



Douglas Partners

Geotechnics | Environment | Groundwater

Preliminary Site Investigation

Proposed Campus Improvement Program
Camperdown and Darlington Campus,
University of Sydney

Prepared for
University of Sydney – Campus Infrastructure and Services

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List of Acronyms

Acronym	Definition
AEC	Area of Environmental Concern
AHD	Australian Height Datum
ASS	Acid Sulphate Soil
AST	Above Ground Storage Tank
bgl	Below Ground Level
BMRI	Brain & Mind Research Institute
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CIP	Campus Improvement Program
CIS	Campus Infrastructure and Services
CLM Act	Contaminated Land Management Act
DP	Douglas Partners Pty Ltd
D.P.	Deposited Plan
DPI	Department of Planning and Infrastructure
DSI	Detailed Site Investigation
ECHTEC	Eastern Collaborative Health & Training Education Centre
EIS	Environmental Impact Study
EPA	Environment Protection Authority
GIL	Groundwater Investigation Level
LEP	Local Environment Plan
LGA	Local Government Area
NOW	NSW Office of Water
NSW	New South Wales
OCP	Organochlorine Pesticides
OH&S	Occupational Health & Safety
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
POEO Act	Protection of the Environment Operations Act
PSI	Preliminary Site Investigation
SEPP	State Environment Planning Policy
SSD	State Significant Development
SSDA	State Significant Development Application
TPH	Total Petroleum Hydrocarbons

Executive Summary

This report presents the results of a preliminary site investigation (PSI) undertaken for the proposed campus improvement program (CIP) at the University of Sydney, Camperdown and Darlington Campuses. The CIP includes the identification of future precincts for coordinated and collaborative growth through new developments, building refurbishments, and ancillary infrastructure upgrades on an annual program for each year of the 2014-2020 period.

The objective of the PSI is to address the Environmental Impact Statement (EIS) requirement for a phase 1 environmental assessment (now referred to as a PSI under current national guidelines). More specifically the objectives of the PSI were to assess the potential for contamination, based on past and present site uses, identify potential areas of environmental concern (AEC), and to comment on the need for further investigation (if required).

The scope of works included a site walkover, review of existing registers, review of previous reports applicable to the site, examination of mapping information, and a review of site history records such as aerial photographs.

The site is comprised of two portions of the university, namely the Camperdown Campus and the Darlington Campus. At the time of the investigation the site was used for mixed purposes, including a teaching facility, open space/sports grounds and student accommodation.

The areas of environmental concern identified during the site history review, the processing of anecdotal information and the site inspection are as follows:

- The University of Sydney holds chemical licenses for the storage and use of a variety of chemical, for experimental purposes. There is a low potential for chemicals to inadvertently enter service pipes and surficial soils;
- The extent of fill across the site used for site formation processes and levelling appears to be extensive on the basis of previous investigations. It is highly likely that fill would be prevalent beneath sports ovals in particular. Previous investigation has identified the presence of fill across much of the site, to depths of up to 9m bgl. The fill has been found to be variable in depth and composition (including some areas containing asbestos, slag and ash);
- Potential for asbestos to be present in surface soils as a result of the demolition of former structures;
- The site inspection and hazardous materials registers have identified hazardous building materials (including asbestos and lead based paint) in many of the older buildings associated with the target precincts;
- Site history indicates that a large part of the Camperdown campus was previously used for farming. It is therefore possible that contamination from the use of pesticides and fertilisers could remain on the site; and
- Parts of the site have been used in the past, either as part of the university activities or as individual operators prior to university acquisition, for commercial purposes, including retail. The nature of some of these activities probably required the use of chemicals of some type.

Based on the outcomes of this PSI, the identified contamination risks are not considered to pose a restriction on the future land uses envisaged by the SSDA, subject to implementing the following recommendations:

- The storage and disposal practices for all dangerous goods within the precinct areas should be reviewed for compliance with current Dangerous Goods codes and standards. If found non-compliant, measures should be implemented to work towards compliance;
- All recommendations provided in the hazardous building materials registers should be implemented as current management measures and/or during demolition, as appropriate. The removal of any hazardous building materials from the site must be conducted in accordance with the appropriate WorkCover codes and standards;
- A detailed site inspection (DSI) should be carried out prior to any future redevelopment works to investigate the areas of environmental concern identified in this report. It is recommended that the DSI be focussed on each individual Precinct (or areas within each Precinct) as they are planned for redevelopment; and
- Any soil to be removed off site must be assessed against the NSW DECCW *Waste Classification Guidelines* (2008, updated 2009) prior to disposal in order to inform disposal options.

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Preliminary Site Investigation

Proposed Campus Improvement Program

Camperdown and Darlington Campus, University of Sydney

1. Introduction

1.1 Overview

This report presents the results of a preliminary site investigation (PSI) undertaken for the proposed campus improvement program (CIP) at the University of Sydney, Camperdown and Darlington Campuses. The investigation was commissioned by Mr Stephane Kerr of the University of Sydney Campus Infrastructure and Services (CIS), and was undertaken in accordance with Douglas Partners' proposal dated 23 October 2013.

The CIP (2014-2020) is aimed at identifying and planning for priority faculty/school/administrative and service concentrations, and addressing development, access, infrastructure, passive and active open space priorities for the above-mentioned 7-year period. The CIP will include identification of future precincts for coordinated and collaborative growth through new developments, building refurbishments, and ancillary infrastructure upgrades on an annual program for each year of the 2014-2020 period.

Once the CIP is formally endorsed by the University Senate, it will be lodged as a Stage 1 Concept Proposal as State Significant Development (SSD) with the NSW Department of Planning and Infrastructure (DPI) for determination. In this regard, the University has written to the Director-General of the DPI seeking his agreement that the CIP qualifies as a 'State Significant Development Application' (SSDA), and Director-General Requirements, being the list of documentation required by relevant Government agencies to be contained in the formal CIP proposal.

The DoPI has advised that the CIP does qualify as a SSD project and has advised that the Environmental Impact Statement (EIS) will need to address the statutory provisions applying to the concept proposal contained in various documents, including SEPP 55. The EIS therefore requires a Phase 1 Environmental Assessment, conducted at desk-top level, to address the relevant provisions of SEPP 55. Further detailed analysis may be required with later detailed applications, and (if so) would be undertaken by the University at that stage.

The objective of this PSI is therefore to address the EIS requirement for a phase 1 environmental assessment (now referred to as a PSI under current national guidelines). More specifically the objectives of the PSI were to assess the potential for contamination, based on past and present site uses, identify potential areas of environmental concern (AEC), and to comment on the need for further investigation (if required).

1.2 Site Identification

The CIP framework identifies the following key priorities earmarked for the CIP 2014-2020 period. The PSI focusses on these Precincts which are also shown on the University Precincts Plan in Appendix A.

- PRECINCT A – DARLINGTON ROAD (Regiment to Maze Crescent car park): Faculty of Arts & Social Sciences, student accommodation, library, retail, conference, and parking facilities;
- PRECINCT B – CITY ROAD (Wentworth Building to International House);
- PRECINCT C – ENGINEERING DARLINGTON: Upgrade of the existing Engineering precinct bounded by Shepherd Street, Cleveland Street (Shepherd Street car park), and east edge of the campus Cadigal Green;
- PRECINCT D – HEALTH SCIENCES comprising the Blackburn-Bosch group of buildings for collocation of Nursing and Midwifery, Pharmacy, and Dentistry;
- PRECINCT E – LIFE SCIENCES and GRANDSTAND (Vet science precinct McMaster to Gunn); and
- PRECINCT F – CULTURAL PRECINCT (including the McCleay building).

The University has identified the Precincts as being located within Lot 1 in deposited plan 179963, and Lot 1 in consolidated title 790620. For the purposes of this report the term “the site” refers to the combined Precincts listed above.

The site is located in the local government area (LGA) of City of Sydney Council. The abovementioned lot areas are 31.4 hectares (ha) and 14.29 ha respectively.

The University is zoned SP2 Infrastructure 1 in the Sydney Local Environmental Plan 2012.

2. Scope of Works

The scope of works in conducting the PSI was as follows:

- A site walkover and observe current site features, site activities and any indications of a potential for contamination;
- Review of readily available site history including current and historic title and deposited plans, previous reports as provided by the University, historical aerial photographs, databases held under the *Contaminated Land Management Act 1997* (CLM Act) and *Protection of the Environment Operations Act 1997* (POEO Act), WorkCover NSW records, and Council Section 149 (2) and (5) certificates;
- Review of published maps including acid sulphate soil potential, geological and topographical maps; a review of groundwater bores registered with the NSW Office of Water and any other relevant information provided by the client; and
- Completion of this PSI report prepared in general accordance with EPA endorsed guidelines. The report provides an outline of the methodology, results and discussion of the site inspection

and potential contamination status of the site. The report also provides recommendations in relation to the findings.

This report was prepared in general accordance with *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*, NSW EPA, reprinted August 2011.

The PSI also addresses Clause 6(2) of the State Environmental Planning Policy No 55—Remediation of Land (SEPP55) and Clause 3.4.1 (Stage 1 – Preliminary Investigation) of the Managing Land Contamination - Planning Guidelines, SEPP 55—Remediation of Land.

3. Site Information

3.1 Site Description

The site is comprised of two portions of the university, namely the Camperdown Campus and the Darlington Campus. The Camperdown Campus is bounded by Parramatta Road to the north, Victoria Park to the east, City Road and Carillon Avenue to the south and Royal Prince Alfred Hospital and Missenden Road to the west. The Darlington Campus is bounded by City Road to the north, Shepherd Street to the east, Abercrombie Street to the south and Darlington Road to the west.

At the time of the investigation the site was used for mixed purposes, including as a teaching facility, open space/sports grounds and student accommodation.

3.2 Surrounding Land Use

The surrounding land use to the university as a whole is as follows:

- North: Parramatta Road to the north, followed by a mixture of residential and commercial / retail premises;
- East: Victoria Park and a mixture of residential and commercial properties;
- South: Residential and commercial properties;
- West: Royal Prince Alfred Hospital and associated facilities and Missenden Road. Some commercial properties are also present.

4. Previous Reports

A number of reports have previously been conducted across the Sydney University site. A summary of relevant reports (as made available to Douglas Partners) is provided below:

WSP Environment and Energy. Phase 1 Environmental Audit The University of Sydney. Oval Number 2 Site, Proposed New Grandstand and Cricket Training Facility, Camperdown Campus, NSW. Ref: 00011142 December 2010

- Conducted to assist in submission of a development application (DA) for a proposed new sports hall and grandstand facilities;
- At the time of the assessment the proposed grandstand was to comprise 1500 seats undercover, 3 indoor cricket practice pitches, function facility with associated kitchen at level 1, undercroft storerooms for sports and ground staff, undercroft change rooms and associated amenities including a canteen, and new sports lighting;
- Approximate area of the grandstand was 1400 m². At time of investigation was surrounded by perimeter fences, garden beds and a pedestrian pathway. At that time the Round House, Bruce Ross House and Chaplaincy were all identified for demolition;
- The topography was relatively flat. Vegetation included the lawn area and small to medium sized shrubs around the perimeter;
- The Round House was a general workshop for the storage and maintenance of equipment. A hardstand concrete surface surrounded the building for the storage of other items;
- To the south of the building was a 2,000L diesel tank, a 250L flammable liquid cabinet, a 250L toxic cabinet labelled for pesticide/herbicide storage, and a chemical spraying trailer;
- An underground concrete pesticide/herbicide capture and dilution tank was present along the western Round House site boundary. It was understood that vehicles and equipment involved in distributing pesticide/herbicide were washed down on the concrete access road in the vicinity of the tank after use;
- Observations made at the time indicated that scarring of the grass was noted on the south western oval perimeter. However, overall vegetation appeared to be in good condition;
- Levelling may have occurred prior to 1930. A low embankment along the south western perimeter of the oval had been created prior to 1978;
- Contamination sources identified included uncontrolled fill, storage of chemicals and the potential to enter surficial soils prior to the emplacement of hardstand in 1994, and the potential for contaminants to enter into surficial soils through cracks in the hardstand, and leakage of chemicals from the capture and dilution tank or runoff; and
- The report recommended a Phase 2 contamination assessment be carried out prior to construction.

