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Project 72138.00
31 January 2011
GRB:lll

Attention: Mr Anthony Rice

Email: AnthonyRice@Stamford.com.au

Dear Sirs

Waste Classification of In-situ Material
110-114 Herring Road, Macquarie Park

1. Introduction

This letter report by Douglas Partners Pty Ltd (DP) provides details of the methodology and findings of a preliminary waste classification assessment of *in situ* materials undertaken by Douglas Partners Pty Ltd (DP) at 110 – 114 Herring Road, Macquarie Park. The work was undertaken at the request of the Stamford Property Services Pty Ltd for the off-site disposal of excavated material.

It is understood that the development of the site will include the construction of seven multi-storey buildings with an associated underground basement to depths of 7 to 13 m below ground level. Excavated material for the basement is proposed to be largely disposed off site.

This assessment was carried out concurrently with a geotechnical investigation and preliminary contamination assessment for the site. The results of the geotechnical investigation are presented separately.

2. Background

A review of the 1930, 1951, 1961, 1970 and 1986 historical aerial photographs indicates that the site was originally used for agricultural purposes (eg grazing) and subsequently developed in the 1950s with several buildings on-site.

3. Site Description

The site is identified as 110 – 114 Herring Road (Lot 1 in D.P.780314), Macquarie Park. It is an approximate rectangular shaped area of 2.24 hectares. The ground surface generally falls to the north

at slopes of approximately 1º to 3º, resulting in an elevation change of approximately 10 m (RL 65.2 – RL 75.1 relative to Australian Height Datum [AHD]).

The site is currently occupied by the Stamford Grand North Ryde Hotel which includes several buildings ranging in height from one to three storeys, a one level underground basement together with associated driveways, gardens and recreational facilities (e.g. pool, tennis court etc).

The site is bounded by the Epping Road to the southwest, Herring Road to the southeast, a residential development which includes single storey villas and a 3 storey unit block to the northeast and a Baptist Retirement Village with one to two storey buildings to the northwest.

Reference to the Sydney 1:100 000 Geological Series Sheet indicates that the site is underlain by Ashfield Shale but in close proximity to Hawkesbury Sandstone at lower elevations to the north. The field work is interpreted as intersecting Mittagong Formation, a thin (typically <6 m) transitional unit between the Ashfield Shale and Hawkesbury Sandstone on the upper portions, and Hawkesbury Sandstone.

4. Waste Classification and Assessment Criteria

The fill soil was assessed in accordance with the Department of Environment and Climate Change (DECC, now the Department of Environment, Climate Change and Water DECCW) *Waste Classification Guidelines*, April 2008 (updated July 2009).

The following publications with background concentration ranges for Australian soils have been referenced in assessing the natural clayey soils within the site:

- NEPC (1999). *National Environmental Protection (Assessment of Site Contamination) Measure,* Schedule B(1) Guidelines on the Investigation Levels for Soil and Groundwater, Background Ranges.
- Australian and New Zealand Environment and Conservation Council/National Health and Medical Research Council (ANZECC/NHMRC): *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites* (1992), Environmental Soil Quality Guidelines, Table 2 - Column A Background (ANZECC A).

With regard to the organic contaminants with no published background concentration ranges, the respective laboratory practical quantitation limits (PQL) of the analytes were used as the evaluation threshold.

5. Fieldwork Methods

The current field work comprised:

- Sixteen boreholes (Bores 101 to 116) drilled with either an underpinning rig or a truck, track or bobcat-mounted auger/rotary drilling and sampling rig. The boreholes were generally drilled to depths ranging from 0.5 m to 2.3 m with 110 mm spiral flight augers, then cased using HW or NW casing and extended to final depths ranging from 10.0 m to 17.55 m by NMLC (52 mm core diameter) diamond coring techniques. Bores 101, 111 and 112 also required diacoring to penetrate concrete layers at various stages during auger drilling. Standard penetration tests (SPTs) were carried out within soils at regular depth intervals. Disturbed soil samples retrieved from the cuttings returned by the auger blade were used for identification and classification purposes.
- One test pit (TP 117) excavated to 0.2 m depth using hand tools for the purpose of obtaining a sample for subsequent laboratory testing.
- Installation of standpipes to depths of 14.0 m, 16.0 m and 11.8 m in Bores 103, 110 and 116 respectively, for subsequent monitoring of the groundwater level. The standpipe wells were purged of water after the completion of drilling and then measured on two subsequent occasions.

Soil samples were collected from the filling and natural clays in every test bore except Bore 101 where difficult drilling conditions precluded sampling. The general sampling procedure is summarised below:

- Collect soil samples directly from the cuttings returned by the auger blade using disposable sampling equipment;
- Transfer samples into laboratory-prepared glass jars, capping immediately and ensuring that the headspace within the sample jar is minimised;
- Label sample containers with individual and unique identification, including project number, sample location and sample depth; and
- Place the glass jars, with Teflon lined lid, into a cooled, insulated and sealed container for transport to the laboratory.

All fieldwork was carried out under the direction of an experienced geo-environmental engineer.

The locations of the bores and pits are given in Drawing 1 (Attachment 1). The test bore and pit surface levels relative to AHD, shown on the borehole and test pit logs, were generally estimated from the survey plan of the site dated 13 October 2010 and prepared by Denny Linker & Co. Pty Ltd (Drawing No. 100915). Test Bore 113 was located within the basement and its level was not indicated on the survey plan and was levelled relative to an identifiable point on the survey plan, to determine its level relative to AHD.

6. Field Work Results

Details of the conditions encountered in the current boreholes and test pits are presented in Attachment 2. The results of previous investigations are presented in Attachment 3. Notes defining classification methods and descriptive terms used in logging the boreholes and test pit are also given in Attachment 2. Summary geological cross sections (Sections A – A' to F – F') are included in Drawings 2 to 7 in Attachment 1.

The material strata encountered in current and previous bores is described in generally increasing depth order below:

FILLING Ranging from 0.2 m to 2.9 m and comprising a surficial layer of asphaltic concrete, concrete or pavers in all but Bores 1 – 4, underlain by gravels, roadbase, crushed sandstone, gravelly silty sand and clayey silty sand. Additional concrete layer were intersected in Bores 101, 107, 109 – 111 and 116;

CLAYS Clay and sandy clay to depths of 0.4 – 2.4 m in Bores 102, 105, 106 and 113 to 116;

MITTAGONG FORMATION Initially a thin layer of weathered sandstone and laminite (sandstone interbedded with approximately 10% to 30% siltstone) overlying medium and high strength, highly weathered to fresh, fragmented to slightly fractured, grey and brown sandstone and laminite with ironstone banding (including medium, high and very high strength bands) and clay seams up to 200 mm thick to depths of 2.7 – 4.7 m in Bores 103 to 111. This unit contains joints dipping from 45° to 90°. A fault with 50 mm displacement was intersected in Bore 111;

SANDSTONE Typically medium and high strength, moderately weathered to fresh, typically fractured to unbroken with some fractured zones, medium and coarse grained, grey and orange sandstone with distinct and indistinct siltstone laminations. This unit contained frequent joints dipping from 45° to 85° and some minor crushed zones.

Outcrops of medium strength sandstone are exposed in the car park on the north-western boundary. The locations and the Reduced Levels of the top of the sandstone exposure are indicated on Drawing 1, Attachment 1.

During the fieldwork in December 2011 asbestos-based products were not observed in the fill.

7. Laboratory Analysis

Selected fill and natural soil samples obtained from the test bores were sent for analysis at a National Association Testing Authorities (NATA) accredited laboratory for a variety of common contaminants including:

- Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Total Petroleum Hydrocarbons (TPH);
- Benzene, Toluene, Ethyl Benzene and Xylene (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAH);
- Polychlorinated Biphenyls (PCB);
- Organochlorine Pesticides (OCP); and
- Asbestos.

Table 2 shows the analytical scheme for the fill and natural soil samples.

