Preliminary Site Investigation inclusive of Supplementary Sampling & Waste Classification

Abbott Road Fields
Curl Curl NSW 2096

Prepared for

Urbis Pty Ltd
(On Behalf of Optus Pty Ltd)

May 2019

New South Wales

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Abbott Road Fields, Curl Curl NSW 2096

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Acknowledgements and Copyright

The following imagery and documentation are attributed to and gratefully acknowledged:

Location Map:	Google Maps
Aerial Photography:	NSW Department of Land Property Information Google Earth Pro, Google Maps
General History:	John Fisher Park and Abbot Road Land Plan of Management Warringah council

All other sources are referenced as footnotes within the document.

1 Executive Summary

Canopy Enterprises Pty Ltd (Canopy) Canopy Enterprises Pty Ltd (Canopy) was engaged by Urbis Pty Ltd on behalf of Optus Pty Ltd (Client) to undertake a Preliminary Site Investigation and preliminary Waste Classifications (PSI/WC) at a small parcel of land that forms part of Abbott Road Fields in Curl Curl, NSW.

Canopy understands that a PSI/WC is required to facilitate the Development Application (DA) to enable the installation of a telecommunications tower and associated equipment shelter. Details of the project are provided in the Summary of Site Details as contained in Table 1 in Section 3.1.

The full suite of findings and conclusions and recommendations are outlined in Section 9 and Section 9.1 respectively, however the salient points can be summarised as follows:

- The Site is located in an Acid Sulfate prone area and the presence of Potential Acid Sulfate Soils has been established (report issued separately);
- The Site is close to the lagoon foreshore/embankment and is likely to have been impacted as a result of historic disposal of dredge spoil;
- All samples that were analysed showed contaminant concentrations below the adopted site criteria and the land is hence considered suitable for this land use.
- The soil at the Site has been classified as General Solid Waste in accordance of the EPA Waste Guidelines Part 1: Classifying Waste (2014);
- The subsurface does however contain Potential Acid Sulfate Soils which will require management regardless of whether or not the spoil is exported off-site or re-used on the Site (see Preliminary Acid Sulfate Soil Assessment report with Reference CUAB-19-PASSA); and

1.1 Recommendations

Based on the above information, Canopy recommends that:

1. An Acid Sulfate Soils Management Plan needs to be commissioned prior to commencement of excavation work. Details are available in the Acid Sulfate Soils report issued separately (Ref: CUAB-19-PASSA);
2. If required, excavated soils can be re-used on-site subject to treatment and testing of the soils in accordance with an Acid Sulfate Soils Management Plan as per Recommendation 1 above;
3. On-site soils meet the contamination criteria for classification as General Solid Waste. All soils to be taken offsite must take into account the presence of Potential Acid Sulfate Soils at the Site prior to being disposed of to a suitable landfill facility (see Section 6.1 and recommendation in the Preliminary Acid Sulfate Soils Assessment).

2 Project Introduction

Canopy Enterprises Pty Ltd (Canopy) was engaged by Urbis Pty Ltd on behalf of Optus Pty Ltd (Client) to undertake a Preliminary Site Investigation and preliminary Waste Classifications (PSI/WC) at a small parcel of land that forms part of Abbott Road Fields in Curl Curl, NSW.

Canopy understands that a PSI/WC is required to facilitate the Development Application (DA) to enable the installation of a telecommunications tower and associated equipment shelter. Details of the project are provided in the Summary of Site Details as contained in Table 1 in Section 3.1.

This investigation has been undertaken in consideration of and generally in accordance with the guidelines and regulatory documents as presented in Section 10 (among others) including in particular the Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites (OEH 2011) (Reporting Guidelines).

2.1 Scope of Work

The scope of works for this assessment includes:

- Review of information relating to the current Site condition (soils), including:
  - Geological maps of the area;
  - Groundwater data; and
  - Acid Sulfate Soil Risk Map.
- Site history review comprising:
  - Historical aerial photography;
  - Historical Land Title Search;
  - NSW Environmental Protection Authority (EPA) Contaminated Land Searches;
  - Historical contamination assessments (if any); and
  - Historical Information available under reasonable endeavour.
- Development of a conceptual site model (CSM);
- Identify potential areas of environmental concern (AECs) and associated contaminants of potential concern (COPCs);
- A detailed site inspection of the Site including drilling and sampling of soils;
- Laboratory analysis of select samples for COPCs; and
- Preparation of this Report.

3 Site Information and Surroundings

3.1 Site Identification

The Site details are summarised in Table 1 below:

Table 1: Summary of Site Details

Subject	Description
Site description (The Site)	Part of Lot 7356/DP1167221 Abbott Road Fields, Curl Curl 2096, NSW As defined in the Site Map in Appendix B.
Site Area approximately	Approximately 150 m^2
The Client:	Urbis Pty Ltd On behalf of Optus Pty Ltd
Council and LEP	Northern Beaches Council, Warringah Local Environmental Plan 2011 (Updated 2018), Map index 010A
Present and proposed zoning	RE1– Public Recreation
Reason for Assessment	Proposed development for the installation of an existing telecommunication tower and equipment shelter as per draft layout contained in Appendix A
ASS Class and Risk Profile	Class 1: Any works Class 3: Works beyond 1 meter below ground surface. Works by which the watertable is likely to be lowered beyond 1 meters below natural ground surface.
Approximate Elevation	3.5 - 4.5 m AHD
Supporting relevant information provided to Canopy:	Geotechnical Investigation: Geosense Drilling and Engineering REF:232, Dated: 03/12/2018 Draft Site Layout, Ref: S 2711-P1 rev 1 Dated 03/12/2018
Additional Information	This assessment has been undertaken by suitably qualified personnel with reference to the relevant Guidelines and Regulations in particular the EPA Reporting Guidelines.

Figure 1 Location Map
Part of Abbott Road Fields, Curl Curl 2096 (Source: Google Maps)

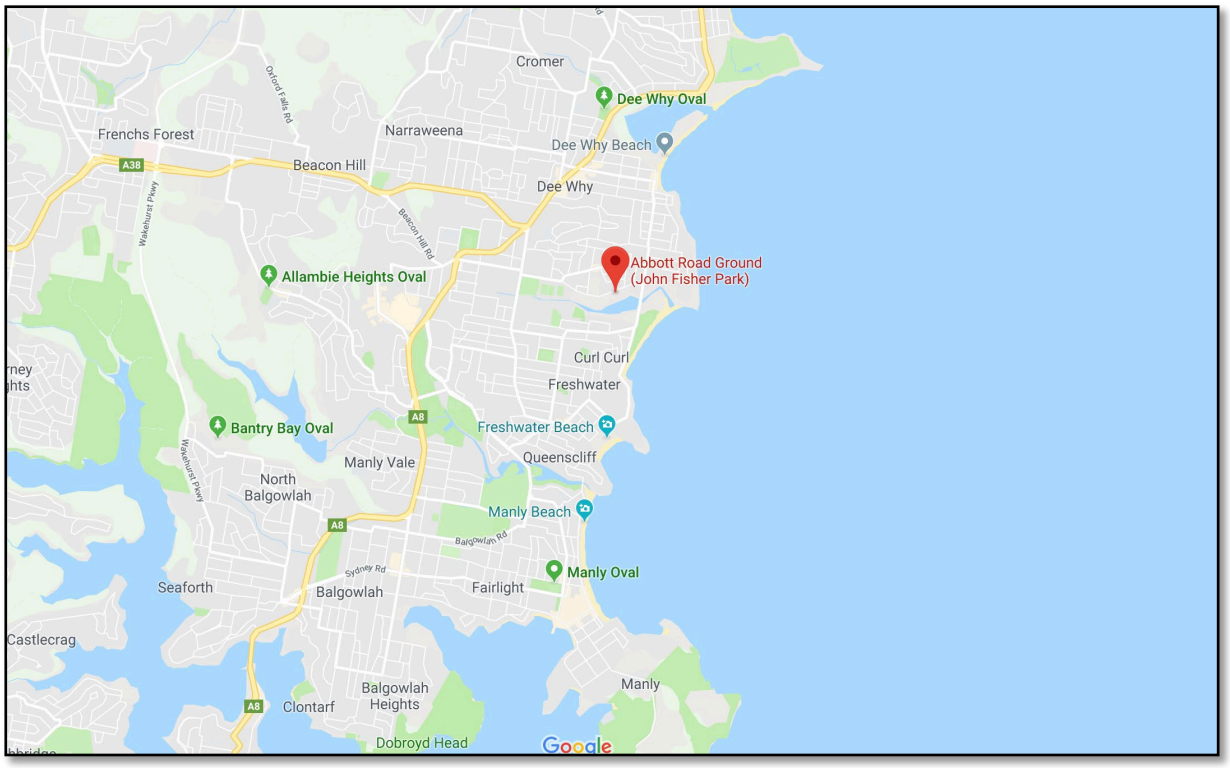
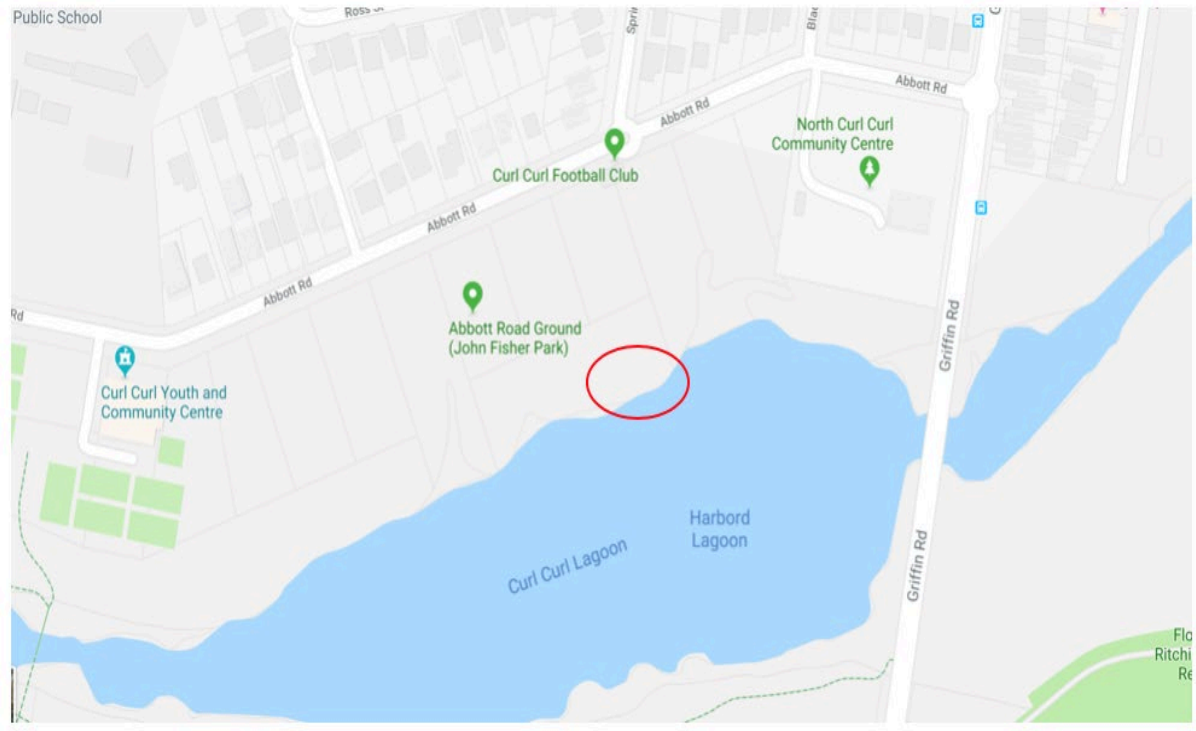


Figure 2 Location Map
Part of Abbott Road Fields, Curl Curl 2096 (Source: Google Maps)



3.2 Site Description / Land Use

The Site is an irregular shaped rectangle which forms a small part of what is otherwise known as Abbott Road Fields (John Fisher Park) in Curl Curl. Abbott Road is located approximately 120 meters to the north of the site. Curl Curl and Harbord Lagoon boarder the site with Greendale Creek flowing through, immediately to the south. The adjoining land uses are comprised of other sports fields to the north, north east and south west. Medium residential housing is situated to the north of Abbott Road and south of Curl Curl and Harbord Lagoons.

Site photographs are provided in Appendix B.

3.3 Topography

Review of the regional topographic maps from SIX maps[1] and Free Map Tools[2] indicated that the site is located at approximately 5 m AHD.

The wider general area surrounding the site slopes toward the south. The site itself is mostly flat and does not show any distinct incline.

3.4 Hydrology and Hydrogeology

There was no stormwater collection system visible on the site, and surface water is believed discharge into onsite grass covered soils or to sun off into Harbord Lagoon.

The Site is within metres of Harbord Lagoon and groundwater at the site is hydraulically connected to the lagoon. The direction of groundwater flow can be assumed to be in a southerly direction towards the lagoon, but tidal influences affecting the water levels in the lagoon would also affect groundwater levels at the Site.

