Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on Preliminary Site Investigation (Contamination) with Limited Sampling

Taronga Reptile and Amphibian Conservation Centre
Taronga Zoo

Prepared for
Taronga Conservation Society Australia

Project 99931.00
July 2021

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

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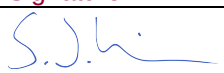
The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		6 July 2021
Reviewer pp		6 July 2021

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Geotechnics / Environment / Groundwater

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Taronga Reptile and Amphibian Conservation Centre
Taronga Zoo

1. Introduction

This report presents the results of a preliminary site investigation (contamination) with limited sampling undertaken for the proposed Reptile and Amphibian Conservation Centre at Taronga Zoo. The work was commissioned by the Taronga Conservation Society Australia and was undertaken in accordance with Douglas Partners' proposal SYD201344.001.Rev1 dated 8 December 2020.

It is understood that a new reptile and amphibian conservation centre is proposed in the central part of the zoo and covers the current meerkat exhibit and area to the west and north west of the exhibit. The proposed development will involve the demolition of various structures, some earthworks, and construction of the new facility which has terraced floor levels and is up to three storeys high at its southern frontage.

The Preliminary Site Investigation was undertaken to:

- assess the previous land uses and likely subsurface conditions to determine the potential for soil and groundwater contamination on the site;
- provide a preliminary assessment of the suitability of the site for the proposed development; and
- provide recommendations for additional investigation, if required.

The Preliminary Site Investigation has been prepared to address the requirements of *State Environmental Planning Policy No 55 – Remediation of Land*. The overall approach for the Preliminary Site Investigation included a review of available historical information, an inspection of the site by an engineer, the drilling of boreholes, soil sampling and laboratory analysis. Details of the site history are given in this report, as well as comments on the issues outlined above.

Douglas Partners (DP) also undertook a geotechnical investigation, the results of which are outlined in the *Report on Geotechnical Investigation* for Project 99931.00 dated July 2021.

This report has not been specifically prepared for site audit purposes.

2. Site Description

The development covers the area to the east of the existing gorilla exhibit, it extends from the eastern boundary of the gorilla exhibit about 100 m to the intersection of the upper and lower paths. The majority of the proposed building is located within the current meerkat exhibit and sloping area to the west and north west of the exhibit, from the southern edge of the upper road / walkway about 30 m south to the northern edge of the lower road / walkway. There are some concrete paths, a shed, some historical

aviaries and the meerkat enclosure located within the proposed development area. It also appears that a deep stormwater pipe runs down the west of the site. It is understood that a historical seal pool was previously located within the site but has now been backfilled.

The site is located on a Hawkesbury Sandstone slope which has been landscaped for its current use. The site has been terraced with several retaining walls and sandstone outcrops and cuttings in the area of the works. Ground surface levels nearby the area range from about RL 45 m to RL 53 m AHD. The higher levels were encountered at the crest of the slope near the upper road / walkway.

Taronga Zoo is located on Lot 22 DP 843294. The portion of the site proposed for redevelopment covers approximately 2,400 m^2 and is shown on Drawing R1 in Appendix B.

3. Geology and Hydrogeology

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. An extract from the geological map is shown in Figure 1.

Figure 1: Extract from geological map

The regional groundwater table is likely to be well below the bedrock surface. Near-surface Hawkesbury Sandstone generally exhibits low permeabilities which result in very low groundwater yields. Groundwater use from this aquifer is therefore unlikely to be significant.

Groundwater is likely to follow the surface topography and flow to the south.

4. Scope of Works

The scope of the Preliminary Site Investigation with limiting sampling was as follows:

- Review various historical documents including aerial photographs, historical title deeds, the EPA Contaminated Land register and groundwater bore licences to determine the nature of previous activities that may have occurred on the site;
- Undertake a brief site inspection;
- Drill four boreholes, collect soil samples and undertake laboratory analysis for a range of common contaminants including:
    - Total recoverable hydrocarbons (TRH)
    - Benzene, toluene, ethylbenzene, xylene (BTEX)
    - Polycyclic aromatic hydrocarbons (PAH)
    - Organochlorine pesticides and organophosphorus pesticides (OCP & OPP)
    - Polychlorinated biphenyls (PCB)
    - Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn)
    - Asbestos
- Provide a Preliminary Site Investigation report which comments on the historical uses of the site, the potential for soil and groundwater contamination to be present, and provides recommendations for follow up action (if required).

5. Site History

5.1 Aerial Photographs

A review of aerial photographs from 1930, 1951, 1961, 1994, 2005 and 2018 was undertaken to evaluate the land-use patterns on the site.

The 1930 aerial photograph shows that the zoo has been established with various paths, cleared areas and some buildings (mainly in the north eastern part of the Zoo). The current site appears to be mainly vegetated with large trees. A path to a cleared area is visible towards the south-west corner of the site and there appears to be a clearing in the east of the site which indicates some development has been undertaken within the area (possible seal ponds and aviaries). The former seal ponds located to the north of the current assessment area appear to have been constructed.

The 1951 photograph shows that a large amount of development has occurred within the zoo and nearby to the site. However, no significant changes to the site area are visible when compared to the 1930 photograph. The 1961 photograph shows similar conditions.

The 1994 photograph shows what appears to be ponds and some concrete structures within the site. It is expected that this is part of the former seal pond enclosure. Due to the resolution of the 1994 photograph it is difficult to identify individual buildings, but the site appears similar between the 1994 and 2005 photograph. In the 2005 photograph, various concrete paths and seating areas can be seen.

The 2018 photograph shows that the previous structures have been demolished and the area mainly revegetated, with a small white roofed structure at the south west of the site and some canopies at the east of the site. DP understands that the former seal ponds in this area were demolished in 2009.

Scanned images of the aerial photographs are provided in Appendix C.

5.2 Historical Land Uses

The Taronga Zoo site was originally Crown land known as Ashton Park. Control of the land was passed to the Zoological Society of NSW between 1912 and 1916 and the zoo was officially opened in 1916. Ownership of the land was officially transferred to the Zoological Parks Board of NSW in 1992.

Taronga Zoo has been progressively developed since its inception and changes to site layout and exhibits have occurred intermittently throughout the zoo's operation. Fill is known to have been imported to the site in the past and asbestos-containing material (ACM) has been identified in existing filling in numerous areas of the site. Title deed information is provided in Appendix C.

5.3 Contaminated Land Public Register

A search undertaken on 16 February 2021 indicated that the development site is not on the Public Register of Notices issued under the Contaminated Land Management Act 1997. No sites within the Mosman Council local government area are listed on the register.

5.4 Groundwater Bore Search

A search of licensed groundwater bores in the Mosman area indicated that there are no licensed groundwater bores within Taronga Zoo.

6. Previous Assessments

Douglas Partners has previously undertaken contamination assessments at Taronga Zoo including:

- Preliminary Contamination Assessment for the Top Entrance and Staff Carpark (Project 37522A dated April 2005);
- Contamination Assessment for the Amazonian Exhibit Area (Project 45819B dated February 2009);
- Contamination Assessment for the 'Heart of the Zoo' Area (Project 71144 dated June 2009);
- Report on Preliminary Site Investigation (Contamination) for the proposed Sumatran tiger redevelopment (Project 73809.01 dated 30 March 2015); and

- Report on Preliminary Site Investigation (Contamination) for the proposed Institute of Science and Learning Centre (Project 85159.00 dated December 2015).

Information from these previous assessments by Douglas Partners was used in the current assessment where relevant.

7. Site Inspection and Discussion with Zoo Staff

A brief site walk over was undertaken by an Associate Engineer on 11 January 2021. Discussions about previous site uses were undertaken with zoo staff in a meeting on 2 March 2021. The inspection and discussions with zoo staff indicated:

- The area proposed for redevelopment currently includes vegetated slopes, some concrete paths, the current meerkat exhibit, some historical aviaries, some canopies and a seating area, as well as a shed. It appears that a deep stormwater pipe runs down the west of the site;
- a historical seal pool and associated infrastructure was previously located within the site but has now been demolished. It is understood that following demolition the former ponds and concrete structures were removed from the site, whilst soil, rock and retaining walls remain on site;
- Likely sources of asbestos in the area are underground services and building materials;
- All solid waste generated on site is removed and recycled or disposed of in an appropriate manner; and
- All liquid waste is treated at an on-site treatment plant prior to being recycled for use within the zoo.

8. Initial Conceptual Site Model

The site appears to have been continually developed since the early to mid-20th Century for use as a zoological facility. The aerial photographs suggest most of the development in the area of interest has been post-1960.

On the basis of the information contained in this report, potentially contaminating activities that may have occurred on the site include:

- The placement of fill on the site (heavy metals, OCP, OPP, TRH, BTEX, PAH, PCB & asbestos);
- Contaminants associated with demolition activities (e.g. lead, asbestos, synthetic mineral fibres and polychlorinated biphenyls (PCBs));
- Contaminants associated with maintenance of the buildings on the site (e.g. pesticides);
- Hazardous building materials (e.g. lead, asbestos, synthetic mineral fibres and PCBs etc.);
- Naturally occurring elements in the soils and rock underlying the site (e.g. heavy metals).

The regional groundwater table is likely to be at considerable depth. The quality of the groundwater should therefore not hinder the proposed development.

Soil vapour intrusion and/or ground gas is currently considered to be a very low risk on the site and would only need to be considered if significant concentrations of volatile organic compounds are encountered on the site. This is considered unlikely for the site in its present state.

The human receptors to soil contamination are likely to be the workers / visitors to the redeveloped site. Construction personnel and nearby workers may also be receptors during the construction phase of the redevelopment project.

The ecological receptors are likely to be limited to the flora and fauna that grow/live on areas of the site in which vegetation is proposed. The area is not known to be ecologically significant.

Exposure pathways are expected to be limited to dermal contact with soils on the site by humans and fauna, ingestion of soils and vegetation by fauna, and phytotoxic exposure to flora.

9. Field Work Methods

Four cored boreholes (RA1 to RA4) were drilled to depths of between 5.5 m and 12.0 m using a Hanjin D8 drilling rig. The boreholes were commenced using solid flight augers to drill through the soil to the top of rock. 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.

Note the coverage of the boreholes and dynamic cone penetration tests (DCPs) was limited to the west portion of the site due to access constraints and to focus on the proposed building footprint.

Environmental sampling was performed according to standard operating procedures outlined in the DP Field Procedures Manual. All sampling data was recorded on DP chain of custody sheets. The general sampling and sample management procedures comprised:

- Collection of samples into laboratory-prepared glass jars with Teflon lined lids by hand, capping immediately and ensuring headspace within the sample jar is minimised;
- Screening for volatile contaminants using a photo-ionisation detection (PID) instrument;
- A new disposable nitrile glove was worn by the field scientist / engineer for each sample collected thereby precluding potential cross-contamination;
- Labelling of sample containers with individual and unique identification details, including project number, sample location and sample depth (where applicable); and
- Placement of the sample jars into a cooled, insulated and sealed container for transport to the laboratory.

10. Field Work Results

The subsurface conditions encountered in the boreholes are presented in the borehole logs in Appendix D. Notes defining descriptive terms and classification methods are included in Appendix D. The boreholes encountered:

- **FILL** – typically concrete over sandy fill to depths of about 2.1 m in the upper boreholes RA1 and RA2, typically synthetic grass or pavers over gravelly or clayey sand and clay fill to depths of about 1.1 m in the lower boreholes RA3 and RA4, ash and traces of ash were encountered at some locations. Overlying
- **SANDSTONE BEDROCK** – sandstone bedrock from depths of between 1.1 m to 2.1 m to the base of the bores at 5.5 m to 12.0 m depth. The rock was generally medium and high strength.

Natural soils were not encountered in the boreholes.

Groundwater was not observed whilst augering in any of the boreholes. The use of water as a drilling fluid during NMLC diamond coring of the bedrock precluded further observation of the groundwater levels below the bedrock surface during the field work.

Five DCPs were carried out in the sloping area that was inaccessible to drilling equipment. Assuming the DCPs refused on rock, these would indicate that the depth to rock in that area is about 0.3 m to 2.4 m. This will require confirmation during construction.

Whilst undertaking the field work, mapping of outcropping rock and areas of obvious fill was completed. Observable rock outcrops are shown in Drawing R1 in Appendix B. Areas of deeper fill were encountered in boreholes RA1 and RA3; it is likely deeper fill may be encountered where filling has been required to achieve current site levels, for example at the top of cuttings and batters and in any natural gullies and possibly historical pools that may have previously run through the site.

The PID reading were generally low and typical of background levels. PID readings are shown on the borehole logs in Appendix D.

11. Laboratory Testing

Envirolab Services Pty Ltd (Envirolab) was commissioned to undertake the analysis of the soil samples. A summary of the results is provided in Table E1 and E2 in Appendix E. The detailed report sheets and chain-of-custody documentation are also included in Appendix E.

12. Selected Comparative Criteria

The National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013, Schedule B1 – Guideline on Investigation Levels for Soil and Groundwater (NEPC, 2013) provides Tier 1 investigation and screening levels for contaminants in various environmental media including soil, groundwater and soil vapour.

Given the current and proposed land use, the site is assumed to be partially a category 'C' site (i.e. HIL Health-based Investigation Level (HIL) C) which include public open space such as parks and playgrounds, and partially a category 'D' site (i.e. HIL D) which uses include commercial and industrial, which assumes typical commercial or light industrial properties, consisting of single or multistorey buildings where work areas are on the ground floor (constructed on a ground level slab) or above subsurface structures (such as basement car parks or storage areas). Ecological-based assessment is

based on the relevant investigation and screening levels/added concentrations for sandy soils sites due to the sandy nature of the fill.

The preliminary Tier 1 site assessment criteria adopted are shown in Table E3 in Appendix E.

13. Discussion of Results

Twelve soil (fill) samples (excluding a QA/QC duplicate) from four test locations were analysed for metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), TRH, BTEX, PAH, OCP, OPP and PCB. All the samples apart from one recorded concentrations of these analytes that were below the adopted site assessment criteria.

One soil sample (RA1 0.2–0.4 m) and one duplicate sample (BD7/20210119 from RA2 0.8-1.0 m) returned B.TEQ results that exceed the HIL limit. Toxicity characteristic leaching procedure (TCLP) testing was undertaken for PAHs on the sample from RA1 0.2-0.4 m and results were below detectable limits and hence is not likely to be leachable. A sample from RA2 0.9-1.0 was inspected and appeared to contain a trace of ash, hence the reason for the difference between the BD7/20210119 and the reference sample RA 0.8-1.0 m may be due to an inclusion of ash in the duplicate sample and not the primary one. Currently the locations where both exceedances occurred is effectively capped by the pavement and is marginally outside the site area, however would need to be remediated as part of the development if similar contamination is encountered within the development footprint.

Twelve soil (fill) samples from were analysed for asbestos (presence / absence). Asbestos was not detected in any of the samples analysed. There were no other obvious signs of possible asbestos containing materials in any of the other samples collected from the boreholes.

14. Preliminary Waste Classification Advice

All materials requiring removal from the 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. However, asbestos is known to be present at the zoo. Any asbestos containing waste would be classified as Special Waste – Asbestos.

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 filling material contained some of these materials but was typically in a soil matrix and could therefore not be 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 concentrations in the samples of fill tested were compared to the CT1 threshold criteria provided in the guidelines. Of the twelve samples tested, there was one exceedance for B(a)P and one for lead. Toxicity characteristic leaching procedure (TCLP) testing was undertaken for PAHs on the sample with the B(a)P and lead exceedances. All results were below the TCLP1 criteria, with all reported concentrations below the SCC1 criteria. Therefore, all samples tested meet the requirements of General Solid Waste (non-putrescible) based on the SCC1 and TCLP1 criteria. CT1, SCC1 and TCLP1 criteria are shown in Table E4 of Appendix E.

Although asbestos was not observed or detected in the soil samples analysed, it is also not uncommon to encounter asbestos in fill on established sites and has been observed in other areas of the zoo. Such encounters should be dealt with under an Asbestos and Unexpected Finds Protocol in the Construction Environmental Management Plan. Any soils containing asbestos would also be classified as Special Waste – Asbestos.

The natural rock below the fill should 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.

Given the preliminary nature of the assigned waste classification, which was based on limited sampling, further testing and observations as well as a formal waste classification are required if materials are to be excavated and removed from the site.

15. Conclusions and Recommendations

The site history information indicates that the wider zoo site was converted from vacant (assumed) Crown land to Taronga Zoo in the early part of the 20th Century. There were no obvious indicators of contaminating activities on the site other than imported fill and in the later years, demolition of buildings that may have contained asbestos-containing material. Obvious sources of contamination were not observed in the assessment area during the recent inspection and site testing.

The laboratory testing indicated that the contaminant concentrations in the soil samples analysed were all within the adopted site assessment criteria (i.e. the health-based and ecological-based investigation/screening levels), apart from two samples for B.TEQ. The two samples with B.TEQ exceedances are located outside the site area, hence are not relevant to the site characterisation itself, but are relevant to give a range of possible background contamination. It is likely that the B.TEQ exceedances are due to trace ash contamination, which would need to be remediated if encountered within the development area.