Table 2: Analytical Scheme for Samples

Sample ID	Material	Heavy Metals	TRH	BTEX	PAH	PCB	OCP	Phenols	Asbestos
101/1.0-1.4m	Filling	✓	✓	✓	✓	✓	✓	✓	✓
102/0.1-0.2m	Filling	✓	✓	✓	✓	✓	✓	✓	✓
102/0.5-0.6m	Clay	✓	✓	✓	✓	✓	✓	✓	
102/1.0-1.1m	Sandstone	✓	✓	✓	✓	✓	✓		
103/0.1-0.2m	Filling	✓	✓	✓	✓	✓	✓		✓
104/0.1-0.2m	Filling	✓	✓	✓	✓	✓	✓	✓	✓
107/0.1-0.2m	Filling	✓	✓	✓	✓	✓	✓	✓	✓
107/0.5-0.6m	Filling	✓	✓	✓	✓	✓	✓		
109/0.1-0.2m	Filling	✓	✓	✓	✓	✓	✓	✓	✓
109/0.5-0.6m	Filling	✓	✓	✓	✓	✓	✓	✓	
110/0.1-0.2m	Filling	✓	✓	✓	✓	✓	✓		✓
110/0.5-0.6m	Filling	✓	✓	✓	✓	✓	✓		
111/0.2-0.3m	Filling	✓	✓	✓	✓	✓	✓	✓	
111/0.5-0.6m	Filling	✓	✓	✓	✓	✓	✓	✓	
112/0.1-0.2m	Filling	✓	✓	✓	✓	✓	✓		✓
115/0.1-0.2m	Filling	✓	✓	✓	✓	✓	✓		✓
116/0.3-0.4m	Filling	✓	✓	✓	✓	✓	✓		
116/1.0-1.1m	Clay	✓	✓	✓	✓	✓	✓		

Envirolab Services, a laboratory accredited by NATA, was employed to conduct the sample analysis. The laboratory is required to carry out routine in-house QC procedures.

Based on the results of the first round of laboratory analysis (Sections 8 and 9) toxicity characteristic leaching procedure (TCLP) tests were carried out on seven samples (TB102/0.1-0.2 m, TB103/0.1-0.2 m, TB104/0.1-0.2 m, TB107/0.1-0.2 m, TB109/0.1-0.2m, TB110/0.1-0.2m and TB116/0.3-0.4 m) and the leachate analysed for either lead, nickel or PAHs.

8. Summary of Results

A summary of the laboratory results are presented in Table 3, attached. Laboratory certificates are also attached (Attachment 4).

Table 3: Results of Soil Analysis (All results in mg/kg unless otherwise stated)

Sample ID	Material	Heavy Metals														Polycyclic Aromatic Hydrocarbons (PAH)				Total Petroleum Hydrocarbons (TPH)		Monocyclic Aromatic Hydrocarbons (BTEX)								Asbestos	Total Polychlorinated Biphenyls (PCB)		Organochlorine Pesticides (OCP)[6]	Phenols	
		Arsenic		Cadmium		Chromium[5]		Copper	Lead		Mercury		Nickel		Zinc	Benzo(a)pyrene		PAH		C6-C9	C10-C36	Benzene		Toluene		Ethylbenzene		Total Xylene							
		SCC[1] (mg/kg)	TCLP[2] (mg/L)	SCC (mg/kg)	TCLP (mg/L)	SCC (mg/kg)	TCLP (mg/L)	SCC (mg/kg)	SCC (mg/kg)	TCLP (mg/L)	SCC (mg/kg)	TCLP (mg/L)	SCC (mg/kg)	TCLP (mg/L)	SCC (mg/kg)	SCC (mg/kg)	TCLP (mg/L)	SCC (mg/kg)	TCLP (mg/L)	SCC (mg/kg)	SCC (mg/kg)	SCC (mg/kg)	TCLP (mg/L)	SCC (mg/kg)	TCLP (mg/L)	SCC (mg/kg)	TCLP (mg/L)	SCC (mg/kg)	TCLP (mg/L)		SCC (mg/kg)	TCLP (mg/L)		SCC (mg/kg)	TCLP (mg/L)
101/1.0-1.4	Filling	9		<0.5		9		35	14		<0.1		14		62	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0		NAD	<0.6		<2.0	<5	
102/0.1-0.2	Filling	<4		<0.5		33		54	4		<0.1		100	0.1	42	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0		NAD	<0.6		<2.0	<5	
102/0.5-0.6	Clay	6		<0.5		35		9	11		<0.1		21		10	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0			<0.6		<2.0		
102/1.0-1.1	Sandstone	9		<0.5		40		4	13		<0.1		9		5	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0			<0.6		<2.0		
103/0.1-0.2	Filling	<4		<0.5		33		64	4		<0.1		81	0.05	39	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0		NAD	<0.6		<2.0	<5	
104/0.1-0.2	Filling	<4		<0.5		17		59	3		<0.1		110	0.09	44	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0		NAD	<0.6		<2.0	<5	
107/0.1-0.2	Filling	<4		<0.5		39		61	4		<0.1		110	0.1	43	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0		NAD	<0.6		<2.0	<5	
107/0.5-0.6	Filling	11		<0.5		22		4	17		<0.1		13		6	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0			<0.6		<2.0		
109/0.1-0.2	Filling	<4		<0.5		65		43	7		<0.1		69	0.04	40	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0		NAD	<0.6		<2.0	<5	
109/0.5-0.6	Filling	7		<0.5		17		10	18		<0.1		6		15	<0.05		<2.7		<25	<250	<0.5		<0.5		<1.0		<3.0			<0.6		<2.0	<5	
110/0.1-0.2	Filling	18		<0.5		24		36	210	0.1	0.1		7		230	0.2		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0		NAD	<0.6		<2.0		
110/0.5-0.6	Filling	8		<0.5		23		18	61		<0.1		6		74	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0			<0.6		<2.0		
111/0.2-0.3	Filling	7		<0.5		19		6	19		<0.1		5		11	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0			<0.6		<2.0	<5	
111/0.5-0.6	Filling	<4		<0.5		14		3	16		<0.1		2		6	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0			<0.6		<2.0	<5	
112/0.1-0.2	Filling	<4		<0.5		15		16	9		<0.1		13		28	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0		NAD	<0.6		<2.0		
115/0.1-0.2	Filling	<4		<0.5		11		28	5		<0.1		28		38	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0		NAD	<0.6		<2.0		
116/0.3-0.4	Filling	<4		<0.5		10		27	43		<0.1		13		43	0.9	<0.001	<11.5	<0.016	<25	<250	<0.5		<0.5		<1.0		<3.0			<0.6		<2.0		
116/1.0-1.1	Clay	<4		<0.5		23		9	7		<0.1		21		22	<0.05		<1.55		<25	<250	<0.5		<0.5		<1.0		<3.0			<0.6		<2.0		
SAC		400		80		400		4000	1200		60		2400		28000	4		80		65	1000	1		130		50		25		NAG	40		40/200/800/40	34000	
Maximum values of Specific Contaminant Concentration for classification without TCLP[3]																																			
General Solid Waste (CT1) (mg/kg)		100	-	20	-	100	-	ND	100	-	4	-	40	-	ND	0.8	-	NA	-	NA	NA	10	-	288	-	600	-	1000	-	NAG	NA	-	NA	288	-
Restricted Solid Waste (CT2) (mg/kg)		400	-	80	-	400	-	ND	400	-	16	-	160	-	ND	3.2	-	NA	-	NA	NA	40	-	1152	-	2400	-	4000	-	NAG	NA	-	NA	1152	-
Maximum values for Specific Contaminant Concentration and Leachable concentration (with TCLP)[4]																																			
General Solid Waste (mg/kg) SCC1 & TCLP1		500	5	100	1	1900	5	ND	1500	5	50	0.2	1050	2	ND	10	0.04	200	NA	650	10000	18	0.5	518	14.4	1080	30	1800	50	NAG	<50	NA	NA	518	14.4
Restricted Solid Waste (mg/kg) SCC2 & TCLP2		2000	20	400	4	7600	20	ND	6000	20	200	0.8	4200	8	ND	23	0.16	800	NA	2600	40000	72	2	2073	57.6	4320	120	7200	200	NAG	<50	NA	NA	2073	57.6

