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**Geotechnical Investigation
Platinum High Rise Development
19 Hercules Street, Hamilton**

**Prepared for
Wentworth Equities No. 2 Pty Ltd**

Project No. BG25-1319A

27 October 2025

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Drawing No. 1	Locality Plan and Test Locations
Drawing No. 2	Section 1-1
Drawing No. 3	Section 2-2
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Appendix A	Bore Report Sheets with Explanatory Notes
Appendix B	Cone Penetration Test Report Sheets
Appendix C	Laboratory Test Results Sheets
Appendix D	Example Acid Sulfate Soil Management Plan

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SECTION 1 - INTRODUCTION

1.1 Project

It is understood that the proposed Platinum High Rise Development is to comprise the construction of 500 residential apartments over 55,000m² of internal space and 5,000m² of retail and restaurant precinct, all suspended over a three level basement; requiring bulk excavation to approximately 10m to 12m depth below existing street level. Details of building column loads were not available at the time of reporting. The location and extent of the site are shown approximately on Drawing No. 1, attached.

1.2 Scope of Work

Based on prior knowledge of the immediate area and the results of previous geotechnical investigation, it was anticipated in 2014 that the site ground conditions may comprise a surface layer of variable quality fill, underlain by deep Quaternary age alluvial deposits comprising interbedded layers of sand, silt, clay and gravel, underlain in turn by variable strength weathered sandstone (rock) at variable depth. A groundwater table in the depth range of 3m to 4m was envisaged. Based on the scope of the proposed development and the anticipated ground conditions, it was proposed to undertake additional geotechnical investigation of the site in 2014 by:

- drilling and sampling three bores to 35m depth (with 5m of rock core drilling per bore);
- undertaking four cone penetration tests (CPT) to 30m depth (or prior refusal); and
- installing two standpipe groundwater monitoring wells.

In 2022 an additional seven CPTs to approximately 30m depth (or prior refusal) were proposed.

It was further proposed that, using the results of previous and the proposed additional fieldwork and laboratory testing outcomes, a report would be produced giving geotechnical design information on each of the following, as appropriate:

- subsurface conditions and laboratory test results;
- groundwater conditions and water level monitoring results;
- earthworks and site preparation;
- use of cut for fill;
- site trafficability during basement excavation;
- erosion and sediment control parameters;
- presence and treatment of acid sulfate soil (ASS) including an Acid Sulfate Soil Management Plan (ASSMP);
- shrink-swell characteristics and moisture reactivity classification of soils;
- temporary dewatering and long term groundwater control options;
- stability criteria for open excavations and stable batter angles;
- permanent and temporary basement retention system options;
- retention system geotechnical design parameters and pressures;
- Wallap analysis results for typical retention system options;
- retention system deflections;
- rock anchor design stresses;
- effects of basement excavation/retention on adjacent services, structures etc.;
- suitable alternative foundation types;
- geotechnical design parameters for foundations;

- rock drillability for foundation construction;
- anticipated foundation depths;
- settlement characteristics of proposed foundation options, including load-settlement plots;
- options for slab-on-ground components including the basement and external slabs – floating or suspended, hydrostatic or non-hydrostatic;
- slab and pavement subgrade design parameters;
- site earthquake classification to Australian Standard AS1170 Part 4 2007; and
- advice on relevant construction issues/difficulties (based on past experience with adjacent sites).

1.3 Commission

Butler Partners has been commissioned in various stages and have previously issued geotechnical investigation reports for the site. This version of the report includes all data obtained for the site and responds to the currently proposed three basement level scheme.

SECTION 2 - THE SITE

2.1 Background

Butler Partners has previously undertaken (for others), a geotechnical investigation of the site by the drilling and sampling of six bore (Bores 101 to 106). A limited acid sulfate soil (ASS) assessment has also been undertaken for part of the site by the drilling and sampling of five bores (Bores B24 to B27 and BPB-13) to between 2.4m and 6.5m depth, with laboratory testing conducted on selected samples. The results of both investigations are given in the following reports (relevant factual results from both reports are included herein):

Additional Geotechnical Investigation
High Rise Development
19 Hercules Street, Hamilton
Project No.: 010-195A Dated: 29 July 2011

Acid Sulfate Soils Investigation
Proposed Extension of Portside Wharf
5 & 19 Hercules Street, Hamilton
Project No.: 03900H Dated: November 2006

Butler Partners has also carried out a geotechnical investigation report for the site for Wentworth Equities No. 2 Pty Ltd for a deeper basement scheme and the results are given in the following report:

Geotechnical Investigation
Platinum High Rise Development
19 Hercules Street, Hamilton
Project No.: 010-195E Dated: 12 December 2019

Subsequent to this an additional seven CPTs were carried out for others, generally around the site perimeter and these CPT results are included in this report.

2.2 Site Description

The site is approximately rectangular in shape, covers an area of approximately 7,500m² and is bounded to the north by Hercules Street, to the east and south by the Portside Wharf development and to the west by two storey retail and commercial buildings. At the time of the additional investigation conducted in 2014, the site had been mostly cleared of previous development and was being used as access for neighbouring developments under construction. Ground surface generally comprised grass/bare earth, with scattered concrete slab remnants from previous development, and some old garden beds and trees located along the northern and eastern site boundaries. A single storey display suite and small bituminous surfaced car park was located on the northern site boundary. An aerial view of the site taken on 26 October 2019 is shown in Photograph 1.



Photograph 1: An aerial view of site taken on 26 October 2019 (Nearmap image)

2.3 Geology

Reference to the Geological Survey of Queensland's 1:31,680 City of Brisbane Sheet indicates that the site is mapped in an area of Quaternary alluvial sand, silt, mud, clay and gravel, underlain by the Tingalpa Formation, which comprises carbonaceous shale and lithic sandstone, with minor conglomerate and coal.

SECTION 3 - FIELDWORK

3.1 Drilling and Sampling Methods

The 2014 investigation comprised the drilling and sampling of three bores (Bores 107 to 109) to between 36m and 40m approximately, with a truck-mounted Hydrapower Scout drilling rig. The bores were initially drilled using solid flight augers to approximately 1.5m depth. Steel casing was then installed in the bores to varying depths and the bores were advanced to 'refusal' in rock using wash bore drilling techniques, utilising 'mud' circulation for cuttings removal. Below wash bore refusal depth the bores were advanced using NMLC rock core drilling methods to recover samples of rock. Strata identification was based on inspection of cuttings recovered in the 'mud' circulation, supplemented with inspection of disturbed Standard Penetration Test (SPT), and 'undisturbed' tube samples and inspection of the rock core. Pocket penetrometer and 'hand' vane-shear strength tests were carried out in undisturbed cohesive samples to assist with strength determination.

On completion of drilling, Bore 107 was backfilled with drill spoil.

3.2 Cone Penetration Tests

Four CPTs (CPT110 to CPT113) were conducted during the 2014 investigation and seven CPTs (CPT114 to CPT120) were conducted in 2022 to near refusal at depths between 15m and 30m approximately. In the CPTs, a 35mm diameter cone tip with a following 130mm long friction sleeve is attached to rods of the same diameter and pushed into the soil by hydraulic thrust from a track-mounted testing rig. Strain gauges in the cone tip and sleeve measure resistance to penetration and the results are transmitted to the surface and recorded on a portable computer.

3.3 Groundwater Monitoring Wells

To allow the groundwater depth to be monitored after completion of the fieldwork, a 'deep' slotted PVC standpipe groundwater monitoring well was installed (and bentonite sealed) into rock in Bores 108 and 109. A 'shallow' monitoring well was also installed adjacent to each bore location. Summary details of the construction of each well are given in Table 1.

Table 1: Summary Groundwater Monitoring Well Construction Details

Bore	Well Type	Monitoring Well Construction Details		
		Total Well Depth (m)	Upper Screen Interval (m)	Lower Screen Interval (m)
108	Shallow	15.0	2.0 – 15.0	-
	Deep	40.0	-	32.0 – 40.0
109	Shallow	15.0	2.0 – 15.0	-
	Deep	35.5	-	28.0 – 35.5

3.4 Bore Locations and Supervision

Bore and CPT locations were set out from existing site features and are indicated approximately on the attached Drawing No. 1. Ground surface levels at the bore and CPT locations were determined by interpolation between contours and spot levels given on PMMs' *Detail Survey*, Drawing No. 22151-2, (dated 6 May 2003).

An experienced geotechnical engineer, logged the stratigraphy encountered in the bores, directed the insitu sampling and testing program, supervised the fieldwork and the installation of the groundwater monitoring wells.

SECTION 4 - INVESTIGATION RESULTS

4.1 Test Reports

The subsurface conditions encountered in Bores 101 to 109, B24 to B27 and BPB-13 are given on Bore Report sheets included in Appendix A, using classification and descriptive terms defined in accompanying notes (which are based on Australian Standard AS1726 – 1993). It should be noted that the rock types indicated on the Bore Report sheets are based on visual assessment only; no petrographic analysis has been undertaken for confirmation.

The results of the CPT tests are given on Cone Penetration Test Report sheets included in Appendix B. The stratigraphy noted on the CPT Report sheets has been **inferred** based on past experience, published correlations and comparison with the bore reports. The results of selected laboratory testing conducted on samples recovered the bores from the various stages of investigation are given on report sheets included in Appendix C.

4.2 Subsurface Conditions

For a description of the subsurface conditions encountered in the bores and CPTs, the Bore and Cone Penetration Test Report sheets should be consulted. The ground conditions encountered in the bore and CPT locations were highly variable in composition and layer depth/thickness and a very broad summary of the subsurface conditions encountered in Bores 101 to 109, B24 to B27 and BPB-13 is given in Table 2.

Due to the nature of dredged material used to 'reclaim' much of the area in the early part of the last century, defining the boundary between potentially dredged fill material and 'Young' alluvium was very difficult and the base of strata levels noted in Table 2 should be considered as approximate only and subject to confirmation. Similarly, the delineation of 'Young' alluvium and 'Old' alluvium noted in Table 2 should also be taken only as approximate, given the inherent difficulties in distinguishing between these soils.

Table 2: Summary of Subsurface Conditions at Bore Locations

Base Level of Strata	Description
RL-3.0m to RL3.0m	FILL: Gravels, clayey and gravelly sand, sand (and possibly some silty clays), dredged fill material and some construction rubble, overlain (at the time of the fieldwork) in Bores 101 and 102 and some of the CPTs by pavement gravel and in Bores 1098 and 109 by concrete slabs.
RL-19.6m to RL-8.3m	YOUNG ALLUVIUM: Variable deposits of interbedded very soft to firm clays and very loose to medium dense sands, gravelly sands and sandy gravel.
RL-26.3m to RL-19.8m	OLD ALLUVIUM AND/OR RESIDUAL SOIL: Generally stiff to very stiff sandy/silty clay, medium dense to very dense sand, clayey/gravelly sand and sandy/clayey gravel.
-	MUDSTONE/SANDSTONE/CONGLOMERATE: Extremely low strength to high strength.

As an aid to stratigraphic interpretation at the site, three sections (Sections 1-1, 2-2 and 3-3) have been drawn through selected bores and the sections are showing on Drawing Nos. 2, 3 and 4, attached.

It should be carefully noted that 'strength inversions' (i.e. 'stronger' materials underlain by 'weaker' materials) were noted at a significant number of locations, within the soils and underlying rock (e.g. soft clay underlying medium dense sand at 4m depth in Bore 102; low strength rock underlying medium strength rock at 33.8m depth in Bore 107; and extremely low strength rock underlying low strength rock at 32.7m depth in Bore 109).

4.3 Groundwater

Free groundwater was encountered in some of the bores during auger drilling at the depths/levels given in Table 3; free groundwater was not encountered in Bores 101, 103, 104, or 106 to 109 during auger drilling. The depths/levels of groundwater measured in the monitoring wells installed in Bores 108 and 109 (after well development) are also included in Table 3.

Table 3: Measured Groundwater Depths/Levels During Auger Drilling and within Piezometer

Bore	Groundwater Observations											
	During Auger Drilling		In Monitoring Wells									
			3 September 2010		20 July 2011		31 August 2014		27 April 2021		5 December 2025	
	Depth (m)	Reduced Level	Depth (m)	Reduced Level	Depth (m)	Reduced Level	Depth (m)	Reduced Level	Depth (m)	Reduced Level	Depth (m)	Reduced Level
102	0.6	RL2.8m	5.0	RL-1.6m	-	-	-	-				
104	-	-	-	-	2.7	RL0.2m	-	-				
105	0.8	RL2.1m	-	-	3.9	RL-1.0m	-	-				
106	-	-	-	-	3.7	RL-0.4m	-	-				
108 Shallow	-	-	-	-	-	-	3.1	RL-0.1m				
108 Deep	-	-	-	-	-	-	2.7	RL0.3m				
109 Shallow	-	-	-	-	-	-	3.2	RL0.4m				
109 Deep	-	-	-	-	-	-	4.4	RL-0.8m				
W1									2.5	RL0.6m	3.1	RL0.0m
W2									2.8	RL0.3m	2.4	RL0.7m

It is considered that groundwater levels beneath the site would be expected to vary seasonally, with prevailing weather and potentially under tidal influence from the Brisbane River. If construction is to commence sometime after completion of the geotechnical investigation, consideration should be given to confirming groundwater levels prior to commencement of construction to determine if changed groundwater conditions exist.

4.4 Laboratory Testing

Selected soil samples recovered from Bores 107 to 109 were tested in a geotechnical testing laboratory to determine erosion and sediment control parameters, vane shear strength, particle size distribution and plasticity and in a chemical testing laboratory to determine acid sulfate soil potential. Selected pieces of rock core were tested for strength and the test results are summarised and discussed in the following sections. The results of testing previously completed on samples recovered from Bores 101 to 106 are also included.

It should be noted that sample descriptions provided in the laboratory results summary tables (and the laboratory test result sheets) are based on the inspection of each individual laboratory test sample only. No allowance has been made in sample descriptions for sampling, sub-sampling or test methodology in determination of the mass material properties. Estimates of mass material properties are provided on each individual Bore Report sheets and as such, the laboratory test results should be read in conjunction with the relevant report sheets.

4.4.1 Erosion and Sediment Control Parameters

Four samples of soil and fill recovered from Bores 107 to 109 were selected for testing to determine Emerson Class Number, pH and electrical conductivity and the test results are presented in Table 4.

Table 4: Summary of Reported Emerson Class, pH and Conductivity Test Results

Location	Depth (m)	Sample Description	Emerson Class No.	pH	Electrical Conductivity (mS/cm)
107	1.0 – 1.45	Fill – Silty Sand	4	8.6	0.09
108	0.5 – 0.95	Clayey Sand	3	8.7	0.03
	1.5 – 1.95	Sand	3	8.2	0.01
109	1.5 – 1.95	Silty Clay	4	9.2	0.05

4.4.2 Particle Size Distribution

Twenty selected samples of soil and fill recovered from Bores 107 to 109 and fourteen samples of soil from Bores 101 to 103 were tested to determine particle size distribution using wash sieve grading techniques and the reported results are summarised in Table 5.

Table 5: Summary of Reported Particle Size Distribution Test Results

Bore	Sample Depth (m)	Sample Description	Sample Moisture Content (%)	Gravel Fraction ⁽¹⁾ (%)	Sand Fraction ⁽²⁾ (%)	Silt and Clay Fraction ⁽³⁾ (%)
101	1.5 – 1.95	Clayey Sand	42.2	15	47	38
	7.5 – 7.95	Clayey Sand	24.4	21	60	19
	13.5 – 13.95	Sandy Clay	23.2	5	41	54
	16.5 – 16.95	Clayey Sand	27.2	-	52	48
	21.0 – 21.37	Clayey Sand	22.2	7	76	17
102	3.0 – 3.45	Gravelly Sand	18.2	18	76	7
	9.0 – 9.45	Sandy Clay	54.0	2	38	60
	13.5 – 13.95	Sand and Gravel	16.2	48	48	4
	16.5 – 16.95	Sandy Gravelly Clay	44.6	21	22	57
	22.5 – 22.95	Sandy Clay	37.4	0	35	65
103	1.5 – 1.95	Gravelly Sand	5.4	19	76	5
	4.5 – 4.95	Sand	24.4	1	97	2
	9.0 – 9.45	Gravelly Sand	16.2	41	45	14
	19.5 – 19.95	Gravelly Sand	17.0	25	70	5
107	1.0 – 1.45	Fill – Silty Sand	10.3	19	61	20
	7.5 – 7.95	Sand	25.8	6	85	9
	10.5 – 10.95	Gravelly Sand	21.4	34	61	5
	16.5 – 16.95	Silty Clay	28.3	-	19	81
	22.5 – 22.95	Sandy Clay	22.6	16	22	62
	24.0 – 24.25	Clayey Sand	15.3	25	44	31
108	0.5 – 0.95	Clayey Sand	17.6	4	66	30
	1.5 – 1.95	Sand	5.7	8	87	5
	4.5 – 4.95	Silty Clay	71.3	11	11	78
	9.0 – 9.45	Gravelly Sand	20.0	24	69	7
	16.5 – 16.95	Silty Clay	50.1	1	14	85
	21.0 – 21.45	Silty Clay	46.3	-	12	88
	24.0 – 24.45	Sandy Clay	30.7	-	35	65
	27.0 – 27.45	Gravelly Sand	11.8	43	47	10

Continued on Page 10

Table 5: Summary of Reported Particle Size Distribution Test Results (Continued)

Bore	Sample Depth (m)	Sample Description	Sample Moisture Content (%)	Gravel Fraction(1) (%)	Sand Fraction(2) (%)	Silt and Clay Fraction(3) (%)
109	1.5 – 1.95	Silty Clay	79.1	1	25	74
	7.5 – 7.95	Silty Clay	52.4	1	4	95
	10.5 – 10.95	Gravelly Sand	22.8	23	68	9
	15.0 – 15.95	Silty Gravelly Sand	22.2	30	51	19
	21.0 – 21.45	Sandy Clay	34.7	10	33	57
	24.0 – 24.45	Sandy Clay	30.5	-	43	57

⁽¹⁾ Particle size <60mm, >2mm; ⁽²⁾ Particle size (approximately) <2mm, >0.75mm; ⁽³⁾ Particle size (approximately) <0.75mm

4.4.3 Plasticity

Seven samples of soil recovered from Bores 107 to 109 and seven samples of soil and weathered rock recovered from Bores 101 to 103 were tested for measurement of plasticity using Atterberg limit and linear shrinkage test methods. The reported test results are summarised in Table 6 and indicate that the majority of samples tested are of medium to high plasticity, with the exception of one test result undertaken on a sample of weathered rock which indicated low plasticity.

Table 6: Summary of Reported Plasticity Test Results

Bore	Depth (m)	Sample Description	Sample Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)	Soil Classification*
101	4.5 – 4.95	Silty Clay	68.5	70	23	47	21.0	CH
	24.0 – 24.05	Mudstone (XW)	13.7	23	14	9	4.5	CL
102	6.0 – 6.45	Silty Clay	66.5	71	31	40	19.5	CH
	16.5 – 16.95	Sandy Clay	44.5	56	24	32	16.0	CH
103	6.0 – 6.45	Sandy Clay	53.5	56	24	32	16.0	CH
	16.5 – 16.95	Sandy Clay	42.6	49	24	25	12.5	CI/CH
	24.0 – 24.45	Silty Clay	55.0	67	28	39	17.5	CH
107	3.0 – 3.45	Silty Clay	19.7	30	19	11	1.5	CI/CL
	16.5 – 16.95	Silty Clay	28.3	48	19	29	10.0	CI
108	4.5 – 4.95	Silty Clay	71.3	81	31	50	16.5	CH
	24.0 – 24.45	Sandy Clay	30.7	44	21	23	13.0	CI
109	1.5 – 1.95	Silty Clay	40.3	58	26	32	17.0	CH
	7.5 – 7.95	Silty Clay	64.0	80	28	52	16.5	CH
	21.0 – 21.45	Sandy Clay	34.7	43	22	21	10.0	CI

* Australian Standard AS1726-1993 Geotechnical site investigations

4.4.4 Vane Shear Strength

Hand vane shear strength tests were undertaken on selected undisturbed tube samples of clay soils recovered from Bores 101, 102 and 107 to 109. The undrained vane shear strength test results (uncorrected for sample plasticity) are summarised in Table 7 and are given on the relevant Bore Report sheets.

Table 7: Laboratory Vane Shear Strength Test Results (Uncorrected)

Bore	Sample Depth (m)	Vane Shear Strength Uncorrected (kPa)
101	3.4	9
102	1.8	12
	4.8	20
107	3.4	35
	4.9	31
	6.4	45
108	4.9	31
	16.9	10
	18.4	6
	21.4	64
	22.9	55
	24.4	64
109	1.9	21
	6.4	37
	7.9	35
	9.4	29
	16.9	26

4.4.5 Acid Sulfate Soils

Thirteen selected samples of soil and fill from Bores 107 to 109 and twelve samples of fill from Bores B24 to B27 and BPB-13 were tested using Chromium Suite analysis to check for ASS potential. The samples were refrigerated until transported to Australian Laboratory Services Pty Ltd (ALS) under standard chain of custody protocol and a summary of the reported test results is given in Table 7.

Table 8: Summary of Reported Chromium Suite Test Results

Bore	Depth (m)	Sample Description	pH _{KCL}	Titrateable Actual Acidity (% S)	Chromium Reducible Sulfur – (S _{CR}) (%S)	Acid Neutralising Capacity (%S)	Net Acidity %S	Calculated Liming Rate kgC _a CO ₃ /tonne
BPB-13	3.0-3.25	Fill – Sand/Clay	5.9	<0.02	0.14	-	0.14	7
	4.5-4.75	Fill - Sand	6.6	<0.02	<0.02	0.14	<0.02	-
B24	2.25-2.4	Fill - Sand	7.3	<0.02	0.02	0.17	<0.02	-
B25	1.2-1.5	Fill - Sand	6.5	<0.02	<0.02	0.22	<0.02	-
	2.6-2.75	Fill - Sand	6.7	<0.02	<0.02	0.14	<0.02	-
	5.5-5.8	Fill - Sand	7.2	<0.02	0.03	0.10	<0.02	-
B26	0.75-1.0	Fill - Sand	7.3	<0.02	<0.02	0.19	<0.02	-
	3.25-3.5	Fill - Sand	6.5	<0.02	<0.02	0.14	<0.02	-
	4.75-5.0	Fill - Sand	6.8	<0.02	0.03	0.22	<0.02	-
B27	1.0-1.25	Fill - Sand	7.6	<0.02	<0.02	0.12	<0.02	-
	3.0-3.25	Fill - Sand	7.0	<0.02	<0.02	0.15	<0.02	-
	5.75-6.0	Fill - Sand	8.7	<0.02	<0.02	0.13	<0.02	-
107	1.0 – 1.45	Fill – Silty Sand	8.8	<0.02	0.024	0.63	<0.02	-
	3.0 – 3.45	Silty Clay	8.6	<0.02	0.274	0.78	<0.02	-
	7.5 – 7.95	Sand	7.9	<0.02	0.052	0.17	<0.02	-
	10.5 – 10.95	Gravelly Sand	9.3	<0.02	0.017	0.58	<0.02	-
	16.5 – 16.95	Silty Clay	6.5	<0.02	<0.005	0.22	<0.02	-

Table 8: Summary of Chromium Suite Test Results (Continued)

Bore	Depth (m)	Sample Description	pHKCL	Titrateable Actual Acidity (% S)	Chromium Reducible Sulfur – (SCR) (%S)	Acid Neutralising Capacity (%S)	Net Acidity %S	Calculated Liming Rate kgCaCO ₃ /tonne
108	0.5 – 0.95	Clayey Sand	6.6	<0.02	<0.005	0.29	<0.02	-
	1.5 – 1.95	Sand	6.6	<0.02	<0.005	0.09	<0.02	-
	4.5 – 4.95	Silty Clay	6.9	<0.02	0.067	0.08	<0.02	-
	9.0 – 9.45	Gravelly Sand	7.5	<0.02	0.071	0.18	<0.02	-
109	1.5 – 1.95	Silty Clay	6.9	<0.02	0.374	0.40	0.11	5
	7.5 – 7.95	Silty Clay	7.1	<0.02	0.554	0.44	0.26	12
	10.5 – 10.95	Gravelly Sand	8.9	<0.02	0.068	0.22	<0.02	-
	21.0 – 21.45	Sandy Clay	9.0	<0.02	0.248	1.61	<0.02	-

Figures in **bold** exceed or equal the QASSMAC Action Criteria for disturbance of >1,000 tonnes of soil (refer Section 5.1)

4.4.6 Rock Strength

Selected rock core samples recovered from Bores 106 to 109 were tested for measurement of rock strength, using Point Load Test [Is(50)] methods. The test results are given on the relevant Bore Report sheet and a table of results is included in Appendix C.

SECTION 5 - ACID SULFATE SOILS

5.1 Assessment Criteria of Acid Sulfate Soils

ASS in Queensland are assessed in accordance with the Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines Version 5.1, Water Quality Australia's National Acid Sulfate Soils Guidance: National acid sulfate soils sampling and identification methods manual – June 2018 and the Queensland State Planning Policy– State Interest guidance material – Emissions and Hazardous Activities – February 2018. The State Planning Policy 2018 Guideline provides Action Criteria for assessing the results of laboratory testing quantifying the acid producing effects based on the sum of existing plus potential acidity. These action criteria are presented Table 9.

Table 9: Action Criteria based on ASS Analysis for Three Broad Texture Categories

Type of Material		Action Criteria (1 – 1000 tonnes disturbed)		Action Criteria (> 1000 tonnes disturbed)	
		Existing + Potential Acidity		Existing + Potential Acidity	
Texture Range	Approx. Clay Content (%)	Equivalent Sulfur %S	Equivalent Acidity Mol H+/tonne	Equivalent Sulfur %S	Equivalent Acidity Mol H+/tonne
Coarse Texture Sands to loamy sands	<5	0.03	18	0.03	18
Medium Texture Sandy loams to light clays	5 - 40	0.06	36	0.03	18
Fine Texture Medium to heavy clays, silty clays	>40	0.1	62	0.03	18

5.2 Discussion of Results

The results of the Chromium Suite analyses (refer Table 8) indicate levels of oxidisable sulfur and potential acidity above the Action Criteria given in Table 9 for three of the twenty-five samples tested. The three sample materials have the potential to generate levels of acidity in excess of the Action Criteria if allowed to oxidise. Significant inherent neutralising capacity was present within all but one of the samples tested. However, application of a neutralising agent will be required to ensure that the potential acidity of any disturbed ASS is adequately treated. As such, an ASSMP will be required for the site and an example ASSMP is attached in Appendix D for consideration.

Twenty-four of the twenty-five Chromium Suite test results indicated significant acid neutralising capacity, presumably as a result of shells being included in the samples. The ability of shells to provide practical neutralising capacity will depend on the shells being uniformly distributed throughout the soils and the shell fragments being fine enough to fully react with generated acidity.

Minimum required liming rates, based on the results of the current and previous Chromium Suite test results, have been calculated by ALS and are given in Table 8. The calculated dosing rates of ag-lime are variable and range up to 12kg/dry tonne of soil. The required liming rate for each 400m³ batch of ASS excavated during construction should be confirmed by additional testing as required by the ASSMP.

Based on the results of the ASS assessment, it is considered that the ASS are likely to be contained in discontinuous lenses/zones and that it will be very difficult to impossible to separate the ASS and non ASS materials during site construction works.

SECTION 6 - GEOTECHNICAL DESIGN DISCUSSION

6.1 Ground Model

The results of the investigation indicate that the site is underlain at the bore and CPT locations by variable subsurface conditions comprising a surface layer of discontinuous pavement and concrete slabs over fill comprising (possibly dredged) sands (possibly with some clay). The fill was underlain at approximately RL-1.0m to RL3.0m by interbedded Young Alluvial strata of variable thickness, high compressibility and relatively low strength, underlain at approximately RL-19.6m to RL-8.3m by Old Alluvium/Residual Soil comprising stiff to very stiff sandy clays and medium dense to very dense clayey sands, sandy gravel and gravelly sands. The soils were underlain in turn at approximately RL-26.3m to RL-19.8m by extremely low to medium strength sedimentary rock. The soils and rock contained strength inversions. In these ground conditions, geotechnical design for the proposed development will need to consider (at least) the following issues:

- subsurface conditions and laboratory test results;
- groundwater conditions and water level monitoring results;
- earthworks and site preparation;
- rock drillability for foundation construction;
- use of cut for fill;
- site trafficability during basement excavation;
- erosion and sediment control parameters;
- presence and treatment of ASS;
- shrink-swell characteristics and moisture reactivity classification of soils;
- temporary dewatering options;
- temporary and long term groundwater control and required perimeter cut-off wall depth;
- stability criteria for open excavations and stable batter angles;
- permanent and temporary basement retention system options;
- retention system geotechnical design parameters and pressures;
- Wallap analysis results for typical retention system options;
- retention system deflections;
- rock anchor design stresses;
- effects of basement excavation/retention on adjacent services, structures etc.;
- suitable alternative foundation types;
- geotechnical design parameters for foundations;
- anticipated foundation depths, variability over the site and presence of strength inversions;
- settlement characteristics of proposed foundation options, including load-settlement plots;
- options for slab-on-ground components including the basement and external slabs – floating or suspended, hydrostatic or non-hydrostatic;
- slab and pavement subgrade design parameters;
- site earthquake classification to Australian Standard AS1170 Part 4 2007; and
- advice on relevant construction issues/difficulties (based on past experience with adjacent sites).

Discussion of geotechnical design parameters, as well as design and construction recommendations and suggestions are detailed in the following sections.

6.2 Existing Fill

It is not known whether the existing fill materials encountered in the bores were 'controlled' at placement (i.e. it is not known whether the fill has been placed and uniformly compact to an appropriate engineering specification). However, based on the appearance of the fill encountered in the bores it is considered that the fill may not have been controlled on placement.

It is considered likely that the construction of the basement will result in the removal of most of the fill. However, if any of the existing fill is required to support any settlement sensitive 'near surface' components of the development, supporting documentation should be obtained and checked to confirm that the fill has been placed in a controlled manner to a specification that is appropriate for the proposed development.

If some of the fill is to remain and the fill cannot be shown to be controlled, then consideration should be given to the potential for variations in both the composition and degree of compaction of the fill. The presence of voids within uncontrolled fill as well as potential soft/loose zones or inclusions of deleterious materials may lead to potentially significant future total and differential settlements, possibly occurring over relatively short distances.

6.3 Earthworks

6.3.1 Site Preparation

Site preparation should involve removal of slabs, pavements, any 'old' footings and services etc., together with removal of any vegetation (including grass, weeds, trees, etc.). Particular attention should be paid to the potential for piles to exist that may have supported buildings that previously occupied the site.

6.3.2 Excavatability

All confined excavations should be fully supported or battered to ensure personnel safety.

6.3.2.1 Bulk Excavation

Soils and fill should be readily removed in bulk and confined excavations using hydraulic excavators. Provision for use of rock breakers etc. is suggested for removal of any derelict structure, etc., (if encountered).

6.3.2.2 Bored Piles

Heavy drilling equipment will be required to drill medium strength rock. In high strength and stronger rock, slow production should be allowed for, combined with high bit wear and use of coring buckets.