Asbestos was not encountered in the current soil samples analysed, however asbestos is known to be present in areas within the zoo. The presence of asbestos on the site should therefore not be discounted noting that previous demolition activities have been undertaken. Note that the presences of asbestos in the fill would result in a classification of 'Special Waste – Asbestos'.

On the basis of the results of this Preliminary Site Investigation, there is little to suggest that activities with a high potential for causing soil and groundwater contamination have been undertaken on the site to date. Any existing fill that is present on the site will need to be assessed for the presence of asbestos materials during construction. An Asbestos and Unexpected Finds Protocol should be incorporated into the Environmental Management Plan for the project so that procedures are in place for handling asbestos and any suspected ash contamination if encountered during construction.

Based on the results of this preliminary site investigation, it is considered that the site can be made suitable for the proposed development. However, further investigation would be required to fully characterise the site and assist in waste classification. It is suggested that a further 7 sample points be tested (9 in total within the site) in accordance with Table A of Contaminated Sites Sampling Design Guidelines, Environmental Protection Agency, September 1995. This could be undertaken following demolition and removal of pavements from the site. Any materials encountered that are deemed unsuitable will need to be removed as part of the construction process.

All materials requiring removal from the site will need to be classified in accordance with *Waste Classification Guidelines* (NSW EPA, 2014). The demolition contractor should ensure that the demolition works are undertaken in an appropriate manner and that cross-contamination of the site does not occur.

16. Limitations

Douglas Partners (DP) has prepared this report for this project at Taronga Zoo in accordance with DP's proposal SSYD201344.P.001.Rev1 dated 8 December 2020 and acceptance received from Mr Paul De Alwis. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Taronga Conservation Society Australia for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the

work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

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

The advice provided relating to provisional waste classification is preliminary only and is subject to confirmation during excavation, through visual and analytical (if required) processes. Note Part 5.6, Section 143 of The Protection of the Environment Operations Act 1997 states that it is an offence for waste to be transported to a place that cannot lawfully be used as a facility to accept that waste. It is the duty of the owner and transporter of the waste to ensure that the waste is disposed of appropriately. DP does not accept liability for the unlawful disposal of waste materials from any site. DP accepts no responsibility for the material tracking, loading, management, transport or disposal of waste from the site.

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

Asbestos has not been detected by observation or by laboratory analysis, either on the surface of the site, or in filling materials at the test locations sampled and analysed. Fill containing building demolition materials has been encountered within Taronga Zoo in previous investigations and is indicative of the possible presence of hazardous building materials (HBM), including asbestos at this site.

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

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

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

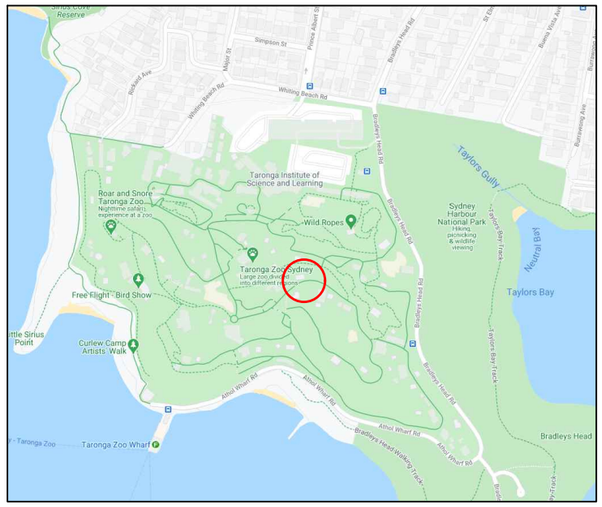
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate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

Site Inspection

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

Appendix B

Drawings



SITE LOCALITY

NOTE:
1: Base image from MetroMap.com.au (Dated 04.12.2020)
2: Proposed building extents and levels were estimated based on the Schematic Design Architectural Drawings (By: DWP Australia Pty Ltd, Project No. RACC 20-0527)

0 5 10 15 20 30 40 60m
1:600 @ A3

LEGEND

- Test Bore Location and Number
- DCP Location and Number
- Rough Outline of Rock Outcrop
- Geological Cross Section
- Site Boundary
- Proposed Building Footprint

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Taronga Conservation Society Australia		TITLE: **Test Location Plan** **Taronga Reptile and Amphibian Conservation Centre** **Taronga Zoo, Mosman**
OFFICE: Sydney	DRAWN BY: CJ/MG	
SCALE: 1:600 @ A3	DATE: 06.07.2021	

PROJECT No:	99931.00
DRAWING No:	R1
REVISION:	1

Appendix C

Site History Information

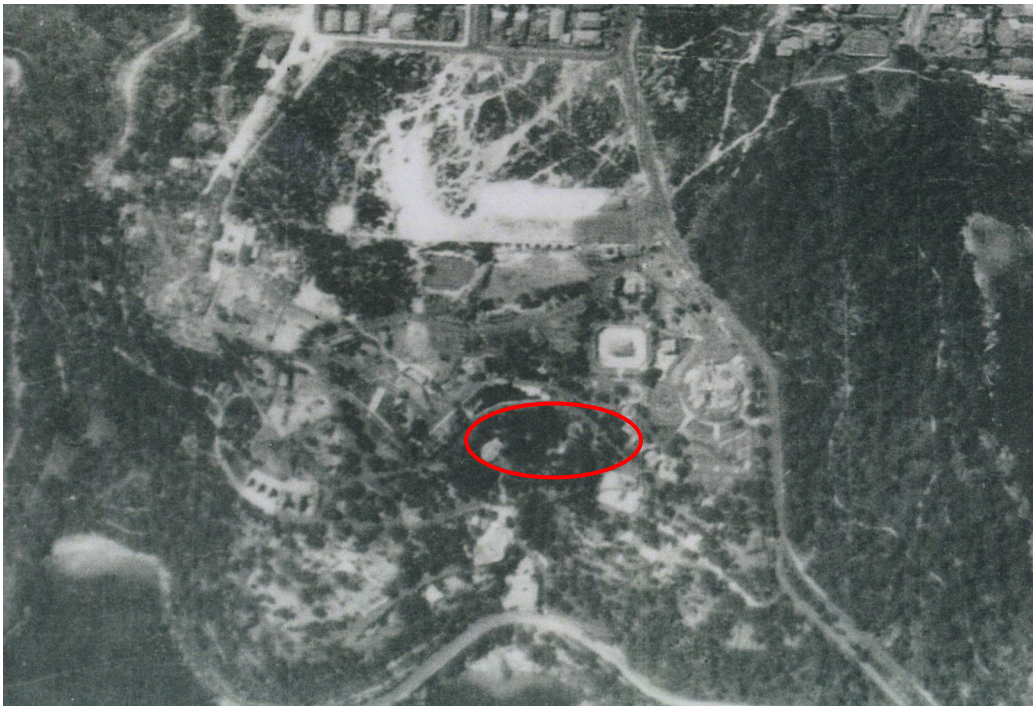


Photo 1 – Aerial photograph from 1930

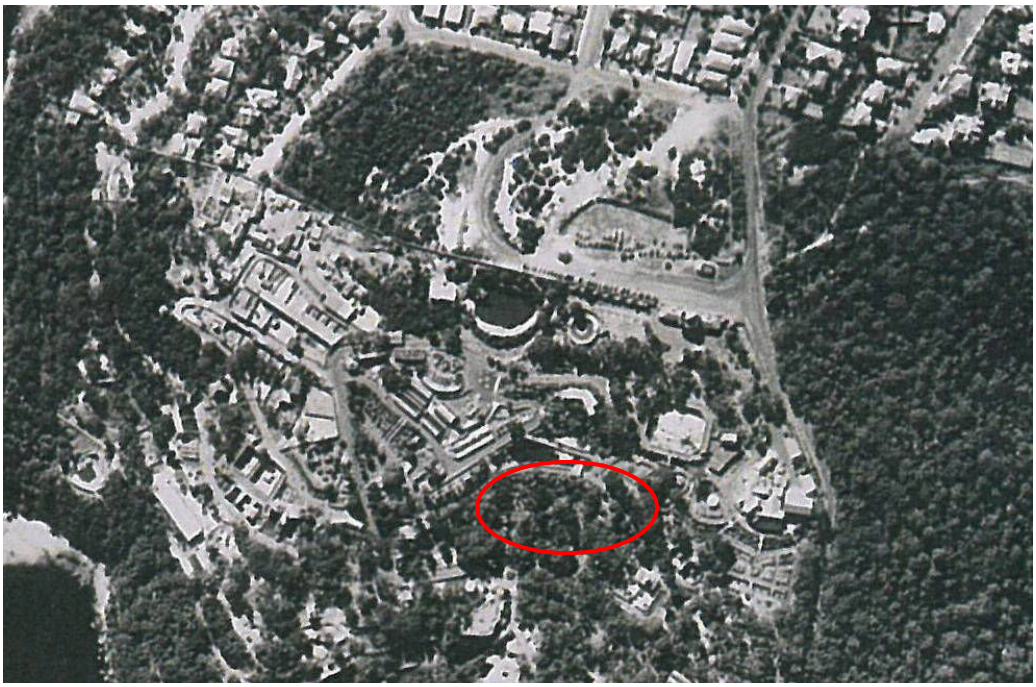


Photo 2 – Aerial photograph from 1951

Douglas Partners Geotechnics / Environment / Groundwater	**Historical Aerial Photographs** **Reptile and Amphibian Conservation Centre** **Taronga Zoo**	PROJECT: 99931.00 PLATE No: A1 REV: 1
	CLIENT: Taronga Conservation Soc.	DATE: 06-July-21

Photo 3 – Aerial photograph from 1961

Photo 4 – Aerial photograph from 1994

Douglas Partners Geotechnics / Environment / Groundwater	**Historical Aerial Photographs** **Reptile and Amphibian Conservation Centre** **Taronga Zoo**	PROJECT: 99931.00 PLATE No: A2 REV: 1
	CLIENT: Taronga Conservation Soc.	DATE: 06-July-21

Photo 5 – Aerial photograph from 2005

Photo 6 – Aerial photograph from 2018

Douglas Partners Geotechnics / Environment / Groundwater	**Historical Aerial Photographs** **Reptile and Amphibian Conservation Centre** **Taronga Zoo**	PROJECT: 99931.00 PLATE No: A3 REV: 1
	CLIENT: Taronga Conservation Soc.	DATE: 06-July-21

ACN: 093 398 611
ABN: 61 093 412 474

Peter S. Hopley Pty Limited
Legal Searchers

1 Boronia Avenue
Mount Annan , NSW , 2567
Mobile: 0412 199 304
Fax 9233 4590 (Attn Box 29)

SUMMARY AS TO OWNERS.

Property: Taronga Zoo

Description: Lot 22 D.P. 843294

The part of the subject land formerly comprised in Lot 5 D.P. 727103 (shown highlighted yellow on D.P. 843294), was Crown Land prior to the issue of Folio Identifier 5/727103, dated 21.09.1992. **This land was Transferred to Zoological Parks Board of New South Wales by Transfer dated 27.10.1992.**

D.P. 727103 describes lot 5 therein as being the residue area of Ashton Park dedicated 29.11.1918.

The title to the remainder of the land prior to Volume 12162 Folio 4 was Crown Land. This title issued to the Zoological Parks Board of New South Wales on 19.07.1973.

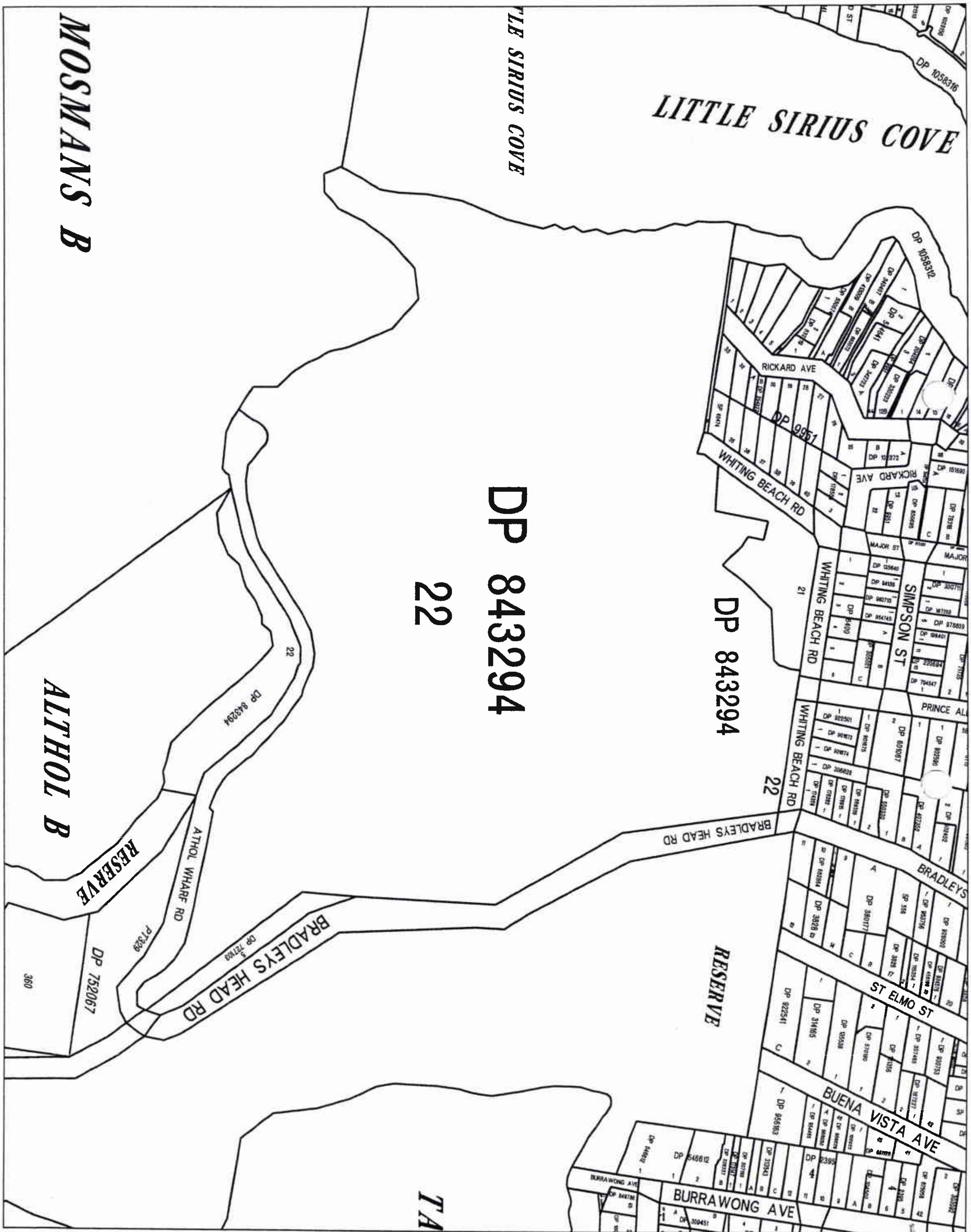
An inspection of Crown Plan 13677 - 3000 disclosed the site of the Zoo to have been formerly comprised within an area known as Ashton Park.(Dedication of Park now revoked).
It is also noted dedicated for Zoological Gardens by various Gazettes dated 24.04.1912, 22.04.1914, 29.11.1918 & 14.10.1932. Now revoked 22.12.1950.

70 acres parcel was dedicated for Zoological Gardens by Gazette dated 22.12.1950 then subsequently revoked by Taronga Park Zoological Act, 1956.

This 70 acres "Taronga Zoological Park" was dedicated as a Public Park by Taronga Zoological Part Act, 1956.

email: grolly@optusnet.com.au

DEPARTMENT OF LANDS .... Client: planroom2
Enquiry Parcel: SIMPSON ST
Locality: MOSMAN Co: CUMBERLAND Ph: WILLOUGHBY
Local Government Area: MOSMAN - Date: 08-NOV-04 - Time: 12:40pm



PLAN FORM 2

SIGNATURE AND SEALS ONLY.

Plan Drawing only to appear in this space

*OFFICE USE ONLY

DP 843294 Ⓔ

N O O Z A 2 A

Registered: [seal] JW 6-12-1994

C.A.

Title System: TORRENS

Purpose: ACQUISITION (NOT A CURRENT PLAN AT REGN. SEE SEC. 327AA L.G.A. ACT)

Ref. Map: U1852 - B3, B4 & B14

Last Plan:

PLAN OF ~~SUBDIVISION~~ OF LOT 2 DP 820325

Lengths are in metres. Reduction Ratio 1: 2500

LGA MOSMAN

Locality: MOSMAN

Parish: WILLOUGHBY

County: CUMBERLAND

This is sheet 1 of my plan in 2 sheets. (Delete if inapplicable)

I, DONALD ROSS BUCHAN of G.H.D. SUREYS P/L P.O. BOX K 839 HAYMARKET 2000

a surveyor registered under the Surveyors Act 1929 hereby certify that the survey represented in this plan is accurate, has been made in accordance with the Survey Practice Regulation 1990 and was completed on 12TH AUGUST 1994

Signature D.R. Buchan

Surveyor registered under Surveyors Act 1929

AZIMUTH 'X'-'Y'

Plans used in preparation of survey/compilation.

