Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Geotechnical Investigation

Proposed Australia Habitat and Taronga Wildlife Retreat
Bradleys Head Road, Mosman

Prepared for
Taronga Conservation Society Australia

Project 73876.01
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Douglas Partners
Geotechnics / Environment / Groundwater

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

	Signature	Date
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Report on Geotechnical Investigation
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1. Introduction

This report describes the results of a geotechnical investigation undertaken for the proposed Australia Habitat and Taronga Wildlife Retreat development at Taronga Zoo, Mosman. The work was undertaken for the Taronga Conservation Society Australia.

It is understood that the new facility and animal exhibits are to be constructed in the area to the south of the existing Taronga Centre. Details of the proposed building layout including excavation depths and footing requirements are yet to be finalised.

Geotechnical investigation was undertaken to provide information on subsurface conditions on the site and included the drilling of eight cored boreholes, the excavation of four test pits, laboratory testing and engineering analysis. Details of the field work and comments relating to design and construction are provided in this report.

Douglas Partners prepared a report for the proposed development in May 2014 (Project 73876.00) following the drilling of the boreholes. This current report has been expanded to include the results of recent test pits and supersedes the previous report.

2. Site Description and Geology

The area of the proposed Australia Habitat and Taronga Wildlife Retreat is located in the eastern portion of the zoo and includes existing animal exhibits and a number of back-of-house areas. It is bounded by the Taronga Centre to the north, Bradleys Head Road to the east, and animal exhibits/holding pens to the south and west.

The zoo is located on the southern side of a steep slope that dips towards Athol Bay. The site has been extensively terraced and numerous retaining walls provide level areas which house exhibits and walking paths/roadways. Many sandstone rock faces and cuttings are evident on the wider zoo site. The surface levels in the area of the development vary from about RL 63 m relative to the Australian Height Datum (AHD) in the northern portion down to about RL 50 m AHD in the southern portion.

The *Sydney 1:100 000 Geological Series Sheet* shows that the site is underlain by Hawkesbury Sandstone which typically comprises medium to coarse-grained quartz sandstone with minor shale and laminite lenses.

3. Field Work Methods

Eight cored boreholes (BH1 to BH8) were drilled to depths of 5.0 m using a DT250 drilling rig. The bores were commenced using solid flight augers to drill through the overburden materials. Soon after rock was encountered, the bores were advanced using NMLC-sized diamond core drilling equipment to obtain 50 mm diameter continuous samples of the rock for identification and strength testing purposes.

Four test pits (TP101 to TP103 and TP103A) were excavated to depths of between 0.85 m and 1.0 m using a 5 t excavator. The materials observed in the pits were logged by a geotechnical engineer.

The locations of the boreholes and test pits are shown on Drawing 1 in Appendix B. The ground surface levels at the test locations were measured to AHD using an automatic level, relative to known benchmarks on the site.

4. Field Work Results

The subsurface conditions encountered in the boreholes are presented in the borehole logs in Appendix C. The subsurface conditions encountered in the test pits are presented in the test pit logs in Appendix D. Notes defining descriptive terms and classification methods are included in Appendix A.

The boreholes encountered:

- FILLING – paving bricks, asphalt and concrete surfacing, underlain by clayey sand, sand, ripped sandstone, concrete boulders, roadbase and silty sand to depths of 0.3 m to 1.7 m;
- NATURAL SOIL – Clayey sand to depths of 0.5 m to 2.1 m in bores BH4 to BH8. Natural soil was not encountered in bores BH1 to BH3; and
- BEDROCK – sandstone bedrock generally initially of extremely low strength, grading to low, medium or high strength sandstone from depths of 0.7 m to 2.1 m to the base of the bores at 5.0 m depth.

The test pits encountered:

- FILLING – clayey, silty and sandy filling with ripped sandstone, charcoal, concrete, roots and rootlets to depths of 0.8 m and 1.0 m. TP103 also encountered steel, brick, concrete and a PVC pipe; and
- BEDROCK – medium strength sandstone from depths of 0.8 m.

Table 1 summarises the levels at which the different materials were encountered in the boreholes.

Table 1: Summary of Material Strata Levels in Boreholes

Stratum	RL of Top of Stratum (m, AHD)							
	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8
Ground Surface/ Filling	62.6	62.7	62.7	58.9	59.0	58.9	56.1	51.7
Natural Soil	NE	NE	NE	57.2	57.8	58.5	55.8	51.0
ELS Sandstone	61.7	61.8	NE	NE	NE	58.4	55.3	50.7
LS, MS or HS Sandstone	61.6	61.7	62.0	57.0	56.9	57.6	55.0	50.2
Base of Borehole	57.6	57.7	57.7	53.9	54.0	53.9	51.1	46.7

Notes: ELS = extremely low strength; LS = low strength; MS = medium strength; HS = high strength; NE = not encountered

Table 2 summarises the levels at which the different materials were encountered in the test pits.

Table 2: Summary of Material Strata Levels in Test Pits

Stratum	RL of Top of Stratum (m, AHD)			
	TP101	TP102	TP103	TP103A
Ground Surface/ Filling	62.0	54.0	51.3	51.3
Natural Soil	NE	NE	NE	NE
MS Sandstone	61.2	53.2	NE	50.5
Base of Test Pit	61.1	53.1	50.3	50.4

Notes: MS = medium strength; NE = not encountered

Seepage was observed at depths of 1.7 m (RL 57.2 m AHD) and 1.6 m (RL 57.4 m AHD) in bores BH4 and BH5, respectively. Seepage or groundwater was not observed during augering in the other bores and the use of drilling fluid prevented groundwater observations during coring. Seepage or groundwater was not observed in the test pits at the time of the field work.

5. Laboratory Testing

5.1 Rock Samples

Thirty-two samples selected from the rock core were tested for axial point load strength index (Is_{50}). The results ranged between 0.2 MPa and 1.7 MPa which correspond to low strength and high strength rock, respectively. These Is_{50} values suggest unconfined compressive strength (UCS) values in excess of 30 MPa for the samples of high strength rock tested.

5.2 Soil Samples

Two soil samples were tested to determine the California bearing ratio (CBR) for pavement design purposes. The samples were prepared by compacting the soil in a steel mould to a dry density ratio of 100% relative to Standard compaction and applying a 4.5 kg surcharge. The samples were then soaked in a water bath for 4 days prior to testing. The results of the testing are summarised in Table 3. The detailed report sheets are included in Appendix E.

Table 3: Laboratory Test Results for California Bearing Ratio

Sample Location	Depth (m)	Material	CBR (%)	Swell (%)
BH4	0.3 – 0.6	Sand filling	45	-0.2
BH7	0.3 – 0.6	Clayey sand	8	0.4

Notes: CBR = California bearing ratio

Eleven soil samples were sent to a NATA accredited analytical laboratory and were analysed for a range of potential organic and inorganic contaminants to provide preliminary information for waste classification purposes. The results of the analysis are summarised in Tables 4 to 7. The detailed results are included in Appendix E.

Table 4: Analytical Results for Selected Organic Compounds in Soil (mg/kg)

Sample/ Depth (m)	Benzene	Toluene	Ethyl-benzene	Xylene	TRH $_{C6-C9}$	TRH $_{C10-C36}$
BH1/0.5	<0.2	<0.5	<1	<3	<25	<250
BH2/0.5	<0.2	<0.5	<1	<3	<25	<250
BH3/0.5	<0.2	<0.5	<1	<3	<25	<250
BH4/0.5	<0.2	<0.5	<1	<3	<25	310
BH5/0.5	<0.2	<0.5	<1	<3	<25	<250
BH6/0.7	<0.2	<0.5	<1	<3	<25	<250
BH7/0.5	<0.2	<0.5	<1	<3	<25	<250
BH8/0.5	<0.2	<0.5	<1	<3	<25	<250
TP101/0.4-0.5	<0.2	<0.5	<1	<3	<25	<250
TP102/0.3-0.4	<0.2	<0.5	<1	<3	<25	<250
TP103/0.3-0.4	<0.2	<0.5	<1	<3	<25	<250

Notes: TRH = total recoverable hydrocarbons

Table 5: Analytical Results for Selected Organic Compounds in Soil (mg/kg)

Sample/ Depth (m)	Total PAH	Benzo(a) pyrene	OCP	PCB	Phenol
BH1/0.5	0.2	0.09	NIL(+)VE	NIL(+)VE	<5
BH2/0.5	18	1.6	2.5	NIL(+)VE	<5
BH3/0.5	1	0.16	NIL(+)VE	NIL(+)VE	<5
BH4/0.5	30	3.1	NIL(+)VE	NIL(+)VE	<5
BH5/0.5	7.3	0.9	NIL(+)VE	NIL(+)VE	<5
BH6/0.7	4.2	0.48	NIL(+)VE	NIL(+)VE	<5
BH7/0.5	3.5	0.51	NIL(+)VE	NIL(+)VE	<5
BH8/0.5	0.56	0.1	NIL(+)VE	NIL(+)VE	<5
TP101/0.4-0.5	NIL +ve	<0.05	NIL(+)VE	NIL(+)VE	<5
TP102/0.3-0.4	0.05	0.05	NIL(+)VE	NIL(+)VE	<5
TP103/0.3-0.4	1.9	0.2	NIL(+)VE	NIL(+)VE	<5

Notes: PAH = polycyclic aromatic hydrocarbons; OCP = organochlorine pesticides; PCB = polychlorinated biphenyls

Table 6: Analytical Results for Selected Heavy Metals in Soil (mg/kg)

Sample/ Depth (m)	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc
BH1/0.5	<4	<0.4	19	9	4	<0.1	18	12
BH2/0.5	<4	<0.4	8	9	11	<0.1	5	16
BH3/0.5	<4	<0.4	8	18	18	<0.1	6	180
BH4/0.5	<4	<0.4	8	11	10	<0.1	8	14
BH5/0.5	<4	<0.4	8	9	19	<0.1	6	17
BH6/0.7	<4	<0.4	10	6	8	<0.1	7	10
BH7/0.5	<4	<0.4	9	4	9	<0.1	4	6
BH8/0.5	<4	<0.4	5	6	20	<0.1	2	12
TP101/0.4-0.5	<4	<0.4	10	7	9	<0.1	7	19
TP102/0.3-0.4	<4	<0.4	4	5	16	<0.1	<1	21
TP103/0.3-0.4	<4	<0.4	8	6	25	<0.1	1	31

Table 7: Leachability Test Results using the Toxicity Characteristics Leaching Procedure (mg/L)

Sample/Depth (m)	Total PAH	Benzo(a)pyrene
BH2/0.5	0.0040	<0.001
BH4/0.5	NIL(+)VE	<0.001
BH5/0.5	NIL(+)VE	<0.001

Notes: PAH = polycyclic aromatic hydrocarbons

6. Geotechnical Model

The site appears to be underlain by minor depths of filling and soil overlying sandstone bedrock. An interpreted geotechnical model is shown as Section A-A on Drawing 2 in Appendix B. The units defined in the section include filling/soils (Unit A), extremely low strength sandstone (Unit B), and low, medium or high strength sandstone (Unit C). The groundwater table is likely to be well below the bedrock surface.

7. Proposed Development

It is understood that the new facility is to be constructed in the area to the south of the existing Taronga Centre. Details of the proposed building layout including excavation depths and footing requirements are yet to be finalised.

The geotechnical issues that may be relevant to the proposed development include excavation, excavation support, slope stability, site preparation, groundwater and foundations. Comments on seismicity and waste classification are also provided.

8. Comments

8.1 Excavation

Excavation for the proposed Australia Habitat and Taronga Wildlife Retreat may be required within filling, natural soils and sandstone bedrock. Excavation in filling, soils and extremely low strength sandstone should be readily achievable using a hydraulic excavator with bucket attachment. Excavation in low, medium and high strength rock will probably require ripping, hammering and/or sawing. Rock strengths in excess of 30 MPa (UCS) were encountered in the boreholes.

8.2 Excavation Support

Excavations in filling, soils and weathered rock will not be able to stand vertically for extended periods of time but may be able to be supported by temporary batters where space permits. A maximum temporary batter slope of 1(H):1(V) is recommended for excavations of up to 3 m depth in these materials. Permanent batters should be flattened to no steeper than 2(H):1(V). The medium and high strength rock should be able to stand vertically providing adverse jointing is not present.

Retaining walls (temporary and/or permanent) may be required in some areas of the site and could be designed using the material and strength parameters outlined in Table 8.

Table 8: Material and Strength Parameters for Retaining Structures

Material	Bulk Unit Weight (kN/m^3)	Coefficient of Active Earth Pressure (K_a)	Coefficient of Earth Pressure at Rest (K_o)	Ultimate Passive Earth Pressure (kPa)
Filling	20	0.4	0.6	-
Natural Soil	20	0.3	0.45	-
ELS Sandstone	22	0.2[1]	0.3[1]	750[2]
LS/MS/HS Sandstone	22	0[1]	0[1]	3000[2]

Notes: [1] Unless unfavourably jointed; [2] Only below ground level and where jointing is favourable; ELS = extremely low strength; LS = low strength; MS = medium strength; HS = high strength

A triangular lateral earth pressure distribution could be assumed for cantilevered walls, and a rectangular or trapezoidal lateral earth pressure distribution for walls propped at their top and base. Lateral pressures due to surcharge loads from sloping ground surfaces, adjacent buildings, construction machinery and vehicles should be included where relevant. Hydrostatic pressure acting on the retaining walls should also be included in the design where adequate drainage is not provided behind the full height of the walls.