Douglas Partners comment: The report applies to Precinct E.

Aurecon. Geotechnical Investigation Report. SUSF Facilities – New Gymnasium and Sports Stand. University of Sydney. Ref: 208877 3 December 2010 Rev 1.

- Two bores were drilled as part of the investigation;
- Fill was observed to depths 6.0 m and 6.1 m below ground level (bgl). Considered likely to be uncontrolled fill. Was identified as silty/sandy clay with gravel;
- Anecdotal evidence from ground staff suggested fill may have come from the demolition of old buildings; and
- Groundwater was encountered at 10.9 m and 5.5 m bgl.

Douglas Partners comment: Applies to Precinct E.

Coffey Geotechnics. Geotechnical Investigation Report. University of Sydney Abercrombie Precinct Development. University of Sydney. Ref:GEOTLCOV24503AA-AF 18 May 2012.

- Investigation conducted for the proposed Abercrombie Precinct development on the Darlington Campus;
- The proposed development was to include the procurement and closure of Rose Street and Boundary Lane, demolition of existing university buildings, bulk excavation of basement car park and other underground storage areas, construction of the Business School Education building and construction of internal roadways/pathways;
- The excavation was to be up to approximately 10 m depth bgl;
- Seventeen boreholes were drilled, two standpipes were installed for groundwater monitoring;
- Fill was observed to contain road pavement materials to depths up to 1.5 m bgl. Under the fill was residual silty clay and clay, followed by weathered shale; and
- Groundwater was observed at depths 2.4 to 7.9 m bgl.

Douglas Partners comment: Located behind Precinct A

Jeffery and Katauskas Pty Ltd (J & K). Report to the University of Sydney on Geotechnical Investigation for Proposed St Paul's College Buildings at St Pauls College, University of Sydney, Camperdown NSW. Ref: 24782S2rpt 5 May 2011.

- Conducted for the proposed construction of residential and common facilities buildings located on the northern portion of the property. Included the construction of a lower basement floor level of RL 30.2 m;
- Twelve boreholes were drilled across the site;
- Fill was encountered to depths up to 9.0 m bgl, with the thickness of fill being greatest in the eastern portion of the site. Fill generally comprised silty sand, silty clay, sandstone gravel and gravelly sand fill. The fill was underlain by silty clay and shale bedrock; and
- Groundwater was encountered at two locations at depths 7.0 m and 14.2 m bgl.

Douglas Partners comment: Located to the south east of Precinct D

Environmental Investigation Services (EIS). Report to the University of Sydney on Stage 1 and Preliminary Stage 2 Environmental Site Assessment for Proposed St Paul's College Buildings at University of Sydney Camperdown NSW. Ref: E24807Krpt May 2011.

- Investigation was conducted to assess the potential risk for significant soil contamination;
- Historical information indicated that the site was agricultural land until around 1855 when it was acquired by the university. Construction of the college began a year later;
- Contamination could potentially be from imported fill and historical activities such as the use of pesticides for gardening or agriculture;
- Contaminants of potential concern (COPC) were considered to be heavy metals, total petroleum hydrocarbons (TPH), BTEX (Benzene, Toluene, Ethyl Benzene, Xylene), Polycyclic Aromatic

Hydrocarbons (PAH), Organochlorine Pesticides (OCP), Organophosphate Pesticides (OPP), Polychlorinated Biphenyls (PCB) and asbestos; and

- Soil samples were collected and analysed at a laboratory. Results indicated that no elevated concentrations of COPC were identified in any of the samples.

Douglas Partners comment: Located to the south east of Precinct D

J & K. Report to the University of Sydney on Geotechnical Investigation for Proposed AIN Building at University of Sydney, Camperdown NSW. Ref:24782S1rpt 15 April 2011.

- The investigation was conducted for the proposed Australian Institute of Nanoscience building;
- The lowest basement floor level was proposed to be at RL 20 m AHD. The project was to involve excavation up to almost 12 m depth, implementation of a soil retaining system and construction of a four storey building over the basement level;
- Eight boreholes were drilled and found to contain fill (generally silty clay, as well as gravelly sand fill) ranging from 0.05 m to 1.9 m. The fill was underlain by silty clay and shale bedrock; and
- Groundwater was encountered in a standpipe at 5.3 m bgl. Groundwater was observed at depths between 2.5 m and 4.9 m bgl.

Douglas Partners comment: Located to the east of Precinct D

EIS. Report to the University of Sydney on Stage 1 and Preliminary Stage 2 Environmental Site Assessment for Proposed AIN Building at University of Sydney, Camperdown NSW. Ref: E24782Krpt May 2011.

- The report was conducted to assess the risk of soil contamination;
- Historical information indicated that the site was agricultural land until around 1855 when it was acquired by the university. Construction of the college began a year later;
- Contamination could potentially be from imported fill and historical activities such as the use of pesticides for gardening or agriculture;
- COPC were considered to be heavy metals, TPH, BTEX, PAH, OCP, OPP, PCB and asbestos; and
- Soil samples were collected and analysed at a laboratory. Results indicated that no elevated concentrations of COPC were identified in any of the samples.

Douglas Partners comment: Located to east of Precinct D

Douglas Partners (DP) Pty Ltd. Report on Phase 1 Contamination Assessment Proposed ARC Development University of Sydney. Ref: 44914 July 2007.

- The investigation was conducted for the proposed development of a Medical Research complex with a series of four and five storey buildings and 1 level of underground parking;
- The aim was to investigate the potential for on-site soil and groundwater contamination and provide an indication on the level of contamination at the site;
- Four test bores were drilled and two groundwater monitoring wells were installed for geotechnical purposes;

- Fill varied in depth from 0.6 m to depths in excess of 6.0 m bgl. Fill contained some ash, slag, bricks and ironstone. Fibre cement fragments were identified at one location;
- Silty clay, clay, shaly clay and shale were encountered beneath the fill;
- Free groundwater was observed at one location at 4.8 m bgl;
- Lead and benzo(a)pyrene exceedences were identified at one location. The lead was considered a hotspot. Ash and slag were also noted at this location;
- The potential for asbestos could not be discounted;
- Zinc marginally exceeded the groundwater investigation level (GIL) in groundwater, however it was considered to be indicative of background levels. All other contaminants in groundwater were below the adopted GIL;
- Acid sulphate soil testing was conducted and it was found that there was the potential for ASS to occur below the water table; and
- All provisional waste classification results at the time of the assessment were classified as solid waste or asbestos contaminated waste (under the former guidelines).

Douglas Partners comment: Located to north of Precinct D

J & K. Report to APP Corporation Pty Ltd on Geotechnical Investigation for Foundations of Proposed 3 TMRI Machine at BMRI Building F, University of Sydney, 100 Mallett Street, Camperdown NSW. Ref: 20593Vrpt 17 October 2006.

- The investigation was conducted for foundations of the proposed Siemens 3 Tesla MRI (3TMRI) machine in the Brain and Mind Research Institute (BMRI);
- One borehole was drilled;
- Fill was encountered to 0.7 m bgl, followed by residual silty clay and shale bedrock at 1.2 m bgl; and
- Groundwater was not encountered during the investigation.

Douglas Partners comment: Located off site to west

Coffey. Geotechnical Investigation and Report for the IXL Garage Refurbishments, University of Sydney. Ref: GEOTLCOV24503AB-AA 5 April 2012.

- Investigation was conducted to assess existing building footprints and foundation conditions;
- Five test pits were excavated using hand tools and a post hole digger;
- Test pits encountered concrete or asphalt overlying fill. Fill consisted of a combination of clay, sand and gravel. Underlying the fill was residual soil consisting of either silty clay or clay; and
- No groundwater was observed in the test pits.

Douglas Partners comment: Located to the south of Precinct A

Coffey and Hollingsworth Consulting Engineers. Taylor-Thomson-Whitting Foundation Investigation for Aeronautical and Mechanical Engineering Buildings, University of Sydney. Ref: 3287 29 October 1970.

- To determine soil, rock and groundwater conditions;
- Twenty test pits were excavated, twenty one boreholes were drilled to a maximum depth of 12.5 m bgl;
- Fill comprised bitumen and roadbase with a mix of sandy clay and clay with brick, concrete blocks, sandstone cobbles and boulders, charcoal, pieces of metal and timber. Fill depth ranged from approximately 0.3 m to 1.8 m bgl. The fill was thought to have been from previous construction and subsequent demolition of structures at the site; and
- Fill was underlain by residual clay, shale then sandstone bedrock. Groundwater was not encountered during the investigation.

Douglas Partners comment: Applies to Precinct C

DP. Response to GHD Comments Proposed Faculty of Law Building Project, University of Sydney Eastern Avenue, Camperdown Campus. Ref: 37866A 22 July 2005.

- Comments on preliminary contamination assessment conducted by DP;
- Elevated PAH identified on site likely to be due to the presence of slag in the fill; and
- Possible localised asbestos, but was to be confirmed by an OH&S Consultant.

Douglas Partners comment: To the south east of Precinct F

DP. Report on Geotechnical Investigation Proposed Law School Building Eastern Avenue University of Sydney Camperdown. Ref: 37193 August 2004.

- Conducted for proposed multi-storey law school, including two levels of basement car parking;
- Five test bores were drilled, two standpipes were installed;
- Fill comprised sand, clay and building rubble fill to approximately 1.7 m overlying stiff and very stiff residual clays, into hard shaly clays then extremely to very low strength shale; and
- No free groundwater was observed during drilling. Standing water levels were later found to be between R.L. 26.5 and 26.7.

Douglas Partners comment: To south east of Precinct F

GHD. University of Sydney Central Building Geotechnical Investigation Report. Ref: 21/12694/--/AV196.doc July 2004.

- Conducted for the proposed central building development comprising the construction of a square six-storey building, tower and associated footbridges;
- Nine boreholes were drilled to near refusal on weathered bedrock at depths between 4.9 m and 7.2 m bgl. Bores were continued to depths between 8.3 and 10.4 m bgl;
- Standpipes were installed in three of the boreholes;

- Fill encountered typically comprised gravelly sand or sandy clay with fragments of glass, brick concrete and tile to between 0.75 m and 1.0 m bgl. Asbestos was identified at one location; and
- Fill was underlain by residual clay between 1.5 and 2.5 m bgl, and weathered bedrock from 2.5 m to 5.5 m bgl.

Douglas Partners comment: Applies to Precinct B

DP. Report on Geotechnical Investigation Darlington Public Domain Works University of Sydney. Ref: 43446 November 2005.

- Proposed construction of two wetlands and a new footbridge, associated landscaping and pavements;
- Five test bores conducted to a maximum depth of 5.5 m bgl;
- Pavement was underlain by fill to depths between 0.5 m and 0.9 m bgl, clay and shale; and
- Free groundwater was encountered at one location at 3.9 m depth.

