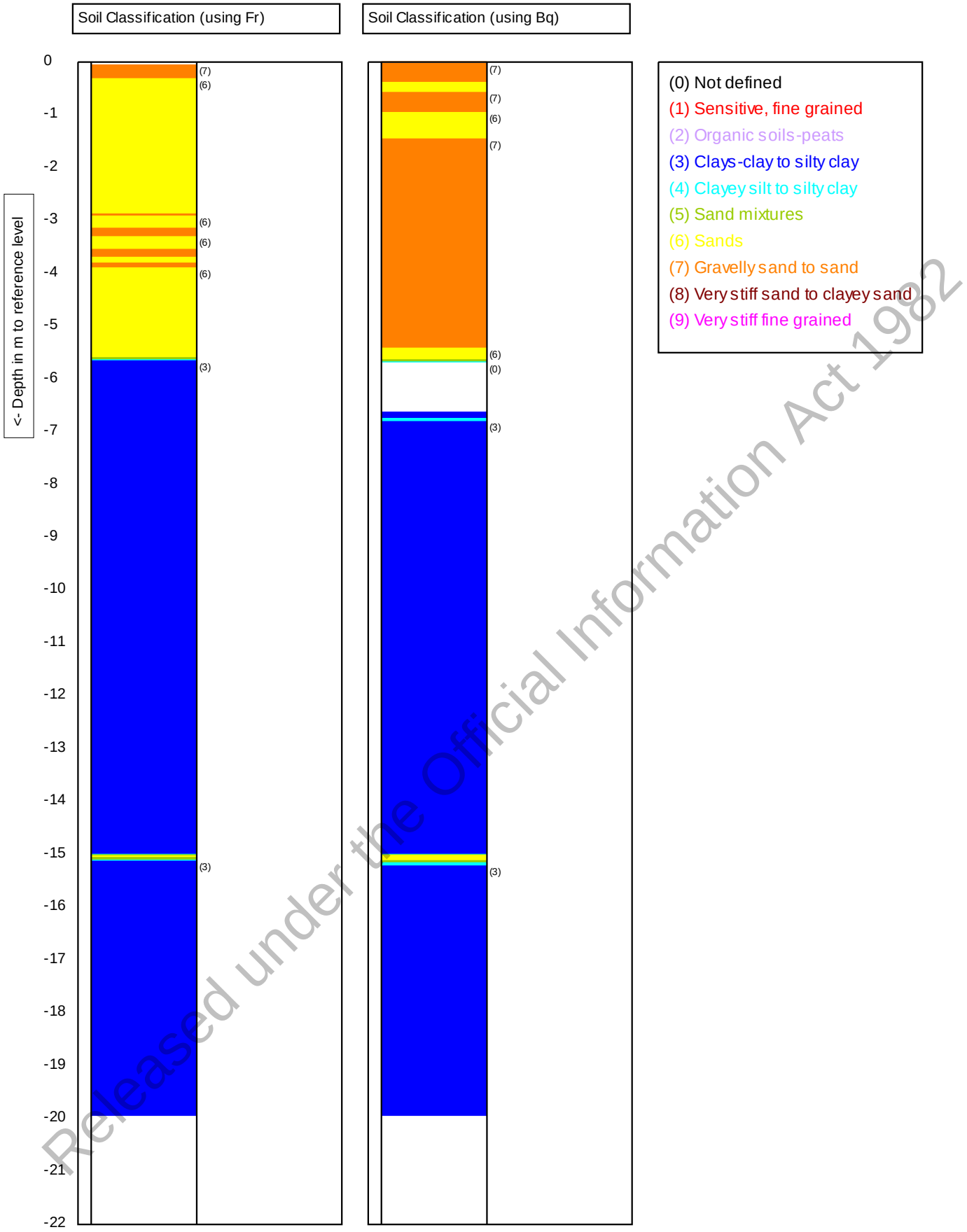
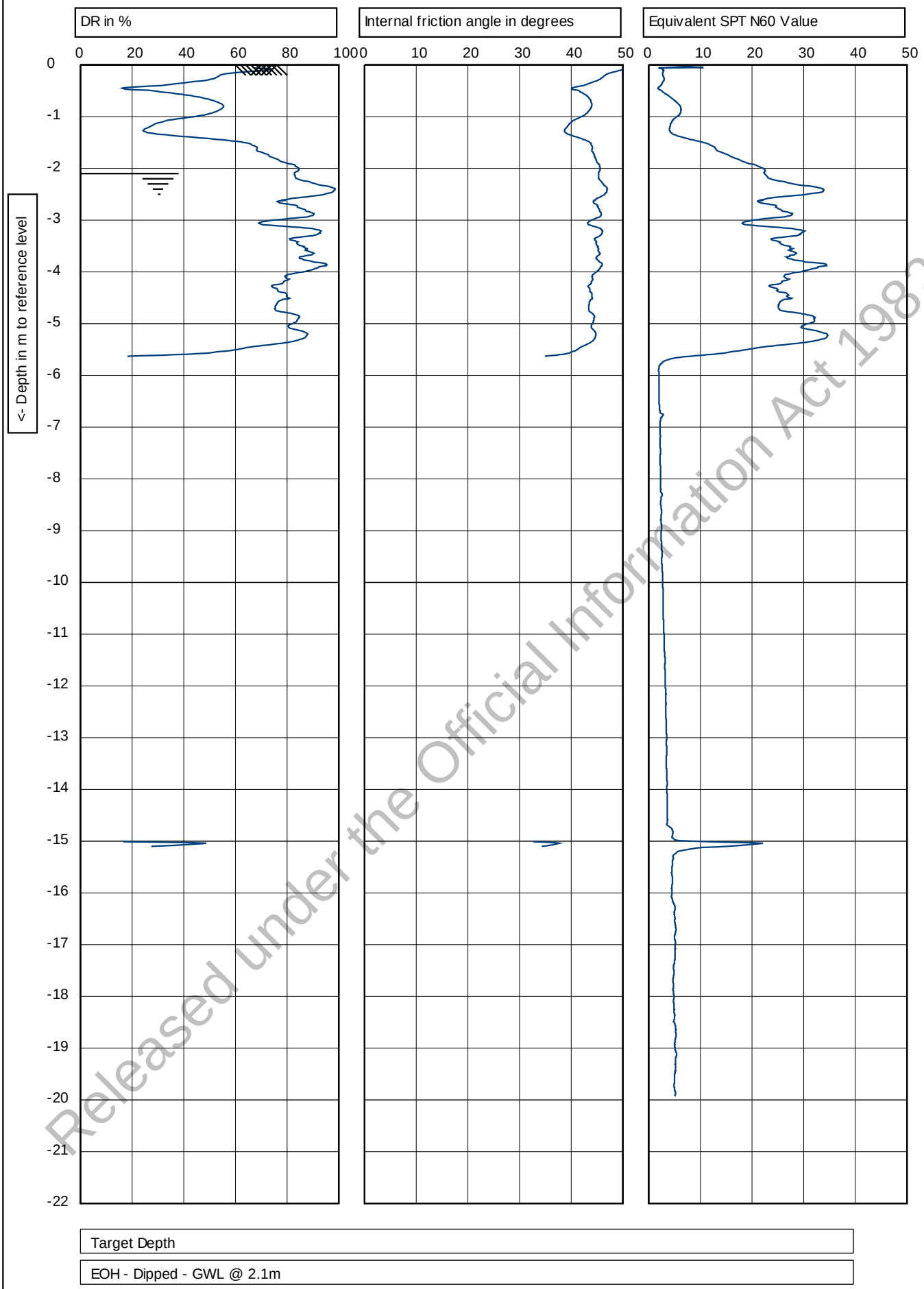