Notes

*	NSW EPA Contaminated Sites: Guidelines for the NSW Site Auditors Scheme, 2006. Health-based guidelines for commercial or industrial (Column 4)
1	Specific Contaminant Concentration (Total Concentration)
2	Toxicity Characteristic Leaching Procedure (TCLP)
3	NSW DECC (2008) Waste Classification Guidelines Part 1: Classifying Waste, Table 1: Contaminant Threshold Values (CT1 & CT2) for classifying waste by chemical assessment without the leaching (TCLP) test
4	NSW DECC (2008) Waste Classification Guidelines Part 1: Classifying Waste, Table 2: Leachable concentration (TCLP) and specific contaminant concentration (SCC) values for classifying waste by chemical assessment
5	All Chromium are assumed to exist in the stable Cr(III) oxidation state, as Cr(VI) will be too reactive and unstable under the normal environment
6	Aldrin+Dieldrin/Chlordane/ DDD+DDE+DDT/Heptachlor
95% UCL*	Based on Student's-t test assuming a normal distribution in accordance with NSW EPA Sampling design Guideline (1995)
-	Not Tested
NA	Not Applicable
ND	Not Defined
NAD	No Asbestos Detected
NAG	No Asbestos on Ground
BD1/16022010	Field Intra Lab Duplicate of sample Bobcat#3/0-0.2
210	Chemical level exceeds the General Solid Waste CT1 level

9. Discussion

9.1 Fill

Classification of the filling was generally conducted in accordance with the six step process as set out in the *Waste Classification Guidelines*, 2008 (updated 2009) as set out in Table 4.

Table 4: Six Step Classification

Step	Comments	Rationale
1. Is it special waste?	No	Waste not considered to be clinical, asbestos or tyre waste
2. Is it liquid waste?	No	Waste composed of soil and building materials
3. Is the waste "pre-classified"?	No	Filling material is not pre-classified,
4. Does the Waste have hazardous waste characteristics	No	Waste not observed to/ or considered at risk to contain explosives, gases, flammable solids, oxidising agents, organic peroxides, toxic substances or corrosive substances, substances liable to spontaneous combustion
5. Chemical Assessment	Conducted	Refer to Table 3
6. Is the Waste Putrescible?	No	All observed components of filling composed of materials pre-classified as non-putrescible (i.e. soil and rock, bricks and concrete, building and demolition waste)

Initial testing indicated that elevated concentrations of nickel, lead and benzo(a)pyrene, exceeding the respective contaminant threshold values for General Solid Waste without TCLP results, were obtained in the following samples:

- TB102/0.1-0.2 m - Nickel
- TB103/0.1-0.2 m - Nickel
- TB104/0.1-0.2 m - Nickel
- TB107/0.1-0.2 m - Nickel
- TB109/0.1-0.2m - Nickel
- TB110/0.1-0.2m - Lead
- TB116/0.3-0.4 m - Benzo(a)pyrene

Therefore, in view of these results, a TCLP leachability test was carried out on these samples and the leachate analysed for either lead, nickel or PAHs (whichever was relevant) to determine whether the classification could be revised.

Leachable concentrations (TCLP) were reported either below the respective leachable concentration (TCLP1 - as noted in Table 3 of the NSW DECC *Waste Classification Guidelines*,) or laboratory limit of reporting in the soil samples submitted for analysis.

Based on the results of the field investigation and laboratory testing a preliminary *in situ* waste classification of **General Solid Waste** is assigned to fill soils on site. Given the presence of filling and the test results, a site inspection by an experienced environmental scientist or engineer is considered necessary once the site has been stripped of filling and excavated soils are stockpiled on site. A site inspection would aim to confirm or otherwise the assigned classification, assess whether further testing is required to confirm the classification, and confirm complete removal of filling (i.e. exposing underlying natural soils). Once this inspection and any additional required testing have occurred, the waste classification may be confirmed.

The fill classified as General Solid Waste in this report, once confirmed, should only be transported to a facility licensed to accept General Solid Waste. Under the current regulatory framework there is no compliance of the materials that would permit recycling and re-use. Further sampling and testing would be required in an attempt to meet current waste exemptions. .

As a general rule, on delivery of the material to the landfill facility, it would be anticipated that the landfill management would check to ensure that the material matches the description and contains no cross-contamination. Any material exhibiting obvious signs of cross-contamination from other sources or materials not described above or odours should be stockpiled and assessed separately by a consultant in accordance with the *Waste Classification Guidelines*.

It should be noted that asbestos-based building materials (e.g. asbestos-cement) are frequently associated with building rubble and demolition waste. Building wastes were identified in the bores and, whilst not detected, asbestos-based waste may be present. If asbestos-based wastes are found during excavation the classification will change to Special Waste (Asbestos), subject to confirmation by the environmental consultant.

Please note that Part 5.6, Section 143 of the Protection of the Environment Operations (POEO) Act 1997 states that is an offence for waste to be transported to a place that cannot lawfully be used as a facility to accept that waste. It is the duty of the owner and transporter of the waste to ensure that the waste is disposed of appropriately. DP accepts no liability for the unlawful disposal of waste materials from any site. DP does not accept any responsibility for the material tracking, loading, management, transport or disposal of waste from the site. Before disposal of the material to a licensed landfill is undertaken, the waste producer will need to obtain prior consent from the landfill. The receiving site should check to ensure that the material received matches the description provided in the report.
If you have any queries please do not hesitate to contact the undersigned.

9.2 Natural Soils

The DECC *Waste Classification Guidelines* 'Part 1 – Classifying Waste' defines Virgin Excavated Natural Material (VENM) as:

"*natural material (such as clay, gravel, sand, soil or rock fines):*

- *that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or process residues, as a result of industrial, commercial, mining or agricultural activities; and*
- *that does not contain sulphidic ores or soils, or any other waste.*

and includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette."

Additional advice is provided on the NSW DECCW web site[1] entitled 'How do you assess whether excavated waste material is VENM?' This advice states:

1. *All VENM should be checked for signs of contamination, such as odours and the presence of any other waste materials, such as bricks, concrete, timber, tiles, and vegetation. A load of excavated material cannot be classified as VENM if it is contaminated or mixed with other waste.*
2. *Check the history of the site from which the material was excavated.*
    - *If the site has been used for commercial, industrial, mining or agricultural purposes at any time in its history, or if the site contains fill material, or there is potential for chemical contamination from past or current uses, additional verification would be needed to establish that the excavated material is VENM.*
    - *If the site is, and has always been, used for residential purposes then excavated material from the site (not including surface layers that may be contaminated with physical debris, vegetation, chemicals and fertilisers or asbestos) would not usually require additional verification to demonstrate that the excavated material is VENM.'*

No further DECCW guidelines or Gazettal notices have been published/issued that provide additional criteria for assessing VENM.

On the basis of the abovementioned definitions, and the laboratory test results which were within typical background ranges for Australian Soils (refer Table 2) it is considered that the natural soils beneath the filling on site are classifiable as VENM. Once again, this preliminary classification is subject to an inspection once all filling has been removed.

The VENM material is suitable for off-site beneficial reuse.

1 http://www.environment.nsw.gov.au/wr/wastewcmr/.venm.htm, available on 21 July 2010.

10. Limitations

Douglas Partners (DP) has prepared this report for a project at 110 – 114 Herring Road, Macquarie Park, NSW in accordance with DP's proposal dated 25 November 2010 and acceptance received from Mr Anthony Rice of Stamford Property Services Pty Ltd on 30 November 2010. The report is provided for the exclusive use of Stamford Property Services Pty Ltd for this project only and for the purpose(s) described in the report. It should not be used for other projects or by a third party. 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 only at the specific sampling 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 anthropogenic influences. Such changes may occur after DP's field testing has been completed.

