GEOTECHNIQUE® PTY LTD
ABN 64 002 841 063

Job No: 13188/4
Our Ref: 13188/4-AA
3 August 2015

Nix Anderson Pty Ltd
17 Chuter Street
MCMAHONS POINT NSW 2060
Email: robert.mcguinness@nxa.com.au

Attention: Mr R McGuinness

Dear Sir

re: **Proposed Redevelopment**
160 Burwood Road, Concord
Additional Contamination Assessment

Further to the contamination assessment report (Report 13188/1-AA dated 12 September 2014); this letter report presents the results of an additional contamination assessment (ACA) at locations (BH11 to BH16) as indicated on the Drawing No 13188/3-AA1. Field sampling was carried out in conjunction with additional geotechnical investigation. The additional geotechnical investigation report is being submitted separately.

The investigation was commissioned by Mr R Ewing of Propertylink Holdings Pty Ltd through a subcontract agreement and was carried out in general accordance with Geotechnique Pty Ltd proposal Q6614-AC dated 12 June 2015.

Proposed Development
We understand that Nix Anderson has been retained by Propertylink to assist in carrying out feasibility review of the above site to assess the development potential on behalf of the site owners – Freshfood Australia Holdings Pty Ltd. It is also understood that the existing Robert Timms Factory (Bushell's) will be relocated prior to development and the site will be developed as an Urban Regeneration Project – an integrated Residential Community.

As requested, assessment of soils in the area between the pathway and the seawall was conducted with recovery and analysis of soil samples from additional boreholes (BH11 to BH16) as nominated by the client.

The objective of the assessment was to ascertain whether the soils being assessed are likely to present a risk of harm to human health and the environment under the conditions for the proposed residential development.

SCOPE OF WORK
In order to achieve the objective of this report, the following scope of work was carried out:

- Site inspection.
- Additional soil sampling by a Geotechnical/Environmental Engineer from Geotechnique in conjunction with geotechnical investigation.

- Chemical analysis by laboratories accredited by the National Association of Testing Authorities (NATA), in accordance with Chains of Custody (COC) prepared by Geotechnique.
- Assessment of field and laboratory Quality Assurance (QA) and Quality Control (QC).
- Assessment of the laboratory analytical results.
- Assessment of soil at the sampled borehole locations.

Regional Geology and Landscape

Reference to the Geological Map of Sydney (Herbert 1983) indicates that the bedrock at the site is likely to be Hawkesbury Sandstone, comprising medium grained quartz sandstone.

Reference to the Soil Landscape Map of Sydney (Chapman et al., 2004) indicates that the landscape at the site belongs to the Gymea Group, which is characterised by undulating to rolling rises and low hills on Hawkesbury Sandstone. However, the site is likely to have been filled in the past to raise levels for development.

FIELD SAMPLING AND LABORATORY TESTING

An Environmental Engineer from Geotechnique was responsible for sampling and logging the sub-surface profile encountered during the field work on 9, 10 and 13 July 2015.

Reference should be made to the engineering borehole logs in Attachment A for detailed descriptions of the soil profile encountered during the field work. Generally, the samples did not have obvious asbestos sheets/pieces, odour, staining or discolouration that would indicate the potential for contamination.

The sampled borehole locations are indicated on the attached Drawing No 13188/3-AA1.

To prevent the potential loss of any volatile compounds, the recovered soil sample for laboratory analysis was immediately transferred into a labelled, laboratory supplied, 250ml glass jar and sealed with an airtight, Teflon screw top lid. The fully filled jar was then placed in a chilled container.

Samples were recovered using one-off nitrile gloves in order to avoid cross contamination between the sampling locations.

In order to ensure the analytical performance of the primary laboratory, duplicate and split samples were prepared and kept in labelled, laboratory supplied, glass jars (acid-washed and solvent-rinsed) sealed with airtight, Teflon screw top lids. The fully filled jars were placed in a chilled container.

The recovered fill sample for asbestos analysis was transferred into a small labelled, plastic bags. The small plastic bags were placed inside a large plastic bag.

At completion of field sampling the chilled container was transported to our Penrith office. All the jars and bottle were then transferred to a refrigerator where the temperature was maintained below 4°C.

The chilled container with recovered samples was forwarded under Chain of Custody (COC) conditions to the primary laboratory SGS Environmental Services (SGS) and the secondary laboratory, Envirolab Services Pty Ltd (Envirolab), both NATA accredited.

On receipt of the samples the laboratories returned the Sample Receipt Advice verifying the integrity of all samples received.

Within the holding times detailed in Schedule B(3) of The *National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 (April 2013)* by the National Environment Protection Council (NEPC), the recovered soil samples were analysed for the following potential contaminants of concern:

- Metals, including, arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn).
- Total Recoverable Hydrocarbons (TRH).
- Benzene, Toluene, Ethyl Benzene and Xylenes (BTEX).
- Organochlorine Pesticides (OCP).
- Polycyclic Aromatic Hydrocarbons (PAH).
- Polychlorinated Biphenyls (PCB).
- Cyanides.
- Phenols.
- Asbestos.

FIELD QUALITY ASSURANCE & QUALITY CONTROL (QA & QC)
The following QA/QC procedures were implemented for the sampling and analytical program.

Trip Spike Sample
Trip spike samples are obtained from the laboratory on a regular basis, prior to conducting field sampling where volatile substances are suspected. The samples are held at Geotechnique in the Penrith office, at less than 4 degrees Celsius, for a period of not more than seven days. During the fieldwork, the trip spike samples are kept in the chilled container with soil samples recovered from the site. The trip spike sample is then forwarded to the primary laboratory together with the soil samples recovered from the site.

The trip spike is prepared by the laboratory by adding a known amount of a pure petrol standard to a clean sand sample. The sample is mixed thoroughly to ensure a relatively homogenous distribution of the spike throughout the sample. When the sample is submitted for analysis, the same procedure is adopted for testing as the soil samples being analysed from the site.

The purpose of the trip spike is to detect any loss or potential loss of volatiles from the soil samples, during field work, transportation, sample extraction or testing.

A trip spike sample (TS1) was forwarded to the primary analytical laboratory with the samples collected from the site and tested for BTEX. The test results for the trip spike sample, reported as a percentage recovery of the applied and known spike concentrations, are shown in Table A.

As indicated in Table A, the results show a generally good recovery (ranging from 99% to 107%) of the spike concentrations.

Based on the above, it is considered that any loss of volatiles from the recovered samples that might have occurred would not affect the outcome / conclusions of this report.

Duplicate Sample

In order to ensure reliable analytical results from the laboratory, one duplicate soil sample was prepared from an original sample and submitted blind to the primary laboratory (SGS Environmental Services) for analysis. The test results for the duplicate sample were compared with the test results of the corresponding original sample and are summarised in the attached Table B. The duplicate frequency adopted complies with the NEPM, which recommends a duplicate frequency of at least 5% (achieved with 1 duplicate sample analysed from 20 samples analysed, i.e. 5%).

A comparison was made and the Relative Percentage Differences (RPD) was computed to assess the difference between the original and duplicate. RPD within 30% are generally considered acceptable. As indicated in Table B, the comparisons between the duplicate and corresponding original sample indicated generally acceptable RPD with the exceptions of higher RPDs for Chromium, lead, nickel and zinc, which were considered due to the heterogeneity of the samples recovered. The concentration of arsenic, copper, lead and nickel of the pairs of samples analysed were also well below the assessment criteria adopted, therefore, the variations are not considered significant and the test results provided by the primary laboratory are deemed reliable for this assessment.

Split Sample

Split samples provide a check on the analytical performance of the primary laboratory. One split sample was submitted for analysis to a secondary laboratory (Envirolab Services Pty Ltd). The split sample frequency adopted complies with the NEPM, which recommends a frequency of 5% (achieved with 1 split sample analysed from 20 samples analysed, i.e. 5%).

