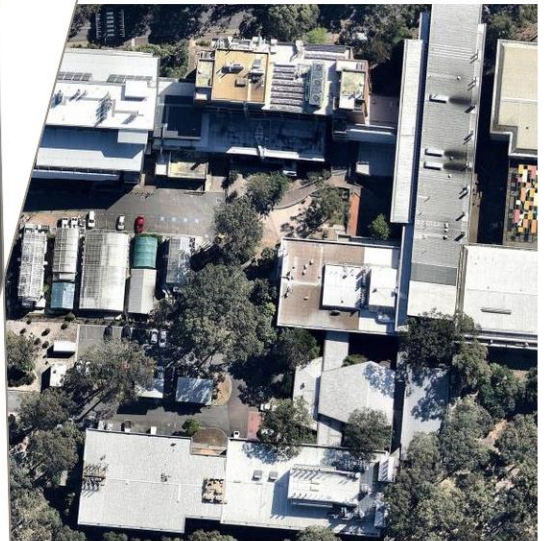


Preliminary Site Investigation

University of Newcastle Proposed
Bio-Resources Facility

82218015



Prepared for
University of Newcastle

82218015.002.1

Contact Information

Cardno (NSW/ACT) Pty Ltd

ABN 95 001 145 035

Unit 1

10 Denney Street

Broadmeadow 2292

Australia

Phone +61 2 4965 4555

Fax +61 2 4965 4666

Author(s):



Malcolm Adrien

Environmental Scientist

Approved By:



Mathew Tendam

Principal Environmental Engineer

Document Information

Prepared for	University of Newcastle
Project Name	University of Newcastle Proposed Bio-Resources Facility
File Reference	82218015.002.1
Job Reference	82218015
Date	15 November 2017
Version Number	1

Effective Date 15/11/2017

Date Approved 15/11/2017

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
0	27/10/17	Draft for review	MA	MT
1	15/11/17	Amendments	DS	MT

© Cardno. Copyright in the whole and every part of this document belongs to Cardno and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Cardno.

This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Table of Contents

1	Introduction	1
	1.1 Background	1
	1.2 Purpose and Objectives	2
	1.3 Scope	2
2	Site Identification	2
3	Site Inspection and Surrounding Environment	3
	3.1 Site Condition	3
	3.2 Surrounding Environment and Land uses	3
4	Published Data	4
	4.1 Regional Geology	4
	4.2 Acid Sulfate Soils	4
	4.3 Hydrogeology	4
	4.4 EPA records Search	5
5	Site History	7
	5.1 General	7
	5.2 Summary of Site History	10
6	Areas and Contaminants of Potential Concern	11
7	Site Investigation Methodology	12
	7.1 Fieldwork Scope	12
	7.2 Laboratory Testing	12
	7.3 Sampling Methodology and Decontamination Procedures	13
8	Criteria for Contamination Assessment	14
	8.1 General	14
9	Laboratory Analytical Results	15
	9.2 Quality Assurance	20
10	Analysis of Results and Field Investigation	20
	10.1 Soil Contamination Assessment	20
	10.2 Subsurface Conditions	20
	10.3 Discussion	21
11	Preliminary Conceptual Site Model	22
12	Conclusions and Recommendations	24
	12.1 Potential for Contamination	24
	12.2 Potential Acid Sulfate Soil	24
	12.3 Soil Contamination	24
	12.4 Conclusions	24
	12.5 Recommendations	24
13	References	25

14	Limitations	26
15	References	34

Appendices

Appendix A	Figures and Photographs
Appendix B	Logs and Explanatory Notes
Appendix C	Analytical Results
Appendix D	Lotsearch Report
Appendix E	Tilte Search
Appendix F	Section 149 Certificate
Appendix G	QA/QC Report

Tables

Table 3-1	Surrounding Land Use	3
Table 4-1	Registered Groundwater Bore Search Summary	4
Table 4-2	Licensed Activities under the PoEO Act 1997	5
Table 4-3	Former Licensed Activities under the PoEO Act 1997, now revoked or surrendered	6
Table 5-1	Historical Title Deed Search Results	8
Table 5-2	Aerial Imagery Review	8
Table 6-1	Site Activities and Potential Contaminants of Concern	11
Table 9-1	Results of Laboratory Analysis for Heavy Metals, results in mg/kg	16
Table 9-2	Results of Laboratory Analysis for PAH, OPP and PCB, results in mg/kg	17
Table 9-3	Results of Laboratory Analysis for TRH, Naphthalene and BTEX, results in mg/kg	18
Table 9-4	Results of Laboratory Analysis for Organochlorine Pesticides, results in mg/kg	19

Figures

Figure 1 - Site location accessed from Nearmap dated 26-09-2017	1
---	---

1 Introduction

1.1 Background

Cardno (NSW/ACT) Pty Ltd (Cardno) was engaged by University of Newcastle (“the client”) to prepare a Preliminary Site Investigation (PSI) for the proposed STEM+M Bio-resources facility upgrade project at the University of Newcastle, Callaghan (“the Site”) as shown in the figure below. The nominated Site comprises one (1) allotment, Lot 1 DP 1188100. For site locality, refer to Drawing 1, attached in **Appendix A**.



Figure 1-1 Site location accessed from Nearmap dated 26-09-2017.

It is understood that the new, rectangular-shaped STEM+M Bio-resources facility is proposed to be situated in the location of the existing Biological Sciences Glass Houses and associated facilities with approximate dimensions’ footprint of 27m by 69m.

The current PSI comprised of a desktop study and site inspection, along with intrusive sampling and laboratory testing within the subject Site. It must be appreciated that the assessment is limited to the subject area as shown within the above figure. Data searches may refer to the allotment in its entirety; however, review will be limited to nominated subject site within the lot.

The PSI was prepared in accordance with the scope presented in Cardno’s proposal 48980518-0123.1.0, dated 21 July 2017, accepted by the client on 2 August 2017.

The assessment was undertaken with reference to NSW EPA “*Guidelines for Consultants Reporting on Contaminated Sites*” [1] and *National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013* [2].

The assessment was undertaken to assess potential for contamination to constrain the proposed STEM+M Bio-resources facility upgrade. The findings and results are presented herein.

1.2 Purpose and Objectives

1.2.1 Preliminary Site Investigation

The purpose of this PSI is to provide the client with preliminary advice on the contamination status of the current Site conditions and the consequent implications for its intended use. The PSI reviews current and historical activities undertaken at the Site and provides a preliminary environmental assessment of the potential for soil and/or groundwater contamination to be present on the Site.

The objectives of the PSI are to:

- > Identify the potential for past or present activities at the Site and, to the extent practicable, surrounding the Site to cause contamination of soil or groundwater at the Site
- > Identify potential areas and contaminants of concern at the Site
- > Identify potential receptors of concern and assess the potential for the protected beneficial uses of the land to be impacted due to contamination
- > Assess the requirement, if any for further environmental investigation to assess or make the Site suitable for the proposed use

The investigation and reporting is preliminary in nature and is undertaken in general accordance with the National Environment Protection (Assessment of Site Contamination) Measure NEPM 2013 guidelines [2] adopted by NSW EPA. The report is not considered to be a Detailed Site Investigation (as defined in NEPM) and as such has not been prepared as the basis of a Site Audit (there is no known requirement for an audit).

1.3 Scope

1.3.1 Preliminary Site Investigation

This Preliminary Site Investigation comprised of the following:

- > Desktop study of NSW EPA Records conducted by Lotsearch Pty Ltd and compiled in “*Environmental Risk and Planning Report, 130 University Drive, Callaghan, NSW 2308, dated 17 October 2017*” [3], the S149 Planning certificate and review of historical aerial photographs.
- > Site inspection, limited intrusive sampling and testing. Sampling comprised the collection of seven (7) samples utilising both hand augers and a truck mounted rig.

2 Site Identification

The subject site details are presented in the table below. For location site please refer to Figure 1-1 in Section 1.

Table 2-1 Site Details

Site Address	130 University Drive Callaghan
Lot Number and Deposited Plan	Lot 1 on DP 1188100
Site Area	Approx. 0.12 ha
Local Government Area	Newcastle City Council
Current Zoning	SP2 Infrastructure

3 Site Inspection and Surrounding Environment

3.1 Site Condition

A site inspection was undertaken by a Geotechnical Scientist from Cardno on 29 September 2017 in order to map salient features of the site and the surrounding area. The inspection comprised a walkover assessment with no restrictions to onsite access. Site photographs are attached as Appendix A. Access to subsurface profile was limited due to the existing structures and concrete foot paths within the green house.

Overall, the site is rectangular in shape and is situated east of Ring Rd, Callaghan in the western portion of the University of Newcastle, Callaghan Campus. The site is bounded by;

- > An existing carpark, paved access road and associated multistorey Medical Science buildings to the north;
- > An existing carpark, access road and small structures to the south;
- > Existing multistorey concrete structures to the east including the biological sciences building and Auchmuty Library; and
- > Ring road to the west.

At the time of inspection, features and observations within the site include the following:

- > Topographically, the site is situated within regionally gentle undulating terrain, locally being positioned adjacent to an intersection of an east-west and north-south trending ridgelines. The site is situated on the north facing slopes associated with the east-west trending ridgeline with slope gradients generally in the range of approximately 3 and 7°.
- > The site comprised six biological sciences glass houses utilised by the University of Newcastle.
- > Concrete paths were located between buildings with isolated regions of grass cover, surficial soil and gravel.
- > A filled area behind a small retaining wall is located in the south-eastern corner of the site.
- > Various tools and equipment were located on concreted areas and around buildings, including cement mixer, motorised conveyor belt, wheel barrows and bins
- > Drainage comprises both underground stormwater drains and surficial runoff following the existing contours of the site which drain into a small channel that runs in a north easterly direction into Bowinbah Creek.
- > Bowinbah Creek drains into Boatman Creek, which joins Iron bark creek approximately 3km to the north which joins the South Channel of the Hunter River.

3.2 Surrounding Environment and Land uses

The site is located within the University of Newcastle Callaghan Campus. Land uses around the site are detailed in the table below.

Table 3-1 Surrounding Land Use

Direction	Land Use or Activity
North	Existing carpark, paved access road and associated multistorey Medical Science buildings.
West	Main Road (Newcastle Inner City Bypass) (approx. 50m from site). Residential development beyond Main Road.
East	Existing multistorey concrete structures to the east associated with the University of Newcastle campus.
South	An existing carpark, access road and small structures.

The area is serviced by public roads and access to the Site is available from Ring Road.

4 Published Data

4.1 Regional Geology

The Newcastle 1:100,000 Geology Map, Geological Series Sheet 9232 [4], indicates the site is situated within the Tomago Coal Measures which is known to comprise Late Permian Age deposits of siltstone, sandstone, claystone, coal and tuff and soils derived from the weathering of these rock types.

Referring to the Soil Landscapes of the Newcastle 1:100 000 Sheet (Sheet 9232) indicates that the Site is underlain by the Beresfield (be) landscape comprising undulating low hills and rises on Permian sediments in the East Maitland Hills region. Slope gradients are in the range of 3-15% with local relief of up to 50m and elevation of 20-50m. Soils usually consist of moderately deep, moderately well to imperfectly drained Yellow Podzolic Soils, Brown Podzolic soils and brown Soloths occurring on crests. Moderately deep, well-drained Red Podzolic Soils and red Soloths occur on upper slopes. Moderately well to imperfectly drained brown Soloths and yellow Soloths occur on sideslopes. Deep, imperfectly to poorly drained Yellow Podzolic Soils, yellow Soloths and Gleyed Podzolic Soils occur on lower slopes.

Hazards include water erosion, waterlogging and high run-on on localised lower slopes. Soils are highly acidic and of low fertility.

4.2 Acid Sulfate Soils

Review of available published data, indicates that the subject site is situated within no known occurrence of acid sulfate soil materials with reference to the “Department of Land and Water Conservation, Wallsend Acid Sulfate Soil Risk Map”, Edition 2, dated December 1997 [5].

Further review of the “Newcastle Local Environmental Plan 2012, Acid Sulfate Soils Map”, Sheet ASS_02, dated 2014 [6], indicates that the site is classified as Class 5 land for potential occurrence of ASS. Class 5 indicates that development consent is required for works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres Australian Height Datum and by which the water table is likely to be lowered below 1 metre Australian Height Datum on adjacent Class 1, 2, 3 or 4 land.

Based on review data Acid Sulfate Soils are unlikely to be encountered onsite.

4.3 Hydrogeology

A search of the NSW Groundwater Database from Department of Primary Industries – Office of Water NSW conducted by Lotsearch [3] identified seventeen (17) bores within a 2 km radius of the Site. The 17 bores are summarised in the table below. Copy of the licensed bore information is presented in the Lotsearch report in **Appendix D**.

Table 4-1 Registered Groundwater Bore Search Summary

Well Number	Intended Purpose	Coordinates	Depth of Bore (m)	SWL (m)	Water Bearing Zone (m)	Proximity to Site (m)
GW202512	Monitoring	32° 53' 22.2" S 151° 41' 49.3" E	18.00	-	16.60-18.00	305 m north
GW202509	Monitoring	32° 53' 20.2" S 151° 41' 54.8" E	11.60	-	10.60-11.60	384 m north
GW202510	Monitoring	32° 53' 18.7" S 151° 41' 55.1" E	12.80	-	11.70-12.80	429 m north
GW202511	Monitoring	32° 53' 16.3" S 151° 41' 55.1" E	9.80	-	9.20-9.80	503 m north
GW202513	Monitoring	32° 53' 17.1" S 151° 41' 59.9" E	4.60	-	3.20-4.60	517 m north-east
GW053186	Recreation	32° 54' 03.3" S 151° 41' 21.1" E	32.00	-	31.00-32.00	1108 m south-west
GW202754	Monitoring	32° 54' 4.6" S 151° 41' 9.2" E	3.00	0.88	-	1340 m south-west

Well Number	Intended Purpose	Coordinates	Depth of Bore (m)	SWL (m)	Water Bearing Zone (m)	Proximity to Site (m)
GW202755	Monitoring	32° 54' 5.3" S 151° 41' 9.7" E	3.40	1.47	-	1346 m south-west
GW202756	Monitoring	32° 54' 5.8" S 151° 41' 9.8" E	3.50	1.79	-	1357 m south-west
GW202753	Monitoring	32° 54' 5.6" S 151° 41' 8.7" E	4.20	1.62	-	1372 m south-west
GW080250	-	32° 52' 44.2" S 151° 42' 7.7" E	4.50	-	-	1541 m north
GW080251	-	32° 52' 39.8" S 151° 41' 37.5" E	10.50	-	-	1620 m north
GW202025	Monitoring	32° 54' 23.1" S 151° 41' 8" E	10.00	2.00	-	1806 m south-west
GW201029	Monitoring	32° 53' 11.7" S 151° 40' 40.4" E	2.00	-	0.90-2.00	1821 m west
GW202024	Monitoring	32° 54' 22.5" S 151° 41' 4.5" E	4.30	1.00	-	1839 m south-west
GW202023	Monitoring	32° 54' 24.6" S 151° 41' 5.4" E	5.30	3.00	-	1879 m south-west
GW201030	Monitoring	32° 53' 10" S 151° 40' 34.4" E	2.00	-	0.80-2.00	1985 m west

4.4 EPA records Search

4.4.1 Contaminated Land Record of Notices

A search of NSW EPA Record of Notices on 16th October 2017 revealed no notices listed within 1 km of the site.

Search results are provided in **Appendix D**.

4.4.2 PoEO Public Register

The PoEO Public Register under Section 308 of the Protection of the Environment Operations (PoEO) Act 1997 contains Environment Protection Licences (EPLs), applications and notices issued by the EPA.

The Public Register was searched on the 16th October 2017 to identify any issues of relevance to the Site. The search revealed two licensed activities within a 1 km radius of the site. These are summarised in **Table 4-2**, below.

Table 4-2 Licensed Activities under the PoEO Act 1997

EPL	Organisation	Name	Address	Suburb	Activity	Distance	Direction
5583	Newcastle City Council	Waterways of Newcastle City	-	Newcastle	Other activities	45m	North-east
1683	Hunter Water Corporation	Newcastle Sewerage System including Shortland Wastewater Treatment Plant	Off Scenic Drive	Merewether	Sewage treatment processing by large plants	973m	South

Additionally, six licensed activities now revoked or surrendered were found within 1 km of the site. These are displayed in the table below.

Table 4-3 Former Licensed Activities under the PoEO Act 1997, now revoked or surrendered

EPL	Organisation	Location	Date Issued	Activity	Distance
12249	The University of Newcastle	Groundwater Remediation Test Site (GRTS), University of Newcastle, University Drive, Callaghan	04/01/2005	Non-thermal treatment of hazardous and other waste	Not within subject site
12249	The University of Newcastle	Groundwater Remediation Test Site (GRTS), University of Newcastle, University Drive, Callaghan	04/01/2005	Waste storage – hazardous, restricted solid, liquid, clinical and related waste and asbestos waste	Not within subject site
4653	Luhrmann Environment Management Pty Ltd	Waterways throughout NSW	-	Application of herbicides	37m
4838	Robert Orchard	Waterways throughout NSW	-	Application of herbicides	37m
6630	Sydney Weed and Pest Management Pty Ltd	Waterways throughout NSW	-	Application of herbicides	37m
12054	BHP Billiton Innovation Pty Ltd	Off Vale Street, Shortland, NSW 2307	06/02/2004	Chemical production waste generation; chemical storage waste generation	276m North

Search results are provided in **Appendix D**.

4.4.3 List of NSW Contaminated Sites Notified to the EPA

A searched of the List of NSW Contaminated Sites Notified to the EPA on 16th October 2017 revealed one (1) site listed on the list of notified sites within 1 km of the site:

- > 298-302 Sandgate Road, Shortland – 7-Eleven (former BP) service station.

Search results are provided in **Appendix D**.

5 Site History

5.1 General

The site history was based on the information in the following documents.

The site history comprised:

- > Review of Section 149 Planning Certificate of Newcastle City Council (NCC)
- > Review of historical aerial photos
- > Review of Title Deeds.
- > Review of NSW EPA database.

5.1.1 Newcastle City Council (NCC) Section 149 Planning Certificate - Lot 1 DP 1188100

The complete S149 certificate is attached within **Appendix F** and is summarised below:

- > Newcastle Development Control Plan applies to the land
- > Newcastle LEP 2012 identifies the zone applying to land as SP2 Infrastructure – Education Establishment.
- > The land does not comprise of a critical habitat
- > The land is not within a Heritage Conservation Area
- > The land is not affected by Coastal Protection
- > The land is not within a proclaimed Mine Subsidence District
- > The land is not affected by a road widening or realignment
- > The land is either in whole or in part, “bushfire prone land”, for the purposes of the *Environmental Planning and Assessment Act 1979*.
- > Development on this land is subjected to flood related development controls
- > No environmental planning instrument applies to land for the acquisition of the land by a public authority
- > Contribution plans apply to the land
- > The land is not affected by the Native Vegetation Act 2003
- > Council has not been notified that an order has been made under the Order Under Trees (Disputes Between Neighbours) Act 2006
- > Council is unaware of whether a valid site compatibility certificate has been issued
- > Council has not been notified that the land includes any residential premises that are registered on the register of loose-fill asbestos insulation.
- > Council records indicate that this land has been identified as being affected by soil or groundwater contamination.
- > Council records indicate the following potentially contaminating landuse(s) may have been carried out on the land: waste storage activities

5.1.2 Historical Title Deeds Search

A Land Title Search was undertaken by Advance Legal Searches Pty Ltd for Lot 1 DP 1188100. Results of the search are provided in Appendix E. Review of the title deed searches indicates that the site has only been Crown Land and owned by the University of Newcastle.

Table 5-1 Historical Title Deed Search Results

Date of Acquisition	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale	Occupation / Possible land Use
Crown Land			
29.10.1954	Dedicated for University and Teachers College Site	Government Gazette 29.10.1954	
18.01.1963	Acquired for Technical Education and University vide Resumption	Government Gazette 18.01.1963	
Lots 2,3 & 4 DP 216528			
1964	The Minister for Education	Vol. 9812 Fol. 210	University Campus
1964	The University of New South Wales	Vol. 9812 Fol. 210	University Campus
1968	# The University of Newcastle	Vol. 9812 Fol. 210	University Campus
Lot 11 DP 531665 & Lots 3 & 4 DP 216528			
1971	# The University of Newcastle	Vol. 11573 Fol. 117	University Campus
Lot 11 DP 531665			
1991	# The University of Newcastle	F / I 11 / 531665	University Campus
Lot 7 DP 804087			
1991	# The University of Newcastle	F / I 7 / 804087	University Campus
Lot 16 DP 817507			
1991	# The University of Newcastle		University Campus
Lot 1 DP 1188100			
2000	# The University of Newcastle	F / I 1 / 1188100	University Campus

Denotes Current Registered Proprietors (Current at 2017)

5.1.3 Review of the Historical Aerial Photos

Cardno has conducted a review of historical aerial photographs supplied by Lotsearch Pty Ltd.

Overall, Cardno's historical aerial review was based on historical aerial imagery, current site inspection, previous investigations and knowledge of the area.

A summary of the interpreted site features is provided in Table 5-2 below.

Table 5-2 Aerial Imagery Review

Date	Reference	Observations
April 1954	Black and White NSW 252-2052	Onsite: The conditions of the site generally consisted of undeveloped land comprising moderately dense bushland. Offsite: The surrounding land uses comprised residential premises within 150m to the west of the site. Surrounding bushland extends approximately 500m to the south, 900m to the north and 1km to the east. A rail line is located 1.4km to the east. A golf course is located beyond the bushland to the north. The bushland is bounded by a road to the south, beyond which is cleared grassland with sporadic trees.
May 1965	Black and White NSW 1410-5017	Onsite: Generally consistent with the 1954 photograph detailed above. Tree cover is slightly less dense. Offsite:

		<p>Several buildings have been constructed approximately 100m to 200m south of the site and 400m to the north of the site. These buildings appear to be consistent with current buildings utilised by the University of Newcastle.</p> <p>Several new buildings and sports fields appear to be under construction approximately 1km to the east.</p> <p>Increase in residential development to the west of the site, including newly constructed roads and dwellings.</p> <p>Decrease in density of tree cover surrounding the site, with small areas of cleared land to the east and south.</p> <p>Land beyond 300m to the south of the site not visible.</p>
19/10/1974	Black and White NSW 2266-95	<p>Onsite:</p> <p>The site has been cleared of some trees, with roads and carparks constructed around the boundary of the site.</p> <p>Offsite:</p> <p>Several buildings, roads and paths have been constructed to the east of the site within the University of Newcastle campus.</p> <p>Two large carparks have been constructed to the south within the University of Newcastle campus.</p> <p>Trees have been cleared for the above mentioned construction, with remnant trees retained between newly constructed buildings, roads and paths.</p> <p>Increase in residential development to the west of the site, including newly constructed roads and dwellings.</p> <p>Increase in commercial development to the south-west of the site, including newly constructed buildings and structures</p> <p>Land beyond 200m to the east of the site not visible.</p>
October 1976	Colour NSW 2404-96	<p>Onsite:</p> <p>Further clearing of trees has occurred on the site to accommodate expansion of the existing carpark on to the site.</p> <p>Offsite:</p> <p>Generally consistent with the 1974 photograph detailed above.</p> <p>Trees have been cleared to north of the site.</p> <p>Several new buildings have been constructed to the south and east within the University of Newcastle campus.</p>
September 1983	Colour NSW 3334-33	<p>Onsite:</p> <p>Several buildings have been constructed on the site.</p> <p>Trees have been cleared in the north west corner of the site to accommodate the new building and a grassed area.</p> <p>Offsite:</p> <p>Generally consistent with the 1976 photograph detailed above.</p> <p>New buildings have been constructed immediately to the north of the site, within the University of Newcastle campus.</p>
November 1993	Colour NSW 92	<p>Onsite:</p> <p>Generally consistent with the 1983 photograph detailed above with two new buildings constructed on the western portion of the site.</p> <p>Offsite:</p> <p>Generally consistent with the 1986 photograph detailed above.</p> <p>The Newcastle Inner City Bypass has been constructed approximately 50m to the west of the site.</p> <p>Wastewater treatment plant constructed approximately 1.5km to the north-west of the site.</p> <p>Electrical sub-station constructed approximately 1.2km to the east of the site.</p>
10/01/2007	Colour	Onsite:

	Google Earth	<p>Generally consistent with the 1993 photograph detailed above with two new buildings constructed on the central and western portions of the site.</p> <p>Offsite: Generally consistent with the 1993 photograph detailed above.</p> <p>Several new buildings have been constructed to the south and east within the University of Newcastle campus.</p> <p>Increase of residential development towards to the south-west a number of newly constructed dwellings.</p>
28/09/2009	Colour Google Earth	<p>Onsite: Generally consistent with the 2007 photograph detailed above.</p> <p>Offsite: Generally consistent with the 2007 photograph detailed above.</p>
31/10/2014	Colour Google Earth	<p>Onsite: Generally consistent with the 2009 photograph detailed above with trees cleared and one new building constructed on the western portion of the site.</p> <p>Offsite: Generally consistent with the 2009 photograph detailed above.</p>

5.2 Summary of Site History

Based on the available historical data, Cardno site inspections and public searches, the current subject site comprised of crown land until it formed part of the Newcastle of University campus from 1964 to present day.

The University Campus encompasses a large area with mixed use ranging from residential to commercial/industrial including a wide variety of activities. Portions of the Site have been filled with slag material which were encountered during the intrusive investigation. The Site has been used as a university since its initial development in 1964. The Newcastle Institute for Energy and Resources (located approximately 300m to the north) has had potentially contaminating activities conducted historically on the site. The NIER Site has been redeveloped in recent years and just north of the NIER building an aged care residential development is currently being constructed.

6 Areas and Contaminants of Potential Concern

The assessment has identified several potential sources of contamination which are summarized in Table 6-1 below.

Table 6-1 Site Activities and Potential Contaminants of Concern

Area of Environmental Concern	Site Activity / Potential Source	Contaminants of Potential Concern	Comments
<i>Onsite Sources</i>			
Surficial disturbance and filling	Potential minor cut and fill operations	Possible contaminants include: Metals Petroleum hydrocarbons (Polycyclic Aromatic Hydrocarbons [PAHs], Total Recoverable Hydrocarbons [TRH], Benzene, Toluene, Ethylbenzene, Xylenes [BTEX]) Organochlorine and Organophosphate Pesticides (OCP/OPP) asbestos	Uncontrolled fill material may be present onsite (for site levels and construction of dams) and offsite (excavated drainage channel).
Under the concrete slab and buildings	It is possible that imported fill has been placed in the footprint of the buildings and carpark areas for the purpose of levelling the site.	TRH/BTEXN/PAHs/Metals, asbestos, OCP/OPPTRH/BTEXN/PAHs/Metals/OCP OPP and asbestos.	Contaminated soils and waste products were commonly used for filling purposes in the time period in which the site was developed.
Buildings	Potential hazardous building materials and storage of chemicals	ACM (asbestos containing materials) and lead paint. Potential storage of pesticides and chemicals.	Age of the structures indicate that ACM may have been used in construction materials
Greenhouses	Pesticide use in operation of greenhouse	Organochlorine and Organophosphate Pesticides (OCP/OPP)	
<i>Offsite Sources</i>			
Service Stations in Shortland	Hydrocarbon storage/lubricants and solvents	TRH/BTEXN/PAH, metals	Potential hydrocarbon storage, lubricants for vehicle maintenance. Service stations approximately 2km north of subject site. The service stations appear to be down gradient from the subject site
Former Waste Land Fill	Waste	Metals/TRH/PAH/PCB/alkanes/sulphides/nutrients/ammonia, landfill gas	149 certificate indicates that land filling may have been conducted within the boundary of the University site. No details are given. However; it is unlikely the landfill is within the subject site due to the current land use, locality and topography of the subject site.

7 Site Investigation Methodology

7.1 Fieldwork Scope

Filed investigation was undertaken on 29 September 2017 and comprised the following:

- > Site walkover by a geotechnical scientist from Cardno to identify potential Environmental Areas of Concern (EAC).
- > Drilling of six (6) shallow bore holes (HA01-HA06) using hand auger tools. Bore holes were targeted with the identified potential Areas of Concern (AEC) and distributed across the site to characterise the overall site subsurface conditions
- > Drilling of two (2) boreholes (BH01- BH02) with a truck mounted scout rig using a combination of 300mm solid flight augers, 150mm solid flight augers with a TC bit and NMLC rock coring techniques. Auguring using solid flight auger techniques was performed to 4.2 and 3.3 m below ground level (BGL) in BH01 and BH02 m respectively. Following, NMLC rock coring techniques were conducted to depths of approximately 10.2 m and 7.1 m BGL respectively.
- > Logging of the subsurface profile.
- > Sampling of material considered representative of subsurface profile encountered across the site.
- > Environmental samples of selected materials were collected for the purpose of laboratory testing. Samples were recovered in accordance with Cardno protocols and were immediately placed into cold storage.
- > Backfilling of holes with the excavation spoil materials.

All fieldwork including logging of subsurface profiles and collecting of samples was carried out by a geotechnical scientist from Cardno. Bores were located by reference to the site features as shown on Figure 1, attached in **Appendix A**. Subsurface conditions are detailed in engineering bores attached in Appendix B, together with explanatory notes.

7.2 Laboratory Testing

Laboratory testing on selected samples recovered during fieldwork comprised the following:

- > Eight (8) samples including duplicate and triplicate sample for quality assurance and control soil contamination tests. The samples were analysed for eight metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn), organochlorine pesticides (OCPs) and organophosphate pesticides (OPPs), Total Recoverable Hydrocarbons (TRH), BTEXN (Benzene, Toluene, Ethyl-benzene, Xylenes and Naphthalene), Polycyclic Aromatic Hydrocarbons (PAH) and Polychlorinated Biphenyls (PCB);
- > One (1) sample collected from the slag materials analysed for TRH, PAH, BTEX and 8 heavy metals;
- > One (1) triplicate sample analysed for BTEXN;
- > One (1) trip spike sample analysed for BTEXN; and
- > One (1) rinsate sample analysed for 8 heavy metals.

Environmental and chemical testing was carried out on soil samples by SGS Australia Pty Ltd, which holds current accreditation with the National Association of Testing Authorities, Australia (NATA) for the analysis performed.

Results of laboratory testing are in the laboratory reports attached in **Appendix C**.

7.3 Sampling Methodology and Decontamination Procedures

Environmental sampling was performed according to Cardno standard operating procedures with sampling data recorded on Chain of Custody sheets.

The methodology utilised is as follows:

- > The use and changing of disposable gloves between each sampling event to prevent cross contamination;
- > A Photo Ionisation Detector (PID) was used to screen each sample using a headspace method with the readings recorded on engineering logs;
- > Decontamination of all sampling equipment using a 3% solution of phosphate free detergent (Decon 90) and distilled water prior to each bore;
- > Samples were collected from a fresh face of the bore hole side wall and not directly off the auger, using a stainless steel trowel;
- > Soil sample storage for all sampling events was via sample containers supplied by SGS laboratories;
- > Sufficient samples with zero headspace into laboratory prepared sampling jars with the sample details added to the label on the jar.
- > Collection of a blind duplicate sample for quality assurance and control (QA/QC);
- > Samples were sent to the laboratory with recommended holding times; and
- > The sample jars were preserved in a chilled esky containing ice immediately after sampling and during transport to the laboratories. The laboratory chain of custody documentation was completed and accompanied the samples during shipment (a copy of the COC is attached to the laboratory test results).

The samples were collected at the intrusive testing locations. A plan (Figure f1) showing the location of each environmental sample is attached in **Appendix A**.

8 Criteria for Contamination Assessment

8.1 General

It should be appreciated that the assessment was preliminary in nature with limited intrusive sampling to address identified areas of environmental concern.

8.1.1 NEPM – NATIONAL ENVIRONMENT PROTECTION (ASSESSMENT OF SITE CONTAMINATION) MEASURE (2013)

The current assessment criteria used in NSW to evaluate soil analytical results are based on the NSW DEC Guidelines for the NSW Site Auditor Scheme 2nd Edition 2006 [7] and National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013 [2] and was used as the criteria for the assessment of the soil on site. Table 5A of Schedule B (1) Guideline on Investigation Levels for Soil and Groundwater provides limits on investigation concentrations for contaminants based on human health and certain exposure scenarios due to site use.

The proposed site use is a mix of commercial and residential and as such the conservative criteria has been adopted. For the purpose of this assessment the following guidelines have been adopted:

- > Health Investigation Levels (HIL's) "Residential A", Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools;
- > Soil Health Screening Levels (HSL) for vapour intrusion recommended for Residential A land use (HSL A).
- > Management Limits for TPH fractions F1-F4 in soil for Residential, Parkland and Open Space land use;
- > Ecological Screening Levels (ESLs) for TPH fractions F1-F4, BTEX and Benzo(a)Pyrene in soil for Residential A land use; and
- > Ecological Investigation Levels (EILs) for urban residential/public open space limits. The thresholds adopted are the mid-range ACL values from Table 1B(1) to 1B(3) NEPM 2013. ACL are generally calculated using pH and cation exchange capacity values. As these analytes were not included in the suite, EIL values for analytes requiring ACL's have been assumed using the based on site conditions of an old suburb (40+ years old) and high traffic area at peak hour (within 50m of Newcastle Inner City Bypass)

9 Laboratory Analytical Results

Chemical testing was carried out on soil samples using SGS Australia Pty Ltd, which holds current accreditation with the National Association of Testing Authorities, Australia (NATA). The initial testing of the soil was undertaken as a preliminary assessment.

All testing was undertaken within the terms of their accreditation. Copies of the testing laboratory reports are shown in Appendix C. The results of laboratory analysis for inorganic and organic contaminants in the soil samples are summarised in the following tables:

Table 9-1 - Results of Laboratory Analysis for Heavy Metals, results in mg/kg

Table 9-2- Results of Laboratory Analysis for PAH, OPP and PCB, results in mg/kg

Table 9-3 - Results of Laboratory Analysis for TRH, Naphthalene and BTEX, results in mg/kg

Table 9-4 - Results of Laboratory Analysis for Organochlorine Pesticides, results in mg/kg

Table 9-1 Results of Laboratory Analysis for Heavy Metals, results in mg/kg

Location	Depth (m)	Date Sampled	Filling (F) / Natural (N)	Material Description			Heavy Metals								
				Secondary Constituent	Primary Constituent	Contaminant Observations	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
HA1 0.4-0.5	0.4-0.5	29/09/2017	N	Silty	CLAY	-	<3	<0.3	3.8	8.2	7	<0.05	3.1	22	
HA2 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	3	<0.3	40	11	20	<0.05	6.8	200	
HA3 0.7-0.8	0.7-0.8	29/09/2017	N	Silty	CLAY	-	46	<0.3	7.9	20	15	<0.05	2.9	25	
HA4 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Trace slag	4	<0.3	16	36	14	<0.05	4.8	120	
HA5 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Trace slag	6	<0.3	13	24	30	<0.05	8.3	230	
HA6 0.4-0.5	0.4-0.5	29/09/2017	N	Silty	CLAY	-	6	<0.3	9.1	8.2	15	<0.05	2.2	43	
DUP	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	3	<0.3	26	11	20	<0.05	6.5	210	
TRIP	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	3.6	< 0.4	39	17	28	< 0.1	9.8	260	
BH001 0.1-0.3	0.01-0.3	29/09/2017	F	-	SLAG	Steel fragment	<3	<0.3	2.7	0.5	<1	< 0.1	<0.5	1.7	
Guideline Values							SGS LOR	3	0.3	0	1	1	0.1	1	1
							EUROFINS LOR	2	0.4	5	5	5	0.1	5	5
NEPM (2013) HILs for Residential A Land-Use (HIL A)							100	20	100	6000	300	40	400	7400	
NEPM (2013) EIL ¹ for Urban Residential/Public Open Space ²							100 ³	NC	250 ⁴	60 ⁴	1100 ³	NC	270 ⁴	400 ⁴	
NSW EPA (2014) General Solid Waste Contaminant Threshold Concentrations (CT1)							100	20	100	NC	100	4	40	NC	
NSW EPA (2014) Restricted Solid Waste Contaminant Threshold Concentrations (CT2) ⁵							400	80	400	NC	400	16	160	NC	

Notes to Table 9-1:

Residential A - residential land-use with garden/accessible soil (home grown produce <10% fruit and vegetable uptake (no poultry)), also includes childcare centres, preschools and primary schools

1 - The EIL is calculated by summing the ACL and the ABC. In the absence of pH, CEC and/or % clay content testing, the most conservative ACL value from Tables 1B(1) to 1B(3) NEPM (2013) is adopted as the EIL.

2 - Urban residential/public open space is broadly equivalent to the Residential A, Residential B and Recreational C land-use criteria

3 - Generic EIL

4 - EIL is assumed based on Site conditions (Age, Traffic volume). Value adopted from Table 1B(1) to 1B(3) NEPM 2013 in the absence of pH, CEC and/or % clay content testing


5 - Where the contaminant threshold value set for restricted solid waste (CT2) is exceeded, a TCLP test must be carried out to determine the leachable concentration of that contaminant and the class of waste.


DUP and TRIP are the QA samples of HA2 0.05-0.15

Contaminant Exceedance Indicators:

Bold - Indicates exceedance of NEPM (2013) HIL A criteria values for Residential A Land-use

Italics - Indicates exceedance of NEPM (2013) EIL criteria values for Urban Residential/Public Open Space Land-use

 Indicates material is classified as General Solid Waste in accordance with NSW EPA (2014), i.e. > CT1 and ≤ SCC1 and ≤ TCLP1

 Indicates material is classified as Restricted Solid Waste in accordance with NSW EPA (2014), i.e. ≤ CT2 and ≤ SCC2 and ≤ TCLP2


 Indicates material is classified as Hazardous Solid Waste in accordance with NSW EPA (2014), i.e. > SCC2 and > TCLP2

Table 9-2 Results of Laboratory Analysis for PAH, OPP and PCB, results in mg/kg

Location	Depth (m)	Date Sampled	Filling (F) / Natural (N)	Material Description			TRH						Naphthalene	BTEX				
							Secondary Constituent	Primary Constituent	Contaminant Observations	C ₆ - C ₉	C ₁₀ - C ₃₆	F1 C ₆ - C ₉		F2 > C ₁₀ - C ₁₆	F3 > C ₁₆ - C ₃₄	F4 > C ₃₄ - C ₄₀	Benzene	Toluene
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
HA1 0.4-0.5	0.4-0.5	29/09/2017	N	Silty	CLAY	-	<20	<110	<20	<25	<90	<120	<0.1	<0.1	<0.1	<0.1	<0.3	
HA2 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	<20	<110	<20	<25	<90	<120	<0.1	<0.1	<0.1	<0.1	0.4	
HA3 0.7-0.8	0.7-0.8	29/09/2017	N	Silty	CLAY	-	<20	<110	<20	<25	<90	<120	<0.1	<0.1	<0.1	<0.1	<0.3	
HA4 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Trace slag	<20	<110	<20	<25	<90	<120	<0.1	<0.1	<0.1	0.2	1.5	
HA5 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Trace slag	<20	<110	<20	<25	<90	<120	<0.1	<0.1	<0.1	0.3	2.8	
HA6 0.4-0.5	0.4-0.5	29/09/2017	N	Silty	CLAY	-	<20	<110	<20	<25	<90	<120	<0.1	<0.1	<0.1	<0.1	<0.3	
DUP	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	<20	<110	<20	<25	<90	<120	<0.1	<0.1	<0.1	<0.1	0.4	
TRIP	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	<20	119	<20	<50	<100	<100	<0.1	<0.1	<0.1	<0.1	<0.3	
BH001 0.1-0.3	0.01-0.3	29/09/2017	F	-	SLAG	Slag	<20	<110	<20	<50	<100	<100	<0.1	<0.1	<0.1	<0.1	<0.3	
Guideline Values							SGS LOR	20	110	20	25	90	120	0	0.1	0	0	0
							EUROFINS LOR	20	50	20	50	100	100	0	0.1	0.1	0.1	0.1
NEPM (2013) HSL A & B - Sand from 0 m to <1 m bgl							NC	NC	45	110	NC	NC	3	0.5	160	55	40	
NEPM (2013) HSL A & B - Silt from 0 m to <1 m bgl							NC	NC	40	230	NC	NC	4	0.6	390	NL	95	
NEPM (2013) HSL A & B - Clay from 0 m to <1 m bgl							NC	NC	50	280	NC	NC	5	0.7	480	NL	110	
NEPM (2013) EIL for Urban Residential/Public Open Space ¹							NC	NC	NC	NC	NC	NC	170 ²	NC	NC	NC	NC	
NEPM (2013) ESL ³ for Urban Residential/Public Open Space ¹ - Course Grained Soils							NC	NC	180 *	120 *	300	2,800	NC	50	85	70	105	
NEPM (2013) ESL ³ for Urban Residential/Public Open Space ¹ - Fine Grained Soils							NC	NC	180 *	120 *	1300	5,600	NC	65	105	125	45	
NEPM (2013) Management Limits ⁴ for Residential, Parkland and Open Space ¹ - Course Grained Soils							NC	NC	700	1000	2500	10,000	NC	NC	NC	NC	NC	
NEPM (2013) Management Limits ⁴ for Residential, Parkland and Open Space ¹ - Fine Grained Soils							NC	NC	800	1000	3500	10,000	NC	NC	NC	NC	NC	
NSW EPA (2014) General Solid Waste Contaminant Threshold Concentrations (CT1)							650	10,000 ⁵	NC	NC	NC	NC	NC	10	288	600	1,000	
NSW EPA (2014) Restricted Solid Waste Contaminant Threshold Concentrations (CT2) ⁶							2,600	40,000 ⁵	NC	NC	NC	NC	NC	40	1152	2,400	4,000	

Notes to Table 9-2:

Residential A - residential land-use with garden/accessible soil (home grown produce <10% fruit and vegetable uptake (no poultry)), also includes childcare centres, preschools and primary schools

1 - Urban residential/public open space is broadly equivalent to the Residential A, Residential B and Recreational C land-use criteria

2 - Generic EIL

3 - ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability

4 - Management limits are applied after consideration of relevant ESLs and HSLs

5 - Contaminants only assessed using the SCC (Specific Contaminant Concentration)

6 - Where the contaminant threshold value set for restricted solid waste (CT2) is exceeded, a TCLP test must be carried out to determine the leachable concentration of that contaminant and the class of waste.

DUP and TRIP are the QA samples of HA2 0.05-0.15

Contaminant Exceedance Indicators:
Bold - Indicates exceedance of NEPM (2013) HIL A criteria values for Residential A Land-use

Italics - Indicates exceedance of NEPM (2013) EIL/ESL criteria values for Urban Residential/Public Open Space Land-use

Double Underline - Indicates exceedance of NEPM (2013) Management Limits for Residential, Parkland and Open Space Land-use

Indicates material is classified as General Solid Waste in accordance with NSW EPA (2014), i.e. > CT1 and ≤ SCC1 and ≤ TCLP1

Indicates material is classified as Restricted Solid Waste in accordance with NSW EPA (2014), i.e. ≤ CT2 and ≤ SCC2 and ≤ TCLP2

Indicates material is classified as Hazardous Solid Waste in accordance with NSW EPA (2014), i.e. > SCC2 and > TCLP2

Table 9-3 Results of Laboratory Analysis for TRH, Naphthalene and BTEX, results in mg/kg

Location	Depth (m)	Date Sampled	Filling (F) / Natural (N)	Material Description			PAH			OPP		Total PCB	
				Secondary Constituent	Primary Constituent	Contaminant Observations	Total	B(a)P	B(a)P TEQ (Upper)	Total	Chlor-pyrifos		
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
HA1 0.4-0.5	0.4-0.5	29/09/2017	N	Silty	CLAY	-	<0.8	<0.1	<0.3	<1	<0.2	<1	
HA2 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	5.8	0.5	0.8	<1	<0.2	<1	
HA3 0.7-0.8	0.7-0.8	29/09/2017	N	Silty	CLAY	-	<0.8	<0.1	<0.3	<1	<0.2	<1	
HA4 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Trace slag	5.1	0.3	0.6	<1	<0.2	<1	
HA5 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Trace slag	1.9	0.2	0.3	<1	<0.2	<1	
HA6 0.4-0.5	0.4-0.5	29/09/2017	N	Silty	CLAY	-	<0.8	<0.1	<0.3	<1	<0.2	<1	
DUP	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	3	0.2	0.4	<1	<0.2	<1	
TRIP	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	1.2	<0.5	1.2	<1.2	<0.2	0.5	
BH001 0.1-0.3	0.01-0.3	29/09/2017	F	-	SLAG	Slag	<0.8	<0.1	<0.3	<1	<0.2	<1	
Guideline Values							SGS LOR	0.80	0.10	0.3	1.0	0.2	1.0
							EUROFINS LOR	0.50	0.50	0.5	1.2	0.2	0.5
NEPM (2013) HILs for Residential A Land-Use (HIL A)							300	NC	3	NC	160	1	
NEPM (2013) EIL for Urban Residential/Public Open Space ¹							NC	NC	NC	NC	NC	NC	
NEPM (2013) ESL ³ for Urban Residential/Public Open Space ¹ - Course Soils							NC	0.7	NC	NC	NC	NC	
NEPM (2013) ESL ³ for Urban Residential/Public Open Space ¹ - Fine Soils							NC	0.7	NC	NC	NC	NC	
NSW EPA (2014) General Solid Waste Contaminant Threshold Concentrations (CT1)							200 ⁴	0.8	NC	250 ⁴	4	< 50 ⁴	
NSW EPA (2014) Restricted Solid Waste Contaminant Threshold Concentrations (CT2) ⁵							800 ⁴	3.2	NC	1,000 ⁴	16	< 50 ⁴	

Notes to Table 9-3:

Residential A - residential land-use with garden/accessible soil (home grown produce <10% fruit and vegetable uptake (no poultry)), also includes childcare centres, preschools and primary schools

1 - Urban residential/public open space is broadly equivalent to the Residential A, Residential B and Recreational C land-use criteria

2 - Generic EIL

3 - ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability

4 - Contaminants only assessed using the SCC (Specific Contaminant Concentration)

5 - Where the contaminant threshold value set for restricted solid waste (CT2) is exceeded, a TCLP test must be carried out to determine the leachable concentration of that contaminant and the class of waste.

DUP and TRIP are the QA samples of HA2 0.05-0.15

Contaminant Exceedance Indicators:
Bold - Indicates exceedance of NEPM (2013) HIL A criteria values for Residential A Land-use

Italics - Indicates exceedance of NEPM (2013) EIL/ESL criteria values for Urban Residential/Public Open Space Land-use

Indicates material is classified as General Solid Waste in accordance with NSW EPA (2014), i.e. > CT1 and ≤ SCC1 and ≤ TCLP1

Indicates material is classified as Restricted Solid Waste in accordance with NSW EPA (2014), i.e. ≤ CT2 and ≤ SCC2 and ≤ TCLP2

Indicates material is classified as Hazardous Solid Waste in accordance with NSW EPA (2014), i.e. > SCC2 and > TCLP2

Table 9-4 Results of Laboratory Analysis for Organochlorine Pesticides, results in mg/kg

Location	Depth (m)	Date Sampled	Filling (F) / Natural (N)	Material Description			OCP										
				Secondary Constituent	Primary Constituent	Contaminant Observations	Total	DDT+DDE+DDD	DDT	Aldrin + Dieldrin	Chlor-dane	Endo-sulfan	Endrin	Hepta-chlor	HCB	Methoxy-chlor	
							mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
HA1 0.4-0.5	0.4-0.5	29/09/2017	N	Silty	CLAY	-	<1.7	<0.3	<0.1	<0.3	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	
HA2 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	<1.7	<0.3	<0.1	<0.3	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	
HA3 0.7-0.8	0.7-0.8	29/09/2017	N	Silty	CLAY	-	<1.7	<0.3	<0.1	<0.3	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	
HA4 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Trace slag	<1.7	<0.3	<0.1	<0.3	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	
HA5 0.05-0.15	0.05-0.15	29/09/2017	F	Silty	SAND	Trace slag	<1.7	<0.3	<0.1	<0.3	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	
HA6 0.4-0.5	0.4-0.5	29/09/2017	N	Silty	CLAY	-	<1.7	<0.3	<0.1	<0.3	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	
DUP	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	<1.7	<0.3	<0.1	<0.3	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	
TRIP	0.05-0.15	29/09/2017	F	Silty	SAND	Steel fragment	<2.0	<0.05	<0.05	<0.1	<0.1	<0.15	<0.05	<0.05	<0.05	<0.05	
BH001 0.1-0.3	0.01-0.3	29/09/2017	F	Silty	SAND	Steel fragment	<2.0	<0.05	<0.05	<0.1	<0.1	<0.15	<0.05	<0.05	<0.05	<0.05	
Guideline Values							SGS LOR	1.7	0.3	0.1	0.3	0.2	0.2	0.2	0.2	0.1	0.1
							EUROFINS LOR	2.00	0.05	0.1	0.10	0.1	0.15	0.05	0.05	0.05	0.05
NEPM (2013) HILs for Residential A Land-Use (HIL A)							NC	240	NC	6	50	270	10	6	10	300	
NEPM (2013) EIL for Urban Residential/Public Open Space ¹							NC	NC	180 ²	NC	NC	NC	NC	NC	NC	NC	NC
NEPM (2013) ESL ³ for Urban Residential/Public Open Space ¹ - Course Soils							NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
NEPM (2013) ESL ³ for Urban Residential/Public Open Space ¹ - Fine Soils							NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
NSW EPA (2014) General Solid Waste Contaminant Threshold Concentrations (CT1)							< 50 ⁴	NC	NC	NC	NC	60	NC	NC	NC	NC	
NSW EPA (2014) Restricted Solid Waste Contaminant Threshold Concentrations (CT2) ⁵							< 50 ⁴	NC	NC	NC	NC	240	NC	NC	NC	NC	

Notes to Table 9-4:

Residential A - residential land-use with garden/accessible soil (home grow n produce <10% fruit and vegetable uptake (no poultry)), also includes childcare centres, preschools and primary schools

1 - Urban residential/public open space is broadly equivalent to the Residential A, Residential B and Recreational C land-use criteria

2 - Generic EIL

3 - ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability

4 - Contaminants only assessed using the SCC (Specific Contaminant Concentration)

5 - Where the contaminant threshold value set for restricted solid waste (CT2) is exceeded, a TCLP test must be carried out to determine the leachable concentration of that contaminant and the class of waste.

DUP and TRIP are the QA samples of HA2 0.05-0.15

Contaminant Exceedance Indicators:
Bold - Indicates exceedance of NEPM (2013) HIL A criteria values for Residential A Land-use

Italics - Indicates exceedance of NEPM (2013) EIL/ESL criteria values for Urban Residential/Public Open Space Land-use

Indicates material is classified as General Solid Waste in accordance with NSW EPA (2014), i.e. > CT1 and ≤ SCC1 and ≤ TCLP1

Indicates material is classified as Restricted Solid Waste in accordance with NSW EPA (2014), i.e. ≤ CT2 and ≤ SCC2 and ≤ TCLP2

Indicates material is classified as Hazardous Solid Waste in accordance with NSW EPA (2014), i.e. > SCC2 and > TCLP2

9.2 Quality Assurance

It was considered that the field and laboratory QA/QC criteria were generally within acceptable limits indicating field sampling, storage, handling and decontamination procedures and laboratory preparation and analysis procedures were adequate for the purposes of the environmental investigation. Full details are provided in the QA/QC report in Appendix G.

10 Analysis of Results and Field Investigation

The objectives of the PSI was to identify any past or present potentially contaminating activities and to provide a preliminary assessment of the overall site contamination. The PSI comprised an assessment of the available historical data, site investigation, and limited laboratory analysis.

This section summarises the investigation findings and provides comments and recommendations regarding the contamination status of the site and requirements for further assessment.

10.1 Soil Contamination Assessment

10.1.1 Heavy Metals

Appraisal of the results indicates that the concentration levels of metals within the samples tested were below the threshold limits as detailed in National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013 [2], "Residential A". Comparison to the NEPM 2013 EIL's indicate all samples are below the EIL criteria for the Site.

10.1.2 Total Petroleum Hydrocarbons (TPH) and BTEX

Appraisal of the results indicates TPH's and BTEX were below the threshold limits as detailed in the National Environment Protection Measure for the Assessment of Site Contamination, 2013 [2] "Residential A".

10.1.3 Polycyclic Aromatic Hydrocarbon (PAH)

Appraisal of the results indicates PAH's were below the threshold limits as detailed in the National Environment Protection Measure for the Assessment of Site Contamination, 2013 [2] "Residential A".

10.1.4 Organophosphorus & Organochlorine Pesticides (OPP/OCP) & Polychlorinated Biphenyls (PCB)

Appraisal of the results indicates that the levels of OPP, OCP and PCB within the samples tested were below the threshold limits as detailed in National Environment Protection Measure for the Assessment of Site Contamination, 2013 [2] "Residential A".

10.1.5 Acid Sulfate Soils

Review of available published data, indicates that the site is situated within no known occurrence of acid sulfate soil materials with reference to the "Department of Land and Water Conservation, Walsend Acid Sulfate Soil Risk Map", Edition 2, dated December 1997 [5].

Due to the available data indicating no known presence of acid sulfate soils, no intrusive sampling and testing was undertaken on the subject site. Based on the available data, the presence of acid sulfate soils onsite is considered highly unlikely.

10.2 Subsurface Conditions

The subsurface conditions encountered in the bore holes are detailed on the report log sheets attached in **Appendix B** together with explanatory notes and bore location plans are attached in **Appendix A**.

The subsurface profile encountered within hand auger bores (HA1-HA6) advanced within the vicinity of the existing building structures generally comprised of silty sand fill materials overlying residual silty clay.

Fill depths were 0.40m, 0.70m and 0.20m below existing surface levels (bsl) within HA2, HA3 and HA6, respectively. Fill encountered in HA1 comprised gravel on surface to 0.05m bsl, overlying residual silty clay.

HA4 and HA5 were terminated at 0.30m due to the presence of services. Fill depths within HA4 and HA5 were to the termination depth of 0.30m. The depth of fill at these locations is unknown as the depth of fill was not penetrated.

No indication of staining or olfactory indication of hydrocarbons, nor fibrous sheeting was observed within the bore holes. Traces of slag were encountered within HA4 and HA5 and traces of steel fragments were encountered in HA2.

Two (2) boreholes (BH01 & BH02) were advanced within the existing pavement formation and the subsurface profile are summarised below:

- > PAVEMENT / FILL: pavement material and associated structural filling to depths of 0.25 m and 0.4 m respectively. A Slag gravel layer was present within BH01 from approximately 0.10 m to 0.25m bsl. Both pavements were surfaced by a 35 mm thick Asphalt wearing course; overlying
- > RESIDUAL SOIL: Medium to high plasticity Silty CLAY was encountered from depths of approximately 0.25 m to 0.4m below ground level to approximately 4.2 m and 6.7 m BGL within boreholes BH01 and BH02 respectively. The residual clays were observed to grade to extremely weathered siltstone extremely; overlying
- > SILTSTONE: Extremely weathered to distinctly weathered, thinly laminated siltstone was encountered in BH01 and BH02 at depths of approximately 4.2 m and 6.7 m to the depth of 10.18 m and 7.09 m BGL respectively

Seepage was not encountered in any of the bore holes at the time of the investigation. It should be noted that groundwater levels are likely to fluctuate with variations in climatic and site conditions.

10.3 Discussion

The subsurface profile encountered across the site generally comprised of silty sand fill materials overlying residual silty clay. Fill depths were 0.40m, 0.70m and 0.20m below existing surface levels (bsl) within HA2, HA3 and HA6, respectively. Fill encountered in HA1 comprised gravel on surface to 0.05m bsl, overlying residual silty clay. HA4 and HA5 were terminated at 0.30m due to the presence of services. Fill depths within HA4 and HA5 were to the termination depth of 0.30m.

No indication of staining or olfactory indication of hydrocarbons (with the exception of slag materials), nor fibrous sheeting was observed within the bore holes. Traces of slag were encountered within HA4 and HA5 and traces of steel fragments were encountered in HA2.

A sample of the slag material was collected and analysed with laboratory results within the adopted site criteria. It must be appreciated that the extent of slag layer beneath the pavement formation is unknown and due to heterogeneous nature of the fill / slag materials, potentially contaminated slag materials may arise.

Based on the findings of this PSI and comparison of the analytical testing undertaken to threshold limits detailed in National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013 [2]. "Residential A", no indication of gross contamination has been identified on the site that exceeds thresholds.

11 Preliminary Conceptual Site Model

11.1.1 General

A Conceptual Site Model (CSM) is “a description of a site including the environmental setting, geological, hydrogeological and soil characteristics together with the nature and distribution of contaminants. Potentially exposed populations and exposure pathways are identified” (NEPM, 2013) [2]. The development of a CSM comprises an iterative process of characterising site contamination on the basis of available information or data. This Preliminary CSM has been prepared to summarise the currently known or suspected contaminants at the Site, their locations, potential receptors of these contaminants and to assess whether linkages may be present between the contaminants and receptors. This Preliminary CSM is the first iteration of the CSM process and should be updated following subsequent rounds of assessment (where applicable) when additional information becomes available.

Based on the findings of the PSI the following Potential Sources of Contamination (PSOC) have been identified on the Site:

11.1.2 Areas of Environmental Concern (AEC)

Areas of Environmental Concern (AEC) are associated with:

- > Potential contamination associated with minor areas of filling and surficial disturbance on site – onsite
- > Potential contamination associated with slag materials beneath pavement materials - onsite
- > Potential pesticide and herbicide use within greenhouses - onsite
- > Asbestos containing materials (ACM) within structures– onsite
- > Potential contaminated soils beneath building pads – onsite

11.1.3 Media potentially impacted

The potential media impacted by contamination may include:

- > Potentially contaminated surficial soils onsite.
- > Potentially contaminated underlying soils onsite.
- > Potentially contaminated fill materials onsite.
- > Potentially contaminated groundwater under the site

11.1.4 Human and Ecological Receptors

The potential human and ecological receptors include the following:

- > Workers involved in the potential remediation / restoration or development of the site (onsite)
- > Future site users (onsite)
- > Site users – students and University staff (onsite)
- > Surface water runoff (offsite) into adjacent drainage channels and creeklines.
- > Local residents and surrounding properties (offsite).

11.1.5 Potential Exposure Pathways

The potential exposure pathways identified include;

- > Air – ingestion
- > Soil – dermal / direct contact
- > Vapour – Inhalation
- > Lateral migration via surface water.

11.1.6 Data Gaps and Uncertainties

Based on the inspection, intrusive sampling, comparison of the analytical testing undertaken to threshold limits detailed in (NEPM), the potential contamination at this site is not considered to present a significant constraint on the proposed redevelopment of subject site. However; It must be appreciated that assessment was limited to accessible soils within the subject site and limited intrusive sampling to address identified areas of environmental concern.

The following data gaps and uncertainties regarding the assessment are detailed below:

- > Limited subsurface access during assessment, due to existing structures and concrete paths.
- > Limited access within existing buildings.
- > Soils beneath the existing building pads were not accessible and assessed which may potentially contain fill or contaminated materials.
- > The extent of slag materials within the pavement formation
- > Limited pavement testing was undertaken.
- > No groundwater samples collected however; groundwater contamination is considered unlikely.

12 Conclusions and Recommendations

This report represents the findings of PSI undertaken on the subject site, University of Newcastle proposed Bio-Resources facility, Callaghan NSW. The assessment aimed to address the objectives outlined in Section 1.2 of this report, namely, to assess at a preliminary / supplementary level:

- > The potential for the former and current site and adjacent sites uses to be a source of contamination.
- > The nature and location of contamination of soil on-site and potential for contamination extending off-site.
- > Whether the contamination status of the site presents any constraint on the proposed use of the site.
- > The need for any further assessment or remedial works before definitive conclusions could be made on the suitability of the site for use.

12.1 Potential for Contamination

Cardno has identified the following potential sources of contamination at or in the vicinity of the site:

- > Previous industrial operations and remediation test programs for contaminated groundwater conducted at the Newcastle Institute for Energy and Resources (NIER) which was formerly the BHP Newcastle Technology Centre. The site has undergone redevelopment recently with the expansion of NIER and the redevelopment of the Shortland Waters Golf Club. As it was licenced activity, the potential for groundwater contamination is considered low.
- > Potentially contaminated soils beneath the building pads.
- > Extent of slag layer beneath the pavement materials is unknown.
- > Potentially ACM materials contained within building structures.

12.2 Potential Acid Sulfate Soil

A Review of the *“Department of Land and Water Conservation, Wallsend Acid Sulfate Soil Risk Map”, Edition 2, dated December 1997*, identifies the site is not situated within known occurrence of acid sulfate soils. As result the likelihood that Actual Acid Sulfate Soils are present at the site is considered low. This was consistent with field observations of the material during the investigation.

12.3 Soil Contamination

A limited intrusive sampling and testing regime has been undertaken to provide a supplementary assessment of the identified AEC's and to address issues identified by the desktop study. Based on the findings of this PSI and comparison of the analytical testing undertaken to threshold limits detailed in National Environment Protection Measure (NEPM) for the Assessment of Site Contamination, 2013 [2]. “Residential A”, no indication of gross contamination has been identified on the site. No COPCs were detected at concentrations above the applicable Tier I screening values.