A preliminary search of the NSW Office of Water Online Database[3] was conducted to identify groundwater bores within the vicinity of the Site. The search indicates that there are four boreholes within a 500 m radius of the Site.

Table 2: Summary of Groundwater Bore Data

Borehole	Owner / Purpose	SWL*	Total Depth	Approx. Distance from Site / Direction
GW109151	Private / Monitoring	10.0 m	120 m	181 m / NE
GW026577	Private / Monitoring	NP**	2.7 m	161 m / NE
GW107537	NP**	1.1 m	4.34 m	168 m / NE
GW110933	Private / Monitoring	1.9 m	4.0 m	214 m / NW
* Standing Water Level ** Not Provided				

[1] http://maps.six.nsw.gov.au/

[2] https://www.freemaptools.com/elevation-finder.htm

[3] https://realtimedata.waternsw.com.au/water.stm

All data obtained from the database search including the locations of those bore holes and where available drillers' notes and descriptions of subsurface conditions are presented in Appendix C.

3.5 Geology and Soils

The Site is located on silty to peaty quartz sand, silt and clay. Ferruginous and humic cementation in places. Common shell layers (Sydney 1:100 000 Geological Map[4]).

Based on information obtained from the NSW Department Environment and Heritage[5] the landscape at the Site is described as follows: level to gently undulating swales, depressions and unfilled lagoons on Quaternary sands. Local relief <10 m, slopes <3%. Watertable at <2 m. Mostly cleared and native vegetation.

Soils are described as very shallow to moderately deep (>150 cm), well sorted, sandy Humus Podzols (Uc2.32) and dark, mottled Siliceous Sands (Uc1.21), overlying buried acid peats (O) in depressions; deep (>200 cm) Podzols (Uc2.12, Uc2.32) and pale Siliceous Sands (Uc1.2) on sandy rises.

Limitations of the group include localised flooding and run-on, high watertables, highly permeable soils.

3.6 Acid Sulfate Soil Risk

A review of the Warringah LEP 2011(Acid Sulfate Soils Map – Sheet ASS_10A) indicates that the site is located with an ASS Class Zone 1 and Class Zone 3. According to LEP Clause 6.1 (2), development consent is required for Class 1 areas with "Any works".

The requirement is consistent with those outlined in Table 2.1 'Classification scheme in the Acid Sulfate Soils Planning Maps' of the Acid Sulfate Soils Guidelines. A requirement for a Preliminary Acid Sulfate Soils Assessment (PASSA) is therefore triggered.

3.7 Salinity Risk

A review of the Hydrogeological Landscapes Overall Salinity Hazards[6] Map shows the site to be outside of any salinity hazard zone. The more detailed Salinity Potential in Western Sydney 2002[7] Map confirmed no salinity risk for the Site.

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4 Sydney 1:100 000 Geological Map, NSW Department of Mineral Resources, Map Sheet 9130, 1st Edition (1983)

5 http://www.environment.nsw.gov.au/eSpade2Webapp#

6 1:125,000 Hydrogeological Landscapes Overall Salinity Hazards, Western Sydney Study Area. Produced by OEH Imagery & Spatial Information Services Wagga Wagga. May 2011

7 Salinity Potential in Western Sydney 2002, Department of Infrastructure, Planning and Natural Resources. Map date March 2003, ISBN 0 7347 5303 9

4 History

4.1 General History

A review of the John Fisher Park and Abbott Road Land Plan of Management (2001) identifies the Site and the surrounding areas history as;

> The site now occupied by John Fisher Park, also referred to as Abbott Road Fields was previously low lying, poorly draining estuarine flats. The area supported Swamp Mahogany (Eucalyptus robusta) heath and scrub, dominated by Swamp Oak (Casuarina glauca). Due to its poorly drained soils, swamp lands and dense vegetation, the area was not suited to colonisation by early settlers who were looking for agricultural land (Benson and Howell, 1990).
>
> Early in the 20th century, part of the land was cleared and drainage was improved for the establishment of market gardens. These gardens retained some proportion of the previous native vegetation. Following World War I, the northern beaches of Sydney became popular holiday resorts.
>
> As motor cars improved access to northern areas, small cottages were built behind the beaches from Manly to Newport. Following World War II intensive urban development began to spread along the coastal beaches and up onto the sandstone plateaus. In response to urban development and population growth in the local area, in 1951 the market gardens were converted into a tip. This involved extensive filling with both putrescible and non-putrescible wastes and resulted in the straightening of the previously more winding Greendale Creek. As a result of the change in hydrology and the addition of fill, the banks of the creek were progressively raised and steepened, narrowing the creek.
>
> Filling was followed by civil works which continued up until the mid-1970's, after which the park was developed as open space, with numerous sporting facilities. The finished park was named after John L. Fisher, Shire President at the time the project began. The park is also referred to as Abbott Road Fields.

Sources and supporting information are provided in Appendix G.

4.2 Heritage Registers

The Site was listed (at the time of preparation of this report) as a heritage item under Australian and NSW Heritage registers. A statement of significance show The Memorial Gateway has historical, technical and aesthetic significance as a man-made and high visual element designed as a formal entrance to the newly established playing fields for both Manly High School and its adjoining sports grounds. It also has a high degree of social significance in its association with famous local sports identities.

Schedule 5 of Council's LEP did not list the site as a heritage item. The search did not identify the presence of any items of national or state significance in the vicinity of the Site.

The results of the heritage database search are provided in Appendix D.

4.3 EPA Records

Search of the NSW EPA's public register under the Protection of the Environment Operations Act 1997 (POEO Act) was undertaken (Appendix E). The search for the Site did not identify any records in the database for the Site.

A search was conducted of the EPA's public contaminated land register (Appendix E). The search showed no entry for the Site. There is a site located 1.2km west of the site which has been notified to the EPA under Section 60 of the Contaminated Land Management Act 1997 (CLM Act). The property is listed as a "Landfill". It is assigned an EPA Site Management Class of "Regulation under CLM Act not required" which means that "The EPA has completed an assessment of the contamination and decided that regulation under the Contaminated Land Management Act 1997 is not required."

4.4 WorkCover NSW Records

Based on the information obtained as part of Canopy's Site History Research procedure, a search of records of WorkCover NSW was not considered to be necessary for this Site.

4.5 Aerial Photographs

Historical aerial photographs were sourced from Google Earth Pro, Six Maps and NSW Department of Land Property Information (LPI). All historic photographs are shown in Appendix G, a summary of the findings is provided below.

Table 3: Summary of Historical Aerial Photograph Information

Year	Site Description and Surrounding Area
1943	It can be observed from the image that the site appears to be a tidal wetland or estuarine environment with coastal vegetation including grasses, sedges and herbs. Abbott Road can be seen to the north of the site and Griffin Road to the east. Low density residential housing lies to the north.
2005	This image shows the site has been levelled and developed into a sports field. Some vegetation can be seen on the south of the site bordering Curl Curl Lagoon. To the north is a carpark bordering Abbott Road with medium density residential housing to the north of Abbott Road.
2009	The Site appears to be more or less in the same state as the previous picture with slight growth of vegetation.
2014	The Site appears to be relatively the same. Additional sporting courts have been constructed approximately 250m to the west of the site.
2018	The Site appears to be more or less in the same state as the previous picture with slight growth of vegetation.

4.6 Historical Land Title Search

Canopy undertook a search of current and past Land Titles for the Site. Results are summarised in Table 4 below:

Table 4: Summary of Historical Land Titles Information

Land Title Certificate Approximate Transfer Date To:	Purchaser/Leasers /Activity
Crown Land	Indicative Date 1886
4/7/2011	Deposited Plan (1167221) Lot/DP (7356/167221) Plan of Crown Land being reserved.

Note: Reasonable effort has been made to ensure titling accuracy to the extent practicable of the landowner/ ID, approximate date of land transfer and previous land sizes and format. However, the sole purpose and intent of the searches is to establish either general or any specific activities on the subject Site which may have a reflection on the potential for contaminated land. Therefore, information herein should not be relied upon for titling or any other purposes whatsoever.

The title certificates revealed that the Site has been owned by the Crown and maintained by various individual entities under the auspice of Council in recent decades. Due to the nature of the dealing in 2011 it would require detailed research to obtain previous title documentation. Given the strong historic indicators in conjunction with field observations which confirm that the Site has been subjected to land fill activities, most likely dredging residual (see section 4.7 below), hence there is no discernible benefit to obtaining further historic titles as sampling and analysis was based on the presence of fill of unknown origin.

Copies of the detailed historical land title certificates obtained are included in Appendix F.

4.7 Summary or Historical Research

The information obtained from the historical sources reviewed has been found to be in general agreement with other sources. The Site's history can reasonably be summarised a plot of land which was a tidal wetland with small amounts of vegetation.

The Site is close to the present (and original) foreshore/embankment of the Curl Curl Lagoon (refer 1943 aerial). It considered likely that the Site was vulnerable to past reshaping/heightening as a result of historic disposal dredge spoil (either intentionally or simply as a matter of convenience). Whilst this is not known factually, the likelihood of dredging activity having occurred historically would be consistent with finding of foreign material within the fill layer to approximately 3 metres depth.

The Site and its surrounds were then progressively converted/upgraded to form part of the present oval sports field from the circa 1960's with the majority of the conversion happening after the late 1970s through to the present era.

A landfill facility was present approximately 1 to 1.5 km west of the Site which appears to the have been active up to circa 1970s**.** It is not considered likely that the landfill activities had any impact on the Site due to the distance from the Site, topography and time lapse.

5 Field Works and Supplementary Sampling Program

5.1 Site Inspection and Sampling

A detailed site inspection was undertaken by Dr Gunnar Haid, Canopy's Senior Environmental Engineer, on 8 May 2019. Findings and observations are discussed below. Site Photographs are provided in Appendix B.

The Site is a small (150-200 m^2) approximately square shaped area located on the southern boundary of Abbott Road Field as indicated in the Site Map in Appendix B. There are no aboveground structures on the Site, and the entire area is covered with grass. There were no fences or other structures indicating the exact proposed boundaries of the Site at the time of the inspection.

The locations for drilling were cleared of underground utilities before carrying out the drilling activities. The boreholes were drilled using a truck mounted rig with solid flight augers.

In order to satisfactorily characterise a site in accordance with the NSW EPA Sampling Design Guidelines (1995) for a site less than 500 m^2, five borehole locations are required as a minimum to be drilled (across the subject site). This number is based on the maximum size of an undetected surface hotspot of a diameter of less than 11.8 m. Given the history of the Site as most likely reclaimed land the most likely area for contamination to be encountered is not necessarily near surface soils as might be typical on the majority of sites. Contamination at any site with a similar history needs to be assumed to be distributed with equal probability which takes account of both the lateral and vertical soil profiles.

With the intention of achieving the best possible understanding of the site conditions, Canopy decided to obtain two near surface samples at two different locations (B1 1.0 m and B2 0.5 m) and to also obtain one additional sample from a deeper area below the surface (3.5 m in B1). Locations of the borings are shown in the Site Map contained within Appendix B.

Samples were obtained directly from the auger by hand using disposable gloves while to the extent possible making sure that cross contamination between layers was avoided. Soil sample jars were fully filled in an attempt to minimise head space.

Filled soil sample containers were immediately placed in an ice chilled esky for transport to the laboratory. A chain of custody (CoC) form was filled in with the sample names, sampling date and required analyses. This documentation and the sample were then sent to the laboratory for analysis, within the prescribed analyte holding times. CoC documentation is presented in Appendix H.

The subsurface conditions found during drilling were broadly speaking a thin layer of top soil (grass covered) followed by a fill layer of fine to medium grained sand with silt and clay containing some rock fragments. Foreign material (rubber, cloth) was encountered to a depth of approximately 3 m bgl.

The fill was followed by natural medium grained to coarse clayey and silty sand of a dark grey colure to a depth of approximately 6.7 m bgl followed by a layer of light grey sandy clay to the total depth of the boring at 10.0 m bgl. Groundwater was encountered at approximately 1.9-2.0 m bgl. A sandy layer of approximately 0.3 m thickness containing a large amount of organic material was notice at the approximate depth of the groundwater level.

Boring B1 reached a total depth of 9.0 m bgl, Boring B2 was terminated at 3.0 m bgl. Bore logs providing more detailed information about the subsurface conditions are provided in Appendix I.

Samples obtained between 2 and 3 m bgl were noted to have odour of decaying organic material. The samples had a dark grey almost black colour and had a buttery doe-like texture which is typically associated with Acid Sulfate Soils. There were no signs that underground storage tanks (USTs) have been used at the Site in the past. Onsite vegetation (the grassed surface) was found to be in healthy looking state and no patches of stressed growth were observed.

A total of three soil samples was collected at the depths indicated above for contamination assessment and submitted to the laboratory for analysis.

Samples were submitted to NATA accredited laboratory Envirolab Services in Chatswood, NSW. Analytical methods complied with NEPM and NSW EPA requirements, with Practical Quantitation Limits (PQLs) used in the laboratory tests less than the adopted site investigation criteria.

Samples were analysed in accordance with the analytical schedule summarised in Table 5 below.

