Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Geotechnical Desktop Review

Site B Development
Showground Road and Pennant Street, Castle Hill

Prepared for
QIC Ltd

Project 84335.16
July 2022

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	84335.16	Document No.	R.001.Rev0
Document title	Report on Geotechnical Desktop Review Site B Development		
Site address	Showground Road and Pennant Street, Castle Hill		
Report prepared for	QIC Ltd		
File name	84335.16.R.001.Rev1		

Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Fiona MacGregor	Ray Blinman	3 June 2022
Revision 1	Fiona MacGregor	Ray Blinman	1 July 2022

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0	1	0	David Radford, Essence Project Management Pty Ltd
Revision 1	1	0	David Radford, Essence Project Management Pty Ltd

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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Reviewer			1 July 2022

bsi. ISO 9001 Quality Management
FS 604853

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1. Introduction

This report presents the results of a geotechnical desktop review carried out by Douglas Partners Pty Ltd (DP) for the proposed Site B Development, to be located on a site occupying most of the block extending between Castle Street, Pennant Street, Showground Road and Kentwell Avenue at Castle Hill.

The desktop review was requested by Essence Project Management Pty Ltd (EPM), on behalf of QIC Limited (QIC) and was undertaken in accordance with the agreed scope, as outlined in DP's email proposal dated 18 March 2022.

It is understood that Site B has been divided into six lots (Lots A to F) and that multistorey residential buildings, with associated basements and access roads, are proposed for each of the lots. Preliminary architectural drawings for the development were prepared by the project architects Clarke Hopkins Clarke, dated February 2021. A selection of these drawings showing the scope of the proposed development are presented in Appendix B.

This desktop study has been undertaken to combine the results of several previous investigations undertaken on or near the site, in order to compile an interpreted geotechnical model for the site and to provide preliminary geotechnical advice for planning of developments across Site B.

A separate geotechnical report has previously been prepared for the proposed leisure centre to be constructed on Lot A (known as the Woodward Development). This report was issued on 1 June 2022 (ref 84335.14.R.002.Rev1).

2. Site Description

Site B occupies most of the block of land at Castle Hill bounded by Castle Street to the north-east, Pennant Street to the south-east, Showground Road to the south-west and Kentwell Avenue to the north-west. The site extends over an area of approximately 4.2 hectares.

The site does not include the property in the eastern corner of the block which is occupied by the Castle Grand public library, a community centre and an associated multistorey residential apartment building. The location of Site B is shown on Figure 1 below.

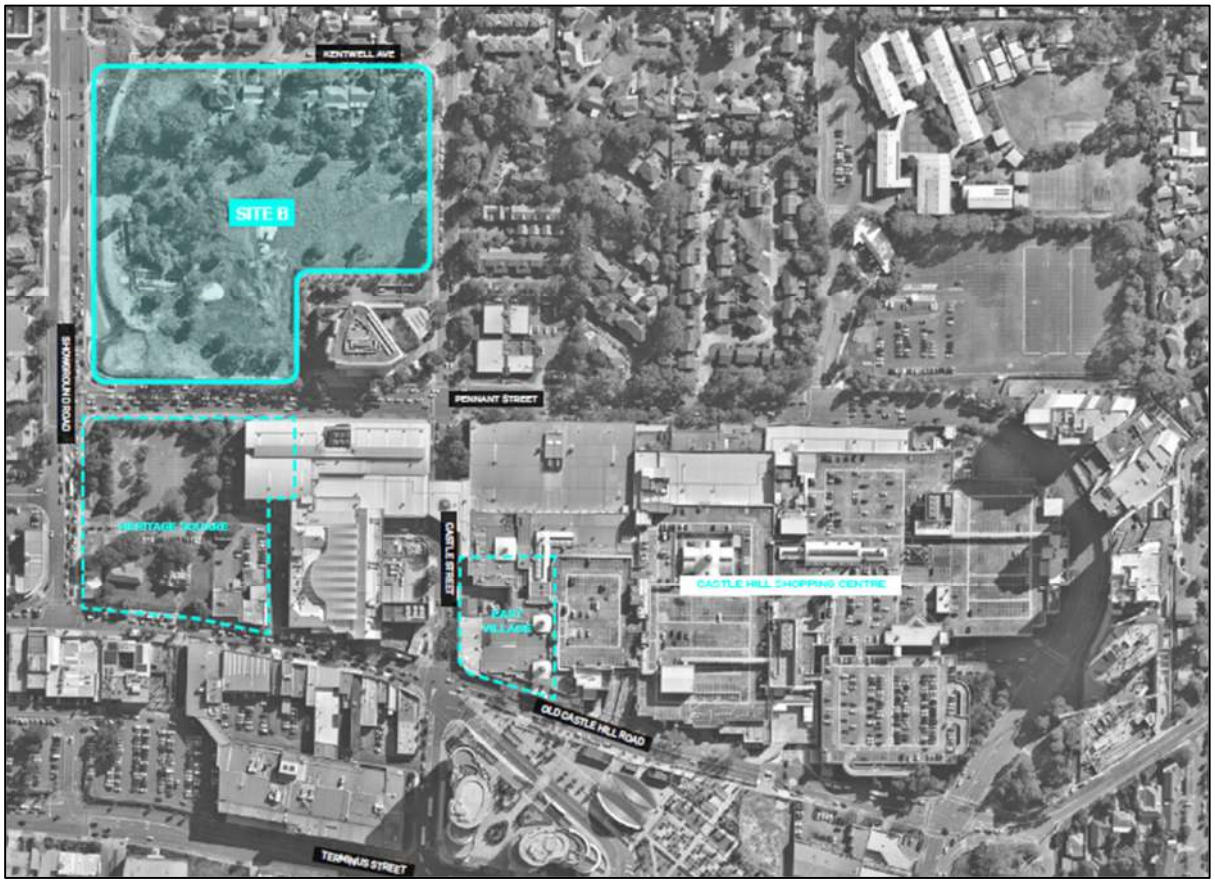


Figure1: Site Location

Much of Site B was previously occupied by a former school which was demolished sometime between 2009 and 2011. The site also encompasses some former residential lots along Kentwell Avenue, Castle Street and Showground Road. The site location and recent site conditions are shown on Drawing 1, in Appendix C.

The ground surface within the site slopes mostly towards the north, from about RL 134 m AHD (Australian Height Datum) in the southern corner of the site to about RL 115 m at the northern corner (intersection of Castle Street and Kentwell Avenue).

Following the demolition of some previous buildings on the site, fill has been placed on some areas to facilitate site drainage and then covered with grass. Mature trees and other vegetation are present over the central portion of the site. Residential properties along Kentwell Avenue are still occupied by one and two storey residences and their gardens.

In 2019, the connection of Kentwell Avenue with Showground Road was cut off as part of the Showground Road upgrade project. The road was widened and a new wider intersection stub was constructed to provide access to the site as part of the staged development of Site B. An unsealed gravel driveway was subsequently formed from the southern end of Kentwell Avenue along the southern boundary and provides access to the adjoining Site B. The driveway has been formed using recycled concrete aggregates.

The twin tunnels of the Sydney Metro North West rail line pass below the southern part of the site, beneath Lots A, D and F. Survey data for the tunnels, as provided by BG&E, shows a stepped, rectangular rail reserve around the twin tunnel cross-section. Reference to the survey data indicates that the stepped zones of the reserve underlie the site with the top of the rail reserve reportedly at reduced levels of RL 119.7 and RL 111.7, reducing to the west. Comparing these levels with existing ground surface levels indicates that the top of the rail reserve is approximately 13 m to 15 m deep.

3. Regional Mapping

3.1 Geology

Reference to the Sydney 1:100 000 Geological Sheets indicates that the site is underlain by Ashfield Shale, which overlies the Mittagong Formation and then the Hawkesbury Sandstone formation.

Ashfield Shale is part of the Wianamatta Group and typically comprises black to dark-grey shale and laminite (finely interbedded siltstones and fine-grained sandstones) with the overlying residual soils typically comprising moderately to highly reactive silty clay and clay.

The Mittagong Formation is a transitional geological sequence between the Ashfield Shale and the underlying Hawkesbury Sandstone and is a relatively thin formation of variable thickness, typically less than about 6 m thick. It typically comprises interbedded shale, laminite and fine-grained quartz sandstone.

Hawkesbury Sandstone typically comprises medium to coarse-grained quartz sandstone, with some minor shale and laminite lenses.

Boreholes drilled as part of DP's investigations have encountered rock belonging to the Ashfield Shale within the proposed excavation depth and the underlying Mittagong Formation. The top of the Hawkesbury Sandstone formation was identified in some of the deeper boreholes which penetrated to depths of 20 m or more.

The Ashfield Shale formation typically includes irregularly spaced joints dipping between 30 and 60 degrees from horizontal with a wide range of orientations, whereas the underlying Hawkesbury Sandstone formation typically includes two sets of near vertical joints trending approximately NNE (020°) and ESE (110°). Shallow dipping (20° to 30°) thrust faults with associated clayey seams are also common within the above geological units.

3.2 Soil Landscapes

Reference to the 1:100 000 Soil Landscapes of Sydney Sheet indicates that the natural soils on the site belong to the Glenorie soil landscape.

The Glenorie soil landscape is characterised by topography of undulating to rolling low hills on Wianamatta Group shales, with local relief to 50 m to 80 m and slopes of 5% to 20%, typically represented by narrow ridges, hillcrests and valleys. This is a residual soil landscape, which the mapping indicates comprises multiple soil horizons that range from deep yellow podzolic soils

comprising mostly clays on lower slopes; humic gleys, yellow podzolic soils (clays) and gleyed podzolic soils along drainage lines; shallow to moderately deep red podzolic soils on crests; and moderately deep red and brown podzolic soils on upper slopes. These soils typically have a high soil erosion hazard, exhibit localised areas of impermeable highly plastic subsoil and are typically moderately reactive.

3.3 Soil Salinity

The NSW Salinity Potential map for Western Sydney indicates a moderate salinity potential category is relevant for the site and its immediate surrounds. The mapping is based on soil type, surface level and general groundwater considerations but is not generally 'ground-truthed', hence actual soil salinity may differ.

3.4 Groundwater Bore Database

An NSW Office of Water groundwater bore search was conducted for the site. There were no groundwater bores identified within 400 m of the site. The closest groundwater bores are more than 400 m away to the east and north-east and lie on the opposite side of a north-south trending ridgeline along which Old Northern Road is located. The bore data indicates groundwater depths of between 10 m and 15 m, although the data from these bores is unlikely to represent the conditions below Site B.

4. Previous Investigations

4.1 Investigation Details

Since 1972, DP has undertaken several investigations for multiple projects across the greater Castle Towers Shopping Centre and adjoining QIC-owned sites. A list of the more recent DP geotechnical investigations which included data from or near the Site B area is presented below.

Table 1: Previous Investigations undertaken on or near Site B

Project No.	Deep Cored Boreholes	Shallow Augered Boreholes	Test Pits	Date
43863	108, 110, 111, 112, 113, 114, 115, 116			Apr 2006
43863A		208, 209, 210, 211, 212, 213, 214		Apr 2006
84335.00	401, 402, 404, 405	P1, P2, P3, P4, P5, P6		June-July 2014
84335.02	501, 502, 503, 504, 523	TP1, TP2, TP3		Mar-Jun 2015
84335.05			TP13, TP14, TP15, TP16, TP17	Dec 2015
84335.14	901, 902, 903	904, 905	WTP1 to WTP12	Mar-Apr 2022

A groundwater monitoring well was installed in BH404 and a data logger set up to record groundwater levels on a twice daily basis between July 2014 and March 2016.

The approximate locations of the tests are shown on Drawing 2 in Appendix C, and copies of the original logs and core photographs are included in Appendix D as follows:

- Appendix D1 – Deep cored boreholes
- Appendix D2 – Shallow augered boreholes
- Appendix D3 – Test Pits

4.2 Geotechnical Units

In the previous investigation reports a standard terminology was used to define the soil and rock units identified in the area. For this assessment all the logs and core photos from the previous investigations in the Site B area were reviewed again and the terminology modified slightly to suit the rocks found on Site B, while remaining generally consistent with the previous reports for the overall area.

Table 2: Interpreted Geotechnical Units

Unit	Typical Description	Typical Core Photograph
1	**Fill, soils and extremely weathered rock** Pavement layers, fill, residual clays and extremely low strength bedrock.	
2a	**Highly to moderately weathered laminite or siltstone** Variable in strength ranging from very low to medium strength, including some high strength bands, shaly clay and iron cemented layers. Fragmented to highly fractured.	
2b	**Moderately to slightly weathered laminite or siltstone** Mostly medium to high strength but with occasional lower and higher strength bands. Variable in strength ranging from extremely low to medium strength, including some high strength bands, shaly clay and iron cemented layers, Fractured to slightly fractured. Joints generally dip at 35 to 80 degrees with a high proportion dipping between 55 and 80 degrees.	

Unit	Typical Description	Typical Core Photograph
3	**Fresh stained to fresh laminite** High strength, light and dark grey laminite with some medium strength bands, Fresh stained to fresh, Slightly fractured to unbroken, Joints generally dip at 35 to 80 degrees with a high proportion dipping between 55 and 80 degrees.	
4	**Fresh black siltstone** Medium to high strength, dark grey and black siltstone Fresh and fresh stained. Slightly fractured to unbroken. Joints dip at 20 to 90 degrees with a significant proportion dipping between 45 and 90 degrees. This unit is also fractured to highly fractured at some bore locations.	
5a	**Mittagong Formation** Irregularly interbedded fine grained light grey sandstone and dark grey siltstone High and very high strength. Fresh with some slightly weathered bands. Slightly fractured to unbroken.	
5b	**Hawkesbury Sandstone** Medium and coarse grained, medium and high strength quartz sandstone. Fresh with some slightly weathered bands. Slightly fractured to unbroken	

4.3 Interpreted Depths and Levels of Units

The interpreted depths below ground level and RLs to the top of each of the above units are summarised in Tables 3 and 4. It should be noted that there is often a gradational change between strata rather than a hard boundary, so these interpreted depths and levels are approximate only. Also, not all units are present in all bores. This may be due to faulting but is more likely due to the inherent variability of the sedimentary rocks.

Table 3: Summary of Interpreted Strata Depths from the deep cored boreholes

Bore No.	Depth to Top of Unit (m)						
	Unit 1	Unit 2a	Unit 2b	Unit 3	Unit 4	Unit 5a	Unit 5b
43863.00 - 2006 Investigation							
108	0	1.8	4.5	6.4	10.9	>13.9	-
110	0	2.6	-	-	9.0	9.9	15.8
111	0	4.6	5.6	6.8	9.3	13.9	>15
112	0	3.0	6.2	-	7.8	11.5	>15
113	0	1.5	5.2	-	8.3	12.7	>15
114	0	7.1	-	-	-	7.1	12.3
115	0	4.7	-	8.0	-	9.4	>11
116	0	3.5	6.0	7.1	-	8.3	>9
84335.00 - 2014 Stage 1 Investigation							
401	0	2.5	3.7	-	6.4	>10	-
402	0	1.5	5.8	-	6.8	11.8	>14
404	0	-	3.3	6.5	11.6	>15.9	-
405	0	1.6	4.0	6.5	9.8	14.4	>16
84335.02 - 2015 Stage 2 Investigation							
501	0	2.6	4.8	6.8	9.9	13.5	17.6
502	0	3.5	5.5	-	8.1	13.7	19.3
503	0	2.8	4.1	6.2	11.9	15.4	19.5
504	0	-	1.5	7.3	8.8	13.0	19.1
523	0	1.9	5.3	-	8.1	11.4	17.8
84335.14 – 2022 Woodward Leisure Centre Investigation							
901	0	1.5	5.0	8.3	-	12.3	>13
902	0	4.6	-	-	-	6.8	>10
903	0	4.1	5.1	7.2	-	8.2	>9

Table 4: Summary of Interpreted Strata Levels from the deep cored boreholes

Bore No.	RL to Top of Unit (m AHD)						
	Unit 1	Unit 2a	Unit 2b	Unit 3	Unit 4	Unit 5a	Unit 5b
43863.00 - 2006 Investigation							
108	133.2	131.4	128.7	126.8	122.3	<119	-
110	130.6	128.0	-	-	121.6	120.7	114.8
111	132.4	127.8	126.8	125.6	123.1	118.5	<117
112	128.4	125.4	122.2	-	120.6	116.9	<113
113	129.3	127.8	124.1	-	121.0	116.6	<114
114	124.4	117.3	-	-	-	117.3	112.1
115	118.1	113.4	-	110.1	-	108.7	<107
116	118.7	115.2	112.7	111.6	-	110.4	<109

Bore No.	RL to Top of Unit (m AHD)						
	Unit 1	Unit 2a	Unit 2b	Unit 3	Unit 4	Unit 5a	Unit 5b
84335.00 - 2014 Stage 1 Investigation							
401	132.0	129.5	128.3	-	125.6	<122	-
402	131.3	129.8	125.5	-	124.5	119.5	<117
404	133.4	-	130.1	126.9	121.8	<117	-
405	130.7	129.1	126.7	124.2	120.9	116.3	<115
84335.02 - 2015 Stage 2 Investigation							
501	132.6	130.0	127.8	125.8	122.7	119.1	115.0
502	127.1	123.6	121.6	-	119.0	113.4	107.8
503	133.2	130.4	129.1	127.0	121.3	117.8	113.7
504	129.3	-	127.8	122.0	120.5	116.3	110.2
523	128.3	126.4	123.0	-	120.2	116.9	110.5
84335.14 – 2022 Woodward Leisure Centre Investigation							
901	128.4	126.9	123.4	120.1	-	116.1	<115
902	123.5	118.9	-	-	-	116.7	<114
903	122.4	118.3	117.3	115.2	-	114.2	<113

In terms of fracturing, typically the Unit 2a was fragmented to highly fractured, while the less weathered Unit 2b was more typically fractured to slightly fractured. In both cases, and also for Units 3 and 4, there were often moderately steeply dipping joints at 35 to 60 degrees below horizontal. These joints were commonly described as planar and smooth and, if they are continuous, have the potential to form large unstable wedges in vertical cuts.

The depth of fracturing varied between boreholes. In most boreholes the rock was typically highly fractured down to depths of 7-8 m below ground level, however in BH401 and BH404 there was very little fracturing for the full depth of drilling, while in BH113 all the cored rock was fractured and highly fractured, with a fault zone identified at a depth of about 14 m. Other evidence of faulting was identified in BH501 at about 17.1 m to 18.1 m depth.

All test pits excavated as part of the investigations were terminated within Unit 1 materials or on top of Unit 2a.

4.4 Groundwater

No free groundwater was observed in any of the boreholes during auger drilling. The use of water as a drilling fluid during diamond core drilling of the bedrock precluded any further observations of groundwater inflow. Previous investigations in this area and on adjoining sites have indicated that permanent groundwater levels probably lie several metres below the base of the proposed lowest basement floor level.

Monitoring of groundwater level in BH404 between July 2014 and March 2016 typically gave levels of RL 128 to RL 129 (4-5 m below ground level) and immediately after periods of heavy rainfall there were short sharp peaks to levels of about RL 131. These results suggest that in this well there is a direct

connection to surface water, either by inadequate sealing of the well and cap or through highly permeable defects in the soil or rock.

Groundwater conditions are typically affected by factors such as soil permeability and seasonal weather conditions and will vary with time.

5. Proposed Development

Site B is divided into Lots A to F (see Figure 2). The proposed development on each of these lots will comprise two or three multistorey buildings constructed over basements on each lot which range in depth from single level to four levels.

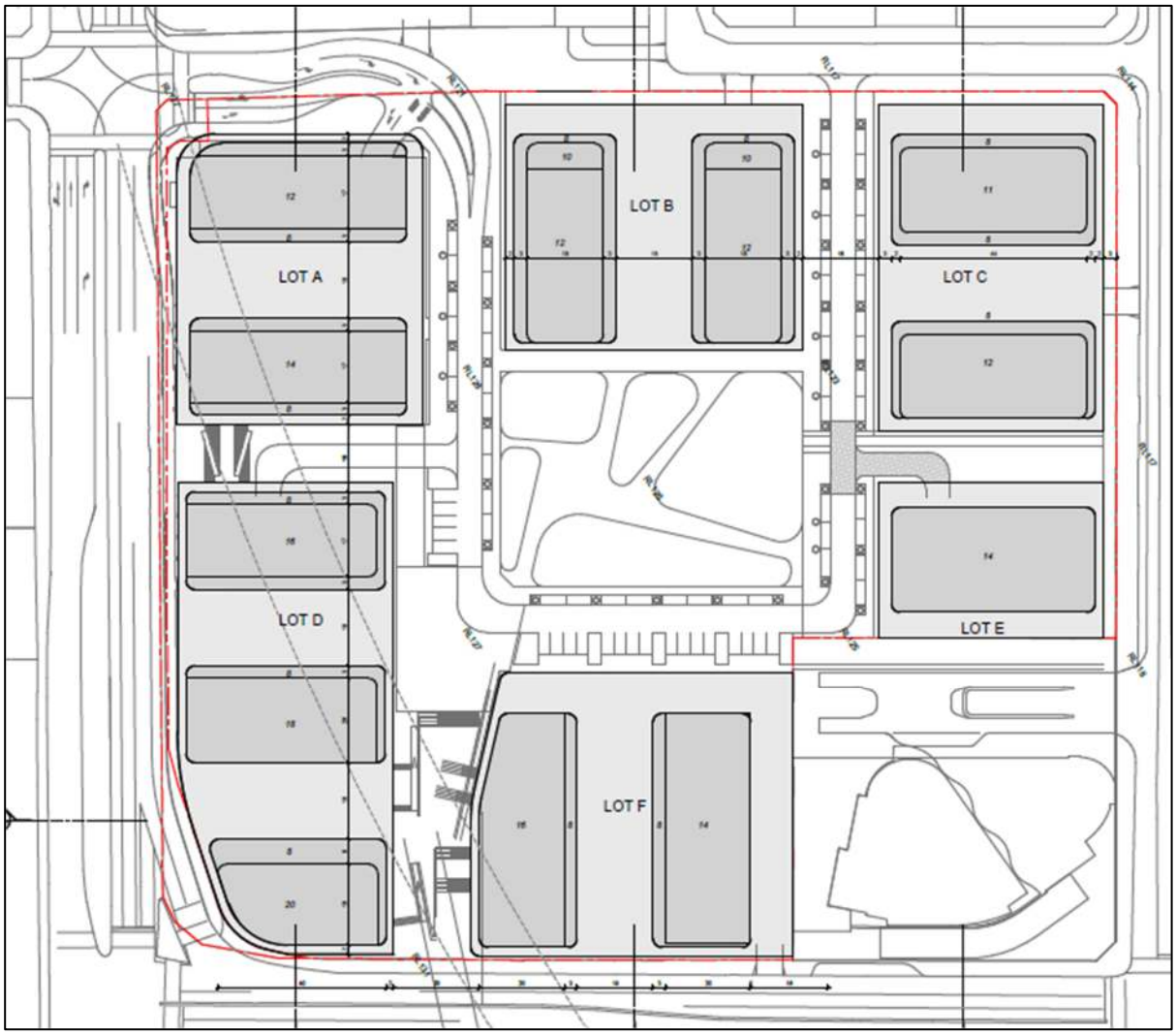


Figure 2: Proposed Lots A to F

Preliminary architectural drawings for the development were prepared by the project architects Clarke Hopkins Clarke, dated March 2022. A selection of site and floor plans, elevations and sections from the full architectural drawing set are presented in Appendix B and an indicative section is shown in Figure 3.

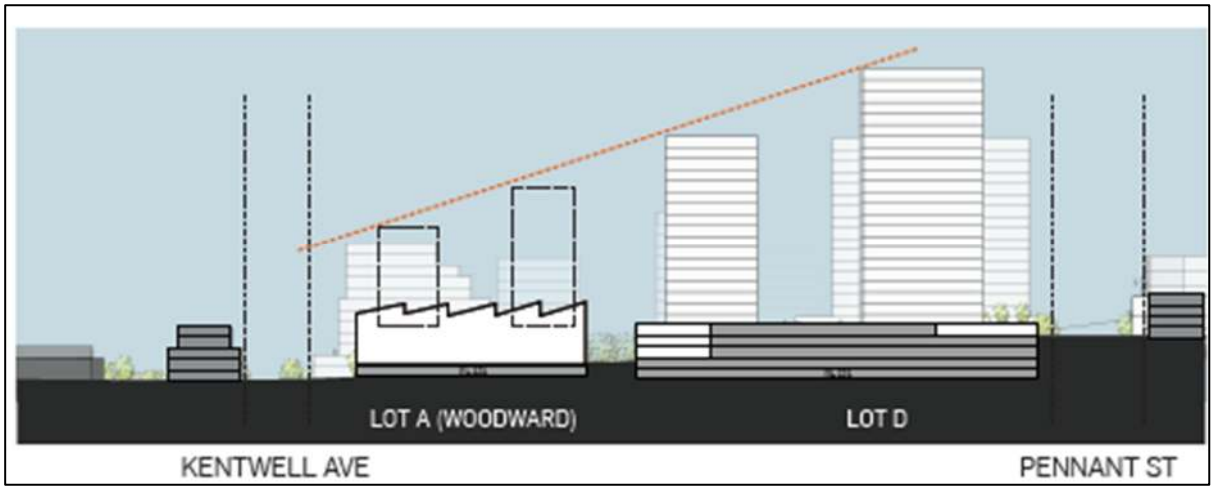


Figure 3: Indicative section through site

Preliminary plans indicate the following bulk excavation levels for each of the lots:

- Lot A – RL 121 m
- Lot B – RL 116 m
- Lot C – RL 113 m
- Lot D – RL 121 m
- Lot E – RL 113 m
- Lot F – RL 121 m

With reference to the existing ground levels over the site, which range from about RL 134 m near the southern corner to about RL 115 m at the northern corner, excavation will be required for the developments on all the lots, with maximum depths of about 13-14 m in the southern corner of the site.

Existing tunnels for the Sydney Metro North West pass below the southern portion of the site (as sketched on Figure 2). It is understood that the top of the Sydney Metro North West rail reserve lies at about RL 119.7 m, which is about 1 m below the proposed basement levels (of RL 121 m) on this part of the site. The effects of the excavation and the application of building loads over the rail reserve will need to be separately analysed in detail as Sydney Metro and/or TfNSW will require a geotechnical impact assessment to be undertaken for any proposed development within the rail tunnel reserve.

6. Comments

6.1 Interpreted Geological Model

The depths and levels of the interpreted geotechnical units at each of the boreholes are presented in Tables 3 and 4. As indicated, there is some variability between boreholes, and not all units are present at all locations, but in very general terms the subsurface profile can be summarised as follows:

Table 5: Summary of Interpreted profile

Unit	Description	Average thickness (m)	RL to top of unit (m)		
			Average	Highest	Lowest
1	Fill, soil and extremely weathered rock	3.1	128.4	133.4	118.1
2a	HW-MW, fractured laminite/siltstone	1.6	125.0	131.4	113.4
2b	MW-SW, M-H laminite/siltstone	2.3	124.7	130.1	112.7
3	Fr, M-H laminite	2.1	121.4	127.0	110.1
4	Fr, M black siltstone	2.3	121.8	125.6	119.0
5a	Mittagong Formation – variably interbedded fine-grained sandstone and siltstone, typically Fr and H	5.9	116.2	120.7	108.7
5b	Hawkesbury Sandstone – medium to coarse grained quartz sandstone, typically SW and H	-	112.0	115.0	107.8

Notes: laminite = finely interbedded dark grey siltstone and light grey, fine grained sandstone
HW = Highly weathered
MW = Moderately weathered
SW = Slightly weathered
Fr = Fresh (unweathered)
M = Medium strength
H = High strength

Indications of faults were identified in some boreholes although the available evidence suggests the faults are mostly minor. It must be assumed, however, that some faulting will be encountered in the sides of the proposed bulk excavations and that additional geotechnical inspection and assessment will be required during site excavation. It is likely that some areas of the proposed excavation will require additional localised support through the installation of additional rock bolts and shotcrete.

Knowledge gained from multiple investigations across the greater Castle Towers Shopping Centre and adjoining QIC-owned sites indicates that groundwater levels lie well below the proposed excavation depths. It is therefore considered likely that drained basements will be appropriate for the site, but additional specific groundwater monitoring will be required during the detailed design investigations in order to obtain site specific information which can be provided to the relevant approval authorities.

Due to the variability in the strata and their levels across the site, specific geotechnical reports will need to be prepared for each site and additional investigations will be required for those lots where there is currently only limited information. The following advice provides generalised information for preliminary planning purposes only.

6.2 Excavation Conditions

The proposed excavations are expected to be up to 13-14 m deep on the higher parts of the site. With reference to the recorded depths of each unit at the deep cored boreholes given in Table 3, it is likely that the deeper excavations will penetrate through Units 1 to 4 and probably into the top of Unit 5a.

Excavation within the pavements, fill, soil profile and extremely to highly weathered, fractured to fragmented rock (i.e. Units 1 and 2a) should be readily achieved by conventional earthmoving equipment such as hydraulic excavators. Some light to medium ripping using a tyne, or the use of rock hammers may be required for layers of stronger rock that are interbedded within Unit 2a.

Excavation within medium and high strength bedrock (i.e. Unit 2b, Unit 3, Unit 4 and Unit 5a) will require medium to heavy ripping, depending on the defect frequency and spacing. The use of large hydraulic rock breakers may be required in areas where very high strength bands or medium strength bedrock with widely spaced fracturing is present. The use of hydraulic rock breakers and possibly a rock saw is anticipated for excavation of footings and trenches in these units.

Any excavated material to be removed from site should be tested for contaminants to allow Waste Classification Assessment in accordance with current NSW EPA requirements.

The results of groundwater monitoring in the area indicate the presence of groundwater at depths of between 2 m and 10 m below existing ground surface levels at the monitoring bore locations. Reference to the borehole log descriptions for these bores indicates that the groundwater surface is typically positioned within the more fractured Unit 2b materials near the contact with Unit 3.

Based on the relatively minor and short term fluctuations of the groundwater levels with rainfall, it is considered that the measured groundwater is primarily perched ephemeral water that will cause intermittent but regular low to moderate seepages that can be adequately managed through standard ‘sump-and-pump’ methods (or drains, subject to available discharge points). Seepage flows are likely to occur mainly along narrow defects within the bedrock and thus relatively small changes in water volumes have substantial but temporary influences on the groundwater levels.

6.3 Vibrations

Excavation of medium and high strength rock using rock hammers will generate vibrations which could potentially damage nearby structures or cause discomfort to residents, therefore it will be necessary to adopt appropriate construction methodologies and equipment to limit vibrations to acceptable levels at adjoining building locations.

Using rock saws or milling heads attached to excavators usually reduces the levels of vibrations, and it may be possible to cut a perimeter trench around excavations in rock using a rock saw to limit the vibrations transmitted to the surrounding ground.

The level of acceptable vibration is dependent on various factors including the type of building or structure (e.g. reinforced concrete, brick, brick-veneer, etc.), its structural condition, the frequency range of vibrations produced by the excavation plant, the natural frequency of the building and the vibration transmitting medium.

Ground vibration can be strongly perceptible to humans at levels above 2.5 mm/s peak particle velocity (PPVi). This is generally much lower than the vibration levels required to cause structural damage to buildings. The Australian Standard AS2670.2-1990 *Evaluation of human exposure to whole-body vibrations – continuous and shock induced vibrations in buildings (1-80 Hz)* indicates an acceptable day time limit of 8 mm/s PPVi for human comfort.

Based on the experience of DP and with reference to AS2670, it is suggested that a maximum PPVi of 8 mm/s (applicable at the foundation level of existing buildings) be adopted for both architectural and human comfort considerations, although this vibration limit may need to be reduced if there are sensitive structures or equipment in the area.

