

## APPENDIX B – CPT LOGS



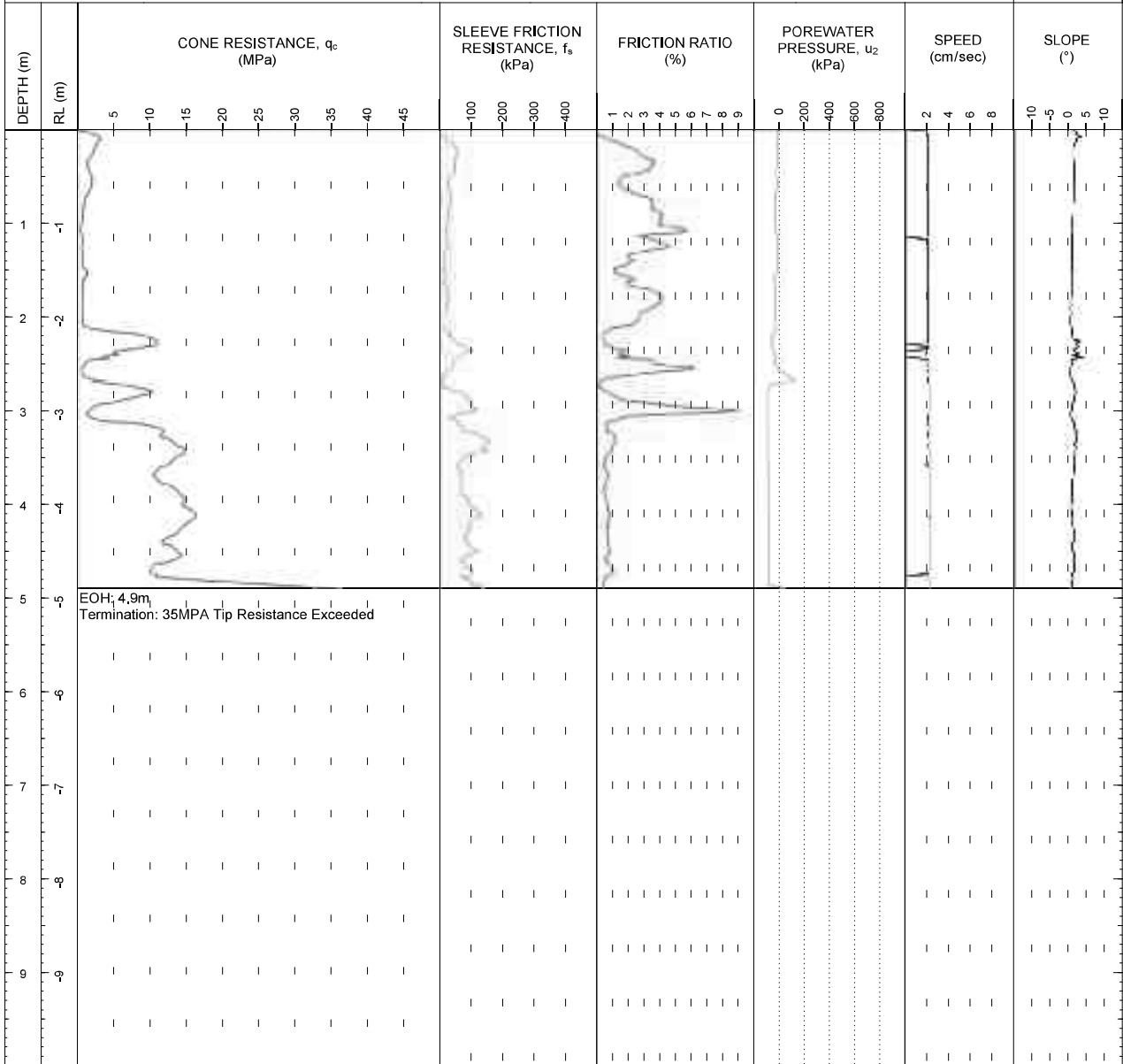
# CONE PENETRATION TEST LOG

**CPT101**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928554.00 NORTHING: 5607964.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 23-08-2018 STATUS: Final data
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CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



<p><b>CONE INFORMATION</b></p> <p>CONE ID: 4447      CONE TYPE: -</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 35%; text-align: center;">INITIAL</td> <td style="width: 35%; text-align: center;">FINAL</td> </tr> <tr> <td>CONE RESISTANCE:</td> <td style="text-align: center;">7.638</td> <td style="text-align: center;">-0.0053</td> </tr> <tr> <td>SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">123.9</td> <td style="text-align: center;">0</td> </tr> <tr> <td>POREWATER PRESSURE:</td> <td style="text-align: center;">237.3</td> <td style="text-align: center;">-0.6</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7.638	-0.0053	SLEEVE FRICTION RESISTANCE:	123.9	0	POREWATER PRESSURE:	237.3	-0.6	<p><b>REMARKS</b></p>   <p><b>SYMBOLS</b></p> <p>▼ Water level</p>
	INITIAL	FINAL											
CONE RESISTANCE:	7.638	-0.0053											
SLEEVE FRICTION RESISTANCE:	123.9	0											
POREWATER PRESSURE:	237.3	-0.6											



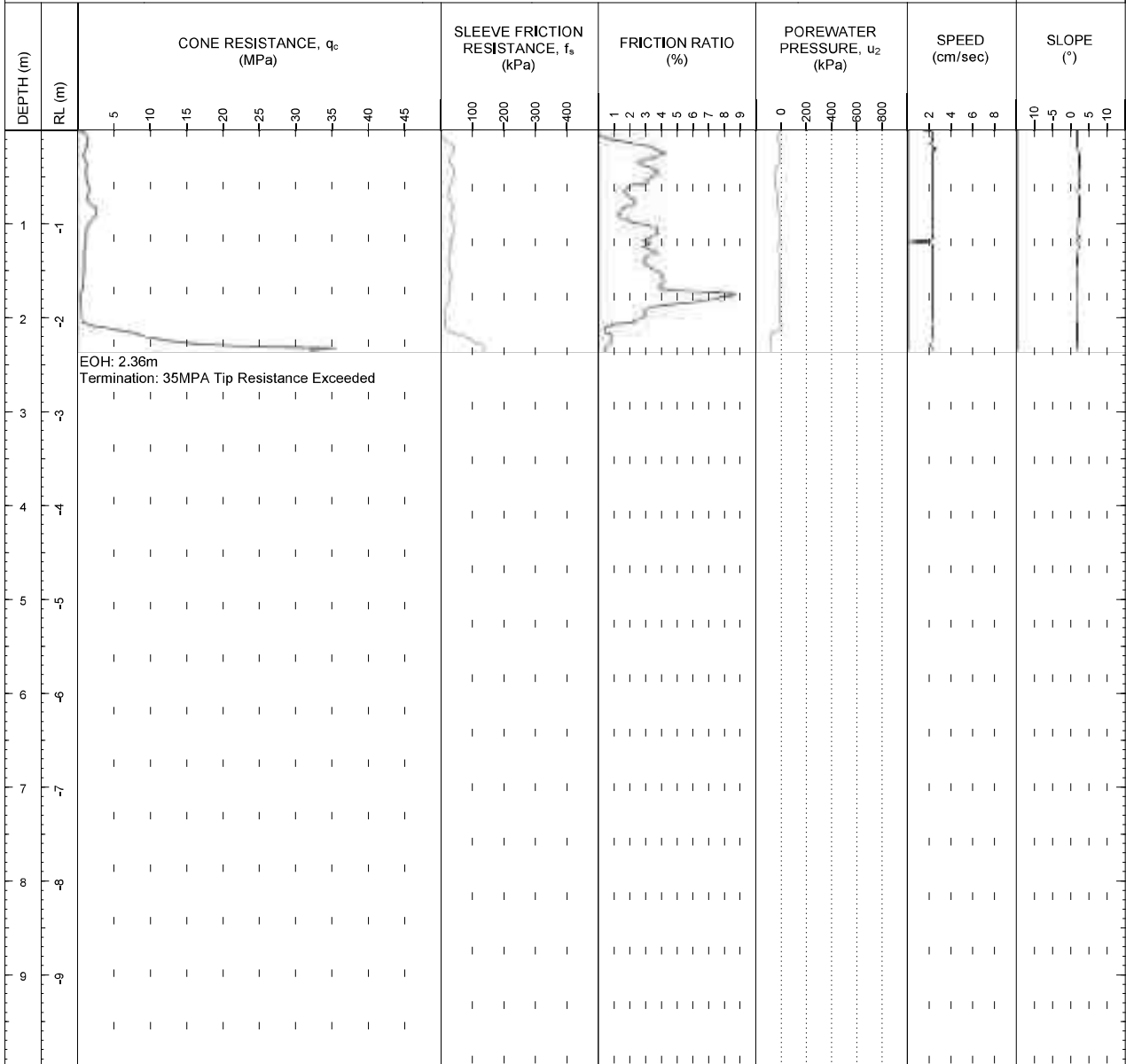
# CONE PENETRATION TEST LOG

**CPT102**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928474.00 NORTHING: 5607953.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 23-08-2018 STATUS: Final data
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CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



<p><b>CONE INFORMATION</b></p> <p>CONE ID: 4447      CONE TYPE: -</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">INITIAL</td> <td style="text-align: center;">FINAL</td> </tr> <tr> <td style="text-align: right;">CONE RESISTANCE:</td> <td style="text-align: center;">7.6534</td> <td style="text-align: center;">0.01</td> </tr> <tr> <td style="text-align: right;">SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">123.6</td> <td style="text-align: center;">0.1</td> </tr> <tr> <td style="text-align: right;">POREWATER PRESSURE:</td> <td style="text-align: center;">237.2</td> <td style="text-align: center;">-0.5</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7.6534	0.01	SLEEVE FRICTION RESISTANCE:	123.6	0.1	POREWATER PRESSURE:	237.2	-0.5	<p><b>REMARKS</b></p>   <p><b>SYMBOLS</b></p> <p>▼ Water level</p>
	INITIAL	FINAL											
CONE RESISTANCE:	7.6534	0.01											
SLEEVE FRICTION RESISTANCE:	123.6	0.1											
POREWATER PRESSURE:	237.2	-0.5											

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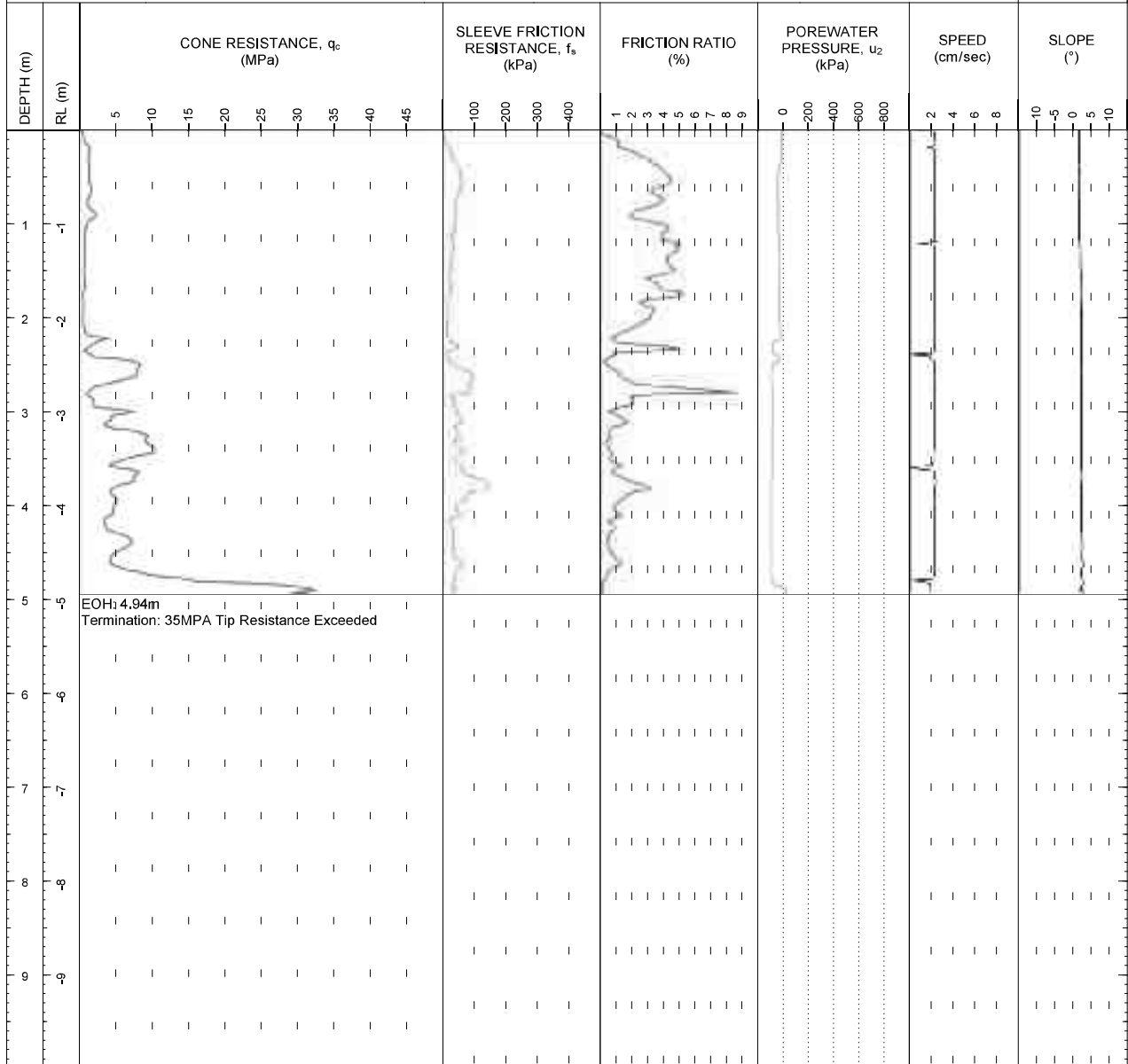
# CONE PENETRATION TEST LOG

**CPT103**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928499.00 NORTHING: 5608029.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 23-08-2018 STATUS: Final data
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CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



EOH: 4.94m  
Termination: 35MPa Tip Resistance Exceeded

<b>CONE INFORMATION</b> CONE ID: 4447      CONE TYPE: -  <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 30%; text-align: center;">INITIAL</td> <td style="width: 30%; text-align: center;">FINAL</td> </tr> <tr> <td>CONE RESISTANCE:</td> <td style="text-align: center;">7.6711</td> <td style="text-align: center;">0</td> </tr> <tr> <td>SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">123.7</td> <td style="text-align: center;">0</td> </tr> <tr> <td>POREWATER PRESSURE:</td> <td style="text-align: center;">237.6</td> <td style="text-align: center;">0</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7.6711	0	SLEEVE FRICTION RESISTANCE:	123.7	0	POREWATER PRESSURE:	237.6	0	<b>REMARKS</b>   <b>SYMBOLS</b> ▼ Water level
	INITIAL	FINAL											
CONE RESISTANCE:	7.6711	0											
SLEEVE FRICTION RESISTANCE:	123.7	0											
POREWATER PRESSURE:	237.6	0											





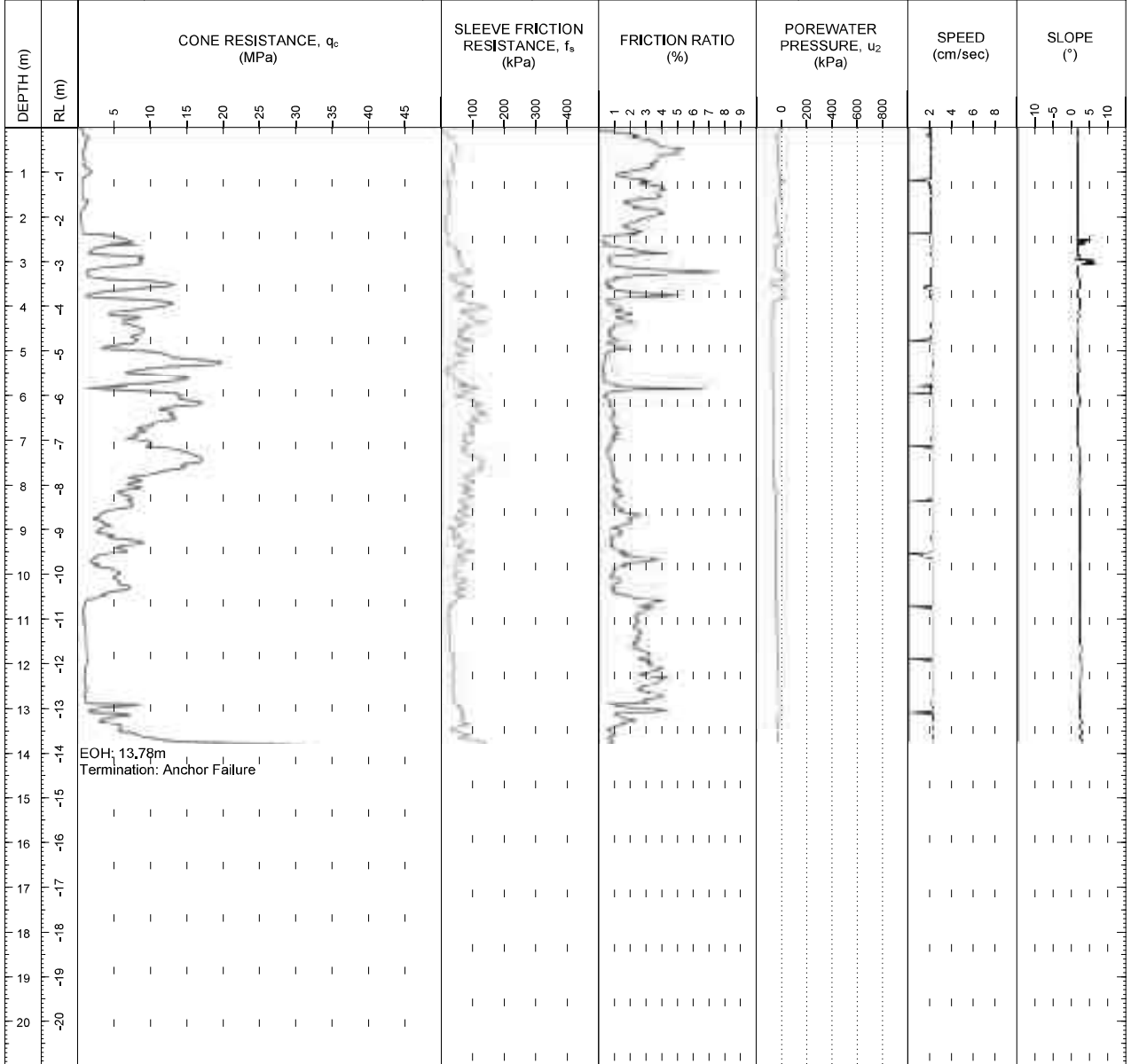
# CONE PENETRATION TEST LOG

**CPT104**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928398.00 NORTHING: 5607946.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 23-08-2018 STATUS: Final data
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CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



<b>CONE INFORMATION</b> CONE ID: 4447      CONE TYPE: -  <table style="width: 100%;"> <tr> <td style="width: 30%;">CONE RESISTANCE:</td> <td style="width: 30%;">INITIAL: 7.6776</td> <td style="width: 30%;">FINAL: -0.0804</td> </tr> <tr> <td>SLEEVE FRICTION RESISTANCE:</td> <td>123.3</td> <td>0.3</td> </tr> <tr> <td>POREWATER PRESSURE:</td> <td>239</td> <td>-2.4</td> </tr> </table>	CONE RESISTANCE:	INITIAL: 7.6776	FINAL: -0.0804	SLEEVE FRICTION RESISTANCE:	123.3	0.3	POREWATER PRESSURE:	239	-2.4	<b>REMARKS</b>  <b>SYMBOLS</b> ▼ Water level
CONE RESISTANCE:	INITIAL: 7.6776	FINAL: -0.0804								
SLEEVE FRICTION RESISTANCE:	123.3	0.3								
POREWATER PRESSURE:	239	-2.4								

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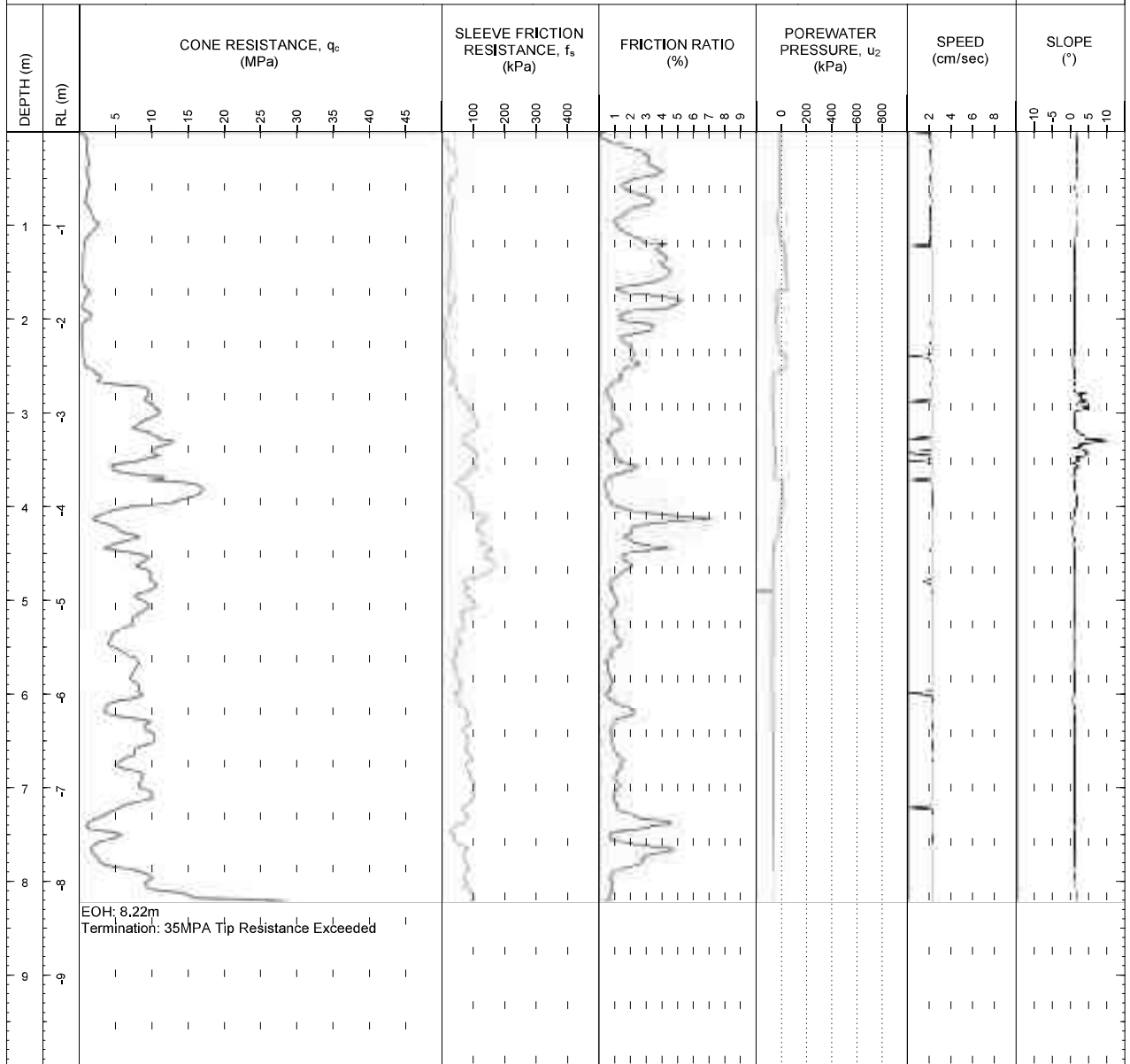
# CONE PENETRATION TEST LOG

**CPT105**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928420.00 NORTHING: 5607882.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 23-08-2018 STATUS: Final data
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CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



<b>CONE INFORMATION</b> CONE ID: 4447      CONE TYPE: -  <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 35%; text-align: center;">INITIAL</td> <td style="width: 35%; text-align: center;">FINAL</td> </tr> <tr> <td style="text-align: right;">CONE RESISTANCE:</td> <td style="text-align: center;">7.6758</td> <td style="text-align: center;">-0.0437</td> </tr> <tr> <td style="text-align: right;">SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">123.4</td> <td style="text-align: center;">0.2</td> </tr> <tr> <td style="text-align: right;">POREWATER PRESSURE:</td> <td style="text-align: center;">238.7</td> <td style="text-align: center;">0.6</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7.6758	-0.0437	SLEEVE FRICTION RESISTANCE:	123.4	0.2	POREWATER PRESSURE:	238.7	0.6	<b>REMARKS</b>  <hr/> <b>SYMBOLS</b> ▼ Water level
	INITIAL	FINAL											
CONE RESISTANCE:	7.6758	-0.0437											
SLEEVE FRICTION RESISTANCE:	123.4	0.2											
POREWATER PRESSURE:	238.7	0.6											

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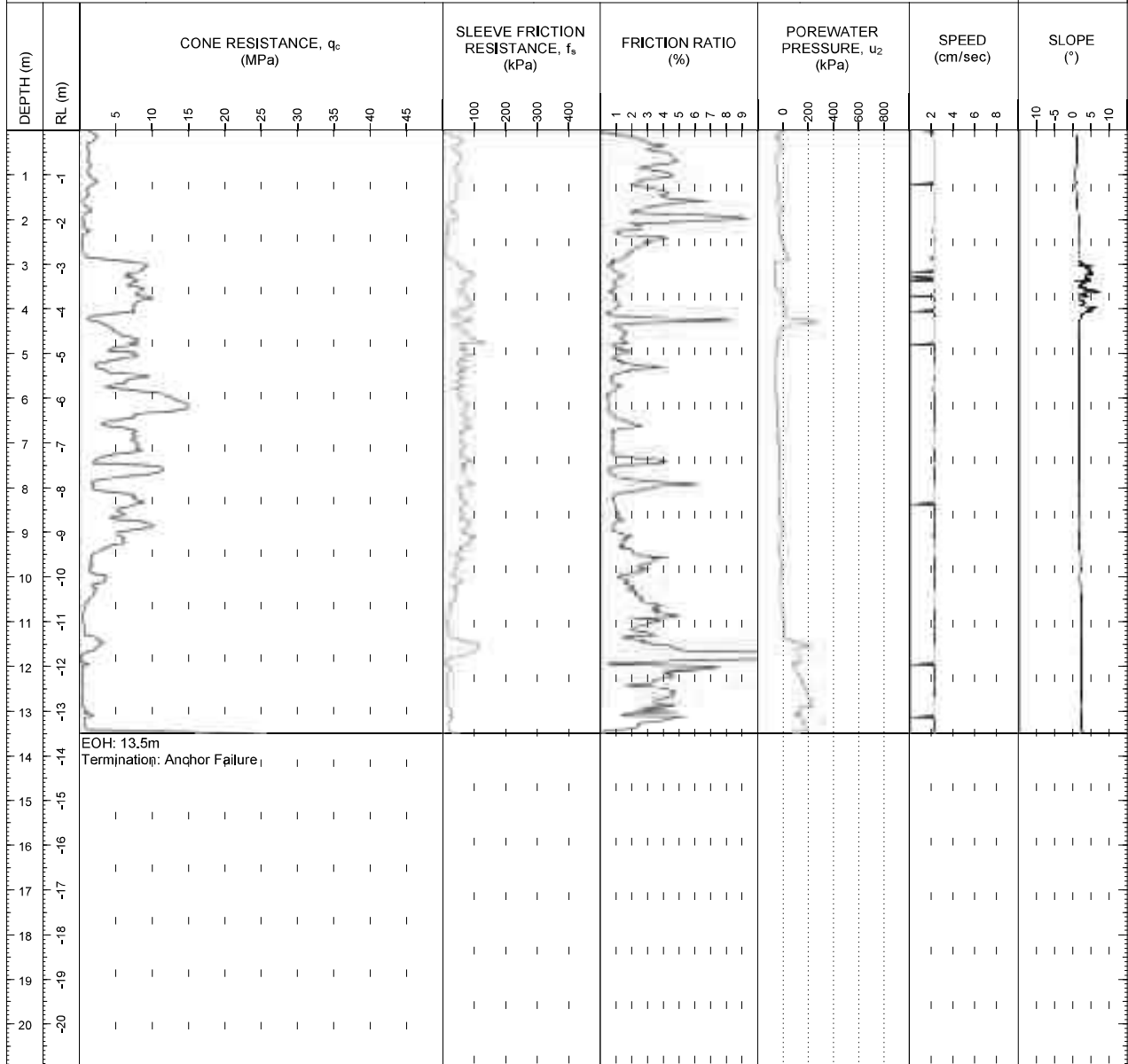
# CONE PENETRATION TEST LOG

**CPT106**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928429.00 NORTHING: 5607791.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 23-08-2018 STATUS: Final data
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CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



EOH: 13.5m  
Termination: Anchor Failure<sub>1</sub>

<b>CONE INFORMATION</b> CONE ID: 4447      CONE TYPE: -  <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 30%; text-align: center;">INITIAL</td> <td style="width: 30%; text-align: center;">FINAL</td> </tr> <tr> <td>CONE RESISTANCE:</td> <td style="text-align: center;">7.6628</td> <td style="text-align: center;">-0.0136</td> </tr> <tr> <td>SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">123.4</td> <td style="text-align: center;">0.1</td> </tr> <tr> <td>POREWATER PRESSURE:</td> <td style="text-align: center;">239</td> <td style="text-align: center;">-2.5</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7.6628	-0.0136	SLEEVE FRICTION RESISTANCE:	123.4	0.1	POREWATER PRESSURE:	239	-2.5	<b>REMARKS</b>  <hr/> <b>SYMBOLS</b> ▼ Water level
	INITIAL	FINAL											
CONE RESISTANCE:	7.6628	-0.0136											
SLEEVE FRICTION RESISTANCE:	123.4	0.1											
POREWATER PRESSURE:	239	-2.5											



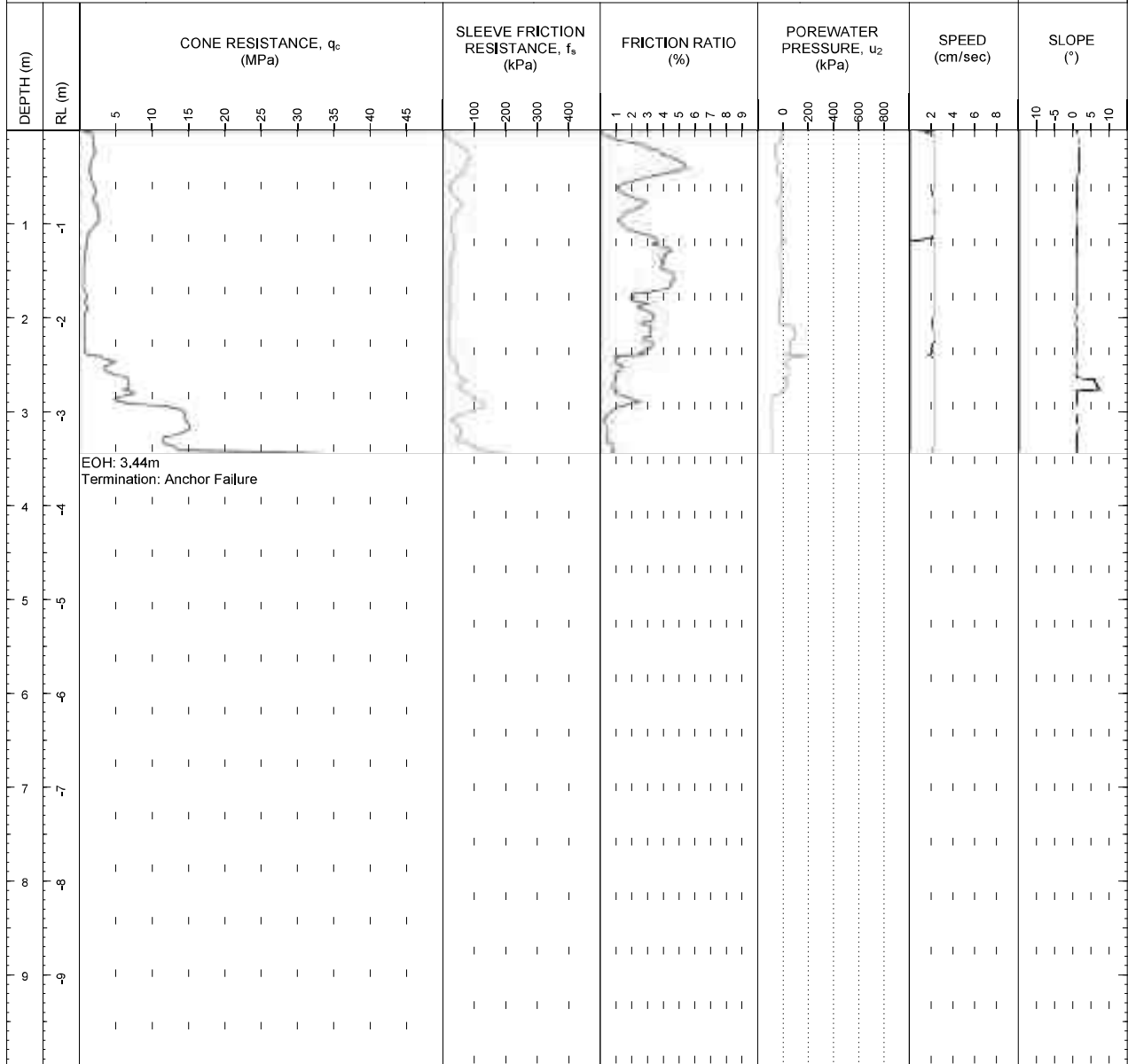
# CONE PENETRATION TEST LOG

**CPT107**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928531.00 NORTHING: 5607871.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 23-08-2018 STATUS: Final data
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CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



<p><b>CONE INFORMATION</b></p> <p>CONE ID: 4447      CONE TYPE: -</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 30%; text-align: center;">INITIAL</td> <td style="width: 30%; text-align: center;">FINAL</td> </tr> <tr> <td>CONE RESISTANCE:</td> <td style="text-align: center;">7.6646</td> <td style="text-align: center;">-0.0266</td> </tr> <tr> <td>SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">123.5</td> <td style="text-align: center;">0.2</td> </tr> <tr> <td>POREWATER PRESSURE:</td> <td style="text-align: center;">238.4</td> <td style="text-align: center;">-1.5</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7.6646	-0.0266	SLEEVE FRICTION RESISTANCE:	123.5	0.2	POREWATER PRESSURE:	238.4	-1.5	<p><b>REMARKS</b></p> <hr/> <p><b>SYMBOLS</b></p> <p>▼ Water level</p>
	INITIAL	FINAL											
CONE RESISTANCE:	7.6646	-0.0266											
SLEEVE FRICTION RESISTANCE:	123.5	0.2											
POREWATER PRESSURE:	238.4	-1.5											

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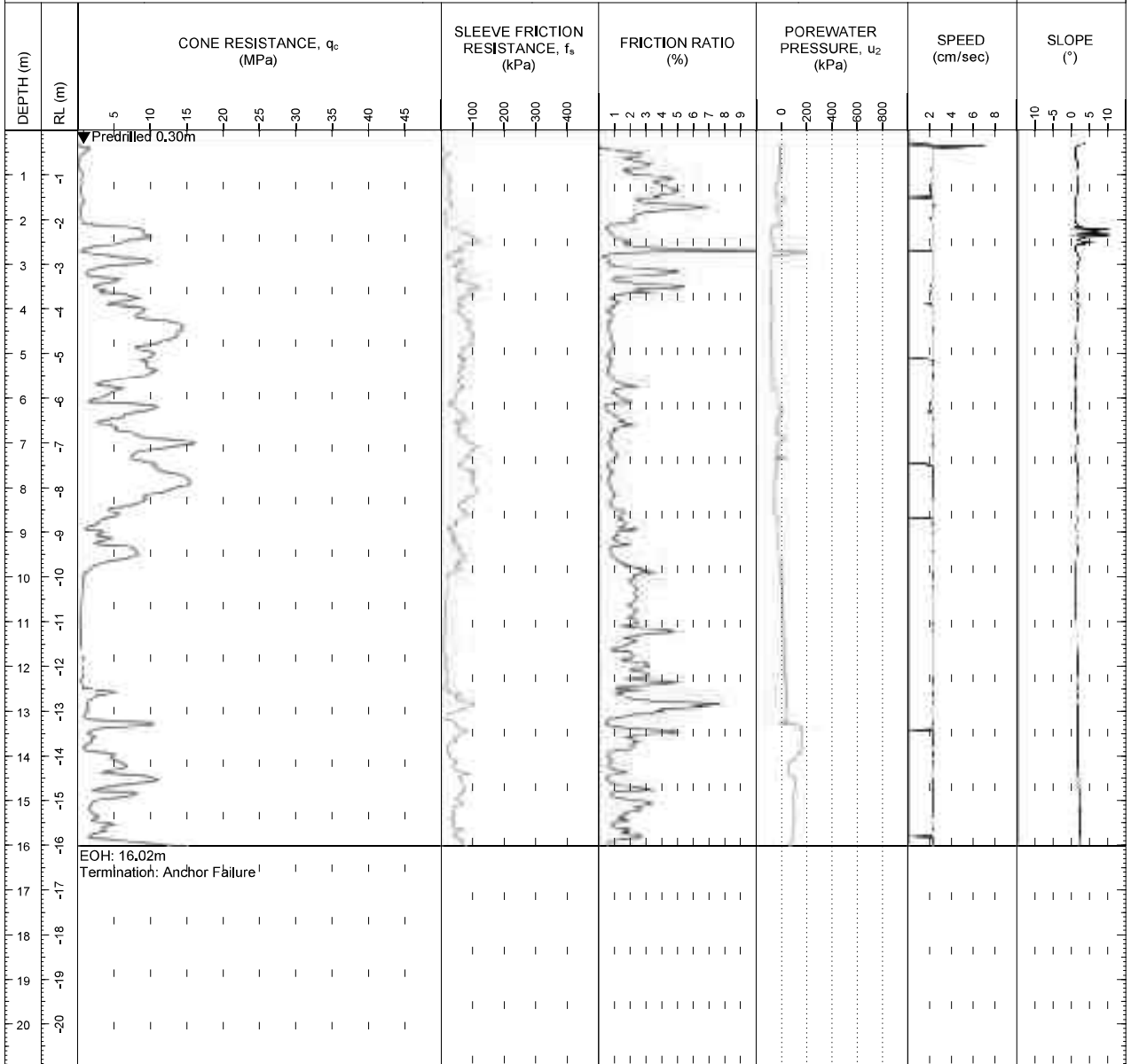
# CONE PENETRATION TEST LOG

**CPT108**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928610.00 NORTHING: 5607922.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 23-08-2018 STATUS: Final data
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CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



<b>CONE INFORMATION</b> CONE ID: 4447      CONE TYPE: -  <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 30%; text-align: center;">INITIAL</td> <td style="width: 30%; text-align: center;">FINAL</td> </tr> <tr> <td>CONE RESISTANCE:</td> <td style="text-align: center;">7.654</td> <td style="text-align: center;">-0.042</td> </tr> <tr> <td>SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">123.6</td> <td style="text-align: center;">0.2</td> </tr> <tr> <td>POREWATER PRESSURE:</td> <td style="text-align: center;">238.6</td> <td style="text-align: center;">-0.4</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7.654	-0.042	SLEEVE FRICTION RESISTANCE:	123.6	0.2	POREWATER PRESSURE:	238.6	-0.4	<b>REMARKS</b>  <b>SYMBOLS</b> ▼ Water level
	INITIAL	FINAL											
CONE RESISTANCE:	7.654	-0.042											
SLEEVE FRICTION RESISTANCE:	123.6	0.2											
POREWATER PRESSURE:	238.6	-0.4											

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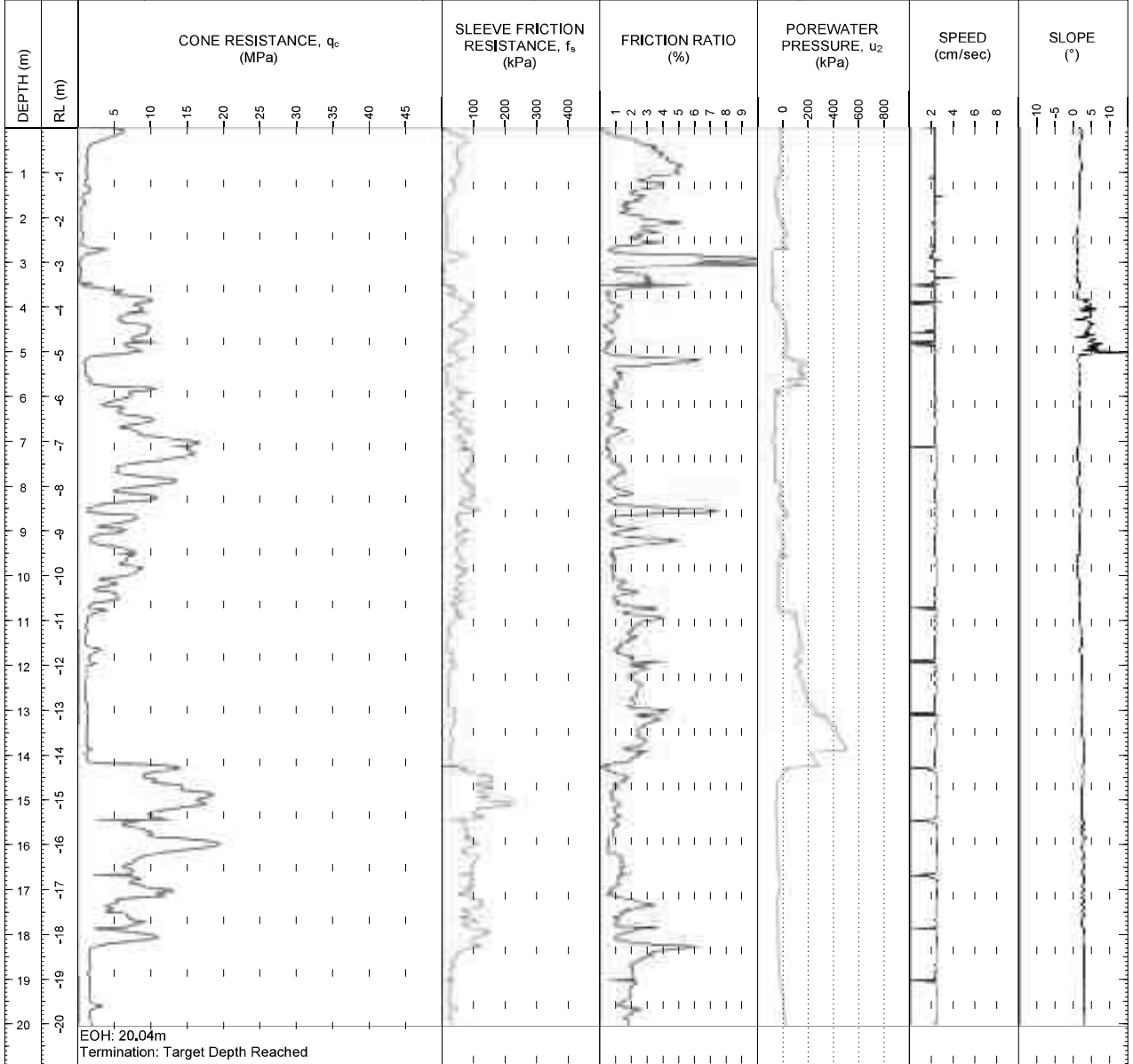
# CONE PENETRATION TEST LOG

**CPT109**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928427.00 NORTHING: 5607698.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 23-08-2018 STATUS: Final data
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CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



<b>CONE INFORMATION</b> CONE ID: 4447      CONE TYPE: -  <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 35%; text-align: center;">INITIAL</td> <td style="width: 35%; text-align: center;">FINAL</td> </tr> <tr> <td style="text-align: center;">CONE RESISTANCE:</td> <td style="text-align: center;">7.6812</td> <td style="text-align: center;">-0.0296</td> </tr> <tr> <td style="text-align: center;">SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">123.2</td> <td style="text-align: center;">0.2</td> </tr> <tr> <td style="text-align: center;">POREWATER PRESSURE:</td> <td style="text-align: center;">237.9</td> <td style="text-align: center;">-0.3</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7.6812	-0.0296	SLEEVE FRICTION RESISTANCE:	123.2	0.2	POREWATER PRESSURE:	237.9	-0.3	<b>REMARKS</b>  <b>SYMBOLS</b> ▼ Water level
	INITIAL	FINAL											
CONE RESISTANCE:	7.6812	-0.0296											
SLEEVE FRICTION RESISTANCE:	123.2	0.2											
POREWATER PRESSURE:	237.9	-0.3											

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# CONE PENETRATION TEST LOG

**CPT110**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd  
 PROJECT: 183970602  
 LOCATION: Lyndhurst Road, Frimley, Hastings  
 OFFICE: RDCL - Hastings

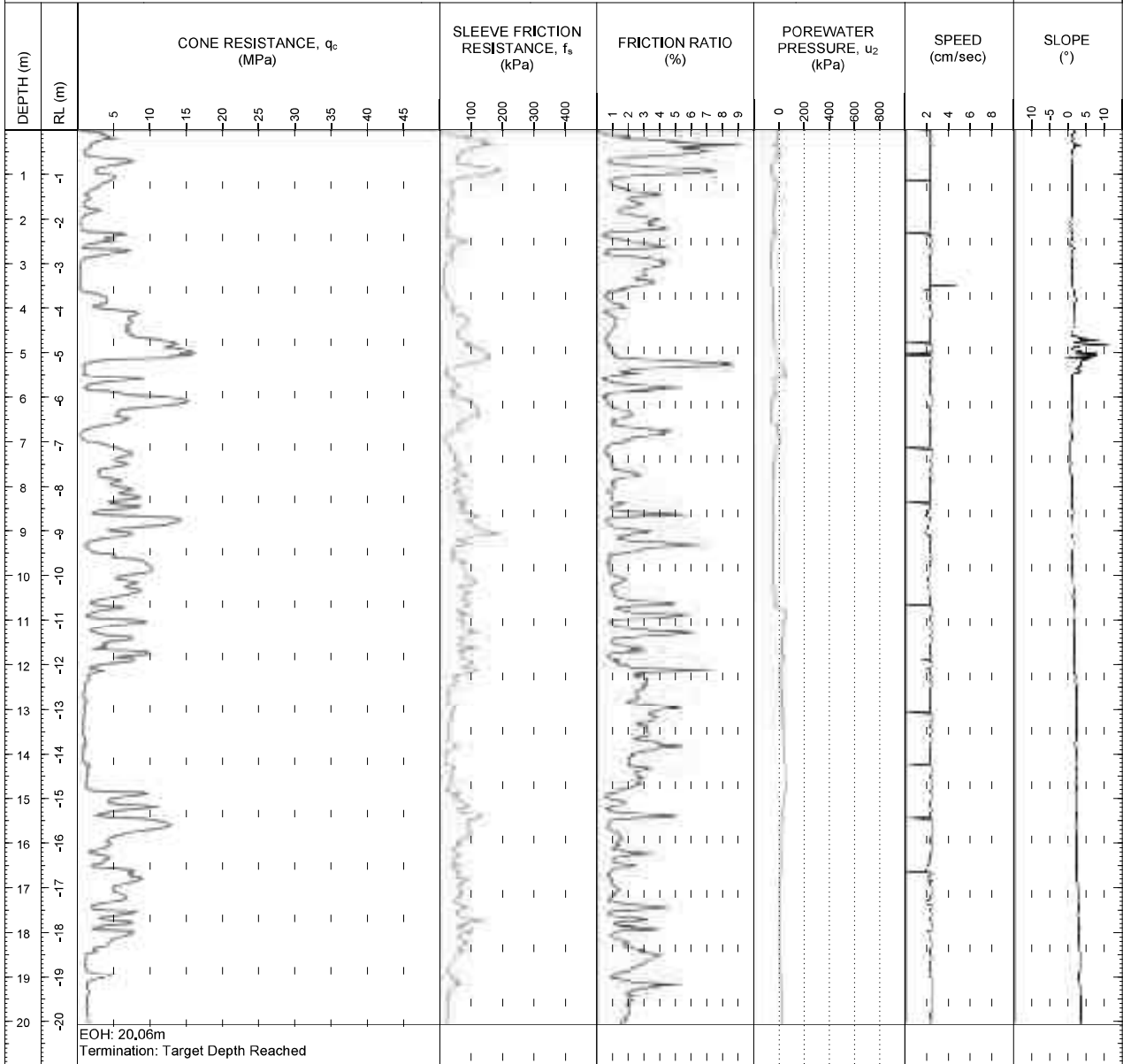
PROJECTION: NZTM2000  
 EASTING: 1928356.00  
 NORTHING: 5607714.00  
 ELEVATION: -  
 DATUM: -

SUB-LOCATION:  
 LOGGED ON: 23-Aug-18 12:00:00 AM  
 PREPARED BY: TS      DATE: 23-08-2018  
 CHECKED BY: TS      DATE: 23-08-2018  
 STATUS: Final data

CONTRACTOR: RDCL

MACHINE: Geoprobe 54LT

OPERATOR: TS



CONE INFORMATION		
CONE ID: 4447	CONE TYPE: -	
	INITIAL	FINAL
CONE RESISTANCE:	7,6681	-0,0289
SLEEVE FRICTION RESISTANCE:	123,1	0,3
POREWATER PRESSURE:	237,5	0,1

REMARKS

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SYMBOLS

▼ Water level



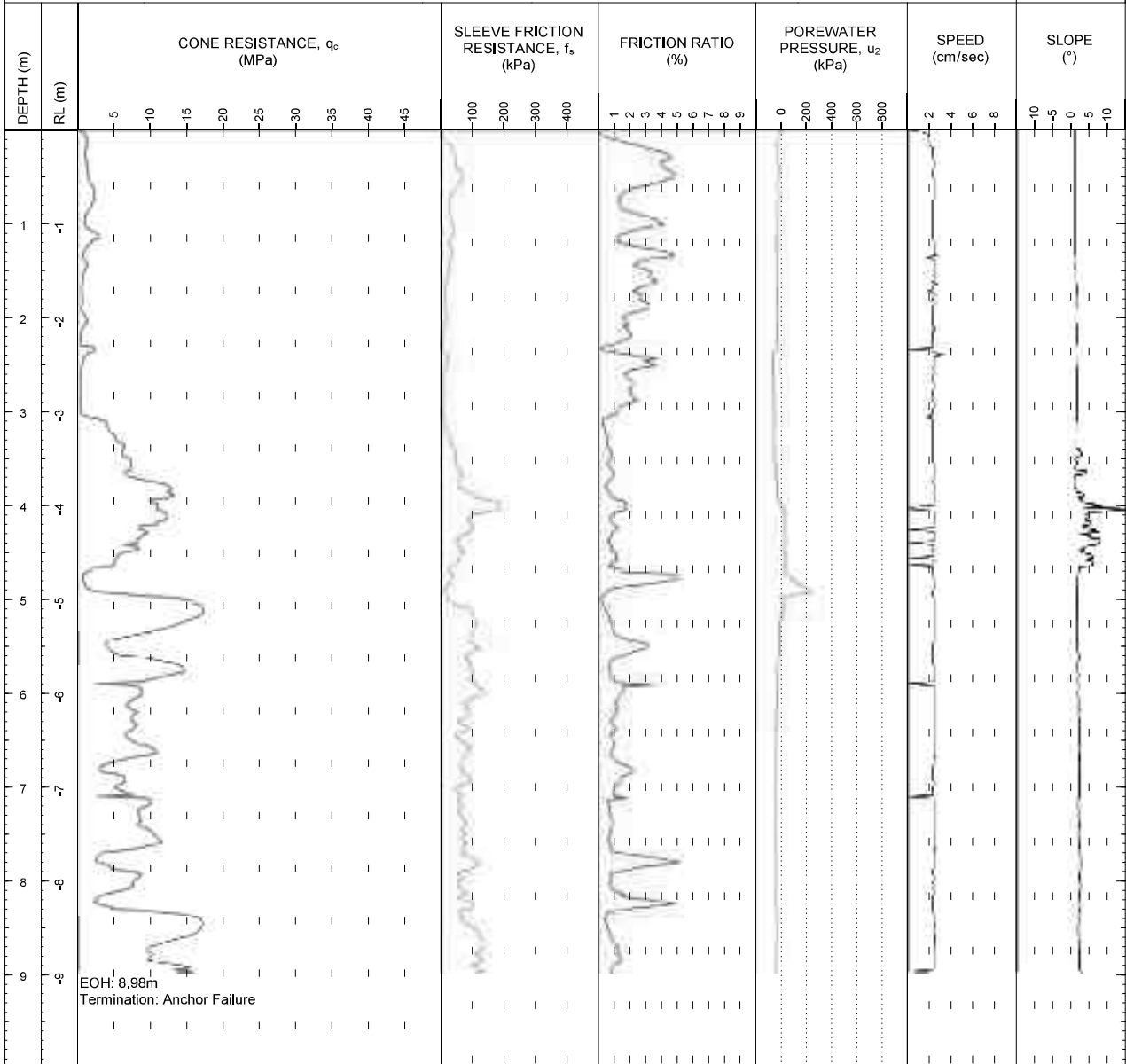
# CONE PENETRATION TEST LOG

CPT111

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd	PROJECTION: NZTM2000	SUB-LOCATION:
PROJECT: 183970602	EASTING: 1928314.00	LOGGED ON: 23-Aug-18 12:00:00 AM
LOCATION: Lyndhurst Road, Frimley, Hastings	NORTHING: 5607786.00	PREPARED BY: TS DATE: 23-08-2018
OFFICE: RDCL - Hastings	ELEVATION: -	CHECKED BY: TS DATE: 23-02-2018
	DATUM: -	STATUS: Final data

CONTRACTOR: RDCL MACHINE: Geoprobe 54LT OPERATOR: TS



CONE INFORMATION			REMARKS
CONE ID: 4447	CONE TYPE: -		
	INITIAL	FINAL	SYMBOLS ▼ Water level
CONE RESISTANCE:	7.6616	-0.0325	
SLEEVE FRICTION RESISTANCE:	123.6	0	
POREWATER PRESSURE:	238.6	-1.1	

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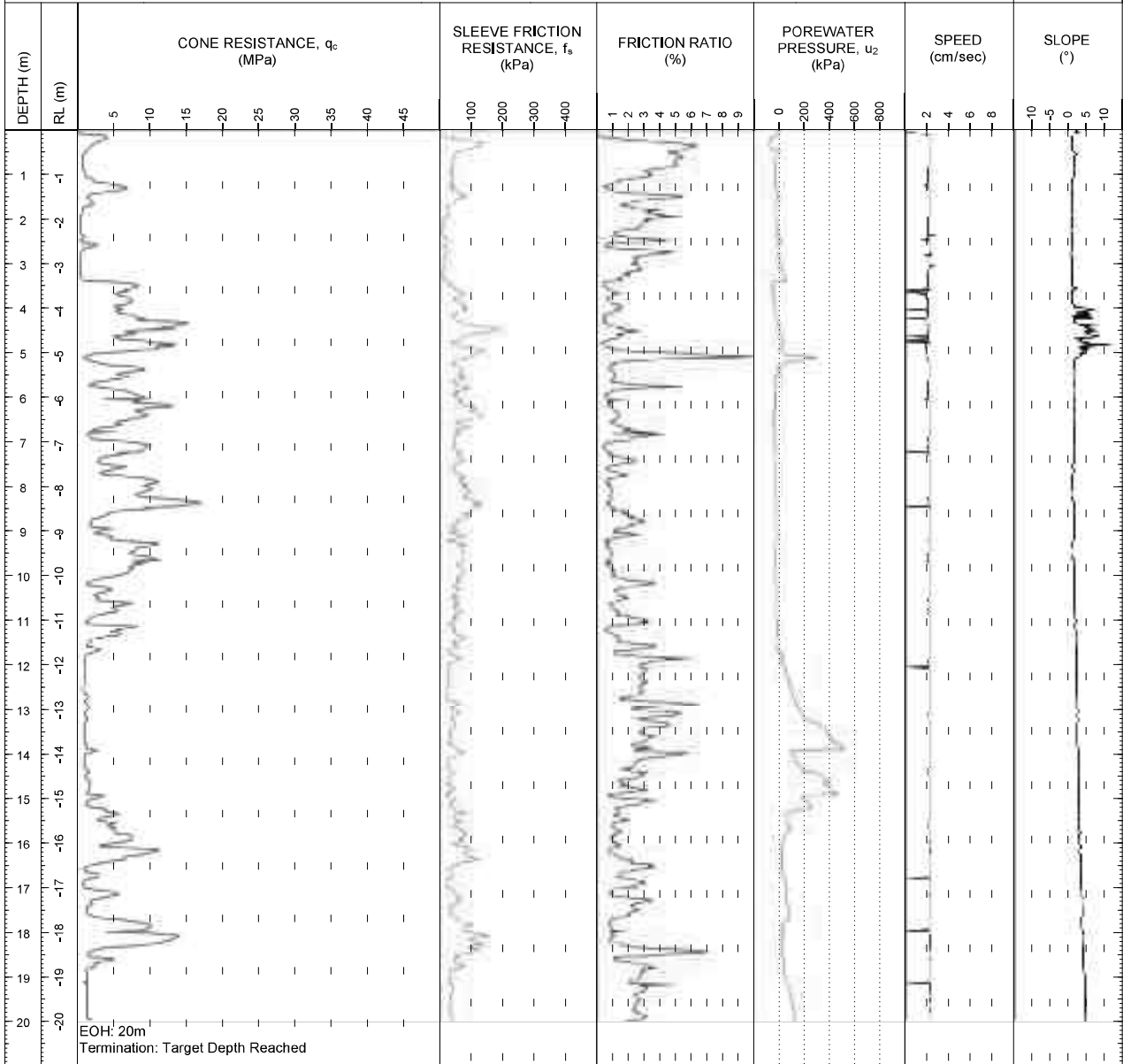
# CONE PENETRATION TEST LOG

**CPT112**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928264.00 NORTHING: 5607839.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 23-08-2018 STATUS: Final data
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CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



<p><b>CONE INFORMATION</b></p> <p>CONE ID: 4447      CONE TYPE: -</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 30%; text-align: center;">INITIAL</td> <td style="width: 30%; text-align: center;">FINAL</td> </tr> <tr> <td>CONE RESISTANCE:</td> <td style="text-align: center;">7,6368</td> <td style="text-align: center;">-0,0526</td> </tr> <tr> <td>SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">123,6</td> <td style="text-align: center;">0,1</td> </tr> <tr> <td>POREWATER PRESSURE:</td> <td style="text-align: center;">238,3</td> <td style="text-align: center;">-1,3</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7,6368	-0,0526	SLEEVE FRICTION RESISTANCE:	123,6	0,1	POREWATER PRESSURE:	238,3	-1,3	<p><b>REMARKS</b></p> <hr/> <p><b>SYMBOLS</b></p> <p>▼ Water level</p>
	INITIAL	FINAL											
CONE RESISTANCE:	7,6368	-0,0526											
SLEEVE FRICTION RESISTANCE:	123,6	0,1											
POREWATER PRESSURE:	238,3	-1,3											

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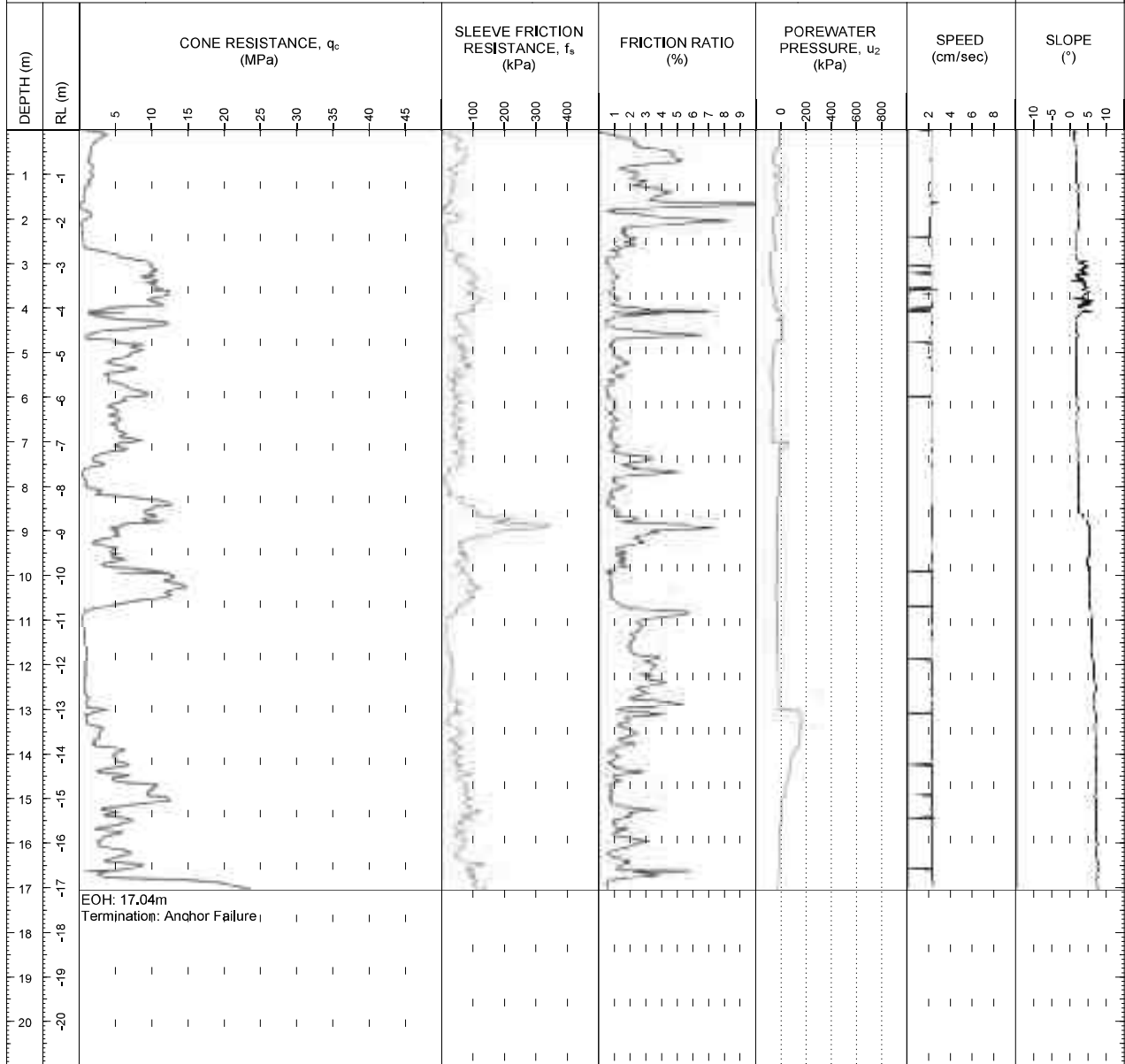
# CONE PENETRATION TEST LOG

**CPT113**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928346.00 NORTHING: 5607875.00 ELEVATION: - DATUM: -	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: TS      DATE: 23-08-2018 CHECKED BY: TS      DATE: 24-08-2018 STATUS: Final data
--	---	--

CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: TS



EOH: 17.04m  
Termination: Anchor Failure

<b>CONE INFORMATION</b>  CONE ID: 4447      CONE TYPE: -  <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 30%; text-align: center;">INITIAL</td> <td style="width: 30%; text-align: center;">FINAL</td> </tr> <tr> <td>CONE RESISTANCE:</td> <td style="text-align: center;">7,6865</td> <td style="text-align: center;">-0,0355</td> </tr> <tr> <td>SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">123.1</td> <td style="text-align: center;">0.3</td> </tr> <tr> <td>POREWATER PRESSURE:</td> <td style="text-align: center;">239</td> <td style="text-align: center;">-1,9</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7,6865	-0,0355	SLEEVE FRICTION RESISTANCE:	123.1	0.3	POREWATER PRESSURE:	239	-1,9	<b>REMARKS</b>   <b>SYMBOLS</b> ▼ Water level
	INITIAL	FINAL											
CONE RESISTANCE:	7,6865	-0,0355											
SLEEVE FRICTION RESISTANCE:	123.1	0.3											
POREWATER PRESSURE:	239	-1,9											

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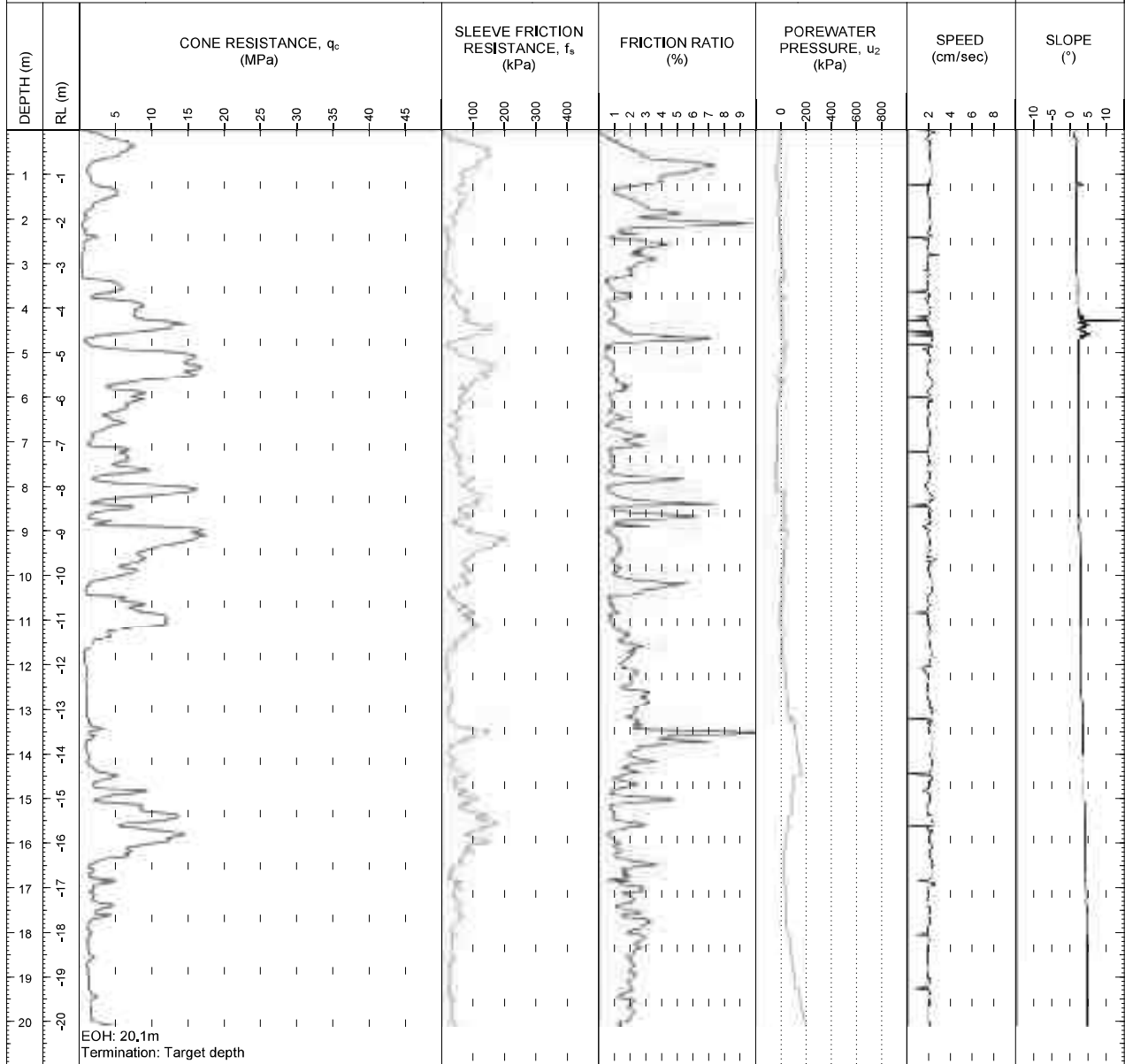
# CONE PENETRATION TEST LOG

**CPT202**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928435.00 NORTHING: 5607734.00 ELEVATION: 0,00 DATUM:	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: BR      DATE: 23-08-2018 CHECKED BY:          DATE: STATUS: Draft data
--	--	--

CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: BR



<b>CONE INFORMATION</b> CONE ID: 4447      CONE TYPE: -  <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 30%; text-align: center;">INITIAL</td> <td style="width: 30%; text-align: center;">FINAL</td> </tr> <tr> <td style="text-align: center;">CONE RESISTANCE:</td> <td style="text-align: center;">7,8748</td> <td style="text-align: center;">0,009</td> </tr> <tr> <td style="text-align: center;">SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">118,2</td> <td style="text-align: center;">0,2</td> </tr> <tr> <td style="text-align: center;">POREWATER PRESSURE:</td> <td style="text-align: center;">232,6</td> <td style="text-align: center;">0,6</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7,8748	0,009	SLEEVE FRICTION RESISTANCE:	118,2	0,2	POREWATER PRESSURE:	232,6	0,6	<b>REMARKS</b>   <b>SYMBOLS</b> ▼ Water level
	INITIAL	FINAL											
CONE RESISTANCE:	7,8748	0,009											
SLEEVE FRICTION RESISTANCE:	118,2	0,2											
POREWATER PRESSURE:	232,6	0,6											

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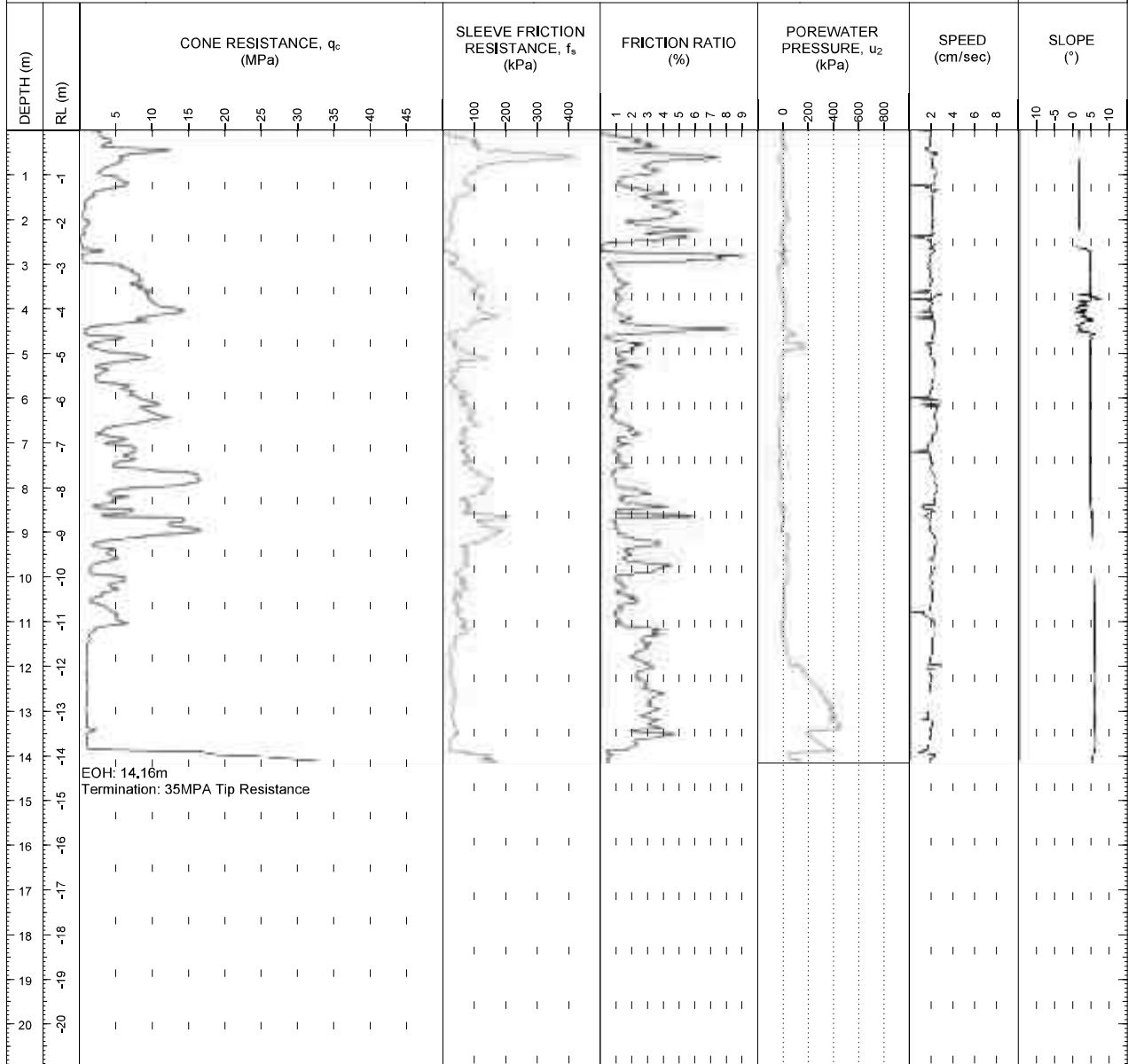
# CONE PENETRATION TEST LOG

**CPT203**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928398.00 NORTHING: 5607785.00 ELEVATION: 0,00 DATUM:	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: BR      DATE: 23-08-2018 CHECKED BY:          DATE: STATUS: Draft data
--	--	--

CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: BR



<p><b>CONE INFORMATION</b></p> <p>CONE ID: 4447      CONE TYPE: -</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">INITIAL</td> <td style="text-align: center;">FINAL</td> </tr> <tr> <td style="text-align: right;">CONE RESISTANCE:</td> <td style="text-align: center;">7,8748</td> <td style="text-align: center;">0,006</td> </tr> <tr> <td style="text-align: right;">SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">117,5</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: right;">POREWATER PRESSURE:</td> <td style="text-align: center;">233,4</td> <td style="text-align: center;">0,2</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7,8748	0,006	SLEEVE FRICTION RESISTANCE:	117,5	0	POREWATER PRESSURE:	233,4	0,2	<p><b>REMARKS</b></p>   <p><b>SYMBOLS</b></p> <p>▼ Water level</p>
	INITIAL	FINAL											
CONE RESISTANCE:	7,8748	0,006											
SLEEVE FRICTION RESISTANCE:	117,5	0											
POREWATER PRESSURE:	233,4	0,2											



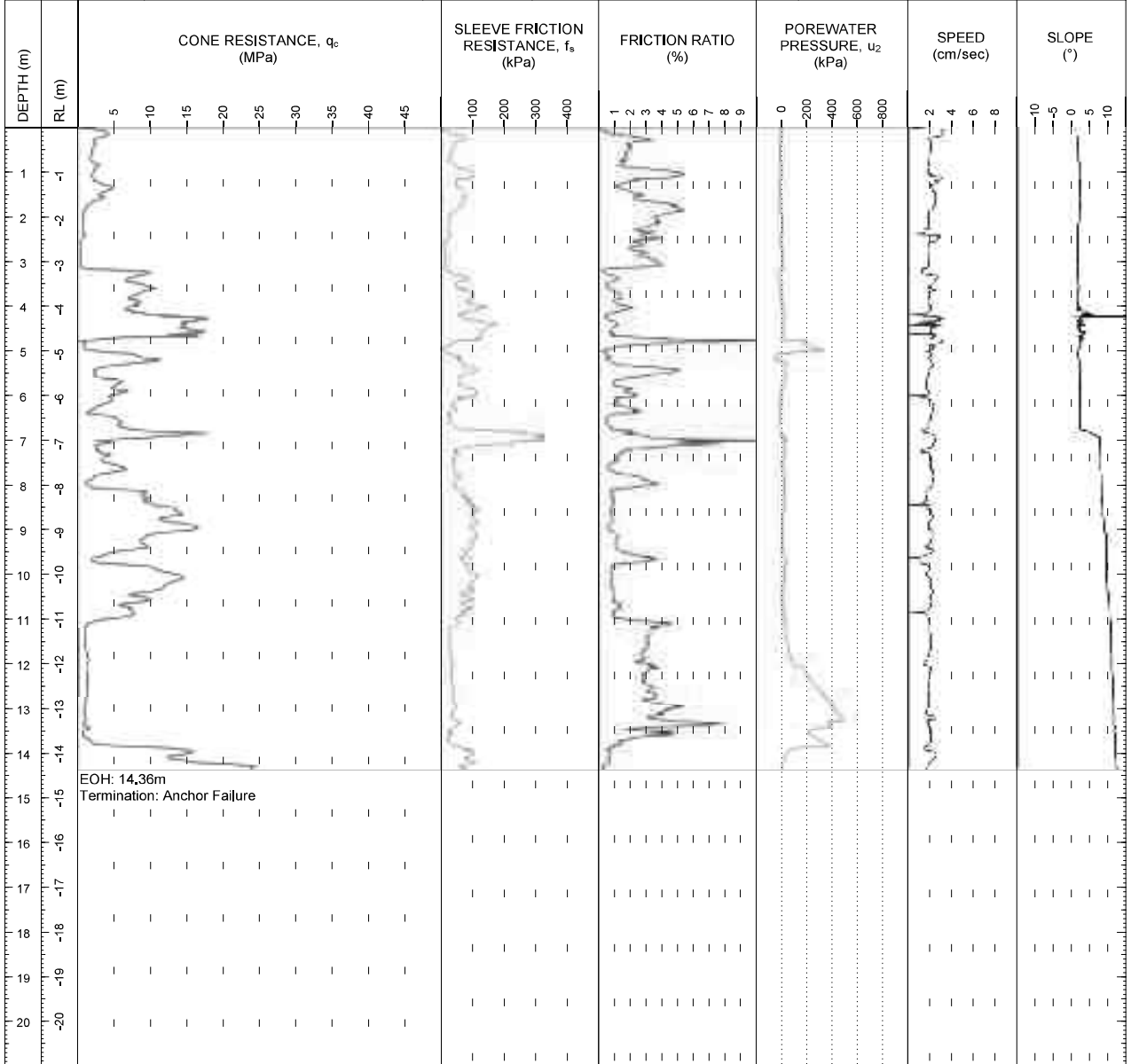
# CONE PENETRATION TEST LOG

**CPT204**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928306.00 NORTHING: 5607881.00 ELEVATION: 0,00 DATUM:	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: BR      DATE: 23-08-2018 CHECKED BY:          DATE: STATUS: Draft data
--	--	--

CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: BR



<p><b>CONE INFORMATION</b></p> <p>CONE ID: 4447      CONE TYPE: -</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">INITIAL</td> <td style="text-align: center;">FINAL</td> </tr> <tr> <td style="text-align: right;">CONE RESISTANCE:</td> <td style="text-align: center;">7.876</td> <td style="text-align: center;">-0.0229</td> </tr> <tr> <td style="text-align: right;">SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">117.6</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: right;">POREWATER PRESSURE:</td> <td style="text-align: center;">234.4</td> <td style="text-align: center;">-1.5</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	7.876	-0.0229	SLEEVE FRICTION RESISTANCE:	117.6	0	POREWATER PRESSURE:	234.4	-1.5	<p><b>REMARKS</b></p> <p> </p> <p><b>SYMBOLS</b></p> <p>▼ Water level</p>
	INITIAL	FINAL											
CONE RESISTANCE:	7.876	-0.0229											
SLEEVE FRICTION RESISTANCE:	117.6	0											
POREWATER PRESSURE:	234.4	-1.5											

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# CONE PENETRATION TEST LOG

**CPT205**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd  
 PROJECT: 183970602  
 LOCATION: Lyndhurst Road, Frimley, Hastings  
 OFFICE: RDCL - Hastings

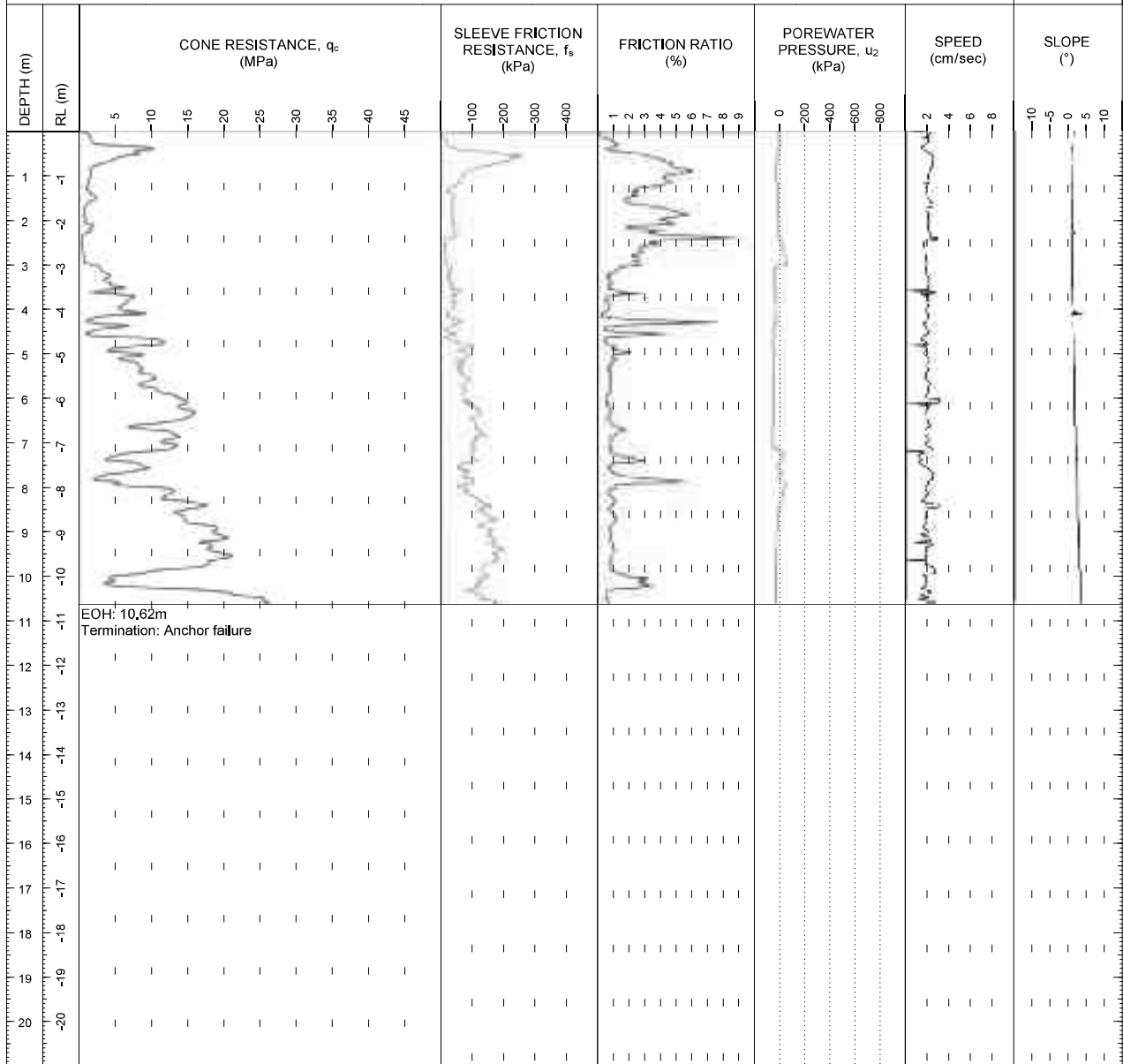
PROJECTION: NZTM2000  
 EASTING: 1928407.00  
 NORTHING: 5607858.00  
 ELEVATION: 0,00  
 DATUM:

SUB-LOCATION:  
 LOGGED ON: 23-Aug-18 12:00:00 AM  
 PREPARED BY: BR DATE: 23-08-2018  
 CHECKED BY: DATE:  
 STATUS: Draft data

CONTRACTOR: RDCL

MACHINE: Geoprobe 54LT

OPERATOR: BR



EOH: 10,62m  
 Termination: Anchor failure

CONE INFORMATION		
CONE ID: 4447	CONE TYPE: -	
	INITIAL	FINAL
CONE RESISTANCE:	7,8495	-0,0006
SLEEVE FRICTION RESISTANCE:	117,9	0
POREWATER PRESSURE:	233,2	0,7

REMARKS

SYMBOLS  
 ▼ Water level



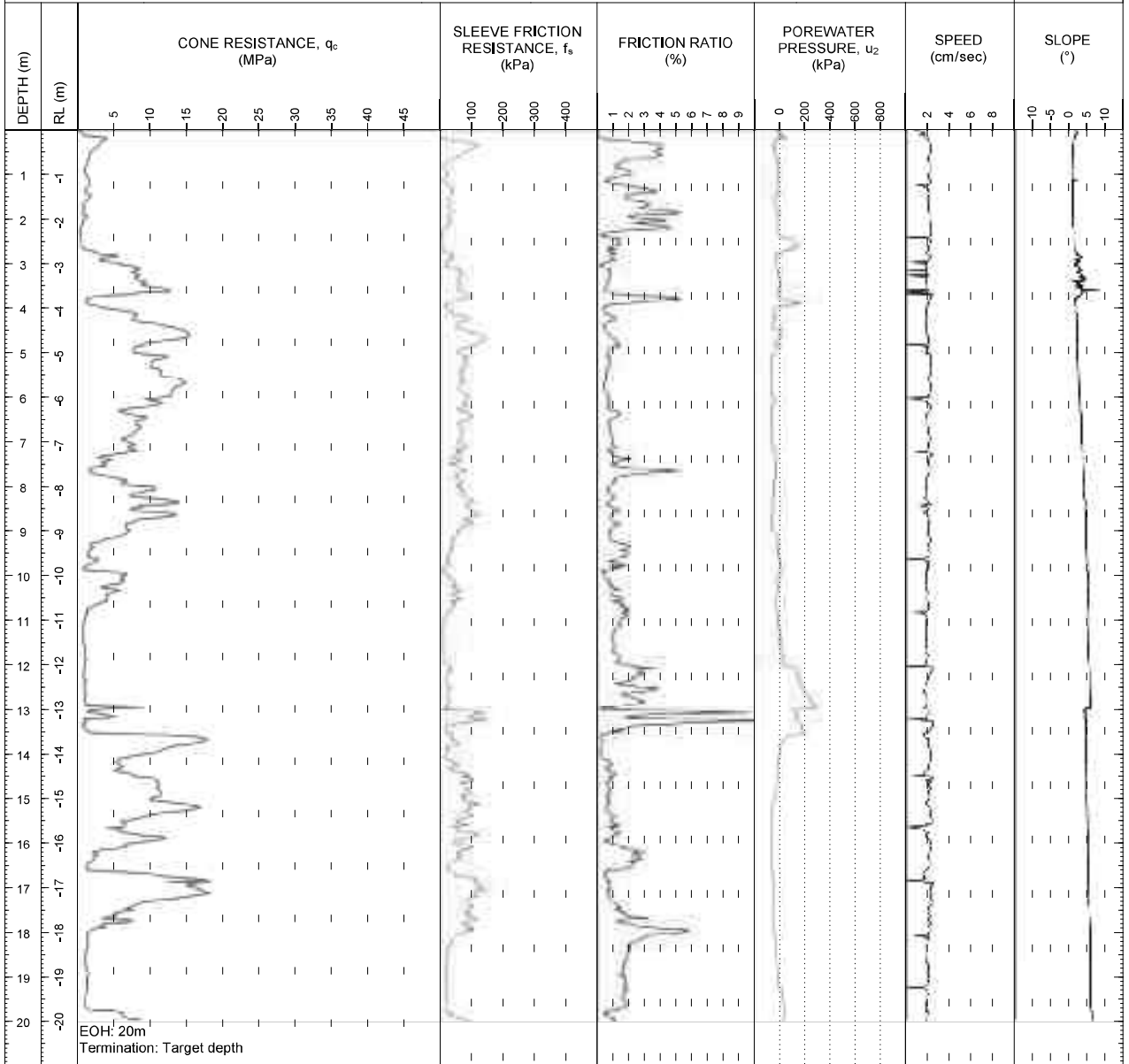
# CONE PENETRATION TEST LOG

**CPT206**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928444.00 NORTHING: 5607853.00 ELEVATION: 0,00 DATUM:	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: BR      DATE: 23-08-2018 CHECKED BY:          DATE: STATUS: Draft data
--	--	--

CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: BR



<b>CONE INFORMATION</b> CONE ID: 4483      CONE TYPE: -  <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 30%; text-align: center;">INITIAL</td> <td style="width: 30%; text-align: center;">FINAL</td> </tr> <tr> <td>CONE RESISTANCE:</td> <td style="text-align: center;">5.9657</td> <td style="text-align: center;">0.0219</td> </tr> <tr> <td>SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">140</td> <td style="text-align: center;">0.2</td> </tr> <tr> <td>POREWATER PRESSURE:</td> <td style="text-align: center;">269.4</td> <td style="text-align: center;">0.2</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	5.9657	0.0219	SLEEVE FRICTION RESISTANCE:	140	0.2	POREWATER PRESSURE:	269.4	0.2	<b>REMARKS</b>   <b>SYMBOLS</b> ▼ Water level
	INITIAL	FINAL											
CONE RESISTANCE:	5.9657	0.0219											
SLEEVE FRICTION RESISTANCE:	140	0.2											
POREWATER PRESSURE:	269.4	0.2											

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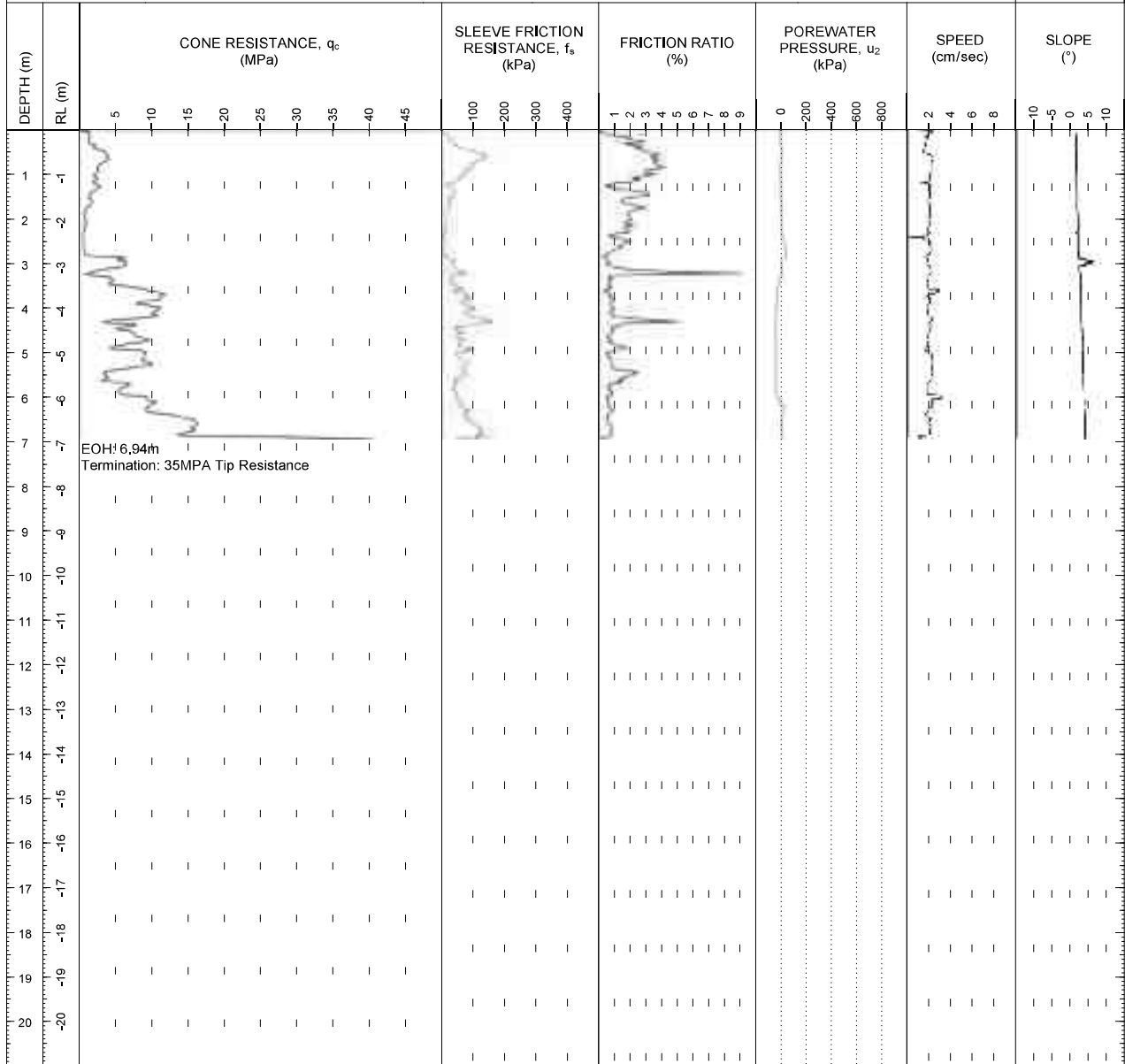
# CONE PENETRATION TEST LOG