12.4 Conclusions

Based on site history and limited laboratory results, the risk of contamination to constrain the development of the site for the proposed use is unlikely. Based on limited laboratory assessment and comparison to NEPM Residential A HILs/HSLs, no indication of gross contamination has been identified on the site. No COPCs were detected at concentrations above the applicable Tier I screening values. The site is considered low to moderate risk of potential contamination based on limited laboratory results, site access limitations and the identified data gaps. As there is a potential risk for contamination within inaccessible areas and the extent of slag is unknown, an unexpected finds protocol should be developed.

12.5 Recommendations

Based on the conclusions above, Cardno recommends:

- > Any soil proposed to be excavated and transported off site for disposal should be classified in accordance with the NSW EPA Waste Classification Guidelines.
- > Validation soil sampling will be required once the soil excavation is complete to ensure that the residual soils are suitable for the ongoing land use

13 References

- [1] NSW EPA, "Contaminated Sites: Guidelines for Consults on Contaminated Sites," NSW Environmental Protection Authority, 1997.
- [2] National Environment Protection (Assessment of Site Contamination) Measure 1999, "Schedule B1 Guidelines on Investigation Levels For Soil and Groundwater," National Environment Protection Council (NEPC), 16 May 2013.
- [3] Lotsearch, Environmental Risk and Planning Report, 130 University Drive, Callaghan, NSW 2308, 2017.
- [4] Geological Survey of Newcastle, *1:100,000 Newcastle Geological Map*, Division of Mines and Geology.
- [5] Department of Land And Water Conservation, "Acid Sulfate Soil Risk Map for Wallsend (Edition 2)," NSW Department of Natural Resources, December 1997.
- [6] Newcastle Local Environment Plan, Acid Sulfate Soils Map, Newcastle City Council, 2012.
- [7] NSW DEC, "Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition)," Department of Environment and Conservation NSW, April 2006.

14 Limitations

Cardno have performed investigation and consulting services for this project in general accordance with current professional and industry standards. The extent of testing was limited to discrete test locations and variations in ground conditions can occur between test locations that cannot be inferred or predicted.

Cardno, or any other reputable consultant, cannot provide unqualified warranties nor does it assume any liability for the site conditions not observed or accessible during the investigations. Site conditions may also change subsequent to the investigations and assessment due to ongoing use.

This report and associated documentation was undertaken for the specific purpose described in the report and shall not be relied on for other purposes. This report was prepared solely for the use by University of Newcastle and any reliance assumed by other parties on this report shall be at such parties own risk.

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

A

FIGURES AND PHOTOGRAPHS

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

B

LOGS AND EXPLANATORY NOTES

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

C

ANALYTICAL RESULTS

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

D

LOTSEARCH REPORT

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

E

TILTE SEARCH

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

F

SECTION 149 CERTIFICATE

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

G

QA/QC REPORT

15 References

- [1] NSW EPA, ""Contaminated Sites: Guidelines for Consults on Contaminated Sites," NSW Environmental Protection Authority, 1997.
- [2] National Environment Protection (Assessment of Site Contamination) Measure 1999, "Schedule B1 Guidelines on Investigation Levels For Soil and Groundwater," National Environment Protection Council (NEPC), 16 May 2013.
- [3] Lotsearch, Environmental Risk and Planning Report, 130 University Drive, Callaghan, NSW 2308, 2017.
- [4] Geological Survey of Newcastle, *1:100,000 Newcastle Geological Map*, Division of Mines and Geology.
- [5] Department of Land And Water Conservation, "Acid Sulfate Soil Risk Map for Wallsend (Edition 2)," NSW Department of Natural Resources, December 1997.
- [6] Newcastle Local Environment Plan, Acid Sulfate Soils Map, Newcastle City Council, 2012.
- [7] NSW DEC, "Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition)," Department of Environment and Conservation NSW, April 2006.



University of Newcastle Proposed Bio-Resources Facility

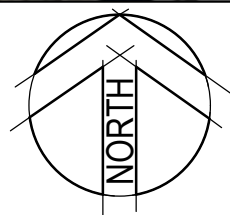
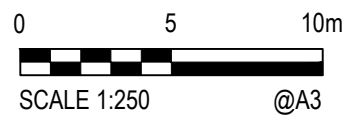
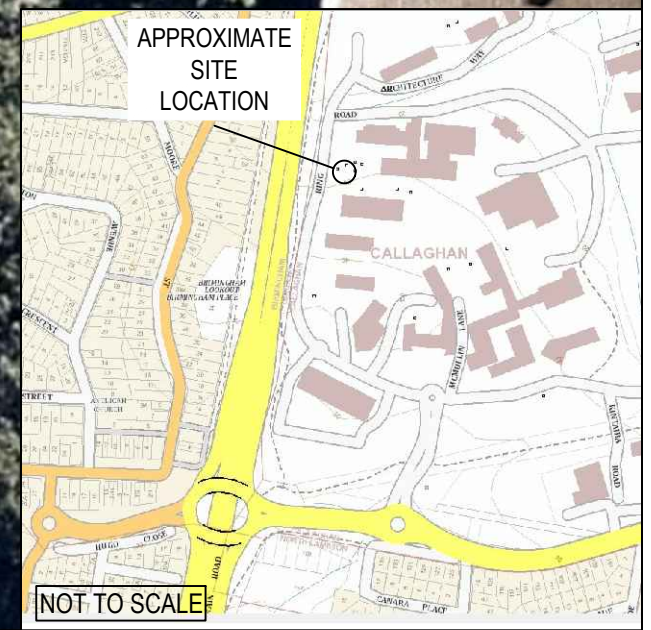
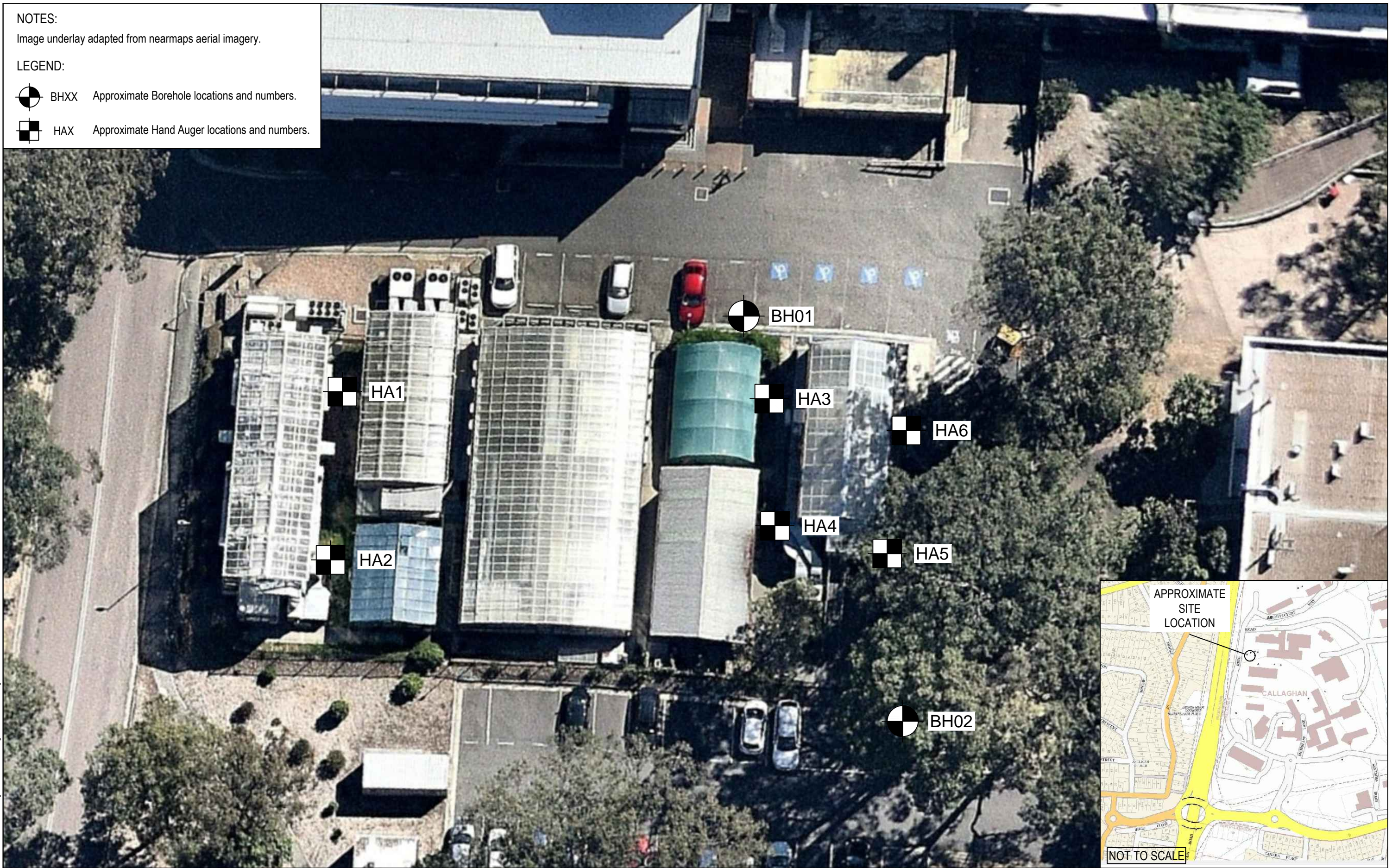
APPENDIX

A

FIGURES

NOTES:
Image underlay adapted from nearmaps aerial imagery.

LEGEND:
 BHXX Approximate Borehole locations and numbers.
 HAX Approximate Hand Auger locations and numbers.



© Cardno Limited
All Rights Reserved.
This document is produced by Cardno Limited solely for the benefit of and use by the client in accordance with the terms of the retainer. Cardno Limited does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.



Cardno
Shaping the Future
Cardno (NSW/ACT) Pty Ltd | ABN 95 001 145 035
Unit 1, 10 Denney Street
Broadmeadow, NSW 2292
Tel: 02 4965 4555 Fax: 02 4965 4666
Web: www.cardno.com.au

Drawn	JG	Date	18/10/17
Checked	IB	Date	25/10/2017
Verified		Date	
Approved		Date	

Client	University of Newcastle
Project	Geotechnical Investigation Bioresources Facility Ring Road, University of Newcastle, Callaghan
Title	Site Plan

Status	FOR INFORMATION ONLY NOT TO BE USED FOR CONSTRUCTION PURPOSES		
Project Number	82218015	Scale	1:250
Drawing Number	DW01	Size	A3
Revision	A		



Photo 1: Wheelbarrow and existing greenhouse equipment in the south-west of the site

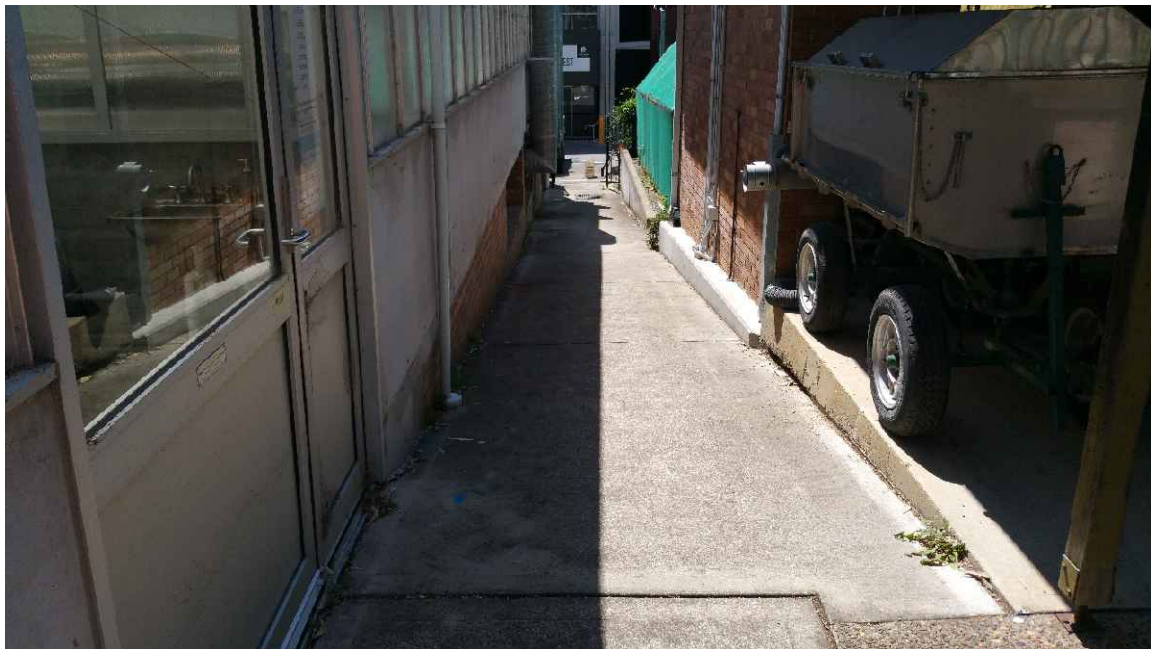


Photo 2: Example of site's tight access, facing north

XREF's: CAD File: N:\Projects\822\FY18\015_LION_BIORESOURCES FACILITY\Reports\PSI\Appendices\A82218015_Site_Photos.dwg



Cardno (NSW/ACT) Pty Ltd | ABN 95 001 145 035
 Unit 1, 10 Denney Street
 Broadmeadow, NSW 2292
 Tel: 02 4965 4555 Fax: 02 4965 4666
 Web: www.cardno.com.au

Dwn	JG	25/10/2017	Date	Client	University of Newcastle			
Chk	DS	25/10/2017	Date	Project	Bioresources Facility		Status	PRELIMINARY
Des	JG		Date	Preliminary Site Investigation				NOT TO BE USED FOR CONSTRUCTION PURPOSES
Ver			Date	University of Newcastle, Callaghan				
App			Date	Title	Site Photos		Scale	Size A4
					Drawing Number		Revn	
					Plate 1		A	



Photo 3: Grassed area between existing greenhouses, facing north

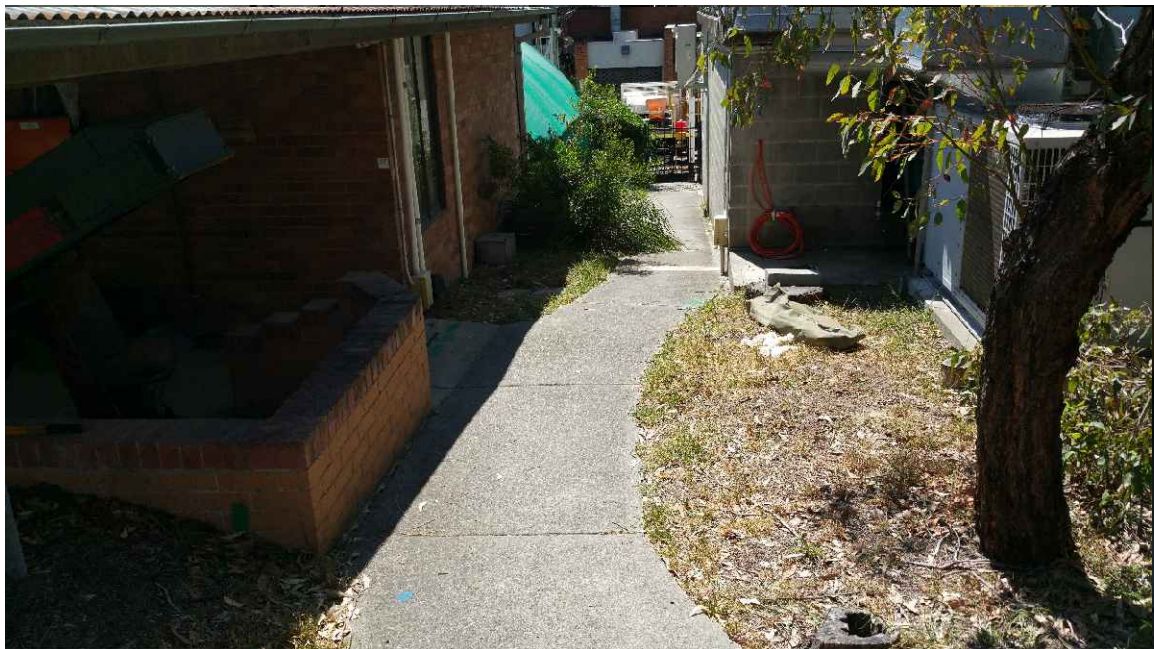


Photo 4: Typical concrete paths around the site


 <p>Cardno Shaping the Future</p> <p>Cardno (NSW/ACT) Pty Ltd ABN 95 001 145 035 Unit 1, 10 Denney Street Broadmeadow, NSW 2292 Tel: 02 4965 4555 Fax: 02 4965 4666 Web: www.cardno.com.au</p>	Dwn	JG	25/10/2017	Date	Client	University of Newcastle				
	Chk	DS	25/10/2017	Date	Project	Bioresources Facility		Status PRELIMINARY		
	Des	JG		Date	Preliminary Site Investigation		NOT TO BE USED FOR CONSTRUCTION PURPOSES			
	Ver			Date	University of Newcastle, Callaghan		Scale	Size	A4	
	App				Title	Site Photos		Drawing Number	Plate 2	
							Revn	A		



Photo 5: Typical paved area in carpark north of the site, facing west



Photo 6: Typical paved, confined area throughout the site



Cardno (NSW/ACT) Pty Ltd | ABN 95 001 145 035
 Unit 1, 10 Denney Street
 Broadmeadow, NSW 2292
 Tel: 02 4965 4555 Fax: 02 4965 4666
 Web: www.cardno.com.au

Dwn	JG	25/10/2017	Date	Client	University of Newcastle			
Chk	DS	25/10/2017	Date	Project	Bioresources Facility		Status	PRELIMINARY
Des	JG		Date	Preliminary Site Investigation				NOT TO BE USED FOR CONSTRUCTION PURPOSES
Ver			Date	University of Newcastle, Callaghan				
App			Date	Title	Site Photos		Scale	Size A4
					Drawing Number		Revn	A
					Plate 3			

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

B

LOGS AND EXPLANATORY NOTES

TESTBORE LOG

CLIENT : University of Newcastle
 PROJECT : Contamination Investigation
 LOCATION : Callaghan

HOLE NO : HA1
 PROJECT REF : 82218015
 SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger

METHOD : Hand Auger

DATE EXCAVATED : 29/9/17

LOGGED BY : JB

CHECKED BY :

LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETROMETER (kPa)	STRUCTURE & Other Observations
		0.0	○ ○ ○ ○		FILL; GRAVEL, medium to coarse, sub-rounded to angular					FILL, gravel on surface
	0.05m ES-HA1	0.05m	▨ ▨ ▨ ▨		Silty CLAY, medium to high plasticity, brown					RESIDUAL
	0.15m		▨ ▨ ▨ ▨		As above, colour change to orange to pale brown	MC = PL	St		X	HP In-situ = 120 kPa
	0.40m ES-HA1	0.30m	▨ ▨ ▨ ▨		Silty CLAY, medium to high plasticity, grey mottled orange					RESIDUAL
	0.50m	0.50m	▨ ▨ ▨ ▨		As above, trace of root fibres	MC = PL	St		X	HP In-situ = 170 kPa
		0.5			Testbore HA1 terminated at 0.50 m End at natural profile					
		1.0								

MOISTURE & GROUNDWATER

- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- ▲ - Water seepage/inflow
- ▼ - Water level

SAMPLES & FIELD TESTS

- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
- SPT - Standard Penetration Test
- HP - Hand/Pocket Penetrometer

CONSISTENCY

- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY

- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH

- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING

- RS - Residual soil
- XL - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

GEOTECH.GLB_Log_CARDNO_TESTHOLE_LOG_82218015_UNIBICRESOURCES_CONTAM.GPJ_18/10/2017_10:46_10.0.000

TESTBORE LOG

CLIENT : University of Newcastle
 PROJECT : Contamination Investigation
 LOCATION : Callaghan

HOLE NO : HA2
 PROJECT REF : 82218015
 SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger

METHOD : Hand Auger

DATE EXCAVATED : 29/9/17

LOGGED BY : JB

CHECKED BY :

LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETROMETER (kPa)	STRUCTURE & Other Observations
		0.0			FILL; Silty SAND, fine to coarse grained, brown, with gravel					FILL; scattered gravel on surface
	0.05m ES-HA2-DUP/TRIP				@0.05m trace of steel fragments					
		0.15m				D - M				
Not Encountered		0.40m ES-HA2			Silty CLAY, low to medium plasticity, dark brown, with sand	MC = PL	F	X		RESIDUAL HP In-situ = 70 kPa
		0.50m			Silty CLAY, medium to high plasticity, grey to brown mottled orange				X	RESIDUAL HP In-situ = 150 kPa
	0.60m ES-HA2					MC = PL	St			
		0.70m			Testbore HA2 terminated at 0.70 m End at natural profile					
		1.0								

MOISTURE & GROUNDWATER

- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- Water seepage/inflow
- Water level

SAMPLES & FIELD TESTS

- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
- SPT - Standard Penetration Test
- HP - Hand/Pocket Penetrometer

CONSISTENCY

- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY

- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH

- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING

- RS - Residual soil
- XW - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

GEOTECH.GLB Log_CARDNO_TESTHOLE_LOG_82218015_UNIBICRESOURCES_CONTAM.GPJ 18/10/2017 10:46 10.0.0.000

TESTBORE LOG

CLIENT : University of Newcastle
 PROJECT : Contamination Investigation
 LOCATION : Callaghan

HOLE NO : HA3
 PROJECT REF : 82218015
 SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger

METHOD : Hand Auger

DATE EXCAVATED : 29/9/17

LOGGED BY : JB

CHECKED BY :

LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETROMETER (kPa)	STRUCTURE & Other Observations
		0.0			FILL; Silty SAND, fine to coarse grained, grey to brown, with gravel and trace of root fibres					FILL/TOPSOIL
	0.05m ES-HA3					D - M				
		0.15m			FILL; SAND, fine to medium grained, pale yellow					FILL; service trench backfill
						D - M				
	0.50m ES-HA3	0.5								
		0.60m								
	0.70m ES-HA3	0.70m			Silty CLAY, low to medium plasticity, grey mottled red	MC = PL	St		X	RESIDUAL HP In-situ = 170 kPa
		0.80m			Testbore HA3 terminated at 0.80 m End at natural profile					
		1.0								

MOISTURE & GROUNDWATER

D - Dry
 M - Moist
 W - Wet
 OMC - Optimum MC
 PL - Plastic Limit
 Water seepage/inflow
 Water level

SAMPLES & FIELD TESTS

U - Undisturbed Sample
 D - Disturbed Sample
 ES - Environmental sample
 B - Bulk Disturbed Sample
 SPT - Standard Penetration Test
 HP - Hand/Pocket Penetrometer

CONSISTENCY

VS - Very Soft
 S - Soft
 F - Firm
 St - Stiff
 VSt - Very Stiff
 H - Hard

RELATIVE DENSITY

VL - Very Loose
 L - Loose
 MD - Medium Dense
 D - Dense
 VD - Very Dense

ROCK STRENGTH

EL - Extremely low
 VL - Very low
 L - Low
 M - Medium
 H - High
 VH - Very high
 EH - Extremely high

ROCK WEATHERING

RS - Residual soil
 XW - Extremely weathered
 DW - Distinctly weathered
 SW - Slightly weathered
 FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

TESTBORE LOG

CLIENT : University of Newcastle
 PROJECT : Contamination Investigation
 LOCATION : Callaghan

HOLE NO : HA4
 PROJECT REF : 82218015
 SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger

METHOD : Hand Auger

DATE EXCAVATED : 29/9/17

LOGGED BY : JB

CHECKED BY :

LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETROMETER (kPa)	STRUCTURE & Other Observations
	0.05m ES-HA4	0.0	█		FILL: Silty SAND, fine to coarse grained, grey to brown, with gravel and trace of slag				100 200 300 400	FILL; scattered grass on surface
	Not Encountered	0.15m	█			D - M				
		0.30m	█		Testbore HA4 terminated at 0.30 m Possible services					
		0.5	█							
		1.0	█							

MOISTURE & GROUNDWATER

- D - Dry
- M - Moist
- W - Wet
- OMC - Optimum MC
- PL - Plastic Limit
- ▲ - Water seepage/inflow
- ▼ - Water level

SAMPLES & FIELD TESTS

- U - Undisturbed Sample
- D - Disturbed Sample
- ES - Environmental sample
- B - Bulk Disturbed Sample
- SPT - Standard Penetration Test
- HP - Hand/Pocket Penetrometer

CONSISTENCY

- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard

RELATIVE DENSITY

- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

ROCK STRENGTH

- EL - Extremely low
- VL - Very low
- L - Low
- M - Medium
- H - High
- VH - Very high
- EH - Extremely high

ROCK WEATHERING

- RS - Residual soil
- XW - Extremely weathered
- DW - Distinctly weathered
- SW - Slightly weathered
- FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

TESTBORE LOG

CLIENT : University of Newcastle
 PROJECT : Contamination Investigation
 LOCATION : Callaghan

HOLE NO : HA5
 PROJECT REF : 82218015
 SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger

METHOD : Hand Auger

DATE EXCAVATED : 29/9/17

LOGGED BY : JB

CHECKED BY :

LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETROMETER (kPa)	STRUCTURE & Other Observations
	0.05m ES-HA5	0.0	●●●●●		FILL; Silty SAND, fine to coarse grained, grey to brown, with gravel and trace of slag	D - M			100 200 300 400	FILL
	0.15m Not Encountered									
	0.20m ES-HA5	0.20m	○●○●○		FILL; GRAVEL, fine to coarse, sub-rounded to sub-angular					FILL; potential drainage trench.
	0.30m	0.30m			Testbore HA5 terminated at 0.30 m Possible services					
		0.5								
		1.0								

MOISTURE & GROUNDWATER
 D - Dry
 M - Moist
 W - Wet
 OMC - Optimum MC
 PL - Plastic Limit
 ▼ - Water seepage/inflow
 ▾ - Water level

SAMPLES & FIELD TESTS
 U - Undisturbed Sample
 D - Disturbed Sample
 ES - Environmental sample
 B - Bulk Disturbed Sample
 SPT - Standard Penetration Test
 HP - Hand/Pocket Penetrometer

CONSISTENCY
 VS - Very Soft
 S - Soft
 F - Firm
 St - Stiff
 VSt - Very Stiff
 H - Hard

RELATIVE DENSITY
 VL - Very Loose
 L - Loose
 MD - Medium Dense
 D - Dense
 VD - Very Dense

ROCK STRENGTH
 EL - Extremely low
 VL - Very low
 L - Low
 M - Medium
 H - High
 VH - Very high
 EH - Extremely high

ROCK WEATHERING
 RS - Residual soil
 XW - Extremely weathered
 DW - Distinctly weathered
 SW - Slightly weathered
 FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

TESTBORE LOG

CLIENT : University of Newcastle
 PROJECT : Contamination Investigation
 LOCATION : Callaghan

HOLE NO : HA6
 PROJECT REF : 82218015
 SHEET : 1 OF 1

EQUIPMENT TYPE : Hand Auger

METHOD : Hand Auger

DATE EXCAVATED : 29/9/17

LOGGED BY : JB

CHECKED BY :

LOCATION : See Drawing for location

GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, plasticity or particle characteristic, colour Rock Type, grain size, colour Secondary and minor components	MOISTURE / WEATHERING	CONSISTENCY / REL DENSITY / ROCK STRENGTH	DYNAMIC PENETROMETER	HAND PENETROMETER (kPa)	STRUCTURE & Other Observations
	0.05m ES-HA6	0.0	•••••		FILL: Silty SAND, fine to coarse grained, grey to brown, with gravel and root fibres	D - M			100 200 300 400	FILL/TOPSOIL
	0.15m									
	0.40m ES-HA6	0.20m	/ / / / /		Silty CLAY, medium plasticity, grey to brown	MC < PL				RESIDUAL
	0.50m	0.5			Testbore HA6 terminated at 0.50 m End at natural profile					
		1.0								

MOISTURE & GROUNDWATER
D - Dry
M - Moist
W - Wet
OMC - Optimum MC
PL - Plastic Limit
▲ - Water seepage/inflow
▼ - Water level

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
ES - Environmental sample
B - Bulk Disturbed Sample
SPT - Standard Penetration Test
HP - Hand/Pocket Penetrometer

CONSISTENCY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

ROCK STRENGTH
EL - Extremely low
VL - Very low
L - Low
M - Medium
H - High
VH - Very high
EH - Extremely high

ROCK WEATHERING
RS - Residual soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh rock

See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD

Explanatory Notes

The methods of description and classification of soils and rocks used in this report are based on *Australian Standard 1726-2017 Geotechnical Site Investigations* Code. Material descriptions are deduced from field observation or engineering examination, and may be appended or confirmed by in situ or laboratory testing. The information is dependent on the scope of investigation, the extent of sampling and testing, and the inherent variability of the conditions encountered.

Subsurface investigation may be conducted by one or a combination of the following methods.

Method	
Test Pitting: excavation/trench	
BH	Backhoe bucket
EX	Excavator bucket
X	Existing excavation
Natural Exposure: existing natural rock or soil exposure	
Manual drilling: hand operated tools	
HA	Hand Auger
Continuous sample drilling	
PT	Push tube
PS	Percussion sampling
SON	Sonic drilling
Hammer drilling	
AH	Air hammer
AT	Air track
Spiral flight auger drilling	
AS	Large diameter short spiral auger
AD/V	Continuous flight spiral auger: V-Bit
AD/T	Continuous flight spiral auger: TC-Bit
HFA	Continuous hollow flight auger
Rotary non-core drilling	
WS	Washbore (mud drilling)
RR	Rock roller
Rotary core drilling	
PQ	85 mm core (wire line core barrel)
HQ	63.5 mm (diamond-tipped core barrel)
NMLC	51.94 mm (diamond-tipped core barrel)
NQ	47 mm (diamond-tipped core barrel)
Concrete coring	
DT	Diatube

Sampling is conducted to facilitate further assessment of selected materials encountered.

Sampling method	
Soil sampling	
B	Bulk disturbed sample
D	Disturbed sample
ES	Environmental sample
SPT	Standard Penetration Test sample
U#	Undisturbed tube sample (# mm diameter)
Water sampling	
W	Water sample
EW	Environmental water sample

Field testing may be conducted as a means of assessment of the in-situ conditions of materials encountered.

Field testing	
SPT	Standard Penetration Test
HP/PP	Hand/Pocket penetrometer
Dynamic Penetrometers (blows per 100/150 mm)	
DCP	Dynamic Cone Penetrometer
PSP	Perth Sand Penetrometer
VS	Vane Shear
PBT	Plate Bearing Test
PID	Photo Ionisation Detector

If encountered with SPT or dynamic penetrometer testing, refusal (R), virtual refusal (VR) or hammer bouncing (HB) may be noted.

The quality of the rock can be assessed by the degree of fracturing and the following.

Rock quality description	
TCR	Total core recovery (%) (Length of core recovered, divided by the length of the core run)
RQD	Rock Quality Designation (%) (sum of axial lengths of core greater than 100 mm long divided by the length of the core run)

Notes on groundwater conditions encountered may include the following.

Groundwater	
Not encountered	Excavation is dry in the short term
Not observed	Groundwater observation not possible
Seepage	Groundwater seeping into hole
Inflow	Groundwater flowing/flooding into hole

Perched groundwater may result in a misleading indication of the depth of the true water table. Groundwater levels are also likely to fluctuate with variations in climatic and site conditions.

Notes on the stability of excavation may include the following.

Rock quality description	
Stable	No obvious/gross short term instability noted
Spalling	Material falling into excavation, may be described as minor or major spalling
Unstable	Collapse of the majority, or one or more face of the excavation

Explanatory Notes – General soil Description

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726-2017 *Geotechnical Site Investigations Code*. In practice, if the material can be remoulded by hand in its field condition or in water it is described as a soil. The dominant soil constituent is given in capital letters, with secondary textures in lower case. In general, descriptions cover: soil type, strength / relative density, moisture, colour, plasticity and inclusions.

Soil types are described according to the dominant particle size on the basis of the following particle sizes

Soil classification	Particle size (mm)	
CLAY	< 0.002	
SILT	0.002 to 0.075	
SAND	<i>fine</i>	0.075 to 0.21
	<i>medium</i>	0.21 to 0.60
	<i>coarse</i>	0.60 to 2.36
GRAVEL	<i>fine</i>	2.36 to 6.7
	<i>medium</i>	6.7 to 19
	<i>coarse</i>	19 to 63
COBBLES	63 to 200	
BOULDERS	> 200	

Soil types are qualified by the presence of minor components on the basis of field examination or grading.

Terminology	In coarse grained soils		In fine grained soils
	% Fines	% coarse	% coarse
Trace	≤ 5	≤ 15	≤ 15
With	>5 to ≤12	>15 to ≤30	>15 to ≤ 30

The strength of cohesive soils is classified by engineering assessment or field/laboratory testing as follows

Strength	Symbol	Undrained shear strength (kPa)
Very Soft	VS	≤12
Soft	S	>12 to ≤25
Firm	F	>25 to ≤50
Stiff	St	>50 to ≤100
Very Stiff	VSt	>100 to ≤200
Hard	H	>200

Cohesionless soils are classified on the basis of relative density as follows.

Strength	Symbol	Density Index (%)
Very Loose	VL	≤15
Loose	L	>15 to ≤35
Medium Dense	MD	>35 to ≤65
Dense	D	>65 to ≤85
Very Dense	VD	>85

The plasticity of cohesive soils is defined as follows.

Plasticity	LL for Silt (%)	LL for Clay (%)
Low	≤50	≤35
Medium	N/A	>35 to ≤50
High	>50	>50

The moisture condition of soil is described by appearance and feel and may be described in relation to the Plastic Limit (PL) or Optimum Moisture Content (OMC). For granular soils, the following guide is adopted.

Moisture condition	Description
Dry	Non-cohesive and free-running
Moist	Cool feel and darkened colour, soils tends to stick together
Wet	Cool feel and darkened colour, free-water forms when handling, soils tend to cohere

The following guide is adopted for cohesive soils.

Moisture condition	Description
Moist, dry of PL	$w < PL$
Moist, near PL	$w \approx PL$
Moist, wet of PL	$w > PL$
Wet, near LL	$w \approx LL$
Wet, wet of LL	$w > LL$

The structure of the soil may be described as follows.

Zoning	Description
Layer	Continuous across exposure or sample
Lens	Discontinuous layer
Pocket	Irregular inclusion of different material

The structure may include; defects such as softened zones, fissures, cracks, joints and root-holes; and coarse grained soils may be described as strongly/weakly cemented.

The soil origin may also be noted if possible to deduce.

Soil origin	Description
Fill	Man-made deposits or disturbed material
Topsoil	Material affected by roots and root fibres
Colluvial soil	Transported down slopes by gravity
Aeolian soil	Transported and deposited by wind
Estuarine soil	Deposited in coastal estuaries
Alluvial soil	Deposited by streams and rivers
Lacustrine soil	Deposited in freshwater lakes
Marine soil	Deposited in marine environment
Extremely weathered	Developed from in-situ weathering, with structure/fabric of parent rock intact
Residual soil	Developed from in-situ weathering, with structure/fabric of parent rock but with soil strength properties

The origin of the soil generally cannot be deduced on the appearance of the material and may be assumed based on further geological evidence or field observation. Where there is doubt, the terms 'possibly' or 'probably' shall be used.

Explanatory Notes – General Rock Description

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726-2017 *Geotechnical Site Investigations Code*. In practice, if the material can be remoulded by hand in its field condition or in water it is described as a soil. The dominant soil constituent is given in capital letters, with secondary textures in lower case. In general, descriptions cover: soil type, strength / relative density, moisture, colour, plasticity and inclusions and where applicable, the defect types, shape, roughness and coating/infill.

Sedimentary rock types are generally described according to the predominant grain size as follows

Rock Type	Description
Sedimentary	Deposited, carbonate (porous or non-porous), volcanic ejection
Igneous	Felsic (much quartz, pale), Intermediate or mafic (little quartz, dark)
Metamorphic	Foliated or non-foliated
Duricrust	Cementing mineralogy (iron oxides or hydroxides, silica, calcium, carbonate, gypsum)

The classification of rock weathering is described based on definitions outlined in AS 1726-2017 as follows

Term	Symbol	Definition
Residual Soil	RS	Soil developed on extremely weathered rock; mass structure and substance are no longer evident
Extremely weathered	XW	Weathered to such an extent that it has 'soil' properties. Mass structure and substance still visible
Distinctly weathered	DW	Strength usually changed and may be highly discoloured. Porosity may be increased by leaching, or decreased due to deposition in pores
Slightly weathered	SW	Slightly discoloured; little/no change of strength from fresh rock
Fresh	FR	Rock shows no sign of decomposition or staining

The rock strength can be defined based on point load index as follows.

Term	Symbol	Point Load Index I_{s50} (MPa)
Very Low	VL	0.03 to 0.1
Low	L	0.1 to 0.3
Medium	M	0.3 to 1
High	H	1 to 3
Very High	VH	3 to 10
Extremely High	EH	> 10

It is important to note that the rock material strength as above is distinct from the rock mass strength can be significantly weaker due to the influence of defects.

For preliminary assessment and in cases where no point load testing is available, the rock strength may be assessed using the field guide specified in AS 1726-2017.

The defect spacing and bedding thickness of rocks measured normal to defects of the same set or bedding can be described as follows.

Definition	Defect spacing (mm)
Thinly laminated	< 6
Laminated	6 to 20
Very thinly bedded	20 to 60
Thinly bedded	60 to 200
Medium bedded	200 to 600
Thickly bedded	600 to 2000
Very thickly bedded	> 2000

Defects in rock mass are described by the following

Terms	Terms	Terms	Terms
Joint	JT	Sheared zone	SZ
Bed parting	BP	Sheared surface	SS
Contact	CO	Seam	SM
Dyke	DK	Crushed Seam	CS
Decomposed zone	DZ	Infilled Seam	IS
Fracture	FC	Foliation	FL
Fracture Zone	FZ	Vein	VN

The shape and roughness of defects in the rock mass are described using the following terms




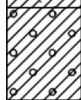
Planarity	Roughness	Planarity	Roughness
Planar	PR	Very Rough	VR
Curved	CU	Rough	R
Undulating	U	Smooth	S
Irregular	IR	Polished	POL
Stepped	ST	Slickensided	SL

The coating or infill associated with defects in rock mass are described as follows




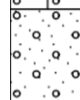
Definition	Symbol	Description
Clean	CN	No visible coating
Stain	SN	No visible coating; surfaces are discoloured
Veneer	VNR	Visible coating of soil or mineral, too thin to measure; may be patchy
Coating	CT	Visible coating or infilling of soil or mineral substance (up to 1 mm)

Graphics Symbol Index




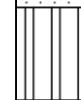






CLAYS

	CLAY
	Silty CLAY
	Sandy CLAY
	Gravelly CLAY





GRAVELS

	GRAVEL
	Clayey GRAVEL
	Silty GRAVEL
	Sandy GRAVEL




SEDIMENTARY ROCKS

	CONGLOMERATE
	BRECCIA
	SANDSTONE
	SILTSTONE
	CLAYSTONE
	MUDSTONE
	SHALE
	COAL
	LIMESTONE
	TUFF







SILTS

	SILT
	Clayey SILT
	Sandy SILT
	Gravelly SILT




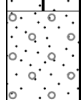
FILL STRATA

	FILL
	CONCRETE
	ASPHALT






METAMORPHIC ROCK

	SLATE/PHYLLITE
	SCHIST
	GNEISS
	QUARTZITE
	SERPENTINE
	HORNFELS




SANDS

	SAND
	Clayey SAND
	Silty SAND
	Gravelly SAND

IGNEOUS ROCK

	GRANITE
	RHYOLITE
	BASALT
	DOLERITE
	VOLCANIC

OTHER SOILS

	High plasticity ORGANIC CLAYS & SILTS
	TOPSOIL
	COBBLES & BOULDERS

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

C

ANALYTICAL RESULTS

CHAIN OF CUSTODY RECORD



LAB Name
Address

Client
Cardno Pty Ltd
PO Box 74
Broadmeadow NSW 2292

Contact Numbers
Phone 0249 494300
Fax 0249 654666

Contact Malcolm Adrien

E-mail malcolm.adrien@cardno.com.au ian.piper@cardno.com.au
(invoice to geotech@cardno.com.au)

Sampled by Malcolm Adrien

Project Ref: 82218015

Date Results Required Standard TAT

Laboratory LIMS ID	Client Sample ID	Date Sampled	Matrix		Containers/Preservation								Analysis Required					
			Soil	Water	Soil Jar (G) Nat. Orange	0.5-1.0 litre (G) Nat. Yellow	0.1-1.0 litre (P) Nat. Green	50mL VOA Vial (G) H ₂ SO ₄ Maroon	0.1-1.0 litre (P) H ₂ SO ₄ Maroon	0.2-1.0 litre (G) H ₂ SO ₄ Maroon	0.1-0.2 (P) Filtered?? Y=Yes, N=No (HNO3) Red	0.2l (P) NaOH Blue	Other	CL17	TRH	BTEX	8 Metals (Total)	
	HA1 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
1	HA1 0.4-0.5	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>				
2	HA2 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>				
	HA2 0.4-0.5	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA2 0.6-0.7	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA3 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA3 0.5-0.6	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA3 0.7-0.8	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>				
3	HA4 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>				
4	HA5 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>				
	HA5 0.2-0.3	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA6 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA6 0.4-0.5	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>				
	RIN	29/09/2017		<input checked="" type="checkbox"/>														<input checked="" type="checkbox"/>
	TRIP SPIKE	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>										<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	TRIP BLANK	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>										<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	DUP	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>				
	TRIP	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>				

SGS EHS Alexandria Laboratory



SE171022 COC
Received: 04 - Oct - 2017

Released by: *James Blane*
Received by: *Suba*

Signature
Signature

Date/Time 3/10/17
Date/Time 08/10/17 @ 11:20

Custody Seals Intact? / Samples Received Chilled?



SAMPLE RECEIPT ADVICE

SE171022

CLIENT DETAILS

Contact **Malcolm Adrien**
Client **CARDNO GEOTECH SOLUTIONS PTY LTD**
Address **34/205-207 Albany Street
North Gosford
NSW 2250**

Telephone **61 2 4320 1000**
Facsimile **61 2 4324 3251**
Email **malcolm.adrien@cardno.com.au**

Project **82218015**
Order Number **CARDNO140915065**
Samples **10**

LABORATORY DETAILS

Manager **Huong Crawford**
Laboratory **SGS Alexandria Environmental**
Address **Unit 16, 33 Maddox St
Alexandria NSW 2015**

Telephone **+61 2 8594 0400**
Facsimile **+61 2 8594 0499**
Email **au.environmental.sydney@sgs.com**

Samples Received **Wed 4/10/2017**
Report Due **Tue 10/10/2017**
SGS Reference **SE171022**

SUBMISSION DETAILS

This is to confirm that 10 samples were received on Wednesday 4/10/2017. Results are expected to be ready by COB Tuesday 10/10/2017. Please quote SGS reference SE171022 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	9 Soil, 1 Water
Date documentation received	4/10/2017	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	13.3°C	Sufficient sample for analysis	Yes
Turnaround time requested	Standard		

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

TRIP - Forwarded to Eurofins
7 Soil samples have been placed on hold as no tests have been assigned for them by the client. These samples will not be processed.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

CLIENT DETAILS

Client **CARDNO GEOTECH SOLUTIONS PTY LTD**

Project **82218015**

SUMMARY OF ANALYSIS

No.	Sample ID	OC Pesticides in Soil	OP Pesticides in Soil	PAH (Polynuclear Aromatic Hydrocarbons) in Soil	PCBs in Soil	Total Recoverable Elements in Soil/Waste	TRH (Total Recoverable Hydrocarbons) in Soil	VOC's in Soil	Volatile Petroleum Hydrocarbons in Soil
001	HA1 0.4-0.5	29	14	26	11	7	10	12	8
002	HA2 0.05-0.15	29	14	26	11	7	10	12	8
003	HA3 0.7-0.8	29	14	26	11	7	10	12	8
004	HA4 0.05-0.15	29	14	26	11	7	10	12	8
005	HA5 0.05-0.15	29	14	26	11	7	10	12	8
006	HA6 0.4-0.5	29	14	26	11	7	10	12	8
008	TRIP SPIKE	-	-	-	-	-	-	12	-
009	TRIP BLANK	-	-	-	-	-	10	12	8
010	DUP	29	14	26	11	7	10	12	8

CONTINUED OVERLEAF

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document. The numbers shown in the table indicate the number of results requested in each package. Please indicate as soon as possible should your request differ from these details. Testing as per this table shall commence immediately unless the client intervenes with a correction.

CLIENT DETAILS

Client **CARDNO GEOTECH SOLUTIONS PTY LTD**

Project **82218015**

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury (total) in Water	Mercury in Soil	Moisture Content	Trace Metals (Total) in Water by ICPMS
001	HA1 0.4-0.5	-	1	1	-
002	HA2 0.05-0.15	-	1	1	-
003	HA3 0.7-0.8	-	1	1	-
004	HA4 0.05-0.15	-	1	1	-
005	HA5 0.05-0.15	-	1	1	-
006	HA6 0.4-0.5	-	1	1	-
007	RIN	1	-	-	7
009	TRIP BLANK	-	-	1	-
010	DUP	-	1	1	-

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document. The numbers shown in the table indicate the number of results requested in each package. Please indicate as soon as possible should your request differ from these details. Testing as per this table shall commence immediately unless the client intervenes with a correction.

CLIENT DETAILS

LABORATORY DETAILS

Contact Malcolm Adrien
 Client CARDNO GEOTECH SOLUTIONS PTY LTD
 Address 34/205-207 Albany Street
 North Gosford
 NSW 2250

Telephone 61 2 4320 1000
 Facsimile 61 2 4324 3251
 Email malcolm.adrien@cardno.com.au

Project **82218015**
 Order Number **CARDNO140915065**
 Samples 10

Manager Huong Crawford
 Laboratory SGS Alexandria Environmental
 Address Unit 16, 33 Maddox St
 Alexandria NSW 2015

Telephone +61 2 8594 0400
 Facsimile +61 2 8594 0499
 Email au.environmental.sydney@sgs.com

SGS Reference **SE171022 R0**
 Date Received 4/10/2017
 Date Reported 10/10/2017

COMMENTS

Accredited for compliance with ISO/IEC 17025-Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES



Dong Liang
 Metals/Inorganics Team Leader



Kamrul Ahsan
 Senior Chemist



Ly Kim Ha
 Organic Section Head

VOC's in Soil [AN433] Tested: 5/10/2017

PARAMETER	UOM	LOR	HA1 0.4-0.5	HA2 0.05-0.15	HA3 0.7-0.8	HA4 0.05-0.15	HA5 0.05-0.15
			SOIL	SOIL	SOIL	SOIL	SOIL
			29/9/2017 SE171022.001	29/9/2017 SE171022.002	29/9/2017 SE171022.003	29/9/2017 SE171022.004	29/9/2017 SE171022.005
Benzene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Toluene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	<0.1	0.2	0.3
m/p-xylene	mg/kg	0.2	<0.2	0.3	<0.2	1.1	2.0
o-xylene	mg/kg	0.1	<0.1	0.1	<0.1	0.4	0.8
Total Xylenes	mg/kg	0.3	<0.3	0.4	<0.3	1.5	2.8
Total BTEX	mg/kg	0.6	<0.6	<0.6	<0.6	1.7	3.2
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1

PARAMETER	UOM	LOR	HA6 0.4-0.5	TRIP SPIKE	TRIP BLANK	DUP
			SOIL	SOIL	SOIL	SOIL
			29/9/2017 SE171022.006	29/9/2017 SE171022.008	29/9/2017 SE171022.009	29/9/2017 SE171022.010
Benzene	mg/kg	0.1	<0.1	[89%]	<0.1	<0.1
Toluene	mg/kg	0.1	<0.1	[96%]	<0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1	[97%]	<0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2	[100%]	<0.2	0.3
o-xylene	mg/kg	0.1	<0.1	[100%]	<0.1	0.2
Total Xylenes	mg/kg	0.3	<0.3	-	<0.3	0.4
Total BTEX	mg/kg	0.6	<0.6	-	<0.6	<0.6
Naphthalene	mg/kg	0.1	<0.1	-	<0.1	<0.1

Volatile Petroleum Hydrocarbons in Soil [AN433] Tested: 5/10/2017

PARAMETER	UOM	LOR	HA1 0.4-0.5	HA2 0.05-0.15	HA3 0.7-0.8	HA4 0.05-0.15	HA5 0.05-0.15
			SOIL	SOIL	SOIL	SOIL	SOIL
			29/9/2017 SE171022.001	29/9/2017 SE171022.002	29/9/2017 SE171022.003	29/9/2017 SE171022.004	29/9/2017 SE171022.005
TRH C6-C9	mg/kg	20	<20	<20	<20	<20	<20
Benzene (F0)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
TRH C6-C10	mg/kg	25	<25	<25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	<25	<25	<25

PARAMETER	UOM	LOR	HA6 0.4-0.5	TRIP BLANK	DUP
			SOIL	SOIL	SOIL
			29/9/2017 SE171022.006	29/9/2017 SE171022.009	29/9/2017 SE171022.010
TRH C6-C9	mg/kg	20	<20	<20	<20
Benzene (F0)	mg/kg	0.1	<0.1	<0.1	<0.1
TRH C6-C10	mg/kg	25	<25	<25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	<25

TRH (Total Recoverable Hydrocarbons) in Soil [AN403] Tested: 6/10/2017

PARAMETER	UOM	LOR	HA1 0.4-0.5	HA2 0.05-0.15	HA3 0.7-0.8	HA4 0.05-0.15	HA5 0.05-0.15
			SOIL	SOIL	SOIL	SOIL	SOIL
			29/9/2017 SE171022.001	29/9/2017 SE171022.002	29/9/2017 SE171022.003	29/9/2017 SE171022.004	29/9/2017 SE171022.005
TRH C10-C14	mg/kg	20	<20	<20	<20	<20	<20
TRH C15-C28	mg/kg	45	<45	<45	<45	<45	<45
TRH C29-C36	mg/kg	45	<45	<45	<45	<45	<45
TRH C37-C40	mg/kg	100	<100	<100	<100	<100	<100
TRH >C10-C16 (F2)	mg/kg	25	<25	<25	<25	<25	<25
TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	<90	<90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	<110	<110	<110	<110
TRH C10-C40 Total	mg/kg	210	<210	<210	<210	<210	<210

PARAMETER	UOM	LOR	HA6 0.4-0.5	TRIP BLANK	DUP
			SOIL	SOIL	SOIL
			29/9/2017 SE171022.006	29/9/2017 SE171022.009	29/9/2017 SE171022.010
TRH C10-C14	mg/kg	20	<20	<20	<20
TRH C15-C28	mg/kg	45	<45	<45	<45
TRH C29-C36	mg/kg	45	<45	<45	<45
TRH C37-C40	mg/kg	100	<100	<100	<100
TRH >C10-C16 (F2)	mg/kg	25	<25	<25	<25
TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90	<90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120	<120	<120
TRH C10-C36 Total	mg/kg	110	<110	<110	<110
TRH C10-C40 Total	mg/kg	210	<210	<210	<210

PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420] Tested: 6/10/2017

PARAMETER	UOM	LOR	HA1 0.4-0.5	HA2 0.05-0.15	HA3 0.7-0.8	HA4 0.05-0.15	HA5 0.05-0.15
			SOIL	SOIL	SOIL	SOIL	SOIL
			29/9/2017 SE171022.001	29/9/2017 SE171022.002	29/9/2017 SE171022.003	29/9/2017 SE171022.004	29/9/2017 SE171022.005
Naphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1	0.3	<0.1	0.2	<0.1
Anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	<0.1	1.3	<0.1	1.3	0.4
Pyrene	mg/kg	0.1	<0.1	1.2	<0.1	1.1	0.3
Benzo(a)anthracene	mg/kg	0.1	<0.1	0.5	<0.1	0.5	0.2
Chrysene	mg/kg	0.1	<0.1	0.4	<0.1	0.4	0.2
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	0.5	<0.1	0.4	0.2
Benzo(k)fluoranthene	mg/kg	0.1	<0.1	0.4	<0.1	0.4	0.2
Benzo(a)pyrene	mg/kg	0.1	<0.1	0.5	<0.1	0.3	0.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	0.5	<0.1	0.3	0.2
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1	0.4	<0.1	0.3	0.1
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ	0.2	<0.2	0.7	<0.2	0.5	0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	0.8	<0.3	0.6	0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	0.7	<0.2	0.5	0.3
Total PAH (18)	mg/kg	0.8	<0.8	5.8	<0.8	5.1	1.9
Total PAH (NEPM/WHO 16)	mg/kg	0.8	<0.8	5.8	<0.8	5.1	1.9

PARAMETER	UOM	LOR	HA6 0.4-0.5	DUP
			SOIL	SOIL
			29/9/2017 SE171022.006	29/9/2017 SE171022.010
Naphthalene	mg/kg	0.1	<0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1	<0.1
Fluorene	mg/kg	0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.1	0.1	0.2
Anthracene	mg/kg	0.1	<0.1	<0.1
Fluoranthene	mg/kg	0.1	0.2	0.6
Pyrene	mg/kg	0.1	0.1	0.6
Benzo(a)anthracene	mg/kg	0.1	<0.1	0.3
Chrysene	mg/kg	0.1	<0.1	0.2
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1	0.2
Benzo(k)fluoranthene	mg/kg	0.1	<0.1	0.2
Benzo(a)pyrene	mg/kg	0.1	<0.1	0.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1	0.2
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1	0.2
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ	0.2	<0.2	0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3	0.4
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2	0.4
Total PAH (18)	mg/kg	0.8	<0.8	3.0
Total PAH (NEPM/WHO 16)	mg/kg	0.8	<0.8	3.0

OC Pesticides in Soil [AN420] Tested: 6/10/2017

PARAMETER	UOM	LOR	HA1 0.4-0.5	HA2 0.05-0.15	HA3 0.7-0.8	HA4 0.05-0.15	HA5 0.05-0.15
			SOIL	SOIL	SOIL	SOIL	SOIL
			29/9/2017 SE171022.001	29/9/2017 SE171022.002	29/9/2017 SE171022.003	29/9/2017 SE171022.004	29/9/2017 SE171022.005
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lindane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Isodrin	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total CLP OC Pesticides	mg/kg	1	<1	<1	<1	<1	<1

OC Pesticides in Soil [AN420] Tested: 6/10/2017 (continued)

PARAMETER	UOM	LOR	HA6 0.4-0.5	DUP
			SOIL - 29/9/2017 SE171022.006	SOIL - 29/9/2017 SE171022.010
Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1
Alpha BHC	mg/kg	0.1	<0.1	<0.1
Lindane	mg/kg	0.1	<0.1	<0.1
Heptachlor	mg/kg	0.1	<0.1	<0.1
Aldrin	mg/kg	0.1	<0.1	<0.1
Beta BHC	mg/kg	0.1	<0.1	<0.1
Delta BHC	mg/kg	0.1	<0.1	<0.1
Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1
o,p'-DDE	mg/kg	0.1	<0.1	<0.1
Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2
Gamma Chlordane	mg/kg	0.1	<0.1	<0.1
Alpha Chlordane	mg/kg	0.1	<0.1	<0.1
trans-Nonachlor	mg/kg	0.1	<0.1	<0.1
p,p'-DDE	mg/kg	0.1	<0.1	<0.1
Dieldrin	mg/kg	0.2	<0.2	<0.2
Endrin	mg/kg	0.2	<0.2	<0.2
o,p'-DDD	mg/kg	0.1	<0.1	<0.1
o,p'-DDT	mg/kg	0.1	<0.1	<0.1
Beta Endosulfan	mg/kg	0.2	<0.2	<0.2
p,p'-DDD	mg/kg	0.1	<0.1	<0.1
p,p'-DDT	mg/kg	0.1	<0.1	<0.1
Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1
Methoxychlor	mg/kg	0.1	<0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1	<0.1
Isodrin	mg/kg	0.1	<0.1	<0.1
Mirex	mg/kg	0.1	<0.1	<0.1
Total CLP OC Pesticides	mg/kg	1	<1	<1

OP Pesticides in Soil [AN420] Tested: 6/10/2017

PARAMETER	UOM	LOR	HA1 0.4-0.5	HA2 0.05-0.15	HA3 0.7-0.8	HA4 0.05-0.15	HA5 0.05-0.15
			SOIL	SOIL	SOIL	SOIL	SOIL
			29/9/2017 SE171022.001	29/9/2017 SE171022.002	29/9/2017 SE171022.003	29/9/2017 SE171022.004	29/9/2017 SE171022.005
Dichlorvos	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dimethoate	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon (Dimpylate)	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenitrothion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Bromophos Ethyl	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Methodathion	mg/kg	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total OP Pesticides*	mg/kg	1.7	<1.7	<1.7	<1.7	<1.7	<1.7

PARAMETER	UOM	LOR	HA6 0.4-0.5	DUP
			SOIL	SOIL
			29/9/2017 SE171022.006	29/9/2017 SE171022.010
Dichlorvos	mg/kg	0.5	<0.5	<0.5
Dimethoate	mg/kg	0.5	<0.5	<0.5
Diazinon (Dimpylate)	mg/kg	0.5	<0.5	<0.5
Fenitrothion	mg/kg	0.2	<0.2	<0.2
Malathion	mg/kg	0.2	<0.2	<0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2	<0.2
Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2	<0.2
Bromophos Ethyl	mg/kg	0.2	<0.2	<0.2
Methodathion	mg/kg	0.5	<0.5	<0.5
Ethion	mg/kg	0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2	<0.2
Total OP Pesticides*	mg/kg	1.7	<1.7	<1.7

PCBs in Soil [AN420] Tested: 6/10/2017

PARAMETER	UOM	LOR	HA1 0.4-0.5	HA2 0.05-0.15	HA3 0.7-0.8	HA4 0.05-0.15	HA5 0.05-0.15
			SOIL	SOIL	SOIL	SOIL	SOIL
			29/9/2017 SE171022.001	29/9/2017 SE171022.002	29/9/2017 SE171022.003	29/9/2017 SE171022.004	29/9/2017 SE171022.005
Arochlor 1016	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1221	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1232	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1242	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1248	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1254	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1260	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1262	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arochlor 1268	mg/kg	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total PCBs (Arochlors)	mg/kg	1	<1	<1	<1	<1	<1

PARAMETER	UOM	LOR	HA6 0.4-0.5	DUP
			SOIL	SOIL
			29/9/2017 SE171022.006	29/9/2017 SE171022.010
Arochlor 1016	mg/kg	0.2	<0.2	<0.2
Arochlor 1221	mg/kg	0.2	<0.2	<0.2
Arochlor 1232	mg/kg	0.2	<0.2	<0.2
Arochlor 1242	mg/kg	0.2	<0.2	<0.2
Arochlor 1248	mg/kg	0.2	<0.2	<0.2
Arochlor 1254	mg/kg	0.2	<0.2	<0.2
Arochlor 1260	mg/kg	0.2	<0.2	<0.2
Arochlor 1262	mg/kg	0.2	<0.2	<0.2
Arochlor 1268	mg/kg	0.2	<0.2	<0.2
Total PCBs (Arochlors)	mg/kg	1	<1	<1

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES [AN040/AN320] Tested: 6/10/2017

PARAMETER	UOM	LOR	HA1 0.4-0.5	HA2 0.05-0.15	HA3 0.7-0.8	HA4 0.05-0.15	HA5 0.05-0.15
			SOIL	SOIL	SOIL	SOIL	SOIL
			29/9/2017 SE171022.001	29/9/2017 SE171022.002	29/9/2017 SE171022.003	29/9/2017 SE171022.004	29/9/2017 SE171022.005
Arsenic, As	mg/kg	3	<3	3	46	4	6
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.3	3.8	40	7.9	16	13
Copper, Cu	mg/kg	0.5	8.2	11	20	36	24
Lead, Pb	mg/kg	1	7	20	15	14	30
Nickel, Ni	mg/kg	0.5	3.1	6.8	2.9	4.8	8.3
Zinc, Zn	mg/kg	0.5	22	200	25	120	230

PARAMETER	UOM	LOR	HA6 0.4-0.5	DUP
			SOIL	SOIL
			29/9/2017 SE171022.006	29/9/2017 SE171022.010
Arsenic, As	mg/kg	3	6	3
Cadmium, Cd	mg/kg	0.3	<0.3	<0.3
Chromium, Cr	mg/kg	0.3	9.1	26
Copper, Cu	mg/kg	0.5	8.2	11
Lead, Pb	mg/kg	1	15	20
Nickel, Ni	mg/kg	0.5	2.2	6.5
Zinc, Zn	mg/kg	0.5	43	210



ANALYTICAL RESULTS

SE171022 R0

Mercury in Soil [AN312] Tested: 9/10/2017

			HA1 0.4-0.5	HA2 0.05-0.15	HA3 0.7-0.8	HA4 0.05-0.15	HA5 0.05-0.15
			SOIL	SOIL	SOIL	SOIL	SOIL
			-	-	-	-	-
			29/9/2017	29/9/2017	29/9/2017	29/9/2017	29/9/2017
PARAMETER	UOM	LOR	SE171022.001	SE171022.002	SE171022.003	SE171022.004	SE171022.005
Mercury	mg/kg	0.05	<0.05	<0.05	<0.05	<0.05	<0.05

			HA6 0.4-0.5	DUP
			SOIL	SOIL
			-	-
			29/9/2017	29/9/2017
PARAMETER	UOM	LOR	SE171022.006	SE171022.010
Mercury	mg/kg	0.05	<0.05	<0.05

Moisture Content [AN002] Tested: 6/10/2017

PARAMETER	UOM	LOR	HA1 0.4-0.5	HA2 0.05-0.15	HA3 0.7-0.8	HA4 0.05-0.15	HA5 0.05-0.15
			SOIL - 29/9/2017 SE171022.001	SOIL - 29/9/2017 SE171022.002	SOIL - 29/9/2017 SE171022.003	SOIL - 29/9/2017 SE171022.004	SOIL - 29/9/2017 SE171022.005
% Moisture	%w/w	0.5	22	4.9	17	3.1	8.5

PARAMETER	UOM	LOR	HA6 0.4-0.5	TRIP BLANK	DUP
			SOIL - 29/9/2017 SE171022.006	SOIL - 29/9/2017 SE171022.009	SOIL - 29/9/2017 SE171022.010
% Moisture	%w/w	0.5	16	<0.5	5.4

Trace Metals (Total) in Water by ICPMS [AN022/AN318] Tested: 6/10/2017

			RIN
			WATER
			-
			29/9/2017
			SE171022.007
PARAMETER	UOM	LOR	
Total Arsenic	µg/L	1	<1
Total Cadmium	µg/L	0.1	<0.1
Total Chromium	µg/L	1	<1
Total Copper	µg/L	1	<1
Total Nickel	µg/L	1	<1
Total Lead	µg/L	1	<1
Total Zinc	µg/L	5	<5

Mercury (total) in Water [AN311(Perth) /AN312] Tested: 6/10/2017

PARAMETER	UOM	LOR	RIN WATER - 29/9/2017 SE171022.007
Total Mercury	mg/L	0.0001	<0.0001

- AN002** The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
- AN022/AN318** Following acid digestion of un filtered sample, determination of elements at trace level in waters by ICP -MS technique, in accordance with USEPA 6020A.
- AN022** The water sample is digested with Nitric Acid and made up to the original volume similar to APHA3030E.
- AN040/AN320** A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
- AN040** A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by ASS or ICP as per USEPA Method 200.8.
- AN311(Perth) /AN312** Mercury by Cold Vapour AAS in Waters: Mercury ions taken from unfiltered sample are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
- AN312** Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
- AN403** Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
- AN403** Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Petroleum Hydrocarbons (TPH) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents .
- AN403** The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
- AN420** (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
- AN420** SVOC Compounds: Semi-Volatile Organic Compounds (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
- AN433** VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC's are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
		IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- a. 1 Bq is equivalent to 27 pCi
- b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : <http://www.sgs.com.au/~media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf>

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.