Subject to the conditions of the adjoining sites at the time of rock excavation, a vibration trial may be considered at the start of excavation to determine if smaller or different types of excavation equipment should be used for bulk or detailed excavations.

6.4 Excavation Support

6.4.1 General

Vertical excavations for the basement levels will require both temporary shoring during construction and permanent retaining wall support as part of the final structures.

Given the highly variable material strength within Units 1, 2a and 2b, and the fractured and jointed nature of the rock, it is recommended that the temporary and permanent support is extended to, and below, the base of Unit 2b.

Vertical excavation within the medium to very high strength rock of Units 3, 4 and 5 will require regular inspections of the face by an experienced engineering geologist or geotechnical engineer for every 1.5 m depth of excavation. Allowance should be made for the rock bolting of any adversely dipping joints and/or faults detected during the geotechnical inspections.

The design of all temporary and permanent retaining walls should consider the possibility of mass instability due to ‘mobilised wedges’ sliding along inclined joints or faults, particularly within the less weathered bedrock. In addition, an allowance should be made for the shotcreting (with reinforcing mesh and galvanised steel dowels) of all siltstone, laminite and shale faces regardless of rock strength, as well as all clay seams and lower strength rock bands, to prevent the otherwise inevitable weathering and progressive degradation of this type of rock, when exposed over the longer term.

Detailed on-going inspection of the excavated rock faces will be required to check for the presence of laterally continuous moderately dipping (inclined) joints that are aligned parallel or near-parallel to the excavation perimeter. Although the probability of such joints is low, if present, they can result in significant instability that can lead to large scale failures of inadequately supported excavations. Appropriate protection and support may include the incorporation of large shear walls and structural propping via floor slabs or the installation of permanent anchors on a grid basis across the excavation face.

Soldier pile walls with reinforced shotcrete infill panels are likely to be suitable options for temporary shoring support. Where the soldier piles extend to below the base of the excavation, an appropriately

determined additional pile socket depth (not less than two pile diameters plus the depth of any adjoining existing or proposed footing excavation, service trench or similar), can be used for lateral support of the pile toe. Additional and higher level lateral support can be provided by either the cantilever action of the soldier pile, where excavation depths are limited, or by regularly vertically spaced 'tie-back' ground anchors.

Where the soldier piles do not extend to the base of the excavation, at least two rows of temporary ground anchors, together with walers, will be required to adequately support the excavation face and 'lock-in' the soldier pile. The soldier piles should extend a minimum distance of 1 m or two pile diameters, whichever is greatest, into medium or high strength Unit 3 or Unit 4 rock immediately below the Unit 2b material. The installation of toe anchors is considered necessary given the fractured nature of Unit 2b and the possibility of adversely aligned joints and the potential for unstable rock wedges to develop during excavation following soldier pile construction. Detailed geotechnical inspection of the rock immediately below the base of the soldier piles should be carried out to check for the presence of adversely oriented defects. If present, such defects will need to be rectified by installing additional rock bolts and/or anchors, as appropriately determined at that time.

Approval should be sought from The Hills Shire Council (Council), Sydney Metro Authority (SMA) and adjoining property owners, where temporary or permanent ground / rock anchors extend onto neighbouring properties, roads or public access areas. Where possible, the proposed building floor slabs should be used to provide long-term permanent support for all basement retaining walls.

Excavation of a soldier pile / infill panel wall system should proceed in vertical lifts of no greater than 1.5 m. At the completion of each excavation lift, reinforced infill panels should be constructed. At no stage should progressive vertical excavation proceed beyond 2 m without the infill panel support being constructed. It is possible that adverse jointing may cause localised instability in the exposed material between the soldier piles which may require additional remedial measures prior to shotcreting.

Appropriate drainage will need to be provided behind the retaining walls. Strip drains should be installed behind the shotcrete of the soldier pile / infill panel wall system at maximum 2 m centres.

An allowance should be made for the shotcreting (i.e. with reinforcing mesh and galvanised steel dowels) of all siltstone and laminite faces regardless of rock strength, as well as all clay seams and lower strength rock bands, to prevent the otherwise inevitable weathering and progressive degradation of this type of rock, when exposed over the longer term.

Within areas that are potentially affected by faults or deeply weathered soil/rock profiles, it is recommended that an experienced geotechnical engineer or engineering geologist is present on site full-time during excavation and the installation of retaining structures to assess the founding conditions and determine if the shoring requires deepening.

It will be necessary to identify the founding conditions for any existing structural footing immediately adjoining or close to the excavation perimeter. Where the shoring system is required to support high level adjoining footings or other similar structural loads, a soldier pile/infill panel wall system is generally not recommended as there is a high risk of the footings being undermined during the period between staged excavation and installation of the temporary support. In such cases, an anchored contiguous pile wall would generally be more appropriate.

6.4.2 Temporary Batters

The following maximum slopes are recommended for any temporary excavation batters.

Table 6: Maximum Recommended Temporary Batter Slopes

Unit	Description	Maximum Temporary Batter
1	Fill, soil and extremely weathered rock	1H :1V
2a	HW-MW, fractured laminite/siltstone	1H :1V
2b	MW-SW, M-H laminite/siltstone	1H :1V
3	Fr, M-H laminite	0.5H :1V
4	Fr, M black siltstone	0.5H :1V
5a	Mittagong Formation – variably interbedded fine-grained sandstone and siltstone, typically Fr and H	Vertical #
5b	Hawkesbury Sandstone – medium to coarse grained quartz sandstone, typically SW and H	Vertical #

Notes: # subject to inspection by experienced geotechnical personnel to identify any adversely oriented defects

In Units 2a and 2b there are numerous moderately dipping joints (typically at 45 degrees from horizontal) which will potentially cause vertical excavations to fail and accordingly maximum slopes of 1H:1V are recommended for these units. In Units 3 and 4 the frequency of these adversely oriented joints is less but still possible, therefore slightly steeper temporary slopes are suggested. In Units 5a and 5b adverse defects are much less likely, but still possible, so it is suggested that vertical excavations could be used, provided that they are regularly inspected during excavation by experienced geotechnical personnel.

6.4.3 Design of Lateral Support

The need to provide shoring and permanent retaining wall support to Units 1, 2a and 2b., but not to Units 3 to 5 (subject to geotechnical inspection and confirmation during construction) means that for some of the deeper excavations the shoring walls could potentially be terminated above the base of the excavation. Lateral support of such structures will require two or more rows of temporary anchors, which will ultimately be replaced in the permanent case by the bracing action of two or more floor slabs within the new building. If, however, the perimeter shoring piles are required to carry vertical structural compression loads then they will need to found below the base of the excavation and probably to a greater socket depth. This will require the drilling of end bearing piles through high strength rock.

The design of temporary and permanent shoring walls should consider loads acting on the walls due to both lateral earth pressures due to soils and weathered rock and potential unstable ‘mobilised wedges’ caused by a combination of adversely oriented defects within the less weathered rock. Design should adopt the more conservative approach or, as a minimum, include provision for both design approaches. For the design for lateral earth pressures, it is suggested that a simplified, and potentially conservative, lateral earth pressure distribution can be adopted for design of multi-propped temporary and permanent walls. A more refined analysis of the wall, that could account for the soil-structure interaction during

progressive excavation and anchoring stages, would require detailed modelling using computer programs such as WALLAP or FLAC.

For a shoring wall that is anchored or propped at multiple levels, the preliminary design for lateral earth pressures could be based on the following, where 'H' is equal to the depth of the excavation to be retained in metres.

- Over the depth of Unit 1 and 2a, adopt a uniform lateral earth pressure distribution of 4H during construction and 5H for the permanent case.
- Over the depth of Unit 2b, adopt a uniform lateral earth pressure of 4H for both construction and the permanent case. This may be conservative at some locations where the rock is of higher strength. Given the highly variably nature of the rock strength in Unit 2b, however, it is not possible to reduce the level of conservatism and hence design should adopt the lesser rock strength case.
- Where there are existing footings adjacent to or close to the crest of the proposed shoring / wall, and where wall movement needs to be reduced as far as practical to limit distress to adjoining footings / structures or in-ground services / utilities, then adopt a uniform lateral earth pressure distribution of 6H for the full height of Units 1, 2a and 2b for construction, reducing to 5H for the permanent case.

The calculation of lateral earth pressures should also consider any surcharge loads resulting from adjoining structures, services, pavements, construction plant or similar.

In places, where excavation depths are limited and moderate ground deflections behind the wall are acceptable, it may be possible to adopt cantilevered or single-anchored walls, which could be designed on the basis of the conventional triangular lateral earth pressure distribution, using the following parameters listed in Table 7.

Table 7: Suggested Active Earth Pressure Coefficients and Bulk Unit Weights

Unit	Description	Active Earth Pressure Coefficient		Bulk Unit Weight (kN/m^3)
		Short Term / Temporary	Long term / Permanent	
1	Fill, soil and extremely weathered rock	0.25	0.3	20
2a	HW-MW, fractured laminite/siltstone	0.2	0.25	21
2b	MW-SW, M-H laminite/siltstone	0.15	0.2	22
3	Fr, M-H laminite	10 kPa uniform[1]	10 kPa uniform[1]	24
4	Fr, M black siltstone	10 kPa uniform[1]	10 kPa uniform[1]	24
5a	Mittagong Formation – variably interbedded fine-grained sandstone and siltstone, typically Fr and H	0.0[1]	0.0[1]	24
5b	Hawkesbury Sandstone – medium to coarse grained quartz sandstone, typically SW and H	0.0[1]	0.0[1]	24

Note: 1. A uniform pressure of 10 kPa should be adopted to account for potential defects but subject to inspection and possible revision of lateral restraint, if appropriate.

Where existing footings are present close to the crest of wall, cantilevered walls should be avoided to mitigate the risk of damage due to lateral ground movements. To limit lateral ground movements, design should adopt a coefficient of 'at rest' earth pressure (K_0 = 0.5).

The socketing of the perimeter piles into rock below bulk excavation level will allow the use of passive pressure in the shoring design. Such sockets should extend a minimum of two pile diameters below the bulk excavation level, with the upper pile diameter depth ignored in the passive pressure calculation. Care must be taken not to over excavate the rock (i.e. by rock sawing or excavation of trenches) below bulk excavation level within the vicinity of pile toes socketed and designed for passive pressure. Below a depth of one pile diameter the following ultimate passive pressures listed in Table 8 are suggested, for which an appropriate factor of safety should be applied to limit wall movement.

Table 8: Suggested Ultimate Passive Earth Pressures

Unit	Description	Passive Earth Pressure (kPa)
1	Fill, soil and extremely weathered rock	Nil
2a	HW-MW, fractured laminite/siltstone	400
2b	MW-SW, M-H laminite/siltstone	1000
3	Fr, M-H laminite	4000
4	Fr, M black siltstone	4000
5a	Mittagong Formation – variably interbedded fine-grained sandstone and siltstone, typically Fr and H	6000
5b	Hawkesbury Sandstone – medium to coarse grained quartz sandstone, typically SW and H	6000

Progressive geotechnical inspection of the excavations is important due to the possible presence of faults or steeply dipping joints across the site. They need to be identified as soon as possible during excavation to determine whether the installation of additional anchors is required.

6.4.4 For Mobilised Wedge Loading

The design of the temporary shoring system and the long-term basement walls should also cater for the possibility that a continuous, planar moderately-dipping joint or fault will 'daylight' near the base of the excavation, leading to large wedges of rock becoming unstable during or after bulk excavation. There have been numerous reported large wedge failures or 'near failures' in excavations in the Ashfield Shale formation in Sydney, as described in Andrews & Braybrooke (2001).

For temporary support of large excavations in Ashfield Shale sufficient rock bolting and anchoring is required to prevent movement or sliding along these continuous defects. Anchorages should be designed to cater for a possible mobilised wedge that would give rise to a total anchor force of $4.2*h^2$ (kN/m) along the length of the wall, where h is the full height of the proposed excavation (in metres). This figure is based on an anchor inclination of 10° below the horizontal plane and the following assumed material and strength parameters:

- Planar failure on a joint/fault dipping at 45°, striking parallel to and 'day-lighting' at the toe of the excavation.

- Shear strength at interface: ϕ = 25°, c = 0 kPa.
- Bulk unit weight of shale wedge (γ) = 21 kN/m^3

The calculation of the 4.2*h^2 total anchor force (per metre run of wall) is based on static analysis, and follows the process set out in Hoek & Bray (1981).

A factor of safety of 1.0 against sliding may be adopted for this design approach given that it assumes an unlikely combination of adverse factors, in particular that the key defect would run the full length and height of the excavation.

The 10° anchor inclination is considered to be the flattest angle that can realistically be used which will allow relatively easy anchor installation and grouting. Should there be a requirement to increase the angle of installation of the anchors then, to keep a similar factor of safety, the anchor capacity would need to be increased.

Inspection of the cut faces during the excavation phase is critical and should be carried out by an experienced geotechnical professional to ensure the adequacy of design. The mapping of all actual joints and faults will also allow the recalculation of the horizontal force required to restrain the actual joint wedges present for final support design. It is noted that this approach to permanent support design will however require considerable interaction between the Structural and Geotechnical Engineer during construction.

6.4.5 Ground Anchors

Temporary ground anchors may be used for the lateral restraint of shoring walls and to support potential unstable wedges until such time that the walls are permanently strutted by the building floor slabs. The anchors should preferably have their bond length within rock of Unit 3 or better.

The design of temporary and permanent ground anchors for the support of piled wall systems may be carried out on the basis of the ultimate bond stresses given in Table 9.

Table 9: Bond Stresses for Anchor Design

Unit	Description	Ultimate Bond Stress (kPa)
2a and 2b	HW-SW, fractured laminite/siltstone	200
3, 4, 5a and 5b	Medium strength or better bedrock	1000

Ground anchors should be designed with a minimum 3 m free length that extends beyond an imaginary line drawn upwards at an angle of 45° from the toe of the wall. The above parameters assume that the anchor holes are clean and thoroughly flushed, with grouting and other installation procedures carried out carefully and in accordance with normal good anchoring practice.

6.4.6 Excavation Induced Ground Movements

Deep excavations within slightly fractured or unbroken bedrock often experience some horizontal movement of the excavation face due to stress relief effects. Release of the broad, 'locked-in' earth stresses will generally cause horizontal movements along the rock bedding surfaces and defects. It is

generally not practical to try to restrain the large, broad scale movements associated with stress relief as the forces are very large.

As preliminary guidance, at the midpoint of the crest of a deep excavated face, stress relief may cause a horizontal movement in the order of 1 to 2 mm/m depth of excavation. The amount of horizontal movement diminishes along the crest away from the midpoint, and down the excavated face away from the crest. The movement would be expected to occur progressively during the excavation and should be completed shortly after the completion of excavation.

To reduce the likelihood of damage occurring in adjoining structures and services due to horizontal ground movements in the near surface soils, it is recommended that the shoring walls are designed so as to limit lateral ground movements at the ground surface to no more than 10 mm. This limit will need to be verified following an assessment of sensitive elements within the vicinity of the excavation (e.g. buried assets and adjoining structures).

6.5 Footings

Where possible, structures should be founded on consistent materials to reduce the risk of differential settlement. It is recommended that the major building structures should be founded on rocks of Unit 3, 4, 5a or 5b. These materials may be exposed at the base of deeper excavations, in which case pad or strip footings may be adopted, or otherwise bored piers will be required to reach suitable founding strata.

Preliminary design of footings may be based on the allowable and ultimate bearing pressures outlined in Table 10.

Table 10: Suggested Footing Design Parameters

Unit	Description	End Bearing (kPa)		Shaft Adhesion (kPa)	
		Allowable	Ultimate	Allowable	Ultimate
1	Fill, soil and extremely weathered rock	150	500	15	25
2a	HW-MW, fractured laminite/siltstone	700	3000	70	100
2b	MW-SW, M-H laminite/siltstone	1000	3500	100	150
3	Fr, M-H laminite	3500	30,000	350	400
4	Fr, M black siltstone	3500	30,000	350	400
5a	Mittagong Formation – variably interbedded fine-grained sandstone and siltstone, typically Fr and H	5000	40,000	500	600
5b	Hawkesbury Sandstone – medium to coarse grained quartz sandstone, typically SW and H	6000	60,000	600	1500

Reduced bearing pressures may apply for foundations affected by faults, although such reductions would need to be determined after a review of the specific site conditions.

Tension piles, if required, should be designed based on 70% of the above suggested design parameters and due consideration should be given to cone 'pull-out' failure mechanisms, where applicable. As a guide, the designer should consider both a 90 degree 'included' cone angle extending up from the top of the rock socket and a 60 degree 'included' cone angle extending up from the toe of the pile.

The parameters given above assume that the footing excavations (e.g. pads or piles) are clean and free of loose debris, with pile sockets free of smear and adequately roughened immediately prior to the placement of concrete. It is recommended that all load bearing foundations should be inspected by an experienced geotechnical engineer or engineering geologist and that one-third of all pad footings founding on Units 4 or 5 be spoon tested to test for the presence of seams of weak material. Within the faulted zones, extensions of the footing depths are anticipated and should be allowed for within the design. Pile drilling should be undertaken with full-time geotechnical presence to ensure that an appropriate bearing stratum is reached and that adequate base and shaft cleaning undertaken.

Pads and piles proportioned for the allowable parameters would not be expected to settle more than 1% of their footing width.

For foundations that are positioned close to the edge of unsupported excavations (i.e. within a distance from the edge of the excavation equal to the excavation height) the adopted design bearing pressure should be halved. Where such excavations are supported by shoring/retaining walls, the wall designer must account for the additional surcharge load applied by the footing. Similarly, when calculating the theoretical lateral movement for shoring/retaining walls, the calculations must include the surcharge load associated within nearby footings.

6.6 Effect of Development on Metro Tunnels

The existing Sydney Metro North West tunnels pass beneath the southern part of Site B, beneath the footprints of development on Lots A, D and F. The potential impacts of the proposed development on the tunnels will need to be assessed in detail in order to provide a geotechnical impact assessment for each development. This assessment will require detailed numerical modelling and preparation of separate reports for submission to Sydney Metro and/or TfNSW.

6.7 Earthquake Loading

Given that most of the site is underlain by more than 3 m of residual soil and highly weathered rock, the site is classified as a 'C_e – Shallow Soil Site' site in accordance with the Earthquake Loading Standard AS1170.4-2007.

6.8 Pavement Design

Laboratory CBR tests undertaken on samples obtained from the natural soil profile in the area typically indicated CBR values ranging between 3% and 6%. To allow for variability in the soils, it is recommended that a subgrade CBR value of 3% is adopted for preliminary design of new pavements.

7. Limitations

Douglas Partners (DP) has prepared this report for this project at the corner of Showground Road and Kentwell Avenue, Castle Hill in accordance with DP's fee proposal (Ref. DP's email dated 18 March 2022) and the acceptance received on 6 April 2022 from David Radford of Essence Project Management Pty ltd, on behalf of QIC Ltd. The work was carried out under the agreed terms of the Consultancy Agreement between QIC and Douglas Partners (Contract No. aibb A0131404478v12 120473187, dated 11 November 2015). This report is provided for the exclusive use of QIC Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during several previous investigations by DP on and nearby the site. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

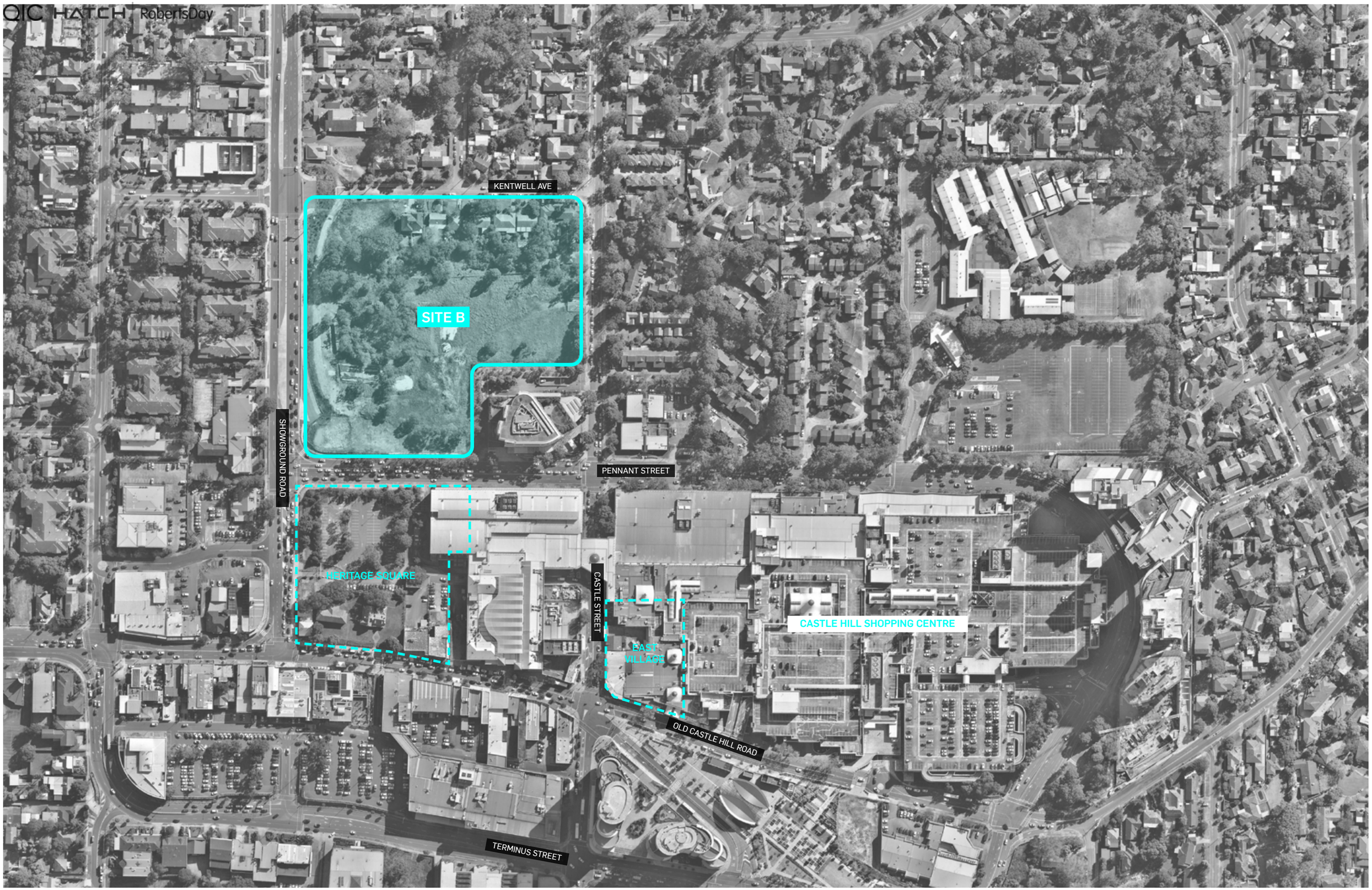
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Architectural Drawings



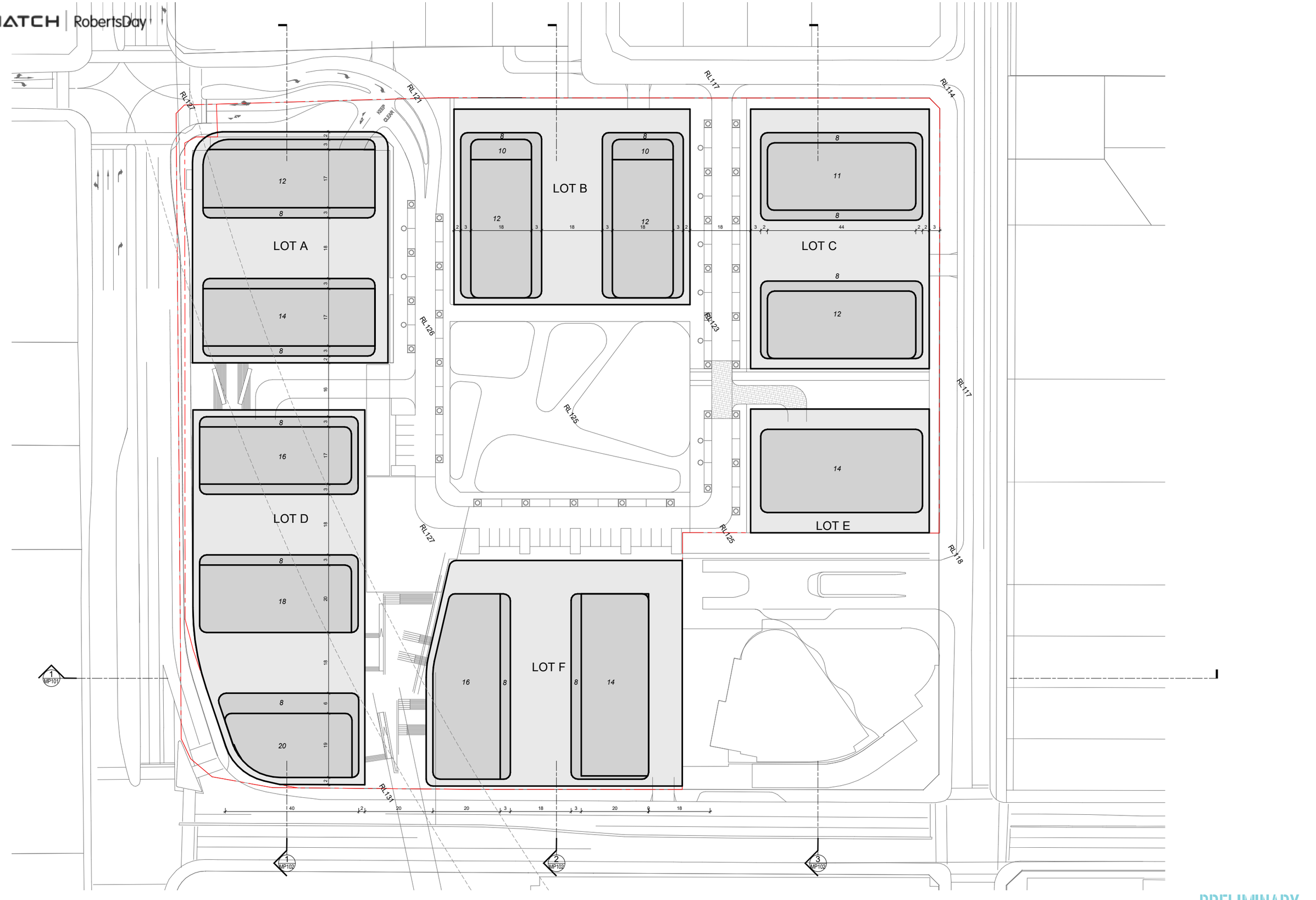
Clarke Hopkins Clarke

CASTLE TOWERS - SITE B
6-14 CASTLE STREET, CASTLE HILL NSW 2154
200121

www.chc.com.au | studio@chc.com.au | 03 9419 4340 | NSW Nominated Architect: Jordan Curran (10259)

SITE LOCATION

28 FEBRUARY 2021



PRELIMINARY

Clarke Hopkins Clarke

CASTLE TOWERS - SITE B
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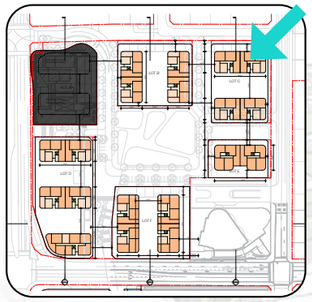
www.chc.com.au | studio@chc.com.au | 03 9419 4340 | NSW Nominated Architect: Jordan Curran (10259)

Scale 1:500 @ A1
Scale 1:1000 @ A3

BUILT FORM PLAN | SK02

28 FEBRUARY 2021



TOTAL

Site	40266 sqm
GFA	147228 sqm
FSR	**3.66**
No. Apartments	1561

LOT D

LOT F

LOT E

LOT B

LOT C

Lot F

Site Area	4526 sqm
GFA	27600 sqm
FSR	**6.10**
Height (levels)	16
No. Apartments	276

Lot D

Site Area	5500 sqm
GFA	42204 sqm
FSR	**7.67**
Height (levels)	20
No. Apartments	441

Lot E

Site Area	2050 sqm
GFA	13680 sqm
FSR	**6.67**
Height (levels)	14
No. Apartments	157

Lot A

Site Area	4000 sqm
GFA	20896 sqm
FSR	**5.22**
Height (levels)	12
No. Apartments	194

Lot C

Site Area	4499 sqm
GFA	21888 sqm
FSR	**4.87**
Height (levels)	12
No. Apartments	252

Lot B

Site Area	4292 sqm
GFA	20960 sqm
FSR	**4.88**
Height (levels)	12
No. Apartments	241

Castle Towers - Site B

28.02.22

Efficiency	0.80
Average Apartment size (m2)	87

Site Area	40266
FSR	3.66
GFA	Apartments
147228	1561

Lot A	5.22 :1 FSR			Max Height 12 Levels : 39m		Site Area 4000		
Building No.	**Levels**	**Use**	**GBA per level**	**No. Levels**	**GBA**	**GFA m2**	**Apartment No.**	
Podium	1 to 3	Commercial	1700	3	5100	4080		
	1 to 3	Residential	1100	3	3300	2640	30	
	Sub Total			**3**	8400	6720	30	
1	4 to 8	Residential	1170	5	5850	4680	54	
	9to 12	Residential	860	4	3440	2752	32	
	Sub Total			**12**	9290	7432	86	
2	4 to 8	Residential	1170	5	5850	4680	54	
	9 to 11	Residential	860	3	2580	2064	24	
	Sub Total			**10**	8430	6744	78	
	Total					**20896**	**194**	

Lot B	4.88 :1 FSR			Max Height 12 Levels : 39m		Site Area 4292		
Building No.	**Levels**	**Use**	**GBA per level**	**No. Levels**	**GBA**	**GFA m2**	**Apartment No.**	
Podium	1 to 3	Residential	2500	3	7500	6000	69	
	Sub Total			**3.0**	7500	6000	69	
1	3 to 8	Residential	1150	6	6900	5520	64	
	9 to 10	Residential	850	2	1700	1360	16	
	11 to 12	Residential	750	1	750	600	7	
	Sub Total			**12**	9350	7480	86	
2	3 to 8	Residential	1150	6	6900	5520	64	
	9 to 10	Residential	850	2	1700	1360	16	
	11 to 12	Residential	750	1	750	600	7	
	Sub Total			**12**	9350	7480	86	
	Total					**20960**	**241**	

Lot C	4.87 :1 FSR			Max Height 12 Levels : 39m		Site Area 4499		
Building No.	**Levels**	**Use**	**GBA per level**	**No. Levels**	**GBA**	**GFA m2**	**Apartment No.**	
Podium	1 to 2	Residential	2720	3	8160	6528	75	
	Sub Total			**3**	8160	6528	75	
1	3 to 8	Residential	1200	5	6000	4800	55	
	9 to 10	Residential	900	4	3600	2880	33	
	Sub Total			**12**	9600	7680	88	
2	3 to 8	Residential	1200	5	6000	4800	55	
	9 to 12	Residential	900	4	3600	2880	33	
	Sub Total			**12**	9600	7680	88	
	Total					**21888**	**252**	

Lot D		7.67 :1 FSR		Max Height 20 Levels : 64m		Site Area 5500		
Building No.	**Levels**	**Use**	**GBA per level**	**No. Levels**	**GBA**	**GFA m2**	**Apartment No.**	
Podium	1 to 3	Commercial	1950	2.5	4875	3900		
	1 to 3	Residential	1700	3	5100	4080	47	
	Sub Total			**3**	9975	7980	47	
1	3 to 8	Residential	1100	6	6600	5280	61	
	9 to 16	Residential	900	8	7200	5760	66	
	Sub Total			**17**	13800	11040	127	
2	3 to 8	Residential	1100	6	6600	5280	61	
	9 to 18	Residential	900	10	9000	7200	83	
	Sub Total			**19**	15600	12480	144	
3	3 to 8	Residential	930	6	5580	4464	51	
	9 to 20	Residential	650	12	7800	6240	72	
	Sub Total			**21**	13380	10704	123	
						42204	**441**	

Lot E		6.67 :1 FSR		Max Height 14 Levels : 45m		Site Area 2050		
Building No.	**Levels**	**Use**	**GBA per level**	**No. Levels**	**GBA**	**GFA m2**	**Apartment No.**	
Podium	1 to 3	Residential	1300	3	3900	3120	36	
	3 to 8	Residential	1200	5	6000	4800	55	
	9 to 14	Residential	1200	6	7200	5760	66	
	Total			**14**		**13680**	**157**	

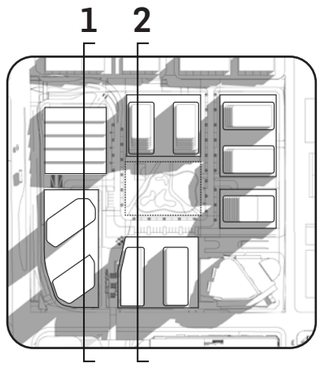
Lot F		6.10 :1 FSR				Site Area 4526		
Building No.	**Levels**	**Use**	**GBA per level**	**No. Levels**	**GBA**	**GFA m2**	**Apartment No.**	
Podium	1 to 3	Commercial	1500	3	4500	3600		
	1 to 3	Residential	1000	3	3000	2400	28	
	Sub Total			**3**	7500	6000	28	
	4 to 8	Residential	1300	5	6500	5200	60	
	9 to 14	Residential	1000	6	6000	4800	55	
Sub Total				**14**	12500	10000	115	
	4 to 8	Residential	1300	5	6500	5200	60	
	9 to 16	Residential	1000	8	8000	6400	74	
Sub Total				**16**	14500	11600	133	
Total						**27600**	**276**	

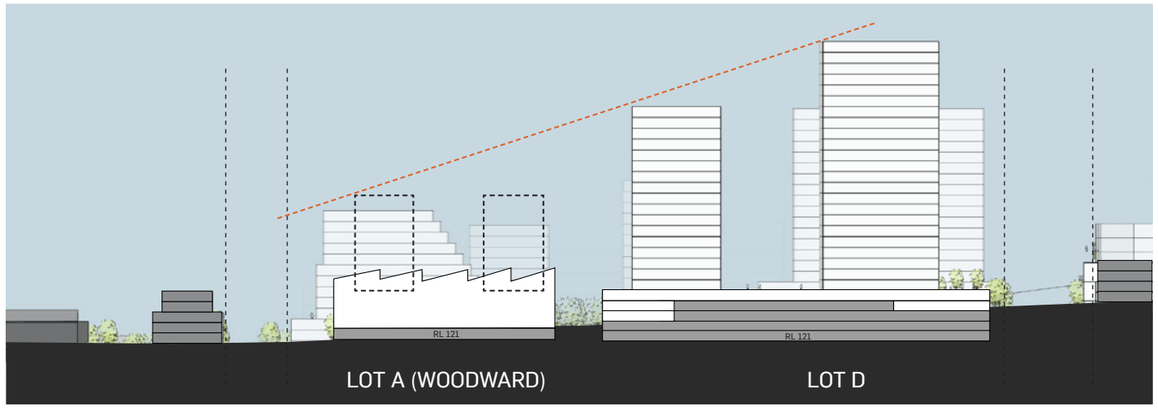
Apartment Typology Areas

Type	Area	Balcony	Apartment Mix
1 bed	55	8.00	0.2
2 bed	76	10.00	0.4
2 bed (family)	110	10.00	0.2
3 bed	100	12.00	0.1
3 bed (family)	135	12.00	0.1
Average Apartment size per typical floorplate			87
Average Balcony size per typical floorplate			10

Notes:
Typical floorplate efficiency discounting balconies, vertical circulation and service risers
GFA Includes all floor area except balconies, vertical circulation and service risers.