**CPT208**

SHEET 1 OF 1

CLIENT: Greenstone Land Developments Ltd PROJECT: 183970602 LOCATION: Lyndhurst Road, Frimley, Hastings OFFICE: RDCL - Hastings	PROJECTION: NZTM2000 EASTING: 1928543.00 NORTHING: 5607895.00 ELEVATION: 0,00 DATUM:	SUB-LOCATION: LOGGED ON: 23-Aug-18 12:00:00 AM PREPARED BY: BR      DATE: 23-08-2018 CHECKED BY:          DATE: STATUS: Draft data
--	--	--

CONTRACTOR: RDCL      MACHINE: Geoprobe 54LT      OPERATOR: BR



EOH! 6.94m  
Termination: 35MPa Tip Resistance

<b>CONE INFORMATION</b> CONE ID: 4483      CONE TYPE: -  <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;"></td> <td style="width: 35%; text-align: center;">INITIAL</td> <td style="width: 35%; text-align: center;">FINAL</td> </tr> <tr> <td>CONE RESISTANCE:</td> <td style="text-align: center;">5.9545</td> <td style="text-align: center;">0.0235</td> </tr> <tr> <td>SLEEVE FRICTION RESISTANCE:</td> <td style="text-align: center;">136.8</td> <td style="text-align: center;">1.6</td> </tr> <tr> <td>POREWATER PRESSURE:</td> <td style="text-align: center;">269.2</td> <td style="text-align: center;">-0,1</td> </tr> </table>		INITIAL	FINAL	CONE RESISTANCE:	5.9545	0.0235	SLEEVE FRICTION RESISTANCE:	136.8	1.6	POREWATER PRESSURE:	269.2	-0,1	<b>REMARKS</b>   <b>SYMBOLS</b> ▼ Water level
	INITIAL	FINAL											
CONE RESISTANCE:	5.9545	0.0235											
SLEEVE FRICTION RESISTANCE:	136.8	1.6											
POREWATER PRESSURE:	269.2	-0,1											

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## APPENDIX C – LIQUEFACTION ASSESSMENT OUTPUTS

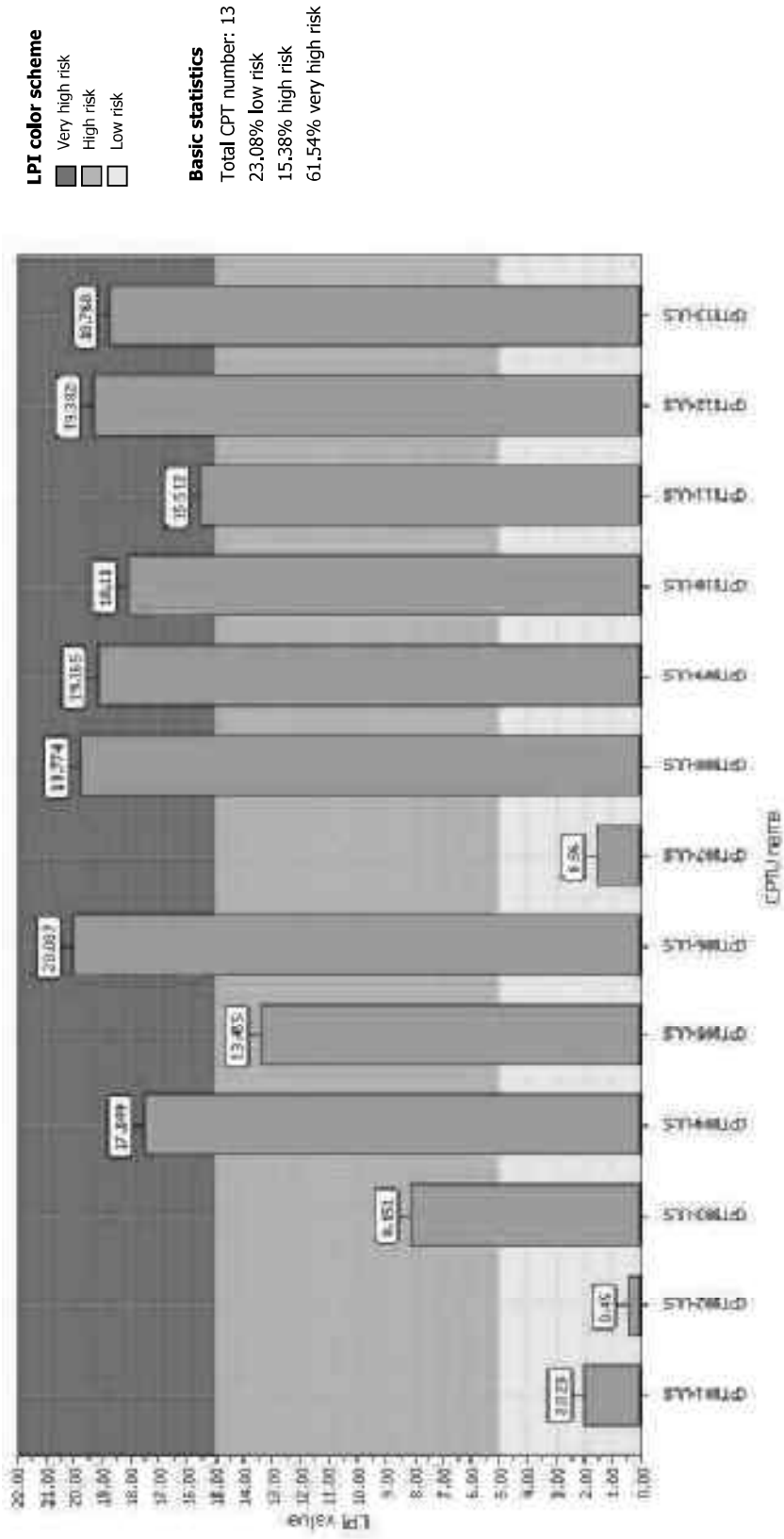


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**Project title :** Lyndhurst Subdivision Stage 7-12

**Location :**

**Overall Liquefaction Potential Index report**

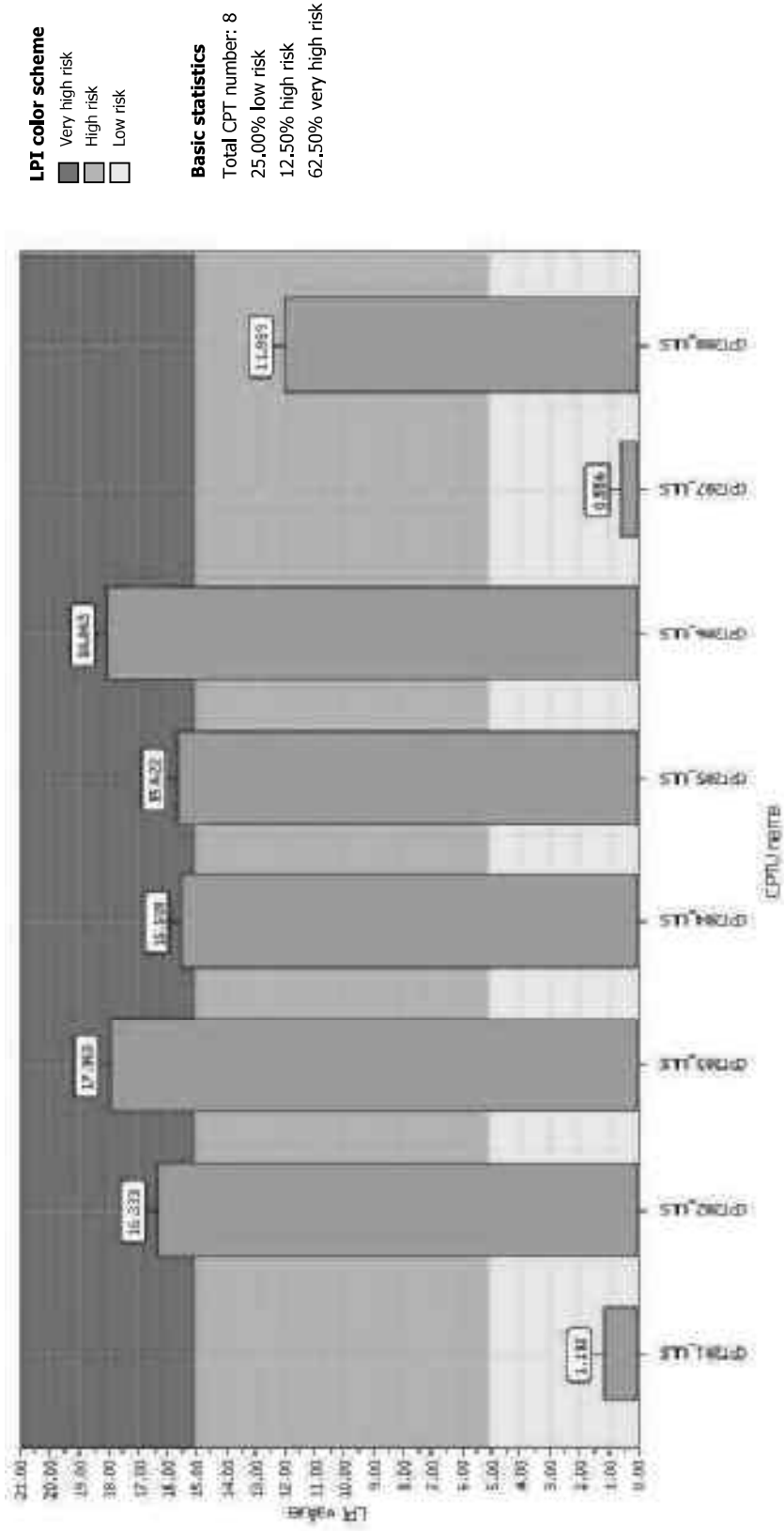




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<http://www.rdcl.co.nz>

**Project title : Geotechnical Investigations**  
**Location : Lyndhurst Road**

**Overall Liquefaction Potential Index report**



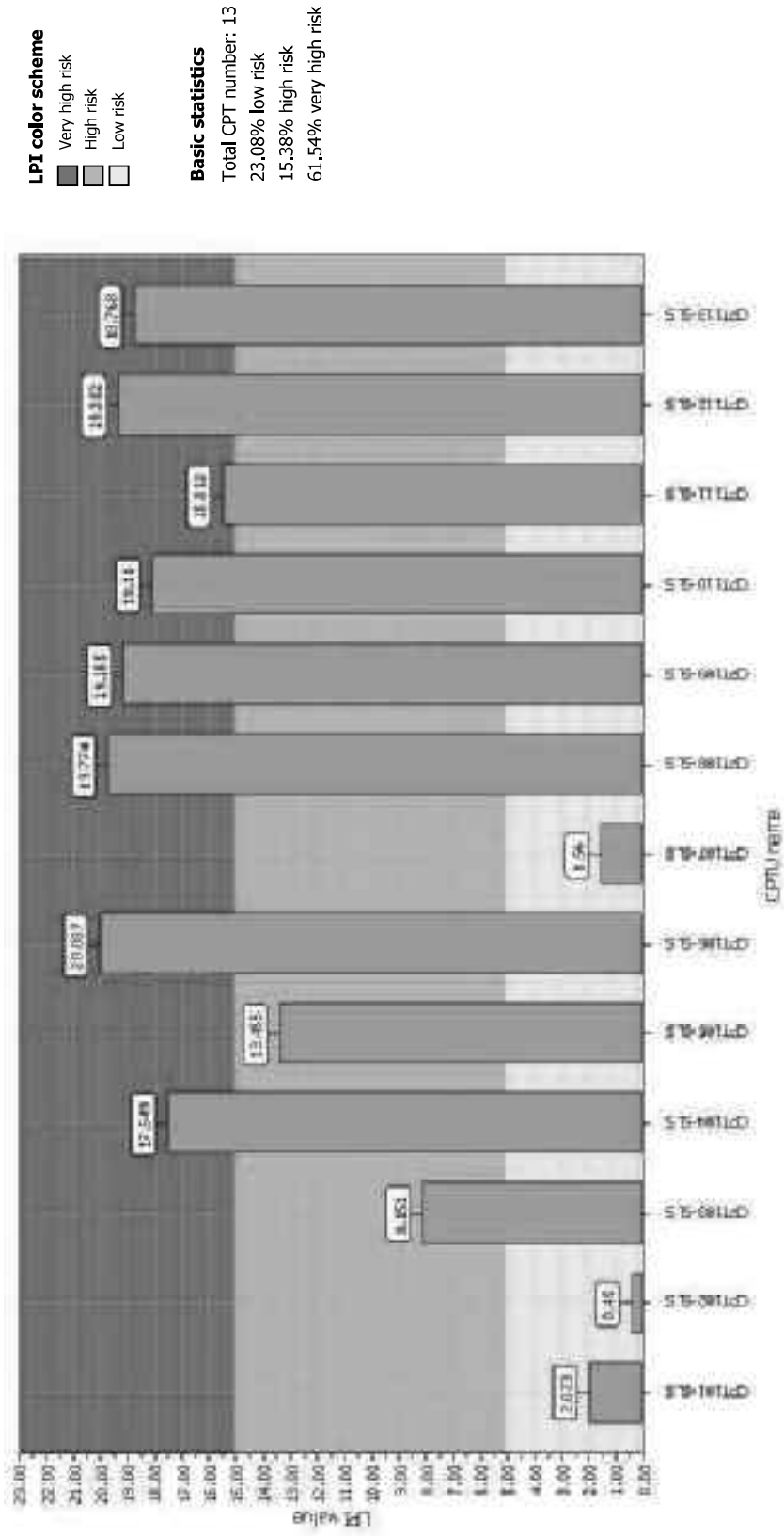


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<http://www.rdcl.co.nz>

**Project title :** Lyndhurst Subdivision Stage 7-12

**Location :**

### Overall Liquefaction Potential Index report

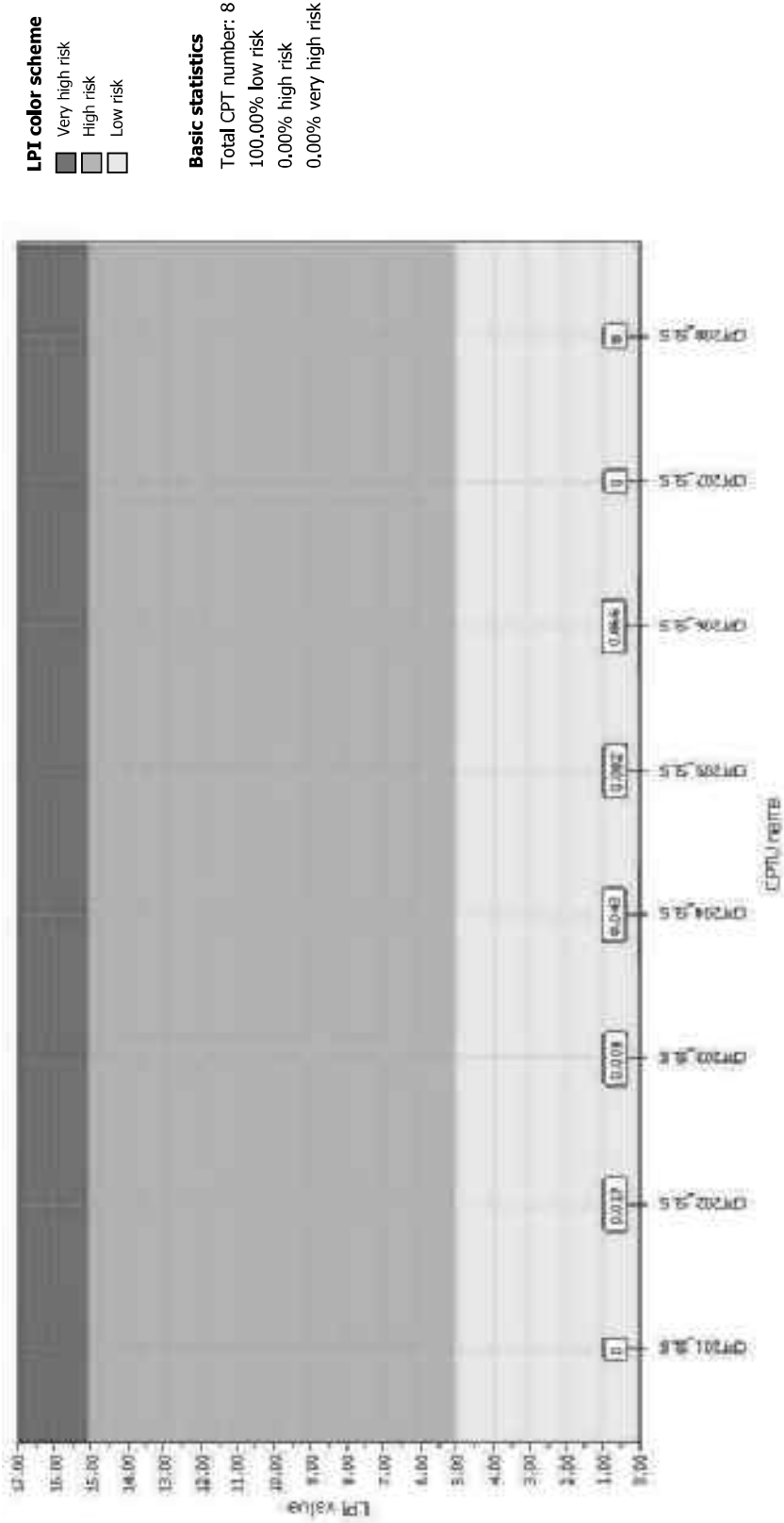




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**Project title : Geotechnical Investigations**  
**Location : Lyndhurst Road**

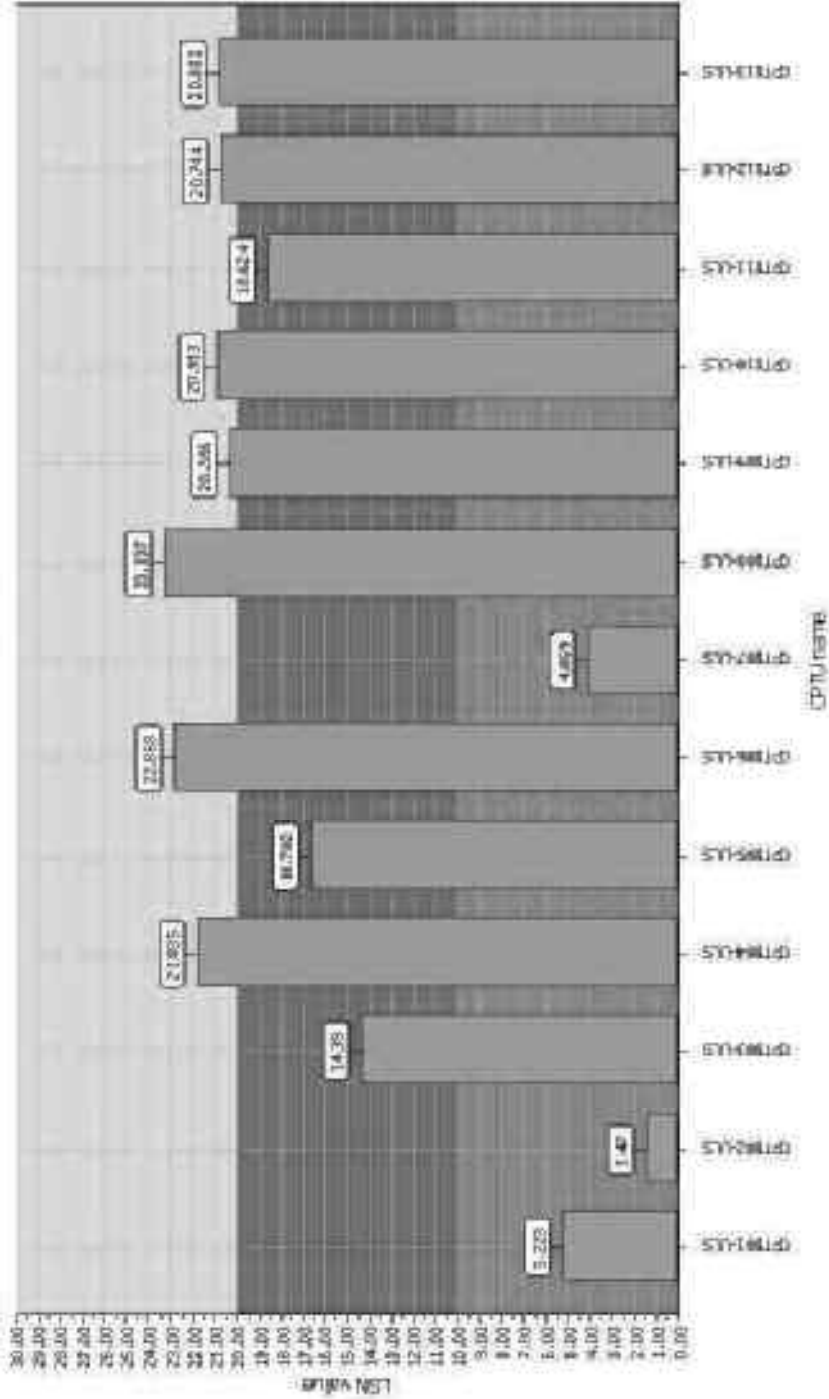
### Overall Liquefaction Potential Index report



Project title : Lyndhurst Subdivision Stage 7-12

Location :

**Overall Liquefaction Severity Number report**



**LSN color scheme**

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

**Basic statistics**

Total CPT number: 13  
 23,08% little liquefaction  
 23,08% minor liquefaction  
 53,85% moderate liquefaction  
 0,00% moderate to major liquefaction  
 0,00% major liquefaction  
 0,00% severe liquefaction

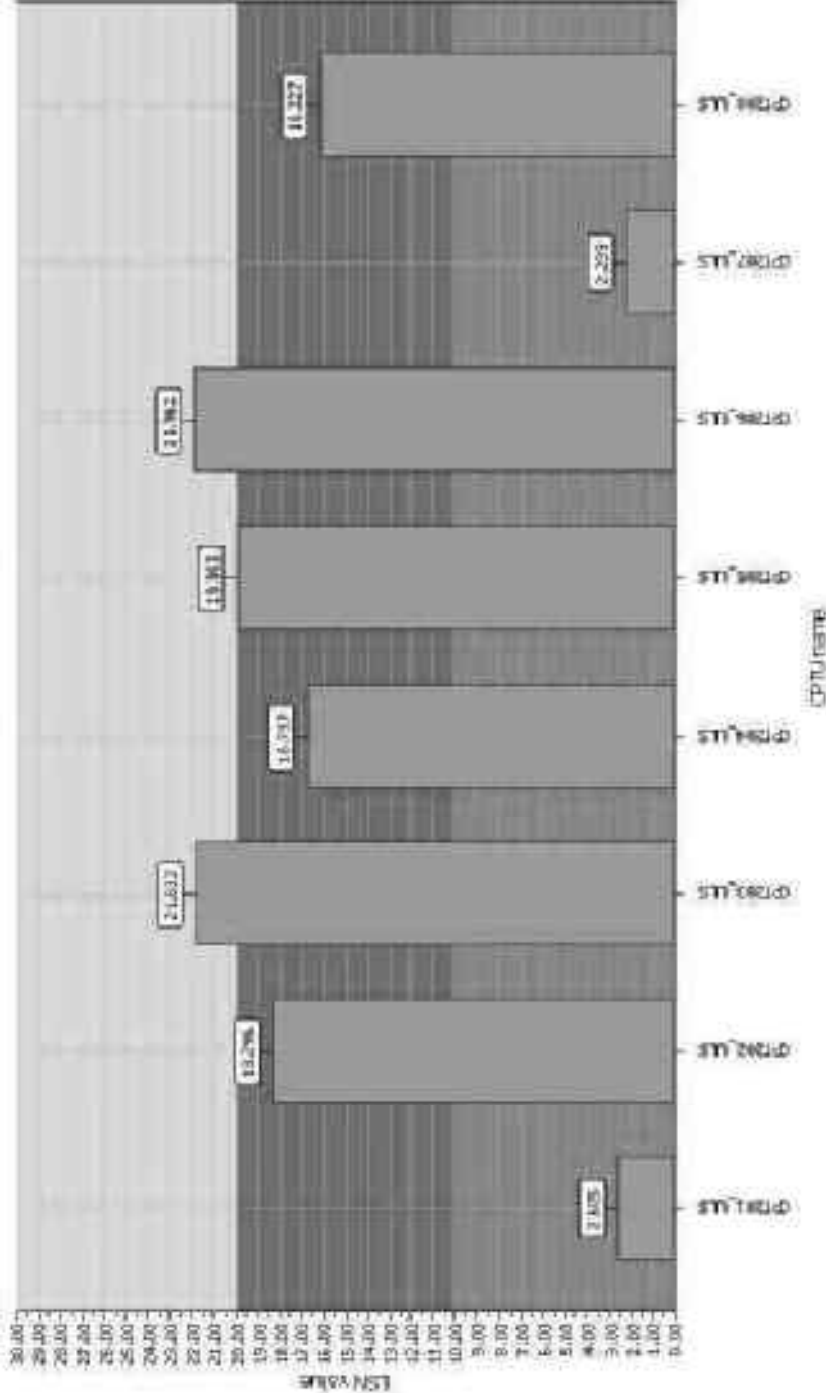




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**Project title : Geotechnical Investigations**  
**Location : Lyndhurst Road**

**Overall Liquefaction Severity Number report**



**LSN color scheme**

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

**Basic statistics**

Total CPT number: 8  
 25,00% little liquefaction  
 50,00% minor liquefaction  
 25,00% moderate liquefaction  
 0,00% moderate to major liquefaction  
 0,00% major liquefaction  
 0,00% severe liquefaction

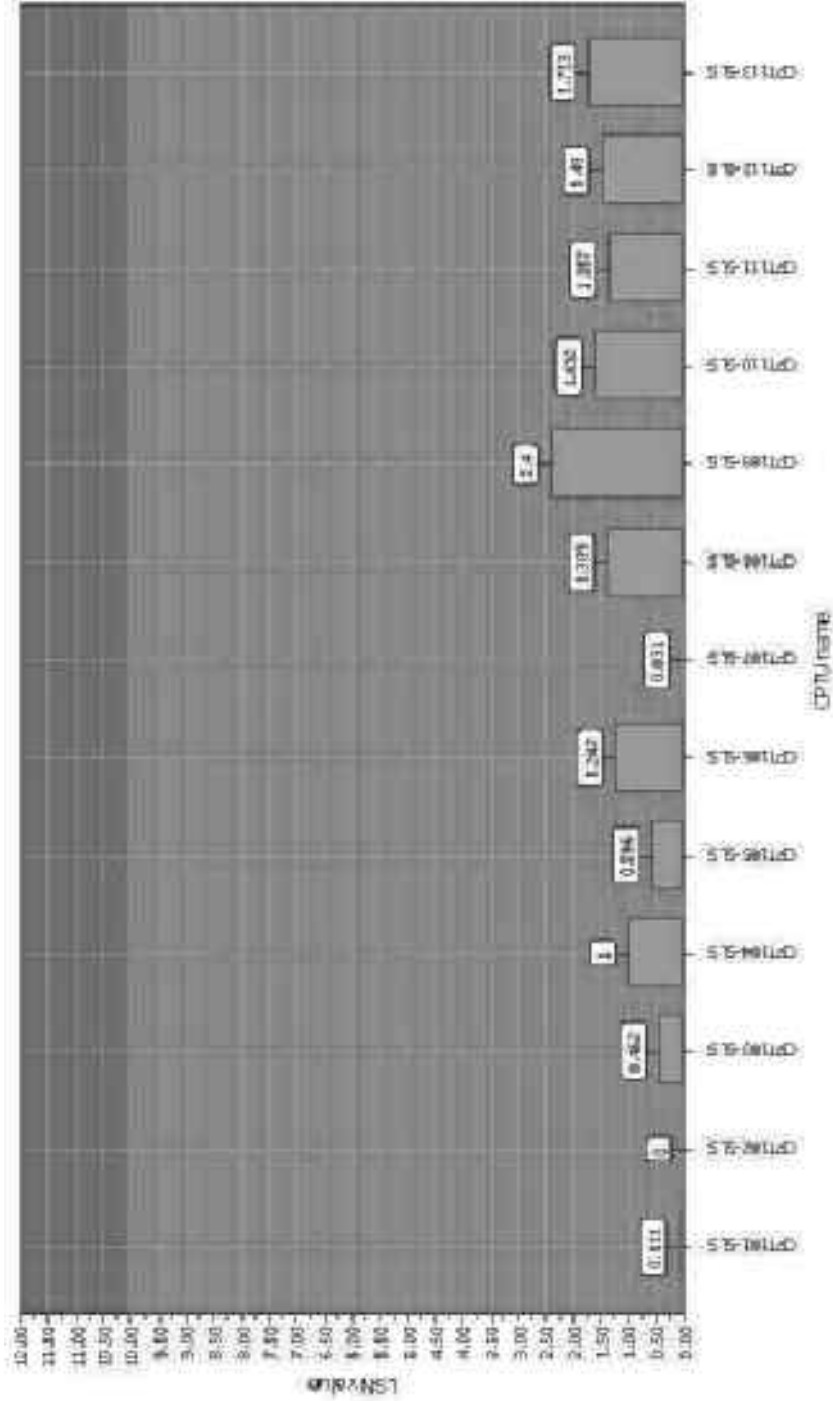


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**Project title :** Lyndhurst Subdivision Stage 7-12

**Location :**

### Overall Liquefaction Severity Number report



#### LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

#### Basic statistics

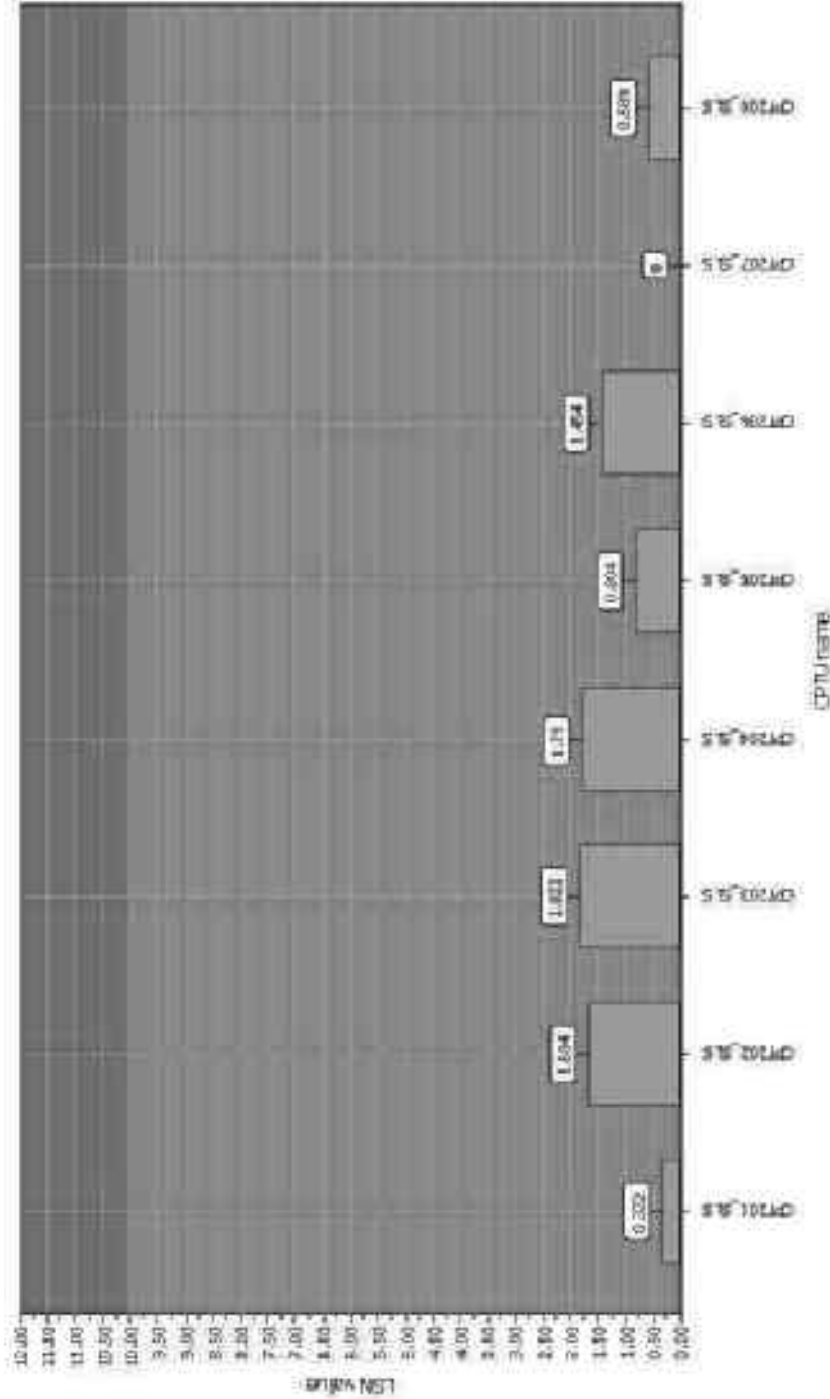
Total CPT number: 13  
 100.00% little liquefaction  
 0.00% minor liquefaction  
 0.00% moderate liquefaction  
 0.00% moderate to major liquefaction  
 0.00% major liquefaction  
 0.00% severe liquefaction



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**Project title : Geotechnical Investigations**  
**Location : Lyndhurst Road**

**Overall Liquefaction Severity Number report**



**LSN color scheme**

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

**Basic statistics**

Total CPT number: 8  
 100.00% little liquefaction  
 0.00% minor liquefaction  
 0.00% moderate liquefaction  
 0.00% moderate to major liquefaction  
 0.00% major liquefaction  
 0.00% severe liquefaction

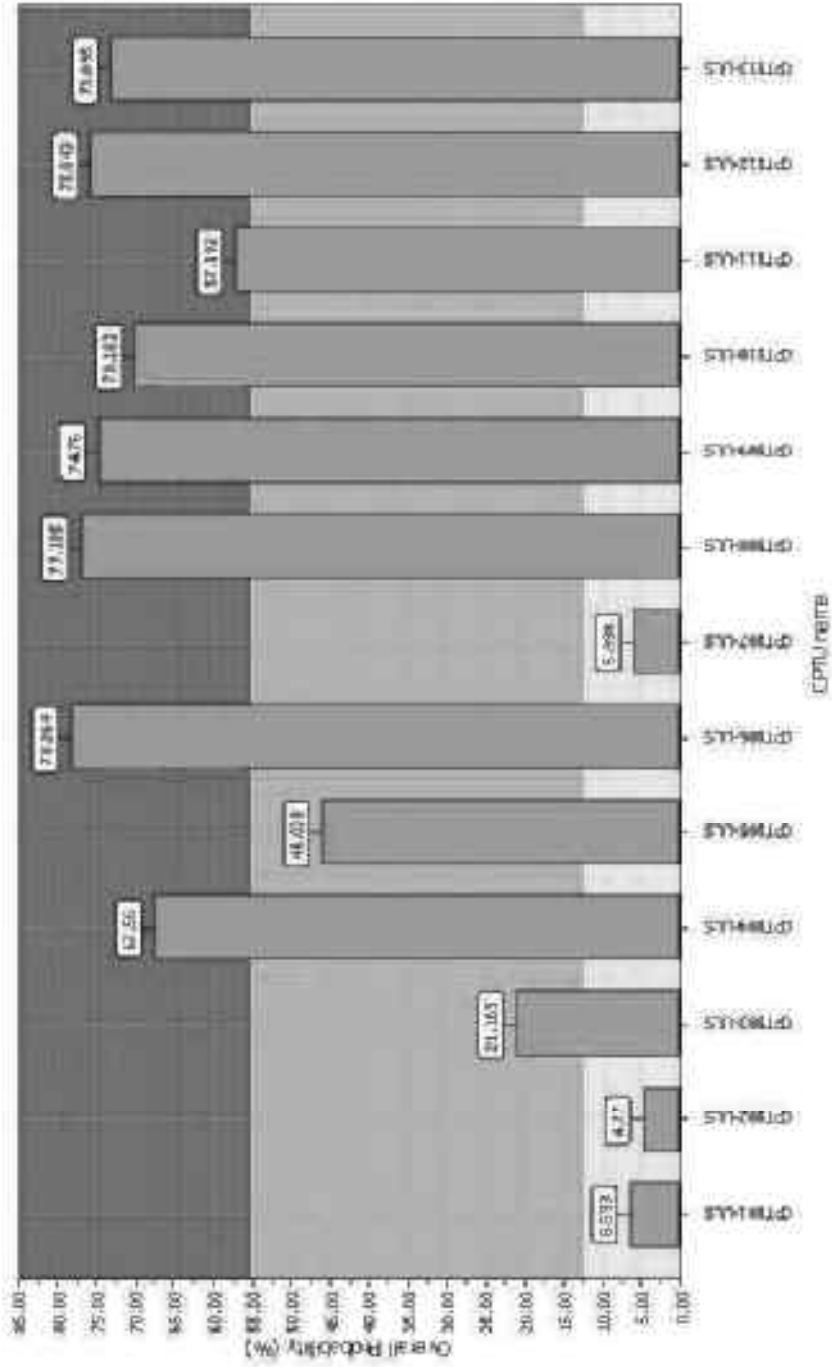


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**Project title :** Lyndhurst Subdivision Stage 7-12

**Location :**

**Overall Probability for Liquefaction report**



**Probability color scheme**  
 Very High Probability  
 High Probability  
 Low Probability

**Basic statistics**

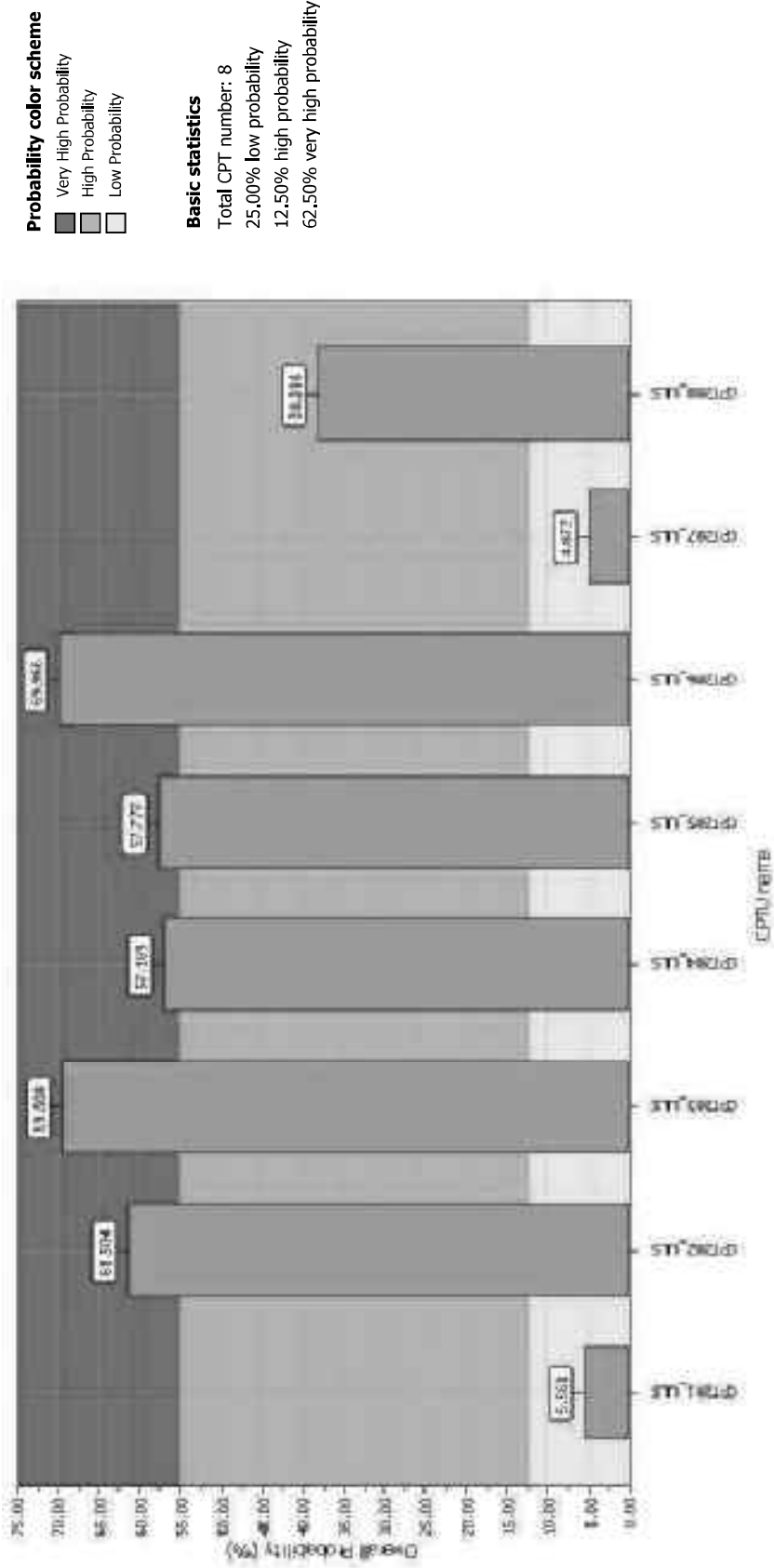
Total CPT number: 13  
 23.08% low probability  
 15.38% high probability  
 61.54% very high probability



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**Project title : Geotechnical Investigations**  
**Location : Lyndhurst Road**

**Overall Probability for Liquefaction report**



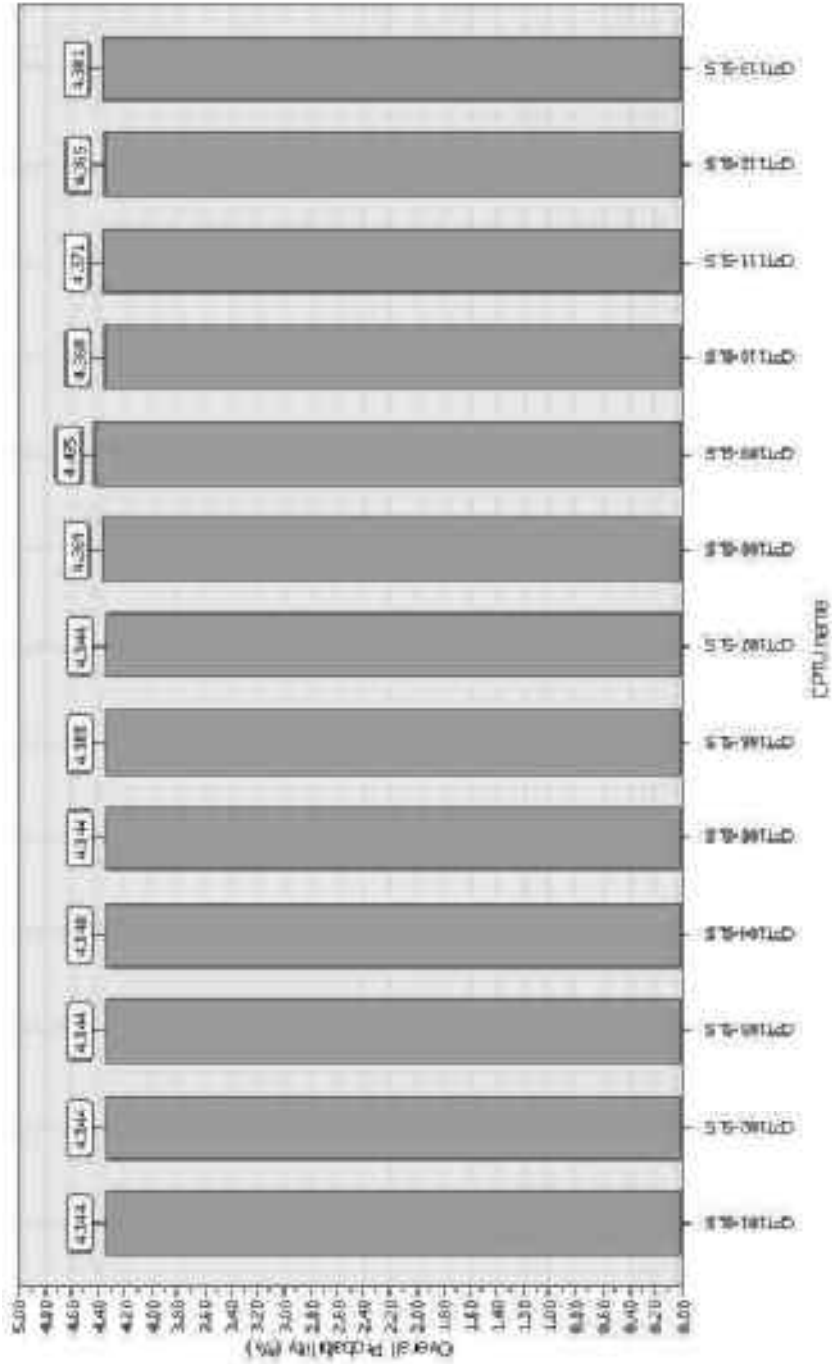


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**Project title :** Lyndhurst Subdivision Stage 7-12

**Location :**

**Overall Probability for Liquefaction report**



**Probability color scheme**  
 Very High Probability  
 High Probability  
 Low Probability

**Basic statistics**

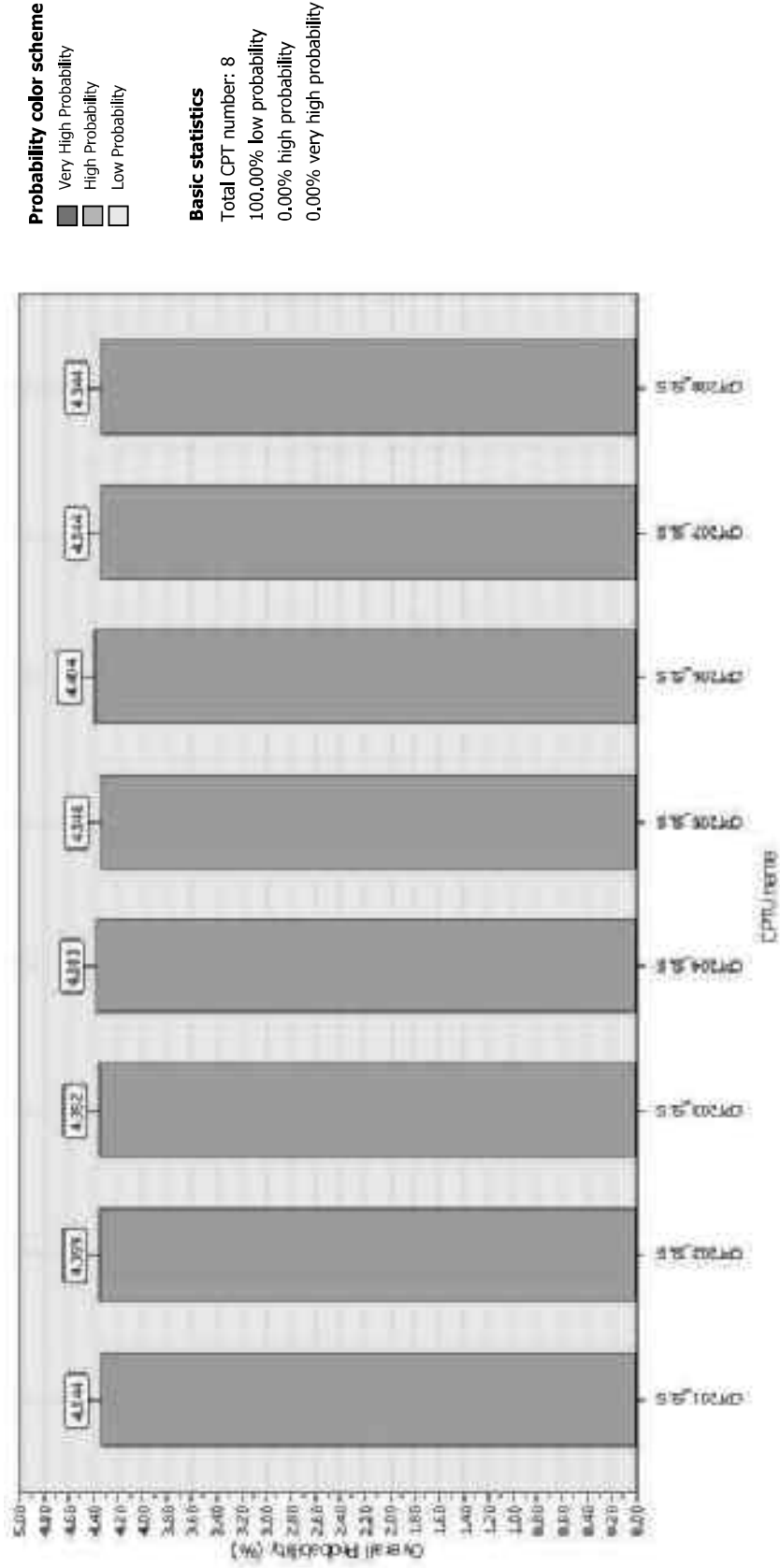
Total CPT number: 13  
 100.00% low probability  
 0.00% high probability  
 0.00% very high probability



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**Project title : Geotechnical Investigations**  
**Location : Lyndhurst Road**

**Overall Probability for Liquefaction report**



**Probability color scheme**  
 Very High Probability  
 High Probability  
 Low Probability

**Basic statistics**  
 Total CPT number: 8  
 100.00% low probability  
 0.00% high probability  
 0.00% very high probability

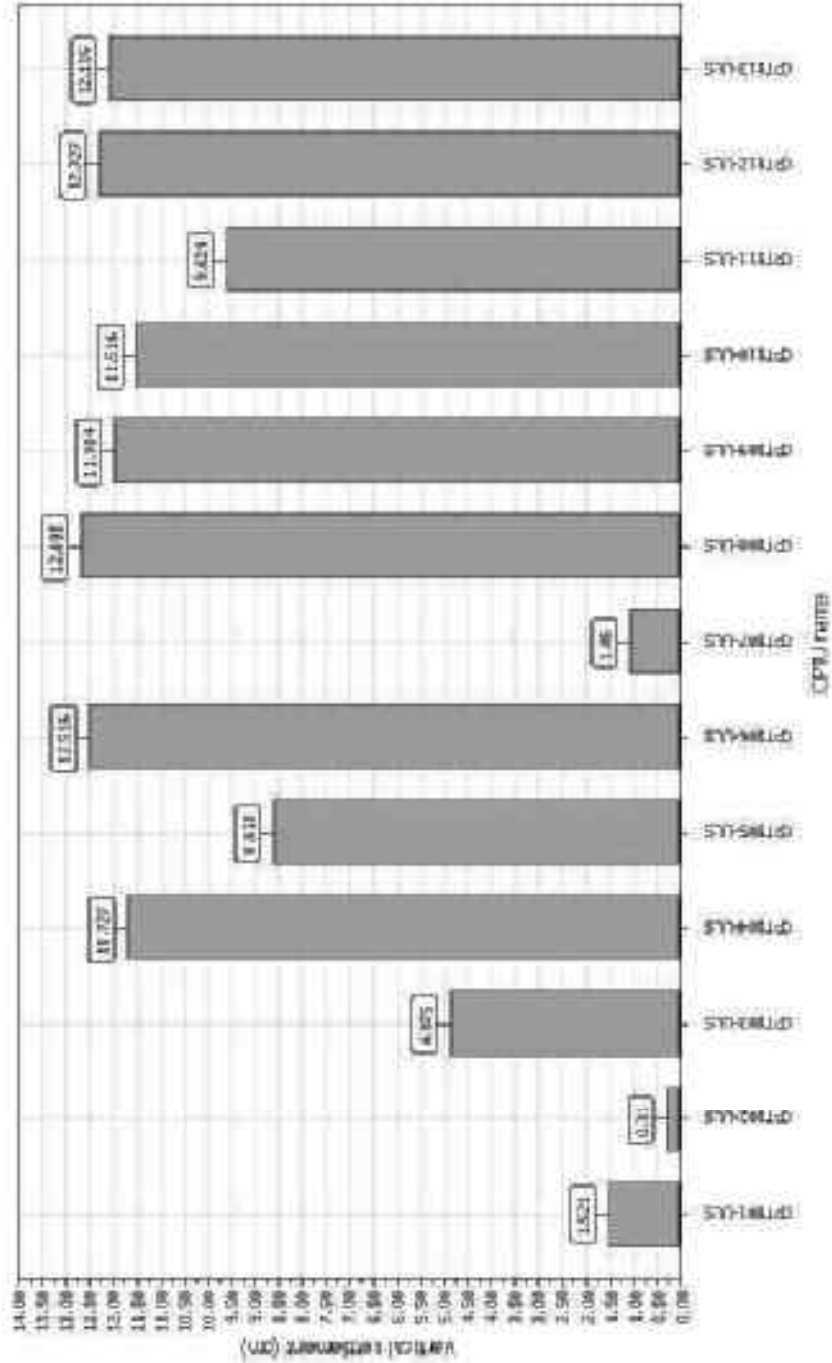


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**Project title :** Lyndhurst Subdivision Stage 7-12

**Location :**

**Overall vertical settlements report**



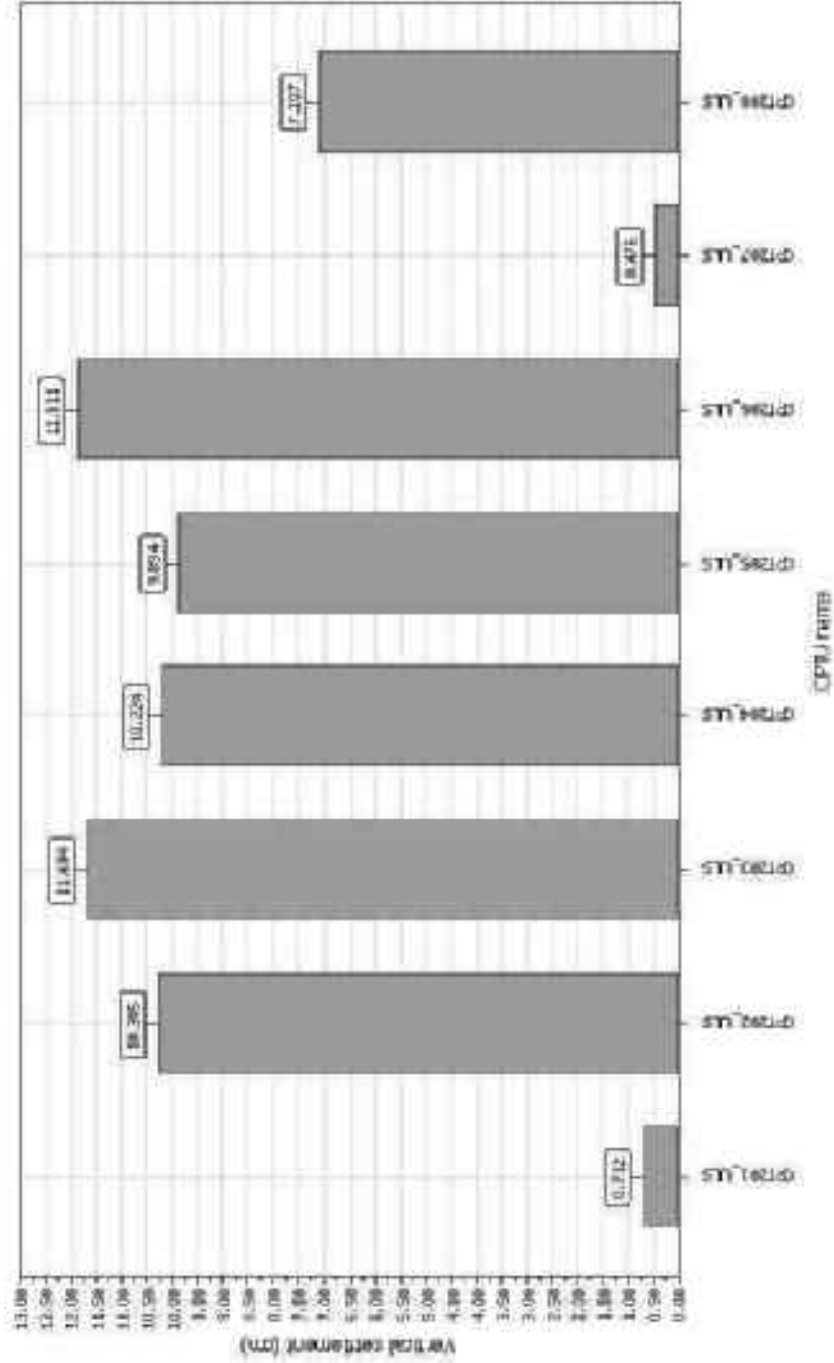




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**Project title : Geotechnical Investigations**  
**Location : Lyndhurst Road**

### Overall vertical settlements report



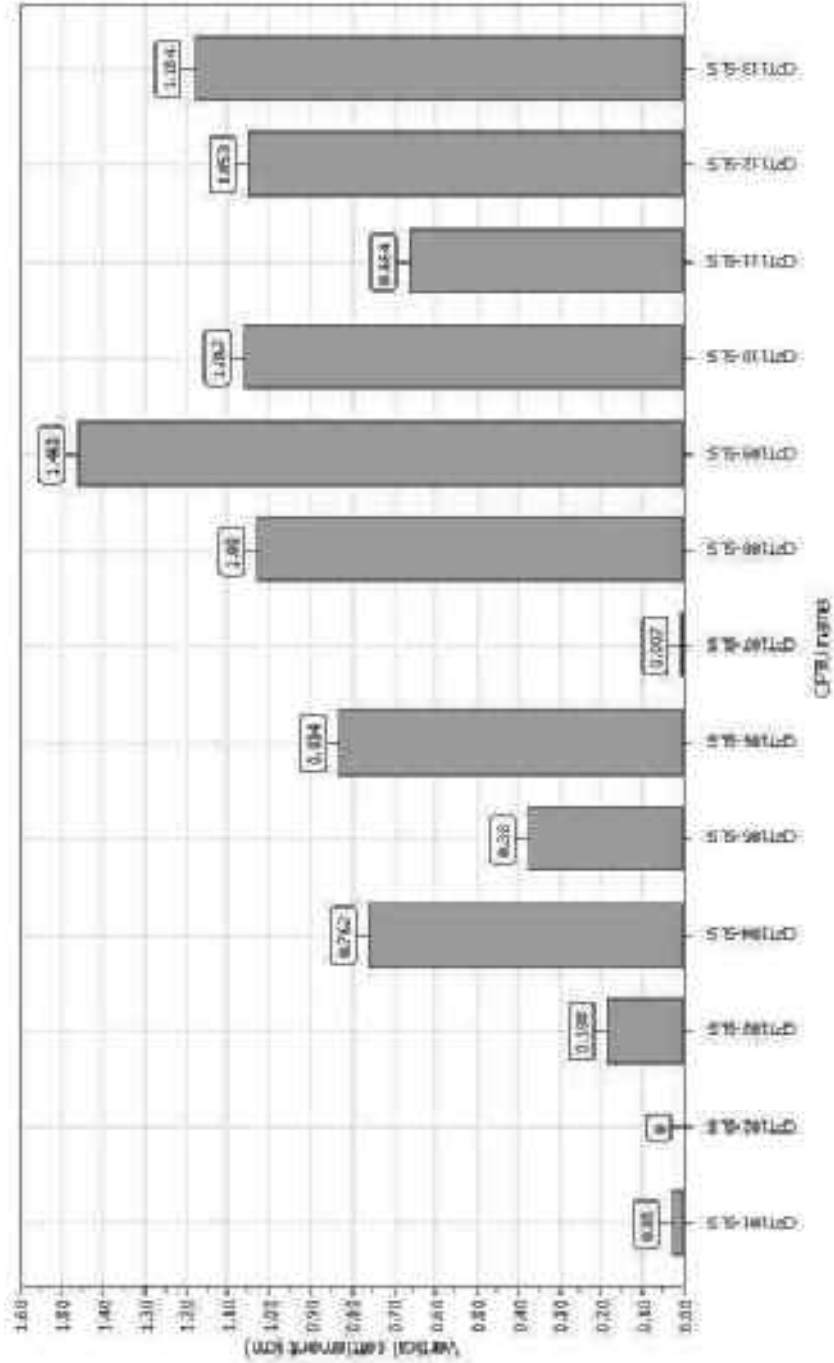


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**Project title :** Lyndhurst Subdivision Stage 7-12

**Location :**

**Overall vertical settlements report**

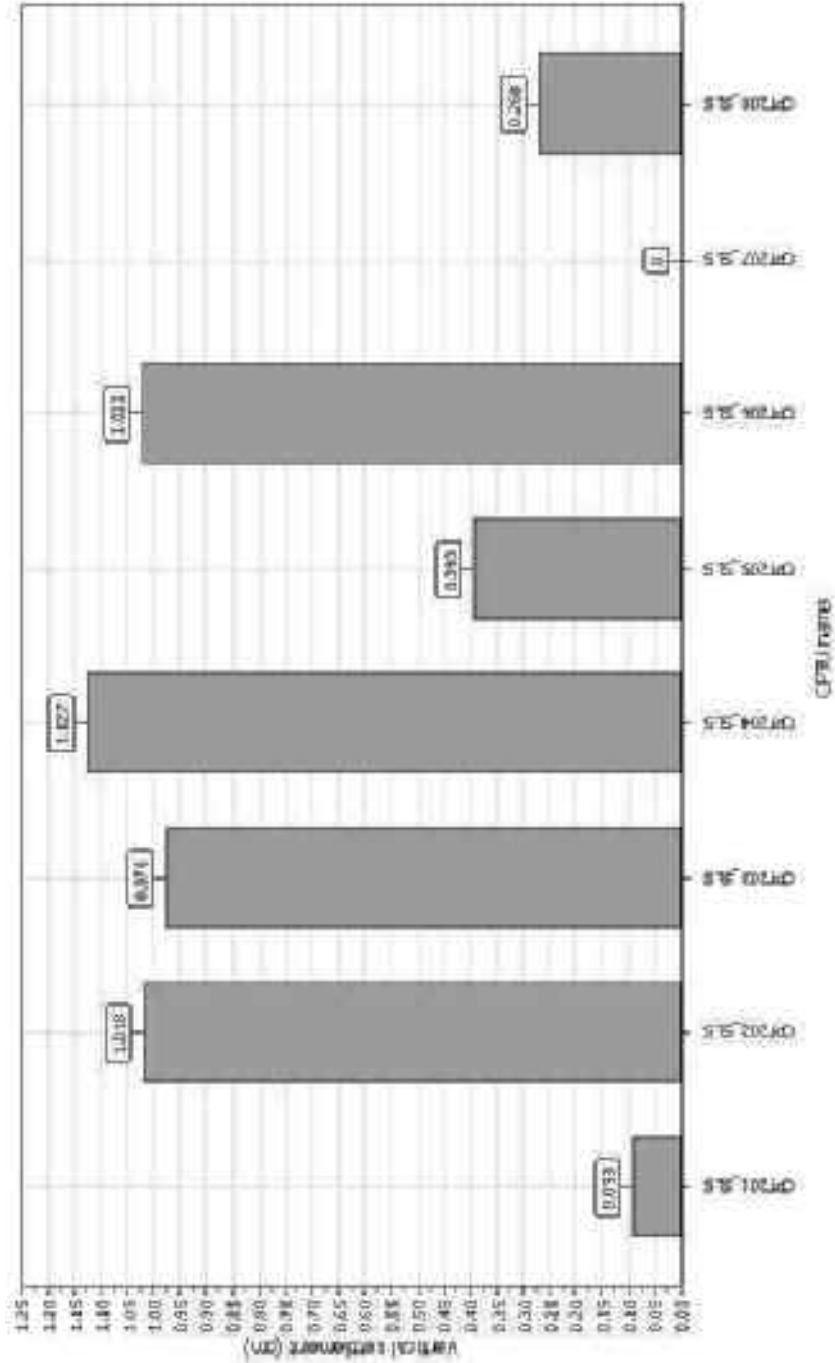




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**Project title : Geotechnical Investigations**  
**Location : Lyndhurst Road**

### Overall vertical settlements report





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**LIQUEFACTION ANALYSIS REPORT**

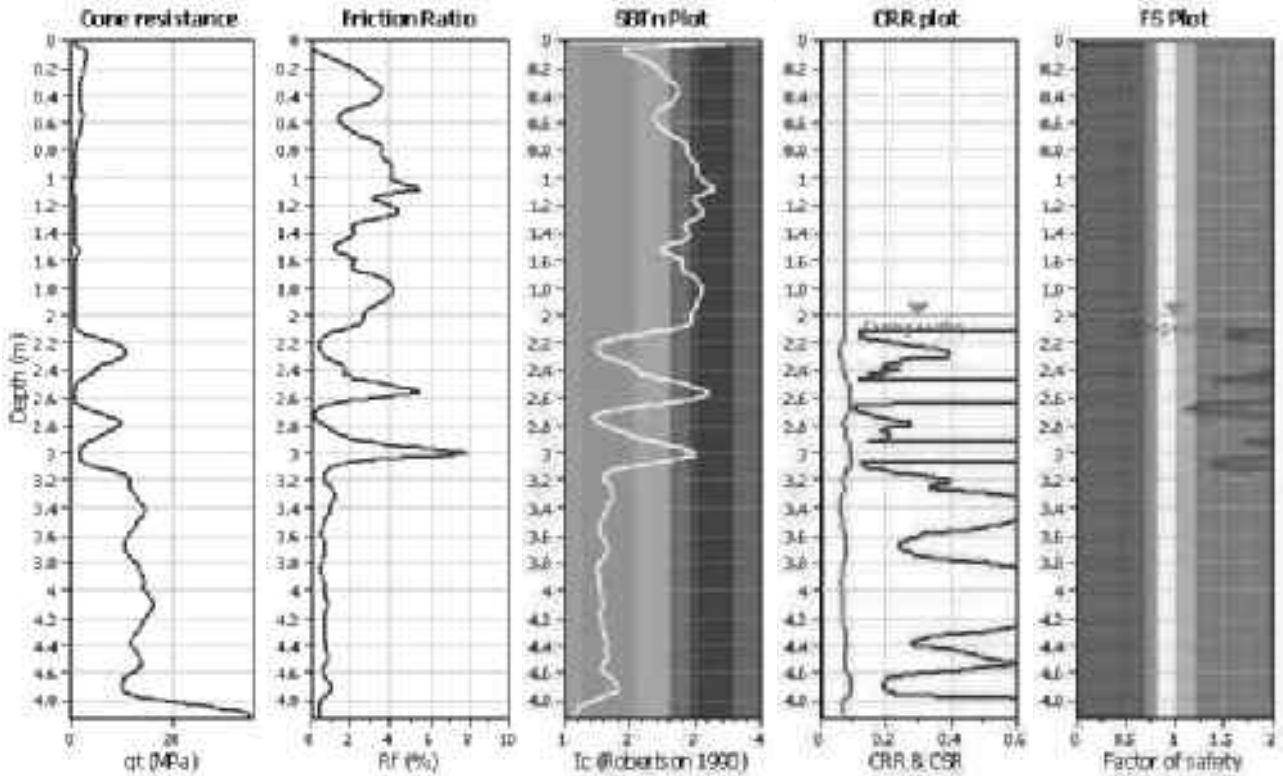
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT101-SLS**

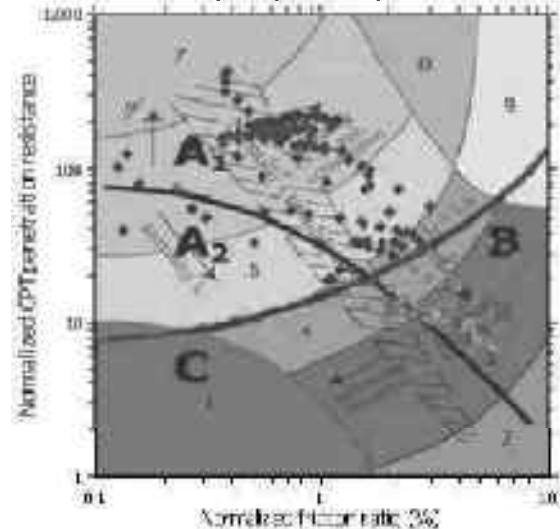
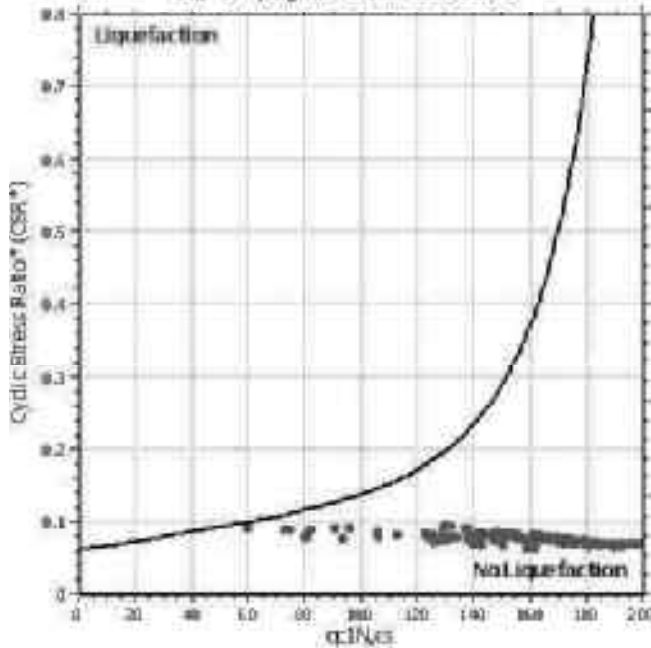
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



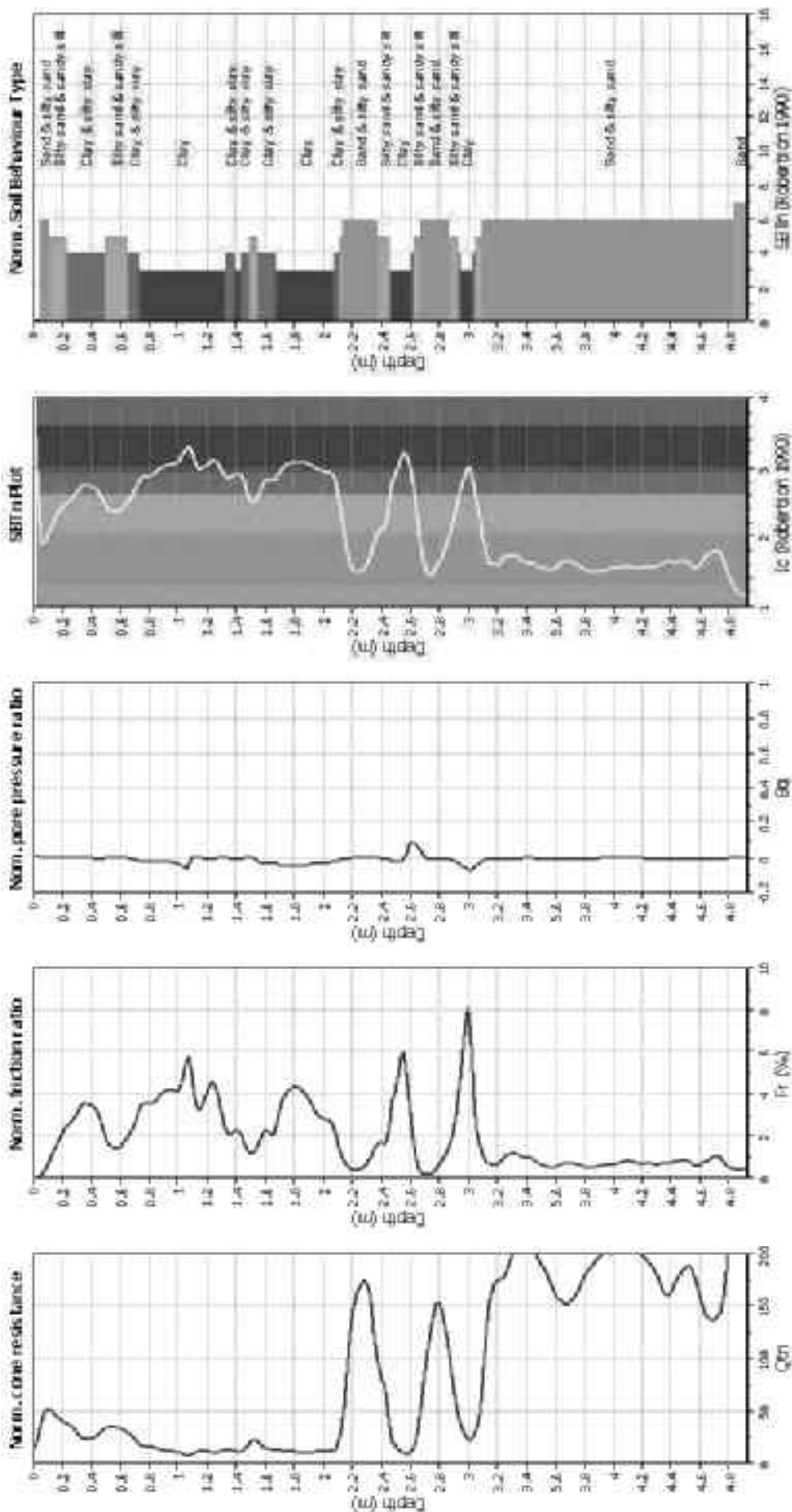
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and grain geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and grain geometry.

### CPT basic interpretation plots (normaliz



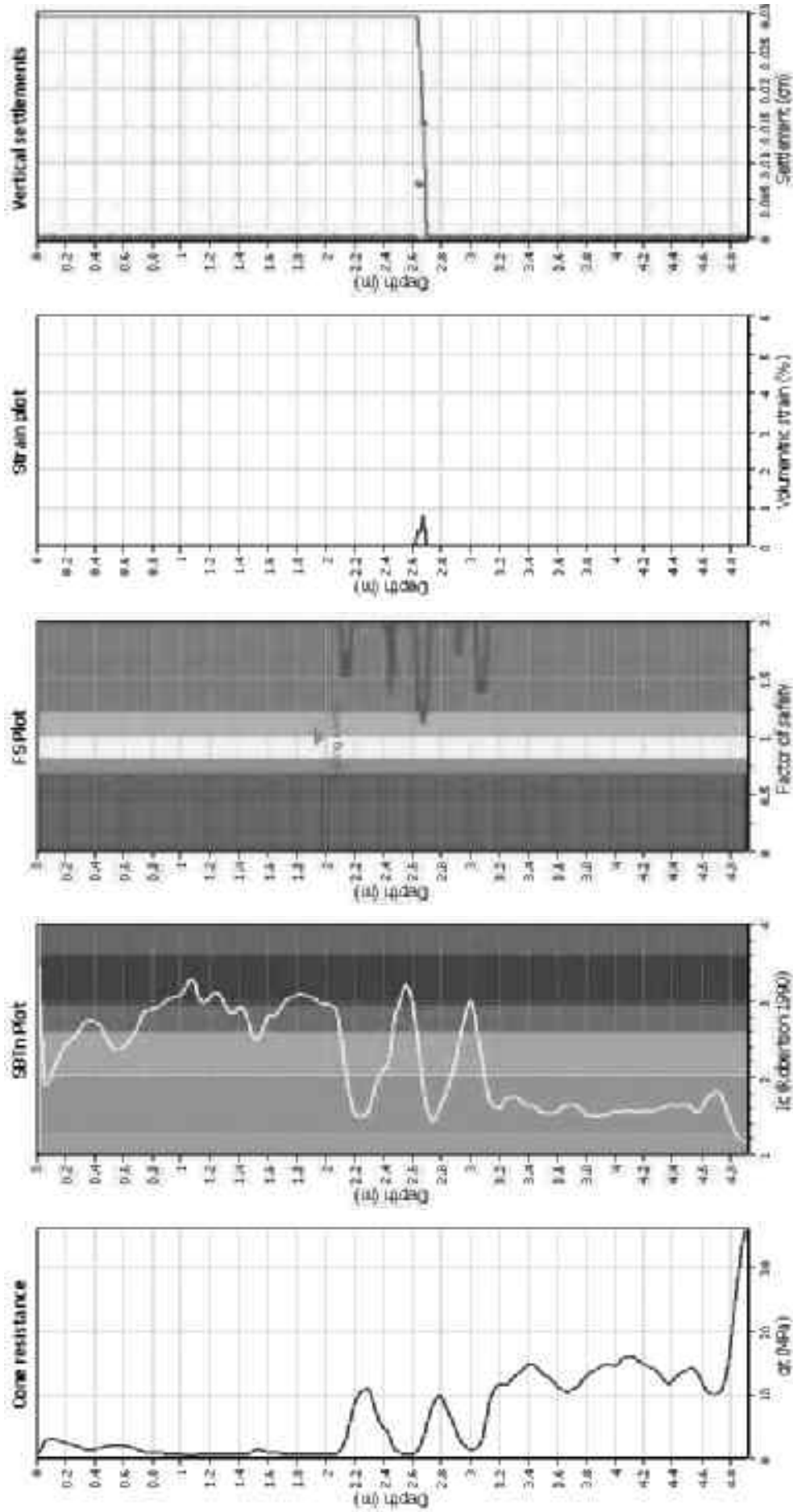
#### Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWL (erthq.):	2.00 m	Fill weight:	N/A
Friction correction method:	B&I (2014)	Average results interval:	3	Transition (solect) applied:	No
Norms to test:	Based on Ic value	Ic cut-off value:	2.60	$f_v$ applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Unit weight calculation:	Based on SBT	Clay line behavior applied:	Sands only
Peak ground acceleration:	0.14	Use fill:	No	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

#### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_t$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

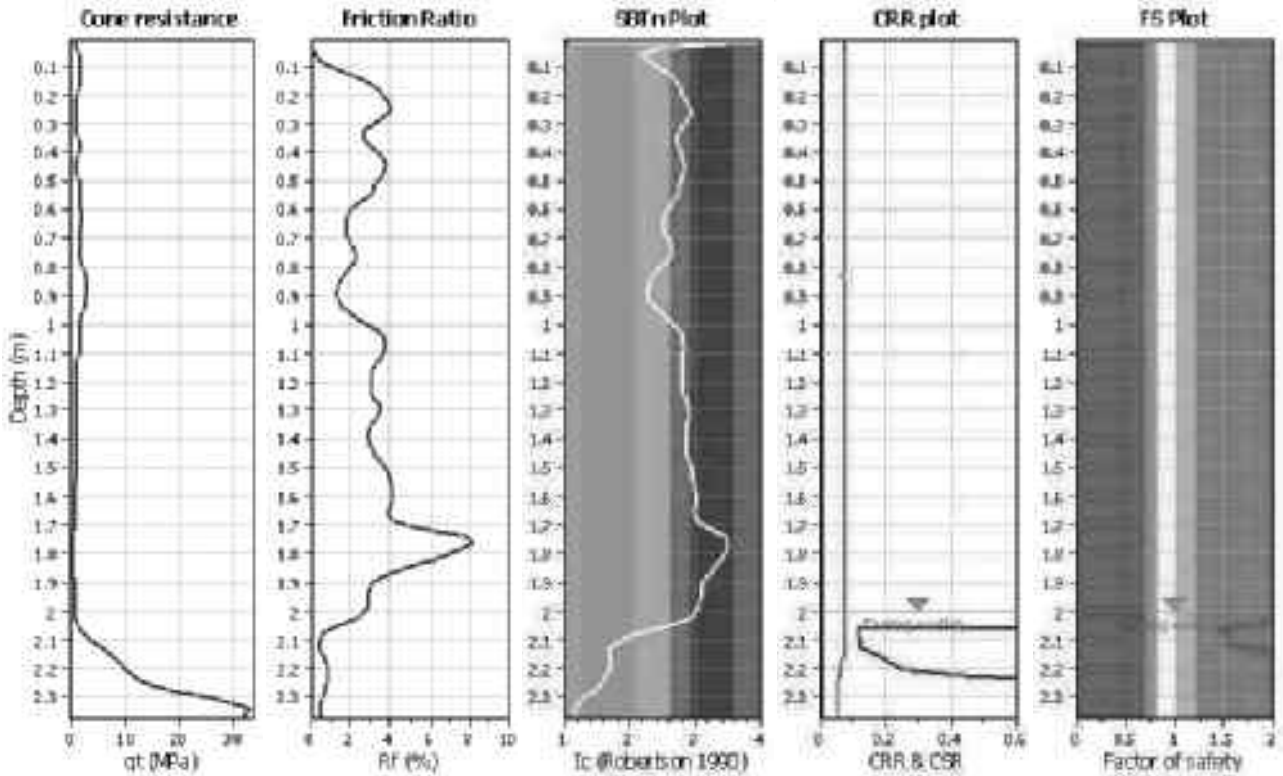
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT102-SLS**

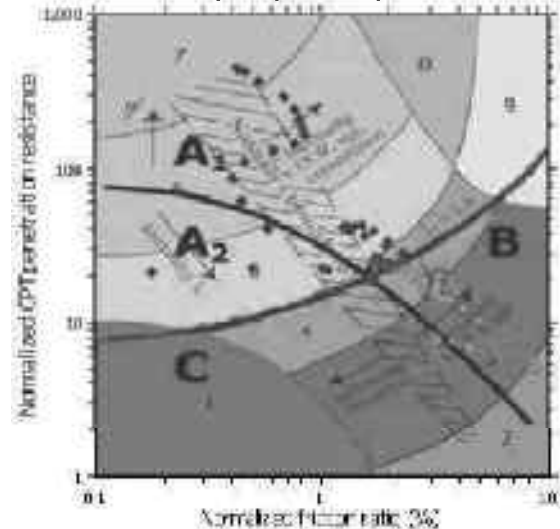
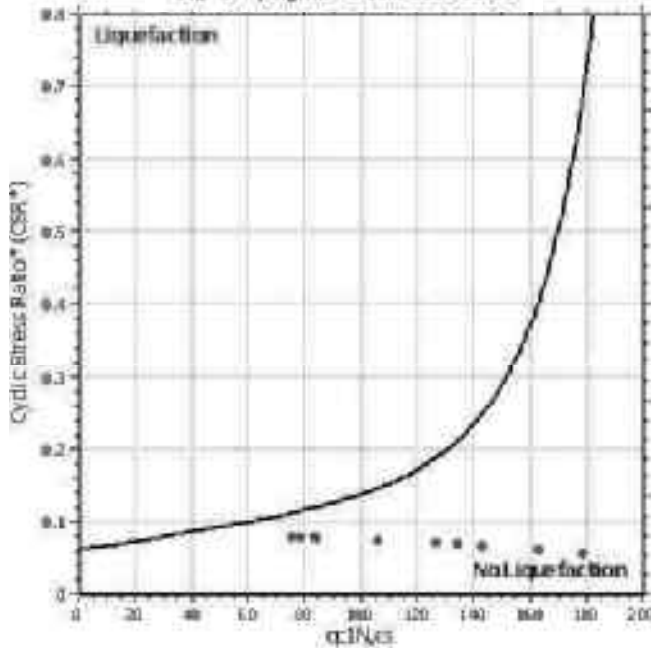
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. defect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



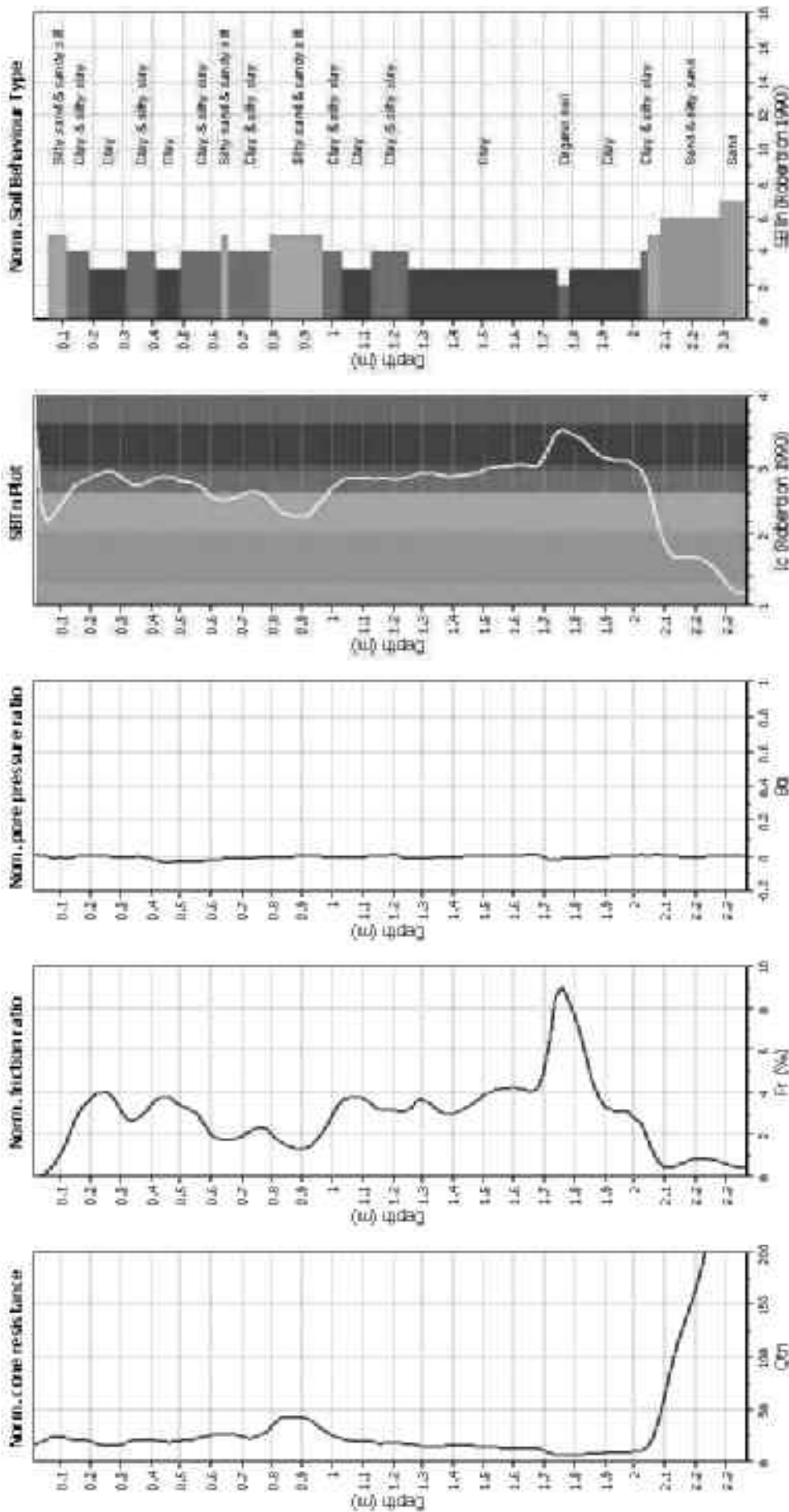
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A1: Cyclic liquefaction likely depending on size and number of cycle (static)  
 Zone A2: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and global geometry.

### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

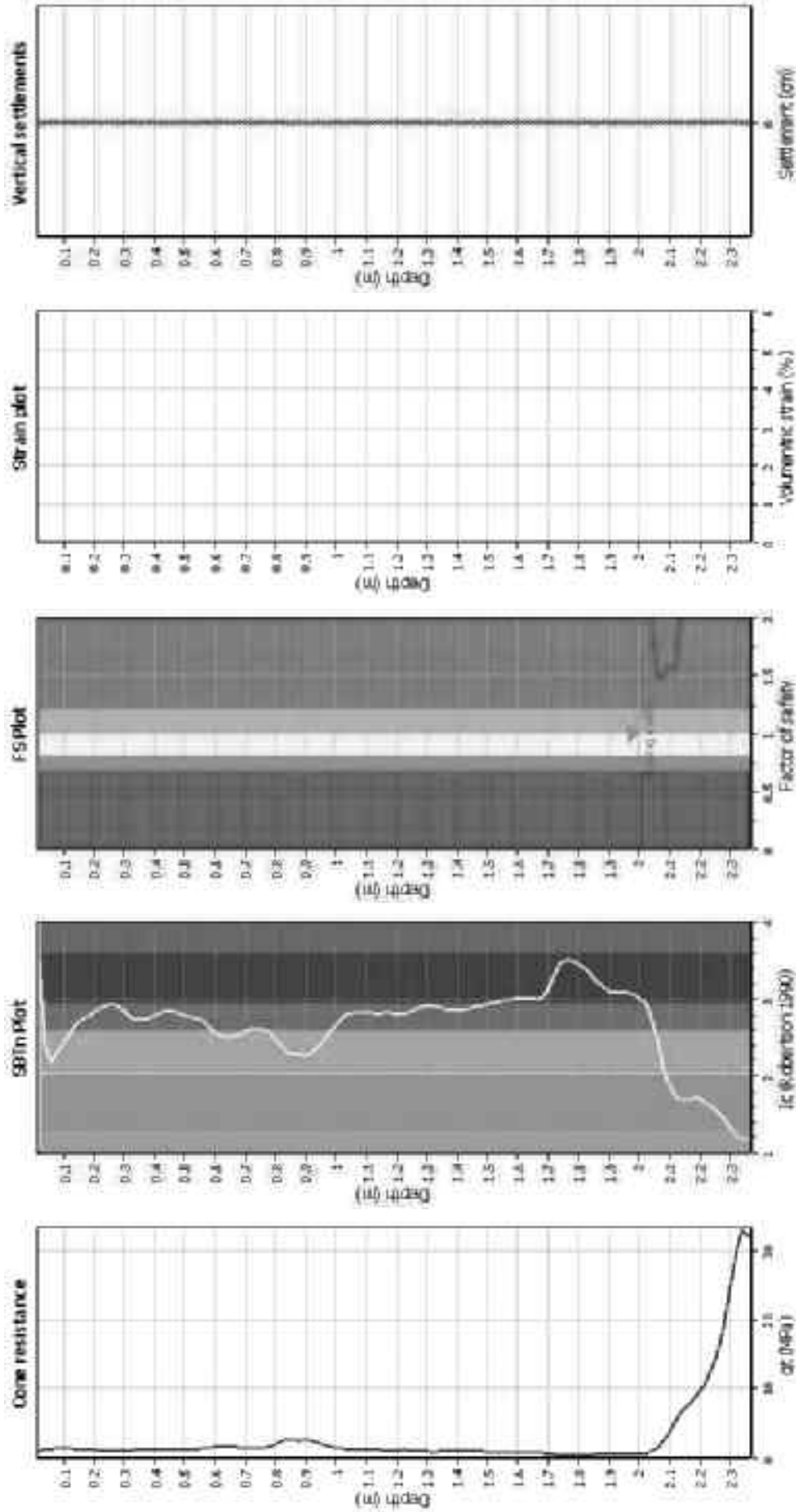
Analyze method:	B&I (2014)	Depth to GW (erthq.):	2.00 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition (select, applied):	No
Norm to test:	Based on Ic value	Ic cut-off value:	2.60	$f_c$ applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Unit weight calculation:	Based on SBT	Clay line behavior applied:	Sands only
Peak ground acceleration:	0.14	Use fill:	No	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

#### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained



### Estimation of post-earthquake settlements



#### Abbreviations

- $q_t$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

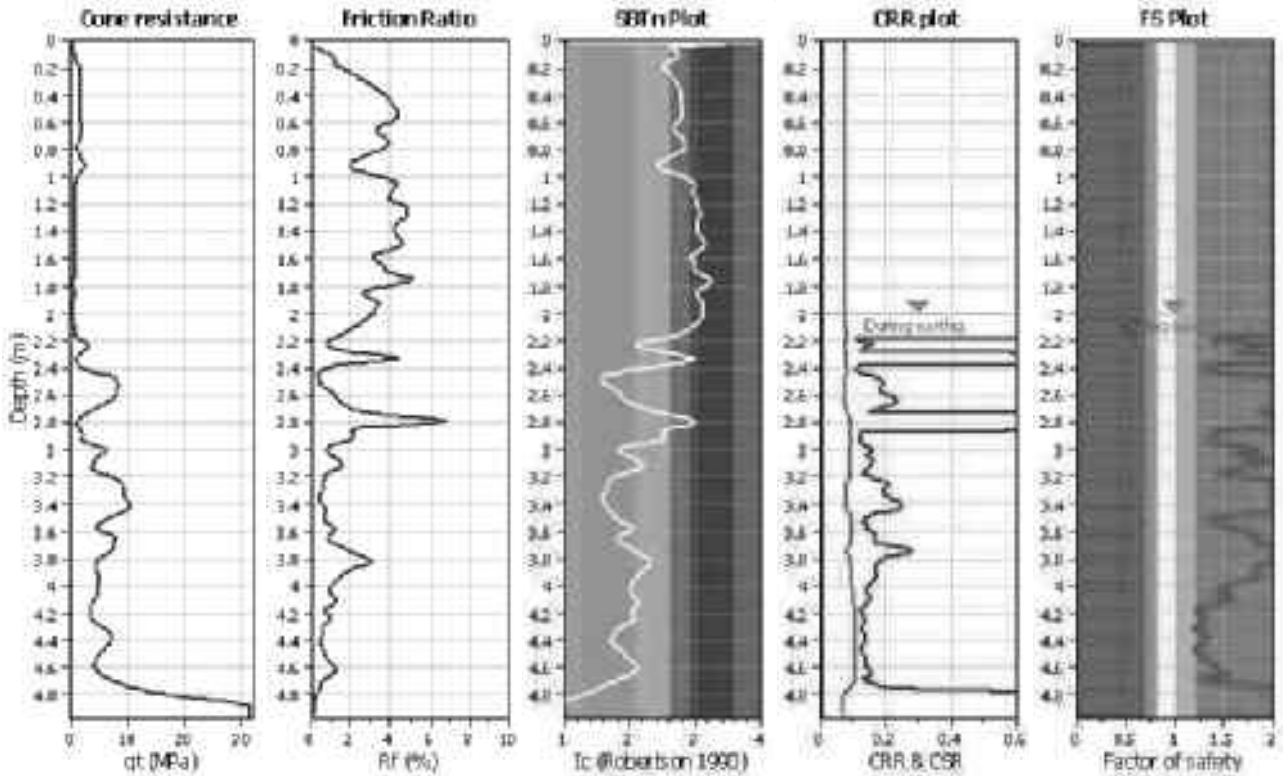
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

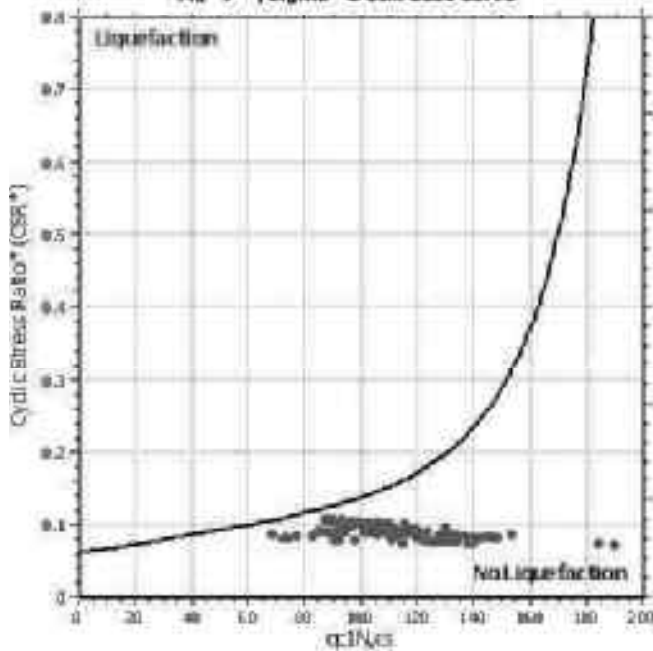
**CPT file : CPT103-SLS**

**Input parameters and analysis data**

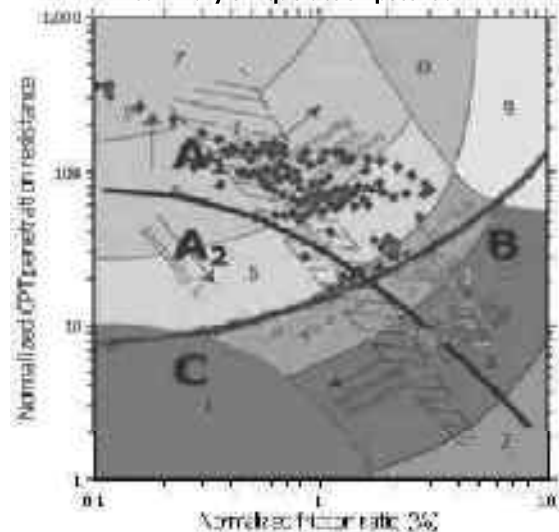
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

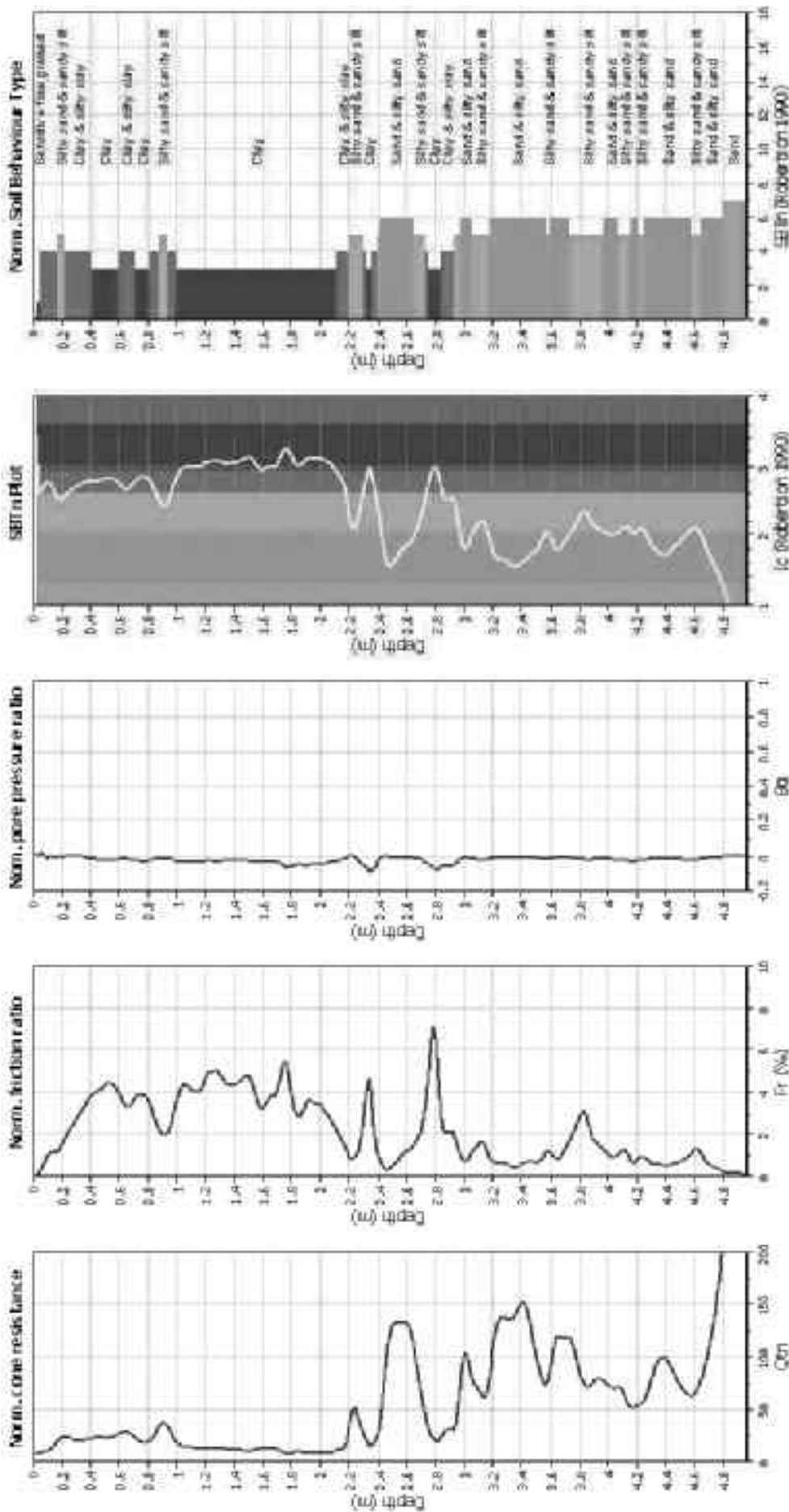


**Summary of liquefaction potential**



Zone A: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and grain geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and grain geometry.

### CPT basic interpretation plots (normaliz

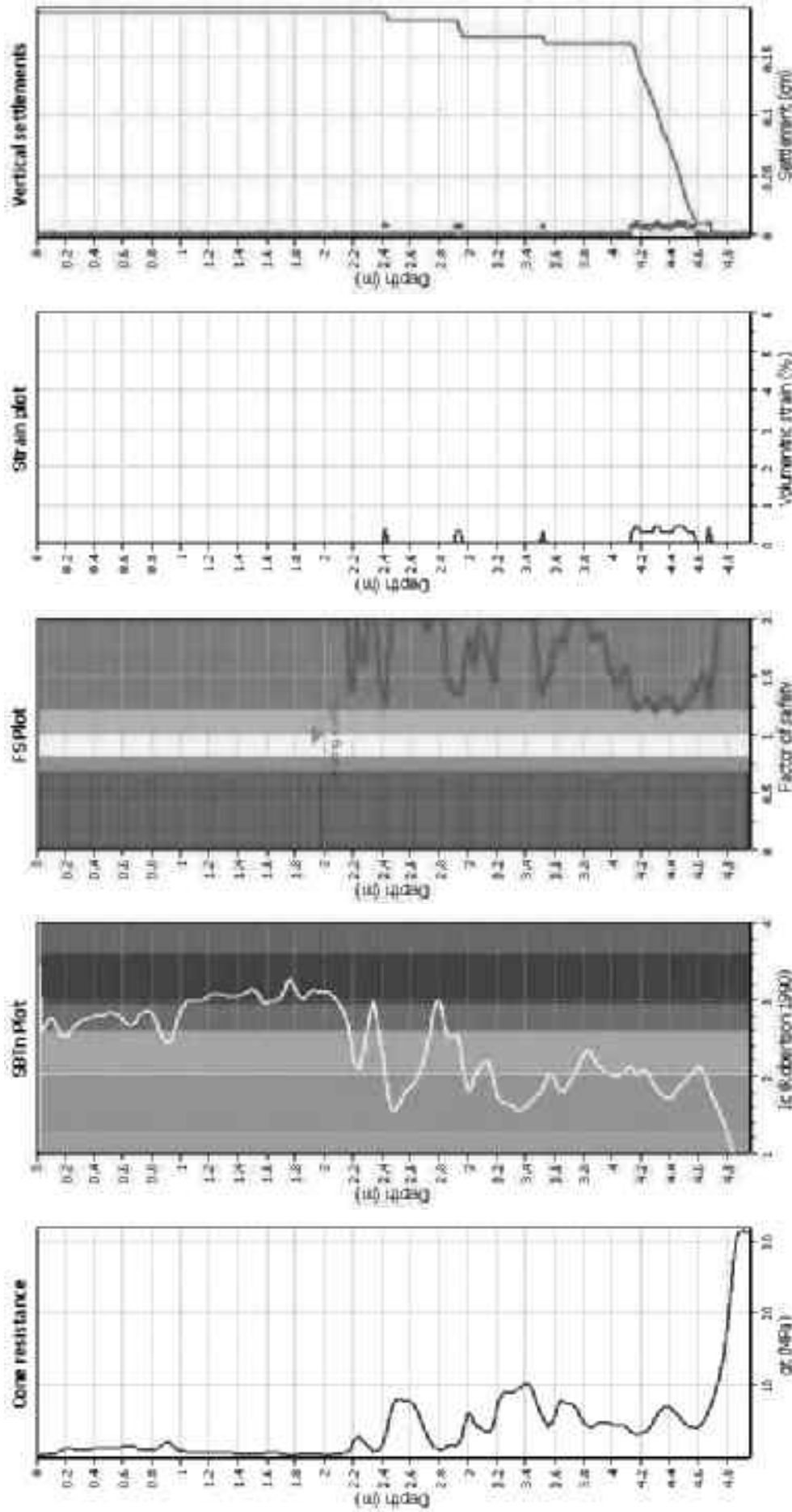


### Input parameters and analysis data

Analyze method:	B&I (2014)	Fill weight:	N/A
Fines correction method:	B&I (2014)	Transition (soeet) applied:	No
Norm to test:	Based on Ic value	R <sub>c</sub> applied:	Yes
Earthquake magnitude M <sub>w</sub> :	6.20	Clay line behavior applied:	Sands only
Peak ground acceleration:	0.14	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m

Depth to GW (earthq.):	2.00 m
Average results interval:	3
Ic cut-off value:	2.60
Unit weight calculation:	Based on SBT
Use fill:	No
Fill height:	N/A

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_t$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

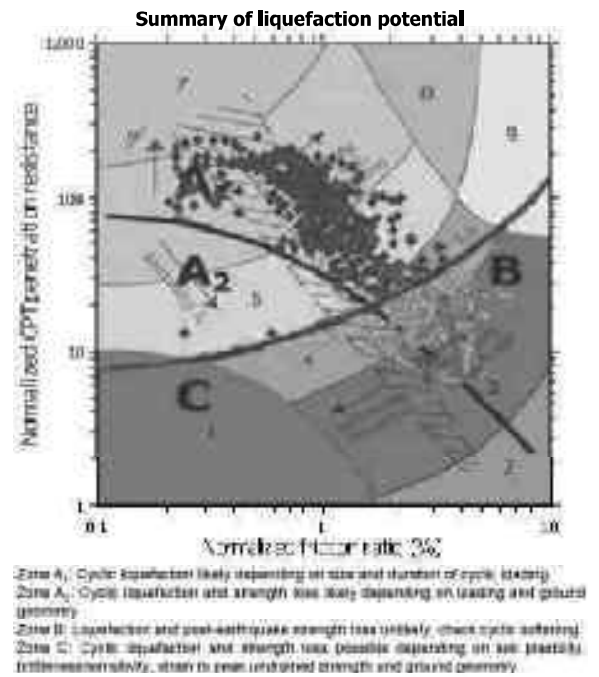
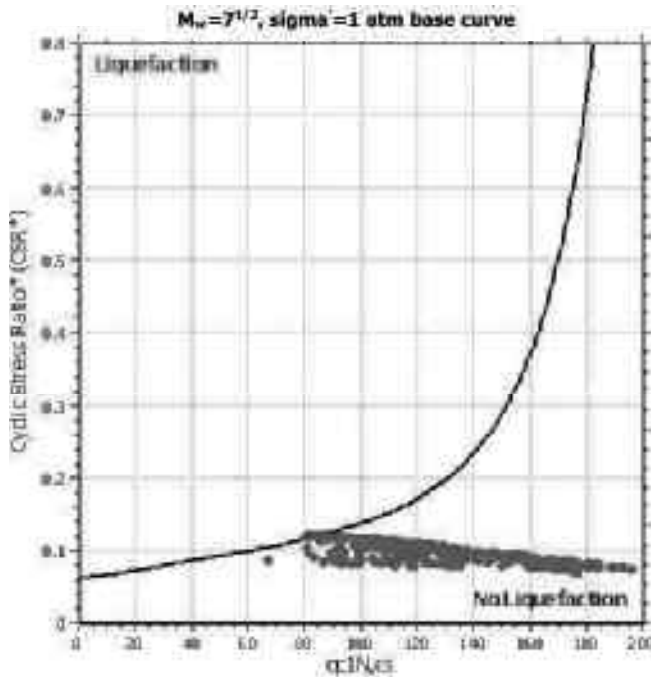
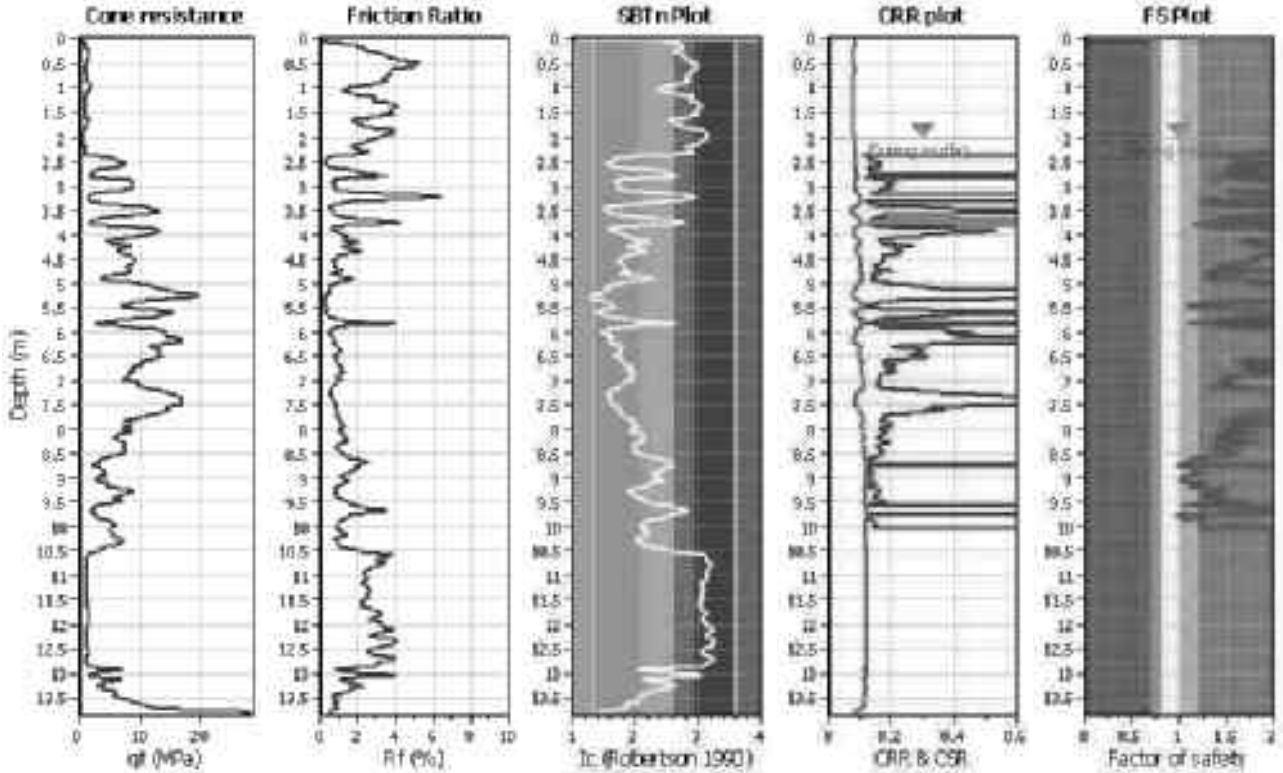
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

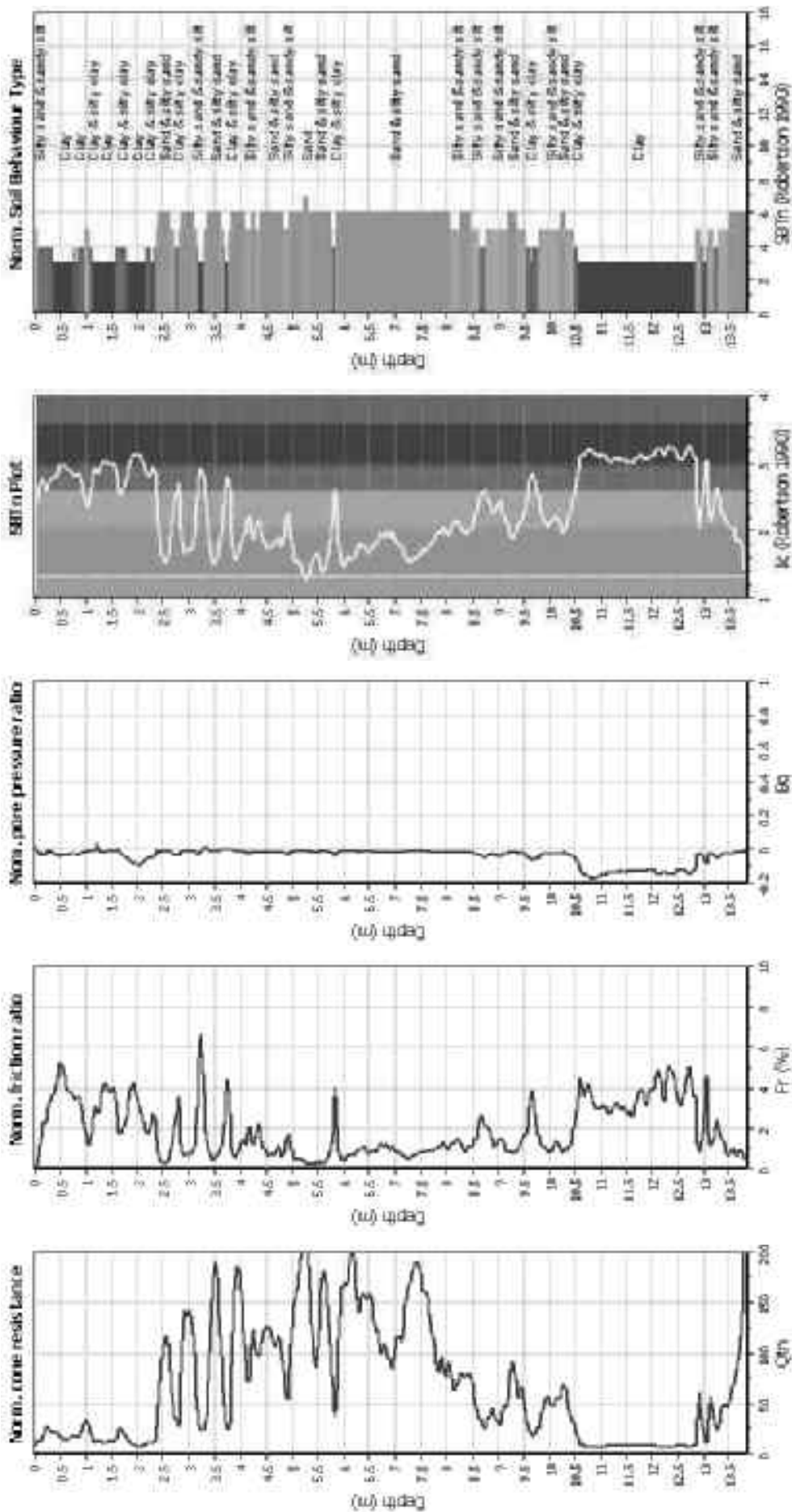
**CPT file : CPT104-SLS**

**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied: Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied: Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth: 10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method: Method



### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

Analyze method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.20  
 Peak ground acceleration: 0.14  
 Depth to water table (meters): 2.00 m

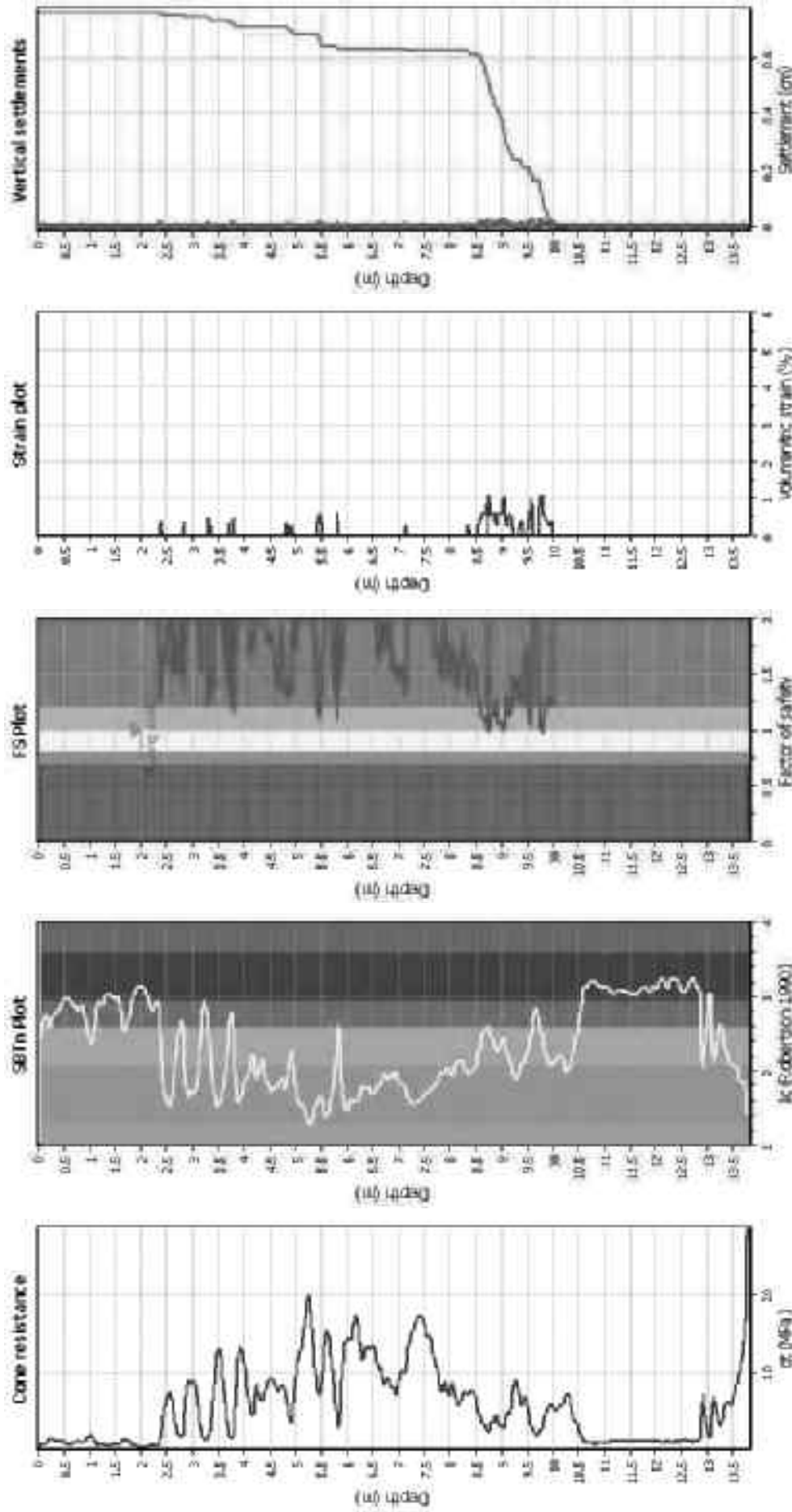
Depth to GWT (earthq.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (lowest) applied: No  
 $f_c$  applied: Yes  
 Clay size binomial applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

#### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain





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**LIQUEFACTION ANALYSIS REPORT**

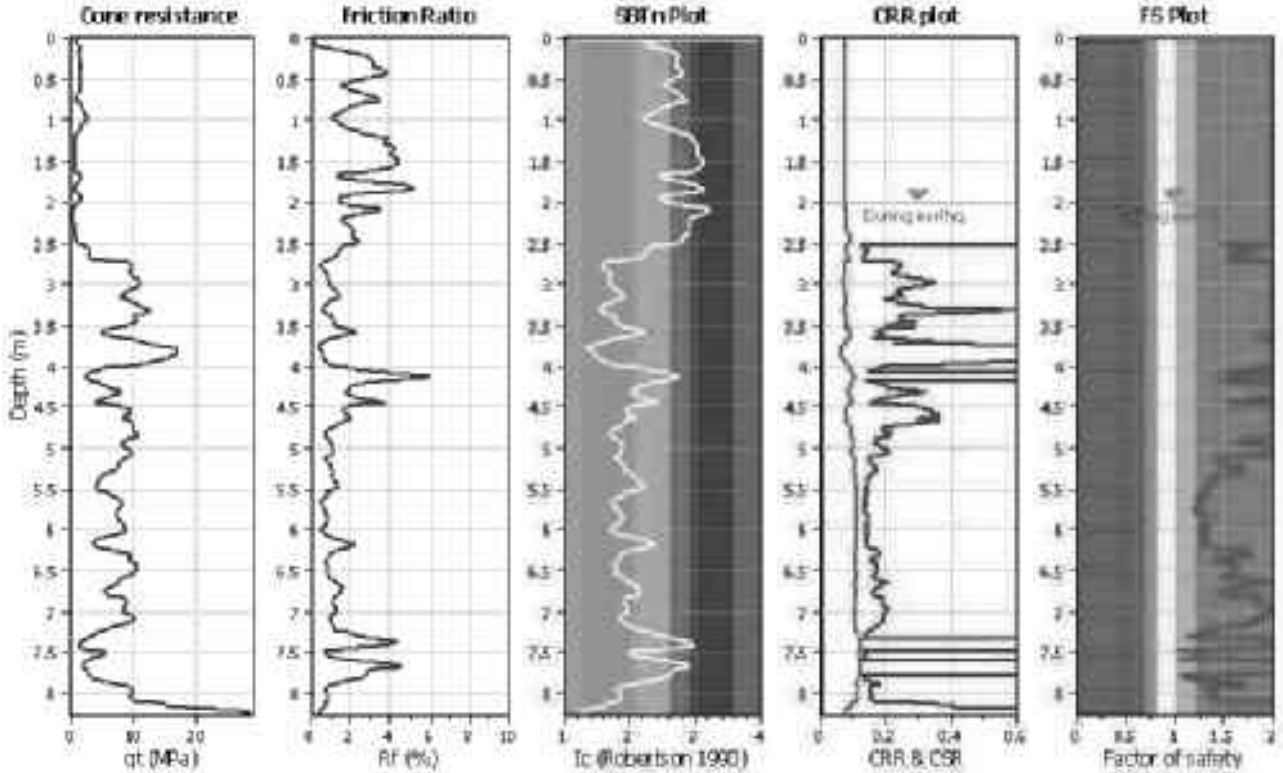
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT105-SLS**

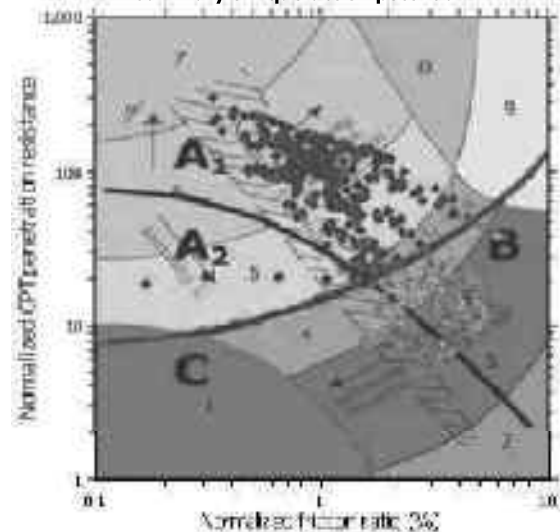
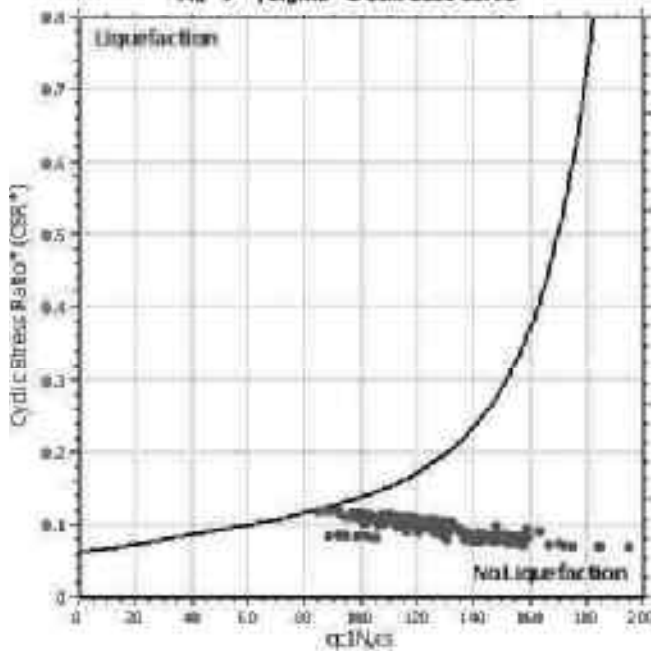
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**

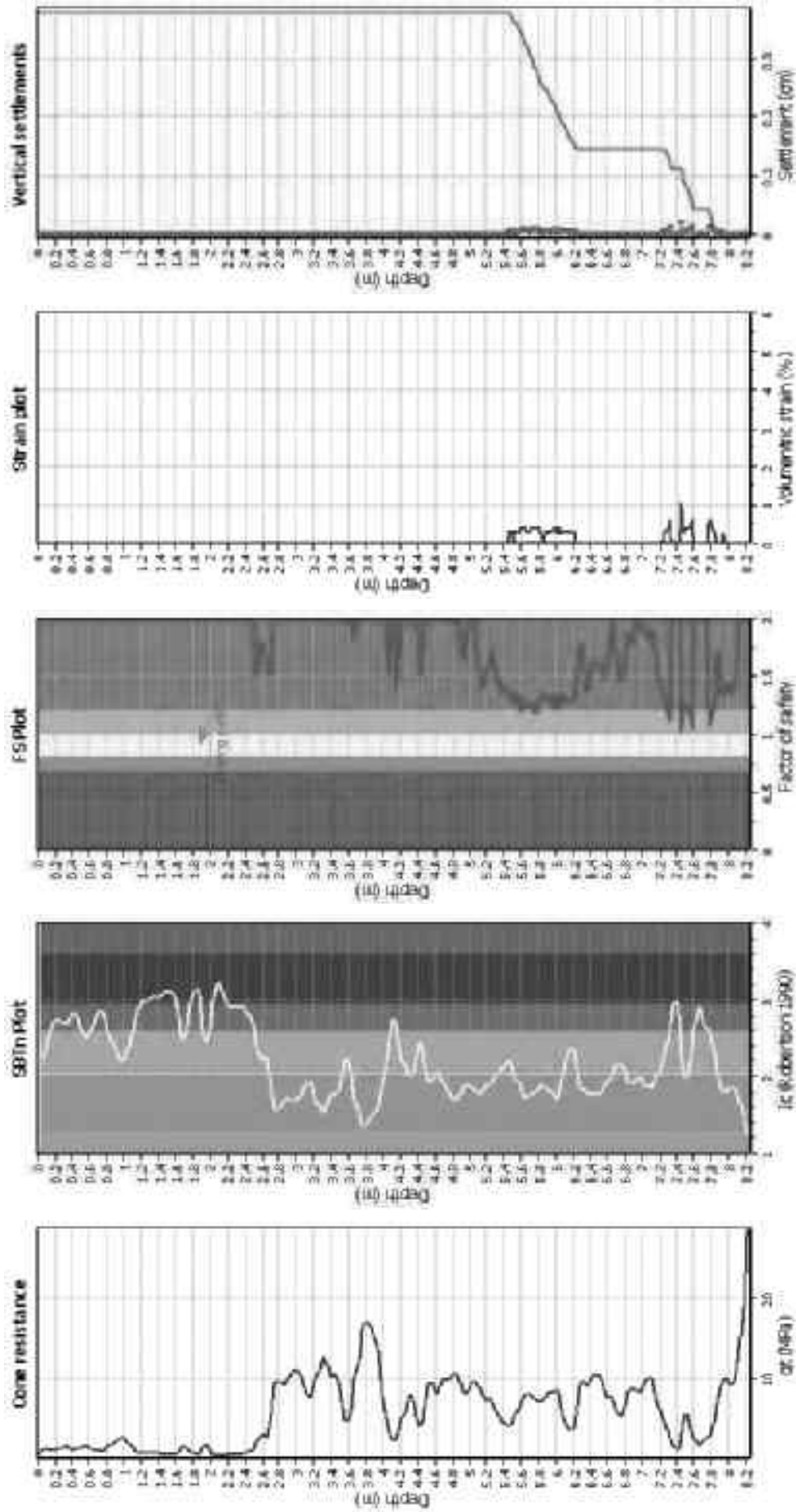


Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and ground geometry.





### Estimation of post-earthquake settlements



#### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

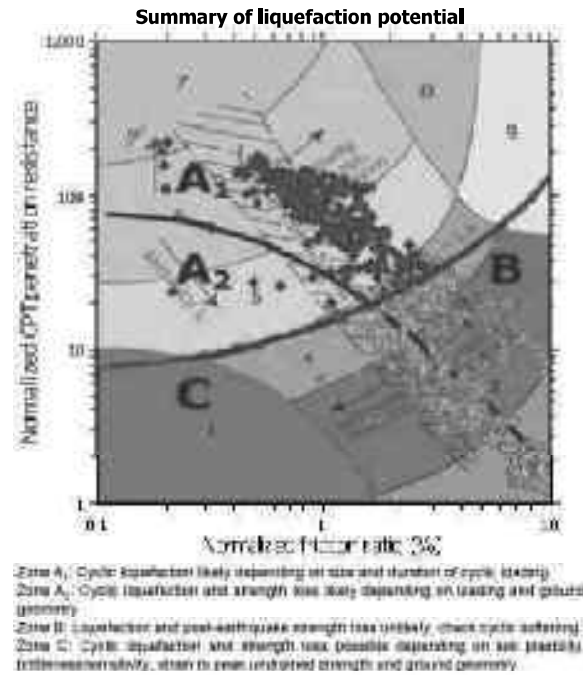
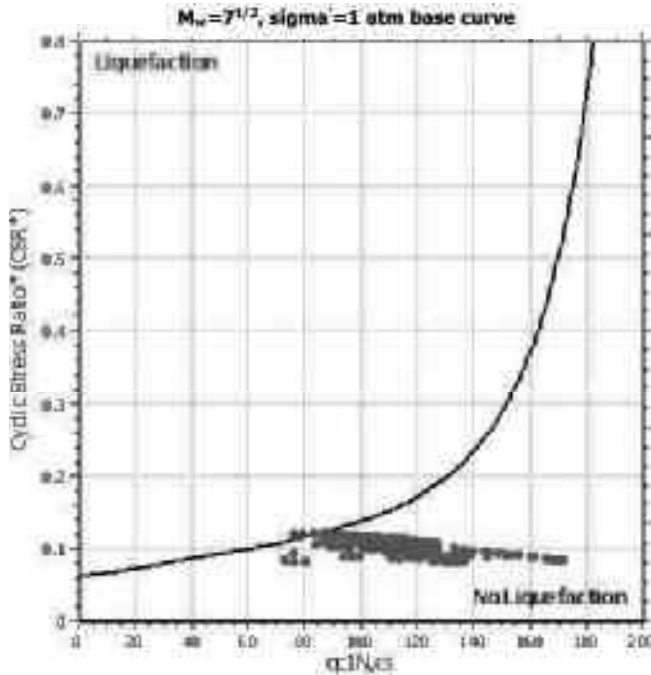
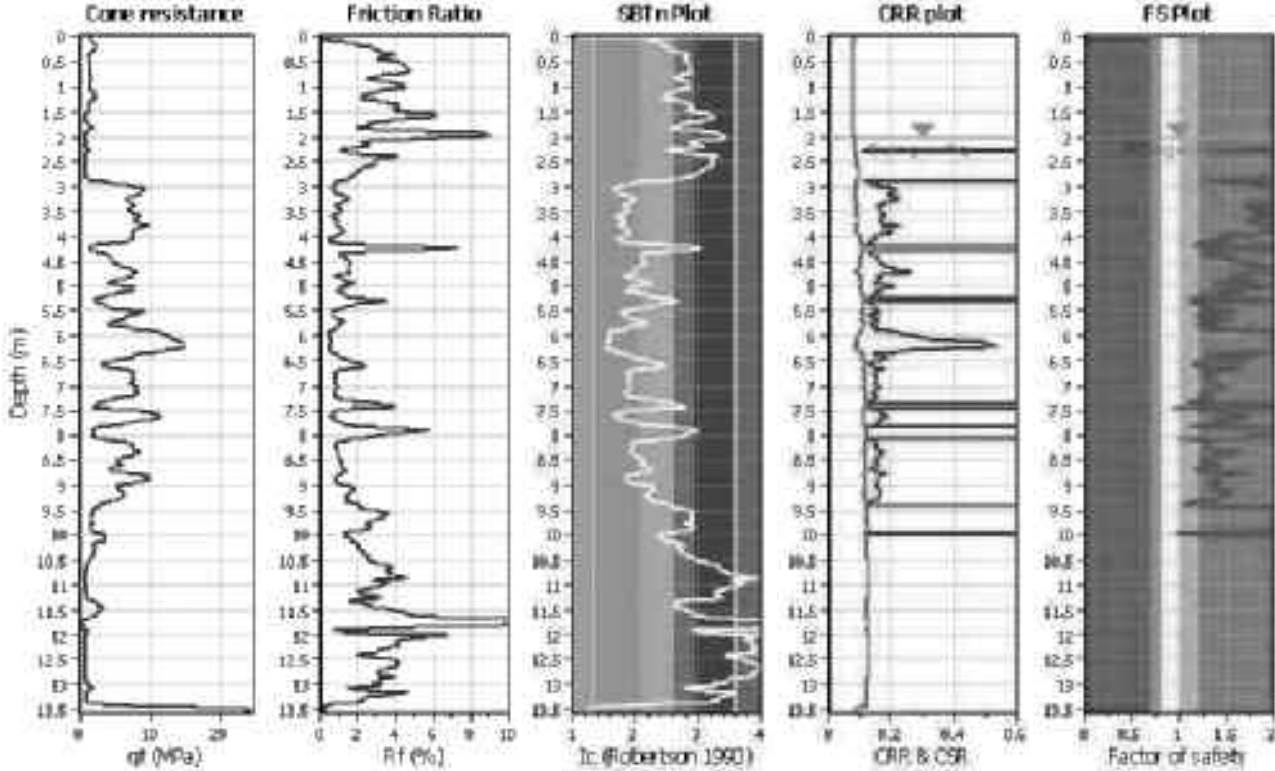
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

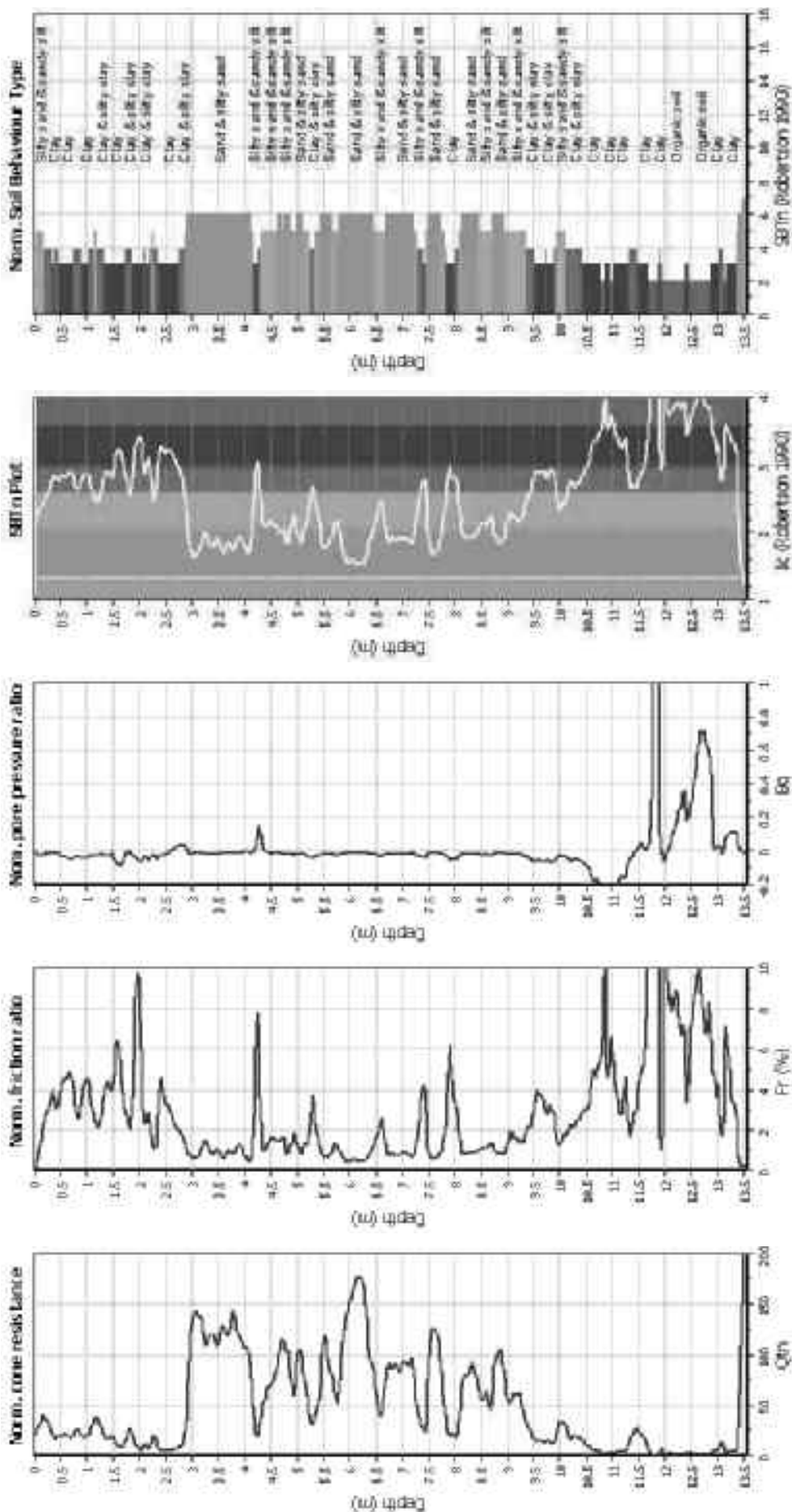
**CPT file : CPT106-SLS**

**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_0$ applied:	Yes	MSF method:	Method



### CPT basic interpretation plots (normaliz



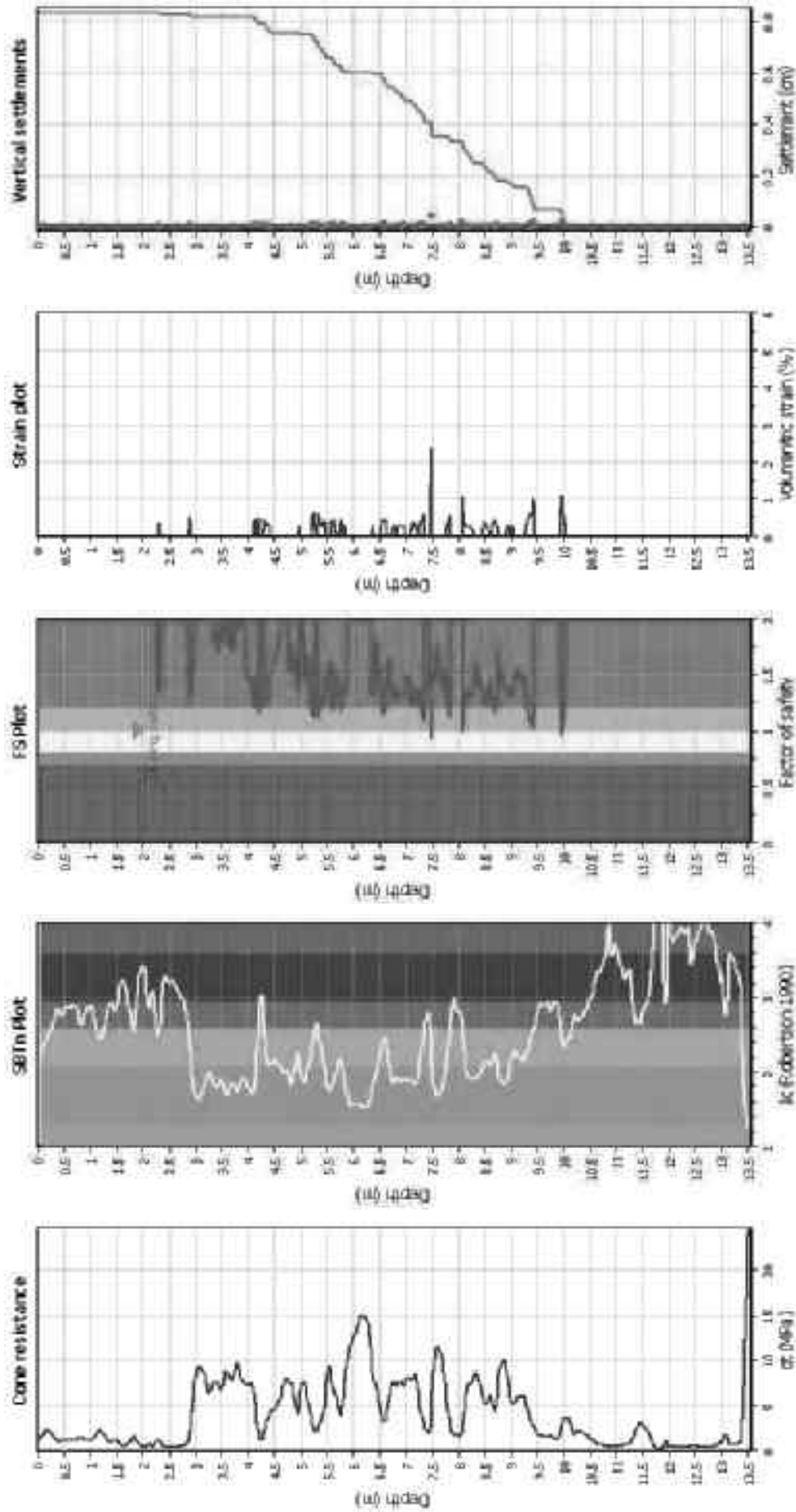
#### Input parameters and analysis data

Analysis method:	B&I (2014)	Fill weight:	N/A
Fines correction method:	B&I (2014)	Transition (lowest) applied:	No
Norm to test:	Based on Ic value	R <sub>f</sub> applied:	Yes
Earthquake magnitude M <sub>w</sub> :	6.20	Clay size behavior applied:	Sands only
Peak ground acceleration:	0.14	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m

#### SBTm legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravelly sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

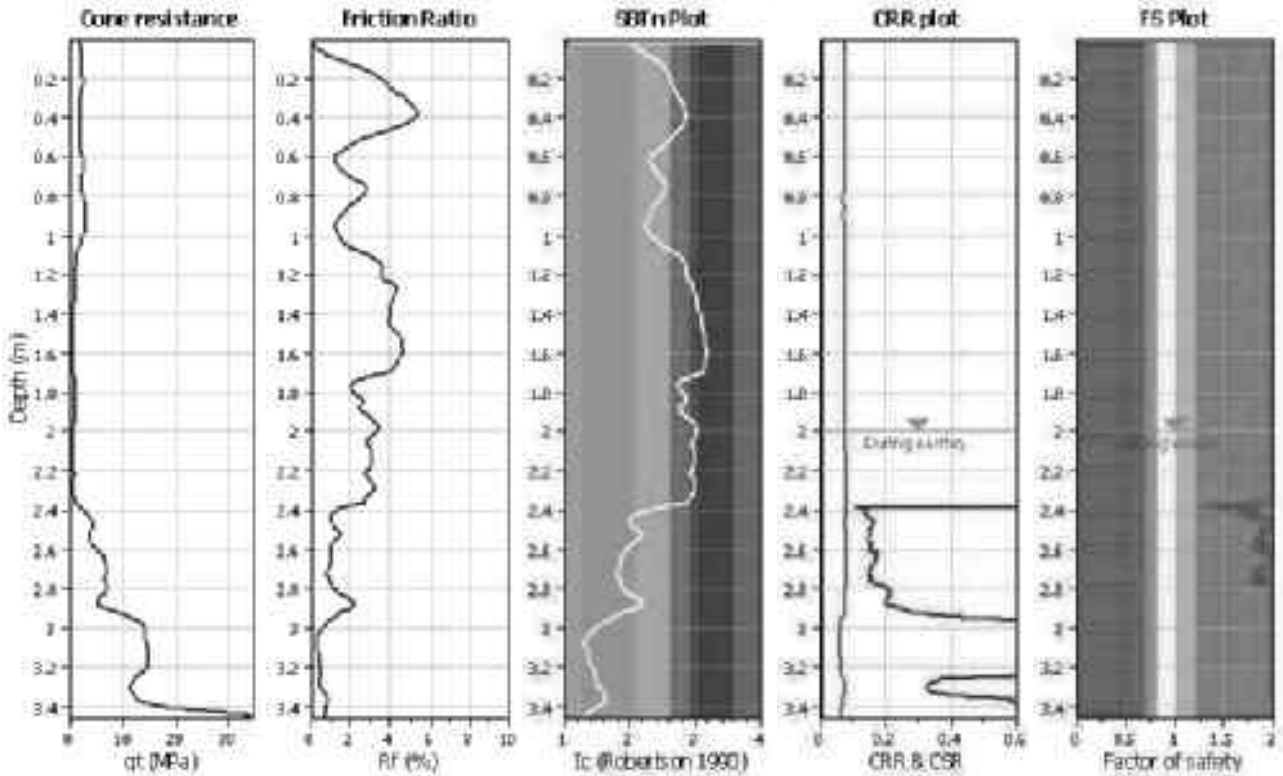
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT107-SLS**

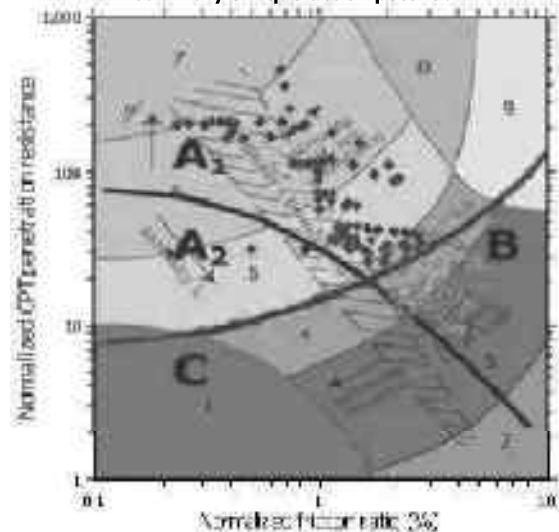
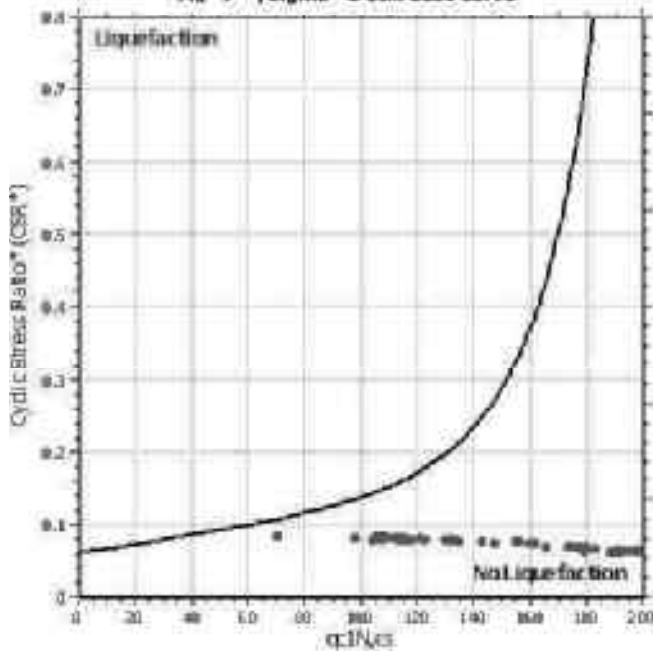
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

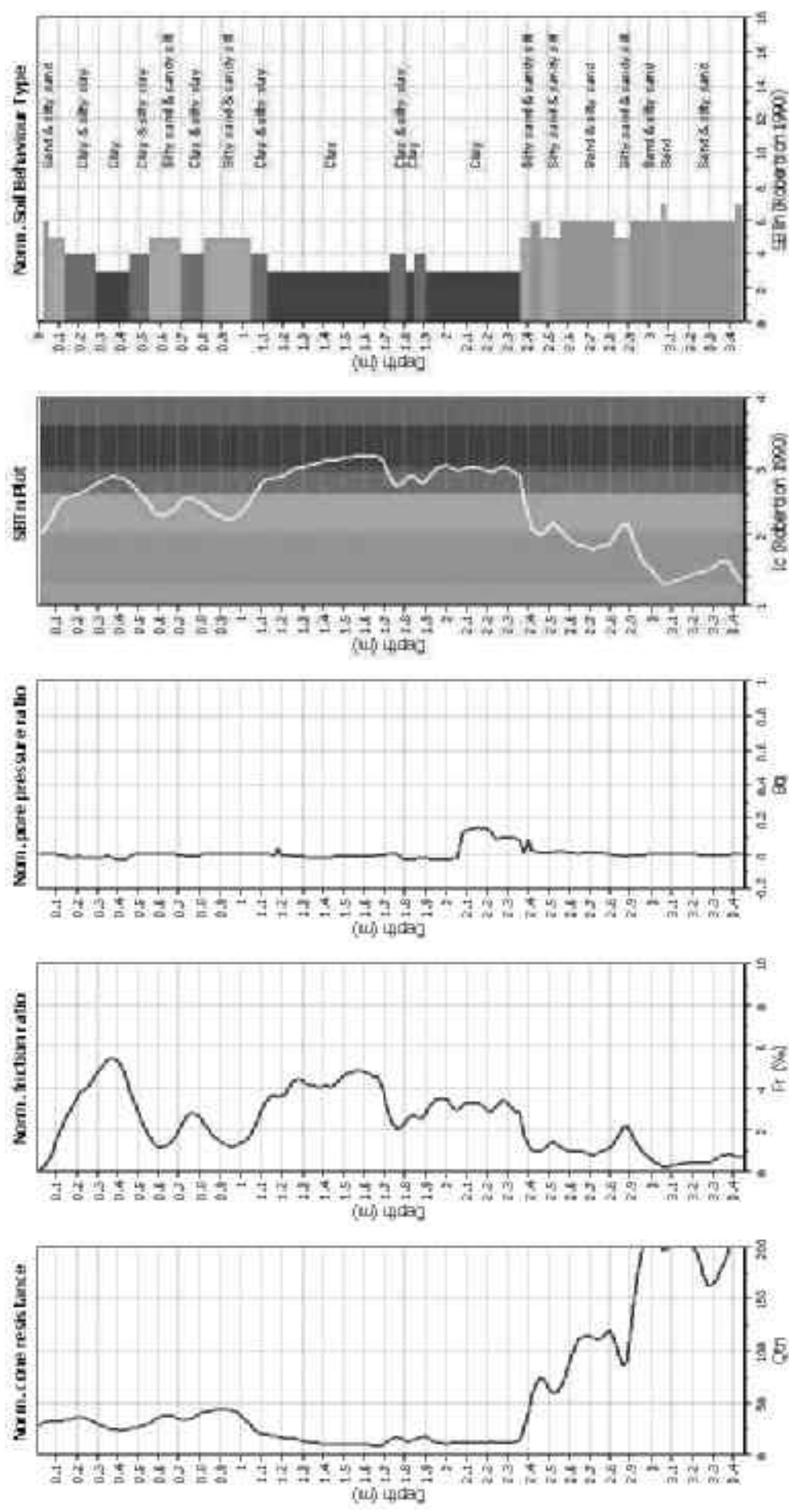
**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and ground geometry.



### CPT basic interpretation plots (normaliz



**Input parameters and analysis data**

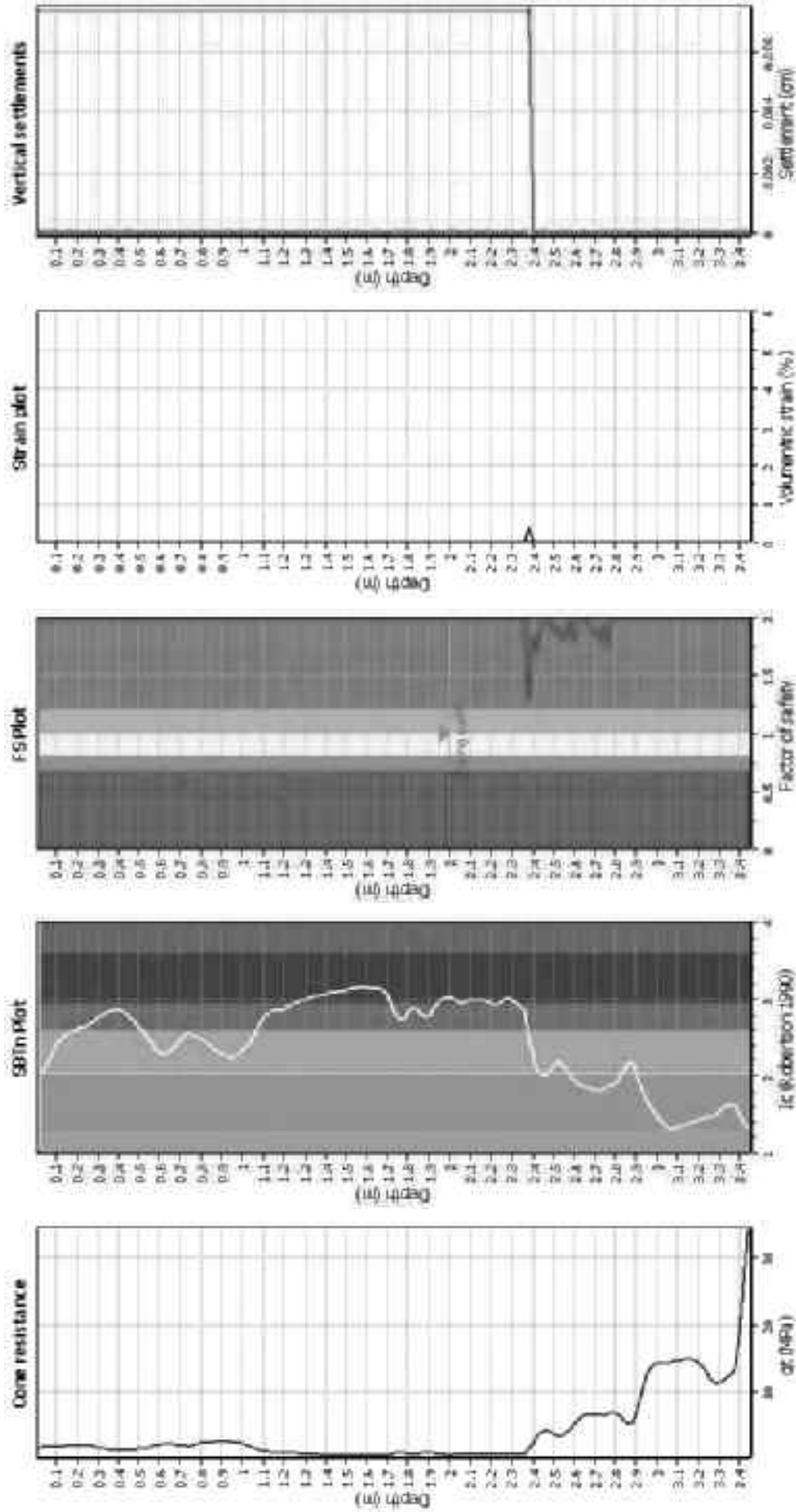
Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.20  
 Peak ground acceleration: 0.14  
 Depth to water table (meters): 2.00 m

Depth to GW (earthq.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (solect) applied: No  
 $f_v$  applied: Yes  
 Clay line behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

- SBTn legend**
- 1. Sensitive fine grained
  - 2. Organic material
  - 3. Clay to silty clay
  - 4. Clayey silt to silty
  - 5. Silty sand to sandy silt
  - 6. Clean sand to silty sand
  - 7. Gravelly sand to sand
  - 8. Very stiff sand to
  - 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- qc Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- Ic Soil Behaviour Type Index
- FS Calculated Factor of Safety against liquefaction
- Volumetric strain Post-liquefaction volumetric strain





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**LIQUEFACTION ANALYSIS REPORT**

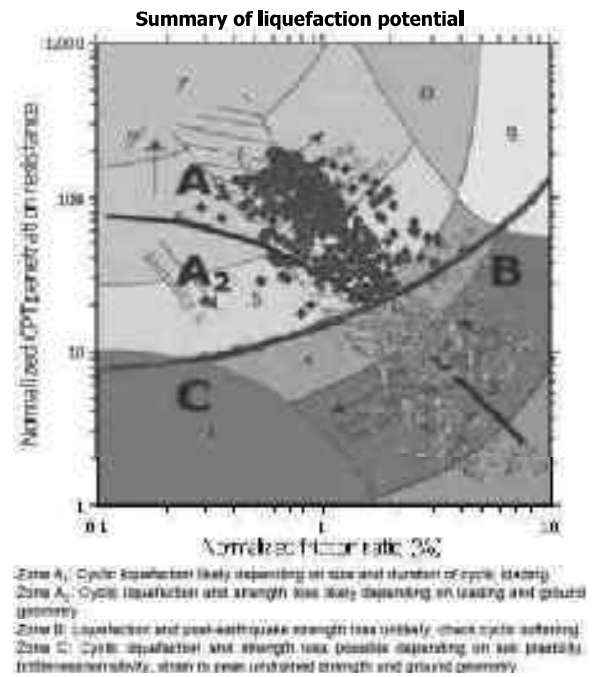
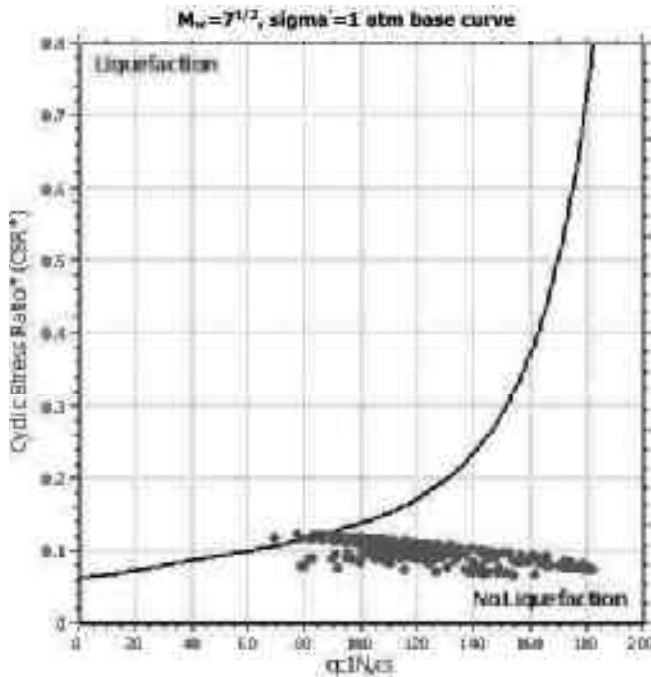
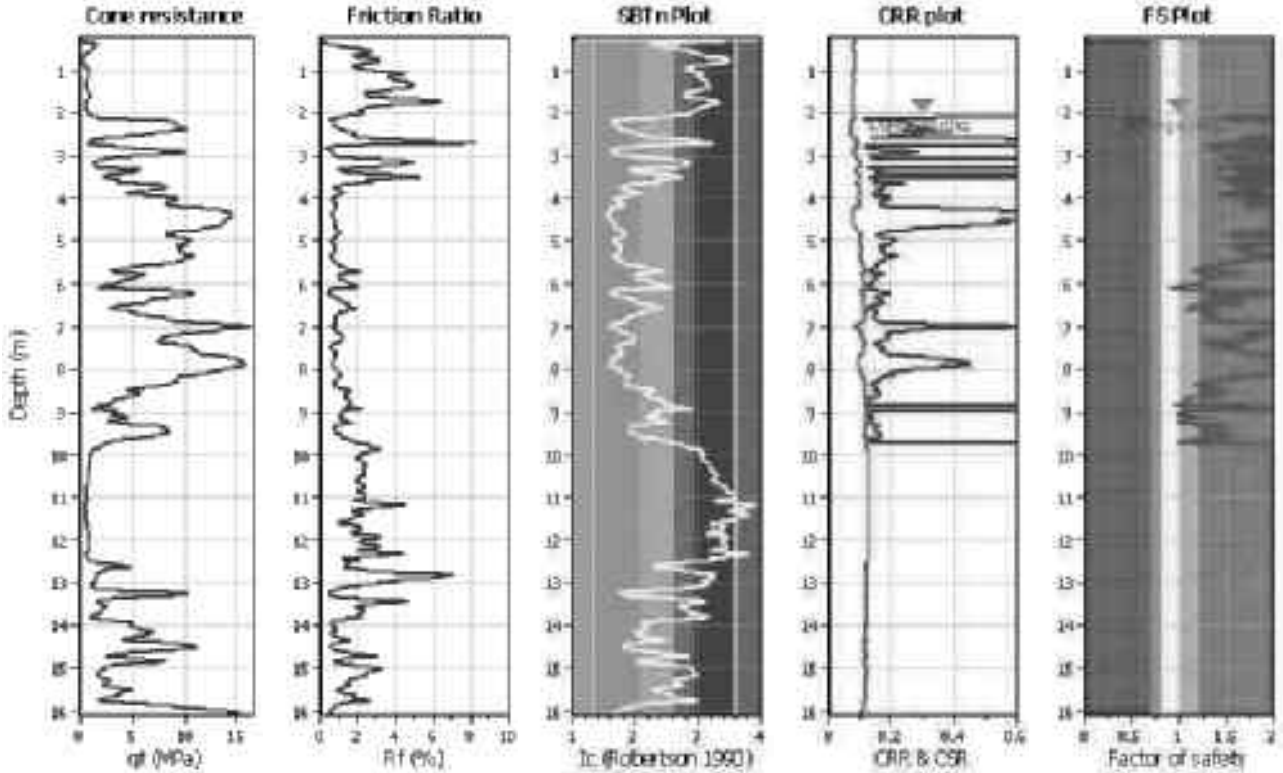
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

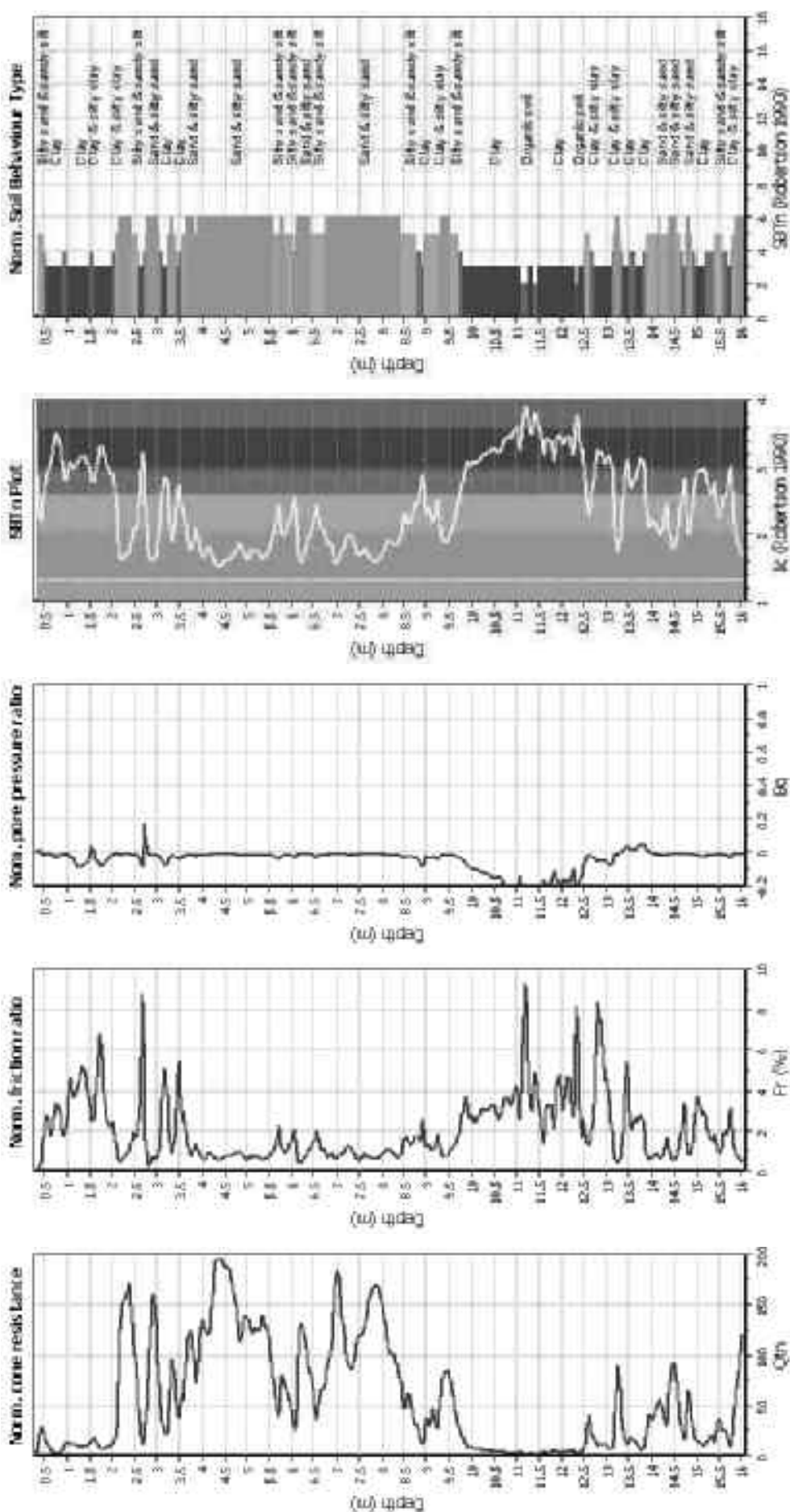
**CPT file : CPT108-SLS**

**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use file:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



### CPT basic interpretation plots (normaliz



**Input parameters and analysis data**

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norms to test: Based on I<sub>c</sub> value  
 Earthquake magnitude M<sub>w</sub>: 6.20  
 Peak ground acceleration: 0.14  
 Depth to water table (meters): 2.00 m

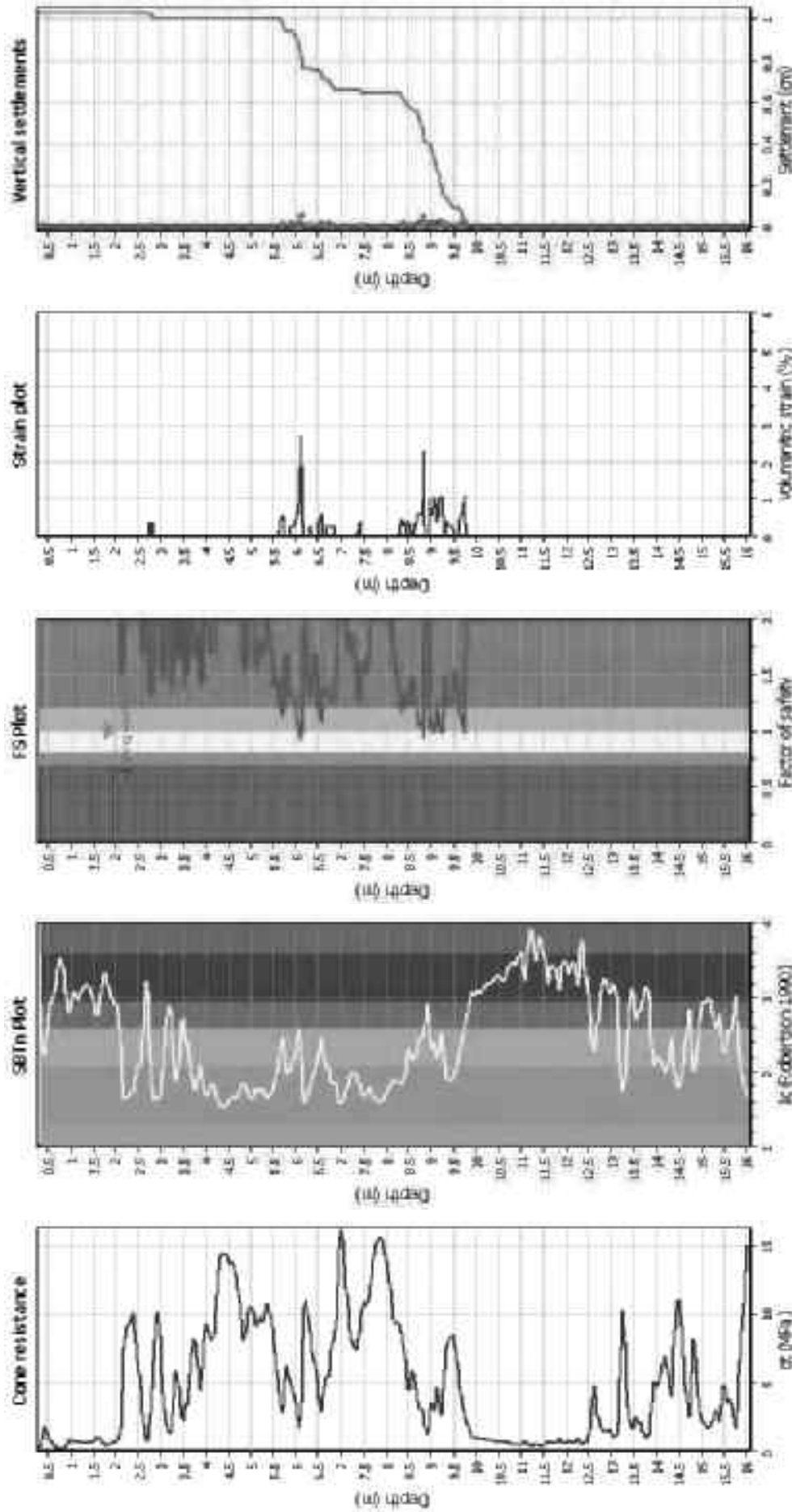
Depth to GWT (earthq.): 2.00 m  
 Average results interval: 3  
 I<sub>c</sub> cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (down): applied: No  
 R<sub>f</sub> applied: Yes  
 Clay line behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

**SBTm legend**

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

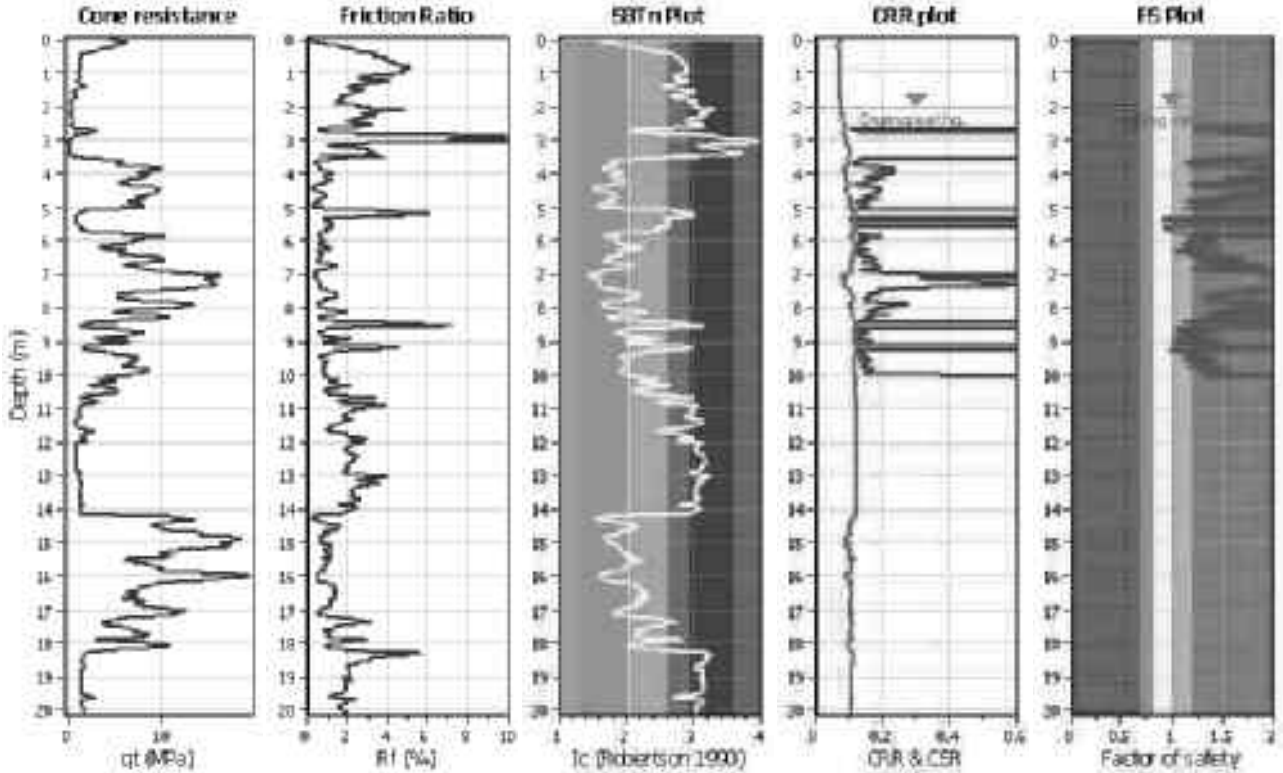
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

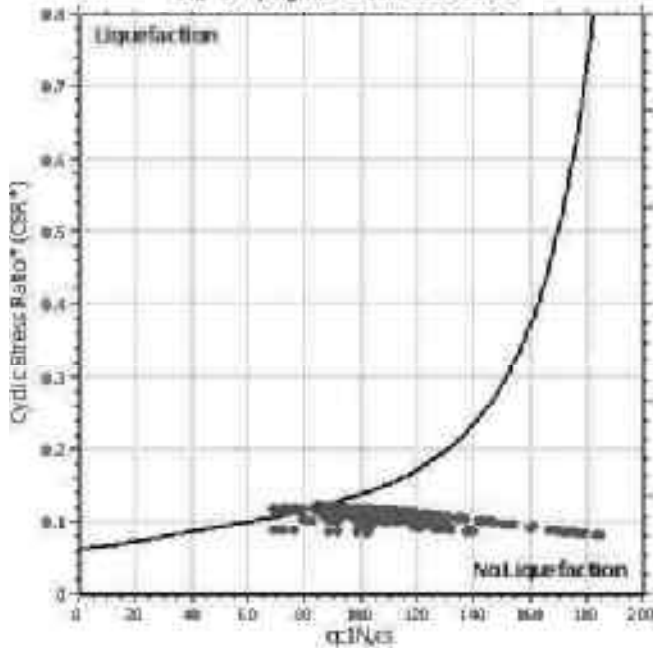
**CPT file : CPT109-SLS**

**Input parameters and analysis data**

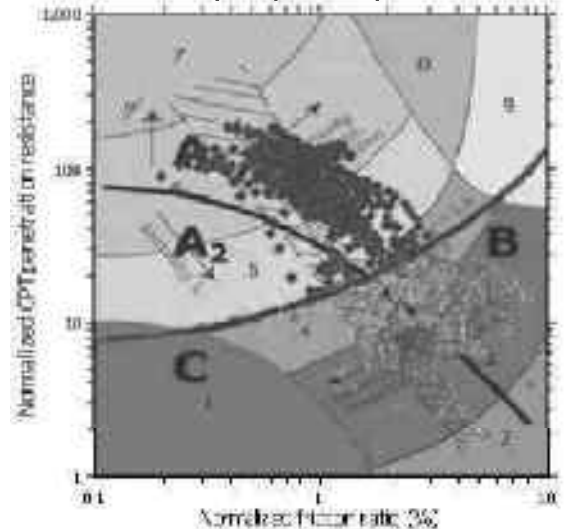
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w = 7^{1/2}$ ,  $\sigma_v = 1$  atm base curve

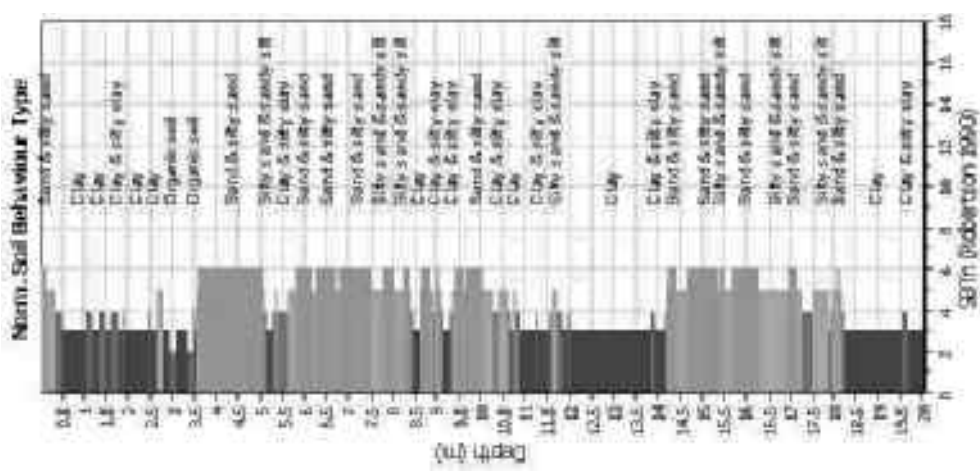
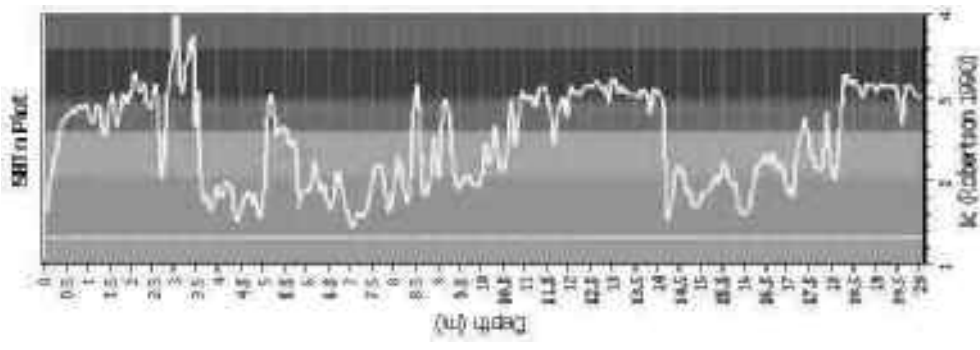
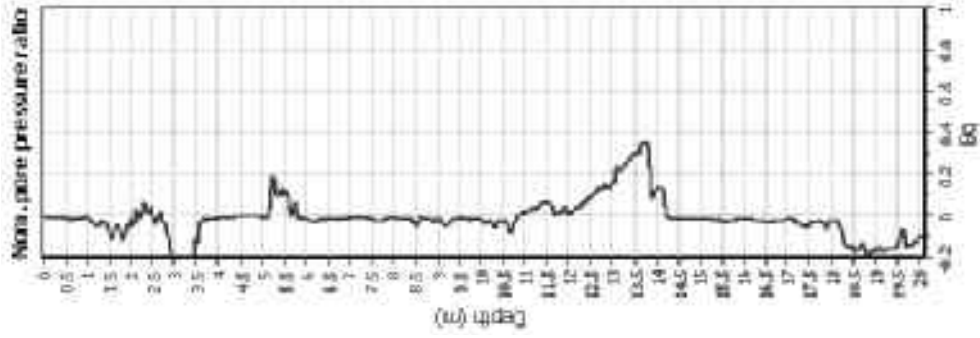
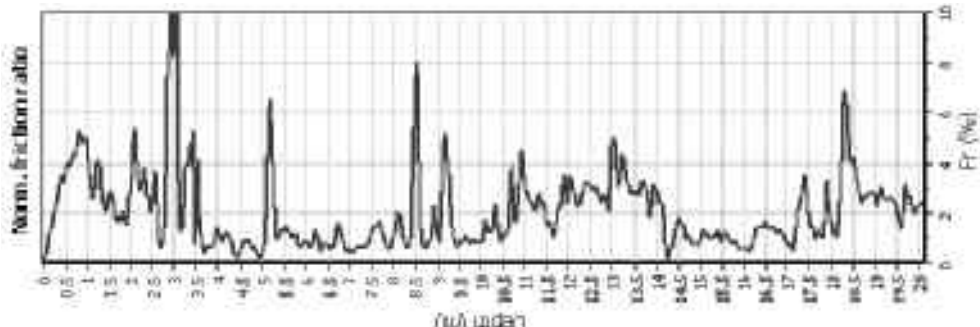
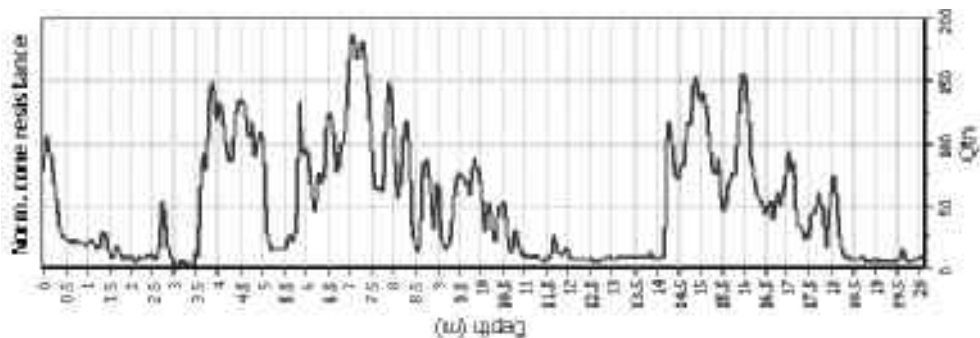


**Summary of liquefaction potential**



Zone A: Cyclic liquefaction likely depending on size and number of cycle (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/normality, strain to zero undrained strength and ground geometry.