Douglas Partners comment: Enclosed by Precincts A, B and C

DP. Report on Geotechnical Investigation Proposed ECHTEC Building Sydney University Camperdown. Ref: 35807A July 2003.

- For the proposed Eastern Collaborative Health and Training Education Centre (ECHTEC) building. The building was to be four storey including a single basement level, adjacent to the Blackburn and Bosch buildings;
- Two bores were drilled to depths of 4.14 m and 4.2 m bgl. One bore was advanced into bedrock to 8.0 m bgl;
- Pavement (bituminous concrete) was observed followed by fill (to depths 0.4 m to 0.7 m bgl), overlying clay to depths of 2.5m bgl. Below was shaly clay with some iron cemented bands to approximately 4 m depth, overlying weathered siltstone; and
- No free groundwater was observed during drilling.

Douglas Partners comment: Applies to Precinct D

Coffey. The University of Sydney – Abercrombie Precinct Development Geotechnical Desk Study. Ref: GEOTLCOV23415AA-AC 19 December 2007.

- Conducted for the proposed development of five new buildings, each to have one level of basement parking;
- Excavations were to extend to R.L. 21.7 m, requiring the excavation of fill; and
- Report recommended that drilling be conducted prior to development, including the installation of two standpipes for groundwater monitoring purposes. Also suggested a contamination assessment.

Douglas Partners comment: To south west of Precinct C

GHD. Phase 1 Site Assessment with Limited Soil Sampling Central Building. Ref: 21/12694/--AV196.doc

- Collected three soil samples, conducted a preliminary waste classification and a site history search;
- Results from the soil sampling found copper, lead and zinc in exceedence of phytotoxicity criteria. All results however were below the adopted commercial/industrial criteria; and
- Asbestos was detected at one location.

Douglas Partners comment: Applies to Precinct B

Based on the previous reports it is evident that fill has been found across the university grounds, to significant depths in some places. The fill composition and quality is variable, with asbestos found in fill at some locations. The fill has generally been underlain by clay, followed by shale and bedrock.

5. Geology, Topography and Hydrogeology

5.1 Geology and Topography

Reference to the Sydney 1:100,000 Geological Series Sheet indicates that the site is underlain by Triassic aged Ashfield Shale of the Wianamatta Group. Ashfield Shale is characterised by black to dark grey shale and laminite.

The regional topography generally slopes to the north east, towards Rozelle and Blackwattle Bays.

5.2 Groundwater Bore Search

A search of the NSW Office of Water (NOW) data for registered bores was conducted on the 1 November 2013. The search identified a total of 22 bores located within a 2km radius of the site.

Standing water levels were recorded to be between 1.0 m bgl (GW109730) and 31.0 m bgl (GW110247). Works summaries were available for all bores except two. Details of these bores are included in Appendix B.

5.3 Regional Hydrogeology

Although groundwater was encountered in bores / wells in some of the previous investigations, each investigation targeted sections of the university and did not assess generally hydrogeology across the university as a whole. As such, the general groundwater levels and flow directions beneath the site are difficult to determine with a holistic study. Based on general topography and proximity of surface water bodies, groundwater in the region is expected to flow to the north towards Rozelle and Blackwattle Bays. These then flow into Sydney Harbour and the Tasman Sea.

5.4 Acid Sulphate Soils

Data supplied by the NSW Department of Environment and Climate Change (now Environment Protection Authority, EPA) based on published 1:25,000 Acid Sulphate Soil (ASS) Risk Mapping, 1994-1998, does not identify the site as an area with an identified risk for ASS. The site is located less than 1 km from an area mapped as “disturbed terrain”, which may require testing for ASS.

Note however that DP (2007) reported a potential for ASS to be present below the water table (located to the north of Precinct D).

6. Site History

A review of the site history was conducted and was based on historical aerial photographs, historical title deeds, a WorkCover Dangerous Goods database search, a search for regulatory notices (issued under the CLM Act and the POEO Act, and a review of Council Section 149 (2) and (5) certificates.

6.1 Aerial Photograph Record Search

Historical aerial photographs from the years 1930, 1943, 1951, 1968, 1970, 1986, 2000 and 2009 were obtained from the NSW Department of Lands Office and Google Earth. These photographs were studied in order to identify past and present likely uses of the site, particularly those of a potentially contaminating nature. The findings are summarised below and copies of the aerial photographs are included in Appendix C.

In summarising the observations, the Camperdown and Darlington Campuses are discussed as a whole, rather than just the target Precincts within each Campus.

- 1930 A number of buildings are located in the north eastern portion of the Camperdown Campus, and on the western and south eastern portions of the campus. The bulk of the buildings (if not all) are likely to be associated with the Sydney University. The majority of the Camperdown campus comprises open space/sports grounds. The Darlington campus area is a mixture of commercial (retail) buildings, urban residential and open space, with only a small component at that time associated with the university (i.e. comprises predominantly private owners). The surrounding area is a mixture of residential and commercial properties, and open space/park land.
- 1943 The Darlington campus area appears to be similar to the 1930 photograph. The Camperdown campus appears to have been further developed, with an increase in the number of buildings across the entire area. There are no significant changes observed to the surrounding lands.
- 1951 Additional buildings are present across the Camperdown campus and more landscaping is observed, making the open spaces more defined. The Darlington Campus area has

not changed noticeably since 1943. More commercial development is appearing in the surrounding area.

- 1968 Additional campus buildings have been added to the Camperdown Campus and parts of the Darlington Campus (note that gradual land acquisition by Sydney University is likely to be taking place at this time). As such, less residential properties are apparent on the Darlington campus. A pool has been constructed in the park to the east of the Camperdown campus, however the remaining surrounding area has not significantly changed since 1951. It is noted that the area photograph does not include the complete Darlington Campus boundary.
- 1970 There are no observed significant changes to the Camperdown Campus. The majority of the residential premises previously located on the Darlington Campus have been replaced by university buildings, or cleared lands ready for development by the University.
- 1986 The Camperdown Campus has not significantly changed since 1970. The Darlington Campus is now largely covered in university buildings and open space areas, apart from numerous commercial / retail structures that remain fronting City Road
- 2000 The Darlington Campus now appears to be completely covered in university buildings with associated landscaping and open space. The Camperdown Campus has not changed significantly since 1986.
- 2009 Additional developments, and redevelopments of old buildings, are evident in both Campuses, particularly to the east of the Camperdown Campus and the central and northern portions of the Darlington Campus.

Overall, the Camperdown Campus has been used as a university since prior to the 1930s (land titles indicate since 1912), whilst the Darlington Campus comprised a large number of residential and commercial (retail) properties at least until the 1970s, from which gradual acquisition by the university appears to have taken place, culminating in the consolidation of individual lots in 1991.

6.2 Historical Title Deeds Search

A search of historical title deeds was conducted for the site. This included a complete search of Lot 1 in deposited plan 179963 and back to 1991 for deposited plan 790620 (at which time a large number of individual lots were consolidated). The searches have been summarised in Tables 1 and 2 below, with extracts provided in Appendix D.

Table 1: As regards Lot 1 in Deposited Plan 179963

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Possible Site Use
27.02.1912 (1912 to date)	# The University of Sydney	University

Denotes current registered proprietor
 Leases & Easements: - NIL

Table 2: As regards Lot 1 in Deposited Plan 790620

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Possible Site Use
11.06.1991 (1991 to 1994)	Her Most Gracious Majesty Queen Elizabeth the Second	University
28.09.1994 (1994 to date)	# The University of Sydney	University

Denotes current registered proprietor

Easements:

- 07.02.2011 Easement for electricity and Other purposes 2 metres & 6.3 metres wide (D.P. 1158655)
- 07.02.2011 Right of Carriageway 6.5 metres and 11.5 metres wide (D.P. 1158655)

Leases:

- 14.11.1996 to Optus Mobile Pty Limited – expires 20.02.2016
- Lease of part to Commonwealth of Australia (J 196658) – expires 31.12.2012
- 08.05.2012 of part to United States Studies Centre, of part – expires 31.07.2016, also 5 year option

It is noted that D.P. 790620 was registered on 11th June 1991

D.P. 790620 is a consolidation of 58 separate parcels.

The title deeds search was conducted on the Lot and D.P. references provided by the University. However, we have been made aware that the Lot and D.P. references provided do not include Precincts D, E, F & G. These precincts would seem to be comprised within Lot 1 D.P. 1171804 and Lot 1966 D.P. 1117595

Based on the title search information and the historical aerial photographs it appears that the site has largely been used as a mixture of residential and university purposes for the past 100 years.

6.3 WorkCover Dangerous Goods Search

A search of the NSW WorkCover Dangerous Goods Database indicated that there were several registered dangerous goods storage depots at the site. WorkCover search documentation is attached in Appendix E.

Based on the WorkCover records, Precincts C to F were listed as containing dangerous goods. These generally comprised flammable liquids (largely solvents) in laboratories and the storage of flammable gas.

An above ground storage tank (AST) of stainless steel construction was registered and located on the lower level of the Chemical Engineering building within Precinct C. The AST has a maximum capacity of 1,000L and contained ethanol and water.

PCB in sealed capacitors is stored in the Electrical Engineering building in Precinct C. The capacitors are stored in lockable wire cages covered by an awning. A substation was also listed for the southern portion of the Evelyn Williams building within Precinct E.

Fireworks and other associated explosives were stored at the Footbridge Theatre in Precinct F (at least in the late 1990s) and used for performances. These are shown in the records to be located in an isolated storage room with a fire rated wall, fire safety curtains and fire doors. These items are no longer stored and the building is no longer used as a theatre.

It is noted that due to the time constraints of the project a full inspection of the dangerous goods stored on the site and the general condition and maintenance of these storage areas was not undertaken.

A summary of the Dangerous Goods stored within the precincts of concern is provided in Table 3, Appendix E.

6.4 Council Section 149 (2) and (5) Certificates

The section 149 (2) and (5) planning certificates for the site were obtained from Sydney City Council and were dated the 4 November 2013.

The certificate indicated the following for 98-148 City Road, Darlington (Lot 1 Deposited Plan 790620):

- The land does not include or comprise critical habitat under the Sydney Local Environment Plan 2012 (Sydney LEP 2012);
- The land is not located within a conservation area;
- The land is identified as being within a heritage conservation area;
- The land is not considered bushfire prone land; and
- The land is not identified as contaminated as prescribed under section 59(2) of the CLM Act 1997. The land is also not subject to any remediation orders or subject to a voluntary management proposal.

The certificate indicated the following for 3 Parramatta Road, Camperdown (includes Lot 1 deposited plan 179963, Lot 11 deposited plan 1171806, Lot 12 deposited plan 1171806, Lot 1 deposited plan 89825 and part lot 1 deposited plan 1171804):

- The land does not include or comprise critical habitat under the Sydney Local Environment Plan 2012 (Sydney LEP 2012);
- The land is not located within a conservation area;
- The land is identified as being within a heritage conservation area;
- The land is not considered bushfire prone land; and
- The land is not identified as contaminated as prescribed under section 59(2) of the CLM Act 1997. The land is subject to a site audit statement, and the subject site contains or has contained contaminants identified in one or more reports or records held by Council.

A copy of the certificates is provided in Appendix F.

6.5 Regulatory Notices Search

The EPA publishes records of contaminated sites under section 58 of the CLM Act on a public database accessed via the internet. The notices relate to investigation and/or remediation of site contamination considered to pose a significant risk of harm under the definition in the CLM Act. More specifically, the notices cover the following:

- Actions taken by the EPA under sections 15, 17, 19, 21, 23, 26 or 28 of the CLM Act;
- Actions taken by the EPA under section 35 and 36 of the Environmentally Hazardous Chemicals Act, 1985; and
- Site audit statements provided to the EPA under section 52 of the CLM Act on sites subject to an enforced declaration order.