Based on Schedule B (3) of the NEPM, the difference in the results between the split samples should in general be within 30% of the mean concentration determined by both laboratories, i.e., RPD should be within 30%. However, this variation can be higher for organic analysis than for inorganics and for low concentrations of analytes. The test results are summarised in the attached Table C.

As indicated in Table C, the comparisons between the split and corresponding original samples indicated generally acceptable RPD with the exception for arsenic, copper, lead and nickel. Higher RPDs calculated for arsenic, copper, lead and nickel were considered due to heterogeneity of the samples analysed. The concentrations of arsenic, copper, lead and nickel for the pairs of samples analysed were also well below the assessment criteria adopted, therefore the variations are not considered significant and the test results provided by the primary laboratory are deemed reliable for this assessment.

LABORATORY QA & QC

Geotechnique uses only NATA accredited laboratories for chemical analyses. The laboratory must also incorporate quality laboratory management systems to ensure trained analysts using validated methods and suitably calibrated equipment in order to produce reliable results.

In addition to the quality control samples, the laboratory must also ensure that all analysts receive certification as to their competence in carrying out the analysis and participate in national and international proficiency studies. SGS and Envirolab are both accredited by NATA. The two laboratories also operate Quality Systems that are designed to comply with ISO/IEC 17025.

All reported laboratory limits of reporting (LOR) / practical quantitation limits (PQL) were less than the assessment criteria.

As part of the analytical run for the project, the laboratories included laboratory blanks, duplicate samples, laboratory control samples, matrix spikes and surrogate spikes.

We have checked the QA/QC procedures and results adopted by the laboratories against the appropriate guidelines. The quality control sample numbers adopted by SGS and Envirolab are considered adequate for the analyses undertaken and generally conform to recommendations provided in the National Environment Protection Measure (NEPM) 1999 (April 2013) "*Guideline on Laboratory Analysis of Potentially Contaminated Soils*".

Overall, the quality control elements adopted by SGS and Envirolab indicate the analytical data to fall within acceptable levels of accuracy and precision for the analysis of soils. The analytical data provided, is therefore considered to be reliable and useable for this assessment.

ASSESSMENT CRITERIA

Investigation levels and screening levels developed in the NEPM 2013 were used in this assessment, as follows:

- Risk-based Health Investigation Levels (HIL) for a broad range of metals and organic substances. The HIL are applicable for assessing human health risk via all relevant pathways of exposure. The HIL as listed in Table 1A (1) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" are provided for different land uses.

  The site is located within a parcel of industrial land, which will be developed into high density residential community. As such, with regard to human health, analytical results will be assessed against risk based HIL for *residential with minimal opportunities for soil access; including dwellings with fully and permanently paved yard space such as high-rise buildings and apartments* (HIL B).

- Health Screening Levels (HSL) for selected petroleum compounds, fractions and Naphthalene are applicable for assessing human health risk via inhalation and direct contact pathways. The HSL depend on specific soil physicochemical properties, land use scenarios and the characteristics of building structures. The HSL listed in Table 1A(3) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" apply to different soil types and depths below surface to >4 m.

  For this assessment, the analytical result was assessed against the available HSL for *with minimal opportunities for soil access; including dwellings with fully and permanently paved yard space such as high-rise buildings and apartments* (HSL B) for clay to depth of 0m to <1m and for sand to depth of 0m to <1m.

- Ecological Screening Levels (ESL) for selected petroleum hydrocarbon compounds, TPH fractions and Benzo(a)Pyrene are applicable for assessing the risk to terrestrial ecosystems. ESL listed in Table 1B(6) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" broadly apply to coarse and fine-grained soils and various land uses and are generally applicable to the top 2m of soil.

  The analytical results were assessed against the available ESL for *urban residential* for coarse and fine-grained soils.

- Ecological Investigation Levels (EIL), a specific type of Soil Quality Guidelines (SQG) for selected metals are applicable for assessing the risk to terrestrial ecosystems. EIL listed in Table 1B(1-5) of Schedule B1 "*Guideline on Investigation Levels for Soil and Groundwater*" depend on specific soil physicochemical properties and land use scenarios and generally apply to the top 2m of soil. The EIL are calculated using 30% effect concentration (EC30) or lowest observed effect concentrations (LOEC) toxicity data. For arsenic and lead generic EIL for *urban residential* land use for aged contamination are adopted. For other metals, where available, EIL are calculated directly by using EIL calculator developed by CSIRO for NEPC.

  For this assessment the analytical results were assessed against the available SQG / EIL for *urban residential* land use for aged contamination in soil for low traffic volume.

- With regard to protection of the environment and impact on plant growth the available Provisional Phytotoxicity Based Investigation Levels (PIL) published in the *Guidelines for the NSW Site Auditor Scheme* (NSW EPA / DEC, 2006) and EIL published in the NEPM 1999 for cadmium and mercury are used.

For discrete soil samples, the individual concentrations of analytes, except Cd and Hg, were assessed against the HIL B / HSL B / ESL / EIL. The individual concentrations of Cd and Hg were assessed against the PIL and HIL B.

For asbestos, the assessed soil must not contain bonded ACM in excess of 0.01%w/w and surface soil within the site should be free of visible ACM, and friable asbestos in the soil should not exceed 0.001% w/w.

The soil will be deemed contaminated or containing contamination "hot spots" if the above criteria are unfulfilled. Further investigation, remediation and/or management will be recommended if the area of concern is found to be contaminated or contain contamination "hot spots".

LABORATORY TEST RESULTS, ASSESSMENT & DISCUSSION

Copies of the actual laboratory test results certificates from SGS are kept in the offices of Geotechnique and will be provided upon request. The test results are also presented in Tables D to H together with the available assessment criteria adopted. A discussion of the test data is presented in the following sub-sections.

Metals

The Metals test results for discrete selected soil samples are presented in Tables D1 and D2 and as shown, all concentrations of Metals were below the available relevant EIL, HIL B. All Cd and Hg concentrations were also below the relevant PIL.

TRH and BTEX

The TRH and BTEX test results for the discrete selected soil samples are presented in Table E. As shown in Table F the concentrations of F1 (TRH C6-C10 less BTEX), F2 (TRH >C10-C16 less Naphthalene), F3 (TRH >C16-C34), F4 (TRH >C34-C40) and BTEX were below the relevant HSL B and / or ESL adopted.

PAH

The PAH test results for the selected discrete soil samples are presented in Table F and as shown, all BaP, BaP TEQ, Naphthalene and Total PAH were below the relevant HIL B or ESL or HSL B or EIL adopted.

OCP
The OCP test results for selected discrete soil samples are presented in Table G and as indicated, OCP were well below the relevant HIL B. The concentrations of DDT were also below the EIL.

PCB
The PCB test results for the selected discrete soil samples are presented in Table G and as shown, the PCB concentrations were below the relevant HIL B adopted.

Phenols
The Phenols test results for the selected discrete soil samples are presented in Table G and as shown, the Phenols concentrations were well below the relevant HIL B adopted.

Cyanides
The Cyanides test results for the selected discrete soil samples are presented in Table G and as shown, the Cyanides concentrations were well below the relevant HIL B adopted.

Asbestos
The asbestos results for the selected discrete soil samples are presented in Table H and as shown, no friable asbestos was detected at the laboratory detection limit of 0.001%.

CONCLUSION AND RECOMMENDATIONS
Based on this assessment, it is considered that soil samples, recovered from boreholes BH11 to BH16 in conjunction with geotechnical investigation, are unlikely to pose a risk of harm to human health and the terrestrial environment and are environmentally suitable for the proposed development.

If suspect materials (identified by unusual staining, odour, discolouration or inclusions such as building rubble, asbestos sheets / pieces, ash material, etc) are encountered during the construction stage, we recommend that this office is contacted for assessment and necessary action.