### CPT basic interpretation plots (normaliz



### Input parameters and analysis data

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on  $I_c$  value  
 Earthquake magnitude  $M_w$ : 6.20  
 Peak ground acceleration: 0.14  
 Depth to water table (meters): 2.00 m

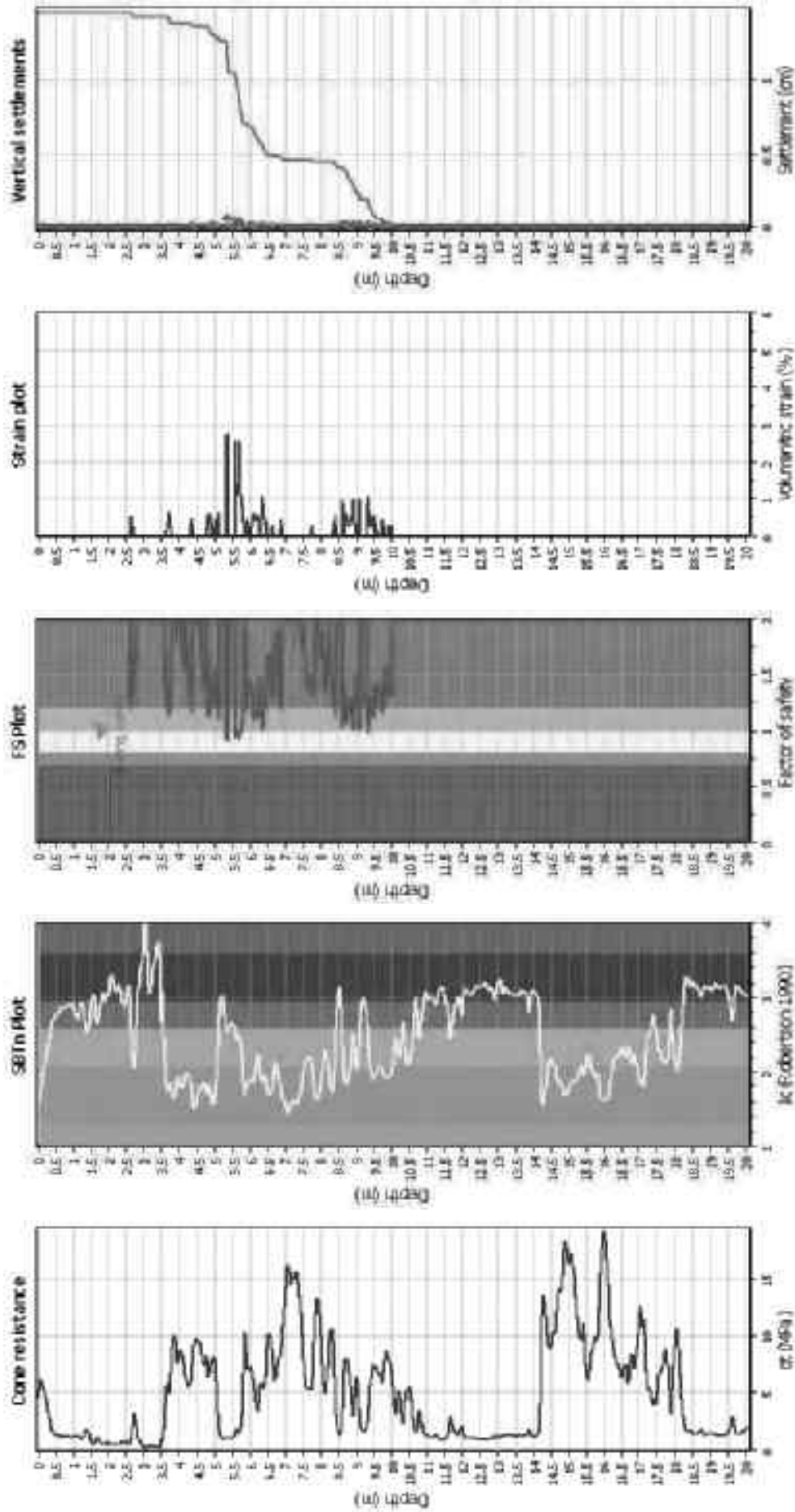
Depth to GWT (ortho.): 2.00 m  
 Average results interval: 3  
 $I_c$  cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (down): applied: No  
 $f_v$  applied: Yes  
 Clay line behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_t$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $k_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain





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**LIQUEFACTION ANALYSIS REPORT**

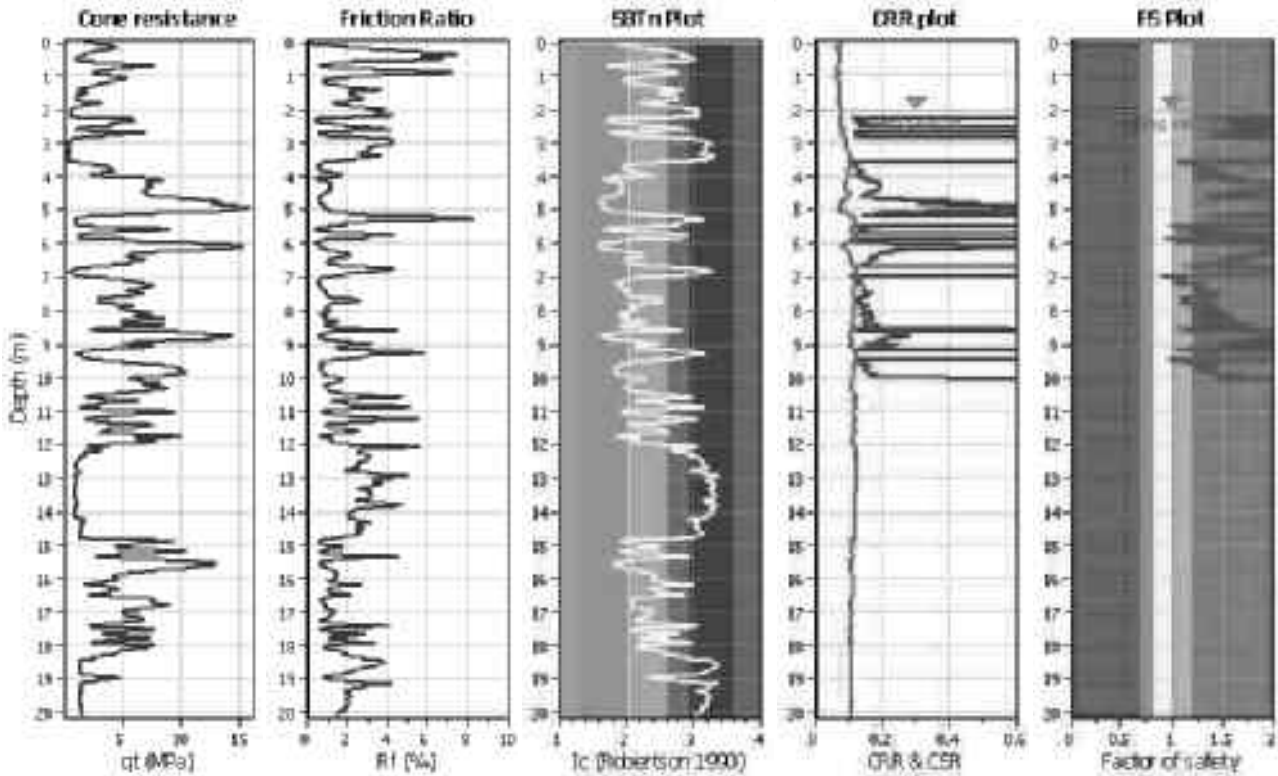
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

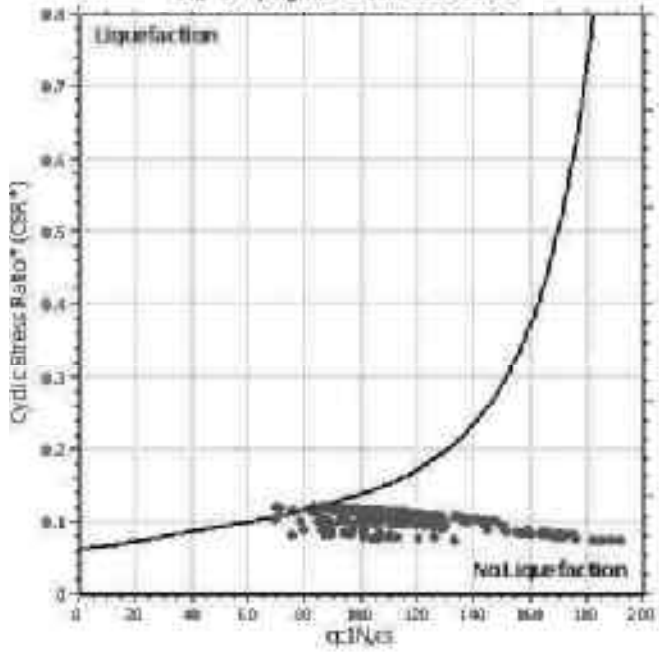
**CPT file : CPT110-SLS**

**Input parameters and analysis data**

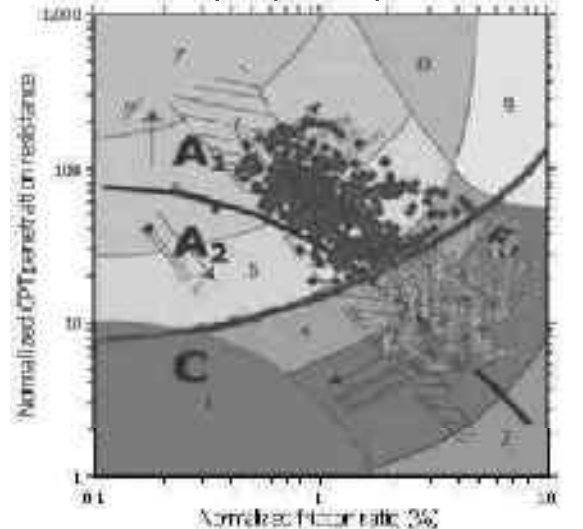
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

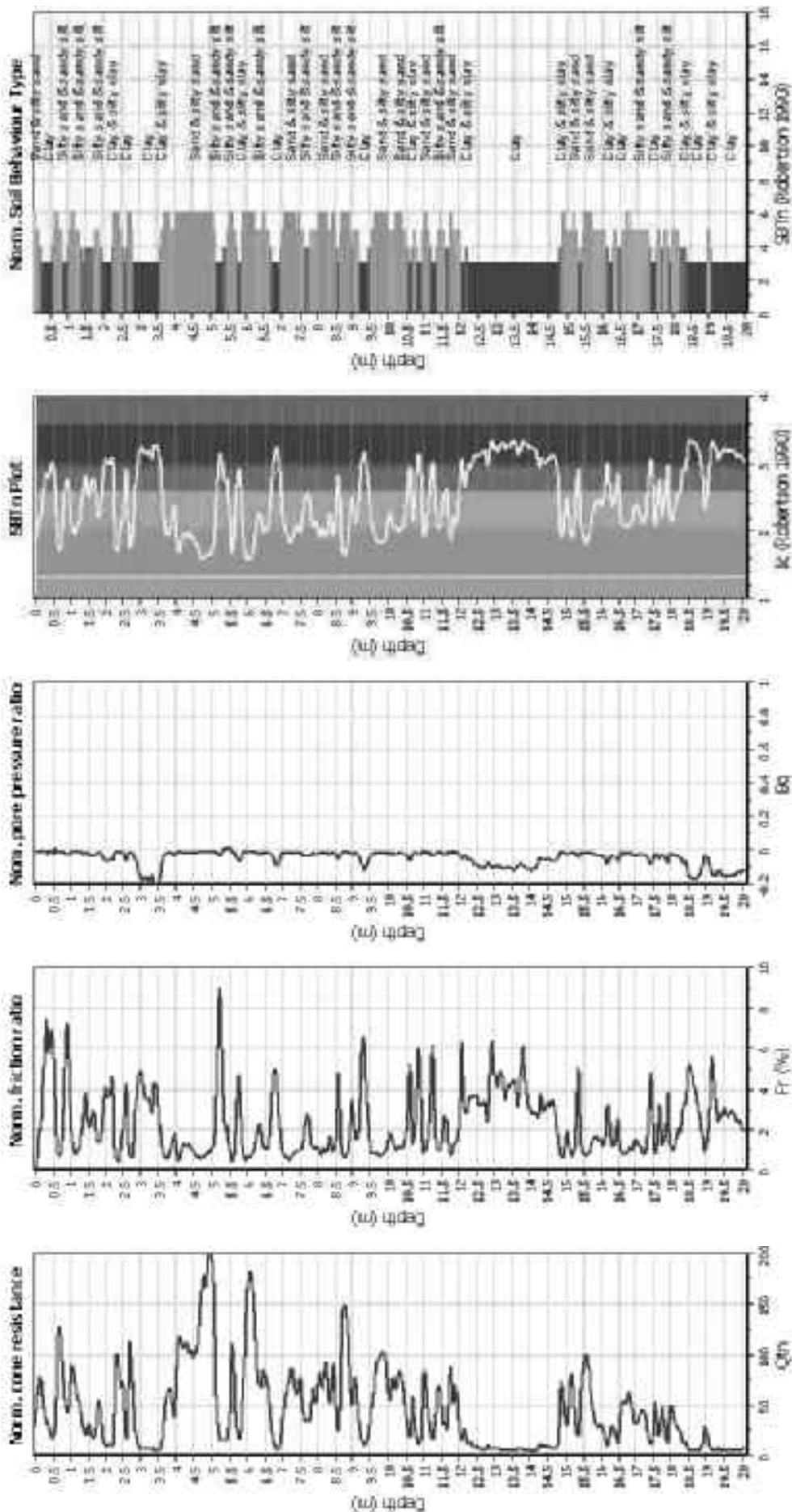


**Summary of liquefaction potential**



Zone A1: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normal stress, strain to zero undrained strength and ground geometry.

### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

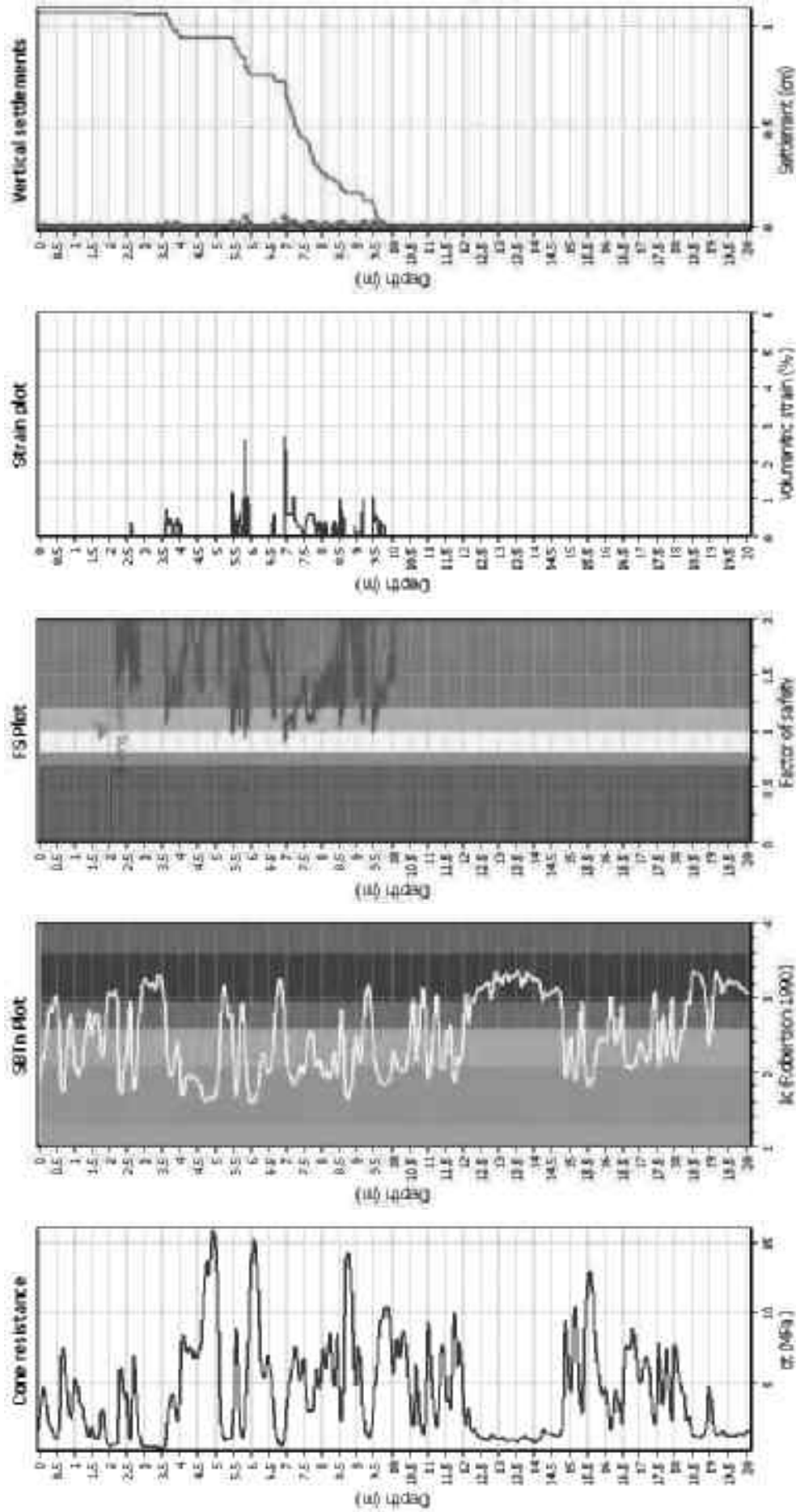
Analysis method:	B&I (2014)	Fill weight:	N/A
Fines correction method:	B&I (2014)	Transition (lowest applied):	No
Norm to test:	Based on $f_c$ value	$f_c$ applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Clay line behavior applied:	Sands only
Peak ground acceleration:	0.14	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m

#### SBTm legend

	1. Sensitive fine grained		7. Gravely sand to sand
	2. Organic material		8. Very stiff sand to silt
	3. Clay to silty clay		9. Very stiff fine grained
	4. Clayey silt to silty		
	5. Silty sand to sandy silt		
	6. Clean sand to silty sand		



### Estimation of post-earthquake settlements



#### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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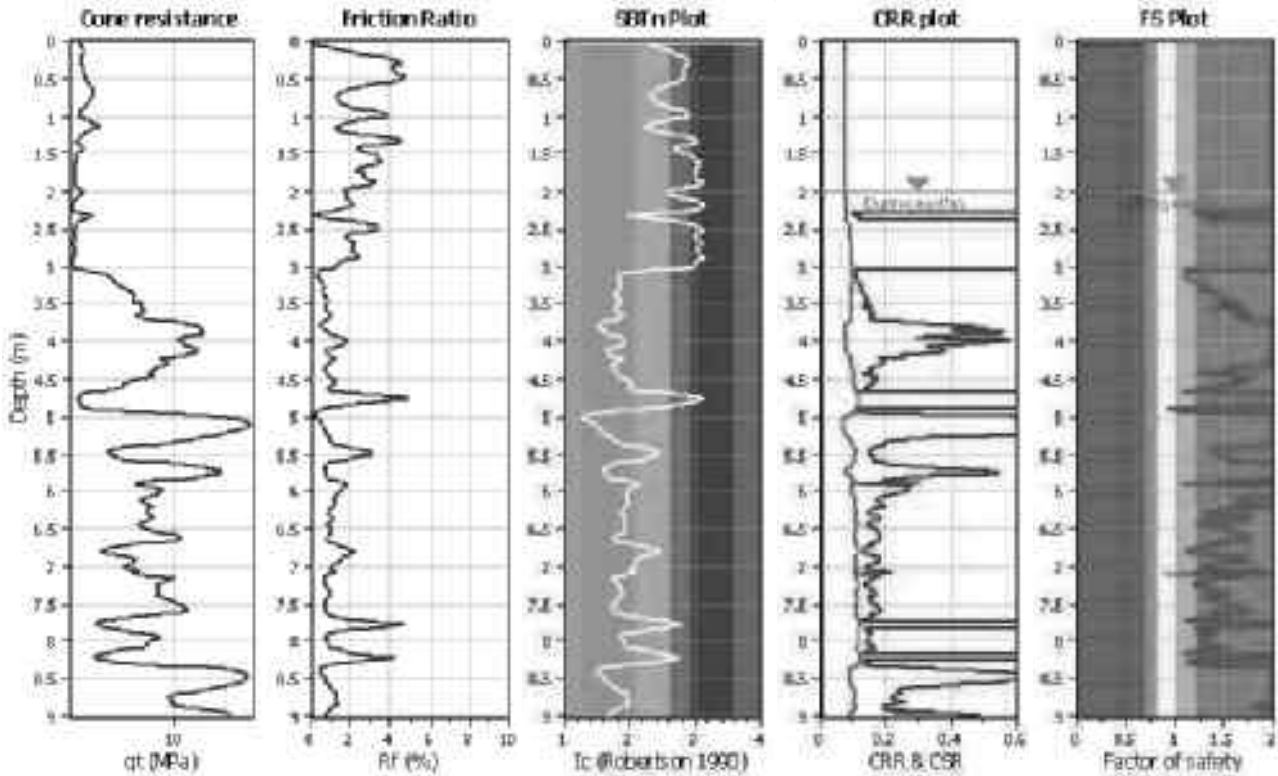
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

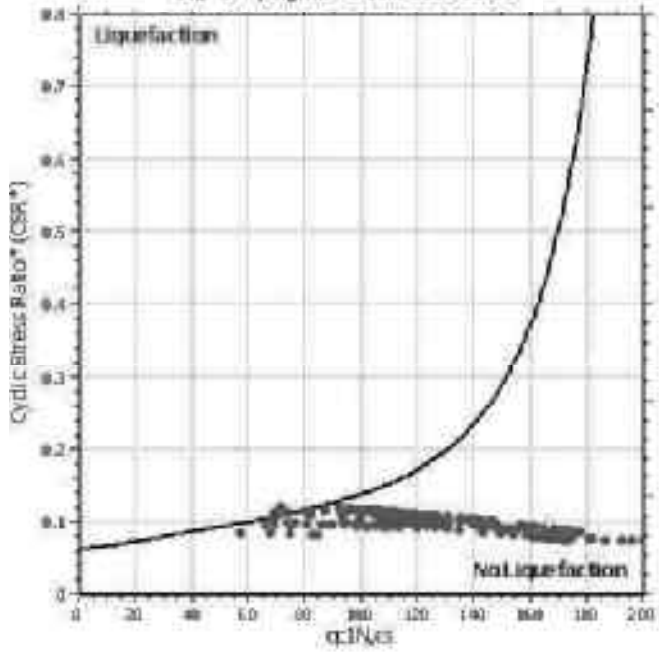
**CPT file : CPT111-SLS**

**Input parameters and analysis data**

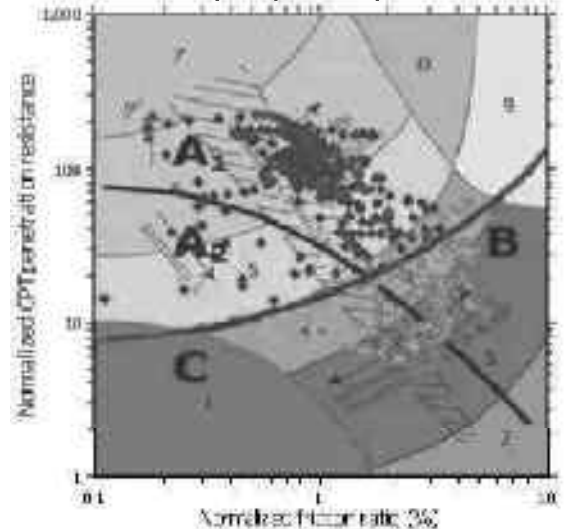
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friss correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

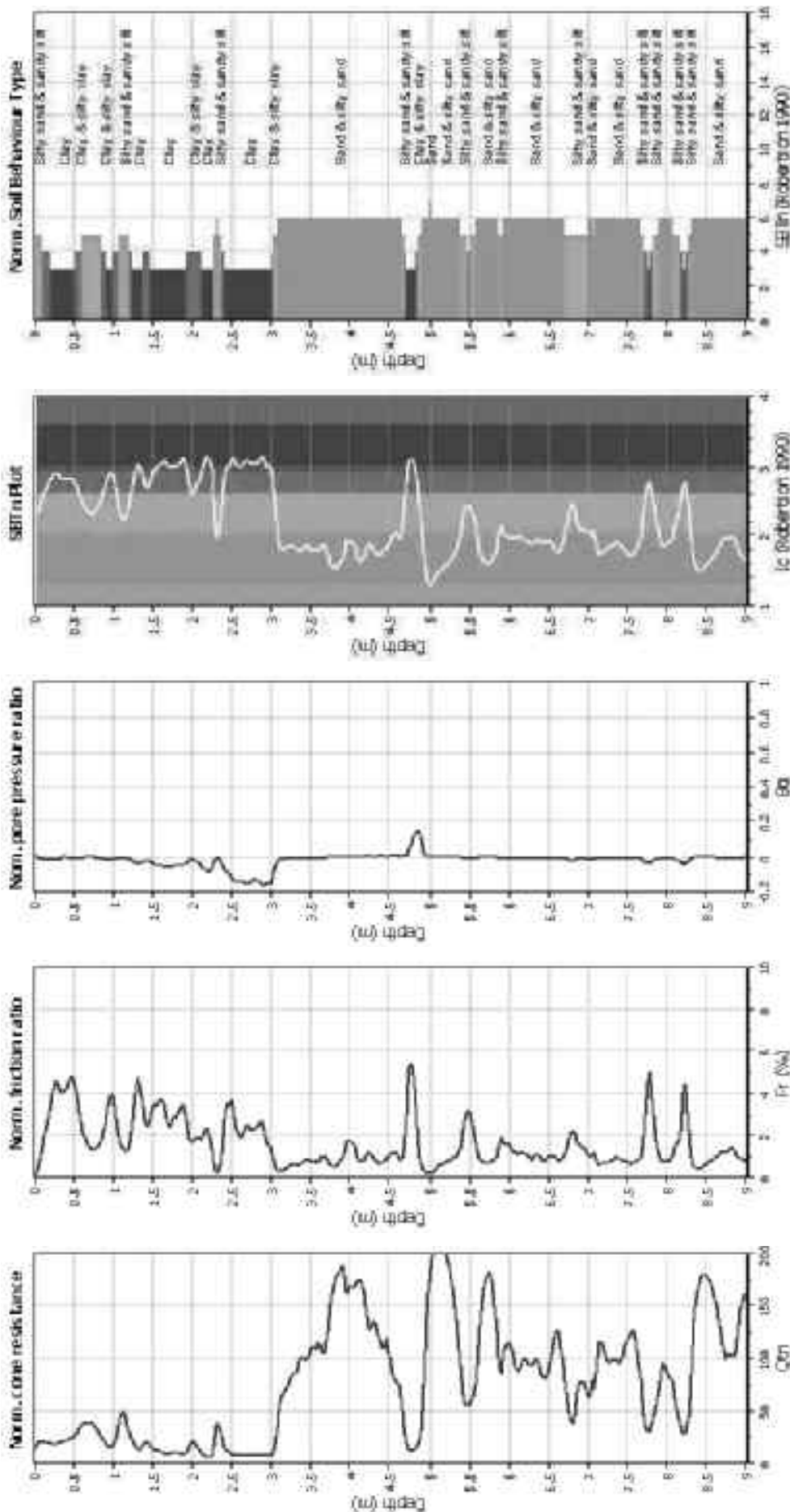


**Summary of liquefaction potential**



Zone A: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>1</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, strain to zero undrained strength and ground geometry.

### CPT basic interpretation plots (normaliz

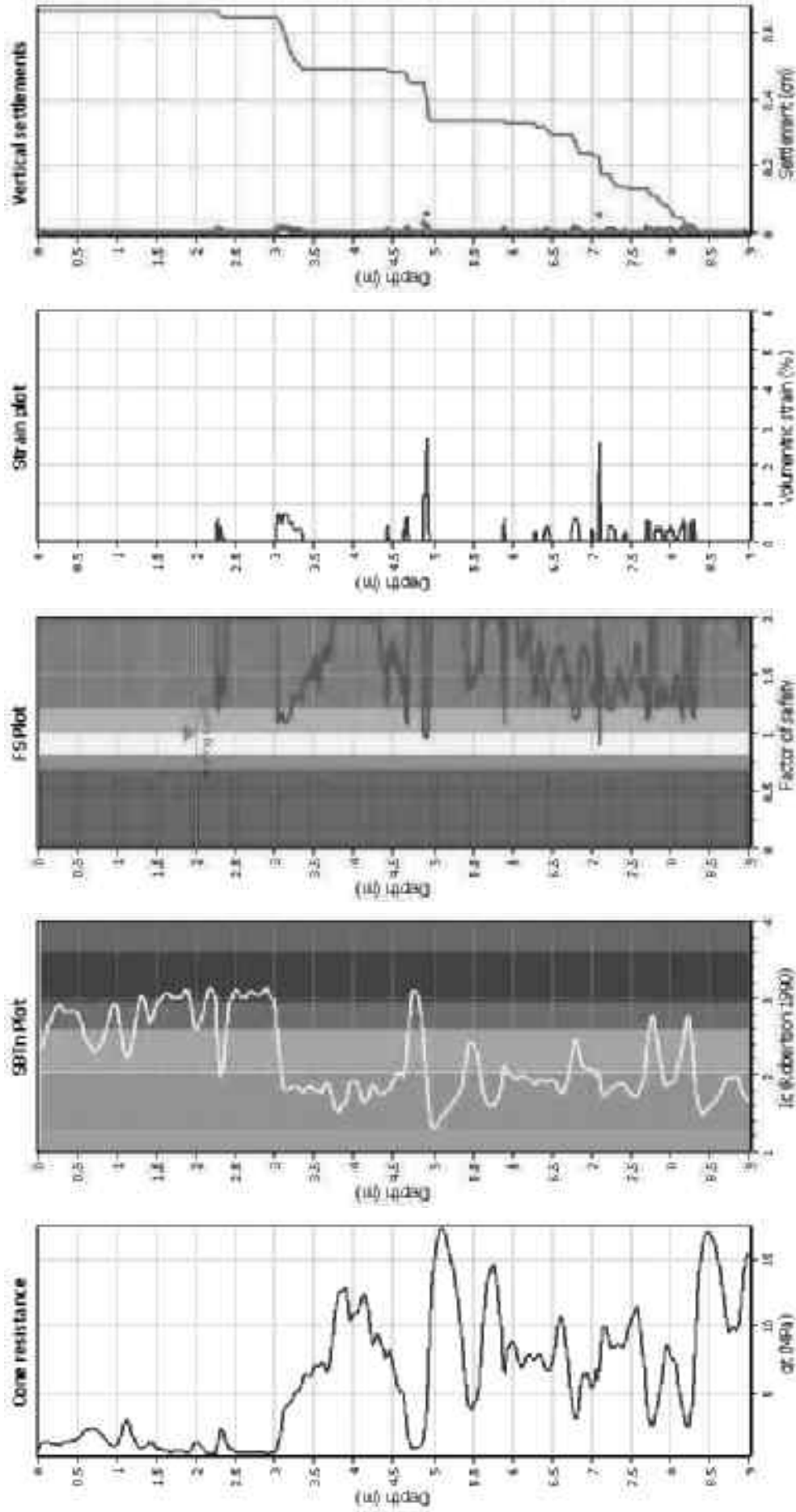


#### Input parameters and analysis data

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Fines correction method:	B&I (2014)	Transition (select, applied):	No
Norm to test:	Based on Ic value	$f_c$ applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Clay size behavior applied:	Sands only
Peak ground acceleration:	0.14	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m

SBTn legend	1. Sensitive fine grained	7. Gravely sand to sand
	2. Organic material	8. Very stiff sand to
	3. Clay to silty clay	9. Very stiff fine grained
	4. Clayey silt to silty	
	5. Silty sand to sandy silt	
	6. Clean sand to silty sand	

### Estimation of post-earthquake settlements



### Abbreviations

- $q_t$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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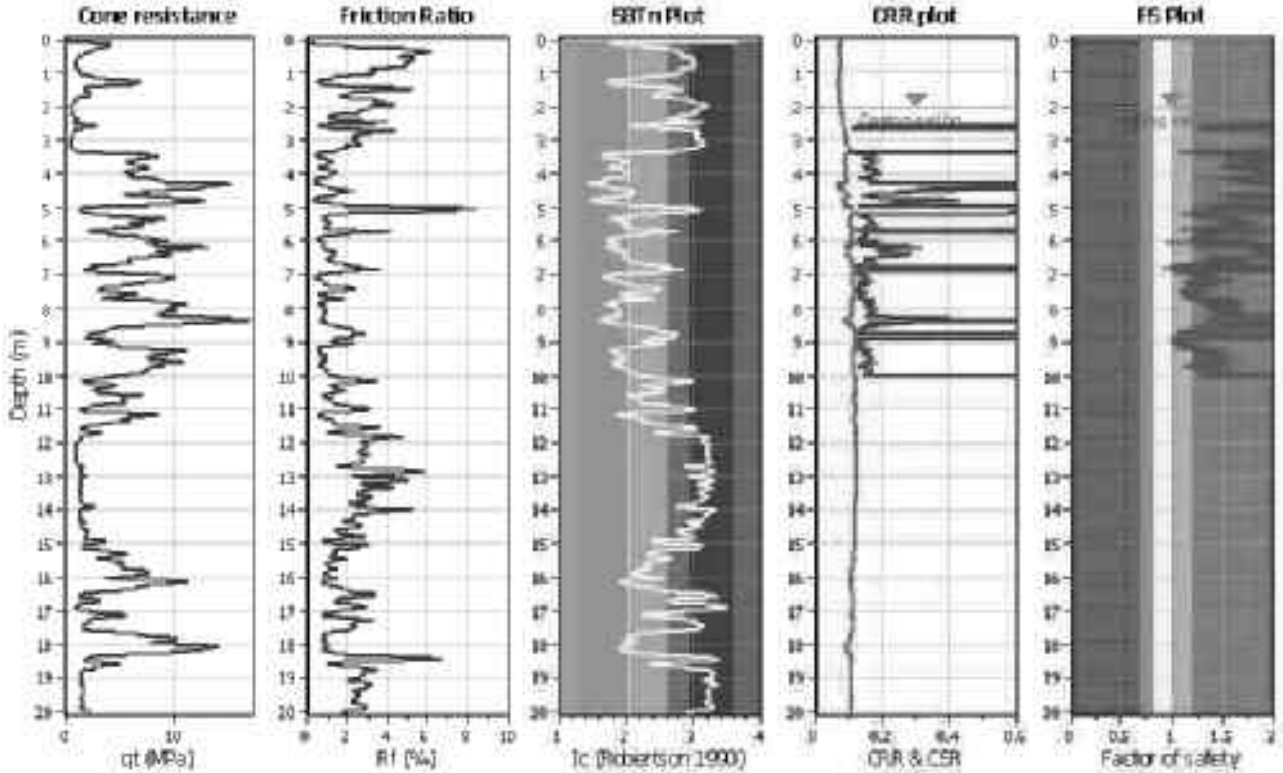
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT112-SLS**

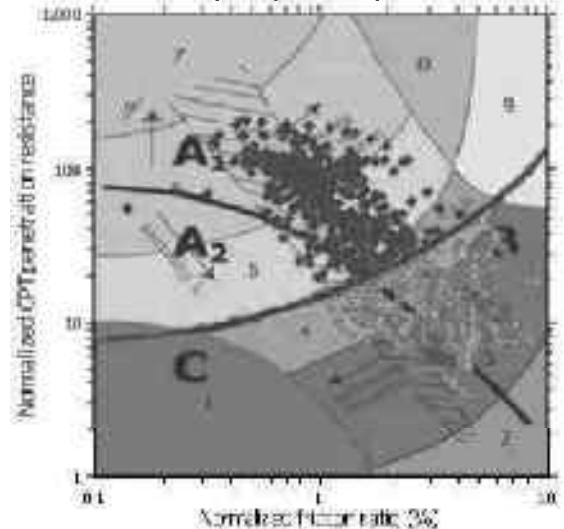
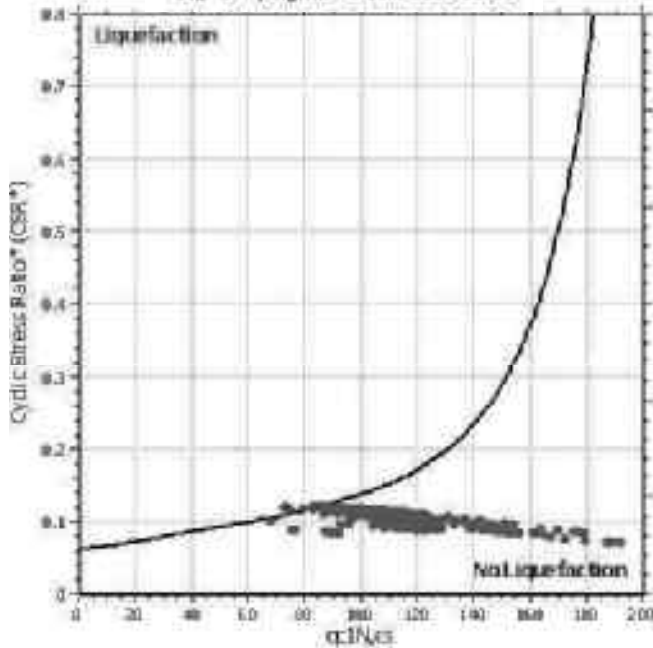
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



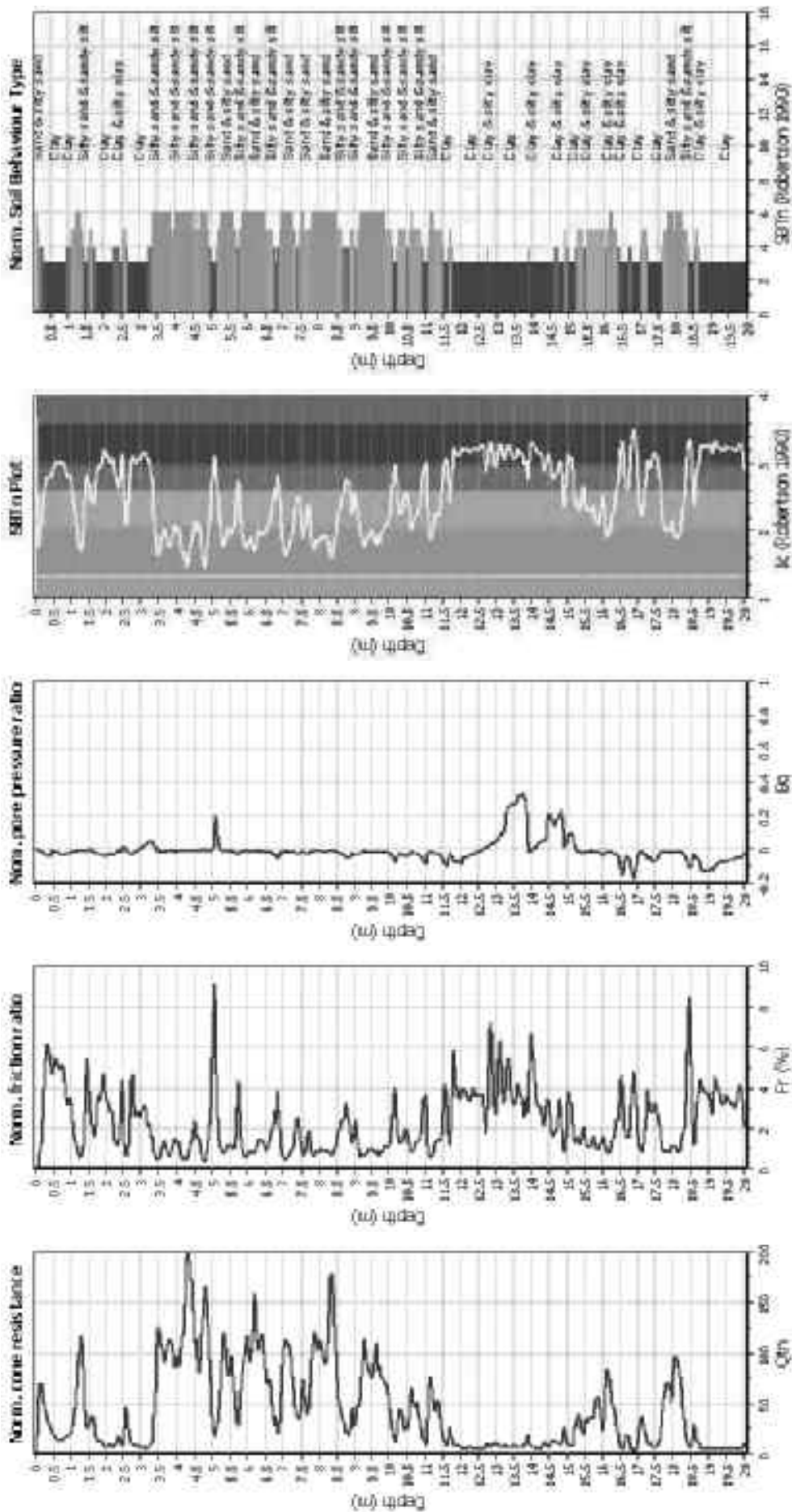
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycle (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and ground geometry.

### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

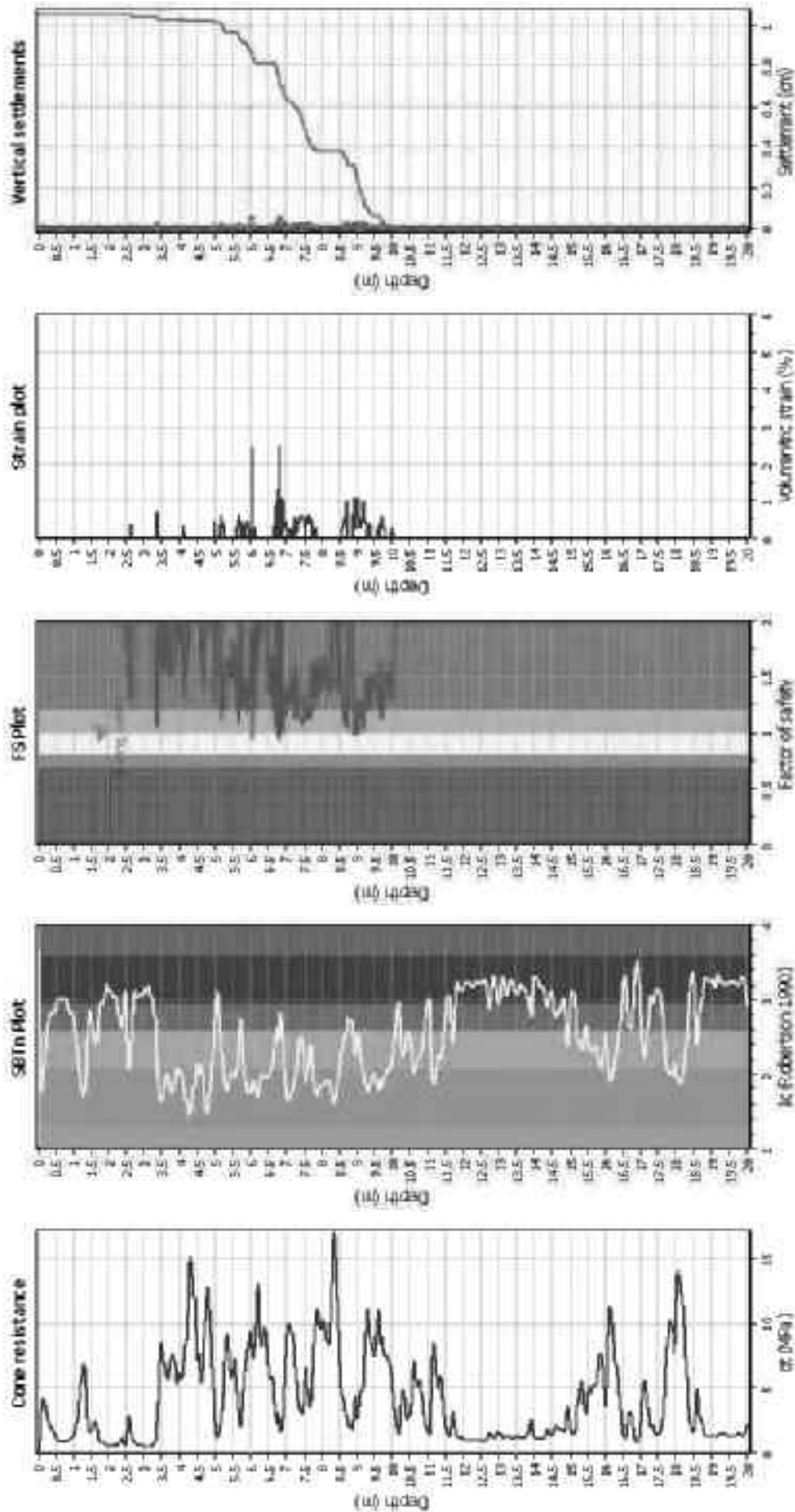
Analysis method:	B&I (2014)	Fill weight:	N/A
Fines correction method:	B&I (2014)	Transition (lowest):	No
Norm to test:	Based on Ic value	$f_c$ applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Clay line behavior applied:	Sands only
Peak ground acceleration:	0.14	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m
Depth to GWT (earthq.):	2.00 m		
Average results interval:	3		
Ic cut-off value:	2.60		
Unit weight calculation:	Based on SBT		
Use fill:	No		
Fill height:	N/A		

#### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained



### Estimation of post-earthquake settlements



#### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

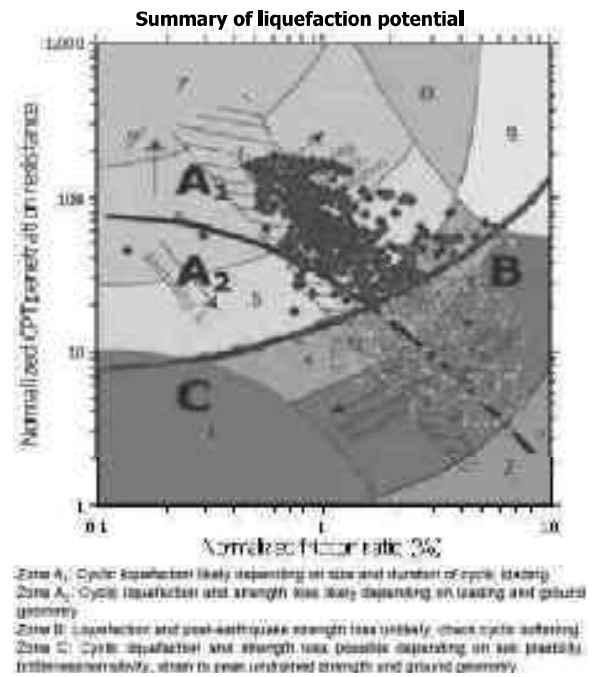
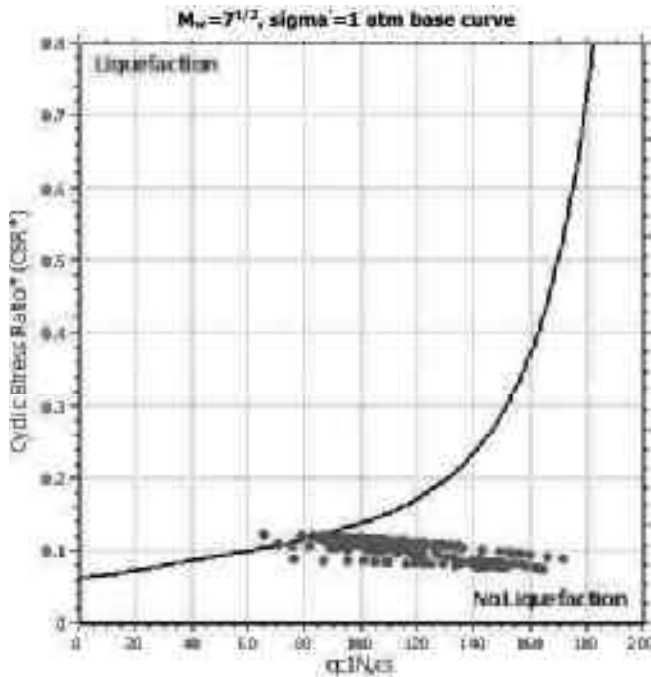
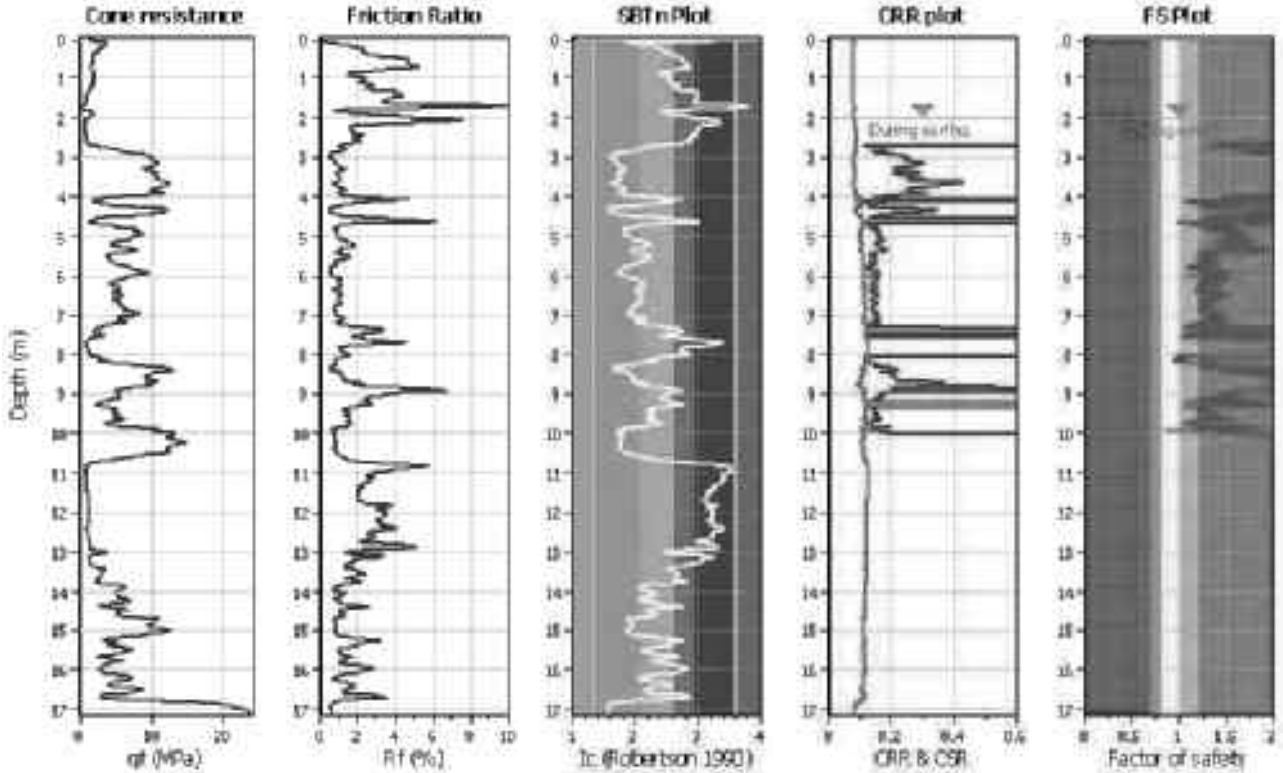
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT113-SLS**

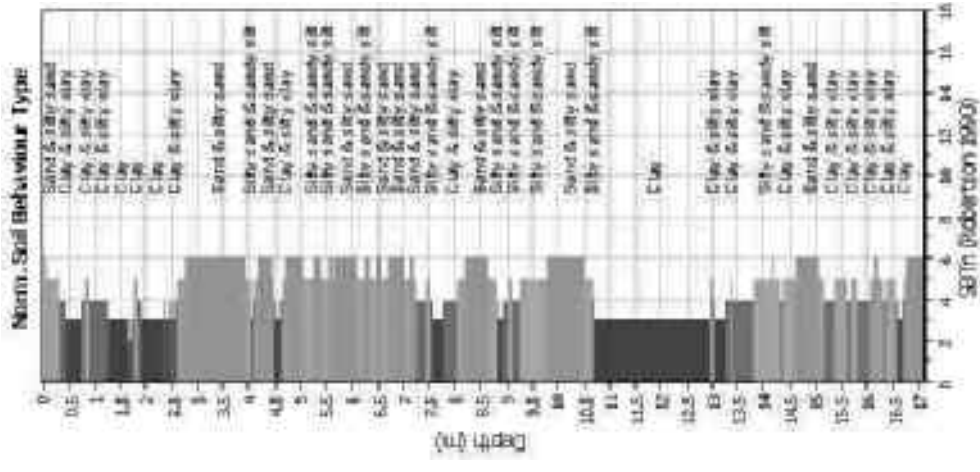
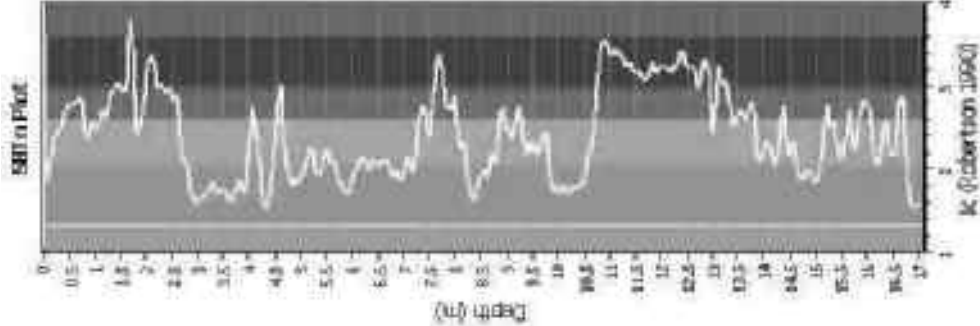
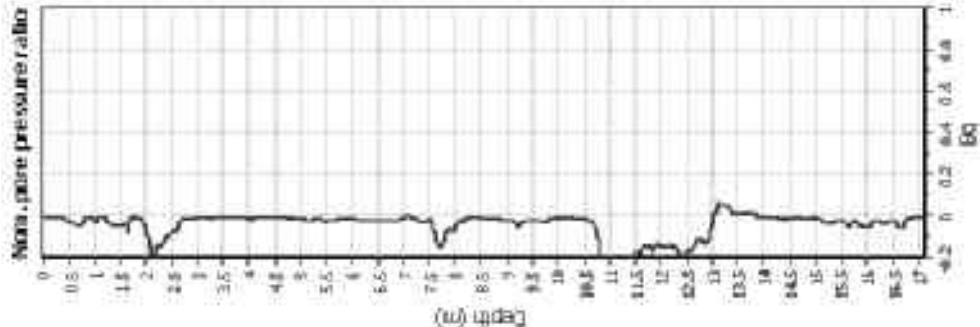
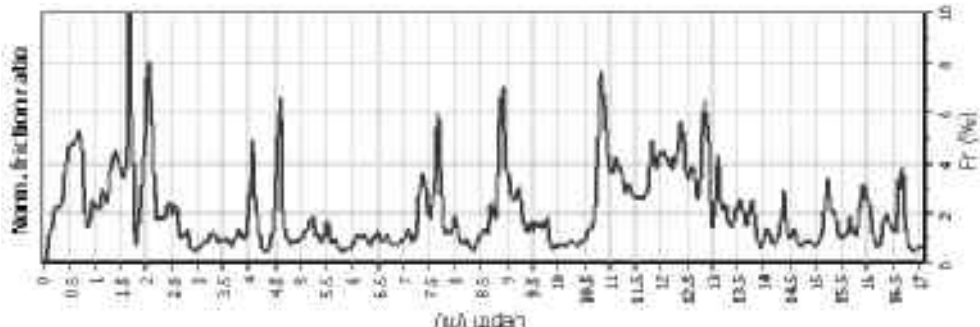
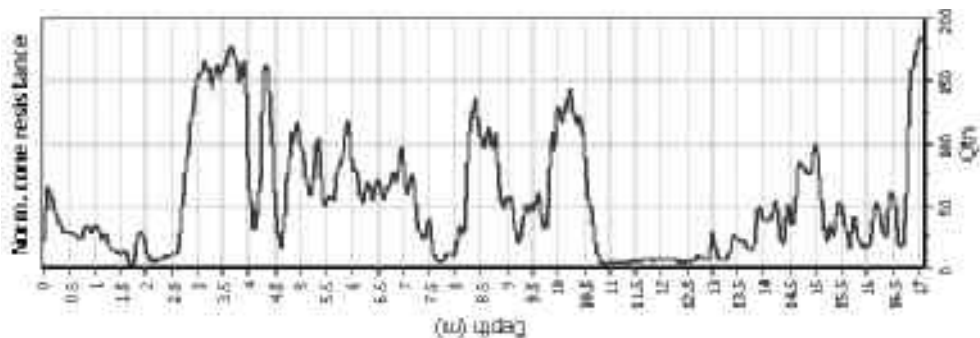
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method





### CPT basic interpretation plots (normaliz



### Input parameters and analysis data

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norms to test: Based on I<sub>c</sub> value  
 Earthquake magnitude M<sub>w</sub>: 6.20  
 Peak ground acceleration: 0.14  
 Depth to water table (meters): 2.00 m

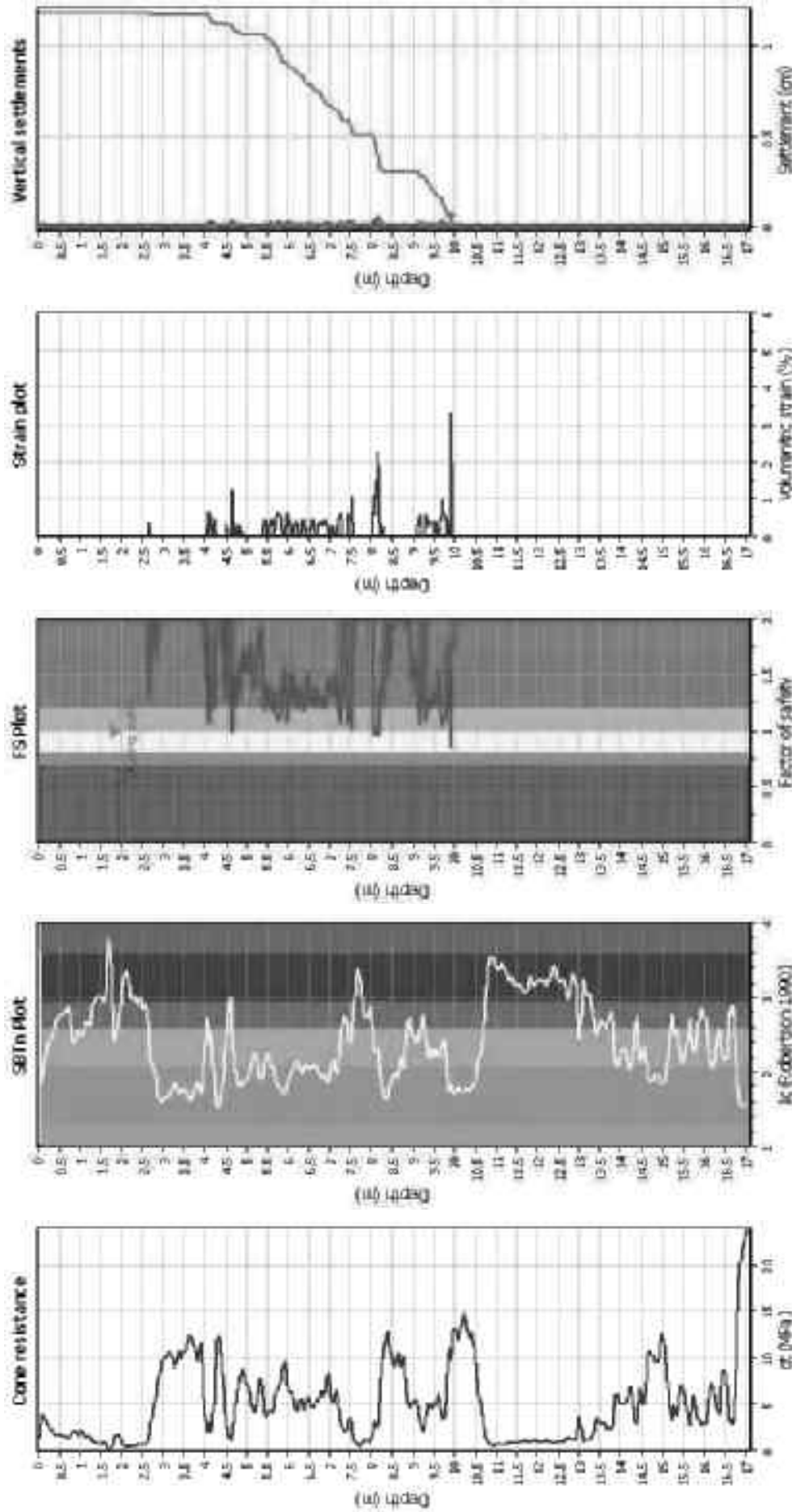
Depth to GWT (earthq.): 2.00 m  
 Average results interval: 3  
 I<sub>c</sub> cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (lowest) applied: No  
 F<sub>v</sub> applied: Yes  
 Clay size behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

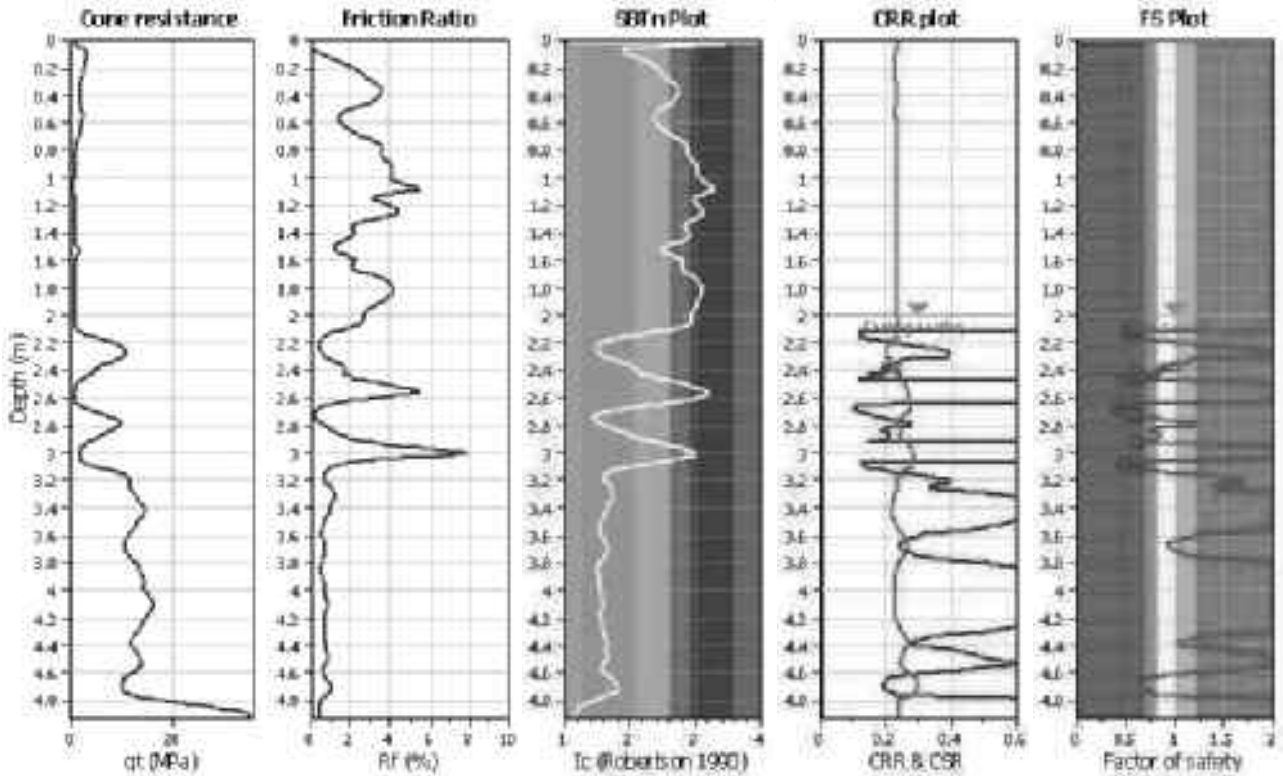
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT101-ULS**

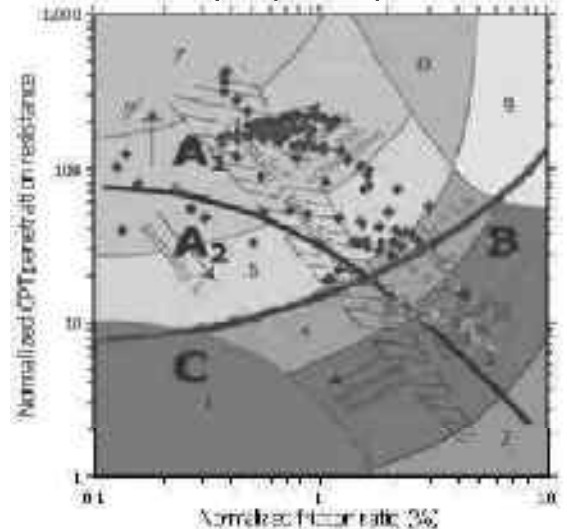
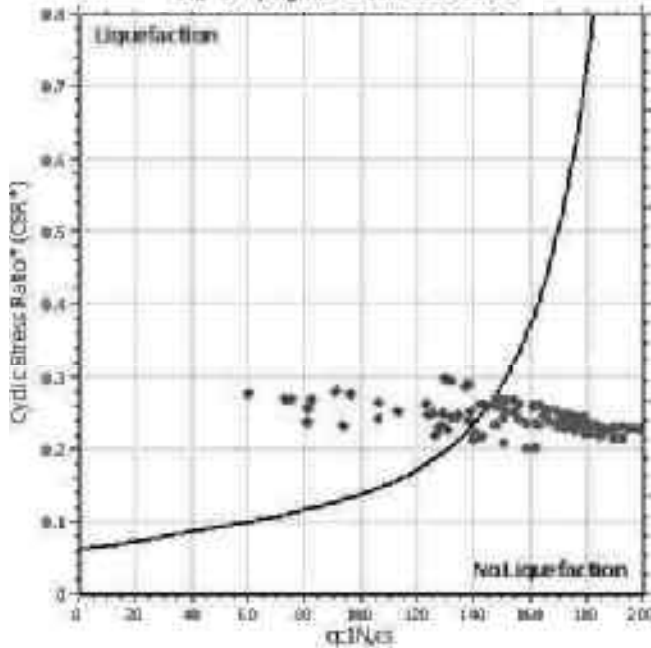
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. defect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



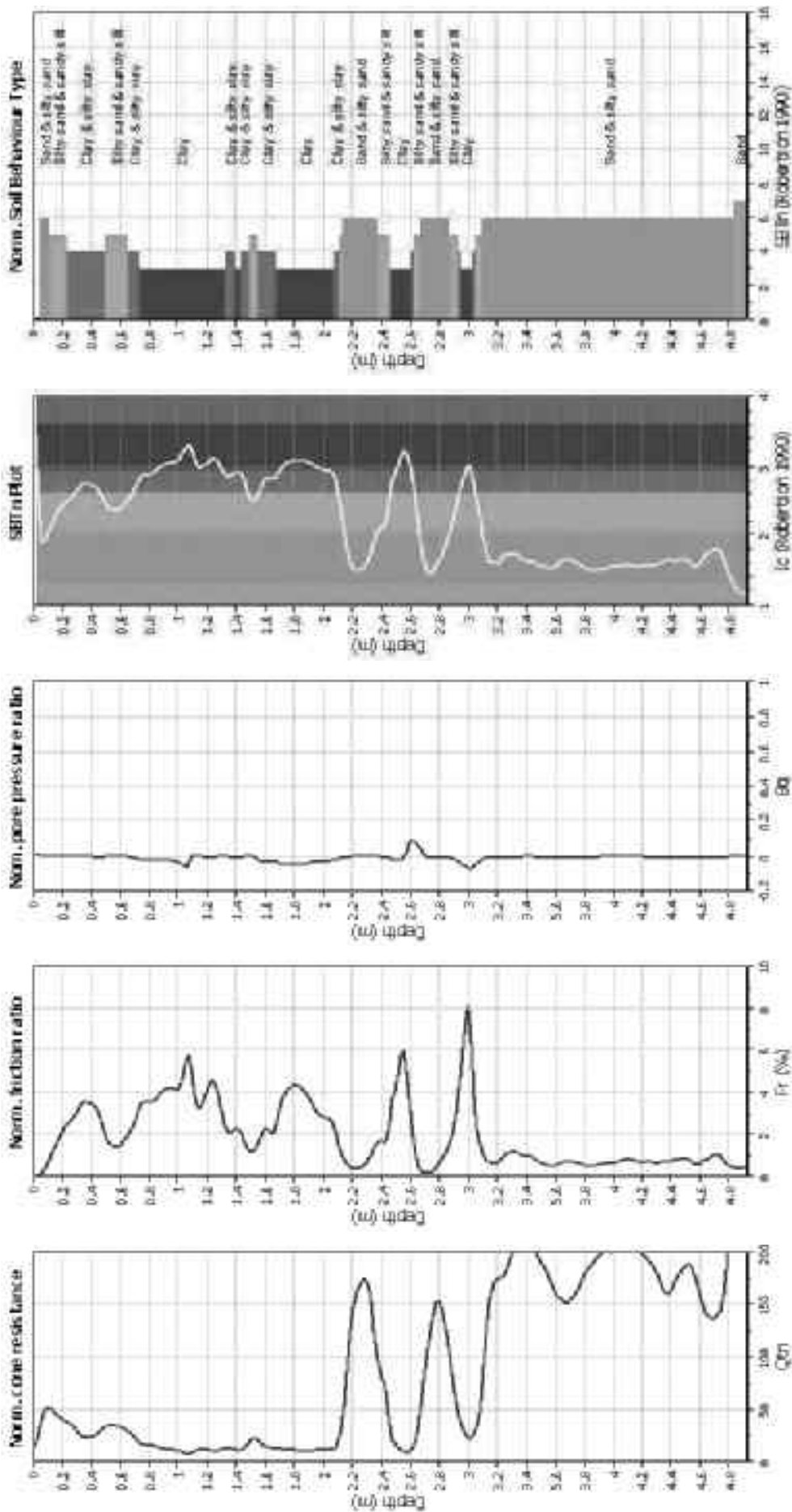
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycle (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and global geometry.

### CPT basic interpretation plots (normaliz



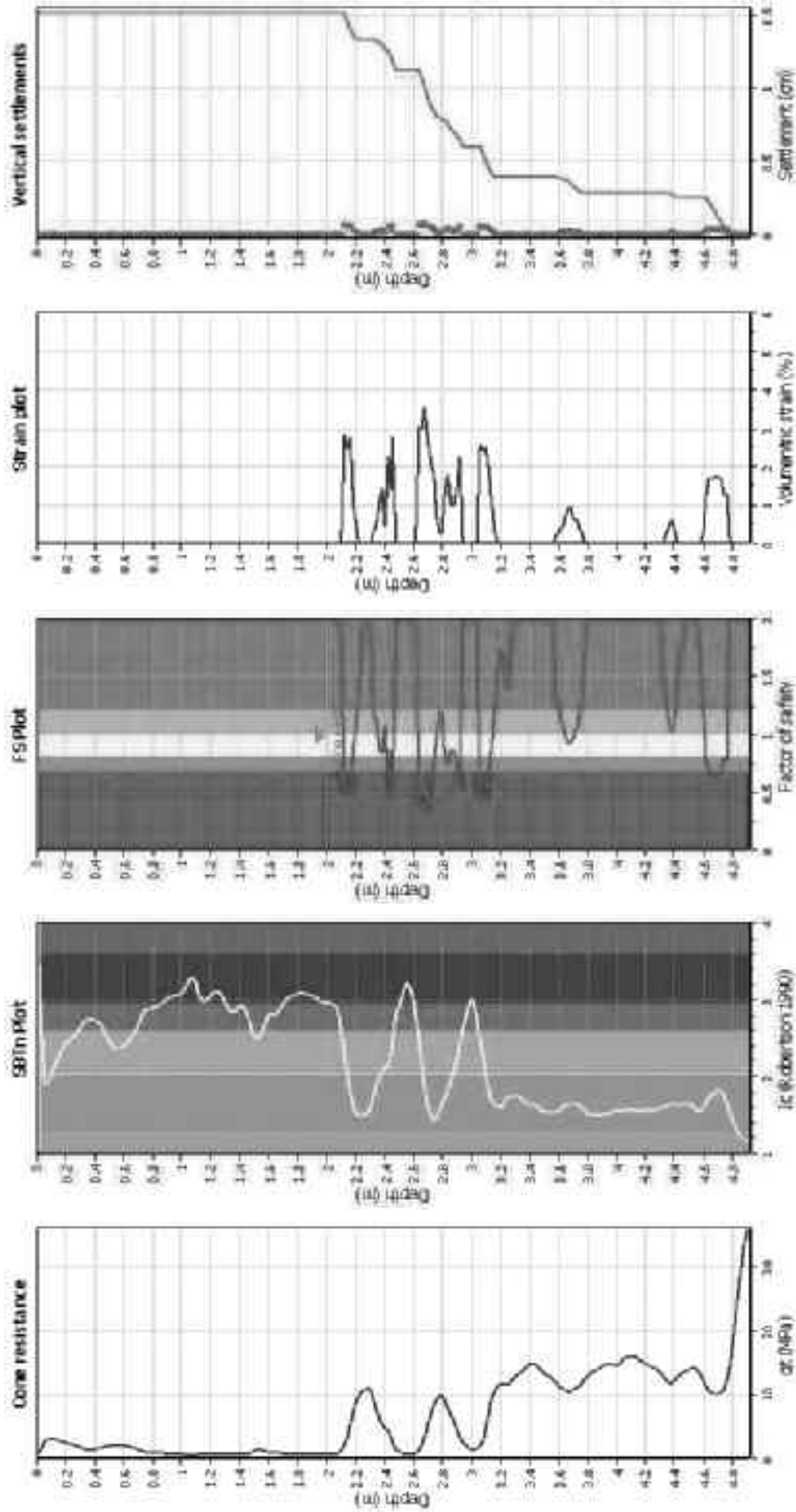
#### Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	2.00 m	Fill weight:	N/A
Flow correction method:	B&I (2014)	Average results interval:	3	Transition (select, applied):	No
Norms to test:	Based on Ic value	Ic cut-off value:	2.60	$f_v$ applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Unit weight calculation:	Based on SBT	Clay size behavior applied:	Sands only
Peak ground acceleration:	0.42	Use fill:	No	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

#### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_t$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

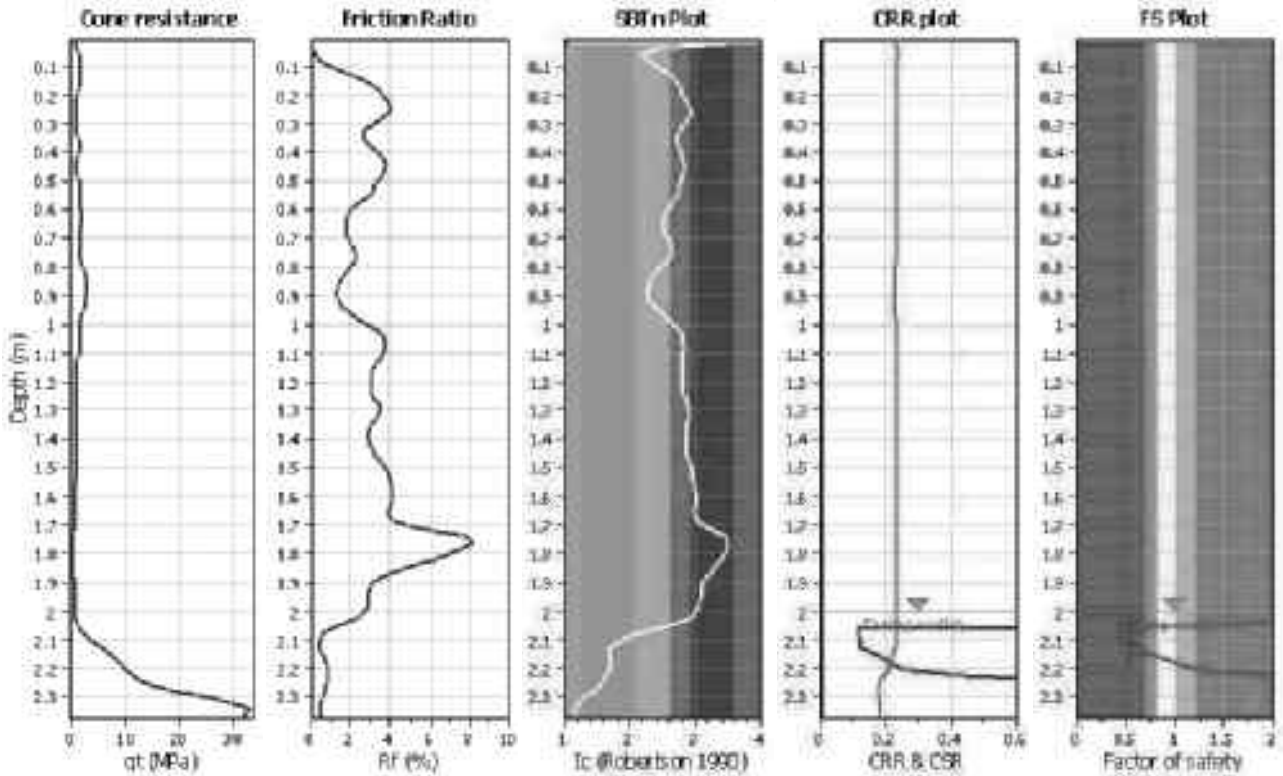
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT102-ULS**

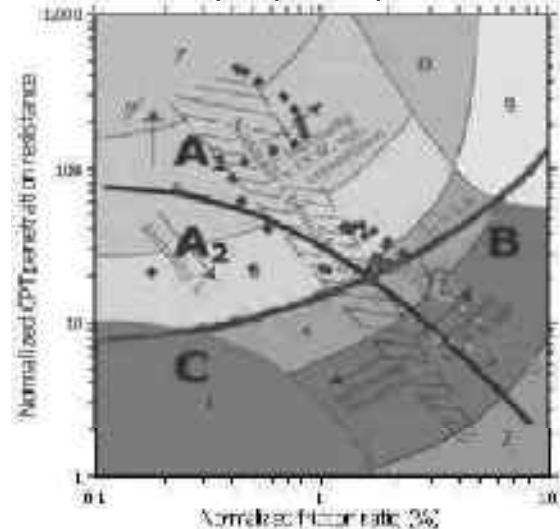
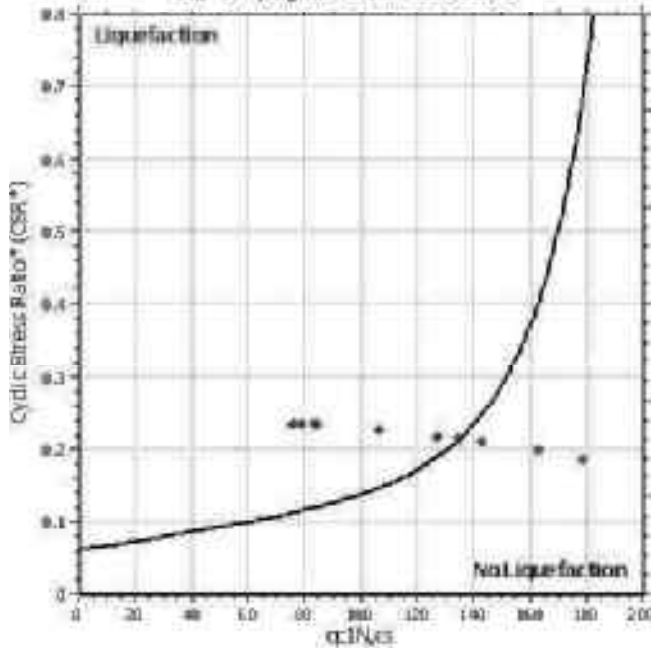
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. defect applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



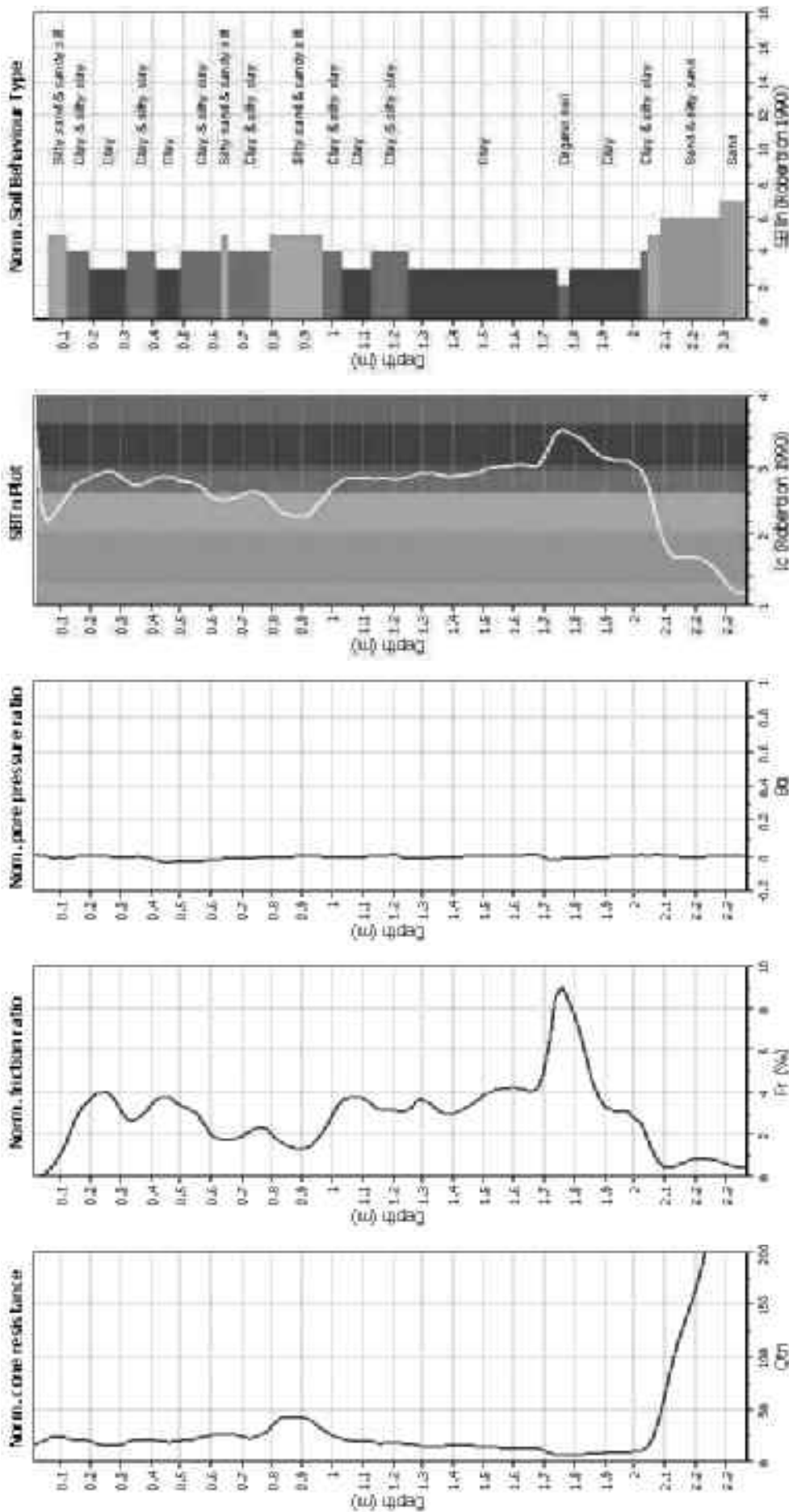
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and ground geometry.

### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

Analyze method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.50  
 Peak ground acceleration: 0.42  
 Depth to water table (meters): 2.00 m

Depth to GW (earthq.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

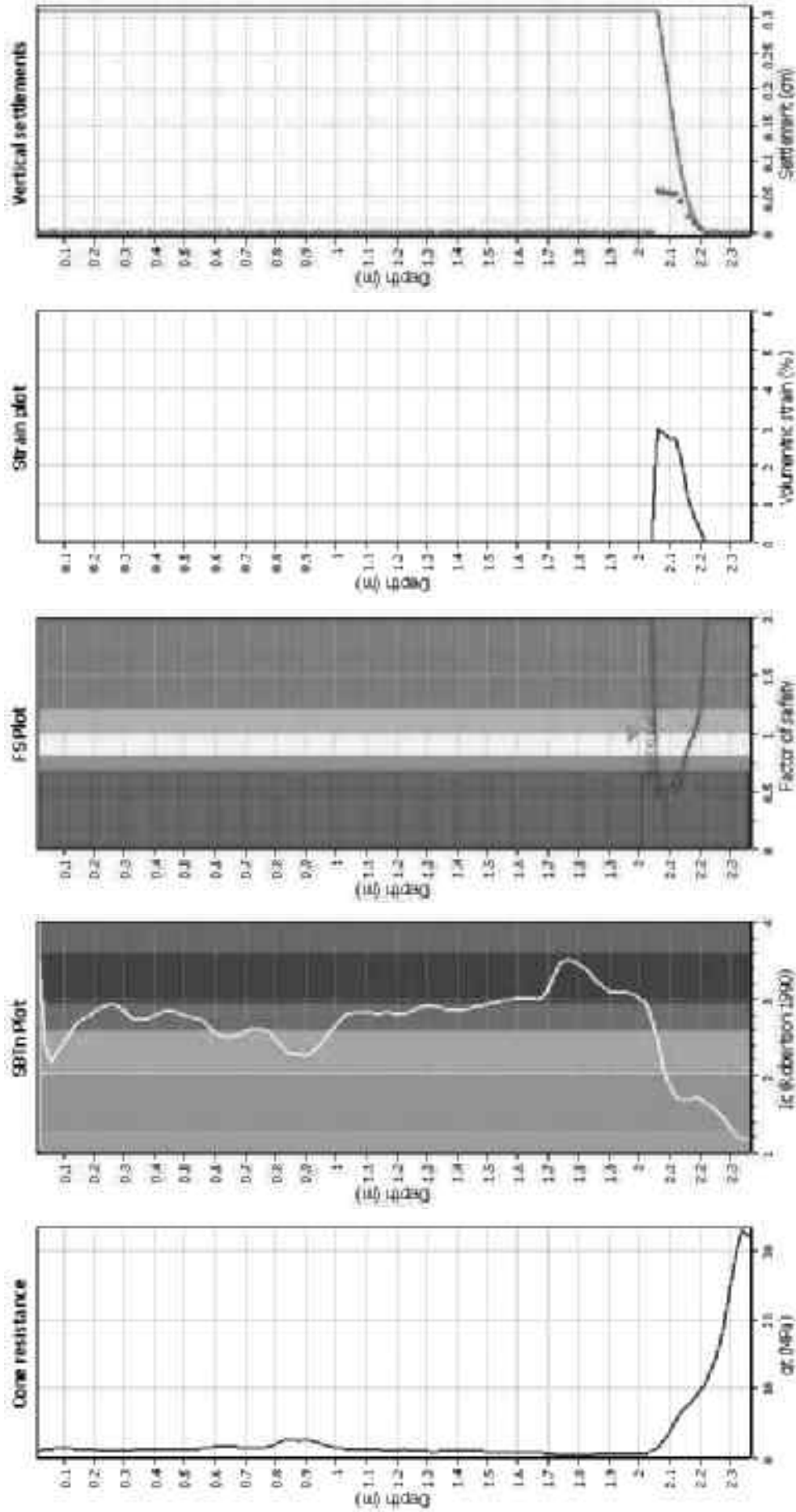
Fill weight: N/A  
 Transition (solect. applied): No  
 $f_c$  applied: Yes  
 Clay line behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

#### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained



### Estimation of post-earthquake settlements



#### Abbreviations

- qt: Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- S<sub>BTn</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain





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**LIQUEFACTION ANALYSIS REPORT**

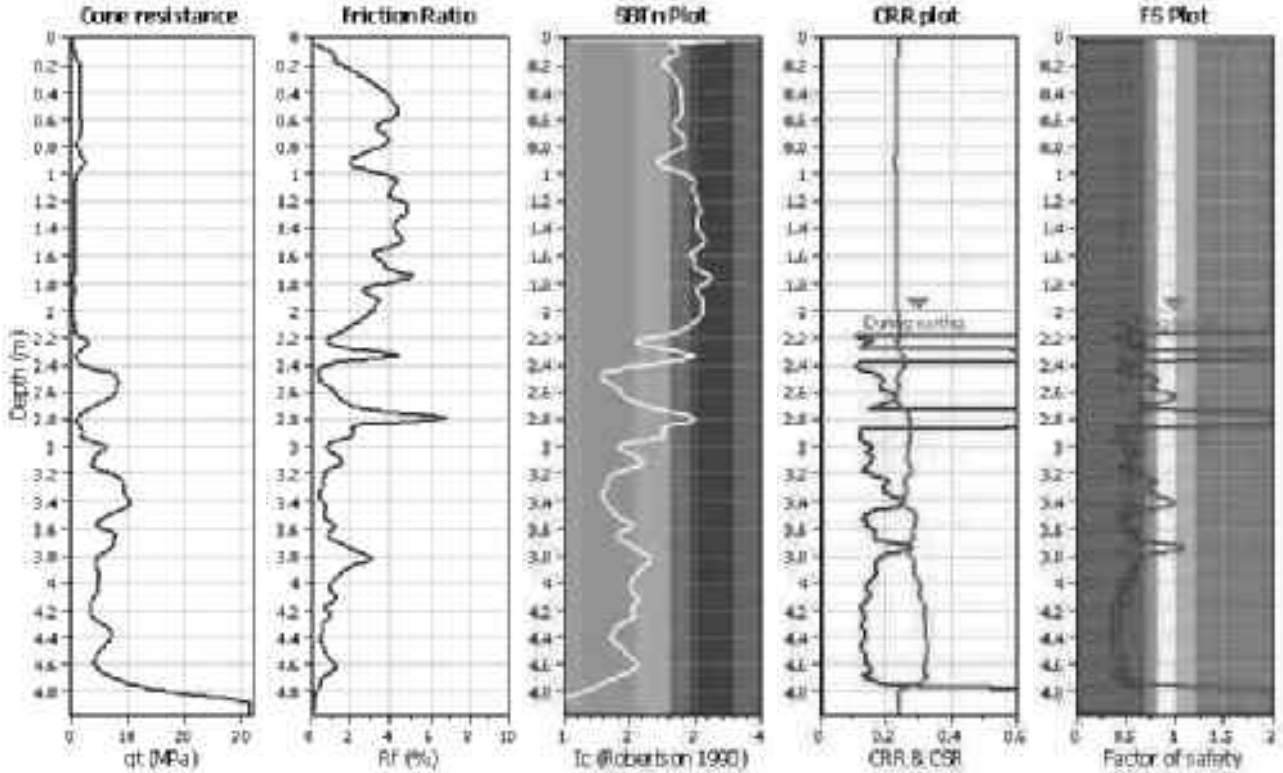
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT103-ULS**

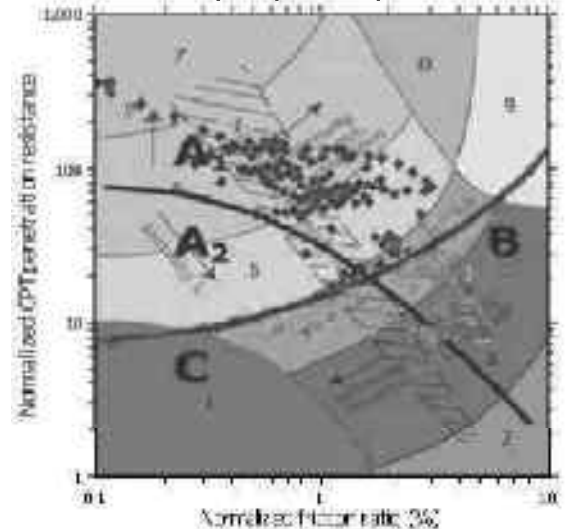
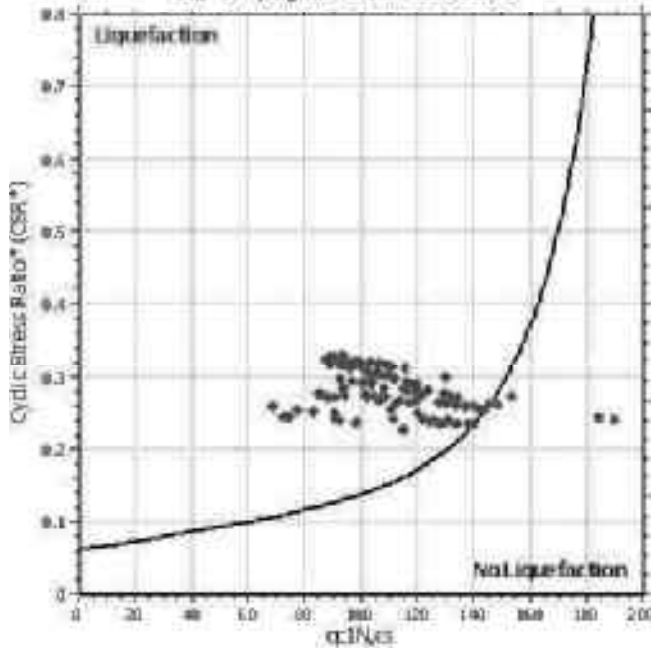
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. defect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

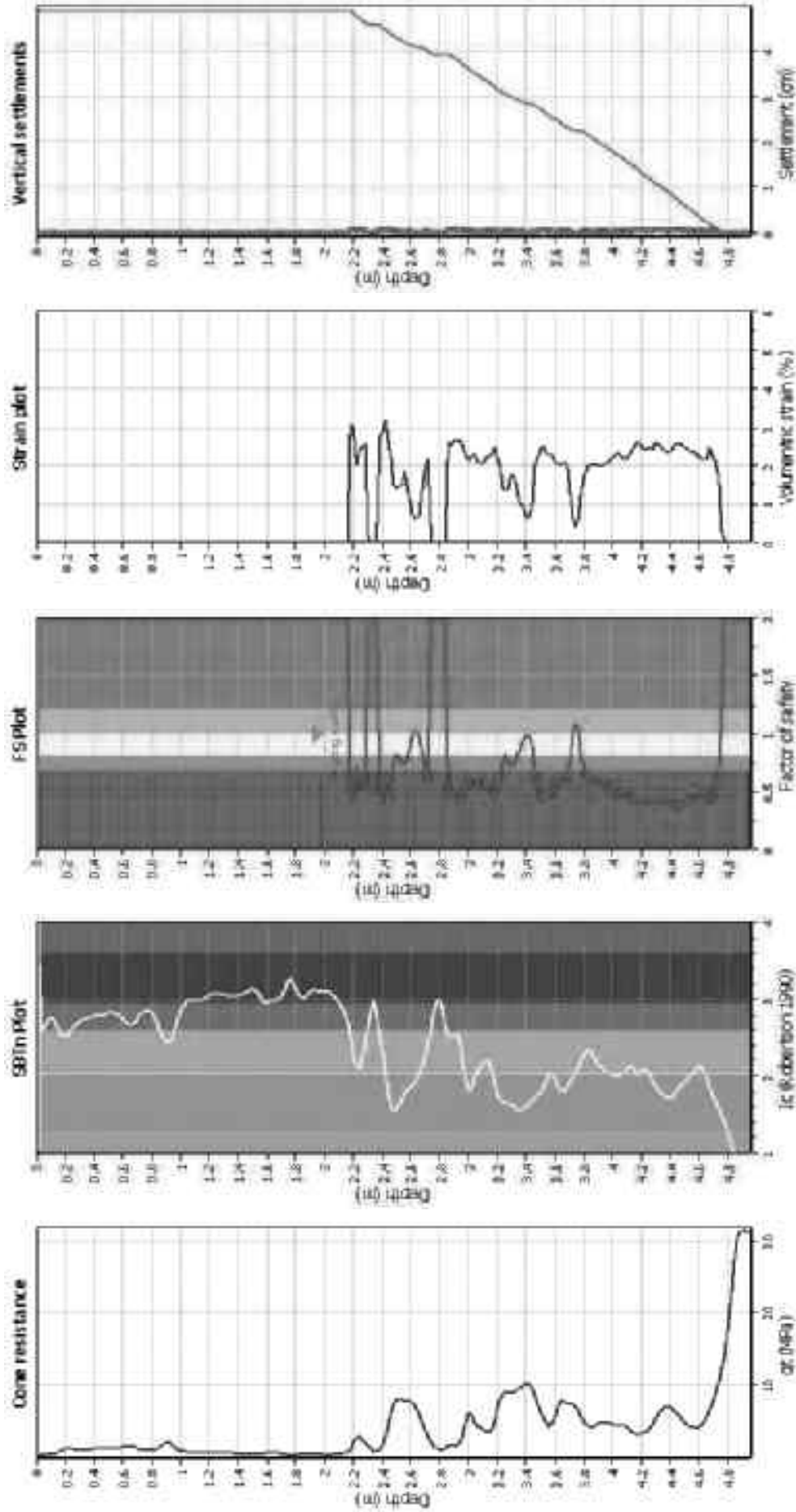
**Summary of liquefaction potential**



Zone A1: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A2: Cyclic liquefaction and strength loss likely depending on loading and grain geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and grain geometry.



