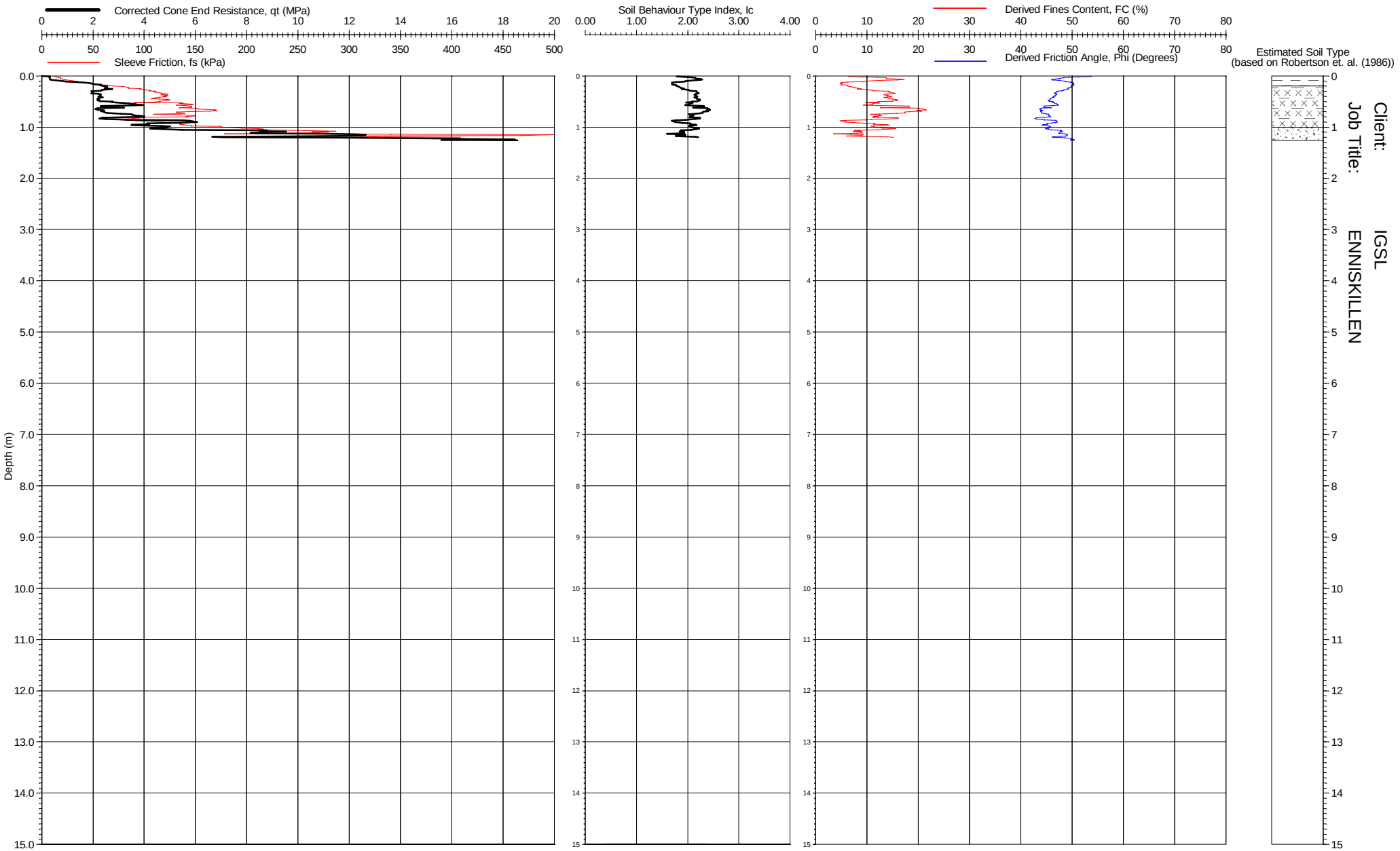
PIEZO CONE PENETRATION TEST

CPT 08A

Form: CPT0005



Client: IGSL

Job Title: ENNISKILLEN

Location: Enniskillen

Coordinates: -

Ground Level: -

Cone & Rig Used: S15-CFIP.1459 - CPT 003

Remarks: Test refused on total pressure.