8.3 Slope Stability

Although the site is located on a south-facing slope, it is underlain by a thin layer of filling and soil (0.5 m to 2.1 m deep) overlying sandstone bedrock. The slope is not therefore considered to be at risk of major slope instability. Excavations will need to be battered or retained in accordance with Section 8.2 of this report to reduce the risk of localised slope instability.

8.4 Site Preparation

Areas of the site that require filling to raise site levels should be stripped of vegetation and existing filling materials prior to proof-rolling with a minimum 10 t steel smooth drum roller. Any areas exhibiting significant heaving should be assessed by a geotechnical engineer to determine any rectification measures that may be required. Proof-rolling will not be required if the subgrade is sandstone bedrock.

Approved filling should then be placed on the prepared subgrade in 250 mm thick layers and compacted to achieve a dry density ratio of at least 98% relative to Standard compaction. This density criteria could be relaxed to a dry density ratio of at least 95% relative to Standard compaction in areas that are not required to support structures or pavements. The moisture content of the filling should be within 2% of optimum if it exhibits clay-like properties. Density testing should be undertaken in accordance with the provisions of AS 3798 – 2007 *Guidelines on earthworks for commercial and residential developments*.

The subgrade in areas where filling is not required should also be prepared in accordance with the above advice if they are required to support structures or pavements.

A design CBR value of 8% could be assumed for the natural clayey sands. Higher values may be able to be justified in areas where the clayey sands are not present, for example where engineered granular filling directly overlies the sandstone bedrock.

8.5 Groundwater

The regional groundwater table is expected to be well below the bedrock surface and flow in a southerly direction towards Athol Bay. However, some seepage through and along strata boundaries should be expected and this should be considered in the design of the drainage systems on the site. Seepage may also need to be removed from footing and pile excavations prior to pouring concrete.

8.6 Foundations

Due to the relatively shallow depth of rock on the site it is recommended that all new structures be founded within the sandstone bedrock on spread footings (e.g. pad footings and strip footings) or on short bored piles. The footings and piles could be designed using the information provided in Table 9.

Table 9: Design Parameters for Spread Footings and Bored Piles

Material Description	Allowable End-Bearing Pressure (kPa)	Allowable Shaft Adhesion[1] (kPa)
ELS Sandstone	700	50
LS/MS/HS Sandstone	3000	300

Notes: [1] Only for piles where adequate socket-roughness has been achieved; ELS = extremely low strength; LS = low strength; MS = medium strength; HS = high strength

The settlement of a footing is dependent on the dimensions of the footing, the load applied and the underlying foundation conditions. Spread footings and piles designed using the information contained in this report should experience settlements of less than 10 mm upon application of the design load.

All new footings should be inspected by an experienced geotechnical professional to check the suitability of the foundation material, and in the case of bored piles the socket roughness and the base cleanliness.

8.7 Seismicity

A Hazard Factor (*Z*) of 0.08 would be appropriate for the development site in accordance with Australian Standard AS 1170.4 – 2007 *Structural design actions – Part 4: Earthquake actions in Australia*. The site sub-soil class would be Class B_e.

8.8 Waste Classification Information

All materials requiring removal from the zoo site will need to be classified in accordance with *Waste Classification Guidelines* (NSW EPA, 2014). The laboratory testing undertaken during this investigation can be used to provide a preliminary indication of the classification of the materials requiring disposal.

The waste classification guidelines include the following six-step process for waste classification:

- Establish if the waste is ‘special waste’
- Establish if the waste is ‘liquid waste’
- Establish if the waste is ‘pre-classified’ by the EPA
- Establish if the waste possesses hazardous characteristics
- Determine the contaminant concentrations of the waste
- Establish if the waste is putrescible

Visual inspection and the laboratory analysis indicated that asbestos was not present in the soil samples tested. The soil samples did not contain clinical waste or tyres and therefore the soils on the site are not classified as special waste. The samples analysed were not in liquid form and therefore could not be described as liquid waste.

The EPA has pre-classified glass, plastic, rubber, bricks, concrete, building and demolition waste, and asphalt waste as General Solid Waste (non-putrescible). The materials within the samples were typically soil and therefore not pre-classified.

The samples analysed did not possess any obvious hazardous characteristics and could not be described as hazardous waste prior to chemical analysis. All samples analysed were assessed on a visual and tactile basis as being incapable of significant biological transformation and are therefore considered to be non-putrescible.

The total and, where relevant, leachable concentrations in the samples tested were compared to the threshold criteria provided in the guidelines. The 11 samples tested can therefore be classified as General Solid Waste (non-putrescible) based on the total and leachable contaminant concentrations. This type of waste requires disposal at an appropriately licensed landfill facility.

The natural soils and rock below the filling may be able to be described as virgin excavated natural material (VENM) upon excavation, providing they are not cross-contaminated during excavation works. VENM can usually be transported to a site for use as filling rather than requiring disposal at landfill.

Although not encountered in this current investigation, it is noted that previous investigations within the zoo have encountered asbestos-containing materials (ACM) as a result of past filling and demolition activities. The possibility of the presence of ACM on this development site should not be discounted and precautions may be required during construction activities to ensure any ACM encountered is handled in an appropriate manner.

9. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for the proposed Australia Habitat and Taronga Wildlife Retreat development at Taronga Zoo, Mosman, in accordance with DPs proposals dated 20 February 2014 and 1 February 2016, and acceptance received from the Taronga Conservation Society Australia. The report is provided for the use of the Taronga Conservation Society Australia 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.

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. Subsurface conditions can change abruptly due to variable geological processes and also as a result of anthropogenic influences. Such changes may occur after DPs field testing has been completed.

DPs advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be limited by undetected variations in ground conditions between sampling locations. The advice may also be limited by budget constraints imposed by others or by site accessibility. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

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

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

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP.

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Appendix A

About this Report

About this Report

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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.

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Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

Sampling Methods

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Sampling

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

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

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

Test Pits

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

Large Diameter Augers

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

Continuous Spiral Flight Augers

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

Non-core Rotary Drilling

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

Continuous Core Drilling

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

Standard Penetration Tests

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

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

The test results are reported in the following form.

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

  4,6,7
  N=13

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

  15, 30/40 mm

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

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

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

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

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are 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

Douglas Partners

Introduction

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

Drilling or Excavation Methods

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

Water

▷	Water seep
▽	Water level

Sampling and Testing

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

Description of Defects in Rock

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

Defect Type

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

Orientation

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

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

Coating or Infilling Term

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

Coating Descriptor

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

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General


Asphalt


Road base


Concrete


Filling

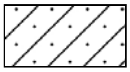
Soils


Topsoil

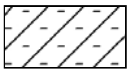

Peat


Clay

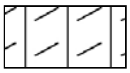

Silty clay

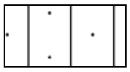

Sandy clay

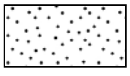

Gravelly clay

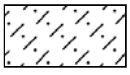

Shaly clay

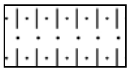

Silt


Clayey silt


Sandy silt

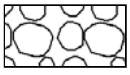

Sand

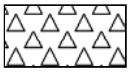

Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

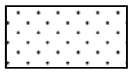

Talus

Sedimentary Rocks

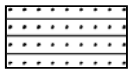

Boulder conglomerate

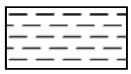

Conglomerate


Conglomeratic sandstone

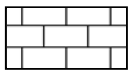

Sandstone


Siltstone


Laminite

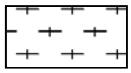

Mudstone, claystone, shale

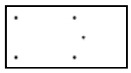

Coal


Limestone

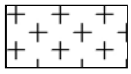
Metamorphic Rocks

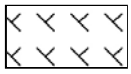

Slate, phyllite, schist

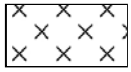

Gneiss

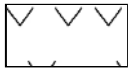

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

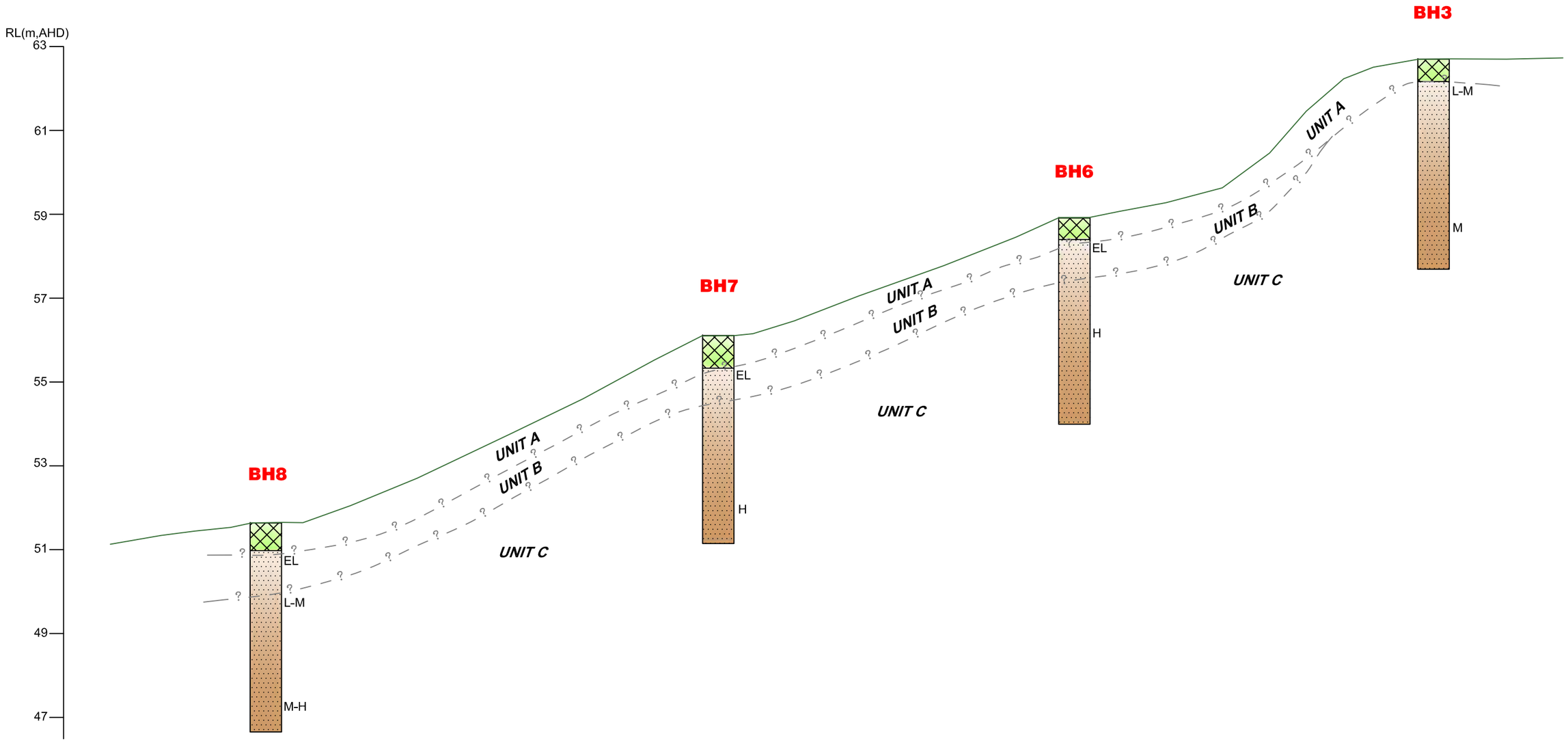
Appendix B

Drawings

N

Cored Borehole Test Pit

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Taronga Cons. Soc. Aust. OFFICE: Sydney DATE: 4 Mar 2016	**Locations of Testing** **Australia Habitat & Taronga Wildlife Retreat** **Bradleys Head Road, Mosman**	PROJECT No: 73876.01 DRAWING No: 1 REVISION: A



0 1 2 3 4 5 7.5 10m
1:100 @ A3 V

0 1 2 3 4 6 8 10 15 20m
1:200 @ A3 H

LEGEND

FILLING/ SOIL

SANDSTONE

— ? — — Inferred Strata Boundary

EL	Extremely low strength
VL	Very low strength
L	Low strength
M	Medium strength
H	High strength

UNIT DESCRIPTIONS

UNIT A	Filling/ Soil
UNIT B	Extremely low strength sandstone
UNIT C	Low, medium or high strength sandstone

Strata boundaries are inferred. Depths accurate only at test locations.