### Estimation of post-earthquake settlements



#### Abbreviations

- $q_t$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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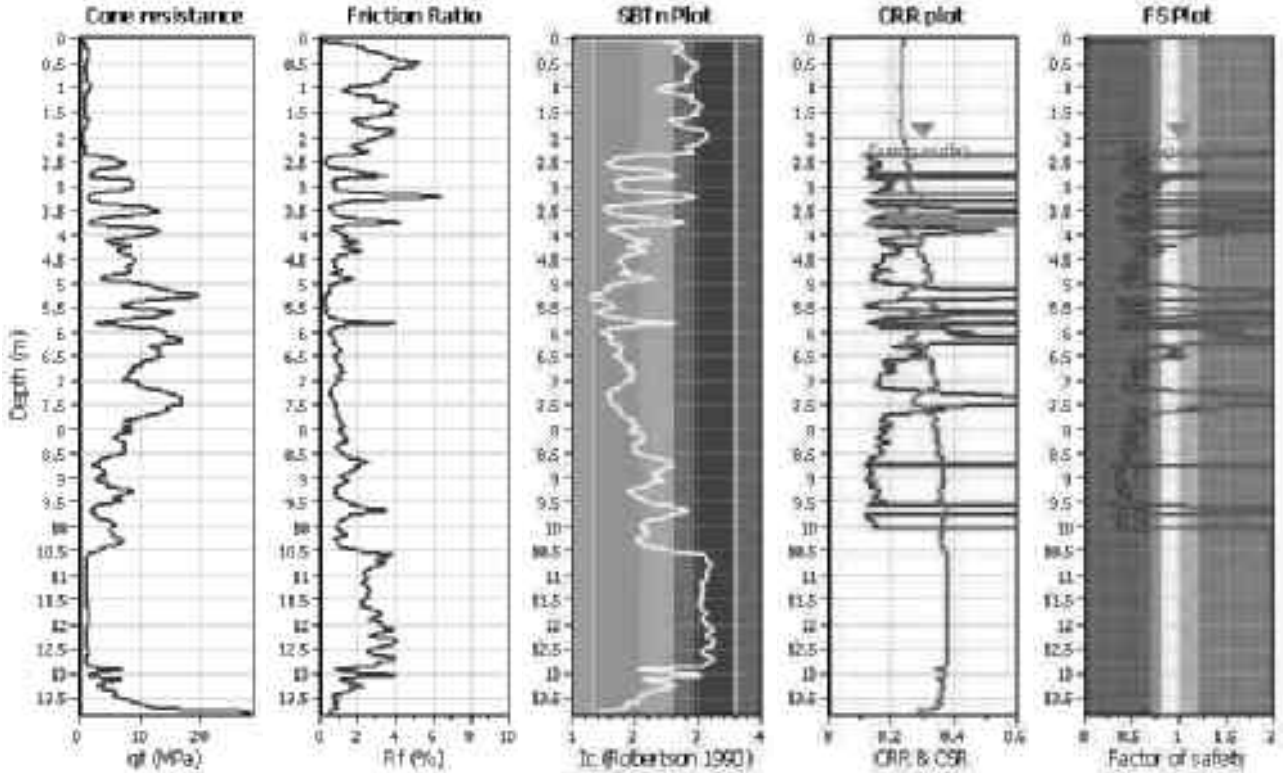
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**Location :**

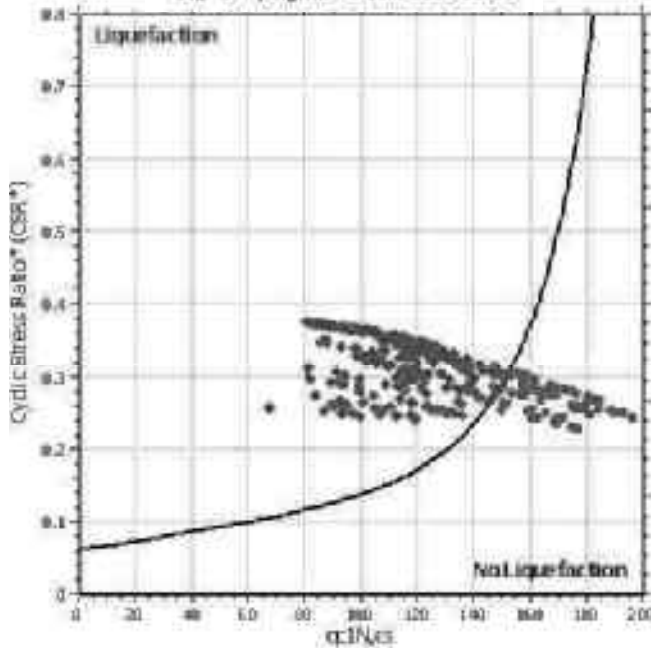
**CPT file : CPT104-ULS**

**Input parameters and analysis data**

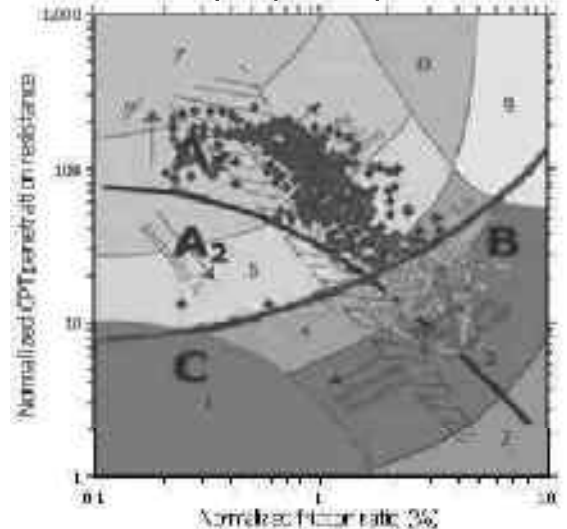
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

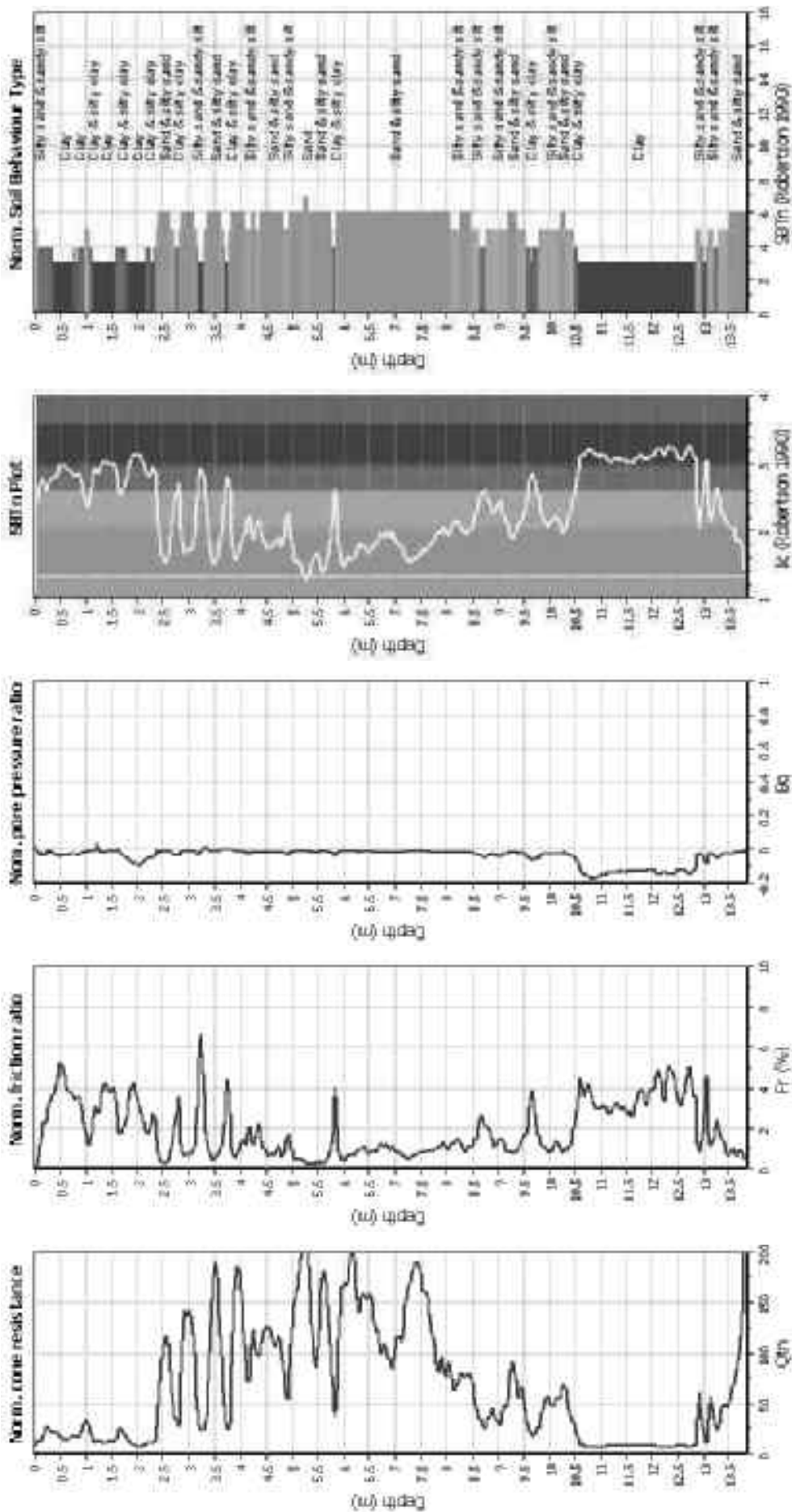


**Summary of liquefaction potential**



Zone A: Cyclic liquefaction likely depending on size and number of cycle (static)  
 Zone A: Cyclic liquefaction and strength loss likely depending on loading and ground geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normal stress to mean undrained strength and ground geometry.

### CPT basic interpretation plots (normaliz



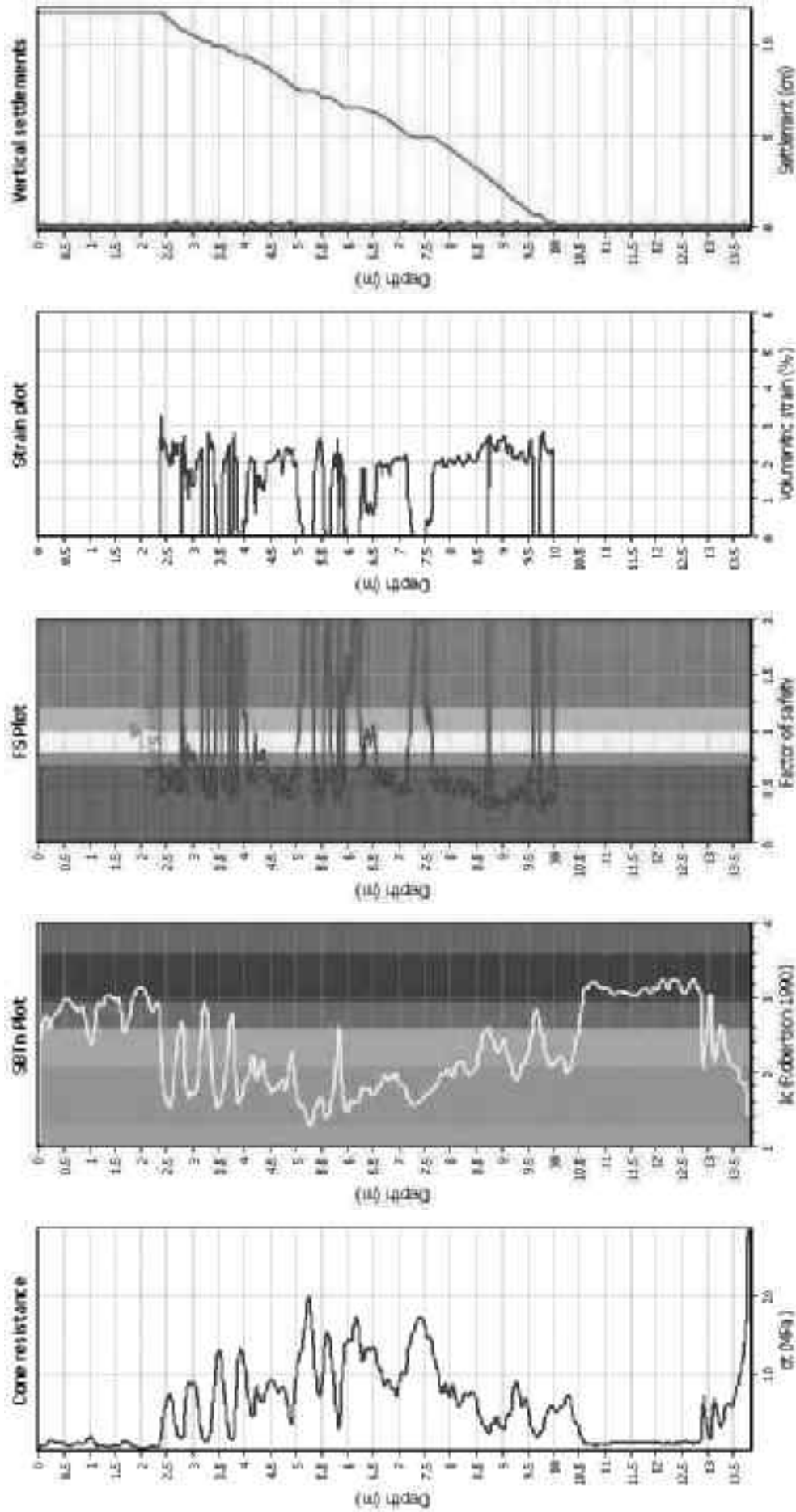
#### Input parameters and analysis data

Analyze method:	B&I (2014)	Fill weight:	N/A
Fines correction method:	B&I (2014)	Transition (soil) applied:	No
Norm to test:	Based on Ic value	$f_c$ applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Clay size boundary applied:	Sands only
Peak ground acceleration:	0.42	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m
Depth to GWT (earthq.):	2.00 m		
Average results interval:	3		
Ic cut-off value:	2.60		
Unit weight calculation:	Based on SBT		
Use fill:	No		
Fill height:	N/A		

#### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $k_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain





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**LIQUEFACTION ANALYSIS REPORT**

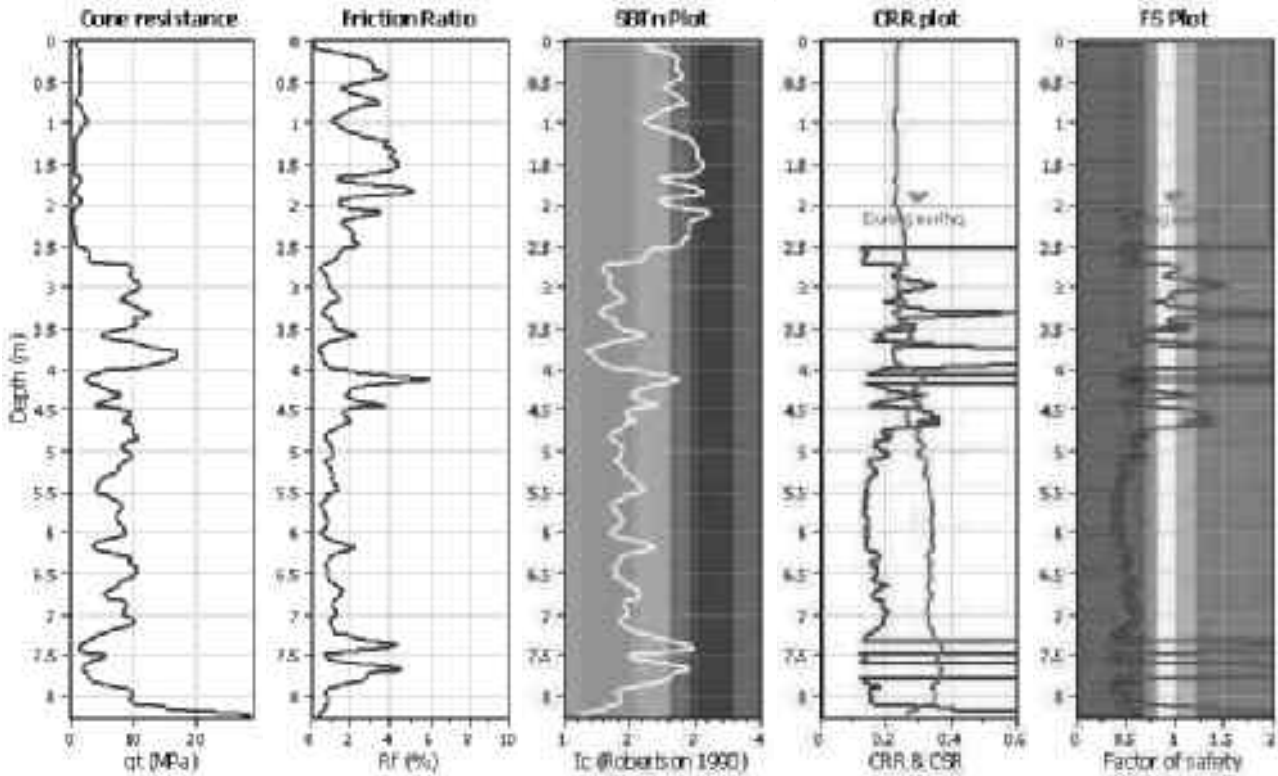
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT105-ULS**

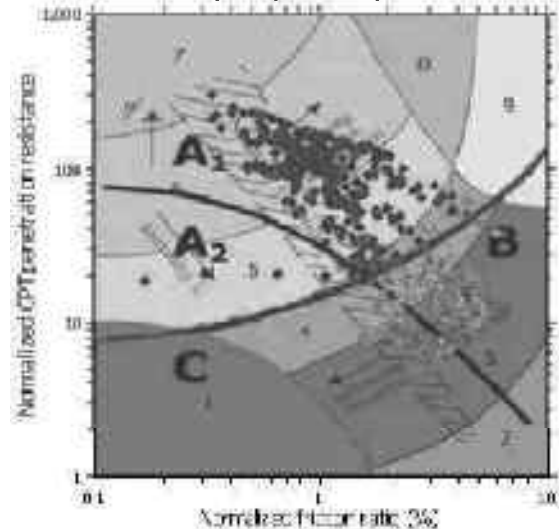
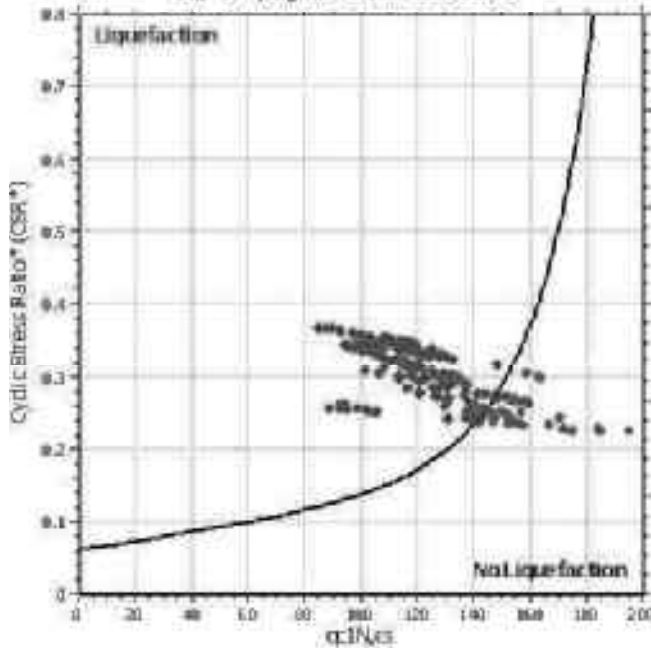
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



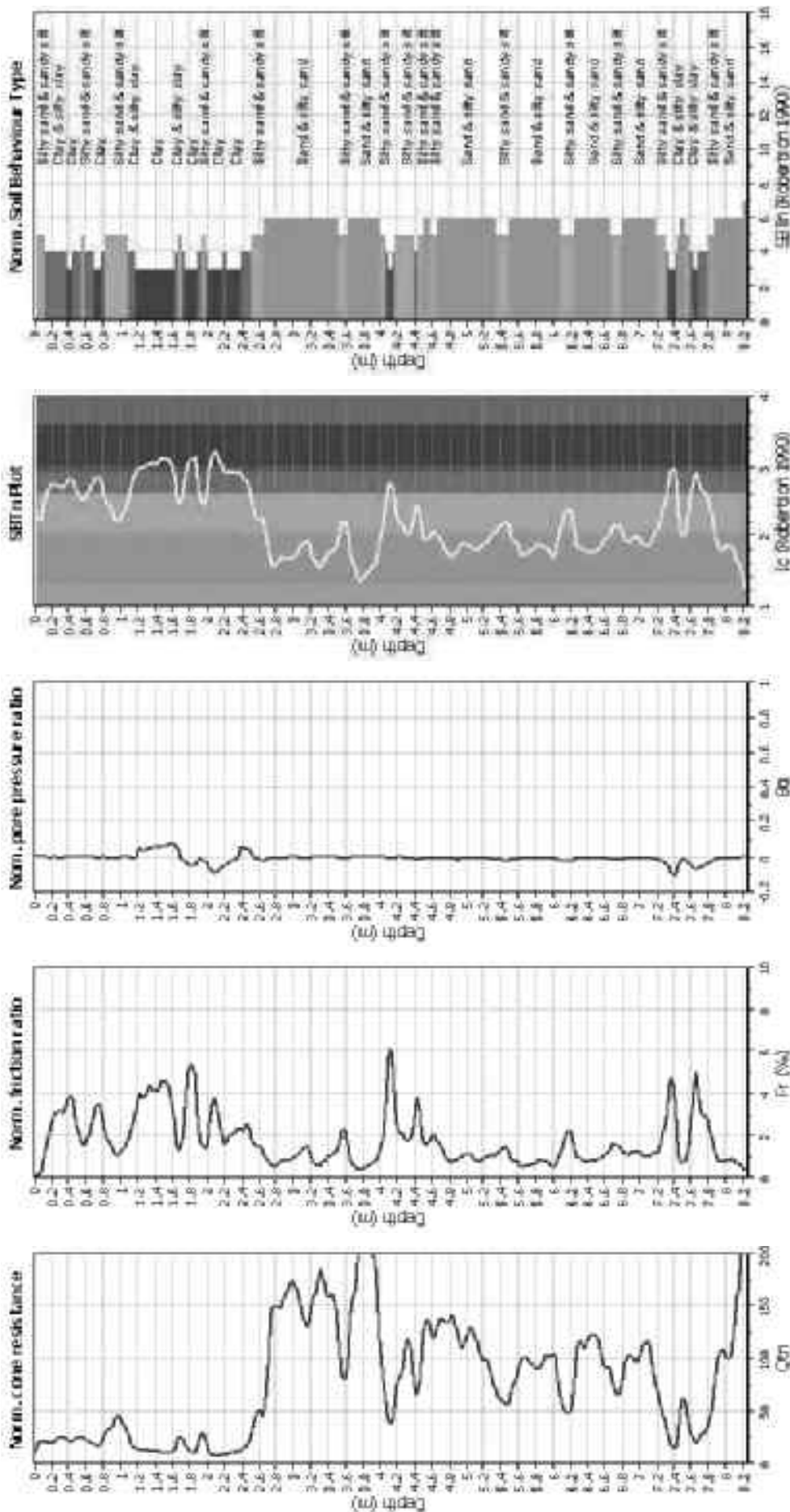
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and global geometry.

### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.50  
 Peak ground acceleration: 0.42  
 Depth to water table (meters): 2.00 m

Depth to GW (earthq.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

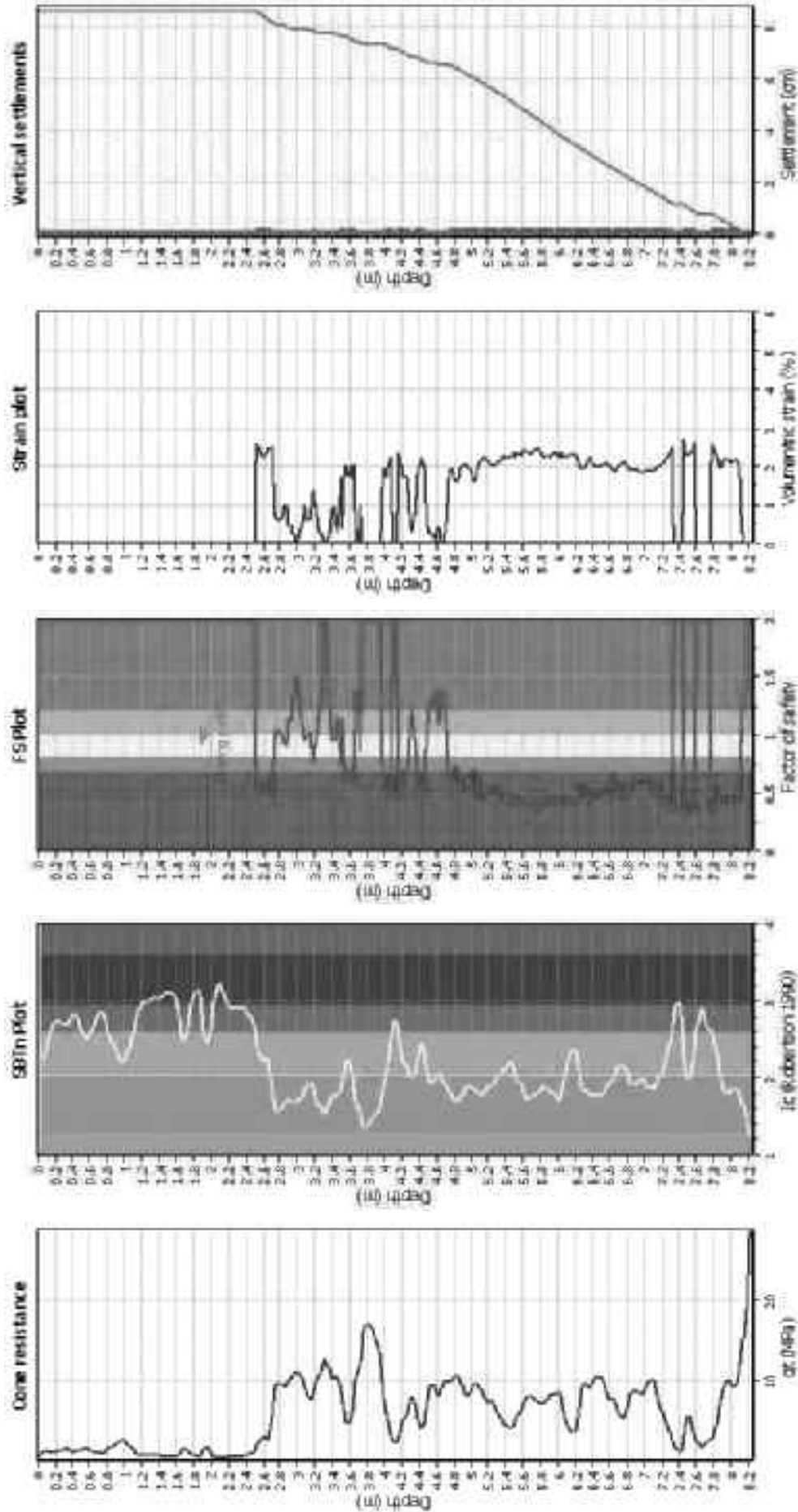
Fill weight: N/A  
 Transition (lowest applied): No  
 $f_c$  applied: Yes  
 Clay size boundary applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

#### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained



### Estimation of post-earthquake settlements



#### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

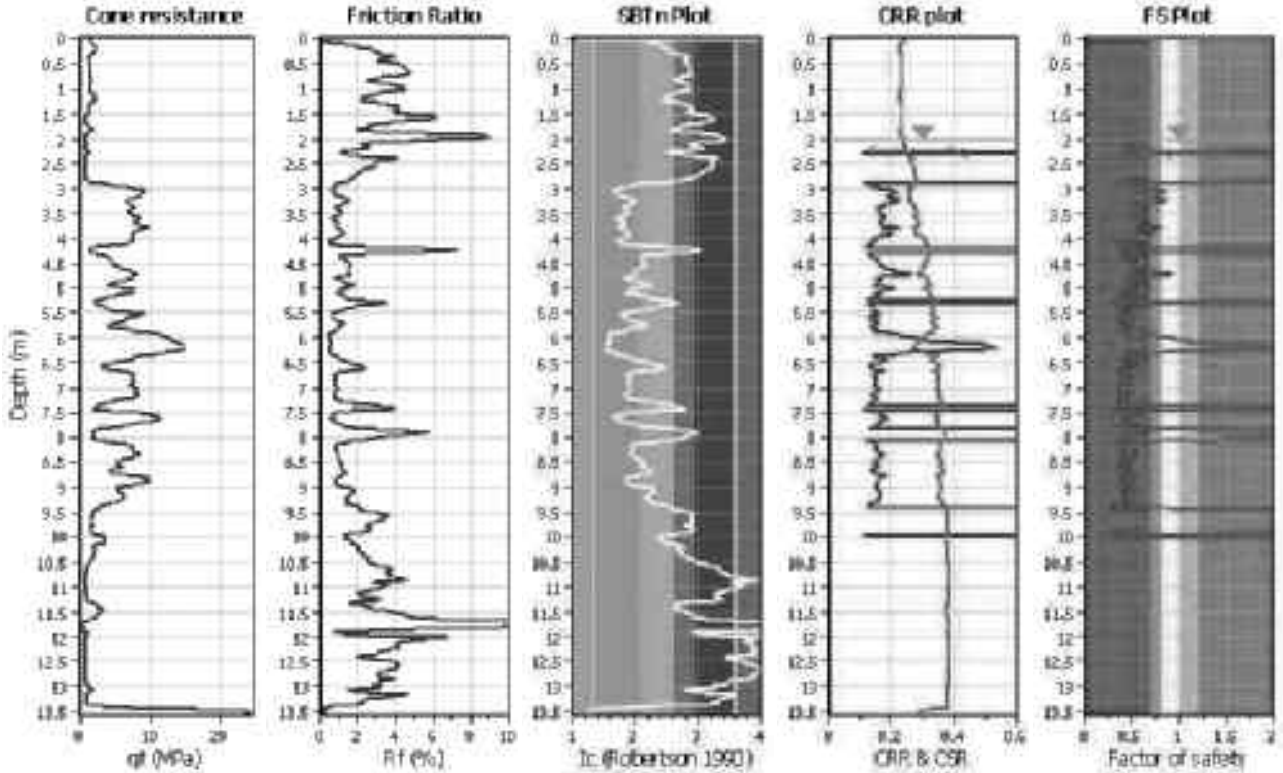
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

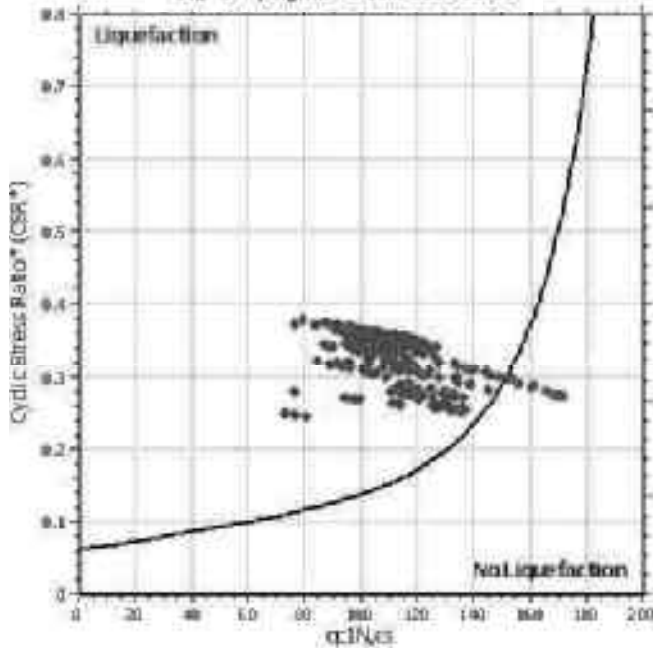
**CPT file : CPT106-ULS**

**Input parameters and analysis data**

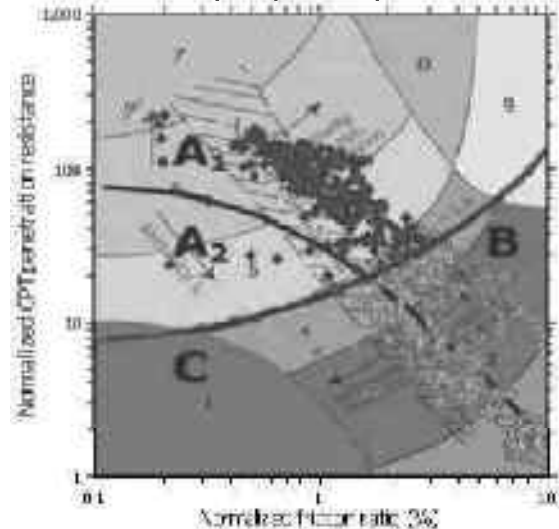
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

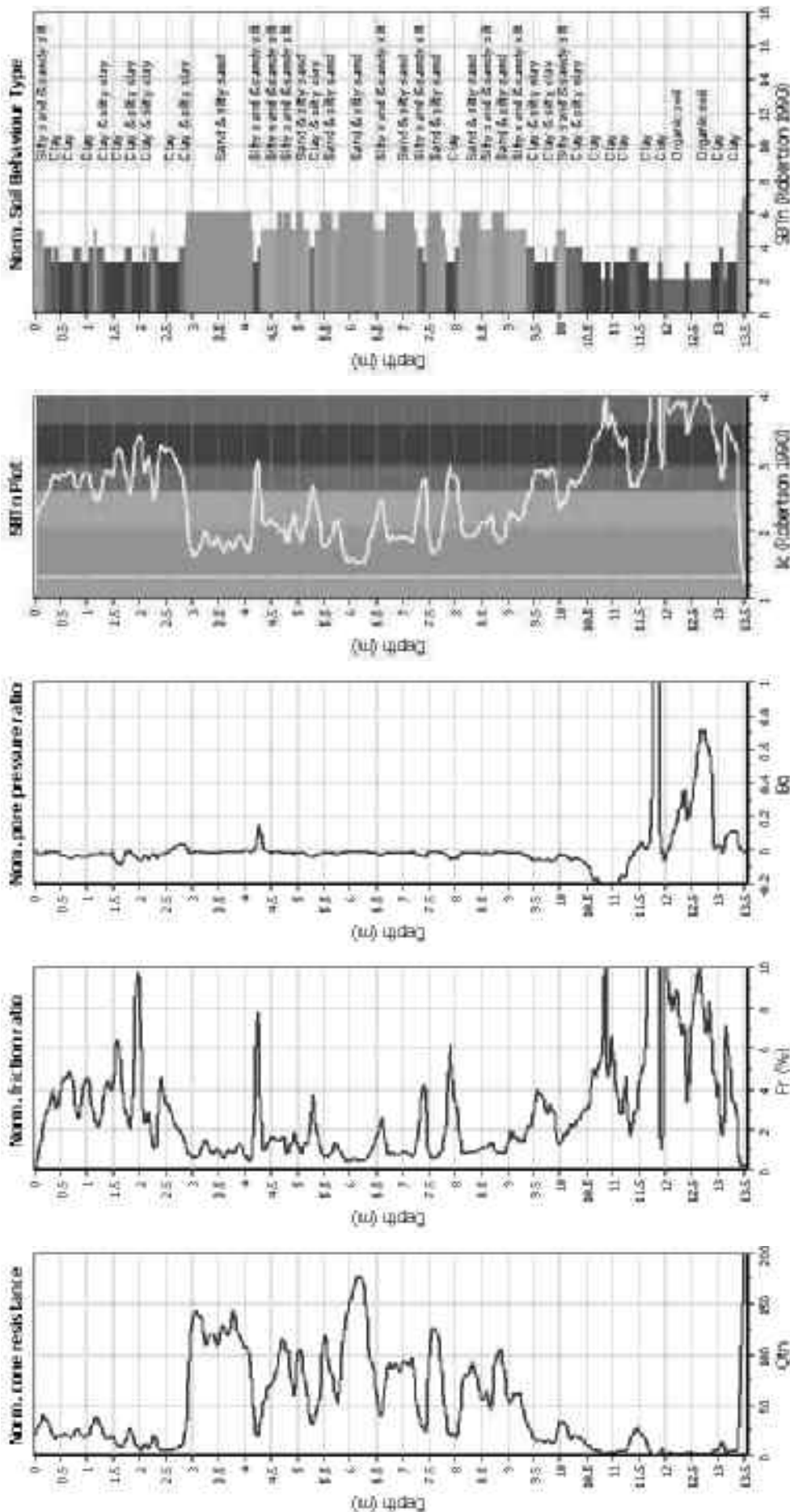


**Summary of liquefaction potential**



Zone A1: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A2: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normal stress to mean undrained strength and ground geometry.

### CPT basic interpretation plots (normaliz



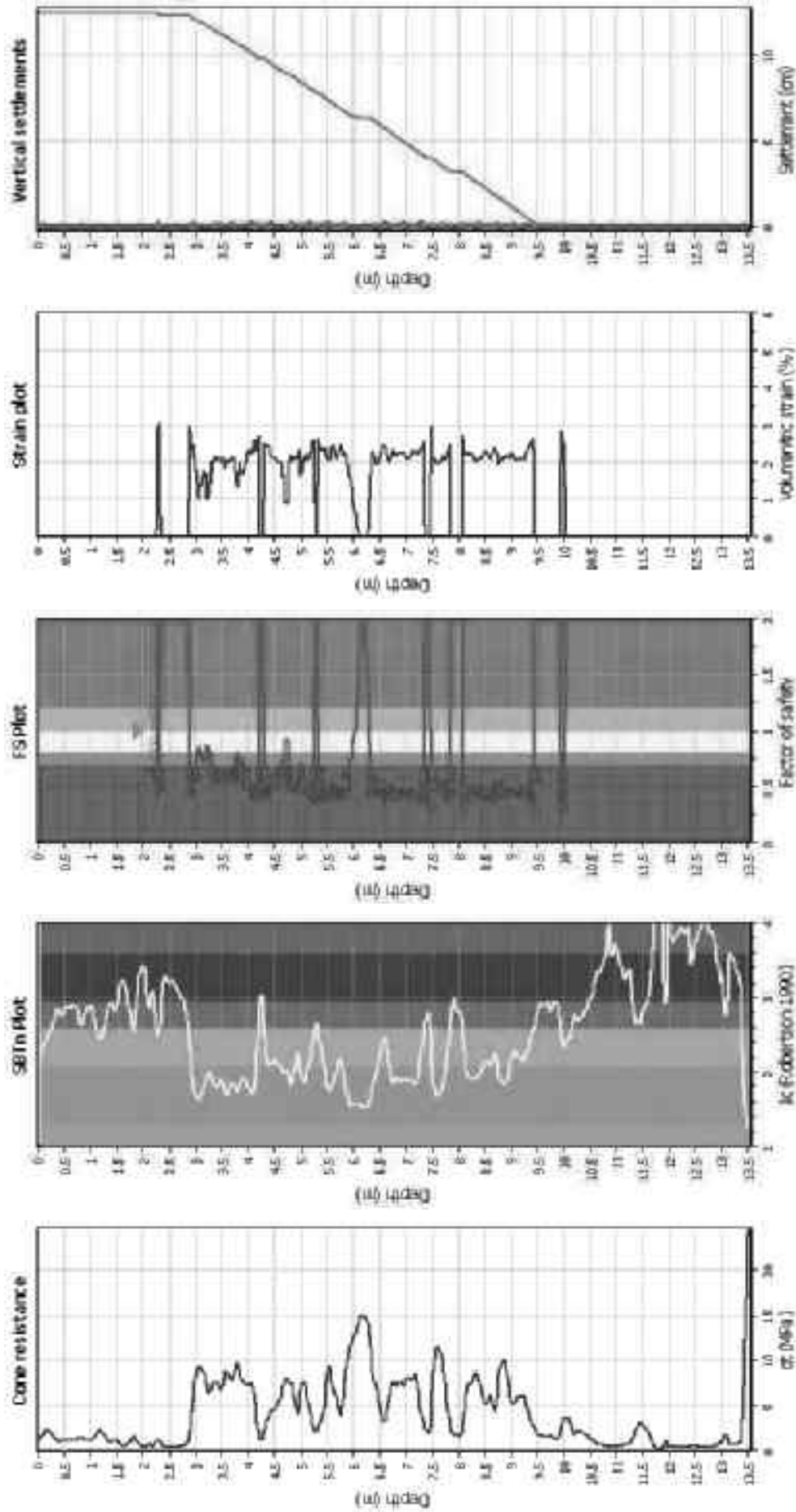
#### Input parameters and analysis data

Analysis method:	B&I (2014)	Fill weight:	N/A
Fines correction method:	B&I (2014)	Transition (lowest) applied:	No
Norm to test:	Based on Ic value	$f_c$ applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Clay size behavior applied:	Sands only
Peak ground acceleration:	0.42	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m
Depth to GWT (earthq.):	2.00 m		
Average results interval:	3		
Ic cut-off value:	2.60		
Unit weight calculation:	Based on SBT		
Use fill:	No		
Fill height:	N/A		

#### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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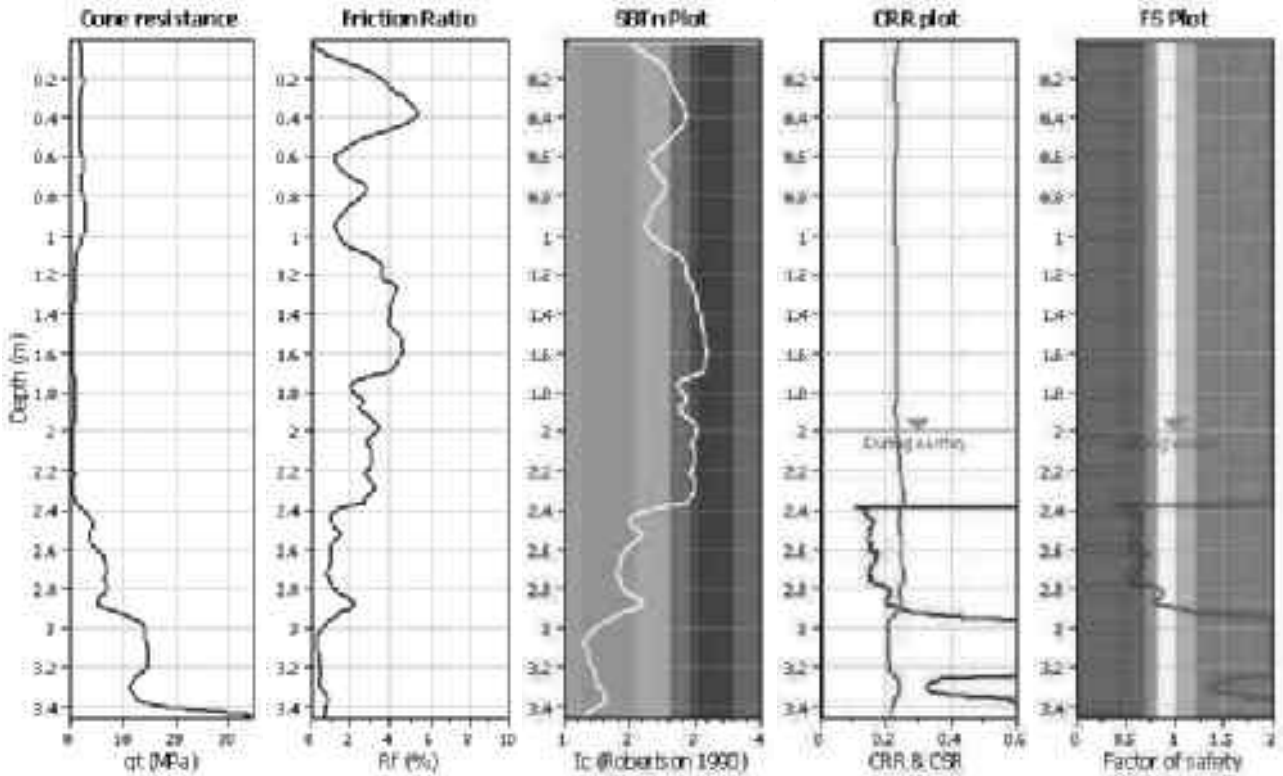
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT107-ULS**

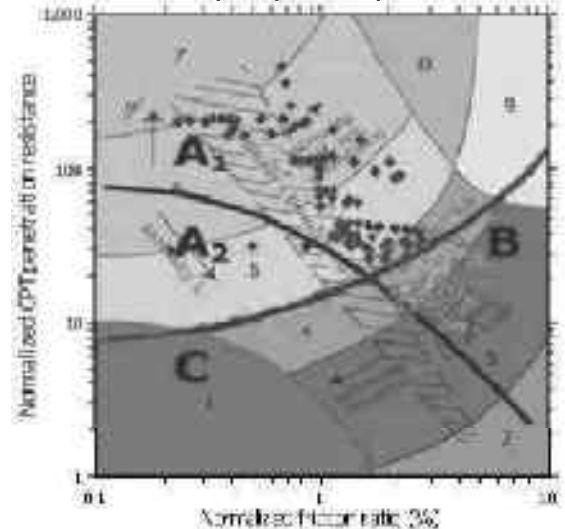
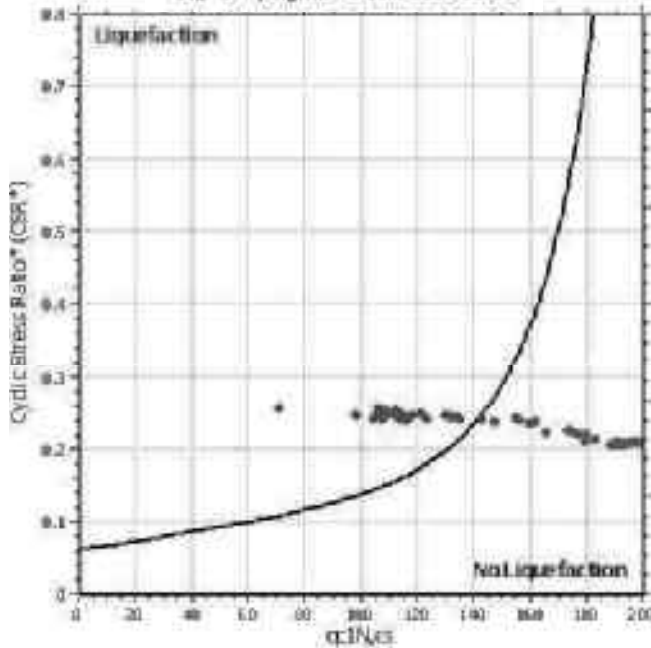
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



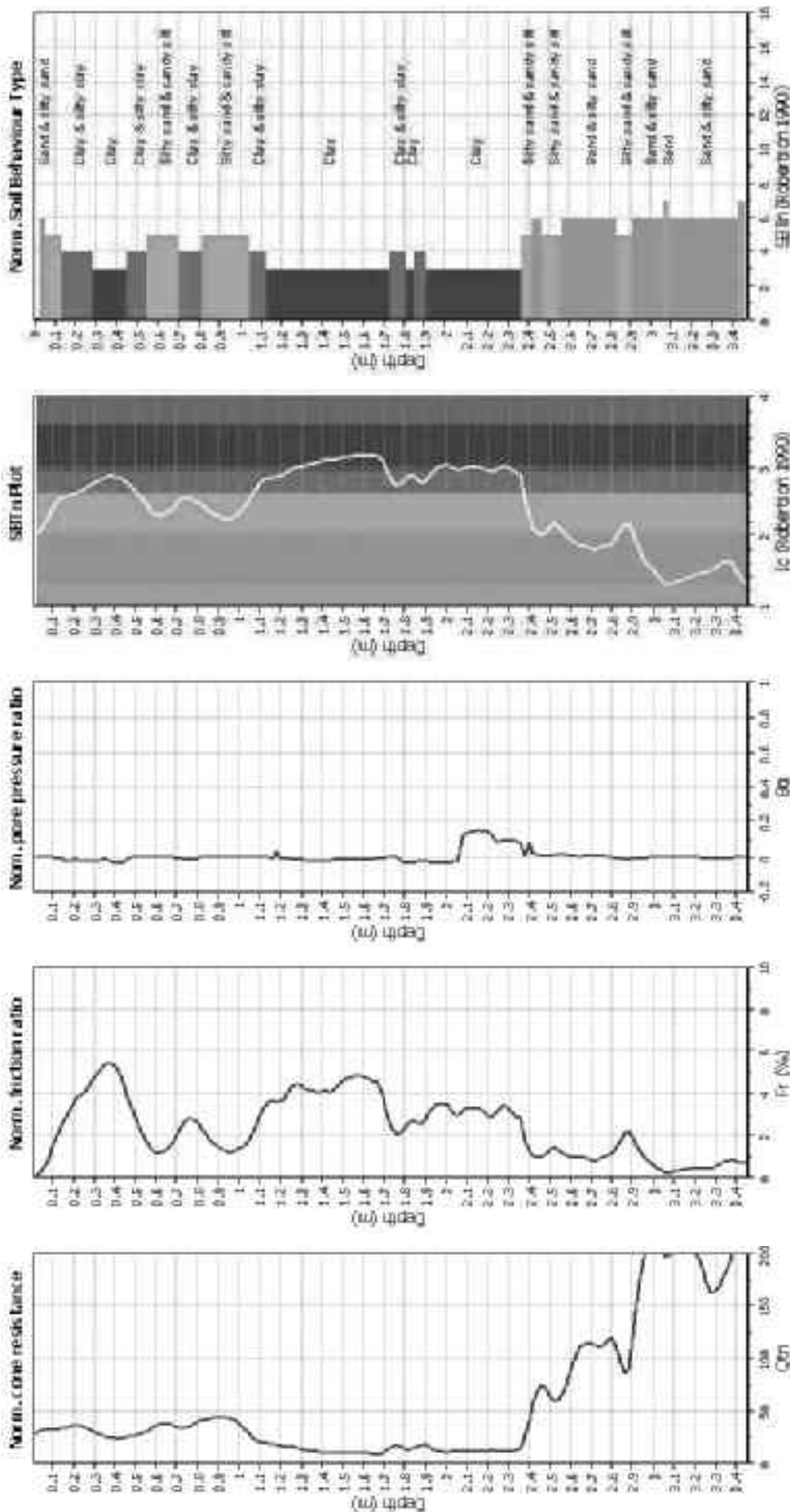
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and global geometry.

### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norms to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.50  
 Peak ground acceleration: 0.42  
 Depth to water table (meters): 2.00 m

Depth to GW (earthq.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

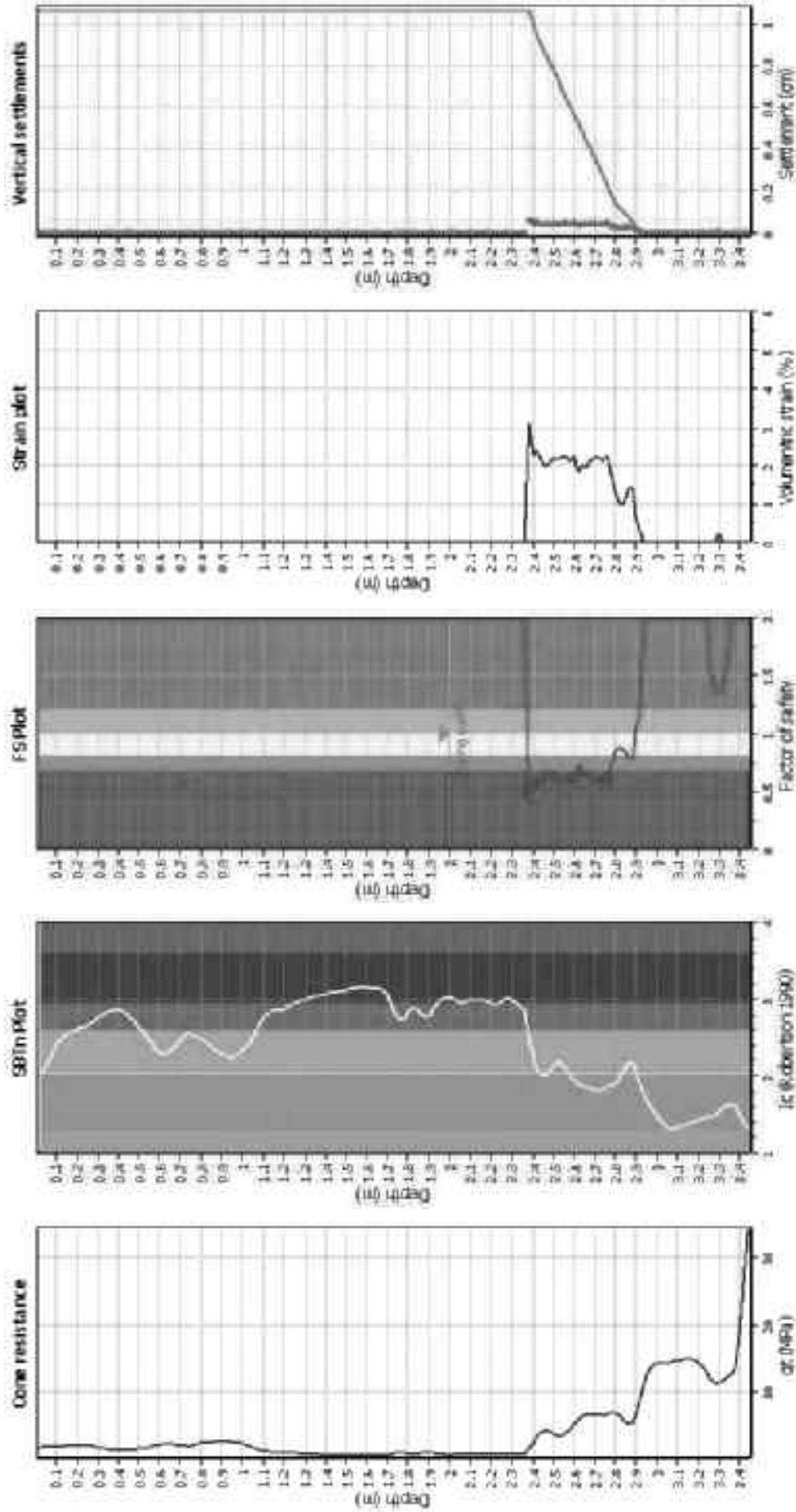
Fill weight: N/A  
 Transition (solect) applied: No  
 $f_c$  applied: Yes  
 Clay line behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

#### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained



### Estimation of post-earthquake settlements



#### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

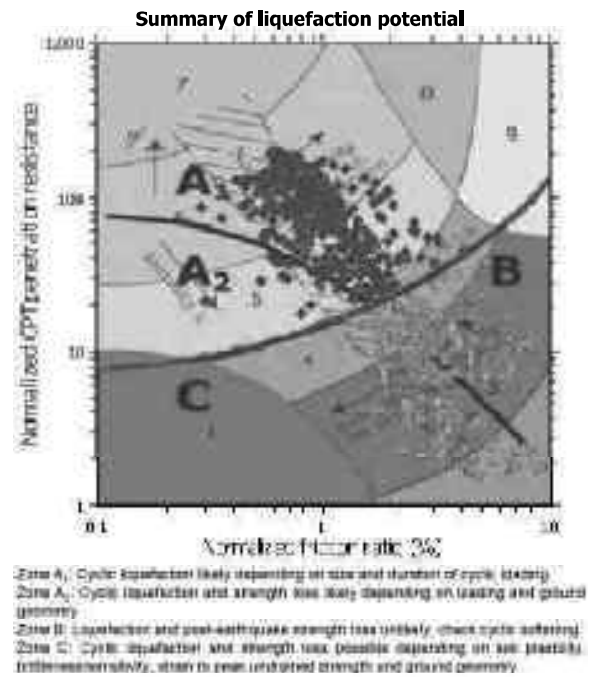
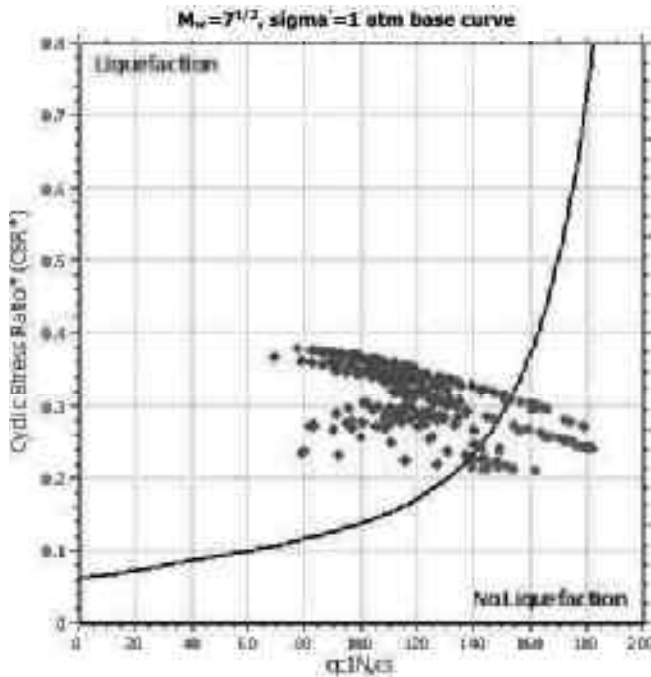
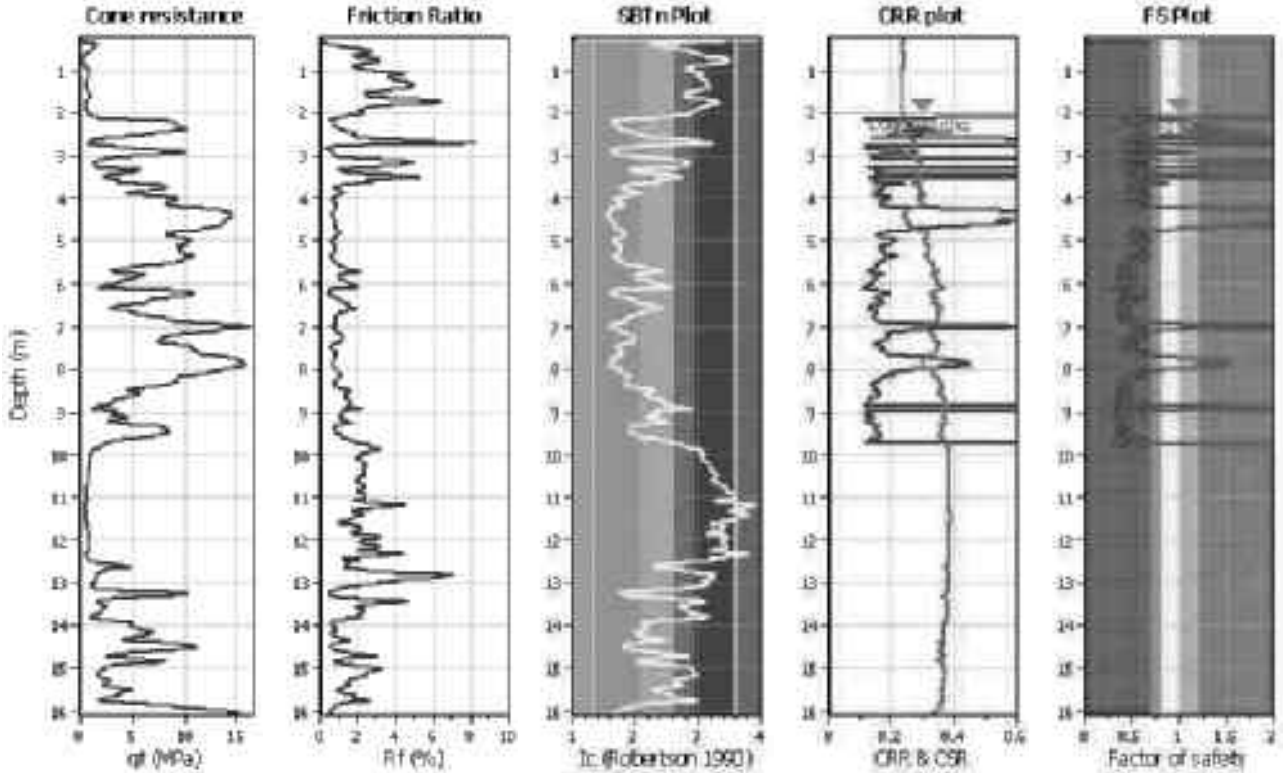
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT108-ULS**

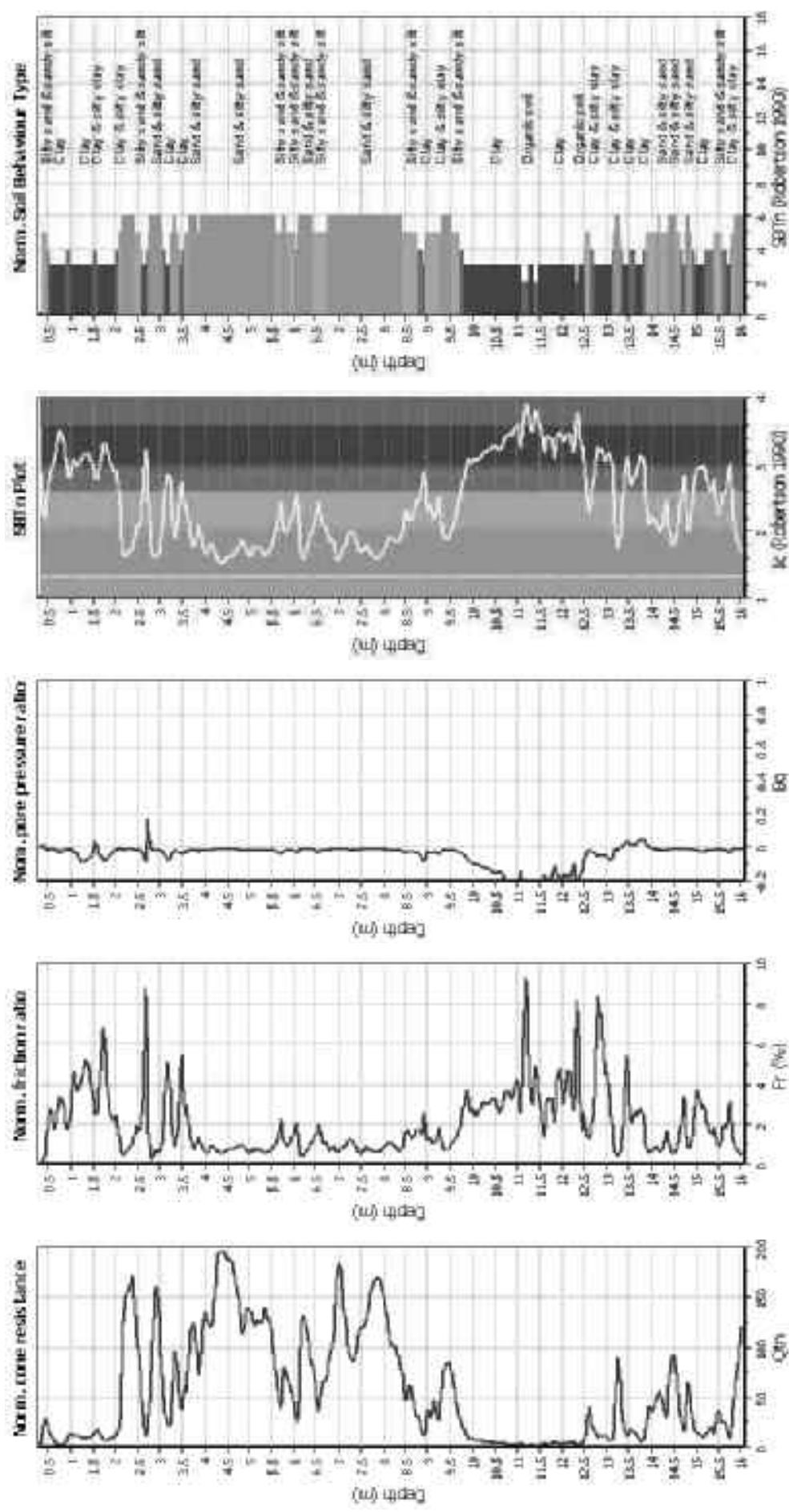
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method





### CPT basic interpretation plots (normaliz



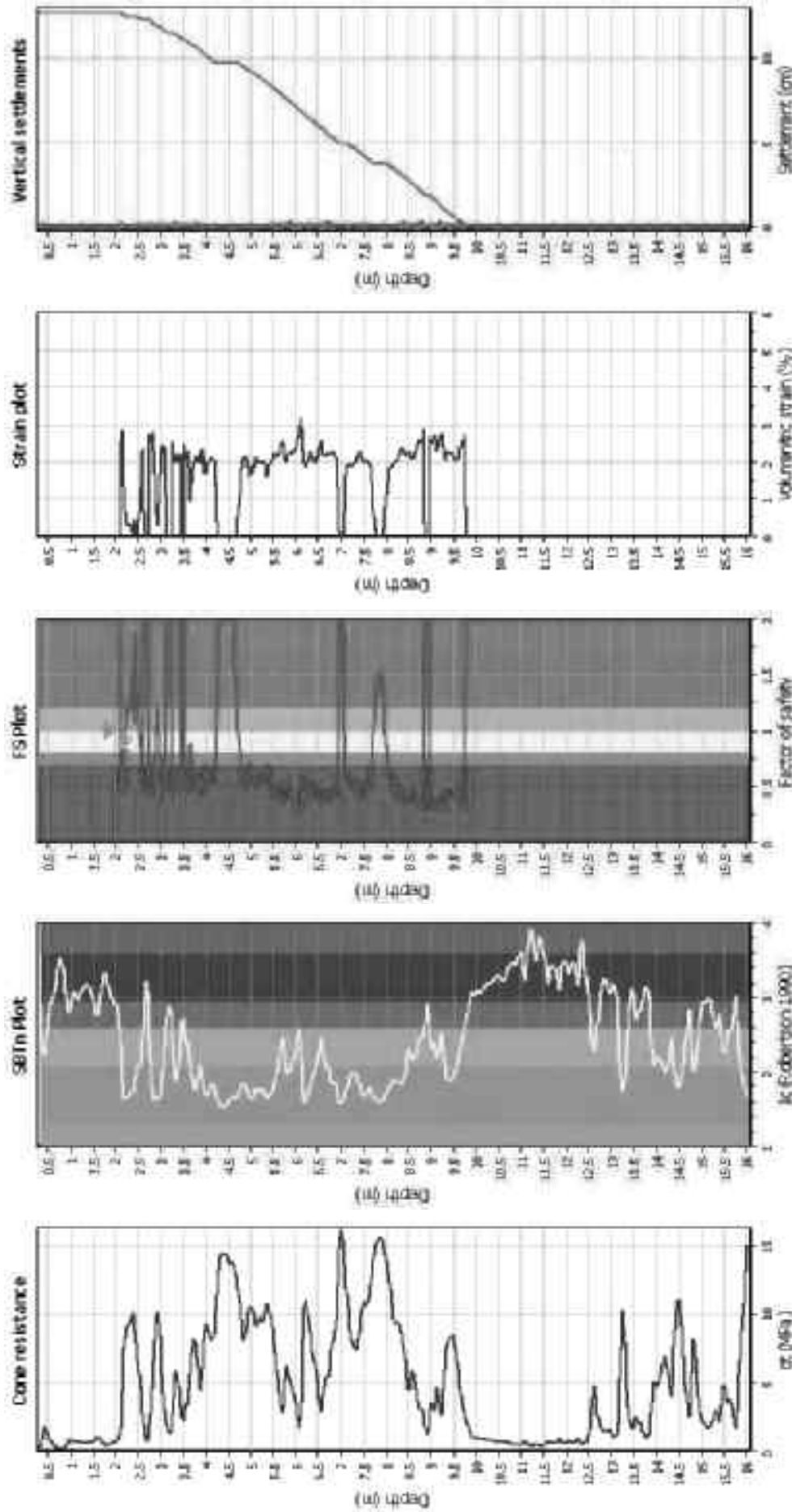
#### Input parameters and analysis data

Analysis method:	B&I (2014)	Fill weight:	N/A
Flow correction method:	B&I (2014)	Transition (direct, applied):	No
Norm to test:	Based on Ic value	R <sub>f</sub> applied:	Yes
Earthquake magnitude M <sub>w</sub> :	6.50	Clay line behavior applied:	Sands only
Peak ground acceleration:	0.42	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m

#### SBTm legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravelly sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

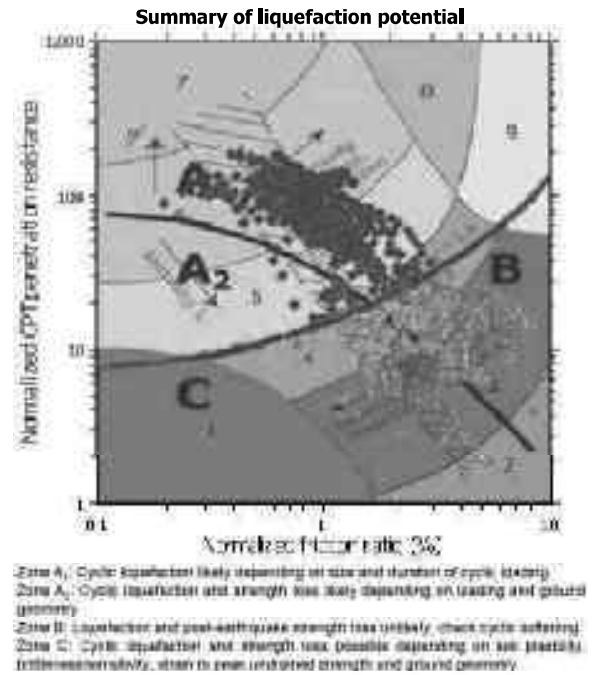
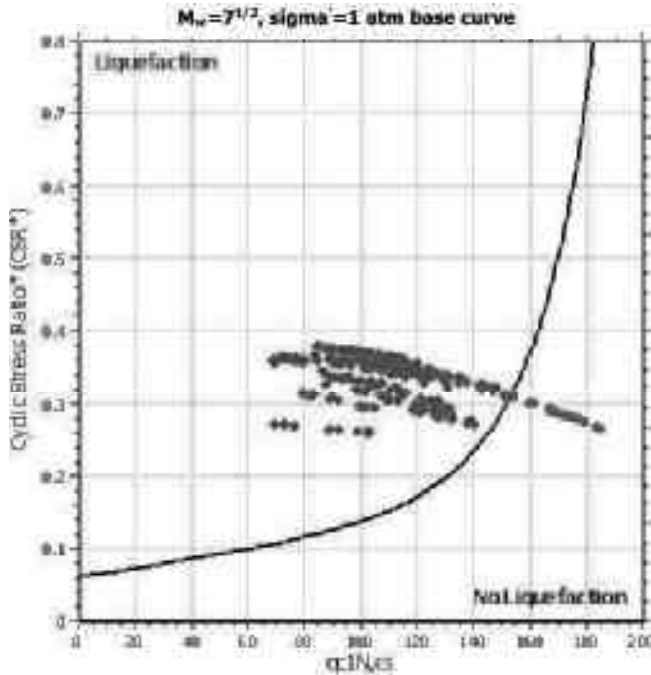
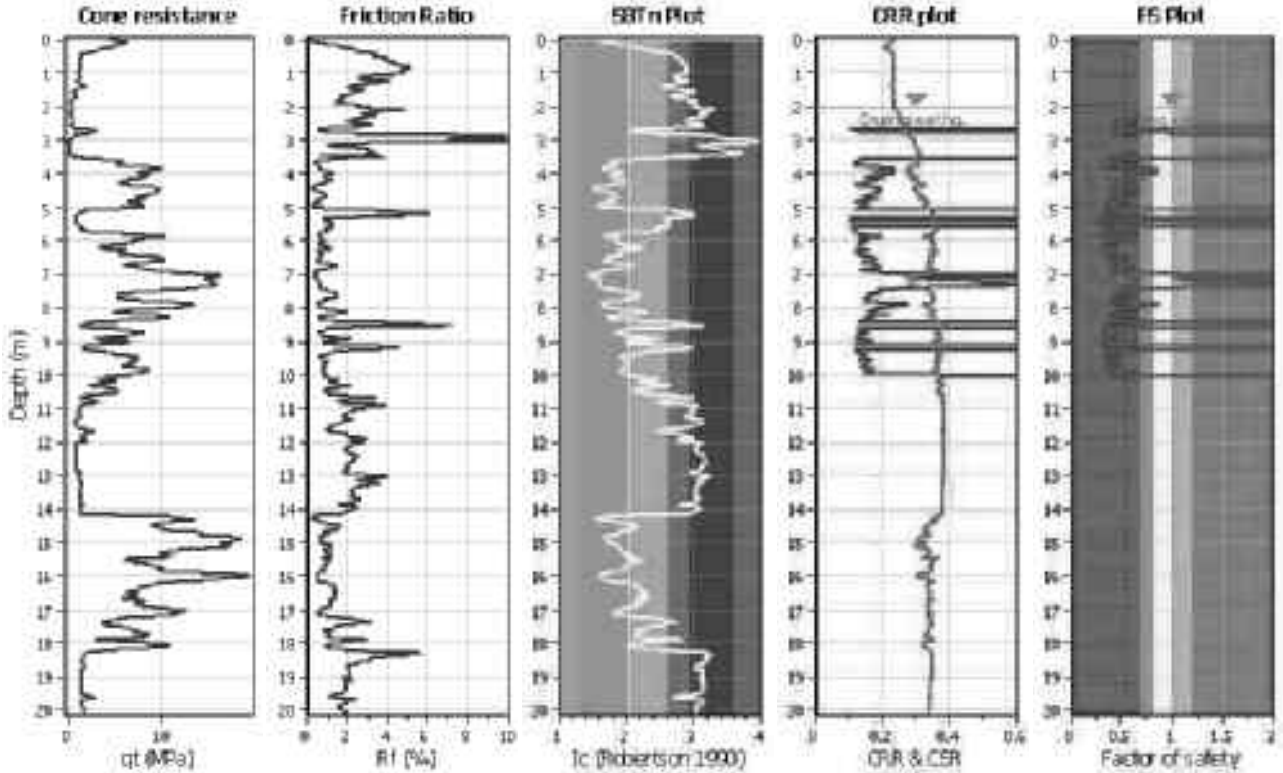
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

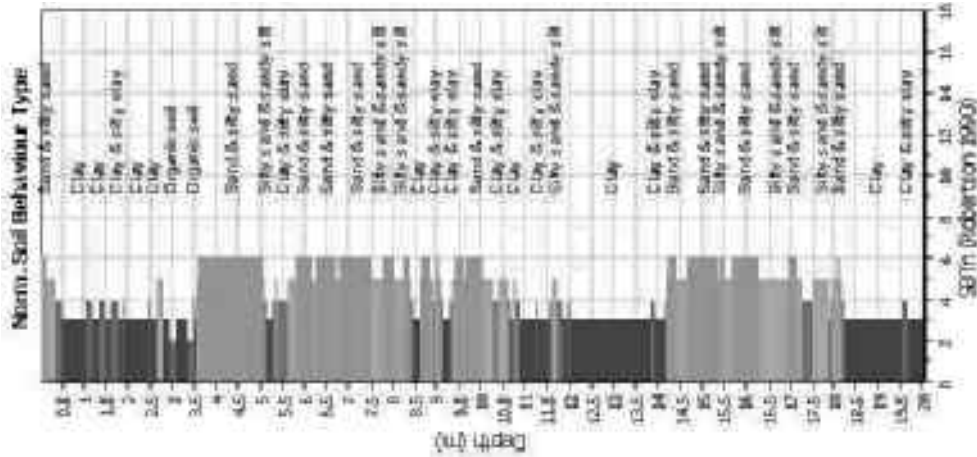
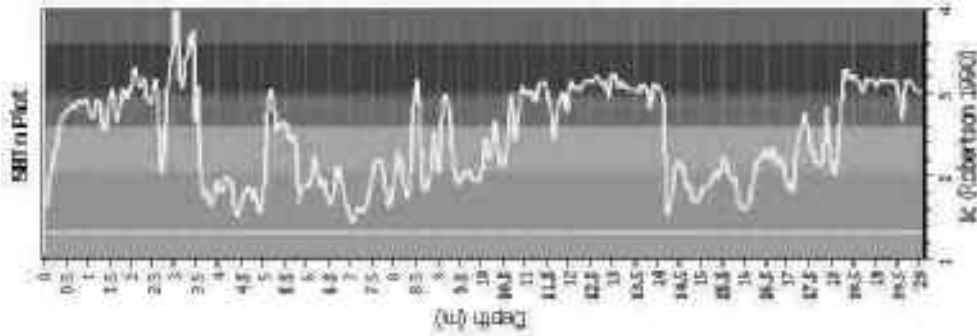
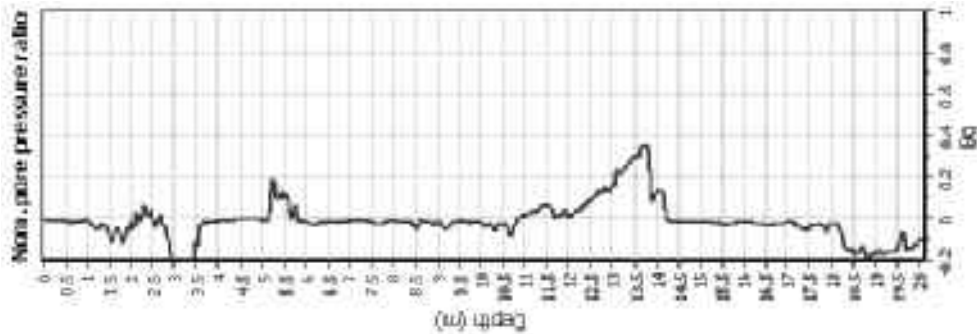
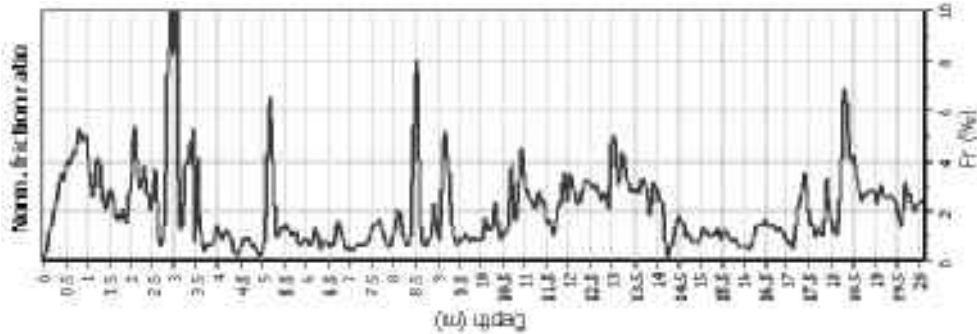
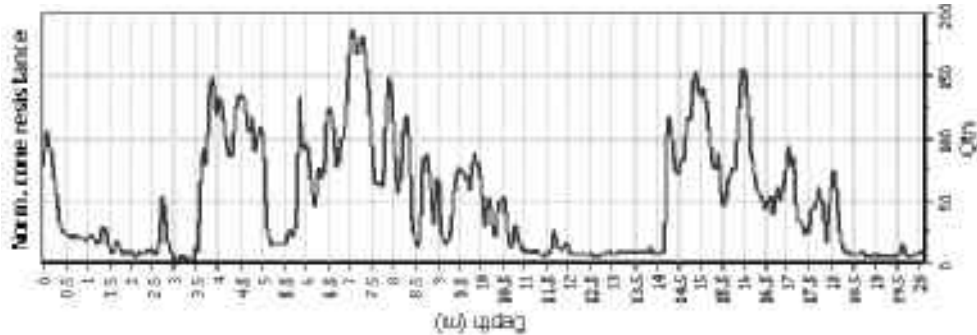
**CPT file : CPT109-ULS**

**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



**CPT basic interpretation plots (normaliz**



**Input parameters and analysis data**

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.50  
 Peak ground acceleration: 0.42  
 Depth to water table (meters): 2.00 m

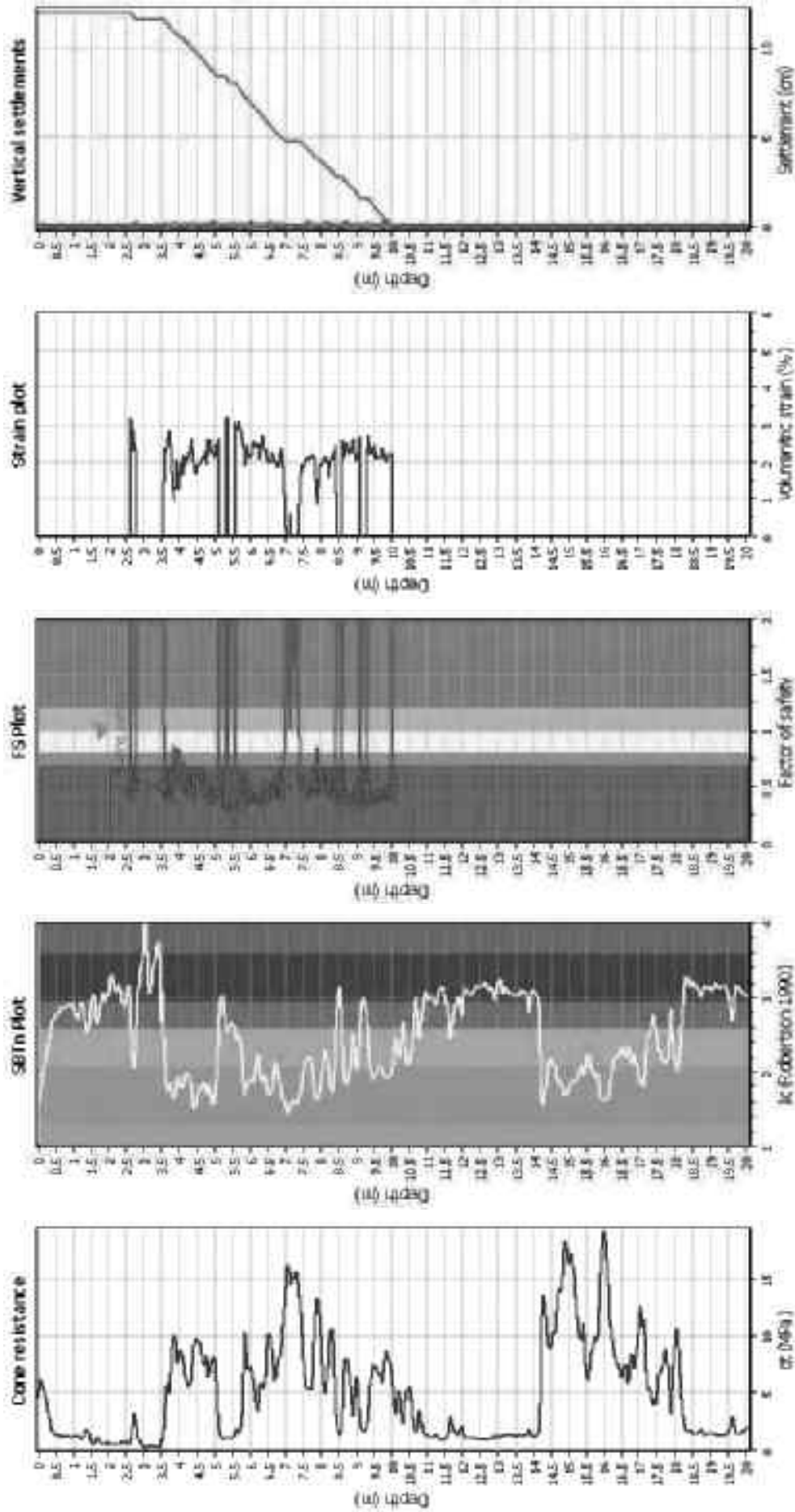
Depth to GWT (ortho.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (down): applied: No  
 $f_v$  applied: Yes  
 Clay line behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

**SBTm legend**

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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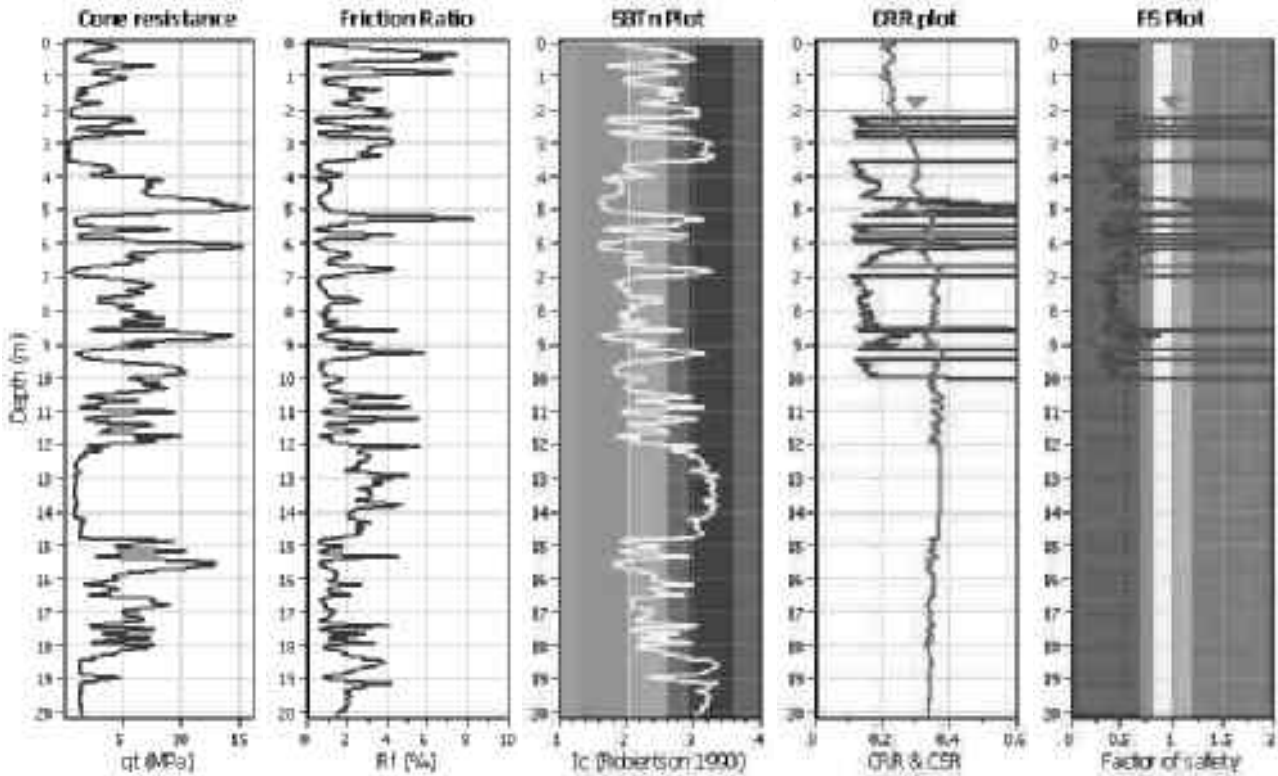
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT110-ULS**

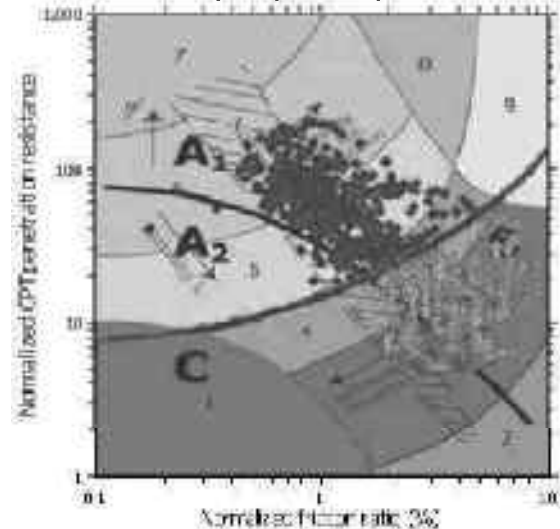
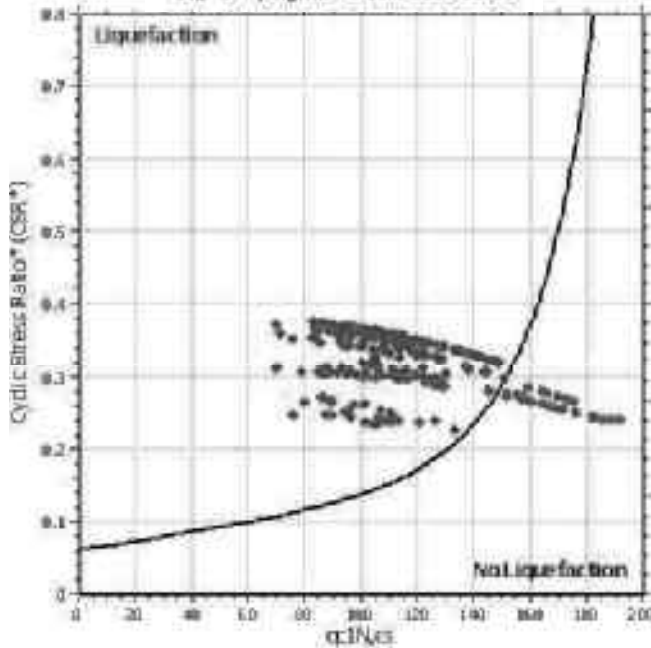
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

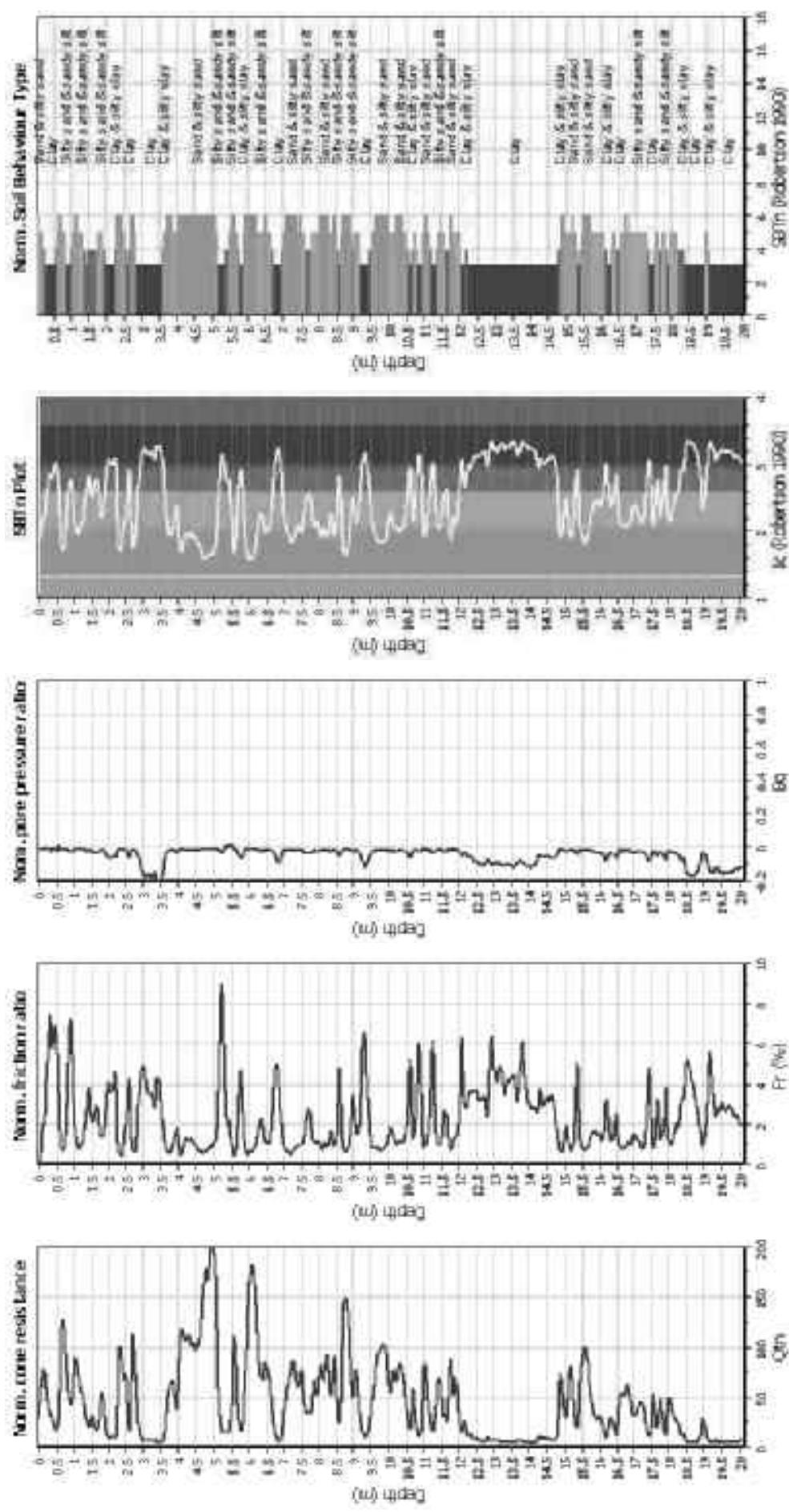
**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and grain geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and grain geometry.