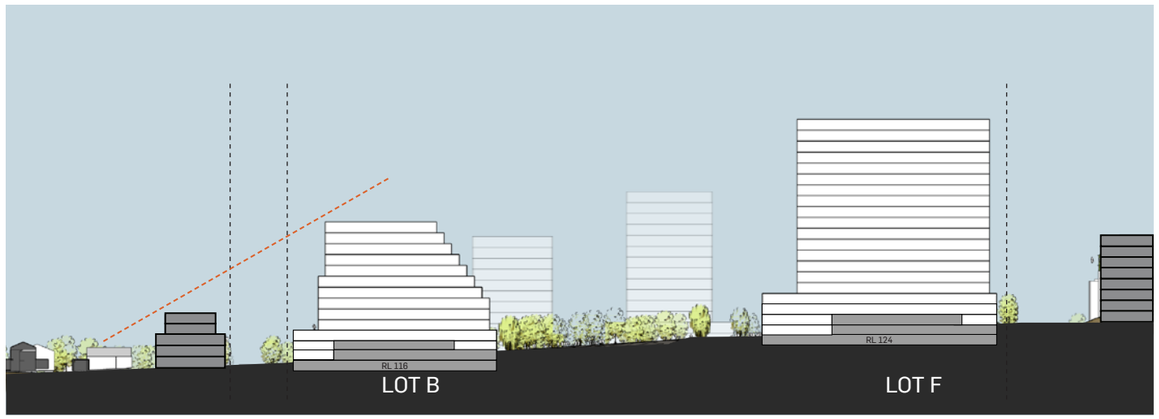
Carparking	Resi cars required
Rate	
0.5	
0.8	
0.8	
1.3	
1.3	
0.84	**1311**
Avg. carparking rate	
Commercial cars	405
Total Cars	1717





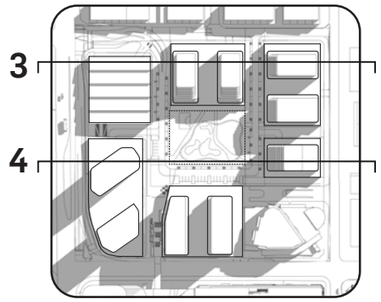
KENTWELL AVE PENNANT ST

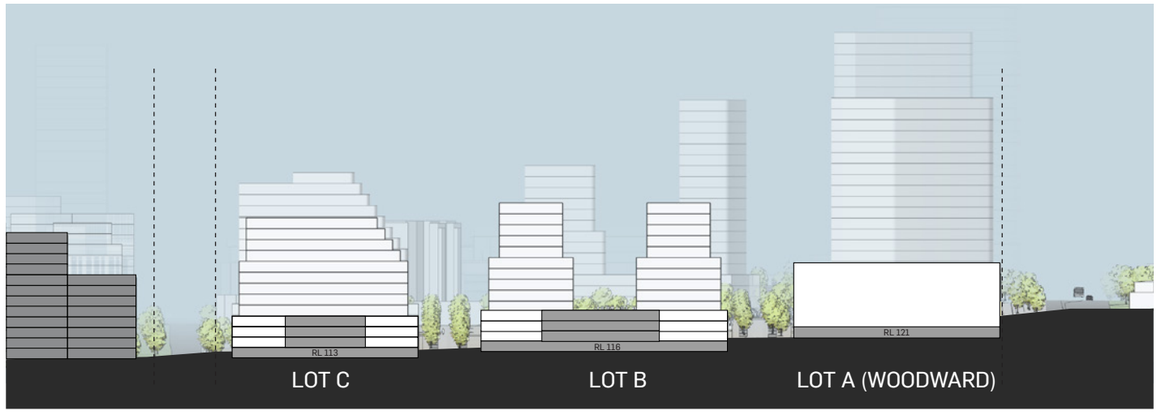
SECTION 1



KENTWELL AVE PENNANT ST

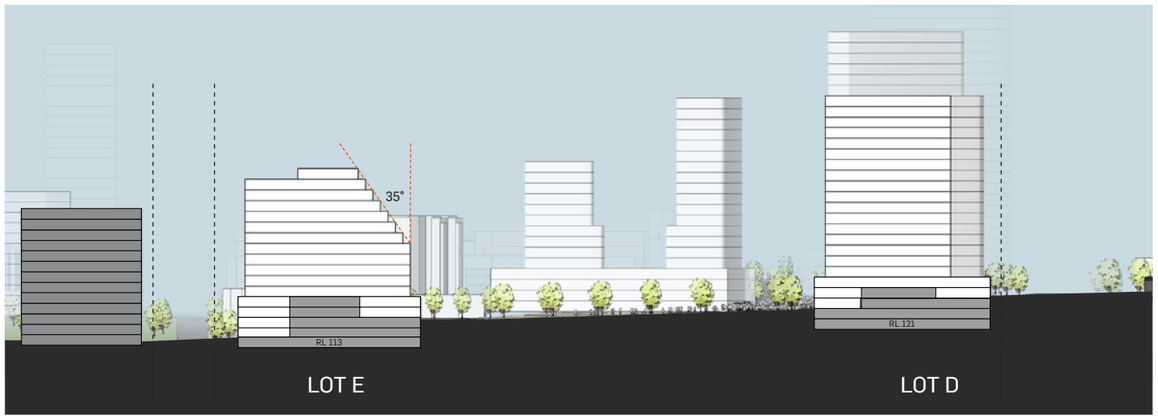
SECTION 2





CASTLE ST SHOWGROUND RD

SECTION 3



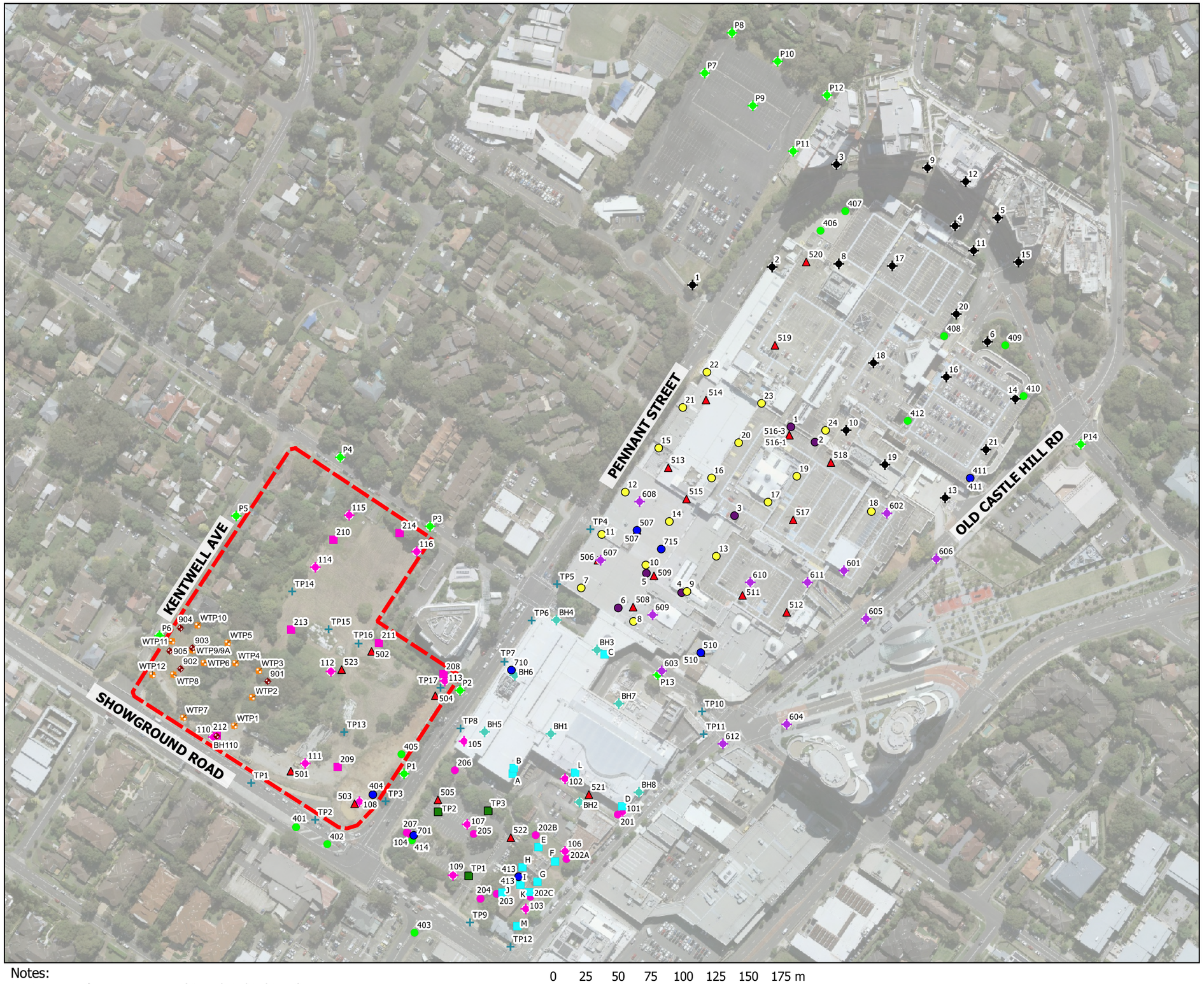
CASTLE ST SHOWGROUND RD

SECTION 4


KENTWELL AVE
SHOWGROUND ROAD
CASTLE STREET
PENNANT STREET
LOT A
RL 121.0
LOT B
RL 116
LOT C
RL 113
LOT D
RL 121.0
LOT E
RL 113
LOT F
RL121
26
20
24
20
24
6
13
20
24
18
20
24
20
24
20
24
24
24
24

Appendix C

DP Drawings



LOCALITY MAP

LEGEND

- Site B
- 2022_Geotechnical Borehole Locations_84335.14
- 2022_Test Pit Locations_84335.14
- Groundwater Well
- 2015_BH601-BH612_84335.05
- 2015_BH501-BH523_84335.02
- 2015_TP13-TP17_84335.05
- 2015_TP1-TP12_84335.03
- 2014_BH401-BH414_84335.00
- 2014_BH P1-BH P14_84335.00
- 2006_BH101-BH116_43863
- 2006_TP208-TP214_43863A
- 2006_BH201-BH207_43863A
- 2006_TP A-TP M_43863
- 2001_TP1-TP3_20438D
- 1995_BH1-BH21_20438
- 1995_BH1-BH8_Coffey
- 1973_BH7-BH24_3852
- 1971_BH1-BH6_3342

Notes:
1. Basemap from Metromap (Dated 22/03/2022)

0 25 50 75 100 125 150 175 m

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	QIC Pty Ltd	TITLE:	**Approximate Test Locations 1972-2022**
OFFICE:	Sydney	DRAWN BY:	MG		**Site B Development**
SCALE:	1:3000 @ A3	DATE:	01.06.2022		**Castle Street, Castle Hill**

N

PROJECT No:	84335.16
DRAWING No:	1
REVISION:	0

LOCALITY MAP

LEGEND

- Site B
- Approximate Boundary of Proposed Lots
- Approximate Boundary of Underlying Rail Tunnel
- 2022_Geotechnical Borehole Locations_84335.14
- 2022_Test Pit Locations_84335.14
- Groundwater Well
- 2015_BH601-BH612_84335.05
- 2015_BH501-BH523_84335.02
- 2015_TP13-TP17_84335.05
- 2015_TP1-TP12_84335.03
- 2014_BH401-BH414_84335.00
- 2014_BH P1-BH P14_84335.00
- 2006_BH101-BH116_43863
- 2006_TP208-TP214_43863A
- 2006_BH201-BH207_43863A
- 2006_TP A-TP M_43863
- 2001_TP1-TP3_20438D
- 1995_BH1-BH21_20438
- 1995_BH1-BH8_Coffey
- 1973_BH7-BH24_3852
- 1971_BH1-BH6_3342

Notes:
1. Basemap from Metromap (Dated 22/03/2022)

0 25 50 75 100 125 m

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	QIC Pty Ltd		
OFFICE:	Sydney	DRAWN BY:	MG
SCALE:	1:1500 @ A3	DATE:	01.06.2022

TITLE: **Approximate Test Locations**
Site B Development
Castle Street, Castle Hill

N

PROJECT No:	84335.16
DRAWING No:	2
REVISION:	0

Appendix D

Results of Previous Boreholes and Test Pits

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with 'Mix of Soil and Cobbles/Boulders' with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- ‘Moist, dry of plastic limit’ or ‘w <PL’ (i.e. hard and friable or powdery).
- ‘Moist, near plastic limit’ or ‘w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- ‘Moist, wet of plastic limit’ or ‘w >PL’ (i.e. soils usually weakened and free water forms on the hands when handling).
- ‘Wet’ or ‘w ≈LL’ (i.e. near the liquid limit).
- ‘Wet’ or ‘w >LL’ (i.e. wet of the liquid limit).

Rock Strength

Rock strength is defined by the Unconfined Compressive Strength and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $Is_{(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Abbreviation	Unconfined Compressive Strength MPa	Point Load Index * $Is_{(50)}$ MPa
Very low	VL	0.6 - 2	0.03 - 0.1
Low	L	2 - 6	0.1 - 0.3
Medium	M	6 - 20	0.3 - 1.0
High	H	20 - 60	1 - 3
Very high	VH	60 - 200	3 - 10
Extremely high	EH	>200	>10

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Residual Soil	RS	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
Extremely weathered	XW	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible
Highly weathered	HW	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Moderately weathered	MW	The whole of the rock material is discoloured , usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock.
Slightly weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	No signs of decomposition or staining.
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.

Rock Descriptions

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections > 100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Douglas Partners

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

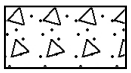
Symbols & Abbreviations

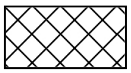
Graphic Symbols for Soil and Rock

General

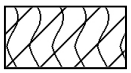

Asphalt

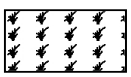

Road base

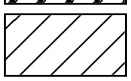

Concrete


Filling

Soils


Topsoil

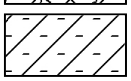

Peat


Clay


Silty clay

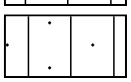

Sandy clay

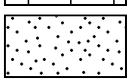

Gravelly clay

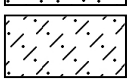

Shaly clay

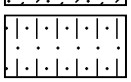

Silt


Clayey silt


Sandy silt

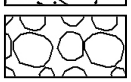

Sand


Clayey sand


Silty sand


Gravel

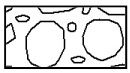

Sandy gravel


Cobbles, boulders

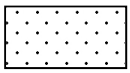

Talus

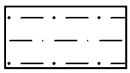
Sedimentary Rocks

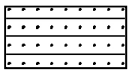

Boulder conglomerate

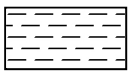

Conglomerate


Conglomeratic sandstone

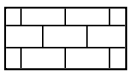

Sandstone


Siltstone

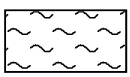

Laminite

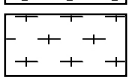

Mudstone, claystone, shale

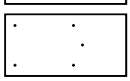

Coal


Limestone

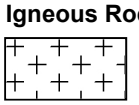
Metamorphic Rocks

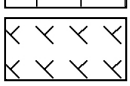

Slate, phyllite, schist

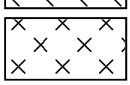

Gneiss

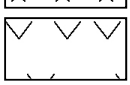

Quartzite

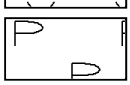
Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

Appendix D1 – Deep Cored Boreholes

BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 133.2 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 108
PROJECT No: 43863
DATE: 19 Apr 06
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
133	0.1	TOPSOIL - brown clayey silt topsoil, with some vegetation										
	0.65	SILTY CLAY - very stiff to hard, orange brown mottled grey silty clay, humid										
132	1	SILTSTONE - very low to low strength, highly to moderately weathered, grey mottled orange siltstone interlaminated with some sandstone layers							S			25/50mm refusal
131	2	- low to medium strength from 1.8m						Unless otherwise stated, rock is fractured along rough, planar, ironstained bedding planes & joints dipping at 0°- 10°				
	3											
	3.3	LAMINITE - medium strength, moderately then slightly weathered, fractured and highly fractured, orange brown and grey laminite, with some very low and extremely low strength, shaly clay bands						3.5m: J75°	C	100	0	PL(A) = 0.3MPa
129	4							4.23m: J50° partially healed 4.28m: J25°				
	5							4.8m: J75° clay veneer 4.85m: J80° 4.93m: J25°	C	100	8	PL(A) = 0.4MPa
128								5.33m: B0°, 5mm clay healed 5.4m: J45°				PL(A) = 0.7MPa
127	6											
	6.26							6.26m: CORE LOSS: 80mm	C	93	43	PL(A) = 2.1MPa
	6.35	LAMINITE - high strength, fresh and fresh stained, slightly fractured, dark and light grey laminite						6.9m: J45°				
	7							7.2m: J35° 3mm clay 7.25m: J35° x 2 7.52m: J45° slickensided	C	100	92	PL(A) = 1.6MPa
125	8							8m: J35° 8.3m: J75° healed				
	9							8.52m: J25° crushed 8.61m: J75°				PL(A) = 1.1MPa
124									C	100	100	

RIG: Multi-Drill Rig **DRILLER:** Tracess **LOGGED:** SI/MMK **CASING:** HW to 0.83m
TYPE OF BORING: Solid flight auger to 3.0m; Rotary to 3.3m; NMLC-Coring to 13.85m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 133.2 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 108
PROJECT No: 43863
DATE: 19 Apr 06
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Type	Core Rec. %	RQD %	Test Results & Comments
123		LAMINITE - high strength, fresh and fresh stained, slightly fractured, dark and light grey laminite *(continued)*						10.3m: J35° 10.55m: J80°	C	100	79	PL(A) = 1.2MPa
	10.9											
122	11	SILTSTONE - high strength, fresh, slightly fractured and unbroken, black siltstone						10.92m: J45°	C	100	98	
121	12							12.1m: J45°	C	100	100	PL(A) = 1.9MPa
	13							13.1m: J90°				PL(A) = 1.3MPa
	13.85	Bore discontinued at 13.85m							C	100	100	PL(A) = 1MPa
119	14											
118	15											
117	16											
	17											
115	18											
114	19											

RIG: Multi-Drill Rig **DRILLER:** Tracess **LOGGED:** SI/MMK **CASING:** HW to 0.83m

TYPE OF BORING: Solid flight auger to 3.0m; Rotary to 3.3m; NMLC-Coring to 13.85m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

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DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSIONS - CASTLE HILL
BORE 108 PROJECT 43863 APRIL 2006
start coring @ 3.3m
4
5
6
7
CORE LOSS 100mm
3.30 — 8.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSIONS - CASTLE HILL
BORE 108 PROJECT 43863 APRIL 2006
8.00 — 13.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSIONS - CASTLE HILL
BORE 108 PROJECT 43863 APRIL 2006
13
END HOLE
13.85
13.00 — 13.85 M

BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 130.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 110
PROJECT No: 43863
DATE: 28 Apr 06
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
130	0.05	ROADBASE - roadbase gravel filling, with yellow brown clay							A			
		SILTY CLAY - orange brown silty clay, with some gravel (possibly filling)							A			
	0.6											
	1.0	SILTSTONE - extremely low then very low and low strength, highly weathered, orange brown and grey siltstone						Note: Unless otherwise stated, rock is fractured along irregular, ironstained bedding plane dipping at 0°- 10°	S			14,28 refusal
129		LAMINITE - low and medium strength, extremely then highly weathered, light brown and grey iron cemented laminite, with some shaly clay bands										
	2											
128	2.6								S			23/60mm refusal
		LAMINITE - alternate bands of medium strength, moderately weathered, iron cemented laminite and grey shaly clay laminations. Generally highly fractured and fragmented						Rock is highly fractured & fragmented from 2.6 to 4.76m, generally along bedding	C	100	0	
	3								C	100	0	PL(A) = 0.3MPa
127												
	4								C	100	0	
126	4.78											
		SILTSTONE - extremely low strength, extremely weathered, slightly fractured, mottled yellow brown siltstone							C	100	65	
	5.28							5.28-7.7m: highly fractured to fragmented				
125		SILTSTONE - medium strength, moderately weathered, highly fractured, orange brown dark grey/black siltstone										PL(A) = 0.4MPa
	6											PL(A) = 0.4MPa
124									C	100	0	
	7											
123									C	100	0	PL(A) = 0.4MPa
	8											
122								8.69m: J50° 8.8m: crushed rock zone				
	9											
	9.0	SILTSTONE - medium strength, fresh stained, slightly fractured, black siltstone						9.25m: J45° smooth	C	100	79	
121	9.85											PL(A) = 0.4MPa
		LAMINITE - see next page						9.92m: J80° stepped				

RIG: Bobcat **DRILLER:** E Grima **LOGGED:** SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 2.6m; NMLC-Coring to 16.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 130.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 110
PROJECT No: 43863
DATE: 28 Apr 06
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
120	10.0	LAMINITE - high strength, fresh, slightly fractured and unbroken, light grey and grey laminite										PL(A) = 1.6MPa
119	11								C	100	100	PL(A) = 1.9MPa
118	12							12.11m: J50°				PL(A) = 1.8MPa
	12.73	SANDSTONE - high strength, fresh, slightly fractured and unbroken, light grey fine grained sandstone										
117	13	13.0-13.47m,13.7-13.95, 14.1-14.25 & 14.85-15.3m: interlaminated sandstone and siltstone							C	100	100	PL(A) = 1.5MPa
116	14											PL(A) = 2.2MPa
115	15							14.91m: J65°, healed				
	16	15.8-16.0m: yellow brown, ironstained sandstone							C	100	88	PL(A) = 2.1MPa
	16.0	Bore discontinued at 16.0m										PL(A) = 1.4MPa
114	17											
113	18											
112	19											
111												

RIG: Bobcat **DRILLER:** E Grima **LOGGED:** SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 2.6m; NMLC-Coring to 16.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

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DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 110 PROJECT 43863 APRIL 2006
2.60 – 7.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 110 PROJECT 43863 APRIL 2006
7.00 — 12.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 110 PROJECT 43863 APRIL 2006
12m
13m
14m
15m
12.00 – 16.00 M

BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 132.4 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 111
PROJECT No: 43863
DATE: 19 Apr 06
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Type	Core Rec. %	RQD %	Test Results & Comments
132	0.15	CONCRETE										
	0.4	FILLING - poorly compacted, brown gravelly clay filling, moist										
		SILTY CLAY - very stiff to hard, orange brown mottled light grey silty clay, humid										
	1											
131	1.35	LAMINITE - extremely low to very low strength, highly weathered, grey mottled orange laminite							S			3,5,10/100mm refusal
	2	- very low and low strength, with some medium strength ironstone bands from 2.0m										
130	3							Note: Unless otherwise stated, rock is fractured along rough, planar, ironstained bedding planes & joints dipping at 0°- 10°				
129	4											
128	4.4	LAMINITE - medium strength, moderately then slightly weathered, highly fractured and fractured, brown, light and dark grey laminite						4.42m: J90°	C	100	53	PL(A) = 0.5MPa
	5							5.02m: J75° irregular	C	100	63	
127								5.22m: J25° clay veneer 5.3m: J30° clay veneer 5.51m: J90° 5.6m: B10° 5.68m: J40° 4-5mm clay 5.75m: J60° 6.02m: J20° 6.1m: J60° 6.29m: J20° 6.34m: J60°	C	100	54	PL(A) = 0.9MPa PL(A) = 1.4MPa
126	6											
	6.5	LAMINITE - high strength, fresh stained then fresh, slightly fractured, light and dark grey laminite										
	7											
125								7.24m: J50° smooth 7.55m: B, ironstained 7.63m: J90° healed 7.84m: J75°	C	100	62	PL(A) = 1.2MPa
	8											
124								8.3m: J60° 8.61m: J45° healed 8.81m: J45° healed	C	100	98	PL(A) = 1.6MPa PL(A) = 1.3MPa
	9											
123								9.29m: B10° slickensided 9.47m: J45° smooth				
	9.6	SILTSTONE - description next page							C	100	99	

RIG: Multi-Drill **DRILLER:** Tracess **LOGGED:** Boyd/SI **CASING:** HW to 1.95m
TYPE OF BORING: Diatube to 0.15m; Solid flight auger to 3.8m; Rotary to 4.23m; NMLC-Coring to 14.94m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

Douglas Partners
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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 132.4 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 111
PROJECT No: 43863
DATE: 19 Apr 06
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Type	Core Rec. %	RQD %	Test Results & Comments
122	10.0	SILTSTONE - high strength, fresh, fractured to slightly fractured, black siltstone						10.04m: J50° clay veneer 10.28m: B10° clay & rock fragments (5mm) 10.4m: J55°	C	100	99	PL(A) = 0.6MPa (brittle failure)
121	11							11.2m: J40° smooth 11.2m: possible crush zone between 11.2 & 11.55m 11.22m: J45° 11.35m: J45° smooth 11.45m: J25° smooth 11.51m: J25° smooth 11.55m: J55° clay veneer	C	100	93	PL(A) = 0.2MPa (brittle failure) PL(A) = 0.9MPa (brittle failure)
120	12											
119	13								C	100	100	PL(A) = 0.6MPa (brittle failure) PL(A) = 1.7MPa
118	14	- with minor sandstone laminations from 13.95m										
	14.15	SANDSTONE - very high strength, fresh, unbroken, light grey fine grained sandstone with some grey siltstone laminations							C	100	100	PL(A) = 3.7MPa
117	14.94	Bore discontinued at 14.94m										
116	15											
115	16											
114	17											
113	18											
	19											

RIG: Multi-Drill **DRILLER:** Tracess **LOGGED:** Boyd/SI **CASING:** HW to 1.95m
TYPE OF BORING: Diatube to 0.15m; Solid flight auger to 3.8m; Rotary to 4.23m; NMLC-Coring to 14.94m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

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DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSIONS - CASTLE HILL
BORE 111 PROJECT 43863 APRIL 2006
START CORE @ 4.23m
3
6
7
8
4.23 — 9.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSIONS - CASTLE HILL
BORE 111 PROJECT 43863 APRIL 2006
9
10
11
12
13
9.00 — 14.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSIONS - CASTLE HILL
BORE 111 PROJECT 43863 APRIL 2006
14
14.00 — 15.00 M

BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 128.4 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 112
PROJECT No: 43863
DATE: 27-28 April 06
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
128	0.1	ROADBASE - dark brown gravelly sand filling							A			
	0.5	SILTY CLAY - orange mottled brown silty clay							A			
		SHALY CLAY - very stiff, grey mottled orange brown shaly clay							A			
127	1								S			3,7,19 N = 26
	2								A			
126	2.0	SILTSTONE - very low strength, highly and extremely weathered, brown and grey siltstone with some low to medium strength, iron cemented bands and minor sandstone laminations						Note: Unless otherwise stated, rock is fractured along irregular, ironstained bedding planes dipping at 0°- 10°	S			25/60mm refusal
	3								C	84	0	
	3.0	SILTSTONE - low and medium strength, moderately and highly weathered, highly fractured, orange brown siltstone with minor sandstone laminations - high strength band 3.54 to 3.93m						3.43m: CORE LOSS: 70mm	C	70	70	PL(A) = 1.1MPa
125	3.43											
	3.93							3.93m: CORE LOSS: 170mm	C	100	0	PL(A) = 0.7MPa
	4							Numerous breaks along ironstained bedding				
	4.25	LAMINITE - medium strength, moderately and fresh stained, fragmented then fractured, grey laminite							C	85	0	PL(A) = 0.4MPa
124	5											
	5.04							5.04m: CORE LOSS: 100mm	C	100	0	PL(A) = 0.5MPa
123												
	5.92								C	100	0	PL(A) = 0.5MPa
	6											
122									C	100	20	PL(A) = 0.4MPa
	7							6.51m: J50° 6.61m: J30° healed 6.61m: highly fractured from 6.61-6.93m along numerous healed joints dipping at 30°- 35° 7.2-7.52m: highly fractured along numerous healed joints dipping 30°- 35°	C	90	0	PL(A) = 0.6MPa
121	7.52											
	7.82	SILTSTONE - high strength, fresh stained then fresh, slightly fractured, black siltstone						7.52m: CORE LOSS: 100mm 7.71m: J65° 8.07m: J20°	C	75	54	PL(A) = 0.9MPa PL(A) = 0.3MPa
	8							8.35m: CORE LOSS: 380mm				
120	8.35											
	9							8.77m: J35° healed 8.94m: J30° 9.08m: J25°	C	93	85	PL(A) = 1MPa
119								9.4m: J40° 9.51m: J80° 9.6m: J60°				

