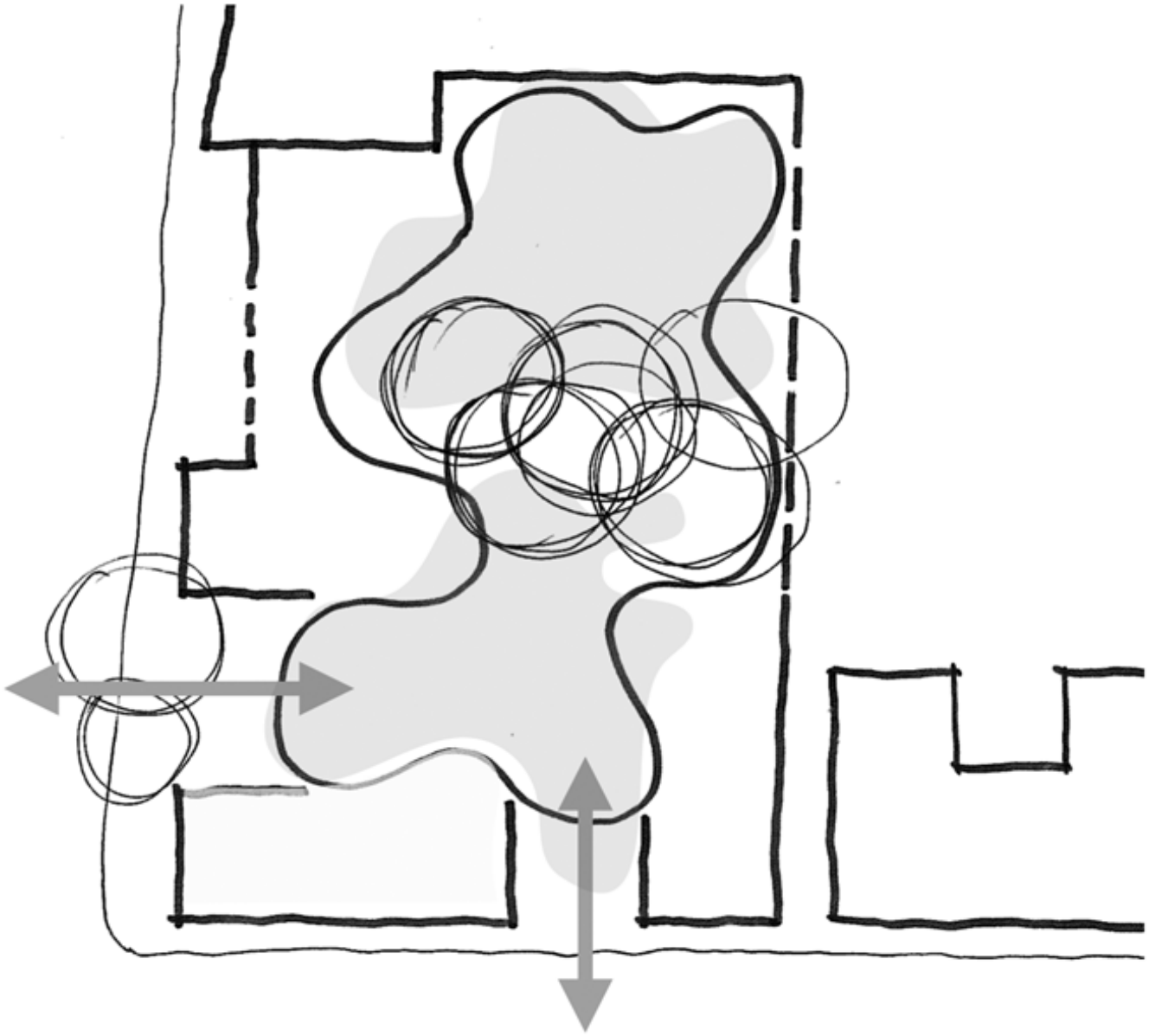
DARLINGTON PUBLIC SCHOOL REDEVELOPMENT

Appendix P — Preliminary Site Investigation

SSD-9914

Prepared by Douglas Partners

For NSW Department of Education



Douglas Partners
Geotechnics / Environment / Groundwater

Integrated Practical Solutions

Report on
Preliminary Site Investigation - Contamination

Darlington Public School Upgrade
417 Abercrombie Street, Darlington, NSW

Prepared for
Billard Leece Partnership Pty Ltd

Project 92277.00
April 2018

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

	Signature	Date
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Executive Summary

Douglas Partners Pty Ltd (DP) was commissioned by Billard Leece Partnership Pty Ltd (BLP) to complete a Preliminary Site Investigation (PSI) of the Darlington Public School property located at 417 Abercrombie Street, Darlington, NSW (the site). DP understands that the site currently comprises an operational primary school and preschool. Redevelopment/upgrading works are proposed for the school complex. The site covers an approximate area of 0.72 ha and is located within the Local Government Area of the City of Sydney. A PSI is required as part of a master plan and concept design and to support future development applications being made with the City of Sydney.

The aim of the PSI is to provide preliminary contamination, salinity and acid sulphate soil information regarding the site's suitability for the proposed redevelopment/upgrading works.

The results of site walkover and desktop investigation identified the following AEC that had the potential for contamination of near surface soils and/or filling at the site:

- AEC1: Presence of former buildings and sheds (Hazardous building materials);
- AEC2: Presence of filling;
- AEC3: Presence of former and current sheds (potential chemical storage); and
- AEC4: Presence of a power pole.
- AEC5: Presence of a former road/laneway.

Targeted sampling was undertaken at 10 locations across the site within identified AEC in the vicinity of former/current site structures, areas of filling, the former road/laneway and a power pole onsite. The results of site inspection and soil sampling identified the following that will require remediation and/or risk assessment or further investigation for the site to be considered suitable for the proposed upgrading works and ongoing use as a primary/pre-school:

- TRH, PAH and lead impact was variously identified in shallow fill soils at two locations in the north western portion of the site and one location in the south eastern portion of the site. Fill at these locations requires remediation and/or risk assessment. Given the identification of slag and charcoal type material within fill at these locations contamination of the fill is potentially associated with historic sourcing of fill from an industrial site with blast furnace activities. Further investigation of fill soils across the site is also required to determine the presence or absence of additional contamination hotspots;
- TRH and zinc impact to shallow soils in the central eastern portion of the site requires further investigation; and
- Potential for ACM impact to shallow soils across the site. Whilst ACM was not identified in the PSI sampling, given the preliminary nature of the PSI; the demolition of numerous structures; and importation of filling, the presence of asbestos impacted soils at the site cannot be ruled out and requires further investigation.

With respect to site contamination the recommended further assessment should build on the information provided in this report with reference to National Environment Protection Council (NEPC, 1999) National Environment Protection Council (Assessment of Site Contamination) Measure 1999 (amended 2013) (NEPC, 2013). Further assessment should include intrusive investigations, sampling, analysis and assessment to determine land use suitability.

It is noted that a hazardous building materials assessment was also completed by DP at the time of the PSI to identify potential hazardous materials within the buildings so that protective measures can be implemented, if required, during redevelopment / upgrading works.

Table of Contents

Page

Report on Preliminary Site Investigation - Contamination
Darlington Public School Upgrade
417 Abercrombie Street, Darlington, NSW

1. Introduction

Douglas Partners Pty Ltd (DP) was commissioned by Billard Leece Partnership Pty Ltd (BLP) to complete a Preliminary Site Investigation (PSI) of the Darlington Public School property located at 417 Abercrombie Street, Darlington, NSW (the site) as shown on Drawing 1 (Appendix A). DP understands that the site currently comprises an operational primary school and preschool. Redevelopment/upgrade works are proposed for the school complex. The site covers an approximate area of 0.72 ha and is located within the Local Government Area of the City of Sydney. A PSI is required as part of a master plan and concept design and to support future development applications being made to the City of Sydney.

The aim of the PSI is to provide preliminary contamination, salinity and acid sulphate soil information regarding the site's suitability for the proposed redevelopment/upgrade works.

DP previously completed a Summary Geotechnical Investigation of the site in December 2009. The current PSI was completed concurrently with a Preliminary Geotechnical Investigation of the site.

2. Scope of Works

The PSI included completion of the following scope of works:

- Review of local topographic, soil, geological, salinity and acid sulphate soils mapping;
- Search of the NSW EPA Land Information records to confirm that there are no statutory notices or licences current on any parts of the site or nearby surrounds under the *Contaminated Land Management Act 1997* and the *Protection of the Environment Operations Act 1997*;
- Search for groundwater bores on or adjacent to the site registered with the NSW Office of Water;
- Review of previous contamination reports for the site;
- Review of historical aerial photography for the site to identify Potential Areas of Environmental Concern (AEC);
- Review of Council Records;
- Undertaking a site visit and walkover to identify additional AEC;
- Preparation of a conceptual site model (CSM);
- Drilling of nine boreholes and targeted soil sampling at ten locations in the vicinity of identified AEC;
- Laboratory analysis of selected soil samples for contaminants of potential concern (COPC);

- Interpretation of laboratory results in accordance with current NSW EPA endorsed guidelines; and
- Preparation of this PSI report outlining the methodology and results of the investigation, and an assessment of the site's suitability for the proposed redevelopment/upgrade and ongoing use of the site as a primary/pre-school.

3. Site Description

3.1 Site Identification

The site comprises the following land parcels as detailed in Table 1 below.

Table 1: Study Area Identification

Lot / Deposited Plan	Current Land Use	Approx. Area (ha)
Darlington Public School, 417 Abercrombie Street, Darlington NSW		
592 / 752049	Primary School	0.49
100 / 623500	Primary School	0.23
Total Approximate Area		**0.72**

3.2 Site Description

The following site description is based on site inspection completed on 28 February 2018, field works completed on 17 March 2018 and review of Nearmap Imagery. Prominent site features are presented on Drawing 2 (Appendix A). Photographic Plates are presented in Appendix B.

The site is located within an area which consists of undulating topography comprising low lying and gently sloping hills with shallow soil cover. The site levels slope towards the southeast from between approximately RL 41, relative to Australian Height Datum (AHD), in the northwest portion of the site to approximately RL 33 in the southeast portion of the site.

The site is an irregular shaped property and is accessed via a driveway that leads from Golden Grove Street located to the west of the site and the School gate fronting Abercrombie Street to the south of the site. The site is comprised of two lots as described below.

Lot 592 DP 752049

The lot is roughly square shaped and comprises the majority of the school grounds and buildings. A large two storey rectangular building is located in the southwest corner of the lot which comprises several school offices and classrooms. The building is constructed of brick walls, concrete slab floors and sheet metal roofing. Several interior walls and ceilings of the building appeared to be constructed of fibre cement sheeting (FCS) suspected of containing asbestos. A courtyard is located to the immediate east of the building and is mostly concrete sealed with two small unsealed garden areas containing large trees and shrubs. Another brick building is located to the immediate east of the courtyard and is also constructed of brick walls, concrete slab floor and metal sheeting roofing. FCS interior walls and ceilings were also observed in portions of the building.

Another large rectangular shaped building is located across the central western portion of the lot and comprises the school hall and a number of classrooms. The building is constructed similarly to the other buildings onsite. An extension of the building is located to the immediate northwest. An area containing play equipment is located to the immediate east of the building. The play equipment area is sealed with a "soft-fall" safety surface material. A concrete path is located immediately adjacent east of the play area with an unsealed garden located further to the east.

Another S – shaped class room building is located across the central south eastern portion of the lot which is also constructed similarly to the other buildings onsite. The area to the immediate north of the S-shaped building is concrete sealed with unsealed gardens and a grassed area located further beyond in the north eastern portion of the lot.

Lot 100 DP 623500

The lot is roughly L – shaped and consists of a basketball court and playground area. The lot is elevated slightly above the remainder of the site (adjacent lot to the south) indicating the area has likely been historically filled. The majority of the area is sealed with asphalt and concrete. The far northern portion of the lot is elevated further above the remainder of the lot and is covered with a "soft-fall" safety surface material. Several large trees also exist within the northern portion of the site. An unsealed garden bed is located along the eastern boundary of the lot and contains several small shrubs.

3.3 Surrounding Landuse

The site is in a residential/educational precinct area with the landuse surrounding the property as follows:

North:	A Sydney University building (residential and educational) with Darlington Lane and residential properties beyond.
East:	Sydney University student accommodation buildings (residential) with Sydney University campus buildings beyond.
South:	Abercrombie Street with residential properties beyond.
West:	Golden Grove Street with residential properties beyond.

3.4 Regional Geology, Soils, Hydrogeology and Hydrology

Reference to the Sydney 1:100 000 Geological Series Sheet indicated that the site is underlain by Ashfield Shale (Rwa) of the Wianamatta Group of Triassic age. This formation typically comprises shale, carbonaceous claystone, laminite, fine to medium grained lithic sandstone and some minor coal bands.

Reference to 1:100 000 *Sydney* Geological Series Sheet 9030 (Edition 1), 1991 indicates that shallow soils at the site comprise Blacktown Soil Landscape (bt) which is characterised by topography of *'gently undulating rises on Wianamatta Group shales and Hawkesbury shale, with local relief to 30 m and slopes usually less than 5%'*. This is a residual landscape which the mapping indicates comprises up to two soil horizons that range from shallow to moderately deep red and brown podzolic soils on crests, upper slopes and well drained areas to yellow podzolic soils on lower slopes and in areas of poor drainage. These soils are typically of low fertility comprising moderately reactive high plasticity subsoils with poor drainage.

A search of the NSW Office of Water groundwater bore data was undertaken by DP on 1 March 2018 and identified one bore within 500m of the site and is detailed in Appendix C. Table 2 below provides a summary of information for the bore in question.

Table 2: Summary of Groundwater Bore Search

Bore ID	Approx. Distance (m) / Direction from Site	Date of Installation	Bore Use	Total Depth (m)	Depth of Water Bearing Zones (m)
GW110247	Northwest/200 m	16/07/2009	Domestic Bore	210	22.0 to 23.0 74.0 to 76.0 188.0 to 188.5

Groundwater monitoring well GW110247 is located up hydraulic gradient of the site.

The nearest surface water receptor down-gradient of the site is Lake Northam located within Victoria Park approximately 850 m northeast of the site.

3.5 Acid Sulphate Soils

Review of NSW Government Office of Environment and Heritage Acid Sulphate Soils Risk mapping indicates that the site is classified as having *'no known occurrence of acid sulphate soil'.*

3.6 Sensitive Receptors and Environments

The nearest sensitive receptors and environments have been identified as follows:

- Current and future site occupants;
- Current and future site workers;
- The nearest residential properties located immediately adjacent to the site's northern and eastern boundaries; and nearby to the west beyond Golden Grove Street and to the south beyond Abercrombie Street;
- The primary environmental receptors down-gradient of the site is Lake Northam located approximately 850 m northeast of the site; and
- Groundwater beneath the site.

4. Review of Site History Information

A desktop review of site history information has been undertaken to identify AEC and related COPC which may arise from previous and current land uses. The desktop investigation was limited to the following:

- A review of previous available contamination investigations;
- A review of historical aerial photographs;

- NSW EPA data base searches;;
- Review of Council Records; and
- Listing of other potential site contamination issues based on DP experience with sites of a similar nature and scale.

Given that historical aerial photographs identified that the site and surrounds have been used for either residential or educational purposes since the 1950's a title search and SafeWork NSW Search for Hazardous Chemicals was not considered warranted.

The following sections detail the methodology of the desktop investigation.

4.1 Previous Contamination Investigations and Reports

4.1.1 DP (2009)

DP completed a Summary Geotechnical Investigation of the site in December 2009.

4.1.2 Parsons Brinkerhoff (2014) Asbestos in Grounds, Asbestos Management Plan

BLP provided DP a recent Asbestos Management Plan (AMP) produced for the site by Parsons Brinkerhoff (PB) in 2014. The AMP was an updated version of previous AMPs produced for the site in 2007 and 2013. In August 2007 FCS fragments containing asbestos were identified on the ground surfaces of the northern playground area at the site. In order to manage the risk of exposure to asbestos FCS fragments were removed from the ground surfaces in August 2007 and July 2013. In a previous inspection report it was proposed that the asbestos zone in the northern playground be encapsulated with an appropriate surface such as hard stand or raised mulch garden beds. The AMP outlines the plan for management of the identified asbestos impacted areas (zones).

The asbestos register in Section 3 of the AMP outlines the areas requiring management as:

- The northern playground area; and
- Northern and north eastern garden beds to school boundary walls.

The PB AMP recommended that the asbestos zone management should include regular inspections and maintenance. The PB AMP included a checklist (in Appendix A of the AMP) which recommended that the checklist be used whenever walkover inspections or maintenance is carried out. The AMP states that "*the checklist is specific to the requirements of the grounds at the Darlington Public School and sets out the frequency of inspections required*".

4.2 Historical Aerial Photography

Historical aerial photographs were reviewed to assist in identifying the history of the site and the surrounding area. Images from 1955, 1961, 1975, 1986 and 1991 were sourced from NSW Land and Property Information. Additionally, images from 2000, 2009 and 2014 were sourced from Google Earth and Nearmaps. All aerial photographs are provided in Drawings 3 to 10 respectively (Appendix A).

A summary of the review of historical aerial photography is detailed in the following table.

Table 3: Summary of Review of Historical Aerial Photographs

Year	Site / Surrounds	Description
1955	Site	Lot 592 – The majority of the lot appears to contain numerous residential semi-detached terrace dwellings and associated backyard sheds. A narrow laneway runs east – west direction through the central portion of the lot. A larger building structure is evident in the south eastern portion of the lot which may have been used for commercial/industrial purposes. Lot 100 – The northern portion of the lot contains several residential semi-detached terraced dwellings and associated backyard sheds. A road runs across the southern portion of the lot.
	Surrounds	North – Darlington Lane is located to the immediate north of the site with a commercial / industrial building located adjacent to the immediate northwest of the site. Residential dwellings are located beyond further to the north. East – Numerous semi-detached residential dwellings. South – Abercrombie Street with numerous semi-detached residential dwellings located beyond. West – Golden Grove Street with larger commercial/industrial buildings located beyond.
1961	Site	The site appears similar to the previous historical aerial photograph.
	Surrounds	The majority of the surrounding areas appear similar to the previous aerial photograph.
1975	Site	Lot 592 - Several of the residential dwellings and sheds across the central, northern and western portions of the lot appear to have been demolished. A large rectangular building, that appears to be one of the current school buildings, has been constructed across the central western portion of the lot. The large commercial / industrial building previously in the south eastern portion of the lot appears to have been demolished and replaced with several smaller building structures. A large rectangular building has been constructed across the south western portion of the lot. Lot 100 - Several of the residential dwellings and sheds across the northern portion of the lot appear to have been demolished.

Year	Site / Surrounds	Description
	Surrounds	Several of the residential dwellings to the east of the southern half of the site have been demolished and the land appears vacant. The majority of the remainder of surrounding areas appear similar to the previous aerial photograph.
1986	Site	Lot 592 – Several buildings have been constructed in the south eastern portion of the lot. The north eastern portion of the lot has been completely cleared of structures and is now a grassed area. Lot 100 – All structures have been demolished and removed from the lot. The lot appears vacant and grass covered. The road previously running through the southern portion of the lot has also been removed and is replaced with grass.
	Surrounds	An asphalt sealed car park has been constructed to the north east of Lot 592 and large building constructed to the southeast of Lot 592. Several of the residential dwellings to the north east of Lot 100 have been demolished. Several of the commercial / industrial buildings to the west of the site have been demolished and redeveloped as a new residential complex. The majority of the remaining land surrounding the site appears similar to the previous aerial photograph.
1991	Site	The site appears similar to the previous historical aerial photograph.
	Surrounds	A number of residential dwellings to the northeast of the site have been demolished. The majority of the remaining land surrounding the site appears similar to the previous aerial photograph.
2000	Site	The site appears similar to the previous historical aerial photograph.
	Surrounds	The majority of the land surrounding the site appears similar to the previous aerial photograph.
2009	Site	The majority of Lot 100 has been covered with an asphalt type material and transformed into a basketball court / playing area. The remainder of the site appears similar to the previous historical aerial photograph.
	Surrounds	The majority of the land surrounding the site appears similar to the previous aerial photograph.

Year	Site / Surrounds	Description
2018	Site	The site appears similar to the previous aerial photograph.
	Surrounds	Several of the buildings to the east of the site have been refurbished or redeveloped The majority of the remaining land surrounding the site appears similar to the previous aerial photograph.

4.3 Regulatory (NSW EPA) Notices Search

A search of the NSW EPA website on 22 May 2017 indicated that:

- No Licences have been issued for the site under the *Protection of the Environment Operations Act 1997*;
- No Notices or Orders to investigate or remediate the site (or immediately adjacent sites) have been issued for the site under the *Contaminated Land Management Act 1997*; and
- The site (or immediately adjacent sites) is not recorded on the public list of NSW contaminated sites reported to the EPA.