Date of Test: 18/10/2016

Date of Plot: 20/10/2016

File Name: 1160372 - CPT 08B

Checked By:

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PIEZO CONE PENETRATION TEST

CPT 08B

Form: CPT0005

APPENDIX D

DISSIPATION TEST DATA

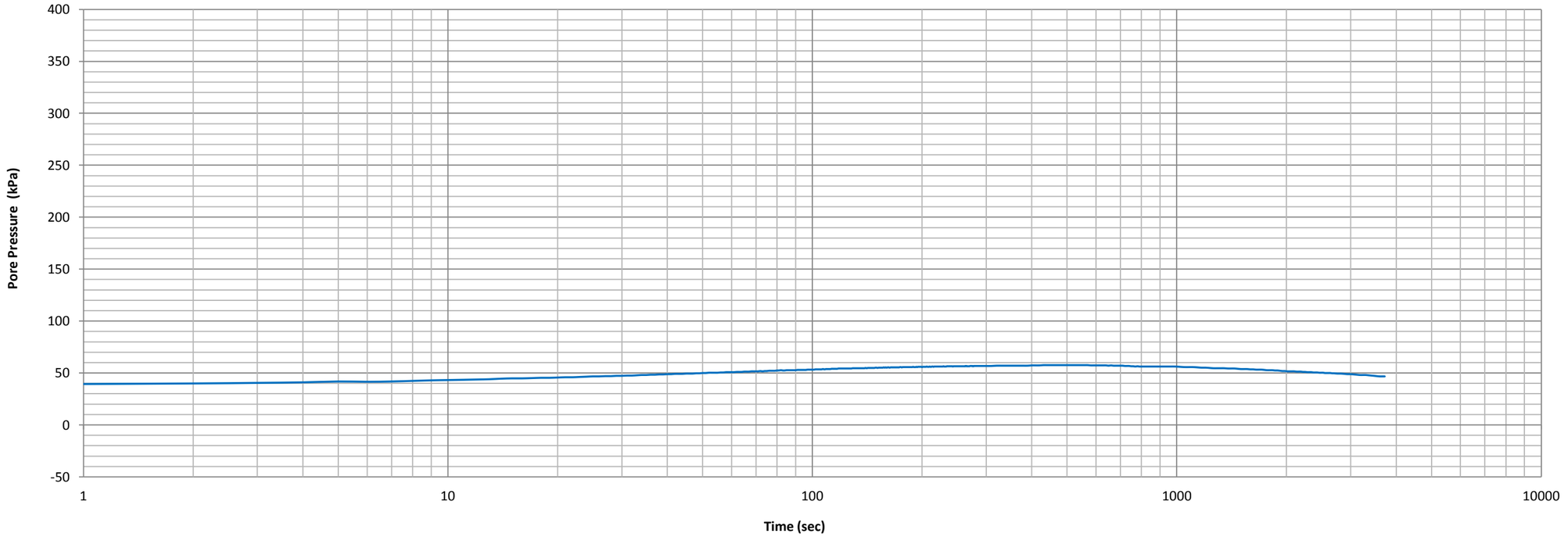
LIST OF FIGURES

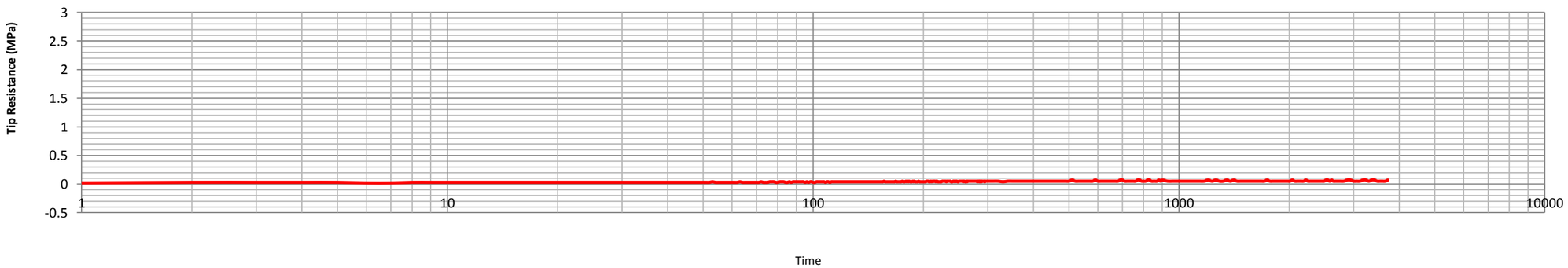
Description	Pages Included
Dissipation Test Results	4