Yours faithfully
Douglas Partners Pty Ltd

Gavin Boyd
Associate

Reviewed by

Lindsay Rockett
Senior Associate

Attachments: 1 - Drawings
2 - Field Work Results
3 – Previous Investigations
4 - Laboratory Test Results

Attachment 1

Drawings 1 to 7

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

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Site Anomalies

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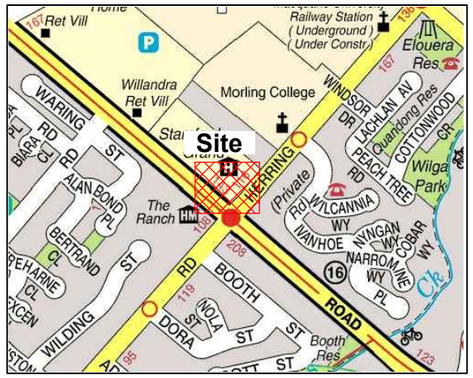
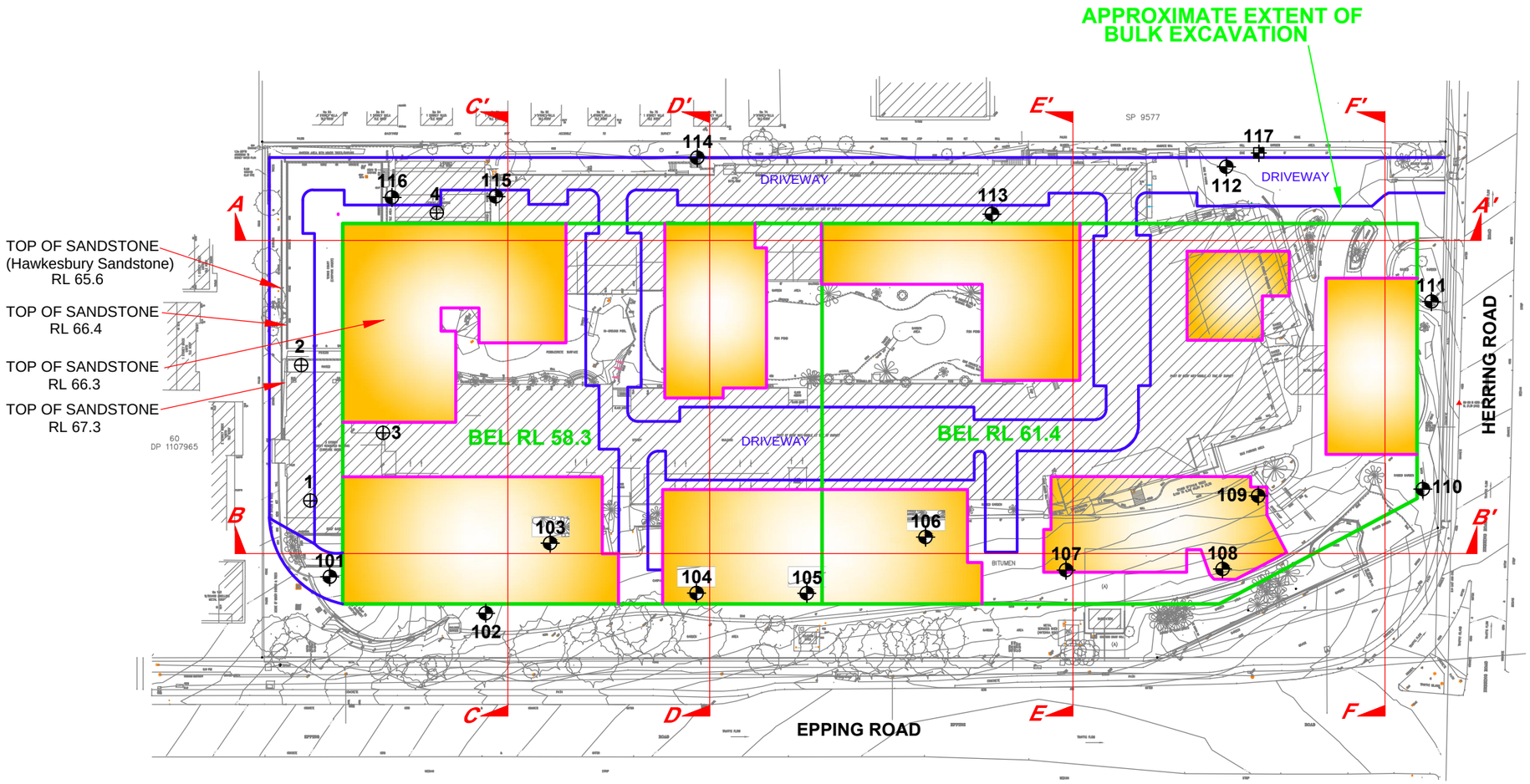


Locality Plan



NOTE:
Survey drawing from Denny Linker & Co
(Ref.100915, dated 13.10.2010)

0 10 20 30 40 50 75 100m

1:1000 @ A3

NOTE: For details of Sections A-A' to F-F'
refer to Drawings 2-7

LEGEND

- ⊕ Previous Test Bore (October 2009)
- ⊕ Current Test Bore (December 2010)
- ⊞ Current Test Pit (December 2010)
- Proposed Multi-Storey Building Footprint
- BEL Bulk Excavation Level

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Stamford Property Services Pty Ltd		TITLE: **Location of Test Bores** **Proposed Macquarie Village** **110 - 114 Herring Road, Macquarie Park**
OFFICE: Sydney	DRAWN BY: PSCH	
SCALE: As shown	DATE: 14.1.2011	

MGA

PROJECT No:	72138
DRAWING No:	1
REVISION:	B

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A

A'

PROPERTY BOUNDARY

PROPOSED BUILDING

PROPOSED BUILDING

PROPOSED BUILDING

PROPERTY BOUNDARY

HERRING ROAD

APPROXIMATE GROUND SURFACE LEVEL

TOP OF SANDSTONE IN EXPOSURE OFFSET 8m SOUTH

116 Offset 9m N

4 Offset 5m N

115 Offset 8m N

114 Offset 13m N

113 Offset 2m N

112 Offset 12m N

111 Offset - 13m S

UNIT 1

UNIT 2

UNIT 3

UNIT 4

EL refusal

M-H

M

H

PROPOSED BASEMENT

BEL RL 58.3

BEL RL 61.4

Bottom Depth 11.84 m

Bottom Depth 10 m

Bottom Depth 10 m

Bottom Depth 10 m

Bottom Depth 14 m

Bottom Depth 14.2 m

72 70 68 66 64 62 60 58 56 54

0 50 100 150 200 250 300 350

DISTANCE ALONG PROFILE (m)

NOTES:
1. The ground surface level is estimated; however is largely unknown over the existing building footprint.
2. Subsurface profile is accurate at bore locations only and may vary significantly away from bores.
3. For details of Section A-A' refer Drawing 1

GEOLOGICAL PROFILE:
UNIT 1: Filling
UNIT 2: Residual clays and extremely weathered rock
UNIT 3: Laminite and fine to medium grained sandstone (Mittagong Formation)
UNIT 4: Medium to coarse grained sandstone (Hawkesbury Sandstone)

NOTE: Summary logs only. Should be read in conjunction with detailed logs.