OPUS

Graphs on this page are not IANZ accredited

Test according ASTM D5778-12 & ISO 22476-1:2012		Predrill:	0.00 m Predrilled
G.L.: 0.00 m MSL	W.L.: -2.10 m	Date:	20/12/2017
Project: Mangapapa School		Cone no.:	C10CFIIP.C14434
Location: 5 Rua St - Gisborne		Project no.:	2-68000.00_HA2212
Position: 2036898, 5710289 NZTM		CPT no.:	01 4/6



Target Depth

EOH - Dipped - GWL @ 2.1m

OPUS

Graphs on this page are not IANZ accredited

u2
150 cm²
10 cm²

Test according ASTM D5778-12 & ISO 22476-1:2012

G.L.: **0.00 m MSL** | W.L.: **-2.10 m**

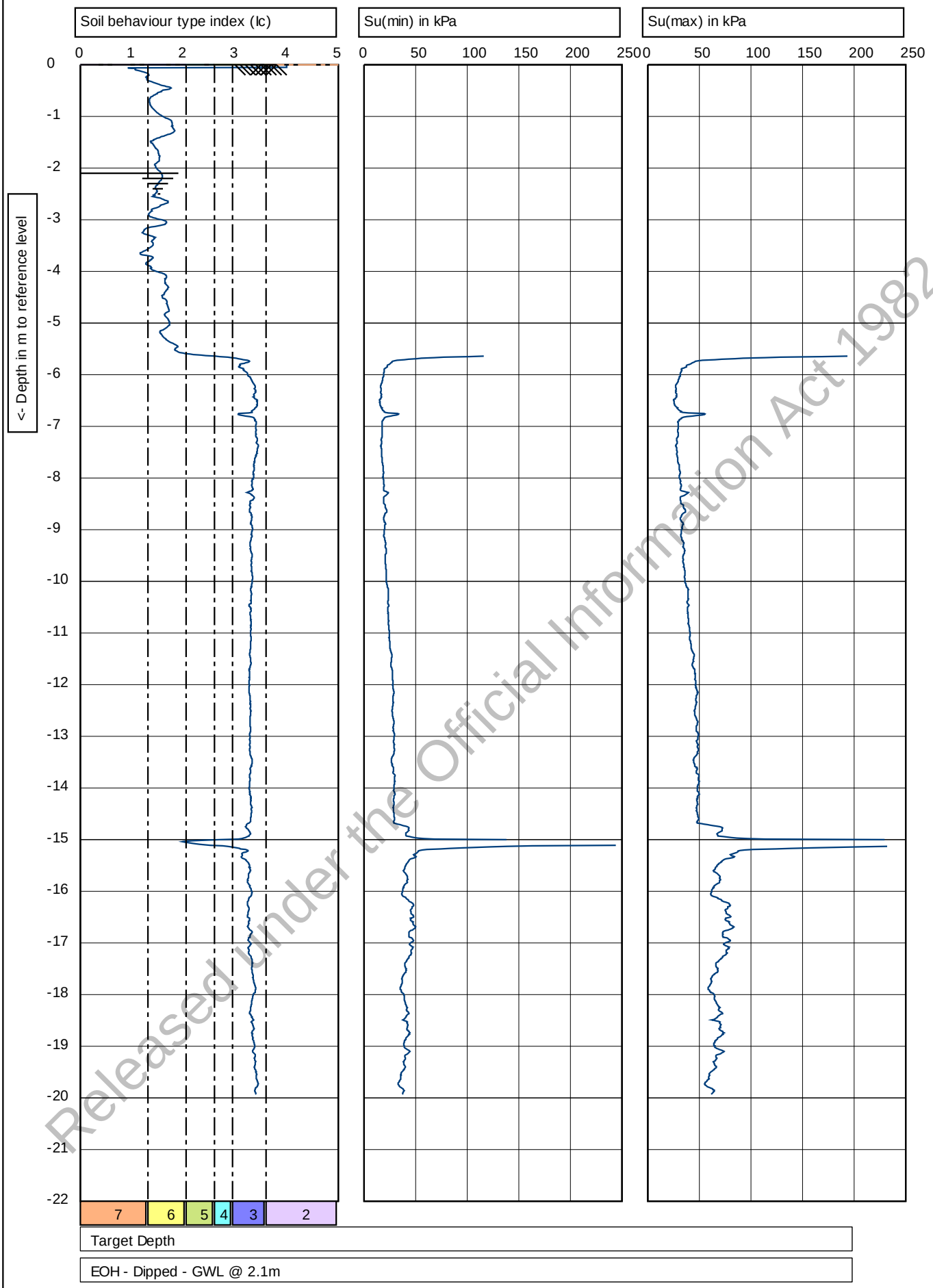
Project: **Mangapapa School**

Location: **5 Rua St - Gisborne**

Position: **2036898, 5710289 NZTM**

Predrill:	**0.00 m Predrilled**
Date:	**20/12/2017**
Cone no.:	**C10CFIIP.C14434**
Project no.:	**2-68000.00_HA2212**
CPT no.:	**01**

1.44



OPUS

Graphs on this page are not IANZ accredited

Test according ASTM D5778-12 & ISO 22476-1:2012		Predrill:	0.00 m Predrilled
G.L.: 0.00 m MSL	W.L.: -2.10 m	Date:	20/12/2017
Project: Mangapapa School		Cone no.:	C10CFIIP.C14434
Location: 5 Rua St - Gisborne		Project no.:	2-68000.00_HA2212
Position: 2036898, 5710289 NZTM		CPT no.:	01 6/6

1.44

calibration certificate

GC10CFIIP.C14427 / 002

Geomil equipment

World's first manufacturer of CPT equipment

Cone number	GC10CFIIP.C14427	Client	Opus International Consultants Ltd - Hamilton
Kind of cone	Compression		4 Fox Street
Calibration date	18-Oct-2017		3216 Hamilton
Print date	18-Oct-2017		New Zealand

