STRUCterre
consulting engineers

33550-14SS

REDLAND CITY COUNCIL

PRIORITY DEVELOPMENT AREAS
SP1 TOONDAH HARBOUR, CLEVELAND
SP2 WEINAM CREEK, REDLAND BAY

DRILLING & TESTING

Date: May 09, 2014

SITE INVESTIGATION REPORT

CLIENT:	**Redland City Council** PO Box 21 CLEVELAND 4163
JOB NUMBER:	**33550-14SS**
PROJECT:	Drilling & Testing - Priority Development Areas REDLAND BAY & CLEVELAND
REPORT DATE:	9 May 2014
DRILL DATES:	17 March 2014 to 24 March 2014

1. PROJECT DETAILS

1.1. Introduction

Structerre Consulting Engineers was commissioned by Redland City Council to undertake a geotechnical investigation at a two priority development precincts in Cleveland and Redland Bay at the following locations:

SP1 Toondah Harbour, Cleveland

BH1-	Lot 66/SP115554	240 Middle Street, Cleveland
BH2-	Lot 58/SP115554	248 Middle Street, Cleveland
BH3-	Lot 79/SL7088	13-21 Emmett Drive, Cleveland
BH4-	Lot 1/RP145396	233 Middle Street, Cleveland
BH5-	Lot 19/SP115544	233 Middle Street, Cleveland
BH6-	Lot 21/SP125288	2-10 Emmett Drive, Cleveland

SP2 Weinam Creek, Redland Bay

BH1-	Lot 902/SP223465	5-9 Weinam Street, Redland Bay
BH2-	Lot 167/CP884275	46-72 Banana Street, Redland Bay
BH3-	Lot 197/SP123870	9 Meissner Street, Redland Bay
BH4-	Lot 197/SP123870	9 Meissner Street, Redland Bay
BH5-	Lot 1/RP90590	22 Meissner Street, Redland Bay
BH6-	Lot 143/SL843	2-26 Meissner Street, Redland Bay

These investigation was carried out to provide the following:
- Strength capacity of the sub-surface profile
- Characteristics of the sub-surface profile

1.2 Regional Geology

The soils and rock encountered on site are derived from the weathering of underlying rock and the erosion of surrounding materials. The 1:500,000 Moreton Geological Map prepared by the Geological Survey of Queensland and New South Wales published in 1980 suggests the investigated sites are underlain by Quaternary estuarine and tidal delta deposits which overlie Tertiary age Basalts, Agglomerate, Rhyolite and Trachyte. It should be noted that the type of rock encountered on site could not be determined, due to both the extreme weathering of the rock and the sampling method used.

2. FIELDWORK

Fieldwork for the geotechnical investigation was carried out by an engineering team from Structerre, and comprised the following:

- Drilling of twelve (12) boreholes using a utilty mounted drilling rig
- Standard Penetration Tests (SPT) conducted within the boreholes to assess the in situ strength of subsurface soil layers.
- Reinstatement of the boreholes with displaced soils.

3. INVESTIGATION RESULTS

Subsurface conditions encountered within the boreholes are described below:

SP1 Toondah Harbour, Cleveland

Borehole 1. 240 Middle Street, Cleveland

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of medium plasticity silty clay to 0.7m which is then underlain by natural medium plasticity silty clay, low plasticity sandy clay and high plasticity silty clays to 12.8m overlying extremely weathered bedrock extending to the borehole termination depth at 15.0m.

The moisture condition of the underlying material was generally dry to moist in the upper profile and moist to wet in the lower profile, Ground water seepage was encountered at 1.8m.

The consistency of the underlying material is found to be stiff in the upper profile, soft between 1.5m and 2.6m, and firm to stiff in the lower profile. The rock encountered is considered extremely weak.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 1 are presented in Table 1:

Table 1 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 1

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Silty CLAY: Stiff	0 – 1.5	50	0	18	10
Sandy / Silty CLAY: Soft	1.5 – 2.6	10	0	16	1
Silty CLAY: Firm to Stiff	2.6 – 5.2	75	0	18	15
Silty CLAY: Firm	5.2 – 10.1	35	0	17	7
Silty CLAY: Firm to Stiff	10.1 – 12.8	75	0	18	15
Extremely Weak Weathered ROCK	12.8 - 15	0	28	17	3

Borehole 2. 248 Middle Street, Cleveland

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of silty sand and high plasticity silty clay to 1.7m which is then underlain by layers natural material comprised of high plasticity silty clay, silty sand and clayey sand to 7.3m overlying high plasticity clay with weathered rock layers extending to the borehole termination depth at 15.0m.

The moisture condition of the underlying material was generally moist in the upper profile and moist to wet in the lower profile, Ground water seepage was encountered at 1.7m.

The consistency of the underlying material is found to be soft to firm and loose to medium dense in the upper profile and firm to stiff in the lower profile.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 2 are presented in Table 2:

Table 2 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 2

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Silty SAND: Loose to Medium Dense	0 – 0.5	0	31	18	15
Silty CLAY: Firm	0.5 – 1.7	5	0	17	7
Silty SAND: Loose	1.7 – 2.4	0	28	16	5
Silty CLAY: Soft	2.4 – 3.2	10	0	16	2
Clayey SAND: Loose	3.2 – 4.9	0	30	16	5
Silty CLAY: Firm to Stiff	4.9 - 15	65	0	18	13

Borehole 3. 13-21 Emmett Drive, Cleveland

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of silty gravel to 0.7m which is then underlain by layers natural material comprised of high plasticity silty clay, silty sand and clayey gravel to 10.5m overlying high plasticity clay with weathered rock layers extending to the borehole termination depth at 15.0m.

The moisture condition of the underlying material was dry in the fill layer and moist to wet in the lower profile, Ground water seepage was encountered at 1.5m.

The consistency of the underlying material is found to be dense in the fill layer, very loose to loose and soft to firm in the upper profile, and stiff to very stiff in the lower profile.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 3 are presented in Table 3:

Table 3 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 3

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Silty GRAVEL: Dense	0 – 0.7	0	35	19	20
Silty SAND: Loose	0.7 – 1.5	5	28	16	5
Silty CLAY: Soft	1.5 – 2.1	10	0	16	1
Clayey GRAVEL: Very Loose	2.1 – 2.9	0	28	16	5
Silty CLAY: Soft	2.9 – 4.8	5	0	16	1
Silty CLAY: Firm	4.8 – 6.1	35	0	17	7
Silty CLAY: Stiff	6.1 - 15	80	0	18	16

Borehole 4. 233 Middle Street, Cleveland

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of sandy silt and silty gravel to 0.8m which is then underlain by layers natural material comprised of silty sandy medium plasticity sandy clay, high plasticity silty clay and peat to 6.7m overlying high plasticity silty clay with weathered rock layers extending to the borehole termination depth at 15.0m.

The moisture condition of the underlying material was dry to moist in the upper profile and moist to wet in the lower profile, Ground water seepage was encountered at 1.4m.

The consistency of the underlying material is found to be firm and dense in the fill layer, loose and soft to firm in the upper profile, and stiff to very stiff in the lower profile.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 4 are presented in Table 4:

Table 4 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 4

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Sandy SILT: Firm	0 – 0.6	0	30	17	5
Silty GRAVEL: Dense	0.6 – 0.8	0	35	19	20
Silty SAND: Loose	0.8 – 1.1	0	29	16	5
Sandy CLAY: Soft	1.1 – 1.9	5	0	16	1
PEAT: Soft	1.9 – 2.1	0	0	16	1
Silty CLAY: Soft to Firm	2.1 – 5.1	5	0	17	2
Sandy CLAY: Stiff	5.1 – 6.7	30	0	18	6
Silty CLAY: Stiff to Very Stiff	6.7 – 10.8	100	0	18	20
Sandy CLAY: Stiff	10.8 - 15	60	0	18	12

Borehole 5. 233 Middle Street, Cleveland

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of sandy silt and medium plasticity sandy clay to 2.2m which is then underlain by natural clayey sand and high plasticity silty clay to 4.2m overlying high plasticity silty clay with weathered rock lenses extending to the borehole termination depth at 15.5m.

The moisture condition of the underlying material was generally dry to moist in the upper profile and moist to wet in the lower profile, Ground water seepage was encountered at 1.8m.