LIMITATIONS
Within the stated scope of work, the services performed by Geotechnique in preparation of this report were conducted in a manner consistent with the level of quality and skill generally exercised by members of the profession and consulting practice.

This report has been prepared for Nix Anderson Pty Ltd for the purpose stated within. Any reliance on this report by other parties shall be at such parties' sole risk as the report might not contain sufficient information for other purposes.

This report shall only be presented in full and may not be used to support any other objective than those set out in the report, except where written approval is provided by Geotechnique.

The information in this report is considered accurate at completion of field sampling (13 July 2015) and in accordance with current site conditions. Any variations to the site form or use beyond this date might nullify the conclusions stated.

No contamination assessment can eliminate all risk; even a rigorous professional assessment might not detect all contamination within the investigated locations.

Reference should be made to the attached "Environmental Notes" for details of the limitations of this assessment.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Yours faithfully
GEOTECHNIQUE PTY LTD

DANDA SAPKOTA
Senior Environmental Engineer

Attached	Attachment A	Drawing No 13188/3-AA1 (Borehole Locations)
	Attachment B	Engineering Borehole Logs
	Attachment C	Laboratory Analytical Results Summary Tables (Tables A to H)
	Attachment D	Environmental Notes

LIST OF REFERENCES

Chapman et al. 2004, *Soil Landscape Series Sheet 9030, Scale 1:100,000 (Sydney),* Soil Conservation Service of NSW, Sydney.

Contaminated Land Management Act

Herbert C 1983, *Geological Series Sheet 9130, Scale 1:100,000 (Sydney),* Department of Minerals and Energy, NSW, Sydney.

NEPM 1999 (April 2013), *National Environment Protection (Assessment of Site Contamination) Measure (NEPM),* National Environmental Protection Council (NEPC), Australia.

ATTACHMENT A

LEGEND

- Borehole (August 2014)
- Borehole (July 2015)

Imagery ©2014 NearMap.com

0 20 40 60 80 100m

Scale 1:2000

GEOTECHNIQUE ® PTY LTD

PO Box 880
Penrith NSW 2750
Tel: 02 4722 2700
Fax: 02 4722 2777
e-mail:info@geotech.com.au
www.geotech.com.au

NOTES

1. Site features are indicative and are not to scale.
2. This drawing has been produced using a base plan provided by others to which additional information e.g test pits, borehole locations or notes have been added. Some or all of the plan may not be relevant at the time of producing this drawing

Nix Management Pty Ltd
Proposed Development
Robert Timms Factory Site (Bushell's)
160 Burwood Road, Concord

Borehole Locations

Drawing No: 13188/3-AA1
Job No: 13188/3
Drawn By: MH
Date: 30 July 2015
Checked By: ZA

File No: 13188-3
Layers: 0, AA1

ATTACHMENT B

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engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 11
Date : 09/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.5

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		GP				0			ASPHALT PAVEMENT				
									FILL: Sandy Gravel, course grained, brown				
		GP			N=12 9,7,5				FILL: Sandy Gravel, coarse grained, yellow				
						1			FILL: Silty Sandy Clay, medium plasticity, red brown				
		GP			N=5 3,2,3								
						2							
		GP											
		GP			N=5 3,2,3	3							
		GP											
	▼					4							
		G						SM	Silty SAND, fine to medium grained, brown to red, with some ironstone	W	D		Groundwater at 4.0m
					N=40 11,20,20				SANDSTONE, grey-brown, low to medium strength, extremely weathered				Bedrock
						5			Refer to Cored Borehole				
						6							
						7							
						8							
						9							

GEOTECHNIQUE
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engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 11
Date : 09/07/2015
Logged/Checked by : MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.5

core size: NMLC **bearing :** **deg.** **datum :** AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength $I_S(50)$ EL VL L M H VH	DEFECT DETAILS defect spacing (mm) 2000 1000 500 300 100 50	DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific / General
				Coring Commenced at 5.0m					
		5		SANDSTONE, fine to coarse grained, grey to red-brown	DW-SW	L-M			
		6							
		7							
				SANDSTONE, fine to coarse grained, grey-brown	DW-SW	M-H			
		8							
		9							
		10							
				Borehole No. 11 terminated at 10.2m					
		11							
		12							
		13							
		14							

GEOTECHNIQUE
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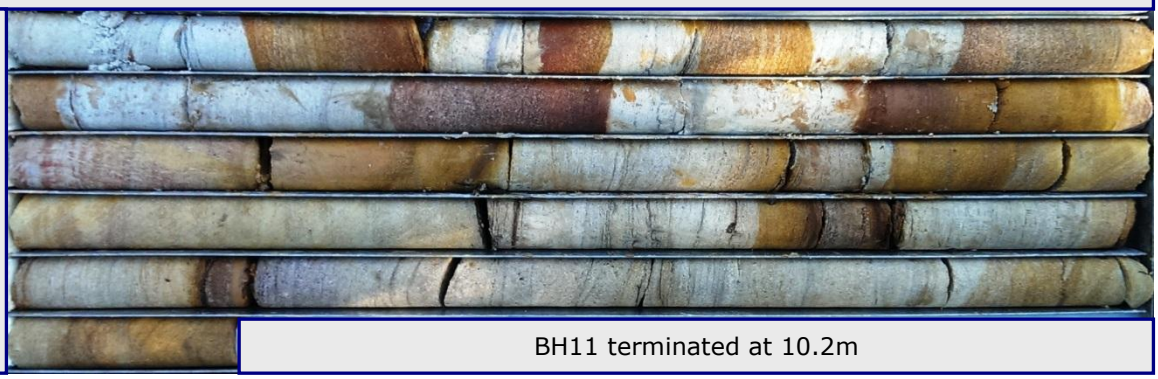
Job No 13188/3 BH11 Started Coring at 5m



BH11 terminated at 10.2m

Nix Anderson Pty Ltd
MT.mh/04.09.2014

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engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 12
Date : 09/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.4

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		GP				0			TOPSOIL: Sandy Silt, low plasticity, dark brown, with some roots				
					N=7 3,3,4				FILL: Silty Clayey Sand, fine to coarse grained, with some gravel				
		GP							FILL: Silty Clay, medium plasticity, grey, with some gravel				
						1							
	▼	GP			N=8 4,3,5								Groundwater at 1.8m
						2							
		GP											
					N=5 1,2,3	3							
		GP											
		G				4		SC-SM	Silty Clayey SAND, fine to medium grained, black to dark brown, with some shell fragments	W			
					N=2 1,1,1			CI	Silty Sandy CLAY, medium plasticity, red to brown	M>PL	L		
						5							
					N=10 3,5,5	6							
						7							Becoming harder to drill
					N=R 12,16/ 100			SC-SM	Silty Clayey SAND, fine to coarse grained, grey-brown to red	W	MD		
						8			SANDSTONE, grey to red-brown, extremely weathered, low strength				Bedrock
						9							

GEOTECHNIQUE
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engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 12
Date : 09/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.4

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						10			Borehole No. 12 terminated at 9.7m due to TC-Bit refusal				
						11							
						12							
						13							
						14							
						15							
						16							
						17							
						18							
						19							

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 13
Date : 10/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.4

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		GP				0			TOPSOIL: Silty Sand, fine to medium grained, dark brown, with some grass roots				
		GP			N=12 4,7,5	1			FILL: Silty Clay, medium plasticity, brown-orange, with some gravel				
		GP			N=6 3,3,3	2			FILL: Silty Clay, medium plasticity, brown-grey				
	▼	GP			N=8 3,4,4	3		SC-SM	Silty Clayey SAND, fine to medium grained, yellow, with some sandstone gravel	W	MD		Groundwater at 2.5m
					N=R 5,8,20/50	4		SM	Silty SAND, fine to coarse grained, grey	W	D		
						5			SANDSTONE, fine to coarse grained, grey-brown to yellow, extremely weathered, low strength				Bedrock
						6			Refer to Cored Borehole				
						7							
						8							
						9							