DP 820325	DP 8400
DP 727103	10341 – 2030
DP 9951	2871 – 3000
DP 84139	9638 – 2030
DP 555395	12456 – 3000
DP 107029	

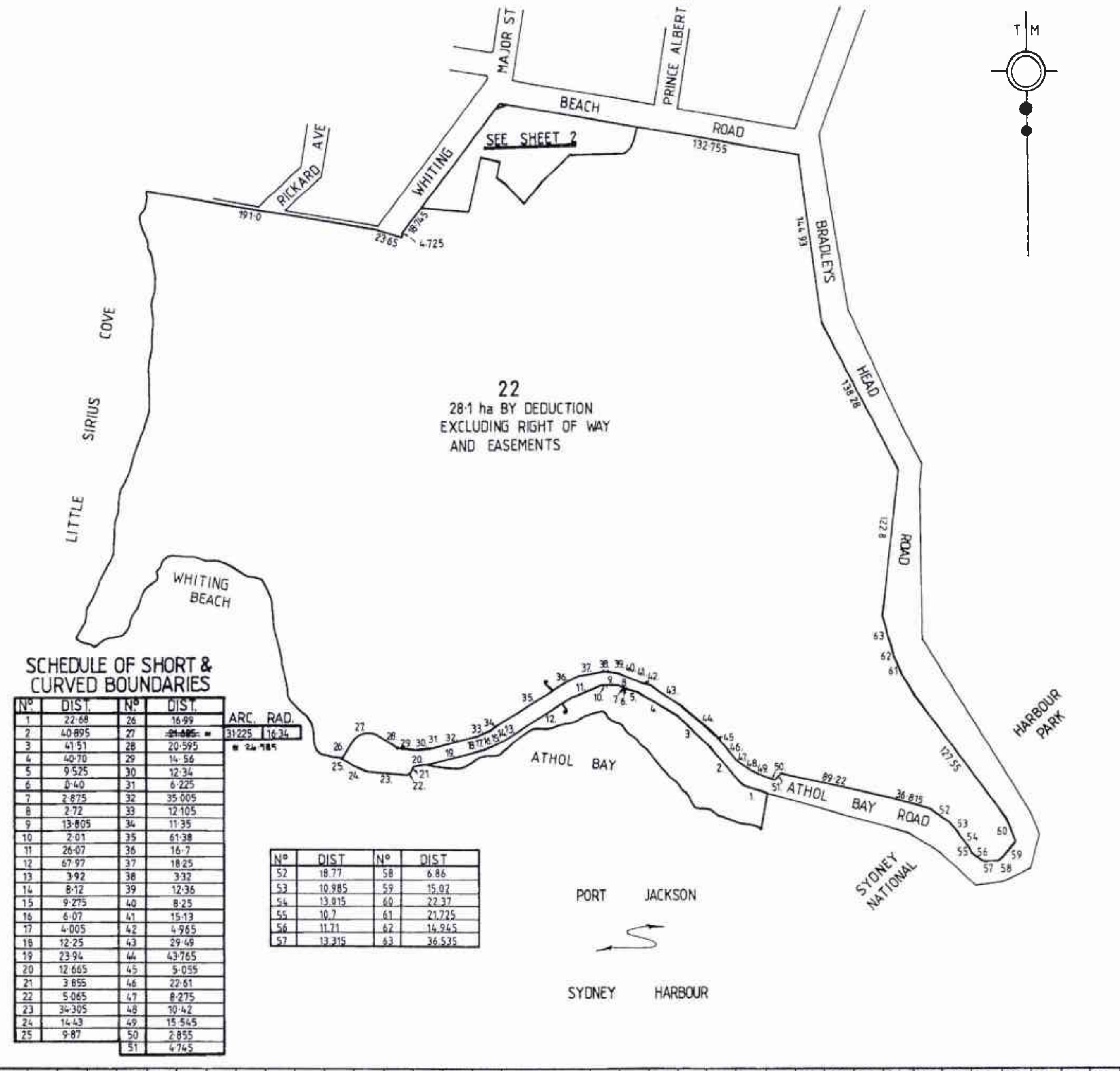
PANEL FOR USE ONLY for statements of intention to dedicate public roads, to create public reserves, drainage reserves, easements, restrictions on the use of land or positive covenants.

IT IS INTENDED TO DEDICATE LOT 23 ~~THE AREA DESIGNATED ROAD WIDENING~~ TO THE PUBLIC. PURSUANT TO SEC 11 OF THE ROADS ACT.

23.10.1997

DISTANCE LINE 27 AMENDED IN L.T.O. VIDE 2113/97

PLAN AMENDED IN LTO. VIDE 1825/[illegible] 20.3.1995



SCHEDULE OF SHORT & CURVED BOUNDARIES

Nº	DIST.	Nº	DIST.	ARC.	RAD.
1	22.68	26	16.99		
2	40.895	27	~~[illegible]~~ ■ (■ 24.785)	31.225	16.34
3	41.51	28	20.595		
4	40.70	29	14.56		
5	9.525	30	12.34		
6	0.40	31	6.225		
7	2.875	32	35.005		
8	2.72	33	12.105		
9	13.805	34	11.35		
10	2.01	35	61.38		
11	26.07	36	16.7		
12	67.97	37	18.25		
13	3.92	38	3.32		
14	8.12	39	12.36		
15	9.275	40	8.25		
16	6.07	41	15.13		
17	4.005	42	4.965		
18	12.25	43	29.49		
19	23.94	44	43.765		
20	12.665	45	5.055		
21	3.855	46	22.61		
22	5.065	47	8.275		
23	34.305	48	10.42		
24	14.43	49	15.545		
25	9.87	50	2.855		
		51	4.745		

Nº	DIST	Nº	DIST
52	18.77	58	6.86
53	10.985	59	15.02
54	13.015	60	22.37
55	10.7	61	21.725
56	11.71	62	14.945
57	13.315	63	36.535

Crown Lands Office Approval

PLAN APPROVED .... Authorised Officer

Land District ....

Paper No ....

Field Book .... pages ....

Council's Certificate

I hereby certify that —
(a) the requirements of the Local Government Act 1919 (other than the requirements for the registration of plans); and
(b) the requirements of †Part 3 Division 2 of the Water Board Act 1987 or †Part 5 Division 2 of the Hunter Water Board (Corporatisation) Act 1991
have been complied with by the applicant in relation to the proposed (insert "new road" "subdivision" or "consolidation") set out herein

Subdivision No

Date

Signature: General Manager/Authorised Person

Council File No.

* This part of certificate to be deleted where the application is only for a consolidation or the opening of a new road or where the land to be subdivided is wholly outside the areas of operations of the Water Board and the Hunter Water Corporation Ltd
† Delete if inapplicable.

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 Table of mm 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390

SURVEYOR'S REFERENCE: 128019

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

PLAN FORM 3 — To be used in conjunction with Plan Form 2 — WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION — *OFFICE USE ONLY

DP 843294

Registered: 6.12.1994

This is sheet 2 of my plan in 2 sheets dated

D.R. Buchan

Surveyor registered under Surveyors Act 1928

This is sheet of the plan of sheets covered by my Certificate No. of

Council Clerk

For use where space is insufficient in any panel on Plan Form 2.

Reduction Ratio 1:1000

SCHEDULE OF REFERENCE MARKS			
No.	DESC.	ORIGIN	BEAR. & DIST.
1	R.M.D.H. & W.IN KB.	PLACED	94° 53' - 7·415
2	R.M.D.H. & W.IN KB	PLACED	152° 30' - 3·805
3	R.M.D.H. & W.IN KB	PLACED	162° 24' - 3·545
4	R.M.D.H. W.IN KB	PLACED	197° 51' - 16·655

DIAGRAM 'B' NOT TO SCALE

DIAGRAM 'C' NOT TO SCALE

DIAGRAM 'A' NOT TO SCALE

RICKARD AVE. — MAJOR ST. — PRINCE ALBERT ST. — BEACH — ROAD — WHITING — BRADLEYS HEAD RD.

BRICK GARAGE — PATHWAY

21 8280 m² — 22

SSM 20465 FD. — SSM 20466 FD. — PM 10599 FD. — PM 33802 FD. — PM 35814 FD. — PM C.B. FD. (D.P. 727103) 102°07'-0·505

SURVEY PRACTICE REGULATION 1990 : CLAUSE 32 (2)					
	I.S.G. CO-ORDINATES				
MARK	EASTING	NORTHING	R.L.	ZONE	ACC.
PM 10599	322 569·806	1254 207·091	85·760	56/1	2
PM 33802	322 420·166	1253 961·955	76·609	56/1	2
PM 35814	322 326·621	1253 987·507	76·8	56/1	2 (H)
					6 (V)
SSM 20465	322 264·907	1253 891·085	79·809	56/1	2
SSM 20466	322 410	1253 990	76·840	56/1	8 (H)
					2 (V)

SOURCE : SURVEY CONTROL INFORMATION MANAGEMENT SYSTEM 14 TH JULY 1992

- EASEMENT FOR ELECTRICITY PURPOSES 2m WIDE
- RIGHT OF WAY 3·66m WIDE & VARIABLE - D.P. 45/1982
- RIGHT OF WAY AND EASEMENT FOR ELECTRICITY PURPOSES 5·5m WIDE } R 168149
- SUBSTATION PREMISES No 4131
- ROAD WIDENING (18·42 m²)

258° 28' 25" - 343·785 BY ME
248° 53' 20" - 343·745 BY C10341 - 2030

Plan Drawing only to appear in this space

SURVEYOR'S REFERENCE: 128019

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

A 237

• OFFICE USE ONLY

DP 727103

Registered 12-12-1988

Purpose PUBLIC ROADS ACT, 1902

Ref. Map U1852 - 84,814,38

C 2 R 5 0 0 N

PUBLIC ROADS ACT, 1902

PLAN OF PROPOSED ROAD

PAPERS: MN 82 H 1155

PARISH WILLOUGHBY COUNTY CUMBERLAND

LAND DISTRICT METROPOLITAN ~~SHIRE~~ MUN. MOSMAN

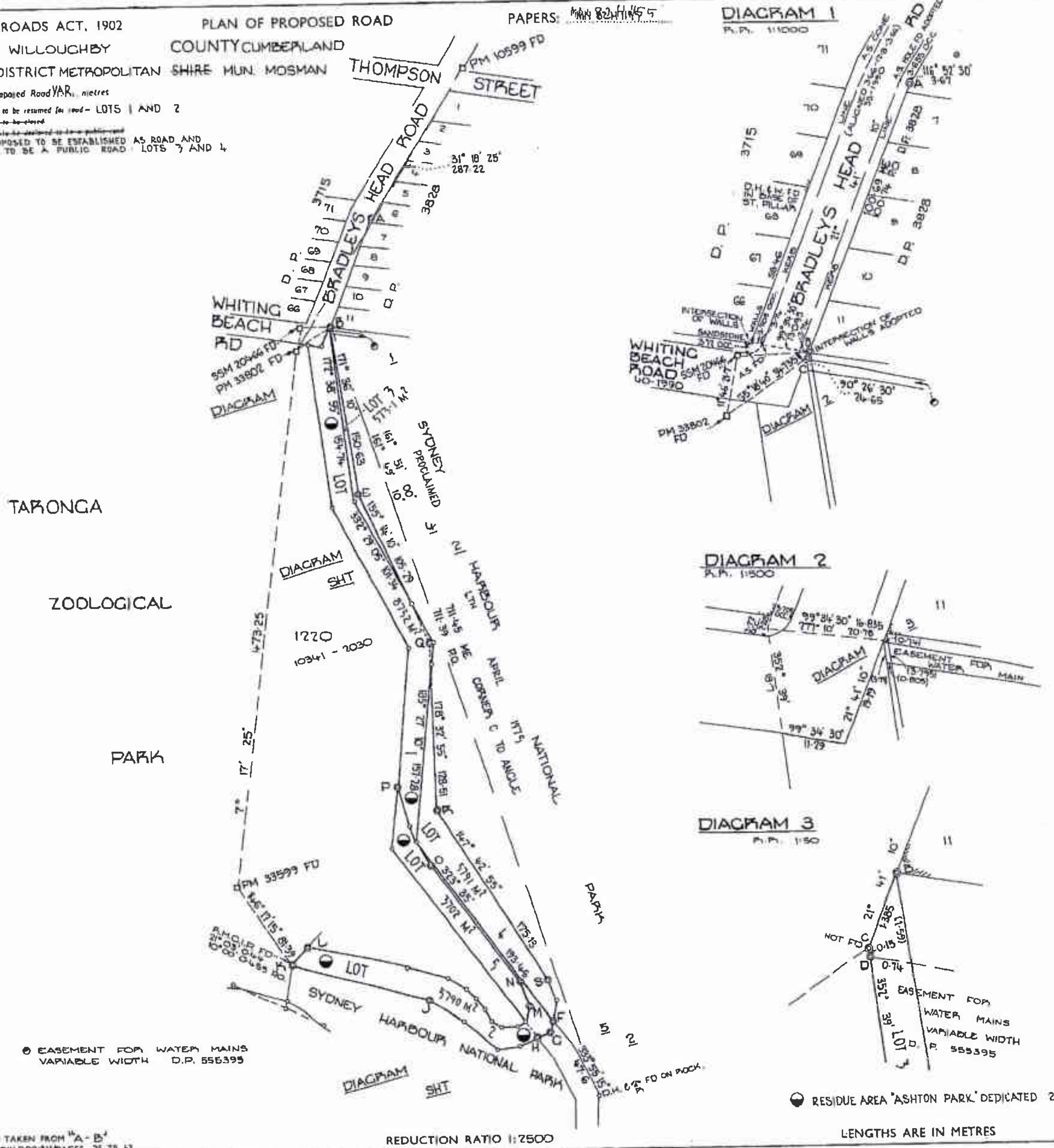
Width of Proposed Road VAR. metres

Lands proposed to be resumed for road – LOTS 1 AND 2

~~Roads proposed to be declared to be a public road~~

~~Roads proposed to be closed~~

LANDS PROPOSED TO BE ESTABLISHED AS ROAD AND DECLARED TO BE A PUBLIC ROAD LOTS 3 AND 4



● EASEMENT FOR WATER MAINS VARIABLE WIDTH D.P. 555395

◐ RESIDUE AREA "ASHTON PARK" DEDICATED 29 - 11 - 1918

LENGTHS ARE IN METRES

REDUCTION RATIO 1:2500

AZIMUTH TAKEN FROM "A - B"

FIELD BOOK LDB 88 PAGES 25 TO 62

REFERENCE MARKS

COR.	BEARING	FROM	METRES
A	116° 11'	D.H. & WING FD.	16·605
		(ORIGIN UNKNOWN) IN CONC	
B	101° 01'	CONC. BLOCK	0·505
	90° 36' 30"	SSM. 20466 FD	24·65
C	55° 18' 40"	PM. 33802 FD	34·735
D	95° 55' 40"	RMC.IPIPE FD	0·938 RD
	100° 47' 10"	R.M.C.I.PIPE FD	0·915 RD.
E	78° 25' 10"	CONC. BLOCK	0·505
F	13° 39' 35"	C.I. PIPE	0·49
G	IRON BOLT IN BITUMEN ON CORNER		
	244° 56' 20" D.H. & W. ON SANDSTONE BORDER		
H	244° 56' 20"	C.I. PIPE	0·5
J	204° 19' 30"	CONC. BLOCK	0·506
K	221° 14' 25"	CONC. BLOCK	0·519
	199° 37' 20" D.H. & W. FD IN S.STONE WALL 19·57		
	190° 00' D.H. & W. FD IN S.STONE WALL 19·54 FD		
L	41° 14' 25"	D.H. & W. IN WALL	0·87
M	201° 39' 35"	C.I. PIPE	0·565
N	240° 58'	C.I. PIPE	0·49
O	239° 20'	C.I. PIPE	0·505
	51° 32' 50"	IRON BOLT IN BITUMEN	
P	264° 35' 30"	C.I. PIPE	0·5
	264° 35' 30"	IRON BOLT IN BITUMEN	8·915
Q	76° 53' 35"	CONC. BLOCK	0·511
R	174° 10' 40"	SSM 53791	5
S	62° 44' 45"	CONC. BLOCK	0·502

This is sheet 1 of my plan in 2 sheets
(delete if inapplicable)

I, ROBERT GEORGE HANNA of BLACKTOWN,
a Surveyor registered under the Surveyors Act, 1929-1916, hereby certify that the survey represented in this plan is accurate and has been made by me in accordance with the Survey Practice Regulations, 1933, and the special requirements of the Department of Lands and was completed on 24-5-1988.

Signature Robert G. Hanna
Surveyor registered under the Surveyors Act, 1929-1916

17 - 11 - 88

ACCEPTED PLAN
(NOT CHECKED IN THE DEPT. OF LANDS)

SURVEYOR'S REFERENCE MN 82 H 1155

10	20	30	40	50	60	70 Table of mm	110	120	130	140

This negative is a photograph made as a permanent record of a document in the custody of the Registrar General this day. 15th December, 1988.

1

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

OFFICE USE ONLY A 297a

D P 727103

Registered: 12-12-1988

This is sheet 2 of my plan in 2 sheets dated 24th MARCH, 1988.