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Taronga Conservation Society Australia		TITLE: **Geotechnical Section A-A**	PROJECT No: 73876.01
OFFICE: Sydney	DRAWN BY: PSCH	**Proposed Australia Habitat and Taronga Wildlife Retreat**	DRAWING No: 2
SCALE: As shown	DATE: 4.03.2016	**Bradleys Head Road, MOSMAN**	REVISION: A

Appendix C

Results of Boreholes

BOREHOLE LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 62.6 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 73876
DATE: 20/3/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
62	0.08	PAVERS										
		FILLING - light grey then grey, fine to medium grained clayey sand filling, moist						Note: Unless otherwise stated, all defects are bedding planes dipping 0°- 10°	D D/E			
	0.85											
1	1.0	SANDSTONE - extremely low strength, light grey and orange-brown, fine to medium grained sandstone						1.07-1.57m: B0° (x6) cln				PL(A) = 0.8
61		SANDSTONE - medium strength, moderately and slightly weathered, slightly fractured, light grey-brown and red-brown, medium to coarse grained sandstone						1.86m: B0°, cly vn				PL(A) = 0.9
2								2.56m: B0°, cly vn	C	100	84	
60	2.75	SANDSTONE - low to medium then medium strength, moderately and slightly weathered then fresh, slightly fractured, light grey-brown and red-brown, medium to coarse grained sandstone with some extremely low strength bands						2.77-2.82m: Ds, 50mm 2.91-2.95m: Ds, 40mm				PL(A) = 0.3
3												
59												
4												PL(A) = 0.3
58	4.51							4.34m: B0°, cly vn 4.43m: CORE LOSS: 80mm	C	81	67	
	4.74							4.51-4.54m: Ds, 30mm 4.59m: B0°, cly, 20mm				
5	5.0	Bore discontinued at 5.0m - target depth reached						4.64m: CORE LOSS: 100mm 4.84m: B20°, cly vn				PL(A) = 0.8
57												
6												
56												
7												
55												
8												
54												
9												
53												

RIG: DT250 **DRILLER:** SY **LOGGED:** JH/SI **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m; NMLC-Coring to 5.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 62.7 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 73876
DATE: 21/3/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
62	0.08	PAVERS										
		FILLING - orange-brown then grey, fine to medium grained clayey sand filling, moist						Note: Unless otherwise stated, all defects are bedding planes dipping 0°- 10°	D E/D			
	0.85											
1	1.0	SANDSTONE - extremely low strength, light grey and orange brown, fine to medium grained sandstone							D			PL(A) = 0.4
61	1.72	SANDSTONE - medium strength, slightly then moderately weathered, slightly fractured then unbroken, brown to red-brown, medium to coarse grained sandstone						1.17-1.3m: B0° (x2) cly vn 1.35m: CORE LOSS: 370mm 1.79-2.15m: B0° (x3) cln	C	82	77	PL(A) = 0.7
2												
60	3.06	SANDSTONE - low to medium strength, slightly weathered, fractured and slightly fractured, light grey-brown, medium to coarse grained sandstone 3.31-3.63m: very low strength						3.06m: B5°, cly vn, fe 3.31m: CORE LOSS: 80mm 3.43-3.53m: Ds, 100mm 3.53m: CORE LOSS: 100mm				PL(A) = 0.3
3	3.31											
	3.39											
	3.63											
4								4.04m: B0°, cly vn 4.06-4.10m: Ds, 40mm 4.12-4.4m: B10° (x5), cly vn 4.46m: B15°, cly, 6mm 4.54-4.92m: B15° (x6) cln	C	100	0	PL(A) = 0.3
58												
5	5.0	Bore discontinued at 5.0m - target depth reached										
57												
6												
56												
7												
55												
8												
54												
9												
53												

RIG: DT250 **DRILLER:** SY **LOGGED:** JH/SI **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 0.9m; Rotary to 1.0m; NMLC-Coring to 5.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Full loss of drilling water from 1.35m

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 62.7 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 73876
DATE: 20/3/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
62	0.1	CONCRETE						Note: Unless otherwise stated, all defects are bedding planes dipping 0°- 10°	D/E			
	0.15	FILLING - light brown, fine to medium sand filling, wet										
	0.45	FILLING - light grey and orange brown, sandstone boulders and concrete blocks										
	0.65	FILLING - grey, fine to medium grained silty sand filling, wet										
61	1	SANDSTONE - medium then low to medium strength, moderately and slightly weathered, fractured and slightly fractured, light brown and brown, medium to coarse grained sandstone. Some very low strength bands						0.69-1.34m: B0° (x7) cln	C	87	33	PL(A) = 0.6 PL(A) = 0.3
60	2							2.11m: CORE LOSS: 100mm 2.21-2.31m: Ds, 100mm 2.34-2.37m: Ds, 30mm 2.37m: CORE LOSS: 100mm				PL(A) = 0.3
	2.21											
	2.47											
	2.9							2.57-2.72m: B5°- 10° (4) cly vn 2.76-2.80m: Ds, 40mm 2.8m: CORE LOSS: 100mm 2.97m: B10°, cly vn 3.11m: B5°, cly, 4mm 3.18m: CORE LOSS: 120mm 3.39m: B0°, cly vn 3.46-3.7m: B10°, cly vn 4.19m: B10°, cly vn 4.28-4.51m: B10° (x7) cly vn	C	94	64	PL(A) = 0.4 PL(A) = 0.4
59	3											
	3.3											
	3.4	SANDSTONE - medium strength, slightly weathered, slightly fractured, light grey-brown, medium to coarse grained sandstone										
58	4											
	5.0	Bore discontinued at 5.0m - target depth reached										
57	5											
56	6											
55	7											
54	8											
53	9											

RIG: DT250 **DRILLER:** SY **LOGGED:** JH/SI **CASING:** HW to 0.65m

TYPE OF BORING: Concrete Core 0.0-0.1m and 0.15-0.45m; Solid flight auger 0.1-0.15m and 0.45-0.65m; NMLC-Coring to 5.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 58.9 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 73876
DATE: 19/3/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
58	0.05	ASPHALT										
	0.3	FILLING - grey, gravelly sand roadbase filling, damp							D			
	1	FILLING - poorly compacted, light brown then grey, fine to medium grained sand filling with traces of crushed sandstone gravel						Note: Unless otherwise stated, all defects are bedding planes dipping 0°- 10°	D/E/B D S			3,5,4 N = 9
57	1.7	CLAYEY SAND - brown, fine to medium grained clayey sand, wet				▼			E			
	1.9	SANDSTONE - high strength, moderately and slightly weathered then fresh, slightly fractured and unbroken, light grey-brown, medium to coarse grained sandstone						2.05-2.07m: B15° (x2), cln 2.35-2.40m: B15° (x2), cln				PL(A) = 1.6
56	2											
	3							3.23m: B20°, cln 3.34m: J15°, pl, ro, cly vn, un				PL(A) = 1.6
55	4								C	100	100	
								4.49m: B5°, cly vn				PL(A) = 1.5
54	5							4.82m: B5°, cly, 2mm				
	5.0	Bore discontinued at 5.0m - target depth reached										
53	6											
52	7											
51	8											
50	9											
49												

RIG: DT250 **DRILLER:** SY **LOGGED:** JH **CASING:** HW to 1.9m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.9m; NMLC-Coring to 5.0m

WATER OBSERVATIONS: Seepage observed at 1.7m

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 59.0 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 73876
DATE: 19/3/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
59	0.05	ASPHALT										
	0.2	FILLING - grey, gravelly sand roadbase filling, damp							D			
		FILLING - poorly compacted, grey, fine to medium grained sand filling, damp							D/E			
58	1								D/S			2,2,3 N = 5
	1.2	CLAYEY SAND - orange-brown, fine to medium grained clayey sand, moist then wet				▼		Note: Unless otherwise stated, all defects are bedding planes dipping 0°- 10°	D/E			
57	2											
	2.05	SANDSTONE - medium to high then high strength, moderately to slightly weathered then fresh, unbroken, brown then grey to light grey, medium to coarse grained sandstone						2.24m: B0°, cly vn				PL(A) = 1
56	3							2.72m: B5°, he, fe				
									C	100	100	PL(A) = 1.7
55	4											
												PL(A) = 1.1
54	5							4.82m: B5°, cly vn				
	5.0	Bore discontinued at 5.0m - target depth reached										
53	6											
52	7											
51	8											
50	9											

RIG: DT250 **DRILLER:** SY **LOGGED:** JH **CASING:** HW to 2.05m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.05m; NMLC-Coring to 5.0m

WATER OBSERVATIONS: Seepage observed at 1.6m

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 58.9 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 73876
DATE: 19/3/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
58	0.05	ASPHALT						Note: Unless otherwise stated, all defects are bedding planes dipping 0°- 10°	D			
	0.35	FILLING - grey, gravelly sand roadbase filling, dry							D			
	0.5	CLAYEY SAND - orange-brown, fine to medium clayey sand, moist							D/E			
58	1.0	SANDSTONE - extremely low strength, orange-brown, fine to medium grained sandstone						1.02-1.07m: B0° (x3) cly vn				
	1.31	SANDSTONE - medium then high strength, moderately and slightly weathered then fresh, slightly fractured then unbroken, brown and grey to light grey, medium to coarse grained sandstone						1.08m: CORE LOSS: 230mm 1.31-1.33m: Ds, 20mm 1.81m: B0°, cly vn				PL(A) = 0.5
57	2								C	93	89	PL(A) = 0.8
								2.58m: B0°, cly, 2mm 2.65m: B5°, cly vn, fe				PL(A) = 1.4
56	3											
55	4								C	100	100	PL(A) = 1.4
54	5	5.0 Bore discontinued at 5.0m - target depth reached						4.98m: B10°, cly vn				
53	6											
52	7											
51	8											
50	9											
49												

RIG: DT250 **DRILLER:** SY **LOGGED:** JH **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m; NMLC-Coring to 5.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 56.1 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 73876
DATE: 20/3/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
56	0.05	ASPHALT										
	0.3	FILLING - grey, gravelly sand roadbase filling, dry							D			
	0.8	CLAYEY SAND - orange-brown, fine to medium grained clayey sand, humid						Note: Unless otherwise stated, all defects are bedding planes dipping 0°- 10°	E/D/B			
55	1.1	SANDSTONE - extremely low strength, light grey and orange-brown, fine to medium grained sandstone							D			4/70mm refusal
		SANDSTONE - medium strength, highly to moderately weathered, slightly fractured, light grey and brown, medium grained sandstone							S			Bouncing PL(A) = 0.5
54	2							1.48m: J75°, cly, 3mm, rootlets 1.55m: B0°, cly, 5mm 1.73-2.08m: B10°, cly vn				
	2.37							2.16-2.22m: Ds, 60mm 2.32m: CORE LOSS: 50mm	C	98	96	PL(A) = 0.9
53	3.1	SANDSTONE - high strength, fresh, slightly fractured and unbroken, light grey, medium to coarse grained sandstone with some siltstone clasts						3.62m: B0°, cly, 2mm				PL(A) = 1.3
52	4								C	100	100	PL(A) = 1.6
51	5.0	Bore discontinued at 5.0m - target depth reached										
50	6											
49	7											
48	8											
47	9											

RIG: DT250 **DRILLER:** SY **LOGGED:** JH/SI **CASING:** HW to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.0m; Rotary to 1.1m; NMLC-Coring to 5.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 51.7 AHD
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 73876
DATE: 21/3/2014
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
51	0.05	ASPHALT										
	0.3	FILLING - grey, fine to medium grained gravelly sand roadbase filling, dry							D			
	0.7	FILLING - brown and grey, silty sand filling with some roots, humid							D/E			
1	0.95	CLAYEY SAND - light grey and grey, fine to medium grained clayey sand, damp						Note: Unless otherwise stated, all defects are bedding planes dipping 0°- 10°	D			
	1.5	SANDSTONE - extremely low then very low strength, light grey and orange brown, fine to medium grained sandstone						1.53-1.82m: B0° (x5) cly vn	S			4,5,20/120mm refusal
50												PL(A) = 0.2
2		SANDSTONE - low then low to medium strength, moderately and slightly weathered, slightly fractured, light grey and light grey-brown to red-brown, medium to coarse grained sandstone						2.04m: B15°, cln				PL(A) = 0.3
								2.42m: B0°, cly, 8mm				
49								2.63m: B0°, cly, 10mm 2.75m: J80°, pl, ro, cln	C	98	84	
3								3.04-3.76m: B10° (x6) cly vn				
48												PL(A) = 0.3
4	4.0							3.93m: CORE LOSS: 70mm 4m: J85°, pl, ro, cly, 2mm, rootlets				
	4.23	SANDSTONE - medium to high strength, fresh, fractured, light grey, medium to coarse grained sandstone						4.05-4.18m: B10° (x3), cln 4.21m: B0°, cly, 10mm 4.31m: J80°, pl, ro, cln 4.59m: J85°, pl, ro, cly vn, fe 4.67m: B0°, cly, 7mm 4.7m: J85°, pl, ro, cly, 2mm, fe 4.74-4.93m: B0° (x4), cln	C	100	0	PL(A) = 1
47												
5	5.0	Bore discontinued at 5.0m - target depth reached										
46												
6												
45												
7												
44												
8												
43												
9												
42												