Table 5: Analytical Schedule

Medium	ID	TRH / BTEX	PAH	Metals (8)	PCB	OC/OP	Asbestos
Soil	B1 1.5 m	X	X	X	X	X	X
Soil	B1 3.5 m	X	X	X	X	X	
Soil	B2 0.5 m	X	X	X	X	X	

5.2 Assessment Criteria

Assessment criteria relevant to Recreational Land Use (HIL-C Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths) were selected from Schedule B 1 Guidelines on Investigation Levels for Soil and Groundwater (National Environment Protection (Assessment of Site Contamination) Measure 1999, amended 2013).

Additional screening criteria were adopted from the Cooperative Research Centre for Contaminant Assessment and Remediation of the Environment (CRC CARE) Health Screening Levels (HSLs) for Petroleum Hydrocarbons in Soil and Groundwater (Friebel and Nadebaum 2011).

The CRC CARE guidance provides the latest approach for assessing the risks of petroleum mixtures for a variety of land use scenarios, and in particular the evaluation of the direct contact and vapour migration intrusion pathways. Consistent with CRC CARE (2013) Petroleum Vapour Intrusion guidance, soil HSLs were applied to the site, as detailed below.

The guidelines selected as relevant screening criteria for soil include those designed for the inhalation of vapour and for direct contact, considering:

- Health Investigation levels (HILs) for soil contaminants for Public Open Space (HIL C);
- Soil HSLs for Vapour Intrusion HIL C for soil and depth specific to the site; and
- Soil Health Screening Levels for Direct Contact HSL C (CRC Care 2011)

During the investigation the Site was found to be well vegetated with a healthy grass surface and no abnormal plant distress or indication of poor plant growth was evident. Soil results were not screened for ecological risk.

5.3 Sample Results

A summary of laboratory results from the investigation is provided in Table 6 below, the laboratory reports are included in Appendix H. The following key findings were reported by the laboratory:

- BTEX / TRH:

  All samples reported concentrations below the adopted site criteria.

- Eight Priority Heavy Metals:

  All samples reported concentrations below the adopted site criteria.

- PAHs:

  All samples reported concentrations below the adopted site criteria;

- OCP, OPP & PCBs:

  All samples reported concentrations below the adopted site criteria.

- Asbestos:

  The analysed sample reported no detectable concentrations of asbestos fibres.

A summary of the results and investigation criteria applied to this investigation is provided below.

Table 6: Assessment Criteria and Results Summary

Analyte	Criteria (mg/kg)	Maximum concentration of all samples [mg/kg]	Exceedance	Samples exceeding criteria
Arsenic	300[1]	10	No	NA
Cadmium	90[1]	<0.4	No	NA
Chromium	300[1]	10	No	NA
Copper	17,000[1]	16	No	NA
Lead	600[1]	27	No	NA
Mercury	80[1]	<0.1	No	NA
Nickel	1,200[1]	3	No	NA
Zinc	30,000[1]	48	No	NA
F1 (TRH C6-C10 less BTEX)	45[2]	<25	No	NA
F2 (TRH C10-C16 less Naphthalene)	110[2]	<50	No	NA
C10 – C16	3,800[3]	<50	No	NA
C16 – C34	5,300[3]	<100	No	NA
C34 – C40	7,400[3]	<100	No	NA
Benzene	0.5[2]	<0.2	No	NA
Ethyl benzene	55[2]	<1	No	NA
Toluene	160[2]	<0.5	No	NA
Xylene	40[2]	<1	No	NA
Naphthalene	3[2]	<1	No	NA
Total PAH	300[1]	4.7	No	NA
PAHs (as BaP TEQ)	3[1]	0.9	No	NA
PCBs	1[1]	<0.1	No	NA
OCP		<0.1	No	NA
OP		<0.1	No	NA
PFOA	10[4]	<0.1	No	NA

1 Health Investigation Levels (HILS) for soil contaminants – Public Open Space (HIL C)

2 Health Screening Levels for Public Open Space (HIL C) for soil contaminants in sand and at a depth of 0 m <1 m. Where no guideline levels are provided for public and open space land use in the referenced literature, HSL A levels for residential land use were applied.

3 Soil Health Screening Levels for Direct Contact HSL-C Recreational Open Space (CRC Care 2011)

6 Waste Classification

Samples obtained were classified in accordance with NSW (EPA) Waste Guidelines Part 1: Classifying Waste (2014) (Waste Guidelines). In accordance with these guidelines, the classification followed a 6-Step process:

Step 1: The material was considered not to be classified as "Special Waste".

Step 2: The material was not liquid waste.

Step 3: The material did not fall into any of the pre-classified waste categories.

Step 4: The material did not possess hazardous characteristics.

Step 5: To determine the material's classification using chemical assessment, a total of three samples was collected from various depths. The amount of material with potential to be disposed of at the Site is estimated to be in the order of 20-30 m^3. The required number of samples outlined in Victorian EPA Soil Sampling Guidelines[8] for an in-situ sampling regime of less than 50 m^3 is three samples.

Step 6: The material was considered to fall into the category of non-putrescible.

6.1 Analytical Results - Waste Classification

During the site visit, pH values were obtained from a total of 20 soil samples that had been obtained as part of the Preliminary Acid Sulfate Soil Assessment (see separate report) using a field measuring tool. The pH values for the samples ranged between 6.6 and 7.8 which is within the natural background range.

The sample analysed for the presence of asbestos did not indicate the presence of asbestos.

Analytical results showed concentrations of all analytes to be below the threshold values for General Solid Waste (GSW). The reports as provided by the laboratory are provided in Appendix H.

Therefore, the material tested at the Site is **classified as General Solid Waste (non-putrescible)** in accordance with the requirements of the Waste Guidelines (if required to be disposed of to a suitable landfill facility).

The soils in the subsurface of the Site contain Potential Acid Sulfate Soils (PASS). A separate Acid Sulfate Soils Assessment report for the Site has been issued Ref: CUAB-19-PASSA dated May 2019. The report recommends that an Acid Sulfate Soils Management Plan is put in place prior to work commencement.

According to Part 4 of the Waste Classification Guidelines[9], PASS can be disposed of in NSW in landfills that are licensed to accept PASS. The material must either be disposed of in water below the permanent water table before it had a chance to oxidise (within 24 of

[8] VIC EPA Industrial Waste Resource Guidelines: Soil Sampling. Publication IWRG702 — June 2009)

[9] NSW EPA Waste Classification Guidelines Part 4: Acid Sulfate Soils. EPA 2014/0798

excavation) and after having met the criteria for chemical analysis in Step 5 of the 6-Step classification process) or it must be treated prior to off-site disposal in accordance with the ASS Manual[10], in which case the material can be disposed of at a licensed landfill above the water table.

If treated PASS is to be disposed of at a landfill, the landfill should be informed that the ASS has been treated in accordance with the neutralising techniques outlined in the ASS Manual and that the waste has also been classified in accordance with Part 1 of the Waste Classification Guidelines.

[10] Ahern C R, Stone, Y, and Blunden B (1998). Acid Sulfate Soils Assessment Guidelines Published by the Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW, Australia

7 Conceptual Site Model

Based on the information presented above, the following Conceptual Site Model is presented:

7.1 Potential Areas and Contaminants of Concern

Based on the Site history review and the observations made during the Site visit, potential Areas of Environmental Concern (AECs) associated with Contaminants of Potential Concern (CoPCs) that have been identified to potentially be present on-site are summarised in Table 7 below:

Table 7: Summary of AEC

Potential AECs / Activity	Contaminants of Potential Concern
Possible fill layer present across the Site	Heavy metals, TRH/BTEX, PAHs, OC/OPs, PCBs, Asbestos
Past use as a sporting field	OC/OP, Arsenic

Based on the site history review and the observations made during the field work, it is difficult to target any specific CoPC. In such cases it is customary to analyse samples for a broad range of the most commonly encountered substances in an attempt to cover a wide range of potential impacts.

Such analysis includes Polycyclic Aromatic Hydrocarbons (PAH), Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene and Xylene (BTEX), Asbestos, Organochlorine Pesticides (OC) and Organophosphorus Pesticides (OP), heavy metals, and Polychlorinated Biphenyls (PCB). This set of analytes is commonly used to ensure to the extent practicable that there have been no impacts from a range of past activities that may have occurred on (or near) a Site (to the extent the historic activities became known under research or could otherwise be reasonably suspected) or if there is fill material of unknown origin present at a Site.

7.2 Potential Impact Areas and Migration

Due to the Site forming part of re-claimed land, contaminants can be encountered at random intervals at any depth. If impact is found in near surface soils, it may have potential to leach or migrate deeper into the soil profile or be moved through groundwater.

Materials commonly present in impacted fill can be used as an indication of the depth of disturbance. Where fill materials impacted with certain contaminants are found to be present, these contaminants have the potential to migrate deeper into natural soils or sometimes off-site (transported via groundwater flow).

No surface water bodies were identified at the site and therefore surface water is not a potentially contaminated medium. Groundwater at the Site is hydraulically connected to the close by Harbord Lagoon. Depth to groundwater at the Site was established to be approximately 2 m bgl. Groundwater was not sampled as part of this investigation.

7.3 Potential Off-Site Migration

There are a number of ways contaminants can migrate from a site. Usually off-site migration is caused by combination of dust (wind), surface water runoff, surface water seeping into the groundwater or groundwater migration. The following properties influence the potential for contaminants to migrate off-site:

- Type of contaminant (solid/liquid, solubility, volatility, general mobility);
- The vertical location of the contaminants;
- The amount (concentration) of contaminants;
- The extent of the contaminants (widespread, localised); and
- The site topography, geology, hydrology and hydrogeology (see sections above).

The CoPC identified at the Site as outlined in Table 7 are solid (e.g. asbestos, heavy metals), liquid (e.g. TPH, PAH, PCBs dissolved in transformer oils) and volatile (volatile short chain hydro carbons).

The ground surface of the site is covered grassed areas, hence the potential for windblown contaminants to migrate from the site is considered to be low. The investigation did establish the presence of groundwater in the soils at the site at a depth of approximately 1.9 – 2.0 m bgl. Given the low levels of contamination encountered at the Site there is only a small risk of off-site migration of potential off-site migration of soil impact.

Nevertheless, it must be noted that the scope of the investigation herein is limited to soil therefore groundwater was not specifically targeted as part of it.

7.4 Potential Receptors

Based on the information available to date, the potential receptors of concern are as follows:

- Site occupants, workers or the public;
- Future users of the Site; and
- Personnel undertaking the excavation of the Site (or other site works).

Potential receptors may be exposed to CoPCs through direct contact with impacted soils and/or ingestion and/or inhalation of dusts / fibres associated with impacted soils or groundwater.

7.5 Potential Contaminant Pathways

Preferential pathways at the Site such as natural and/or man-made pathways that result in the preferential migration of CoPCs as either liquids or gasses have not been identified at the Site.

The groundwater table in the area is at a depth of 1.9 – 2.0 m bgl. Given the low levels of CoPC fond at the Site, groundwater is the sandy shallower soil horizon natural preferential pathway at the Site.

8 Quality Control and Quality Assurance

8.1 Field QC Samples

Intra-laboratory field duplicate (blind or field duplicates) samples are used to determine the precision associated with all or part of the sample collection and measurement process. They are two independent samples collected as nearly as possible, from the same point in space and time. The two samples are collected from the same source using the same type of sampling equipment. Each field duplicate is collected and stored in separate sample containers and transported in the same shipping container[11].

Inter-laboratory duplicate samples are field duplicate samples submitted to two different laboratories to provide a check of the analytical performance of the primary laboratory and specifically, the reproducibility of primary laboratory data. The laboratory chosen for the analysis of all samples is NATA registered and has a rigorous quality program in place (See laboratory reports in Appendix H). It is regularly audited as part of the NATA registration.

Considering the preliminary nature of this investigation, it is Canopy's opinion that the quality control implemented by the laboratory is sufficiently rigorous for this type of investigation and the submission of intra-laboratory duplicate samples and inter-laboratory duplicate samples would not provide data that would add to the results in a substantial way. The same is valid in this case for trip blanks and trip spikes.

Potential cross contamination between sampling locations can be an issue at contamination assessments. Rinsate samples are used to assess the effectiveness of decontamination procedures. Levels of contaminants resulting from cross contamination between sample locations would in all likelihood over-estimate site impact rather than mask the presence of contaminants. No rinsate samples were submitted as part of this investigation which was for the reasons given above considered acceptable for this investigation.

8.2 Laboratory Quality Program

Laboratory QA/QC is provided in the reports in Appendix H and summarised below:

- Laboratory analysis of soil samples was undertaken by a NATA accredited environmental testing laboratory.
- All soil samples were extracted and analysed within holding times.
- No target analytes were detected in any of the method blanks.
- RPDs for the laboratory duplicate soil samples were within the acceptable range for all samples.
- Percentage recovery results for laboratory control samples were within the acceptable range for all samples.
- Percentage recovery results for surrogate samples were within the acceptable range for all samples.
- Percentage recovery results for matrix spikes were within the acceptable range for all samples.

[11] Lee, C C. Environmental Engineering Dictionary. 4th ed., Government Institutes, 2005.