### CPT basic interpretation plots (normaliz



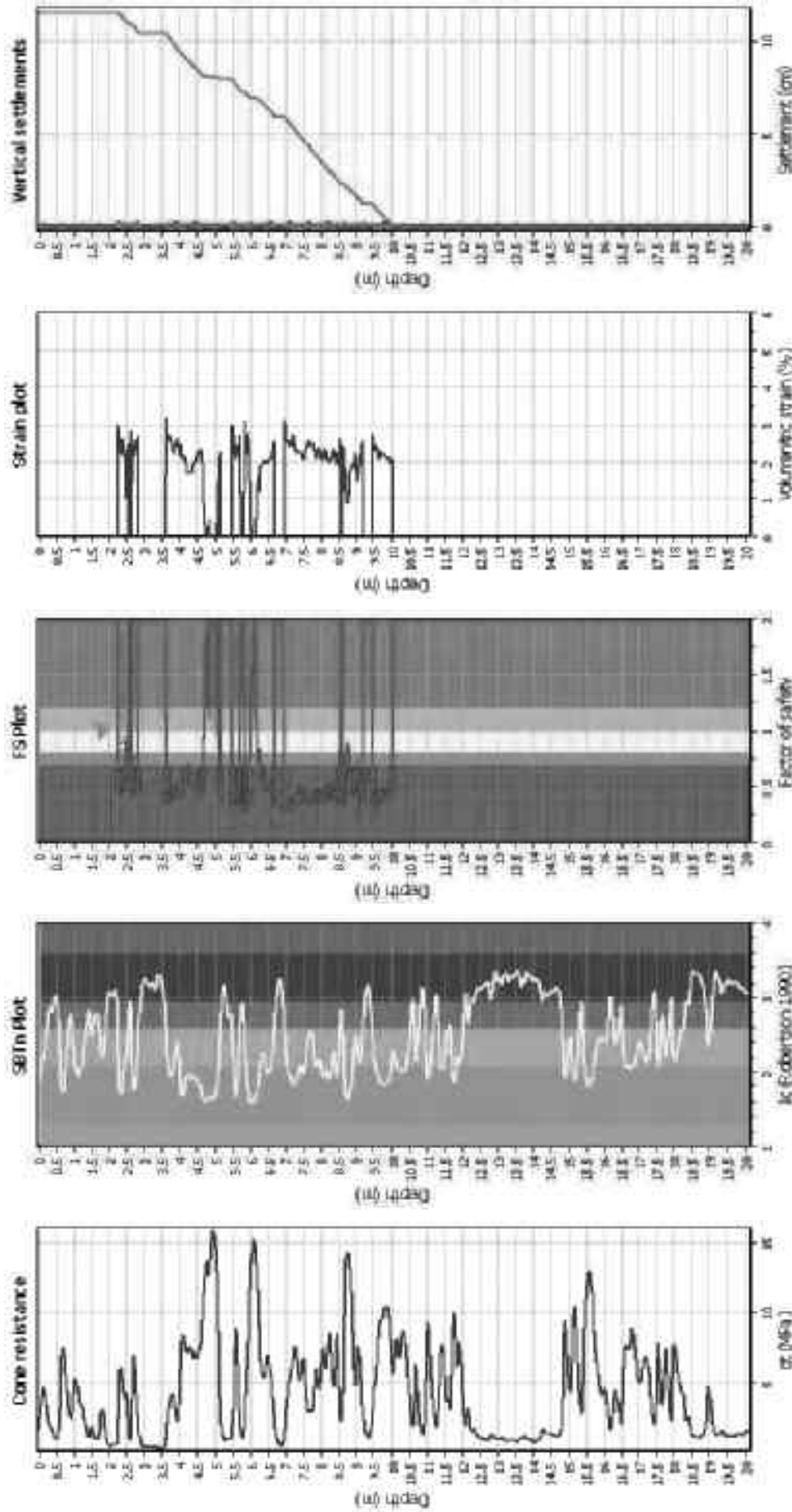
**Input parameters and analysis data**

Analysis method:	B&I (2014)	Fill weight:	N/A
Fines correction method:	B&I (2014)	Transition (lowest):	No
Norm to test:	Based on Ic value	$f_c$ applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Clay line behavior applied:	Sands only
Peak ground acceleration:	0.42	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m

**SBTm legend**

<span style="display: inline-block; width: 10px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> 1. Sensitve fine grained	<span style="display: inline-block; width: 10px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> 7. Gravely sand to sand
<span style="display: inline-block; width: 10px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> 2. Organic material	<span style="display: inline-block; width: 10px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> 8. Very stiff sand to
<span style="display: inline-block; width: 10px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> 3. Clay to silty clay	<span style="display: inline-block; width: 10px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> 9. Very stiff fine grained
<span style="display: inline-block; width: 10px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> 4. Clayey silt to silty	
<span style="display: inline-block; width: 10px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> 5. Silty sand to sandy silt	
<span style="display: inline-block; width: 10px; height: 10px; background-color: #cccccc; border: 1px solid black;"></span> 6. Clean sand to silty sand	

### Estimation of post-earthquake settlements



### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain





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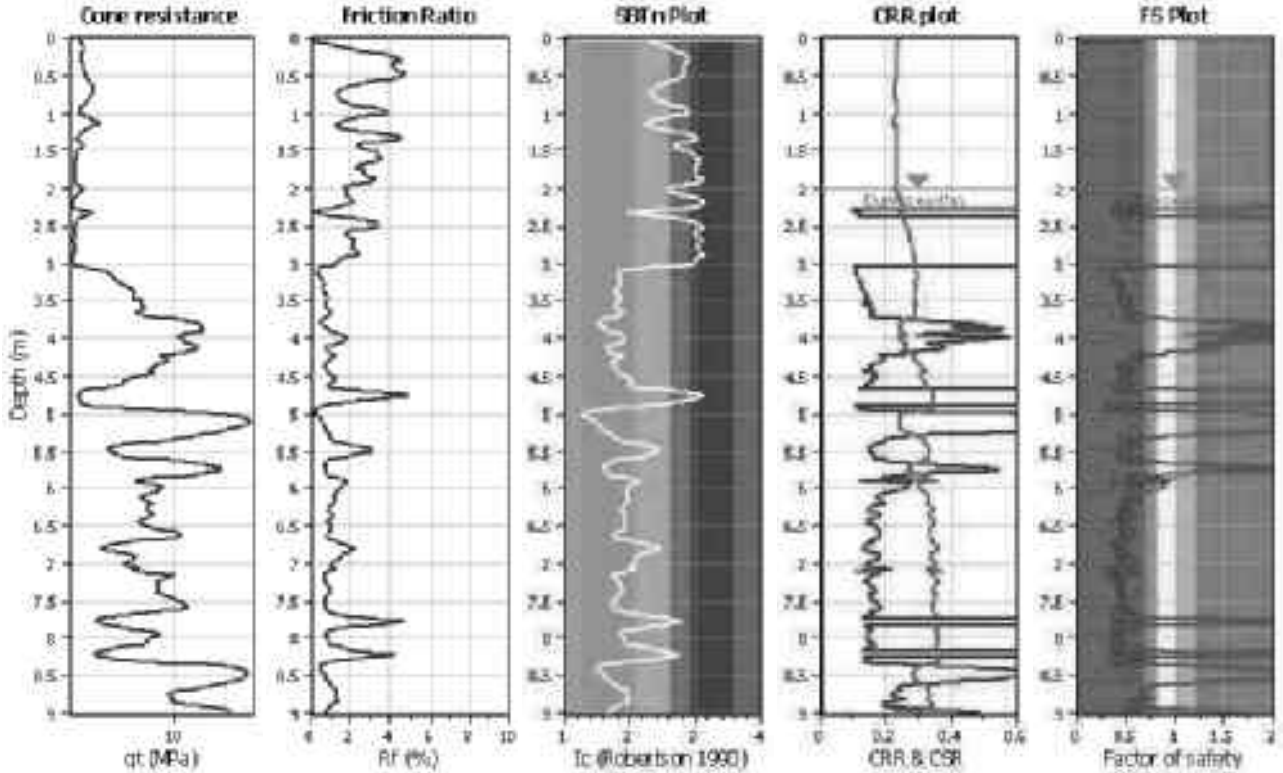
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT111-ULS**

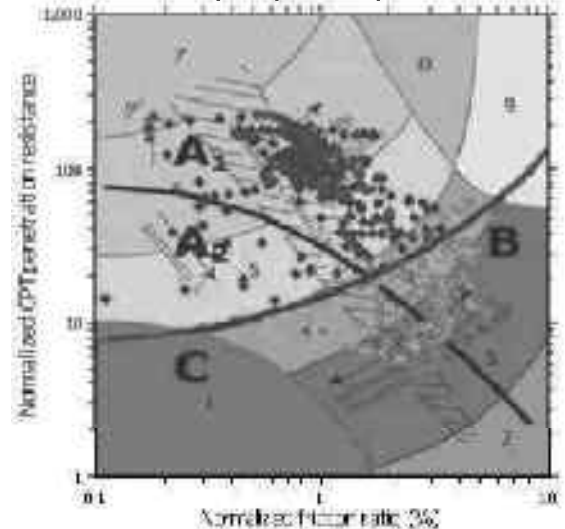
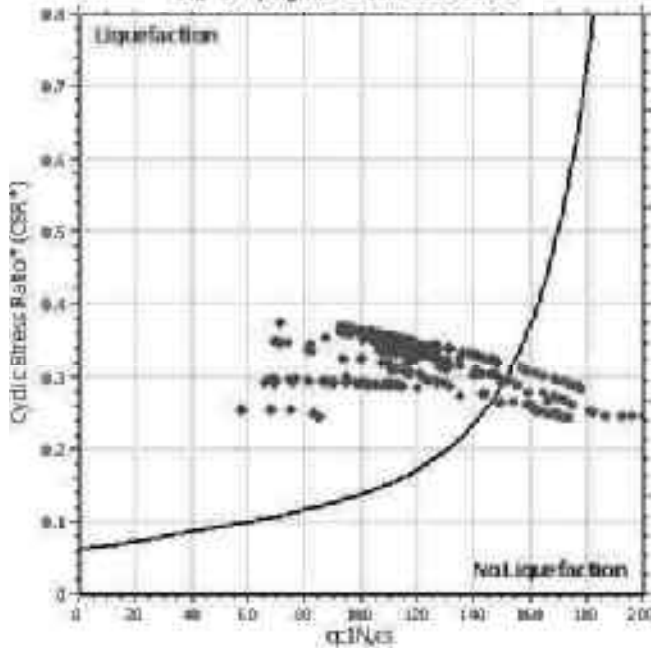
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



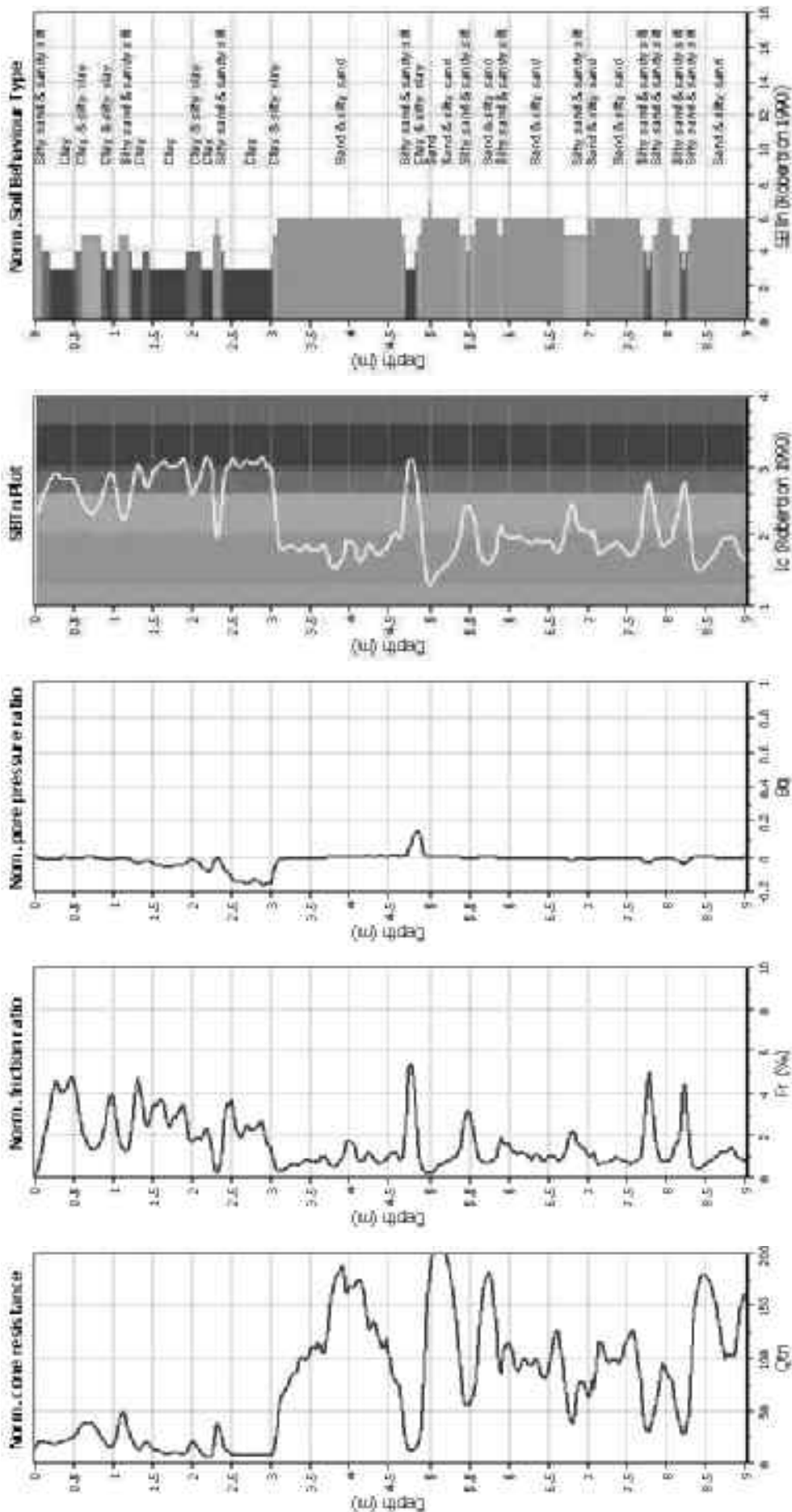
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normal stress, strain to zero undrained strength and global geometry.

### CPT basic interpretation plots (normaliz



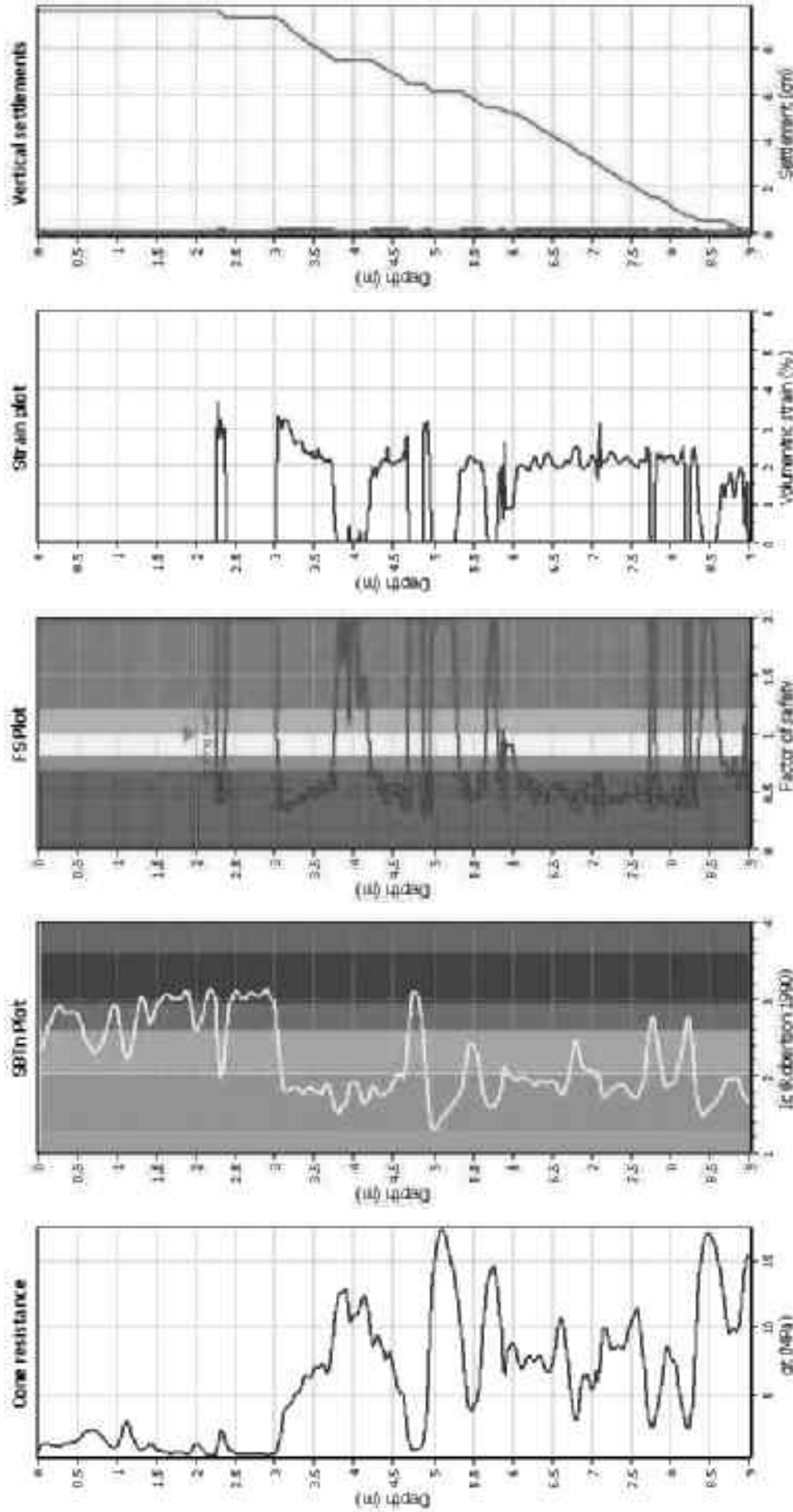
#### Input parameters and analysis data

Analyze method:	B&I (2014)	Fill weight:	N/A
Flow correction method:	B&I (2014)	Transition (select, applied):	No
Norm to test:	Based on Ic value	$f_c$ applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Clay size behavior applied:	Sands only
Peak ground acceleration:	0.42	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m

#### SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty	7. Gravelly sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_t$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

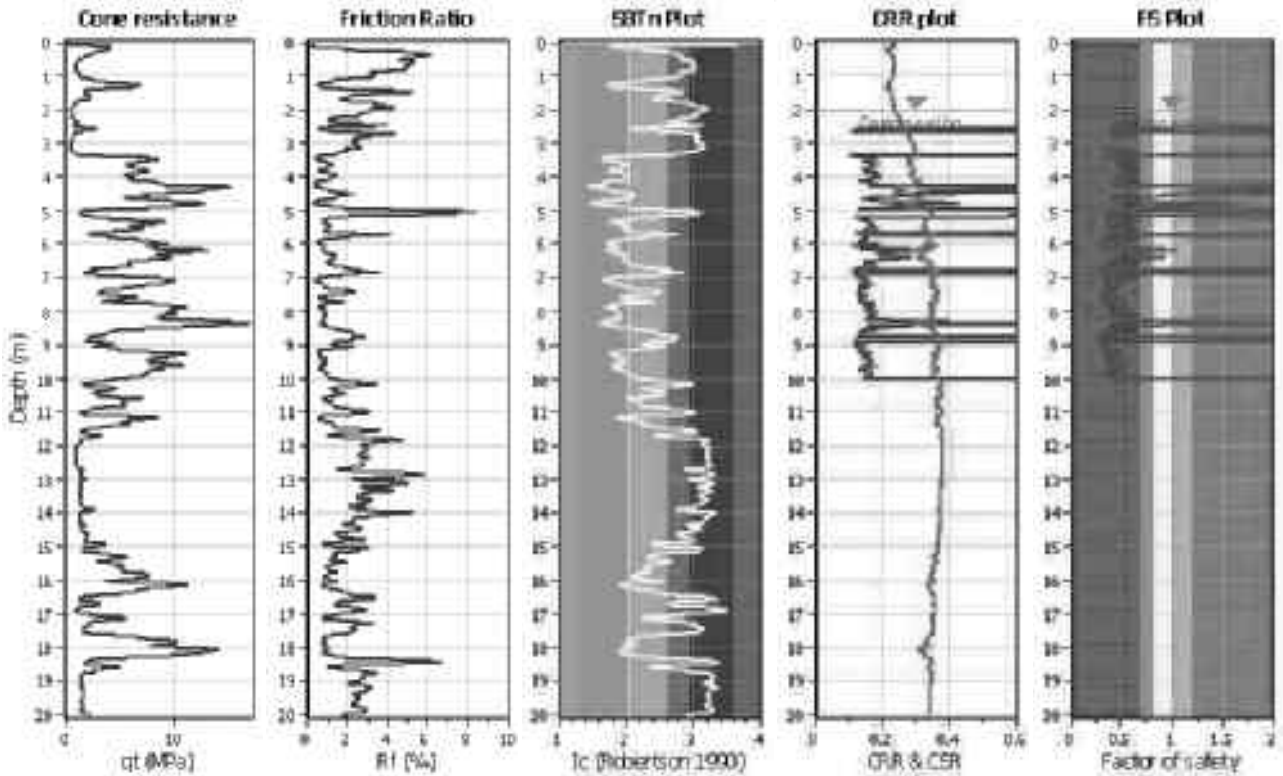
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

**CPT file : CPT112-ULS**

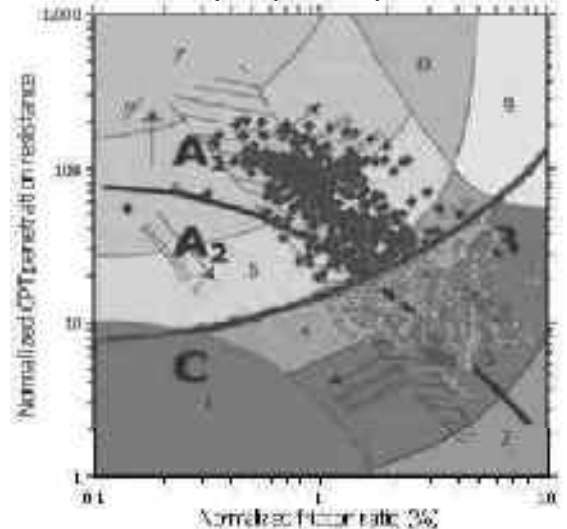
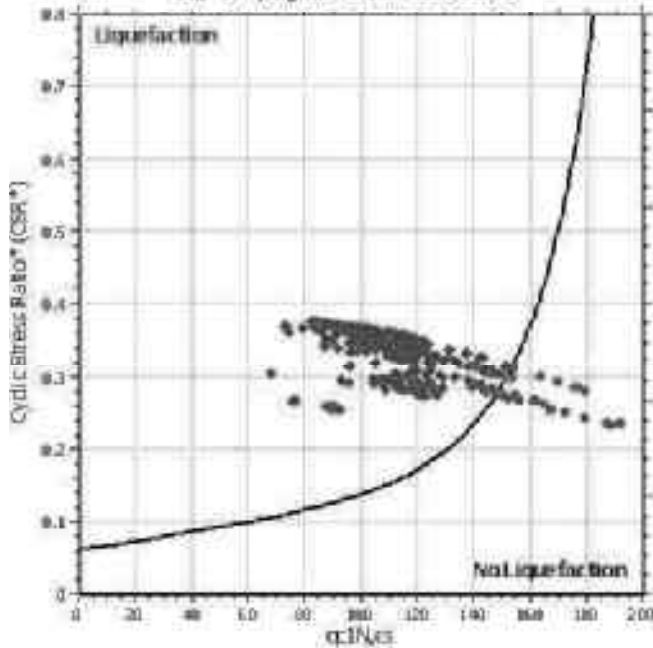
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



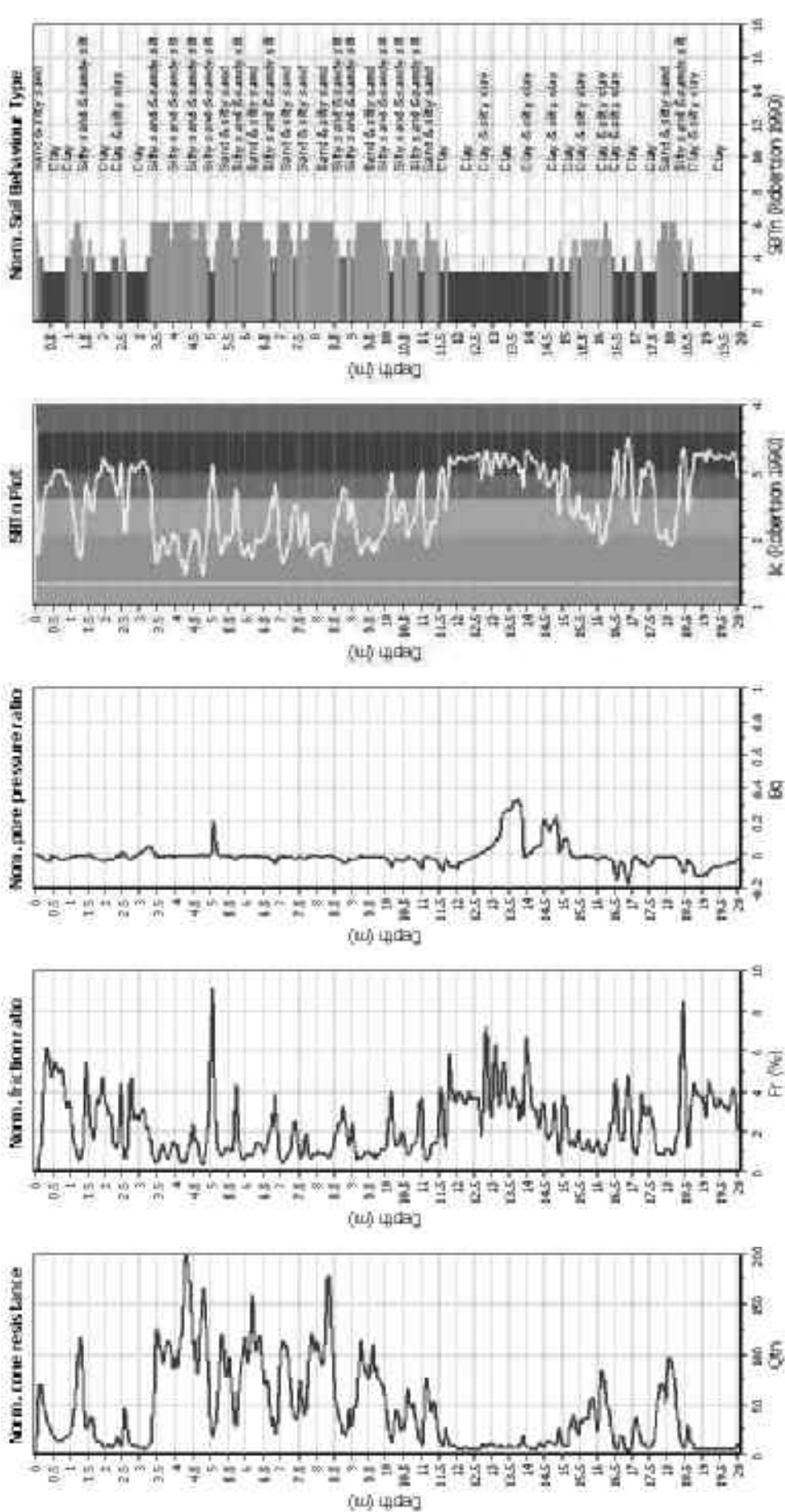
$M_w=7^{1/2}$ , sigma =1 atm base curve

**Summary of liquefaction potential**



Zone A1: Cyclic liquefaction likely depending on size and number of cycle (static)  
 Zone A2: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone C: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normal stress, strain to zero undrained strength and ground geometry.

### CPT basic interpretation plots (normaliz



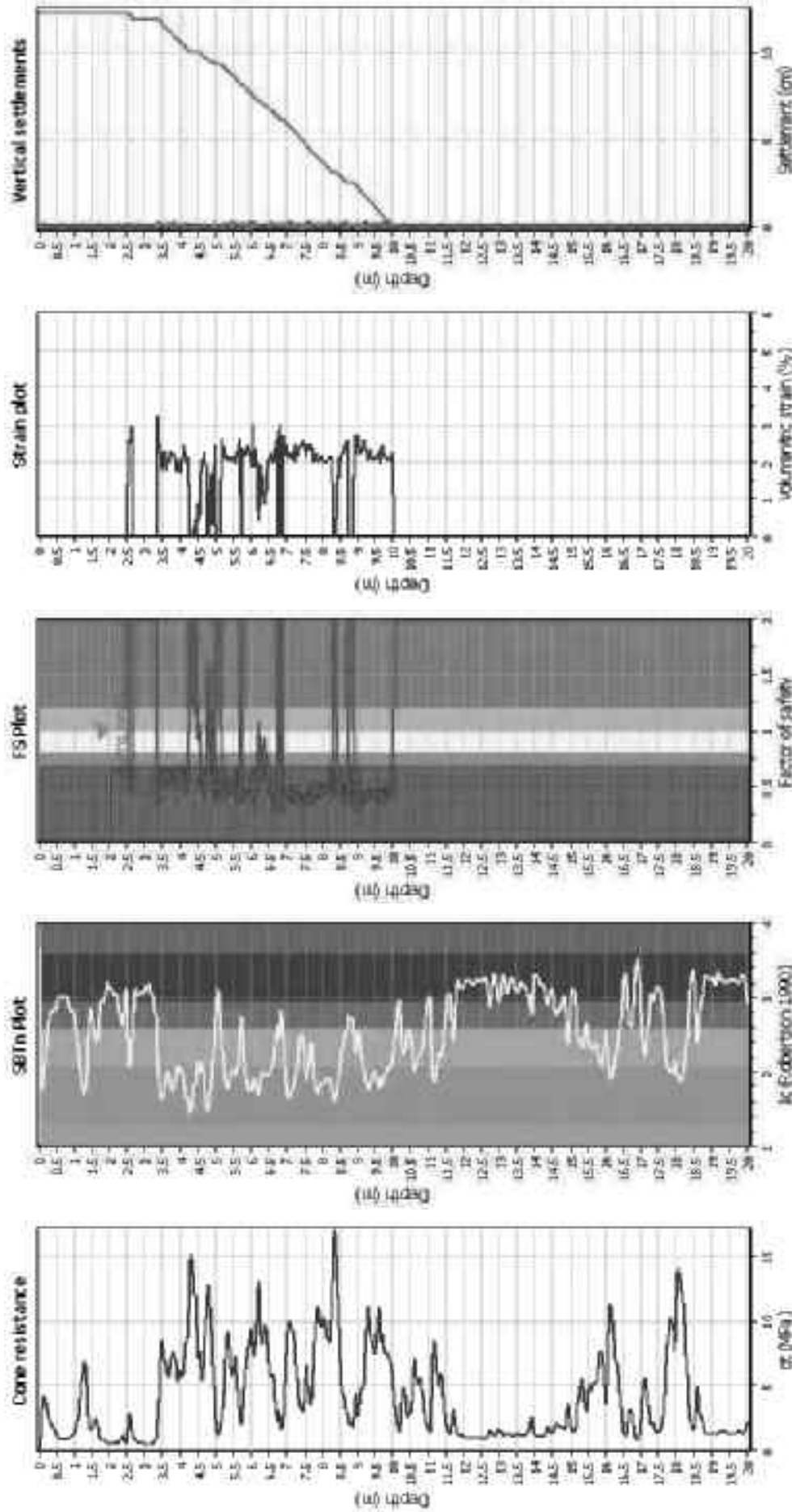
#### Input parameters and analysis data

Analysis method:	B&I (2014)	Fill weight:	N/A
Fines correction method:	B&I (2014)	Transition (lowest):	No
Norm to test:	Based on I <sub>c</sub> value	R <sub>f</sub> applied:	Yes
Earthquake magnitude M <sub>w</sub> :	6.50	Clay size behavior applied:	Sands only
Peak ground acceleration:	0.42	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m
Depth to GWT (earthq.):	2.00 m		
Average results interval:	3		
I <sub>c</sub> cut-off value:	2.60		
Unit weight calculation:	Based on SBT		
Use fill:	No		
Fill height:	N/A		

#### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain





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**LIQUEFACTION ANALYSIS REPORT**

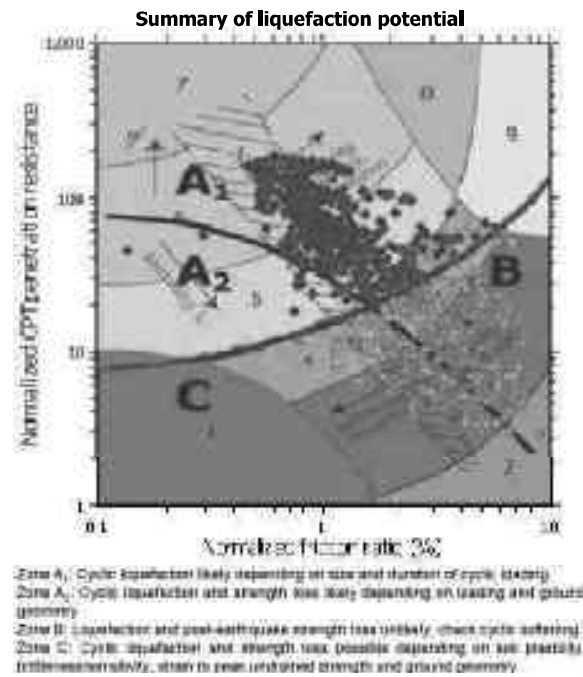
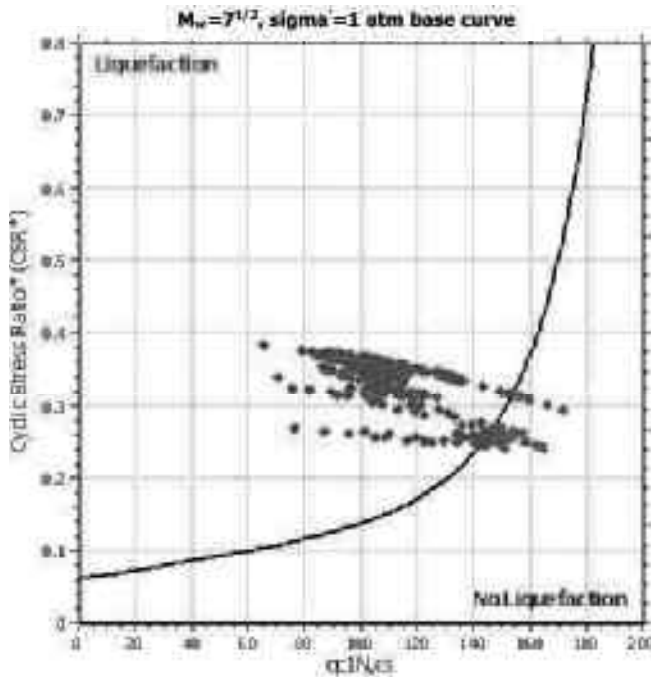
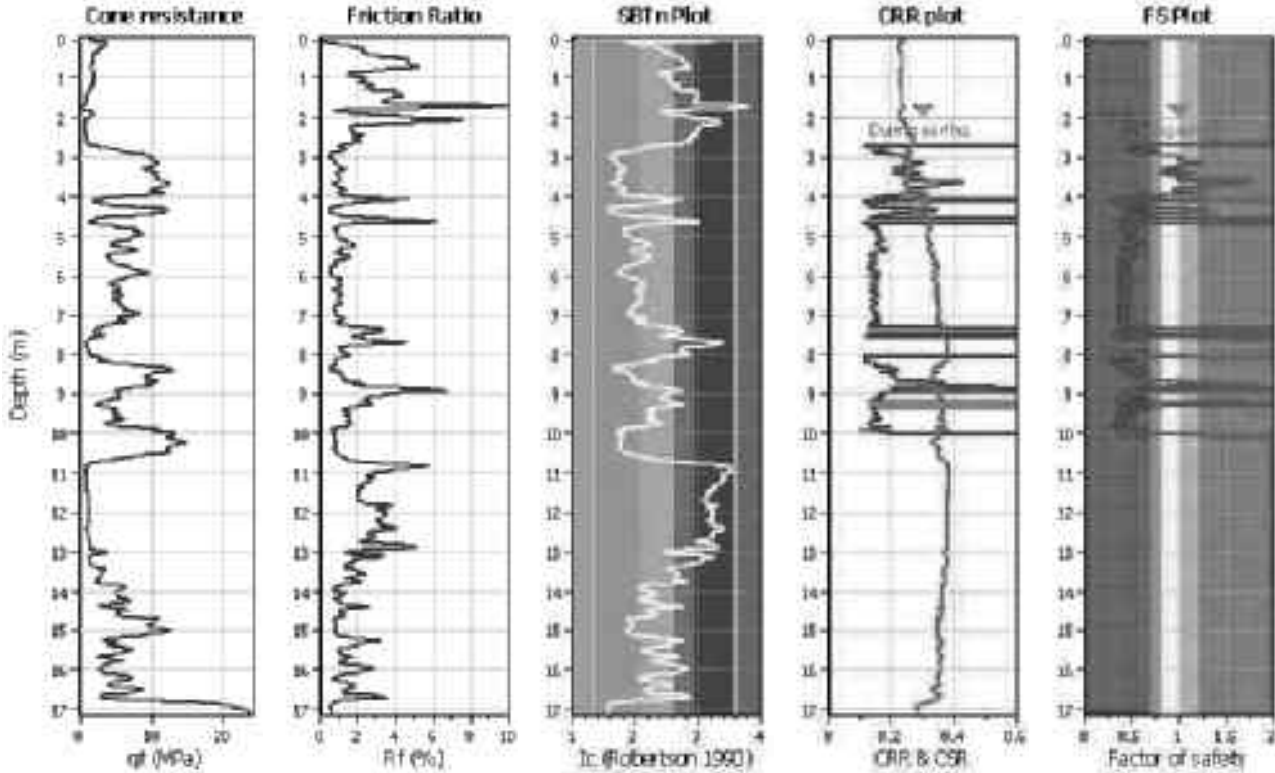
**Project title : Lyndhurst Subdivision Stage 7-12**

**Location :**

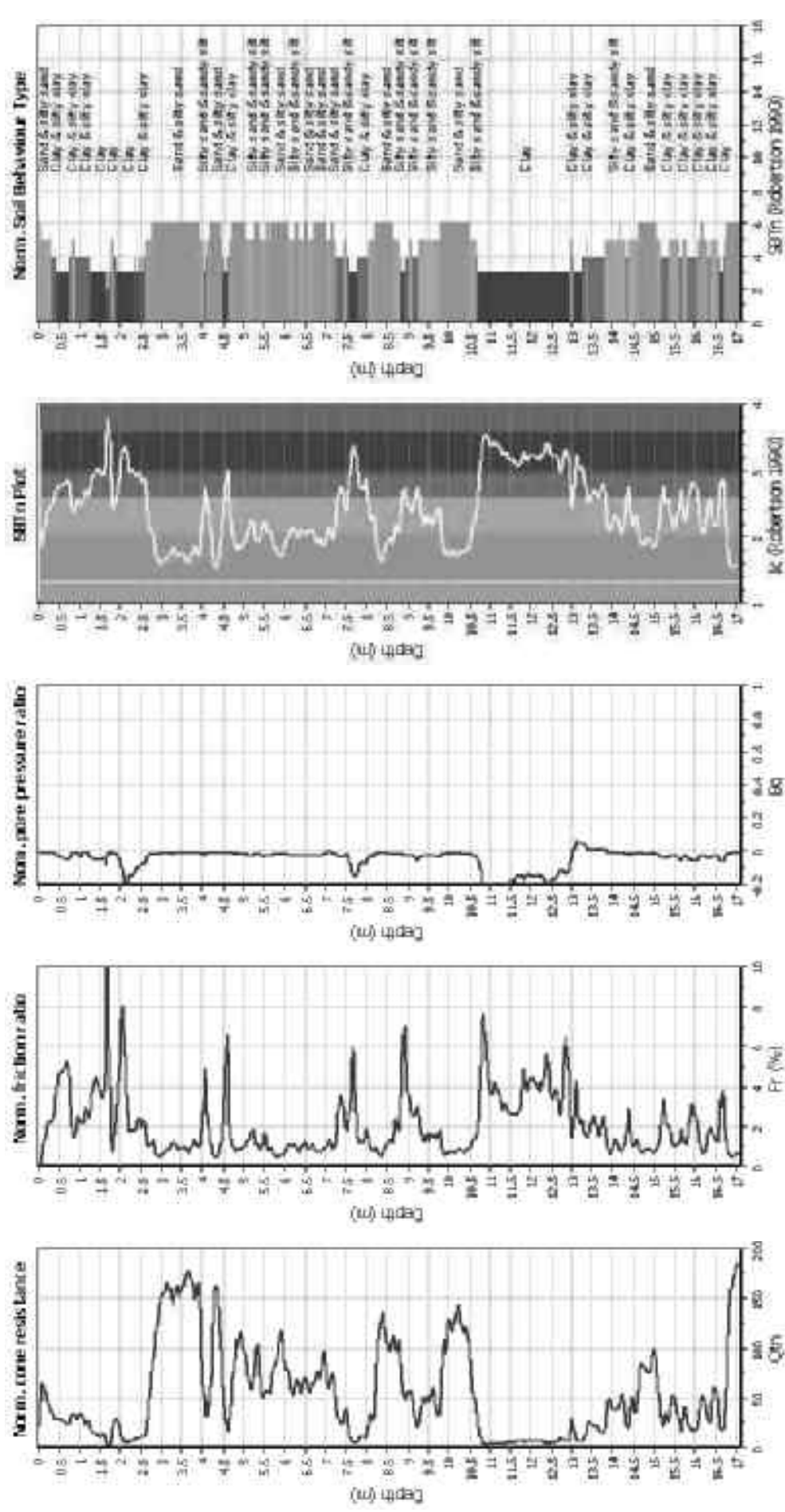
**CPT file : CPT113-ULS**

**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



**CPT basic interpretation plots (normaliz**



**Input parameters and analysis data**

Analysis method:	B&I (2014)
Flow correction method:	B&I (2014)
Norm to test:	Based on $I_c$ value
Earthquake magnitude $M_w$ :	6.50
Peak ground acceleration:	0.42
Depth to water table (meters):	2.00 m

Depth to GWT (earthq.):	2.00 m	Fill weight:	N/A
Average results interval:	3	Transition (down):	applied
$I_c$ cut-off value:	2.60	$I_c$ applied:	Yes
Unit weight calculation:	Based on SBT	Clay limit behavior applied:	Sands only
Use fill:	No	Limit depth applied:	Yes
Fill height:	N/A	Limit depth:	10.00 m

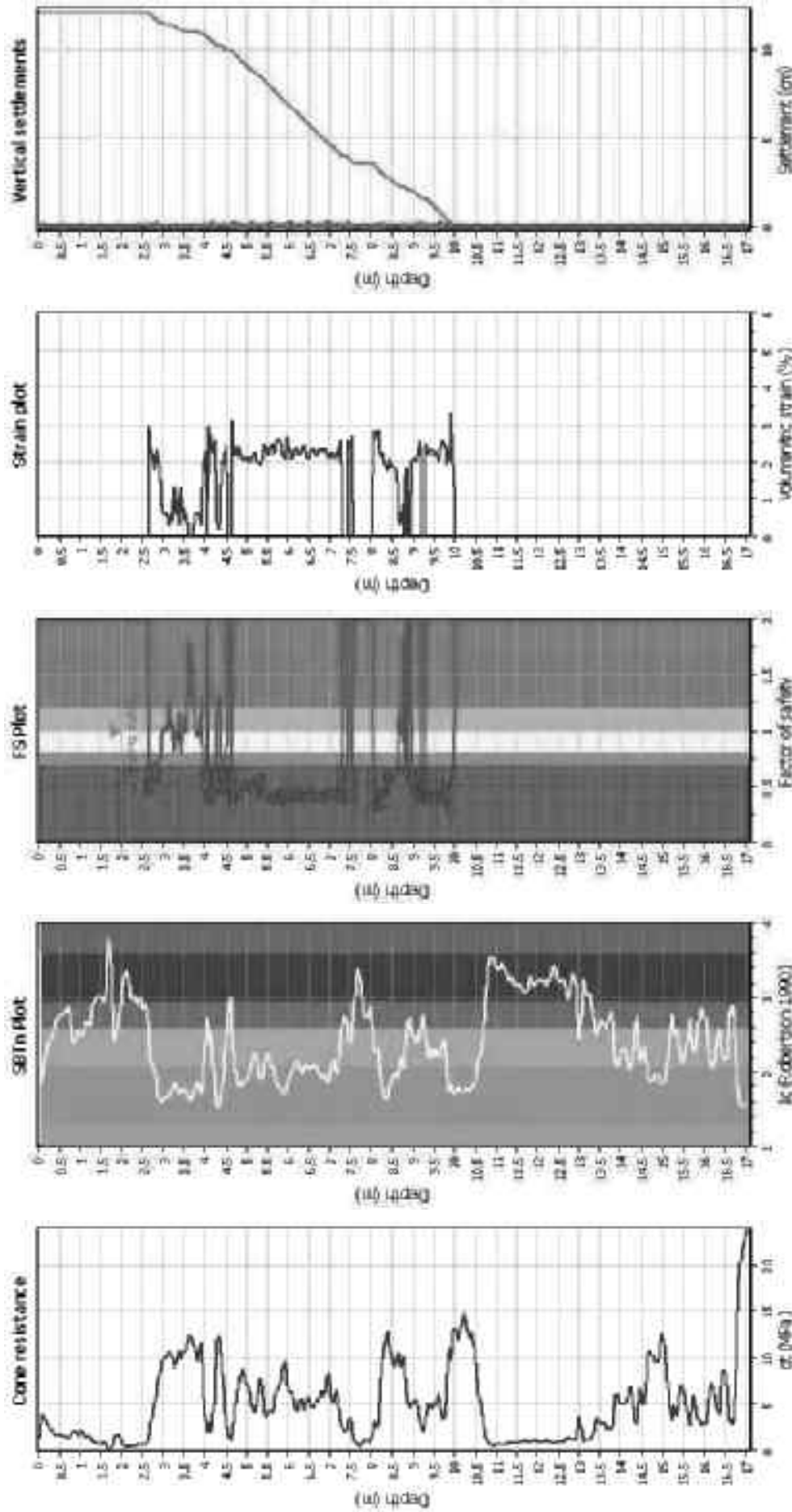
  

**SBTm legend**

<span style="display:inline-block; width:15px; height:15px; background-color:gray; border:1px solid black;"></span> 1. Sensitive fine grained	<span style="display:inline-block; width:15px; height:15px; background-color:lightgray; border:1px solid black;"></span> 7. Gravely sand to sand
<span style="display:inline-block; width:15px; height:15px; background-color:darkgray; border:1px solid black;"></span> 2. Organic material	<span style="display:inline-block; width:15px; height:15px; background-color:lightgray; border:1px solid black;"></span> 8. Very stiff sand to
<span style="display:inline-block; width:15px; height:15px; background-color:darkgray; border:1px solid black;"></span> 3. Clay to silty clay	<span style="display:inline-block; width:15px; height:15px; background-color:lightgray; border:1px solid black;"></span> 9. Very stiff fine grained
<span style="display:inline-block; width:15px; height:15px; background-color:darkgray; border:1px solid black;"></span> 4. Clayey silt to silty	
<span style="display:inline-block; width:15px; height:15px; background-color:lightgray; border:1px solid black;"></span> 5. Silty sand to sandy silt	
<span style="display:inline-block; width:15px; height:15px; background-color:darkgray; border:1px solid black;"></span> 6. Clean sand to silty sand	



### Estimation of post-earthquake settlements



### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

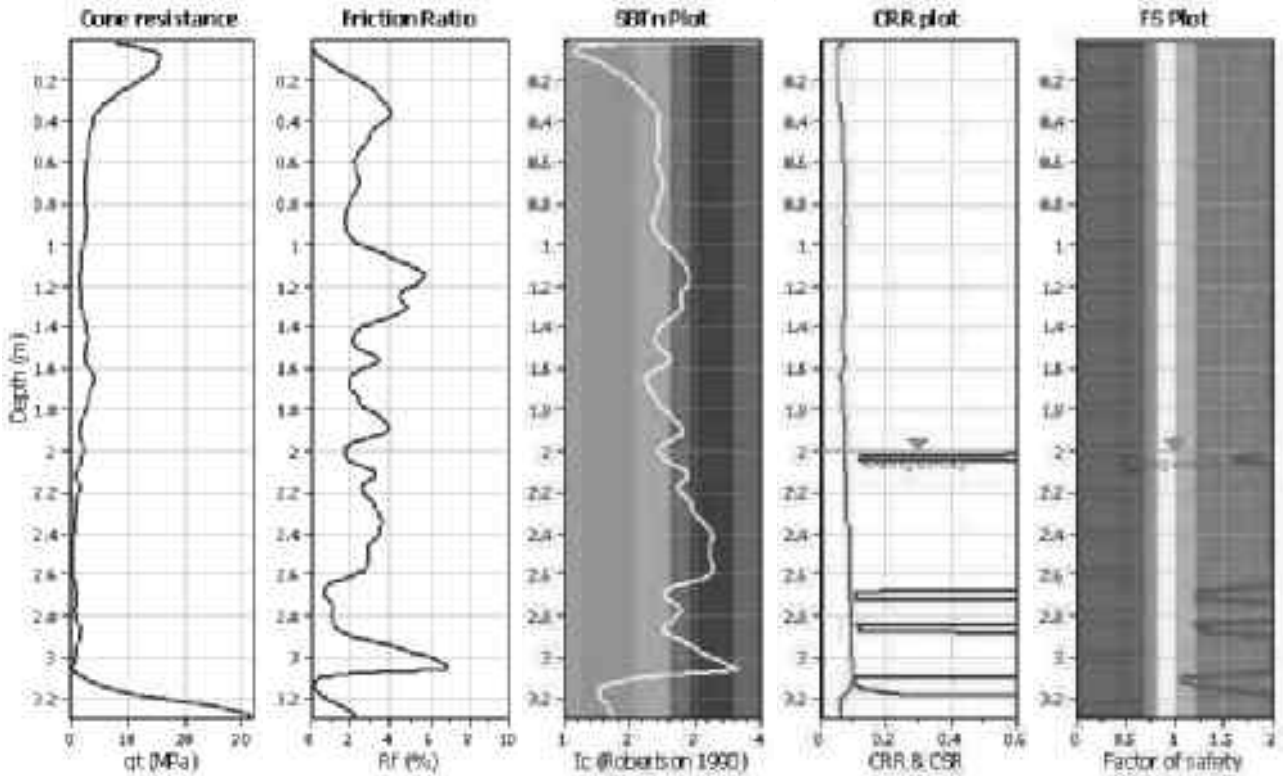
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

**CPT file : CPT201\_SLS**

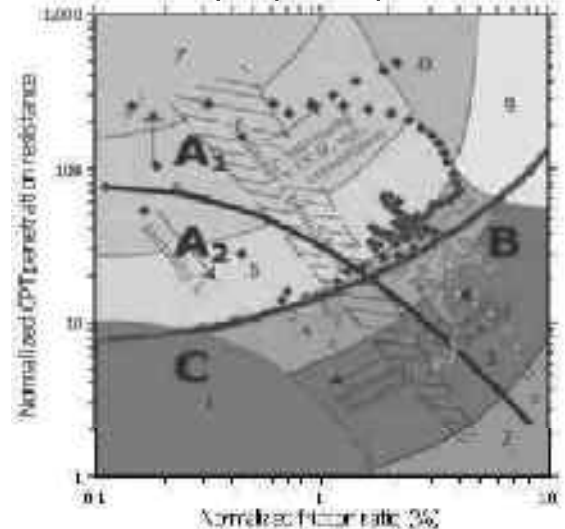
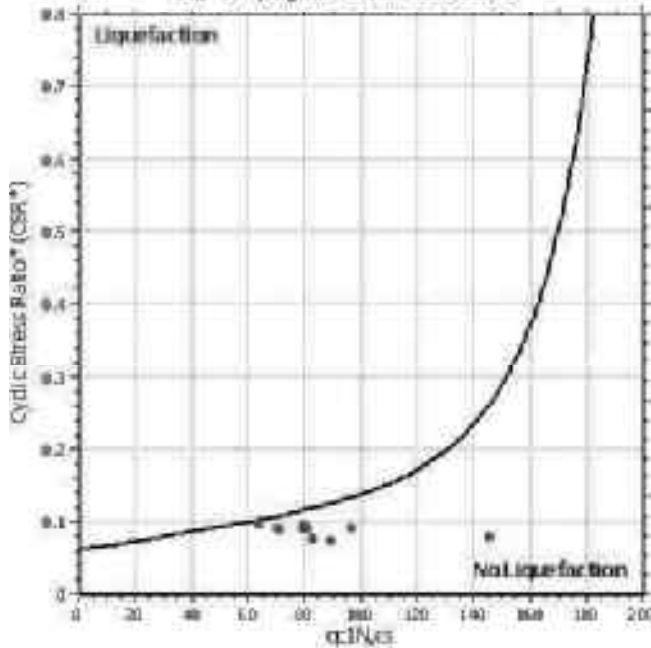
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. defect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



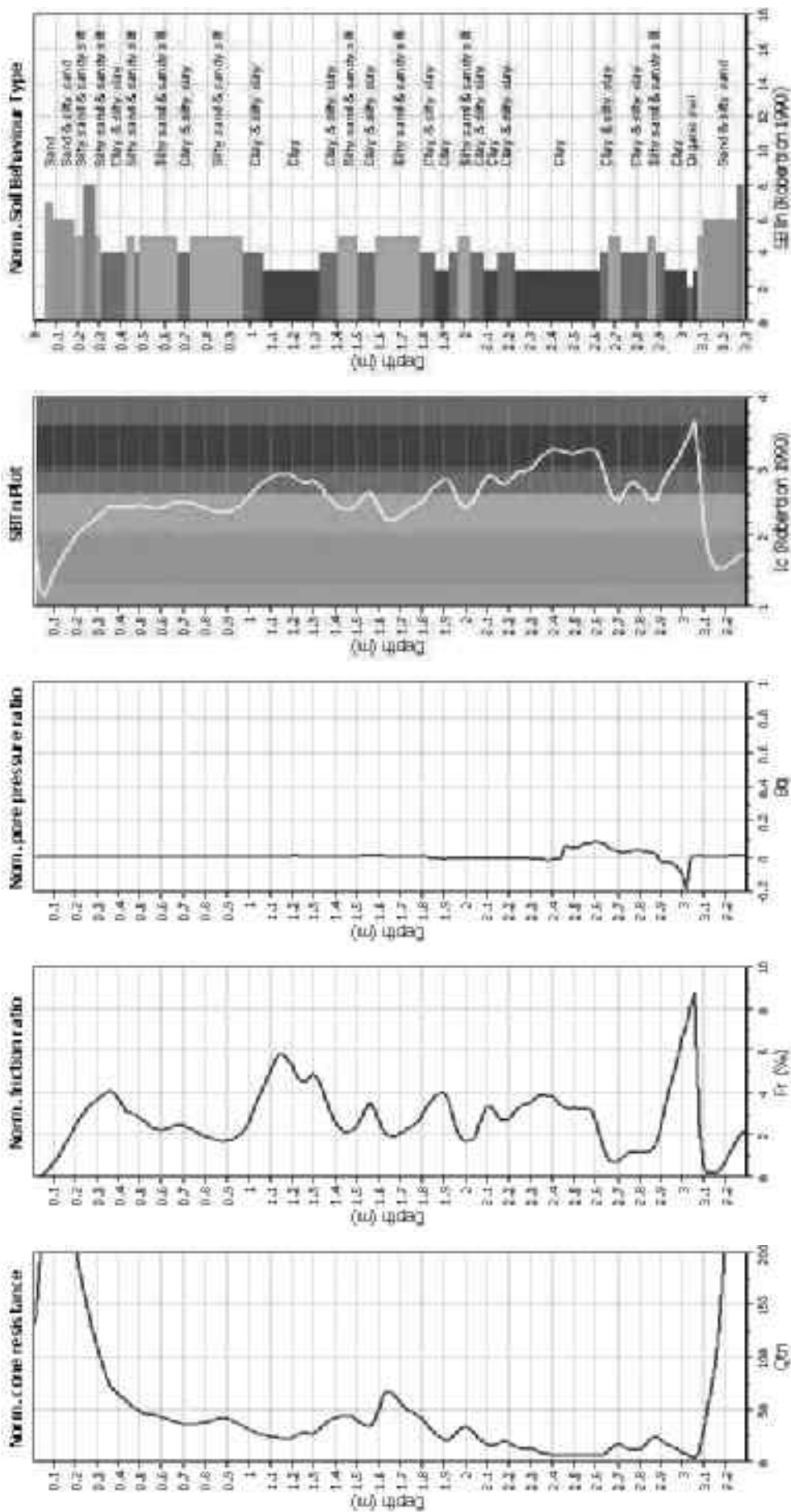
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycle (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and global geometry.

### CPT basic interpretation plots (normaliz



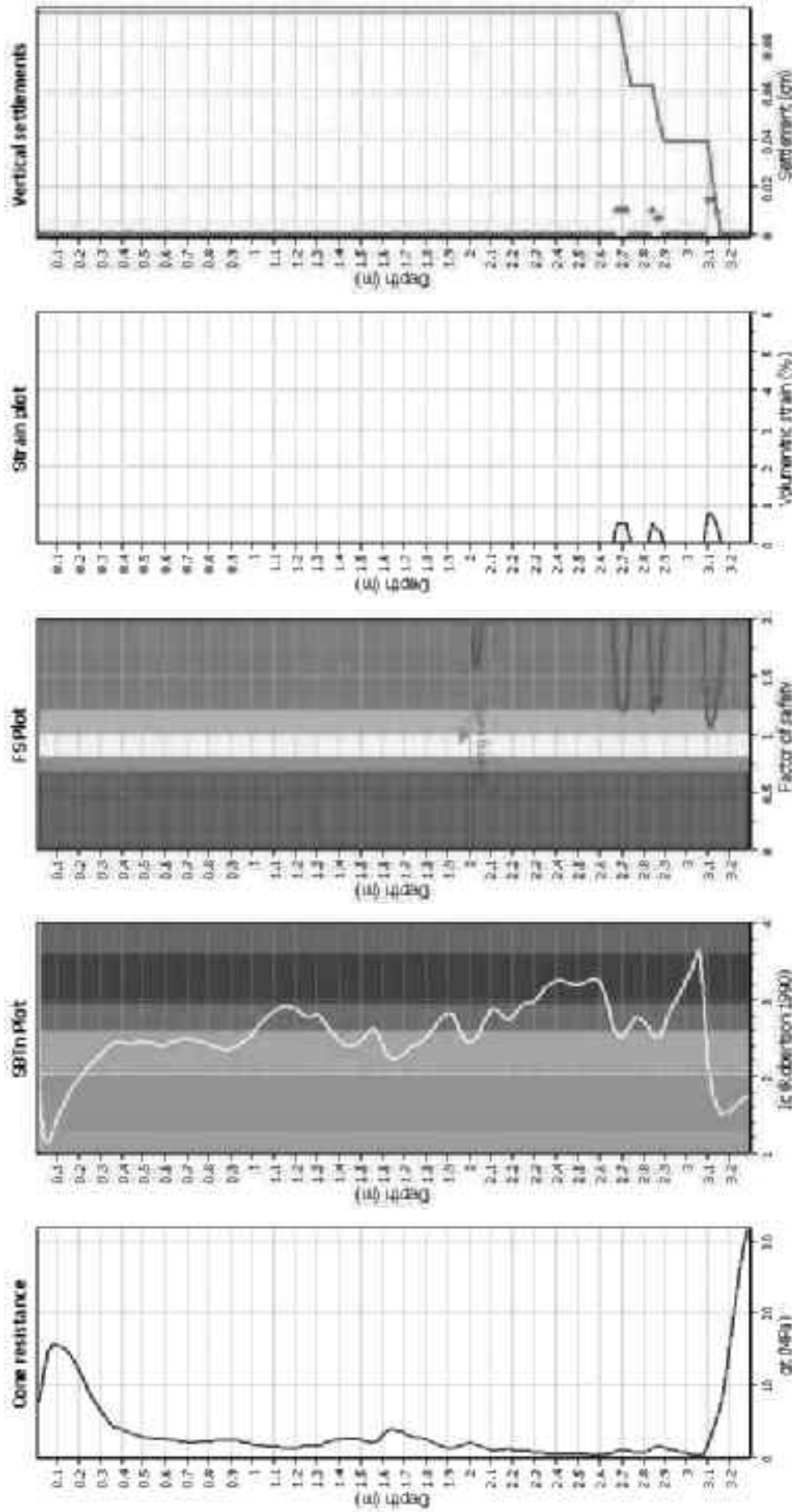
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Flow correction method:	B&I (2014)	Average results interval:	3	Transition (solect. applied):	No
Norm to test:	Based on Ic value	Ic cut-off value:	2.60	$f_v$ applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Unit weight calculation:	Based on SBT	Clay limit behavior applied:	Sands only
Peak ground acceleration:	0.14	Use fill:	No	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

**SBTn legend**

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- t<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

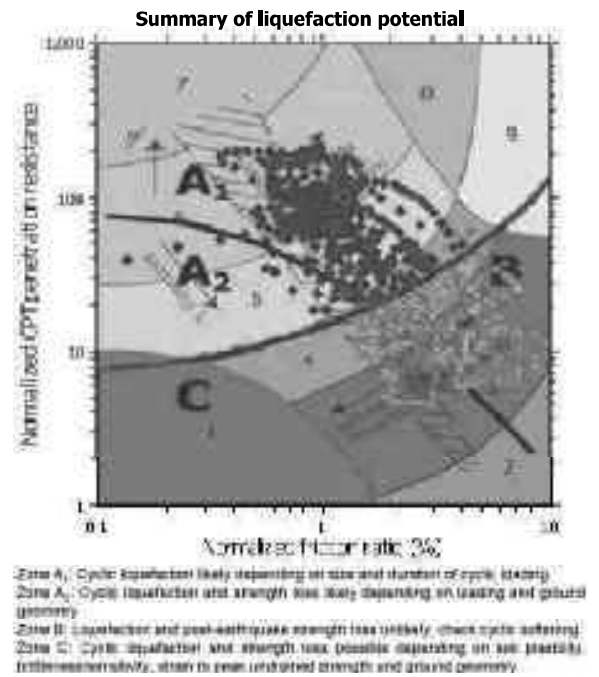
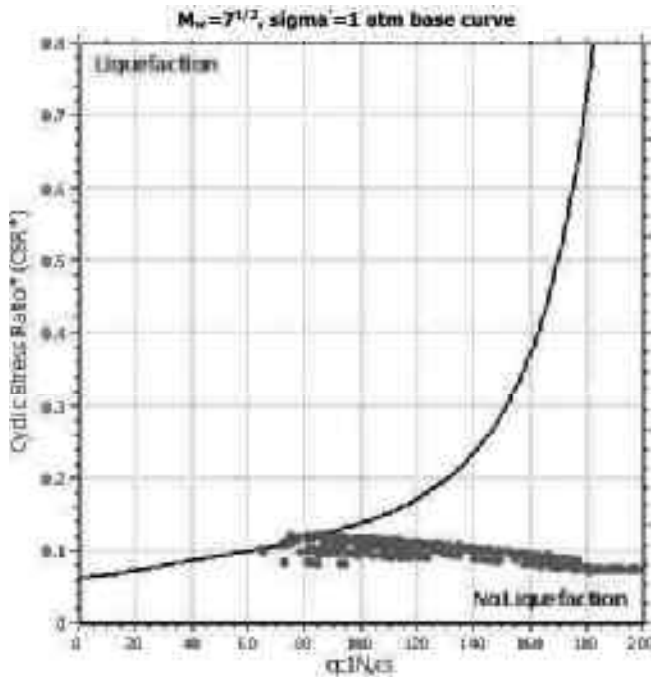
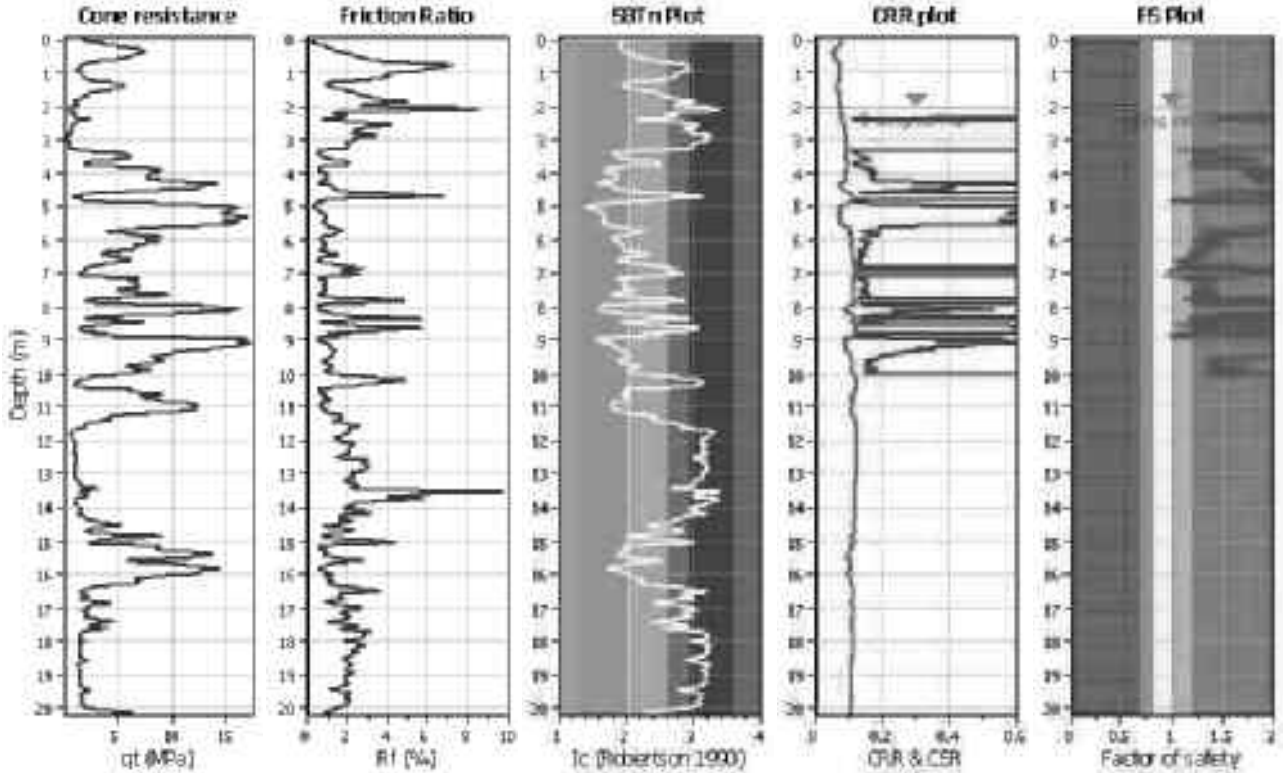
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

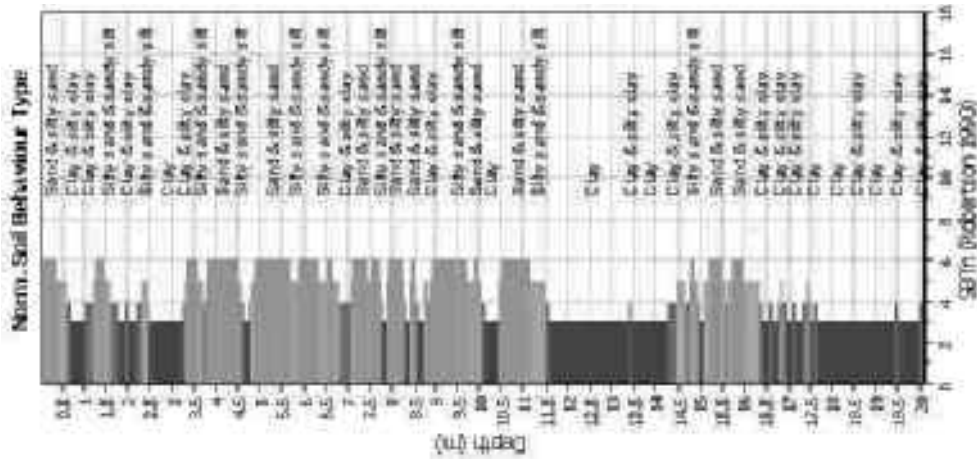
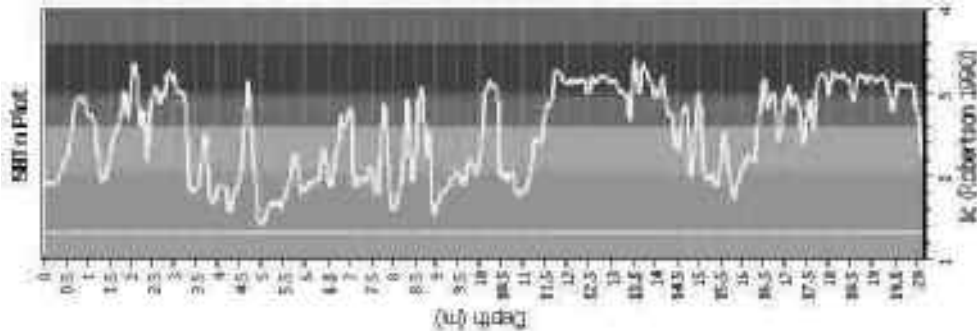
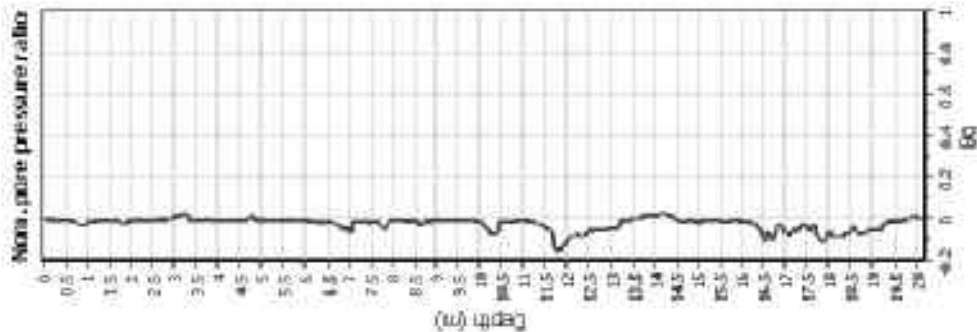
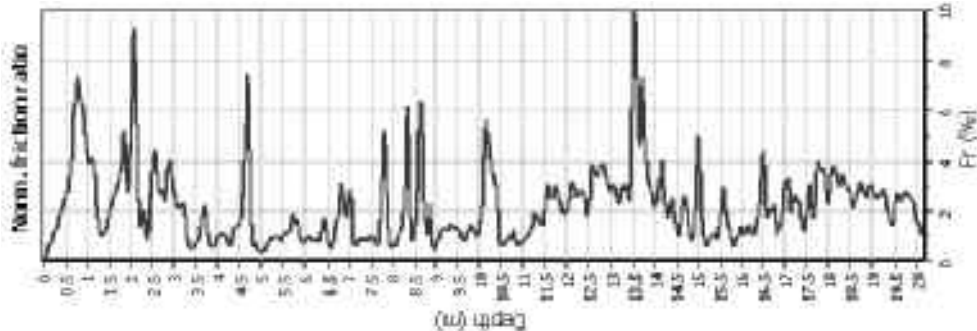
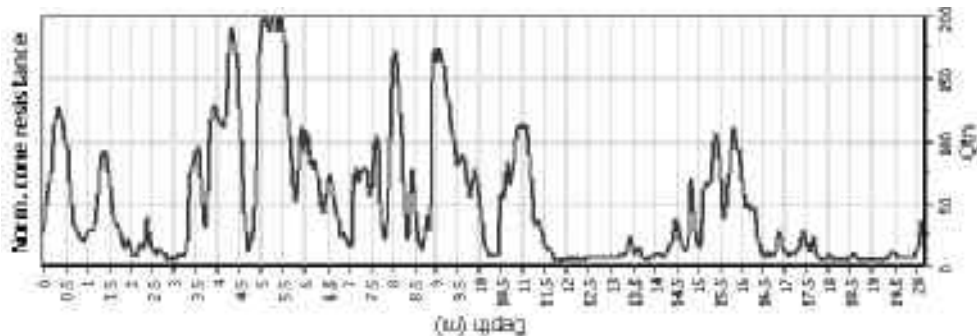
**CPT file : CPT202\_SLS**

**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.20  
 Peak ground acceleration: 0.14  
 Depth to water table (meters): 2.00 m

Depth to GWT (earthq.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

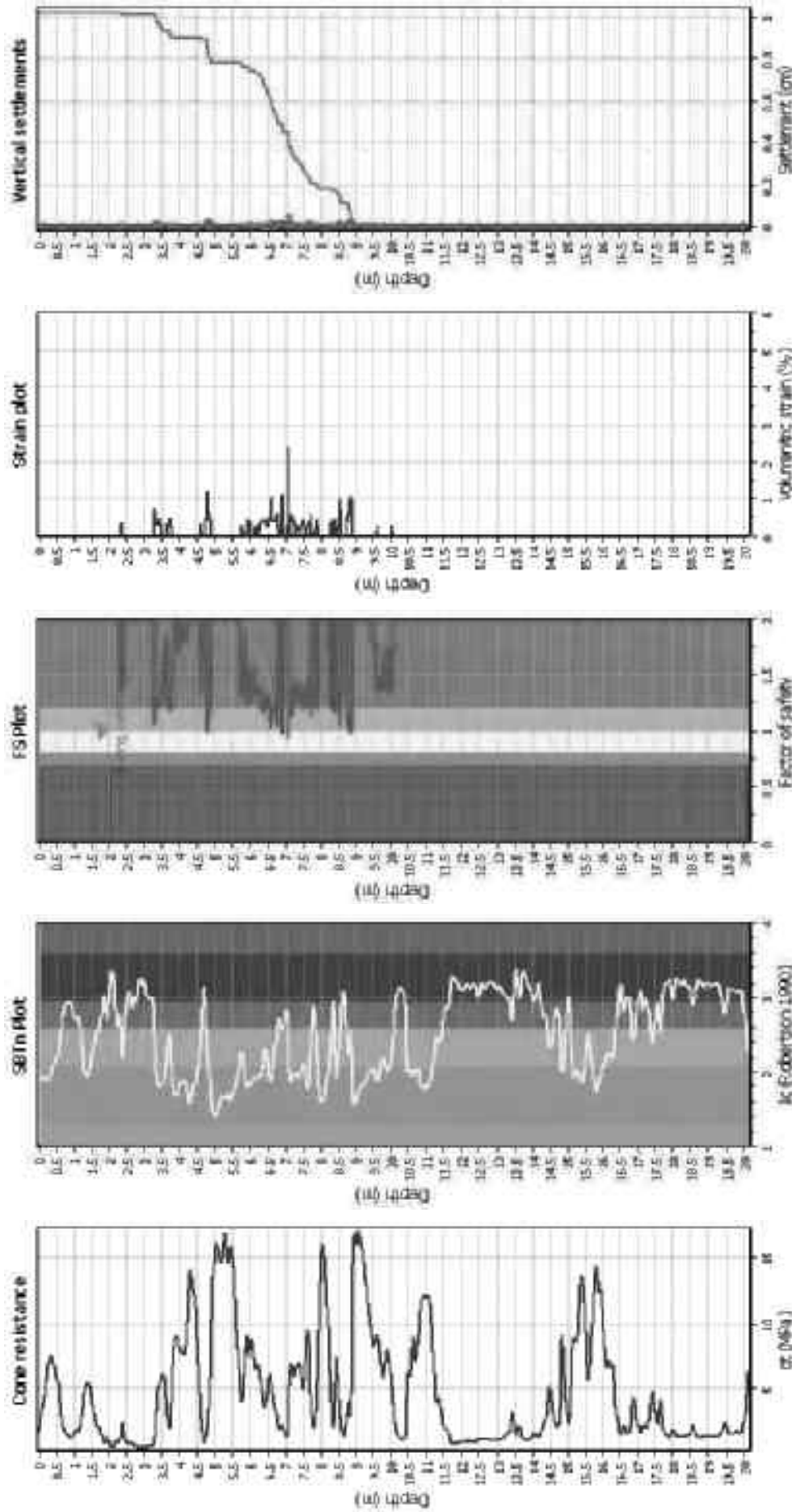
Fill weight: N/A  
 Transition (lowest) applied: No  
 $f_c$  applied: Yes  
 Clay size behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

#### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained



### Estimation of post-earthquake settlements



### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

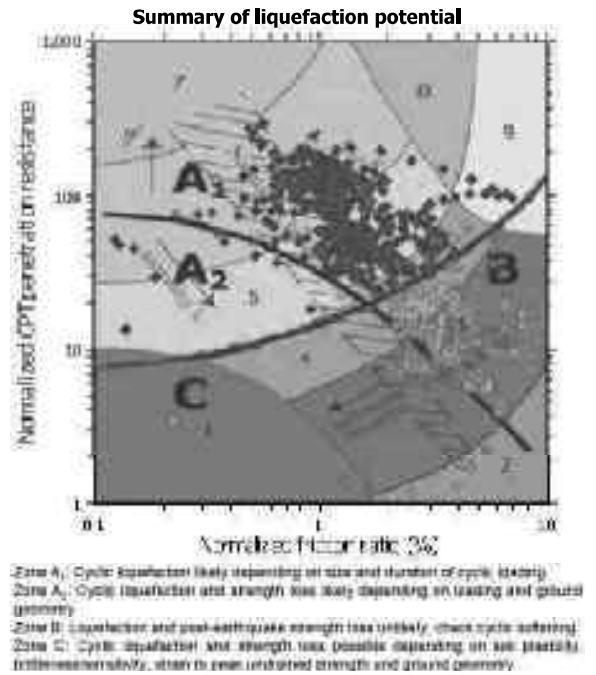
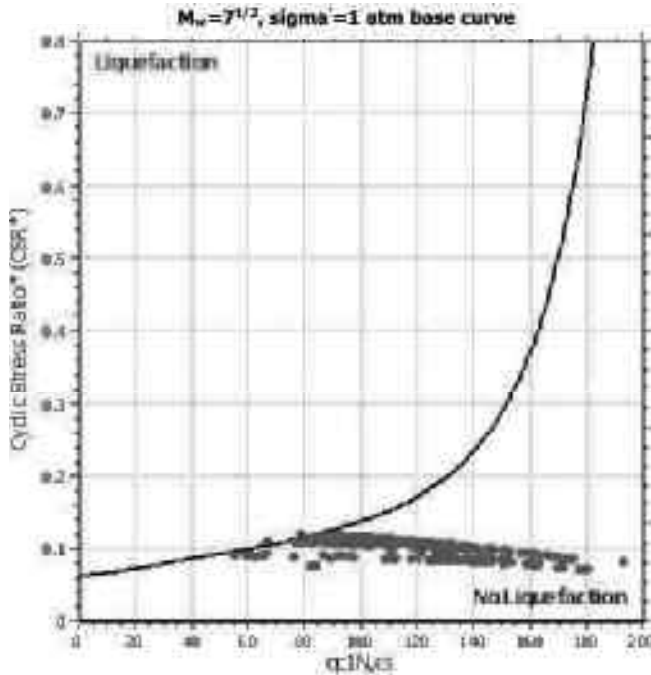
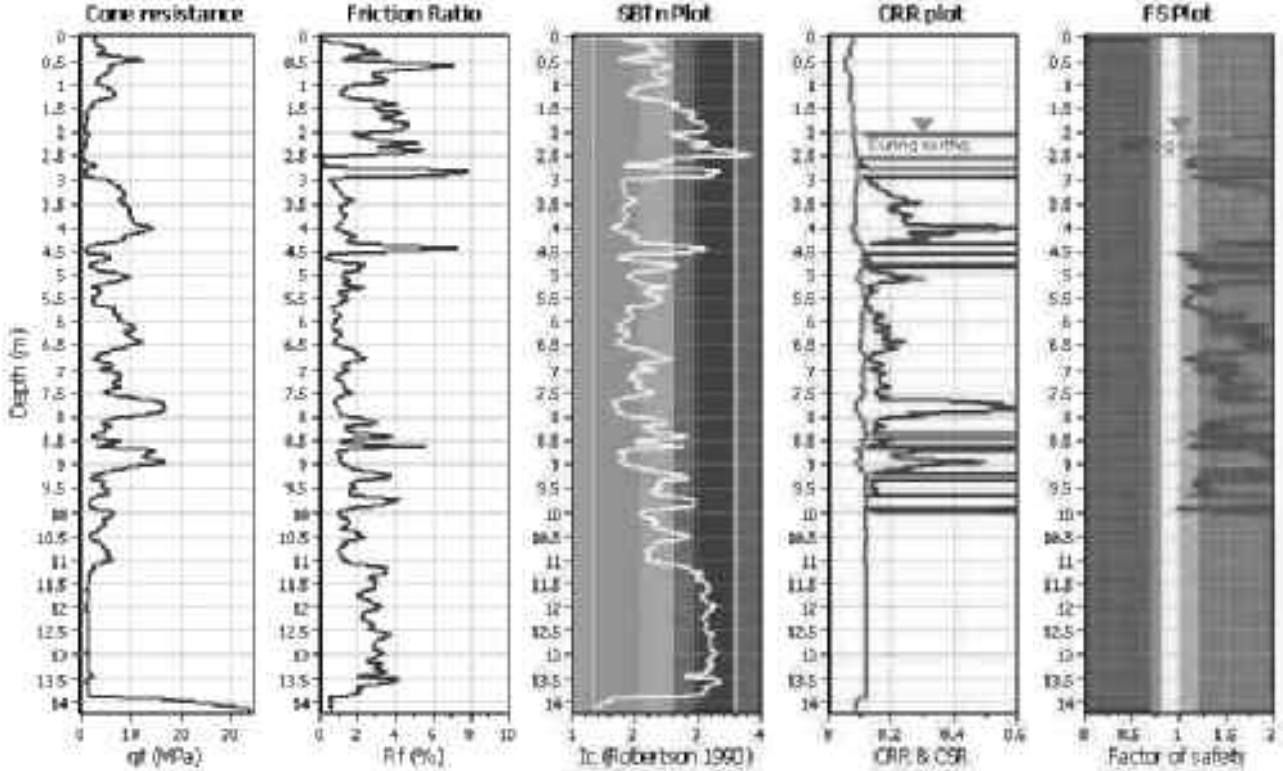
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

**CPT file : CPT203\_SLS**

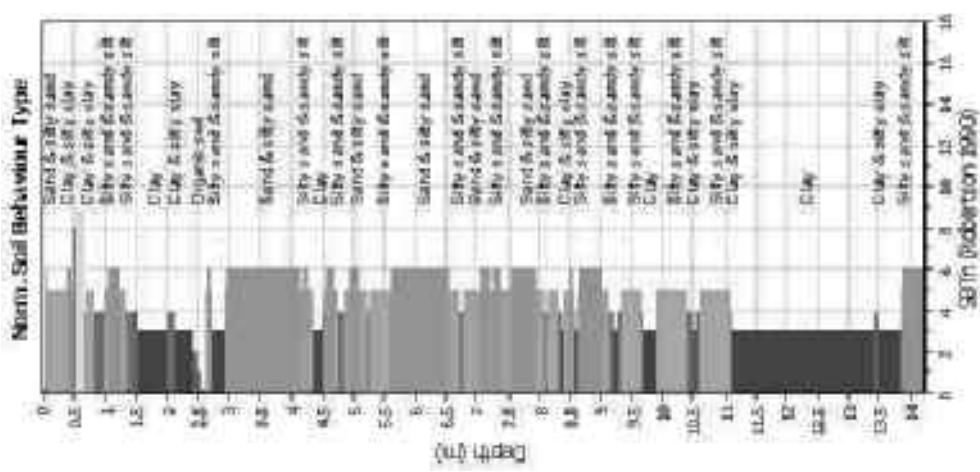
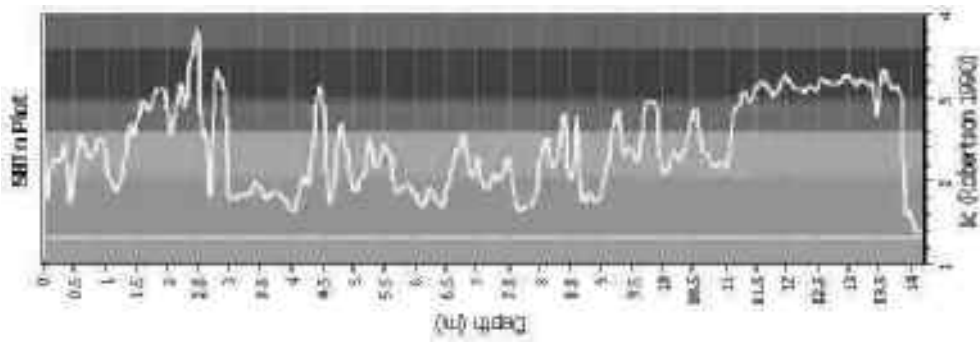
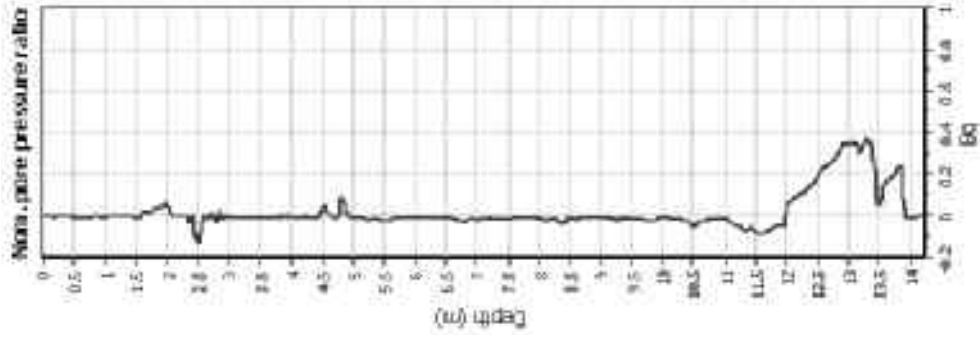
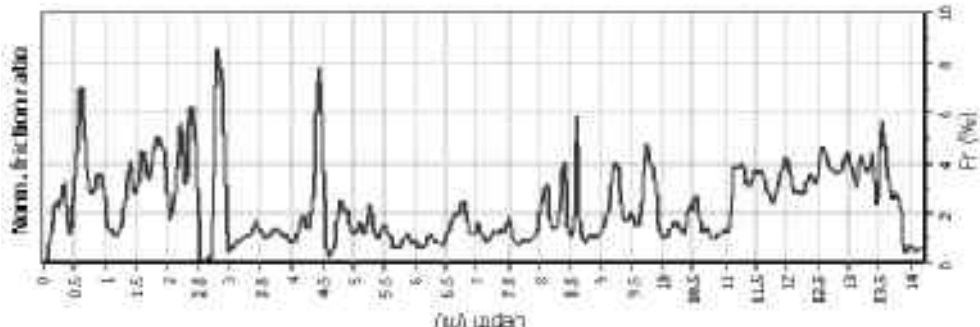
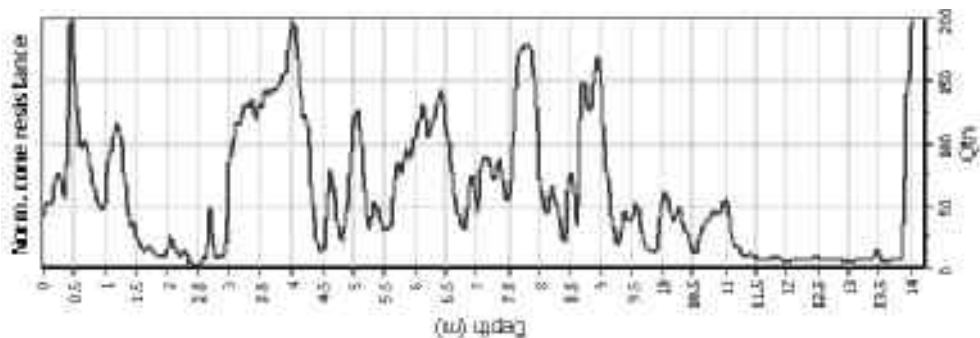
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method





### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on I<sub>c</sub> value  
 Earthquake magnitude M<sub>w</sub>: 6.20  
 Peak ground acceleration: 0.14  
 Depth to water table (meters): 2.00 m

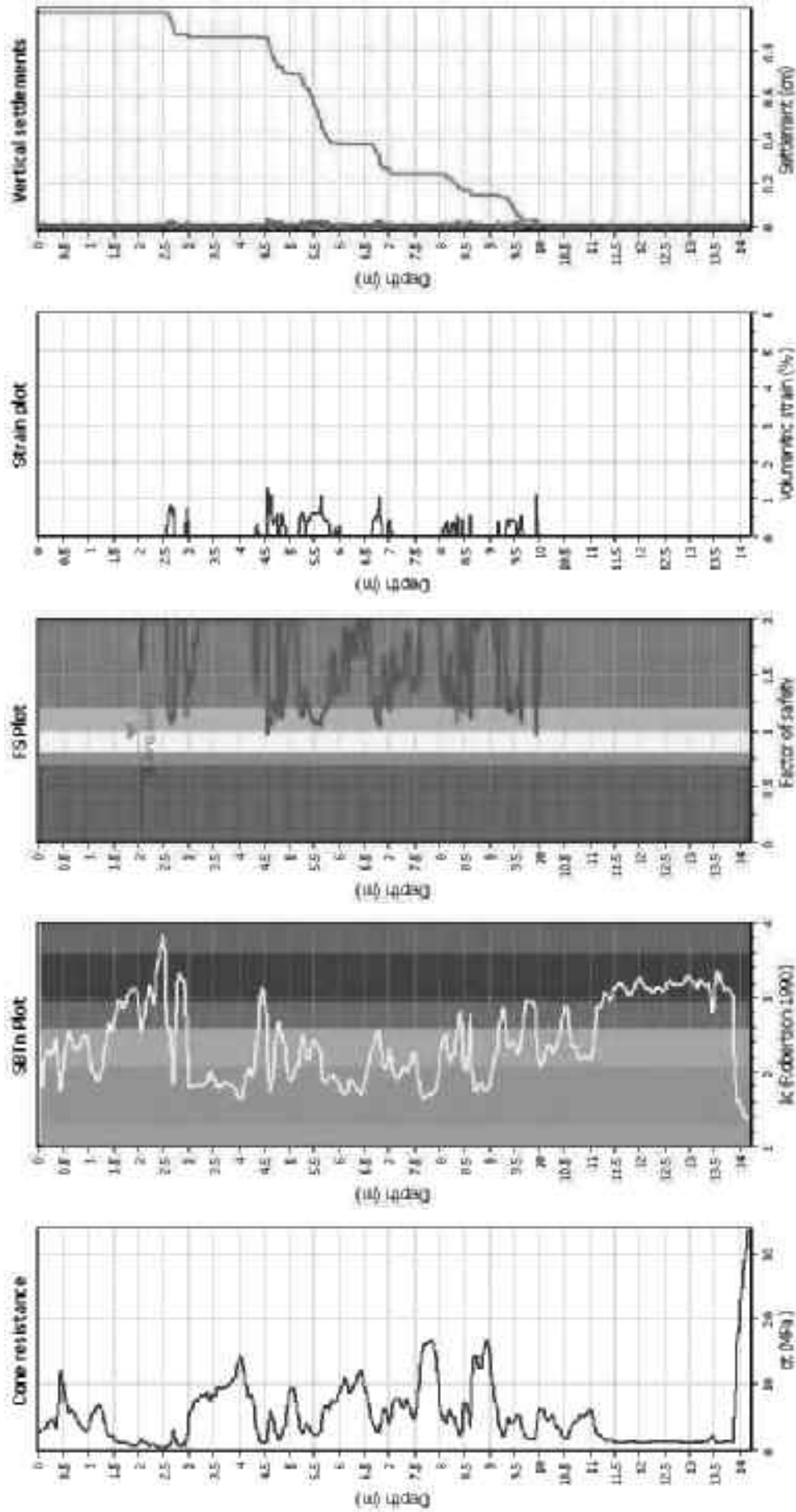
Depth to GW (earthq.): 2.00 m  
 Average results interval: 3  
 I<sub>c</sub> cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (lowest) applied: No  
 F<sub>v</sub> applied: Yes  
 Clay size behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

#### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

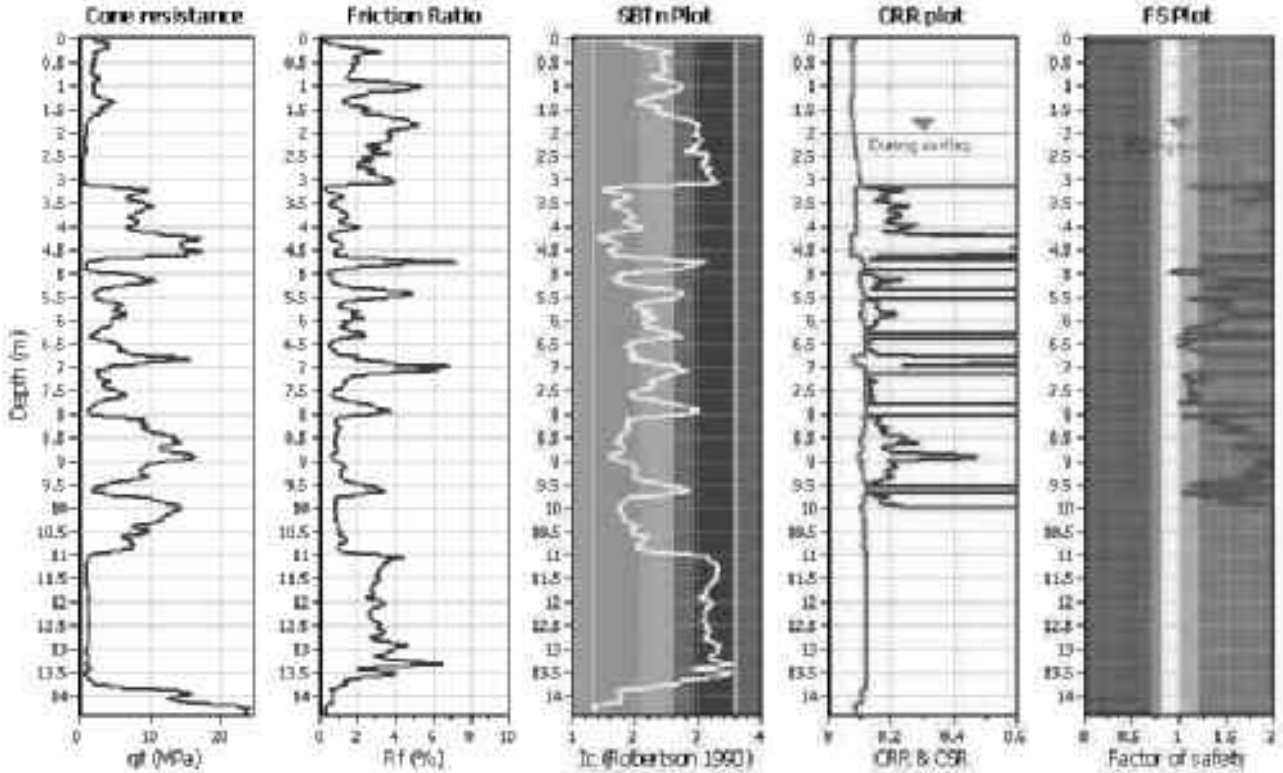
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

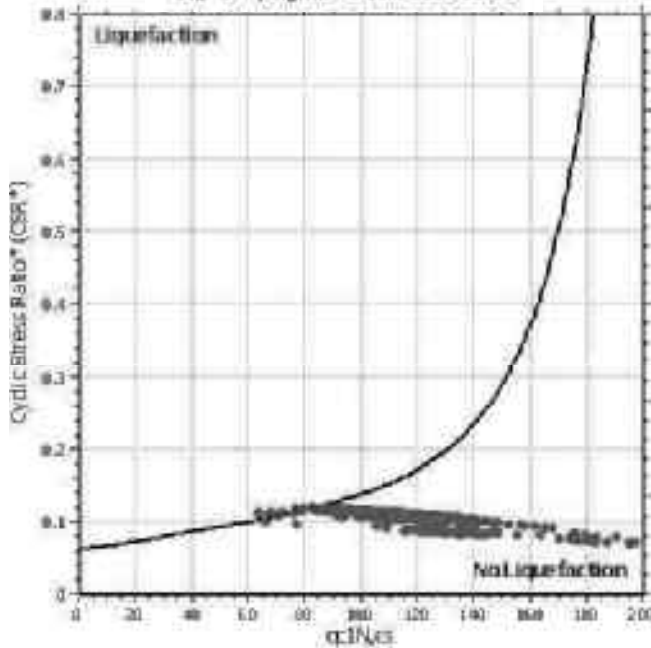
**CPT file : CPT204\_SLS**

**Input parameters and analysis data**

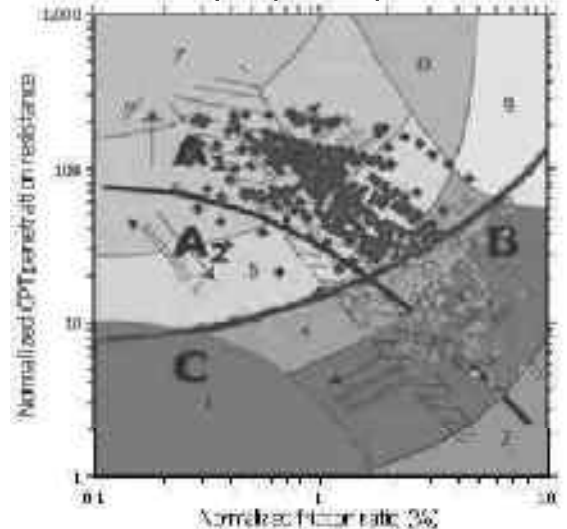
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_{vm}=1$  atm base curve

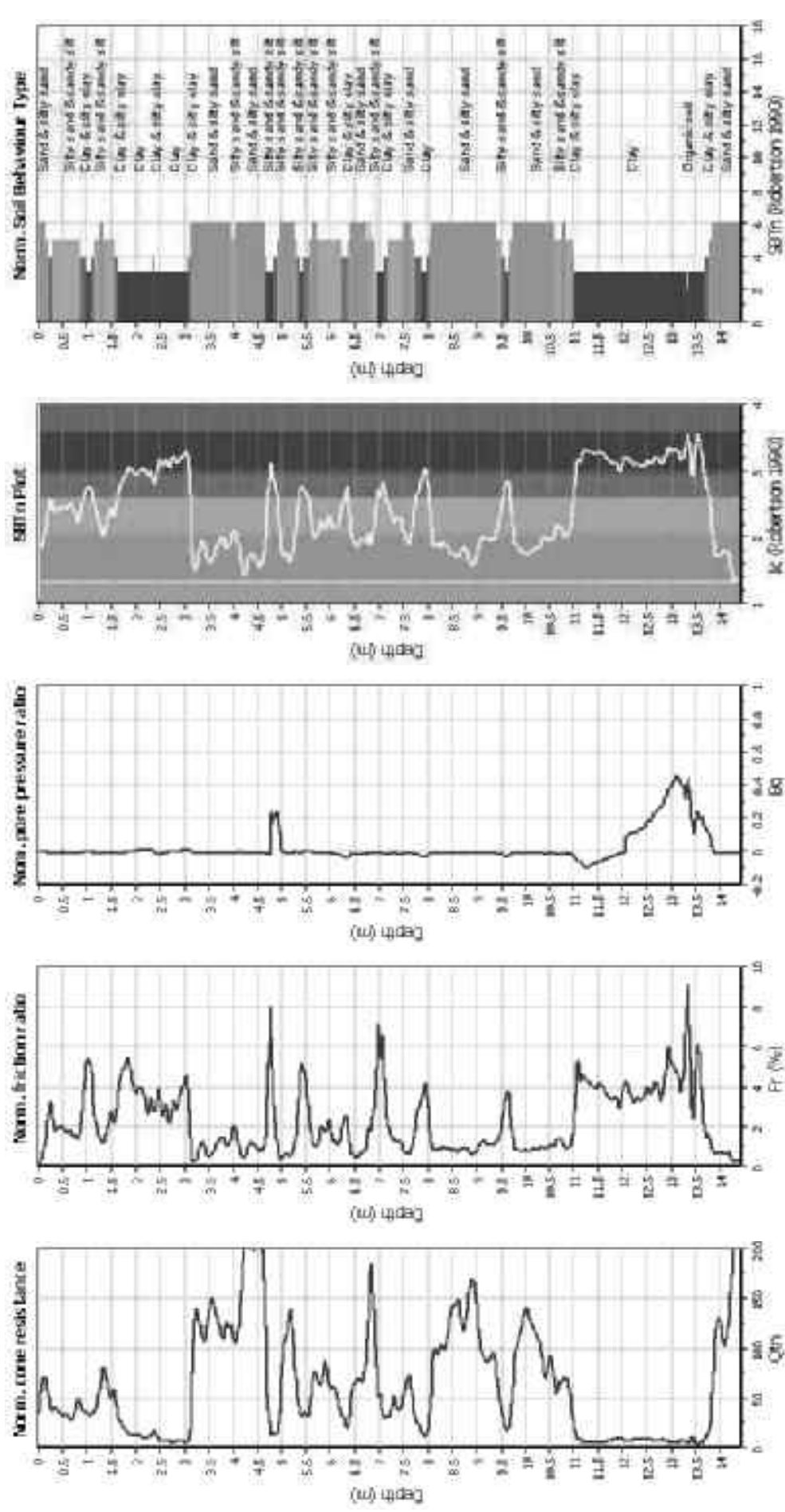


**Summary of liquefaction potential**



Zone A1: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A2: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normal stress, strain to zero undrained strength and ground geometry.