Enniskillen
IGSL

PORE PRESSURE DISSIPATION TEST

IN SITU
SITE INVESTIGATION

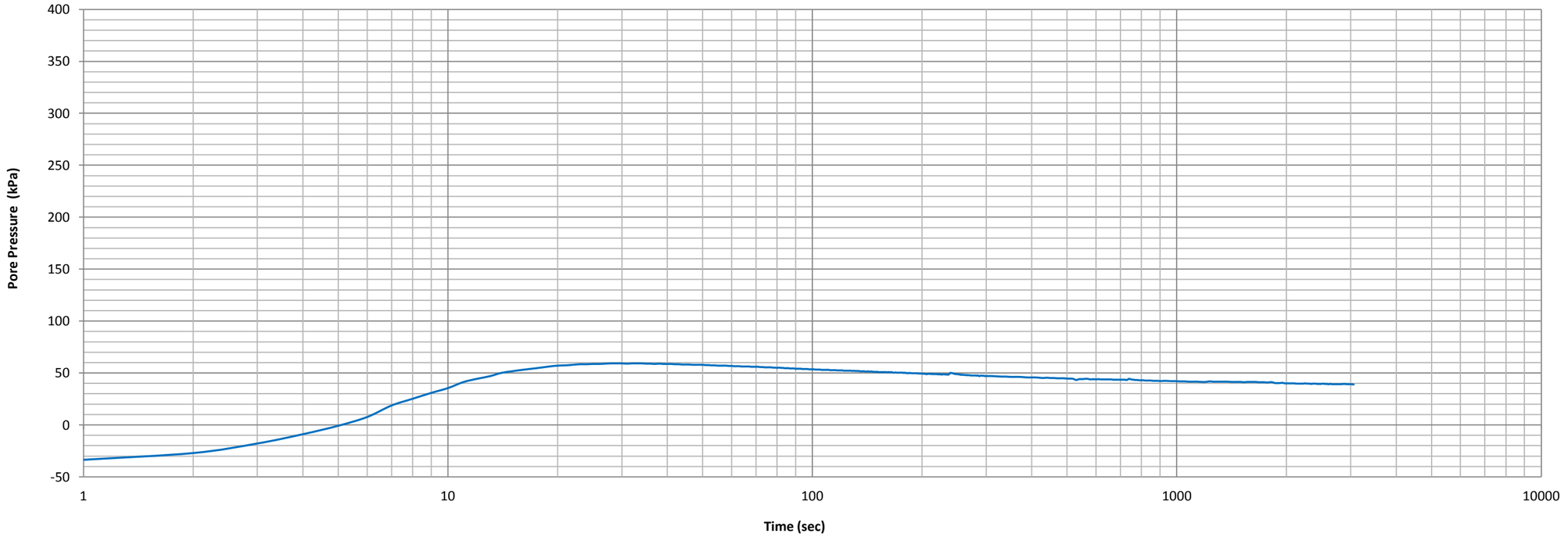


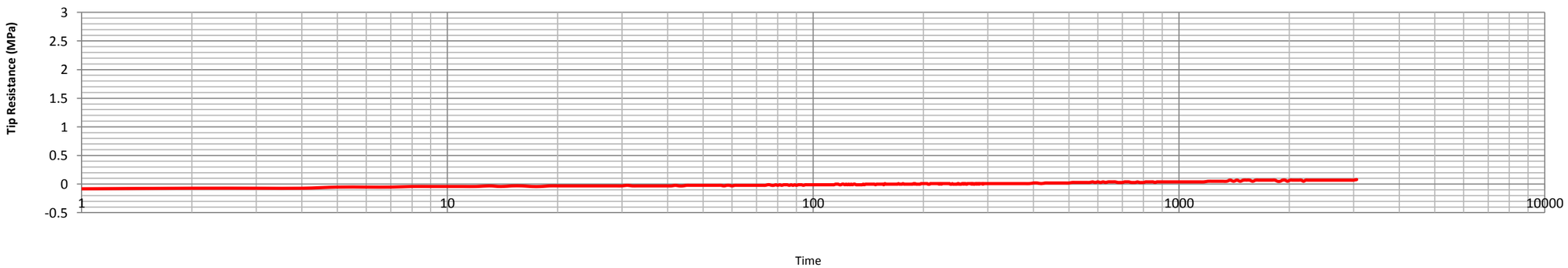


Project No:	1160372		**Project Title:**	Enniskillen		**Client:**	IGSL	
Depth (m):	3.00		**Cone Area (cm2):**	15		**Date:**	18/10/2016	**Location** CPT 01 D01
Water Table (m):	2.00		**Filter Position:**	U2 Shoulder		**Cone Number:**	S15-CFIP.1459	
T20 (s):	2730		**Ch (Ir=50) (m^2/yr):**	1		**Ch (Ir=500) (m^2/yr):**	5	

