Appendix F
Window Sampler Logs

aurecon
Aurecon (New Zealand) Limited
Unit 1, 150 Cavendish Road
PO BOX 1061
Christchurch 8140
New Zealand
Telephone: +64 3 366 0821
www.aurecongroup.com
Facsimile: +64 3 379 6955
Email: christchurch@ap.aurecongroup.com

Client: **Ngai Tahu Property Ltd & CDL Land Ltd**
Project Name: **Prestons Road Subdivision**
Location: **Prestons Road, Christchurch**
Project Reference: **223488**

CPT 115

BOREHOLE INFORMATION	**CO-ORDINATES N/A**		
Drilling Method: CPT Rig with Window Sampler	Easting: N/A	Date Started: 30/01/2012	Logged by: TJM, PTA
Diameter Core:	Northing: N/A	Date Completed: 30/01/2012	Input by: PTA
Contractor: McMillan Drilling	Ground Level: N/A	Inclination:	Checked by: JSM
		Orientation:	Verified by: JK

Method/Casing	Core Recovery (%)	Water Loss (%)	Groundwater Level (m)	R.L. (m)	Depth (m)	Graphic Log	Material Description	USC Description	Consistency/Density	Moisture	Sample	In-Situ Testing	Laboratory Testing	Notes	Backfill	Geological Unit
DP			NOT RECORDED		1		No sampling.						NO LABORATORY TESTING			
					2											
					3											
					3.70											
	100				4		SAND, brownish grey, wet, sand is fine to medium grained and uniformly graded.	SP		W						
					5											
					6											
					6.50		Borehole Terminated at 6.5m (Target Depth)									
					7											
					8											
					9											

Method
CC concrete core
OB open barrel
SSA solid stem auger
HSA hollow stem auger
WASH wash drill
PQ3 PQ Triple Tube
HQ3 HQ Triple Tube
NQ3 NQ Triple Tube
NMLC NMLC Triple Tube
DP Direct Push
DT Dual Tube (70mm)
Casing

USC Classification
CH Inorganic CLAYS high plasticity
CI Inorganic CLAYS medium plasticity
CL Inorganic CLAYS low plasticity
GC Clayey GRAVEL
GM Silty GRAVEL
GP Poorly Graded GRAVEL
GW Well Graded GRAVEL
MH Inorganic SILT high plasticity
ML Inorganic SILT low plasticity
OH ORGANIC CLAY medium to high plasticity
OL ORGANIC SILT low plasticity
PT PEAT and highly organic soils
SC Clayey SAND
SM Silty SAND
SP Poorly graded SAND
SW Well graded SAND

Consistency
VS very soft
S soft
F firm
S stiff
VS very stiff
H hard

Density
VL very loose
L loose
MD medium dense
D dense
VD very dense

Soil Samples
B bulk
U undisturbed
D disturbed

Water
at end of excavation
at time of excavation
at time of closure

In Situ Testing
PP pen penetrometer
VS vane shear
SPT std. pen. test
SS split spoon
SC solid cone
HB hammer bouncing
SH sinks under own weight

Moisture
D dry
M moist
W wet
S saturated

Backfill

Graphic Log
SAND

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Client: **Ngai Tahu Property Ltd & CDL Land Ltd**
Project Name: **Prestons Road Subdivision**
Location: **Prestons Road, Christchurch**
Project Reference: **223488**

CPT 127

BOREHOLE INFORMATION	**CO-ORDINATES N/A**		
Drilling Method: CPT Rig with Window Sampler	Easting: N/A	Date Started: 30/01/2012	Logged by: TJM, PTA
Diameter Core:	Northing: N/A	Date Completed: 30/01/2012	Input by: PTA
Contractor: McMillan Drilling	Ground Level: N/A	Inclination:	Checked by: JSM
		Orientation:	Verified by: JK

Method/Casing	Core Recovery (%)	Water Loss (%)	Groundwater Level (m)	R.L. (m)	Depth (m)	Graphic Log	Material Description	USC Description	Consistency/Density	Moisture	Sample	In-Situ Testing	Laboratory Testing	Notes	Backfill	Geological Unit
DP			NOT RECORDED		0		No sampling.						NO LABORATORY TESTING			
					6.00											
	100				6		SAND, light brownish grey, saturated, sand is fine to medium grained and uniformly graded.	SP		S						
					10.00		Borehole Terminated at 10m (Target Depth)									

Method
CC concrete core
OB open barrel
SSA solid stem auger
HSA hollow stem auger
WASH wash drill
PQ3 PQ Triple Tube
HQ3 HQ Triple Tube
NQ3 NQ Triple Tube
NMLC NMLC Triple Tube
DP Direct Push
DT Dual Tube (70mm)
Casing

USC Classification
CH Inorganic CLAYS high plasticity
CI Inorganic CLAYS medium plasticity
CL Inorganic CLAYS low plasticity
GC Clayey GRAVEL
GM Silty GRAVEL
GP Poorly Graded GRAVEL
GW Well Graded GRAVEL
MH Inorganic SILT high plasticity
ML Inorganic SILT low plasticity
OH ORGANIC CLAY medium to high plasticity
OL ORGANIC SILT low plasticity
PT PEAT and highly organic soils
SC Clayey SAND
SM Silty SAND
SP Poorly graded SAND
SW Well graded SAND

Consistency
VS very soft
S soft
F firm
S stiff
VS very stiff
H hard

Density
VL very loose
L loose
MD medium dense
D dense
VD very dense

Sub-Samples
B bulk
U undisturbed
D disturbed

Water
▽ at end of excavation
▼ at time of excavation
▼ at time of closure

In Situ Testing
PP pen penetrometer
VS vane shear
SPT std. pen. test
SS split spoon
SC solid cone
HB hammer bouncing
SH sinks under own weight

Moisture
D dry
M moist
W wet
S saturated

Backfill

Graphic Log
SAND

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Email: christchurch@ap.aurecongroup.com

Client: **Ngai Tahu Property Ltd & CDL Land Ltd**
Project Name: **Prestons Road Subdivision**
Location: **Prestons Road, Christchurch**
Project Reference: **223488**

CPT 140

BOREHOLE INFORMATION	**CO-ORDINATES N/A**		
Drilling Method: CPT Rig with Window Sampler	Easting: N/A	Date Started: 2/02/2012	Logged by: TJM, PTA
Diameter Core:	Northing: N/A	Date Completed: 2/02/2012	Input by: PTA
Contractor: McMillan Drilling	Ground Level: N/A	Inclination:	Checked by: JSM
		Orientation:	Verified by: JK

Method/Casing	Core Recovery (%)	Water Loss (%)	Groundwater Level (m)	R.L. (m)	Depth (m)	Graphic Log	Material Description	USC Description	Consistency/Density	Moisture	Sample	In-Situ Testing	Laboratory Testing	Notes	Backfill	Geological Unit
DP			NOT RECORDED		1		No sampling.						NO LABORATORY TESTING			
					2											
					3											
							3.60									
	100				4		SAND, brownish grey, wet, sand is fine to medium grained and uniformly graded.	SP		W						
					5											
					6											
					7											
					8											
							8.50									
					9		Borehole Terminated at 8.5m (Target Depth)									

Method
CC concrete core
OB open barrel
SSA solid stem auger
HSA hollow stem auger
WASH wash drill
PQ3 PQ Triple Tube
HQ3 HQ Triple Tube
NQ3 NQ Triple Tube
NMLC NMLC Triple Tube
DP Direct Push
DT Dual Tube (70mm)
Casing

USC Classification
CH Inorganic CLAYS high plasticity
CI Inorganic CLAYS medium plasticity
CL Inorganic CLAYS low plasticity
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GM Silty GRAVEL
GP Poorly Graded GRAVEL
GW Well Graded GRAVEL
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OH ORGANIC CLAY medium to high plasticity
OL ORGANIC SILT low plasticity
PT PEAT and highly organic soils
SC Clayey SAND
SM Silty SAND
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SW Well graded SAND

Consistency
VS very soft
S soft
F firm
S stiff
VS very stiff
H hard

Density
VL very loose
L loose
MD medium dense
D dense
VD very dense

Soil Samples
B bulk
U undisturbed
D disturbed

Water
at end of excavation
at time of excavation
at time of closure

In Situ Testing
PP pen penetrometer
VS vane shear
SPT std. pen. test
SS split spoon
SC solid cone
HB hammer bouncing
SH sinks under own weight

Moisture
D dry
M moist
W wet
S saturated

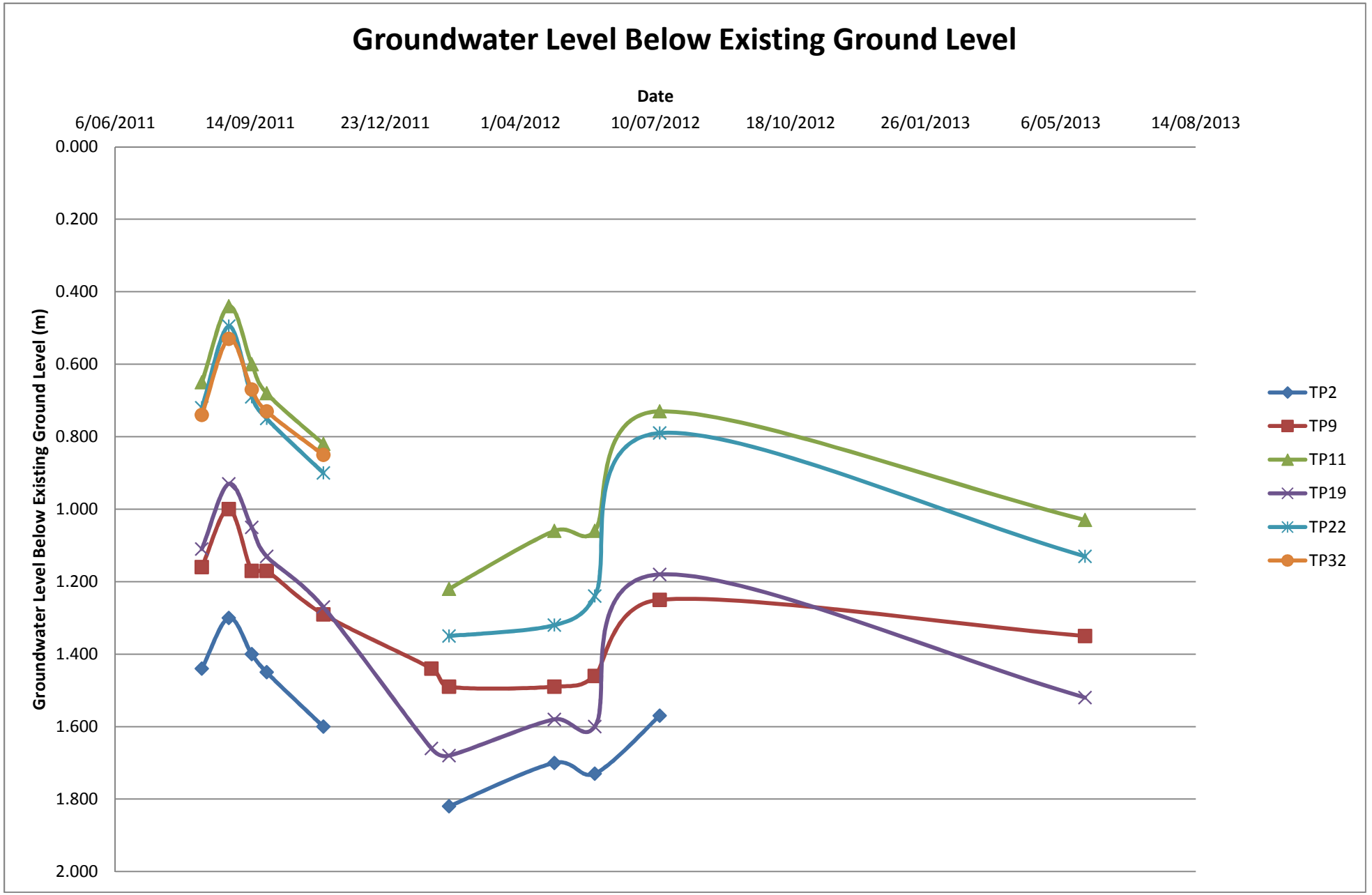
Backfill

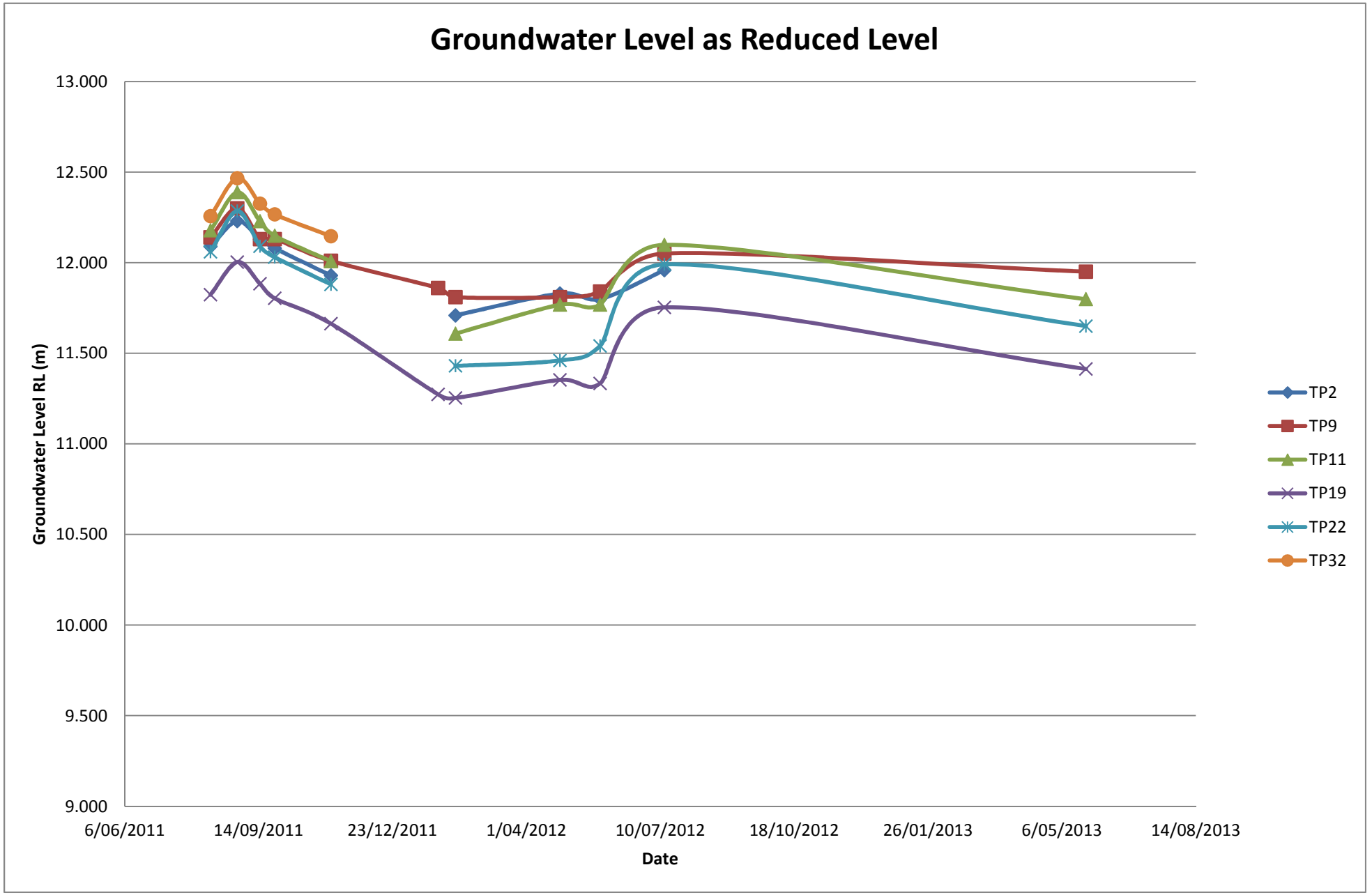
Graphic Log
SAND

Last Generated: 28/05/2012 10:57:28 a.m.

Database File: SAMPLES LOG.GPJ, Library: AURECON CHRISTCHURCH.GLB, Data template: CHCH DATA TEMPLATE NOV 2010.GDT

Appendix G
Groundwater Monitoring


Groundwater Level Below Existing Ground Level
Date
6/06/2011
14/09/2011
23/12/2011
1/04/2012
10/07/2012
18/10/2012
26/01/2013
6/05/2013
14/08/2013
Groundwater Level Below Existing Ground Level (m)
0.000
0.200
0.400
0.600
0.800
1.000
1.200
1.400
1.600
1.800
2.000
TP2
TP9
TP11
TP19
TP22
TP32


Groundwater Level as Reduced Level
13.000
12.500
12.000
11.500
11.000
10.500
10.000
9.500
9.000
Groundwater Level RL (m)
6/06/2011
14/09/2011
23/12/2011
1/04/2012
10/07/2012
18/10/2012
26/01/2013
6/05/2013
14/08/2013
Date
TP2
TP9
TP11
TP19
TP22
TP32

Appendix H
Laboratory Results

Central Testing Services
18 Ngapara Street, P.O. Box 397, ALEXANDRA, Central Otago, NZ
Telephone (03) 448 7644, Fax (03) 448 7401, Email alan.julius@xtra.co.nz

Reference No: 11/1151

Date: 27 August 2011

TEST REPORT – PRESTONS INVESTIGATIONS

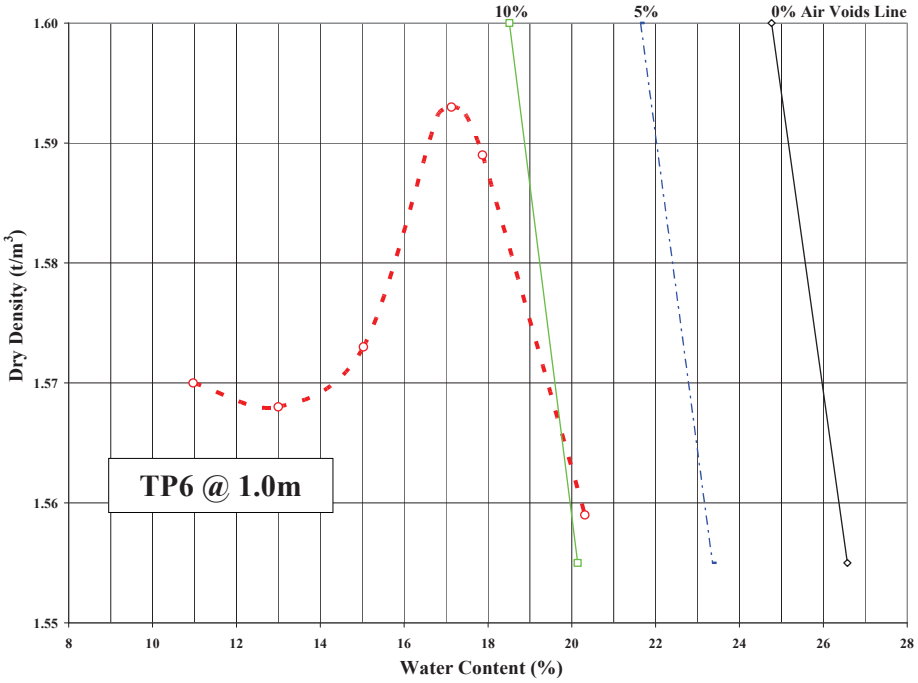
Client Details:	**Aurecon New Zealand Ltd, P.O. Box 1061, Christchurch**	**Attention:**	**James Muirson**
Job Description:	**Prestons Subdivision Investigations, Prestons Road, Christchurch**		
Sample Description:	**SAND**	**Sample Source:**	**TP:6 @ 1.0m**
Sampled By:	**M. Derksen**	**Date Received:**	**18-Aug-11**
Date & Time Sampled:	**4-Aug-11**	**Sample Method:**	**Test Pit**

WATER CONTENT & NZ STANDARD COMPACTION - NZS 4402:1986, Test 2.1 & 4.1.1

% Retained: (+19.0mm Test Sieve)	**0.0 %**
Water Content: (As Received)	**4.9 %**
Maximum Dry Density:	**1.59 t/m^3**
Optimum Water Content:	**17.0 %**

Notes:

- *The sample received was in a natural state.*
- *The material tested in the NZ Standard Compaction test was whole soil.*
- *The air voids lines were calculated from an assumed solid dry density of 2.65 t/m^3.*



Additional Notes:

- *IANZ endorsement of this report applies to the samples as received.*
- *IANZ endorsement of this report does not apply to the sample description.*
- *This report may not be reproduced except in full.*

Tested By: B.J. Lippers & A.P. Julius **Date: 19 to 26-Aug-11**

Transcriptions Checked By: apjulius

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

434 new zealand accredited laboratory

Central Testing Services
18 Ngapara Street, P.O. Box 397, ALEXANDRA, Central Otago, NZ
Telephone (03) 448 7644, Fax (03) 448 7401, Email alan.julius@xtra.co.nz

Reference No: 11/1151

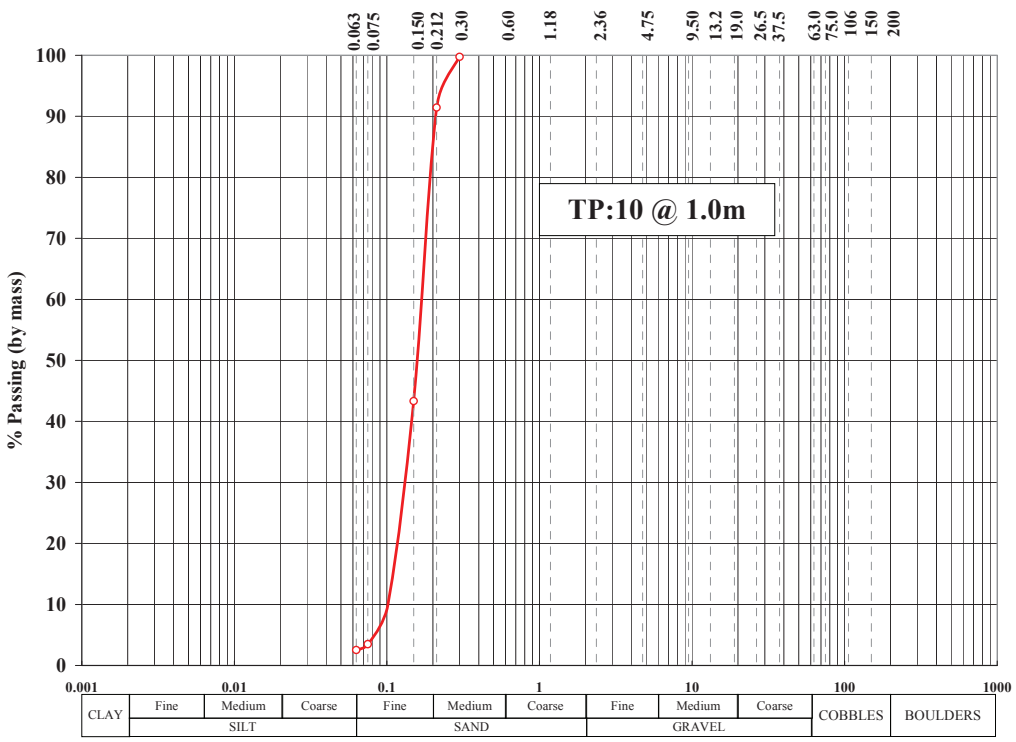
Date: 27 August 2011

TEST REPORT – PRESTONS INVESTIGATIONS (cont.)

Client Details:	**Aurecon New Zealand Ltd, P.O. Box 1061, Christchurch**	**Attention:**	**James Muirson**
Job Description:	**Prestons Subdivision Investigations, Prestons Road, Christchurch**		
Sample Description:	**f/m SAND with trace of silt**	**Sample Source:**	**TP:10 @ 1.0m**
Sampled By:	**M. Derksen**	**Date Received:**	**18-Aug-11**
Date & Time Sampled:	**3-Aug-11 @ 8.30am**	**Sample Method:**	**Test Pit**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
37.5	
26.5	
19.0	
13.2	
9.50	
4.75	
2.00	
1.18	
0.60	
0.30	100
0.212	91
0.150	43
0.075	3
0.063	3



The material was received in a natural state.
The percentage passing the 63µm test sieve was obtained by difference.

WATER CONTENT - NZS 4402:1986, Test 2.1	
Water Content: (As Received)	**22.5 %**
Note: The sample received was in a natural state.	