A search of the POEO public register identified the following for nearby properties:

- A POEO licence issued to INTEC Ltd in 2001 and varied in 2004 for the property located at buildings on Maze Crescent, Darlington located approximately 350 m down gradient of the site. The licence was for “Hazardous, Industrial or Group A Waste generation or storage”. The licence is no longer in force; and
- A POEO licence issued to John Holland in 2015 for “Land Based Extractive Activity”. The property is located at the corner of Codrington and Abercrombie Streets Darlington located approximately 175 m down gradient of the site.

Given the distances and general down gradient location of the above properties it is considered unlikely that the properties present a significant contamination risk to the site.

Search results are presented in Appendix D.

4.4 Review of Council Records

A planning certificate issued under section 10.7 ((formerly section 149 (parts 2&5)) *Environmental Planning and Assessment Act 1979* (NSW) for the property was obtained from Council of City of Sydney. Review of the planning certificate identified the following for the property:

- The land does not include or comprises critical habitat or with a wilderness area;
- The land is not in a conservation area;
- The land is not an item of environmental heritage;
- The land is not proclaimed to be in a mine subsidence district;
- The land is not affected by a landslip policy;

- The land is not affected by bushfire provisions and has not been identified as bushfire prone land;
- The land is not affected by policies that restrict development due to tidal inundation;
- The land is not affected by policies that restrict development due to the likelihood of acid sulphate soils;
- Council's policy "Building in a Salinity Prone Environment" applies to the site;
- The land is affected by flood related development controls;
- The land is not biodiversity certified;
- The land is not listed on the loose fill asbestos register subject to *Home Building Act 1989*; and
- The land has not been identified as significantly contaminated or is not subject to a management order under the *Contaminated Land management Act 1997.*

An informal request was also made on 16 March 2018 to the City of Sydney under the *Government Information (Public Access) Act 2009* for information relating to site history, development applications and potential contamination at the property. An email reply provided by the City of Sydney on 21 March 2018 states that council representatives were unable to locate any information requested from their database.

Documents provided by Council are presented in Appendix E.

4.5 Anecdotal Information

Discussion with the grounds keeper at the school and several school staff indicated fragments of ACM had previously been identified in an unsealed basement area beneath a school building in the central western portion of the site. It is unclear from the discussions whether the ACM fragments were removed. Access to the area was limited during site inspection and field works therefore the presence of ACM fragments beneath the building cannot be ruled out.

5. Preliminary Conceptual Site Model

5.1 Potential Sources of Contamination (AEC)

Hazardous Building Materials (AEC1)

Historical aerial photographs and site inspection identified a number of residential dwellings and associated sheds previously located across the site which have since been demolished in the period between 1961 to 1984. Review of the AMP produced by PB has identified that fragments of asbestos containing materials were previously identified in the northern portion of the site which is now a sealed area subject to an AMP. Anecdotal information also suggests fragments of ACM have previously been identified beneath a building in the central western portion of the site.

There is therefore potential for contamination of shallow soils across the site to be impacted by hazardous building material related COPC including:

- Asbestos; and
- Lead.

Areas of Filling (AEC2)

Review of aerial photographs and site inspection identified portions of the site, particularly the northern areas, have been historically filled.

There is therefore potential for soil impact at the site from fill of an unknown origin and building/demolition waste related COPC including:

- Total Recoverable Hydrocarbons (TRH);
- Benzene, toluene, ethylbenzene and xylenes (BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Polychlorinated biphenyls (PCBs);
- Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn);
- Organophosphate pesticides (OCPs);
- Organophosphate pesticides (OPPs); and
- Asbestos.

Chemical and Fuel Storage (AEC3)

Review of historical aerial photographs identified several sheds associated with the former residential dwellings onsite before they were demolished.

Many of the sheds may have been used for chemical and fuel storage therefore there is potential for contamination of shallow soils as the result of spillages and storage malpractice. COPC associated with chemical and fuel storage include:

- TRH;
- BTEX;
- PAHs;
- PCBs;
- Heavy metals;
- OCPs; and
- OPPs.

Power Pole (AEC4)

Site inspection identified one timber power pole located in the courtyard fronting Abercrombie Street in the southern portion of the site. Therefore there is potential for contamination of surface soils in the immediate vicinity of the power pole to be impacted by related COPC including:

- TRH;
- BTEX;
- PAHs; and
- OCPs.

Former Road / Lane Way (AEC5)

Review of historical aerial photographs indicates a former road/landway running in an east-west direction through the central portion of the site. Therefore there is potential for contamination of surface soils in the immediate vicinity of the former road from related COPC including:

- TRH;
- BTEX; and
- PAHs.

5.2 Potential Receptors

The following potential human receptors (R) have been identified for the Site:

- R1 – Construction and maintenance workers (during Site redevelopment);
- R2 – Future site users following development of the Site; and
- R3 – Land users in adjacent areas (residential).

The following potential ecological receptors (R) have been identified for the Site:

- R4 – Local groundwater, and receiving water bodies;
- R5 – Surface water bodies (offsite creeks); and
- R6 – Local ecology. DP notes that potential ecological receptors are usually associated with the upper 2 m (root zone and habitation zone for many species) of the soil profile.

5.3 Potential Pathways

Potential pathways for contamination include the following:

- P1 – Ingestion and dermal contact;
- P2 – Inhalation of fibres and/or dust and/or vapours;
- P3 – Leaching of contaminants and vertical migration into groundwater;
- P4 – Surface water run-off;
- P5 – Lateral migration of groundwater providing base flow to watercourses; and
- P6 – Direct contact with ecological receptors.

5.4 Summary of Potential Complete Pathways

A ‘source - pathway - receptor’ approach has been used to assess the potential risks of harm being caused to human or ecological receptors from contamination sources on or in the vicinity of the Sites, via exposure pathways. The possible pathways between the above sources (AEC1 - AEC4) and receptors (R1 to R6) are provided in Table 4 below. Assessment of the CSM was used to determine data gaps and the requirement for sampling and analysis to assess the suitability of the Sites for the proposed residential use.

Table 4: Conceptual Site Model

Potential Source	Exposure Pathway	Receptor	Requirement for Additional Data and / or Management
AEC1: Presence of former buildings and sheds (Hazardous building materials) AEC2: Presence of filling AEC3: Presence of former sheds (potential fuel / chemical storage) AEC4: Presence of a power pole AEC5: Presence of a former road/laneway	P1 – Ingestion and dermal contact; P2 – Inhalation of fibres and/or dust and/or vapours	R1 - Construction and maintenance workers. R2 – Future site users following development of the site. R3 – Land users in adjacent areas. R5 – Surface water bodies. R6 – Local groundwater and receiving water bodies.	Given the identified potential contaminant sources, the initial fate (lay down mechanism) of potential contaminants is likely to be expressed firstly in surface soils. An intrusive investigation is therefore required to quantify and assess potential contamination impact to surface soils. (A further assessment of deeper soils and groundwater may be deemed necessary should significant contamination be identified in surface soils).
	P3 – Leaching of contaminants and vertical migration into groundwater. P4 – Surface water run-off. P5 – Lateral migration of groundwater providing baseflow to watercourses.		
	P6 – Direct contact of contaminated ground with ecological receptors.	R4 – Local ecology.	

6. Field Work

Soil sampling was completed at a total of 10 locations across the site on 17 March 2018. Boring and surface sample locations are shown on Drawing 11, Appendix A. Soil samples were collected in each AEC as identified from the PSI desktop investigation (described in Section 5.1 and in 6.1).

The field investigation was designed in accordance with the seven step data quality objectives (DQO) process provided in Appendix F, Schedule B2 of the National Environment Protection (Assessment of Site Contamination) Measure 1999 as amended 2013 (NEPC, 2013). The DQO adopted for this PSI are provided in Appendix F.

6.1 Soil Sampling Methodology and Rationale

Soil sampling was completed at nine locations (BH1 to BH9) by boring with a Kubota KX018-4 1.7 tonne excavator fitted with a 150 mm power auger to a maximum depth of 3.0 metres below ground level (m bgl). Surface soil sampling (0.0 - 0.1 m bgl) at the power pole was completed with a shovel. Soil samples were collected based on identified AEC and visual observations during field work. Test bores/surface sampling locations and COPC analysis rationale for each AEC is presented as follows.

Table 5: Location, Sampling and Analysis Rationale

Boring/ Surface Sample ID	Location and Sample Rationale	Sample Depths (mbg)	Laboratory Analysis
BH1	Location selected given former residential buildings and potential filling. Also general site coverage	0.2	TRH, BTEX, Heavy metals (9), PAHs, OCPs, OPPs, PCBs and asbestos
BH2	Location selected given former residential buildings and potential filling. Also general site coverage	0.5	TRH, BTEX, Heavy metals (9), PAHs, OCPs, OPPs, PCBs and asbestos
BH3	Location selected given former residential buildings, possible sheds and filling.	0.2	TRH, BTEX, Heavy metals (9), PAHs, OCPs, OPPs, PCBs, phenols and asbestos
BH4	Location selected given former residential buildings, possible sheds and filling.	0.2	TRH, BTEX, Heavy metals (9), PAHs, OCPs, OPPs, PCBs, phenols and asbestos
BH5	Location selected given former road/laneway, residential buildings, possible sheds and filling.	0.2	TRH, BTEX, Heavy metals (9), PAHs, OCPs, OPPs, PCBs, phenols and asbestos
BH6	Location selected given former road/laneway, residential buildings, possible sheds and filling. Also potential hazardous building materials subject to AMP	0.2	TRH, BTEX, Heavy metals (9), PAHs, OCPs, OPPs, PCBs, phenols and asbestos
BH7	Location selected given former residential buildings, possible sheds and filling. Also potential hazardous building materials subject to AMP	0.2	TRH, BTEX, Heavy metals (9), PAHs, OCPs, OPPs, PCBs, phenols and asbestos

Boring/ Surface Sample ID	Location and Sample Rationale	Sample Depths (mbg)	Laboratory Analysis
BH8	Location selected given former residential buildings, possible sheds and filling. Also potential hazardous building materials subject to AMP	0.2	TRH, BTEX, Heavy metals (9), PAHs, OCPs, OPPs, PCBs, phenols and asbestos
BH9	Location selected given former residential buildings, possible sheds and filling.	0.2	TRH, BTEX, Heavy metals (9), PAHs, OCPs, OPPs, PCBs, phenols and asbestos
Power Pole	Presence of power pole	0.0 – 0.2	TRH, BTEX, PAHs and OCPs

6.2 Soil Sampling Procedures

All boring sampling data was recorded on bore logs (Appendix G) with all samples also recorded on chain-of-custody sheets. The general sampling procedure adopted for the collection of environmental samples is summarised below:

- Collection of soil samples was completed using disposable sampling equipment (new nitrile glove for each sample) from the drilling auger or the shovel. Samples were collected taking care to not include soil that was directly in contact with either the surface of auger or shovel;
- Transfer samples into laboratory-prepared glass jars, completely filled to ensure the headspace within the sample jar is minimised, and capping immediately to minimise loss of volatiles;
- Label sample containers with individual and unique identification, including project number, sample location and sample depth;
- Place the glass jars, with Teflon lined lid, into a cooled, insulated and sealed container for transport to the laboratory; and
- Collection of additional replicate samples at a rate of 10% for QA/QC requirements.

Samples designated for analysis were dispatched to NATA accredited laboratory Envirolab Services at Chatswood NSW for analysis of primary samples and intra-laboratory replicates.

6.3 Site Assessment Criteria

The Site Assessment Criteria (SAC) applied in this PSI have been informed by the proposed land use (i.e. residential with accessible soils) and the CSM - which identified human and ecological receptors to potential contamination on the Site (refer to Section 6). Analytical results were assessed (as a Tier 1 assessment) against the investigation and screening levels as per Schedule B1, National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPC, 2013).

Residential land use criteria with accessible soil were adopted given the Site is currently a primary and pre-school (as required by the ASC NEPM). The derivation of the SAC is included in Appendix F and the adopted SAC are listed in the analytical results table (Tables H1 in Appendix H).

6.4 Field Work Observations and Results

Relatively uniform geological conditions were encountered across most of the Site and generally included the following strata:

- Fill or Clayey Silt topsoil, comprising minor gravel inclusions encountered from surface to 0.2 m bgl; overlying;
- Filling comprising grey mottled silty clay from 0.2 to 1.5 m bgl – Slag and charcoal type gravel material was observed in fill at loactions BH2, BH5, BH7 and BH9; overlying
- Silty clay encountered at depths from 0.9 to 2.0 m bgl; and overlying
- Weathered sandstone or shale encountered at depths from 0.9 to 2.0 m bgl.

With the exception of BH1 and BH5 anthropogenic material including crushed bricks, ceramics and concrete were variously encountered in fill at all locations.

No free groundwater was observed in the bores during drilling for the short time that they were left open.

6.5 Laboratory Analytical Results

The analytical results for the soil samples collected during this PSI are summarised in Table H1 in Appendix H, together with the adopted SAC. The laboratory certificate of analysis for this PSI is provided in Appendix I.

6.5.1 TRH and BTEX

F2 compounds (TRH C_{16} - C_{34} – BTEX) were detected at concentrations exceeding ecological investigation level (120 mg/kg) in the shallow fill soil sample BH5/0.5 (150 mg/kg)

TRH C_{16} - C_{34} compounds were detected at concentrations exceeding ecological investigation levels (300 mg/kg) in the shallow fill soil samples BH2/0.5 (1200 mg/kg), BH5/0.2 (2400 mg/kg), BH6/0.2 (360 mg/kg) and BH9/0.2 (1100 mg/kg).

TRH and BTEX were not detected at concentrations exceeding SAC in remaining soil samples analysed.

6.5.2 PAHs

Benzo(a)pyrene (BaP) was detected at concentrations in excess of environmental investigation levels (0.7 mg/kg) in shallow fill soil samples BH2/0.5 (22 mg/kg), BH5/0.2 (37 mg/kg), BH6/0.2 (5.1 mg/kg), BH7/0.2 (1.6 mg/kg).

BaP toxic equivalent (TEQ) contaminants were detected at concentrations exceeding residential health investigation levels (3 mg/kg) in shallow fill soil samples BH2/0.5 (33 mg/kg), BH5/0.2 (57 mg/kg) and BH6/0.2 (7.8 mg/kg).

Total PAHs were detected at concentrations exceeding the residential health investigation level (300 mg/kg) in the shallow fill soil sample BH5/0.2 (550 mg/kg).

PAHs were not detected at concentrations exceeding SAC in remaining soil samples analysed.

6.5.3 Heavy Metals

Lead was detected at concentration in excess of residential health investigation levels (300 mg/kg) in the shallow fill soil sample BH6/0.2 (650 mg/kg).

Zinc was detected at concentration in excess of environmental investigation levels (760 mg/kg) in the shallow fill soil sample BH9/0.2 (2100 mg/kg).

Heavy metals were not detected at concentrations exceeding SAC in remaining soil samples analysed.

6.5.4 Phenols

Phenols were not detected at concentrations exceeding SAC in all soil samples analysed.

6.5.5 OCPs, OPPs and PCBs

OCPs, OPPs and PCBs were not detected at concentrations exceeding SAC in all soil samples analysed.

6.5.6 Asbestos

Asbestos was not detected in all soil samples analysed.

Materials suspected of containing asbestos was not observed on sites surface soils or in fill at any of the sampling locations (despite being noted previously by other investigators and site users refer Sections 4.1 and 5.1, above).

6.5.7 QAQC

A review of the adopted QA/QC procedures and results (Appendix J) indicates that the data quality indicators (DQIs) have generally been met. On this basis, the sampling and laboratory methods used during the investigation were found to meet the DQO for this project (as discussed in Appendix F).

7. Discussion

7.1 TRH, PAH and lead Soil Impact

COPC including TRH in the form of longer chain compounds (TRH $C_{10} – C_{16}$ and TRH C_{16} - C_{34}), PAHs (BaP and BaP TEQ compounds) and lead were detected at concentrations exceeding SAC in the shallow fill samples (0.2 to 0.5 mbgl) collected at locations BH2, BH5, BH6 and BH7. Given that concentrations of COPC at locations BH2, BH5 and BH6 generally exceeded 250% of the adopted SAC's (particularly BaP in excess of HILs) these areas represent contamination hotspots. Soils in the vicinity of these locations therefore require remediation and/or risk assessment for the site to be considered suitable for the proposed building upgrades and ongoing use of the site as primary/pre-school. Further investigation would be required to define the lateral and vertical extent of impact to soils requiring remediation and/or risk assessment. It is noted that dark slag like material was observed in fill at locations BH2 and BH5 and flecks of dark charcoal type material observed in fill at BH7. Given the contaminants identified (longer chain TRH, PAHs and lead) there is potential that hotspot contamination may be associated with slag and charcoal deposits within the fill. Slag and charcoal type material are often associated with industrial blast furnace activities.

Given the random spatial distribution of the identified hotspots and the preliminary/limited nature of sampling the presence of other hotspots across the site cannot be ruled out. Further investigation, likely in the form of systematic sampling of fill across the site, is also required to determine the presence or absence of additional contamination hotspots.

Remediation of soils may not be warranted at locations BH7 given that concentration of BaP at this location exceeds EIL only and the area is generally sealed with a soft-fall safety surface material limiting ecological exposure to soils in this area.

7.2 TRH and Zinc Soil Impact at BH9

TRH C_{16} - C_{34} and zinc was detected at concentrations (>250%) exceeding the EIL only in the shallow soil sample collected at location BH9 in an unsealed area in the central eastern portion of the site. The area will require further investigation to determine whether the TRH and zinc concentrations are anomalous/isolated or indicative of widespread impact to shallow soils in the central eastern portion of the site. Further investigation of TRH and zinc can be completed at the time of additional hotspot investigation across the site. In the event widespread impact is identified, and the area is to remain unsealed, the soils in the area will require remediation and/or risk assessment for the site to be considered suitable for the ongoing use of the site as a primary school.

7.3 Asbestos Soil Impact

Bonded ACM was identified by previous investigations on surface soils across the northern portions of the site. Whilst the PB AMP described that observable fragments across the northern portion of the site had been removed the mostly sealed area is now subject to the AMP. Any work in the northern portion of the site, as described in the AMP, where there is potential for ground disturbance must be completed with reference to the procedures in the AMP and in accordance with the relevant legislation, regulations and guidance documents including:

- NSW *Work Health and Safety Act 2011*;
- NSW *Work Health and Safety Regulation 2017*;

- The Safe Work Australia (SWA) *Code of Practice: How to Manage and Control Asbestos in the Workplace, 2016; and*
- The SWA *Code of Practice: How to Safely Remove Asbestos, 2016.*

Whilst field observations and laboratory analysis of soil samples collected from shallow fill soils across the site did not identify asbestos, the presence of asbestos impacted soils across the remainder of the site cannot be ruled out given:

- The preliminary and limited nature of the PSI sampling;
- Historical aerial photographs suggest demolition of former buildings and sheds across the entire site;
- Anecdotal information suggests bonded ACM fragments may also be present in other portions of the site, particularly beneath current buildings; and
- Site inspection of several interior walls and ceilings of the school buildings indicated construction of FCS materials suspected of containing asbestos.

Accordingly further investigation across the site is required to provide greater certainty regarding the presence or absence of asbestos in site soils (particularly the remainder of the site not subject to the AMP) in order for the site to be considered suitable for the proposed upgrades and ongoing use as a primary school.

8. Conclusions and Recommendations

The results of site walkover and desktop investigation identified the following AEC that had the potential for contamination of near surface soils and/or filling at the site:

- AEC1: Presence of former buildings and sheds (Hazardous building materials);
- AEC2: Presence of filling;
- AEC3: Presence of former and current sheds (potential chemical storage);
- AEC4: Presence of a power pole; and
- AEC5: Presence of a former road/laneway.

Targeted sampling was undertaken at 10 locations across the site within identified AEC in the vicinity of former/current site structures, areas of filling, the former road/laneway and a power pole onsite. The results of site inspection and soil sampling identified the following that will require remediation and/or risk assessment or further investigation for the site to be considered suitable for the proposed upgrading works and ongoing use as a primary/pre-school:

- TRH, PAH and lead impact was variously identified in shallow fill soils at two locations in the north western portion of the site and one location in the south eastern portion of the site. Fill at these locations requires remediation and/or risk assessment. Given the identification of slag and charcoal type material within fill at these locations contamination of the fill is potentially associated with historic sourcing of fill from an industrial site with blast furnace activities. Further investigation of fill soils across the site is also required to determine the presence or absence of additional contamination hotspots;

- TRH and zinc impact to shallow soils in the central eastern portion of the site requires further investigation; and
- Potential for ACM impact to shallow soils across the site. Whilst ACM was not identified in the PSI sampling, given the preliminary nature of the PSI; the demolition of numerous structures; and importation of filling, the presence of asbestos impacted soils at the site cannot be ruled out and requires further investigation.