A search of the public database was conducted on 1 November 2013 and revealed that the subject site was not listed.

It should be noted that the EPA record of notices for contaminated land does not provide a record of all contaminated land in NSW.

A search was also undertaken of sites reported to the EPA under Section 60 of the CLM Act which deals with the duty to report contaminated sites (Note: the sites on this list may not necessarily warrant regulatory intervention). The site was not listed as having previously been reported to the EPA.

The EPA also issues licences to the owners or operators of various industrial premises under the POEO Act. Licence conditions relate to the owners or operators of various industrial premises under the POEO Act. Licence conditions relate to pollution prevention and monitoring, and cleaner production through recycling and reuse and the implementation of best practice.

The EPA has made available a public register of notices under section 308 of the POEO Act. The register contains:

- Environmental protection licences;
- Applications for new licences and to transfer or vary existing licences;
- Environmental protection and noise control licences;
- Conviction in prosecutions under the POEO Act;
- The result of civil proceedings;
- Licence review information;
- Exemptions of the POEO Act or Regulations;
- Approvals granted under Clause 9 of the POEO (Control of Burning) Regulation; and
- Approvals granted under Clause 7a of the POEO (Clean Air) Regulations.

A search of the register indicated that there were no licences registered for the site.

7. Site Inspection

A site inspection was conducted by an experienced DP Environmental Scientist on the 30 October 2013. Photographs from the site inspection are provided in Appendix G. The following observations were noted:

Precinct A: City Road West Merewether Precinct

- The main buildings within the precinct are the Sydney University Regiment Building, Darlington Centre, Institute Building, Merewether Building, Storie Dixon Building and Darlington House;
- The Sydney University Regiment is a blonde bricked three storey building, with sandstone capping on steps and criss crossed white metal bars on the windows. The Regiment has been training military students since approximately 1962. No internal access was obtained, however there was suspected to be fibre cement materials and potential lead paint, given the age of the building;
- The Darlington Centre, House and Terraces comprise a mixture of heritage listed and more recent buildings. Some landscaped areas were evident and a bitumen driveway ran along the Darlington Road section of the campus;
- The Institute Building was constructed during the 1870s, and is currently used largely as offices for the United States Studies Centre. The building was originally the Deaf, Dumb and Blind Institute. The area appears to be largely hardstand, with some landscaping noticed adjacent to Darlington Road. There was suspected to be fibre cement material and lead paint to have been used throughout the building (photo 1) given the age of the building;
- The Merewether Building is largely constructed of brick, with roof tiles and corrugated iron observed. The surrounding area appeared to have potentially been cut or filled (photo 2). A number of service pits were observed in the surrounding area. Based on the age of the building there was suspected to be fibre cement material, lead paint and PCB in light fittings (photo 3); and
- The Storie Dixon Building is a multi-storey red bricked building with older style glass panel windows, located at the rear of the Institute. The building was suspected to contain fibre cement materials, lead paint and/or PCBs in light fittings

Precinct B: City Road East Precinct

- The main buildings within the precinct are the Wentworth Building, Jane Foss Russell Building, Wilkinson Building, International House and W.H. Maze Building;
- The Wentworth Building was noted to be of recent construction, with its first stage of construction completed in 1972. The front portion of the building is partially grassed and paved, and drainage was observed (photo 4). The building houses a number of eating facilities, a bar, health services including an optometrist and pharmacy, IT services and travel agent. Based on the presence of food facilities there is the potential for grease traps to be present;
- The Jane Foss Russell Building is of relatively recent construction and comprised largely of hardstand. The building was largely concrete and glass. Food facilities were present and therefore the presence of grease traps was likely. Verge Gallery (showcasing student art) was also present in the building;

- The Wilkinson Building is of brown brick and concrete construction (photo 5). A small number of raised garden beds were present, however the majority of the site was paved. Based on the apparent age of the building fibre cement material, lead paint and PCBs are suspected to be present; and
- The W.H. Maze and International House Buildings are constructed of brown brick. The roof of W.H. Maze is tiled and a green metal frame exterior was noted. International House is round in construction, with some white concrete in its construction and green painted features. Both buildings have a small amount of landscaping but are largely paved. Based on the apparent age of the buildings, fibre cement material, lead paint and PCBs are suspected to be present.

Precinct C: Engineering Precinct

- The main buildings within the precinct are the School of Information Technology, Chemical Engineering Building, P.N.R. Building, Electrical Engineering Building, Rose Street Building, Civil Engineering and Civil and Mining Buildings, Mechanical Engineering Building (photo 6), Engineering Link, Aeronautical Building and Shepard Street car park;
- Chemical stores are located within the Chemical Engineering building and Electrical Engineering building;
- The Shepard Street car park is multi-storey and of concrete construction. There are suspected to be fibre cement material within the building given the apparent age of the building;
- By 1978 the entire engineering precinct had been relocated to the Darlington Campus. Based on the age of the majority of the buildings, there was suspected to be fibre cement material, lead paint and PCBs to be present (photo 7). The engineering precinct also contains several workshops and laboratories which are likely to use a variety of chemicals, as noted in the Dangerous Goods register (photo 8, see Section 6.3);
- A café is located within the P.N.R Building, which had the potential to have an associated grease trap; and
- It is noted that the School of Information Technology, Aeronautical Engineering, Rose Street and Gordon Yu-Hoi Chiu buildings are all of more recent construction and were considered unlikely to contain fibre cement material, lead paint or PCBs.

Precinct D: Health Precinct

- The main buildings within the precinct are the Blackburn Building and Bosch Buildings 1A and 1B;
- The Charles Perkins Centre is already under construction at the time of the investigation, located adjacent to Oval 1;
- A flammable goods store was observed in front of the Blackburn Building, which may contain/historically contained chemicals of potential concern. Access to the store was not possible at the time of the inspection, however the area appeared to be hardstand;
- The Blackburn Building was constructed in 1933 (photo 9). Based on the age of the building and inspection, the building is suspected to contain fibre cement materials, lead paint and PCBs (photos 10, 11 and 12). It is also considered likely that chemicals have been stored/used within the laboratories of the building (see Section 6.3). Overall the building was in fair condition;
- Areas surrounding the Bosch Buildings may have been filled for levelling and landscaping purposes. Based on the age of the buildings they are suspected to contain fibre cement material,

lead paint and PCBs. Chemicals were also stored within the building. Overall the building was in fair condition (photo 13 and 14); and

- It was noted that there is a food outlet in the Bosch Building and there may be the potential for a grease trap to be present.

Precinct E: Life Sciences Precinct

- Main buildings within the precinct include the Veterinary Science Conference Centre (1998), R.D. Watt Building, J.D. Stewart Building, McMaster Building (including annex, garage and storehouse), Gatekeeper Lodge, Evelyn Williams Building, The Round House and R.M.C. Gunn Building and animal pens;
- An asphalt road runs along the front of the J.D. Stewart building which was in poor to fair condition (photo 15). A number of stormwater pits and airconditioning units were noted. Based on the age of the building (constructed between 1910 and 1912) the building is suspected to contain fibre cement material, lead paint and PCBs. Any laboratories within the building were also likely to use chemicals;
- The R.M.C Gunn Building is also of older construction and is suspected to contain fibre cement material, lead paint and PCBs (photo 16). The building also contains laboratories which are likely to use chemicals. Overall the building is in fair condition;
- A grassed area adjacent to Parramatta Road and the Ross Street entrance was being used for scooter/motorcycle parking. There was considered to be the potential for oil or petrol to leak from the bikes into subsurface soils. Nearby are two greenhouses. It is not known whether pesticides or other chemicals are used here, which may have the potential to enter into subsoils (photo 17);
- A former carpark near the Ross Street entrance has been converted into a demountable village. The area was covered in asphalt, however fill was noted to the east of the buildings (photo 18 and 19);
- The R.D. Watt Building was constructed between 1914 to 1916. Based on the age of the building it is suspected to contain fibre cement material, lead paint and PCBs;
- Chemicals are known to be stored in the Evelyn Williams building and the McMaster building; and
- The area of the proposed grandstand was covered in grass at the time of the inspection, with small to medium sized shrubs around the perimeter of the oval. The oval was set up for cricket practice, but is also used for other sports throughout the year. A temporary marquee structure is being used as a grandstand (photos 22 and 23).

Precinct F: Cultural Precinct

- Main buildings within the precinct include the Heydon-Laurence Building, Holme Building and Footbridge Theatre, Holme Building Substation, Science Road Cottage, Edgeworth David Building, McCleay Building and The Quadrangle;
- It was noted that parts of the precinct areas may have been cut and filled for levelling purposes;
- The Quadrangle construction originally started with the construction of the Great Hall and East Wing, built between 1855 and 1863. Over the years additions may have had the potential to contain fibre cement material, lead paint and PCBs. Overall the building is in good condition;
- The McCleay Museum was constructed between 1886 and 1887 to house the natural history collection of the McCleay family (photo 20). Extensions to the building were conducted between

1906 and 1918. The building is in overall good condition. Over the years there is the potential that lead paint, fibre cement material and PCBs have been used throughout the building;

- The Holme Building was constructed between 1910 to 1912, with a tearoom added in 1913 (photo 21). The Union hall or Theatre was completed in 1916. The building is suspected to contain fibre cement material, lead paint and PCBs. A number of eateries are also present within the building and there is the potential for grease traps to be present;
- Chemicals (potentially hazardous) are known to be stored in the Footbridge Theatre, McMillan building, Zoology building, and the McCleay building; and
- The Holme Building Substation has the potential to contain asbestos and PCBs within the transformers.

8. Hazardous Materials Register

A register has been compiled for the University of Sydney outlining the hazardous materials on the site. A summary of the main buildings within the target precincts is provided in Table 4 below.