6.3.3 Subgrade Preparation

Subgrade preparation for a slab-on-ground basement slab should comprise the uniform recompaction of any subgrade materials disturbed during bulk excavation. However, in areas where 'soft/firm' clays and 'loose' sands are located at, or close below, subgrade level, it will not be possible to obtain proper compaction and allowance is suggested for over excavation and replacement with a track rolled granular trafficability layer (refer Section 6.3.4), placed under engineering supervision.

6.3.4 Trafficability

Trafficability for plant is expected to be difficult to impossible in excavations and consideration should be given to placement of a coarse granular (or equivalent) working surface. The actual layer thickness required for light construction plant (e.g. skid steer loaders etc.) must be determined, based on the actual layout and loading of the proposed traffic and subgrade conditions exposed. However, as a preliminary guide only, a coarse granular bridging layer of approximately 0.2m and 0.3m thick may be required to assist with site trafficability for 'lightweight' tracked plant over a sand subgrade; a substantially thicker layer would be required for 'light weight' tracked plant in areas of subgrade comprising clays (or where clays are located 'close' below excavation level). However, trafficability layer thicknesses must be determined specifically for the plant proposed to traffic the site, and the exposed ground conditions. The required thickness for 'heavy' plant would be expected to be substantial and likely to include a requirement for the use of geotextiles.

6.3.5 Surface Water Drainage

It is suggested that the basement excavation be properly drained so that water does not cause wetting up and softening of subgrade soils. Operating construction traffic over wet subgrades would be expected to result in significant subgrade damage and bogging of plant.

6.3.6 Acid Sulfate Soils

Based on the results of previous and the current ASS testing undertaken by Butler Partners, it is considered that basement excavation will require management under an Acid Sulfate Soil Management Plan (ASSMP).

6.4 Basement Excavation Support

6.4.1 Alternative Support Systems

The basement excavation sides will need to be continuously supported to prevent instability (and to control groundwater inflow and external groundwater table lowering). Anchoring, bracing or internal strutting (e.g. with floor slabs) will be required and due consideration should be given in design to existing services, buildings or proposed 'load-out points' located close to the proposed excavation. Three potential retention system options are discussed below.

6.4.1.1 Soldier Piles and Shotcrete Panels Wall

Very loose to medium dense sand and very soft to soft clays were encountered during the investigation and use of a soldier pile and shotcrete panel wall retention system would involve significant construction difficulties and is not recommended for use.

6.4.1.2 Cast Insitu Contiguous Pile Wall

A contiguous pile wall would not be water proof and groundwater seepage and soil would probably flow into the basement excavation through gaps between the piles, also leading to external lowering of groundwater levels. It is considered that use of a contiguous pile wall would not be suitable for basement excavation support.

6.4.1.3 Cast Insitu Secant or Cased Secant Pile Wall

Temporary and permanent support could be provided by a system of anchored secant piles drilled along basement walls. The secant pile wall utilises alternate 'hard' and 'soft' (i.e. reinforced and un-reinforced) piles to provide continuous support. A cased secant pile wall would be expected to provide better control over pile verticality.

6.4.1.4 Diaphragm Wall

An anchored or propped diaphragm wall could be adopted for both temporary and permanent basement excavation support and is considered to be the lowest risk wall type.

6.4.2 **Design Wall Pressures**

Permanent retaining wall pressures could be estimated for drained conditions, retaining horizontal ground, using the parameters given in Table 10, in conjunction with a triangular pressure distribution.

Table 10: Retaining Wall Design Parameters

Material	Strength/Density	Total Weight (t/m ²)	Flexible Wall: 'Active' pressure coefficient (k_a)	Rigid Wall: 'At Rest' pressure coefficient (k_o)
Sand	very loose	1.7	0.40	0.60
	loose	1.8	0.35	0.55
	medium dense	1.9	0.30	0.45
	dense	2.0	0.25	0.35
	very dense	2.1	0.20	0.30
Clay	very stiff to firm	1.8	0.45	0.6

Due allowance must also be included for groundwater pressure, surcharge effects from construction loading, the effects of sloping retained materials, backfill compaction stresses, reactive soil/fill pressures, buildings/structures on adjacent sites etc., each of which may introduce additional loads into the retaining walls.

For an excavation support system braced by stressed anchors (and/or struts), it is suggested that a detailed analysis of wall-soil/rock stiffness interaction be undertaken using Wallap (or similar) methods. If such an analysis is not to be undertaken, the total wall pressure determined using the earth pressure coefficients given in Table 10 could be redistributed into a trapezoidal pressure envelope for the purposes of preliminarily estimating strut/anchor loads. One trapezoidal distribution that could be considered for use (if a Wallap analysis is not undertaken), with an excavation depth H, is as follows:

- pressure increasing linearly from zero (or surcharge pressure) at ground surface to maximum pressure at 0.25H;
- constant maximum pressure between 0.25H and 0.75H; and
- pressure reducing linearly from maximum to zero (or surcharge pressure) from 0.75H to 1.0H.

It is strongly suggested that detailed numerical analysis (e.g. Wallap analysis) be undertaken as part of the design of basement retention systems (and to check any preliminary trapezoidal pressure distribution results), because use of a finite element analysis (or similar methods) will enable a more exact analysis of wall-ground interaction to be modelled (than is possible using a conventional 'trapezoidal' pressure distribution approach); some economies in design and construction would be expected to be achieved as a result.

Even if a drainage system is installed behind retaining walls, it would be prudent to allow for water pressures from elevated groundwater which may occur during or following prolonged 'wet' weather, or from blocked drainage etc. A lower factor of safety would be expected to be appropriate for use with a temporarily elevated water level. If a drained basement option is adopted however, very careful consideration must be given to the potential of off-site detrimental effects of any groundwater table lowering, which must be prevented.

6.4.3 Preliminary Wallap Analysis

To provide a preliminary estimate of potential basement wall geometry for a section through the basement wall at Hercules Street, preliminary analysis of a potential basement excavation retention system has been undertaken for a 'top-down' excavation process. Analysis was undertaken for a three level basement design, with the lowest excavation level RL-8.1m. The wall analysis was undertaken using the finite element computer program Wallap, which allows for staged construction to be analysed, and provides wall bending moments, shear forces and lateral deflections for each construction stage.

The Wallap analysis results detailed herein are only intended to provide a preliminary indication of possible basement wall structural requirements for initial costing estimates and are not intended as a guide to the required wall type, or finalised wall dimensions. Significant additional detailed Wallap analysis is needed as input to the detailed design of the wall, once the final basement wall types, basement design levels and construction processes are selected. The wall depth adopted for the analysis was based on structural considerations and was not based on any groundwater inflow considerations, which must be separately assessed.

6.4.3.1 Adopted Ground Conditions

The ground conditions adopted for the Wallap analysis were based on the strata encountered in Bore 101. Since the bore was terminated at a relatively shallow depth, a layer of 8.5m thick extremely low to very low strength rock was assumed below RL-19.8m, based on the ground conditions encountered in the other bores. It was also assumed that the extremely low to very low strength rock was underlain by medium strength rock which extended to the bottom of the model. A summary of the simplified stratigraphic layers adopted for the analysis is given in Table 11.

Table 11: Ground Profile Adopted in Analysis

Material	Top of Layer (m)
Fill	RL3.3
Very soft silty clay	RL1.2
Loose gravel	RL-2.5
Very loose gravel	RL-3.8
Loose sandy gravel	RL-6.7
Very stiff silty (sandy) clay	RL-8.3
Medium dense (clayey) sand	RL-11.8
Very dense clayey/gravelly sand	RL-17.3
Extremely low to very low strength rock*	RL-19.8
Medium strength rock*	RL-28.3

*Note: these two layer were estimated based on the other bores.

6.4.3.2 Retention System

Analysis has been carried out for a secant pile wall retention system used with a top-down construction method to avoid use of stressed anchors for wall support. The wall properties assumed for the analysis are given in Table 12 and must be confirmed by the project structural engineer.

Table 12: Assumed Wall Properties

Parameter	Value
	Secant Piles
Wall Type	Diaphragm wall
Pile Diameter (m)	0.8m at 0.7m spacing
Toe Depth – below ground level behind wall (m)	24.3
Toe Reduced Level (m)	RL-21.0m
Young's Modulus - E(GPa)	28

The properties assumed for the basement floor slabs are given in Table 13. The slab properties must be confirmed by the project structural engineer.

Table 13: Assumed Floor Slab Properties

Floors	Reduced Level (m)	Thickness* (mm)	Young's Modulus - E(GPa)	Assumed Free Length* (m)
Ground	RL3.3	150	28	25
B1	RL-0.01	150	28	25
B2	RL-3.21	150	28	25
B3	RL-7.41	150	28	25

* Assumed only; to be confirmed by the project structural engineer

6.4.3.3 Groundwater and Surcharge

The groundwater level was assumed to be constant at 2m below the ground surface behind (external to) the wall and to be lowered down to 0.3m below the excavation level in front of the wall during each excavation stage. A uniform surcharge pressure of 20kPa was applied behind the wall.

6.4.3.4 Construction Stages

The analysis simulated a 'top-down' construction procedure, with a floor slab initially cast at ground level (RL-3.3m). Excavation was then undertaken and the next lowest basement floor slab was installed at that excavation level. The excavation then proceeded to the lowest floor level.

6.4.3.5 Analysis Result

The preliminary analysis results, based on the assumed floor slab and wall properties nominated in Table 12 and Table 13, are summarised in Table 14 and Figure 1.

Table 14: Maximum Calculated Wall Deflection and Structural Forces

Parameter		Calculated Maximum Value
Secant Wall	Bending Moment (kNm/m)	922
	Shear Force (kN/m)	385
	Deflection (mm)	42

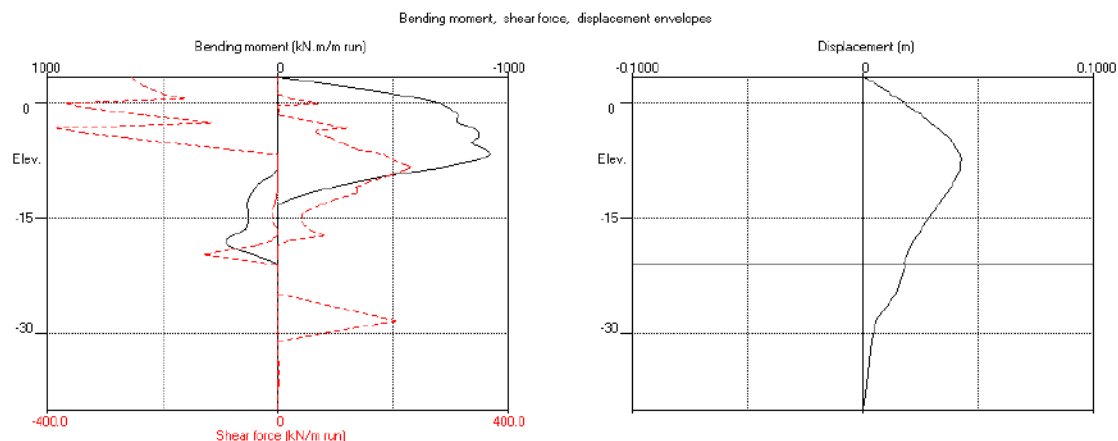


Figure 1: Wallap calculated bending moment, shear force and displacement envelopes

6.5 Groundwater Control

The proposed basement bulk earthworks level is below groundwater levels that have previously been measured by Butler Partners over a number of years on large sites located in close proximity to the site and are below groundwater levels measured in the groundwater monitoring bores installed at the site.

It will be necessary to ensure that any old services (and backfill) etc. connecting into the site are properly 'capped' to prevent them from becoming 'water conduits' into the site.

6.5.1 Temporary

To enable 'dry' construction of the basement to be undertaken, a lowering of the groundwater table internally to the excavation will be required. Suitable control methods comprise a spear point pumping system in sands (probably for local lowering) or pumping from large diameter bores (probably for clays and for overall lowering).

Lowering of groundwater levels external to the basement must be avoided, as it will result in consolidation settlement beneath adjacent sites.

Acid sulfate soil, contamination and water quality issues must be properly assessed and appropriately designed for, prior to disposal of collected waters soil/fill off-site.

6.5.2 Permanent

Where a secant pile wall and top down construction is adopted for basement construction, two general options are discussed below for permanent control of groundwater inflow to the basement.

Option 1: **Fully tanked basement:** The basement walls and the lowest basement floor slab could be designed for hydrostatic pressures ('tanked'), equivalent to the highest predicted groundwater levels at the site.

Option 2: **Basement cut-off wall:** The depth of the cut-off wall would be set to effectively 'seal' the basement and act as a 'cut-off' to inflow, thus minimising groundwater table lowering external to the site. A specifically designed under slab drainage system would be required and design of basement walls would need to include hydrostatic loading. This option may require a deeper toe level for the diaphragm wall than is required purely for excavation support.

The materials surrounding any basement level will be variable and are likely to include highly permeable sands (based on the results at the test locations). Groundwater inflows into the basement calculated from inferred permeabilities would be expected to be significant; a detailed groundwater study and analysis of the currently proposed basement layout/level is required to predict actual inflows and required basement cut-off wall depth.

Use of a drained basement would require the basement perimeter to be completely enclosed by a continuous impermeable 'cut-off' wall that would be required to be founded into weathered rock, encountered in the bores at approximately 23m to 29m depth; the actual wall depth would require confirmation by a detailed groundwater modelling assessment, in addition to the structural requirements for the wall.

6.6 Foundations

Based on the results of the investigation, it is considered that bored cast insitu piles may be the most 'suitable' pile type for support of 'moderate to heavy' foundation loads.

It should be carefully noted that 'strength inversions' were noted in a significant number of bores (i.e. 'strong' layers underlain by 'softer' layers), which must be carefully considered in foundation design and selection of suitable founding levels. It will be essential to check, as part of detailed foundation design, that piles will not be adversely affected by any 'softer' layers that may exist below founding level (e.g. clay layers that may exist beneath dense sand/gravel layers).

The effect of group action should be considered where piles are to act in groups, and an overall foundation capacity of less than the sum of individual pile capacities could result where piles are closely spaced.

6.6.1 Piles

6.6.1.1 Driven Piles

The structural capacity of the pile section adopted will dictate load carrying capacity of piles driven to 'set'; indicative ultimate geotechnical strengths (R_{ug}) and maximum working loads for various precast concrete pile sections are presented in Table 15.

Table 15: Approximate Ultimate and Working Load Capacity for Precast, Driven Concrete Piles

Pile	Approximate Ultimate Geotechnical Strength (R_{ug}) at 'Set' (kN)	Approximate Maximum Working Load Capacity at 'Set' (kN)
300mm square	3,500	1,400
350mm square	4,500	1,800
400mm square	5,500	2,200

Application of an appropriate geotechnical strength reduction factor (ϕ_g) to $R_{d,ug}$ gives a design geotechnical strength ($R_{d,g}$) which, using limit state design, must be greater than or equal to the design action effect (E_d). A project specific ϕ_g value should be assessed based on the average risk rating values determined using Table 4.3.2(A) of AS2159 – 2009 *Piling – Design and Installation* in combination with an assessment of the level of redundancy in the overall piling system and the amount/type of pile testing proposed. Values of ϕ_g could range from 0.4 for very high risk piles with low redundancy and limited testing through to 0.9 for very low risk piles with high redundancy where not less than 10% of the piles are subject to a successful static load test. A typical ϕ_g value for moderate risk precast piles in a low redundancy pile system where 10% of all piles are subject to dynamic load testing would be approximately 0.7. Location and project specific assessment of ϕ_g , using the methodology described in Section 4.3 of AS2159 – 2009, must be carried out as part of detailed pile design.

Design pile penetration depths would be expected to be highly variable across the site. As a preliminary guide to the possible 'highest' toe levels that would be expected (without predrilling) for driven, precast concrete piles, estimates have been made at each bore location of the possible highest pile toe levels and the estimates are given in Table 16. As can be seen from the estimated toe levels, predrilling will be required to ensure that adequate pile length, 'fixity' and design load capacity are achieved.

Table 16: Preliminary Estimate of Driven Precast Concrete Pile Toe Levels, Without Predrilling

Bore	Estimated Maximum Toe Level ⁽¹⁾
101	RL-19m to RL-21m
102	RL-23m to RL-25m ⁽²⁾
103	RL-25m to RL-26m ⁽²⁾
104	RL-28m to RL-29m
105	RL-22m to RL-23m
106	RL-22m to RL-23m
107	RL-22m to RL-24m
108	RL-27m to RL-28m
109	RL-23m to RL-24m

⁽¹⁾ These pile toe levels are not considered appropriate for construction, as predrilling will be required to deepen pile toe levels

⁽²⁾ Insufficient bore depth

It will be essential to confirm that driven pile lengths are adequate to provide design pile capacity, 'fixity' etc. It is strongly suggested that pile load capacity assessments be undertaken on all piles during installation and on selected piles after installation using dynamic assessment methods. It will be necessary to allow piles to 'set-up', possibly for three to four days, prior to confirming load capacity by dynamic test methods.

The installation of driven piles will involve noise and vibration and it will be necessary to properly assess any potential effects that noise and vibration may have on adjoining structures/residents/services at the time of construction.

6.6.1.2 Bored Piles

Maximum allowable working pressure values for bored pile design are given in Table 17 (together with estimated settlement modulus values). Ultimate (failure) stress values can be estimated by multiplying the working stress values by 2.5.

All bored pile excavations should be inspected during drilling by a qualified geotechnical engineer/engineering geologist prior to casting, to confirm rock quality and final pile dimensions.

Table 17: Maximum Working Bearing Pressures for Bored Piles

Rock Strength	Maximum Allowable Working Bearing Pressure (kPa)		Estimated Settlement Modulus (MPa)	Poissons Ratio
	Shaft	Base		
extremely low	15	Not recommended	30 – 50	0.15 – 0.25
very low	75	750	50 – 80	
low	150	1,500	80 – 300	
medium	350	3,500*	300 – 1,000	
high	600	6,000*	1000 – 8,000	

* Only if rock quality below founding level is confirmed (refer Section 6.11.2)

It is considered that local variations in rock strength (and depth) will occur over the site and it is suggested that a 'flexible' approach be adopted to the foundation design, construction methodology and costing, so that pile sizes/founding depths can be readily adjusted as required during construction, without cost/time penalties being incurred.

6.7 Foundation Settlement

Pile settlement (including 'group' effects) should be checked in detail as part of foundation design.

6.7.1 Driven Piles

Based on a structural load equivalent to the maximum working load, the toe settlement of a single pile, driven to 'set' in dense sand/gravel or weathered rock would not be expected to exceed 5mm to 7mm, provided no 'softer' strata exists below founding level.

6.7.2 Bored Piles

Preliminary estimates of single pile load-settlement response have been made for initial comparative evaluation purposes. The estimates have been undertaken for two idealised ground conditions; two pile diameters; the lower and upper range of settlement modulus values given in Table 17; and the results are plotted as load-settlement curves in Figure 2 to Figure 5.

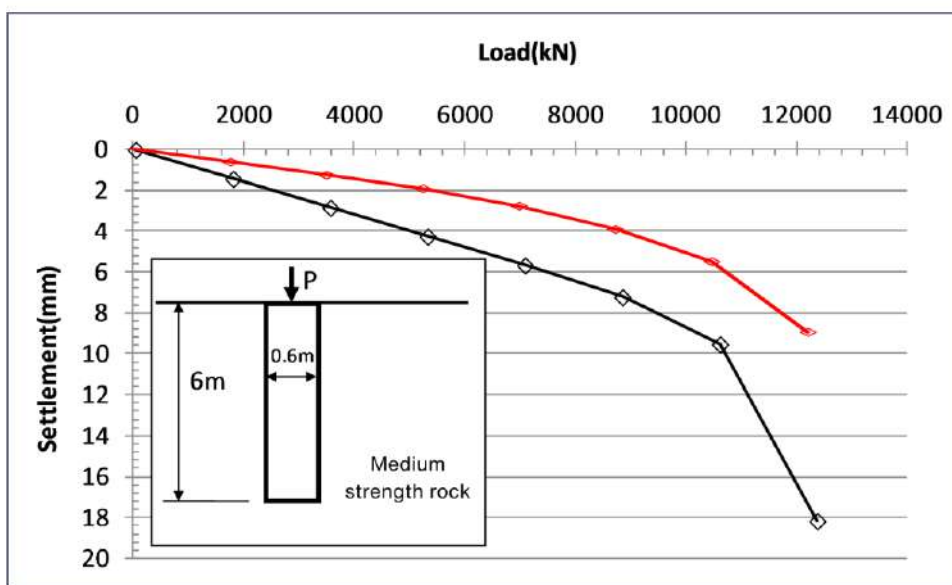


Figure 2: Medium strength rock, 0.6m diameter pile, low and *high* modulus

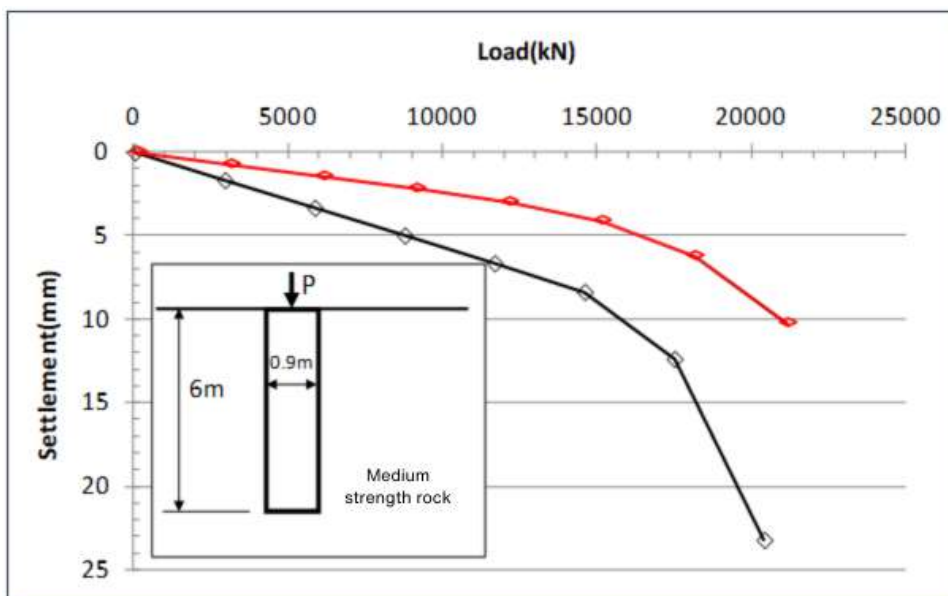


Figure 3: Medium strength rock, 0.9m diameter pile, low and *high* modulus

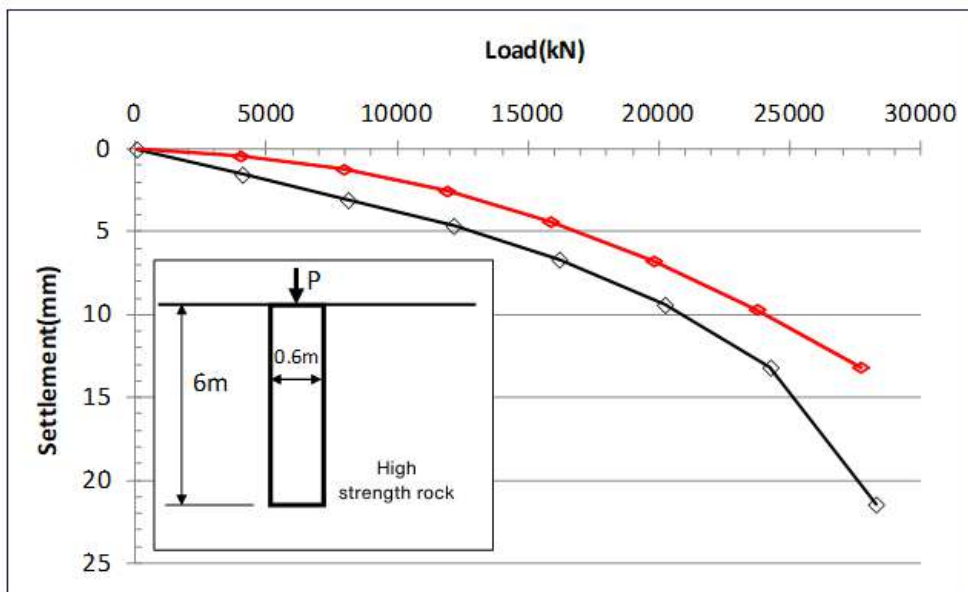


Figure 4: High strength rock, 0.6m diameter pile, low and *high* modulus

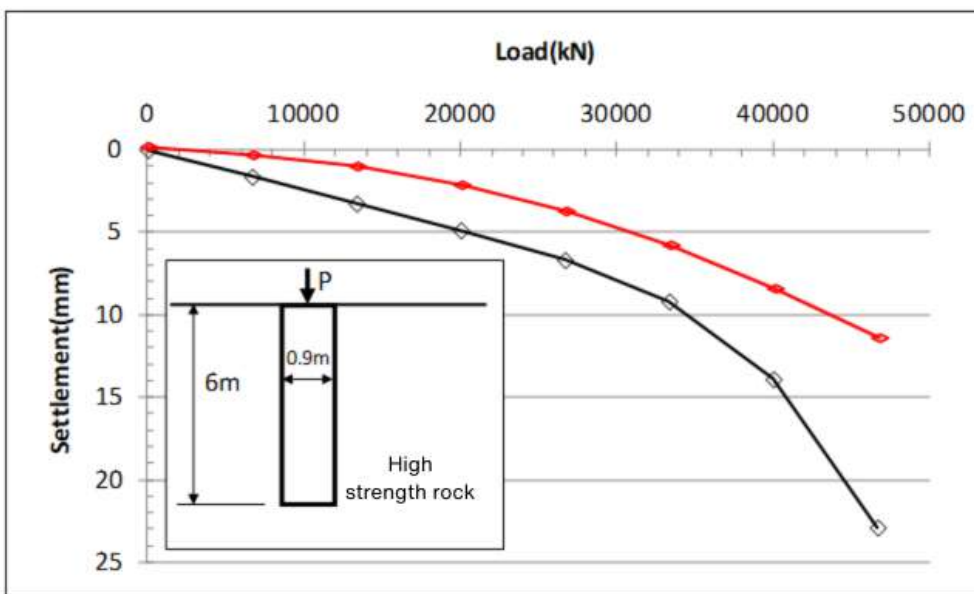


Figure 5: High strength rock, 0.9m diameter pile, low and *high* modulus

6.8 Site Settlement

As compressible alluvial soils of variable thickness underlie the site, application of any new net fill load to these soils would cause non-uniform settlement across the site. Site settlements (largely dependent on the variation in thickness and consolidation properties of the compressible alluvium across the site, as well as the magnitude and layout of any sustained fill loadings) should be checked in detail as part of the assessment and design of movement sensitive site features. The site may still be experiencing some (probably minor) creep settlement, under the weight of the existing fill.

6.9 Reactive Soils

The alluvial clays underlying the site are expected to be moderately to highly reactive and would readily change volume with change in moisture content. As the clays are likely to be at (or close to) saturation moisture content, the most likely reactive movement would be shrinkage due to the clays drying out (if exposed) during the construction process. If the clays are allowed to dry out, future wet-up could result in some heave occurring.

6.10 Earthquake Site Factor

With reference to Australian Standard AS1170.4 – 2007 (R2018/Amdt2-2018) *Structural design actions, Part 4 - Earthquake actions in Australia*, it is considered that the following may be adopted for the site:

- Hazard Factor (Z): 0.08
- Class Definition: Based on the results of seismic cone penetration testing (SCPT) undertaken at another site located in similar alluvial soil conditions in close proximity to the Brisbane River, it is considered that the site in its current condition may be a sub-soil Class E_e, Very Soft Soil site. Site specific SCPT tests are required to confirm the actual Class Definition.

6.11 Construction Monitoring

British Standard BS 7385: Part 2 – 1993 *Evaluation and Measurement for Vibration in Buildings* provides vibration limits to minimise the likelihood of cosmetic building damage from ground vibration occurring and this Standard is referenced in Appendix J in Australian Standard AS 2187: Part 2 – 2006 *Explosives – Storage and use – Use of explosives* for assessment of transitory vibrations. Sources of vibration which are considered in the Standard include demolition, blasting (carried out during mineral extraction or construction excavation), piling, ground treatments (e.g. compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

BS 7385 – 2 sets guide values which are given in Table 20 and are for building vibration based on the lowest vibration levels above which cosmetic damage has been credibly demonstrated. These levels are judged to give a minimal risk of vibration induced cosmetic damage, where ‘minimal risk’ for a named effect is usually taken as a 95% probability of no effect.

Table 18: Transient Vibration Guide Values for Cosmetic Damage (BS 7385 – 2)

Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4Hz to 15Hz	15Hz and above
1	Reinforced or framed structures, industrial and heavy commercial buildings	50mm/s at 4Hz and above	
2	Unreinforced or light framed structure. Residential or light commercial type buildings	15mm/s at 4Hz increasing to 20mm/s at 15Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above

German Standard DIN 4150: Part 3 – 1986 (reissued in 1999 without substantive changes) also provides commonly referenced guidelines for evaluating the effects of vibration on structures. The DIN Standard gives ‘safe levels’ up to which no cosmetic damage due to vibration effects has been observed and these limits are summarised in Table 19.

Table 19: Vibration Velocity Guideline for Evaluating the Effects of Short-Term Vibration on Structures

Line	Type of Structure	Guideline Values for Velocity, v_i , in mm/s			
		Vibration at the Foundation at a Frequency of			Vibration at Horizontal Plane of Highest Floor at All Frequencies
		1Hz to 10Hz	10Hz to 50Hz	50Hz to 100Hz*	
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10	8

* At frequencies above 100Hz, the values given in this column may be used as minimum values

The DIN 4150 – 3 Levels are more conservative than BS 7385 – 2 (generally twice as stringent), to avoid a small risk of cosmetic cracking.

Vibration will be caused by excavation (and any future demolition) work at the site. There is significant debate as to the maximum amount of vibration that buildings (and services) can accommodate, however, vibration restrictions should be set with a realistic appreciation for the normal operational environment of the site and the type of plant/methods to be used for excavation.

Development of a peak particle velocity criteria in conjunction with a frequency component is considered necessary to enable adequate monitoring and control. Whilst vibration assessment was outside the scope of the investigation, it is anticipated that the preliminary threshold values given in Table 20 may be suitable as an initial guide (subject to confirmation).

Table 20: Preliminary Vibration Limits

Description	Maximum Velocity (mm/s)	Frequency Range (Hz)
Buildings with existing defects, having visible cracks in brickwork.	6	10
Undamaged buildings in technically good condition, apart from minor defects such as cracks in plaster.	10	10 – 50

A dilapidation survey of adjacent buildings (and services) is strongly recommended prior to commencement of site work and vibration monitoring and control should be undertaken during any site demolition, and all building construction work (especially, but not only, in-ground works).

6.11.1 Boundary Movement

Boundary movements will occur as a consequence of the excavation process. Such movements are not possible to prevent or to accurately predict. It is considered essential that an accurate survey monitoring program of the excavation boundary and adjacent buildings be put in place for the duration of the excavation works, so that if untoward movement does occur (e.g. due to latent, adverse ground conditions) excavation face support can be upgraded/modified as required. The monitoring must be implemented prior to excavation commencing and without delay as construction proceeds, and should be to an accuracy of not less than 1mm (horizontal and vertical), so that any movement trends can be readily identified.