STATEMENT OF QA/QC PERFORMANCE

SE171022 R0

CLIENT DETAILS

Contact **Malcolm Adrien**
Client **CARDNO GEOTECH SOLUTIONS PTY LTD**
Address **34/205-207 Albany Street
North Gosford
NSW 2250**

Telephone **61 2 4320 1000**
Facsimile **61 2 4324 3251**
Email **malcolm.adrien@cardno.com.au**

Project **82218015**
Order Number **CARDNO140915065**
Samples **10**

LABORATORY DETAILS

Manager **Huong Crawford**
Laboratory **SGS Alexandria Environmental**
Address **Unit 16, 33 Maddox St
Alexandria NSW 2015**

Telephone **+61 2 8594 0400**
Facsimile **+61 2 8594 0499**
Email **au.environmental.sydney@sgs.com**

SGS Reference **SE171022 R0**
Date Received **04 Oct 2017**
Date Reported **10 Oct 2017**

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document and was supplied by the Client. This QA/QC Statement must be read in conjunction with the referenced Analytical Report. The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Duplicate	Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES	2 items
-----------	---	---------

SAMPLE SUMMARY

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Mercury (total) In Water

Method: ME-(AU)-[ENV]AN311(Perth) /AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
RIN	SE171022.007	LB133725	29 Sep 2017	04 Oct 2017	27 Oct 2017	06 Oct 2017	27 Oct 2017	06 Oct 2017

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA1 0.4-0.5	SE171022.001	LB133902	29 Sep 2017	04 Oct 2017	27 Oct 2017	09 Oct 2017	27 Oct 2017	10 Oct 2017
HA2 0.05-0.15	SE171022.002	LB133902	29 Sep 2017	04 Oct 2017	27 Oct 2017	09 Oct 2017	27 Oct 2017	10 Oct 2017
HA3 0.7-0.8	SE171022.003	LB133902	29 Sep 2017	04 Oct 2017	27 Oct 2017	09 Oct 2017	27 Oct 2017	10 Oct 2017
HA4 0.05-0.15	SE171022.004	LB133902	29 Sep 2017	04 Oct 2017	27 Oct 2017	09 Oct 2017	27 Oct 2017	10 Oct 2017
HA5 0.05-0.15	SE171022.005	LB133902	29 Sep 2017	04 Oct 2017	27 Oct 2017	09 Oct 2017	27 Oct 2017	10 Oct 2017
HA6 0.4-0.5	SE171022.006	LB133902	29 Sep 2017	04 Oct 2017	27 Oct 2017	09 Oct 2017	27 Oct 2017	10 Oct 2017
DUP	SE171022.010	LB133902	29 Sep 2017	04 Oct 2017	27 Oct 2017	09 Oct 2017	27 Oct 2017	10 Oct 2017

Moisture Content

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA1 0.4-0.5	SE171022.001	LB133754	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	11 Oct 2017	09 Oct 2017
HA2 0.05-0.15	SE171022.002	LB133754	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	11 Oct 2017	09 Oct 2017
HA3 0.7-0.8	SE171022.003	LB133754	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	11 Oct 2017	09 Oct 2017
HA4 0.05-0.15	SE171022.004	LB133754	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	11 Oct 2017	09 Oct 2017
HA5 0.05-0.15	SE171022.005	LB133754	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	11 Oct 2017	09 Oct 2017
HA6 0.4-0.5	SE171022.006	LB133754	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	11 Oct 2017	09 Oct 2017
TRIP BLANK	SE171022.009	LB133754	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	11 Oct 2017	09 Oct 2017
DUP	SE171022.010	LB133754	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	11 Oct 2017	09 Oct 2017

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA1 0.4-0.5	SE171022.001	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA2 0.05-0.15	SE171022.002	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA3 0.7-0.8	SE171022.003	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA4 0.05-0.15	SE171022.004	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA5 0.05-0.15	SE171022.005	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA6 0.4-0.5	SE171022.006	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
TRIP BLANK	SE171022.009	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
DUP	SE171022.010	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017

OP Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA1 0.4-0.5	SE171022.001	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA2 0.05-0.15	SE171022.002	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA3 0.7-0.8	SE171022.003	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA4 0.05-0.15	SE171022.004	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA5 0.05-0.15	SE171022.005	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA6 0.4-0.5	SE171022.006	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
TRIP BLANK	SE171022.009	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
DUP	SE171022.010	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA1 0.4-0.5	SE171022.001	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA2 0.05-0.15	SE171022.002	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA3 0.7-0.8	SE171022.003	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA4 0.05-0.15	SE171022.004	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA5 0.05-0.15	SE171022.005	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA6 0.4-0.5	SE171022.006	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
TRIP BLANK	SE171022.009	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
DUP	SE171022.010	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017

PCBs in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA1 0.4-0.5	SE171022.001	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA2 0.05-0.15	SE171022.002	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA3 0.7-0.8	SE171022.003	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA4 0.05-0.15	SE171022.004	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

PCBs in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA5 0.05-0.15	SE171022.005	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA6 0.4-0.5	SE171022.006	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
TRIP BLANK	SE171022.009	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
DUP	SE171022.010	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA1 0.4-0.5	SE171022.001	LB133774	29 Sep 2017	04 Oct 2017	28 Mar 2018	06 Oct 2017	28 Mar 2018	09 Oct 2017
HA2 0.05-0.15	SE171022.002	LB133774	29 Sep 2017	04 Oct 2017	28 Mar 2018	06 Oct 2017	28 Mar 2018	09 Oct 2017
HA3 0.7-0.8	SE171022.003	LB133774	29 Sep 2017	04 Oct 2017	28 Mar 2018	06 Oct 2017	28 Mar 2018	09 Oct 2017
HA4 0.05-0.15	SE171022.004	LB133774	29 Sep 2017	04 Oct 2017	28 Mar 2018	06 Oct 2017	28 Mar 2018	09 Oct 2017
HA5 0.05-0.15	SE171022.005	LB133774	29 Sep 2017	04 Oct 2017	28 Mar 2018	06 Oct 2017	28 Mar 2018	09 Oct 2017
HA6 0.4-0.5	SE171022.006	LB133774	29 Sep 2017	04 Oct 2017	28 Mar 2018	06 Oct 2017	28 Mar 2018	09 Oct 2017
DUP	SE171022.010	LB133774	29 Sep 2017	04 Oct 2017	28 Mar 2018	06 Oct 2017	28 Mar 2018	09 Oct 2017

Trace Metals (Total) in Water by ICPMS

Method: ME-(AU)-[ENV]AN022/AN318

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
RIN	SE171022.007	LB133718	29 Sep 2017	04 Oct 2017	28 Mar 2018	06 Oct 2017	28 Mar 2018	06 Oct 2017

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA1 0.4-0.5	SE171022.001	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA2 0.05-0.15	SE171022.002	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA3 0.7-0.8	SE171022.003	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA4 0.05-0.15	SE171022.004	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA5 0.05-0.15	SE171022.005	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
HA6 0.4-0.5	SE171022.006	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
TRIP BLANK	SE171022.009	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017
DUP	SE171022.010	LB133739	29 Sep 2017	04 Oct 2017	13 Oct 2017	06 Oct 2017	15 Nov 2017	09 Oct 2017

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA1 0.4-0.5	SE171022.001	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
HA2 0.05-0.15	SE171022.002	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
HA3 0.7-0.8	SE171022.003	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
HA4 0.05-0.15	SE171022.004	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
HA5 0.05-0.15	SE171022.005	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
HA6 0.4-0.5	SE171022.006	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
TRIP SPIKE	SE171022.008	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
TRIP BLANK	SE171022.009	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
DUP	SE171022.010	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
HA1 0.4-0.5	SE171022.001	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
HA2 0.05-0.15	SE171022.002	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
HA3 0.7-0.8	SE171022.003	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
HA4 0.05-0.15	SE171022.004	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
HA5 0.05-0.15	SE171022.005	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
HA6 0.4-0.5	SE171022.006	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
TRIP SPIKE	SE171022.008	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
TRIP BLANK	SE171022.009	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017
DUP	SE171022.010	LB133698	29 Sep 2017	04 Oct 2017	13 Oct 2017	05 Oct 2017	14 Nov 2017	10 Oct 2017

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Tetrachloro-m-xylene (TCMX) (Surrogate)	HA1 0.4-0.5	SE171022.001	%	60 - 130%	94
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	89
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	93
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	90
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	82
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	91
	DUP	SE171022.010	%	60 - 130%	90

OP Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	HA1 0.4-0.5	SE171022.001	%	60 - 130%	88
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	94
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	88
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	100
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	98
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	98
	DUP	SE171022.010	%	60 - 130%	96
d14-p-terphenyl (Surrogate)	HA1 0.4-0.5	SE171022.001	%	60 - 130%	88
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	90
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	88
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	90
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	94
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	96
	DUP	SE171022.010	%	60 - 130%	90

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	HA1 0.4-0.5	SE171022.001	%	70 - 130%	88
	HA2 0.05-0.15	SE171022.002	%	70 - 130%	94
	HA3 0.7-0.8	SE171022.003	%	70 - 130%	88
	HA4 0.05-0.15	SE171022.004	%	70 - 130%	100
	HA5 0.05-0.15	SE171022.005	%	70 - 130%	98
	HA6 0.4-0.5	SE171022.006	%	70 - 130%	98
	DUP	SE171022.010	%	70 - 130%	96
d14-p-terphenyl (Surrogate)	HA1 0.4-0.5	SE171022.001	%	70 - 130%	88
	HA2 0.05-0.15	SE171022.002	%	70 - 130%	90
	HA3 0.7-0.8	SE171022.003	%	70 - 130%	88
	HA4 0.05-0.15	SE171022.004	%	70 - 130%	90
	HA5 0.05-0.15	SE171022.005	%	70 - 130%	94
	HA6 0.4-0.5	SE171022.006	%	70 - 130%	96
	DUP	SE171022.010	%	70 - 130%	90
d5-nitrobenzene (Surrogate)	HA1 0.4-0.5	SE171022.001	%	70 - 130%	92
	HA2 0.05-0.15	SE171022.002	%	70 - 130%	92
	HA3 0.7-0.8	SE171022.003	%	70 - 130%	90
	HA4 0.05-0.15	SE171022.004	%	70 - 130%	92
	HA5 0.05-0.15	SE171022.005	%	70 - 130%	100
	HA6 0.4-0.5	SE171022.006	%	70 - 130%	98
	DUP	SE171022.010	%	70 - 130%	96

PCBs in Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Tetrachloro-m-xylene (TCMX) (Surrogate)	HA1 0.4-0.5	SE171022.001	%	60 - 130%	94
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	89
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	93
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	90
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	82
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	91
	DUP	SE171022.010	%	60 - 130%	90

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units
-----------	-------------	---------------	-------

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOC's in Soil (continued)

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	HA1 0.4-0.5	SE171022.001	%	60 - 130%	84
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	101
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	97
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	107
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	101
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	96
	TRIP SPIKE	SE171022.008	%	60 - 130%	111
	TRIP BLANK	SE171022.009	%	60 - 130%	103
d4-1,2-dichloroethane (Surrogate)	DUP	SE171022.010	%	60 - 130%	110
	HA1 0.4-0.5	SE171022.001	%	60 - 130%	86
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	92
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	91
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	103
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	96
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	99
	TRIP SPIKE	SE171022.008	%	60 - 130%	116
d8-toluene (Surrogate)	TRIP BLANK	SE171022.009	%	60 - 130%	106
	DUP	SE171022.010	%	60 - 130%	106
	HA1 0.4-0.5	SE171022.001	%	60 - 130%	85
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	95
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	92
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	107
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	99
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	102
Dibromofluoromethane (Surrogate)	TRIP SPIKE	SE171022.008	%	60 - 130%	119
	TRIP BLANK	SE171022.009	%	60 - 130%	109
	DUP	SE171022.010	%	60 - 130%	108
	HA1 0.4-0.5	SE171022.001	%	60 - 130%	81
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	72
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	74
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	83
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	80
Dibromofluoromethane (Surrogate)	HA6 0.4-0.5	SE171022.006	%	60 - 130%	78
	TRIP SPIKE	SE171022.008	%	60 - 130%	90
	TRIP BLANK	SE171022.009	%	60 - 130%	83
	DUP	SE171022.010	%	60 - 130%	84

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	HA1 0.4-0.5	SE171022.001	%	60 - 130%	84
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	101
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	97
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	107
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	101
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	96
	TRIP BLANK	SE171022.009	%	60 - 130%	103
	DUP	SE171022.010	%	60 - 130%	110
d4-1,2-dichloroethane (Surrogate)	HA1 0.4-0.5	SE171022.001	%	60 - 130%	86
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	92
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	91
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	103
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	96
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	99
	TRIP BLANK	SE171022.009	%	60 - 130%	106
	DUP	SE171022.010	%	60 - 130%	106
d8-toluene (Surrogate)	HA1 0.4-0.5	SE171022.001	%	60 - 130%	85
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	95
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	92
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	107
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	99
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	102

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Volatile Petroleum Hydrocarbons in Soil (continued)

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
d8-toluene (Surrogate)	TRIP BLANK	SE171022.009	%	60 - 130%	109
	DUP	SE171022.010	%	60 - 130%	108
Dibromofluoromethane (Surrogate)	HA1 0.4-0.5	SE171022.001	%	60 - 130%	81
	HA2 0.05-0.15	SE171022.002	%	60 - 130%	72
	HA3 0.7-0.8	SE171022.003	%	60 - 130%	74
	HA4 0.05-0.15	SE171022.004	%	60 - 130%	83
	HA5 0.05-0.15	SE171022.005	%	60 - 130%	80
	HA6 0.4-0.5	SE171022.006	%	60 - 130%	78
	TRIP BLANK	SE171022.009	%	60 - 130%	83
	DUP	SE171022.010	%	60 - 130%	84

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Mercury in Soil

Method: ME-(AU)-ENVJAN312

Sample Number	Parameter	Units	LOR	Result
LB133902.001	Mercury	mg/kg	0.05	<0.05

OC Pesticides in Soil

Method: ME-(AU)-ENVJAN420

Sample Number	Parameter	Units	LOR	Result
LB133739.001	Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1
	Alpha BHC	mg/kg	0.1	<0.1
	Lindane	mg/kg	0.1	<0.1
	Heptachlor	mg/kg	0.1	<0.1
	Aldrin	mg/kg	0.1	<0.1
	Beta BHC	mg/kg	0.1	<0.1
	Delta BHC	mg/kg	0.1	<0.1
	Heptachlor epoxide	mg/kg	0.1	<0.1
	Alpha Endosulfan	mg/kg	0.2	<0.2
	Gamma Chlordane	mg/kg	0.1	<0.1
	Alpha Chlordane	mg/kg	0.1	<0.1
	p,p'-DDE	mg/kg	0.1	<0.1
	Dieldrin	mg/kg	0.2	<0.2
	Endrin	mg/kg	0.2	<0.2
	Beta Endosulfan	mg/kg	0.2	<0.2
	p,p'-DDD	mg/kg	0.1	<0.1
	p,p'-DDT	mg/kg	0.1	<0.1
	Endosulfan sulphate	mg/kg	0.1	<0.1
	Endrin Aldehyde	mg/kg	0.1	<0.1
	Methoxychlor	mg/kg	0.1	<0.1
Endrin Ketone	mg/kg	0.1	<0.1	
Isodrin	mg/kg	0.1	<0.1	
Mirex	mg/kg	0.1	<0.1	
Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	93

OP Pesticides in Soil

Method: ME-(AU)-ENVJAN420

Sample Number	Parameter	Units	LOR	Result	
LB133739.001	Dichlorvos	mg/kg	0.5	<0.5	
	Dimethoate	mg/kg	0.5	<0.5	
	Diazinon (Dimpylate)	mg/kg	0.5	<0.5	
	Fenitrothion	mg/kg	0.2	<0.2	
	Malathion	mg/kg	0.2	<0.2	
	Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2	
	Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2	
	Bromophos Ethyl	mg/kg	0.2	<0.2	
	Methidathion	mg/kg	0.5	<0.5	
	Ethion	mg/kg	0.2	<0.2	
	Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2	
	Surrogates	2-fluorobiphenyl (Surrogate)	%	-	102
		d14-p-terphenyl (Surrogate)	%	-	104

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-ENVJAN420

Sample Number	Parameter	Units	LOR	Result
LB133739.001	Naphthalene	mg/kg	0.1	<0.1
	2-methylnaphthalene	mg/kg	0.1	<0.1
	1-methylnaphthalene	mg/kg	0.1	<0.1
	Acenaphthylene	mg/kg	0.1	<0.1
	Acenaphthene	mg/kg	0.1	<0.1
	Fluorene	mg/kg	0.1	<0.1
	Phenanthrene	mg/kg	0.1	<0.1
	Anthracene	mg/kg	0.1	<0.1
	Fluoranthene	mg/kg	0.1	<0.1
	Pyrene	mg/kg	0.1	<0.1
	Benzo(a)anthracene	mg/kg	0.1	<0.1
	Chrysene	mg/kg	0.1	<0.1
	Benzo(a)pyrene	mg/kg	0.1	<0.1

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result
LB133739.001	Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
	Dibenzo(ah)anthracene	mg/kg	0.1	<0.1
	Benzo(ghi)perylene	mg/kg	0.1	<0.1
	Total PAH (18)	mg/kg	0.8	<0.8
	Surrogates			
	d5-nitrobenzene (Surrogate)	%	-	102
	2-fluorobiphenyl (Surrogate)	%	-	102
	d14-p-terphenyl (Surrogate)	%	-	104

PCBs in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result
LB133739.001	Arochlor 1016	mg/kg	0.2	<0.2
	Arochlor 1221	mg/kg	0.2	<0.2
	Arochlor 1232	mg/kg	0.2	<0.2
	Arochlor 1242	mg/kg	0.2	<0.2
	Arochlor 1248	mg/kg	0.2	<0.2
	Arochlor 1254	mg/kg	0.2	<0.2
	Arochlor 1260	mg/kg	0.2	<0.2
	Arochlor 1262	mg/kg	0.2	<0.2
	Arochlor 1268	mg/kg	0.2	<0.2
	Total PCBs (Arochlors)	mg/kg	1	<1
Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	%	-	93

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result
LB133774.001	Arsenic, As	mg/kg	3	<3
	Cadmium, Cd	mg/kg	0.3	<0.3
	Chromium, Cr	mg/kg	0.3	<0.3
	Copper, Cu	mg/kg	0.5	<0.5
	Lead, Pb	mg/kg	1	<1
	Nickel, Ni	mg/kg	0.5	<0.5
	Zinc, Zn	mg/kg	0.5	<0.5

Trace Metals (Total) in Water by ICPMS

Method: ME-(AU)-[ENV]AN022/AN318

Sample Number	Parameter	Units	LOR	Result
LB133718.001	Total Arsenic	µg/L	1	<1
	Total Cadmium	µg/L	0.1	<0.1
	Total Copper	µg/L	1	<1
	Total Lead	µg/L	1	<1
	Total Nickel	µg/L	1	<1
	Total Zinc	µg/L	5	<5

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB133739.001	TRH C10-C14	mg/kg	20	<20
	TRH C15-C28	mg/kg	45	<45
	TRH C29-C36	mg/kg	45	<45
	TRH C37-C40	mg/kg	100	<100
	TRH C10-C36 Total	mg/kg	110	<110

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result	
LB133698.001	Monocyclic Aromatic Hydrocarbons	Benzene	mg/kg	0.1	<0.1
		Toluene	mg/kg	0.1	<0.1
		Ethylbenzene	mg/kg	0.1	<0.1
		m/p-xylene	mg/kg	0.2	<0.2
		o-xylene	mg/kg	0.1	<0.1
	Polycyclic VOCs	Naphthalene	mg/kg	0.1	<0.1
		Surrogates			
		Dibromofluoromethane (Surrogate)	%	-	87
		d4-1,2-dichloroethane (Surrogate)	%	-	88
		d8-toluene (Surrogate)	%	-	89
	Bromofluorobenzene (Surrogate)	%	-	89	
Totals	Total BTEX	mg/kg	0.6	<0.6	

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result
LB133698.001	TRH C6-C9	mg/kg	20	<20
	Surrogates			
	Dibromofluoromethane (Surrogate)	%	-	87
	d4-1,2-dichloroethane (Surrogate)	%	-	88
	d8-toluene (Surrogate)	%	-	89

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE171022.010	LB133902.014	Mercury	mg/kg	0.05	<0.05	<0.05	193	0
SE171127.006	LB133902.024	Mercury	mg/kg	0.05	0.00748698530	0.0057698125	200	0

Moisture Content

Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE171022.009	LB133754.011	% Moisture	%w/w	0.5	<0.5	<0.5	200	0
SE171022.010	LB133754.013	% Moisture	%w/w	0.5	5.4	5.3	49	3

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE170990.002	LB133739.014	Hexachlorobenzene (HCB)	mg/kg	0.1	0	0	200	0
		Alpha BHC	mg/kg	0.1	0	0	200	0
		Lindane	mg/kg	0.1	0	0	200	0
		Heptachlor	mg/kg	0.1	0	0	200	0
		Aldrin	mg/kg	0.1	0	0	200	0
		Beta BHC	mg/kg	0.1	0	0	200	0
		Delta BHC	mg/kg	0.1	0	0	200	0
		Heptachlor epoxide	mg/kg	0.1	0	0	200	0
		o,p'-DDE	mg/kg	0.1	0	0	200	0
		Alpha Endosulfan	mg/kg	0.2	0	0	200	0
		Gamma Chlordane	mg/kg	0.1	0	0	200	0
		Alpha Chlordane	mg/kg	0.1	0	0	200	0
		trans-Nonachlor	mg/kg	0.1	0	0	200	0
		p,p'-DDE	mg/kg	0.1	0	0	200	0
		Dieldrin	mg/kg	0.2	0	0	200	0
		Endrin	mg/kg	0.2	0	0	200	0
		o,p'-DDD	mg/kg	0.1	0	0	200	0
		o,p'-DDT	mg/kg	0.1	0	0	200	0
		Beta Endosulfan	mg/kg	0.2	0	0	200	0
		p,p'-DDD	mg/kg	0.1	0	0	200	0
		p,p'-DDT	mg/kg	0.1	0	0	200	0
		Endosulfan sulphate	mg/kg	0.1	0	0	200	0
		Endrin Aldehyde	mg/kg	0.1	0	0	200	0
Methoxychlor	mg/kg	0.1	0	0	200	0		
Endrin Ketone	mg/kg	0.1	0	0	200	0		
Isodrin	mg/kg	0.1	0	0	200	0		
Mirex	mg/kg	0.1	0	0	200	0		
Total CLP OC Pesticides			mg/kg	1	0	0	200	0
Surrogates								
		Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.133	0.133	30	0
SE171022.010	LB133739.025	Hexachlorobenzene (HCB)	mg/kg	0.1	<0.1	<0.1	200	0
		Alpha BHC	mg/kg	0.1	<0.1	<0.1	200	0
		Lindane	mg/kg	0.1	<0.1	<0.1	200	0
		Heptachlor	mg/kg	0.1	<0.1	<0.1	200	0
		Aldrin	mg/kg	0.1	<0.1	<0.1	200	0
		Beta BHC	mg/kg	0.1	<0.1	<0.1	200	0
		Delta BHC	mg/kg	0.1	<0.1	<0.1	200	0
		Heptachlor epoxide	mg/kg	0.1	<0.1	<0.1	200	0
		o,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	0
		Alpha Endosulfan	mg/kg	0.2	<0.2	<0.2	200	0
		Gamma Chlordane	mg/kg	0.1	<0.1	<0.1	200	0
		Alpha Chlordane	mg/kg	0.1	<0.1	<0.1	200	0
		trans-Nonachlor	mg/kg	0.1	<0.1	<0.1	200	0
		p,p'-DDE	mg/kg	0.1	<0.1	<0.1	200	0
		Dieldrin	mg/kg	0.2	<0.2	<0.2	200	0
		Endrin	mg/kg	0.2	<0.2	<0.2	200	0
		o,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	0
		o,p'-DDT	mg/kg	0.1	<0.1	<0.1	200	0
		Beta Endosulfan	mg/kg	0.2	<0.2	<0.2	200	0
		p,p'-DDD	mg/kg	0.1	<0.1	<0.1	200	0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

OC Pesticides in Soil (continued)

Method: ME-(AU)-JENVJAN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE171022.010	LB133739.025	p,p'-DDT	mg/kg	0.1	<0.1	<0.1	200	0
		Endosulfan sulphate	mg/kg	0.1	<0.1	<0.1	200	0
		Endrin Aldehyde	mg/kg	0.1	<0.1	<0.1	200	0
		Methoxychlor	mg/kg	0.1	<0.1	<0.1	200	0
		Endrin Ketone	mg/kg	0.1	<0.1	<0.1	200	0
		Isodrin	mg/kg	0.1	<0.1	<0.1	200	0
		Mirex	mg/kg	0.1	<0.1	<0.1	200	0
		Total CLP OC Pesticides	mg/kg	1	<1	<1	200	0
Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.14	0.13	30	5	

OP Pesticides in Soil

Method: ME-(AU)-JENVJAN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %	
SE170990.002	LB133739.014	Dichlorvos	mg/kg	0.5	0	0	200	0	
		Dimethoate	mg/kg	0.5	0	0	200	0	
		Diazinon (Dimpylate)	mg/kg	0.5	0	0	200	0	
		Fenitrothion	mg/kg	0.2	0	0	200	0	
		Malathion	mg/kg	0.2	0	0	200	0	
		Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	0	0	200	0	
		Parathion-ethyl (Parathion)	mg/kg	0.2	0.01	0	200	0	
		Bromophos Ethyl	mg/kg	0.2	0.01	0.02	200	0	
		Methidathion	mg/kg	0.5	0	0	200	0	
		Ethion	mg/kg	0.2	0	0	200	0	
		Azinphos-methyl (Guthion)	mg/kg	0.2	0	0	200	0	
		Total OP Pesticides*	mg/kg	1.7	0.02	0.02	200	0	
		Surrogates	2-fluorobiphenyl (Surrogate)	mg/kg	-	0.47	0.48	30	2
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.42	0.46	30	9
SE171022.010	LB133739.025	Dichlorvos	mg/kg	0.5	<0.5	<0.5	200	0	
		Dimethoate	mg/kg	0.5	<0.5	<0.5	200	0	
		Diazinon (Dimpylate)	mg/kg	0.5	<0.5	<0.5	200	0	
		Fenitrothion	mg/kg	0.2	<0.2	<0.2	200	0	
		Malathion	mg/kg	0.2	<0.2	<0.2	200	0	
		Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	<0.2	<0.2	200	0	
		Parathion-ethyl (Parathion)	mg/kg	0.2	<0.2	<0.2	200	0	
		Bromophos Ethyl	mg/kg	0.2	<0.2	<0.2	200	0	
		Methidathion	mg/kg	0.5	<0.5	<0.5	200	0	
		Ethion	mg/kg	0.2	<0.2	<0.2	200	0	
		Azinphos-methyl (Guthion)	mg/kg	0.2	<0.2	<0.2	200	0	
		Total OP Pesticides*	mg/kg	1.7	<1.7	<1.7	200	0	
		Surrogates	2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	30	0
			d14-p-terphenyl (Surrogate)	mg/kg	-	0.5	0.5	30	4

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-JENVJAN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE170990.002	LB133739.014	Naphthalene	mg/kg	0.1	0	0	200	0
		2-methylnaphthalene	mg/kg	0.1	0	0	200	0
		1-methylnaphthalene	mg/kg	0.1	0	0	200	0
		Acenaphthylene	mg/kg	0.1	0	0	200	0
		Acenaphthene	mg/kg	0.1	0	0	200	0
		Fluorene	mg/kg	0.1	0	0	200	0
		Phenanthrene	mg/kg	0.1	0	0	200	0
		Anthracene	mg/kg	0.1	0	0	200	0
		Fluoranthene	mg/kg	0.1	0	0.01	200	0
		Pyrene	mg/kg	0.1	0	0	200	0
		Benzo(a)anthracene	mg/kg	0.1	0.01	0.01	200	0
		Chrysene	mg/kg	0.1	0.01	0.01	200	0
		Benzo(b&j)fluoranthene	mg/kg	0.1	0.01	0.01	200	0
		Benzo(k)fluoranthene	mg/kg	0.1	0.01	0.01	200	0
		Benzo(a)pyrene	mg/kg	0.1	0	0	200	0
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	0	0	200	0
		Dibenzo(ah)anthracene	mg/kg	0.1	0	0	200	0
		Benzo(ghi)perylene	mg/kg	0.1	0	0	200	0
		Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ (mg/kg)	0.2	0	0	200	0

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %	
SE170990.002	LB133739.014	Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	0.242	0.242	134	0	
		Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	0.121	0.121	175	0	
		Total PAH (18)	mg/kg	0.8	0	0	200	0	
		Surrogates							
		d5-nitrobenzene (Surrogate)	mg/kg	-	0.47	0.47	30	0	
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.47	0.48	30	2	
SE171022.010	LB133739.025	d14-p-terphenyl (Surrogate)	mg/kg	-	0.42	0.46	30	9	
		Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0	
		2-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0	
		1-methylnaphthalene	mg/kg	0.1	<0.1	<0.1	200	0	
		Acenaphthylene	mg/kg	0.1	<0.1	<0.1	200	0	
		Acenaphthene	mg/kg	0.1	<0.1	<0.1	200	0	
		Fluorene	mg/kg	0.1	<0.1	<0.1	200	0	
		Phenanthrene	mg/kg	0.1	0.2	0.2	84	5	
		Anthracene	mg/kg	0.1	<0.1	<0.1	200	0	
		Fluoranthene	mg/kg	0.1	0.6	0.7	46	16	
		Pyrene	mg/kg	0.1	0.6	0.6	47	10	
		Benzo(a)anthracene	mg/kg	0.1	0.3	0.3	64	17	
		Chrysene	mg/kg	0.1	0.2	0.2	75	0	
		Benzo(b&j)fluoranthene	mg/kg	0.1	0.2	0.3	70	8	
		Benzo(k)fluoranthene	mg/kg	0.1	0.2	0.2	79	5	
		Benzo(a)pyrene	mg/kg	0.1	0.2	0.3	70	8	
		Indeno(1,2,3-cd)pyrene	mg/kg	0.1	0.2	0.3	70	8	
		Dibenzo(ah)anthracene	mg/kg	0.1	<0.1	<0.1	200	0	
		Benzo(ghi)perylene	mg/kg	0.1	0.2	0.2	77	5	
		Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ (mg/kg)	0.2	0.3	0.4	66	8	
		Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	0.4	0.5	76	6	
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	0.4	0.4	59	7			
Total PAH (18)	mg/kg	0.8	3.0	3.2	56	9			
Surrogates									
d5-nitrobenzene (Surrogate)	mg/kg	-	0.5	0.5	30	0			
2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	30	0			
d14-p-terphenyl (Surrogate)	mg/kg	-	0.5	0.5	30	4			

PCBs in Soil

Method: ME-(AU)-[ENV]AN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE170990.002	LB133739.014	Arochlor 1016	mg/kg	0.2	0	0	200	0
		Arochlor 1221	mg/kg	0.2	0	0	200	0
		Arochlor 1232	mg/kg	0.2	0	0	200	0
		Arochlor 1242	mg/kg	0.2	0	0	200	0
		Arochlor 1248	mg/kg	0.2	0	0	200	0
		Arochlor 1254	mg/kg	0.2	0	0	200	0
		Arochlor 1260	mg/kg	0.2	0	0	200	0
		Arochlor 1262	mg/kg	0.2	0	0	200	0
		Arochlor 1268	mg/kg	0.2	0	0	200	0
		Total PCBs (Arochlors)	mg/kg	1	0	0	200	0
		Surrogates						
Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.133	0.133	30	0		
SE171022.010	LB133739.025	Arochlor 1016	mg/kg	0.2	<0.2	<0.2	200	0
		Arochlor 1221	mg/kg	0.2	<0.2	<0.2	200	0
		Arochlor 1232	mg/kg	0.2	<0.2	<0.2	200	0
		Arochlor 1242	mg/kg	0.2	<0.2	<0.2	200	0
		Arochlor 1248	mg/kg	0.2	<0.2	<0.2	200	0
		Arochlor 1254	mg/kg	0.2	<0.2	<0.2	200	0
		Arochlor 1260	mg/kg	0.2	<0.2	<0.2	200	0
		Arochlor 1262	mg/kg	0.2	<0.2	<0.2	200	0
		Arochlor 1268	mg/kg	0.2	<0.2	<0.2	200	0
		Total PCBs (Arochlors)	mg/kg	1	<1	<1	200	0
		Surrogates						
Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0	0	30	5		

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Original	Duplicate	Parameter	Units	LOR
----------	-----------	-----------	-------	-----

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES (continued)

Method: ME-(AU)-[ENV]AN040/AN320

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE170993.010	LB133774.014	Arsenic, As	mg/kg	3	<3	<3	200	0
		Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	200	0
		Chromium, Cr	mg/kg	0.3	3.9	5.2	41	27
		Copper, Cu	mg/kg	0.5	0.8	0.7	98	20
		Lead, Pb	mg/kg	1	4	4	58	6
		Nickel, Ni	mg/kg	0.5	<0.5	<0.5	161	0
SE171022.010	LB133774.024	Zinc, Zn	mg/kg	0.5	0.5	0.6	200	0
		Arsenic, As	mg/kg	3	3	<3	63	26
		Cadmium, Cd	mg/kg	0.3	<0.3	<0.3	200	0
		Chromium, Cr	mg/kg	0.3	26	28	32	8
		Copper, Cu	mg/kg	0.5	11	22	33	65 @
		Lead, Pb	mg/kg	1	20	18	35	11
		Nickel, Ni	mg/kg	0.5	6.5	5.4	38	18
		Zinc, Zn	mg/kg	0.5	210	410	31	62 @

Trace Metals (Total) in Water by ICPMS

Method: ME-(AU)-[ENV]AN022/AN318

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE171022.007	LB133718.006	Total Arsenic	µg/L	1	<1	<1	200	0
		Total Cadmium	µg/L	0.1	<0.1	<0.1	200	0
		Total Chromium	µg/L	1	<1	<1	200	0
		Total Copper	µg/L	1	<1	<1	200	0
		Total Lead	µg/L	1	<1	<1	200	0
		Total Nickel	µg/L	1	<1	<1	200	0
		Total Zinc	µg/L	5	<5	<5	163	0

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %	
SE170990.002	LB133739.014	TRH C10-C14	mg/kg	20	0	0	200	0	
		TRH C15-C28	mg/kg	45	0	0	200	0	
		TRH C29-C36	mg/kg	45	0	0	200	0	
		TRH C37-C40	mg/kg	100	0	0	200	0	
		TRH C10-C36 Total	mg/kg	110	0	0	200	0	
		TRH C10-C40 Total	mg/kg	210	0	0	200	0	
		TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	0	0	200	0
			TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	0	0	200	0
			TRH >C16-C34 (F3)	mg/kg	90	0	0	200	0
TRH >C34-C40 (F4)	mg/kg		120	0	0	200	0		
SE171022.010	LB133739.025	TRH C10-C14	mg/kg	20	<20	<20	200	0	
		TRH C15-C28	mg/kg	45	<45	<45	200	0	
		TRH C29-C36	mg/kg	45	<45	<45	200	0	
		TRH C37-C40	mg/kg	100	<100	<100	200	0	
		TRH C10-C36 Total	mg/kg	110	<110	<110	200	0	
		TRH C10-C40 Total	mg/kg	210	<210	<210	200	0	
		TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	<25	<25	200	0
			TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25	<25	200	0
			TRH >C16-C34 (F3)	mg/kg	90	<90	<90	200	0
TRH >C34-C40 (F4)	mg/kg		120	<120	<120	200	0		

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %		
SE171022.003	LB133698.014	Monocyclic Aromatic	Benzene	mg/kg	0.1	<0.1	<0.1	200	0	
			Toluene	mg/kg	0.1	<0.1	<0.1	200	0	
		Polycyclic	Ethylbenzene	mg/kg	0.1	<0.1	<0.1	200	0	
			m/p-xylene	mg/kg	0.2	<0.2	<0.2	200	0	
			o-xylene	mg/kg	0.1	<0.1	<0.1	200	0	
		Surrogates	Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0	
			Dibromofluoromethane (Surrogate)	mg/kg	-	3.7	4.6	50	21	
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.6	5.7	50	22	
			d8-toluene (Surrogate)	mg/kg	-	4.6	5.8	50	23	
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.9	5.5	50	13	
			Totals	Total Xylenes	mg/kg	0.3	<0.3	<0.3	200	0
			Total BTEX	mg/kg	0.6	<0.6	<0.6	200	0	

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOC's in Soil (continued)

Method: ME-(AU)-IENVJAN433

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %	
SE171022.010	LB133698.021	Monocyclic	Benzene	mg/kg	0.1	<0.1	<0.1	200	0
		Aromatic	Toluene	mg/kg	0.1	<0.1	<0.1	200	0
			Ethylbenzene	mg/kg	0.1	<0.1	<0.1	200	0
			m/p-xylene	mg/kg	0.2	0.3	0.3	104	15
			o-xylene	mg/kg	0.1	0.2	0.1	101	14
		Polycyclic	Naphthalene	mg/kg	0.1	<0.1	<0.1	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.2	3.8	50	10
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	5.3	4.6	50	13
			d8-toluene (Surrogate)	mg/kg	-	5.4	4.7	50	14
			Bromofluorobenzene (Surrogate)	mg/kg	-	5.5	4.8	50	13
		Totals	Total Xylenes	mg/kg	0.3	0.4	0.4	103	15
			Total BTEX	mg/kg	0.6	<0.6	<0.6	96	20

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-IENVJAN433

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %	
SE171022.003	LB133698.014		TRH C6-C10	mg/kg	25	<25	<25	200	0
			TRH C6-C9	mg/kg	20	<20	<20	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	3.7	4.6	30	21
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.6	5.7	30	22
			d8-toluene (Surrogate)	mg/kg	-	4.6	5.8	30	23
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.9	5.5	30	13
		VPH F Bands	Benzene (F0)	mg/kg	0.1	<0.1	<0.1	200	0
SE171022.010	LB133698.021		TRH C6-C10	mg/kg	25	<25	<25	200	0
			TRH C6-C9	mg/kg	20	<20	<20	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.2	3.8	30	10
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	5.3	4.6	30	13
			d8-toluene (Surrogate)	mg/kg	-	5.4	4.7	30	14
			Bromofluorobenzene (Surrogate)	mg/kg	-	5.5	4.8	30	13
		VPH F Bands	Benzene (F0)	mg/kg	0.1	<0.1	<0.1	200	0
	TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	200	0		

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB133902.002	Mercury	mg/kg	0.05	0.20	0.2	70 - 130	98

OC Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB133739.002	Heptachlor	mg/kg	0.1	0.2	0.2	60 - 140	122
	Aldrin	mg/kg	0.1	0.2	0.2	60 - 140	123
	Delta BHC	mg/kg	0.1	0.3	0.2	60 - 140	125
	Dieldrin	mg/kg	0.2	0.2	0.2	60 - 140	116
	Endrin	mg/kg	0.2	0.2	0.2	60 - 140	119
	p,p'-DDT	mg/kg	0.1	0.2	0.2	60 - 140	97
Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.14	0.15	40 - 130	91

OP Pesticides in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB133739.002	Dichlorvos	mg/kg	0.5	1.9	2	60 - 140	94
	Diazinon (Dimpylate)	mg/kg	0.5	2.0	2	60 - 140	100
	Chlorpyrifos (Chlorpyrifos Ethyl)	mg/kg	0.2	1.7	2	60 - 140	85
	Ethion	mg/kg	0.2	1.4	2	60 - 140	72
	Surrogates	2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	40 - 130
	d14-p-terphenyl (Surrogate)	mg/kg	-	0.4	0.5	40 - 130	88

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB133739.002	Naphthalene	mg/kg	0.1	3.7	4	60 - 140	93	
	Acenaphthylene	mg/kg	0.1	3.5	4	60 - 140	87	
	Acenaphthene	mg/kg	0.1	3.7	4	60 - 140	93	
	Phenanthrene	mg/kg	0.1	3.6	4	60 - 140	90	
	Anthracene	mg/kg	0.1	3.7	4	60 - 140	91	
	Fluoranthene	mg/kg	0.1	3.6	4	60 - 140	89	
	Pyrene	mg/kg	0.1	3.3	4	60 - 140	82	
	Benzo(a)pyrene	mg/kg	0.1	3.7	4	60 - 140	94	
	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	92
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	92
	d14-p-terphenyl (Surrogate)	mg/kg	-	0.4	0.5	40 - 130	88	

PCBs in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB133739.002	Arochlor 1260	mg/kg	0.2	0.4	0.4	60 - 140	101

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB133774.002	Arsenic, As	mg/kg	3	48	50	80 - 120	96
	Cadmium, Cd	mg/kg	0.3	49	50	80 - 120	97
	Chromium, Cr	mg/kg	0.3	48	50	80 - 120	95
	Copper, Cu	mg/kg	0.5	48	50	80 - 120	97
	Lead, Pb	mg/kg	1	48	50	80 - 120	97
	Nickel, Ni	mg/kg	0.5	47	50	80 - 120	95
	Zinc, Zn	mg/kg	0.5	48	50	80 - 120	97

Trace Metals (Total) in Water by ICPMS

Method: ME-(AU)-[ENV]AN022/AN318

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB133718.002	Total Arsenic	µg/L	1	19	20	80 - 120	96
	Total Cadmium	µg/L	0.1	20	20	80 - 120	102
	Total Copper	µg/L	1	20	20	80 - 120	101
	Total Lead	µg/L	1	22	20	80 - 120	108
	Total Nickel	µg/L	1	19	20	80 - 120	97
	Total Zinc	µg/L	5	19	20	80 - 120	97

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR
---------------	-----------	-------	-----

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

TRH (Total Recoverable Hydrocarbons) in Soil (continued)

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB133739.002	TRH C10-C14	mg/kg	20	38	40	60 - 140	95	
	TRH C15-C28	mg/kg	45	<45	40	60 - 140	98	
	TRH C29-C36	mg/kg	45	<45	40	60 - 140	78	
	TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	39	40	60 - 140	98
	TRH >C16-C34 (F3)	mg/kg	90	<90	40	60 - 140	88	
	TRH >C34-C40 (F4)	mg/kg	120	<120	20	60 - 140	70	

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB133698.002	Monocyclic	Benzene	mg/kg	0.1	2.2	2.9	60 - 140	77
		Aromatic	Toluene	mg/kg	0.1	2.5	2.9	60 - 140
	Ethylbenzene		mg/kg	0.1	2.5	2.9	60 - 140	87
	m/p-xylene		mg/kg	0.2	5.0	5.8	60 - 140	86
	o-xylene		mg/kg	0.1	2.6	2.9	60 - 140	89
	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.0	5	60 - 140	80
		d4-1,2-dichloroethane (Surrogate)	mg/kg	-	5.5	5	60 - 140	110
		d8-toluene (Surrogate)	mg/kg	-	5.6	5	60 - 140	112
		Bromofluorobenzene (Surrogate)	mg/kg	-	5.7	5	60 - 140	114

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB133698.002	TRH C6-C10	mg/kg	25	<25	24.65	60 - 140	99	
		mg/kg	20	22	23.2	60 - 140	95	
	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.0	5	60 - 140	80
		d4-1,2-dichloroethane (Surrogate)	mg/kg	-	5.5	5	60 - 140	110
		d8-toluene (Surrogate)	mg/kg	-	5.6	5	60 - 140	112
		Bromofluorobenzene (Surrogate)	mg/kg	-	5.7	5	60 - 140	114
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	7.25	60 - 140	133

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury (total) In Water

Method: ME-(AU)-[ENV]AN311(Perth) /AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE170899.001	LB133725.004	Total Mercury	mg/L	0.0001	0.0077	<0.0001	-	-

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE171108.001	LB133902.004	Mercury	mg/kg	0.05	0.21	<0.05	0.2	83

PCBs in Soil

Method: ME-(AU)-[ENV]AN420

QC Sample	Sample Number	Parameter	Units	LOR	Original	Spike	Recovery%
SE170989.001	LB133739.026	Arochlor 1016	mg/kg	0.2	0	-	-
		Arochlor 1221	mg/kg	0.2	0	-	-
		Arochlor 1232	mg/kg	0.2	0	-	-
		Arochlor 1242	mg/kg	0.2	0	-	-
		Arochlor 1248	mg/kg	0.2	0	-	-
		Arochlor 1254	mg/kg	0.2	0	-	-
		Arochlor 1260	mg/kg	0.2	0	0.4	104
		Arochlor 1262	mg/kg	0.2	0	-	-
		Arochlor 1268	mg/kg	0.2	0	-	-
		Total PCBs (Arochlors)	mg/kg	1	0	-	-
Surrogates	Tetrachloro-m-xylene (TCMX) (Surrogate)	mg/kg	-	0.135	-	90	

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE170993.001	LB133774.004	Arsenic, As	mg/kg	3	49	<3	50	98
		Cadmium, Cd	mg/kg	0.3	50	<0.3	50	100
		Chromium, Cr	mg/kg	0.3	53	2.8	50	100
		Copper, Cu	mg/kg	0.5	52	0.8	50	103
		Lead, Pb	mg/kg	1	53	3	50	100
		Nickel, Ni	mg/kg	0.5	49	<0.5	50	98
		Zinc, Zn	mg/kg	0.5	51	<0.5	50	101

Trace Metals (Total) in Water by ICPMS

Method: ME-(AU)-[ENV]AN022/AN318

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE170957.001	LB133718.004	Total Arsenic	µg/L	1	29	10	20	93
		Total Cadmium	µg/L	0.1	22	0.2	20	108
		Total Copper	µg/L	1	55	38	20	82
		Total Lead	µg/L	1	36	16	20	100
		Total Nickel	µg/L	1	67	51	20	83
		Total Zinc	µg/L	5	120	100	20	80

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%	
SE170989.001	LB133739.026	TRH C10-C14	mg/kg	20	35	0	40	88	
		TRH C15-C28	mg/kg	45	68	34	40	85	
		TRH C29-C36	mg/kg	45	50	0	40	125	
		TRH C37-C40	mg/kg	100	<100	0	-	-	
		TRH C10-C36 Total	mg/kg	110	150	34	-	-	
		TRH C10-C40 Total	mg/kg	210	<210	56	-	-	
		TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	38	0	40	95
		TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	38	0	-	-	
		TRH >C16-C34 (F3)	mg/kg	90	<90	56	40	68	
		TRH >C34-C40 (F4)	mg/kg	120	<120	0	-	-	

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%	
SE170917.001	LB133698.004	Monocyclic	Benzene	mg/kg	0.1	1.8	<0.1	2.9	61
		Aromatic	Toluene	mg/kg	0.1	2.0	<0.1	2.9	69
		Ethylbenzene	mg/kg	0.1	1.9	<0.1	2.9	64	
		m/p-xylene	mg/kg	0.2	3.8	<0.2	5.8	65	
		o-xylene	mg/kg	0.1	2.0	<0.1	2.9	67	

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

VOC's in Soil (continued)

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%	
SE170917.001	LB133698.004	Polycyclic	Naphthalene	mg/kg	0.1	<0.1	<0.1	-	-
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.1	4.1	-	82
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.3	4.2	-	86
			d8-toluene (Surrogate)	mg/kg	-	4.0	3.9	-	80
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.0	4.2	-	79
			Totals	Total Xylenes	mg/kg	0.3	5.7	<0.3	-
		Total BTEX	mg/kg	0.6	11	<0.6	-	-	

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%	
SE170917.001	LB133698.004	TRH C6-C10	mg/kg	25	<25	<25	24.65	83	
		TRH C6-C9	mg/kg	20	<20	<20	23.2	80	
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.1	4.1	-	82
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.3	4.2	-	86
			d8-toluene (Surrogate)	mg/kg	-	4.0	3.9	-	80
			Bromofluorobenzene (Surrogate)	mg/kg	-	4.0	4.2	-	79
		VPH F	Benzene (F0)	mg/kg	0.1	1.8	<0.1	-	-
Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	<25	7.25	126		

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: $RPD = | \text{OriginalResult} - \text{ReplicateResult} | \times 100 / \text{Mean}$

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times \text{SDL} / \text{Mean} + \text{LR}$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022_QA_QC_Plan.pdf

- * NATA accreditation does not cover the performance of this service .
 - ** Indicative data, theoretical holding time exceeded.
 - Sample not analysed for this analyte.
 - IS Insufficient sample for analysis.
 - LNR Sample listed, but not received.
 - LOR Limit of reporting.
 - QFH QC result is above the upper tolerance.
 - QFL QC result is below the lower tolerance.
-
- ① At least 2 of 3 surrogates are within acceptance criteria.
 - ② RPD failed acceptance criteria due to sample heterogeneity.
 - ③ Results less than 5 times LOR preclude acceptance criteria for RPD.
 - ④ Recovery failed acceptance criteria due to matrix interference.
 - ⑤ Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
 - ⑥ LOR was raised due to sample matrix interference.
 - ⑦ LOR was raised due to dilution of significantly high concentration of analyte in sample.
 - ⑧ Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
 - ⑨ Recovery failed acceptance criteria due to sample heterogeneity.
 - ⑩ LOR was raised due to high conductivity of the sample (required dilution).
 - † Refer to Analytical Report comments for further information.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This test report shall not be reproduced, except in full.

Log in Today - TCLP Analysis - Job No: SE171696 (1 sample)

Miguel Barritt, Elsa (Sydney)

Tue 24/10/2017 10:21 AM

To: AU.SampleReceipt.Sydney (Sydney) <AU.SampleReceipt.Sydney@sgs.com>;

Cc: Inglis Brien <inglis.brien@cardno.com.au>;

📎 1 attachments (472 KB)

SE171696_COC.pdf;

SGS EHS Alexandria Laboratory



SE171696A COC

Received: 24 – Oct – 2017

Hi Sample Receipt,

FYA – As per client (Inglis) phone request this morning please log in Sample SE171696 (See COC attached) for TCLP – Metals & PAH on a 1 day TAT (Due tomorrow - Wed 25.10.17)

Any questions or issues let me know.

Kind Regards

Elsa Miguel Barritt

Environment, Health & Safety

Customer Service Representative

SGS Australia Pty Ltd

Unit 16, 33 Maddox Street

Alexandria, NSW, 2015

Phone: +61 (0)2 8594 0400

Direct: +61 (0)2 8594 0455

Fax: +61 (0)2 8594 0499

E-mail: Elsa.MiguelBarritt@sgs.com

Web: www.au.sgs.com



SAMPLE RECEIPT ADVICE

SE171696A

CLIENT DETAILS

Contact Inglis Brien
Client CARDNO (NSW/ACT) PTY LTD
Address Unit 1
10 Denney Street
Broadmeadow
NSW 2292
Telephone 61 2 4940 5527
Facsimile 61 2 4965 4666
Email inglis.brien@cardno.com.au
Project **82218015 Additional**
Order Number **82218015**
Samples 1

LABORATORY DETAILS

Manager Huong Crawford
Laboratory SGS Alexandria Environmental
Address Unit 16, 33 Maddox St
Alexandria NSW 2015
Telephone +61 2 8594 0400
Facsimile +61 2 8594 0499
Email au.environmental.sydney@sgs.com
Samples Received Tue 24/10/2017
Report Due Wed 25/10/2017
SGS Reference **SE171696A**

SUBMISSION DETAILS

This is to confirm that 1 sample was received on Tuesday 24/10/2017. Results are expected to be ready by COB Wednesday 25/10/2017. Please quote SGS reference SE171696A when making enquiries. Refer below for details relating to sample integrity upon receipt.

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	1 Soil
Date documentation received	24/10/17@10:21am	Type of documentation received	Email
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	9.3°C	Sufficient sample for analysis	Yes
Turnaround time requested	Next Day		

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.



SAMPLE RECEIPT ADVICE

SE171696A

CLIENT DETAILS

Client **CARDNO (NSW/ACT) PTY LTD**

Project **82218015 Additional**

SUMMARY OF ANALYSIS

No.	Sample ID	Mercury in TCLP Extract	Metals in TCLP Extract by ICPOES	PAH (Polynuclear Aromatic Hydrocarbons) in TCLP	TCLP (Toxicity Characteristic Leaching
001	BH001 0.1-0.3	1	7	22	6

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document. The numbers shown in the table indicate the number of results requested in each package. Please indicate as soon as possible should your request differ from these details. Testing as per this table shall commence immediately unless the client intervenes with a correction.

CLIENT DETAILS

LABORATORY DETAILS

Contact Malcolm Adrien
 Client CARDNO (NSW/ACT) PTY LTD
 Address Unit 1
 10 Denney Street
 Broadmeadow
 NSW 2292
 Telephone 61 2 4949 4300
 Facsimile 61 2 4965 4666
 Email malcolm.adrien@cardno.com.au
 Project **82218015**
 Order Number **82218015**
 Samples 1

Manager Huong Crawford
 Laboratory SGS Alexandria Environmental
 Address Unit 16, 33 Maddox St
 Alexandria NSW 2015
 Telephone +61 2 8594 0400
 Facsimile +61 2 8594 0499
 Email au.environmental.sydney@sgs.com
 SGS Reference **SE171696 R0**
 Date Received 23/10/2017
 Date Reported 24/10/2017

COMMENTS

Accredited for compliance with ISO/IEC 17025-Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES



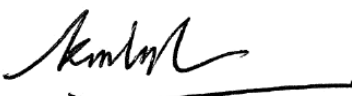
Akheeqar Beniamen
 Chemist



Bennet Lo
 Senior Organic Chemist/Metals Chemist



Dong Liang
 Metals/Inorganics Team Leader



Ly Kim Ha
 Organic Section Head

VOC's in Soil [AN433] Tested: 23/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
			SE171696.001
PARAMETER	UOM	LOR	
Benzene	mg/kg	0.1	<0.1
Toluene	mg/kg	0.1	<0.1
Ethylbenzene	mg/kg	0.1	<0.1
m/p-xylene	mg/kg	0.2	<0.2
o-xylene	mg/kg	0.1	<0.1
Total Xylenes	mg/kg	0.3	<0.3
Total BTEX	mg/kg	0.6	<0.6
Naphthalene	mg/kg	0.1	<0.1

Volatile Petroleum Hydrocarbons in Soil [AN433] Tested: 23/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
			SE171696.001
PARAMETER	UOM	LOR	
TRH C6-C9	mg/kg	20	<20
Benzene (F0)	mg/kg	0.1	<0.1
TRH C6-C10	mg/kg	25	<25
TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25

TRH (Total Recoverable Hydrocarbons) in Soil [AN403] Tested: 23/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
			SE171696.001
PARAMETER	UOM	LOR	
TRH C10-C14	mg/kg	20	<20
TRH C15-C28	mg/kg	45	<45
TRH C29-C36	mg/kg	45	<45
TRH C37-C40	mg/kg	100	<100
TRH >C10-C16 (F2)	mg/kg	25	<25
TRH >C10-C16 (F2) - Naphthalene	mg/kg	25	<25
TRH >C16-C34 (F3)	mg/kg	90	<90
TRH >C34-C40 (F4)	mg/kg	120	<120
TRH C10-C36 Total	mg/kg	110	<110
TRH C10-C40 Total	mg/kg	210	<210

PAH (Polynuclear Aromatic Hydrocarbons) in Soil [AN420] Tested: 23/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
			SE171696.001
PARAMETER	UOM	LOR	
Naphthalene	mg/kg	0.1	<0.1
2-methylnaphthalene	mg/kg	0.1	<0.1
1-methylnaphthalene	mg/kg	0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1
Acenaphthene	mg/kg	0.1	<0.1
Fluorene	mg/kg	0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1
Anthracene	mg/kg	0.1	<0.1
Fluoranthene	mg/kg	0.1	<0.1
Pyrene	mg/kg	0.1	<0.1
Benzo(a)anthracene	mg/kg	0.1	<0.1
Chrysene	mg/kg	0.1	<0.1
Benzo(b&j)fluoranthene	mg/kg	0.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.1	<0.1
Benzo(a)pyrene	mg/kg	0.1	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
Dibenzo(ah)anthracene	mg/kg	0.1	<0.1
Benzo(ghi)perylene	mg/kg	0.1	<0.1
Carcinogenic PAHs, BaP TEQ <LOR=0	TEQ	0.2	<0.2
Carcinogenic PAHs, BaP TEQ <LOR=LOR	TEQ (mg/kg)	0.3	<0.3
Carcinogenic PAHs, BaP TEQ <LOR=LOR/2	TEQ (mg/kg)	0.2	<0.2
Total PAH (18)	mg/kg	0.8	<0.8
Total PAH (NEPM/WHO 16)	mg/kg	0.8	<0.8

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES [AN040/AN320] Tested: 24/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
			SE171696.001
PARAMETER	UOM	LOR	
Arsenic, As	mg/kg	3	<3
Cadmium, Cd	mg/kg	0.3	<0.3
Chromium, Cr	mg/kg	0.3	2.7
Copper, Cu	mg/kg	0.5	0.5
Lead, Pb	mg/kg	1	<1
Nickel, Ni	mg/kg	0.5	<0.5
Zinc, Zn	mg/kg	0.5	1.7

Mercury in Soil [AN312] Tested: 24/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
			SE171696.001
PARAMETER	UOM	LOR	
Mercury	mg/kg	0.05	<0.05

Moisture Content [AN002] Tested: 23/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
			SE171696.001
PARAMETER	UOM	LOR	
% Moisture	%w/w	0.5	9.0

METHOD

METHODOLOGY SUMMARY

- AN002** The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
- AN040/AN320** A portion of sample is digested with nitric acid to decompose organic matter and hydrochloric acid to complete the digestion of metals. The digest is then analysed by ICP OES with metals results reported on the dried sample basis. Based on USEPA method 200.8 and 6010C.
- AN040** A portion of sample is digested with Nitric acid to decompose organic matter and Hydrochloric acid to complete the digestion of metals and then filtered for analysis by ASS or ICP as per USEPA Method 200.8.
- AN312** Mercury by Cold Vapour AAS in Soils: After digestion with nitric acid, hydrogen peroxide and hydrochloric acid, mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500
- AN403** Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). F2 is reported directly and also corrected by subtracting Naphthalene (from VOC method AN433) where available.
- AN403** Additionally, the volatile C6-C9 fraction may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Petroleum Hydrocarbons (TPH) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
- AN403** The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
- AN420** (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).
- AN420** Carcinogenic PAHs may be expressed as Benzo(a)pyrene equivalents by applying the BaP toxicity equivalence factor (NEPM 1999, June 2013, B7). These can be reported as the individual PAHs and as a sum of carcinogenic PAHs. The sum is reported three ways, the first assuming all <LOR results are zero, the second assuming all <LOR results are half the LOR and the third assuming all <LOR results are the LOR.
- AN433** VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC's are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
		IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- a. 1 Bq is equivalent to 27 pCi
- b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : <http://www.sgs.com.au/~media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf>

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.