RIG: Scout **DRILLER:** L Cooper **LOGGED:** SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 3.0m; NMLC-Coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB.
Date: 6/6/06

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 128.4 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 112
PROJECT No: 43863
DATE: 27-28 April 06
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
118	10.0	SILTSTONE - high strength, fresh stained then fresh, slightly fractured, black siltstone *(continued)*							C	93	85	PL(A) = 0.6MPa
	11							10.77m: J20° smooth 10.83m: J20° smooth				
117	11.52	SANDSTONE - high then very high strength, fresh, slightly fractured, light grey fine grained sandstone with siltstone laminations and bands						11.39m: B (x3)	C	100	94	PL(A) = 1MPa
	12											PL(A) = 1.7MPa
116								12.25-12.4m: J90° B (x2)				
		12.72-13.05 & 13.57-14.25m: alternate bands of siltstone and sandstone										
	13											PL(A) = 1.7MPa
115								13.55m: B 13.61m: B	C	100	98	
	14											PL(A) = 4MPa
	15 15.0	Bore discontinued at 15.0m										
113												
	16											
112												
	17											
111												
	18											
110												
	19											
109												

RIG: Scout **DRILLER:** L Cooper **LOGGED:** SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 3.0m; NMLC-Coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

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DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 112 PROJECT 43863 APRIL 2006
3
4
5
6
CORE LOSS 0.10
3.00 — 8.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 112 PROJECT 43863 APRIL 2006
CORE LOSS 0.25
CORE LOSS 0.14
8
9
10
11
12
8.00 — 13.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 112 PROJECT 43863 APRIL 2006
13
14
13.00 — 15.00 M

BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 129.3 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 113
PROJECT No: 43863
DATE: 02 May 06
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
129	0.1	ASPHALTIC CONCRETE							A			
		ROADBASE - dark brown sandy gravel roadbase filling							A			
	0.5	SILTY CLAY - grey mottled yellow and brown silty clay							A			
	1.0	SHALY CLAY - hard, mottled red brown shaly clay						Note: Unless otherwise stated, rock is fractured along rough, planar, ironstained bedding plane dipping at 0°- 10°	S			22,30/50mm refusal
128	1.2	SILTSTONE - medium strength, moderately weathered, highly fractured and fragmented, light grey brown siltstone. Some extremely low and very low strength bands						Note: strength may be underestimated due to slippage and brittle nature of rock				
								Numerous breaks along bedding	C	69	0	PL(A) = 0.5MPa
	2.0							2m: CORE LOSS: 220mm				
127	2.6							2.6m: CORE LOSS: 400mm	C	50	0	
	3								C	86	46	PL(A) = 0.8MPa
126	3.43							3.43m: CORE LOSS: 60mm	C	90	46	
	3.8	LAMINITE - medium strength, fresh stained and moderately weathered, fractured and fragmented, red brown and grey laminite						3.92m: J30° 4.04m: J40°				
	4											
125	4.13	4.09-4.13 & 4.70-4.73m: has extremely low strength clayey bands						4.13m: CORE LOSS: 70mm	C	100	20	PL(A) = 0.4MPa
								4.63m: J40° 4.78m: J85°- 90°				
	5							5.08m: J85°				
124		5.37-5.90m: has numerous healed joints dipping at 5°- 35°						5.32m: J25°	C	93	28	PL(A) = 0.2MPa
	5.91							5.67m: J45° healed 5.72m: B0°- 5° with 2mm clay 5.76m: J75°- 85° undulating, partially healed				
	6							5.91m: CORE LOSS: 90mm				PL(A) = 0.4MPa
123								6.02m: J30°- 35° 6.39m: J25° 6.48m: J40°- 45° 6.65m: J40°- 45° 6.93m: J35°- 40° undulating 7.26m: J45° 7.33m: J40°- 45°	C	88	13	PL(A) = 0.5MPa
	7											
	7.0	SILTSTONE - medium strength, fresh stained, fractured and highly fractured, dark grey and black siltstone										
122		7.50-7.62m: highly weathered, clayey band (possible crush zone)										
	7.75							7.4m: J85°- 90° (possible crush zone between 7.40 & 7.61m, 120mm clay) 7.75m: CORE LOSS: 250mm				
	8							8m: J45° rough 8.18m: J20° 8.47m: J25° & 40° 8.66m: J35° healed 8.86-8.80m: J45° 9.0-9.90m: J85°- 90°	C	100	22	PL(A) = 0.5MPa
121												
	9											
120		- fresh from 9.65m						9.68m: J70° smooth	C	100	13	PL(A) = 0.5MPa

RIG: Scout **DRILLER:** L Cooper **LOGGED:** SI **CASING:** HW to 1.3m

TYPE OF BORING: Solid flight auger to 1.3m; Rotary to 1.5m; NMLC-Coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 129.3 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 113
PROJECT No: 43863
DATE: 02 May 06
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
119	10.0	SILTSTONE - medium strength, fresh stained, fractured and highly fractured, light grey and black siltstone *(continued)*						10.04m: J85°	C	100	13	
								10.23m: J60° & 30° (stepped) 10.5m: J70° smooth 10.63m: J40° smooth 10.72m: J40° smooth 10.79m: J45° smooth 10.8m: J85°- 90° 11.1m: J85° undulating, partially healed				PL(A) = 0.7MPa
118	11	- some fragmented zones possibly by drilling						11.55m: J85° smooth	C	100	24	PL(A) = 0.4MPa
								11.78m: J45° & 65° smooth 11.83m: J85° 11.95m: J70° smooth 12m: Irregular jointing between 12.0 & 12.50m (possible crush zone)				
117	12											
	12.74	SANDSTONE - high strength, fresh, fractured, grey fine grained sandstone with some siltstone layers and laminations						12.68m: B0°- 5° smooth 12.8m: J65° healed 13.1m: J65° healed				PL(A) = 0.6MPa
116	13							13.19m: J75° 13.36m: J85° healed 13.42m: J85° healed 13.53m: J85°- 90° undulating	C	89	40	
		13.76-14.28m: faulted contact with up to 0.5m clay and fragmented rock						13.76m: Fault J70° with up to 500mm clay & fragmented rock 14m: CORE LOSS: 190mm				
115	14 14.0							14.47m: J40°- 45° 14.68m: B0°- 5° with 2-3mm clay	C	63	48	PL(A) = 2.7MPa
	14.7							14.7m: CORE LOSS: 300mm				
114	15 15.0	Bore discontinued at 15.0m										
	16											
113	17											
112	18											
111	19											
110												

RIG: Scout **DRILLER:** L Cooper **LOGGED:** SI **CASING:** HW to 1.3m

TYPE OF BORING: Solid flight auger to 1.3m; Rotary to 1.5m; NMLC-Coring to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

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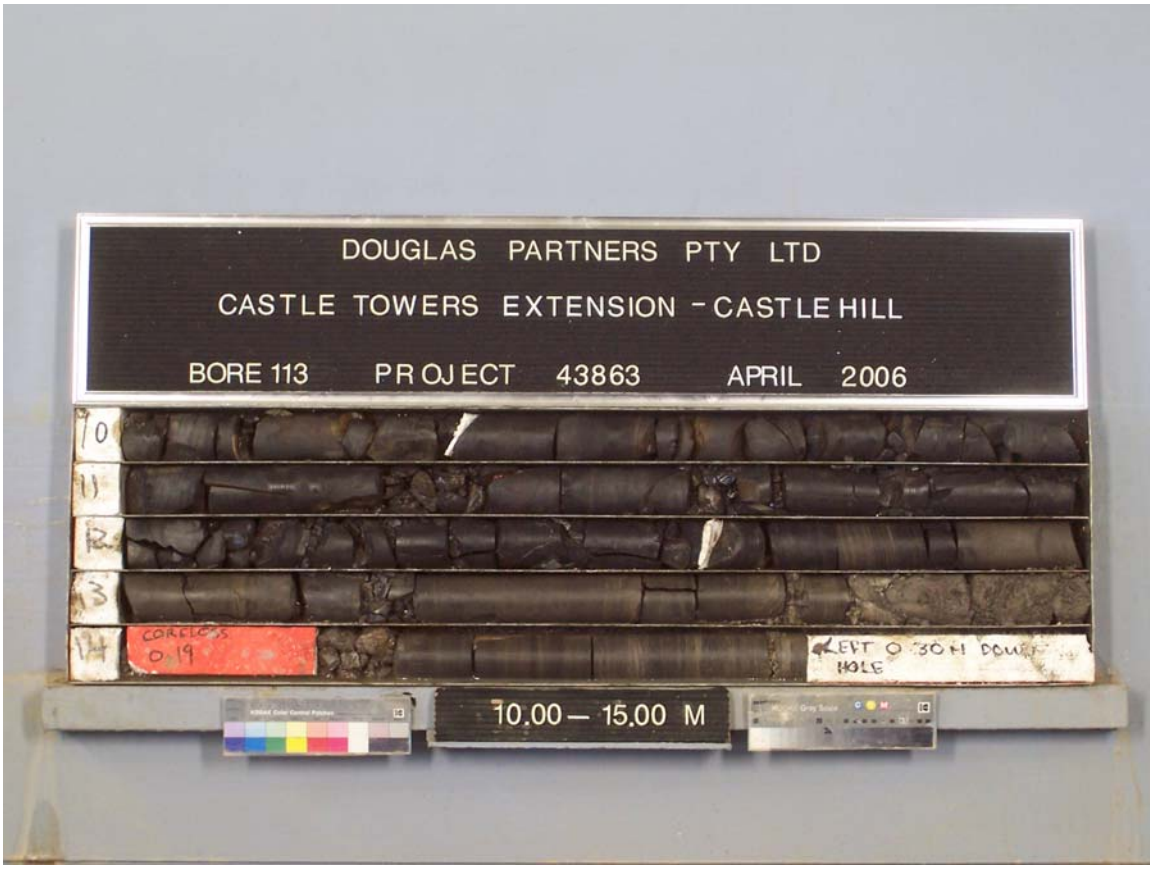
DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 113 PROJECT 43863 APRIL 2006
CASTLE TOWERS 43863
B/H 113 START 1.5 M
CORE LOSS 0.20
CORE LOSS 0.40
C/L 0.01
C/L 0.07
C/L 0.85
1.50 — 6.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 113 PROJECT 43863 APRIL 2006
6
7
8
9
CORE LOSS
6.15
6.00 — 10.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 113 PROJECT 43863 APRIL 2006
CORELOSS 0.19
10.00 — 15.00 M

BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 124.4 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 114
PROJECT No: 43863
DATE: 03 May 06
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
124	0.2	TOPSOIL - brown gravelly clay topsoil with some vegetation							A			
	0.6	FILLING - dark brown silty clay filling, with a trace of sand and glass fragments							A			
		SILTY CLAY - very stiff, grey mottled orange brown silty clay, with some ironstone bands and gravel							A			
123	1								S			6,10,12 N = 22
122	2	- hard from 2.5m							S			8,14,17 N = 31
	3	- grading to shaly clay						Note: Unless otherwise stated, rock is fractured along rough, irregular, ironstained bedding planes & joints dipping at 0°- 10°				
121	3.7	SILTSTONE - alternate bands of extremely low, low and medium strength, extremely, highly and moderately weathered, highly fractured and fractured, orange brown and grey siltstone						Defects obscured by weathering	C	100	0	
	4								C	100	36	
120									C	100	27	PL(A) = 0.3MPa
	5								C	100	24	
119									C	100	0	
	6								C	100	47	PL(A) = 0.5MPa
118								7.32m: J75°				
	7							7.53m: J20°				
	7.12	SILTSTONE - medium strength, moderately then slightly weathered, fractured, orange brown and grey siltstone										PL(A) = 0.7MPa
117		7.5-7.53 & 7.64-7.69m: extremely low strength and extremely weathered bands						8.15m: B, ironstained				
	8							8.3m: B x 3				
116									C	100	80	PL(A) = 0.7MPa
	9							8.8m: J20°				PL(A) = 1.5MPa
	9.12	SANDSTONE - high strength, fresh, slightly fractured, light grey fine grained sandstone with some siltstone laminations										
115	9.59	LAMINITE - description next page						9.5m: J65° healed				

RIG: Bobcat **DRILLER:** E Grima **LOGGED:** SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 3.7m; NMLC-Coring to 15.05m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

Douglas Partners
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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 124.4 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 114
PROJECT No: 43863
DATE: 03 May 06
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
114	10.0	LAMINITE - high strength, fresh, unbroken, dark and light grey laminite							C	100	80	
	11											PL(A) = 1.3MPa
113												PL(A) = 2.3MPa
	12								C	100	100	
112	12.3	SANDSTONE - high strength, fresh, unbroken, light grey fine grained sandstone						12.55m: J40°				PL(A) = 2.8MPa
	13											
111												PL(A) = 2.1MPa
	14											PL(A) = 1.7MPa
110		- laminite from 12.85 to 13.1m							C	100	100	PL(A) = 1.3MPa
	15	15.05 Bore discontinued at 15.05m										
109												
	16											
108												
	17											
107												
	18											
106												
	19											
105												

RIG: Bobcat **DRILLER:** E Grima **LOGGED:** SI **CASING:** HW to 2.5m

TYPE OF BORING: Solid flight auger to 2.5m; Rotary to 3.7m; NMLC-Coring to 15.05m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: CRB
Date: 6/6/06

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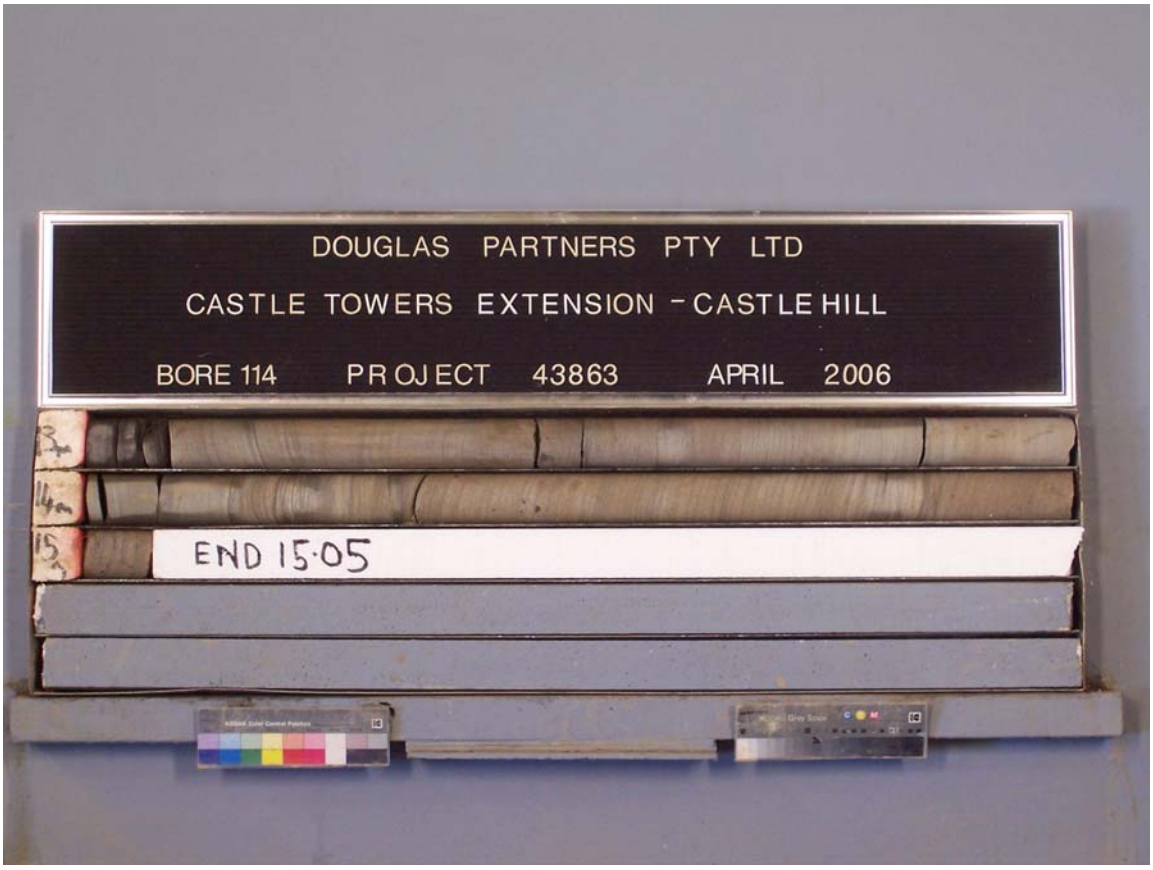
DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 114 PROJECT 43863 APRIL 2006
3m
4m
5m
6m
7m
CASTLE HILL
B/H 114
43863
START
3.7m
3.70 — 8.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 114 PROJECT 43863 APRIL 2006
8m
9m
10m
11m
12m
8.00 – 13.00 M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 114 PROJECT 43863 APRIL 2006
END 15.05

BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 118.1 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 115
PROJECT No: 43863
DATE: 04 May 06
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
118	0.1	TOPSOIL - dark brown silty clay topsoil with some roots and vegetation							A			
		FILLING - orange brown silty clay filling, with a trace of gravel							A			
117	0.7 / 1	FILLING - brown and orange brown silty clay and gravelly clay filling, with concrete and metal fragments							A			
									S			10,20,22 N = 42
	1.6	SILTSTONE - extremely low strength, extremely weathered, grey mottled orange brown siltstone, with some ironstone bands and numerous shaly clay bands							A			
116	2											
									S			25/76 refusal
	3					▼		Unless otherwise stated, rock is fractured along rough, irregular, ironstained bedding planes & joints dipping at 0°- 10°				
114	4.0	SILTSTONE - extremely low to very low strength, highly and moderately weathered, highly fractured, orange brown and grey siltstone with shaly clay bands and some low strength, iron cemented bands						weathering obscures defects	C	100	0	
	4.7								C	100	20	
113	5	SILTSTONE - medium strength, moderately and highly weathered, fractured and highly fractured yellow brown and brown grey siltstone. Some extremely weathered, extremely low and very low strength bands						4.8m: J45° numerous breaks along bedding				PL(A) = 0.5MPa
								5.52m: J65°	C	100	19	
112	6							6.24m: J35° healed 6.34m: J25°				PL(A) = 0.4MPa
								6.63m: J45° 6.68m: J60°	C	100	34	
	7											PL(A) = 0.7MPa
	7.42	SANDSTONE - medium strength, slightly weathered, highly fractured, light brown and grey sandstone. Some clay bands						7.3m: J40° & 25° stepped 7.71m: J90° healed				PL(A) = 1.8MPa
110	8 / 8.0	LAMINITE - high strength, fresh, slightly fractured and unbroken, grey laminite with some fine grained sandstone bands and laminations						8.3m: B5° 8.4m: B10°	C	100	73	
109	9							9.2m: J30° clay veneer 9.23m: J45° clay veneer 9.29m: J35° smooth, concoidal				PL(A) = 1.6MPa

RIG: Bobcat **DRILLER:** E Grima **LOGGED:** SI **CASING:** HW to 2.9m

TYPE OF BORING: Solid flight auger to 2.9m; Rotary to 4.0m; NMLC-Coring to 11.30m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 11.3m. Lowest 3m slotted

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: CRB
Date: 6/6/06

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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 118.1 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 115
PROJECT No: 43863
DATE: 04 May 06
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
108		LAMINITE - high strength, fresh, slightly fractured and unbroken, grey laminite with some fine grained sandstone bands and laminations *(continued)*							C	100	73	PL(A) = 2.1MPa
107	11								C	100	100	PL(A) = 2.4MPa
	11.3	Bore discontinued at 11.3m										
106	12											
	13											
104	14											
	15											
102	16											
	17											
100	18											
99	19											

RIG: Bobcat **DRILLER:** E Grima **LOGGED:** SI **CASING:** HW to 2.9m

TYPE OF BORING: Solid flight auger to 2.9m; Rotary to 4.0m; NMLC-Coring to 11.30m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 11.3m. Lowest 3m slotted

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo Ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

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DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 115 PROJECT 43863 APRIL 2006
4,00 — 9.00M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 115 PROJECT 43863 APRIL 2006
9m
10
11m
END @ 11·3M
9.00— 11.30M

BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Castle Towers Extensions
LOCATION: Cnr Old Northern & Showground Roads, Castle Hill

SURFACE LEVEL: 118.7 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 116
PROJECT No: 43863
DATE: 04 May 06
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
118	0.05	ROADBASE - blue grey slightly silty, gravel roadbase							A			
		GRAVELLY CLAY - dark brown gravelly clay and silty clay (possible filling)							A			
	1.0	SHALY CLAY - hard, grey mottled orange brown shaly clay with some ironstone bands, gravel and some extremely low strength bands							A			
117									S			8,22,28 N = 50
	2											
116		- some very low strength siltstone bands from 2.5m						Note: Unless otherwise stated, rock is fractured along rough, irregular, ironstianed bedding planes & joints dipping at 0°- 10°	S			14,22,22 N = 44
	3	- extremely low to very low strength siltstone from 3.0m										
	3.5	SILTSTONE - extremely low and medium strength, highly and moderately weathered, highly fractured, light brown and grey siltstone. Some shaly clay bands above 5.0m						Weathering and degree of fracturing obscures defects	C	100	0	
115									C	100	0	
	4							Numerous breaks along bedding				
114									C	100	0	
	5											
113									C	100	0	
	6							5.7m: J35°	C	100	10	
	6.34	SILTSTONE - medium then high strength, fresh stained, slightly fractured siltstone. Some sandstone laminations and bands below 6.9m						6.35,6.52m: B5° ironstained 6.44m: J20° 6.61m: J70 healed, 40° 6.81m: J20° healed	C	100	95	PL(A) = 0.5MPa
112	7											
		- fresh from 7.34m						7.26m: J25°				PL(A) = 1.5MPa
111												
	8							7.93m: J75°				PL(A) = 1.3MPa
110								8.32m: J90°	C	100	100	
	8.85	SANDSTONE - high strength, fresh, unbroken, light grey fine grained sandstone. Some siltstone laminations						8.69m: J20°				PL(A) = 1.9MPa
	9											
109	9.38	Bore discontinued at 9.38m										

RIG: Bobcat **DRILLER:** E Grima **LOGGED:** SI **CASING:** GL to 2.9m

TYPE OF BORING: Solid flight auger to 2.9m; Rotary to 3.5m; NMLC-Coring to 9.38m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: GRB
Date: 6/6/06

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DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 116 PROJECT 43863 APRIL 2006
CASTLE HILL 43863.
B/H 116
START 3.5M
3M
4M
5M
6M
7M
3.50— 8.00M


DOUGLAS PARTNERS PTY LTD
CASTLE TOWERS EXTENSION - CASTLE HILL
BORE 116 PROJECT 43863 APRIL 2006
END @ 9.38 m - BH 116.
8.00 — 9.38M

BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 132.0 AHD
EASTING: 314915
NORTHING: 6265677
DIP/AZIMUTH: 90°/--

BORE No: 401
PROJECT No: 84335.00
DATE: 22 - 23/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
132	0.1	ASPHALTIC CONCRETE										
	0.28	CONCRETE SLAB										
		FILLING - dark brown, silty clay filling with some gravel, damp							D			
	0.7	LAMINITE - extremely low to very low strength, grey and brown shale										
131	1	From 1.0m: very low to low strength							D S			14/150 refusal
130	2							Note: Unless otherwise stated, rock is fractured along rough planar bedding planes dipping 0°- 10°				
	2.4											
	2.51	LAMINITE - medium strength, moderately and moderately to slightly weathered, fragmented to fractured and slightly fractured, grey-brown laminite with approximately 20% fine sandstone lamination. Some very low strength bands						2.46m: CORE LOSS: 50mm 2.5m: B5°, cly co, 4mm 2.7m: J90°, fe stn, 10mm 2.8m: J45°, cly co, 2mm 3.02m: J90°, fe stn, 10mm 3.14m: J45°, cln, ro, 20mm 3.16m: J40°, cln, ro, 20mm 3.31m: B0°, cly co, 5mm 3.7m: J, with clay coating 4.03m: B0°, cly co, 5mm 4.37m: J15°, cln, sm 4.68m: J20°, cly co, 5mm 4.87m: B0°, fe stn	C	100	60	PL(A) = 0.6 PL(A) = 0.7
129	3											
128	4											PL(A) = 0.6
127	5								C	100	67	PL(A) = 0.7
126	6							5.55m: J55°, cln, ro 5.63m: J15°, cln, ro 5.8m: J40°, cly co, 5mm 5.86m: J35°, fe stn 6.06m: J15°, cln, sm 6.14m: J10°, cln, ro 6.27m: J30°, cln, sm 6.39m: J20°, cln, sm				PL(A) = 1
	6.36	SHALE - medium to high and high strength, fresh, slightly fractured, grey shale										
125	7							6.8m: J10°, cln, sm 6.83m: J15°, cln, sm 7.3m: B0°, cly 7.65m: J35°, pl, sm, cln 7.75m: J45°, pl, sm, Cz, 5mm				PL(A) = 1.4
124	8								C	100	100	PL(A) = 1
123	9							8.5m: J35°, pl, sm, cln 9.25m: J60°, pl, sm, cln				PL(A) = 1
	10.0							9.72m: J30°, pl, sm, cln				

Bore discontinued at 10.0m

RIG: DT 100 **DRILLER:** SM **LOGGED:** AL/SI **CASING:** HW to 1.2m

TYPE OF BORING: Diatube to 0.28m; Solid flight auger to 1.0m; Wash boring to 2.4m; NMLC-Coring to 10.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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CASTLE TOWERS EXPANSION PROJECT – CASTLE HILL

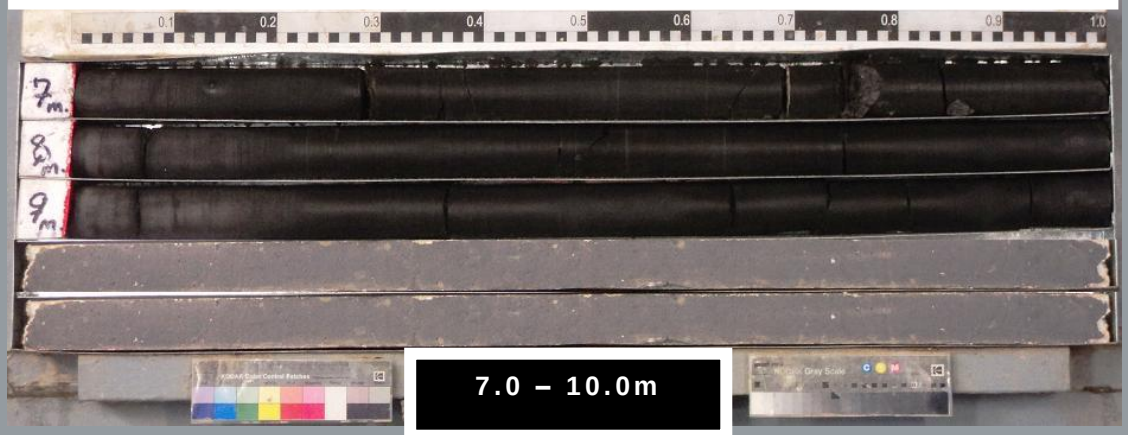
BORE 401 PROJECT 84335.00 JUN 2014

2.4 – 7.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWERS EXPANSION PROJECT – CASTLE HILL

BORE 401 PROJECT 84335.00 JUN 2014



7.0 – 10.0m

BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 131.3 AHD
EASTING: 314939
NORTHING: 6265664
DIP/AZIMUTH: 90°/--

BORE No: 402
PROJECT No: 84335.00
DATE: 23 - 25/6/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
131	0.31	ASPHALTIC CONCRETE										
		FILLING - dark brown, silty clay filling with some shale gravel, damp						Note: Unless otherwise stated, rock is fractured along rough planar bedding planes dipping 0°- 10°	D			
	0.7	LAMINITE - extremely low to very low strength, grey and brown shale										
130	1	From 1.0m: very low to low strength							D S			20/100mm refusal bouncing
	1.45	LAMINITE - medium to high then medium strength, moderately weathered, fractured and slightly fractured, grey-brown laminite with approximately 25% fine sandstone laminations						2.03m: B0°, cly co, 1mm 2.68m: J50°, cly co, 2mm 2.83m: B10°, cly co, 2mm 3m: J90°, cly co, 2mm, 40mm 3.15m: B0°, cly co, 1mm 3.22m: B0°, cly co, 5mm 3.46m: J90°, cln, ro, 10mm 3.9m: J25°, cln, ro 4m: B10°, cln, ro 4.08m: B5°, cly co, 2mm 4.15m: B0°, cly co, 4mm 4.28m: J15°, cln, ro 4.33m: J15°, fe stn 4.62m: CORE LOSS: 70mm 4.74m: J50°, cly vn 4.89m: J25°, cln, ro 4.93m: J90°, cln, ro, 70mm 5m: J30°, cln, ro 5.11m: J90°, cln, ro, 70mm 5.12m: J90°, cln, ro, 40mm 5.19m: J90°, cln, ro, 220mm 5.45-5.47m: B5°, fe stn 5.54m: CORE LOSS: 230mm 6.16m: J30°, cln, sm 6.89m: J30°, cly vn 7.04m: J80°, cln, sm, 170mm 7.44m: J25°, cln, sm 7.46m: J90°, cln, ro, 80mm 7.54m: J20°, cln, sm 8.9m: J90°, cln, ro, 40mm 9.17m: J15°, cln, sm 9.26-9.33m: J10°- 15°, cln, sm (x3)	C	100	89	PL(A) = 1.6 PL(A) = 0.5
129	2											
	3								C	100	55	PL(A) = 0.7
128	3.6	LAMINITE - medium strength, highly to moderately weathered, fractured and slightly fractured grey brown laminite with approximately 20% fine sandstone laminations. Some extremely low to very low strength bands							C	92	45	PL(A) = 0.6
	4											
127	4.69											
	5											
126	5.77	SHALE - medium strength, slightly weathered then fresh stained fractured to slightly fractured, grey-brown shale. Some very low strength bands							C	100	76	PL(A) = 0.5 PL(A) = 0.4
	6											
125	7											
124	7.5	SHALE - medium and high strength, fresh, slightly fractured, grey shale										PL(A) = 1.6
	8								C	100	88	PL(A) = 1.3
123	9											
122												PL(A) = 0.7
									C	100	97	

RIG: DT 100 **DRILLER:** SM **LOGGED:** AL/SI **CASING:** HW to 1.0m

TYPE OF BORING: Diatube to 0.31m; Solid flight auger to 1.0m; Wash boring to 1.45m; NMLC-Coring to 14.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 131.3 AHD
EASTING: 314939
NORTHING: 6265664
DIP/AZIMUTH: 90°/--