Channel 1	Cone resistance (q_c) $q_c = Q_c / A_c$	Channel 2	Local sleeve friction (f_s) $f_s = F_s / A_s$	Channel 3	Pore pressure (u)
Range	0 ... 100 kN	Range	0 ... 22.5 kN	Range	0 ... 50 bar
A_c	1000 mm²	A_s	15000 mm²		
Zero load reading	206 mV	Zero load reading	197 mV	Zero load reading	211 mV
a-factor	0.8	b-factor	0		
		Offset	80 mm		

Q_c Load (kN)	Eqv. q_c (MPa)	Output (mV)	F_s Load (kN)	Eqv. f_s (MPa)	Output (mV)	Pressure (bar)	Eqv. u (MPa)	Output (mV)
0	0	0	0.00	0.00	0	0	0.0	0
10	10	852	2.25	0.15	814	5	0.5	845
20	20	1708	4.50	0.30	1620	10	1.0	1700
30	30	2563	6.75	0.45	2432	15	1.5	2552
40	40	3416	9.00	0.60	3240	20	2.0	3408
50	50	4270	11.25	0.75	4036	25	2.5	4267
60	60	5124	13.50	0.90	4853	30	3.0	5116
70	70	5975	18.00	1.20	6459	35	3.5	5963
80	80	6825	20.25	1.35	7270	40	4.0	6812
90	90	7673	22.50	1.50	8063	45	4.5	7664
100	100	8523	20.25	1.35	7272	50	5.0	8528
90	90	7674	18.00	1.20	6479			
80	80	6826	13.50	0.90	4864			
70	70	5978	11.25	0.75	4056			
60	60	5124	9.00	0.60	3257			
50	50	4274	6.75	0.45	2448			
40	40	3420	4.50	0.30	1645			
30	30	2566	2.25	0.15	827			
20	20	1710	0.00	0.00	0			
10	10	855						
0	0	0						

Zero load error	0.00 %	Zero load error	0.00 %	Zero load error	0.02 %
Max. linearity	0.15 %	Max. linearity	0.52 %	Max. linearity	0.13 %
Max. hysteresis	0.05 %	Max. hysteresis	0.31 %		

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calibration certificate

GC10CFIIP.C14427 / 002

Geomil equipment

World's first manufacturer of CPT equipment

Channel 4	Inclination X	Channel 5	Inclination Y	Channel 6	None
Range	-20 ... 20 °	Range	-20 ... 20 °		

Angle (°)	Output (mV)	Angle (°)	Output (mV)
-20	2484	-20	2475
-15	2542	-15	2534
-10	2617	-10	2601
-5	2676	-5	2675
0	2754	0	2748
5	2817	5	2820
10	2894	10	2882
15	2965	15	2960
20	3024	20	3012

Calibration instrument(s)	Certificate number(s)	Date(s)
GCU1000/1-170214-011/1	2012591.06600.1	14-Feb-2017

Remark

We declare that the electrical cone with serial number GC10CFIIP.C14427 has been calibrated and that the specifications are according to the ISO 22476-1:2012 (Geotechnical investigation and testing – Field testing - Part 1: Electrical cone and piezocone penetration test).
The calibrations are traceable to national and international standards.

Date	18-Oct-2017	Date	18-Oct-2017
Calibrated by	Marijn Kints	Approved by	Joost Neugebauer

Signature

Signature

LLOYD'S REGISTER LRQA ISO 9001

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APPENDIX C - Core Logs

Soil Description

Log Identification: BH01 Page 1 of 3

Geological Unit	Field Description	Depth (meters)	Graphic log	Investigation Method	Rock strength	Field Test Data: Undrained Shear Strength (kPa) Peak / Residual	Field Test Data: Core Recovery (%)	Field Test Data: SPT results	Groundwater Level
								N60 / 75 mm / 75 mm / 75 mm / 75 mm / 75 mm / 75mm	
TOPSOIL	TOPSOIL; dark brown. Moist.								
LATE QUATERNARY BEACH AND TERRACE COVER DEPOSITS	SAND; brown. Moist.	0.5		HQ			70%		
	Below 1.0m, trace of charcol.	1.0							
		1.5		SPT- O			SPT	19 — 3 2 — 4 4 5 6	
	Below 1.9m, dark grey, moist to wet.	2.0		HQ			100%		
	Below 2.1m, trace of shell fragments.								
	SAND; yellowish grey. Wet to moist.	2.5							
	Below 2.7m, trace of shell fragments.	3.0		SPT-O			SPT	18 — 3 3 — 3 5 4 6	
	SAND, trace of shell fragments; dark grey. Wet.	3.5		HQ			90%		
	Fine to medium grain SAND; orangish grey. Moist to wet.	4.0							
	Fine grain SAND, trace of shell fragments; dark grey to black. Moist to wet.	4.5		SPT-O			SPT	19 — 3 2 — 3 5 5 6	
		5.0		HQ			95%		
	CLAY, trace of organics (fibreous); dark grey. Moist, highly plastic.	5.5							

Notes:
1. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
2. Soils have been described in general accordance with NZ Geomechanics Society "Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes", December 2005
3. Undrained shear strengths (where reported) have been corrected in general accordance with NZ Geotech Society Inc. "Guideline for Hand Held Shear Vane Test", August 2001.

BCD GROUP

Job name: Mangapapa School and Tologa Bay Area School
Site location: Mangapapa School, Gisborne
Date of logging: 15/01/2018
Date of investigation: 18/12/2017

Job Number: 17-0708
Shear Vane ID: N/A
Logged By: LH
Checked By: BM

Soil Description

Log Identification: BH01 Page 2 of 3

Geological Unit	Field Description	Depth (meters)	Graphic log	Investigation Method	Rock strength	Undrained Shear Strength (kPa) Peak / Residual	Core Recovery (%)	SPT results N60	SPT results 75 mm	SPT results 75 mm	SPT results 75 mm	SPT results 75 mm	SPT results 75 mm	SPT results 75mm	Groundwater Level
LATE QUATERNARY BEACH AND TERRACE COVER DEPOSITS	CLAY, trace of organics (fibreous); dark grey. Moist, highly plastic.	6.0		HQ											
				SPT-O			SPT	1	0	0	1	0	0	0	
	Below 6.4m, trace of shell fragments.	6.5		HQ											
	Below 7.2m, lense of SAND for 50mm.	7.0													
		7.5		SPT-O			SPT	1	0	0	1	0	0	0	
		8.0		HQ											
		8.5													
		9.0		SPT-O			SPT	1	0	0	1	0	0	0	
	Below 9.5m, lense of organic material for 50mm.	9.5		HQ											
		10.0													
		10.5		SPT-O			SPT	0	0	0	0	0	0	0	
		11.0													

Notes:

1. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
2. Soils have been described in general accordance with NZ Geomechanics Society "Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes", December 2005
3. Undrained shear strengths (where reported) have been corrected in general accordance with NZ Geotech Society Inc. "Guideline for Hand Held Shear Vane Test", August 2001.