Additional Notes:

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Tested By: B.J. Lippers & A.P. Julius **Date: 19 to 26-Aug-11**

Transcriptions Checked By:

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Reference No: 11/1151

Date: 27 August 2011

TEST REPORT – PRESTONS INVESTIGATIONS (cont.)

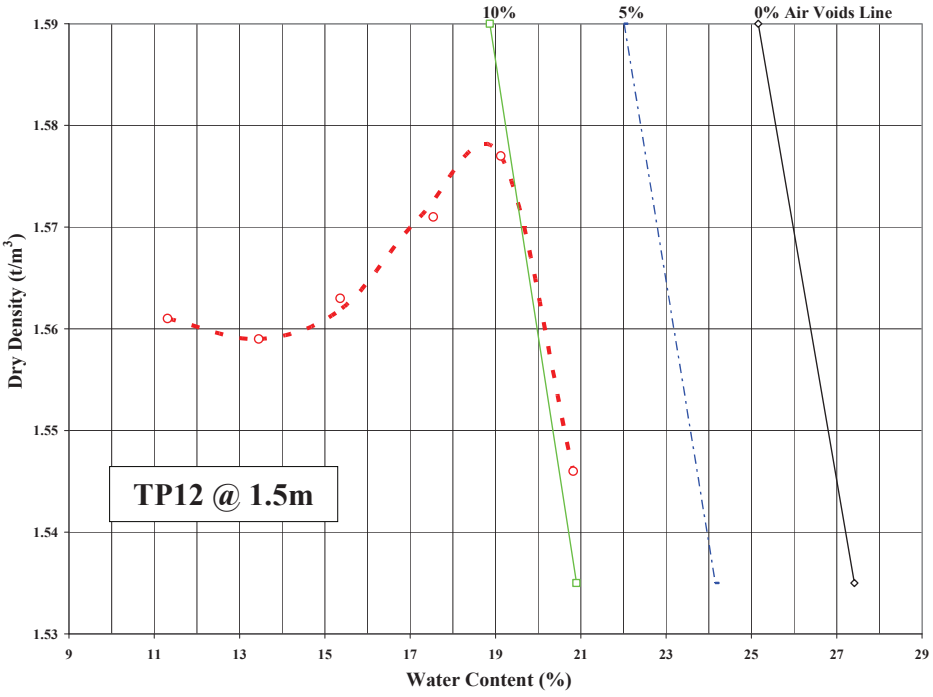
Client Details:	**Aurecon New Zealand Ltd, P.O. Box 1061, Christchurch**	**Attention:**	**James Muirson**
Job Description:	**Prestons Subdivision Investigations, Prestons Road, Christchurch**		
Sample Description:	**SAND**	**Sample Source:**	**TP:12 @ 1.5m**
Sampled By:	**M. Derksen**	**Date Received:**	**18-Aug-11**
Date & Time Sampled:	**4-Aug-11 @ 11.00am**	**Sample Method:**	**Test Pit**

WATER CONTENT & NZ STANDARD COMPACTION - NZS 4402:1986, Test 2.1 & 4.1.1

% Retained: (+19.0mm Test Sieve)	**0.0 %**
Water Content: (As Received)	**21.4 %**
Maximum Dry Density:	**1.58 t/m^3**
Optimum Water Content:	**19.0 %**

Notes:

- *The sample received was in a natural state.*
- *The material tested in the NZ Standard Compaction test was whole soil.*
- *The air voids lines were calculated from an assumed solid dry density of 2.65 t/m^3.*



Additional Notes:

- *IANZ endorsement of this report applies to the samples as received.*
- *IANZ endorsement of this report does not apply to the sample description.*
- *This report may not be reproduced except in full.*

Tested By: B.J. Lippers & A.P. Julius **Date: 19 to 26-Aug-11**

Transcriptions Checked By:

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Telephone (03) 448 7644, Fax (03) 448 7401, Email alan.julius@xtra.co.nz

Reference No: 11/1151

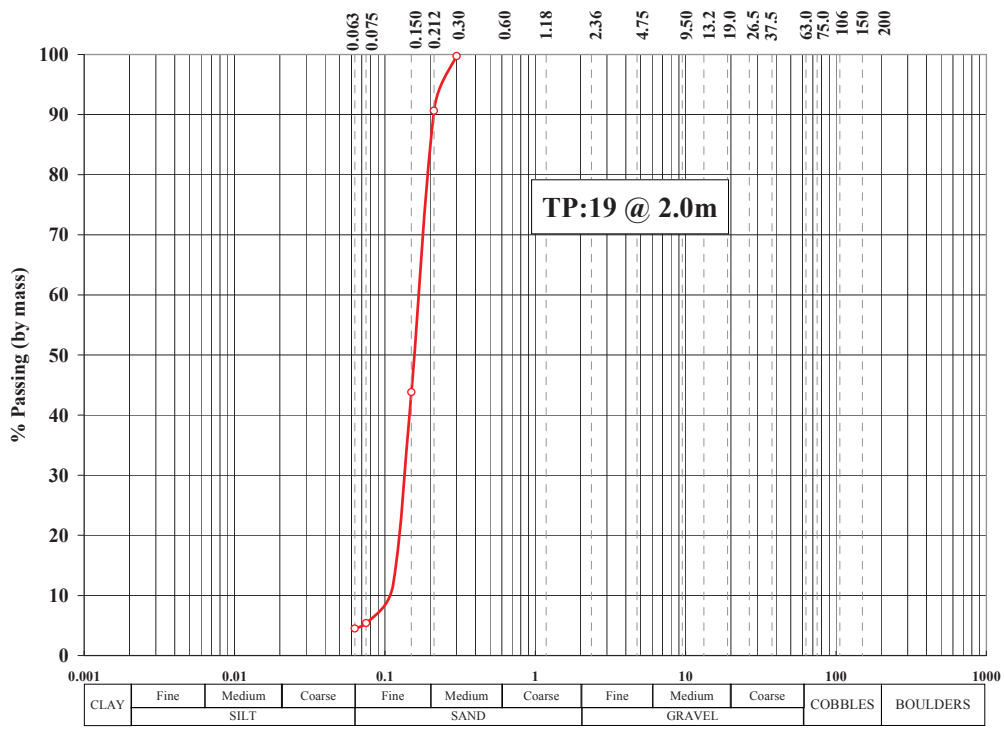
Date: 27 August 2011

TEST REPORT – PRESTONS INVESTIGATIONS (cont.)

Client Details:	**Aurecon New Zealand Ltd, P.O. Box 1061, Christchurch**	**Attention:**	**James Muirson**
Job Description:	**Prestons Subdivision Investigations, Prestons Road, Christchurch**		
Sample Description:	**f/m SAND with trace of silt**	**Sample Source:**	**TP:19 @ 2.0m**
Sampled By:	**M. Derksen**	**Date Received:**	**18-Aug-11**
Date & Time Sampled:	**3-Aug-11 @ 11.50am**	**Sample Method:**	**Test Pit**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
37.5	
26.5	
19.0	
13.2	
9.50	
4.75	
2.00	
1.18	
0.60	
0.30	100
0.212	91
0.150	44
0.075	5
0.063	4



The material was received in a natural state.
The percentage passing the 63µm test sieve was obtained by difference.

WATER CONTENT - NZS 4402:1986, Test 2.1	
Water Content: (As Received)	**19.4 %**
Note: The sample received was in a natural state.	

Additional Notes:

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- *IANZ endorsement of this report does not apply to the sample description.*
- *This report may not be reproduced except in full.*

Tested By: B.J. Lippers & A.P. Julius **Date: 19 to 26-Aug-11**

Transcriptions Checked By:

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

434 new zealand accredited laboratory

Central Testing Services
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Telephone (03) 448 7644, Fax (03) 448 7401, Email alan.julius@xtra.co.nz

Reference No: 11/1151

Date: 27 August 2011

TEST REPORT – PRESTONS INVESTIGATIONS (cont.)

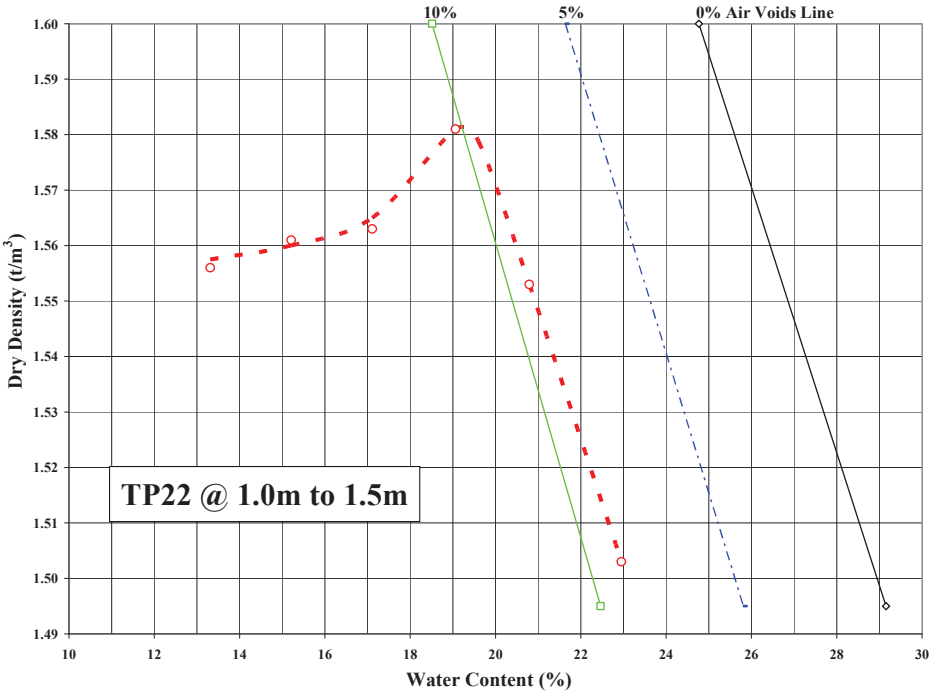
Client Details:	**Aurecon New Zealand Ltd, P.O. Box 1061, Christchurch**	**Attention:**	**James Muirson**
Job Description:	**Prestons Subdivision Investigations, Prestons Road, Christchurch**		
Sample Description:	**SAND**	**Sample Source:**	**TP:22 @ 1.0m to 1.5m**
Sampled By:	**M. Derksen**	**Date Received:**	**18-Aug-11**
Date & Time Sampled:	**3-Aug-11 @ 11.00am**	**Sample Method:**	**Test Pit**

WATER CONTENT & NZ STANDARD COMPACTION - NZS 4402:1986, Test 2.1 & 4.1.1

% Retained: (+19.0mm Test Sieve)	**0.0 %**
Water Content: (As Received)	**24.5 %**
Maximum Dry Density:	**1.58 t/m^3**
Optimum Water Content:	**19.0 %**

Notes:

- *The sample received was in a natural state.*
- *The material tested in the NZ Standard Compaction test was whole soil.*
- *The air voids lines were calculated from an assumed solid dry density of 2.65 t/m^3.*



Additional Notes:

- *IANZ endorsement of this report applies to the samples as received.*
- *IANZ endorsement of this report does not apply to the sample description.*
- *This report may not be reproduced except in full.*

Tested By: B.J. Lippers & A.P. Julius **Date: 19 to 26-Aug-11**

Transcriptions Checked By:

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Telephone (03) 448 7644, Fax (03) 448 7401, Email alan.julius@xtra.co.nz

Reference No: 11/1151

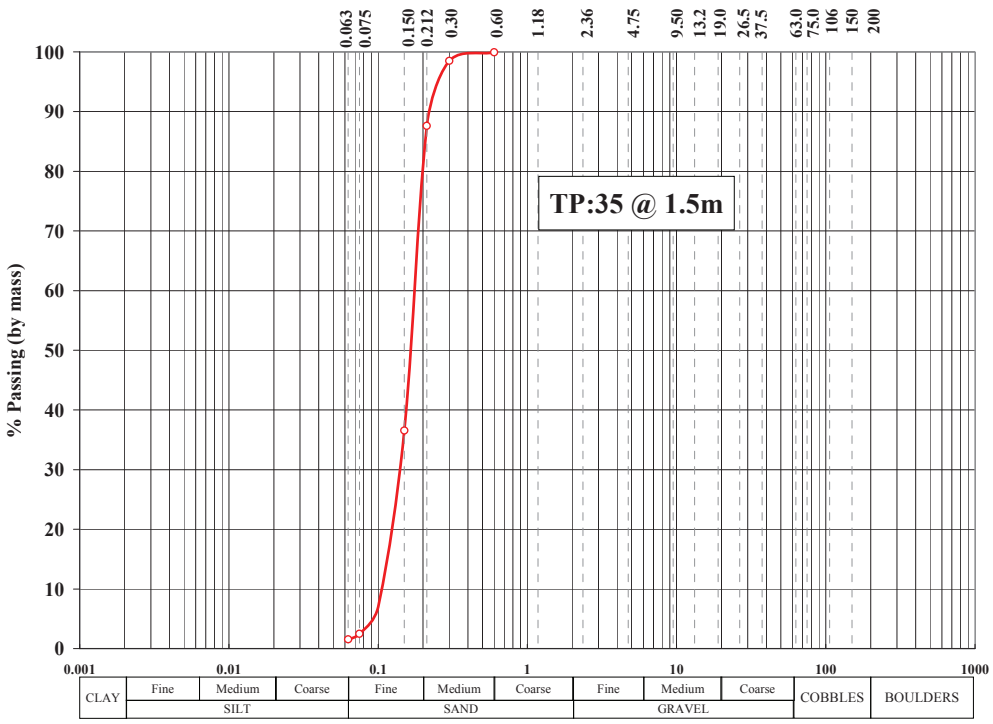
Date: 27 August 2011

TEST REPORT – PRESTONS INVESTIGATIONS (cont.)

Client Details:	**Aurecon New Zealand Ltd, P.O. Box 1061, Christchurch**	**Attention:**	**James Muirson**
Job Description:	**Prestons Subdivision Investigations, Prestons Road, Christchurch**		
Sample Description:	**f/m SAND with trace of silt**	**Sample Source:**	**TP:35 @ 1.5m**
Sampled By:	**M. Derksen**	**Date Received:**	**18-Aug-11**
Date & Time Sampled:	**4-Aug-11 @ 7.45am**	**Sample Method:**	**Test Pit**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
37.5	
26.5	
19.0	
13.2	
9.50	
4.75	
2.00	
1.18	
0.60	100
0.30	99
0.212	88
0.150	37
0.075	2
0.063	2



The material was received in a natural state.
The percentage passing the 63µm test sieve was obtained by difference.

WATER CONTENT - NZS 4402:1986, Test 2.1	
Water Content: (As Received)	**19.5 %**
Note: The sample received was in a natural state.	

Additional Notes:

- *IANZ endorsement of this report applies to the samples as received.*
- *IANZ endorsement of this report does not apply to the sample description.*
- *This report may not be reproduced except in full.*

Tested By: B.J. Lippers & A.P. Julius **Date: 19 to 26-Aug-11**

Transcriptions Checked By:

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

434 new zealand accredited laboratory

Central Testing Services
18 Ngapara Street, P.O. Box 397, ALEXANDRA, Central Otago, NZ
Telephone (03) 448 7644, Fax (03) 448 7401, Email alan.julius@xtra.co.nz

Reference No: 12/388

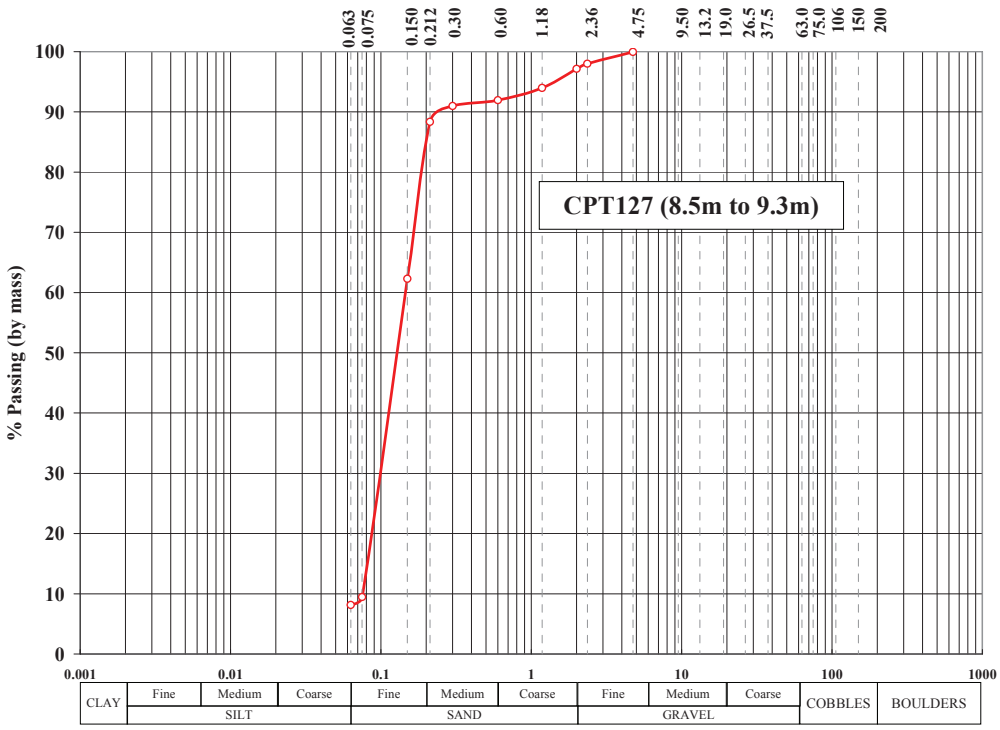
Date: 13 March 2012

TEST REPORT – PRESTON INVESTIGATIONS

Client Details:	**Aurecon New Zealand Ltd, P.O. Box 1061, Christchurch**	**Attention:**	**M. Derken**
Job Description:	**Preston Investigations**	**Sample Source:**	**CPT127 @ 8.5m to 9.3m**
Sample Description:	**f/c SAND with minor silt**	**Sampled By:**	**Aurecon Staff**
Date & Time Sampled:	**Unknown**	**Sample Method:**	**CPT**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
37.5	
26.5	
19.0	
13.2	
9.50	
4.75	100
2.36	98
2.00	97
1.18	94
0.60	92
0.30	91
0.212	88
0.150	62
0.075	9
0.063	8



The material was received in a natural state.
The percentage passing the 63µm test sieve was obtained by difference.

WATER CONTENT RESULT - NZS 4402:1986, Test 2.1	
Water Content: (As Received)	**11.8 %**
Note: The sample received was in a natural state.	

Note:

- *IANZ endorsement of this report applies to the samples as received.*
- *IANZ endorsement of this report does not apply to the sample description.*
- *This report may not be reproduced except in full.*

Tested By: A.P. Julius **Date: 3 to 12-Mar-12**

Transcriptions Checked By:

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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Central Testing Services
18 Ngapara Street, P.O. Box 397, ALEXANDRA, Central Otago, NZ
Telephone (03) 448 7644, Fax (03) 448 7401, Email alan.julius@xtra.co.nz

Reference No: 12/388

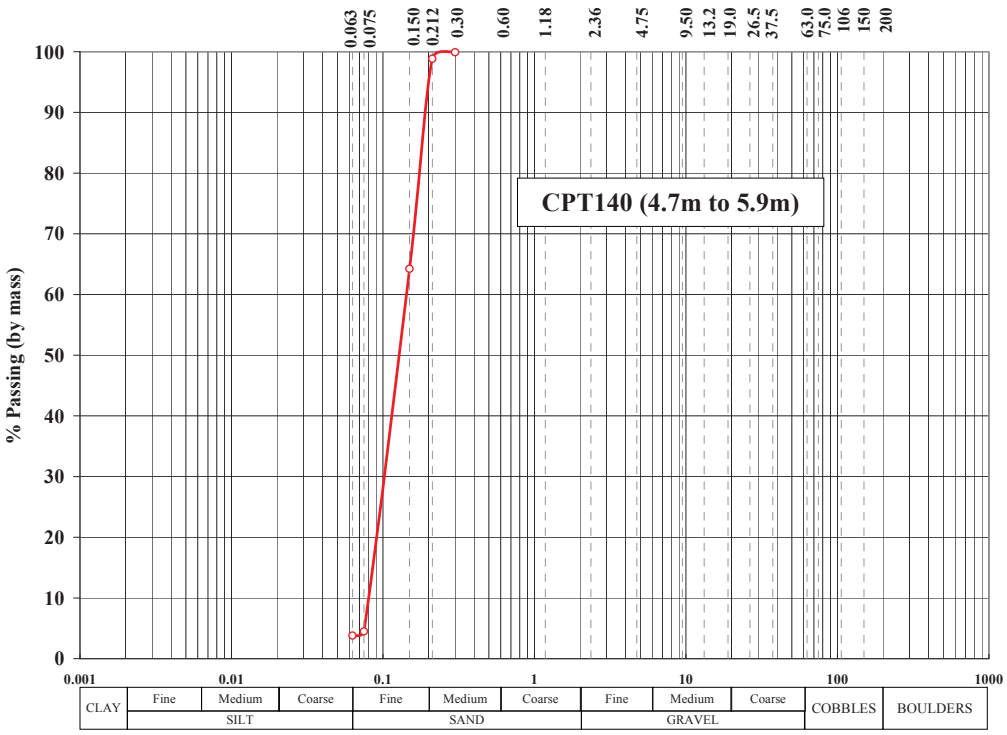
Date: 13 March 2012

TEST REPORT – PRESTON INVESTIGATIONS

Client Details:	**Aurecon New Zealand Ltd, P.O. Box 1061, Christchurch**	**Attention:**	**M. Derken**
Job Description:	**Preston Investigations**	**Sample Source:**	**CPT140 @ 4.7m to 5.9m**
Sample Description:	**f/m SAND with trace of silt**	**Sampled By:**	**Aurecon Staff**
Date & Time Sampled:	**Unknown**	**Sample Method:**	**CPT**

PARTICLE SIZE ANALYSIS (NZS 4402:1986, Test 2.8.1)

Test Sieve (mm)	% Passing (by mass)
37.5	
26.5	
19.0	
13.2	
9.50	
4.75	
2.00	
1.18	
0.60	
0.30	100
0.212	99
0.150	64
0.075	4
0.063	4



The material was received in a natural state.
The percentage passing the 63µm test sieve was obtained by difference.

WATER CONTENT RESULT - NZS 4402:1986, Test 2.1	
Water Content: (As Received)	**24.2 %**
Note: The sample received was in a natural state.	