BORE No: 402
PROJECT No: 84335.00
DATE: 23 - 25/6/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
121		SHALE - medium and high strength, fresh, slightly fractured, grey shale *(continued)*						10.16m: J80°, cln, sm, 150mm				PL(A) = 0.7
120	11							10.91m: J25°, cln, ro	C	100	97	PL(A) = 0.8
	11.6	LAMINITE - high strength, fresh, slightly fractured, light grey to grey laminite with approximately 20% fine sandstone laminations and bands						11.77m: J10°, cln, ro 11.85m: B0°, cly co, 1mm				PL(A) = 1.4
119	12											PL(A) = 2.1
118	13							12.65m: J40°, cln, sm	C	100	100	PL(A) = 2
	14.0	Bore discontinued at 14.0m										
117	14											
116	15											
115	16											
114	17											
113	18											
112	19											

RIG: DT 100 **DRILLER:** SM **LOGGED:** AL/SI **CASING:** HW to 1.0m

TYPE OF BORING: Diatube to 0.31m; Solid flight auger to 1.0m; Wash boring to 1.45m; NMLC-Coring to 14.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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DOUGLAS PARTNERS PTY LTD

CASTLE TOWERS EXPANSION PROJECT – CASTLE HILL

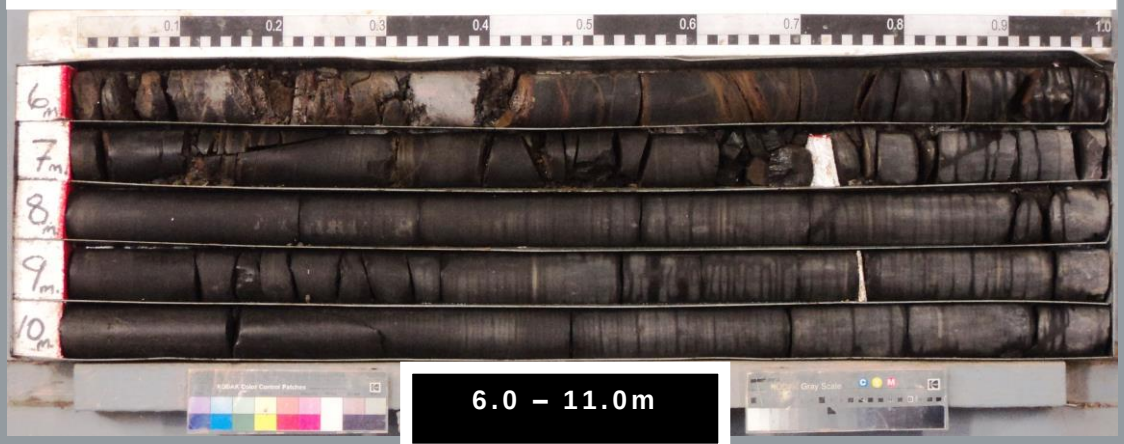
BORE 402 PROJECT 84335.00 JUN 2014

1.45 – 6.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWERS EXPANSION PROJECT – CASTLE HILL

BORE 402 PROJECT 84335.00 JUN 2014



6.0 – 11.0m

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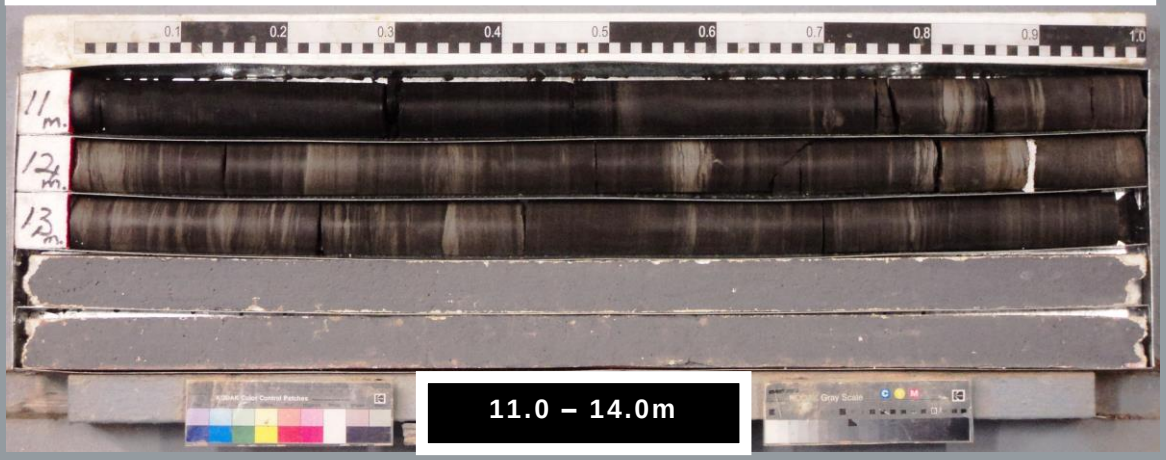
CASTLE TOWERS EXPANSION – CASTLE HILL

BORE 402 PROJECT 84335.00 JUN 2014



11.0 – 14.0m

BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 133.4 AHD
EASTING: 314974
NORTHING: 6265702
DIP/AZIMUTH: 90°/--

BORE No: 404
PROJECT No: 84335.00
DATE: 19 - 20/6/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
133	0	FILLING - grey-brown, silty fine sand filling with grass roots, humid							E			PID<5ppm
									A			
									A			PID<5ppm
									E			
	1								E			PID<5ppm
	1.0	CLAY - very stiff to hard, grey clay, moist							A			PID<5ppm
132									E			3,16/140mm
	2								S			refusal
131								Note: Unless otherwise stated, rock is fractured along rough planar bedding planes dipping 0°- 10°				
	2.6	LAMINITE - extremely low to very low strength, grey-brown shale							S			17,17,20/110mm refusal
	3											
130	3.33	LAMINITE - medium and high strength, moderately weathered, fractured to slightly fractured, grey-brown laminite with approximately 25% fine sandstone lamination						3.45-4.12m: B (x6) 0°-5°, cly, 5-10mm	C	100	82	PL(A) = 1.2
	4											
129	4.3	LAMINITE - high strength, slightly weathered then fresh, slightly fractured and unbroken, light grey-brown then grey laminite with approximately 25% fine sandstone lamination						4.19m: J30°, pl, ro, fe 4.38-5.47m: B (x6) 0°, fe				PL(A) = 2.2
	5								C	100	93	PL(A) = 1.2
128												
	6							5.71-6.0m: J85°, un, ro, fe, cly				PL(A) = 1.4
127								6.25 & 6.3m: B5°, fe 6.42m: J85°, un, ro, fe 6.52m: J45°, pl, ro, fe 6.58m: B0°, cly, 5mm				
	7											PL(A) = 1.6
126												
	8								C	100	100	PL(A) = 2.3
125												
	9							>>				PL(A) = 1.5
124									C	100	95	

RIG: DT 100 **DRILLER:** SM **LOGGED:** SI **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger to 1.0m; Rotary to 3.33m; NMLC-Coring to 15.9m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe piezometer installed: Slotted 15.9 to 3.0m, Solid 3.0 to 0.0m, Bentonite 2.0 to 0.0m, Quickset concrete 0.3 to 0.0m with gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 133.4 AHD
EASTING: 314974
NORTHING: 6265702
DIP/AZIMUTH: 90°/--

BORE No: 404
PROJECT No: 84335.00
DATE: 19 - 20/6/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
123		LAMINITE - high strength, slightly weathered then fresh, slightly fractured and unbroken, light grey-brown then grey laminite with approximately 25% fine sandstone lamination *(continued)*										PL(A) = 1.5
122	11											PL(A) = 1.9
	11.55	SHALE - very low then medium strength, fresh, slightly fractured and unbroken, grey shale						11.44m: B5°, cly 11.56-11.66m: Sz 11.66m: J55°, pl, sm, cln	C	100	95	
121	12							12.28m: J20°, st, ro, cln 12.34m: J45°, pl, sm, cln 12.53-12.63m: J80°, pl, sm, cln				PL(A) = 0.5
120	13							12.76m: J30°- 35°, cu, ro, cln				PL(A) = 0.9
								13.65m: J45°, pl, sm, cln				
119	14							14.3m: J45°- 55°, cu, sm, cln	C	100	100	PL(A) = 0.7
118	15											PL(A) = 0.7
	15.9	Bore discontinued at 15.9m						15.78m: J35°, pl, sm, cln				
117	16											
116	17											
115	18											
114	19											

RIG: DT 100 **DRILLER:** SM **LOGGED:** SI **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger to 1.0m; Rotary to 3.33m; NMLC-Coring to 15.9m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe piezometer installed: Slotted 15.9 to 3.0m, Solid 3.0 to 0.0m, Bentonite 2.0 to 0.0m, Quickset concrete 0.3 to 0.0m with gatic cover

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

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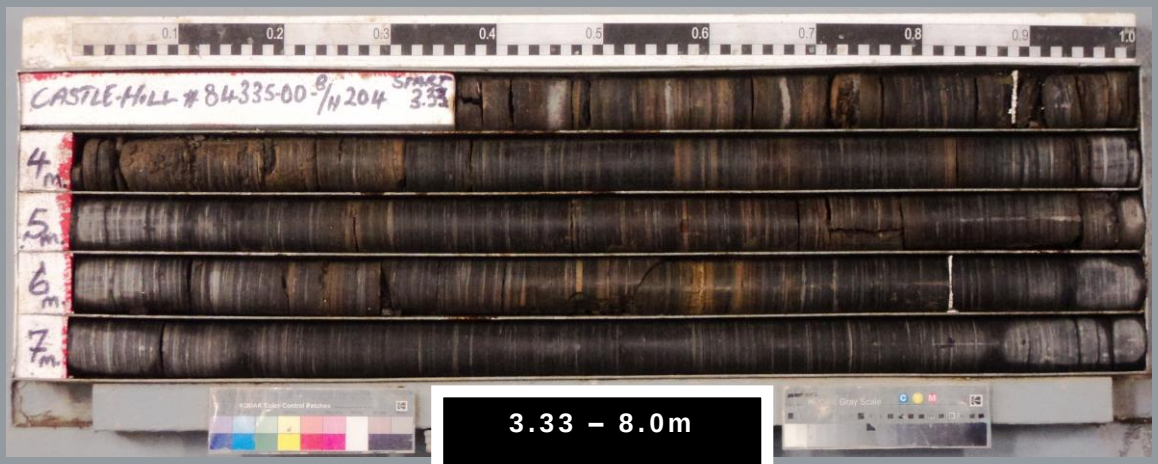
CASTLE TOWERS EXPANSION PROJECT – CASTLE HILL

BORE 404 PROJECT 84335.00 JUN 2014



3.33 – 8.0m

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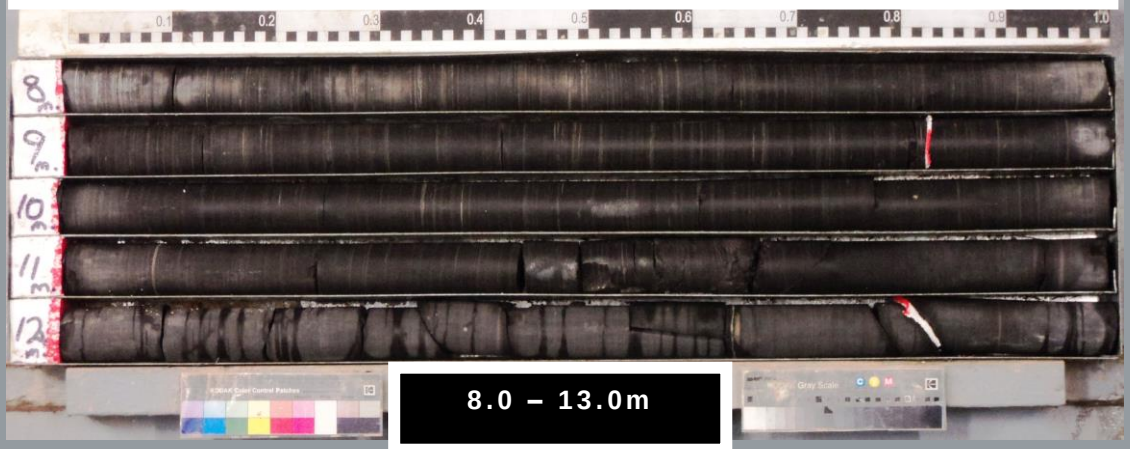
CASTLE TOWERS EXPANSION PROJECT – CASTLE HILL

BORE 404 PROJECT 84335.00 JUN 2014



8.0 – 13.0m

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CASTLE TOWERS EXPANSION – CASTLE HILL

BORE 404 PROJECT 84335.00 JUN 2014

13.0 – 15.9m

BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 130.7 AHD
EASTING: 314996
NORTHING: 6265733
DIP/AZIMUTH: 90°/--

BORE No: 405
PROJECT No: 84335.00
DATE: 19/6/2014
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
	0.15	ASPHALT		A/E			PID<5
	0.25	FILLING - brown, fine sand and silt					
	0.35	FILLING - possible asphalt fall in, humid		A/E			PID<5
130	0.7	CLAY - stiff, red-brown, slightly gravelly clay. Gravel is fine to medium angular shale/mudstone	Note: Unless otherwise stated, rock is fractured along rough planar bedding planes dipping 0°- 10°	S			20/150mm refusal
1		LAMINITE - extremely low strength, light grey laminite		A/E*			
	1.57			E			
129		LAMINITE - medium strength, highly weathered, fragmented to fractured then slightly fractured, light grey to grey-brown laminite	1.63 & 1.78m: J35°, he	E	100	81	PL(A) = 0.5
2			1.99-2.2m: fg	C			
	2.35		2.2m: CORE LOSS: 150mm				
128			2.5m: J45°, pl, sm, fe	C	87	52	PL(A) = 0.6
3			2.66m: B5°, fe				
			3.1 & 3.2m: B5°, cly				
127	3.7		3.5-3.77m: B (x3) 0°, fe	C	100	67	PL(A) = 0.8
		LAMINITE - medium strength, moderately to slightly weathered, fractured and slightly fractured, grey-brown laminite with approximately 30% fine sandstone laminations	3.9-4.0m: J85°, un, ro, fe				
4			4.15m: J25°, pl, ro, fe				PL(A) = 0.9
			4.2-4.55m: B (x5) 0°, fe	C	100	81	
126			4.6m: J35°, pl, ro, fe				
5			4.65-5.23m: B (x12) 0°-5°, fe				PL(A) = 0.8
			5.27m: J30°, pl, ro, fe				
125	5.8		5.5-5.73m: B's 0°, fe				
	6.0		5.65m: J55°, pl, ro, fe				
6		LAMINITE - medium and high strength, moderately to slightly weathered then fresh stained, fractured then slightly fractured, grey-brown laminite with approximately 20% fine sandstone laminations	5.73m: CORE LOSS: 70mm	C	95	84	PL(A) = 1.2
			5.8-6.0m: J80°, pl, ro, fe				
124			6.05-6.5m: B (x11) 0°, fe				
7			6.5m: J45°- 70°, cu, ro, fe				
			6.6m: J45°, pl, sm, cly				
			6.8-6.95m: J (x3) 55°-60°, pl, ro, cly				
123			7.07 & 7.15m: J70° & 80°, he				PL(A) = 0.8
8			7.4m: F30°, pl, sm, fe				
			7.55 & 7.6m: J70°, pl, ro, fe				
			7.73m: F30°, pl, sm, cln				
122	8.75		8.1m: J70°, pl, ro, fe & J80°, pl, ro, fe				
		SHALE - medium then medium to high strength, fresh, slightly fractured and unbroken, grey shale with a trace of fine sandstone lamination	8.36m: B0°, cly, 5mm	C	100	96	PL(A) = 1.1
9			8.7m: J85°, pl, sm, fe				
			9.06m: J35°, pl, sm, cln				PL(A) = 0.7
121			9.55m: J80°, pl, ro, cln				
			9.7-10.10m: J85°, pl, ro, cln	C	100	100	

RIG: DT 100 **DRILLER:** SM **LOGGED:** SI/JRP **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger to 1.0m; Rotary to 15.7m; NMLC-Coring to 16.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Water loss at about 9.8m. *BD1/190614 collected at 1.0-1.2m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 130.7 AHD
EASTING: 314996
NORTHING: 6265733
DIP/AZIMUTH: 90°/--

BORE No: 405
PROJECT No: 84335.00
DATE: 19/6/2014
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
120	11	SHALE - medium then medium to high strength, fresh, slightly fractured and unbroken, grey shale with a trace of fine sandstone lamination *(continued)*						10.8m: J55°- 70°, cu, ro, cln 10.9-11.25m: J70°- 85°, cu, ro, cly 11.25m: B0°, cly	C	100	100	PL(A) = 0.7
119	12							12.15-12.35m: J (x4) 35°- 55°, pl, ro, cln 12.45m: J30°, pl, ro, Cz, 10mm	C	100	87	PL(A) = 1.3 PL(A) = 0.9
118	13							13m: J45°, pl, sm, cln				PL(A) = 1.1
117	14							13.8m: J85°, pl, sm, cln 14m: J65°, pl, sm, cln				
116	14.4	LAMINITE - high strength, fresh, slightly fractured and unbroken, light grey to grey laminite with approximately 40% fine sandstone laminations and beds							C	100	99	PL(A) = 1.3
115	15							15.4-15.5m: J85°, un, ro, cln				PL(A) = 1.9
	16 16.0	Bore discontinued at 16.0m										
114	17											
113	18											
112	19											
111												

RIG: DT 100 **DRILLER:** SM **LOGGED:** SI/JRP **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger to 1.0m; Rotary to 15.7m; NMLC-Coring to 16.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Water loss at about 9.8m. *BD1/190614 collected at 1.0-1.2m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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CASTLE TOWERS EXPANSION – CASTLE HILL

BORE 405 PROJECT 84335.00 JUN 2014

1.57 – 6.0m

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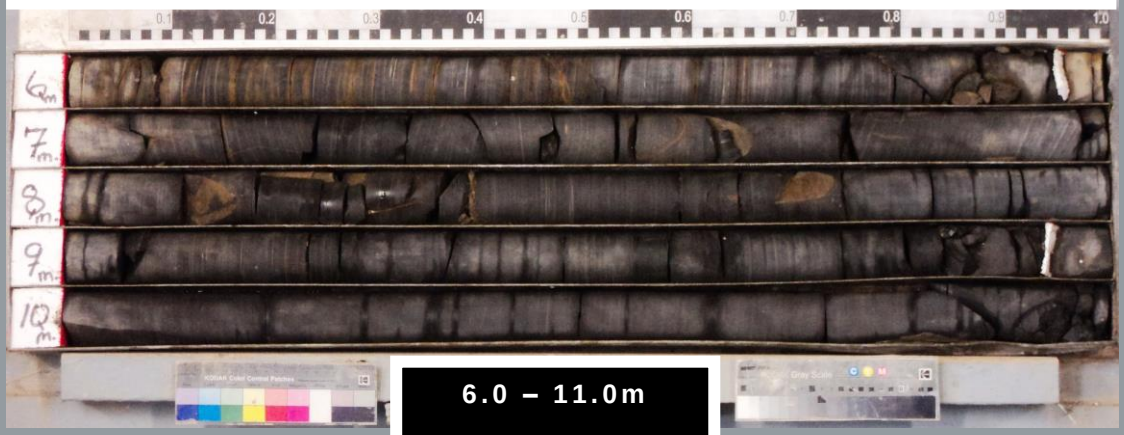
CASTLE TOWERS EXPANSION – CASTLE HILL

BORE 405 PROJECT 84335.00 JUN 2013



6.0 – 11.0m

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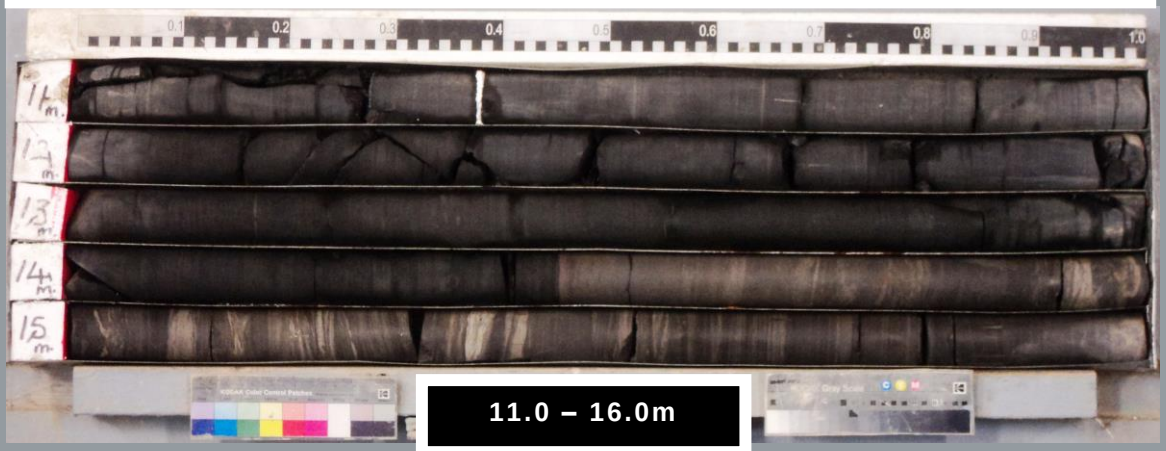
CASTLE TOWERS EXPANSION – CASTLE HILL

BORE 405 PROJECT 84335.00 JUL 2014



11.0 – 16.0m

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 132.59 AHD
EASTING: 314911
NORTHING: 6265720
DIP/AZIMUTH: 90°/--

BORE No: 501
PROJECT No: 84335.02
DATE: 25/3/2015
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			EW HW MW SW FS FR		Ex Low / Very Low / Low / Medium / High / Very High / Ex High		0.01 / 0.05 / 0.10 / 0.50 / 1.00	B - Bedding J - Joint S - Shear F - Fault				
132	0.2	FILLING - crushed shale and roadbase gravel filling							A			
		FILLING - brown, silty clay and crushed shale filling, humid							A			
	1.0	LAMINITE - very low strength, light grey-brown laminite						Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	A			
131	1.5	LAMINITE - very low and medium strength, highly weathered, fragmented to fractured, light grey and brown laminite with high strength iron cemented bands						1.5m: CORE LOSS: 100mm 1.6-1.83m: fg, fe	C	55	0	PL(A) = 1.2
	2.2							2m: CORE LOSS: 200mm				
	2.4	LAMINITE - medium and high strength, moderately weathered, fractured, grey-brown laminite with approximately 30% fine sandstone laminations and some clay bands						2.2-2.4m: fg 2.4m: J30°, un, ro, fe 2.5 & 2.55m: J45°, pl, ro, cly 2.62, 2.7 & 2.77m: J25°-30°, pl, ro, cln 2.85m: J45°, pl, sm, cly 3.1m: J30°, pl, ro, cly 3.14-3.56m: B, fe, cly	C	100	18	PL(A) = 0.5 PL(A) = 1.5 PL(A) = 1.1
128	4.2	LAMINITE - medium strength, moderately then slightly weathered, fractured, grey-brown laminite with approximately 30% fine sandstone laminations and some clay bands						3.7-3.8m: B (x2) 5°, fe 3.8-3.9m: J85°, pl, ro, fe 3.9m: B10°, cly, 5mm & J75°- 80°, cu, ro, fe 4.13m: J60°, un, ro, cly 4.2m: J30° & 75°, st, ro, cln 4.23m: B5°, cly 4.33m: J50°, un, ro, cln 4.56m: B0°, cly, 10mm 4.66m: J45°, un, ro, cln 4.75-5.5m: B0°- 5°, fe 5.25m: B5°, cly, 10mm 5.5-5.75m: J70°, cu, ro, Cz, 30mm 5.8m: J (x2) 45° & 70°, st, ro, cly 6.0-6.05m: cly 6.1-6.3m: B0°- 5°, fe 6.35m: J35°, pl, ro, fe 6.45 & 6.5m: J60°- 70°, pl, ro, fe & Cz 6.75-6.8m: Cz	C	100	40	PL(A) = 0.8 PL(A) = 0.6
126	6.8	SHALE - high then medium to high strength, fresh stained then fresh, slightly fractured, grey shale with approximately 5-10% fine sandstone laminations						7.1-7.3m: B5°, fe 7.73m: J70°, pl, ro, fe 7.8m: B5°, fe 8.45, 8.55 & 8.75m: J55°- 60°, pl, ro, fe	C	100	78	PL(A) = 0.9 PL(A) = 0.9 PL(A) = 1.1
123	10.0							9.7, 9.8 & 9.9m: J30°, pl, sm, cln	C	97	85	PL(A) = 1

RIG: Scout 2 **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 1.5m

TYPE OF BORING: Solid flight auger to 1.5m; NMLC-Coring to 24.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 132.59 AHD
EASTING: 314911
NORTHING: 6265720
DIP/AZIMUTH: 90°/--

BORE No: 501
PROJECT No: 84335.02
DATE: 25/3/2015
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
122	10.05	SHALE - medium and high strength, fresh, slightly fractured and unbroken, dark grey shale						10m: CORE LOSS: 50mm 10.05 & 10.15-10.20m: J30°- 35°, pl, sm, fe 10.55m: J45° & 60°, st, ti	C	97	85	PL(A) = 1.3
121	11							11.33m: J30°, pl, sm, cln 11.5-11.7m: J80°, pl, sm, si				PL(A) = 0.8
120	12							11.94m: J85°, pl, sm, cln	C	100	100	PL(A) = 1.3
119	13							12.94m: J45°, pl, sm, cln 13.05m: J60°, pl, sm, Cz, 10mm 13.3m: B5°, Cz, 10mm 13.5m: J30° & 45°, st, ro, cln				PL(A) = 3.5
118	13.45	LAMINITE - high strength, fresh, slightly fractured and unbroken, light grey and grey, laminite with approximately 50% fine sandstone laminations and beds 13.6m: very high strength sandstone										PL(A) = 2.2
117	14								C	100	99	PL(A) = 1.6
116	15											
115	16							16.1-16.2m: J60°- 70°, cu, ro, cln 16.3 & 16.33m: J35°, pl, ro, cln 16.55-16.65m: J85°, un, ro, cln				PL(A) = 1.8
114	17							17.15m: Fault 70°, pl, ro, cly, 5mm				
	17.55	SANDSTONE - high strength, fresh, slightly fractured, light grey, fine to medium grained sandstone						17.5m: J25°, pl, ro, cly, 10mm 17.9m: J70°, ti 18.05-18.3m: Fault, 75°-90°, ti	C	100	97	PL(A) = 1.5 PL(A) = 1.2
113	18							18.6-18.65m: Sz 18.8m: J30°, pl, ro, cln				
	19											
	19.1	SANDSTONE - medium then high strength, fresh, slightly fractured and unbroken, light grey, medium to coarse grained sandstone						19.12m: J60°, pl, ro, cln				PL(A) = 0.6
									C	100	100	

RIG: Scout 2 **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 1.5m

TYPE OF BORING: Solid flight auger to 1.5m; NMLC-Coring to 24.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 132.59 AHD
EASTING: 314911
NORTHING: 6265720
DIP/AZIMUTH: 90°/--

BORE No: 501
PROJECT No: 84335.02
DATE: 25/3/2015
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
112		SANDSTONE - medium then high strength, fresh, slightly fractured and unbroken, light grey, medium to coarse grained sandstone *(continued)*										
	21							20.85m: B15°, cly vn, ti	C	100	100	PL(A) = 1.4
								21.2m: B0°, cbs co				
111								21.7m: J30°, pl, ro, cln				PL(A) = 1.4
	22	22.0m: some siltstone laminations at 5°- 10°										
												PL(A) = 1.7
110	23								C	100	100	
												PL(A) = 1.8
109	24 24.0	Bore discontinued at 24.0m										
108	25											
107	26											
106	27											
105	28											
104	29											
103												

RIG: Scout 2 **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 1.5m

TYPE OF BORING: Solid flight auger to 1.5m; NMLC-Coring to 24.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

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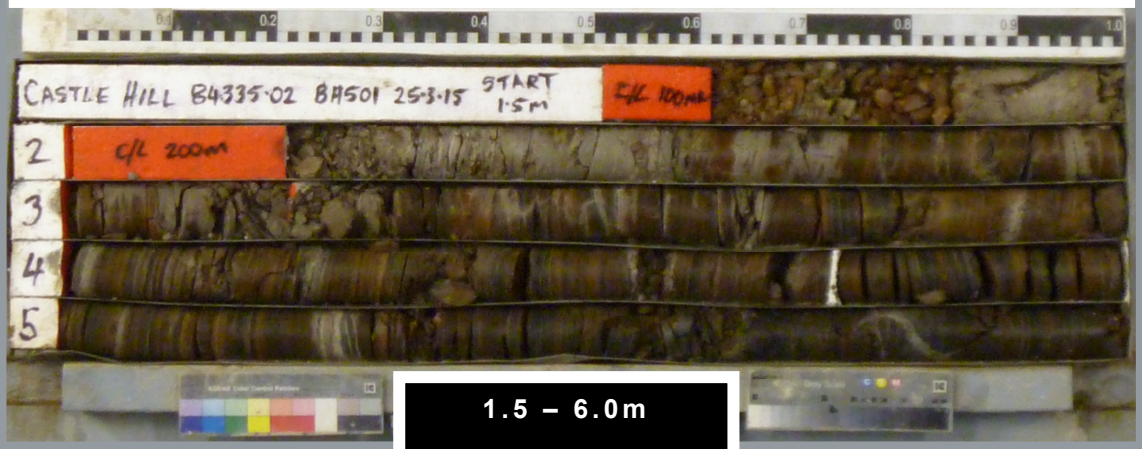
CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 501 PROJECT 84335.02 MARCH 2015

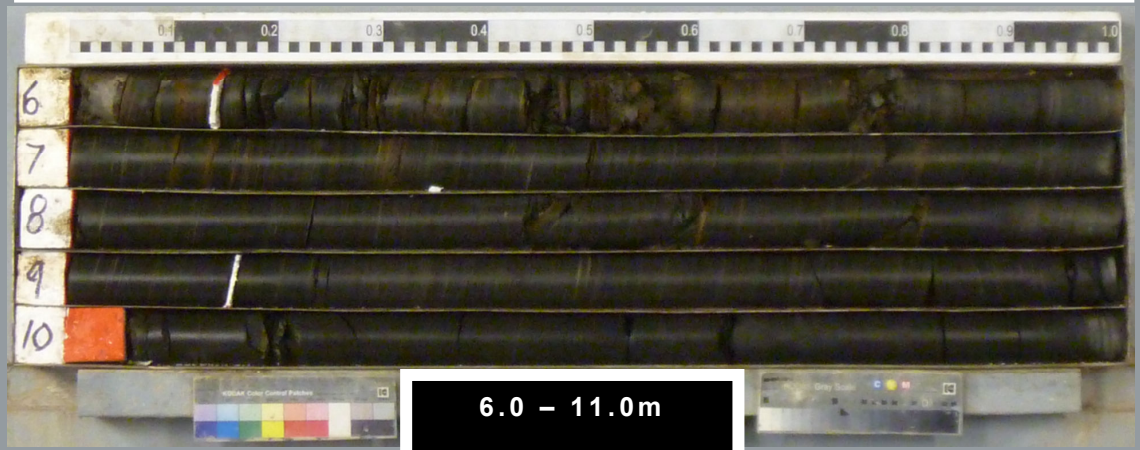


1.5 – 6.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 501 PROJECT 84335.02 MARCH 2015