BCD GROUP

Job name: Mangapapa School and Tologa Bay Area School
Site location: Mangapapa School, Gisborne
Date of logging: 15/01/2018
Date of investigation: 18/12/2017

Job Number: 17-0708
Shear Vane ID: N/A
Logged By: LH
Checked By:

Soil Description

Log Identification: BH01 Page 3 of 3

Geological Unit	Field Description	Depth (meters)	Graphic log	Investigation Method	Rock strength	Undrained Shear Strength (kPa) Peak / Residual	Field Test Data: Core Recovery (%)	Field Test Data: SPT results N60	Field Test Data: SPT results 75 mm	75 mm	75 mm	75 mm	75 mm	75mm	Groundwater Level
LATE QUATERNARY BEACH AND TERRACE COVER DEPOSITS	CLAY, trace of organics (fibreous); dark grey. Moist, highly plastic.	11.5		HQ			100%								
		12.0		SPT-O			SPT	1	0	0	1	0	0	0	
		12.5		HQ											
	Below 13.1m, lense of oragnic material for 20mm.	13.0													
		13.5		SPT-O			SPT	1	0	0	1	0	0	0	
		14.0		HQ											
	Fine grain SAND; light grey. Moist to wet.	14.5													
	CLAY; dark bluish grey. Moist, highly plastic.	15.0		SPT-O			SPT	1	0	0	1	0	0	0	
	End of borehole at 15.0 m. Target depth.	15.5		HQ											
		16.0													
		16.5													

Notes:

1. The stratification lines represent the approximate boundary between soil types and the transition may be gradual.
2. Soils have been described in general accordance with NZ Geomechanics Society "Guideline for the Field Classification and Description of Soil and Rock for Engineering Purposes", December 2005
3. Undrained shear strengths (where reported) have been corrected in general accordance with NZ Geotech Society Inc. "Guideline for Hand Held Shear Vane Test", August 2001.

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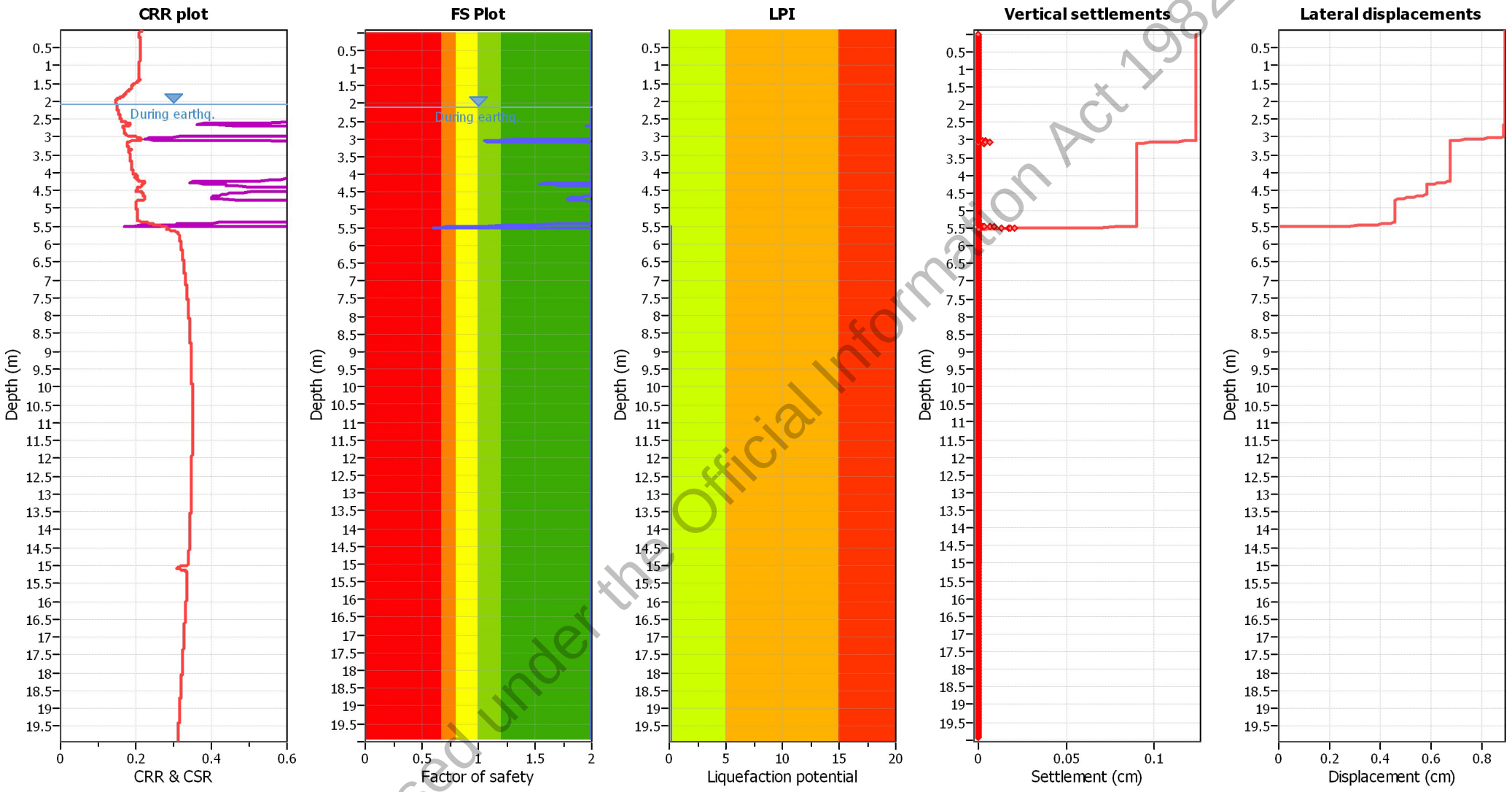
Site location: Mangapapa School, Gisborne
Date of logging: 15/01/2018
Date of investigation: 18/12/2017

Job Number: 17-0708
Shear Vane ID: N/A
Logged By: LH
Checked By:

APPENDIX D - Liquifaction Analysis

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.10 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.10 m	Fill height:	N/A	Limit depth:	20.00 m