LEGEND

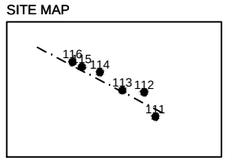
- Core Loss
- Concrete
- Filling
- Laminite
- Pavers
- Sandstone coarse grained
- Sandstone fine grained
- Sandy Clay
- Silty clay

ROCK STRENGTH
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High

SOIL CONSISTENCY
vs - very soft
s - soft
f - firm
st - stiff
vst - very stiff
h - hard
vl - very loose
l - loose
md - medium dense
d - dense
vd - very dense

TESTS / OTHER
N - Standard penetration test value
- Water level
BEL Bulk excavation level
Inferred boundary

SITE MAP



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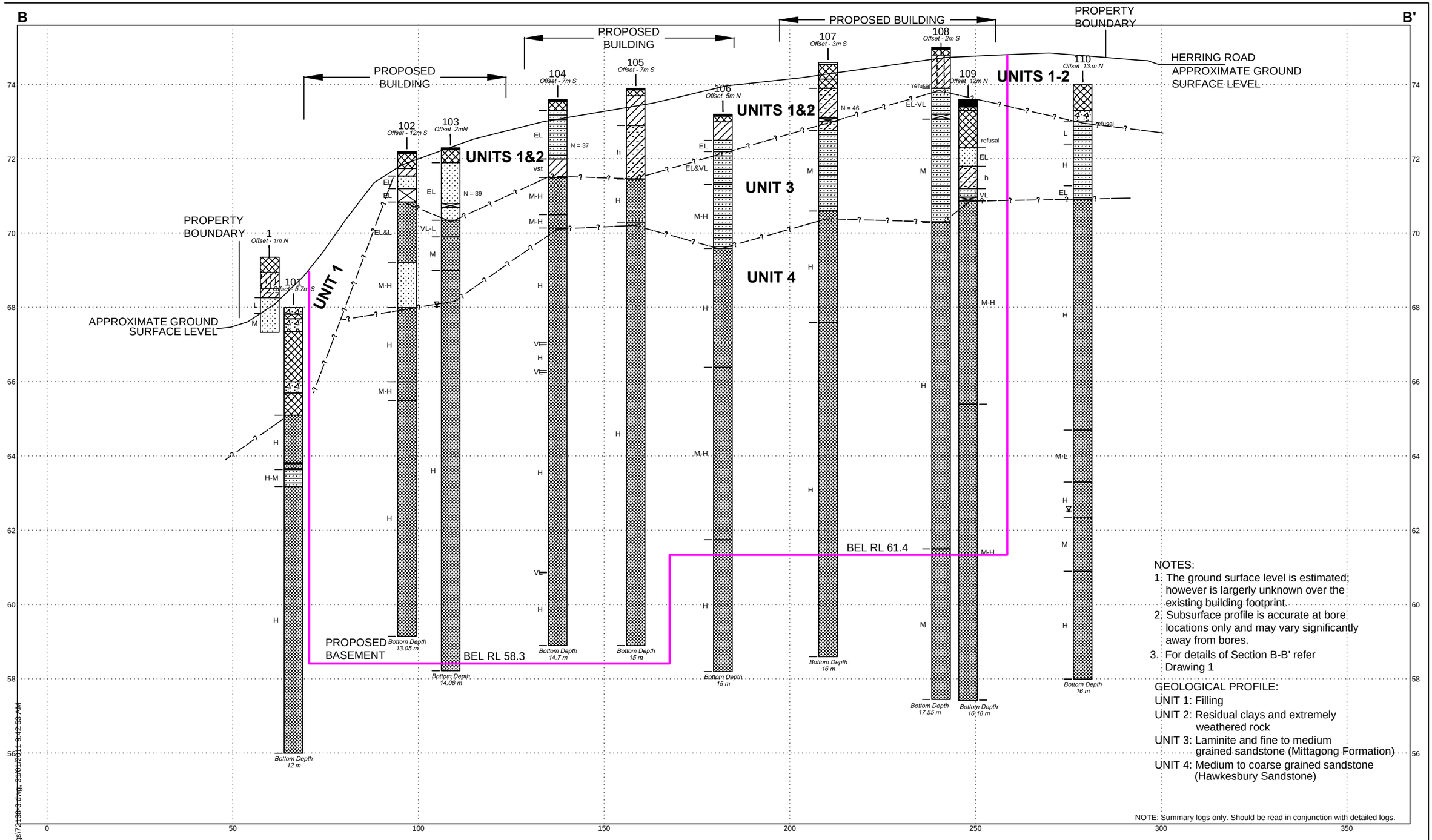
Geotechnics / Environment / Groundwater

CLIENT: Stamford Property Services Pty Ltd		TITLE: **INTERPRETED GEOLOGICAL SECTION A - A'**	PROJECT No: 72138
OFFICE: Sydney	DRAWN BY: GRB/LD	**Proposed Macquarie Village**	DRAWING No: 2
SCALE: 1:1000 (H) 1:100 (V) @ A3	DATE: 17.01.2011	**110-114 Herring Road, Macquarie Park**	REVISION: 0



NOTES:
1. The ground surface level is estimated; however is largerly unknown over the existing building footprint.
2. Subsurface profile is accurate at bore locations only and may vary significantly away from bores.
3. For details of Section B-B' refer Drawing 1

GEOLOGICAL PROFILE:
UNIT 1: Filling
UNIT 2: Residual clays and extremely weathered rock
UNIT 3: Laminite and fine to medium grained sandstone (Mittagong Formation)
UNIT 4: Medium to coarse grained sandstone (Hawkesbury Sandstone)

NOTE: Summary logs only. Should be read in conjunction with detailed logs.

LEGEND
- Core Loss
- Silty Clay
- Asphaltic Concrete
- Clay
- Concrete
- Filling
- Laminite
- Sandstone coarse grained
- Sandstone fine grained
- Shaly Clay
- Silty clay

ROCK STRENGTH
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High

SOIL CONSISTENCY
vs - very soft
s - soft
f - firm
st - stiff
vst - very stiff
h - hard
vl - very loose
l - loose
md - medium dense
d - dense
vd - very dense

TESTS / OTHER
N - Standard penetration test value
Water level
BEL Bulk excavation level
Inferred boundary

SITE MAP

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Geotechnics / Environment / Groundwater

CLIENT: Stamford Property Services Pty Ltd		TITLE: **INTERPRETED GEOLOGICAL SECTION B - B'**	PROJECT No: 72138
OFFICE: Sydney	DRAWN BY: GRB/LD	**Proposed Macquarie Village**	DRAWING No: 3
SCALE: 1:1000 (H) 1:100 (V) @ A3	DATE: 17.01.2011	**110 - 114 Herring Road, Macquarie Park**	REVISION: 0

C

C'

PROPERTY BOUNDARY

PROPOSED BUILDING

EPPING ROAD

102
Offset 2m N

103
Offset - 9.0m S

APPROXIMATE GROUND SURFACE LEVEL

UNIT 1

UNIT 2

EL

EL

EL

N = 39

EL&L

VL-L

UNIT 3

M

3
Offset - 2.4m W

PROPOSED BUILDING

PROPERTY BOUNDARY

M-H

H

L

R

APPROXIMATE GROUND SURFACE LEVEL

115
Offset 2m NW

M-H

UNIT 4

H

H

M-H

M

Bottom Depth
13.05 m

Bottom Depth
14.08 m

PROPOSED BASEMENT

BEL RL 58.3

Bottom Depth
10 m

72
70
68
66
64
62
60
58
56
54

0
20
40
60
80
100
120
140
160

DISTANCE ALONG PROFILE (m)

NOTES:
1. The ground surface level is estimated; however is largerly unknown over the existing building footprint.
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3. For details of Section C-C' refer Drawing 1

GEOLOGICAL PROFILE:
UNIT 1: Filling
UNIT 2: Residual clays and extremely weathered rock
UNIT 3: Laminite and fine to medium grained sandstone (Mittagong Formation)
UNIT 4: Medium to coarse grained sandstone (Hawkesbury Sandstone)

NOTE: Summary logs only. Should be read in conjunction with detailed logs.