Note:

- *IANZ endorsement of this report applies to the samples as received.*
- *IANZ endorsement of this report does not apply to the sample description.*
- *This report may not be reproduced except in full.*

Tested By: A.P. Julius **Date: 3 to 12-Mar-12**

Transcriptions Checked By:

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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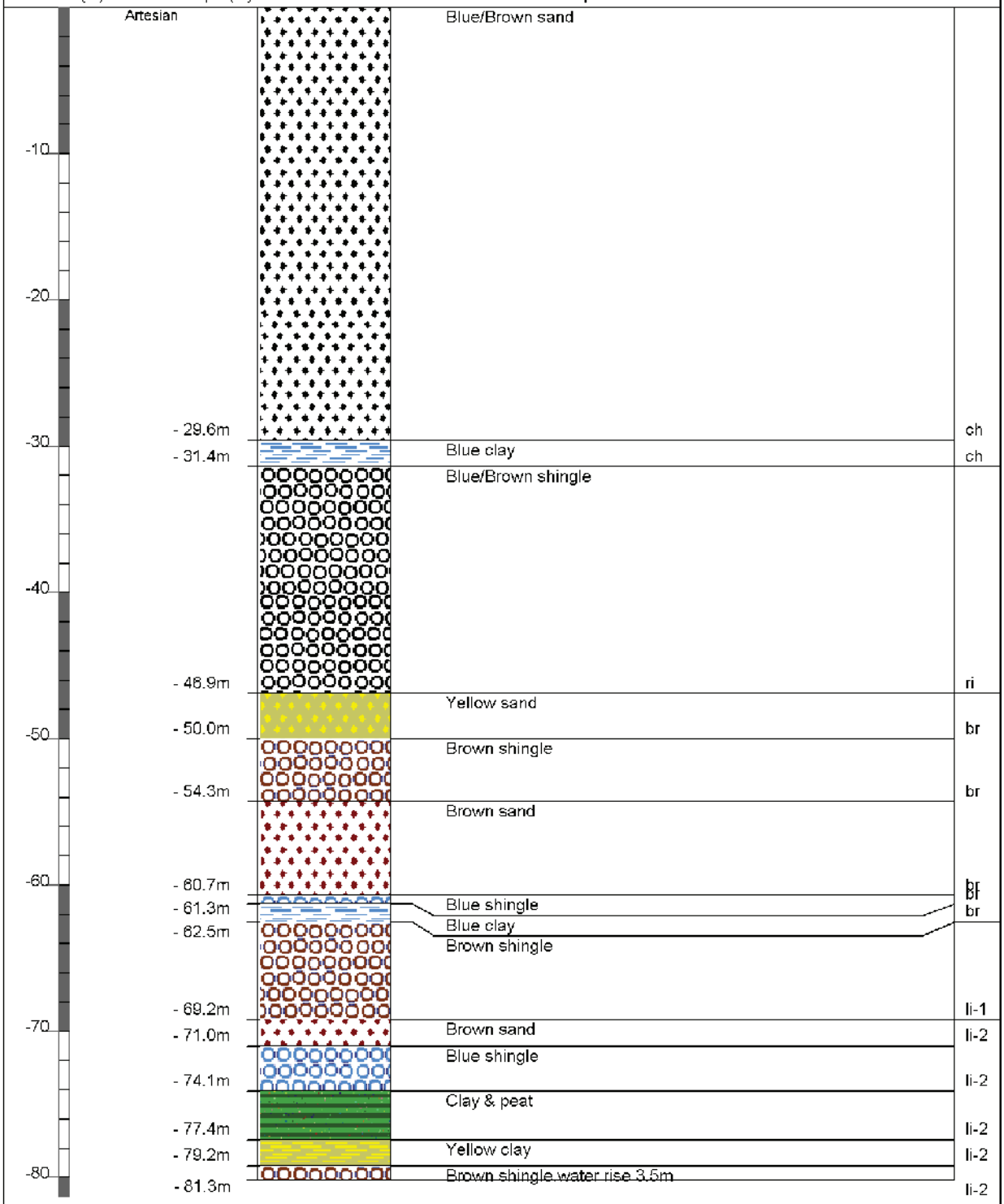
Appendix I
ECan Logs

Borelog for well M35/1575

Gridref: M35:837-469 Accuracy : 4 (1=high, 5=low)
Ground Level Altitude : 4.6 +MSD
Driller : Job Osborne (& Co/Ltd)
Drill Method : Unknown
Drill Depth : -80.19m Drill Date : 30/11/1922

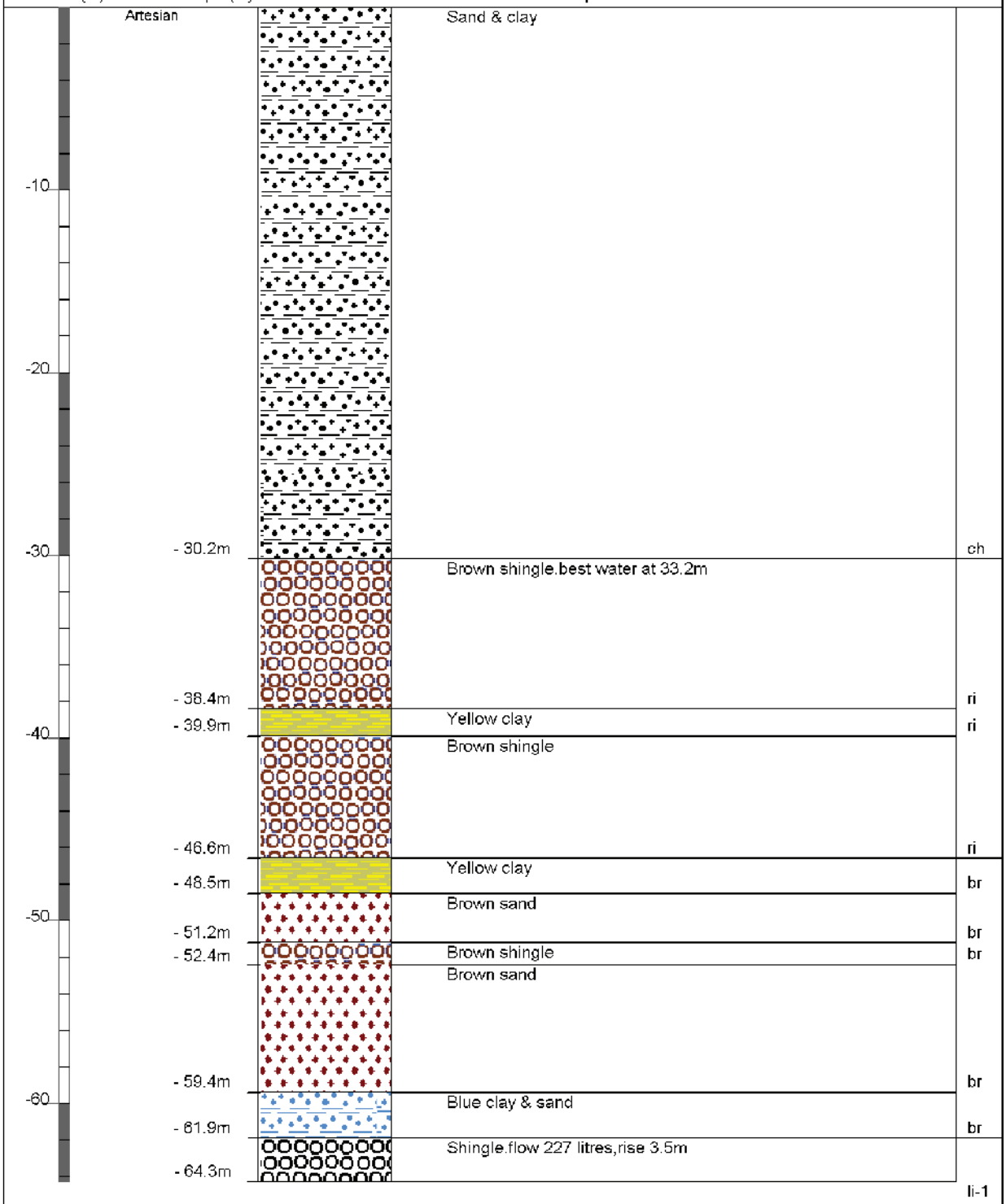
Environment Canterbury Regional Council



Borelog for well M35/1608

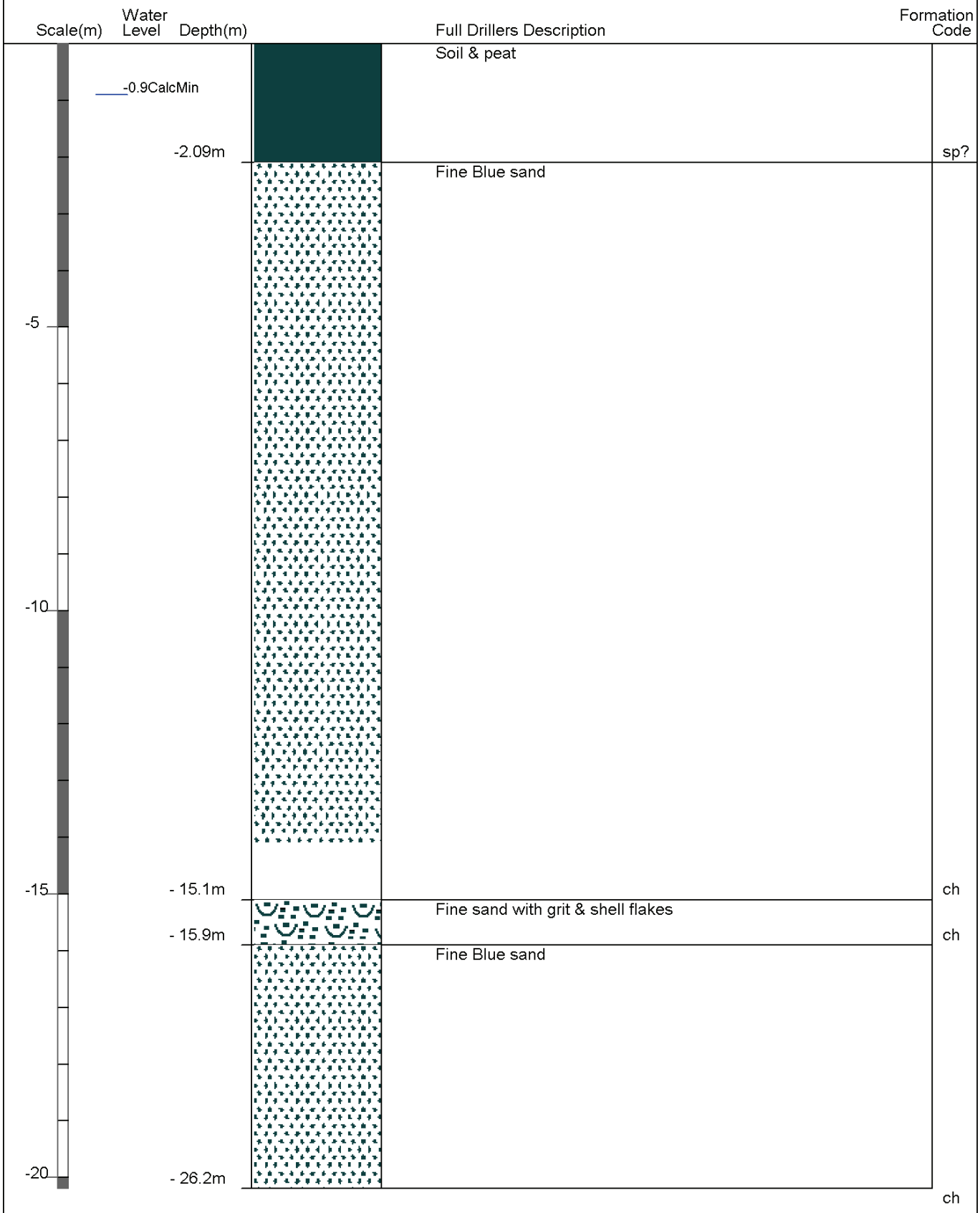
Gridref: M35:835-469 Accuracy : 4 (1=high, 5=low)
Ground Level Altitude : 4.6 +MSD
Driller : not known
Drill Method : Driven Pipe
Drill Depth : -64.3m Drill Date :

Environment Canterbury Regional Council



Borelog for well M35/4577 page 1 of 2

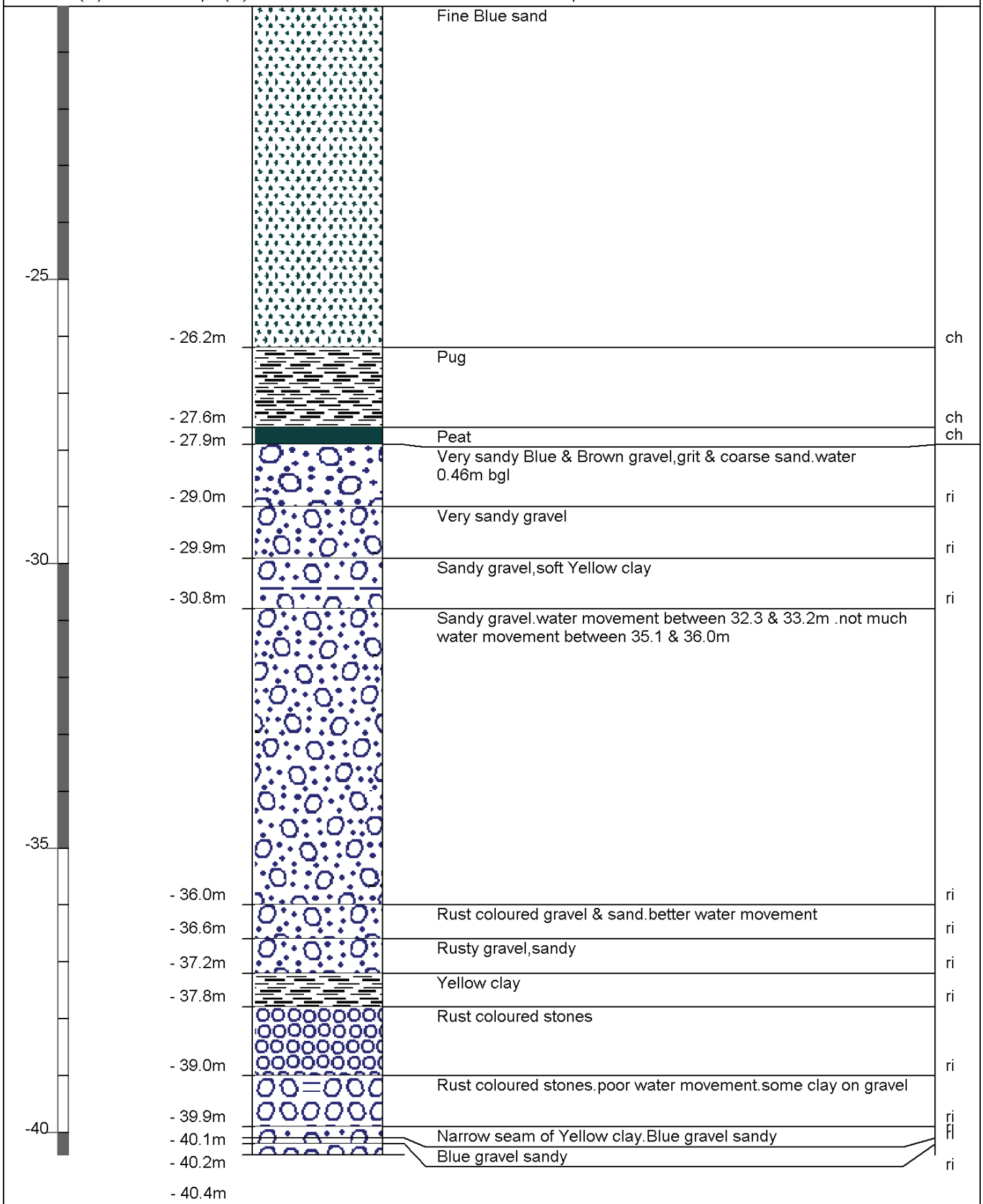
Gridref: M35:8324-4805 Accuracy : 4 (1=best, 4=worst)
Ground Level Altitude : 4.9 +MSD
Driller : Stevens J O
Drill Method : Cable Tool
Drill Depth : -40.4m Drill Date : 22/11/1984



Borelog for well M35/4577 page 2 of 2

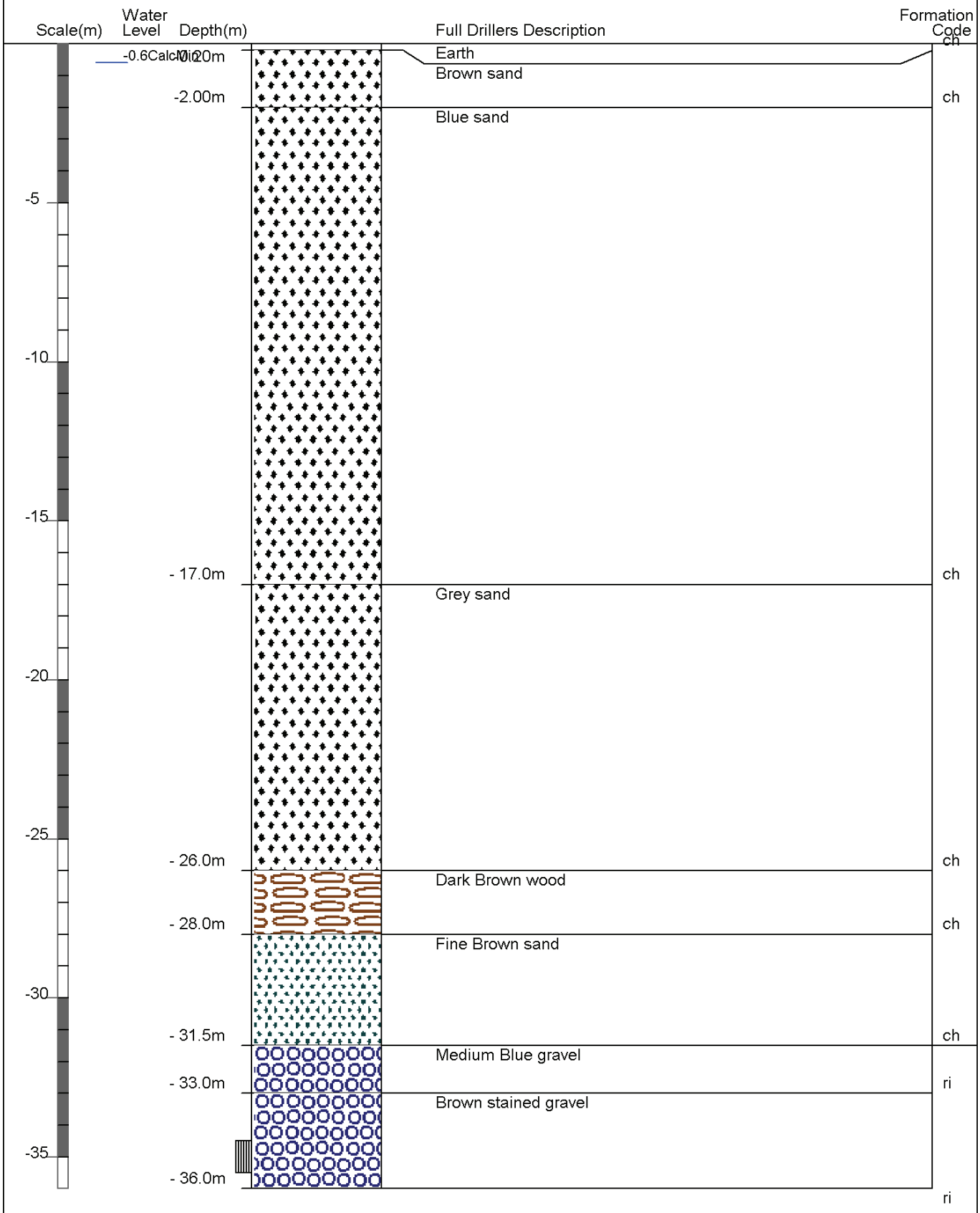
Gridref: M35:8324-4805 Accuracy : 4 (1=best, 4=worst)
Ground Level Altitude : 4.9 +MSD
Driller : Stevens J O
Drill Method : Cable Tool
Drill Depth : -40.4m Drill Date : 22/11/1984

Environment Canterbury
Your regional council



Borelog for well M35/5690

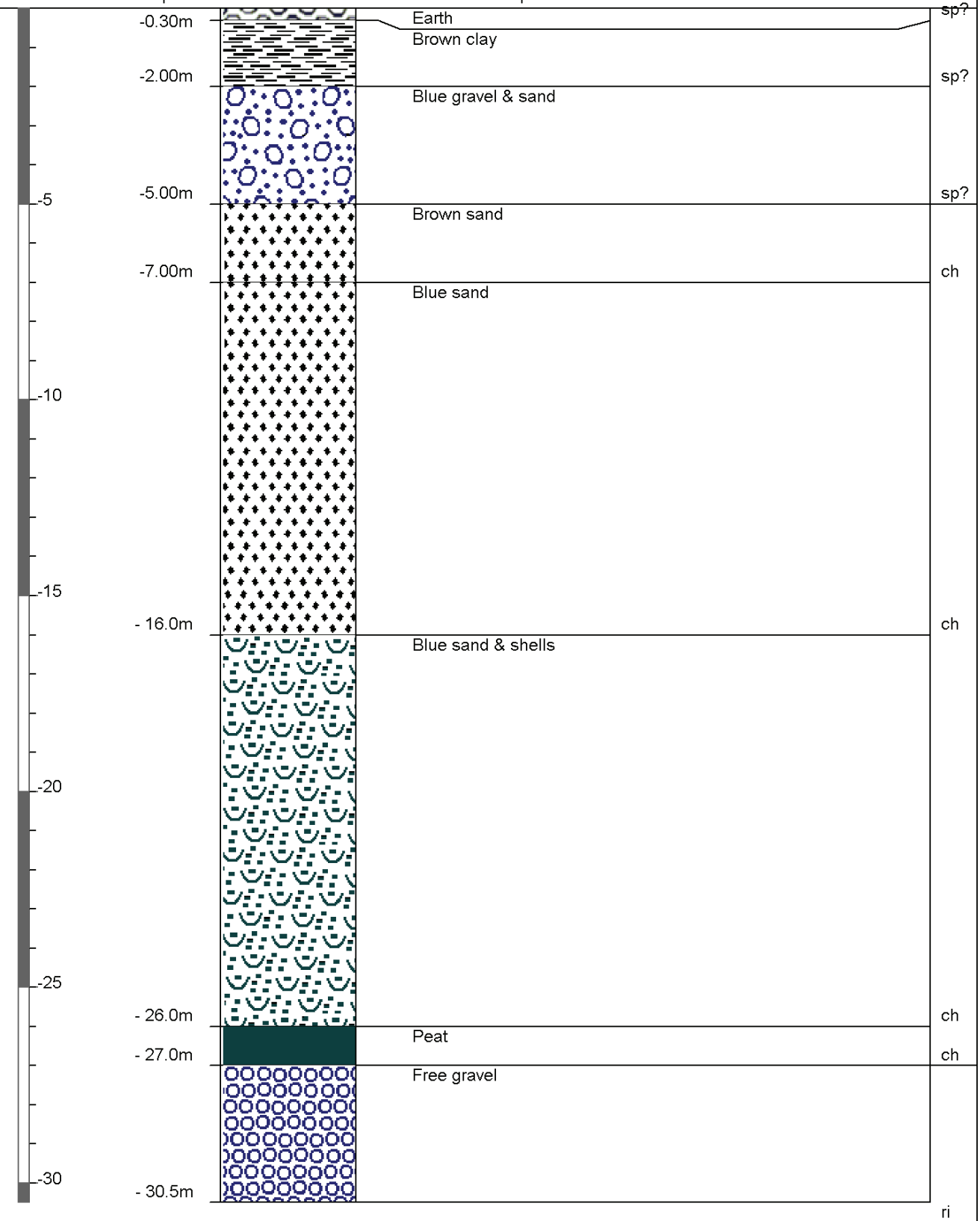
Gridref: M35:8365-4686 Accuracy : 4 (1=best, 4=worst)
Ground Level Altitude : 5.8 +MSD
Driller : McMillan Water Wells Ltd
Drill Method : Rotary/Percussion
Drill Depth : -36m Drill Date : 30/06/1987



Borelog for well M35/6362

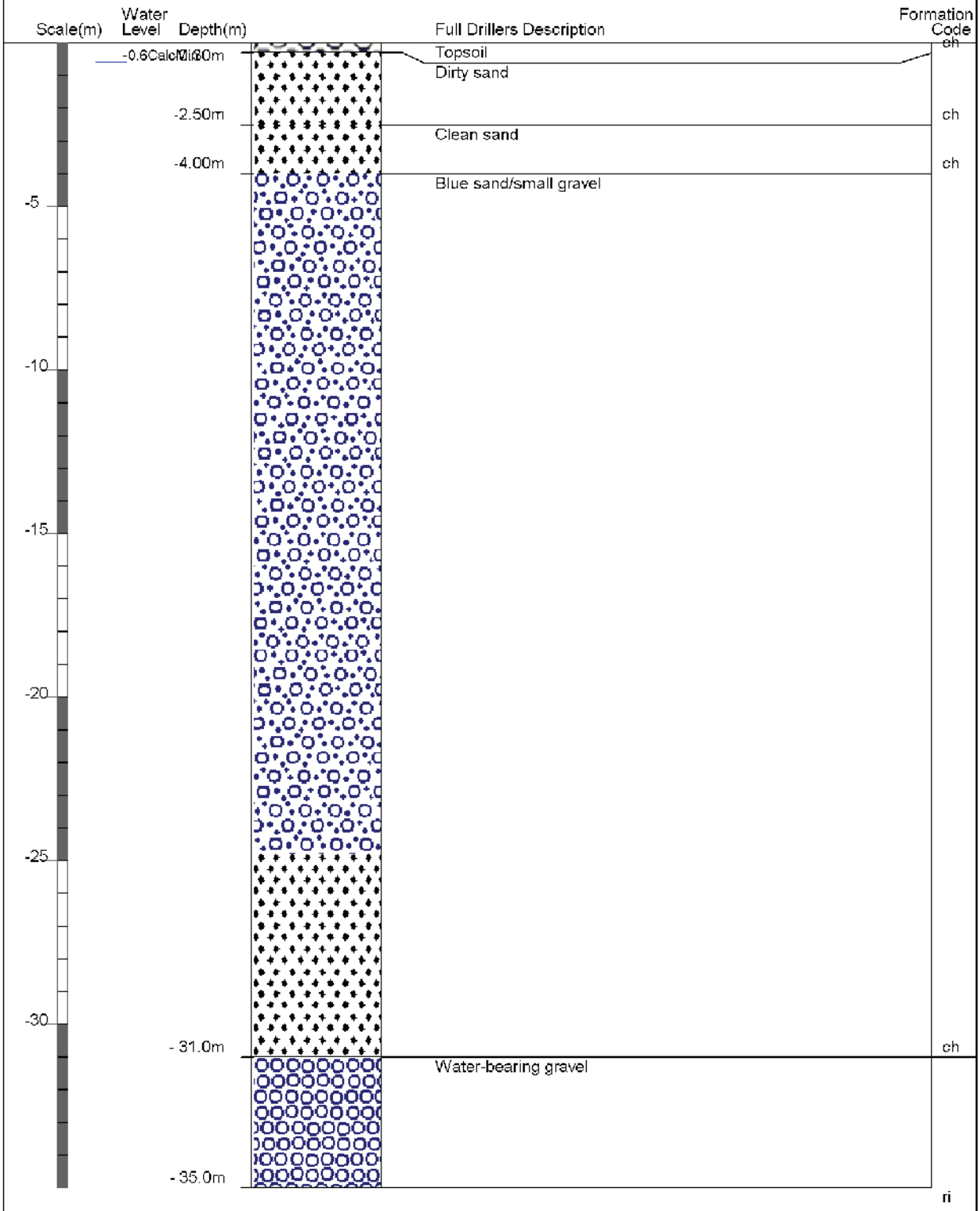
Gridref: M35:8293-4807
Ground Level Altitude 5.1 +MSD
Driller : McMillan Water Wells Ltd.
Drill Method: Rotary/Percussion
Drill Depth : -30.5m Drill Date : 19/04/1990