9 Findings and Conclusions

Based on the results of the investigation and subject to the limitations in Section 12 (noting the investigation is concerned with soils only) the following conclusions are made:

- The Site forms part of Abbott Road Fields in Curl Curl and has a size of approximately 150-200 m^2;
- The Site is located in an Acid Sulfate prone area and the presence of Potential Acid Sulfate Soils has been established (report issued separately);
- The Site is not located in an area prone to salinity risk hence a salinity assessment is not considered to be necessary;
- The Site is close to the lagoon foreshore/embankment and is likely to have been impacted as a result of historic disposal of dredge spoil;
- Foreign material was observed within the fill layer to approximately 3 metres depth which is consistent with dredging activity having occurred historically;
- No stress was observed in the vegetation and no surface staining typical of contamination was encountered;
- Two boreholes were drilled across the Site as part of the investigation's supplementary sampling program;
- The subsurface of the Site in all borings was found to contain a surface layer of topsoil followed by fill material containing to a depth of approximately 4.0 m bgl which was then followed by natural soils (clay and sand mixtures);
- Groundwater was encountered at the Site at approximately 1.9 m - 2.0 m bgl but not analysed as part of this investigation;
- A total of three samples was submitted to the laboratory and analysed for a broad range of analytes as part of the investigation;
- The sampling program conducted as part of this investigation targeted a wide range of target contaminants;
- All samples that were analysed showed contaminant concentrations below the adopted site criteria and the land is hence considered suitable for this land use;
- The soil at the Site has been classified as General Solid Waste in accordance of the EPA Waste Guidelines Part 1: Classifying Waste (2014);
- The subsurface does however contain Potential Acid Sulfate Soils which will require management regardless of whether or not the spoil is exported off-site or re-used on the Site (see Preliminary Acid Sulfate Soil Assessment report with Reference CUAB-19-PASSA); and
- Visible assessment of samples did not indicate the presence of Asbestos in the soils, and laboratory analysis did not detect asbestos fibres.

9.1 Recommendations

Based on the above information, Canopy recommends that:

4. An Acid Sulfate Soils Management Plan needs to be commissioned prior to commencement of excavation work. Details are available in the Acid Sulfate Soils report issued separately (Ref: CUAB-19-PASSA);
5. If required, excavated soils can be re-used on-site subject to treatment and testing of the soils in accordance with an Acid Sulfate Soils Management Plan as per Recommendation 1 above;
6. Should any evidence become apparent during site/earth works that asbestos or asbestos fragments (or other contaminants including hydrocarbon odours) are present in soils then appropriate actions should be undertaken in accordance with relevant guidelines and regulations;
7. Any soils imported to the Site must be validated as suitable for Public Open Space land use; and
8. On-site soils meet the contamination criteria for classification as General Solid Waste. All soils to be taken offsite must take into the presence of Potential Acid Sulfate Soils at the Site prior to being disposed of to a suitable landfill facility (see Section 6.1 and recommendation in the Preliminary Acid Sulfate Soils Assessment).

The conclusions and recommendations should be read together in conjunction with the full report and the Limitations.

10 List of Key Guidelines and Regulations

- National Environment Protection (Assessment of Site Contamination) Measure 1999. (amended 2013);
- Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites (OEH 2011);
- Contaminated Sites: Sampling Design Guidelines, NSW EPA, 1995 (EPA 1995);
- State Environmental Planning Policy No. 55;
- Contaminated Sites: Guidelines for the NSW Site Auditor Scheme, 3rd Edition, NSW EPA, (October 2017);
- EPA Waste Guidelines Part 1: Classifying Waste (2014);
- Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014 – The excavated natural material order 2014;
- Ahern C R, Stone, Y, and Blunden B (1998). Acid Sulfate Soils Assessment Guidelines Published by the Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW, Australia (Acid Sulfate Soils Guidelines);
- CRC CARE 2017, Risk-based management and remediation guidance for benzo(a)pyrene, CRC CARE Technical Report no. 39, CRC for Contamination Assessment and Remediation of the Environment, Newcastle, Australia;
- HEPA (Heads of EPAs Australia and New Zealand and the Australian Government Department of the Environment and Energy (2018). PFAS National Environmental Management Plan (NEMP).

11 List of Abbreviations

A list of the common abbreviations that may be used throughout this report is provided below.

ACM	Asbestos Containing Material
AEC	Area of Environmental Concern
AHD	Australian Height Datum
B(a)P	Benzo(a)pyrene
bgl	Below Ground Level
BTEX	Benzene, toluene, ethylbenzene and xylenes
CEMP	Construction Environmental Management Plan
CoPCs	Contaminants of Potential Concern
CoC	Chain of Custody
CRC CARE	Cooperative Research Centre for Contaminant Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DA	Development Application
DP	Deposited Plan
DQOs	Data Quality Objectives
DSI	Detailed Site Investigation
EMP	Environmental Management Plan
EPA	NSW Environment Protection Authority
ha	Hectare
HIL	Health based investigation level
HSL	Health screening levels
LOR	Limit of Reporting
NEPM	National Environment Protection Measures
NHMRC	National Health and Medical Research Council
OC	Organochlorine Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PFAS	Per- and Poly-Fluoroalkyl Substances
PFOS	Perfluorooctane Sulfonate
PCB	Polychlorinated Biphenyl
PQL	Practical Quantification Limit
RAP	Remedial Action Plan
RPD	Relative Percentage Difference
PSI	Preliminary Site Investigation
SAP	Sampling Analysis Plan
TCLP	Toxic Characteristic Leaching Potential
VOC	Volatile Organic Compounds
TRH	Total Recoverable Hydrocarbons

12 Limitations

The findings of this Report are based on the Scope of Work as defined herein noting the investigation is limited to the site soils (notwithstanding limited observations of structures in the vicinity if relevant due to the potential for the presence of ACMs). Canopy Enterprises Pty Ltd (Canopy) performed services in a manner consistent with industry standards for the undertaking similar works. The assessment was undertaken with regard to the proposed development and land use.

It is not possible to identify all hazardous or toxic materials which may be present on the Site and this assessment should not be interpreted as a guarantee that hazardous or toxic materials (including any hazardous or toxic materials not referred to) do not exist across the Site or between sampling points of the identified Areas of Environmental Concern (AEC).

Canopy accepts no liability for use or interpretation by any person or entity other than reasonable use and interpretation by the Client or their representative who engaged the works or relevant third parties and which relates directly to the intended purposes of the investigation.

All conclusions and considerations regarding this property represent the professional opinions of Canopy's personnel involved with the project and should not be considered a strictly legal interpretation of existing environmental guidelines or regulations.

Canopy assumes no responsibility or liability for errors in the public data utilised, statements from sources outside of Canopy or any consequential developments arising outside of the scope of this project. In the unlikely event however that Canopy was proven to be in error, given the nature, scale and cost of the assessment in comparison to the costs of the underlying works Canopy's liability for consequential damage is limited to the value of Canopy's engagement to the extent the law permits.

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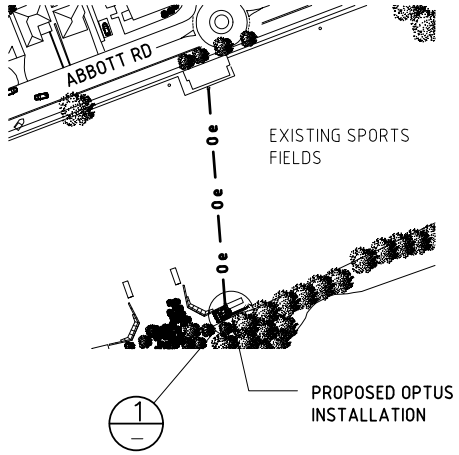
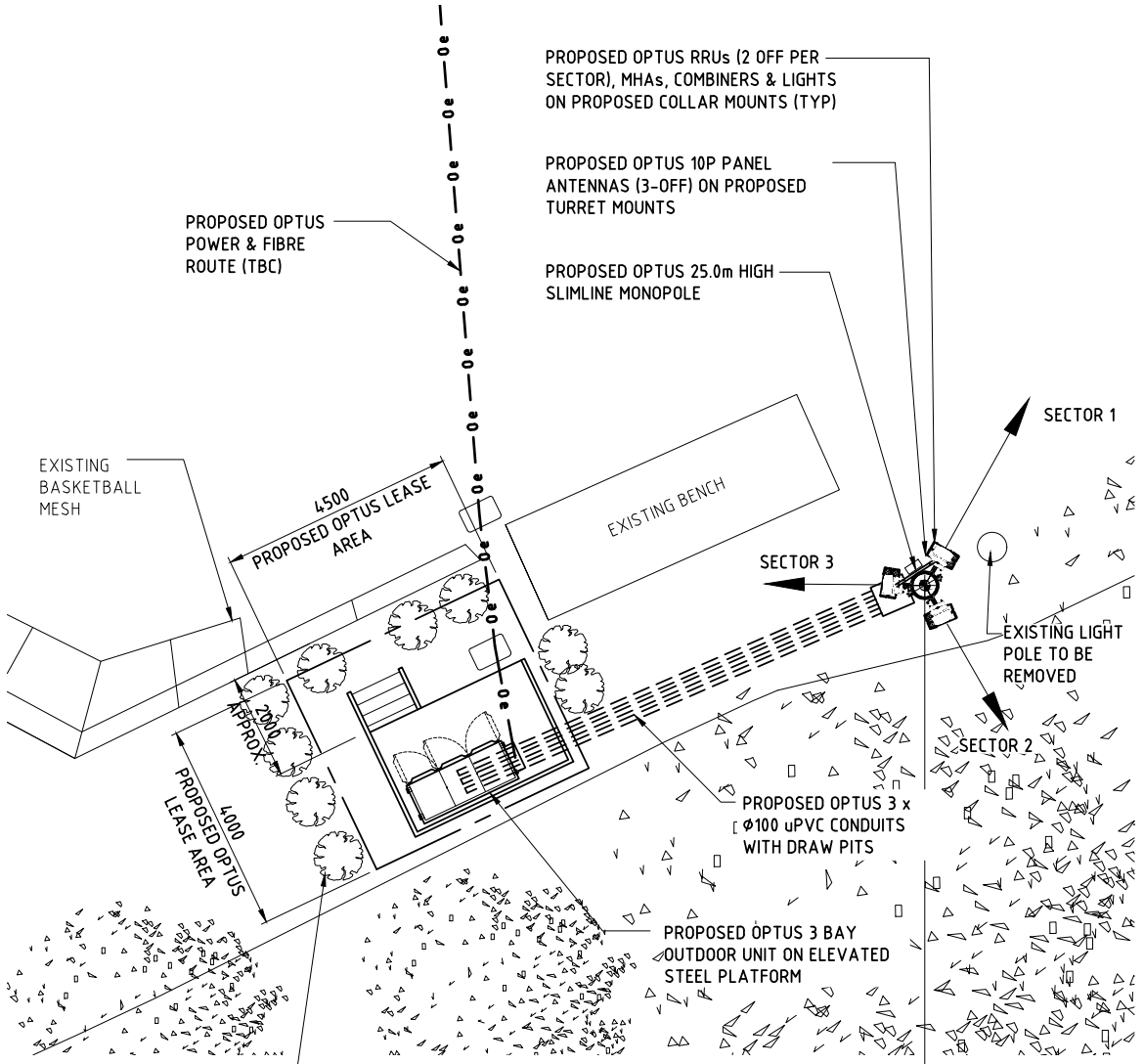
Appendix A
Construction Details

LOCALITY MAP



OVERALL SITE PLAN

SCALE 1:2500



DETAIL 1

SCALE 1:100

NOTE:
THIS DRAWING IS DIAGRAMMATIC ONLY AND SHOULD NOT BE SCALED. DIMENSIONS, COORDINATES, AND LEVELS SHOWN ARE NOMINAL AND SUBJECT TO CONFIRMATION BY SURVEYOR.