Table 4: Summary of Hazardous Materials in Relevant Precincts

Precinct	Building	Material Identification	Register
City Road West – Merewether Precinct			
A	Sydney University Regiment	Asbestos – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report, Noel Arnold and Associates, 27 June 2012</i>
	Darlington Centre	Asbestos – presumed positive Lead Paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report, Noel Arnold and Associates, 16 May 2012</i>
	Institute	Asbestos – yes	<i>Asbestos Materials Risk Assessment Report, Noel Arnold and Associates, 12 September 2011</i>
	Merewether	Asbestos – yes	<i>Asbestos Materials Risk Assessment Report, Noel Arnold and Associates, 25 July 2011</i>
	Storie Dixon	Asbestos – yes Lead Paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report, Noel Arnold and Associates, 14 March 2012</i>
	Darlington House	None Suspected – partial survey	Pickford & Rhyder, April 2009

Precinct	Building	Material Identification	Register
B	City Road East Precinct		
	Wentworth	Asbestos – yes	<i>Asbestos Materials Risk Assessment Report</i> , Noel Arnold and Associates, 17 May 2011
	Jane Foss Russell	Not surveyed, none suspected (constructed 2006)	Pickford & Rhyder, February 2009
	Wilkinson	Asbestos – yes	<i>Asbestos Risk Assessment Report</i> , Noel Arnold and Associates, 11 May 2011
	International House	Asbestos – yes Lead Paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 8 May 2012
	W.H. Maze	Asbestos – presumed positive Lead Paint – no	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 9 May 2012
C	Engineering Precinct		
	Chemical Engineering Precinct	Asbestos – yes Lead Paint - yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 18 June 2012
	P.N.R.	Asbestos – yes Lead paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 4 May 2012
	Electrical Engineering	Asbestos – yes	<i>Asbestos Materials Risk Assessment Report</i> , Noel Arnold and Associates, 5 July 2011
	Rose Street	Asbestos – presumed positive Lead Paint – no	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 14 May 2012
	Civil Engineering	Asbestos – yes	<i>Asbestos Materials Risk Assessment Report</i> , Noel Arnold and Associates, 18 August 2011
	Civil and Mining Engineering	Asbestos – yes Lead Paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 23 February 2012

Precinct	Building	Material Identification	Register
C (Cont'd)	Mechanical Engineering	Asbestos – yes	<i>Asbestos Materials Risk Assessment Report</i> , Noel Arnold and Associates, 31 May 2011
	Aeronautical Engineering	Asbestos – yes Lead paint – no	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 21 February 2012
	Shepherd Street Carpark	Not surveyed, not known	Pickford & Rhyder, September 2007
	School of Information Technology	Not surveyed, not known	Pickford & Ryder, September 2007
	Engineering Link	Not surveyed, not known	Pickford & Rhyder, September 2007
	Gordon Yu-Hoi Chiu	Asbestos – no	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 5 August 2012
D	Health Precinct		
	Bosch 1A	Asbestos – yes Lead paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 4 April 2012
	Bosch 1B	Asbestos – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 22 March 2012
	Blackburn	Asbestos – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 24 May 2011
E	Life Sciences Precinct		
	Veterinary Science Conference Centre	Asbestos – presumed positive	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 16 March 2012
	R.D. Watt	Asbestos – yes Lead paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 28 March 2012
	J.D. Stewart	Asbestos – yes Lead paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 27 April & 1 May 2012

Precinct	Building	Material Identification	Register
E (Cont'd)	McMaster	Asbestos – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report, Noel Arnold and Associates, 30 January 2012</i>
	McMaster Annex	Asbestos – yes Lead paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report, Noel Arnold and Associates, 20 March 2011</i>
	McMaster Annex Garage	Not surveyed, not known	Pickford & Rhyder, September 2007
	McMaster Annex Storehouse	Not surveyed, not known	Pickford & Rhyder, September 2007
	Gatekeeper Lodge	Asbestos – yes, partially surveyed	Pickford & Ryder, September 2008
	Evelyn Williams	Asbestos – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report, Noel Arnold and Associates, 23 & 30 March 2012</i>
	The Round House	Lead paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report, Noel Arnold and Associates, 6 March 2012</i>
	R.M.C. Gunn	Asbestos – yes Lead paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report, Noel Arnold and Associates, 5 April 2012</i>
	R.M.C. Gunn Animal Pens	Asbestos – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report, Noel Arnold and Associates, 17 April 2012</i>

Precinct	Building	Material Identification	Register
F	Cultural Precinct		
	Heydon-Laurence	Asbestos – yes Lead paint – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 2 March 2012
	Holme Building and Footbridge Theatre	Asbestos – yes	<i>Asbestos Materials Risk Assessment Report</i> , Noel Arnold and Associates, 29 June 2011
	Holme Building Substation	Asbestos – yes Lead paint – yes PCBs suspected	<i>Hazardous Materials Refurbishment Survey Report, Substation 54/ Holme Building, USYD Camperdown NSW</i> , Noel Arnold and Associates, August 2011.
	Science Road Cottage	Partial survey, none suspected	Pickford & Rhyder, January 2009
	Edgeworth David	Asbestos – yes Lead paint - yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 15 March 2012
	McCleay	Asbestos – yes	<i>Asbestos and Lead Paint Materials Risk Assessment Report</i> , Noel Arnold and Associates, 22 February 2012
	The Quadrangle	Asbestos – yes	<i>Asbestos Materials Risk Assessment Report</i> , Noel Arnold and Associates, 14 March 2011

Based on the register provided for review to DP, several areas within the precincts of concern have buildings which contain asbestos and/or lead paint. Reference should be made to the relevant registers for details on the locations and condition of the identified hazardous building materials.

9. Areas of Environmental Concern

The areas of environmental concern identified during the site history review, the processing of anecdotal information and the site inspection are as follows:

Science Laboratories

The University of Sydney holds chemical licenses for the storage and use of a variety of chemical, for experimental purposes. More specifically for this investigation, for Precincts C to E. There is the potential for discharge from the laboratories to contain chemical contamination.

- While in most cases the disposal of chemicals (or waste containing these chemicals) into sinks is not likely to be practiced, there is the possibility that this may occur inadvertently. Therefore there may be the potential for contaminated water to enter into waterways.
- There is the potential for chemical spills within the chemical stores. Where bunding is present it will help to contain spills, however there is still the potential for overflow or cracking in pavements to transport chemicals into surficial soils.

A summary identifying the dangerous goods located in each of the buildings is provided in Appendix E.

The contaminants associated with such chemicals present a potential risk to the following:

- Construction workers conducting works beneath the buildings, and/or in association with sewer and stormwater systems linked to the buildings;
- Users and visitors to the existing and future buildings in the vicinity of these stores / drainage areas, through vapour intrusion; and
- Groundwater if the chemicals migrate through soils to the groundwater table.

Importation of Fill

- The extent of fill across the site used for site formation processes and levelling appears to be extensive on the basis of previous investigations. It is highly likely that fill would be prevalent beneath sports ovals in particular. Previous investigation has identified the presence of fill across much of the site, to depths of up to 9m bgl. The fill has been found to be variable in depth and composition (including some areas containing slag and ash); and
- A number of previous investigations have noted the presence of asbestos in the fill. The previously reported analysis of fill for other contaminants is limited but where reported the concentrations were generally low.

The contaminants associated with imported fill (where contaminated) present a potential risk to the following:

- Construction workers conducting works in the fill, through direct contact and inhalation;
- Users and visitors to the future developments through vapour intrusion (if volatile contaminants are present);
- Nearby residents, commercial workers, students and the general public if the contamination is not properly managed during excavation and construction works;
- Groundwater if the contamination is able to migrate through soils to the groundwater table; and
- General ecology (including plants) if contaminants detrimental to ecological health are retained in zones of potential exposure (e.g. as surface soils).

Asbestos in Surface Soils

- Parts of the site have previously been used for residential and commercial purposes. There is the potential that former residential and commercial properties may have contained fibre cement material and lead paint. Demolition of these buildings could have resulted in the burial of fibre cement fragments beneath the site. These properties have largely been associated with the

Darlington Campus, however the demolition of older university buildings in the Camperdown Campus may have the same impact;

Asbestos in surface soils (if and where present) presents a potential risk to the following:

- Construction workers conducting works in the surface soils, through direct contact and inhalation;
- Nearby residents, commercial workers, students and the general public if the asbestos is not properly managed during excavation and construction works; and
- Users of the future development if asbestos is retained in surface soils.

Building Materials

The site inspection and hazardous materials registers have identified hazardous building materials (including asbestos and lead based paint) in many of the older buildings associated with the target precincts.

Hazardous building materials (where present) present a potential risk to the following:

- Construction workers conducting demolition works, through direct contact and inhalation;
- Nearby residents, commercial workers, students and the general public if the hazardous materials are not properly managed during building demolition works; and
- Users of the existing buildings if the hazardous building materials deteriorate and produce breathable fibres.

Agricultural Use

Site history indicates that a large part of the Camperdown campus was previously used for farming. It is therefore possible that contamination from the use of pesticides and fertilisers could remain on the site. Pesticides may also have been applied to the sports ovals in the past. Common pesticide contaminants include persistent OCP and OPP. A range of heavy metals can also be associated with pesticides and fertilisers. These contaminants would be mainly concentrated in the surficial, topsoil horizon.

The contaminants associated with pesticides and fertilisers present a potential risk to the following:

- Construction workers conducting works in the impacted soils, through direct contact and inhalation;
- Nearby residents, commercial workers, students and the general public if the contamination is not properly managed during excavation and construction works;
- Groundwater if the contamination is able to migrate through soils to the groundwater table; and
- General ecology (including plants) if contaminants detrimental to ecological health are retained in zones of potential exposure (e.g. as surface soils).

Commercial Activities

Parts of the site have been used in the past, either as part of the university activities or as individual operators prior to university acquisition, for commercial purposes, including retail. The nature of some

of these activities probably required the use of chemicals of some type. Such examples include dry cleaning (chlorinated solvents), and vehicle maintenance / repair (petroleum hydrocarbons, degreasers). As such, there is a potential for parts of the site to be impacted by such chemicals, which can have localised and/or widespread impacts.

The contaminants associated with such chemicals present a potential risk to the following:

- Construction workers conducting works in impacted soils and/or groundwater;
- Users and visitors to the existing and future buildings in the vicinity of impacted soils and/or groundwater, through vapour intrusion; and
- Groundwater if the chemicals migrate through soils to the groundwater table.

10. Conclusions and Recommendations

10.1 Conclusions

At the time of this investigation the precincts of concern were occupied primarily by the University of Sydney buildings, pavements, open spaces and sports ovals.

In overall terms, given the current varied use and history of the site, the principal contamination risks are considered to be associated with:

- The historical use of fibre cement products potentially containing asbestos;
- The historical use of lead paint in older buildings; and
- The variability of imported fill quality and quantity across the site.

It should be noted that no intrusive sampling was undertaken as part of the current assessment and, therefore, no detailed comments can be made with regard to the actual levels of subsoil or groundwater contamination. Intrusive investigation would be required to determine the actual degree and/or extent of contamination of the site.

Based on the outcomes of this PSI, the identified contamination risks are not considered to pose a restriction on the future land uses envisaged by the SSDA, subject to implementing the recommendations under Section 10.2.

10.2 Recommendations

Recommendations in regard to planned new developments and refurbishments within the site are outlined below:

- The storage and disposal practices for all dangerous goods within the precinct areas should be reviewed for compliance with current Dangerous Goods codes and standards. If found non-compliant, measures should be implemented to work towards compliance;

- All recommendations provided in the hazardous building materials registers should be implemented as current management measures and/or during demolition, as appropriate. The removal of any hazardous building materials from the site must be conducted in accordance with the appropriate WorkCover codes and standards;
- A detailed site inspection (DSI) should be carried out prior to any future redevelopment works to investigate the areas of environmental concern identified in this report. It is recommended that the DSI be focussed on each individual Precinct (or areas within each Precinct) as they are planned for redevelopment; and
- Any soil to be removed off site must be assessed against the NSW DECCW *Waste Classification Guidelines* (2008, updated 2009) prior to disposal in order to inform disposal options.

11. Limitations

Douglas Partners (DP) has prepared this report for this project at The University of Sydney in accordance with DP's proposal dated 23 October 2013 and acceptance received from Stephane Kerr of the University of Sydney. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of The University of Sydney 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.