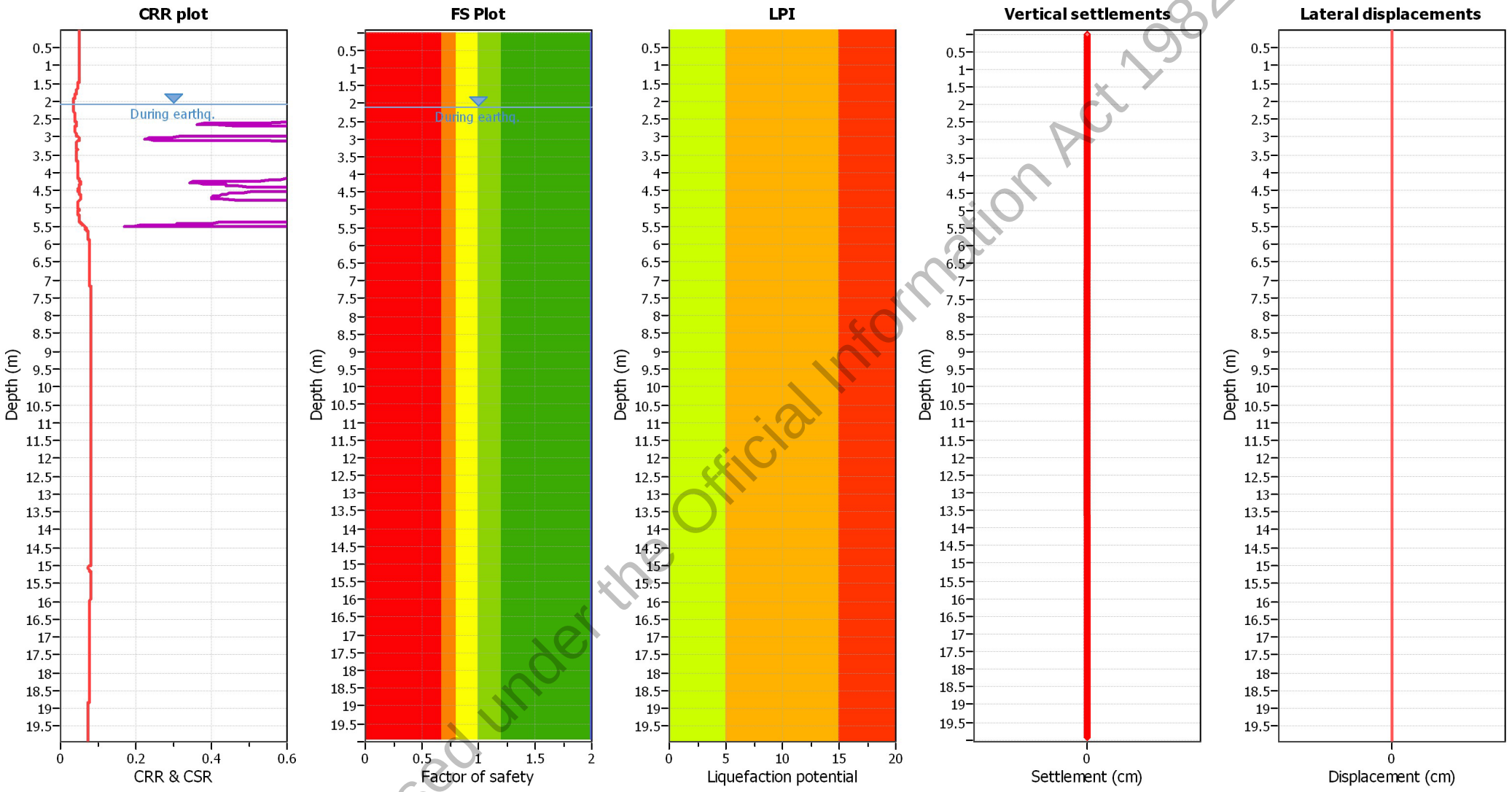
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.10 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.09	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.10 m	Fill height:	N/A	Limit depth:	20.00 m

F.S. color scheme

- Almost certain it will liquefy
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LPI color scheme

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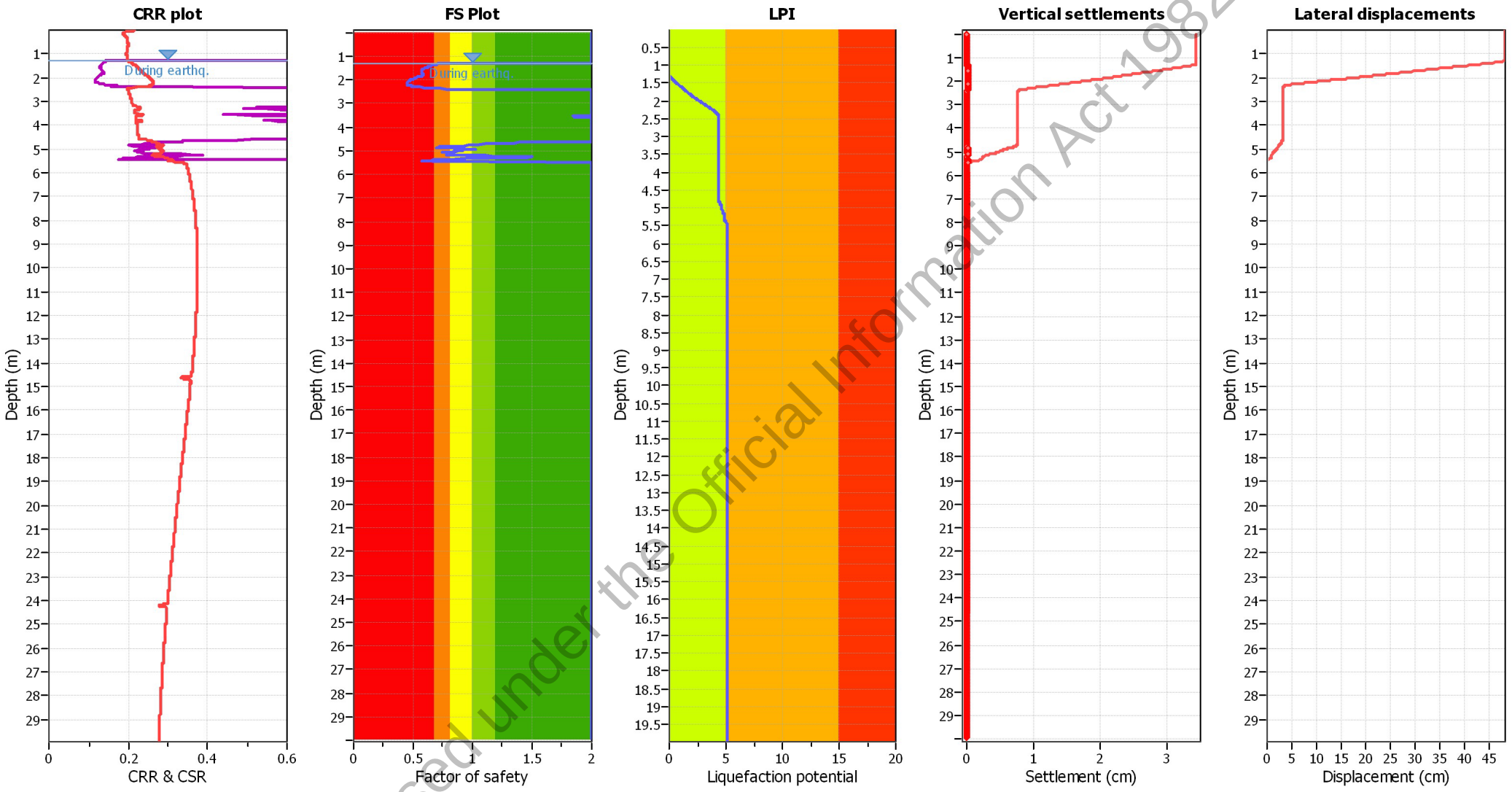
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.30 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.30 m	Fill height:	N/A	Limit depth:	20.00 m