6.0 – 11.0m

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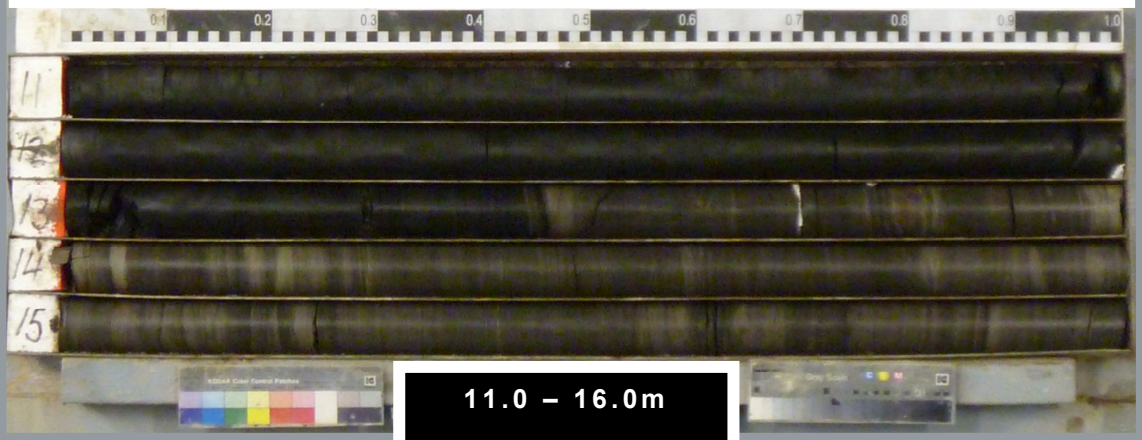
CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 501 PROJECT 84335.02 MARCH 2015

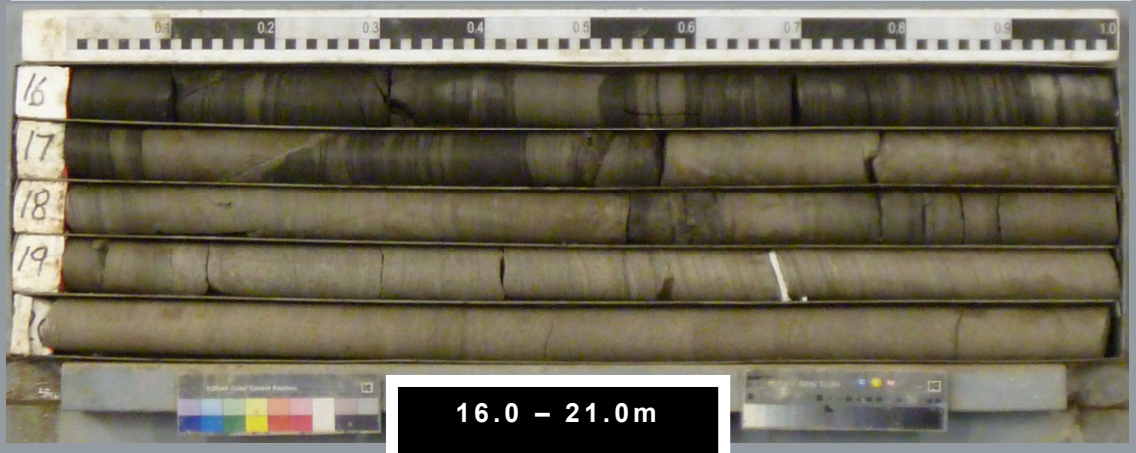


11.0 – 16.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 501 PROJECT 84335.02 MARCH 2015

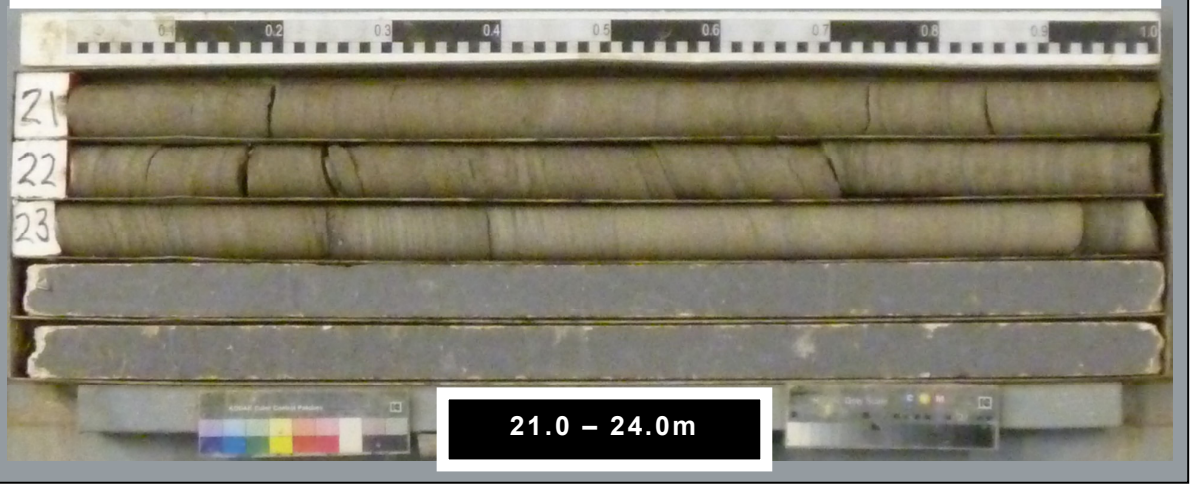


16.0 – 21.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 501 PROJECT 84335.02 JAN 2015



21.0 – 24.0m

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 127.07 AHD
EASTING: 314973
NORTHING: 6265812
DIP/AZIMUTH: 90°/--

BORE No: 502
PROJECT No: 84335.02
DATE: 24/3/2015
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
127	0.2	ROADBASE GRAVEL FILLING							A			
		FILLING - light grey-brown, silty clay and crushed rock fragments filling							A			
126	1								A			3,2,2
									S			N = 4
125	2							Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°				
	2.05	LAMINITE - extremely low strength, light grey-brown laminite										
124	3							2.5m: CORE LOSS: 1000mm				
	3.5	LAMINITE - medium to high then medium strength, highly and slightly weathered, fragmented to fractured, grey-brown laminite with approximately 20% fine sandstone laminations and some clay bands						3.5-3.68m: fg 3.68-3.9m: B0°, fe 3.9-4.0m: fg	C	55	0	PL(A) = 1.9
123	4							4.1m: J40°, pl, ro, cly, 5mm 4.2m: J55°, un, ro, cly 4.3m: J50°, un, ro, fe				PL(A) = 0.9
122	5	5.16-5.37m: light grey						4.45m: J45°, pl, sm, cly 4.5m: J50°, pl, ro, cly 4.56m: J45°, pl, ro, cly 4.63-4.85m: fg, fe 4.9m: B0°, cly, 20mm 5.16-5.37m: Ds				
	5.5	SHALE - medium strength, slightly weathered and fresh stained, fractured and slightly fractured, grey-brown then grey, shale with approximately 5-10% fine sandstone laminations						5.44m: J70°, pl, ro, fe 5.66m: J70°, pl, ro, fe 5.75m: B0°, cly, 20mm 5.87m: B0°, fe, cly, 20mm 5.98m: J45°, pl, ro, fe 6.05 & 6.10m: B0°, fe, cly, 2-10mm 6.22m: J35°, fe, he 6.3m: J60°, fe, he 6.38m: J45°, pl, ro, fe 6.52-7.0m: B0°, fe	C	100	26	
121	6											PL(A) = 0.5
120	7							7m: CORE LOSS: 150mm	C	92	33	
	7.15											
	7.5	SHALE - medium and high strength, fresh stained then fresh, slightly fractured and unbroken, grey to dark grey shale						7.15-7.3m: B0°- 5°, fe 7.33m: J45°, pl, sm, cln 7.4-7.53m: fg, fe 7.8-8.0m: B0°, fe 8m: J45°, pl, sm, cln 8.15m: J65°, pl, ro, fe				PL(A) = 1.3
119	8							8.35m: B10°, fe				PL(A) = 0.8
118	9							8.82m: J35°, pl, sm, cln	C	100	100	
								9.54-9.7m: 70°- 90°, cu, ro, cln				PL(A) = 1.2

RIG: Scout 2 **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 2.6m

TYPE OF BORING: Solid flight auger to 2.5m; NMLC-Coring to 19.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 127.07 AHD
EASTING: 314973
NORTHING: 6265812
DIP/AZIMUTH: 90°/--

BORE No: 502
PROJECT No: 84335.02
DATE: 24/3/2015
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
117		SHALE - medium and high strength, fresh stained then fresh, slightly fractured and unbroken, grey to dark grey shale *(continued)*							C	100	100	PL(A) = 1.2
116	11							10.88m: J70°- 80-°, cu, ro, cln 11.05m: J45°, sl, sm, cln 11.25m: J35°, pl, sm, cln 11.38m: J25°, pl, sm, cln				PL(A) = 1.2
115	12								C	100	100	PL(A) = 0.8
114	13							12.8m: J85°, pl, ro, cln 13.23m: J70°, pl, sm, cln				PL(A) = 1.2
	13.4	SILTSTONE - high strength, fresh, slightly fractured to unbroken, light grey siltstone										
113	14											PL(A) = 1.9
	14.2	LAMINITE - high strength, fresh, slightly fractured and unbroken, light grey to grey, laminite. Approximately 50% fine sandstone laminations and beds							C	100	99	PL(A) = 1.6
112	15							15.52m: J60°, sl, sm, Sz, 20mm				
111	16							15.85m: J55°, pl, sm, cln				PL(A) = 2.1
110	17	17.0-17.45m: fractured						17.08-17.12m: J70°, un, ro, cln				
	17.45	SANDSTONE - high strength, fresh, unbroken, fine to medium grained, light grey sandstone						17.15m: J60°, un, ro, cln 17.25m: J80°, un, ro, cln 17.33m: J70°, he 17.4-17.44m: Sz 17.44m: J45°, pl, sm, cly				PL(A) = 1.7
109	18								C	100	92	PL(A) = 1.8
108	19	18.95-19.28m: grey, some siltstone laminations										
	19.25	19.25m: medium grained										PL(A) = 1.8
	19.7	Bore discontinued at 19.7m										

RIG: Scout 2 **DRILLER:** LC **LOGGED:** SI **CASING:** HW to 2.6m

TYPE OF BORING: Solid flight auger to 2.5m; NMLC-Coring to 19.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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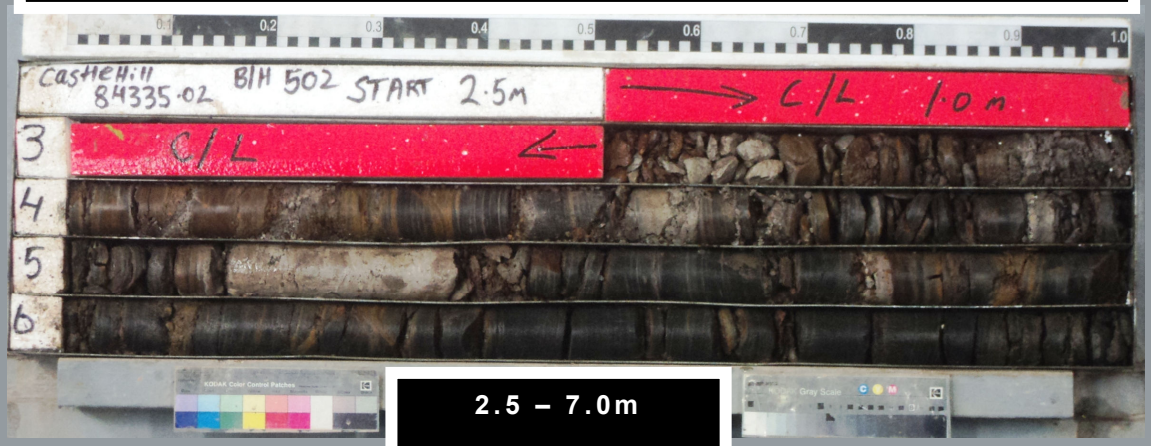
CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 502 PROJECT 84335.02 MARCH 2015

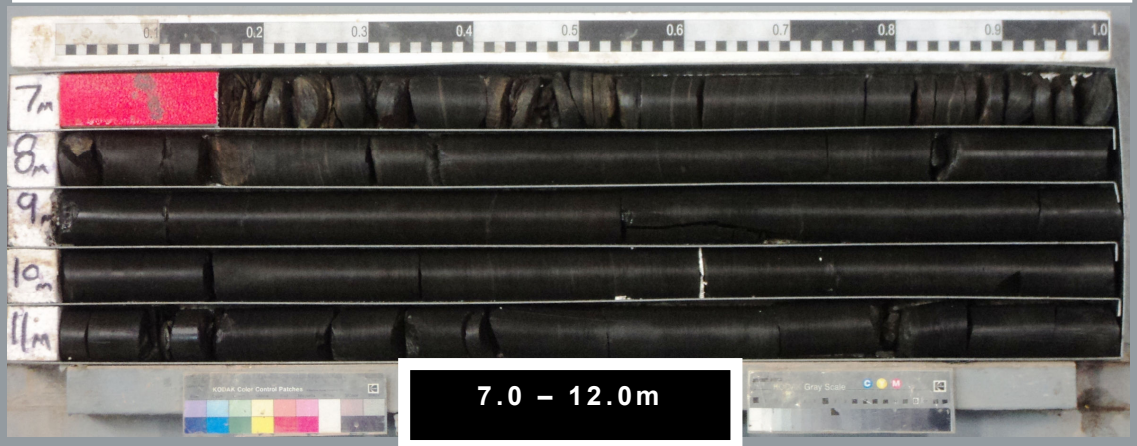


2.5 – 7.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 502 PROJECT 84335.02 MARCH 2015

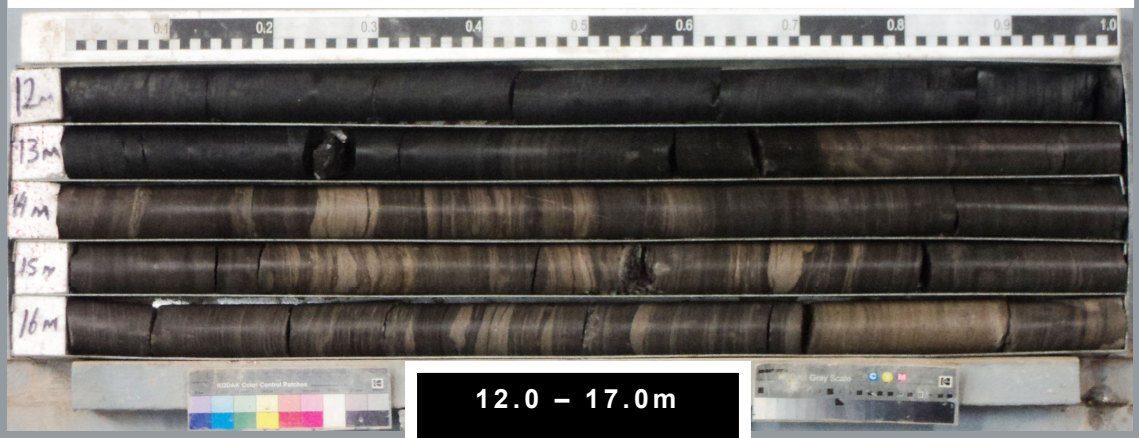


7.0 – 12.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 502 PROJECT 84335.02 MARCH 2015



12.0 – 17.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 502 PROJECT 84335.02 MARCH 2015

17.0 – 19.7m

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 133.17 AHD
EASTING: 314960
NORTHING: 6265695
DIP/AZIMUTH: 90°/--

BORE No: 503
PROJECT No: 84335.02
DATE: 25/3/2015
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
133	0.1	ASPHALTIC CONCRETE										
	0.2	FILLING - light grey-brown, silty clay filling with some sand										
		SILTY CLAY - apparently very stiff, light grey-brown, silty clay, moist										
	0.8	LAMINITE - extremely low to very low strength, light grey laminite						Note: Unless otherwise stated, defects are rough planar bedding dipping 0°- 10°				
132	1											
	1.3	LAMINITE - extremely low strength, extremely to highly weathered, highly fragmented to fractured, light grey to grey laminite with some medium strength ironstone cemented bands						1.3m: CORE LOSS: 320mm				
	1.62							1.85-2.45m: Ds/cly	C	77	0	
131	2							2.68-3.0m: fg, fe				
	3							3.07m: J60°, fe, he 3.17m: B0°, cly, 5mm 3.19m: J30°, pl, ro, cly, 2mm 3.25-3.35m: cly 3.4-3.69m: B0°- 5°, fe 3.71m: J30°, pl, ro 3.79m: B0°, ir, ro, cly, 10mm 4.04m: J50°, ir, ro, fe 4.25m: B0°, fe	C	100	18	PL(A) = 1.2 PL(A) = 0.7 PL(A) = 1.1
130	3.0	LAMINITE - medium and high strength, highly then slightly weathered to fresh stained, highly fractured, grey-brown laminite, approximately 60% shale, 40% fine grained sandstone laminations										
129	4											
	4.25	LAMINITE - high strength, slightly weathered to fresh stained, fractured and slightly fractured, grey-brown laminite, approximately 30% fine grained sandstone laminations						4.68m: B0°, pl, fe, 5mm 5.04m: B10°, fe 5.48m: J35°, pl, ro, fe 5.58m: J30°, pl, ro, fe 5.8m: B0°, fe 5.91m: B0°, cly, 10mm 5.93m: J30°, ir, ro 6.03m: B10°, fe 6.13m: J45°, pl, ro, cly,15mm	C	100	82	PL(A) = 1.6 PL(A) = 1.4 PL(A) = 1.4
128	5											
127	6											
	6.45	SHALE - high strength, fresh, unbroken, grey shale with approximately 5-10% fine grained sandstone laminations										
126	7											
125	8							8.45m: 5% fine grained sandstone laminations	C	100	99	PL(A) = 1.5
124	9											PL(A) = 1.8

RIG: Scout 2 **DRILLER:** SS **LOGGED:** IW/SI **CASING:** HW to 1.1m

TYPE OF BORING: NMLC-Coring from 1.3m to 24.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 133.17 AHD
EASTING: 314960
NORTHING: 6265695
DIP/AZIMUTH: 90°/--

BORE No: 503
PROJECT No: 84335.02
DATE: 25/3/2015
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
123		SHALE - high strength, fresh, unbroken, grey shale with approximately 5-10% fine grained sandstone laminations *(continued)*							C	100	99	PL(A) = 1.2
122	11											
	11.47	SHALE - medium strength, fresh, slightly fractured and unbroken, dark grey shale						11.39m: J30°, pl, sm				PL(A) = 0.9
121	12							11.98m: J20°, pl, sm, cln 12.23-12.3m: Sz 12.32m: J30°, ir, ro 12.35m: J45°, pl, sm 12.42m: J45°, pl, sm	C	100	92	PL(A) = 0.7
120	13							13.01m: J60°, pl, sm, cln				PL(A) = 0.5
119	14							13.67m: J40°, pl, sm, cly 13.85m: J45°, pl, sm, cln	C	100	96	PL(A) = 0.6
118	15							14.91m: J55°, pl, sm, cln				
	15.38	LAMINITE - high strength, fresh, slightly fractured and unbroken, light grey and grey laminite, approximately 40% shale, 60% fine grained sandstone laminations and beds						15.27-15.38m: J90°, ir, ro 15.57m: J50°, pl, sm, cln				PL(A) = 2.2
117	16											PL(A) = 1.9
116	17											PL(A) = 2
	17.46 17.53							17.46m: CORE LOSS: 70mm	C	98	97	
115	18							17.87m: J35°, pl, ro, cly				
	19											PL(A) = 2.2
114	19.53	SANDSTONE - description next page							C	100	95	PL(A) = 1.3

RIG: Scout 2 **DRILLER:** SS **LOGGED:** IW/SI **CASING:** HW to 1.1m

TYPE OF BORING: NMLC-Coring from 1.3m to 24.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 133.17 AHD
EASTING: 314960
NORTHING: 6265695
DIP/AZIMUTH: 90°/--

BORE No: 503
PROJECT No: 84335.02
DATE: 25/3/2015
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
113		SANDSTONE - high strength, fresh, slightly fractured and unbroken, light grey, fine to medium grained sandstone *(continued)*										PL(A) = 2.6
		20.6-20.7m: medium strength, moderately weathered shale band						20.69m: B0°, pl, fe, 20mm	C	100	95	
112	21											PL(A) = 1.3
	21.7	SANDSTONE - high strength, fresh, slightly fractured, light grey, medium to coarse grained sandstone						21.7-21.98m: J80°, ir, ro, he				
111	22							22.12m: B20°, cly vn, ti				
								22.48m: B20°, pl, ro, ti				PL(A) = 1.8
110	23							22.81m: B10°, pl, ro, cly, 5mm	C	100	95	
								23.24m: B20°, pl, ro, cln				PL(A) = 2.1
	24 24.0	Bore discontinued at 24.0m										
109												
108	25											
107	26											
106	27											
105	28											
104	29											

RIG: Scout 2 **DRILLER:** SS **LOGGED:** IW/SI **CASING:** HW to 1.1m

TYPE OF BORING: NMLC-Coring from 1.3m to 24.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

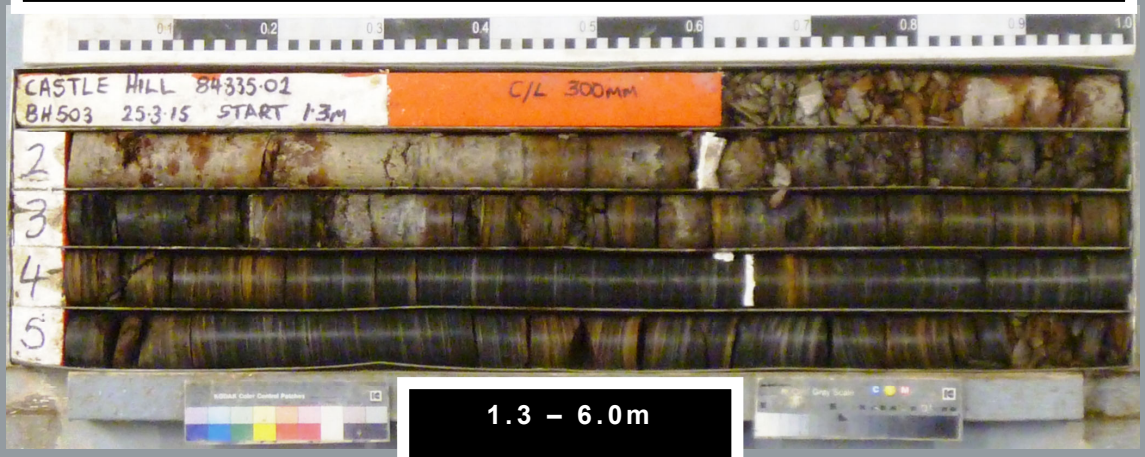
A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 503 PROJECT 84335.02 MARCH 2015

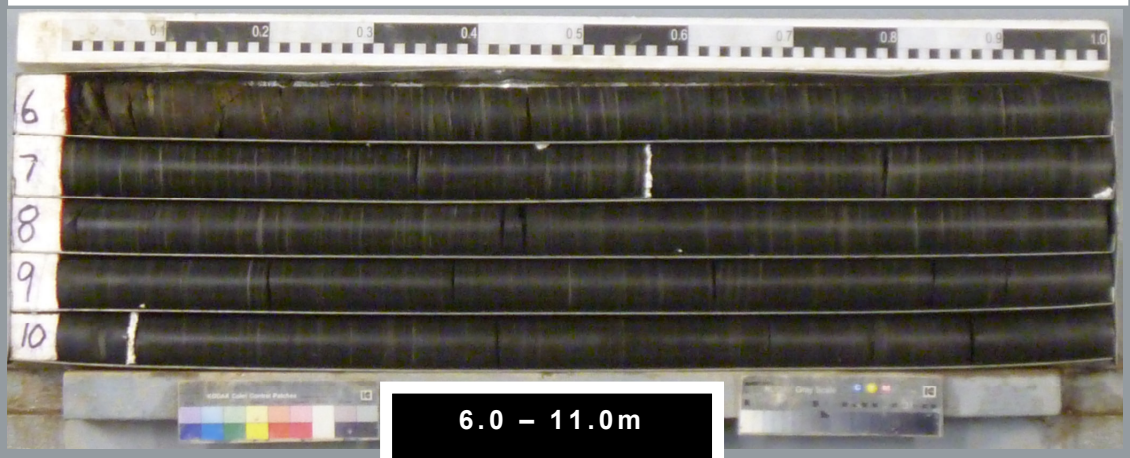


1.3 – 6.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 503 PROJECT 84335.02 MARCH 2015

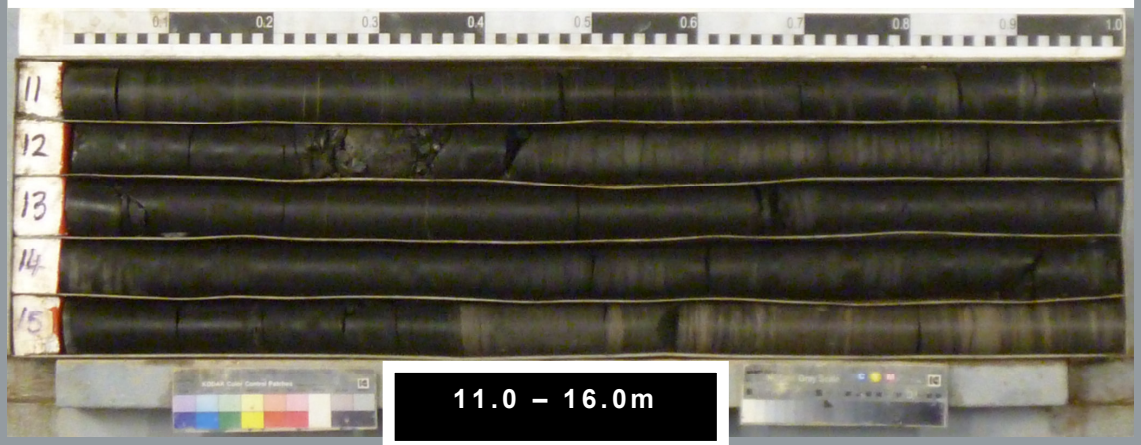


6.0 – 11.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 503 PROJECT 84335.02 MARCH 2015

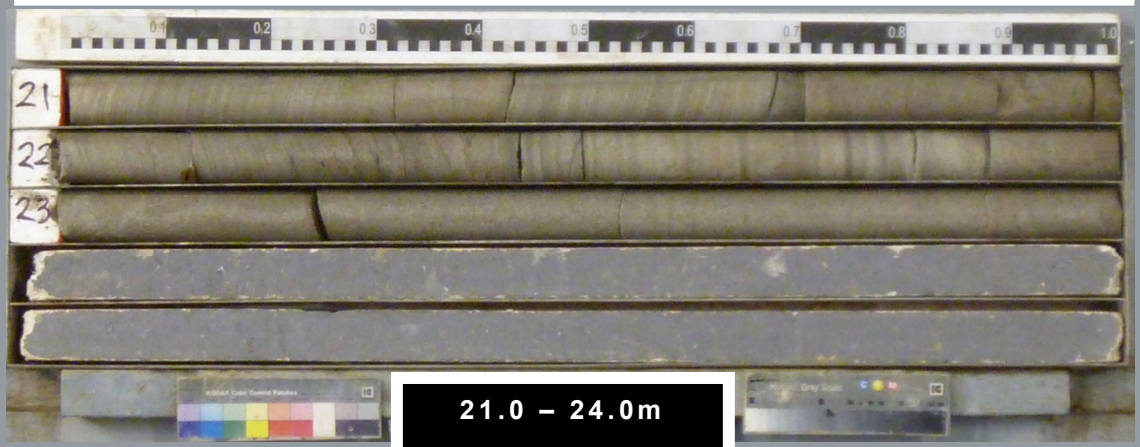


11.0 – 16.0m

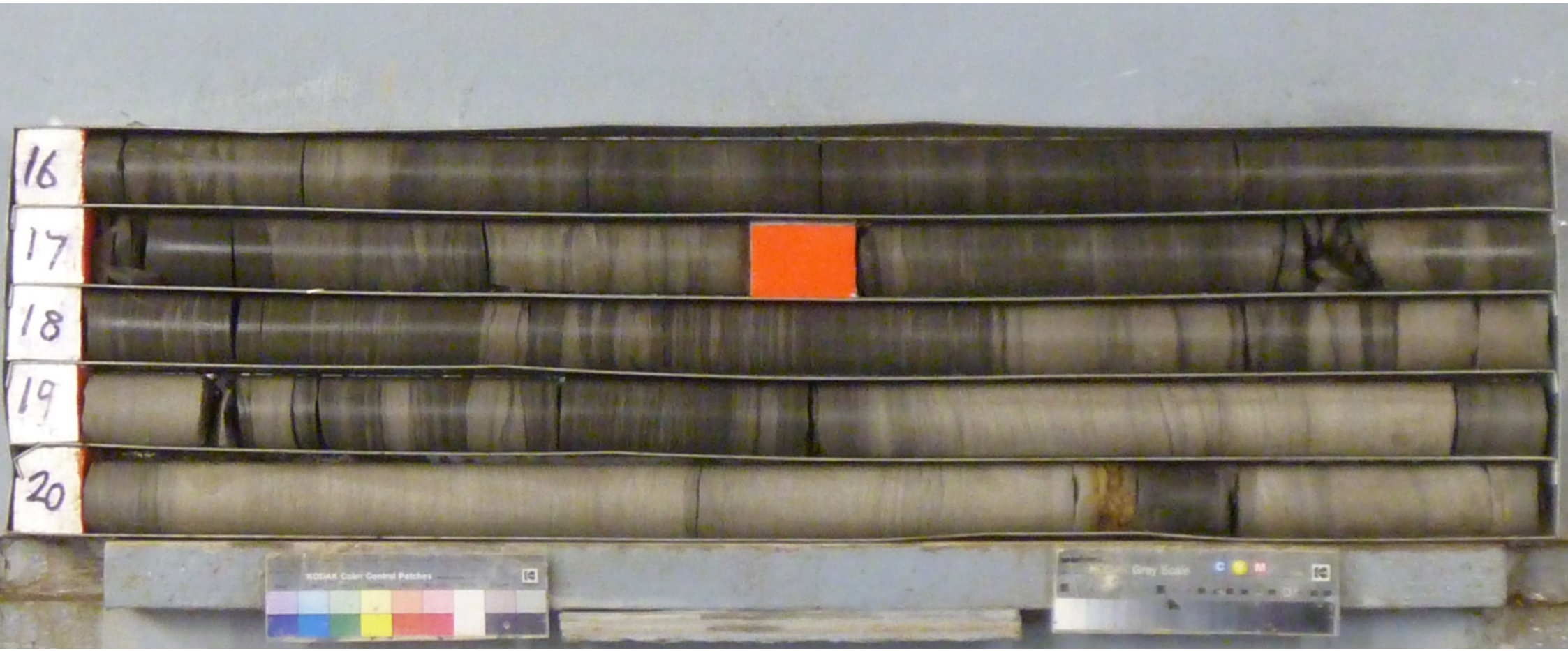
DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 503 PROJECT 84335.02 MARCH 2015



21.0 – 24.0m


16
17
18
19
20
KODAK Color Control Patches
Grey Scale

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 129.25 AHD
EASTING: 315022
NORTHING: 6265778
DIP/AZIMUTH: 90°/--