Environment Canterbury
Your regional council



Borelog for well M35/8069

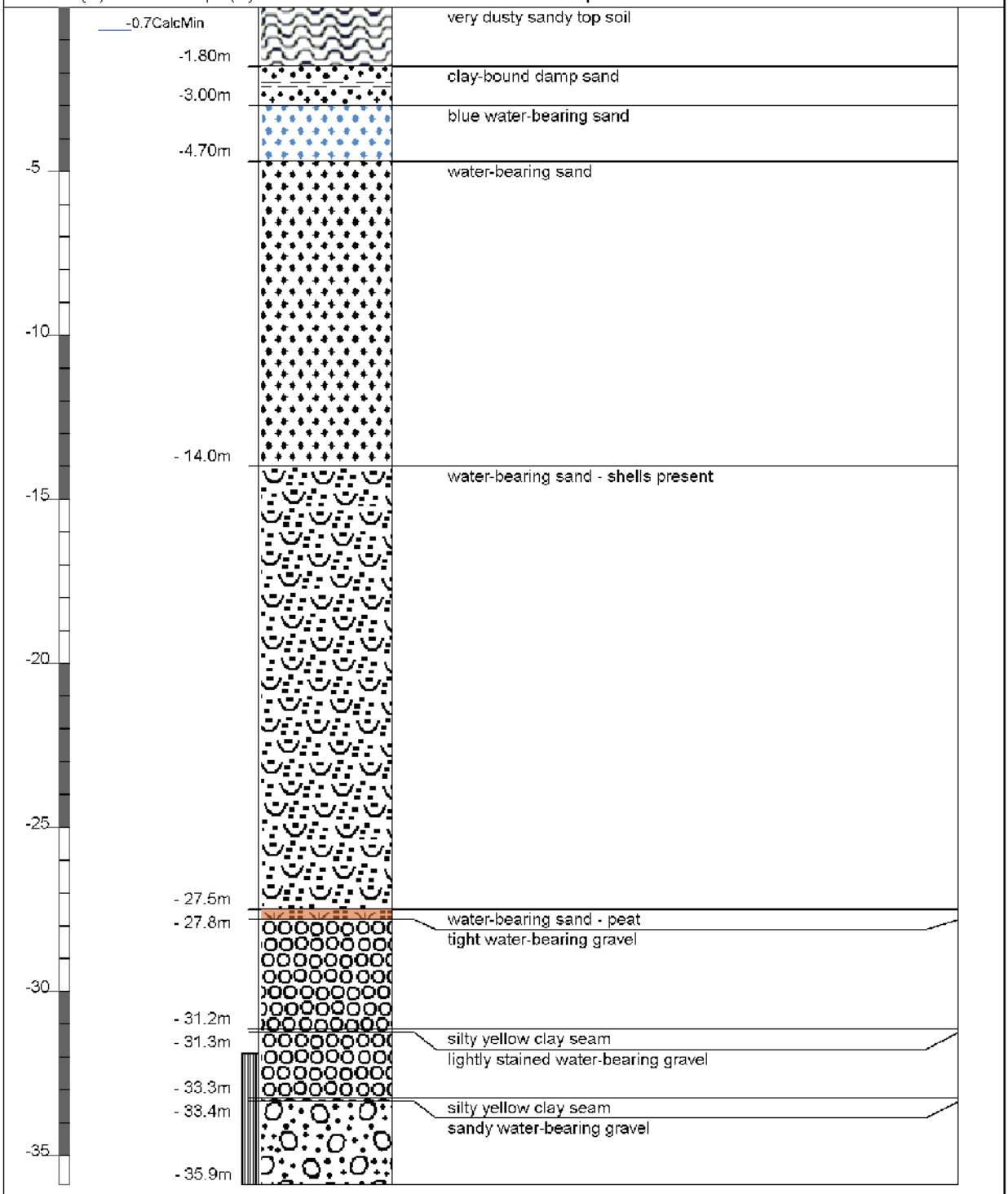
Gridref: M35:8296-4717 Accuracy : 4 (1=best, 4=worst)
Ground Level Altitude : 5.1 +MSD
Driller : C W Drilling and Investigations Ltd
Drill Method : Hydraulic/Percussion
Drill Depth : -35m Drill Date :



Borelog for well M35/10124

Gridref: M35:8301-4735 Accuracy : 4 (1=high, 5=low)
Ground Level Altitude : 5.97 +MSD
Driller : Clemence Drilling Contractors
Drill Method : Rotary/Percussion
Drill Depth : -35.9m Drill Date : 25/11/2005

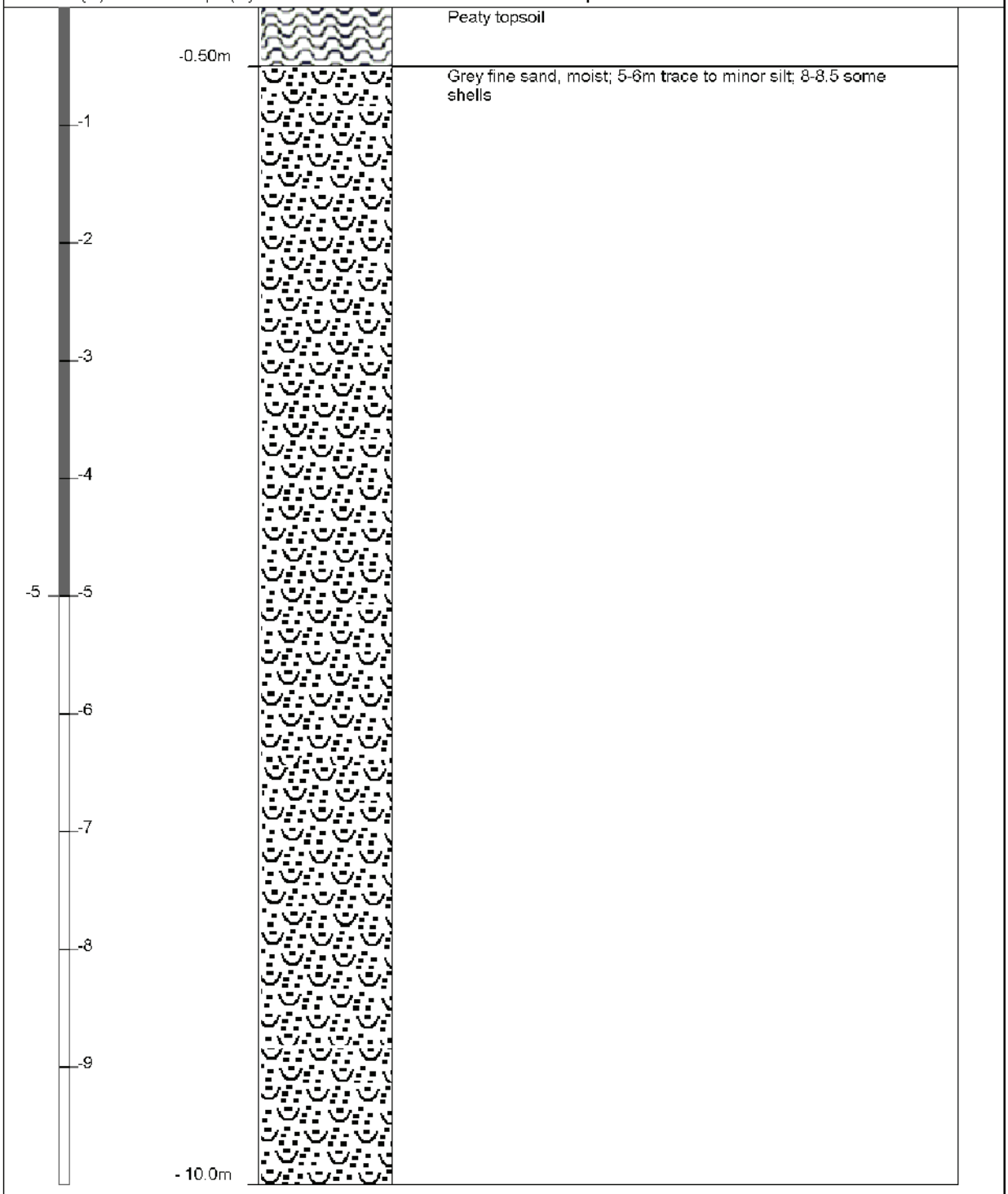
Environment Canterbury Regional Council



Borelog for well M35/11720

Gridref: M35:8310-4785 Accuracy : 3 (1=high, 5=low)
Ground Level Altitude : 6.01 +MSD
Driller : Texco Drilling Ltd
Drill Method : Rotary/Percussion
Drill Depth : -10m Drill Date : 11/07/2007

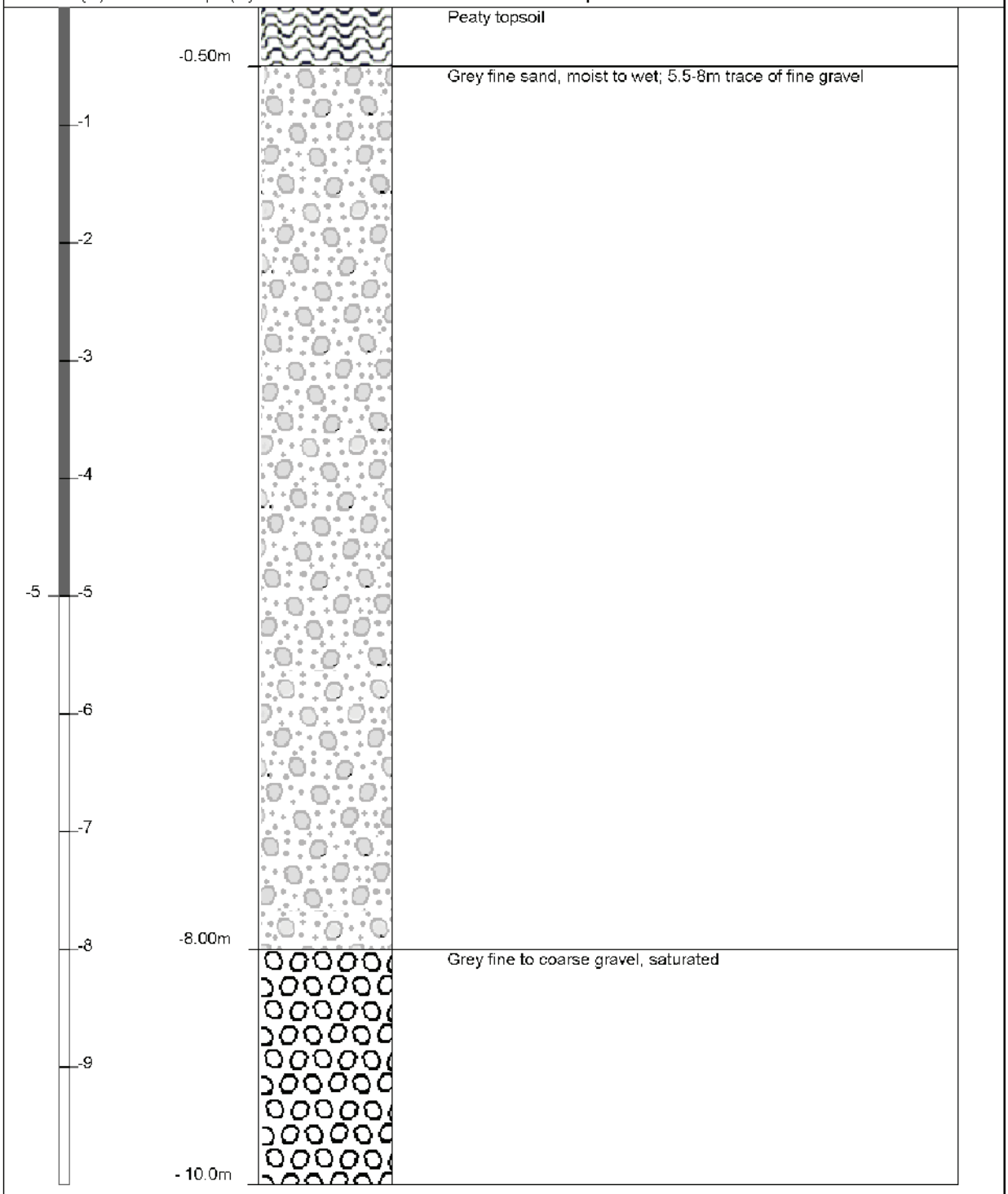
Environment Canterbury Regional Council



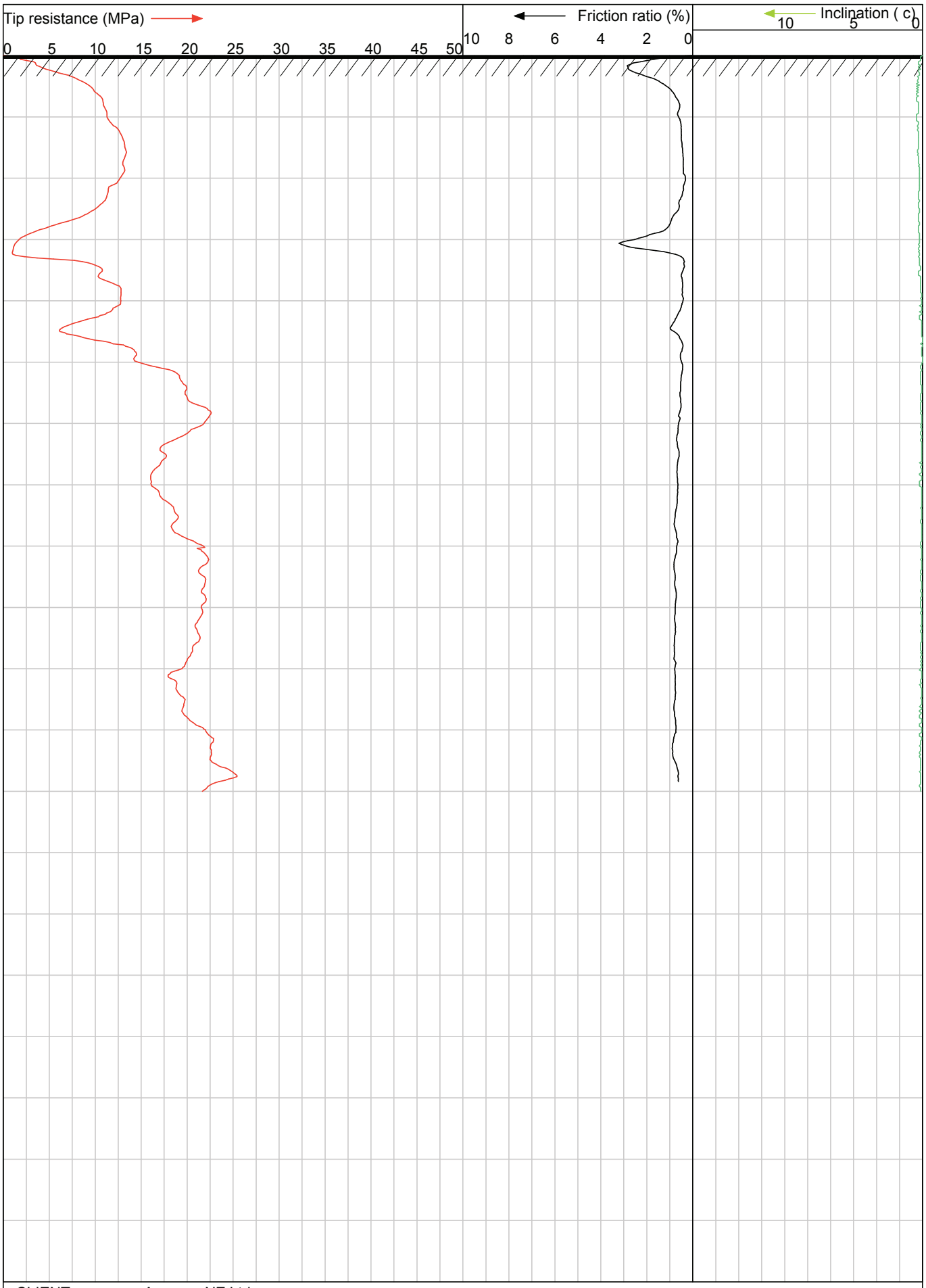
Borelog for well M35/11721

Gridref: M35:8340-4801 Accuracy : 3 (1=high, 5=low)
Ground Level Altitude : 5.78 +MSD
Driller : McMillan Water Wells Ltd
Drill Method : Rotary/Percussion
Drill Depth : -10m Drill Date : 12/07/2007

Environment Canterbury Regional Council



Appendix J
Impact Compactor CPT Logs



CLIENT : Aurecon NZ Ltd
LOCATION : Prestons Trial Areas - Post
DATE : 27-3-2012
OPERATOR : N.Barnes
REMARK 1 : CPT414
REMARK 2 : Target Depth

JOB # : 10260
TEST # : 414

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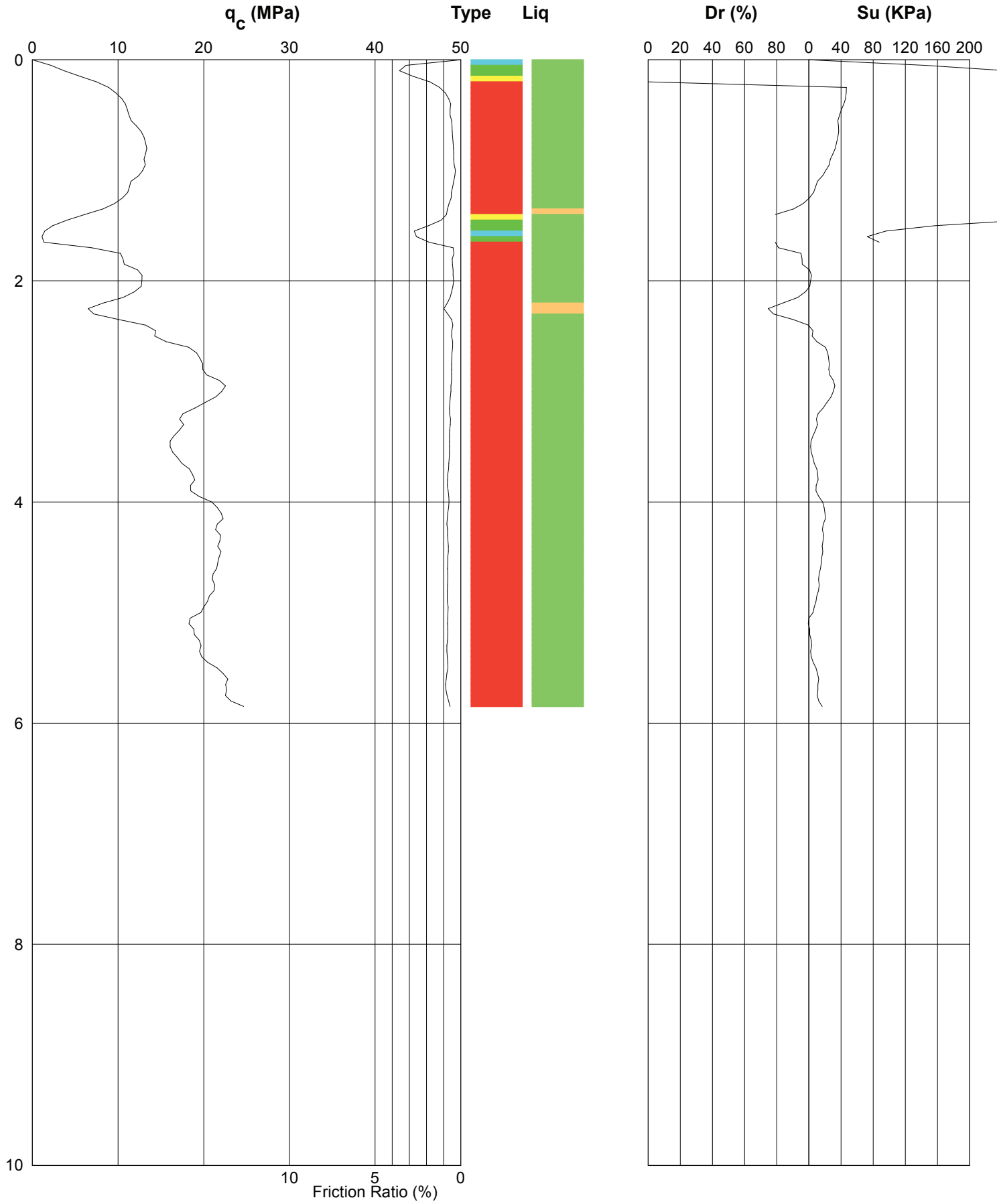
PIEZOCONE PENETROMETER TEST (CPTU) INTERPRETIVE REPORT



Job No:	10260	Date:	27-3-2012
CPT No:	CPT414	Operator:	N. Barnes
Project:	Aurecon NZ Ltd	Remark:	Target Depth
Location:	Prestons Trial Areas - Post		