SITE ADDRESS:

LOT 7201 GRIFFIN ROAD,
NORTH CURL CURL,
NSW 2099

NOTES:

1. **BASIS OF DESIGN**
   - SITE INSPECTION 20/10/15
2. **PANEL ANTENNAS**
   - 1-OFF PER SECTOR (EACH 2.7m LONG) AT EL 25.5m
   - SECTOR 1 - ??, SECTOR 2 - ??, SECTOR 3 -??
   - MOUNTED ON PROPOSED TURRET MOUNTS
3. **TRANSMISSION**
   - FIBRE - OPTUS TO CONFIRM
4. **EQUIPMENT SHELTER**
   - 3 BAY OUTDOOR UNIT, COLOURED "PALE EUCALYPT/PAPER BARK" ON ELEVATED STEEL PLATFORM
5. **OPTUS MONOPOLE**
   - 25.0m HIGH MONOPOLE WITH 2 OFF COLLAR MOUNT AT EL 25m AND 22m FOR PANEL ANTENNAS AND RRUs RESPECTIVELY
6. **FEEDER CABLES**
   - SIZE: 7/8" ALL SECTORS ??????
   - LENGTH: 45m ALL SECTORS
   - OTHER DETAIL NOT SHOWN ON PLAN
7. **SITE ACCESS**
   - VIA ABBOTT ROAD
8. **ANTENNA ACCESS**
   - ACCESS VIA CHERRY PICKER ???
9. **POWER SUPPLY**
   - 3-PHASE 63 AMP POWER SUPPLY TO BE PROVIDED
   - DETAILS TO BE CONFIRMED/ADVISED
10. **OTHER (PAINTING, LANDSCAPING, SCREENING)**
    - LOCATED IN FLOOD ZONE.
    - EXISTING FLOOD LIGHT POLE TO BE REMOVED, LIGHTS TO BE RELOCATED TO THE NEW MONOPOLE AT CL 22.0m

MGA ZONE	56
E	341 903
N	6 262 499
AT	℄ MONOPOLE

Rev	Date	Revision Details	Consultant	CAD	Designer	Verifier	Approver
02	18.02.19	LAYOUT & CONFIGURATION UPDATED FOR APPROVAL	URBIS	PP	PP	PP	NSN
01	11.11.15	ISSUED FOR APPROVAL	MYD	NA	NA	RS	PM

NOKIA

Client: OPTUS

Project: MOBILE NETWORK AUSTRALIA
SITE ID- S2711 - ?
CURL CURL-O
LOT 7201 GRIFFIN RD,NSW,2099

Drawing Title: DRAFT SITE LAYOUT

Drawing Status: FOR APPROVAL

Drawing No. S2711-P1

Revision 02

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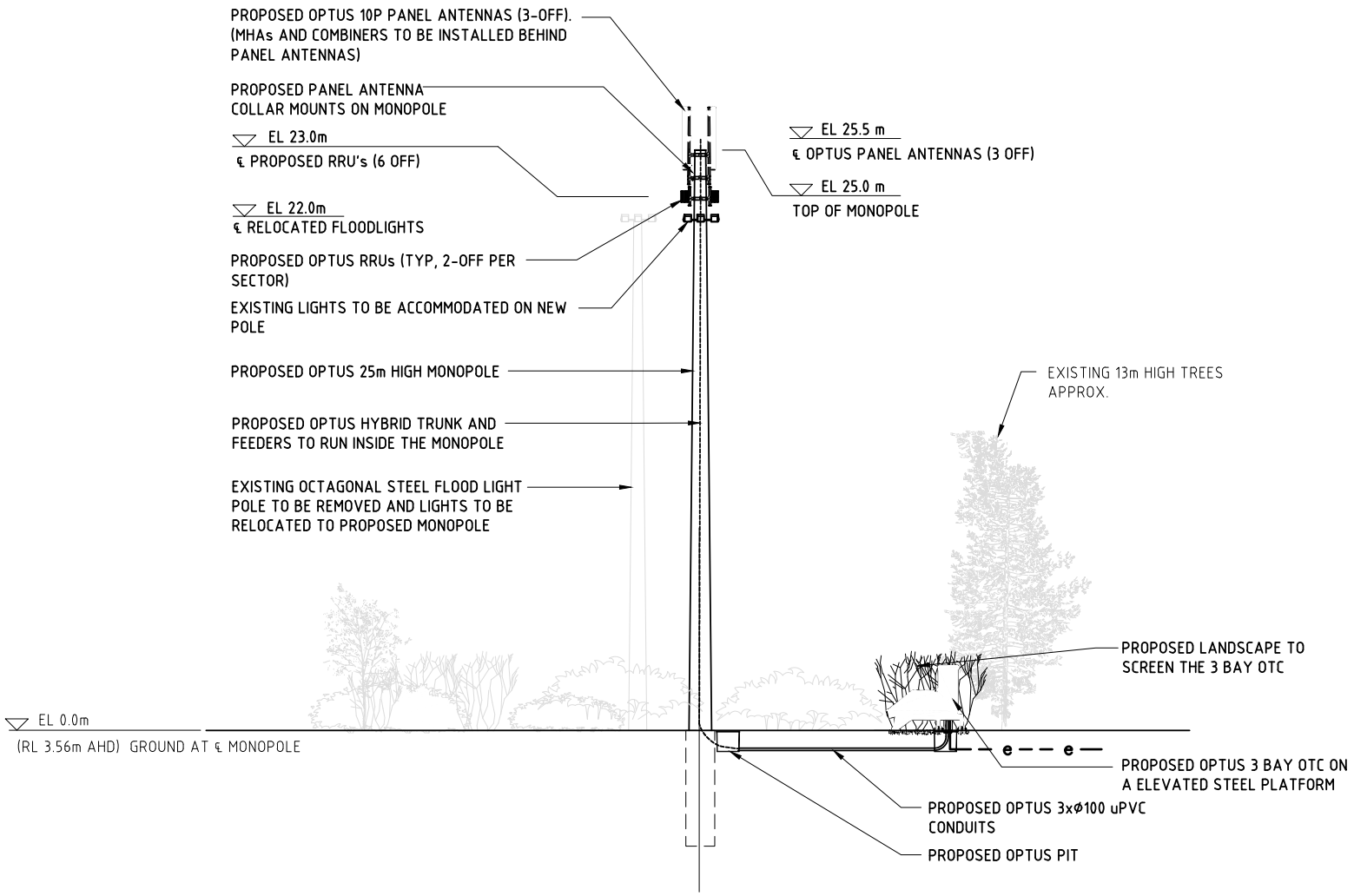
A3

NOTE:
THIS DRAWING IS DIAGRAMMATIC ONLY AND SHOULD NOT BE SCALED.



NORTH WEST ELEVATION

SCALE 1:200

Rev	Date	Revision Details	Consultant	CAD	Designer	Verifier	Approver
02	18.02.19	LAYOUT & CONFIGURATION UPDATED FOR APPROVAL	URBIS	PP	PP	PP	NSN
01	11.11.15	ISSUED FOR APPROVAL	MYD	NA	NA	RS	PM

NOKIA

Client: OPTUS

Project: MOBILE NETWORK AUSTRALIA
SITE ID- S2711 - ?
CURL CURL-O
LOT 7201 GRIFFIN RD,NSW,2099

Drawing Title: DRAFT SITE ELEVATION

Drawing Status: FOR APPROVAL

Drawing No. S2711-P2

Revision 02

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20 10 0 10 20 30 40 50mm

A3

Appendix B
Site Map, Sampling Locations, Site Photographs

Site Map

Note: Red line is the approximate boundary of Site, red dots show approximate sampling locations

Source: Google Earth Pro

Photo 1:
Setup process for Boring B1

Photo 2:
Locations of Borings B1 and B2 upon completion of drilling operations

Appendix C
Groundwater Borehole Search Results

WaterNSW
Work Summary

GW110933

Licence: | **Licence Status:**

Authorised Purpose(s):
Intended Purpose(s): DOMESTIC

Work Type: Spear
Work Status: Supply Obtained
Construct.Method: Auger
Owner Type: Private

Commenced Date:
Completion Date: 21/06/2010

Final Depth: 4.00 m
Drilled Depth: 4.00 m

Contractor Name: (None)
Driller: Michael Peter Sprouster
Assistant Driller:

Property:
GWMA:
GW Zone:

Standing Water Level (m): 1.900
Salinity Description:
Yield (L/s): 0.900

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:			
Licensed:	CUMBERLAND	MANLY COVE	51//1094334

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:

CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6262548.000
Easting: 341703.000

Latitude: 33°45'55.3"S
Longitude: 151°17'26.3"E

GS Map: -

MGA Zone: 56

Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.00	110			Auger
1		Annulus	Waterworn/Rounded	0.00	0.00				Graded
1	1	Casing	Pvc Class 9	0.00	3.00	110			Glued
1	1	Opening	Screen	3.00	4.00	50		0	Stainless Steel, Screwed, A: 6.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
1.90	4.00	2.10	Unknown	1.90		0.90		01:00:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.20	0.20	TOSOIL	Topsoil	
0.20	0.50	0.30	SANDS MIXED	Sand	
0.50	1.40	0.90	SAND GREY AND CLAY	Sand	
1.40	1.90	0.50	SAND DARK WITH CLAY	Sand	
1.90	2.50	0.60	CLAY	Clay	
2.50	3.00	0.50	SAND AND CLAY	Sand	
3.00	4.00	1.00	SAND AND QUARTZ	Sand	

Remarks

21/06/2010: Form A Remarks:
Good quality water and flow for domestic use.

***** End of GW110933 *****

WaterNSW
Work Summary

GW107537

Licence: | **Licence Status:**

Authorised Purpose(s):
Intended Purpose(s): RECREATION (GROUNDWATER)

Work Type: Bore
Work Status:
Construct.Method: Auger
Owner Type:

Commenced Date:
Completion Date: 10/04/2005

Final Depth: 4.34 m
Drilled Depth: 4.34 m

Contractor Name: WATER WORKS
Driller: Andrew Malcolm Chalmers
Assistant Driller:

Property:
GWMA:
GW Zone:

Standing Water Level (m): 1.100
Salinity Description:
Yield (L/s): 1.470

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:			
Licensed:	CUMBERLAND	MANLY COVE	2682 752038

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:

CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6262584.000
Easting: 342042.000

Latitude: 33°45'54.3"S
Longitude: 151°17'39.5"E

GS Map: -

MGA Zone: 56

Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	4.34	125			Auger
1	1	Casing	Pvc Class 9	-0.30	4.34	114			Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
1.10	4.34	3.24	Unknown	1.10	1.10	1.47	4.34		550.00

Drillers Log

From	To	Thickness	Drillers Description	Geological Material	Comments
(m)	(m)	(m)			
0.00	2.00	2.00	CLAY FILL	Clay	
2.00	4.34	2.34	SAND	Sand	

Remarks

18/10/2006: Previous Lic No: 10BL165295

*** End of GW107537 ***

WaterNSW
Work Summary

GW109151

Licence:
Licence Status:
Authorised Purpose(s):
Intended Purpose(s): RECREATION (GROUNDWATER)

Work Type: Bore
Work Status: Test Hole
Construct.Method: Other
Owner Type: Private

Commenced Date:
Completion Date: 05/08/2008
Final Depth: 120.00 m
Drilled Depth: 120.00 m

Contractor Name: INTERTEC DRILLING SERVICES
Driller: Paul Sheehy
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m): 10.000
Salinity Description:
Yield (L/s): 2.100

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:			
Licensed:	CUMBERLAND	MANLY COVE	253 752038

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6262626.000
Easting: 341987.000
Latitude: 33°45'52.9"S
Longitude: 151°17'37.4"E

GS Map: -
MGA Zone: 56
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	27.20	230			Other
1		Hole	Hole	27.20	32.80	165			Rotary Air/Mud
1		Hole	Hole	32.80	120.00	156			Down Hole Hammer
1	1	Casing	Pvc Class 9	-0.30	41.70	140			Suspended in Clamps
1	1	Casing	Steel	-0.30	29.30	156	146		Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
56.80	57.10	0.30	Unknown			2.10			610.00

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.50	2.50	SAND, YELLOW	Sand	
2.50	27.20	24.70	SAND/CLAY	Sand	
27.20	32.80	5.60	SANDSTONE WEATHERED	Sandstone	
32.80	34.90	2.10	SANDSTONE GREY	Sandstone	
34.90	35.50	0.60	CLAY	Clay	
35.50	44.70	9.20	SANDSTONE GREY	Sandstone	
44.70	44.90	0.20	SANDSTONE FRACTURED	Sandstone	
44.90	56.80	11.90	SANDSTONE GREY	Sandstone	
56.80	57.10	0.30	SANDSTONE FRACTURED	Sandstone	
57.10	58.90	1.80	SANDSTONE DARK GREY	Sandstone	
58.90	62.00	3.10	SANDSTONE GREY	Sandstone	
62.00	65.00	3.00	SILTSTONE GREY	Siltstone	
65.00	91.90	26.90	SANDSTONE GREY	Sandstone	
91.90	98.50	6.60	SILTSTONE GREY	Siltstone	
98.50	101.50	3.00	SILTSTONE RED	Siltstone	
101.50	115.00	13.50	SANDSTONE GREY	Sandstone	
115.00	120.00	5.00	SILTSTONE RED	Siltstone	

Remarks

02/04/2009: Previous Lic No:10BL600432

*** End of GW109151 ***

WaterNSW
Work Summary

GW026577

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): IRRIGATION

Work Type: Spear
Work Status:
Construct.Method:
Owner Type: Private

Commenced Date:
Completion Date: 01/12/1965
Final Depth: 2.70 m
Drilled Depth:

Contractor Name: (None)
Driller:
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBERLAND	MANLY COVE	UNKNOWN FROM HYDSYS
Licensed:			

Region: 10 - Sydney South Coast
River Basin: 213 - SYDNEY COAST - GEORGES RIVER
Area/District:
CMA Map: 9130-2N
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6262590.000
Easting: 342029.000
Latitude: 33°45'54.1"S
Longitude: 151°17'39.0"E

GS Map: -
MGA Zone: 56
Coordinate Source: GD.,PR. MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing		-0.90	-0.90				

Remarks

19/02/1975: SITED WOMENS BOWL CLUB CURL CURL

Appendix D
Heritage Register Search Results

Memorial Gateway, John Fisher Park

Item details

Name of item:	Memorial Gateway, John Fisher Park
Type of item:	Built
Group/Collection :	Parks, Gardens and Trees
Category:	Urban Park
Primary address:	Abbott Road, North Curl Curl, NSW 2099
Local govt. area:	Warringah

All addresses

Street Address	Suburb/town	LGA	Parish	County	Type
Abbott Road	North Curl Curl	Warringah			Primary Address

Statement of significance:

The Memorial Gateway has historical, technical and aesthetic significance as a man-made and high visual element designed as a formal entrance to the newly established playing fields for both Manly High School and its adjoining sports grounds. It also has a high degree of social significance in its association with famous local sports identies.