STATEMENT OF QA/QC PERFORMANCE

SE171696 R0

CLIENT DETAILS

Contact Malcolm Adrien
Client CARDNO (NSW/ACT) PTY LTD
Address Unit 1
10 Denney Street
Broadmeadow
NSW 2292
Telephone 61 2 4949 4300
Facsimile 61 2 4965 4666
Email malcolm.adrien@cardno.com.au

Project **82218015**
Order Number **82218015**
Samples 1

LABORATORY DETAILS

Manager Huong Crawford
Laboratory SGS Alexandria Environmental
Address Unit 16, 33 Maddox St
Alexandria NSW 2015
Telephone +61 2 8594 0400
Facsimile +61 2 8594 0499
Email au.environmental.sydney@sgs.com

SGS Reference **SE171696 R0**
Date Received 23 Oct 2017
Date Reported 24 Oct 2017

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document and was supplied by the Client. This QA/QC Statement must be read in conjunction with the referenced Analytical Report. The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	Moisture Content	1 item
	PAH (Polynuclear Aromatic Hydrocarbons) in Soil	1 item
	TRH (Total Recoverable Hydrocarbons) in Soil	1 item
	VOC's in Soil	1 item
	Volatile Petroleum Hydrocarbons in Soil	1 item
Matrix Spike	Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES	1 item

SAMPLE SUMMARY

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	1 Soil
Date documentation received	23/10/2017	Type of documentation received	COC
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	9.3°C	Sufficient sample for analysis	Yes
Turnaround time requested	Next Day		

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696.001	LB135029	29 Sep 2017	23 Oct 2017	27 Oct 2017	24 Oct 2017	27 Oct 2017	24 Oct 2017

Moisture Content

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696.001	LB134984	29 Sep 2017	23 Oct 2017	13 Oct 2017	23 Oct 2017†	28 Oct 2017	24 Oct 2017

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696.001	LB134981	29 Sep 2017	23 Oct 2017	13 Oct 2017	23 Oct 2017†	02 Dec 2017	24 Oct 2017

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696.001	LB135037	29 Sep 2017	23 Oct 2017	28 Mar 2018	24 Oct 2017	28 Mar 2018	24 Oct 2017

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696.001	LB134981	29 Sep 2017	23 Oct 2017	13 Oct 2017	23 Oct 2017†	02 Dec 2017	24 Oct 2017

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696.001	LB134980	29 Sep 2017	23 Oct 2017	13 Oct 2017	23 Oct 2017†	02 Dec 2017	24 Oct 2017

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696.001	LB134980	29 Sep 2017	23 Oct 2017	13 Oct 2017	23 Oct 2017†	02 Dec 2017	24 Oct 2017

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) In Soil

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	BH001 0.1-0.3	SE171696.001	%	70 - 130%	110
d14-p-terphenyl (Surrogate)	BH001 0.1-0.3	SE171696.001	%	70 - 130%	110
d5-nitrobenzene (Surrogate)	BH001 0.1-0.3	SE171696.001	%	70 - 130%	108

VOC's In Soil

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH001 0.1-0.3	SE171696.001	%	60 - 130%	79
d4-1,2-dichloroethane (Surrogate)	BH001 0.1-0.3	SE171696.001	%	60 - 130%	71
d8-toluene (Surrogate)	BH001 0.1-0.3	SE171696.001	%	60 - 130%	71
Dibromofluoromethane (Surrogate)	BH001 0.1-0.3	SE171696.001	%	60 - 130%	79

Volatile Petroleum Hydrocarbons In Soil

Method: ME-(AU)-[ENV]AN433

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	BH001 0.1-0.3	SE171696.001	%	60 - 130%	79
d4-1,2-dichloroethane (Surrogate)	BH001 0.1-0.3	SE171696.001	%	60 - 130%	71
d8-toluene (Surrogate)	BH001 0.1-0.3	SE171696.001	%	60 - 130%	71
Dibromofluoromethane (Surrogate)	BH001 0.1-0.3	SE171696.001	%	60 - 130%	79

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result
LB135029.001	Mercury	mg/kg	0.05	<0.05

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result
LB134981.001	Naphthalene	mg/kg	0.1	<0.1
	2-methylnaphthalene	mg/kg	0.1	<0.1
	1-methylnaphthalene	mg/kg	0.1	<0.1
	Acenaphthylene	mg/kg	0.1	<0.1
	Acenaphthene	mg/kg	0.1	<0.1
	Fluorene	mg/kg	0.1	<0.1
	Phenanthrene	mg/kg	0.1	<0.1
	Anthracene	mg/kg	0.1	<0.1
	Fluoranthene	mg/kg	0.1	<0.1
	Pyrene	mg/kg	0.1	<0.1
	Benzo(a)anthracene	mg/kg	0.1	<0.1
	Chrysene	mg/kg	0.1	<0.1
	Benzo(a)pyrene	mg/kg	0.1	<0.1
	Indeno(1,2,3-cd)pyrene	mg/kg	0.1	<0.1
	Dibenzo(ah)anthracene	mg/kg	0.1	<0.1
	Benzo(ghi)perylene	mg/kg	0.1	<0.1
	Total PAH (18)	mg/kg	0.8	<0.8
	Surrogates	d5-nitrobenzene (Surrogate)	%	-
2-fluorobiphenyl (Surrogate)		%	-	102
d14-p-terphenyl (Surrogate)		%	-	102

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result
LB135037.001	Arsenic, As	mg/kg	3	<3
	Cadmium, Cd	mg/kg	0.3	<0.3
	Chromium, Cr	mg/kg	0.3	<0.3
	Copper, Cu	mg/kg	0.5	<0.5
	Lead, Pb	mg/kg	1	<1
	Nickel, Ni	mg/kg	0.5	<0.5
	Zinc, Zn	mg/kg	0.5	<0.5

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB134981.001	TRH C10-C14	mg/kg	20	<20
	TRH C15-C28	mg/kg	45	<45
	TRH C29-C36	mg/kg	45	<45
	TRH C37-C40	mg/kg	100	<100
	TRH C10-C36 Total	mg/kg	110	<110

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result	
LB134980.001	Monocyclic Aromatic Hydrocarbons	Benzene	mg/kg	0.1	<0.1
		Toluene	mg/kg	0.1	<0.1
		Ethylbenzene	mg/kg	0.1	<0.1
		m/p-xylene	mg/kg	0.2	<0.2
		o-xylene	mg/kg	0.1	<0.1
	Polycyclic VOCs	Naphthalene	mg/kg	0.1	<0.1
		Surrogates	Dibromofluoromethane (Surrogate)	%	-
	d4-1,2-dichloroethane (Surrogate)		%	-	81
	d8-toluene (Surrogate)		%	-	85
	Totals	Bromofluorobenzene (Surrogate)	%	-	80
Total BTEX		mg/kg	0.6	<0.6	

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR
---------------	-----------	-------	-----

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Volatile Petroleum Hydrocarbons in Soil (continued)

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result
LB134980.001	TRH C6-C9	mg/kg	20	<20
	Surrogates			
	Dibromofluoromethane (Surrogate)	%	-	78
	d4-1,2-dichloroethane (Surrogate)	%	-	81
	d8-toluene (Surrogate)	%	-	85

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = | \text{OriginalResult} - \text{ReplicateResult} | \times 100 / \text{Mean}$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times \text{SDL} / \text{Mean} + \text{LR}$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE171647A.006	LB135029.007	Mercury	mg/kg	0.05	<0.05	<0.05	132	0

Moisture Content

Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE171696.001	LB134984.022	% Moisture	%w/w	0.5	9.0	8.8	41	3
SE171701.001	LB134984.024	% Moisture	%w/w	0.5	10.67484662579.6038415366		40	11

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %		
SE171701.001	LB134980.025	Monocyclic	Benzene	mg/kg	0.1	0	0	200	0	
		Aromatic	Toluene	mg/kg	0.1	0	0	200	0	
			Ethylbenzene	mg/kg	0.1	0	0	200	0	
			m/p-xylene	mg/kg	0.2	0	0	200	0	
			o-xylene	mg/kg	0.1	0	0	200	0	
		Polycyclic	Naphthalene	mg/kg	0.1	0	0.01	0.01	200	0
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.02	3.68	3.68	50	9
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	3.57	3.95	3.95	50	10
			d8-toluene (Surrogate)	mg/kg	-	3.64	4.86	4.86	50	29
			Bromofluorobenzene (Surrogate)	mg/kg	-	3.76	3.86	3.86	50	3
		Totals	Total Xylenes	mg/kg	0.3	0	0	0	200	0
			Total BTEX	mg/kg	0.6	0	0	0	200	0

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %		
SE171701.001	LB134980.025	TRH C6-C10	TRH C6-C10	mg/kg	25	0	1.02	200	0	
			TRH C6-C9	mg/kg	20	0	0.97	200	0	
		Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	4.02	3.68	3.68	30	9
			d4-1,2-dichloroethane (Surrogate)	mg/kg	-	3.57	3.95	3.95	30	10
			d8-toluene (Surrogate)	mg/kg	-	3.64	4.86	4.86	30	29
			Bromofluorobenzene (Surrogate)	mg/kg	-	3.76	3.86	3.86	30	3
		VPH F Bands	Benzene (F0)	mg/kg	0.1	0	0	0	200	0
			TRH C6-C10 minus BTEX (F1)	mg/kg	25	0	1.02	1.02	200	0

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB135029.002	Mercury	mg/kg	0.05	0.18	0.2	70 - 130	92

PAH (Polynuclear Aromatic Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB134981.002	Naphthalene	mg/kg	0.1	4.2	4	60 - 140	105	
	Acenaphthylene	mg/kg	0.1	4.1	4	60 - 140	103	
	Acenaphthene	mg/kg	0.1	4.3	4	60 - 140	107	
	Phenanthrene	mg/kg	0.1	4.2	4	60 - 140	104	
	Anthracene	mg/kg	0.1	4.3	4	60 - 140	106	
	Fluoranthene	mg/kg	0.1	4.0	4	60 - 140	101	
	Pyrene	mg/kg	0.1	4.0	4	60 - 140	99	
	Benzo(a)pyrene	mg/kg	0.1	4.1	4	60 - 140	102	
	Surrogates	d5-nitrobenzene (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	100
		2-fluorobiphenyl (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	100
		d14-p-terphenyl (Surrogate)	mg/kg	-	0.5	0.5	40 - 130	98

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB135037.002	Arsenic, As	mg/kg	3	52	50	80 - 120	104
	Cadmium, Cd	mg/kg	0.3	53	50	80 - 120	107
	Chromium, Cr	mg/kg	0.3	53	50	80 - 120	106
	Copper, Cu	mg/kg	0.5	52	50	80 - 120	103
	Lead, Pb	mg/kg	1	53	50	80 - 120	107
	Nickel, Ni	mg/kg	0.5	53	50	80 - 120	107
	Zinc, Zn	mg/kg	0.5	54	50	80 - 120	107

TRH (Total Recoverable Hydrocarbons) in Soil

Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB134981.002	TRH C10-C14	mg/kg	20	43	40	60 - 140	108	
	TRH C15-C28	mg/kg	45	45	40	60 - 140	113	
	TRH C29-C36	mg/kg	45	<45	40	60 - 140	110	
	TRH F Bands	TRH >C10-C16 (F2)	mg/kg	25	44	40	60 - 140	110
		TRH >C16-C34 (F3)	mg/kg	90	<90	40	60 - 140	118
		TRH >C34-C40 (F4)	mg/kg	120	<120	20	60 - 140	120

VOC's in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB134980.002	Monocyclic	Benzene	mg/kg	0.1	2.7	2.9	60 - 140	94
		Aromatic	Toluene	mg/kg	0.1	2.0	2.9	60 - 140
	Ethylbenzene		mg/kg	0.1	2.0	2.9	60 - 140	69
	m/p-xylene		mg/kg	0.2	4.0	5.8	60 - 140	69
	o-xylene		mg/kg	0.1	2.0	2.9	60 - 140	68
	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	3.8	5	60 - 140	76
		d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.1	5	60 - 140	81
		d8-toluene (Surrogate)	mg/kg	-	4.4	5	60 - 140	87
		Bromofluorobenzene (Surrogate)	mg/kg	-	4.4	5	60 - 140	88

Volatile Petroleum Hydrocarbons in Soil

Method: ME-(AU)-[ENV]AN433

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB134980.002	TRH C6-C10	TRH C6-C10	mg/kg	25	<25	24.65	60 - 140	85
		TRH C6-C9	mg/kg	20	<20	23.2	60 - 140	71
	Surrogates	Dibromofluoromethane (Surrogate)	mg/kg	-	3.8	5	60 - 140	76
		d4-1,2-dichloroethane (Surrogate)	mg/kg	-	4.1	5	60 - 140	81
		d8-toluene (Surrogate)	mg/kg	-	4.4	5	60 - 140	87
		Bromofluorobenzene (Surrogate)	mg/kg	-	4.4	5	60 - 140	88
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	mg/kg	25	<25	7.25	60 - 140	115

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

Mercury in Soil

Method: ME-(AU)-[ENV]AN312

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE171701.001	LB135029.004	Mercury	mg/kg	0.05	0.23	0.02884034481	0.2	98

Total Recoverable Elements in Soil/Waste Solids/Materials by ICPOES

Method: ME-(AU)-[ENV]AN040/AN320

QC Sample	Sample Number	Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE171701.001	LB135037.004	Arsenic, As	mg/kg	3	53	2.61783355533	50	101
		Cadmium, Cd	mg/kg	0.3	46	0.23747086247	50	92
		Chromium, Cr	mg/kg	0.3	54	5.82086316461	50	96
		Copper, Cu	mg/kg	0.5	65	16.0038399100E	50	99
		Lead, Pb	mg/kg	1	89	52.3001304251E	50	74
		Nickel, Ni	mg/kg	0.5	48	2.49061702186	50	91
		Zinc, Zn	mg/kg	0.5	180	08.5863788988	50	145 Ⓣ

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: $RPD = | \text{OriginalResult} - \text{ReplicateResult} | \times 100 / \text{Mean}$

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times \text{SDL} / \text{Mean} + \text{LR}$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here : http://www.sgs.com.au/~media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022_QA_QC_Plan.pdf

- * NATA accreditation does not cover the performance of this service .
 - ** Indicative data, theoretical holding time exceeded.
 - Sample not analysed for this analyte.
 - IS Insufficient sample for analysis.
 - LNR Sample listed, but not received.
 - LOR Limit of reporting.
 - QFH QC result is above the upper tolerance.
 - QFL QC result is below the lower tolerance.
-
- ① At least 2 of 3 surrogates are within acceptance criteria.
 - ② RPD failed acceptance criteria due to sample heterogeneity.
 - ③ Results less than 5 times LOR preclude acceptance criteria for RPD.
 - ④ Recovery failed acceptance criteria due to matrix interference.
 - ⑤ Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
 - ⑥ LOR was raised due to sample matrix interference.
 - ⑦ LOR was raised due to dilution of significantly high concentration of analyte in sample.
 - ⑧ Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
 - ⑨ Recovery failed acceptance criteria due to sample heterogeneity.
 - ⑩ LOR was raised due to high conductivity of the sample (required dilution).
 - † Refer to Analytical Report comments for further information.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This test report shall not be reproduced, except in full.

CLIENT DETAILS

Contact **Inglis Brien**
 Client **CARDNO (NSW/ACT) PTY LTD**
 Address **Unit 1
 10 Denney Street
 Broadmeadow
 NSW 2292**
 Telephone **61 2 4940 5527**
 Facsimile **61 2 4965 4666**
 Email **inglis.brien@cardno.com.au**
 Project **82218015 Additional**
 Order Number **82218015**
 Samples **1**

LABORATORY DETAILS

Manager **Huong Crawford**
 Laboratory **SGS Alexandria Environmental**
 Address **Unit 16, 33 Maddox St
 Alexandria NSW 2015**
 Telephone **+61 2 8594 0400**
 Facsimile **+61 2 8594 0499**
 Email **au.environmental.sydney@sgs.com**
 SGS Reference **SE171696A R0**
 Date Received **24/10/2017**
 Date Reported **25/10/2017**

COMMENTS

Accredited for compliance with ISO/IEC 17025-Testing. NATA accredited laboratory 2562(4354).

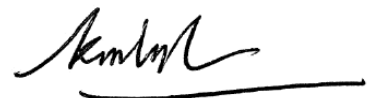
SIGNATORIES



Dong Liang
 Metals/Inorganics Team Leader



Huong Crawford
 Production Manager



Ly Kim Ha
 Organic Section Head

TCLP (Toxicity Characteristic Leaching Procedure) for Organics/SVOC [AN006] Tested: 24/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
PARAMETER	UOM	LOR	SE171696A.001
pH 1:20	pH Units	-	10
pH 1:20 plus HCL	pH Units	-	1.7
Extraction Solution Used	No unit	-	1
Mass of Sample Used*	g	-	25
Volume of ExtractionSolution Used*	mL	-	500
pH TCLP after 18 hours	pH Units	-	5.7

PAH (Polynuclear Aromatic Hydrocarbons) in TCLP Extract [AN420] Tested: 24/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
PARAMETER	UOM	LOR	SE171696A.001
Naphthalene	µg/L	0.1	<0.1
2-methylnaphthalene	µg/L	0.1	<0.1
1-methylnaphthalene	µg/L	0.1	<0.1
Acenaphthylene	µg/L	0.1	<0.1
Acenaphthene	µg/L	0.1	<0.1
Fluorene	µg/L	0.1	<0.1
Phenanthrene	µg/L	0.1	<0.1
Anthracene	µg/L	0.1	<0.1
Fluoranthene	µg/L	0.1	<0.1
Pyrene	µg/L	0.1	<0.1
Benzo(a)anthracene	µg/L	0.1	<0.1
Chrysene	µg/L	0.1	<0.1
Benzo(b&j)fluoranthene	µg/L	0.1	<0.1
Benzo(k)fluoranthene	µg/L	0.1	<0.1
Benzo(a)pyrene	µg/L	0.1	<0.1
Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1
Dibenzo(ah)anthracene	µg/L	0.1	<0.1
Benzo(ghi)perylene	µg/L	0.1	<0.1
Total PAH (18)	µg/L	1	<1

Metals in TCLP Extract by ICPOES [AN320] Tested: 24/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
PARAMETER	UOM	LOR	SE171696A.001
Arsenic, As	mg/L	0.02	<0.02
Cadmium, Cd	mg/L	0.001	<0.001
Chromium, Cr	mg/L	0.005	<0.005
Copper, Cu	mg/L	0.005	<0.005
Lead, Pb	mg/L	0.02	<0.02
Nickel, Ni	mg/L	0.005	<0.005
Zinc, Zn	mg/L	0.01	<0.01

Mercury in TCLP Extract [AN311(Perth) /AN312] Tested: 24/10/2017

			BH001 0.1-0.3
			SOIL
			-
			29/9/2017
PARAMETER	UOM	LOR	SE171696A.001
Mercury	mg/L	0.0001	<0.0001

METHOD

METHODOLOGY SUMMARY

- AN006** Contaminants of interest in a waste material are leached out of the waste with a selected leaching solution under controlled conditions. The ratio of sample to extraction fluid is 100g to 2L (1 to 20 by mass). The concentration of each contaminant of interest is determined in the leachate by appropriate methods after separation from the sample by filtering. Base on USEPA 1311.
- AN006** Extraction Fluid #1: This fluid is made by combining 128.6mL of dilute sodium hydroxide solution and 11.5mL glacial acetic acid with water and diluting to a volume of 2 litres. The pH of this fluid should be 4.93 ± 0.05 .
- AN006** Extraction Fluid #2: This fluid is made by diluting 5.7mL glacial acetic acid with water to a volume of 1 litre. The pH of this fluid should be 2.88 ± 0.05 .
- AN020** Unpreserved water sample is filtered through a 0.45µm membrane filter and acidified with nitric acid similar to APHA3030B.
- AN311(Perth) /AN312** Mercury by Cold Vapour AAS in Waters: Mercury ions are reduced by stannous chloride reagent in acidic solution to elemental mercury. This mercury vapour is purged by nitrogen into a cold cell in an atomic absorption spectrometer or mercury analyser. Quantification is made by comparing absorbances to those of the calibration standards. Reference APHA 3112/3500.
- AN320** Metals by ICP-OES: Samples are preserved with 10% nitric acid for a wide range of metals and some non-metals. This solution is measured by Inductively Coupled Plasma. Solutions are aspirated into an argon plasma at 8000-10000K and emit characteristic energy or light as a result of electron transitions through unique energy levels. The emitted light is focused onto a diffraction grating where it is separated into components .
- AN320** Photomultipliers or CCDs are used to measure the light intensity at specific wavelengths. This intensity is directly proportional to concentration. Corrections are required to compensate for spectral overlap between elements . Reference APHA 3120 B.
- AN420** (SVOCs) including OC, OP, PCB, Herbicides, PAH, Phthalates and Speciated Phenols (etc) in soils, sediments and waters are determined by GCMS/ECD technique following appropriate solvent extraction process (Based on USEPA 3500C and 8270D).

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
**	Indicative data, theoretical holding time exceeded.	NVL	Not validated.	LOR	Limit of Reporting.
		IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		

Samples analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the "Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.

Note that in terms of units of radioactivity:

- a. 1 Bq is equivalent to 27 pCi
- b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here : <http://www.sgs.com.au/~media/Local/Australia/Documents/Technical%20Documents/MP-AU-ENV-QU-022%20QA%20QC%20Plan.pdf>

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.



STATEMENT OF QA/QC PERFORMANCE

SE171696A R0

CLIENT DETAILS

Contact Inglis Brien
Client CARDNO (NSW/ACT) PTY LTD
Address Unit 1
10 Denney Street
Broadmeadow
NSW 2292
Telephone 61 2 4940 5527
Facsimile 61 2 4965 4666
Email inglis.brien@cardno.com.au
Project **82218015 Additional**
Order Number **82218015**
Samples 1

LABORATORY DETAILS

Manager Huong Crawford
Laboratory SGS Alexandria Environmental
Address Unit 16, 33 Maddox St
Alexandria NSW 2015
Telephone +61 2 8594 0400
Facsimile +61 2 8594 0499
Email au.environmental.sydney@sgs.com
SGS Reference **SE171696A R0**
Date Received 24 Oct 2017
Date Reported 25 Oct 2017

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document and was supplied by the Client. This QA/QC Statement must be read in conjunction with the referenced Analytical Report. The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	PAH (Polynuclear Aromatic Hydrocarbons) in TCLP Extract	1 item
	TCLP (Toxicity Characteristic Leaching Procedure) for Organics/SVOC	1 item

SAMPLE SUMMARY

Samples clearly labelled	Yes	Complete documentation received	Yes
Sample container provider	SGS	Sample cooling method	Ice Bricks
Samples received in correct containers	Yes	Sample counts by matrix	1 Soil
Date documentation received	24/10/17@10:21am	Type of documentation received	Email
Samples received in good order	Yes	Samples received without headspace	Yes
Sample temperature upon receipt	9.3°C	Sufficient sample for analysis	Yes
Turnaround time requested	Next Day		

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the sampled date is not supplied then compliance with criteria cannot be determined. If the received date is after one or both due dates then holding time will fail by default.

Mercury in TCLP Extract

Method: ME-(AU)-[ENV]AN311(Perth) /AN312

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696A.001	LB135082	29 Sep 2017	24 Oct 2017	27 Oct 2017	24 Oct 2017	27 Oct 2017	25 Oct 2017

Metals in TCLP Extract by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696A.001	LB135097	29 Sep 2017	24 Oct 2017	28 Mar 2018	24 Oct 2017	22 Apr 2018	25 Oct 2017

PAH (Polynuclear Aromatic Hydrocarbons) in TCLP Extract

Method: ME-(AU)-[ENV]AN420

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696A.001	LB135103	29 Sep 2017	24 Oct 2017	20 Oct 2017	24 Oct 2017†	03 Dec 2017	25 Oct 2017

TCLP (Toxicity Characteristic Leaching Procedure) for Organics/SVOC

Method: ME-(AU)-[ENV]AN006

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH001 0.1-0.3	SE171696A.001	LB135059	29 Sep 2017	24 Oct 2017	13 Oct 2017	24 Oct 2017†	07 Nov 2017	25 Oct 2017

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in TCLP Extract

Method: ME-(AU)-[ENV]AN420

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
2-fluorobiphenyl (Surrogate)	BH001 0.1-0.3	SE171696A.001	%	40 - 130%	44
d14-p-terphenyl (Surrogate)	BH001 0.1-0.3	SE171696A.001	%	40 - 130%	60
d5-nitrobenzene (Surrogate)	BH001 0.1-0.3	SE171696A.001	%	40 - 130%	46

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Mercury in TCLP Extract

Method: ME-(AU)-[ENV]AN311(Perth) /AN312

Sample Number	Parameter	Units	LOR	Result
LB135082.001	Mercury	mg/L	0.0001	-0.0044

Metals in TCLP Extract by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Number	Parameter	Units	LOR	Result
LB135097.001	Arsenic, As	mg/L	0.02	<0.02
	Cadmium, Cd	mg/L	0.001	<0.001
	Chromium, Cr	mg/L	0.005	<0.005
	Copper, Cu	mg/L	0.005	<0.005
	Lead, Pb	mg/L	0.02	<0.02
	Nickel, Ni	mg/L	0.005	<0.005
	Zinc, Zn	mg/L	0.01	<0.01

PAH (Polynuclear Aromatic Hydrocarbons) in TCLP Extract

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result
LB135103.001	Naphthalene	µg/L	0.1	<0.1
	2-methylnaphthalene	µg/L	0.1	<0.1
	1-methylnaphthalene	µg/L	0.1	<0.1
	Acenaphthylene	µg/L	0.1	<0.1
	Acenaphthene	µg/L	0.1	<0.1
	Fluorene	µg/L	0.1	<0.1
	Phenanthrene	µg/L	0.1	<0.1
	Anthracene	µg/L	0.1	<0.1
	Fluoranthene	µg/L	0.1	<0.1
	Pyrene	µg/L	0.1	<0.1
	Benzo(a)anthracene	µg/L	0.1	<0.1
	Chrysene	µg/L	0.1	<0.1
	Benzo(a)pyrene	µg/L	0.1	<0.1
	Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1
	Dibenzo(ah)anthracene	µg/L	0.1	<0.1
	Benzo(ghi)perylene	µg/L	0.1	<0.1
Surrogates	d5-nitrobenzene (Surrogate)	%	-	64
	2-fluorobiphenyl (Surrogate)	%	-	72
	d14-p-terphenyl (Surrogate)	%	-	82

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: $RPD = |OriginalResult - ReplicateResult| \times 100 / Mean$

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times SDL / Mean + LR$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

PAH (Polynuclear Aromatic Hydrocarbons) in TCLP Extract

Method: ME-(AU)-ENVJAN420

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %		
SE171452A.001	LB135103.023	Naphthalene	µg/L	0.1	<0.1	0	200	0		
		2-methylnaphthalene	µg/L	0.1	<0.1	0	200	0		
		1-methylnaphthalene	µg/L	0.1	<0.1	0	200	0		
		Acenaphthylene	µg/L	0.1	<0.1	0	200	0		
		Acenaphthene	µg/L	0.1	<0.1	0	200	0		
		Fluorene	µg/L	0.1	<0.1	0	200	0		
		Phenanthrene	µg/L	0.1	<0.1	0.02	200	0		
		Anthracene	µg/L	0.1	<0.1	0.02	200	0		
		Fluoranthene	µg/L	0.1	<0.1	0	200	0		
		Pyrene	µg/L	0.1	<0.1	0.04	200	0		
		Benzo(a)anthracene	µg/L	0.1	<0.1	0.02	200	0		
		Chrysene	µg/L	0.1	<0.1	0.02	200	0		
		Benzo(b&j)fluoranthene	µg/L	0.1	<0.1	0	200	0		
		Benzo(k)fluoranthene	µg/L	0.1	<0.1	0	200	0		
		Benzo(a)pyrene	µg/L	0.1	<0.1	0	200	0		
		Indeno(1,2,3-cd)pyrene	µg/L	0.1	<0.1	0	200	0		
		Dibenzo(ah)anthracene	µg/L	0.1	<0.1	0	200	0		
		Benzo(ghi)perylene	µg/L	0.1	<0.1	0	200	0		
		Surrogates		d5-nitrobenzene (Surrogate)	µg/L	-	0.2	0.21	30	9
				2-fluorobiphenyl (Surrogate)	µg/L	-	0.2	0.21	30	5
		d14-p-terphenyl (Surrogate)	µg/L	-	0.3	0.23	30	12		

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Metals in TCLP Extract by ICPOES

Method: ME-(AU)-[ENV]AN320

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB135097.002	Arsenic, As	mg/L	0.02	2.1	2	80 - 120	103
	Cadmium, Cd	mg/L	0.001	2.0	2	80 - 120	101
	Chromium, Cr	mg/L	0.005	2.0	2	80 - 120	99
	Copper, Cu	mg/L	0.005	1.9	2	80 - 120	95
	Lead, Pb	mg/L	0.02	2.0	2	80 - 120	101
	Nickel, Ni	mg/L	0.005	2.0	2	80 - 120	100
	Zinc, Zn	mg/L	0.01	2.0	2	80 - 120	100

PAH (Polynuclear Aromatic Hydrocarbons) in TCLP Extract

Method: ME-(AU)-[ENV]AN420

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %	
LB135103.002	Naphthalene	µg/L	0.1	27	40	60 - 140	68	
	Acenaphthylene	µg/L	0.1	27	40	60 - 140	68	
	Acenaphthene	µg/L	0.1	27	40	60 - 140	69	
	Phenanthrene	µg/L	0.1	29	40	60 - 140	71	
	Anthracene	µg/L	0.1	29	40	60 - 140	73	
	Fluoranthene	µg/L	0.1	26	40	60 - 140	66	
	Pyrene	µg/L	0.1	28	40	60 - 140	70	
	Benzo(a)pyrene	µg/L	0.1	32	40	60 - 140	79	
	Surrogates	d5-nitrobenzene (Surrogate)	µg/L	-	0.3	0.5	40 - 130	62
		2-fluorobiphenyl (Surrogate)	µg/L	-	0.3	0.5	40 - 130	66
d14-p-terphenyl (Surrogate)		µg/L	-	0.4	0.5	40 - 130	74	

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub-sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spikes were required for this job.

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: $RPD = | \text{OriginalResult} - \text{ReplicateResult} | \times 100 / \text{Mean}$

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: $MAD = 100 \times \text{SDL} / \text{Mean} + \text{LR}$

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifier when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: http://www.sgs.com.au/~media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022_QA_QC_Plan.pdf

- * NATA accreditation does not cover the performance of this service .
 - ** Indicative data, theoretical holding time exceeded.
 - Sample not analysed for this analyte.
 - IS Insufficient sample for analysis.
 - LNR Sample listed, but not received.
 - LOR Limit of reporting.
 - QFH QC result is above the upper tolerance.
 - QFL QC result is below the lower tolerance.
-
- ① At least 2 of 3 surrogates are within acceptance criteria.
 - ② RPD failed acceptance criteria due to sample heterogeneity.
 - ③ Results less than 5 times LOR preclude acceptance criteria for RPD.
 - ④ Recovery failed acceptance criteria due to matrix interference.
 - ⑤ Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
 - ⑥ LOR was raised due to sample matrix interference.
 - ⑦ LOR was raised due to dilution of significantly high concentration of analyte in sample.
 - ⑧ Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
 - ⑨ Recovery failed acceptance criteria due to sample heterogeneity.
 - ⑩ LOR was raised due to high conductivity of the sample (required dilution).
 - † Refer to Analytical Report comments for further information.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This test report shall not be reproduced, except in full.

CHAIN OF CUSTODY RECORD



LAB Name
Address

Client
Cardno Pty Ltd
PO Box 74
Broadmeadow NSW 2292

Contact Numbers
Phone 0249 494300
Fax 0249 654666

Contact
Malcolm Adrien

E-mail
malcolm.adrien@cardno.com.au ian.piper@cardno.com.au
(invoice to geotech@cardno.com.au)

Sampled by
Malcolm Adrien

Project Ref:
82218015

Date Results Required
Standard TAT

566466

Laboratory LIMS ID	Client Sample ID	Date Sampled	Matrix		Containers/Preservation								Analysis Required					
			Soil	Water	Soil Jar (G) Nat. Orange	0.5-1.0 litre (G) Nat. Yellow	0.1-1.0 litre (P) Nat. Green	50mL VOA Vial (G) H ₂ SO ₄ Maroon	0.1-1.0 litre (P) H ₂ SO ₄ Maroon	0.2-1.0 litre (G) H ₂ SO ₄ Maroon	0.1-0.2 (P) Filtered?? Y=Yes, N=No (HNO ₃) Red	0.2l (P) NaOH Blue	Other	CL17	TRH	BTEX	8 Metals (Total)	
	HA1 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA1 0.4-0.5	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA2 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA2 0.4-0.5	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA2 0.6-0.7	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA3 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA3 0.5-0.6	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA3 0.7-0.8	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA4 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA5 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA5 0.2-0.3	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA6 0.05-0.15	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	HA6 0.4-0.5	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	RIN	29/09/2017		<input checked="" type="checkbox"/>														
	TRIP SPIKE	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	TRIP BLANK	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	DUP	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													
	TRIP	29/09/2017	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>													

Released by: *[Signature]*
Received by: *[Signature]*

Signature: *[Signature]*
Signature: *[Signature]*

Date/Time: 3/10/17
Date/Time: 02/10/17 @ 11:20

Custody Seals Intact? / Samples Received Chilled?

SGS EHS Alexandria Laboratory

SE171022 COC
Received: 04 - Oct - 2017

Red: *[Signature]* *[Signature]*
5/10 2:57pm

Sample Receipt Advice

Company name: **Cardno (NSW/ACT) Pty Ltd**
Contact name: **Malcolm Adrien**
Project name: **SOIL ANALYSIS**
Project ID: **82218015**
COC number: **Not provided**
Turn around time: **5 Day**
Date/Time received: **Oct 5, 2017 2:57 PM**
Eurofins | mgt reference: **566466**

Sample information

- A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- All samples have been received as described on the above COC.
- COC has been completed correctly.
- Attempt to chill was evident.
- Appropriately preserved sample containers have been used.
- All samples were received in good condition.
- Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- Appropriate sample containers have been used.
- Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8400 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Malcolm Adrien - malcolm.adrien@cardno.com.au.

Company Name: Cardno (NSW/ACT) Pty Ltd	Order No.:	Received: Oct 5, 2017 2:57 PM
Address: Level 9, 203 Pacific Highway St Leonards NSW 2065	Report #: 566466	Due: Oct 12, 2017
	Phone: 0294967700	Priority: 5 Day
	Fax: 02 9499 3902	Contact Name: Malcolm Adrien
Project Name: SOIL ANALYSIS		
Project ID: 82218015		

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Organophosphorus Pesticides	Polychlorinated Biphenyls	Metals M8	BTEX and Naphthalene	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271													
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X	X	
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
External Laboratory													
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID								
1	TRIP	Sep 29, 2017		Soil	S17-Oc06118	X	X	X	X	X	X	X	
Test Counts						1	1	1	1	1	1	1	

Certificate of Analysis

Cardno (NSW/ACT) Pty Ltd
Level 9, 203 Pacific Highway
St Leonards
NSW 2065



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: **Malcolm Adrien**

Report **566466-S**
Project name SOIL ANALYSIS
Project ID 82218015
Received Date Oct 05, 2017

Client Sample ID			TRIP
Sample Matrix			Soil
Eurofins mgt Sample No.			S17-Oc06118
Date Sampled			Sep 29, 2017
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	20	mg/kg	< 20
TRH C10-C14	20	mg/kg	< 20
TRH C15-C28	50	mg/kg	50
TRH C29-C36	50	mg/kg	69
TRH C10-36 (Total)	50	mg/kg	119
BTEX			
Benzene	0.1	mg/kg	< 0.1
Toluene	0.1	mg/kg	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2
o-Xylene	0.1	mg/kg	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3
4-Bromofluorobenzene (surr.)	1	%	102
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene ^{N02}	0.5	mg/kg	< 0.5
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20
TRH C6-C10	20	mg/kg	< 20
TRH >C10-C16	50	mg/kg	< 50
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50
TRH >C16-C34	100	mg/kg	< 100
TRH >C34-C40	100	mg/kg	< 100
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5
Chrysene	0.5	mg/kg	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5



Client Sample ID			TRIP
Sample Matrix			Soil
Eurofins mgt Sample No.			S17-Oc06118
Date Sampled			Sep 29, 2017
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Fluoranthene	0.5	mg/kg	0.6
Fluorene	0.5	mg/kg	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5
Naphthalene	0.5	mg/kg	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5
Pyrene	0.5	mg/kg	0.6
Total PAH*	0.5	mg/kg	1.2
2-Fluorobiphenyl (surr.)	1	%	96
p-Terphenyl-d14 (surr.)	1	%	99
Organochlorine Pesticides			
Chlordanes - Total	0.1	mg/kg	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05
a-BHC	0.05	mg/kg	< 0.05
Aldrin	0.05	mg/kg	< 0.05
b-BHC	0.05	mg/kg	< 0.05
d-BHC	0.05	mg/kg	< 0.05
Dieldrin	0.05	mg/kg	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05
Endrin	0.05	mg/kg	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05
Heptachlor	0.05	mg/kg	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05
Methoxychlor	0.2	mg/kg	< 0.2
Toxaphene	1	mg/kg	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1
Dibutylchloroendate (surr.)	1	%	72
Tetrachloro-m-xylene (surr.)	1	%	82
Organophosphorus Pesticides			
Azinphos-methyl	0.2	mg/kg	< 0.2
Bolstar	0.2	mg/kg	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2
Coumaphos	2	mg/kg	< 2
Demeton-S	0.2	mg/kg	< 0.2
Demeton-O	0.2	mg/kg	< 0.2
Diazinon	0.2	mg/kg	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2
Dimethoate	0.2	mg/kg	< 0.2

Client Sample ID			TRIP
Sample Matrix			Soil
Eurofins mgt Sample No.			S17-Oc06118
Date Sampled			Sep 29, 2017
Test/Reference	LOR	Unit	
Organophosphorus Pesticides			
Disulfoton	0.2	mg/kg	< 0.2
EPN	0.2	mg/kg	< 0.2
Ethion	0.2	mg/kg	< 0.2
Ethoprop	0.2	mg/kg	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2
Fenthion	0.2	mg/kg	< 0.2
Malathion	0.2	mg/kg	< 0.2
Merphos	0.2	mg/kg	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2
Mevinphos	0.2	mg/kg	< 0.2
Monocrotophos	2	mg/kg	< 2
Naled	0.2	mg/kg	< 0.2
Omethoate	2	mg/kg	< 2
Phorate	0.2	mg/kg	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2
Ronnel	0.2	mg/kg	< 0.2
Terbufos	0.2	mg/kg	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2
Tokuthion	0.2	mg/kg	< 0.2
Trichloronate	0.2	mg/kg	< 0.2
Triphenylphosphate (surr.)	1	%	100
Polychlorinated Biphenyls			
Aroclor-1016	0.5	mg/kg	< 0.5
Aroclor-1221	0.1	mg/kg	< 0.1
Aroclor-1232	0.5	mg/kg	< 0.5
Aroclor-1242	0.5	mg/kg	< 0.5
Aroclor-1248	0.5	mg/kg	< 0.5
Aroclor-1254	0.5	mg/kg	< 0.5
Aroclor-1260	0.5	mg/kg	< 0.5
Total PCB*	0.5	mg/kg	< 0.5
Dibutylchlorodate (surr.)	1	%	72
Tetrachloro-m-xylene (surr.)	1	%	82
Heavy Metals			
Arsenic	2	mg/kg	3.6
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	39
Copper	5	mg/kg	17
Lead	5	mg/kg	28
Mercury	0.1	mg/kg	< 0.1
Nickel	5	mg/kg	9.8
Zinc	5	mg/kg	260
% Moisture	1	%	5.7

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported. A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: TRH C6-C36 - LTM-ORG-2010	Sydney	Oct 09, 2017	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Oct 09, 2017	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Oct 09, 2017	14 Day
BTEX - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Oct 09, 2017	14 Day
Polycyclic Aromatic Hydrocarbons - Method: LTM-ORG-2140 PAH and Phenols in Soils by GCMS	Sydney	Oct 09, 2017	14 Days
Organochlorine Pesticides - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Oct 09, 2017	14 Day
Organophosphorus Pesticides - Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS	Sydney	Oct 09, 2017	14 Day
Polychlorinated Biphenyls - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Oct 09, 2017	28 Days
Metals M8 - Method: LTM-MET-3040_R0 TOTAL AND DISSOLVED METALS AND MERCURY IN WATERS BY ICP-MS	Sydney	Oct 09, 2017	28 Day
% Moisture - Method: LTM-GEN-7080 Moisture	Sydney	Oct 06, 2017	14 Day

Company Name: Cardno (NSW/ACT) Pty Ltd	Order No.:	Received: Oct 5, 2017 2:57 PM
Address: Level 9, 203 Pacific Highway St Leonards NSW 2065	Report #: 566466	Due: Oct 12, 2017
	Phone: 0294967700	Priority: 5 Day
	Fax: 02 9499 3902	Contact Name: Malcolm Adrien
Project Name: SOIL ANALYSIS		
Project ID: 82218015		

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Organophosphorus Pesticides	Polychlorinated Biphenyls	Metals M8	BTEX and Naphthalene	Moisture Set	Total Recoverable Hydrocarbons
Melbourne Laboratory - NATA Site # 1254 & 14271													
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X	X	X
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
External Laboratory													
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID								
1	TRIP	Sep 29, 2017		Soil	S17-Oc06118	X	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1	1

Internal Quality Control Review and Glossary

General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
- All soil results are reported on a dry basis, unless otherwise stated.
- All biota results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
- SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
- Samples were analysed on an 'as received' basis.
- This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the Sample Receipt Advice.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	Quality Systems Manual ver 5.1 US Department of Defense
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.1 where no positive PFAS results have been reported have been reviewed and no data was affected.

QC Data General Comments

- Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
- Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
- Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
- Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
- pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
- Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
- Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
- For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
- Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
TRH C6-C10	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40	mg/kg	< 100			100	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g,h,i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a,h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/kg	< 0.1			0.1	Pass	
4,4'-DDD	mg/kg	< 0.05			0.05	Pass	
4,4'-DDE	mg/kg	< 0.05			0.05	Pass	
4,4'-DDT	mg/kg	< 0.05			0.05	Pass	
a-BHC	mg/kg	< 0.05			0.05	Pass	
Aldrin	mg/kg	< 0.05			0.05	Pass	
b-BHC	mg/kg	< 0.05			0.05	Pass	
d-BHC	mg/kg	< 0.05			0.05	Pass	
Dieldrin	mg/kg	< 0.05			0.05	Pass	
Endosulfan I	mg/kg	< 0.05			0.05	Pass	
Endosulfan II	mg/kg	< 0.05			0.05	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endosulfan sulphate	mg/kg	< 0.05			0.05	Pass	
Endrin	mg/kg	< 0.05			0.05	Pass	
Endrin aldehyde	mg/kg	< 0.05			0.05	Pass	
Endrin ketone	mg/kg	< 0.05			0.05	Pass	
g-BHC (Lindane)	mg/kg	< 0.05			0.05	Pass	
Heptachlor	mg/kg	< 0.05			0.05	Pass	
Heptachlor epoxide	mg/kg	< 0.05			0.05	Pass	
Hexachlorobenzene	mg/kg	< 0.05			0.05	Pass	
Methoxychlor	mg/kg	< 0.2			0.2	Pass	
Toxaphene	mg/kg	< 1			1	Pass	
Method Blank							
Organophosphorus Pesticides							
Azinphos-methyl	mg/kg	< 0.2			0.2	Pass	
Bolstar	mg/kg	< 0.2			0.2	Pass	
Chlorfenvinphos	mg/kg	< 0.2			0.2	Pass	
Chlorpyrifos	mg/kg	< 0.2			0.2	Pass	
Chlorpyrifos-methyl	mg/kg	< 0.2			0.2	Pass	
Coumaphos	mg/kg	< 2			2	Pass	
Demeton-S	mg/kg	< 0.2			0.2	Pass	
Demeton-O	mg/kg	< 0.2			0.2	Pass	
Diazinon	mg/kg	< 0.2			0.2	Pass	
Dichlorvos	mg/kg	< 0.2			0.2	Pass	
Dimethoate	mg/kg	< 0.2			0.2	Pass	
Disulfoton	mg/kg	< 0.2			0.2	Pass	
EPN	mg/kg	< 0.2			0.2	Pass	
Ethion	mg/kg	< 0.2			0.2	Pass	
Ethoprop	mg/kg	< 0.2			0.2	Pass	
Ethyl parathion	mg/kg	< 0.2			0.2	Pass	
Fenitrothion	mg/kg	< 0.2			0.2	Pass	
Fensulfothion	mg/kg	< 0.2			0.2	Pass	
Fenthion	mg/kg	< 0.2			0.2	Pass	
Malathion	mg/kg	< 0.2			0.2	Pass	
Merphos	mg/kg	< 0.2			0.2	Pass	
Methyl parathion	mg/kg	< 0.2			0.2	Pass	
Mevinphos	mg/kg	< 0.2			0.2	Pass	
Monocrotophos	mg/kg	< 2			2	Pass	
Naled	mg/kg	< 0.2			0.2	Pass	
Omethoate	mg/kg	< 2			2	Pass	
Phorate	mg/kg	< 0.2			0.2	Pass	
Pirimiphos-methyl	mg/kg	< 0.2			0.2	Pass	
Pyrazophos	mg/kg	< 0.2			0.2	Pass	
Ronnel	mg/kg	< 0.2			0.2	Pass	
Terbufos	mg/kg	< 0.2			0.2	Pass	
Tetrachlorvinphos	mg/kg	< 0.2			0.2	Pass	
Tokuthion	mg/kg	< 0.2			0.2	Pass	
Trichloronate	mg/kg	< 0.2			0.2	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/kg	< 0.5			0.5	Pass	
Aroclor-1221	mg/kg	< 0.1			0.1	Pass	
Aroclor-1232	mg/kg	< 0.5			0.5	Pass	
Aroclor-1242	mg/kg	< 0.5			0.5	Pass	
Aroclor-1248	mg/kg	< 0.5			0.5	Pass	
Aroclor-1254	mg/kg	< 0.5			0.5	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Aroclor-1260	mg/kg	< 0.5			0.5	Pass	
Total PCB*	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	92			70-130	Pass	
TRH C10-C14	%	89			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	100			70-130	Pass	
Toluene	%	111			70-130	Pass	
Ethylbenzene	%	115			70-130	Pass	
m&p-Xylenes	%	109			70-130	Pass	
o-Xylene	%	110			70-130	Pass	
Xylenes - Total	%	110			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	107			70-130	Pass	
TRH C6-C10	%	90			70-130	Pass	
TRH >C10-C16	%	92			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	101			70-130	Pass	
Acenaphthylene	%	99			70-130	Pass	
Anthracene	%	103			70-130	Pass	
Benz(a)anthracene	%	96			70-130	Pass	
Benzo(a)pyrene	%	101			70-130	Pass	
Benzo(b&j)fluoranthene	%	95			70-130	Pass	
Benzo(g,h,i)perylene	%	100			70-130	Pass	
Benzo(k)fluoranthene	%	114			70-130	Pass	
Chrysene	%	103			70-130	Pass	
Dibenz(a,h)anthracene	%	102			70-130	Pass	
Fluoranthene	%	100			70-130	Pass	
Fluorene	%	102			70-130	Pass	
Indeno(1,2,3-cd)pyrene	%	102			70-130	Pass	
Naphthalene	%	97			70-130	Pass	
Phenanthrene	%	98			70-130	Pass	
Pyrene	%	98			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
4,4'-DDE	%	103			70-130	Pass	
a-BHC	%	101			70-130	Pass	
Aldrin	%	103			70-130	Pass	
b-BHC	%	98			70-130	Pass	
d-BHC	%	93			70-130	Pass	

Test	Units	Result 1	Acceptance Limits	Pass Limits	Qualifying Code		
Dieldrin	%	102	70-130	Pass			
Endosulfan I	%	101	70-130	Pass			
Endosulfan II	%	95	70-130	Pass			
Endosulfan sulphate	%	95	70-130	Pass			
g-BHC (Lindane)	%	99	70-130	Pass			
Heptachlor epoxide	%	102	70-130	Pass			
Hexachlorobenzene	%	95	70-130	Pass			
LCS - % Recovery							
Organophosphorus Pesticides							
Diazinon	%	97	70-130	Pass			
Dimethoate	%	86	70-130	Pass			
Ethion	%	87	70-130	Pass			
Fenitrothion	%	80	70-130	Pass			
Methyl parathion	%	77	70-130	Pass			
Mevinphos	%	102	70-130	Pass			
LCS - % Recovery							
Polychlorinated Biphenyls							
Aroclor-1260	%	114	70-130	Pass			
LCS - % Recovery							
Heavy Metals							
Arsenic	%	97	70-130	Pass			
Cadmium	%	95	70-130	Pass			
Chromium	%	100	70-130	Pass			
Copper	%	100	70-130	Pass			
Lead	%	98	70-130	Pass			
Mercury	%	99	70-130	Pass			
Nickel	%	99	70-130	Pass			
Zinc	%	95	70-130	Pass			
Test	Lab Sample ID	QA Source	Units	Result 1	Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1			
TRH C6-C9	S17-Oc09283	NCP	%	97	70-130	Pass	
TRH C10-C14	S17-Oc07509	NCP	%	93	70-130	Pass	
Spike - % Recovery							
BTEX				Result 1			
Benzene	S17-Oc09283	NCP	%	104	70-130	Pass	
Toluene	S17-Oc09283	NCP	%	114	70-130	Pass	
Ethylbenzene	S17-Oc09283	NCP	%	118	70-130	Pass	
m&p-Xylenes	S17-Oc09283	NCP	%	114	70-130	Pass	
o-Xylene	S17-Oc09283	NCP	%	113	70-130	Pass	
Xylenes - Total	S17-Oc09283	NCP	%	114	70-130	Pass	
Spike - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1			
Naphthalene	S17-Oc09283	NCP	%	115	70-130	Pass	
TRH C6-C10	S17-Oc09283	NCP	%	94	70-130	Pass	
TRH >C10-C16	S17-Oc07509	NCP	%	96	70-130	Pass	
Spike - % Recovery							
Polycyclic Aromatic Hydrocarbons				Result 1			
Acenaphthene	S17-Oc03835	NCP	%	103	70-130	Pass	
Acenaphthylene	S17-Oc03835	NCP	%	101	70-130	Pass	
Anthracene	S17-Oc03835	NCP	%	108	70-130	Pass	
Benz(a)anthracene	S17-Oc03835	NCP	%	100	70-130	Pass	
Benzo(a)pyrene	S17-Oc03835	NCP	%	103	70-130	Pass	
Benzo(b&j)fluoranthene	S17-Oc03835	NCP	%	97	70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Benzo(g,h,i)perylene	S17-Oc03835	NCP	%	104			70-130	Pass	
Benzo(k)fluoranthene	S17-Oc03835	NCP	%	116			70-130	Pass	
Chrysene	S17-Oc03835	NCP	%	104			70-130	Pass	
Dibenz(a,h)anthracene	S17-Oc03835	NCP	%	104			70-130	Pass	
Fluoranthene	S17-Oc03835	NCP	%	100			70-130	Pass	
Fluorene	S17-Oc03835	NCP	%	105			70-130	Pass	
Indeno(1,2,3-cd)pyrene	S17-Oc03835	NCP	%	103			70-130	Pass	
Naphthalene	S17-Oc03835	NCP	%	99			70-130	Pass	
Phenanthrene	S17-Oc03835	NCP	%	104			70-130	Pass	
Pyrene	S17-Oc03835	NCP	%	101			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
4,4'-DDD	S17-Oc10349	NCP	%	112			70-130	Pass	
4,4'-DDE	S17-Oc10341	NCP	%	78			70-130	Pass	
4,4'-DDT	S17-Oc03836	NCP	%	79			70-130	Pass	
a-BHC	S17-Oc10341	NCP	%	89			70-130	Pass	
Aldrin	S17-Oc10341	NCP	%	92			70-130	Pass	
b-BHC	S17-Oc10341	NCP	%	80			70-130	Pass	
d-BHC	S17-Oc10341	NCP	%	79			70-130	Pass	
Dieldrin	S17-Oc10349	NCP	%	97			70-130	Pass	
Endosulfan I	S17-Oc10341	NCP	%	126			70-130	Pass	
Endosulfan II	S17-Oc10349	NCP	%	95			70-130	Pass	
Endosulfan sulphate	S17-Oc10349	NCP	%	103			70-130	Pass	
Endrin	S17-Oc10002	NCP	%	96			70-130	Pass	
Endrin aldehyde	S17-Oc10341	NCP	%	128			70-130	Pass	
Endrin ketone	S17-Oc10002	NCP	%	108			70-130	Pass	
g-BHC (Lindane)	S17-Oc10349	NCP	%	83			70-130	Pass	
Heptachlor	S17-Oc10341	NCP	%	74			70-130	Pass	
Heptachlor epoxide	S17-Oc10341	NCP	%	99			70-130	Pass	
Hexachlorobenzene	S17-Oc10341	NCP	%	71			70-130	Pass	
Methoxychlor	S17-Oc10002	NCP	%	71			70-130	Pass	
Toxaphene	S17-Oc10002	NCP	%	107			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1260	S17-Oc05124	NCP	%	92			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S17-Oc05592	NCP	%	103			70-130	Pass	
Cadmium	S17-Oc05592	NCP	%	106			70-130	Pass	
Chromium	S17-Oc05592	NCP	%	111			70-130	Pass	
Copper	S17-Oc05592	NCP	%	93			70-130	Pass	
Lead	S17-Oc05592	NCP	%	112			70-130	Pass	
Mercury	S17-Oc05592	NCP	%	106			70-130	Pass	
Nickel	S17-Oc05592	NCP	%	97			70-130	Pass	
Zinc	S17-Oc05592	NCP	%	102			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S17-Oc09281	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S17-Oc05595	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	S17-Oc05595	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	S17-Oc05595	NCP	mg/kg	< 50	< 50	<1	30%	Pass	

Duplicate								
BTEX				Result 1	Result 2	RPD		
Benzene	S17-Oc09281	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Toluene	S17-Oc09281	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Ethylbenzene	S17-Oc09281	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
m&p-Xylenes	S17-Oc09281	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
o-Xylene	S17-Oc09281	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Xylenes - Total	S17-Oc09281	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
Naphthalene	S17-Oc09281	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
TRH C6-C10	S17-Oc09281	NCP	mg/kg	< 20	< 20	<1	30%	Pass
TRH >C10-C16	S17-Oc05595	NCP	mg/kg	< 50	< 50	<1	30%	Pass
TRH >C16-C34	S17-Oc05595	NCP	mg/kg	< 100	< 100	<1	30%	Pass
TRH >C34-C40	S17-Oc05595	NCP	mg/kg	< 100	< 100	<1	30%	Pass
Duplicate								
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD		
Acenaphthene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Acenaphthylene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Anthracene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benz(a)anthracene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(a)pyrene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(b&j)fluoranthene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(g,h,i)perylene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(k)fluoranthene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Chrysene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Dibenz(a,h)anthracene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Fluoranthene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Fluorene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Indeno(1,2,3-cd)pyrene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Naphthalene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Phenanthrene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Pyrene	S17-Oc03831	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Duplicate								
Organochlorine Pesticides				Result 1	Result 2	RPD		
Chlordanes - Total	S17-Oc09280	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
4,4'-DDD	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
4,4'-DDE	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
4,4'-DDT	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
a-BHC	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Aldrin	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
b-BHC	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
d-BHC	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Dieldrin	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan I	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan II	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan sulphate	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin aldehyde	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin ketone	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
g-BHC (Lindane)	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor epoxide	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Hexachlorobenzene	S17-Oc09280	NCP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Methoxychlor	S17-Oc09280	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Toxaphene	S17-Oc09280	NCP	mg/kg	< 1	< 1	<1	30%	Pass

Duplicate								
Organophosphorus Pesticides				Result 1	Result 2	RPD		
Azinphos-methyl	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Bolstar	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Chlorfenvinphos	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Chlorpyrifos	S17-Oc10347	NCP	mg/kg	0.3	0.4	30	30%	Pass
Chlorpyrifos-methyl	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Coumaphos	S17-Oc10347	NCP	mg/kg	< 2	< 2	<1	30%	Pass
Demeton-S	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Demeton-O	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Diazinon	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Dichlorvos	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Dimethoate	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Disulfoton	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
EPN	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Ethion	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Ethoprop	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Ethyl parathion	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Fenitrothion	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Fensulfothion	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Fenthion	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Malathion	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Merphos	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Methyl parathion	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Mevinphos	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Monocrotophos	S17-Oc10347	NCP	mg/kg	< 2	< 2	<1	30%	Pass
Naled	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Omethoate	S17-Oc10347	NCP	mg/kg	< 2	< 2	<1	30%	Pass
Phorate	S17-Oc10347	NCP	mg/kg	0.3	0.6	72	30%	Fail
Pirimiphos-methyl	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Pyrazophos	S17-Oc03831	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Ronnel	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Terbufos	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Tetrachlorvinphos	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Tokuthion	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Trichloronate	S17-Oc10347	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Duplicate								
Polychlorinated Biphenyls				Result 1	Result 2	RPD		
Aroclor-1016	S17-Oc09280	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1221	S17-Oc09280	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Aroclor-1232	S17-Oc09280	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1242	S17-Oc09280	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1248	S17-Oc09280	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1254	S17-Oc09280	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1260	S17-Oc09280	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic	S17-Oc05591	NCP	mg/kg	11	10	2.0	30%	Pass
Cadmium	S17-Oc05591	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass
Chromium	S17-Oc05591	NCP	mg/kg	28	27	4.0	30%	Pass
Copper	S17-Oc05591	NCP	mg/kg	59	57	4.0	30%	Pass
Lead	S17-Oc05591	NCP	mg/kg	63	60	4.0	30%	Pass
Mercury	S17-Oc05591	NCP	mg/kg	0.2	0.1	3.0	30%	Pass
Nickel	S17-Oc05591	NCP	mg/kg	30	29	3.0	30%	Pass
Zinc	S17-Oc05591	NCP	mg/kg	120	110	3.0	30%	Pass

Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S17-Oc06118	CP	%	5.7	5.5	3.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
Q15	The RPD reported passes Eurofins mgt's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Nibha Vaidya Analytical Services Manager



Glenn Jackson

National Operations Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

Eurofins | mgt shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins | mgt be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

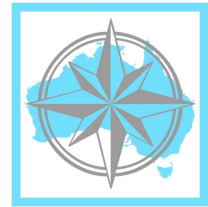
University of Newcastle Proposed Bio-Resources Facility

APPENDIX

D

LOTSEARCH REPORT

Lotsearch



Environmental Risk and Planning Report

130 University Drive, Callaghan, NSW 2308

Report Date: 17 Oct 2017 10:27:59

Disclaimer:

The purpose of this report is to provide an overview of some of the site history, environmental risk and planning information available, affecting an individual address or geographical area in which the property is located. It is not a substitute for an on-site inspection or review of other available reports and records. It is not intended to be, and should not be taken to be, a rating or assessment of the desirability or market value of the property or its features. You should obtain independent advice before you make any decision based on the information within the report. The detailed terms applicable to use of this report are set out at the end of this report.

