Phase 2
Detailed Environmental Site Assessment

Cronulla Sharks Redevelopment

Stage 1

Lot 11 in DP 526492

461 Captain Cook Drive

Woolooware NSW

Prepared for

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EXECUTIVE SUMMARY

DLA Environmental (DLA) was commissioned by Bluestone Capital Venture No.1 Pty Ltd. to prepare a Phase 2 Detailed Environmental Site Assessment as part of the Stage 1 re-development works of the Cronulla Sutherland Leagues Club and associated facilities on the property (Site) bounded by Captain Cook Drive and Woolooware Road North Woolooware NSW, formerly identified as Part Lot of Lot 11 in DP 526492. Refer to **Figure 1** – Site Location and **Figure 2** – Site Layout

The Site is located at 461 Captain Cook Drive, Woolooware NSW, and is located within the Sutherland Shire Council Local Government area. The site is currently occupied by the Cronulla-Sutherland Leagues Club. The Site is currently zoned Private Recreation Zone under the Sutherland Shire Local Environmental Plan 2006. The focus of this report is the area identified as the Stage 1 development, which comprises an area of approximately 2.2 hectares, and is currently used a car park for the Cronulla Sutherland Leagues Club and associated facilities.

The Cronulla Sutherland Leagues Club site is legally described as Lot 11 DP 526492 and Lot 20 DP 529644 and is known as 461 Captain Cook Drive, Woolooware. Three lots owned by Sutherland Shire Council (being Lot 21 DP 529644, Lot 1 DP 711486 and Lot 1 DP 501920) are also included within the proposed Development. The existing Lots are presently subject to Plan of Subdivision creating Lot 1 and Lot 2.

The site is located on the northern side of Captain Cook Drive approximately 1.5 kilometres from Caringbah (to the south west) and 2 kilometers from Cronulla (to the south east). The site is bounded by the Solander playing fields to the west, Woolooware Bay to the north, and a Service Station and Gymnasium to the east. The Woolooware Golf Club and the Captain Cook Oval are located to the south of the site across Captain Cook Drive.

The overall Site is irregular in shape with an area of approximately 10.0 hectares, of which approximately 6ha is occupied by Toyota Stadium, Leagues Club building and the eastern car park and 4ha is occupied by the western training fields and car park. The investigation area is the Stage 1 development area which covers the current car park and covers a total area of approximately 2.2ha.

Toyota Stadium (also known as Endeavour Field and Shark Park) and the Cronulla Sutherland Leagues Club building occupy the central portion of the site, and represent a major community and entertainment hub within the region. The western playing fields within

the site are private open space used as training fields for the Cronulla Sharks and for local games by the Cronulla Caringbah Junior Rugby League Football Club, whilst the remainder of the site is occupied by car parking.

The Taren Point Employment Area is located approximately 200 metres to the northwest of the site and occupies land located generally between the waterfront, Taren Point Road and the Captain Cook Bridge. Woolooware Railway Station is located 1 kilometre to the south west of the site, and Caringbah Town Centre is approximately 3 kilometres by road to the south west.

The site is located to the south of Woolooware Bay which forms part of the north boundary of the site investigation area. The regional topography falls gently towards the Bay to the north, apart from the golf course to the south of Captain Cook Drive that was generally at a lower level than the site. Sections of the site appear to have been filled above surrounding levels including the spectator areas. Regional drainage patterns are generally toward Woolooware Bay to the north via a storm water channel located between the east and west sections of the site. Due to previous grading of the Site some sections drain locally toward Captain Cook Drive toward the south rather than Woolooware Bay. An easement for transmission lines is located across the north section of the site.

For descriptive purposes the site can be divided into two (2) principal sections, the eastern section that is occupied by an on-grade car park; and the western section that is occupied by the Main Club facility.

The Site is currently subject to Stage 1 development works which includes the upgrade of Toyota Park and its facilities, the development of additional commercial space including a Medical Centre, and improvements to the current Leagues Club adjoining Toyota Park. The Stage 1 area is currently used as a car park, and after redevelopment the Stage 1 area will be used as car parking space with retail space on the western and north western portion and a medical facility on the south western portion of the Stage 1 area. The redevelopment being consistent with the current zoning and land use as commercial/industrial with the relevant land use criteria being Table 5a Column F – Commercial/Industrial NEPM 1999.

This assessment chemically evaluated the levels of soil contaminants and conducted both visual and historical investigation of the potential environmental impacts on the site. Several potential sources of contamination associated with past filling operations during development were identified.

The soil profile encountered across the site consisted of estuarine clay with a shallow groundwater table. Subgrade fill was encountered directly below the hardstand to an average depth of 0.3m. Uncontrolled fill materials were encountered across Site to a depth in excess of four (4) metres.

Due to a large number of studies conducted previously on the Site, a judgemental sampling strategy was adopted which was justified by previous investigation identifying site consistent fill materials across the site, and the numbers of samples selected and their locations were considered to be representative of the identified soils on-site. The judgemental sampling strategy was also used to fill data gaps of the previous assessments or to clarify previous findings.

For the purpose of this assessment, a total of fourteen (14) soil samples plus duplicates were collected across the Site.

TPH, BTEX, PAH, Heavy Metals and OC/OP/PCB concentrations on all samples analysed were in compliance with the NSW Service Station Guidelines and the NEPM 1999 table 5a column F – Commercial/Industrial Criteria.

Groundwater was found to be present at a depth of 3 - 4m. One (1) groundwater monitoring well (MW#2), and two (2) methane gas monitoring wells (MW#1 and MW#3) were installed. Refer to **Figure 3** – *Site Sampling Locations.*

Groundwater analysis indicated an elevated concentration of zinc in MW#2 (300µg/L). MW#1 and MW#3 exhibited much lower concentrations of 3µg/L respectively. It is believed MW#2 concentration levels of zinc are anomalous and not consistent with other on-site recorded concentrations or with groundwater monitoring conducted previously. No other exceedances were recorded for groundwater analytes.

Acid sulphate soils were noted to be present on-site from the Acid Sulphate Soils Risk Maps and verified by sample collection and analysis. The acid sulphate soils present on-site are associated with the former natural wetland estuarine system. These are typical of coastal estuarine systems. Any excavations where acid sulphate soils are disturbed should be the subject of an Acid Sulphate Soils Management Plan.

Methane concentrations were samples at three (3) locations relative to proposed building locations with a maximum concentration of 0.2% recorded. Field observations at the time of

borehole drilling and test pitting, recorded results of up to 19% v/v within the proposed car park area. This is consistent with previous recorded results.

Asbestos fragments were detected in six (6) of the fourteen (14) bore holes or test pits excavated. Asbestos fibre analysis conducted on all soil samples revealed no respirable fibres detected. The identification of fragments of asbestos is consistent with previous investigation findings. The asbestos fragments were detected within the fill materials.

All concentrations of TRH, PAH compounds, BTEX fractions, PCB and OPP were not detected above the Site Acceptance Criteria in any of the soil samples collected at the Site. Heavy metal concentrations were in compliance with Table 5a Column F – Commercial/Industrial NEPM 1999. The water samples collected comply with the NSW (ANZECC) 2000 Australian and New Zealand Guidelines for Fresh and Marine Water Quality. The most applicable criteria being the 95% trigger values for marine water as the receiving waters are Woolooware Bay.

No off-site influences affecting or potentially affecting the Site were identified.

Asbestos fragments were detected in 40% of the test pits excavated. Large numbers of fragments were not evident in any location with single fragments typically identified. Respirable fibres were not detected in any of the soil samples collected. It appears that although asbestos is present it does not appear to be in large quantities or impacting the total Site. Irrespective of the above, the Site should be subject to an Asbestos Management Plan.

Methane concentrations from monitoring wells installed resulted in low concentrations being recorded. Field monitoring at the time of excavation of test pits recorded levels of up to 19% v/v. Although low results were recorded in the monitoring wells, specifically located in most sensitive areas enough previous information exists to warrant a cautious approach to accepting the low levels as being typical of the entire site.

The completion of this report concludes that the Site assessment objectives, according to the Site Acceptance Criteria, have been achieved. It is the opinion of DLA Environmental that any future development of the Site will require the issues of methane gas, acid sulphate soils and asbestos to be addressed. A Remediation Action Plan (RAP) will be required at that time.

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 General

DLA Environmental (DLA) was commissioned by Bluestone Capital Venture No.1 Pty Ltd. to prepare a Phase 2 Detailed Environmental Site Assessment as part of the Stage 1 re-development works of the Cronulla Sutherland Leagues Club and associated facilities on the property (Site) bounded by Captain Cook Drive and Woolooware Road North Woolooware NSW, formerly identified as Part Lot of Lot 11 in DP 526492.

Refer to **Figure 1** - *Site Location and* **Figure 2** - Site Layout.

1.2 Objectives of the Assessment

The Office of Environment and Heritage (OEH) states that a Detailed Site Environmental Assessment should provide comprehensive information on:

- Any issues raised in preliminary investigations;
- The type, extent and level of contamination;
- Contaminant dispersal in the air, surface water, groundwater, soil and dust;
- The potential effects of contaminants on public health, the environment and building structures;
- Off-site impacts on soil, sediment and biota (where applicable); and
- The adequacy and entirety of all information available to be used in making decisions on remediation.

The project objectives of this Environmental Assessment are to satisfy the stated DECC Detailed Site Investigation requirements in accordance with *NSW EPA Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* and, in the absence of any prior assessments, will also incorporate the requirements of a site investigation, which should:

- Identify all past and present potentially contaminating activities;
- Identify potential contamination types;
- Discuss the site condition;
- Provide a detailed assessment of site contamination; and,
- Assess the need for further investigations.

The proposed investigation program and the detailed site assessment are designed to be suitable to assess the presence of any unacceptable risk to human health or the environment on-site or off-site. The report draws conclusions regarding the suitability of the site for continued use as a service station, further intended use, or provide recommendations for remedial works.

1.3 Data Quality Objectives

The National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM) and Australian Standard (AS) 4482.1-2005 recommend that data quality objectives (DQOs) be implemented during the investigation of potentially contaminated sites. The DQO process described in AS 4482.1-2005 *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil Part 1: Non-Volatile and Semi-Volatile Compounds* outlines seven (7) distinct steps to outline the project goals, decisions, constraints and an assessment of the project uncertainties and how to address these when they arise. They define the quality and quantity of data needed to support decisions relating to the environmental condition of a site. They also outline the defining criteria that a data collection design should satisfy, including when, where, how and number of samples to be collected.

The DQO's for the investigations were to:

State the Problem

Determine, from a contamination point of view, if the land is suitable to be developed for Commercial/Industrial land use in accordance with the requirements of *State Environmental Planning Policy No. 55* and the *Environmental Planning and Assessment Act. 1979*. This includes researching previous site investigations, historical searches (titles, land use of site and adjacent sites, and aerial photographs), identification of chemicals of concern, media they inhabit and possible migration pathways (to and from the site), potential exposures to human and/or environmental receptors, and concerns with the potential clean up and desired future land use of the property. Statistical evidence needs to determine that the identified site does not present an unacceptable risk to human health or the environment and is suitable for the intended land use.

Identify the Decision

The decisions to be made on the contamination and the new environmental data required includes considering relevant site contamination criteria for each medium (fill, soil and sediment). A proposed use of the 95% UCL on the mean concentrations for all soil

chemicals of potential concern must be less than the site criteria identified for land use suitability. Decisions include:

- Has the presence of underground storage tanks adversely effected soil and groundwater contaminant concentrations?
- Have service station and mechanical workshop operations adversely effected soil and groundwater contaminant concentrations?
- Do any potential offsite contaminant sources exist which may impact upon the site?

Identify Inputs to Decision

This step requires the identification of the environmental variables/characteristics that need measuring, identification of which media (fill, soil etc.) needs to be collected, identification of the site criteria for each medium of concern, and appropriate analytical testing. Inputs include:

- Systematic and judgemental soil sampling and representative analysis of all materials identified at the site;
- Determination of the general concentrations of heavy metals, hydrocarbons, pesticides and PCB's across the site;
- Statistical analysis of the analytical data;
- Identifying current and future potential receptors and the likelihood of exposure to unacceptable levels of contamination both on and off site.

Define the Study Boundaries

Specify the spatial and temporal aspects of the environmental media that the data must represent to support decision. To identify the boundaries (both spatial and temporal) of the investigation and any restrictions that may hinder the assessment process. This includes onsite inspections and discussions with informed individuals. The physical study will focus on fill materials and natural soils within the confines of the proposed lot boundary.

Refer to **2.0** – Site Description, **Figure 2** – *Site Layout.*

Develop a Decision Rule

To define the parameter(s) of interest, specify the action level and provide a logical basis for choosing from alternative actions. The site will be considered suitable for its intended land use if soils comply with the Health Investigation Levels (HIL) provided in NEPM 1999, Table 5a and the NSW EPA Service Station Guidelines 1994 in line with the following Site Assessment Criteria (SAC) being applied to the data:

- The 95% Upper Confidence Limit (UCL) of the arithmetic mean for each Contaminant of Concern must comply with the respective HIL;
- The individual contaminant concentration should not exceed the SAC by more than 250%, and;
- The standard deviation of individual contaminants should not exceed 50% of the SAC.

The site will be deemed unsuitable for its intended use or containing contamination "hotspots" if any of the above criteria are unfulfilled.

The following publications have been reviewed with respect to the assessment criteria and sampling methodology of soils and water at the site:

- NSW EPA Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites;
- Schedule B1 Guideline on the Investigation Levels for Soil and Groundwater from the National Environment Protection (Assessment of Site Contamination) Measure 1999 Table 5a Column F – Commercial/Industrial;
- NSW EPA Service Station Guidelines 1994;
- NSW DEC Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination, 2007;
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000);
- Standards Australia AS4482.1 2nd Edition: Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil – Part 1: Non-Volatile and Semi-Volatile Compounds, 2005;
- NSW EPA Contaminated Sites: Sampling Design Guidelines, 1995, and;
- NSW EPA Guidelines for the NSW Site Auditor Scheme, second edition 2006.

Refer to **3.2** – Soil, Gas and Groundwater Criteria

Specify Limits on Decision Errors.

Specify the decision-maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data. Incorrect decisions are caused by using data that is not representative of site conditions because of sampling or analytical error.

A site under investigation is assumed to be contaminated until statistically proven otherwise (eg: H_o= Analyte 95% UCL exceeds the SAC), therefore two types of error are possible; Type 1 error (α or false negative), where the site is assessed to be uncontaminated when it actually is, and Type 2 error (β or false positive), when the site is assessed to be contaminated though it actually isn't. The more severe consequence is with Type 1 errors (α) since the risk of jeopardising human or environmental health outweighs the consequences of additional remediation costs. Therefore to achieve appropriate confidence in the data probabilities are set at 5% for Type 1 error, whilst Type 2 errors are set at a 20% probability limit.

Field and laboratory quality controls are implemented to avoid error and to ensure the action levels exceed the measurement detection limits for Contaminants Of Concern (COC) detected in field blanks, rinsate blanks, volatile-spiked trip samples and laboratory method blanks. The performance of decision making inputs will be enhanced through the application of Data Quality Indicators (DQI), defined as follows:

Precision A quantitative measure of the variability (or reproducibility) of data;

Accuracy A quantitative measure of the closeness of reported data to the "true" value;

Representativeness The confidence (expressed qualitatively) that data are representative of each media present on the site.

Completeness A measure of the amount of useable data from a data collection activity;

Comparability The confidence (expressed qualitatively) that data can be considered equivalent for each sampling and analytical event.

DLA Environmental adopted the following methods to satisfy all DQI's:

Data Precision and Accuracy	
Adequate Sampling Density	Sampling carried out in accordance with procedure B of the NSW EPA *Contaminated Sites: Sampling Design Guidelines*, 1995;
	Use of analytical laboratories with adequately trained and experienced testing staff experienced in the analyses undertaken, with appropriate NATA certification.
Acceptable field and laboratory Relative Percentage Difference (RPD) for duplicate comparison	>10 x LOR: 30% inorganics; 50% organics (Field) <10 x LOR: Assessed on individual basis (Field) >5 x LOR: 50% (laboratory) <5 x LOR: No Limit (laboratory)
In accordance with AS4482.1 – 2005 field duplicate RPD criteria is increased with organic analytes and for low concentrations. These criteria cannot reasonably exceed the laboratory's precision, therefore laboratory criteria have been adopted.	
Trip Blanks/ Rinsate Blanks	No Detection above LOR
Trip Spikes	Recoverable concentrations of volatiles between 60 – 140%
Adequate laboratory performance	Based on acceptance criteria of laboratory as specified on certificate of analysis: includes: blank samples, matrix spikes, control samples, and surrogate spike samples
Data Representativeness	
Sample and analysis selection	Representativeness of all potential contaminants
Trip Blanks/ Rinsate Blanks	No Detection above LOR
Trip Spikes	Recoverable concentrations of volatiles between 60 – 140%
Duplicate Samples	Adequate duplicate, split, rinsate and trip blank sample numbers
Laboratory selection	Adequate laboratory internal quality control and quality assurance methods, complying with the NEPM.
Documentation Completeness	
chain of custody records	Laboratory sample receipt information received confirming receipt of samples intact and appropriate chain of custody
	NATA registered laboratory results certificates provided
Data Completeness	
	Analysis for all potential contaminants of concern.
	Field duplicate sample numbers complying with NEPM
	Rinsate samples recovered regularly
	Trip spike samples prepared and sent with field samples regularly
Comparability	
	Use of NATA registered laboratories
	Test methods consistent for each sample in accordance with the Sampling Analysis and Quality Plan
	Detailed logs of all sample locations to be recorded
	Test methods comparable between primary and secondary laboratory
	Acceptable RPD's between original samples and field duplicates and inter-laboratory triplicate samples.

Optimise the Design for Obtaining Data.

Identify a resource-effective sampling and analysis design for data collection that satisfy the DQO's. The sampling and analytical plan is designed to avoid Type 1 and Type 2 errors and includes defining minimum sample numbers required to detect contamination as determined with procedures provided in the NSW EPA 1995 Sampling Design Guidelines and AS 4482.1 - 2005 and appropriate quality control procedures.

Due to a large number of studies conducted previously on the Site, a judgemental sampling strategy was adopted which was justified by previous investigation identifying site consistent fill materials across the site, and the numbers of samples selected and their locations were considered to be representative of the identified soils on-site The judgemental sampling strategy was also used to fill data gaps of the previous assessments or to clarify previous findings.

Refer to **3.0 –** Site Investigation Plan.

1.4 Statutory Framework

The pollution control and environmental planning statutes in NSW, which most likely apply are:

- Contaminated Land Management Act 1997;
- Protection of the Environment Operations Act 1997;
- Dangerous Goods Act 1975;
- Ozone Protection Act 1989;
- Waste Minimisation and Management Act 1995;
- Water Board (Corporatisation) Act 1994;
- Environmental Planning and Assessment Act 1979; and,
- Local Government Act 1993.

In addition, regulations and planning instruments made under these Acts may also apply.

The *Protection of the Environment Operations Act* (POEO), 1997 commenced operation on 1st July 1999 and has repealed the following Acts:

- The Clean Waters Act 1970;
- The Clean Air Act 1961;
- The Noise Control Act 1975;
- The Environmental Offences and Penalties Act 1989; and;
- The Pollution Control Act 1970.

The Act also incorporates the major regulatory provisions of *the Waste Minimisation and Management Act* 1995.

The repealed Acts are incorporated into the POEO Act. Thus, regulations made under the repealed Acts are now regulations under the POEO Act or until otherwise amended and licences issued under the repealed Acts are deemed to be licences under the POEO Act. The POEO Act provides a common licence to cover emissions to all environmental media. The Act lists certain "scheduled activities" which have to be licensed.

The *Contaminated Land Management Act*, 1997 specifies the legal requirements for the registration, investigation and remediation of contaminated land, and for the registration and accreditation of site auditors. It repeals the requirements of the *Environmentally Hazardous Chemicals Act*, 1985 in relation to audits and the accreditation of site auditors.

The *Environmental Planning and Assessment Act*, 1989 gives local authorities the power to regulate development within their areas of responsibility and to impose specific consent conditions, which cover environmental issues. In addition, the *Local Government Act* 1993 requires approval from Council for certain works/activities to be obtained.

1.5 Scope of Work

The investigation and assessment was conducted using the following methods:

- Review of historical aerial photographs available from the Land Information Centre;
- Reviewing all environmental conditions of the site including the geology and hydrogeology;
- Providing a comprehensive overview of the sites previous and current land uses and potential contamination issues, and;

- Investigation of soil and groundwater chemical concentrations relative to the NSW Service Station Guidelines 1994 and the NEPM 1999 HIL's.

The assessment and report has been conducted in accordance with the following:

- The National Environment Protection (Assessment of Site Contamination) Measure (NEPM), National Environment Protection Council 1999;
- NSW EPA Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, November 1997;
- NSW EPA Contaminated Sites: Guidelines for the NSW Site Auditor Scheme, second edition 2006;
- NSW EPA Guidelines for Assessing Service Station Sites, 1994;
- The Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites, Australian and New Zealand Environment and Conservation Council and the National Health and Medical Research Council (NHMRC), January 1992, and;
- NSW DECC Waste Classification Guidelines, 2009.

2.0 SITE DESCRIPTION

2.1 Site Identification

The Site is located at 461 Captain Cook Drive, Woolooware NSW, and is located within the Sutherland Shire Council Local Government area. The site is currently occupied by the Cronulla-Sutherland Leagues Club. The Site is currently zoned Private Recreation Zone under the Sutherland Shire Local Environmental Plan 2006. The focus of this report is the area identified as the Stage 1 development, which comprises an area of approximately 2.2 hectares, and is currently used a car park for the Cronulla Sutherland Leagues Club and associated facilities.

The Cronulla Sutherland Leagues Club site is legally described as Lot 11 DP 526492 and Lot 20 DP 529644 and is known as 461 Captain Cook Drive, Woolooware. Three lots owned by Sutherland Shire Council (being Lot 21 DP 529644, Lot 1 DP 711486 and Lot 1 DP 501920) are also included within the proposed Development. The existing Lots are presently subject to Plan of Subdivision creating Lot 1 and Lot 2.

The site is located on the northern side of Captain Cook Drive approximately 1.5 kilometres from Caringbah (to the south west) and 2 kilometers from Cronulla (to the south east). The Site is bounded by the Solander playing fields to the west, Woolooware Bay to the north, and a Service Station and Gymnasium to the east. The Woolooware Golf Club and the Captain Cook Oval are located to the south of the site across Captain Cook Drive.

The overall Site is irregular in shape with an area of approximately 10.0 hectares, of which approximately 6ha is occupied by Toyota Stadium, Leagues Club building and the eastern car park and 4ha is occupied by the western training fields and car park. The investigation area is the Stage 1 development area which covers the current car park and covers a total area of approximately 2.2ha.