**CPT basic interpretation plots (normaliz**



**Input parameters and analysis data**

Analyze method:	B&I (2014)
Fines correction method:	B&I (2014)
Norm to test:	Based on Ic value
Earthquake magnitude $M_w$ :	6.20
Peak ground acceleration:	0.14
Depth to water table (meters):	2.00 m

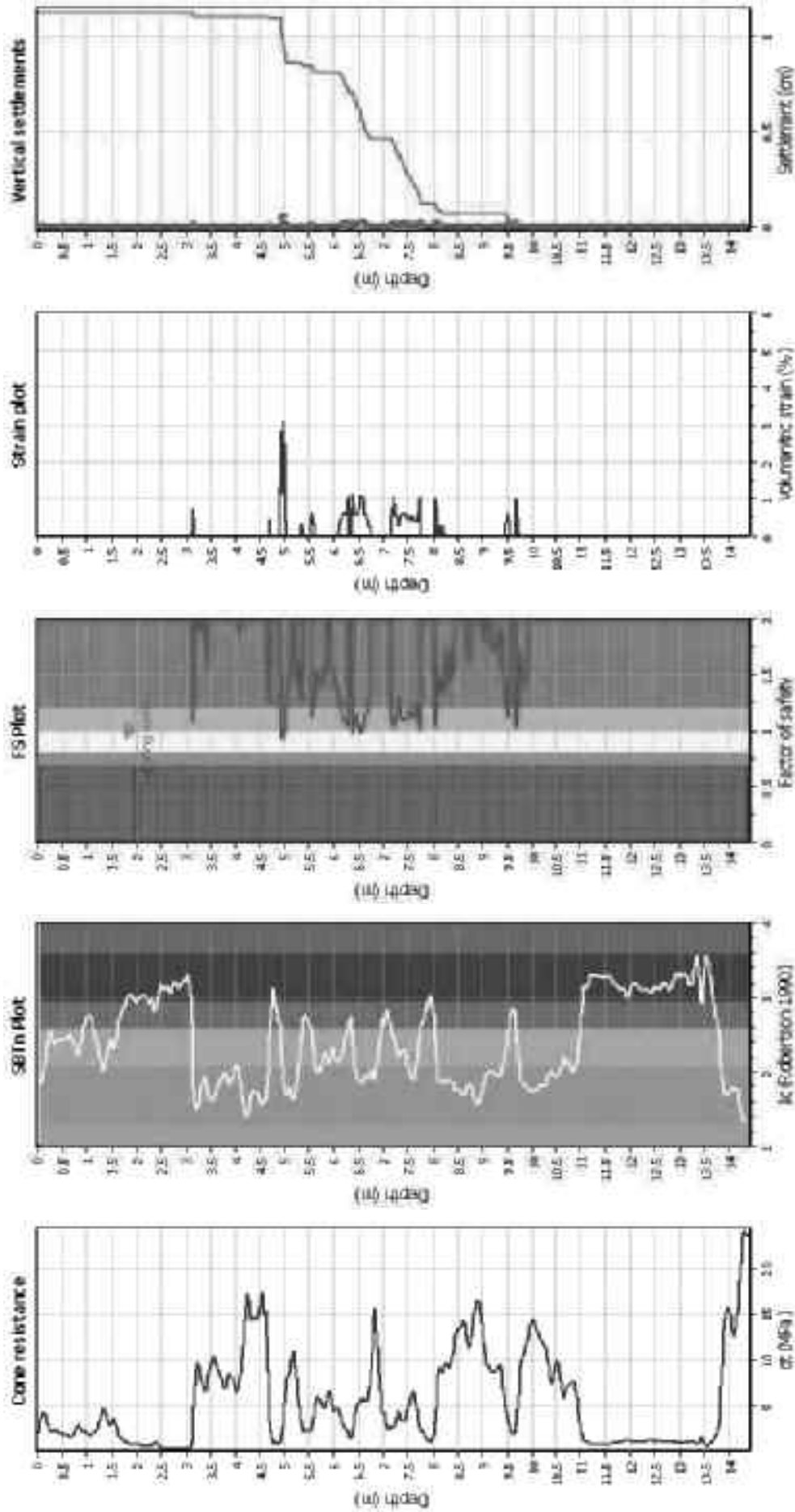
Depth to GWT (earthq.):	2.00 m	Fill weight:	N/A
Average results interval:	3	Transition (lowest) applied:	No
Ic cut-off value:	2.60	$R_f$ applied:	Yes
Unit weight calculation:	Based on SBT	Clay line behavior applied:	Sands only
Use fill:	No	Limit depth applied:	Yes
Fill height:	N/A	Limit depth:	10.00 m

**SBTm legend**

<span style="display:inline-block; width:10px; height:10px; background-color:gray;"></span>	1. Sensitive fine grained	<span style="display:inline-block; width:10px; height:10px; background-color:lightgray;"></span>	4. Clayey silt to silty	<span style="display:inline-block; width:10px; height:10px; background-color:lightgray;"></span>	7. Gravelly sand to sand
<span style="display:inline-block; width:10px; height:10px; background-color:lightgray;"></span>	2. Organic material	<span style="display:inline-block; width:10px; height:10px; background-color:lightgray;"></span>	5. Silty sand to sandy silt	<span style="display:inline-block; width:10px; height:10px; background-color:lightgray;"></span>	8. Very stiff sand to
<span style="display:inline-block; width:10px; height:10px; background-color:lightgray;"></span>	3. Clay to silty clay	<span style="display:inline-block; width:10px; height:10px; background-color:lightgray;"></span>	6. Clean sand to silty sand	<span style="display:inline-block; width:10px; height:10px; background-color:lightgray;"></span>	9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

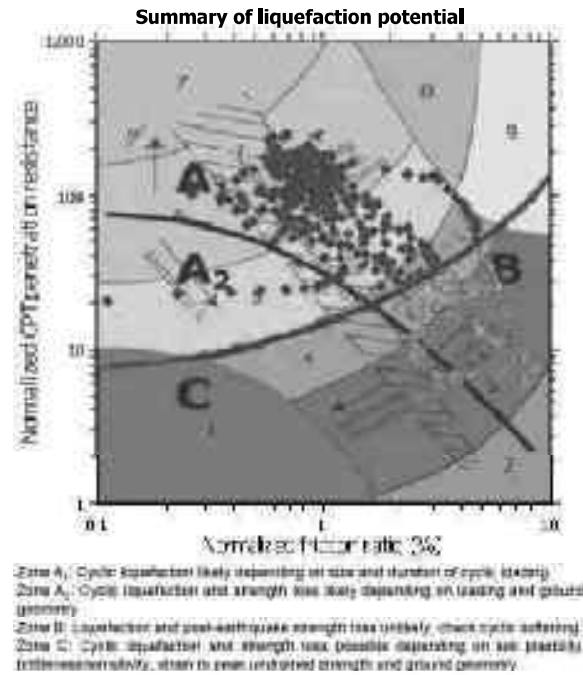
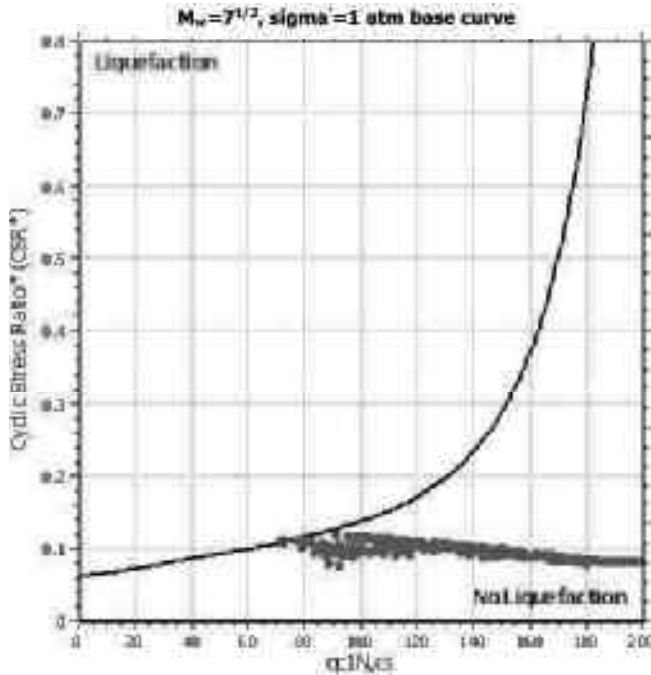
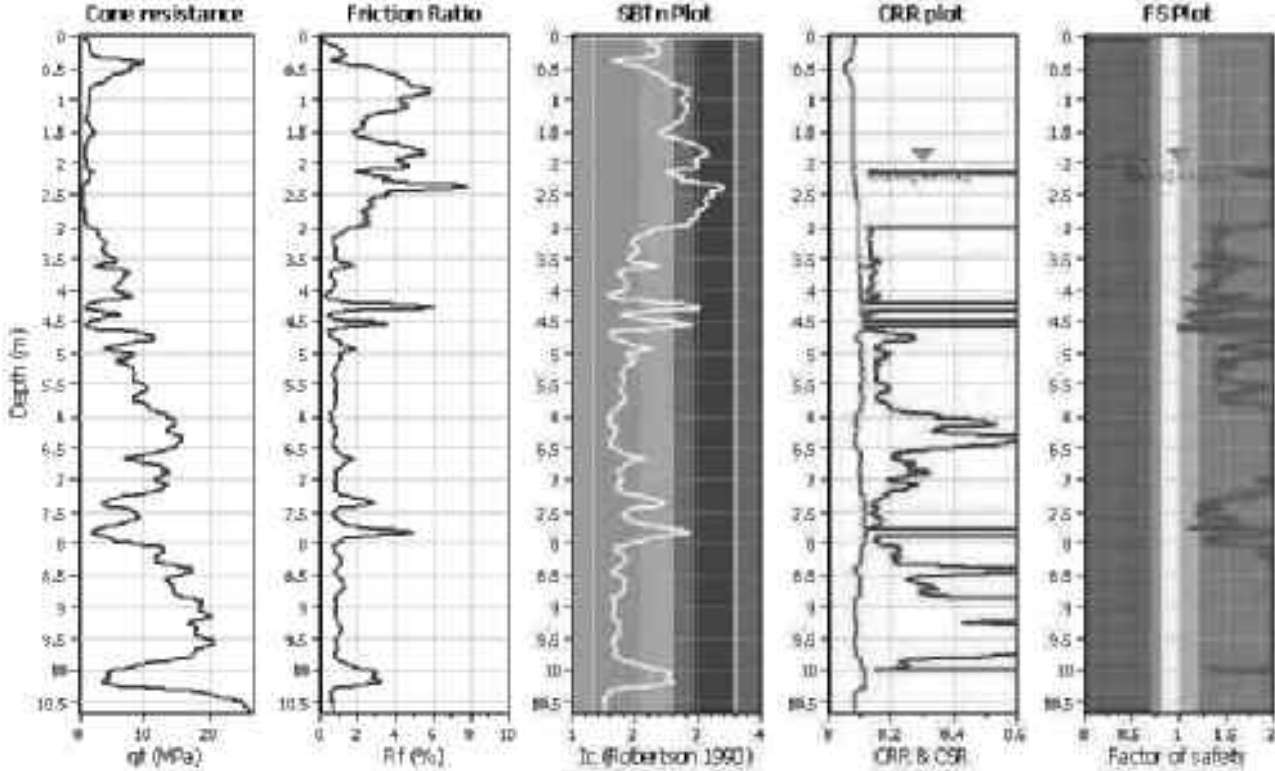
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

**CPT file : CPT205\_SLS**

**Input parameters and analysis data**

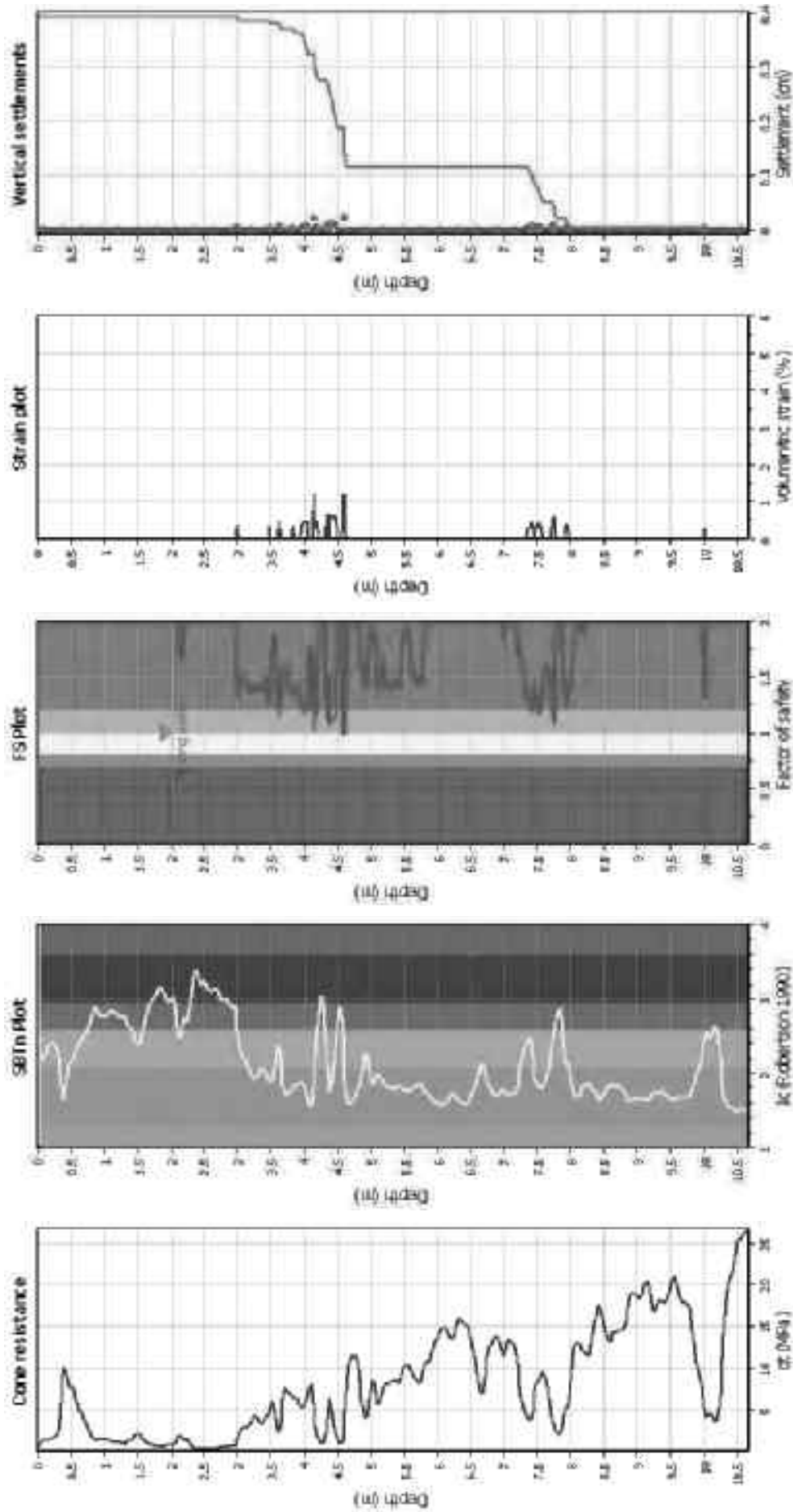
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method







### Estimation of post-earthquake settlements



### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain





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**LIQUEFACTION ANALYSIS REPORT**

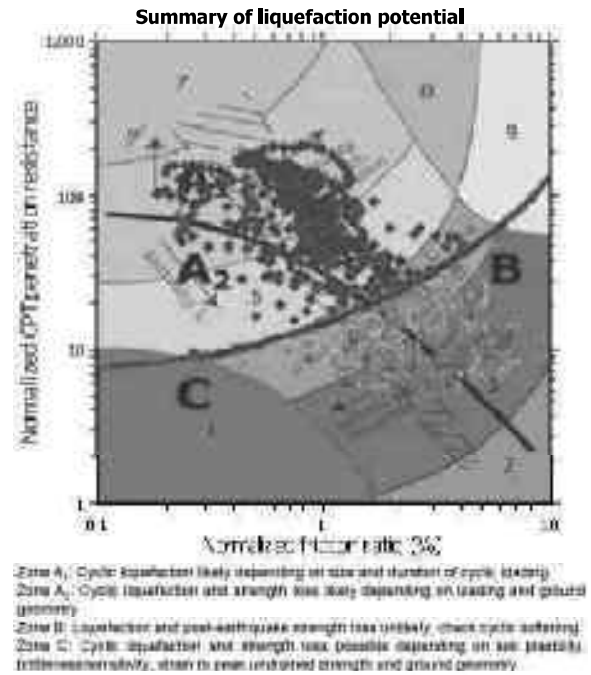
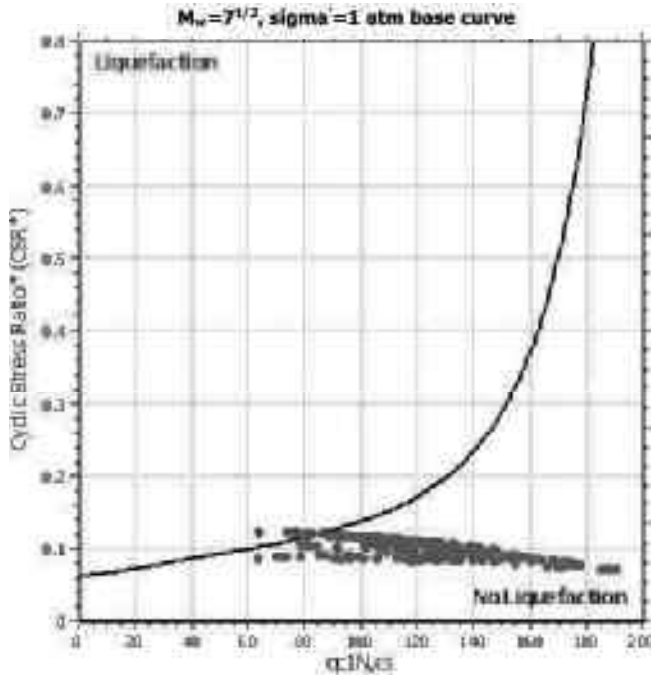
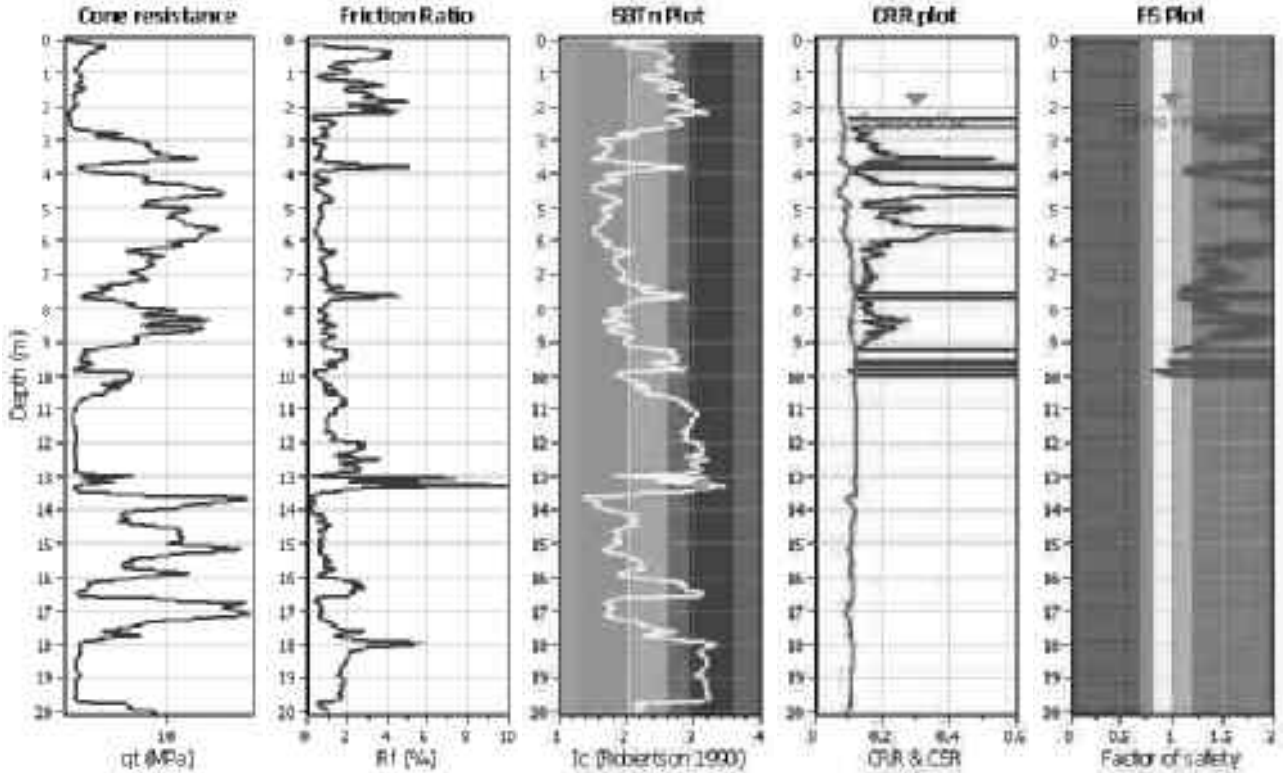
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

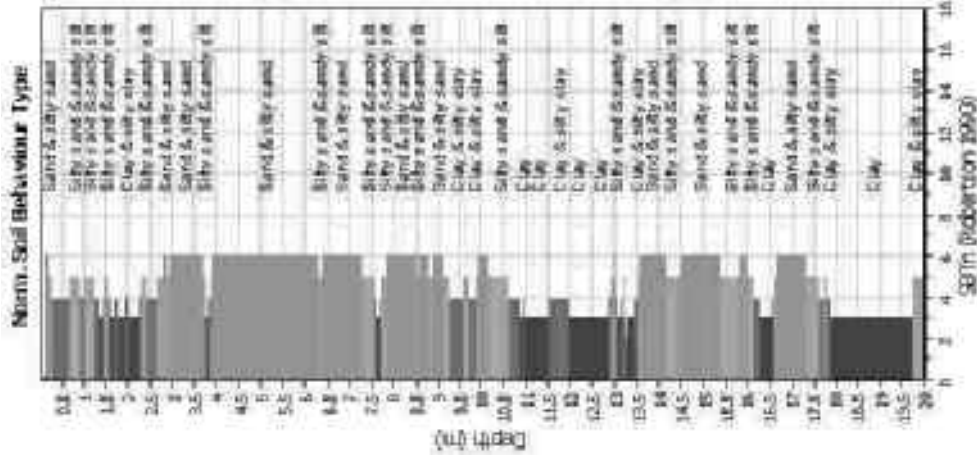
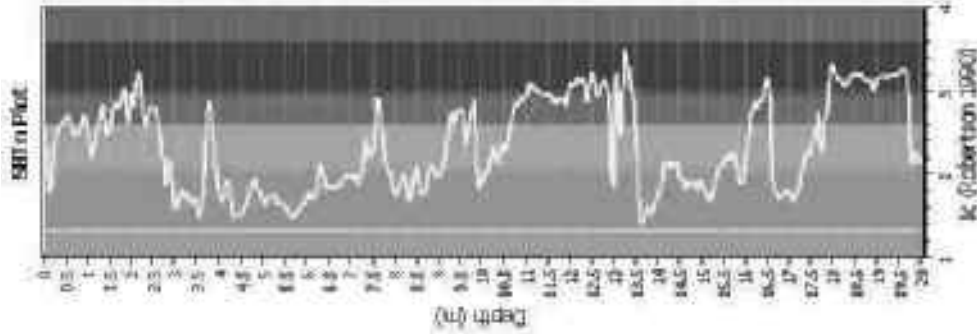
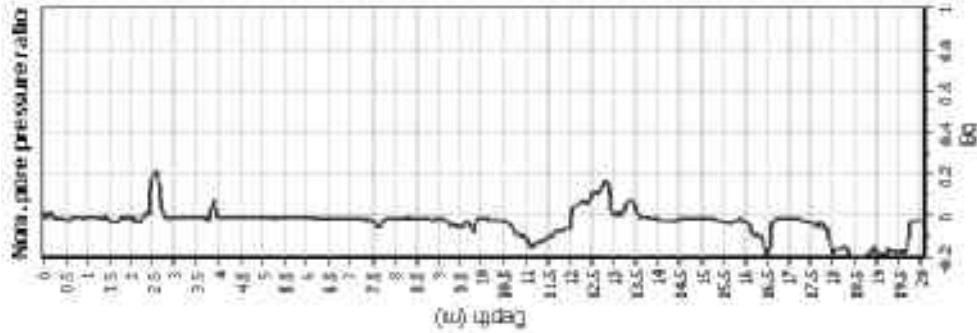
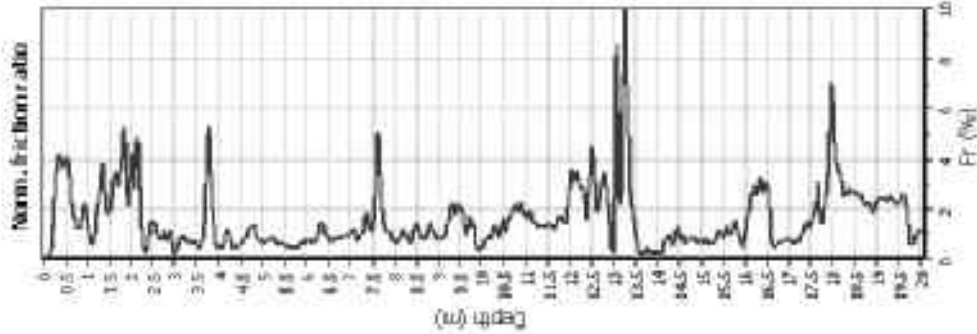
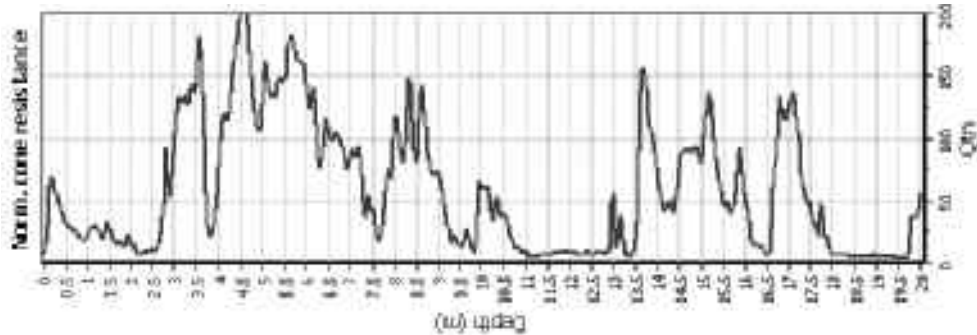
**CPT file : CPT206\_SLS**

**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



### CPT basic interpretation plots (normaliz



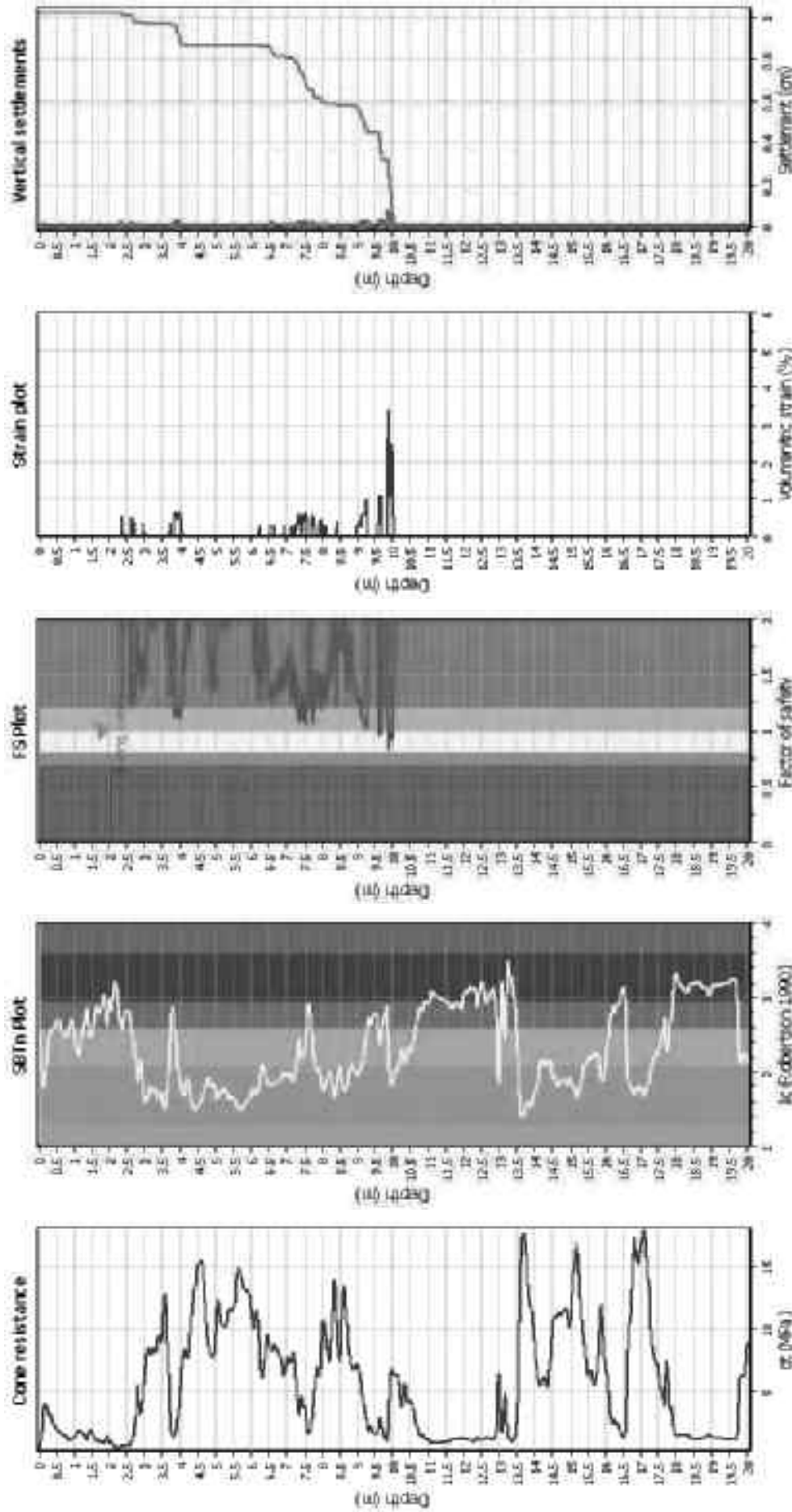
### Input parameters and analysis data

Analysis method:	B&I (2014)	Fill weight:	N/A
Flow correction method:	B&I (2014)	Transition (slow, rapid):	No
Norm to test:	Based on $I_c$ value	$f_t$ applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Clay line behavior applied:	Sands only
Peak ground acceleration:	0.14	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m
Depth to GWT (earthq.):	2.00 m		
Average results interval:	3		
$I_c$ cut-off value:	2.60		
Unit weight calculation:	Based on SBT		
Use fill:	No		
Fill height:	N/A		

### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

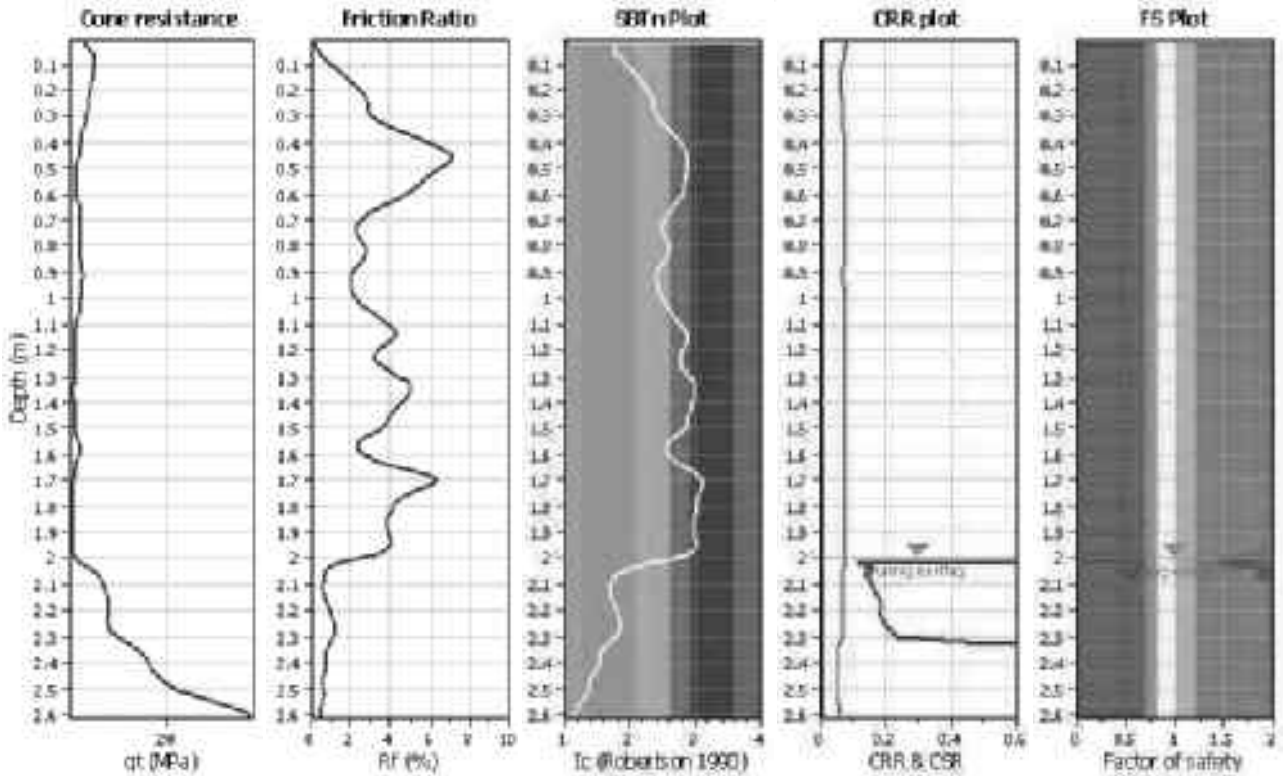
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

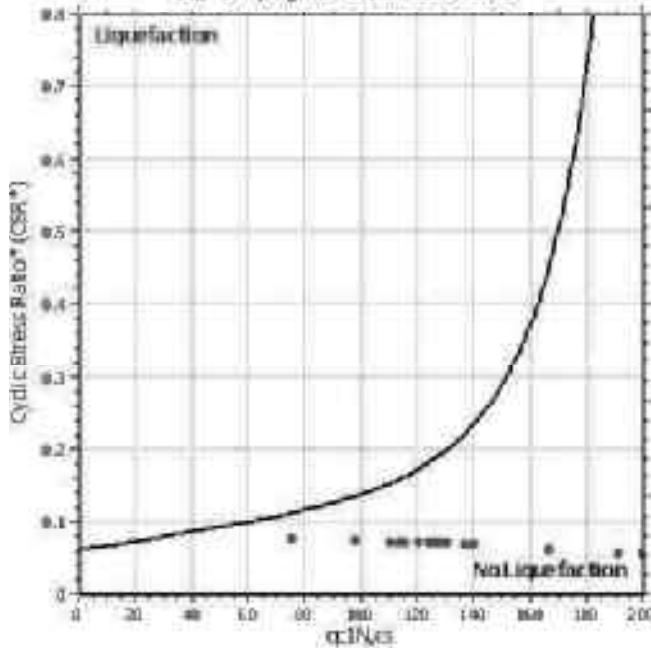
**CPT file : CPT207\_SLS**

**Input parameters and analysis data**

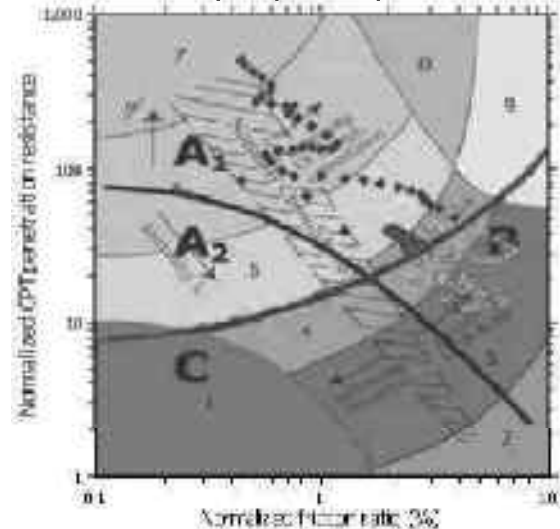
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

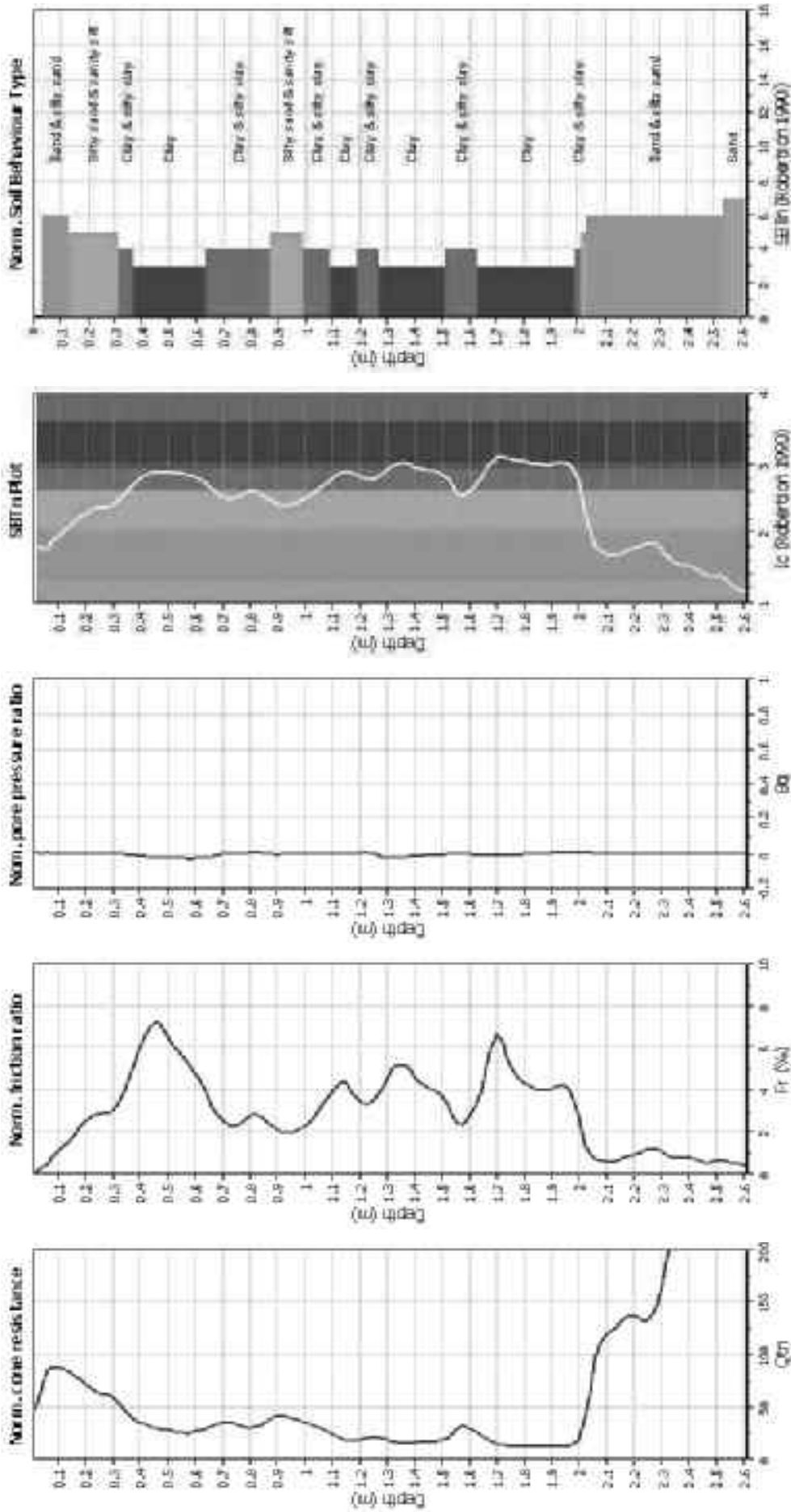


**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone C: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone B: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and global geometry.

### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.20  
 Peak ground acceleration: 0.14  
 Depth to water table (meters): 2.00 m

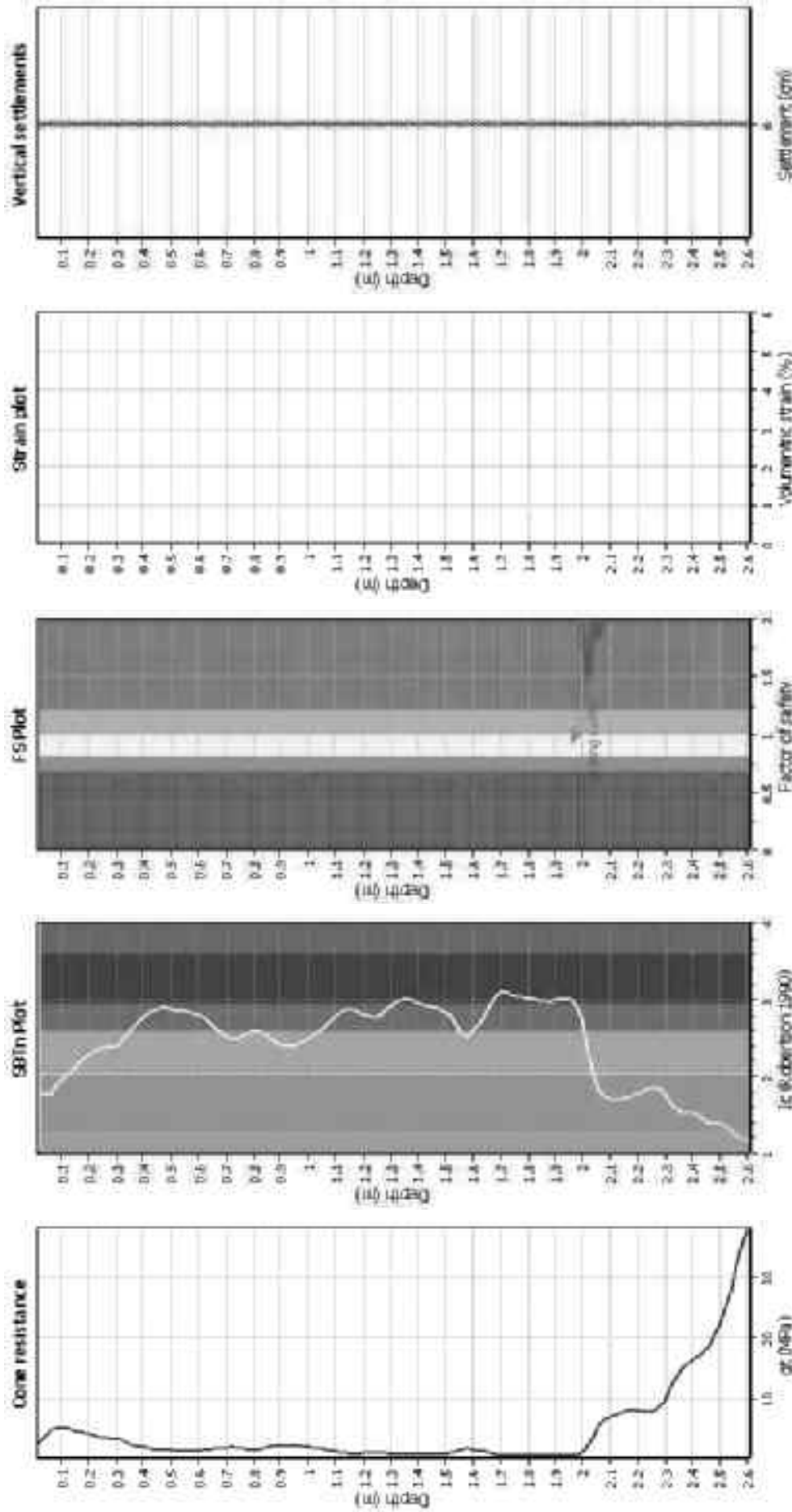
Depth to GW (earthq.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (select, applied): No  
 $f_c$  applied: Yes  
 Clay size behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

#### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- qf: Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain





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**LIQUEFACTION ANALYSIS REPORT**

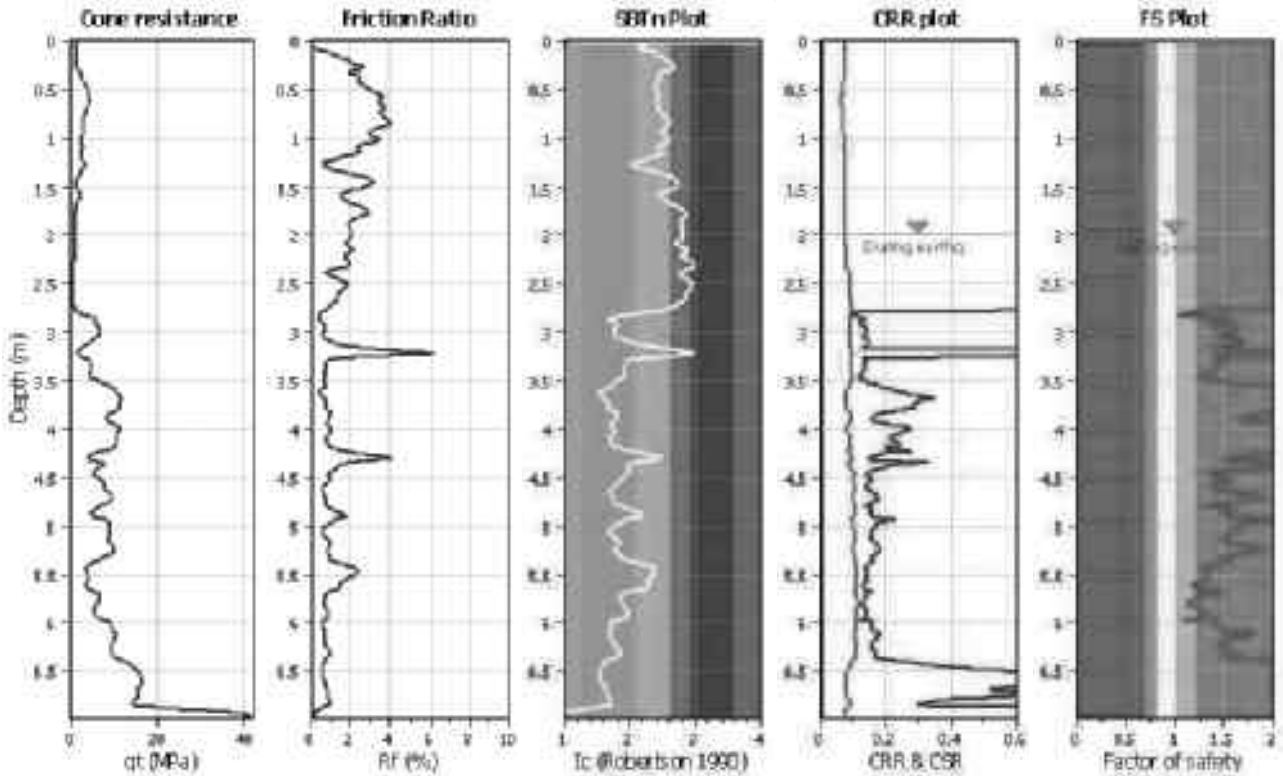
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

**CPT file : CPT208\_SLS**

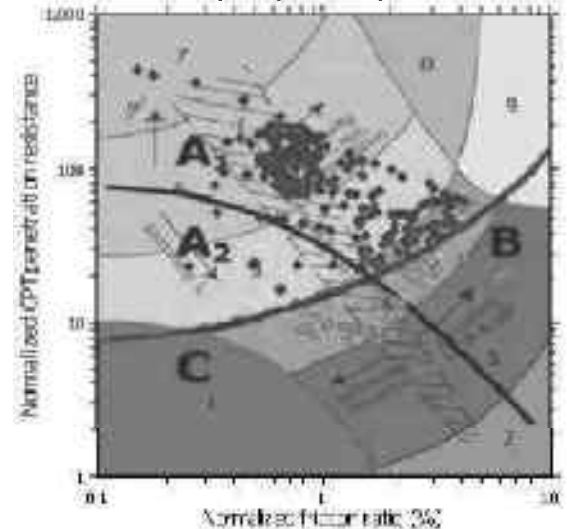
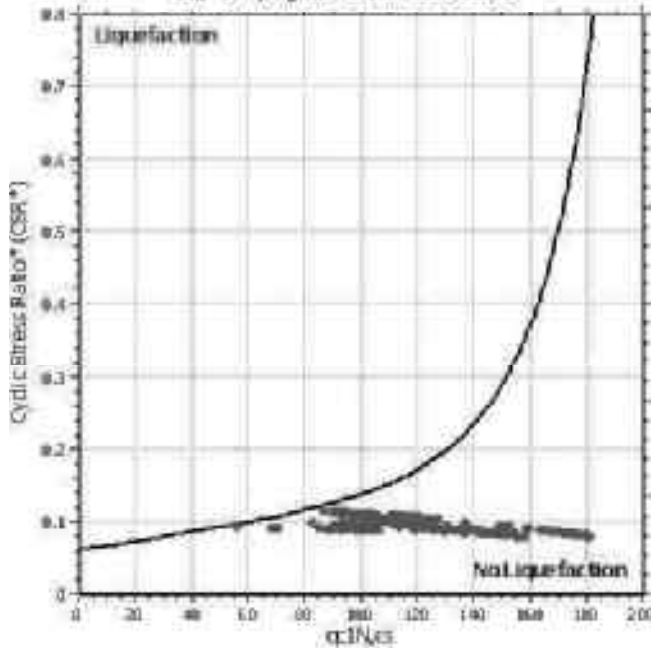
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use file:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.20	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.14	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



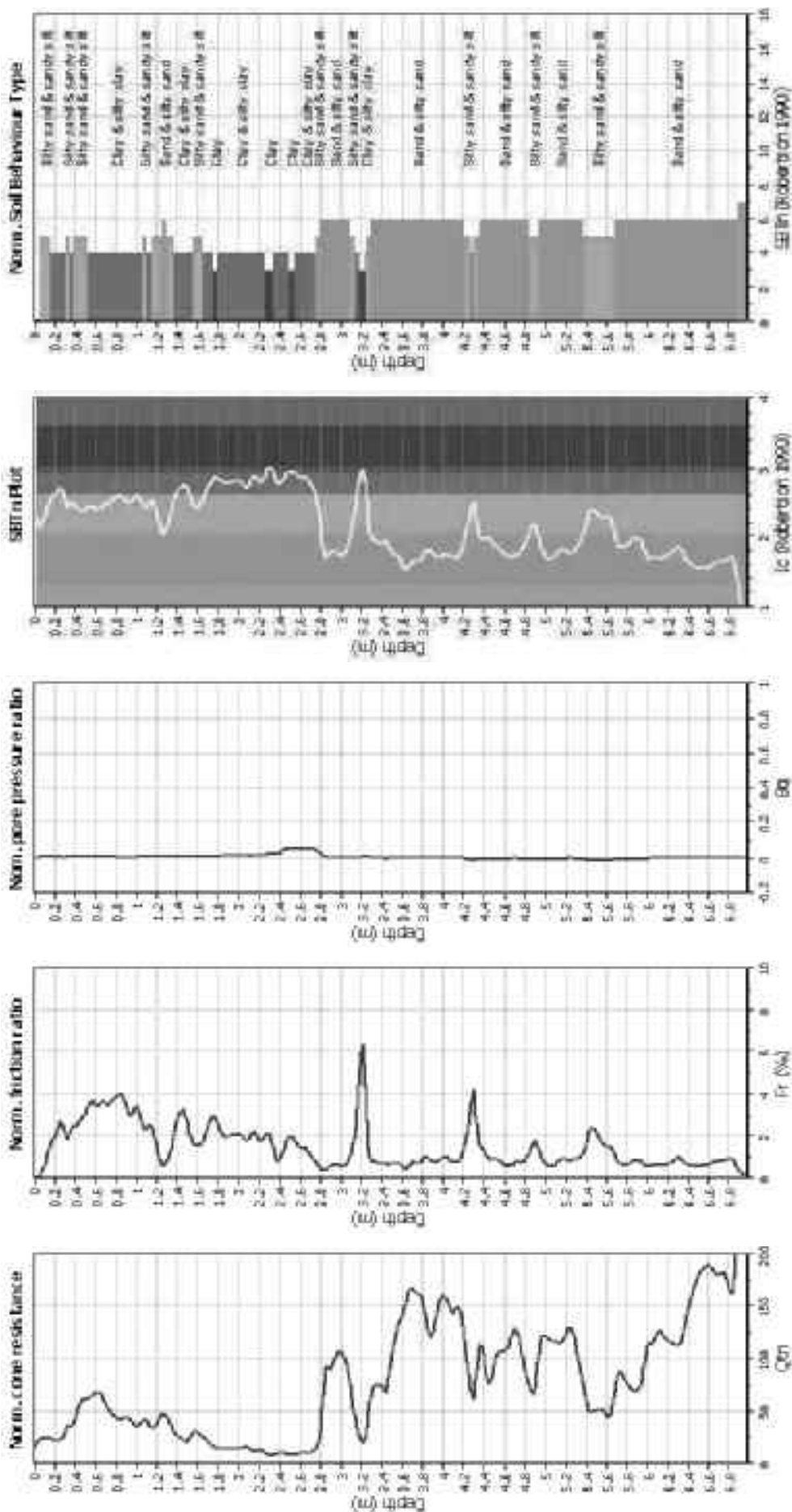
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycle (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and global geometry.

### CPT basic interpretation plots (normaliz



**Input parameters and analysis data**

Analyze method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on I<sub>c</sub> value  
 Earthquake magnitude M<sub>w</sub>: 6.20  
 Peak ground acceleration: 0.14  
 Depth to water table (meters): 2.00 m

Depth to GW (earthq.): 2.00 m  
 Average results interval: 3  
 I<sub>c</sub> cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

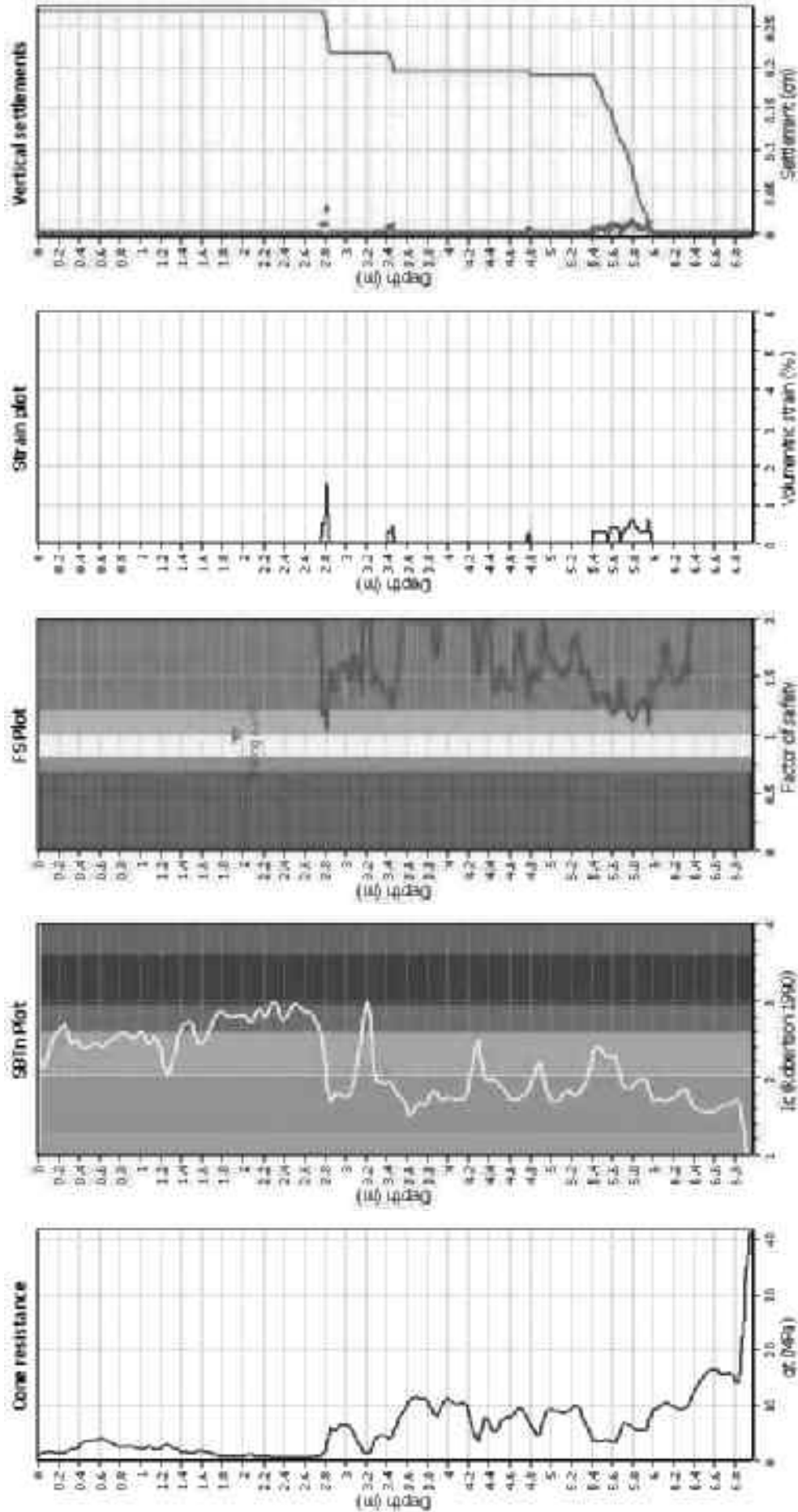
Fill weight: N/A  
 Transition (solect) applied: No  
 F<sub>v</sub> applied: Yes  
 Clay size behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

**SBTn legend**

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained



### Estimation of post-earthquake settlements



#### Abbreviations

- $q_t$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

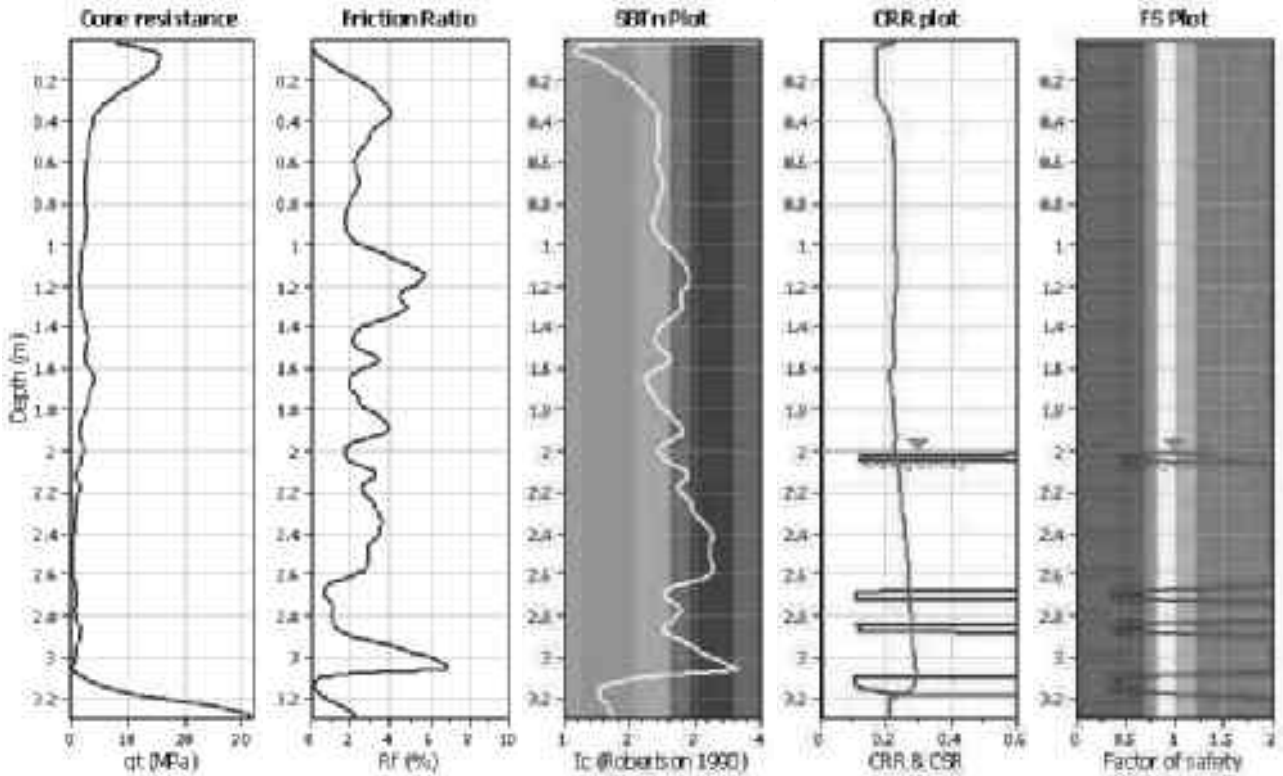
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

**CPT file : CPT201\_ULS**

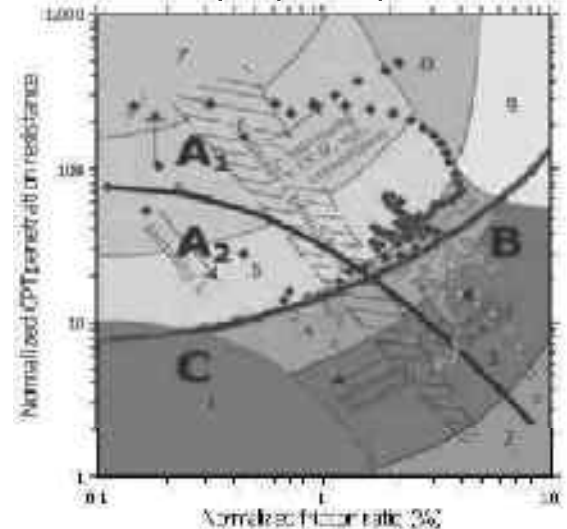
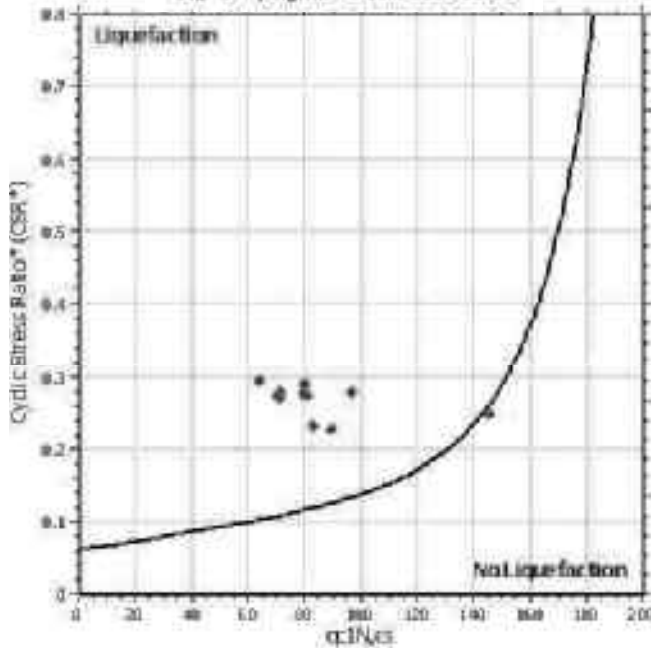
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



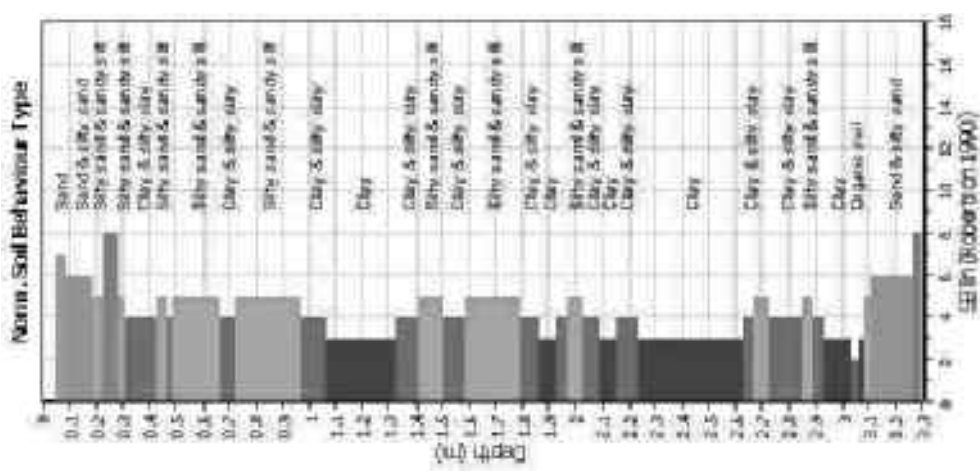
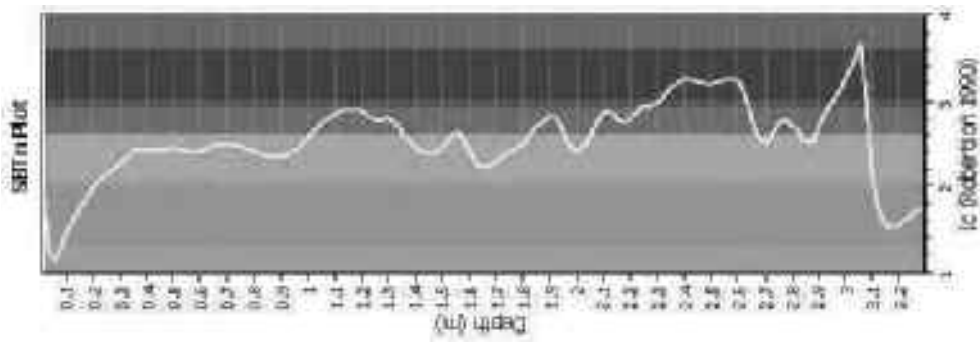
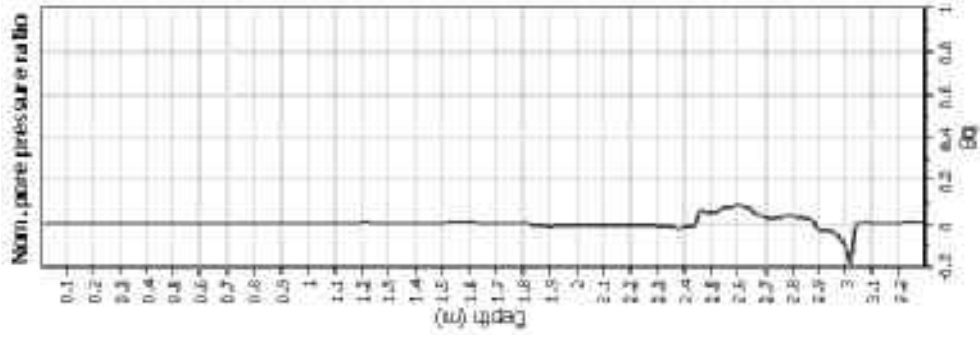
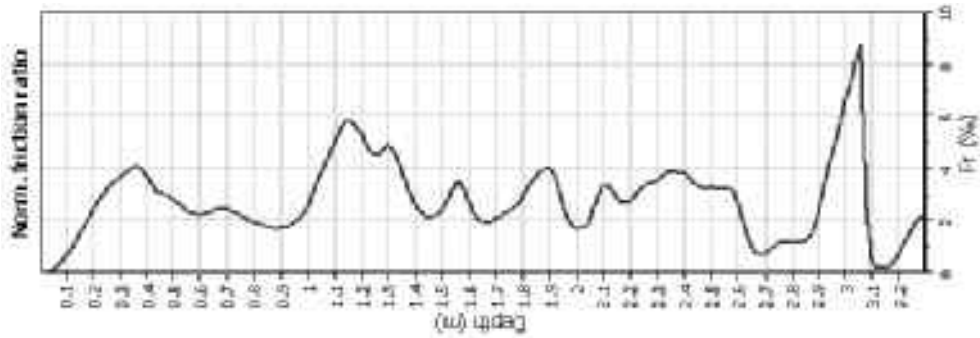
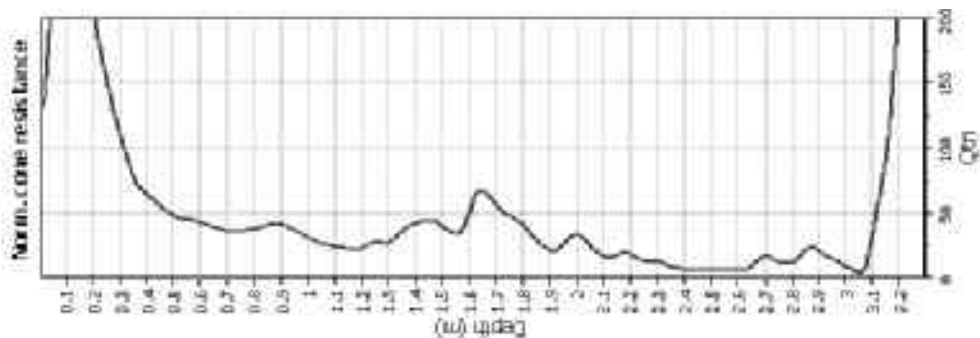
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A<sub>1</sub>: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and ground geometry.