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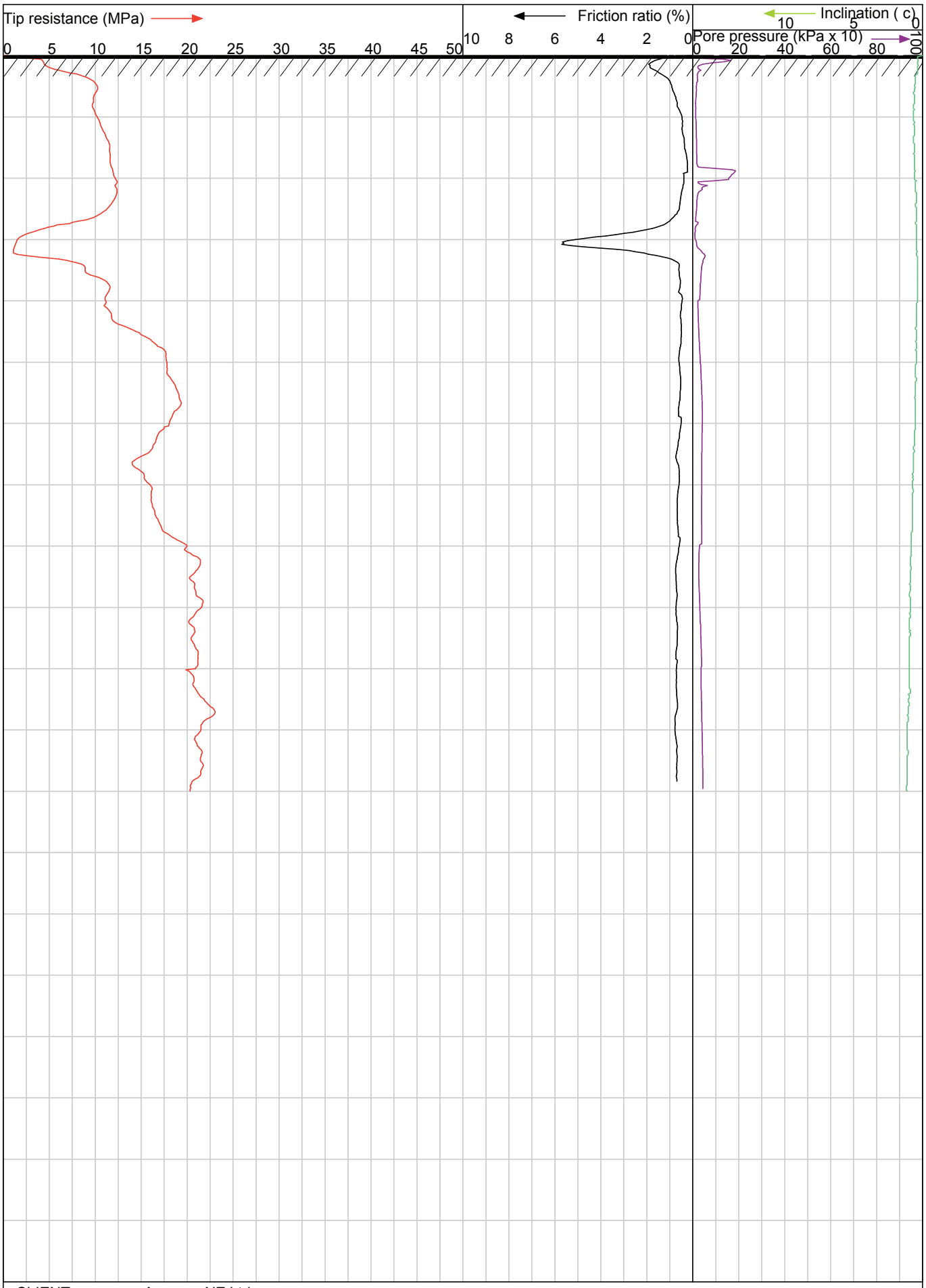

CLIENT	:	Aurecon NZ Ltd
LOCATION	:	Prestons Trial Areas - Post
DATE	:	27-3-2012
OPERATOR	:	N.Barnes
REMARK 1	:	CPTu415
REMARK 2	:	Target Depth

JOB # : 10260
TEST # : 415

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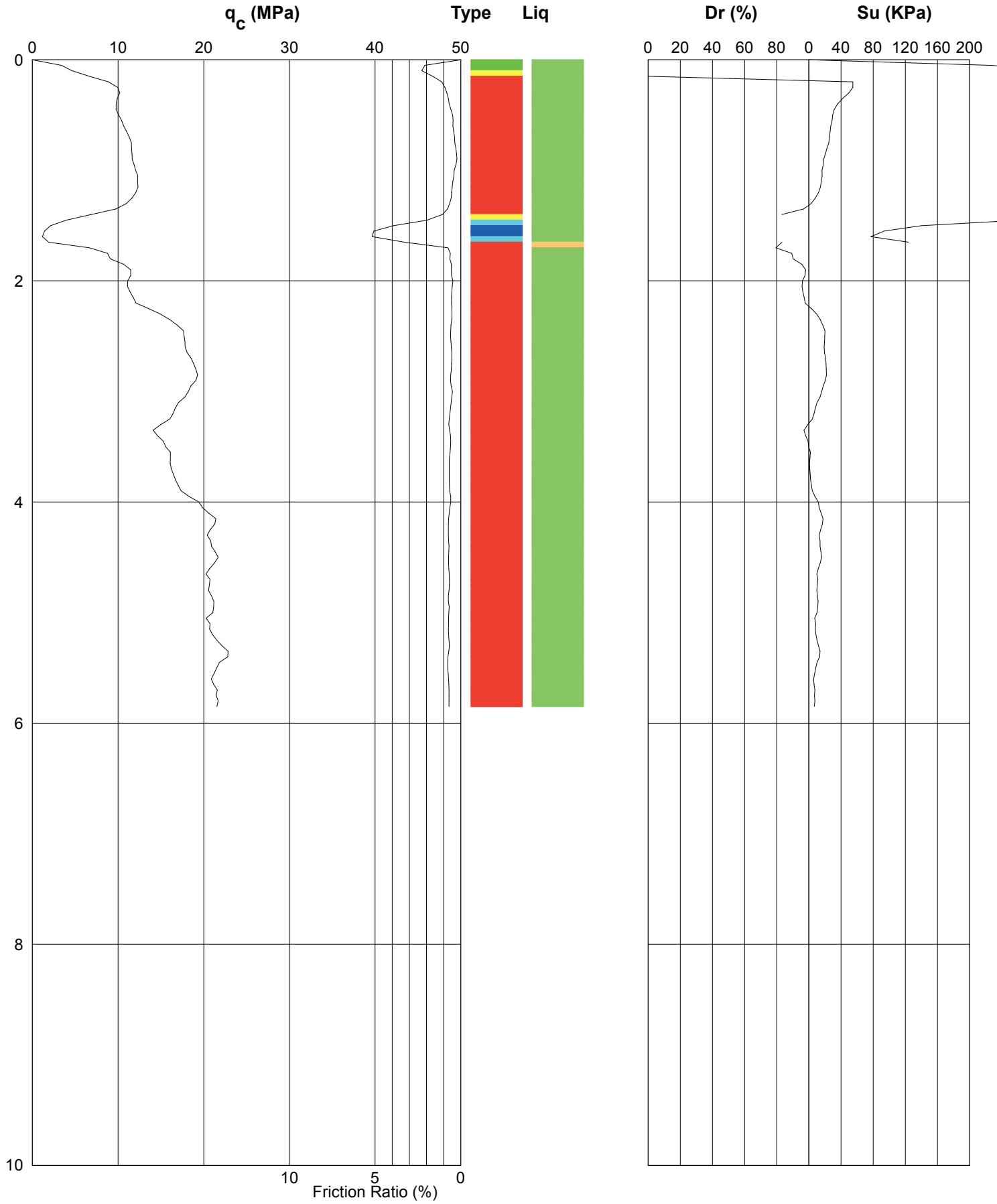
PIEZOCONE PENETROMETER TEST (CPTU) INTERPRETIVE REPORT



Job No:	10260	Date:	27-3-2012
CPT No:	CPTu415	Operator:	N. Barnes
Project:	Aurecon NZ Ltd	Remark:	Target Depth
Location:	Prestons Trial Areas - Post		

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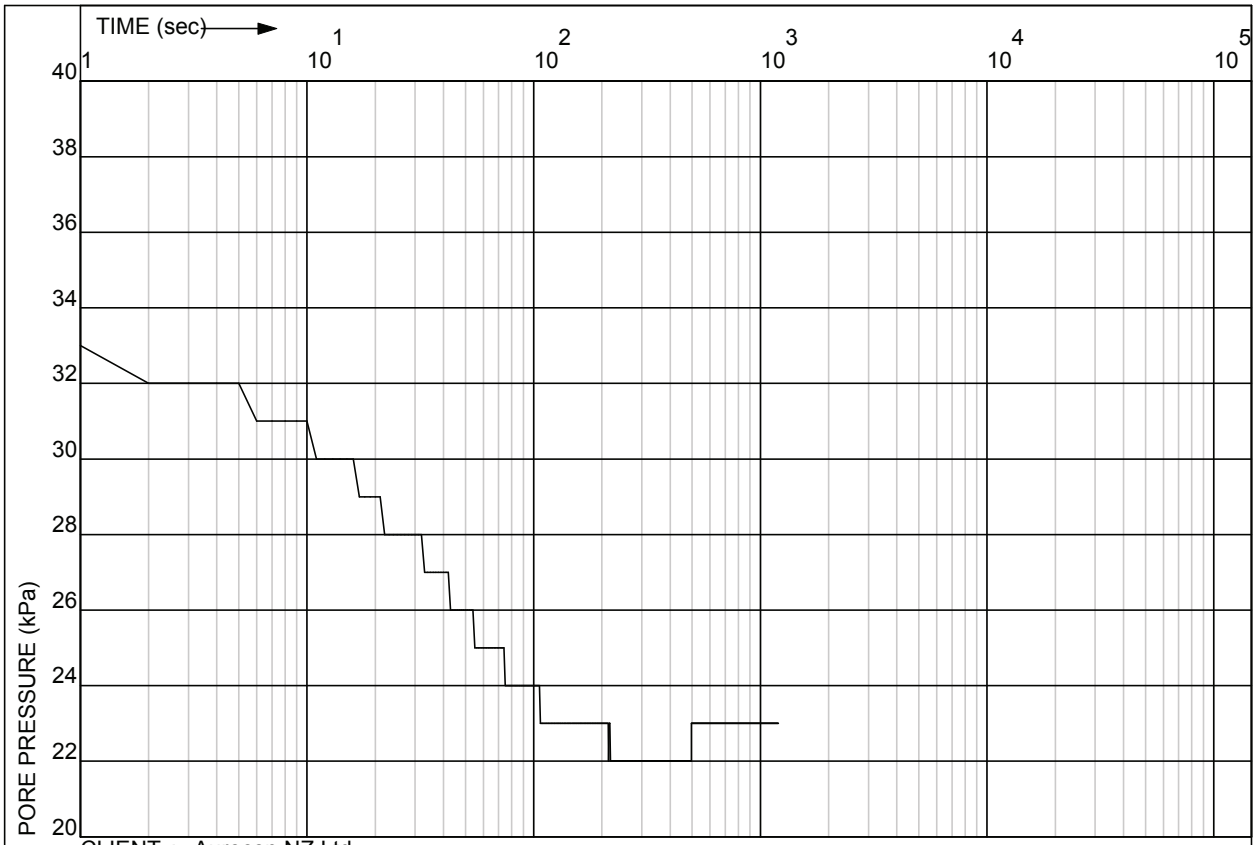

CLIENT : Aurecon NZ Ltd
DESCRIPTION : Prestons Trial Areas - Post
DATE : 27-3-2012
OPERATOR : N.Barnes
CONE TYPE: I-CFXYP20-10
REMARK : CPTu415

JOB # : 10260
TEST # : 415
DEPTH : 2.01

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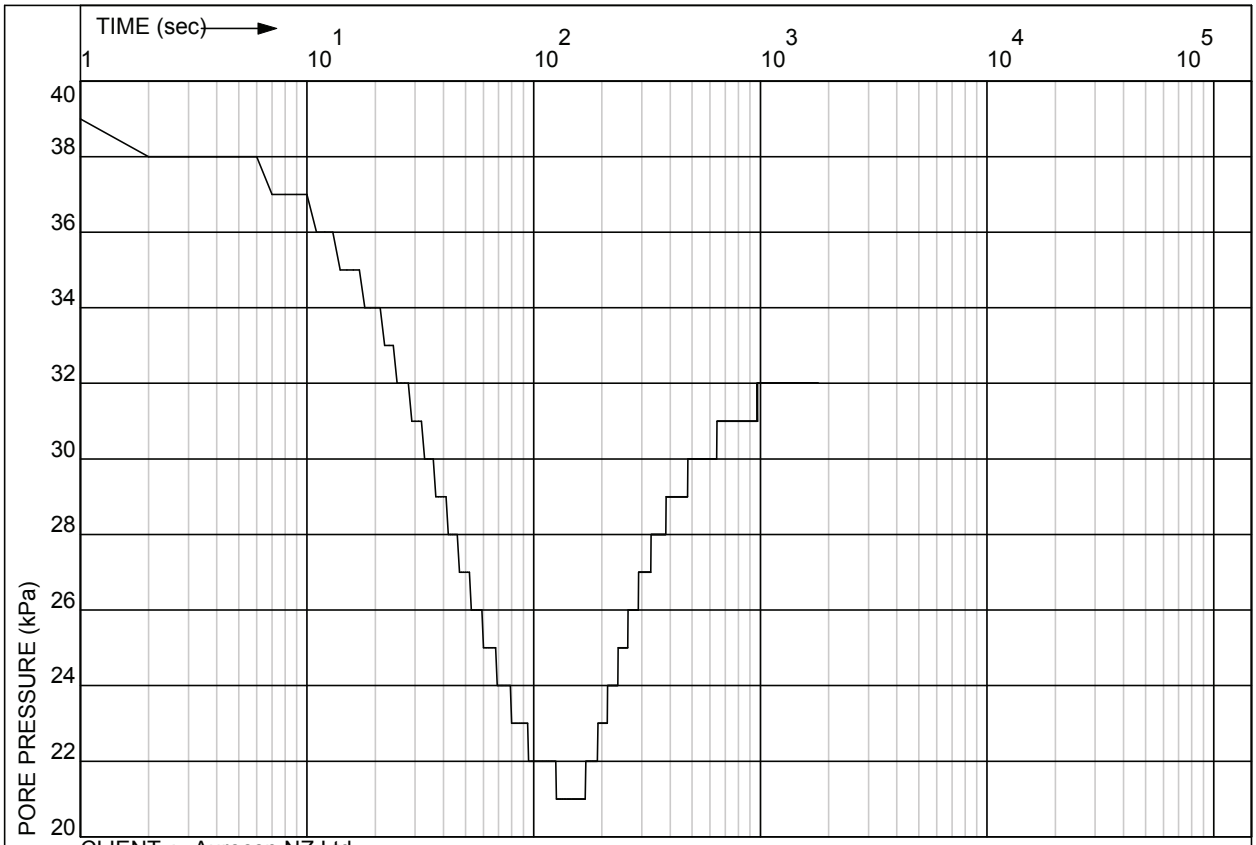

CLIENT : Aurecon NZ Ltd
DESCRIPTION : Prestons Trial Areas - Post
DATE : 27-3-2012
OPERATOR : N.Barnes
CONE TYPE: I-CFXYP20-10
REMARK : CPTu415

JOB # : 10260
TEST # : 415
DEPTH : 4.0

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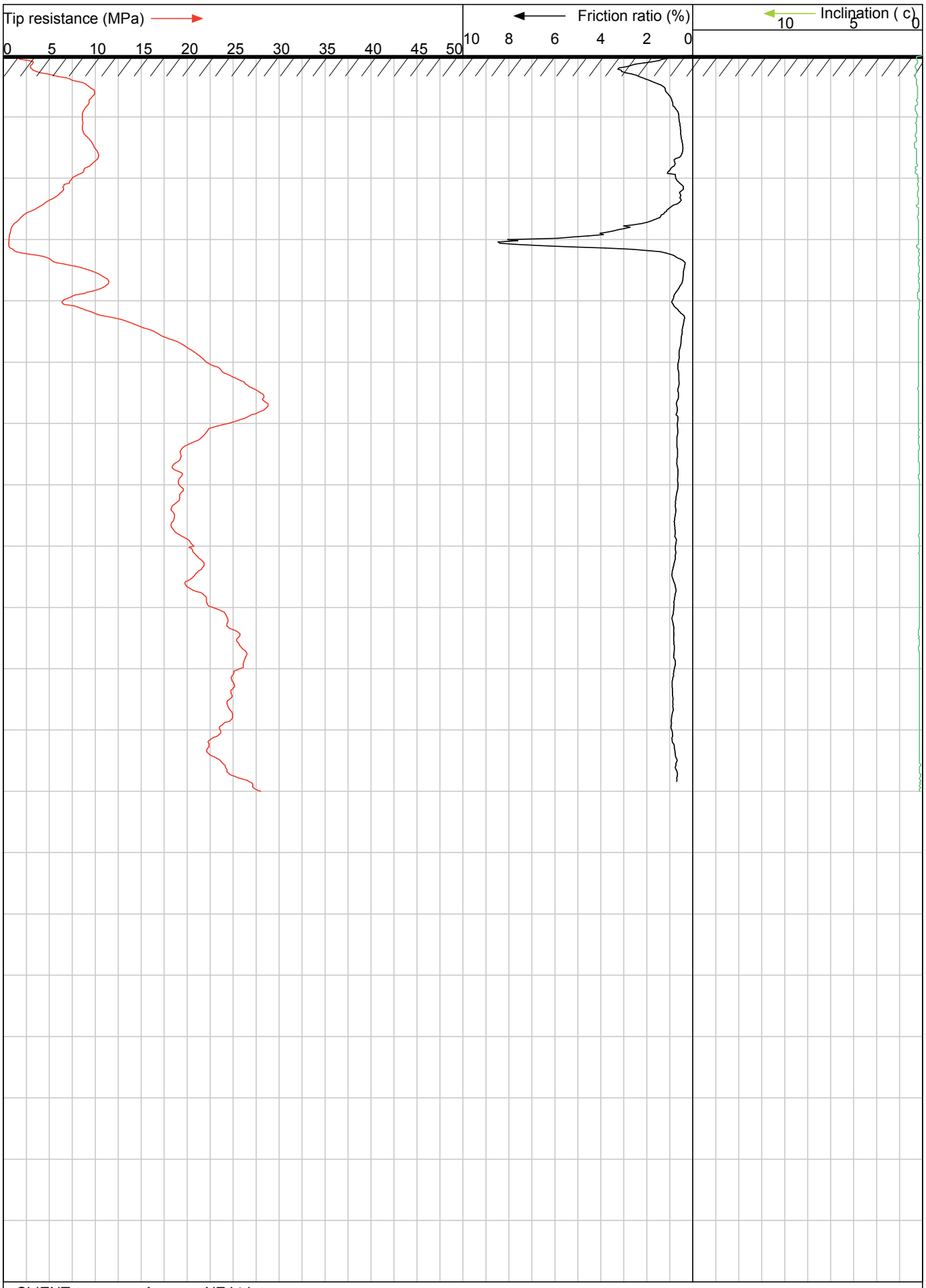

CLIENT : Aurecon NZ Ltd
LOCATION : Prestons Trial Areas - Post
DATE : 27-3-2012
OPERATOR : N.Barnes
REMARK 1 : CPT416
REMARK 2 : Target Depth

JOB # : 10260
TEST # : 416

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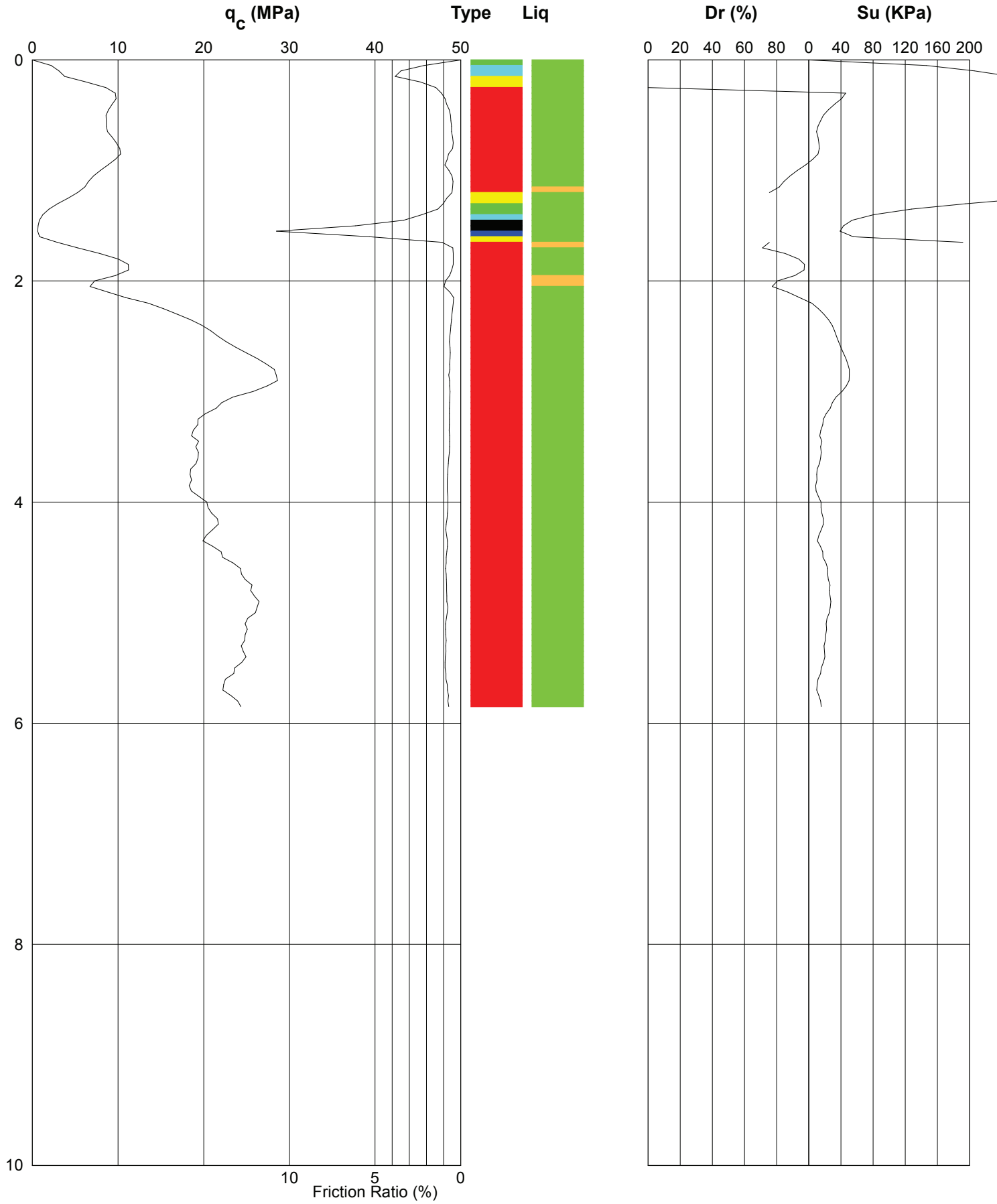
PIEZOCONE PENETROMETER TEST (CPTU) INTERPRETIVE REPORT



Job No:	10260	Date:	27-3-2012
CPT No:	CPT416	Operator:	N. Barnes
Project:	Aurecon NZ Ltd	Remark:	Target Depth
Location:	Prestons Trial Areas - Post		

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CPT ANALYSIS NOTES

Soil Type

Interpretation using chart of Robertson & Campanella (1983). This is a simple but well proven interpretation using cone tip resistance (q_C) and friction ratio (f_R) only. No normalisation for overburden stress is applied. Cone tip resistance measured with the piezocone is corrected with measured pore pressure (u_C).

- sand (and gravel)
- silt-sand
- silt
- clay-silt
- clay
- peat

Liquefaction Screening

The purpose of the screening is to highlight susceptible soils, that is sand and silt-sand in a relatively loose condition. This is not a full liquefaction risk assessment which requires knowledge of the particular earthquake risk at a site and additional analysis. The screening is based on the chart of Shibata and Teparaksa (1988).

- high susceptibility
- medium susceptibility
- low susceptibility

High susceptibility is here defined as requiring a shear stress ratio of 0.2 to cause liquefaction with D_{50} for sands assumed to be 0.25 mm and for silty sands to be 0.05 mm.

Medium susceptibility is here defined as requiring a shear stress ratio of 0.4 to cause liquefaction with D_{50} for sands assumed to be 0.25 mm and for silty sands to be 0.05 mm.

Low susceptibility is all other cases.

Relative Density (D_R)

Based on the method of Baldi et. al. (1986) from data on normally consolidated sand.

Undrained Shear Strength (S_U)

Derived from the bearing capacity equation using $S_U = (q_C - \sigma_{VO})/15$.