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 13
Date : 10/07/2015
Logged/Checked by : MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.4

core size: NMLC **bearing :** **deg.** **datum :** AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength $I_S(50)$ EL VL L M H VH	DEFECT DETAILS defect spacing (mm) 2000 1000 500 300 100 50	DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific / General
				Coring Commenced at 5.8m					
		6		SANDSTONE, fine to coarse grained, brown to red-grey	DW	L-M			
				SANDSTONE, fine to coarse grained, grey to red-brown	DW	L-M			
		7		CORE LOSS: 7.4-7.5m					Core loss 100mm
				SANDSTONE, fine to coarse grained, grey to red-brown	DW	M			
		8		SANDSTONE, fine to coarse grained, brown to grey	DW-SW	M-H			
		9							
		10		Borehole No. 13 terminated at 10.0m					
		11							
		12							
		13							
		14							
		15							

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Job No 13188/3 BH13 Started Coring at 5.8m

5.0m
6.0m
7.0m
8.0m
9.0m

BH13 terminated at 10.0m

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 14
Date : 10/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.2

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						0			TOPSOIL: Silty Sand, fine to medium grained, brown, with some grass roots				
		GP			N=6 1,2,4				FILL: Silty Clay, medium plasticity, grey-brown				
						1			FILL: Silty Sand, fine to medium grained, brown, with trace of iron shards				
		GP			N=20 11,15,5								
		GP				2			Silty SAND, fine to medium grained, grey-brown				
	▼				N=9 10,5,4	3		SM	Silty SAND, fine to coarse grained, grey-brown	W	MD		Groundwater at 3.0m
						4			Silty SAND, fine to medium grained, grey	W	MD		
					N=13 3,5,8			SC-SM	Silty Clayey SAND, fine to coarse grained, red-brown	W	MD		
						5							
					N=23 5,11,12	6		SM	Silty SAND, fine to coarse grained, red- brown, with some sandstone fragments	W	MD		
						7			SANDSTONE, red-brown to grey, extremely weathered, low strength				Bedrock
					N=R 25/50				SANDSTONE, grey to red, distinctly weathered, low to medium strength				
						8							
						9							

GEOTECHNIQUE
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engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 14
Date : 10/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.2

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
						10			Borehole No. 14 terminated at 10.0m				
						11							
						12							
						13							
						14							
						15							
						16							
						17							
						18							
						19							

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 15
Date : 13/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.2

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		GP				0			TOPSOIL: Silty Sand, fine to medium grained, brown, with some grass				
		GP			N=R 3,5,25/50	1			FILL: Silty Sandy Clay, medium plasticity, brown				
									Borehole No. 15 terminated at 1.3m due to refusal in possible sandstone boulder				
						2							
						3							
						4							
						5							
						6							
						7							
						8							
						9							

GEOTECHNIQUE
PTY LTD

engineering log - borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 16
Date : 13/07/2015
Logged/Checked by: MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.2

hole diameter : 125 **mm** **bearing :** **deg.** **datum :** AHD

method	groundwater	env samples	PID reading (ppm)	geo samples	field test	depth or R.L. in meters	graphic log	classification symbol	MATERIAL DESCRIPTION soil type, plasticity or particle characteristic, colour, secondary and minor components.	moisture condition	consistency density index	hand penetrometer kPa	Remarks and additional observations
		GP				0			TOPSOIL: Silty Sand, fine to medium grained, brown, with grass roots				
		GP			N=10 3,6,4				FILL: Silty Clay, medium plasticity, grey-brown				
						1			FILL: Silty Sand, fine to coarse grained, brown, with some gravel				
		GP			N=12 3,4,8								
						2							
					N=R 25/50	3			FILL: Silty Sand, fine grained, brown, with some boulders				
						4							
						5							
						6		SM	Silty SAND, fine to medium grained, dark brown, with some shell fragments	W			
						7							
						8			Refer to Cored Borehole				
						9							

GEOTECHNIQUE
PTY LTD

engineering log
cored borehole

Client : Nix Anderson Pty Ltd
Project : Proposed Development
Location : 160 Burwood Road, Concord

Job No. : 13188/3
Borehole No. : 16
Date : 13/07/2015
Logged/Checked by : MT

drill model and mounting : Utility Mounted **slope :** **deg.** **R.L. surface :** ≅3.2

core size: NMLC **bearing :** **deg.** **datum :** AHD

barrel lift	water loss/level	depth of R.L. in meters	graphic log	CORE DESCRIPTION rock type, grain characteristics, colour, structure, minor components.	weathering	strength	point load index strength $I_S(50)$ EL VL L M H VH	defect spacing (mm) 2000 1000 500 300 100 50	DEFECT DETAILS DESCRIPTION type, inclination, thickness, planarity, roughness, coating. Specific / General
				Coring Commenced at 7.6m					
				CORE LOSS: 7.6-7.85m					Core loss 250mm
		8		SANDSTONE, fine to coarse grained, red-brown, grey	DW-SW	M			
		9							
				SANDSTONE, fine to coarse grained, red-brown	DW-SW	M-H			
		10							
		11		SANDSTONE, fine to coarse grained, grey	SW-FR	H-VH			
		12							
				Borehole No. 16 terminated at 12.2m					
		13							
		14							
		15							
		16							
		17							

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Job No 13188/3 BH16 Started Coring at 7.6m

7.0m — 7.6m

8.0m

9.0m

10.0m

11.0m

12.0m — BH16 terminated at 12.2m

Nix Anderson Pty Ltd
MT.mh/04.09.2014

KEY TO SYMBOLS

Symbol Description

Strata symbols

	**Pavement (Bitumen, Concrete Slab, etc)**
	**Fill**
	**Silty Sand**
	**Sandstone**
	**Topsoil**
	**Silty Clayey Sand**
	**Silty Sandy Clay medium plasticity**

Misc. Symbols

	**Groundwater**

Descriptions of various line types (solid, dotted, etc.)

____	**Profile change**
_ _ _	**Gradual profile change**

Notes:

1. **Exploratory borings were drilled between 13/07/2015 and 13/07/2015 using a 50, 100 and 125mm diameter continuous flight power auger.**

2. **These logs are subject to the limitations, conclusions and recommendations in this report.**

3. **Results of tests conducted on samples recovered are reported on the logs.**

KEY TO SYMBOLS

Symbol Description

Strata symbols

 **Sandstone**

 **Core Loss**

Misc. Symbols

× **Point Load Strength**

Descriptions of various line types (solid, dotted, etc.)

____ **Profile change**

_ _ _ **Gradual profile change**

Notes:

1. **Exploratory borings were drilled between 13/07/2015 and 13/07/2015 using a 50, 100 and 125mm diameter continuous flight power auger.**

2. **These logs are subject to the limitations, conclusions and recommendations in this report.**

3. **Results of tests conducted on samples recovered are reported on the logs.**

Log Symbols & Abbreviations (Non-cored Borehole Log)