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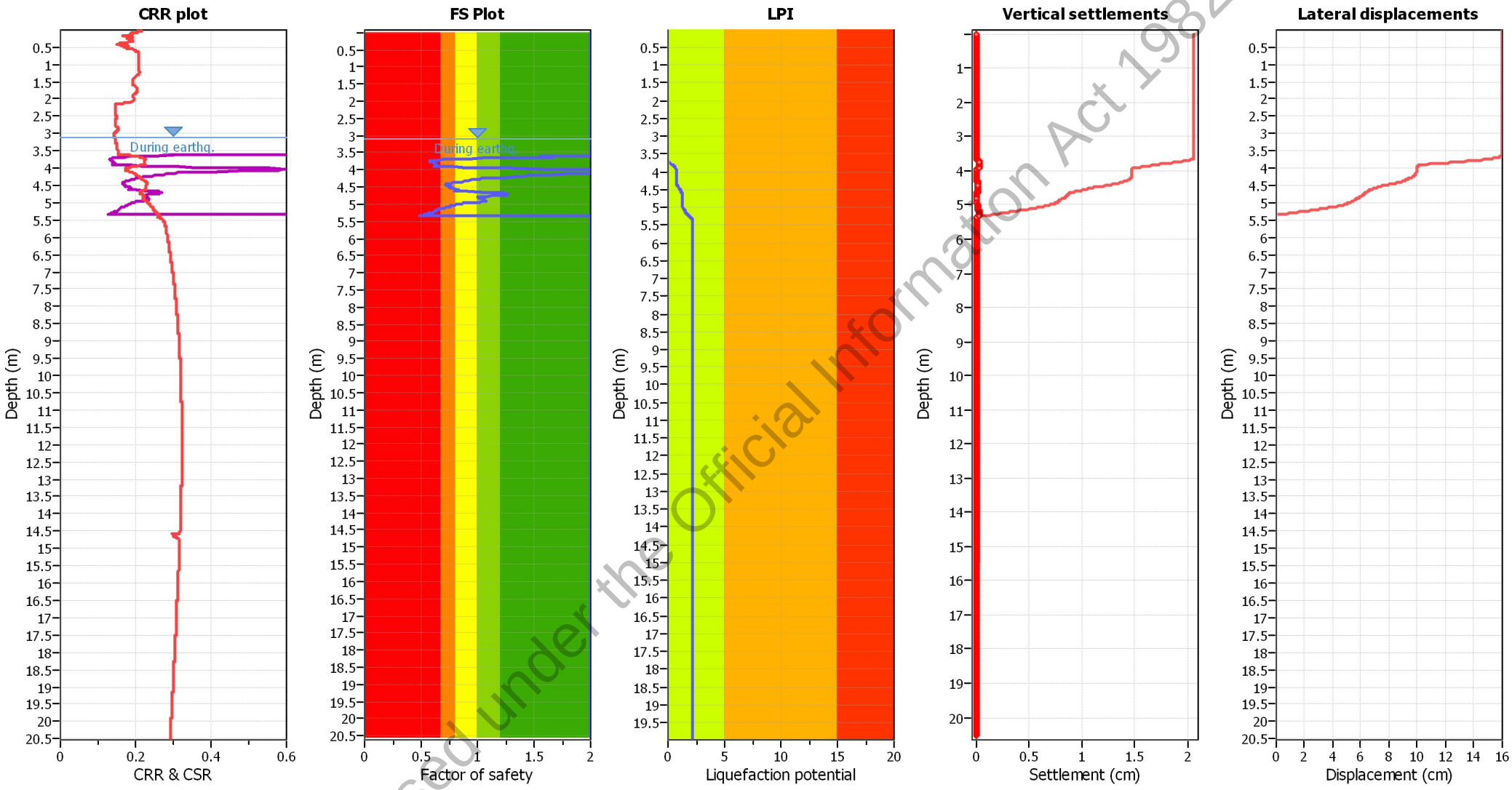
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.10 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.10 m	Fill height:	N/A	Limit depth:	20.00 m

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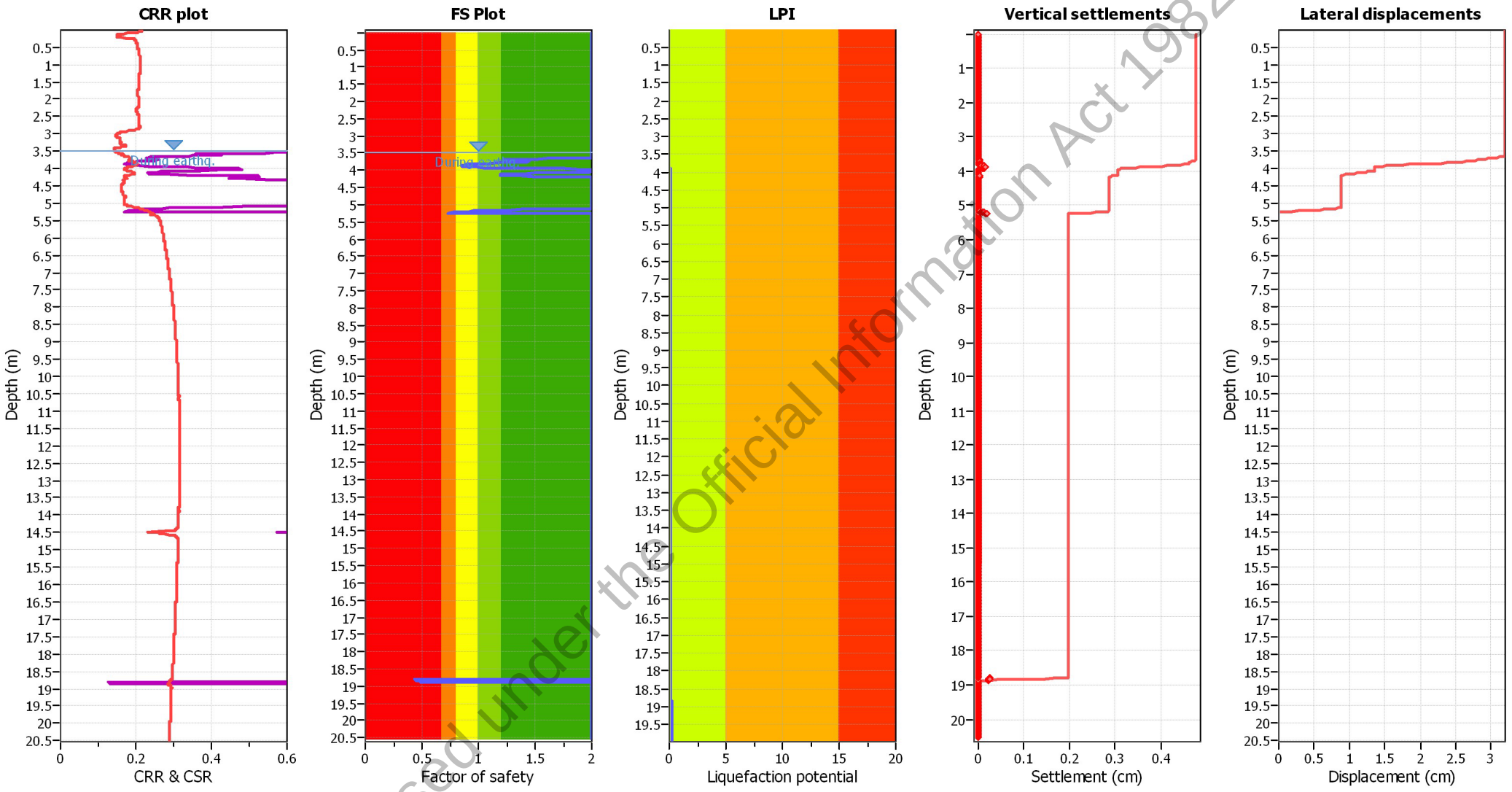