Toyota Stadium (also known as Endeavour Field and Shark Park) and the Cronulla Sutherland Leagues Club building occupy the central portion of the site, and represent a major community and entertainment hub within the region. The western playing fields within the site are private open space used as training fields for the Cronulla Sharks and for local games by the Cronulla Caringbah Junior Rugby League Football Club, whilst the remainder of the site is occupied by car parking.

The Taren Point Employment Area is located approximately 200 metres to the northwest of the site and occupies land located generally between the waterfront, Taren Point Road and

the Captain Cook Bridge. Woolooware Railway Station is located 1 kilometre to the south west of the site, and Caringbah Town Centre is approximately 3 kilometres by road to the south west.

The Site is located to the south of Woolooware Bay which forms part of the north boundary of the Site investigation area. The regional topography falls gently towards the Bay to the north, apart from the golf course to the south of Captain Cook Drive that was generally at a lower level than the site. Sections of the Site appear to have been filled above surrounding levels including the spectator areas. Regional drainage patterns are generally toward Woolooware Bay to the north via a storm water channel located between the east and west sections of the site. Due to previous grading of the site some sections drain locally toward Captain Cook Drive toward the south rather than Woolooware Bay. An easement for transmission lines is located across the north section of the site.

For descriptive purposes the site can be divided into two (2) principal sections (as shown on **Figure 2**)

- The eastern section that is occupied by an on-grade car park (Stage 1 Area); and,
- The western section that is occupied by the Main Club facility.

Refer **Figure 1** – *Site location* and **Figure 2** - *Site Layout*

2.2 Proposed future Land use

The Site is currently subject to Stage 1 development works which includes the upgrade of Toyota Park and its facilities, the development of additional commercial space including a Medical Centre, and improvements to the current Leagues Club adjoining Toyota Park. The Stage 1 area is currently used as a car park, and after redevelopment the Stage 1 area will be used as car parking space with retail space on the western and north western portion and a medical facility on the south western portion of the Stage 1 area. The redevelopment being consistent with the current zoning and land use as commercial/industrial with the relevant land use criteria being Table 5a Column F – Commercial/Industrial NEPM 1999.

2.3 Environmental Setting

2.3.1 Boundaries and Surrounding Land Use

The Taren Point Employment Area is located approximately 200 metres to the north-west of the site and occupies land located generally between the waterfront, Taren Point Road and the Captain Cook Bridge. Woolooware Railway Station is located 1 kilometre to the south west of the site, and Caringbah Town Centre is approximately 3 kilometres by road to the south west.

The Site is located to the south of Woolooware Bay which forms part of the northern boundary of the site investigation area. For descriptive purposes the site can be divided into two (2) principal sections (as shown on Figure 2), the eastern portion of the Site which is currently occupied by an on-grade car park (Stage 1 Area), and the western portion that is occupied by the Main Club facility.

2.3.2 Site Topography and Hydrology

The regional topography falls gently towards Woolooware Bay to the north, apart from the golf course to the south of Captain Cook Drive that was generally at a lower level than the site. Sections of the site appear to have been filled above surrounding levels including the spectator areas. Regional drainage patterns are generally toward Woolooware Bay to the north via a storm water channel located between the east and west sections of the site. Due to previous grading of the site some sections drain locally toward Captain Cook Drive toward the south rather than Woolooware Bay. An easement for transmission lines is located across the north section of the Site.

2.3.3 Site Geology and Soils

The 1:100,000 geological map of Wollongong-Port Hacking (Map 9029-91 29, 1:100,000 Department of Mineral Resources —1985) indicates the site to be underlain by manmade fill which typically consists of dredged estuarine sand and mud, coal washing, industrial and household waste. The fill is typically underlain by Quaternary aged deposits of organic rich, mostly “muddy” marine sand with Hawkesbury Sandstone at greater depths.

The soil profile encountered across the site consisted of alluvial clay with a shallow water table. Clay was found to the maximum depth of the boreholes which was approximately 6m

for bore holes with groundwater wells installed, and 5m for all remaining bore holes. Compacted road base fill was encountered directly below the hardstand to a maximum depth of 0.3m, however it was generally found to be less than 0.1m thick. All other soils encountered across the site appeared to be natural.

Refer to **Appendix B** – Bore Logs

2.3.4 Acid Sulphate Soils

The acid sulfate soil (ASS) risk maps indicate areas of high risk, low risk and no known occurrence of acid sulfate soils. The ASS Risk Map for Wollongong Port Hacking (Acid Sulfate Soil Risk Map- 9129 N4 edition 2, December 1997, 1:25000, Department of Land and Soil Conservation) indicates that the site is located at the boundary of two areas as summarised below:

- The majority of the site lies within an area classified as “disturbed terrain” which is indicated to extend to depths of approximately 1 m to 4m. Disturbed terrain may include filled areas, often associated with reclamation of low lying swamps for urban development, mined or dredged areas, or areas of heavy ground disturbance associated with the construction of dams and levees. Soil investigation is commonly necessary to assess acid sulphate soil conditions in these areas; and
- The area immediately to the north of the site (i.e. the mangrove area beyond the filled areas) is classified as being of “high probability” of ASS occurrence at or near the ground surface. This classification is typically associated with estuarine swamps, intertidal flats and supratidal flats. There is considered to be a significant environmental risk associated with this classification if ASS materials are disturbed by activities such as shallow drainage, excavation or clearing.

Refer to **Appendix B** - Bore logs

2.3.5 Methane

It should be noted that the car park and Club facilities are constructed on former Mangrove Swamps, a well-recognised source of methane generation.

Three (3) gas monitoring wells were installed strategically on the Site to provide up to date information on the gas concentrations specifically related to the development, in particular

the on-ground structures of the proposed Medical Centre and Club Leisure Facility located to the south and north of the existing Club respectively.

Refer to section **4.0 – Results** for methane analysis

2.3.6 Site Meteorology

The Bureau of Meteorology presents the average annual rainfall for the Cronulla area at 1082.1mm, with an average of 96.1 days of greater than 1mm rainfall annually. The annual mean temperature range is from 13.4°C - 22.2°C, and an annual average daytime temperature of 21.8°C.

2.4 Development Controls

2.4.1 Council Records

A search of building and development application records held by Sutherland Shire Council was undertaken during the DLA investigation. These records indicate that the site was part of a larger parcel of land bought by the Council from numerous private owners in the late 1950s. The land was purchased with the intention of filling these low-lying areas with 'hard fill' (non-putrescible wastes) to enable the long term development of sports fields. Filling was completed in a number of stages managed by private contractors (from 1964 to 1967) and Council (after 1967).

In 1962 the Electricity Commission of NSW resumed a portion at the north of the site for the Kurnell Transmission Line. In 1965 a drainage culvert was constructed to the west of the main playing field across from Captain Cook Drive to Woolooware Bay at the north.

The Leagues Club and Stadium area of the site were sold by tender to the Cronulla Sutherland Leagues Club in 1968 with an agreement that the Council would fill the remainder of the site and transfer the ownership to the Leagues Club.

Development of the stadium and other club facilities was undertaken in a number of stages with approval for the main Club building obtained in 1973. Approval for spectator seating, change rooms and amenities facilities was obtained in 1979 and extensions to the Club and spectator facilities were undertaken in 1981.

Associated with the construction and upgrade of the spectator areas in 1981 land reclamation resulting in the construction of a fill mound approximately 6m above the field level was undertaken within the transmission line easement. Correspondence records indicate that council approval for this development was not sought prior to the commencement of development works. This mound extended beyond the Leagues Club land into Woolooware Bay. Council subsequently ordered that stabilisation works be undertaken.

Further development of the club facilities and extensions to the club were approved in 1996.

Numerous other development proposals have been lodged with the Council including an industrial development, recreational theme park (water slides, go-kart track, fast food restaurant) and a service station. None of these have eventuated.

2.4.2 Contaminated Land Record Search

A search was conducted of all records pertaining to section 58 of the Contaminated Land Management Act 1997 and revealed that the Site at 461 Captain Cook Drive Woolooware NSW is not encumbered by any notices from the NSW EPA with regard to contaminated land

2.5 Site History

Review of aerial photography, historical titles and anecdotal information, suggests the Site was vacant until it was developed for its current purpose in 1960. The Site encompasses the main playing field originally known as Endeavor Field, currently named Toyota Park, the adjoining Cronulla-Sutherland Leagues Club and associated facilities including training fields located to the west of Toyota Park. The Site is currently undergoing development including upgrading of the Toyota Park Stadium as well as the development of commercial premises and a Medical Centre during stage 1 works

2.5.1 Aerial Photograph Review

Table 2a – Aerial Photograph Review Summary

Aerial Photograph	Description
1951	The site and surrounding area was a mangrove swamp. Captain Cook Drive had not been constructed. Some minor roads, mainly unpaved, led into this area.
1956	The area remained similar to the 1951 photo, with dense mangroves. Captain Cook Drive had been constructed and surrounding roads had been surfaced.
1961	The site appeared similar to the 1956 photo apart from an open channel running from south to north at the centre of the site. Filling operation was in progress in the area to the south of Captain Cook Drive, and further to the south a golf course was apparent. Residential areas were located further to the south.
1965	The location of the current stadium and Leagues Club was being filled. The east and west sections of the site remained similar to the 1961 photo with dense mangrove swamp. Land-filling of mangrove swamp to the south of the road and further to the west was also visible.
1970	The east and west sections of the site were being filled. A football field had been constructed on the area occupied by the present day stadium. A small covered spectator stand was visible to the west of the oval. A school had been constructed to the south-east of the site and the golf course had been completed and extended to Captain Cook Drive. Back filling had also been completed in areas further to the east and west of the site.
1978	Reclamation of the site had been completed. A multistorey club house had been built to the east of the field and landscaped mounds were apparent at the north and south ends of the field. A paved car park was located to the east of the club and two football fields had been constructed to the west of the main field. A single storey building was located at the south of these fields. To the west and east of the site the land was vegetated. The surrounding land use to the south appeared similar to the 1970 photo.
1989	The site appeared similar to the 1978 photo with a car park to the east of the club and a car park and two fields to the west of the stadium. Several more spectator areas had been constructed at the stadium and several more ovals had been constructed to the west of the site.
1998	The south—west portion of the site appeared to have been paved with asphalt and was in use as a car park. The two football fields remained to the north. A larger spectator stand had been constructed at the west of the football stadium. The club had been extended to the east with a driveway and club entrance. A car park remained to the east of the club. To the east of the site the area was vegetated with scrub and trees that graded to mangroves. To the south of the site the land use remained similar to the previous photo. To the west of the site several ovals and a large industrial complex were evident.

Aerial photography prints clearly outlining the previous existence on the Site of mangrove swamps, and the filling sequence conducted by Sutherland Shire Council and the presence of the only land use as Cronulla Sharks evident of the Site.

2.6 Onsite Inspection

2.6.1 General

The Cronulla Sharks Club was operating during the site inspection. The car park was substantially filled with vehicles. An adjoining gymnasium was observed to the east of the car park area.

The soil profile encountered across the investigation area consisted of sandy fill materials, sandy clays and silty clays overlying estuarine muds. A maximum depth of 4.5 metres was reached during drilling. Water was found to exist from approximately 3-4m.

2.6.2 Heritage / Archaeological Items

No heritage or items of archaeological significance were noted either from the historical review or site inspection.

2.7 Off-Site Observations

No current activities were apparent in the immediate surroundings of the site which may potentially cause contamination.

2.8 Potential Contamination Summary

The site history indicates the potential for contamination as the site has been subject to importation of fill materials throughout various stages of development over a number of years. Potential sources for contamination exist, with a number of features identified at the site including;

- A large capped car park area;
- Significant quantities of uncontrolled fill material;

- The obvious elevated nature of the Site above the natural profile of the adjacent estuarine system;

2.9 Summary of Past and Recent Environmental Investigation Reports

2.9.1 Previous Investigation Reports

EIS have previously prepared the following environmental assessment/investigation reports for various sections of wider Leagues Club site. A number of investigations have been undertaken over the years for a variety of different proposed developments:

1. ***"Report to St George Partnership Banking L td, Environmental Site Screening (of Site C) at Cronulla Leagues Club, Captain Cook Drive, Woolooware",* Ref: El 071 *5 SC/a,* dated 1 November 1994.**

This investigation involved drilling six boreholes in the west section of the site (in the open playing fields). The boreholes encountered fill material ranging from 2m to 3m deep. Eight soil samples were analysed for heavy metals, all of the results were less than the SAC adopted for the purpose of this review. Four soil composite samples were analysed for organics and potentially elevated concentrations of benzo(a)pyrene were detected in one of the samples. However these composite results are not considered to be reliable. Five groundwater samples were analysed. However, as with the composites these results are not considered to be particularly reliable.

2. ***"Report to St George Partnership Banking Ltd, Environmental Site Screening (of Site B) at Cronulla Leagues Club, Captain Cook Drive, Woolooware",* Ref: El 071 5SB/b, dated 1 November 1 994.**

This investigation involved drilling three boreholes in the east section of the site (in the car park). The boreholes encountered fill material 3m to 4m deep. Six soil samples were analysed for heavy metals, all of the results were less than the SAC adopted for the purpose of this review. One soil composite sample was analysed for organics and potentially elevated concentrations of benzo(a)pyrene were detected in the sample. However these composite results are not considered to be reliable. One groundwater sample was analysed. However, as with the composite these results are not considered to be particularly reliable.

3. *"Report to All Star Real Estate on Further Contamination Investigation (Site C) for Cronulla Sutherland Leagues Club at Captain Cook Drive, Woolooware"* Ref: El 071 5S/a, dated 1 5 February 1 995.

This investigation involved the drilling of 34 boreholes in a regular grid across the west section of the site. Most of the boreholes were terminated in the fill at a depth of 1 m. Thirty soil samples were analysed for heavy metals. Two samples contained lead concentrations greater than 1200mg/kg (i.e. the SAC adopted for the purpose of this review). The maximum lead result was 2295mg/kg. Four groundwater samples were analysed. However, these results are not considered to be particularly reliable. During drilling the methane gas concentration in the boreholes was measured. The methane gas concentrations ranged from 0% to 5% v/v.

4. *"Report to Cronulla Sharks Rugby Leagues Club on Environmental Site Screening for Shark Park Redevelopment at Cronulla Leagues Club, Captain Cook Drive, Woolooware",* Ref: El 5009FRPT/2, dated 29 November 2000.

- This investigation included a desk top site history assessment together with an additional ten boreholes drilled across the site. The limited site history indicated that:
- The site was mangrove swamp in the 1 950s and was gradually backfilled in the 1960s and 1970s;
- By 1978 the basic current layout of the site was complete;
- Council records indicated that Council had purchased the land in the 1950s with the intention of filling the low lying areas with non-putrescible waste;
- The Leagues Club and Stadium area of the site were sold by tender to the Cronulla Sutherland Leagues Club in 1968 with an agreement that the Council would fill the remainder of the site and transfer the ownership to the Leagues Club;
- Development of the stadium and other club facilities was undertaken in a number of stages with approval for the main Club building obtained in 1973. Approval for spectator seating, change rooms and amenities facilities was obtained in1979 and extensions to the club and spectator facilities were undertaken in1981; and
- A fill mound approximately 6m above the field level was constructed in the north section of the stadium on 1981. Records indicate that approval for this development was not sought from the council. This mound extended beyond the

Leagues Club land into Woolooware Bay. Council subsequently ordered that stabilisation works be undertaken.

- Of the ten (10) boreholes, four were drilled in the western playing fields, four (4) were drilled in the eastern car park and two (2) were drilled in the area to the north of the stadium. The boreholes in the western playing fields encountered up to 3.2m of fill, the boreholes in the eastern car park encountered 3.4 to 4.5m of fill and the boreholes drilled to the north of the stadium encountered greater than 6m of fill (these two boreholes were drilled in the spectator's hill). A total of 19 soils samples were analysed for heavy metals and all of the results were less than the SAC adopted for the purpose of this review.
- Nineteen (19) soil samples were analysed for a range of heavy metals. All of the results were less than the SAC adopted for the purpose of this review. Eight (8) composite samples were analysed for organic compounds. Although no significant elevations of organics were recorded in the composite samples the results are not considered to be reliable. Three (3) of the deeper natural soil samples (estuarine clayey silt/silty clay) were screened for potential ASS conditions using the POCAS analytical technique. The samples were all considered to be potential ASS (PASS).
- Significant concentrations of methane gas were encountered in four (4) of the boreholes (up to a maximum concentration of 42% v/v).

5. *"Report to Cronulla Sutherland Leagues Club on Further Environmental Site Assessment for Proposed Cronulla Leagues Club Rezoning at Captain Cook Drive, Woolooware",* Ref:E171 19FK-rpt, dated October 2002.

- This investigation included ten (10) boreholes across the eastern car park for a proposed basement and two (2) boreholes on the west side of the western playing fields for a proposed power easement. The fill depths in the eastern car park ranged from approximately 2.0m in the south west corner of the car park to approximately 4.5m along the north boundary. The depth of fill encountered in the two boreholes drilled on the west boundary of the western playing fields ranged from approximately 1m to 2m.
- Twenty four (24) soil samples were analysed for heavy metals, polycyclic aromatic hydrocarbons and organochlorine pesticides. One (1) sample contained an elevated concentration of lead (2,400mg/kg) above the SAC adopted for the purpose of this review. The remaining results were all less than the SAC adopted

for the purpose of this review. Twelve samples were analysed for petroleum hydrocarbons. The results were all less than the SAC adopted for the purpose of this review.

- Twenty two (22) of the underlying natural samples were analysed for potential acid sulphate soil. The results indicated that the underlying natural soils are considered to be potential acid sulphate soils.
- Groundwater in the boreholes was measured up to 26 hours after completion of drilling at depths that ranged from 2.4m to 3.2m below the existing ground levels.
- Methane gas was encountered in the boreholes at concentrations that ranged from 0% to 19% v/v.

6. *"Report to Cronulla-Sutherland District Rugby League Football Club on Environmental Site Assessment for Proposed Upgrade Works at Toyota Park, 461 Captain Cook Drive, Woolooware",* Ref: E20345FJ-RPT, dated August 2006.

- This investigation was confined to the south section of the western playing fields and the accessible open areas adjacent to the north, south and west of the stadium. The depth of fill in the south section of the western playing fields ranged from 1 .6m to 4.3m. The depth of fill in the accessible areas adjacent to the west and south of the stadium ranged from 1.1m to 4.2m. The depth of fill in the area to the north of the stadium ranged from 1 4m to 8.6m (it should be noted that these boreholes were drilled in the hill located to the north of the stadium). Monitoring wells were installed in eight of the boreholes. Groundwater levels were found to range from 0.41m AHD to 1.2m AHD (this correlates to approximately 1 m to 2m below existing site levels). This investigation was designed to address the requirements *SEPP55-Remediation of Land, Managing Land Contamination: Planning Guidelines*[12]. The investigation was also the subject of a contaminated site audit review by Mr. Rod Harwood of Environmental Strategies. However, the audit was never completed due to the cancelation of the proposed development.
- A summary of the detailed soil laboratory analysis is provided below:
- Seventy (70) soil samples were analysed for heavy metals and polycyclic aromatic hydrocarbons. One sample contained an elevated concentration of lead (1400mg/kg) above the SAC adopted for the purpose of this review. The remaining results were all less than the SAC adopted for the purpose of this review;

- Sixty one (61) samples were analysed for organochlorine pesticides. The results were all less than the SAC adopted for the purpose of this review;
- Thirteen (13) samples were analysed for organophosphate pesticides and phenoxy acid herbicides. The results were all less than the practical quantification limit of the analytical technique;
- Seventy (70) samples were analysed for petroleum hydrocarbons. The results were all less than SAC adopted for the purpose of this review;
- Fifty eight (58) fill samples were screened for asbestos. Asbestos was detected in eighteen of the samples;
- Thirteen (13) fill samples and thirty four (34) natural samples were screened for ASS characteristics using the SPOCAS method. The fill and natural soil samples were considered to be PASS.
- A summary of the groundwater chemistry results encountered in the eight monitoring wells is provided below:
- Groundwater pH was generally neutral and ranged from pH6.7 to 7.4;
- Electrical conductivity ranged from 2,200 uS/cm to 34,000 uS/cm;
- The groundwater samples did not contain organochlorine, organophosphate or herbicide concentrations above the adopted SAC.
- Elevated arsenic concentrations were encountered in seven of the eight monitoring wells. These results were considered to be associated with regional groundwater conditions rather than a site specific source;
- One (1) groundwater sample contained an elevated mercury concentration of 3.7ug/L compared to the site assessment criteria of 0.4pg/L. However this result may have been an anomaly as it was not confirmed by the analysis of a duplicate sample;
- The concentrations of ammonia in the groundwater samples ranged from 2. 1 mg/L to 34mg/L and were all above the SAC of 0.9lmg/L.
- The concentrations of volatile organic compounds (VOCs) and petroleum hydrocarbons were less than the practical quantification limits and less than the adopted SAC;
- Two groundwater samples were analysed for herbicides, organophosphate pesticides and organochlorine pesticides. The results were all less than the SAC.

A summary of the Methane Gas monitoring results encountered in the eight (8) monitoring wells is provided below:

Methane gas readings were obtained from the eight (8) monitoring wells. Methane gas reading in six of the eight wells exceeded 1 .25% v/v, with a maximum concentration of 29% v/v.

The following letters have also been prepared for the project:

1. *"Assessment of Existing Stockpiled Material for Re-use, Toyota Park, 461 Captain Cook Drive, Woolooware"* Dated 22 August 2007, Ref: E20345FJ2 Let;

2. *"Acid Sulfate Soil Management Plan, Proposed Upgrade of Sports Stadium Facilities, 461 Captain Cook Drive, Woolooware"* Dated 29 August 2007;

3. *"Review of Methane Measures for Proposed Southern Grandstand Works, Toyota Park, 461 Captain Cook Drive, Woolooware"* Dated 30 August 2007, Ref: E20345FJ Let-M; and,

4. *"Review of Methane Measures for Proposed Southern Grandstand Works, Toyota Park, 461 Captain Cook Drive, Woolooware"* Dated 30 August 2007, Ref: E20345FJ Let-M2.

Summary of Previous Investigations

The Cronulla Sharks Site consists of three principal sections: the western playing fields (an open grassed area); the centrally located stadium and associated club house; and the eastern car park (an on-grade asphalt paved car park). The north section of the site is bounded by mangrove swamp and Woolooware Bay. Aerial photographs indicated that the site was initially mangrove swamp that was backfilled sometime in the 1950s tol960s. The basic layout of the site buildings had been completed by 1978.

Since 1994 EIS have undertaken a number of investigations in various sections of the Site for a variety of proposed developments.