With respect to site contamination the recommended further assessment should build on the information provided in this report with reference to National Environment Protection Council (NEPC, 1999) National Environment Protection Council (Assessment of Site Contamination) Measure 1999 (amended 2013) (NEPC, 2013). Further assessment should include intrusive investigations, sampling, analysis and assessment to determine land use suitability.

A hazardous building materials assessment was also completed by DP at the time of the PSI and Preliminary Geotechnical Investigation to identify potential hazardous materials within the buildings so that protective measures can be implemented, if required, during redevelopment/upgrading works.

9. References

1. Department of Infrastructure Planning and Natural Resources (DIPNR, 2002) '*Salinity Potential in Western Sydney*' map.
2. Parson Brinkerhoff. Asbestos in Grounds, Asbestos Management Plan, Darlington Public School, Darlington NSW, (Project reference 1735_ASB_150514_AMP).
3. Nearmap website, https://go.nearmap.com/
4. NSW Department of Planning and Environment - Resources and Energy, Geological Survey of NSW 1:100 000 Sydney Geological Series Sheet 9030.
5. NSW Department of Primary Industries Office of Water website http://allwaterdata.water.nsw.gov.au/water.stm
6. NSW Government Office of Environment and Heritage Acid Sulphate Soils Risk Maps

10. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for this project at Darlington Public School, 417 Abercrombie Street, Darlington NSW in accordance with DP's proposal MAC180016.P.001.Rev1 dated 13 March 2018 and acceptance received from Michael Cashell dated 16 March 2018. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Billard Leece Partnership Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

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

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

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

Douglas Partners Pty Ltd

Appendix A

Drawings 1 to 11

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd		
OFFICE: Macarthur	DRAWN GAR	
SCALE: 1:602	DATE: 16.03.2018	

TITLE: **Site Locality Map**
Preliminary Site Investigation
417 Abercrombie Street, Darlington NSW

N

PROJECT No:	92277.00
DRAWING No:	1
REVISION:	A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd	
OFFICE: Macarthur	DRAWN BY: GAR
SCALE: 1:700	DATE: 16.03.2018

TITLE: **Site Features Map**
Preliminary Site Investigation
417 Abercrombie Street, Darlington NSW

N

PROJECT No: 92277.00
DRAWING No: 2
REVISION: A

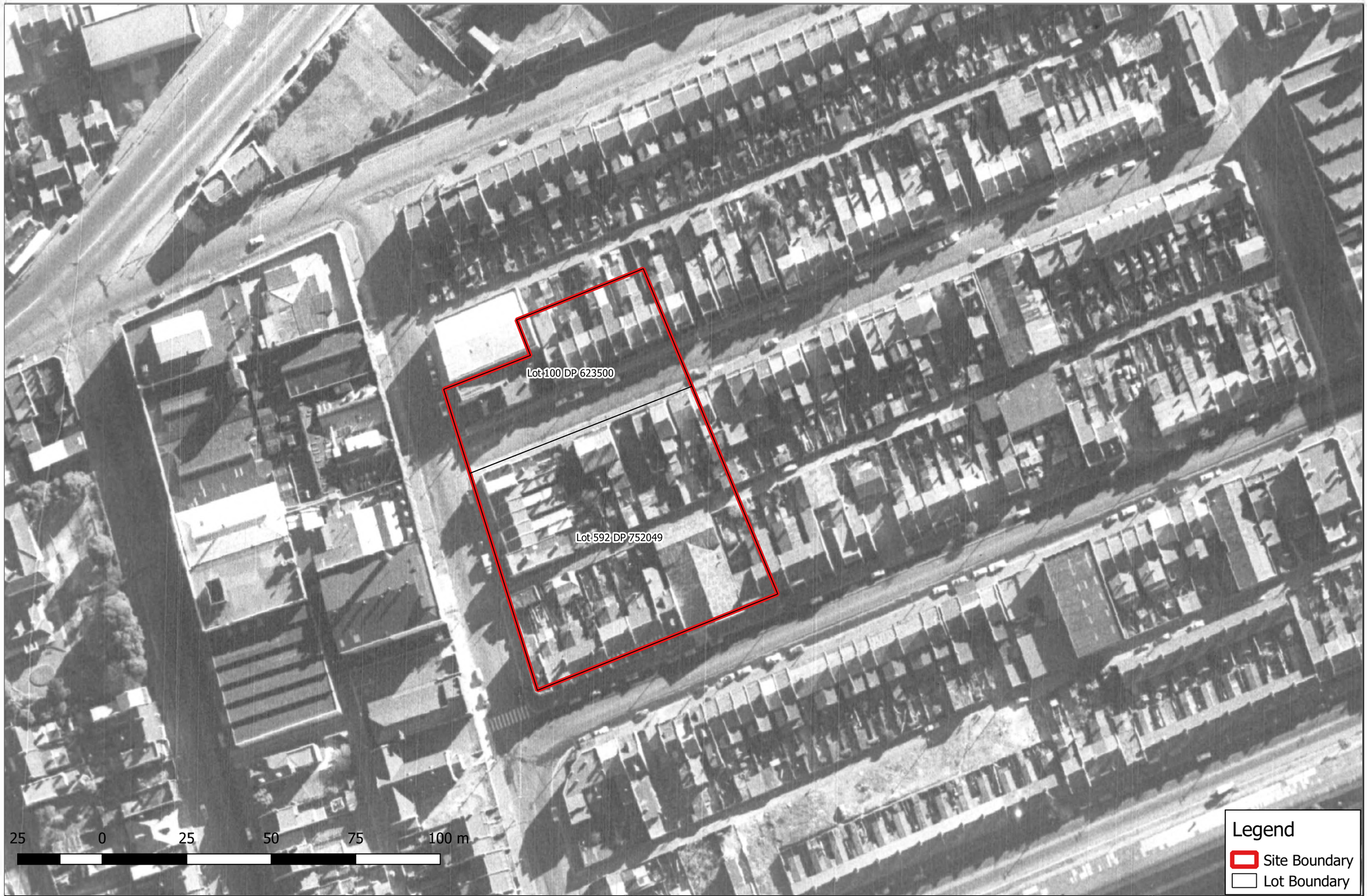
Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd	
OFFICE: Macarthur	DRAWN BY: GAR
SCALE: 1:1,034	DATE: 16.03.2018

TITLE: **Historical Aerial - 1955**
Preliminary Site Investigation
417 Abercrombie Street, Darlington NSW

N

PROJECT No: 92277.00
DRAWING No: 3
REVISION: A



Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd		TITLE: **Historical Aerial - 1961** **Preliminary Site Investigation** **417 Abercrombie Street, Darlington NSW**
OFFICE: Macarthur	DRAWN BY: GAR	
SCALE: 1:1,034	DATE: 16.03.2018	

N

PROJECT No: 92277.00
DRAWING No: 4
REVISION: A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd	
OFFICE: Macarthur	DRAWN BY: GAR
SCALE: 1:1,034	DATE: 16.03.2018

TITLE: **Historical Aerial - 1975**
Preliminary Site Investigation
417 Abercrombie Street, Darlington NSW

N

PROJECT No:	92277.00
DRAWING No:	5
REVISION:	A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd		TITLE: **Historical Aerial - 1986** **Preliminary Site Investigation** **417 Abercrombie Street, Darlington NSW**
OFFICE: Macarthur	DRAWN BY: GAR	
SCALE: 1:1,034	DATE: 16.03.2018	

N

PROJECT No: 92277.00
DRAWING No: 6
REVISION: A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd	
OFFICE: Macarthur	DRAWN BY: GAR
SCALE: 1:1,034	DATE: 16.03.2018

TITLE: **Historical Aerial - 1991**
Preliminary Site Investigation
417 Abercrombie Street, Darlington NSW

N

PROJECT No: 92277.00
DRAWING No: 7
REVISION: A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd	
OFFICE: Macarthur	DRAWN BY: GAR
SCALE: 1:1,034	DATE: 16.03.2018

TITLE: **Historical Aerial - 2000**
Preliminary Site Investigation
417 Abercrombie Street, Darlington NSW

N

PROJECT No: 92277.00
DRAWING No: 8
REVISION: A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd	
OFFICE: Macarthur	DRAWN BY: GAR
SCALE: 1:517	DATE: 16.03.2018

TITLE: **Historical Aerial - 2009**
Preliminary Site Investigation
417 Abercrombie Street, Darlington NSW

N

PROJECT No:	92277.00
DRAWING No:	9
REVISION:	A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd	
OFFICE: Macarthur	DRAWN BY: GAR
SCALE: 1:602	DATE: 16.03.2018

TITLE: **Historical Aerial - 2018**
Preliminary Site Investigation
417 Abercrombie Street, Darlington NSW

N

PROJECT No:	92277.00
DRAWING No:	10
REVISION:	A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Billard Leece Partnership Pty Ltd	
OFFICE: Macarthur	DRAWN BY: GAR
SCALE: 1:517	DATE: 16.03.2018

TITLE: **Sample Location Map**
Preliminary Site Investigation
417 Abercrombie Street, Darlington NSW

N

PROJECT No:	92277.00
DRAWING No:	11
REVISION:	A

Appendix B

Photographic Plates

Photograph 1 - South facing school building in south western portion of site with Abercrombie Street in foreground

Photograph 2 - Court yard area in southern portion of site

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT: 92277.00
	Preliminary Site Investigation	PLATE No: 1
	417 Abercrombie Street, Darlington NSW	REV: 0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: 16-Apr-18

Photograph 3 - Central portion of site

Photograph 4 - Basketball court area in northern portion of site

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Preliminary Site Investigation** **417 Abercrombie Street, Darlington NSW**	PROJECT: 92277.00 PLATE No: 2 REV: 0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: 16-Apr-18

Photograph 5 - Unsealed garden bed adjacent to sites eastern boundary

Photograph 6 - Far northern portion of site . Elevated area with rubber safety seal material covering majority of area.

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Preliminary Site Investigation** **417 Abercrombie Street, Darlington NSW**	PROJECT: 92277.00 PLATE No: 3 REV: 0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: 16-Apr-18

Photograph 7 - Central northern portion of site

Photograph 8 - Central southern portion of site

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Preliminary Site Investigation** **417 Abercrombie Street, Darlington NSW**	PROJECT: 92277.00 PLATE No: 4 REV: 0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: 16-Apr-18

Photograph 9 - Playground area in central western portion of site with classroom building beyond

Photograph 10 - Golden Grove Street with Church and residential properties beyond to the west of site

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs**	PROJECT: 92277.00
	Preliminary Site Investigation	PLATE No: 5
	417 Abercrombie Street, Darlington NSW	REV: 0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: 16-Apr-18

Photograph 10 - Building used by Sydney University to the immediate northwest of site

Photograph 11 - Abercrombie Street to the south of site with residential properties beyond

Douglas Partners Geotechnics / Environment / Groundwater	**Site Photographs** **Preliminary Site Investigation** **417 Abercrombie Street, Darlington NSW**	PROJECT: 92277.00 PLATE No: 6 REV: 0
	CLIENT: Billard Leece Partnership Pty Ltd	DATE: 16-Apr-18

Appendix C

NSW Office of Water Bore Search

Department of Primary Industries
Office of Water

Home | About us | Water Management | Water Licensing | Urban Water | Real-time data

close this window

home · help · login · contact · customise

All Groundwater
find a site

- All Groundwater Map
  - North Coast Region
  - Hunter Region
  - Greater Sydney Region
    - **Hawkesbury Riv...**
    - Georges River Basin
    - Wollongong Basin
  - South Coast Region
  - Northwest Region
  - Central West Region
  - Southwest Region
  - Far West Region
  - Great Artesian Basin
  - Coal Basins

bandwidth ◉ high ○ low

glossary and metadata

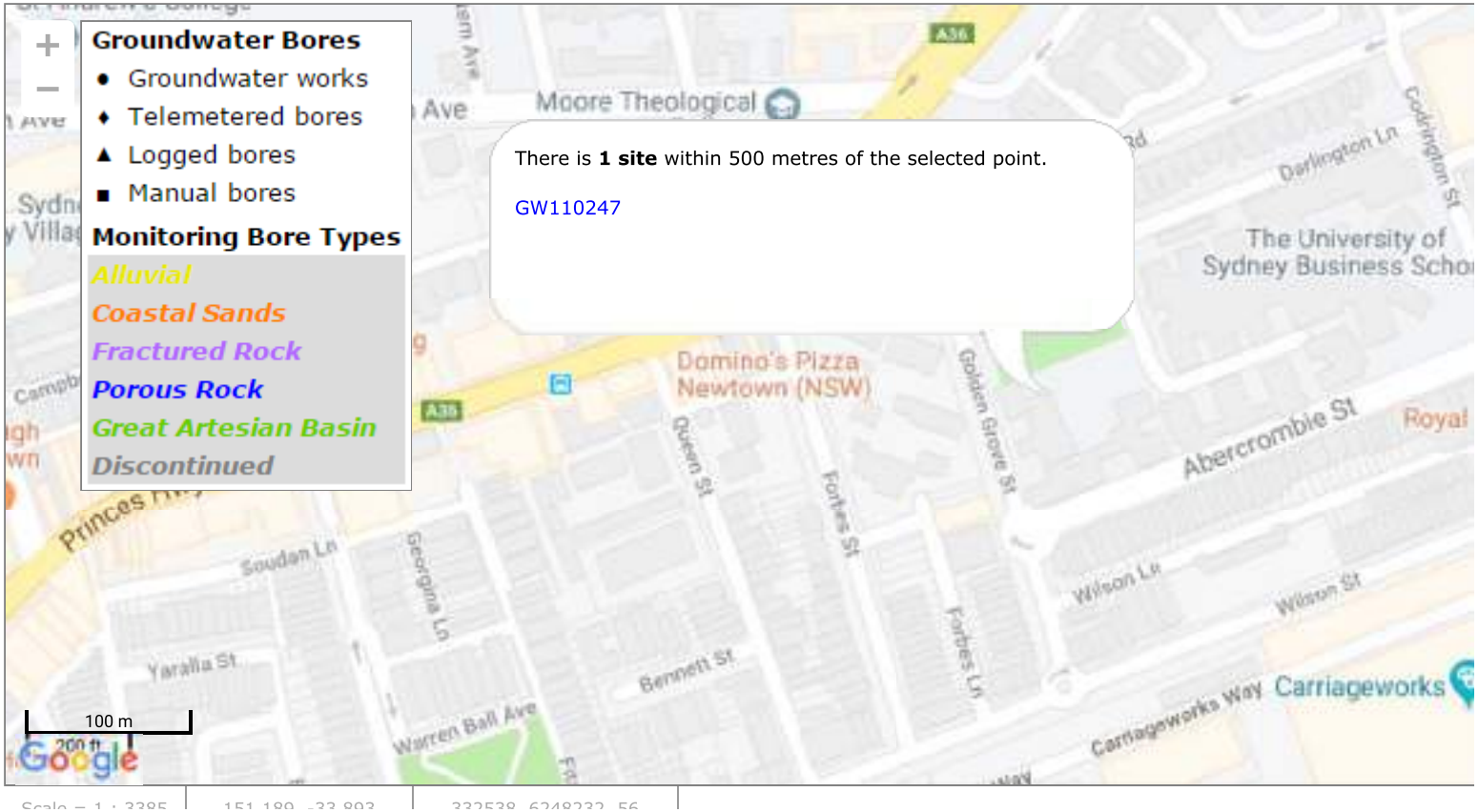
All Groundwater » All Groundwater Map » Greater Sydney Region

Hawkesbury River Basin

bookmark this page

All data times are Eastern Standard Time

Map



NSW Office of Water
Work Summary

GW110247

Licence: 10BL603148 **Licence Status:** CONVERTED

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

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date: **Final Depth:** 210.00 m
Completion Date: 16/07/2009 **Drilled Depth:** 210.00 m

Contractor Name: INTERTEC DRILLING SERVICES
Driller: William Crump
Assistant Driller:

Property: MOORE THEOLOGICAL COLLEGE CL 21 KING ST NEWTOWN 2042 NSW **Standing Water Level:** 31.000
GWMA: **Salinity:**
GW Zone: **Yield:** 0.130

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.39	28//939363
Licensed:			

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6248363.0 **Latitude:** 33°53'30.4"S
Elevation Source: Unknown **Easting:** 332357.0 **Longitude:** 151°11'13.4"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** Unknown

Construction

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

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	2.50	204			Rotary Air
1		Hole	Hole	2.50	108.00	162			Down Hole Hammer
1		Hole	Hole	108.00	210.00	156			Down Hole Hammer
1	1	Casing	Pvc Class 9	-0.30	41.70	140			Suspended in Clamps, Screwed and Glued
1	1	Casing	Steel	-0.30	5.70	156			Suspended in Clamps, Driven into Hole

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
22.00	23.00	1.00	Unknown			0.05			3750.00
74.00	76.00	2.00	Unknown			0.10			3300.00
188.00	188.50	0.50	Unknown	31.00		0.13			4400.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.00	2.00	CLAY BROWN	Clay Loam	
2.00	4.50	2.50	CLAY GREY	Clay Loam	
4.50	22.00	17.50	SHALE GREY	Shale	
22.00	23.00	1.00	SHALE SOFT	Shale	
23.00	33.00	10.00	SHALE HARD	Shale	
33.00	74.00	41.00	SANDSTONE GREY	Sandstone	
74.00	76.00	2.00	SANDSTONE AND QUARTZ FINE	Sandstone	
76.00	134.00	58.00	SANDSTONE GREY	Sandstone	
134.00	135.50	1.50	SANDSTONE QUARTZ FINE	Sandstone	
135.50	153.50	18.00	SANDSTONE GREY	Sandstone	
153.50	154.00	0.50	SANDSTONE QUARTZ FINE	Sandstone	
154.00	168.00	14.00	SANDSTONE GREY	Sandstone	
168.00	170.00	2.00	SANDSTONE SHALE BEDDING	Sandstone	
170.00	188.00	18.00	SANDSTONE GREY	Sandstone	
188.00	188.50	0.50	SANDSTONE QUARTZ	Sandstone	
188.50	210.00	21.50	SANDSTONE GREY	Sandstone	

Remarks

***** End of GW110247 *****

Appendix D

NSW EPA Searches

Search results

Your search for:Suburb: DARLINGTON

Search Again
Refine Search

did not find any records in our database.