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.38	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.50 m	Fill height:	N/A	Limit depth:	20.00 m

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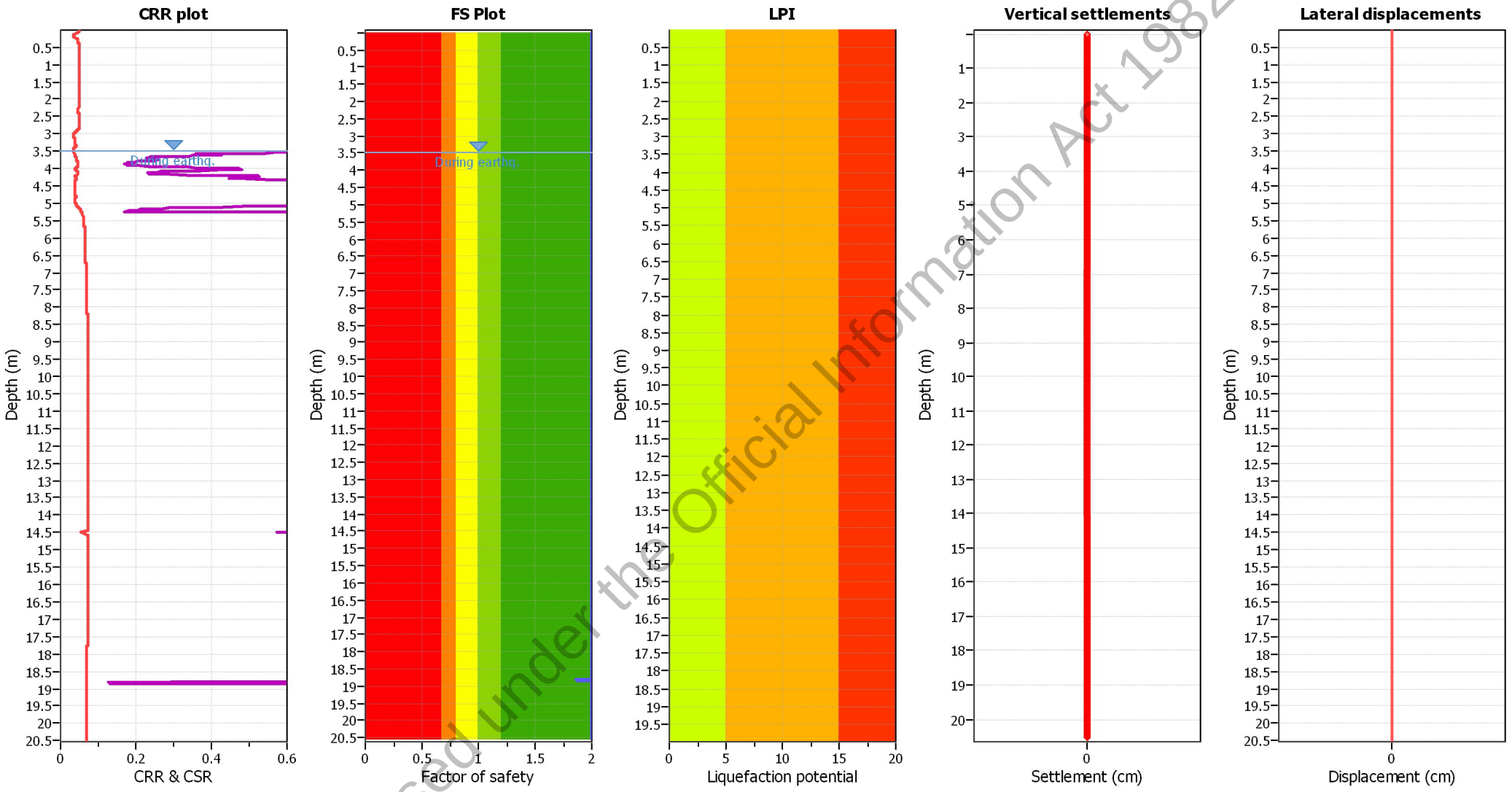
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.09	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.50 m	Fill height:	N/A	Limit depth:	20.00 m