A number of the results in the earlier reports (pre 2001) are not considered to be reliable enough for inclusion in data sets for future reports. The reasons for this are:

- The organics analysis was undertaken on composite samples (i.e. samples from three or four adjacent boreholes were combined together into one sample to

provide a broad screening). Although common at the time this process can result in artifacts;

- QA/QC procedures in the field and in the laboratory in the older reports do not comply with the very stringent procedures that are currently implemented;
- The current procedures for groundwater well installation and subsequent sampling are considered to result in samples that are more representative of actual groundwater conditions; and,
- Due to the above issues old data sets would not be acceptable to a site auditor undertaking a review of older reports.
- However, old data sets can be discussed in general terms and may be useful if they backup the conclusions of more robust data sets.
- Based on the results of investigations a number of general conclusions can be drawn:
- The site sits on approximately 1.0m to 4.5 m of fill and is underlain by natural estuarine soil including silty sand, clayey sand and sandy clay. Bedrock was encountered at depths ranging from 1.2m to 26m. Groundwater was generally encountered at 1 to 2m below the current site levels;
- The investigations have not encountered any significant widespread chemical soil contamination. Some isolated elevations of lead have been encountered. During the 2006 investigation, 30% of the soil samples were found to contain traces of asbestos;
- The investigations have not encountered any significant widespread groundwater contamination.
- Elevated concentrations of arsenic encountered during one of the investigations were considered to be a regional issue rather than a site specific one;
- Both the fill and natural soils are considered to be PASS; and,
- The site is generating methane gas as a result of organic material buried during the filling process.

2.9.2 Recent Environmental Investigations

In order to provide a report that meets the requirements of a Stage 2 Detailed Investigation as specified in *SEPP55* there were a number of issues and data gaps that needed to be resolved. DLA addressed these data gaps and updated the past data of the Site focusing on

Stage 1 of the Development. The need for a NSW EPA Accredited Site Auditor was highlighted. A Sampling Analysis Quality Plan (SAQP) was provided to the Site Auditor before undertaking the assessments.

These recent assessments included the following:

- The appointment of an NSW EPA licensed independent contaminated site auditor to undertake a review of former and recent investigations. DLA understand that Mr. James Davis of Enviroview Pty Ltd has been engaged to provide this function;
- Representative soil sampling over the Stage 1 Development Area so that the final sampling density meets that specified in the *NSW EPA Sampling Design Guidelines (1995),* or are adequate to conclude that the remedial strategies proposed are adequate to resolve all Site potential issues;
- Analysis of soil samples for chemical contaminants;
- Methane monitoring across the site;
- Installation of additional groundwater monitoring wells and groundwater sampling for a more accurate understanding of groundwater conditions;
- Updating of the Acid Sulfate Soil Management Plan presented in the 2006 report to take account of new data and the proposed new development; and,
- Implementation of adequate QA/QC procedures so that a reliable, robust data set can be generated;

2.9.3 Past Environmental Assessment Integrity

EIS Pty Ltd conducted both Site Environmental Investigations and Geotechnical Assessments to assess the potential contamination to be present on the property. The Investigations recommended that a Detailed Investigation be undertaken to provide reassurance to the levels of contamination at the Site. This Detailed Investigation was undertaken by DLA Environmental in accordance with the Guidelines outlined in the NSW EPA documents *Guidelines for Consultants Reporting on Contaminated Sites*, *Sampling Design Guidelines* and *Guidelines for the NSW Site Auditor Scheme.*

The Site has not changed or has been *influenced/impacted* in any form since the initial assessment and final assessment. The landform remains unchanged.

3.0 SITE INVESTIGATION PLAN

3.1 Field Investigation Procedure

Field investigations at 461 Captain Cook Drive Woolooware, were undertaken between the 19th to the 24th December 2012 and comprised of the following:

- Inspect site and conduct a review of site history and aerial photographs to identify appropriate sampling locations prior to the commencement of work;
- Review and assess the collected data to evaluate any impact on the development of the Site;
- Review of previously collected data from the Site to compliment boreholes and test pits excavated over the Site;
- Excavation and sampling of eight (8) test pits through the northern landscaped mound and along the edge of the eastern car park;
- Drilling and sampling of eleven (11) bore holes through the eastern car park;
- Drilling and sampling of three (3) bore holes along the western edge of the western drainage channel;
- Sampling of thirteen (13) temporary soil gas locations;

As part of the assessment, two (2) gas monitoring wells and one (1) groundwater monitoring well was installed in the investigation area. Gas monitoring well construction consisted of 50mm PVC pipe installed to a depth of 2.5mbgl for MW#1(BH8) and MW#3. The gas monitoring wells were screened from 2.5mbgl to 1mbgl, and cased to ground level. The groundwater monitoring well construction consisted of 50mm PVC pipe installed to a depth of 4.5mbgl for MW#2 (BH11), screened from 4.5mbgl to 2.5mbgl, and cased to ground level. A bentonite seal was installed from ground level to a depth of 0.75m. Below 0.75m a 2mm course gravel and sand filter was placed. The installation of the wells was finished with placement of cast iron gatic covers with concrete surround. All monitoring wells were placed utilising a 4WD mounted drill rig.

Refer to **Figure 3** – *Site Sampling Locations*

3.1.1 Sampling Strategy

A Sampling Analysis Quality Plan was developed prior to Site work. Field soil sampling comprised the following:

- The sampling program concentrated on both natural soils and fill soils;
- Sampling was conducted on a gradient from lowest to highest potential contamination to minimise cross contamination;
- Samples were collected in accordance with the NSW EPA Sampling Design Guidelines and National Environmental Protection (Assessment of Site Contamination) Measure 1999.

A judgemental sampling strategy was employed in accordance with NSW EPA Sample Design Guidelines 1995 that targeted identified areas of potential contamination. Representative samples of natural soils and potential fill material were collected. Sample locations were selected to target contamination sources associated with past filling activities.

3.1.2 Sample Collection

All samples were collected by DLA Environmental who is specifically trained in contamination investigation techniques and health and safety procedures. All techniques used are specified in DLA Environmental Field Manual for Contaminated Sites, which are based on methods specified by the United States Environment Protection Agency (US EPA) and The National Environmental Protection (Assessment of Site Contamination) Measure (NEPM), 1999.

Soil samples for chemical analyses were collected in accordance with the NSW EPA Samples Guidelines 1994, NEPM 1999 and AS4482.1-2005. Samples were obtained by using a decontaminated trowel from soils excavated using a truck mounted drill rig or from the excavator bucket, where soils had not come into contact with the bucket walls. The soil was placed into a non-preserved glass container with a Teflon lined threaded cap. The samples were transported in a chilled and security sealed portable cooler to a NATA registered laboratory and analysed for Contaminants of Concern

Ground Water Well Development, Purging and Sampling methodology was undertaken in accordance with the *Murray-Darling Basin Groundwater Quality Sampling Guidelines* as

required by the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008.

Methane gas sampling of the monitoring wells involved an active extraction of gas utilising a GEM 2000 Landfill Gas Analyser coupled to a gas cap sealing the well. This approach is based on the gas concentrating at the top of the well and therefore providing a model of gas accumulation below building slabs or basements. Readings were recorded after attachment when levels were relatively stable, readings were also taken in the gas wells with the cap removed to estimate production rates of gases exiting the soil and mixing with the atmosphere; these readings were also recorded levels were relatively stable.

For temporary bore methane sampling, a clay cap with a Teflon tube inserted to a depth of approximately one metre (1m) was used to seal the borehole after completion of drilling to the required depth. A GFM410 Landfill Gas Analyser, which was calibrated prior to use, was attached to the Teflon tube and a field gas methane measurement was recorded.

Refer to **Appendix D** - Field and Laboratory Quality Assurance

3.1.3 Analytical Strategy

Samples were analysed for a range of contaminant indicators that may be associated with past and present land uses, i.e. contamination from fuel oil spills. Soil samples were analysed by Envirolab Services Pty Ltd of Chatswood for the following parameters:

Inorganic

- Heavy metals: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), and zinc (Zn).
- Asbestos

Organic

- Total Recoverable Hydrocarbons (TRH);
- Monocyclic aromatic hydrocarbons (BTEX);
- Volatile TPH (vTPH);
- Organochlorine (OC) Pesticides;

- Organophosphorus (OP) Pesticides;
- Polychlorinated Biphenyls (PCB).
- Polycyclic Aromatic Hydrocarbons (PAH).
- Methane

Photo Ionisation Detection (PID) assessments were undertaken during drilling of boreholes. All PID measurements were below the detection level of the equipment. All samples were analysed for TRH and heavy metals, whilst sufficient analysis of other contaminants was undertaken to allow confident assessment of all representative areas of the site.

Refer to **Attachment A** – NATA Certified Analytical Results.

3.2 Site Assessment Criteria

3.2.1 Rationale for the Selection of Assessment Criteria

The criteria selected have been chosen in accordance with current Australian and NSW EPA guidelines. Australian Guidelines have been used in preference to international guidelines where available. These criteria are the most current and widely accepted guidelines in use at present in Australia, and have generally been developed using a risk-based approach. Therefore, the general selected guidelines provide a satisfactory framework for the site assessment.
The Site Acceptance Criteria (SAC) are as follows:

- The 95% Upper Confidence Limit (UCL) of the arithmetic mean for each Contaminant of Concern must comply with the respective HIL.
- The individual contaminant concentration should not exceed the HIL by more than 250%, and;
- The standard deviation of individual contaminants should not exceed 50% of the HIL.

3.2.2 Soil, Gas and Groundwater Criteria

Criteria for assessing the site were derived from the following publications:

- Schedule B1 Guideline on the Investigation Levels for Soil and Groundwater from the National Environment Protection (Assessment of Site Contamination) Measure 1999 Table 5a Column F – Commercial Industrial;
- NSW EPA Guidelines for Assessing Service Station Sites 1994;
- NSW EPA Guidelines for the NSW Site Auditor Scheme, second edition 2006.
- ANZECC 2000, Australian Water Quality Guidelines for Fresh and Marine Waters, Australian and New Zealand Environment and Conservation Council, Kingston.
- NSW DECCW, 2010, Vapour Intrusion: Technical Practice Note
- CIRIA, 2007, Assessing Risks Posed by Hazardous Ground Gases to Buildings.
- NSW EPA Guidelines for the Assessment and Management of Sites Impacted Hazardous Ground Gases (Draft).

For the purpose of this assessment a Site Acceptance Criteria for methane of 5% of the Lower Explosive Limit value of 5%v/v has been adopted for the Stage 1 works area. Any methane detected under proposed occupied areas will warrant further investigation or remediation.

It should be noted that no established criteria currently exists for dissolved methane in groundwater. However, all detections will be investigated further and remediated where required based on the potential to impact the Site in the future.

Refer to **Table 3a** and **Table 3b** for Soils and Groundwater assessment criteria adopted for the Site.

Table 3a – Soil Assessment Criteria

Analytes	Thresholds (mg/kg dry wt)	Sources
Benzene	1	NSW Service Station Guidelines
Toluene	130[a]	
Ethylbenzene	50[b]	
Xylene (total)	25[b]	
TPH: C_6-C_9	65	NSW Service Station Guidelines
TPH: C_{10}-C_{40}	1000	
Arsenic	500	NEPM 1999, Table 5a, Column F
Cadmium	100	
Chromium	500	
Copper	5000	
Lead	1500	
Mercury	75	
Nickel	3000	
Zinc	35000	
B(a)P	5	NEPM 1999, Table 5a, Column F
Total PAH's	100	
PCB	50	NEPM 1999, Table 5a, Column F
Pesticides:		
(Aldrin/Dieldrin)	50	
Chlordane	250	
DDT+DDE+DDD	1000	
Odours	No Odours	NSW EPA

[a] The toluene threshold concentration is the Netherlands Maximum Permissible Concentration (MPC) to protect terrestrial organisms in soil. This value was obtained by applying the US EPA assessment factor to terrestrial chronic No Observed Effect Concentration (NOEC) data. The MPC is an "indicative" value (Van de Plassche et al 1993: Van de Plassche and Bockting 1993).

[b] Human health and ecological based protection level for toluene. The threshold concentration presented here is the Netherlands intervention value for the protection of terrestrial organisms. Other considerations such as odours and the protection of groundwater may require a lower remediation criterion.

Table 3b – Groundwater Investigation Levels

Analytes	Service Station Guidelines	ANZECC Marine Water (µg/L)		NHMRC Drinking Water Guidelines 2004 (µg/L)
		95%	90%	
Benzene	300	700	900	1
Toluene	300[+]	ID	ID	800
Ethylbenzene	80	ID	ID	300
M+P-Xylene		ID	ID	600
Total Xylene	380	ID	ID	
TPH: C_6 - C_{40}	600[1]			ID
T-1,2 dichloroethene		ID	ID	
C-1,2 dichloroethene		ID	ID	
Trichloroethene				
1,2 dichloroethane				
Chlorobenzene				
Arsenic (III)				
Arsenic (V)				7
Cadmium		5.5	14	2
Chromium (III)		27.4	48.6	
Chromium (VI)		4.4	20	50
Copper		1.3	3	2000
Lead	5	4.4	6.6	10
Mercury (inorganic)		0.4	0.7	1
Nickel		70	200	20
Zinc		15	23	ID
PAH's				
Napthalene				
Anthracene		70	90	ID
Phenanthrene				
Fluoranthene				
B(a)P		ID	ID	0.01
PCB (Total)		ID	ID	0.05
Phenolics		400	520	ID

[1] The NSW EPA Guidelines for Assessing Service Station sites and the ANZECC water quality Guidelines do not provide any reference for TPH levels in groundwater. In the absence of accepted criteria, the Dutch Intervention guidelines have been referenced as a guide only. The Dutch guidelines do not provide criteria for the C6-C9 hydrocarbon fractions, but provide values for mineral oil hydrocarbons (C10-C36 chain). The Dutch Intervention guideline for mineral oil is 600µg/litre. This guideline is health based rather than ecosystem based.

[2] The ANZECC threshold criteria of 7µg/L is a low reliability trigger level for protection of aquatic ecosystems and is derived from a study on the effects of petroleum hydrocarbons on tropical marine organisms. This level has not been adopted as it is below the most sensitive detection level of the laboratory.
ID=Insufficient Data; *Low reliability trigger values are provided where possible as an indicative guideline only in the absence of a high reliability 95% value.

3.2.3 Limitations of the Assessment Criteria

All criteria have limitations. Not all chemical analytes are covered by each set of guidelines, requiring some criteria to be sourced from elsewhere. This is particularly relevant to the Dutch guidelines, which provide a guideline for assessment for some analytes not covered by the Australian guidelines. Only criteria relevant to Australia have been used in the interpretation of analytical data on the Site.

4.0 RESULTS

4.1 Field observations

The majority of the investigation area is currently asphalt hardstand covering approximately 70% of the total area of the Site, the remainder being the Club Facility and associated landscaped areas. The fill materials below the hardstand area were predominantly sandy fill materials, Sandy clays and silty clays containing building rubble and general waste of a non-putrescible nature. All fill materials overlying natural estuarine silty clays.

Refer to **Appendix B** – Bore logs

4.2 Laboratory Results

4.2.1 Soil Analysis

All soils are analysed against the site criteria: Schedule B1 Guideline on the Investigation Levels for Soil and Groundwater from the National Environment Protection (Assessment of Site Contamination) Measure 1999 Table 5a Column F – Commercial/Industrial, consistent with the proposed land use for commercial and retail spaces. The sampling regime involved the collection of representative surface samples and subsurface samples where possible.

A total of fourteen (14) soil samples were submitted to Envirolab Services Pty Ltd for a range of laboratory analyses. A summary of the results of the assessment conducted at the Woolooware Site are summarized below, with exceedances of relevant SAC values highlighted.

Refer to **Appendix A** - NATA Certified Analytical Results for a complete summary of sample analysis.

Monocyclic Aromatic Hydrocarbons (BTEX)

Monocyclic Aromatic Hydrocarbons (BTEX fractions), associated with petrol contamination, were not detected above the laboratory Limit of Reporting (LOR) in any of the samples collected.

Total Petroleum Hydrocarbons (TPH)

A total of fourteen (14) soil samples included duplicates were analysed for Total Petroleum Hydrocarbon (TPH) compounds from the boreholes.

Concentrations above the Service Station Guidelines (most sensitive) of 65 mg/kg (C_6 – C_9) and 1000 mg/kg (C_{10}-C_{36}) were not detected in any samples.

Table 4a – TPH in Soil (mg/kg)

	Total Petroleum Hydrocarbons				
Sample ID	**C_6-C_9**	**C_{10}-C_{14}**	**C_{15}-C_{28}**	**C_{29}-C_{36}**	**Total**
BH1 - 1	<25	<50	<100	<100	nd
BH1 - 2	<25	<50	<100	<100	nd
BH1 - 3	<25	<50	<100	<100	nd
BH7 - 1	<25	<50	<100	<100	nd
BH7 - 2	<25	<50	<100	<100	nd
BH9 - 1	<25	<50	<100	<100	nd
BH9 - 2	<25	<50	110	110	110
BH12 - 1	<25	<50	140	140	140
BH13 - 1	<25	<50	<100	<100	nd
TP4	<25	<50	<100	<100	nd
TP5	<25	<50	<100	<100	nd
TP10	<25	<50	<100	<100	nd
TP10A	<25	<50	120	320	440
TP14 (BH14)	<25	<50	<100	<100	nd
HIL	**65**	**-**	**-**	**-**	**1000**

Pesticides

Four (4) samples including duplicates were submitted for pesticide and herbicide analysis (OCP). No concentrations of Organochlorine (OCP) or Organophosphorus (OPP) Pesticides were recorded above LOR and are therefore within the Site Acceptance Criteria (SAC). No evidence of impaction from pesticides or herbicides was noted.

Polycyclic Aromatic Hydrocarbons (PAH)

Fourteen (14) samples were analysed for Polycyclic Aromatic Hydrocarbons (PAH). Concentrations of Benzo (a) Pyrene ranged from below the LOR to 1.3 mg/kg. Concentrations of total PAH compounds detected ranged from below the LOR to 16.6mg/kg. All detections were below their respective Site Acceptance Criteria (SAC).

Polychlorinated Biphenyls (PCBs)

Four (4) samples including duplicates were analysed for Polychlorinated Biphenyls (PCB). There were no concentrations of PCB recorded above the LOR and hence none above the site assessment criteria.

Heavy Metals

A total of fourteen (14) soil samples including duplicates were submitted for analysis of all eight (8) heavy metals as recommended by the NSW EPA. All samples complied with the Site acceptance criteria of NEHF F – *Commercial/Industrial* and the *NSW Service Station Guidelines 1994*.

Refer to **Table 4b**- Metals in Soil

Table 4b- Metals in Soil (mg/Kg)

Parameter	Acid Extractable Metals							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
Average (n=14)	8	1.8	47.9	58.4	111.5	0.18	11.7	281
Standard Deviation	3.4	1.5	104.8	55.3	133	0.1	10.4	310
Min (mg/Kg)	4	0.6	8	3	6	0.1	2	12
Max (mg/Kg)	16	4.7	410	190	510	0.3	37	890
Number Exceeding	0	0	0	0	0	0	0	0
HIL (NEPM F)	**500**	**100**	**500**	**5000**	**1500**	**75**	**3000**	**35000**

Asbestos

All soil samples collected were analysed for the presence of asbestos fibres. One sample, TP14 (BH14) (0.5 – 1.0) contained the presence of synthetic mineral fibres, however no asbestos was detected at the reporting limit of 0.1g/kg. All other soil samples returned negative results for the presence of asbestos fibres. Asbestos fragments were detected in the fill materials of boreholes TP6, TP10, BH11, BH12, BH13 and TP14 (BH14).

Refer to **Figure 3** – *Site Sampling Locations* for details and refer to **Appendix D** – Asbestos Site Management Plan

4.2.2 Gas Analysis

Previous Investigations

Elevated levels of methane gas were encountered in the boreholes drilled in the vicinity of the proposed basement excavation and electrical transmission easement. The methane readings were recorded in the deposited waste and within the underlying organic rich silty clay and silty sand soils that were formerly the surficial mangrove sediment deposits. All buildings within 250m of deposited waste should be designed so as not to accumulate methane gas. Where well testing shows methane concentrations exceeding 1.25% methane (v/v) or 25% of the lower explosive limit, an appropriate and effective gas generation/control system is recommended. Levels of methane gas at four sample locations (BH907, BH908 and BH912 refer to *Further Environmental Assessment* prepared by EIS dated 2002) exceeded the 1.25% v/v methane threshold.

Current Investigation

Due to the known presence of methane on-site, methane sampling was conducted in the priority areas where building structures are planned.

Table 4c – Gas Analysis (Volume %)

Gas Analysis (Volume %)							
Sample Description	**Carbon Dioxide**	**Oxygen**	**Carbon Monoxide**	**Methane**	**Hydrogen**	**Nitrogen**	**Barometric Pressure**
MW1(BH8) (c)	5.8%	15.1%	nd	0.2%	low	78.9%	1006mb
MW1(BH8) (o)	5.3%	15.5%	0.001%	0%	nd	79.2%	
MW2(BH11) (c)	6.1%	13.7%	2%	0%	low	80.2%	1004mb
MW2(BH11) (o)	5.9%	14.4%	2%	0%	low	81%	
MW3 (BH14) (o)	0.1%	19.7%	1%	0%	low	80.2%	1003mb

(c) = Closed

(o) = Open

A gas concentration of 0.2% v/v was recorded at the location of the proposed Medical Centre, located to the south of the existing Club. MW#3 is located on the eastern boundary of the car park adjacent to the location of the proposed Woolooware North Road. Low concentrations similar to the other two wells were recorded.

Irrespective of the low results recorded in these important locations elevated concentrations above recent results have been recorded across the Site and most applicable to the car park area. Gas concentrations of up to 29% v/v have been record by previous assessments. Field measurements conducted during the recent investigations within excavated boreholes and test pits by DLA Environmental found concentrations up to 19% v/v borehole placed in the car park area.

Refer to **Table 4d** – Field Gas Analysis below and **Figure 2** – *Site Layout*

Table 4d – Field Gas Measurements

Field Gas Measurements			
Location	**CH_4 (v/v%)**	**CO_2 (v/v%)**	**O_2 (v/v%)**
BH1	0.4	0.8	19.3
BH2	3.5	1.3	18
BH3	0.1	0.8	18.9
BH7	5.8	4.3	15.2
BH9	1.4	10.9	1.8
BH11	5.8	4.3	15.2
BH12	3	5.8	12.4
BH13	19	15	5

4.2.3 Water Analysis

Three (3) groundwater samples were collected from groundwater wells installed by DLA in December 2012. Water samples were tested for a range of analytes including pH, Electrical Conductivity (EC), Methane (CH_4) and the eight Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) recommended by the NSW EPA.