LEGEND

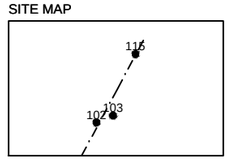
- Core Loss
- Asphaltic Concrete
- Clay
- Concrete
- Filling
- Laminite
- Sandstone coarse grained
- Sandstone fine grained
- Sandy Clay

ROCK STRENGTH
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High

SOIL CONSISTENCY
vs - very soft
s - soft
f - firm
st - stiff
vst - very stiff
h - hard
vl - very loose
l - loose
md - medium dense
d - dense
vd - very dense

TESTS / OTHER
N - Standard penetration test value
- Water level
BEL Bulk excavation level
R Pengo Auger refusal
Inferred boundary

SITE MAP



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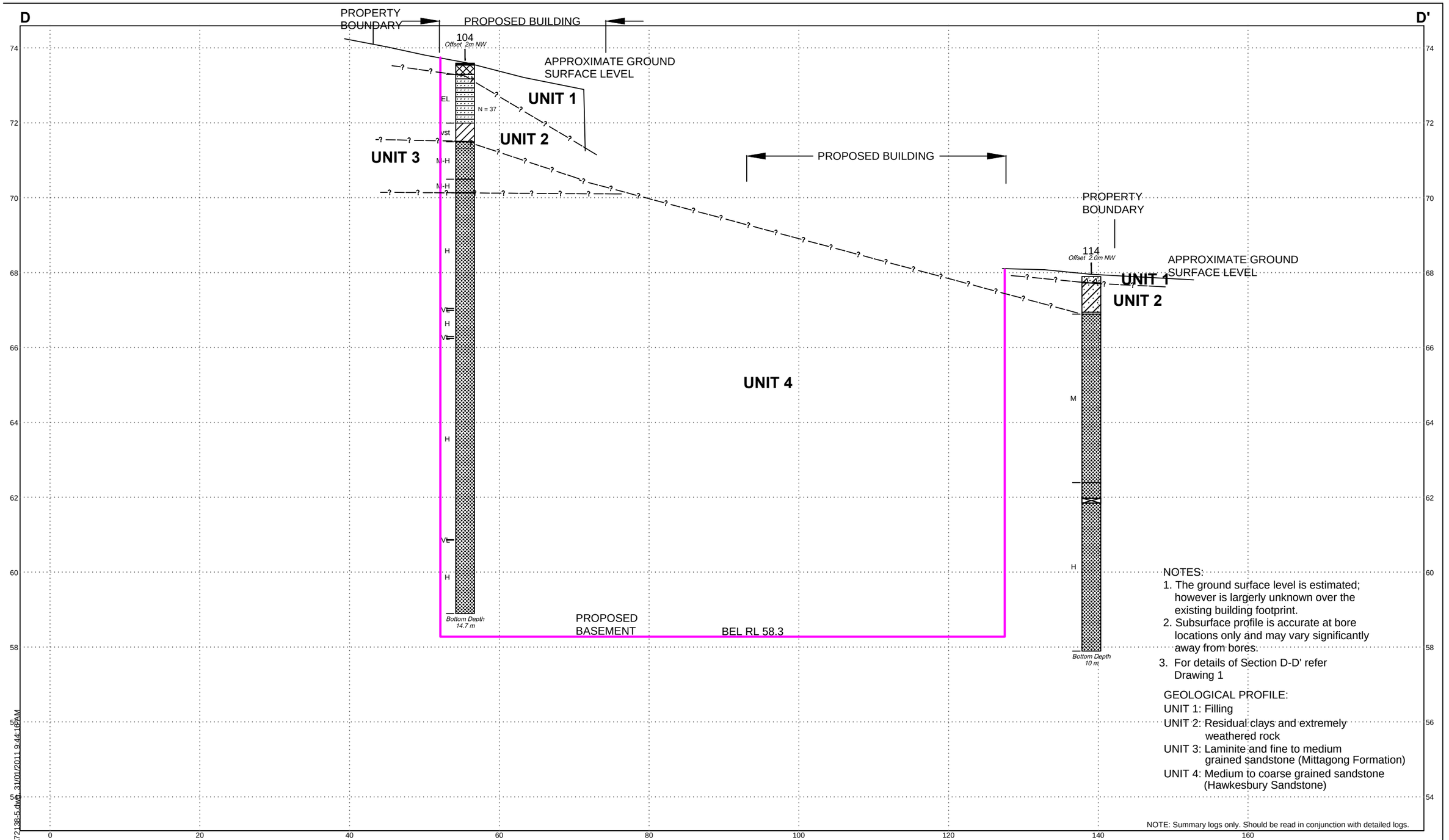
Geotechnics / Environment / Groundwater

CLIENT: Stamford Property Services Pty Ltd		TITLE: **INTERPRETED GEOLOGICAL SECTION C - C'**	PROJECT No: 72138
OFFICE: Sydney	DRAWN BY: GRB/LD	**Proposed Macquarie Village**	DRAWING No: 4
SCALE: 1:500 (H) 1:100 (V) @ A3	DATE: 17.01.2011	**110 - 114 Herring Road, Macquarie Park**	REVISION: 0



NOTES:

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3. For details of Section D-D' refer Drawing 1

GEOLOGICAL PROFILE:

UNIT 1: Filling

UNIT 2: Residual clays and extremely weathered rock

UNIT 3: Laminite and fine to medium grained sandstone (Mittagong Formation)

UNIT 4: Medium to coarse grained sandstone (Hawkesbury Sandstone)

NOTE: Summary logs only. Should be read in conjunction with detailed logs.

LEGEND

- Core Loss
- Asphaltic Concrete
- Clay
- Concrete
- Filling
- Laminite
- Sandstone coarse grained
- Sandstone fine grained
- Sandy Clay

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EL - Extremely Low
VL - Very Low
L - Low
M - Medium
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s - soft
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h - hard
vl - very loose
l - loose
md - medium dense
d - dense
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TESTS / OTHER
N - Standard penetration test value
Water level
BEL Bulk excavation level
Inferred boundary

0 10
Horizontal Scale (metres)

Vertical Exaggeration = 5.0

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Geotechnics / Environment / Groundwater

CLIENT: Stamford Property Services Pty Ltd		TITLE: **INTERPRETED GEOLOGICAL SECTION D - D'**	PROJECT No: 72138
OFFICE: Sydney	DRAWN BY: GRB/LD	**Proposed Macquarie Village**	DRAWING No: 5
SCALE: 1:500 (H) 1:100 (V) @ A3	DATE: 17.01.2011	**110 - 114 Herring Road, Macquarie Park**	REVISION: 0

E

E'

PROPERTY BOUNDARY

PROPOSED BUILDING

107

APPROXIMATE GROUND SURFACE LEVEL

h

N = 46

UNITS 1 & 2

PROPOSED BUILDING

PROPERTY BOUNDARY

M

UNIT 3

APPROXIMATE GROUND SURFACE LEVEL

H

113

Offset 15m NW

UNITS 1 & 2

H

UNIT 4

H

M

PROPOSED BASEMENT

BEL RL 61.4

Bottom Depth 16 m

Bottom Depth 10 m

76 74 72 70 68 66 64 62 60 58 56

0 20 40 60 80 100 120 140 160

DISTANCE ALONG PROFILE (m)

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NOTE: Summary logs only. Should be read in conjunction with detailed logs.