RIG: DT250 **DRILLER:** SY **LOGGED:** JH/SI **CASING:** HW to 1.5m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.5m; NMLC-Coring to 5.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

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

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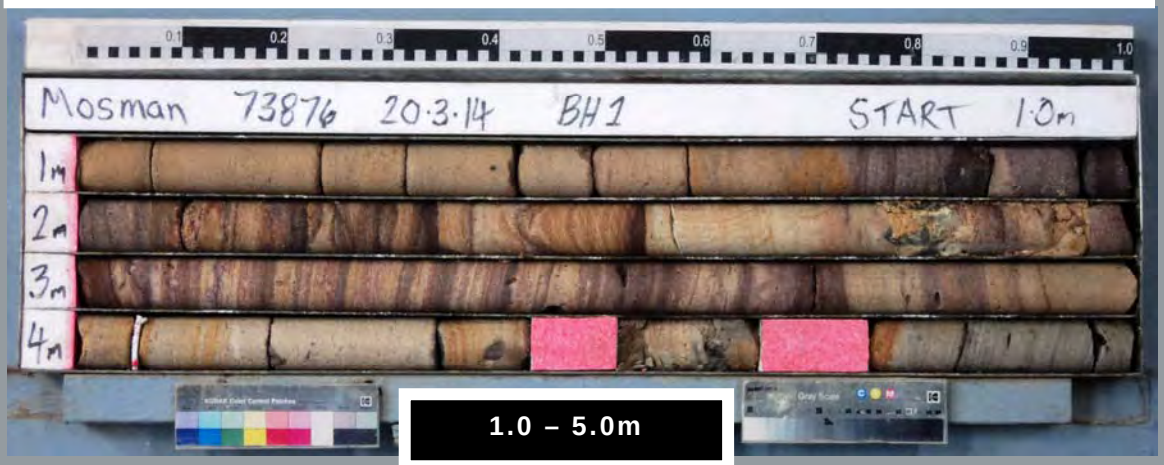
DOUGLAS PARTNERS PTY LTD

PROPOSED WILDLIFE RETREAT, TARONGA ZOO - MOSMAN

BORE 1 PROJECT 73876 MAR 2014

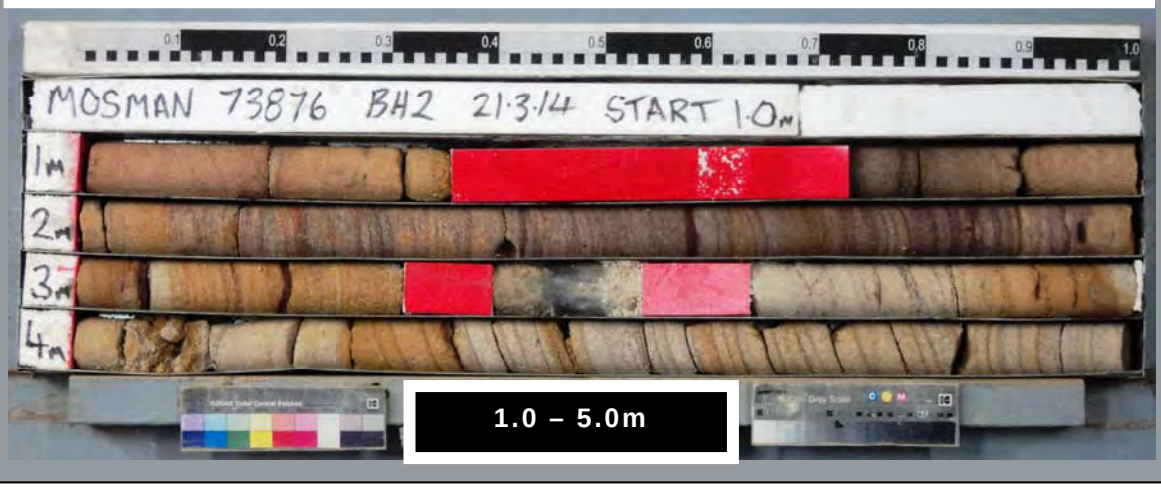


1.0 – 5.0m

DOUGLAS PARTNERS PTY LTD

PROPOSED WILDLIFE RETREAT, TARONGA ZOO - MOSMAN

BORE 2 PROJECT 73876 MAR 2014



1.0 – 5.0m

DOUGLAS PARTNERS PTY LTD

PROPOSED WILDLIFE RETREAT, TARONGA ZOO - MOSMAN

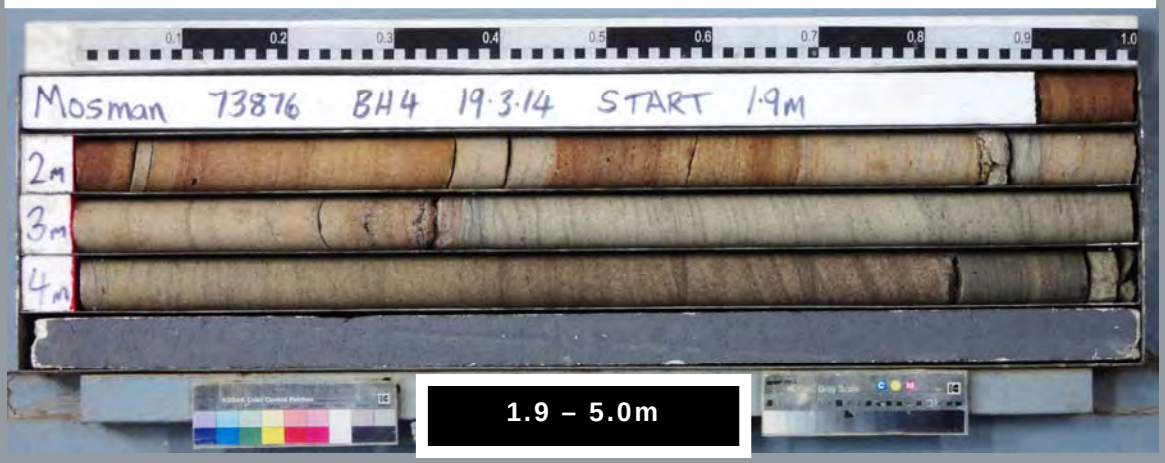
BORE 3 PROJECT 73876 MAR 2014

0.65 – 5.0m

DOUGLAS PARTNERS PTY LTD

PROPOSED WILDLIFE RETREAT, TARONGA ZOO - MOSMAN

BORE 4 PROJECT 73876 MAR 2014

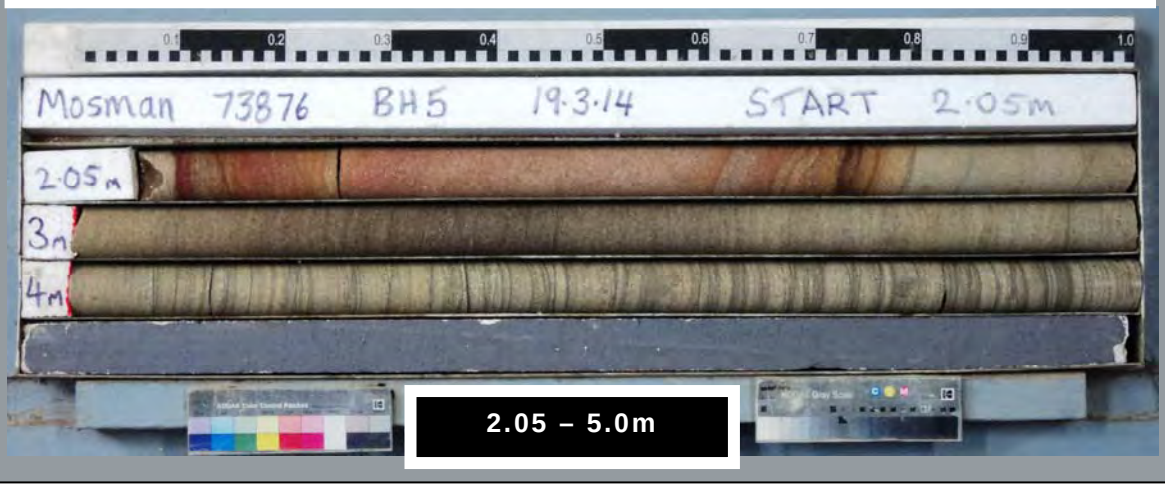


1.9 – 5.0m

DOUGLAS PARTNERS PTY LTD

PROPOSED WILDLIFE RETREAT, TARONGA ZOO - MOSMAN

BORE 5 PROJECT 73876 MAR 2014

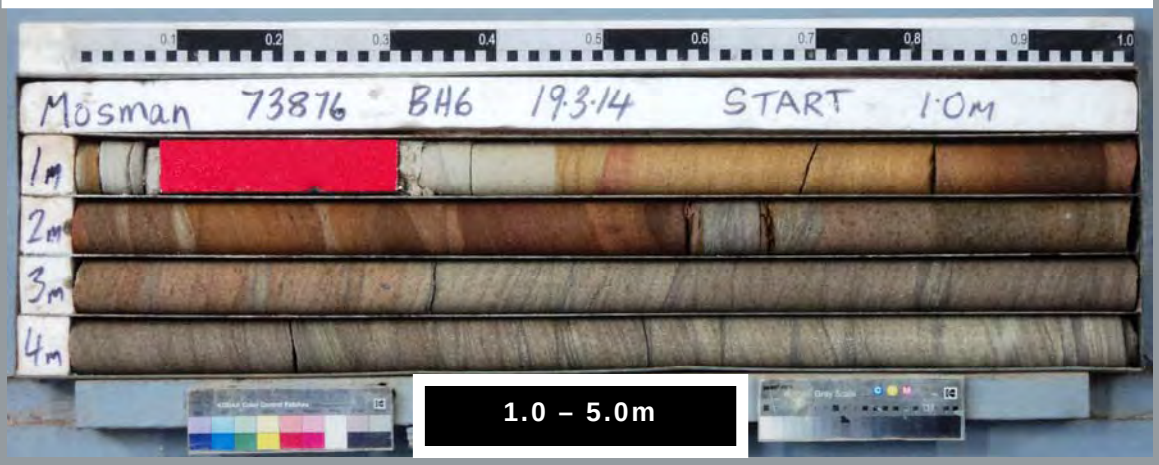


2.05 – 5.0m

DOUGLAS PARTNERS PTY LTD

PROPOSED WILDLIFE RETREAT, TARONGA ZOO - MOSMAN

BORE 6 PROJECT 73876 MAR 2014

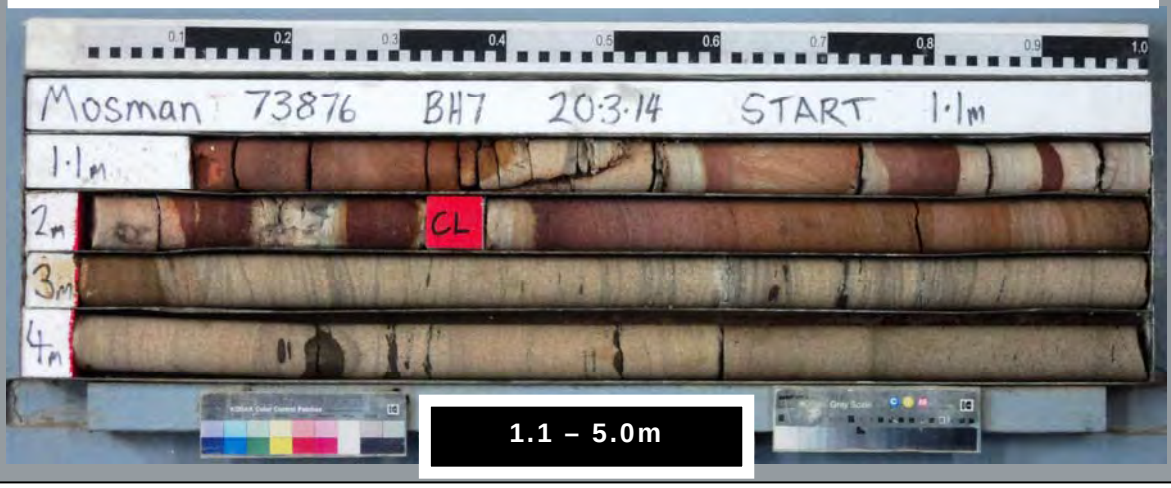


1.0 – 5.0m

DOUGLAS PARTNERS PTY LTD

PROPOSED WILDLIFE RETREAT, TARONGA ZOO - MOSMAN

BORE 7 PROJECT 73876 MAR 2014

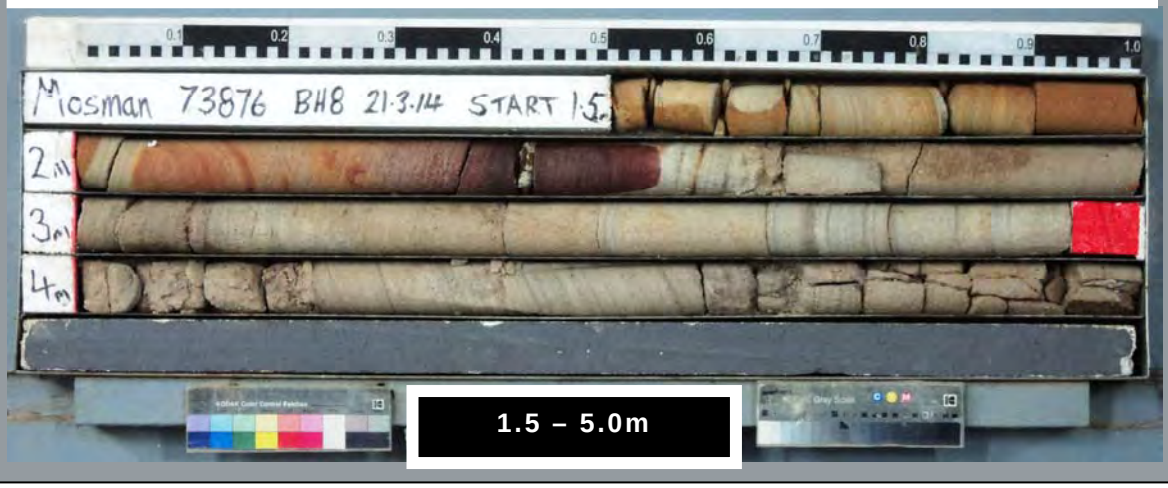


1.1 – 5.0m

DOUGLAS PARTNERS PTY LTD

PROPOSED WILDLIFE RETREAT, TARONGA ZOO - MOSMAN

BORE 8 PROJECT 73876 MAR 2014



1.5 – 5.0m

Appendix D

Results of Test Pits

TEST PIT LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 62.0 AHD
EASTING:
NORTHING:

PIT No: 101
PROJECT No: 73876.01
DATE: 16/2/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
62		FILLING - brown, clayey, silty, fine to medium grained sand filling with some rootlets and roots, moist		D/E	0.0 0.1				
				D/E	0.4 0.5				
	0.6	FILLING - light brown and grey, slightly clayey, fine to medium grained sand filling with sandstone gravel/cobbles, moist							
	0.7	FILLING - grey, silty, fine to medium grained sand filling with some charcoal, moist to wet		D/E	0.7				
	0.8	SANDSTONE - medium strength, orange and grey, fine to medium grained sandstone			0.8				
	0.85	Pit discontinued at 0.85m - refusal							
61	1								1

RIG: 5t excavator
LOGGED: KM
SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

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TEST PIT LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 54.0 AHD
EASTING:
NORTHING:

PIT No: 102
PROJECT No: 73876.01
DATE: 16/2/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
54		FILLING - brown, slightly sandy, clayey silt filling (topsoil) with some roots and rootlets, moist		D/E	0.0 0.1				
	0.2	FILLING - brown, slightly clayey, fine to medium grained sand filling with a trace of sandstone cobbles and roots, moist		D/E	0.3 0.4				
	0.8	SANDSTONE - medium strength, orange-brown and grey, fine to medium grained sandstone							
	0.85	Pit discontinued at 0.85m - refusal							
53	1								1

RIG: 5t excavator
LOGGED: KM
SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 51.3 AHD
EASTING:
NORTHING:

PIT No: 103
PROJECT No: 73876.01
DATE: 16/2/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
51	0.3	FILLING - brown, silty, fine to medium grained sand filling with roots and rootlets, moist		D/E	0.0 0.1				
		FILLING - orange-brown and brown, clayey, fine to medium grained sand filling (generally ripped sandstone) with a trace of sandstone cobbles		D/E	0.3 0.4				
		0.4-0.5m: grey-brown, clayey sand band with charcoal							
		0.6m: trace of steel and brick (up to 150mm fragments)		D/E	0.6				
		0.7m: concrete boulder			0.7				
		0.8m: PVC pipe 200mm							
	1 1.0	Pit discontinued at 1.0m - due to service							1
50									

RIG: Hand tools to 0.8m; 5t excavator

LOGGED: KM

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Australia Habitat and Taronga Wildlife Retreat
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 51.3 AHD
EASTING:
NORTHING:

PIT No: 103A
PROJECT No: 73876.01
DATE: 16/2/2016
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
51	0.0	FILLING - brown, silty, fine to medium grained sand filling with roots and rootlets and a trace of concrete cobbles, moist		D/E	0.0				
	0.1				0.1				
	0.3	FILLING - orange-brown, clayey, fine to medium grained sand filling with some sandstone gravel/cobbles (ripped sandstone), moist							
	0.5	FILLING - grey-brown, clayey, fine to medium grained sand filling with a trace of medium to coarse sandstone gravel, moist		D/E	0.5				
	0.6	FILLING - light brown, slightly silty, fine to medium sand filling with a trace of medium to coarse ironstone gravel, moist		D/E	0.6				
	0.7				0.7				
	0.8	SANDSTONE - medium strength, pink-brown, fine to medium grained sandstone							
	0.85	Pit discontinued at 0.85m - refusal							
50	1								1

5 10 15 20

RIG: 5t excavator

LOGGED: KM

SURVEY DATUM: MGA94

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

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

SAMPLING & IN SITU TESTING LEGEND

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

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Appendix E

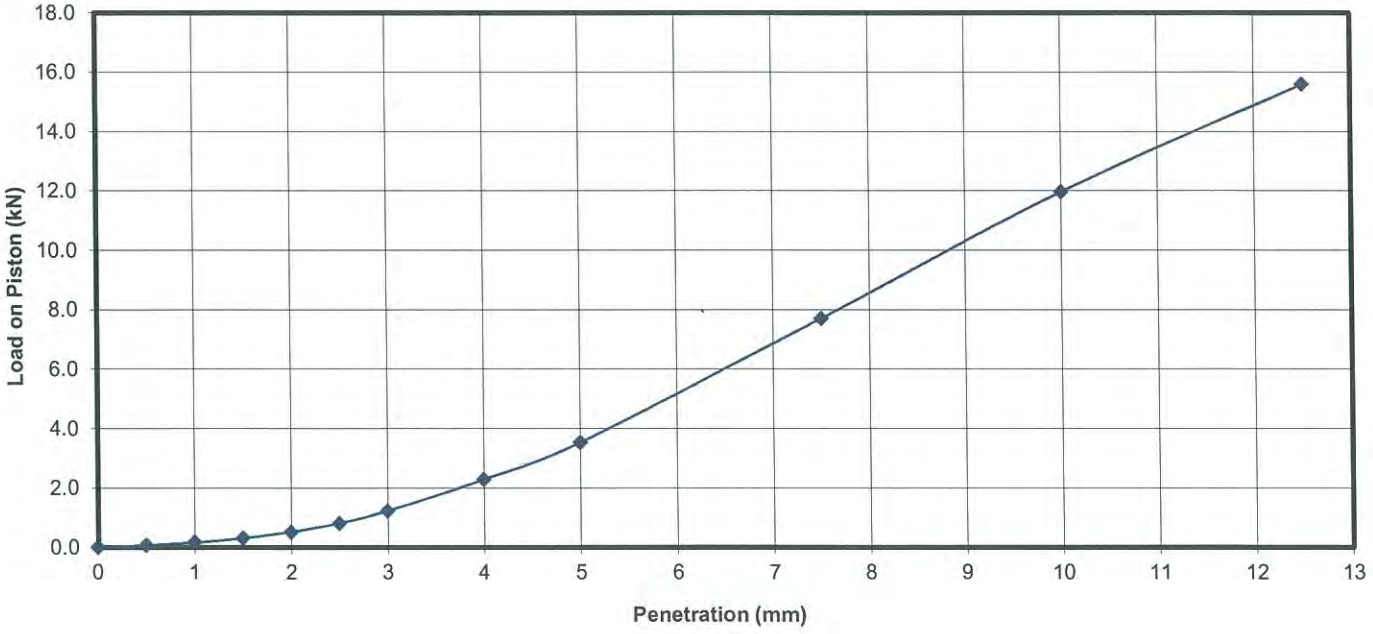
Laboratory Test Results

Douglas Partners
Geotechnics I Environment I Groundwater

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
96 Hermitage Road
West Ryde
NSW 2114Phone (02) 9809 0666
Fax (02) 9809 4095

Results of California Bearing Ratio Test

Client :	Taronga Conservation Society Australia	**Project No. :**	73876.00
		Report No. :	1
Project :	MOSMAN Taronga Eco Lodge	**Report Date :**	10/04/2014
		Date Sampled :	19/03/2014
Location :	Bradley Head Rd, Mosman	**Date of Test:**	8/04/2014
Test Location :	BH4		
Depth / Layer :	-	**Page:**	1 of 1



Description: Black sand and crushed gravel

Test Method(s): AS1289 6.1.1, AS1289 5.1.1, AS1289 2.1.1

Sampling Method(s): Sampled by Engineering Department

Percentage > 19mm: 0% Excluded

LEVEL OF COMPACTION: 100% of STD MDD
MOISTURE RATIO: 99% of STD OMC
SURCHARGE: 4.5 kg
SOAKING PERIOD: 4 days
SWELL: -0.2%

CONDITION		MOISTURE CONTENT %	DRY DENSITY t/m^3
At compaction		10.5	1.99
After soaking		11.5	1.99
After test	Top 30mm of sample	11.0	-
	Remainder of sample	10.9	-
Field values		9.6	-
Standard Compaction		10.7	1.98

RESULTS		
TYPE	**PENETRATION**	**CBR (%)**
TOP	**5.0 mm**	**45**

NATA Accredited Laboratory No 828
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025

Brett Hughes
Laboratory Manager

Douglas Partners
Geotechnics I Environment I Groundwater

Douglas Partners Pty Ltd
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96 Hermitage Road
West Ryde
NSW 2114Phone (02) 9809 0666
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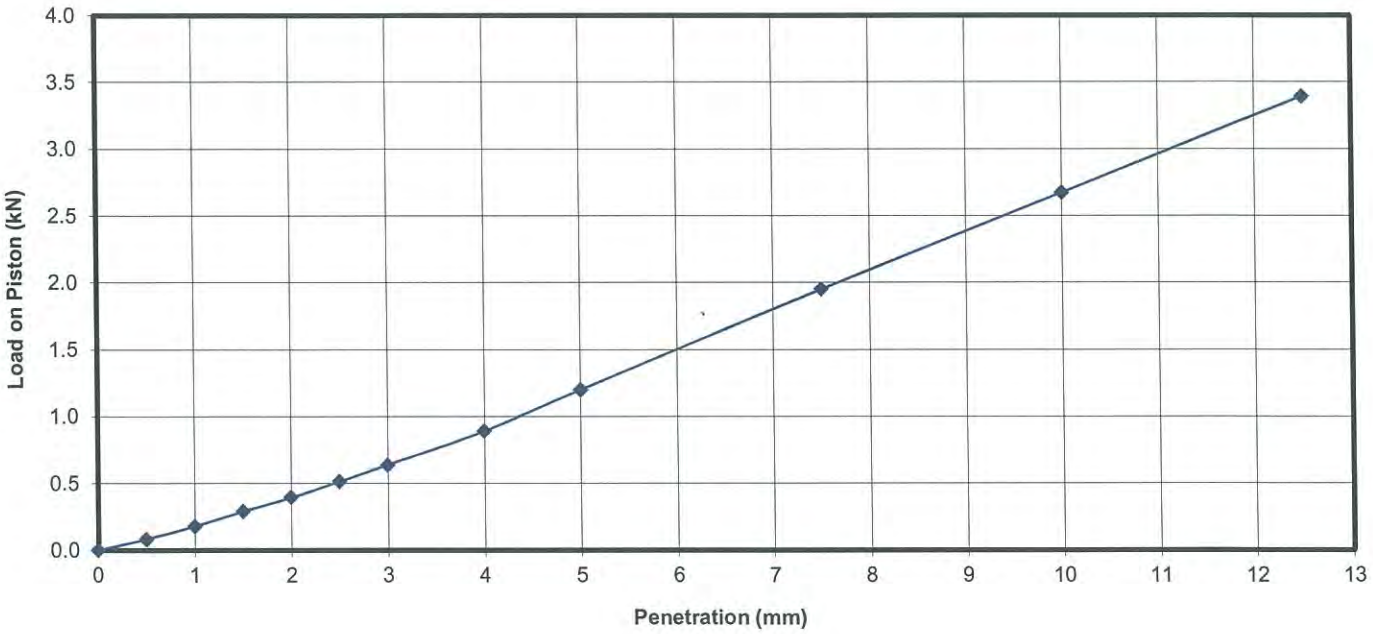
Results of California Bearing Ratio Test

Client :	Taronga Conservation Society Australia	**Project No. :**	73876.00
		Report No. :	2
Project :	MOSMAN Taronga Eco Lodge	**Report Date :**	10/04/2014
		Date Sampled :	19/03/2014
Location :	Bradley Head Rd, Mosman	**Date of Test:**	8/04/2014
Test Location :	BH7		
Depth / Layer :	-	**Page:**	1 of 1