The consistency of the underlying material is found to be firm to stiff in the upper profile, soft and very loose between 1.5m and 2.5m, and firm in the lower profile.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 5 are presented in Table 5:

Table 5 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 5

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Sandy SILT: Firm	0 – 0.3	0	30	17	10
Sandy CLAY: Firm to Stiff	0.3 – 1.5	35	0	17	7
Sandy CLAY: Soft	1.5 – 2.2	5	0	16	1
Clayey SAND: Very Loose	2.2 – 2.5	15	0	16	2
Silty CLAY: Firm	2.5 – 15	35	0	17	7

Borehole 6. 2-10 Emmett Drive, Cleveland

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of medium plasticity silty clay and low plasticity gravelly clay to 2.3m which is then underlain by natural high plasticity silty clay 6.2m overlying high plasticity silty clay with weathered rock lenses extending to the borehole termination depth at 15.0m.

The moisture condition of the underlying material was generally moist to wet throughout the profile, Ground water seepage was encountered at 1.5m.

The consistency of the underlying material is found to be soft to firm in the upper profile, firm to stiff in the middle profile, and stiff to very stiff in the lower profile.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 6 are presented in Table 6:

Table 6 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 6

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Silty CLAY: Firm	0 – 1.3	25	0	17	5
Gravelly CLAY: Soft	1.3 – 2.3	5	0	16	1
Silty CLAY: Soft	2.3 – 4.4	5	0	16	1
Silty CLAY: Firm to Stiff	4.4 – 6.2	55	0	18	11
Silty CLAY: Stiff to Very Stiff	6.2 – 15	85	0	19	20

SP2 Weinam Creek, Redland Bay

Borehole 1. 5-9 Weinam Street, Redland Bay

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of sandy silt and medium plasticity silty clay to 1.1m which is then underlain by natural high plasticity silty clay to 4.4m overlying high plasticity silty clay with rock lenses and sandy silt / extremely weathered bedrock extending to the borehole termination depth at 15.0m.

The moisture condition of the underlying material was generally dry to moist in the upper profile and moist to wet in the lower profile, Ground water seepage was encountered at 1.3m.

The consistency of the underlying material is found to be stiff to very stiff in the upper profile, very loose to loose in the middle profile, and firm to stiff in the lower profile. The rock encountered is considered extremely weak.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 1 are presented in Table 7:

Table 7 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 1

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Sandy SILT: Stiff	0 – 0.2	0	35	17	10
Silty CLAY: Stiff to Very Stiff	0.2 – 1.1	50	0	18	15
Silty SAND: Very Loose to Loose	1.1 – 1.5	0	28	16	2
Silty CLAY: Soft	1.5 – 2.2	10	0	16	2
Silty CLAY: Firm to Stiff	2.2 – 6.7	40	0	18	10
Sandy SILT: Firm / Extremely Weak	6.7 – 8.1	0	28	17	5
Silty CLAY: Stiff	8.1 – 10.5	85	0	18	17
Sandy SILT: Firm to Stiff / Extremely Weak	10.5 – 15	65	0	18	13

Borehole 2. 46-72 Banana Street, Redland Bay

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by natural silty sand to 1.1m which is then underlain by high plasticity silty clay to 12.4m overlying extremely weathered bedrock extending to the borehole termination depth at 15.0m.

The moisture condition of the underlying material was generally dry to moist in the upper profile and moist to wet in the lower profile, Ground water seepage was encountered at 3.5m.

The consistency of the underlying material is found to be medium dense in the upper profile and firm to stiff in the lower profile. The rock encountered is considered extremely weak.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 2 are presented in Table 8:

Table 8 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 2

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Silty SAND: Medium Dense	0 – 1.1	0	33	18	15
Silty CLAY: Firm	1.1 – 6.7	35	0	17	7
Silty SAND: Firm to Stiff	6.7 – 12.4	50	0	18	10
Weathered ROCK: Extremely Weak	12.4 – 15	0	28	18	9

Borehole 3. 9 Meissner Street, Redland Bay

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of silty gravel, clayey silt and high plasticity silty clay to 2.2m which is then underlain by natural high plasticity silty clays to 11.5m overlying extremely weathered bedrock extending to the borehole termination depth at 15.0m.

The moisture condition of the underlying material was generally dry to moist in the upper profile and moist to wet in the lower profile, Ground water seepage was encountered at 1.6m.

The consistency of the underlying material is found to be firm to stiff and dense in the fill layer, very loose to loose and soft between 2.2m and 3.9m, firm to stiff in the middle profile and soft to firm in the lower profile. The rock encountered is considered extremely weak.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 3 are presented in Table 9:

Table 9 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 3

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Silty GRAVEL: Dense	0 – 0.4	0	35	19	20
Clayey SILT: Firm	0.4 – 1.6	0	30	17	10
Silty CLAY: Stiff	1.6 – 2.2	40	0	18	8
Clayey Sandy GRAVEL: Very Loose to Loose	2.2 – 2.8	0	28	16	5
Silty CLAY: Soft to Firm	2. 8 – 4.6	15	0	17	3
Silty CLAY: Stiff	4.6 – 7.7	70	0	18	14
Silty CLAY: Firm to Stiff	7.7 – 10.2	40	0	18	8
Silty CLAY: Soft to Firm	10.2 – 11.5	35	0	17	7
Weathered ROCK: Extremely Weak	11.5 – 15	0	28	17	4

Borehole 4. 9 Meissner Street, Redland Bay

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of sandy silt and medium plasticity silty clay to 1.3m which is then underlain by natural silty sand, medium plasticity sandy clay, silty gravel and high plasticity silty clays to 11.1m overlying extremely weathered bedrock extending to the borehole termination depth at 15.0m.

The moisture condition of the underlying material was generally dry to moist in the upper profile and moist to wet in the lower profile, Ground water seepage was encountered at 1.8m.

The consistency of the underlying material is found to be soft to firm and loose in the upper profile and firm to stiff in the lower profile. The rock encountered is considered extremely weak.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 4 are presented in Table 10:

Table 10 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 4

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Sandy SILT: Firm	0 – 0.2	0	30	17	5
Silty CLAY: Firm	0.2 – 1.3	25	0	17	5
Silty SAND: Loose	1.3 – 1.4	0	29	16	5
Sandy CLAY: Soft	1.4 – 2.1	10	0	16	2
Silty GRAVEL: Loose	2.1 – 2.2	0	29	16	5
Silty CLAY: Soft	2.2 – 4.0	10	0	16	2
Silty CLAY: Firm to Stiff	4.0 – 11.1	60	0	18	12
Weathered ROCK: Extremely Weak	11.1 – 15	0	28	17	5

Borehole 5. 22 Meissner Street, Redland Bay

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of sandy silt, medium to high plasticity silty clays to 2.5m which is then underlain by natural peat, low plasticity sandy clay, high plasticity sandy clay and silty sand to 7.4m overlying high plasticity silty clay with weathered rock lenses extending to the borehole termination depth at 15.0m.

The moisture condition of the underlying material was generally dry to moist in the upper profile and moist to wet in the lower profile, Ground water seepage was encountered at 2.7m.

The consistency of the underlying material is found to be soft to firm and loose in the upper profile and firm to stiff in the lower profile.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 5 are presented in Table 11:

Table 11 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 5

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Sandy SILT: Firm	0 – 0.2	0	30	17	5
Silty CLAY: Firm to Soft	0.2 – 2.5	5	0	16	2
PEAT: Soft	2.5 – 2.7	0	0	16	1
Sandy / Silty CLAY: Soft	2.7 – 6.5	5	0	16	2
Silty SAND: Loose	6.5 – 7.4	0	29	16	5
Silty CLAY: Soft to Firm	7.4 – 9.5	20	0	17	4
Silty CLAY: Stiff	9.5 – 10.4	55	0	18	11
Silty CLAY: Firm to Stiff	10.4 – 13	25	0	17	5
Silty CLAY: Stiff	13 – 15	55	0	18	11

Borehole 6. 2-26 Meissner Street, Redland Bay

Soil test locations are attached in Appendix 1, drill logs in Appendix 2, Site photos in Appendix 3 and laboratory results are attached in Appendix 4.

The borehole investigation revealed that the site is underlain by fill comprised of silty sand to 0.6m which is then underlain by natural high plasticity silty clays to 4.7m overlying high plasticity silty clay with weathered rock lenses extending to the borehole termination depth at 15.0m

The moisture condition of the underlying material was generally dry to moist in the fill profile and moist to wet in the natural profile, Ground water seepage was encountered at 3.5m.

The consistency of the underlying material is found to be loose and soft to firm in the upper profile and stiff in the lower profile.