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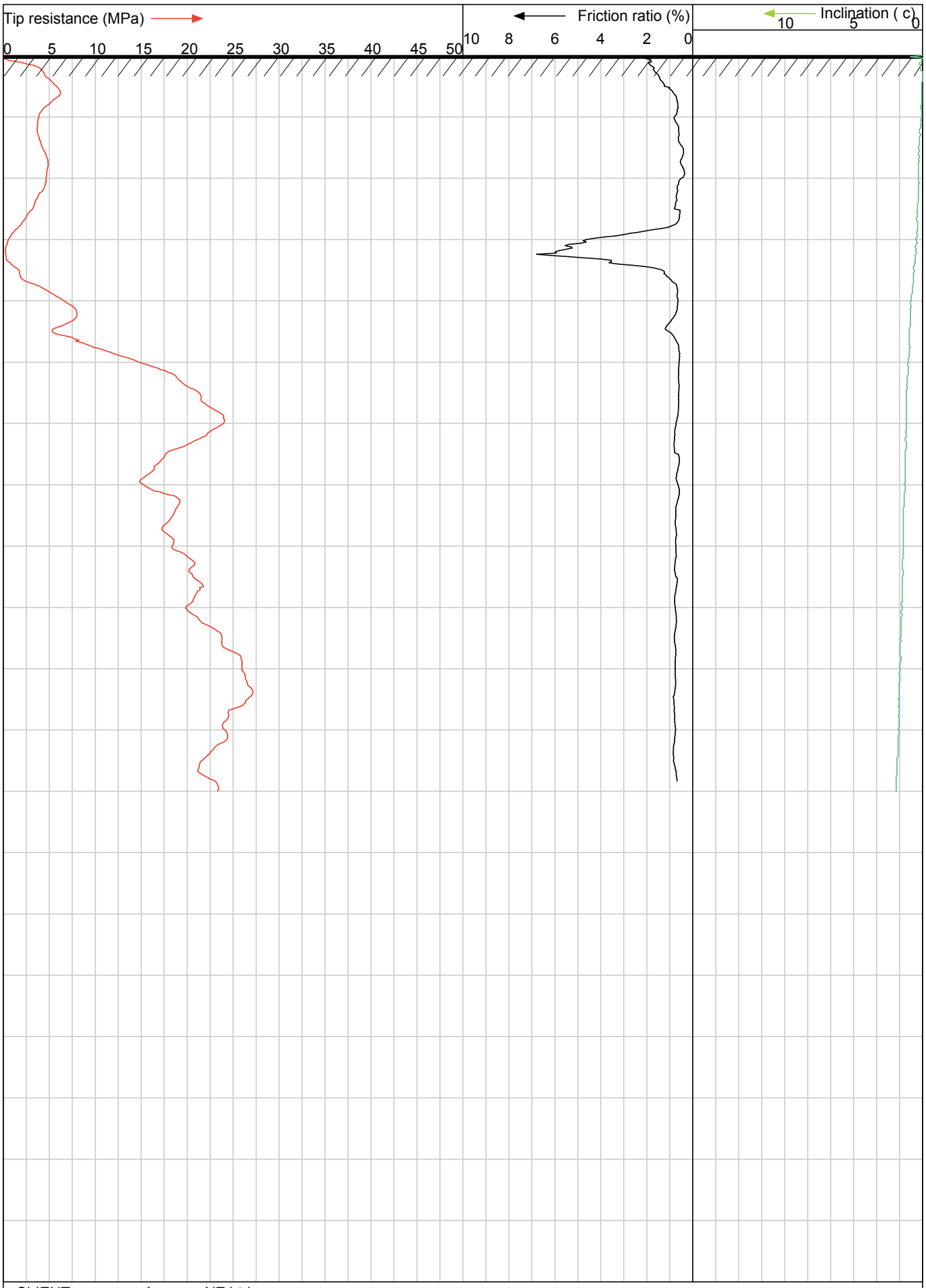

CLIENT : Aurecon NZ Ltd
LOCATION : Prestons Trial Areas - Post
DATE : 19-3-2012
OPERATOR : H Pardoe.
REMARK 1 : CPT214
REMARK 2 : Target Depth

JOB # : 10260
TEST # : 214

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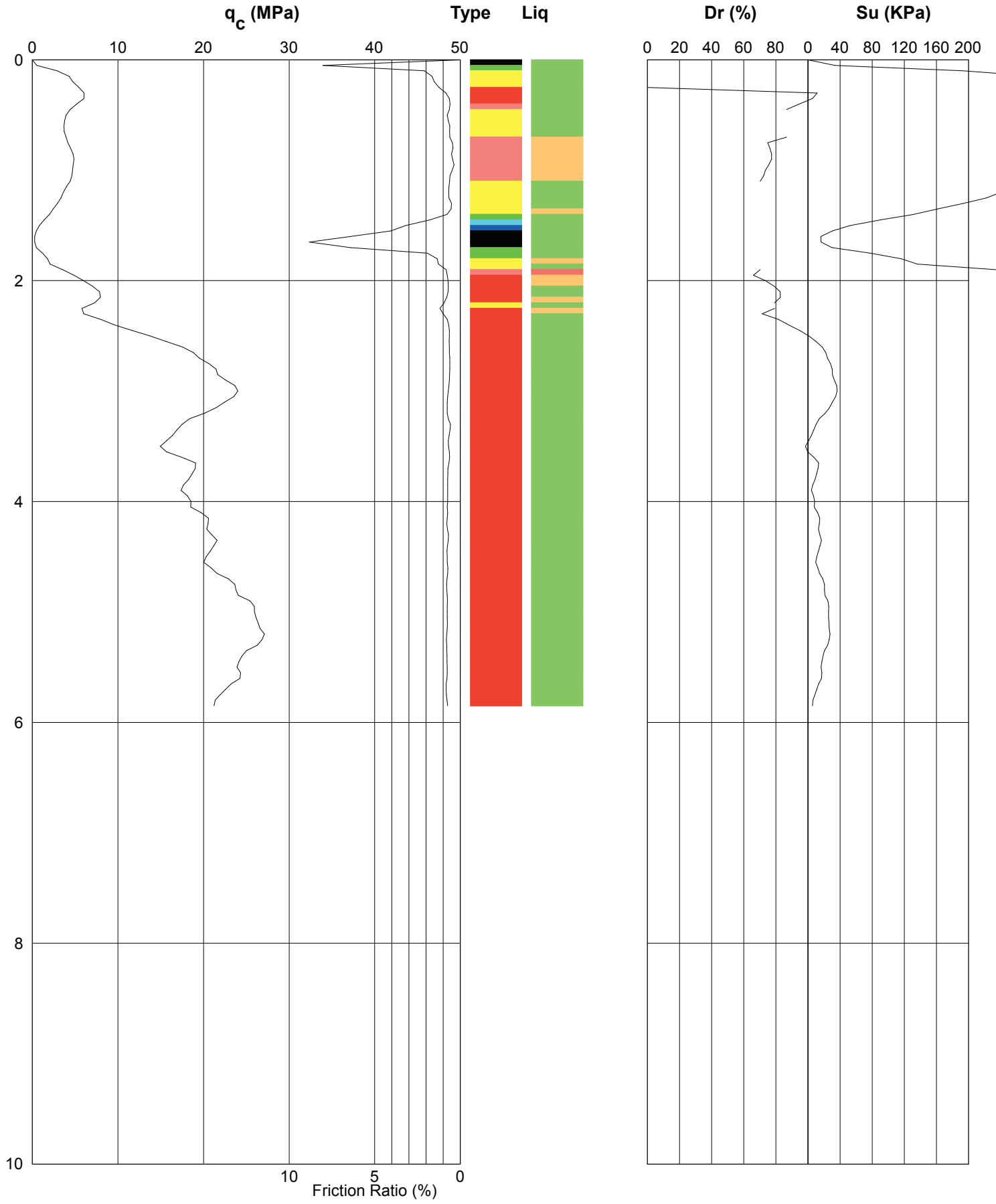
PIEZOCONE PENETROMETER TEST (CPTU) INTERPRETIVE REPORT



Job No:	10260	Date:	19-3-2012
CPT No:	CPT214	Operator:	H Pardoe
Project:	Aurecon NZ Ltd	Remark:	Target Depth
Location:	Prestons Trial Areas - Post		

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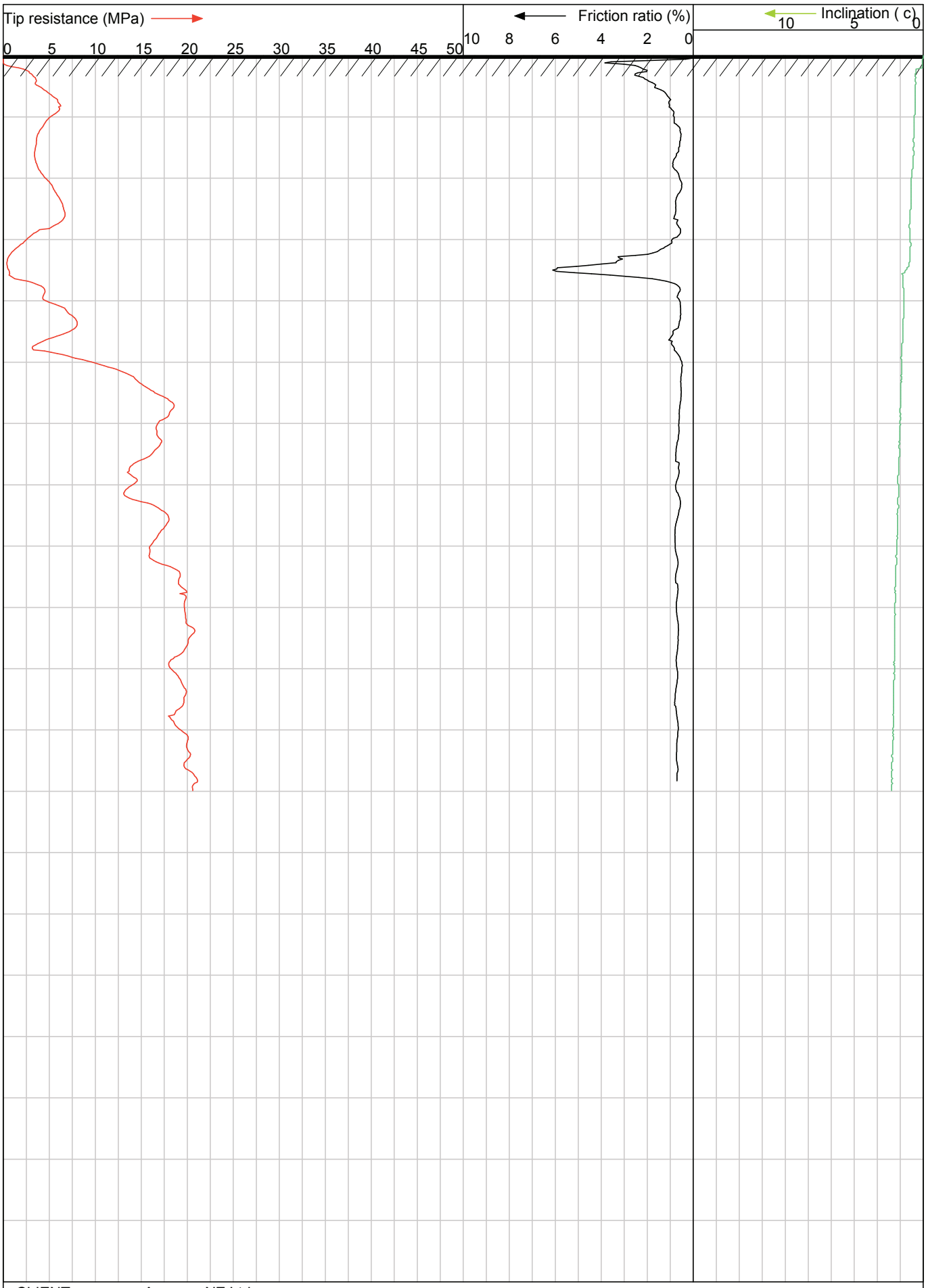

CLIENT : Aurecon NZ Ltd
LOCATION : Prestons Trial Areas - Post
DATE : 19-3-2012
OPERATOR : H Pardoe.
REMARK 1 : CPT215
REMARK 2 : Target Depth

JOB # : 10260
TEST # : 215

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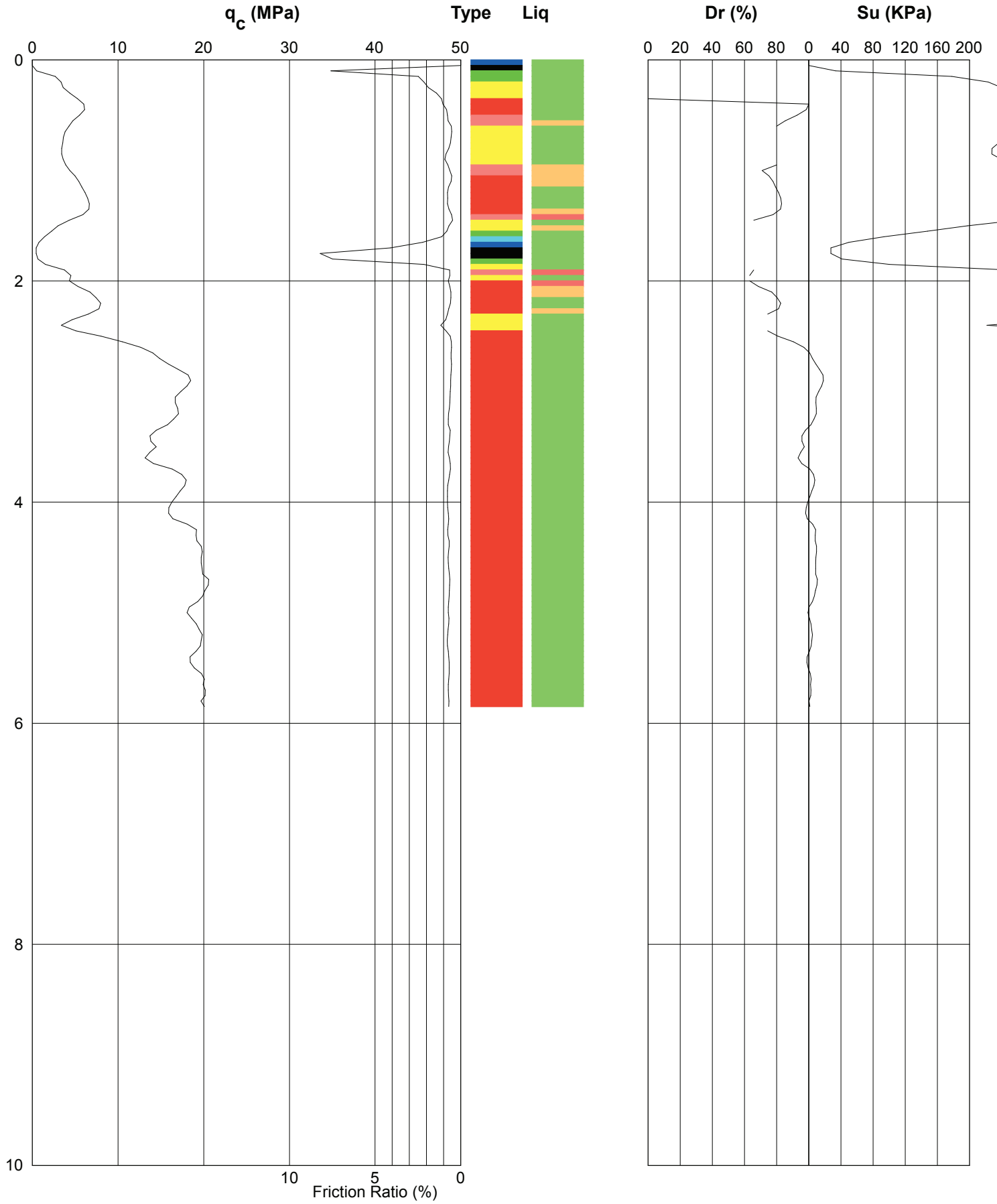
PIEZOCONE PENETROMETER TEST (CPTU) INTERPRETIVE REPORT



Job No:	10260	Date:	19-3-2012
CPT No:	CPT215	Operator:	H Pardoe
Project:	Aurecon NZ Ltd	Remark:	Target Depth
Location:	Prestons Trial Areas - Post		

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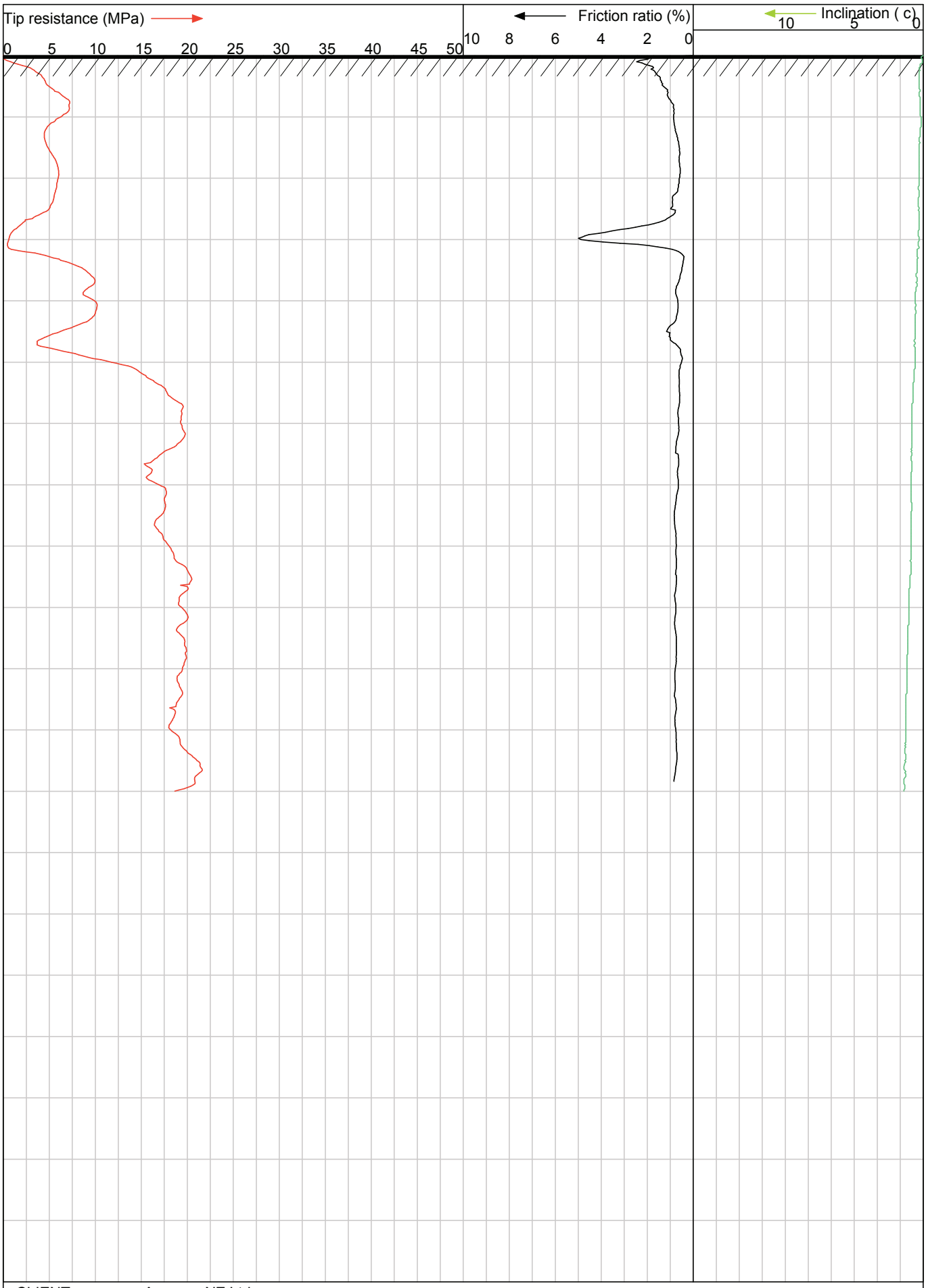

CLIENT : Aurecon NZ Ltd
LOCATION : Prestons Trial Areas - Post
DATE : 19-3-2012
OPERATOR : H Pardoe.
REMARK 1 : CPT216
REMARK 2 : Target Depth

JOB # : 10260
TEST #: 216

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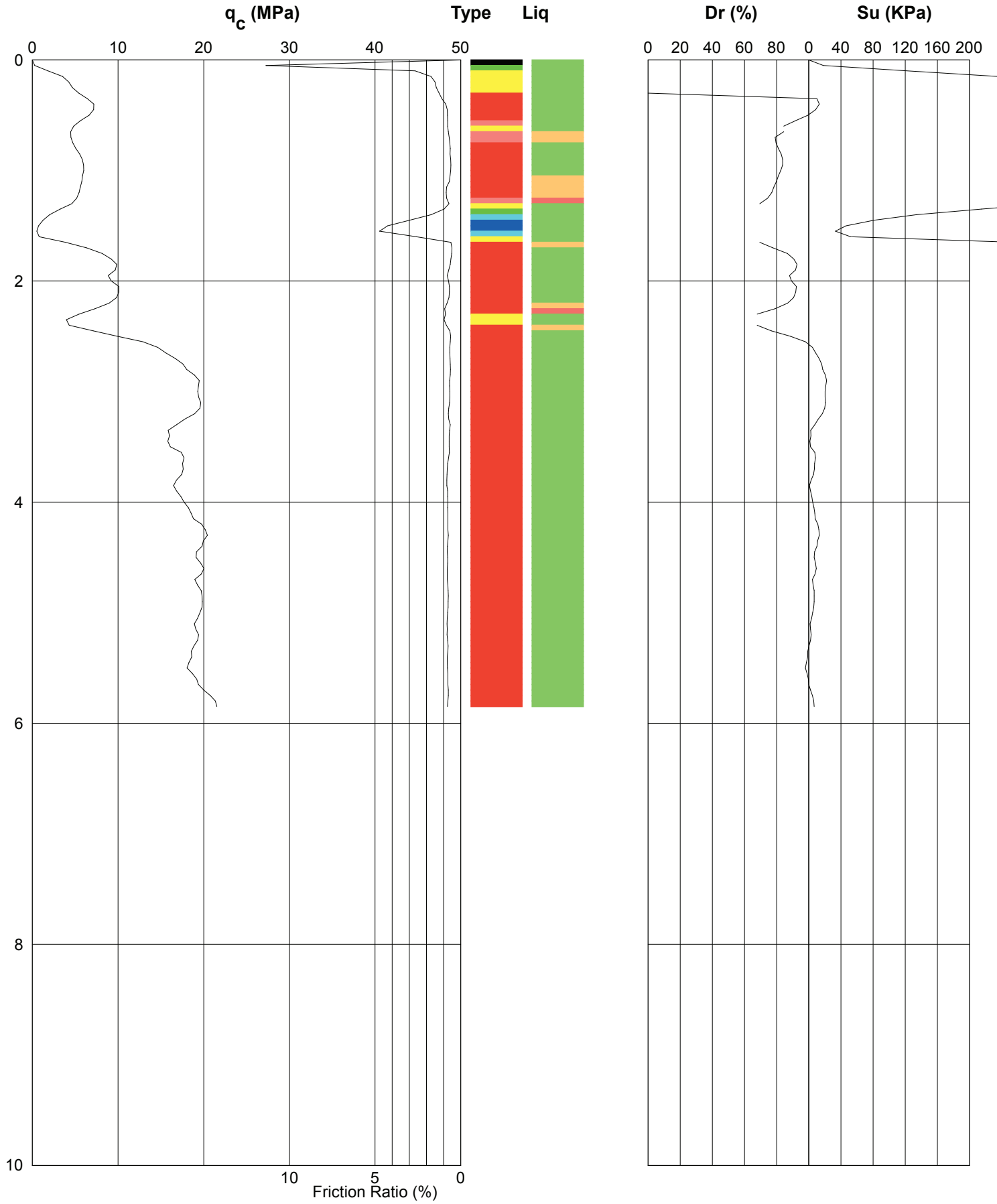
PIEZOCONE PENETROMETER TEST (CPTU) INTERPRETIVE REPORT



Job No:	10260	Date:	19-3-2012
CPT No:	CPT216	Operator:	H Pardoe
Project:	Aurecon NZ Ltd	Remark:	Target Depth
Location:	Prestons Trial Areas - Post		