6.11.2 Foundation Predrilling

All bored pile foundation excavations should be inspected by a qualified engineer/geologist prior to casting, to confirm rock quality. 'Cored' inspection bores should be located beneath all 'major' foundations (supported in medium strength or stronger rock) to a depth below founding levels of not less than 1.5 times minimum footing width, to ensure that clay seams, 'fragmented zones' etc. do not exist within the zone of foundation stress influence and to enable confirmation/modification of working bearing pressures on a footing by footing basis as required, by local rock conditions. If cored bores are not undertaken, a significant reduction in allowable and bearing pressure would be required and it is suggested that end bearing pressures be limited to not more than 2,500kPa (for medium strength and stronger rock) in the absence of pre-drilling.

BUTLER PARTNERS PTY LTD

MIKE NEIGHBOUR
Principal

Reviewed by:
RICARDO ZANNIN-PESCE
Associate

Important Information about Your Geotechnical Engineering Report

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

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

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply the report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time to perform additional study.* Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that

have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/THE BEST PEOPLE ON EARTH exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

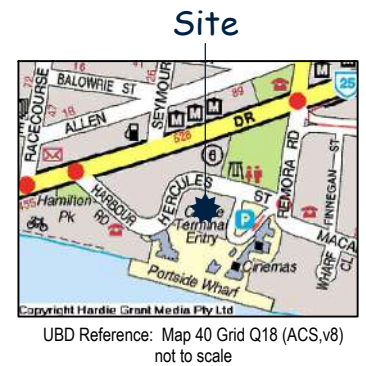


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Platinum High Rise Development

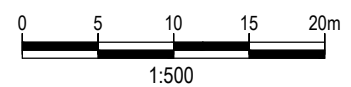
19 Hercules Street, Hamilton

Locality Plan and Test Locations

Wentworth Equities No.2 Pty Ltd

CLIENT:

SCALE AT A3:



DATE:	OCT 2025
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DRAWN:	JB
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APPROVED: _____

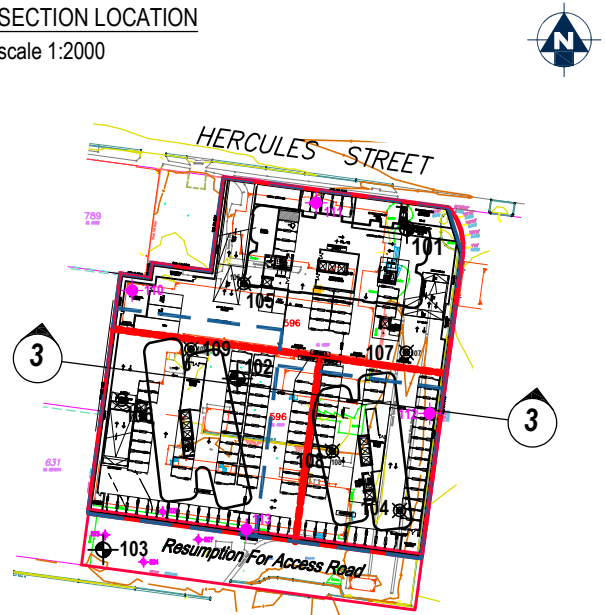
PROJECT No:	010-195E
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DRAWING No: 1 REV: C

Reference: PMM Pty Ltd's 'Contour and Detail Survey', Drawing No.6121-04-01B, dated 06.05.2003;
Custance's 'Basement Level 04', Drawing No. SK-PP-109 E, dated 27.05.14 and 'Basement Level 3-7',
Drawing No. SK-PP-100 H, dated 27.05.14.
FUSE Architect's Basement 1 Plan Sketch Design, Sheet No. DA 106 Rev 01, dated 26.11.2019

DATE:	OCT 2025
DRAWN:	JB
APPROVED:	
PROJECT No:	010-195E
DRAWING No: 3	REV: C

SECTION LOCATION
scale 1:2000

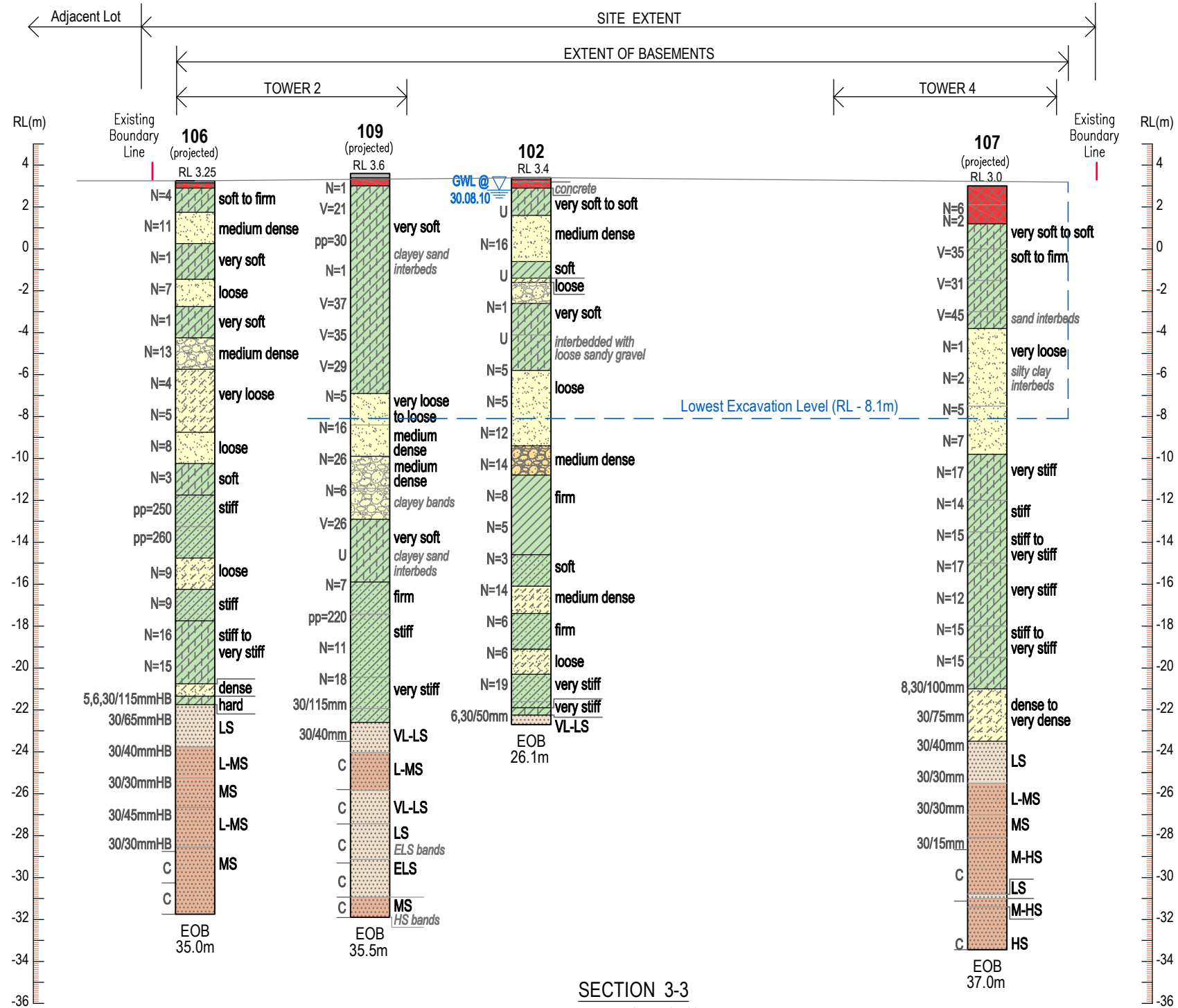


LEGEND

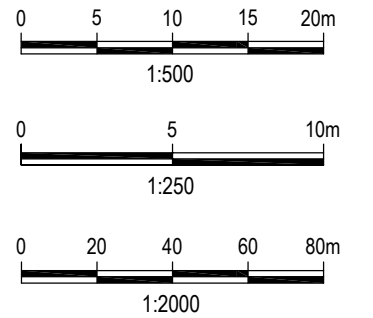
	Asphalt/Paving		Groundwater Level and Date Encountered
	Fill		
	Sand		
	Clayey Sand		
	Gravelly Sand		
	Gravel		
	Sandy Gravel		
	Clayey Gravel		
	Clay		
	Sandy Clay		
	Silty Clay		
	Silty Sandy Clay		
	Conglomerate		
	Mudstone		
	Sandstone		
	EL-LS Rock		
	M-HS Rock		

N=5 SPT 'N' Value
U Undisturbed Sample

ROCK STRENGTHS:
ELS - Extremely Low Strength
VLS - Very Low Strength
LS - Low Strength
MS - Medium Strength
HS - High Strength



SCALE AT A3:



Platinum
High Rise Development

19 Hercules Street, Hamilton

Section 3-3

Wentworth Equities No.2 Pty Ltd

DATE:	OCT 2025
DRAWN:	JB
APPROVED:	
PROJECT No:	010-195E
DRAWING No:	4
REV:	C

APPENDIX A

BORE REPORT SHEETS WITH EXPLANATORY NOTES

BORE REPORT

BORE 101

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 1 of 3

Date: 27 August 2010

Ground Surface Level: RL3.2m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
0	ASPHALTIC CONCRETE	3.2					
	FILL						
	- grey and grey-brown, gravel, fine to coarse grained, angular						
1	- pale brown, fine to medium grained gravel, particles increasing with depth up to cobble size (possible dredged material)	2.0					
	- grey-brown, clayey gravel, fine to medium grained, angular (possible dredged material)			S	1.5	1,2,1 N=3	
2	- brown, clayey sand, medium grained	1.0			1.95		
	CLAY (CH/OH)						
	- very soft to soft, dark grey/black, with semi-decayed/decayed wood (peaty clay), interbedded with thin sand (SP) layers			U	3.0	V=9kPa	
3		0.0			3.45		
	CLAY (CH)						
	- very soft, grey	-1.0		S	4.5	1,0,0 N=0	
4		-2.0			4.95		
	GRAVEL (GP)						
	- loose, grey, fine grained, subangular/subrounded with coarse grained sand, locally tending to a gravelly sand	-3.0		S	6.0	4,5,4 N=9	
6		-4.0			6.45		
	- very loose, with trace of shell fragments and sandy clay bands	-5.0		S	7.5	0,1,1 N=2	
7		-6.0		S	7.95		
8					9.0	0,0,1 N=1	
9					9.45		
10							

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Jacro 350

Drilling Method: Auger to 3.0m, casing to 13.5m, then wash bore to 25.0m

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 101

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 2 of 3

Date: 27 August 2010

Ground Surface Level: RL3.2m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
11	SANDY GRAVEL (GP) - loose/medium dense, grey, white and red, subangular/subrounded, fine to coarse grained	-8.0		S	10.5 10.95	5,4,5 N=9	
12	SILTY CLAY (CH) - very stiff, yellow-brown, with fine grained sand and trace of fine grained, subrounded gravel	-9.0		S	12.0 12.45	9,14,13 N=27	
13	SILTY SANDY CLAY/GRAVELLY SAND (CH) - very stiff, grey mottled brown, interbedded with gravelly sand (SW)	-10.0		S	13.5 13.95	7,14,15 N=29	
14	medium dense, brown, with fine grained gravel, subangular, fine to coarse grained sand	-11.0					
15	CLAYEY SAND (SC) - medium dense, orange-brown, fine grained sand	-12.0		S	15.0 15.45	4,7,10 N=17	
16		-13.0					
17		-14.0					
18	- trace of subrounded, fine grained gravel	-15.0		S	18.0 18.45	4,7,9 N=16	
19	SAND (SP) - medium dense, orange-brown, fine to medium grained, with sandy clay (CH), very stiff, grey mottled orange-brown bands	-16.0		S	19.5 19.95	6,8,8 N=16	
20							

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Jacro 350

Drilling Method: Auger to 3.0m, casing to 13.5m, then wash bore to 25.0m

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 101

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 3 of 3

Date: 27 August 2010

Ground Surface Level: RL3.2m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
21	SAND (SP) - medium dense, orange-brown, fine to medium grained, with sandy clay (CH), very stiff, grey mottled orange-brown bands						
	CLAYEY SAND (SC) - very dense, orange-brown, fine to medium grained, with trace of fine to medium grained gravel, subrounded/subangular and with occasional coarse gravel/cobble layers	-18.0		S	21.0 21.37	12,25,30/70mm	
22		-19.0					
23	GRAVELLY SAND (SP) - very dense, orange-brown, fine to medium grained sand, medium to coarse subrounded gravel	-20.0		S	22.5 22.6	30/100mm	
24	MUDSTONE (XW) - extremely low to very low strength, dark grey, with rare orange-brown staining	-21.0		S	24.0 24.05	30/50mm	
25	SANDSTONE (DW) - extremely low to very low strength, grey, fine to coarse grained	-22.0		S	25.5 25.55	30/50mm	
26	End of Bore at 25.55 m	-23.0					
27		-24.0					
28		-25.0					
29		-26.0					
30							

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Jacro 350

Drilling Method: Auger to 3.0m, casing to 13.5m, then wash bore to 25.0m

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT

BORE 102

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 1 of 3

Date: 30 August 2010

Ground Surface Level: RL3.4m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
0	ASPHALTIC CONCRETE	3.4					Bentonite
	FILL						
	- grey-brown, sandy gravel						
1	- low strength, pale grey-brown concrete						
	SILTY CLAY (CH)	2.0		U	1.5	V=12kPa	
	- very soft to soft, grey (possible fill)				1.9		
2	SAND (SP)	1.0					
	- medium dense, grey fine to medium grained sand interbedded with sandy gravel (GP) fine to medium grained with trace of shell fragments (possible fill)						
3		0.0		S	3.0	3,7,9 N=16	
					3.45		Spoil
4	CLAY (CH)	-1.0		U	4.5		
	- soft, dark grey						
5	CLAYEY SAND (SC)	-2.0			4.95	V=20kPa	
	- loose, grey, fine to medium grained						
	GRAVELLY SAND (SW)						
	- loose, grey, fine to coarse grained sand with fine grained gravel						
6	SILTY CLAY (CH)	-3.0		S	6.0	0,0,1 N=1	
	- very soft, dark grey				6.45		Casing
7		-4.0		U	7.5		
	- interbedded with sandy gravel (GP) loose, grey fine particle size, subangular/subrounded				7.95		
8		-5.0					
9	SAND (SP)	-6.0		S	9.0	2,2,3 N=5	
	- loose, grey medium to coarse grained with trace of fine to medium grained gravel, subangular				9.45		
10							

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Jacro 350

Drilling Method: Auger to 3.0m, casing to 18m, then wash bore

Groundwater: Groundwater encountered at 0.6m during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 102

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 2 of 3

Date: 30 August 2010

Ground Surface Level: RL3.4m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
11	SAND (SP) - loose, grey medium to coarse grained with trace of fine to medium grained gravel, subangular	-7.0		S	10.5 10.95	1,2,3 N=5	
12	- medium dense	-8.0		S	12.0 12.45	2,5,7 N=12	
13	SANDY GRAVEL (GP) - medium dense, grey, fine to medium grained size, subrounded/subangular with medium to coarse sand and shell fragments	-9.0		S	13.5 13.95	9,8,6 N=14	
14	CLAY (CH) - firm, grey interbedded with sandy gravel (GP) loose to medium dense, grey, fine to medium grained, subangular/subrounded with medium to coarse grained sand and shell fragments	-10.0		S	15.0 15.45	4,4,4 N=8	
15		-11.0		S	16.5 16.95	1,2,3 N=5	
16		-12.0		S	18.0 18.45	0,1,2 N=3	
17	SANDY CLAY (CH) - soft, grey, fine to medium grained sand with trace of fine grained gravel	-13.0		S	19.5 19.95	4,7,7 N=14	
18		-14.0		S			
19	CLAYEY SAND (SC) - medium dense, grey, fine to medium grained	-15.0		S			
20		-16.0		S			

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Jacro 350

Drilling Method: Auger to 3.0m, casing to 18m, then wash bore

Groundwater: Groundwater encountered at 0.6m during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT

BORE 102

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 3 of 3

Date: 30 August 2010

Ground Surface Level: RL3.4m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
21	CLAYEY SAND (SC) - medium dense, grey, fine to medium grained	-17.0					
	SANDY CLAY (CH) - firm, grey-brown fine to medium grained sand	-18.0		S	21.0 21.45	2,4,2 N=6	
22		-19.0					
23	CLAYEY SAND (SC) - loose, orange brown, fine grained sand	-20.0		S	22.5 22.95	0,2,4 N=6	
24	SANDY CLAY (CH) - very stiff, orange-brown, with gravel, fine to medium grained subrounded to subangular	-21.0		(S)	24.0 24.45	4,9,10 N=19	
25	- medium to coarse grained gravel	-22.0					
26	SILTY CLAY (CH) - hard, grey-orange-brown, with trace of sand, fine to medium grained	-22.0		S	25.5 25.7	6,30/50mm	
27	SANDSTONE (XW/DW) - extremely low to very low strength, orange-brown, fine grained - grading low strength	-23.0					
	End of Bore at 26.1 m (Wash bore refusal)	-24.0					
28		-25.0					
29		-26.0					
30							

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Jacro 350

Drilling Method: Auger to 3.0m, casing to 18m, then wash bore

Groundwater: Groundwater encountered at 0.6m during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT

BORE 103

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 1 of 3

Date: 1 September 2010

Ground Surface Level: RL3.0m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
0	FILL - dark grey, topsoil - orange-brown, gravel, subangular, fine to coarse grained	3.0					
1	- grey-brown, gravelly sand, medium to coarse grained sand, with fine to medium grained gravel, subrounded/subangular	2.0					
2	SAND (SW) - medium dense, grey-brown with trace of fine gravel	1.0		S	1.5 1.95	6,8,7 N=15	
3	SAND (SP) - medium dense, grey-brown, fine to medium grained	0.0		S	3.0 3.45	9,9,8 N=17	
4		-1.0					
5	- loose, grey, fine to medium grained	-2.0		S	4.5 4.95	3,3,3 N=6	
6	CLAY (CH) - soft to firm, grey interbedded with sand (SP), very loose, grey, fine to medium grained	-3.0		S	6.0 6.45	1,2,2 N=4	
7	- gravel inclusions	-4.0					
8	GRAVEL (GP) - medium dense, grey-brown, fine grading medium grained, subrounded with medium to coarse grained sand	-5.0		S	7.25 7.95	5,6,7 N=13	
9	GRAVELLY SAND (SW) - medium dense, grey, fine grained angular/subangular gravel and medium to coarse grained sand	-6.0		S	9.0 9.45	7,6,7 N=13	
10		-7.0					

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Jacro 350

Drilling Method: Auger to 3.0m, casing to 18m, then wash bore

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 103

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 2 of 3

Date: 1 September 2010

Ground Surface Level: RL3.0m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
11	SANDY GRAVEL (GP) - loose, grey, fine to medium grained, subangular, sand, fine to medium grained, with shell fragments	-8.0		S	10.5 10.95	3,3,2 N=5	
12	- medium to coarse grained - loose, grey, fine to medium grained, subangular, sand, fine to medium grained, with shell fragments	-9.0		S	12.0 12.45	5,3,5 N=8	
13	- loose, grey, medium to coarse grained gravel, subangular/subrounded, medium to coarse sand, with shell fragments	-10.0		S	13.5 13.95	5,2,4 N=6	
15	CLAY (CH) - stiff to very stiff, grey, interbedded with sand (SP), medium dense, grey, fine to medium grained	-12.0		S	15.0 15.45	3,6,10 N=16	
16	- soft to firm, grey, with occasional bands of sand (SP), very loose, grey, fine to medium grained	-13.0		S	16.5 16.95	3,3,1 N=4	
18	CLAYEY SAND (SC) - medium dense, grey, fine to coarse grained, with gravel (GP) bands, grey, fine to coarse grained	-15.0		S	18.0 18.45	5,6,7 N=13	
19	GRAVELLY SAND (GP) - medium dense, grey, fine to medium grained sand, medium to coarse grained subangular gravel	-16.0		S	19.5 19.95	9,6,7 N=13	
20	- coarse grained	-17.0					

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Jacro 350

Drilling Method: Auger to 3.0m, casing to 18m, then wash bore

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT

BORE 104

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 1 of 4

Date: 29 June 2011

Ground Surface Level: Approx. RL2.9m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
0	ASPHALT - 40mm thick	2.9				Stick up 0.14m	
1	FILL - brown sand (SP) medium dense, fine to coarse gravel, moist	2.0		S	0.5 0.95	4,6,6 N=12	
2	- very loose	1.0		S	2.0 2.45	2,1,1 N=2	
3	- dark grey gravelly sand (SP), fine to coarse grained sand, fine to medium subangular to subrounded gravel, with some clay	0.0		U	3.5 3.95	pp<10	
4		-1.0					Backfill
5	SAND (SP) - very loose, dark grey, medium to coarse grained, with some clay (possibly fill)	-2.0		S	5.0 5.45	2,2,1 N=3	
6		-3.0					
7	SANDY CLAY (CI) - very soft, dark grey, fine to medium grained	-4.0		S	6.5 6.95	5,5,1 N=6	
8	SAND (SP) - very loose, dark grey, medium to coarse grained	-5.0		S	8.0 8.45	11,3,2 N=5	
9	- with trace of crushed shells	-6.0					
10		-7.0		S	9.5 9.95	2,2,3 N=5	

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Mobile B40L mounted on Volvo FL10

Drilling Method: Auger to 2.0m, HWT casing to 2.0m, NW casing to 15.0m, wash bore to 35.0m

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 104

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 2 of 4

Date: 29 June 2011

Ground Surface Level: Approx. RL2.9m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
11	SAND (SP) - very loose, dark grey, medium to coarse grained, with trace crushed chells - loose, with trace of silt	-8.0		S	11.0 11.45	3,3,4 N=7	
12	- very loose, with trace of crushed shells	-9.0		S	12.5 12.95	3,0,4 N=4	
14	SILTY CLAY (CH) - very soft, dark grey, with trace of fine to medium grained sand	-11.0		S	14.0 14.45	2,0,1 N=1	
15	SANDY CLAY (CI) - very soft to soft, dark grey, fine to medium grained sand	-12.0		U	15.5 15.95		Backfill
17		-14.0		(U)	17.0 17.45		
18	SAND (SP) - loose, dark grey, medium to coarse grained sand, trace of fine subrounded gravel, trace of crushed shells, with some clay	-15.0		S	18.5 18.95	5,5,4 N=9	
20		-17.0					

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Mobile B40L mounted on Volvo FL10

Drilling Method: Auger to 2.0m, HWT casing to 2.0m, NW casing to 15.0m, wash bore to 35.0m

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 104

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 3 of 4

Date: 29 June 2011

Ground Surface Level: Approx. RL2.9m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
21	GRAVELLY SAND (SP) - loose, dark grey, medium to coarse grained sand, fine to medium subangular gravel, trace of crushed shells, trace of silt	-18.0		S	20.0 20.45	7,6,3 N=9	
22	SILTY CLAY (CH) - very soft to soft, dark grey, trace of fine grained sand, trace of shells	-19.0		S	21.5 21.95	1,0,1 N=1	
23	- very stiff, dark grey, trace of fine grained sand	-20.0		U	23.0 23.45	pp=120	
24		-21.0		U	24.5 24.95	pp=130	Backfill
25	- firm to stiff, dark grey, trace of fine grained sand	-22.0		S	26.0 26.45	0,4,4 N=8	
26		-23.0		(U)	27.5 27.95		
27	SANDY GRAVEL (GP) - brown, fine to medium subangular gravel, fine to coarse grained sand, with some clay	-25.0		D	29.0 29.2		
28	SANDSTONE (DW) - very low strength, pale grey, fine to medium grained	-26.0					
29		-27.0					
30							

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Mobile B40L mounted on Volvo FL10

Drilling Method: Auger to 2.0m, HWT casing to 2.0m, NW casing to 15.0m, wash bore to 35.0m

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 104

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 4 of 4

Date: 29 June 2011

Ground Surface Level: Approx. RL2.9m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
31	SANDSTONE (DW) - very low strength, pale grey, fine to medium grained	-28.0		S	30.5	4,10,23/60mm HB	Backfill Bentonite 30/60 mm HB Sand 30/35mm HB 30/40mm HB Fall in
					30.86		
32		-29.0		(S)	32.0	30/60 mm HB	
					32.06		
33	-30.0	(S)	33.5	30/35mm HB			
				33.535			
34	-31.0						
35	End of Bore at 35.04 m	-32.0	S	35.0	30/40mm HB		
36		-33.0					
37		-34.0					
38		-35.0					
39		-36.0					
40		-37.0					

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Mobile B40L mounted on Volvo FL10

Drilling Method: Auger to 2.0m, HWT casing to 2.0m, NW casing to 15.0m, wash bore to 35.0m

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 103

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 3 of 3

Date: 1 September 2010

Ground Surface Level: RL3.0m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
21	SANDY GRAVEL (GP) - medium dense, grey, fine to medium grained, angular/subangular	-18.0		S	21.0	2,2,5 N=7	
	CLAYEY GRAVEL (GC) - medium dense, grey, fine to medium grained				21.45		
22	CLAY (CH) - firm, grey	-19.0					
	- soft				22.5	0,1,2 N=3	
23		-20.0		S	22.95		
	- soft to firm				24.0	0,1,3 N=4	
24		-21.0		S	24.45		
25		-22.0			25.5	0,1,3 N=4	
26		-23.0		S	25.95		
27	CONGLOMERATE (DW) - extremely low to very low strength, grey mottled orange-brown, fine to coarse gravel	-24.0		S	27.0	22,27,30/60mm	
	- low strength				27.36		
28	End of Bore at 27.7 m (Wash bore refusal)	-25.0					
29		-26.0					
30		-27.0					

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Jacro 350

Drilling Method: Auger to 3.0m, casing to 18m, then wash bore

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 105

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 1 of 4

Date: 27 June 2011

Ground Surface Level: Approx. RL2.9m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
0	FILL - pale grey brown, sandy gravel (GM), fine to coarse grained sand, fine to coarse subangular gravel, with crushed concrete, wood, plastic, crushed bricks, moist	2.9					
1	- brown sandy clay (SC), fine to coarse grained sand, with some fine to coarse subangular gravel, moist	2.0		U	0.5 0.95		
2	- grey sand (SP), medium to coarse grained	1.0					
	SANDY CLAY (CI) - grey, fine grained sand, saturated, (possibly fill)			S	2.0 2.45	0,0,1 N=1	
3	SAND (SP) - very loose, grey, fine to medium grained, saturated, (possibly fill)	0.0					
	SANDY CLAY (SC) - soft, grey, fine grained sand, saturated, (possibly fill)			U	3.5 3.95	pp=60	
4		-1.0					
5	SILTY CLAY (CH) - soft, grey, trace of fine grained sand	-2.0		S	5.0 5.45	0,0,1 N=1	
6		-3.0					
7		-4.0		(U)	6.5 6.95		
8	CLAYEY SAND (SC) - very loose, grey, medium to coarse grained	-5.0		S	8.0 8.45	0,0,1 N=1	
9	GRAVELLY SAND (SP) - loose, grey, medium to coarse grained sand, fine to medium subangular gravel, trace of shells	-6.0					
10		-7.0		S	9.5 9.95	1,3,4 N=7	

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Mobile B40L

Drilling Method: Auger to 2.0m, HWT casing to 2.0m, NW casing to 14.0m, wash bore to 38.0m

Groundwater: Groundwater encountered at 0.8m during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 105

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 2 of 4

Date: 27 June 2011

Ground Surface Level: Approx. RL2.9m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
11	GRAVELLY SAND (SP) - loose, grey, medium to coarse grained sand, fine to medium subangular gravel, trace of shells	-8.0		S	11.0 11.45	4,3,4 N=7	
12	- medium dense, grey	-9.0					
13	- brown	-10.0		S	12.5 12.95	11,11,13 N=24	
14		-11.0		S	14.0 14.45	6,13,6 N=19	
15	SILTY CLAY (CH) - stiff, brown, with fine sand, faint hydrocarbon odour	-12.0					
16		-13.0		S	15.5 15.95	3,4,5 N=9	
17	SANDY GRAVELLY CLAY (GC) - stiff to very stiff, brown, fine to coarse grained sand, fine subangular gravel	-14.0		S	17.0 17.45	12,9,6 N=15	
18	SANDY CLAY (CI) - very stiff, grey with brown mottle, fine grained sand	-15.0					
19		-16.0		S	18.5 18.95	5,7,10 N=17	
20	SAND (SP) - medium dense, brown, fine grained, trace of clay	-17.0					

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Mobile B40L

Drilling Method: Auger to 2.0m, HWT casing to 2.0m, NW casing to 14.0m, wash bore to 38.0m

Groundwater: Groundwater encountered at 0.8m during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 105

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 3 of 4

Date: 27 June 2011

Ground Surface Level: Approx. RL2.9m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
21	SAND (SP) - medium dense, brown, fine grained, trace of clay	-18.0		S	20.0 20.45	6,4,7 N=11	
22		-19.0		(S)	21.5 21.95	28,13,12 N=25	
23	GRAVELLY CLAY (GC) - hard, brown, fine to medium subangular gravel, with fine to coarse grained sand	-20.0		S	23.0 23.29	23,30/140mm	
24	GRAVELLY SAND (SP) - very dense, brown, fine to coarse grained sand, fine to medium subangular gravel, with some clay	-21.0		S	24.5 24.59	30/90mm HB	
25	SAND (SP) - very dense, pale grey, fine grained - brown, fine to coarse grained sand	-22.0		S	26.0 26.065	30/65mm HB	
26		-23.0					
27		-24.0					
28		-25.0					
29	SANDSTONE (DW) - extremely low strength to very low strength, pale grey, fine to medium grained	-26.0					
30		-27.0					

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Mobile B40L

Drilling Method: Auger to 2.0m, HWT casing to 2.0m, NW casing to 14.0m, wash bore to 38.0m

Groundwater: Groundwater encountered at 0.8m during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



BORE 105

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

Page No: 4 of 4

Date: 27 June 2011

Ground Surface Level: Approx. RL2.9m*

Depth (m)	Description	RL (m)	Lithology	Sample Type	Sample Depth (m)	Test Results	Groundwater Monitoring Bore
31	SANDSTONE (DW) - extremely low strength to very low strength, pale grey, fine to medium grained	-28.0					
32		-29.0					
33		-30.0					
34		-31.0					
35		-32.0					
36	- medium strength	-33.0					
37		-34.0					
38	End of Bore at 38.04 m	-35.0		S	38.0 38.04	30/40mm	
39		-36.0					
40		-37.0					

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetrometer Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Mobile B40L

Drilling Method: Auger to 2.0m, HWT casing to 2.0m, NW casing to 14.0m, wash bore to 38.0m

Groundwater: Groundwater encountered at 0.8m during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



Client:

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

BORE 106

Page No: 1 of 4

Date: 1 July 2011

Ground Surface Level: Approx. RL3.3m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results
0	CONCRETE SLAB	3.3										
0.5	FILL - grey gravel (GP), fine to coarse subangular to subrounded gravel with trace of subrounded cobbles					S	0.5					1,2,2
0.95							0.95					N=4
2.0	SILTY CLAY (CH) - soft to firm, dark grey, trace of fine grained sand, trace of organic matter (possible fill)	2.0										
2.45						S	2.45					3,5,6
2.0							2.0					N=11
3.0	SAND (SP) - medium dense, brown, fine to coarse grained, with trace of shells (possible fill)	1.0										
3.5							3.5					0,0,1
3.95	SILTY CLAY (CH) - very soft, dark grey, trace of fine grained sand	0.0				S	3.95					N=1
5.0							5.0					4,4,3
5.45	SAND (SP) - loose, dark grey, fine to coarse grained	-2.0				S	5.45					N=7
6.5							6.5					0,0,1
6.95	SILTY CLAY (CH) - very soft, dark grey, trace of fine grained sand	-3.0				S	6.95					N=1
8.0							8.0					6,7,6
8.45	GRAVELLY SAND (SP) - medium dense, grey, medium to coarse grained sand, fine subrounded gravel, trace of clay	-5.0				S	8.45					N=13
9.5							9.5					1,2,2
9.95	CLAYEY SAND (SC) - very loose, grey, fine to coarse grained	-6.0				S	9.95					N=4

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50) Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d) Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a) Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i) Lump Test
VF	Field Vane Shear Strength, Uncorrected (kPa)					

Rig: Mobile B40L

Logged by:

Drilling Method: Solid stem auger to 2.0m, HWT casing to 2.0m, NW casing to 15.0m, wash bore to 32.0m, NMLC to 35.0m

Groundwater: Groundwater not encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



Client:

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

BORE 106

Page No: 2 of 4

Date: 1 July 2011

Ground Surface Level: Approx. RL3.3m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results
11	CLAYEY SAND (SC) - very loose, grey, fine to coarse grained	-7.0					11.0					3,2,3
		-8.0				(S)	11.45					N=5
12	SAND (SP) - loose, grey, fine to coarse grained, with trace of crushed shells and fine subrounded gravel	-9.0				S	12.5					3,4,4
13		-10.0					12.95					N=8
14	SILTY CLAY (CH) - soft, dark grey, with trace of fine grained sand	-11.0				S	14.0					1,1,2
15		-12.0					14.45					N=3
16	SANDY CLAY (CI) - stiff, grey with brown mottle, fine to coarse grained sand, trace of fine gravel	-13.0				U	15.5					pp=250
		-14.0					15.95					
17	- fine grained sand	-15.0				U	17.0					pp=260
		-16.0					17.27					
18	CLAYEY SAND (SC) - loose, brown, fine grained	-17.0				S	18.5					3,4,5
19		-18.0					18.95					N=9
20	SANDY CLAY (CI) - stiff, brown, fine grained sand	-19.0										

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test
VF	Field Vane Shear Strength, Uncorrected (kPa)						

Rig: Mobile B40L

Logged by:

Drilling Method: Solid stem auger to 2.0m, HWT casing to 2.0m, NW casing to 15.0m, wash bore to 32.0m, NMLC to 35.0m

Groundwater: Groundwater not encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



Client:

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

BORE 106

Page No: 3 of 4

Date: 1 July 2011

Ground Surface Level: Approx. RL3.3m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results
21	SANDY CLAY (CI) - stiff, brown, fine grained sand	-17.0				S	20.0 20.45					4,4,5 N=9
22	SILTY CLAY (CH) - stiff to very stiff, brown, with some fine grained sand	-18.0				S	21.5 21.95					6,7,9 N=16
23		-19.0										
24	CLAYEY SAND (SC) - dense, brown, fine grained	-20.0				S	23.0 23.45					6,6,9 N=15
25	SILTY CLAY (CL) - hard, pale grey with brown mottle	-21.0				S	24.5 24.915					5,6,30/115mm HB
26	SANDSTONE (XW) - low strength, brown, fine grained	-22.0										
27	SANDSTONE (HW) - low to medium strength, pale brown, fine to medium grained	-23.0				S	26.0 26.065					30/65mm HB
28		-24.0				S	27.5 27.54					30/40mm HB
29	- medium strength, grey	-25.0				S	29.0 29.04					30/30mm HB
30		-26.0										

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50) Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d) Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a) Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i) Lump Test
VF	Field Vane Shear Strength, Uncorrected (kPa)					

Rig: Mobile B40L

Logged by:

Drilling Method: Solid stem auger to 2.0m, HWT casing to 2.0m, NW casing to 15.0m, wash bore to 32.0m, NMLC to 35.0m

Groundwater: Groundwater not encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



Client:

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195A

BORE 106

Page No: 4 of 4

Date: 1 July 2011

Ground Surface Level: Approx. RL3.3m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results
31	SANDSTONE (HW) - low to medium strength, grey	-27.0	32.03m to 32.08m, core loss			S	30.5 30.545					30/45mm HB
		-28.0										
32	- medium strength	-29.0			0	S	32.0 32.03 32.08 32.75	0.7(d) 0.6(a)	97	100		30/30mm HB
33		-30.0				C						
34		-31.0										
35	End of Bore at 35 m	-32.0			0	C	33.5 33.6 34.75 35.0	0.6(d) 0.6(a)	100	100		
36		-33.0										
37		-34.0										
38		-35.0										
39		-36.0										
40												

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test
VF	Field Vane Shear Strength, Uncorrected (kPa)						

Rig: Mobile B40L

Logged by:

Drilling Method: Solid stem auger to 2.0m, HWT casing to 2.0m, NW casing to 15.0m, wash bore to 32.0m, NMLC to 35.0m

Groundwater: Groundwater not encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail & Contour Survey', Dwg. 6121-04-01B, dated 6.05.03

BORE REPORT



Client: Wentworth Equities No.2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

BORE 107

Page No: 1 of 3

Date: 15 to 19 August 2014

Ground Surface Level: RL3.0m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results
0	FILL - grey-brown, sandy gravel, fine to coarse subangular, fine to coarse grained sand, with cobbles (construction rubble)	3.0										
1	- brown, gravelly sand, fine to coarse grained, fine to medium subangular gravel	2.0				D	0.4					4,4,2 N=6
2	SILTY CLAY (CI) - very soft to soft, dark grey, interbedded with fine clayey sand	1.0				S	0.8					3,1,1 N=2
3	- soft to firm	0.0				S	1.45					
4	- with sea shells	-1.0					1.5					
5	- interbedded with sand, fine to coarse grained	-2.0				U	1.95					V=35
6	SAND (SP) - very loose, grey, fine to coarse grained, interbedded with silty clay	-3.0					3.0					
7	- with some fine to coarse subrounded gravel	-4.0				U	3.45					V=31
8		-5.0					4.5					
9		-6.0				U	4.95					V=45
10		-7.0					6.0					
11		-8.0				U	6.45					
12		-9.0					7.5					0,0,1 N=1
13		-10.0				S	7.95					
							9.0					1,1,1 N=2
						S	9.45					
							10.5					3,2,3 N=5
						S	10.95					
							12.0					2,3,4 N=7
						(S)	12.45					

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test
VF	Field Vane Shear Strength, Uncorrected (kPa)						

Rig: Hydrapower Scout

Logged by: RZ

Drilling Method: Auger to 1.5m, casing to 18.0m, washbore to 31.15m, then NMLC

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail and Contour Survey', Dwg. G121-04-01B, dated 6.05.2003

BORE REPORT



Client: Wentworth Equities No.2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

BORE 107

Page No: 2 of 3

Date: 15 to 19 August 2014

Ground Surface Level: RL3.0m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results
14	SILTY CLAY (CI) - very stiff, brown	-11.0				S	13.5 13.95					5,8,9 N=17
15	- stiff	-12.0				(S)	15.0 15.45					5,6,8 N=14
16		-13.0										
17	- stiff to very stiff, with fine grained sand	-14.0				S	16.5 16.95					5,6,9 N=15
18	- very stiff	-15.0				S	18.0 18.45					6,7,10 N=17
19		-16.0										
20		-17.0				S	19.5 19.95					4,6,6 N=12
21	- stiff to very stiff, brown mottled grey	-18.0				S	21.0 21.45					6,6,9 N=15
22		-19.0										
23	- with some fine grained sand	-20.0				S	22.5 22.95					6,7,8 N=15
24	CLAYEY SAND (SC) - dense to very dense, orange-brown, fine grained, with fine to coarse subangular gravel	-21.0				S	24.0 24.25					8,30/100mm
25		-22.0										
26		-23.0				(S)	25.5 25.58					30/75mm

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test
VF	Field Vane Shear Strength, Uncorrected (kPa)						

Rig: Hydrapower Scout

Logged by: RZ

Drilling Method: Auger to 1.5m, casing to 18.0m, washbore to 31.15m, then NMLC

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail and Contour Survey', Dwg. G121-04-01B, dated 6.05.2003

BORE REPORT



Client: Wentworth Equities No.2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

BORE 107

Page No: 3 of 3

Date: 15 to 19 August 2014

Ground Surface Level: RL3.0m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results
27	CLAYEY SAND (SC) - dense to very dense, orange-brown, fine grained, with fine to coarse subangular gravel	-24.0					27.0					
	SANDSTONE (XW) - low strength, grey, fine to medium grained					(S)	27.04					30/40mm
28		-25.0										
29	- low to medium strength	-26.0				S	28.5 28.53					30/30mm
30	- medium strength, grey, fine to medium grained	-27.0				S	30.0 30.03					30/30mm
31		-28.0					31.5					
	SANDSTONE (MW) - medium to high strength, grey, fine to coarse grained with some fine to medium subrounded gravel inclusions					S	31.65	0.3(d) 0.3(a)				30/15mm
32		-29.0	32.13m,J,10,vii,clay,12mm		1	C	32.5	0.7(d) 0.8(a)	100	100		
33		-30.0										
			33.67m,J,10,vii,coal,1mm				33.6	0.2(d) 0.4(a)				
34	- low strength	-31.0	33.95m,J,15,vii,clay,8mm 33.97m to 34.16m,J,80,vii,clay,1mm				34.1					
	- medium to high strength		34.68m,J,15,vii,coal,1mm				34.62	1.3(d) 1.9(a)				
35	- high strength	-32.0			1	C	35.58	0.8(d) 0.8(a)	100	99		
36		-33.0	35.52m,J,10,vii,clay,10mm									
							36.54	1.1(d) 1.1(a)				
37	End of Bore at 37 m	-34.0					37.0					
38		-35.0										
39		-36.0										

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test
VF	Field Vane Shear Strength, Uncorrected (kPa)						

Rig: Hydrapower Scout

Logged by: RZ

Drilling Method: Auger to 1.5m, casing to 18.0m, washbore to 31.15m, then NMLC

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail and Contour Survey', Dwg. G121-04-01B, dated 6.05.2003

BORE REPORT



Client: Wentworth Equities No.2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

BORE 108

Page No: 1 of 3

Date: 25 August 2014

Ground Surface Level: RL3.0m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results	Groundwater Monitoring Well Details
0	CONCRETE SLAB - 30mm thick, with 20mm bituminous concrete topping	3.0					0.5					0,3,4 N=7	
1	CLAYEY SAND (SC) - loose, grey mottled with brown, fine grained possible fill	2.0				S	0.95					2,2,4 N=6	
2	SAND (SP) - loose, brown, fine to coarse grain, possible fill	1.0				S	1.95					3,5,2 N=7	
3	SILTY CLAY (CH) - firm, grey, fine to medium grained sand	0.0				S	3.0					V=31	
4		-1.0				U	3.45					3,3,3 N=6	
5		-2.0					4.5					4,3,3 N=6	
6	SAND (SW) - loose, grey, fine to medium grained sand, shell remains	-3.0				S	4.95					3,3,3 N=6	
7		-4.0					6.0					3,3,3 N=6	
8	- loose, grey mottled with white, fine to coarse grained sand, with fine grained gravel	-5.0				S	6.45					9,3,4 N=7	
9		-6.0					7.5					2,3,4 N=7	
10		-7.0				S	7.95						
11		-8.0					9.0						
12	- loose, brown, mottled grey, fine to coarse grained, sand, abundant shell remains, trace of fine grained gravel, soft clay seams	-9.0				S	9.45						
13		-10.0					10.5						
							10.95						
							12.0						
							12.45						

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test

Rig: Hydrapower Scout

Logged by: RZ

Drilling Method: Auger to 1.5m, casing to 30m, washbore to 33.0m, NMLC to 33.9m, washbore to 34.5m then NMLC

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail and Contour Survey', Dwg. G121-04-01B, dated 6.05.2003

BORE REPORT



Client: Wentworth Equities No.2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

BORE 108

Page No: 2 of 3

Date: 25 August 2014

Ground Surface Level: RL3.0m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results	Groundwater Monitoring Well Details
14	SAND (SW) - loose, brown, mottled grey, fine to coarse grained, sand, abundant shell remains, trace of fine grained gravel, soft clay seams	-11.0				S	13.5					4,4,4 N=8	
							13.95						
15	SILTY CLAY (CL) - very soft, grey, with sand seams	-12.0				S	15.0					3,3,1 N=4	
							15.45						
16						U	16.5					V=10	
							16.95						
17	SILTY CLAY (CH) - soft, grey, trace of fine grained sand	-13.0				U	18.0					V=6	
							18.45						
18						S	19.5					0,0,4 N=4	
							19.95						
19	- stiff	-14.0				U	21.0					V=64	
							21.45						
20						U	22.5					V=55	
							22.95						
21	SANDY CLAY (CI) - stiff, grey, fine grained sand	-15.0				U	24.0					V=64	
							24.45						
22						S	25.5					8,13,11 N=24	
							25.95						
23	GRAVELLY SAND (SW) - medium dense, brown, fine to coarse grained sand, fine to medium grained subrounded to subangular gravel	-16.0											
24		-17.0											
25		-18.0											
26		-19.0											
27		-20.0											
		-21.0											
		-22.0											
		-23.0											
		-24.0											

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test

Rig: Hydrapower Scout

Logged by: RZ

Drilling Method: Auger to 1.5m, casing to 30m, washbore to 33.0m, NMLC to 33.9m, washbore to 34.5m then NMLC

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail and Contour Survey', Dwg. G121-04-01B, dated 6.05.2003

BORE REPORT



Client: Wentworth Equities No.2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

BORE 108

Page No: 3 of 3

Date: 25 August 2014

Ground Surface Level: RL3.0m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results	Groundwater Monitoring Well Details
28	GRAVELLY SAND (SW) - medium dense, brown, fine to coarse grained sand, fine to medium grained subrounded to subangular gravel	25.0				S	27.0 27.45					17,19,17 N=36	
29	SANDSTONE (XW) - extremely low strength, grey mottled brown and white, fine to coarse grained sand	26.0				S	28.5 28.55					30/50mm	
30	- extremely low to very low strength	27.0				S	30.0 30.04					30/35mm Bentonite	
31		28.0					31.5					30/40mm	
32		29.0				S	31.54					30/35mm	
33		30.0				S	33.0						
34		31.0				C	33.04 33.23 33.4	0.01(d) 0.01(a)	95	0			
35	- low strength, occasional very low strength seams	32.0		34.5m to 35.7m, 10J, 5 to 30, vii, clean, 1mm to 3mm			33.9		10	0		Sand	
36		33.0		35.9m, J, 30, vii, clean, 1mm 36.0m, J, 60, vii, clean, 1mm 36.3m, J, 15, VII, clean, 1mm 36.6m, J, 15, vii, clean, 1mm 36.8m, J, 60, vii, Fe, 1mm/J, 15, vii, Fe, 1mm	9	C	34.5 34.56	1.0(d) 1.0(a)		58			
37		34.0		36.9m to 37.4m, 6J, 0 to 60, vii, clean, 1mm to 2mm 37.6m, J, 0, vii, clean, 1mm 37.9m, J, 15, iv, clean, 1mm 38.1, J, 45, vii, clean, 1mm 38.36m, J, 15, vii, clean, 1mm	5		35.4 35.7	0.1(d) 0.1(a)	100	92		Screen	
38	CONGLOMERATE (SW) - medium strength, grey mottled with dark grey and white, fine to medium grained	35.0					36.54 36.9	1.2(d) 1.1(a)					
39		36.0		39.1m, J, 45, vii, clean, 1mm 39.5m, J, 45, vii, clean, 1mm 39.54m, J, 0, vii, clean, 2mm 39.6m, J, 15, vii, clean, 1mm	6	C	37.45	1.0(d) 0.5(a)	80				
40	End of Bore at 40 m	37.0			3		38.4 38.42	0.7(d) 0.7(a)	100	90			
							39.65 40.0	0.3(d) 0.3(a)					

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test

Rig: Hydrapower Scout

Logged by: RZ

Drilling Method: Auger to 1.5m, casing to 30m, washbore to 33.0m, NMLC to 33.9m, washbore to 34.5m then NMLC

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail and Contour Survey', Dwg. G121-04-01B, dated 6.05.2003

BORE REPORT



Client: Wentworth Equities No.2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

BORE 109

Page No: 1 of 3

Date: 20 August 2014

Ground Surface Level: RL3.6m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results	Groundwater Monitoring Well Details
0	CONCRETE SLAB - 200mm thick	3.6											
1	FILL - grey-brown, gravelly clay, fine subangular, with fine to coarse grained sand	2.0				S	0.5 0.95					0,0,1 N=1	
2	SILTY CLAY (CH) - very soft, dark grey interbedded with clayey sand, fine to medium grained	1.0				U	1.5 1.95					Backfill V=21	
3		0.0				U	3.0 3.45					pp=30	
4		-1.0				S	4.5 4.95					0,0,1 N=1	
5		-2.0				U	6.0 6.45					V=37	
6		-3.0				U	7.5 7.95					V=35	
7		-4.0				U	9.0 9.45					V=29	
8		-5.0				S	10.5 10.95					2,2,3 N=5	
9		-6.0				S	12.0 12.45					7,8,8 N=16	
10	SAND (SM) - very loose to loose, grey, medium to coarse grained, with gravel	-7.0											
11		-8.0											
12	- medium dense	-9.0											
13													

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test

Rig: Hydrapower Scout

Logged by: RZ

Drilling Method: Auger to 1.5m, casing to 1.5m, washbore to 27.0m, NMLC to 29.6m, washbore to 31.0m, NMLC to 32.9m, washbore to 34.5m, then NMLC

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail and Contour Survey', Dwg. G121-04-01B, dated 6.05.2003

BORE REPORT



Client: Wentworth Equities No.2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

BORE 109

Page No: 2 of 3

Date: 20 August 2014

Ground Surface Level: RL3.6m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results	Groundwater Monitoring Well Details
14	GRAVELLY SAND (SM) - medium dense, grey, medium to coarse grained sand, fine to medium subrounded gravel	-10.0				S	13.5 13.95					11,12,14 N=26	
15	- with some clayey bands	-11.0				S	15.0 15.45					5,3,3 N=6	
16		-12.0											
17	SILTY CLAY (CH) - very soft, dark grey, interbedded with clayey sand, fine to coarse grained	-13.0				U	16.5 16.95					V=26	
18		-14.0				(U)	18.0 18.45						
19		-15.0											
20	SANDY CLAY (CI) - firm, brown, fine grained sand	-16.0				S	19.5 19.95					7,2,5 N=7	
21	- stiff	-17.0				U	21.0 21.45					pp=220	
22		-18.0											
23		-19.0				S	22.5 22.95					5,5,6 N=11	
24	- very stiff	-20.0				S	24.0 24.45					4,7,1 N=18	
25		-21.0											Casing →
26	- with coarse subangular gravel	-22.0				S	25.5 25.62					30/115mm	

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Pushtube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test

Rig: Hydrapower Scout

Logged by: RZ

Drilling Method: Auger to 1.5m, casing to 1.5m, washbore to 27.0m, NMLC to 29.6m, washbore to 31.0m, NMLC to 32.9m, washbore to 34.5m, then NMLC

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail and Contour Survey', Dwg. G121-04-01B, dated 6.05.2003

BORE REPORT



Client: Wentworth Equities No.2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

BORE 109

Page No: 3 of 3

Date: 20 August 2014

Ground Surface Level: RL3.6m*

Depth (m)	Description	RL (m)	Lithology	Structures	Average Number of Defects/m	Sample Type	Sample Depth (m)	Is(50) (MPa)	Core Recovery (%)	RQD (%)	Sample ID	Test Results	Groundwater Monitoring Well Details
27	SANDSTONE (XW) - very low to low strength, pale brown mottled brown, fine grained	23.0		27.1m, J, 10, vii, clean, 1mm 27.21m, J, 10, vii, clean, 1mm 27.42m, J, 10, vii, clean, 1mm		S	27.0 27.04						Bentonite 30/40mm
28	SANDSTONE (MW) - low to medium strength, pale grey, fine to coarse grained	24.0		28.36m, J, 45, vii, clean, 1mm	2-3	C	27.65 28.5	0.1(d) 0.1(a) 0.7(d) 0.7(a)	100	96			
29		25.0		28.85m, J, 10, vii, clean, 1mm									
30	- very low to low strength	26.0		29.5m, J, 20, vii, coal, 10mm 29.58m, J, 20, vii, coal, 5mm	4-5	C	29.4 29.43 29.6	0.3(d) 0.1(a)	100	0			Sand
31		27.0				W							
32	- low strength, with bands of extremely low strength rock	28.0		31.16m, J, 45, vii, quartz, 2mm 31.32m, J, 45, vii, coal, 1mm 31.4m, J, 30, vii, clean, 1mm 31.82mm to 32.2m, core loss	4-5	C	31.0 31.7 32.5 32.9	0.04(d) 0.05(a) 0.2(d) 0.1(a)	78	62			
33	- extremely low strength	29.0											
34		30.0				W							
35	- medium strength, with bands of high strength rock	31.0		34.5m to 35.5m, 113, 0 to 45, vii, clean, 1mm to 2mm	4-5	C	34.4 34.5	0.9(d) 1.3(a)	95				Screen
36	End of Bore at 35.5 m	32.0					35.5						
37		33.0											
38		34.0											
39		35.0											

U	Undisturbed Tube Sample (50mm dia)	S	Standard Penetration Test (SPT)	E	Environmental Sample	Is(50)	Point Load Test Result (MPa)
D	Disturbed Sample	HB	SPT Hammer Bouncing	Up	Push tube Sample	(d)	Diametral Test
B	Bulk Sample	()	No Sample Recovery	C	NMLC Coring	(a)	Axial Test
pp	Pocket Penetrometer Test (kPa)	V	Vane Shear Strength, Uncorrected (kPa)			(i)	Lump Test

Rig: Hydrapower Scout

Logged by: RZ

Drilling Method: Auger to 1.5m, casing to 1.5m, washbore to 27.0m, NMLC to 29.6m, washbore to 31.0m, NMLC to 32.9m, washbore to 34.5m, then NMLC

Groundwater: No free groundwater encountered during auger drilling

Remarks: *Approximate ground surface level interpolated from PMM Pty Limited's 'Detail and Contour Survey', Dwg. G121-04-01B, dated 6.05.2003

BORE REPORT



Client:

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 03900G

BORE B24

Page No: 1 of 1

Date: 23 September 2006

Ground Surface Level: RL 3.0m*

Depth (m)	Description	RL (m)	Lithology	ASS Samples	ASS Sample Depth (m)	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	FILL	3.0		1	0.0	E	0.0	B24A	
	- black, fine grained topsoil, humic matter			2	0.25		0.1		
	- brown, medium grained sand			3	0.5	E	0.4	B24B	
	- coarse sand, with trace of grey ash			4	0.75		0.5		
1	- moist	2.0		5	1.0	E	0.9	B24C	
				6	1.25		1.0		
				7	1.5				
				8	1.75				
2	- wet	1.0		9	2.0	E	2.0	B24D	
				10	2.25		2.2		
	End of Bore at 2.4 m				2.4				
3		0.0							
4		-1.0							
5		-2.0							
6		-3.0							

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetration Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: 6610 D7 Geoprobe

Drilling Method: Pushtube

Groundwater: No free groundwater encountered during drilling

Remarks: * Interpolated from unreferenced plan provided by Multiplex Developments Australia Pty Ltd

Logged by:

BORE REPORT



Client:

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

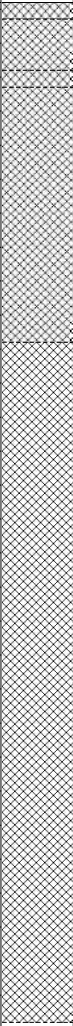
Project No: 03900G

BORE B25

Page No: 1 of 1

Date: 23 September 2006

Ground Surface Level: RL 3.0m*

Depth (m)	Description	RL (m)	Lithology	ASS Samples	ASS Sample Depth (m)	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	<i>FILL</i> - sand - brown, medium grained sand - coarse sand, with trace of grey ash - moist	3.0					0.0	B25A	
						E	0.1		
				1	0.25				
				2	0.5				
1				2.0		1.0		1.0	
				3	1.2	E	1.3		
					1.5				
							1.8	B25C	
2		1.0		4	2.0	E	2.0		
	- wet							B25D	
				5	2.25		2.4		
				6	2.4	E	2.4		
				7	2.5		2.6		
				8	2.6				
3		0.0			2.75				
				9	2.8				
				10	3.0				
				11	3.2				
				12	3.5				
4		-1.0	13	3.6					
			14	3.75					
			15	4.0					
				4.25					
				4.5					
				4.75					
5		-2.0	16	5.0					
			17	5.25					
			18	5.5					
			19	5.75					
6	End of Bore at 6 m	-3.0			6.0				

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetration Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: 6610 D7 Geoprobe

Drilling Method: Pushtube

Groundwater: Free groundwater encountered at 3.0m depth

Remarks: * Interpolated from unreferenced plan provided by Multiplex Developments Australia Pty Ltd. Loose sands running into hole at 4.0m depth

Logged by:

BORE REPORT



Client:

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 03900G

BORE B26

Page No: 1 of 1

Date: 23 September 2006

Ground Surface Level: RL 3.0m*

Depth (m)	Description	RL (m)	Lithology	ASS Samples	ASS Sample Depth (m)	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	FILL - grey, moderate plasticity clay - black, medium grained sand, with ash, slightly moist - brown, coarse sand, with shell fragments	3.0							
						E	0.05 0.15	B26A	
				2	0.25				
				3	0.5	E	0.5	B26B	
				4	0.75		0.7		
1		2.0			1.0				
				6	1.25				
					1.5	E	1.5	B26C	
				8	1.75		1.7		
2		1.0		9	2.0				
					2.25	E	2.2	B26D	
	- fine grained sand, moist						2.4		
					2.75				
3	- fine grained clayey sand	0.0		12	3.0				
	- brown, medium grained sand, wet			13	3.25				
				14	3.5				
				15	3.75				
4		-1.0		16	4.0				
				17	4.25				
	SAND - brown, coarse grained			18	4.5				
				19	4.75				
5		-2.0		20	5.0				
				21	5.25				
	End of Bore at 5.25 m								
6		-3.0							

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetration Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: 6610 D7 Geoprobe

Drilling Method: Pushtube

Groundwater: No free groundwater encountered during drilling

Remarks: * Interpolated from unreferenced plan provided by Multiplex Developments Australia Pty Ltd

Logged by:

BORE REPORT



Client:

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 03900G

BORE B27

Page No: 1 of 1

Date: 23 September 2006

Ground Surface Level: RL 3.0m*

Depth (m)	Description	RL (m)	Lithology	ASS Samples	ASS Sample Depth (m)	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	<i>FILL</i> - grey, moderate plasticity clay - medium grained sand, slightly moist - brown, coarse sand	3.0					0.05 0.15 0.4 0.5	B27A B27B	
1		2.0		4 5 6	0.75 1.0 1.25 1.5	E		B27C D1 D2	
2		1.0							
3	- medium grained sand, minor clay, moist	0.0		11 12 13 14 15	2.5 2.75 3.0 3.25 3.5 3.75				
4	- fine grained sand, wet	-1.0		16 17 18	4.0 4.25 4.5				
5	<i>SAND</i> - brown, coarse grained	-2.0		19 20 21 22 23 24	4.75 5.0 5.25 5.5 5.65 5.8				
6	End of Bore at 5.8 m	-3.0							

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetration Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: 6610 D7 Geoprobe

Drilling Method: Pushtube

Groundwater: No free groundwater encountered during drilling

Remarks: * Interpolated from unreferenced plan provided by Multiplex Developments Australia Pty Ltd. Sands running into hole at 5.75m depth

Logged by:

BORE REPORT



Client:

Project: Platinum High Rise Development

Location: 5 Hercules Street, Hamilton

Project No: 03900G

BORE BPB-13

Page No: 1 of 1

Date: 5 September 2006

Ground Surface Level: RL 3.0m*

Depth (m)	Description	RL (m)	Lithology	ASS Samples	ASS Sample Depth (m)	Sample Type	Sample Depth (m)	Sample ID	Test Results
0	CONCRETE - 120mm thick pavement	3.0		1	0.0				
				2	0.25	E	0.25	BP-13A	
	FILL - brown, coarse sand, occasional gravel, slightly moist			3	0.5	E	0.5	BP-13B	
	- brown, coarse sand, slightly moist			4	0.75		0.9	BP-13C	
1	- brown, coarse sand, occasional gravel, slightly moist	2.0		5	1.0	E	1.0		
				6	1.25				
				7	1.5				
				8	1.75				
2	- brown, coarse sand, slightly moist	1.0		9	2.0	E	1.9	BP-13D	
				10	2.25		2.0		
				11	2.5				
				12	2.75				
3		0.0		13	3.0	E	2.9	BP-13E	
	CLAY - grey, with coarse sand, medium plasticity, moist			14	3.25	E	3.0		
				15	3.5		3.2	BP-13F	
	SAND - pale brown, coarse sand, occasional high plasticity clay lenses			16	3.75		3.5		
4		-1.0		17	4.0				
				18	4.25				
				19	4.5				
				20	4.75				
5		-2.0		21	5.0				
				22	5.25				
				23	5.5				
				24	5.75				
6		-3.0		25	6.0	E	6.0	BP-13G	
				26	6.25				
					6.5		6.5		
End of Bore at 6.5 m									

D Disturbed Sample

B Bulk Sample

U Undisturbed Tube (50mm diameter)

pp Pocket Penetrometer Test (kPa)

E Environmental Sample

S Standard Penetration Test (SPT)

HB SPT Hammer Bouncing

() No Sample Recovery

C NMLC Coring

Is(50) Point Load Test Result (MPa)

(d) Diametral Point Load Strength Test

(a) Axial Point Load Strength Test

Rig: Hand equipment

Drilling Method: Auger

Groundwater: No free groundwater encountered during auger drilling

Remarks: * Approximate ground surface level interpolated from unreferenced plan provided by Multiplex Developments Australia Pty Ltd

Logged by:

Notes on Description and Classification of Soil

The methods of description and classification of soils used in this report are generally based on Australian Standard AS1726-1993 *Geotechnical Site Investigations*.

Soil description is based on an assessment of disturbed samples, as recovered from bores and excavations, or from undisturbed materials as seen in excavations and exposures or in undisturbed samples. Descriptions given on report sheets are an interpretation of the conditions encountered at the time of investigation.