Based on the findings, the subsurface soil profile and inferred geotechnical design parameters for Borehole 6 are presented in Table 12:

Table 12 – Subsurface Soil Profile and Inferred Geotechnical Design Parameters for Borehole 6

Material Description	Depth (m)	c_u (kPa)	Ø (^{O})	γ (kN/m^3)	E_u (MPa)
Silty SAND: Loose	0 – 0.6	0	30	16	5
Silty CLAY: Firm	0.6 – 1.4	25	0	17	5
Silty CLAY: Soft	1.4 – 3.5	5	0	16	1
Silty CLAY: Soft to Firm	3.5 – 4.7	30	0	17	6
Silty SAND: Stiff	4.7 – 15	50	0	17	10

4. DISCUSSION

4.1 General

Based on the results of this investigation, it appeared that the SP1 – Toondah Harbour, Cleveland site was underlain by a generalised profile comprising loose to medium dense silty sand and/or firm to stiff silty clays to a depth of about 1.5m below the existing ground level (begl). This layer was then underlain by a very loose to loose silty sand and/or soft sandy/silty clay, and localised peat material, to about 4.9m begl. This very loose / soft soil materials were then underlain by firm to stiff/very stiff silty clay to target depth of 15m begl, except in borehole 1 where an extremely weak weathered rock was encountered from 10.5 begl to target depth.

SP2 – Weinam Creek, Redland Bay site can be generalised as having the same profile as SP1 - Toondah Harbour, Cleveland site, except that the extremely weak weathered rock was encountered in majority of the boreholes from 10.5 begl to target depth.

The geotechnical design parameters were inferred based on generally accepted SPT correlations for clay and sand. In this report the soil modulus E_u were estimated according to CIRIA 1995 where E_u for clay is approximately 1 times N_{SPT}. Look 1997 suggested c_u for clay to be approximately 5 times N_{SPT}. Angle of internal friction and E_u for sand were determined using suggested values from Look 1997.

4.2 Issues and Further Work

At the time of writing this report, the proposed developments are not yet known to the authors of this report. However based on this preliminary geotechnical investigation the main geotechnical issues that can be highlighted are the following:

1. Due to the observed groundwater levels observed, about 1.0m begl, any proposed excavation would likely require dewatering. ASS assessment should also be undertaken to ascertain ecological systems are not harmed during excavation or earthworks on these sites and building structures are adequately designed against acid attacks.

2. Due to poor ground conditions from the top 4m begl, building foundations may be founded on deep foundations or ground improvements be undertaken to provide adequate foundation bearing capacities and limit foundation settlements.

   Assuming a 1.0 x 1.0 x 0.3m footing embedded at 0.3m begl, our preliminary bearing capacity calculation results are:

Location	Ultimate Bearing Capacity (kPa)	Allowable Bearing Capacity assuming FOS = 3 (kPa)	Settlement at Allowable Bearing Pressure (mm)
Toondah Harbour, Cleveland	65	21	>5
Weinam Creek, Redland	35	11	>5

3. There is potential consolidation issues of the soft clay materials on both sites and therefore this must be looked into depending on the nature of the proposed development.

4. Further geotechnical investigations of these sites should be undertaken with Cone Penetration Testing (CPT) at closer spacing to provide better site coverage. An advantage of using CPT over other sampling methods is that it provides continuous, or virtually continuous record of ground conditions. Preferably, CPT should be supplemented by borings and by other tests, either in situ or in the laboratory.

LIMITATION OF FIELD INVESTIGATIONS

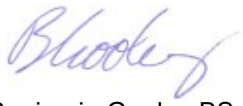
This report has been prepared in accordance with generally accepted consulting practice for Redland City Council using information supplied at the time and for the project specific requirements as understood by Structerre. To the best of our knowledge the information contained in this report is accurate at the date of issue, however it should be emphasised that any changes to ground conditions and/or the proposed structures may invalidate the recommendations given herein.

The conclusions and recommendations in this report are based on the site conditions revealed through selective point sampling, representing the conditions of the site in total, although the area investigated represents only a small portion of the site. The actual characteristics may vary significantly between successive test locations and sample intervals other than where observations, explorations and investigations have been made.

The materials and their geotechnical properties presented in this report may not represent the full range of materials and strengths that actually exist on site and the recommendations should be regarded as preliminary in nature. Allowances should be made for variability in ground conditions and any consequent impact on the development. Structerre accepts no responsibility and shall not be liable for any consequence of variations in ground conditions.

If any detail of this report is unclear, contact this office.

Responsibility for this report is acknowledged by



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BOREHOLE LOCATIONS

SP1 – Toondah Harbour, Cleveland

BOREHOLE LOCATIONS

SP2 – Weinam Creek, Redland Bay

STRUCterre consulting engineers

Job number:	33550-14GS	Logged	APOD
Site Address:	Lot 66 - SP115554 240 Middle St, Cleveland	Checked	BG
Date:	19/03/2014	Page	1 of 1

Borehole 1
SP1 - Toondah Harbour CLEVELAND

Borehole 1

Depth (M)		fill	Description	SPT	N Value	MC
0.0			FILL: Silty CLAY (CI) Stiff			
0.1			Mottled Grey-Red-Brown, Dry to Moist,			
0.2			with sand & gravel			
0.3						
0.4						
0.5						
0.6						
0.7			Silty CLAY (CI) Stiff			
0.8			Red-Brown, Dry to Moist,			
0.9			with gravel			
1.0						
1.1						
1.2						
1.3						
1.4						
1.5			Sandy CLAY (CL) Soft			
1.6			Mottled Grey-Red-Brown, Moist to Wet,			
1.7			with gravel	0		
1.8			Silty CLAY (CH) Soft	0	0	59.1%
1.9			Dark Grey, Wet,	1		
2.0			"Marine Clay"			
2.1						
2.2						
2.3						
2.4						
2.5						
2.6			Silty CLAY (CH) Firm to Stiff			
2.7			Mottled Grey-Orange-Red, Moist to Wet,			
2.8			trace gravel			
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5				5		
3.6				6	15	
3.7				9		
3.8						
3.9						
4.0						
4.1						
4.2						
4.3						
4.4						
4.5						
4.6						
4.7						
4.8						
4.9						
5.0						
5.1						
5.2			Silty CLAY (CH) Firm			
5.3			Mottled Grey-Green-Orange-Red,			
5.4			Moist to Wet, trace gravel			
5.5						

Borehole 1 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
5.5				2		
5.6				3	7	
5.7				4		
5.8						
5.9						
6.0						
6.1						
6.2						
6.3						
6.4						
6.5						
6.6						
6.7						
6.8			Silty CLAY (CH) Firm			
6.9			Mottled Light Grey-Orange-Red, Moist,			
7.0			with weathered rock layers			
7.1						
7.2						
7.3						
7.4						
7.5				2		
7.6				3	7	
7.7				4		
7.8						
7.9						
8.0						
8.1						
8.2						
8.3						
8.4						
8.5						
8.6						
8.7						
8.8						
8.9						
9.0						
9.1						
9.2						
9.3						
9.4						
9.5				1		
9.6				2	5	
9.7				3		
9.8						
9.9						
10.0						
10.1			Silty CLAY (CH) Firm to Stiff			
10.2			Mottled Light Grey-Orange-Red, Moist,			
10.3			with weathered rock layers			
10.4						
10.5						
10.6						
10.7						
10.8						
10.9						
11.0						

Borehole 1 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
11.0						
11.1						
11.2						
11.3						
11.4						
11.5				5		
11.6				7	15	
11.7				8		
11.8						
11.9						
12.0						
12.1						
12.2						
12.3						
12.4						
12.5						
12.6						
12.7						
12.8			Extremely Weathered Rock,			
12.9			Extremely weak,			
13.0			Orange-Brown-Red-Yellow-Grey, Moist,			
13.1						
13.2						
13.3						
13.4						
13.5						
13.6						
13.7						
13.8						
13.9						
14.0						
14.1						
14.2						
14.3						
14.4						
14.5						
14.6						
14.7				1		
14.8				1	3	36.7%
14.9				2		
15.0			End of Borehole @ 15.0m			
15.1						
15.2						
15.3						
15.4						
15.5						
15.6						
15.7						
15.8						
15.9						
16.0						
16.1						
16.2						
16.3						
16.4						
16.5						

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Borehole 2
SP1 - Toondah Harbour CLEVELAND

Borehole 2

Depth (M)		fill	Description	SPT	N Value	MC
0.0			FILL: Silty SAND (SM) Loose to Medium Dense			
0.1			Red-Brown, Moist, with gravel			
0.2						
0.3						
0.4						
0.5			FILL: Silty CLAY (CH) Firm			
0.6			Mottled Grey-Brown-Red, Moist,			
0.7			trace sand & gravel			
0.8						
0.9						
1.0						
1.1						
1.2						
1.3						
1.4				0		
1.5				0	0	18.9%
1.6				1		
1.7			Silty SAND (SM) Loose			
1.8			Dark Grey, Wet,			
1.9			with shell fragments			
2.0						
2.1						
2.2						
2.3						
2.4			Silty CLAY (CH) Soft			
2.5			Dark Grey, Wet,			
2.6			"Marine Clay"			
2.7						
2.8						
2.9						
3.0						
3.1						
3.2			Clayey SAND (SC) Loose			
3.3			Dark Grey, Wet,			
3.4			with gravel			
3.5				2		
3.6				4	6	
3.7				2		
3.8						
3.9						
4.0						
4.1						
4.2						
4.3						
4.4						
4.5						
4.6						
4.7						
4.8						
4.9			Silty CLAY (CH) Firm to Stiff			
5.0			Mottled Grey-Orange-Red-Brown,			
5.1			Moist to Wet, trace gravel			
5.2						
5.3						
5.4						
5.5						