Robert G. Hanna

Surveyor registered under Surveyors Act 1929

DIAGRAM 4

DIAGRAM 5

REFERENCE TO TRAVERSE

LINE	BEARING	DIST
1	101° 38' 10"	99·22
2	104° 38' 10"	36·815
3	113° 38' 10"	18·77
4	130° 08' 10"	10·985
5	113° 52' 10"	15·015
6	151° 08' 10"	10·27
7	104° 46' 10"	11·71
8	81° 41' 10"	12·316
9	55° 30' 10"	6·86
10	30° 04' 20"	15·08
11	358° 27' 50"	22·37
12	5° 38' 10"	122·95
13	329° 22' 00"	11·775
14	351° 34' 10"	54·945
15	344° 23' 15"	36·555

POR. 1220

LOT 3 573·1 m²

WHITING BEACH RD.

LOT 1

LOT 2

LOT 4

POR. 1220

4810 - 3000

5791 m²

5790m²

DIAGRAMS REDUCTION RATIO 1:1000

LENGTHS ARE IN METRES

SURVEYOR'S REFERENCE MN 82 H 1155

2

10 20 30 40 50 60 70 Table of mm 110 120 130 140

This negative is a photograph made as a permanent record of a document in the custody of the Registrar General this day. 15th December, 1988.

PLAN FORM 3 | To be used in conjunction with Plan Form 2 | **WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION** | *OFFICE USE ONLY

D P 820325

Registered: SH 26-9-1991

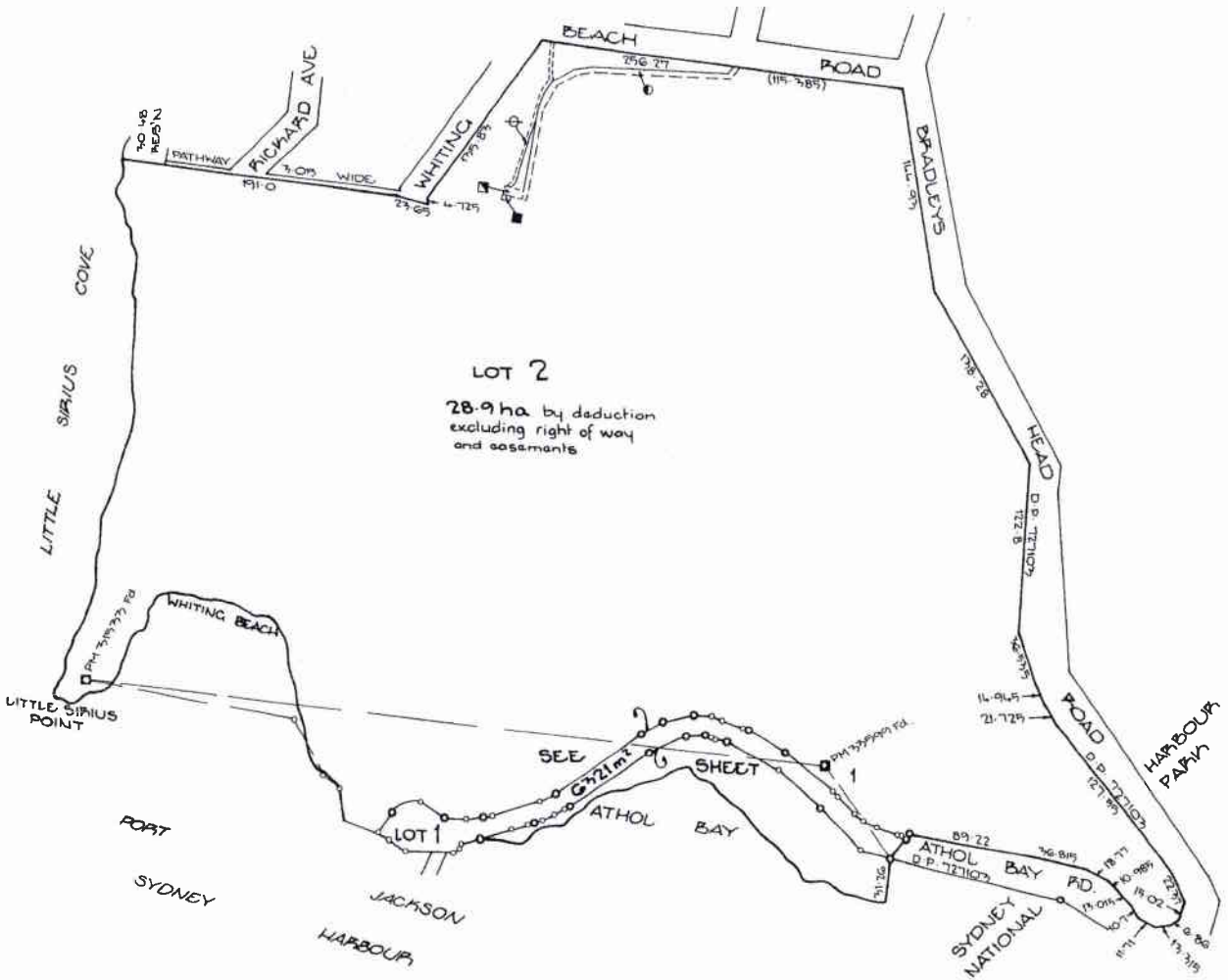
This is sheet 2 of my plan in 2 sheets dated

Surveyor registered under Surveyors Act 1929

This is sheet of the plan of sheets covered by this Certificate No. of

Council Clerk

For use where space is insufficient in any panel on Plan Form 2.



AREA BY DEDUCTION

PORTION 1220	+ 29·15 ha
PORTION 1209	+ 0·1242 ha
LOT 5 D.P. 727107	+ 0·7702 ha
PROPOSED ROAD LOT 1	− 0·6321 ha
S.C.C. SUBSTATION PREMISES (D.P. 491982)	− 0·0021 ha
RIGHT OF WAY	− 0·0888 ha
S.C.C. EASEMENT	− 0·0216 ha
	28·8998 ha ex R.O.W & E'MENTS

- RIGHT OF WAY 3·66 WIDE & VARIABLE – D.P. 491982
- EASEMENT FOR ELECTRICITY PURPOSES 2·0 WIDE
- RIGHT OF WAY & EASEMENT FOR ELECTRICITY PURPOSES 8·5 WIDE
- LOT 1 D.P. 491982 – SUBSTATION PREMISES No. L1791

REDUCTION RATIO: 1:2500

Reduction Ratio 1:

Plan Drawing only to appear in this space

SURVEYOR'S REFERENCE:

PLAN FORM 2

Plan Drawing only to appear in this space

SIGNATURE AND SEALS ONLY.

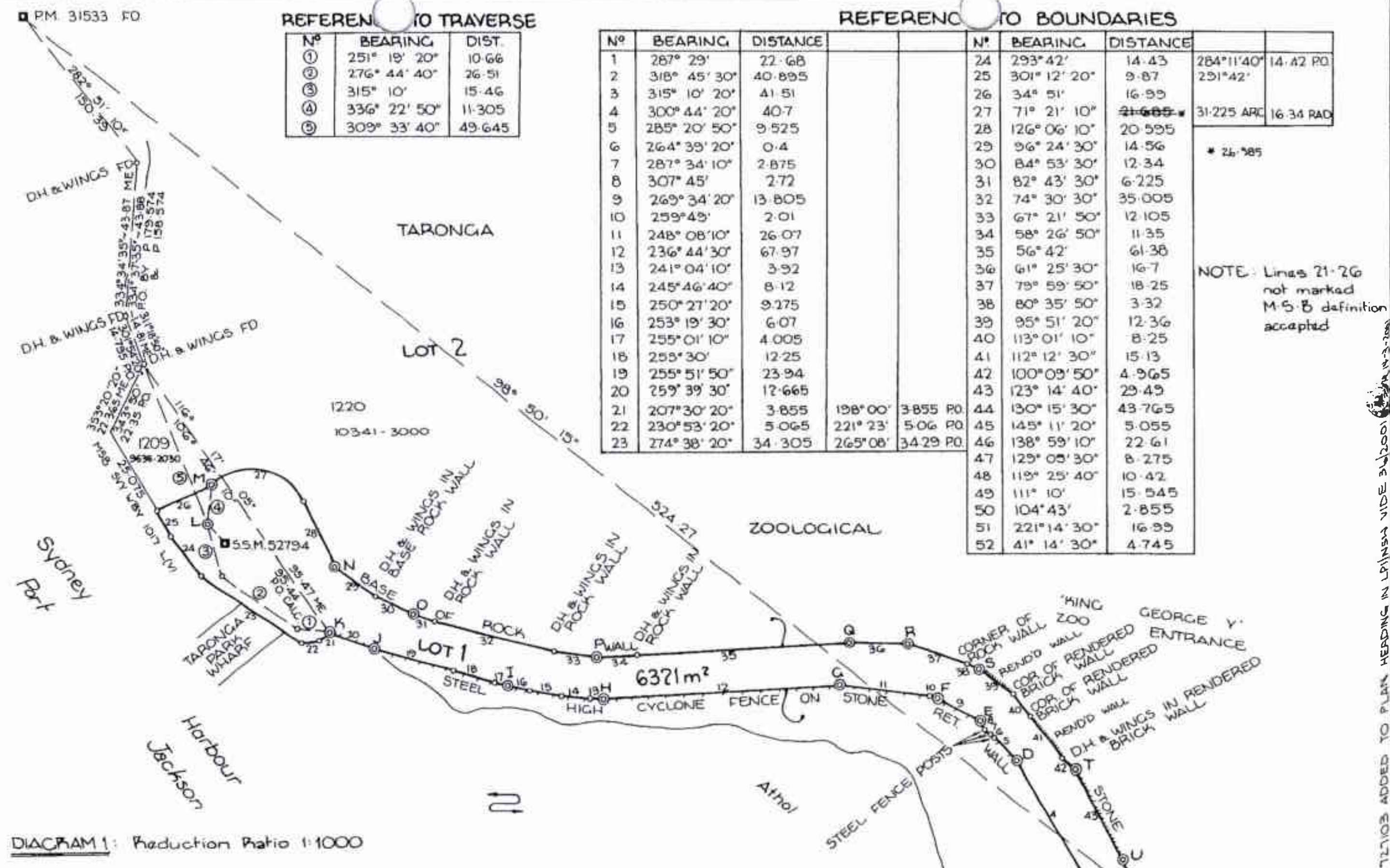


DIAGRAM 1: Reduction Ratio 1:1000

NOTE: Lines 21-26 not marked M.S.B. definition accepted

REFERENCE TO TRAVERSE

Nº	BEARING	DIST.
①	251° 19' 20"	10.66
②	276° 44' 40"	26.51
③	315° 10'	15.46
④	336° 22' 50"	11.305
⑤	309° 33' 40"	49.645

REFERENCE TO BOUNDARIES

Nº	BEARING	DISTANCE		
1	287° 29'	22.68		
2	318° 45' 30"	40.895		
3	315° 10' 20"	41.51		
4	300° 44' 20"	40.7		
5	285° 20' 50"	9.525		
6	264° 39' 20"	0.4		
7	287° 34' 10"	2.875		
8	307° 45'	2.72		
9	269° 34' 20"	13.805		
10	259° 45'	2.01		
11	248° 08' 10"	26.07		
12	236° 44' 30"	67.97		
13	241° 04' 10"	3.92		
14	245° 46' 40"	8.12		
15	250° 27' 20"	9.275		
16	253° 19' 30"	6.07		
17	255° 01' 10"	4.005		
18	255° 30'	12.25		
19	255° 51' 50"	23.94		
20	259° 39' 30"	12.665		
21	207° 30' 20"	3.855	198° 00'	3.855 PO
22	230° 53' 20"	5.065	221° 23'	5.06 PO
23	274° 38' 20"	34.305	265° 08'	34.29 PO

Nº	BEARING	DISTANCE		
24	293° 42'	14.43	284° 11' 40"	14.42 PO
25	301° 12' 20"	9.87	251° 42'	
26	34° 51'	16.99		
27	71° 21' 10"	~~21.685~~ *	31.225 ARC	16.34 RAD
28	126° 06' 10"	20.595		
29	96° 24' 30"	14.56		
30	84° 53' 30"	12.34		
31	82° 43' 30"	6.225		
32	74° 30' 30"	35.005		
33	67° 21' 50"	12.105		
34	58° 26' 50"	11.35		
35	56° 42'	61.38		
36	61° 25' 30"	16.7		
37	79° 59' 50"	18.25		
38	80° 35' 50"	3.32		
39	95° 51' 20"	12.36		
40	113° 01' 10"	8.25		
41	112° 12' 30"	15.13		
42	100° 09' 50"	4.965		
43	123° 14' 40"	29.49		
44	130° 15' 30"	43.765		
45	145° 11' 20"	5.055		
46	138° 59' 10"	22.61		
47	129° 09' 30"	8.275		
48	119° 25' 40"	10.42		
49	111° 10'	15.545		
50	104° 43'	2.855		
51	221° 14' 30"	16.99		
52	41° 14' 30"	4.745		

* 26.985

REFERENCE TO CORNERS

CORNER	BEARING	FROM	METRES
A	PEG FD	(D.P. 727103)	
	204° 19' 30"	R.M. CONC. BLOCK FD	0.505
B	PEG FD	(D.P. 727103)	
	221° 14' 25"	R.M. CONC. BLOCK FD	0.52
C	334° 06'	D.H & W FD IN STEP	3.645
D	STEEL FENCE POST ON CORNER		
	223° 45'	D.H & W IN PATH	1.43
E	STEEL FENCE POST ON CORNER		
	144° 01' 20"	D.H & W IN KERB	2.938
F	STEEL FENCE POST		
	142° 43' 20"	D.H & W IN KERB	2.53
G	STEEL FENCE POST		
	146° 22'	D.H & W IN KERB	1.67
H	STEEL FENCE POST		
	84° 10' 15"	D.H & W IN KERB	4.23
I	STEEL FENCE POST		
	136° 32' 20"	D.H & W IN KERB	1.96
J	STEEL FENCE POST		
	227° 25'	D.H & W IN KERB	3.32
K	D.H & W FD IN STONE RET'G WALL		
	85° 49' 20"	D.H & W IN WALL	1.64
L	D.H & W IN CONCRETE EDGING		
	288° 48' 30"	55M. 52794	7.285

COR.	BEARING	FROM	METRES
M	IRON BOLT IN BITUMEN 0.15 BELOW SURFACE		
	268° 48'	D.H & W IN KERB	0.775
N	D.H & W IN BASE OF ROCK CLIFF		
	53° 32'	D.H & W IN KERB	2.03
O	D.H & W IN CONCRETE		
	351° 54'	IRON BOLT IN BIT.	1.72
P	D.H & W IN ROCK WALL		
	350° 33'	IRON BOLT IN BIT.	1.675
Q	334° 05'	IRON BOLT IN BIT.	1.66
R	297° 47'	IRON BOLT IN BIT.	3.84
S	COR. RENDERED BRICK WALL		
	1° 47'	IRON BOLT IN BIT.	0.91
T	D.H & W IN WALL		
	10° 00'	IRON BOLT IN BIT.	1.57
U	COR. OF ROCK WALL		
	47° 57'	D.H & W IN COR. WALL	0.38
V	D.H & W IN ROCK		
	284° 43'	G.I. NAIL & W IN POWER POLE	2.31
W	41° 14' 30"	D.H & W IN WALL	0.87

Table of mm: 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 … 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360 370 380 390

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

Crown Lands Office Approval

PLAN APPROVED 3/9/91
Authorised Officer
Land District: METROPOLITAN
Paper No.: MN 82 H 1155
Field Book: LD 90/11 MN pages 17 – 54

Council Clerk's Certificate

I hereby certify that —
(a) the requirements of the Local Government Act, 1919 (other than the requirements for the registration of plans), and
*(b) the requirements of section 34B of the † Metropolitan Water, Sewerage and Drainage Act, 1924, as amended, † Hunter District Water, Sewerage, and Drainage Act, 1938, as amended
have been complied with by the applicant in relation to the proposed ....
(Insert "new road", "subdivision" or "consolidated lot") set out herein
Subdivision No. ....
Date ....
(Signature) ....
Council Clerk
Council File No. ....
*This part of certificate to be deleted where the application is only for a consolidated lot or the opening of a new road or where the land to be subdivided is wholly outside the areas of operations of the Metropolitan Water Sewerage and Drainage Board and the Hunter District Water Board.
† Delete if inapplicable.

SURVEYOR'S REFERENCE:

*OFFICE USE ONLY

DP 820325 (B)

N O O 2 R 2 A

Registered: [seal] SH 26.9.1991

C.A.