Table of Contents

Location Confidences.....	2
Dataset Listings.....	3
Site Location Aerial	5
Contaminated Land & Waste Management Facilities.....	6
EPA PFAS Investigation Program	9
EPA Other Sites with Contamination Issues	10
EPA Current Licensed Activities.....	11
EPA Delicensed & Former Licensed Activities.....	13
UPSS Sensitive Zones.....	15
Historical Business Activities.....	16
Historical Aerial Imagery & Maps	23
Topographic Features	36
Elevation Contours.....	41
Hydrogeology & Groundwater.....	42
Geology.....	45
Naturally Occurring Asbestos Potential.....	47
Soil Landscapes.....	48
Acid Sulfate Soils	50
Dryland Salinity	52
Mining Subsidence Districts	53
State Environmental Planning.....	55
Local Environmental Planning.....	57
Heritage	60
Natural Hazards	62
Ecological Constraints.....	64
Terms & Conditions.....	69

Location Confidences

Where Lotsearch has had to georeference features from supplied addresses, a location confidence has been assigned to the data record. This indicates a confidence to the positional accuracy of the feature. Where applicable, a code is given under the field heading “LC” or “LocConf”. These codes lookup to the following location confidences:

LC Code	Location Confidence
1	Georeferenced to the site location / premise or part of site
2	Georeferenced with the confidence of the general/approximate area
3	Georeferenced to the road or rail
4	Georeferenced to the road intersection
5	Feature is a buffered point
6	Land adjacent to Georeferenced Site
7	Georeferenced to a network of features

Dataset Listing

Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	Department Finance, Services & Innovation	17/10/2017	17/10/2017	Daily	-	-	-	-
Topographic Data	Department Finance, Services & Innovation	10/04/2015	01/04/2015	As required	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority	25/09/2017	04/09/2017	Monthly	1000	0	0	1
Contaminated Land: Records of Notice	Environment Protection Authority	03/10/2017	03/10/2017	Monthly	1000	0	0	0
Former Gasworks	Environment Protection Authority	24/09/2017	16/01/2017	Monthly	1000	0	0	0
National Waste Management Site Database	Geoscience Australia	24/09/2017	07/03/2017	Quarterly	1000	0	0	0
EPA PFAS Investigation Program	Environment Protection Authority	24/09/2017	24/09/2017	Monthly	2000	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	24/09/2017	24/09/2017	Quarterly	1000	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	04/10/2017	04/10/2017	Monthly	1000	0	1	2
Delicensed POEO Activities still Regulated by the EPA	Environment Protection Authority	04/10/2017	04/10/2017	Monthly	1000	0	0	2
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	04/10/2017	04/10/2017	Monthly	1000	2	5	6
UPSS Environmentally Sensitive Zones	Department of Environment, Climate Change and Water	14/04/2015	12/01/2010	As required	1000	0	0	0
UBD Business Directory 1982 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1982 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory 1970 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	1
UBD Business Directory 1970 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory 1961 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1961 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory 1950 (Premise & Intersection Matches)	Hardie Grant			Not required	150	0	0	0
UBD Business Directory 1950 (Road & Area Matches)	Hardie Grant			Not required	150	-	0	0
UBD Business Directory Drycleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	1000	0	0	9
UBD Business Directory Drycleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	1000	-	0	7
Points of Interest	Department Finance, Services & Innovation	01/02/2017	01/02/2017	Annually	1000	0	0	23
Tanks (Areas)	Department Finance, Services & Innovation	01/02/2017	01/02/2017	Annually	1000	0	0	1
Tanks (Points)	Department Finance, Services & Innovation	01/02/2017	01/02/2017	Annually	1000	0	0	1
Major Easements	Department Finance, Services & Innovation	01/02/2017	01/02/2017	As required	1000	0	0	15
State Forest	Department Finance, Services & Innovation	01/02/2017	29/06/2016	As required	1000	0	0	0
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment and Heritage	01/02/2017	31/12/2016	Annually	1000	0	0	0
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	08/10/2014	17/03/2000	As required	1000	1	1	1
Groundwater Boreholes	NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corporation; Commonwealth of Australia (Bureau of Meteorology) 2015	21/03/2016	01/12/2015	Annually	2000	0	0	17

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features Onsite	No. Features within 100m	No. Features within Buffer
Geological Units 1:250,000	NSW Department of Industry, Resources & Energy	20/08/2014		None planned	1000	1	-	4
Geological Structures 1:250,000	NSW Department of Industry, Resources & Energy	20/08/2014		None planned	1000	0	-	0
Naturally Occurring Asbestos Potential	NSW Department of Industry, Resources & Energy	04/12/2015	24/09/2015	Unknown	1000	0	0	0
Soil Landscapes	NSW Office of Environment and Heritage	12/08/2014		None planned	1000	1	-	4
Standard Local Environmental Plan Acid Sulfate Soils	NSW Planning and Environment	07/10/2016	07/10/2016	As required	500	1	-	-
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	None planned	1000	0	0	0
Dryland Salinity Potential of Western Sydney	NSW Office of Environment and Heritage	12/05/2017	01/01/2002	None planned	1000	-	-	-
Mining Subsidence Districts	Department Finance, Services & Innovation	13/07/2017	01/07/2017	As required	1000	0	0	1
SEPP 14 - Coastal Wetlands	NSW Planning and Environment	17/12/2015	24/10/2008	Annually	1000	0	0	1
SEPP 26 - Littoral Rainforest	NSW Planning and Environment	17/12/2015	05/02/1988	Annually	1000	0	0	0
SEPP 71 - Coastal Protection	NSW Planning and Environment	17/12/2015	01/08/2003	Annually	1000	0	0	1
SEPP Major Developments 2005	NSW Planning and Environment	09/03/2013	25/05/2005	Under Review	1000	0	0	0
SEPP Strategic Land Use Areas	NSW Planning and Environment	01/08/2017	28/01/2014	Annually	1000	0	0	0
LEP - Land Zoning	NSW Planning and Environment	23/09/2017	23/09/2017	Quarterly	1000	2	3	25
LEP - Minimum Subdivision Lot Size	NSW Planning and Environment	23/09/2017	23/09/2017	Quarterly	0	0	-	-
LEP - Height of Building	NSW Planning and Environment	23/09/2017	23/09/2017	Quarterly	0	0	-	-
LEP - Floor Space Ratio	NSW Planning and Environment	23/09/2017	23/09/2017	Quarterly	0	0	-	-
LEP - Land Application	NSW Planning and Environment	23/09/2017	23/09/2017	Quarterly	0	1	-	-
LEP - Land Reservation Acquisition	NSW Planning and Environment	23/09/2017	23/09/2017	Quarterly	0	0	-	-
State Heritage Items	NSW Office of Environment and Heritage	01/08/2017	27/05/2016	Quarterly	1000	0	0	0
Local Heritage Items	NSW Planning and Environment	23/09/2017	23/09/2017	Monthly	1000	0	0	3
Bush Fire Prone Land	NSW Rural Fire Service	24/09/2017	06/09/2017	Quarterly	1000	1	2	3
Lower Hunter and Central Coast Regional Vegetation Survey	NSW Office of Environment and Heritage	28/02/2015	16/11/2009	As required	1000	1	1	6
RAMSAR Wetlands	Commonwealth of Australia Department of the Environment	08/10/2014	24/06/2011	As required	1000	0	0	0
ATLAS of NSW Wildlife	NSW Office of Environment and Heritage	17/10/2017	17/10/2017	Daily	10000	-	-	-

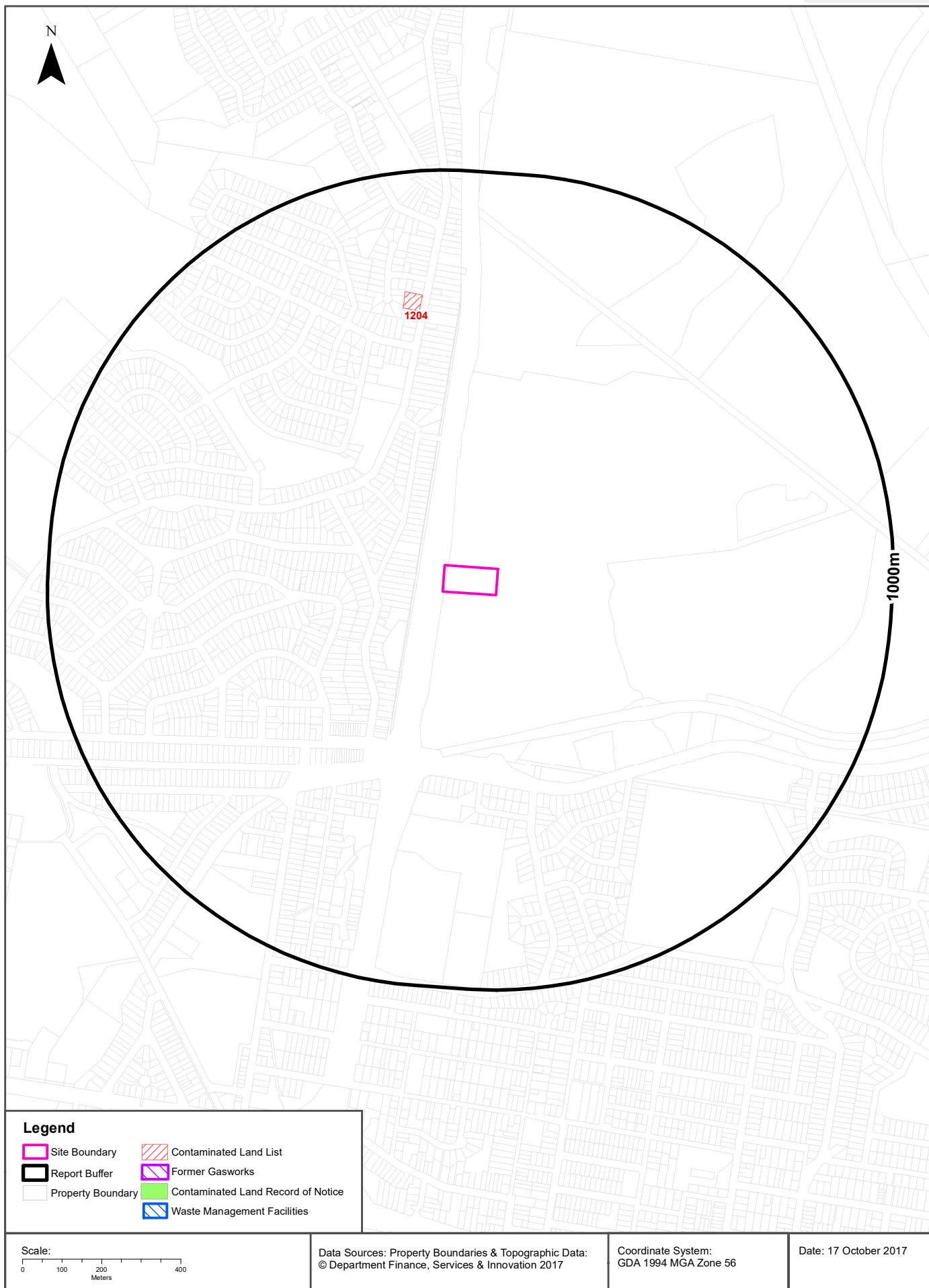
Aerial Imagery 2016

130 University Drive, Callaghan, NSW 2308



Contaminated Land & Waste Management Facilities

130 University Drive, Callaghan, NSW 2308



Contaminated Land & Waste Management Facilities

130 University Drive, Callaghan, NSW 2308

List of NSW contaminated sites notified to EPA

Records from the NSW EPA Contaminated Land list within the dataset buffer:

Map Id	Site	Address	Suburb	Activity	Management Class	Status	Location Confidence	Dist (m)	Direction
1204	7-Eleven (Former BP) Service Station	298-302 Sandgate Road	Shortland	Service Station	Regulation under CLM Act not required	Current EPA List	Premise Match	646m	North

The values within the EPA site management class in the table above, are given more detailed explanations in the table below:

EPA site management class	Explanation
Contamination being managed via the planning process (EP&A Act)	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. The contamination of this site is managed by the consent authority under the Environmental Planning and Assessment Act 1979 (EP&A Act) planning approval process, with EPA involvement as necessary to ensure significant contamination is adequately addressed. The consent authority is typically a local council or the Department of Planning and Environment.
Contamination currently regulated under CLM Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). Management of the contamination is regulated by the EPA under the CLM Act. Regulatory notices are available on the EPA's Contaminated Land Public Record of Notices.
Contamination currently regulated under POEO Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. Management of the contamination is regulated under the Protection of the Environment Operations Act 1997 (POEO Act). The EPA's regulatory actions under the POEO Act are available on the POEO public register.
Contamination formerly regulated under the CLM Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). The contamination was addressed under the CLM Act.
Contamination formerly regulated under the POEO Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed under the Protection of the Environment Operations Act 1997 (POEO Act).
Contamination was addressed via the planning process (EP&A Act)	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed by the appropriate consent authority via the planning process under the Environmental Planning and Assessment Act 1979 (EP&A Act).
Ongoing maintenance required to manage residual contamination (CLM Act)	The EPA has determined that ongoing maintenance, under the Contaminated Land Management Act 1997 (CLM Act), is required to manage the residual contamination. Regulatory notices under the CLM Act are available on the EPA's Contaminated Land Public Record of Notices.
Regulation being finalised	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997. A regulatory approach is being finalised.
Regulation under the CLM Act not required	The EPA has completed an assessment of the contamination and decided that regulation under the Contaminated Land Management Act 1997 is not required.
Under assessment	The contamination is being assessed by the EPA to determine whether regulation is required. The EPA may require further information to complete the assessment. For example, the completion of management actions regulated under the planning process or Protection of the Environment Operations Act 1997. Alternatively, the EPA may require information via a notice issued under s77 of the Contaminated Land Management Act 1997 or issue a Preliminary Investigation Order.

NSW EPA Contaminated Land List Data Source: Environment Protection Authority
 © State of New South Wales through the Environment Protection Authority

Contaminated Land & Waste Management Facilities

130 University Drive, Callaghan, NSW 2308

Contaminated Land: Records of Notice

Record of Notices within the dataset buffer:

Map Id	Name	Address	Suburb	Notices	Area No	Location Confidence	Distance	Direction
N/A	No records in buffer							

Contaminated Land Records of Notice Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority
Terms of use and disclaimer for Contaminated Land: Record of Notices, please visit
<http://www.epa.nsw.gov.au/clm/clmdisclaimer.htm>

Former Gasworks

Former Gasworks within the dataset buffer:

Map Id	Location	Council	Further Info	Location Confidence	Distance	Direction
N/A	No records in buffer					

Former Gasworks Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Landfill	Reprocess	Transfer	Comments	Loc Conf	Dist (m)	Direction
N/A	No records in buffer											

Waste Management Facilities Data Source: Australian Government Geoscience Australia
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

EPA PFAS Investigation Program

130 University Drive, Callaghan, NSW 2308

EPA PFAS Investigation Program

Sites that are part of the EPA PFAS investigation program, within the dataset buffer:

Id	Site	Address	Location Confidence	Distance	Direction
N/A	No records in buffer				

EPA PFAS Investigation Program: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

EPA Other Sites with Contamination Issues

130 University Drive, Callaghan, NSW 2308

EPA Other Sites with Contamination Issues

This dataset contains other sites identified on the EPA website as having contamination issues. This dataset currently includes:

- James Hardie asbestos manufacturing and waste disposal sites
- Radiological investigation sites in Hunter's Hill

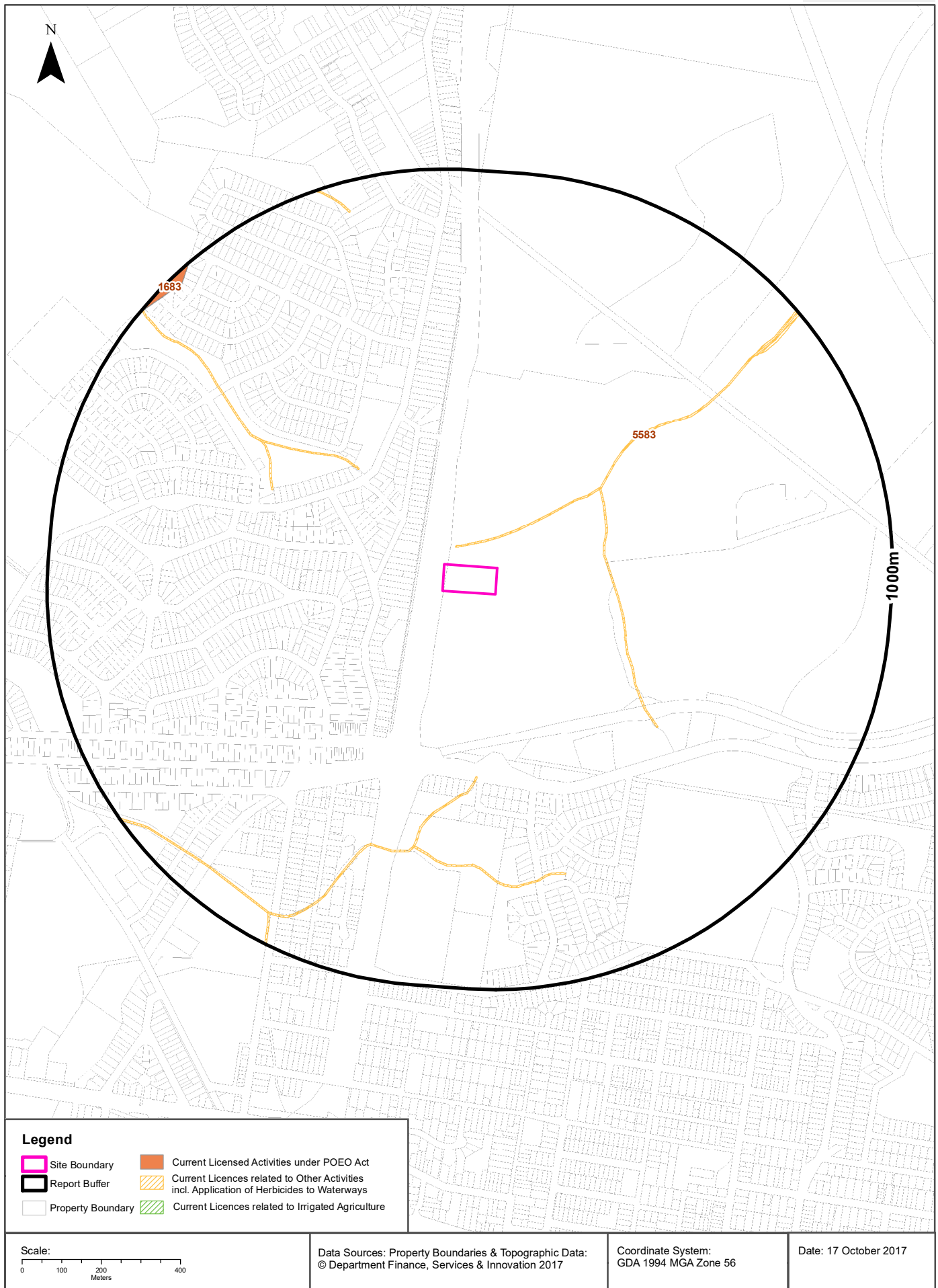
Sites within the dataset buffer:

Site Id	Site Name	Site Address	Dataset	Comments	Location Confidence	Distance	Direction
N/A	No records in buffer						

EPA Other Sites with Contamination Issues: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Current EPA Licensed Activities

130 University Drive, Callaghan, NSW 2308



EPA Activities

130 University Drive, Callaghan, NSW 2308

Licensed Activities under the POEO Act 1997

Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

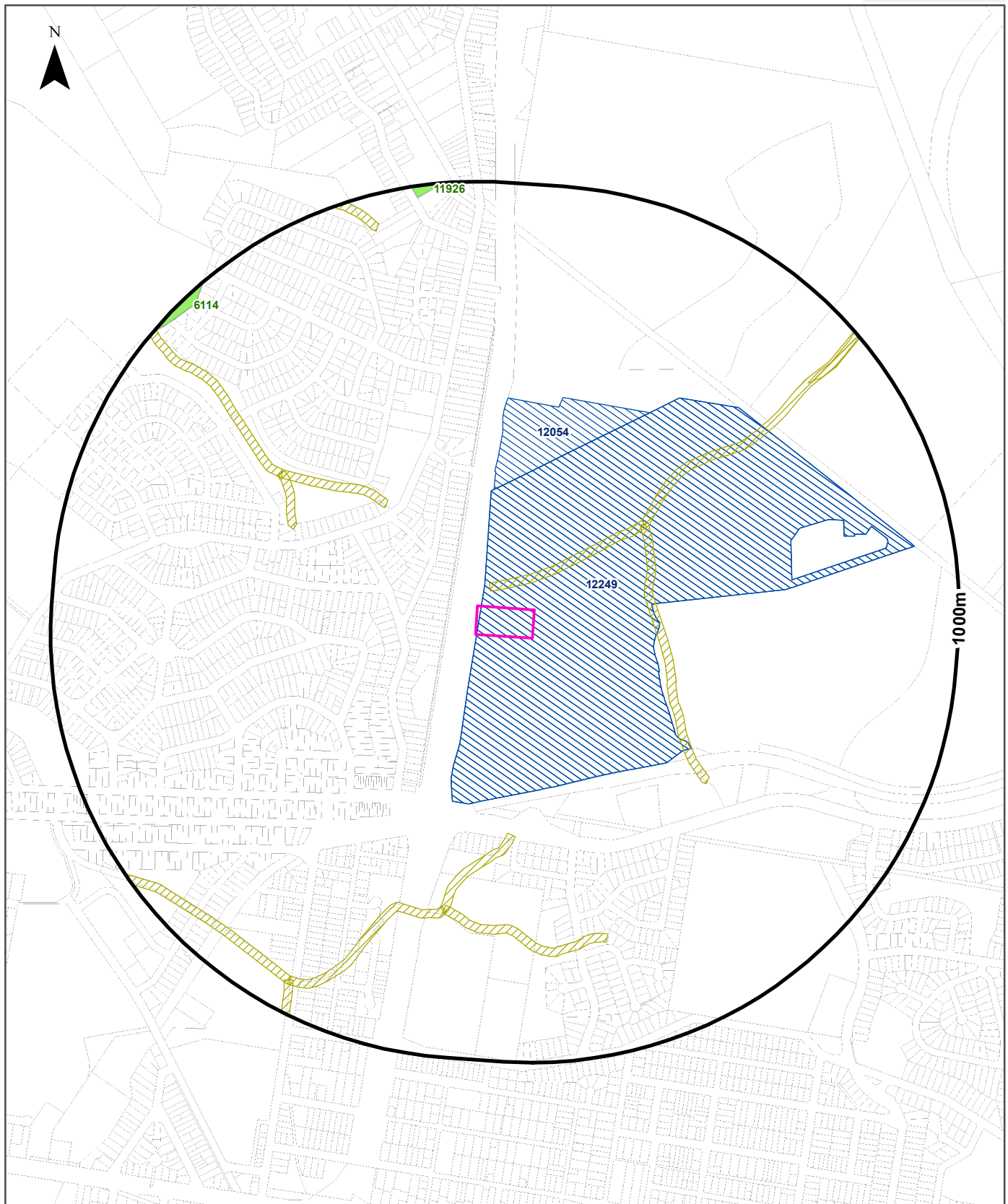
EPL	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
5583	NEWCASTLE CITY COUNCIL	WATERWAYS OF NEWCASTLE CITY	-	NEWCASTLE	Other activities	7	45m	North East
1683	HUNTER WATER CORPORATION	NEWCASTLE SEWERAGE SYSTEM including BURWOOD BEACH WASTEWATER TREATMENT PLANT AND SHORTLAND WASTEWATER TREATMENT PLANT	OFF SCENIC DRIVE	MEREWETHER	Sewage treatment processing by large plants	1	973m	South

POEO Licence Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

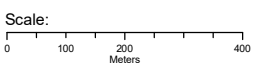
Delicensed & Former Licensed EPA Activities

130 University Drive, Callaghan, NSW 2308



Legend

- Site Boundary
- Delicensed Activities still Regulated by EPA
- Report Buffer
- Former Licensed/Regulated Activities (revoked or surrendered)
- Property Boundary
- Surrendered Licences related to Other Activities on Waterways incl. Application of Herbicides



Property Boundary Data Source:
© Department Finance, Services & Innovation 2017

Coordinate System:
GDA 1994 MGA Zone 56

Date: 17 October 2017

EPA Activities

130 University Drive, Callaghan, NSW 2308

Delicensed Activities still regulated by the EPA

Delicensed activities still regulated by the EPA, within the dataset buffer:

Licence No	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
6114	HUNTER WATER CORPORATION	SHORTLAND CHEMICAL STORAGE FACILITY	OFF ADEN ST	SHORTLAND	Hazardous, Industrial or Group A Waste Generation or Storage	1	973m	North West
11926	THE HUNTER VALLEY PRIVATE HOSPITAL PTY LTD	HUNTER VALLEY PRIVATE HOSPITAL	20 MAWSON STREET	SHORTLAND	Hazardous, Industrial or Group A Waste Generation or Storage	1	973m	North

Delicensed Activities Data Source: Environment Protection Authority
 © State of New South Wales through the Environment Protection Authority

Former Licensed Activities under the POEO Act 1997, now revoked or surrendered

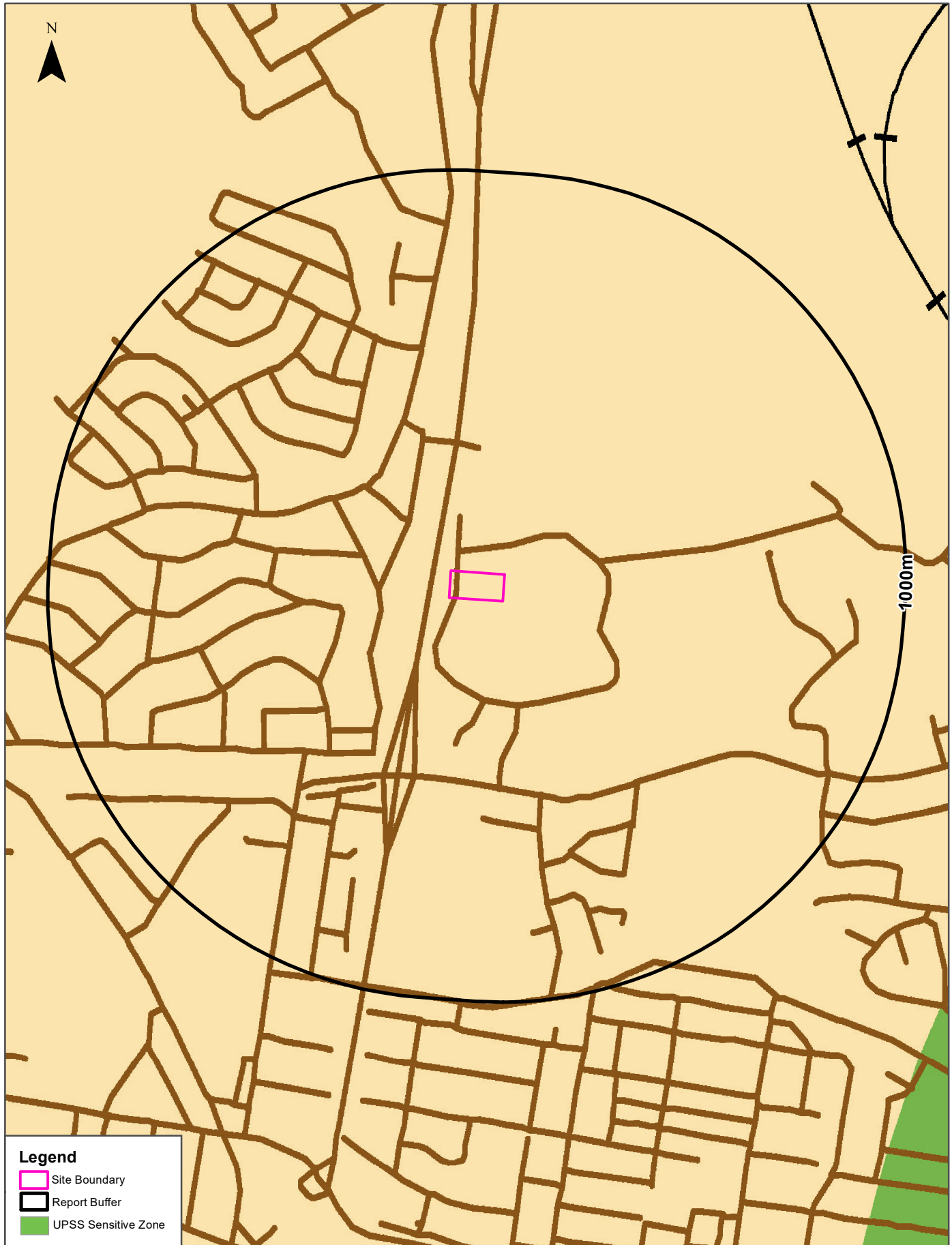
Former Licensed activities under the Protection of the Environment Operations Act 1997, now revoked or surrendered, within the dataset buffer:

Licence No	Organisation	Location	Status	Issued Date	Activity	Loc Conf	Distance	Direction
12249	THE UNIVERSITY OF NEWCASTLE	Groundwater Remediation Test Site (GRTS), University of Newcastle, University Drive, CALLAGHAN	Surrendered	04/01/2005	Non-thermal treatment of hazardous and other waste	1	0m	Onsite
12249	THE UNIVERSITY OF NEWCASTLE	Groundwater Remediation Test Site (GRTS), University of Newcastle, University Drive, CALLAGHAN	Surrendered	04/01/2005	Waste storage - hazardous, restricted solid, liquid, clinical and related waste and asbestos waste	1	0m	Onsite
4653	LUHRMANN ENVIRONMENT MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW	Surrendered		Other Activities / Non Scheduled Activity - Application of Herbicides	7	37m	-
4838	Robert Orchard	Various Waterways throughout New South Wales - SYDNEY NSW 2000	Surrendered		Other Activities / Non Scheduled Activity - Application of Herbicides	7	37m	-
6630	SYDNEY WEED & PEST MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW - PROSPECT, NSW, 2148	Surrendered		Other Activities / Non Scheduled Activity - Application of Herbicides	7	37m	-
12054	BHP BILLITON INNOVATION PTY. LTD.	Off Vale Street, SHORTLAND, NSW 2307	Surrendered	06/02/2004	Chemical production waste generation; Chemical storage waste generation	1	276m	North

Former Licensed Activities Data Source: Environment Protection Authority
 © State of New South Wales through the Environment Protection Authority

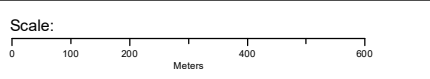
UPSS Sensitive Zones

130 University Drive, Callaghan, NSW 2308



Legend

- Site Boundary
- Report Buffer
- UPSS Sensitive Zone



UPSS Data Source: Environment Protection Authority
© Dept of Environment, Climate Change & Water (NSW)

Coordinate System:
GDA 1994 MGA Zone 56

Date: 17 October 2017

Historical Business Directories

130 University Drive, Callaghan, NSW 2308

1982 Business Directory Records Premise or Road Intersection Matches

Records from the 1982 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1982 Business Directory Records Road or Area Matches

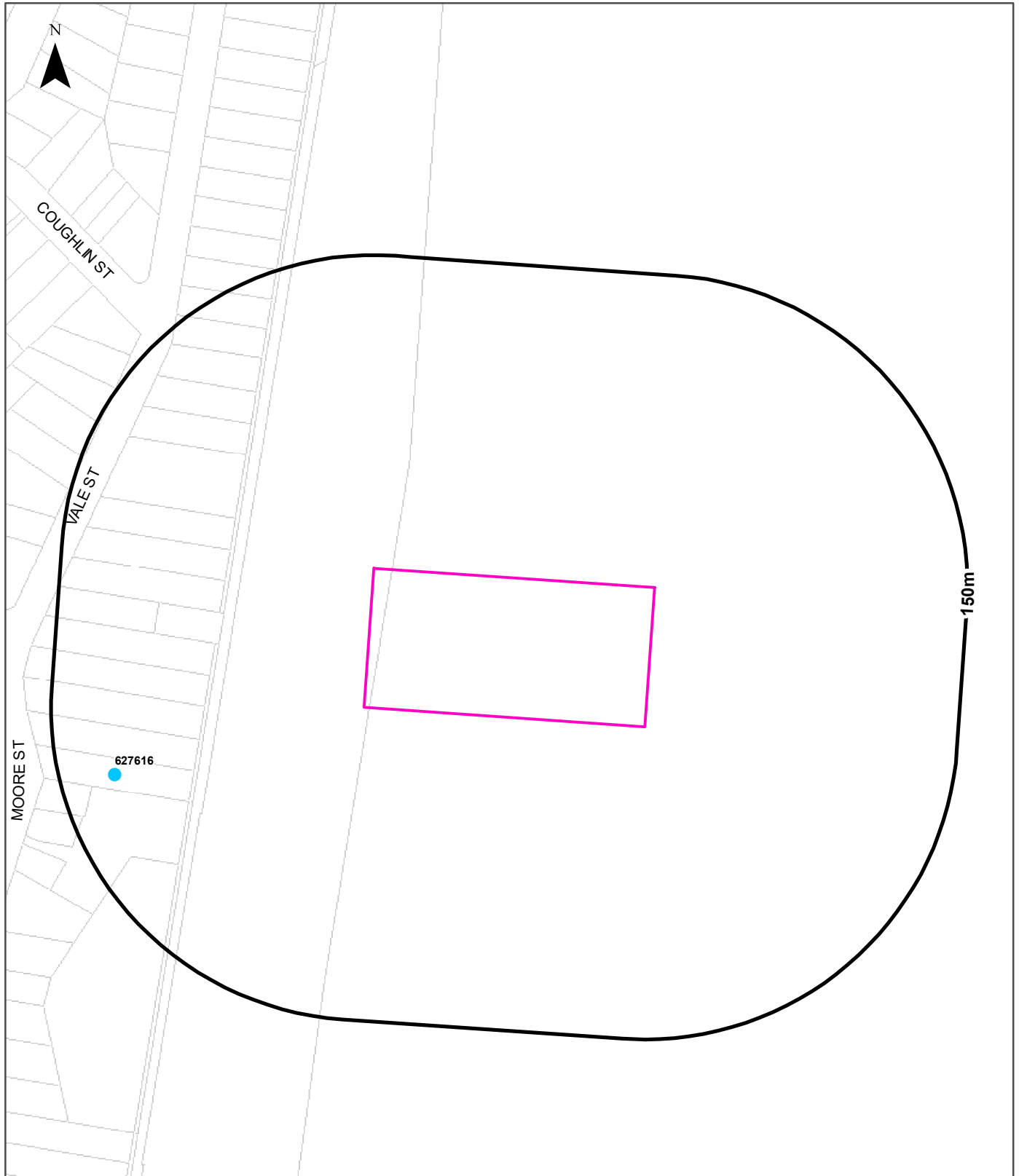
Records from the 1982 UBD Business Directory, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
N/A	No records in buffer			

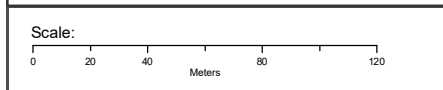
Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1970 Historical Business Directory Records

130 University Drive, Callaghan, NSW 2308



Legend	
Site Boundary	1970 Business Directory Activities Records Mapped to Specific Premise
Report Buffer	1970 Business Directory Activities Records Mapped to Road Intersection
Property Boundary	1970 Business Directory Activities Records Mapped to Road Corridor
	1970 Business Directory Activities Records Mapped to a General Area



Data Sources: Universal Business Directories (UBD) - Derived Data Licensed from Hardie Grant.
Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2017

Coordinate System: GDA 1994 MGA Zone 56

Date: 17 October 2017

Historical Business Directories

130 University Drive, Callaghan, NSW 2308

1970 Business Directory Records Premise or Road Intersection Matches

Records from the 1970 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
ELECTRICAL CONTRACTORS-LICENSED	Threlfall, N., 46 Moore St., Birmingham Gardens, Newcastle	627616	Premise Match	124m	West

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1970 Business Directory Records Road or Area Matches

Records from the 1970 UBD Business Directory, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
N/A	No records in buffer			

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

130 University Drive, Callaghan, NSW 2308

1961 Business Directory Records Premise or Road Intersection Matches

Records from the 1961 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1961 Business Directory Records Road or Area Matches

Records from the 1961 UBD Business Directory, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
N/A	No records in buffer			

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

130 University Drive, Callaghan, NSW 2308

1950 Business Directory Records Premise or Road Intersection Matches

Records from the 1950 UBD Business Directory, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Feature Point	Direction
N/A	No records in buffer				

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

1950 Business Directory Records Road or Area Matches

Records from the 1950 UBD Business Directory, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Business Activity	Premise	Ref No.	Location Confidence	Distance to Road Corridor or Area
N/A	No records in buffer			

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

130 University Drive, Callaghan, NSW 2308

Dry Cleaners, Motor Garages & Service Stations Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a premise or road intersection, within the dataset buffer:

Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Feature Point	Direction
MOTOR SERVICE STATIONS- PETROL, OIL, ETC..	Shortland Service Station, 231 Sandgate Rd., Shortland, Newcastle	136691	1961	Premise Match	271m	North West
MOTOR GARAGES &/OR ENGINEERS	Simpson's Service Station, 278 Sandgate Rd., Shortland,, Newcastle	631945	1970	Premise Match	533m	North
MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Amoco Service Station, 300 Sandgate Rd., Shortland Newcastle	177086	1982	Premise Match	673m	North
MOTOR SERVICE STATIONS	Esso Servicenter, 302 Sandgate Rd., Shortland, Newcastle	632150	1970	Premise Match	673m	North
MOTOR SERVICE STATIONS- PETROL, OIL, ETC..	K.B. Service Station, 302 Sandgate Rd., Shortland, Newcastle	136647	1961	Premise Match	673m	North
MOTOR GARAGES &/OR ENGINEERS	K.B. Service Station, 302 Sandgate Rd., Shortland, Newcastle	136313	1961	Premise Match	673m	North
MOTOR GARAGES &/OR ENGINEERS	Shortland Service Station, 321 Sandgate Rd., Shortland,, Newcastle	631944	1970	Premise Match	917m	North
MOTOR GARAGES &/OR ENGINEERS	Gray, Wal, 321 Sandgate Rd., Shortland, Newcastle	136296	1961	Premise Match	917m	North
MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Total Shortland Service Station, 321 Sandgate Rd.. Shortland Newcastle	177299	1982	Premise Match	918m	North

Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Historical Business Directories

130 University Drive, Callaghan, NSW 2308

Dry Cleaners, Motor Garages & Service Stations Road or Area Matches

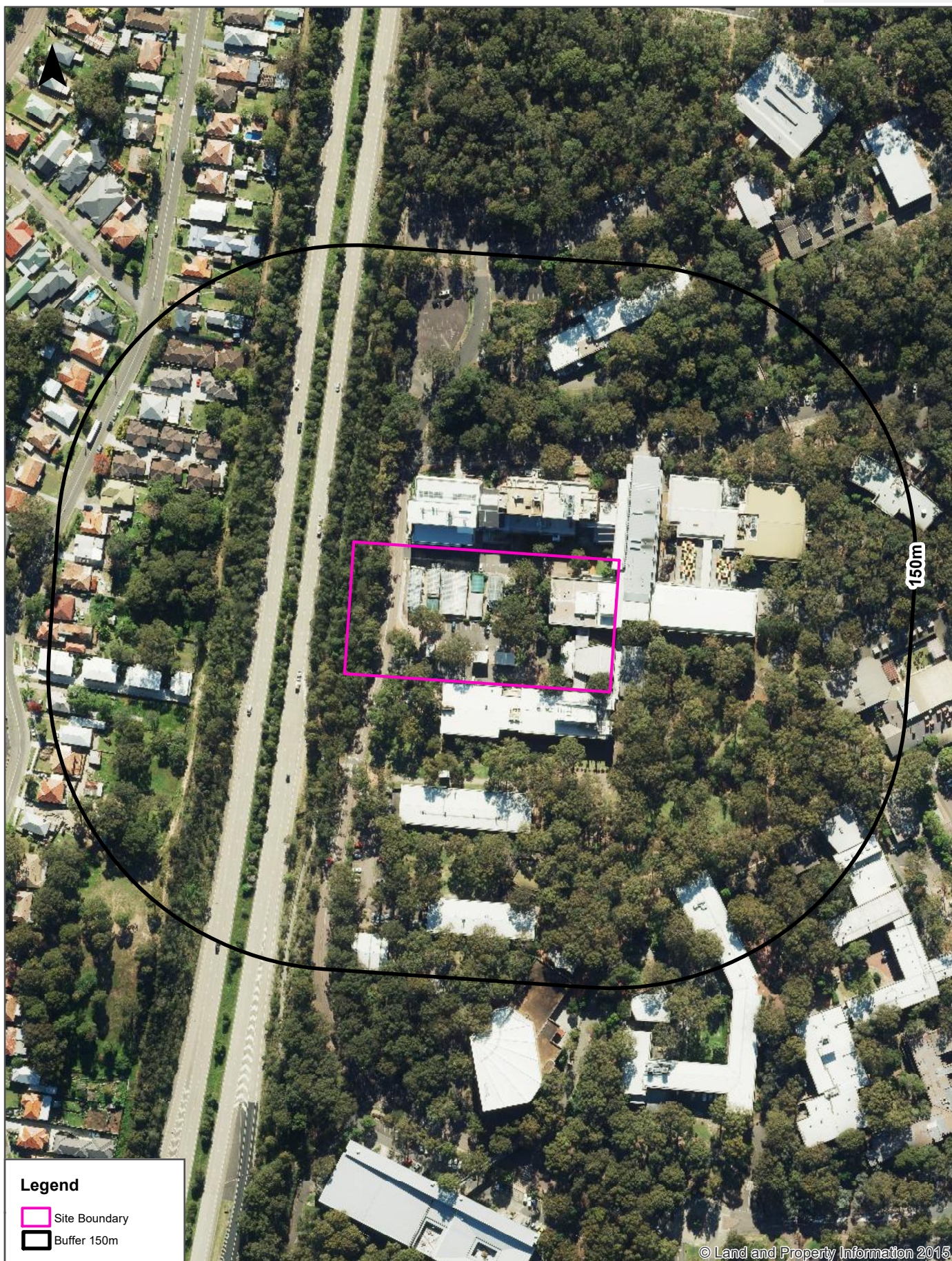
Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
MOTOR GARAGES &/OR ENGINEERS	BP Birmingham Station, Sandgate Rd., Birmingham Gardens, Newcastle	631844	1970	Road Match	284m
MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Blue Gum Service Station, Blue Gum Rd., Jesmond, Newcastle	632176	1970	Road Match	604m
MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	BP Jesmond, Blue Gum Rd., Jesmond Newcastle	177126	1982	Road Match	604m
MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Caltex Service Station, Blue Gum Rd Newcastle	177146	1982	Road Match	604m
MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Hugo's Garage & Service Station, Blue Gum Rd., Jesmond, Newcastle	632238	1970	Road Match	604m
MOTOR GARAGES &/OR ENGINEERS	Hugos Garage & Service Station, Blue Gum Rd., Jesmond., Newcastle	631892	1970	Road Match	604m
MOTOR GARAGES &/OR ENGINEERS	Collins, C. E., Bourke Pl., Birmingham Gardens Newcastle	126967	1950	Road Match	689m



Business Directory Content Derived from Universal Business Directories (UBD) - Licensed from Hardie Grant

Aerial Imagery 2014

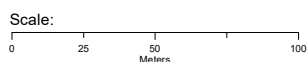
130 University Drive, Callaghan, NSW 2308



Legend

-  Site Boundary
-  Buffer 150m

© Land and Property Information 2015



Data Sources: Historical Aerials: © Department Finance, Services & Innovation

Coordinate System: GDA 1994 MGA Zone 56



Date: 17 October 2017

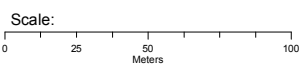
Aerial Imagery 2009

130 University Drive, Callaghan, NSW 2308



Legend

-  Site Boundary
-  Buffer 150m



Data Sources: Aerial Imagery © 2017 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

Coordinate System:
GDA 1994 MGA Zone 56



Date: 16 October, 2017

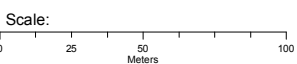
Aerial Imagery 2007

130 University Drive, Callaghan, NSW 2308



Legend

-  Site Boundary
-  Buffer 150m



Data Sources: Aerial Imagery © 2017 Google Inc, used with permission. Google and the Google logo are registered trademarks of Google Inc.

Coordinate System:
GDA 1994 MGA Zone 56

Date: 16 October, 2017



Aerial Imagery 1993

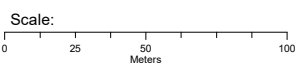
130 University Drive, Callaghan, NSW 2308v



150m

Legend

-  Site Boundary
-  Buffer 150m



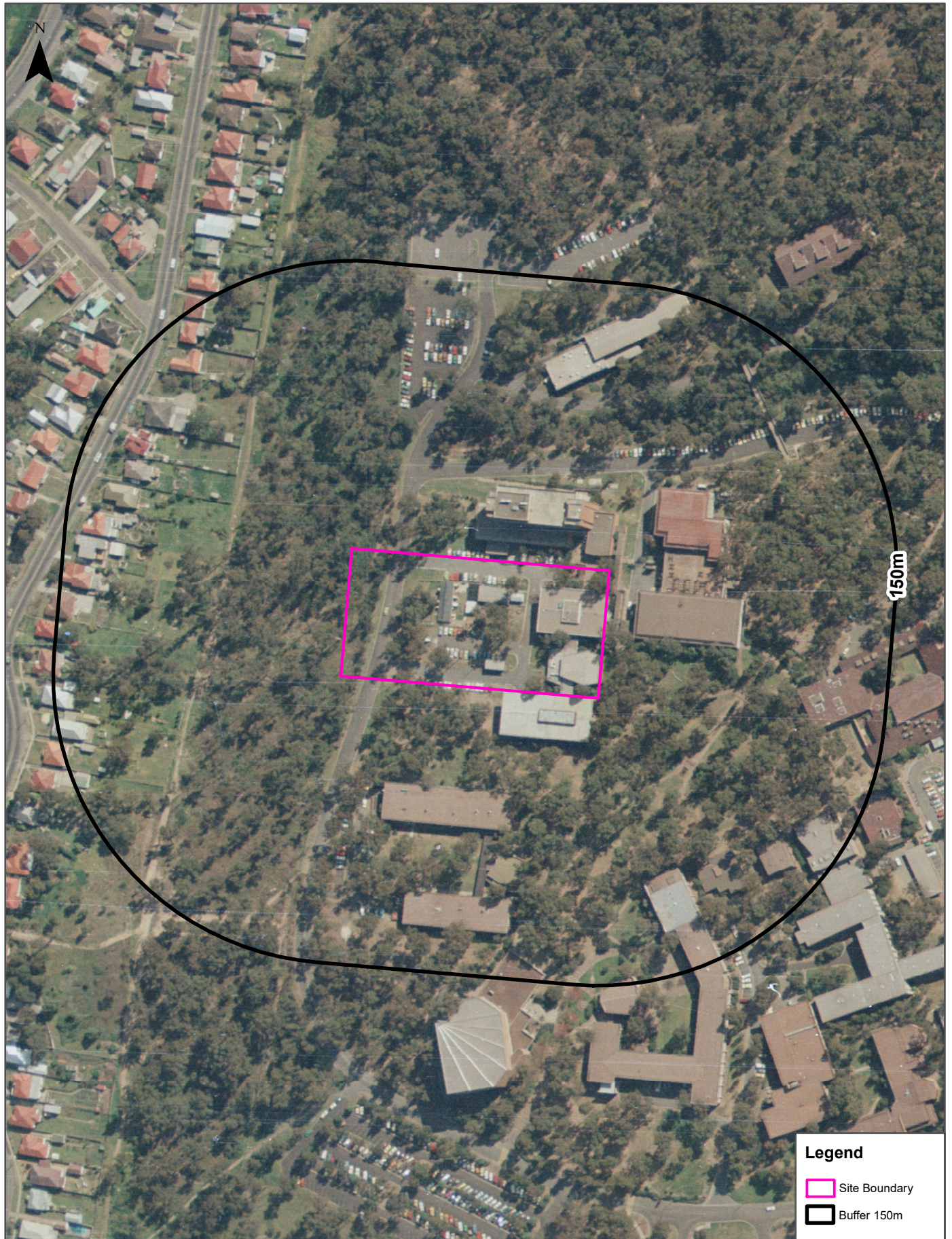
Data Sources: Historical Aerials: © Department Finance, Services & Innovation

Coordinate System: GDA 1994 MGA Zone 56

Date: 16 October 2017

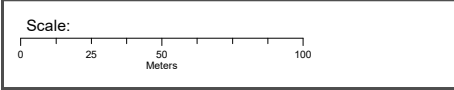
Aerial Imagery 1983

130 University Drive, Callaghan, NSW 2308v



Legend

- Site Boundary
- Buffer 150m



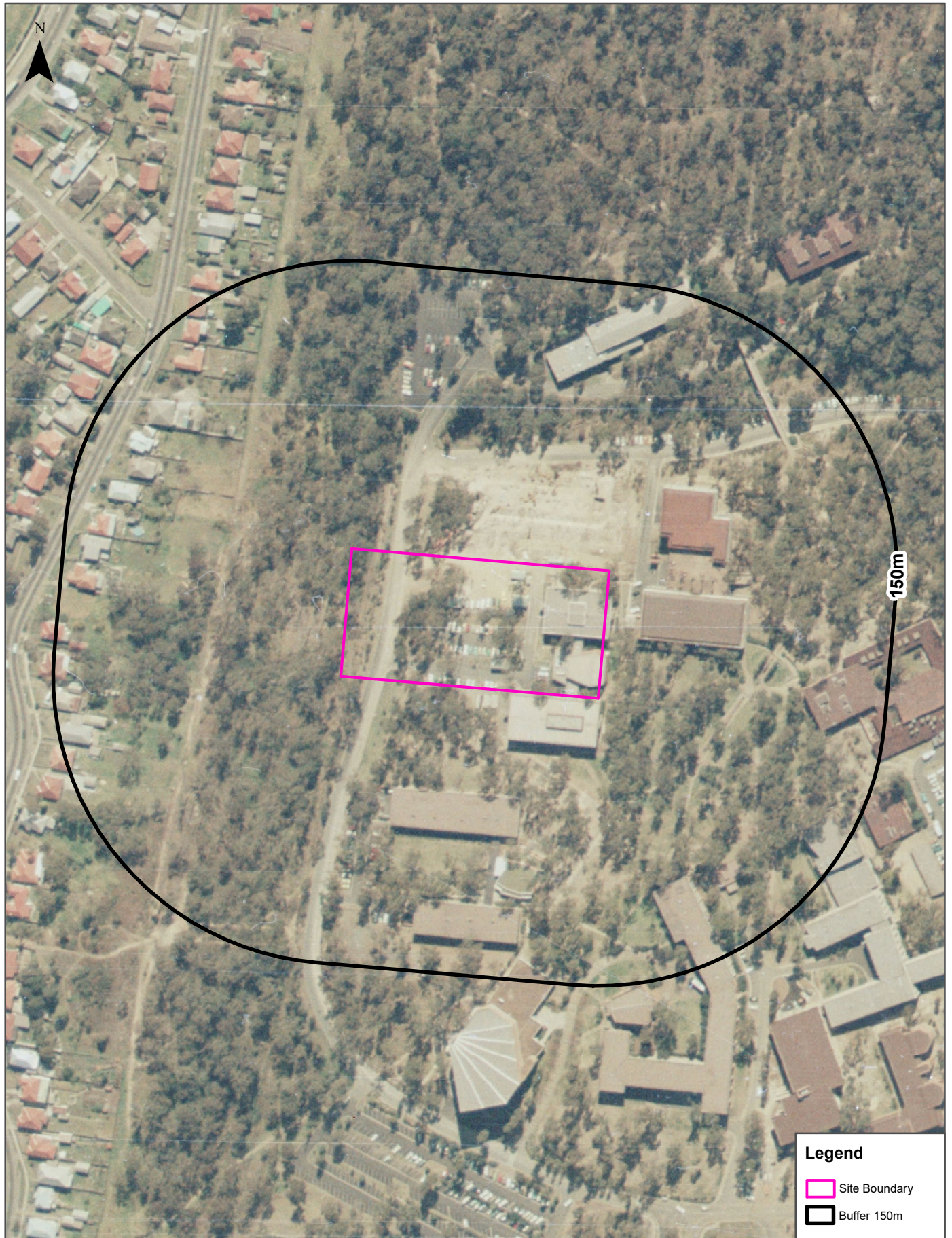
Data Sources: Historical Aerials: © Department Finance, Services & Innovation

Coordinate System: GDA 1994 MGA Zone 56



Date: 16 October 2017

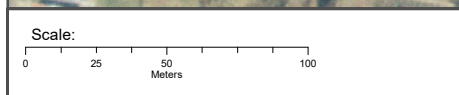
Aerial Imagery 1976

130 University Drive, Callaghan, NSW 2308v



Legend

-  Site Boundary
-  Buffer 150m



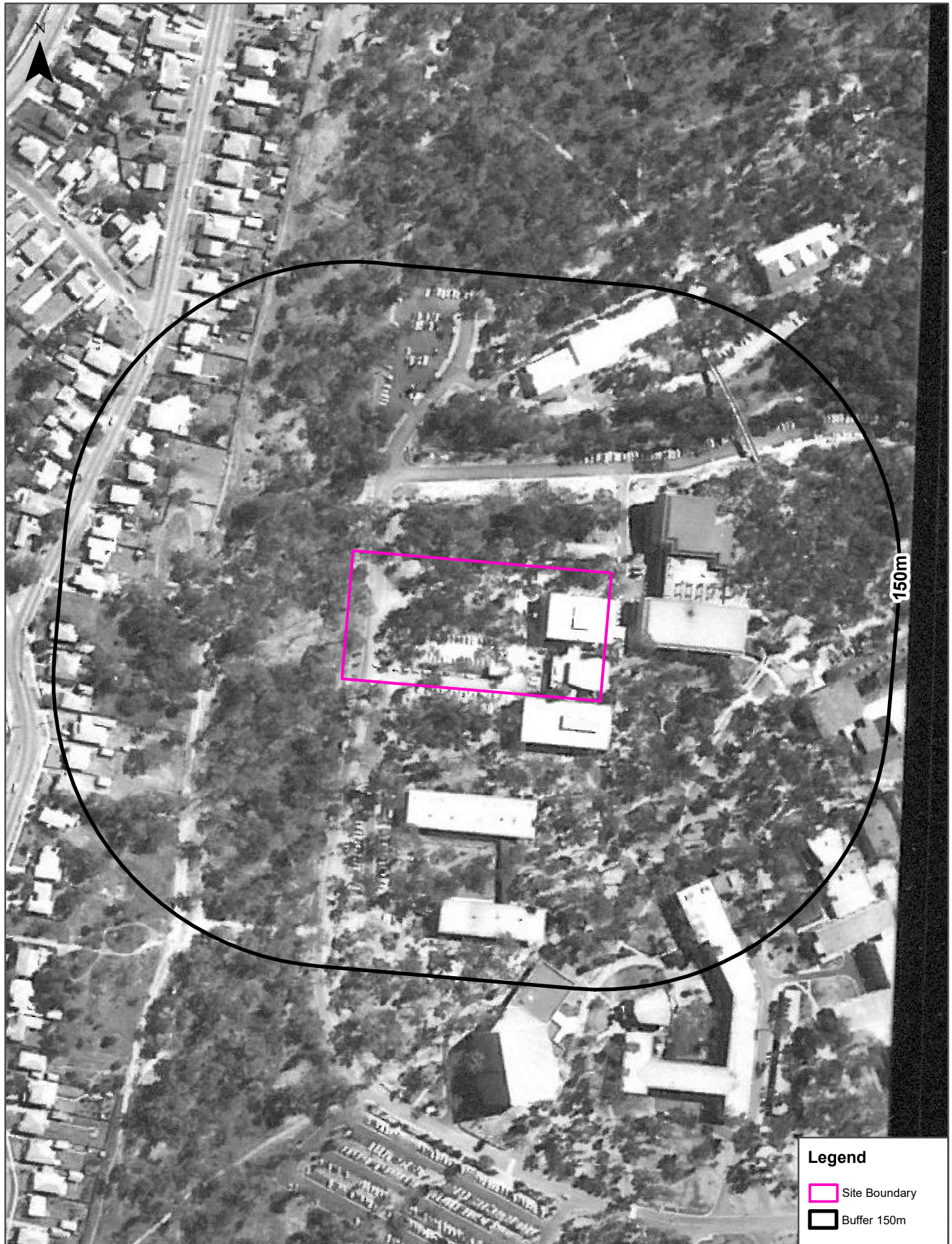
Data Sources: Historical Aerials: © Department Finance, Services & Innovation

Coordinate System: GDA 1994 MGA Zone 56

Date: 16 October 2017



Aerial Imagery 1974

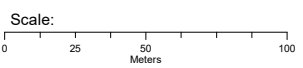
130 University Drive, Callaghan, NSW 2308v



150m

Legend

-  Site Boundary
-  Buffer 150m



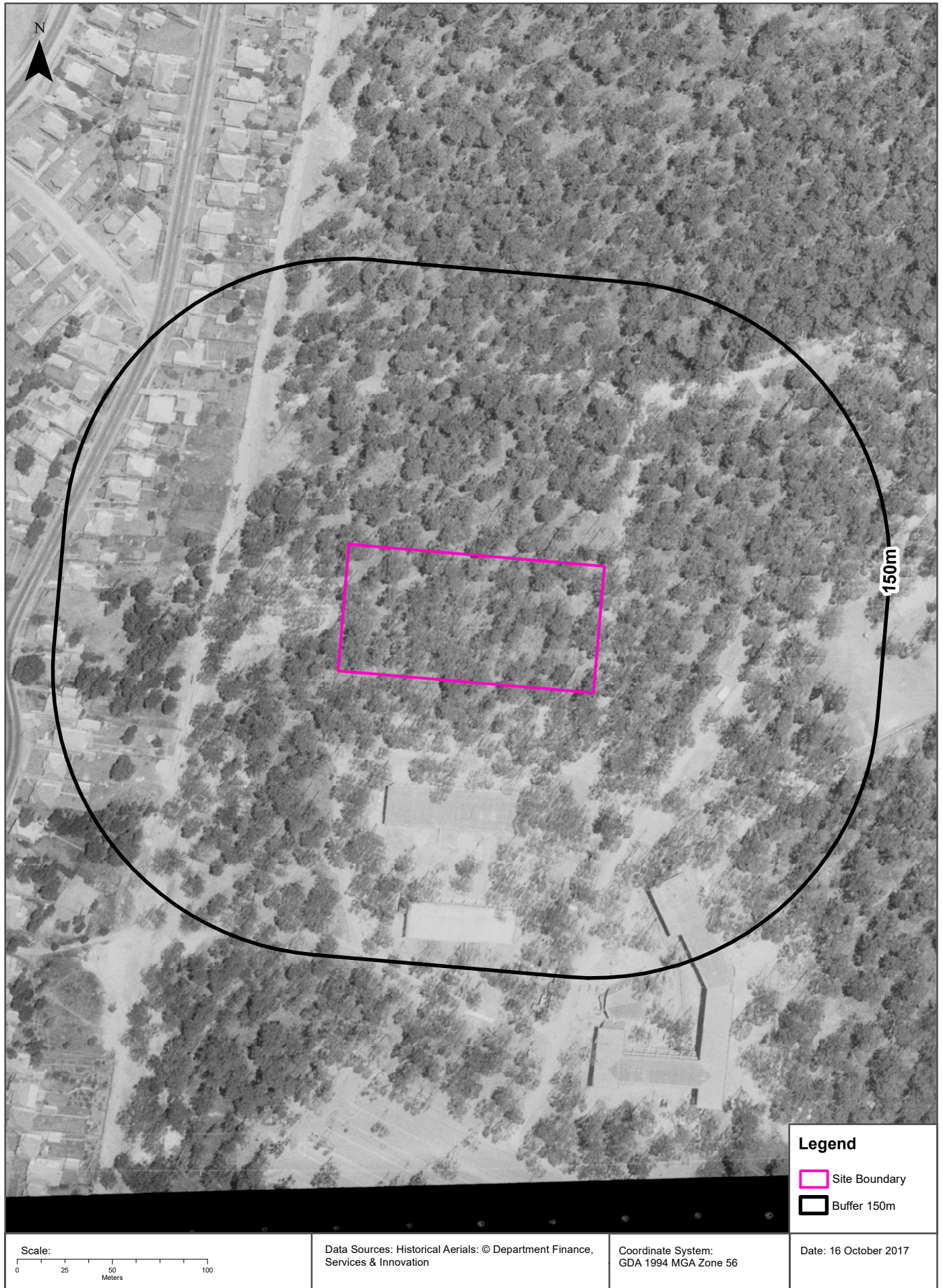
Data Sources: Historical Aerials: © Department Finance, Services & Innovation