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

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

Search TIP

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

... more search tips

More information about particular sites may be available from:

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

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

If you want to know whether a specific site has been the subject of notices issued by the EPA under the CLM Act, we suggest that you search by Local Government Area only and carefully review the sites that are listed.
This public record provides information about sites regulated by the EPA under the Contaminated Land Management Act 1997, including sites currently and previously regulated under the Environmentally Hazardous Chemicals Act 1985. Your inquiry using the above

search criteria has not matched any record of current or former regulation. You should consider searching again using different criteria. The fact that a site does not appear on the record does not necessarily mean that it is not affected by contamination. The site may have been notified to the EPA but not yet assessed, or contamination may be present but the site is not yet being regulated by the EPA. Further information about particular sites may be available from the appropriate planning authority, for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act. In addition the EPA may be regulating contamination at the site through a licence under the Protection of the Environment Operations Act 1997. You may wish to search the POEO public register.POEO public register

For

1 March 2018

business and industry ()

For local government ()

Contact us

131 555 (tel:131555)

Online (http://www.epa.nsw.gov.au/about-us/contact-us/feedback/feedback-form)

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

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

Accessibility (http://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/help-index)
Disclaimer (http://www.epa.nsw.gov.au/about-us/contact-us/website-service-standards/disclaimer)

Find us on (https://www.linkedin.com/company/nsw-epa) (https://www.youtube.com)

Licence summary

Search Again Return to Previous Page

Summary Licence No: 11472

View this licence (PDF document 200 kb)

Licence holder: **INTEC LTD**
Premises: INTEC LTD
Room 427, Building J01, Maze Crescent, the University of Sydney, DARLINGTON, NSW, 2008
LGA: SYDNEY **Catchment:** Sydney Coast & Georges River
Administrative fee: $760.00
Licence status: No_longer_in_force
Activity type: Hazardous, Industrial or Group A Waste Generation or Storage
Licence review: Complete date 07 Jun 2004
Due date 07 Jun 2009
Pollution incident management plan: No

Notices

Number	Issue date	Notice type
1037711	07 Jun 2004	s.58 Licence Variation

Annual Returns

Start date	End date	Date received	Non-compliance	LBL data
18-Jul-2006	17-Jul-2007	10-Sep-2007	No	Not available
18-Jul-2005	17-Jul-2006	06-Sep-2006	No	Not available
18-Jul-2004	17-Jul-2005	12-Sep-2005	No	Not available
18-Jul-2003	17-Jul-2004	03-Sep-2004	No	Not available
18-Jul-2002	17-Jul-2003	09-Sep-2003	No	Not available
18-Jul-2001	17-Jul-2002	10-Sep-2002	No	Not available

Notice summary

Search Again Return to Previous Page

Summary of Notice No: 1037711

View report (PDF document 943 kb)

Organisation: INTEC LTD
Location: INTEC LTD
Room 427, Building J01, Maze Crescent, the University of Sydney, DARLINGTON, NSW, 2008
LGA: SYDNEY
Catchment: Sydney Coast & Georges River
Issue date: 07 Jun 2004
Notice type: s.58 Licence Variation

Licence

Number	Name	Licence status
11472	INTEC LTD	No longer in force

Licence summary

Search Again Return to Previous Page

Summary Licence No: 20362

View this licence (PDF document 152 kb)

Licence holder: JOHN HOLLAND PTY LTD
Premises: University of Sydney Darlington Campus
Corner Codrington and Abercrombie Streets, DARLINGTON, NSW, 2008
LGA: SYDNEY **Catchment:** Sydney Coast & Georges River
Administrative fee: $1,830.00
Licence status: Surrendered
Activity type: Land-based extractive activity
Licence review: Due date 20 Jan 2019
Pollution incident management plan: Last tested 05 Sep 2014

Applications

Number	Application type	Current status	Date received
1526943	s.80 Surrender of a Licence	Issued	05 Dec 2014

Notices

Number	Issue date	Notice type
1526943	08 Jan 2015	s.80 Surrender of a Licence

Annual Returns

Start date	End date	Date received	Non-compliance	LBL data
20-Jan-2014	08-Jan-2015	06-Mar-2015	yes	Not available

Search results

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

Suburb - DARLINGTON

returned 3 results

Export to excel 1 of 1 Pages Search Again

Number	Name	Location	Type	Status	Issued date
11472	INTEC LTD	Room 427, Building J01, Maze Crescent, the University of Sydney, DARLINGTON, NSW 2008	POEO licence	No longer in force	17 Jul 2001
1037711	INTEC LTD	Room 427, Building J01, Maze Crescent, the University of Sydney, DARLINGTON, NSW 2008	s.58 Licence Variation	Issued	07 Jun 2004
20362	JOHN HOLLAND PTY LTD	Corner Codrington and Abercrombie Streets, DARLINGTON, NSW 2008	POEO licence	Surrendered	20 Jan 2014

27 February 2018

Suburb	Site Name	Site Address	Contamination Activity Type	EPA Management Class	Latitude	Longitude
CREMORNE	Shell Coles Express Service Station	225 Military ROAD	Service Station	Regulation under CLM Act not required	-33.83063306	151.226223
CRESTWOOD	Former Caltex Depot Queanbeyan	36 Kendall (Cnr Stephens Rd) AVENUE	Other Petroleum	Regulation under CLM Act not required	-35.34615546	149.207807
CRINGILA	Cringila Public School	Sheffield STREET	Landfill	Regulation under CLM Act not required	-34.4719665	150.8695522
CROA	Breen Holdings	Bate Bay ROAD	Other Industry	Regulation under CLM Act not required	-34.03861737	151.1614114
CROWS NEST	Caltex Service Station	111-121 Falcon STREET	Service Station	Regulation under CLM Act not required	-33.82868236	151.2060317
CROYDON	Caltex Service Station	404-410 Liverpool ROAD	Service Station	Regulation under CLM Act not required	-33.88853994	151.115879
CROYDON	BP Ashfield	582-586 Parramatta ROAD	Service Station	Under assessment	-33.87399409	151.1267296
CROYDON PARK	Mobil Service Station	334 Georges River ROAD	Service Station	Regulation under CLM Act not required	-33.89771626	151.0999194
CULCAIRN	Caltex Service Station	2883 Olympic HIGHWAY	Service Station	Regulation under CLM Act not required	-35.67441635	147.0356845
CULLEN BULLEN	Baal Bone Colliery	Castlereagh HIGHWAY	Other Industry	Regulation under CLM Act not required	-33.27193875	150.0587194
CUNDLETOWN	Caltex Service Station (1 Manning River Drive)	Old Pacific HIGHWAY	Service Station	Regulation under CLM Act not required	-31.89329598	152.5068225
CURL CURL	John Fisher Park	Corner Harbord and Abbott ROADS	Landfill	Regulation under CLM Act not required	-33.76352692	151.2798462
DACEYVILLE	Astrolabe Park	Cook AVENUE	Landfill	Regulation being finalised	-33.92963704	151.221773
DAPTO	RailCorp Dapto	(Rear of property) 12-14 Hamilton STREET	Other Industry	Regulation under CLM Act not required	-34.50045405	150.787353
DARLINGHURST	Proposed Retail Unit	139-155 Palmer STREET	Unclassified	Regulation under CLM Act not required	-33.87504688	151.2168106
DARLINGHURST	18-28 Neild Avenue, Darlinghurst	18-28 Neild AVENUE	Landfill	Under assessment	-33.87876581	151.2276546
DARLINGHURST	Cross City Tunnel	Riley Street and William STREET	Service Station	Contamination was addressed via the planning process (EP&A Act)	-33.87424636	151.2158305
DEE WHY	United Dee Why	1 The Strand STREET	Service Station	Under assessment	-33.75569207	151.2959451
DEE WHY	Caltex Service Station	793-797 Pittwater ROAD	Service Station	Regulation under CLM Act not required	-33.74566596	151.2920719
DEE WHY	Roche Products Dee Why Facility	Inman ROAD	Other Industry	Contamination currently regulated under CLM Act	-33.73834964	151.2876392
DEE WHY	Dee Why Town Centre	Pittwater ROAD	Other Industry	Regulation under CLM Act not required	-33.753169	151.2875805
DENHAM COURT	Service Station and Caravan Park Denham Court	505 Campbelltown ROAD	Service Station	Under assessment	-33.98208395	150.8459471
DENILIQUIN	Former Deniliquin Caltex Depot	116-118 Hardinge (Cnr Wood St) STREET	Service Station	Regulation under CLM Act not required	-35.53196985	144.9544597
DENILIQUIN	BP Depot (Reliance Petroleum)	125 - 127 Hardinge STREET	Service Station	Regulation under CLM Act not required	-35.53222124	144.9517397
DENILIQUIN	Former Shell Depot	143-147 Napier STREET	Other Petroleum	Regulation under CLM Act not required	-35.5342355	144.953169

Appendix E

Council of City of Sydney Records and s149 (Parts 2&5) Certificate

City of Sydney
Town Hall House
456 Kent Street
Sydney NSW 2000
Telephone +61 2 9265 9333
Fax +61 2 9265 9222
council@cityofsydney.nsw.gov.au
GPO Box 1591 Sydney NSW 2001
cityofsydney.nsw.gov.au

DOUGLAS PARTNERS PTY LTD
8 WALER CRES
SMEATON GRANGE NSW 2567

PLANNING CERTIFICATE

Under Section 10.7 of the Environmental Planning and Assessment Act, 1979

Applicant:	DOUGLAS PARTNERS PTY LTD
Applicant's reference:	GRANT RUSSELL
Address of property:	417-445 Abercrombie Street , DARLINGTON NSW 2008
Owner:	MINISTER of EDUCATION TRAINING & YOUTH AFFAIRS
Description of land:	Lot 100 DP 623500, Lot 592 DP 752049
Certificate No.:	2018301707
Certificate Date:	19/03/18
Receipt No:	115246
Fee:	$80.00
Paid:	16/03/18

Title information and description of land are provided from data supplied by the Valuer General and shown where available.

Issuing Officer
per **Monica Barone**
Chief Executive Officer

CERTIFICATE ENQUIRIES:
Ph: 9265 9333
Fax: 9265 9415

PLANNING CERTIFICATE UNDER SECTION 10.7 (2) OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

MATTERS AFFECTING THE LAND AS PRESCRIBED BY SCHEDULE 4 - ENVIRONMENTAL PLANNING & ASSESSMENT REGULATION, 2000, CLAUSES (1) - (2).

DEVELOPMENT CONTROLS

The following information must be read in conjunction with and subject to all other provisions of the environmental planning instruments specified in this certificate.

ZONING

Zone SP2 Infrastructure (Sydney Local Environmental Plan 2012)

1 Objectives of zone
• To provide for infrastructure and related uses.
• To prevent development that is not compatible with or that may detract from the provision of infrastructure.

2 Permitted without consent
Nil

3 Permitted with consent
Horticulture; Roads; Water storage facilities; Water treatment facilities; The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose.

4 Prohibited
Any development not specified in item 2 or 3

PROPOSED ZONING

This property is not affected by a draft zone.

LOCAL PLANNING CONTROLS

Sydney Local Environmental Plan 2012 (as amended) – Published 14 December 2012 NSW Legislation Website.

Sydney Development Control Plan 2012 (as amended) - (commenced 14.12.2012)

Planning Proposal: Sydney Local Environmental Plan 2012 – Amendment to Clause 4.6

This Planning Proposal proposes an amendment to Sydney Local Environmental Plan 2012 to allow council to consider and assess development applications for playground equipment; sculptures & artworks; and community notice and public information signs, that may result in minor additional overshadowing to certain parks and public places in Central Sydney.

HERITAGE

State Heritage Register (Amendment To Heritage Act, 1977 Gazetted 2/4/99)
This property may be identified as being of state heritage significance, and entered on the State Heritage Register.

To confirm whether the site is listed under the Heritage Act 1977 a Section 167 Certificate should be obtained from the NSW Heritage Office by contacting the NSW Heritage office on (02) 9873 8500 for an application from or by downloading the application form from www.heritage.nsw.gov.au

STATE PLANNING INSTRUMENTS

Full copies of State Environmental Planning Policies are available online at www.planning.nsw.gov.au.

State Environmental Planning Policy No. 19 – Bushland in Urban Areas
This is a policy to protect and preserve bushland within certain urban areas, as part of the natural heritage or for recreational, educational and scientific purposes. This policy is designed to protect bushland in public open space zones and reservations, and to ensure that bush preservation is given a high priority when local environmental plans for urban development are prepared.

State Environmental Planning Policy No. 32 – Urban Consolidation
This policy implements the principles of urban consolidation, including the orderly, economic use and development of land. The policy enables urban land which is no longer required for the purpose for which it is currently zoned or used to be redeveloped for multi-unit housing and related development.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
This policy aims to amend the definitions of hazardous and offensive industries; to render ineffective any environmental planning instruments not defining hazardous or offensive as per this policy; to control development of hazardous and offensive industries.

State Environmental Planning Policy No. 55 – Remediation of Land
This policy provides planning controls for the remediation of contaminated land. The policy states that land must not be developed if it is unsuitable for a proposed use because it is contaminated. If the land is unsuitable, remediation must take place before the land is developed. The policy makes remediation permissible across the State, defines when consent is required, requires all remediation to comply with standards, ensures land is investigated if contamination is suspected, and requires councils to be notified of all remediation proposals. To assist councils and developers, the Department, in conjunction with the Environment Protection Authority, has prepared Managing Land Contamination: Planning Guidelines.

State Environmental Planning Policy No. 64 – Advertising and Signage
This policy aims to ensure that signage (including advertising):
Is compatible with the desired amenity and visual character of an area, and
- Provides effective communications in suitable locations, and
- Is of a high quality design and finish.

To this end the policy regulates signage (but not content) under Part 4 of the Act and provides limited time consents for the display of certain advertisements. The policy does not apply to signage that is exempt development under an environmental planning instrument. It does apply to all signage that can be displayed with or without consent and is visible from any public place or reserve, except as provided by the policy.

This policy should be read in conjunction with the Sydney Local Environmental Plan 2005, the City of Sydney Signage and Advertising Structures Development Control Plan 2005 and State Environmental Planning Policy No. 60 where these apply.

State Environmental Planning Policy No. 65 – Design Quality of Residential Flat Buildings
This policy aims to improve the design quality of flats of three or more storeys with four or more self contained dwellings. The policy sets out a series of design principles for local councils to consider when assessing development proposals for residential flat development. The policy also creates a role for an independent design review panel and requires the involvement of a qualified designer in the design and approval process.

State Environmental Planning Policy No.70 – Affordable Housing (Revised Schemes) (Gazetted 31.05.02)
The policy identifies that there is a need for affordable housing in the City of Sydney, describes the kinds of households for which affordable housing may be provided and makes a requirement with respect to the imposition of conditions relating to the provision of affordable housing (provided other requirements under the Act are met).

State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004
This Policy does not apply to land described in Schedule 1 (Environmentally sensitive land), or land that is zoned for industrial purposes, or land to which an interim heritage order made under the *Heritage Act 1997* by the Minister administering that Act applies, or land to which a listing on the State Heritage Register kept under the *Heritage Act 1997* applies.

The Policy aims to encourage the provision of housing (including residential care facilities) that will increase the supply and diversity of residences that meet the needs of seniors or people with a disability, and make efficient use of existing infrastructure and services, and be of good design.

State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004
Aims to ensure consistency in the implementation of the BASIX scheme throughout the State. This Policy achieves its aim by overriding provisions of other environmental planning instruments and development control plans that would otherwise add to, subtract from or modify any obligations arising under the BASIX scheme.

State Environmental Planning Policy (State Significant Precincts) 2005
This Policy aims to identify development of economic, social or environmental significance to the State or regions of the State so as to provide a consistent and comprehensive assessment and decision making process for that development.
NB: This SEPP also contains exempt & complying provisions

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
This Policy aims to provide for the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of the State.

State Environmental Planning Policy (Temporary Structures and Places of Public Entertainment) 2007

This Policy aims to ensure that suitable provision is made for ensuring the safety of persons using temporary structures or places of public entertainment.

State Environmental Planning Policy (Infrastructure) 2007
This Policy aims to facilitate the effective delivery of infrastructure across the state.
NB: This SEPP also contains exempt & complying provisions

State Environmental Planning Policy (Repeal of Concurrence and Referral Provisions) 2008
This Policy is an 'amending instrument' that removes or modifies referral and concurrence clauses within local environmental plans (LEPs), regional environmental plans (REPs) and State environmental planning policies (SEPPs).

State Environmental Planning Policy (Exempt and Complying Development Codes) 2008
This Policy Streamlines assessment processes for development that complies with specified development standards. The policy provides exempt and complying development codes that have State-wide application, identifying, in the General Exempt Development Code, types of development that are of minimal environmental impact that may be carried out without the need for development consent; and, in the General Housing Code, types of complying development that may be carried out in accordance with a complying development certificate as defined in the Environmental Planning and Assessment Act 1979.

State Environmental Planning Policy (Affordable Rental Housing) 2009
Establishes a consistent planning regime for the provision of affordable rental housing. The policy provides incentives for new affordable rental housing, facilitates the retention of existing affordable rentals, and expands the role of not-for-profit providers. It also aims to support local centres by providing housing for workers close to places of work, and facilitate development of housing for the homeless and other disadvantaged people. NOTE: Does not apply to land at Green Square or at Ultimo Pyrmont, or on southern employment land.

State Environmental Planning Policy (Urban Renewal) 2010
The aims of this Policy are as follows:
(a) to establish the process for assessing and identifying sites as urban renewal precincts,
(b) to facilitate the orderly and economic development and redevelopment of sites in and around urban renewal precincts,
(c) to facilitate delivery of the objectives of any applicable government State, regional or metropolitan strategies connected with the renewal of urban areas that are accessible by public transport.

State Environmental Planning Policy (State and Regional Development) 2011
The aims of this Policy are as follows:
(a) to identify development that is State significant development,
(b) to identify development that is State significant infrastructure and critical State significant infrastructure,
(c) to confer functions on joint regional planning panels to determine development applications.

State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017
The aims of this Policy are:
(a) to protect the biodiversity values of trees and other vegetation in non-rural areas of the State, and
(b) to preserve the amenity of non-rural areas of the State through the preservation of trees and other vegetation.

State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017
The aim of this Policy is to facilitate the effective delivery of educational establishments and early education and care facilities across the state.

Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005
This plan applies to land within the Sydney Harbour Catchment, as shown edged heavy black on the Sydney Harbour Catchment Map, being part of the Sydney Region declared by order published in Gazette No 38 of 7 April 1989 at page 1841.

This plan has the following aims with respect to the Sydney Harbour Catchment:
to ensure that the catchment, foreshores, waterways and islands of Sydney Harbour are recognised, protected and maintained: as outstanding natural asset, and as a public asset of national and heritage significance, for existing and future generations; to ensure a healthy, sustainable environment on land and water; to achieve a high quality urban environment; to ensure a prosperous working waterfront and an effective transport corridor, to encourage a culturally rich and vibrant place for people; to ensure accessibility to and along Sydney Harbour and its foreshores; to ensure the protection, maintenance and rehabilitation of watercourses, wetlands, riparian lands, remnant vegetation and ecological connectivity, to provide a consolidated, simplified and updated legislative framework for future planning.

OTHER MATTERS AFFECTING THE LAND AS PRESCRIBED BY SCHEDULE 4 - E. P. & A. REGULATION, 2000. CLAUSES (3) - (10)

(3) Complying Development

(1) The extent to which the land is land on which complying development may be carried out under each of the codes for complying development because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4),1.18(1)(c3) and 1.19 of *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*.

(2) The extent to which complying development may not be carried out on that land because of the provisions of clauses 1.17A (1) (c) to (e), (2), (3) and (4),1.18(1)(c3) and 1.19 of that Policy and the reasons why it may not be carried out under those clauses.

(3) If the council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land, a statement that a restriction applies to the land, but it may not apply to all of the land, and that council does not have sufficient information to ascertain the extent to which complying development may or may not be carried out on the land.

Note: All Exempt and Complying Development Codes: Council does not have sufficient information to ascertain the extent of a land based exclusion on a property. Despite any statement preventing the carrying out of complying development in the Codes listed below, complying development may still be carried out providing the development is not on the land affected by the exclusion and meets the requirements and standards of *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*.

General Housing Code & Commercial and Industrial (New Buildings and Additions) Code

Complying development **may not** be carried out on the land under the General Housing Code & the Commercial and Industrial (New Buildings and Additions) Code if because of the provisions of clause 1.17A, 1.18(1)(c3) & 1.19 (Land-based requirements for exempt and complying development) any of the following statements are **YES**

▪ Clause 1.19(5)d. Land that is significantly contaminated land within the meaning of the Contaminated Land Management Act 1997. (Applies only to the Commercial and Industrial (New Buildings and Additions) Code.	NO
▪ Clause 1.17A(d). Has been identified as a property that comprises, or on which there is, an item that is listed on the State Heritage Register under the *Heritage Act 1977* or that is subject to an interim heritage order under the *Heritage Act 1977*.	NO
▪ Clause 1.17A(d) & 1.18(1)(c3). Has been identified as a property that comprises, or on which there is, a heritage item or draft heritage item.	**NO**
▪ Clause 1.17A(c). Has been identified as being within a wilderness area (identified under the *Wilderness Act 1987*.	**NO**
▪ Clause 1.17A(e) & 1.19(1)e or 1.19(5)f. Has been identified as land that is within an environmentally sensitive area or by an environmental planning instrument as being within a buffer area, a river front area, an ecologically sensitive area, environmentally sensitive land or a protected area	**NO**
▪ Clause 1.19(1)a.or 1.19(5)a Has been identified as being within a heritage conservation area or a draft heritage conservation area.	**NO**
▪ Clause 1.19(1)b or 1.19(5)b. Has been identified as being land that is reserved for a public purpose in an environmental planning instrument.	**NO**
▪ Clause 1.19(1)c or 1.19(5)c. Has been identified as being on an Acid Sulfate Soils Map as being Class 1 or Class 2.	**NO**
▪ Clause 1.19(1)d or 1.19(5)e. Has been identified as land that is subject to a biobanking agreement under part 7A of the threatened Species Conservation Act 1995 or a property vegetation plan under the Native Vegetation Act 2003.	**NO**
▪ Clause 1.19(1)f or 1.19(5)g. Has been identified by an environmental planning instrument, a development control plan or a policy adopted by the Council as being or affected by a coastline hazard, a coastal hazard or a coastal erosion hazard.	**NO**
▪ Clause 1.19(1)g or 1.19(5)h. Has been identified as being land in a foreshore area.	**NO**
▪ Clause 1.19(1)h. Has been identified as land that is in the 25 ANEF contour or a higher ANEF contour. (Applies only to the General Housing Code)	**NO**
▪ Clause 1.19(1)j or 1.19(5)i. Has been identified as unsewered land within a drinking water catchment.	**NO**
▪ Clause 1.19(1)i. Has been identified as land that is declared to be a special area under the Sydney Water Catchment Management Act 1998.	**NO**

Housing Alterations Code
Complying development under the Housing Alterations Code **may** be carried out on the land.

Commercial and Industrial Alterations Code
Complying development under the Commercial and Industrial Alterations Code **may** be carried out on the land.

Subdivisions Code
Complying development under the Subdivisions Code **may** be carried out on the land.