Borehole 2 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
5.5				5		
5.6				9	19	
5.7				10		
5.8						
5.9						
6.0						
6.1						
6.2						
6.3						
6.4						
6.5						
6.6						
6.7						
6.8						
6.9						
7.0						
7.1						
7.2						
7.3			Silty CLAY (CH) Stiff			
7.4			Mottled Grey-Orange-Red,			
7.5			Moist, with weathered rock layers	4		
7.6				6	14	
7.7				8		
7.8						
7.9						
8.0						
8.1						
8.2						
8.3						
8.4						
8.5						
8.6						
8.7						
8.8						
8.9						
9.0						
9.1						
9.2						
9.3						
9.4						
9.5				4		
9.6				3	8	
9.7				6		
9.8						
9.9						
10.0						
10.1						
10.2						
10.3						
10.4						
10.5						
10.6						
10.7						
10.8						
10.9						
11.0						

Borehole 2 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
11.0						
11.1						
11.2						
11.3						
11.4						
11.5				5		
11.6				6	16	
11.7				10		
11.8						
11.9						
12.0						
12.1						
12.2						
12.3						
12.4						
12.5						
12.6						
12.7						
12.8						
12.9						
13.0						
13.1						
13.2						
13.3						
13.4						
13.5						
13.6						
13.7						
13.8						
13.9						
14.0						
14.1						
14.2						
14.3						
14.4						
14.5						
14.6						
14.7				4		
14.8				6	12	49.3%
14.9				6		
15.0			End of Borehole @ 15.0m			
15.1						
15.2						
15.3						
15.4						
15.5						
15.6						
15.7						
15.8						
15.9						
16.0						
16.1						
16.2						
16.3						
16.4						
16.5						

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Borehole 3
SP1 - Toondah Harbour CLEVELAND

Borehole 3

Depth (M)	fill	Description	SPT	N Value	MC
0.0		FILL: Silty GRAVEL (GM) Dense			
0.1		Dark Grey, Dry			
0.2					
0.3					
0.4					
0.5					
0.6					
0.7		Silty SAND (SM) Loose			
0.8		Red-Brown, Moist to Wet,			
0.9					
1.0					
1.1					
1.2					
1.3					
1.4					
1.5		Silty CLAY (CH) Soft	0		
1.6		Dark Grey, Moist to Wet,	0	0	27.9%
1.7		with organic material "Marine Clay"	1		
1.8					
1.9					
2.0					
2.1		Clayey GRAVEL (GC) Very Loose			
2.2		Red-Brown-Dark Gray, Wet, with sand			
2.3					
2.4					
2.5					
2.6					
2.7					
2.8					
2.9		Silty CLAY (CH) Soft			
3.0		Dark Grey, Wet,			
3.1		"Marine Clay"			
3.2					
3.3					
3.4					
3.5			0		
3.6			0	0	
3.7			1		
3.8					
3.9					
4.0					
4.1					
4.2					
4.3					
4.4					
4.5					
4.6					
4.7					
4.8		Silty CLAY (CH) Firm			
4.9		Mottled Grey-Orange-Red, Moist to Wet,			
5.0		trace sand & gravel			
5.1					
5.2					
5.3					
5.4					
5.5					

Borehole 3 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
5.5			2		
5.6			2	7	
5.7			5		
5.8					
5.9					
6.0					
6.1		Silty CLAY (CH) Stiff to Very Stiff			
6.2		Mottled Grey-Orange-Red, Moist,			
6.3		trace sand & gravel			
6.4					
6.5					
6.6					
6.7					
6.8					
6.9					
7.0					
7.1					
7.2					
7.3					
7.4					
7.5			4		
7.6			8	20	
7.7			12		
7.8					
7.9					
8.0					
8.1					
8.2					
8.3					
8.4					
8.5					
8.6		Silty CLAY (CH) Stiff			
8.7		Mottled Grey-Orange-Red, Moist,			
8.8		trace sand & gravel			
8.9					
9.0					
9.1					
9.2					
9.3					
9.4					
9.5					
9.6			8		
9.7			7	15	
9.8			8		
9.9					
10.0					
10.1					
10.2					
10.3					
10.4					
10.5		Silty CLAY (CH) Stiff			
10.6		Mottled Light Grey-Orange-Red, Moist,			
10.7		with weathered rock layers			
10.8					
10.9					
11.0					

Borehole 3 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
11.0					
11.1					
11.2					
11.3		Silty CLAY (CH) Stiff			
11.4		Mottled Grey-Green-Orange-Red, Moist,			
11.5		with weathered rock layers	8		
11.6			8	17	
11.7			9		
11.8					
11.9					
12.0					
12.1					
12.2					
12.3					
12.4					
12.5					
12.6					
12.7					
12.8					
12.9					
13.0					
13.1					
13.2					
13.3					
13.4					
13.5					
13.6					
13.7					
13.8					
13.9					
14.0					
14.1					
14.2					
14.3					
14.4					
14.5			5		
14.6			5	15	37.5%
14.7			10		
14.8					
14.9					
15.0		End of Borehole @ 15.0m			
15.1					
15.2					
15.3					
15.4					
15.5					
15.6					
15.7					
15.8					
15.9					
16.0					
16.1					
16.2					
16.3					
16.4					
16.5					

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Borehole 4
SP1 - Toondah Harbour CLEVELAND

Borehole 4

Depth (M)	fill	Description	SPT	N Value	MC
0.0		FILL: Sandy SILT (ML) Firm			
0.1		Brown-Grey, Dry to Moist,			
0.2					
0.3					
0.4					
0.5					
0.6		FILL: Silty GRAVEL (GM) Dense			
0.7		Orange-Brown-Grey, Dry to Moist			
0.8		Silty SAND (SM) Loose, Red-Brown,			
0.9		Dry to Moist, with gravel & trace clay			
1.0					
1.1		Sandy CLAY (CI) Soft			
1.2		Mottled Grey-Red-Brown, Wet, with gravel			
1.3					
1.4		Silty CLAY (CH) Soft			
1.5		Dark Grey, Moist to Wet,	0		
1.6		"Marine Clay"	0	0	33.1%
1.7			1		
1.8					
1.9		PEAT (PT) Soft			
2.0		Dark Grey, Wet			
2.1		Silty CLAY (CH) Soft			
2.2		Dark Grey, Wet,			
2.3		"Marine Clay"			
2.4					
2.5					
2.6					
2.7					
2.8					
2.9					
3.0					
3.1					
3.2					
3.3					
3.4					
3.5			0		
3.6			0	1	
3.7			1		
3.8					
3.9					
4.0					
4.1					
4.2					
4.3		Silty CLAY (CH) Firm			
4.4		Mottled Grey-Brown-Red, Moist to Wet,			
4.5		with gravel			
4.6					
4.7					
4.8					
4.9					
5.0					
5.1		Sandy CLAY (CH) Stiff			
5.2		Mottled Grey-Brown-Red, Moist,			
5.3		with gravel			
5.4					
5.5					

Borehole 4 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
5.5			2		
5.6			3	6	
5.7			3		
5.8					
5.9					
6.0					
6.1					
6.2					
6.3					
6.4					
6.5					
6.6					
6.7		Silty CLAY (CH) Stiff to Very Stiff			
6.8		Mottled Grey-Brown-Red, Moist,			
6.9		with weathered rock layers			
7.0					
7.1					
7.2					
7.3					
7.4					
7.5			5		
7.6			7	17	
7.7			10		
7.8					
7.9					
8.0					
8.1					
8.2					
8.3					
8.4					
8.5					
8.6					
8.7					
8.8					
8.9					
9.0					
9.1					
9.2					
9.3					
9.4					
9.5					
9.6					
9.7			7		
9.8			10	22	
9.9			12		
10.0					
10.1					
10.2					
10.3					
10.4					
10.5					
10.6					
10.7					
10.8		Sandy CLAY (CH) Stiff			
10.9		Mottled Grey-Orange-Red, Moist,			
11.0		with weathered rock layers			