Log Column	Symbol/Value		Description
Drilling Method	V-bit TC-bit RR DB BB		Hardened steel 'V' shaped bit attached to auger Tungsten Carbide bit attached to auger Tricone (Rock Roller) bit Drag bit Blade bit
Groundwater	Dry 		Groundwater not encountered to the drilled or auger refusal depth Groundwater level at depths shown on log Groundwater seepage at depths shown on log
Environment Sample	GP G P		Glass bottle and plastic bag sample over depths shown on log Glass bottle sample over depths shown on log Plastic bag sample over depths shown on log
PID Reading	100		PID reading in ppm
Geotechnical Sample	DS DB U_{50}		Disturbed Small bag sample over depths shown on log Disturbed Bulk sample over depths shown on log Undisturbed 50mm tube sample over depths shown on log
Field Test	N=10 3,5,5 N=R 10,15/100		Standard Penetration Test (SPT) 'N' value. Individual numbers indicate blows per 150mm penetration. 'R' represents refusal to penetration in hard/very dense soils or in cobbles or boulders. The first number represents10 blows for 150mm penetration whereas the second number represents 15 blows for 100mm penetration where SPT met refusal
	DCP/PSP	5 6 R/10	Dynamic Cone Penetration (DCP) or Perth Sand Penetrometer (PSP). Each number represents blows per 100mm penetration. 'R/10' represents refusal after 10mm penetration in hard/very dense soils or in gravels or boulders.
Classification	GP GW GM GC SP SW SM SC ML MI MH CL CI CH		Poorly Graded GRAVEL Well graded GRAVEL Silty GRAVEL Clayey GRAVEL Poorly graded SAND Well graded SAND Silty SAND Clayey SAND SILT / Sandy SILT / clayey SILT, low plasticity SILT / Sandy SILT / clayey SILT, medium plasticity SILT / Sandy SILT / clayey SILT, high plasticity CLAY / Silty CLAY / Sandy CLAY / Gravelly CLAY, low plasticity CLAY / Silty CLAY / Sandy CLAY / Gravelly CLAY, medium plasticity CLAY / Silty CLAY / Sandy CLAY / Gravelly CLAY, high plasticity
Moisture Condition Cohesive soils Cohesionless soils	 M<PL M=PL M>PL D M W		 Moisture content less than Plastic Limit Moisture content equal to Plastic Limit Moisture content to be greater than Plastic Limit Dry - Runs freely through hand Moist - Tends to cohere Wet - Tends to cohere

Consistency Cohesive soils	Term	Undrained shear strength, C_u (kPa)	Hand Penetrometer (Qu)
VS	Very Soft	≤12	<25
S	Soft	>12 ≤25	25 – 50
F	Firm	>25 ≤50	50 – 100
St	Stiff	>50 ≤100	100 – 200
VSt	Very Stiff	>100 ≤200	200 – 400
H	Hard	>200	>400

Density Index Cohesionless soils	Term	Density Index, I_D (%)	SPT 'N' (blows/300mm)
VL	Very Loose	≤15	≤5
L	Loose	>15 ≤35	>5 ≤10
M	Medium Dense	>35 ≤65	>10 ≤30
D	Dense	>65 ≤85	>30 ≤50
VD	Very Dense	>85	>50

Hand Penetrometer	100 200	Unconfined compressive strength (q_u) in kPa determined using pocket penetrometer, at depths shown on log
Remarks	 Residual Alluvium Colluvial Aeolian Marine	Geological origin of soils Residual soils above bedrock River deposited Alluvial soils Gravity deposited Colluvial soils Wind deposited Aeolian soils Marine Soils

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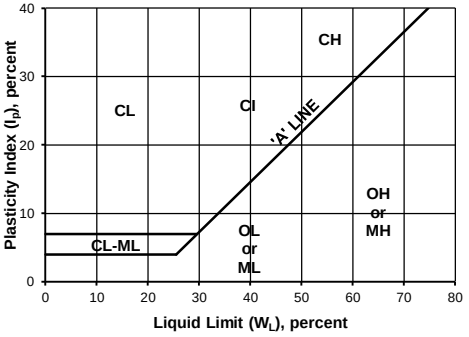
AS1726 – Unified Soil Classification System

Major Divisions		Particle size (mm)	Group Symbol	Typical Names	Field Identifications Sand and Gravels			Laboratory classification				
	BOULDERS	200						% (2) < 0.075mm	Plasticity of Fine Fraction	$C_u = D_{60}/D_{10}$	$C_c = (D_{30})^2/(D_{10}D_{60})$	Notes
	COBBLES	63										
COARSE GRAINED SOILS (more than half of material less 63mm is larger than 0.075mm)	GRAVELS (more than half of coarse fraction is larger than 2.36mm)	Coarse 20	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength			0-5	-	>4	between 1 and 3	1. Identify lines by the method given for fine grained soils 2. Borderline classifications occur when the percentage of fines (fraction smaller than 0.075mm size) is greater than 5% and less than 12%. Borderline classifications require the use of dual symbols e.g. SP-SM, GW-GC
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength			0-5	-	Fails to comply with above		
		Medium 6	GM	Silty gravels, gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength			12-50	Below 'A' line or I_p<4	-	-	
		Fine 2.36	GC	Clayey gravels, gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength			12-50	Above 'A' line or I_p>7	-	-	
	SANDS (more than half of coarse fraction is smaller than 2.36mm)	Coarse 0.6	SW	Well-graded sands, gravelly sands, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength			0-5	-	>6	between 1 and 3	
		Medium 0.2	SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength			0-5	-	Fails to comply with above		
		Fine 0.075	SM	Silty sands, sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength			12-50	Below 'A' line or I_p<4	-	-	
			SC	Clayey sand, sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength			12-50	Above 'A' line of I_p>7	-	-	
FINE GRAINED SOILS (more than half of material less than 63mm is smaller than 0.075mm)					**Dry Strength**	**Dilatancy**	**Toughness**					
	SILTS & CLAYS (liquid limit < 50%)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	None to low	Quick to slow	None	More than 50% passing 0.075mm	Below 'A' line			
			CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	Medium to high	None to very slow	Medium		Above 'A' line			
			OL	Organic silts and organic silty clays of low plasticity	Low to medium	Slow	Low		Below 'A' line			
	SILTS & CLAYS (liquid limit > 50%)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	Low to medium	Slow to none	Low to medium		Below 'A' line			
			CH	Inorganic clays of medium to high plasticity, fat clays	High to very high	None	High		Above 'A' line			
			OH	Organic clays of medium to high plasticity, organic silts	Medium to high	None to very slow	Low to medium		Below 'A' line			
	HIGHLY ORGANIC SOILS		Pt	Peat and highly organic soils	Identified by colour, odour, spongy feel and generally by fibrous texture			Effervesces with H_2O_2				

Use the gradation of material passing 63mm for classification of fractions according to the criteria given in 'Major Divisions'

Log Symbols & Abbreviations (Cored Borehole Log)

Log Column	Symbol	Description
Core Size		Nominal Core Size (mm)
	NQ	47
	NMLC	52
	HQ	63
Water Loss	◀	Complete water loss
	◁	Partial water loss
Weathering	FR	Fresh — Rock shows no sign of decomposition or staining
	SW	Slightly Weathered — Rock is slightly discoloured but shows little or no change of strength from fresh rock
	DW	Distinctly Weathered — Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased by deposition of weathering products in pores
	EW	Extremely Weathered — Rock is weathered to such an extent that it has 'soil' properties, i.e. it either disintegrate or can be remoulded, in water
	RS	Residual Soil — Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but soil has not been significantly transported
Strength		Term — Point Load Strength Index (I_{s50}, MPa)
	EL	Extremely Low — ≤0.03
	VL	Very Low — >0.03 ≤0.1
	L	Low — >0.1 ≤0.3
	M	Medium — >0.3 ≤1
	H	High — >1 ≤3
	VH	Very High — >3 ≤10
	EH	Extremely High — >10
Defect Spacing		Description — Spacing (mm)
		Extremely closely spaced — <20
		Very closely spaced — 20 to 60
		Closely spaced — 60 to 200
		Medium spaced — 200 to 600
		Widely spaced — 600 to 2000
		Very widely spaced — 2000 to 6000
		Extremely widely spaced — >6000
Defect Description		
Type	Bp	Bedding parting
	Fp	Foliation parting
	Jo	Joint
	Sh	Sheared zone
	Cs	Crushed seam
	Ds	Decomposed seam
	Is	Infilled seam
Macro-surface geometry	St	Stepped
	Cu	Curved
	Un	Undulating
	Ir	Irregular
	Pl	Planar
Micro-surface geometry	Ro	Rough
	Sm	Smooth
	Sl	Slickensided
Coating or infilling	cn	clean
	sn	stained
	vn	veneer
	cg	coating