Rural Housing Code
The Rural Housing Code does not apply to this Local Government Area.

General Development Code
Complying development under the General Development Code **may** be carried out on the land.

Demolition Code
Complying development under the Demolition Code **may** be carried out on the land.

(4) Coastal Protection Act, 1979

The council has not been notified by the department of public works that the land is affected by the operation of section 38 or 39 of the coastal protection act, 1979.

(4A) Certain information relating to beaches and coasts

(1) In relation to a coastal council an order has **not** been made under Part 4D of the coastal Protection Act 1979 in relation to temporary coastal protection works (within the meaning of that Act) on the land (or on public land adjacent to that land).

(2) In relation to a coastal council : Council has **not** been notified under section 55X of the Coastal Protection Act 1979 that temporary coastal protection works (within the meaning of that Act) have been placed on the land (or on public land adjacent to that land)

(4B) Annual charges under Local Government Act 1993 for coastal protection services that relate to existing coastal protection works

In relation to a coastal council : The owner (or any previous owner) of the land has not consented in writing to the land being subject to annual charges under section 496B of the Local Government Act 1993 for coastal protection services that relate to existing coastal protection works (within the meaning of section 553B of that Act).

Note. “Existing coastal protection works” are works to reduce the impact of coastal hazards on land (such as seawalls, revetments, groynes and beach nourishment) that existed before the commencement of section 553B of the Local Government Act 1993.

(5) Mine Subsidence District

This land has not been proclaimed to be a mine subsidence district within the meaning of section 15 of the mine subsidence compensation act, 1961.

(6) Road Widening and/or Road Realignment affected by (a) Division 2 of Part 3 of the Roads act 1993 or (c) any resolution of council or other authority.

This land **is not** affected by road widening and/or road realignment under section 25 of the Roads Act, 1993 and/or resolution of Council or any other authority.

(6) Road Widening and/or Road Realignment Affected by (b) any environmental planning instrument.

This land **is not** affected by any road widening or road realignment under any planning instrument.

(7) Council and other public authorities policies on hazard risk restrictions:

(a) The land **is not** affected by a policy adopted by the Council that that restricts the development of the land because of the likelihood of land slip, bushfire, flooding, tidal inundation, subsidence, acid sulphate soils or any other risk; and

(b) The land **is not** affected by a policy adopted by any other public authority and notified to the council for the express purpose of its adoption by that authority being referred to on planning certificate issued by Council, that restricts the development of the land because of the likelihood of land slip, bushfire, flooding, tidal inundation, subsidence, acid sulphate soils or any other risk.

(7A) Flood related development controls information.

The development on this land or part of this land is subject to flood related development controls refer to Clause 7.15 of Sydney Local Environment Plan 2012 and Section 3.7 of Sydney Development Control Plan 2012.

(8) Land reserved for acquisition

No environmental planning instrument, or proposed environmental planning instrument applying to the land, provides for the acquisition of the land by a public authority, as referred to in section 27 of the Act.

(9) Contribution plans

The following Contributions Plans apply to properties within the City of Sydney local government area. Contributions plans marked **YES** may apply to this property:

▪ Central Sydney Development Contributions Plan 2013 – in operation 9th July 2013	**NO**
▪ City of Sydney Development Contributions Plan 2015 – in operation 1st July 2016	**YES**
▪ Redfern Waterloo Authority Contributions Plan 2006 – in operation 16th May 2007 ▪ Redfern Waterloo Authority Affordable Housing Contributions Plan – in operation 16th May 2007	**NO**

(9A) Biodiversity certified land

The land has not been certified as biodiversity certified land.

(10) Biobanking Agreement

Council has not been notified of a biobanking agreement under Part 7A of the Threatened Species Conservation Act 1995.

(11) Bush fire prone land

The land has not been identified as Bush fire prone land.

(12) Property vegetation plans

Not Applicable.

(13) Orders under Trees (Disputes Between Neighbours) Act 2006

Council has not been notified of an order which as been made under the *Trees (Disputes Between Neighbours) Act 2006* to carry out work in relation to a tree on the land.

(14) Directions under Part 3A

Not Applicable.

(15) Site compatibility certificates and conditions for seniors housing

(a) The land to which the certificate relates is not subject to a current site compatibility certificate (seniors housing), of which Council is aware, in respect of proposed development on the land.

(b) The land to which the certificate relates is not subject to any condition of consent to a development application granted after 11 October 2007 required by State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004.

(16) Site compatibility certificates for infrastructure

The land to which the certificate relates is not subject to a valid site compatibility certificate (infrastructure), of which Council is aware, in respect of proposed development on the land.

(17) Site compatibility certificates and conditions for affordable rental housing

(a) The land to which the certificate relates is not subject to a current site compatibility certificate (affordable rental housing), of which Council is aware, in respect of proposed development on the land.

(b) The land to which the certificate relates is not subject to any terms of a kind referred to in clause 17(1) or 37(1) of State Environmental Planning Policy (Affordable Rental Housing) 2009 that have been imposed as a condition of consent to a development application in respect of the land.

(18) Paper subdivision information

Not Applicable.

(19) Site verification certificates

The land to which the certificate relates is not subject to a valid site verification certificate of which Council is aware.

(20) Loose-fill asbestos insulation

Not Applicable

(21) Affected building notices and building product rectification orders

(1)The land to which the certificate relates is not subject to any affected building notice of which Council is aware.

(2) (a) The land to which the certificate relates is not subject to any building product rectification order of which Council is aware and has not been fully complied with.

(b) The land to which the certificate relates is not subject to any notice of intention to make a building product rectification order of which Council is aware and is outstanding.

Note. The following matters are prescribed by section 59 (2) of the *Contaminated Land Management Act 1997* as additional matters to be specified in a planning certificate:

(a) The land to which the certificate relates **is not** declared to be **significantly contaminated land** within the meaning of that act as at the date when the certificate is issued.

(b) The land to which the certificate relates **is not** subject to a **management order** within the meaning of that act as at the date when the certificate is issued.

(c) The land to which the certificate relates **is not** the subject of an **approved voluntary management proposal** within the meaning of that act at the date the certificate is issued.

(d) The land to which the certificate relates **is not** the subject of an **ongoing maintenance order** within the meaning of that act as at the date when the certificate is issued.

(e) As at the date when the certificate is issued, Council **has not** identified that a **site audit statement** within the meaning of that act has been received in respect of the land the subject of the certificate.

PLANNING CERTIFICATE SECTION 10.7 (2) INFORMATION:
Information provided in accordance with planning certificate section 10.7 (2) has been taken from council's records and advice from other authorities but council disclaims all liability for any omission or inaccuracy in the information. Specific inquiry should be made where doubt exists.

PLANNING CERTIFICATE UNDER SECTION 10.7 (5) OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

PLANNING CERTIFICATE SECTION 10.7 (5) ADVICE is current as at 12:00 noon two working days prior to the date of issue of this certificate. The following matters have been considered & details provided where information exists: easements in favour of council; parking permit scheme; heritage floor space restrictions; low-rental residential building; foreshore building line; tree preservation order.

Contaminated Land Potential:
Council records do not have sufficient information about the uses (including previous uses) of the land which is the subject of this section 149 certificate to confirm that the land has not been used for a purpose which would be likely to have contaminated the land. Parties should make their own enquiries as to whether the land may be contaminated.

Hazard Risk Restriction:
The City of Sydney Local Environmental Plan 2012 incorporates Acid Sulfate soil maps. Development on the land identified in those maps should have regard to Division 4 clause 7.16 of the LEP.

Construction Noise and View Loss Advice:
Intending purchasers are advised that the subject property may be affected by construction noise and loss or diminution of views as a result of surrounding development.

City of Sydney Tree Preservation Order 2004 (TPO)
This order applies to all land where South Sydney Local Environmental Plan 1998 applies and the City of Sydney Council or the Central Sydney Planning Committee is the relevant consent authority under the *Environmental Planning & Assessment* Act 1979. Contact Council's Contract and Asset Management section for more information.

Outstanding Notice & Order information
In relation to this property, there **is not** an outstanding Order or Notice of Intention to issue an Order relating to Fire Safety (being an Order or Notice of Intention to issue an Order of type 6, 10, 11 under Section 121B of the Environmental Planning and Assessment Act, 1979). Further information about the Order or Notice of Intention to issue an Order may be obtained by applying for a certificate under Section 121ZP of the Environmental Planning and Assessment Act and Section 735A of the Local Government Act.

In relation to this property, there **is not** an outstanding Order or Notice of Intention to issue an Order (being an Order or Notice of Intention to issue an Order of a type other than relating to fire safety). Further information about the Order or Notice of Intention to issue an Order may be obtained by applying for a certificate under Section 121ZP of the Environmental Planning and Assessment Act and Section 735A of the Local Government Act.

Residential & Visitor Parking Permit Schemes
The City of Sydney co-ordinates a Resident Permit Parking Scheme and a Visitor Permit Parking scheme. This property may be restricted from participating in either scheme. Eligibility may change after the date of this certificate, as parking supply and other traffic demands change. For more information contact Council's call centre on 9265 9333.

ADVICE FROM OTHER BODIES

Advice provided in accordance with planning certificate section 10.7 (5) is supplied in good faith. Council accepts no liability for the validity of the advice given. (see section 10.7 (6) of the Environmental Planning and Assessment Act, 1979).

For information regarding outstanding notices and orders a CERTIFICATE FOR OUTSTANDING NOTICES OF INTENTION AND/OR AN ORDER UNDER SECTION 735A OF THE LOCAL GOVERNMENT ACT, 1993 AND SECTION 121ZP OF THE ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979 may be applied for at Sydney City Council.

Planning certificate section 10.7 (2), local planning controls are available for inspection at the following locations:

General Enquiries:
Telephone: 02 9265 9333
Facsimile: 02 9265 9415

Town Hall House
Level 2
Town Hall House
456 Kent Street
Sydney
8am – 6pm Monday - Friday

Glebe Customer Service Centre
Glebe Library
186 Glebe Point Road
Glebe
9am – 5pm Monday – Friday

Neighbourhood Service Centre Kings Cross
50 Darlinghurst Road
Potts Point
9am – 5pm, Monday – Friday
9am – 12pm Saturday

Neighbourhood Service Centre Redfern
158 Redfern Street
Redfern
9am-5pm Monday – Friday
9am – 12 Noon Saturday

Green Square Customer Service Centre
The Tote
100 Joynton Avenue
Zetland
10am-6pm Monday – Friday

State planning controls are available for inspection at the following locations:

Sydney Harbour Foreshore Authority (former Sydney Cove Authority and Darling Harbour Authority)
Level 6
66 Harrington Street
The Rocks

Department of Planning & Infrastructure Information Centre
23-33 Bridge Street,
Sydney NSW 2000

Where planning certificate section 10.7 (5) matters are supplied, complete details are available by writing to:
Chief Executive Officer
City of Sydney
G.P.O. Box 1591
Sydney NSW 2000

End of Document

Grant Russell

From: Peri Aria <paria@cityofsydney.nsw.gov.au>
Sent: Wednesday, 21 March 2018 7:23 AM
To: Grant Russell
Subject: RE: Informal Access to Information Request - Darlington Public School

Categories: Filed by Newforma

Hi Grant,

In response, I am unable to locate any information you requested in our database.

You may need to contact the Minister of Education Training & Youth Affairs or NSW Planning to obtain further information.

Regards,

Peri Aria
Information Access Coordinator
Data & Information Mgt

CITYOFSYDNEY 2030
Sydney2030/Green.Global.Connected

Telephone: +612 9246 7604
cityofsydney.nsw.gov.au

From: Grant Russell <Grant.Russell@douglaspartners.com.au>
Sent: Friday, 16 March 2018 2:07 PM
To: City of Sydney <council@cityofsydney.nsw.gov.au>
Subject: Informal Access to Information Request - Darlington Public School

To whom it may concern,

Please find attached Informal Access to Information Request and letter of authorisation from site (Darlington Public School) owner to apply. We are basically after any information regarding development applications / consent and any information regarding potentially contaminating activities occurring on or near to site.
Regards
Grant

Grant Russell | Environmental Scientist
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
18 Waler Crescent Smeaton Grange NSW 2567
P: 02 4647 0075 | F: 02 4646 1886 | M: 0418 116 545 | E: Grant.Russell@douglaspartners.com.au

Appendix F

Data Quality Objectives and Site Assessment Criteria

Appendix F - 1 Data Quality Objectives

The PSI has been devised broadly in accordance with the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure* 1999 as amended 2013 (NEPC, 2013). The DQO process is outlined as follows:

F1.1 State the Problem

Redevelopment/upgrading works are proposed for the primary school and preschool located at the site. Desktop studies have identified the following potentially contaminating activities occurring onsite that have the potential to impact surface soils at the site:

- Current and former structures and sheds onsite (hazardous building materials);
- Filling of areas with material of an unknown origin;
- Current and former structures and sheds onsite (chemical and fuel storage); and
- Presence of a timber power pole onsite.

The "problem" to be addressed is the extent and nature of potential contamination at the site and whether the site is suitable for the proposed development.

The objectives of the investigation are as follows:

- Assess the contamination status of the site and the suitability of the site, from a contamination standpoint, for the proposed redevelopment/upgrading works and continued use of the site as a primary school and preschool.

F1.2 Identify the Decision/Goal of the Study

The suitability of the site for the proposed redevelopment/upgrading works and continued primary school/preschool use was assessed based on the findings of the site walkover and a comparison of the analytical results for contaminants of potential concern (COPC) with the adopted site assessment criteria (SAC). The adopted SAC are provided in Section G2 below.

Based on the past land use, the main COPC are expected to be total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), heavy metals and asbestos. Other commonly found contaminants which may be present include phenols, organophosphate pesticides (OPP) and polychlorinated biphenyls (PCB).

The following specific decisions were considered as part of the PSI:

- Did field observation and analytical results identify potential contamination sources (AEC) which were not included in the preliminary CSM?
- Were COPC present in soil at concentrations that pose a potential risk to identified receptors?
- Is the data sufficient to make a decision regarding the abovementioned risks, the suitability of the site for the proposed development?

- Does contamination at the site, if encountered, trigger the Duty to Report requirements under the CLM Act 1997?
- Are there any off-site migration issues that need to be considered?

F1.3 Identify Information Inputs

Inputs into the decisions are as follows:

- Review of regional geology, topography and hydrogeology information;
- Review of site history information;
- Completion of a site inspection;
- Soil samples were collected in the immediate vicinity of identified potential sources of contamination (AEC) across the Site from a total of nine boring locations and one surface soil sample location;
- The lithology of the Site as described in the bore logs (Appendix H);
- Field and laboratory QA/QC data to assess the suitability of the environmental data for the PSI (Appendix K);
- All analysis was undertaken at a NATA accredited laboratory; and
- Laboratory reported concentrations of contaminants of concern were compared with the NEPC (2013) criteria as discussed in Section F2.

F1.4 Define the Study Boundaries

The site is located at 417 Abercrombie Street, Darlington NSW within the local government area of Council of the City of Sydney. The site covers an approximate total area of 0.72 hectares and is comprised of the following two lots:

- Lot 592 Deposited Plan 752049; and
- Lot 100 Deposited Plan 623500.

The Site location and boundaries are shown on Drawing 1, Appendix A.

The investigation was undertaken to a maximum depth of 3.2 m below ground level (bgl) across the Site.

Field investigations were undertaken on 17 March 2018 by a DP Environmental Scientist.

F1.5 Develop the Analytical Approach (or decision rule)

The information obtained during the assessment was used to characterise the Site in terms of contamination issues and risk to human health and the environment. The decision rules used in characterising the site were as follows:

- The adopted SAC was the NSW Environment Protection Authority (EPA) endorsed criteria; and
- The contaminant concentrations in soil were compared to the adopted SAC to determine whether further investigation or remedial action was required.

Field and laboratory test results were considered useable for the assessment after evaluation against the following data quality indicators (DQIs):

- Precision – a measure of variability or reproducibility of data;
- Accuracy – a measure of closeness of the data to the 'true' value;
- Representativeness – the confidence (qualitative) of data representativeness of media present on site;
- Completeness – a measure of the amount of usable data from a data collection activity; and
- Comparability – the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event.

The specific limits are outlined in the data QA/QC procedures and results (Appendix K).

F1.6 Specify the Performance or Acceptable Criteria

Decision errors for the respective COPC for fill and natural soils are:

1. Deciding that fill and natural soil at the Site exceeds the adopted SAC when they truly do not; and
2. Deciding that fill and natural soil at the Site is within the adopted SAC when they truly do not.

Decision errors for the PSI were minimised and measured by the following:

- The sampling regime targeted each stratum identified to account for site variability;
- Sample collection and handling techniques were in accordance with DP's *Field Procedures Manual*;
- Samples were prepared and analysed by a NATA-accredited laboratory with the acceptance limits for laboratory QA/QC parameters based on the laboratory reported acceptance limits and those stated in NEPC (2013);
- The analyte selection is based on the available site history, past site activities and site features. The potential for contaminants other than those proposed to be analysed is considered to be low;
- The SAC were adopted from established and NSW EPA endorsed guidelines. The SAC have risk probabilities already incorporated; and
- A NATA accredited laboratory using NATA endorsed methods are used to perform laboratory analysis. Where NATA endorsed methods are not used, the reasons are stated. The effect of using non-NATA methods on the decision making process are explained.

F1.7 Optimise the design for obtaining data

Sampling design and procedures that were implemented to optimise data collection for achieving the DQOs included the following;

- A NATA accredited laboratory using NATA endorsed methods were used to perform laboratory analysis;
- Additional soil samples were collected but kept 'on hold' pending details of initial analysis so that they could be analysed if further delineation was required; and
- Adequately experienced environmental scientists/engineers were chosen to conduct field work and sample analysis interpretation.

Appendix F – 2 - Site Assessment Criteria

The Site Assessment Criteria (SAC) applied in the current investigation are informed by the preliminary CSM which identified human and environmental receptors to potential contamination on the site (refer to Section 5). Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising investigation and screening levels as per Schedule B1, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013).

The investigation and screening levels applied in the current investigation comprise levels adopted for a recreational land use scenario with garden/accessible soil which includes childcare centres, preschools and primary schools.

F2.1 Health Investigation and Screening Levels

The generic Health Investigation Levels (HILs) and Health Screening Levels (HSLs) are considered to be appropriate for the assessment of human health risk associated with contamination at the site. The adopted soil HILs and HSLs for the potential contaminants of concern are presented in Table F2, with inputs into their derivation shown in Table F1.

As shown in Table F2 the adopted HSLs are based on a potential vapour intrusion pathway, as identified in the CSM. Although the CSM also identifies a direct contact pathway as well as construction worker receptors, the corresponding HSLs are significantly higher than those for the vapour intrusion pathway and are therefore not drivers for further assessment and/or remediation. As such the direct contact and intrusive maintenance worker HSLs have not been listed.

Table F1: Inputs to the Derivation of HSLs

Variable	Input	Rationale
Potential exposure pathway	Inhalation of vapours	Potential exposure pathways
Soil Type	Sand and sandy clay	Dominant soil type in surface soils (see Test Pit Logs – Appendix G)
Depth to contamination	0 m to <1 m	Potential contamination sources likely to impact surface soils

Table F2: HIL and HSL in mg/kg Unless Otherwise Indicated

Contaminants		HIL- A	HSL- A & B
Metals	Arsenic	100	-
	Cadmium	20	-
	Chromium (VI)	100	-
	Copper	6000	-
	Lead	300	-
	Mercury (inorganic)	40	-
	Nickel	400	-
	Zinc	7400	-
PAH	Benzo(a)pyrene TEQ[1]	3	-
	Total PAH	300	-
	Naphthalene	-	4
TRH	C6 – C10 (less BTEX) [F1]	-	40
	>C10-C16 (less Naphthalene) [F2]	-	230
	>C16-C34 [F3]	-	-
	>C34-C40 [F4]	-	-
BTEX	Benzene	-	0.6
	Toluene	-	390
	Ethylbenzene	-	NL[3]
	Xylenes	-	95

Contaminants		HIL- A	HSL- A & B
OCP	Aldrin + Dieldrin	6	-
	Chlordane	50	-
	DDT+DDE+DDD	240	-
	Endosulfan	270	-
	Endrin	10	-
	Heptachlor	6	-
	HCB	10	-
	Methoxychlor	300	-
OPP	Chlorpyrifos	160	-
PCB [2]		1	-

Notes:

1 Sum of carcinogenic PAH

2 Non dioxin-like PCBs only.

3 The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

F2.2 Ecological Investigation Levels

Ecological Investigation Levels (EILs) and Added Contaminant Limits (ACLs), where appropriate, have been derived in NEPC (2013) for only a short list of contaminants comprising As, Cu, Cr (III), DDT, naphthalene, Ni, Pb and Zn. The adopted EILs, derived using the *Interactive (Excel) Calculation Spreadsheet* (Standing Council on Environment and Water (SCEW) website (http://www.scew.gov.au/node/941)) are shown in the following Table F4, with inputs into their derivation shown on Table F3.