Borehole 4 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
11.0					
11.1					
11.2					
11.3					
11.4					
11.5			4		
11.6			5	11	
11.7			6		
11.8					
11.9					
12.0					
12.1					
12.2					
12.3					
12.4					
12.5					
12.6					
12.7					
12.8					
12.9					
13.0					
13.1					
13.2					
13.3					
13.4					
13.5					
13.6					
13.7					
13.8					
13.9					
14.0					
14.1					
14.2					
14.3					
14.4					
14.5			3		
14.6			5	14	48.7%
14.7			9		
14.8					
14.9					
15.0		End of Borehole @ 15.0m			
15.1					
15.2					
15.3					
15.4					
15.5					
15.6					
15.7					
15.8					
15.9					
16.0					
16.1					
16.2					
16.3					
16.4					
16.5					

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Borehole 5
SP1 - Toondah Harbour CLEVELAND

Borehole 5

Depth (M)	fill	Description	SPT	N Value	MC
0.0		FILL: Sandy SILT (ML) Firm, Brown,			
0.1		Dry to Moist, with sand & gravel			
0.2					
0.3		FILL: Sandy CLAY (Cl) Firm to Stiff			
0.4		Mottled Orange-Red-Brown-Grey,			
0.5		Dry to Moist, with gravel & trace sand			
0.6					
0.7					
0.8					
0.9					
1.0					
1.1					
1.2					
1.3					
1.4					
1.5		FILL: Sandy CLAY (Cl) Soft	0		
1.6		Mottled Orange-Brown-Dark Grey,	0	0	38.3%
1.7		Moist to Wet, with gravel	1		
1.8					
1.9					
2.0					
2.1					
2.2		Clayey SAND (SC) Very Loose			
2.3		Dark Grey, Moist to Wet, with gravel			
2.4					
2.5		Silty CLAY (CH) Firm			
2.6		Dark Grey, Moist to Wet, trace gravel			
2.7					
2.8					
2.9					
3.0					
3.1					
3.2					
3.3					
3.4					
3.5			2		
3.6			2	5	
3.7			3		
3.8					
3.9					
4.0					
4.1					
4.2		Silty CLAY (CH) Firm			
4.3		Dark Grey, Moist,			
4.4		with weathered rock lenses			
4.5					
4.6					
4.7					
4.8					
4.9					
5.0					
5.1					
5.2					
5.3					
5.4					
5.5					

Borehole 5 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
5.5			2		
5.6			3	7	
5.7			4		
5.8					
5.9					
6.0					
6.1					
6.2					
6.3		Silty CLAY (CH) Firm			
6.4		Mottled Grey-Orange-Red, Moist to Wet,			
6.5		with weathered rock lenses			
6.6					
6.7					
6.8					
6.9					
7.0					
7.1					
7.2					
7.3					
7.4					
7.5		Silty CLAY (CH) Firm	2		
7.6		Mottled Grey-Orange-Brown, Wet,	2	6	
7.7		with weathered rock lenses	4		
7.8					
7.9					
8.0					
8.1					
8.2					
8.3					
8.4					
8.5					
8.6					
8.7					
8.8					
8.9					
9.0					
9.1					
9.2					
9.3					
9.4			2		
9.5			3	8	
9.6			5		
9.7					
9.8					
9.9					
10.0					
10.1					
10.2					
10.3					
10.4					
10.5					
10.6					
10.7					
10.8					
10.9					
11.0					

Borehole 5 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
11.0					
11.1					
11.2					
11.3					
11.4					
11.5			3		
11.6			4	8	
11.7			4		
11.8					
11.9					
12.0					
12.1					
12.2					
12.3					
12.4					
12.5					
12.6					
12.7					
12.8		Silty CLAY (CH) Firm			
12.9		Mottled Grey-Brown-Yellow, Wet,			
13.0		with weathered rock lenses			
13.1					
13.2					
13.3					
13.4					
13.5			2		
13.6			3	7	
13.7			4		
13.8					
13.9					
14.0					
14.1					
14.2					
14.3					
14.4					
14.5					
14.6					
14.7					
14.8					
14.9					
15.0					
15.1			3		
15.2			2	5	52.2%
15.3			3		
15.4					
15.5		End of Borehole @ 15.5m			
15.6					
15.7					
15.8					
15.9					
16.0					
16.1					
16.2					
16.3					
16.4					
16.5					

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Borehole 6
SP1 - Toondah Harbour CLEVELAND

Borehole 6

Depth (M)		fill	Description	SPT	N Value	MC
0.0			FILL: Silty CLAY (CI) Firm			
0.1			Mottled Grey-Red-Brown, Moist to Wet,			
0.2			trace sand			
0.3						
0.4						
0.5						
0.6						
0.7						
0.8						
0.9						
1.0						
1.1						
1.2						
1.3			FILL: Gravelly CLAY (CL) Soft			
1.4			Mottled Grey-Dark Grey, Wet			
1.5				0		
1.6				0	0	42.3%
1.7				1		
1.8						
1.9						
2.0						
2.1						
2.2						
2.3			Silty CLAY (CH) Soft			
2.4			Dark Grey, Wet,			
2.5			with sand & organic material			
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5				0		
3.6				0	0	
3.7				1		
3.8						
3.9						
4.0						
4.1						
4.2						
4.3						
4.4			Silty CLAY (CH) Firm to Stiff			
4.5			Mottled Orange-Red, Moist to Wet,			
4.6			with gravel			
4.7						
4.8						
4.9						
5.0						
5.1						
5.2						
5.3						
5.4						
5.5						

Borehole 6 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
5.5						
5.6				2		
5.7				4	11	
5.8				7		
5.9						
6.0						
6.1						
6.2			Silty CLAY (CH) Stiff to Very Stiff			
6.3			Mottled Orange-Red, Moist to Wet,			
6.4			with weathered rock lenses			
6.5						
6.6						
6.7						
6.8						
6.9						
7.0						
7.1						
7.2						
7.3						
7.4						
7.5						
7.6				6		
7.7				8	20	
7.8				12		
7.9						
8.0						
8.1						
8.2						
8.3						
8.4						
8.5						
8.6						
8.7						
8.8						
8.9						
9.0						
9.1						
9.2						
9.3						
9.4						
9.5				5		
9.6				6	15	
9.7				9		
9.8						
9.9						
10.0						
10.1						
10.2						
10.3						
10.4						
10.5						
10.6						
10.7			Silty CLAY (CH) Stiff to Very Stiff			
10.8			Mottled Grey-Orange-Red-Brown, Moist,			
10.9			with weathered rock lenses			
11.0						

Borehole 6 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
11.0						
11.1						
11.2						
11.3						
11.4						
11.5				4		
11.6				7	15	
11.7				8		
11.8						
11.9						
12.0						
12.1						
12.2						
12.3						
12.4						
12.5						
12.6						
12.7						
12.8						
12.9						
13.0						
13.1						
13.2						
13.3						
13.4						
13.5						
13.6						
13.7						
13.8						
13.9						
14.0						
14.1						
14.2						
14.3						
14.4						
14.5				15		
14.6				30	>50	25.1%
14.7						
14.8						
14.9						
15.0			End of Borehole @ 15.0m			
15.1						
15.2						
15.3						
15.4						
15.5						
15.6						
15.7						
15.8						
15.9						
16.0						
16.1						
16.2						
16.3						
16.4						
16.5						

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Job number:	33550-14GS	Logged	APOD
Site Address:	Lot 902 - SP223465 5-9 Weinam St, Redland Bay	Checked	BG
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Borehole 1
SP2 - Weinam Creek REDLAND BAY

Borehole 1

Depth (M)	fill	Description	SPT	N Value	MC
0.0		FILL: Sandy SILT (ML) Stiff			
0.1		Mottled Brown, Dry			
0.2		FILL: Silty CLAY (CI) Stiff to Very Stiff			
0.3		Mottled Grey-Orange-Red-Brown,			
0.4		Dry to Moist, with sand & gravel			
0.5					
0.6					
0.7					
0.8					
0.9					
1.0					
1.1		Silty SAND (SM) Very Loose to Loose			
1.2		Brown-Grey, Moist to Wet,			
1.3					
1.4					
1.5		Silty CLAY (CH) Soft	0		
1.6		Mottled Grey-Orange-Red, Wet,	0	0	45.1%
1.7		with gravel	1		
1.8					
1.9					
2.0					
2.1					
2.2		Silty CLAY (CH) Firm			
2.3		Mottled Grey-Orange-Red-Brown,			
2.4		Moist to Wet, with weathered rock lenses			
2.5					
2.6					
2.7					
2.8					
2.9					
3.0					
3.1					
3.2					
3.3					
3.4					
3.5			2		
3.6			3	8	
3.7			5		
3.8					
3.9					
4.0					
4.1					
4.2					
4.3					
4.4		Silty CLAY (CH) Stiff			
4.5		Mottled Grey-Orange-Red-Brown, Moist,			
4.6		with weathered rock lenses			
4.7					
4.8					
4.9					
5.0					
5.1					
5.2					
5.3					
5.4					
5.5					