Date significance updated: 08 Mar 07

Note: The State Heritage Inventory provides information about heritage items listed by local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the OEH ***copyright and disclaimer****.*

Description

Designer/Maker:	Mr Geoffrey Lumsdaine, Architect
Construction years:	1961-1962
Physical description:	The gateway was among the first structures in Australia to be designed using hyperbolic parabaloid form. This was developed by Louis Kahn in the United states in the late 1950s when there was enthusiasm for exploring architectural possibilities using geometric forms and experimentation with light-weight concrete skins and roofs. It was taken up for use in public structures such as stadium, swimming pools and churches in Australia. The gateway retains the dimensions, layout and form of the original structure.
Physical	As a result of the increase in the level of the playing fields, the brick piers of the gateway

Appendix E

EPA Register Search Results

Home Environment protection licences POEO Public Register Search for licences, applications and notices

Search results

Your search for: **General Search** with the following criteria

Suburb - Curl Curl

returned 0 result

Search Again

For business and industry

For local government

Contact us

131 555 (tel:131555)

info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)

EPA Office Locations (https://www.epa.nsw.gov.au/about-us/contact-us/locations)

Accessibility (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index)
Disclaimer (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/disclaimer)
Privacy (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/privacy)
Copyright (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/copyright)

Find us on

Search for Environmental Protection Licences, applications, notices, audits or pollution studies and reduction programs

Home Contaminated land Record of notices

Search results

Your search for:Suburb: CURL CURL

Search Again
Refine Search

did not find any records in our database.

If a site does not appear on the record it may still be affected by contamination. For example:

- Contamination may be present but the site has not been regulated by the EPA under the Contaminated Land Management Act 1997 or the Environmentally Hazardous Chemicals Act 1985.
- The EPA may be regulating contamination at the site through a licence or notice under the Protection of the Environment Operations Act 1997 (POEO Act).
- Contamination at the site may be being managed under the planning process.

Search TIP

To search for a specific site, search by LGA (local government area) and carefully review all sites listed.

... more search tips

More information about particular sites may be available from:

- The POEO public register
- The appropriate planning authority: for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act.

See What's in the record and What's not in the record.

If you want to know whether a specific site has been the subject of notices issued by the EPA under the CLM Act, we suggest that you search by Local Government Area only and carefully review the sites that are listed.
This public record provides information about sites regulated by the EPA under the Contaminated Land Management Act 1997, including sites currently and previously regulated under the Environmentally Hazardous Chemicals Act 1985. Your inquiry using the above search criteria has not matched any record of current or former regulation. You should consider searching again using different criteria. The fact that a site does not appear on the record does not necessarily mean that it is not affected by contamination. The site may have been notified to the EPA but not yet assessed, or contamination may be present but the site is not yet being regulated by the EPA. Further information about particular sites may be available from the appropriate planning authority, for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act. In addition the EPA may be regulating contamination at the site through a licence under the Protection of the Environment Operations Act 1997. You may wish to search the POEO public register.POEO public register

27 April 2019

For business and industry

For local government

Contact us

131 555 (tel:131555)

info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)

EPA Office Locations (https://www.epa.nsw.gov.au/about-us/contact-us/locations)

Accessibility (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index)
Disclaimer (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/disclaimer)
Privacy (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/privacy)
Copyright (https://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/copyright)

Find us on

Search of the Contaminated Land Record

Suburb	SiteName	Address	ContaminationActivity Type	ManagementClass	Latitude	Longitude
CRESTWOOD	Former BP Queanbeyan	64 Uriarra ROAD	Service Station	Regulation under CLM Act not required	-35.34646177	149.2246263
CRONULLA	Breen Holdings	Bate Bay ROAD	Other Industry	Regulation under CLM Act not required	-34.03861737	151.1614114
CROWS NEST	Caltex Service Station	111-121 Falcon STREET	Service Station	Regulation under CLM Act not required	-33.82868236	151.2060317
CROYDON	Caltex Service Station	404-410 Liverpool ROAD	Service Station	Regulation under CLM Act not required	-33.88853994	151.115879
CROYDON	BP Ashfield	584 Parramatta ROAD	Service Station	Regulation under CLM Act not required	-33.87399409	151.1267296
CROYDON PARK	Mobil Service Station	334 Georges River ROAD	Service Station	Regulation under CLM Act not required	-33.89771626	151.0999194
CULCAIRN	Caltex Service Station	2883 Olympic HIGHWAY	Service Station	Regulation under CLM Act not required	-35.67441635	147.0356845
CULLEN BULLEN	Baal Bone Colliery	Castlereagh HIGHWAY	Other Industry	Regulation under CLM Act not required	-33.27193875	150.0587194
CUNDLETOWN	Caltex Service Station (1 Manning River Drive)	Old Pacific HIGHWAY	Service Station	Regulation under CLM Act not required	-31.89329598	152.5068225
CURL CURL	John Fisher Park	Corner Harbord and Abbott ROADS	Landfill	Regulation under CLM Act not required	-33.76352692	151.2798462
DACEYVILLE	Astrolabe Park	Cook AVENUE	Landfill	Under assessment	-33.92963704	151.221773
DAPTO	RailCorp Dapto	(Rear of property) 12-14 Hamilton STREET	Other Industry	Regulation under CLM Act not required	-34.50045405	150.787353
DAPTO	Nicheinvest Pty Ltd	133-139 Lakelands DRIVE	Service Station	Under assessment	-34.50335	150.803144
DARLINGHURST	Proposed Retail Unit	139-155 Palmer STREET	Unclassified	Regulation under CLM Act not required	-33.87504688	151.2168106
DARLINGHURST	Cross City Tunnel	Riley Street and William STREET	Service Station	Contamination was addressed via the planning process (EP&A Act)	-33.87424636	151.2158305
DARLINGHURST	18-28 Neild Avenue, Darlinghurst	18-28 Neild AVENUE	Landfill	Regulation under CLM Act not required	-33.87876581	151.2276546
DEE WHY	United Dee Why	1 The Strand STREET	Service Station	Contamination currently regulated under POEO Act	-33.75569207	151.2959451

List of NSW Contaminated sites Notified to the EPA

Appendix F
Land Title Search Results

NEW SOUTH WALES LAND REGISTRY SERVICES - HISTORICAL SEARCH

SEARCH DATE
23/5/2019 8:28PM

FOLIO: 7356/1167221

First Title(s): THIS FOLIO
Prior Title(s): CROWN LAND

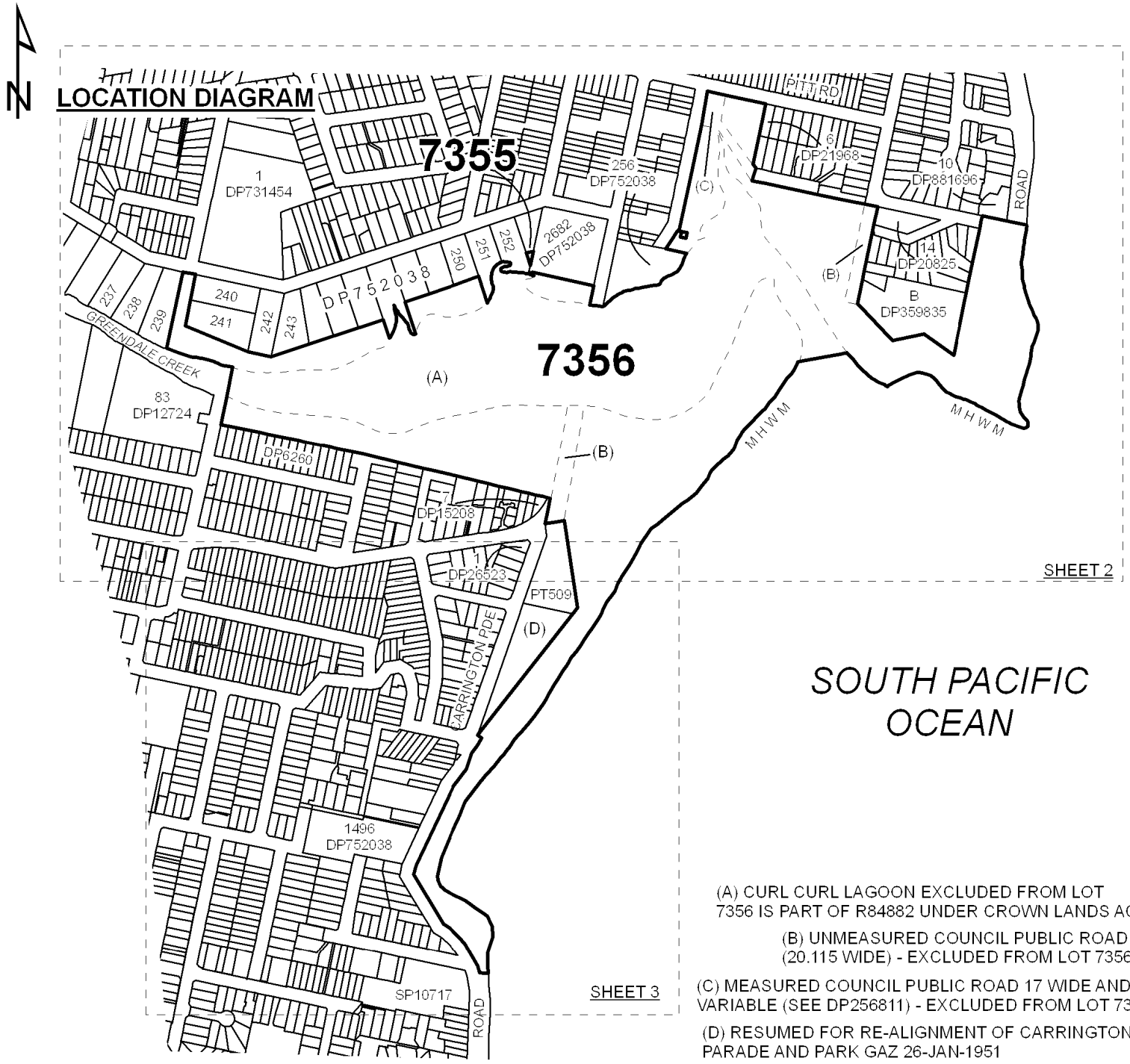
Recorded	Number	Type of Instrument	C.T. Issue
4/7/2011	DP1167221	DEPOSITED PLAN	FOLIO CREATED CT NOT ISSUED
4/7/2011	CA158903	CONVERSION ACTION	
18/3/2014	AI365044	REQUEST	
18/3/2014	AI145335	LEASE BY A RESERVE TRUST	

*** END OF SEARCH ***

CUAB-19 PRINTED ON 23/5/2019

Search Date/Time: **23/05/2019 8:28PM**

DP 1167221



(A) CURL CURL LAGOON EXCLUDED FROM LOT 7356 IS PART OF R84882 UNDER CROWN LANDS ACT

(B) UNMEASURED COUNCIL PUBLIC ROAD (20.115 WIDE) - EXCLUDED FROM LOT 7356

(C) MEASURED COUNCIL PUBLIC ROAD 17 WIDE AND VARIABLE (SEE DP256811) - EXCLUDED FROM LOT 7356

(D) RESUMED FOR RE-ALIGNMENT OF CARRINGTON PARADE AND PARK GAZ 26-JAN-1951

Registered : 04-07-2011

Title System : CROWN LAND

Purpose : CROWN LAND CONVERSION

Reference Map: U1860-92, U2760-7, U2760-43

Last Plan: 2570 - 2030, DP1074766, DP1030960, DP1118079, DP1118734, DP1118751, DP1118754, DP1118756, DP1118738, DP1118740, DP1118077 & DP1118736