In the case of cone or piezocone penetrometer tests, actual soil samples are not recovered and soil description is inferred based on published correlations, past experience and comparison with bore and/or test pit data (if available).

Soil classification is based on the particle size distribution of the soil and the plasticity of the portion of the material finer than 0.425mm. The description of particle size distribution and plasticity is based on the results of visual field estimation, laboratory testing or both. When assessed in the field, the properties of the soil are estimated; precise description will always require laboratory testing to define soil properties.

Where soil can be clearly identified as FILL this will be noted as the main soil type followed by a description of the composition of the fill (e.g. FILL – yellow-brown, fine to coarse grained gravelly clay fill with concrete rubble). If the soil is assessed as possibly being fill this will be noted as an additional observation.

Soils are generally described using the following sequence of terms. In certain instances, not all of the terms will be included in the soil description.

MAIN SOIL TYPE (CLASSIFICATION GROUP SYMBOL)

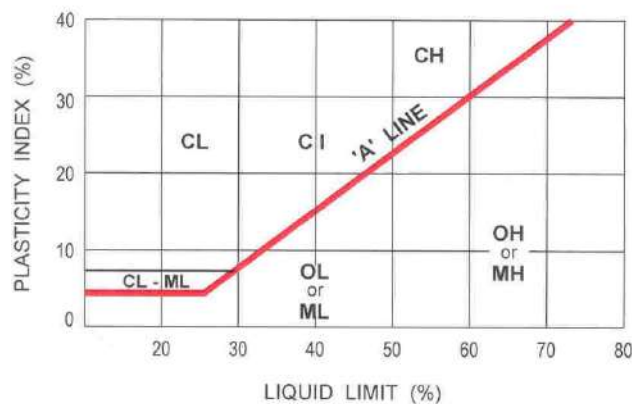
- strength/density, colour, structure/grain size, secondary and minor components, additional observations

Information on the definition of descriptive and classification terms follows.

SOIL TYPE and CLASSIFICATION GROUP SYMBOLS

	Major Divisions	Particle Size	Classification Group Symbol	Typical Names
COARSE GRAINED SOILS (more than half of material is larger than 0.075 mm)	BOULDERS	> 200mm		
	COBBLES	63 – 200mm		
	GRAVELS (more than half of coarse fraction is larger than 2.36mm)	Coarse: 20 – 63mm Medium: 6 – 20mm Fine: 2.36 – 6mm	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines, uniform gravels.
			GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (more than half of coarse fraction is smaller than 2.36mm)	Coarse: 0.6 – 2.36mm Medium: 0.2 – 0.6mm Fine: 0.075 – 0.2mm	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands.
			SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (more than half of material is smaller than 0.075 mm)	SILTS & CLAYS (liquid limit <50%)		ML	Inorganic silts and very fine sands, silty/clayey fine sands or clayey silts with low plasticity.
			CL and CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS & CLAYS (liquid limit >50%)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils.
			CH	Inorganic clays of high plasticity.
			OH	Organic clays of medium to high plasticity, organic silts.
	HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.

PLASTICITY CHART FOR CLASSIFICATION OF FINE GRAINED SOILS



(Reference: Australian Standard AS1726-1993 *Geotechnical site investigations*)

DESCRIPTIVE TERMS FOR MATERIAL PROPORTIONS

Coarse Grained Soils		Fine Grained Soils	
% Fines	Modifier	% Coarse	Modifier
< 5	Omit, or use 'trace'	< 15	Omit, or use trace.
5 – 12	Describe as 'with clay/silt' as applicable.	15 – 30	Describe as 'with sand/gravel' as applicable.
> 12	Prefix soil as 'silty/clayey' as applicable	> 30	Prefix soil as 'sandy/gravelly' as applicable.

STRENGTH TERMS – COHESIVE SOILS

Strength Term	Undrained Shear Strength	Field Guide to Strength
Very soft	< 12kPa	Exudes between the fingers when squeezed in hand.
Soft	12 – 25kPa	Can be moulded by light finger pressure.
Firm	25 – 50kPa	Can be moulded by strong finger pressure.
Stiff	50 – 100kPa	Cannot be moulded by fingers, can be indented by thumb.
Very stiff	100 – 200kPa	Can be indented by thumb nail.
Hard	> 200kPa	Can be indented with difficulty by thumb nail.

DENSITY TERMS – NON COHESIVE SOILS

Density Term	Density Index	SPT "N"	CPT Cone Resistance
Very loose	< 15%	0 – 5	0 – 2MPa
Loose	15 – 35%	5 – 10	2 – 5MPa
Medium dense	35 – 65%	10 – 30	5 – 15MPa
Dense	65 – 85%	30 – 50	15 – 25MPa
Very dense	> 85%	> 50	> 25MPa

COLOUR

The colour of a soil will generally be described in a 'moist' condition using simple colour terms (eg. black, grey, red, brown etc.) modified as necessary by "pale", "dark", "light" or "mottled". Borderline colours will be described as a combination of colours (eg. grey-brown).

EXAMPLE

e.g. CLAYEY SAND (SC) – medium dense, grey-brown, fine to medium grained with silt.

Indicates a medium dense, grey-brown, fine to medium grained clayey sand with silt.

Notes on Description and Classification of Rock

The methods of description and classification of rock used in this report are generally based on Australian Standard AS1726-1993 *Geotechnical site investigations*.

Rock description is based on an assessment of disturbed samples, as recovered from bores and excavations, or from undisturbed materials as seen in excavations and exposures, or in core samples. Descriptions given on report sheets are an interpretation of the conditions encountered at the time of investigation.

Notes outlining the method and terminology adopted for the description of rock defects are given below, however, detailed information on defects can generally only be determined where rock core is taken, or excavations or exposures allow detailed observation and measurement.

Rocks are generally described using the following sequence of terms. In certain instances not all of the terms will be included in the rock description.

ROCK TYPE (WEATHERING SYMBOL), strength, colour, grain size, defect frequency

Information on the definition of descriptive and classification terms follows.

ROCK TYPE

In general, simple rock names are used rather than precise geological classifications.

ROCK MATERIALS WEATHERING CLASSIFICATION

Term	Weathering Symbol	Definition
Residual soil	RS	Soil developed from extremely weathered rock; the mass structure and substance fabrics are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely weathered	XW	Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrates or can be remoulded in water.
Distinctly weathered *	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
- Highly weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock, usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
- Moderately weathered	MW	Rock substance affected by weathering to the extent that staining extends throughout the whole of the rock substance and the original colour of the fresh rock may be no longer recognisable.
Slightly weathered	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition or staining.

* Subdivision of this weathering grade into highly and moderately may be used where applicable.

STRENGTH OF ROCK MATERIAL

Term	Symbol	Point Load Index I_s (50)	Field Guide To Strength
Extremely low	EL	<0.03MPa	Easily remoulded by hand to a material with soil properties.
Very low	VL	0.03 – 0.1MPa	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure.
Low	L	0.1 – 0.3MPa	Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
Medium	M	0.3 – 1.0MPa	Readily scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty.
High	H	1.0 – 3.0MPa	A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
Very high	VH	3.0 – 10.0MPa	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
Extremely high	EH	>10MPa	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Notes:

1. These terms refer to the strength of the rock material and not to the strength of the rock mass which may be considerably weaker due to the effect of rock defects.
2. The field guide visual assessment for rock strength may be used for preliminary assessment or when point load testing is not available.
3. Anisotropy of rock may affect the field assessment of strength.

COLOUR

The colour of a rock will generally be described in a 'moist' condition using simple colour terms (e.g. black, grey, red, brown, etc) modified as necessary by 'pale', 'dark', 'light' or 'mottled'. Borderline colours will be described as a combination of colours (e.g. grey-brown).

GRAIN SIZE

Descriptive Term	Particle Size Range
Coarse grained	0.6 – 2.0mm
Medium grained	0.2 – 0.6mm
Fine grained	0.06 – 0.2mm

DEFECT FREQUENCY

Where appropriate, a defect frequency may be recorded as part of the rock description and will be expressed as the number of natural (or interpreted natural) defects present in an equivalent one metre length of core; by use of the following defect frequency descriptive terms; or both. The descriptive terms refer to the spacing of all types of natural defects along which the rock is discontinuous and include, bedding plane partings, joints and other rock defects, but excludes known artificial fractures such as drilling breaks.

Defect Frequency	Description
Fragmented	Rock core is comprised primarily of fragments of length less than 20mm, and mostly of width less than the core diameter.
Highly Fractured	Core lengths are generally less than 20mm to 40mm with occasional fragments.
Fractured	Core lengths are mainly 30mm to 100mm with occasional shorter and longer sections.
Fractured to Slightly Fractured	Core lengths are mainly 100mm to 300mm with occasional shorter to longer sections.
Slightly Fractured	Core lengths are generally 300mm to 1,000mm with occasional longer sections and occasional sections of 100mm to 300mm.
Unbroken	The core does not contain any fractures.

EXAMPLE

e.g. SANDSTONE (XW) – low strength, pale brown, fine to coarse grained, slightly fractured.

ROCK DEFECT LOGGING

Defects are discontinuities in the rock mass and include joints, sheared zones, cleavages and bedding partings. The ability to observe and log defects will depend on the investigation methodology. Defects logged in core are described using the abbreviations noted in the following tables.

The *depth* noted in the description is measured in metres from the ground surface, the *defect angle* is measured in degrees from horizontal, and the defect *thickness* is measured normal to the plane of the defect and is in millimetres (unless otherwise noted).

Defects are generally described using the following sequence of terms:

Depth, Defect Type, Defect Angle (dip), Surface Roughness, Infill, Thickness

DEFECT TYPE

B	– Bedding
J	– Joint
S	– Shear Zone
C	– Crushed Zone

SURFACE ROUGHNESS

i	- rough or irregular, stepped
ii	- smooth, stepped
iii	- slickensided, stepped
iv	- rough or irregular, undulating
v	- smooth, undulating
vi	- slickensided, undulating
vii	- rough or irregular, planar
viii	- smooth planar
ix	- slickensided, planar

INFILL

Infill refers to secondary minerals or other materials formed on the surface of the defect and some common descriptions are given in the following table together with their abbreviations.

Ls	- limonite staining
Fe	- iron staining
Cl	- clay
Mn	- manganese staining
Qtz	- quartz
Ca	- calcite
Clean	- no visible infill

EXAMPLE

3.59m, J, 90, vii, Ls, 1mm

indicates a joint at 3.59m depth that is at 90° to horizontal (i.e. vertical), is rough or irregular and planar, limonite stained and 1mm thick.

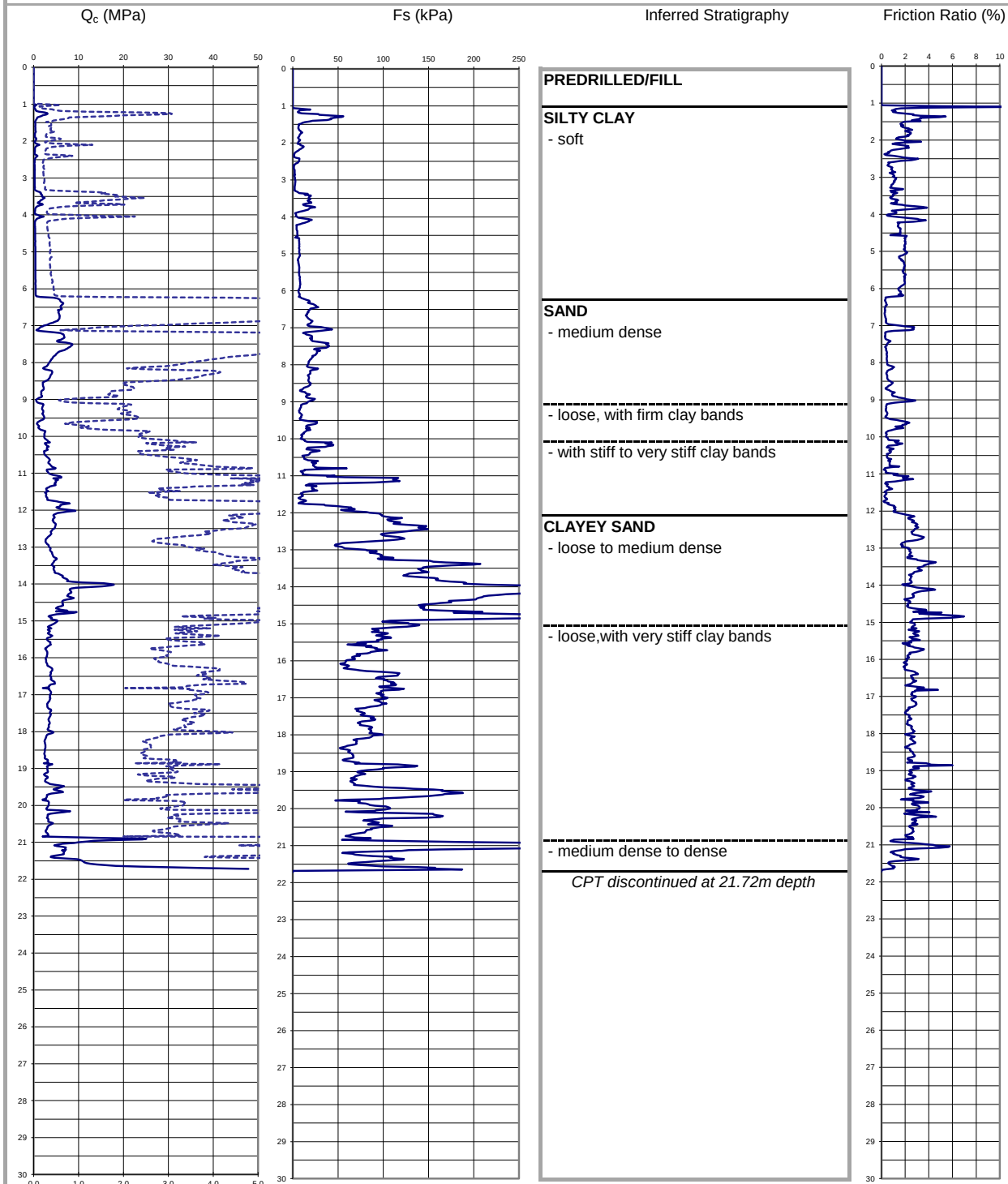
APPENDIX B

CONE PENETRATION TEST REPORT SHEETS

CONE PENETRATION TEST REPORT

CLIENT: Wentworth Equities No.2 Pty Ltd
PROJECT: Platinum High Rise Development
LOCATION: 19 Hercules Street, Hamilton
PROJECT NO.: BG25-1319A

CPT: 114
DATE: 30/11/2022
SURFACE LEVEL: RL3.2m*

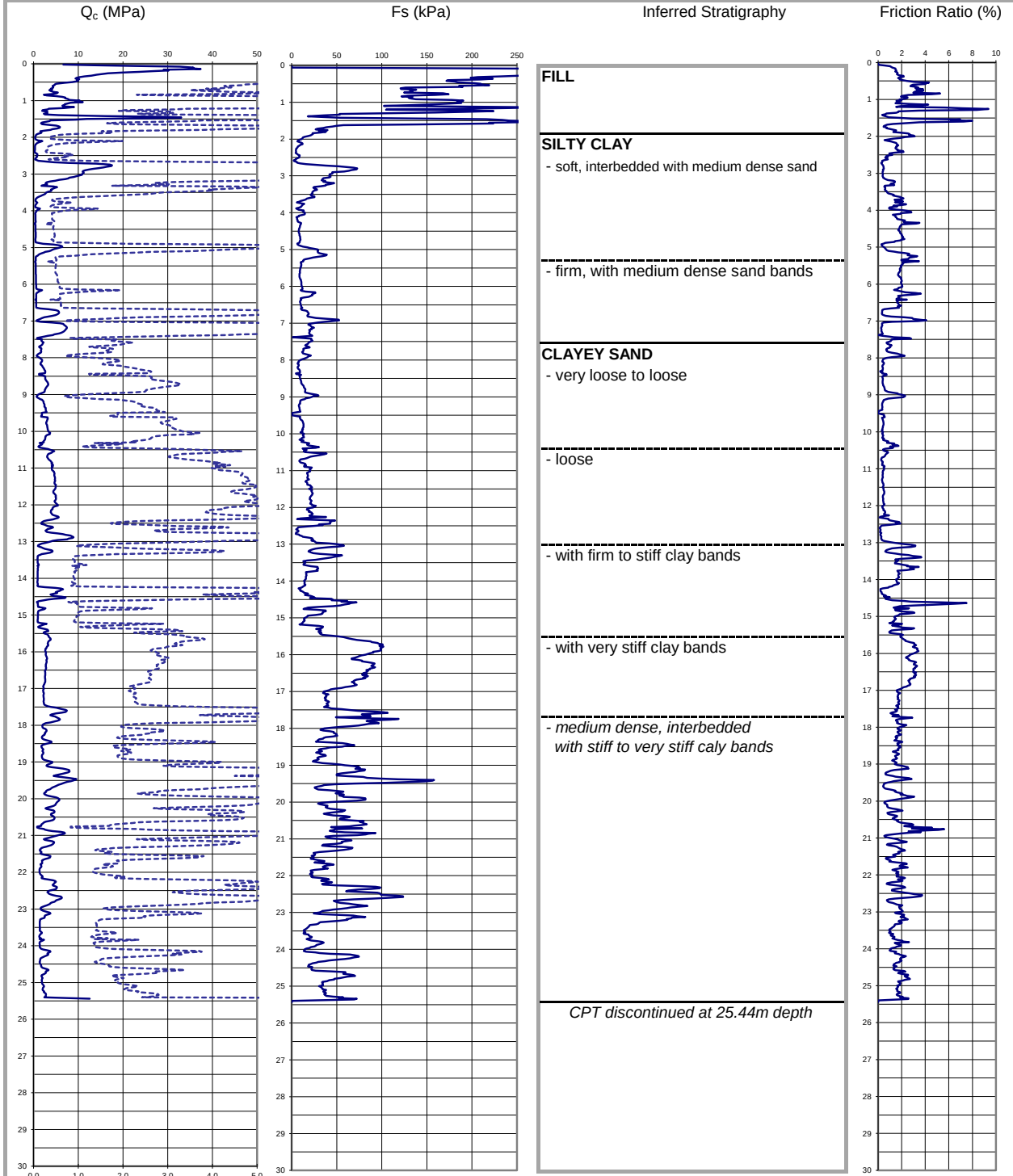


Remarks: * Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, date 6.05.03

CONE PENETRATION TEST REPORT

CLIENT: Wentworth Equities No.2 Pty Ltd
PROJECT: Platinum High Rise Development
LOCATION: 19 Hercules Street, Hamilton
PROJECT NO.: BG25-1319A

CPT: 115
DATE: 23/11/2022
SURFACE LEVEL: RL3.1m*

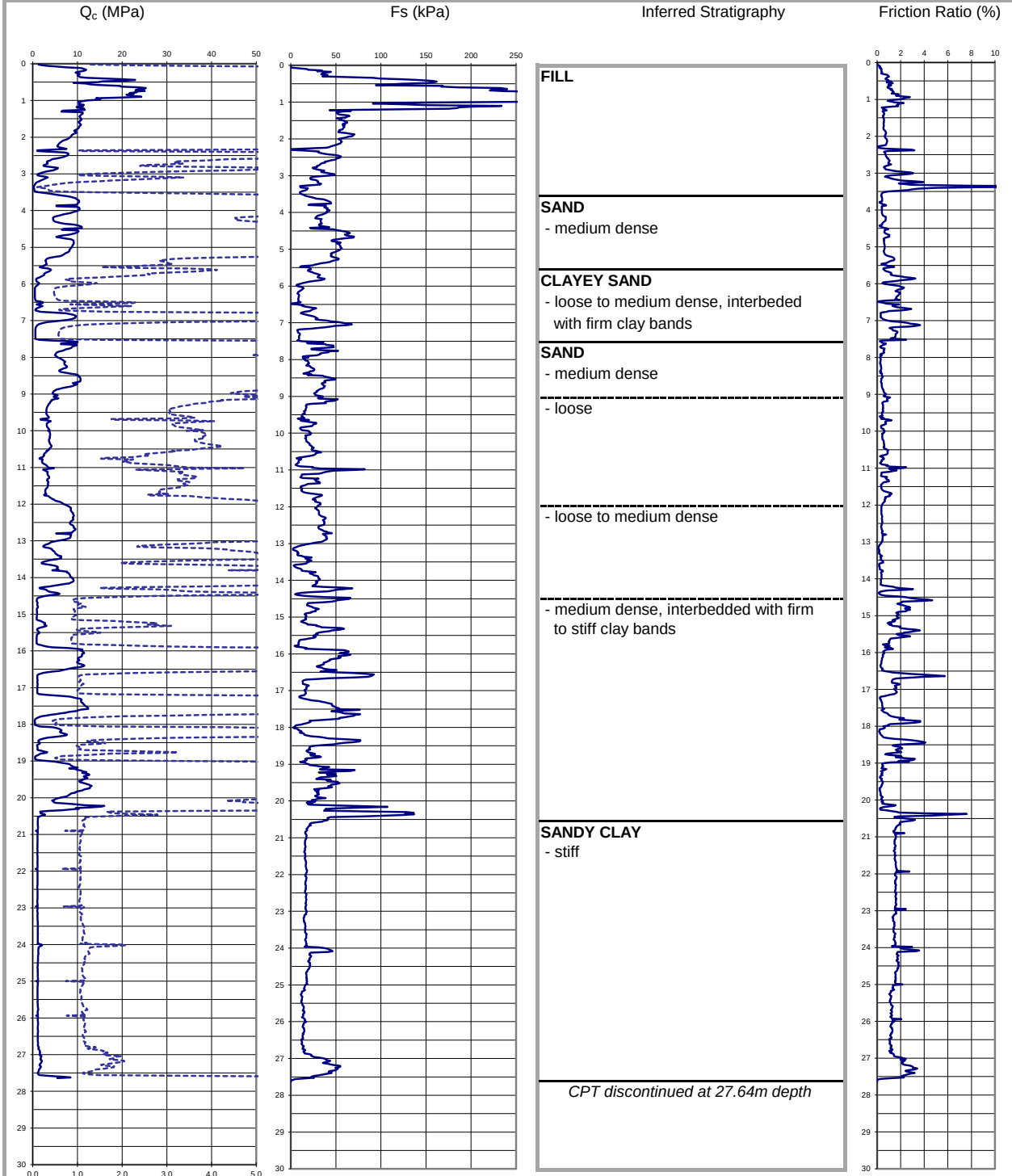


Remarks: * Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, date 6.05.03

CONE PENETRATION TEST REPORT

CLIENT: Wentworth Equities No.2 Pty Ltd
PROJECT: Platinum High Rise Development
LOCATION: 19 Hercules Street, Hamilton
PROJECT NO.: BG25-1319A

CPT: 116
DATE: 28/11/2022
SURFACE LEVEL: RL3.0m*

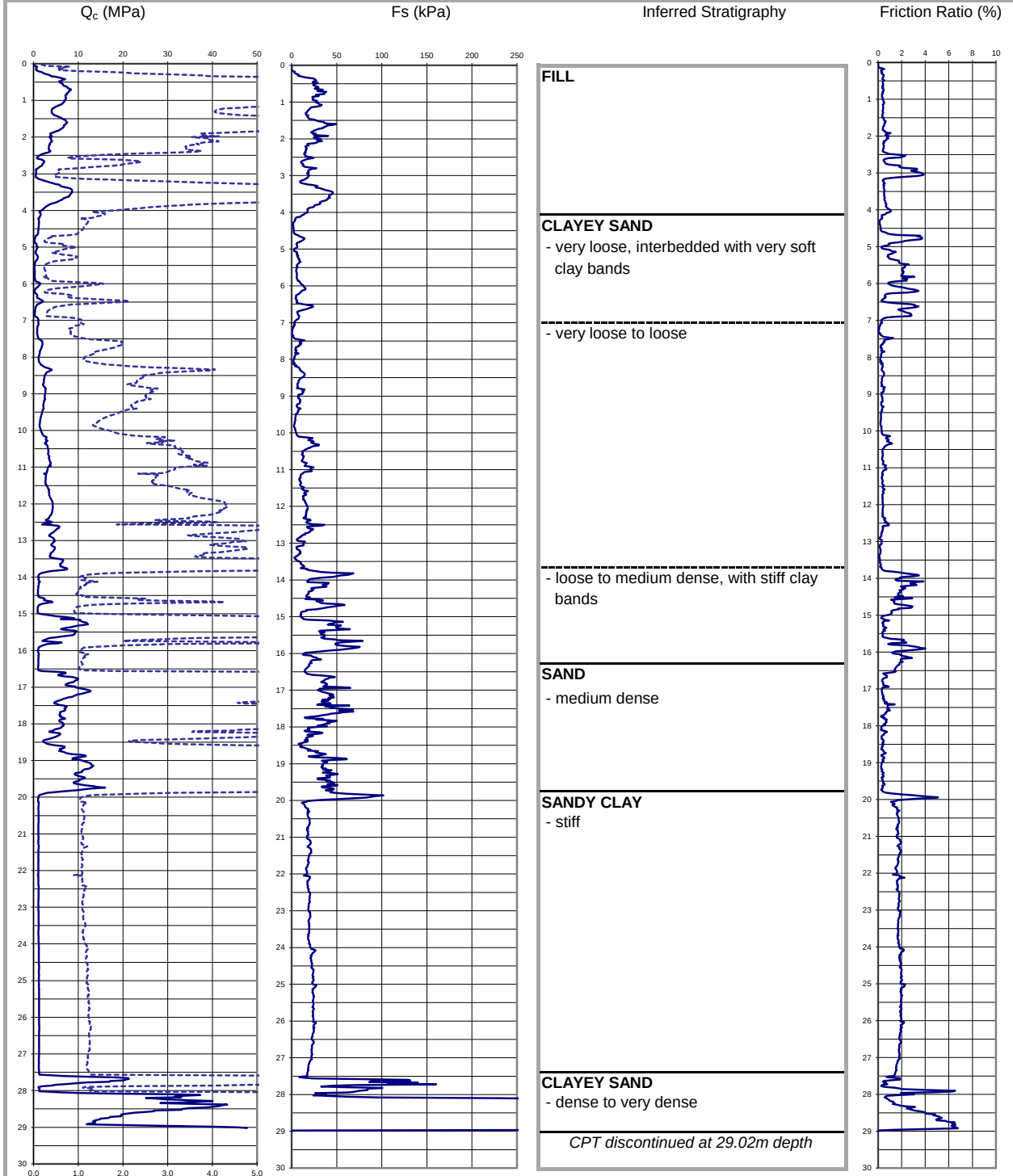


Remarks: * Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, date 6.05.03

CONE PENETRATION TEST REPORT

CLIENT: Wentworth Equities No.2 Pty Ltd
PROJECT: Platinum High Rise Development
LOCATION: 19 Hercules Street, Hamilton
PROJECT NO.: BG25-1319A

CPT: 117
DATE: 30/11/2022
SURFACE LEVEL: RL3.0m*

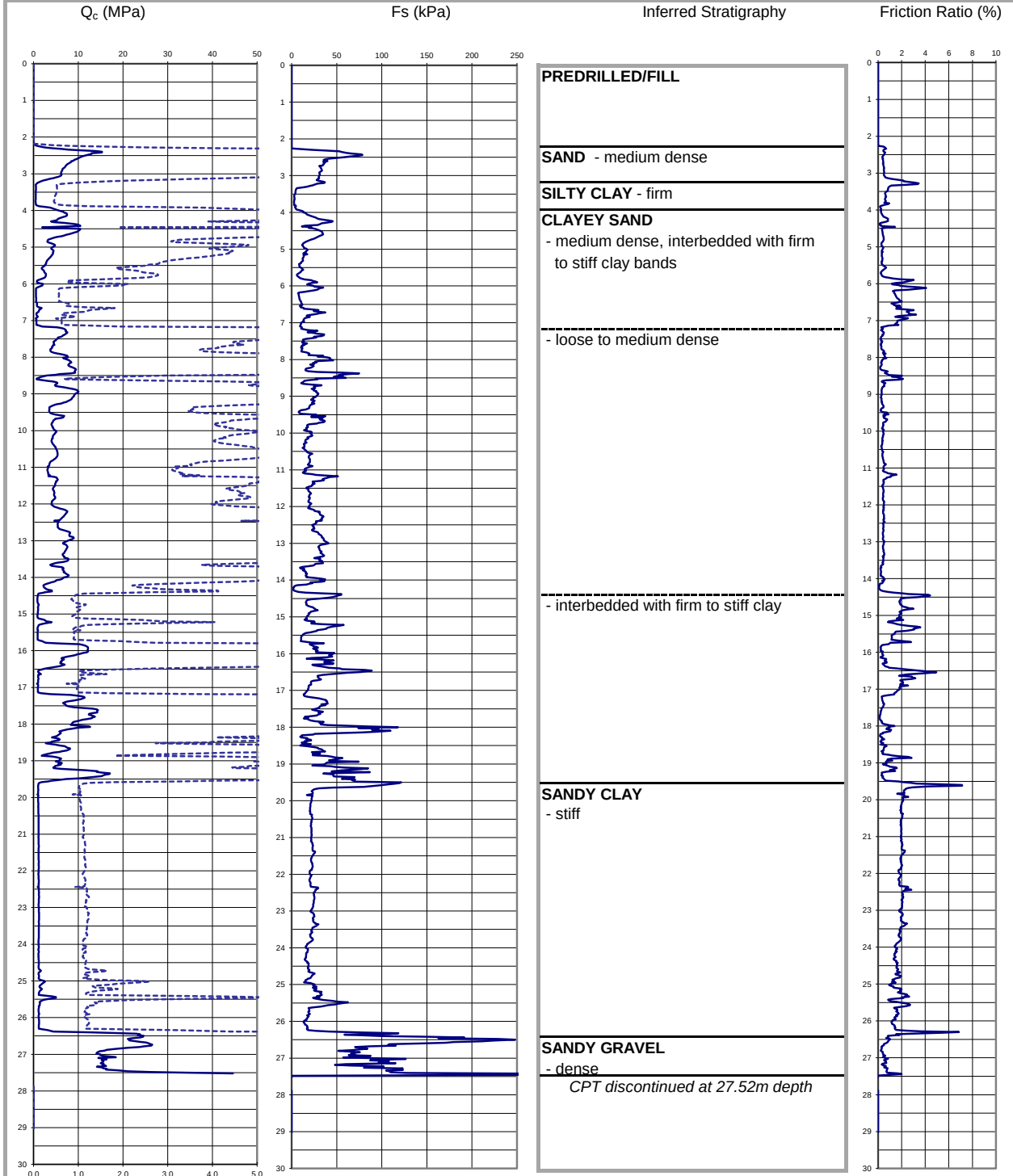


Remarks: * Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, date 6.05.03

CONE PENETRATION TEST REPORT

CLIENT: Wentworth Equities No.2 Pty Ltd
PROJECT: Platinum High Rise Development
LOCATION: 19 Hercules Street, Hamilton
PROJECT NO.: BG25-1319A