AS1726 – Identification of Sedimentary Rocks for Engineering Purposes

Grain Size mm		Bedded rocks (mostly sedimentary)									
More than 20	20	Grain Size Description				At least 50% of grains are of carbonate				At least 50% of grains are of fine-grained volcanic rock	
	6	RUDACEOUS		CONGLOMERATE Rounded boulders, cobbles and gravel cemented in a finer matrix		LIMESTONE and DOLOMITE (undifferentiated)		Calcirudite		Fragments of volcanic ejecta in a finer matrix	SALINE ROCKS
	2			Breccia Irregular rock fragments in a finer matrix						Rounded grains AGGLOMERATE Angular grains VOLCANIC BRECCIA	Halite Anhydrite
	0.6	ARENACEOUS	Coarse	SANDSTONE Angular or rounded grains, commonly cemented by clay, calcite or iron minerals				Calcarenite		Cemented volcanic ash	Gypsum
	0.2		Medium	Quartzite Quartz grains and siliceous cement						TUFF	
	0.06		Fine	Arkose Many feldspar grains Greywacke Many rock chips							
	0.002	ARGILLACEOUS		MUDSTONE	SILTSTONE Mostly silt	Calcareous Mudstone		Calcisiltite	CHALK	Fine-grained TUFF	
	Less than 0.002			SHALE Fissile	CLAYSTONE Mostly clay			Calcilutite		Very fine-grained TUFF	
Amorphous or crypto-crystalline				Flint: occurs as hands of nodules in the chalk Chert: occurs as nodules and beds in limestone and calcareous sandstone							COAL LIGNITE
				Granular cemented – except amorphous rocks							
				SILICEOUS		CALCAREOUS				SILICEOUS	CARBONACEOUS
				SEDIMENTARY ROCKS Granular cemented rocks vary greatly in strength, some sandstones are stronger than many Igneous rocks. Bedding may not show in hand specimens and is best seen in outcrop. Only sedimentary rocks, and some metamorphic rocks derived from them, contain fossils Calcareous rocks contain calcite (calcium carbonate) which effervesces with dilute hydrochloric acid						

AS1726 – Identification of Metamorphic and Igneous Rocks for Engineering Purposes

Obviously foliated rocks (mostly metamorphic)		Rocks with massive structure and crystalline texture (mostly igneous)						Grain size (mm)
Grain size description			Grain size description	Pegmatite			Pyrosenite	More than 20
		MARBLE						20
COARSE	GNEISS Well developed but often widely spaced foliation sometimes with schistose bands	QUARTZITE	COARSE	GRANITE	Diorite	GABBRO	Peridorite	6
	Migmatite Irregularly foliated: mixed schists and gneisses	Granulite HORNFELS		These rocks are sometimes phorphyritic and are then described, for example, as porphyritic granite				2
MEDIUM	SCHIST Well developed undulose foliation; generally much mica	Amphibolite	MEDIUM	Micorgranite	Microdiorite	Dolerite		0.6
		Serpentine		These rocks are sometimes phorphyritic and are then described as porphyries				0.2
								0.06
FINE	PHYLLITE Slightly undulose foliation; sometimes 'spotted'		FINE	RHYOLITE	ANDESITE	BASALT		0.002
	SLATE Well developed plane cleavage (foliation)			These rocks are sometimes phorphyritic and are then described as porphyries				Less than 0.002
	Mylonite Found in fault zones, mainly in igneous and metamorphic areas			Obsidian	Volcanic glass			Amorphous or cryptocrystalline
CRYSTALLINE				Pale<----------->Dark				
SILICEOUS		Mainly SILICEOUS		ACID Much quartz	INTERMEDIATE Some quartz	BASIC Little or no quartz	ULTRA BASIC	
METAMORPHIC ROCKS Most metamorphic rocks are distinguished by foliation which may impart fissility. Foliation in gneisses is best observed in outcrop. Non-foliated metamorphics are difficult to recognize except by association. Any rock baked by contact metamorphism is described as 'hornfels' and is generally somewhat stronger than the parent rock Most fresh metamorphic rocks are strong although perhaps fissile			IGNEOUS ROCKS Composed of closely interlocking mineral grains. Strong when fresh; not porous Mode of occurrence : 1 Batholith; 2 Laccoliths; 3 Sills; 4 Dykes; 5 Lava Flows; 6 Veins					

ATTACHMENT C

TABLE A
TRIP SPIKE SAMPLE
(Ref No: 13188/4-AA)

ANALYTES	Trip Spike TS1
BTEX	
Benzene	100%
Toluene	107%
Ethyl Benzene	99%
Xylenes	100%

Note : results are reported as percentage recovery of known spike concentrations

TABLE B
DUPLICATE SAMPLE
(Ref No: 13188/4-AA)

ANALYTES	BH11 0-0.15m mg/kg	Duplicate D1 mg/kg	RELATIVE PERCENTAGE DIFFERENCES (RPD) %
METALS			
Arsenic	<3	<3	-
Cadmium	0.4	<0.3	-
Chromium	37	18	69
Copper	29	29	0
Lead	10	6	50
Mercury	0.01	<0.01	-
Nickel	36	6.7	137
Zinc	49	27	58
TOTAL PETROLEUM HYDROCARBONS (TPH)			
F1 (C6-C10 less BTEX)	<25	<25	-
F2 (>C10-C16)	<25	<25	-
F3 (>C16-C34)	<90	<90	-
F4 (>C34-C40)	<120	<120	-
BTEX			
Benzene	<0.1	<0.1	-
Toluene	<0.1	<0.1	-
Ethyl Benzene	<0.1	<0.1	-
Xylenes	<0.3	<0.3	-
POLYCYCLIC AROMATIC HYDROCARBONS			
Benzo(a)Pyrene TEQ	<0.3	<0.3	-
Total PAH	1	<0.8	-
Naphthalene	<0.1	<0.1	-
Benzo(a)Pyrene	<0.1	<0.1	-
ORGANOCHLORINE PESTICIDES (OCP)			
Hexachlorobenzene (HCB)	<0.1	<0.1	-
Heptachlor	<0.1	<0.1	-
Aldrin+Dieldrin	<0.15	<0.15	-
Endrin	<0.2	<0.2	-
Methoxychlor	<0.1	<0.1	-
Mirex	<0.1	<0.1	-
Endosulfan (alpha, beta & sulphate)	<0.5	<0.5	-
DDD+DDE+DDT	<0.6	<0.6	-
Chlordane (alpha & gamma)	<0.2	<0.2	-
POLYCHLORINATED BIPHENYLS (PCB)			
Total PCB	<1	<1	-
CYANIDES & PHENOLS			
Cyanides	<0.5	<0.5	-
Phenols	<5	<5	-

TABLE C
SPLIT SAMPLE
(Ref No: 13188/4-AA)