DP752038__UP122132_7356_1 CA158903

PLAN OF CROWN LAND BEING RESERVE

Lengths are in metres. Reduction Ratio - NTS

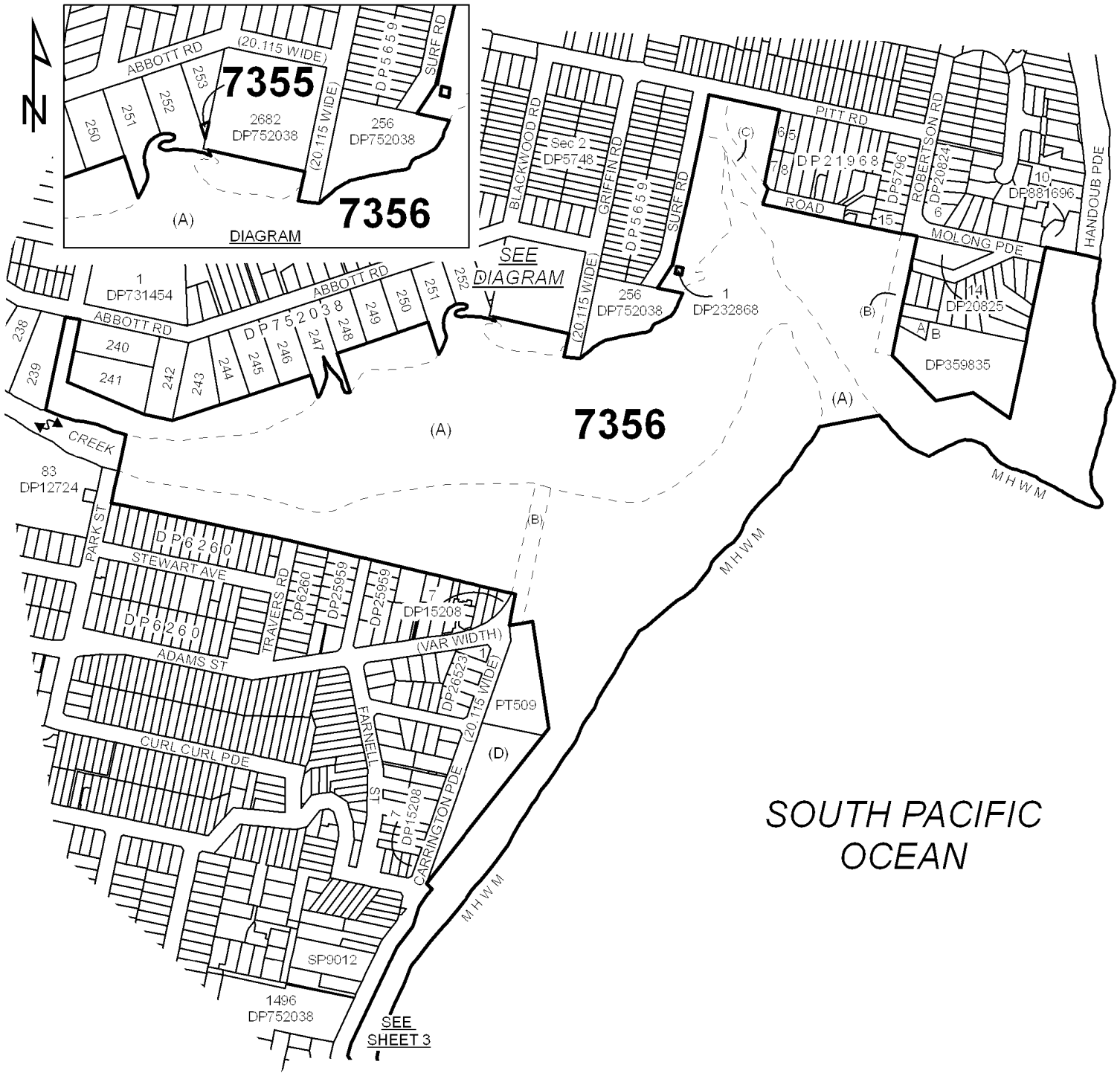
Sheet 1 of 3 sheets

LGA:	WARRINGAH
LOCALITY :	FRESHWATER
PARISH :	MANLY COVE
COUNTY :	CUMBERLAND

THIS PLAN WAS PREPARED SOLELY TO IDENTIFY THE LAND ABOVE AND THE BOUNDARIES HAVE NOT BEEN INVESTIGATED BY THE REGISTRAR GENERAL

THIS PLAN IS NOT A CURRENT PLAN IN TERMS OF S.7A CONVEYANCING ACT 1919

Drawn By: AJ
Signed Off: RW
Office: Head Office, Crown Lands Division, Newcastle



DP 1167221

Registered : 04-07-2011

DP752038__UP122133_7356_2

Sheet 2 of 3 sheets

DP 1167221

Registered : 04-07-2011

DP752038__UP122134_7356_3

Sheet 3 of 3 sheets

Appendix G
Historical Research Information
&
Historical Aerials

Research References:

Google Earth. (2019). Google Earth – Google Earth. [online] Available at: https://www.google.com/earth/ [Accessed 18 May 2019].

John Fisher Park and Abbott Road Land Plan of Management. (2001). Retrieved from https://files.northernbeaches.msw.gov.au/sites/default/files/test-grab/juppom.pdf [Accessed 18 May 2019].

Six Maps 1943 Imagery. (2019). *Six Maps*. Retrieved from https://maps.six.nsw.gov.au/#

Six Maps aerial Curl Curl 1943

Curl Curl Aerial 1991

Google Earth Pro 2005

Google Earth Pro 2009

Google Earth Pro 2014

Google Earth Pro 2018

Appendix H
Laboratory Reports

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 42 43 44

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph 02 9910 6200 / sydney@envirolab.com.au

Perth Lab - MPL Laboratories.
16-18 Hayden Crt Myaree, WA 6154
Ph 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
1A Dalmore Drive Scoresby VIC 3179
Ph 03 9763 2500 / melbourne@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
Ph 07 3266 9532 / brisbane@envirolab.com.au

Client: Canopy Enterprises

Contact Person: Fenn Hinchcliffe

Sampler: G Haid

Address:

Phone: Mob: 0402 411 177

Email: fenn@canopyenterprises.com, gunnar@canopyenterprises.com

Client Project Name / Number / Site etc (ie report title): CUAB-19

PO No.:

Date results required:

Or choose: standard / same day / 1 day / 2 day / 3 day

Report format: esdat / equis /

Lab Comments:

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Priority Metals	PAH	OC/OP	BTEX/TRH	PCB	Comb 6	Comb 6a	SPOCAS								Comments: Provide as much information about the sample as you can
1	B1	0.5	8.5.19	Soil x 2																
2	B1	1.0	"	x 1																
3	B1	1.5	"	x 2							x									
4	B1	2.0	"	x 1								x								
5	B1	3.0	"	x 1																
6	B1	3.5	"	x 2						x										
7	B1	5.0	"	x 1																
8	B1	5.5	"	x 1																
9	B1	6.5	"	x 1																
10	B1	7.0	"	x 1																
11	B1	7.5	"	x 1																
12	B1	8.0	"	x 1								x								
13	B1	8.5	"	x 1																
14	B1	9.0	"	x 1																
15	B1	10.0	"	x 1																
16	B2	0.5	"	x 1						x										
17	B2	1.0	"	x 1																
18	B2	2.0 (XXX)	"	x 1																
19	B2	3.0	"	x 1								x								
extra 20	B2	2-5																		

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

Job No: 21 7051.

Date Received: 080519
Time Received: 1331
Received by: ELS
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (Company): Canopy Enterprises

Print Name: G Haid

Date & Time: 8.5.19 / 13:35

Signature:

Received by (Company): ELS

Print Name: Ellen Wh

Date & Time: 080519 1331

Signature:

Lab use only:

Samples Received: Cool or Ambient (circle one)

Temperature Received at: (if applicable)

Transported by: Hand delivered / courier

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 217051

Client Details

Client	Canopy Enterprises Pty Ltd
Attention	Fenn Hinchcliffe
Address	16/40 Hilly St, Mortlake, NSW, 2137

Sample Details

Your Reference	**CUAB-19**
Number of Samples	20 Soil
Date samples received	08/05/2019
Date completed instructions received	08/05/2019

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	13/05/2019
Date of Issue	13/05/2019

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

Asbestos Approved By
Analysed by Asbestos Approved Identifier: Aida Marner
Authorised by Asbestos Approved Signatory: Matt Tang

Results Approved By
Ken Nguyen, Reporting Supervisor
Matthew Tang, Asbsestos Supervisor
Nick Sarlamis, Inorganics Supervisor
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		217051-3	217051-6	217051-16
Your Reference	UNITS	B1	B1	B2
Depth		1.5	3.5	0.5
Date Sampled		08/05/2019	08/05/2019	08/05/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	09/05/2019	09/05/2019	09/05/2019
Date analysed	-	10/05/2019	10/05/2019	10/05/2019
TRH C_6 - C_9	mg/kg	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	112	112	113

svTRH (C10-C40) in Soil				
Our Reference		217051-3	217051-6	217051-16
Your Reference	UNITS	B1	B1	B2
Depth		1.5	3.5	0.5
Date Sampled		08/05/2019	08/05/2019	08/05/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	09/05/2019	09/05/2019	09/05/2019
Date analysed	-	09/05/2019	09/05/2019	09/05/2019
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50
Surrogate o-Terphenyl	%	86	89	90

PAHs in Soil				
Our Reference		217051-3	217051-6	217051-16
Your Reference	UNITS	B1	B1	B2
Depth		1.5	3.5	0.5
Date Sampled		08/05/2019	08/05/2019	08/05/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	09/05/2019	09/05/2019	09/05/2019
Date analysed	-	10/05/2019	10/05/2019	10/05/2019
Naphthalene	mg/kg	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.2	<0.1	0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.3	<0.1	0.6
Pyrene	mg/kg	0.3	<0.1	0.7
Benzo(a)anthracene	mg/kg	0.1	<0.1	0.4
Chrysene	mg/kg	0.2	<0.1	0.5
Benzo(b,j+k)fluoranthene	mg/kg	0.3	<0.2	0.9
Benzo(a)pyrene	mg/kg	0.2	0.05	0.61
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.3
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1	<0.1	0.4
Total +ve PAH's	mg/kg	1.7	0.05	4.7
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	0.8
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	0.8
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	0.9
Surrogate p-Terphenyl-d14	%	99	91	92

Organochlorine Pesticides in soil				
Our Reference		217051-3	217051-6	217051-16
Your Reference	UNITS	B1	B1	B2
Depth		1.5	3.5	0.5
Date Sampled		08/05/2019	08/05/2019	08/05/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	09/05/2019	09/05/2019	09/05/2019
Date analysed	-	09/05/2019	09/05/2019	09/05/2019
HCB	mg/kg	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	94	96	95

Organophosphorus Pesticides				
Our Reference		217051-3	217051-6	217051-16
Your Reference	UNITS	B1	B1	B2
Depth		1.5	3.5	0.5
Date Sampled		08/05/2019	08/05/2019	08/05/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	09/05/2019	09/05/2019	09/05/2019
Date analysed	-	09/05/2019	09/05/2019	09/05/2019
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1
Surrogate TCMX	%	94	96	95

PCBs in Soil				
Our Reference		217051-3	217051-6	217051-16
Your Reference	UNITS	B1	B1	B2
Depth		1.5	3.5	0.5
Date Sampled		08/05/2019	08/05/2019	08/05/2019
Type of sample		Soil	Soil	Soil
Date extracted	-	09/05/2019	09/05/2019	09/05/2019
Date analysed	-	09/05/2019	09/05/2019	09/05/2019
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1
Surrogate TCLMX	%	94	96	95

Acid Extractable metals in soil				
Our Reference		217051-3	217051-6	217051-16
Your Reference	UNITS	B1	B1	B2
Depth		1.5	3.5	0.5
Date Sampled		08/05/2019	08/05/2019	08/05/2019
Type of sample		Soil	Soil	Soil
Date prepared	-	09/05/2019	09/05/2019	09/05/2019
Date analysed	-	09/05/2019	09/05/2019	09/05/2019
Arsenic	mg/kg	5	<4	10
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	6	10	6
Copper	mg/kg	11	16	6
Lead	mg/kg	27	27	14
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	2	3	2
Zinc	mg/kg	48	33	26

Moisture				
Our Reference		217051-3	217051-6	217051-16
Your Reference	UNITS	B1	B1	B2
Depth		1.5	3.5	0.5
Date Sampled		08/05/2019	08/05/2019	08/05/2019
Type of sample		Soil	Soil	Soil
Date prepared	-	09/05/2019	09/05/2019	09/05/2019
Date analysed	-	10/05/2019	10/05/2019	10/05/2019
Moisture	%	13	23	6.5