CPT: 118
DATE: 30/11/2022
SURFACE LEVEL: RL3.0m*

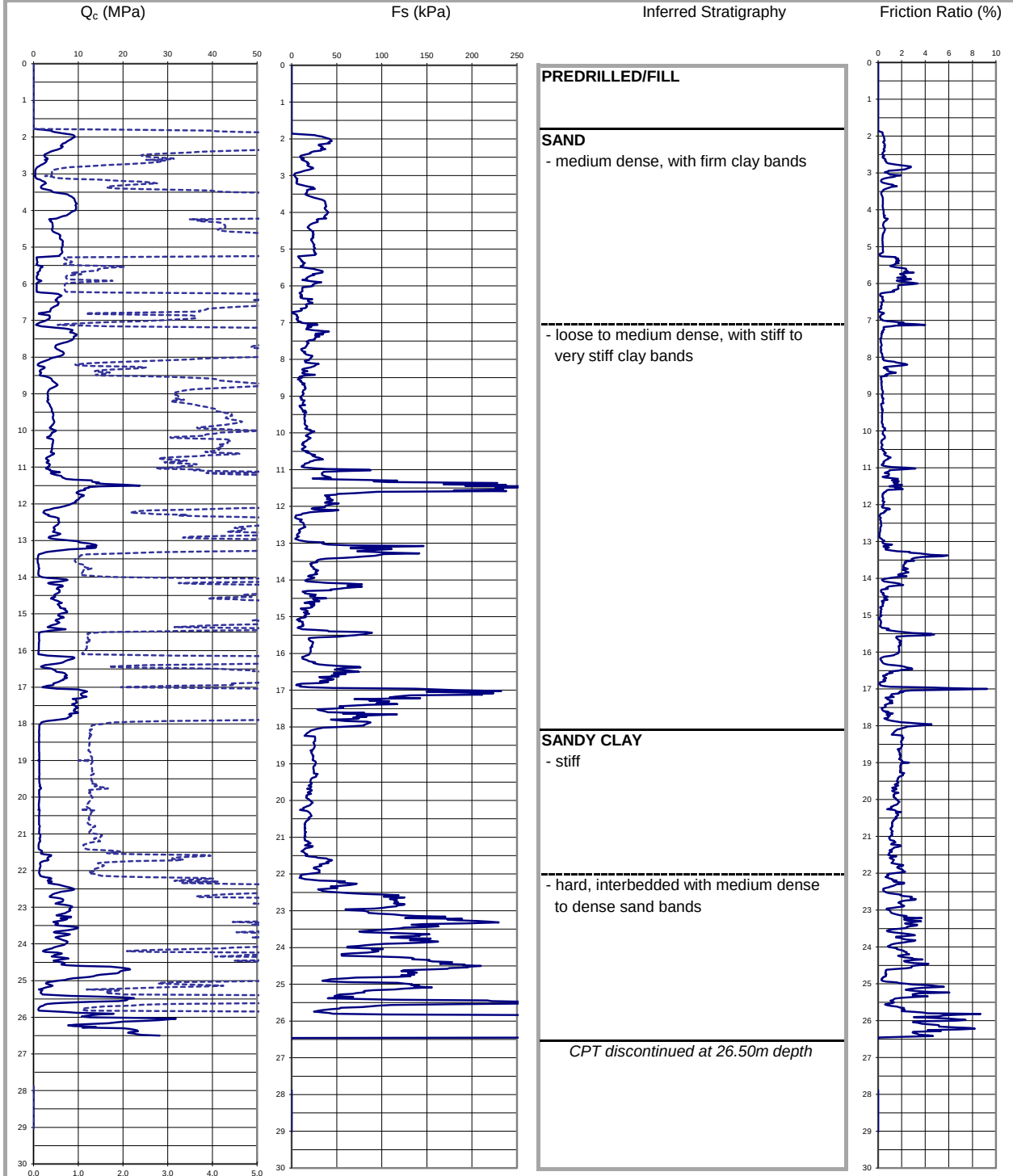


Remarks: * Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, date 6.05.03

CONE PENETRATION TEST REPORT

CLIENT: Wentworth Equities No.2 Pty Ltd
PROJECT: Platinum High Rise Development
LOCATION: 19 Hercules Street, Hamilton
PROJECT NO.: BG25-1319A

CPT: 119
DATE: 30/11/2022
SURFACE LEVEL: RL3.0m*

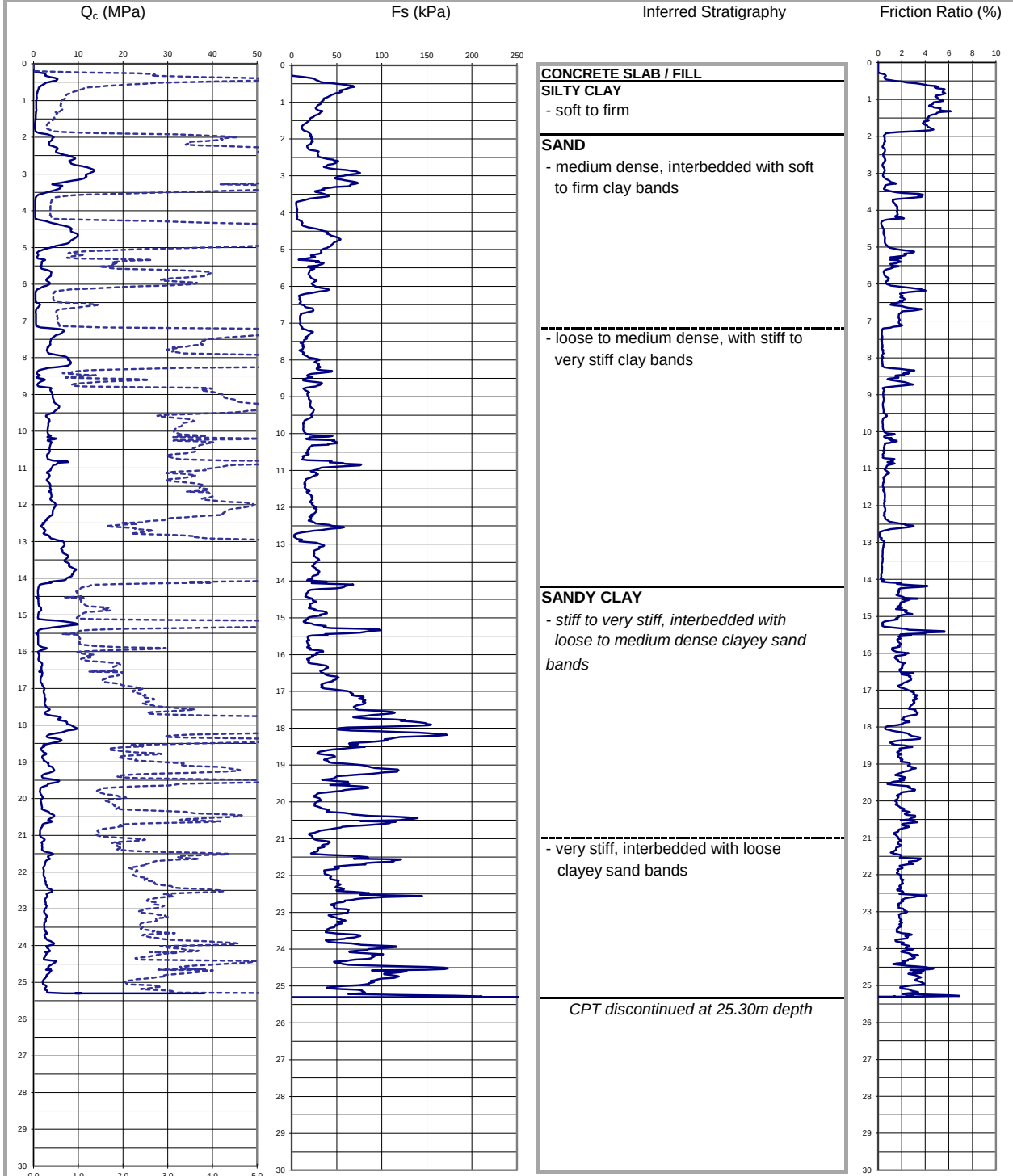


Remarks: * Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, date 6.05.03

CONE PENETRATION TEST REPORT

CLIENT: Wentworth Equities No.2 Pty Ltd
PROJECT: Platinum High Rise Development
LOCATION: 19 Hercules Street, Hamilton
PROJECT NO.: BG25-1319A

CPT: 120
DATE: 30/11/2022
SURFACE LEVEL: RL3.2m*



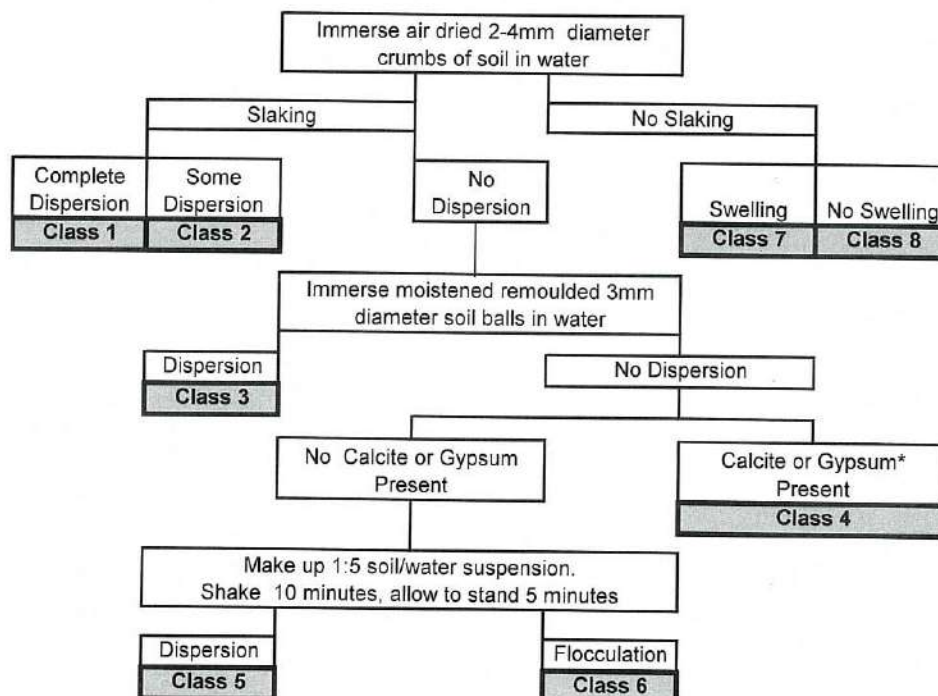
Remarks: * Approximate ground surface level interpolated from PMM Pty Ltd's 'Detail & Contour Survey', Dwg. 6121-04-01B, date 6.05.03

APPENDIX C

LABORATORY TEST RESULTS SHEETS

EMERSON CLASS NUMBER,
Test Procedure: AS1289.3.8.1 - 2006
CONDUCTIVITY and
pH TEST WORKSHEET
Test Procedure: AS1289.4.3.1 - 1997

Client:	Wentworth Equities No. 2 Pty Ltd	Tested by:	AT/LD
Project:	Platinum High Rise Development	Date:	2/09/2014
Location:	19 Hercules Street	Checked by:	AT
	Hamilton	Date:	4/09/2014
Project No.:	010-195E	Report No.:	010-195E_EC_N_B1409-01

Determination of Emerson Class Number

Test Number	B1409-01	B1409-08	B1409-09	B1409-16
Bore Number and Depth	107 1.0-1.45	108 0.5-0.95	108 1.5-1.95	109 1.5-1.95
Date Sampled	19/08/2014	19/08/2014	19/08/2014	19/08/2014
Material Description	Fill - Silty Sand	Clayey Sand	Sand	Silty Clay
Water Type (distilled, potable, site)	Distilled	Distilled	Distilled	Distilled
Water Temperature (°C)	22.6	22.0	22.6	22.4
Emerson Class Number	4	3	3	4
pH	8.6	8.7	8.2	9.2
Conductivity (mS/cm)	0.09	0.03	0.01	0.05



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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

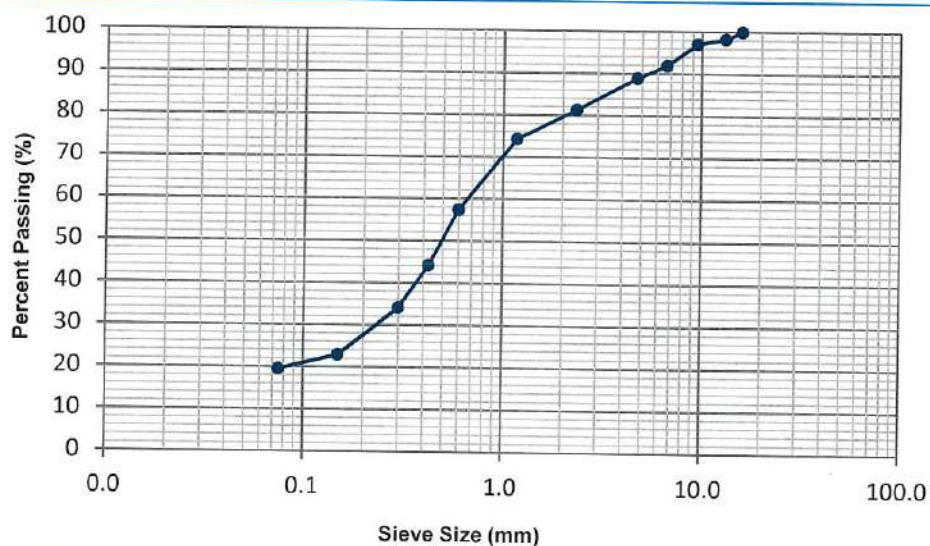
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-01

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-01
Bore No.:	107
Depth (m):	1.0-1.45
Sample Moisture Content (%):	10.3

AS SIEVE SIZE (mm)	PERCENT PASSING
16.0	100
13.2	98
9.5	97
6.7	92
4.75	89
2.36	81
1.18	74
0.600	57
0.425	44
0.300	34
0.150	23
0.075	20



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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Tested by: LA/AM

Date: 2/09/2014

Project: Platinum High Rise Development

Checked by: LA/AM

Date: 4/09/2014

Location: 19 Hercules Street, Hamilton

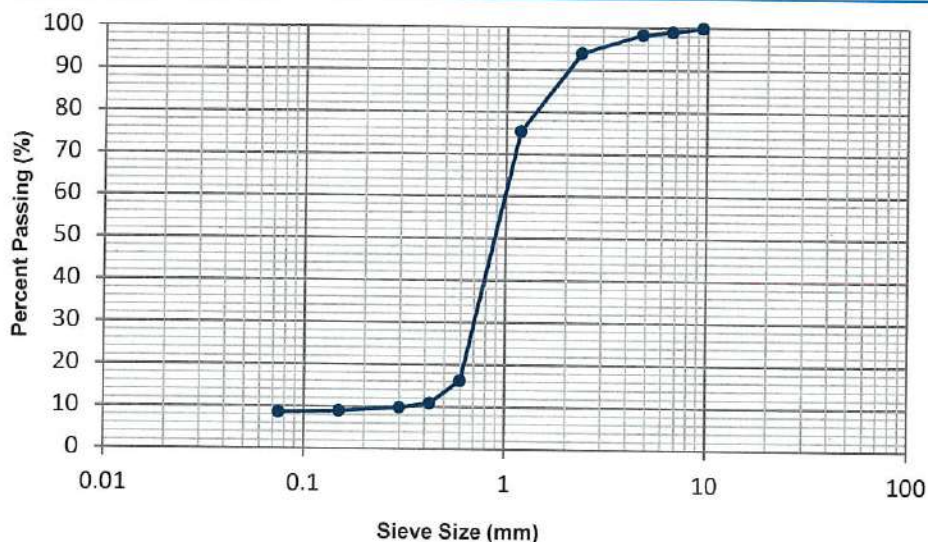
Report No.: 010-195E_PSD_B1409-03

Project No: 010-195E

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-03
Bore No.:	107
Depth (m):	7.5-7.95
Sample Moisture Content (%):	25.8

AS SIEVE SIZE (mm)	PERCENT PASSING
9.5	100
6.7	99
4.75	98
2.36	94
1.18	75
0.600	16
0.425	11
0.300	10
0.150	9
0.075	9



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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

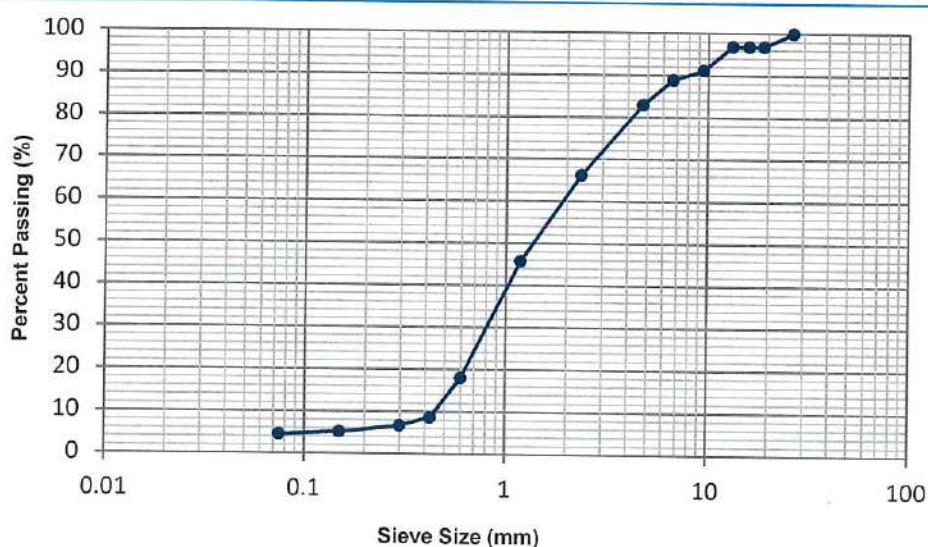
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-04

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-04
Bore No.:	107
Depth (m):	10.5-10.95
Sample Moisture Content (%):	21.4

AS SIEVE SIZE (mm)	PERCENT PASSING
26.5	100
19.0	97
16.0	97
13.2	97
9.5	91
6.7	89
4.75	83
2.36	66
1.18	46
0.600	18
0.425	9
0.300	7
0.150	5
0.075	5



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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

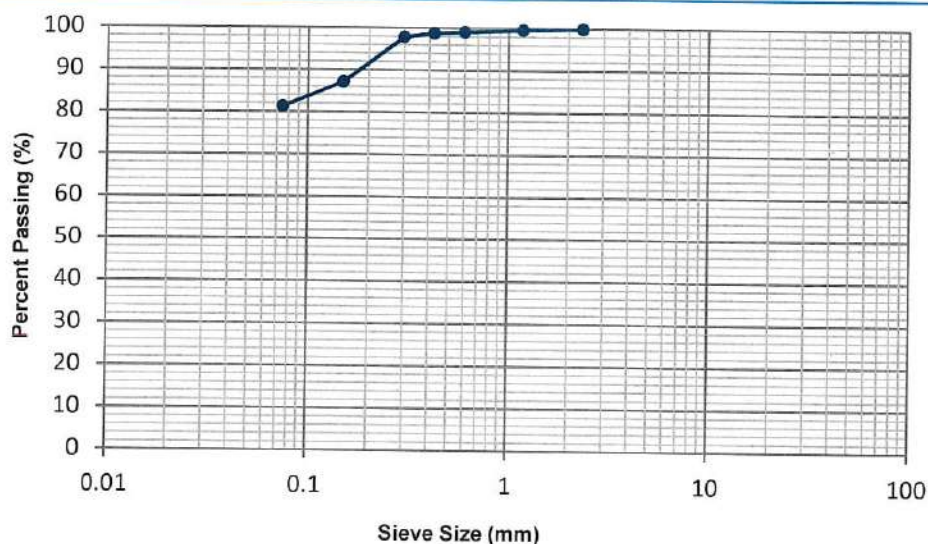
Client: Wentworth Equities No. 2 Pty Ltd
Project: Platinum High Rise Development
Location: 19 Hercules Street, Hamilton
Project No: 010-195E

Tested by: LA/AM **Date:** 2/09/2014
Checked by: LA/AM **Date:** 4/09/2014
Report No.: 010-195E_PSD_B1409-05

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Sample No.:	B1409-05
Bore No.:	107
Depth (m):	16.5-16.95
Sample Moisture Content (%):	28.3

AS SIEVE SIZE (mm)	PERCENT PASSING
2.36	100
1.18	100
0.600	99
0.425	99
0.300	98
0.150	87
0.075	81



Comments:



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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

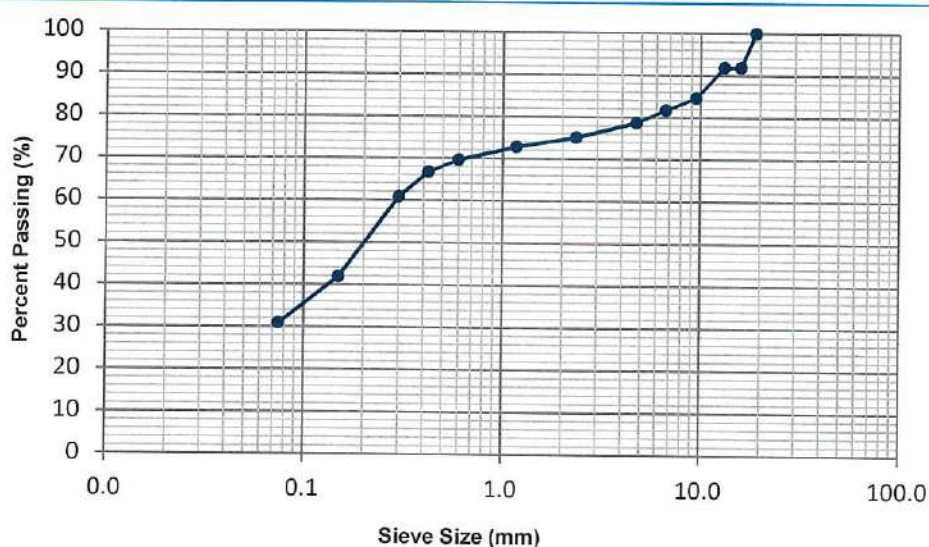
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-06

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-06
Bore No.:	107
Depth (m):	24.0-24.25
Sample Moisture Content (%):	15.3

AS SIEVE SIZE (mm)	PERCENT PASSING
19.0	100
16.0	92
13.2	92
9.5	85
6.7	82
4.75	79
2.36	75
1.18	73
0.600	70
0.425	67
0.300	61
0.150	42
0.075	31



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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: AS1289.2.1.1

Test Procedure: Q103A

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

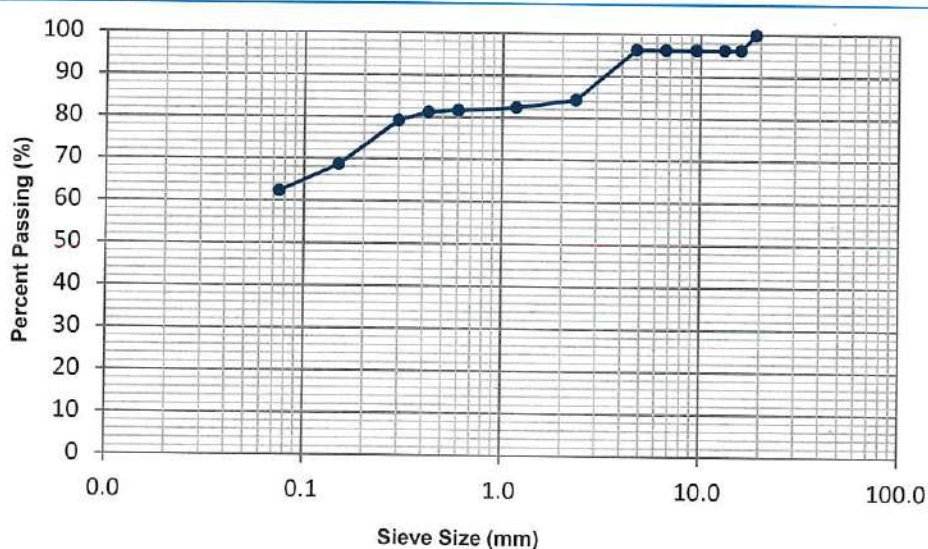
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-07

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-07
Bore No.:	107
Depth (m):	22.5-22.95
Sample Moisture Content (%):	22.6

AS SIEVE SIZE (mm)	PERCENT PASSING
19.0	100
16.0	96
13.2	96
9.5	96
6.7	96
4.75	96
2.36	84
1.18	82
0.600	82
0.425	81
0.300	79
0.150	69
0.075	62



Comments:

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

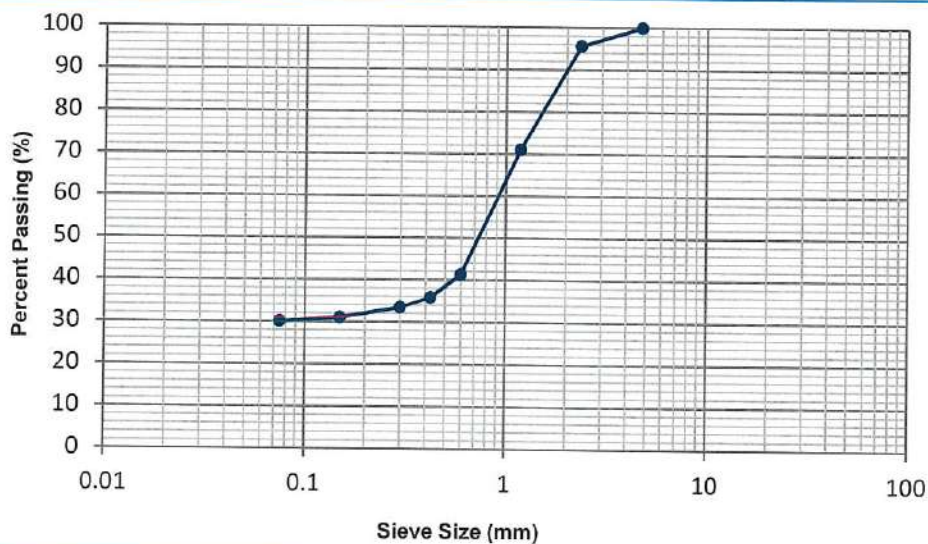
Client: Wentworth Equities No. 2 Pty Ltd
Project: Platinum High Rise Development
Location: 19 Hercules Street, Hamilton
Project No: 010-195E

Tested by: LA/AM **Date:** 2/09/2014
Checked by: LA/AM **Date:** 4/09/2014
Report No.: 010-195E_PSD_B1409-08

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-08
Bore No.:	108
Depth (m):	0.5-0.95
Sample Moisture Content (%):	17.6

AS SIEVE SIZE (mm)	PERCENT PASSING
4.75	100
2.36	96
1.18	71
0.600	41
0.425	36
0.300	34
0.150	31
0.075	30



Comments:

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Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

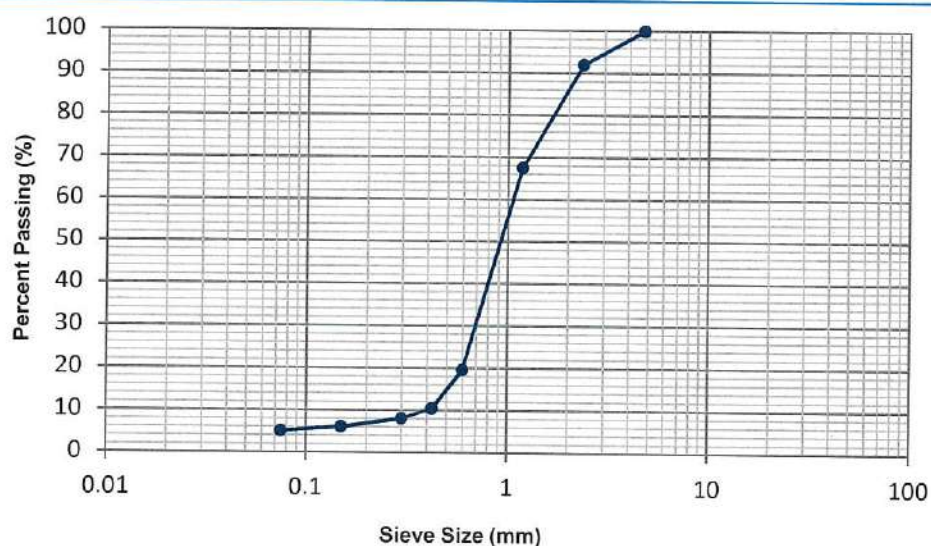
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-09

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-09
Bore No.:	108
Depth (m):	1.5-1.95
Sample Moisture Content (%):	5.7

AS SIEVE SIZE (mm)	PERCENT PASSING
4.75	100
2.36	92
1.18	67
0.600	20
0.425	10
0.300	8
0.150	6
0.075	5



Comments:



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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 1/09/2014

Checked by: LA/AM

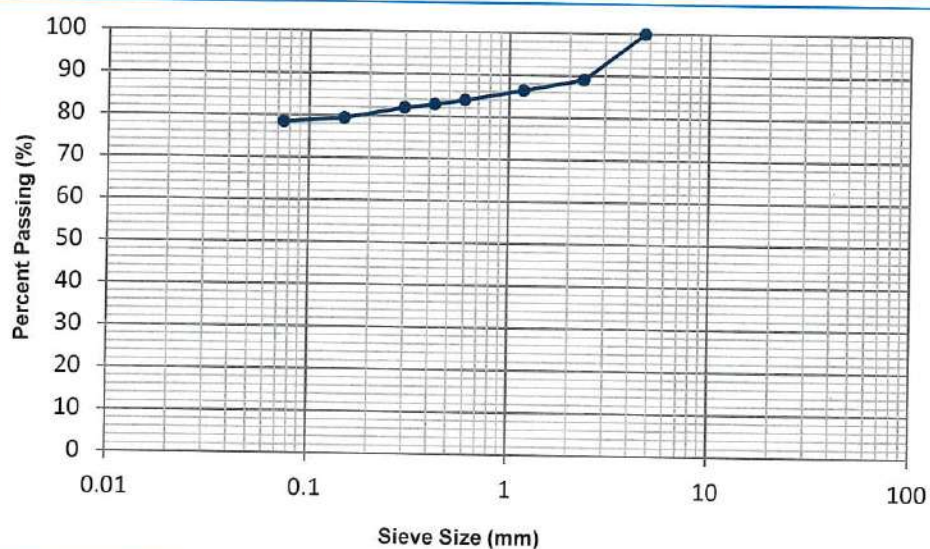
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-10

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-10
Bore No.:	108
Depth (m):	4.5-4.95
Sample Moisture Content (%):	71.3

AS SIEVE SIZE (mm)	PERCENT PASSING
4.75	100
2.36	89
1.18	86
0.600	84
0.425	83
0.300	82
0.150	79
0.075	78



Comments:



Quality
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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