Heavy Metals

All three (3) samples were analysed for eight heavy metals as recommended by the NSW EPA. One sample, MW2, returned concentrations of zinc above the ANZECC 2000 95% Protection of Fresh Water Species Criteria. All remaining analytes are below the SAC.

Refer to **Table 4e** below.

Table 4e – Heavy Metals in Water (µg/L) - Dissolved

Parameter	Heavy Metals in Water – Dissolved							
	As	**Cd**	**Cr**	**Cu**	**Pb**	**Hg**	**Ni**	**Zn**
Average (n=3)	1.7	nd	nd	nd	2	nd	5.7	**102**
Standard Deviation	0.0	nd	nd	nd	2.6	nd	2.5	**171**
Min (mg/Kg)	1	nd	nd	nd	0.5	nd	3	3
Max (mg/Kg)	2	nd	nd	nd	5	nd	8	**300**
Number Exceeding	0	0	0	0	0	0	0	0
SAC (ANZECC 95%)	**24**	**0.2**	**NA**	**1.4**	**3.4**	**0.6**	**11**	**8**

Nd- Non Detection

Electrical Conductivity and pH

All three (3) samples were analysed for Electrical Conductivity and pH. Refer to **Table 4f** below for details.

Table 4f – Electrical Conductivity and pH

Sample	*Electrical Conductivity*	pH
MW1 (BH8)	4,400	6.8
MW2 (BH11)	5,100	6.7
MW3 (BH14)	4,200	6.9

Methane

All three samples were analysed for the presence of methane. Refer to **Table 4g** below for details.

Table 4g – Methane in Water

Sample	*Methane (µg/L)*
MW1 (BH8	8,400
MW2 (BH11)	1,400
MW3 (BH14)	5,600

4.3 QA/QC Comments

The results of the field and laboratory quality assurance and quality control procedures complied with all stated DQOs. While a degree of homogeneity is expected, the very nature of the material and the contaminant concentrations would create expectancy for some heterogeneity.

A review of the QA/QC controls incorporated into the process and given the generally low concentrations of contaminants present in the soil on site generally, relative to threshold concentrations, the required degree of confidence in the results can be obtained. It is considered that the analytical data generated is of an acceptable degree of accuracy and precision for the purpose of assessing the soil quality on the site.

Refer to **Appendix D** - Field and Laboratory Quality Assurance

5.0 DISCUSSION

This assessment chemically evaluated the levels of soil contaminants and conducted both visual and historical investigation of the potential environmental impacts on the site. Several potential sources of contamination associated with past filling operations during development were identified.

The soil profile encountered across the investigation area consisted of estuarine clay with a shallow groundwater table. Subgrade fill was encountered directly below the hardstand to an average depth of 0.3m. Uncontrolled fill materials were encountered across Site to a depth in excess of four (4) metres.

Due to a large number of studies conducted previously on the Site, a judgemental sampling strategy was adopted which was justified by previous investigation identifying site consistent fill materials across the site, and the numbers of samples selected and their locations were considered to be representative of the identified soils on-site. The judgemental sampling strategy was also used to fill data gaps of the previous assessments or to clarify previous findings.

For the purpose of this assessment, a total of fourteen (14) soil samples plus duplicates were collected across the Site.

TPH, BTEX, PAH, Heavy Metals and OC/OP/PCB concentrations on all samples analysed were in compliance with the NSW Service Station Guidelines and the NEPM 1999 table 5a column F – Commercial/Industrial Criteria.

Groundwater was found to be present at a depth of 3 - 4m. One (1) groundwater monitoring well (MW#2), and two (2) methane gas monitoring wells (MW#1 and MW#3) were installed. Refer to **Figure 3** – *Site Sampling Locations.*

Groundwater analysis indicated an elevated concentration of zinc in MW#2 (300µg/L) with MW#1 and MW#3 exhibiting much lower concentrations at 3µg/L each. It is believed MW#2 concentration of zinc is anomalous and not consistent with other on-site recorded concentrations or with groundwater monitoring conducted previously. No other exceedances were recorded for groundwater analytes.

Acid sulphate soils were noted to be present on-site from the Acid Sulphate Soils Risk Maps and verified by sample collection and analysis. The acid sulphate soils present on-site are

associated with the former natural wetland estuarine system. These are typical of coastal estuarine systems. Any excavations where acid sulphate soils are disturbed should be the subject of an Acid Sulphate Soils Management Plan.

Methane concentrations were samples at three (3) locations relative to proposed building locations. A concentration of 0.2% v/v was the highest recorded result recorded during DLA Site sampling. Field observations at the time of bore hole drilling and test pit excavation, recorded results of up to 19% v/v within the proposed car park area. This is consistent with previous recorded results.

Asbestos fragments were detected in six (6) of the fourteen (14) bore holes / test pits drilled and excavated on Site. Asbestos fibre analysis conducted on all soil samples revealed no respirable fibres detected. The identification of fragments of asbestos is consistent with previous investigation findings. The asbestos fragments were detected within the fill materials.

6.0 CONCLUSIONS

All concentrations of TRH, PAH compounds, BTEX fractions, PCB and OPP were not detected above the Site Acceptance Criteria in any of the soil samples collected at the Site. Heavy metal concentrations were in compliance with Table 5a Column F – Commercial/Industrial NEPM 1999. The water samples collected comply with the NSW (ANZECC) 2000 Australian and New Zealand Guidelines for Fresh and Marine Water Quality. The most applicable criteria being the 95% trigger values for marine water as the receiving waters are Woolooware Bay.

No off-site influences affecting or potentially affecting the Site were identified.

Asbestos fragments were detected in approximately 40% of the test pits excavated. Large numbers of fragments were not evident in any location with single fragments typically identified. Respirable fibres were not detected in any of the soil samples collected. It appears that although asbestos is present it does not appear to be in large quantities or impacting the total Site. Please refer to the Asbestos Management Plan which has been produced by DLA for matters regarding asbestos on-site.

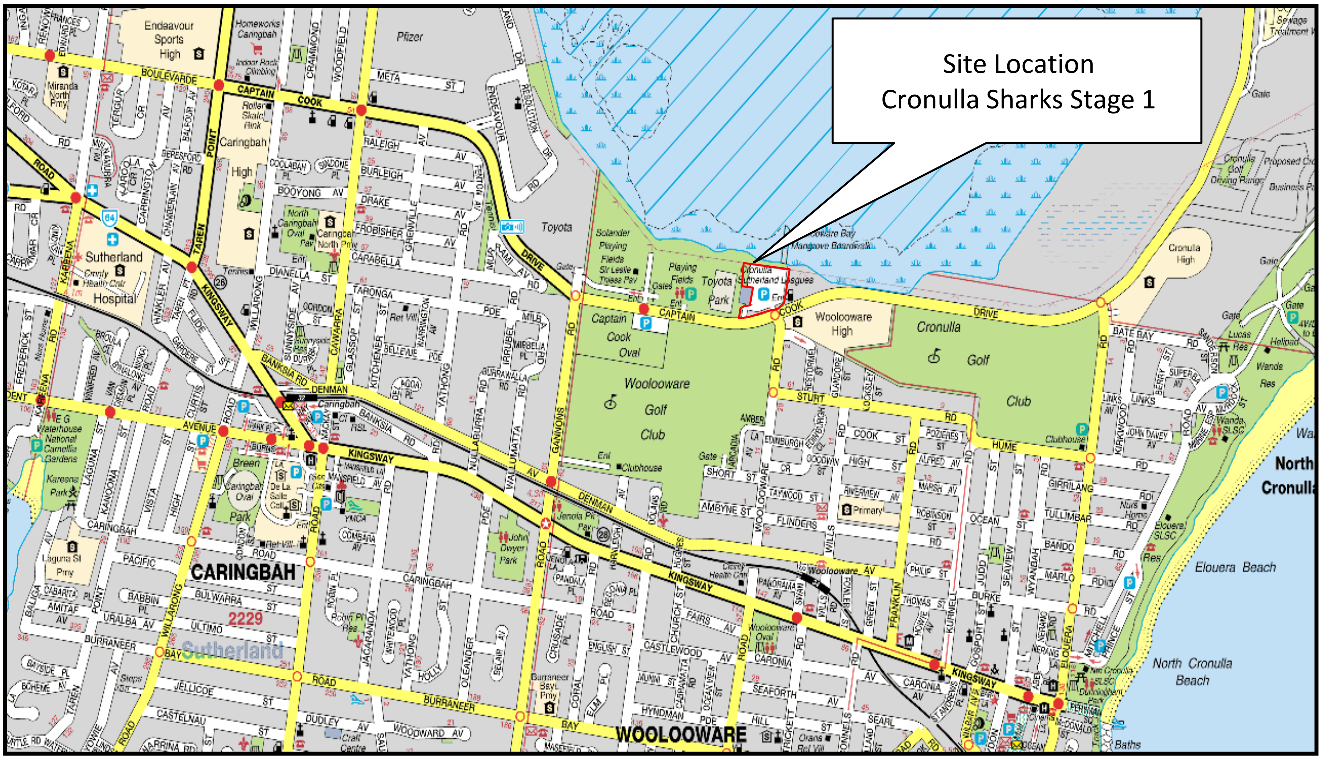
Methane concentrations from monitoring wells installed resulted in low concentrations being recorded. Field monitoring at the time of excavation of test pits recorded levels of up to 19% v/v. Although low results were recorded in the monitoring wells, specifically located in most sensitive areas enough previous information exists to warrant a cautious approach to accepting the low levels as being typical of the entire site.

Acid sulphate soils are present on-site associated with the former natural wetland estuarine system. These are typical of coastal estuarine systems. Any excavations where acid sulphate soils are disturbed should be the subject of an Acid Sulphate Soils Management Plan.

The completion of this report concludes that the Site assessment objectives, according to the Site Acceptance Criteria, have been achieved. It is the opinion of DLA Environmental that any future development of the Site will require the issues of methane gas, acid sulphate soils and asbestos to be addressed. A Remediation Action Plan (RAP) will be required at that time.

Figure 1

Site Location



DLA environmental Unit 2b/30 Leighton Place Hornsby, NSW 2077	**DESIGNED:** DLA	SITE LOCATION	
	COMPILED: SS	**CLIENT:** Park View Constructions Pty Ltd	**DRAWING:** 18/12/2012
	PROJ. No. DL3007	**LOCATION:** 461 Captain Cook Drive, Woolooware, NSW 2230	**FIGURE:** 1

Figure 2

Site Layout

Figure modified from GoogleEarth air photo dated 1-1-2009

Legend

- Stage 1 Area
- Commercial/Retail Areas

Scale (m)

0 25 50

N

DLA environments
Unit 2b/30 Leighton Place
Hornsby, NSW 2077

Newcastle Office
Phone (02) 4949 3800
Fax (02) 4949 3811

Sydney Office
Phone (02) 9476 1765
Fax (02) 9476 1557

Title: Stage 1 Site Layout			
Client: Bluestone	Job No: DL3007	Figure No: 2	Date: 29/01/2013
	Scale: As Shown	Sheet: 1 of 1	Revision: R01

Figure 3

Site Sampling Locations

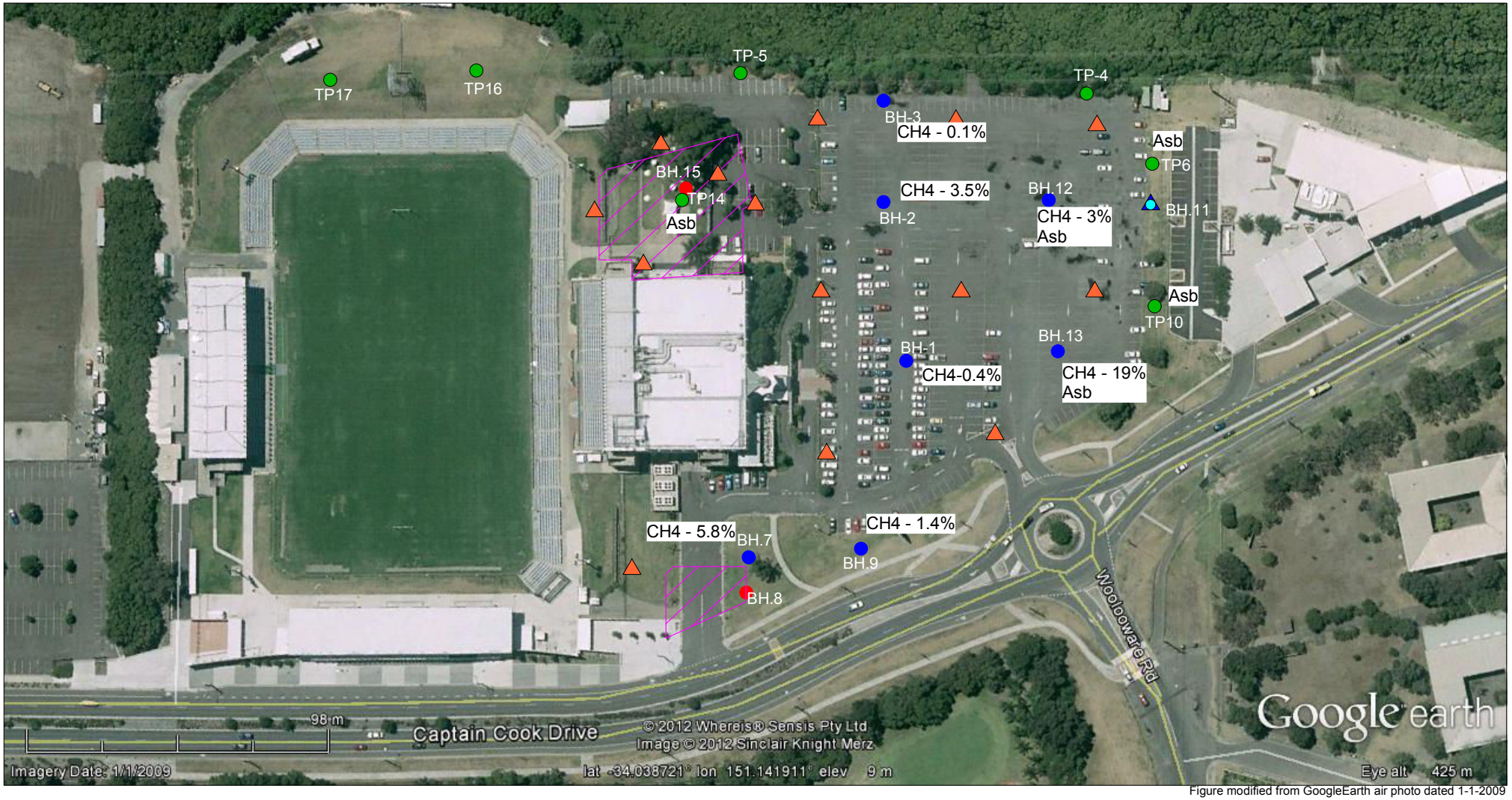


Figure modified from GoogleEarth air photo dated 1-1-2009

Scale (m)

0 25 50

Legend

- Previous Investigation Locations (13)
- Groundwater Well (1)
- Approximate Location of new retail buildings
- Gas & water well location (2)
- Bore hole location (14)
- Test pit location (8)

N

DLA environmental
Unit 2b/30 Leighton Place
Hornsby, NSW 2077

Newcastle Office
Phone (02) 4949 3800
Fax (02) 4949 3811

Sydney Office
Phone (02) 9476 1765
Fax (02) 9476 1557

Title: Site Layout with Sample Locations

Client:	Job No:	Figure No:	Date:
Bluestone	DL3007	3	29/01/2013
	Scale: As Shown	Sheet: 1 of 1	Revision: R00

Appendix A

NATA Certified Analytical Results

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

DLA environmental

Combo1=TRH/BTEX/Pb
Combo2=TRH/BTEX/PAH/Pb
Combo3=TRH/BTEX/PAH/Met
Combo4=TRH/BTEX/PAH/Met/Phen
Combo5=TRH/BTEX/PAH/OC/PCB/Met
Combo6=TRH/BTEX/PAH/OC/OP/PCB/Met
Combo7=TRH/BTEX/PAH/OC/PCB/Met/Phen
Combo8=TRH/BTEX/PAH/OC/OP/PCB/Met/Phen
Combo9=TRH/BTEX/PAH/OC/PCB/Met/Phen/CN
Combo10=TRH/BTEX/PAH/OC/OP/PCB/Met/Phen/CN
Combo11=TRH/BTEX/PAH/OC/PCB/12met/Phen/CN
Combo12=TRH/BTEX/PAH/OC/PCB/Met/TCLP-PAH ,6 Met
Combo13=TRH/BTEX/PAH/OC/OP/PCB/Met/TCLP-PAH ,6Met

A Combo with an `A' indicates Asbestos is also needed.

Client: DLA
Contact Person: Patrick
Project Mgr: RICH CAJE
Sampler:
Address: 2B/30 Leighton Place, Hornsby 2077
Phone: 9476 1765 **Mob:** 0427 237 097
Email: dlassociates@bigpond.com

Client Project Name / Number / Site etc (ie report title): DL 3007 - CRONULLA
PO No.:
Envirolab Quote No. :
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Report format: esdat / equis /
Lab Comments:

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 3	Combo 6	Asbestos	Comments
1	BH1-1	0.2	19.12.12			X		
2	1-2	1			X			
3	1-3	4			X			
4	7-1	0-3				X		
5	7-2	1			X			
6	9-1	1			X			
7	9-2	2			X			
8	12-1	0-9				X		
9	13-1	0.3-0.5				X		
10	TP4	0.5-1					X	
11	TP5	0.5					X	
12	TP10	0.5-1					X	
13	TP11A	11					X	

Provide as much information about the sample as you can

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

Job No: 83594
Date Received: 20/12/12
Time Received: 15:50
Received by: AV
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (Company): DLA
Print Name: Patrick
Date & Time:
Signature: SPW 20.12.12.

Received by (Company): FLS
Print Name: A.Weir
Date & Time: 20/12/12 15:50
Signature:

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

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

DLA environmental

Combo1=TRH/BTEX/Pb
Combo2=TRH/BTEX/PAH/Pb
Combo3=TRH/BTEX/PAH/Met
Combo4=TRH/BTEX/PAH/Met/Phen
Combo5=TRH/BTEX/PAH/OC/PCB/Met
Combo6=TRH/BTEX/PAH/OC/OP/PCB/Met
Combo7=TRH/BTEX/PAH/OC/PCB/Met/Phen
Combo8=TRH/BTEX/PAH/OC/OP/PCB/Met/Phen
Combo9=TRH/BTEX/PAH/OC/PCB/Met/Phen/CN
Combo10=TRH/BTEX/PAH/OC/OP/PCB/Met/Phen/CN
Combo11=TRH/BTEX/PAH/OC/PCB/12met/Phen/CN
Combo12=TRH/BTEX/PAH/OC/PCB/Met/TCLP-PAH ,6 Met
Combo13=TRH/BTEX/PAH/OC/OP/PCB/Met/TCLP-PAH ,6Met

A Combo with an `A' indicates Asbestos is also needed.

Client: DLA
Contact Person: Patrick
Project Mgr:
Sampler:
Address: 2B/30 Leighton Place, Hornsby 2077
Phone: 9476 1765 **Mob:** 0427 237 097
Email: dlassociates@bigpond.com

Client Project Name / Number / Site etc (ie report title):
PO No.:
Envirolab Quote No. :
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Report format: esdat / equis /
Lab Comments:

Sample Information					Tests Required																Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Combo 3	Asbestos	BTEX														Provide as much information about the sample as you can
14	TP 14	0.5-1m	19.12.12	S																	
15	16-1	0.5																			
16	16-2	1m																			
17	16-3	1.8																			
18	16-1A	0.5																			
19	17-1	1m																			
20	-2	2m																			
21/22	TS/TB	-		W			X														

Relinquished by (Company): DLA
Print Name: Patrick
Date & Time: 20.12.12
Signature:

Received by (Company): ELS
Print Name: A.Weir
Date & Time: 20/12/12 15:50
Signature:

Lab use only:
Samples Received: Cool / 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
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

CERTIFICATE OF ANALYSIS 83594

Client:
David Lane Associates
2B, 30 Leighton Pl
Hornsby
NSW 2077

Attention: Richard Case

Sample log in details:

Your Reference:	**DL3007, Cronulla**		
No. of samples:	20 Soils, 2 Waters		
Date samples received / completed instructions received	20/12/12	/	20/12/12

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

Report Details:

Date results requested by: / Issue Date:	9/01/13	/	4/01/13
Date of Preliminary Report:	Not issued		

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Nancy Zhang
Chemist

Rhian Morgan
Reporting Supervisor

Lulu Guo
Approved Signatory

Alex MacLean
Chemist

ACCREDITED FOR TECHNICAL COMPETENCE

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	83594-1	83594-2	83594-3	83594-4	83594-5
Your Reference	----------	BH1-1	BH1-2	BH1-3	BH7-1	BH7-2
Depth	----------	0.2	1.0	4.0	0.3	1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	22/12/2012	22/12/2012	22/12/2012	22/12/2012	22/12/2012
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	94	110	104	107	104

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	83594-6	83594-7	83594-8	83594-9	83594-10
Your Reference	----------	BH9-1	BH9-2	BH12-1	BH13-1	TP4
Depth	----------	1.0	2.0	0.9	0.3-0.5	0.5-1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	22/12/2012	22/12/2012	22/12/2012	22/12/2012	22/12/2012
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	104	104	98	99	89

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	83594-11	83594-12	83594-13	83594-14	83594-15
Your Reference	----------	TP5	TP10	TP10A	TP14	TP16-1
Depth	----------	0.5	0.5-1.0	0.5-1.0	0.5-1.0	0.5
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	22/12/2012	22/12/2012	22/12/2012	22/12/2012	22/12/2012
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	103	94	96	89	102

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	83594-16	83594-17	83594-18	83594-19	83594-20
Your Reference	----------	TP16-2	TP16-3	TP16-1A	TP17-1	TP17-2
Depth	----------	1.0	1.8	0.5	1.0	2.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	22/12/2012	22/12/2012	22/12/2012	22/12/2012	22/12/2012
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	94	95	93	99	101

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	83594-1	83594-2	83594-3	83594-4	83594-5
Your Reference	----------	BH1-1	BH1-2	BH1-3	BH7-1	BH7-2
Depth	----------	0.2	1.0	4.0	0.3	1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	96	99	100	100	101

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	83594-6	83594-7	83594-8	83594-9	83594-10
Your Reference	----------	BH9-1	BH9-2	BH12-1	BH13-1	TP4
Depth	----------	1.0	2.0	0.9	0.3-0.5	0.5-1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	110	140	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	180	190	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	98	104	99	96	97

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	83594-11	83594-12	83594-13	83594-14	83594-15
Your Reference	----------	TP5	TP10	TP10A	TP14	TP16-1
Depth	----------	0.5	0.5-1.0	0.5-1.0	0.5-1.0	0.5
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	120	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	320	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	340	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	230	<100	<100
Surrogate o-Terphenyl	%	100	96	99	99	95