Borehole 1 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
5.5			4		
5.6			5	11	
5.7			6		
5.8					
5.9					
6.0					
6.1					
6.2					
6.3					
6.4					
6.5					
6.6					
6.7		Sandy SILT (ML)/Extremely Weathered Rock			
6.8		Firm/Extremely Weak,			
6.9		Mottled Grey-Orange-Brown, Moist to Wet			
7.0					
7.1					
7.2					
7.3					
7.4					
7.5			1		
7.6			3	6	
7.7			3		
7.8					
7.9					
8.0					
8.1		Silty CLAY (CH) Stiff			
8.2		Mottled Grey-Brown-Red-Yellow, Moist,			
8.3		with weathered rock layers throughout			
8.4					
8.5					
8.6					
8.7					
8.8					
8.9					
9.0					
9.1					
9.2					
9.3					
9.4					
9.5			3		
9.6			7	17	
9.7			10		
9.8					
9.9					
10.0					
10.1					
10.2					
10.3					
10.4					
10.5		Sandy SILT (ML)/Extremely Weathered Rock			
10.6		Firm to Stiff/Extremely Weak to Very Weak			
10.7		Mottled Grey-Orange-Brown, Moist to Wet			
10.8					
10.9					
11.0					

Borehole 1 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
11.0					
11.1					
11.2					
11.3					
11.4					
11.5			3		
11.6			6	13	
11.7			7		
11.8					
11.9					
12.0					
12.1					
12.2					
12.3					
12.4					
12.5					
12.6					
12.7					
12.8					
12.9					
13.0					
13.1					
13.2					
13.3					
13.4					
13.5					
13.6					
13.7					
13.8					
13.9					
14.0					
14.1					
14.2					
14.3					
14.4					
14.5					
14.6					
14.7			2		
14.8			3	7	51.5%
14.9			4		
15.0		End of Borehole @ 15.0m			
15.1					
15.2					
15.3					
15.4					
15.5					
15.6					
15.7					
15.8					
15.9					
16.0					
16.1					
16.2					
16.3					
16.4					
16.5					

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Job number:	33550-14GS	Logged	APOD
Site Address:	Lot 167 - CP884275	Checked	BG
	46-72 Banana St, Redland Bay		
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Borehole 2
SP2 - Weinam Creek REDLAND BAY

Borehole 2

Depth (M)		fill	Description	SPT	N Value	MC
0.0			Silty SAND (SM) Medium Dense			
0.1			Red-Brown, Dry,			
0.2						
0.3						
0.4						
0.5						
0.6			Silty SAND (SM) Medium Dense			
0.7			Orange-Brown, Dry to Moist,			
0.8						
0.9						
1.0						
1.1			Silty CLAY (CH) Firm			
1.2			Mottled Grey-Orange-Red, Moist to Wet,			
1.3			with gravel			
1.4						
1.5				3		
1.6				3	7	51.5%
1.7				4		
1.8						
1.9						
2.0						
2.1						
2.2						
2.3						
2.4						
2.5						
2.6						
2.7						
2.8						
2.9						
3.0						
3.1						
3.2						
3.3						
3.4						
3.5				3		
3.6				2	7	
3.7				5		
3.8						
3.9						
4.0						
4.1						
4.2						
4.3						
4.4						
4.5						
4.6						
4.7						
4.8						
4.9						
5.0						
5.1						
5.2						
5.3						
5.4						
5.5						

Borehole 2 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
5.5				2		
5.6				3	7	
5.7				4		
5.8						
5.9						
6.0						
6.1						
6.2						
6.3						
6.4						
6.5						
6.6						
6.7			Silty CLAY (CH) Firm to Stiff			
6.8			Mottled Grey-Orange-Red, Moist to Wet,			
6.9			with gravel			
7.0						
7.1						
7.2						
7.3						
7.4						
7.5				2		
7.6				4	10	
7.7				6		
7.8						
7.9						
8.0						
8.1						
8.2						
8.3						
8.4						
8.5						
8.6						
8.7						
8.8						
8.9						
9.0						
9.1						
9.2						
9.3						
9.4						
9.5				3		
9.6				3	8	
9.7				5		
9.8						
9.9						
10.0						
10.1						
10.2						
10.3						
10.4						
10.5			Silty CLAY (CH) Firm to Stiff			
10.6			Mottled Grey-Red-Yellow-Orange, Moist,			
10.7			with gravel			
10.8						
10.9						
11.0						

Borehole 2 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
11.0						
11.1						
11.2						
11.3						
11.4						
11.5				4		
11.6				4	11	
11.7				7		
11.8						
11.9						
12.0						
12.1						
12.2						
12.3						
12.4			Extremely Weathered Rock,			
12.5			Extremely Weak,			
12.6			Orange-Yellow-Brown-Grey, Moist to Wet			
12.7						
12.8						
12.9						
13.0						
13.1						
13.2						
13.3						
13.4						
13.5						
13.6						
13.7						
13.8						
13.9						
14.0						
14.1						
14.2						
14.3						
14.4						
14.5						
14.6				2		
14.7				4	9	54.8%
14.8				5		
14.9						
15.0			End of Borehole @ 15.0m			
15.1						
15.2						
15.3						
15.4						
15.5						
15.6						
15.7						
15.8						
15.9						
16.0						
16.1						
16.2						
16.3						
16.4						
16.5						

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Borehole 3
SP2 - Weinam Creek REDLAND BAY

Borehole 3

Depth (M)		fill	Description	SPT	N Value	MC
0.0			FILL: Silty GRAVEL (GM) Dense			
0.1			Orange-Grey, Dry,			
0.2						
0.3						
0.4			FILL: Clayey SILT (ML) Firm			
0.5			Mottled Grey-Orange-Brown, Dry to Moist,			
0.6			with gravel			
0.7						
0.8						
0.9						
1.0						
1.1						
1.2						
1.3						
1.4						
1.5						
1.6			FILL: Silty CLAY (CH) Stiff	3		
1.7			Mottled Grey-Orange-Brown,Moist to Wet,	3	8	41.3%
1.8				5		
1.9						
2.0						
2.1						
2.2			Clayey Sandy GRAVEL (GC)			
2.3			Very Loose to Loose, Red-Brown, Wet			
2.4						
2.5						
2.6						
2.7						
2.8			Silty CLAY (CH) Soft			
2.9			Dark Grey, Wet,			
3.0			trace sand			
3.1						
3.2						
3.3						
3.4						
3.5				0		
3.6				1	3	
3.7				3		
3.8						
3.9			Silty CLAY (CH) Firm			
4.0			Mottled Grey-Orange-Red, Moist to Wet,			
4.1			trace sand & gravel			
4.2						
4.3						
4.4						
4.5						
4.6			Silty CLAY (CH) Stiff			
4.7			Mottled Light Grey-Orange-Red, Moist,			
4.8			trace gravel			
4.9						
5.0						
5.1						
5.2						
5.3						
5.4						
5.5						

Borehole 3 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
5.5				2		
5.6				5	14	
5.7				9		
5.8						
5.9						
6.0						
6.1						
6.2						
6.3						
6.4						
6.5						
6.6						
6.7						
6.8						
6.9						
7.0						
7.1						
7.2						
7.3						
7.4						
7.5				2		
7.6				3	8	
7.7			Silty CLAY (CH) Firm to Stiff	5		
7.8			Mottled Light Grey-Orange-Brown, Moist,			
7.9			trace gravel			
8.0						
8.1						
8.2						
8.3						
8.4						
8.5						
8.6						
8.7						
8.8						
8.9						
9.0						
9.1						
9.2						
9.3						
9.4						
9.5				3		
9.6				3	7	
9.7				4		
9.8						
9.9						
10.0						
10.1						
10.2			Silty CLAY (CH) Soft to Firm			
10.3			Mottled Grey-Orange-Red, Moist,			
10.4			trace gravel			
10.5						
10.6						
10.7						
10.8						
10.9						
11.0						