BORE No: 504
PROJECT No: 84335.02
DATE: 23/3/2015
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Type	Core Rec. %	RQD %	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Test Results & Comments
129	0.1	ASPHALTIC CONCRETE	A			Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	
	0.2	ROADBASE - grey, sandy gravel with some silt, damp	A				
		SANDY SILT - brown and light brown, sandy silt with trace of ironstone gravel, damp					
128	1.0	- probable weathered shale at 0.6m	A S				12,19,25/50mm refusal
	1.5	LAMINITE - extremely low to very low strength, light grey and orange-brown, laminite with some ironstone bands					PL(A) = 1.3
127	2	LAMINITE - high strength, moderately weathered, fractured, light grey-brown, laminite with approximately 30% fine sandstone laminations	C	100	75	1.8-1.85m: J90°- 45°, st, ro, cly co 2.05m: J45° & 80°, st, ro, cly vn 2.26m: J30°, pl, ro, fe, cly 2.45m: J45°, pl, ro, fe	PL(A) = 1.3
	2.5	LAMINITE - medium strength, moderately then slightly weathered, fractured to slightly fractured, grey-brown, laminite with approximately 20% fine sandstone laminations and some clay bands				2.56-2.64m: J70°, un, ro, partially he, fe stn 2.73m: J35°, pl, ro, fe 2.8 & 2.9m: J45°- 0°, st, ro, fe, cly vn 2.94m: J50°, ir, ro, cly co, 2mm 3.35-3.4m: J55°, un, ro, cly co, 2mm, fe 3.51-3.55m: Cz 3.75m: J35°, pl, sm, partially he, fe stn 3.84-3.92m & 3.94-4.07m: J's (x5) 65°- 75°, pl, ro, fe stn, cly 4.17 & 4.2m: J45°, pl, ro, fe 4.38m: J40°, ir, ro, cly, 3mm 4.64m: J70°, pl, ro, fe 4.77-4.82m: Ds 4.82-5.42m: J90°, ir, fe, partially he	PL(A) = 0.6
126	3						
125	4		C	100	70		PL(A) = 0.6
124	5						PL(A) = 0.6
123	6					5.48m: J20°, pl, ro, cly 5.64-5.9m: J (x4) 45°- 80°, un, ro, cly vn, fe stn 6.2m & 6.35m: B0°, fe 6.5m: J50°, pl, ro, cly vn	PL(A) = 0.5
122	7		C	100	55	6.75m: J30°, un, ro, cln 6.88-6.92m: J30°, pl, sm, Cz, 30mm 7.15m: J45°, pl, ro, fe 7.33m: J30°, he, fe 7.54 & 7.6m: J45°, pl, ro, fe/he	PL(A) = 0.7
121	8						
	8.8	SHALE - medium to high and high strength, fresh, fragmented to fractured and slightly fractured, grey shale with some very low and very low to low strength bands along shear zone	C	100	75	8.7m: J35°, fe, he	PL(A) = 0.6
120	9					8.9m: J30°, pl, sm, cln 9.07m: J45°, pl, sm, cln 9.2-9.2m: J50°- 80°, cu, sm, cln 9.31m: J45°, pl, sm, cln 9.4-9.55m: J (x3) 35°- 50°, pl, sm, cln 9.73m: B0°, cly, 5mm	PL(A) = 1.4

RIG: Scout 2 **DRILLER:** LC **LOGGED:** MP/SI **CASING:** HW to 1.2m

TYPE OF BORING: Solid flight auger to 1.0m; Rotary drilling to 1.5m; NMLC-Coring to 21.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 129.25 AHD
EASTING: 315022
NORTHING: 6265778
DIP/AZIMUTH: 90°/--

BORE No: 504
PROJECT No: 84335.02
DATE: 23/3/2015
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
119		SHALE - medium to high and high strength, fresh, fragmented to fractured and slightly fractured, grey shale with some very low and very low to low strength bands along shear zone *(continued)*						10.0-10.15m: J90°, pl, sm, partially he 10.15-10.2m: Sz & J30°, sl, sm, cly 10.2 & 10.29m: J60°, pl, sm, cln	C	100	75	
118	11	10.44-10.69m: shear zone						10.44m: J45°, pl, sm, cly 10.44-10.69m: Sz 10.92-11.0 & 11.07-11.12m: J80°, pl, ro, cly vn 11.26-11.34m: J65°, pl, sm, cln 11.52-11.68m: J75°, pl, sm, partially he 11.85-12.1m: J90°, pl, sm, cln 12.1-12.15m: J60°, pl, sm, cln 12.25-12.5m: J (x3) 65°-75°, pl, sm, cly	C	100	55	PL(A) = 1.5 PL(A) = 1.1 PL(A) = 1
117	12											
116	13 13.1	SILTSTONE - high strength, fresh, slightly fractured, light grey and grey siltstone						12.6-12.8m: J75°, pl, sm, cln 12.82-12.97m: J (x3) 45°- 60°, pl, sm, cln or he 13.2-13.4m: J75°, pl, ro, cln 13.5-13.6m: J30° & 85°, st, ro, cln	C	100	90	PL(A) = 1.8
115	14 14.0	LAMINITE - high and very high strength, fresh, slightly fractured and unbroken, light grey to grey, laminite with approximately 40% fine sandstone laminations and beds						14.4-14.55m: J75°, un, ro, cln 14.8m: J, sv, pl, ro, cln				PL(A) = 1.8
114	15							15.08m: J45° & 80°, st, ro, cln 15.3m: J45°, pl, sm, Cz, 20mm 15.5m: J30° & 75°, st, ro, cln				PL(A) = 2
113	16											PL(A) = 3.4
112	17								C	100	86	PL(A) = 3.5 PL(A) = 2.7
111	17.5 18 18.3	LAMINITE/SANDSTONE - medium strength, fresh, fractured and slightly fractured, light grey and grey, fine sandstone/laminite. 50% siltstone/sandstone laminations and beds 17.65-17.75m: microfaults						17.62-18.0m: microfaults 18.09m: J35°, pl, ro, Cz, 20mm				PL(A) = 0.1
110	19 19.13	SANDSTONE - very low strength, highly weathered, fractured, light grey and brown, fine to medium grained sandstone 18.3-18.75m: possible fault zone						18.13m: J50°, pl, ro, cln & J90°, he 18.2m: Fault & Sz? 18.3-18.75m: fault zone/shear zone 18.35m: J45°, pl, ro, cly 19.0-19.1m: Sz 19.1m: J55°, pl, ro, fe, cly 19.3m: B0°, fe, cly 19.55-19.8m: B5°, cly 19.84-19.87m: cly	C	100	61	PL(A) = 0.7
		SANDSTONE - description next page										

RIG: Scout 2 **DRILLER:** LC **LOGGED:** MP/SI **CASING:** HW to 1.2m

TYPE OF BORING: Solid flight auger to 1.0m; Rotary drilling to 1.5m; NMLC-Coring to 21.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 129.25 AHD
EASTING: 315022
NORTHING: 6265778
DIP/AZIMUTH: 90°/--

BORE No: 504
PROJECT No: 84335.02
DATE: 23/3/2015
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
109		SANDSTONE - medium then high strength, moderately weathered, slightly fractured then unbroken, brown, medium to coarse grained sandstone with some very low strength bands *(continued)*							C	100	61	PL(A) = 1.5 PL(A) = 1.3
108	21 21.0	Bore discontinued at 21.0m - target depth reached										
107	22											
106	23											
105	24											
104	25											
103	26											
102	27											
101	28											
100	29											

RIG: Scout 2 **DRILLER:** LC **LOGGED:** MP/SI **CASING:** HW to 1.2m

TYPE OF BORING: Solid flight auger to 1.0m; Rotary drilling to 1.5m; NMLC-Coring to 21.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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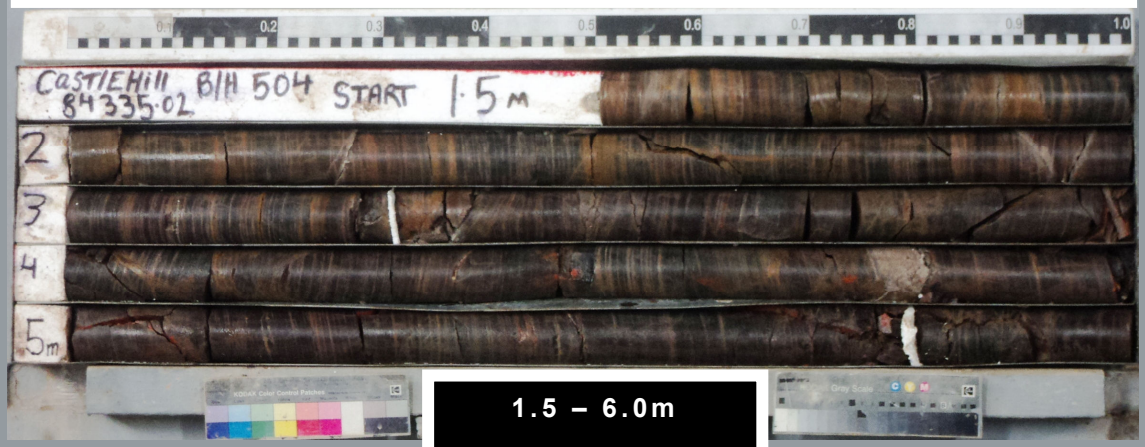
CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 504 PROJECT 84335.02 MARCH 2015



1.5 – 6.0m

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CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 504 PROJECT 84335.02 MARCH 2015

6.0 – 11.0m

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CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 504 PROJECT 84335.02 MARCH 2015

11.0 – 16.0m

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CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 504 PROJECT 84335.02 MARCH 2015

16.0 – 21.0m

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 128.25 AHD
EASTING: 314950
NORTHING: 6265798
DIP/AZIMUTH: 90°/--

BORE No: 523
PROJECT No: 84335.02
DATE: 19/6/2015
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Type	Core Rec. %	RQD %	Test Results & Comments
128	0	**FILLING** - light brown to brown, sandy clay filling with a trace of gravel (roadbase), moist	A			
	0.6	**SILTY CLAY** - stiff to very stiff, brown, silty clay with a trace of ironstone gravel, moist	A			
127	1	Note: Unless otherwise stated, rock is fractured along rough planar bedding dipping 0°- 10°	A S			3,7,16 N = 23
	1.6	**LAMINITE** - extremely low strength, grey-brown laminite				
	1.9	**LAMINITE** - medium strength, highly to moderately weathered, highly fractured to fractured, grey-brown laminite with some clay bands				
126	2	1.9-2.3m: B (x6) 0°, fe 2.3-2.33m: Cs 2.45-2.75m: B (x7) 0°, cly, 1-5mm	C	100	0	PL(A) = 1.1
125	3	2.9m: B0°, cly, 10mm & J, sv, un, ro, cly 3.0-3.4m: B (x5) 0°, fe 3.4-3.42m: Cs 3.55-4.52m: B (X15) 0°-5°, fe, cly, 5-10mm				PL(A) = 0.4
124	4		C	100	0	PL(A) = 0.5
123	5	4.7 & 4.8m: Cs, 20mm 5m: J80°, un, ro, fe 5.06-5.25m: fg				
	5.35	5.25m: CORE LOSS: 100mm				
	5.6	**SHALE** - medium strength, slightly weathered, fractured, dark grey and brown shale 5.47m: J45°, un, ro, cly 5.6m: J35°, un, ro, fe 5.65-7.31m: B (x15) 0°, fe	C	94	28	PL(A) = 0.6 PL(A) = 0.4
122	6					
121	7	7.4m: J, sv, (80°), un, ro, fe 7.95-8.25m: J70°- 80°, st, ro, fe				PL(A) = 0.6
120	8	8.3m: B0°, fg 10mm	C	100	79	PL(A) = 1.4
	8.15	**SHALE** - high then medium strength, fresh, slightly fractured then unbroken, grey shale				
119	9	9.6m: B0°, fe				PL(A) = 1.2
			C	100	100	

RIG: Scout 1 **DRILLER:** SS **LOGGED:** SI **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger to 1.0m; Rotary to 1.9m; NMLC-Coring to 25.0m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 128.25 AHD
EASTING: 314950
NORTHING: 6265798
DIP/AZIMUTH: 90°/--

BORE No: 523
PROJECT No: 84335.02
DATE: 19/6/2015
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
118		SHALE - high then medium strength, fresh, slightly fractured then unbroken, grey shale *(continued)*										PL(A) = 0.9
117	11							10.95m: J55° & 30°, st, ro, cln				
	11.35	INTERBEDDED SANDSTONE/SILTSTONE - high strength, fresh, slightly fractured, light grey and grey, fine grained sandstone interbedded with siltstone						11.3m: J45°, pl, ro, cln	C	100	100	PL(A) = 1.6
116	12							12.25m: J90°				PL(A) = 2.6
115	13							13.12m: J50° & 80°, cu, ro, cln				PL(A) = 1.5
114	14							14.35m: J45°, un, ro, cln	C	100	100	PL(A) = 1.3
113	15							14.85m: J40°, pl, ro, cln				PL(A) = 2.2
112	16											
	16.1	SANDSTONE - high strength, fresh, slightly fractured and unbroken, light grey, fine grained sandstone with some carbonaceous laminations						16.1m: B0°, cly				PL(A) = 1.5
111	17							16.8-17.0m: J70° & 85°, st, ro, cln	C	100	100	PL(A) = 2.4
	17.8	SANDSTONE - high strength, fresh then moderately to slightly weathered, slightly fractured then unbroken, light grey and red-brown, medium grained sandstone										
110	18							18.45m: J30°, cly co				PL(A) = 1.4
109	19							19.15m: B20°, cly vn	C	100	100	PL(A) = 2.3
	20.0							19.7m: B5°, ir, fe stn				

RIG: Scout 1 **DRILLER:** SS **LOGGED:** SI **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger to 1.0m; Rotary to 1.9m; NMLC-Coring to 25.0m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 128.25 AHD
EASTING: 314950
NORTHING: 6265798
DIP/AZIMUTH: 90°/--

BORE No: 523
PROJECT No: 84335.02
DATE: 19/6/2015
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
108		SANDSTONE - high strength, fresh then moderately to slightly weathered, slightly fractured then unbroken, light grey and red-brown, medium grained sandstone										PL(A) = 1.3
								20.3m: B0°, cly co				
								20.52m: B0°, fe stn				
107	21								C	100	100	
								21.25-21.4m: J70°, un, ro, fe				PL(A) = 1.4
106	22											
								22.15m: B0°, cly co				
												PL(A) = 1.4
105	23							23.1m: J30°, un, ro, cln				
								23.5m: J30°, pl, ro, cln	C	100	100	
												PL(A) = 1.3
104	24											
												PL(A) = 1.4
	25 25.0	Bore discontinued at 25.0m										
103												
	26											
102												
	27											
101												
	28											
100												
	29											
99												

RIG: Scout 1 **DRILLER:** SS **LOGGED:** SI **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger to 1.0m; Rotary to 1.9m; NMLC-Coring to 25.0m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U$_x$	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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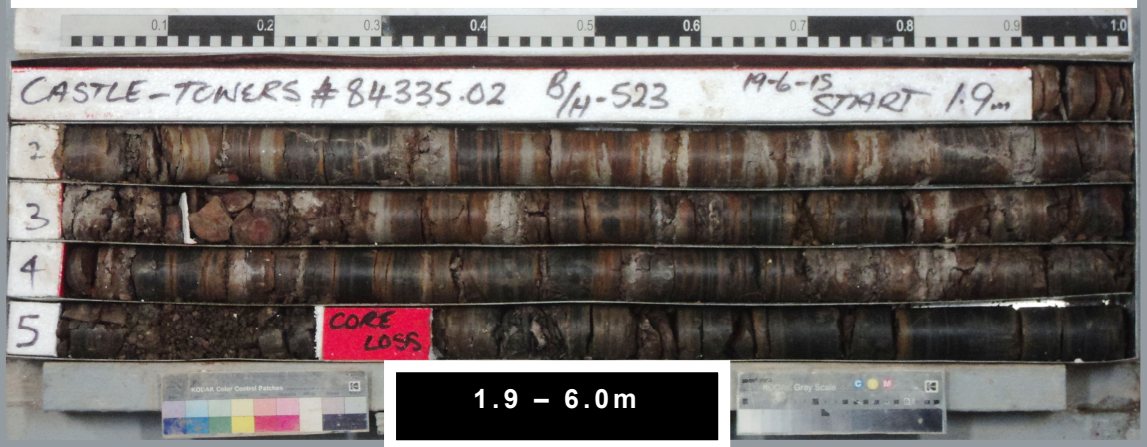
CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 523 PROJECT 84335.02 JUN 2015



1.9 – 6.0m

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CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 523 PROJECT 84335.02 JUN 2015

6.0 – 11.0m

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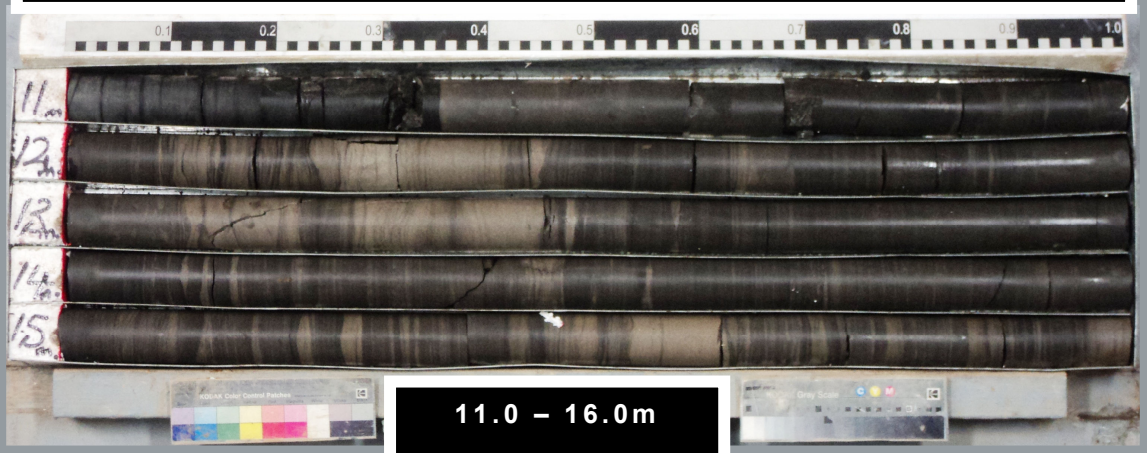
CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 523 PROJECT 84335.02 JUN 2015



11.0 – 16.0m

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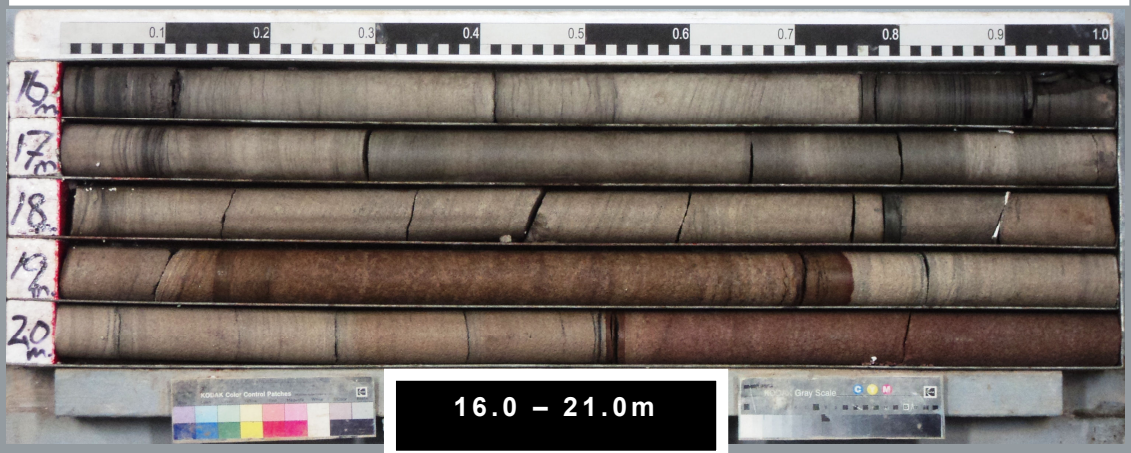
CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 523 PROJECT 84335.02 JUN 2015



16.0 – 21.0m

DOUGLAS PARTNERS PTY LTD

CASTLE TOWER EXPANSION PROJECT – CASTLE HILL

BORE 523 PROJECT 84335.02 JUN 2015

21.0 – 25.0m

BOREHOLE LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 128.4 AHD
EASTING: 314893.2
NORTHING: 6265789
DIP/AZIMUTH: 90°/--

BORE No: 901
PROJECT No: 84335.14
DATE: 3/3/2022
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			EW HW MW SW FS FR		Ex Low / Very Low / Low / Medium / High / Very High / Ex High		0.01 / 0.05 / 0.10 / 0.50 / 1.00	B - Bedding J - Joint S - Shear F - Fault				
128	0.2	TOPSOIL/Silty CLAY: medium plasticity, dark brown-grey, with fine to medium siltstone gravel and root fibres, w~PL							D/E			
	0.8	Silty CLAY CH: high plasticity, dark brown mottled pale brown, with fine to medium siltstone and ironstone gravel, w~PL, stiff, residual							D/E			
	1							Unless otherwise stated, rock is fractured along smooth or rough planar bedding dipping at 0°-5° with clay coating or iron strain	D/E/S			25/100 refusal
127	1.3	Gravelly CLAY CL: low plasticity, pale brown, fine subangular to angular siltstone gravel, with silt, w<PL, very stiff, residual (extremely weathered rock) Below 1.0m: becoming hard						1.43m: 2mm 1.49m: J70°-90°, cu, ro, cly vn 1.5m: 2mm	C	90	0	PL(A) = 1.1
	2							2.14m: J60°, pl, ro, cly vn				
126	2.7	SILTSTONE: pale grey, dark grey and orange-brown, approximately 15-20% fine grained sandstone laminations, very low to low strength with high strength bands, highly to moderately weathered, fractured, Ashfield Shale						2.49m: J60°, pl, ro, cly co 3mm 2.57m: CORE LOSS: 130mm 3.02m: J60°, pl, ro, cly vn 3.14m: J60°, pl, ro, cln 3.15m: B0°-5°, pl, ro, cly co 3mm 3.24m: J80°, st, ro, cln 3.54m: J30°, pl, sm, fe stn	C	100	10	PL(A) = 0.78 PL(A) = 0.12
	3											
125	3.46	SILTSTONE: dark grey and orange-brown, approximately 5% fine grained sandstone laminations, low to medium strength, slightly to highly weathered with extremely weathered bands, fractured, fragmented in places, Ashfield Shale						3.66m: J60°, pl, sm, cly co 2mm 3.7m: J30°, pl, sm, cln 3.73m: J30°, pl, sm, cln 3.81m: J45°-80°, cu, sm, cln 3.91m: J45°, pl, sm, cln 4.52m: J45°, pl, sm, fe stn	C	93	0	PL(A) = 0.17
	4											
124												
	5											
123	5.5							4.68m: J60°, pl, ro, fe stn 4.83m: J60°, pl, ro, cly co 2mm 4.94m: J30°, pl, sm, fe stn 5.12m: J30°-80°, cu, sm, fe stn	C	90	0	
	6											
122	6.5							5.4m: CORE LOSS: 100mm 5.52m: J90°, pl, sm, cln 5.6m: B0°-5°, pl, ro, cly co 10mm 5.72m: J60°, pl, sm, cln 5.88m: J30°, pl, sm, cln 6.4m: CORE LOSS: 100mm 6.67m: B0°-5°, pl, ro, cly co 200mm 7m: J90°, pl, ro, fe stn 7.23m: J45°, pl, ro, fe stn	C	100	15	PL(A) = 0.36 PL(A) = 0.12
	7											
121												
	8											
120	8.4	SILTSTONE: dark grey, pale grey and orange-brown, approximately 30-40% fine grained sandstone laminations, medium strength, slightly to moderately weathered, fractured, Ashfield Shale						7.53m: J60°, pl, ro, fe stn 7.64m: J60°, pl, ro, fe stn 9.22m: J30°, pl, ro, fe stn 9.42m: J30°, pl, ro, cln	C	100	73	PL(A) = 0.98
	9											
119												

RIG: Geo 305 **DRILLER:** Ground Test **LOGGED:** SL **CASING:** HWT to 1.3m

TYPE OF BORING: Solid Flight Auger to 1.3m, NMLC Coring to 13.35m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 128.4 AHD
EASTING: 314893.2
NORTHING: 6265789
DIP/AZIMUTH: 90°/--

BORE No: 901
PROJECT No: 84335.14
DATE: 3/3/2022
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
118		SILTSTONE: dark grey, pale grey and orange-brown, approximately 30-40% fine grained sandstone laminations, medium strength, slightly to moderately weathered, fractured, Ashfield Shale *(continued)*						10.33m: J60°, pl, fe vn, he 10.4m: J45°, pl, fe, vn, he 10.81m: J30°-60°, cu, ro, fe stn	C	100	73	
117	11	Between 10.10-10.25m: cross-bedded Between 10.74-10.85m: cross-bedded										PL(A) = 0.78
	12											PL(A) = 0.53
116	12.32	SANDSTONE: fine grained, pale brown-grey and orange-brown, 10-15% siltstone laminations, high to very high strength, slightly to moderately weathered, fractured with extremely weathered bands, probable Mittagong Formation						12.45m: J60°-90°, ir, ro, fe stn, partially he 12.61m: J60°, pl, fe stn, he 12.75m: J80°-90°, pl, ro, fe stn 13.12m: J80°-90°, pl, ro, fe stn	C	100	55	PL(A) = 4.3
	13											
115	13.35	Bore discontinued at 13.35m - Limit of Investigation										PL(A) = 0.5
	14											
114												
	15											
113												
	16											
112												
	17											
111												
	18											
110												
	19											
109												

RIG: Geo 305 **DRILLER:** Ground Test **LOGGED:** SL **CASING:** HWT to 1.3m

TYPE OF BORING: Solid Flight Auger to 1.3m, NMLC Coring to 13.35m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 901 PROJECT: 84335.14 MARCH 2022

1.3 – 5.0 m

BORE: 901 PROJECT: 84335.14 MARCH 2022

5.0 – 10.0 m

BORE: 901 **PROJECT: 84335.14** **MARCH 2022**

10.0 – 13.35 m

BOREHOLE LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 123.5 AHD
EASTING: 314826.3
NORTHING: 6265798.6
DIP/AZIMUTH: 90°/--

BORE No: 902
PROJECT No: 84335.14
DATE: 7/3/2022
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
123	0.15	FILL/TOPSOIL/Gravelly CLAY: medium plasticity, dark brown, medium, angular to subangular gravel, with silt and root fibres, w<PL							D/E			
	0.7	FILL/Silty CLAY: medium plasticity, dark brown, with gravel, w<PL							D/E			
1	1.0	Silty CLAY CL: low plasticity, brown, with fine to medium, angular to subangular ironstone and siltstone gravel, w<PL, stiff, residual							D/E S			21,25/120 refusal
122	1.4	CLAY CH: high plasticity, pale grey mottled orange-brown, with low to low strength, orange-brown siltstone bands, w<PL, very stiff, extremely weathered rock							C	100	0	
2												
121		CLAY CH: high plasticity, pale grey, with orange-brown and red-brown, low strength siltstone bands, w<PL, very stiff, extremely weathered rock							C	100	0	
3	3.12							3m: CORE LOSS: 120mm				
120								Unless otherwise stated, rock is fractured along smooth or rough planar bedding dipping at 0°-5°, some with iron stain or clay coating to 5mm	C	93	0	
4												
119	4.55	SILTSTONE: orange-brown, dark brown and grey, approximately 30-40% fine grained sandstone laminations, very low to low strength, highly weathered with extremely weathered bands, fractured, Ashfield Shale										
5								4.86-6.03m: (x5)				PL(A) = 0.17
118												
6								6.11m: J80°-90°, pl, ro, fe stn	C	100	18	PL(A) = 0.36
117		Below 6.53m: dark brown to black iron-cement present on fractures						6.4m: B0°-5°, pl, ro, cly co 20mm				
	6.75							6.56m: B0°-5°, pl, ro, cly co 15mm				
7		SANDSTONE: fine grained, pale grey, orange-brown and pale brown, approximately 5-10% siltstone laminations, medium to high strength, highly to moderately weathered with extremely weathered bands, fractured, probable Mittagong Formation						6.74m: B0°-5°, pl, ro, cly co 25mm				PL(A) = 0.74
116								6.9m: J70°-80°, pl, ro, fe stn				
								7.25m: B0°-5°, pl, ro, cly co 20mm				
8								7.32m: J45°, pl, ro, cln				PL(A) = 0.75
								7.5m: J45°, pl, he				
115								7.73-7.85m: J45°(x2), pl, ro, fe stn				
								8.44m: B0°-5°, pl, ro, cly co 12mm	C	100	23	PL(A) = 0.44
9								8.72m: J70°-80°, pl, ro, fe, he				
								8.87m: B0°-5°, pl, ro, cly co 30mm				
114								9.04m: B0°-5°, pl, ro, cly co 35mm				
								9.3m: J80°-90°, ir, ro, fe, he				
								9.58m: B10°-15°, pl, ro,				
	10.0	Bore discontinued at 10.0m - Limit of Investigation										

RIG: Geo 305 **DRILLER:** Ground Test **LOGGED:** SL **CASING:** HWT to 1.4m, HQ to 3.0m

TYPE OF BORING: Solid Flight Auger to 1.4m, Wash Bore to 3.0m, NMLC Coring to 10.00m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 123.5 AHD
EASTING: 314826.3
NORTHING: 6265798.6
DIP/AZIMUTH: 90°/--

BORE No: 902
PROJECT No: 84335.14
DATE: 7/3/2022
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
113	11							cly co 5mm 9.59m: J70°-80°, pl, he 9.68m: J70°-80°, pl, ro, cly co 10mm 9.92m: J60°-70°, pl, ro, cln				PL(A) = 1.1
112	12											
111	13											
110	14											
109	15											
108	16											
107	17											
106	18											
105	19											
104												

RIG: Geo 305 **DRILLER:** Ground Test **LOGGED:** SL **CASING:** HWT to 1.4m, HQ to 3.0m

TYPE OF BORING: Solid Flight Auger to 1.4m, Wash Bore to 3.0m, NMLC Coring to 10.00m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 902 PROJECT: 84335.14 MARCH 2022

1.4 – 5.0 m

BORE: 902 PROJECT: 84335.14 MARCH 2022

5.0 – 10.0 m

BOREHOLE LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 122.4 AHD
EASTING: 314835.3
NORTHING: 6265814.6
DIP/AZIMUTH: 90°/--

BORE No: 903
PROJECT No: 84335.14
DATE: 4/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			EW HW MW SW FS FR		Ex Low Very Low Low Medium High Very High Ex High		0.01 0.05 0.10 0.50 1.00	B - Bedding J - Joint S - Shear F - Fault				
122	0.15	FILL/TOPSOIL/Gravelly CLAY: medium plasticity, dark brown, medium, angular to subangular gravel, with silt and root fibres, w<PL							D/E			
	0.6	FILL/CLAY: medium plasticity, dark brown, with fine angular ironstone and siltstone gravel and root fibres, w<PL							D/E			
121	1	CLAY CI: medium plasticity, pale grey mottled orange-brown, with silt, w<PL, stiff, residual							D/E S			4,6,6 N = 12
	1.65	Below 1.1m: becoming pale grey, very stiff							D/E			
120	2	Silty CLAY CL: low plasticity, pale grey, with fine angular siltstone and shale gravel, w<PL, very stiff to hard, extremely weathered rock							D			
									D S			14,16,18 N = 34
119	3							Unless otherwise stated, rock is fractured along rough planar bedding dipping at 0°-5° with iron stain				
	3.8	SILTSTONE: dark grey and orange-brown, laminated, very low strength, highly weathered, fractured, Ashfield Shale							S			25/60 refusal
118	4							4.15-4.29m: J90°(x3), ir, ro, fe stn				
	4.1	SILTSTONE: dark grey, orange-brown and pale grey, approximately 5-10% fine grained sandstone laminations, low to medium strength, slightly to moderately weathered with extremely weathered bands, fractured, Ashfield Shale						4.51-4.63m: B0°-5°(x2), pl, ro, cly co 10mm 4.73-4.92m: J90°(x4), pl, ro, fe stn 5.07-7.20m: B0°-5°(x20), pl, ro, cly co 10mm	C	100	0	PL(A) = 0.32
117	5											
	6											PL(A) = 0.51
116	6.38	SILTSTONE: dark grey, orange-brown and pale grey, approximately 40-50% fine grained sandstone laminations, low to high strength, moderately weathered to fresh, slightly fractured, Ashfield Shale										PL(A) = 0.58
115	7	Between 7.68-7.88m: fine grained sandstone band						7.67m: B0°-5°, pl, ro, cly co 10mm 7.71m: J70°-80°, pl, ro, fe stn 7.87m: B0°-5°, pl, ro, cly co 2mm 8.17m: B0°-5°, pl, ro, cly co 2mm	C	100	35	PL(A) = 0.28
	8											
	8.16	SANDSTONE: fine to medium grained, pale grey, pale brown and orange-brown, <5% siltstone laminations, high strength, slightly weathered to fresh, slightly fractured, probable Mittagong Formation										PL(A) = 1.9
114	9											
	9.0	Bore discontinued at 9.0m - Target Depth Reached										PL(A) = 1.5
113												