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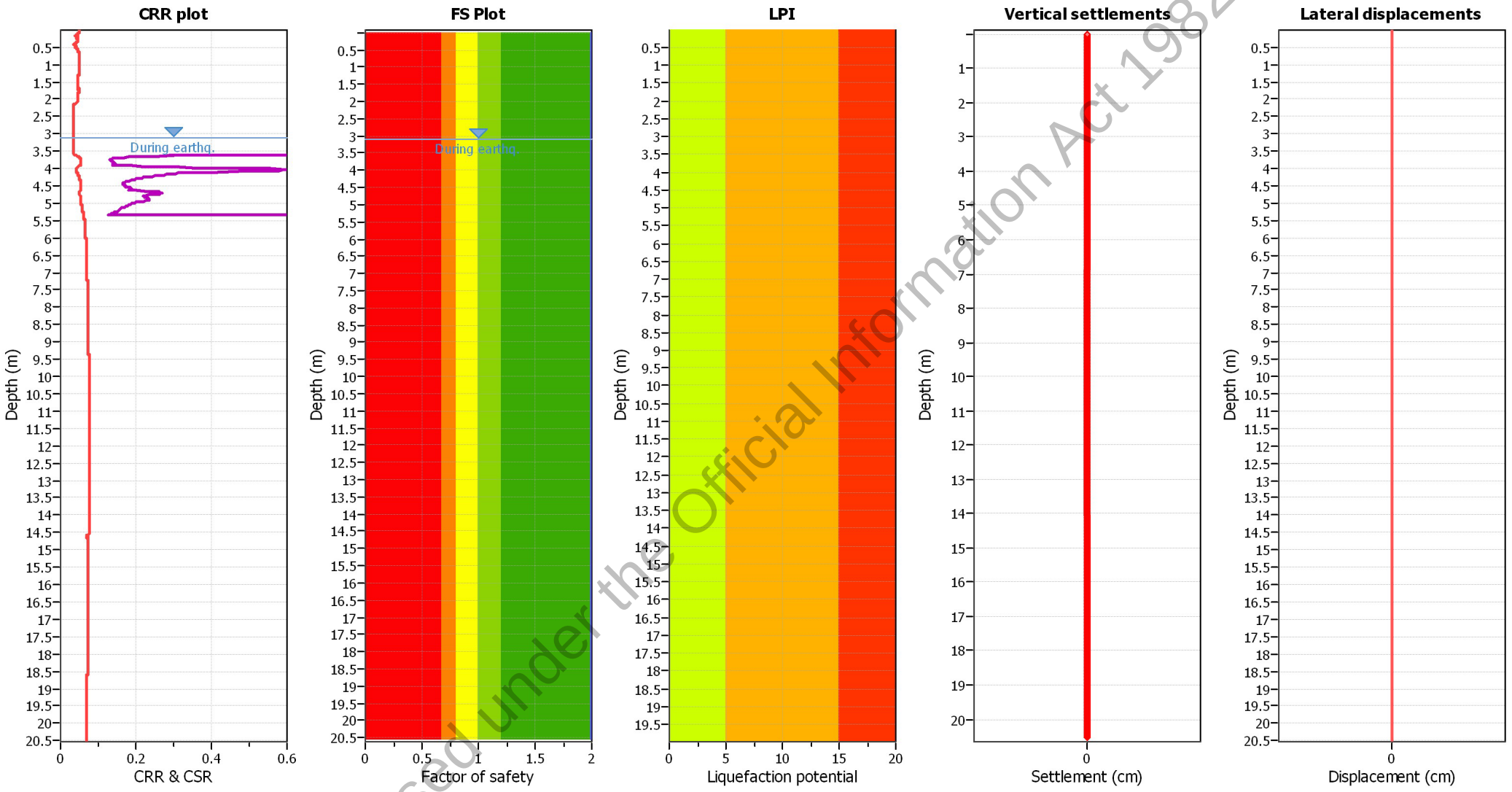

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	3.10 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.09	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	3.10 m	Fill height:	N/A	Limit depth:	20.00 m

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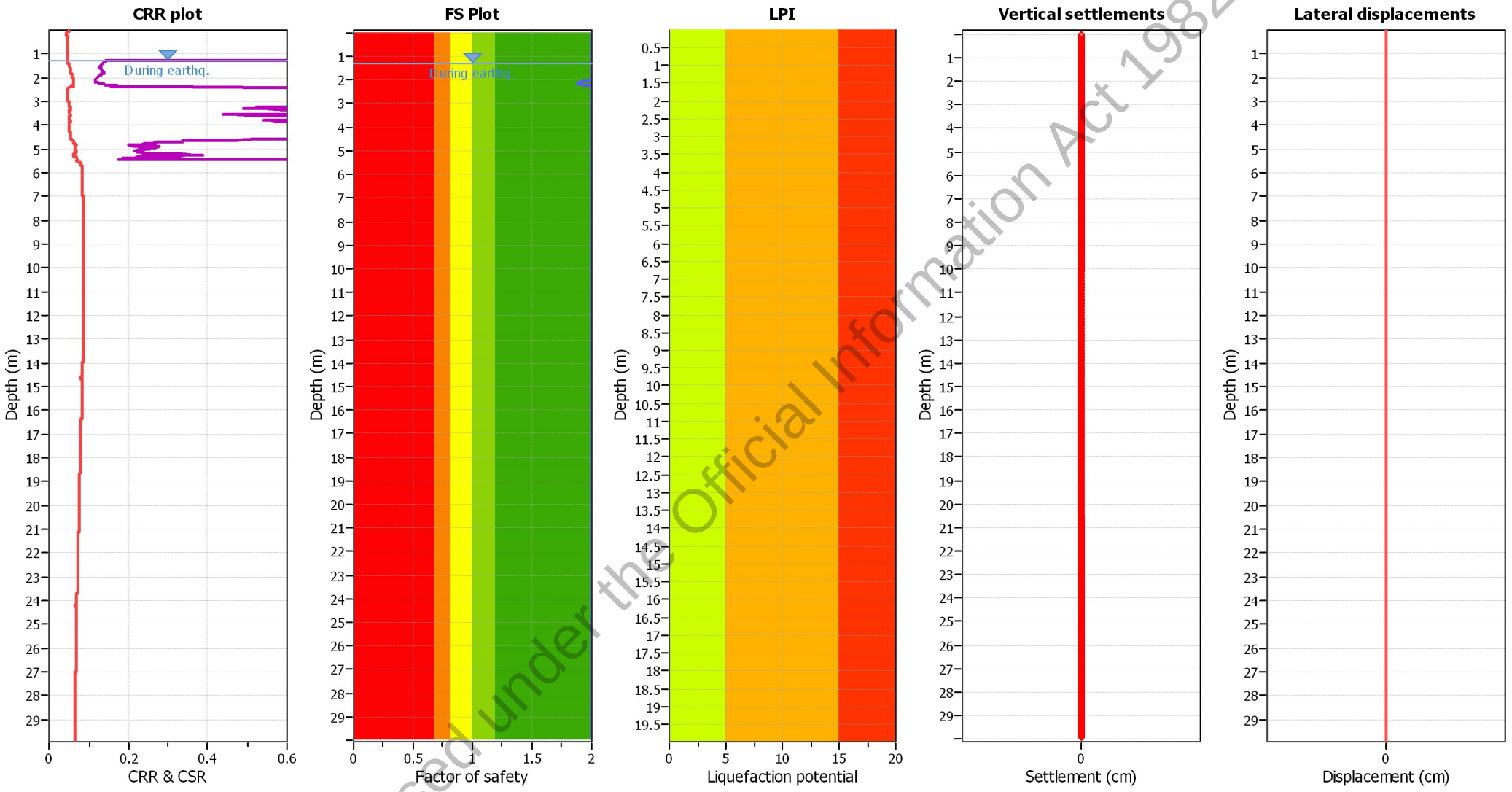
Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.30 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.09	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.30 m	Fill height:	N/A	Limit depth:	20.00 m

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