Title System: TORRENS

Purpose: PUBLIC ROADS ACT, 1902

Ref. Map: U1852-84 #, U1852-83 *, U1852-84 *

Last Plan:

PLAN OF SUBDIVISION OF PORTION 1220 & PORTION 1209 & LOT 5 IN D.P. 727103

Lengths are in metres. Reduction Ratio 1:1000

Mun./Shire/City: MOSMAN

Locality: ATHOL BAY

Parish: WILLOUGHBY Sht 4

County: CUMBERLAND

This is sheet 1 of my plan in 2 sheets

I, ROBERT GEORGE HANNA of M.L.O. BLACKTOWN
a surveyor registered under the Surveyors Act, 1929, as amended, hereby certify that the survey represented in this plan /Regarding lot 1 only/ is accurate and has been made in accordance with the Survey Practice Regulations, 1933 and any special requirements of the Department of Lands, and was completed on 28TH JULY 1988.

Signature: Robert G. Hanna
Surveyor registered under Surveyors Act, 1929, as amended.
Datum Line of Azimuth: A - B
\#Insert date of survey.

Plans used in preparation of survey/~~compilation~~:
9638-2030
10341-2030
D P 727103

PANEL FOR USE ONLY for statements of intention to dedicate public roads or to create public reserves, drainage reserves, easements or restrictions as to user.

LAND PROPOSED TO BE RESUMED FOR ROAD ~ LOT 1 (Gov. Gaz. 13th Sept. 1991)

LOT 5 DP727103 ADDED TO PLAN HEADING IN LPI/NSW VIDE 31/2001

PLAN AMENDED IN LTO SH 110492

DISTANCE LINE 27 AMENDED IN L.T.O. WITH SURVEYOR'S CONSENT VIDE 2113/97 23.10.1997

PLAN HEADING AMENDED IN LTO VIDE 183/95 20.3.1995

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LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE
10/11/2004 8:46PM

FOLIO: 5/727103

First Title(s): 5/727103
Prior Title(s): CROWN LAND

Recorded	Number	Type of Instrument	C.T. Issue
21/9/1992	DP822431	DEPOSITED PLAN	LOT RECORDED FOLIO NOT CREATED
25/9/1992	DP727103	DEPOSITED PLAN	FOLIO CREATED CT NOT ISSUED
27/10/1992	E850966	TRANSFER	EDITION 1
14/3/2001	7474587	DEPARTMENTAL DEALING	FOLIO CANCELLED

*** END OF SEARCH ***

zoo PRINTED ON 10/11/2004

No. 1973/1677

of New South Wales

12162084

Vol. 12162 Fol. 4
Registered 19-7-1973
Registrar General

GRANT OF LAND

(UNDER THE ZOOLOGICAL PARKS BOARD ACT, 1973)

ELIZABETH the SECOND, by the Grace of God of the United Kingdom, Australia and Her other Realms and Territories Queen, Head of the Commonwealth, Defender of the Faith:-

TO ALL to whom these Presents shall come, Greeting:-

WHEREAS by the Zoological Parks Board Act, 1973 it is provided (inter alia) that notwithstanding anything in the Crown Lands Consolidation Act, 1913 the Governor of Our State of New South Wales may grant any of the lands described in Schedules 3 and 4 to the said Zoological Parks Board Act, 1973 (being the lands hereinafter described and intended to be hereby granted) to the ZOOLOGICAL PARKS BOARD OF NEW SOUTH WALES the body corporate constituted under the said Zoological Parks Board Act, 1973 (hereinafter called the GRANTEE) for an estate in fee simple subject to such exceptions reservations and conditions as are specified in the Grant AND WHEREAS the said Zoological Parks Board Act, 1973 came into force on the fourth day of June 1973 NOW KNOW YE that in pursuance of the said Zoological Parks Board Act, 1973 WE HAVE GRANTED and for Us Our Heirs and Successors DO HEREBY GRANT unto the GRANTEE and its Assigns subject to the provisions of the said Zoological Parks Board Act, 1973 and to the exceptions reservations and conditions hereinafter contained ALL THAT parcel of land in Our said State containing by admeasurement twenty nine point one five hectares be the same more or less situated in the County of Cumberland Parish of Willoughby at Mosman Being Portion 1220 as shown in plan catalogued No. C.10341-2030 in the Department of Lands ALSO ALL THAT parcel of land containing by admeasurement one thousand two hundred and thirty nine square metres be the same more or less situated as aforesaid Being Portion 1209 as shown in plan catalogued No. C.9638-2030 in the Department of Lands As per plan on page 3 hereof with all Rights and Appurtenances whatsoever thereto belonging TO HOLD unto the GRANTEE and its Assigns for ever for the purposes of the said Zoological Parks Board Act, 1973 PROVIDED NEVERTHELESS AND WE DO HEREBY RESERVE AND EXCEPT unto Us Our Heirs and Successors all minerals which the said lands contain with full power and authority for Us Our Heirs and Successors and such person

(Page 1) Vol. 12162 Fol. 4

PERSONS ARE CAUTIONED AGAINST ALTERING OR ADDING TO THIS CERTIFICATE OR ANY NOTIFICATION HEREON

FOR ENDORSEMENTS SEE PAGE 4

or persons as shall from time to time be authorised by Us or Them to enter upon the said lands and to search for mine dig and remove the said minerals AND ALSO all such parts and so much of the said lands as may hereafter be required for public ways in over and through the same to be set out by Our Governor for the time being of Our said State or some person by him authorised in that respect with full power for Us Our Heirs and Successors and for Our Governor as aforesaid by such person or persons as shall be by Us Them or him authorised in that behalf to make and conduct all such public ways and the right of full and free ingress egress and regress into out of and upon the said lands for the several purposes aforesaid or any of them IN TESTIMONY WHEREOF We have caused this Our Grant to be Sealed with the Seal of Our said State

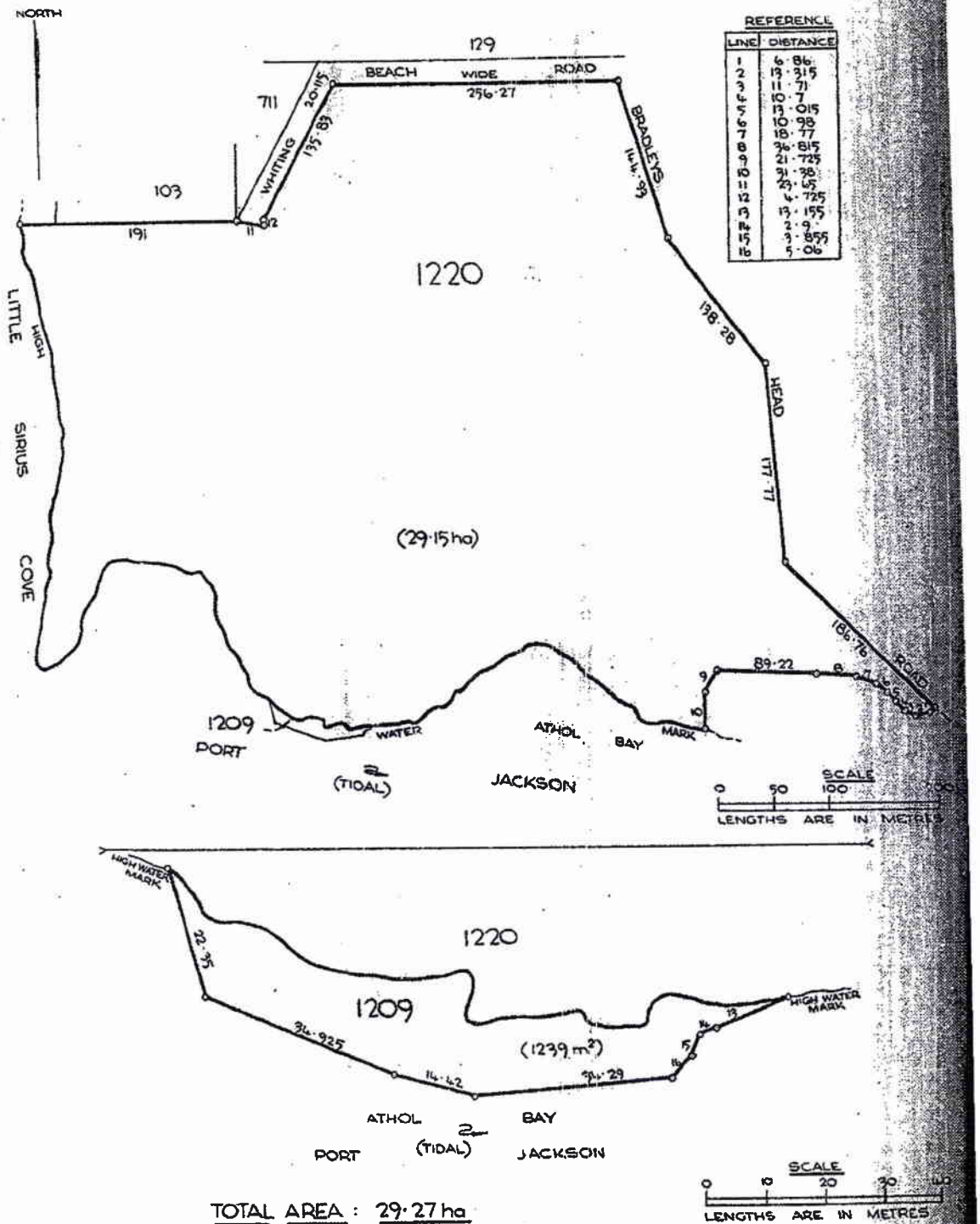
WITNESS Our Governor of Our State of New South Wales and its Dependencies in the Commonwealth of Australia, at Sydney in Our said State, this sixth day of July in the twenty second year of Our Reign and in the year of Our Lord one thousand nine hundred and seventy three

H. A. Cutler

Governor.

Vol. 1262 Fol. 4

PLAN REFERRED TO



REFERENCE

LINE	DISTANCE
1	6·86
2	13·315
3	11·71
4	10·7
5	13·015
6	10·98
7	18·77
8	36·815
9	21·725
10	31·38
11	23·45
12	4·725
13	13·155
14	2·9
15	3·855
16	5·06

TOTAL AREA : 29·27 ha

R 830 V. C. N. Blight, Government Printer.

SCHEDULE OF REGISTERED PROPRIETORS

REGISTERED PROPRIETOR	INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	ENTERED	Signature of Registrar General

OT6 13/79 R168149 Lease f50 ...

DP 820325R

SCHEDULE OF ENCUMBRANCES ETC.

	INSTRUMENT NATURE	INSTRUMENT NUMBER	INSTRUMENT DATE	PARTICULARS	ENTERED	Signature of Registrar General	CANCELLATION		
L	Lease	R168149P	—	of substation premises shown in plan with R168149 together with a Right of way and Easement for Electricity purposes over other parts of the land within described to the Sydney County Council. Date of Expiry 20-12-2034.	19-6-1979	[signature]			

NOTE: ENTRIES RULED THROUGH AND AUTHENTICATED BY THE SEAL OF THE REGISTRAR GENERAL ARE CANCELLED

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LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE
10/11/2004 8:46PM

FOLIO: 2/820325

First Title(s): VOL 12162 FOL 4
Prior Title(s): VOL 12162 FOL 4

Recorded	Number	Type of Instrument	C.T. Issue
26/9/1991	DP820325	DEPOSITED PLAN	LOT RECORDED FOLIO NOT CREATED
15/3/1995	O75284	APPLICATION	FOLIO CREATED CT NOT ISSUED
8/5/1995	O62051	DEPARTMENTAL DEALING	FOLIO CANCELLED
18/9/1997	3423995	DEPARTMENTAL DEALING	FOLIO CANCELLED
23/12/1999	6451883	DEPARTMENTAL DEALING	

*** END OF SEARCH ***

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LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE
10/11/2004 8:46PM

FOLIO: 22/843294

First Title(s): VOL 12162 FOL 4
Prior Title(s): 2/820325

Recorded	Number	Type of Instrument	C.T. Issue
6/12/1994	DP843294	DEPOSITED PLAN	LOT RECORDED FOLIO NOT CREATED
8/5/1995	062051	APPLICATION	FOLIO CREATED CT NOT ISSUED
18/9/1997	3423995	DEPARTMENTAL DEALING	
	PRIOR TITLES(S) AS AMENDED: 2/820325, 5/727103.		
14/3/2001	7474590	DEPARTMENTAL DEALING	

*** END OF SEARCH ***

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LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 22/843294

SEARCH DATE	TIME	EDITION NO	DATE
10/11/2004	8:45 PM	-	-

CERTIFICATE OF TITLE HAS NOT ISSUED

LAND

LOT 22 IN DEPOSITED PLAN 843294
AT ATHOL BAY
LOCAL GOVERNMENT AREA: MOSMAN
PARISH OF WILLOUGHBY COUNTY OF CUMBERLAND
TITLE DIAGRAM: DP843294

FIRST SCHEDULE

ZOOLOGICAL PARKS BOARD OF NEW SOUTH WALES

SECOND SCHEDULE (2 NOTIFICATIONS)

1. LAND EXCLUDES MINERALS AND IS SUBJECT TO RESERVATIONS AND CONDITIONS IN FAVOUR OF THE CROWN - SEE CROWN GRANT(S)
* 2. R168149 LEASE TO SYDNEY COUNTY COUNCIL OF SUBSTATION PREMISES NO. 4131 SHOWN IN DP451982. TOGETHER WITH A RIGHT OF WAY & EASEMENT FOR ELECTRICITY PURPOSES OVER ANOTHER PART OF THE LAND ABOVE DESCRIBED. EXPIRES 26.12.2024

NOTATIONS

NOTE: LODGED DEALINGS SHOULD BE ACCOMPANIED BY PRIOR CERTIFICATE OF TITLES VOL 12162 FOL 4 & 5/727103
UNREGISTERED DEALINGS: NIL

*** END OF SEARCH ***

Appendix D

Field Work Results

Sampling

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

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

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

Test Pits

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

Large Diameter Augers

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

Continuous Spiral Flight Augers

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

Non-core Rotary Drilling

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

Continuous Core Drilling

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

Standard Penetration Tests

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

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

The test results are reported in the following form.

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

  4,6,7
  N=13

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

  15, 30/40 mm

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

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

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

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

Description and Classification Methods

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

Soil Types

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

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

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

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

Definitions of grading terms used are:

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

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

In fine grained soils (>35% fines)

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

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

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

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

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

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

Soil Descriptions

Cohesive Soils

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

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

Cohesionless Soils

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

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

Soil Origin

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

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

Moisture Condition – Coarse Grained Soils

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

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

Moisture Condition – Fine Grained Soils

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

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

Rock Strength

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

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

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

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

Degree of Weathering

The degree of weathering of rock is classified as follows:

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

Rock Descriptions

Degree of Fracturing

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

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

Rock Quality Designation

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

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

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

Stratification Spacing

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

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

Symbols & Abbreviations

Douglas Partners

Introduction

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

Drilling or Excavation Methods

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

Water

▷	Water seep
▽	Water level

Sampling and Testing

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

Description of Defects in Rock

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

Defect Type

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

Orientation

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

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

Coating or Infilling Term

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

Coating Descriptor

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

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

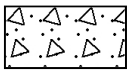
Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General


Asphalt


Road base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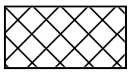
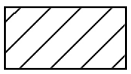
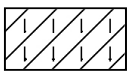

Filling

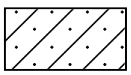
Soils


Topsoil

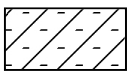

Peat

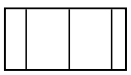

Clay

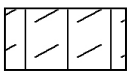

Silty clay

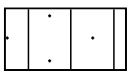

Sandy clay

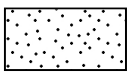

Gravelly clay

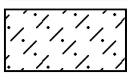

Shaly clay

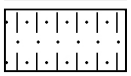

Silt


Clayey silt


Sandy silt

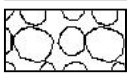

Sand

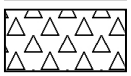

Clayey sand


Silty sand


Gravel

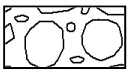

Sandy gravel


Cobbles, boulders

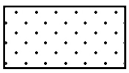

Talus

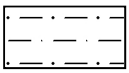
Sedimentary Rocks

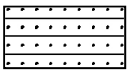

Boulder conglomerate

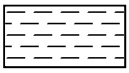

Conglomerate


Conglomeratic sandstone

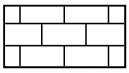

Sandstone


Siltstone

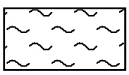

Laminite

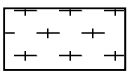

Mudstone, claystone, shale


Coal


Limestone

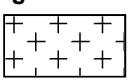
Metamorphic Rocks

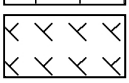

Slate, phyllite, schist

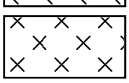

Gneiss

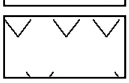

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: Taronga Conservation Society Australia
PROJECT: Reptile and Amphibian Project
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 52.7 AHD
EASTING: 337342
NORTHING: 6253797
DIP/AZIMUTH: 90°/--

BORE No: RA1
PROJECT No: 99931.00
DATE: 18/1/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
52	0.19	ASPHALTIC WEARING COURSE over CONCRETE										
		FILL/Gravelly SAND: fine, grey, fine sandstone gravel, with silt, trace ash, dry, apparently medium dense							A/E			PID<1 ppm
	0.7	FILL/Gravelly SAND: fine to medium, brown, fine sandstone gravel, trace silt, trace ash, dry, apparently medium dense							A/E*			PID<1 ppm
51	1								S/E			3,3,3 N = 6 PID<1 ppm
	1.6	FILL/SAND: fine to medium, orange, moist, apparently medium dense							A/E			PID<1 ppm
	2								A/E			PID<1 ppm
50	2.1	SANDSTONE: medium to coarse grained, red-brown, medium then high strength, moderately weathered, fractured, Hawkesbury Sandstone						2.3m: CORE LOSS: 130mm 2.58m: B0°,pl, ro, cly vn	C	68	68	PL(A) = 0.9
	2.43											PL(A) = 1.4
	3											PL(A) = 1.5
49	2.97	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, slightly fractured, Hawkesbury Sandstone						3.48m: B0°, pl, ro, cly co 1mm 3.88m: Ds, 20mm	C	100	99	
	4											
48		4.64m-4.74m: fine grained, medium to high strength band						4.74m: B0°, pl, ro, cly co 1mm				PL(A) = 0.7
	5											
47												PL(A) = 1.4
	6											
	6.0	SANDSTONE: medium grained, pale grey, high strength, fresh, slightly fractured, Hawkesbury Sandstone										
46	7							>>	C	100	100	PL(A) = 1.7
45												PL(A) = 1.4
	8											
44												PL(A) = 1.5
	9							9m: B0°, pl, ro, cly vn	C	100	97	PL(A) = 1.8
	9.34	SANDSTONE: *as below*						9.34m: J60°, cu, sm, cln 9.43m: B0°, pl, sm, cly co 5mm 9.54m: B0°, pl, sm, cly vn				PL(A) = 0.5 PL(A) = 1.1
43												

RIG: Hanjin D8 **DRILLER:** Hagstrom **LOGGED:** KR **CASING:** HQ to 2.1m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.10m, NMLC drilling to 12.00m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: *Blind duplicate taken at 0.8-1.0m (BD6/20210118).

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: Reptile and Amphibian Project
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 52.7 AHD
EASTING: 337342
NORTHING: 6253797
DIP/AZIMUTH: 90°/--

BORE No: RA1
PROJECT No: 99931.00
DATE: 18/1/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
42		SANDSTONE: medium grained with siltstone clasts and bands, pale grey and dark grey, high strength, fresh, slightly fractured, Hawkesbury Sandstone *(continued)*							C	100	97	PL(A) = 1.1
	10.63											
41	11	SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, slightly fractured, Hawkesbury Sandstone										PL(A) = 1.8
									C	100	100	
40	12 12.0	Bore discontinued at 12.0m - Target depth reached										
39	13											
38	14											
37	15											
36	16											
35	17											
34	18											
33	19											

RIG: Hanjin D8 **DRILLER:** Hagstrom **LOGGED:** KR **CASING:** HQ to 2.1m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.10m, NMLC drilling to 12.00m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: *Blind duplicate taken at 0.8-1.0m (BD6/20210118).

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: Reptile and Amphibian Project
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 52.6 AHD
EASTING: 337375
NORTHING: 6253801
DIP/AZIMUTH: 90°/--

BORE No: RA2
PROJECT No: 99931.00
DATE: 19/1/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
52	0.2	ASPHALTIC WEARING COURSE over CONCRETE										
		FILL/Silty SAND: fine, pale-brown, with sandstone gravel, trace ash, dry, apparently medium dense to dense							A/E			PID<1 ppm
	0.7											
51	1	FILL/SAND: fine, red-brown, with sandstone gravel, silt, trace ash, dry, apparently medium dense to dense							A/E*			PID<1 ppm
									S/E			4,5,6 N = 11
	1.3								A/E			PID<1 ppm
		FILL/SAND: fine to medium, brown, with sandstone gravel, ash, moist, apparently dense										PID<1 ppm
50	1.8								A/E			PID<1 ppm
	2											
	2.12	FILL/Silty SAND: fine to medium, dark brown, with clay, trace fine sandstone gravel, moist, apparently dense						2.23m: B0°, pl, ro, cln 2.27m: CORE LOSS: 30mm 2.37m: B5°, ir, ro, cly vn	C	92	63	PL(A) = 0.8
	2.27											
	2.3											
		SANDSTONE: medium to coarse grained, yellow-brown, medium to high strength, moderately weathered, fractured, Hawkesbury Sandstone										PL(A) = 0.8
49	3											
	3.52	2.23-2.27m: low strength band						3.29m: B0°, pl, ro, cly co 10mm 3.37m: Cs, 30mm				
		SANDSTONE: medium grained, pale grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone							C	100	96	PL(A) = 1.4
	4							4.13m: B0°, pl, ro, cly co 2mm 4.14m: B0°, pl, ro, cly co 2mm 4.7m: B0°, pl, ro, fe stn				
48	5											
47	6											PL(A) = 1
									C	100	99	PL(A) = 1.1
46	7											PL(A) = 1.5
								7.76m: Ds, 40mm				
45	8											PL(A) = 1.3
44	9								C	100	98	
								9.31m: B0°, pl, ro, cly co 5mm 9.35m: B0°, pl, ro, cly co 10mm				PL(A) = 1.7
43												

RIG: Hanjin D8 **DRILLER:** Hagstrom **LOGGED:** KR **CASING:** HQ to 2.1m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.12m, NMLC drilling to 11.55m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: *Blind duplicate taken at 0.8-1.0m (BD7/20210119).

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: Reptile and Amphibian Project
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 52.6 AHD
EASTING: 337375
NORTHING: 6253801
DIP/AZIMUTH: 90°/--

BORE No: RA2
PROJECT No: 99931.00
DATE: 19/1/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
42	11	SANDSTONE: medium grained, pale grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone *(continued)*							C	100	98	PL(A) = 1.7 PL(A) = 1.5
41	11.55	Bore discontinued at 11.55m - Target depth reached										
41	12											
40	13											
39	14											
38	15											
37	16											
36	17											
35	18											
34	19											
33												

RIG: Hanjin D8 **DRILLER:** Hagstrom **LOGGED:** KR **CASING:** HQ to 2.1m

TYPE OF BORING: Solid flight auger (TC-bit) to 2.12m, NMLC drilling to 11.55m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: *Blind duplicate taken at 0.8-1.0m (BD7/20210119).

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: Reptile and Amphibian Project
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 45.6 AHD
EASTING: 337359
NORTHING: 6253777
DIP/AZIMUTH: 90°/--

BORE No: RA3
PROJECT No: 99931.00
DATE: 20/1/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
45	0.05	SYNTHETIC GRASS AND FOAM							A/E*			PID<1 ppm
	0.2	FILL/Gravelly SAND: fine to medium, yellow-brown, fine igneous gravel, moist							A/E			PID<1 ppm
	0.5	FILL/Clayey SAND: fine to medium, dark brown, with silt, moist, apparently medium dense							A/E*			PID<1 ppm
1	1.1	FILL/Silty CLAY: low to medium plasticity, pale grey mottled pale yellow, with fine sand, w~PL, apparently stiff Below 1.0m: w>PL							A/E S			PID<1 ppm 1/100,B refusal
44								1.21m: B0°, pl, ro, cly co 5mm				PID<1 ppm
2	2.11	SANDSTONE: medium to coarse grained, red-brown, medium to high strength, moderately weathered, unbroken, Hawkesbury Sandstone							C	100	100	PL(A) = 1 PL(A) = 1.2
43		SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, slightly fractured, Hawkesbury Sandstone						2.83m: Cs, 30mm 3.03m: B0° pl, ro, cly co 5mm				PL(A) = 1.5
3												
42		3.86-3.96m: siltstone clasts						3.99m: B0°, pl, ro, cly co 2mm	C	100	100	
4												PL(A) = 1.7
41												PL(A) = 2.2
5												
40	5.54	Bore discontinued at 5.54m - Target depth reached										
6												
39												
7												
38												
8												
37												
9												
36												

RIG: Hanjin D8 **DRILLER:** Hagstrom **LOGGED:** KR **CASING:** HQ to 1.1m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.10m, NMLC drilling to 5.54m

WATER OBSERVATIONS: Clayey fill moisture content greater than plastic limit below 1.0m depth

REMARKS: *Blind duplicates taken at 0.1-0.2m (BD8/20210120) and 0.5-0.6m (BD9/20210120)

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: Reptile and Amphibian Project
LOCATION: Bradleys Head Road, Mosman

SURFACE LEVEL: 45.8 AHD
EASTING: 337375
NORTHING: 6253780
DIP/AZIMUTH: 90°/--

BORE No: RA4
PROJECT No: 99931.00
DATE: 19/1/2021
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
45	0.05	PAVERS										
	0.1											
	0.2	FILL/SAND: fine to medium, orange, moist							A/E*			PID<1 ppm
	0.3								A/E			PID<1 ppm
	0.6	CONCRETE										
		FILL/SAND: fine to medium, grey, with fine igneous gravel, moist										
1	1.05	FILL/Clayey SAND: fine to medium, dark brown, with silt, moist							A/E			PID<1 ppm
									S			3/5,B refusal
		FILL/Silty CLAY: low to medium plasticity, pale grey mottled pale yellow, with fine sand, w~PL, apparently stiff										PID<1 ppm
44	1.91											PL(A) = 0.9
2		SANDSTONE: medium to coarse grained, red-brown, medium to high strength, moderately weathered, unbroken, Hawkesbury Sandstone										PL(A) = 0.9
									C	100	100	
												PL(A) = 1.4
												PL(A) = 1
43								2.62m: B0°, pl, ro, cly co 5mm				
3		SANDSTONE: medium to coarse grained, pale grey, high strength, fresh, slightly fractured, Hawkesbury Sandstone										
42												PL(A) = 1.4
4									C	100	100	
								4.22m: B0°, pl, ro, cly co 1mm				
												PL(A) = 1.6
41												
5												PL(A) = 0.9
	5.52	5.39-5.52m: massive sandstone, very high strength										PL(A) = 5.9
40		Bore discontinued at 5.52m - Target depth reached										
6												
39												
7												
38												
8												
37												
9												
36												

RIG: Hanjin D8 **DRILLER:** Hagstrom **LOGGED:** KR **CASING:** HQ to 1.0m

TYPE OF BORING: Solid flight auger (TC-bit) to 1.05m, NMLC drilling to 5.52m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: *No sample taken for asbestos testing at 0.2-0.3m.

SAMPLING & IN SITU TESTING LEGEND

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

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Appendix E

Laboratory Test Results

Table E1: Contaminant Concentrations in Soil

Sample/ Depth (m)	B	T	E	X	F1	F2	+PAH	B.TEQ	B(a)P	+OCP	+OPP	+PCB	Asbestos	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	(Y/N)	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
RA1 0.2-0.4	<0.2	<0.5	<1	<3	<25	<50	46	9.2	6.4	NIL	NIL	NIL	N	<4	<0.4	8	43	5	0.4	8	18
RA1 0.8-1.0	<0.2	<0.5	<1	<3	<25	<50	0.2	<0.5	0.1	NT	NT	NT	N	<4	<0.4	9	<1	3	<0.1	<1	5
RA1 1.4-1.5	<0.2	<0.5	<1	<3	<25	<50	3.1	0.6	0.4	NT	NT	NT	N	<4	<0.4	9	4	9	<0.1	2	14
RA2 0.3-0.5	<0.2	<0.5	<1	<3	<25	<50	4.2	1	0.68	NIL	NIL	NIL	N	<4	<0.4	8	4	10	0.1	2	13
RA2 0.8-1.0	<0.2	<0.5	<1	<3	<25	<50	1.2	<0.5	0.2	NT	NT	NT	N	<4	<0.4	16	1	8	<0.1	2	9
RA2 1.9-2.0	<0.2	<0.5	<1	<3	<25	<50	<0.05	<0.5	<0.05	NT	NT	NT	N	<4	<0.4	3	<1	4	<0.1	<1	2
RA3 0.4-0.5	<0.2	<0.5	<1	<3	<25	<50	0.3	<0.5	0.08	NIL	NIL	NIL	N	<4	<0.4	8	3	25	<0.1	1	22
RA3 0.5-0.6	<0.2	<0.5	<1	<3	<25	<50	<0.05	<0.5	<0.05	NT	NT	NT	N	<4	<0.4	9	<1	120	<0.1	<1	7
RA3 0.9-1.0	<0.2	<0.5	<1	<3	<25	<50	<0.05	<0.5	<0.05	NIL	NIL	NIL	N	<4	<0.4	11	4	7	<0.1	<1	11
RA4 0.2-0.3	<0.2	<0.5	<1	<3	<25	53	0.85	<0.5	0.1	NT	NT	NT	N	<4	<0.4	11	20	19	<0.1	8	37
RA4 0.3-0.5	<0.2	<0.5	<1	<3	<25	<50	1.2	<0.5	0.2	NIL	NIL	NIL	N	<4	<0.4	8	8	19	<0.1	4	74
RA4 0.9-1.0	<0.2	<0.5	<1	<3	<25	<50	<0.05	<0.5	<0.05	NIL	NIL	NIL	N	<4	<0.4	6	1	7	<0.1	<1	12
BD7/20210119 -							24	3.7	2.6					<4	<0.4	8	24	43	<0.1	5	78
BD9/20210120							<0.5	1.2	<0.5					<5	<1	13	<5	6	<0.1	<2	5
TS -	102%	98%	100%																		
TB -	<0.2	<0.5	<1	<3	<25																

Notes: B = Benzene; T = Toluene; E = Ethylbenzene; X = Xylene; Napth. = Naphthalene; F1 = (C_6 – C_{10}) – BTEX; F2 = (C_{11} – C_{16}) – Naphthalene; +PAH = Positive polycyclic aromatic hydrocarbons; B.TEQ = Carcinogenic PAHs (as B(a)P TEQ); B(a)P = Benzo(a)pyrene
OCP = Organochlorine pesticides; OPP = Organophosphorus pesticides; PCB = Polychlorinated biphenyls; As = Arsenic; Cd = Cadmium; Cr = Chromium; Cu = Copper; Pb = Lead; Hg = Mercury; Ni = Nickel; Zn = Zinc; NIL = below detection limits
NT = not tested; NA = not applicable

Table E2: Toxicity Characteristic Leaching Procedure Testing Results

Sample/ Depth (m)							+PAH		B(a)P									Pb			
							mg/L		mg/L									mg/L			
RA1 0.2-0.4							NIL(+)VE		<0.001												
RA3 0.5-0.6																		<0.03			

Table E3: NEPM Investigation/Screening Levels[1]

Sample/ Depth (m)	B	T	E	X	F1	F2	+PAH	B.TEQ	B(a)P	+OCP	+OPP	+PCB	Asbestos	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	(Y/N)	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Health-Based[1]	3			230	260		300	3		Various	Various	1		300	90	300	17000	600	80	1200	30000
Ecological-Based[2]	50	85	70	105	180	120			20					100		400	190	1100		170	400
Management Limit					700	1000															

Notes: B = Benzene; T = Toluene; E = Ethylbenzene; X = Xylene; Napth. = Naphthalene; F1 = (C_6 – C_{10}) – BTEX; F2 = (C_{11} – C_{16}) – Naphthalene; +PAH = Positive polycyclic aromatic hydrocarbons; B.TEQ = Carcinogenic PAHs (as B(a)P TEQ); B(a)P = Benzo(a)pyrene
OCP = Organochlorine pesticides; OPP = Organophosphorus pesticides; PCB = Polychlorinated biphenyls; As = Arsenic; Cd = Cadmium; Cr = Chromium; Cu = Copper; Pb = Lead; Hg = Mercury; Ni = Nickel; Zn = Zinc;
[1]Based on National Environment Protect (Assessment of Site Contamination) Measure 1999 (updated 2013) for the lesser of 'C' public open space or 'D' commercial and industrial sites, assumed sandy soil with > 10% clay content, pH or 6.0 and CEC of 10 cmol/kg
[2]Based on advice in CRC Care Technical Report no. 39

Table E4: Waste Classification Criteria[1]

Sample/ Depth (m)	B	T	E	X	C_6-C_9	C_{10}-C_{36}	+PAH	B.TEQ	B(a)P	+OCP[2]	+OPP[2]	+PCB	Asbestos	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	(Y/N)	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
General Solid Waste																					
CT1	10	288	600	1000	650	10000	200	N/A	0.8	<50	<50	<50	N	100	20	100	N/A	100	4	40	N/A
SCC1	18	518	1080	1800	650	10000	200	N/A	10	<50	<50	<50	N	500	100	1900	N/A	1500	50	1050	N/A
TCLP1 (mg/L)	0.5	14.4	30	50	N/A	N/A	N/A	N/A	0.04	N/A	N/A	N/A	N/A	5	1	5	N/A	5	0.2	2	N/A

Notes: B = Benzene; T = Toluene; E = Ethylbenzene; X = Xylene; C_6 – C_9 TRH; C_{10} – C_{36} TRH; +PAH = Positive polycyclic aromatic hydrocarbons; B.TEQ = Carcinogenic PAHs (as B(a)P TEQ); OCP = Organochlorine pesticides; OPP = Organophosphorus pesticides; PCB = Polychlorinated biphenyls; As = Arsenic; Cd = Cadmium; Cr = Chromium; Cu = Copper; Pb = Lead; Hg = Mercury; Ni = Nickel; Zn = Zinc; N/A = not applicable
[1]Based on Waste Classification Guidelines (NSW EPA, 2014); [2]As part of Scheduled Chemicals

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CHAIN OF CUSTODY DESPATCH SHEET

Updated CoC 22/01/2021 13:26.