RIG: Geo 305 **DRILLER:** Ground Test **LOGGED:** SL **CASING:** HWT to 4.1m

TYPE OF BORING: Solid Flight Auger to 4.1m, NMLC Coring to 9.00m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 9.0m (screen 2.0m-9.0m, Sand 1.5m-9.0m, Bentonite 0.5m-1.5m, Cement 0.0m to 0.5m, 0.5m stick up with monument)

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BORE: 903 PROJECT: 84335.14 MARCH 2022

4.1 – 8.0 m

BORE: 903 PROJECT: 84335.14 MARCH 2022

8.0 – 9.0 m

Appendix D2 – Shallow Augered Boreholes

BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Preliminary Contamination Assessment
LOCATION: Cnr Old Northern Rd & Showground Rd, Castle Hill

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 208
PROJECT No: 43863A
DATE: 19 Apr 06
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.1	ASPHALTIC CONCRETE			0.1				
		ROADBASE - dark brown sandy gravel roadbase		A			PID<1ppm		
	0.3	SILTY CLAY - red brown silty clay (possibly filling)		A	0.3		PID<1ppm		
	0.5	SILTY CLAY - hard, grey mottled yellow silty clay		A	0.5		PID<1ppm		
	0.7	Bore discontinued at 0.7m in silty clay - refusal			0.7				
	1								1
	2								2
	3								3
	4								4

RIG: Bobcat mounted auger **DRILLER:** B Ellis **LOGGED:** Karpiel **CASING:** Uncased
TYPE OF BORING: 125mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: CFK
Date: 29.05.06

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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Preliminary Contamination Assessment
LOCATION: Cnr Old Northern Rd & Showground Rd, Castle Hill

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 209
PROJECT No: 43863A
DATE: 19 Apr 06
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	FILLING - brown slightly clayey silt (topsoil), with traces of rock fragments and vegetation		A	0.0		PID<1ppm		
				A	0.3		PID<1ppm		
	0.7	SILTSTONE - very low strength, light grey mottled orange siltstone with some sandstone layers			0.5				
				A	0.8		PID<1ppm		
	1				1.0				1
				A	1.3		PID<1ppm		
	1.5	Bore discontinued at 1.5m in siltstone - target depth reached			1.5				
	2								2
	3								3
	4								4

RIG: Bobcat mounted auger **DRILLER:** B Ellis **LOGGED:** Karpiel **CASING:** Uncased
TYPE OF BORING: 125mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: CFK
Date: 29.05.06

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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Preliminary Contamination Assessment
LOCATION: Cnr Old Northern Rd & Showground Rd, Castle Hill

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 210
PROJECT No: 43863A
DATE: 19 Apr 06
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - brown silty clay filling, with rock fragment and fragments of brick and terracotta		A	0.0		PID<1ppm		
				A	0.3		PID<1ppm		
	1				0.5				1
				A	1.3		PID<1ppm		
	1.5	Bore discontinued at 1.5m - refusal in filling			1.5				
	2								2
	3								3
	4								4

RIG: Bobcat mounted auger **DRILLER:** B Ellis **LOGGED:** Karpiel **CASING:** Uncased
TYPE OF BORING: 125mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: CFK
Date: 29.05.06

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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Preliminary Contamination Assessment
LOCATION: Cnr Old Northern Rd & Showground Rd, Castle Hill

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 211
PROJECT No: 43863A
DATE: 19 Apr 06
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.0	FILLING - brown slightly clayey, sandy silt filling with traces of rock fragments		A	0.0		PID<1ppm		
				A	0.3		PID<1ppm		
	0.7	SILTY CLAY - orange brown silty clay (possibly filling)			0.5				
	1			A	0.8		PID<1ppm		1
					1.0				
	1.5	Bore discontinued at 1.5m in silty clay - target depth reached		A	1.3		PID<1ppm		
	2				1.5				2
	3								3
	4								4

RIG: Bobcat mounted auger **DRILLER:** B Ellis **LOGGED:** Karpiel **CASING:** Uncased
TYPE OF BORING: 125mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: CFK
Date: 29.05.06

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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Preliminary Contamination Assessment
LOCATION: Cnr Old Northern Rd & Showground Rd, Castle Hill

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 212
PROJECT No: 43863A
DATE: 19 Apr 06
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - brown sandy silt filling with rock fragments		A	0.1 - 0.3		PID=1ppm		
	0.4	Bore discontinued at 0.4m - refusal on concrete							
	1								
	2								
	3								
	4								

RIG: Bobcat mounted auger **DRILLER:** B Ellis **LOGGED:** Karpiel **CASING:** Uncased
TYPE OF BORING: 125mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U,	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ⫧ Water level

CHECKED
Initials: CPK
Date: 29.05.06

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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Preliminary Contamination Assessment
LOCATION: Cnr Old Northern Rd & Showground Rd, Castle Hill

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 213
PROJECT No: 43863A
DATE: 19 Apr 06
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		FILLING - brown clayey silt (topsoil) with some vegetation		A	0.0		PID<1ppm		
				A	0.3		PID<1ppm		
	0.6	SILTY CLAY - stiff, red brown silty clay with some ironstone bands			0.5				
	1			A*	0.8		PID<1ppm		1
					1.0				
				A	1.8		PID<1ppm		
	2 2.0	Bore discontinued at 2.0m in silty clay - target depth reached			2.0				2
	3								3
	4								4

RIG: Bobcat mounted auger **DRILLER:** B Ellis **LOGGED:** Karpiel **CASING:** Uncased

TYPE OF BORING: 110mm diameter solid flight auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *Denotes field replicate sample BD3190406 taken

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials: CFK
Date: 29.05.06

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BOREHOLE LOG

CLIENT: Queensland Investment Corporation
PROJECT: Preliminary Contamination Assessment
LOCATION: Cnr Old Northern Rd & Showground Rd, Castle Hill

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 214
PROJECT No: 43863A
DATE: 19 Apr 06
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
	0.05	ROADBASE - blue grey gravel roadbase			0.05				
		SILTY CLAY - brown silty clay with traces of gravel		A			PID<1ppm		
	0.3				0.3				
	0.6	SHALY CLAY - hard, grey mottled orange shaly clay							
					0.8				
				A			PID<1ppm		
1	1.0	Bore discontinued at 1.0m - in shaly clay			1.0				1
2									2
3									3
4									4

RIG: Bobcat mounted auger **DRILLER:** B Ellis **LOGGED:** Karpiel **CASING:** Uncased
TYPE OF BORING: 110mm diameter solid flight auger
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U$_x$	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ⫧ Water level

CHECKED
Initials: CFK
Date: 29.05.06

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BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 131.5 AHD
EASTING: 314998
NORTHING: 6265718
DIP/AZIMUTH: 90°/--

BORE No: P1
PROJECT No: 84335.00
DATE: 22/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
131	0.05	ASPHALT - 50mm thick							
		ROADBASE - cement stabilised road base: 550mm thick							
	0.6	SHALE - low strength, moderately weathered, brown shale		B	0.6 0.9				
	1								1
	1.1	Bore discontinued at 1.1m							
130	2								2
129	3								3
128	4								4
127	5								5
126	6								6
125	7								7
124	8								8
123	9								9
122									

RIG: Excavator **DRILLER:** KT **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: 300mm diameter auger

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 127.0 AHD
EASTING: 315041
NORTHING: 6265782
DIP/AZIMUTH: 90°/--

BORE No: P2
PROJECT No: 84335.00
DATE: 22/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
127	0.05	ASPHALT - 50mm thick							
		ROADBASE - cement stabilised roadbase 550mm thick							
	0.6	SHALE - low strength, moderately weathered, brown shale							
126	1			B	0.8				1
	1.2	Bore discontinued at 1.2m			1.1				
125	2								2
124	3								3
123	4								4
122	5								5
121	6								6
120	7								7
119	8								8
118	9								9

RIG: Excavator **DRILLER:** KT **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: 300mm diameter auger

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 121.4 AHD
EASTING: 315018
NORTHING: 6265908
DIP/AZIMUTH: 90°/--

BORE No: P3
PROJECT No: 84335.00
DATE: 25/6 & 1/7/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
121	0.18	ASPHALT - 180mm thick							
		ROADBASE - cement stabilised roadbase, 1320mm thick		D	0.4				
	1			B	0.9 1.0				
120	1.5	GRAVEL - bluemetal gravel with sand (roadbase)							
	2	2.0 Bore discontinued at 2.0m							
119	3								
118	4								
117	5								
116	6								
115	7								
114	8								
113	9								
112									

RIG: Excavator **DRILLER:** KT/BM **LOGGED:** PGH/JS **CASING:** Uncased

TYPE OF BORING: 300mm diameter auger to 1.1m; 250mm Diatube to 1.5m; 150mm auger to 2.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Auger refusal at 1.1m on cement stabilised roadbase

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 115.6 AHD
EASTING: 314949
NORTHING: 6265961
DIP/AZIMUTH: 90°/--

BORE No: P4
PROJECT No: 84335.00
DATE: 22/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
115	0.06	ASPHALT - 60mm thick							
	0.2	ROADBASE - blue metal gravel and sand, dry		B	0.3				
	0.6	CLAY - very stiff, orange clay with ironstone gravel, dry			0.6				
		CLAY - hard, grey clay with ironstone gravel							
	1.0	SHALE - medium strength, slightly weathered, grey shale							
	1.2	Bore discontinued at 1.25m - auger refusal							

RIG: Excavator **DRILLER:** KT **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: 300mm diameter auger

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 116.3 AHD
EASTING: 314869
NORTHING: 6265916
DIP/AZIMUTH: 90°/--

BORE No: P5
PROJECT No: 84335.00
DATE: 22/6/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
116	0.1	ASPHALT - 100mm thick							
	0.3	ROADBASE - crushed sandstone gravel and cobbles with some clay, dry		B	0.3 0.6				
	0.75	CLAY - stiff to very stiff, grey clay with some ironstone gravel							
	0.9	SHALE - low strength, moderately weathered shale							
115	1.1	SHALE - low to medium strength, moderately to slightly weathered shale							
		Bore discontinued at 1.1m - auger refusal							
114	2								
113	3								
112	4								
111	5								
110	6								
109	7								
108	8								
107	9								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: Excavator **DRILLER:** KT **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: 300mm diameter auger

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Limited
PROJECT: Castle Towers Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: 121.6 AHD
EASTING: 314810
NORTHING: 6265824
DIP/AZIMUTH: 90°/--

BORE No: P6
PROJECT No: 84335.00
DATE:
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
121	0.06	ASPHALT - 60mm thick							
	0.4	ROADBASE - angular bluemetal gravel with some sand, dry							
	0.6	FILLING - crushed sandstone gravel and cobbles with some sand, dry		B	0.7				
	1	CLAY - very stiff, grey clay with some ironstone gravel			0.9				
	1.2								
120	1.3	SHALE - low to medium strength, moderately weathered shale							
		Bore discontinued at 1.3m - auger refusal							
119	2								
118	3								
117	4								
116	5								
115	6								
114	7								
113	8								
112	9								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: Excavator **DRILLER:** KT **LOGGED:** PGH **CASING:** Uncased

TYPE OF BORING: 300mm diameter auger

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: --
EASTING: -33.73264
NORTHING: 151.00214
DIP/AZIMUTH: 90°/--

BORE No: TP1
PROJECT No: 84335.02
DATE: 27/4/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		FILLING - apparently variably compacted, dark brown, sandy clay filling with some fine, medium and coarse gravel and some rootlets, damp							A/E			
	1								A/E			
	1.1	Bore discontinued at 1.1m - services located										

RIG: Vacuum truck **DRILLER:** Cardno **LOGGED:** MB **CASING:** Uncased
TYPE OF BORING: Potholing
WATER OBSERVATIONS: No free groundwater observed
REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	⧗	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: --
EASTING: -33.73284
NORTHING: 151.00249
DIP/AZIMUTH: 90°/--

BORE No: TP2
PROJECT No: 84335.02
DATE: 27/4/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		CONCRETE FOOTPATH - no steel reinforcement observed										
	0.14	FILLING - apparently variably compacted, brown and grey, fine to medium gravelly sand filling with some clay and rootlets							A/E*			
	0.5	Bore discontinued at 0.5m - services located										
	1											

RIG: Vacuum truck **DRILLER:** Cardno **LOGGED:** MB **CASING:** Uncased

TYPE OF BORING: Potholing

WATER OBSERVATIONS: No free groundwater observed

REMARKS: *Triplicate samples RS1A, RS1B taken at 0.2m to 0.3m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	⧗	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Pty Ltd
PROJECT: Castle Tower Expansion Project
LOCATION: Castle Street, Castle Hill

SURFACE LEVEL: --
EASTING: -33.73256
NORTHING: 151.00297
DIP/AZIMUTH: 90°/--

BORE No: TP3
PROJECT No: 84335.02
DATE: 27/4/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		FILLING - brown, sandy clay filling with some fine, medium and coarse gravel and rootlets, damp							A/E			
	0.95	Bore discontinued at 0.95m - services located										
	1											

RIG: Vacuum truck **DRILLER:** Cardno **LOGGED:** MB **CASING:** Uncased

TYPE OF BORING: Potholing

WATER OBSERVATIONS: No free groundwater observed

REMARKS: DCP not carried out due to unknown location of gas line. Shale cutting located adjacent to footpath

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	⧗	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 120.5 AHD
EASTING: 314826.1
NORTHING: 6265829.9
DIP/AZIMUTH: 90°/--

BORE No: 904
PROJECT No: 84335.14
DATE: 7/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
120	0.15	FILL/TOPSOIL/Gravelly CLAY: medium plasticity, dark brown, medium, angular to subangular gravel, with root fibres, w>PL							D/E			
	0.4	FILL/CLAY: medium plasticity, dark brown, with fine angular ironstone and siltstone gravel, with root fibres, w<PL							D/E			
	1	CLAY CI: medium plasticity, pale grey mottled orange-brown, with silt, w<PL, stiff, residual							B			
	1.1	Silty CLAY CL: low plasticity, pale grey, with fine angular siltstone and shale gravel, w<PL, very stiff to hard, extremely weathered rock							D/E			
119	1.5	Bore discontinued at 1.5m - Target Depth Reached							D/E			

RIG: Geo 305 **DRILLER:** Ground Test **LOGGED:** SL **CASING:** Uncased

TYPE OF BORING: Solid Flight Auger to 1.5m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 122.1 AHD
EASTING: 314817.9
NORTHING: 6265812.3
DIP/AZIMUTH: 90°/--

BORE No: 905
PROJECT No: 84335.14
DATE: 7/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
122		FILL/TOPSOIL/Gravelly CLAY: medium plasticity, dark brown, medium, angular to subangular gravel, with root fibres, w>PL							D/E			
	0.15	FILL/Silty CLAY: medium plasticity, dark brown, with gravel, w<PL							D/E			
	0.6	CLAY CI: medium plasticity, pale grey mottled orange-brown, with silt, w<PL, stiff, residual							B			
121	1								D/E			
	1.2	Silty CLAY CL: low plasticity, pale grey, with fine angular siltstone and shale gravel, w<PL, very stiff to hard, extremely weathered rock							D/E			
	1.5	Bore discontinued at 1.5m - Target Depth Reached										

RIG: Geo 305 **DRILLER:** Ground Test **LOGGED:** SL **CASING:** Uncased

TYPE OF BORING: Solid Flight Auger to 1.5m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Appendix D3 – Test Pits

TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Castle Towers Expansion Project
LOCATION: 6-14 Castle Street, Castle Hill

SURFACE LEVEL: 131.7 AHD
EASTING: 314952
NORTHING: 6265750

PIT No: TP13
PROJECT No: 84335.05
DATE: 8/12/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
131	0.3	FILLING - apparently moderately compacted, grey and brown, silty clay filling with some fine to coarse sand, humid		D	0.2				
		SILTY CLAY - very stiff, brown, silty clay with some fine to medium ironstone gravel, humid			0.3				
				D	0.5				
	0.8				0.6				
		SHALY CLAY - hard, light brown and grey, shaly clay with some ironstone bands, humid		D	0.9				
	1			D	1.0				
				B	1.1				
	1.15	SHALE - extremely low to very low strength, light brown-grey, shale with some ironstone bands							
				D	1.4				
					1.5				
130	1.6	Pit discontinued at 1.6m - refusal on low strength shale							
129	2								
128	3								
127	4								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: 4.5t excavator - 300mm wide bucket

LOGGED: MB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	⧗	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Castle Towers Expansion Project
LOCATION: 6-14 Castle Street, Castle Hill

SURFACE LEVEL: 123.4 AHD
EASTING: 314912
NORTHING: 6265858

PIT No: TP14
PROJECT No: 84335.05
DATE: 8/12/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
123	0.4	FILLING - apparently well compacted, yellow-brown, sandy clay filling with some fine to coarse ripped sandstone gravel, concrete fragments and steel reinforcement bar, humid		D	0.2 0.3				
		SILTY CLAY - stiff to very stiff, dark brown, silty clay with some fine to medium ironstone gravel, damp		D	0.5 0.6				
122	1	1.0m: becoming red-brown		D	1.0 1.1				
		1.4m: becoming grey mottled light brown		D	1.6 1.7				
	2			D	2.1 2.2				
121	2.3	SHALE - extremely low to very low strength, light brown-grey, shale with some ironstone bands		D	2.4				
	2.5	Pit discontinued at 2.5m - refusal on low strength shale			2.5				
120	3								
119	4								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: 4.5t excavator - 300mm wide bucket

LOGGED: MB/JN

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	⧗	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Castle Towers Expansion Project
LOCATION: 6-14 Castle Street, Castle Hill

SURFACE LEVEL: 125.7 AHD
EASTING: 314940
NORTHING: 6265829

PIT No: TP15
PROJECT No: 84335.05
DATE: 8/12/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
125	0.0	SILTY CLAY - very stiff to hard, dark brown, silty clay with some rootlets, humid		D	0.0				
		0.2m: with some fine to medium ironstone gravel			0.1				
				D	0.4				
	0.6				0.5				
		SILTY CLAY - hard, orange-brown mottled grey, silty clay with some fine to medium ironstone gravel, damp							
	1			B	0.8				1
				D	0.9				
	1.2				1.0				
		SHALE - extremely low to very low strength, light brown and grey, shale with some ironstone bands		D	1.3				
124	1.4	Pit discontinued at 1.4m - refusal on low strength shale			1.4				
	2								2
123									
	3								3
122									
	4								4
121									

5 10 15 20

RIG: 4.5t excavator - 300mm wide bucket

LOGGED: MB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	⧗	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Castle Towers Expansion Project
LOCATION: 6-14 Castle Street, Castle Hill

SURFACE LEVEL: 126.9 AHD
EASTING: 314963
NORTHING: 6265818

PIT No: TP16
PROJECT No: 84335.05
DATE: 8/12/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
126	0.0	FILLING - apparently well compacted, light grey and brown, silty clay with some fine to coarse sand and fine to medium gravel (crushed basalt), humid		D	0.0 – 0.1				
		0.4m: with sulphur odour		D	0.5 – 0.6				
	0.7	SILTY CLAY - very stiff to hard, brown, silty clay with some fine to medium ironstone gravel, damp		D	0.9 – 1.0				
	1	1.2m: becoming mottled light brown and grey		D	1.3 – 1.4				
	1.6	SHALE - extremely low to very low strength, light brown and grey, shale with some ironstone bands		D	1.8 – 1.9				
125	2			D	2.1				
	2.2	Pit discontinued at 2.2m - refusal on low strength shale			2.2				
124	3								
123	4								
122									

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: 4.5t excavator - 300mm wide bucket

LOGGED: MB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	⧗	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Castle Towers Expansion Project
LOCATION: 6-14 Castle Street, Castle Hill

SURFACE LEVEL: 128.9 AHD
EASTING: 315026
NORTHING: 6265784

PIT No: TP17
PROJECT No: 84335.05
DATE: 8/12/2015
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
128	0	FILLING - apparently well compacted, brown and grey, silty clay filling with some fine to coarse sand and fine to medium gravel (ripped shale and crushed basalt), damp		D	0.1				
					0.2				
				D	0.4				
					0.5				
	0.6	SILTY CLAY - hard, brown, silty clay with some fine to medium ironstone gravel, damp			0.7				
				B	0.8				
				D	0.9				
	1	1.0m: becoming mottled orange-brown and grey							1
	1.2	SHALE - extremely low to very low strength, light brown and grey, shale with some ironstone bands		D	1.2				
	1.3	Pit discontinued at 1.3m - refusal on low strength shale			1.3				
127	2								2
126	3								3
125	4								4
124									

RIG: 4.5t excavator - 300mm wide bucket

LOGGED: MB

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	⧗	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 130.2 AHD
EASTING: 314868.9
NORTHING: 6265756.4

PIT No: WTP1
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
130	0.0	FILL/Gravelly SAND: fine to coarse, dark brown, angular to sub angular gravel with timber, asphalt, trace rootlets		E	0.0		PID<1 ppm		
				E	0.1		AF/FA (0.0-0.2m)		
	0.2	FILL/Silty CLAY: low to medium plasticity, dark brown to pale brown, with igneous and sandstone gravel, timber, plastic, asphalt, trace rootlets, w<PL			0.2		AF/FA (0.2-0.6m)		
					0.3		PID<1 ppm		
				E					
				E	0.4				
	0.6	Silty CLAY CL-CI: low to medium plasticity, red-orange and pale grey, stiff, with siltstone gravel, trace rootlets, residual, w<PL			0.6				
					0.8		PID<1 ppm		
	1			E					1
					0.9				
129	1.3	Pit discontinued at 1.3m - Target Depth Reached							

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 129.6 AHD
EASTING: 314902.4
NORTHING: 6265762.7

PIT No: WTP2
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
									5 10 15 20
		FILL/Silty CLAY: low plasticity, dark brown to pale brown, with fine grained sand, timber and rootlets, w<PL		E*	0.0		PID<1 ppm		
					0.1		AF/FA (0-0.3m)		
				E					
	0.3	Silty CLAY CI: medium plasticity, red-brown and pale grey with siltstone gravel, trace rootlets, residual, moist, w<PL			0.3				
129							PID<1 ppm		
				E	0.5				
	1				0.6				1
	1.1	Pit discontinued at 1.1m - Target Depth Reached							
128									

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: *Field replicate BD1/20220310 taken at 0-0.1m depth, AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 129.4 AHD
EASTING: 314890.7
NORTHING: 6265802.6

PIT No: WTP3
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
129	0.0	FILL/Silty CLAY: low plasticity, dark brown, with wood (branches up to 35 mm diameter), timber, terracotta pipe fragments, plastic and igneous gravel, trace rootlets, w<PL, moist		E	0.0		PID<1 ppm		
				E	0.1		AF/FA and PACM (0.0-0.3m)		
	0.3	Silty CLAY CI: medium plasticity, red-orange and pale grey, with siltstone gravel, trace rootlets, w<PL, moist, residual			0.3				
				E	0.5		PID<1 ppm		
					0.6				
128	1.0	Pit discontinued at 1.0m - Target Depth Reached							1

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: AF/FA=Asbestos Fines/Fibrous Asbestos sample, PACM=Potential Asbestos Containing Material

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 124.4 AHD
EASTING: 314838.5
NORTHING: 6265795.9

PIT No: WTP4
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
124	0.2	FILL/Silty CLAY: low to medium plasticity, dark brown, with timber, trace rootlets, w<PL		E	0.0		PID<1 ppm		
				E	0.1		AF/FA (0.0-0.2m)		
		Pit discontinued at 0.2m - Target Depth Reached			0.2				
123	1								1

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 125.1 AHD
EASTING: 314862.5
NORTHING: 6265816.7

PIT No: WTP5
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
125	0.0	FILL/Silty CLAY: low to medium plasticity, dark brown, with wood (branches up to 35mm diameter), igneous and sandstone gravel , plastic, glass, bricks, terracotta pipe fragments and rootlets, w<PL		E	0.0		PID<1 ppm		
				E	0.1		AF/FA (0.0-0.2m)		
	0.2	Silty CLAY CL-CI: low to medium plasticity, pale grey and mottled orange, with siltstone gravel, trace rootlets, w<PL, residual			0.2				
				E	0.3		PID<1 ppm		
					0.4				
	1 1.0	Pit discontinued at 1.0m - Target Depth Reached							1
124									

5 10 15 20

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 124.8 AHD
EASTING: 314843.2
NORTHING: 6265797.3

PIT No: WTP6
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
124	0.0	FILL/Silty CLAY: low to medium plasticity, dark brown, with timber, bricks, terracotta pipe fragments and rootlets, w<PL		E*	0.0		PID<1 ppm		
				E	0.1		AF/FA (0.0-0.2m)		
	0.2	Silty CLAY CL-CI: low to medium plasticity, pale grey and mottled orange, with siltstone gravel, trace rootlets, w<PL, residual			0.2				
				E	0.3		PID<1 ppm		
					0.4				
	1.0	Pit discontinued at 1.0m - Target Depth Reached							1
123									

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: Free groundwater observed whilst excavating at 0.3m depth, possibly perched from recent rain

REMARKS: *Field replicate BD5/20220310 taken at 0.0-0.1m depth, AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 128.5 AHD
EASTING: 314829.6
NORTHING: 6265760.6

PIT No: WTP7
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
128	0.0	FILL/Silty CLAY: low plasticity, dark brown, with rootlets and timber, w<PL		E	0.0		PID<1 ppm		
				E	0.1		AF/FA (0.0-0.15m)		
	0.15	FILL/Silty CLAY: low to medium plasticity, pale brown, with igneous and sandstone gravel, terracotta pipe fragments, trace rootlets, w<PL			0.15		AF/FA (0.15-1.0m)		
				E*	0.3		PID<1 ppm		
					0.4				
				E					
127	1.0	Silty CLAY CL-CI: low to medium plasticity, pale grey and mottled orange, with siltstone gravel, w<PL, residual			1.0				1
				E	1.2		PID<1 ppm		
					1.3				
	1.6	Pit discontinued at 1.6m - Target Depth Reached							

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: *Field replicate BD2/20220310 taken at 0.3-0.4m depth, AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 124.4 AHD
EASTING: 314825.9
NORTHING: 6265789

PIT No: WTP8
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
124	0.0	FILL/Silty CLAY: low plasticity, dark brown to pale brown, with bricks, glass, timber, igneous gravel and rootlets, w<PL		E	0.0		PID<1 ppm		
				E	0.1		AF/FA (0.0-0.3m)		
	0.3	Silty CLAY CL-CI: low to medium plasticity, pale grey and mottled orange-yellow, with siltstone gravel, trace rootlets, w<PL, residual			0.3				
				E	0.5		PID<1 ppm		
					0.6				
123	1.0	Pit discontinued at 1.0m - Target Depth Reached							1

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 122.7 AHD
EASTING: 314835.2
NORTHING: 6265811.1

PIT No: WTP9
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
122	0.0	FILL/Silty CLAY: low to medium plasticity, dark brown, with bricks, igneous and sandstone gravel and rootlets, w<PL		E	0.0		PID<1 ppm		
					0.1		AF/FA (0.0-0.4m)		
				E					
	0.4	Silty CLAY CL-CI: low to medium plasticity, pale grey and mottled orange, with siltstone gravel, trace rootlets, w<PL, residual			0.4				
				E	0.5		PID<1 ppm		
					0.6				
	1								1
	1.1	Pit discontinued at 1.1m - Target Depth Reached							
121									

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 122.3 AHD
EASTING: 314824.7
NORTHING: 6265810.2

PIT No: WTP9A
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
122		FILL/Silty CLAY: low to medium plasticity, dark brown, with plastic, terracotta pipe fragments, wood (branches up to 50mm diameter), metal sheets, glass, tile, bricks and igneous gravel, trace rootlets							
	0.4	Pit discontinued at 0.4m - Test pit discontinued due to water inflow to surface level (note: significant rainfall in preceding week)							
	1								1
121									

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: Free groundwater observed whilst excavating at 0.3m depth, possibly perched from recent rain

REMARKS: AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 120.8 AHD
EASTING: 314838.1
NORTHING: 6265833.5

PIT No: WTP10
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
120	0.0	FILL/Silty CLAY: low to medium plasticity, dark brown, with bricks, igneous gravel and rootlets, w<PL		E*	0.0		PID<1 ppm		
	0.1			E	0.1		AF/FA (0.0-0.2m)		
	0.2	Silty CLAY CL-CI: low to medium plasticity, red-orange and pale grey, trace rootlets, w<PL, residual			0.2				
	0.3			E	0.3		PID<1 ppm		
	0.4				0.4				
	1.0	Pit discontinued at 1.0m - Target Depth Reached							1
119									

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: *Field replicate BD4/20220310 taken at 0.0-0.1m depth, AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 121.3 AHD
EASTING: 314820.1
NORTHING: 6265819.8

PIT No: WTP11
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
121	0.0	FILL/Silty CLAY: low plasticity, dark brown, with bricks, plastic and rootlets, w<PL		E	0.0		PID<1 ppm		
				E	0.1		AF/FA (0.0-0.2m)		
	0.2	Silty CLAY CL-CI: low to medium plasticity, pale grey and mottled orange, with siltstone gravel, w<PL, residual			0.2				
				E	0.3		PID<1 ppm		
					0.4				
	1 1.0	Pit discontinued at 1.0m - Target Depth Reached							1
120									

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: QIC Ltd
PROJECT: Proposed Leisure Centre
LOCATION: Showground Road & Kentwell Avenue, Castle Hill

SURFACE LEVEL: 124.3 AHD
EASTING: 314802.4
NORTHING: 6265797

PIT No: WTP12
PROJECT No: 84335.14
DATE: 10/3/2022
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
124	0.0	FILL/Silty CLAY: low to medium plasticity, dark brown to pale brown, with bricks, plastic, glass, concrete, igneous gravel and rootlets, w<PL		E*	0.0		PID<1 ppm		
					0.1		AF/FA (0.0-0.5m)		
				E					
	0.5	FILL/Silty CLAY: low to medium plasticity, dark grey, with igneous gravel, trace rootlets, w<PL			0.5		AF/FA (0.5-0.9m)		
					0.6		PID<1 ppm		
				E					
				E	0.7				
	0.9	Silty CLAY CL-CI: low to medium plasticity, pale grey and mottled orange, trace rootlets, w<PL, residual			0.9				
123	1				1.0		PID<1 ppm		1
				E					
					1.1				
	1.5	Pit discontinued at 1.5m - Target Depth Reached							

RIG: 4t Excavator with 450mm wide bucket

LOGGED: SR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed whilst excavating

REMARKS: *Field replicate BD3/20220310 taken at 0.0-0.1m depth, AF/FA=Asbestos Fines/Fibrous Asbestos sample

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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