☐

Test Procedure: Q103A

☐

Test Procedure: AS1289.2.1.1

☒

Test Procedure: Q103B

☐

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

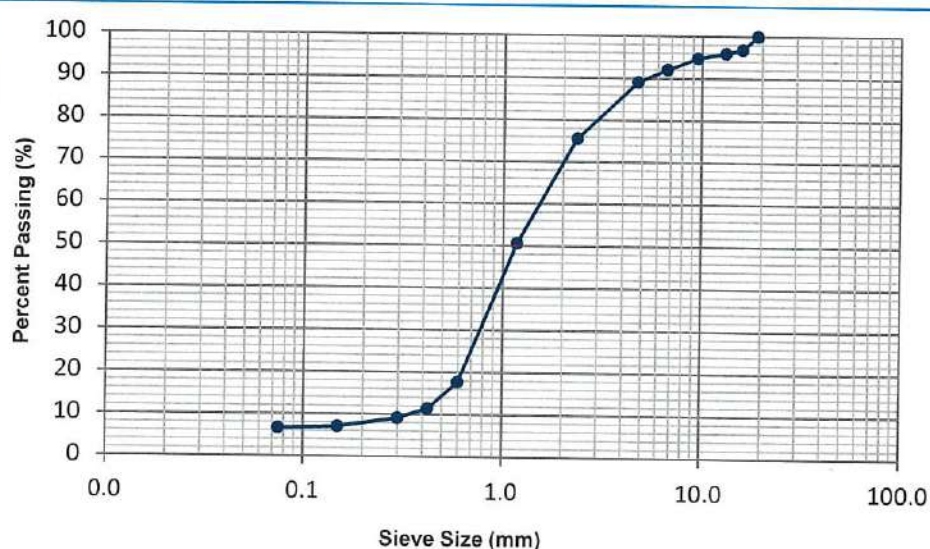
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-11

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-11
Bore No.:	108
Depth (m):	9.0-9.45
Sample Moisture Content (%):	20.0

AS SIEVE SIZE (mm)	PERCENT PASSING
19.0	100
16.0	97
13.2	96
9.5	95
6.7	92
4.75	89
2.36	76
1.18	51
0.600	18
0.425	11
0.300	9
0.150	7
0.075	7



Comments:

Quality
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Newstead Queensland 4006
Telephone: (07) 3852 3800
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Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

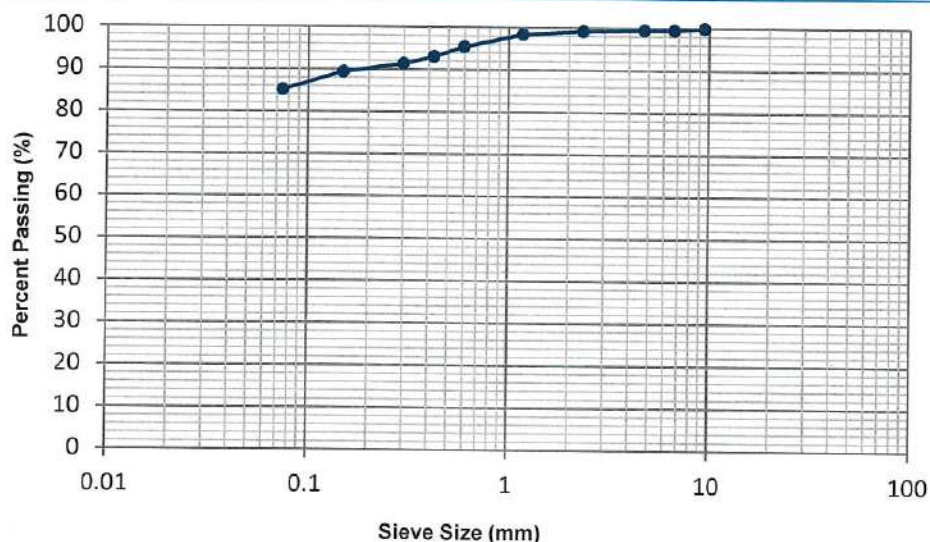
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-12

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-12
Bore No.:	108
Depth (m):	16.5-16.95
Sample Moisture Content (%):	50.1

AS SIEVE SIZE (mm)	PERCENT PASSING
9.5	100
6.7	99
4.75	99
2.36	99
1.18	98
0.600	95
0.425	93
0.300	91
0.150	89
0.075	85



Comments:



Quality
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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

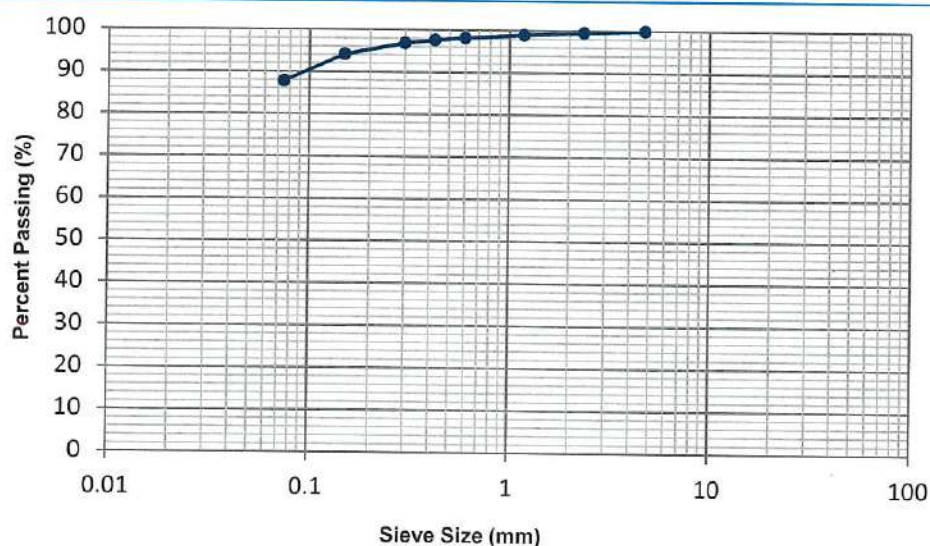
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-13

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-13
Bore No.:	108
Depth (m):	21.0-21.45
Sample Moisture Content (%):	46.3

AS SIEVE SIZE (mm)	PERCENT PASSING
4.75	100
2.36	100
1.18	99
0.600	98
0.425	98
0.300	97
0.150	94
0.075	88



Comments:

Quality
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Newstead Queensland 4006
Telephone: (07) 3852 3800
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Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

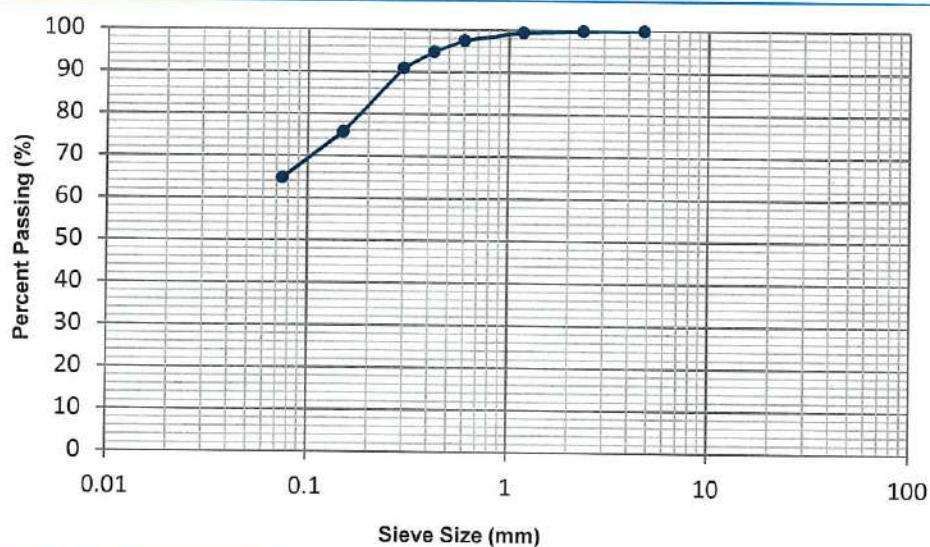
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-14

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-14
Bore No.:	108
Depth (m):	24.0-24.45
Sample Moisture Content (%):	30.7

AS SIEVE SIZE (mm)	PERCENT PASSING
4.75	100
2.36	100
1.18	99
0.600	98
0.425	95
0.300	91
0.150	76
0.075	65



Comments:



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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

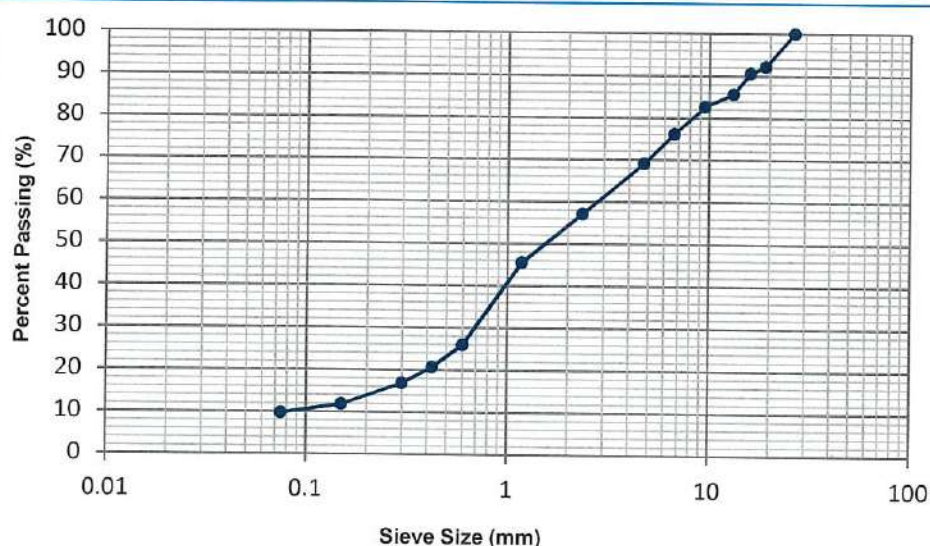
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-15

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-15
Bore No.:	108
Depth (m):	27.0-27.45
Sample Moisture Content (%):	11.8

AS SIEVE SIZE (mm)	PERCENT PASSING
26.5	100
19.0	92
16.0	91
13.2	86
9.5	83
6.7	76
4.75	69
2.36	57
1.18	46
0.600	26
0.425	21
0.300	17
0.150	12
0.075	10



Comments:



Quality
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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

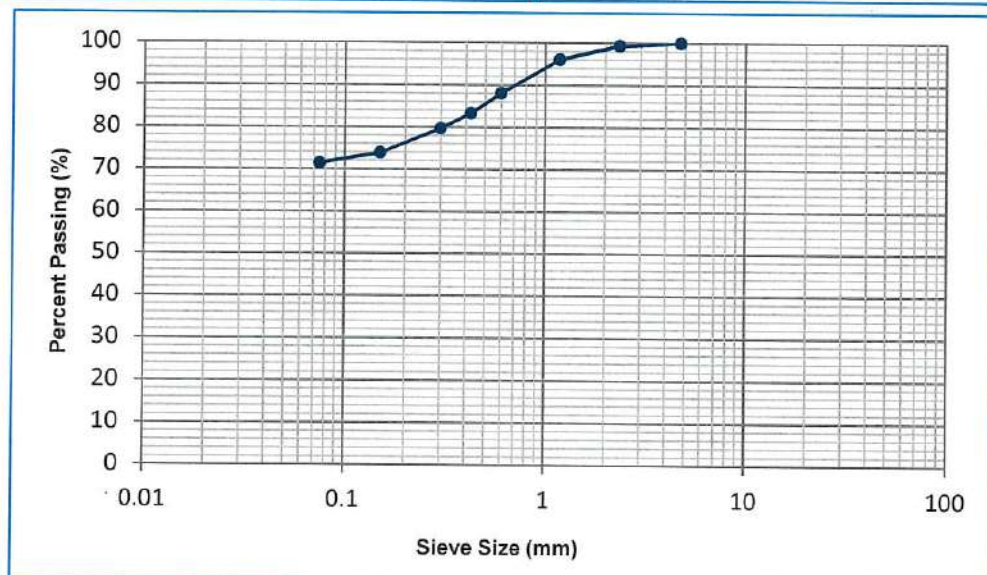
Client: Wentworth Equities No. 2 Pty Ltd
Project: Platinum High Rise Development
Location: 19 Hercules Street, Hamilton
Project No: 010-195E

Tested by: LA/AM **Date:** 2/09/2014
Checked by: LA/AM **Date:** 4/09/2014
Report No.: 010-195E_PSD_B1409-16

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-16
Bore No.:	109
Depth (m):	1.5-1.95
Sample Moisture Content (%):	79.1

AS SIEVE SIZE (mm)	PERCENT PASSING
4.75	100
2.36	99
1.18	96
0.600	88
0.425	83
0.300	80
0.150	74
0.075	71



Comments:

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

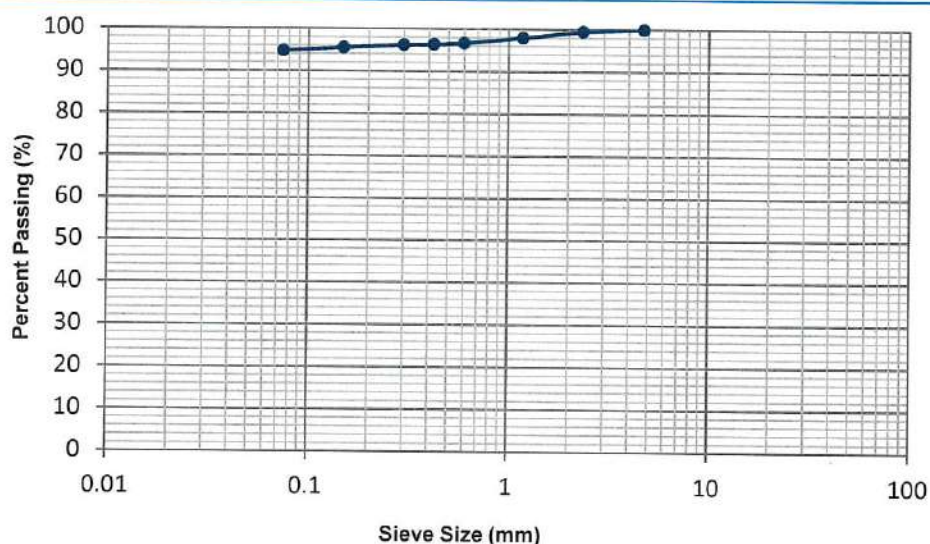
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-17

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-17
Bore No.:	109
Depth (m):	7.5-7.95
Sample Moisture Content (%):	52.4

AS SIEVE SIZE (mm)	PERCENT PASSING
4.75	100
2.36	99
1.18	98
0.600	97
0.425	96
0.300	96
0.150	96
0.075	95



Comments:



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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

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Test Procedure: Q103A

☐

Test Procedure: AS1289.2.1.1

☒

Test Procedure: Q103B

☐

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

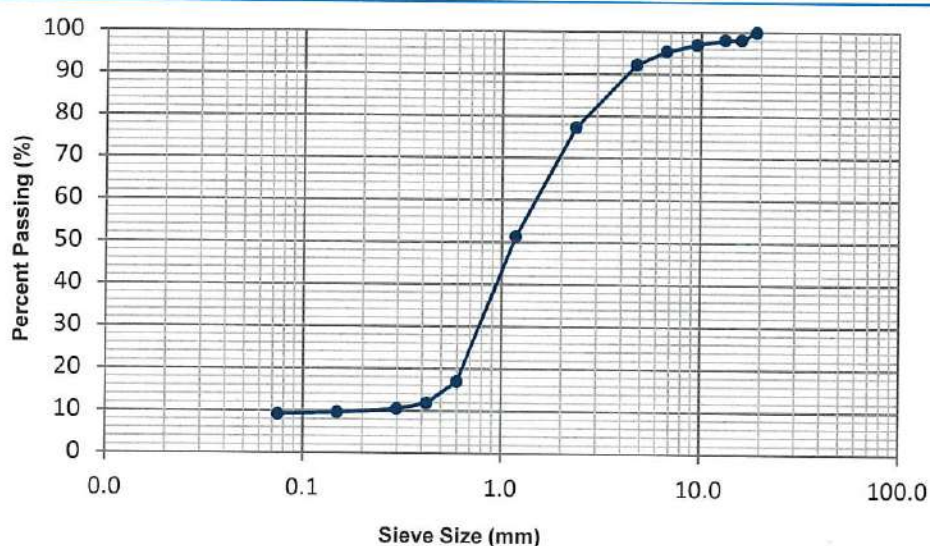
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-18

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-18
Bore No.:	109
Depth (m):	10.5-10.95
Sample Moisture Content (%):	22.8

AS SIEVE SIZE (mm)	PERCENT PASSING
19.0	100
16.0	98
13.2	98
9.5	97
6.7	95
4.75	92
2.36	77
1.18	51
0.600	17
0.425	12
0.300	11
0.150	10
0.075	9



Comments:



Quality
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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

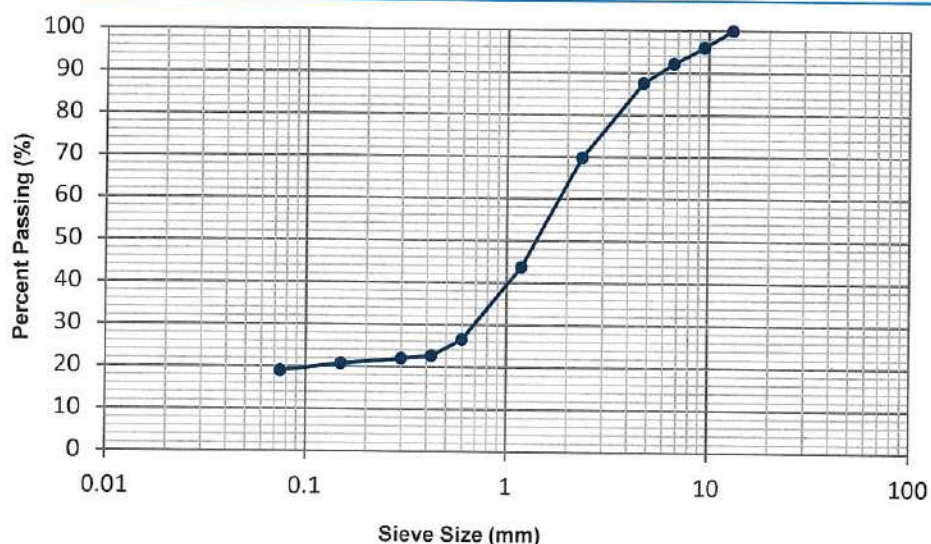
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-19

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-19
Bore No.:	109
Depth (m):	15.0-15.45
Sample Moisture Content (%):	22.2

AS SIEVE SIZE (mm)	PERCENT PASSING
13.2	100
9.5	96
6.7	92
4.75	88
2.36	70
1.18	44
0.600	27
0.425	23
0.300	22
0.150	21
0.075	19



Comments:



Quality
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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

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Test Procedure: Q103A

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Test Procedure: AS1289.2.1.1

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Test Procedure: Q103B

☐

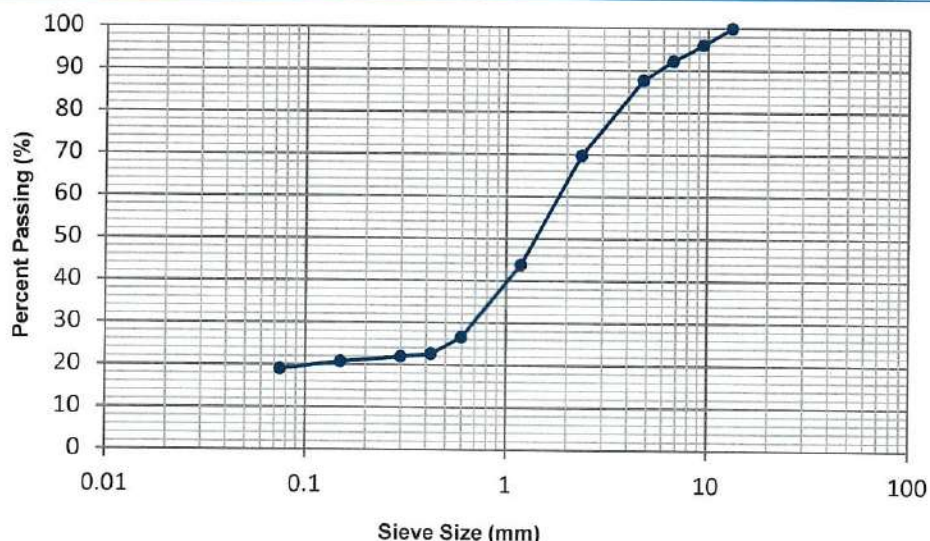
Client: Wentworth Equities No. 2 Pty Ltd
Project: Platinum High Rise Development
Location: 19 Hercules Street, Hamilton
Project No: 010-195E

Tested by: LA/AM **Date:** 2/09/2014
Checked by: LA/AM **Date:** 4/09/2014
Report No.: 010-195E_PSD_B1409-19

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-19
Bore No.:	109
Depth (m):	15.0-15.45
Sample Moisture Content (%):	22.2

AS SIEVE SIZE (mm)	PERCENT PASSING
13.2	100
9.5	96
6.7	92
4.75	88
2.36	70
1.18	44
0.600	27
0.425	23
0.300	22
0.150	21
0.075	19



Comments:

Quality
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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

Client: Wentworth Equities No. 2 Pty Ltd

Project: Platinum High Rise Development

Location: 19 Hercules Street, Hamilton

Project No: 010-195E

Tested by: LA/AM

Date: 2/09/2014

Checked by: LA/AM

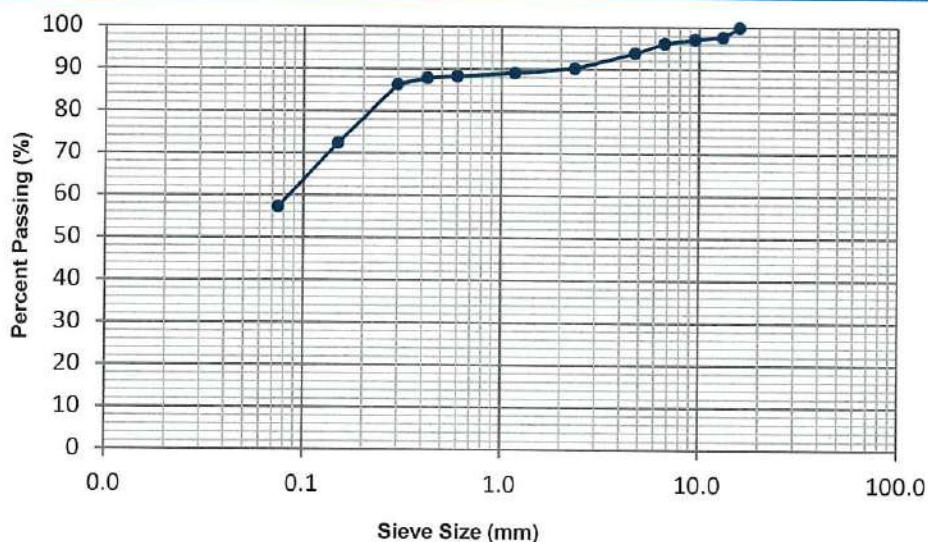
Date: 4/09/2014

Report No.: 010-195E_PSD_B1409-20

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-20
Bore No.:	109
Depth (m):	21.0-21.45
Sample Moisture Content (%):	34.7

AS SIEVE SIZE (mm)	PERCENT PASSING
16.0	100
13.2	98
9.5	97
6.7	96
4.75	94
2.36	90
1.18	89
0.600	88
0.425	88
0.300	86
0.150	72
0.075	57



Comments:



Quality
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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1

Test Procedure: Q103A

Test Procedure: AS1289.2.1.1

Test Procedure: Q103B

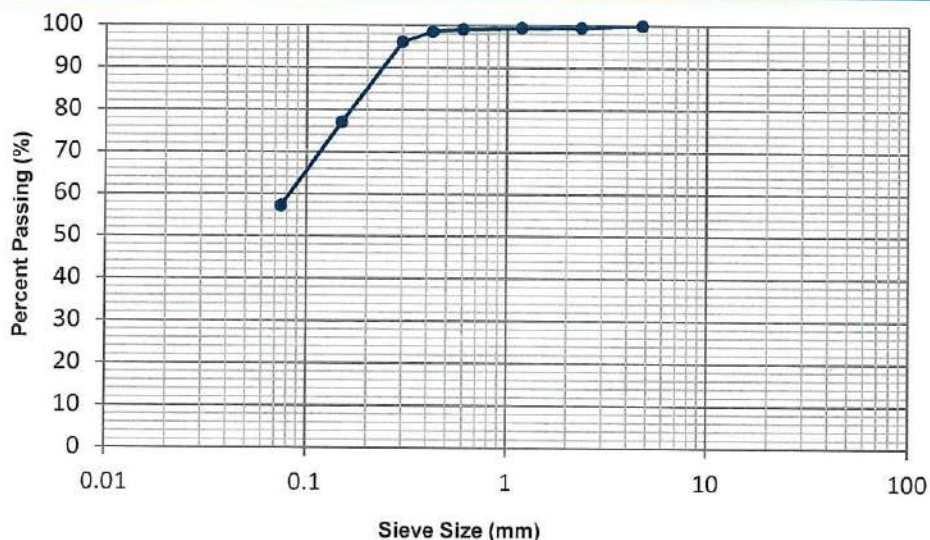
Client: Wentworth Equities No. 2 Pty Ltd
Project: Platinum High Rise Development
Location: 19 Hercules Street, Hamilton
Project No: 010-195E

Tested by: LA/AM **Date:** 2/09/2014
Checked by: LA/AM **Date:** 4/09/2014
Report No.: 010-195E_PSD_B1409-21

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample No.:	B1409-21
Bore No.:	109
Depth (m):	24.0-24.45
Sample Moisture Content (%):	30.5

AS SIEVE SIZE (mm)	PERCENT PASSING
4.75	100
2.36	100
1.18	99
0.600	99
0.425	98
0.300	96
0.150	77
0.075	57



Comments:



Quality
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Atterberg Limits Test Report

Test Procedure: AS1289.2.1.1 - 2005

Test Procedure: AS1289.3.1.2 - 2009

Test Procedure: AS1289.3.2.1 - 2009

Test Procedure: AS1289.3.3.1 - 2009

Test Procedure: AS1289.3.4.1 - 2008

Client:	Wentworth Equities No. 2 Pty Ltd	Report No.:	010-195E_ATL_B1409-02		
Project:	Platinum High Rise Development	Tested by:	LD	Date:	3/09/2014
Location:	19 Hercules Street	Checked by:	LD	Date:	4/09/2014
Project No.:	010-195E	THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL			

Sample Number:	B1409-02	B1407-05	B1407-10	B1407-14	B1409-16
Bore No.:	107	107	108	108	109
Depth (m):	3.0-3.45	16.5-16.95	4.5-4.95	24.0-24.45	1.5-1.95

Liquid Limit (%)	30	48	81	44	58
Plastic Limit (%)	19	19	31	21	26
Plasticity Index (%)	11	29	50	23	32
Linear Shrinkage (%)	1.5	10.0	16.5	13.0	17.0
Sample Moisture Content (%)	19.7	28.3	71.3	30.7	40.3

Remarks:

Shrinkage Mould Length (mm)	149.96	125.12	150.01	149.99	150.02
Sample History	Natural State	Natural State	Natural State	Natural State	Natural State
Sample Preparation	Wet Sieved	Wet Sieved	Wet Sieved	Wet Sieved	Wet Sieved
Cracking of Linear Shrinkage Sample	No	No	No	No	No
Crumbling of Linear Shrinkage Sample	No	No	Yes	No	No
Curling of Linear Shrinkage Sample	Yes	Yes	Yes	Yes	Yes

Comments:



Quality
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Atterberg Limits Test Report

Test Procedure: AS1289.2.1.1 - 2005

Test Procedure: AS1289.3.1.2 - 2009

Test Procedure: AS1289.3.2.1 - 2009

Test Procedure: AS1289.3.3.1 - 2009

Test Procedure: AS1289.3.4.1 - 2008

Client:	Wentworth Equities No. 2 Pty Ltd	Report No.:	010-195E_ATL_B1409-17		
Project:	Platinum High Rise Development	Tested by:	LD	Date:	3/09/2014
Location:	19 Hercules Street, Hamilton	Checked by:	LD	Date:	4/09/2014
Project No.:	010-195E	THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL			

Sample Number:	B1409-17	B1409-20			
Bore No.:	109	109			
Depth (m):	7.5-7.95	21.0-21.45			

Liquid Limit (%)	80	43			
Plastic Limit (%)	28	22			
Plasticity Index (%)	52	21			
Linear Shrinkage (%)	16.5	10.0			
Sample Moisture Content (%)	64.0	34.7			

Remarks:

Shrinkage Mould Length (mm)	150.03	126.26			
Sample History	Natural State	Natural State			
Sample Preparation	Wet Sieved	Wet Sieved			
Cracking of Linear Shrinkage Sample	No	No			
Crumbling of Linear Shrinkage Sample	No	No			
Curling of Linear Shrinkage Sample	No	No			

Comments:

**POINT LOAD STRENGTH INDEX TEST REPORT**

Australian Standards AS 4133.4.1 - 2007

Australian Standard AS1726-1993 Geotechnical site investigation

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enquiries@butlerpartners.com.au

Client:	Wentworth Equities No. 2 Pty Ltd	Tested by:	RZ
Project:	Platinum High Rise Development	Date:	22 August 2014
Location:	19 Hercules Street	Checked by:	RZ
	Hamilton	Date:	22 August 2014
Project No.:	010-195E	Report No.:	010-195E_PL_106

Bore	Depth (m)	Test Type	Sample Description	Point Load Strength [Is(50)] (MPa)	Rock Strength Category*
106	32.75	Diametral	Sandstone	0.7	Medium
		Axial	Sandstone	0.6	Medium
	33.60	Diametral	Sandstone	0.6	Medium
		Axial	Sandstone	0.6	Medium
	34.75	Diametral	Sandstone	0.3	Medium
		Axial	Sandstone	0.4	Medium
107	31.65	Diametral	Sandstone	0.3	Medium
		Axial	Sandstone	0.3	Medium
	32.50	Diametral	Sandstone	0.7	Medium
		Axial	Sandstone	0.8	Medium
	33.60	Diametral	Sandstone	0.2	Low
		Axial	Sandstone	0.4	Medium
	34.62	Diametral	Sandstone	1.3	High
		Axial	Sandstone	1.9	High
	35.58	Diametral	Sandstone	0.8	Medium
		Axial	Sandstone	0.8	Medium
	36.54	Diametral	Sandstone	1.1	High
		Axial	Sandstone	1.1	High
108	33.23	Diametral	Sandstone	0.01	Extremely low
		Axial	Sandstone	0.01	Ex low
	34.56	Diametral	Sandstone	1.0	Medium
		Axial	Sandstone	1.0	Medium
	35.40	Diametral	Sandstone	0.1	Low
		Axial	Sandstone	0.1	Low
	36.54	Diametral	Sandstone	1.2	High
		Axial	Sandstone	1.1	High
	37.45	Diametral	Sandstone	1.0	High
		Axial	Sandstone	0.5	Medium
	38.42	Diametral	Sandstone	0.7	Medium
		Axial	Sandstone	0.7	Medium
109	39.65	Diametral	Sandstone	0.3	Low
		Axial	Sandstone	0.3	Low
	27.65	Diametral	Sandstone	0.1	Low
		Axial	Sandstone	0.1	Low
	28.50	Diametral	Sandstone	0.7	Medium
		Axial	Sandstone	0.7	Medium
	29.43	Diametral	Sandstone	0.3	Medium
		Axial	Sandstone	0.1	Low
	31.70	Diametral	Sandstone	0.04	Very low
		Axial	Sandstone	0.05	Very low
	32.50	Diametral	Sandstone	0.2	Low
		Axial	Sandstone	0.1	Low
109	34.40	Diametral	Sandstone	0.9	Medium
		Axial	Sandstone	1.3	High