### CPT basic interpretation plots (normaliz



**Input parameters and analysis data**

Analyze method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.50  
 Peak ground acceleration: 0.42  
 Depth to water table (meters): 2.00 m

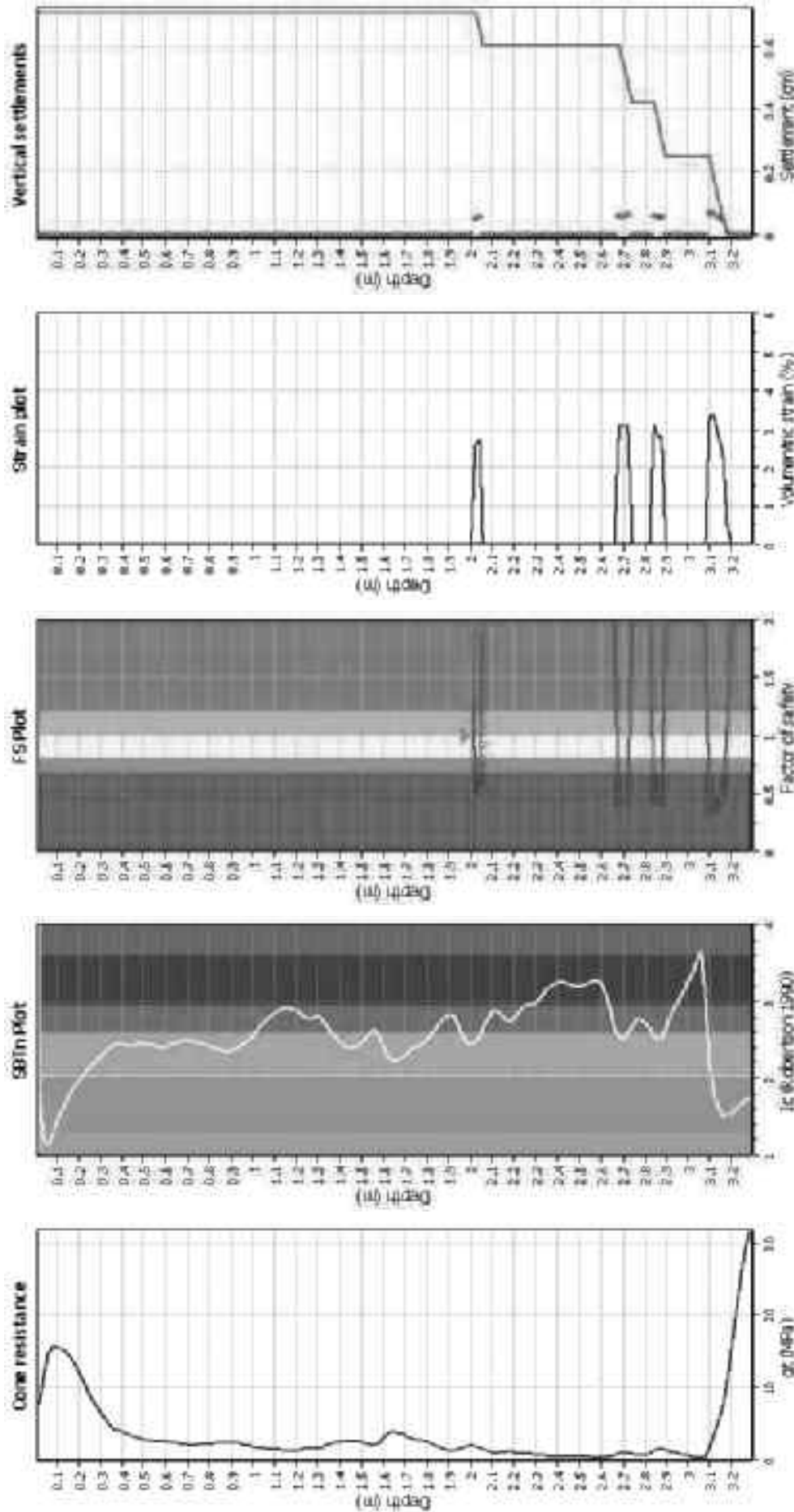
Depth to GW (earthq.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (solect) applied: No  
 $f_c$  applied: Yes  
 Clay size behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

**SBTn legend**

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

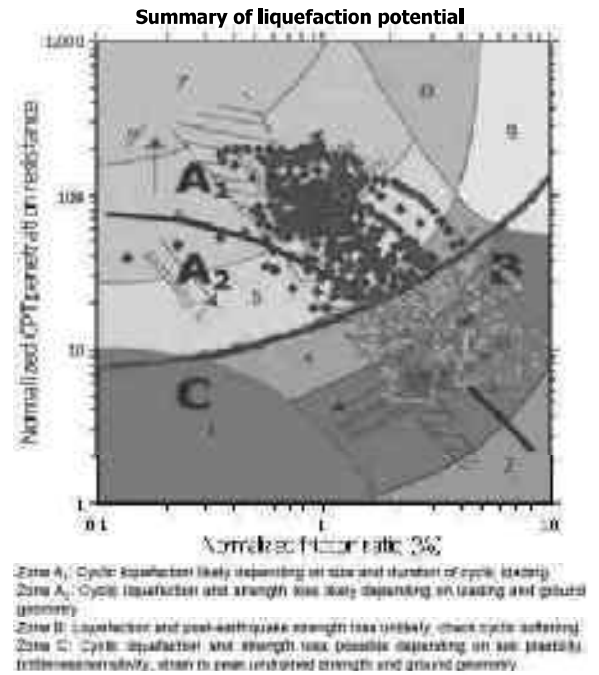
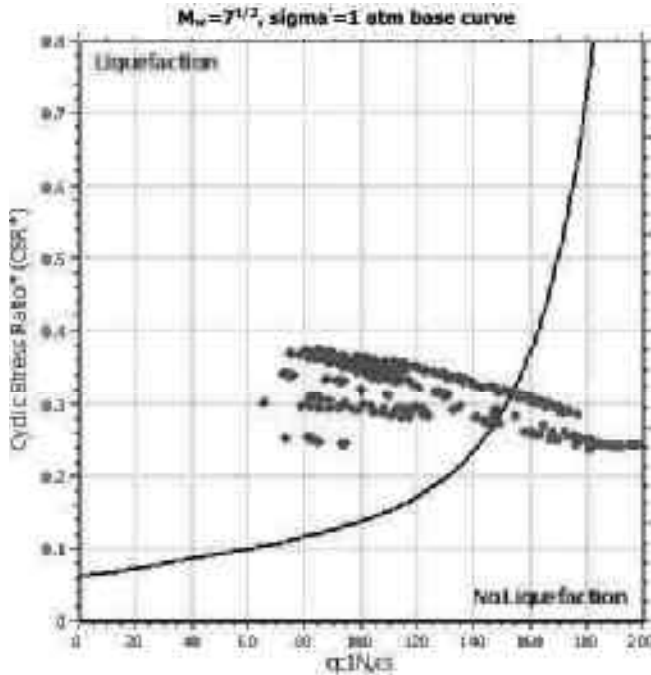
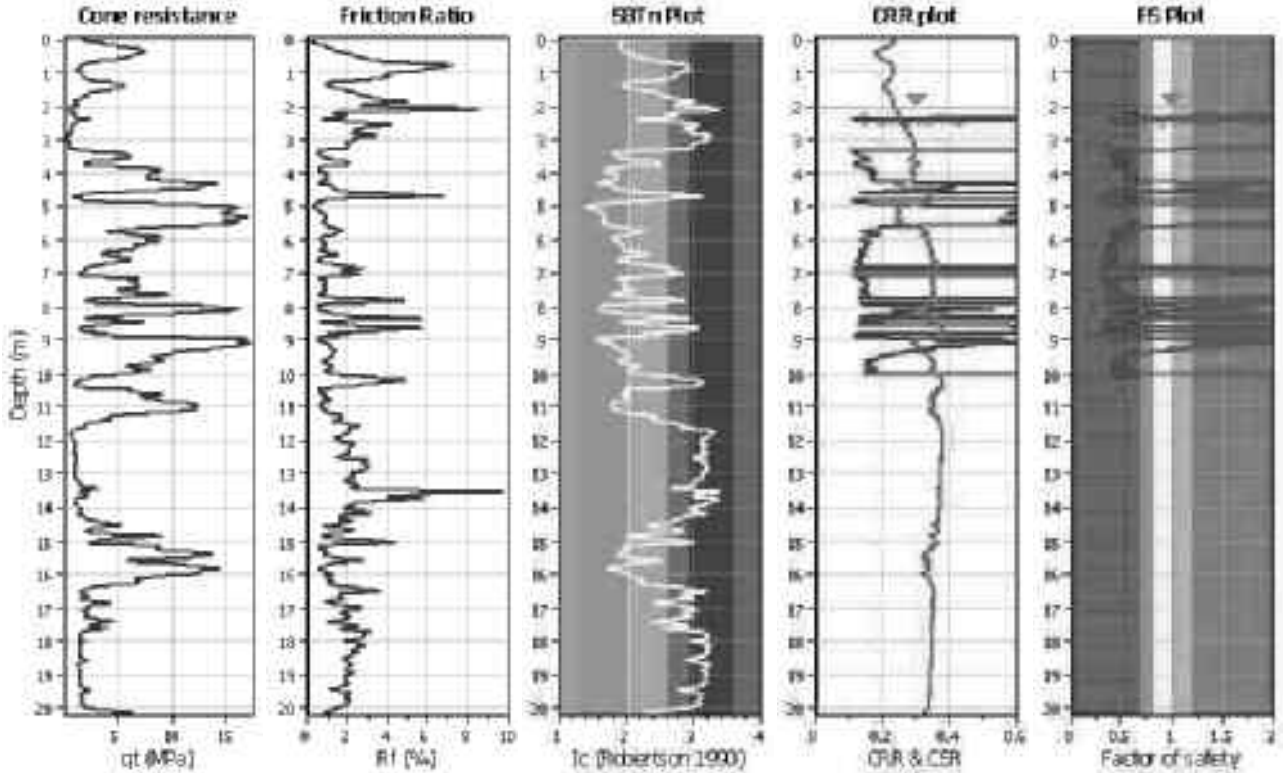
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

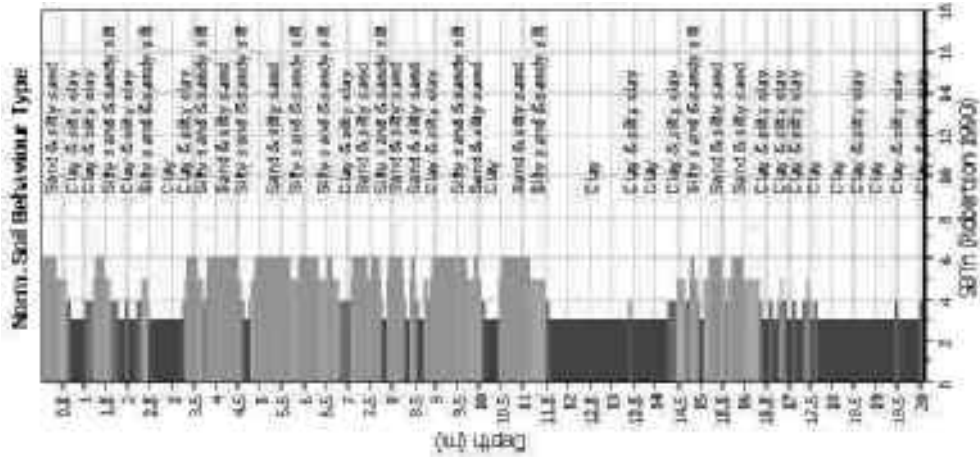
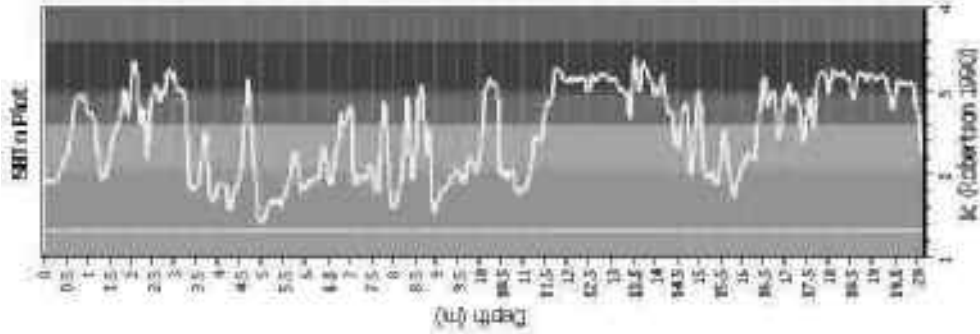
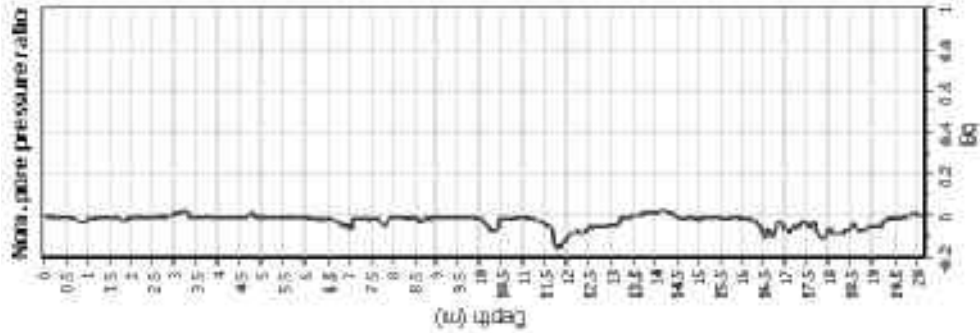
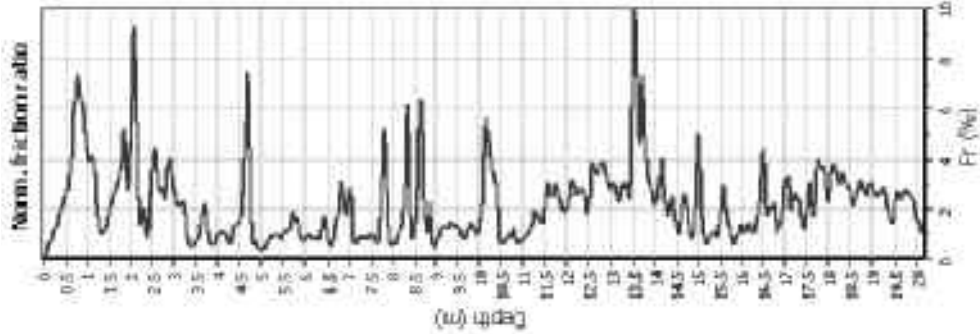
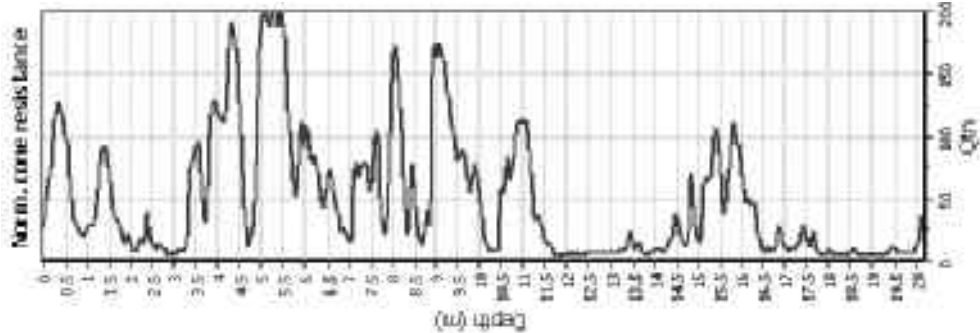
**CPT file : CPT202\_ULS**

**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. defect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on  $I_c$  value  
 Earthquake magnitude  $M_w$ : 6.50  
 Peak ground acceleration: 0.42  
 Depth to water table (meters): 2.00 m

Depth to GWT (earthq.): 2.00 m  
 Average results interval: 3  
 $I_c$  cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

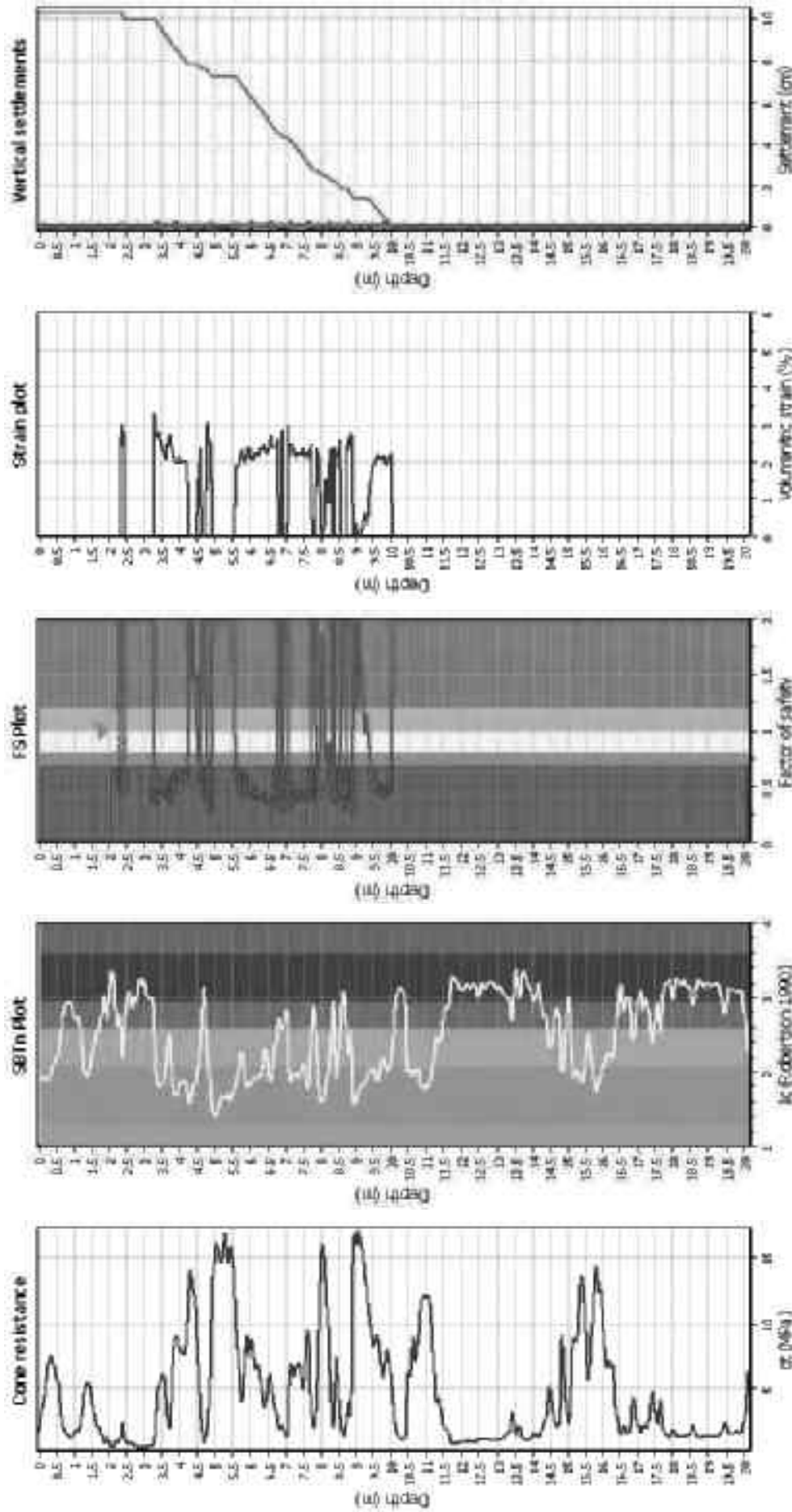
Fill weight: N/A  
 Transition (down): applied: No  
 $f_v$  applied: Yes  
 Clay size behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

#### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained



### Estimation of post-earthquake settlements



### Abbreviations

- qt: Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- Ic: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

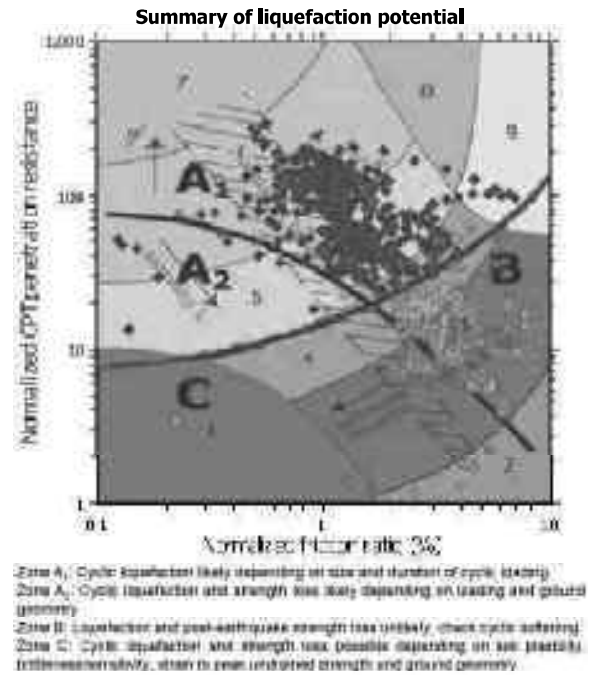
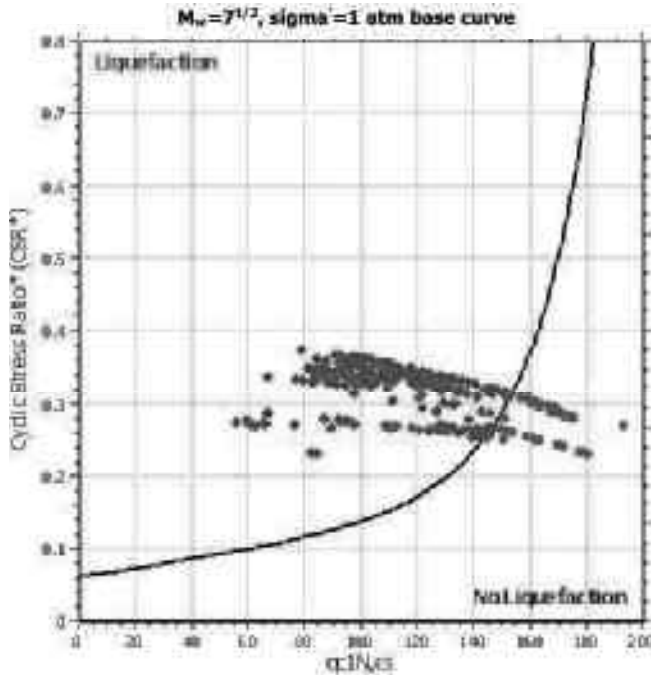
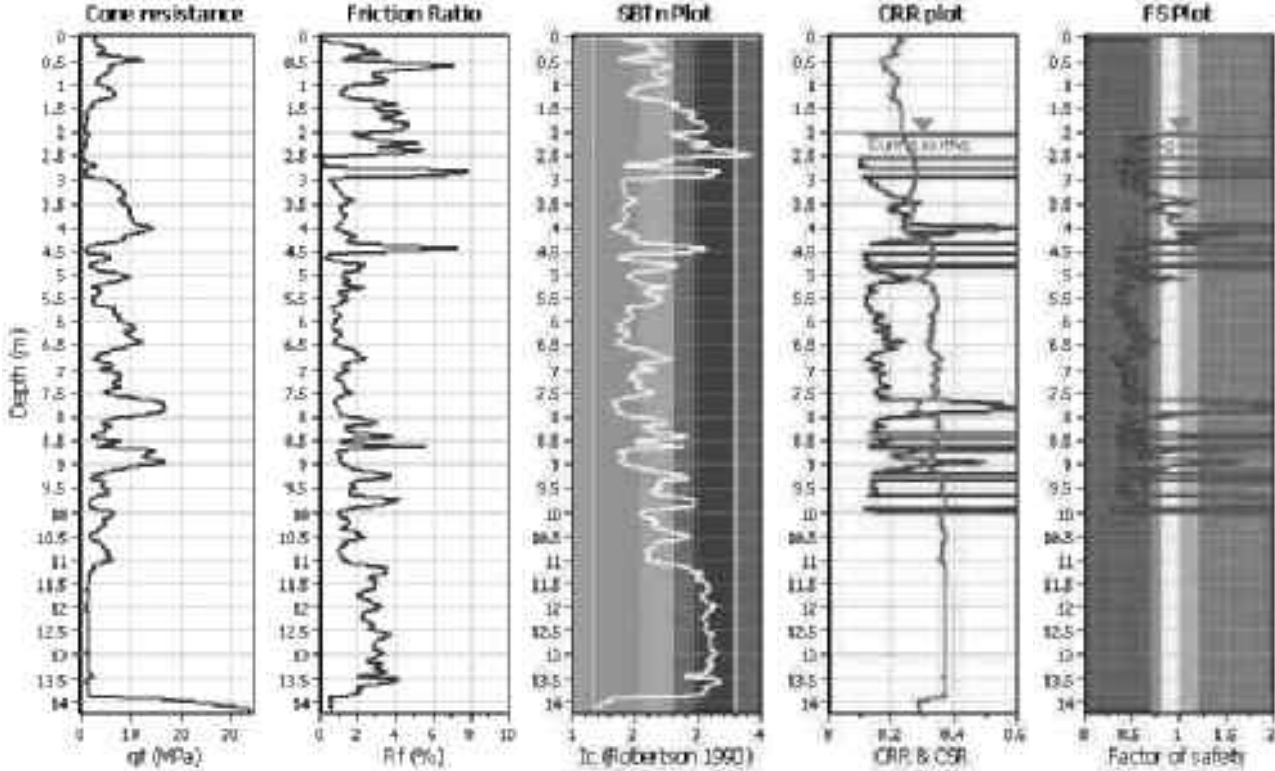
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

**CPT file : CPT203\_ULS**

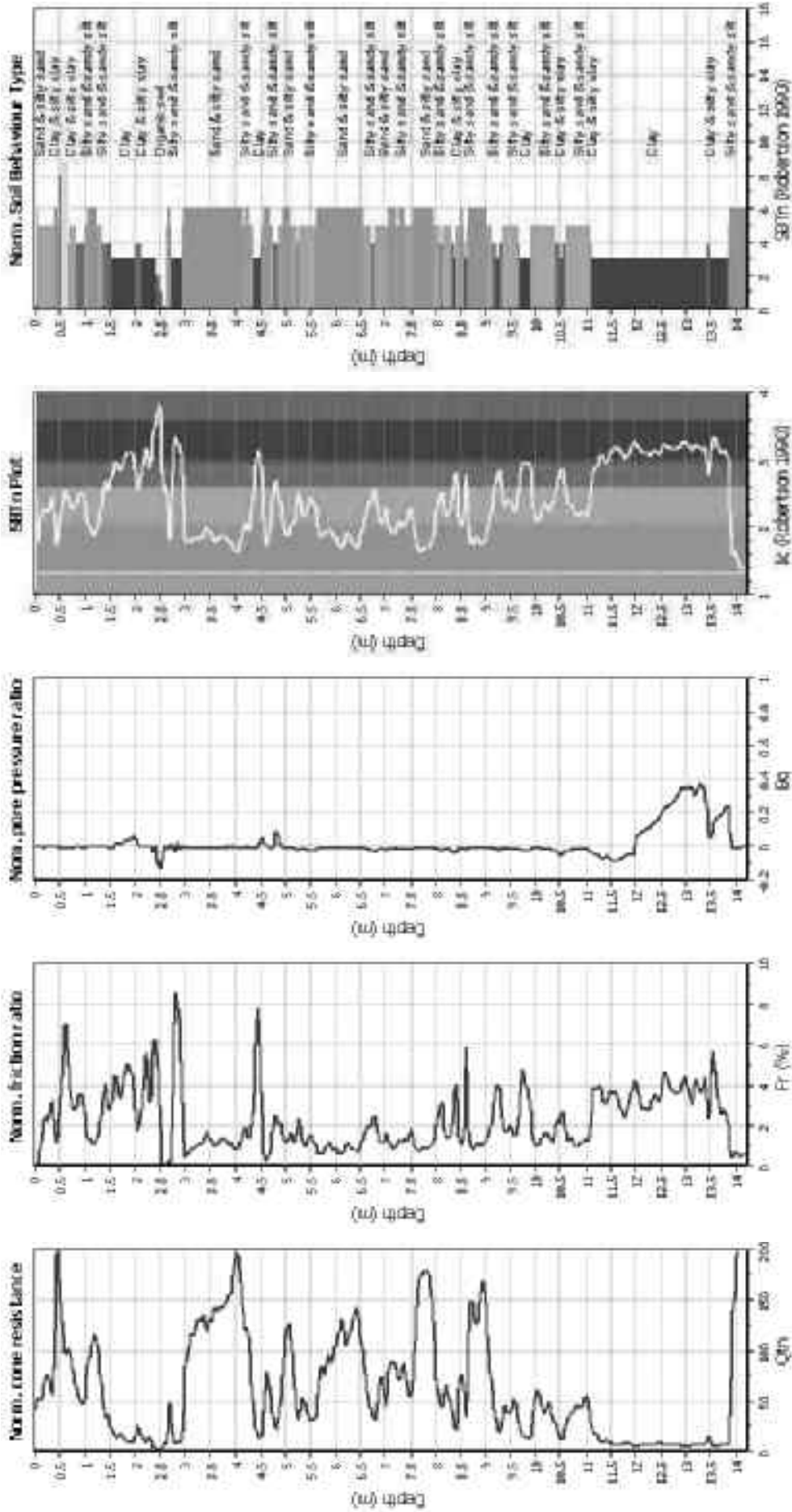
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied: Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied: Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. defect. applied:	No	Limit depth: 10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method: Method





### CPT basic interpretation plots (normaliz



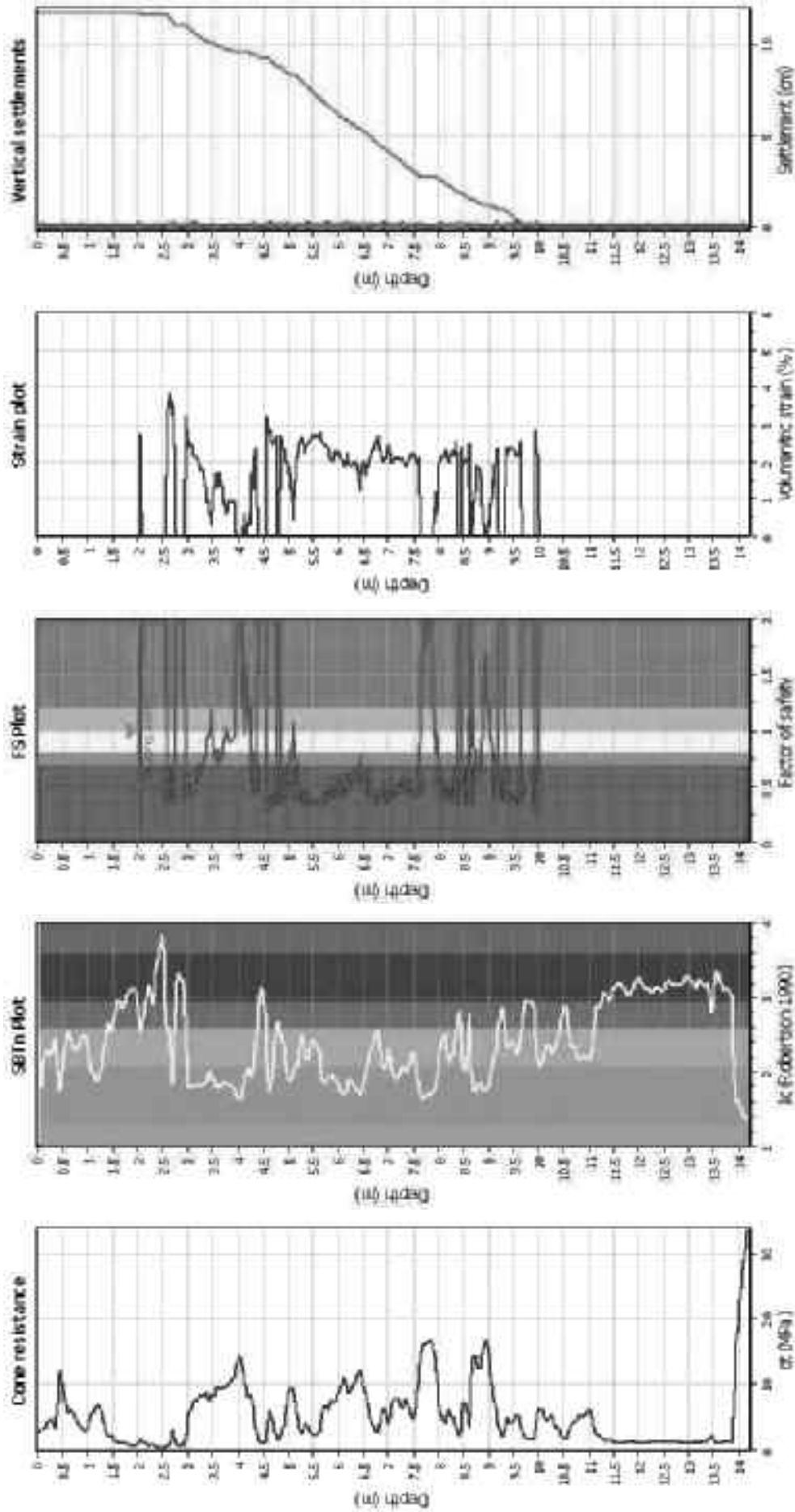
#### Input parameters and analysis data

Analyze method:	B&I (2014)
Flies correction method:	B&I (2014)
Norm to test:	Based on Ic value
Earthquake magnitude $M_w$ :	6.50
Peak ground acceleration:	0.42
Depth to water table (meters):	2.00 m
Depth to GWT (earthq.):	2.00 m
Average results interval:	3
Ic cut-off value:	2.60
Unit weight calculation:	Based on SBT
Use fill:	No
Fill height:	N/A
Fill weight:	N/A
Transition (down): applied:	No
$f_c$ applied:	Yes
Clay line behavior applied:	Sands only
Limit depth applied:	Yes
Limit depth:	10.00 m

#### SBTm legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

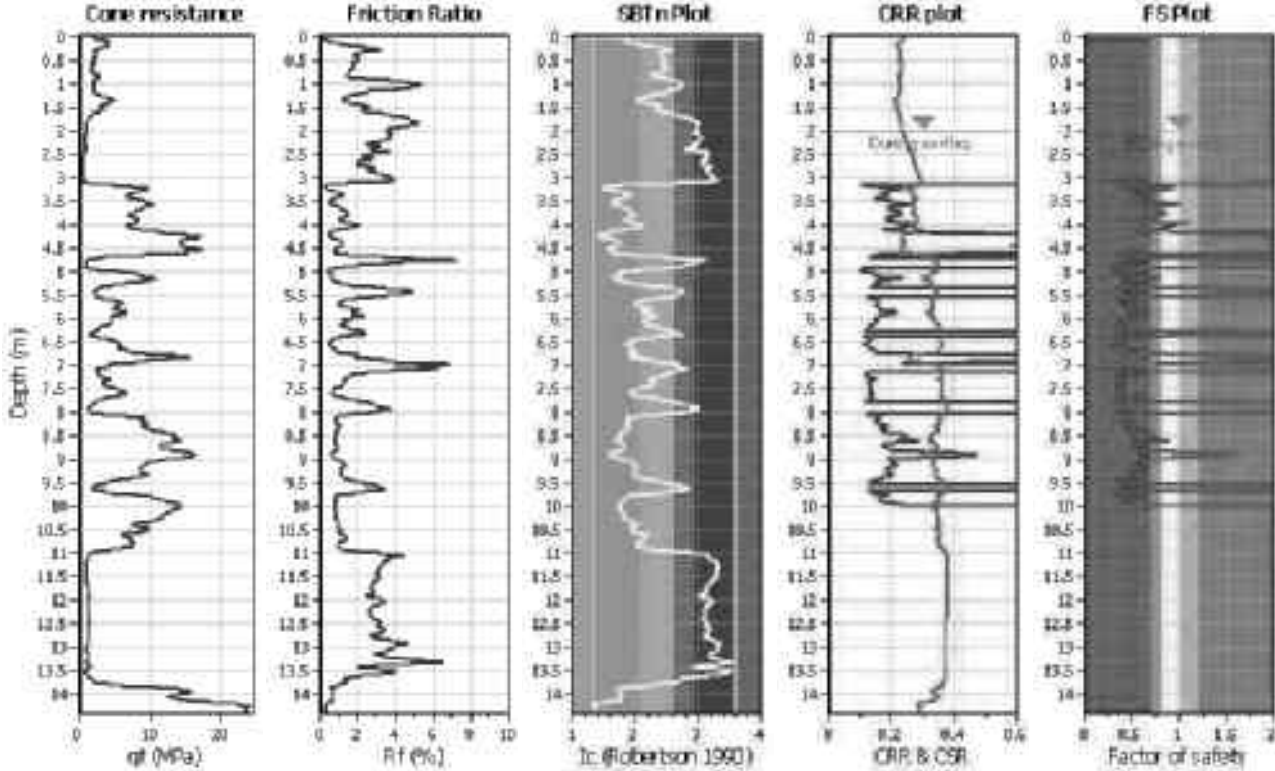
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

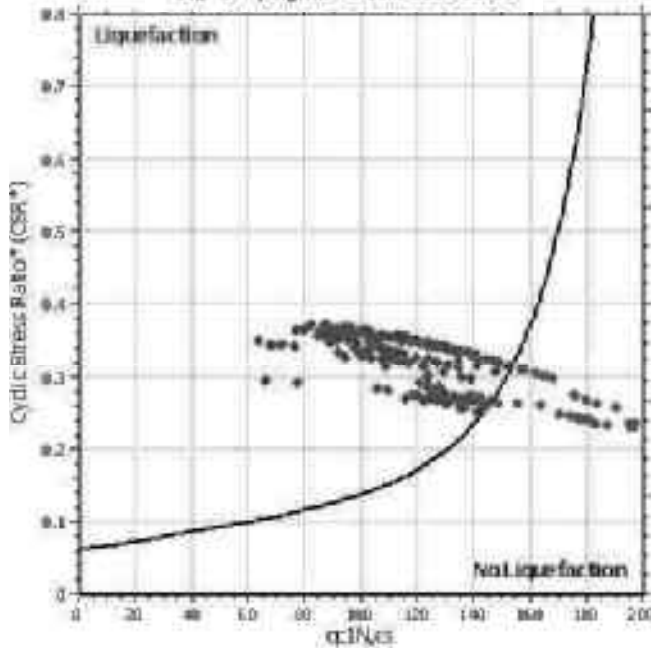
**CPT file : CPT204\_ULS**

**Input parameters and analysis data**

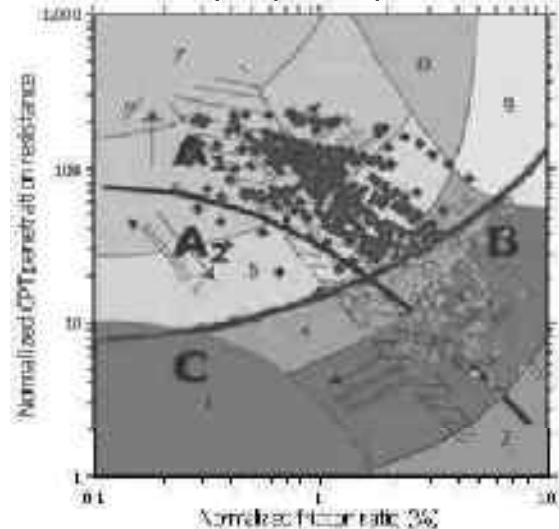
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fit:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thins. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

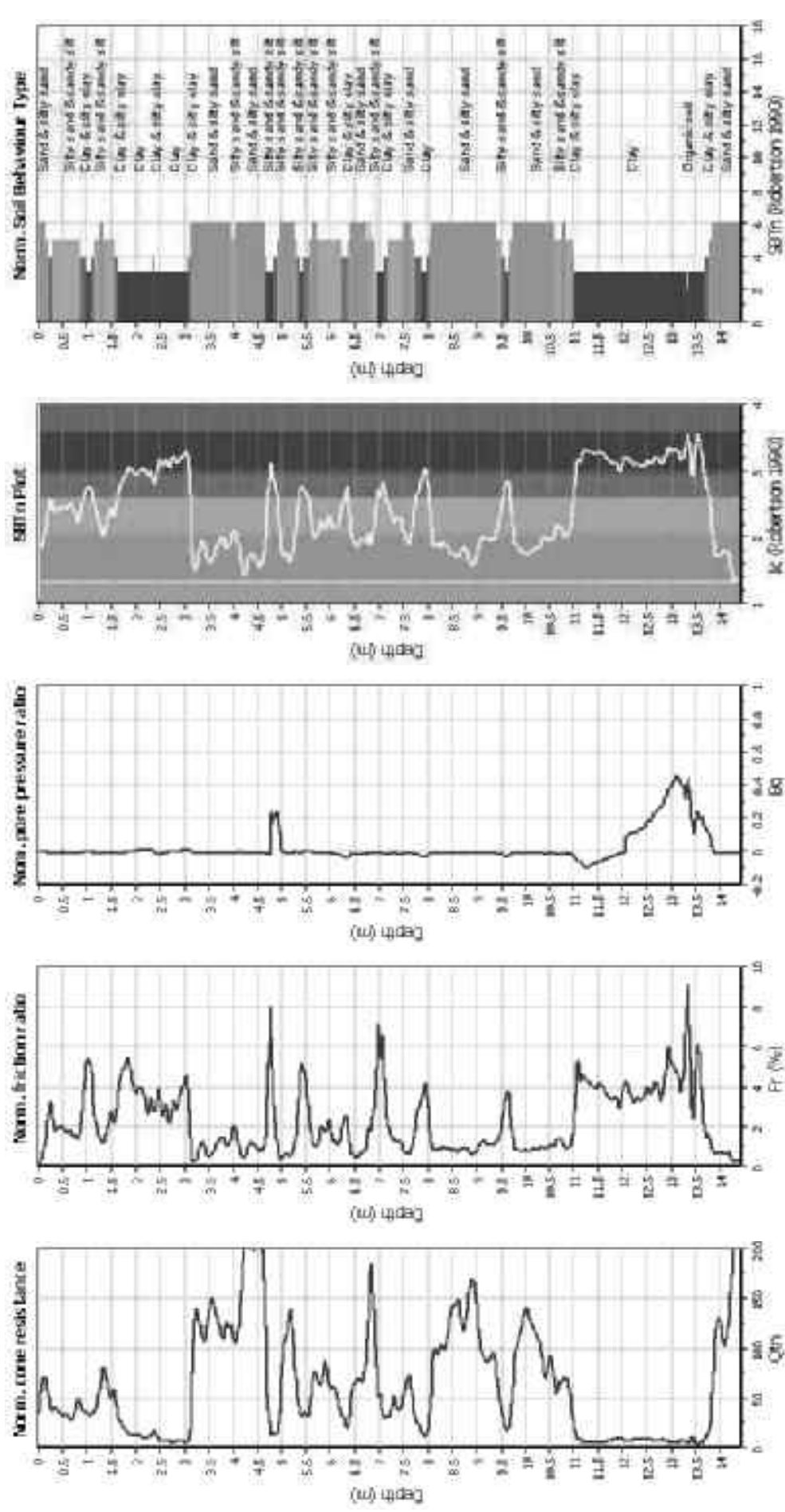


**Summary of liquefaction potential**



Zone A: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A: Cyclic liquefaction and strength loss likely depending on loading and grain geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and grain geometry.

### CPT basic interpretation plots (normaliz



**Input parameters and analysis data**

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.50  
 Peak ground acceleration: 0.42  
 Depth to water table (meters): 2.00 m

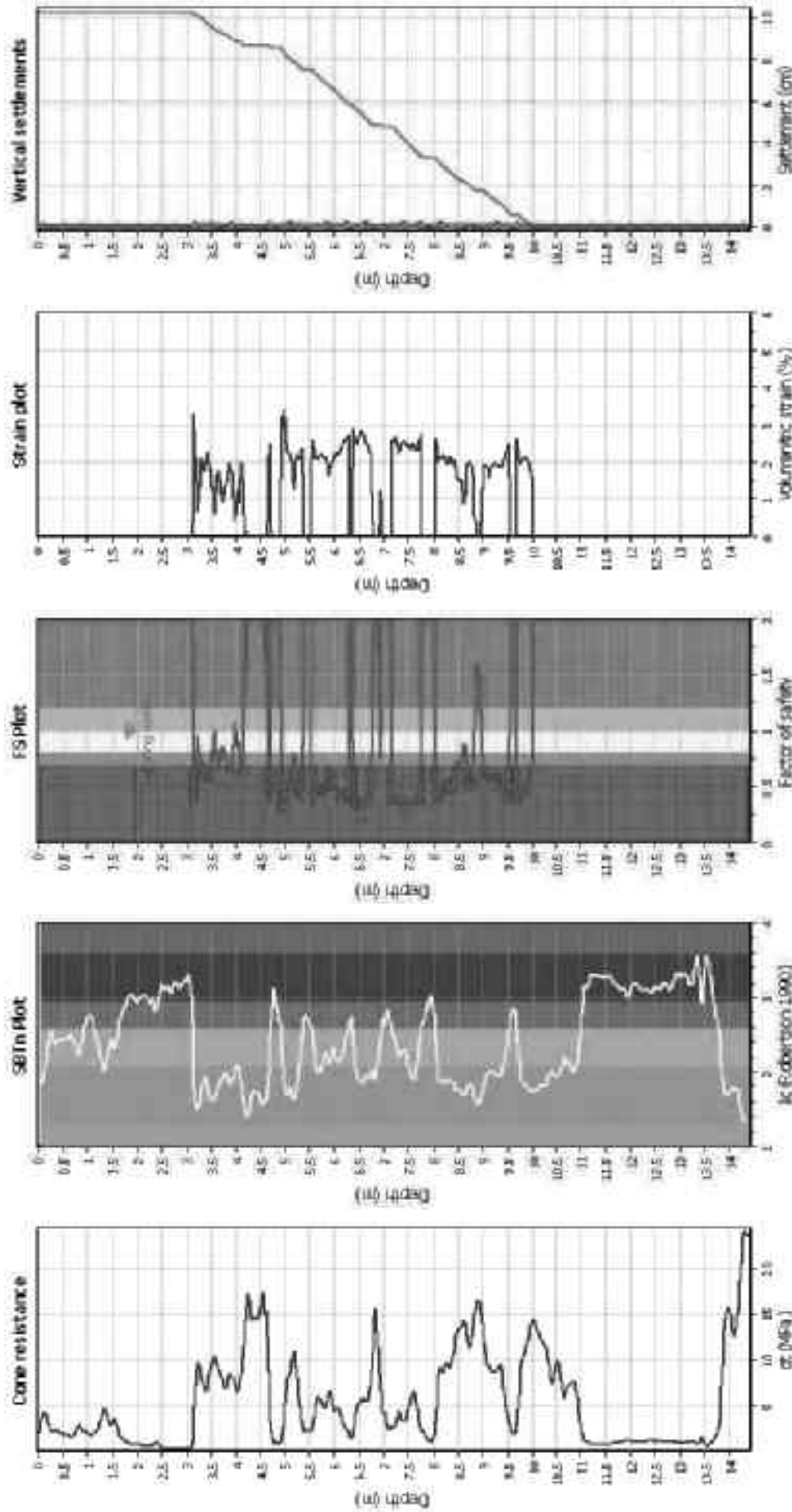
Depth to GWT (earthq.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (lowest) applied: No  
 $f_c$  applied: Yes  
 Clay line behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

**SBTm legend**

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravelly sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

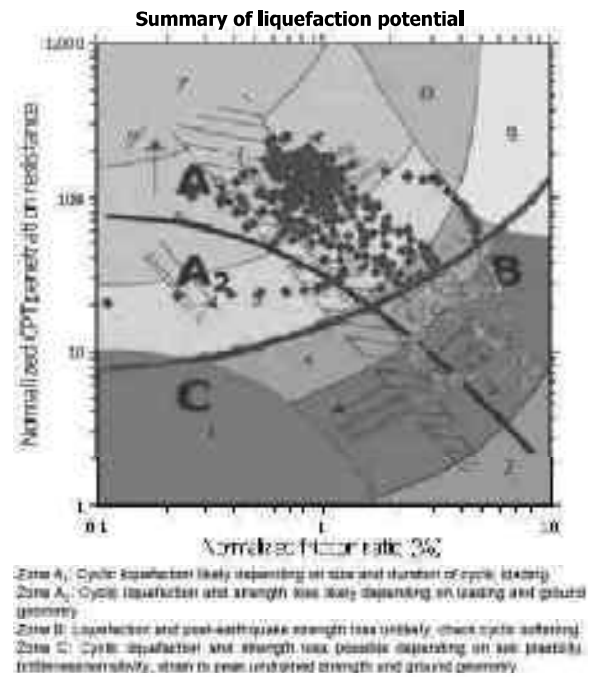
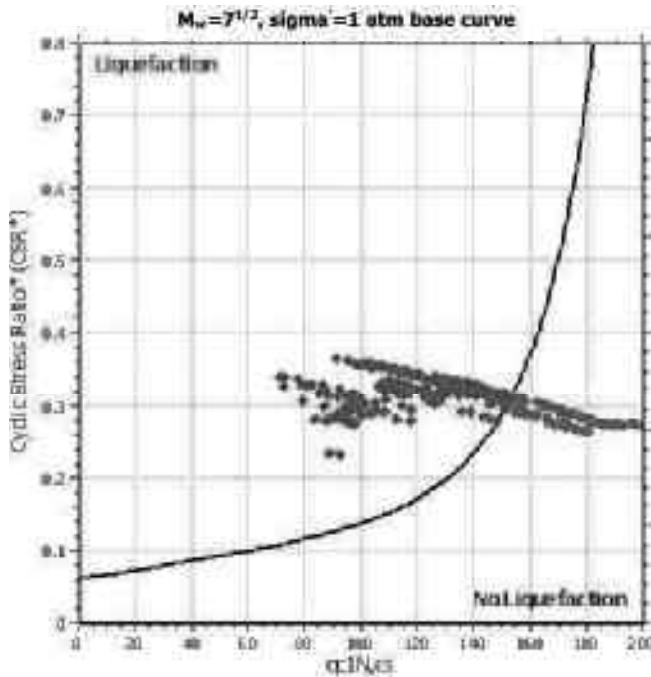
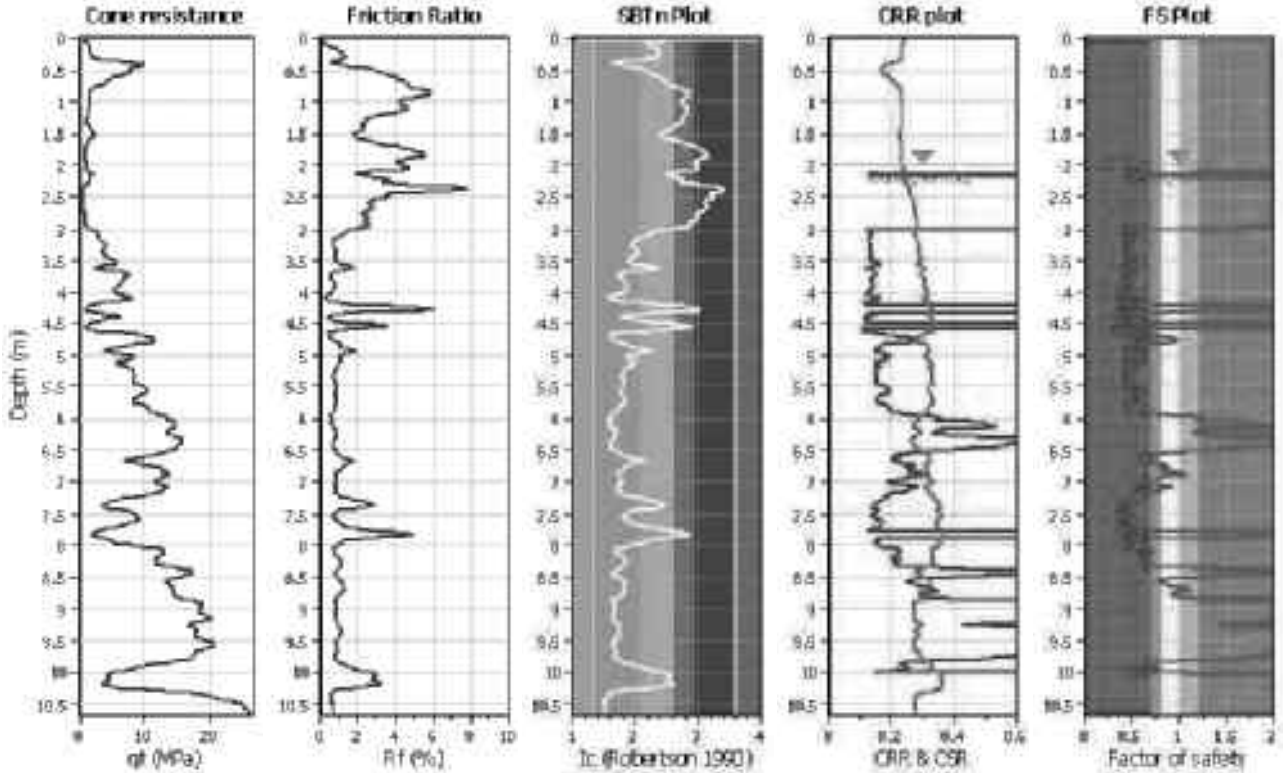
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

**CPT file : CPT205\_ULS**

**Input parameters and analysis data**

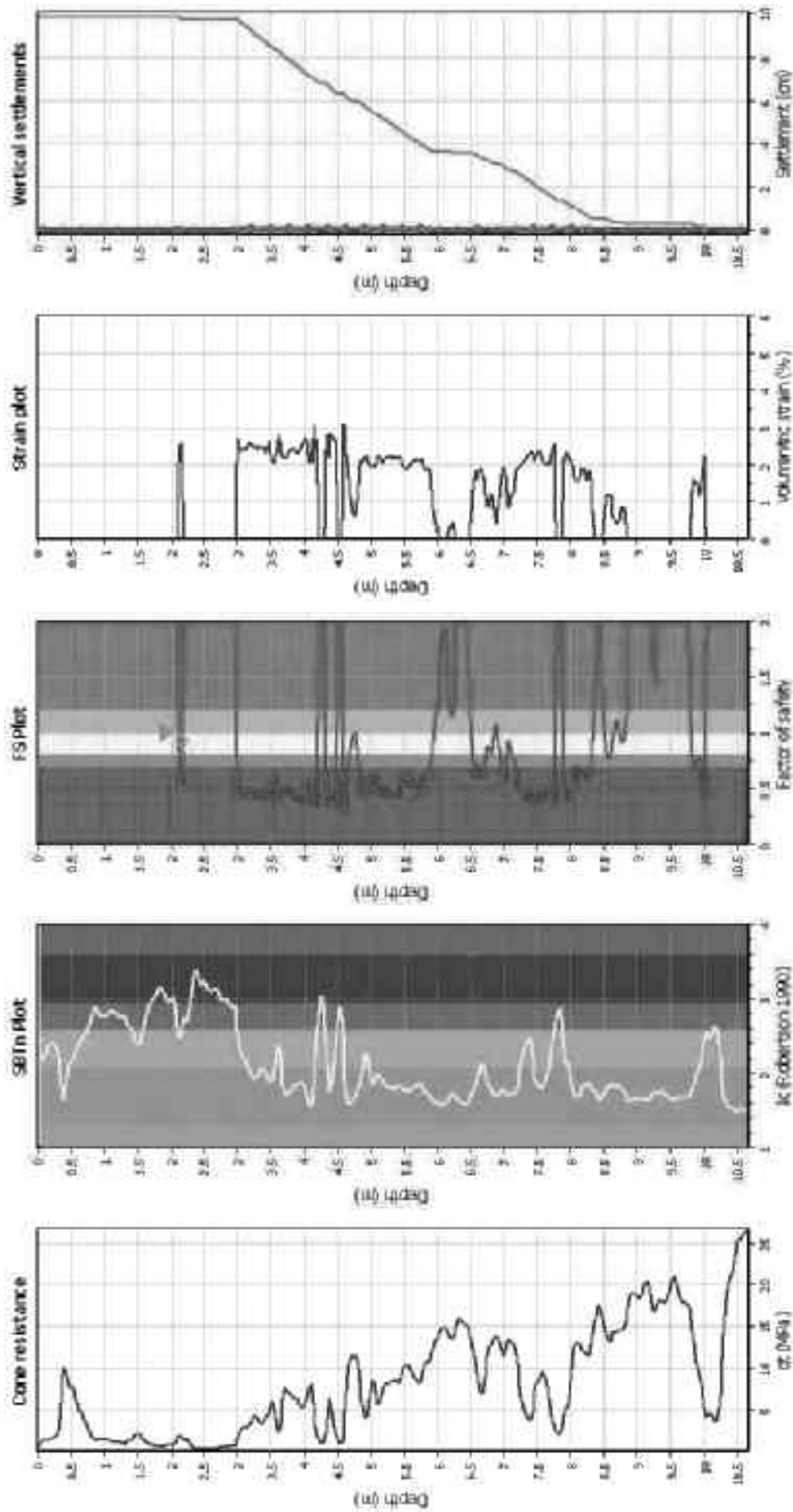
Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method







### Estimation of post-earthquake settlements



### Abbreviations

- $q_c$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $I_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain





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**LIQUEFACTION ANALYSIS REPORT**

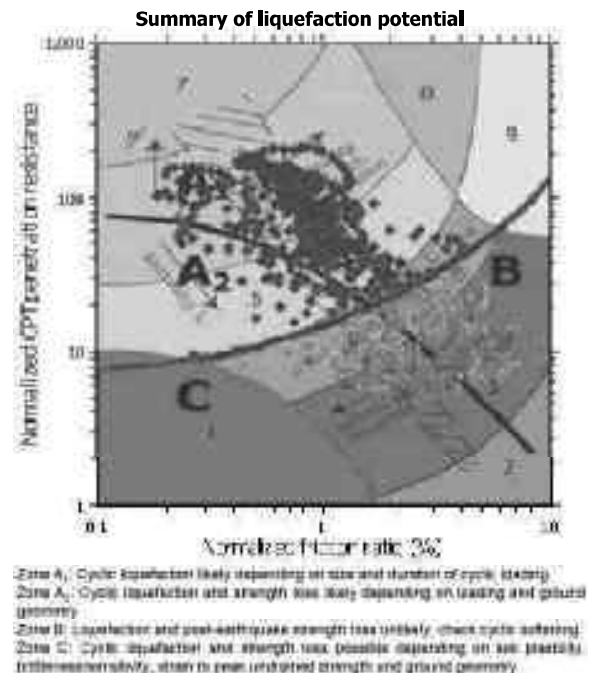
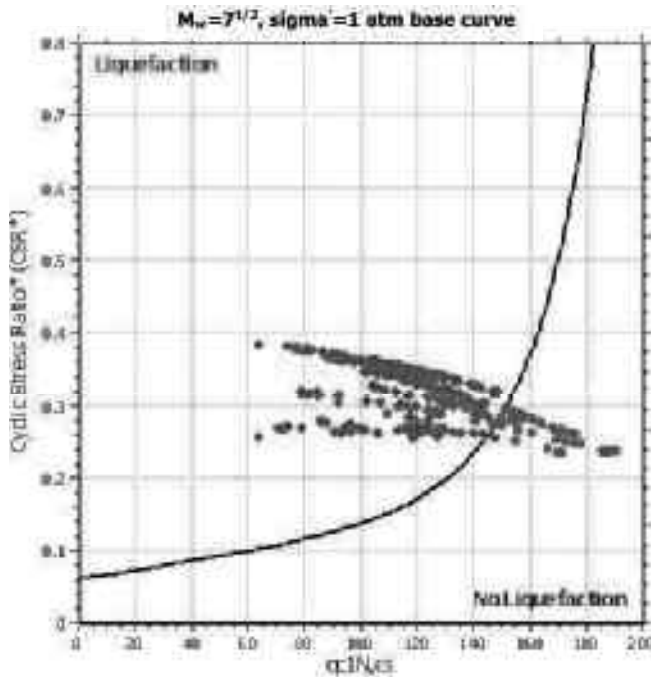
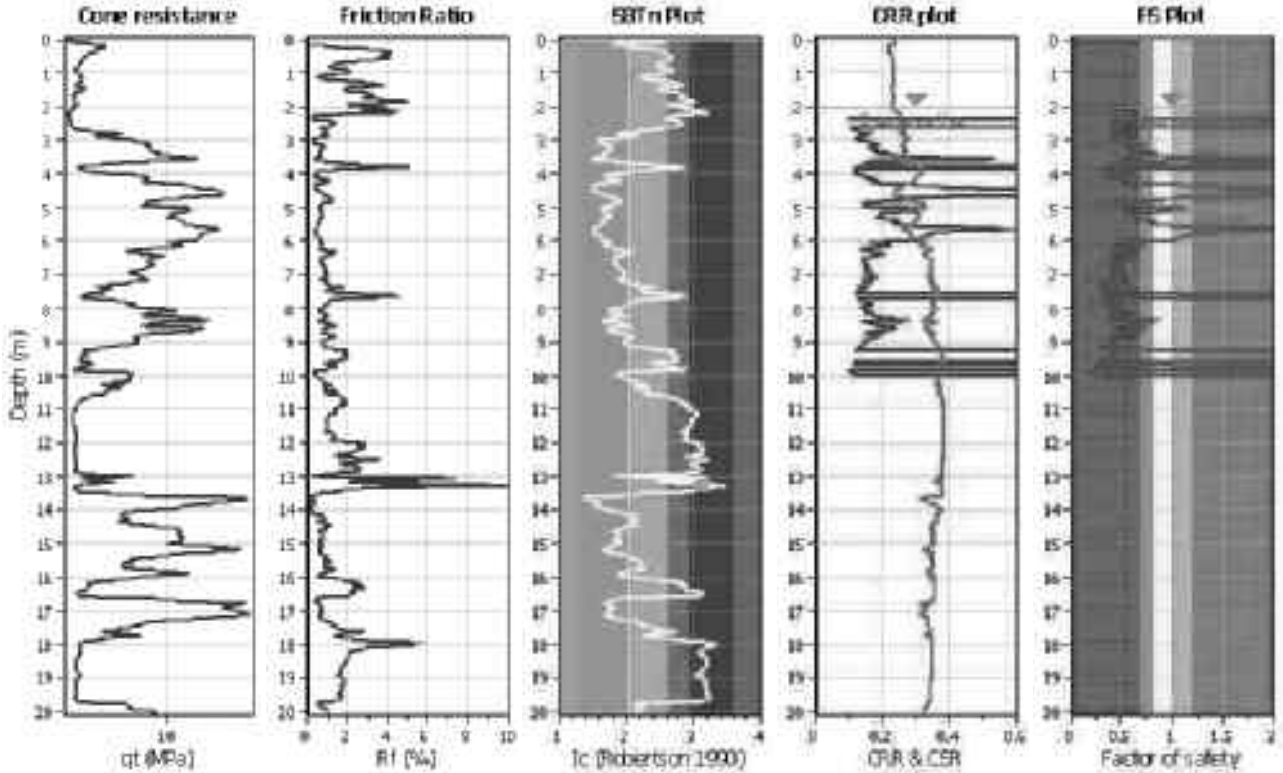
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

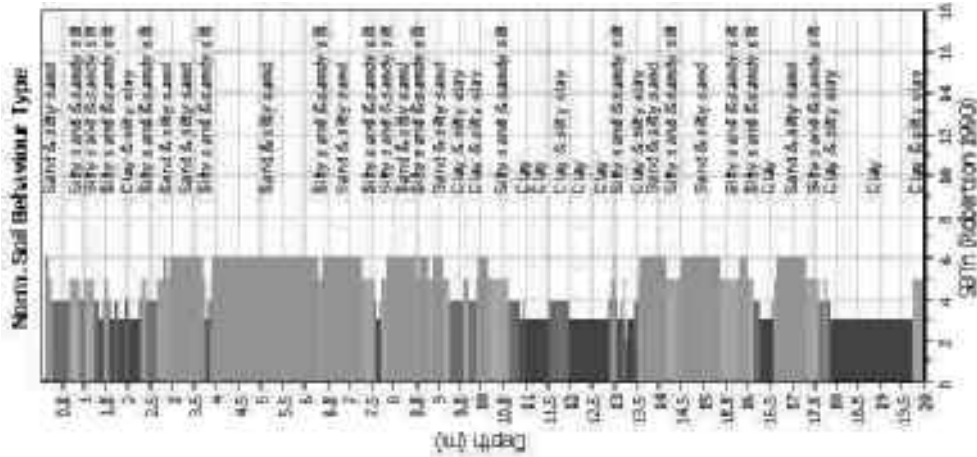
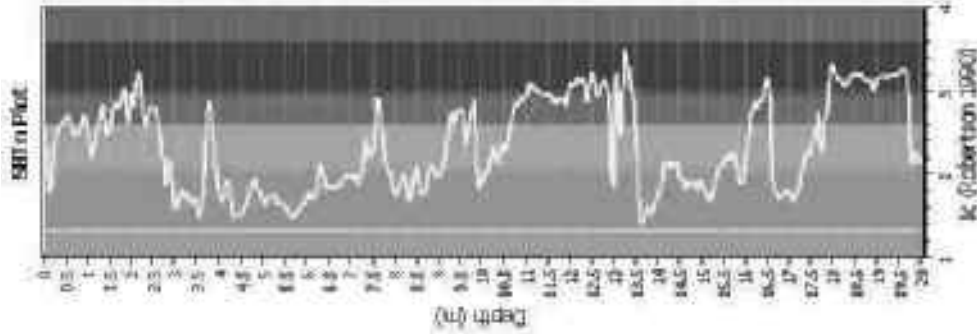
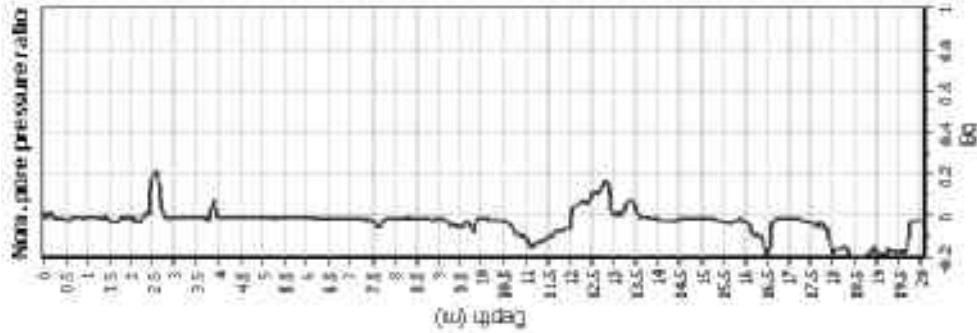
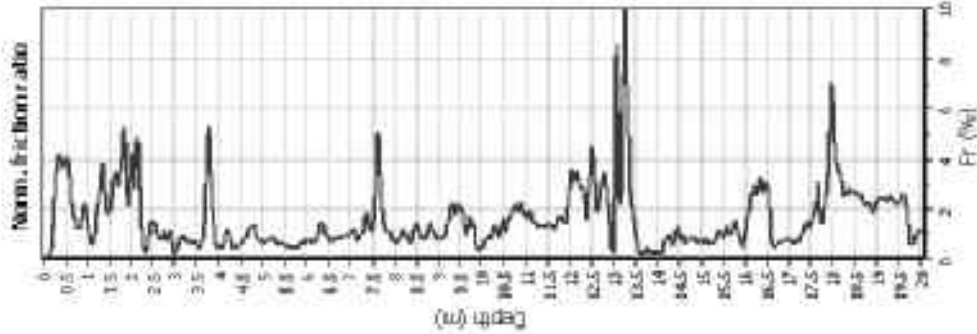
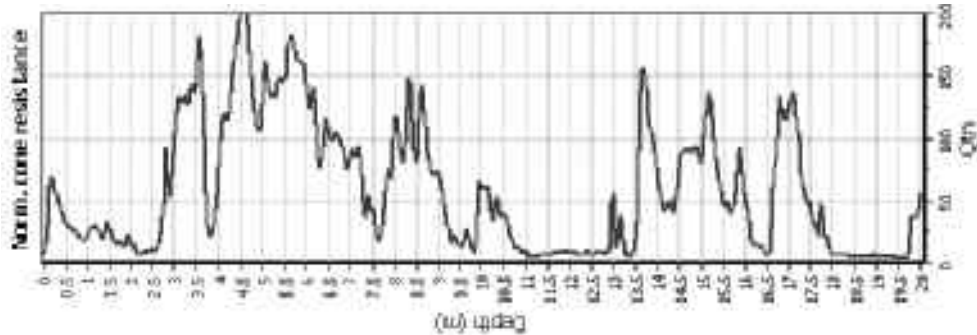
**CPT file : CPT206\_ULS**

**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



### CPT basic interpretation plots (normaliz



### Input parameters and analysis data

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on  $I_c$  value  
 Earthquake magnitude  $M_w$ : 6.50  
 Peak ground acceleration: 0.42  
 Depth to water table (meters): 2.00 m

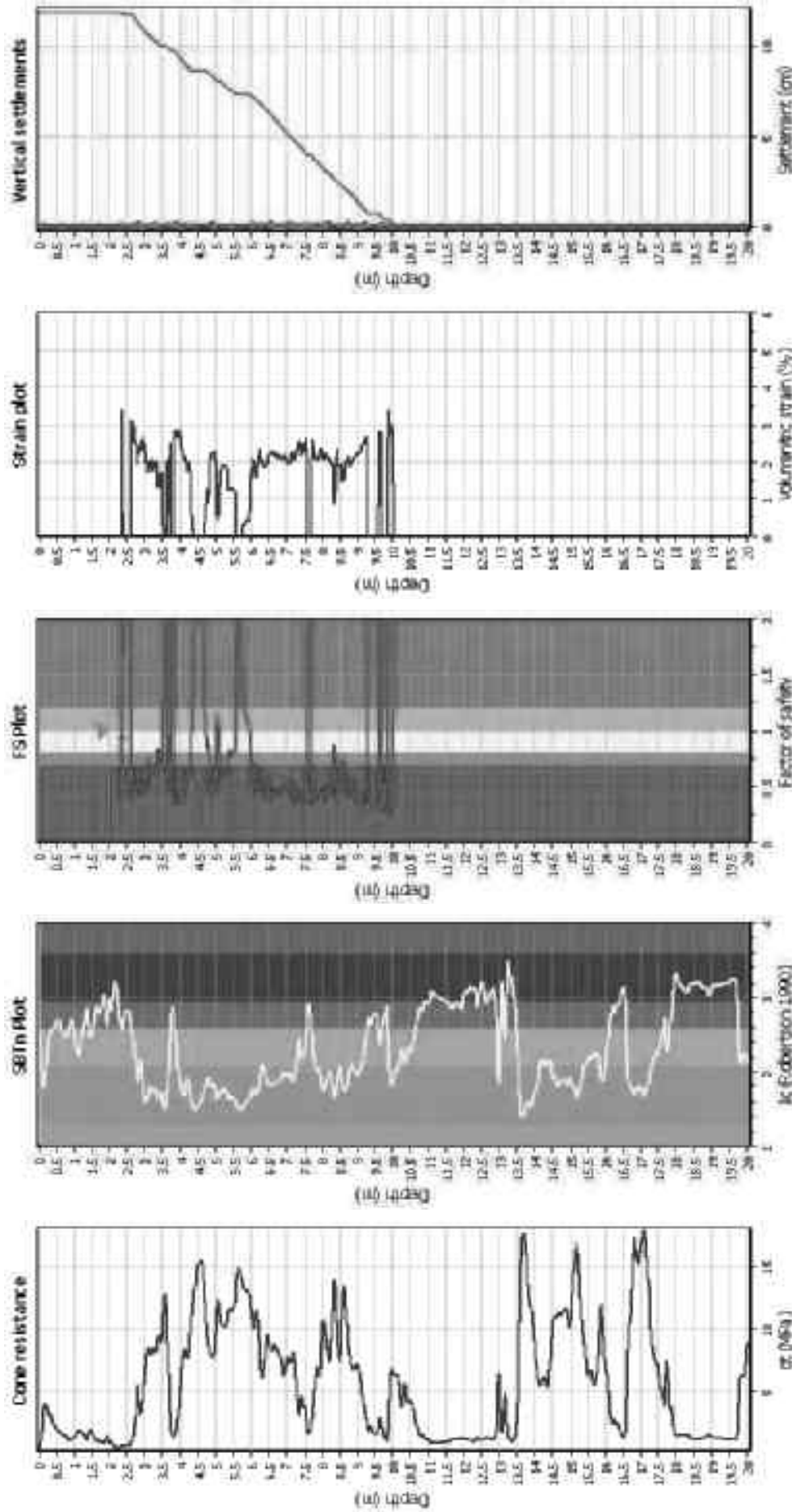
Depth to GWT (earthq.): 2.00 m  
 Average results interval: 3  
 $I_c$  cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

Fill weight: N/A  
 Transition (down): applied: No  
 $R_f$  applied: Yes  
 Clay size boundary applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- $q_t$ : Total cone resistance (cone resistance  $q_c$  corrected for pore water effects)
- $k_c$ : Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain



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**LIQUEFACTION ANALYSIS REPORT**

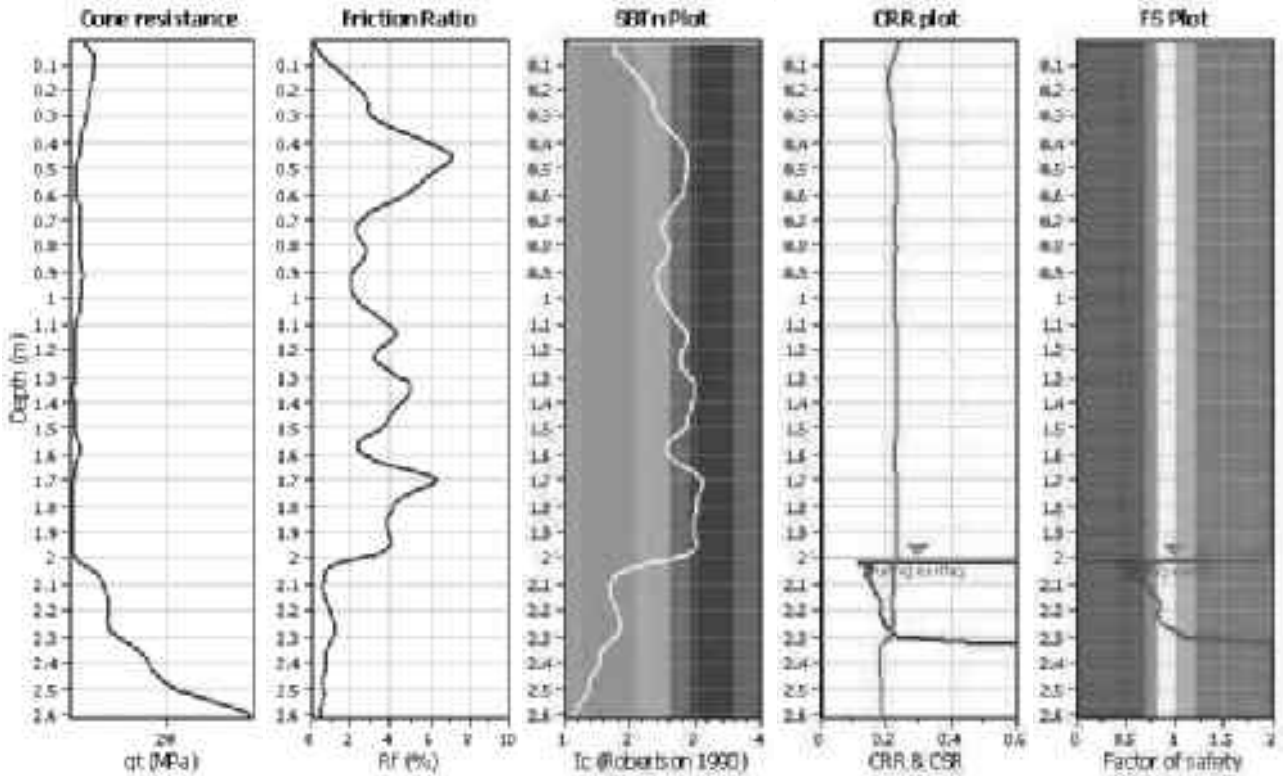
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

**CPT file : CPT207\_ULS**

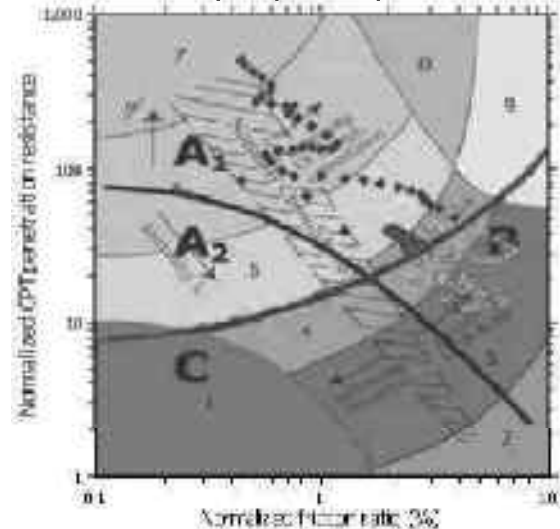
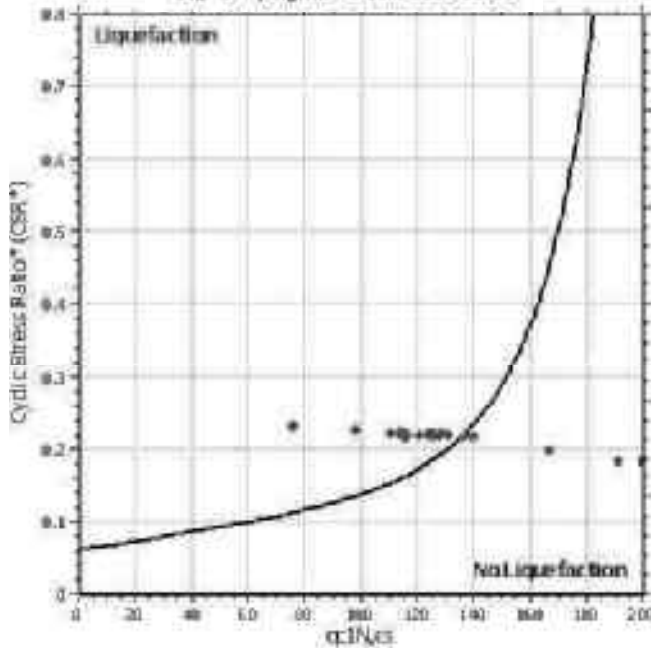
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. defect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



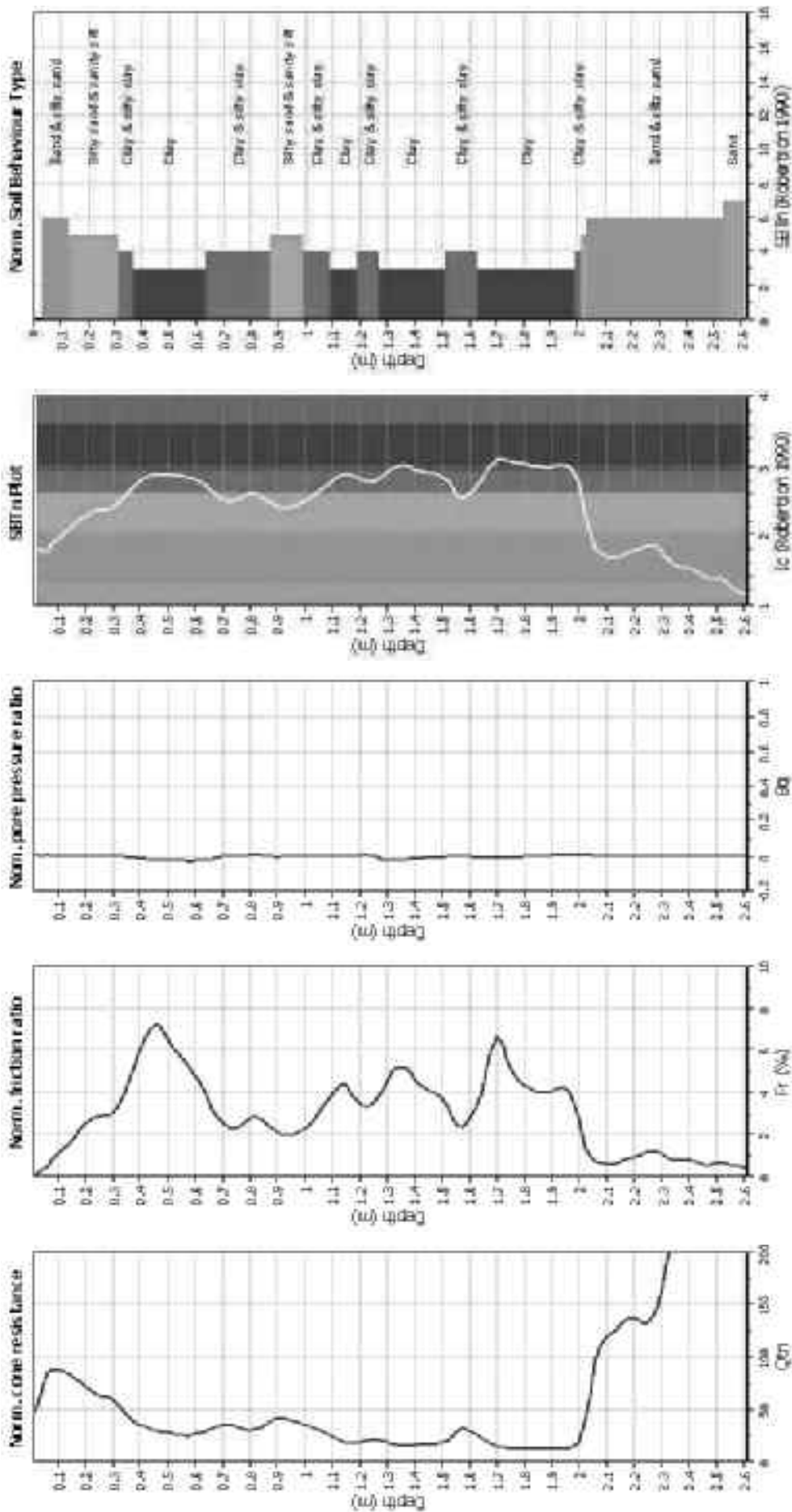
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A1: Cyclic liquefaction likely depending on size and number of cycles (static)  
 Zone A2: Cyclic liquefaction and strength loss likely depending on loading and global geometry  
 Zone C: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and global geometry.

### CPT basic interpretation plots (normaliz



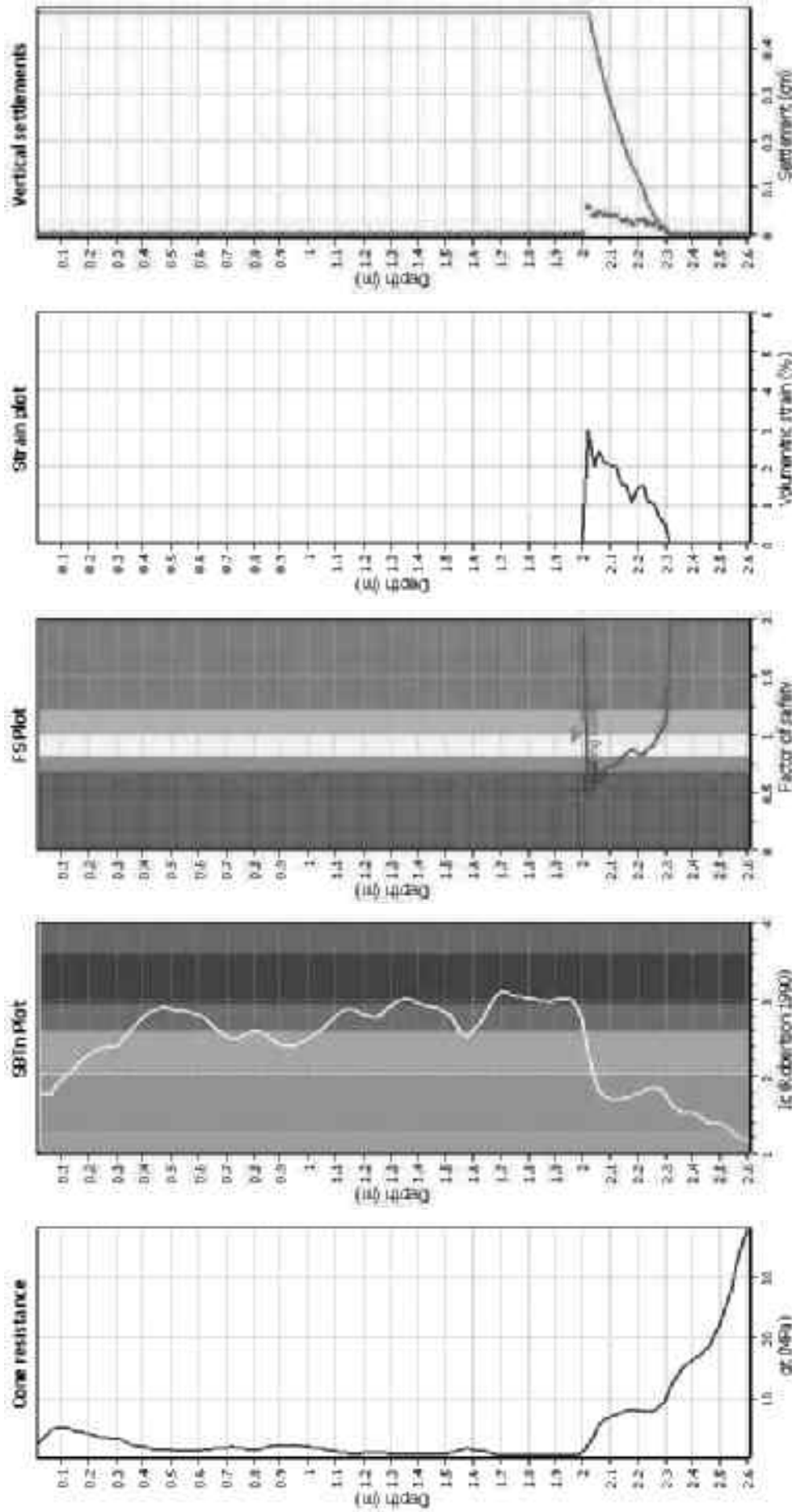
#### Input parameters and analysis data

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Fines correction method:	B&I (2014)	Transition (solect) applied:	No
Norm to test:	Based on Ic value	$f_c$ applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Clay size behavior applied:	Sands only
Peak ground acceleration:	0.42	Limit depth applied:	Yes
Depth to water table (meters):	2.00 m	Limit depth:	10.00 m
Depth to GW (earthq.):	2.00 m		
Average results interval:	3		
Ic cut-off value:	2.60		
Unit weight calculation:	Based on SBT		
Use fill:	No		
Fill height:	N/A		

#### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained

### Estimation of post-earthquake settlements



#### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volume strain: Post-liquefaction volumetric strain





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**LIQUEFACTION ANALYSIS REPORT**

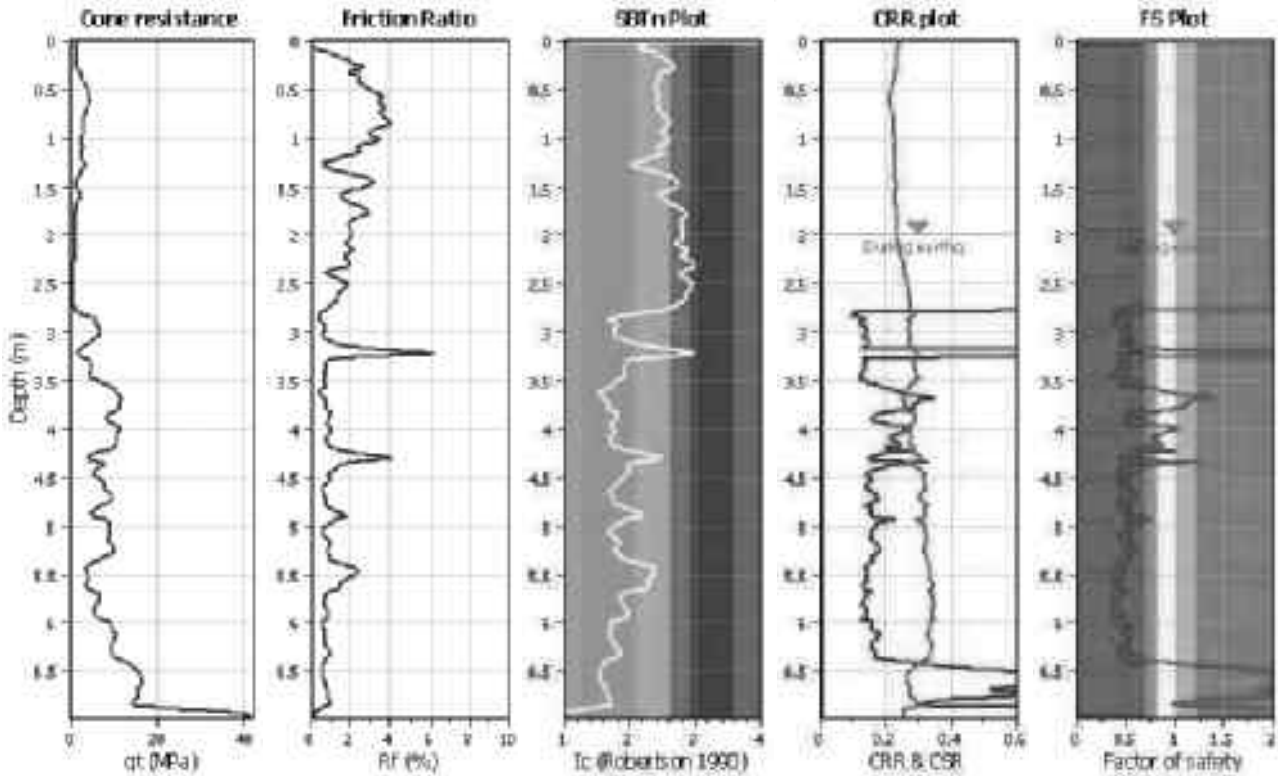
**Project title : Geotechnical Investigations**

**Location : Lyndhurst Road**

**CPT file : CPT208\_ULS**

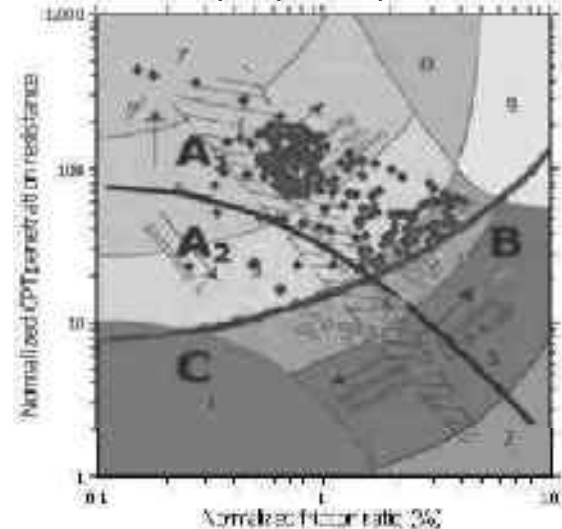
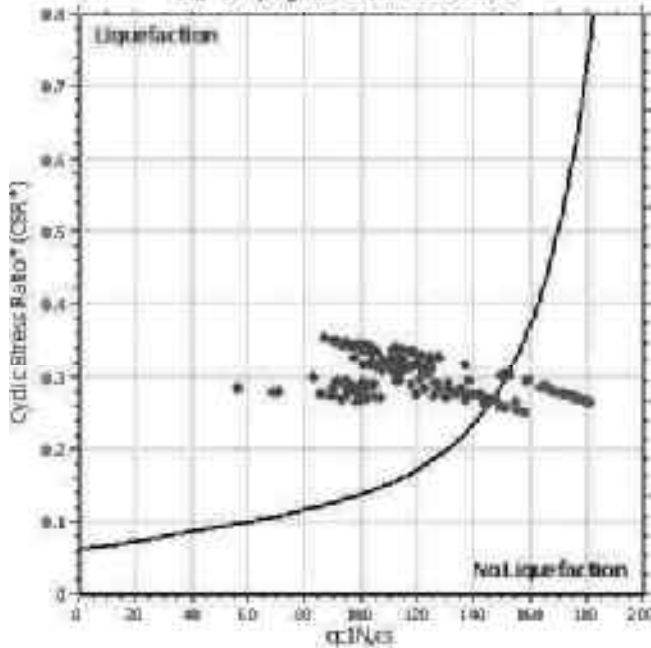
**Input parameters and analysis data**

Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use file:	No	Clay like behavior	
Friction correction method:	B&I (2014)	G.W.T. (earthq.):	2.00 m	Fill weight:	N/A	applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	Yes
Earthquake magnitude $M_w$ :	6.50	Ic cut-off value:	2.60	Thurs. detect. applied:	No	Limit depth:	10.00 m
Peak ground acceleration:	0.42	Unit weight calculation:	Based on SBT	$K_s$ applied:	Yes	MSF method:	Method



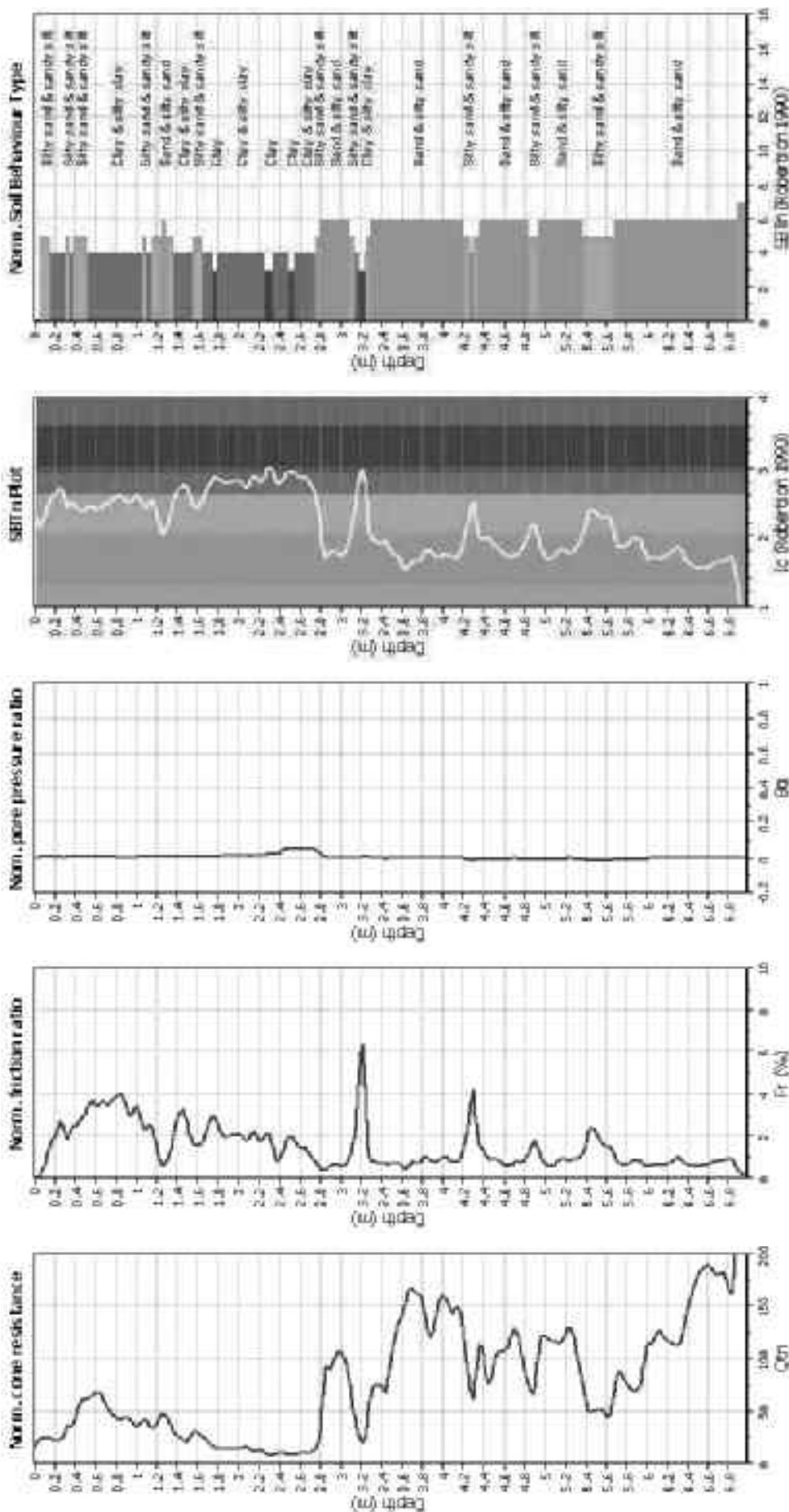
$M_w=7^{1/2}$ ,  $\sigma_v=1$  atm base curve

**Summary of liquefaction potential**



Zone A: Cyclic liquefaction likely depending on size and number of cycle (static)  
 Zone A<sub>2</sub>: Cyclic liquefaction and strength loss likely depending on loading and grain geometry  
 Zone B: Liquefaction and post-earthquake strength loss unlikely (check cyclic softening)  
 Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness, normality, strain to zero undrained strength and grain geometry.

### CPT basic interpretation plots (normaliz



#### Input parameters and analysis data

Analysis method: B&I (2014)  
 Fines correction method: B&I (2014)  
 Norm to test: Based on Ic value  
 Earthquake magnitude  $M_w$ : 6.50  
 Peak ground acceleration: 0.42  
 Depth to water table (meters): 2.00 m

Depth to GW (earthq.): 2.00 m  
 Average results interval: 3  
 Ic cut-off value: 2.60  
 Unit weight calculation: Based on SBT  
 Use fill: No  
 Fill height: N/A

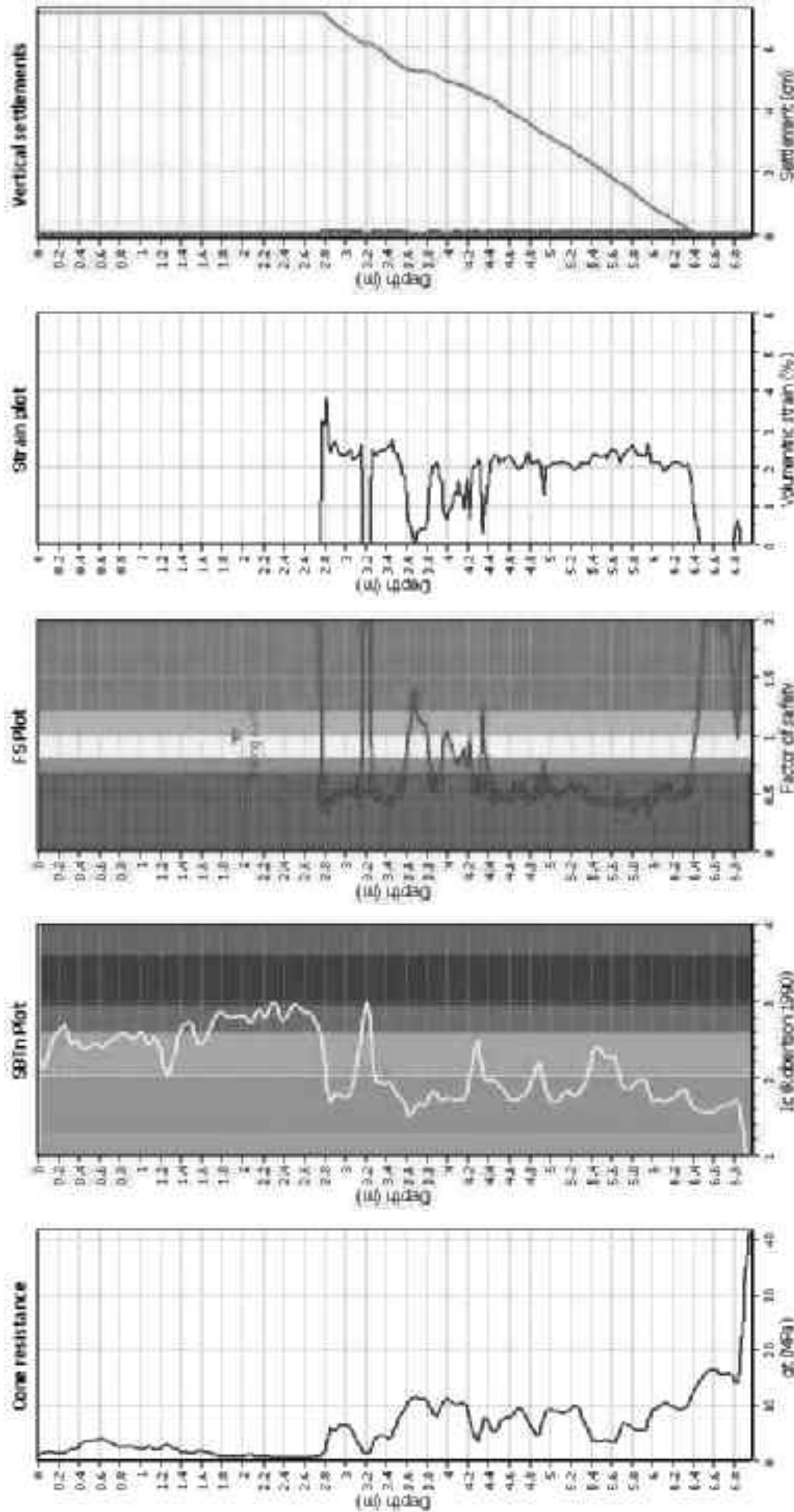
Fill weight: N/A  
 Transition (solect) applied: No  
 $f_c$  applied: Yes  
 Clay size behavior applied: Sands only  
 Limit depth applied: Yes  
 Limit depth: 10.00 m

#### SBTn legend

- 1. Sensitive fine grained
- 2. Organic material
- 3. Clay to silty clay
- 4. Clayey silt to silty
- 5. Silty sand to sandy silt
- 6. Clean sand to silty sand
- 7. Gravely sand to sand
- 8. Very stiff sand to
- 9. Very stiff fine grained



### Estimation of post-earthquake settlements



#### Abbreviations

- q<sub>t</sub>: Total cone resistance (cone resistance q<sub>c</sub> corrected for pore water effects)
- I<sub>c</sub>: Soil Behaviour Type Index
- FS: Calculated Factor of Safety against liquefaction
- Volumetric strain: Post-liquefaction volumetric strain

## APPENDIX D – FORM 6 (224c)

**APPENDIX 62  
FORM 6**

To: Hastings District Council  
Private Bag 9002  
HASTINGS 4156

**STATEMENT OF PROFESSIONAL OPINION AS TO SUITABILITY OF LAND FOR  
BUILDING DEVELOPMENT**

Subdivision: Stage 9 Lyndhurst Subdivision  
 Owner/Developer: Greenstone Land Development Ltd  
 Location: Hastings  
 I, GAMERON ANDREW WYLLIE  
 (full name)  
 of Resource Development Consultants Ltd  
 (address)

hereby confirm that:

1. I am a suitably qualified professional experienced in the field of Geotechnical Engineering and was retained by the owner/developer in this regard on the above subdivision. My qualifications are BSc, MSc, CEng, CMA Eng NE
2. The extent of my inspections during construction, and the results of all tests carried out are described in my report dated R-183970602A-02
3. In my professional opinion, not to be construed as a guarantee, I consider that:
  - \* a. ~~The earth fill shown on the approved Plan No. \_\_\_\_\_ placed in compliance with the Code of Practice of the Hastings District Council.~~
  - b. ~~The completed works give due regard to the land slope and foundation stability considerations.~~
  - c. ~~The filled ground is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604 and related documents providing that:~~
    - i. \_\_\_\_\_
    - ii. \_\_\_\_\_
    - iii. \_\_\_\_\_
  - \* d. The original ground not affected by filling is suitable for the erection thereon of residential buildings not requiring specific design in terms of NZS 3604 and related documents providing that:
    - i. Requires ground improvement in accordance with
    - ii. the RDC geotechnical Report R-183970602A-02
    - iii. \_\_\_\_\_
4. This professional opinion is furnished to the Council and the owner/developer for their purposes alone, on the express conditions that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of erection of any dwelling.

Signed [Signature] Date 30/07/19

\* Delete items not applicable.

A similar form for those giving their professional opinion relating to the new NES on contaminated soils

## Important Information about This

# Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

### Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled.* No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

### Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

### You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

### This Report May Not Be Reliable

*Do not rely on this report* if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be, and, in general, if you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying it.* A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

### Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures.

*Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

### **This Report's Recommendations Are Confirmation-Dependent**

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

### **This Report Could Be Misinterpreted**

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

### **Give Constructors a Complete Report and Guidance**

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may

perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

### **Read Responsibility Provisions Closely**

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

### **Geoenvironmental Concerns Are Not Covered**

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old*.

### **Obtain Professional Assistance to Deal with Moisture Infiltration and Mold**

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration*. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. *Geotechnical engineers are not building-envelope or mold specialists*.



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