Borehole 3 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
11.0						
11.1						
11.2						
11.3						
11.4						
11.5			Extremely Weathered Rock,	2		
11.6			Extremely Weak,	1	4	
11.7			Orange-Red-Brown, Moist	3		
11.8						
11.9						
12.0						
12.1						
12.2						
12.3						
12.4						
12.5						
12.6						
12.7						
12.8						
12.9						
13.0						
13.1						
13.2						
13.3						
13.4						
13.5						
13.6						
13.7						
13.8						
13.9						
14.0						
14.1						
14.2						
14.3						
14.4						
14.5						
14.6				3		
14.7				4	12	44.9%
14.8				8		
14.9						
15.0			End of Borehole @ 15.0m			
15.1						
15.2						
15.3						
15.4						
15.5						
15.6						
15.7						
15.8						
15.9						
16.0						
16.1						
16.2						
16.3						
16.4						
16.5						

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Job number:	33550-14GS	Logged	APOD
Site Address:	Lot 197 - SP123870 9 Meissner St, Redland Bay	Checked	BG
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Borehole 4
SP2 - Weinam Creek REDLAND BAY

Borehole 4

Depth (M)		fill	Description	SPT	N Value	MC
0.0			FILL: Sandy SILT (ML) Firm			
0.1			Black, Dry to Moist			
0.2			FILL: Silty CLAY (CI) Firm			
0.3			Mottled Orange-Red-Brown-Grey,			
0.4			Dry to Moist, with sand & gravel			
0.5						
0.6						
0.7						
0.8						
0.9						
1.0						
1.1						
1.2						
1.3			Silty SAND (SM) Loose, Dark Grey, Moist			
1.4			Sandy CLAY (CI) Soft			
1.5			Mottled Grey-Orange-Brown, Moist to Wet,	2		
1.6			with gravel	1	2	53.9%
1.7				1		
1.8						
1.9						
2.0						
2.1			Silty GRAVEL (GM) Loose, Red-Brown, Wet			
2.2			Silty CLAY (CH) Soft			
2.3			Dark Grey, Wet,			
2.4			"Marine Clay" with Peat layers			
2.5						
2.6						
2.7						
2.8						
2.9						
3.0			Silty CLAY (CH) Soft to Firm			
3.1			Mottled Grey-Orange-Yellow, Wet,			
3.2			trace gravel			
3.3						
3.4						
3.5				0		
3.6				1	2	
3.7				2		
3.8						
3.9						
4.0			Silty CLAY (CH) Firm to Stiff			
4.1			Mottled Grey-Orange-Yellow, Moist,			
4.2			trace gravel			
4.3						
4.4						
4.5						
4.6						
4.7						
4.8						
4.9						
5.0						
5.1						
5.2						
5.3						
5.4						
5.5						

Borehole 4 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
5.5				5		
5.6				5	14	
5.7				9		
5.8						
5.9						
6.0						
6.1						
6.2						
6.3						
6.4						
6.5						
6.6						
6.7						
6.8						
6.9						
7.0						
7.1						
7.2						
7.3						
7.4						
7.5				5		
7.6				5	13	
7.7				8		
7.8						
7.9						
8.0						
8.1						
8.2						
8.3						
8.4						
8.5						
8.6						
8.7						
8.8						
8.9						
9.0						
9.1						
9.2						
9.3						
9.4						
9.5				3		
9.6				4	10	
9.7				6		
9.8						
9.9						
10.0						
10.1						
10.2						
10.3						
10.4						
10.5			Silty CLAY (CH) Stiff			
10.6			Mottled Light Grey-Yellow-Red-Brown,			
10.7			Moist, trace gravel			
10.8						
10.9						
11.0						

Borehole 4 - Continued

Depth (M)		fill	Description	SPT	N Value	MC
11.0						
11.1			Extremely Weathered Rock,			
11.2			Extremely Weak,			
11.3			Light Grey-Red-Brown, Moist			
11.4						
11.5						
11.6				3		
11.7				4	9	
11.8				5		
11.9						
12.0						
12.1						
12.2						
12.3						
12.4						
12.5						
12.6						
12.7						
12.8						
12.9						
13.0						
13.1						
13.2						
13.3						
13.4						
13.5						
13.6						
13.7						
13.8						
13.9						
14.0						
14.1						
14.2						
14.3						
14.4						
14.5				1		
14.6				2	6	17.5%
14.7				4		
14.8						
14.9						
15.0			End of Borehole @ 15.0m			
15.1						
15.2						
15.3						
15.4						
15.5						
15.6						
15.7						
15.8						
15.9						
16.0						
16.1						
16.2						
16.3						
16.4						
16.5						

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Job number:	33550-14GS	Logged	APOD
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Borehole 5
SP2 - Weinam Creek REDLAND BAY

Borehole 5

Depth (M)	fill	Description	SPT	N Value	MC
0.0		FILL: Sandy SILT (ML) Firm			
0.1		Grey-Brown, Dry to Moist			
0.2		FILL: Silty CLAY (CH) Firm			
0.3		Mottled Red-Orange-Brown-Grey,			
0.4		Dry to Moist, trace sand & gravel			
0.5					
0.6					
0.7					
0.8		FILL: Silty CLAY (CI) Soft			
0.9		Mottled Red-Orange-Brown-Grey,			
1.0		Moist to Wet, with sand			
1.1					
1.2					
1.3					
1.4					
1.5			0		
1.6			0	0	37.8%
1.7			1		
1.8					
1.9					
2.0					
2.1					
2.2					
2.3					
2.4					
2.5		Peat (PT) Soft, Dark Grey, Wet			
2.6					
2.7		Sandy CLAY (CL) Soft			
2.8		Mottled Yellow-Brown-Grey, Wet,			
2.9		with silt & with gravel			
3.0					
3.1					
3.2		Sandy CLAY (CL) Soft			
3.3		Orange-Brown, Wet,			
3.4		with gravel			
3.5			0		
3.6			0	0	
3.7			1		
3.8					
3.9					
4.0					
4.1					
4.2		Silty CLAY (CH) Soft			
4.3		Dark Grey, Wet,			
4.4		"Marine Clay"			
4.5					
4.6					
4.7					
4.8					
4.9					
5.0					
5.1					
5.2					
5.3					
5.4					
5.5					

Borehole 5 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
5.5			0		
5.6			0	1	
5.7			1		
5.8					
5.9					
6.0					
6.1					
6.2					
6.3					
6.4					
6.5		Silty SAND (SM) Loose			
6.6		Grey, Wet, with gravel			
6.7					
6.8					
6.9					
7.0					
7.1					
7.2					
7.3					
7.4		Silty CLAY (CH) Soft			
7.5		Mottled Grey-Orange-Brown, Wet,			
7.6		with sand lenses & trace gravel			
7.7			2		
7.8			1	4	
7.9			3		
8.0					
8.1					
8.2					
8.3					
8.4		Silty CLAY (CH) Soft to Firm			
8.5		Mottled Grey-Orange-Brown, Wet,			
8.6		with sand lenses & trace gravel			
8.7					
8.8					
8.9					
9.0					
9.1					
9.2					
9.3					
9.4					
9.5		Silty CLAY (CH) Stiff	3		
9.6		Mottled Grey-Orange-Red-Brown, Moist,	4	11	
9.7		with weathered rock lenses	7		
9.8					
9.9					
10.0					
10.1					
10.2					
10.3					
10.4		Silty CLAY (CH) Firm to Stiff			
10.5		Mottled Grey-Orange-Red-Brown, Moist,			
10.6		with weathered rock lenses			
10.7					
10.8					
10.9					
11.0					

Borehole 5 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
11.0					
11.1					
11.2					
11.3					
11.4		Silty CLAY (CH) Firm to Stiff			
11.5		Mottled Grey-Orange-Red, Moist,	1		
11.6		with weathered rock lenses	2	5	
11.7			3		
11.8					
11.9					
12.0					
12.1					
12.2					
12.3					
12.4					
12.5					
12.6					
12.7					
12.8					
12.9					
13.0		Silty CLAY (CH) Stiff			
13.1		Mottled Brown-Grey-Orange, Moist,			
13.2		with weathered rock lenses			
13.3					
13.4					
13.5					
13.6					
13.7					
13.8					
13.9					
14.0					
14.1					
14.2					
14.3					
14.4					
14.5					
14.6			3		
14.7			5	11	53.4%
14.8			6		
14.9					
15.0		End of Borehole @ 15.0m			
15.1					
15.2					
15.3					
15.4					
15.5					
15.6					
15.7					
15.8					
15.9					
16.0					
16.1					
16.2					
16.3					
16.4					
16.5					

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Job number:	33550-14GS	Logged	APOD
Site Address:	Lot 143 - SL843	Checked	BG
	2-26 Meissner St, Redland Bay		
Date:	24/03/2014	Page	1 of 1