PORE PRESSURE DISSIPATION TEST

IN SITU
SITE INVESTIGATION



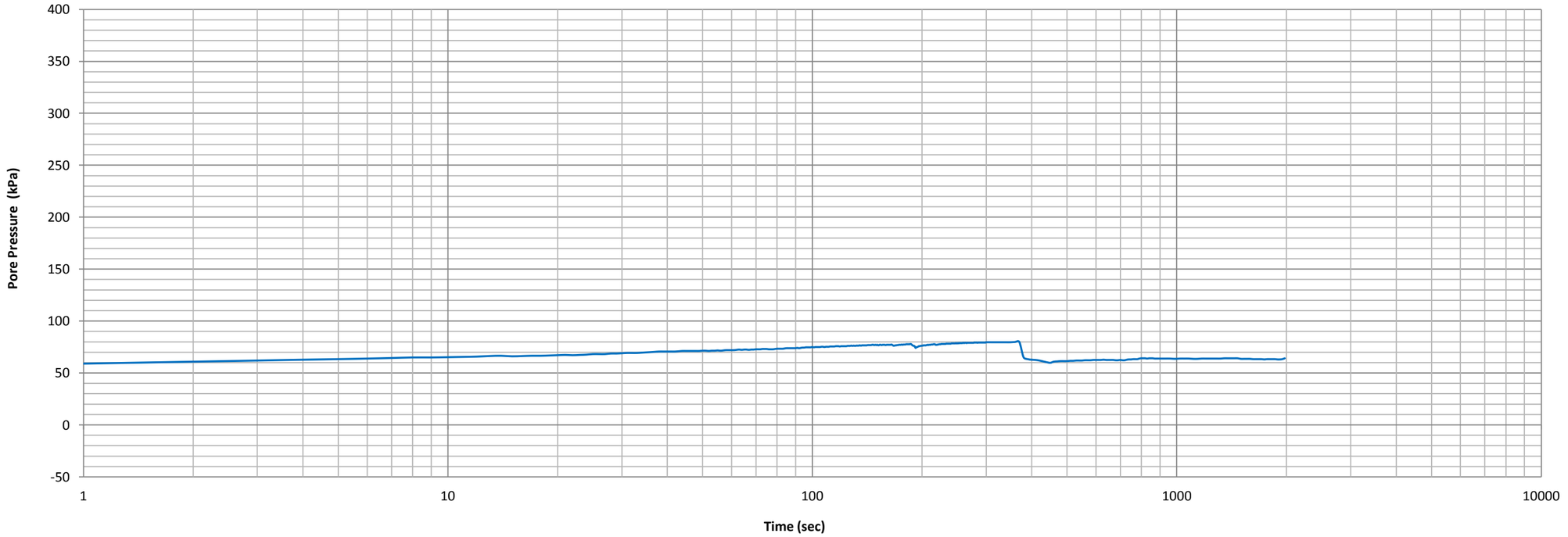


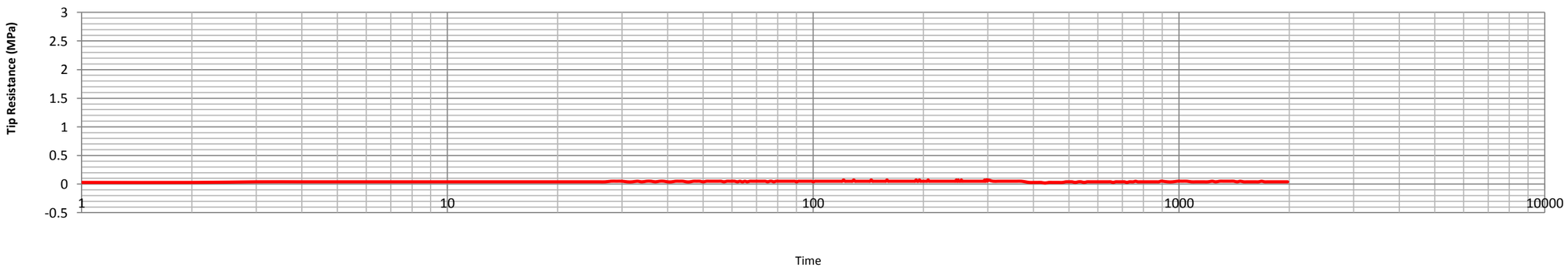
Project No:	1160372		**Project Title:**	Enniskillen		**Client:**	IGSL	
Depth (m):	3.00		**Cone Area (cm2):**	15		**Date:**	17/10/2016	**Location** CPT 02 D01
Water Table (m):	2.00		**Filter Position:**	U2 Shoulder		**Cone Number:**	S15-CFIP.1459	
T40 (s):	2542		**Ch (Ir=50) (m^2/yr):**	6		**Ch (Ir=500) (m^2/yr):**	19	