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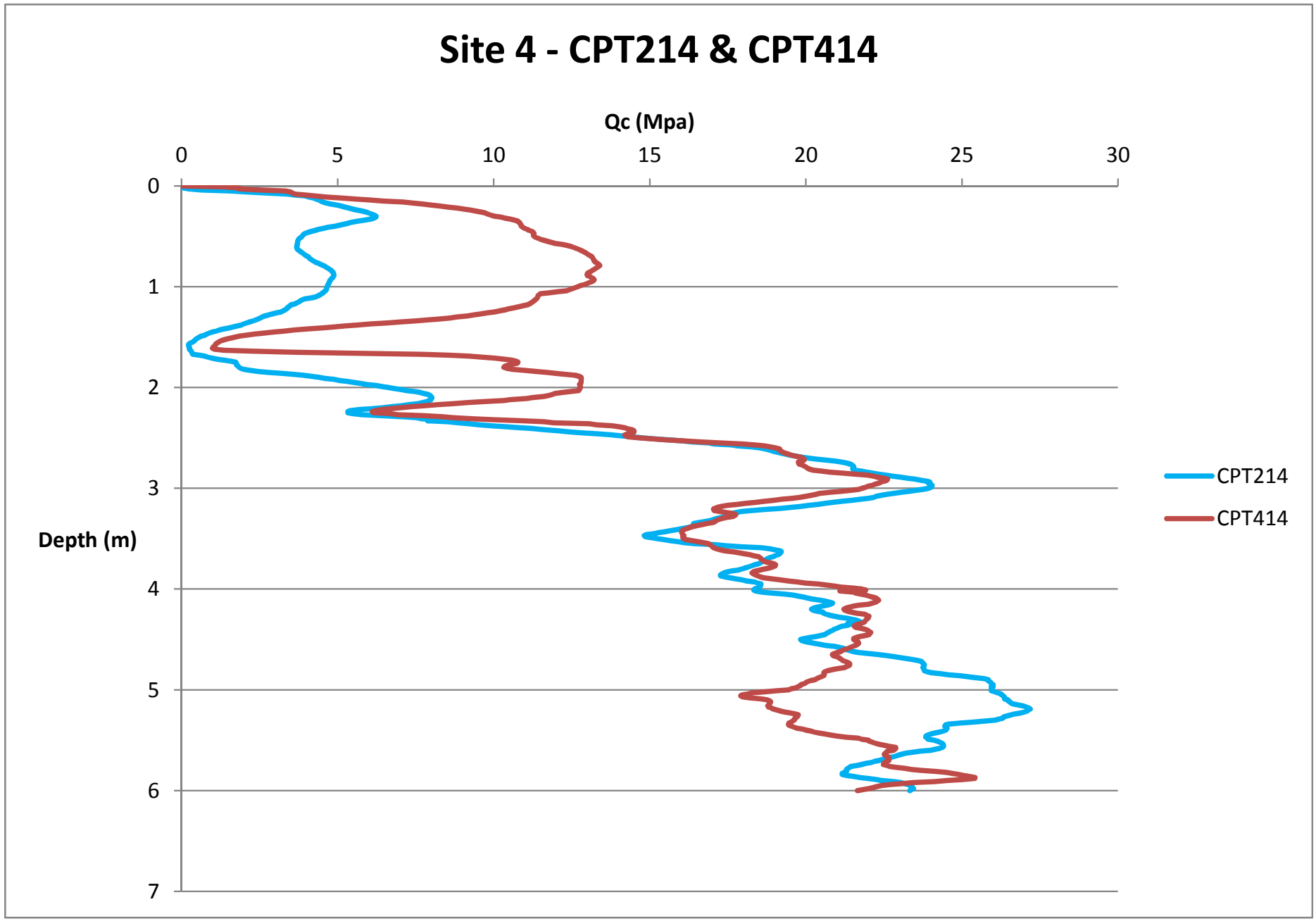
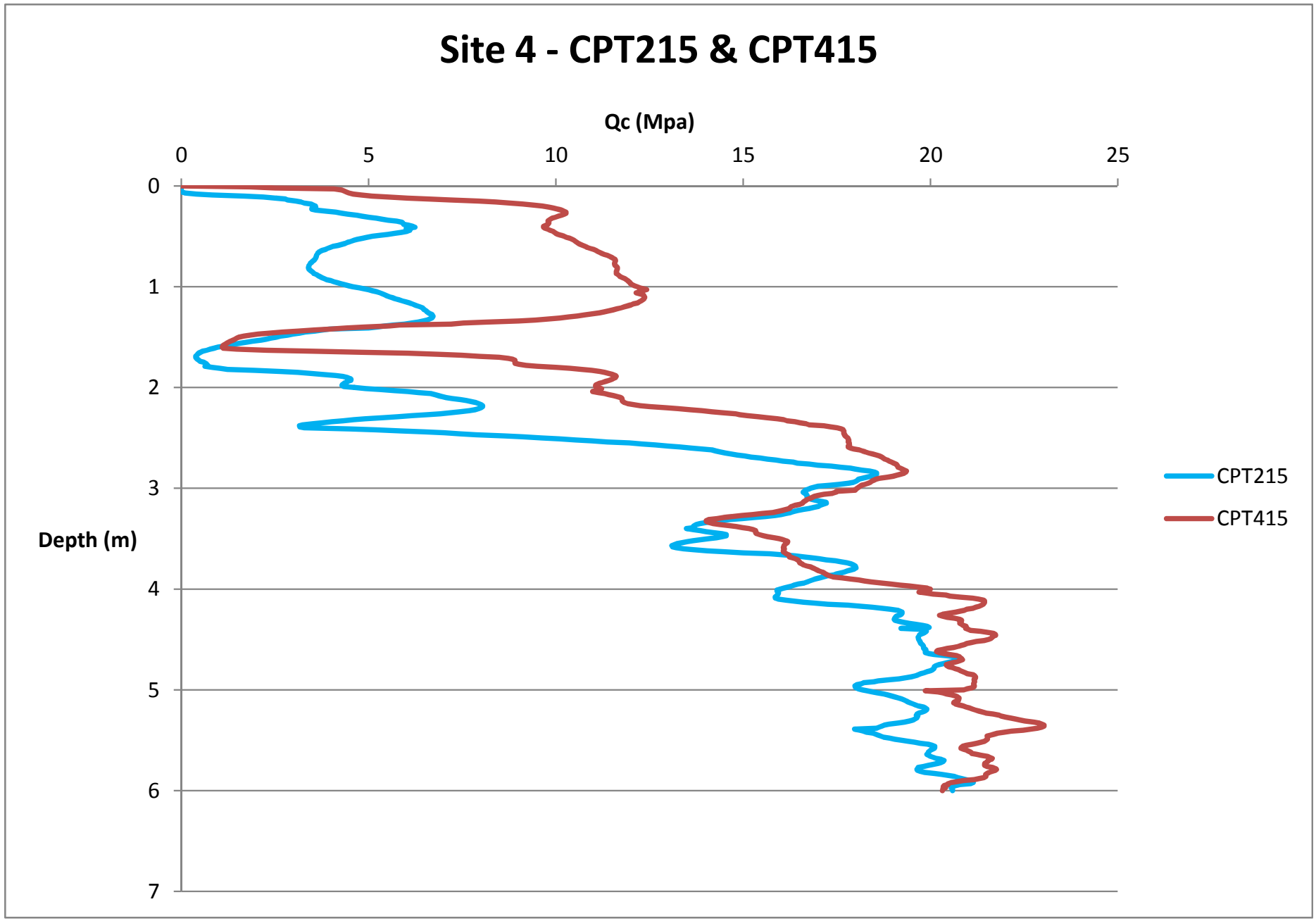
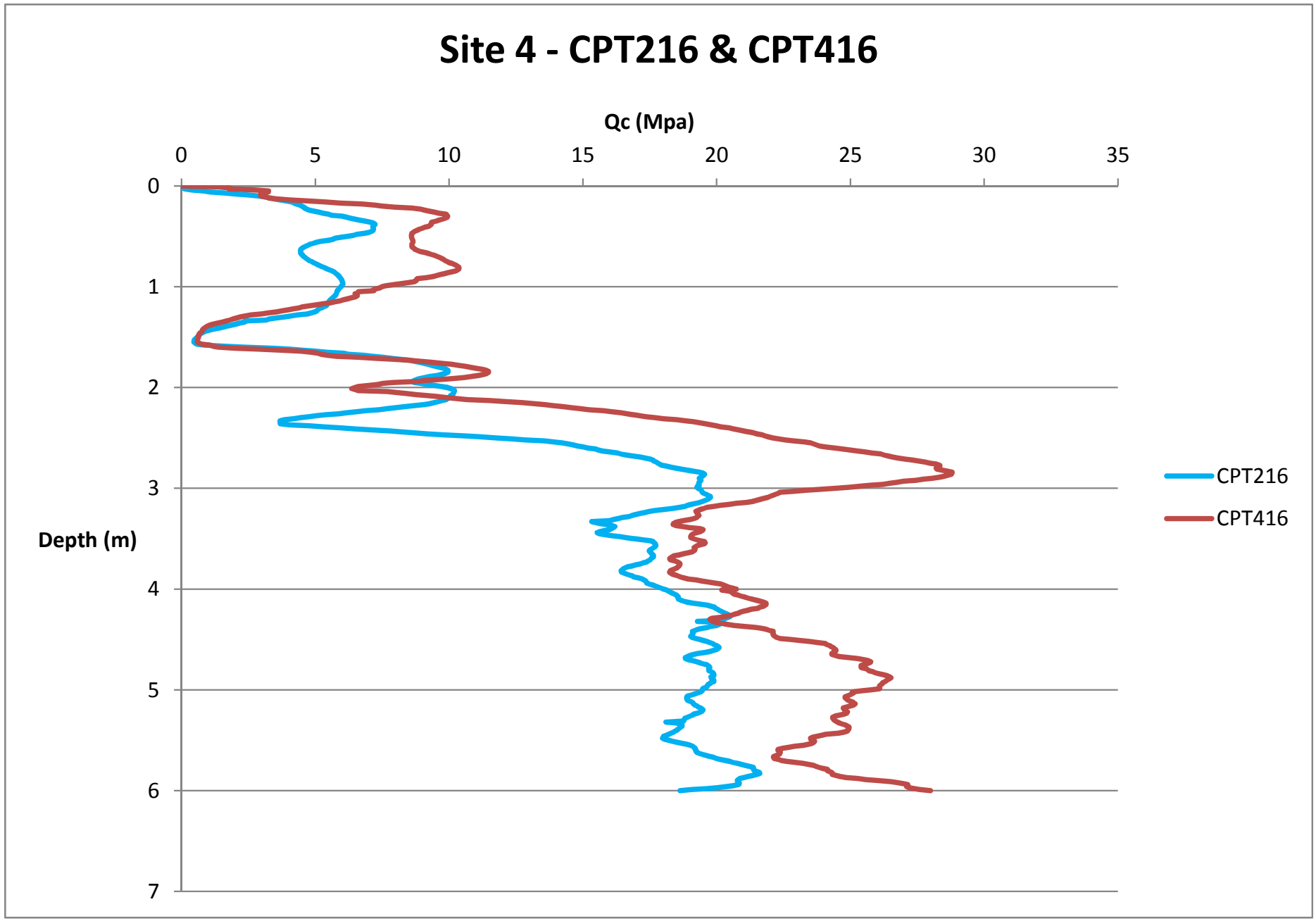
Appendix K
Impact Compactor Pre & Post CPT Logs Qc Comparisons


Site 4 - CPT214 & CPT414
Qc (Mpa)
0
5
10
15
20
25
30
Depth (m)
0
1
2
3
4
5
6
7
CPT214
CPT414


Site 4 - CPT215 & CPT415
Qc (Mpa)
0
5
10
15
20
25
Depth (m)
0
1
2
3
4
5
6
7
CPT215
CPT415


Site 4 - CPT216 & CPT416
Qc (Mpa)
0
5
10
15
20
25
30
35
Depth (m)
0
1
2
3
4
5
6
7
CPT216
CPT416

Appendix L
Liquefaction Assessment Results

Summary of Liquefaction Results for Prestons South

Earthquake Cases:
Serviceability Limit State (SLS) EQ Case (From MBIE Guidelines) - PGA = 0.13g Mag = 7.5
Intermediate EQ Case (Based on NZS1170.2004) - PGA = 0.2g Mag = 7.5
Ultimate Limit State (ULS) EQ Case (From MBIE Guidelines) - PGA = 0.35g Mag = 7.5

2007 CPTs for Upper 10m Soil Profile

	Liquefaction Induced Settlements As Calculated (in mm)								Liquefaction Induced Settlements To the Nearest 5mm (in mm)							
	I&B Method (10m)			NCEER Method (10m)			Technical Category			I&B Method (10m)			NCEER Method (10m)			Technical Category
	SLS	INT	ULS	SLS	INT	ULS				SLS	INT	ULS	SLS	INT	ULS	
CPT006 (2007)	4	19	31	0	1	5	TC2		**CPT006 (2007)**	5	20	30	0	0	5	TC2
CPT007 (2007)	20	28	36	15	21	25	TC2		**CPT007 (2007)**	20	30	35	15	20	25	TC2
CPT008 (2007)	7	14	21	2	5	9	TC1		**CPT008 (2007)**	5	15	20	5	5	10	TC1

2011 CPTs for Upper 10m Soil Profile

	Liquefaction Induced Settlements As Calculated (in mm)								Liquefaction Induced Settlements To the Nearest 5mm (in mm)							
	I&B Method (10m)			NCEER Method (10m)			Technical Category			I&B Method (10m)			NCEER Method (10m)			Technical Category
	SLS	INT	ULS	SLS	INT	ULS				SLS	INT	ULS	SLS	INT	ULS	
CPT01	0	1	8	1	1	4	TC1		**CPT01**	0	0	10	0	0	5	TC1
CPT02	0	6	29	0	1	10	TC2		**CPT02**	0	5	30	0	0	10	TC2
CPT03	0	5	19	0	2	5	TC1		**CPT03**	0	5	20	0	0	5	TC1
CPT04	1	9	25	0	1	5	TC1		**CPT04**	0	10	25	0	0	5	TC1
CPT05	4	26	50	0	5	20	TC2		**CPT05**	5	25	50	0	5	20	TC2

	Liquefaction Induced Settlements As Calculated (in mm)								Liquefaction Induced Settlements To the Nearest 5mm (in mm)							
	I&B Method (10m)			NCEER Method (10m)			Technical Category			I&B Method (10m)			NCEER Method (10m)			Technical Category
	SLS	INT	ULS	SLS	INT	ULS				SLS	INT	ULS	SLS	INT	ULS	
CPT06	9	29	55	7	19	39	TC2		**CPT06**	10	30	55	5	20	40	TC2
CPT07	0	10	34	0	1	7	TC2		**CPT07**	0	10	35	0	0	5	TC2
CPT08	0	3	20	2	9	27	TC1		**CPT08**	0	5	20	0	10	25	TC1
CPT09	15	36	45	20	30	41	TC2		**CPT09**	15	35	45	20	30	40	TC2
CPT10	4	22	29	1	4	15	TC2		**CPT10**	5	20	30	0	5	15	TC2
CPT11	0	7	23	1	4	13	TC1		**CPT11**	0	5	25	0	5	15	TC1
CPT12	6	22	31	3	11	18	TC2		**CPT12**	5	20	30	5	10	20	TC2
CPT13	0	3	21	1	1	4	TC1		**CPT13**	0	5	20	0	0	5	TC1
CPT14	1	9	30	0	1	5	TC2		**CPT14**	0	10	30	0	0	5	TC2
CPT15	12	44	63	3	12	31	TC2		**CPT15**	10	45	65	5	10	30	TC2
CPT16	2	13	20	0	5	10	TC1		**CPT16**	0	15	20	0	5	10	TC1
CPT17	6	19	33	4	10	16	TC2		**CPT17**	5	20	35	5	10	15	TC2
CPT18	5	16	30	2	7	13	TC2		**CPT18**	5	15	30	0	5	15	TC2
CPT19	0	9	38	0	0	4	TC2		**CPT19**	0	10	40	0	0	5	TC2
CPT20	12	35	41	7	17	27	TC2		**CPT20**	10	35	40	5	15	25	TC2
CPT21	2	10	27	3	6	11	TC2		**CPT21**	0	10	25	5	5	10	TC2
CPT22	2	5	13	10	14	15	TC1		**CPT22**	0	5	15	10	15	15	TC1
CPT23	1	5	12	18	27	35	TC1		**CPT23**	0	5	10	20	25	35	TC1
CPT24	0	1	9	0	0	1	TC1		**CPT24**	0	0	10	0	0	0	TC1
CPT25	1	9	39	0	2	9	TC2		**CPT25**	0	10	40	0	0	10	TC2
CPT26	3	27	39	3	16	30	TC2		**CPT26**	5	25	40	5	15	30	TC2
CPT27	0	1	12	1	3	12	TC1		**CPT27**	0	0	10	0	5	10	TC1
CPT28	0	4	31	0	0	3	TC2		**CPT28**	0	5	30	0	0	5	TC2
CPT29	5	25	44	0	0	5	TC2		**CPT29**	5	25	45	0	0	5	TC2
CPT30	7	26	49	0	2	9	TC2		**CPT30**	5	25	50	0	0	10	TC2

2012 CPTs for Upper 10m Soil Profile

	Liquefaction Induced Settlements As Calculated (in mm)								Liquefaction Induced Settlements To the Nearest 5mm (in mm)							
	I&B Method (10m)			NCEER Method (10m)			Technical Category			I&B Method (10m)			NCEER Method (10m)			Technical Category
	SLS	INT	ULS	SLS	INT	ULS				SLS	INT	ULS	SLS	INT	ULS	
CPT101	3	18	39	1	4	9	TC2		**CPT101**	5	20	40	0	5	10	TC2
CPT102	2	14	20	1	3	9	TC1		**CPT102**	0	15	20	0	5	10	TC1
CPT103	1	6	20	0	1	6	TC1		**CPT103**	0	5	20	0	0	5	TC1
CPT104	0	2	8	0	0	2	TC1		**CPT104**	0	0	10	0	0	0	TC1
CPT105	1	7	17	0	2	7	TC1		**CPT105**	0	5	15	0	0	5	TC1
CPT106	5	21	41	3	14	20	TC2		**CPT106**	5	20	40	5	15	20	TC2
CPT107	0	2	16	0	0	2	TC1		**CPT107**	0	0	15	0	0	0	TC1
CPT108	0	3	17	0	1	6	TC1		**CPT108**	0	5	15	0	0	5	TC1
CPT109	0	3	15	0	0	1	TC1		**CPT109**	0	5	15	0	0	0	TC1
CPT110	0	3	17	1	8	21	TC1		**CPT110**	0	5	15	0	10	20	TC1
CPT111	0	0	9	0	0	1	TC1		**CPT111**	0	0	10	0	0	0	TC1
CPT112	1	11	28	1	3	11	TC2		**CPT112**	0	10	30	0	5	10	TC2
CPT113	1	7	31	1	4	10	TC2		**CPT113**	0	5	30	0	5	10	TC2
CPT114	0	0	2	0	0	0	TC1		**CPT114**	0	0	0	0	0	0	TC1
CPT115	1	7	31	0	1	10	TC2		**CPT115**	0	5	30	0	0	10	TC2
CPT116	1	9	24	1	4	10	TC1		**CPT116**	0	10	25	0	5	10	TC1
CPT117	0	3	11	0	0	3	TC1		**CPT117**	0	5	10	0	0	5	TC1
CPT118	6	15	27	1	5	8	TC2		**CPT118**	5	15	25	0	5	10	TC2
CPT119	2	5	9	0	1	3	TC1		**CPT119**	0	5	10	0	0	5	TC1
CPT120	4	6	10	0	0	1	TC1		**CPT120**	5	5	10	0	0	0	TC1
CPT121	9	18	34	6	12	19	TC2		**CPT121**	10	20	35	5	10	20	TC2
CPT122	0	6	20	0	1	4	TC1		**CPT122**	0	5	20	0	0	5	TC1

	Liquefaction Induced Settlements As Calculated (in mm)								Liquefaction Induced Settlements To the Nearest 5mm (in mm)							
	I&B Method (10m)			NCEER Method (10m)			Technical Category			I&B Method (10m)			NCEER Method (10m)			Technical Category
	SLS	INT	ULS	SLS	INT	ULS				SLS	INT	ULS	SLS	INT	ULS	
CPT123	0	2	25	0	0	3	TC1		**CPT123**	0	0	25	0	0	5	TC1
CPT124	0	4	33	0	1	7	TC2		**CPT124**	0	5	35	0	0	5	TC2
CPT125	0	7	29	0	1	5	TC2		**CPT125**	0	5	30	0	0	5	TC2
CPT126	6	16	24	3	10	12	TC1		**CPT126**	5	15	25	5	10	10	TC1
CPT127	4	26	41	0	2	10	TC2		**CPT127**	5	25	40	0	0	10	TC2
CPT128	0	1	6	0	1	2	TC1		**CPT128**	0	0	5	0	0	0	TC1
CPT129	1	5	8	1	4	6	TC1		**CPT129**	0	5	10	0	5	5	TC1
CPT130	0	7	26	0	1	7	TC2		**CPT130**	0	5	25	0	0	5	TC2
CPT131	0	1	13	0	0	1	TC1		**CPT131**	0	0	15	0	0	0	TC1
CPT132	9	17	20	11	18	20	TC1		**CPT132**	10	15	20	10	20	20	TC1
CPT133	6	16	25	2	9	13	TC1		**CPT133**	5	15	25	0	10	15	TC1
CPT134	0	5	21	0	2	7	TC1		**CPT134**	0	5	20	0	0	5	TC1
CPT135	0	0	10	0	0	1	TC1		**CPT135**	0	0	10	0	0	0	TC1
CPT136	0	3	26	0	0	4	TC2		**CPT136**	0	5	25	0	0	5	TC2
CPT137	0	9	24	0	1	6	TC1		**CPT137**	0	10	25	0	0	5	TC1
CPT138	0	0	1	0	0	0	TC1		**CPT138**	0	0	0	0	0	0	TC1
CPT139	0	1	18	0	0	1	TC1		**CPT139**	0	0	20	0	0	0	TC1
CPT140	1	10	30	0	0	3	TC2		**CPT140**	0	10	30	0	0	5	TC2
CPT141	1	13	34	0	1	5	TC2		**CPT141**	0	15	35	0	0	5	TC2
CPT179	0	4	25	0	1	5	TC1		**CPT179**	0	5	25	0	0	5	TC1

2007 CPTs for Full CPT Depth

	Liquefaction Induced Settlements As Calculated (in mm)								Liquefaction Induced Settlements To the Nearest 5mm (in mm)							
	I&B Method (Full Depth)			NCEER Method (Full Depth)					I&B Method (Full Depth)			NCEER Method (Full Depth)				
	SLS	INT	ULS	SLS	INT	ULS			SLS	INT	ULS	SLS	INT	ULS		
CPT006 (2007)	4	19	31	0	1	5			**CPT006 (2007)**	5	20	30	0	0	5	
CPT007 (2007)	20	28	36	15	21	25			**CPT007 (2007)**	20	30	35	15	20	25	
CPT008 (2007)	7	14	21	2	5	9			**CPT008 (2007)**	5	15	20	5	5	10	

2011 CPTs for Full CPT Depth

	Liquefaction Induced Settlements As Calculated (in mm)								Liquefaction Induced Settlements To the Nearest 5mm (in mm)							
	I&B Method (Full Depth)			NCEER Method (Full Depth)					I&B Method (Full Depth)			NCEER Method (Full Depth)				
	SLS	INT	ULS	SLS	INT	ULS			SLS	INT	ULS	SLS	INT	ULS		
CPT01	0	1	8	1	1	4			**CPT01**	0	0	10	0	0	5	
CPT02	0	10	52	0	3	16			**CPT02**	0	10	50	0	5	15	
CPT03	0	5	22	0	2	5			**CPT03**	0	5	20	0	0	5	
CPT04	1	9	29	0	1	6			**CPT04**	0	10	30	0	0	5	
CPT05	14	63	119	6	19	54			**CPT05**	15	65	120	5	20	55	
CPT06	9	29	60	7	19	40			**CPT06**	10	30	60	5	20	40	
CPT07	11	47	94	5	16	42			**CPT07**	10	45	95	5	15	40	
CPT08	10	40	81	2	12	48			**CPT08**	10	40	80	0	10	50	
CPT09	16	44	73	20	32	50			**CPT09**	15	45	75	20	30	50	
CPT10	13	61	122	6	17	61			**CPT10**	15	60	120	5	15	60	
CPT11	0	7	23	0	4	13			**CPT11**	0	5	25	0	5	15	
CPT12	14	47	84	6	20	42			**CPT12**	15	45	85	5	20	40	

	Liquefaction Induced Settlements As Calculated (in mm)									Liquefaction Induced Settlements To the Nearest 5mm (in mm)							
	I&B Method (Full Depth)			NCEER Method (Full Depth)						I&B Method (Full Depth)			NCEER Method (Full Depth)				
	SLS	INT	ULS	SLS	INT	ULS				SLS	INT	ULS	SLS	INT	ULS		
CPT13	0	6	39	0	0	8			**CPT13**	0	5	40	0	0	10		
CPT14	7	32	73	2	8	25			**CPT14**	5	30	75	0	10	25		
CPT15	13	64	133	4	15	52			**CPT15**	15	65	135	5	15	50		
CPT16	5	35	91	1	8	31			**CPT16**	5	35	90	0	10	30		
CPT17	14	43	80	4	12	25			**CPT17**	15	45	80	5	10	25		
CPT18	13	40	78	6	7	35			**CPT18**	15	40	80	5	5	35		
CPT19	2	29	87	0	4	25			**CPT19**	0	30	85	0	5	25		
CPT20	12	37	49	7	17	30			**CPT20**	10	35	50	5	15	30		
CPT21	4	28	78	3	11	31			**CPT21**	5	30	80	5	10	30		
CPT22	4	12	25	11	16	20			**CPT22**	5	10	25	10	15	20		
CPT23	3	11	24	19	29	40			**CPT23**	5	10	25	20	30	40		
CPT24	0	4	24	0	0	4			**CPT24**	0	5	25	0	0	5		
CPT25	12	51	99	4	17	48			**CPT25**	10	50	100	5	15	50		
CPT26	3	27	39	3	16	30			**CPT26**	5	25	40	5	15	30		
CPT27	5	18	44	2	9	27			**CPT27**	5	20	45	0	10	25		
CPT28	15	60	165	5	18	57			**CPT28**	15	60	165	5	20	55		
CPT29	6	34	68	0	3	13			**CPT29**	5	35	70	0	5	15		
CPT30	7	32	84	0	2	14			**CPT30**	5	30	85	0	0	15		