Borehole 6
SP2 - Weinam Creek REDLAND BAY

Borehole 6

Depth (M)	fill	Description	SPT	N Value	MC
0.0		FILL: Silty SAND (SM) Loose			
0.1		Red-Brown-Grey, Dry to Moist,			
0.2		with waste materials			
0.3					
0.4					
0.5					
0.6		Silty CLAY (CH) Firm			
0.7		Mottled Brown-Orange-Grey, Moist,			
0.8		trace gravel			
0.9					
1.0					
1.1					
1.2					
1.3					
1.4		Silty CLAY (CH) Soft			
1.5		Dark Grey, Moist to Wet, trace sand	0		
1.6		with organic material, "Marine Clay"	0	0	37.8%
1.7			1		
1.8					
1.9					
2.0					
2.1					
2.2					
2.3					
2.4					
2.5					
2.6					
2.7					
2.8					
2.9					
3.0					
3.1					
3.2					
3.3					
3.4					
3.5		Silty CLAY (CH) Soft to Firm	1		
3.6		Grey, Moist to Wet	2	6	
3.7			4		
3.8					
3.9					
4.0					
4.1					
4.2					
4.3					
4.4					
4.5					
4.6					
4.7		Silty CLAY (CH) Stiff			
4.8		Mottled Grey-Orange-Red, Moist to Wet,			
4.9		with weathered rock lenses			
5.0					
5.1					
5.2					
5.3					
5.4					
5.5					

Borehole 6 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
5.5			4		
5.6			7	18	
5.7			11		
5.8					
5.9					
6.0					
6.1					
6.2					
6.3					
6.4					
6.5					
6.6					
6.7					
6.8					
6.9					
7.0					
7.1					
7.2					
7.3					
7.4					
7.5			2		
7.6			4	9	
7.7			5		
7.8					
7.9					
8.0					
8.1					
8.2					
8.3					
8.4					
8.5					
8.6					
8.7					
8.8		Silty CLAY (CH) Stiff			
8.9		Mottled Light Grey-Orange-Red, Moist,			
9.0		with weathered rock lenses			
9.1					
9.2					
9.3					
9.4					
9.5			3		
9.6			4	9	
9.7			5		
9.8					
9.9					
10.0					
10.1					
10.2					
10.3					
10.4					
10.5					
10.6					
10.7					
10.8					
10.9					
11.0					

Borehole 6 - Continued

Depth (M)	fill	Description	SPT	N Value	MC
11.0					
11.1					
11.2					
11.3					
11.4					
11.5			3		
11.6			5	10	
11.7			5		
11.8					
11.9					
12.0					
12.1					
12.2					
12.3					
12.4					
12.5					
12.6		Silty CLAY (CH) Stiff			
12.7		Mottled Red-Brown-Yellow-Grey, Moist,			
12.8		with weathered rock lenses			
12.9					
13.0					
13.1					
13.2					
13.3					
13.4					
13.5					
13.6					
13.7					
13.8					
13.9					
14.0					
14.1					
14.2					
14.3					
14.4					
14.5					
14.6			2		
14.7			3	8	56.6%
14.8			5		
14.9					
15.0		End of Borehole @ 15.0m			
15.1					
15.2					
15.3					
15.4					
15.5					
15.6					
15.7					
15.8					
15.9					
16.0					
16.1					
16.2					
16.3					
16.4					
16.5					

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SOIL TEST *photos page 1*

Site Photo 1 – Borehole 1
SP1 - Toondah Harbour
240 Middle Street, Cleveland

Site Photo 2 – Borehole 1
SP1 - Toondah Harbour
240 Middle Street, Cleveland

Site Photo 3 – Borehole 2
SP1 - Toondah Harbour
248 Middle Street, Cleveland

Site Photo 4 – Borehole 2
SP1 - Toondah Harbour
248 Middle Street, Cleveland

Site Photo 5 – Borehole 3
SP1 - Toondah Harbour
13-21 Emmett Drive, Cleveland

Site Photo 6 – Borehole 3
SP1 - Toondah Harbour
13-21 Emmett Drive, Cleveland

SOIL TEST *photos page 2*

Site Photo 7 – Borehole 4
SP1 - Toondah Harbour
233 Middle Street, Cleveland

Site Photo 8 – Borehole 4
SP1 - Toondah Harbour
233 Middle Street, Cleveland

Site Photo 9 – Borehole 5
SP1 - Toondah Harbour
233 Middle Street, Cleveland

Site Photo 10 – Borehole 5
SP1 - Toondah Harbour
233 Middle Street, Cleveland

Site Photo 11 – Borehole 6
SP1 - Toondah Harbour
2-10 Emmett Drive, Cleveland

Site Photo 12 – Borehole 6
SP1 - Toondah Harbour
2-10 Emmett Drive, Cleveland

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SOIL TEST *photos page 3*

Site Photo 13 – Borehole 1
SP2 - Weinam Creek
5-9 Weinam Street, Redland Bay

Site Photo 14 – Borehole 1
SP2 - Weinam Creek
5-9 Weinam Street, Redland Bay

Site Photo 15 – Borehole 2
SP2 - Weinam Creek
46 Banana Street, Redland Bay

Site Photo 16 – Borehole 2
SP2 - Weinam Creek
46 Banana Street, Redland Bay

Site Photo 17 – Borehole 3
SP2 - Weinam Creek
9 Meissner Street, Redland Bay

Site Photo 18 – Borehole 3
SP2 - Weinam Creek
9 Meissner Street, Redland Bay

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SOIL TEST *photos page 4*

Site Photo 19 – Borehole 4
SP2 - Weinam Creek
9 Meissner Street, Redland Bay

Site Photo 20 – Borehole 4
SP2 - Weinam Creek
9 Meissner Street, Redland Bay

Site Photo 21 – Borehole 5
SP2 - Weinam Creek
22 Meissner Street, Redland Bay

Site Photo 22 – Borehole 5
SP2 - Weinam Creek
22 Meissner Street, Redland Bay

Site Photo 23 – Borehole 6
SP2 - Weinam Creek
2-26 Meissner Street, Redland Bay

Site Photo 24 – Borehole 6
SP2 - Weinam Creek
2-26 Meissner Street, Redland Bay

LABORATORY TEST *results*

Testhole	Approx Depth (m)	Material Description	USCS Classification	Insitu Moisture Content	Percentage (%) Passing 2.36 mm	Percentage (%) Passing 425 micron	Liquid Limit (%)	Linear Shrinkage (%)	I_{ps} Estimated Shrink Swell Index (%/pF)
TH BH1	5.5	Sandy CLAY	CH	59.1	100	100	90.8	24.1	4.9
TH BH1	14.5	XW Rock		36.7	100	88	77.4	16.3	3.3
TH BH2	5.5	Silty CLAY	CH	18.9	100	100	53.3	16.4	3.3
TH BH2	14.5	Silty CLAY	CH	49.3	100	97	75.6	15.4	3.1
TH BH3	5.5	Silty CLAY	CH	27.9	100	100	57.9	17.1	3.5
TH BH3	14.5	Silty CLAY	CH	37.5	100	96	89.5	23.0	4.7
TH BH4	5.5	Silty CLAY	CH	33.1	100	99	76.3	19.3	3.9
TH BH4	14.5	Silty CLAY	CI	48.7	96	86	55.1	13.0	2.6
TH BH5	5.5	Sandy CLAY	CI	38.3	90	65	48.3	12.3	2.5
TH BH5	15.0	Silty CLAY	CH	52.2	100	95	137.9	22.9	4.6
TH BH6	5.5	Gravelly CLAY	CL	42.3	70	58	55.4	4.1	0.8
TH BH6	14.5	Silty CLAY	CH	25.1	100	98	92.3	16.8	3.4
WC BH1	5.5	Sandy CLAY	CH	45.1	91	63	128.5	26.3	5.3
WC BH1	14.5	Sandy SILT / XW Rock	ML?	51.1	78	64	43.7	7.8	1.5
WC BH2	5.5	Silty CLAY	CH	51.5	82	72	159.4	29.9	6.0
WC BH2	14.5	XW Rock		54.8	96	91	88.8	20.6	4.2
WC BH3	5.5	Silty CLAY	CH	41.3	100	100	90.8	16.8	3.4
WC BH3	14.5	XW Rock		44.9	88	74	65.4	13.0	2.6
WC BH4	5.5	Sandy CLAY	CI	53.8	72	59	36.8	11.1	2.2
WC BH4	14.5	XW Rock		17.5	99	83	70.7	15.6	3.2
WC BH5	5.5	Silty CLAY	CI	37.8	100	76	28.0	7.7	1.5
WC BH5	14.5	Silty CLAY	CH	53.4	95	81	81.7	18.5	3.7
WC BH6	5.5	Silty CLAY	CH	37.8	100	90	104.6	19.1	3.9
WC BH6	14.5	Silty CLAY	CH	56.6	97	82	99.7	20.2	4.1