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	83594-16	83594-17	83594-18	83594-19	83594-20
Your Reference	----------	TP16-2	TP16-3	TP16-1A	TP17-1	TP17-2
Depth	----------	1.0	1.8	0.5	1.0	2.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	570	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	350	<100	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	820	<100	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	160	<100	<100	<100	<100
Surrogate o-Terphenyl	%	134	99	93	100	95

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- ----------	83594-1 BH1-1 0.2 19/12/2012 Soil	83594-2 BH1-2 1.0 19/12/2012 Soil	83594-3 BH1-3 4.0 19/12/2012 Soil	83594-4 BH7-1 0.3 19/12/2012 Soil	83594-5 BH7-2 1.0 19/12/2012 Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	0.9	0.2
Pyrene	mg/kg	<0.1	<0.1	<0.1	1.0	0.2
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	0.5	0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	0.5	0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	0.9	0.3
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	0.54	0.20
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	0.6	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	0.4	0.1
Benzo(a)pyrene TEQ	mg/kg	<0.5	<0.5	<0.5	1	<0.5
Surrogate p-Terphenyl-d_{14}	%	95	97	103	101	101

PAHs in Soil						
Our Reference:	UNITS	83594-6	83594-7	83594-8	83594-9	83594-10
Your Reference	----------	BH9-1	BH9-2	BH12-1	BH13-1	TP4
Depth	----------	1.0	2.0	0.9	0.3-0.5	0.5-1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	0.2	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	0.1	0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.5	1.5	1.7	<0.1	<0.1
Anthracene	mg/kg	0.1	0.4	0.4	<0.1	<0.1
Fluoranthene	mg/kg	0.5	2.8	2.4	0.1	<0.1
Pyrene	mg/kg	0.4	2.9	2.3	0.1	<0.1
Benzo(a)anthracene	mg/kg	0.2	1.2	1.1	<0.1	<0.1
Chrysene	mg/kg	0.2	1	0.9	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	0.3	1.8	1.5	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.18	1.3	1.1	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	0.8	0.6	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.1	0.6	0.5	<0.1	<0.1
Benzo(a)pyrene TEQ	mg/kg	<0.5	2	1	<0.5	<0.5
Surrogate p-Terphenyl-d_{14}	%	98	103	99	99	105

PAHs in Soil						
Our Reference:	UNITS	83594-11	83594-12	83594-13	83594-14	83594-15
Your Reference	----------	TP5	TP10	TP10A	TP14	TP16-1
Depth	----------	0.5	0.5-1.0	0.5-1.0	0.5-1.0	0.5
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	0.1	0.3	<0.1	<0.1
Pyrene	mg/kg	0.1	0.1	0.3	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.07	0.1	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d_{14}	%	105	101	105	107	99

PAHs in Soil						
Our Reference:	UNITS	83594-16	83594-17	83594-18	83594-19	83594-20
Your Reference	----------	TP16-2	TP16-3	TP16-1A	TP17-1	TP17-2
Depth	----------	1.0	1.8	0.5	1.0	2.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Naphthalene	mg/kg	1.2	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	2.7	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.3	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	2.4	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	23	0.2	<0.1	<0.1	<0.1
Anthracene	mg/kg	5.9	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	28	0.3	0.1	<0.1	<0.1
Pyrene	mg/kg	26	0.3	0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	14	0.2	<0.1	<0.1	<0.1
Chrysene	mg/kg	11	0.1	<0.1	<0.1	<0.1
Benzo(b+k)fluoranthene	mg/kg	20	0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	15	0.17	0.08	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	7.2	0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	1.8	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	5.6	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	mg/kg	21	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d_{14}	%	99	97	97	101	99

Organochlorine Pesticides in soil					
Our Reference:	UNITS	83594-1	83594-4	83594-8	83594-9
Your Reference	----------	BH1-1	BH7-1	BH12-1	BH13-1
Depth	----------	0.2	0.3	0.9	0.3-0.5
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	22/12/2012	22/12/2012	22/12/2012	22/12/2012
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	99	96	93	91

Organophosphorus Pesticides					
Our Reference:	UNITS	83594-1	83594-4	83594-8	83594-9
Your Reference	----------	BH1-1	BH7-1	BH12-1	BH13-1
Depth	----------	0.2	0.3	0.9	0.3-0.5
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	22/12/2012	22/12/2012	22/12/2012	22/12/2012
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	99	96	93	91

PCBs in Soil					
Our Reference:	UNITS	83594-1	83594-4	83594-8	83594-9
Your Reference	----------	BH1-1	BH7-1	BH12-1	BH13-1
Depth	----------	0.2	0.3	0.9	0.3-0.5
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	21/12/2012	21/12/2012	21/12/2012	21/12/2012
Date analysed	-	22/12/2012	22/12/2012	22/12/2012	22/12/2012
Arochlor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1
Arochlor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	99	96	93	91

Acid Extractable metals in soil						
Our Reference:	UNITS	83594-1	83594-2	83594-3	83594-4	83594-5
Your Reference	----------	BH1-1	BH1-2	BH1-3	BH7-1	BH7-2
Depth	----------	0.2	1.0	4.0	0.3	1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	27/12/2012	27/12/2012	27/12/2012	27/12/2012	27/12/2012
Date analysed	-	27/12/2012	27/12/2012	27/12/2012	27/12/2012	27/12/2012
Arsenic	mg/kg	4	5	16	8	5
Cadmium	mg/kg	<0.5	<0.5	1.0	<0.5	<0.5
Chromium	mg/kg	9	8	25	21	15
Copper	mg/kg	3	13	35	38	5
Lead	mg/kg	6	26	190	94	30
Mercury	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Nickel	mg/kg	3	2	12	10	2
Zinc	mg/kg	12	26	460	76	32

Acid Extractable metals in soil						
Our Reference:	UNITS	83594-6	83594-7	83594-8	83594-9	83594-10
Your Reference	----------	BH9-1	BH9-2	BH12-1	BH13-1	TP4
Depth	----------	1.0	2.0	0.9	0.3-0.5	0.5-1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	27/12/2012	27/12/2012	27/12/2012	27/12/2012	27/12/2012
Date analysed	-	27/12/2012	27/12/2012	27/12/2012	27/12/2012	27/12/2012
Arsenic	mg/kg	10	4	9	<4	6
Cadmium	mg/kg	4.7	<0.5	<0.5	<0.5	0.6
Chromium	mg/kg	28	18	17	49	9
Copper	mg/kg	52	75	63	20	17
Lead	mg/kg	80	38	89	33	74
Mercury	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	14	5	5	37	5
Zinc	mg/kg	160	54	340	90	280

Acid Extractable metals in soil						
Our Reference:	UNITS	83594-11	83594-12	83594-13	83594-14	83594-15
Your Reference	----------	TP5	TP10	TP10A	TP14	TP16-1
Depth	----------	0.5	0.5-1.0	0.5-1.0	0.5-1.0	0.5
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	27/12/2012	27/12/2012	27/12/2012	27/12/2012	27/12/2012
Date analysed	-	27/12/2012	27/12/2012	27/12/2012	27/12/2012	27/12/2012
Arsenic	mg/kg	12	7	9	9	<4
Cadmium	mg/kg	<0.5	1.9	1.3	1.4	<0.5
Chromium	mg/kg	12	25	410	24	6
Copper	mg/kg	59	98	150	190	7
Lead	mg/kg	21	130	510	240	17
Mercury	mg/kg	0.1	0.2	0.2	0.3	0.3
Nickel	mg/kg	8	12	22	27	1
Zinc	mg/kg	46	890	860	610	20

Acid Extractable metals in soil						
Our Reference:	UNITS	83594-16	83594-17	83594-18	83594-19	83594-20
Your Reference	----------	TP16-2	TP16-3	TP16-1A	TP17-1	TP17-2
Depth	----------	1.0	1.8	0.5	1.0	2.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date digested	-	27/12/2012	27/12/2012	27/12/2012	27/12/2012	27/12/2012
Date analysed	-	27/12/2012	27/12/2012	27/12/2012	27/12/2012	27/12/2012
Arsenic	mg/kg	7	6	<4	27	<4
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	mg/kg	18	20	6	10	10
Copper	mg/kg	28	10	8	1	<1
Lead	mg/kg	150	27	20	14	3
Mercury	mg/kg	0.4	<0.1	0.5	<0.1	<0.1
Nickel	mg/kg	3	4	1	<1	<1
Zinc	mg/kg	94	38	23	7	2

Acid Extractable metals in soil		
Our Reference:	UNITS	83594-23
Your Reference	----------	BH1-1 - Triplicate
Depth	----------	0.2
Date Sampled		19/12/2012
Type of sample		Soil
Date digested	-	27/12/2012
Date analysed	-	27/12/2012
Arsenic	mg/kg	5
Cadmium	mg/kg	<0.5
Chromium	mg/kg	10
Copper	mg/kg	3
Lead	mg/kg	7
Mercury	mg/kg	<0.1
Nickel	mg/kg	3
Zinc	mg/kg	12

Moisture						
Our Reference:	UNITS	83594-1	83594-2	83594-3	83594-4	83594-5
Your Reference	----------	BH1-1	BH1-2	BH1-3	BH7-1	BH7-2
Depth	----------	0.2	1.0	4.0	0.3	1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	21/12/12	21/12/12	21/12/12	21/12/12	21/12/12
Date analysed	-	27/12/12	27/12/12	27/12/12	27/12/12	27/12/12
Moisture	%	13	20	50	7.9	18

Moisture						
Our Reference:	UNITS	83594-6	83594-7	83594-8	83594-9	83594-10
Your Reference	----------	BH9-1	BH9-2	BH12-1	BH13-1	TP4
Depth	----------	1.0	2.0	0.9	0.3-0.5	0.5-1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	21/12/12	21/12/12	21/12/12	21/12/12	21/12/12
Date analysed	-	27/12/12	27/12/12	27/12/12	27/12/12	27/12/12
Moisture	%	16	16	16	16	24

Moisture						
Our Reference:	UNITS	83594-11	83594-12	83594-13	83594-14	83594-15
Your Reference	----------	TP5	TP10	TP10A	TP14	TP16-1
Depth	----------	0.5	0.5-1.0	0.5-1.0	0.5-1.0	0.5
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	21/12/12	21/12/12	21/12/12	21/12/12	21/12/12
Date analysed	-	27/12/12	27/12/12	27/12/12	27/12/12	27/12/12
Moisture	%	16	18	32	21	22

Moisture						
Our Reference:	UNITS	83594-16	83594-17	83594-18	83594-19	83594-20
Your Reference	----------	TP16-2	TP16-3	TP16-1A	TP17-1	TP17-2
Depth	----------	1.0	1.8	0.5	1.0	2.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	21/12/12	21/12/12	21/12/12	21/12/12	21/12/12
Date analysed	-	27/12/12	27/12/12	27/12/12	27/12/12	27/12/12
Moisture	%	21	16	22	19	14

Asbestos ID - soils						
Our Reference:	UNITS	83594-10	83594-11	83594-12	83594-13	83594-14
Your Reference	----------	TP4	TP5	TP10	TP10A	TP14
Depth	----------	0.5-1.0	0.5	0.5-1.0	0.5-1.0	0.5-1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	4/01/2013	4/01/2013	4/01/2013	4/01/2013	4/01/2013
Sample mass tested	g	Approx 40g	Approx 40g	Approx 40g	Approx 40g	Approx 40g
Sample Description	-	Light brown sandy soil	Light brown sandy soil	Light brown sandy soil	Light brown sandy soil	Pale brown sandy soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	Synthetic mineral fibre detected No asbestos detected at reporting limit of 0.1g/kg
Trace Analysis	-	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected

Asbestos ID - soils						
Our Reference:	UNITS	83594-15	83594-16	83594-17	83594-18	83594-19
Your Reference	----------	TP16-1	TP16-2	TP16-3	TP16-1A	TP17-1
Depth	----------	0.5	1.0	1.8	0.5	1.0
Date Sampled		19/12/2012	19/12/2012	19/12/2012	19/12/2012	19/12/2012
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	4/01/2013	4/01/2013	4/01/2013	4/01/2013	4/01/2013
Sample mass tested	g	Approx 40g	Approx 40g	Approx 40g	Approx 40g	Approx 40g
Sample Description	-	Pale sandy soil	Light brown sandy soil	Pale sandy soil	Pale sandy soil	Pale sandy soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg	No asbestos detected at reporting limit of 0.1g/kg
Trace Analysis	-	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected	No respirable fibres detected

Asbestos ID - soils		
Our Reference:	UNITS	83594-20
Your Reference	----------	TP17-2
Depth	----------	2.0
Date Sampled		19/12/2012
Type of sample		Soil
Date analysed	-	4/01/2013
Sample mass tested	g	Approx 40g
Sample Description	-	Pale sandy soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg
Trace Analysis	-	No respirable fibres detected

BTEX in Water			
Our Reference:	UNITS	83594-21	83594-22
Your Reference	----------	TS	TB
Depth	----------	-	-
Date Sampled		19/12/2012	19/12/2012
Type of sample		Water	Water
Date extracted	-	21/12/2012	21/12/2012
Date analysed	-	21/12/2012	21/12/2012
Benzene	µg/L	110%	<1
Toluene	µg/L	107%	<1
Ethylbenzene	µg/L	107%	<1
m+p-xylene	µg/L	107%	<2
o-xylene	µg/L	106%	<1
Surrogate Dibromofluoromethane	%	97	96
Surrogate toluene-d8	%	97	98
Surrogate 4-BFB	%	96	94

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 draft Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 draft Guideline on Investigation Levels for Soil and Groundwater.
Org-012 subset	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM draft B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105 deg C for a minimum of 4 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			21/12/2012	83594-1	21/12/2012 || 21/12/2012	LCS-1	21/12/2012
Date analysed	-			22/12/2012	83594-1	22/12/2012 || 22/12/2012	LCS-1	22/1/2012
TRH C_6 - C_9	mg/kg	25	Org-016	<25	83594-1	<25 || <25	LCS-1	117%
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	83594-1	<25 || <25	LCS-1	117%
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	25	Org-016	[NT]	83594-1	<25 || <25	[NR]	[NR]
Benzene	mg/kg	0.2	Org-016	<0.2	83594-1	<0.2 || <0.2	LCS-1	130%
Toluene	mg/kg	0.5	Org-016	<0.5	83594-1	<0.5 || <0.5	LCS-1	119%
Ethylbenzene	mg/kg	1	Org-016	<1	83594-1	<1 || <1	LCS-1	110%
m+p-xylene	mg/kg	2	Org-016	<2	83594-1	<2 || <2	LCS-1	113%
o-Xylene	mg/kg	1	Org-016	<1	83594-1	<1 || <1	LCS-1	114%
naphthalene	mg/kg	1	Org-014	<1	83594-1	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	111	83594-1	94 || 104 || RPD: 10	LCS-1	113%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			21/12/2012	83594-1	21/12/2012 || 21/12/2012	LCS-1	21/12/2012
Date analysed	-			21/12/2012	83594-1	21/12/2012 || 21/12/2012	LCS-1	21/12/2012
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	83594-1	<50 || <50	LCS-1	86%
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	83594-1	<100 || <100	LCS-1	108%
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	83594-1	<100 || <100	LCS-1	89%
TRH>C_{10}-C_{16}	mg/kg	50	Org-003	<50	83594-1	<50 || <50	LCS-1	86%
TRH>C_{10} - C_{16} less Naphthalene (F2)	mg/kg	50	Org-003	[NT]	83594-1	<50 || <50	[NR]	[NR]
TRH>C_{16}-C_{34}	mg/kg	100	Org-003	<100	83594-1	<100 || <100	LCS-1	89%
TRH>C_{34}-C_{40}	mg/kg	100	Org-003	<100	83594-1	<100 || <100	LCS-1	94%
Surrogate o-Terphenyl	%		Org-003	100	83594-1	96 || 99 || RPD: 3	LCS-1	87%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			21/12/2012	83594-1	21/12/2012 || 21/12/2012	LCS-1	21/12/2012
Date analysed	-			21/12/2012	83594-1	21/12/2012 || 21/12/2012	LCS-1	21/12/2012
Naphthalene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	LCS-1	111%
Acenaphthylene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Phenanthrene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	LCS-1	110%
Anthracene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	LCS-1	112%
Fluoranthene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Pyrene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	LCS-1	110%
Benzo(a)anthracene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	LCS-1	111%
Chrysene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Benzo(b+k)fluoranthene	mg/kg	0.2	Org-012 subset	<0.2	83594-1	<0.2 || <0.2	LCS-1	104%
Benzo(a)pyrene	mg/kg	0.05	Org-012 subset	<0.05	83594-1	<0.05 || <0.05	[NR]	[NR]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	LCS-1	111%
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012 subset	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Benzo(a)pyrene TEQ	mg/kg	0.5	Org-012 subset	[NT]	83594-1	<0.5 || <0.5	[NR]	[NR]
Surrogate p-Terphenyl-d_{14}	%		Org-012 subset	100	83594-1	95 || 96 || RPD: 1	LCS-1	91%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			21/12/2012	83594-1	21/12/2012 || 21/12/2012	LCS-1	21/12/2012
Date analysed	-			21/12/2012	83594-1	22/12/2012 || 22/12/2012	LCS-1	22/12/2012
HCB	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	LCS-1	85%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	LCS-1	104%
Heptachlor	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	LCS-1	82%
delta-BHC	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	LCS-1	98%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	LCS-1	90%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	LCS-1	90%
Dieldrin	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	LCS-1	87%
Endrin	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	LCS-1	85%
pp-DDD	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	LCS-1	90%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	LCS-1	95%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	93	83594-1	99 || 97 || RPD: 2	LCS-1	91%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			21/12/2012	83594-1	21/12/2012 || 21/12/2012	LCS-1	21/12/2012
Date analysed	-			21/12/2012	83594-1	22/12/2012 || 22/12/2012	LCS-1	22/12/2012
Diazinon	mg/kg	0.1	Org-008	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Dimethoate	mg/kg	0.1	Org-008	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Ronnel	mg/kg	0.1	Org-008	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	83594-1	<0.1 || <0.1	LCS-1	96%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	83594-1	<0.1 || <0.1	LCS-1	97%
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	83594-1	<0.1 || <0.1	LCS-1	103%
Surrogate TCMX	%		Org-008	93	83594-1	99 || 97 || RPD: 2	LCS-1	97%
QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			21/12/2012	83594-1	21/12/2012 || 21/12/2012	LCS-1	21/12/2012
Date analysed	-			21/12/2012	83594-1	22/12/2012 || 22/12/2012	LCS-1	22/12/2012
Arochlor 1016	mg/kg	0.1	Org-006	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1221	mg/kg	0.1	Org-006	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1232	mg/kg	0.1	Org-006	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1242	mg/kg	0.1	Org-006	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1248	mg/kg	0.1	Org-006	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Arochlor 1254	mg/kg	0.1	Org-006	<0.1	83594-1	<0.1 || <0.1	LCS-1	125%
Arochlor 1260	mg/kg	0.1	Org-006	<0.1	83594-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	93	83594-1	99 || 97 || RPD: 2	LCS-1	101%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date digested	-			27/12/2012	83594-1	27/12/2012 || 27/12/2012	LCS-1	27/12/2012
Date analysed	-			27/12/2012	83594-1	27/12/2012 || 27/12/2012	LCS-1	27/12/2012
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	83594-1	4 || 4 || RPD: 0	LCS-1	92%
Cadmium	mg/kg	0.5	Metals-020 ICP-AES	<0.5	83594-1	<0.5 || <0.5	LCS-1	96%
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	83594-1	9 || 10 || RPD: 11	LCS-1	95%
Copper	mg/kg	1	Metals-020 ICP-AES	<1	83594-1	3 || 6 || RPD: 67	LCS-1	94%
Lead	mg/kg	1	Metals-020 ICP-AES	<1	83594-1	6 || 9 || RPD: 40	LCS-1	93%
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	83594-1	<0.1 || <0.1	LCS-1	88%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	83594-1	3 || 4 || RPD: 29	LCS-1	95%
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	83594-1	12 || 16 || RPD: 29	LCS-1	96%

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

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

QUALITY CONTROL BTEX in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			21/12/2012	[NT]	[NT]	LCS-W1	21/12/2012
Date analysed	-			21/12/2012	[NT]	[NT]	LCS-W1	21/12/2012
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	109%
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	112%
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	113%
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	LCS-W1	113%
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	LCS-W1	113%
Surrogate Dibromofluoromethane	%		Org-016	94	[NT]	[NT]	LCS-W1	87%
Surrogate toluene-d8	%		Org-016	99	[NT]	[NT]	LCS-W1	99%
Surrogate 4-BFB	%		Org-016	93	[NT]	[NT]	LCS-W1	95%