Description: Yellow brown clay and sand

Test Method(s): AS1289 6.1.1, AS1289 5.1.1, AS1289 2.1.1

Sampling Method(s): Sampled by Engineering Department

Percentage > 19mm: 0% Excludec

LEVEL OF COMPACTION: 100% of STD MDD
MOISTURE RATIO: 102% of STD OMC
SURCHARGE: 4.5 kg
SOAKING PERIOD: 4 days
SWELL: 0.4%

CONDITION		MOISTURE CONTENT %	DRY DENSITY t/m^3
At compaction		12.1	1.93
After soaking		13.8	1.93
After test	Top 30mm of sample	13.7	-
	Remainder of sample	13.2	-
Field values		10.2	-
Standard Compaction		11.9	1.93

RESULTS		
TYPE	**PENETRATION**	**CBR (%)**
TOP	**5.0 mm**	**8**

NATA Accredited Laboratory No 828
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Accredited for compliance with ISO/IEC 17025

Brett Hughes
Laboratory Manager

Envirolab Services Pty Ltd
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CERTIFICATE OF ANALYSIS 106991

Client:
Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Peter Oitmaa

Sample log in details:

Your Reference:	**73876, Mosman**		
No. of samples:	8 Soils		
Date samples received / completed instructions received	24/03/2014	/	24/03/2014

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	31/03/14	/	27/03/14
Date of Preliminary Report:	Not Issued		

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Results Approved By:

Jacinta Hurst
Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	106991-1	106991-2	106991-3	106991-4	106991-5
Your Reference	----------	BH1	BH2	BH3A	BH4	BH5
Depth	----------	0.5	0.5	0.5	0.5	0.5
Date Sampled		20/03/2014	21/03/2014	20/03/2014	19/03/2014	19/03/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014	26/03/2014	26/03/2014
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	95	87	87	87	88

vTRH(C6-C10)/BTEXN in Soil				
Our Reference:	UNITS	106991-6	106991-7	106991-8
Your Reference	----------	BH6	BH7	BH8
Depth	----------	0.7	0.5	0.5
Date Sampled		19/03/2014	20/03/2014	21/03/2014
Type of sample		Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	90	91	94

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	106991-1	106991-2	106991-3	106991-4	106991-5
Your Reference	----------	BH1	BH2	BH3A	BH4	BH5
Depth	----------	0.5	0.5	0.5	0.5	0.5
Date Sampled		20/03/2014	21/03/2014	20/03/2014	19/03/2014	19/03/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	110	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	200	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	120	<100	250	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	150	<100
Surrogate o-Terphenyl	%	91	92	85	86	89

svTRH (C10-C40) in Soil				
Our Reference:	UNITS	106991-6	106991-7	106991-8
Your Reference	----------	BH6	BH7	BH8
Depth	----------	0.7	0.5	0.5
Date Sampled		19/03/2014	20/03/2014	21/03/2014
Type of sample		Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	25/03/2014	25/03/2014	25/03/2014
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100
Surrogate o-Terphenyl	%	90	89	91

PAHs in Soil						
Our Reference:	UNITS	106991-1	106991-2	106991-3	106991-4	106991-5
Your Reference	----------	BH1	BH2	BH3A	BH4	BH5
Depth	----------	0.5	0.5	0.5	0.5	0.5
Date Sampled		20/03/2014	21/03/2014	20/03/2014	19/03/2014	19/03/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014	26/03/2014	26/03/2014
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	0.1	<0.1	0.2	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	0.3	<0.1
Fluorene	mg/kg	<0.1	0.3	<0.1	0.2	<0.1
Phenanthrene	mg/kg	<0.1	1.9	<0.1	2.4	0.3
Anthracene	mg/kg	<0.1	0.5	<0.1	0.7	0.1
Fluoranthene	mg/kg	<0.1	3.2	0.1	4.6	1.1
Pyrene	mg/kg	0.1	3.4	0.2	5.0	1.1
Benzo(a)anthracene	mg/kg	<0.1	1.3	<0.1	2.4	0.6
Chrysene	mg/kg	<0.1	1.3	0.1	2.3	0.6
Benzo(b+k)fluoranthene	mg/kg	<0.2	2.3	0.2	4.5	1.4
Benzo(a)pyrene	mg/kg	0.09	1.6	0.16	3.1	0.90
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	1.0	0.1	1.8	0.5
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.1	<0.1	0.2	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	1.0	0.1	1.8	0.5
Benzo(a)pyrene TEQ NEPM B1	mg/kg	<0.5	2.0	<0.5	4.0	1.0
Total +ve PAH's	mg/kg	0.20	18	1.0	30	7.3
Surrogate p-Terphenyl-d14	%	94	95	89	88	96

PAHs in Soil				
Our Reference:	UNITS	106991-6	106991-7	106991-8
Your Reference	----------	BH6	BH7	BH8
Depth	----------	0.7	0.5	0.5
Date Sampled		19/03/2014	20/03/2014	21/03/2014
Type of sample		Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.2	<0.1	0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.7	0.4	0.2
Pyrene	mg/kg	0.7	0.5	0.2
Benzo(a)anthracene	mg/kg	0.4	0.3	<0.1
Chrysene	mg/kg	0.4	0.3	<0.1
Benzo(b+k)fluoranthene	mg/kg	0.7	0.8	<0.2
Benzo(a)pyrene	mg/kg	0.48	0.51	0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	0.3	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.3	0.3	<0.1
Benzo(a)pyrene TEQ NEPM B1	mg/kg	1.0	1.0	<0.5
Total +ve PAH's	mg/kg	4.2	3.5	0.56
Surrogate p-Terphenyl-d14	%	96	95	98

Organochlorine Pesticides in soil						
Our Reference:	UNITS	106991-1	106991-2	106991-3	106991-4	106991-5
Your Reference	----------	BH1	BH2	BH3A	BH4	BH5
Depth	----------	0.5	0.5	0.5	0.5	0.5
Date Sampled		20/03/2014	21/03/2014	20/03/2014	19/03/2014	19/03/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014	26/03/2014	26/03/2014
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	2.4	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	93	96	86	90	92

Organochlorine Pesticides in soil				
Our Reference:	UNITS	106991-6	106991-7	106991-8
Your Reference	----------	BH6	BH7	BH8
Depth	----------	0.7	0.5	0.5
Date Sampled		19/03/2014	20/03/2014	21/03/2014
Type of sample		Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014
HCB	mg/kg	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	95	92	93

PCBs in Soil						
Our Reference:	UNITS	106991-1	106991-2	106991-3	106991-4	106991-5
Your Reference	----------	BH1	BH2	BH3A	BH4	BH5
Depth	----------	0.5	0.5	0.5	0.5	0.5
Date Sampled		20/03/2014	21/03/2014	20/03/2014	19/03/2014	19/03/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014	26/03/2014	26/03/2014
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	93	96	86	90	92

PCBs in Soil				
Our Reference:	UNITS	106991-6	106991-7	106991-8
Your Reference	----------	BH6	BH7	BH8
Depth	----------	0.7	0.5	0.5
Date Sampled		19/03/2014	20/03/2014	21/03/2014
Type of sample		Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1
Arochlor 1221	mg/kg	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1
Surrogate TCLMX	%	95	92	93

Total Phenolics in Soil						
Our Reference:	UNITS	106991-1	106991-2	106991-3	106991-4	106991-5
Your Reference	----------	BH1	BH2	BH3A	BH4	BH5
Depth	----------	0.5	0.5	0.5	0.5	0.5
Date Sampled		20/03/2014	21/03/2014	20/03/2014	19/03/2014	19/03/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Total Phenolics in Soil				
Our Reference:	UNITS	106991-6	106991-7	106991-8
Your Reference	----------	BH6	BH7	BH8
Depth	----------	0.7	0.5	0.5
Date Sampled		19/03/2014	20/03/2014	21/03/2014
Type of sample		Soil	Soil	Soil
Date extracted	-	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	25/03/2014	25/03/2014	25/03/2014
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5

Acid Extractable metals in soil						
Our Reference:	UNITS	106991-1	106991-2	106991-3	106991-4	106991-5
Your Reference	----------	BH1	BH2	BH3A	BH4	BH5
Depth	----------	0.5	0.5	0.5	0.5	0.5
Date Sampled		20/03/2014	21/03/2014	20/03/2014	19/03/2014	19/03/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	19	8	8	8	8
Copper	mg/kg	9	9	18	11	9
Lead	mg/kg	4	11	18	10	19
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	18	5	6	8	6
Zinc	mg/kg	12	16	180	14	17

Acid Extractable metals in soil				
Our Reference:	UNITS	106991-6	106991-7	106991-8
Your Reference	----------	BH6	BH7	BH8
Depth	----------	0.7	0.5	0.5
Date Sampled		19/03/2014	20/03/2014	21/03/2014
Type of sample		Soil	Soil	Soil
Date digested	-	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	25/03/2014	25/03/2014	25/03/2014
Arsenic	mg/kg	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	10	9	5
Copper	mg/kg	6	4	6
Lead	mg/kg	8	9	20
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	7	4	2
Zinc	mg/kg	10	6	12

Moisture						
Our Reference:	UNITS	106991-1	106991-2	106991-3	106991-4	106991-5
Your Reference	----------	BH1	BH2	BH3A	BH4	BH5
Depth	----------	0.5	0.5	0.5	0.5	0.5
Date Sampled		20/03/2014	21/03/2014	20/03/2014	19/03/2014	19/03/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/03/2014	25/03/2014	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014	26/03/2014	26/03/2014
Moisture	%	8.4	9.4	23	5.9	9.0

Moisture				
Our Reference:	UNITS	106991-6	106991-7	106991-8
Your Reference	----------	BH6	BH7	BH8
Depth	----------	0.7	0.5	0.5
Date Sampled		19/03/2014	20/03/2014	21/03/2014
Type of sample		Soil	Soil	Soil
Date prepared	-	25/03/2014	25/03/2014	25/03/2014
Date analysed	-	26/03/2014	26/03/2014	26/03/2014
Moisture	%	6.6	8.4	7.5

Asbestos ID - soils						
Our Reference:	UNITS	106991-1	106991-2	106991-3	106991-4	106991-5
Your Reference	----------	BH1	BH2	BH3A	BH4	BH5
Depth	----------	0.5	0.5	0.5	0.5	0.5
Date Sampled		20/03/2014	21/03/2014	20/03/2014	19/03/2014	19/03/2014
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	27/03/2014	27/03/2014	27/03/2014	27/03/2014	27/03/2014
Sample mass tested	g	Approx 40g	Approx 40g	Approx 40g	Approx 40g	Approx 40g
Sample Description	-	Brown sandy soil	Brown sandy soil	Brown fine-grained soil	Beige sandy soil	Beige sandy soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg
Trace Analysis	-	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected

Asbestos ID - soils				
Our Reference:	UNITS	106991-6	106991-7	106991-8
Your Reference	----------	BH6	BH7	BH8
Depth	----------	0.7	0.5	0.5
Date Sampled		19/03/2014	20/03/2014	21/03/2014
Type of sample		Soil	Soil	Soil
Date analysed	-	27/03/2014	27/03/2014	27/03/2014
Sample mass tested	g	Approx 40g	Approx 40g	Approx 40g
Sample Description	-	Mustard sandy soil	Mustard sandy soil	Brown sandy soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg
Trace Analysis	-	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Inorg-030	Total Phenolics - determined colorimetrically following distillation, based upon APHA 22nd ED 5530 D.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/03/2014	106991-1	25/03/2014 || 25/03/2014	LCS-5	25/03/2014
Date analysed	-			26/03/2014	106991-1	26/03/2014 || 26/03/2014	LCS-5	26/03/2014
TRHC$_6$ - C$_9$	mg/kg	25	Org-016	<25	106991-1	<25 || <25	LCS-5	100%
TRHC$_6$ - C$_{10}$	mg/kg	25	Org-016	<25	106991-1	<25 || <25	LCS-5	100%
Benzene	mg/kg	0.2	Org-016	<0.2	106991-1	<0.2 || <0.2	LCS-5	91%
Toluene	mg/kg	0.5	Org-016	<0.5	106991-1	<0.5 || <0.5	LCS-5	93%
Ethylbenzene	mg/kg	1	Org-016	<1	106991-1	<1 || <1	LCS-5	101%
m+p-xylene	mg/kg	2	Org-016	<2	106991-1	<2 || <2	LCS-5	107%
o-Xylene	mg/kg	1	Org-016	<1	106991-1	<1 || <1	LCS-5	105%
naphthalene	mg/kg	1	Org-014	<1	106991-1	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	97	106991-1	95 || 92 || RPD: 3	LCS-5	97%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/03/2014	106991-1	25/03/2014 || 25/03/2014	LCS-5	25/03/2014
Date analysed	-			25/03/2014	106991-1	25/03/2014 || 25/03/2014	LCS-5	25/03/2014
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	106991-1	<50 || <50	LCS-5	87%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	106991-1	<100 || <100	LCS-5	95%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	106991-1	<100 || <100	LCS-5	118%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	106991-1	<50 || <50	LCS-5	87%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	106991-1	<100 || <100	LCS-5	95%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	106991-1	<100 || <100	LCS-5	118%
Surrogate o-Terphenyl	%		Org-003	88	106991-1	91 || 90 || RPD: 1	LCS-5	82%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base || Duplicate || %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/03/2014	106991-1	25/03/2014 || 25/03/2014	LCS-5	25/03/2014
Date analysed	-			26/03/2014	106991-1	26/03/2014 || 26/03/2014	LCS-5	26/03/2014
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	LCS-5	98%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	LCS-5	103%
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	LCS-5	99%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	LCS-5	101%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	0.1 || <0.1	LCS-5	95%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	LCS-5	94%
Benzo(b+k)fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	106991-1	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	106991-1	0.09 || <0.05	LCS-5	108%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012 subset	93	106991-1	94 || 92 || RPD: 2	LCS-5	97%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/03/2014	106991-1	25/03/2014 || 25/03/2014	LCS-5	25/03/2014
Date analysed	-			26/03/2014	106991-1	26/03/2014 || 26/03/2014	LCS-5	26/03/2014
HCB	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	LCS-5	111%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	LCS-5	74%
Heptachlor	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	LCS-5	99%
delta-BHC	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	LCS-5	103%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	LCS-5	122%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	LCS-5	94%
Dieldrin	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	LCS-5	90%
Endrin	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	LCS-5	93%
pp-DDD	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	LCS-5	107%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	LCS-5	100%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	92	106991-1	93 || 92 || RPD: 1	LCS-5	93%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/03/2014	106991-1	25/03/2014 || 25/03/2014	LCS-5	25/03/2014
Date analysed	-			26/03/2014	106991-1	26/03/2014 || 26/03/2014	LCS-5	26/03/2014
Arochlor 1016	mg/kg	0.1	Org-006	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1221	mg/kg	0.1	Org-006	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	Org-006	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	Org-006	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	Org-006	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	Org-006	<0.1	106991-1	<0.1 || <0.1	LCS-5	116%
Arochlor 1260	mg/kg	0.1	Org-006	<0.1	106991-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	92	106991-1	93 || 92 || RPD: 1	LCS-5	80%
QUALITY CONTROL Total Phenolics in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/03/2014	106991-1	25/03/2014 || 25/03/2014	LCS-1	25/03/2014
Date analysed	-			25/03/2014	106991-1	25/03/2014 || 25/03/2014	LCS-1	25/03/2014
Total Phenolics (as Phenol)	mg/kg	5	Inorg-030	<5	106991-1	<5 || <5	LCS-1	87%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date digested	-			25/03/2014	106991-1	25/03/2014 || 25/03/2014	LCS-7	25/03/2014
Date analysed	-			25/03/2014	106991-1	25/03/2014 || 25/03/2014	LCS-7	25/03/2014
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	106991-1	<4 || <4	LCS-7	100%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	106991-1	<0.4 || <0.4	LCS-7	107%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	106991-1	19 || 23 || RPD: 19	LCS-7	103%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	106991-1	9 || 9 || RPD: 0	LCS-7	103%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	106991-1	4 || 4 || RPD: 0	LCS-7	101%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	106991-1	<0.1 || <0.1	LCS-7	94%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	106991-1	18 || 22 || RPD: 20	LCS-7	102%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	106991-1	12 || 14 || RPD: 15	LCS-7	104%

QUALITY CONTROL Moisture	UNITS	PQL	METHOD	Blank
Date prepared	-			[NT]
Date analysed	-			[NT]
Moisture	%	0.1	Inorg-008	[NT]

QUALITY CONTROL Asbestos ID - soils	UNITS	PQL	METHOD	Blank
Date analysed	-			[NT]

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	106991-2	25/03/2014
Date analysed	-	[NT]	[NT]	106991-2	26/03/2014
TRHC$_6$ - C$_9$	mg/kg	[NT]	[NT]	106991-2	89%
TRHC$_6$ - C$_{10}$	mg/kg	[NT]	[NT]	106991-2	89%
Benzene	mg/kg	[NT]	[NT]	106991-2	85%
Toluene	mg/kg	[NT]	[NT]	106991-2	85%
Ethylbenzene	mg/kg	[NT]	[NT]	106991-2	89%
m+p-xylene	mg/kg	[NT]	[NT]	106991-2	94%
o-Xylene	mg/kg	[NT]	[NT]	106991-2	92%
naphthalene	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%	[NT]	[NT]	106991-2	83%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	106991-2	25/03/2014
Date analysed	-	[NT]	[NT]	106991-2	25/03/2014
TRHC$_{10}$ - C$_{14}$	mg/kg	[NT]	[NT]	106991-2	88%
TRHC$_{15}$ - C$_{28}$	mg/kg	[NT]	[NT]	106991-2	116%
TRHC$_{29}$ - C$_{36}$	mg/kg	[NT]	[NT]	106991-2	94%
TRH>C$_{10}$-C$_{16}$	mg/kg	[NT]	[NT]	106991-2	88%
TRH>C$_{16}$-C$_{34}$	mg/kg	[NT]	[NT]	106991-2	116%
TRH>C$_{34}$-C$_{40}$	mg/kg	[NT]	[NT]	106991-2	94%
Surrogate o-Terphenyl	%	[NT]	[NT]	106991-2	84%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	106991-2	25/03/2014
Date analysed	-	[NT]	[NT]	106991-2	26/03/2014
Naphthalene	mg/kg	[NT]	[NT]	106991-2	99%
Acenaphthylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	[NT]	[NT]	106991-2	108%
Phenanthrene	mg/kg	[NT]	[NT]	106991-2	90%
Anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	[NT]	[NT]	106991-2	91%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Pyrene	mg/kg	[NT]	[NT]	106991-2	94%
Benzo(a)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	[NT]	[NT]	106991-2	120%
Benzo(b+k)fluoranthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	[NT]	[NT]	106991-2	108%
Indeno(1,2,3-c,d)pyrene	mg/kg	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	[NT]	[NT]	106991-2	94%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	106991-2	25/03/2014
Date analysed	-	[NT]	[NT]	106991-2	26/03/2014
HCB	mg/kg	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	[NT]	[NT]	106991-2	97%
gamma-BHC	mg/kg	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	[NT]	[NT]	106991-2	97%
Heptachlor	mg/kg	[NT]	[NT]	106991-2	101%
delta-BHC	mg/kg	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	[NT]	[NT]	106991-2	#
Heptachlor Epoxide	mg/kg	[NT]	[NT]	106991-2	102%
gamma-Chlordane	mg/kg	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	[NT]	[NT]	106991-2	94%
Dieldrin	mg/kg	[NT]	[NT]	106991-2	104%
Endrin	mg/kg	[NT]	[NT]	106991-2	101%
pp-DDD	mg/kg	[NT]	[NT]	106991-2	111%
Endosulfan II	mg/kg	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	[NT]	[NT]	106991-2	102%
Methoxychlor	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate TCMX	%	[NT]	[NT]	106991-2	85%

QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	106991-2	25/03/2014
Date analysed	-	[NT]	[NT]	106991-2	26/03/2014
Arochlor 1016	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1221	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1232	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1242	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1248	mg/kg	[NT]	[NT]	[NR]	[NR]
Arochlor 1254	mg/kg	[NT]	[NT]	106991-2	111%
Arochlor 1260	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%	[NT]	[NT]	106991-2	85%
QUALITY CONTROL Total Phenolics in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	106991-2	25/03/2014
Date analysed	-	[NT]	[NT]	106991-2	25/03/2014
Total Phenolics (as Phenol)	mg/kg	[NT]	[NT]	106991-2	94%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date digested	-	[NT]	[NT]	106991-2	25/03/2014
Date analysed	-	[NT]	[NT]	106991-2	25/03/2014
Arsenic	mg/kg	[NT]	[NT]	106991-2	94%
Cadmium	mg/kg	[NT]	[NT]	106991-2	96%
Chromium	mg/kg	[NT]	[NT]	106991-2	95%
Copper	mg/kg	[NT]	[NT]	106991-2	102%
Lead	mg/kg	[NT]	[NT]	106991-2	94%
Mercury	mg/kg	[NT]	[NT]	106991-2	90%
Nickel	mg/kg	[NT]	[NT]	106991-2	91%
Zinc	mg/kg	[NT]	[NT]	106991-2	113%

Report Comments:

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.

OC/PCB's in soil:# Percent recovery is not possible to report as the high concentration of analytes in the sample/s have caused interference.

Asbestos ID was analysed by Approved Identifier:	Matt Mansfield
Asbestos ID was authorised by Approved Signatory:	Matt Mansfield

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client:

Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde NSW 2114

ph: 02 9809 0666
Fax: 02 9809 4095

Attention: Peter Oitmaa

Sample log in details:

Your reference:	**73876, Mosman**
Envirolab Reference:	**106991**
Date received:	24/03/2014
Date results expected to be reported:	**31/03/14**

Samples received in appropriate condition for analysis:	YES
No. of samples provided	8 Soils
Turnaround time requested:	Standard
Temperature on receipt (°C)	7.6
Cooling Method:	Ice
Sampling Date Provided:	YES

Comments:

Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples.

Contact details:

Please direct any queries to Aileen Hie or Jacinta Hurst
ph: 02 9910 6200 fax: 02 9910 6201
email: ahie@envirolabservices.com.au or jhurst@envirolabservices.com.au

Douglas Partners
Geotechnics · Environment · Groundwater

CHAIN OF CUSTODY

Project Name: Mosman
Project No: 73876 Sampler: J.H.
Project Mgr: Peter Oitmaa Mob. Phone: 0412 574 518
Email: peter.oitmaa@douglaspartners.com.au
Date Required: Std Lab Quote No.

To: Envirolab Services
12 Ashley Street, Chatswood NSW 2067
Attn: Tania Notaras
Phone: 02 9910 6200 Fax: 02 9910 6201
Email: tnotaras@envirolabservices.com.au

Sample ID	Sample Depth	Lab ID	Sampling Date	Sample Type S - soil W – water	Container type	Analytes								Notes
						8 Heavy Metals	TRH BTEX	PAH	OCP	PCB	Phenol	Asbestos		
BH1	0.5	1	20/3	S	Jar									
BH2	0.5	2	21/3											
BH3A	0.5	3	20/3											
BH4	0.5	4	19/3											
BH5	0.5	5	19/3											
BH6	0.7	6	19/3											
BH7	0.5	7	20/3											
BH8	0.5	8	21/3											

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200
Job No: 106991
Date Received: 24/3/14
Time Received: 15:30
Received by:
Temp: Cool/Ambient
Cool Packs: Ice/Pack
Security: Intact/Broken/None

Lab Report No.
Send Results to: Douglas Partners Address: 96 Hermitage Road, West Ryde 2114
Phone: (02) 9809 0666
Fax: (02) 9809 4095

Relinquished by: P. Oitmaa Signed: Date & Time: 24/3 1400 Received By: Date & Time: 24/3 15:30
Relinquished by: Signed: Date & Time: Received By: Date & Time:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 106991-A

Client:
Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Peter Oitmaa

Sample log in details:

Your Reference:	**73876, Mosman**
No. of samples:	Additional testing 3 soils
Date samples received / completed instructions received	24/03/2014 / 09/04/14

Analysis Details:
Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	11/04/14 / 11/04/14
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

PAHs in TCLP (USEPA 1311)				
Our Reference:	UNITS	106991-A-2	106991-A-4	106991-A-5
Your Reference	----------	BH2	BH4	BH5
Depth	----------	0.5	0.5	0.5
Date Sampled		21/03/2014	19/03/2014	19/03/2014
Type of sample		Soil	Soil	Soil
pH of soil for fluid# determ.	pH units	9.6	9.8	9.7
pH of soil for fluid # determ. (acid)	pH units	1.5	1.5	1.6
Extraction fluid used	-	1	1	1
pH of final Leachate	pH units	5.1	5.2	5.1
Date extracted	-	10/04/2014	10/04/2014	10/04/2014
Date analysed	-	11/04/2014	11/04/2014	11/04/2014
Naphthalene in TCLP	mg/L	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	0.003	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(b+k)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001
Total +ve PAH's	mg/L	0.0040	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	111	128	121

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using AS 4439 and USEPA 1311 and in house method INORG-004.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Org-012 subset	Leachates are extracted with Dichloromethane and analysed by GC-MS.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.

QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			10/04/2014	[NT]	[NT]	LCS-1	10/04/2014
Date analysed	-			11/04/2014	[NT]	[NT]	LCS-1	11/04/2014
Naphthalene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-1	105%
Acenaphthylene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Acenaphthene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Fluorene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-1	118%
Phenanthrene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-1	110%
Anthracene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Fluoranthene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-1	111%
Pyrene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-1	116%
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Chrysene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-1	100%
Benzo(b+k)fluoranthene in TCLP	mg/L	0.002	Org-012 subset	<0.002	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	LCS-1	121%
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012 subset	<0.001	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	108	[NT]	[NT]	LCS-1	123%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NA: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Aileen Hie

From: Peter Oitmaa [Peter.Oitmaa@douglaspartners.com.au]
Sent: Wednesday, 9 April 2014 2:25 PM
To: Aileen Hie
Cc: Jacinta Hurst
Subject: TCLP request - ELS ref. 106991
Attachments: TCLP Order.pdf

106991 A
due 18/4
2 days

Hi Aileen,

Can you please undertake TCLP testing for PAHs on your sample no.s 2, 4 & 5 please?