Enniskillen
IGSL

PORE PRESSURE DISSIPATION TEST

IN SITU
SITE INVESTIGATION



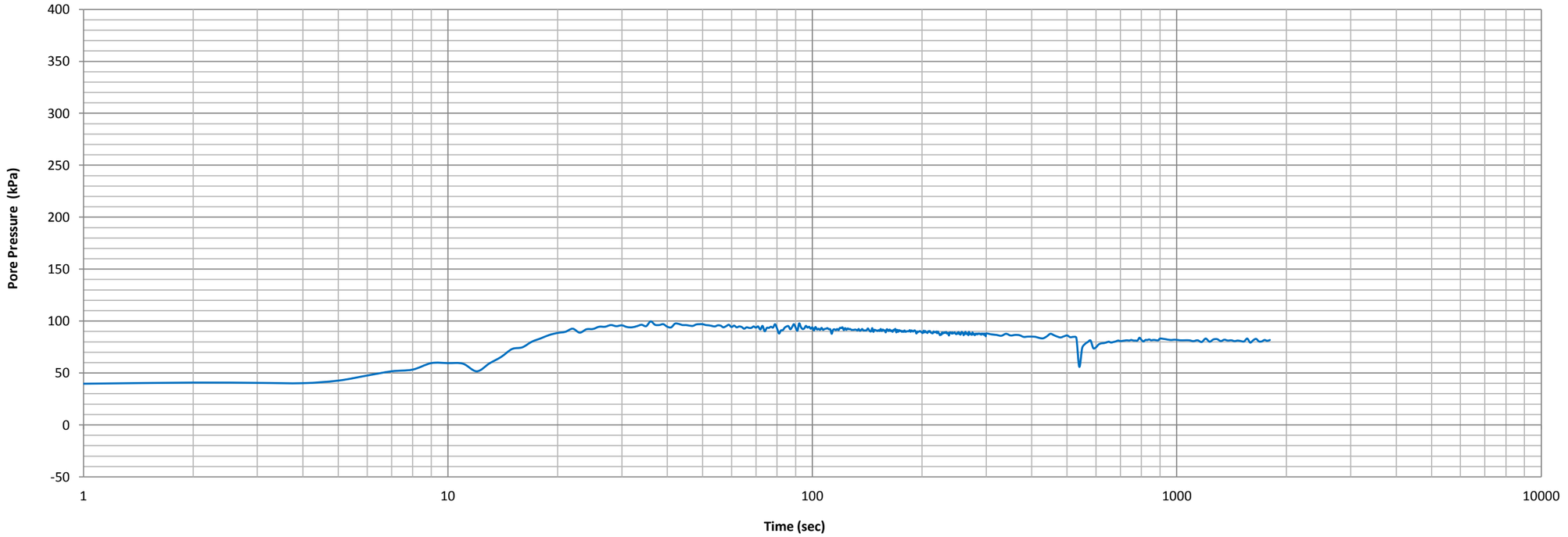


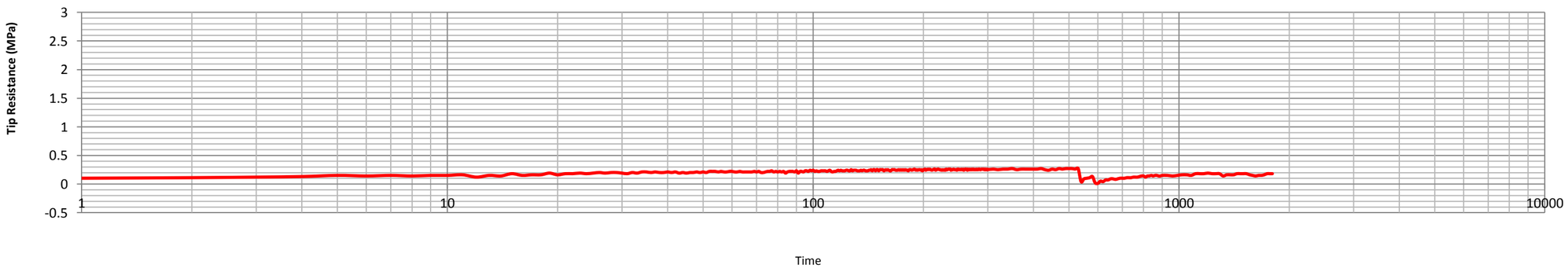
Project No:	1160372		**Project Title:**	Enniskillen		**Client:**	IGSL		**Location** CPT 07 D01
Depth (m):	5.00		**Cone Area (cm2):**	15		**Date:**	18/10/2016		
Water Table (m):	2.00		**Filter Position:**	U2 Shoulder		**Cone Number:**	S15-CFIP.1459		
T40 (s):	Not Reached		**Ch (Ir=50) (m^2/yr):**	-		**Ch (Ir=500) (m^2/yr):**	-		

Enniskillen
IGSL

PORE PRESSURE DISSIPATION TEST

IN SITU
SITE INVESTIGATION





Project No:	1160372		**Project Title:**	Enniskillen		**Client:**	IGSL		**Location** CPT 07 D02
Depth (m):	8.78		**Cone Area (cm2):**	15		**Date:**	18/10/2016		
Water Table (m):	2.00		**Filter Position:**	U2 Shoulder		**Cone Number:**	S15-CFIP.1459		
T40 (s):	Not Reached		**Ch (Ir=50) (m^2/yr):**	-		**Ch (Ir=500) (m^2/yr):**	-		

Appendix E. Summary of Outline Earthworks Design

Earthwork ref.	Chainage (m)	Earthwork Type	Proposed slope gradient (V:H)	Notes/ additional works
1	0-185	Embankment	1:2	Approach embankments to Sillees River crossing. Bored piles with a geotextile/geogrid load transfer platform are required as a foundation to these embankments.
2	185-273	Cutting	1:3	
3	273-466	Embankment	1:2	Alluvium up to 3m deep is expected between Ch 520m and 580m. This should be excavated and replaced with suitable compacted fill.
4	466-729	Cutting	1:3	
5	729-1140	Embankment	1:2	Ground improvement work is required between Ch 970m and Ch1120m. Soil mix columns are presented as a possible solution in this report, however other options could be explored. Alluvium up to 3m deep is present between Ch 1190 to Ch 1225.This should be excavated and replaced with suitable compacted fill.
6	1140-1218	Cutting	1:3	
7	1218-1291	Embankment	1:2	
8	1291-1361	Cutting	1:3	
9	1361-1650	Embankment	1:2	Alluvium up to 2m deep is expected between Ch 1650m and 1750m. This should be excavated and replaced with suitable compacted fill.
10	1650-1856	Cutting	1:3	
11	1856-2100	Embankment	1:2	Alluvium up to 3m deep is expected between Ch 1955m and 1990m, this should be excavated and replaced with suitable compacted fill.

Appendix F. General Arrangement Drawings

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