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	83594-11	21/12/2012 || 21/12/2012	83594-2	21/12/2012
Date analysed	-	83594-11	22/12/2012 || 22/12/2012	83594-2	22/12/2012
TRH C_6 - C_9	mg/kg	83594-11	<25 || <25	83594-2	100%
TRH C_6 - C_{10}	mg/kg	83594-11	<25 || <25	83594-2	100%
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	83594-11	<25 || <25	[NR]	[NR]
Benzene	mg/kg	83594-11	<0.2 || <0.2	83594-2	110%
Toluene	mg/kg	83594-11	<0.5 || <0.5	83594-2	101%
Ethylbenzene	mg/kg	83594-11	<1 || <1	83594-2	94%
m+p-xylene	mg/kg	83594-11	<2 || <2	83594-2	97%
o-Xylene	mg/kg	83594-11	<1 || <1	83594-2	97%
naphthalene	mg/kg	83594-11	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%	83594-11	103 || 104 || RPD: 1	83594-2	85%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	83594-11	21/12/2012 || 21/12/2012	83594-2	21/12/2012
Date analysed	-	83594-11	21/12/2012 || 21/12/2012	83594-2	21/12/2012
TRHC$_{10}$ - C$_{14}$	mg/kg	83594-11	<50 || <50	83594-2	84%
TRHC$_{15}$ - C$_{28}$	mg/kg	83594-11	<100 || <100	83594-2	108%
TRHC$_{29}$ - C$_{36}$	mg/kg	83594-11	<100 || <100	83594-2	91%
TRH>C$_{10}$-C$_{16}$	mg/kg	83594-11	<50 || <50	83594-2	84%
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	83594-11	<50 || <50	[NR]	[NR]
TRH>C$_{16}$-C$_{34}$	mg/kg	83594-11	<100 || <100	83594-2	91%
TRH>C$_{34}$-C$_{40}$	mg/kg	83594-11	<100 || <100	83594-2	96%
Surrogate o-Terphenyl	%	83594-11	100 || 95 || RPD: 5	83594-2	83%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	83594-11	21/12/2012 || 21/12/2012	83594-2	21/12/2012
Date analysed	-	83594-11	21/12/2012 || 21/12/2012	83594-2	21/12/2012
Naphthalene	mg/kg	83594-11	<0.1 || <0.1	83594-2	85%
Acenaphthylene	mg/kg	83594-11	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	83594-11	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	83594-11	<0.1 || <0.1	83594-2	82%
Phenanthrene	mg/kg	83594-11	<0.1 || <0.1	83594-2	86%
Anthracene	mg/kg	83594-11	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	83594-11	0.1 || 0.1 || RPD: 0	83594-2	85%
Pyrene	mg/kg	83594-11	0.1 || 0.1 || RPD: 0	83594-2	80%
Benzo(a)anthracene	mg/kg	83594-11	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	83594-11	<0.1 || <0.1	83594-2	84%
Benzo(b+k)fluoranthene	mg/kg	83594-11	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	83594-11	<0.05 || 0.05	83594-2	93%
Indeno(1,2,3-c,d)pyrene	mg/kg	83594-11	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	83594-11	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	83594-11	<0.1 || <0.1	[NR]	[NR]
Benzo(a)pyrene TEQ	mg/kg	83594-11	<0.5 || <0.5	[NR]	[NR]
Surrogate p-Terphenyl-d$_{14}$	%	83594-11	105 || 100 || RPD: 5	83594-2	72%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date digested	-	83594-11	27/12/2012 || 27/12/2012	LCS-2	27/12/2012
Date analysed	-	83594-11	27/12/2012 || 27/12/2012	LCS-2	27/12/2012
Arsenic	mg/kg	83594-11	12 || 12 || RPD: 0	LCS-2	96%
Cadmium	mg/kg	83594-11	<0.5 || <0.5	LCS-2	95%
Chromium	mg/kg	83594-11	12 || 10 || RPD: 18	LCS-2	95%
Copper	mg/kg	83594-11	59 || 61 || RPD: 3	LCS-2	95%
Lead	mg/kg	83594-11	21 || 31 || RPD: 38	LCS-2	93%
Mercury	mg/kg	83594-11	0.1 || 0.1 || RPD: 0	LCS-2	87%
Nickel	mg/kg	83594-11	8 || 7 || RPD: 13	LCS-2	86%
Zinc	mg/kg	83594-11	46 || 51 || RPD: 10	LCS-2	95%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date extracted	-	83594-16	21/12/2012 || 21/12/2012
Date analysed	-	83594-16	21/12/2012 || 21/12/2012
Naphthalene	mg/kg	83594-16	1.2 || 4.6 || RPD: 117
Acenaphthylene	mg/kg	83594-16	2.7 || 12 || RPD: 127
Acenaphthene	mg/kg	83594-16	0.3 || 1.6 || RPD: 137
Fluorene	mg/kg	83594-16	2.4 || 8.9 || RPD: 115
Phenanthrene	mg/kg	83594-16	23 || 65 || RPD: 95
Anthracene	mg/kg	83594-16	5.9 || 18 || RPD: 101
Fluoranthene	mg/kg	83594-16	28 || 51 || RPD: 58
Pyrene	mg/kg	83594-16	26 || 49 || RPD: 61
Benzo(a)anthracene	mg/kg	83594-16	14 || 26 || RPD: 60
Chrysene	mg/kg	83594-16	11 || 21 || RPD: 62
Benzo(b+k)fluoranthene	mg/kg	83594-16	20 || 35 || RPD: 55
Benzo(a)pyrene	mg/kg	83594-16	15 || 27 || RPD: 57
Indeno(1,2,3-c,d)pyrene	mg/kg	83594-16	7.2 || 13 || RPD: 57
Dibenzo(a,h)anthracene	mg/kg	83594-16	1.8 || 3.0 || RPD: 50
Benzo(g,h,i)perylene	mg/kg	83594-16	5.6 || 11 || RPD: 65
Benzo(a)pyrene TEQ	mg/kg	83594-16	21 || 38 || RPD: 58
Surrogate p-Terphenyl-d_{14}	%	83594-16	99 || 103 || RPD: 4

Client Reference: DL3007, Cronulla

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date digested	-	[NT]	[NT]	83594-2	27/12/2012
Date analysed	-	[NT]	[NT]	83594-2	27/12/2012
Arsenic	mg/kg	[NT]	[NT]	83594-2	98%
Cadmium	mg/kg	[NT]	[NT]	83594-2	88%
Chromium	mg/kg	[NT]	[NT]	83594-2	93%
Copper	mg/kg	[NT]	[NT]	83594-2	116%
Lead	mg/kg	[NT]	[NT]	83594-2	96%
Mercury	mg/kg	[NT]	[NT]	83594-2	84%
Nickel	mg/kg	[NT]	[NT]	83594-2	86%
Zinc	mg/kg	[NT]	[NT]	83594-2	100%

Report Comments:

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteriae has been exceeded for 83594-1 for Cu. Therefore a triplicate result has been issued as laboratory sample number 83594-23.

PAH's in soil: 83594-16 The RPD for duplicate results is accepted due to the non homogenous nature of the sample/s.

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

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

INS: Insufficient sample for this test
NA: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

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

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

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

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

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

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

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

CHAIN OF CUSTODY - Client

17372

ENVIROLAB GROUP - National Phone number 1300 42 43 44

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Adelaide Lab - Envirolab Services
7 Palmerton Road Windsor Gardens, SA 5087
Ph 0406 350 706 / adelaide@envirolab.com.au

Client: DLA Environmental
Contact Person: Richard Batten
Project Mgr: "
Sampler: "
Address: Unit 2B, 30 Loftus St, Forestville, NSW, 2087
Phone: 0425 333597 **Mob:**
Fax:
Email: dla.rbatten@bigpond.com

Client Project Name / Number / Site etc (ie report title): DL3007 Granville Sharks
PO No.:
Envirolab Quote No. :
Date results required: 48hr TAT
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Lab comments:

Sample Information					Tests Required				Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	Pb_EC	As* NS	dissolved Mercury		Provide as much information about the sample as you can
1	MW1		23/1	water	x	x	x		*As Filter
2	MW2		↓	↓	↓	↓	↓		
3	MW3		↓	↓	↓	↓	↓		

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

Job No: 84586
Date Received: 23-01-13
Time Received: 15:40
Received by: Jia.L
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Relinquished by (company): DLA Environmental
Print Name: Richard Batten
Date & Time: 23/1
Signature:

Received by (company): ELS
Print Name: Jia.L
Date & Time: 23.01.13/ 15.40
Signature:

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

White - Lab copy / Blue - Client copy / Pink - Retain in Book

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

CERTIFICATE OF ANALYSIS 84586

Client:
David Lane Associates
2B, 30 Leighton Pl
Hornsby
NSW 2077

Attention: Richard Bolton

Sample log in details:

Your Reference:	**DL3007, Cronulla Sharks**		
No. of samples:	3 waters		
Date samples received / completed instructions received	23/01/13	/	23/01/13

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

Report Details:

Date results requested by: / Issue Date:	25/01/13	/	25/01/13
Date of Preliminary Report:	Not issued		

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

Results Approved By:

Rhian Morgan
Reporting Supervisor

Nick Sarlamis
Inorganics Supervisor

Giovanni Agosti
Technical Manager

HM in water - dissolved				
Our Reference:	UNITS	84586-1	84586-2	84586-3
Your Reference	----------	MW1	MW2	MW3
Date Sampled	----------	23/01/2013	23/01/2013	23/01/2013
Type of sample		Water	Water	Water
Date prepared	-	24/01/2013	24/01/2013	24/01/2013
Date analysed	-	24/01/2013	24/01/2013	24/01/2013
Arsenic-Dissolved	µg/L	2	2	1
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1
Lead-Dissolved	µg/L	<1	5	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	3	6	8
Zinc-Dissolved	µg/L	3	300	3

Miscellaneous Inorganics				
Our Reference:	UNITS	84586-1	84586-2	84586-3
Your Reference	----------	MW1	MW2	MW3
Date Sampled	----------	23/01/2013	23/01/2013	23/01/2013
Type of sample		Water	Water	Water
Date prepared	-	24/01/2013	24/01/2013	24/01/2013
Date analysed	-	24/01/2013	24/01/2013	24/01/2013
pH	pH Units	6.8	6.7	6.9
Electrical Conductivity	µS/cm	4,400	5,100	4,200

Miscellaneous test in air				
Our Reference:	UNITS	84586-1	84586-2	84586-3
Your Reference	----------	MW1	MW2	MW3
Date Sampled	----------	23/01/2013	23/01/2013	23/01/2013
Type of sample		Water	Water	Water
Methane	µg/L	8,400	1,400	5,600

Method ID	Methodology Summary
Metals-022 ICP-MS	Determination of various metals by ICP-MS.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA 22nd ED, 4500-H+.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell and dedicated meter, in accordance with APHA 22nd ED 2510 and Rayment & Lyons.
AT-006	Dissolved gases determined by GC-FID using method USEPA SOP RSK175

QUALITY CONTROL HM in water - dissolved	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			24/01/2013	84586-1	24/01/2013 || 24/01/2013	LCS-W1	24/01/2013
Date analysed	-			24/01/2013	84586-1	24/01/2013 || 24/01/2013	LCS-W1	24/01/2013
Arsenic-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	84586-1	2 || 2 || RPD: 0	LCS-W1	91%
Cadmium-Dissolved	µg/L	0.1	Metals-022 ICP-MS	<0.1	84586-1	<0.1 || <0.1	LCS-W1	90%
Chromium-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	84586-1	<1 || <1	LCS-W1	88%
Copper-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	84586-1	<1 || <1	LCS-W1	84%
Lead-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	84586-1	<1 || <1	LCS-W1	93%
Mercury-Dissolved	µg/L	0.05	Metals-021 CV-AAS	<0.05	84586-1	<0.05 || <0.05	LCS-W1	96%
Nickel-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	84586-1	3 || 3 || RPD: 0	LCS-W1	87%
Zinc-Dissolved	µg/L	1	Metals-022 ICP-MS	<1	84586-1	3 || 3 || RPD: 0	LCS-W1	86%

QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			24/01/2013	84586-1	24/01/2013 || 24/01/2013	LCS-W1	24/01/2013
Date analysed	-			24/01/2013	84586-1	24/01/2013 || 24/01/2013	LCS-W1	24/01/2013
pH	pH Units		Inorg-001	[NT]	84586-1	6.8 || 6.8 || RPD: 0	LCS-W1	101%
Electrical Conductivity	µS/cm	1	Inorg-002	<1	84586-1	4400 || 4400 || RPD: 0	LCS-W1	100%

QUALITY CONTROL Miscellaneous test in air	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Methane	µg/L	5	AT-006	<5	84586-1	8400 || 8400 || RPD: 0	LCS	98%

QUALITY CONTROL HM in water - dissolved	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	84586-2	24/01/2013
Date analysed	-	[NT]	[NT]	84586-2	24/01/2013
Arsenic-Dissolved	µg/L	[NT]	[NT]	84586-2	98%
Cadmium-Dissolved	µg/L	[NT]	[NT]	84586-2	92%
Chromium-Dissolved	µg/L	[NT]	[NT]	84586-2	89%
Copper-Dissolved	µg/L	[NT]	[NT]	84586-2	82%
Lead-Dissolved	µg/L	[NT]	[NT]	84586-2	92%
Mercury-Dissolved	µg/L	[NT]	[NT]	84586-2	92%
Nickel-Dissolved	µg/L	[NT]	[NT]	84586-2	82%
Zinc-Dissolved	µg/L	[NT]	[NT]	84586-2	#

Report Comments:

Trace Metals: # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

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

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

Quality Control Definitions

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

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

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

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

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

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

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

Aileen Hie

From: Richard Bolton [dla.rbolton@bigpond.com]
Sent: Thursday, 24 January 2013 3:28 PM
To: Simon Song; Aileen Hie
Subject: 84586 - Cronulla Sharks

Importance: High

Hi guys,

Additional request please on all the water samples MW1-MW3:

Ammonia, VOC's and TRH's on a 24hr TAT.

Thanks.

If you have any questions please do not hesitate to contact our office.

84586A
24hrs T/A
due 25/1

Regards,

Richard Bolton
Sydney Regional Manager
M: 0425 333 597

DLA environmental

Sydney

Unit 2B 30 Leighton Place,
Hornsby NSW 2077
Phone: 9476 1765
Fax: 9476 1557
Email: dlassociates@bigpond.com

Maitland

42B Church Street PO Box 137,
Branxton NSW 2335
Phone: 49330001
Email: dla.hunter@bigpond.com

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

CERTIFICATE OF ANALYSIS 84586-A

Client:
David Lane Associates
2B, 30 Leighton Pl
Hornsby
NSW 2077

Attention: Richard Bolton

Sample log in details:

Your Reference:	**DL3007, Cronulla Sharks**
No. of samples:	3 waters
Date samples received / completed instructions received	23/01/13 / 24/01/13

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

Report Details:

Date results requested by: / Issue Date:	25/01/13 / 25/01/13
Date of Preliminary Report:	Not issued

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

Nancy Zhang
Chemist

Nick Sarlamis
Inorganics Supervisor

VOCs in water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	84586-A-1 MW1 23/01/2013 Water	84586-A-2 MW2 23/01/2013 Water	84586-A-3 MW3 23/01/2013 Water
Date extracted	-	24/01/2013	24/01/2013	24/01/2013
Date analysed	-	25/01/2013	25/01/2013	25/01/2013
Dichlorodifluoromethane	µg/L	<10	<10	<10
Chloromethane	µg/L	<10	<10	<10
Vinyl Chloride	µg/L	<10	<10	<10
Bromomethane	µg/L	<10	<10	<10
Chloroethane	µg/L	<10	<10	<10
Trichlorofluoromethane	µg/L	<10	<10	<10
1,1-Dichloroethene	µg/L	<1	<1	<1
Trans-1,2-dichloroethene	µg/L	<1	<1	<1
1,1-dichloroethane	µg/L	<1	<1	<1
Cis-1,2-dichloroethene	µg/L	<1	<1	<1
Bromochloromethane	µg/L	<1	<1	<1
Chloroform	µg/L	<1	<1	<1
2,2-dichloropropane	µg/L	<1	<1	<1
1,2-dichloroethane	µg/L	<1	<1	<1
1,1,1-trichloroethane	µg/L	<1	<1	<1
1,1-dichloropropene	µg/L	<1	<1	<1
Cyclohexane	µg/L	<1	<1	<1
Carbon tetrachloride	µg/L	<1	<1	<1
Benzene	µg/L	<1	<1	<1
Dibromomethane	µg/L	<1	<1	<1
1,2-dichloropropane	µg/L	<1	<1	<1
Trichloroethene	µg/L	<1	<1	<1
Bromodichloromethane	µg/L	<1	<1	<1
trans-1,3-dichloropropene	µg/L	<1	<1	<1
cis-1,3-dichloropropene	µg/L	<1	<1	<1
1,1,2-trichloroethane	µg/L	<1	<1	<1
Toluene	µg/L	<1	<1	<1
1,3-dichloropropane	µg/L	<1	<1	<1
Dibromochloromethane	µg/L	<1	<1	<1
1,2-dibromoethane	µg/L	<1	<1	<1
Tetrachloroethene	µg/L	<1	<1	<1
1,1,1,2-tetrachloroethane	µg/L	<1	<1	<1
Chlorobenzene	µg/L	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1
Bromoform	µg/L	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2
Styrene	µg/L	<1	<1	<1
1,1,2,2-tetrachloroethane	µg/L	<1	<1	<1
o-xylene	µg/L	<1	<1	<1
1,2,3-trichloropropane	µg/L	<1	<1	<1

VOCs in water Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- ----------	84586-A-1 MW1 23/01/2013 Water	84586-A-2 MW2 23/01/2013 Water	84586-A-3 MW3 23/01/2013 Water
Isopropylbenzene	µg/L	2	<1	<1
Bromobenzene	µg/L	<1	<1	<1
n-propyl benzene	µg/L	2	<1	<1
2-chlorotoluene	µg/L	<1	<1	<1
4-chlorotoluene	µg/L	<1	<1	<1
1,3,5-trimethyl benzene	µg/L	<1	<1	<1
Tert-butyl benzene	µg/L	<1	<1	<1
1,2,4-trimethyl benzene	µg/L	<1	<1	<1
1,3-dichlorobenzene	µg/L	<1	<1	<1
Sec-butyl benzene	µg/L	<1	<1	<1
1,4-dichlorobenzene	µg/L	<1	<1	<1
4-isopropyl toluene	µg/L	<1	<1	<1
1,2-dichlorobenzene	µg/L	<1	<1	<1
n-butyl benzene	µg/L	<1	<1	<1
1,2-dibromo-3-chloropropane	µg/L	<1	<1	<1
1,2,4-trichlorobenzene	µg/L	<1	<1	<1
Hexachlorobutadiene	µg/L	<1	<1	<1
1,2,3-trichlorobenzene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	97	98	100
Surrogate toluene-d8	%	99	100	99
Surrogate 4-BFB	%	101	99	98

vTRH in Water (C6-C9) NEPM				
Our Reference:	UNITS	84586-A-1	84586-A-2	84586-A-3
Your Reference	----------	MW1	MW2	MW3
Date Sampled	----------	23/01/2013	23/01/2013	23/01/2013
Type of sample		Water	Water	Water
Date extracted	-	24/01/2013	24/01/2013	24/01/2013
Date analysed	-	25/01/2013	25/01/2013	25/01/2013
TRHC$_6$ - C$_9$	µg/L	<10	<10	<10
TRHC$_6$ - C$_{10}$	µg/L	15	<10	<10
Surrogate Dibromofluoromethane	%	97	98	100
Surrogate toluene-d8	%	99	100	99
Surrogate 4-BFB	%	101	99	98

svTRH (C10-C40) in Water				
Our Reference:	UNITS	84586-A-1	84586-A-2	84586-A-3
Your Reference	----------	MW1	MW2	MW3
Date Sampled	----------	23/01/2013	23/01/2013	23/01/2013
Type of sample		Water	Water	Water
Date extracted	-	25/01/2013	25/01/2013	25/01/2013
Date analysed	-	25/01/2013	25/01/2013	25/01/2013
TRHC$_{10}$ - C$_{14}$	µg/L	140	<50	<50
TRHC$_{15}$ - C$_{28}$	µg/L	530	<100	<100
TRHC$_{29}$ - C$_{36}$	µg/L	<100	<100	<100
TRH>C$_{10}$ - C$_{16}$	µg/L	210	<50	<50
TRH>C$_{16}$ - C$_{34}$	µg/L	400	<100	<100
TRH>C$_{34}$ - C$_{40}$	µg/L	<100	<100	<100
Surrogate o-Terphenyl	%	114	119	117

Miscellaneous Inorganics				
Our Reference:	UNITS	84586-A-1	84586-A-2	84586-A-3
Your Reference	----------	MW1	MW2	MW3
Date Sampled	----------	23/01/2013	23/01/2013	23/01/2013
Type of sample		Water	Water	Water
Date prepared	-	25/01/2013	25/01/2013	25/01/2013
Date analysed	-	25/01/2013	25/01/2013	25/01/2013
Ammonia as N in water	mg/L	12	0.72	8.1

Method ID	Methodology Summary
Org-013	Water samples are analysed directly 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 draft Guideline on Investigation Levels for Soil and Groundwater.
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 draft Guideline on Investigation Levels for Soil and Groundwater.
Inorg-057	Ammonia - determined colourimetrically based on EPA350.1 and APHA 22nd ED 4500-NH3 F, Soils are analysed following a KCl extraction.