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.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the environmental components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

This report must be read in conjunction with all 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

Site Drawings & Notes About this Report

North
←



PROJECT No:	73716
DWG No:	1
REVISION:	A

Site Location Plan and Precincts
Preliminary Site Investigation
University of Sydney

CLIENT:	University of Sydney
OFFICE:	Sydney
DATE:	8 Nov 2013



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

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

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

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

Groundwater

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

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

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

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

Reports

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

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

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

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

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

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

Appendix B

Groundwater Bore Search

NSW OFFICE OF WATER Work Summary

GW109730

Licence :10BL162346

Licence Status Active
Authorised Purpose(s)
MONITORING BORE

Intended Purpose(s)
MONITORING BORE

Work Type :Bore

Work Status :

Construct. Method :Auger - Solid Flight

Owner Type :Private

Commenced Date : Final Depth : 6.50 m
Completion Date :28-Aug-2003 Drilled Depth : 6.50 m

Contractor Name :TERRATEST

Driller :1673 TUCKER, Jason Douglas

Assistant Driller's Name :

Property : - N S W HOUSING CORP

Standing Water Level : 1.00 m
Salinity : 1,000.00 mg/L
Yield :

GWMA : -

GW Zone : -

Site Details

Site Chosen By
Client

County
Form A :CUMBERLAND
Licensed :CUMBERLAND

Parish
PETERSHAM
PETERSHAM

Portion/Lot DP
54/852576
54 852576

Region :10 - SYDNEY SOUTH COAST

CMA Map :

River Basin :

Grid Zone :

Scale :

Area / District :

Elevation :

Northing :6247634

Latitude (S) :33° 53' 54"

Elevation Source :

Easting :332089

Longitude (E) :151° 11' 3"

GS Map :

MGA Zone :56

Coordinate Source :

Construction

Negative depths indicate Above Ground Level:

H-Hole:P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	0.00	6.50	100			Auger - Solid Flight
1	1	Casing PVC Class 18	0.00	3.50	50			
1	1	Opening Screen	3.00	6.50	50			PVC Class 18; A: .4mm; Screwed
1		Annulus Waterworn/Rounded	2.00	6.50				Graded; GS: 2-5mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
1.00	6.50	5.50		1.00					

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	TOPSOIL	Topsoil	
0.50	1.00	0.50	CLAY ORANGE,MOIST,FIRM, MODERATE PLASTICITY	Clay Loam	
1.00	1.50	0.50	CLAY,ORANGE/GREY,VERY STIFF,MODERATE PLASTICITY	Clay	
1.50	2.00	0.50	CLAY,ORANGE/GREY,VERY STIFF,MODERATE PLASTICITY3	Clay	
2.00	3.00	1.00	CLAY,GREY,RED,VR Y STIFF,NON PLASTIC,DAMP	Clay	
3.00	4.00	1.00	CLAY,GREY,RED,VR Y STIFF,NON PLASTIC	Clay	
4.00	4.50	0.50	CLAY,GREY/RED,SOME GRAVEL,NON PLASTIC,DAMP	Clay	
4.50	5.00	0.50	CLAY,WATER AT 4.5m	Clay	
5.00	5.50	0.50	CLAY,GRAVELLY,GREY/RED,WET,NON PLASTIC,HETEROGENOUS,STIFF	Clay	
5.50	6.50	1.00	CLAY,BROWN,GREY,WET,HOMOGENOUS	Clay	

Remarks

*** End of GW109730 ***

NSW OFFICE OF WATER Work Summary

GW109733

Licence :I0BL162346

Licence Status Active
Authorised Purpose(s)
MONITORING BORE

Intended Purpose(s)
MONITORING BORE

Work Type :Bore

Work Status :

Construct. Method :Hand Auger

Owner Type :Private

Commenced Date : Final Depth : 2.40 m

Completion Date :05-Sep-2003 Drilled Depth : 2.40 m

Contractor Name :

Driller :400 UNKNOWN, Unkown

Assistant Driller's Name :

Property : - N S W HOUSING CORP

Standing Water Level : 1.40 m

GWMA : -

Salinity : 1,000.00 mg/L

GW Zone : -

Yield :

Site Details

Site Chosen By
Client

County
Form A :CUMBERLAND
Licensed :CUMBERLAND

Parish
PETERSHAM
PETERSHAM

Portion/Lot DP
54/852576
54 852576

Region :10 - SYDNEY SOUTH COAST

CMA Map :

River Basin :

Grid Zone :

Scale :

Area / District :

Elevation :

Northing :6247631

Latitude (S) :33° 53' 54"

Elevation Source :

Easting :332082

Longitude (E) :151° 11' 2"

GS Map : MGA Zone :56

Coordinate Source :

Construction

Negative depths indicate Above Ground Level:

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	0.00	2.40	125			Hand Auger
1	1	Casing PVC Class 18	0.00	0.90	50			
1	1	Opening Screen	0.90	2.40	50			PVC Class 18; A: .4mm; Screwed
1		Annulus Waterworn/Rounded	0.60	2.40				Graded; GS: 2-5mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
1.40	2.40	1.00		1.40					

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.80	0.80	FILL,CLAY,SILTY SOIL,CEMENT,GRAVELS,HARD IN GROUND,DRY,NO ODOUR	Fill	
0.80	1.50	0.70	CLAY,BLACK/GREY SMEARING AND STAINING IN SOIL,HIGH PLASTICITY	Clay	
1.50	2.00	0.50	CLAY,NATURAL RED COLOURING BECOMING APPARAENT IN SOIL,DRY	Clay	
2.00	2.40	0.40	CLAY,RED SOIL COLOURING,NO ODOUR	Clay	

Remarks

*** End of GW109733 ***

NSW OFFICE OF WATER Work Summary

GW109731

Licence :10BL162346

Licence Status Active
Authorised Purpose(s)
MONITORING BORE

Intended Purpose(s)
MONITORING BORE

Work Type :Bore

Work Status :

Construct. Method :Auger - Solid Flight

Owner Type :Private

Commenced Date : Final Depth : 6.00 m
Completion Date :28-Aug-2003 Drilled Depth : 6.00 m

Contractor Name :TERRATEST

Driller :1673 TUCKER, Jason Douglas

Assistant Driller's Name :

Property : - N S W HOUSING CORP

Standing Water Level : 1.10 m

GWMA : -

Salinity : 1,000.00 mg/L

GW Zone : -

Yield :

Site Details

Site Chosen By
Client

County
Form A :CUMBERLAND
Licensed :CUMBERLAND

Parish
PETERSHAM
PETERSHAM

Portion/Lot DP
54/852576
54 852576

Region :10 - SYDNEY SOUTH COAST

CMA Map :

River Basin :

Grid Zone :

Scale :

Area / District :

Elevation :

Northing :6247634

Latitude (S) :33° 53' 54"

Elevation Source :

Easting :332066

Longitude (E) :151° 11' 2"

GS Map :

MGA Zone :56

Coordinate Source :

Construction

Negative depths indicate Above Ground Level:

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	6.00	100			Auger - Solid Flight
1	I	Casing	PVC Class 18	0.00	3.00	50			
1	I	Opening	Screen	3.00	6.00	50			PVC Class 18; A: .4mm; Screwed
1		Annulus	Waterworn/Rounded	2.00	6.00				Graded; GS: 2-5mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
1.10	6.00	4.90		1.10					

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.50	0.50	TOPSOIL,BROWN,DRY,HETEROGENOUS	Topsoil	
0.50	1.00	0.50	FILL.SLAG.BLACK.RESIDUAL WHITE CLAY.	Fill	
1.00	1.50	0.50	CLAY,BROWN,RED,STIFF,NON PLASTIC,DAMP	Clay	
1.50	2.00	0.50	CLAY, RED/BROWN,STIFF,NON PLASTIC	Clay	
2.00	2.50	0.50	CLAY,RED/GREY,STIFF,PLASTIC, DAMP	Clay	
2.50	3.00	0.50	CLAY,RED/GREY,STIFF,NON PLASTIC	Clay	
3.00	4.00	1.00	CLAY,RED/GREY,STIFF,NON PLASTIC	Clay	
4.00	5.00	1.00	CLAY,RED/GREY,STIFF,ON PLASTIC	Clay	
5.00	5.50	0.50	CLAY,VERY STIFF,NON PLASTIC.	Clay	
5.50	6.00	0.50	CLAY,BROWN,LOOSE,SOFT,MOIST	Clay	

Remarks

*** End of GW109731 ***

NSW OFFICE OF WATER Work Summary

GW109729

Licence :10BL162346

Licence Status Active
Authorised Purpose(s)
MONITORING BORE

Intended Purpose(s)
MONITORING BORE

Work Type :Bore

Work Status :

Construct. Method :Auger - Solid Flight

Owner Type :Private

Commenced Date : Final Depth : 6.00 m
Completion Date :02-Sep-2003 Drilled Depth : 6.00 m

Contractor Name :TERRATEST

Driller :1673 TUCKER, Jason Douglas

Assistant Driller's Name :

Property : - N S W HOUSING CORP

Standing Water Level : 1.40 m
Salinity : 1,000.00 mg/L
Yield :

GWMA : -

GW Zone : -

Site Details

Site Chosen By
Client

County
Form A :CUMBERLAND
Licensed :CUMBERLAND

Parish
PETERSHAM
PETERSHAM

Portion/Lot DP
54/852576
54 852576

Region :10 - SYDNEY SOUTH COAST

CMA Map :

River Basin :

Grid Zone :

Scale :

Area / District :

Elevation :

Northing :6247641

Latitude (S) :33° 53' 54"

Elevation Source :

Easting :332074

Longitude (E) :151° 11' 2"

GS Map :

MGA Zone :56

Coordinate Source :

Construction

Negative depths indicate Above Ground Level;

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	0.00	6.00	100			Auger - Solid Flight
1	1	Casing PVC Class 18	0.00	3.00	50			
1	1	Opening Screen	3.00	6.00	50			PVC Class 18; A: .4mm; Screwed
1		Annulus Waterworn/Rounded	2.60	6.00				Graded; GS: .2-5mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
1.40	6.00	4.60		1.40					

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.20	0.20	PAVERS,CONCRETE	Peat	
0.20	0.70	0.50	FILL,CLAY,SILTY SOIL, BROWN,BLACK,HARD IN GROUND,DRY,NO ODOUR	Fill	
0.70	1.80	1.10	CLAY,TIGHT,LIGHT BROWN,HIGH PLASTICITY,DRY,NO ODOUR	Clay	
1.80	3.00	1.20	CLAY,RED COLOUR,NO ODOUR,DRY	Clay	
3.00	4.00	1.00	CLAY,NO ODOUR,DRY	Clay	
4.00	6.00	2.00	CLAY,VERY HOMOGENEOUS	Clay	

Remarks

*** End of GW109729 ***

NSW OFFICE OF WATER Work Summary

GW109732

Licence :10BL162346

Licence Status Active
Authorised Purpose(s)
MONITORING BORE

Intended Purpose(s)
MONITORING BORE

Work Type :Bore

Work Status :

Construct. Method :Auger - Solid Flight

Owner Type :Private

Commenced Date : Final Depth : 4.30 m
Completion Date :02-Sep-2003 Drilled Depth : 4.30 m

Contractor Name :TERRATEST
Driller :1673 TUCKER, Jason Douglas

Assistant Driller's Name :

Property : - N S W HOUSING CORP
GWMA : -
GW Zone : -

Standing Water Level : 1.50 m
Salinity : 1,000.00 mg/L
Yield :

Site Details

Site Chosen By Client	County Form A :CUMBERLAND Licensed :CUMBERLAND	Parish PETERSHAM PETERSHAM	Portion/Lot DP 54//852576 54 852576
Region :10 - SYDNEY SOUTH COAST		CMA Map :	
River Basin :		Grid Zone :	Scale :
Area / District :			
Elevation :		Northing :6247629	Latitude (S) :33° 53' 54"
Elevation Source :		Easting :332071	Longitude (E) :151° 11' 2"
GS Map :	MGA Zone :56	Coordinate Source :	

Construction

Negative depths indicate Above Ground Level:

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	0.00	4.30	100			Auger - Solid Flight
1	1	Casing PVC Class 18	0.00	2.00	50			
1	1	Opening Screen	2.00	4.30	50			PVC Class 18; A: .4mm
1		Annulus Waterworn/Rounded	1.70	4.30				Graded; GS: 2-5mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
1.50	4.30	2.80		1.50					

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.10	0.10	TOPSOIL,SILTY,BLACK,LOOSE,FINE GRAIN,DRY,NO ODOUR	Topsoil	
0.10	1.20	1.10	CLAY,LIGHT BROWN,STICKY,STIFF,HIGH PLASTICITY,NO ODOUR	Clay	
1.20	2.00	0.80	CLAY,RED,ORANGE,STIFF,MODERATE PLASTICITY,DRY,NO ODOUR	Clay	
2.00	3.30	1.30	CLAY BECOMING LESS PLASTIC,BRITTLE AND DRY WITH DEPTH	Clay Loam	
3.30	4.30	1.00	CLAY,GREY,WITH IRONSTONE BANDS, SOFT, STIFF,HIGH PLASTICITY,GR EY CLAY	Clay	

Remarks

*** End of GW109732 ***

NSW OFFICE OF WATER Work Summary

GW103259

Licence :10BL159644

Licence Status Active
Authorised Purpose(s)
MONITORING BORE

Intended Purpose(s)
MONITORING BORE

Work Type :Bore
Work Status :Equipped - bore used for obs
Construct. Method :Auger
Owner Type :Local Govt

Commenced Date : Final Depth : 2.50 m
Completion Date :11-Dec-2000 Drilled Depth : 2.50 m

Contractor Name :MACQUARIE DRILLING
Driller :1712 HOWE, Steve Robert

Assistant Driller's Name :

Property : - O DEA RESERVE
GWMA : -
GW Zone : -

Standing Water Level :
Salinity :
Yield :

Site Details

Site Chosen By
Geologist

County
Form A :CUMBERLAND
Licensed :CUMBERLAND

Parish
PETERSHAM
PETERSHAM

Portion/Lot DP
1//600644
1 600644

Region :10 - SYDNEY SOUTH COAST
River Basin :220 - TOWAMBA RIVER
Area / District :

CMA Map :9130-3S
Grid Zone :56/1

BOTANY BAY
Scale :1:25,000

Elevation :
Elevation Source :

Northing :6248466
Easting :331115

Latitude (S) :33° 53' 26"
Longitude (E) :151° 10' 25"

GS Map : MGA Zone :56

Coordinate Source :

Construction

Negative depths indicate Above Ground Level:

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	0.00	2.50	124			
1	1	Casing P.V.C.	0.00	0.00	50			
1	1	Opening Slots	0.00	0.00	50			PVC; Sawn
1		Annulus (Unknown)	0.00	5.00				Graded

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)
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(No Water Bearing Zone Details Found)

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
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Remarks

GW has 4 form A's created new GW for each
GW110746 - 1
GW110477 - 2
GW110478 - 3
GW110479 - 4

*** End of GW103259 ***

Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
Document Generated on Friday, November 1, 2013

[Print Report](#)

[Works Details](#) [Site Details](#) [Form A Licensed Construction](#) [Water Bearing Zones](#) [Drillers Log](#)

Work Requested -- GW109649

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW109649
 LIC-NUM 10BL602485
 AUTHORISED-PURPOSES MONITORING BORE
 INTENDED-PURPOSES MONITORING BORE
 WORK-TYPE Bore
 WORK-STATUS
 CONSTRUCTION-METHOD Auger - Hollow Flight
 OWNER-TYPE Private
 COMMENCE-DATE
 COMPLETION-DATE 2008-05-03
 FINAL-DEPTH (metres) 7.20
 DRILLED-DEPTH (metres) 7.20
 CONTRACTOR-NAME
 DRILLER-NAME
 PROPERTY WEST APARTMENTS PTY LTD
 GWMA -
 GW-ZONE -
 STANDING-WATER-LEVEL 2.95
 SALINITY 869.00
 YIELD 1.00

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
 RIVER-BASIN
 AREA-DISTRICT
 CMA-MAP
 GRID-ZONE
 SCALE
 ELEVATION
 ELEVATION-SOURCE
 NORTHING 6249352.00
 EASTING 333320.00
 LATITUDE 33 52' 59"
 LONGITUDE 151 11' 52"
 GS-MAP

AMG-ZONE 56
 COORD-SOURCE
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH ST ANDREW
 PORTION-LOT-DP 1//546296

Licensed (top)

COUNTY CUMBERLAND
 PARISH ST ANDREW
 PORTION-LOT-DP 1 546296

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	7.20	100			Auger - Hollow Flight
1	1	Casing	PVC Class 18	0.00	1.10	61	51		Screwed; Seated on Bottom PVC Class 18; Casing - Machine Slotted;
1	1	Opening	Slots - Horizontal	1.10	7.20	61			SL: 42mm; A: .2mm; Screwed
1		Annulus	Waterworn/Rounded	1.00	7.20				Graded; GS: 3- 5mm

Water Bearing Zones (top)

FROM- DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK- CAT- DESC	S- W-L	D- D- L	YIELD	TEST-HOLE- DEPTH (metres)	DURATION	SALINITY
3.20	6.20	3.00		2.95		1.00			

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-	COMMENT
------	----	-----------	------	------	---------

MATERIAL

0.00	4.80	4.80	FILL,GREY,BROWN,GRAVEL,CLAY,SILT
4.80	5.90	1.10	SILTY SAND,LT GREY,RED,MED COARSE GRAINED
5.90	7.20	1.30	SANDSTONE RED BROWN,WEATHERED WITH CLAY BANDS

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NSW OFFICE OF WATER Work Summary

GW106192

Licence :10BL164184

Licence Status :Active
Authorised Purpose(s)
DOMESTIC

Intended Purpose(s)
DOMESTIC

Work Type :Spear
Work Status :Supply Obtained
Construct. Method :Jetted - Water
Owner Type :Private

Commenced Date : Final Depth : 6.00 m
Completion Date :10-Dec-2004 Drilled Depth : 6.00 m

Contractor Name :B&B Drilling
Driller :1649 BARRETT, Michael Gerard

Assistant Driller's Name :

Property : - DYER
GWMA : -
GW Zone : -

Standing Water Level : 4.00 m
Salinity : Good
Yield : 0.50 L/s cumulative

Site Details

Site Chosen By

County
Form A :CUMBERLAND
Licensed :CUMBERLAND

Parish
ALEXANDRIA
ALEXANDRIA

Portion/Lot DP
8//248162
8 248162

Region :10 - SYDNEY SOUTH COAST
River Basin :213 - SYDNEY COAST - GEORGES RIVER
Area / District :

CMA Map :9130-3S
Grid Zone :56/1

BOTANY BAY
Scale :1:25,000

Elevation : 0.00
Elevation Source :(Unknown)

Northing :6247611
Easting :333418

Latitude (S) :33° 53' 55"
Longitude (E) :151° 11' 54"

GS Map : MGA Zone :56

Coordinate Source :GIS - Geographic Information System

Construction

Negative depths indicate Above Ground Level:

H-Hole;P-Pipe;OD-Outside Diameter;ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity;PL-Placement of Gravel Pack;PC-Pressure Cemented;S-Sump;CE-Centralisers

H	P	Component	Type	From (m)	To (m)	OD (mm)	ID (mm)	Interval	Details
1		Hole	Hole	0.00	6.00	90			Jetted - Water
1	1	Casing	P.V.C.	0.00	5.40	32	26		Glued; Seated on Bottom; Cap
1	1	Opening	Screen ~ Wire Wound	5.40	6.00	50			Stainless Steel; A: .15mm; Screwed

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)
4.00	6.00	2.00		4.00		0.50			Good

Drillers Log

From (m)	To (m)	Thickness(m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	topsoil	Topsoil	
0.30	2.20	1.90	sand, yellow	Sand	
2.20	2.30	0.10	rock, coffee	Rock	
2.30	4.50	2.20	sand, brown	Sand	
4.50	6.00	1.50	sand, grey	Sand	

Remarks

updated from original form A

*** End of GW106192 ***

Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
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Work Requested -- GW109648

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW109648
 LIC-NUM 10BL602485
 AUTHORISED-PURPOSES MONITORING BORE
 INTENDED-PURPOSES MONITORING BORE
 WORK-TYPE Bore
 WORK-STATUS
 CONSTRUCTION-METHOD Auger - Hollow Flight
 OWNER-TYPE Private
 COMMENCE-DATE
 COMPLETION-DATE 2008-05-03
 FINAL-DEPTH (metres) 6.20
 DRILLED-DEPTH (metres) 6.20
 CONTRACTOR-NAME
 DRILLER-NAME
 PROPERTY WEST APARTMENTS PTY LTD
 GWMA -
 GW-ZONE -
 STANDING-WATER-LEVEL 5.23
 SALINITY 1302.00
 YIELD 0.50

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
 RIVER-BASIN
 AREA-DISTRICT
 CMA-MAP
 GRID-ZONE
 SCALE
 ELEVATION
 ELEVATION-SOURCE
 NORTHING 6249333.00
 EASTING 333342.00
 LATITUDE 33 52' 60"
 LONGITUDE 151 11' 52"
 GS-MAP

AMG-ZONE 56
 COORD-SOURCE
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH ST ANDREW
 PORTION-LOT-DP 1//546296

Licensed (top)

COUNTY CUMBERLAND
 PARISH ST ANDREW
 PORTION-LOT-DP 1 546296

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	6.20	100			Auger - Hollow Flight
1	1	Casing	PVC Class 18	0.00	2.60	61	51		Screwed; Seated on Bottom PVC Class 18; Casing - Machine Slotted;
1	1	Opening	Slots - Horizontal	2.60	6.20	61			SL: 42mm; A: .2mm; Screwed
1		Annulus	Waterworn/Rounded	1.00	6.20				Graded; GS: 3- 5mm

Water Bearing Zones (top)

FROM- DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK- CAT- DESC	S- W-L	D- D- L	YIELD	TEST-HOLE- DEPTH (metres)	DURATION	SALINITY
5.20	6.20	1.00		5.23		0.50			

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-	COMMENT
------	----	-----------	------	------	---------

			MATERIAL
0.00	2.90	2.90	FILL,BROWN/GREY,LOOSE GRAVEL,CONCRETE,SAND
2.90	4.90	2.00	SILTY CLAY,LT GREY,MOTT.BROWN HIGH PLASTICITY
4.90	5.80	0.90	SILTY SAND,LT GREY,MED COURSE GRAINED
5.80	6.20	0.40	SANDSTONE,RED,BROWN,WEATHERED,CLAY BANDS

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Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
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Work Requested -- GW110247

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW110247
 LIC-NUM 10WA109284
 AUTHORISED-PURPOSES DOMESTIC
 INTENDED-PURPOSES DOMESTIC
 WORK-TYPE Bore
 WORK-STATUS
 CONSTRUCTION-METHOD Rotary Air
 OWNER-TYPE Private
 COMMENCE-DATE
 COMPLETION-DATE 2009-07-16
 FINAL-DEPTH (metres) 210.00
 DRILLED-DEPTH (metres) 210.00
 CONTRACTOR-NAME
 DRILLER-NAME
 PROPERTY MOORE THEOLOGICAL COLLEGE CL
 GWMA -
 GW-ZONE -
 STANDING-WATER-LEVEL 31.00
 SALINITY 4400.00
 YIELD 0.13