Project No:	99931.00	**Suburb:**	Mosman	**To:**	EnviroLab
Project Name:	Taronga Zoo, Reptile and Amphibian	**Order Number**			12 Ashley Street, Chatswood 2067
Project Manager:	Sam Balian	**Sampler:**	KR	**Attn:**	Aileen Hie
Emails:	Sam.Balian@douglaspartners.com.au			**Phone:**	(02) 9910 6200
Date Required:	Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ **Standard** ☐			**Email:**	Ahie@envirolab.com.au
Prior Storage:	☐ **Esky** ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	**Yes** ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)		

Sample ID	Lab ID	Date Sampled	Sample Type (S - soil W - water)	Container Type (G - glass P - plastic)	Analytes: Combo 8	Combo 3a	Asb ID	metals	PAH	BTEX	Asbestos NEPM	pH, CEC, iron, TOC	Aggressivity	Notes/preservation
RA1/0.2-0.4	1	18/01/21	S	G/P	X						X			
RA1/0.8-1.0	2	18/01/21	S	G/P		X								
RA1/1.4-1.5	3	18/01/21	S	G/P		X						X		
RA2/0.3-0.5	4	19/01/21	S	G/P	X						X			
RA2/0.8-1.0	5	19/01/21	S	G/P		X								
RA2/1.9-2.0	6	19/01/21	S	G/P		X								
RA3/0.4-0.5	7	20/01/21	S	G/P	X						X			
RA3/0.5-0.6	8	20/01/21	S	G/P		X						X		
RA3/0.9-1.0	9	20/01/21	S	G/P	X						X		X	
RA4/0.2-0.3*	10	19/01/21	S	G/P	→	X					↓			
RA4/0.3-0.5*	11	19/01/21	S	G/P	X ←						X			
RA4/0.9-1.0	12	19/01/21	S	G/P	X						X		X	
BD9/20210120	ALS	20/01/21	S	G										*please send BD9/20210120
BD7/20210119	13	19/01/21	S	G				X	X					to ALS for interlab
TS	14									X				analysis of metals and
TB	15									X				PAH
PQL (S) mg/kg														ANZECC PQLs req'd for all water analytes ☐

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No: 260040

Total number of samples in container: 23 **Relinquished by:** AS **Transported to laboratory by:** Courier

Send Results to: Douglas Partners Pty Ltd **Address** **Phone:** **Fax:**

Signed: **Received by:** **Date & Time:**

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY DESPATCH SHEET

Project No:	99931.00	**Suburb:**	Mosman	**To:**	EnviroLab
Project Name:	Taronga Zoo, Reptile and Amphibian	**Order Number**			12 Ashley Street, Chatswood 2067
Project Manager:	Sam Balian	**Sampler:**	KR	**Attn:**	Aileen Hie
Emails:	Sam.Balian@douglaspartners.com.au			**Phone:**	(02) 9910 6200
Date Required:	Same day ☐ 24 hours ☐ 48 hours ☐ 72 hours ☐ **Standard** ☐			**Email:**	Ahie@envirolab.com.au
Prior Storage:	☐ **Esky** ☐ Fridge ☐ Shelved	Do samples contain 'potential' HBM?	**Yes** ☐ No ☐ (If YES, then handle, transport and store in accordance with FPM HAZID)		

Sample ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 8	Combo 3a	Asb ID	metals	PAH	BTEX	Asbestos NEPM	pH, CEC, iron, TOC	Aggressivity	Notes/preservation
RA1/0.2-0.4	1	18/01/21	S	G/P	X						X			
RA1/0.8-1.0	2	18/01/21	S	G/P		X								
RA1/1.4-1.5	3	18/01/21	S	G/P		X						X		
RA2/0.3-0.5	4	19/01/21	S	G/P	X						X			
RA2/0.8-1.0	5	19/01/21	S	G/P		X								
RA2/1.9-2.0	6	19/01/21	S	G/P		X								
RA3/0.4-0.5	7	20/01/21	S	G/P	X						X			
RA3/0.5-0.6	8	20/01/21	S	G/P		X						X		
RA3/0.9-1.0	9	20/01/21	S	G/P	X						X		X	
RA4/0.2-0.3	10	19/01/21	S	G/P	X						X			
RA4/0.3-0.5	11	19/01/21	S	G/P		X								
RA4/0.9-1.0	12	19/01/21	S	G/P	X						X		X	
BD9/20210120	ALS	20/01/21	S	G										*please send BD9/20210120
BD7/20210119	13	19/01/21	S	G				X	X					to ALS for interlab
TS	14									X				analysis of metals and
TB	15									X				PAH
PQL (S) mg/kg												**ANZECC PQLs req'd for all water analytes** ☐		

PQL = practical quantitation limit. If none given, default to Laboratory Method Detection Limit

Metals to Analyse: 8HM unless specified here:

Lab Report/Reference No:

Total number of samples in container: 23 **Relinquished by:** AS **Transported to laboratory by:** Courier

Send Results to: Douglas Partners Pty Ltd **Address** **Phone:** **Fax:**

Signed: **Received by:** **Date & Time:** 21/01/21 16.40

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

Job No: 260070
Date Received: 21/01/21
Time Received: 16.40
Received By:
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

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

CERTIFICATE OF ANALYSIS 260040

Client Details

Client	Douglas Partners Pty Ltd
Attention	Sam Balian
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**99931.00, Taronga Zoo Reptile and Amphibian**
Number of Samples	15 SOIL
Date samples received	21/01/2021
Date completed instructions received	22/01/2021

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	29/01/2021
Date of Issue	29/01/2021

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Asbestos Approved By
Analysed by Asbestos Approved Identifier: Nyovan Moonean
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Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		260040-1	260040-2	260040-3	260040-4	260040-5
Your Reference	UNITS	RA1	RA1	RA1	RA2	RA2
Depth		0.2-0.4	0.8-1.0	1.4-1.5	0.3-0.5	0.8-1.0
Date Sampled		18/01/2021	18/01/2021	18/01/2021	19/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	29/01/2021	29/01/2021	29/01/2021	29/01/2021	29/01/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_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
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	82	83	81	83	81

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		260040-6	260040-7	260040-8	260040-9	260040-10
Your Reference	UNITS	RA2	RA3	RA3	RA3	RA4
Depth		1.9-2.0	0.4-0.5	0.5-0.6	0.9-1.0	0.2-0.3
Date Sampled		19/01/2021	20/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	29/01/2021	29/01/2021	29/01/2021	29/01/2021	29/01/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_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
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	81	73	76	71	88

vTRH(C6-C10)/BTEXN in Soil					
Our Reference		260040-11	260040-12	260040-14	260040-15
Your Reference	UNITS	RA4	RA4	TS	TB
Depth		0.3-0.5	0.9-1.0	-	-
Date Sampled		19/01/2021	19/01/2021	19/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	29/01/2021	29/01/2021	29/01/2021	29/01/2021
TRH C_6 - C_9	mg/kg	<25	<25	[NA]	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	[NA]	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	[NA]	<25
Benzene	mg/kg	<0.2	<0.2	102%	<0.2
Toluene	mg/kg	<0.5	<0.5	98%	<0.5
Ethylbenzene	mg/kg	<1	<1	100%	<1
m+p-xylene	mg/kg	<2	<2	99%	<2
o-Xylene	mg/kg	<1	<1	100%	<1
naphthalene	mg/kg	<1	<1	[NA]	<1
Total +ve Xylenes	mg/kg	<3	<3	[NA]	<3
Surrogate aaa-Trifluorotoluene	%	86	88	101	86

svTRH (C10-C40) in Soil						
Our Reference		260040-1	260040-2	260040-3	260040-4	260040-5
Your Reference	UNITS	RA1	RA1	RA1	RA2	RA2
Depth		0.2-0.4	0.8-1.0	1.4-1.5	0.3-0.5	0.8-1.0
Date Sampled		18/01/2021	18/01/2021	18/01/2021	19/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	350	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	230	<100	<100	<100	<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	550	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	220	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	770	<50	<50	<50	<50
Surrogate o-Terphenyl	%	96	90	88	87	90

svTRH (C10-C40) in Soil						
Our Reference		260040-6	260040-7	260040-8	260040-9	260040-10
Your Reference	UNITS	RA2	RA3	RA3	RA3	RA4
Depth		1.9-2.0	0.4-0.5	0.5-0.6	0.9-1.0	0.2-0.3
Date Sampled		19/01/2021	20/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	120
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	53
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	53
TRH >C_{16} -C_{34}	mg/kg	120	<100	<100	<100	140
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	120	<50	<50	<50	200
Surrogate o-Terphenyl	%	88	89	88	93	90

svTRH (C10-C40) in Soil			
Our Reference		260040-11	260040-12
Your Reference	UNITS	RA4	RA4
Depth		0.3-0.5	0.9-1.0
Date Sampled		19/01/2021	19/01/2021
Type of sample		SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	89	86

PAHs in Soil						
Our Reference		260040-1	260040-2	260040-3	260040-4	260040-5
Your Reference	UNITS	RA1	RA1	RA1	RA2	RA2
Depth		0.2-0.4	0.8-1.0	1.4-1.5	0.3-0.5	0.8-1.0
Date Sampled		18/01/2021	18/01/2021	18/01/2021	19/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.4	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.7	<0.1	0.2	<0.1	<0.1
Anthracene	mg/kg	0.5	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	4.6	<0.1	0.4	0.4	0.1
Pyrene	mg/kg	5.8	<0.1	0.4	0.5	0.1
Benzo(a)anthracene	mg/kg	4.2	<0.1	0.3	0.4	0.1
Chrysene	mg/kg	3.8	<0.1	0.2	0.3	0.1
Benzo(b,j+k)fluoranthene	mg/kg	10	<0.2	0.6	1	0.3
Benzo(a)pyrene	mg/kg	6.4	0.1	0.4	0.68	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	3.7	<0.1	0.2	0.4	0.1
Dibenzo(a,h)anthracene	mg/kg	0.9	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	5.0	0.1	0.3	0.5	0.1
Total +ve PAH's	mg/kg	46	0.2	3.1	4.2	1.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	9.2	<0.5	<0.5	0.9	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	9.2	<0.5	0.5	0.9	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	9.2	<0.5	0.6	1	<0.5
Surrogate p-Terphenyl-d14	%	103	102	103	101	101

PAHs in Soil						
Our Reference		260040-6	260040-7	260040-8	260040-9	260040-10
Your Reference	UNITS	RA2	RA3	RA3	RA3	RA4
Depth		1.9-2.0	0.4-0.5	0.5-0.6	0.9-1.0	0.2-0.3
Date Sampled		19/01/2021	20/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	0.1	<0.1	<0.1	0.2
Pyrene	mg/kg	<0.1	0.1	<0.1	<0.1	0.2
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.08	<0.05	<0.05	0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Total +ve PAH's	mg/kg	<0.05	0.3	<0.05	<0.05	0.85
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	97	99	98	102	85

PAHs in Soil				
Our Reference		260040-11	260040-12	260040-13
Your Reference	UNITS	RA4	RA4	BD7/20210119
Depth		0.3-0.5	0.9-1.0	-
Date Sampled		19/01/2021	19/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.4
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	1.1
Anthracene	mg/kg	<0.1	<0.1	0.4
Fluoranthene	mg/kg	0.2	<0.1	4.1
Pyrene	mg/kg	0.2	<0.1	3.9
Benzo(a)anthracene	mg/kg	0.1	<0.1	2.3
Chrysene	mg/kg	0.1	<0.1	2.1
Benzo(b,j+k)fluoranthene	mg/kg	0.3	<0.2	4.2
Benzo(a)pyrene	mg/kg	0.2	<0.05	2.6
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	1.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	0.3
Benzo(g,h,i)perylene	mg/kg	0.1	<0.1	1.5
Total +ve PAH's	mg/kg	1.2	<0.05	24
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	3.7
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	3.7
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	3.7
Surrogate p-Terphenyl-d14	%	97	99	101

Organochlorine Pesticides in soil						
Our Reference		260040-1	260040-4	260040-7	260040-9	260040-11
Your Reference	UNITS	RA1	RA2	RA3	RA3	RA4
Depth		0.2-0.4	0.3-0.5	0.4-0.5	0.9-1.0	0.3-0.5
Date Sampled		18/01/2021	19/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
HCB	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
gamma-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	<0.1	<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
Endosulfan II	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
Endrin Aldehyde	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
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
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	108	108	107	111	104

Organochlorine Pesticides in soil		
Our Reference		260040-12
Your Reference	UNITS	RA4
Depth		0.9-1.0
Date Sampled		19/01/2021
Type of sample		SOIL
Date extracted	-	27/01/2021
Date analysed	-	28/01/2021
alpha-BHC	mg/kg	<0.1
HCB	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	107

Organophosphorus Pesticides in Soil						
Our Reference		260040-1	260040-4	260040-7	260040-9	260040-11
Your Reference	UNITS	RA1	RA2	RA3	RA3	RA4
Depth		0.2-0.4	0.3-0.5	0.4-0.5	0.9-1.0	0.3-0.5
Date Sampled		18/01/2021	19/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	108	108	107	111	104

Organophosphorus Pesticides in Soil		
Our Reference		260040-12
Your Reference	UNITS	RA4
Depth		0.9-1.0
Date Sampled		19/01/2021
Type of sample		SOIL
Date extracted	-	27/01/2021
Date analysed	-	28/01/2021
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Parathion	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Ethion	mg/kg	<0.1
Azinphos-methyl (Guthion)	mg/kg	<0.1
Surrogate TCMX	%	107

PCBs in Soil						
Our Reference		260040-1	260040-4	260040-7	260040-9	260040-11
Your Reference	UNITS	RA1	RA2	RA3	RA3	RA4
Depth		0.2-0.4	0.3-0.5	0.4-0.5	0.9-1.0	0.3-0.5
Date Sampled		18/01/2021	19/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	108	108	107	111	104

PCBs in Soil		
Our Reference		260040-12
Your Reference	UNITS	RA4
Depth		0.9-1.0
Date Sampled		19/01/2021
Type of sample		SOIL
Date extracted	-	27/01/2021
Date analysed	-	28/01/2021
Aroclor 1016	mg/kg	<0.1
Aroclor 1221	mg/kg	<0.1
Aroclor 1232	mg/kg	<0.1
Aroclor 1242	mg/kg	<0.1
Aroclor 1248	mg/kg	<0.1
Aroclor 1254	mg/kg	<0.1
Aroclor 1260	mg/kg	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1
Surrogate TCMX	%	107

Acid Extractable metals in soil						
Our Reference		260040-1	260040-2	260040-3	260040-4	260040-5
Your Reference	UNITS	RA1	RA1	RA1	RA2	RA2
Depth		0.2-0.4	0.8-1.0	1.4-1.5	0.3-0.5	0.8-1.0
Date Sampled		18/01/2021	18/01/2021	18/01/2021	19/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	8	9	9	8	16
Copper	mg/kg	43	<1	4	4	1
Lead	mg/kg	5	3	9	10	8
Mercury	mg/kg	0.4	<0.1	<0.1	0.1	<0.1
Nickel	mg/kg	8	<1	2	2	2
Zinc	mg/kg	18	5	14	13	9
Iron	mg/kg	[NA]	[NA]	7,200	[NA]	[NA]

Acid Extractable metals in soil						
Our Reference		260040-6	260040-7	260040-8	260040-9	260040-10
Your Reference	UNITS	RA2	RA3	RA3	RA3	RA4
Depth		1.9-2.0	0.4-0.5	0.5-0.6	0.9-1.0	0.2-0.3
Date Sampled		19/01/2021	20/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Arsenic	mg/kg	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	3	8	9	11	11
Copper	mg/kg	<1	3	<1	4	20
Lead	mg/kg	4	25	120	7	19
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	1	<1	<1	8
Zinc	mg/kg	2	22	7	11	37
Iron	mg/kg	[NA]	[NA]	14,000	[NA]	8,600

Acid Extractable metals in soil				
Our Reference		260040-11	260040-12	260040-13
Your Reference	UNITS	RA4	RA4	BD7/20210119
Depth		0.3-0.5	0.9-1.0	-
Date Sampled		19/01/2021	19/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	27/01/2021	27/01/2021	27/01/2021
Arsenic	mg/kg	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	8	6	8
Copper	mg/kg	8	1	24
Lead	mg/kg	19	7	43
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	4	<1	5
Zinc	mg/kg	74	12	78

Misc Soil - Inorg						
Our Reference		260040-1	260040-4	260040-7	260040-9	260040-11
Your Reference	UNITS	RA1	RA2	RA3	RA3	RA4
Depth		0.2-0.4	0.3-0.5	0.4-0.5	0.9-1.0	0.3-0.5
Date Sampled		18/01/2021	19/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg		
Our Reference		260040-12
Your Reference	UNITS	RA4
Depth		0.9-1.0
Date Sampled		19/01/2021
Type of sample		SOIL
Date prepared	-	27/01/2021
Date analysed	-	27/01/2021
Total Phenolics (as Phenol)	mg/kg	<5