LEGEND

- Core Loss
- Shaly Clay
- Concrete
- Filling
- Laminite
- Sandstone coarse grained
- Sandstone fine grained
- Sandy Clay

ROCK STRENGTH
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High

SOIL CONSISTENCY
vs - very soft
s - soft
f - firm
st - stiff
vst - very stiff
h - hard
vl - very loose
l - loose
md - medium dense
d - dense
vd - very dense

TESTS / OTHER
N - Standard penetration test value
▼ - Water level
BEL Bulk excavation level
Inferred boundary

0 10
Horizontal Scale (metres)

Vertical Exaggeration = 5.0

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Geotechnics / Environment / Groundwater

CLIENT: Stamford Property Services Pty Ltd		TITLE: **INTERPRETED GEOLOGICAL SECTION E - E'**	PROJECT No: 72138
OFFICE: Sydney	DRAWN BY: GRB/LD	**Proposed Macquarie Village**	DRAWING No: 6
SCALE: 1:500 (H) 1:100 (V) @ A3	DATE: 17.01.2011	**110 - 114 Herring Road, Macquarie Park**	REVISION: 0

F

F'

PROPERTY BOUNDARY

PROPOSED BUILDING

110
Offset - 7m NE

111
Offset - 10m NE

PROPERTY BOUNDARY

APPROXIMATE GROUND SURFACE LEVEL

refusal

refusal

UNIT 1 & 2

UNIT 3

UNIT 4

EL

EL

L

H

H

H

H

M-H

M-L

H

M

H

H

PROPOSED BASEMENT BEL RL 61.4

Bottom Depth 16 m

Bottom Depth 14.2 m

76
74
72
70
68
66
64
62
60
58
56

0
20
40
60
80
100
120
140
160

DISTANCE ALONG PROFILE (m)

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LEGEND
- Filling
- Concrete
- Laminite
- Sandstone coarse grained

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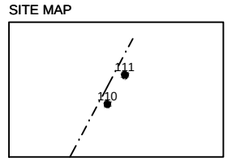

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Geotechnics / Environment / Groundwater

CLIENT: Stamford Property Services Pty Ltd		TITLE: **INTERPRETED GEOLOGICAL SECTION F - F'**	PROJECT No: 72138
OFFICE: Sydney	DRAWN BY: GRB/LD	**Proposed Macquarie Village**	DRAWING No: 7
SCALE: 1:500 (H) 1:100 (V) @ A3	DATE: 17.01.2011	**110 - 114 Herring Road, Macquarie Park**	REVISION: 0

Attachment 2

Field Work Results

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Douglas Partners

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Soil Descriptions

Douglas Partners

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726, Geotechnical Site Investigations Code. 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	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

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

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

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	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

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;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and 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 test procedure is described by Australian Standard 4133.4.1 - 1993. The terms used to describe rock strength are as follows:

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

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

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 some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and loner sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

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

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

where 'sound' rock is assessed to be rock of low strength or better. 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

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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

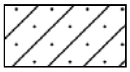
Soils


Topsoil

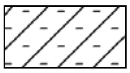

Peat


Clay

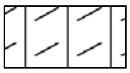

Silty clay

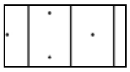

Sandy clay

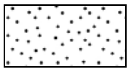

Gravelly clay

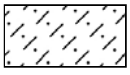

Shaly clay

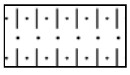

Silt


Clayey silt


Sandy silt

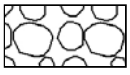

Sand

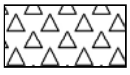

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

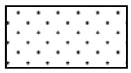

Talus

Sedimentary Rocks

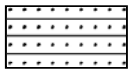

Boulder conglomerate

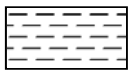

Conglomerate


Conglomeratic sandstone

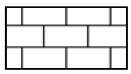

Sandstone


Siltstone


Laminite

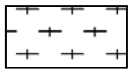

Mudstone, claystone, shale

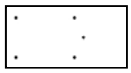

Coal


Limestone

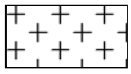
Metamorphic Rocks

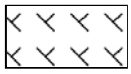

Slate, phyllite, schist

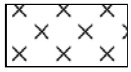

Gneiss

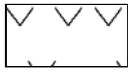

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: Stamford Property Services Pty Ltd
PROJECT: Macquarie Village
LOCATION: 110-114 Herring Road, Macquarie Park

SURFACE LEVEL: 68 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 101
PROJECT No: 72138
DATE: 20/12/2010
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)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
68	0.18	CONCRETE - 180mm										
	0.3	FILLING - poorly compacted, grey gravel filling										
	0.65	CONCRETE - 350mm										
67	1	FILLING - poorly compacted, yellow brown, sandstone cobbles and boulders filling							A/E			
66	2.0	CONCRETE - 300mm						Note: Unless otherwise stated, rock is fractured along rough planar bedding planes dipping between 0°- 10°				
	2.3	FILLING - poorly compacted, grey gravel filling										
65	2.9	SANDSTONE - high strength, moderately then highly weathered, fractured to slightly fractured, light grey and red-purple, medium to coarse grained sandstone							C	96	84	PL(A) = 1.6
64	4								C	100	100	
	4.2							4m: J85°, pl, ro, fe				
	4.36	LAMINITE - high then medium strength, moderately weathered, slightly fractured, dark grey laminite						4.18m: CORE LOSS: 20mm	C	100	77	PL(A) = 0.6
	4.82	SANDSTONE - high strength, fresh and fresh stained then slightly weathered, slightly fractured and unbroken, medium to coarse grained sandstone with distinct laminations						4.2m: J80°, pl, ro, fe 4.34m: CORE LOSS: 20mm 4.75m: Cz, 20mm 5.23m: Cs, 10mm	C	100	92	
63	5								C	100	94	
									C	100	100	PL(A) = 1.2
62	6								C	100	100	PL(A) = 1.1
61	7											PL(A) = 2
60	8								C	100	97	PL(A) = 1.6
59	9											PL(A) = 1
									C	100	100	

RIG: Multi-drill **DRILLER:** Traccess **LOGGED:** PGH **CASING:** NW to 2.0m

TYPE OF BORING: Diatube 0.00-0.18m & 0.3-0.60m; Solid flight auger (TC-bit) 0.18-0.30 & 0.60-2.0m; NMLC-Coring 2.0-2.3m & 2.8-12.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Difficulty recovering samples in filling due to collapsing ground conditions

SURVEY DATUM:

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: Stamford Property Services Pty Ltd
PROJECT: Macquarie Village
LOCATION: 110-114 Herring Road, Macquarie Park

SURFACE LEVEL: 68 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 101
PROJECT No: 72138
DATE: 20/12/2010
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
58		SANDSTONE - high strength, fresh and fresh stained then slightly weathered, slightly fractured and unbroken, medium to coarse grained sandstone with distinct laminations *(continued)*							C	100	100	PL(A) = 2.5
57	11								C	100	100	PL(A) = 2
56	12 12.0	Bore discontinued at 12.0m										
55	13											
54	14											
53	15											
52	16											
51	17											
50	18											
49	19											

RIG: Multi-drill **DRILLER:** Traccess **LOGGED:** PGH **CASING:** NW to 2.0m

TYPE OF BORING: Diatube 0.00-0.18m & 0.3-0.60m; Solid flight auger (TC-bit) 0.18-0.30 & 0.60-2.0m; NMLC-Coring 2.0-2.3m & 2.8-12.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Difficulty recovering samples in filling due to collapsing ground conditions

SURVEY DATUM:

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

DOUGLAS PARTNERS PTY LTD

MACQUARIE VILLAGE

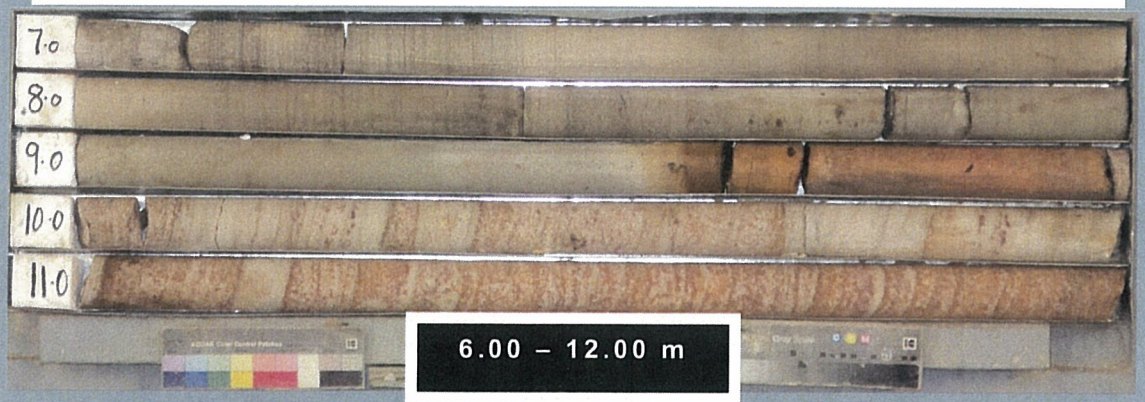
BORE 101 PROJECT 72138 20 DECEMBER 2010

2.90 – 6.00 m

DOUGLAS PARTNERS PTY LTD

MACQUARIE VILLAGE

BORE 101 PROJECT 72138 20 DECEMBER 2010



6.00 – 12.00 m

BOREHOLE LOG

CLIENT: Stamford Property Services Pty Ltd
PROJECT: Macquarie Village
LOCATION: 110-114 Herring Road, Macquarie Park

SURFACE LEVEL: 72.2 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 72138
DATE: 9/12/2010
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)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
72	0.05	ASPHALT - 50mm thick						Note: Unless otherwise stated, rock is fractured along rough planar bedding planes dipping between 0°- 10°	E/A			
	0.46	FILLING (ROADBASE) - grey blue metal gravel filling							E/A			
	0.66	CLAY - red brown clay with ironstone bands							E/A			
71	1.0	SANDSTONE - extremely low strength, extremely weathered, sandstone with high strength ironstone bands										
	1.36	SANDSTONE - extremely low and low strength with medium to high strength ironstone bands, extremely and highly weathered, fractured, red brown and light grey, medium grained sandstone						1m: CORE LOSS: 360mm	C	82	77	PL(A) = 0.8
70	2											PL(A) = 0.6
								2.77m: J50°, pl, ro				
	3.0	SANDSTONE - medium to high strength, moderately weathered, fractured and slightly fractured, light grey, fine to medium grained sandstone						3.07m: Cz, 20mm	C	100	88	PL(A) = 0.7
69	3	- distinct and indistinct laminations from 3.7 to 4.6m						3.7m: Cs, 10mm				
	4											
	4.2	SANDSTONE - high strength, slightly and moderately weathered, slightly fractured, light grey and light orange, medium grained sandstone										PL(A) = 1.8
68	5											PL(A) = 1.3
67									C	100	100	
	6											
66	6.2	SANDSTONE - medium to high strength, moderately weathered, slightly fractured, orange brown, medium grained sandstone						6.22m: Cs, 10mm 6.36m: Cz, pl, ro, cly				PL(A) = 0.5
	6.7	SANDSTONE - high strength, slightly weathered then fresh, slightly fractured, light orange then grey, medium grained sandstone 7.4-7.5m: distinct laminations						7.13m: Cs, 10mm				PL(A) = 1.1
65	7											
	8								C	100	100	PL(A) = 1.6
64												PL(A) = 1.6
	9											
63								9.78m: J70°, pl, ro, cln				

RIG: Bobcat **DRILLER:** SS **LOGGED:** PGH **CASING:** HW to 13.05m

TYPE OF BORING: Solid flight auger (TC-bit) to 0.90m; NMLC-Coring to 13.05m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SURVEY DATUM:

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: Stamford Property Services Pty Ltd
PROJECT: Macquarie Village
LOCATION: 110-114 Herring Road, Macquarie Park

SURFACE LEVEL: 72.2 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 102
PROJECT No: 72138
DATE: 9/12/2010
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
62	11	SANDSTONE - high strength, slightly weathered then fresh, slightly fractured, light orange then grey, medium grained sandstone *(continued)*										PL(A) = 1.3
61	12	12.45-13.05m: distinct laminations						11.36m: Cs, 10mm	C	100	98	PL(A) = 1.7
60	13	13.05 Bore discontinued at 13.05m										
59	14											
58	15											
57	16											
56	17											
55	18											
54	19											
53												

RIG: Bobcat **DRILLER:** SS **LOGGED:** PGH **CASING:** HW to 13.05m
TYPE OF BORING: Solid flight auger (TC-bit) to 0.90m; NMLC-Coring to 13.05m
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS:

SURVEY DATUM:

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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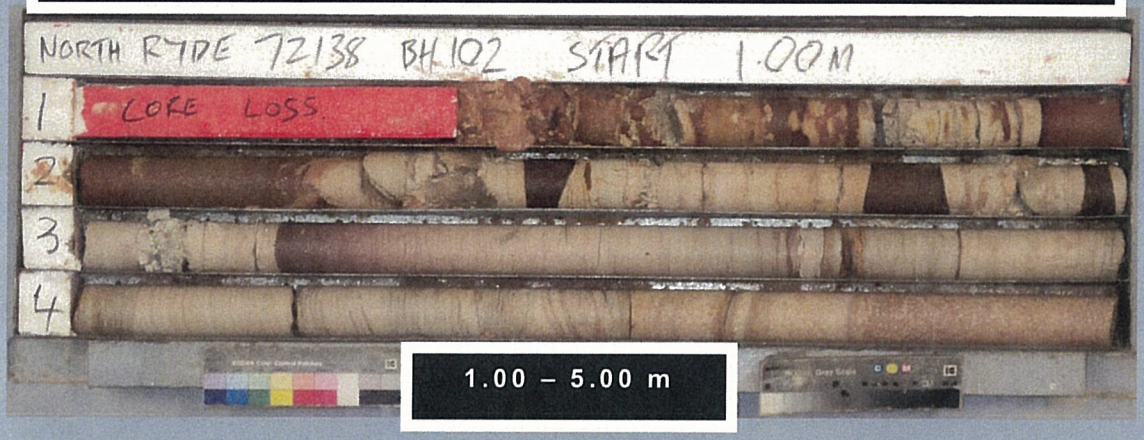
MACQUARIE VILLAGE

BORE 102 PROJECT 72138 9 DECEMBER 2010

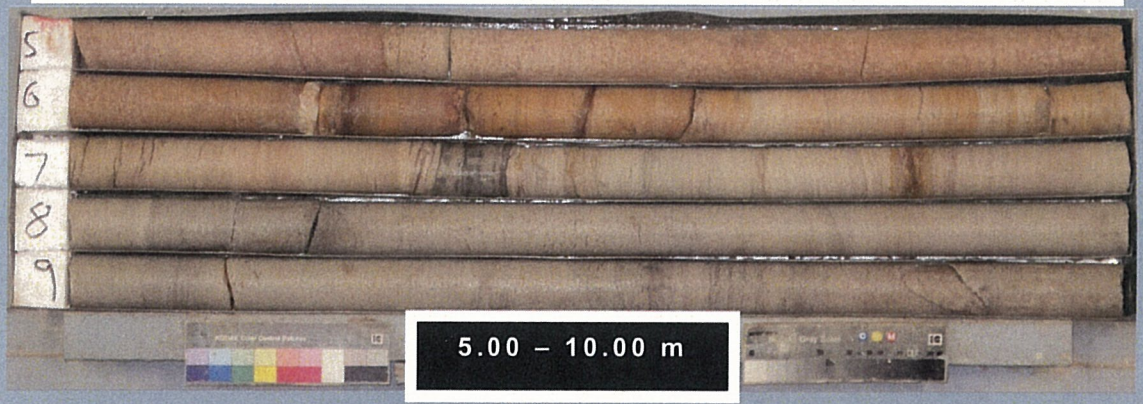


1.00 – 5.00 m

DOUGLAS PARTNERS PTY LTD

MACQUARIE VILLAGE

BORE 102 PROJECT 72138 9 DECEMBER 2010



5.00 – 10.00 m


DOUGLAS PARTNERS PTY LTD
MACQUARIE VILLAGE
BORE 102 PROJECT 72138 9 DECEMBER 2010
10
11
12
13
END OF HOLE AT 13.05 M
10.00 – 13.05 m