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
 RIVER-BASIN
 AREA-DISTRICT
 CMA-MAP
 GRID-ZONE
 SCALE
 ELEVATION
 ELEVATION-SOURCE
 NORTHING 6248363.00
 EASTING 332357.00
 LATITUDE 33 53' 30"
 LONGITUDE 151 11' 13"
 GS-MAP

AMG-ZONE 56
 COORD-SOURCE
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH PETERSHAM
 PORTION-LOT-DP 28//939363

Licensed (top)

COUNTY CUMBERLAND
 PARISH PETERSHAM
 PORTION-LOT-DP 28 939363

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
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	Steel	-0.30	5.70	156			Driven into Hole; Suspended in Clamps
1	1	Casing	PVC Class 9	-0.30	41.70	140			Screwed and Glued; Suspended in Clamps

Water Bearing Zones (top)

FROM- DEPTH (metres)	TO- DEPTH (metres)	THICKNESS (metres)	ROCK- CAT- DESC	S-W- L	D- D- L	YIELD	TEST- HOLE- DEPTH (metres)	DURATION	SALINITY
22.00	23.00	1.00				0.05		0.25	3750.00
74.00	76.00	2.00				0.10		0.25	3300.00
188.00	188.50	0.50		31.00		0.13		0.25	4400.00

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	2.00	2.00	CLAY BROWN		

2.00	4.50	2.50	CLAY GREY
4.50	22.00	17.50	SHALE GREY
22.00	23.00	1.00	SHALE SOFT
23.00	33.00	10.00	SHALE HARD
33.00	74.00	41.00	SANDSTONE GREY
74.00	76.00	2.00	SANDSTONE AND QUARTZ FINE
76.00	134.00	58.00	SANDSTONE GREY
134.00	135.50	1.50	SANDSTONE QUARTZ FINE
135.50	153.50	18.00	SANDSTONE GREY
153.50	154.00	0.50	SANDSTONE QUARTZ FINE
154.00	168.00	14.00	SANDSTONE GREY
168.00	170.00	2.00	SANDSTONE SHALE BEDDING
170.00	188.00	18.00	SANDSTONE GREY
188.00	188.50	0.50	SANDSTONE QUARTZ
188.50	210.00	21.50	SANDSTONE GREY

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Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
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Work Requested -- GW109646

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW109646
 LIC-NUM 10BL602486
 AUTHORISED-PURPOSES MONITORING BORE
 INTENDED-PURPOSES MONITORING BORE
 WORK-TYPE Bore
 WORK-STATUS
 CONSTRUCTION-METHOD Auger
 OWNER-TYPE Private
 COMMENCE-DATE
 COMPLETION-DATE 2008-05-03
 FINAL-DEPTH (metres) 8.20
 DRILLED-DEPTH (metres) 8.20
 CONTRACTOR-NAME
 DRILLER-NAME
 PROPERTY WEST APARTMENTS PTY LTD
 GWMA -
 GW-ZONE -
 STANDING-WATER-LEVEL 5.93
 SALINITY 1258.00
 YIELD 1.00

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
 RIVER-BASIN
 AREA-DISTRICT
 CMA-MAP
 GRID-ZONE
 SCALE
 ELEVATION
 ELEVATION-SOURCE
 NORTHING 6249293.00
 EASTING 333312.00
 LATITUDE 33 53' 1"
 LONGITUDE 151 11' 51"
 GS-MAP

AMG-ZONE 56
 COORD-SOURCE
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH ST ANDREW
 PORTION-LOT-DP 1//216724

Licensed (top)

COUNTY CUMBERLAND
 PARISH ST ANDREW
 PORTION-LOT-DP 1 216724

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	8.20	100			Auger
1	1	Casing	PVC Class 18	0.00	1.10	61	51		Screwed; Seated on Bottom PVC Class 18; Casing - Machine Slotted;
1	1	Opening	Slots - Horizontal	1.10	8.20	61			SL: 4.2mm; A: .2mm
1		Annulus	Waterworn/Rounded	1.10	8.20				Graded; GS: 3- 5mm

Water Bearing Zones (top)

FROM- DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK- CAT- DESC	S- W-L	D- D- L	YIELD	TEST-HOLE- DEPTH (metres)	DURATION	SALINITY
6.30	8.20	1.90		5.93		1.00			

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO- MATERIAL	COMMENT
0.00	0.80	0.80	FILL,LT GREY,SAND,CONCRETE,BRICK,METAL FRAG.		

0.80	2.80	2.00	SILTY CLAY,BROWN,GREY,MED PLASTICITY
2.80	5.00	2.20	CLAYEY SAND,GREY/DARK GREY
5.00	8.00	3.00	SILTY SAND,LT GREY/RED
8.00	8.20	0.20	SANDSTONE,RED,BROWN,WEATHERED,CLAY BANDS

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Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
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Work Requested -- GW105317

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW105317
 LIC-NUM 10BL161846
 AUTHORISED-PURPOSES MONITORING BORE
 INTENDED-PURPOSES MONITORING BORE
 WORK-TYPE Bore
 WORK-STATUS
 CONSTRUCTION-METHOD Auger
 OWNER-TYPE
 COMMENCE-DATE
 COMPLETION-DATE 2003-03-21
 FINAL-DEPTH (metres) 6.50
 DRILLED-DEPTH (metres) 6.50
 CONTRACTOR-NAME
 DRILLER-NAME
 PROPERTY JONES
 GWMA -
 GW-ZONE -
 STANDING-WATER-LEVEL 1.70
 SALINITY
 YIELD

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
 RIVER-BASIN
 AREA-DISTRICT
 CMA-MAP
 GRID-ZONE
 SCALE
 ELEVATION
 ELEVATION-SOURCE
 NORTHING 6247846.00
 EASTING 331965.00
 LATITUDE 33 53' 47"
 LONGITUDE 151 10' 58"
 GS-MAP

AMG-ZONE 56
 COORD-SOURCE
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH PETERSHAM
 PORTION-LOT-DP A 102760

Licensed (top)

COUNTY CUMBERLAND
 PARISH PETERSHAM
 PORTION-LOT-DP A 102760

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	6.50	100			Auger
1	1	Casing	P.V.C.	0.00	3.50	50			C: 0-.2m; Screwed; Seated on Bottom
1	1	Opening	Slots - Horizontal	3.50	6.50	50			PVC; Stamped; SL: 3mm; A: 1mm
1		Annulus	Waterworn/Rounded	2.50	6.50				Graded

Water Bearing Zones (top)

no details

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	1.10	1.10	FILL,SILTY, SANDY CLAY		
1.10	6.50	5.40	SILTY CLAY,HIGH PLASTICITY		

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Groundwater Works Summary

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Work Requested -- GW111408

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW111408
 LIC-NUM 10BL604530
 AUTHORISED-PURPOSES MONITORING BORE
 INTENDED-PURPOSES MONITORING BORE
 WORK-TYPE Bore
 WORK-STATUS Equipped - bore used for obs
 CONSTRUCTION-METHOD Auger - Solid Flight
 OWNER-TYPE Private
 COMMENCE-DATE
 COMPLETION-DATE 2011-02-05
 FINAL-DEPTH (metres) 4.40
 DRILLED-DEPTH (metres) 4.40
 CONTRACTOR-NAME
 DRILLER-NAME
 PROPERTY REIL DEALERSHIP
 GWMA -
 GW-ZONE -
 STANDING-WATER-LEVEL 2.07
 SALINITY
 YIELD

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
 RIVER-BASIN
 AREA-DISTRICT
 CMA-MAP
 GRID-ZONE
 SCALE
 ELEVATION
 ELEVATION-SOURCE
 NORTHING 6249142.00
 EASTING 332066.00
 LATITUDE 33 53' 5"
 LONGITUDE 151 11' 3"
 GS-MAP

AMG-ZONE 56
 COORD-SOURCE
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH PETERSHAM
 PORTION-LOT-DP 8//30884

Licensed (top)

COUNTY CUMBERLAND
 PARISH PETERSHAM
 PORTION-LOT-DP 8 30884

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	4.40	125			Auger - Solid Flight
1	1	Casing	PVC Class 18	0.00	1.30	60	50		Screwed; Seated on Bottom; End cap
1	1	Opening	Slots - Horizontal	1.30	4.40	60			PVC Class 18; Casing - Machine Slotted; Screwed
1		Annulus	Crushed Aggregate	0.70	4.40				Graded; GS: 0-0mm

Water Bearing Zones (top)

FROM- DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK- CAT- DESC	S- W-L	D- D- L	YIELD	TEST-HOLE- DEPTH (metres)	DURATION	SALINITY
0.00	0.00	0.00		2.07					

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO- MATERIAL	COMMENT
0.00	0.22	0.22	CONCRETE SLAB		
0.22	0.50	0.28	GRAVEL ROADBASE		
0.50	1.10	0.60	FILLING,GREY BROWN AND GREY,SILTY CLAY CLAY,GREY,SILTY WITH TRACE OF		

1.10 4.40 3.30 IRONSTONE, GRAVEL, DAMP

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Groundwater Works Summary

For information on the meaning of fields please see [Glossary](#)
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Work Requested -- GW103258

Works Details [\(top\)](#)

GROUNDWATER NUMBER GW103258
 LIC-NUM 10BL159644
 AUTHORISED-PURPOSES MONITORING BORE
 INTENDED-PURPOSES MONITORING BORE
 WORK-TYPE Bore
 WORK-STATUS Equipped - bore used for obs
 CONSTRUCTION-METHOD Auger
 OWNER-TYPE Local Govt
 COMMENCE-DATE
 COMPLETION-DATE 2000-01-18
 FINAL-DEPTH (metres) 7.00
 DRILLED-DEPTH (metres) 7.00
 CONTRACTOR-NAME
 DRILLER-NAME
 PROPERTY O DEA RESERVE
 GWMA -
 GW-ZONE -
 STANDING-WATER-LEVEL
 SALINITY 795.00
 YIELD

Site Details [\(top\)](#)

REGION 10 - SYDNEY SOUTH COAST
 RIVER-BASIN
 AREA-DISTRICT
 CMA-MAP
 GRID-ZONE
 SCALE
 ELEVATION
 ELEVATION-SOURCE
 NORTHING 6248466.00
 EASTING 331116.00
 LATITUDE 33 53' 26"
 LONGITUDE 151 10' 25"
 GS-MAP

AMG-ZONE 56
 COORD-SOURCE
 REMARK

Form-A (top)

COUNTY CUMBERLAND
 PARISH PETERSHAM
 PORTION-LOT-DP 1//600644

Licensed (top)

COUNTY CUMBERLAND
 PARISH PETERSHAM
 PORTION-LOT-DP 1 600644

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
 ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE- NO	PIPE- NO	COMPONENT- CODE	COMPONENT- TYPE	DEPTH- FROM (metres)	DEPTH- TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	7.00	125			Auger
1	1	Casing	P.V.C.	0.00	3.00	50			C: 0-3m; Screwed; Cap
1	1	Opening	Slots - Horizontal	3.00	7.00	50			PVC; SL: 4mm; A: 1mm

Water Bearing Zones (top)

FROM- DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK- CAT- DESC	S- W-L	D- D- L	YIELD	TEST-HOLE- DEPTH (metres)	DURATION	SALINITY
5.50	6.20	0.70		5.50					

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	6.20	6.20	FILL		
6.20	7.00	0.80	SHALE		

Warning To Clients: This raw data has been supplied to the Department of Infrastructure, Planning and Natural Resources (DIPNR) by drillers, licensees and other sources. The DIPNR does not verify the accuracy of this data. The data is presented for use by you at your own risk. You should consider verifying this data before relying on it. Professional hydrogeological advice should be sought in interpreting and using this data.