Results by Fri night would be great. Order attached.

Thanks,

Peter Oitmaa | Senior Associate
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
96 Hermitage Road West Ryde NSW 2114 | PO Box 472 West Ryde NSW 1685
P: 02 9809 0666 | F: 02 9809 4095 | M: 0412 574 518 | E: Peter.Oitmaa@douglaspartners.com.au

12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 141720

Client:

Douglas Partners Pty Ltd
96 Hermitage Rd
West Ryde
NSW 2114

Attention: Kelly McPhee

Sample log in details:

Your Reference:	**73876.01, Mosman**		
No. of samples:	3 Soils		
Date samples received / completed instructions received	16/02/16	/	16/02/16

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	19/02/16	/	18/02/16
Date of Preliminary Report:	Not Issued		

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Jacinta Hurst
Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil				
Our Reference:	UNITS	141720-1	141720-2	141720-3
Your Reference	---------- -	TP1	TP2	TP3
Depth	----------	0.4-0.5	0.3-0.4	0.3-0.4
Date Sampled		16/02/2016	16/02/2016	16/02/2016
Type of sample		Soil	Soil	Soil
Date extracted	-	17/02/2016	17/02/2016	17/02/2016
Date analysed	-	18/02/2016	18/02/2016	18/02/2016
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	103	95	80

svTRH (C10-C40) in Soil				
Our Reference:	UNITS	141720-1	141720-2	141720-3
Your Reference	----------	TP1	TP2	TP3
Depth	- ----------	0.4-0.5	0.3-0.4	0.3-0.4
Date Sampled		16/02/2016	16/02/2016	16/02/2016
Type of sample		Soil	Soil	Soil
Date extracted	-	17/02/2016	17/02/2016	17/02/2016
Date analysed	-	17/02/2016	17/02/2016	17/02/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100
Surrogate o-Terphenyl	%	79	79	81

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	141720-1 TP1 0.4-0.5 16/02/2016 Soil	141720-2 TP2 0.3-0.4 16/02/2016 Soil	141720-3 TP3 0.3-0.4 16/02/2016 Soil
Date extracted	-	17/02/2016	17/02/2016	17/02/2016
Date analysed	-	17/02/2016	17/02/2016	17/02/2016
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	0.2
Pyrene	mg/kg	<0.1	<0.1	0.2
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.1
Chrysene	mg/kg	<0.1	<0.1	0.2
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	0.4
Benzo(a)pyrene	mg/kg	<0.05	0.05	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE	0.05	1.9
Surrogate p-Terphenyl-d14	%	88	81	86

Organochlorine Pesticides in soil				
Our Reference:	UNITS	141720-1	141720-2	141720-3
Your Reference	----------	TP1	TP2	TP3
Depth	- ----------	0.4-0.5	0.3-0.4	0.3-0.4
Date Sampled		16/02/2016	16/02/2016	16/02/2016
Type of sample		Soil	Soil	Soil
Date extracted	-	17/02/2016	17/02/2016	17/02/2016
Date analysed	-	17/02/2016	17/02/2016	17/02/2016
HCB	mg/kg	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	84	84	85

Organophosphorus Pesticides Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	141720-1 TP1 0.4-0.5 16/02/2016 Soil	141720-2 TP2 0.3-0.4 16/02/2016 Soil	141720-3 TP3 0.3-0.4 16/02/2016 Soil
Date extracted	-	17/02/2016	17/02/2016	17/02/2016
Date analysed	-	17/02/2016	17/02/2016	17/02/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	84	84	85

PCBs in Soil				
Our Reference:	UNITS	141720-1	141720-2	141720-3
Your Reference	----------	TP1	TP2	TP3
Depth	- ----------	0.4-0.5	0.3-0.4	0.3-0.4
Date Sampled		16/02/2016	16/02/2016	16/02/2016
Type of sample		Soil	Soil	Soil
Date extracted	-	17/02/2016	17/02/2016	17/02/2016
Date analysed	-	17/02/2016	17/02/2016	17/02/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1
Surrogate TCLMX	%	84	84	85

Acid Extractable metals in soil				
Our Reference:	UNITS	141720-1	141720-2	141720-3
Your Reference	----------	TP1	TP2	TP3
Depth	- ----------	0.4-0.5	0.3-0.4	0.3-0.4
Date Sampled		16/02/2016	16/02/2016	16/02/2016
Type of sample		Soil	Soil	Soil
Date prepared	-	17/02/2016	17/02/2016	17/02/2016
Date analysed	-	17/02/2016	17/02/2016	17/02/2016
Arsenic	mg/kg	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	10	4	8
Copper	mg/kg	7	5	6
Lead	mg/kg	9	16	25
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	7	<1	1
Zinc	mg/kg	19	21	31

Misc Soil - Inorg				
Our Reference:	UNITS	141720-1	141720-2	141720-3
Your Reference	----------	TP1	TP2	TP3
	-			
Depth	----------	0.4-0.5	0.3-0.4	0.3-0.4
Date Sampled		16/02/2016	16/02/2016	16/02/2016
Type of sample		Soil	Soil	Soil
Date prepared	-	17/02/2016	17/02/2016	17/02/2016
Date analysed	-	17/02/2016	17/02/2016	17/02/2016
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5

Moisture Our Reference: Your Reference	UNITS ----------	141720-1 TP1	141720-2 TP2	141720-3 TP3
Depth	- ----------	0.4-0.5	0.3-0.4	0.3-0.4
Date Sampled		16/02/2016	16/02/2016	16/02/2016
Type of sample		Soil	Soil	Soil
Date prepared	-	17/02/2016	17/02/2016	17/02/2016
Date analysed	-	18/02/2016	18/02/2016	18/02/2016
Moisture	%	11	9.0	8.1

Asbestos ID - soils				
Our Reference:	UNITS	141720-1	141720-2	141720-3
Your Reference	----------	TP1	TP2	TP3
	-			
Depth	----------	0.4-0.5	0.3-0.4	0.3-0.4
Date Sampled		16/02/2016	16/02/2016	16/02/2016
Type of sample		Soil	Soil	Soil
Date analysed	-	17/02/2016	17/02/2016	17/02/2016
Sample mass tested	g	Approx. 45g	Approx. 35g	Approx. 70g
Sample Description	-	Brown coarse grain soil & rocks	Brown coarse grain soil & rocks	Brown sandy soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			17/02/2016	[NT]	[NT]	LCS-2	17/02/2016
Date analysed	-			18/02/2016	[NT]	[NT]	LCS-2	18/02/2016
TRHC$_6$ - C$_9$	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-2	107%
TRHC$_6$ - C$_{10}$	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-2	107%
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	LCS-2	105%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-2	112%
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-2	106%
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	LCS-2	105%
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-2	104%
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	109	[NT]	[NT]	LCS-2	108%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			17/02/2016	[NT]	[NT]	LCS-2	17/02/2016
Date analysed	-			17/02/2016	[NT]	[NT]	LCS-2	17/02/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-2	92%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-2	100%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-2	95%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-2	92%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-2	100%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-2	95%
Surrogate o-Terphenyl	%		Org-003	83	[NT]	[NT]	LCS-2	91%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			17/02/2016	[NT]	[NT]	LCS-2	17/02/2016
Date analysed	-			17/02/2016	[NT]	[NT]	LCS-2	17/02/2016
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-2	91%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-2	89%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-2	89%
Anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-2	84%
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-2	86%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-2	96%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	[NT]	[NT]	LCS-2	101%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	90	[NT]	[NT]	LCS-2	104%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			17/02/2016	[NT]	[NT]	LCS-1	17/02/2016
Date analysed	-			17/02/2016	[NT]	[NT]	LCS-1	17/02/2016
HCB	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	83%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	80%
Heptachlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	97%
delta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	79%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	88%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	87%
Dieldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	90%
Endrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	91%
pp-DDD	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	87%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-1	92%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCMX	%		Org-005	86	[NT]	[NT]	LCS-1	102%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			17/02/2016	[NT]	[NT]	LCS-1	17/02/2016
Date analysed	-			17/02/2016	[NT]	[NT]	LCS-1	17/02/2016
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-1	93%
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-1	93%
Dimethoate	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-1	97%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-1	98%
Malathion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-1	80%
Parathion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-1	95%
Ronnel	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-1	102%
Surrogate TCMX	%		Org-008	86	[NT]	[NT]	LCS-1	102%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			17/02/2016	[NT]	[NT]	LCS-1	17/02/2016
Date analysed	-			17/02/2016	[NT]	[NT]	LCS-1	17/02/2016
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	LCS-1	110%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-006	86	[NT]	[NT]	LCS-1	102%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			17/02/2016	[NT]	[NT]	LCS-3	17/02/2016
Date analysed	-			17/02/2016	[NT]	[NT]	LCS-3	17/02/2016
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	LCS-3	110%
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	LCS-3	107%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-3	109%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-3	110%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-3	104%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	LCS-3	95%
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-3	104%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	LCS-3	105%
QUALITY CONTROL Misc Soil - Inorg	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			17/02/2016	[NT]	[NT]	LCS-1	17/02/2016
Date analysed	-			17/02/2016	[NT]	[NT]	LCS-1	17/02/2016
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	LCS-1	103%

Report Comments:

Asbestos: Excessive sample volume was provided for asbestos analysis. A portion of the supplied sample was sub-sampled according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.

Note: Samples 141720-1 to 3 were sub-sampled from bags provided by the client.

Asbestos ID was analysed by Approved Identifier:	Lulu Scott
Asbestos ID was authorised by Approved Signatory:	Lulu Scott

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NR: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd
Attention	Kelly McPhee

Sample Login Details	
Your Reference	73876.01, Mosman
Envirolab Reference	**141720**
Date Sample Received	16/02/2016
Date Instructions Received	16/02/2016
Date Results Expected to be Reported	**19/02/2016**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	3 Soils
Turnaround Time Requested	72hr
Temperature on receipt (°C)	14.9
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolabservices.com.au	Email: jhurst@envirolabservices.com.au

Sample and Testing Details on following page

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Sample Id	*vTRH(C6-C10)/BTEXN in Soil*	*svTRH (C10-C40) in Soil*	*PAHs in Soil*	*Organochlorine Pesticides in soil*	*Organophosphorus Pesticides*	*PCBs in Soil*	*Acid Extractable metals in soil*	*Total Phenolics (as Phenol)*	*Asbestos ID - soils*
TP1-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓
TP2-0.3-0.4	✓	✓	✓	✓	✓	✓	✓	✓	✓
TP3-0.3-0.4	✓	✓	✓	✓	✓	✓	✓	✓	✓

CHAIN OF CUSTODY

Douglas Partners
Geotechnics | Environment | Groundwater

Client:	Douglas Partners	**Project Number**	73876.01
Contact Person:	Kelly McPhee	**Project Name:**	Mosman
Project Mgr:	Peter Oitmaa	**PO No.:**	
Sampler:	Kelly McPhee	**lab Quote No. :**	
Address:	96 Hermitage Road West Ryde NSW 2114	**Date results required:**	3 day
		Or choose:	standard / same day / 1 day / 2 day / 3 day
		Note: Inform lab in advance if urgent turnaround is required - surcharges apply	
Phone:	9809 0666 **Mob:** 0419 781 366	**Report format:**	esdat / PDF / Excel
Email:	kelly.mcphee @douglaspartners.com.au peter.oitmaa @douglaspartners.com.au	**Comments:**	
Prior Storage (Fridge / Esky / Shelf)			

To:	Envirolab Services		
Contact Person:	Aileen Hie		
Address:	12 Ashley Street Chatswood NSW 2068		
Phone:	02 9910 6200		
Fax:	02 9910 6201		
Email:	ahie@envirolab.com.au		
Laboratory Report No:			
Lab Comments:			

	Sample information					Tests Required												Comments
	Field Sample ID	Depth	Date sampled	Container Type	Type of sample	Combo 8a												
1	TP1	0.4-0.5	3/02/2016	bag / jar	soil	X												
2	TP2	0.3-0.4	3/02/2016	bag / jar	soil	X												
3	TP3	0.3-0.4	3/02/2016	bag / jar	soil	X												
			16/2/16															

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 141720.
Date Received: 160216.
Time Received: 1620
Received by: CB.
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by:	Douglas Partners	**Sample Receipt**	
Hand delivered / Courier (by whom)		**Received by (Company):**	ELS.
Condition of Sample at dispatch Cool or Ambient (circle)		**Print Name:**	CALUM BONSER
Temperature (if Applicable):		**Date & Time:**	1620 160216.
Print Name:	Kelly McPhee	**Signature:**	CB.
Date & Time:	16/02/2016 2:15pm		
Signature:			

Lab use only:	
Samples Received: Cool or Ambient (circle one)	
Temperature Received at:	14.9 (if applicable)
Transported by: Hand delivered / courier	