ANALYTES	BH13 0-0.15m mg/kg (SGS)	Split Sample S1 mg/kg (ENVIROLAB)	RELATIVE PERCENTAGE DIFFERENCES (RPD) %
METALS			
Arsenic	6	4	40
Cadmium	0.5	<0.4	-
Chromium	16	15	6
Copper	20	35	55
Lead	24	15	46
Mercury	0.02	<0.1	-
Nickel	7.5	14	60
Zinc	32	32	0
TOTAL PETROLEUM HYDROCARBONS (TPH)			
F1 (C6-C10 less BTEX)	<25	<25	-
F2 (>C10-C16)	<25	<50	-
F3 (>C16-C34)	<90	<100	-
F4 (>C34-C40)	<120	<100	-
BTEX			
Benzene	<0.1	<0.2	-
Toluene	<0.1	<0.5	-
Ethyl Benzene	<0.1	<1	-
Xylenes	<0.3	<3	-
POLYCYCLIC AROMATIC HYDROCARBONS (PAH)			
Benzo(a)Pyrene TEQ	<0.3	<0.5	-
Total PAH	<0.8	<1.55	-
Naphthalene	<0.1	<0.1	-
Benzo(a)Pyrene	<0.1	<0.05	-
ORGANOCHLORINE PESTICIDES (OCP)			
Hexachlorobenzene (HCB)	<0.1	<0.1	-
Heptachlor	<0.1	<0.1	-
Aldrin+Dieldrin	<0.15	<0.2	-
Endrin	<0.2	<0.1	-
Methoxychlor	<0.1	<0.1	-
Mirex	<0.1	-	-
Endosulfan (alpha (I), beta (II) & sulphate)	<0.5	<0.3	-
DDD+DDE+DDT	<0.6	<0.3	-
Chlordane (alpha & gamma)	<0.2	<0.2	-
POLYCHLORINATED BIPHENYLS (PCB)			
Total PCB	<1	<0.7	-
CYANIDES & PHENOLS			
Cyanides	<0.5	<0.5	-
Phenols	<5	<5	-

TABLE D1
METALS, CATION EXCHANGE CAPACITY (CEC) & pH TEST RESULTS
DISCRETE SAMPLES
(Ref No: 13188/4-AA)

Sample Location	Depth (m)	METALS (mg/kg) ARSENIC	CADMIUM	CHROMIUM (Total)	COPPER	LEAD	MERCURY	NICKEL	ZINC	CEC (cmol/kg)	pH
BH11	2.5-2.8	5	0.3	13	5.1	16	0.01	0.6	4.4	3.5	4.9
BH12	0-0.15	4	<0.3	12	17	19	0.02	4.9	26	8.4	7
BH12	1.5-1.8	6	0.3	12	16	21	0.02	2.2	21	-	-
BH13	0-0.15	6	0.5	16	20	24	0.02	7.5	32	10	7.9
BH13	1.5-1.8	6	0.4	13	6.8	20	0.01	1.4	8.8	8.1	7.2
BH14	0-0.15	4	0.3	14	16	20	0.11	6.3	36	-	-
BH14	2.0-2.1	<3	<0.3	19	4	7	0.03	2.1	100	-	-
BH15	0-0.15	6	0.4	13	21	28	0.01	5.5	36	-	-
BH15	0.5-0.8	5	0.4	14	21	29	0.02	6.4	32	12	7.1
BH16	0.5-0.8	5	0.3	16	19	19	0.02	5.5	22	-	-
BH16	1.5-1.8	<3	<0.3	32	21	19	0.03	2.4	34	2.6	9
Limits of Reporting (LOR)		3	0.3	0.5	0.5	1	0.05	0.5	0.5	0.02	-
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)											
Health-based Investigation Levels (HIL)[a] B - Residential B		500	150	500[c]	30000	1200	30[d]	1200	60000		
Ecological Investigation Levels (EIL)[b] Urban residential		100[e]	-	400[f]	95	1100[g]	-	10	160		
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)											
Provisional Phytotoxity-Based Investigation Levels (PIL)			3				1				

Notes:
a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
b: EIL of aged chromium(III), nickel & zinc were derived from calculation spreadsheet developed by CSIRO for NEPC; old NSW suburb with low traffic volume; the lowest CEC=2.6 cmolc/kg & pH=4.9; the assumed clay content=10 % were selected for derivation of EIL; a conservative approach.

EIL of aged copper was calculated based on the pH and the CEC of the sample analysed and the lowest value of the ACL was adopted.

c: Chromium (VI)
d: Methyl Mercury
e: Generic EIL for aged arsenic
f: Chromium (III)
g: Generic added contaminant limit for aged lead + ambient background concentration; old NSW suburb with low traffic volume.

TABLE D2
METALS, CATION EXCHANGE CAPACITY (CEC) & pH TEST RESULTS
DISCRETE SAMPLE
(Ref No: 13188/4-AA)

Sample Location	Depth (m)	METALS (mg/kg) ARSENIC	CADMIUM	CHROMIUM (Total)	COPPER	LEAD	MERCURY	NICKEL	ZINC	CEC (cmol/kg)	pH
BH11	0-0.15	<3	0.4	37	29	10	0.01	36	49	14	9.1
Limits of Reporting (LOR)		3	0.3	0.5	0.5	1	0.05	0.5	0.5	0.02	-
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)											
Health-based Investigation Levels (HIL)[a] B - Residential B		500	150	500[c]	30000	1200	30[d]	1200	60000		
Ecological Investigation Levels (EIL)[b] - Urban residential		100[e]	-	410[f]	190	1100[g]	-	210	600		
GUIDELINES FOR THE NSW SITE AUDITOR SCHEME (2006)											
Provisional Phytotoxity-Based Investigation Levels (PIL)			3				1				

Notes:
a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.
b: EIL of aged chromium(III), nickel & zinc were derived from calculation spreadsheet developed by CSIRO for NEPC; old NSW suburb with low traffic volume; CEC=14 cmolc/kg & pH=9.1; the assumed clay content=10 % were selected for derivation of EIL; a conservative approach.

EIL of aged copper was calculated based on the pH and the CEC of the sample analysed and the lower value of the two ACL was adopted.

c: Chromium (VI)
d: Methyl Mercury
e: Generic EIL for aged arsenic
f: Chromium (III)
g: Generic added contaminant limit for aged lead + ambient background concentration; old NSW suburb with low traffic volume.

TABLE E
TOTAL RECOVERABLE HYDROCARBONS (TRH) AND BTEX TEST RESULTS
DISCRETE SAMPLES
(Ref No: 13188/4-AA)

											NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)																			
			TRH (mg/kg)					BTEX (mg/kg)				Health Screening Levels (HSL) B High density residential						Ecological Screening Levels for fine-grained soil Urban residential								Ecological Screening Levels for coarse-grained soil Urban residential							
Sample Location	Depth (m)	Soil type	F1	F2*	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2*	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES	F1	F2**	F3	F4	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES
BH11	0-0.15	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH11	2.5-2.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	110	440	0.5	310	NL	95	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH12	0-0.15	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH12	1.5-1.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	70	240	0.5	220	NL	60	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH13	0-0.15	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH13	1.5-1.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	70	240	0.5	220	NL	60	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH14	0-0.15	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH15	0-0.15	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH15	0.5-0.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH16	0.5-0.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	45	110	0.5	160	55	40	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
BH16	1.5-1.8	sand	<25	<25	<25	<90	<120	<0.1	<0.1	<0.1	<0.3	70	240	0.5	220	NL	60	-	-	-	-	-	-	-	-	180	120	300	2800	50	85	70	105
Limits of Reporting (LOR)			25	25	25	90	120	0.1	0.1	0.1	0.3																						

Notes:
F1: C6-C10 less BTEX
F2*: >C10-C16 less Naphthalene
F2**: >C10-C16
F3: >C16-C34
F4: >C34-C40
NL: Not Limiting

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TABLE F
POLYCYCLIC AROMATIC HYDROCARBONS (PAH) TEST RESULTS
DISCRETE SAMPLES
(Ref No: 13188/4-AA)

							NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)					
			PAH (mg/kg)				Health-based Investigation Levels (HIL) B[a] Residential B		Health Screening Level (HSL) B - High density residential	Generic Ecological Investigation Level (EIL) - Urban residential	Ecological Screening Level (ESL) - Urban residential	
Sample Location	Depth (m)	Soil type	BaP TEQ	TOTAL PAHs	NAPHTHALENE	BENZO(a)PYRENE (BaP)	BaP TEQ	TOTAL PAHs	NAPHTHALENE	NAPHTHALENE	BENZO(a)PYRENE (BaP)	
BH11	0-0.15	sand	<0.3	1	<0.1	<0.1	4	400	3	170	0.7	
BH11	2.5-2.8	sand	<0.3	<0.8	<0.1	<0.1	4	400	NL	170	0.7	
BH12	0-0.15	sand	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7	
BH12	1.5-1.8	sand	<0.3	<0.8	<0.1	<0.1	4	400	NL	170	0.7	
BH13	0-0.15	sand	<0.3	1	<0.1	<0.1	4	400	3	170	0.7	
BH13	1.5-1.8	sand	<0.3	<0.8	<0.1	<0.1	4	400	NL	170	0.7	
BH14	0-0.15	sand	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7	
BH15	0-0.15	sand	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7	
BH15	0.5-0.8	sand	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7	
BH16	0.5-0.8	sand	<0.3	<0.8	<0.1	<0.1	4	400	3	170	0.7	
BH16	1.5-1.8	sand	1.4	11	<0.1	**1**	4	400	NL	170	0.7	
Limits of Reporting (LOR)			0.3	0.8	0.1	0.1						

Notes: a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

NL: Not Limimting

TABLE G
ORGANOCHLORINE PESTICIDES (OCP), POLYCHLORINATED BIPHENYLS (PCB), CYANIDES & PHENOLS TEST
DISCRETE SAMPLES
(Ref No: 13188/4-AA)

Sample Location	Depth (m)	OCP (mg/kg)										(mg/kg)	(mg/kg)	(mg/kg)
		HEXACHLOROBENZENE (HCB)	HEPTACHLOR	ALDRIN+DIELDRIN	ENDRIN	METHOXYCHLOR	MIREX	ENDOSULFAN (alpha, beta & sulphate)	DDD+DDE+DDT	DDT	CHLORDANE (alpha & gamma)	PCB	Cyanides	Phenols
BH11	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH11	2.5-2.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	-	-
BH12	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH12	1.5-1.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	-	-
BH13	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH13	1.5-1.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	-	-
BH14	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH15	0-0.15	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH15	0.5-0.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	-	-
BH16	0.5-0.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	<0.5	<5
BH16	1.5-1.8	<0.1	<0.1	<0.15	<0.2	<0.1	<0.1	<0.5	<0.6	<0.2	<0.2	<1	-	-
Limits of Reporting (LOR)		0.1	0.1	0.15	0.2	0.1	0.1	0.5	0.6	0.2	0.2	1	0.1	0.1
NATIONAL ENVIRONMENT PROTECTION AMENDMENT MEASURE (2013)														
Health-based Investigation Levels (HIL) [a] B - Residential B		15	10	10	20	500	20	400	600		90	1	300	45000
Ecological Investigation Levels (EIL) - Urban residential										180 [b]				

Notes: a: Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

b: Generic EIL for DDT

TABLE H
ASBESTOS TEST RESULTS
DISCRETE SAMPLES
(Ref No: 13188/4-AA)

Sample Location	Depth (m)	ASBESTOS
BH11	0-0.15	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH11	2.5-2.8	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH12	0-0.15	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH13	0-0.15	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH14	0-0.15	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH15	0-0.15	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w
BH16	0.5-0.8	No Friable Asbestos exceeded the laboratory limit of reporting of 0.001%w/w

ATTACHMENT D

IMPORTANT INFORMATION REGARDING YOUR ENVIRONMENTAL SITE ASSESSMENT

These notes have been prepared by Geotechnique Pty Ltd, using guidelines prepared by the ASFE (Associated Soil and Foundation Engineers). The notes are offered to assist in the interpretation of your environmental site assessment report.

REASONS FOR AN ENVIRONMENTAL ASSESSMENT

Environmental site assessments are typically, though not exclusively, performed in the following circumstances:

- As a pre-acquisition assessment on behalf of a purchaser or a vendor, when a property is to be sold
- As a pre-development assessment, when a property or area of land is to be redeveloped, or the land use has changed, e.g. from a factory to a residential subdivision
- As a pre-development assessment of greenfield sites, to establish baseline conditions and assess environmental, geological and hydrological constraints to the development of e.g. a landfill
- As an audit of the environmental effects of previous and present site usage

Each circumstance requires a specific approach to assessment of soil and groundwater contamination. In all cases the objective is to identify and if possible quantify the risks that unrecognised contamination poses to the ongoing proposed activity. Such risks may be financial (clean-up costs or limitations in site use) and physical (health risks to site users or the public).

ENVIRONMENTAL SITE ASSESSMENT LIMITATIONS

Although information provided by an environmental site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment might not detect all contamination within a site. Contaminants could be present in areas that were not surveyed or sampled, or migrate to areas that did not show signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant that may occur; only the most likely contaminants are screened.

AN ENVIRONMENTAL SITE ASSESSMENT REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS

In the following events and in order to avoid cost problems, you should ask your consultant to assess any changes in the conclusion and recommendations made in the assessment:

- When the nature of the proposed development is changed e.g. if a residential development is proposed, rather than a commercial development
- When the size or configuration of the proposed development is altered e.g. if a basement is added
- When the location or orientation of the proposed structure is modified
- When there is a change of land ownership, or
- For application to an adjacent site

ENVIRONMENTAL SITE ASSESSMENT FINDINGS ARE PROFESSIONAL ESTIMATES

Site assessment identifies actual sub-surface conditions only at those points where samples are taken, when they are taken. Data obtained from the sampling and subsequent laboratory analyses are interpreted by geologists, engineers or scientists and opinions are drawn about the overall sub-surface conditions, the nature and extent of contamination, the likely impact on any proposed development and appropriate remediation measures. Actual conditions may differ from those inferred, because no professional, no matter how qualified and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, however, steps can be taken to help minimise the impact. For this reason site owners should retain the services of their consultants throughout the development stages of the project in order to identify variances, conduct additional tests that may be necessary and to recommend solutions to problems encountered on site.

Soil and groundwater contamination is a field in which legislation and interpretation of legislation by government departments is changing rapidly. Whilst every attempt is made by Geotechnique Pty Ltd to be familiar with current policy, our interpretation of the investigation findings should not be taken to be that of the relevant authority. When approval from a statutory authority is required for a project, approval should be directly sought.

STABILITY OF SUB-SURFACE CONDITIONS

Sub-surface conditions can change by natural processes and site activities. As an environmental site assessment is based on conditions existing at the time of the investigation, project decisions should not be based on environmental site assessment data that may have been affected by time. The consultant should be requested to advise if additional tests are required.

ENVIRONMENTAL SITE ASSESSMENTS ARE PERFORMED FOR SPECIFIC PURPOSES AND CLIENTS

Environmental site assessments are prepared in response to a specific scope of work required to meet the specific needs of specific individuals e.g. an assessment prepared for a consulting civil engineer may not be adequate to a construction contractor or another consulting civil engineer.

An assessment should not be used by other persons for any purpose or by the client for a different purpose. No individual, other than the client, should apply an assessment, even for its intended purpose, without first conferring with the consultant. No person should apply an assessment for any purpose other than that originally contemplated, without first conferring with the consultant.

MISINTERPRETATION OF ENVIRONMENTAL SITE ASSESSMENTS

Costly problems can occur when design professionals develop plans based on misinterpretation of an environmental site assessment. In order to minimise problems, the environmental consultant should be retained to work with appropriate design professionals, to explain relevant findings and to review the adequacy of plans and specifications relative to contamination issues.

LOGS SHOULD NOT BE SEPARATED FROM THE REPORT

Borehole and test pit logs are prepared by environmental scientists, engineers or geologists, based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these would not be redrawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate this problem, however, contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. Should this occur, delays and disputes, or unanticipated costs may result.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of sub-surface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations, such as contractors.

READ RESPONSIBILITY CLAUSES CLOSELY

An environmental site assessment is based extensively on judgement and opinion; therefore, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. In order to aid in prevention of this problem, model clauses have been developed for use in written transmittals. These are definitive clauses, designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment and you are encouraged to read them closely. Your consultant will be happy to give full and frank answers to any questions you may have.