*Australian Standard AS1726-1993 Geotechnical site investigation

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1 – 2009

Test Procedure: AS1289.2.1.1 – 2005

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 enquiries@butlerpartners.com.au

Client:		Tested by:	BW
Project:	Platinum High Rise Development	Date:	07/09/10
Location:	19 Hercules Street, Hamilton	Checked by:	MH
Project No.:	010-195A	Date:	09/09/10
		Report No.:	010-195A_PSD_101_1

Sample No.:	010-195A_101_1
Borehole:	101
Depth (m):	1.5-1.95
Sample Moisture Content (%):	42.2

AS SIEVE SIZE (mm)	PERCENT PASSING
19.0	100
13.2	94
9.5	91
6.7	90
4.75	89
2.36	85
1.18	79
0.600	64
0.425	51
0.300	45
0.150	40
0.075	38

Sample No.:	010-195A_101_3
Borehole:	101
Depth (m):	7.5-7.95
Sample Moisture Content (%):	24.4

AS SIEVE SIZE (mm)	PERCENT PASSING
9.5	100
6.7	98
4.75	94
2.36	79
1.18	66
0.600	30
0.425	23
0.300	21
0.150	20
0.075	19

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1 – 2009

Test Procedure: AS1289.2.1.1 - 2005

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Client:		Tested by:	BW
Project:	Platinum High Rise Development	Date:	07/09/10
Location:	19 Hercules Street, Hamilton	Checked by:	MH
Project No.:	010-195A	Date:	09/09/10
		Report No.:	010-195A_PSD_101_4

Sample No.:	010-195A_101_4
Borehole:	101
Depth (m):	13.5-13.95
Sample Moisture Content (%):	23.2

AS SIEVE SIZE (mm)	PERCENT PASSING
6.7	100
4.75	98
2.36	95
1.18	87
0.600	80
0.425	75
0.300	71
0.150	61
0.075	54

Sample No.:	010-195A_101_5
Borehole:	101
Depth (m):	16.5-16.95
Sample Moisture Content (%):	27.2

AS SIEVE SIZE (mm)	PERCENT PASSING
0.600	100
0.425	99
0.300	94
0.150	65
0.075	48

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1 – 2009

Test Procedure: AS1289.2.1.1 – 2005

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Client:		Tested by:	BW
Project:	Platinum High Rise Development	Date:	07/09/10
Location:	19 Hercules Street, Hamilton	Checked by:	MH
Project No.:	010-195A	Date:	09/09/10
		Report No.:	010-195A_PSD_101_6

Sample No.:	010-195A_101_6
Borehole:	101
Depth (m):	21.0-21.37
Sample Moisture Content (%):	22.2

AS SIEVE SIZE (mm)	PERCENT PASSING
19.0	100
13.2	98
9.5	98
6.7	96
4.75	95
2.36	93
1.18	92
0.600	82
0.425	62
0.300	38
0.150	19
0.075	17

Sample No.:	010-195A_102_1
Borehole:	102
Depth (m):	3.0-3.45
Sample Moisture Content (%):	18.2

AS SIEVE SIZE (mm)	PERCENT PASSING
19.0	100
13.2	99
9.5	97
6.7	94
4.75	91
2.36	82
1.18	74
0.600	59
0.425	46
0.300	33
0.150	9
0.075	6

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1 – 2009
 Test Procedure: AS1289.2.1.1 - 2005

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Client:		Tested by:	BW
Project:	Platinum High Rise Development	Date:	07/09/10
Location:	19 Hercules Street, Hamilton	Checked by:	MH
Project No.:	010-195A	Date:	09/09/10
		Report No.:	010-195A_PSD_102_3

Sample No.:	010-195A_102_3
Borehole:	102
Depth (m):	9.0-9.45
Sample Moisture Content (%):	54.0

AS SIEVE SIZE (mm)	PERCENT PASSING
6.7	100
4.75	99
2.36	98
1.18	94
0.600	75
0.425	67
0.300	65
0.150	62
0.075	60

Sample No.:	010-195A_102_4
Borehole:	102
Depth (m):	13.5-13.95
Sample Moisture Content (%):	16.2

AS SIEVE SIZE (mm)	PERCENT PASSING
26.5	100
19.0	97
13.2	93
9.5	89
6.7	79
4.75	69
2.36	52
1.18	40
0.600	25
0.425	14
0.300	9
0.150	5
0.075	4

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1 – 2009

Test Procedure: AS1289.2.1.1 – 2005

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Client:		Tested by:	BW
Project:	Platinum High Rise Development	Date:	07/09/10
Location:	19 Hercules Street, Hamilton	Checked by:	MH
Project No.:	010-195A	Date:	09/09/10
		Report No.:	010-195A PSD 102_5

Sample No.:	010-195A_102_5
Borehole:	102
Depth (m):	16.5-16.95
Sample Moisture Content (%):	44.6

AS SIEVE SIZE (mm)	PERCENT PASSING
19.0	100
13.2	97
9.5	97
6.7	93
4.75	86
2.36	79
1.18	76
0.600	69
0.425	64
0.300	63
0.150	61
0.075	57

Sample No.:	010-195A_102_6
Borehole:	102
Depth (m):	22.5-22.95
Sample Moisture Content (%):	37.4

AS SIEVE SIZE (mm)	PERCENT PASSING
0.425	100
0.300	99
0.150	88
0.075	65

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1 – 2009

Test Procedure: AS1289.2.1.1 - 2005

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Client:		Tested by:	BW
Project:	Platinum High Rise Development	Date:	07/09/10
Location:	19 Hercules Street, Hamilton	Checked by:	MH
Project No.:	010-195A	Date:	09/09/10
		Report No.:	010-195A_PSD_103_1

Sample No.:	010-195A_103_1
Borehole:	103
Depth (m):	1.5-1.95
Sample Moisture Content (%):	5.4

AS SIEVE SIZE (mm)	PERCENT PASSING
13.2	100
9.5	99
6.7	98
4.75	95
2.36	81
1.18	55
0.600	19
0.425	12
0.300	9
0.150	6
0.075	5

Sample No.:	010-195A_103_2
Borehole:	103
Depth (m):	4.5-4.95
Sample Moisture Content (%):	24.4

AS SIEVE SIZE (mm)	PERCENT PASSING
13.2	100
9.5	99
6.7	99
4.75	99
2.36	99
1.18	97
0.600	41
0.425	16
0.300	8
0.150	3
0.075	2

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Procedure: AS1289.3.6.1 – 2009
 Test Procedure: AS1289.2.1.1 – 2005

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Client:		Tested by:	BW
Project:	Platinum High Rise Development	Date:	07/09/10
Location:	19 Hercules Street, Hamilton	Checked by:	MH
Project No.:	010-195A	Date:	09/09/10
		Report No.:	010-195A_PSD_103_4

Sample No.:	010-195A_103_4
Borehole:	103
Depth (m):	9.0-9.45
Sample Moisture Content (%):	16.2

AS SIEVE SIZE (mm)	PERCENT PASSING
19.0	100
13.2	99
9.5	96
6.7	88
4.75	76
2.36	59
1.18	36
0.600	33
0.425	30
0.300	16
0.150	15
0.075	14

Sample No.:	010-195A_103_6
Borehole:	103
Depth (m):	19.5-19.95
Sample Moisture Content (%):	17.0

AS SIEVE SIZE (mm)	PERCENT PASSING
13.2	100
9.5	98
6.7	92
4.75	86
2.36	75
1.18	60
0.600	32
0.425	16
0.300	12
0.150	7
0.075	5

ATTERBERG LIMITS TEST REPORT

Test Procedure: AS1289.2.1.1 - 2005

Test Procedure: AS1289.3.1.2 - 2009

Test Procedure: AS1289.3.2.1 - 2009

Test Procedure: AS1289.3.3.1 - 2009

Test Procedure: AS1289.3.4.1 - 2008

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Client:		Tested by:	BW
Project:	Platinum High Rise Development	Date:	08/09/10
Location:	19 Hercules Street, Hamilton	Checked by:	MH
Project No.:	010-195A	Date:	09/09/10
		Report No.:	010-195A_ATL_101_2

Sample No.:	010-195A_101_2
Borehole:	101
Depth (m):	4.5-4.95

Liquid Limit (%)	70
Plastic Limit (%)	23
Plasticity Index (%)	47
Linear Shrinkage (%)	21.0+
Sample Moisture Content (%)	68.5

Remarks: The sample was tested, oven dried, dry sieved and tested in a 127mm mould.

* Crumbling occurred

+ Curling occurred

Sample No.:	010-195A_101_7
Borehole:	101
Depth (m):	24.0-24.05

Liquid Limit (%)	23
Plastic Limit (%)	14
Plasticity Index (%)	9
Linear Shrinkage (%)	4.5
Sample Moisture Content (%)	13.7

Remarks: The sample was tested, oven dried, dry sieved and tested in a 127mm mould.

* Crumbling occurred

+ Curling occurred

Sample No.:	010-195A_102_2
Borehole:	102
Depth (m):	6.0-6.45

Liquid Limit (%)	71
Plastic Limit (%)	31
Plasticity Index (%)	40
Linear Shrinkage (%)	19.5+
Sample Moisture Content (%)	66.5

Remarks: The sample was tested, oven dried, dry sieved and tested in a 127mm mould.

* Crumbling occurred

+ Curling occurred

ATTERBERG LIMITS TEST REPORT

Test Procedure: AS1289.2.1.1 - 2005
 Test Procedure: AS1289.3.1.2 - 2009
 Test Procedure: AS1289.3.2.1 - 2009
 Test Procedure: AS1289.3.3.1 - 2009
 Test Procedure: AS1289.3.4.1 - 2008

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Client:		Tested by:	JE
Project:	Platinum High Rise Development	Date:	08/09/10
Location:	19 Hercules Street, Hamilton	Checked by:	MH
Project No.:	010-195A	Date:	09/09/10
		Report No.:	010-195A_ATL_102_5

Sample No.:	010-195A_102_5
Borehole:	102
Depth (m):	16.5-16.95

Liquid Limit (%)	56
Plastic Limit (%)	24
Plasticity Index (%)	32
Linear Shrinkage (%)	16.0+
Sample Moisture Content (%)	44.6

Remarks: The sample was tested, oven dried, dry sieved and tested in a 127mm mould.
 * Crumbling occurred + Curling occurred

Sample No.:	010-195A_103_3
Borehole:	103
Depth (m):	6.0-6.45

Liquid Limit (%)	56
Plastic Limit (%)	24
Plasticity Index (%)	32
Linear Shrinkage (%)	16.0+
Sample Moisture Content (%)	53.5

Remarks: The sample was tested, oven dried, dry sieved and tested in a 250mm mould.
 * Crumbling occurred + Curling occurred

Sample No.:	010-195A_103_5
Borehole:	103
Depth (m):	16.5-16.95

Liquid Limit (%)	49
Plastic Limit (%)	24
Plasticity Index (%)	25
Linear Shrinkage (%)	12.5+
Sample Moisture Content (%)	42.6

Remarks: The sample was tested, oven dried, dry sieved and tested in a 250mm mould.
 * Crumbling occurred + Curling occurred

ATTERBERG LIMITS TEST REPORT

Test Procedure: AS1289.2.1.1 - 2005

Test Procedure: AS1289.3.1.2 - 2009

Test Procedure: AS1289.3.2.1 - 2009

Test Procedure: AS1289.3.3.1 - 2009

Test Procedure: AS1289.3.4.1 - 2008

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Client:		Tested by:	JE
Project:	Platinum High Rise Development	Date:	08/09/10
Location:	19 Hercules Street, Hamilton	Checked by:	MH
Project No.:	010-195A	Date:	09/09/10
		Report No.:	010-195A_ATL_103_7

Sample No.:	010-195A_103_7
Borehole:	103
Depth (m):	24.0-24.45
Liquid Limit (%)	67
Plastic Limit (%)	28
Plasticity Index (%)	39
Linear Shrinkage (%)	17.5+
Sample Moisture Content (%)	55.0

Remarks: The sample was tested, oven dried, dry sieved and tested in a 250mm mould.

* Crumbling occurred

+ Curling occurred

CERTIFICATE OF ANALYSIS

Work Order	: EB1441699	Page	: 1 of 5
Client	: BUTLER PARTNERS PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: MR BRUCE BUTLER	Contact	: Customer Services EB
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E-mail	: bbutler@butlerpartners.com.au	E-mail	: ALSEnviro.Brisbane@alsglobal.com
Telephone	: +61 38523800	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38523808	Facsimile	: +61-7-3243 7218
Project	: 010-195E	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: 6840	Date Samples Received	: 02-Sep-2014 15:15
C-O-C number	: —	Issue Date	: 09-Sep-2014 16:17
Sampler	: RICARDO ZANNIN-PESCE	No. of samples received	: 13
Site	: Hamilton	No. of samples analysed	: 13
Quote number	: —		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Satishkumar Trivedi	2 IC Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO_3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.
- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Client sample ID

				B1309-01 BH107 1.0-1.45	B1309-02 BH107 3.0-3.45	B1309-03 BH107 7.5-7.95	B1309-04 BH107 10.5-10.95	B1309-05 BH107 16.5-16.95
Client sampling date / time				[02-Sep-2014]	[02-Sep-2014]	[02-Sep-2014]	[02-Sep-2014]	[02-Sep-2014]
Compound	CAS Number	LOR	Unit	EB1441699-001	EB1441699-002	EB1441699-003	EB1441699-004	EB1441699-005
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	8.8	8.6	7.9	9.3	6.5
Titrateable Actual Acidity (23F)	---	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	0.024	0.275	0.052	0.017	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	15	172	32	11	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	---	0.01	% CaCO3	1.96	2.44	0.53	1.80	0.67
acidity - Acid Neutralising Capacity (a-19A2)	---	10	mole H+ / t	391	488	106	360	134
sulfidic - Acid Neutralising Capacity (s-19A2)	---	0.01	% pyrite S	0.63	0.78	0.17	0.58	0.22
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	---	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	---	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	---	1	kg CaCO3/t	<1	<1	<1	<1	<1



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Client sample ID

				B1309-05 BH108 0.5-0.95	B1309-05 BH108 1.5-1.95	B1309-05 BH108 4.5-4.95	B1309-05 BH108 9.0-9.45	B1309-05 BH109 1.5-1.95
Client sampling date / time				[02-Sep-2014]	[02-Sep-2014]	[02-Sep-2014]	[02-Sep-2014]	[02-Sep-2014]
Compound	CAS Number	LOR	Unit	EB1441699-006	EB1441699-007	EB1441699-008	EB1441699-009	EB1441699-010
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	6.6	6.6	6.9	7.5	6.9
Titrateable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	0.067	0.071	0.374
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	42	44	233
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.91	0.27	0.24	0.55	1.24
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	182	54	48	110	248
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.29	0.09	0.08	0.18	0.40
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	0.11
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	10	<10	68
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	5



Analytical Results

Sub-Matrix: **SOIL**
 (Matrix: **SOIL**)

Client sample ID

				B1309-05 BH109 7.5-7.95	B1309-05 BH109 10.5-10.95	B1309-05 BH109 15.0-15.45	---	---
Client sampling date / time				[02-Sep-2014]	[02-Sep-2014]	[02-Sep-2014]	---	---
Compound	CAS Number	LOR	Unit	EB1441699-011	EB1441699-012	EB1441699-013	-----	-----
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)	---	0.1	pH Unit	7.1	8.9	9.0	---	---
Titrateable Actual Acidity (23F)	---	2	mole H+ / t	<2	<2	<2	---	---
sulfidic - Titrateable Actual Acidity (s-23F)	---	0.02	% pyrite S	<0.02	<0.02	<0.02	---	---
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	---	0.005	% S	0.554	0.068	0.248	---	---
acidity - Chromium Reducible Sulfur (a-22B)	---	10	mole H+ / t	346	43	155	---	---
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	---	0.01	% CaCO3	1.36	0.68	5.02	---	---
acidity - Acid Neutralising Capacity (a-19A2)	---	10	mole H+ / t	272	136	1000	---	---
sulfidic - Acid Neutralising Capacity (s-19A2)	---	0.01	% pyrite S	0.44	0.22	1.61	---	---
EA033-E: Acid Base Accounting								
ANC Fineness Factor	---	0.5	-	1.5	1.5	1.5	---	---
Net Acidity (sulfur units)	---	0.02	% S	0.26	<0.02	<0.02	---	---
Net Acidity (acidity units)	---	10	mole H+ / t	164	<10	<10	---	---
Liming Rate	---	1	kg CaCO3/t	12	<1	<1	---	---

CERTIFICATE OF ANALYSIS

<i>Client</i>	: BUTLER PARTNERS PTY LTD	<i>Laboratory</i>	: ALS Environmental Brisbane	<i>Page</i>	: 1 of 6
<i>Contact</i>	: MR ST JOHN HERBERT	<i>Contact</i>	: Michael Heery	<i>Work Order</i>	: EB0609621
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<i>Project</i>	: 03900H	<i>Quote number</i>	: BN/217/06	<i>No. of samples</i>	- Received : 12
<i>Order number</i>	: SH				Analysed : 12
<i>C-O-C number</i>	: - Not provided -				
<i>Site</i>	: - Not provided -				

ALSE - Excellence in Analytical Testing


NATA Accredited Laboratory
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This document is issued in
accordance with NATA's
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ISO/IEC 17025.

This document has been electronically signed by those names that appear on this report and are the authorised signatories. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatory</i>	<i>Position</i>	<i>Department</i>
Cass Sealby	Senior Chemist - Acid Sulphate Soils	Inorganics - NATA 825 (818 - Brisbane)

Comments

This report for the ALSE reference EB0609621 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- Analytical Results for Samples Submitted
- Surrogate Recovery Data

The analytical procedures used by ALS Environmental have been developed from established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insufficient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting, * Indicates failed Surrogate Recoveries.

Specific comments for Work Order **EB0609621**

Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO_3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. Conversion to liming rate in $\text{kg/m}^3 = \text{kg/t} \times \text{wet bulk density in t/m}^3$.
Retained Acidity not required because pH KCl greater than or equal to 4.5

Page Number : 3 of 6
 Client : BUTLER PARTNERS PTY LTD
 Work Order : EB0609621



Analytical Results

				Client Sample ID : Sample Matrix Type / Description : Sample Date / Time : Laboratory Sample ID :	B27-1.25 SOIL 27 Sep 2006 15:00 EB0609621-001	B27-3.25 SOIL 27 Sep 2006 15:00 EB0609621-002	B27-5.76 SOIL 27 Sep 2006 15:00 EB0609621-003	B26-1.0 SOIL 27 Sep 2006 15:00 EB0609621-004	B26-4.75 SOIL 27 Sep 2006 15:00 EB0609621-005
Analyte	CAS number	LOR	Units						
EA033-A: Actual Acidity									
pH KCl (23A)		0.1	pH Unit		7.6	7.0	8.7	7.3	6.8
Titrateable Actual Acidity (23F)		2	mole H+ / t		<2	<2	<2	<2	<2
sulfidic - Titrateable Actual Acidity (s-23F)		0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)		0.02	% S		<0.02	<0.02	0.03	<0.02	0.03
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t		<10	<10	20	<10	18
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)		0.01	% CaCO3		0.38	0.48	0.42	0.60	0.69
acidity - Acid Neutralising Capacity (a-19A1)		10	mole H+ / t		76	96	84	120	138
sulfidic - Acid Neutralising Capacity (s-19A1)		0.01	% pyrite S		0.12	0.15	0.13	0.19	0.22
EA033-E: Acid Base Accounting									
ANC Fineness Factor		0.5	-		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)		10	mole H+ / t		<10	<10	<10	<10	<10
Liming Rate		1	kg CaCO3/t		<1	<1	<1	<1	<1

Page Number : 4 of 6

Client : BUTLER PARTNERS PTY LTD

Work Order : EB0609621



ALS Environmental

Analytical Results

Analytical Results

Client Sample ID :				B26-3.5	B25-1.2	B25-2.6	B25-5.8	BPB13-13
Sample Matrix Type / Description :				SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date / Time :				27 Sep 2006 15:00	27 Sep 2006 15:00	27 Sep 2006 15:00	27 Sep 2006 15:00	27 Sep 2006 15:00
Laboratory Sample ID :				EB0609621-006	EB0609621-007	EB0609621-008	EB0609621-009	EB0609621-010
Analyte	CAS number	LOR	Units					
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit	6.5	6.5	6.7	7.2	5.9
Titrateable Actual Acidity (23F)		2	mole H+ / t	<2	<2	<2	<2	4
sulfidic - Titrateable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.02	% S	<0.02	<0.02	<0.02	0.03	0.14
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10	<10	<10	20	86
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)		0.01	% CaCO3	0.43	0.69	0.45	0.30	---
acidity - Acid Neutralising Capacity (a-19A1)		10	mole H+ / t	86	138	90	60	---
sulfidic - Acid Neutralising Capacity (s-19A1)		0.01	% pyrite S	0.14	0.22	0.14	0.10	---
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)		0.02	% S	<0.02	<0.02	<0.02	<0.02	0.14
Net Acidity (acidity units)		10	mole H+ / t	<10	<10	<10	<10	90
Liming Rate		1	kg CaCO3/t	<1	<1	<1	<1	7



POINT LOAD STRENGTH INDEX TEST REPORT

Australian Standards AS 4133.4.1 - 2007
 Australian Standard AS1726-1993 Geotechnical site investigation

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Client:	Wentworth Equities No. 2 Pty Ltd	Tested by:	RZ
Project:	High Rise Mixed Use Development	Date:	22 August 2014
Location:	19 Hercules Street Hamilton	Checked by:	RZ
Project No.:	010-195E	Date:	22 August 2014
		Report No.:	010-195E_PL_106

Bore	Depth (m)	Test Type	Sample Description	Point Load Strength [Is(50)] (MPa)	Rock Strength Category*
106	32.75	Diametral	Sandstone	0.7	Medium
		Axial	Sandstone	0.6	Medium
	33.60	Diametral	Sandstone	0.6	Medium
		Axial	Sandstone	0.6	Medium
	34.75	Diametral	Sandstone	0.3	Medium
		Axial	Sandstone	0.4	Medium
107	31.65	Diametral	Sandstone	0.3	Medium
		Axial	Sandstone	0.3	Medium
	32.50	Diametral	Sandstone	0.7	Medium
		Axial	Sandstone	0.8	Medium
	33.60	Diametral	Sandstone	0.2	Low
		Axial	Sandstone	0.4	Medium
	34.62	Diametral	Sandstone	1.3	High
		Axial	Sandstone	1.9	High
	35.58	Diametral	Sandstone	0.8	Medium
		Axial	Sandstone	0.8	Medium
108	33.23	Diametral	Sandstone	0.01	Extremely low
		Axial	Sandstone	0.01	Ex low
	34.56	Diametral	Sandstone	1.0	Medium
		Axial	Sandstone	1.0	Medium
	35.40	Diametral	Sandstone	0.1	Low
		Axial	Sandstone	0.1	Low
	36.54	Diametral	Sandstone	1.2	High
		Axial	Sandstone	1.1	High
	37.45	Diametral	Sandstone	1.0	High
		Axial	Sandstone	0.5	Medium
	38.42	Diametral	Sandstone	0.7	Medium
		Axial	Sandstone	0.7	Medium
109	27.65	Diametral	Sandstone	0.3	Low
		Axial	Sandstone	0.1	Low
	28.50	Diametral	Sandstone	0.7	Medium
		Axial	Sandstone	0.7	Medium
	29.43	Diametral	Sandstone	0.3	Medium
		Axial	Sandstone	0.1	Low
	31.70	Diametral	Sandstone	0.04	Very low
		Axial	Sandstone	0.05	Very low
	32.50	Diametral	Sandstone	0.2	Low
		Axial	Sandstone	0.1	Low
	34.40	Diametral	Sandstone	0.9	Medium
		Axial	Sandstone	1.3	High

*Australian Standard AS1726-1993 Geotechnical site investigation

APPENDIX D

EXAMPLE ACID SULFATE SOIL MANAGEMENT PLAN

APPENDIX D

EXAMPLE ACID SULFATE SOIL MANAGEMENT PLAN

Platinum High Rise Development 19 Hercules Street, Hamilton Acid Sulfate Soil Management Plan (ASSMP)

Element	Acid Sulfate Soil Management Plan
Objective/Target	The objective of the ASSMP is to control net acidity levels within soils disturbed during site development works, and to restrict to an acceptable level any potential on-site and off-site environmental impacts during site redevelopment.
ASS Management Strategy	To mitigate and manage potential environmental impacts associated with ASS during the development works. This will be achieved as follows: The disturbance during site development works requires a materials handling and management strategy to be in place, as well as procedures for either on-site lime treatment of soils or, the appropriate off-site treatment of soils (if a suitably sized and appropriately located space is not available for on-site treatment).
Tasks/Actions	The following actions have been carried out prior to the commencement of the construction and earthworks activities. - An ASS investigation has been carried out to assess the soils within the redevelopment site, to a maximum depth of 6m below the existing surface level. The sandy soils have been shown to contain negligible to moderate levels of net acidity, whilst soils containing clay have recorded net acidity levels exceeding QASSMAC action criteria. The soils containing clay will require ASS management to restrict potential environmental impacts. The following actions will be carried out during the disturbance of soils during the redevelopment of the site. - It is considered that insufficient area will be available to create a temporary stockpile and treatment area, however, if on-site treatment is undertaken then lime treatment of the soils will be undertaken as described below. - Where on-site treatment is not possible the sediments will be excavated, then transported in a sealed truck to an appropriately designed off-site treatment area for neutralisation. ASS Treatment On-Site - The soils forming the base of the basement excavation where clay occurs will require an application of ag-lime at a rate of 5kg/square metre. - Where excavated soils are to be treated on-site, a suitably sized dedicated treatment area will be created. Soils to be treated shall be placed on the treatment area in layers not thicker than 0.3m. - Bunding will be constructed around the perimeter of the designated treatment area to intercept and contain run-off from the area during the soil treatment operations. - The base of the treatment area is to be lime treated prior to placement of each layer of sediments. Re-treatment with ag-lime is required prior to placement of each new layer of sediments to be treated, and at the conclusion of all treatment. The base of the treatment pad shall have the minimum ag-lime application of 5 kg/square metre. - Soils containing clay have been shown by laboratory testing to comprise levels of net acidity, above the QASSIT Action Criteria. The removal of soils containing clay will require neutralisation. The removed soils will require spreading out within the designated treatment area in layers not exceeding 0.3m thickness. Ag-lime will be applied evenly over the surface of the treatment area and thoroughly blended into the ASS at a rate of 12kg of ag-lime/tonne of dry soil.

Platinum High Rise Development 19 Hercules Street, Hamilton Acid Sulfate Soil Management Plan (ASSMP)

Element	Acid Sulfate Soil Management Plan						
Tasks/Actions (cont'd)	The above liming rates are based on a factor of safety of 1.5 and the use of good quality fine ag-lime with a neutralising value of not less than 80%. - When incorporation of the lime is complete, chromium suite validation testing of the treated spoil will be carried out to establish that sufficient ag-lime has been added to neutralise the acid generation potential of the spoil. Chromium suite validation testing will be carried out at a rate of one test per 400m³ of treated spoil. Each validation test will be deemed to have passed if the net acidity result of the chromium suite test is <0.02%S. A higher net acidity result will require the application of additional ag-lime until a satisfactory net acidity validation result has been achieved. - Once ag-lime treatment is complete, the treated spoil may then be stockpiled for later use or off-site disposal (as appropriate). - Lime-treated, stockpiled soil shall have sediment fences and/or hay bales placed downslope to intercept any eroded material. Earthen bunds shall be constructed downslope of stockpile areas to divert run-off/drainage to a collection sump. The water quality of the sump is to be monitored against the water quality objective criteria for a tidal estuary. ASS Treatment Off-Site Where soils are required to be treated off-site, treatment of the soils will be undertaken either: - in accordance with the provisions of this ASSMP for on-site treatment, modified as necessary for use at an accessible alternative off-site treatment area; or - in accordance with the ASSMP for the designated off-site treatment area.						
Performance Indicators	<u>Retained Water</u> Laboratory testing of the water encountered during basement excavation will be carried out for pH, dissolved oxygen and turbidity. These parameters will be assessed against the equivalent water quality objective criteria for a tidal estuary as follows: <table border="0" style="margin-left: 40px;"> <tr> <td>pH</td><td>6.5 to 8.5</td></tr> <tr> <td>Disturbed Oxygen</td><td>80% to 100% saturation</td></tr> <tr> <td>Turbidity</td><td>20NTU</td></tr> </table> <u>Treated Soil</u> Chromium suite testing carried out for validation of applied liming rates will be deemed to be acceptable if the net acidity level recorded is <0.02%S.	pH	6.5 to 8.5	Disturbed Oxygen	80% to 100% saturation	Turbidity	20NTU
pH	6.5 to 8.5						
Disturbed Oxygen	80% to 100% saturation						
Turbidity	20NTU						
Frequency/Timing	<u>Retained Water</u> Water quality within basement excavations will be monitored regularly during soil removal and particularly following substantial rainfall events. Retained water will be sampled, tested and treated to an acceptable level when compared to the water quality objective criteria for tidal estuary as given above. <u>Treated ASS</u> The sampling and testing of any lime treated soils will be subject to validation testing at a rate of one test per 400m³ of treated soil, which will be repeated until satisfactory results are obtained.						
Contingency Plan	If lime treatment of soils is unsuccessful whereby performance targets are not being met as indicated by the validation testing and water quality testing procedures then: - the soil removal schedule will be reassessed and action taken to determine the problems causing the unsuccessful performance; - if the problems are related to ineffective implementation of the ASSMP, then the plan will be audited by a person nominated by the project manager to ensure improved implementation (monitoring and testing will be increased to ensure compliance with the established standards); and - any significant changes to the ASSMP will be subject to discussions with the relevant regulatory authorities.						

Platinum High Rise Development 19 Hercules Street, Hamilton Acid Sulfate Soil Management Plan (ASSMP)

Element	Acid Sulfate Soil Management Plan
Responsibility	The satisfactory implementation of the ASSMP by the contractor will be the responsibility of the project manager, who will ensure: • the contractor is made aware of site specific conditions and implications for the management of sediments within the site; • the contractor complies with the elements of the ASSMP and erosion control measures proposed; • correct methods for the collection of samples and testing are employed and that the results are reported to the relevant site authorities; and • corrective action measures proposed by the pipeline contractor are approved. The contractor's responsibilities will include: • awareness of site conditions and requirements for the implementation of the ASSMP; • supervision of the mixing and soil amelioration process; • modification of earthworks/construction procedures to comply with the ASSMP; • presentation of proposed corrective action measures (if required) which will then be approved by the project manager; and • implementation of approved corrective actions.
Reporting	The contractor shall report to the project manager representative on: • the effectiveness of the operating strategies; • problems in implementing the ASSMP management strategies; • compliance with testing requirements, run-off control and materials handling; and • effectiveness of any corrective action adopted.