Coordinate System: GDA 1994 MGA Zone 56

Date: 16 October 2017

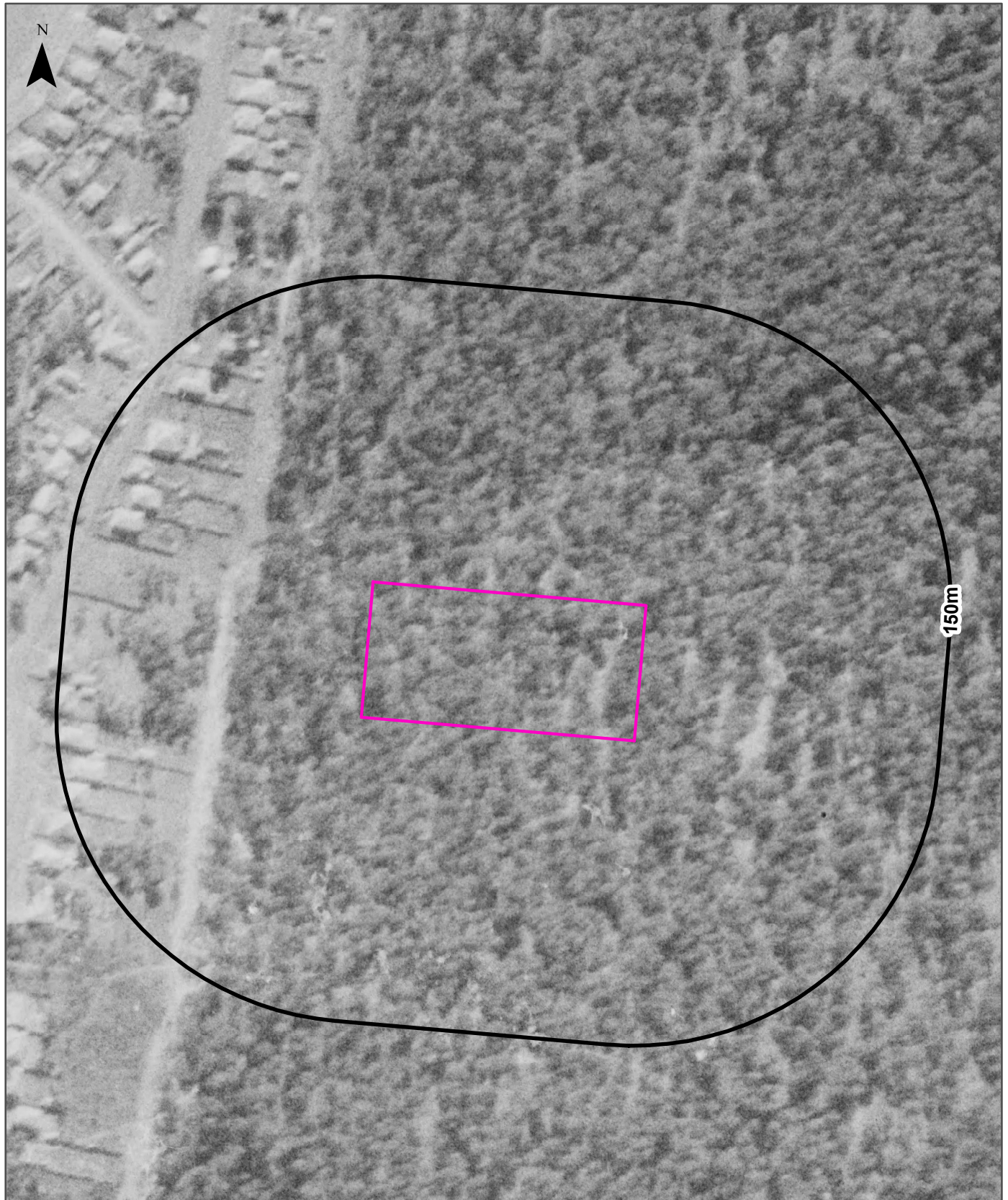
Aerial Imagery 1965

130 University Drive, Callaghan, NSW 2308v



Aerial Imagery 1954

130 University Drive, Callaghan, NSW 2308v



Legend	
	Site Boundary
	Buffer 150m



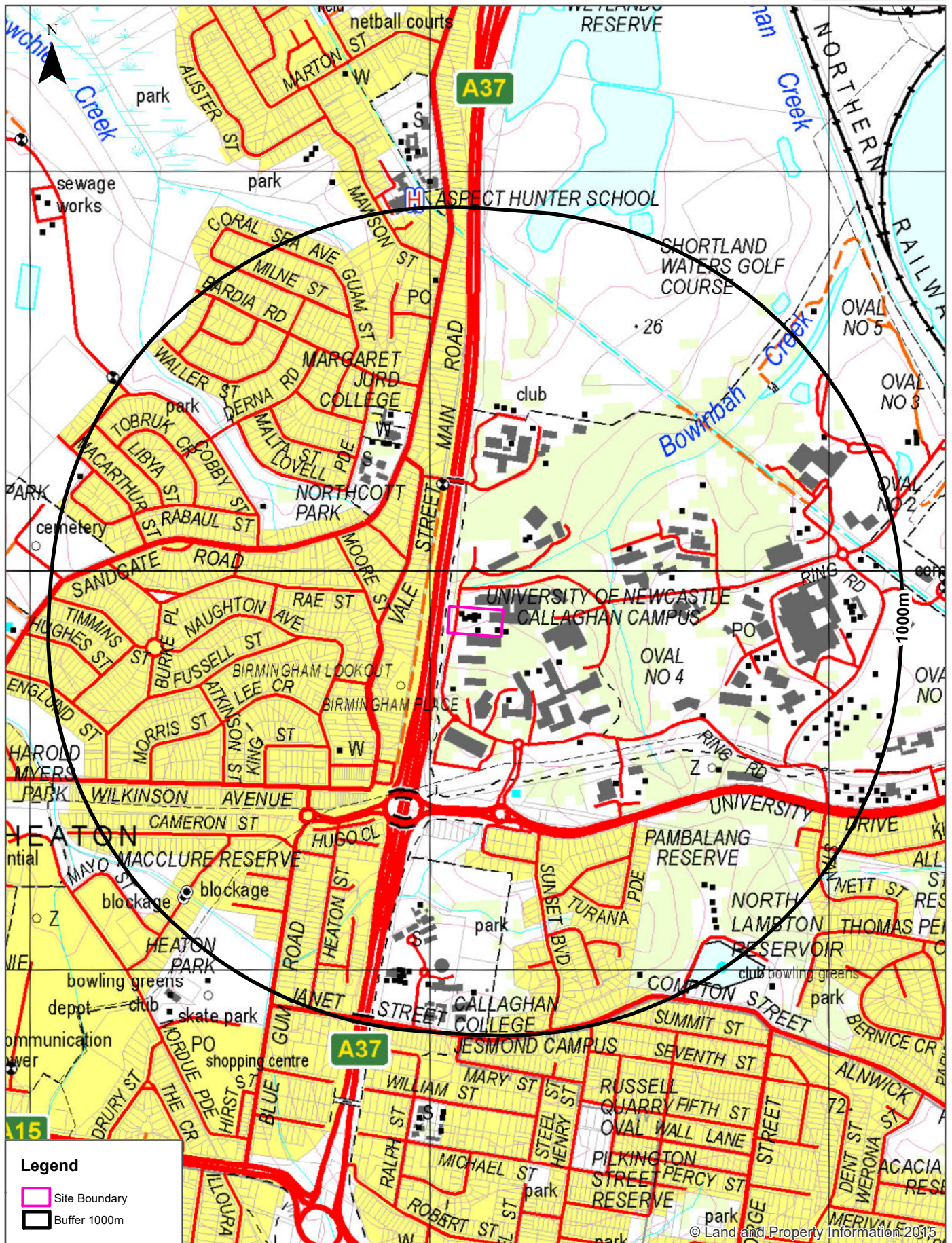
Data Sources: Historical Aerials: © Department Finance, Services & Innovation

Coordinate System: GDA 1994 MGA Zone 56

Date: 16 October 2017

Topographic Map 2015

130 University Drive, Callaghan, NSW 2308



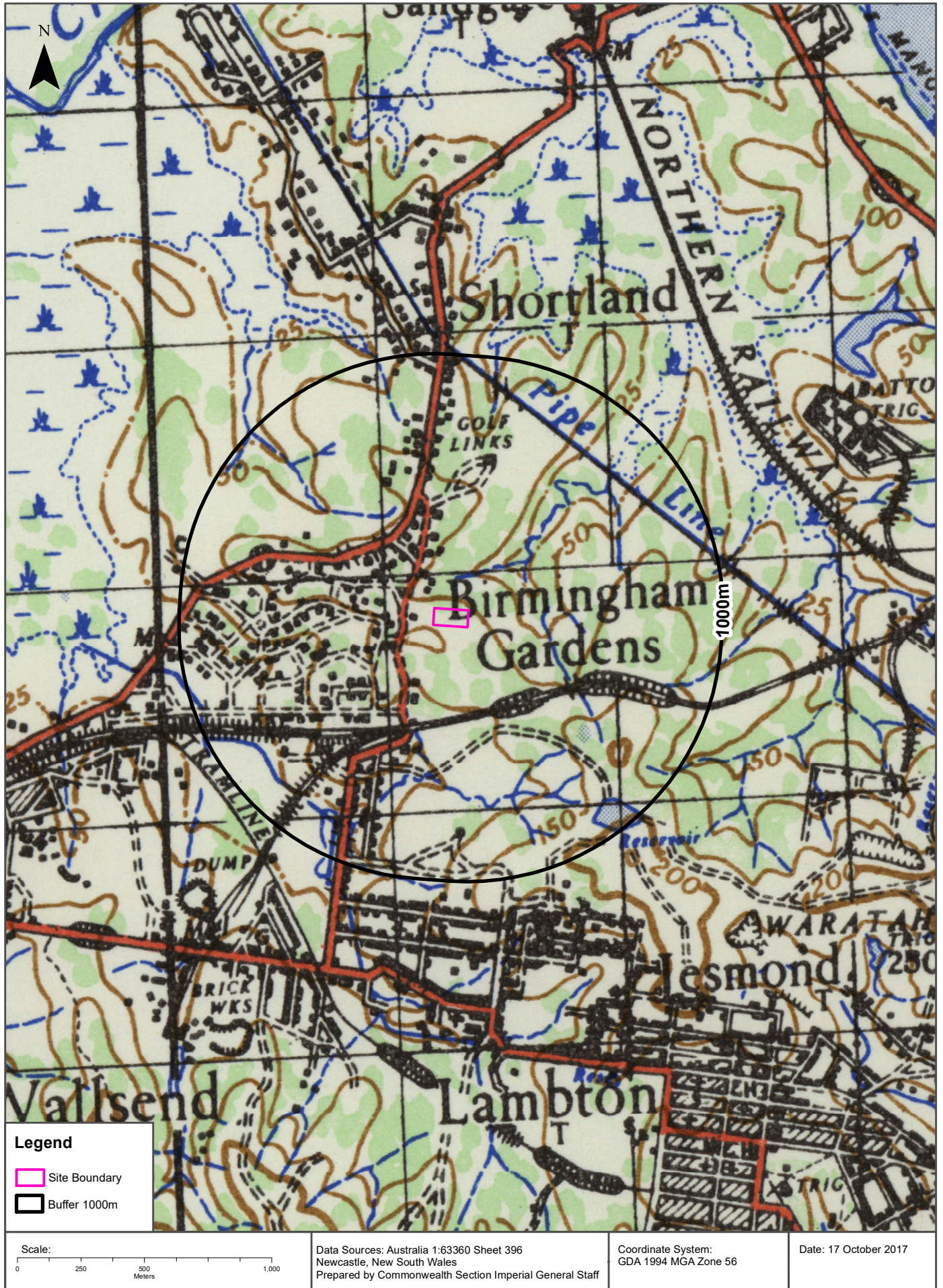
Historical Map 1981

130 University Drive, Callaghan, NSW 2308



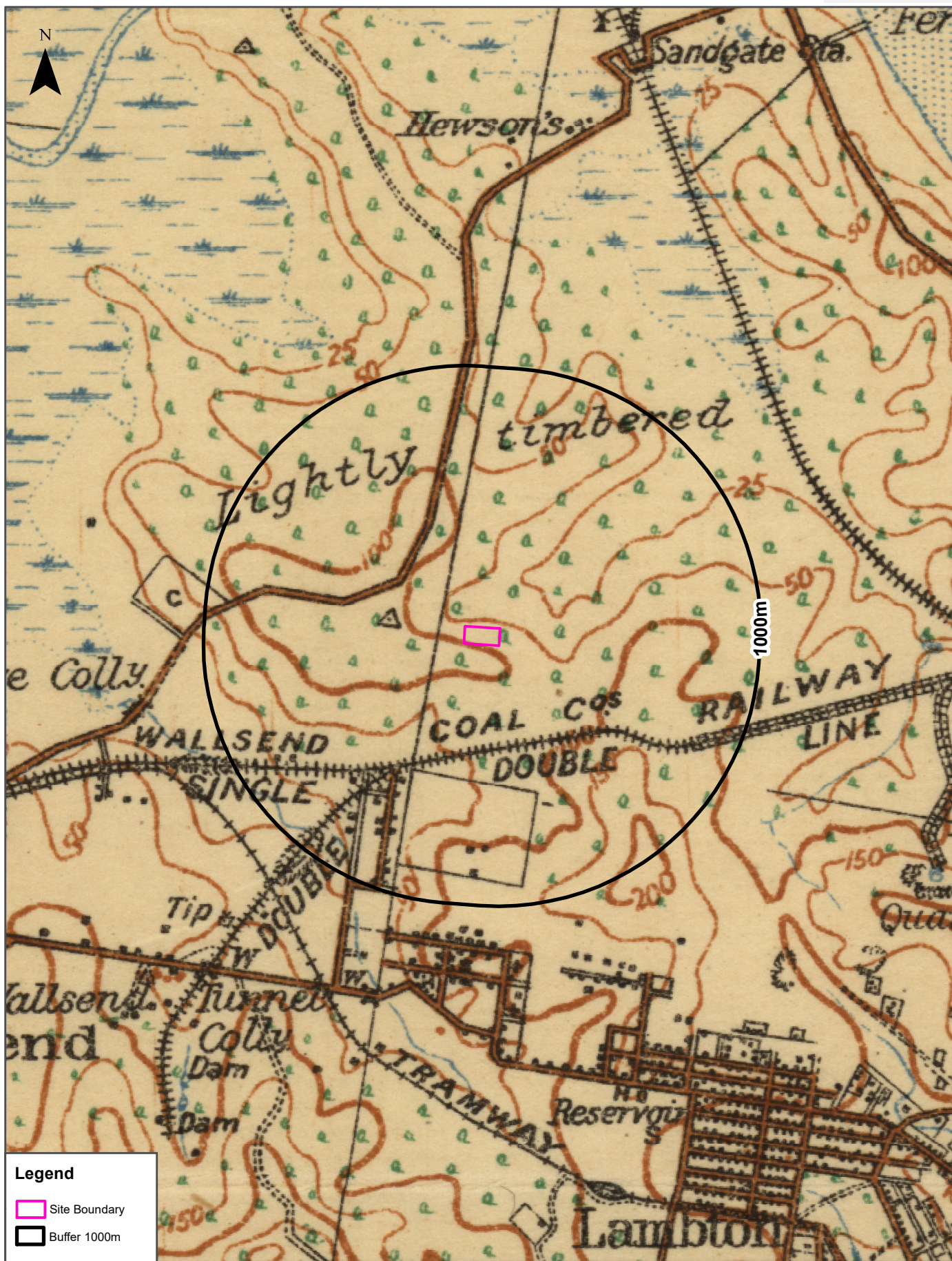
Historical Map 1941

130 University Drive, Callaghan, NSW 2308



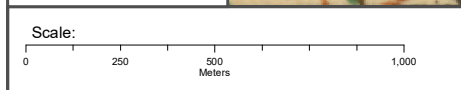
Historical Map 1913

130 University Drive, Callaghan, NSW 2308



Legend

- Site Boundary
- Buffer 1000m



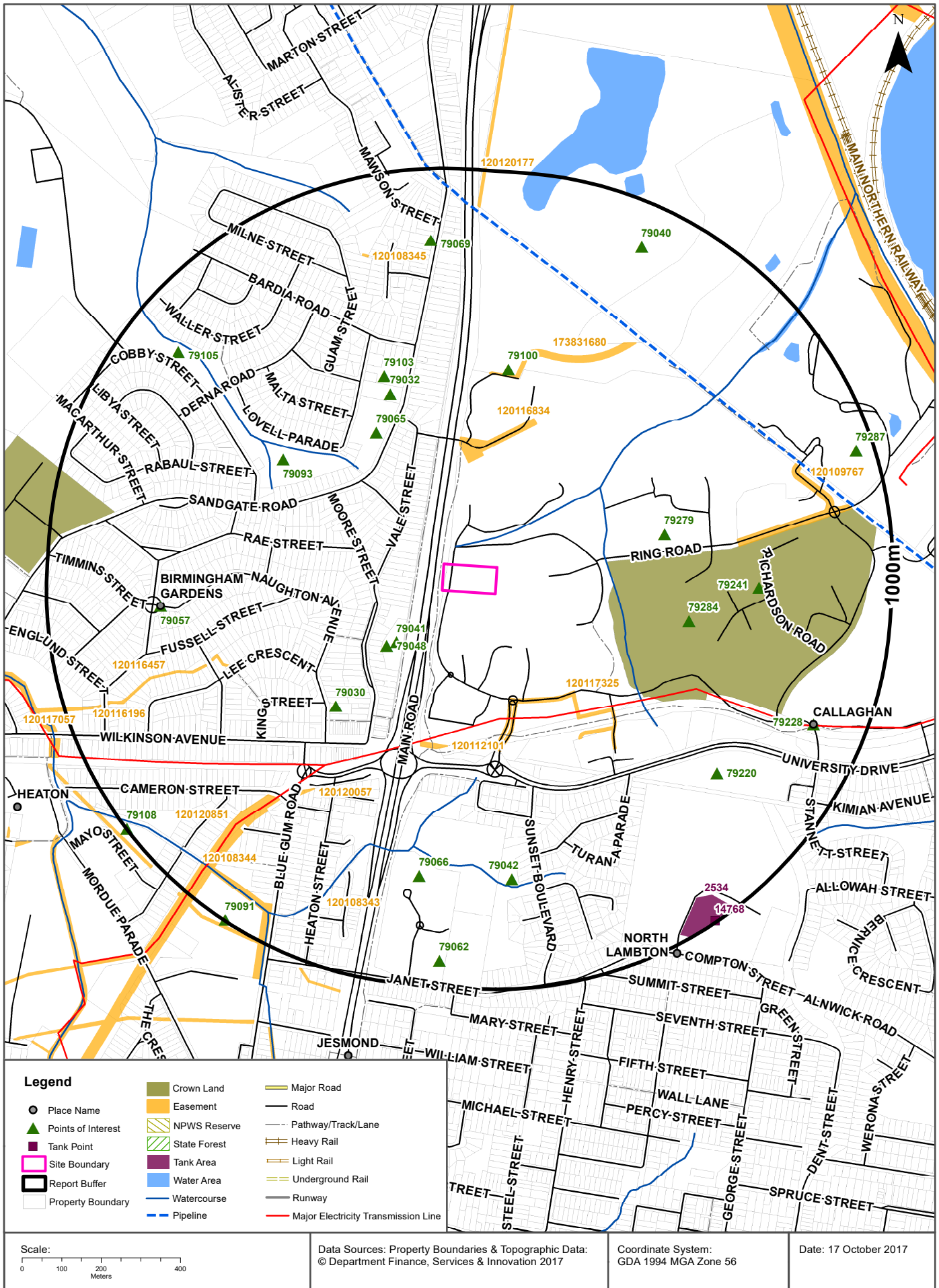
Data Sources: Australia 1:63360 Sheet 396
Newcastle, New South Wales
Prepared by Commonwealth Section Imperial General Staff

Coordinate System:
GDA 1994 MGA Zone 56

Date: 17 October 2017

Topographic Features

130 University Drive, Callaghan, NSW 2308



Topographic Features

130 University Drive, Callaghan, NSW 2308

Points of Interest

What Points of Interest exist within the dataset buffer?

Map Id	Feature Type	Label	Distance	Direction
79041	Lookout	BIRMINGHAM LOOKOUT	175m	South West
79048	Park	BIRMINGHAM PLACE	199m	South West
79065	Primary School	OUR LADY OF VICTORIES PRIMARY SCHOOL	373m	North West
79030	Place Of Worship	ANGLICAN CHURCH	398m	South West
79279	University	UNIVERSITY OF NEWCASTLE CALLAGHAN CAMPUS	430m	East
79032	Place Of Worship	CATHOLIC CHURCH	450m	North West
79093	Park	NORTHCOTT PARK	485m	North West
79284	Sports Field	OVAL NO 4	493m	East
79103	High School	MARGARET JURD COLLEGE	498m	North West
79100	Club	SHORTLAND WATERS GOLF CLUB	502m	North
79241	Post Office	NEWCASTLE UNIVERSITY POST OFFICE	663m	East
79057	Suburb	BIRMINGHAM GARDENS	713m	West
79220	Park	PAMBALANG RESERVE	719m	South East
79042	Park	Park	722m	South
79066	Primary School	HEATON PUBLIC SCHOOL	724m	South
79069	Post Office	SHORTLAND POST OFFICE	819m	North
79105	Park	Park	859m	North West
79228	Suburb	CALLAGHAN	868m	South East
79040	Golf Course	SHORTLAND WATERS GOLF COURSE	889m	North East
79062	High School	CALLAGHAN COLLEGE JESMOND CAMPUS	934m	South
79287	Sports Field	OVAL NO 2	953m	East
79091	Sports Field	HEATON PARK	998m	South West
79108	Park	MACCLURE RESERVE	999m	South West

Topographic Data Source: © Land and Property Information (2015)

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Topographic Features

130 University Drive, Callaghan, NSW 2308

Tanks (Areas)

What are the Tank Areas located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
2534	Water	Operational	NORTH LAMBTON RESERVOIR	04/12/2012	921m	South East

Tanks (Points)

What are the Tank Points located within the dataset buffer?

Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
14768	Water	Operational	NORTH LAMBTON RESERVOIR	01/01/2012	996m	South East

Tanks Data Source: © Land and Property Information (2015)

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Major Easements

What Major Easements exist within the dataset buffer?

Note. Easements provided by LPI are not at the detail of local governments. They are limited to major easements such as Right of Carriageway, Electrical Lines (66kVa etc.), Easement to drain water & Significant subterranean pipelines (gas, water etc.).

Map Id	Easement Class	Easement Type	Easement Width	Distance	Direction
120116834	Primary	Undefined		261m	North
120117325	Primary	Undefined		265m	South East
120112101	Primary	Undefined		387m	South
173831680	Primary	Right of way	Var	481m	North East
120119606	Primary	Undefined		566m	West
120120057	Primary	Undefined		597m	South West
120109767	Primary	Undefined		610m	East
120116457	Primary	Undefined		626m	West
120120851	Primary	Undefined		669m	South West
120108345	Primary	Undefined		801m	North
120108343	Primary	Undefined		840m	South West
120116196	Primary	Undefined		884m	West
120108344	Primary	Undefined		904m	South West
120120177	Primary	Undefined		908m	North

Map Id	Easement Class	Easement Type	Easement Width	Distance	Direction
120117057	Primary	Undefined		956m	West

Easements Data Source: © Land and Property Information (2015)

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Topographic Features

130 University Drive, Callaghan, NSW 2308

State Forest

What State Forest exist within the dataset buffer?

State Forest Number	State Forest Name	Distance	Direction
N/A	No records in buffer		

State Forest Data Source: © Land and Property Information (2015)

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

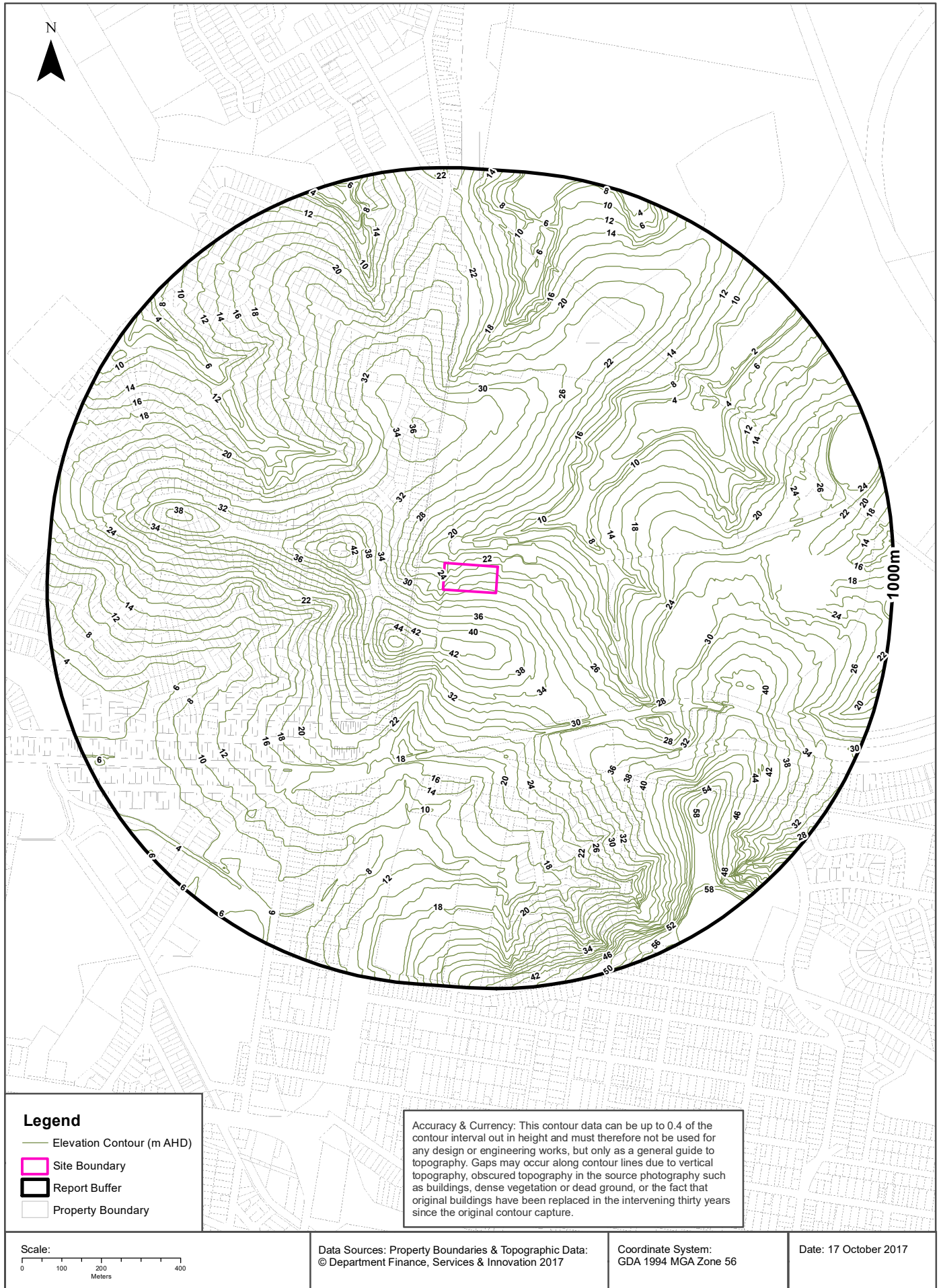
National Parks and Wildlife Service Reserves

What NPWS Reserves exist within the dataset buffer?

Reserve Number	Reserve Type	Reserve Name	Gazetted Date	Distance	Direction
N/A	No records in buffer				

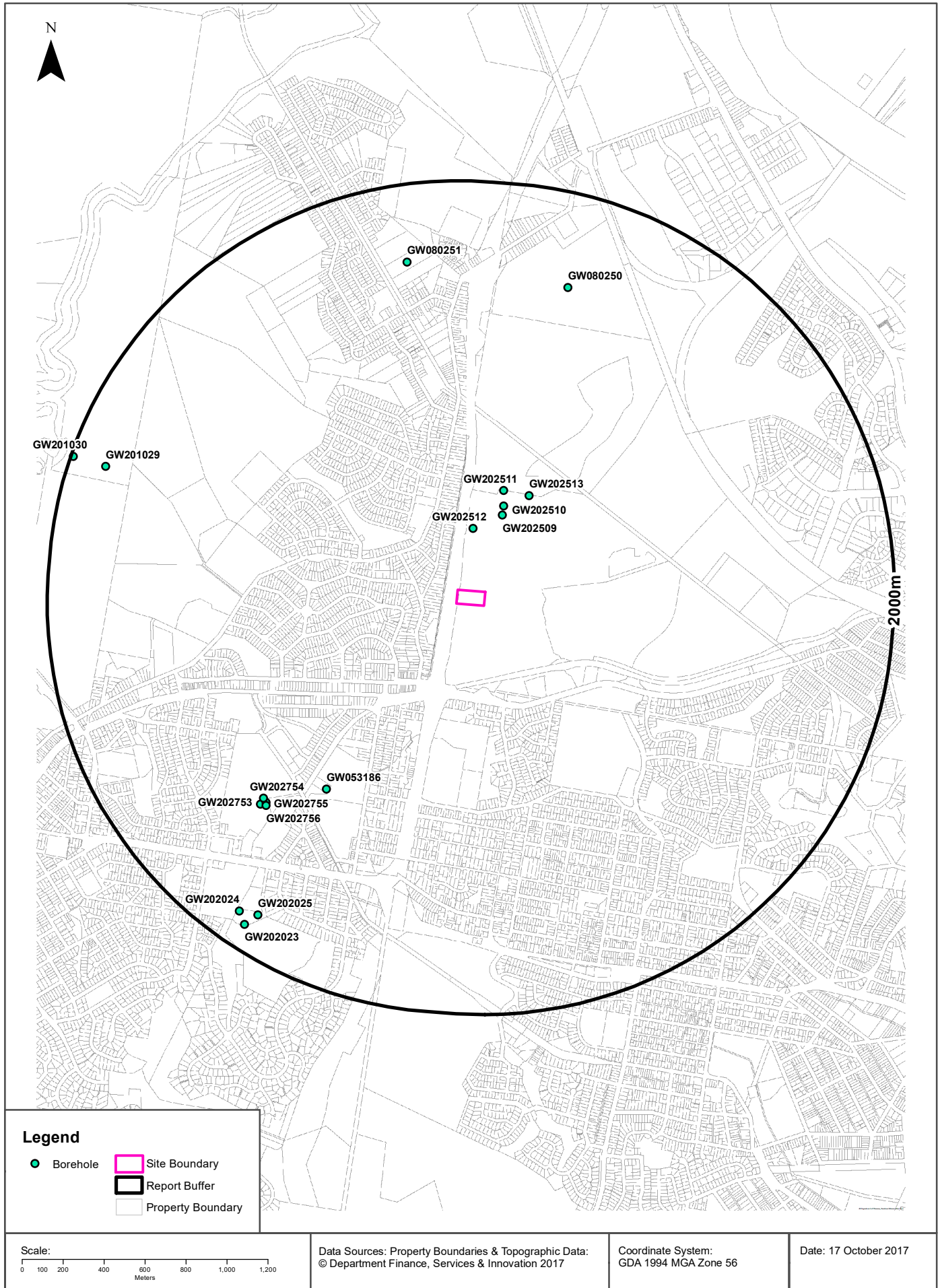
NPWS Data Source: © Land and Property Information (2015)

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>



Groundwater Boreholes

130 University Drive, Callaghan, NSW 2308



Hydrogeology & Groundwater

130 University Drive, Callaghan, NSW 2308

Hydrogeology

Description of aquifers on-site:

Description
Fractured or fissured, extensive aquifers of low to moderate productivity

Description of aquifers within the dataset buffer:

Description
Fractured or fissured, extensive aquifers of low to moderate productivity

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Groundwater Boreholes

Boreholes within the dataset buffer:

GW No.	Licence No	Work Type	Owner Type	Purpose	Contractor	Complete Date	Final Depth (m)	Drilled Depth (m)	Salinity (mg/L)	SWL (m)	Yield (L/s)	Elev (AHD)	Dist	Dir
GW202512	20BL173130	Bore	Private	Monitoring		20/07/2012	18.00	18.00					305m	North
GW202509	20BL173130	Bore	Private	Monitoring		20/07/2012	11.60	11.60					384m	North
GW202510	20BL173130	Bore	Private	Monitoring		20/07/2012	12.80	12.80					429m	North
GW202511	20BL173130	Bore	Private	Monitoring		20/07/2012	9.80	9.80					503m	North
GW202513	20BL173130	Bore	Private	Monitoring		20/07/2012	4.60	4.60					517m	North East
GW053186	20BL118687	Bore	Private	Recreation		01/01/1981	32.00	32.00	V.Salty				1108 m	South West
GW202754	20BL173083	Bore	Private	Monitoring	Total Drilling	09/02/2012	3.00	3.00	527	0.88			1340 m	South West
GW202755	20BL173083	Bore	Private	Monitoring	Total Drilling	09/02/2012	3.40	3.40	632	1.47			1346 m	South West
GW202756	20BL173083	Bore	Private	Monitoring	Total Drilling	09/02/2012	3.50	3.50	788	1.79			1357 m	South West
GW202753	20BL173083	Bore	Private	Monitoring	Total Drilling	09/02/2012	4.20	4.20	1862	1.62			1372 m	South West
GW080250	20BL168280	Bore				01/01/2002	4.50	4.50					1541 m	North
GW080251	20BL168281	Bore	Local Govt		Total Drilling	01/04/2002	10.50	10.50					1620 m	North
GW202025	20BL168685	Bore	Private	Monitoring	McDermott Drilling	01/07/2002	10.00	10.00		2.00			1806 m	South West
GW201029	20BL172655	Bore	Other Govt	Monitoring		18/09/2008	2.00						1821 m	West
GW202024	20BL168685	Bore	Private	Monitoring	McDermott Drilling	01/07/2002	4.30	4.30		1.00			1839 m	South West
GW202023	20BL168685	Bore	Private	Monitoring	McDermott Drilling	01/07/2002	5.30	5.30		3.00			1879 m	South West
GW201030	20BL172655	Bore	Other Govt	Monitoring		18/09/2008	2.00						1985 m	West

Borehole Data Source : NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corporation for all bores prefixed with GW. All other bores © Commonwealth of Australia (Bureau of Meteorology) 2015. Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Hydrogeology & Groundwater

130 University Drive, Callaghan, NSW 2308

Driller's Logs

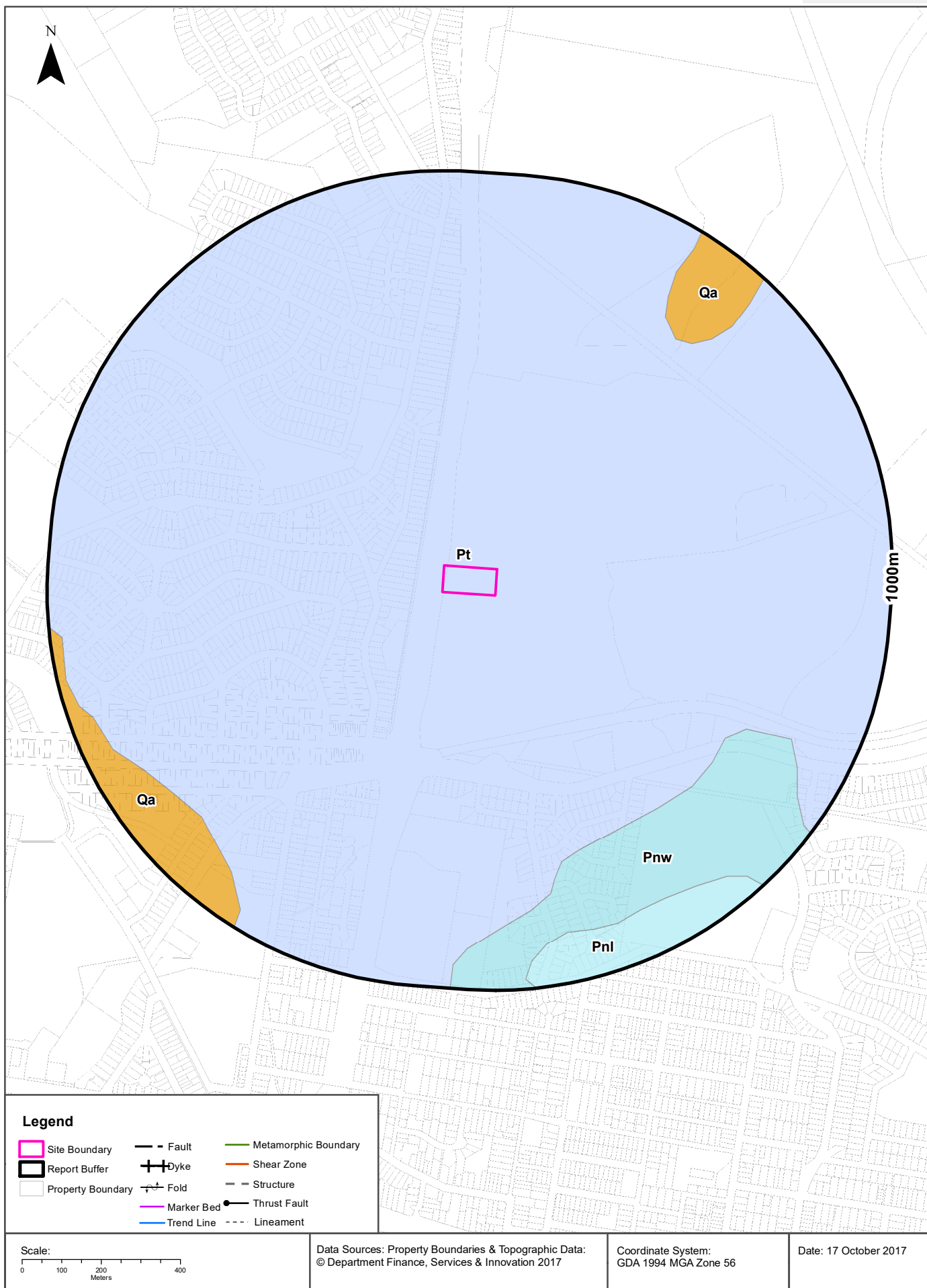
Drill log data relevant to the boreholes within the dataset buffer:

Groundwater No	Drillers Log	Distance	Direction
GW202512	0.00m-0.15m Silty CLAY; brown 0.15m-1.20m Silty CLAY; brown-orange mottled 1.20m-9.50m SILTSTONE, extremely weathered; light brown with some gravel, soft lense from 3.7m-3.8m & softer lense from ~6.0m-6.2m 9.50m-16.60m SILTSTONE; dark grey-dark brown 16.60m-17.50m COAL; soft, dark grey-black, presumed groundwater encountered 17.50m-18.00m TUFF; white	305m	North
GW202509	0.00m-0.15m Fill, Clayey Sandy SILT; brown, some gravel & rootlets 0.15m-0.75m Fill, Sandy GRAVEL; red-brown, with coal fragments, angular & round gravel/cobbles to 30mm 0.75m-1.50m Silty CLAY; orange-brown, with some gravel, becoming grey from 0.95m 1.50m-1.80m Siltstone/Claystone; extremely weathered, light brown-grey, some gravel 1.80m-2.50m Silty Clay/weathered Siltstone; mottled brown-orange 2.50m-3.40m Siltstone, weathered; orange-brown 3.40m-6.00m Sandstone, weathered; orange-brown 6.00m-7.50m Tuff; white 7.50m-8.80m Coal; black 8.80m-11.60m Tuff; white, near refusal	384m	North
GW202510	0.00m-0.05m FILL, Clayey SAND; dark brown, with some rootlets 0.05m-0.50m FILL, Clayey SAND; grey with some orange mottling, some gravel 0.50m-2.00m Silty CLAY; grey with some orange mottling 2.00m-2.35m SANDSTONE/SILTSTONE, extremely weathered; brown to orange-brown 2.35m-7.00m SANDSTONE; orange-brown 7.00m-7.50m COAL; dark grey-black 7.50m-12.80m TUFF; pale grey-white, soft lense from ~8.0-8.3m	429m	North
GW202511	0.00m-0.15m Silty CLAY; dark brown 0.15m-0.80m FILL, Clayey Gravelly SAND; dark brown, with slag/cement clasts 0.80m-2.60m SANDSTONE; pale brown, becoming orange-brown from ~2.0m 2.60m-3.50m COAL; black 3.50m-3.60m Silty CLAY; pale pink-brown, with trace-some gravel 3.60m-4.90m COAL; black 4.90m-9.80m TUFF; pale grey-white, soft lense from 8.0-8.2m	503m	North
GW202513	0.00m-0.20m FILL, Clayey Silty SAND; dark brown, some gravel & roots 0.20m-0.25m FILL, Concrete Slab 0.25m-0.30m FILL; Woodchips/Mulch 0.30m-0.35m FILL, Silty SAND; pale brown, trace of gravel 0.35m-0.45m FILL, Silty CLAY; dark grey 0.45m-0.60m FILL, Sandy GRAVEL; dark grey-black, angular 0.60m-1.20m Silty CLAY; dark grey 1.20m-2.10m Silty CLAY; pale grey - wood fragments/fibres, hard lense at 2.0-2.1m 2.10m-4.20m CLAYSTONE/SANDSTONE; pale brown 4.20m-4.60m CLAYSTONE/SILTSTONE; pale brown	517m	North East
GW053186	0.00m-0.15m Topsoil 0.15m-3.00m Clay 3.00m-24.38m Shale 24.38m-27.38m Coal 27.38m-32.00m Mudstone Water Supply	1108m	South West
GW202754	0.00m-0.26m Fill; Concrete 0.26m-0.30m Sand, gravelly; light brown & grey, fine to coarse grained 0.30m-0.50m Gravel, sandy; orange/brown & grey/brown 0.50m-1.30m Clay; with sand & gravel, grey/black, fine to coarse grained 1.30m-3.00m Clay, sandy; with silt, black with grey & brown mottling	1340m	South West
GW202755	0.00m-0.22m Fill; concrete 0.22m-0.30m Gravel; sandy, wet 0.30m-1.20m Sand; black, fine grained 1.20m-3.40m Gravel; silty sandy, black, stiff	1346m	South West
GW202756	0.00m-0.19m Fill; Concrete 0.19m-0.50m Sand; gravelly clayey, dark grey/brown 0.50m-3.50m Clay; sandy gravelly	1357m	South West
GW202753	0.00m-0.34m Fill; Concrete 0.34m-2.90m Sand, silty; black, coarse grained 2.90m-4.20m Clay; light grey/brown, fine grained, stiff	1372m	South West

Drill Log Data Source: NSW Department of Primary Industries - Office of Water / Water Administration Ministerial Corp
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

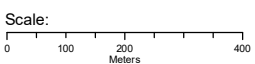
Geology 1:250,000

130 University Drive, Callaghan, NSW 2308



Legend

- Site Boundary
- Report Buffer
- Property Boundary
- Fault
- Dyke
- Fold
- Marker Bed
- Trend Line
- Metamorphic Boundary
- Shear Zone
- Structure
- Thrust Fault
- Lineament



Data Sources: Property Boundaries & Topographic Data:
© Department Finance, Services & Innovation 2017

Coordinate System:
GDA 1994 MGA Zone 56

Date: 17 October 2017

Geology

130 University Drive, Callaghan, NSW 2308

Geological Units

What are the Geological Units onsite?

Symbol	Description	Unit Name	Group	Sub Group	Age	Dom Lith	Map Sheet	Dataset
Pt	Siltstone, sandstone, coal, tuff, claystone, conglomerate, minor clay	Tomago Coal Measures	Tomago Coal Measures		Palaeozoic			1:250,000

What are the Geological Units within the dataset buffer?

Symbol	Description	Unit Name	Group	Sub Group	Age	Dom Lith	Map Sheet	Dataset
Pnl	Sandstone, siltstone, claystone, coal, tuff	Lambton Subgroup	Newcastle Coal Measures	Lambton Subgroup	Palaeozoic			1:250,000
Pnw	Sandstone	Waratah Sandstone	Newcastle Coal Measures		Palaeozoic			1:250,000
Pt	Siltstone, sandstone, coal, tuff, claystone, conglomerate, minor clay	Tomago Coal Measures	Tomago Coal Measures		Palaeozoic			1:250,000
Qa	Undifferentiated alluvial deposits; sand, silt, clay and gravel; some residual and colluvial deposits. Includes some channel, levee, lacustrine, floodplain and swamp deposits. May include some higher level Tertiary terraces	undifferentiated			Cainozoic			1:250,000

Geological Structures

What are the Geological Structures onsite?

Feature	Name	Description	Map Sheet	Dataset
No features				1:250,000

What are the Geological Structures within the dataset buffer?

Feature	Name	Description	Map Sheet	Dataset
No features				1:250,000

Geological Data Source : NSW Department of Industry, Resources & Energy

© State of New South Wales through the NSW Department of Industry, Resources & Energy

Naturally Occurring Asbestos Potential

130 University Drive, Callaghan, NSW 2308

Naturally Occurring Asbestos Potential

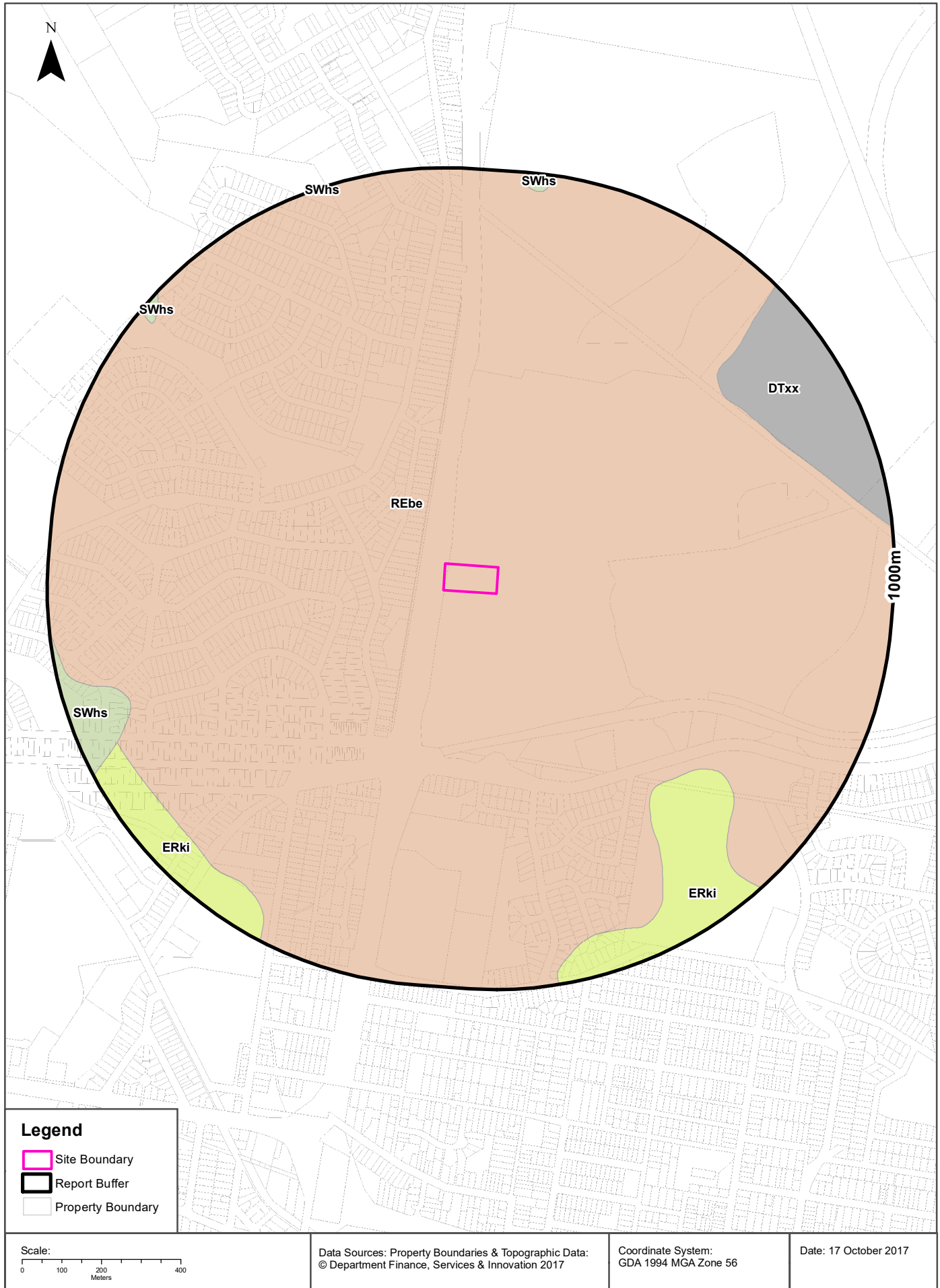
Naturally Occurring Asbestos Potential within the dataset buffer:

Potential	Sym	Strat Name	Group	Formation	Scale	Min Age	Max Age	Rock Type	Dom Lith	Description	Dist	Dir
No records in buffer												

Mining Subsidence District Data Source: © State of New South Wales through NSW Department of Industry, Resources & Energy

Soil Landscapes

130 University Drive, Callaghan, NSW 2308



Soils

130 University Drive, Callaghan, NSW 2308

Soil Landscapes

What are the onsite Soil Landscapes?

Soil Code	Name	Group	Process	Map Sheet	Scale
REbe	BERESFIELD		RESIDUAL	Newcastle	1:100,000

What are the Soil Landscapes within the dataset buffer?

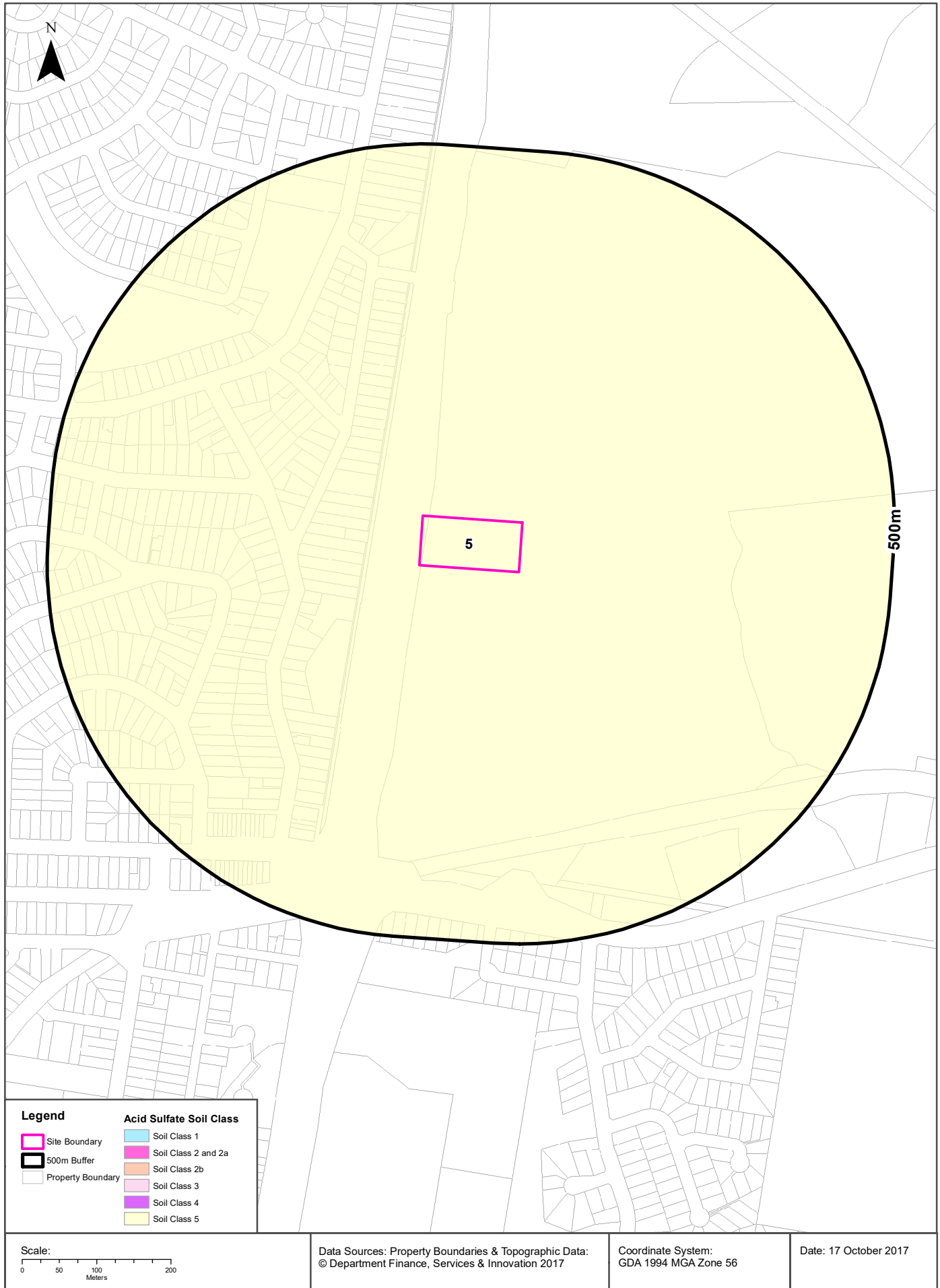
Soil Code	Name	Group	Process	Map Sheet	Scale
DTxx	DISTURBED TERRAIN		DISTURBED TERRAIN	Newcastle	1:100,000
ERki	KILLINGWORTH		EROSIONAL	Newcastle	1:100,000
REbe	BERESFIELD		RESIDUAL	Newcastle	1:100,000
SWhs	HEXHAM SWAMP		SWAMP	Newcastle	1:100,000

Soils Landscapes Data Source : NSW Office of Environment and Heritage

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Acid Sulfate Soils

130 University Drive, Callaghan, NSW 2308



Standard Local Environmental Plan Acid Sulfate Soils

130 University Drive, Callaghan, NSW 2308

Standard Local Environmental Plan Acid Sulfate Soils

What is the on-site Acid Sulfate Soil Plan Class that presents the largest environmental risk?

Soil Class	Description	LEP
5	Works within 500 metres of adjacent Class 1, 2, 3, or 4 land that is below 5 metres AHD and by which the watertable is likely to be lowered below 1 metre AHD on adjacent Class 1, 2, 3 or 4 land, present an environmental risk	Newcastle Local Environmental Plan 2012

If the on-site Soil Class is 5, what other soil classes exist within 500m?

Soil Class	Description	LEP	Distance	Direction
None				

Acid Sulfate Data Source Accessed 07/10/2016: NSW Crown Copyright - Planning and Environment
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Dryland Salinity

130 University Drive, Callaghan, NSW 2308

Dryland Salinity - National Assessment

Is there Dryland Salinity - National Assessment data onsite?

No

Is there Dryland Salinity - National Assessment data within the dataset buffer?

No

What Dryland Salinity assessments are given?

Assessment 2000	Assessment 2020	Assessment 2050	Distance	Direction
N/A	N/A	N/A	N/A	N/A

Dryland Salinity Data Source : National Land and Water Resources Audit

The Commonwealth and all suppliers of source data used to derive the maps of "Australia, Forecast Areas Containing Land of High Hazard or Risk of Dryland Salinity from 2000 to 2050" do not warrant the accuracy or completeness of information in this product. Any person using or relying upon such information does so on the basis that the Commonwealth and data suppliers shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information. Any persons using this information do so at their own risk.

In many cases where a high risk is indicated, less than 100% of the area will have a high hazard or risk.

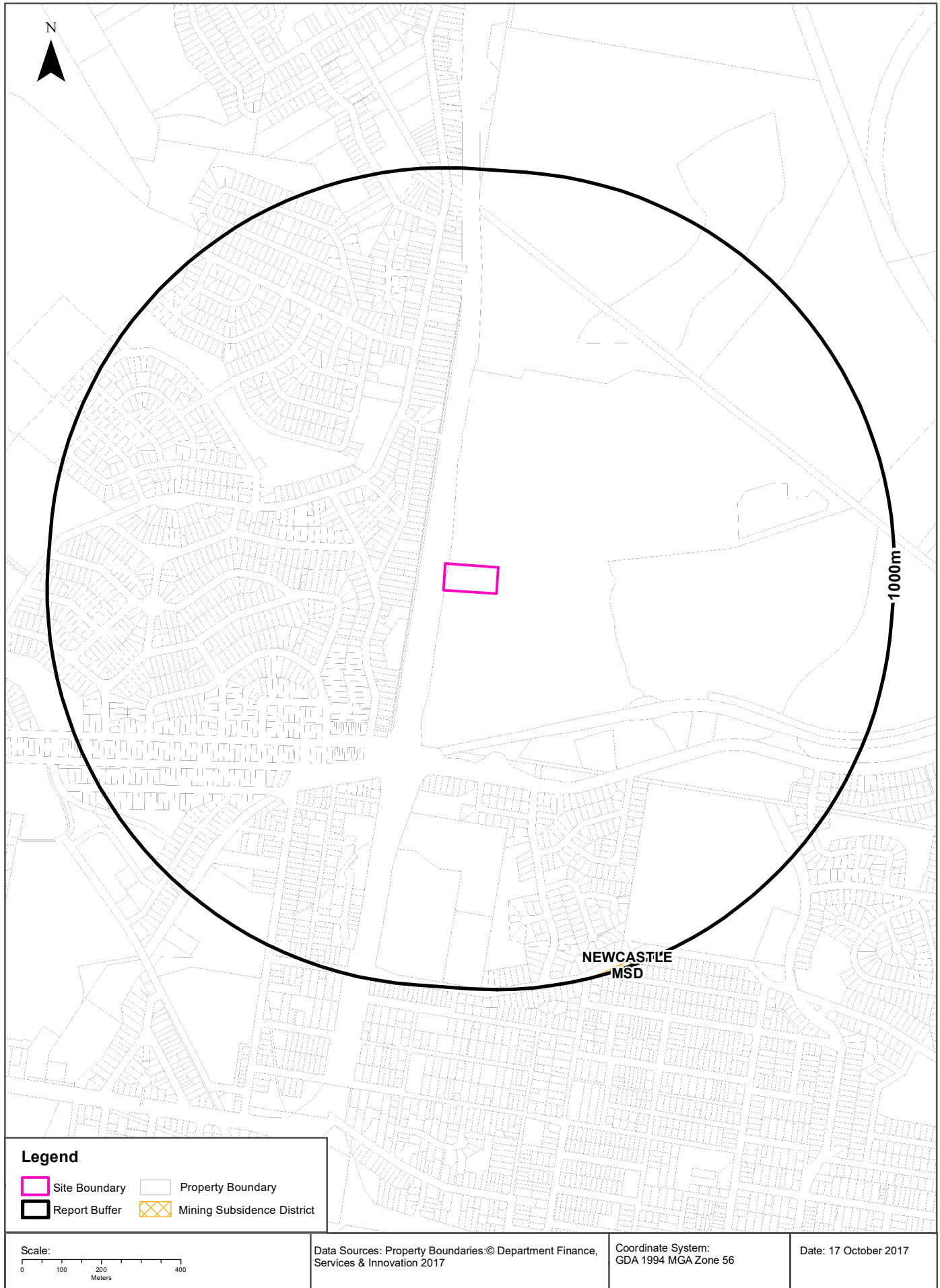
Dryland Salinity Potential of Western Sydney

Dryland Salinity Potential of Western Sydney within the dataset buffer?

Feature Id	Classification	Description	Distance	Direction
N/A	Outside Data Coverage			

Dryland Salinity Potential of Western Sydney Data Source : NSW Office of Environment and Heritage

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>



Mining Subsidence Districts

130 University Drive, Callaghan, NSW 2308

Mining Subsidence Districts

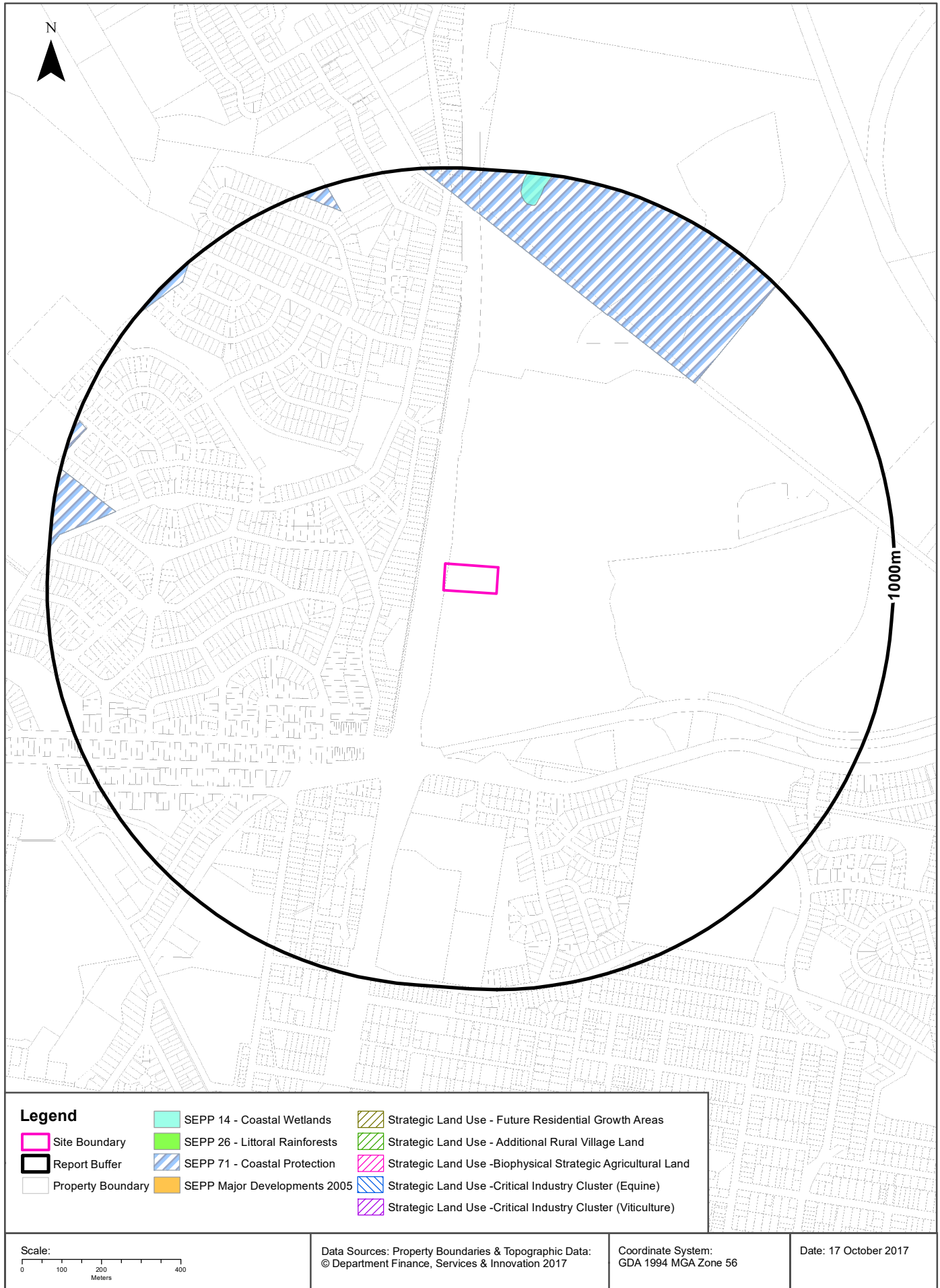
Mining Subsidence Districts within the dataset buffer:

District	Distance	Direction
NEWCASTLE	983m	South

Mining Subsidence District Data Source: © Land and Property Information (2016)
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

State Environmental Planning Policy

130 University Drive, Callaghan, NSW 2308



Environmental Zoning

130 University Drive, Callaghan, NSW 2308

State Environmental Planning Policy Protected Areas

Are there any State Environmental Planning Policy Protected Areas onsite or within the dataset buffer?