Asbestos ID - soils		
Our Reference		217051-3
Your Reference	UNITS	B1
Depth		1.5
Date Sampled		08/05/2019
Type of sample		Soil
Date analysed	-	09/05/2019
Sample mass tested	g	Approx. 30g
Sample Description	-	Brown sandy soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected

sPOCAS + %S w/w				
Our Reference		217051-4	217051-12	217051-19
Your Reference	UNITS	B1	B1	B2
Depth		2.0	8.0	3.0
Date Sampled		08/05/2019	08/05/2019	08/05/2019
Type of sample		Soil	Soil	Soil
Date prepared	-	09/05/2019	09/05/2019	09/05/2019
Date analysed	-	09/05/2019	09/05/2019	09/05/2019
pH $_{kcl}$	pH units	8.2	4.6	5.5
TAA pH 6.5	moles H^+ /t	<5	6	<5
s-TAA pH 6.5	%w/w S	<0.01	0.01	<0.01
pH $_{Ox}$	pH units	8.0	4.6	2.8
TPA pH 6.5	moles H^+ /t	<5	12	68
s-TPA pH 6.5	%w/w S	<0.01	0.02	0.11
TSA pH 6.5	moles H^+ /t	<5	6	64
s-TSA pH 6.5	%w/w S	<0.01	0.01	0.10
ANC_E	% $CaCO_3$	0.44	<0.05	<0.05
a-ANC_E	moles H^+ /t	88	<5	<5
s-ANC_E	%w/w S	0.14	<0.05	<0.05
S_{KCl}	%w/w S	0.01	<0.005	0.02
S_P	%w/w	0.16	0.007	0.29
S_{POS}	%w/w	0.14	0.007	0.27
a-S_{POS}	moles H^+ /t	90	<5	170
Ca_{KCl}	%w/w	0.12	0.01	0.04
Ca_P	%w/w	0.45	0.02	0.20
Ca_A	%w/w	0.33	0.008	0.15
Mg_{KCl}	%w/w	0.005	0.022	0.007
Mg_P	%w/w	0.026	0.029	0.018
Mg_A	%w/w	0.021	0.007	0.011
S_{HCl}	%w/w S	<0.005	<0.005	<0.005
S_{NAS}	%w/w S	<0.005	<0.005	<0.005
a-S_{NAS}	moles H^+ /t	<5	<5	<5
s-S_{NAS}	%w/w S	<0.01	<0.01	<0.01
Fineness Factor	-	1.5	1.5	1.5
a-Net Acidity	moles H^+ /t	<5	11	170
s-Net Acidity	%w/w S	<0.01	0.02	0.27
Liming rate	kg $CaCO_3$ /t	<0.75	0.81	13
s-Net Acidity without -ANCE	%w/w S	0.14	0.017	0.27
a-Net Acidity without ANCE	moles H^+ /t	90	11	170
Liming rate without ANCE	kg $CaCO_3$ /t	6.7	0.81	13

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.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-064	sPOCAS determined using titrimetric and ICP-AES techniques. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. 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-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. 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-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	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-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.

Method ID	Methodology Summary
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. '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-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. 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	217051-6
Date extracted	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
Date analysed	-			10/05/2019	3	10/05/2019	10/05/2019		10/05/2019	10/05/2019
TRH C_6 - C_9	mg/kg	25	Org-016	<25	3	<25	<25	0	109	100
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	3	<25	<25	0	109	100
Benzene	mg/kg	0.2	Org-016	<0.2	3	<0.2	<0.2	0	105	96
Toluene	mg/kg	0.5	Org-016	<0.5	3	<0.5	<0.5	0	108	101
Ethylbenzene	mg/kg	1	Org-016	<1	3	<1	<1	0	111	100
m+p-xylene	mg/kg	2	Org-016	<2	3	<2	<2	0	110	101
o-Xylene	mg/kg	1	Org-016	<1	3	<1	<1	0	113	101
naphthalene	mg/kg	1	Org-014	<1	3	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	115	3	112	109	3	118	115

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217051-6
Date extracted	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
Date analysed	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	3	<50	<50	0	104	105
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	3	<100	<100	0	106	117
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	3	<100	<100	0	114	108
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	3	<50	<50	0	104	105
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	3	<100	<100	0	106	117
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	3	<100	<100	0	114	108
Surrogate o-Terphenyl	%		Org-003	90	3	86	88	2	102	100

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217051-6
Date extracted	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
Date analysed	-			10/05/2019	3	10/05/2019	10/05/2019		10/05/2019	10/05/2019
Naphthalene	mg/kg	0.1	Org-012	<0.1	3	<0.1	<0.1	0	106	108
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	3	<0.1	<0.1	0	100	102
Phenanthrene	mg/kg	0.1	Org-012	<0.1	3	0.2	0.2	0	90	92
Anthracene	mg/kg	0.1	Org-012	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	3	0.3	0.4	29	90	90
Pyrene	mg/kg	0.1	Org-012	<0.1	3	0.3	0.4	29	92	92
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	3	0.1	0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	3	0.2	0.2	0	116	118
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	3	0.3	0.3	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	3	0.2	0.2	0	104	104
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	3	<0.1	0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	3	0.1	0.2	67	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	95	3	99	94	5	97	93

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217051-6
Date extracted	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
Date analysed	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
HCB	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	92	86
gamma-BHC	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	99	89
Heptachlor	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	100	95
delta-BHC	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	93	89
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	105	100
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	99	96
Dieldrin	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	110	106
Endrin	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	97	83
pp-DDD	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	103	78
Endosulfan II	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	102	99
Methoxychlor	mg/kg	0.1	Org-005	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	101	3	94	95	1	95	87

QUALITY CONTROL: Organophosphorus Pesticides						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217051-6
Date extracted	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
Date analysed	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	106	105
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	106	101
Dimethoate	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	102	112
Fenitrothion	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	102	99
Malathion	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	97	75
Parathion	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	99	96
Ronnel	mg/kg	0.1	Org-008	<0.1	3	<0.1	<0.1	0	103	100
Surrogate TCMX	%		Org-008	101	3	94	95	1	96	96

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217051-6
Date extracted	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
Date analysed	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	3	<0.1	<0.1	0	117	117
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	101	3	94	95	1	96	96

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	217051-6
Date prepared	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
Date analysed	-			09/05/2019	3	09/05/2019	09/05/2019		09/05/2019	09/05/2019
Arsenic	mg/kg	4	Metals-020	<4	3	5	<4	22	87	105
Cadmium	mg/kg	0.4	Metals-020	<0.4	3	<0.4	<0.4	0	111	105
Chromium	mg/kg	1	Metals-020	<1	3	6	6	0	120	112
Copper	mg/kg	1	Metals-020	<1	3	11	17	43	108	108
Lead	mg/kg	1	Metals-020	<1	3	27	35	26	109	117
Mercury	mg/kg	0.1	Metals-021	<0.1	3	<0.1	<0.1	0	95	102
Nickel	mg/kg	1	Metals-020	<1	3	2	2	0	109	104
Zinc	mg/kg	1	Metals-020	<1	3	48	57	17	111	105

QUALITY CONTROL: sPOCAS + %S w/w					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			09/05/2019	[NT]	[NT]	[NT]	[NT]	09/05/2019	[NT]
Date analysed	-			09/05/2019	[NT]	[NT]	[NT]	[NT]	09/05/2019	[NT]
pH $_{kcl}$	pH units		Inorg-064	[NT]	[NT]	[NT]	[NT]	[NT]	90	[NT]
TAA pH 6.5	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	105	[NT]
s-TAA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pH $_{Ox}$	pH units		Inorg-064	[NT]	[NT]	[NT]	[NT]	[NT]	101	[NT]
TPA pH 6.5	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	88	[NT]
s-TPA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
TSA pH 6.5	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-TSA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
ANC_E	% $CaCO_3$	0.05	Inorg-064	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-ANC_E	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-ANC_E	%w/w S	0.05	Inorg-064	<0.05	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{KCl}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{POS}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-S_{POS}	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ca_{KCl}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ca_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ca_A	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mg_{KCl}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mg_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Mg_A	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{HCl}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
S_{NAS}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-S_{NAS}	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-S_{NAS}	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Fineness Factor	-	1.5	Inorg-064	<1.5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Liming rate	kg $CaCO_3$ /t	0.75	Inorg-064	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
s-Net Acidity without -ANCE	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
a-Net Acidity without ANCE	moles H^+ /t	5	Inorg-064	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]

QUALITY CONTROL: sPOCAS + %S w/w					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	[NT]	[NT]	[NT]	[NT]	[NT]	[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.

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; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

Asbestos: Excessive sample volume was provided for asbestos analysis.
A portion of the supplied sample was sub-sampled according to Envirolab procedures. We cannot guarantee that this sub-sample is indicativeof the entire sample.
Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.
Note: Sample 217051-3 was sub-sampled from a bag provided by the client.

Appendix I
Bore Logs

BORE LOG

Project: Curl Curl Date: 8/05/2019 Bore ID: B1

Site: Abbot Road Fields
Curl Curl NSW 2095
Logged by: Gunnar Haid
Driller: D Hart
Company:

Project ID: CUAB-19

Method: Full flight auger
Water Level: 1.9 m Static:

Depth [m]	Groundwater	Sample	PID (PPM)	UCSC Class	Description
					Top soil loam, grass, organics, roots
		0.5			Fill, layers of fine to medium grained sand, rock fragments, some foreign material, light brown, getting darker with depth, damp
1m		1.0			
		1.5			
2m	GW	2.0			Fill, fine to medium grained sand with silt, dark grey, wet Organic decay odour
3m		3.0			
		3.5			
4m					
5m		5.0			Fine to medium grained sand with clay and silt content increasing with depth, dark grey, wet
		5.5			
6m					Continue next sheet

Description		Colour	Structure	Moisture	Cohesive Soils		Sand & Gravel			Secondary
Fill	Clayey	Red	Homogenous	Dry	Very soft	Non plastic	Very loose	Boulders	Poorly sorted	And (35-50%)
Clay	Silly	Yellow	Heterogeneous	Damp	Soft	Low plasticity	Loose	Cobbles	(well graded)	Some (20-35%)
Silt	Sandy	White	Stratified	Moist	Firm	Mod plasticity	Medium loose	Coarse gravel	well sorted	Little (10-20%)
Sand	Gravelly	Black	Laminated	Wet	Stiff	High plasticity	Dense	Fine gravel	(poorly graded)	Trace (0-10%)
Gravel	Organic	Brown	Lens	Saturated	Very stiff		Very dense	Coarse sand		Contamination
Topsoil		Grey	Root holes		Hard					Odour
Peat		Mottled	occasional							

Disclaimer: This bore log is intended for environmental not geotechnical purposes

BORE LOG

Project: Curl Curl Date: 8/05/2019 Bore ID: B1

Site: Abbot Road Fields
Curl Curl NSW 2095
Logged by: Gunnar Haid

Project ID: CUAB-19

Driller: D Hart
Company:

Method: Full flight auger
Water Level: 1.9 m Static:

Depth [m]	Groundwater	Sample	PID (PPM)	UCSC Class	Description
		6.5			Fine to medium grained sand with clay and silt content increasing with depth, dark grey, wet
7m		7.0			
		7.5			
8m		8.0			Sandy clay, medium plasticity, light grey, wet
9m		9.0			
10m		10.0			EOH @ 10.0 m
11m					
12m					

Description		Colour	Structure	Moisture	Cohesive Soils		Sand & Gravel			Secondary
Fill	Clayey	Red	Homogenous	Dry	Very soft	Non plastic	Very loose	Boulders	Poorly sorted	And (35-50%)
Clay	Silly	Yellow	Heterogeneous	Damp	Soft	Low plasticity	Loose	Cobbles	(well graded)	Some (20-35%)
Silt	Sandy	White	Stratified	Moist	Firm	Mod plasticity	Medium loose	Coarse gravel	well sorted	Little (10-20%)
Sand	Gravelly	Black	Laminated	Wet	Stiff	High plasticity	Dense	Fine gravel	(poorly graded)	Trace (0-10%)
Gravel	Organic	Brown	Lens	Saturated	Very stiff		Very dense	Coarse sand		Contamination
Topsoil		Grey	Root holes		Hard					Odour
Peat		Mottled	occasional							

Disclaimer: This bore log is intended for environmental not geotechnical purposes

BORE LOG

Project: Curl Curl Date: 8/05/2019 Bore ID: B2

Site: Abbot Road Fields
Curl Curl NSW 2095

Project ID: CUAB-19

Logged by: Gunnar Haid

Driller: D Hart

Method: Full flight auger

Company:

Water Level: 1.9 m Static:

Depth [m]	Groundwater	Sample	PID (PPM)	UCSC Class	Description
					Top soil loam, grass, organics, roots
		0.5			Fill, layers of fine to medium grained sand, rock fragments, some foreign material, light brown, getting darker with depth, damp
1m		1.0			
		1.5			
	GW				
2m		2.0			Fill, fine to medium grained sand with silt, dark grey, wet Organic decay odour
		2.5			
3m		3.0			EOH @ 3.0 m

Description		Colour	Structure	Moisture	Cohesive Soils		Sand & Gravel			Secondary
Fill	Clayey	Red	Homogenous	Dry	Very soft	Non plastic	Very loose	Boulders	Poorly sorted (well graded)	And (35-50%)
Clay	Silly	Yellow	Heterogeneous	Damp	Soft	Low plasticity	Loose	Cobbles		Some (20-35%)
Silt	Sandy	White	Stratified	Moist	Firm	Mod plasticity	Medium loose	Coarse gravel		Little (10-20%)
Sand	Gravelly	Black	Laminated	Wet	Stiff	High plasticity	Dense	Fine gravel	well sorted (poorly graded)	Trace (0-10%)
Gravel	Organic	Brown	Lens	Saturated	Very stiff		Very dense	Coarse sand		Contamination
Topsoil		Grey	Root holes		Hard					
Peat		Mottled	occasional							Odour

Disclaimer: This bore log is intended for environmental not geotechnical purposes