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			24/01/2013	[NT]	[NT]	LCS-W1	24/01/2013
Date analysed	-			25/01/2013	[NT]	[NT]	LCS-W1	25/01/2013
Dichlorodifluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Chloromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Vinyl Chloride	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Bromomethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Chloroethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
Trichlorofluoromethane	µg/L	10	Org-013	<10	[NT]	[NT]	[NR]	[NR]
1,1-Dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Trans-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,1-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	102%
Cis-1,2-dichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Bromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Chloroform	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	102%
2,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	123%
1,1,1-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	101%
1,1-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Cyclohexane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Carbon tetrachloride	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Dibromomethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Trichloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	107%
Bromodichloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	98%
trans-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
cis-1,3-dichloropropene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,1,2-trichloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Toluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,3-dichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Dibromochloromethane	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	93%
1,2-dibromoethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Tetrachloroethene	µg/L	1	Org-013	<1	[NT]	[NT]	LCS-W1	103%
1,1,1,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Chlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Ethylbenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Bromoform	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
m+p-xylene	µg/L	2	Org-013	<2	[NT]	[NT]	[NR]	[NR]
Styrene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,1,2,2-tetrachloroethane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
o-xylene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL VOCs in water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
1,2,3-trichloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Isopropylbenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Bromobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
n-propyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
2-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
4-chlorotoluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,3,5-trimethyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Tert-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2,4-trimethyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,3-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Sec-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,4-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
4-isopropyl toluene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
n-butyl benzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2-dibromo-3-chloropropane	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2,4-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Hexachlorobutadiene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
1,2,3-trichlorobenzene	µg/L	1	Org-013	<1	[NT]	[NT]	[NR]	[NR]
Surrogate Dibromofluoromethane	%		Org-013	95	[NT]	[NT]	LCS-W1	101%
Surrogate toluene-d8	%		Org-013	100	[NT]	[NT]	LCS-W1	100%
Surrogate 4-BFB	%		Org-013	95	[NT]	[NT]	LCS-W1	98%

QUALITY CONTROL vTRH in Water (C6-C9) NEPM	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			24/01/2013	[NT]	[NT]	LCS-W1	24/01/2013
Date analysed	-			25/01/2013	[NT]	[NT]	LCS-W1	25/01/2013
TRHC$_{6}$ - C$_{9}$	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	105%
TRHC$_{6}$ - C$_{10}$	µg/L	10	Org-016	<10	[NT]	[NT]	LCS-W1	105%
Surrogate Dibromofluoromethane	%		Org-013	95	[NT]	[NT]	LCS-W1	102%
Surrogate toluene-d8	%		Org-013	100	[NT]	[NT]	LCS-W1	100%
Surrogate 4-BFB	%		Org-013	95	[NT]	[NT]	LCS-W1	99%
QUALITY CONTROL svTRH (C10-C40) in Water	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/01/2013	[NT]	[NT]	LCS-W1	25/01/2013
Date analysed	-			25/01/2013	[NT]	[NT]	LCS-W1	25/01/2013
TRHC$_{10}$ - C$_{14}$	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W1	61%
TRHC$_{15}$ - C$_{28}$	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	87%
TRHC$_{29}$ - C$_{36}$	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	87%
TRH>C$_{10}$ - C$_{16}$	µg/L	50	Org-003	<50	[NT]	[NT]	LCS-W1	61%
TRH>C$_{16}$ - C$_{34}$	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	87%
TRH>C$_{34}$ - C$_{40}$	µg/L	100	Org-003	<100	[NT]	[NT]	LCS-W1	87%
Surrogate o-Terphenyl	%		Org-003	70	[NT]	[NT]	LCS-W1	70%
QUALITY CONTROL Miscellaneous Inorganics	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			25/01/2013	[NT]	[NT]	LCS-1	25/01/2013
Date analysed	-			25/01/2013	[NT]	[NT]	LCS-1	25/01/2013
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	[NT]	[NT]	LCS-1	97%

Report Comments:

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

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

Quality Control Definitions

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

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

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

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

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

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batched of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

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

Appendix B

Bore Logs

Soil Profile Log

BH - 1

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	4wd Mounted Drill Rig
Hole Size	100mm Solid Flight Auger	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
			-	Asphalt			30mm thick	
			Fill	Black Silty clay Fill		-1	Landfill Gas on completion of borehole: CH4 - 0.4% CO2 - 0.8% O2 - 19.3%	
	0.5							
	1		Fill	Grey Sandy Fill w/ wire, timber, steel drum.		-2		
	1.5							
	2.0		Fill	Black fine grained sand Fill				
			Fill	Organic woody fill with ash				
	2.5							
	3.0							
	3.5		Fill	Brown Gravelly clay fill				
	4.0					-3		
							PID - 55.4	
	4.5		OL	Natural estuarine silt				

Soil Profile Log

BH - 2

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	4wd Mounted Drill Rig
Hole Size	100mm Solid Flight Auger	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
			-	Asphalt			30mm thick	
			Fill	Black Silty clay Fill			Landfill Gas on completion of borehole: CH4 - 3.5% CO2 - 1.3% O2 - 18%	
	0.5							
	1							
	1.5						PID - 0.0	
	2.0		Fill	Grey Sandy Fill w/ timber, steel, plastic and glass.				
	2.5							
	3.0							
	3.5							
				Natural estuarine silt				
				End of Log				
	4.0							
	4.5							

Soil Profile Log

BH - 3

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	4wd Mounted Drill Rig
Hole Size	100mm Solid Flight Auger	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
	0		Fill	Sandy Clay Fill			Landfill Gas on completion of borehole: CH4 - 0.1% CO2 - 0.8% O2 - 18.9%	
	0.5							
	1							
	1.5			Grey Sandy Fill w/ timber, steel, plastic and glass.			PID - 0.0	
	2.0		Fill					
	2.5							
	3.0			Hole Terminated due to drill Jamming				
	3.5							
	4.0							
	4.5							

Soil Profile Log

TP - 4

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	Back Hoe
Hole Size	450mm x 3m	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
	0		-					
			Fill	Loamy Topsoil				
	0.5			Orange mottled clay and crushed sandstone		TP4		
	1							
	1.5			Orang/yellow gravelly Clay fill with brick				
	2.0							
	2.5		Fill	Orange Clay Fill				
	3.0		OL	Natural Estuarine Silt				
	3.5							
	4.0							
	4.5							

Soil Profile Log

TP - 5

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	Back Hoe
Hole Size	450mm x 3m	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
	0.5		Fill	Sandy Fill with brick and tile.		TP5		
	1							
	1.5							
	2.0							
	2.5							
	3.0							
	3.5		OL	Natural Estuarine Silt				
	4.0							
	4.5							

Soil Profile Log

TP - 6

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	Back Hoe
Hole Size	450mm x 3m	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
			-	Loamy Topsoil				
			Fill	Mottled orange Clay / sandstone				
	0.5							
	1			Silty sand Fill with waste material including scrap metal, plastic, timber, brick, fibro asbestos and glass.				
	1.5							
	2.0							
	2.5							
	3.0		OL	Natural estuarine silt				
	3.5							
	4.0						PID - 55.4	
	4.5							

Soil Profile Log

BH -7

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	4wd Mounted Drill Rig
Hole Size	100mm Solid Flight Auger	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
			Fill	Black Silty loam Fill				
			Fill	Silty Clay Fill		-1	Landfill Gas on completion of borehole: CH4 - 5.8% CO2 - 4.3% O2 - 15.2% CO - 4ppm	
	0.5							
	1					-2		
	1.5						PID - 0.0	
	2.0		Fill	Grey silty Sand and clay Fill w/ timber, carpet, duct tape, steel, plastic and glass..				
	2.5							
	3.0							
	3.5							
			OL	Natural Estuarine Silts				
	4.0							
	4.5							

Soil Profile Log

BH - 8

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	4wd Mounted Drill Rig
Hole Size	100mm Solid Flight Auger	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
			Fill	Black Silty loam Fill				Bentonite Cement Plug
			Fill	Silty Clay Fill				
	0.5							
	1							2mm sand filter
	1.5		Fill	Grey silty Sand and clay Fill w/ timber, steel, plastic and glass.				
	2.0							
	2.5							
	3.0							
	3.5							
	4.0							
	4.5							

Soil Profile Log

BH - 9

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	4wd Mounted Drill Rig
Hole Size	100mm Solid Flight Auger	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
			Fill	Black Silty loam Fill				
			Fill	Silty Clay Fill			Landfill Gas on completion of borehole: CH4 - 1.4% CO2 - 10.9% O2 - 1.8%	
	0.5							
	1					-1		
	1.5						PID - 0.0	
	2.0		Fill	Grey Sandy Fill w/ timber, carpet, steel, plastic and glass.		-2		
	2.5							
	3.0							
	3.5							
			OL	Natural Estuarine Silts				
	4.0							
	4.5							

Soil Profile Log

TP -10

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	Back Hoe
Hole Size	450mm x 3m	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
			-	Loamy Topsoil				
			Fill	Mottled orange Clay / sandstone				
	0.5							
					TP10			
	1							
	1.5			Silty sand Fill with waste material including scrap metal, car wheel, plastic, timber, brick, fibro asbestos and glass.				
	2.0							
	2.5							
	3.0		OL	Natural estuarine silt				
	3.5							
	4.0						PID - 55.4	
	4.5							

Soil Profile Log

BH -11

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	4wd Mounted Drill Rig
Hole Size	100mm Solid Flight Auger	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
	0		Fill	Black Silty loam Fill				Bentonite Cement Plug
	0.5		Fill	Mottled orange Clay / sandstone				
	1		Fill	Silty sand Fill with waste material including scrap metal, plastic, timber, brick, fibro asbestos and glass..			PID - 0.0	2mm sand filter
	1.5							
	2.0							
	2.5							
	3.0							
	3.5				Δ		Water at 3.4m	2mm sand filter
	4.0		OL	Natural Estuarine Silts				
	4.5							5.0m

Soil Profile Log

BH -12

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	4wd Mounted Drill Rig
Hole Size	100mm Solid Flight Auger	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
			Fill	Asphalt			30mm Thickness	
			Fill	Dark grey / orange Silty Clay Fill			Landfill Gas on completion of borehole:	
	0.5						CH4 - 3%	
							CO2 - 5.8%	
	1						O2 - 12.4%	
						-1	CO - 3ppm	
	1.5						PID - 0.0	
	2.0		Fill	Grey Sandy Fill w/ timber, fibro asbestos, steel, plastic and glass.				
	2.5							
	3.0							
	3.5							
			OL	Natural Estuarine Silts				
	4.0							
	4.5							

Soil Profile Log

BH - 13

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	4wd Mounted Drill Rig
Hole Size	100mm Solid Flight Auger	Co-ordinates:	

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
	0		Fill	Asphalt			30mm Thickness	
	0.5		Fill	Dark grey / orange Silty Clay Fill			Landfill Gas on completion of borehole: CH4 - 19% CO2 - 15% O2 - 5%	
	1							
	1.5						PID - 0.0	
	2.0		Fill	Grey Sandy Fill w/ timber, fibro asbestos, steel, plastic and glass.				
	2.5							
	3.0							
	3.5							
	4.0		OL	Natural Estuarine Silts				
	4.5							

Soil Profile Log

BH - 14

Client:	Parkview	Job Type:	St.2 Assessment
Project No:	DL3007	Address:	Captain Cook Drive, Woolooware NSW
Date:	19/12/2012	Logged By:	R Case
Site ID:	Cronulla Sharks	Method:	Back Hoe
Hole Size	450mm x 2m	Co-ordinates:	

BH-15 Adjacent

Method	Depth (m)	Graphic Log	USCS Classification	Material Description	Moisture	Sampling	Field Records/Comments	Monitoring well Details
	0		Fill	Black Silty loam Fill	TP14			Bentonite Cement Plug
			Fill	Silty Clay Fill				
	0.5			Grey Sandy Fill w/ steel, plastic, fibro asbestos and glass.			PID - 0.0	
	1							
	1.5			Silty Clay Fill				2mm sand filter
				End of Log				
	2.0		Fill					
	2.5							
	3.0							
	3.5							
			OL	Natural Estuarine Silts				
	4.0							
	4.5							

Appendix C

Asbestos Site Management Plan

SITE ASBESTOS MANAGEMENT PLAN

Cronulla Sharks Redevelopment Stage 1 Commercial and Retail Including Car Parking

Lot 11 in DP 526492 461 Captain Cook Drive Woolooware NSW 2230

Rev 0.0

Prepared for:
Bluestone Capital Ventures No.1 Pty Ltd
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January 2013

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1.0 INTRODUCTION

DLA Environmental (DLA) was commissioned by Bluestone Capital Venture No.1 Pty Ltd to prepare a Site Asbestos Management Plan (SAMP) for the re-development works associated with Cronulla Sharks property, part Lot 11 DP526492 461 Captain Cook Drive Woolooware NSW.. Previous Assessments undertaken at the Site have identified asbestos containing materials within the fill materials associated primarily with what is known as the Eastern Car Park Area. A Site Asbestos Management Plan (SAMP) has been prepared which considers the risks to workers from identified asbestos contamination/waste.

Previous assessments of the Site were undertaken by Environmental Investigation Services (EIS) from 1994 through to 2006 of the entire Cronulla Sharks Site. This included Stage 2 which is located to the west of the main stadium. This Stage has been designated for seven hundred (700) residential units, ranging from 8-16 storeys. Asbestos was detected within eighteen (18) of fifty eight (58) samples collected as part of the 2006 Site Assessment within Stage 2.

DLA undertook further investigation in December 2012. DLA noted asbestos fragments associated with the fill layer of the landfill materials. The fragments were located within eight (8) of the fourteen (14) test pits excavated on the Stage 1 area.

All soil samples collected (20) were analysed for the presence of asbestos fibres. One sample, TP14 (0.5 – 1.0) contained the presence of synthetic mineral fibres, however no asbestos was detected at the reporting limit of 0.1g/kg. All other soil samples returned negative results for the presence of asbestos fibres or other fibres. Asbestos fragments were detected in the fill materials of boreholes TP6, TP10, BH11, BH12, BH13 and TP14. Previous environmental assessments conducted indicated that 30% of the Boreholes excavated contained minor asbestos content. Limited numbers of these Boreholes were within the Stage 1 area.

Refer to **Figure 1** – Site Layout with Sample Locations for details.

Although asbestos was present in fibre form, it appears to have originated from a bonded source and no fibres of respirable dimensions were identified.

The SAMP is required to satisfy the *NSW DEC Site Auditor Scheme Guidelines 2nd Edition. 2006* to negate the risk of potential exposure to, or release of, contamination from on-site fill soils. The SAMP is also intended to outline management hierarchy, responsibilities and actions required in the event asbestos contamination is located during development of the Site.

This SAMP has been prepared by DLA for the purpose of ongoing management of the environmental controls that are outlined within this report, to address on site potential asbestos contamination and health risk concerns.. The SAMP is to be submitted to all contractors involved with the development that will impact sub-surface fill soils within the Site boundaries.

The Australian and New Zealand Conservation Council (ANZECC) Guidelines for the Assessment of On-Site Containment of Contaminated Soil, 1999 indicates that any Site Management Plan should clearly identify:

- Environmental objectives;
- Control systems supporting each objective;
- Maintenance requirements for each control system;
- Routine monitoring requirements for each control system;
- Range of acceptable values for monitored parameters
- Action levels which trigger intervention in response to monitoring observations;
- Contingency responses in the event that failure of control systems is identified outside routine monitoring (emergency response);
- A documentation protocol to record maintenance activities, monitoring results, non-conformances, and actions taken to rectify any non-conformance; and
- A reporting procedure to ensure effective communication of information.

This report provides information to address all of the points listed above to ensure the integrity of the remediation strategy for the long term.

2.0 STATUTORY REQUIREMENTS

Guidelines covering asbestos contaminated environments are issued by the WorkCover Authority of New South Wales, and by the Australian Safety and Compensation Commission (ASCC). The latter guidelines are the most relevant to this Project and are recognised as such by all workers in the asbestos field.

Relevant source documents include those detailed below:

- Code of Practice for the Safe Removal of Asbestos [NOHSC:2002 (2005)]
- Code of Practice for the Management and Control; of Asbestos in Work places [NOHSC:2018] (2005)
- Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres [NOHSC:3003 (2005)];

Above all the requirements of the Workplace Health and Safety Act 2011 and the associated regulations under the Act the Workplace Health and Safety Regulations 2011 *Asbestos – Particular Provisions.*

The debate over the friable or bonded nature of asbestos fragment contamination of soils has been ongoing for some time. NSW WorkCover Authority have clarified the situation recently in their documentation *Your Guide to Working with Asbestos 2008.*

The Working with Asbestos Guide concludes the following:

Asbestos in Soils (Contaminated Sites)

- *Asbestos cement fragments on or in the surface layer should be removed as bonded asbestos material.*
- *Where there has been damage to the bonded material so that it has been crushed and become friable this material should be treated as friable asbestos and removed by a friable asbestos removal contractor.*
- *Where the condition of the asbestos material or the extent of contamination has*

not been established, competent Occupational Hygienists should assess the site and determine safe work procedures for the remediation of the site. The assessment and safe work procedure should reflect the level of hazard and the proposed use of the land. Environmental and Planning legislative requirements will also need compliance

- *Buried limpet, lagging or other friable asbestos material is to be treated as friable and removed by a friable asbestos removal contractor.*

3.0 ASBESTOS MONITORING PROGRAM

Project Management in association with the Environmental Hygienist will establish monitoring programs to ensure that all activities undertaken in relation to asbestos comply with relevant exposure limits, standards and guidelines.

Areas of the Stage 1 Re-development area have been identified as containing asbestos in the previous environmental reports and the additional pre-construction assessments completed by DLA Environmental in accordance with the requirements These areas will have specific Safe Work Method Statements (SWMS's) and monitoring programs implemented.

Monitoring requirements will include

- Background Air Borne Asbestos Monitoring prior to the commencement of work within the identified areas;
- Daily Airborne Asbestos Monitoring during all works undertaken within identified areas; and,
- Meteorological monitoring - wind speed and direction during works within identified areas.

The Project Manager will ensure that workers entering the site meet the standards of this Management Plan.

3.1 Airborne Asbestos Criteria

The risk associated with asbestos relates to the inhalation of air borne asbestos fibres. These fibres may be liberated by disturbance of the asbestos containing material.

NOHSC has set air quality criteria. This criterion has been incorporated into the appropriate OH and S Regulations. The exposure standard sets out the time-weighted average (TWA) fibre concentration of the air breathed by the worker throughout a working shift, as calculated from one or more measurements taken over

a sampling period of not less than four hours using the Membrane Filter Method.

The TWA airborne concentrations shall not exceed:

- Chrysotile - 0.1 fibres per millilitre
- Crocidolite - 0.1 fibres per millilitre
- Amosite - 0.1 fibres per millilitre
- other forms of asbestos - 0.1 fibres per millilitre
- any mixture of these, or where the composition is unknown - 0.1 fibres per millilitre.

These values may be reviewed from time to time, therefore the most recent publication of the NOHSC Exposure Standards document [NOHSC: 1003] should be consulted for any variations and in consultation with the latest legislative requirements.

Air sampling is used to determine exposure to airborne asbestos fibres, using a modified version of the Membrane Filter Method (NOHSC, 2005).

Once the below stated air sampling methodology has determined asbestos exposure levels, a level of action is to be taken in response to the recorded levels. These actions are listed below in **Table 1**.

Table 1
Recommended Action Levels for Asbestos Exposures

Measured Fibre Concentration (% of Exposure Standard)	Recommended Action
<0.01 fibres/ml	No action necessary; maintain a low-level baseline air sampling program and Continue with Control Measures
≥ 0.01 fibres per ml	Review Control Measures. Ensure all PPE requirements and Decontamination practices are being complied with in the area. Increase monitoring frequency, focussing on personal exposure monitoring and worker category assessment. Ensure personal exposures are maintained as low as practicable. Investigate workplace/work practices and control measures. Invoke agreed work and management procedures. Implement routine personal monitoring and auditing procedures.
Result ≥ 0.02 fibres/ml	Stop work in the affected area and investigate the cause of elevated results Designate area and take remedial action. Implement formal asbestos management procedures including cease work until such time as asbestos concentrations are acceptable.

It is important that interpretation of these results are undertaken by an experienced person conversant with the Membrane filter method and its limitations, particularly given that the asbestos matrix is soils and dust that may inadvertently positively bias results.

All results of air sampling must be recorded and filed. The results will be reported and made available to all employees.

Auditing procedures should be used as the primary technique to ensure that agreed work and management procedures and control measures are operating effectively.

Airborne Asbestos monitoring will be carried out using the only internationally recognised sampling and analytical methodology - the Membrane Filter Method for Estimating Airborne Asbestos Dust [NOHSC:3003 (2005)].

3.2 Air Sampling Strategy

A preliminary background air sampling investigation is to be conducted areas which have been identified as containing asbestos. The background monitoring will provide baseline concentrations prior to the work commencing and form the basis for more extensive sampling if required.

A colour coding strategy depending on potential for asbestos exposure or the identified presence of asbestos has been formalised for all areas of the Project easement.

White Areas

White Areas are areas not affected by asbestos and have no known potential for asbestos exposures. Airborne asbestos monitoring is not required within these areas.

Grey Areas

The potential for asbestos exposure within grey areas is minor. Areas are classified as grey if a minor unexpected find of asbestos containing material is identified during construction, in accordance with the attached Unexpected Finds Protocol. It is the responsibility of the Site Foreman in consultation with the Project Manager to determine whether airborne asbestos monitoring is required.

As required, during works within these areas, exposure control monitoring will be conducted daily until the area is designated White.

Black Areas

Black areas are areas of known asbestos containing materials where disturbance of asbestos materials is likely. Monitoring will be conducted daily during works within

these areas and will continue until the area is designated White. The monitoring strategy for this area will then apply.

3.2.1 Number of Monitors

The number of monitors used will be as required but as a minimum two (2) samplers within a designated area.

3.2.2 Duration and Location of Monitors

Environmental air monitoring will be undertaken continuously and reported in four (4) hour intervals. These monitoring periods may be varied depending on filter dust loadings but always in accordance with the requirements of the membrane filter method.

The location of monitors will be as follows:

1. On the boundaries of designated asbestos work areas.

2. Within the cabins of representative plant and equipment.

3. Within lunch and amenity facilities.

3.2.3 Sample Result Feedback

Monitoring results will be reported to the Project Manager as soon as possible after the conclusion of the monitoring interval. Results will be readily available and accessible to both management and employees and will be displayed in a prominent position. Every week, the Project Manager will provide a summary of current monitoring results detailing dates of sampling, fibre concentration levels and the date of notification of results to the Project Manager. These results will be communicated to all site personnel.

4.0 RECOMMENDED IDENTIFICATION, CHARACTERISATION AND REMEDIAL PROCEDURES

4.1 Asbestos Management Strategy Overview

Previous Environmental Investigations have identified asbestos containing materials along sections of the Cronulla Sharks Redevelopment. These areas have been categorised into one of three categories depending upon known asbestos content. The soils will be designated **black, grey or white** as outlined below.

- **BLACK:** Asbestos containing materials present, requiring off-site disposal;

- **WHITE:** Soils not impacted, which can be beneficially reused on site;

- **GREY:** Materials that may contain bonded asbestos, but at a very minor concentration and manageable by remediation by an Asbestos Licensed Contractor through hen picking (under DLA supervision). The ultimate aim is to create material suitable for beneficial re-use on site. All remediated grey materials are subject to asbestos clearance certification and, when opportunity exists, are to be placed at a depth of >1.0 metres below final surface levels;

4.2 Excavation Strategy

In the event that asbestos related materials are identified, the procedures below will be implemented.

Prior to any commencement of excavation within areas known to contain asbestos contamination, the surface should be inspected and hen-picked to remove any rogue surface bonded asbestos fragments, therefore minimising cross contamination of the Site (this will not include materials within areas designated as Black). In sealed areas, such as those beneath car parks, this is to be done immediately following the removal of asphalt and sub grade.

4.2.1 Unexpected Finds

Due to the nature of material it is never possible to guarantee every fragment of asbestos containing material has been identified. In the event that soil disturbance uncovers a fragment of an asbestos containing material within areas identified as White, given its bonded matrix and isolated nature; this event would not pose an unacceptable health risk to the property. However all asbestos events should be addressed and for this reason an Unexpected Finds Protocol has been included for future construction activities in this documentation. The Unexpected Finds Protocol should be implemented to address any minor discoveries during the construction activities and planned civil works.

The **Unexpected Finds Protocol** is attached in **Attachment 1**.

4.2.2 White Material

These materials are suitable for re-use on-site without any remediation of treatment. All white material however will be subject to a visual inspection and an Unexpected Finds Protocol. In the event of an unexpected find of asbestos containing material within a White area, the Protocol will allow for assessment to determine whether the materials will be reclassified as either Black or Grey depending upon the nature and volume of asbestos containing materials discovered.

4.2.3 Grey Material

All works within these areas are to be undertaken under the supervision of an Environmental Hygienist.

Unexpected finds of bonded asbestos containing materials classed as ‘minor’ by the unexpected finds protocol will be identified if deemed suitable for remediation as Grey Material. The material will be hen picked in-situ to remove all visible fragments. All works within these areas are to be undertaken under the supervision of an AS2 licensed asbestos removal contractor. Visual clearance will be undertaken by DLA Environmental prior to compaction/placement.

Grey material that fails validation following remedial works (black material), will be classified for off-site disposal at a NSW EPA licensed landfill, utilising the NSW DECC 2009, Waste Classification Guidelines.

The **detailed remedial approach** for *Grey Materials* is outlined below:

4.2.3.1 Essential Requirements

1. Supervision by an Environmental Hygienist and Project Manager;
2. The presence of an AS2 Asbestos Removal Contractor;
3. Notification to WorkCover and a Permit obtained;
4. Licensed transporters for removed materials;
5. Licensed landfill to receive material;
6. Personal protective equipment including disposable overalls and respiratory protection;
7. Inspection of excavation and transport machinery prior to exiting contaminated area;
8. Dumping certification from landfill; and,
9. Airborne asbestos monitoring.