Table F3: Inputs to the Derivation of EILs

Variable	Input	Rationale
Age of contaminants	"Aged" (>2 years)	Given the potential sources of soil contamination are from historic use, the contamination is considered as "aged" (>2 years);
pH	7.2	2 selected samples were tested for pH. The average pH value has been used as an initial screening.
CEC	18 cmolc/kg	2 selected samples were tested for CEC. The average CEC value has been used as an initial screening.

Variable	Input	Rationale
Clay content	10 %	Conservative value for initial screen
Traffic volumes	high	The Site is considered to be located within a high traffic area
State / Territory	New South Wales	-

Table F4: EIL in mg/kg

Analyte		EIL
Metals	Arsenic	100
	Copper	230
	Nickel	250
	Chromium III	410
	Lead	1100
	Zinc	760
PAH	Naphthalene	170
OCP	DDT	180

F2.3 Ecological Screening Levels

Ecological Screening Levels (ESLs) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESLs, based on a fine soil type are shown in the following Table F5.

Table F5: ESL in mg/kg

Analyte		ESL[1]	Comments
TRH	C6 – C10 (less BTEX) [F1]	180*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	>C10-C16 (less Naphthalene) [F2]	120*	
	>C16-C34 [F3]	300	
	>C34-C40 [F4]	2800	
BTEX	Benzene	50	
	Toluene	85	
	Ethylbenzene	70	
	Xylenes	105	
PAH	Benzo(a)pyrene	0.7	

F2.4 Management Limits

In addition to appropriate consideration and application of the HSLs and ESLs, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

The adopted management limits, based on a fine soil type (Section 11.1), are shown in the following Table F6.

Table F6: Management Limits in mg/kg

Analyte		Management Limit
TRH	$C_6 - C_{10}$ (F1) #	800
	$>C_{10}$-C_{16} (F2) #	1000
	$>C_{16}$-C_{34} (F3)	3500
	$>C_{34}$-C_{40} (F4)	10 000

Separate management limits for BTEX and naphthalene are not available hence these have not been subtracted from the relevant fractions to obtain F1 and F2

F2.5 Asbestos in Soil

NEPC (2013) defines the various asbestos types as follows:

Bonded ACM: Asbestos containing material which is in sound condition, bound in a matrix of cement or resin, and cannot pass a 7 mm x 7 mm sieve.

FA: Fibrous asbestos material including severely weathered cement sheet, insulation products and woven asbestos material. This material is typically unbonded or was previously bonded and is now significantly degraded and crumbling.

AF: Asbestos fines including free fibres, small fibre bundles and also small fragments of bonded ACM that pass through a 7 mm x 7 mm sieve.

Health Screening Levels (HSLs) for asbestos in soil, which are based on likely exposure levels for different scenarios, have been adopted in NEPC (2013) from the Western Australian Department of Health (WA DoH) publication Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia 2009 (WA DoH 2009).

On the basis of the proposed land use, and in accordance with Table 7, Schedule B1, NEPC (2013) the following asbestos HSLs have been adopted:

Table F6: Health Screening Levels for Asbestos Contamination in Soil (% w/w)

Form of Asbestos	HSL
Bonded ACM	0.01%
FA and AF	0.001 %
All Forms of Asbestos	No visible asbestos for surface soil

Appendix G

Bore Hole Logs

BOREHOLE LOG

CLIENT: Billard Leece Partnership Pty Ltd
PROJECT: Darlington Public School Upgrade
LOCATION: 417 Abercrombie Street, Darlington, NSW

SURFACE LEVEL: 32.7 mAHD
EASTING: 332592
NORTHING: 6248235
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 92277.00
DATE: 17/3/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
32	0.0	FILLING - brown sandy clayey silt with some roots and gravel		E	0.2				
	0.5	FILLING - grey mottled red silty clay, MC<PL		D	0.5				
	1.0	FILLING - grey mottled light brown sandy silty clay with very low strength, highly weathered shale bands		D	1.0				
31	1.5	SILTY CLAY - stiff to hard, brown silty clay with a trace of ironstone gravel, MC<PL		D	1.5				
	2.0	- becoming red mottled grey below 2.0m		D	2.0				
30	2.5	- with iron indurated bands below 2.5m		D	2.5				
	3.0	Bore discontinued at 3.0m - limit of investigation		D	3.0				
29									

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: Kubota KX018-4 1.7t excavator **DRILLER:** John **LOGGED:** LAH **CASING:** N/A
TYPE OF BORING: 150mm SFA
WATER OBSERVATIONS: No free groundwater observed whilst augering
REMARKS: Location coordinates are in MGA94 Zone 56.

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics | Environment | Groundwater

BOREHOLE LOG

CLIENT: Billard Leece Partnership Pty Ltd
PROJECT: Darlington Public School Upgrade
LOCATION: 417 Abercrombie Street, Darlington, NSW

SURFACE LEVEL: 33.7 mAHD
EASTING: 332591
NORTHING: 6248258
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 92277.00
DATE: 17/3/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
33	0.2	FILLING - brown sandy clayey silt with some gravel and roots							
		FILLING - brown sandy silty clay with gravel and crushed brick gravel, MC<PL, dark slag like gravel was noted in fill		E	0.2				
					0.4				
				B D	0.5 0.6				
	1.0	SILTY CLAY - stiff to hard, brown and red silty clay with some ironstone gravel, MC<PL		D	1.0				
				D	1.5				
32		- becoming grey mottled red below 1.7m							
	2.0			D	2.0				
				D	2.5				
31	3.0	Bore discontinued at 3.0m - limit of investigation		D	3.0				
30									

RIG: Kubota KX018-4 1.7t excavator **DRILLER:** John **LOGGED:** LAH **CASING:** N/A

TYPE OF BORING: 150mm SFA

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics | Environment | Groundwater

BOREHOLE LOG

CLIENT: Billard Leece Partnership Pty Ltd
PROJECT: Darlington Public School Upgrade
LOCATION: 417 Abercrombie Street, Darlington, NSW

SURFACE LEVEL: 33.3 mAHD
EASTING: 332571
NORTHING: 6248261
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 92277.00
DATE: 17/3/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
33	0.1	FILLING - brown clayey silt (topsoil)							
		FILLING - brown clayey sand and silty clay with some sandstone and basalt gravel		E	0.2				
	0.5	FILLING - grey brown clayey sand with some gravel and a trace of anthropogenics comprising crushed brick gravel, dry		D/E	0.5				
	0.9	SANDSTONE - extremely low strength, extremely weathered, grey sandstone		D	1.0				
32	1.0	Bore discontinued at 1.0m - refusal on very low to low strength sandstone							
31									
30									

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20; 1, 2, 3

RIG: Kubota KX018-4 1.7t excavator **DRILLER:** John **LOGGED:** LAH **CASING:** N/A

TYPE OF BORING: 150mm SFA

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

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

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics | Environment | Groundwater

BOREHOLE LOG

CLIENT: Billard Leece Partnership Pty Ltd
PROJECT: Darlington Public School Upgrade
LOCATION: 417 Abercrombie Street, Darlington, NSW

SURFACE LEVEL: 34.5 mAHD
EASTING: 332549
NORTHING: 6248237
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 92277.00
DATE: 17/3/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
	0.12	CONCRETE							
		FILLING - red, brown and grey silty clay with some gravel MC>PL		E	0.2				
34		- becoming grey below 0.4m		D/E	0.5				
	1	- becoming brown with a trace of crushed ceramics (gravel-sized) below 0.9m		D/E	1.0				1
33	1.5	SILTY CLAY - stiff to hard, brown silty clay with a trace of ironstone gravel, MC<PL		D	1.5				
	2			D	2.0				2
32		- becoming grey mottled red with iron indurated bands below 2.5m		D	2.5				
	3	3.0 Bore discontinued at 3.0m - limit of investigation		D	3.0				3
31									

RIG: Kubota KX018-4 1.7t excavator **DRILLER:** John **LOGGED:** LAH **CASING:** N/A

TYPE OF BORING: 150mm SFA

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

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

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Billard Leece Partnership Pty Ltd
PROJECT: Darlington Public School Upgrade
LOCATION: 417 Abercrombie Street, Darlington, NSW

SURFACE LEVEL: 34.9 mAHD
EASTING: 332546
NORTHING: 6248279
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 92277.00
DATE: 17/3/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
34	0.07	ASPHALTIC CONCRETE							
		FILLING - brown clayey sandy silt with some gravel, moist							
	0.2	FILLING - brown and grey silty clay, MC<PL, dark slag like gravel was noted in fill		E	0.2				
				D/E	0.5				
	1.0	SILTY CLAY - stiff to hard, light brown and grey silty clay with a trace of ironstone gravel, MC<PL		D	1.0				1
				U_{50}					
				D	1.45 1.5				
33		- becoming grey mottled light brown below 1.8m							
	2			D	2.0				2
		- becoming grey mottled red below 2.4m		D	2.5				
32	3.0	Bore discontinued at 3.0m - limit of investigation		D	3.0				3
31									

RIG: Kubota KX018-4 1.7t excavator **DRILLER:** John **LOGGED:** LAH **CASING:** N/A

TYPE OF BORING: 150mm SFA

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

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

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Billard Leece Partnership Pty Ltd
PROJECT: Darlington Public School Upgrade
LOCATION: 417 Abercrombie Street, Darlington, NSW

SURFACE LEVEL: 35.7 mAHD
EASTING: 332540
NORTHING: 6248306
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 92277.00
DATE: 17/3/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
35		FILLING - brown clayey sandy silt with some roots and gravel including crushed terracotta gravel, MC<PL		E	0.2				
				D	0.5				
	1 1.0	SILTY CLAY - stiff to hard, brown mottled red silty clay with some ironstone gravel, MC<PL		D	1.0				1
		- becoming red mottled grey and light brown below 1.3m		D	1.5				
34	2 2.0	SHALE - extremely low strength, extremely weathered, grey shale		D	2.0				2
		- with iron indurated bands below 2.5m		D	2.5				
33	3 3.0	Bore discontinued at 3.0m - limit of investigation		D	3.0				3
32									

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: Kubota KX018-4 1.7t excavator **DRILLER:** John **LOGGED:** LAH **CASING:** N/A

TYPE OF BORING: 150mm SFA

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

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

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Billard Leece Partnership Pty Ltd
PROJECT: Darlington Public School Upgrade
LOCATION: 417 Abercrombie Street, Darlington, NSW

SURFACE LEVEL: 40.2 mAHD
EASTING: 332560
NORTHING: 6248326
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 92277.00
DATE: 17/3/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
40	0.4	FILLING - brown clayey silty sand with some gravel, moist		E	0.2				
		FILLING - brown sandy silty clay with some gravel and crushed concrete gravel, MC<PL, glass and flecks of dark black charcoal material noted in fill		D/E	0.5				
39	1.0	SHALE - extremely low strength, extremely weathered, grey shale		D	1.0				
				D	1.5				
38	2.0			D	2.0				
				D	2.5				
37	3.0	Bore discontinued at 3.0m - limit of investigation		D	3.0				

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: Kubota KX018-4 1.7t excavator **DRILLER:** John **LOGGED:** LAH **CASING:** N/A

TYPE OF BORING: 150mm SFA

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

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

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Billard Leece Partnership Pty Ltd
PROJECT: Darlington Public School Upgrade
LOCATION: 417 Abercrombie Street, Darlington, NSW

SURFACE LEVEL: 40.8 mAHD
EASTING: 332586
NORTHING: 6248320
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 92277.00
DATE: 17/3/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
40.8	0.0	FILLING - brown sandy clayey silt with rootlets and some gravel (topsoil)		E	0.2				
	0.3	FILLING - brown clayey silty sand with some gravel and a trace of crushed concrete gravel, moist		B	0.4				
				D/E	0.5				
					0.6				
40	1			D	1.0				1
	1.5	SILTY CLAY - stiff to hard, grey mottled light brown and red silty clay with some ironstone gravel, MC<PL		D	1.5				
39	2			D	2.0				2
		- becoming grey mottled red with iron indurated bands below 2.5m		D	2.5				
38	3								3
	3.0	Bore discontinued at 3.0m - limit of investigation		D	3.0				
37									

RIG: Kubota KX018-4 1.7t excavator **DRILLER:** John **LOGGED:** LAH **CASING:** N/A

TYPE OF BORING: 150mm SFA

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

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

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Billard Leece Partnership Pty Ltd
PROJECT: Darlington Public School Upgrade
LOCATION: 417 Abercrombie Street, Darlington, NSW

SURFACE LEVEL: 34.6 mAHD
EASTING: 332587
NORTHING: 6248287
DIP/AZIMUTH: 90°/--

BORE No: 9
PROJECT No: 92277.00
DATE: 17/3/2018
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
34	0.0	FILLING - dark brown clayey silt (topsoil)		D1/E	0.2				
	0.3	FILLING - brown clayey sand with gravel, some silty clay and crushed brick gravel, flecks of charcoal type material observed in clay clumps		B D/E	0.3 0.5				
					0.6				
	1.0	SILTY CLAY - stiff to hard, red mottled grey silty clay with some ironstone gravel, MC<PL		D U_{50}	1.0				
					1.25				
33		- becoming grey mottled red below 1.5m		D	1.5				
32	2.0			D	2.0				
				D	2.5				
31	3.0	Bore discontinued at 3.0m - limit of investigation		D	3.0				

RIG: Kubota KX018-4 1.7t excavator **DRILLER:** John **LOGGED:** LAH **CASING:** N/A

TYPE OF BORING: 150mm SFA

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. D1 is the duplicate sample of E at 0.2m

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

SAMPLING & IN SITU TESTING LEGEND

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

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Appendix H

Summary Table H1

Table H1 - Summary of Soil Sampling and Chemical Analysis Results (Results in mg/kg - unless specified)

Sample Location	Sample Depth (m)	Sampling Date	Heavy Metals								PAH					TRH				BTEX				OCPs, OPPs & PCBs								
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	B(a)P TEQ	B(a)P	Total PAH	Naphthalene	Phenols	C6-C10 less BTEX [F1]	>C10-C16 (less Naphthalene) [F2]	>C16-C34	>C34-C40	Benzene	Toluene	Ethylbenzene	Total Xylenes	Aldrin + dieldrin	Chlordane	DDT + DDE + DDD	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Asbestos
Practical Quantitation Limit (PQL)			4	0.4	1	1	1	0.1	1	1	0.5	0.05	0.1	1	5	25	50	100	100	0.2	0.5	1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Assessment Criteria																																
NEPC (2013) HIL A / HSL A & B[2]			**100**	**20**	**100**	**6000**	**300**	**40**	**400**	**7400**	**3**	**ND**	**300**	**4 #**	**3000**	**40 #**	**230 #**	**ND**	**ND**	**0.6 #**	**390 #**	**NL**	**95 #**	**6**	**50**	**240**	**270**	**10**	**6**	**10**	**300**	**ND**
NEPC (2013) EIL / ESL [2]			**100**	**ND**	**410 ###**	**230 ###**	**1100**	**ND**	**250 ###**	**760 ###**	**ND**	**0.7 ##**	**ND**	**170**	**ND**	**180 ##**	**120 ##**	**300 ##**	**2800 ##**	**50 ##**	**85 ##**	**70 ##**	**105 ##**	**ND**	**ND**	**180***	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
NEPC (2013) Management Limits			**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**800**	**1000**	**3500**	**10000**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**	**ND**
Analytical Results of Boring and Surface Samples																																
BH1	0.2	17/03/2018	<4	4	10	28	46	<0.1	7	100	<0.5	0.08	0.79	<0.1	<5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH2	0.5	17/03/2018	5	<0.4	16	18	96	0.2	4	210	**33**	**22**	250	1.4	<5	<25	<50	**1200**	330	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NAD
BH3	0.2	17/03/2018	6	<0.4	18	15	170	0.1	9	82	<0.5	0.3	3.1	<0.1	<5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH4	0.2	17/03/2018	7	<0.4	17	10	24	<0.1	14	24	<0.5	0.1	0.85	<0.1	<5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH5	0.2	17/03/2018	4	<0.4	9	48	120	0.3	4	69	**57**	**37**	**550**	3.5	<5	<25	150	**2400**	360	<0.2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	NAD
BH6	0.2	17/03/2018	10	1	54	120	**650**	0.6	42	560	**7.8**	**5.1**	66	0.3	<5	<25	<50	**360**	130	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH7	0.2	17/03/2018	10	<0.4	22	37	91	0.1	6	63	2.4	**1.6**	21	0.1	<5	<25	<50	<100	<100	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH8	0.2	17/03/2018	5	<0.4	11	29	59	<0.1	11	73	0.7	0.5	5.2	<0.1	<5	<25	<50	100	100	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
BH9	0.2	17/03/2018	8	<0.4	17	21	76	<0.1	6	**2100**	<0.5	0.06	0.85	<0.1	<5	<25	<50	**1100**	620	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NAD
Powerpole	0.0 - 0.2	17/03/2018	-	-	-	-	-	-	-	-	<0.5	0.2	1.5	<0.1	-	<25	62	180	150	<0.2	<0.5	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-

Notes:

All results in mg/kg on a dry weight basis unless specified

NAD - No Asbestos Detected

ND - Not detected

HIL - Health Investigation Level

[2] The HIL A/ HSL A/EIL / ESLs were based on National Environmental Protection Measures (NEPC) 2013

HSL A and HSL B assuming silt (0m - <1m depth)

Bold - Concentration exceeding SAC

- Not analysed

Appendix I

Laboratory Certificate and Chain of Custody Documentation

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

CERTIFICATE OF ANALYSIS 187756

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Grant Russell
Address	18 Waler Crescent, Smeaton Grange, NSW, 2567

Sample Details

Your Reference	**92277.00, Darlington Public School Contam**
Number of Samples	21 Soil
Date samples received	21/03/2018
Date completed instructions received	21/03/2018

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	28/03/2018
Date of Issue	27/03/2018

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Asbestos Approved By
Analysed by Asbestos Approved Identifier: Jessica Hie
Authorised by Asbestos Approved Signatory: Paul Ching

Results Approved By
Dragana Tomas, Senior Chemist
Jeremy Faircloth, Organics Supervisor
Leon Ow, Chemist
Long Pham, Team Leader, Metals
Nancy Zhang, Assistant Lab Manager
Nick Sarlamis, Inorganics Supervisor
Paul Ching, Senior Analyst
Priya Samarawickrama, Senior Chemist

Authorised By

David Springer, General Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		187756-1	187756-3	187756-4	187756-6	187756-9
Your Reference	UNITS	BH1 0.2	BH2 0.5	BH3 0.2	BH4 0.2	BH5 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	96	92	84	87	92

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		187756-11	187756-12	187756-14	187756-16	187756-18
Your Reference	UNITS	BH6 0.2	BH7 0.2	BH8 0.2	BH9 0.2	Powerpole
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	87	82	90	84	85

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		187756-19	187756-20	187756-21
Your Reference	UNITS	D1	TB	TS
Date Sampled		17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018
TRH C_6 - C_9	mg/kg	<25	<25	[NA]
TRH C_6 - C_{10}	mg/kg	<25	<25	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	[NA]
Benzene	mg/kg	<0.2	<0.2	102%
Toluene	mg/kg	<0.5	<0.5	103%
Ethylbenzene	mg/kg	<1	<1	103%
m+p-xylene	mg/kg	<2	<2	102%
o-Xylene	mg/kg	<1	<1	103%
naphthalene	mg/kg	<1	<1	[NA]
Total +ve Xylenes	mg/kg	<1	<1	[NT]
Surrogate aaa-Trifluorotoluene	%	84	92	102

svTRH (C10-C40) in Soil						
Our Reference		187756-1	187756-3	187756-4	187756-6	187756-9
Your Reference	UNITS	BH1 0.2	BH2 0.5	BH3 0.2	BH4 0.2	BH5 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	23/03/2018	22/03/2018	22/03/2018	23/03/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	730	<100	<100	1,800
TRH C_{29} - C_{36}	mg/kg	<100	600	<100	<100	810
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	150
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	150
TRH >C_{16} -C_{34}	mg/kg	<100	1,200	<100	<100	2,400
TRH >C_{34} -C_{40}	mg/kg	<100	330	<100	<100	360
Total +ve TRH (>C10-C40)	mg/kg	<50	1,500	<50	<50	2,900
Surrogate o-Terphenyl	%	101	#	95	94	#

svTRH (C10-C40) in Soil						
Our Reference		187756-11	187756-12	187756-14	187756-16	187756-18
Your Reference	UNITS	BH6 0.2	BH7 0.2	BH8 0.2	BH9 0.2	Powerpole
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018	22/03/2018	23/03/2018	23/03/2018
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	230	<100	<100	340	<100
TRH C_{29} - C_{36}	mg/kg	190	<100	110	940	180
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	62
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	62
TRH >C_{16} -C_{34}	mg/kg	360	<100	100	1,100	180
TRH >C_{34} -C_{40}	mg/kg	130	<100	100	620	150
Total +ve TRH (>C10-C40)	mg/kg	490	<50	200	1,700	390
Surrogate o-Terphenyl	%	101	97	96	94	98

svTRH (C10-C40) in Soil		
Our Reference		187756-19
Your Reference	UNITS	D1
Date Sampled		17/03/2018
Type of sample		Soil
Date extracted	-	22/03/2018
Date analysed	-	23/03/2018
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	430
TRH C_{29} - C_{36}	mg/kg	1,200
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	1,300
TRH >C_{34} -C_{40}	mg/kg	770
Total +ve TRH (>C10-C40)	mg/kg	2,100
Surrogate o-Terphenyl	%	94