Moisture						
Our Reference		260040-1	260040-2	260040-3	260040-4	260040-5
Your Reference	UNITS	RA1	RA1	RA1	RA2	RA2
Depth		0.2-0.4	0.8-1.0	1.4-1.5	0.3-0.5	0.8-1.0
Date Sampled		18/01/2021	18/01/2021	18/01/2021	19/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
Moisture	%	0.4	1.3	2.3	2.0	1.7

Moisture						
Our Reference		260040-6	260040-7	260040-8	260040-9	260040-10
Your Reference	UNITS	RA2	RA3	RA3	RA3	RA4
Depth		1.9-2.0	0.4-0.5	0.5-0.6	0.9-1.0	0.2-0.3
Date Sampled		19/01/2021	20/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	27/01/2021	27/01/2021	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
Moisture	%	4.6	2.7	2.3	1.1	2.1

Moisture				
Our Reference		260040-11	260040-12	260040-13
Your Reference	UNITS	RA4	RA4	BD7/20210119
Depth		0.3-0.5	0.9-1.0	-
Date Sampled		19/01/2021	19/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	27/01/2021	27/01/2021	27/01/2021
Date analysed	-	28/01/2021	28/01/2021	28/01/2021
Moisture	%	7.5	2.1	1.8

Asbestos ID - soils NEPM						
Our Reference		260040-1	260040-4	260040-7	260040-9	260040-11
Your Reference	UNITS	RA1	RA2	RA3	RA3	RA4
Depth		0.2-0.4	0.3-0.5	0.4-0.5	0.9-1.0	0.3-0.5
Date Sampled		18/01/2021	19/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
Sample mass tested	g	913.55	929.27	572.9	867.92	586.54
Sample Description	-	Grey fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown coarse-grained soil & rocks	Brown clayey soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	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	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	No asbestos detected	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected	No visible asbestos detected
ACM >7mm Estimation*	g	–	–	–	–	–
FA and AF Estimation*	g	–	–	–	–	–
FA and AF Estimation*#2	%(w/w)	<0.001	<0.001	<0.001	<0.001	<0.001

Asbestos ID - soils NEPM		
Our Reference		260040-12
Your Reference	UNITS	RA4
Depth		0.9-1.0
Date Sampled		19/01/2021
Type of sample		SOIL
Date analysed	-	28/01/2021
Sample mass tested	g	675.18
Sample Description	-	Grey clayey soil & rocks
Asbestos ID in soil (AS4964) >0.1g/kg	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected
Total Asbestos[#1]	g/kg	<0.1
Asbestos ID in soil <0.1g/kg*	-	No visible asbestos detected
ACM >7mm Estimation*	g	–
FA and AF Estimation*	g	–
FA and AF Estimation*#2	%(w/w)	<0.001

Asbestos ID - soils						
Our Reference		260040-2	260040-3	260040-5	260040-6	260040-8
Your Reference	UNITS	RA1	RA1	RA2	RA2	RA3
Depth		0.8-1.0	1.4-1.5	0.8-1.0	1.9-2.0	0.5-0.6
Date Sampled		18/01/2021	18/01/2021	19/01/2021	19/01/2021	20/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date analysed	-	28/01/2021	28/01/2021	28/01/2021	28/01/2021	28/01/2021
Sample mass tested	g	Approx. 70g	Approx. 40g	Approx. 50g	Approx. 55g	Approx. 60g
Sample Description	-	Brown coarse-grained soil & rocks	Beige fine-grained soil & rocks	Red fine-grained soil & rocks	Black fine-grained soil & rocks	Beige coarse-grained 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	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	No asbestos detected	No asbestos detected

Asbestos ID - soils		
Our Reference		260040-10
Your Reference	UNITS	RA4
Depth		0.2-0.3
Date Sampled		19/01/2021
Type of sample		SOIL
Date analysed	-	28/01/2021
Sample mass tested	g	Approx. 35g
Sample Description	-	Grey coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected

Misc Inorg - Soil					
Our Reference		260040-3	260040-8	260040-9	260040-12
Your Reference	UNITS	RA1	RA3	RA3	RA4
Depth		1.4-1.5	0.5-0.6	0.9-1.0	0.9-1.0
Date Sampled		18/01/2021	20/01/2021	20/01/2021	19/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL
Date prepared	-	25/01/2021	25/01/2021	25/01/2021	25/01/2021
Date analysed	-	25/01/2021	25/01/2021	25/01/2021	25/01/2021
pH 1:5 soil:water	pH Units	7.9	9.0	9.6	8.2
Total Organic Carbon (Walkley Black)	mg/kg	3,800	1,300	[NA]	[NA]
Electrical Conductivity 1:5 soil:water	µS/cm	[NA]	[NA]	410	600
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	[NA]	290	710
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	[NA]	120	33

CEC			
Our Reference		260040-3	260040-8
Your Reference	UNITS	RA1	RA3
Depth		1.4-1.5	0.5-0.6
Date Sampled		18/01/2021	20/01/2021
Type of sample		SOIL	SOIL
Date prepared	-	29/01/2021	29/01/2021
Date analysed	-	29/01/2021	29/01/2021
Exchangeable Ca	meq/100g	3.3	6.2
Exchangeable K	meq/100g	0.2	0.3
Exchangeable Mg	meq/100g	1.4	0.51
Exchangeable Na	meq/100g	0.36	0.52
Cation Exchange Capacity	meq/100g	5.2	7.5

Method ID	Methodology Summary
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.
ASB-001	Asbestos ID - Identification of asbestos in soil samples using Polarised Light Microscopy and Dispersion Staining Techniques. Minimum 500mL soil sample was analysed as recommended by "National Environment Protection (Assessment of site contamination) Measure, Schedule B1 and "The Guidelines from the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia - May 2009" with a reporting limit of 0.1g/kg (0.01% w/w) as per Australian Standard AS4964-2004. Results reported denoted with * are outside our scope of NATA accreditation. **NOTE** #1 Total Asbestos g/kg was analysed and reported as per Australian Standard AS4964 (This is the sum of ACM >7mm, <7mm and FA/AF) **NOTE** #2 The screening level of 0.001% w/w asbestos in soil for FA and AF only applies where the FA and AF are able to be quantified by gravimetric procedures. This screening level is not applicable to free fibres. Estimation = Estimated asbestos weight Results reported with "--" is equivalent to no visible asbestos identified using Polarised Light microscopy and Dispersion Staining Techniques.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
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-036	Total Organic Carbon or Matter - A titrimetric method that measures the oxidisable organic content of soils.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Metals-020	Determination of various metals by ICP-AES.
Metals-020	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Metals-021	Determination of Mercury by Cold Vapour AAS.

Method ID	Methodology Summary
Org-020	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-020	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. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ 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. 'EQ 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. 'EQ 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-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.

Method ID	Methodology Summary
Org-023	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-023	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. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	260040-4
Date extracted	-			28/01/2021	1	27/01/2021	27/01/2021		28/01/2021	28/01/2021
Date analysed	-			29/01/2021	1	29/01/2021	29/01/2021		29/01/2021	29/01/2021
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	103	96
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	103	96
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	104	99
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	99	94
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	104	95
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	104	95
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	104	95
naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	83	1	82	82	0	87	82

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	27/01/2021	27/01/2021		[NT]	[NT]
Date analysed	-			[NT]	11	29/01/2021	29/01/2021		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	11	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	11	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	11	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	11	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	11	86	82	5	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	260040-4
Date extracted	-			27/01/2021	1	27/01/2021	27/01/2021		27/01/2021	27/01/2021
Date analysed	-			27/01/2021	1	28/01/2021	28/01/2021		28/01/2021	28/01/2021
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	104	98
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	350	300	15	95	95
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	230	210	9	123	72
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	104	98
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	1	550	470	16	95	95
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	1	220	220	0	123	72
Surrogate o-Terphenyl	%		Org-020	88	1	96	96	0	103	105

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	27/01/2021	27/01/2021		[NT]	[NT]
Date analysed	-			[NT]	11	28/01/2021	28/01/2021		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	11	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	[NT]	11	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	11	89	89	0	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	260040-4
Date extracted	-			27/01/2021	1	27/01/2021	27/01/2021		27/01/2021	27/01/2021
Date analysed	-			28/01/2021	1	28/01/2021	28/01/2021		28/01/2021	28/01/2021
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	99	99
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	0.4	0.3	29	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	104
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	104
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	0.7	0.9	25	101	98
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	0.5	0.5	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	4.6	4.3	7	105	95
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	5.8	4.9	17	105	95
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	4.2	3.6	15	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	3.8	3.2	17	110	109
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	10	8.5	16	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	6.4	5.3	19	125	124
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	3.7	3.0	21	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	0.9	0.7	25	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	5.0	4.1	20	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	102	1	103	100	3	91	92

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	27/01/2021	27/01/2021		[NT]	[NT]
Date analysed	-			[NT]	11	28/01/2021	28/01/2021		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	11	0.2	0.2	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	11	0.2	0.2	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	0.2	67	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	0.2	67	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	11	0.3	0.3	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	11	0.2	0.2	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	11	0.1	0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	11	97	100	3	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	260040-4
Date extracted	-			27/01/2021	1	27/01/2021	27/01/2021		27/01/2021	27/01/2021
Date analysed	-			28/01/2021	1	28/01/2021	28/01/2021		28/01/2021	28/01/2021
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	106	106
HCB	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	106
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	119	115
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	99	99
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	112	112
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	111	116
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	93	96
Endrin	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	88	95
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	110
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	109	122
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	110	1	108	109	1	105	105

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	27/01/2021	27/01/2021		[NT]	[NT]
Date analysed	-			[NT]	11	28/01/2021	28/01/2021		[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
HCB	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	11	104	108	4	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	260040-4
Date extracted	-			27/01/2021	1	27/01/2021	27/01/2021		27/01/2021	27/01/2021
Date analysed	-			28/01/2021	1	28/01/2021	28/01/2021		28/01/2021	28/01/2021
Dichlorvos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	129	110
Dimethoate	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	111	107
Fenitrothion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	105	113
Malathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	77	82
Chlorpyriphos	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	99	103
Parathion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	112	112
Bromophos-ethyl	mg/kg	0.1	Org-022	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	137	135
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	110	1	108	109	1	105	105

QUALITY CONTROL: Organophosphorus Pesticides in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	27/01/2021	27/01/2021		[NT]	[NT]
Date analysed	-			[NT]	11	28/01/2021	28/01/2021		[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-022	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	[NT]	11	104	108	4	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	260040-4
Date extracted	-			27/01/2021	1	27/01/2021	27/01/2021		27/01/2021	27/01/2021
Date analysed	-			28/01/2021	1	28/01/2021	28/01/2021		28/01/2021	28/01/2021
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	120	120
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	110	1	108	109	1	105	105

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	27/01/2021	27/01/2021		[NT]	[NT]
Date analysed	-			[NT]	11	28/01/2021	28/01/2021		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	[NT]	11	104	108	4	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-5	260040-4
Date prepared	-			27/01/2021	1	27/01/2021	27/01/2021		27/01/2021	27/01/2021
Date analysed	-			27/01/2021	1	27/01/2021	27/01/2021		27/01/2021	27/01/2021
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	101	98
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	103	95
Chromium	mg/kg	1	Metals-020	<1	1	8	9	12	99	96
Copper	mg/kg	1	Metals-020	<1	1	43	55	24	101	106
Lead	mg/kg	1	Metals-020	<1	1	5	5	0	98	94
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.4	0.4	0	108	97
Nickel	mg/kg	1	Metals-020	<1	1	8	9	12	100	96
Zinc	mg/kg	1	Metals-020	<1	1	18	20	11	106	88
Iron	mg/kg	10	Metals-020	<10	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: Acid Extractable metals in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	27/01/2021	27/01/2021		[NT]	[NT]
Date analysed	-			[NT]	11	27/01/2021	27/01/2021		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	11	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	11	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	11	8	7	13	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	11	8	6	29	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	11	19	18	5	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	11	4	2	67	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	11	74	73	1	[NT]	[NT]

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	260040-4
Date prepared	-			27/01/2021	1	27/01/2021	27/01/2021		27/01/2021	27/01/2021
Date analysed	-			27/01/2021	1	27/01/2021	27/01/2021		27/01/2021	27/01/2021
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	1	<5	<5	0	99	94

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	260040-9
Date prepared	-			25/01/2021	3	25/01/2021	25/01/2021		25/01/2021	25/01/2021
Date analysed	-			25/01/2021	3	25/01/2021	25/01/2021		25/01/2021	25/01/2021
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	3	7.9	8.0	1	101	[NT]
Total Organic Carbon (Walkley Black)	mg/kg	1000	Inorg-036	<1000	3	3800	4100	8	94	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	96	114
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	[NT]	[NT]	[NT]	[NT]	96	106

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			29/01/2021	[NT]	[NT]	[NT]	[NT]	29/01/2021	[NT]
Date analysed	-			29/01/2021	[NT]	[NT]	[NT]	[NT]	29/01/2021	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	99	[NT]
Exchangeable K	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	103	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Exchangeable Na	meq/100g	0.1	Metals-020	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

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.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Asbestos-ID in soil: NEPM
This report is consistent with the reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1, May 2013. This is reported outside our scope of NATA accreditation.

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.
Note: Samples 260040-2, 3, 5, 6, 8, 10 were sub-sampled from bags provided by the client.

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CERTIFICATE OF ANALYSIS 260047-A

Client Details

Client	Douglas Partners Pty Ltd
Attention	Sam Balian
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**99931.00, Taronga Zoo Wildlife Hospital**
Number of Samples	24 SOIL
Date samples received	21/01/2021
Date completed instructions received	02/03/2021

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.

Report Details

Date results requested by	09/03/2021
Date of Issue	09/03/2021

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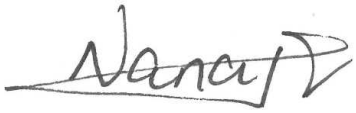
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Dragana Tomas, Senior Chemist
Hannah Nguyen, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

TCLP Preparation - Acid						
Our Reference		260047-A-6	260047-A-7	260047-A-8	260047-A-12	260047-A-19
Your Reference	UNITS	WH3	WH4	WH4	WH6	WH9
Depth		0.15-0.25	0.4-0.5	0.9-1.0	0.3-0.5	0.6-0.7
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
pH of soil for fluid# determ.	pH units	9.9	9.6	9.1	9.4	9.2
pH of soil TCLP (after HCl)	pH units	1.9	1.9	1.8	1.8	1.8
Extraction fluid used	-	1	1	1	1	1
pH of final Leachate	pH units	5.2	5.2	5.1	5.1	5.1

PAHs in TCLP (USEPA 1311)					
Our Reference		260047-A-6	260047-A-7	260047-A-8	260047-A-12
Your Reference	UNITS	WH3	WH4	WH4	WH6
Depth		0.15-0.25	0.4-0.5	0.9-1.0	0.3-0.5
Date Sampled		14/01/2021	14/01/2021	14/01/2021	14/01/2021
Type of sample		SOIL	SOIL	SOIL	SOIL
Date extracted	-	05/03/2021	05/03/2021	05/03/2021	05/03/2021
Date analysed	-	08/03/2021	08/03/2021	08/03/2021	08/03/2021
Naphthalene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	69	72	72	70

Metals in TCLP USEPA1311		
Our Reference		260047-A-19
Your Reference	UNITS	WH9
Depth		0.6-0.7
Date Sampled		14/01/2021
Type of sample		SOIL
Date extracted	-	08/03/2021
Date analysed	-	08/03/2021
Lead in TCLP	mg/L	0.05

Method ID	Methodology Summary
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP) using Zero Headspace Extraction (zHE) using AS4439 and USEPA 1311.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004. Please note that the mass used may be scaled down from the default based on sample mass available.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Org-022/025	Leachates are extracted with Dichloromethane and analysed by GC-MS/GC-MSMS.

QUALITY CONTROL: PAHs in TCLP (USEPA 1311)						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	260047-A-7
Date extracted	-			05/03/2021	6	05/03/2021	05/03/2021		05/03/2021	05/03/2021
Date analysed	-			08/03/2021	6	08/03/2021	08/03/2021		08/03/2021	08/03/2021
Naphthalene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	86	90
Acenaphthylene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	[NT]	[NT]
Acenaphthene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	124	86
Fluorene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	128	88
Phenanthrene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	120	76
Anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	[NT]	[NT]
Fluoranthene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	110	78
Pyrene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	114	76
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	[NT]	[NT]
Chrysene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	112	72
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-022/025	<0.002	6	<0.002	<0.002	0	[NT]	[NT]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	106	74
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	[NT]	[NT]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	[NT]	[NT]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-022/025	<0.001	6	<0.001	<0.001	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	70	6	69	75	8	83	73

QUALITY CONTROL: Metals in TCLP USEPA1311					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	260047-A-19
Date extracted	-			08/03/2021	[NT]	[NT]	[NT]	[NT]	08/03/2021	08/03/2021
Date analysed	-			08/03/2021	[NT]	[NT]	[NT]	[NT]	08/03/2021	08/03/2021
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	[NT]	[NT]	97	90

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

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.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

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: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-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.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.