4.2.3.2 Responsibilities

1. The Project Manager is to ensure the transporters of the asbestos contaminated material carries an appropriate environment protection license;
2. The Project Manager is to ensure the disposal landfill facility is appropriately licensed to receive the waste;

3. Appropriate personal protective equipment is readily available;

4. The Project Manager to ensure all infrastructure to conduct the works are in place;

5. Ensure dumping certificates are received from the transporter indicating correct tonnages;

6. The work area is identified and secured to prevent unauthorised access;

7. The Environmental Hygienist is to provide Supervision of works to ensure correct procedures are implemented;

8. The Environmental Hygienist is to provide airborne asbestos fibre monitoring throughout the process;

9. The Environmental Hygienist to provide Clearance Certification prior to allowing unrestricted access and works to re-commence in the area.

4.2.3.3 Procedure

1. All operators are to be suitably protected during all sorting, inspection and removal practices.

   Personal protection must include:

   - disposable overalls
   - respiratory protection
   - safety boots
   - hard hat
   - enclosed cabin equipment;

2. The identified areas of minor contamination (grey material) are to be investigated in accordance with the Unexpected Finds Protocol and any asbestos contaminated materials are to be removed and disposed of at an appropriately licensed landfill. All visible asbestos fragments are to be identified and removed

by a Class 2 Asbestos Removalist. The procedure involves extensively hen-picking the material, obtaining visual clearance, re-turning the materials, repeat hen-picking and obtaining final clearance by way of visual inspection and airborne asbestos monitoring. Works undertaken under supervision and consultation with Environmental Hygienist.

3. Plant operators are to remain inside vehicle during the operation. The excavator air-conditioning is to be on recycle only or switched off;

4. Unauthorised access is to be prevented to this area;

5. On completion of the treatment and asbestos detailing process the materials are ready for asbestos clearance assessments prior to chemical classification and ultimately re-use on-site;

If to be beneficially re-used on-site the *grey materials* should be placed at the lower depths with *white materials* at surface levels. This is seen only as a precautionary measure and is not necessary if material handling procedures does not allow this practice in certain areas.

If the materials are to be removed from site this will be undertaken in accordance with the DECCW Waste Classification Guidelines 2009.

Remediation works are planned for commencement following appointment of an appropriate Contractor with Class AS2 capabilities, notification and the obtaining of the relevant work permits from WorkCover Authority.

4.2.4 Black Material

All works within these areas are to be undertaken under the supervision of an AS2 licensed asbestos removal contractor and Environmental Hygienist. These are materials deemed unsuitable for remediation, suitable only for waste classification according to the NSW DECC 2009, Waste Classification Guidelines, for off-site disposal at an NSW EPA licensed landfill.

If an area is designated as Black, the materials will be chemically assessed and loaded directly into trucks for off-site disposal at a suitably licensed facility. Dockets issued by the land fill facility will be collected.

If existing data obtained from previous reports is insufficient, it is proposed the stockpiled waste will be sampled with a frequency of approximately 1 per 100m^3 or 1 per 180 tonnes, with 1/10 samples having intra-laboratory duplicates, and 1/20 samples having inter laboratory duplicate samples collected for sampling QA/QC in accordance with the NSW DECC 2008, *Waste Classification Guidelines*.

It is feasible to contain detected contaminants (Black Materials) on-site provided all conditions relating to storage, placement and final land-use can be addressed.

Outlined below are the responsibilities and procedures to be employed during **the direct off-site disposal** of the contamination *(black)* materials, if required.

4.2.4.1 Essential Requirements

1. Licensed transporters for material;
2. Supervision by a Class 2 Licensed Asbestos Removalist;
3. Notification to WorkCover and a Permit obtained;
4. Licensed landfill to receive material;
5. Personal protective equipment including disposable overalls and respiratory protection;
6. Inspection of excavation and transport machinery prior to exiting contaminated area;
7. Dumping certification from landfill; and,
8. Airborne asbestos monitoring.

4.2.4.2 Responsibilities

1. The Project Manager is to ensure the transporter of the asbestos contaminated material carries appropriate environment protection license;

2. The Project Manager is to ensure the disposal landfill facility is appropriately licensed to receive the waste;

3. Appropriate personal protective equipment is readily available;

4. The Project Manager to ensure all infrastructure to conduct the works are in place;

5. Ensure dumping certificates are received from the transporter indicating correct tonnages;

6. The work area is identified and secured to prevent unauthorised access;

7. The Environmental Hygienist is to provide Supervision of excavation to ensure correct quantities are removed;

8. The Environmental Hygienist is to provide airborne asbestos fibre monitoring throughout the process;

9. The Environmental Hygienist to provide Clearance Certification prior to allowing unrestricted access and works to re-commence in the area;

10. The Environmental Hygienist is to ensure the trucks are appropriately lined and the operation is kept wet at all times.

4.2.4.3 Procedure

1. All operators are to be suitably protected during excavation and truck loading practices.

Personal protection must include:

- disposable overalls
- respiratory protection
- safety boots
- hard hat;
- enclosed cabin equipment;

2. The identified areas present on the site are to be excavated and the asbestos contaminated materials are to be removed from the site and disposed of at an appropriately licensed landfill. Excavation is to continue until such time as DLA Environmental is satisfied the contamination has been removed;

3. Trucks arriving in the loading area are to use the designated roadways only and park in designated areas;

4. Drivers are to prepare the truck for receival of material before entering the loading area ie. tarps pulled back, plastic lined etc;

5. The truck driver is to remain inside his vehicle during the loading operation. The truck air-conditioning is to be on recycle only or switched off;

6. The truck after loading may transport the material to a suitable area for the load to be secured and any spillage removed from the truck body;

7. The operation is to be kept wet at all times;

8. Unauthorised access is to be prevented;

9. At least two operators should be involved in the truck loading operation. One operator to drive the loading equipment whilst the other operator remain adjacent continuously wetting the material by hose;

10. On completion of the truck loading operation the load is to be wetted thoroughly;

11. The removalist operator should cover the load with plastic;

12. Material inadvertently spilt on the ledges of the truck or truck sides are to be washed off prior to the truck leaving the area. This material is to be included in the last load of the disposal process;

13. On completion of the work the operators should hose down the loading equipment and place this material in the last load at the same time washing the bucket into the truck;

14. The truck may then move to a queuing area to cover the load prior to leaving the site;

15. On completion of the work the operators should move to the decontamination facility, remove their disposable overalls and bag them for disposal in the last truckload. Respirators can then be removed.

16. Airborne asbestos monitoring at the boundary and facilities ie lunchrooms etc is to be conducted during all operations, and;

17. A clearance inspection is conducted following the disposal exercise to ensure all contaminated material has been removed.

4.2.4.4 Off-Site Disposal of Asbestos Contaminated Materials

Landfill disposal is the simplest of all remediation methods, and involves the loading out of the contaminated materials, and disposal off-site to a NSW EPA approved landfill disposal site with appropriate environmental safeguards.

EPA permits disposal of contaminated material subject to an approval process. The EPA document “Classifying Waste” sets out the methodology for assessing and classifying wastes to be disposed to landfill. Essentially, wastes are classified into four (4) groups:

General Solid (putrescible/non-putrescible), Restricted, Hazardous and Special Waste

Any material classified as *black* is contaminated with bonded asbestos fragments and therefore in accordance with Schedule 1 Part 3 of the Operations Act is classified as Special Waste. In accordance with Table 7: Disposal of Special Waste is suitable for disposal at landfill licensed to accept bonded Asbestos materials.

Figure 1

Site Layout with Sample Locations

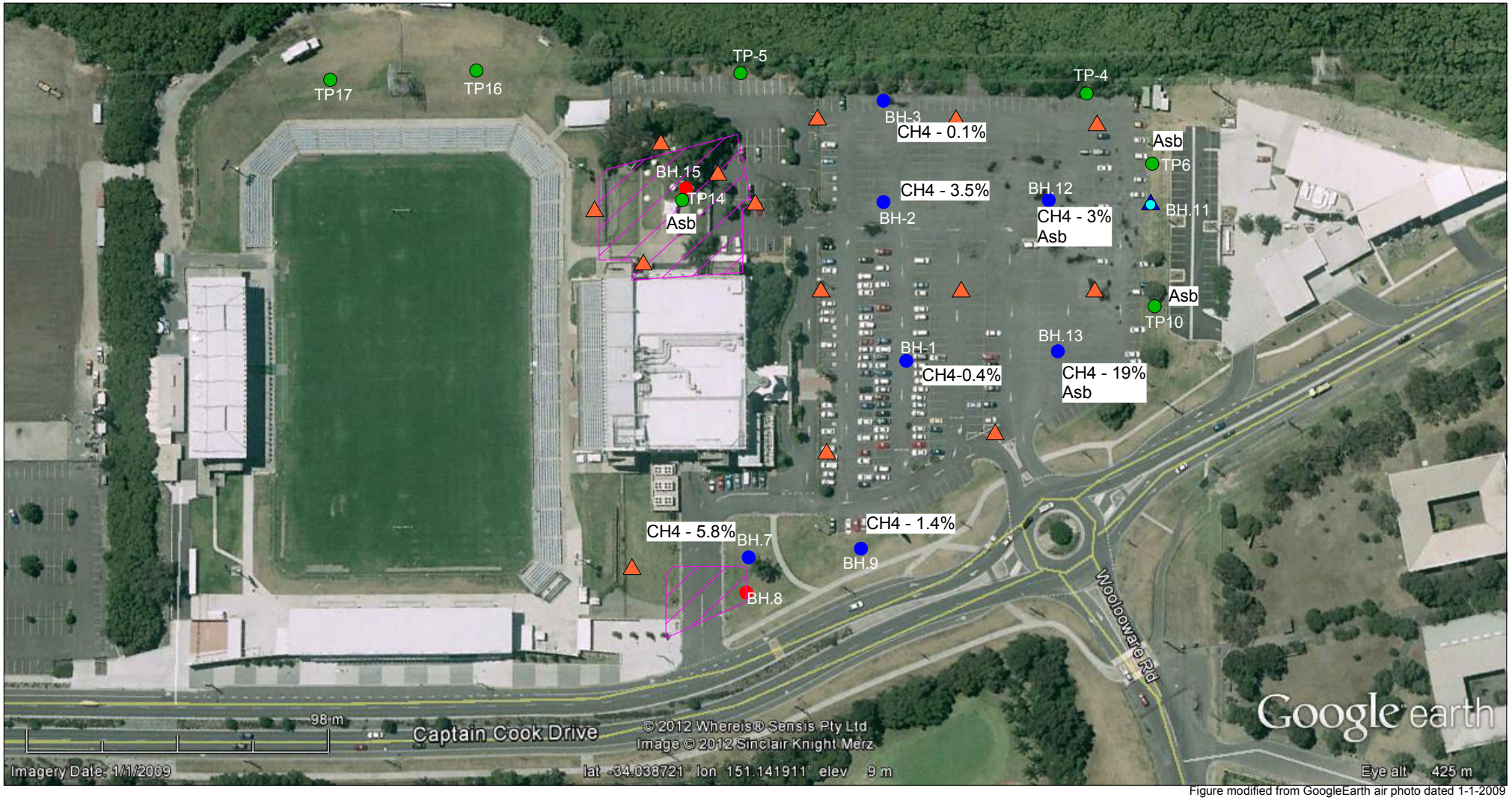

Figure modified from GoogleEarth air photo dated 1-1-2009

Scale (m)

0 25 50

Legend

- Previous Investigation Locations (13)
- Groundwater Well (1)
- Approximate Location of new retail buildings
- Gas & water well location (2)
- Bore hole location (14)
- Test pit location (8)

N

DLA environmental
Unit 2b/30 Leighton Place
Hornsby, NSW 2077

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Phone (02) 4949 3800
Fax (02) 4949 3811

Sydney Office
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Title: Site Layout with Sample Locations

Client:	Job No:	Figure No:	Date:
Bluestone	DL3007	1	29/01/2013
	Scale: As Shown	Sheet: 1 of 1	Revision: R00

Attachment 1

Unexpected Finds Protocol

Bluestone Capital Ventures No.1 Pty Ltd

Cronulla Sharks Re-development

Unexpected Find of Asbestos Containing Material

PROTOCOL

Listed below are the steps that need to be followed in the event of an unexpected discovery of suspected asbestos containing materials during the Construction Works associated with Stage 1 Cronulla Sharks Re-development

This protocol is to be kept on-site in an accessible location for all operators to read with its contents included in the on-site or pre-works “tool box” meeting.

➢ SUSPECTED ASBESTOS MATERIAL UNCOVERED

1. Cease disturbance of the material and leave the immediate area.

2. Contact the Site Foreman or appropriate Manager.

3. Foreman to conduct an assessment of the location of the suspected asbestos containing material taking into consideration possible asbestos matrix and quantity of material.

   ie. if the quantity is small the Foreman initiates a cleanup using appropriate personal protective equipment and procedures.

4. If Foreman decides the material and quantities warrants further investigation the area is to be barricaded off to provide a ten (10) metre exclusion zone. Work can recommence in adjacent areas outside the exclusion zone.

5. The Foreman arranges with his Manager to organise a further qualified assessment of the suspected materials by the Environmental Hygienist.

6. Visual assessments and samples collected by a suitably qualified Environmental Hygienist. Samples sent to a NATA registered laboratory for analysis.

➢ CONFIRM PRESENCE OF ASBESTOS BY VISUAL OR ANALYSIS?

YES – Conduct asbestos clean-up utilising accepted practices in accordance with the NOHSC Code of Practice and Particular Provisions of the OHS Regulation 2011.

- Conduct visual Clearance Inspections and Airborne Asbestos Monitoring.
- If both inspections and monitoring are acceptable the barricades can be removed and resume work notification instructed.
- Complete the Asbestos Incident Report form and forward to appropriate Management.

NO - Remove the barricades and resume work.

Bluestone Capital Ventures No.1 Pty Ltd

Cronulla Sharks Re-development

Asbestos Incident Report

Report Number_____

Date of Incident_____

Time of Incident_____

Location of Incident_____

Details of Incident:

_____
_____
_____
_____
_____
_____
_____
_____
_____

Classification of Incident (Circle) Minor asbestos Incident

Major Asbestos Incident

Breach of Regulations

Regulatory Involvement

Immediate Action Taken:

_____
_____
_____
_____
_____
_____

Signed:_____ Date:_____

Appendix D

Field and Laboratory Quality Assurance

Appendix D1 – Field Quality Control

During the preliminary site assessment of contaminated sites the integrity of data collected is considered paramount. With the assessment of the Site, a number of measures were taken to ensure the quality of the data. These included:

Sample Containers

Soil samples collected during the investigation were placed immediately into laboratory prepared glass jars with Teflon lid inserts. Standard identification labels were adhered to each individual container and labelled according to depth, date, sampling team and media collected.

Decontamination

All equipment used in the sampling program which includes a hand auger, spades and mixing bowl was decontaminated prior to use and between samples to prevent cross contamination. Decontamination of equipment involved the following procedures:

- Cleaning equipment in potable water to remove gross contamination;
- Cleaning in a solution of Decon 90;
- Rinsing in clean demineralised water then wiping with clean lint free cloths;

Water sampling equipment consisted of single use disposable bailer and Low Flow Peristaltic pump with replaceable Teflon tubing.

David Lane Associates also adopted a sampling gradient of lowest to highest potential contamination to minimise the impact of cross contamination. This gradient was determined from the historical review and the on-site inspection that was carried out prior to sampling.

Although DLA maintains consistent sampling procedures, a rinsate sample is obtained to ensure false positive samples are not generated and that decontamination procedures are effective in preventing cross contamination. The Rinsate water is collected after being in contact generally with the trowel used for sampling. Analytical results that target the

contaminants of concern are compared to a blank sample, which is taken directly from the rinsate water container supplied by the laboratory.

Sample Tracking, Identification and Holding Times

All samples were forwarded to EnviroLab under recognised chain of custodies with clear identification outlining the date, location, sampler and sample ID. All samples were recorded by the laboratory as meeting their respective holding times. The sample tracking system is considered adequate for the purposes of sample collection.

Sample Transport

All samples were packed into an esky with ice from the time of collection alongside a trip blank and trip spike. These were transported under chain of custody from the site to EnviroLab Services Pty Ltd a NATA registered laboratory located in Chatswood. During the project, the laboratory reported that all the samples arrived intact and were analysed within holding times for the respective analytes.

Samples were kept below 4°C at all times, soil samples submitted for asbestos analysis are not required to be kept below 4°C. All Trip Spike results were within acceptance criteria providing validation that the transport procedures were satisfactory.

Field Duplicate Samples

Field duplicate samples for soil were prepared in the field through the following process:

- A larger than normal quantity of soil is recovered from the sample location selected for duplication.
- The sample is placed in a decontaminated stainless bowl and mixed as thoroughly as practicable before being divided into equal parts.
- Two Portions of the sub-sample are immediately transferred, one for an intra-laboratory duplicate and another as a sample.
- Samples are placed into a labelled, laboratory supplied 250ml glass jar and sealed with an airtight, Teflon screw top lid. The fully filled jars are

labelled as the sample and duplicate and immediately placed in a chilled esky.

Duplicate samples were prepared on the basis of sample numbers recovered during the field work. The duplicate sample frequency was computed using the total number of samples analysed as part of this assessment. The duplicate sample frequencies are shown below:

Soil Samples	18 samples	2 intra laboratory duplicates	11.1%

Comparisons of the laboratory chemical test results were made between the duplicate samples and the original samples. The differences were calculated as %RPD in order to assess the precision of sampling procedures. The DQO for comparisons between the duplicates and original samples are commonly set at less than 30% for inorganics and 50% for organics.

It should be noted although the DQO that laboratories set the acceptable RPD limit to 100% or greater where the detection levels are less than five (5) times the EQL and at 75% when the concentration is between five (5) and ten (10) times the EQL. Non detections are calculated using 0.5 of the PQL to allow a valid statistical result.

The duplicate chemical samples were analysed for the same analytes as the primary sample, with the obtained results compared against the primary sample.

Heavy Metal Duplicates

The RPD values calculated for intra lab duplicate metal concentrations generally did not comply with the DQO's. Ten (10) exceedances were noted within heavy metal concentrations; however the actual difference in measured concentrations was not significant, particularly when considered against the respective HIL.

Table D1- Calculated intra-laboratory RPDs for Metals

Sample ID	Metal Analyte							
	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
TP10	7	1.9	25	98	130	nd	12	890
TP10A	9	1.3	410	150	510	nd	22	860
RPD %	25%	38%	177%	42%	119%	0%	59%	3%
TP16 – 1	nd	nd	6	7	17	0.30	1	20
TP16 – 1A	nd	nd	6	8	20	0.50	1	23
RPD %	0%	nd	0%	13%	16%	50%	0%	14%
DQO%*	**30**	**30**	**30**	**30**	**30**	**30**	**30**	**30**
LOR**	**4**	**0.5**	**1**	**1**	**1**	**0.05**	**1**	**1**

DQO Assumes >5 x EQL

It is the opinion of DLA that the observed level of heterogeneity is acceptable and presents negligible risk to human health or the environment when considered in the context of the overall validation data.

PAH Duplicates

The RPD values calculated for intra lab duplicate PAH concentrations generally did not comply with the DQO's. Three (3) exceedances were noted within PAH concentrations; however the actual difference in measured concentrations was not significant, particularly when considered against the respective HIL.

Table D2- Calculated intra-laboratory RPDs for PAH's

Sample ID	PAH	
	B(a)P	Total
TP10	0.07	0.27
TP10A	0.1	1
RPD %	35%	115%
TP16 – 1	0.17	1.57
TP16 – 1A	0.8	0.28
RPD %	130%	139%
DQO%*	50%	50%
LOR**	0.05	0.05

DQO Assumes >5 x EQL

Field duplicates provide an indication of the whole investigation process, including the sampling process, sample preparation and analysis. The accuracy of the data is considered to be adequate due to the effect on confidence intervals with low concentrations in the samples and their duplicates.

D2 – Laboratory Analytical and Quality Plan

The integrity of analytical data provides the second step in the QA/QC process for total data compliance. The data validation techniques adopted by David Lane Associates are based upon techniques published by the US EPA and in line with methods and guidelines adopted by the NSW EPA and outlined in the NEPM, 1999.

Descriptions are provided of the specific mechanisms used in the assessment of accuracy, precision and useability of analytical data within the project.

Refer to **Appendix A**- NATA Accredited Analytical Results

Duplicates

Laboratory Duplicates are tested to ensure the results meet the requirements of QA/QC. The samples from the Site showed a percent recovery for all analytes not exceeding the respective laboratory criteria.

Laboratory Detection Limits

Laboratory detection limits for soil and water analyses by EnviroLab are outlined in Table C5 and C6 below:

Table D3 – Method of Soil Analysis – EnviroLab

Analyte	Method	Level of Reporting
Polycyclic Aromatic Hydrocarbons	USEPA SW-846 Method 8270,	0.1 (Ind. Analyte)
Metals	USEPA 200.7 USEPA 7471A	Hg <0.10 As-Cd-Cr-Cu- <0.10 Ni-Pb-Zn <0.5
Pesticides	USEPA SW-846 Method 8081 USEPA SW-846 Method 8140 USEPA SW-846 Method 8080 USEPA SW-846 Method 8870	OCP 0.10 OPP 0.10
PCB	USEPA SW-846 Method 8080 USEPA SW-846 Method 8081	PCB 0.10
BTEX	USEPA SW-846 Method 8260	Benzene 1.0 Toluene 1.0 Ethylbenzene 1.0 Total Xylene 3.0
TPH	USEPA SW-846 Method 8260 USEPA SW-846 Method 8000	C6-C9 25 C10-C14 50 C15-C28 100 C29-C36 100

Table D4 - Method of Water Analysis – Envirolab

Analyte	Method	Level of Reporting Water µg/L	
Metals	USEPA 200.7 USEPA 3005A	As-Cu-Cr-Ni-Pb-Zn- Cd Hg	0.01 0.1 0.5
BTEX	USEPA 8260 USEPA 5030	Benzene Toluene Ethylbenzene m&p -xylene Ortho-xylene	1.0 1.0 1.0 1.0 1.0
TPH	USEPA 8020A USEPA 8000	C6-C9 C10-C14 C15-C28 C29-C36	10 50 100 100
PAH	USEPA 8310 USEPA 8270	Benzo (b)&(k) fluoranthene Each other Analyte	2 1
Pesticides	USEPA 8081	OCP OPP	1 1
PCB VOC VHC	USEPA 8082 USEPA 8260B USEPA 8260B		1