2012 CPTs for Full CPT Depth

	Liquefaction Induced Settlements As Calculated (in mm)								Liquefaction Induced Settlements To the Nearest 5mm (in mm)							
	I&B Method (Full Depth)			NCEER Method (Full Depth)						I&B Method (Full Depth)			NCEER Method (Full Depth)			
	SLS	INT	ULS	SLS	INT	ULS				SLS	INT	ULS	SLS	INT	ULS	
CPT101	3	18	39	1	4	9			**CPT101**	5	20	40	0	5	10	
CPT102	2	17	31	0	3	11			**CPT102**	0	15	30	0	5	10	
CPT103	2	14	50	0	3	17			**CPT103**	0	15	50	0	5	15	
CPT104	9	32	74	5	11	34			**CPT104**	10	30	75	5	10	35	
CPT105	1	11	39	0	2	11			**CPT105**	0	10	40	0	0	10	
CPT106	6	31	66	3	15	30			**CPT106**	5	30	65	5	15	30	
CPT107	0	5	28	0	0	6			**CPT107**	0	5	30	0	0	5	
CPT108	0	3	19	0	0	6			**CPT108**	0	5	20	0	0	5	
CPT109	0	3	17	0	0	1			**CPT109**	0	5	15	0	0	0	
CPT110	0	3	17	1	8	21			**CPT110**	0	5	15	0	10	20	
CPT111	0	0	11	0	0	2			**CPT111**	0	0	10	0	0	0	
CPT112	3	24	62	0	5	23			**CPT112**	5	25	60	0	5	25	
CPT113	31	67	110	1	5	19			**CPT113**	30	65	110	0	5	20	
CPT114	0	0	2	0	0	0			**CPT114**	0	0	0	0	0	0	
CPT115	29	67	112	19	36	70			**CPT115**	30	65	110	20	35	70	
CPT116	6	31	80	3	11	34			**CPT116**	5	30	80	5	10	35	
CPT117	2	13	36	0	3	14			**CPT117**	0	15	35	0	5	15	
CPT118	6	15	27	1	5	8			**CPT118**	5	15	25	0	5	10	
CPT119	2	5	9	0	1	3			**CPT119**	0	5	10	0	0	5	
CPT120	19	38	61	10	19	34			**CPT120**	20	40	60	10	20	35	
CPT121	15	42	89	9	19	43			**CPT121**	15	40	90	10	20	45	
CPT122	12	38	81	6	14	35			**CPT122**	10	40	80	5	15	35	
CPT123	4	15	62	2	7	18			**CPT123**	5	15	60	0	5	20	
CPT124	1	10	62	0	2	15			**CPT124**	0	10	60	0	0	15	

	Liquefaction Induced Settlements As Calculated (in mm)									Liquefaction Induced Settlements To the Nearest 5mm (in mm)							
	I&B Method (Full Depth)			NCEER Method (Full Depth)						I&B Method (Full Depth)			NCEER Method (Full Depth)				
	SLS	INT	ULS	SLS	INT	ULS				SLS	INT	ULS	SLS	INT	ULS		
CPT125	5	22	71	3	6	21			**CPT125**	5	20	70	5	5	20		
CPT126	8	26	49	4	13	23			**CPT126**	10	25	50	5	15	25		
CPT127	18	43	66	12	16	28			**CPT127**	20	45	65	10	15	30		
CPT128	0	3	17	0	0	4			**CPT128**	0	5	15	0	0	5		
CPT129	1	9	28	1	4	11			**CPT129**	0	10	30	0	5	10		
CPT130	10	30	71	4	12	30			**CPT130**	10	30	70	5	10	30		
CPT131	1	7	38	0	2	9			**CPT131**	0	5	40	0	0	10		
CPT132	9	17	20	11	18	20			**CPT132**	10	15	20	10	20	20		
CPT133	6	16	25	2	9	13			**CPT133**	5	15	25	0	10	15		
CPT134	1	8	30	0	3	10			**CPT134**	0	10	30	0	5	10		
CPT135	7	18	45	5	1	19			**CPT135**	5	20	45	5	0	20		
CPT136	0	3	33	0	0	5			**CPT136**	0	5	35	0	0	5		
CPT137	0	10	33	0	1	7			**CPT137**	0	10	35	0	0	5		
CPT138	0	4	22	0	1	5			**CPT138**	0	5	20	0	0	5		
CPT139	0	6	42	0	0	6			**CPT139**	0	5	40	0	0	5		
CPT140	1	10	30	0	0	3			**CPT140**	0	10	30	0	0	5		
CPT141	7	35	90	3	9	27			**CPT141**	5	35	90	5	10	25		
CPT179	7	34	90	4	10	37			**CPT179**	5	35	90	5	10	35		

Assessment Against Ishihara Plot (1985)

Assessment is based on the liquefaction plots for the Idriss and Boulanger Method
0.2g Plot used for SLS & INT Earthquake Cases and 0.4g Plot used for ULS Earthquake Case

	SLS & INT	ULS			SLS & INT	ULS			SLS & INT	ULS			SLS & INT	ULS
CPT006	NO	YES		**CPT17**	NO	YES		**CPT101**	NO	YES		**CPT121**	NO	YES
CPT007	NO	YES		**CPT18**	YES	YES		**CPT102**	NO	YES		**CPT122**	NO	NO
CPT008	NO	YES		**CPT19**	NO	YES		**CPT103**	NO	NO		**CPT123**	NO	NO
CPT01	NO	NO		**CPT20**	YES	YES		**CPT104**	NO	NO		**CPT124**	NO	NO
CPT02	NO	YES		**CPT21**	NO	NO		**CPT105**	NO	NO		**CPT125**	NO	YES
CPT03	NO	YES		**CPT22**	NO	NO		**CPT106**	NO	YES		**CPT126**	NO	NO
CPT04	NO	YES		**CPT23**	NO	NO		**CPT107**	NO	YES		**CPT127**	YES	YES
CPT05	YES	YES		**CPT24**	NO	NO		**CPT108**	NO	NO		**CPT128**	NO	NO
CPT06	NO	YES		**CPT25**	NO	NO		**CPT109**	NO	NO		**CPT129**	NO	NO
CPT07	NO	YES		**CPT26**	YES	YES		**CPT110**	NO	NO		**CPT130**	NO	NO
CPT08	NO	NO		**CPT27**	NO	NO		**CPT111**	NO	NO		**CPT131**	NO	YES
CPT09	YES	YES		**CPT28**	NO	YES		**CPT112**	NO	YES		**CPT132**	NO	NO
CPT10	YES	YES		**CPT29**	YES	YES		**CPT113**	NO	NO		**CPT133**	NO	YES
CPT11	NO	NO		**CPT30**	YES	YES		**CPT114**	NO	NO		**CPT134**	NO	YES
CPT12	YES	YES						**CPT115**	NO	NO		**CPT135**	NO	NO
CPT13	NO	YES						**CPT116**	NO	NO		**CPT136**	NO	NO
CPT14	NO	NO						**CPT117**	NO	NO		**CPT137**	NO	YES
CPT15	YES	YES						**CPT118**	NO	YES		**CPT138**	NO	NO
CPT16	NO	YES						**CPT119**	NO	NO		**CPT139**	NO	YES
								CPT120	NO	NO		**CPT140**	NO	YES
												CPT141	NO	NO
												CPT179	NO	NO

Appendix M
Gravel Embankment Assessments

Preston South Subdivision 235361-050-01

Gravel Embankment Assessment

Using Idriss & Boulanger Liquefaction Profiles for ULS Earthquake Event

Channel - 2m Depth

CPT Test	Depth of Liquefaction (m)				Thickness of Liquefiable Soils (m)			
	0-1m	1m-2m	2m-3m	3m-4m	0-1m	1m-2m	2m-3m	3m-4m
CPT12	x	x	-	-	0.3	0.8	-	-
CPT14	-	x	-	-	-	0.5	-	-
CPT15	x	x	x (2.5m)	x (3.6m)	0.5	1.0	0.5	0.1
CPT17	x	x	-	-	0.5	0.1	-	-
CPT18	x	x	-	-	0.4	0.2	-	-
CPT19	x	x	x (2.3m)	-	0.1	1.0	0.3	-
CPT29	x	x	x (2.1m)	-	0.8	1.0	0.1	-
CPT115	-	-	-	-	-	-	-	-
CPT117	-	x	-	-	-	0.4	-	-
CPT120	-	x	-	-	-	0.1	-	-
CPT121	-	x	-	-	-	1.0	-	-
CPT122	-	x	-	-	-	0.2	-	-
CPT124	-	x	x (2.5m)	-	-	0.6	0.3	-
CPT128	-	x	-	-	-	0.2	-	-
CPT129	-	x	-	-	-	0.2	-	-
CPT133	x	x	-	x (3.7m)	0.1	0.6	-	0.2
CPT134	-	x	x (2.1m)	-	-	0.9	0.1	-
CPT136	-	x	-	x (3.8m)	-	0.2	-	0.4
CPT137	x	x	-	-	0.2	0.8	-	-
CPT138	-	-	-	-	-	-	-	-
CPT139	x	x	-	-	0.4	0.5	-	-

Southern Channel - 3m Depth

CPT Test	Depth of Liquefaction (m)				Thickness of Liquefiable Soils (m)			
	0-1m	1m-2m	2m-3m	3m-4m	0-1m	1m-2m	2m-3m	3m-4m
CPT10	x	x	-	-	0.2	0.9	-	-
CPT12	x	x	-	-	0.3	0.8	-	-
CPT106	-	x	-	x (4m)	-	1.0	-	0.5
CPT112	-	x	x (2.6m)	-	-	1.0	0.6	-

Basin - 3m Depth

CPT Test	Depth of Liquefaction (m)				Thickness of Liquefiable Soils (m)			
	0-1m	1m-2m	2m-3m	3m-4m	0-1m	1m-2m	2m-3m	3m-4m
CPT15	x	x	x (2.5m)	x (3.6m)	0.5	1.0	0.5	0.1
CPT123	-	x	x (2.1m)	-	-	0.6	0.1	-
CPT124	-	x	x (2.5m)	-	-	0.6	0.3	-

Note: Numbers in brackets is the lowest depth of the liquefiable layer below existing ground level.

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Aurecon offices are located in:
Angola, Australia, Botswana, China, Ethiopia, Hong Kong, Indonesia, Lesotho, Libya, Malawi, Mozambique, Namibia, New Zealand, Nigeria, Philippines, Singapore, South Africa, Swaziland, Tanzania, Thailand, Uganda, United Arab Emirates, Vietnam.

1 : 3,000 on A4

28/06/2019 7:06:27 AM

Christchurch City Council

ph: 941-8300 fax: 941-8385

Accuracy not guaranteed. Onsite verification required. Display of data scale dependent, full detail available at 1:500.

Private Drainage

Standard Infrastructure
- Bio Gas
- Condensate Trap
- End Cap
- Inlet
- Outlet
- Valve
- Main
- Cable

Water Intake/Supply
- Connector
- Bellows
- Connector
- Hydrant

Water Intake/Supply
- Inlet
- Meter
- Outlet
- Pump
- Restrictor
- Valve
- Air Release
- Butterfly
- Flow restriction
- Gate
- Pressure Activated
- Sluice
- Valve
- Reservoir
- Structure
- Lateral
- Main
- Sub Main

Wastewater
- End Cap
- Valve
- Air Gap Separator
- Vent
- Eye
- Eye (Vertical)
- Outfall
- Pump
- Junction
- Access
- Flush Manhole
- Inspection Point
- Standard Manhole
- Trap
- Vented Manhole
- Lateral
- Main
- Pressure Main

Wastewater
- Lateral Fitting

Local Pressure
- CP Control Panel
- BK Boundary Kit
- T Tank System
- Site
- V Vacuum Chamber
- BU Vacuum Breather

Stormwater
- Bend
- Change
- Eye
- Flow Restriction
- Inlet
- Dome Sump
- Double Sump
- Gross Debris Trap

Stormwater
- Inlet
- Inlet
- Inlet Headwall
- Pipe End
- Silt Trap
- Single Sump
- Soak Pit
- Triple Sump
- Junction
- Standard Manhole
- Outlet
- Pump
- Structure
- Basin
- Lateral
- Main
- Lateral Fitting
- Double Sump

Stormwater
- Lateral Fitting
- Single Sump
- Soak Pit
- Inspection point
- Manhole

All services
- Pipe Protection
- *a* Abandoned
- *p* Proposed
- *os* Out of service

Landbase
- Easement

1 : 3,000 on A4

28/06/2019 7:08:46 AM

Christchurch City Council

ph: 941-8300 fax: 941-8385

Accuracy not guaranteed. Onsite verification required. Display of data scale dependent, full detail available at 1:500. Client Selected Legend.

Property Info

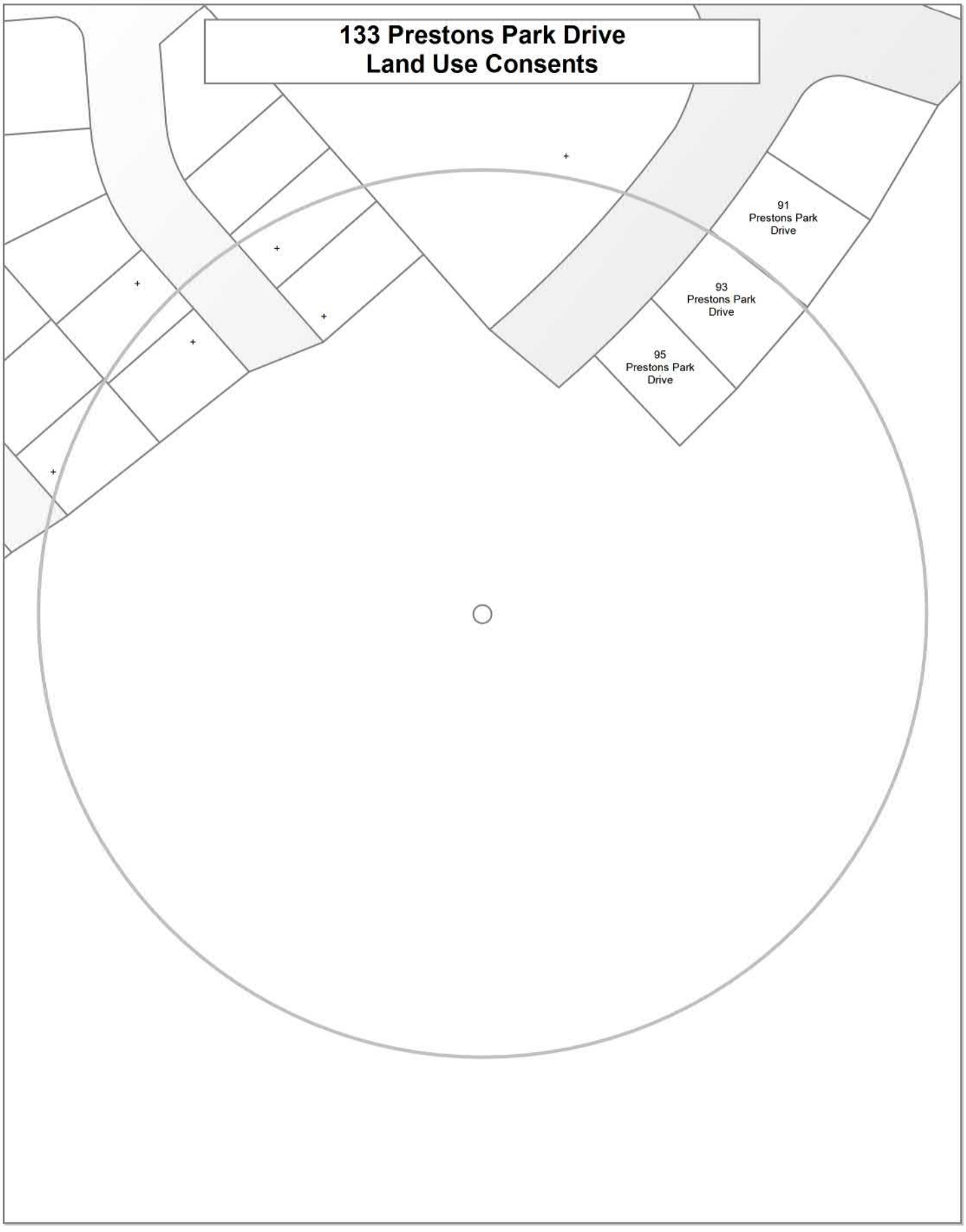
Built Feature
- Tank

Landbase
- Road Name
- Road Hierarchy
- Central City Local Distributor
- Central City Main Distributor
- Collector
- Local Road
- Major Arterial
- Minor Arterial
- Motorway
- Pedestrian
- Private
- Rating Unit
- Rating Unit (Fill)
- Rating Unit (No Fill)

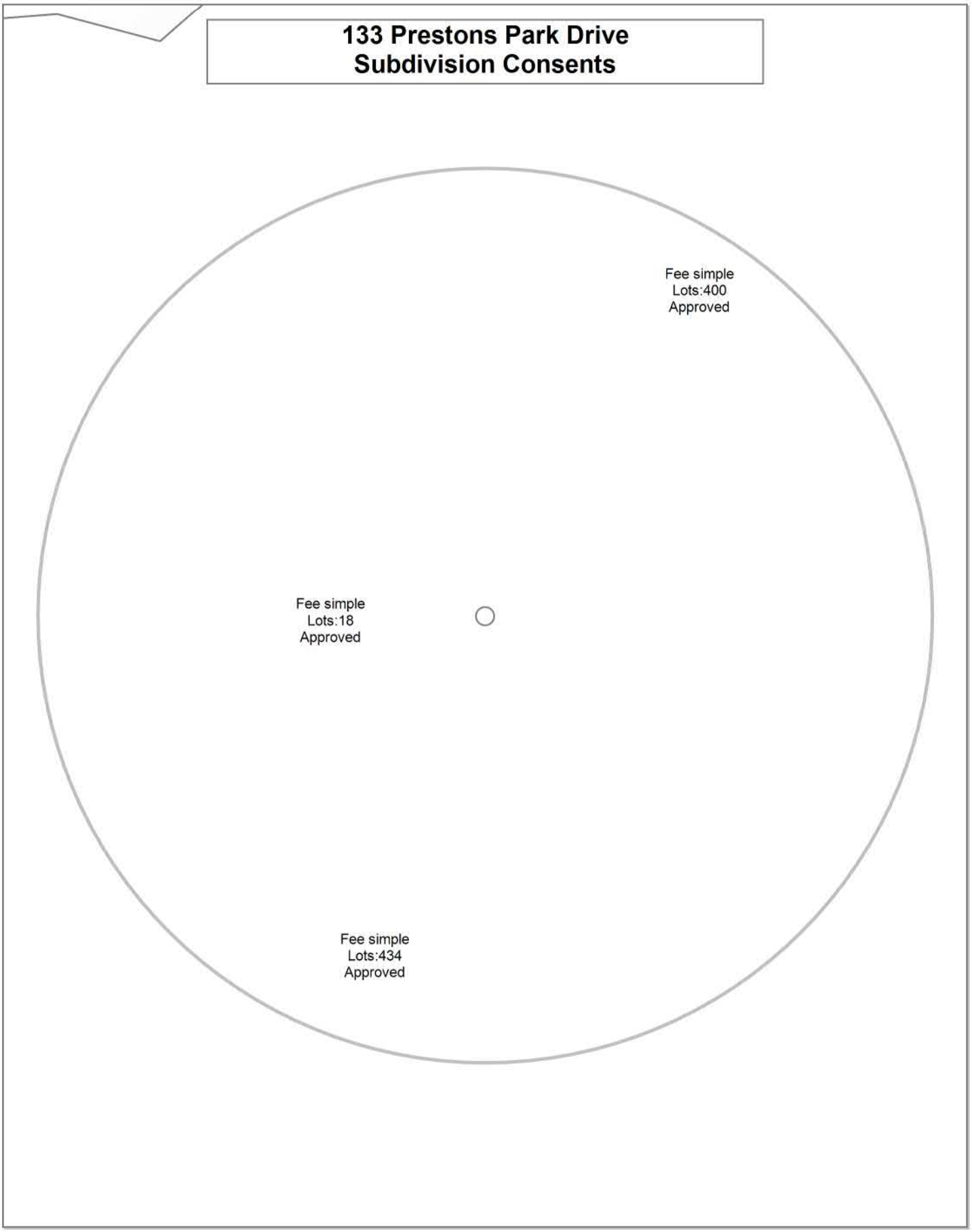
Aerial Photo 2016
- Aerial Photo 2016 CC 5
- Aerial Photo 2016 BP 6
- Aerial Photo 2016 4

Spatial Query Report

Christchurch City Council



Christchurch City Council



Spatial Query Report

Land Use Resource Consents within 100 metres of 133 Prestons Park Drive

Note:This list does not include subdivision Consents and Certificates of Compliance issued under the Resource Management Act.

91 Prestons Park Drive

RMA/2019/233

Three double sided static billboards advertising the Prestons Park development for a duration 5 years, flexibility in location and content of display sought. One double sided billboard adjacent to the Prestons Road frontage, two double sided billboards adjacent to the Mairehau Road frontage.

Processing complete

Applied 08/02/2019

Decision issued 10/04/2019

Granted 10/04/2019

93 Prestons Park Drive

RMA/2019/233

Three double sided static billboards advertising the Prestons Park development for a duration 5 years, flexibility in location and content of display sought. One double sided billboard adjacent to the Prestons Road frontage, two double sided billboards adjacent to the Mairehau Road frontage.

Processing complete

Applied 08/02/2019

Decision issued 10/04/2019

Granted 10/04/2019

95 Prestons Park Drive

RMA/2019/233

Three double sided static billboards advertising the Prestons Park development for a duration 5 years, flexibility in location and content of display sought. One double sided billboard adjacent to the Prestons Road frontage, two double sided billboards adjacent to the Mairehau Road frontage.

Processing complete

Applied 08/02/2019

Decision issued 10/04/2019

Granted 10/04/2019

Data Quality Statement

Land Use Consents

All resource consents are shown for sites that have been labelled with an address. For sites that have been labelled with a cross (+) no resource consents have been found. Sites that have no label have not been checked for resource consents. This will be particularly noticeable on the margins of the search radius. If there are such sites and you would like them included in the check, please ask for the LIM spatial query to be rerun accordingly. This will be done free of charge although there may be a short delay. Resource consents which are on land occupied by roads, railways or rivers are not, and currently cannot be displayed, either on the map or in the list. Resource consents that relate to land that has since been subdivided, will be shown in the list, but not on the map. They will be under the address of the land as it was at the time the resource consent was applied for. Resource consents that are listed as Non-notified and are current, may in fact be notified resource consents that have not yet been through the notification process. If in doubt. Please phone (03)941 8999.

The term “resource consents” in this context means land use consents. Subdivision consents and certificates of compliance are excluded.

Spatial Query Report

Subdivision Consents

All subdivision consents are shown for the sites that have been labelled with consent details. For Sites that have been labelled with a cross (+) no records have been found. Sites that have no label have not been checked for subdivision consents. This will be particularly noticeable on the margins of the search radius. If there are such sites and you would like them included in the check, please ask for the LIM spatial query to be rerun accordingly. This will be done free of charge although there may be a short delay.

The term “subdivision consents” in this context means a resource consent application to subdivide land. Non subdivision land use resource consents and certificates of compliance are excluded.

This report will only record those subdivision applications which have not been completed i.e once a subdivision has been given effect to and the new lots/properties have been established the application which created those lots will not be shown

All subdivision consent information is contained on the map and no separate list is supplied