PAHs in Soil						
Our Reference		187756-1	187756-3	187756-4	187756-6	187756-9
Your Reference	UNITS	BH1 0.2	BH2 0.5	BH3 0.2	BH4 0.2	BH5 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Naphthalene	mg/kg	<0.1	1.4	<0.1	<0.1	3.5
Acenaphthylene	mg/kg	<0.1	4.6	0.1	<0.1	17
Acenaphthene	mg/kg	<0.1	0.8	<0.1	<0.1	1
Fluorene	mg/kg	<0.1	2.8	<0.1	<0.1	5.5
Phenanthrene	mg/kg	0.2	28	0.3	<0.1	82
Anthracene	mg/kg	<0.1	8.7	0.1	<0.1	22
Fluoranthene	mg/kg	0.2	39	0.5	0.2	98
Pyrene	mg/kg	0.2	41	0.5	0.2	93
Benzo(a)anthracene	mg/kg	0.1	20	0.3	0.1	48
Chrysene	mg/kg	<0.1	18	0.2	0.1	36
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	33	0.4	0.2	56
Benzo(a)pyrene	mg/kg	0.08	22	0.3	0.1	37
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	12	0.2	<0.1	18
Dibenzo(a,h)anthracene	mg/kg	<0.1	3.6	<0.1	<0.1	6.9
Benzo(g,h,i)perylene	mg/kg	<0.1	16	0.2	<0.1	22
Total +ve PAH's	mg/kg	0.79	250	3.1	0.85	550
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	33	<0.5	<0.5	57
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	33	<0.5	<0.5	57
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	33	<0.5	<0.5	57
Surrogate p-Terphenyl-d14	%	99	119	106	103	115

PAHs in Soil						
Our Reference		187756-11	187756-12	187756-14	187756-16	187756-18
Your Reference	UNITS	BH6 0.2	BH7 0.2	BH8 0.2	BH9 0.2	Powerpole
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Naphthalene	mg/kg	0.3	0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	1.4	0.6	0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.6	0.2	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	8.0	2.8	0.4	0.1	0.1
Anthracene	mg/kg	2.3	0.8	0.2	<0.1	<0.1
Fluoranthene	mg/kg	12	3.3	0.8	0.2	0.3
Pyrene	mg/kg	11	3.3	0.8	0.3	0.3
Benzo(a)anthracene	mg/kg	5.9	1.7	0.4	<0.1	0.2
Chrysene	mg/kg	4.8	1.5	0.4	<0.1	0.1
Benzo(b,j+k)fluoranthene	mg/kg	8.1	2.5	0.8	<0.2	0.3
Benzo(a)pyrene	mg/kg	5.1	1.6	0.5	0.06	0.2
Indeno(1,2,3-c,d)pyrene	mg/kg	2.9	0.9	0.3	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	0.9	0.3	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	3.4	1.1	0.4	0.1	0.1
Total +ve PAH's	mg/kg	66	21	5.2	0.85	1.5
Benzo(a)pyrene TEQ calc (zero)	mg/kg	7.8	2.4	0.6	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	7.8	2.4	0.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	7.8	2.4	0.7	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	100	102	104	96	100

PAHs in Soil		
Our Reference		187756-19
Your Reference	UNITS	D1
Date Sampled		17/03/2018
Type of sample		Soil
Date extracted	-	22/03/2018
Date analysed	-	22/03/2018
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	0.2
Pyrene	mg/kg	0.2
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	0.2
Total +ve PAH's	mg/kg	0.66
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	95

Organochlorine Pesticides in soil						
Our Reference		187756-1	187756-3	187756-4	187756-6	187756-9
Your Reference	UNITS	BH1 0.2	BH2 0.5	BH3 0.2	BH4 0.2	BH5 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018	22/03/2018	23/03/2018	23/03/2018
HCB	mg/kg	<0.1	<1	<0.1	<0.1	<1
alpha-BHC	mg/kg	<0.1	<1	<0.1	<0.1	<1
gamma-BHC	mg/kg	<0.1	<1	<0.1	<0.1	<1
beta-BHC	mg/kg	<0.1	<1	<0.1	<0.1	<1
Heptachlor	mg/kg	<0.1	<1	<0.1	<0.1	<1
delta-BHC	mg/kg	<0.1	<1	<0.1	<0.1	<1
Aldrin	mg/kg	<0.1	<1	<0.1	<0.1	<1
Heptachlor Epoxide	mg/kg	<0.1	<1	<0.1	<0.1	<1
gamma-Chlordane	mg/kg	<0.1	<1	<0.1	<0.1	<1
alpha-chlordane	mg/kg	<0.1	<1	<0.1	<0.1	<1
Endosulfan I	mg/kg	<0.1	<1	<0.1	<0.1	<1
pp-DDE	mg/kg	<0.1	<1	<0.1	<0.1	<1
Dieldrin	mg/kg	<0.1	<1	<0.1	<0.1	<1
Endrin	mg/kg	<0.1	<1	<0.1	<0.1	<1
pp-DDD	mg/kg	<0.1	<1	<0.1	<0.1	<1
Endosulfan II	mg/kg	<0.1	<1	<0.1	<0.1	<1
pp-DDT	mg/kg	<0.1	<1	<0.1	<0.1	<1
Endrin Aldehyde	mg/kg	<0.1	<1	<0.1	<0.1	<1
Endosulfan Sulphate	mg/kg	<0.1	<1	<0.1	<0.1	<1
Methoxychlor	mg/kg	<0.1	<1	<0.1	<0.1	<1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Surrogate TCMX	%	96	102	103	104	108

Organochlorine Pesticides in soil						
Our Reference		187756-11	187756-12	187756-14	187756-16	187756-19
Your Reference	UNITS	BH6 0.2	BH7 0.2	BH8 0.2	BH9 0.2	D1
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	98	89	90	90	94

Organophosphorus Pesticides						
Our Reference		187756-1	187756-3	187756-4	187756-6	187756-9
Your Reference	UNITS	BH1 0.2	BH2 0.5	BH3 0.2	BH4 0.2	BH5 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018	22/03/2018	23/03/2018	23/03/2018
Azinphos-methyl (Guthion)	mg/kg	<0.1	<1	<0.1	<0.1	<1
Bromophos-ethyl	mg/kg	<0.1	<1	<0.1	<0.1	<1
Chlorpyriphos	mg/kg	<0.1	<1	<0.1	<0.1	<1
Chlorpyriphos-methyl	mg/kg	<0.1	<1	<0.1	<0.1	<1
Diazinon	mg/kg	<0.1	<1	<0.1	<0.1	<1
Dichlorvos	mg/kg	<0.1	<1	<0.1	<0.1	<1
Dimethoate	mg/kg	<0.1	<1	<0.1	<0.1	<1
Ethion	mg/kg	<0.1	<1	<0.1	<0.1	<1
Fenitrothion	mg/kg	<0.1	<1	<0.1	<0.1	<1
Malathion	mg/kg	<0.1	<1	<0.1	<0.1	<1
Parathion	mg/kg	<0.1	<1	<0.1	<0.1	<1
Ronnel	mg/kg	<0.1	<1	<0.1	<0.1	<1
Surrogate TCMX	%	96	102	103	104	108

Organophosphorus Pesticides						
Our Reference		187756-11	187756-12	187756-14	187756-16	187756-19
Your Reference	UNITS	BH6 0.2	BH7 0.2	BH8 0.2	BH9 0.2	D1
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	98	89	90	90	94

PCBs in Soil						
Our Reference		187756-1	187756-3	187756-4	187756-6	187756-9
Your Reference	UNITS	BH1 0.2	BH2 0.5	BH3 0.2	BH4 0.2	BH5 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018	22/03/2018	23/03/2018	23/03/2018
Aroclor 1016	mg/kg	<0.1	<1	<0.1	<0.1	<1
Aroclor 1221	mg/kg	<0.1	<1	<0.1	<0.1	<1
Aroclor 1232	mg/kg	<0.1	<1	<0.1	<0.1	<1
Aroclor 1242	mg/kg	<0.1	<1	<0.1	<0.1	<1
Aroclor 1248	mg/kg	<0.1	<1	<0.1	<0.1	<1
Aroclor 1254	mg/kg	<0.1	<1	<0.1	<0.1	<1
Aroclor 1260	mg/kg	<0.1	<1	<0.1	<0.1	<1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<1
Surrogate TCLMX	%	96	102	103	104	108

PCBs in Soil						
Our Reference		187756-11	187756-12	187756-14	187756-16	187756-19
Your Reference	UNITS	BH6 0.2	BH7 0.2	BH8 0.2	BH9 0.2	D1
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	98	89	90	90	94

Acid Extractable metals in soil						
Our Reference		187756-1	187756-3	187756-4	187756-6	187756-9
Your Reference	UNITS	BH1 0.2	BH2 0.5	BH3 0.2	BH4 0.2	BH5 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Arsenic	mg/kg	<4	5	6	7	4
Cadmium	mg/kg	4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	10	16	18	17	9
Copper	mg/kg	28	18	15	10	48
Lead	mg/kg	46	96	170	24	120
Mercury	mg/kg	<0.1	0.2	0.1	<0.1	0.3
Nickel	mg/kg	7	4	9	14	4
Zinc	mg/kg	100	210	82	24	69

Acid Extractable metals in soil						
Our Reference		187756-11	187756-12	187756-14	187756-16	187756-19
Your Reference	UNITS	BH6 0.2	BH7 0.2	BH8 0.2	BH9 0.2	D1
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Arsenic	mg/kg	10	10	5	8	12
Cadmium	mg/kg	1	<0.4	<0.4	<0.4	0.5
Chromium	mg/kg	54	22	11	17	11
Copper	mg/kg	120	37	29	21	20
Lead	mg/kg	650	91	59	76	34
Mercury	mg/kg	0.6	0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	42	6	11	6	7
Zinc	mg/kg	560	63	73	2,100	3,300

Misc Soil - Inorg						
Our Reference		187756-1	187756-3	187756-4	187756-6	187756-9
Your Reference	UNITS	BH1 0.2	BH2 0.5	BH3 0.2	BH4 0.2	BH5 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg						
Our Reference		187756-11	187756-12	187756-14	187756-16	187756-19
Your Reference	UNITS	BH6 0.2	BH7 0.2	BH8 0.2	BH9 0.2	D1
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Inorg - Soil			
Our Reference		187756-1	187756-14
Your Reference	UNITS	BH1 0.2	BH8 0.2
Date Sampled		17/03/2018	17/03/2018
Type of sample		Soil	Soil
Date prepared	-	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018
pH 1:5 soil:water	pH Units	6.9	7.5

CEC			
Our Reference		187756-1	187756-14
Your Reference	UNITS	BH1 0.2	BH8 0.2
Date Sampled		17/03/2018	17/03/2018
Type of sample		Soil	Soil
Date prepared	-	22/03/2018	22/03/2018
Date analysed	-	22/03/2018	22/03/2018
Exchangeable Ca	meq/100g	12	19
Exchangeable K	meq/100g	0.4	0.5
Exchangeable Mg	meq/100g	1.4	2.5
Exchangeable Na	meq/100g	0.10	<0.1
Cation Exchange Capacity	meq/100g	14	22

Moisture						
Our Reference		187756-1	187756-3	187756-4	187756-6	187756-9
Your Reference	UNITS	BH1 0.2	BH2 0.5	BH3 0.2	BH4 0.2	BH5 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Moisture	%	6.9	12	18	12	5.3

Moisture						
Our Reference		187756-11	187756-12	187756-14	187756-16	187756-18
Your Reference	UNITS	BH6 0.2	BH7 0.2	BH8 0.2	BH9 0.2	Powerpole
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	22/03/2018	22/03/2018	22/03/2018	22/03/2018	22/03/2018
Date analysed	-	23/03/2018	23/03/2018	23/03/2018	23/03/2018	23/03/2018
Moisture	%	14	13	15	17	28

Moisture		
Our Reference		187756-19
Your Reference	UNITS	D1
Date Sampled		17/03/2018
Type of sample		Soil
Date prepared	-	22/03/2018
Date analysed	-	23/03/2018
Moisture	%	23

Asbestos ID - soils						
Our Reference		187756-1	187756-3	187756-4	187756-6	187756-9
Your Reference	UNITS	BH1 0.2	BH2 0.5	BH3 0.2	BH4 0.2	BH5 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	27/03/2018	27/03/2018	27/03/2018	27/03/2018	27/03/2018
Sample mass tested	g	Approx. 20g	Approx. 35g	Approx. 45g	Approx. 50g	Approx. 50g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils					
Our Reference		187756-11	187756-12	187756-14	187756-16
Your Reference	UNITS	BH6 0.2	BH7 0.2	BH8 0.2	BH9 0.2
Date Sampled		17/03/2018	17/03/2018	17/03/2018	17/03/2018
Type of sample		Soil	Soil	Soil	Soil
Date analysed	-	27/03/2018	27/03/2018	27/03/2018	27/03/2018
Sample mass tested	g	Approx. 15g	Approx. 55g	Approx. 15g	Approx. 20g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Metals-009	Determination of exchangeable cations and cation exchange capacity in soils using 1M Ammonium Chloride exchange and ICP-AES analytical finish.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.

Method ID	Methodology Summary
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	187756-3
Date extracted	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Date analysed	-			23/03/2018	1	23/03/2018	23/03/2018		23/03/2018	23/03/2018
TRH C_6 - C_9	mg/kg	25	Org-016	<25	1	<25	<25	0	94	85
TRH C_6 - C_{10}	mg/kg	25	Org-016	<25	1	<25	<25	0	94	85
Benzene	mg/kg	0.2	Org-016	<0.2	1	<0.2	<0.2	0	80	70
Toluene	mg/kg	0.5	Org-016	<0.5	1	<0.5	<0.5	0	88	80
Ethylbenzene	mg/kg	1	Org-016	<1	1	<1	<1	0	98	91
m+p-xylene	mg/kg	2	Org-016	<2	1	<2	<2	0	101	93
o-Xylene	mg/kg	1	Org-016	<1	1	<1	<1	0	101	93
naphthalene	mg/kg	1	Org-014	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	94	1	96	90	6	97	86

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2018	22/03/2018		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2018	23/03/2018		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-016	[NT]	19	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-016	[NT]	19	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-016	[NT]	19	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-016	[NT]	19	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-016	[NT]	19	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-016	[NT]	19	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-016	[NT]	19	<1	<1	0	[NT]	[NT]
naphthalene	mg/kg	1	Org-014	[NT]	19	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-016	[NT]	19	84	86	2	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	187756-3
Date extracted	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Date analysed	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	23/03/2018
TRH C_{10} - C_{14}	mg/kg	50	Org-003	<50	1	<50	<50	0	109	116
TRH C_{15} - C_{28}	mg/kg	100	Org-003	<100	1	<100	<100	0	94	90
TRH C_{29} - C_{36}	mg/kg	100	Org-003	<100	1	<100	<100	0	108	#
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	<50	1	<50	50	0	109	116
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	<100	1	<100	120	18	94	90
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	<100	1	<100	<100	0	108	#
Surrogate o-Terphenyl	%		Org-003	103	1	101	100	1	102	108

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2018	22/03/2018		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2018	23/03/2018		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-003	[NT]	19	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-003	[NT]	19	430	550	24	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-003	[NT]	19	1200	1400	15	[NT]	[NT]
TRH >C_{10} -C_{16}	mg/kg	50	Org-003	[NT]	19	<50	<50	0	[NT]	[NT]
TRH >C_{16} -C_{34}	mg/kg	100	Org-003	[NT]	19	1300	1700	27	[NT]	[NT]
TRH >C_{34} -C_{40}	mg/kg	100	Org-003	[NT]	19	770	990	25	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-003	[NT]	19	94	94	0	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	187756-3
Date extracted	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Date analysed	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Naphthalene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	92	110
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	94	91
Phenanthrene	mg/kg	0.1	Org-012	<0.1	1	0.2	<0.1	67	99	122
Anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.1	67	90	#
Pyrene	mg/kg	0.1	Org-012	<0.1	1	0.2	0.1	67	92	#
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	1	0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	96	#
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	1	0.08	0.06	29	93	#
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	112	1	99	102	3	115	113

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2018	22/03/2018		[NT]	[NT]
Date analysed	-			[NT]	19	22/03/2018	22/03/2018		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-012	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-012	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-012	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-012	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-012	[NT]	19	0.1	0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-012	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-012	[NT]	19	0.2	0.2	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-012	[NT]	19	0.2	0.2	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-012	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-012	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-012	[NT]	19	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-012	[NT]	19	<0.05	0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	[NT]	19	0.2	0.2	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012	[NT]	19	95	94	1	[NT]	[NT]

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	187756-3
Date extracted	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Date analysed	-			23/03/2018	1	22/03/2018	22/03/2018		23/03/2018	23/03/2018
HCB	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	98	102
gamma-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	87	97
Heptachlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	90	93
delta-BHC	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	81	85
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	84	87
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	94	112
Dieldrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	100	113
Endrin	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	94	112
pp-DDD	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	82	84
Endosulfan II	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	80	91
Methoxychlor	mg/kg	0.1	Org-005	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	96	1	96	99	3	116	126

QUALITY CONTROL: Organochlorine Pesticides in soil					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2018	22/03/2018		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2018	23/03/2018		[NT]	[NT]
HCB	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
alpha-BHC	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
gamma-BHC	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
delta-BHC	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Heptachlor Epoxide	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
gamma-Chlordane	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dieldrin	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endrin	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan II	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endrin Aldehyde	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Methoxychlor	mg/kg	0.1	Org-005	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-005	[NT]	19	94	84	11	[NT]	[NT]

QUALITY CONTROL: Organophosphorus Pesticides						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	187756-3
Date extracted	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Date analysed	-			23/03/2018	1	22/03/2018	22/03/2018		23/03/2018	23/03/2018
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	90	112
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	76	87
Dimethoate	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	93	95
Fenitrothion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	98	101
Malathion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	73	91
Parathion	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	106	109
Ronnel	mg/kg	0.1	Org-008	<0.1	1	<0.1	<0.1	0	98	111
Surrogate TCMX	%		Org-008	96	1	96	99	3	110	106

QUALITY CONTROL: Organophosphorus Pesticides						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2018	22/03/2018		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2018	23/03/2018		[NT]	[NT]
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Bromophos-ethyl	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Diazinon	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dichlorvos	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Dimethoate	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Ethion	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Fenitrothion	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Malathion	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Parathion	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Ronnel	mg/kg	0.1	Org-008	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-008	[NT]	19	94	84	11	[NT]	[NT]

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	187756-3
Date extracted	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Date analysed	-			23/03/2018	1	22/03/2018	22/03/2018		23/03/2018	23/03/2018
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	100	105
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	96	1	96	99	3	110	106

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	22/03/2018	22/03/2018		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2018	23/03/2018		[NT]	[NT]
Aroclor 1016	mg/kg	0.1	Org-006	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-006	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-006	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-006	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-006	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-006	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1260	mg/kg	0.1	Org-006	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCLMX	%		Org-006	[NT]	19	94	84	11	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	187756-3
Date prepared	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Date analysed	-			23/03/2018	1	23/03/2018	23/03/2018		23/03/2018	23/03/2018
Arsenic	mg/kg	4	Metals-020	<4	1	<4	<4	0	109	90
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	4	4	0	102	91
Chromium	mg/kg	1	Metals-020	<1	1	10	11	10	108	91
Copper	mg/kg	1	Metals-020	<1	1	28	28	0	112	127
Lead	mg/kg	1	Metals-020	<1	1	46	46	0	104	110
Mercury	mg/kg	0.1	Metals-021	<0.1	1	<0.1	<0.1	0	101	100
Nickel	mg/kg	1	Metals-020	<1	1	7	8	13	105	96
Zinc	mg/kg	1	Metals-020	<1	1	100	110	10	102	#

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	19	22/03/2018	22/03/2018		[NT]	[NT]
Date analysed	-			[NT]	19	23/03/2018	23/03/2018		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	19	12	7	53	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	19	0.5	0.6	18	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	19	11	13	17	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	19	20	30	40	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	19	34	38	11	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	19	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	19	7	8	13	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	19	3300	2100	44	[NT]	[NT]

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	187756-3
Date prepared	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Date analysed	-			22/03/2018	1	22/03/2018	22/03/2018		22/03/2018	22/03/2018
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	1	<5	<5	0	99	95

QUALITY CONTROL: Misc Soil - Inorg						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	22/03/2018	22/03/2018		[NT]	[NT]
Date analysed	-			[NT]	11	22/03/2018	22/03/2018		[NT]	[NT]
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	[NT]	11	<5	<5	0	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date prepared	-			22/03/2018	[NT]	[NT]	[NT]	[NT]	22/03/2018	[NT]
Date analysed	-			22/03/2018	[NT]	[NT]	[NT]	[NT]	22/03/2018	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: CEC						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-4	[NT]
Date prepared	-			22/03/2018	14	22/03/2018	22/03/2018		22/03/2018	[NT]
Date analysed	-			22/03/2018	14	22/03/2018	22/03/2018		22/03/2018	[NT]
Exchangeable Ca	meq/100g	0.1	Metals-009	<0.1	14	19	19	0	104	[NT]
Exchangeable K	meq/100g	0.1	Metals-009	<0.1	14	0.5	0.5	0	114	[NT]
Exchangeable Mg	meq/100g	0.1	Metals-009	<0.1	14	2.5	2.5	0	104	[NT]
Exchangeable Na	meq/100g	0.1	Metals-009	<0.1	14	<0.1	<0.1	0	103	[NT]

Result Definitions

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

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

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

Laboratory Acceptance Criteria

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

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

Report Comments

PAH's in soil:
Percent recovery is not possible to report as the high concentration of analytes in the sample/s have caused interference.
svTRH (C10-C40) in Soil - # Percent recovery is not possible to report as the high concentration of analytes in the sample/s have caused interference.