Dataset	Onsite	Within Site Buffer	Distance
SEPP14 - Coastal Wetlands	No	Yes	920m
SEPP26 - Littoral Rainforests	No	No	N/A
SEPP71 - Coastal Protection Zone	No	Yes	672m

SEPP Protected Areas Data Source: NSW Department of Planning & Environment
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

State Environmental Planning Policy Major Developments (2005)

State Environmental Planning Policy Major Developments within the dataset buffer:

Map Id	Feature	Effective Date	Distance	Direction
N/A	No records within buffer			

SEPP Major Development Data Source: NSW Department of Planning & Environment
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

State Environmental Planning Policy Strategic Land Use Areas

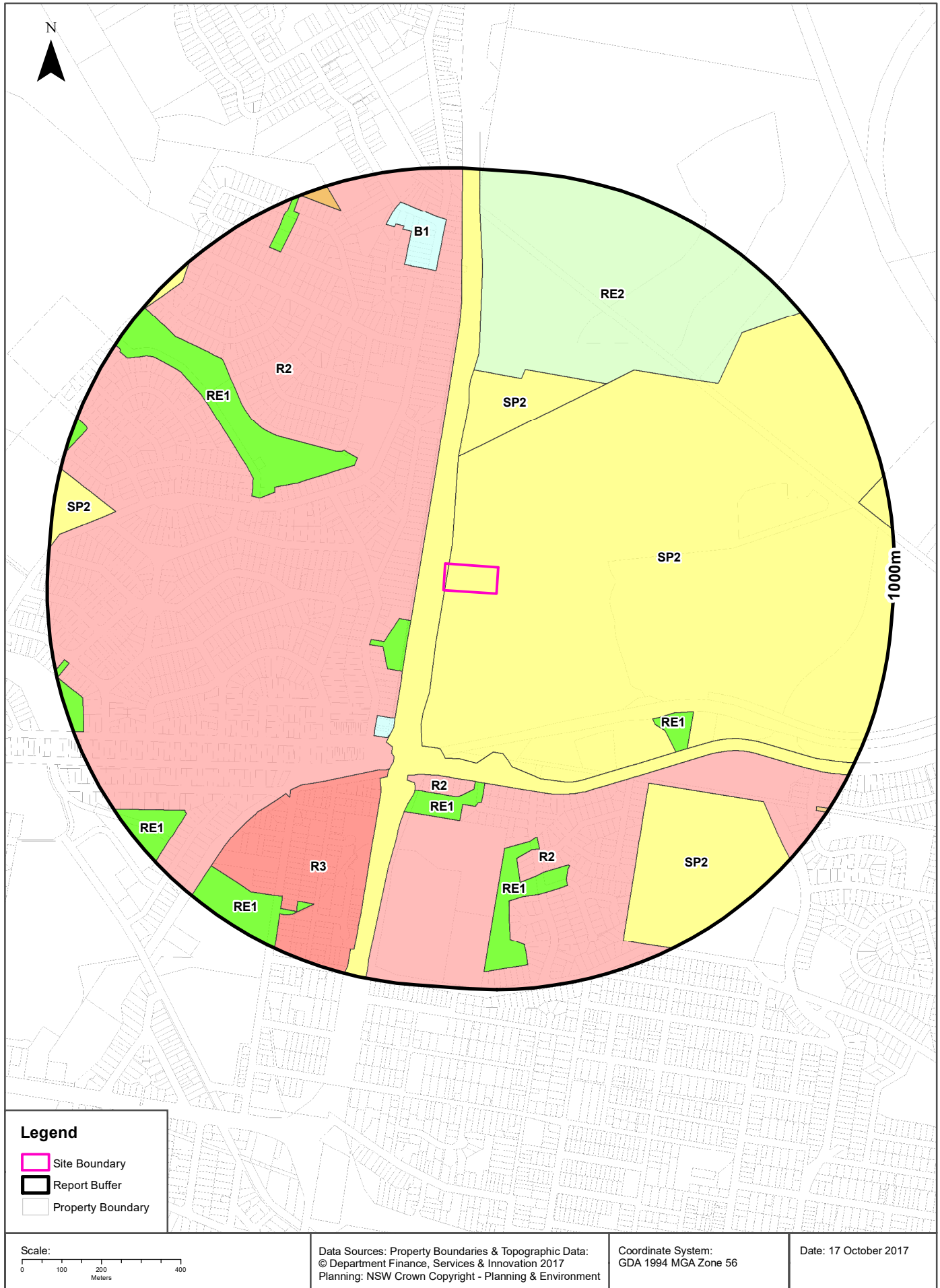
State Environmental Planning Policy Strategic Land Use Areas onsite or within the dataset buffer:

Strategic Land Use	SEPPNo	Effective Date	Amendment	Amendment Year	Distance	Direction
No records within buffer						

SEPP Strategic Land Use Data Source: NSW Department of Planning & Environment
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

LEP Planning Zones

130 University Drive, Callaghan, NSW 2308



Local Environmental Plan

130 University Drive, Callaghan, NSW 2308

Land Zoning

What Local Environmental Plan Land Zones exist within the dataset buffer?

Zone	Description	Purpose	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
SP2	Infrastructure	Educational Establishment	Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		0m	Onsite
SP2	Infrastructure	Classified Road	Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		0m	Onsite
R2	Low Density Residential		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		62m	North West
RE1	Public Recreation		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		113m	South West
SP2	Infrastructure	Educational Establishment	Newcastle Local Environmental Plan 2012	14/03/2014	14/03/2014	07/07/2017	Amendment No 4	273m	North
RE1	Public Recreation		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		339m	North West
B1	Neighbourhood Centre		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		345m	South West
R2	Low Density Residential		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		467m	South
R3	Medium Density Residential		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		472m	South West
RE1	Public Recreation		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		477m	South
R2	Low Density Residential		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		479m	South East
RE2	Private Recreation		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		481m	North East
RE1	Public Recreation		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		503m	South East
SP2	Infrastructure	Water Supply System	Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		612m	South East
RE1	Public Recreation		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		624m	South
B1	Neighbourhood Centre		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		741m	North
SP2	Infrastructure	Cemetery	Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		842m	West
RE1	Public Recreation		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		857m	South West
RE1	Public Recreation		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		891m	North West
SP2	Infrastructure	Electricity Transmission	Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		922m	East
E2	Environmental Conservation		Newcastle Local Environmental Plan 2012	01/03/2013	01/03/2013	07/07/2017	State Environmental Planning Policy Amendment (Minmi-Newcastle Link Road) 2013	930m	North West
RE1	Public Recreation		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		949m	West
RE1	Public Recreation		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		966m	West
E3	Environmental Management		Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		969m	South East
SP2	Infrastructure	Sewerage System	Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	07/07/2017		973m	North West

Local Environment Plan Data Source: NSW Crown Copyright - Planning & Environment

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Local Environmental Plan

130 University Drive, Callaghan, NSW 2308

Minimum Subdivision Lot Size

What are the onsite Local Environmental Plan Minimum Subdivision Lot Sizes?

Symbol	Minimum Lot Size	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Percentage of Site Area
No Data							

Maximum Height of Building

What are the onsite Local Environmental Plan Maximum Height of Buildings?

Symbol	Maximum Height of Building	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Percentage of Site Area
No Data							

Floor Space Ratio

What are the onsite Local Environmental Plan Floor Space Ratios?

Symbol	Floor Space Ratio	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Percentage of Site Area
No Data							

Land Application

What are the onsite Local Environmental Plan Land Applications?

Application Type	LEP or SEPP	Published Date	Commenced Date	Currency Date	Amendment	Percentage of Site Area
Included	Newcastle Local Environmental Plan 2012	31/05/2014	31/05/2014	31/05/2014	State Environmental Planning Policy Amendment (Newcastle) 2014	100

Land Reservation Acquisition

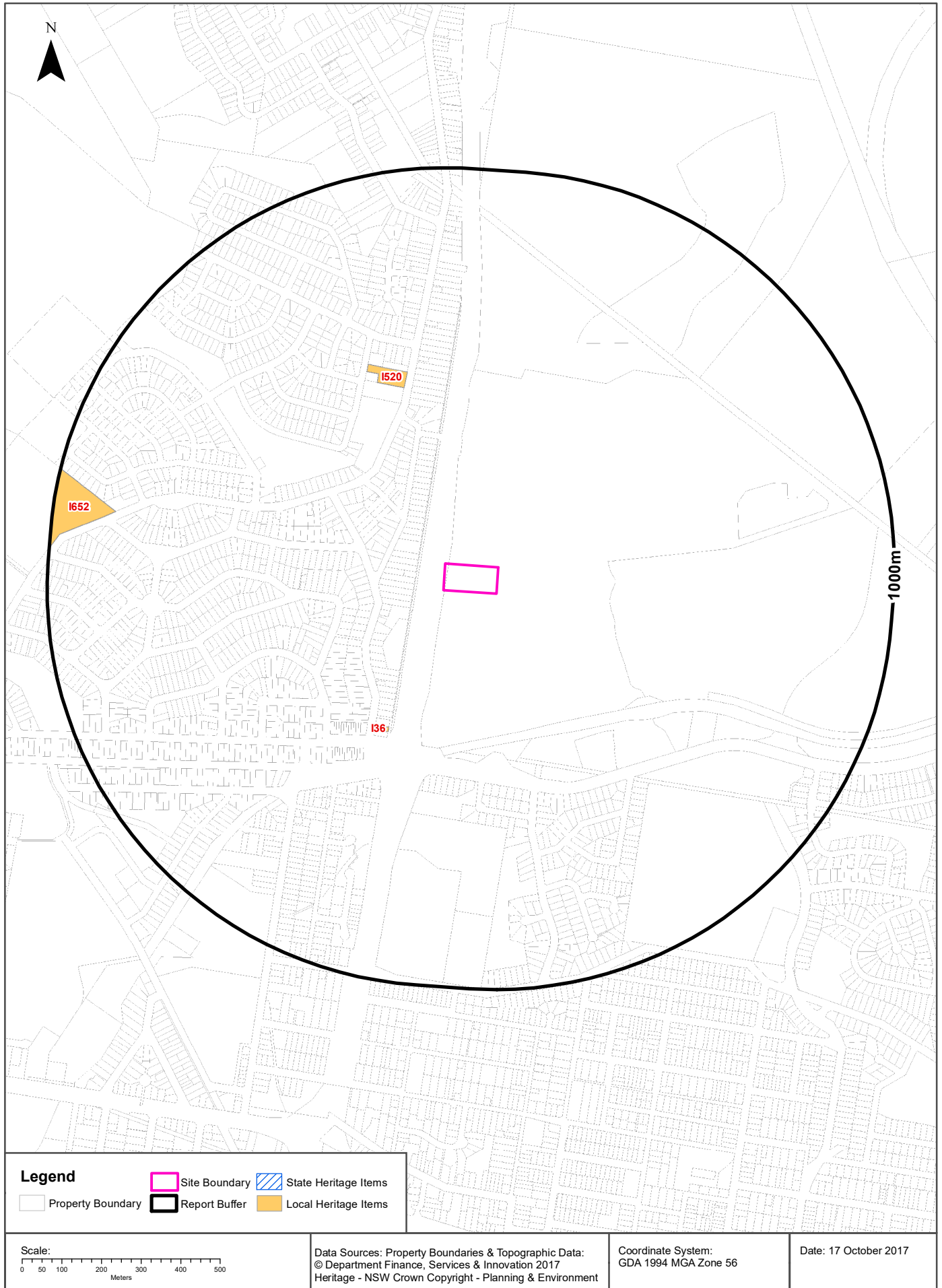
What are the onsite Local Environmental Plan Land Reservation Acquisitions?

Reservation	LEP	Published Date	Commenced Date	Currency Date	Amendment	Comments	Percentage of Site Area
No Data							

Local Environment Plan Data Source: NSW Crown Copyright - Planning & Environment
Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Heritage Items

130 University Drive, Callaghan, NSW 2308



Heritage

130 University Drive, Callaghan, NSW 2308

State Heritage Items

What are the State Heritage Items located within the dataset buffer?

Map Id	Name	Address	LGA	Listing Date	Listing No	Plan No	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: NSW Crown Copyright - Planning & Environment

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Local Heritage Items

What are the Local Heritage Items located within the dataset buffer?

Map Id	Name	Classification	Significance	LEP or Act	Published Date	Commenced Date	Currency Date	Distance	Direction
I36	The Regal Cinema	Item - General	Local	Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	11/07/2016	372m	South West
I520	Uniting Church	Item - General	Local	Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	11/07/2016	457m	North
I652	Wallsend General Cemetery	Item - General	Local	Newcastle Local Environmental Plan 2012	15/06/2012	15/06/2012	11/07/2016	842m	West

Heritage Data Source: NSW Crown Copyright - Planning & Environment

Creative Commons 3.0 © Commonwealth of Australia <http://creativecommons.org/licenses/by/3.0/au/deed.en>

Natural Hazards - Bush Fire Prone Land

130 University Drive, Callaghan, NSW 2308



Natural Hazards

130 University Drive, Callaghan, NSW 2308

Bush Fire Prone Land

What are the nearest Bush Fire Prone Land Categories that exist within the dataset buffer?

Bush Fire Prone Land Category	Distance	Direction
Vegetation Buffer	0m	Onsite
Vegetation Category 1	3m	North East
Vegetation Category 2	610m	South East

NSW Bush Fire Prone Land - © NSW Rural Fire Service under Creative Commons 4.0 International Licence

Ecological Constraints - Vegetation & RAMSAR Wetlands

130 University Drive, Callaghan, NSW 2308



Ecological Constraints

130 University Drive, Callaghan, NSW 2308

Lower Hunter and Central Coast Regional Vegetation Survey

What vegetation from the Lower Hunter and Central Coast Regional Survey exists within the dataset buffer?

Map id	Unit Desc	Canopy Code	Canopy Cover	Species	Distance	Direction
15	Coastal Foothills Spotted Gum - Ironbark Forest	OF	Mid Dense (Open Forest) 50- <100% cover	C. maculata / E. umbra / E. siderophloia	0m	Onsite
15	Coastal Foothills Spotted Gum - Ironbark Forest	W	Wetland	C. maculata / E. umbra / E. siderophloia	532m	North East
30	Coastal Plains Smooth-barked Apple Woodland	OF	Mid Dense (Open Forest) 50- <100% cover	A. costata / C. gummifera / E. capitellata / E. umbra	633m	South East
46	Freshwater Wetland Complex	W	Wetland	Ludwigia peploides subsp montevidensis / Paspalum distichum / Eleocharis sphacelata / Juncus usitatus	714m	North East
46	Freshwater Wetland Complex	OF	Mid Dense (Open Forest) 50- <100% cover	Ludwigia peploides subsp montevidensis / Paspalum distichum / Eleocharis sphacelata / Juncus usitatus	776m	North East
30	Coastal Plains Smooth-barked Apple Woodland	WO	Sparse (Woodland) 20-<50% cover	A. costata / C. gummifera / E. capitellata / E. umbra	909m	South East

Lower Hunter and Central Coast Regional Vegetation Survey: NSW Office of Environment and Heritage

RAMSAR Wetlands

What RAMSAR Wetland areas exist within the dataset buffer?

Map Id	RAMSAR Name	Wetland Name	Designation Date	Source	Distance	Direction
N/A	No records in buffer					

RAMSAR Wetlands Data Source: © Commonwealth of Australia - Department of Environment

Ecological Constraints

130 University Drive, Callaghan, NSW 2308

ATLAS of NSW Wildlife

Endangered & Vulnerable Species on the ATLAS of NSW Wildlife database, within 10km of the site?

Class	Family	Scientific	Common	Exotic	NSW Status	Commonwealth Status
Amphibia	Hylidae	<i>Litoria aurea</i>	Green and Golden Bell Frog	No	Endangered, Protected	Vulnerable
Aves	Accipitridae	<i>Circus assimilis</i>	Spotted Harrier	No	Vulnerable, Protected	
Aves	Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	No	Vulnerable, Protected	CAMBA
Aves	Accipitridae	<i>Hieraaetus morphnoides</i>	Little Eagle	No	Vulnerable, Protected	
Aves	Accipitridae	<i>Lophoictinia isura</i>	Square-tailed Kite	No	Vulnerable, Protected, Category 3 Sensitive Species	
Aves	Accipitridae	<i>Pandion cristatus</i>	Eastern Osprey	No	Vulnerable, Protected, Category 3 Sensitive Species	
Aves	Anatidae	<i>Oxyura australis</i>	Blue-billed Duck	No	Vulnerable, Protected	
Aves	Anatidae	<i>Stictonetta naevosa</i>	Freckled Duck	No	Vulnerable, Protected	
Aves	Anseranatidae	<i>Anseranas semipalmata</i>	Magpie Goose	No	Vulnerable, Protected	
Aves	Ardeidae	<i>Botaurus poiciloptilus</i>	Australasian Bittern	No	Endangered, Protected	Endangered
Aves	Ardeidae	<i>Ixobrychus flavicollis</i>	Black Bittern	No	Vulnerable, Protected	
Aves	Artamidae	<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	No	Vulnerable, Protected	
Aves	Burhinidae	<i>Burhinus grallarius</i>	Bush Stone-curlew	No	Endangered, Protected	
Aves	Cacatuidae	<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	No	Vulnerable, Protected, Category 3 Sensitive Species	
Aves	Cacatuidae	<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo	No	Vulnerable, Protected, Category 2 Sensitive Species	
Aves	Charadriidae	<i>Charadrius leschenaultii</i>	Greater Sand-plover	No	Vulnerable, Protected	V,C,J,K
Aves	Charadriidae	<i>Charadrius mongolus</i>	Lesser Sand-plover	No	Vulnerable, Protected	E,C,J,K
Aves	Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	No	Endangered, Protected	
Aves	Climacteridae	<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	No	Vulnerable, Protected	
Aves	Columbidae	<i>Ptilinopus magnificus</i>	Wompoo Fruit-Dove	No	Vulnerable, Protected	
Aves	Columbidae	<i>Ptilinopus regina</i>	Rose-crowned Fruit-Dove	No	Vulnerable, Protected	
Aves	Columbidae	<i>Ptilinopus superbus</i>	Superb Fruit-Dove	No	Vulnerable, Protected	
Aves	Diomedidae	<i>Diomedea exulans</i>	Wandering Albatross	No	Endangered, Protected	E,J
Aves	Estrildidae	<i>Stagonopleura guttata</i>	Diamond Firetail	No	Vulnerable, Protected	
Aves	Falconidae	<i>Falco subniger</i>	Black Falcon	No	Vulnerable, Protected	
Aves	Haematopodidae	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	No	Vulnerable, Protected	
Aves	Haematopodidae	<i>Haematopus longirostris</i>	Pied Oystercatcher	No	Endangered, Protected	
Aves	Jacanidae	<i>Irediparra gallinacea</i>	Comb-crested Jacana	No	Vulnerable, Protected	
Aves	Laridae	<i>Sternula albifrons</i>	Little Tern	No	Endangered, Protected	CAMBA, JAMBA, ROKAMBA
Aves	Meliphagidae	<i>Anthochaera phrygia</i>	Regent Honeyeater	No	Critically Endangered Species, Protected	Critically Endangered

Class	Family	Scientific	Common	Exotic	NSW Status	Commonwealth Status
Aves	Meliphagidae	Epthianura albifrons	White-fronted Chat	No	Vulnerable, Protected	
Aves	Neosittidae	Daphoenositta chrysoptera	Varied Sittella	No	Vulnerable, Protected	
Aves	Petroicidae	Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	No	Vulnerable, Protected	
Aves	Petroicidae	Petroica boodang	Scarlet Robin	No	Vulnerable, Protected	
Aves	Pomatostomidae	Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	No	Vulnerable, Protected	
Aves	Procellariidae	Ardenna carneipes	Flesh-footed Shearwater	No	Vulnerable, Protected	J,K
Aves	Procellariidae	Macronectes giganteus	Southern Giant Petrel	No	Endangered, Protected	Endangered
Aves	Procellariidae	Pterodroma solandri	Providence Petrel	No	Vulnerable, Protected	JAMBA
Aves	Psittacidae	Glossopsitta pusilla	Little Lorikeet	No	Vulnerable, Protected	
Aves	Psittacidae	Lathamus discolor	Swift Parrot	No	Endangered, Protected, Category 3 Sensitive Species	Critically Endangered
Aves	Psittacidae	Neophema pulchella	Turquoise Parrot	No	Vulnerable, Protected, Category 3 Sensitive Species	
Aves	Rostratulidae	Rostratula australis	Australian Painted Snipe	No	Endangered, Protected	Endangered
Aves	Scolopacidae	Calidris ferruginea	Curlw Sandpiper	No	Endangered, Protected	CE,C,J,K
Aves	Scolopacidae	Calidris tenuirostris	Great Knot	No	Vulnerable, Protected	CE,C,J,K
Aves	Scolopacidae	Limicola falcinellus	Broad-billed Sandpiper	No	Vulnerable, Protected	CAMBA, JAMBA, ROKAMBA
Aves	Scolopacidae	Limosa limosa	Black-tailed Godwit	No	Vulnerable, Protected	CAMBA, JAMBA, ROKAMBA
Aves	Scolopacidae	Xenus cinereus	Terek Sandpiper	No	Vulnerable, Protected	CAMBA, JAMBA, ROKAMBA
Aves	Strigidae	Ninox connivens	Barking Owl	No	Vulnerable, Protected, Category 3 Sensitive Species	
Aves	Strigidae	Ninox strenua	Powerful Owl	No	Vulnerable, Protected, Category 3 Sensitive Species	
Aves	Sulidae	Sula dactylatra	Masked Booby	No	Vulnerable, Protected	J,K
Aves	Tytonidae	Tyto longimembris	Eastern Grass Owl	No	Vulnerable, Protected, Category 3 Sensitive Species	
Aves	Tytonidae	Tyto novaehollandiae	Masked Owl	No	Vulnerable, Protected, Category 3 Sensitive Species	
Aves	Tytonidae	Tyto tenebricosa	Sooty Owl	No	Vulnerable, Protected, Category 3 Sensitive Species	
Mammalia	Balaenopteridae	Megaptera novaeangliae	Humpback Whale	No	Vulnerable, Protected	Vulnerable
Mammalia	Dasyuridae	Phascogale tapoatafa	Brush-tailed Phascogale	No	Vulnerable, Protected	
Mammalia	Dugongidae	Dugong dugon	Dugong	No	Endangered, Protected	
Mammalia	Emballonuridae	Saccolaimus flaviventris	Yellow-bellied Sheath-tail-bat	No	Vulnerable, Protected	
Mammalia	Molossidae	Mormopterus norfolkensis	Eastern Freetail-bat	No	Vulnerable, Protected	
Mammalia	Otariidae	Arctocephalus forsteri	New Zealand Fur-seal	No	Vulnerable, Protected	
Mammalia	Petauridae	Petaurus norfolcensis	Squirrel Glider	No	Vulnerable, Protected	
Mammalia	Phascolarctidae	Phascolarctos cinereus	Koala	No	Vulnerable, Protected	Vulnerable
Mammalia	Pteropodidae	Pteropus poliocephalus	Grey-headed Flying-fox	No	Vulnerable, Protected	Vulnerable
Mammalia	Vespertilionidae	Chalinolobus dwyeri	Large-eared Pied Bat	No	Vulnerable, Protected	Vulnerable
Mammalia	Vespertilionidae	Falsistrellus tasmaniensis	Eastern False Pipistrelle	No	Vulnerable, Protected	
Mammalia	Vespertilionidae	Miniopterus australis	Little Bentwing-bat	No	Vulnerable, Protected	

Class	Family	Scientific	Common	Exotic	NSW Status	Commonwealth Status
Mammalia	Vespertilionidae	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	No	Vulnerable, Protected	
Mammalia	Vespertilionidae	Myotis macropus	Southern Myotis	No	Vulnerable, Protected	
Mammalia	Vespertilionidae	Scoteanax rueppellii	Greater Broad-nosed Bat	No	Vulnerable, Protected	
Mammalia	Vespertilionidae	Vespadelus troughtoni	Eastern Cave Bat	No	Vulnerable, Protected	
Reptilia	Cheloniidae	Chelonia mydas	Green Turtle	No	Vulnerable, Protected	Vulnerable
Flora	Apocynaceae	Cynanchum elegans	White-flowered Wax Plant	No	Endangered, Protected	Endangered
Flora	Asteraceae	Rutidosis heterogama	Heath Wrinklewort	No	Vulnerable, Protected	Vulnerable
Flora	Elaeocarpaceae	Tetratheca glandulosa		No	Vulnerable, Protected	
Flora	Elaeocarpaceae	Tetratheca juncea	Black-eyed Susan	No	Vulnerable, Protected	Vulnerable
Flora	Fabaceae (Faboideae)	Pultenaea maritima	Coast Headland Pea	No	Vulnerable, Protected	
Flora	Juncaginaceae	Maundia triglochinos		No	Vulnerable, Protected	
Flora	Myrtaceae	Angophora inopina	Charmhaven Apple	No	Vulnerable, Protected	Vulnerable
Flora	Myrtaceae	Callistemon linearifolius	Netted Bottle Brush	No	Vulnerable, Protected, Category 3 Sensitive Species	
Flora	Myrtaceae	Eucalyptus parramattensis subsp. decadens		No	Vulnerable, Protected	Vulnerable
Flora	Myrtaceae	Melaleuca biconvexa	Biconvex Paperbark	No	Vulnerable, Protected	Vulnerable
Flora	Myrtaceae	Syzygium paniculatum	Magenta Lilly Pilly	No	Endangered, Protected	Vulnerable
Flora	Orchidaceae	Diuris praecox	Rough Doubletail	No	Vulnerable, Protected, Category 2 Sensitive Species	Vulnerable
Flora	Orobanchaceae	Euphrasia arguta		No	Critically Endangered Species, Protected	Critically Endangered
Flora	Polygonaceae	Muehlenbeckia costata	Scrambling Lignum	No	Vulnerable, Protected	
Flora	Proteaceae	Grevillea parviflora subsp. parviflora	Small-flower Grevillea	No	Vulnerable, Protected	Vulnerable
Flora	Proteaceae	Grevillea shiressii		No	Vulnerable, Protected	Vulnerable
Flora	Zannichelliaceae	Zannichellia palustris		No	Endangered, Protected	

Data does not include records not defined as either endangered or vulnerable, and category 1 sensitive species are also excluded. NSW Office of Environment and Heritage's Atlas of NSW Wildlife, which holds data from a number of custodians. Data obtained 16/10/2017

USE OF REPORT – APPLICABLE TERMS

The following terms apply to any person (End User) who is given the Report by the person who purchased the Report from Lotsearch Pty Ltd (ABN: 89 600 168 018) (Lotsearch) or who otherwise has access to the Report. The contract terms that apply between Lotsearch and the purchaser of the Report are specified in the order form pursuant to which the Report was ordered and the terms set out below are of no effect as between Lotsearch and the purchaser of the Report.

1. End User acknowledges and agrees that:
 - (a) the Report is compiled from or using content (**Third Party Content**) which is comprised of:
 - (i) content provided to Lotsearch by third party content suppliers with whom Lotsearch has contractual arrangements or content which is freely available (**Third Party Content Suppliers**);
 - (j) content which is derived from content described in paragraph (i);
 - (b) Lotsearch does not take any responsibility for or give any warranty in relation to the accuracy or completeness of any Third Party Content included in the Report;
 - (c) the Third Party Content Suppliers do not constitute an exhaustive set of all repositories or sources of information available in relation to the property which is the subject of the Report (**Property**);
 - (d) Lotsearch has not undertaken any physical inspection of the property;
 - (e) Lotsearch does not warrant that all land uses or features whether past or current are identified in the Report;
 - (f) the Report does not include any information relating to the actual state or condition of the Property;
 - (g) the Report should not be used or taken to indicate or exclude actual fitness or unfitness of a Property for any particular purpose;
 - (h) the Report should not be relied upon for determining saleability or value or making any other decisions in relation to the Property and in particular should not be taken to be a rating or assessment of the desirability or market value of the property or its features; and
 - (i) the End User should undertake its own inspections of the Property to satisfy itself that there are no defects or failures.
2. The End User may not make the Report or any copies or extracts of the report or any part of it available to any other person. If End User wishes to provide the Report to any other person or make extracts or copies of the Report, it must contact the purchaser of the Report before doing so to ensure the proposed use is consistent with the contract terms between Lotsearch and the purchaser.
3. Neither Lotsearch (nor any of its officers, employees or agents) nor any of its Third Party Content Suppliers will have any liability to End User or any person to whom End User provides the Report and End User must not represent that Lotsearch or any of its Third Party Content Suppliers accepts liability to any such person or make any other representation to any such person on behalf of Lotsearch or any Third Party Content Supplier.
4. End User must not remove any copyright notices, trade marks, digital rights management information, other embedded information, disclaimers or limitations from the Report or authorise any person to do so.
5. End User acknowledges and agrees that Lotsearch and Third Party Content Suppliers retain ownership of all copyright, patent, design right (registered or unregistered), trade marks (registered or unregistered), database right or other data right, moral right or know how or any other intellectual property right in any Report or any other item, information or data included in or provided as part of a Report.
6. To the extent permitted by law and subject to paragraph 7, all implied terms, representations and warranties whether statutory or otherwise relating to the subject matter of these terms other than as expressly set out in these terms are excluded.
7. Subject to paragraph 8, Lotsearch excludes liability to End User for loss or damage of any kind, however caused, due to Lotsearch's negligence, breach of contract, breach of any law, in equity, under indemnities or otherwise, arising out of all acts, omissions and events whenever occurring.
8. Lotsearch acknowledges that if, under applicable State, Territory or Commonwealth law, End User is a consumer certain rights may be conferred on End User which cannot be excluded, restricted or modified. If so, and if that law applies to Lotsearch, then, Lotsearch's liability is limited to the greater of an amount equal to the cost of resupplying the Report and the maximum extent permitted under applicable laws.
9. Subject to paragraph 7, neither Lotsearch nor the End User is liable to the other for any indirect, incidental, consequential, special or exemplary damages arising out of or in relation to these terms.
10. These terms are subject to New South Wales law.

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

E

TILTE SEARCH

ADVANCE LEGAL SEARCHERS PTY LTD

(ACN 147 943 842)

ABN 82 147 943 842

18/36 Osborne Road,
Manly NSW 2095

Telephone: +612 9977 6713

Mobile: 0412 169 809

Email: search@alsearchers.com.au

24th October 2017

LOTSEARCH PTY LTD
Level 3, 68 Alfred Street,
MILSONS POINT, NSW 2061

Attention: Howard Waldron,

RE: 130 University Drive,
Callaghan
Reference: LS002209

Note: Historical Search is of part Lot 1 DP 1188100, being part indicated in site diagram.

Current Search

Folio Identifier 1/1188100 (title attached)

DP 1188100 (plan attached)

Dated 23rd October 2017

Registered Proprietor:

THE UNIVERSITY OF NEWCASTLE

Title Tree
Lot 1 DP 1188100

Folio Identifier 1/1188100

Folio Identifier 7/804087

Folio Identifier 11/531665

Certificate of Title Volume 11573 Folio 117

Certificate of Title Volume 9812 Folio 210

PA 43800

Government Gazette 18th January 1963

Government Gazette 29th October 1954

Crown Land

G. 1
NEW SOUTH WALES

CERTIFICATE OF TITLE
PROPERTY ACT, 1900, as amended.



Application No. 43800

Vol. 9812 Fol. 210

CANCELLED W 21-9-1964
1st Edition issued 21-9-1964



EH

(Page 1) Vol. 9812 Fol. 210

I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

Witness



ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lots 2, 3 and 4 in Deposited Plan 216528 at Shortland in the City of Newcastle Parish of Newcastle and County of Northumberland. Excepting thereout the minerals specified by Section 141 of the Public Works Act, 1912.

Registrar General.

FIRST SCHEDULE (continued overleaf)

THE MINISTER OF EDUCATION.


Registrar General.

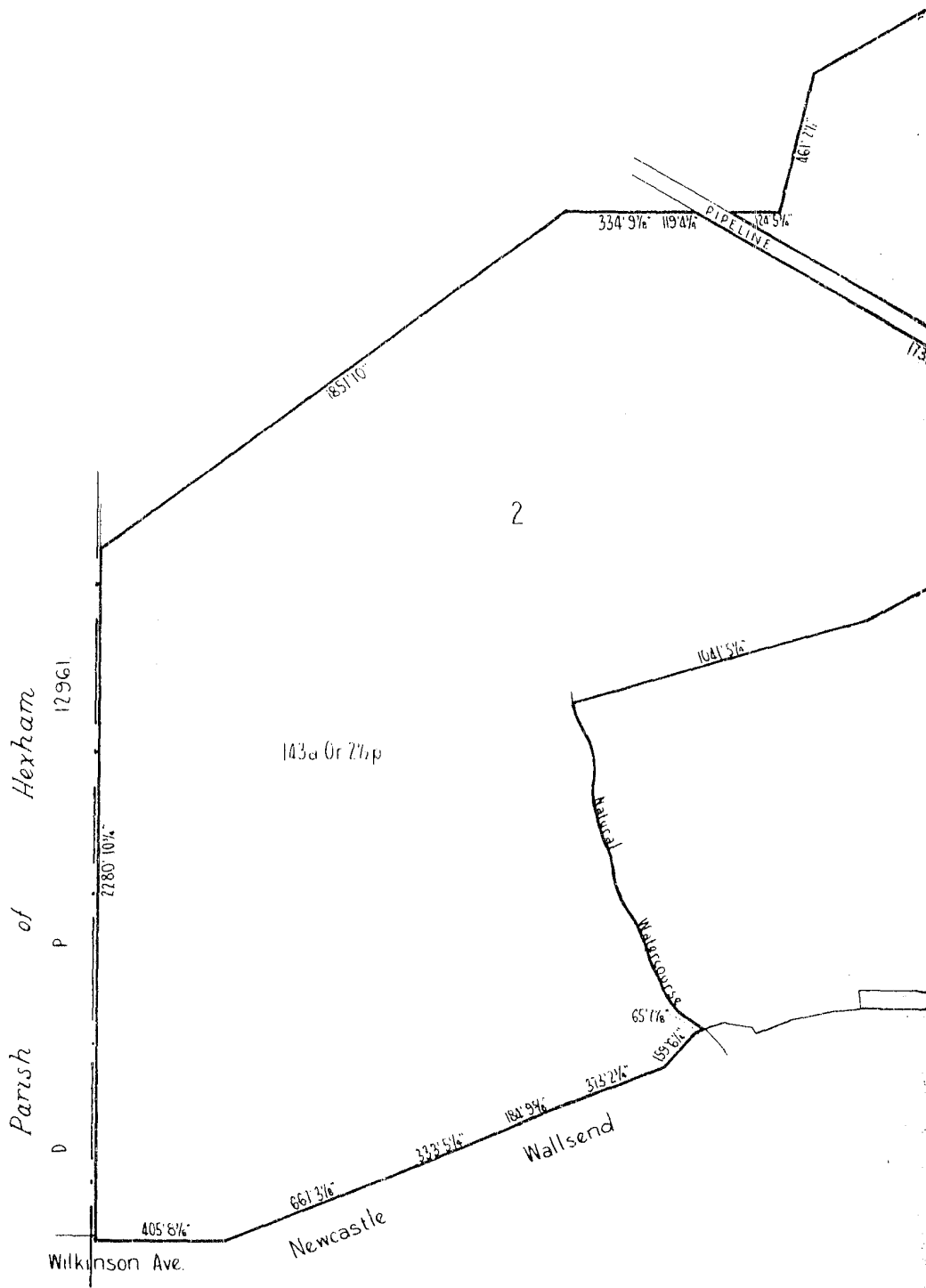
SECOND SCHEDULE (continued overleaf)

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

20941:52(25)

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

PLAN SHOWING LOCAL



DP216528 M.M.K.

Total Area 235a.0r39 1/2p.
Scale 400 feet to one inch

11573 Fol 117
(Page 1) Vol.

NEW SOUTH WALES

STATE OF NEW SOUTH WALES
REGISTRY OF LANDS
REGISTRATION ACT, 1900, as amended.



11573117

Appln. No. 43800

Prior Title Vol. 9812 Fol. 210

Vol. 11573 Fol. 117
~~CANCELLED~~
Edition issued 23-4-1971
DEPOSITED PLAN 531665



SEE AUTO FOLIO

I certify that the person described in the First Schedule is the registered proprietor of the undermentioned estate in the land within described subject nevertheless to such exceptions encumbrances and interests as are shown in the Second Schedule.

Witness *Barnes*

Jawatson
Registrar General.



GRN

ESTATE AND LAND REFERRED TO

Estate in Fee Simple in Lot 11 in Deposited Plan 531665 and Lots 3 and 4 in Deposited Plan 216528 at Shortland in the City of Newcastle Parish of Newcastle and County of Northumberland being land for which no Crown Grant has issued. EXCEPTING THEREOUT the minerals specified by Section 141 of the Public Works Act, 1912.

FIRST SCHEDULE

* THE UNIVERSITY OF NEWCASTLE.

XC

Jawatson
Registrar General.

SECOND SCHEDULE

CV 1. Covenant created by Transfer No. M110023² as regards Lot 11 in Deposited Plan 531665.

Jawatson
Registrar General.

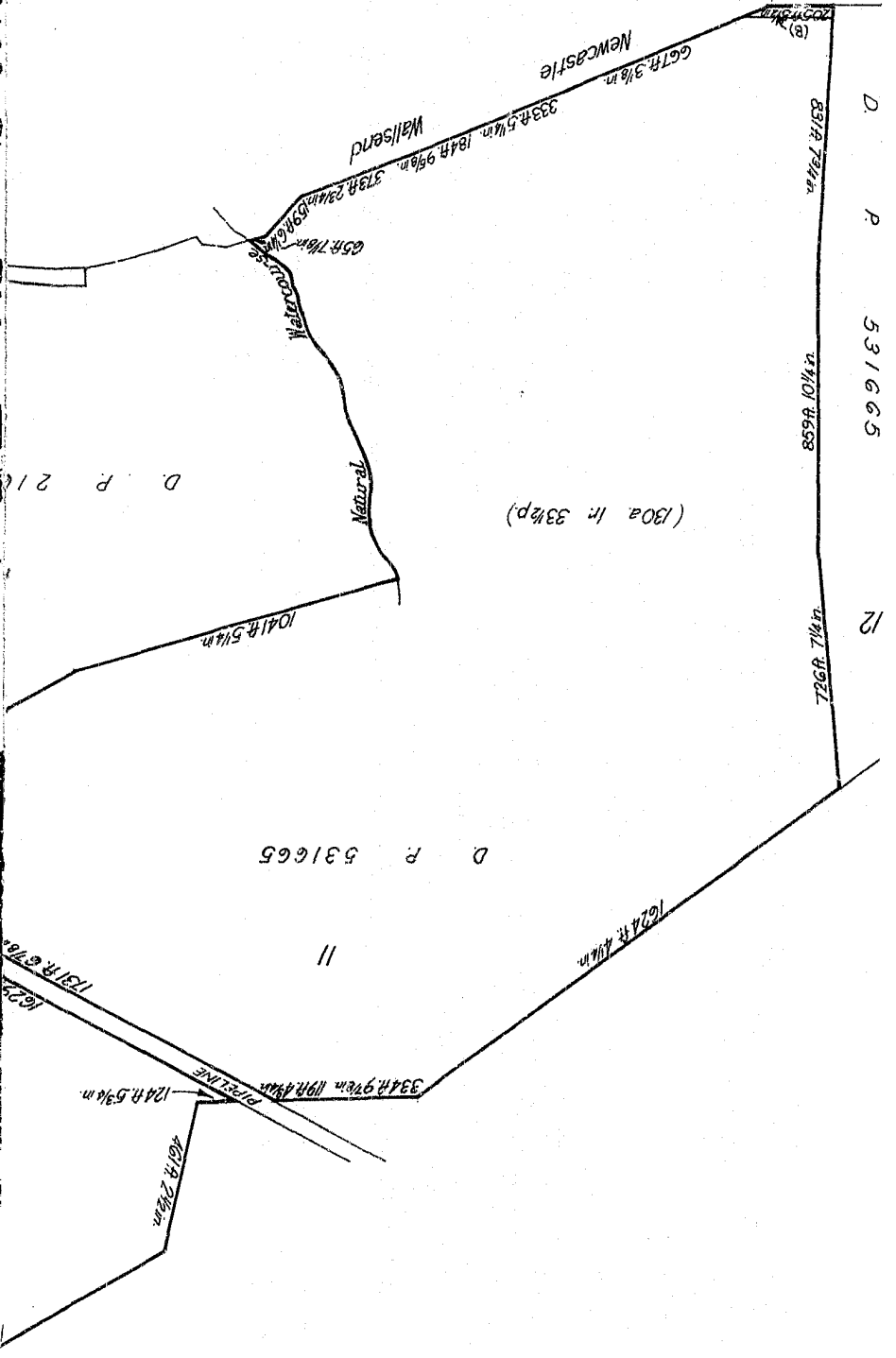
~~CANCELLED~~

WARNING: THIS DOCUMENT MUST NOT BE REMOVED FROM THE LAND TITLES OFFICE.

D P 531665

Scale: 400 feet

Total Area: 222a



Total Area: 222a

Plan Showing Location of

FIRST SCHEDULE (continued)

REGISTERED PROPRIETOR

Registrar General

2247160 LEASE TO COMMONWEALTH SAVINGS BANK OF AUSTRALIA OF THE COMMONWEALTH BANK BUILDING. BETWEEN THE NORTHERN END OF THE McMULLIN BUILDING AND THE DRAMA STUDIO. WITH ADJACENT CARPARK SPACES AT THE UNIVERSITY OF NEWCASTLE, SHORTLAND. EXPIRES 31.12.1991. REGISTERED 24.10.1990.



G.L.

SEE INTO 1000

SECOND SCHEDULE (continued)

PARTICULARS

Registrar General

CANCELLATION

PARTICULARS	Registrar General	CANCELLATION

NOTATIONS AND UNREGISTERED DEALINGS

--	--	--

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

FIRST SCHEDULE (continued)	
REGISTERED PROPRIETOR	Registrar General
<p style="font-size: 2em; opacity: 0.5;">CANCELLED</p>	

SECOND SCHEDULE (continued)		
PARTICULARS	Registrar General	CANCELLATION

NOTATIONS AND UNREGISTERED DEALINGS		

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

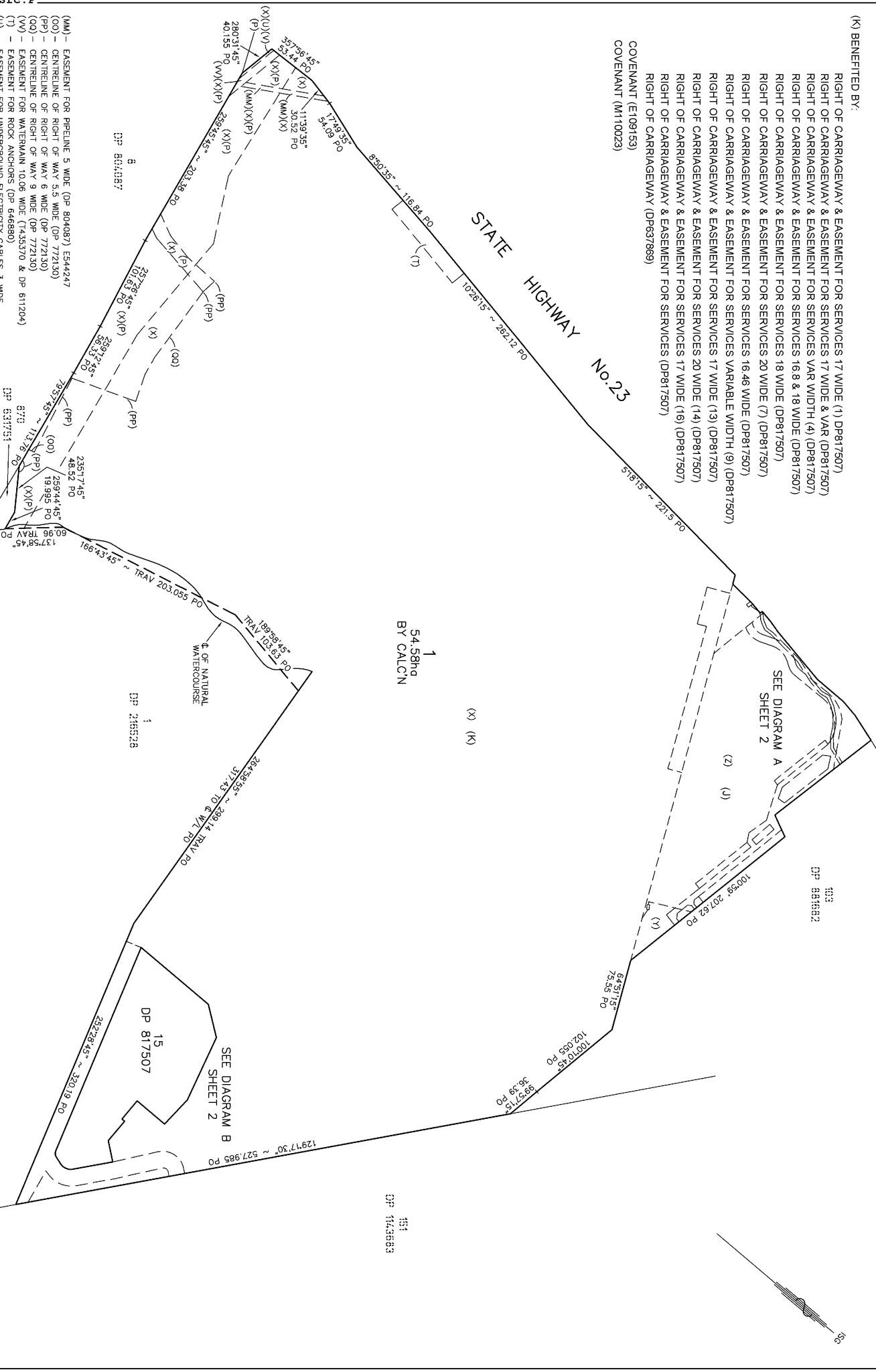
Ref:advlgs / Src:P

PLAN FORM 2 (A2)

WARNING: CREAMING OR FOLDING WILL LEAD TO REFLECTION

Sheet 1 of 2 sheets

- (K) BENEFITED BY:
- RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 17 WIDE (1) (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 17 WIDE & VAR (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES VAR WIDTH (4) (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 16.8 & 18 WIDE (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 18 WIDE (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 20 WIDE (7) (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 16.46 WIDE (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES VARIABLE WIDTH (9) (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 17 WIDE (13) (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 20 WIDE (14) (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 17 WIDE (16) (DP817507)
 - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES (DP817507)
 - RIGHT OF CARRIAGEWAY (DP837869)
 - COVENANT (E109153)
 - COVENANT (M110023)



- (MM) - EASEMENT FOR PRELINE 5 WIDE (DP 804087) E544247
- (OO) - CENTRELINE OF RIGHT OF WAY 5.5 WIDE (DP 772130)
- (PP) - CENTRELINE OF RIGHT OF WAY 6 WIDE (DP 772130)
- (QQ) - CENTRELINE OF RIGHT OF WAY 9 WIDE (DP 772130)
- (VV) - EASEMENT FOR WATERMAIN 10.06 WIDE (1453370 & DP 811204)
- (TT) - EASEMENT FOR ROCK ANCHORS (DP 646880)
- (U) - EASEMENT FOR UNDERGROUND ELECTRICITY CABLES 3 WIDE AND VARIABLE (DP 265379)
- (Y) - EASEMENT FOR GAS PIPELINE 3 WIDE AND VARIABLE (DP 265379)
- (X) - LAND EXCLUDES MINERALS (S.141 PUBLIC WORKS ACT 1912)
- (Z) - LAND EXCLUDES MINERALS - SEE BK 1210 No.935
- (2) - LAND EXCLUDES MINERALS - SEE BK 1210 No.935

Surveyor: BENJAMEN JOHN BELFIELD
 Date of Survey: 07/03/2012
 Surveyor's Ref: 1022TJPA 2012.M7100 (126) COMP

PLAN OF CONSOLIDATION OF LOT 101 DP 881682 & LOT 16 DP 817507

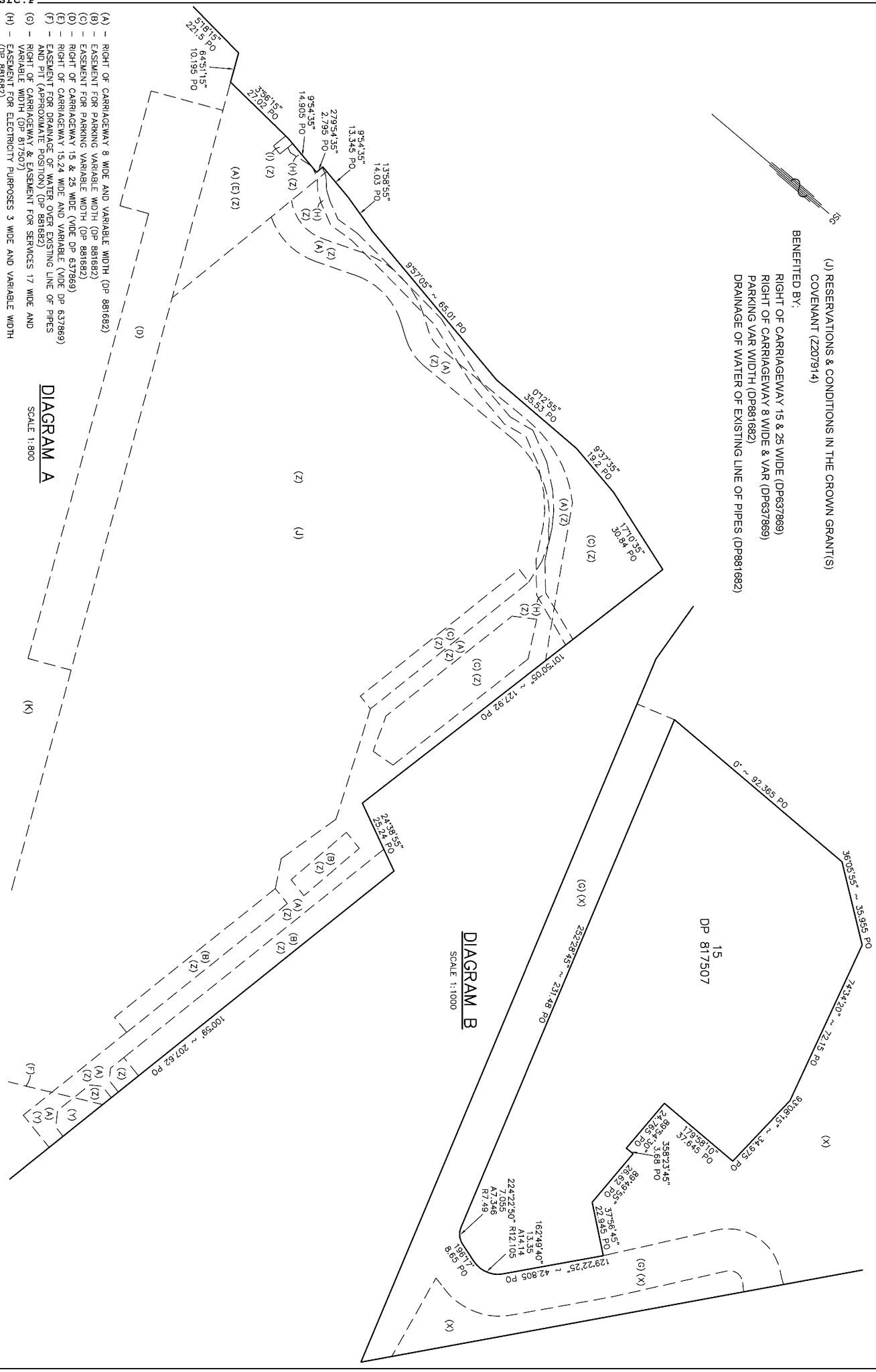
LGA: NEWCASTLE
 Locality: CALLAGHAN / SHORTLAND
 Subdivision No: -

Registered
 15.8.2013

DP1188100

10	20	30	40	50	60	70	80	90	100	110	120	130	140
Scale of mm													

(J) RESERVATIONS & CONDITIONS IN THE CROWN GRANT(S)
 COVENANT (Z207914)
 BENEFITED BY:
 RIGHT OF CARRIAGEWAY 15 & 25 WIDE (DP637869)
 RIGHT OF CARRIAGEWAY 8 WIDE & VAR (DP637869)
 PARKING VAR WIDTH (DP681682)
 DRAINAGE OF WATER OF EXISTING LINE OF PIPES (DP681682)



- (A) - RIGHT OF CARRIAGEWAY 8 WIDE AND VARIABLE WIDTH (DP 881682)
- (B) - EASEMENT FOR PARKING VARIABLE WIDTH (DP 881682)
- (C) - EASEMENT FOR PARKING VARIABLE WIDTH (DP 881682)
- (D) - RIGHT OF CARRIAGEWAY 15 & 25 WIDE (VDE DP 637869)
- (E) - RIGHT OF CARRIAGEWAY 15,24 WIDE AND VARIABLE (VDE DP 637869)
- (F) - EASEMENT FOR DRAINAGE OF WATER OVER EXISTING LINE OF PIPES AND PIT (APPROXIMATE POSITION) (DP 881682)
- (G) - RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 17 WIDE AND (DP 881682)
- (H) - EASEMENT FOR TRANSMISSION LINE (DP 648697) (0291562) AND ACCESS THERETO VARIABLE WIDTH
- (I) - EASEMENT FOR ELECTRICITY SUBSTATION 3,5 WIDE (DP 881682)
- (X) - LAND EXCLUDES MINERALS (S141 PUBLIC WORKS ACT 1912)
- (Y) - LAND EXCLUDES MINERALS - SEE BK 1210 No.936
- (Z) - LAND EXCLUDES MINERALS - SEE BK 1210 No.935

DIAGRAM A
SCALE 1:800

DIAGRAM B
SCALE 1:1000

Surveyor: BENJAMIN JOHN BELFIELD Date of Survey: 07/03/2012 Surveyor's Ref: 2012/M7100 (126) COMP	PLAN OF CONSOLIDATION OF LOT 101 DP 881682 & LOT 16 DP 817507	LGA: NEWCASTLE Locality: CALLAGHAN / SHORTLAND Subdivision No: -	Registered 15.8.2013	DP1188100
---	---	--	-------------------------	-----------

10 20 30 40 50 60 70 80 90 100 110 120 130 140

PLAN FORM 6

WARNING: Creasing or folding will lead to rejection

ePlan

DEPOSITED PLAN ADMINISTRATION SHEET

Sheet 1 of 1 sheet(s)

SIGNATURES, SEALS AND STATEMENTS of intention to dedicate public roads, public reserves and drainage reserves or create easements, restrictions on the use of land and positive covenants

Office Use Only

DP1188100

Office Use Only

Registered:  15.8.2013
 Title System: TORRENS
 Purpose: CONSOLIDATION

PLAN OF CONSOLIDATION OF LOT 101
 DP 881682 AND LOT 16 DP 817507

LGA: Newcastle
 Locality: Shortland / Callaghan
 Parish: Newcastle
 County: Northumberland

Survey Certificate

I, Benjamen John Belfield of Monteath & Powys Pty Limited a surveyor registered under the Surveying and Spatial Information Act 2002, certify that the survey represented in this plan is accurate, has been made in accordance with the Surveying and Spatial Information Regulation 2006 and was completed on: 07/03/2012

The survey relates to

(specify the land actually surveyed or specify any land shown in the plan that is not the subject of the survey)

Signature  Dated: 28/03/12

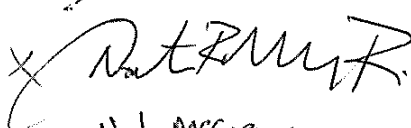
Surveyor registered under the Surveying and Spatial Information Act 2002

Datum Line: N/A
 Type: Urban/Rural

Plans used in the preparation of survey/compilation
 DP 881682
 DP 817507

(If space is insufficient use PLAN FORM 6A annexure sheet)

Surveyor's Reference: 10-227DPA
 2012M7100(126) COMP


 Neil McCuega
 Chief Operating Officer
 25/1/13

If space is insufficient use PLAN FORM 6A annexure sheet
 Crown Lands NSW/Western Lands Office Approval

.....in approving this plan certify
 (Authorised Officer)
 that all necessary approvals in regard to the allocation of the land shown herein have been given

Signature:
 Date:
 File Number:
 Office:

Subdivision Certificate

I certify that the provisions of s.109J of the Environmental Planning and Assessment Act 1979 have been satisfied in relation to:

the proposed set out herein
 (insert 'subdivision' or 'new road')

* Authorised Person/* General Manager/* Accredited Certifier

Consent Authority:
 Date of Endorsement:
 Accreditation no:
 Subdivision Certificate no:
 File no:

* Strike through inapplicable parts.

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE

23/10/2017 4:00PM

FOLIO: 1/1188100

First Title(s): OLD SYSTEM
 Prior Title(s): 16/817507 101/881682

Recorded	Number	Type of Instrument	C.T. Issue
15/8/2013	DP1188100	DEPOSITED PLAN	FOLIO CREATED EDITION 1
14/5/2014	AH999805	REJECTED - SUB-LEASE	
22/9/2014	AI908770	REQUEST	
4/10/2014	AI937358	LEASE	EDITION 2
24/6/2015	AJ597277	DEPARTMENTAL DEALING	
29/6/2015	AJ607665	DEPARTMENTAL DEALING	
29/6/2015	AJ515311	SURRENDER OF LEASE	
29/6/2015	AJ515312	SURRENDER OF LEASE	
29/6/2015	AJ515313	SURRENDER OF LEASE	
29/6/2015	AJ515314	SURRENDER OF LEASE	EDITION 3
20/7/2015	AJ666679	DEPARTMENTAL DEALING	
25/1/2016	AJ682912	LEASE	
25/1/2016	AJ682913	LEASE	
25/1/2016	AJ682914	LEASE	
25/1/2016	AJ682915	LEASE	EDITION 4
5/10/2016	AK760967	LEASE	
5/10/2016	AK760968	LEASE	
5/10/2016	AK760969	LEASE	EDITION 5
18/11/2016	AK933756	TRANSFER OF LEASE	
18/11/2016	AK933757	LEASE	EDITION 6
29/3/2017	AM25754	LEASE	
29/3/2017	AM25755	LEASE	EDITION 7
23/5/2017	AM362500	LEASE	
23/5/2017	AM362501	LEASE	EDITION 8

*** END OF SEARCH ***

advlegs

PRINTED ON 23/10/2017

GlobalX Information Services Pty Ltd (ABN 99 073 436 414) an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with section 96B(2) of the Real Property Act 1900.
 * ANY ENTRIES PRECEDED BY AN ASTERISK DO NOT APPEAR ON THE CURRENT EDITION OF THE CERTIFICATE OF TITLE
WARNING: THE INFORMATION APPEARING UNDER NOTATIONS HAS NOT BEEN FORMALLY RECORDED IN THE REGISTER.

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE

23/10/2017 4:00PM

FOLIO: 11/531665

First Title(s): SEE PRIOR TITLE(S)

Prior Title(s): VOL 11573 FOL 117

Recorded	Number	Type of Instrument	C.T. Issue
28/3/1988		TITLE AUTOMATION PROJECT	LOT RECORDED FOLIO NOT CREATED
1/10/1991		CONVERTED TO AUTO CONSOL 11573-117	CONSOL CREATED CT NOT ISSUED
4/3/1992		EXCISED FROM AUTO CONSOL 11573-117	
5/3/1992	E301901	DEPARTMENTAL DEALING	
9/3/1992	E109153	TRANSFER	FOLIO CANCELLED
29/7/1996		AMENDMENT: LOCAL GOVT AREA	
8/2/2000	6546032	DEPARTMENTAL DEALING	

*** END OF SEARCH ***

advlegs

PRINTED ON 23/10/2017

GlobalX Information Services Pty Ltd (ABN 99 073 436 414) an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with section 96B(2) of the Real Property Act 1900.
* ANY ENTRIES PRECEDED BY AN ASTERISK DO NOT APPEAR ON THE CURRENT EDITION OF THE CERTIFICATE OF TITLE
WARNING: THE INFORMATION APPEARING UNDER NOTATIONS HAS NOT BEEN FORMALLY RECORDED IN THE REGISTER.

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE

23/10/2017 4:00PM

FOLIO: 16/817507

First Title(s): OLD SYSTEM

Prior Title(s): 7/804087

<u>Recorded</u>	<u>Number</u>	<u>Type of Instrument</u>	<u>C.T. Issue</u>
9/10/1992	DP817507	DEPOSITED PLAN	FOLIO CREATED EDITION 1
13/10/1992	DP646880	DEPOSITED PLAN	
14/5/1993	I163444	LEASE	
14/5/1993	I163445	SUB-LEASE	EDITION 2
25/3/1994	DP648897	DEPOSITED PLAN	
8/4/1994	U128489	TRANSFER GRANTING EASEMENT	EDITION 3
25/5/1995	DP265379	DEPOSITED PLAN	EDITION 4
6/6/1995	O285703	DEPARTMENTAL DEALING	
27/7/1995	O291562	TRANSFER GRANTING EASEMENT	EDITION 5
18/12/1995	O273273	REQUEST	
22/4/1998	3920688	TRANSFER RELEASING EASEMENT	EDITION 6
27/11/2000	7244999	LEASE	EDITION 7
4/4/2001	7522086	LEASE	EDITION 8
24/9/2001	7965651	LEASE	EDITION 9
23/9/2002	8973897	LEASE	EDITION 10
11/1/2003	9283553	VARIATION OF LEASE	
22/12/2005	AC6211	LEASE	EDITION 11
23/9/2006	AC616195	LEASE	EDITION 12
20/11/2006	AC751301	LEASE	EDITION 13
23/11/2006	AC761586	LEASE	EDITION 14

END OF PAGE 1 - CONTINUED OVER

advlegs

PRINTED ON 23/10/2017

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE

23/10/2017 4:00PM

FOLIO: 16/817507

PAGE 2

Recorded	Number	Type of Instrument	C.T. Issue
16/4/2007	AD19657	LEASE	
16/4/2007	AD19658	LEASE	
16/4/2007	AD19659	LEASE	EDITION 15
16/7/2008	AD647092	WITHDRAWN - LEASE	
12/8/2008	AE9583	SURRENDER OF LEASE	
12/8/2008	AE9584	REQUEST	
12/8/2008	AD884573	LEASE	
12/8/2008	AE9585	SUB-LEASE	
12/8/2008	AE139168	LEASE	
29/9/2008	AE239764	SUB-LEASE	
29/9/2008	AE239765	SUB-LEASE	
29/9/2008	AE239766	SUB-LEASE	
29/9/2008	AE239767	SUB-LEASE	
16/10/2008	AD647091	REJECTED - LEASE	
17/10/2008	AE274870	DEPARTMENTAL DEALING	EDITION 16
21/10/2008	AD647091	RE-INSTATED - LEASE	
21/10/2008	AD647091	LEASE	EDITION 17
13/11/2008	AE320920	SUB-LEASE	
15/9/2009	AE910608	LEASE	EDITION 18
8/9/2010	AF683710	SURRENDER OF LEASE	
8/9/2010	AF683711	SURRENDER OF LEASE	
8/9/2010	AF683712	SURRENDER OF LEASE	
8/9/2010	AF683713	SURRENDER OF LEASE	
8/9/2010	AF683715	SUB-LEASE	
8/9/2010	AF683716	SUB-LEASE	
8/9/2010	AF683717	SUB-LEASE	
28/10/2010	AF831953	SUB-LEASE	
10/3/2011	AG110225	SUB-LEASE	
15/4/2011	AG163277	SUB-LEASE	
14/12/2011	AG678069	TRANSFER OF LEASE	

END OF PAGE 2 - CONTINUED OVER

advlegs

PRINTED ON 23/10/2017

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - HISTORICAL SEARCH

SEARCH DATE

23/10/2017 4:00PM

FOLIO: 16/817507

PAGE 3

<u>Recorded</u>	<u>Number</u>	<u>Type of Instrument</u>	<u>C.T. Issue</u>
5/3/2013	AH590438	LEASE	EDITION 19
18/3/2013	AH595192	SUB-LEASE	
15/8/2013	DP1188100	DEPOSITED PLAN	FOLIO CANCELLED

*** END OF SEARCH ***

advlegs

PRINTED ON 23/10/2017

GlobalX Information Services Pty Ltd (ABN 99 073 436 414) an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with section 96B(2) of the Real Property Act 1900.

* ANY ENTRIES PRECEDED BY AN ASTERISK DO NOT APPEAR ON THE CURRENT EDITION OF THE CERTIFICATE OF TITLE
WARNING: THE INFORMATION APPEARING UNDER NOTATIONS HAS NOT BEEN FORMALLY RECORDED IN THE REGISTER.

of payment of Registration or other fees.

JUN 11 10 37 1964

43
43900

R. J. McKAY
Crown Solicitor

per *R. J. McKAY*
REAL PROPERTY ACT 1900

W. H. M. S.

APPLICATION UNDER SECTION 31A OF THE REAL PROPERTY
ACT 1900 IN RESPECT OF LAND AT SHORTLAND BY THE
MINISTER FOR EDUCATION.

11-668

Mc 23-6-64

The Registrar General,
S Y D N E Y.

The parcel of land containing 235 acres 39 $\frac{3}{4}$ perches or thereabouts situate in the City of Newcastle, Parish of Newcastle, County of Northumberland, more particularly described in the Schedule hereunder written was, excluding all such mines and deposits thereunder as are mentioned in Section 141 of the Public Works Act, 1912, as amended, resumed under the Public Works Act, 1912 as amended for the purpose of the University of New South Wales by Notification of Resumption (a copy of which appears hereafter) published in the Government Gazette of the 18th January 1963 and was vested in the Minister for Education as Constructing Authority on behalf of Her Majesty the Queen AND the said land not being under the provisions of the Real Property Act, 1900, the Minister for Education as Constructing Authority in pursuance of Section 31A of the Real Property Act, 1900 as amended HEREBY makes application for the issue to him of a Certificate of Title under the provisions of the lastmentioned Act in respect of the said land excluding mines and deposits.

New Crown Land

Formerly part of C.T. Vol. 5052 Fol. 239 on which is endorsed Tsh. r. Surre. F270015 + 20th Schedule notification.

THE SCHEDULE HEREINBEFORE REFERRED TO

ALL THAT piece or parcel of Crown land situate in the City of Newcastle Parish of Newcastle and County of Northumberland being Lots 2, 3 and 4 Deposited Plan No. 216,528 and having an area of 235 acres 39 $\frac{3}{4}$ perches or thereabouts,

Dated at Sydney this fourteenth day of May 1964.

THE OFFICIAL SEAL of THE MINISTER
FOR EDUCATION the Constructing
Authority under the Public Works
Act, 1912 as amended was hereto
affixed in the presence of:

Eric Wetherell

Andrew J.P.

9812 210

Cert. of T., issued Vol. Fol.
Dated

21 SEP 1964

PUBLISHED IN NEW SOUTH WALES GOVERNMENT GAZETTE No. 5
OF 18th January, 1963.

Fol. 152.

AND
TECHNICAL EDUCATION/UNIVERSITY OF NEW SOUTH WALES
ACT, 1949-1958. - PUBLIC WORKS ACT, 1912, AS AMENDED.

ACQUISITION OF LAND FOR THE PURPOSE OF THE TECHNICAL
EDUCATION AND UNIVERSITY OF NEW SOUTH WALES ACT,
1949-1958.

In pursuance of the provisions of Section 49 of the Technical Education and ^{University of} ~~University of~~ New South Wales Technology Act, 1949, it is hereby notified and declared by His Excellency the Governor, acting with the advice of the Executive Council, that so much of the land described in the Schedule hereto as is Crown land is hereby appropriated, and so much of the said land as is private property is hereby resumed under the Public Works Act, 1912, as amended, for the purpose of the University of New South Wales, and that the said land is vested in the Minister for Education as Constructing Authority on behalf of Her Majesty the Queen.

Dated at Sydney, this Ninth day of January One thousand nine hundred and sixty three.

K.W. STREET.

By deputation from His Excellency the Governor.
By His Excellency's Command,
Ernest Wetherell, Minister for Education.

THE SCHEDULE

ALL THAT piece or parcel of Crown land situate in the City of Newcastle Parish of Newcastle and County of Northumberland being lots 2, 3 and 4 deposited plan 216,528 and having an area of 235 acres 39 $\frac{1}{2}$ perches or thereabouts.

~~The value of the land in the Application at the date of Resumption was £~~

agrees with the Govt

6/2/73 20 JWH

State Crown Sols.

University of Texas 61/0107/12037

State Crown
Solicitor

[Faint, illegible text, possibly bleed-through from the reverse side of the page]

Alan [illegible]
15.6.68

LAND AND PROPERTY INFORMATION NEW SOUTH WALES - TITLE SEARCH

FOLIO: 1/1188100

SEARCH DATE	TIME	EDITION NO	DATE
23/10/2017	8:38 AM	8	23/5/2017

LAND

LOT 1 IN DEPOSITED PLAN 1188100
 AT CALLAGHAN & SHORTLAND
 LOCAL GOVERNMENT AREA NEWCASTLE
 PARISH OF NEWCASTLE COUNTY OF NORTHUMBERLAND
 TITLE DIAGRAM DP1188100

FIRST SCHEDULE

THE UNIVERSITY OF NEWCASTLE

SECOND SCHEDULE (62 NOTIFICATIONS)

- 1 RESERVATIONS AND CONDITIONS IN THE CROWN GRANT(S) WITHIN THE PART(S) SHOWN SO INDICATED IN THE TITLE DIAGRAM
- 2 LAND EXCLUDES MINERALS (S.141 PUBLIC WORKS ACT, 1912) WITHIN THE PART(S) SHOWN SO INDICATED IN THE TITLE DIAGRAM
- 3 BK 1210 NO 936 LAND EXCLUDES MINERALS WITHIN THE PART(S) SHOWN SO INDICATED IN THE TITLE DIAGRAM
- 4 BK 1210 NO 935 LAND EXCLUDES MINERALS WITHIN THE PART(S) SHOWN SO INDICATED IN THE TITLE DIAGRAM
- 5 F702707 SUBJECT TO THE PROVISIONS OF CLAUSE 29 OF THE BROKEN HILL PROPRIETARY COMPANY LIMITED (RECLAMATION AND EXCHANGE) AGREEMENT RATIFICATION ACT, 1950 OF THE PART(S) FORMERLY IN 101/881682
- 6 E109153 COVENANT AFFECTING THE PART SHOWN SO BURDENED IN THE TITLE DIAGRAM.
- 7 M110023 COVENANT AFFECTING THE PART SHOWN SO BURDENED IN THE TITLE DIAGRAM.
- 8 Z207914 COVENANT AFFECTING THE PART SHOWN SO BURDENED IN THE TITLE DIAGRAM.
- 9 T435370 EASEMENT FOR WATER MAIN 10.06 METRE(S) WIDE AFFECTING THE PART(S) SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 10 E544247 EASEMENT FOR PIPELINE 5 METRE(S) WIDE AFFECTING THE PART(S) SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 11 DP637869 RIGHT OF CARRIAGEWAY 15 & 25 METRE(S) WIDE AFFECTING THE PART(S) SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 12 DP637869 RIGHT OF CARRIAGEWAY 15.24 METRE(S) WIDE & VARIABLE WIDTH AFFECTING THE PART(S) SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 13 DP637869 RIGHT OF CARRIAGEWAY APPURTENANT TO THE PART(S) OF

END OF PAGE 1 - CONTINUED OVER

advlegs

PRINTED ON 23/10/2017

SECOND SCHEDULE (62 NOTIFICATIONS) (CONTINUED)

- 14 DP637869 THE LAND SHOWN SO BENEFITED IN THE TITLE DIAGRAM
RIGHT OF CARRIAGEWAY 15 & 25 METRE(S) WIDE
APPURTENANT TO THE PART(S) OF THE LAND SHOWN SO
BENEFITED IN THE TITLE DIAGRAM
- 15 DP772130 RIGHT OF WAY 5.5 METRE(S) WIDE AFFECTING THE PART(S)
SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 16 DP772130 RIGHT OF WAY 6 METRE(S) WIDE AFFECTING THE PART(S)
SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 17 DP772130 RIGHT OF WAY 9 METRE(S) WIDE AFFECTING THE PART(S)
SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 18 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 17
METRE(S) WIDE & VARIABLE WIDTH AFFECTING THE PART(S)
SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 19 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 17
METRE(S) WIDE REFERRED TO AND NUMBERED (1) IN THE
S.88B INSTRUMENT APPURTENANT TO THE PART(S) OF THE
LAND SHOWN SO BENEFITED IN THE TITLE DIAGRAM
- 20 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 17
METRE(S) WIDE & VARIABLE WIDTH APPURTENANT TO THE
PART(S) OF THE LAND SHOWN SO BENEFITED IN THE TITLE
DIAGRAM
- 21 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES
VARIABLE WIDTH REFERRED TO AND NUMBERED (4) IN THE
S.88B INSTRUMENT APPURTENANT TO THE PART(S) OF THE
LAND SHOWN SO BENEFITED IN THE TITLE DIAGRAM
- 22 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 16.8 &
18 METRE(S) WIDE APPURTENANT TO THE PART(S) OF THE
LAND SHOWN SO BENEFITED IN THE TITLE DIAGRAM
- 23 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 18
METRE(S) WIDE APPURTENANT TO THE PART(S) OF THE LAND
SHOWN SO BENEFITED IN THE TITLE DIAGRAM
- 24 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 20
METRE(S) WIDE REFERRED TO AND NUMBERED (7) IN THE
S.88B INSTRUMENT APPURTENANT TO THE PART(S) OF THE
LAND SHOWN SO BENEFITED IN THE TITLE DIAGRAM
- 25 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 16.46
METRE(S) WIDE & VARIABLE WIDTH APPURTENANT TO THE
PART(S) OF THE LAND SHOWN SO BENEFITED IN THE TITLE
DIAGRAM
- 26 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES
VARIABLE WIDTH REFERRED TO AND NUMBERED (9) IN THE
S.88B INSTRUMENT APPURTENANT TO THE PART(S) OF THE
LAND SHOWN SO BENEFITED IN THE TITLE DIAGRAM
- 27 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 17
METRE(S) WIDE REFERRED TO AND NUMBERED (13) IN THE
S.88B INSTRUMENT APPURTENANT TO THE PART(S) OF THE

END OF PAGE 2 - CONTINUED OVER

advlegs

PRINTED ON 23/10/2017

SECOND SCHEDULE (62 NOTIFICATIONS) (CONTINUED)

- 28 DP817507 LAND SHOWN SO BENEFITED IN THE TITLE DIAGRAM
RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 20
METRE(S) WIDE REFERRED TO AND NUMBERED (14) IN THE
S.88B INSTRUMENT APPURTENANT TO THE PART(S) OF THE
LAND SHOWN SO BENEFITED IN THE TITLE DIAGRAM
- 29 DP817507 RIGHT OF CARRIAGEWAY & EASEMENT FOR SERVICES 17
METRE(S) WIDE REFERRED TO AND NUMBERED (16) IN THE
S.88B INSTRUMENT APPURTENANT TO THE PART(S) OF THE
LAND SHOWN SO BENEFITED IN THE TITLE DIAGRAM
- 30 DP881682 RIGHT OF CARRIAGEWAY 8 METRE(S) WIDE AND VARIABLE
WIDTH AFFECTING THE PART(S) SHOWN SO BURDENED IN THE
TITLE DIAGRAM
- 31 U128489 EASEMENT FOR ROCK ANCHORS AFFECTING THE PART(S)
SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 32 DP881682 RIGHT OF CARRIAGEWAY 8 METRE(S) WIDE AND VARIABLE
WIDTH APPURTENANT TO THE PART(S) OF THE LAND SHOWN SO
BENEFITED IN THE TITLE DIAGRAM
- 33 DP881682 EASEMENT FOR PARKING VARIABLE WIDTH (B) AFFECTING
THE PART(S) SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 34 DP265379 EASEMENT FOR GAS PIPELINE 3 METRE(S) WIDE AND
VARIABLE WIDTH AFFECTING THE PART(S) SHOWN SO BURDENED
IN THE TITLE DIAGRAM
- 35 DP881682 EASEMENT FOR PARKING VARIABLE WIDTH APPURTENANT TO
THE PART(S) OF THE LAND SHOWN SO BENEFITED IN THE
TITLE DIAGRAM
- 36 DP265379 EASEMENT FOR UNDERGROUND ELECTRICITY CABLES 3
METRE(S) WIDE AND VARIABLE WIDTH AFFECTING THE PART(S)
SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 37 DP881682 EASEMENT FOR PARKING VARIABLE WIDTH (C) AFFECTING
THE PART(S) SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 38 O291562 EASEMENT FOR TRANSMISSION LINE AFFECTING THE
PART(S) SHOWN SO BURDENED IN THE TITLE DIAGRAM
- 39 DP881682 EASEMENT FOR DRAINAGE OF WATER OVER EXISTING LINE OF
PIPES AND PIT AFFECTING THE PART(S) SHOWN SO BURDENED
IN THE TITLE DIAGRAM
- 40 DP881682 EASEMENT FOR DRAINAGE OF WATER OVER EXISTING LINE OF
PIPES APPURTENANT TO THE PART(S) OF THE LAND SHOWN SO
BENEFITED IN THE TITLE DIAGRAM
- 41 DP881682 EASEMENT FOR ELECTRICITY PURPOSES 3 METRE(S) WIDE
AND VARIABLE WIDTH AFFECTING THE PART(S) SHOWN SO
BURDENED IN THE TITLE DIAGRAM
- 42 DP881682 EASEMENT FOR ELECTRICITY SUBSTATION 3.5 METRE(S)
WIDE AFFECTING THE PART(S) SHOWN SO BURDENED IN THE
TITLE DIAGRAM
- 43 AD19658 LEASE TO JIREH INTERNATIONAL PTY LIMITED OF SHOP 2,
LEVEL 2, SHORTLAND UNION BUILDING, UNIVERSITY OF

END OF PAGE 3 - CONTINUED OVER

advlegs

PRINTED ON 23/10/2017

SECOND SCHEDULE (62 NOTIFICATIONS) (CONTINUED)

- NEWCASTLE, UNIVERSITY DRIVE, CALLAGHAN. EXPIRES: 26/5/2012. OPTION OF RENEWAL: 5 YEARS.
- 44 AF683715 LEASE TO UNIFOOD GROUP PTY LTD (SEE AG678069) OF PREMISES KNOWN AS RAFTERS, LEVEL 2, SHORTLAND BUILDING, UNIVERSITY OF NEWCASTLE, CALLAGHAN. EXPIRES: 31/12/2014. OPTION OF RENEWAL: 5 YEARS WITH A FURTHER 5 YEARS AND A FURTHER 2 YEARS 3 MONTHS AND 1 DAY.
- 45 AF683716 LEASE TO UNIFOOD GROUP PTY LTD (SEE AG678069) OF PREMISES KNOWN AS MCLARTY DINING, LEVEL 2, SHORTLAND BUILDING, UNIVERSITY OF NEWCASTLE, CALLAGHAN. EXPIRES: 31/12/2014. OPTION OF RENEWAL: 5 YEARS WITH A FURTHER 5 YEARS AND A FURTHER 2 YEARS 3 MONTHS AND 1 DAY.
- 46 AF683717 LEASE TO UNIFOOD GROUP PTY LTD (SEE AG678069) OF PREMISES KNOWN AS HUB CAFE, LEVEL 3, SHORTLAND BUILDING, UNIVERSITY OF NEWCASTLE, CALLAGHAN. EXPIRES: 31/12/2014. OPTION OF RENEWAL: 5 YEARS WITH A FURTHER 5 YEARS AND A FURTHER 2 YEARS 3 MONTHS AND 1 DAY.
- 47 AF831953 LEASE TO FRESH FOOD EXPRESS PTY LIMITED OF SHOP 1, LEVEL ONE, SHORTLAND BUILDING, UNIVERSITY OF NEWCASTLE, CALLAGHAN. EXPIRES: 31/7/2014. OPTION OF RENEWAL: 4 YEARS.
- 48 AG110225 LEASE TO S & L EDWARDS INVESTMENTS PTY LTD OF SHOPS 205, 209, 210, 211, 212, 213 LEVEL 2, SHORTLAND BUILDING - UNIVERSITY OF NEWCASTLE, CALLAGHAN. EXPIRES: 30/1/2016. OPTION OF RENEWAL: 5 YEARS.
- 49 AG163277 LEASE TO FUJI XEROX AUSTRALIA PTY LIMITED OF SHOPS 201, 203 & 204, LEVEL 2, SHORTLAND BUILDING, CALLAGHAN. EXPIRES: 31/1/2016. OPTION OF RENEWAL: 5 YEARS.
- 50 AH595192 LEASE TO GAVIN LEIGH SMITH & STUART JAMES SHORTLAND OF SHOP 110B, LEVEL 1, SHORTLAND BUILDING, THE UNIVERSITY OF NEWCASTLE, UNIVERSITY DRIVE, CALLAGHAN. EXPIRES: 30/6/2018. OPTION OF RENEWAL: 5 YEARS.
- AK933756 TRANSFER OF LEASE AH595192 LESSEE NOW SHORTLAND MEDICAL CENTRE PTY LIMITED
- 51 AJ682912 LEASE TO TELSTRA CORPORATION LIMITED OF THE PART SHOWN HATCHED IN PLAN WITH AJ682912. EXPIRES: 31/3/2019.
- 52 AJ682913 LEASE TO TELSTRA CORPORATION LIMITED OF THE PART SHOWN HATCHED IN PLAN WITH AJ682913. COMMENCES: 1/4/2019. EXPIRES: 31/3/2024.
- 53 AJ682914 LEASE TO TELSTRA CORPORATION LIMITED OF THE PART SHOWN HATCHED IN PLAN WITH AJ682914. COMMENCES: 1/4/2024. EXPIRES: 31/3/2029.
- 54 AJ682915 LEASE TO TELSTRA CORPORATION LIMITED OF THE PART SHOWN HATCHED IN PLAN WITH AJ682915. COMMENCES:

END OF PAGE 4 - CONTINUED OVER

advlegs

PRINTED ON 23/10/2017

SECOND SCHEDULE (62 NOTIFICATIONS) (CONTINUED)

- 1/4/2029. EXPIRES: 31/3/2034.
- 55 AK760967 LEASE TO HELIOS FOOD PTY LIMITED OF THE AREA KNOWN AS ROOMS 236, 236A, 238, 238A, 239, 240, 241, 242, 243, 243A, 244, 245, 246, 247, 248, 249, 250, 253, 254 AND 265 ON LEVEL 2, SHORTLAND BUILDING, UNIVERSITY OF NEWCASTLE, CALLAGHAN. EXPIRES: 31/12/2019. OPTION OF RENEWAL: 5 YEARS AND A FURTHER OPTION OF 2 YEARS, 3 MONTHS AND 1 DAY.
- 56 AK760968 LEASE TO HELIOS FOOD PTY LIMITED OF THE AREA KNOWN AS ROOMS 231 AND 237 ON LEVEL 2, SHORTLAND BUILDING, UNIVERSITY OF NEWCASTLE, CALLAGHAN. EXPIRES: 31/12/2019. OPTION OF RENEWAL: 5 YEARS AND A FURTHER OPTION OF 2 YEARS 3 MONTHS AND 1 DAY.
- 57 AK760969 LEASE TO HELIOS FOOD PTY LIMITED OF THE AREA KNOWN AS ROOMS 304, 305 AND 306 ON LEVEL 3, SHORTLAND BUILDING, UNIVERSITY OF NEWCASTLE, CALLAGHAN. EXPIRES: 31/12/2019. OPTION OF RENEWAL: 5 YEARS AND A FURTHER OPTION OF 2 YEARS 3 MONTHS AND 1 DAY.
- 58 AK933757 LEASE TO UNIVERSITY CO-OPERATIVE BOOKSHOP LIMITED OF ROOMS 130, 132, 132A, 132B AND 133, LEVEL 1, SHORTLAND UNION BUILDING, UNIVERSITY DRIVE, CALLAGHAN. EXPIRES: 2/10/2020.
- 59 AM25754 LEASE TO FRESH FOOD EXPRESS PTY LIMITED OF SHOP 1, LEVEL 1, BUILDING KNOWN AS SHORTLAND BUILDING, UNIVERSITY OF NEWCASTLE, CALLAGHAN. EXPIRES: 31/7/2018.
- 60 AM25755 LEASE TO RESTECH PTY LTD OF ROOMS 105, 109, 111 AND 112, BUILDING EB, UNIVERSITY OF NEWCASTLE, CALLAGHAN. EXPIRES: 13/8/2018. OPTION OF RENEWAL: 2 YEARS.
- 61 AM362500 LEASE TO FUJI XEROX AUSTRALIA PTY LIMITED OF ROOMS 204, 205 & 205A, LEVEL 2, SHORTLAND UNION BLDG, UNIVERSITY DR, CALLAGHAN. EXPIRES: 31/1/2021.
- 62 AM362501 LEASE TO NEWCASTLE PERMANENT BUILDING SOCIETY LIMITED OF ROOMS 221, 221A, 221B, 221C, 221D, 221E & 221F, LEVEL 2, SHORTLAND BUILDING, UNIVERSITY DR, CALLAGHAN. EXPIRES: 31/10/2018.

NOTATIONS

DP648897 NOTE: DP648897 PROPOSED EASEMENT PLAN

UNREGISTERED DEALINGS: DP1233389.

*** END OF SEARCH ***

advlegs

PRINTED ON 23/10/2017

GlobalX Information Services Pty Ltd (ABN 99 073 436 414) an approved NSW Information Broker hereby certifies that the information contained in this document has been provided electronically by the Registrar General in accordance with section 96B(2) of the Real Property Act 1900.

* ANY ENTRIES PRECEDED BY AN ASTERISK DO NOT APPEAR ON THE CURRENT EDITION OF THE CERTIFICATE OF TITLE
WARNING: THE INFORMATION APPEARING UNDER NOTATIONS HAS NOT BEEN FORMALLY RECORDED IN THE REGISTER.

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

F

SECTION 149 CERTIFICATE



PLANNING CERTIFICATE

Section 149, Environmental Planning and Assessment Act 1979

To: Lotsearch Pty Ltd
Level 3, 68 Alfred Street
MILSONS POINT NSW 2061

Certificate No: PL2017/05204
Fees: \$133.00
Receipt No(s): D000662739

Your Reference: LS002009

Date of Issue: 24/10/2017

<p>The Land: Lot 1 DP 1188100 8 University Drive Callaghan NSW 2308</p>
--

Advice provided on this Certificate:

Advice under section 149(2): see items 1 – 20
Additional advice under section 149 (5): see Items 21 – 29

IMPORTANT: Please read this certificate carefully

This certificate contains important information about the land.

Please check for any item which could be inconsistent with the proposed use or development of the land. If there is anything you do not understand, phone Council's **Customer Enquiry Centre** on (02) 4974 2000, or come in and see us.

The information provided in this certificate relates only to the land described above. If you need information about adjoining or nearby land, or about the Council's development policies for the general area, contact Council's **Customer Enquiry Centre**.

All information provided is correct as at 24/10/2017. However, it's possible for changes to occur within a short time. We recommend that you only rely upon a very recent certificate.

Newcastle City Council

PO Box 489
NEWCASTLE 2300

Phone: (02) 4974 2000
Facsimile: (02) 4974 2222

Customer Enquiry Centre

Ground floor,
282 King Street
Newcastle NSW 2300

Office hours:

Mondays to Fridays 8.30 am to 5.00 pm

PART 1:

ADVICE PROVIDED UNDER SECTION 149(2)

ATTENTION: The explanatory notes appearing in italic print within Part 1 are provided to assist understanding, but do not form part of the advice provided under section 149(2). These notes shall be taken as being advice provided under section 149(5).

1. Names of relevant planning instruments and DCPs

The following environmental planning instruments, proposed environmental planning instruments and development control plans apply to the land, either in full or in part.

State Environmental Planning Policy No. 44 - Koala Habitat Protection

State Environmental Planning Policy No. 50 - Canal Estate Development

State Environmental Planning Policy No. 55 - Remediation of Land

State Environmental Planning Policy No. 62 - Sustainable Aquaculture

State Environmental Planning Policy No. 64 - Advertising and Signage

State Environmental Planning Policy (Housing For Seniors or People with a Disability) 2004

State Environmental Planning Policy (State Significant Precincts) 2005

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

State Environmental Planning Policy (Temporary Structures) 2007

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

State Environmental Planning Policy (State and Regional Development) 2011

Newcastle Local Environmental Plan 2012

Newcastle Development Control Plan 2012

2. Zoning and land use under relevant LEPs

Newcastle Local Environmental Plan 2012

Zoning: The Newcastle Local Environmental Plan 2012 identifies the land as being within the following zone(s):

Zone SP2 Infrastructure -Educational Establishment
--

Note: Refer to www.newcastle.nsw.gov.au or www.legislation.nsw.gov.au web site for LEP instrument and zoning maps.

The following is an extract from the zoning provisions contained in Newcastle Local Environmental Plan 2012:

Zone SP2 Infrastructure

- **Objectives of zone**

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

- **Permitted without consent**

Roads

- **Permitted with consent**

The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose

- **Prohibited**

Any development not specified in, permitted without consent or permitted with consent

Minimum land dimensions for erection of a dwelling-house: The Newcastle Local Environmental Plan 2012 contains development standards relating to minimum land dimensions for the erection of a dwelling house. Refer to clause 4.1 Minimum subdivision lot size and Part 4 Principle development standards of the Newcastle LEP 2012 for provisions relating to minimum lot sizes for residential development.

Critical habitat: The Newcastle Local Environmental Plan 2012 does not identify the land as including or comprising critical habitat.

Heritage conservation area: The land is not within a heritage conservation area under the Newcastle Local Environmental Plan 2012.

Heritage items: There are no heritage items listed in the Newcastle Local Environmental Plan 2012 situated on the land.

3. Complying development

Note Other requirements: *The advice below for all Complying Development Codes, is limited to identifying whether or not the land, the subject of the certificate, is land on which complying development may be carried out because of Clauses 1.17A(1)(c) to (e), (2), (3) & (4), 1.18 (1)(c3) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 (the Codes SEPP).*

General Housing Code

Complying development under the General Housing Code MAY be carried out on this land.

Rural Housing Code

Complying development under the Rural Housing Code MAY be carried out on this land.

Housing Alterations Code

Complying development under the Housing Alterations Code MAY be carried out on this land.

General Development Code

Complying development under the General Development Code MAY be carried out on this land.

Commercial and Industrial Alterations Code

Complying development under the Commercial and Industrial Alterations Code MAY be carried out on this land.

Commercial and Industrial (New Buildings and Additions) Code

Complying development under the Commercial and Industrial (New Buildings and Additions) Code MAY be carried out on this land.

Subdivision Code

Complying development under the Subdivision Code MAY be carried out on this land.

Demolition Code

Complying development under the Demolition Code MAY be carried out on this land.

Fire Safety Code

Complying development under the Fire Safety Code MAY be carried out on this land.

4. Coastal Protection Act 1979

The land IS NOT AFFECTED by the operation of sections 38 or 39 of the Coastal Protection Act 1979.

4A. Certain information relating to beaches and coasts

The land IS NOT AFFECTED by an order under Part 4D of the Coastal Protection Act 1979 in relation to temporary coastal protection works (within the meaning of that Act) on the land (or on public land adjacent to that land), except where the council is satisfied that such an order has been fully complied with.

The Council HAS NOT been notified under section 55X of the Coastal Protection Act 1979 that temporary coastal protection works (within the meaning of that Act) have been placed on the land (or on public land adjacent to that land).

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

The land IS NOT subject to an agreement for annual charges under section 496B of the Local Government Act 1993 for coastal protection services (within the meaning of section 553B of that Act).

5. Mine Subsidence Compensation Act 1961

The land IS NOT within a proclaimed Mine Subsidence District under the Mine Subsidence Compensation Act 1961.

NOTE: The above advice is provided to the extent that Council has been notified by the Mine Subsidence Board. For up-to-date details, contact the Mine Subsidence Board, 117 Bull Street, Newcastle West. Ph (02) 49084300.

6. Road widening or realignment

NOTE: The Roads and Maritime Services (RMS) may have proposals that are not referred to in this item. For advice about affectation by RMS proposals, contact the Roads and Maritime Services, Locked Mail Bag 30 Newcastle 2300. Ph: 131 782.

The land IS NOT AFFECTED by any road widening or road realignment under Division 2 of Part 3 of the Roads Act 1993.

The land IS NOT AFFECTED by any road widening or road realignment under an environmental planning instrument.

The land IS NOT AFFECTED by road widening or road realignment under a resolution of the Council.

7. Policies on hazard risk restrictions

Except as stated below, the land is not affected by a policy referred to in Item 7 of Schedule 4 of the Environmental Planning and Assessment Regulation 2000 that restricts the development of the land because of the likelihood of land slip, bushfire, tidal inundation, subsidence, acid sulphate soils or any other risk (other than flooding).

Potential acid sulfate soils: Works carried out on the land must be undertaken in accordance with Clause 6.1 Acid sulfate soils of the Newcastle Local Environmental Plan 2012.

Land Contamination: Council has land contamination information/records in relation to this property. Council has adopted a policy of restricting development or imposing conditions on properties affected by land contamination. Refer to Section 5.02 Land Contamination of Newcastle Development Control Plan 2012, which may be inspected or purchased at Council's Customer Enquiry Centre.

Bush fire: Under clause 5.11 Bush fire hazard reduction of the Newcastle LEP 2012, bush fire hazard reduction work authorised by the Rural Fires Act 1997 may be carried out on any land without development consent.
NOTE: The Rural Fires Act 1997 also makes provision relating to the carrying out of development on bush fire prone land.

NOTE: The absence of a policy to restrict development of the land because of the likelihood of a particular risk does not imply that the land is free from that risk. The Council considers the likelihood of natural and man-made risks when determining development applications under section 79C of the Environmental Planning and Assessment Act 1979. Detailed investigation carried out in conjunction with the preparation or assessment of a development application may result in the Council either refusing development consent or imposing conditions of consent on the basis of risks that are not identified above.

7A. Flood related development controls information

Council's information currently indicates that the property is, or contains, flood prone land as defined in the Floodplain Development Manual: the management of flood liable land, April 2005 published by the NSW Government.

Development of flood prone land is controlled by Section 4.01 Flood Management of Newcastle DCP 2012. The Newcastle DCP 2012 provides restrictions or imposes conditions with respect to all development of flood prone land. This includes development for the purpose of dwelling houses, dual occupancies, multi dwelling housing or residential flat buildings.

NOTE: More detailed flood information specific to the property is available on separate flooding certificate application through Council's Customer Contact Centre on (02) 4974 2000

8. Land reserved for acquisition

The land is not identified for acquisition by a public authority (as referred to in section 27 of the Act) by any environmental planning instrument or proposed environmental planning instrument applying to the land.

9. Contributions plans

The following contribution plan/s apply to the land.

Section 94A Development Contributions Plan 2009 - August 2017:

The Plan specifies section 94A contributions that may be imposed as a condition of development consent.

NOTE: Contributions plans are available on Council's website or may be inspected or purchased at Council's Customer Enquiry Centre.

9A. Biodiversity certified land

The land IS NOT biodiversity certified land within the meaning of Part 7AA of the Threatened Species Conservation Act 1995.

10. Biobanking agreements

The land IS NOT land to which a biobanking agreement under Part 7A of the Threatened Species Conservation Act 1995 relates.

11. Bush fire prone land

The land, either in whole or in part IS bush fire prone land for the purposes of the Environmental Planning and Assessment Act 1979.

12. Property vegetation plans

Not applicable. The Native Vegetation Act 2003 does not apply to the Newcastle local government area.

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

Council HAS NOT been notified that an order has been made under the Trees (Disputes between Neighbours) Act 2006 to carry out work in relation to a tree on the land.

14. Directions under Part 3A

The land IS NOT AFFECTED by a direction by the Minister in force under section 75P (2) (c1) of the Act.

15. Site compatibility certificates and conditions for seniors housing

(a) The land IS NOT AFFECTED by a current site compatibility certificate (of which the Council is aware) issued under the State Environmental Planning Policy (Housing for Seniors and People with a Disability) 2004.

(b) The land IS NOT AFFECTED by any terms of kind referred to in clause 18(2) of the State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004, that have been imposed as a condition of consent to a development application granted after 11 October, 2007 in respect of the land.

16. Site compatibility certificates for infrastructure

The land IS NOT AFFECTED by a valid site compatibility certificate (of which the Council is aware) issued under the State Environmental Planning Policy (Infrastructure) 2007.

17. Site compatibility certificates and conditions for affordable rental housing

The land IS NOT AFFECTED by a valid site compatibility certificate (of which the Council is aware) issued under the State Environmental Planning Policy (Affordable Rental Housing) 2009.

18. Paper subdivision information

The land IS NOT AFFECTED by any development plan that applies to the land or that is proposed to be subject to a consent ballot.

19. Site verification certificates

The land IS NOT AFFECTED by a current site verification certificate (of which the Council is aware) issued under the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.

20. Loose-fill asbestos insulation

The Council HAS NOT been notified that the land includes any residential premises (within the meaning of Division 1A of Part 8 of the Home Building Act 1989) that are listed on the register of loose-fill asbestos insulation, that is required to be maintained under that Division.

Note: The following matters are prescribed by section 59(2) of the Contaminated Land Management Act 1997.

The land to which the certificate relates is the subject of the following site audit statement(s) within the meaning of the Contaminated Land Management Act 1997.

1. Site Audit Statement No. GN467 (30/7/2013) Produced by Environ Australia Pty Ltd. You can contact Council's Compliance Services Unit on (02) 49742525 to obtain further information. NOTE: Contamination information that relates to the land that is not required to be disclosed under section 59(2) Contaminated Land Management Act 1997, may be provided under a section 149(5) certificate.

PART 2:

ADVICE PROVIDED UNDER SECTION 149(5)

ATTENTION: Section 149(6) of the Act states that a Council shall not incur any liability in respect of advice provided in good faith pursuant to sub-section 149(5).

21. Outstanding Notices and Orders issued by Council.

Council records indicate that this premise IS NOT AFFECTED by a current notice or order (excluding the notices or orders mentioned in the note below).

NOTE: The Council has not inspected the premises immediately prior to the issue of this certificate. It is possible that the premises are affected by matters of which the Council is unaware.

NOTE: This Certificate does not include any advice regarding outstanding notices or orders issued under the Environmental Planning and Assessment Act 1979 or the Local Government Act 1993. To obtain advice regarding these matters, you should lodge an application for a Certificate as to Outstanding Notices and Orders (accompanied by the appropriate fee). For further information, please contact the Customer Enquiry Centre on (02) 4974 2000.

22. Further consent requirements under the Newcastle Local Environmental Plan 2012.

The following provisions of the Newcastle Local Environmental Plan 2012 affect the carrying out of development on the land. These provisions are in addition to those required to be disclosed at Item 2 of this Certificate.

Refer to clause 3.1 Exempt Development of the Newcastle Local Environmental Plan 2012

Refer to clause 3.2 Complying Development of the Newcastle Local Environmental Plan 2012

Note: The Newcastle Local Environmental 2012 may have additional provisions that affect the carry out of development. Refer to the Newcastle Local Environmental 2012 for the full affect it may have on the land or obtain profession advice for more information.

23. Suspension of covenants.

Refer to 1.9A Suspension of covenants, agreements and instruments of the Newcastle Local Environmental Plan 2012.

24. Draft development control plans.

The following draft development control plans APPLY to the land. The draft plans are exhibited pursuant to Part 3 of the Environmental Planning and Assessment Regulation 2000.

Draft Newcastle Development Control Plan 2012 - Section 4.04 Safety & Security

Draft Newcastle Development Control Plan 2012 - Section 5.03 Tree Management

Draft Newcastle Development Control Plan 2012 - Section 9.00 Glossary

25. Heritage Act 1977.

The land IS NOT AFFECTED by a listing on the State Heritage Register or an Interim Heritage Order that is in force under the Heritage Act 1977.

NOTE: The above advice is provided to the extent that Council has been notified by the Heritage Council of NSW. For up-to-date details, contact the Office of Environment and Heritage, PO Box A290, South Sydney NSW 1232 Ph: (02) 9995 5000.

26. Listing by National Trust of Australia.

The land IS NOT AFFECTED by a listing of the National Trust of Australia (NSW).

NOTE: The above advice is provided to the extent that Council has been notified by the National Trust of Australia (NSW). For up-to-date details, contact the National Trust Ph 02 9258 0123.

27. Australian Heritage Database.

The land IS NOT AFFECTED by a listing on the Australian Heritage Database.

NOTE: The above advice is provided to the extent that Council has been notified by the Department of the Environment. For up-to-date details, contact the Department of the Environment, Heritage, King Edward Terrace, Parkes ACT 2600. Ph (02) 6274 1111.

28. Environment Protection & Biodiversity Conservation Act 1999 (Cth)

Under the (Commonwealth) Environment Protection and Biodiversity Conservation Act 1999, actions which have, may have or are likely to have, a significant impact on a matter of national environmental significance may be taken only with the approval of the Commonwealth Minister for the Environment.

Approval is also required for actions that have a significant effect on the environment of Commonwealth land. These actions may be on Commonwealth land or other land.

This approval is in addition to any approvals under the (NSW) Environmental Planning and Assessment Act 1979 or other NSW legislation.

Matters of national environmental significance are:

- declared World Heritage areas
- declared Ramsar wetlands
- listed threatened species and ecological communities
- listed migratory species
- nuclear actions
- the environment of Commonwealth marine areas.

Locations within the City of Newcastle that are a declared Ramsar wetland include Kooragang Nature Reserve and Shortland Wetlands. Listed threatened species and listed migratory species are known to occur within the City of Newcastle.

29. Other matters

The land is affected by the following:

Newcastle earthquake

Earthquakes occurred in the vicinity of Newcastle on 28th December 1989 and 6 August 1994. Buildings on the land may have suffered damage as a consequence of the earthquakes. Prospective purchasers are advised to make their own enquiries as to whether the property is affected by any damage.

Local Planning Strategy

The Local Planning Strategy is the principal land use strategy for Newcastle. It was adopted by the Council on 28 July 2015. The Strategy is taken into account when the Council assesses development applications and amendments to the Newcastle Local Environmental Plan 2012.

Note: Refer to Council's website to view the document. www.newcastle.nsw.gov.au

Lower Hunter Regional Strategy (2006 - 2031)

The Lower Hunter Regional Strategy has been prepared by the Department of Planning and Infrastructure. The contents of the strategy will be taken into account when Council assesses development applications and amendments to the Newcastle Local Environmental Plan 2012.

Note: Refer to Council's website to view the document. www.newcastle.nsw.gov.au

Newcastle City-Wide Floodplain Risk Management Study and Plan (2012)

The Newcastle City-wide Floodplain Risk Management Study and Plan addresses flood management for the City of Newcastle. The Study and Plan will be taken into account when Council assesses development applications and amendments to the Newcastle Local Environmental Plan 2012.

Note: Refer to Council's website to view the document. www.newcastle.nsw.gov.au

Stormwater drain

The Council's records indicate that a stormwater drain passes through the land. A registered easement to drain water has not been created for this drain.

Contaminated land information

Council records indicate that this land has been identified as being affected by soil or groundwater contamination. Recommendations have been made regarding restrictions or special conditions over the use or development of the land. Council is in possession of the following management plan(s) which apply to the land:

1. Report: Douglas Partners Pty Ltd (December 2011) Interim Environmental Management Plan - Soil and Water Management NIER Site, prepared for The University of Management - Project 49538.02.
2. Report: Douglas Partners Pty Ltd (June 2014) Long Term Environmental management Plan
Council is in possession of the following contaminated land document(s) which relate to the land. Persons relying on the certificate are advised to examine and consider the contents of each document:

1. Report: Robert Carr & Associates Pty Ltd (November 2004) Environmental Assessment Proposed Demolition Area C & D Blocks Newcastle Technology Centre Off Vale St Shortland Prepared for BHP Billiton RCA Ref: 4403-002/0.
2. Report: Robert Carr & Associates Pty Ltd (December 2004) Phase 2 Environmental Site Assessment Proposed Demolition Area Newcastle Technology Centre Off Vale St Shortland Prepared for Kate Noble on behalf of BHP Billiton RCA Ref: 4549-002/0.
3. Report: RCA Australia Pty Ltd (March 2005) Contamination Delineation and Groundwater Investigation Proposed Demolition Area Newcastle Technology Centre Off Vale St Shortland RCA Ref: 4549-003/1
4. Report: RCA Australia Pty Ltd (May 2005) Remedial Action Plan Proposed Demolition Area Newcastle Technology Centre Off Vale St Shortland RCA Ref: 4549-005/1
5. Letter: RCA Australia Pty Ltd (30 May 2005) Notice of Category 2 Site Remediation Proposed Demolition Area, Newcastle Technology Centre Off Vale Street, Shortland.
6. Report: Robert Carr & Associates Pty Ltd (November 2005) Site Remediation and Validation Demolition Area Newcastle Technology Centre. RCA Ref: 4911-002/1.
7. Report: Douglas Partners Pty Ltd (May 2011) Baseline Soil and Groundwater Testing
8. Report: RCA Australia (May 2013) Detailed Site Investigation
9. Site Audit Report No. GN 467 (July 2013) Produced by Environ Australia Pty Ltd.

Council records indicate the following potentially contaminating landuse(s) may have been carried out on the land:

1. waste storage activities

Persons relying on the certificate are advised to make their own investigations as to whether the land is affected by elevated concentrations of soil or groundwater contaminants in relation to proposed purchase or use of land.

Issued without alterations or additions, 24/10/17

Authorised by

JEREMY BATH

INTERIM CHIEF EXECUTIVE OFFICER

University of Newcastle Proposed Bio-Resources Facility

APPENDIX

G

QA/QC REPORT

File Reference: 82218015 QAQC Report

Date: 17 October 2017

University of Newcastle
University Drive
Callaghan, NSW, 2308

QA/QC Report

Preliminary Site Investigation

Bio-Resource Facility, University of Newcastle

This Quality Assurance and Quality Control (QA/QC) report assesses the reliability of field procedures adopted and the analytical results produced as part of the Preliminary Site Investigation for the proposed redevelopment of the Bio-Resource Facility at the University of Newcastle, NSW ('the site'). The following data quality indicators have been adopted with reference to the National Environment Protection Council, National Environment Protection (Assessment of Site Contamination) Measure, 1999 (amended, April 2013) (NEPM, 2013):

- > Precision – The quantitative measure of variability of reproducibility of the data. Is a measure of the reproducibility of on measurements under a given set of conditions the Relative Percent Difference ('RPD') has been adopted to assess the precision of data between duplicate sample pairs;
- > Accuracy – The quantitative measure of the closeness of the reported data to the true value. It is a measure of the bias in the analytical results and can often be attributed to: field contamination; insufficient preservation or sample preparation; or inappropriate analytical techniques. Accuracy of the analytical data is assessed by consideration of laboratory control samples, laboratory spikes and analytical techniques in accordance with appropriate standards. Accuracy of the fieldwork is assessed against an assessment of field blank, field trip and rinsate results;
- > Representativeness – The confidence that the data is representative of each medium present on the site. Data representativeness is achieved by the collection of samples at an appropriate pattern and density as well as consistent and repeatable sampling techniques and procedures;
- > Completeness – A measure of the amount of usable data (expressed as a %) from a data collection activity. Sufficient data is required to enable an assessment of the Decision Rules; and,
- > Comparability – The confidence that data may be considered to be equivalent for each sampling and analytical event. This is achieved through consistent sampling and analytical testing and reporting techniques.

The data quality objectives, requirements and indicators for the assessment are presented in Table 1 below.

Table 1 Data Quality Objectives, Requirements and Indicators

Data Quality Objective	Requirement	Data Quality Indicator
Precision		
Intra-laboratory Duplicates	1 per 20 samples	RPDs < 50%
Inter-laboratory Duplicates	1 per 20 samples	RPDs < 50%
Laboratory Duplicates	Minimum of 1 per batch per analyte.	RPDs < 50%
Accuracy		
Laboratory Matrix Spikes	1 per batch per volatile/semi-volatile analyte	Recoveries 50% to 150%
Laboratory Surrogate Spikes	1 per volatile/semi-volatile analyte sample (as appropriate)	Recoveries 70% to 130%
Laboratory Method Blanks	At least 1 per batch per analyte tested	Result < Limit of reporting
Laboratory Control Samples	At least 1 per batch per analyte tested	Result < Limit of reporting
Rinsate samples	1 per sampling day	Result < Limit of reporting
Representativeness		
Sampling methodology	Appropriate for the sample type and analytes	Meet Requirement
Samples extracted and analysed within holding times	Specific to each analyte	Meet Requirement
Comparability		
Sampling approach	Consistent for each sample	Meet Requirement
Analysis methodology	Consistent methodology for each sample	Meet Requirement
Handling conditions and sampler	Consistent for each sample	Meet Requirement
Field observations and analytical results	Field observations to support analytical results	Meet Requirement
Consistent laboratory Limit of Reporting (LOR)	Consistent between primary and secondary laboratories	Meet Requirement
Completeness		
Chain of Custody Documentation	Appropriately completed	Meet Requirement
Field Sampling Documentation	Appropriately completed	Meet Requirement
Satisfactory quality assurance/quality control procedures	In accordance with relevant guidance	Meet Requirement

1 Field QA/QC Results

1.1 Duplicate Sampling Techniques

1.1.1 Soil Sampling

Duplicate samples were collected by splitting soil samples in the field. This comprised collecting a sample of soil from the borehole and splitting it equally (per volume) into three laboratory supplied jars (primary, duplicate and triplicate). This process was repeated until all jars were full and zero headspace remained. Care was taken to collect a representative sample in each jar, that is, from the same strata, location and depth within the bore hole.

Field splitting was employed rather than sample homogenisation (blending of a sample in a bowl) and splitting to minimise VOC loss.

1.2 Decontamination Procedures

Decontamination of non-disposable equipment was conducted between sampling events and comprised:

- > The scrubbing of field equipment in contact with potentially contaminated materials with a scrubbing brush and a container of 1% Decon 90 solution; and,
- > Rinsing of equipment with deionised water following scrubbing to remove the detergent.

1.3 Relative Percentage Difference

The precision or repeatability of laboratory results obtained between field split primary and replicate samples (ie. duplicate and triplicate samples) is derived by the calculation of the relative percentage differences (RPDs). The calculation of the RPD is conducted using the following equation:

$$\text{RPD (\%)} = \frac{\text{Original} - \text{Duplicate}}{(\text{Original} + \text{Duplicate}) / 2} \times 100$$

A RPD of +/- 50% is generally considered acceptable.

The comparative analysis between the primary and replicate samples for the sampling event is summarised below in Table 2. Note that when the laboratory result for one or both samples is below the PQL the RPD has been given as NA. Complete laboratory reports are provided in Appendix C.

Table 2 Replicate RDP results for HA2 0.05 – 0.15 / DUP/ TRIP

Contaminant Species		Units	PQL ¹	PQL ²	Primary Sample ID	Duplicate ID	Triplicate ID	MAX RPD
					HA2 0.05-0.15	DUP	TRIP	
					29/09/2017	29/09/2017	29/09/2017	
Heavy Metals	As	mg/kg	3	2	3	3	3.6	18%
	Cd	mg/kg	0.3	0.4	<0.3	<0.3	< 0.4	NA
	Cr	mg/kg	0.3	5	40	26	39	42%
	Cu	mg/kg	0.5	5	11	11	17	43%
	Pb	mg/kg	1	5	20	20	28	33%
	Hg	mg/kg	0.05	0.1	<0.05	<0.05	< 0.1	NA
	Ni	mg/kg	0.5	5	6.8	6.5	9.8	40%
	Zn	mg/kg	0.5	5	200	210	260	26%
TRH	C ₆ - C ₉	mg/kg	20	20	<20	<20	<20	NA
	C ₁₀ - C ₃₆	mg/kg	110	50	<110	<110	119	NA
	F1 C ₆ - C ₉	mg/kg	20	20	<20	<20	<20	NA
	F2 > C ₁₀ - C ₁₆	mg/kg	25	50	<25	<25	<50	NA
	F3 > C ₁₆ - C ₃₄	mg/kg	90	100	<90	<90	<100	NA
	F4 > C ₃₄ - C ₄₀	mg/kg	120	100	<120	<120	<100	NA
Naphthalene		mg/kg	0.1	0.1	<0.1	<0.1	<0.1	NA
BTEX	Benzene	mg/kg	0.1	0.1	<0.1	<0.1	<0.1	NA
	Toluene	mg/kg	0.1	0.1	<0.1	<0.1	<0.1	NA
	Ethyl Benzene	mg/kg	0.1	0.1	<0.1	<0.1	<0.1	NA
	Total Xylenes	mg/kg	0.3	0.3	0.4	0.4	<0.3	NA
PAH	Total	mg/kg	0.8	0.5	5.8	3	1.2	131%
	B(a)P	mg/kg	0.1	0.5	0.5	0.2	<0.5	NA
	B(a)P TEQ (Upper)	mg/kg	0.3	0.5	0.8	0.4	1.2	100%
OCP	Total	mg/kg	1.7	2	<1.7	<1.7	<2.0	NA
	DDT+DDE+DDD	mg/kg	0.3	0.05	<0.3	<0.3	<0.05	NA
	DDT	mg/kg	0.1	0.05	<0.1	<0.1	<0.05	NA
	Aldrin + Dieldrin	mg/kg	0.3	0.1	<0.3	<0.3	<0.1	NA
	Chlordane	mg/kg	0.2	0.1	<0.2	<0.2	<0.1	NA
	Endosulfan	mg/kg	0.2	0.15	<0.2	<0.2	<0.15	NA
	Endrin	mg/kg	0.2	0.05	<0.2	<0.2	<0.05	NA
	Hepta-chlor	mg/kg	0.2	0.05	<0.1	<0.1	<0.05	NA
	HCB	mg/kg	0.1	0.05	<0.1	<0.1	<0.05	NA
OPP	Methoxychlor	mg/kg	0.1	0.05	<0.1	<0.1	<0.05	NA
	Total	mg/kg	1	1.2	<1	<1	<1.2	NA
	Chlorpyrifos	mg/kg	0.2	0.2	<0.2	<0.2	<0.2	NA
Total PCB		mg/kg	1	0.5	<1	<1	0.5	NA

Notes to Table:

Bold - indicates exceedance of the acceptable RPD range of +/- 50%

1. SGS LOR Values
2. Eurofins LOR Values

The replicate RPD results summarised in Table 2 indicate that the samples analysed were generally within the acceptable RPD range of +/- 50% with the following exception:

- > Total Polycyclic Aromatic Hydrocarbons (PAH); and
- > Benzene (a) Pyrene, TEQ (Upper).

Elevated RPD values were considered tolerable due to:

- > Concentrations of some analytes being less than 5 times the PQL, which can produce elevated RPD values, despite the low magnitude differences in the concentrations of the replicate pairs; and,
- > The splitting of materials in the field to reduce volatile loss instead of homogenised blending.

The RPD results indicate the sampling methodology was acceptable and laboratory precision or repeatability was achieved.

1.4 Rinsate Samples

Rinsate samples are samples of laboratory prepared water poured over or through decontaminated field sampling equipment prior to the collection of environmental samples. Following completion of decontamination procedures (refer Section 1.2) laboratory supplied de-ionised water was poured over sampling equipment (typically a stainless steel garden trowel) and collected into a clean sampling jar for contaminant analysis. Rinsate samples are recovered to determine the adequacy of decontamination procedures and the potential for cross contamination of samples through use of adulterated sampling equipment.

Laboratory results for the Total Heavy Metals analysis of rinsate samples for the investigation are summarised in Table 3. Complete laboratory reports sheets are provided in Appendix C.

Table 3 Summary of TRH/BTEX Rinsate laboratory results

Sample ID	Date Sampled	Total Heavy Metals							
		Arsenic	Cadmium	Chromium	Copper	Nickel	Lead	Zinc	Mercury
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RIN	29/09/2017	<1	<0.1	<1	<1	<1	<1	<5	<0.001
SGS PQL		1	0	1	2	1	1	5	0.001

Notes to Table:

BOLD - Indicates laboratory result is greater than the laboratory PQL

PQL - Practical Quantification Limit

The rinsate laboratory results summarised in Table 3 were all less than the laboratory PQL, indicating that field decontamination procedures were generally adequate.

1.5 Trip Blanks

Trip blanks are a laboratory supplied analyte free matrix (laboratory certified clean sands for solid samples or de-ionised water for water samples). Trip blanks are taken from the laboratory to the sampling site, unopened and unexposed to sampling procedures and subjected to the same preservation methods as the field samples. The samples are then analysed to determine the potential for cross- contamination into the samples as a result of field handling, storage and shipping procedures. Laboratory results for the trip blank samples for the PSI are summarised in Table 4. Complete laboratory reports sheets are provided in Appendix C.

Table 4 Summary of Trip Blank Laboratory Results

Sample ID	Date Sampled	BTEX						
		Benzene	Toluene	Ethyl-benzene	m+p-Xylene	o-Xylene	Total Xylenes	Napthalene
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
TRIP BLANK	29/09/2017	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<0.1
ENVIROLAB PQL		0.1	0.1	0.1	0.2	0.1	0.3	0

Notes to Table:

BOLD - Indicates laboratory result is greater than the laboratory PQL

PQL - Practical Quantification Limit

The trip blank laboratory results summarised in Table 4 were all less than the laboratory PQL, indicating that field handling, storage and shipping procedures were generally adequate.

1.6 Trip Spikes

Trip spikes are a laboratory prepared sample injected or spiked with a known concentration of contaminants, in this case BTEX. The trip spikes were taken from the laboratory to the sampling site, unopened and unexposed to sampling procedures and subjected to the same preservation methods as the field samples. The samples are then analysed to determine the loss of VOCs as a result of field handling, storage and shipping procedures. Laboratory results for the trip spike samples for the PSI are summarised in Table 5 below. Complete laboratory reports sheets are provided in Appendix C.

Table 5 Summary of Trip Spike Laboratory Results

Sample ID	Date Sampled	BTEX				
		Benzene	Toluene	Ethyl-benzene	o-Xylene	m+p-Xylene
TRIP SPIKE	29/09/2017	89%	96%	97%	100%	100%

Notes to Table:

BOLD - Indicates the contaminant recovery is less than the specified DQI of 60 - 100%

The trip spike laboratory results summarised in Table 5 were within the acceptable contaminant recovery limits of 60-100%, indicate that field handling, storage and shipping procedures were generally adequate.

2 Laboratory QA/QC Results

2.1 Laboratory Replicates

Laboratory replicates are generated by subjecting a separate aliquot of sample through the same preparation and analysis procedures as the primary sample. Comparison of the primary sample to the duplicate will yield a precision measurement (expressed as RPD) in a given matrix.

The laboratory acceptance criteria for duplicate samples are as follows:

- > If results are less than 5 times the PQL, any RPD is acceptable; and,
- > If results are greater than 5 times the PQL, an RPD of 0-50% is acceptable.

Two samples returned RPD's outside of the acceptance criteria. Due to the low contaminant concentrations the RPD's are not considered to be a significant difference and are not indicative of inadequate field quality control. The RPD results are considered to be acceptable.

2.2 Method Blanks

A Method Blank is an analyte free matrix (laboratory certified clean sands for solid samples or de-ionised water for water samples) which is subjected to the complete preparation and analytical procedure to assess contamination introduced during laboratory procedures.

All laboratory results for method blank analysis were below the PQL indicating laboratory procedures were adequate to prevent cross contamination of samples.

2.3 Matrix Spikes

The Matrix Spike is a separate aliquot of the sample spiked with known concentrations of the analytes of interest. It is analyzed to determine, including the matrix interferences, if the procedure is working within established control limits. Analyte recoveries must lie between 70-130% for inorganics, 60-140% for organics and 10-140% for SVOC and Phenols.

Matrix spike recoveries were all within acceptable laboratory criteria.

3 Summary

It was considered that the field and laboratory QA/QC criteria were generally within acceptable limits indicating field sampling, storage, handling and decontamination procedures and laboratory preparation and analysis procedures were adequate for the purposes of the environmental investigation.