Organochlorine Pesticides, OP and PCB in soil (sample 3,9) - PQL has been raised due to interference from analytes(other than those being tested) in the sample/s.

Acid Extractable metals in soil - # 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.

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Darlington Public School Contam			**To:**	Envirolab Services
Project No:	92277.00	**Sampler:**	Grant Russell		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Grant Russell	**Mob. Phone:**	0418 116 545	**Attn:**	Tania Notaras
Email:	Grant.Russell@Douglaspartners.com.au;			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - Soil, W - water)	Container Type (G - Glass, P - Plastic)	Analytes: Combo 8a	CEC	pH	TRH & BTEX	PAH	Combo 8			Hold	Notes/preservation
BH1 0.2	1	17/03/18	S	G/P	x	x	x							
BH2 0.2	2	17/03/18	S	G/P									x	
BH2 0.5	3	17/03/18	S	G/P	x									
BH3 0.2	4	17/03/18	S	G/P	x									
BH3 0.5	5	17/03/18	S	G/P									x	
BH4 0.2	6	17/03/18	S	G/P	x									
BH4 0.5	7	17/03/18	S	G/P									x	
BH4 1.0	8	17/03/18	S	G/P									x	
BH5 0.2	9	17/03/18	S	G/P	x									
BH5 0.5	10	17/03/18	S	G/P									x	
BH6 0.2	11	17/03/18	S	G/P	x									
BH7 0.2	12	17/03/18	S	G/P	x									
BH7 0.5	13	17/03/18	S	G/P									x	

[redacted] 182756 21/3/18 13:30 JC 12.3°C

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Water Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 20/03/2018	**Received by:** ELS / JC	21/3/18	13:30

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY

Project Name:	Darlington Public School Contam			**To:**	Envirolab Services
Project No:	92277.00	**Sampler:**	Grant Russell		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	Grant Russell	**Mob. Phone:**	0418 116 545	**Attn:**	Tania Notaras
Email:	Grant.Russell@Douglaspartners.com.au;			**Phone:**	(02) 9910 6200 Fax: (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

187756

Sample ID	Lab ID	Date Sampled	Sample Type: S - Soil, W - water	Container Type: G - Glass, P - Plastic	Analytes: Combo 8a	CEC	pH	TRH & BTEX	PAH	Combo 8			Hold	Notes/preservator
BH8.02	14	17/03/18	S	G/P	x	x	x							
BH8 0.5	15	17/03/18	S	G/P									x	
BH9 0.2	16	17/03/18	S	G/P	x									
BH9 0.5	17	17/03/18	S	G/P									x	
Powerpole	18	17/03/18	S	G/P				x	x					
D1	19	17/03/18	S	G/P						x				
TB	20	-	S	G				x						
TS	21	-	S	G				x						

Lab Report No: 187756

Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Water Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	LOC		**Transported to laboratory by:**		
Signed:		**Date & Time:** 20/03/2018	**Received by:** 21/3/18 JE		

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Grant Russell

Sample Login Details

Your reference	92277.00, Darlington Public School Contam
Envirolab Reference	187756
Date Sample Received	21/03/2018
Date Instructions Received	21/03/2018
Date Results Expected to be Reported	28/03/2018

Sample Condition

Samples received in appropriate condition for analysis	YES
No. of Samples Provided	21 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12.3
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

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

Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticidesin soil	Organophosphorus Pesticides	PCBsin Soil	Acid Extractable metalsin soil	Total Phenolics (as Phenol)	pH1:5 soil:water	CEC	Asbestos ID - soils	On Hold
BH1 0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
BH2 0.2												✓
BH2 0.5	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH3 0.2	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH3 0.5												✓
BH4 0.2	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH4 0.5												✓
BH4 1.0												✓
BH5 0.2	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH5 0.5												✓
BH6 0.2	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH7 0.2	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH7 0.5												✓
BH8 0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
BH8 0.5												✓
BH9 0.2	✓	✓	✓	✓	✓	✓	✓	✓			✓	
BH9 0.5												✓
Powerpole	✓	✓	✓									
D1	✓	✓	✓	✓	✓	✓	✓	✓				
TB	✓											
TS	✓											

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.

Appendix J

QA/QC

Appendix J
Data Quality Assurance and Quality Control Assessment

J1 Data Quality Indicators

Field and laboratory procedures were assessed against the following data quality indicators (DQIs):

Table J1: Data Quality Indicators

DQI	Performance Indicator	Acceptable Range
Precision		
Field considerations	SOPs appropriate and complied with	Field staff follow SOPs in the DP *Field Procedures Manual*
	field replicates	Precision average relative percent difference (RPD) result <5 times PQL, no limit; results >5 times PQL, 0% - 30%
Laboratory considerations	laboratory duplicates	Precision average RPD result <5 times PQL, no limit; results >5 times PQL, 0% - 50%
	laboratory-prepared volatile trip spikes	Recovery of 60-140%
Accuracy (bias)		
Field considerations	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*
Laboratory considerations	Analysis of:	
	laboratory-prepared volatile trip spikes	Recovery of 60-140%
	Laboratory-prepared trip blanks (field blanks)	<PQL
	method blanks (laboratory blanks)	Recovery of 60-140%
	matrix spikes	Recovery of 70-130% (inorganics); 60-140% (organics)
	matrix spike duplicates	Recovery of 70-130% (inorganics); 60-140% (organics); Recovery 70 “low” to 130% “high” indicates interference
	surrogate spikes	Recovery of 70-130% (inorganics); 60-140% (organics)
	laboratory control samples	Recovery of 70-130% (inorganics); 60-140% (organics)
Completeness		
Field considerations	All critical locations sampled	All critical locations sampled in accordance with the DQO’s (Appendix D)
	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*
	Experienced sampler	Experienced DP Environmental Engineer to conduct field work and sampling
	Documentation correct	Maintain COC documentation at all times
	Sample holding times complied with	Sample holding times complied with

DQI	Performance Indicator	Acceptable Range
Laboratory considerations	All critical samples analysed according to DQO's	All critical locations analysed in accordance with the DQO's
	Appropriate methods and PQLs	Appropriate methods and PQLs have been used by the contract laboratory
	Sample documentation complete	Maintain COC documentation at all times
Comparability		
Field considerations	Same SOPs used on each occasion	Field staff to follow SOPs in the DP *Field Procedures Manual*
	Experienced sampler	Experienced DP Environmental Scientist/Engineer to conduct field work and sampling
	Same types of samples collected	Same types of samples collected
Laboratory considerations	Sample analytical methods used (including clean-up)	Methods to be NATA accredited
	Sample PQLs (justify/quantify if different)	Consistent PQLs to be used
	Same laboratories (justify/quantify if different)	Same analytical laboratory for primary samples to be used
Representativeness		
Field considerations	Appropriate media sampled according to DQO's (Appendix D)	Appropriate media sampled according to DQO's (Appendix D)
	All media identified in DQO's sampled	All media identified in DQO's sampled
Laboratory considerations	All samples analysed according to DQO's	All samples analysed according to DQO's

Notes to Table 1: SOP – Standard Operating Procedure
DQO – Data Quality Objectives (Appendix D)

J2 Field Quality Assurance and Quality Control

The field QC procedures for sampling as prescribed in the standard operating procedures (SOPs) in the Douglas Partners *Field Procedures Manual* were followed at all times during the assessment. All sample locations and media were in accordance with the DQO (i.e. as per scope of work in DP's proposal).

J2.1 Sampling Team

Sampling was undertaken by an experienced DP Environmental Scientist.

J2.2 Sample Collection and Weather Conditions

Sample collection procedures and dispatch are reported in body of the report. Sampling was undertaken during sunny and hot conditions.

J2.3 Logs

Logs for each soil sampling location were recorded in the field. The individual samples were recorded on the field logs along with the sample identity, location, depth, initials of sampler, duplicate locations, duplicate type and site observations. Logs are presented in Appendix H.

J2.4 Chain-of-Custody

Chain-of-Custody information was recorded on the Chain-of-Custody (COC) sheets and accompanied samples to the analytical laboratory. Signed copies of COCs are presented in Appendix J, prior to the laboratory certificates.

J2.5 Sample Splitting Techniques

Replicate samples were collected in the field as a measure of precision of the results. Field replicates samples for soil were collected from the same location and an identical depth to the primary sample. Equal portions of the primary sample were placed into the sampling Kars and sealed. The sample was not homogenised in a bowl to prevent the loss of volatiles from the soil. Replicate samples were labelled with a DP identification number, recorded on DP logs, so as to conceal their relationship to their primary sample from the analysing laboratory.

J2.6 Duplicate Frequency

Field sampling comprised intra-laboratory duplicate sampling, at a rate of approximately one duplicate sample for every ten primary samples.

J2.7 Relative Percentage Difference

A measure of the consistency of results for field samples is derived by the calculation of relative percentage differences (RPDs) for duplicate samples. RPDs have only been considered where a concentration is greater than five times the practical quantitation limit (PQL).

J2.7.1 Intra-Laboratory Replicate Analysis

Replicates were tested to assess data 'precision' and the reproducibility within the primary laboratory (Envirolab Pty Ltd) as a measure of consistency of sampling techniques. One replicate sample was analysed. The Relative Percent Difference (RPD) between replicate results is used as a measure of laboratory reproducibility and is given by the following:

$$\text{RPD} = \frac{(\text{Replicate result } 1 - \text{Replicate result } 2)}{(\text{Replicate result } 1 + \text{Replicate result } 2)/2} \text{ x } 100$$

The RPD can have a value between 0% and 200%. An RPD data quality objective of up to 30% is considered to be within the acceptable range.

The comparative results of analysis between primary and duplicate samples are summarised in the table below. Where one or both results were below the PQL, an RPD was not calculated.

Table J2: RPD Results

Sample	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn
BH9/0.2	8	<0.4	17	21	76	<0.1	6	2100
D1	12	0.5	11	20	34	<0.1	7	3300
Difference	4	-	6	1	42	-	1	1200
RPD (%)	40	-	42.9	4.9	76.36	-	15.38	44.4

Notes: Bold RPD >30
Concentration of either paired duplicated not greater than five times PQL
D1 = Inter-laboratory duplicate

All RPD values were within the acceptable range of ± 30 with the exception of:

- Arsenic in inter-laboratory duplicate pair BH9/0.2 and D1;
- Chromium in inter-laboratory duplicate pair BH9/0.2 and D1;
- Lead in inter-laboratory duplicate pair BH9/0.2 and D1;
- Zinc in inter-laboratory duplicate pair BH9/0.2 and D1;

The exceedances are considered either likely due the low levels of metals detected and /or to the heterogeneity of the soil. The exceedances are not considered to affect the results of the investigation. Overall, the intra-laboratory and inter-laboratory comparisons indicate that the sampling technique was consistent and repeatable and therefore acceptable precision was achieved.

J3 Laboratory Quality Assurance and Quality Control

Envirolab Services was used as the primary laboratory. Appropriate methods and PQLs were used by the laboratory. Sample methods were NATA accredited (noting the exception for fibrous asbestos (FA) and asbestos fines (AF) quantification to 0.001% w/w).

J3.1 Surrogate Spike

This sample is prepared by adding a known amount of surrogate, which behaves similarly to the analyte, prior to analysis to each sample. The recovery result indicates the proportion of the known concentration of the surrogate that is detected during analysis and is used to assess data 'accuracy'. Results within acceptance limits indicate that the extraction technique was effective.

J3.2 Reference and Daily Check Sample Results – Laboratory Control Sample (LCS)

This sample comprises spiking either a standard reference material or a control matrix (such as a blank of sand or water) with a known concentration of specific analytes. The LCS is then analysed and results compared against each other to determine how the laboratory has performed with regard to sample preparation and analytical procedure and is used to assess data 'accuracy'. LCSs are analysed at a frequency of one in 20, with a minimum of one analysed per batch.

J3.3 Laboratory Duplicate Results

These are additional portions of a sample which are analysed in exactly the same manner as all other samples and is used to assess data 'precision'. The laboratory acceptance criteria for duplicate samples are: in cases where the level is <5Xpql - any RPD is acceptable; and in cases where the level is >5xPQL - 0-50% RPD is acceptable.

J3.4 Laboratory Blank Results

The laboratory blank, sometimes referred to as the method blank or reagent blank is the sample prepared and analysed at the beginning of every analytical run, following calibration of the analytical apparatus and is used to assess data 'accuracy'. This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, it can be determined by processing solvents and reagents in exactly the same manner as for samples. Laboratory blanks are analysed at a frequency of 1 in 20, with a minimum of one per batch.

J3.5 Matrix Spike

This is a sample duplicate prepared by adding a known amount of analyte prior to analysis, and then treated exactly the same as all other samples. The recovery result indicates the proportion of the known concentration of the analyte that is detected during analysis and is used to assess data 'accuracy'. The laboratory acceptance criteria for matrix spike samples are generally 70 - 130% for inorganic/metals; and 60 - 140% for organics; and 10 - 140% for SVOC and speciated phenols.

J3.6 Results of Laboratory QC

The laboratory QC for surrogate spikes, LCS, laboratory duplicate results, laboratory blanks and matrix spikes results are reported in the laboratory certificate of analysis.

The laboratory quality control samples were within the laboratory acceptance criteria. It is considered that an acceptable level of laboratory precision and accuracy was achieved and that surrogate spikes, LCS, laboratory duplicate results, laboratory blanks and matrix spike results were of an acceptable level overall. On the basis of this assessment, the laboratory data set is considered to have complied with the DQIs.

J3.7 Overall Assessment of QA/QC

Specific limits associated with sample handling and laboratory QA/QC was assessed against the DQIs and a summary of compliance is presented in the following table.

Table J5: Data Quality Indicators

DQI	Performance Indicator	Acceptable Range	Compliance
Precision			
Field considerations	SOPs appropriate and complied with	Field staff follow SOPs in the DP *Field Procedures Manual*	C
	field replicates	Precision average relative percent difference (RPD) result <5 times PQL, no limit; results >5 times PQL, 0% - 30%	C
Laboratory considerations	laboratory duplicates	Precision average RPD result <5 times PQL, no limit; results >5 times PQL, 0% - 50%	C
	laboratory-prepared volatile trip spikes	Recovery of 60-140%	C
Accuracy (bias)			
Field considerations	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*	C
Laboratory considerations	Analysis of:		
	laboratory-prepared volatile trip spikes	Recovery of 60-140%	C
	laboratory-prepared trip blanks (field blanks)	<PQL	C
	method blanks (laboratory blanks)	Recovery of 60-140%	C
	matrix spikes	Recovery of 70-130% (inorganics); 60-140% (organics)	C
	matrix spike duplicates	Recovery of 70-130% (inorganics); 60-140% (organics); Recovery 70 “low” to 130% “high” indicates interference	C
	surrogate spikes	Recovery of 70-130% (inorganics); 60-140% (organics)	C
	laboratory control samples	Recovery of 70-130% (inorganics); 60-140% (organics)	C
Completeness			
Field considerations	All critical locations sampled	All critical locations sampled in accordance with the SAQP	C
	SOPs appropriate and complied with	Field staff to follow SOPs in the DP *Field Procedures Manual*	C
	Experienced sampler	Experienced DP Environmental Scientist/Engineer to conduct field work and sampling	C
	Documentation correct	Maintain COC documentation at all times	C
	Sample holding times complied with	Sample holding times complied with	C

DQI	Performance Indicator	Acceptable Range	Compliance
Laboratory considerations	All critical samples analysed according to SAQP	All critical locations analysed in accordance with the SAQP	C
	Appropriate methods and PQLs	Appropriate methods and PQLs have been used by the contract laboratory	C
	Sample documentation complete	Maintain COC documentation at all times	C
Comparability			
Field considerations	Same SOPs used on each occasion	Field staff to follow SOPs in the DP *Field Procedures Manual*	C
	Experienced sampler	Experienced DP Environmental Scientist/Engineer to conduct field work and sampling	C
	Same types of samples collected (filtered)	Field filtering for metals	NA
Laboratory considerations	Sample analytical methods used (including clean-up)	Methods to be NATA accredited	C
	Sample PQLs (justify/quantify if different)	Consistent PQLs to be used	C
	Same laboratories (justify/quantify if different)	Same analytical laboratory for primary samples to be used	C
Representativeness			
Field considerations	Appropriate media sampled according to DQOs	Appropriate media sampled according to DQOs	C
	All media identified in DQOs sampled	All media identified in DQOs sampled	C
Laboratory considerations	All samples analysed according to DQOs	All samples analysed according to DQOs	C

Notes to Table 5:
C – Compliance
PC – Partial Compliance
NC – Non-Compliance
NA – Not Applicable
SOP – Standard Operating Procedure
DQO – Data Quality Objectives

A review of the adopted QA/QC procedures and results indicates that the DQIs have generally been met with compliance and a minor partial-compliance. On this basis, the sampling and laboratory methods used during the investigation were found to meet DQOs for this project.

Appendix K

About this Report

About this Report

Douglas Partners

Introduction

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

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

Copyright

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 2007. The terms used to describe rock strength are as follows:

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

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

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

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

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and longer sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

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

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

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

Stratification Spacing

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

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

Sampling Methods

Douglas Partners

Sampling

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

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

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

Test Pits

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

Large Diameter Augers

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

Continuous Spiral Flight Augers

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

Non-core Rotary Drilling

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

Continuous Core Drilling

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

Standard Penetration Tests

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

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

The test results are reported in the following form.

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

  4,6,7
  N=13

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

  15, 30/40 mm

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

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

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

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

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726-1993, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

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

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

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

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

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

Cohesive Soils

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

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

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

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

Soil Origin

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

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.

Symbols & Abbreviations

Douglas Partners

Introduction

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

Drilling or Excavation Methods

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

Water

▷	Water seep
▽	Water level

Sampling and Testing

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

Description of Defects in Rock

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

Defect Type

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

Orientation

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

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

Coating or Infilling Term

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

Coating Descriptor

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

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

Symbols & Abbreviations

Graphic Symbols for Soil and Rock

General


Asphalt


Road base

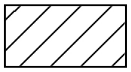

Concrete


Filling

Soils


Topsoil


Peat

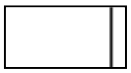

Clay


Silty clay

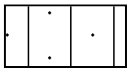

Sandy clay


Gravelly clay


Shaly clay


Silt


Clayey silt


Sandy silt


Sand


Clayey sand


Silty sand


Gravel


Sandy gravel


Cobbles, boulders

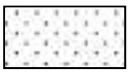

Talus

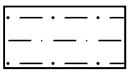
Sedimentary Rocks


Boulder conglomerate

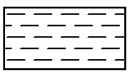

Conglomerate


Conglomeratic sandstone

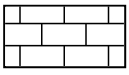

Sandstone


Siltstone

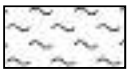

Laminite


Mudstone, claystone, shale

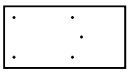

Coal


Limestone

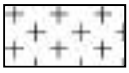
Metamorphic Rocks


Slate, phyllite, schist

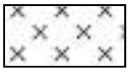

Gneiss

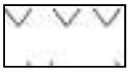

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry