

16 April 2019

Leone McEntee
Planning Manager
Health Infrastructure
Level 14, 77 Pacific Highway
North Sydney NSW 2060

Dear Leone

Response to Comments and Submissions: Brookvale Community Health Centre (SSD 6980) Modification 2

This correspondence provides a response to the issues raised by the Department of Planning and Environment (DP&E) and Northern Beaches Council following submission of the application pursuant to section 4.55 of the *Environmental Planning and Assessment Act 1979* to modify the consent for State Significant Development 6980 for the Brookvale Community Health Centre (BCHC).

The application seeks approval for the establishment and operation of a temporary site compound for up to 16 months to support construction of the new pedestrian footbridge at Brookvale. A response to the comments and issues are provided in Table 1 below.

Table 1 Responses to comments and issues

Submissions	Response
Northern Beaches Council	
Suggestions to reduce the impact of the development include:	
Artwork or visually appealing graphics on the site hoarding. Given the compound will be used for 16 months, Council strongly recommends that the hoarding include artwork or graphics to improve the streetscape appearance of what will otherwise be a work site at a highly frequented area	Hoarding which features Transport for New South Wales (TfNSW) branding and messaging would be used for the proposed temporary site compound.
Minimise noise impacts to nearby residents. It is acknowledged that the affected residents adjoin Pittwater Road, however, afterhours work during low traffic times will be required and efforts should be made to minimise the noise impacts.	Noted. Control measures and safeguards to minimise potential noise impacts to nearby residents, particularly during works outside standard construction hours will form part of the Construction Noise and Vibration Management Plan developed to satisfy Conditions of Approval B21.
Measures to suppress dust from the construction of the bridge and within the compound should be used. A large number	Noted. Control measures and safeguards to minimise potential impacts from dust emissions will form part of the Construction Environmental Management Plan developed to satisfy

Submissions	Response
of pedestrians and public transport users congregate at the bus stop, in close proximity to the compound.	Condition of Approval B19.
General comments on the bridge structure include:	
It is recommended that the elevator be predominantly glass, giving the structure a light weight appearance (eg: the elevator at the top Ryde pedestrian bridge crossing).	Noted, this submission relates to the approved development rather than the proposed modification. However, it is noted the design of the pedestrian footbridge incorporates glass panel features, giving the lift structure a light weight appearance.
Advertising signage on the bridge should not be so large that it dominates the structure and is an unreasonable distraction to drivers.	Noted, this submission relates to the approved development rather than the proposed modification. Advertising signage on the pedestrian footbridge as noted in Section 5.1.5 of the Environmental Impact Statement, is subject to a separate environmental assessment and approval process. This assessment process will include a road safety audit to assess potential driver distraction from any proposed advertising.
DP&E	
A revised site plan in high resolution which includes relevant lots to be provided to support the application.	A revised site plan which includes Lot and DP boundaries is included as Attachment A.
Confirmation of landowners consent to be provided to support the application.	As noted in the Environmental Assessment for the proposed modification Lot 102, DP1247294 has been acquired from Westfield by TfNSW for the new pedestrian Bridge. Landowners consent for the proposed modification request is provided as Attachment B. It is noted subsequent to submission of the modification request on 18 February 2019, consent from the landowner was received for use of this additional area to the south of the work zone for the temporary site compound. The site plan provided as Attachment A has been revised accordingly to shown the enlarged site footprint.
Clarification on the extent of earthworks for the proposed temporary site compound.	Earthworks would generally be required to level the existing raised landscaped garden area adjacent to the car park (refer to Figure 1 below).  Figure 1 Temporary site compound (view to the south) Earthworks works would extend to a maximum depth of 0.2 metres below ground level. The total disturbance for the proposed temporary site compound and associated utility connections would be around 42 cubic metres.

Submissions	Response
The Phase 1 Preliminary Site Investigation Report to be provided to support the application.	The Phase 1 Preliminary Site Investigation Report and Site Suitability Assessment is provided as Attachment C.
Compliance with Clause 6.1 Acid Sulfate Soils of WLEP 2011 to be addressed noting "Environmental Assessment asserts that no excavation below the natural ground level is proposed, but also states that excavation of up to 1m is proposed, and additional earthworks to install utilities may occur. If necessary, please prepare an Acid Sulfate Soils Management Plan.	The Preliminary Site Investigation completed for the concept design phase notes fill material is present to depths of between 1.5 metres and 2.1 metres below ground level. As noted above excavation for the proposed site compound would extend to a maximum depth of 0.2 metres below ground level and would be limited to fill material. As excavation would not extend into the natural ground surface, impacts associated with ASS are not expected and accordingly an Acid Sulfate Soils Management Plan is not required for the proposed temporary site compound.

No amendments have been made to the proposed temporary site compound as a result of the submissions received.

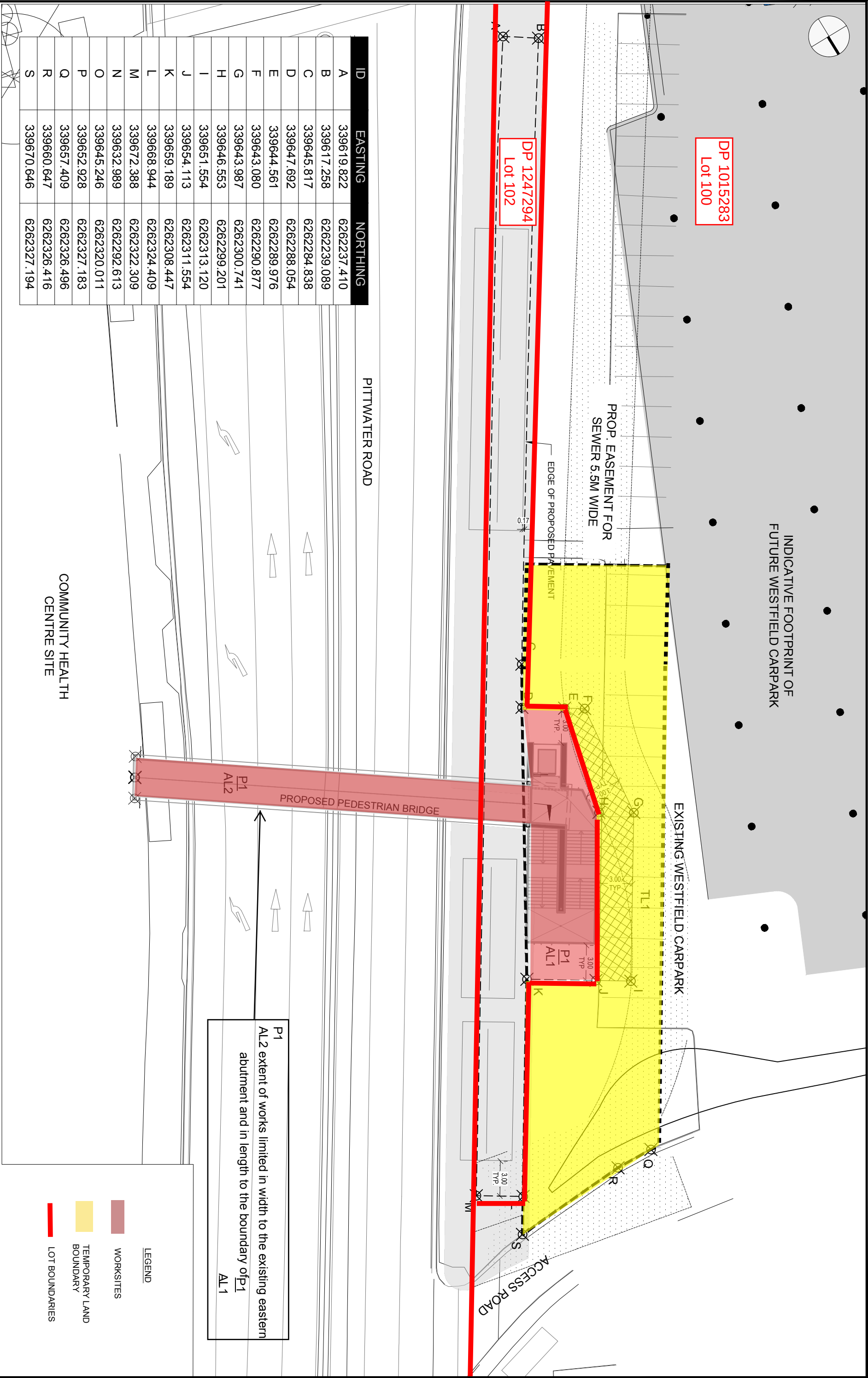
Should any further information or clarification be required in relation to this response to submissions, please contact the undersigned or phone Lisa Montesin on 0414 243 539

Yours sincerely



Sharbel Sarkis
A/Senior Project Manager
Infrastructure & Place
Transport for NSW

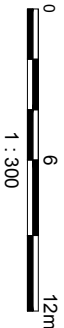
Attachment A Site Plan



ID	EASTING	NORTHING
A	339619.822	626237.410
B	339617.258	6262239.089
C	339645.817	6262284.838
D	339647.692	6262288.054
E	339644.561	6262289.976
F	339643.080	6262290.877
G	339643.987	6262300.741
H	339646.553	6262299.201
I	339651.554	6262313.120
J	339654.113	6262311.554
K	339659.189	6262308.447
L	339668.944	6262324.409
M	339672.388	6262322.309
N	339632.989	6262292.613
O	339645.246	6262320.011
P	339652.928	6262327.183
Q	339657.409	6262326.496
R	339660.647	6262326.416
S	339670.646	6262327.194

COMMUNITY HEALTH
CENTRE SITE

Scales



Status
PRELIMINARY
NOT FOR CONSTRUCTION

Reg'n No

-



NORTHERN BEACHES B-LINE PROGRAM
BROOKVALE

SSD 6980 Site Compound
Modification Attachment A

Project Company Stage Type Design Lot Dwg No.

Rev

Rev	Description	Date	Approved
1	FOR INFORMATION	13.03.2019	

50mm on Original

Attachment B Construction easement terms and landowners consent

SCENTRE GROUP

28 March 2019

Andrew Naylor
Project Manager
Northern Beaches B-Line Program
Infrastructure & Services
Transport for NSW

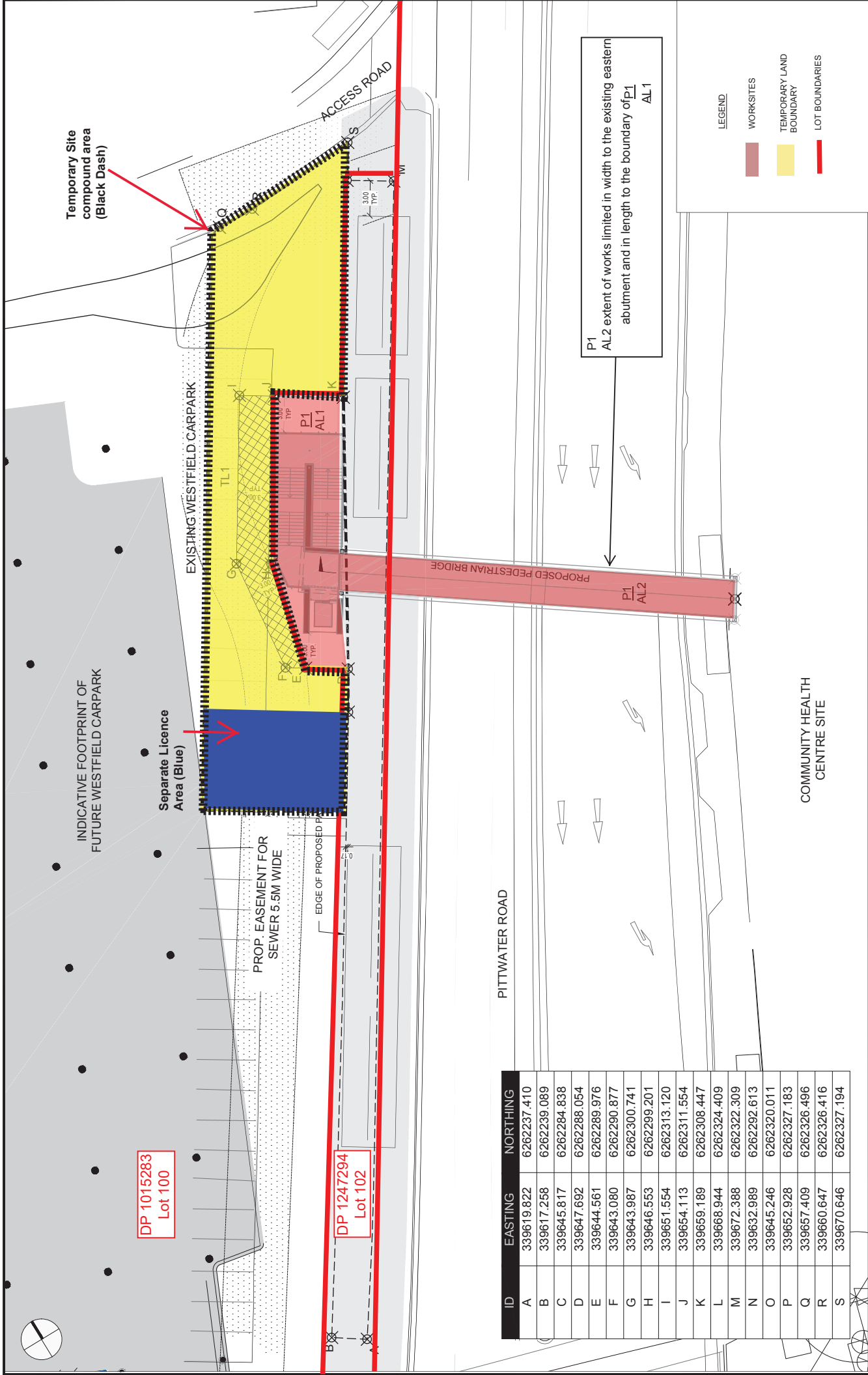
WESTFIELD WARRINGAH MALL – LOT 100 DP1015283

On behalf of Scentre Management Limited ACN 001 670 579 as trustee of the WestArt Trust and AMP Warringah Mall Pty Limited as trustee for the Warringah Mall Trust ("the Owners"), being the owners of Westfield Warringah Mall ("the Property") we hereby authorise Transport for NSW to submit a modification to State Significant Development (SSD) 6980 consent for the Brookvale Community Health Centre, for the purpose of establishing a temporary site compound on the Property (within the location shown on the attached plan) to support construction of the pedestrian bridge across Pittwater Road.

Yours sincerely
Scentre Limited



DAVID BRENNAN
Development Executive



ID	EASTING	NORTHING
A	339619.822	6262237.410
B	339617.258	6262239.089
C	339645.817	6262284.838
D	339647.692	6262288.054
E	339644.561	6262289.976
F	339643.080	6262290.877
G	339643.987	6262300.741
H	339646.553	6262299.201
I	339651.554	6262313.120
J	339654.113	6262311.554
K	339659.189	6262308.447
L	339668.944	6262324.409
M	339672.388	6262322.309
N	339632.989	6262292.613
O	339645.246	6262320.011
P	339652.928	6262327.183
Q	339657.409	6262326.496
R	339660.647	6262326.416
S	339670.646	6262327.194

Scale

0 6 12m

1 : 300

FOR INFORMATION

13.03.2019

1

Description

Date

Approved

PRELIMINARY

NOT FOR CONSTRUCTION

A3

MGA ZONE 56

AHD

Other Model 0

Regn No

-

Project

Company

Stage

Type

Design Lot

Doc No

Rev

NORTHERN BEACHES B-LINE PROGRAM

BROOKVALE

SSD 6980 Site Compound

Modification Attachment A

Transport for NSW

NSW GOVERNMENT

From: Tim Parker
To: [Vitor Reis](#); [Andrew Naylor](#); [Grace Agnew](#); [Mark Silvia](#)
Cc: [David Brennan](#)
Subject: RE: Brookvale - Site Visit
Date: Friday, 8 February 2019 3:30:15 PM
Attachments: [image003.png](#)
[image004.jpg](#)
[image001.png](#)

Hi Vitor,

Thank you for sending this through.

The revised compound proposal make sense from a practicality perspective.

Three additional car spaces are agreed in principle and can be encapsulated in the works area agreement.

Kind regards,

Tim Parker

Operations Manager - Customer Experience
Westfield Warringah Mall

SCENTRE GROUP

T +

M +

E tparker@scentregroup.com

FB [Scentre Group](#)

W westfield.com.au/warringahmall



From: Vitor Reis [mailto:Vitor.Reis@Downergroup.com]

Sent: Tuesday, 5 February 2019 5:54 PM

To: Andrew Naylor <Andrew.Naylor@transport.nsw.gov.au>; Grace Agnew <Grace.Agnew@transport.nsw.gov.au>; Mark Silvia <Mark.Silvia@Downergroup.com>; Tim Parker <TParker@Scentregroup.com>

Subject: Brookvale - Site Visit

Hi Tim,

Thank you for making yourself available for today's site visit.

As per our discussion please find attached our proposal for the site compound. As we mentioned, in order to avoid plant access through the carpark we are proposing to take 3 additional car spaces that will allow to move the site sheds to this location, making room for plant access from the road. Having this additional space will allow for the concrete trucks, concrete pumps, etc to park and operate within the hoarding.

Regarding the additional car spaces for site team/workers I will confirm it in our next meeting.

Please let me know if you have any issue.

Regards,

Vitor Reis
Planning Engineer
Downer Group



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Think before you print

Downer

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Attachment C Preliminary Site Investigation and Site Suitability Assessment



Phase 1: Preliminary Site Investigation

Pittwater Rd, Warringah Mall, Brookvale, NSW 2100

Reference No. 3001515
Prepared for Transport NSW
20 September 2018

Document Control

Document:	Phase 1: Preliminary Site Investigation
File Location:	\\AUSYFSV003\Projects Disk 02\$\3001515 – Brookvale Pedestrian Bridge\007 Deliverables\Phase 1 ESA
Project Name:	Pittwater Rd, Warringah Mall, Brookvale, NSW 2100
Project Number:	3001515
Revision Number:	Final R0

Revision History

REVISION NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED FOR ISSUE BY
Revision 0	20/09/2018	Mark Laidlaw	Penelope Ford	Chen Wang

Issue Register

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Important Notice

This report is confidential and is provided solely for the purposes of providing contamination advice regarding the proposed development at Lot 100, Pittwater Road, Brookvale (DP 1015283). This report is provided pursuant to a Consultancy Agreement between SMEC Australia Pty Limited ("SMEC") and Transport NSW, under which SMEC undertook to perform a specific and limited task for Transport NSW. This report is strictly limited to the matters stated in it and subject to the various assumptions, qualifications and limitations in it and does not apply by implication to other matters. SMEC makes no representation that the scope, assumptions, qualifications and exclusions set out in this report will be suitable or sufficient for other purposes nor that the content of the report covers all matters which you may regard as material for your purposes.

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ABBREVIATIONS & ACRONYMS

ABBREVIATION / ACRONYM	DESCRIPTION
ACM	Asbestos containing material
AEC	Area of environmental concern
AHD	Australian Height Datum
ASS	Acid sulfate soils
BTEX	Benzene, toluene, ethylbenzene and xylenes
CoC	Contaminants of Concern
COC	Chain of Custody
EPA	Environment Protection Authority
EPL	Environment Protection Licence
m	Metres
m bgl	Metres below ground level
OCP	Organochlorine pesticides
OPP	Organophosphorus pesticides
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyls
POEO Act	Protection of the Environment Operations Act
TRH	Total recoverable hydrocarbons

Executive Summary

SMEC Australia Pty Ltd (SMEC) was engaged by Transport NSW to conduct a Assessment at a portion of Lot 100 (DP1015283) commonly known as the Warringah Mall, Brookvale, NSW 2100.

This preliminary site investigation (PSI) was required to assist Transport NSW as part of their landowner due diligence to evaluate the contamination status of the area proposed for excavation and pilling for the pedestrian bridge pier (the site).

The objectives of the PSI was to:

- Understand the history of the site and surrounding areas
- Identify potential sources of contamination and determine potential contaminants of concern
- Identify potential adjacent human and ecological receptors
- Evaluate if contamination (if any) poses a risk to human health or the environment and/or has the potential to preclude development of the site for the pedestrian bridge
- Develop a Preliminary Conceptual Site Model
- Provide recommendations on the need for further investigations and/or management based on preliminary findings.

The scope of the PSI included:

- Historical desktop assessment
- Review of local hydrogeology gleaned from previous Geotechnical Assessments
- Preparing this report.

A site history review indicated that the site appears to have a history of residential to then commercial/industrial land use. The subject site is part of the registered contaminated site of Warringah Mall where a former Dry Cleaning business was known to operate. Historically a number of other contaminated sites have been registered in the immediate vicinity, associated mainly with former refuelling facilities. Given the potential exists for contamination to have historically migrated onto or through the subject site at various depths any proposed excavations / pilling has the potential to:

- Engage a remnant contamination plume at various depths where seepage water and/or groundwater may be encountered
- Encounter volatile organic compounds (VOCs) in the form of volatile sub-surface gases or hydrocarbon odours
- Intersect hydrocarbon impacted fill, soil and/or groundwater

It is understood that excavations and pilling will extend to approximately 7-9 m bgl during the construction of the pedestrian bridge pier. As such, the entire horizontal and vertical extent of the site is considered to be an Area of Environmental Concern.

The predominant contaminants of concern and their origins include:

- Uncontrolled fill imported onto the site during the shopping centre and / or road constructions comprising ACM, heavy metals, petroleum hydrocarbons, road engineering products and pesticides
- Petroleum hydrocarbon impacts to soil, groundwater and soil vapours originating from the surrounding known contaminated sites including the Brookvale Bus Depot located 75 m northeast of the site
- Potential solvent impacts to soil, groundwater and soil vapour from the former dry-cleaning facility to the west of the site
- The potential application of herbicides / pesticides from historical farming and to a lesser extent, current landscaping.

In order to adequately manage known and unknown contamination risks within the proposed excavation area, it is recommended management measures be developed and implemented. These include but are not limited to:

- Development of a sampling regime of soil to be excavated for the purpose of off-site disposal. This material will need to be issued a waste classification prior to disposal at a licenced facility. Soil sampling and analysis will be undertaken in accordance with NEPM (2013) with analytical results compared against the NSW EPA Waste

Classification Guidelines: Part 1 Classifying Waste. This regime can either be conducted *in situ* via borehole drilling prior to construction or during the excavation and stockpiling. It should be noted that standard laboratory turnaround times are 5-7 working days

- A Contamination Management Plan (CMP) to inform the Client and contractors of their requirements and how to achieve appropriate management of contamination under the POEO Act to *'reduce risks to human health and prevent the degradation of the environment'*
- An Unexpected Finds Protocol (UFP) if contamination is encountered during site works. In this case work should immediately cease and the UFP should be implemented immediately
- If Asbestos Containing Materials (ACM) are identified, an Asbestos Management Plan (AMP) is recommended to safeguard site workers and the general public during scheduled construction work.

1 INTRODUCTION

SMEC Australia Pty Ltd (SMEC) was engaged by Transport NSW as part of the Downer Engineering Pty Ltd Design and Construct agreement, to conduct a Contamination Assessment at a portion of Lot 100 (DP1015283) commonly known as Pittwater Rd, Warringah Mall, NSW 2100, Brookvale, NSW.

This preliminary site investigation (PSI) was required to assist Transport NSW as part of their landowner due diligence to confirm that the area proposed for the installation of the western end of a pedestrian bridge pier (the site) is suitable from a contaminated land perspective. A map showing the proposed site is presented in **Figure 1, Appendix A**.

1.1 Proposed Development

The site is located within the Northern Beaches Council (Council) Local Government Area (LGA) and is presently zoned "B3 Commercial Core" under Council's Local Environmental Plan (LEP), 2011.

Based on information provided by NSW Roads and Maritime Services (RMS), SMEC understand that a draft plan has been prepared to accommodate a single pedestrian bridge across Pittwater Road.

1.2 Project Objectives

The objectives of the PSI were to:

- Understand the history of the site
- Identify potential sources of contamination and determine potential contaminants of concern
- Identify potential adjacent human and ecological receptors
- Develop a Preliminary Conceptual Site Model
- Provide recommendations on the need for further investigations and/or management based on preliminary findings.

1.3 Scope of Works

To meet the above objectives, the following scope of works and staging was undertaken:

- Historical desktop assessment of the site comprising a review of all available information for the subject site (including previous investigations, historical aerial photography/satellite imagery, acquisition and review of planning certificates 2 and 5, zoning, geology, topography, geology, hydrogeology, acid sulphate soils, contaminated land records search and POEO database search)
- A review of available Geotechnical Assessments to identify sub-strata fill
- Preparation of this report detailing the findings.

1.4 Published Guidelines and Framework

The assessment has been undertaken with reference to:

- NEPM National Environment Protection (Assessment of Site Contamination) Measure (1999), Schedule B (1) Guidelines on Investigation Levels for Soil and Groundwater, as amended 2013.
- NSW Environment Protection Authority (EPA) (2014), Waste Classification Guidelines – Part 1: Classification of waste
- NSW EPA (2011) Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Land
- NSW EPA (formerly DECC) (2006) Contaminated Sites Guidelines for the NSW Site Auditor Scheme (2nd edition).

2 SITE INFORMATION

2.1 Site Description and Zoning

The site comprises a portion on eastern boundary of Lot 100 DP 1015283 located at the Warringah Mall, Brookvale, NSW. The site is currently composed of a concrete sidewalk and landscaped area and is located adjacent to the western side of Pittwater Road, Brookvale. The Warringah mall parking lot is located to the west. The site location and layout is provided in **Figure 1, Appendix A**.

A summary of site information is presented below in Table 2-1.

Table 2-1: Summary of site information

TITLE IDENTIFIER	LOT 100 (DP1015283)
Address	Pittwater Road, Brookvale NSW 2100
Area	Portion of Lot 100: Total area: 200 m ² .
Owner	Transport NSW
Zoning	The site is located within the Northern Beaches Local Government Area (LGA) and is presently zoned "B3 Commercial Core" under Council's <i>Local Environmental Plan, 2011</i> .
Current Land use	Warringah Mall sidewalk and landscaped area
Proposed land use	The proposed land use is for a pier of a pedestrian bridge to be constructed on a portion of the lot, using piling and excavation methods to 7-9 m bgl.
Surrounding land use	North: The land immediately to the north of the site comprises a sidewalk containing two pedestrian rain canopies and a landscaped strip of land. Beyond is Bunnings. The land immediately northwest of the site consists of the Warringah Mall parking lot. South: A sidewalk and Pittwater Road are located south of the site. East: Pittwater Road is located immediately east of the site, and beyond is the NSW Health community development site. West: The Warringah Mall parking lot is located west of the site.

2.2 Topography and Landforms

According to the software Daftlogic (2018), the site elevation in the proposed pedestrian bridge is approximately 12.0mAHD.

The tiled concrete sidewalk in the area of interest of Lot 100 is flat while the landscaped area to the west of the sidewalk slopes to the west towards the Warringah Mall parking lot.

2.3 Vegetation

The area of interest in Lot 100 is comprised of an approximately 7m wide concrete tiled sidewalk. To the west of the sidewalk is an approximately 5 m wide landscaped area containing ornamental grasses and several small trees. The landscaped vegetation does not appear to show any signs of stress.

2.4 Site Geology

Reference to the Sydney 1:100,000 Geological Sheet (Sheet 9130, 1983) indicates that the site is likely to be underlain by Quaternary Sediments comprising silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in places with common Shell layers.

2.5 Site Lithology

Reference to the NSW Office of Environment and Heritage eSPADE Soil Landscape Viewer indicates that:

- The project site is situated on 'Disturbed Terrain' extensively disturbed by human activity including complete disturbance, removal or burial of soil.
- Soil is generally turfed fill and is commonly capped with up to 40cm of sandy loam or up to 60 centimetres of compacted clay over fill materials.
- The site limitations are dependent on the nature of the fill material. Potential mass movement hazard, unconsolidated low wet strength materials, impermeable soil, poor drainage, localised very low fertility and toxic materials.
- The range of soil types that may be encountered in the area include loose black sandy loam, compacted mottled clay, variable transported fill and dark dredged muds and sands.

2.6 Acid Sulfate Soil Risk

The NSW Government eSPADE website describes the site as being located near the margin of a zone comprising acid sulphate zone (L4) 'Low probability, >3 m below ground surface'. The digital atlas of Australian soils indicated that the site is located in an area with a low probability of acid sulphate soil.

2.7 Hydrology and hydrogeology

According to the NSW Office of Environment and Heritage eSpade software, a drainage channel labelled 'Brookvale Creek' has historically crossed Lot 100 diagonally from the northwest and exited on the south-eastern portion of Lot 100. The direction of flow is towards the southeast. Brookvale Creek has historically discharged into Manly Creek. It is likely that currently Brookvale Creek has been changed into a stormwater drain. Surface runoff from Lot 100 likely flows into the Brookvale Creek drain. The groundwater flow beneath the site likely flows towards the south-southeast. The depth to groundwater from a borehole (GW107745) located 450m southeast of the site was 9.0 metres below ground level.

SMEC completed a preliminary search of the Department of Water and Energy Online Database on 9 September 2018 to identify groundwater bores within the vicinity of the site. The search indicated that nine bores are registered under the database within a 500 metre radius of the site. Details of the bores are provided in Table 2-2.

Douglas Partners conducted a Geotechnical Investigation (DP, 2015) at 612-624 Pittwater Road (western side of Pittwater Road). The geotechnical report indicated that groundwater water is likely to be perched with ephemeral water associated with stormwater ingress running over the surface of the rock (and overlying residual clays). The regional groundwater table is expected to be at a lower elevation (RL8 m to RL9 m AHD), as was encountered in some boreholes at the northern end of the site.

SMEC Testing Services Pty Ltd conducted a Geotechnical Investigation (SMEC Testing, 2014) at the corner of William Street and Pittwater Road, Brookvale, and identified perched groundwater at 1.8 – 3.8m bgl.

Table 2-2: Summary of registered groundwater bores.

BOREHOLE ID	STANDING WATER LEVEL (M BGL)	COMMENTS	PURPOSE
GW107745	9.0	Borehole is located approximately 450m south-east of the Site. The borehole is 15.0m deep.	Domestic
GW108944	Not Indicated	Borehole is located approximately 500m south-west of the Site. The borehole depth was not indicated.	Domestic
GW115096	Not Indicated	Borehole is located approximately 500m west of the Site. The borehole depth was not indicated.	Not Indicated
GW115097	Not Indicated	Borehole is located approximately 500m west of the Site. The borehole depth was not indicated.	Not Indicated
GW115098	Not Indicated	Borehole is located approximately 500m west of the Site. The borehole depth was not indicated.	Not Indicated
GW115099	Not Indicated	Borehole is located approximately 500m west of the Site. The borehole depth was not indicated.	Not Indicated
GW114515	Not Indicated	Borehole is located approximately 400m east of the Site. The borehole depth is 4.5m.	Monitoring Bore
GW114516	Not Indicated	Borehole is located approximately 400m east of the Site. The borehole depth is 4.5m.	Monitoring Bore
GW114517	Not Indicated	Borehole is located approximately 400m east of the Site. The borehole depth is 4.0m.	Monitoring Bore

3 SITE HISTORY AND OBSERVATIONS

3.1 General

Site history information was reviewed from the following information sources:

- Review of historical aerial photography (1943, 2005 - present). We note that aerial photography between the 1943 and 2005 period was not viewed
- A search of NSW EPA Contaminated Land and licence records under the Protection of the Environment and Operations (POEO) Act
- Planning Certificates 2 and 5
- Review of existing literature relating to the Site.

3.2 Aerial Photography

Historic aerial photos reviewed during this study are presented in **Appendix B**. Site features and surrounding site conditions are summarised in Table 3-1.

Table 3-1: Historical Aerial Photo Review

YEAR	SITE DESCRIPTION AND SURROUNDING AREA
Aerial Photo – 1943 (Sixmap, B/W)	Onsite: The 1943 aerial photograph appears to indicate that the site is vacant in a residential setting with several small trees. The residential dwelling is located approximately 75-100m south of the site. A drainage ditch is located north and west of the site. The quality of the photo is relatively poor. Offsite: Dwellings are present off-site to the north and one dwelling is located directly east of the site across Pittwater Road (assumed to be residential). Brookvale Creek appears to be oriented from the northwest to the southeast across Lot 100.
Satellite Imagery 2005 (Google Earth; Colour)	Onsite: The site consists of a concrete sidewalk and a rain canopy located adjacent to Pittwater Road. A landscaped area is located on the western portion of the site Offsite: The area to the west is a parking lot with a pedestrian rain canopy leading to the Warringah Mall. The Warringah Mall is located west of the parking lot. The area to the north consists of a parking lot, landscaped area and sidewalk. A commercial building is located further to the north. The area to the east consists of Pittwater Road. The area to the east of Pittwater Road consists of commercial buildings and a residential property. It appears that the residential property is the same property identified east of the site in the 1943 aerial photograph. There is one vacant property south of the residential property. The area to the south is Pittwater Road and a road intersection.
Aerial Photo 2010 (Nearmap; Colour)	Onsite: The site remains the same as it was in 2005. Offsite: The area to the east, south and north remains the same as they were in 2005.
Aerial Photo 2015 (Nearmap; Colour)	Onsite: The site remains the same as it was in 2005 and 2010. Offsite: The area to the east, south and north remains the same as they were in 2005 and 2010.
Aerial Photo 2018 (Nearmap, Colour)	Onsite: The sidewalk at the site has been covered by concrete tiles. The landscaping on the western portion of the site has been re-landscaped. Offsite: Two rain canopies have been installed in the sidewalk immediately north of the site and two rain canopies have been installed south of the site. The trees in the landscaping west of the sidewalk along Pittwater Road have been cut down and the area has been re-landscaped.

YEAR	SITE DESCRIPTION AND SURROUNDING AREA
	The residential property and the vacant lot located on the east side of Pittwater road have been replaced by a large multi-story building. The commercial buildings located northeast of the site across Pittwater Street have also been replaced with new buildings.

3.3 Publicly Available Information Review

Insufficient time was available to obtain publicly available information from the Northern Beaches Councils. Requests made to the council require up to 20 days to complete.

3.3.1 Planning Certificates 2 and 5

Information contained within the planning certificate 2 and 5 for lot 100 is summarised below. The planning certificates are provided in **Appendix C**.

LOT 100

- Zone B3 – Commercial Core
- The land is not significantly contaminated and is not subject to a management order or an approved voluntary management proposal
- The land is not subject to an ongoing maintenance order and is not the subject of a site audit statement
- Acid Sulfate Soils-Class 4 and 5 were identified on the Acid Sulfate Soils Map of the Warringah Local Environmental Plan 2011 (WLEP 2011).

3.3.2 Land Title Search

A land title search was not conducted due to insufficient time was available.

Title searches were also not deemed essential for the findings of the investigation.

3.3.3 Contaminated Land Search

A search of the NSW EPA Contaminated Land records on 10 September 2018 showed there were seven notified sites within a one kilometre radius of the site. None of the sites currently require management by the NSW EPA under the Contaminated Lands Management Act 1997 (CLM Act).

Although none of the registered sites require direct NSW EPA management, it should be noted that A known Dry Cleaning business was formerly located at the Warringah Mall, and was previously registered as a contaminated site. There are also numerous existing or former service station sites in close proximity to the site. As such, any proposed excavations / pilling have the potential to intersect contaminated fill, soil and/or groundwater. The potential also exists for volatile sub-surface gases to be present.

A summary of the NSW EPA Contaminated Land records search results are provided in **Appendix D**.

Table 3-2: NSW EPA Contaminated Land Records Search Results

Site Name	Contamination Activity Type	EPA Management Class	Distance from Site (km)
AMP Warringah Mall	Other Industry	Regulation under CLM Act not required	0 m
Brookvale Bus Depot	Other Petroleum	Regulation under CLM Act not required	75 m (NE)
Harrison Manufacturing	Other Industry	Regulation under CLM Act not required	395 m (NW)
Littles Dry Cleaning	Other Industry	Regulation under CLM Act not required	533 m (W)
Caltex Service Station Brookvale	Service Station	Regulation under CLM Act not required	847 m (NE)
Woolworths Petrol Brookvale	Service Station	Regulation under CLM Act not required	914m (NE)
Coles Express Service Station Brookvale	Service Station	Regulation under CLM Act not required	1,100 m (NE)

3.3.4 POEO Database Search

A search of the NSW EPA Protection of the Environment Operations register on 10 September 2018 showed there were two POEO licences that have been issued within a one kilometre radius of the site. There are 10 licenses that are either no longer in force or have been surrendered. Table 3-4 summarises the licences identified between one kilometre from the Site.

A full summary of the POEO Database search is provided in **Appendix E**.

Table 3-3: Summary of POEO licenses identified within a 1km radius of the site

Licence No.	Name	Location	Status	Distance from Site
20681	Cozens Paper Recycling Pty Ltd	Unit 3 100 Old Pittwater Road, Brookvale, NSW 2100	Issued	601 m (NW)
139	Harrison Manufacturing Co. PTY Limited	75 Old Pittwater Road, Brookvale, NSW 2100	Issued	338 m (NW)

3.4 Site interviews

No site interviews were conducted or deemed necessary for the investigation.

3.5 Site History Summary

The earliest available information for the site that SMEC reviewed was a 1943 black and white aerial photograph, showing the area as vacant land in a residential setting.

Warringah Mall was constructed in 1963 by the Hammerson Group and has remained under a similar land use since then. Aerial photography between 2005 and 2015 indicates little change with a concrete sidewalk covered by a pedestrian rain canopy, and landscaping west of the sidewalk. Since 2015 the pedestrian rain canopy was removed and the site was reconstructed with concrete tiles on the sidewalk and new landscaping west of the sidewalk.

Although none of the contaminated land registered sites require direct NSW EPA management, a known Dry Cleaning business was formerly located at Warringah Mall, and therefore the area of interest was previously registered as a contaminated site. Also there are numerous existing or former service station sites in close proximity to the area of interest, including a former Mobil service station across Pittwater Road and a former Caltex service station at the nearby Bunnings site.

Any proposed excavations / pilling has the potential to:

- Engage a remnant contamination plume at various depths where seepage water and/or groundwater may be encountered
- Encounter volatile organic compounds (VOCs) in the form of volatile sub-surface gases or hydrocarbon odours
- Intersect hydrocarbon impacted fill, soil and/or groundwater.

4 CONCEPTUAL SITE MODEL

4.1 Conceptual Site Model Overview

Based on the findings of the desk based review, SMEC has identified areas of potential environmental concern and associated contaminants of potential concern.

A preliminary Conceptual Site Model (CSM) has been prepared which presents potential source(s), pathway(s) and ecological/human receptor(s) linkages. The preliminary CSM should form the basis for decisions regarding the scope of works for further assessment and the ongoing contamination management and remediation options.

The CSM is made up of contaminants of concern (CoCs) and receptors that could be exposed to the CoCs.

4.2 Potential Areas of Environmental Concern

Table 4-1 identifies the AEC's that have been identified based on the available site history information. The location of AEC1 to AEC2 is presented in **Figure 4, Appendix A**.

Table 4-1 Summary of Risks Associated with AECs

AEC NO.	POTENTIAL AEC	LIKELIHOOD OF CONTAMINATION ¹	CONTAMINANTS OF POTENTIAL CONCERN
1	Potential uncontrolled fill from former shopping centre and road constructions	Medium	Heavy metals, PAHs, TPH, BTEX, Pesticides, PCBs, ACM (+others depending on fill source)
2	Potential petroleum hydrocarbon impacts to soil, groundwater and gas originating from the surrounding known contaminated sites including the Brookvale Bus Depot located 75 m northeast of the site	Medium to High	TPH, BTEX, PAHs
3	Potential solvent impacts to soil, groundwater and gas from the former dry-cleaning facility to the west of the site	Medium to High	Chlorinated Solvents, TPH, BTEX, PAHs, PCBs, phenols
4	The potential application of herbicides in the landscaped area at the site.	Low	Herbicides

Notes: 1. This is our qualitative assessment of likelihood of contamination being detected from the data reviewed, not financial or other risk associated if contamination were to be detected.

4.3 Potential Contaminants of Concern

Based on the desktop review and site inspection, the contaminants of potential concern (COPC) are shown in Section 4.2.

4.3.1 Heavy Metals

Heavy metals are likely to occur in fill originating from offsite. The site may have been subject to historical uncontrolled filling; therefore, areas of heavy metal impacted soils may be encountered.

Lead impacts may have also originated from nearby former hydrocarbon storage areas.

4.3.2 Petroleum Hydrocarbons

As noted in Section 3.3.3, numerous former registered contaminated sites surround the site. As such, a detailed suite of hydrocarbons have the potential to be present within fill, natural soil and groundwater.

Hydrocarbons from fuels, solvents, oils and cleaning products have potential to be present in the fill materials that may have been imported from off site.

PAHs are a group of pollutants generated primarily during the incomplete combustion of organic materials (eg coal, oil, petrol and wood).

BTEX refers to a group of chemicals comprising benzene, toluene, ethylbenzene and Xylene. The primary man-made releases of BTEX compounds are through emissions from motor vehicles and are also associated with petroleum products paints, thinners, rubber products, adhesives.

4.3.3 Asbestos

There is a potential for ACM to be present in uncontrolled fill used within the development of Warringah Mall.

4.3.4 Herbicides and Pesticides

Herbicides and pesticides may have been applied throughout the area either from historical farming and / to vegetation at the site; herbicides have the potential to impact near surface soils.

4.3.5 Polychlorinated Biphenyls (PCBs)

PCBs were mainly used as electric insulating oils, lubricants and coolants in electrical devices eg transformers and capacitors. Due to the unknown nature and origin of site-wide fill there is potential for PCBs to be present on-site.

4.3.6 Persistence in the Environment

The potential contaminants of concern identified which have a relatively high degree of persistence in the environment include:

- OCPs and OPPs
- Heavy metals
- Asbestos
- Some PAHs
- Longer chain hydrocarbons (i.e. >C29)

4.4 Exposure Pathways

The pathways of exposure consist of:

- A transport mechanism
- A route of exposure.

Based on site information, there is potential for following contamination pathways to exist during construction activities:

- Disturbance of soil contamination and exposure by ingestion, dermal contact or inhalation;
- Air transport of particulates (dust) or vapour intrusion/ground emissions of volatiles and exposure by inhalation;
- Ignition of potential explosive atmospheres within volatile vapours; and
- Rainwater infiltration and leachate seepage into underlying soils, rock and groundwater bearing layers' exposure by ingestion, dermal contact or inhalation.

4.5 Potential Receptors

4.5.1 Human Receptors

Based on the information available, potential human receptors include:

- Current and future users of the site including public open space users
- Intrusive maintenance workers (e.g. accessing utilities)
- Site personnel involved in the proposed site development
- Local residents and general public in neighbouring areas

- Recreational users of surface water in areas downstream of the site.

4.5.2 Ecological Receptors

Based on the information available, the potential ecological receptors comprise:

- Flora and fauna in areas within and surrounding the site
- The terrestrial and aquatic ecosystems of Brookvale Creek
- Root zone of landscaped plants.

4.5.3 Potential source-pathway-receptor linkages

Potential source-pathway-receptor (S-P-R) linkages are where soil, surface water and/or groundwater contamination (if present) has the potential for adverse impact on human health or ecological values for the Site via complete exposure pathways. Table 4-2 summarises the potential source-pathway-receptor linkages for each of the identified human and ecologically sensitive receptors.

Table 4-2 Potential S-P-R Linkages

SOURCE	PATHWAY	RECEPTOR
Potential Human Health Receptors		
Potentially contaminated groundwater	Direct Contact (ingestion, dermal contact, inhalation)	Construction/Maintenance Workers On/off-site groundwater users Recreational Users of downstream surface waters
	Vapour Migration	On/off -site maintenance workers
Herbicides	Direct Contact (ingestion, dermal contact, inhalation)	Public Open Space Users Construction/Maintenance Workers
	Surface water run-off	Recreational Users of downstream surface waters
Site wide fill	Direct Contact (ingestion, dermal contact, inhalation)	Public Open Space Users Construction/Maintenance Workers
Asbestos Containing Materials (ACMs) within site wide fill	Inhalation of fibres	Construction/Maintenance Workers Public Open Space Users
Potential Ecological Receptors		
Potentially contaminated groundwater	Migrations of contaminants within groundwater	Aquatic ecosystems of Brookvale Creek Plants
Herbicides	Surface water run-off	Aquatic ecosystems of Brookvale Creek Flora and Fauna Surrounding the site
	Migration within groundwater	Aquatic ecosystems of Brookvale Creek Plants
Site wide fill	Leaching and dissolution followed by groundwater migration	

5 ENVIRONMENTAL INVESTIGATION CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

A site history review indicated that the site appears to have a history of residential to then commercial/industrial land use.

The subject site is part of the registered contaminated site of Warringah Mall where a former Dry Cleaning business was known to operate. Historically a number of other contaminated sites have been registered in the immediate vicinity, associated mainly with former refuelling facilities. Given the potential exists for contamination to have historically migrated onto or through the subject site at various depths any proposed excavations / pilling has the potential to:

- Engage a remnant contamination plume at various depths where seepage water and/or groundwater may be encountered
- Encounter volatile organic compounds (VOCs) in the form of volatile sub-surface gases or hydrocarbon odours
- Intersect hydrocarbon impacted fill, soil and/or groundwater

It is understood that excavations and pilling will extend to approximately 7-9 m bgl during the construction of the pedestrian bridge pier. As such, the entire horizontal and vertical extent of the excavation / pilling is considered to be an Area of Environmental Concern.

The predominant contaminants of concern and their origins include:

- Uncontrolled fill imported onto the site during the shopping centre and / or road constructions comprising ACM, heavy metals, petroleum hydrocarbons, road engineering products and pesticides
- Petroleum hydrocarbon impacts to soil, groundwater and soil vapours originating from the surrounding known contaminated sites including the Brookvale Bus Depot located 75 m northeast of the site
- Potential solvent impacts to soil, groundwater and soil vapour from the former dry-cleaning facility to the west of the site
- The potential application of herbicides / pesticides from historical farming and to a lesser extent, current landscaping.

A conceptual site model was developed and indicates that a range of on/offsite receptors could be impacted by contamination if it were present including human receptors and ecological receptors.

5.2 Recommendations

In order to adequately manage known and unknown contamination risks within the proposed excavation area, it is recommended management measures be developed and implemented. These include but are not limited to:

- Development of a sampling regime of soil to be excavated requiring off-site disposal. This material will need to be issued a waste classification prior to disposal at a licenced facility. Soil sampling and analysis will be undertaken in accordance with NEPM (2013) with analytical results compared against the NSW EPA Waste Classification Guidelines: Part 1 Classifying Waste. This regime can either be conducted *in situ* via borehole drilling prior to construction or during the excavation and stockpiling. It should be noted that standard laboratory turnaround times are 5-7 working days
- A Contamination Management Plan (CMP) to inform the Client and contractors of their requirements and how to achieve appropriate management of contamination under the POEO Act to *'reduce risks to human health and prevent the degradation of the environment'*
- An Unexpected Finds Protocol (UFP) if contamination is encountered during site works. In this case work should immediately cease and the UFP should be implemented immediately
- If Asbestos Containing Materials (ACM) are identified, an Asbestos Management Plan (AMP) is recommended to safeguard site workers and the general public during scheduled construction work.

6 REFERENCES

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Cardno Ref: 80018112_L001_RevA_Brkvale_WC&ISA

12 October 2018

Nicolai Clausen
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Dear Nicolai,

INDICATIVE WASTE CLASSIFICATION & INITIAL SOIL ASSESSMENT – BROOKVALE FOOTBRIDGE, PITTWATER ROAD, BROOKVALE NSW

Cardno (NSW/ACT) Pty Ltd, was engaged by Downer Group ('the Client') to provide this Indicative Waste Classification for approximately 15 m³ of material at three proposed vertical piling locations to maximum depths of 17 metres below ground level (mBGL) and 1 mBGL at one location.

The project involves the construction of a pedestrian footbridge and as such, spoil material generated during piling works require classification in accordance with regulatory guidelines to facilitate their appropriate management, and to identify potential risks to human health during the construction phase. The location of the in-situ soils subject to this indicative waste classification are shown on **Figure 1** in **Appendix A**.

1 Objectives

The objective of this work was to:

- > Provide an indicative classification of the soil materials in general accordance with the NSW EPA *Waste Classification Guidelines* (2014); and
- > Assess the soil materials onsite that may potentially to be disturbed during the proposed construction against the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 (NEPC, 1999).

2 Scope of Work

The following scope of work was carried out in order to address the objectives of this investigation:

- > Reviewed the Acid Sulfate Soil Risk Maps as documented in the NSW Office of Environment and Heritage eSPADE GIS tool
- > Twelve (12) representative soil samples were collected from two (2) soil borehole locations
- > Samples were submitted for analytical testing of the contaminants of potential concern (COPCs) associated with this land use, to a NATA accredited laboratory
- > The results of the analytical testing were evaluated and indicative waste classification and interim soil assessment presented in this letter report.

3 Site Description

The Site is located adjacent to Pittwater Road, Brookvale, approximately 16 kilometres north of the Sydney CBD. Brookvale Creek is the closest body of water, located approximately 75 m west to south of the Site.

The potential for the presence of Acid Sulfate Soils (ASS) or Potential Acid Sulfate Soils (PASS) at the Site was reviewed via the ASS Risk Mapping within the NSW Planning Portal tool; with the Site shown within an area of low ASS risk. A Class 5 ASS area is located approximately 30 m west of the site, with a Class 4 ASS area surrounding the site approximately 40 m to the west and north and 70 m to the south and east.

4 Fieldwork

Sampling of the soil materials was undertaken on 23 and 24 of August 2018 by an experienced Cardno Geotechnical Engineer. Representative soil samples were collected from three (3) soil borings, BH1 (advanced to 17 mBGL), BH3 (advanced to 1 mBGL) and the shallow Fill materials of BH2. Borehole locations are presented in **Figure 1** in **Appendix A**.

Samples were collected using laboratory supplied sample containers with boreholes advanced using a track-mounted drilling rig. Soil sampling was carried out in accordance with AS4482.1 (2005), with samples collected directly from the flights of the auger or core by the Geotechnical Engineer, using a new pair of nitrile gloves for each sample. Samples were placed into laboratory-supplied jars and packed in chilled transport containers for transport to the nominated NATA-accredited laboratory.

Sample descriptions and analytes from each borehole location are provided in **Tables 4-1** to **4-2**. Borehole logs are included in **Appendix C**, and photographs are included in **Appendix D**.

Table 4-1 BH1 Sampling Log

Samples	Date Collected	Depth (mbgl)	Material Description	Analytes
- BH1-E1 0.2-0.4; - BH1-E2 0.8-1; - BH1-E3 3.2-3.4; - BH1-E4 4.8-5; - BH1-E5 6.0-6.15; - BH1-E6 8-8.2; - BH1-E7 10-10.2; - BH1-E8 12-12.2; - BH1-E9 14-14.2	23/08/2018	0-0.1	Topsoil: Silty sand, fine to coarse grained, brown with organic fragments	Total Recoverable Hydrocarbons (TRH); Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene (BTEXN); Polycyclic Aromatic Hydrocarbons (PAHs); Organochlorine Pesticides (OCPs); Organophosphate Pesticides (OPP); Polychlorinated Biphenyls (PCBs); Metals (As, Cd, Cr, Cu, Pb, Ni, Hg and Zn); Asbestos (weight/weight%); Acid Sulfate Soil Screen (pH _F /pH _{FOX}); Chromium Suite Analysis)
		0.1-0.8	FILL: Silty clayey sand, fine to medium grained, brown, trace organics	
		0.8-2.1	FILL: Silty clayey sand, brown, orange and grey, trace sub-angular, fine to coarse grained gravel, trace plastic and brick fragments	
		2.1-2.6	Sandy CLAY: Medium to high plasticity, pale grey, brown and pale orange, fine to medium grained sand, trace sub-angular, fine to medium grained quartz gravel	
		2.6-3.6	Silty CLAY: Medium to high plasticity, pale grey, red and orange, trace ironstone gravel, trace pockets of fine to medium grained sand	
		3.6-4.1	Silty CLAY: Medium to high plasticity, red, trace pockets of fine to medium grained sand	
		4.1-5.0	Clayey SAND: Fine to medium grained, pale grey, trace sub-rounded, fine quartz gravel	
		5.0-5.4	Clayey SAND: Fine to coarse grained, pale orange, medium to high plasticity clay	
		5.4-5.55	Sandy CLAY: Medium to high plasticity, red and grey, with ironstone gravel	
		5.55-17.0	SANDSTONE: Fine to medium grained, orange, pale brown, red and pale grey	

Table 4-2 BH2 Sampling Log

Samples	Date Collected	Depth (mbgl)	Material Description	Analytes
BH2-E1 0.3-0.5	23/08/2018	0-0.1	Topsoil: Gravelly silty sand, fine to medium grained, pale brown, sub-angular, fine to coarse grained gravel, trace rootlets	TRH; BTEXN; PAHs; OCPs; OPPs; PCBs; Metals; Asbestos (weight/weight%); Acid Sulfate Soil Screen (pH _F /pH _{FOX}); Chromium Suite analysis
		0.1-1.5	FILL: Clayey SAND, fine to medium grained, pale brown mottled orange, low to medium plasticity clay, trace sandstone	

Table 4-3 BH3 Sampling Log

Samples	Date Collected	Depth (mbgl)	Material Description	Analytes
		0.0-0.11	ASPHALT	
		0.11-0.16	FILL: Gravelly sand (heavily stabilised), fine to coarse grained, brown, fine to coarse angular gravel	
- BH3-E1 0.25-0.35 - BH3-E2 0.6-0.7	23/08/2018	0.16-0.22	FILL: Sandy gravel (moderately stabilised), fine to coarse grained, sandstone, brown, white, and orange, fine to coarse grained sand, trace cobbles	TRH; BTEXN; PAHs; OCPs; OPPs; PCBs; Metals; Asbestos (weight/weight%); Acid Sulfate Soil Screen (pH _F /pH _{FOX}); Chromium Suite analysis
		0.22-0.45	FILL: Clayey sand, fine to medium grained, orange and grey	
		0.45-1.0	SANDSTONE: Fine to medium grained, pale red, orange, and brown, highly to moderately weathered, low to medium strength	

5 Adopted Criteria

5.1 Waste Classification Criteria

The NSW EPA (2014) *Waste Classification Guidelines* set out a six-step process for classifying waste. The following sets out the classification steps for the soil material:

Step 1: Is the waste 'special waste'? **NO**.

Step 2: Is the waste 'liquid waste'? **NO**.

Step 3: Is the waste 'pre-classified'? **NO**.

Step 4: Does the waste possess hazardous characteristics? **NO**.

Step 5: Determining a waste's classification using chemical assessment. **Appendix B**.

Step 6: Is the waste putrescible? **NO**.

Adopted Threshold Criteria (CT) values for relevant contaminants analysed are included in **Appendix B**.

5.2 Initial Soil Assessment Criteria

Soil assessment screening criteria for the excavation were derived from the following guidelines:

- > 'Schedule B(1) – Guideline on the Investigation Levels for Soil and Groundwater' of the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 (NEPC, 1999) as varied May 2013 (the 'NEPM 2013'):
 - Table 1A(1) The Health Investigation Levels for soil contaminants;
 - Table 1A(3): The Health Screening Levels for Vapour Intrusion (HSL's);
 - Ecological Screening Levels for lead, chromium (III), nickel, copper and zinc (methodology for deriving these ESL's is outlined below);
 - Table 1B(4) Generic added contaminant limits for lead in soils irrespective of their physicochemical properties;

- Table 1B(5) Generic EILs for aged arsenic, fresh DDT and fresh naphthalene in soils irrespective of their physicochemical properties;
- Table 1B(6) Ecological Screening Levels for TRH fractions F1 – F4, BTEX and benzo(a)pyrene in soil.
- > 'Schedule B(5c) – Guideline on Ecological Investigation Levels for Arsenic, Chromium (III), Copper, DDT, Lead, Naphthalene, Nickel and Zinc' NEPM 2013;
- > Table 80: Ambient Background Concentrations (ABCs) for aged nickel in old suburbs in NSW.
- > 'Technical Report No. 10 Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater Part 1: Technical Development Document, CRC Care, September 2011 (CRC Care 2011):
- > Table A4: Soil HSLs for Direct Contact and Intrusive Maintenance Workers.
- > Section 2 of the ASSMAC (1998) ASS Assessment Guidelines.

As the Site is proposed to be used as a pedestrian footbridge, the adopted criteria for the site from the NEPM 2013 guideline are the Health-based Investigation Levels (HILs), the Health-screening Levels (HSL), the Ecological Screening Levels (ESLs) and the Ecological Investigation levels for 'recreational / open space C'. As the soil materials investigated consisted generally of sands and underlying clays, the HSL's for coarse and fine soil textures have been applied.

Adopted soil screening criteria values for relevant contaminants analysed are included in **Tables 1 to 3 in Attachment B**.

6 Analytical Results

Summarised analytical results are provided in **Appendix B**. Laboratory reports are provided in **Appendix E**. The analytical laboratory contracted to perform the testing services (Eurofins mgt NSW) is NATA accredited for the analyses undertaken. An interpretation of the data is summarised as follows:

6.1 Indicative Waste Classification

- > TRH were reported at concentrations above the laboratory Limits of Reporting (LORs) but below the Contaminant Threshold 1 (CT1) criteria for General Solid Waste (GSW) in all analysed samples
- > BTEX were not detected at concentrations above the laboratory LORs or CT1 criteria for GSW in any analysed sample
- > PAHs were generally detected at concentrations above the laboratory LORs but below the CT1 criteria for GSW in all analysed samples, with the exception of Benzo(a)pyrene. Specifically:
 - Benzo(a)pyrene was detected at concentrations above the CT1 criteria for GSW (0.8 mg/kg) in samples BH2-E1 0.3-0.5 (1.4 mg/kg) and BH3-E1 0.25-0.35 (1.8 mg/kg)
- > Heavy Metals were reported at concentrations above the laboratory LORs but below the CT1 criteria for GSW in all analysed samples
- > Moderately Harmful Pesticides and Scheduled Chemicals were not detected at concentrations above the laboratory LORs or the CT1 criteria for GSW in any analysed sample
- > PCBs were not detected at concentrations above the laboratory LORs or CT1 criteria for GSW in any analysed sample
- > Asbestos was not detected in concentrations above the laboratory LOR in any of the analysed samples
- > Field pH results ranged between 4.7 (very strongly acidic) to 8.6 (slightly alkaline), and pH (peroxide) values ranged between 4.1 (extremely acidic) to 6.9 (neutral). The results of the analysis, in conjunction with the ASS Risk maps, indicate that the soils on site are not considered to be actual or potential acid sulfate soils.

- > The results of the Chromium Suite analysis indicate acidity within fill material, however sulfidic acidity and chromium reducible sulfur were below the adopted action criteria for disturbance of <1000 t of fine grained soils.

6.2 Initial Soil Assessment

- > TRH were reported at concentrations above the laboratory Limits of Reporting (LORs) but below the adopted NEPM 2013 Ecological Screening Level (ESL) and NEPM 2013 Health Screening Level (HSL) criteria for recreational / open space C in all analysed samples
- > BTEX were not detected at concentrations above the laboratory LORs or the adopted NEPM 2013 ESL and NEPM 2013 HSL criteria for recreational / open space C in any analysed sample
- > PAHs were generally detected at concentrations above the laboratory LORs but below the adopted NEPM 2013 ESL and NEPM 2013 Health Investigation Level (HIL) criteria for recreational / open space C, with the exception of Benzo(a)pyrene. Specifically:
 - > Benzo(a)pyrene was detected at concentrations above the adopted NEPM 2013 ESL (1.4 mg/kg) criteria for recreational / open space C in samples BH2-E1 0.3-0.5 (1.4 mg/kg) and BH3-E1 0.25-0.35 (1.8 mg/kg)
- > Heavy Metals were reported at concentrations above the laboratory LORs but below the adopted NEPM 2013 ESL and NEPM 2013 HIL criteria for recreational / open space C in all analysed samples
- > Organochlorine and Organophosphorous Pesticides were not detected at concentrations above the laboratory LORs or the adopted NEPM 2013 ESL and NEPM 2013 HIL criteria for recreational / open space C in any analysed sample
- > PCBs were not detected at concentrations above the laboratory LORs or the adopted NEPM 2013 HIL criteria for recreational / open space C in any analysed sample
- > Asbestos was not detected in concentrations above the laboratory LOR in any analysed samples.

7 Quality Assurance / Quality Control

In accordance with Cardno's Quality Assurance and Quality Control (QA/QC) procedures and AS4482.1 (2005), samples were stored in insulated transport containers containing ice and delivered to the designated laboratories under Chain of Custody documentation within 48 hours of sample collection.

Chain of Custody records are included in **Appendix E**.

A review of the laboratory analytical data indicated that:

- > laboratory analysis of samples was undertaken by a NATA accredited laboratory
- > the laboratory limits of reporting (LOR) were below the adopted criteria
- > samples were extracted and analysed within holding times
- > analyte percentage recoveries in surrogate samples were within acceptance limits
- > analyte concentrations in laboratory method blanks were within acceptance limits
- > Relative Percent Differences (RPD) between the laboratory parent samples and duplicate samples were within the acceptance limit of 30%
- > analyte percentage recoveries in laboratory samples were within the acceptance limit of 70-130%

8 Conclusions and Recommendations

Based on the background review, site inspection and analytical testing carried out, the soil materials that form the subject of this investigation are classified as *Restricted Solid Waste (non-putrescible)*. This assessment applies to the Fill: Gravelly sand and gravelly to sandy clays, orange, brown and black, Residual Soils: Silty clay and clay, pale grey and orange, and bedrock consisting of Shale; orange brown and grey, with iron staining and clay from which the samples were taken as described in **Table 4-1 to 4-3**.

The material is classified as **Restricted Solid Waste** due to:

- Benzo(a)pyrene concentrations in two samples being $\geq$ CT1 values for General Solid Waste

If offsite disposal of the soil material is required, the soil material should be disposed of at a facility licenced to accept *Restricted Solid Waste (non-putrescible)*.

Due diligence should be employed during excavation of the materials to ensure materials which differ from those sampled, or exhibiting signs of contamination not previously identified during the fieldwork (asbestos, stains, odours, acid sulfate soils etc.) are separated and assessed.

Should you have any queries with the report, please do not hesitate to contact Bob Campbell on (02) 9495 8186.

Yours sincerely,

Ben Withnall
Environmental Scientist
Cardno (NSW/ACT)

Bob Campbell
Senior Environmental Scientist
Cardno (NSW/ACT)

Appendices

Appendix A – Site Plan

Appendix B – Laboratory Summary Tables

Appendix C – Borehole Logs

Appendix D – Site Photographs

Appendix E – Laboratory Reports

Limitations

This report does not provide a complete assessment of the environmental status of the site, and is limited to the scope defined above. The extent of soil sampling and laboratory analysis has been designed to address the project scope only and may not identify contamination occurring in other areas, or occurring after sampling was conducted.

Due to the proposed method of spoil generation being vertical piling, samples were collected down the proposed piling profile. As a result, the extent of this waste classification is limited to spoil materials generated from the vertical piling works carried out at the sample locations.

The current assessment is focussed on the determination of the contamination status for offsite disposal. The report does not constitute an 'Environmental Site Assessment' as set out in the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM), nor a 'Site Audit Statement' under the meaning set out in the Contaminated Land Management Act 1997. No hydrogeological or groundwater assessment has been undertaken, and no geotechnical advice made or implied.

Appendix A – Figures



Borehole Locations

BROOKVALE PED BRIDGE
FIGURE 1

Legend

⊕ Borehole Locations



1:700 Scale at A4

Metres
0 5 10 20



Map Produced by Cardno NSW/ACT (W&E)
Date: 2018-10-04
Coordinate System: GCS WGS 1984
Project: 80018112
Map: 80018112-GS001-SitePlan.mxd 01

Appendix B – Laboratory Summary Tables



	BTEX						TRH					CRC Care TRH Fractions							
	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	C6-C10	C10-C16	C16-C34	C34-C40	C10 - C40 (Sum of total)	F1: C6-C10 less BTEX	F2: >C10-C16 less Naphthalene	
	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	mg/kg	mg/kg	mg/kg	mg/kg	
LOR	0.1	0.1	0.1	0.2	0.1	0.3	20	20	50	50	50	20	50	100	100	100	20	50	
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged 0-2m																			
NEPM 2013 ESL UR/POS, Fine Soil 0-2m	65	105	125			45		120					120	1300	5600		180		
NEPM 2013 HIL, Recreational C																			
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay 0-1m	NL	NL	NL			NL											NL	NL	
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay 1-2m	NL	NL	NL			NL											NL	NL	
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay 2-4m	NL	NL	NL			NL											NL	NL	
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay >4m	NL	NL	NL			NL											NL	NL	
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand 0-1m	NL	NL	NL			NL											NL	NL	
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand 1-2m	NL	NL	NL			NL											NL	NL	
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand 2-4m	NL	NL	NL			NL											NL	NL	
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand >4m	NL	NL	NL			NL											NL	NL	

Site	Field ID	Location	Sample Date																
Brookvale Footbridge - Waste Class & ISA	BH1-E1 0.2-0.4	BH1-E1 0.2-0.4	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100
	BH1-E2 0.8-1	BH1-E2 0.8-1		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100
	BH1-E3 3.2-3.4	BH1-E3 3.2-3.4		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100
	BH1-E4 4.8-5	BH1-E4 4.8-5		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100
	BH1-E5 6.0-6.15	BH1-E5 6.0-6.15		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100
	BH1-E6 8-8.2	BH1-E6 8-8.2		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100
	BH1-E7 10-10.2	BH1-E7 10-10.2		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100
	BH1-E8 12-12.2	BH1-E8 12-12.2		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100
	BH1-E9 14-14.2	BH1-E9 14-14.2		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100
	BH2-E1 0.3-0.5	BH2-E1 0.3-0.5		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	81	93	174	<20	<50	160	<100	160
	BH3-E1 0.25-0.35	BH3-E1 0.25-0.35		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	110	120	230	<20	<50	200	<100	200
	BH3-E2 0.6-0.7	BH3-E2 0.6-0.7		<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100

Statistical Summary																			
Maximum Concentration				<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	110	120	230	<20	<50	200	<100	200
Average Concentration				<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	37	39	55	<20	<50	72	<100	72
Standard Deviation				0	0	0	0	0	0	0	0	28	32	70	0	0	51	0	51



			PAH																				Asbestos		Metals		
			Benzo(a)pyrene TEQ (half LOR)_	Benzo(a)pyrene TEQ (upper bound) *	Benzo(b+i)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	BaP TEQ (zero)	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	Detected (D) / Not Detected (ND)				
			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	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	Comment	mg/kg	mg/kg	mg/kg
LOR			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5			2	0.4	5
NEPM 2013 EIL UR/POS, low pH, CEC, clay content - aged 0-2m																			170						100		190
NEPM 2013 ESL UR/POS, Fine Soil 0-2m										0.7																	
NEPM 2013 HIL, Recreational C			3																		300				300	90	
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay 0-1m																				NL							
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay 1-2m																				NL							
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay 2-4m																				NL							
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Clay >4m																				NL							
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand 0-1m																				NL							
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand 1-2m																				NL							
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand 2-4m																				NL							
NEPM 2013 Soil HSL Recreational C, for Vapour Intrusion, Sand >4m																				NL							
Site	Field ID	Location	Sample Date																								
Brookvale Footbridge - Waste Class & ISA	BH1-E1 0.2-0.4	BH1-E1 0.2-0.4	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	2.5	<0.4	12
	BH1-E2 0.8-1	BH1-E2 0.8-1		0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	<2	<0.4	19	
	BH1-E3 3.2-3.4	BH1-E3 3.2-3.4		0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	9.6	<0.4	24	
	BH1-E4 4.8-5	BH1-E4 4.8-5		0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	<2	<0.4	19	
	BH1-E5 6.0-6.15	BH1-E5 6.0-6.15		0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	2.4	<0.4	12	
	BH1-E6 8-8.2	BH1-E6 8-8.2		0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	<2	<0.4	6.4	
	BH1-E7 10-10.2	BH1-E7 10-10.2		0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	<2	<0.4	6.4	
	BH1-E8 12-12.2	BH1-E8 12-12.2		0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	<2	<0.4	<5	
	BH1-E9 14-14.2	BH1-E9 14-14.2		0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	<2	<0.4	<5	
	BH2-E1 0.3-0.5	BH2-E1 0.3-0.5		2.1	2.4	1.1	<0.5	<0.5	<0.5	1.1	1.9	1.4	0.9	1.3	1.2	<0.5	2.4	<0.5	1.1	<0.5	13.8	0.9	2.4	ND	2.4	<0.4	20
	BH3-E1 0.25-0.35	BH3-E1 0.25-0.35		2.6	2.9	1.5	<0.5	<0.5	<0.5	0.9	2.4	1.8	1.4	1.4	1	<0.5	1.5	<0.5	1.6	<0.5	12.9	<0.5	1.8	ND	<2	<0.4	<5
	BH3-E2 0.6-0.7	BH3-E2 0.6-0.7		0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	<2	<0.4	22
Statistical Summary																											
Maximum Concentration				2.6	2.9	1.5	<0.5	<0.5	<0.5	1.1	2.4	1.8	1.4	1.4	1.2	<0.5	2.4	<0.5	1.6	<0.5	13.8	0.9	2.4	ND	9.6	<0.4	24
Average Concentration				0.9	1.4	0.4	<0.5	<0.5	<0.5	0.4	0.6	0.5	0.4	0.4	0.4	<0.5	0.5	<0.5	0.4	<0.5	2.4	0.3	0.6	ND	2.1	<0.4	12
Standard Deviation				0.7	0.6	0.4	0	0	0	0.3	0.8	0.5	0.4	0.4	0.3	0	0.7	0	0.4	0	5.1	0.2	0.7	ND	2.5	0	8

[illegible][illegible]

Statistical Summary

[illegible]

[illegible][illegible]

Statistical Summary

[illegible]

[illegible]



	BTEX						TRH					CRC Care TRH Fractions						
	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)	C6-C10	C10-C16	C16-C34	C34-C40	C10 - C40 (Sum of total)	F1: C6-C10 less BTEX	F2: >C10-C16 less Naphthalene
	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	mg/kg	mg/kg	mg/kg	mg/kg
LOR	0.1	0.1	0.1	0.2	0.1	0.3	20	20	50	50	50	20	50	100	100	100	20	50
NSW 2014 General Solid Waste CT1 (No Leaching)	10	288	600			1000	650				10000							
NSW 2014 Restricted Solid Waste CT2 (No Leaching)	40	1152	2400			4000	2600				40000							
NSW 2014 General Solid Waste SCC1 (with leached)	18	518	1080			1800	6500				10000							
NSW 2014 Restricted Solid Waste SCC1 (with leached)																		

Site	Location		Sample Date																		
Brookvale Footbridge Waste Class & ISA	BH1-E1 0.2-0.4	BH1-E1 0.2-0.4	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100	<20	<50
	BH1-E2 0.8-1	BH1-E2 0.8-1	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100	<20	<50
	BH1-E3 3.2-3.4	BH1-E3 3.2-3.4	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100	<20	<50
	BH1-E4 4.8-5	BH1-E4 4.8-5	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100	<20	<50
	BH1-E5 6.0-6.15	BH1-E5 6.0-6.15	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100	<20	<50
	BH1-E6 8-8.2	BH1-E6 8-8.2	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100	<20	<50
	BH1-E7 10-10.2	BH1-E7 10-10.2	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100	<20	<50
	BH1-E8 12-12.2	BH1-E8 12-12.2	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100	<20	<50
	BH1-E9 14-14.2	BH1-E9 14-14.2	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100	<20	<50
	BH2-E1 0.3-0.5	BH2-E1 0.3-0.5	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	81	93	174	<20	<50	160	<100	160	<20	<50
	BH3-E1 0.25-0.35	BH3-E1 0.25-0.35	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	110	120	230	<20	<50	200	<100	200	<20	<50
	BH3-E2 0.6-0.7	BH3-E2 0.6-0.7	23/08/2018	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	<50	<50	<50	<20	<50	<100	<100	<100	<20	<50

Statistical Summary																			
Maximum Concentration	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	<20	<20	110	120	230	<20	<50	200	<100	200	<20	<50	
Average Concentration	0.1	0.1	0.1	0.2	0.1	0.3	20	20	58	59	75	20	50	113	100	113	20	50	
Standard Deviation	0	0	0	0	0	0	0	0	19	23	60	0	0	32	0	32	0	0	

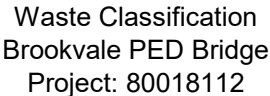
	PAH																				Asbestos
	Benzo(a)pyrene TEQ (half LOR)_	Benzo(a)pyrene TEQ (upper bound) *	Benzo(b+i)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	BaP TEQ (zero)	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene	Asbestos
	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	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	% w/w
LOR	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.001
NSW 2014 General Solid Waste CT1 (No Leaching)									0.8									200			
NSW 2014 Restricted Solid Waste CT2 (No Leaching)									3.2												
NSW 2014 General Solid Waste SCC1 (with leached)									10												
NSW 2014 Restricted Solid Waste SCC1 (with leached)																					

Site	Location		Sample Date																					
Brookvale Footbridge Waste Class & ISA	BH1-E1 0.2-0.4	BH1-E1 0.2-0.4	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.001	
	BH1-E2 0.8-1	BH1-E2 0.8-1	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.001	
	BH1-E3 3.2-3.4	BH1-E3 3.2-3.4	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.001	
	BH1-E4 4.8-5	BH1-E4 4.8-5	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.001	
	BH1-E5 6.0-6.15	BH1-E5 6.0-6.15	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.001	
	BH1-E6 8-8.2	BH1-E6 8-8.2	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.001	
	BH1-E7 10-10.2	BH1-E7 10-10.2	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.001	
	BH1-E8 12-12.2	BH1-E8 12-12.2	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.001	
	BH1-E9 14-14.2	BH1-E9 14-14.2	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.001	
	BH2-E1 0.3-0.5	BH2-E1 0.3-0.5	23/08/2018	2.1	2.4	1.1	<0.5	<0.5	<0.5	1.1	1.9	1.4	0.9	1.3	1.2	<0.5	2.4	<0.5	1.1	<0.5	13.8	0.9	2.4	<0.001
	BH3-E1 0.25-0.35	BH3-E1 0.25-0.35	23/08/2018	2.6	2.9	1.5	<0.5	<0.5	<0.5	0.9	2.4	1.8	1.4	1.4	1	<0.5	1.5	<0.5	1.6	<0.5	12.9	<0.5	1.8	<0.001
	BH3-E2 0.6-0.7	BH3-E2 0.6-0.7	23/08/2018	0.6	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.001

Statistical Summary																						
Maximum Concentration	2.6	2.9	1.5	<0.5	<0.5	<0.5	1.1	2.4	1.8	1.4	1.4	1.2	<0.5	2.4	<0.5	1.6	<0.5	13.8	0.9	2.4	<0.001	
Average Concentration	0.89	1.4	0.63	0.5	0.5	0.5	0.58	0.78	0.68	0.61	0.64	0.6	0.5	0.74	0.5	0.64	0.5	2.6	0.53	0.77	0.001	
Standard Deviation	0.69	0.57	0.32	0	0	0	0.2	0.65	0.44	0.27	0.33	0.24	0	0.6	0	0.35	0	5	0.12	0.64	0	

[illegible]

[illegible]



Site	Location		Sample Date																		
Brookvale Footbridge Waste Class & ISA	BH1-E1 0.2-0.4	BH1-E1 0.2-0.4	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH1-E2 0.8-1	BH1-E2 0.8-1	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH1-E3 3.2-3.4	BH1-E3 3.2-3.4	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH1-E4 4.8-5	BH1-E4 4.8-5	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH1-E5 6.0-6.15	BH1-E5 6.0-6.15	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH1-E6 8-8.2	BH1-E6 8-8.2	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH1-E7 10-10.2	BH1-E7 10-10.2	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH1-E8 12-12.2	BH1-E8 12-12.2	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH1-E9 14-14.2	BH1-E9 14-14.2	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH2-E1 0.3-0.5	BH2-E1 0.3-0.5	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH3-E1 0.25-0.35	BH3-E1 0.25-0.35	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	BH3-E2 0.6-0.7	BH3-E2 0.6-0.7	23/08/2018	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

[illegible]

Appendix C – Borehole Logs

NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH1

FILE / JOB NO : 80018112

SHEET : 1 OF 5

PROJECT : Brookvale Pedestrian Bridge

CLIENT : Downer

LOCATION : Brookvale

FEATURE :

POSITION : E: 339652.65, N: 6262300.57

SURFACE ELEVATION : 10.950 (AHD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Comacchio 205

MOUNTING : Track

CONTRACTOR : Terratest

DRILLER : AZ

DATE STARTED : 23/8/18

DATE COMPLETED : 24/8/18

DATE LOGGED : 23/8/18

LOGGED BY : AC

CHECKED BY : TH

DRILLING					MATERIAL							
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
ADT CASING					0.0	0.0			Silty SAND fine to coarse grained, brown, with organic fragments	M	L	TOPSOIL
	0.20m ES-E1					0.20			Silty Clayey SAND fine to medium grained, brown, trace organics			FILL
	0.40m					0.40						
						10.5				M	L - MD	
	0.80m ES-E2					0.80						
	1.00m			1.00m SPT 5, 4, 5 N=9	10.0	1.0			Silty Clayey SAND brown, orange and grey, trace sub-angular, fine to coarse grained gravel, trace plastic and brick fragments			
						9.5				M	L	
						9.0						
	2.10m D-D					2.0			Sandy CLAY medium to high plasticity, pale grey, brown and pale orange, fine to medium grained sand, trace sub-angular, fine to medium grained quartz gravel	M (>PL)	St	RESIDUAL SOIL
	2.50m		E	2.50m SPT 3, 4, 5 N=9	8.5	2.60			Silty CLAY medium to high plasticity, pale grey, red and orange, trace ironstone gravel, trace pockets of fine to medium grained sand			2.60: HP Samp = 200 - 250 kPa
						8.0				M (>PL)	St - VSt	
	3.20m ES-E3					7.5						
	3.40m											
	3.60m ES-Agg1											
	3.80m											
4.00m				4.00m SPT 4, 6, 5 N=11	7.0	4.0			Silty CLAY medium to high plasticity, red, trace pockets of fine to medium grained sand	M (>PL)	St - VSt	
4.45m					6.5			Clayey SAND fine to medium grained, pale grey, trace sub-rounded, fine quartz gravel				
4.60m ES-Agg2							SC		M	MD		
4.80m ES-E4												
5.00m												

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

CARDNO (NSW/ACT) PTY LTD



NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH1

PROJECT : Brookvale Pedestrian Bridge

CLIENT : Downer

FILE / JOB NO : 80018112

LOCATION : Brookvale

FEATURE :

SHEET : 2 OF 5

POSITION : E: 339652.65, N: 6262300.57

SURFACE ELEVATION : 10.950 (AHD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Comacchio 205

MOUNTING : Track

CONTRACTOR : Terratest

DRILLER : AZ

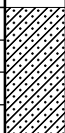
DATE STARTED : 23/8/18

DATE COMPLETED : 24/8/18

DATE LOGGED : 23/8/18

LOGGED BY : AC

CHECKED BY : TH

DRILLING					MATERIAL						
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL) DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
ADIT CASING	D-D	E		SPT 20/50mm N=R 5.5m	5.0		SC	Clayey SAND fine to coarse grained, pale orange, medium to high plasticity clay	W	MD	
	5.40m				5.40m						
	5.50m				5.5		CI-CH	Sandy CLAY medium to high plasticity, red and grey, with ironstone gravel	M (>PL)	H	
Continued as Cored Drill Hole											
					5.0						
					6.0						
					4.5						
					4.0						
					7.0						
					3.5						
					3.0						
					8.0						
					2.5						
					2.0						
					9.0						
					1.5						
					10.0						

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

CARDNO (NSW/ACT) PTY LTD



HOLE NO : BH1
FILE / JOB NO : 80018112
SHEET : 3 OF 5

CLIENT : Downer
FEATURE :

SURFACE ELEVATION : 10.950 (AHD)

ANGLE FROM HORIZONTAL : 90°

MOUNTING : Track

CONTRACTOR : Terratest

DRILLER : AZ

DATE COMPLETED : 24/8/18

DATE LOGGED : 23/8/18

LOGGED BY : AC

CHECKED BY : TH

BARREL (Length) : 3.00 m BIT : Stepped

BIT CONDITION : Good

DRILLING		WATER		STRENGTH		DEFECT TYPE		COATING		INFILL	
AD/T	Auger Drilling with TC Bit		10 Oct., 73 Water	EH	Extremely High	BP	Bedding Plane	CN	Clean	CA	Calcite
AD/V	Auger Drilling with V Bit		Level on Date shown	VH	Very High	CL	Cleavage	CT	Coating (>= 1.0m)	CLAY	Clay
AS	Auger Screwing			H	High	CS	Crushed Seam	FILLED	Filled	FE	Iron Oxide
DB	Washbore with Drag Bit		water inflow	M	Medium	CZ	Crushed Zone	SN	Stained	FE	Iron Oxide Clay
DT	Diatube			L	Low	DB	Drilling Break	VR	Veneer (< 1.0mm)	CLAY	
HMLC	HMLC Core Barrel		water outflow	VL	Very Low	FC	Fracture			KT	Chlorite
HQ3	HQ3 Core Barrel			EL	Extremely Low	HB	Handling Break			MS	Secondary Mineral
NMLC	NMLC Core Barrel	WEATHERING				IS	Infilled Seam			MU	Unidentified Minerals
NQ3	NQ3 Core Barrel	FR	Fresh	ROUGHNESS		JT	Joint	CU	Curved	QZ	Quartz
PQ3	PQ3 Core Barrel	SW	Slightly Weathered	POL	Polished	SM	Seam	DIS	Discontinuous	X	Carbonaceous
R	Rock Roller	MW	Moderately Weathered	RF	Rough	SS	Shear Seam	IR	Irregular		
		HW	Highly Weathered	S	Smooth	SZ	Shear Zone	PR	Planar		
		EW	Extremely Weathered	SL	Slickensided	VN	Vein	ST	Stepped		
				VR	Very Rough	VO	Void	UN	Undulose		
						FA	Fault				



Cardno
Shaping the Future

CORED DRILL HOLE LOG

HOLE NO : BH1

FILE / JOB NO : 80018112

SHEET : 4 OF 5

PROJECT : Brookvale Pedestrian Bridge
LOCATION : Brookvale

CLIENT : Downer
FEATURE :

POSITION : E: 339652.65, N: 6262300.57

SURFACE ELEVATION : 10.950 (AHD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Comacchio 205

MOUNTING : Track

CONTRACTOR : Terratest

DRILLER : AZ

DATE STARTED : 23/8/18

DATE COMPLETED : 24/8/18

DATE LOGGED : 23/8/18

LOGGED BY : AC

CHECKED BY : TH

CASING DIAMETER : HWT

BARREL (Length) : 3.00 m

BIT : Stepped

BIT CONDITION : Good

DRILLING					MATERIAL					ROCK MASS				
PROGRESS		WATER	(CORE LOSS DRILL RUN %)	SAMPLES & FIELD TESTS	ELEVATION (RL) DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● Axial ○ Diametral	RQD (%)	DEFECT SPACING (mm)	DEFECTS (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other		
DRILLING & CASING														
NMLC														
95% Water RETURN			0% LOSS	10.26m Is(50) a=0.43 d=0.4 MPa	10.0		SANDSTONE fine to medium grained, pale grey, bedding at 5-20° (continued)	SW		90		10.00: HB		
95% Water RETURN			0% LOSS	11.24m Is(50) d=0.21 a=0.27 MPa	11.50							10.13: BP, 10°, Un, RF, Cn		
95% Water RETURN			0% LOSS	12.28m Is(50) a=1.42 d=0.8 MPa	12.00							10.23: HB		
95% Water RETURN			0% LOSS	13.30m Is(50) a=0.34 d=0.21 MPa	13.00							10.33: DB		
95% Water RETURN			0% LOSS	14.24m Is(50) d=0.65 a=0.43 MPa	14.30							10.64: HB		
95% Water RETURN			0% LOSS									10.73: BP, 10°, PR, RF, Cn		
95% Water RETURN			0% LOSS									10.83-11.00: JT, 70°, Un, RF, Cn		
95% Water RETURN			0% LOSS									11.00: HB		
95% Water RETURN			0% LOSS									11.40: BP, 20°, Un, RF, Cn		
95% Water RETURN			0% LOSS									11.50: DL		
95% Water RETURN			0% LOSS									11.78: BP, 10°, PR, RF, Cn		
95% Water RETURN			0% LOSS									11.90-12.10: FZ		
95% Water RETURN			0% LOSS									12.40: BP, Un, RF, Cn		
95% Water RETURN			0% LOSS									13.00: HB		
95% Water RETURN			0% LOSS									13.58: BP, Un, RF, Clay Ct		
95% Water RETURN			0% LOSS									13.65: BP, Un, RF, Clay Ct, 10 mm		
95% Water RETURN			0% LOSS									13.75: HB		
95% Water RETURN			0% LOSS									14.00: HB		
95% Water RETURN			0% LOSS									14.30: DL		
95% Water RETURN			0% LOSS									14.31: DB		
95% Water RETURN			0% LOSS			14.76: BP, 20°, IR, RF, Fe Sn								
95% Water RETURN			0% LOSS			14.77: BP, 20°, IR, RF, Fe Sn								
95% Water RETURN			0% LOSS			14.83: BP, 20°, IR, RF, Fe Sn								
95% Water RETURN			0% LOSS			14.85-14.95: JT, IR, RF								

DRILLING

AD/T Auger Drilling with TC Bit
AD/V Auger Drilling with V Bit
AS Auger Screwing
DB Washbore with Drag Bit
DT Diatube
HMLC HMLC Core Barrel
HQ3 HQ3 Core Barrel
NMLC NMLC Core Barrel
NQ3 NQ3 Core Barrel
PQ3 PQ3 Core Barrel
R Rock Roller

WATER

10 Oct., 73 Water Level on Date shown
water inflow
water outflow

WEATHERING

FR Fresh
SW Slightly Weathered
MW Moderately Weathered
HW Highly Weathered
EW Extremely Weathered

STRENGTH

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

ROUGHNESS

POL Polished
RF Rough
S Smooth
SL Slickensided
VR Very Rough

DEFECT TYPE

BP Bedding Plane
CL Cleavage
CS Crushed Seam
CZ Crushed Zone
DB Drilling Break
FC Fracture
HB Handling Break
IS Infilled Seam
JT Joint
SM Seam
SS Shear Seam
SZ Shear Zone
VN Vein
VO Void
FA Fault

COATING

CN Clean
CT Coating (>= 1.0mm)
FILLED Filled
SN Stained
VR Veneer (< 1.0mm)

PLANARITY

CU Curved
DIS Discontinuous
IR Irregular
PR Planar
ST Stepped
UN Undulose

INFILL

CA Calcite
CLAY Clay
FE Iron Oxide
FE Iron Oxide Clay
CLAY Clay
KT Chlorite
MS Secondary Mineral
MU Unidentified Mineral
OZ Quartz
X Carbonaceous

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

CARDNO (NSW/ACT) PTY LTD



HOLE NO : BH1
FILE / JOB NO : 80018112
SHEET : 5 OF 5

CLIENT : Downer
FEATURE :

SURFACE ELEVATION : 10.950 (AHD)

ANGLE FROM HORIZONTAL : 90°

MOUNTING : Track

CONTRACTOR : Terratest

DRILLER : AZ

DATE COMPLETED : 24/8/18

DATE LOGGED : 23/8/18

LOGGED BY : AC

CHECKED BY : TH

BARREL (Length) : 3.00 m BIT : Stepped

BIT CONDITION : Good

DRILLING		WATER		STRENGTH		DEFECT TYPE		COATING		INFILL	
AD/T	Auger Drilling with TC Bit		10 Oct., 73 Water	EH	Extremely High	BP	Bedding Plane	CN	Clean	CA	Calcite
AD/V	Auger Drilling with V Bit		Level on Date shown	VH	Very High	CL	Cleavage	CT	Coating ($\geq 1.0\text{m}$)	CLAY	Clay
AS	Auger Screwing		water inflow	H	High	CS	Crushed Seam	FILLED	Filled	FE	Iron Oxide
DB	Washbore with Drag Bit			M	Medium	CZ	Crushed Zone	SN	Stained	FE	Iron Oxide Clay
DT	Diatube		water outflow	L	Low	DB	Drilling Break	VR	Veneer ($< 1.0\text{mm}$)	CLAY	
HMLC	HMLC Core Barrel			VL	Very Low	FC	Fracture			KT	Chlorite
HQ3	HQ3 Core Barrel	WEATHERING		EL	Extremely Low	HB	Handling Break			MS	Secondary Mineral
NMLC	NMLC Core Barrel					IS	Infilled Seam	PLANARITY		MU	Unidentified Mineral
NQ3	NQ3 Core Barrel	FR	Fresh	ROUGHNESS		JT	Joint	CU	Curved	QZ	Quartz
PQ3	PQ3 Core Barrel	SW	Slightly Weathered	POL	Polished	SM	Seam	DJS	Discontinuous	X	Carbonaceous
R	Rock Roller	MW	Moderately Weathered	RF	Rough	SS	Shear Seam	IR	Irregular		
		HW	Highly Weathered	S	Smooth	SZ	Shear Zone	PR	Planar		
		EW	Extremely Weathered	SL	Slickensided	VN	Vein	ST	Stepped		
				VR	Very Rough	VO	Void	UN	Undulose		
						FA	Fault				



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TITLE:

Borehole Core Photographs – BH1
Geotechnical Investigation – Brookvale Pedestrian Bridge

PROJECT NO:
80018112TEST DATE:
24 August 2018INCLINATION:
90°CORED LENGTH: **BOX 1 OF 3**
5.55m to 10.0m – 4.45m LengthDRILL RIG:
Comacchio Geo 205CONTRACTOR:
TerratestLOGGED BY:
ACCHECKED BY:
TH**BH1****5.55m to 10.00m****BOX 1 OF 3**



TITLE:

Borehole Core Photographs – BH1
Geotechnical Investigation – Brookvale Pedestrian Bridge

PROJECT NO:
80018112

TEST DATE:
24 August 2018

INCLINATION:
90°

CORED LENGTH: **BOX 2 OF 3**
10.00m to 15.00m – 5.00m
Length

DRILL RIG:
Comacchio Geo 205

CONTRACTOR:
Terratest

LOGGED BY:
AC

CHECKED BY:
TH

BH1
10.00m to 15.00m
BOX 2 OF 3





TITLE:

Borehole Core Photographs – BH1
Geotechnical Investigation – Brookvale Pedestrian Bridge

PROJECT NO:
80018112

TEST DATE:
24 August 2018

INCLINATION:
90°

CORED LENGTH: **BOX 3 OF 3**
15.00m to 17.00m – 2.00m
Length

DRILL RIG:
Comacchio Geo 205

CONTRACTOR:
Terratest

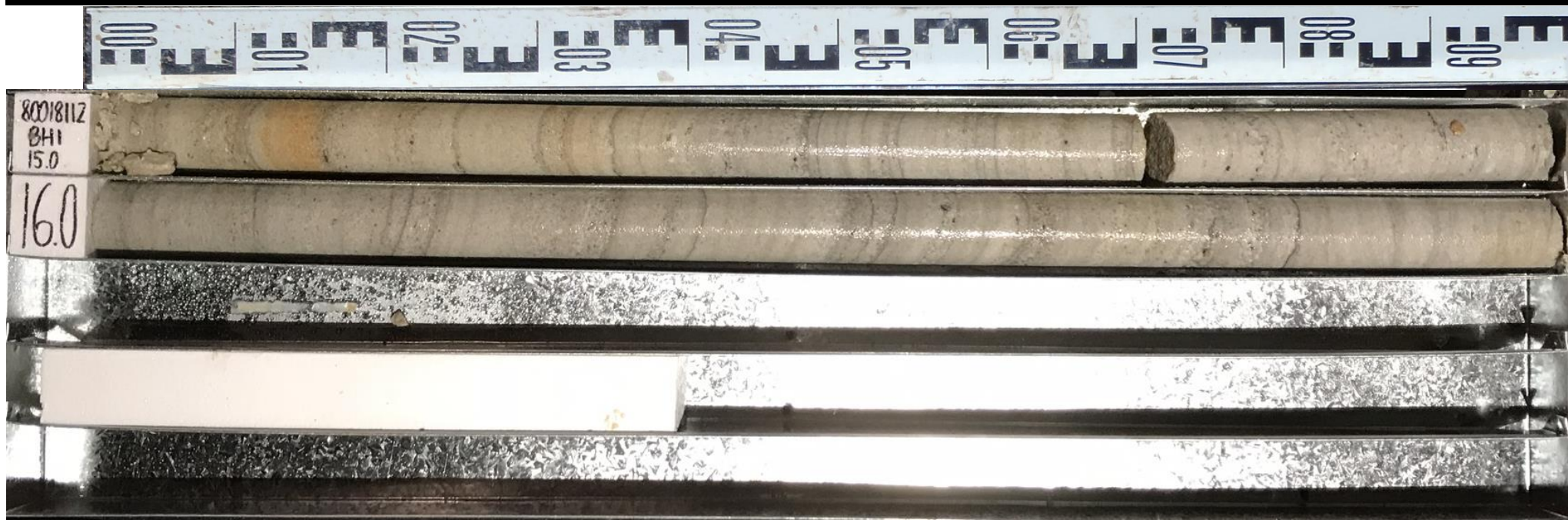
LOGGED BY:
AC

CHECKED BY:
TH

BH1

15.00m to 17.00m

BOX 3 OF 3



NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH2

FILE / JOB NO : 80018112

SHEET : 1 OF 5

PROJECT : Brookvale Pedestrian Bridge

CLIENT : Downer

LOCATION : Brookvale

FEATURE :

POSITION : E: 339646.63, N: 6262290.25

SURFACE ELEVATION : 11.040 (AHD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hanjin DB8

MOUNTING : Track

CONTRACTOR : Sytech Drilling

DRILLER : JC

DATE STARTED : 23/8/18

DATE COMPLETED : 24/8/18

DATE LOGGED : 24/8/18

LOGGED BY : HD

CHECKED BY : TH

DRILLING					MATERIAL								
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	STRUCTURE & Other Observations
ADT CASING					11.0	0.0				M			TOPSOIL
	0.30m ES-ES1					0.10m			Gravelly Silty SAND fine to medium grained, pale brown, sub-angular, fine to coarse grained gravel, trace rootlets				FILL
	0.50m								Clayey SAND fine to medium grained, pale brown mottled orange, low to medium plasticity clay, trace Sandstone				
					1.50m	1.50m			Sandy CLAY medium to high plasticity, pale orange mottled grey, fine to medium grained sand				RESIDUAL SOIL
	2.00m ES-ES2				1.95m	2.0							
	2.20m							CI-CH		M (<PL)		F	
	2.80m D-D1												
	3.00m				3.00m	3.0			Sandy CLAY medium to high plasticity, grey, fine to medium grained sand				3.10: HP Samp = 220 - 240 kPa
	4.20m ES-ES3				4.50m	4.5							4.60: HP Samp = 190 - 210 kPa
	4.50m												
												</	

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

CARDNO (NSW/ACT) PTY LTD



NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH2

FILE / JOB NO : 80018112

SHEET : 2 OF 5

PROJECT : Brookvale Pedestrian Bridge

CLIENT : Downer

LOCATION : Brookvale

FEATURE :

POSITION : E: 339646.63, N: 6262290.25

SURFACE ELEVATION : 11.040 (AHD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hanjin DB8

MOUNTING : Track

CONTRACTOR : Sytech Drilling

DRILLER : JC

DATE STARTED : 23/8/18

DATE COMPLETED : 24/8/18

DATE LOGGED : 24/8/18

LOGGED BY : HD

CHECKED BY : TH

DRILLING					MATERIAL							
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	STRUCTURE & Other Observations
AD/T CASING	5.50m D-D2	F			6.0	5.0		CI-CH	Sandy CLAY medium to high plasticity, grey, fine to medium grained sand (<i>continued</i>)	M (<i><PL</i>)	VSt	
					5.20m	Silty SAND fine to coarse grained, pale grey		M	MD - D			
					6.00m	H		6.00m SPT 23/60mm N=1R 6.06m	6.00m	SANDSTONE fine to medium, dark brown mottled orange, estimated extremely low to very low strength, extremely weathered		
		VH			5.0	6.0						
					4.5				Continued as Cored Drill Hole			
					7.0							
					4.0							
					3.5							
					8.0							
					3.0							
					2.5							
					9.0							
					2.0							
					1.5							

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

CARDNO (NSW/ACT) PTY LTD



HOLE NO : BH2
FILE / JOB NO : 80018112
SHEET : 3 OF 5

CLIENT : Downer
FEATURE :

SURFACE ELEVATION : 11.040 (AHD)

ANGLE FROM HORIZONTAL : 90°

MOUNTING : Track

CONTRACTOR : Sytech Drilling

DRILLER : JC

DATE COMPLETED : 24/8/18

DATE LOGGED : 24/8/18

LOGGED BY : HD

CHECKED BY : TH

BARREL (Length) : 3.00 m BIT : Stepped

BIT CONDITION : Good

DRILLING		WATER		STRENGTH		DEFECT TYPE		COATING		INFILL	
AD/T	Auger Drilling with TC Bit		10 Oct., 73 Water	EH	Extremely High	BP	Bedding Plane	CN	Clean	CA	Calcite
AD/V	Auger Drilling with V Bit		Level on Date shown	VH	Very High	CL	Cleavage	CT	Coating ($\geq 1.0m$)	CLAY	Clay
AS	Auger Screwing		water inflow	H	High	CS	Crushed Seam	FILLED	Filled	FE	Iron Oxide
DB	Washbore with Drag Bit		water outflow	M	Medium	CZ	Crushed Zone	SN	Stained	FE	Iron Oxide Clay
DT	Diatube			L	Low	DB	Drilling Break	VR	Veneer ($< 1.0mm$)	CLAY	
HMLC	HMLC Core Barrel			VL	Very Low	FC	Fracture			KT	Chlorite
HQ3	HQ3 Core Barrel	WEATHERING		EL	Extremely Low	HB	Handling Break	PLANARITY		MS	Secondary Mineral
NMLC	NMLC Core Barrel	FR	Fresh			IS	Infilled Seam			MU	Unidentified Mineral
NQ3	NQ3 Core Barrel	SW	Slightly Weathered	ROUGHNESS		JT	Joint	CU	Curved	QZ	Quartz
PQ3	PQ3 Core Barrel	MW	Moderately Weathered	POL	Polished	SM	Seam	DJS	Discontinuous	X	Carbonaceous
R	Rock Roller	HW	Highly Weathered	RF	Rough	SS	Shear Seam	IR	Irregular		
		EW	Extremely Weathered	S	Smooth	SZ	Shear Zone	PR	Planar		
				SL	Slickensided	VN	Vein	ST	Stepped		
				VR	Very Rough	VO	Void	UN	Undulose		
						FA	Fault				



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CORED DRILL HOLE LOG

HOLE NO : BH2

FILE / JOB NO : 80018112

SHEET : 4 OF 5

PROJECT : Brookvale Pedestrian Bridge
LOCATION : Brookvale

CLIENT : Downer
FEATURE :

POSITION : E: 339646.63, N: 6262290.25

SURFACE ELEVATION : 11.040 (AHD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hanjin DB8

MOUNTING : Track

CONTRACTOR : Sytech Drilling

DRILLER : JC

DATE STARTED : 23/8/18

DATE COMPLETED : 24/8/18

DATE LOGGED : 24/8/18

LOGGED BY : HD

CHECKED BY : TH

CASING DIAMETER : HWT

BARREL (Length) : 3.00 m BIT : Stepped

BIT CONDITION : Good

DRILLING					MATERIAL					ROCK MASS					
PROGRESS		WATER	(CORE LOSS DRILL RUN %)	SAMPLES & FIELD TESTS	ELEVATION (RL) DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● Axial ○ Diametral	RQD (%)	DEFECT SPACING (mm)	DEFECTS (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other			
DRILLING & CASING															
NIMLC					90% Water RETURN					0% LOSS					
					10.24m Is(50) a=1.33 d=1.35 MPa										
					11.20m Is(50) a=0.16 d=0.27 MPa	11.30m									
					12.07										
					12.95m Is(50) d=1.37 a=1.63 MPa										
					13.95m Is(50) d=1.07 a=1 MPa										
					14.31m Is(50) a=0.87 d=0.76 MPa										
					0% LOSS										
					100% Water RETURN										

DRILLING	WATER	STRENGTH	DEFECT TYPE	COATING	INFILL
AD/T Auger Drilling with TC Bit AD/V Auger Drilling with V Bit AS Auger Screwing DB Washbore with Drag Bit DT Diatube HMLC HMLC Core Barrel HQ3 HQ3 Core Barrel NMLC NMLC Core Barrel NQ3 NQ3 Core Barrel PQ3 PQ3 Core Barrel R Rock Roller	10 Oct., 73 Water Level on Date shown water inflow water outflow WEATHERING FR Fresh SW Slightly Weathered MW Moderately Weathered HW Highly Weathered EW Extremely Weathered	EH Extremely High VH Very High H High M Medium L Low VL Very Low EL Extremely Low ROUGHNESS POL Polished RF Rough S Smooth SL Slickensided VR Very Rough	BP Bedding Plane CL Cleavage CS Crushed Seam CZ Crushed Zone DB Drilling Break FC Fracture HB Handling Break IS Infilled Seam JT Joint SM Seam SS Shear Seam SZ Shear Zone VN Vein VO Void FA Fault	CN Clean CT Coating (>= 1.0m) FILLED Filled SN Stained VR Veneer (< 1.0mm) PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose	CA Calcite CLAY Clay FE Iron Oxide FE Iron Oxide Clay CLAY Clay KT Chlorite MS Secondary Mineral MU Unidentified Mineral OZ Quartz X Carbonaceous

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

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CORED DRILL HOLE LOG

HOLE NO : BH2

FILE / JOB NO : 80018112

SHEET : 5 OF 5

PROJECT : Brookvale Pedestrian Bridge
LOCATION : Brookvale

CLIENT : Downer
FEATURE :

POSITION : E: 339646.63, N: 6262290.25

SURFACE ELEVATION : 11.040 (AHD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Hanjin DB8

MOUNTING : Track

CONTRACTOR : Sytech Drilling

DRILLER : JC

DATE STARTED : 23/8/18

DATE COMPLETED : 24/8/18

DATE LOGGED : 24/8/18

LOGGED BY : HD

CHECKED BY : TH

CASING DIAMETER : HWT

BARREL (Length) : 3.00 m BIT : Stepped

BIT CONDITION : Good

DRILLING					MATERIAL					ROCK MASS					
PROGRESS		CORE LOSS (CORE LOSS DRILL DEPTH RUN %)	SAMPLES & FIELD TESTS	ELEVATION (RL) DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50)					RQD (%)	DEFECT SPACING (mm)	DEFECTS (joints, partings, seams, zones, etc) Description, orientation, infilling or coating, shape, roughness, thickness, other
NMLC DRILLING & CASING	WATER							EL -0.03 VL -0.1 L -0.3 M -1 H -3 VH -10 EH	● Axial ○ Diametral						
NMLC		15.17		15.0 15.17m		SANDSTONE fine to medium grained, grey, indistinctly bedded at 0-10° (continued) BOREHOLE BH2 TERMINATED AT 15.17 m Target depth						100		15.00: HB 15.03: BP, 5°, PR, RF, Clay Vr	

DRILLING

AD/T Auger Drilling with TC Bit
AD/V Auger Drilling with V Bit
AS Auger Screwing
DB Washbore with Drag Bit
DT Diatube
HMLC HMLC Core Barrel
HQ3 HQ3 Core Barrel
NMLC NMLC Core Barrel
NQ3 NQ3 Core Barrel
PQ3 PQ3 Core Barrel
R Rock Roller

WATER

10 Oct., 73 Water
Level on Date shown
water inflow
water outflow

WEATHERING

FR Fresh
SW Slightly Weathered
MW Moderately Weathered
HW Highly Weathered
EW Extremely Weathered

STRENGTH

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

ROUGHNESS

POL Polished
RF Rough
S Smooth
SL Slicksided
VR Very Rough

DEFECT TYPE

BP Bedding Plane
CL Cleavage
CS Crushed Seam
CZ Crushed Zone
DB Drilling Break
FC Fracture
HB Handling Break
IS Infilled Seam
JT Joint
SM Seam
SS Shear Seam
SZ Shear Zone
VN Vein
VO Void
FA Fault

COATING

CN Clean
CT Coating (>= 1.0m)
FILLED Filled
SN Stained
VR Veneer (< 1.0mm)

PLANARITY

CU Curved
DIS Discontinuous
IR Irregular
PR Planar
ST Stepped
UN Undulose

INFILL

CA Calcite
CLAY Clay
FE Iron Oxide
FE Iron Oxide Clay
CLAY Clay
KT Chlorite
MS Secondary Mineral
MU Unidentified Mineral
OZ Quartz
X Carbonaceous

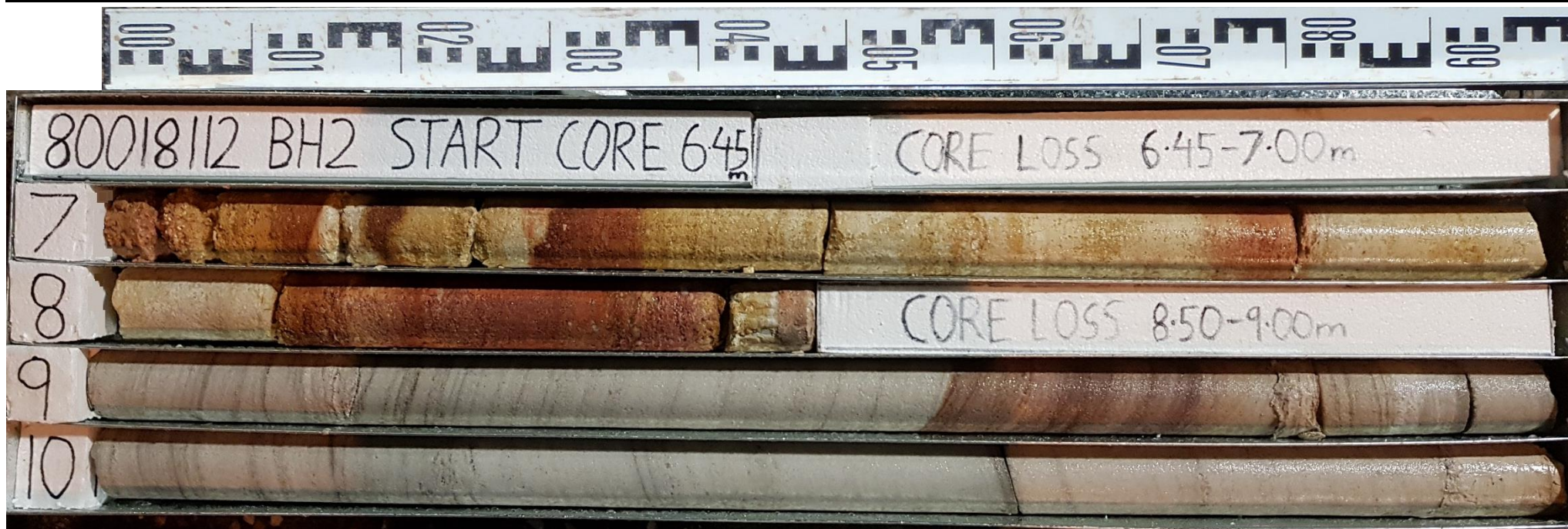
See Explanatory Notes for details of abbreviations & basis of descriptions.

CARDNO (NSW/ACT) PTY LTD





TITLE:

Borehole Core Photographs – BH2
Geotechnical Investigation – Brookvale Pedestrian BridgePROJECT NO:
80018112TEST DATE:
24 August 2018INCLINATION:
90°CORED LENGTH: **BOX 1 OF 2**
6.45m to 11.0m – 4.55m LengthDRILL RIG:
Hanjin DB8CONTRACTOR:
Sytech DrillingLOGGED BY:
HDCHECKED BY:
TH**BH2****6.45m to 11.00m****BOX 1 OF 2**



TITLE:

Borehole Core Photographs – BH2
Geotechnical Investigation – Brookvale Pedestrian Bridge

PROJECT NO:
80018112

TEST DATE:
24 August 2018

INCLINATION:
90°

CORED LENGTH: **BOX 2 OF 2**
11.00m to 15.17m – 4.17m
Length

DRILL RIG:
Hanjin DB8

CONTRACTOR:
Sytech Drilling

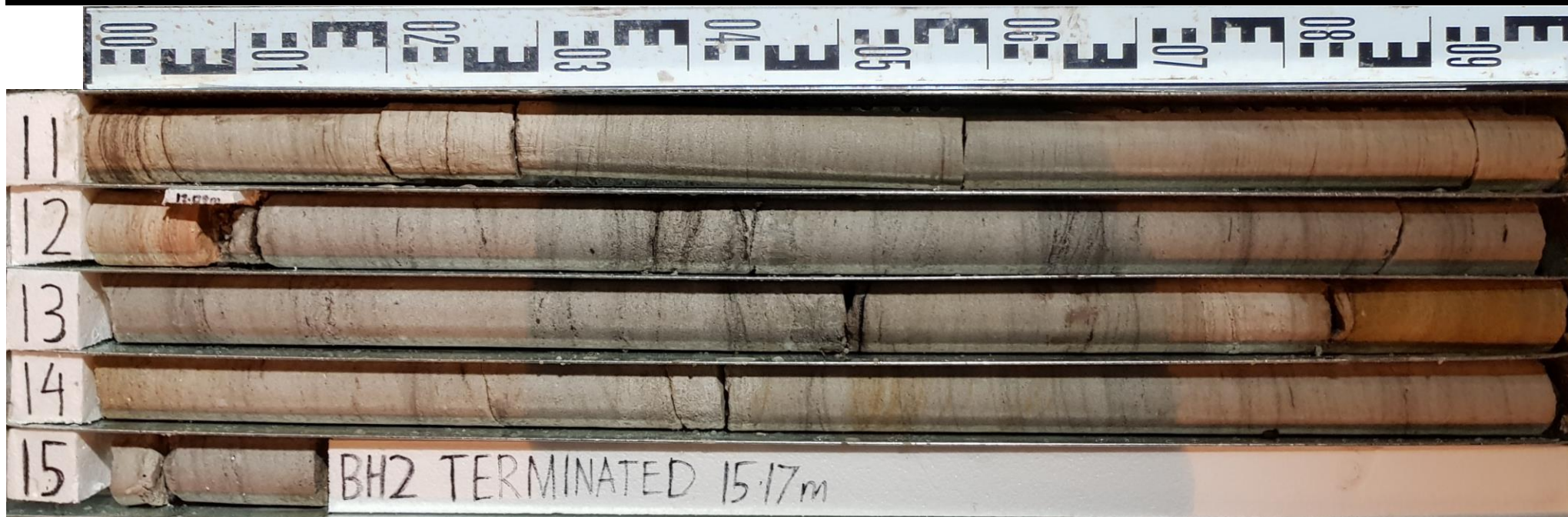
LOGGED BY:
HD

CHECKED BY:
TH

BH2

11.00m to 15.17m

BOX 2 OF 2



NON-CORE DRILL HOLE - GEOLOGICAL LOG

HOLE NO : BH3

FILE / JOB NO : 80018112

SHEET : 1 OF 1

PROJECT : Brookvale Pedestrian Bridge

CLIENT : Downer

LOCATION : Brookvale

FEATURE :

POSITION : E: 339664.83, N: 6262208.91

SURFACE ELEVATION : 15.820 (AHD)

ANGLE FROM HORIZONTAL : 90°

RIG TYPE : Comacchio 205

MOUNTING : Track

CONTRACTOR : Terratest

DRILLER : AZ

DATE STARTED : 23/8/18

DATE COMPLETED : 24/8/18

DATE LOGGED : 23/8/18

LOGGED BY : AC

CHECKED BY : TH

DRILLING					MATERIAL								
DRILLING & CASING	SAMPLES	DRILLING PENETRATION	GROUND WATER LEVELS	FIELD TESTS	ELEVATION (RL)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Plasticity or Particle Characteristic, Colour, Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	RELATIVE DENSITY	STRUCTURE & Other Observations
DT AD/T	0.25m ES-E1 0.35m	VH	Not Encountered		0.0				0.07m ASPHALT AC10 0.11m black 0.16m ASPHALT AC20 0.22m black				ROAD SURFACE
	0.50m B-B 0.60m ES-E2 0.70m 0.80m	M VH				15.5		0.42m Gravelly SAND (Heavily stabilised) fine to coarse grained, brown, fine to coarse angular gravel 0.45m Sandy GRAVEL (Moderately stabilised) fine to coarse grained, sandstone, brown, white, and orange, fine to coarse grained sand, trace cobbles Clayey SAND fine to medium grained, orange and grey SANDSTONE fine to medium grained, pale red, orange, and brown, highly to moderately weathered, low to medium strength				BASECOURSE FILL possibly BEDROCK	
					15.0								
					1.0			1.00m	BOREHOLE BH3 TERMINATED AT 1.00 m Target depth				
					14.5								
					14.0								
					2.0								
					13.5								
					3.0								
					12.5								
					12.0								
					4.0								
					11.5								
					11.0								
					5.0								

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

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BH3

	TITLE: Pavement Core Borehole Photographs		
	Geotechnical Investigation – Brookvale Pedestrian Bridge		
	PROJECT NO:	TEST DATE:	PREPARED BY:
	80018112	23/08/2018	HD



BH3

	TITLE: Pavement Core Borehole Photographs Geotechnical Investigation – Brookvale Pedestrian Bridge		
	PROJECT NO: 80018112	TEST DATE: 23/08/2018	PREPARED BY: HD

Appendix D – Site Photographs



Photograph 1: BH4 upper core showing weathered shale with clay banding.



Photograph 2: BH4 lower core showing grey thinly laminated shale.



Photograph 3: BH2 upper core showing weathered shale with clay banding.



Photograph 4 BH2 lower core showing grey thinly laminated shale.



Photograph 5: BH3 location at North Strathfield Station.



Photograph 6: BH3 core showing orange and brown shale with clay.

Appendix E- Laboratory Reports

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: Ben Withnall

Report 614342-S
 Project name BROOKVALE PEDESTRIAN BRIDGE GI
 Project ID 80018112
 Received Date Aug 24, 2018

Client Sample ID			BH1-E1 0.2-0.4	BH1-E2 0.8-1	BH1-E3 3.2-3.4	BH1-E4 4.8-5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34006	S18-Au34007	S18-Au34008	S18-Au34009
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	147	84	110	81
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			BH1-E1 0.2-0.4	BH1-E2 0.8-1	BH1-E3 3.2-3.4	BH1-E4 4.8-5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34006	S18-Au34007	S18-Au34008	S18-Au34009
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	98	96	96	98
p-Terphenyl-d14 (surr.)	1	%	100	105	109	110
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4.4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4.4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchloroendate (surr.)	1	%	99	107	106	100
Tetrachloro-m-xylene (surr.)	1	%	80	94	102	99
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			BH1-E1 0.2-0.4	BH1-E2 0.8-1	BH1-E3 3.2-3.4	BH1-E4 4.8-5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34006	S18-Au34007	S18-Au34008	S18-Au34009
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	96	91	88	91
Polychlorinated Biphenyls						
Aroclor-1016	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1221	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1232	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1242	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1248	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1254	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1260	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PCB*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibutylchlorendate (surr.)	1	%	99	107	106	100
Tetrachloro-m-xylene (surr.)	1	%	80	94	102	99
Heavy Metals						
Arsenic	2	mg/kg	2.5	< 2	9.6	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	12	19	24	19
Copper	5	mg/kg	6.5	< 5	< 5	< 5
Lead	5	mg/kg	26	19	10	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	5.0	< 5	< 5
Zinc	5	mg/kg	34	< 5	< 5	< 5
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.6	8.3	5.7	5.4
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	6.9	6.6	5.9	4.2
Reaction Ratings* ^{S05}		comment	4.0	4.0	4.0	2.0

Client Sample ID			BH1-E1 0.2-0.4	BH1-E2 0.8-1	BH1-E3 3.2-3.4	BH1-E4 4.8-5
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34006	S18-Au34007	S18-Au34008	S18-Au34009
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Chromium Suite						
pH-KCL	0.1	pH Units	9.1	8.8	6.1	5.2
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	< 2	4.7	14
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	< 0.02	< 0.02	< 0.02	0.02
Chromium Reducible Sulfur ^{S04}	0.005	% S	< 0.005	< 0.005	0.018	0.007
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	11	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite ^{S02}	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	3.0	1.6	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	600	310	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt) ^{S03}	0.02	% S	0.96	0.50	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	0.02	0.03
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	16	18
CRS Suite - Liming Rate ^{S01}	1	kg CaCO3/t	< 1	< 1	1.2	1.4
Extraneous Material						
<2mm Fraction	0.005	g	110	110	120	120
>2mm Fraction	0.005	g	27	39	< 0.005	0.72
Analysed Material	0.1	%	81	75	100	99
Extraneous Material	0.1	%	19	25	< 0.1	0.6
% Moisture	1	%	5.5	20	17	15

Client Sample ID			BH2-E1 0.3-0.5	BH3-E1 0.25-0.35	BH3-E2 0.6-0.7	BH1-E5 6.0-6.15
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34010	S18-Au34013	S18-Au34014	S18-Au34015
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	81	110	< 50	< 50
TRH C29-C36	50	mg/kg	93	120	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	174	230	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	105	119	117	84

Client Sample ID			BH2-E1 0.3-0.5	BH3-E1 0.25-0.35	BH3-E2 0.6-0.7	BH1-E5 6.0-6.15
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34010	S18-Au34013	S18-Au34014	S18-Au34015
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	160	200	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	160	200	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	1.9	2.4	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	2.1	2.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	2.4	2.9	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	1.1	0.9	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	1.4	1.8	< 0.5	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	1.1	1.5	< 0.5	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	0.9	1.4	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	1.3	1.4	< 0.5	< 0.5
Chrysene	0.5	mg/kg	1.2	1.0	< 0.5	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	2.4	1.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	1.1	1.6	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	0.9	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	2.4	1.8	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	13.8	12.9	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	98	100	95	110
p-Terphenyl-d14 (surr.)	1	%	96	95	105	109
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4,4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4,4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4,4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
α-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
β-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
δ-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
γ-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05

Client Sample ID			BH2-E1 0.3-0.5	BH3-E1 0.25-0.35	BH3-E2 0.6-0.7	BH1-E5 6.0-6.15
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34010	S18-Au34013	S18-Au34014	S18-Au34015
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchloroendate (surr.)	1	%	101	98	94	92
Tetrachloro-m-xylene (surr.)	1	%	98	89	85	98
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	98	98	90	108

Client Sample ID			BH2-E1 0.3-0.5	BH3-E1 0.25-0.35	BH3-E2 0.6-0.7	BH1-E5 6.0-6.15
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34010	S18-Au34013	S18-Au34014	S18-Au34015
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Polychlorinated Biphenyls						
Aroclor-1016	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1221	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1232	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1242	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1248	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1254	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1260	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PCB*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibutylchloredate (surr.)	1	%	101	98	94	92
Tetrachloro-m-xylene (surr.)	1	%	98	89	85	98
Heavy Metals						
Arsenic	2	mg/kg	2.4	< 2	< 2	2.4
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	20	< 5	22	12
Copper	5	mg/kg	34	< 5	5.6	< 5
Lead	5	mg/kg	98	< 5	< 5	< 5
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	8.5	< 5	< 5	< 5
Zinc	5	mg/kg	120	< 5	< 5	< 5
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	8.5	6.1	6.0	4.7
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	5.6	4.4	4.8	4.1
Reaction Ratings* ^{S05}		comment	4.0	2.0	3.0	1.0
Chromium Suite						
pH-KCL	0.1	pH Units	8.4	5.8	5.0	5.5
Acid trail - Titratable Actual Acidity	2	mol H+/t	< 2	7.6	14	4.7
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	< 0.02	< 0.02	0.02	< 0.02
Chromium Reducible Sulfur ^{S04}	0.005	% S	0.010	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite ^{S02}	0.02	% S	n/a	n/a	n/a	n/a
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO3	2.2	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	440	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt) ^{S03}	0.02	% S	0.70	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	0.02	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	< 10	< 10	14	< 10
CRS Suite - Liming Rate ^{S01}	1	kg CaCO3/t	< 1	< 1	1.0	< 1
Extraneous Material						
<2mm Fraction	0.005	g	130	120	160	140
>2mm Fraction	0.005	g	10	92	1.3	2.0
Analysed Material	0.1	%	93	57	99	99
Extraneous Material	0.1	%	7.1	43	0.8	1.4
% Moisture	1	%	21	15	11	7.8

Client Sample ID			BH1-E6 8-8.2	BH1-E7 10-10.2	BH1-E8 12-12.2	BH1-E9 14-14.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34016	S18-Au34017	S18-Au34018	S18-Au34019
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	< 50	< 50	< 50	< 50
TRH C29-C36	50	mg/kg	< 50	< 50	< 50	< 50
TRH C10-36 (Total)	50	mg/kg	< 50	< 50	< 50	< 50
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	62	67	72	77
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	< 100	< 100
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	0.6	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	1.2	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
2-Fluorobiphenyl (surr.)	1	%	101	112	100	107
p-Terphenyl-d14 (surr.)	1	%	104	114	104	116

Client Sample ID			BH1-E6 8-8.2	BH1-E7 10-10.2	BH1-E8 12-12.2	BH1-E9 14-14.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34016	S18-Au34017	S18-Au34018	S18-Au34019
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4,4'-DDD	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4,4'-DDE	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
4,4'-DDT	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
a-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Aldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
b-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
d-BHC	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
g-BHC (Lindane)	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Methoxychlor	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Toxaphene	1	mg/kg	< 1	< 1	< 1	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	< 0.05	< 0.05	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibutylchloroendate (surr.)	1	%	87	88	88	87
Tetrachloro-m-xylene (surr.)	1	%	91	92	91	90
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Bolstar	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Coumaphos	2	mg/kg	< 2	< 2	< 2	< 2
Demeton-S	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Diazinon	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
EPN	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Fenthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Malathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Merphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2

Client Sample ID			BH1-E6 8-8.2	BH1-E7 10-10.2	BH1-E8 12-12.2	BH1-E9 14-14.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34016	S18-Au34017	S18-Au34018	S18-Au34019
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Methyl parathion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Monocrotophos	2	mg/kg	< 2	< 2	< 2	< 2
Naled	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Omethoate	2	mg/kg	< 2	< 2	< 2	< 2
Phorate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Ronnel	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Terbufos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
Triphenylphosphate (surr.)	1	%	104	114	111	117
Polychlorinated Biphenyls						
Aroclor-1016	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1221	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aroclor-1232	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1242	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1248	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1254	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aroclor-1260	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Total PCB*	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Dibutylchlorendate (surr.)	1	%	87	88	88	87
Tetrachloro-m-xylene (surr.)	1	%	91	92	91	90
Heavy Metals						
Arsenic	2	mg/kg	< 2	< 2	< 2	< 2
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	6.4	6.4	< 5	< 5
Copper	5	mg/kg	< 5	< 5	< 5	< 5
Lead	5	mg/kg	< 5	14	6.6	9.7
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	< 5	< 5	< 5
Zinc	5	mg/kg	< 5	< 5	< 5	< 5
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.0	6.3	6.3	6.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.5	4.9	4.3	4.9
Reaction Ratings ^{S05}		comment	2.0	4.0	4.0	4.0
Chromium Suite						
pH-KCL	0.1	pH Units	5.1	5.6	4.6	5.3
Acid trail - Titratable Actual Acidity	2	mol H+/t	6.7	4.5	18	6.8
sulfidic - TAA equiv. S% pyrite	0.02	% pyrite S	< 0.02	< 0.02	0.03	< 0.02
Chromium Reducible Sulfur ^{S04}	0.005	% S	< 0.005	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3	< 3
Sulfur - KCl Extractable	0.02	% S	n/a	n/a	n/a	n/a
HCl Extractable Sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur	0.02	% S	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - acidity units	10	mol H+/t	n/a	n/a	n/a	n/a
Net Acid soluble sulfur - equivalent S% pyrite ^{S02}	0.02	% S	n/a	n/a	n/a	n/a

Client Sample ID			BH1-E6 8-8.2	BH1-E7 10-10.2	BH1-E8 12-12.2	BH1-E9 14-14.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S18-Au34016	S18-Au34017	S18-Au34018	S18-Au34019
Date Sampled			Aug 23, 2018	Aug 23, 2018	Aug 23, 2018	Aug 23, 2018
Test/Reference	LOR	Unit				
Chromium Suite						
Acid Neutralising Capacity (ANCbt)	0.01	%CaCO ₃	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H ⁺ /t	n/a	n/a	n/a	n/a
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt) ^{S03}	0.02	% S	n/a	n/a	n/a	n/a
ANC Fineness Factor		factor	1.5	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	< 0.02	< 0.02	0.03	< 0.02
CRS Suite - Net Acidity (Acidity Units)	10	mol H ⁺ /t	< 10	< 10	18	< 10
CRS Suite - Liming Rate ^{S01}	1	kg CaCO ₃ /t	< 1	< 1	1.4	< 1
Extraneous Material						
<2mm Fraction	0.005	g	140	180	180	190
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005	7.7
Analysed Material	0.1	%	100	100	100	96
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1	3.9
% Moisture	1	%	10	14	4.1	6.6

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	Sep 07, 2018	14 Day
BTEX - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Sep 07, 2018	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Sep 07, 2018	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: TRH C6-C40 - LTM-ORG-2010	Sydney	Sep 07, 2018	14 Day
Polycyclic Aromatic Hydrocarbons - Method: LTM-ORG-2130 PAH and Phenols in Soil and Water	Sydney	Sep 07, 2018	14 Days
Metals M8 - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Sep 07, 2018	28 Day
Organochlorine Pesticides - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Sep 07, 2018	14 Day
Organophosphorus Pesticides - Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS	Sydney	Sep 07, 2018	14 Day
Polychlorinated Biphenyls - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Sep 07, 2018	28 Days
Acid Sulfate Soils Field pH Test - Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests	Brisbane	Sep 06, 2018	7 Days
Chromium Reducible Sulfur Suite			
Chromium Suite - Method: LTM-GEN-7070	Brisbane	Sep 06, 2018	6 Week
Extraneous Material - Method: LTM-GEN-7050/7070	Brisbane	Sep 06, 2018	6 Week
% Moisture - Method: LTM-GEN-7080 Moisture	Sydney	Sep 05, 2018	14 Day

Company Name: Cardno (NSW/ACT) Pty Ltd
Address: Level 9, 203 Pacific Highway
St Leonards
NSW 2065

Project Name: BROOKVALE PEDESTRIAN BRIDGE GI
Project ID: 80018112

Order No.:
Report #: 614342
Phone: 0294967700
Fax: 02 9499 3902

Received: Aug 30, 2018 11:41 AM
Due: Sep 10, 2018
Priority: 7 Day
Contact Name: Ben Withnall

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Organophosphorus Pesticides	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Metals M8	BTEX	Chromium Reducible Sulfur Suite	Moisture Set	Total Recoverable Hydrocarbons	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271																		
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X		X	X		X	X	X
Brisbane Laboratory - NATA Site # 20794												X			X			
Perth Laboratory - NATA Site # 23736																		
External Laboratory																		
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID													
1	BH1-E1 0.2-0.4	Aug 23, 2018		Soil	S18-Au34006	X			X	X	X	X			X	X		X
2	BH1-E2 0.8-1	Aug 23, 2018		Soil	S18-Au34007	X			X	X	X	X			X	X		X
3	BH1-E3 3.2-3.4	Aug 23, 2018		Soil	S18-Au34008	X			X	X	X	X			X	X		X
4	BH1-E4 4.8-5	Aug 23, 2018		Soil	S18-Au34009	X			X	X	X	X			X	X		X
5	BH2-E1 0.3-0.5	Aug 23, 2018		Soil	S18-Au34010	X			X	X	X	X			X	X		X
6	BH2-E2 2-2.2	Aug 23, 2018		Soil	S18-Au34011		X											
7	BH2-E3 4.2-4.5	Aug 23, 2018		Soil	S18-Au34012		X											

Company Name: Cardno (NSW/ACT) Pty Ltd
Address: Level 9, 203 Pacific Highway
St Leonards
NSW 2065

Project Name: BROOKVALE PEDESTRIAN BRIDGE GI
Project ID: 80018112

Order No.:
Report #: 614342
Phone: 0294967700
Fax: 02 9499 3902

Received: Aug 30, 2018 11:41 AM
Due: Sep 10, 2018
Priority: 7 Day
Contact Name: Ben Withnall

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Organophosphorus Pesticides	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Metals M8	BTEX	Chromium Reducible Sulfur Suite	Moisture Set	Total Recoverable Hydrocarbons	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271																		
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X		X	X		X	X	X
Brisbane Laboratory - NATA Site # 20794												X			X			
Perth Laboratory - NATA Site # 23736																		
8	BH3-E1 0.25-0.35	Aug 23, 2018		Soil	S18-Au34013	x			x	x	x	x			x	x		x
9	BH3-E2 0.6-0.7	Aug 23, 2018		Soil	S18-Au34014	x			x	x	x	x			x	x		x
10	BH1-E5 6.0-6.15	Aug 23, 2018		Soil	S18-Au34015	x		x	x	x	x	x	x	x	x	x	x	
11	BH1-E6 8-8.2	Aug 23, 2018		Soil	S18-Au34016	x		x	x	x	x	x	x	x	x	x	x	
12	BH1-E7 10-10.2	Aug 23, 2018		Soil	S18-Au34017	x		x	x	x	x	x	x	x	x	x	x	
13	BH1-E8 12-12.2	Aug 23, 2018		Soil	S18-Au34018	x		x	x	x	x	x	x	x	x	x	x	
14	BH1-E9 14-14.2	Aug 23, 2018		Soil	S18-Au34019	x		x	x	x	x	x	x	x	x	x	x	
15	BH2-E4 7.26-	Aug 23, 2018		Soil	S18-Au34020		x											

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Melbourne Laboratory - NATA Site # 1254 & 14271																		
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X		X	X		X	X	X
Brisbane Laboratory - NATA Site # 20794												X			X			
Perth Laboratory - NATA Site # 23736																		
	7.46																	
16	BH2-E5 9-9.19	Aug 23, 2018		Soil	S18-Au34021		X											
17	BH2-E6 11-11.2	Aug 23, 2018		Soil	S18-Au34022		X											
18	BH2-E7 12.12-12.3	Aug 23, 2018		Soil	S18-Au34023		X											
19	BH2-E8 13.52-13.75	Aug 23, 2018		Soil	S18-Au34024		X											
20	BH1-E2 1.1-1.3	Aug 23, 2018		Soil	S18-Au34025		X											
21	BH1 16-16.2	Aug 23, 2018		Soil	S18-Au34026		X											
Test Counts						12	9	5	12	12	12	12	5	5	12	12	5	7

Internal Quality Control Review and Glossary

General

1. 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.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. 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 SRA.

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.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****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.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. 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.
2. 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.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. 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.
6. 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.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. 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	%	126			70-130	Pass	
TRH C10-C14	%	97			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	120			70-130	Pass	
Toluene	%	121			70-130	Pass	
Ethylbenzene	%	112			70-130	Pass	
m&p-Xylenes	%	124			70-130	Pass	
o-Xylene	%	116			70-130	Pass	
Xylenes - Total	%	121			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	116			70-130	Pass	
TRH C6-C10	%	115			70-130	Pass	
TRH >C10-C16	%	107			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	91			70-130	Pass	
Acenaphthylene	%	84			70-130	Pass	
Anthracene	%	100			70-130	Pass	
Benz(a)anthracene	%	79			70-130	Pass	
Benzo(a)pyrene	%	86			70-130	Pass	
Benzo(b&j)fluoranthene	%	89			70-130	Pass	
Benzo(g,h,i)perylene	%	91			70-130	Pass	
Benzo(k)fluoranthene	%	90			70-130	Pass	
Chrysene	%	85			70-130	Pass	
Dibenz(a,h)anthracene	%	89			70-130	Pass	
Fluoranthene	%	97			70-130	Pass	
Fluorene	%	86			70-130	Pass	
Indeno(1,2,3-cd)pyrene	%	85			70-130	Pass	
Naphthalene	%	87			70-130	Pass	
Phenanthrene	%	102			70-130	Pass	
Pyrene	%	102			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
4,4'-DDD	%	102			70-130	Pass	
4,4'-DDE	%	103			70-130	Pass	
4,4'-DDT	%	103			70-130	Pass	
α-BHC	%	106			70-130	Pass	
Aldrin	%	105			70-130	Pass	

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
b-BHC				%	105			70-130	Pass	
d-BHC				%	101			70-130	Pass	
Dieldrin				%	103			70-130	Pass	
Endosulfan I				%	103			70-130	Pass	
Endosulfan II				%	101			70-130	Pass	
Endosulfan sulphate				%	100			70-130	Pass	
Endrin				%	93			70-130	Pass	
Endrin aldehyde				%	90			70-130	Pass	
Endrin ketone				%	86			70-130	Pass	
g-BHC (Lindane)				%	106			70-130	Pass	
Heptachlor				%	105			70-130	Pass	
Heptachlor epoxide				%	104			70-130	Pass	
Hexachlorobenzene				%	106			70-130	Pass	
Methoxychlor				%	108			70-130	Pass	
LCS - % Recovery										
Organophosphorus Pesticides										
Diazinon				%	95			70-130	Pass	
Dimethoate				%	75			70-130	Pass	
Ethion				%	71			70-130	Pass	
Fenitrothion				%	82			70-130	Pass	
Methyl parathion				%	89			70-130	Pass	
Mevinphos				%	92			70-130	Pass	
LCS - % Recovery										
Polychlorinated Biphenyls										
Aroclor-1260				%	87			70-130	Pass	
LCS - % Recovery										
Heavy Metals										
Arsenic				%	94			70-130	Pass	
Cadmium				%	98			70-130	Pass	
Chromium				%	113			70-130	Pass	
Copper				%	118			70-130	Pass	
Lead				%	118			70-130	Pass	
Mercury				%	107			70-130	Pass	
Nickel				%	118			70-130	Pass	
Zinc				%	112			70-130	Pass	
LCS - % Recovery										
Chromium Suite										
Chromium Reducible Sulfur				%	89			70-130	Pass	
Acid Neutralising Capacity (ANCbt)				%	101			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	S18-Au35369	NCP	%	93			70-130	Pass		
TRH C10-C14	S18-Se02136	NCP	%	86			70-130	Pass		
Spike - % Recovery										
BTEX					Result 1					
Benzene	S18-Au35369	NCP	%	82			70-130	Pass		
Toluene	S18-Au35369	NCP	%	95			70-130	Pass		
Ethylbenzene	S18-Au35369	NCP	%	99			70-130	Pass		
m&p-Xylenes	S18-Au35369	NCP	%	105			70-130	Pass		
o-Xylene	S18-Au35369	NCP	%	106			70-130	Pass		
Xylenes - Total	S18-Au35369	NCP	%	105			70-130	Pass		
Spike - % Recovery										
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Naphthalene	S18-Au35369	NCP	%	101			70-130	Pass	
TRH C6-C10	S18-Au35369	NCP	%	99			70-130	Pass	
TRH >C10-C16	S18-Se02136	NCP	%	94			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S18-Au41111	NCP	%	70			70-130	Pass	
Cadmium	S18-Au41111	NCP	%	89			70-130	Pass	
Chromium	S18-Au41111	NCP	%	84			70-130	Pass	
Copper	S18-Au41111	NCP	%	91			70-130	Pass	
Lead	S18-Au41111	NCP	%	81			70-130	Pass	
Mercury	S18-Au41111	NCP	%	110			70-130	Pass	
Nickel	S18-Au41111	NCP	%	81			70-130	Pass	
Zinc	S18-Au41032	NCP	%	99			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S18-Au34007	CP	%	105			70-130	Pass	
Acenaphthylene	S18-Au34007	CP	%	104			70-130	Pass	
Anthracene	S18-Au34007	CP	%	107			70-130	Pass	
Benz(a)anthracene	S18-Au34007	CP	%	101			70-130	Pass	
Benzo(a)pyrene	S18-Au34007	CP	%	101			70-130	Pass	
Benzo(b&j)fluoranthene	S18-Au34007	CP	%	109			70-130	Pass	
Benzo(g,h,i)perylene	S18-Au34007	CP	%	90			70-130	Pass	
Benzo(k)fluoranthene	S18-Au34007	CP	%	110			70-130	Pass	
Chrysene	S18-Au34007	CP	%	102			70-130	Pass	
Dibenz(a,h)anthracene	S18-Au34007	CP	%	92			70-130	Pass	
Fluoranthene	S18-Au34007	CP	%	118			70-130	Pass	
Fluorene	S18-Au34007	CP	%	108			70-130	Pass	
Indeno(1,2,3-cd)pyrene	S18-Au34007	CP	%	89			70-130	Pass	
Naphthalene	S18-Au34007	CP	%	105			70-130	Pass	
Phenanthrene	S18-Au34007	CP	%	112			70-130	Pass	
Pyrene	S18-Au34007	CP	%	119			70-130	Pass	
Spike - % Recovery									
Organophosphorus Pesticides				Result 1					
Diazinon	S18-Au34007	CP	%	118			70-130	Pass	
Dimethoate	S18-Au34007	CP	%	107			70-130	Pass	
Ethion	S18-Au34007	CP	%	104			70-130	Pass	
Fenitrothion	S18-Au34007	CP	%	104			70-130	Pass	
Methyl parathion	S18-Au34007	CP	%	116			70-130	Pass	
Mevinphos	S18-Au34007	CP	%	127			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1260	S18-Au34007	CP	%	113			70-130	Pass	
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
4,4'-DDD	S18-Au34015	CP	%	116			70-130	Pass	
4,4'-DDE	S18-Au34015	CP	%	116			70-130	Pass	
4,4'-DDT	S18-Au34015	CP	%	114			70-130	Pass	
α-BHC	S18-Au34015	CP	%	119			70-130	Pass	
Aldrin	S18-Au34015	CP	%	120			70-130	Pass	
β-BHC	S18-Au34015	CP	%	118			70-130	Pass	
δ-BHC	S18-Au34015	CP	%	117			70-130	Pass	
Dieldrin	S18-Au34015	CP	%	114			70-130	Pass	
Endosulfan I	S18-Au34015	CP	%	117			70-130	Pass	
Endosulfan II	S18-Au34015	CP	%	114			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endosulfan sulphate	S18-Au34015	CP	%	110			70-130	Pass	
Endrin aldehyde	S18-Au34015	CP	%	91			70-130	Pass	
Endrin ketone	S18-Au34015	CP	%	90			70-130	Pass	
g-BHC (Lindane)	S18-Au34015	CP	%	119			70-130	Pass	
Heptachlor	S18-Au34015	CP	%	116			70-130	Pass	
Heptachlor epoxide	S18-Au34015	CP	%	117			70-130	Pass	
Hexachlorobenzene	S18-Au34015	CP	%	123			70-130	Pass	
Methoxychlor	S18-Au34015	CP	%	110			70-130	Pass	
Toxaphene	S18-Au34015	CP	%	110			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1260	S18-Au34015	CP	%	116			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	S18-Au41032	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	S18-Au41032	NCP	mg/kg	26	23	11	30%	Pass	
TRH C15-C28	S18-Au41032	NCP	mg/kg	160	160	3.0	30%	Pass	
TRH C29-C36	S18-Au41032	NCP	mg/kg	220	220	2.0	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S18-Au41032	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	S18-Au41032	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	S18-Au41032	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	S18-Au41032	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	S18-Au41032	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total	S18-Au41032	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S18-Au41032	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
TRH C6-C10	S18-Au41032	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	S18-Au41032	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	S18-Au41032	NCP	mg/kg	350	340	3.0	30%	Pass	
TRH >C34-C40	S18-Au41032	NCP	mg/kg	130	150	15	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g,h,i)perylene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a,h)anthracene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1,2,3-cd)pyrene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate								
Organochlorine Pesticides				Result 1	Result 2	RPD		
Chlordanes - Total	S18-Au34006	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
4,4'-DDD	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
4,4'-DDE	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
4,4'-DDT	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
a-BHC	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Aldrin	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
b-BHC	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
d-BHC	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Dieldrin	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan I	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan II	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endosulfan sulphate	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin aldehyde	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Endrin ketone	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
g-BHC (Lindane)	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Heptachlor epoxide	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Hexachlorobenzene	S18-Au34006	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass
Methoxychlor	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Toxaphene	S18-Au34006	CP	mg/kg	< 1	< 1	<1	30%	Pass
Duplicate								
Organophosphorus Pesticides				Result 1	Result 2	RPD		
Azinphos-methyl	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Bolstar	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Chlorfenvinphos	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Chlorpyrifos	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Chlorpyrifos-methyl	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Coumaphos	S18-Au34006	CP	mg/kg	< 2	< 2	<1	30%	Pass
Demeton-S	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Demeton-O	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Diazinon	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Dichlorvos	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Dimethoate	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Disulfoton	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
EPN	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Ethion	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Ethoprop	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Ethyl parathion	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Fenitrothion	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Fensulfothion	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Fenthion	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Malathion	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Merphos	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Methyl parathion	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Mevinphos	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Monocrotophos	S18-Au34006	CP	mg/kg	< 2	< 2	<1	30%	Pass
Naled	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Omethoate	S18-Au34006	CP	mg/kg	< 2	< 2	<1	30%	Pass
Phorate	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Pirimiphos-methyl	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Pyrazophos	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Ronnel	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Terbufos	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass

Duplicate								
Organophosphorus Pesticides				Result 1	Result 2	RPD		
Tetrachlorvinphos	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Tokuthion	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Trichloronate	S18-Au34006	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
Duplicate								
Polychlorinated Biphenyls				Result 1	Result 2	RPD		
Aroclor-1016	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1221	S18-Au34006	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Aroclor-1232	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1242	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1248	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1254	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Aroclor-1260	S18-Au34006	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic	S18-Se00869	NCP	mg/kg	5.3	5.0	5.0	30%	Pass
Cadmium	S18-Se00869	NCP	mg/kg	0.9	0.9	9.0	30%	Pass
Chromium	S18-Au41110	NCP	mg/kg	13	13	2.0	30%	Pass
Copper	S18-Se00869	NCP	mg/kg	19	17	7.0	30%	Pass
Lead	S18-Se00869	NCP	mg/kg	39	43	11	30%	Pass
Mercury	S18-Se00869	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Nickel	S18-Se00869	NCP	mg/kg	5.1	< 5	4.0	30%	Pass
Zinc	S18-Se00869	NCP	mg/kg	210	200	7.0	30%	Pass
Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	S18-Au34006	CP	pH Units	8.6	8.6	pass	30%	Pass
Reaction Ratings*	S18-Au34006	CP	comment	4.0	4.0	pass	30%	Pass
Duplicate								
Chromium Suite				Result 1	Result 2	RPD		
pH-KCL	S18-Au34006	CP	pH Units	9.1	9.1	<1	30%	Pass
Acid trail - Titratable Actual Acidity	S18-Au34006	CP	mol H+/t	< 2	< 2	<1	30%	Pass
sulfidic - TAA equiv. S% pyrite	S18-Au34006	CP	% pyrite S	< 0.02	< 0.02	<1	30%	Pass
Chromium Reducible Sulfur	S18-Au34006	CP	% S	< 0.005	< 0.005	<1	30%	Pass
Chromium Reducible Sulfur -acidity units	S18-Au34006	CP	mol H+/t	< 3	< 3	<1	30%	Pass
Sulfur - KCl Extractable	S18-Au34006	CP	% S	n/a	n/a	n/a	30%	Pass
HCl Extractable Sulfur	S18-Au34006	CP	% S	n/a	n/a	n/a	30%	Pass
Net Acid soluble sulfur	S18-Au34006	CP	% S	n/a	n/a	n/a	30%	Pass
Net Acid soluble sulfur - acidity units	S18-Au34006	CP	mol H+/t	n/a	n/a	n/a	30%	Pass
Net Acid soluble sulfur - equivalent S% pyrite	S18-Au34006	CP	% S	n/a	n/a	n/a	30%	Pass
Acid Neutralising Capacity (ANCbt)	S18-Au34006	CP	%CaCO3	3.0	3.0	<1	30%	Pass
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	S18-Au34006	CP	% S	0.96	0.96	<1	30%	Pass
ANC Fineness Factor	S18-Au34006	CP	factor	1.5	1.5	<1	30%	Pass
CRS Suite - Net Acidity (Sulfur Units)	S18-Au34006	CP	% S	< 0.02	< 0.02	<1	30%	Pass
CRS Suite - Net Acidity (Acidity Units)	S18-Au34006	CP	mol H+/t	< 10	< 10	<1	30%	Pass
CRS Suite - Liming Rate	S18-Au34006	CP	kg CaCO3/t	< 1	< 1	<1	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
% Moisture	S18-Au40836	NCP	%	20	18	8.0	30%	Pass
Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	S18-Au34015	CP	pH Units	4.7	4.6	pass	30%	Pass
Reaction Ratings*	S18-Au34015	CP	comment	1.0	1.0	pass	30%	Pass

Duplicate								
Chromium Suite				Result 1	Result 2	RPD		
pH-KCL	S18-Au34018	CP	pH Units	4.6	4.6	<1	30%	Pass
Acid trail - Titratable Actual Acidity	S18-Au34018	CP	mol H+/t	18	19	2.9	30%	Pass
sulfidic - TAA equiv. S% pyrite	S18-Au34018	CP	% pyrite S	0.03	0.03	3.0	30%	Pass
Chromium Reducible Sulfur	S18-Au34018	CP	% S	< 0.005	< 0.005	<1	30%	Pass
Chromium Reducible Sulfur -acidity units	S18-Au34018	CP	mol H+/t	< 3	< 3	<1	30%	Pass
Sulfur - KCl Extractable	S18-Au34018	CP	% S	n/a	n/a	n/a	30%	Pass
HCl Extractable Sulfur	S18-Au34018	CP	% S	n/a	n/a	n/a	30%	Pass
Net Acid soluble sulfur	S18-Au34018	CP	% S	n/a	n/a	n/a	30%	Pass
Net Acid soluble sulfur - acidity units	S18-Au34018	CP	mol H+/t	n/a	n/a	n/a	30%	Pass
Net Acid soluble sulfur - equivalent S% pyrite	S18-Au34018	CP	% S	n/a	n/a	n/a	30%	Pass
Acid Neutralising Capacity (ANCbt)	S18-Au34018	CP	%CaCO3	n/a	n/a	n/a	30%	Pass
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt)	S18-Au34018	CP	% S	n/a	n/a	n/a	30%	Pass
ANC Fineness Factor	S18-Au34018	CP	factor	1.5	1.5	<1	30%	Pass
CRS Suite - Net Acidity (Sulfur Units)	S18-Au34018	CP	% S	0.03	0.03	n/a	30%	Pass
CRS Suite - Net Acidity (Acidity Units)	S18-Au34018	CP	mol H+/t	18	19	n/a	30%	Pass
CRS Suite - Liming Rate	S18-Au34018	CP	kg CaCO3/t	1.4	1.4	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
S01	Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil' multiply 'reported results' x 'wet bulk density of soil in t/m3'
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl is greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised By

Nibha Vaidya	Analytical Services Manager
Nibha Vaidya	Senior Analyst-Asbestos (NSW)



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](#).

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Certificate of Analysis



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.

Cardno (NSW/ACT) Pty Ltd
Level 9, 203 Pacific Highway
St Leonards
NSW 2065

Attention:	Ben Withnall
Report	614342-AID
Project Name	BROOKVALE PEDESTRIAN BRIDGE GI
Project ID	80018112
Received Date	Aug 24, 2018
Date Reported	Sep 11, 2018

Methodology:

Asbestos Fibre Identification	Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques. <i>NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.</i>
Unknown Mineral Fibres	Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity. <i>NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.</i>
Subsampling Soil Samples	The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed. <i>NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.</i>
Bonded asbestos-containing material (ACM)	The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination. The resultant material is then further examined in accordance with AS 4964 - 2004. <i>NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.</i>
Limit of Reporting	The performance limitation of the AS4964 method for inhomogeneous samples is around 0.1 g/kg (0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis where required, this is considered to be at the nominal reporting limit of 0.01 % (w / w). The examination of large sample sizes (500 mL is recommended) may improve the likelihood of identifying ACM in the > 2mm fraction. The NEPM screening level of 0.001 % (w / w) asbestos in soil for FA (friable asbestos) and AF (asbestos fines) then applies where they are able to be quantified by gravimetric procedures. This quantitative screening is not generally applicable to FF (free fibres) and results of Trace Analysis are referred. <i>NOTE: NATA News March 2014, p.7, states in relation to AS4964: "This is a qualitative method with a nominal reporting limit of 0.01%" and that currently in Australia "there is no validated method available for the quantification of asbestos". Accordingly, NATA Accreditation does not cover the performance of this service (indicated with an asterisk). This report is consistent with the analytical procedures and reporting recommendations in the National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended) and the Western Australia Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia, 2009, including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil, June 2011.</i>

Project Name BROOKVALE PEDESTRIAN BRIDGE GI
Project ID 80018112
Date Sampled Aug 23, 2018
Report 614342-AID

Client Sample ID	Eurofins mgt Sample No.	Date Sampled	Sample Description	Result
BH1-E1 0.2-0.4	18-Au34006	Aug 23, 2018	Approximate Sample 698g Sample consisted of: Brown fine-grained sandy soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH1-E2 0.8-1	18-Au34007	Aug 23, 2018	Approximate Sample 714g Sample consisted of: Brown fine-grained sandy soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH1-E3 3.2-3.4	18-Au34008	Aug 23, 2018	Approximate Sample 556g Sample consisted of: Pinkish coarse-grained clayey soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH1-E4 4.8-5	18-Au34009	Aug 23, 2018	Approximate Sample 673g Sample consisted of: Grey coarse-grained clayey soil	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH2-E1 0.3-0.5	18-Au34010	Aug 23, 2018	Approximate Sample 835g Sample consisted of: Brown fine-grained sandy soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH3-E1 0.25-0.35	18-Au34013	Aug 23, 2018	Approximate Sample 707g Sample consisted of: Light brown fine-grained sandy soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH3-E2 0.6-0.7	18-Au34014	Aug 23, 2018	Approximate Sample 826g Sample consisted of: Pinkish-beige coarse-grained sandy soil	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH1-E5 6.0-6.15	18-Au34015	Aug 23, 2018	Approximate Sample 558g Sample consisted of: Orange-brown coarse-grained sandy soil	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH1-E6 8-8.2	18-Au34016	Aug 23, 2018	Approximate Sample 412g Sample consisted of: Beige coarse-grained sandy soil	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH1-E7 10-10.2	18-Au34017	Aug 23, 2018	Approximate Sample 438g Sample consisted of: Beige fine-grained sandy soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

Client Sample ID	Eurofins mgt Sample No.	Date Sampled	Sample Description	Result
BH1-E8 12-12.2	18-Au34018	Aug 23, 2018	Approximate Sample 509g Sample consisted of: Beige coarse-grained sandy soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
BH1-E9 14-14.2	18-Au34019	Aug 23, 2018	Approximate Sample 487g Sample consisted of: Beige coarse-grained soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

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
Asbestos - LTM-ASB-8020	Sydney	Sep 05, 2018	Indefinite

Company Name: Cardno (NSW/ACT) Pty Ltd
Address: Level 9, 203 Pacific Highway
St Leonards
NSW 2065

Project Name: BROOKVALE PEDESTRIAN BRIDGE GI
Project ID: 80018112

Order No.:
Report #: 614342
Phone: 0294967700
Fax: 02 9499 3902

Received: Aug 30, 2018 11:41 AM
Due: Sep 10, 2018
Priority: 7 Day
Contact Name: Ben Withnall

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Polycyclic Aromatic Hydrocarbons	Organochlorine Pesticides	Organophosphorus Pesticides	Polychlorinated Biphenyls	Acid Sulfate Soils Field pH Test	Metals M8	BTEX	Chromium Reducible Sulfur Suite	Moisture Set	Total Recoverable Hydrocarbons	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271																		
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X		X	X		X	X	X
Brisbane Laboratory - NATA Site # 20794												X			X			
Perth Laboratory - NATA Site # 23736																		
External Laboratory																		
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID													
1	BH1-E1 0.2-0.4	Aug 23, 2018		Soil	S18-Au34006	X			X	X	X	X			X	X		X
2	BH1-E2 0.8-1	Aug 23, 2018		Soil	S18-Au34007	X			X	X	X	X			X	X		X
3	BH1-E3 3.2-3.4	Aug 23, 2018		Soil	S18-Au34008	X			X	X	X	X			X	X		X
4	BH1-E4 4.8-5	Aug 23, 2018		Soil	S18-Au34009	X			X	X	X	X			X	X		X
5	BH2-E1 0.3-0.5	Aug 23, 2018		Soil	S18-Au34010	X			X	X	X	X			X	X		X
6	BH2-E2 2-2.2	Aug 23, 2018		Soil	S18-Au34011		X											
7	BH2-E3 4.2-4.5	Aug 23, 2018		Soil	S18-Au34012		X											

Company Name: Cardno (NSW/ACT) Pty Ltd
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Melbourne Laboratory - NATA Site # 1254 & 14271																		
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X		X	X		X	X	X
Brisbane Laboratory - NATA Site # 20794												X			X			
Perth Laboratory - NATA Site # 23736																		
8	BH3-E1 0.25-0.35	Aug 23, 2018		Soil	S18-Au34013	x			x	x	x	x			x	x		x
9	BH3-E2 0.6-0.7	Aug 23, 2018		Soil	S18-Au34014	x			x	x	x	x			x	x		x
10	BH1-E5 6.0-6.15	Aug 23, 2018		Soil	S18-Au34015	x		x	x	x	x	x	x	x	x	x	x	
11	BH1-E6 8-8.2	Aug 23, 2018		Soil	S18-Au34016	x		x	x	x	x	x	x	x	x	x	x	
12	BH1-E7 10-10.2	Aug 23, 2018		Soil	S18-Au34017	x		x	x	x	x	x	x	x	x	x	x	
13	BH1-E8 12-12.2	Aug 23, 2018		Soil	S18-Au34018	x		x	x	x	x	x	x	x	x	x	x	
14	BH1-E9 14-14.2	Aug 23, 2018		Soil	S18-Au34019	x		x	x	x	x	x	x	x	x	x	x	
15	BH2-E4 7.26-	Aug 23, 2018		Soil	S18-Au34020		x											

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Melbourne Laboratory - NATA Site # 1254 & 14271																		
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X		X	X		X	X	X
Brisbane Laboratory - NATA Site # 20794												X			X			
Perth Laboratory - NATA Site # 23736																		
	7.46																	
16	BH2-E5 9-9.19	Aug 23, 2018		Soil	S18-Au34021		X											
17	BH2-E6 11-11.2	Aug 23, 2018		Soil	S18-Au34022		X											
18	BH2-E7 12.12-12.3	Aug 23, 2018		Soil	S18-Au34023		X											
19	BH2-E8 13.52-13.75	Aug 23, 2018		Soil	S18-Au34024		X											
20	BH1-E2 1.1-1.3	Aug 23, 2018		Soil	S18-Au34025		X											
21	BH1 16-16.2	Aug 23, 2018		Soil	S18-Au34026		X											
Test Counts						12	9	5	12	12	12	12	5	5	12	12	5	7

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. 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.

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Western Australia Department of Health
NOHSC	National Occupational Health and Safety Commission
ACM	Bonded asbestos-containing material means any material containing more than 1% asbestos and comprises asbestos-containing-material which is in sound condition, although possibly broken or fragmented, and where the asbestos is bound in a matrix such as cement or resin. Common examples of ACM include but are not limited to: pipe and boiler insulation, sprayed-on fireproofing, troweled-on acoustical plaster, floor tile and mastic, floor linoleum, transite shingles, roofing materials, wall and ceiling plaster, ceiling tiles, and gasket materials. This term is restricted to material that cannot pass a 7 mm x 7 mm sieve. This sieve size is selected because it approximates the thickness of common asbestos cement sheeting and for fragments to be smaller than this would imply a high degree of damage and hence potential for fibre release.
FA	FA comprises friable asbestos material and includes severely weathered cement sheet, insulation products and woven asbestos material. This type of friable asbestos is defined here as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. This material is typically unbonded or was previously bonded and is now significantly degraded (crumbling).
PACM	Presumed Asbestos-Containing Material means thermal system insulation and surfacing material found in buildings, vessels, and vessel sections constructed no later than 1980 that are assumed to contain greater than one percent asbestos but have not been sampled or analyzed to verify or negate the presence of asbestos.
AF	Asbestos fines (AF) are defined as free fibres, or fibre bundles, smaller than 7mm. It is the free fibres which present the greatest risk to human health, although very small fibres (< 5 microns in length) are not considered to be such a risk. AF also includes small fragments of bonded ACM that pass through a 7 mm x 7 mm sieve. (Note that for bonded ACM fragments to pass through a 7 mm x 7 mm sieve implies a substantial degree of damage which increases the potential for fibre release.)
AC	Asbestos cement means a mixture of cement and asbestos fibres (typically 90:10 ratios).

Comments

Au34016, 017, 019: Sample received was less than the nominal 500mL as recommended in Section 4.10 of the NEPM Schedule B1 - Guideline on Investigation Levels for Soil and Groundwater.

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
N/A	Not applicable

Asbestos Counter/Identifier:

Laxman Dias Senior Analyst-Asbestos (NSW)

Authorised by:

Nibha Vaidya Senior Analyst-Asbestos (NSW)



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.

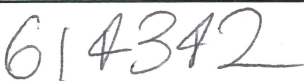
[illegible]

0 0 0 0 0



Notes

- 1 Client to mark with "X" or description of sample to be tested as required
- 2 BS = Bulk Sample, ES = Environmental Sample, DS = Disturbed Sample, SPT = SPT sample



30/8 11:41am 614342

Sample Receipt Advice

Company name: **Cardno (NSW/ACT) Pty Ltd**
Contact name: **Ben Withnall**
Project name: **BROOKVALE PEDESTRIAN BRIDGE GI**
Project ID: **80018112**
COC number: **Not provided**
Turn around time: **7 Day**
Date/Time received: **Aug 30, 2018 11:41 AM**
Eurofins | mgt reference: **614342**

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.
- ☐ Split sample sent to requested external lab.
- ☐ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Extra samples received: BH1-E2 1.1-1.3 (jar), BH1 16-16.2 (bag)

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8415 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Ben Withnall - ben.withnall@cardno.com.au.

Note: A copy of these results will also be delivered to the general Cardno (NSW/ACT) Pty Ltd email address.

Company Name:	Cardno (NSW/ACT) Pty Ltd	Order No.:		Received:	Aug 30, 2018 11:41 AM
Address:	Level 9, 203 Pacific Highway	Report #:	614342	Due:	Sep 10, 2018
	St Leonards	Phone:	0294967700	Priority:	7 Day
	NSW 2065	Fax:	02 9499 3902	Contact Name:	Ben Withnall
Project Name:	BROOKVALE PEDESTRIAN BRIDGE GI				
Project ID:	80018112				
Eurofins mgt Analytical Services Manager : Nibha Vaidya					

[illegible]

Company Name:	Cardno (NSW/ACT) Pty Ltd	Order No.:		Received:	Aug 30, 2018 11:41 AM
Address:	Level 9, 203 Pacific Highway	Report #:	614342	Due:	Sep 10, 2018
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Eurofins mgt Analytical Services Manager : Nibha Vaidya					

Company Name: Cardno (NSW/ACT) Pty Ltd
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Melbourne Laboratory - NATA Site # 1254 & 14271																		
Sydney Laboratory - NATA Site # 18217						X	X	X	X	X	X		X	X		X	X	X
Brisbane Laboratory - NATA Site # 20794												X			X			
Perth Laboratory - NATA Site # 23736																		
	7.46																	
16	BH2-E5 9-9.19	Aug 23, 2018		Soil	S18-Au34021		X											
17	BH2-E6 11-11.2	Aug 23, 2018		Soil	S18-Au34022		X											
18	BH2-E7 12.12-12.3	Aug 23, 2018		Soil	S18-Au34023		X											
19	BH2-E8 13.52-13.75	Aug 23, 2018		Soil	S18-Au34024		X											
20	BH1-E2 1.1-1.3	Aug 23, 2018		Soil	S18-Au34025		X											
21	BH1 16-16.2	Aug 23, 2018		Soil	S18-Au34026		X											
Test Counts						12	9	5	12	12	12	12	5	5	12	12	5	7

Cardno Ref: 80018112_L002_v2_Brookvale_TN-SCA

11 April 2019

Gareth O'Brien
Downer Group – Transport and Infrastructure
Ground Floor, Shop 3, 77 Pacific Highway
North Sydney, NSW, 2060

Attention: Gareth O'Brien

Cardno (NSW/ACT) Pty Ltd
ABN 95 001 145 035

Level 9 - The Forum
203 Pacific Highway
St Leonards NSW 2065
Australia

Phone +61 2 9496 7700
Fax +61 2 9496 7748

www.cardno.com

Dear Gareth,

TECHNICAL NOTE – SOIL CONTAMINATION ASSESSMENT AND WASTE CLASSIFICATION – BROOKVALE TEMPORARY SITE COMPOUND, PITTWATER ROAD, BROOKVALE NSW

Cardno (NSW/ACT) Pty Ltd, was engaged by Downer Group ('the Client') to provide this Soil Contamination Assessment and Waste Classification of the area proposed for temporary occupation as a site compound located adjacent Warringah Mall, Pittwater Road, Brookvale NSW (the Site). The area is comprised of a section of carpark and garden beds and forms part of Lot 102 DP1247294 and Lot 100 DP1015283. The Site location and boundary are shown on **Figure 1** in **Attachment A**.

The project involves the construction of a pedestrian footbridge and will require the temporary occupation of a section of carpark and garden beds for installation of a site compound. The objective of the works undertaken is to investigate the potential for soil contamination at the site which may pose a risk to human health or the environment. Further, to provide advice on the land use suitability of the site to continue to operate as a commercial / industrial compound.

Cardno understands that during site establishment works the overburden fill material (spoil) within the garden beds will be excavated to a maximum depth of 0.2 metres below ground level (mBGL) at the site, leaving the current hardstand carpark area undisturbed. Further, it is also understood that approximately 42 m³ of spoil would be generated and will also require classification in accordance with regulatory guidelines to facilitate their appropriate management and/or disposal.

The location of the site and *in-situ* soils subject to this report are shown on **Figure 1** in **Attachment A**.

The works were undertaken in accordance with Cardno's proposal dated 2 April 2019.

1 Objectives

The objective of this work was to:

- > Assess the shallow soils onsite to a maximum depth of 1.0 mBGL for potential risks to human health and the environment under the proposed land use against the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 (NEPC, 1999) Amendment 2013.
- > Provide a waste classification of the soil materials to a maximum depth of 0.2 mBGL (*in-situ*) required to be removed in general accordance with the NSW EPA *Waste Classification Guidelines* (2014).

2 Scope of Work

The following scope of work was carried out in order to address the objectives of this investigation:

- > Reviewed available aerial photography from 2009 to present for the site
- > Reviewed the Site, surrounds and Acid Sulfate Soil Risk Maps as documented in the NSW Office of Environment and Heritage eSPADE GIS tool
- > Conducted a site walkover to identify any indicators of potential contamination
- > Advanced five (5) soil borings using hand tools to a maximum depth of 1.1 mBGL or refusal
- > Thirteen (13) representative soil samples were collected from the five (5) soil borings
- > Samples were submitted for analytical testing of the contaminants of potential concern (CoPC) associated with this land use, to a NATA accredited laboratory
- > The results of the analytical testing were evaluated against assessment criteria for the proposed commercial / industrial land use and a waste classification presented in this Technical Note.

3 Site Description

The Site is located adjacent to Pittwater Road, Brookvale, approximately 16 kilometres north of the Sydney CBD. Brookvale Creek is the closest body of water, located approximately 75 m west to south of the Site. The area intended for occupation, excluding the lift shaft, is approximately 660 m². Accessible soils and garden beds make up the remainder of the site with an approximate area of 315 m².

The site use is currently as a carpark and garden beds as part of Warringah Mall. A review of aerial photographs from 2009 to the present indicates that the site has been in use as a carpark and garden bed, with redevelopment of the area between September 2016 and December 2017 as part of facility upgrades.

The potential for the presence of Acid Sulfate Soils (ASS) or Potential Acid Sulfate Soils (PASS) at the Site was reviewed via the ASS Risk Mapping within the NSW Planning Portal tool; with the Site shown within an area of low ASS risk. A Class 5 ASS area is located approximately 30 m west of the site, with a Class 4 ASS area surrounding the site approximately 40 m to the west and north and 70 m to the south and east. The results of Acid Sulfate Soils Field Screening undertaken during the investigation revealed that ASS/PASS are unlikely to be present within the material sampled.

4 Fieldwork

Based on the NSW EPA *Sampling Design Guidelines* (1995) a total of five (5) sampling locations were advanced in order to characterise the accessible soils with an approximate area of 315 m².

Sampling of the soil material was undertaken 4 April 2019 by an experienced Cardno Environmental Scientist. Representative soil samples were collected from five (5) soil borings, HA01 to HA05 advanced to the target depth of 1.0 mBGL, or depth of refusal (0.75 mBGL at HA01, HA02 and 0.85 mBGL at HA03). Borehole locations are presented in **Figure 1** in **Attachment A**.

Samples were collected using laboratory supplied sample containers with boreholes advanced using a hand held auger. Soil sampling was carried out in accordance with AS4482.1 (2005), with samples collected directly from the auger return, using a new pair of nitrile gloves for each sample. Samples were placed into laboratory-supplied jars and packed in chilled transport containers for transport to the nominated NATA-accredited laboratory.

Sample descriptions and analytes from each borehole location are provided in **Tables 4-1 to 4-5**. Borehole logs are included in **Attachment C**, and photographs are included in **Attachment D**.

Table 4-1 HA01 Sampling Log

Samples	Date Collected	Depth (mbgl)	Material Description	Analytes
- HA01_0.1-0.2 - H01_0.5 - HA01_0.7	04/04/2019	0-0.03	Mulch	Total Recoverable Hydrocarbons (TRH); Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene (BTEXN); Polycyclic Aromatic Hydrocarbons (PAHs); Organochlorine Pesticides (OCPs); Organophosphate Pesticides (OPP); Polychlorinated Biphenyls (PCBs); Metals (As, Cd, Cr, Cu, Pb, Ni, Hg and Zn); Asbestos (weight/weight%); Acid Sulfate Soil Screen (pH _F /pH _{FOX}); Physiochemical parameters
		0.1-0.4	FILL: Clayey SAND, fine to coarse grained, pale brown, trace fine grained gravel and rootlets	
		0.4-0.75	FILL: Sandy CLAY, medium plasticity, grey to pale brown, fine to medium grained sand, trace aggregate, brick and concrete fragments	

Table 4-2 HA02 Sampling Log

Samples	Date Collected	Depth (mbgl)	Material Description	Analytes
- HA02_0.0-0.1 - HA02_0.2-0.3 - HA02_0.5-0.6 - HA02_0.7-0.8	04/04/2019	0-0.3	FILL: Clayey SAND, fine to coarse grained, pale brown, trace fine grained gravel, rootlets, mulch	TRH; BTEXN; PAHs; OCPs; OPPs; PCBs; Metals; Asbestos (weight/weight%); Acid Sulfate Soil Screen (pH _F /pH _{FOX});
		0.3-0.75	FILL: Sandy CLAY, medium plasticity, brown, fine to coarse grained sand, trace sandstone gravel	

Table 4-3 HA03 Sampling Log

Samples	Date Collected	Depth (mbgl)	Material Description	Analytes
- HA03_0.0-0.1 - HA03_0.6	04/04/2019	0-0.05	Mulch	TRH; BTEXN; PAHs; OCPs; OPPs; PCBs; Metals; Asbestos (weight/weight%); Physiochemical parameters
		0.05-0.5	FILL: Clayey SAND, fine to coarse grained, orange brown, trace fine grained gravel, trace mulch, rootlets, concrete	
		0.5-0.7	FILL: Sandy CLAY, medium plasticity, dark grey	
		0.7-0.85	FILL: Sandy CLAY, medium plasticity, brown, fine to coarse grained sand, trace fine grained gravel, trace rootlets, concrete	

Table 4-4 HA04 Sampling Log

Samples	Date Collected	Depth (mbgl)	Material Description	Analytes
- HA04_0.1 - HA04_0.7 - HA07_1.0	04/04/2019	0-0.1	FILL: Clayey SAND, fine to coarse grained, pale brown, medium plasticity clay	TRH; BTEXN; PAHs; OCPs; OPPs; PCBs; Metals; Asbestos (weight/weight%)
		0.1-0.6	FILL: Clayey SAND, fine to coarse grained, brown, medium plasticity clay	
		0.6-1.0	Sandy CLAY: medium plasticity, orange, fine to coarse grained sand, trace sandstone gravel	

Table 4-5 HA05 Sampling Log

Samples	Date Collected	Depth (mbgl)	Material Description	Analytes
- HA05_0.1, QA100, QA200 - HA05_0.3 - HA05_1.0	04/04/2019	0-0.2	FILL: Clayey SAND, fine to coarse grained, pale brown, medium plasticity clay, trace fine grained gravel, trace mulch	TRH; BTEXN; PAHs; OCPs; OPPs; PCBs; Metals; Asbestos (weight/weight%); Acid Sulfate Soil Screen (pH _F /pH _{FOX}); Physiochemical parameters
		0.2-0.5	FILL: Sandy CLAY, medium plasticity, dark grey, fine to coarse grained sand, trace mulch	
		0.5-0.7	FILL: SAND, medium to coarse grained, orange pink	
		0.7-0.9	SAND: coarse grained, orange white pink, with medium plasticity clay	
		0.9-1.1	SAND: medium grained, brown	

5 Adopted Criteria

5.1 Site Assessment Criteria

Soil assessment screening criteria for the excavation were derived from the following guidelines:

- > 'Schedule B(1) – Guideline on the Investigation Levels for Soil and Groundwater' of the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 (NEPC, 1999) as varied May 2013 (the 'NEPM'):
- Table 1A(1) The Health Investigation Levels for soil contaminants;
- Table 1A(3): The Health Screening Levels for Vapour Intrusion (HSL's);
- Site Specific Ecological Investigation Levels (EILs) for chromium, nickel, copper and zinc calculated via the Ecological Investigation Level Calculation Spreadsheet, developed by CSIRO for the National Environment Protection Council, December 2010
- Table 1B(4) Generic added contaminant limits for lead in soils irrespective of their physicochemical properties;
- Table 1B(5) Generic EILs for aged arsenic, fresh DDT and fresh naphthalene in soils irrespective of their physicochemical properties;

- Table 1B(6) Ecological Screening Levels for TRH fractions F1 – F4, BTEX and in soil.
- > CRC Care (2017) *Technical Report No. 39 Risk-Based Management and Remediation Advice for Benzo(a)pyrene*, January 2017:
 - > Table 11 'High reliability ecological guideline for fresh B(a)P' (derived from the CCME 2010 Soil Quality Guidelines (SQGs)).
- > 'Schedule B(5c) – Guideline on Ecological Investigation Levels for Arsenic, Chromium (III), Copper, DDT, Lead, Naphthalene, Nickel and Zinc' NEPM 2013;
- > 'Technical Report No. 10 Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater Part 1: Technical Development Document, CRC Care, September 2011 (CRC Care 2011):
- > Table A4: Soil HSLs for Direct Contact and Intrusive Maintenance Workers.
- > Section 2 of the ASSMAC (1998) ASS Assessment Guidelines.

As the area to be occupied is proposed to be used as a construction compound, the adopted criteria for the site from the NEPM guidelines are the Health-based Investigation Levels (HILs), the Health-screening Levels (HSL), the Ecological Screening Levels (ESLs) and the Ecological Investigation levels for 'commercial / industrial D'. As the soil materials investigated consisted generally of sands with some clays present, the HSL's for coarse soil textures have been applied for conservatism.

Adopted soil screening criteria values for relevant contaminants analysed are included in **Attachment B**.

5.2 Waste Classification Criteria

The NSW EPA (2014) *Waste Classification Guidelines* set out a six-step process for classifying waste. The following sets out the classification steps for the soil material:

Step 1: Is the waste 'special waste'? **YES**.

Step 2: Is the waste 'liquid waste'? **NO**.

Step 3: Is the waste 'pre-classified'? **NO**.

Step 4: Does the waste possess hazardous characteristics? **NO**.

Step 5: Determining a waste's classification using chemical assessment. **Attachment B**.

Step 6: Is the waste putrescible? **NO**.

Adopted Contaminant Threshold (CT) values for relevant contaminants analysed are included in **Attachment B**.

6 Analytical Results

Summarised analytical results are provided in **Attachment B**. Laboratory reports are provided in **Attachment E**. The analytical laboratories contracted to perform the testing services (Eurofins mgt and ALS Global) are NATA accredited for the analyses undertaken. An interpretation of the data is summarised as follows:

6.1 Soil Contamination Assessment

- > TRH were reported at concentrations above the laboratory Limits of Reporting (LORs) but below the adopted NEPM Ecological Screening Level (ESL) and NEPM Health Screening Level (HSL) criteria for commercial / industrial land use in all analysed samples
- > BTEX were not detected at concentrations above the laboratory LORs or the adopted NEPM ESL and NEPM HSL criteria for commercial / industrial land use in any analysed sample
- > PAHs were generally detected at concentrations above the laboratory LORs but below the adopted CCME 2010 SQG and NEPM Health Investigation Level (HIL) criteria for commercial / industrial land use in all analysed samples
- > Heavy Metals were reported at concentrations above the laboratory LORs but below the adopted Site Specific EILs and NEPM HIL criteria for commercial / industrial land use in all analysed samples
- > Organochlorine and Organophosphorous Pesticides were not detected at concentrations above the laboratory LORs or the adopted NEPM ESL and NEPM HIL criteria for commercial / industrial land use in any analysed sample
- > PCBs were not detected at concentrations above the laboratory LORs or the adopted NEPM HIL criteria for commercial / industrial land use in any analysed sample
- > Chrysotile asbestos was detected in the form of Asbestos Fines above the adopted NEPM HSL for commercial / industrial land use (0.001% w/w) in one (1) sample, HA04_0.1, with a concentration of 0.0054% w/w.

6.2 Indicative Waste Classification

- > TRH were reported at concentrations above the laboratory Limits of Reporting (LORs) but below the Contaminant Threshold 1 (CT1) criteria for General Solid Waste (GSW) in all analysed samples
- > BTEX were not detected at concentrations above the laboratory LORs or CT1 criteria for GSW in any analysed sample
- > PAHs were generally detected at concentrations above the laboratory LORs but below the CT1 criteria for GSW in all analysed samples with the exception of benzo(a)pyrene, specifically
 - Benzo(a)pyrene was detected above the CT1 criteria for GSW (0.8 mg/kg) but below the CT2 criteria for Hazardous Waste in one quality control sample (QA200) with a concentration of 1.0 mg/kg
 - Subsequent Toxicity Characteristic Leaching Procedure (TCLP) testing undertaken reported benzo(a)pyrene concentrations below the laboratory LOR and the TCLP1 criteria for GSW
- > Heavy Metals were reported at concentrations above the laboratory LORs but below the CT1 criteria for GSW in all analysed samples
- > Moderately Harmful Pesticides and Scheduled Chemicals were not detected at concentrations above the laboratory LORs or the CT1 criteria for GSW in any analysed sample
- > PCBs were not detected at concentrations above the laboratory LORs or CT1 criteria for GSW in any analysed sample
- > Chrysotile asbestos was detected in the form of Asbestos Fines in one sample (HA04_0.1)

- > Field pH results ranged between 7.7 (slightly alkaline) to 8.5 (alkaline), and pH (peroxide) values ranged between 4.7 (acidic) to 6.7 (neutral). The results of the analysis, in conjunction with the ASS Risk maps, indicate that the soils sampled are unlikely to contain ASS/PASS.

7 Quality Assurance / Quality Control

In accordance with Cardno's Quality Assurance and Quality Control (QA/QC) procedures and AS4482.1 (2005), samples were stored in insulated transport containers containing ice and delivered to the designated laboratories under Chain of Custody documentation within 48 hours of sample collection.

Chain of Custody records are included in **Appendix E**.

A review of the laboratory analytical data indicated that:

- > Laboratory analysis of samples was undertaken by a NATA accredited laboratory
- > The laboratory limits of reporting (LOR) were below the adopted criteria
- > Samples were extracted and analysed within holding times
- > Analyte percentage recoveries in surrogate samples were within acceptance limits
- > Analyte concentrations in laboratory method blanks were within acceptance limits
- > Relative Percent Differences (RPD) between the laboratory parent samples and duplicate samples were within the acceptance limit of 30%
- > Relative Percent Differences (RPD) between inter- and intra-laboratory duplicate, triplicate and parent samples were generally within the acceptance limits, with one outlier for Total PAHs likely due to heterogeneity within the fill material
- > Analyte percentage recoveries in laboratory samples were within the acceptance limit of 70-130%

8 Conclusions and Recommendations

8.1 Conclusions

Cardno has completed a Soil Contamination Assessment and Waste Classification of the area proposed for temporary occupation as a site compound located at Pittwater Road, Brookvale NSW. The purpose of the works was to investigate soils at the site to an approximate depth of 1.0 mBGL to determine whether contaminants of concern are present which may pose a risk to human health or the environment under the proposed land use, and to provide a waste classification of material to be removed.

8.1.1 Soil contamination assessment

Based on the findings of the investigation, contaminant concentrations in soil were generally below the adopted human health and ecological screening criteria for the proposed commercial / industrial land use with the exception of asbestos. Asbestos Fines detected within shallow soils at HA04 above the adopted HSL potentially pose a risk to human health via inhalation. In order to render the site suitable for the intent land use and reduce the potential health risks, remediation, management and/or health risk assessment is required.

8.1.2 Waste classification

Based on the background review, site inspection and analytical testing carried out, the soil materials that form the subject of this investigation are classified as *Special Waste – Asbestos*, mixed with *General Solid Waste (non-putrescible)*. This assessment applies to the approximately 42 m³ of material to depths of between 0.1 and 0.2 mBGL described as Fill: Clayey SAND and Sandy CLAY, pale brown, with mulch and traces of rootlets, concrete, plastic and aggregate from which the samples were taken as described in **Table 4-1 to 4-5**.

The material is classified as **Special Waste – Asbestos** mixed with **General Solid Waste (non-putrescible)** due to:

- Chrysotile asbestos being detected in the form of Asbestos Fines
- Benzo(a)pyrene concentrations in one sample being above the CT1 criteria however leachable concentrations were below the TCLP1 criteria for General Solid Waste.

If offsite disposal of the soil material is required, the soil material should be disposed of at a facility licenced to accept *Special Waste – Asbestos (as General Solid Waste)*.

Due diligence should be employed during excavation of the materials to ensure materials which differ from those sampled, or exhibiting signs of contamination not previously identified during the fieldwork (asbestos, stains, odours, acid sulfate soils etc.) are separated and assessed.

8.2 Recommendations

In order to address the identified asbestos impacts to fill material and to render the site suitable for the proposed temporary occupation as a site compound, the approach dictated in the following sections is to be undertaken in conjunction with site preparation works. This technical note details the overall process to be implemented, and in all cases the processes, controls and requirements of the Construction Environmental Management Plan (CEMP, NBBP-150009-BVL-GE-0003) and Work Health and Safety Management Plan (WHSMP, NBBP-150009-BVL-0001) for the project are to be adhered to.

All Site workers and attendees must follow the Unexpected Finds Protocol if potentially contaminated or hazardous materials are unexpectedly encountered during the site remediation and construction activities undertaken at the Site.

8.2.1 Site remedial option

As part of site establishment works, the spoil required to be removed to depths of between 0.1 and 0.2 mBGL within the garden beds as shown in **Figure 2** in **Attachment A** is to be stripped and disposed of at a landfill licenced to accept Special Waste – Asbestos (as General Solid Waste). The remedial approach is to be performed jointly by a suitably qualified environmental consultant, occupational hygienist and a licensed contractor and will involve the following general steps:

1. Engagement of a licenced Class A Asbestos Removalist to undertake works involving asbestos removal and remediation
2. Preparation of an Asbestos Management Plan / Asbestos Removal Control Plan detailing the removal process and site specific control measures to be implemented
3. Notification to SafeWork NSW of the intention to remove friable asbestos
4. Provision of Asbestos Air Monitoring (AAM) during disturbance of asbestos containing soils
5. Stripping of spoil and removal off-site to a suitably licenced landfill, including material tracking and disposal documentation
6. Provision of an Asbestos Clearance Certificate including Clearance AAM for site surfaces following works.

8.2.2 Surface validation and material import

Once surface preparation works are complete, a demarcation layer (e.g. geotextile or similar product) is to be placed across the accessible soils in order to provide a barrier to underlying soils. Following placement of the demarcation layer, engineered material (i.e. Densely Graded Base) and/or other suitable capping material is to be imported and spread across the area. The material is to be compactable, and not to contain CoPCs above the Site Assessment Criteria in **Section 5.1**. The material will remain in place for the duration of the temporary occupation.

Should you have any queries with the report, please do not hesitate to contact Ben Withnall on (02) 9495 8188.

Yours sincerely,



Ben Withnall
Environmental Scientist
Cardno (NSW/ACT)



Sam Levi – CEnvP (Site Contamination Specialist)
Principal Environmental Scientist
Cardno (NSW/ACT)

Attachments

Attachment A – Figures

Attachment B – Laboratory Summary Tables

Attachment C – Borehole Logs

Attachment D – Site Photographs

Attachment E – Laboratory Reports

9 Limitations

This letter has been prepared for the client, and their agents for the purpose defined in the scope above. Use of the letter by other parties for different purposes shall be at their own risk. The current assessment is focussed on the determination of contamination within the proposed area and purposes for occupation, and to inform off-site disposal. Cardno cannot guarantee completeness or accuracy of any data, descriptions or conclusions based on information provided to it by others.

The agreed scope of this assessment has been limited for the current purposes of the Client. The remedial approach presented in this letter may not remediate all types of contamination occurring in all areas of the site.

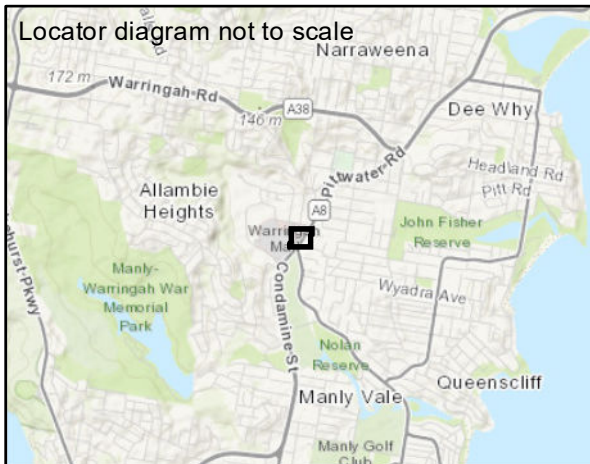
This Document has been provided by Cardno subject to the following limitations:

- > This Document has been prepared for the particular purpose outlined in Cardno's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose;
- > The scope and the period of Cardno's services are as described in Cardno's proposal, and are subject to restrictions and limitations. Cardno did not perform a complete assessment of all possible conditions or circumstances that may exist at the site;
- > Cardno classified all the tested fill material as "special waste – asbestos" due to the reasons provided above in Section 8.1.2 of this Technical Note. It is noted however that the northern section of the site may be classified as General Solid Waste, should it be required, and as a separate assessment. Due to the nature of the detected CoPC, the lateral and vertical extent of the defined area will require additional verification sampling.
- > Conditions may exist which may limit the effectiveness of the proposed remedial approach, including geologic and hydrologic conditions, the presences of services or other underground infrastructure. Accordingly, more than one phase of remediation may be required to achieve the goals of this letter;
- > In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Cardno's opinions are based upon information that existed at the time of the production of the Document. It is understood that the services provided allowed Cardno to form no more than an opinion of the actual conditions of the site at the time this Document was prepared and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.
- > Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Cardno for incomplete or inaccurate data supplied by others.
- > Cardno may have retained sub consultants affiliated with Cardno to provide services for the benefit of Cardno. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any direct legal recourse to, and waives any claim, demand, or cause of action against, Cardno's affiliated companies, and their employees, officers and directors.

This letter is not any of the following:

- > A Site Audit Report or Site Audit Statement as defined under the Contaminated Land Management Act, 1997
- > A Detailed ESA or Environmental Site Investigation sufficient for an Environmental Auditor to be able to conclude a Site Audit Report and Site Audit Statement
- > A detailed hydrogeological assessment in conformance with NSW DEC (2007) Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination
- > An assessment of groundwater contaminants potentially arising from the site or other sites or sources nearbyA Detailed Site Assessment or a preoccupation assessment (i.e. baseline assessment) of the site to determine suitability of the entire parcel of land at the site for one or more beneficial uses of land.

Attachment A – Figures



Site Location

BROOKVALE PED BRIDGE

SOIL CONTAMINATION
ASSESSMENT AND
WASTE CLASSIFICATION

FIGURE 1

Legend

 Site Boundary
(Indicative)

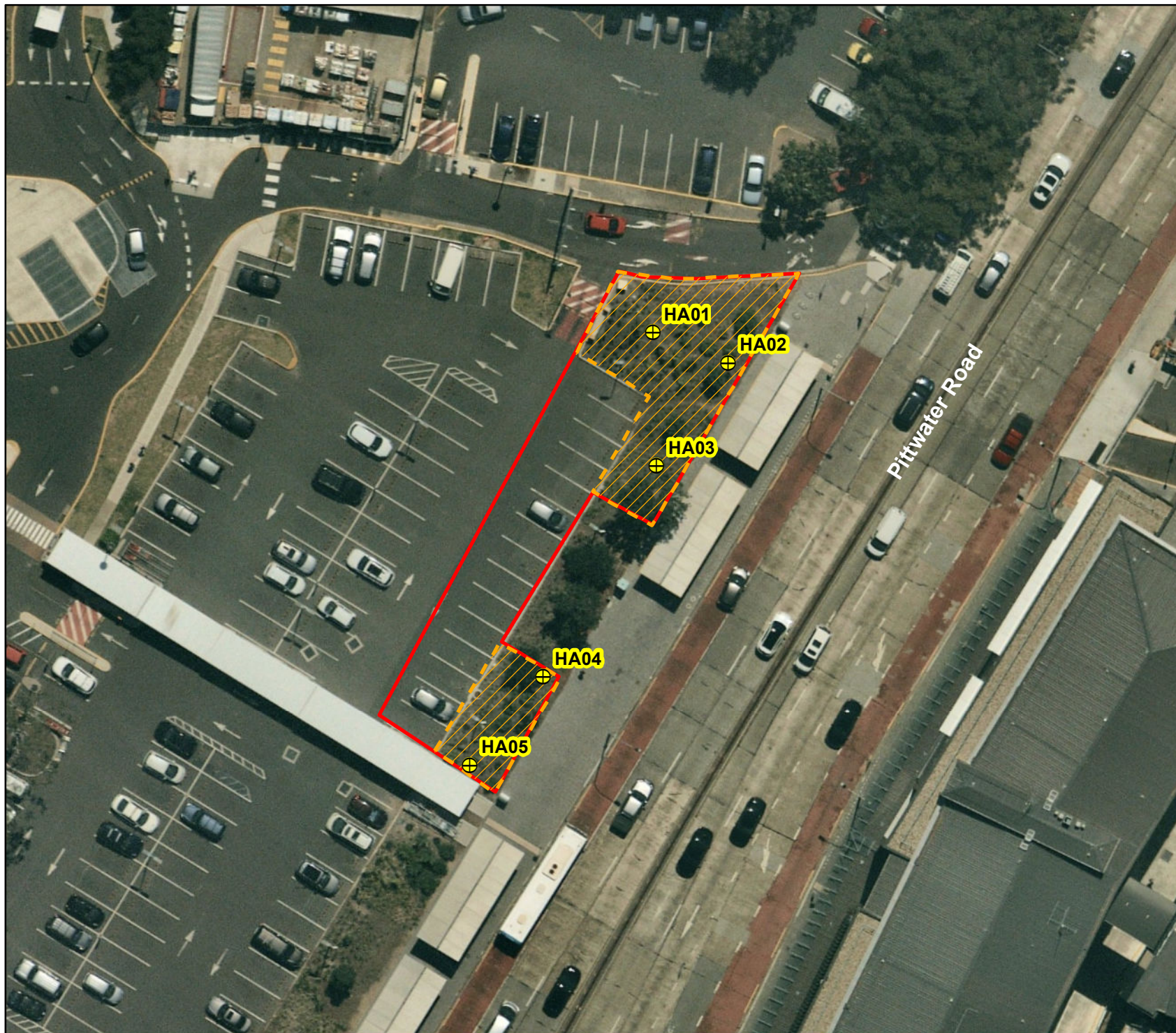


1:1,000 Scale at A4

Metres
0 5 10 20



Map Produced by Cardno NSW/ACT (W&E)
Date: 2019-04-09
Coordinate System: GDA 1994 MGA Zone 56
Project: 80018112
Map: 80018112-GS002-SiteLocation.mxd 01
Base imagery supplied by neamap 2019



Site Map

BROOKVALE PED BRIDGE

SOIL CONTAMINATION
ASSESSMENT AND
WASTE CLASSIFICATION

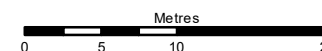
FIGURE 2

Legend

-  Site Boundary
(Indicative)
-  Hand Auger Locations
(Indicative)
-  Exposed soils for
excavation



1:500 Scale at A4



Map Produced by Cardno NSW/ACT (W&E)
Date: 2019-04-09
Coordinate System: GDA 1994 MGA Zone 56
Project: 80018112
Map: 80018112-GS003-SiteMap.mxd 01
Base imagery supplied by neamap 2019

Attachment B – Laboratory Summary Tables



	BTEX							TPH				
	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	C6 - C9	C10 - C14	C15 - C28	C29-C36	+C10 - C36 (Sum of total)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.1	0.1	0.1	0.2	0.1	0.3	0.2	10	20	50	50	50
NSW 2014 General Solid Waste CT1 (No Leaching)	10	288	600			1,000		650				10,000
NSW 2014 Restricted Solid Waste CT2 (No Leaching)	40	1,152	2,400			4,000		2,600				40,000
NEPM 2013 Sch B1 Table 7 Asbestos HSLs												
NEPM 2013 HIL, Commercial/Industrial D												
CRCCARE 2011 Soil HSL for Direct Contact, HSL-D Com/Ind												
0-1m	430	99,000	27,000			81,000						
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour	3					230						
NEPM 2013 ESL Comm./Ind., Coarse Soil 0-2m	75	135	165			180			170			
Site Specific NEPM 2013 EIL Comm./Ind., aged 0-2m												

Field ID	Date												
HA01_0.1-0.2	4/04/2019	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		<20	30	220	130	380
HA01_0.5	4/04/2019												
HA01_0.7	4/04/2019												
HA02_0.0-0.1	4/04/2019	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		<20	60	350	170	580
HA02_0.2	4/04/2019												
HA02_0.5	4/04/2019												
HA02_0.7	4/04/2019	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		<20	<20	<50	<50	<50
HA03_0.0-0.1	4/04/2019	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		<20	<20	65	<50	65
HA03_0.6	4/04/2019												
HA04_0.1	4/04/2019	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		<20	<20	85	84	169
HA04_1.0	4/04/2019	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		<20	<20	<50	<50	<50
HA05_0.1	4/04/2019	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		<20	<20	<50	<50	<50
HA05_0.3	4/04/2019	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		<20	<20	150	66	216
HA05_1.0	4/04/2019												
QA100	4/04/2019	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3		<20	<20	<50	<50	<50
QA200	4/04/2019	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50

Statistics													
Maximum Concentration	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<20	60	350	170	580
Average Concentration *	0.055	0.07	0.07	0.12	0.07	0.16			9.5	18	102	62	154
Standard Deviation *	0.016	0.063	0.063	0.047	0.063	0.032			1.6	16	108	51	191

* A Non Detect Multiplier of 0.5 has been applied.



	CRC Care TPH Fractions							PAH					
	C6-C10	C10-C16	C16-C34	C34-C40	C10 - C40 (Sum of total)	F1: C6-C10 less BTEX	F2: >C10-C16 less Naphthalene	Benzo(a)pyrene TEQ (half LOR)_	Benzo(a)pyrene TEQ (upper bound) *	Benzo(b+j)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene
	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
EQL	10	50	100	100	50	10	50	0.5	0.5	0.5	0.5	0.5	0.5
NSW 2014 General Solid Waste CT1 (No Leaching)													
NSW 2014 Restricted Solid Waste CT2 (No Leaching)													
NEPM 2013 Sch B1 Table 7 Asbestos HSLs													
NEPM 2013 HIL, Commercial/Industrial D								40					
CRCCARE 2011 Soil HSL for Direct Contact, HSL-D Com/0-1m	26,000	20,000	27,000	38,000									
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour						260							
NEPM 2013 ESL Comm./Ind., Coarse Soil 0-2m			1,700	3,300		215	170						
Site Specific NEPM 2013 EIL Comm./Ind., aged 0-2m													

Field ID	Date													
HA01_0.1-0.2	4/04/2019	<20	<50	300	120	420	<20	<50	0.6	1.2	<0.5	<0.5	<0.5	<0.5
HA01_0.5	4/04/2019													
HA01_0.7	4/04/2019													
HA02_0.0-0.1	4/04/2019	<20	90	430	140	660	<20	90	1.1	1.4	0.5	<0.5	<0.5	<0.5
HA02_0.2	4/04/2019													
HA02_0.5	4/04/2019													
HA02_0.7	4/04/2019	<20	<50	<100	<100	<100	<20	<50	0.6	1.2	<0.5	<0.5	<0.5	<0.5
HA03_0.0-0.1	4/04/2019	<20	<50	<100	<100	<100	<20	<50	0.6	1.2	<0.5	<0.5	<0.5	<0.5
HA03_0.6	4/04/2019													
HA04_0.1	4/04/2019	<20	<50	140	<100	140	<20	<50	1.2	1.5	0.7	<0.5	<0.5	<0.5
HA04_1.0	4/04/2019	<20	<50	<100	<100	<100	<20	<50	0.6	1.2	<0.5	<0.5	<0.5	<0.5
HA05_0.1	4/04/2019	<20	<50	<100	<100	<100	<20	<50	1.1	1.4	<0.5	<0.5	<0.5	<0.5
HA05_0.3	4/04/2019	<20	<50	160	<100	160	<20	<50	0.6	1.2	<0.5	<0.5	<0.5	<0.5
HA05_1.0	4/04/2019													
QA100	4/04/2019	<20	<50	<100	<100	<100	<20	<50	1.2	1.5	0.6	<0.5	<0.5	<0.5
QA200	4/04/2019	<10	<50	<100	<100	<50	<10	<50	1.6	1.8	1.2	<0.5	<0.5	<0.5

Statistics														
Maximum Concentration	<20	90	430	140	660	<20	90	1.6	1.8	1.2	<0.5	<0.5	<0.5	<0.5
Average Concentration *	9.5	32	133	66	166	9.5	32	0.92	1.4	0.45	0.25	0.25	0.25	0.25
Standard Deviation *	1.6	21	133	34	210	1.6	21	0.36	0.2	0.31	0	0	0	0

* A Non Detect Multiplier of 0.5 has been applied.



	PAH													
	Benz(a)anthracene	BaP TEQ (zero)	Benzo(a)pyrene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Pyrene
	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
EQL	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
NSW 2014 General Solid Waste CT1 (No Leaching)			0.8									200		
NSW 2014 Restricted Solid Waste CT2 (No Leaching)			3.2											
NEPM 2013 Sch B1 Table 7 Asbestos HSLs														
NEPM 2013 HIL, Commercial/Industrial D												4,000		
CRCCARE 2011 Soil HSL for Direct Contact, HSL-D Com/0-1m											11,000			
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour														
NEPM 2013 ESL Comm./Ind., Coarse Soil 0-2m			20											
Site Specific NEPM 2013 EIL Comm./Ind., aged 0-2m											370			

Field ID	Date														
HA01_0.1-0.2	4/04/2019	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA01_0.5	4/04/2019														
HA01_0.7	4/04/2019														
HA02_0.0-0.1	4/04/2019	0.7	0.8	0.7	<0.5	<0.5	<0.5	<0.5	1.4	<0.5	<0.5	<0.5	5.4	0.9	1.2
HA02_0.2	4/04/2019														
HA02_0.5	4/04/2019														
HA02_0.7	4/04/2019	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA03_0.0-0.1	4/04/2019	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA03_0.6	4/04/2019														
HA04_0.1	4/04/2019	0.6	0.9	0.7	<0.5	<0.5	0.5	<0.5	1.2	<0.5	0.7	<0.5	6.4	0.8	1.2
HA04_1.0	4/04/2019	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA05_0.1	4/04/2019	<0.5	0.7	0.7	<0.5	<0.5	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	2.3	<0.5	0.8
HA05_0.3	4/04/2019	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA05_1.0	4/04/2019														
QA100	4/04/2019	0.5	1.0	0.8	0.5	0.5	0.5	<0.5	1.1	<0.5	<0.5	<0.5	5.5	<0.5	1.0
QA200	4/04/2019	0.8	1.3	1.0	0.8	<0.5	0.8	<0.5	1.8	<0.5	0.6	<0.5	8.7	<0.5	1.7

Statistics															
Maximum Concentration	0.8	1.3	1	0.8	0.5	0.8	<0.5	1.8	<0.5	0.7	<1	8.7	0.9	1.7	
Average Concentration *	0.41	0.6	0.51	0.33	0.28	0.36	0.25	0.76	0.25	0.33	0.26	3	0.37	0.72	
Standard Deviation *	0.22	0.39	0.29	0.18	0.079	0.19	0	0.59	0	0.17	0.04	3.2	0.25	0.54	

* A Non Detect Multiplier of 0.5 has been applied.



	Asbestos			Metals								
	Asbestos from ACM in Soil	Asbestos from FA & AF in Soil	Asbestos Reported Result									
	%w/w	%w/w	Comment	Arsenic mg/kg	Cadmium mg/kg	Chromium (III+VI) mg/kg	Copper mg/kg	Iron mg/kg	Lead mg/kg	Mercury mg/kg	Nickel mg/kg	Zinc mg/kg
EQL				2	0.4	2	5	20	5	0.1	2	5
NSW 2014 General Solid Waste CT1 (No Leaching)			Y/N	100	20	100			100	4	40	
NSW 2014 Restricted Solid Waste CT2 (No Leaching)				400	80	400			400	16	160	
NEPM 2013 Sch B1 Table 7 Asbestos HSLs	0.04	0.001										
NEPM 2013 HIL, Commercial/Industrial D				3,000	900		240,000		1,500	730	6,000	400,000
CRCCARE 2011 Soil HSL for Direct Contact, HSL-D Com/0-1m												
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour												
NEPM 2013 ESL Comm./Ind., Coarse Soil 0-2m												
Site Specific NEPM 2013 EIL Comm./Ind., aged 0-2m				160		700	340		1,800		510	1300

Field ID	Date												
HA01_0.1-0.2	4/04/2019	<0.001	<0.001	N	8.5	<0.4	15	160	11,000	54	<0.1	8.8	180
HA01_0.5	4/04/2019												
HA01_0.7	4/04/2019	<0.001	<0.001	N									
HA02_0.0-0.1	4/04/2019	<0.001	<0.001	N	11	<0.4	18	150		47	<0.1	9.7	250
HA02_0.2	4/04/2019												
HA02_0.5	4/04/2019	<0.001	<0.001	N									
HA02_0.7	4/04/2019				3.4	<0.4	20	29		20	<0.1	9.6	48
HA03_0.0-0.1	4/04/2019	<0.001	<0.001	N	4.3	<0.4	30	22		52	0.1	19	80
HA03_0.6	4/04/2019								9,300				
HA04_0.1	4/04/2019	<0.001	0.0054	Y	2.6	<0.4	8.7	44		31	<0.1	<5	59
HA04_1.0	4/04/2019				2.6	<0.4	24	<5	20,000	12	<0.1	<5	11
HA05_0.1	4/04/2019	<0.001	<0.001	N	<2	<0.4	11	17		28	<0.1	<5	39
HA05_0.3	4/04/2019				2.7	<0.4	14	29		31	<0.1	5.8	46
HA05_1.0	4/04/2019												
QA100	4/04/2019				<2	<0.4	20	18		27	<0.1	12	40
QA200	4/04/2019				<5	<1	10	16		56	<0.1	3	51

Statistics													
Maximum Concentration	NA	0.0054	NA	11	<1	30	160	20,000	56	0.1	19	250	
Average Concentration *	NA	0.00077	NA	4	0.23	17	49	13,433	36	0.055	7.5	80	
Standard Deviation *	NA	0.002	NA	3.3	0.095	6.7	57	5,750	15	0.016	5.4	75	

* A Non Detect Multiplier of 0.5 has been applied.



Soil Analytical Summary
Brookvale Pedestrian Bridge - Site CompoundID: 80018112

Downer
Brookvale NSW

	Field	pH	NA	Inorganics	SVOCs	Organochlorine Pesticides								
	pH (Field)	pH (Fox)	Reaction Ratings*	pH (Lab)	EPN	Vic EPA IWRG 621 OCP (Total)*	Vic EPA IWRG 621 Other OCP (Total)*	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	d-BHC
	PH UNITS	pH Unit	COMMENT	pH_Units	mg/kg	MG/KG	MG/KG	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.1	0.1		0.1	0.2	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.1	0.05
NSW 2014 General Solid Waste CT1 (No Leaching)														
NSW 2014 Restricted Solid Waste CT2 (No Leaching)														
NEPM 2013 Sch B1 Table 7 Asbestos HSLs														
NEPM 2013 HIL, Commercial/Industrial D											45		530	
CRCCARE 2011 Soil HSL for Direct Contact, HSL-D Com/0-1m														
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour														
NEPM 2013 ESL Comm./Ind., Coarse Soil 0-2m														
Site Specific NEPM 2013 EIL Comm./Ind., aged 0-2m														

Field ID	Date														
HA01_0.1-0.2	4/04/2019				7.7	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05
HA01_0.5	4/04/2019	8.3	6.7	3.0											
HA01_0.7	4/04/2019														
HA02_0.0-0.1	4/04/2019														
HA02_0.2	4/04/2019	8.5	6.4	3.0											
HA02_0.5	4/04/2019					<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05
HA02_0.7	4/04/2019														
HA03_0.0-0.1	4/04/2019					<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05
HA03_0.6	4/04/2019				7.7										
HA04_0.1	4/04/2019					<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05
HA04_1.0	4/04/2019				6.1										
HA05_0.1	4/04/2019														
HA05_0.3	4/04/2019					<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05
HA05_1.0	4/04/2019	7.7	4.7	2.0											
QA100	4/04/2019														
QA200	4/04/2019														

Statistics															
Maximum Concentration	8.5	6.7	3	7.7	<0.2	<0.2	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05
Average Concentration *	8.2	5.9	2.7	7.2	0.1	0.1	0.1	0.025	0.025	0.025	0.025	0.025	0.025	0.05	0.025
Standard Deviation *	0.42	1.1	0.58	0.92	0	0	0	0	0	0	0	0	0	0	0

* A Non Detect Multiplier of 0.5 has been applied.



	Organochlorine Pesticides															
	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Toxaphene
	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	mg/kg	mg/kg
EQL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.2	1
NSW 2014 General Solid Waste CT1 (No Leaching)					60	60	60									
NSW 2014 Restricted Solid Waste CT2 (No Leaching)					240	240	240									
NEPM 2013 Sch B1 Table 7 Asbestos HSLs																
NEPM 2013 HIL, Commercial/Industrial D			3,600					100				50		80	2,500	160
CRCCARE 2011 Soil HSL for Direct Contact, HSL-D Com/																
0-1m																
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour																
NEPM 2013 ESL Comm./Ind., Coarse Soil 0-2m																
Site Specific NEPM 2013 EIL Comm./Ind., aged 0-2m		640														

Field ID	Date																
HA01_0.1-0.2	4/04/2019	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
HA01_0.5	4/04/2019																
HA01_0.7	4/04/2019																
HA02_0.0-0.1	4/04/2019																
HA02_0.2	4/04/2019																
HA02_0.5	4/04/2019	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
HA02_0.7	4/04/2019																
HA03_0.0-0.1	4/04/2019	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
HA03_0.6	4/04/2019																
HA04_0.1	4/04/2019	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
HA04_1.0	4/04/2019																
HA05_0.1	4/04/2019																
HA05_0.3	4/04/2019	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
HA05_1.0	4/04/2019																
QA100	4/04/2019																
QA200	4/04/2019																

Statistics																	
Maximum Concentration		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1
Average Concentration *		0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.1	0.5
Standard Deviation *		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* A Non Detect Multiplier of 0.5 has been applied.



	Organophosphorous Pesticides													
	Tokuthion	Azinophos methyl	Bolstar (Sulprofos)	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Demeton-O	Demeton-S	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion
	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
EQL	0.2	0.2	0.2	0.2	0.2	0.2	2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
NSW 2014 General Solid Waste CT1 (No Leaching)					4									
NSW 2014 Restricted Solid Waste CT2 (No Leaching)					16									
NEPM 2013 Sch B1 Table 7 Asbestos HSLs														
NEPM 2013 HIL, Commercial/Industrial D					2,000									
CRCCARE 2011 Soil HSL for Direct Contact, HSL-D Com/														
0-1m														
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour														
NEPM 2013 ESL Comm./Ind., Coarse Soil 0-2m														
Site Specific NEPM 2013 EIL Comm./Ind., aged 0-2m														

Field ID	Date														
HA01_0.1-0.2	4/04/2019	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
HA01_0.5	4/04/2019														
HA01_0.7	4/04/2019														
HA02_0.0-0.1	4/04/2019														
HA02_0.2	4/04/2019														
HA02_0.5	4/04/2019	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
HA02_0.7	4/04/2019														
HA03_0.0-0.1	4/04/2019	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
HA03_0.6	4/04/2019														
HA04_0.1	4/04/2019	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
HA04_1.0	4/04/2019														
HA05_0.1	4/04/2019														
HA05_0.3	4/04/2019	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
HA05_1.0	4/04/2019														
QA100	4/04/2019														
QA200	4/04/2019														

Statistics															
Maximum Concentration		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Average Concentration *		0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Standard Deviation *		0	0	0	0	0	0	0	0	0	0	0	0	0	0

* A Non Detect Multiplier of 0.5 has been applied.



	Organophosphorous Pesticides															
	Ethoprop	Fenitrothion	Fensulfothion	Fenthion	Malathion	Merphos	Methyl parathion	Mevinphos (Phosdrin)	Monocrotophos	Naled (Dibrom)	Omethoate	Phorate	Pyrazophos	Ronnel	Terbufos	Trichloronate
	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	mg/kg	mg/kg
EQL	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2	0.2	2	0.2	0.2	0.2	0.2	0.2
NSW 2014 General Solid Waste CT1 (No Leaching)																
NSW 2014 Restricted Solid Waste CT2 (No Leaching)																
NEPM 2013 Sch B1 Table 7 Asbestos HSLs																
NEPM 2013 HIL, Commercial/Industrial D																
CRCCARE 2011 Soil HSL for Direct Contact, HSL-D Com/0-1m																
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour																
NEPM 2013 ESL Comm./Ind., Coarse Soil 0-2m																
Site Specific NEPM 2013 EIL Comm./Ind., aged 0-2m																

Field ID	Date																
HA01_0.1-0.2	4/04/2019	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2
HA01_0.5	4/04/2019																
HA01_0.7	4/04/2019																
HA02_0.0-0.1	4/04/2019																
HA02_0.2	4/04/2019																
HA02_0.5	4/04/2019	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2
HA02_0.7	4/04/2019																
HA03_0.0-0.1	4/04/2019	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2
HA03_0.6	4/04/2019																
HA04_0.1	4/04/2019	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2
HA04_1.0	4/04/2019																
HA05_0.1	4/04/2019																
HA05_0.3	4/04/2019	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2
HA05_1.0	4/04/2019																
QA100	4/04/2019																
QA200	4/04/2019																

Statistics																	
Maximum Concentration		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.2
Average Concentration *		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	1	0.1	0.1	0.1	0.1	0.1
Standard Deviation *		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* A Non Detect Multiplier of 0.5 has been applied.



	Tetrachlorvinphos	Pesticides		Polychlorinated Biphenyls							
		Parathion	Pirimiphos-methyl	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	PCBs (Sum of total)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.2	0.2	0.2	0.5	0.1	0.5	0.5	0.5	0.5	0.5	0.5
NSW 2014 General Solid Waste CT1 (No Leaching)											50
NSW 2014 Restricted Solid Waste CT2 (No Leaching)											50
NEPM 2013 Sch B1 Table 7 Asbestos HSLs											
NEPM 2013 HIL, Commercial/Industrial D											7
CRCCARE 2011 Soil HSL for Direct Contact, HSL-D Com/											
0-1m											
NEPM 2013 Soil HSL Commercial/Industrial D, for Vapour											
NEPM 2013 ESL Comm./Ind., Coarse Soil 0-2m											
Site Specific NEPM 2013 EIL Comm./Ind., aged 0-2m											

Field ID	Date											
HA01_0.1-0.2	4/04/2019	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA01_0.5	4/04/2019											
HA01_0.7	4/04/2019											
HA02_0.0-0.1	4/04/2019											
HA02_0.2	4/04/2019											
HA02_0.5	4/04/2019	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA02_0.7	4/04/2019											
HA03_0.0-0.1	4/04/2019	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA03_0.6	4/04/2019											
HA04_0.1	4/04/2019	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA04_1.0	4/04/2019											
HA05_0.1	4/04/2019											
HA05_0.3	4/04/2019	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
HA05_1.0	4/04/2019											
QA100	4/04/2019											
QA200	4/04/2019											

Statistics												
Maximum Concentration	<0.2	<0.2	<0.2	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Average Concentration *	0.1	0.1	0.1	0.25	0.05	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0

* A Non Detect Multiplier of 0.5 has been applied.

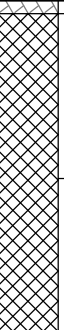
			Field ID	QA200
			Date	4/04/2019
	Unit	EQL	NSW 2014 General Solid Waste TCLP1	
NA				
TCLP Fluid	-	1		1
PAH				
Benzo(a)pyrene	µg/L	0.5	40	<0.5
Inorganics				
pH (Final)	pH Unit	0.1		5.5
pH (Initial)	pH_Units	0.1		8.6
pH (after HCL)	pH_Units	0.1		1.4

Number of Results	Maximum Concentration
1	1
1	<0.5
1	5.5
1	8.6
1	1.4

		Field ID	HA05_0.1	QA100	RPD	QA200	RPD
		Date	4/04/2019	4/04/2019		4/04/2019	
	Unit	EQL					
BTEX							
Benzene	mg/kg	0.1	<0.1	<0.1	0	<0.2	0
Toluene	mg/kg	0.1	<0.1	<0.1	0	<0.5	0
Ethylbenzene	mg/kg	0.1	<0.1	<0.1	0	<0.5	0
Xylene (m & p)	mg/kg	0.2	<0.2	<0.2	0	<0.5	0
Xylene (o)	mg/kg	0.1	<0.1	<0.1	0	<0.5	0
Xylene Total	mg/kg	0.3	<0.3	<0.3	0	<0.5	0
Total BTEX	mg/kg	0.2				<0.2	
TPH							
C6 - C9	mg/kg	10	<20	<20	0	<10	0
C10 - C14	mg/kg	20	<20	<20	0	<50	0
C15 - C28	mg/kg	50	<50	<50	0	<100	0
C29-C36	mg/kg	50	<50	<50	0	<100	0
+C10 - C36 (Sum of total)	mg/kg	50	<50	<50	0	<50	0
CRC Care TPH Fractions							
C6-C10	mg/kg	10	<20	<20	0	<10	0
C10-C16	mg/kg	50	<50	<50	0	<50	0
C16-C34	mg/kg	100	<100	<100	0	<100	0
C34-C40	mg/kg	100	<100	<100	0	<100	0
C10 - C40 (Sum of total)	mg/kg	50	<100	<100	0	<50	0
F1: C6-C10 less BTEX	mg/kg	10	<20	<20	0	<10	0
F2: >C10-C16 less Naphthalene	mg/kg	50	<50	<50	0	<50	0
PAH							
Benzo(a)pyrene TEQ (half LOR)_	mg/kg	0.5	1.1	1.2	9	1.6	37
Benzo(a)pyrene TEQ (upper bound) *	mg/kg	0.5	1.4	1.5	7	1.8	25
Benzo(b+j)fluoranthene	mg/kg	0.5	<0.5	0.6	18	1.2	82
Acenaphthene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0
Acenaphthylene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0
Anthracene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0
Benz(a)anthracene	mg/kg	0.5	<0.5	0.5	0	0.8	46
BaP TEQ (zero)	mg/kg	0.5	0.7	1.0	35	1.3	60
Benzo(a)pyrene	mg/kg	0.5	0.7	0.8	13	1.0	35
Benzo(g,h,i)perylene	mg/kg	0.5	<0.5	0.5	0	0.8	46
Benzo(k)fluoranthene	mg/kg	0.5	<0.5	0.5	0	<0.5	0
Chrysene	mg/kg	0.5	<0.5	0.5	0	0.8	46
Dibenz(a,h)anthracene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0
Fluoranthene	mg/kg	0.5	0.8	1.1	32	1.8	77
Fluorene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	<0.5	<0.5	0	0.6	18
Naphthalene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0
PAHs (Sum of total)	mg/kg	0.5	2.3	5.5	82	8.7	116
Phenanthrene	mg/kg	0.5	<0.5	<0.5	0	<0.5	0
Pyrene	mg/kg	0.5	0.8	1.0	22	1.7	72
Metals							
Arsenic	mg/kg	2	<2	<2	0	<5	0
Cadmium	mg/kg	0.4	<0.4	<0.4	0	<1	0
Chromium (III+VI)	mg/kg	2	11	20	58	10	10
Copper	mg/kg	5	17	18	6	16	6
Lead	mg/kg	5	28	27	4	56	67
Mercury	mg/kg	0.1	<0.1	<0.1	0	<0.1	0
Nickel	mg/kg	2	<5	12	82	3	0
Zinc	mg/kg	5	39	40	3	51	27

Attachment C – Borehole Logs

Client:	Downer	Job No: 80018112	Sheet: 1 of 1
Project:	Brookvale Pedestrian Bridge GI		
Location:	Pittwater Road		
Position:	Angle from Horizontal: 90°	Surface Elevation:	
Rig Type: Hand Auger	Mounting:	Driller: BW	
Casing Diameter:			Contractor: Cardno
Data Started: 4/4/19	Date Completed: 4/4/19	Logged By: BW	Checked By: SL

Drilling			Water	Sampling & Testing	Depth (m)	Material Description					
Method	Resistance	Casing		Sample or Field Test		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
↑ HA ↓			Not Encountered	ES 0.10 m HA01_0.1-0.2	0.5		0.03m Mulch	M		TOPSOIL	
				FILL: Clayey SAND, fine to coarse grained, pale brown, medium plasticity clay, trace fine grained gravel, trace rootlets			FILL				
				ES 0.50 m HA01_0.5			0.40m			0.10 m: PID = 2.6ppm	
				ES 0.70 m HA01_0.7			FILL: Sandy CLAY, medium plasticity, grey, fine to medium grained sand, trace brick, concrete, aggregate			0.50 m: PID = 6.4ppm	
							0.60m: turning pale brown in colour			0.60 m: PID = 3.7ppm	
							0.75m			TERMINATED AT 0.75 m Refusal	
			</								

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL 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
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Downer		Hole No: HA02	
Project: Brookvale Pedestrian Bridge GI		Job No: 80018112	
Location: Pittwater Road		Sheet: 1 of 1	
Position:		Angle from Horizontal: 90°	Surface Elevation:
Rig Type: Hand Auger		Mounting:	Driller: BW
Casing Diameter:		Contractor: Cardno	
Data Started: 4/4/19		Date Completed: 4/4/19	Logged By: BW
		Checked By: SL	

Drilling			Water	Sampling & Testing	Depth (m)	Material Description					
Method	Resistance	Casing		Sample or Field Test		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
↑ HA ↓			Not Encountered	ES 0.00 m HA02 0.0-0.1	0.5		0.30m	FILL: Clayey SAND, fine to coarse grained, pale brown, medium plasticity, trace fine grained gravel, trace rootlets, mulch	M		FILL
	ES 0.20 m HA02 0.2-0.3	FILL: Sandy CLAY, medium plasticity, brown, fine to coarse grained sand, trace sandstone gravel		0.20 m: PID = 2.8ppm							
	ES 0.50 m HA02 0.5-0.6			0.50 m: PID = 4.9ppm							
	ES 0.70 m HA02 0.7-0.8	0.75m		0.70 m: PID = 6.4ppm							
								TERMINATED AT 0.75 m Refusal			
					1.0						
					1.5						
					2.0						
					2.5						

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL 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
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Downer		Hole No: HA03	
Project: Brookvale Pedestrian Bridge GI		Job No: 80018112	
Location: Pittwater Road		Sheet: 1 of 1	
Position:		Angle from Horizontal: 90°	Surface Elevation:
Rig Type: Hand Auger		Mounting:	Driller: BW
Casing Diameter:		Contractor: Cardno	
Data Started: 4/4/19		Date Completed: 4/4/19	Logged By: BW
		Checked By: SL	

Drilling			Water	Sampling & Testing	Depth (m)	Material Description					
Method	Resistance	Casing		Sample or Field Test		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
HA			Not Encountered	ES 0.00 m HA03_0.0-0.1	0.5		0.05m	Mulch	M		TOPSOIL
							FILL: Clayey SAND, fine to coarse grained, orange brown, medium plasticity clay, trace fine grained gravel, trace mulch, rootlets, concrete				FILL
						0.50m	FILL: Sandy CLAY: medium plasticity clay, dark grey, fine to coarse grained sand				0.10 m: PID = 2.4ppm
						0.70m	FILL: Sandy CLAY, medium plasticity clay, brown, fine to coarse grained sand, trace fine grained gravel, trace rootlets, trace concrete				
				ES 0.60 m HA03_0.6			0.85m	TERMINATED AT 0.85 m Refusal			

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL 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
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Downer		Hole No: HA04	
Project: Brookvale Pedestrian Bridge GI			
Location: Pittwater Road		Job No: 80018112	Sheet: 1 of 1
Position:		Angle from Horizontal: 90°	Surface Elevation:
Rig Type: Hand Auger		Mounting:	Driller: BW
Casing Diameter:		Contractor: Cardno	
Data Started: 4/4/19		Date Completed: 4/4/19	Logged By: BW
		Checked By: SL	

Drilling			Water	Sampling & Testing	Depth (m)	Material Description					
Method	Resistance	Casing		Sample or Field Test		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
↑ HA ↓			Not Encountered	ES 0.10 m HA04_0.1	0.10		0.10m	FILL: Clayey SAND, fine to coarse grained, pale brown, medium plasticity clay FILL: Clayey SAND, fine to coarse grained, brown, medium plasticity clay	M		FILL 0.10 m: PID = 2.8ppm
				ES 1.00 m HA04_1.0	0.60		0.60m	Sandy CLAY: medium plasticity, orange, fine to coarse grained sand, trace sandstone gravel			RESIDUAL SOIL 0.70 m: PID = 0.2ppm
					1.0		1.00m	TERMINATED AT 1.00 m Target depth			
					1.5						
					2.0						
					2.5						

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL 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
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client:	Downer
Project:	Brookvale Pedestrian Bridge GI
Location:	Pittwater Road

Job No: 80018112

Sheet: 1 of 1

Position: _____ **Angle from Horizontal:** 90° **Surface Elevation:** _____

Rig Type: Hand Auger	Mounting:	Driller: BW
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Casing Diameter: Contractor: Cardno

Data Started: 4/4/19	Date Completed: 4/4/19	Logged By: BW	Checked By: SL
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Drilling				Sampling & Testing	Material Description								
Method	Resistance	Casing	Water	Sample or Field Test	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations		
↑ HA ↓			Not Encountered	0.10 m HA05_0.1, QA100, QA200	0.5			FILL: Clayey SAND, fine to coarse grained, pale brown, medium plasticity clay, trace fine grained gravel, trace mulch	M		FILL		
		0.20m		FILL: Sandy CLAY, medium plasticity, dark grey, fine to coarse grained sand, trace mulch			0.10 m: PID = 1.2ppm						
		0.50m		FILL: SAND, medium to coarse grained, orange pink									
		0.70m											
					1.00 m HA05_1.0	1.0		SP	SAND: coarse grained, orange white pink, with medium plasticity clay			RESIDUAL SOIL	
							SP	SAND: medium grained, brown			1.00 m: PID = 0.4ppm		
								1.10m					
								TERMINATED AT 1.10 m Target depth					
					1.5								
					2.0								
					2.5								
METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller				PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow			FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)			SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content		SOIL 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	
Refer to explanatory notes for details of abbreviations and basis of descriptions													
CARDNO (NSW/ACT) PTY LTD													

Attachment D – Site Photographs



Photograph 1: Site layout and location, facing north.



Photograph 2: Site layout and HA01 location, facing north east.



Photograph 3: Representative shallow clayey SAND fill material at HA03.



Photograph 4 Representative sandy CLAY material at HA04.

Appendix E- Laboratory Reports

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: Ben Withnall

Report 649232-S
Project name DOWNER BROOKEVALE PEDESTRIAN BRIDGE
Project ID 80018112
Received Date Apr 04, 2019

Client Sample ID			HA01_0.1-0.2	HA01_0.5	HA02_0.0-0.1	HA02_0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08305	S19-Ap08306	S19-Ap08308	S19-Ap08309
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	-	< 20	-
TRH C10-C14	20	mg/kg	30	-	60	-
TRH C15-C28	50	mg/kg	220	-	350	-
TRH C29-C36	50	mg/kg	130	-	170	-
TRH C10-36 (Total)	50	mg/kg	380	-	580	-
BTEX						
Benzene	0.1	mg/kg	< 0.1	-	< 0.1	-
Toluene	0.1	mg/kg	< 0.1	-	< 0.1	-
Ethylbenzene	0.1	mg/kg	< 0.1	-	< 0.1	-
m&p-Xylenes	0.2	mg/kg	< 0.2	-	< 0.2	-
o-Xylene	0.1	mg/kg	< 0.1	-	< 0.1	-
Xylenes - Total	0.3	mg/kg	< 0.3	-	< 0.3	-
4-Bromofluorobenzene (surr.)	1	%	68	-	77	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	-	< 0.5	-
TRH C6-C10	20	mg/kg	< 20	-	< 20	-
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	-	< 20	-
TRH >C10-C16	50	mg/kg	< 50	-	90	-
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	-	90	-
TRH >C16-C34	100	mg/kg	300	-	430	-
TRH >C34-C40	100	mg/kg	120	-	140	-
TRH >C10-C40 (total)*	100	mg/kg	420	-	660	-
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	-	0.8	-
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	-	1.1	-
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	-	1.4	-
Acenaphthene	0.5	mg/kg	< 0.5	-	< 0.5	-
Acenaphthylene	0.5	mg/kg	< 0.5	-	< 0.5	-
Anthracene	0.5	mg/kg	< 0.5	-	< 0.5	-
Benz(a)anthracene	0.5	mg/kg	< 0.5	-	0.7	-
Benzo(a)pyrene	0.5	mg/kg	< 0.5	-	0.7	-
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	< 0.5	-	0.5	-
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	-	< 0.5	-
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	-	< 0.5	-
Chrysene	0.5	mg/kg	< 0.5	-	< 0.5	-

Client Sample ID			HA01_0.1-0.2	HA01_0.5	HA02_0.0-0.1	HA02_0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08305	S19-Ap08306	S19-Ap08308	S19-Ap08309
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	-	< 0.5	-
Fluoranthene	0.5	mg/kg	< 0.5	-	1.4	-
Fluorene	0.5	mg/kg	< 0.5	-	< 0.5	-
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	-	< 0.5	-
Naphthalene	0.5	mg/kg	< 0.5	-	< 0.5	-
Phenanthrene	0.5	mg/kg	< 0.5	-	0.9	-
Pyrene	0.5	mg/kg	< 0.5	-	1.2	-
Total PAH*	0.5	mg/kg	< 0.5	-	5.4	-
2-Fluorobiphenyl (surr.)	1	%	93	-	93	-
p-Terphenyl-d14 (surr.)	1	%	66	-	101	-
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	-	-	-
α-BHC	0.05	mg/kg	< 0.05	-	-	-
Aldrin	0.05	mg/kg	< 0.05	-	-	-
β-BHC	0.05	mg/kg	< 0.05	-	-	-
δ-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	-	-	-
γ-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	< 0.2	-	-	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.2	-	-	-
Dibutylchloroendate (surr.)	1	%	107	-	-	-
Tetrachloro-m-xylene (surr.)	1	%	122	-	-	-
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	-	-	-

Client Sample ID			HA01_0.1-0.2	HA01_0.5	HA02_0.0-0.1	HA02_0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08305	S19-Ap08306	S19-Ap08308	S19-Ap08309
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Dimethoate	0.2	mg/kg	< 0.2	-	-	-
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	%	102	-	-	-
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	-	-	-
Dibutylchlorendate (surr.)	1	%	107	-	-	-
Tetrachloro-m-xylene (surr.)	1	%	122	-	-	-
% Clay	1	%	8.8	-	-	-
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	310	-	-	-
pH (units)(1:5 soil:CaCl2 extract at 25°C as rec.)	0.1	pH Units	7.7	-	-	-
Total Organic Carbon	0.1	%	3.8	-	-	-
% Moisture	1	%	30	-	23	-
Heavy Metals						
Arsenic	2	mg/kg	8.5	-	11	-
Cadmium	0.4	mg/kg	< 0.4	-	< 0.4	-
Chromium	5	mg/kg	15	-	18	-
Copper	5	mg/kg	160	-	150	-
Iron	20	mg/kg	11000	-	-	-
Lead	5	mg/kg	54	-	47	-

Client Sample ID			HA01_0.1-0.2	HA01_0.5	HA02_0.0-0.1	HA02_0.2
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08305	S19-Ap08306	S19-Ap08308	S19-Ap08309
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Mercury	0.1	mg/kg	< 0.1	-	< 0.1	-
Nickel	5	mg/kg	8.8	-	9.7	-
Zinc	5	mg/kg	180	-	250	-
Heavy Metals						
Iron (%)	0.01	%	1.1	-	-	-
Cation Exchange Capacity						
Cation Exchange Capacity	0.05	meq/100g	37	-	-	-
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	-	8.3	-	8.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	-	6.7	-	6.4
Reaction Ratings* ^{S05}		comment	-	3.0	-	3.0

Client Sample ID			HA02_0.5	HA02_0.7	HA03_0.0-0.1	HA03_0.6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08310	S19-Ap08311	S19-Ap08312	S19-Ap08313
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	-	< 20	< 20	-
TRH C10-C14	20	mg/kg	-	< 20	< 20	-
TRH C15-C28	50	mg/kg	-	< 50	65	-
TRH C29-C36	50	mg/kg	-	< 50	< 50	-
TRH C10-36 (Total)	50	mg/kg	-	< 50	65	-
BTEX						
Benzene	0.1	mg/kg	-	< 0.1	< 0.1	-
Toluene	0.1	mg/kg	-	< 0.1	< 0.1	-
Ethylbenzene	0.1	mg/kg	-	< 0.1	< 0.1	-
m&p-Xylenes	0.2	mg/kg	-	< 0.2	< 0.2	-
o-Xylene	0.1	mg/kg	-	< 0.1	< 0.1	-
Xylenes - Total	0.3	mg/kg	-	< 0.3	< 0.3	-
4-Bromofluorobenzene (surr.)	1	%	-	77	84	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	-	< 0.5	< 0.5	-
TRH C6-C10	20	mg/kg	-	< 20	< 20	-
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	-	< 20	< 20	-
TRH >C10-C16	50	mg/kg	-	< 50	< 50	-
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	-	< 50	< 50	-
TRH >C16-C34	100	mg/kg	-	< 100	< 100	-
TRH >C34-C40	100	mg/kg	-	< 100	< 100	-
TRH >C10-C40 (total)*	100	mg/kg	-	< 100	< 100	-
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	-	< 0.5	< 0.5	-
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	-	0.6	0.6	-
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	-	1.2	1.2	-
Acenaphthene	0.5	mg/kg	-	< 0.5	< 0.5	-
Acenaphthylene	0.5	mg/kg	-	< 0.5	< 0.5	-
Anthracene	0.5	mg/kg	-	< 0.5	< 0.5	-

Client Sample ID Sample Matrix Eurofins mgt Sample No. Date Sampled Test/Reference	LOR	Unit	HA02_0.5 Soil S19-Ap08310 Apr 04, 2019	HA02_0.7 Soil S19-Ap08311 Apr 04, 2019	HA03_0.0-0.1 Soil S19-Ap08312 Apr 04, 2019	HA03_0.6 Soil S19-Ap08313 Apr 04, 2019
Polycyclic Aromatic Hydrocarbons						
Benz(a)anthracene	0.5	mg/kg	-	< 0.5	< 0.5	-
Benzo(a)pyrene	0.5	mg/kg	-	< 0.5	< 0.5	-
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	-	< 0.5	< 0.5	-
Benzo(g,h,i)perylene	0.5	mg/kg	-	< 0.5	< 0.5	-
Benzo(k)fluoranthene	0.5	mg/kg	-	< 0.5	< 0.5	-
Chrysene	0.5	mg/kg	-	< 0.5	< 0.5	-
Dibenz(a,h)anthracene	0.5	mg/kg	-	< 0.5	< 0.5	-
Fluoranthene	0.5	mg/kg	-	< 0.5	< 0.5	-
Fluorene	0.5	mg/kg	-	< 0.5	< 0.5	-
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	-	< 0.5	< 0.5	-
Naphthalene	0.5	mg/kg	-	< 0.5	< 0.5	-
Phenanthrene	0.5	mg/kg	-	< 0.5	< 0.5	-
Pyrene	0.5	mg/kg	-	< 0.5	< 0.5	-
Total PAH*	0.5	mg/kg	-	< 0.5	< 0.5	-
2-Fluorobiphenyl (surr.)	1	%	-	85	90	-
p-Terphenyl-d14 (surr.)	1	%	-	96	65	-
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	-	< 0.1	-
4,4'-DDD	0.05	mg/kg	< 0.05	-	< 0.05	-
4,4'-DDE	0.05	mg/kg	< 0.05	-	< 0.05	-
4,4'-DDT	0.05	mg/kg	< 0.05	-	< 0.05	-
α-BHC	0.05	mg/kg	< 0.05	-	< 0.05	-
Aldrin	0.05	mg/kg	< 0.05	-	< 0.05	-
β-BHC	0.05	mg/kg	< 0.05	-	< 0.05	-
δ-BHC	0.05	mg/kg	< 0.05	-	< 0.05	-
Dieldrin	0.05	mg/kg	< 0.05	-	< 0.05	-
Endosulfan I	0.05	mg/kg	< 0.05	-	< 0.05	-
Endosulfan II	0.05	mg/kg	< 0.05	-	< 0.05	-
Endosulfan sulphate	0.05	mg/kg	< 0.05	-	< 0.05	-
Endrin	0.05	mg/kg	< 0.05	-	< 0.05	-
Endrin aldehyde	0.05	mg/kg	< 0.05	-	< 0.05	-
Endrin ketone	0.05	mg/kg	< 0.05	-	< 0.05	-
γ-BHC (Lindane)	0.05	mg/kg	< 0.05	-	< 0.05	-
Heptachlor	0.05	mg/kg	< 0.05	-	< 0.05	-
Heptachlor epoxide	0.05	mg/kg	< 0.05	-	< 0.05	-
Hexachlorobenzene	0.05	mg/kg	< 0.05	-	< 0.05	-
Methoxychlor	0.2	mg/kg	< 0.2	-	< 0.2	-
Toxaphene	1	mg/kg	< 1	-	< 1	-
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	-	< 0.05	-
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	-	< 0.05	-
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.2	-	< 0.2	-
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.2	-	< 0.2	-
Dibutylchloroendate (surr.)	1	%	77	-	81	-
Tetrachloro-m-xylene (surr.)	1	%	83	-	92	-
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	-	< 0.2	-
Bolstar	0.2	mg/kg	< 0.2	-	< 0.2	-
Chlorfenvinphos	0.2	mg/kg	< 0.2	-	< 0.2	-
Chlorpyrifos	0.2	mg/kg	< 0.2	-	< 0.2	-

Client Sample ID			HA02_0.5	HA02_0.7	HA03_0.0-0.1	HA03_0.6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08310	S19-Ap08311	S19-Ap08312	S19-Ap08313
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	-	< 0.2	-
Coumaphos	2	mg/kg	< 2	-	< 2	-
Demeton-S	0.2	mg/kg	< 0.2	-	< 0.2	-
Demeton-O	0.2	mg/kg	< 0.2	-	< 0.2	-
Diazinon	0.2	mg/kg	< 0.2	-	< 0.2	-
Dichlorvos	0.2	mg/kg	< 0.2	-	< 0.2	-
Dimethoate	0.2	mg/kg	< 0.2	-	< 0.2	-
Disulfoton	0.2	mg/kg	< 0.2	-	< 0.2	-
EPN	0.2	mg/kg	< 0.2	-	< 0.2	-
Ethion	0.2	mg/kg	< 0.2	-	< 0.2	-
Ethoprop	0.2	mg/kg	< 0.2	-	< 0.2	-
Ethyl parathion	0.2	mg/kg	< 0.2	-	< 0.2	-
Fenitrothion	0.2	mg/kg	< 0.2	-	< 0.2	-
Fensulfothion	0.2	mg/kg	< 0.2	-	< 0.2	-
Fenthion	0.2	mg/kg	< 0.2	-	< 0.2	-
Malathion	0.2	mg/kg	< 0.2	-	< 0.2	-
Merphos	0.2	mg/kg	< 0.2	-	< 0.2	-
Methyl parathion	0.2	mg/kg	< 0.2	-	< 0.2	-
Mevinphos	0.2	mg/kg	< 0.2	-	< 0.2	-
Monocrotophos	2	mg/kg	< 2	-	< 2	-
Naled	0.2	mg/kg	< 0.2	-	< 0.2	-
Omethoate	2	mg/kg	< 2	-	< 2	-
Phorate	0.2	mg/kg	< 0.2	-	< 0.2	-
Pirimiphos-methyl	0.2	mg/kg	< 0.2	-	< 0.2	-
Pyrazophos	0.2	mg/kg	< 0.2	-	< 0.2	-
Ronnel	0.2	mg/kg	< 0.2	-	< 0.2	-
Terbufos	0.2	mg/kg	< 0.2	-	< 0.2	-
Tetrachlorvinphos	0.2	mg/kg	< 0.2	-	< 0.2	-
Tokuthion	0.2	mg/kg	< 0.2	-	< 0.2	-
Trichloronate	0.2	mg/kg	< 0.2	-	< 0.2	-
Triphenylphosphate (surr.)	1	%	86	-	92	-
Polychlorinated Biphenyls						
Aroclor-1016	0.5	mg/kg	< 0.5	-	< 0.5	-
Aroclor-1221	0.1	mg/kg	< 0.1	-	< 0.1	-
Aroclor-1232	0.5	mg/kg	< 0.5	-	< 0.5	-
Aroclor-1242	0.5	mg/kg	< 0.5	-	< 0.5	-
Aroclor-1248	0.5	mg/kg	< 0.5	-	< 0.5	-
Aroclor-1254	0.5	mg/kg	< 0.5	-	< 0.5	-
Aroclor-1260	0.5	mg/kg	< 0.5	-	< 0.5	-
Total PCB*	0.5	mg/kg	< 0.5	-	< 0.5	-
Dibutylchloredate (surr.)	1	%	77	-	81	-
Tetrachloro-m-xylene (surr.)	1	%	83	-	92	-
% Clay	1	%	-	-	-	11
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	-	-	-	200
pH (units)(1:5 soil:CaCl2 extract at 25°C as rec.)	0.1	pH Units	-	-	-	7.7
Total Organic Carbon	0.1	%	-	-	-	2.2
% Moisture	1	%	18	14	17	17

Client Sample ID			HA02_0.5	HA02_0.7	HA03_0.0-0.1	HA03_0.6
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08310	S19-Ap08311	S19-Ap08312	S19-Ap08313
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Arsenic	2	mg/kg	-	3.4	4.3	-
Cadmium	0.4	mg/kg	-	< 0.4	< 0.4	-
Chromium	5	mg/kg	-	20	30	-
Copper	5	mg/kg	-	29	22	-
Iron	20	mg/kg	-	-	-	9300
Lead	5	mg/kg	-	20	52	-
Mercury	0.1	mg/kg	-	< 0.1	0.1	-
Nickel	5	mg/kg	-	9.6	19	-
Zinc	5	mg/kg	-	48	80	-
Heavy Metals						
Iron (%)	0.01	%	-	-	-	0.93
Cation Exchange Capacity						
Cation Exchange Capacity	0.05	meq/100g	-	-	-	29

Client Sample ID			HA04_0.1	HA04_1.0	HA05_0.1	HA05_0.3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08314	S19-Ap08315	S19-Ap08316	S19-Ap08317
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	20	mg/kg	< 20	< 20	< 20	< 20
TRH C10-C14	20	mg/kg	< 20	< 20	< 20	< 20
TRH C15-C28	50	mg/kg	85	< 50	< 50	150
TRH C29-C36	50	mg/kg	84	< 50	< 50	66
TRH C10-36 (Total)	50	mg/kg	169	< 50	< 50	216
BTEX						
Benzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Toluene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	< 0.2	< 0.2
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Xylenes - Total	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3
4-Bromofluorobenzene (surr.)	1	%	78	87	77	77
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
TRH C6-C10	20	mg/kg	< 20	< 20	< 20	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	20	mg/kg	< 20	< 20	< 20	< 20
TRH >C10-C16	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C10-C16 less Naphthalene (F2) ^{N01}	50	mg/kg	< 50	< 50	< 50	< 50
TRH >C16-C34	100	mg/kg	140	< 100	< 100	160
TRH >C34-C40	100	mg/kg	< 100	< 100	< 100	< 100
TRH >C10-C40 (total)*	100	mg/kg	140	< 100	< 100	160
Polycyclic Aromatic Hydrocarbons						
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	0.9	< 0.5	0.7	< 0.5
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	1.2	0.6	1.1	0.6
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.5	1.2	1.4	1.2
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5

Client Sample ID			HA04_0.1	HA04_1.0	HA05_0.1	HA05_0.3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08314	S19-Ap08315	S19-Ap08316	S19-Ap08317
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons						
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benz(a)anthracene	0.5	mg/kg	0.6	< 0.5	< 0.5	< 0.5
Benzo(a)pyrene	0.5	mg/kg	0.7	< 0.5	0.7	< 0.5
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	0.7	< 0.5	< 0.5	< 0.5
Benzo(g,h,i)perylene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Chrysene	0.5	mg/kg	0.5	< 0.5	< 0.5	< 0.5
Dibenz(a,h)anthracene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Fluoranthene	0.5	mg/kg	1.2	< 0.5	0.8	< 0.5
Fluorene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Indeno(1,2,3-cd)pyrene	0.5	mg/kg	0.7	< 0.5	< 0.5	< 0.5
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Phenanthrene	0.5	mg/kg	0.8	< 0.5	< 0.5	< 0.5
Pyrene	0.5	mg/kg	1.2	< 0.5	0.8	< 0.5
Total PAH*	0.5	mg/kg	6.4	< 0.5	2.3	< 0.5
2-Fluorobiphenyl (surr.)	1	%	94	88	94	86
p-Terphenyl-d14 (surr.)	1	%	66	94	100	59
Organochlorine Pesticides						
Chlordanes - Total	0.1	mg/kg	< 0.1	-	-	< 0.1
4,4'-DDD	0.05	mg/kg	< 0.05	-	-	< 0.05
4,4'-DDE	0.05	mg/kg	< 0.05	-	-	< 0.05
4,4'-DDT	0.05	mg/kg	< 0.05	-	-	< 0.05
α-BHC	0.05	mg/kg	< 0.05	-	-	< 0.05
Aldrin	0.05	mg/kg	< 0.05	-	-	< 0.05
β-BHC	0.05	mg/kg	< 0.05	-	-	< 0.05
δ-BHC	0.05	mg/kg	< 0.05	-	-	< 0.05
Dieldrin	0.05	mg/kg	< 0.05	-	-	< 0.05
Endosulfan I	0.05	mg/kg	< 0.05	-	-	< 0.05
Endosulfan II	0.05	mg/kg	< 0.05	-	-	< 0.05
Endosulfan sulphate	0.05	mg/kg	< 0.05	-	-	< 0.05
Endrin	0.05	mg/kg	< 0.05	-	-	< 0.05
Endrin aldehyde	0.05	mg/kg	< 0.05	-	-	< 0.05
Endrin ketone	0.05	mg/kg	< 0.05	-	-	< 0.05
γ-BHC (Lindane)	0.05	mg/kg	< 0.05	-	-	< 0.05
Heptachlor	0.05	mg/kg	< 0.05	-	-	< 0.05
Heptachlor epoxide	0.05	mg/kg	< 0.05	-	-	< 0.05
Hexachlorobenzene	0.05	mg/kg	< 0.05	-	-	< 0.05
Methoxychlor	0.2	mg/kg	< 0.2	-	-	< 0.2
Toxaphene	1	mg/kg	< 1	-	-	< 1
Aldrin and Dieldrin (Total)*	0.05	mg/kg	< 0.05	-	-	< 0.05
DDT + DDE + DDD (Total)*	0.05	mg/kg	< 0.05	-	-	< 0.05
Vic EPA IWRG 621 OCP (Total)*	0.1	mg/kg	< 0.2	-	-	< 0.2
Vic EPA IWRG 621 Other OCP (Total)*	0.1	mg/kg	< 0.2	-	-	< 0.2
Dibutylchloroendate (surr.)	1	%	91	-	-	83
Tetrachloro-m-xylene (surr.)	1	%	88	-	-	86

Client Sample ID			HA04_0.1	HA04_1.0	HA05_0.1	HA05_0.3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08314	S19-Ap08315	S19-Ap08316	S19-Ap08317
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Azinphos-methyl	0.2	mg/kg	< 0.2	-	-	< 0.2
Bolstar	0.2	mg/kg	< 0.2	-	-	< 0.2
Chlorfenvinphos	0.2	mg/kg	< 0.2	-	-	< 0.2
Chlorpyrifos	0.2	mg/kg	< 0.2	-	-	< 0.2
Chlorpyrifos-methyl	0.2	mg/kg	< 0.2	-	-	< 0.2
Coumaphos	2	mg/kg	< 2	-	-	< 2
Demeton-S	0.2	mg/kg	< 0.2	-	-	< 0.2
Demeton-O	0.2	mg/kg	< 0.2	-	-	< 0.2
Diazinon	0.2	mg/kg	< 0.2	-	-	< 0.2
Dichlorvos	0.2	mg/kg	< 0.2	-	-	< 0.2
Dimethoate	0.2	mg/kg	< 0.2	-	-	< 0.2
Disulfoton	0.2	mg/kg	< 0.2	-	-	< 0.2
EPN	0.2	mg/kg	< 0.2	-	-	< 0.2
Ethion	0.2	mg/kg	< 0.2	-	-	< 0.2
Ethoprop	0.2	mg/kg	< 0.2	-	-	< 0.2
Ethyl parathion	0.2	mg/kg	< 0.2	-	-	< 0.2
Fenitrothion	0.2	mg/kg	< 0.2	-	-	< 0.2
Fensulfothion	0.2	mg/kg	< 0.2	-	-	< 0.2
Fenthion	0.2	mg/kg	< 0.2	-	-	< 0.2
Malathion	0.2	mg/kg	< 0.2	-	-	< 0.2
Merphos	0.2	mg/kg	< 0.2	-	-	< 0.2
Methyl parathion	0.2	mg/kg	< 0.2	-	-	< 0.2
Mevinphos	0.2	mg/kg	< 0.2	-	-	< 0.2
Monocrotophos	2	mg/kg	< 2	-	-	< 2
Naled	0.2	mg/kg	< 0.2	-	-	< 0.2
Omethoate	2	mg/kg	< 2	-	-	< 2
Phorate	0.2	mg/kg	< 0.2	-	-	< 0.2
Pirimiphos-methyl	0.2	mg/kg	< 0.2	-	-	< 0.2
Pyrazophos	0.2	mg/kg	< 0.2	-	-	< 0.2
Ronnel	0.2	mg/kg	< 0.2	-	-	< 0.2
Terbufos	0.2	mg/kg	< 0.2	-	-	< 0.2
Tetrachlorvinphos	0.2	mg/kg	< 0.2	-	-	< 0.2
Tokuthion	0.2	mg/kg	< 0.2	-	-	< 0.2
Trichloronate	0.2	mg/kg	< 0.2	-	-	< 0.2
Triphenylphosphate (surr.)	1	%	97	-	-	80
Polychlorinated Biphenyls						
Aroclor-1016	0.5	mg/kg	< 0.5	-	-	< 0.5
Aroclor-1221	0.1	mg/kg	< 0.1	-	-	< 0.1
Aroclor-1232	0.5	mg/kg	< 0.5	-	-	< 0.5
Aroclor-1242	0.5	mg/kg	< 0.5	-	-	< 0.5
Aroclor-1248	0.5	mg/kg	< 0.5	-	-	< 0.5
Aroclor-1254	0.5	mg/kg	< 0.5	-	-	< 0.5
Aroclor-1260	0.5	mg/kg	< 0.5	-	-	< 0.5
Total PCB*	0.5	mg/kg	< 0.5	-	-	< 0.5
Dibutylchlorendate (surr.)	1	%	91	-	-	83
Tetrachloro-m-xylene (surr.)	1	%	88	-	-	86

Client Sample ID			HA04_0.1	HA04_1.0	HA05_0.1	HA05_0.3
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins mgt Sample No.			S19-Ap08314	S19-Ap08315	S19-Ap08316	S19-Ap08317
Date Sampled			Apr 04, 2019	Apr 04, 2019	Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit				
% Clay	1	%	-	13	-	-
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	-	52	-	-
pH (units)(1:5 soil:CaCl2 extract at 25°C as rec.)	0.1	pH Units	-	6.1	-	-
Total Organic Carbon	0.1	%	-	0.5	-	-
% Moisture	1	%	21	12	19	16
Heavy Metals						
Arsenic	2	mg/kg	2.6	2.6	< 2	2.7
Cadmium	0.4	mg/kg	< 0.4	< 0.4	< 0.4	< 0.4
Chromium	5	mg/kg	8.7	24	11	14
Copper	5	mg/kg	44	< 5	17	29
Iron	20	mg/kg	-	20000	-	-
Lead	5	mg/kg	31	12	28	31
Mercury	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Nickel	5	mg/kg	< 5	< 5	< 5	5.8
Zinc	5	mg/kg	59	11	39	46
Heavy Metals						
Iron (%)	0.01	%	-	2.0	-	-
Cation Exchange Capacity						
Cation Exchange Capacity	0.05	meq/100g	-	4.6	-	-

Client Sample ID			HA05_1.0	QA100
Sample Matrix			Soil	Soil
Eurofins mgt Sample No.			S19-Ap08318	S19-Ap08319
Date Sampled			Apr 04, 2019	Apr 04, 2019
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	-	< 50
TRH C10-36 (Total)	50	mg/kg	-	< 50
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	%	-	75
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
Naphthalene ^{N02}	0.5	mg/kg	-	< 0.5
TRH C6-C10	20	mg/kg	-	< 20
TRH C6-C10 less BTEX (F1) ^{N04}	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
TRH >C10-C40 (total)*	100	mg/kg	-	< 100

Client Sample ID			HA05_1.0	QA100
Sample Matrix			Soil	Soil
Eurofins mgt Sample No.			S19-Ap08318	S19-Ap08319
Date Sampled			Apr 04, 2019	Apr 04, 2019
Test/Reference	LOR	Unit		
Polycyclic Aromatic Hydrocarbons				
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	-	1.0
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	-	1.2
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	-	1.5
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	-	0.8
Benzo(b&j)fluoranthene ^{N07}	0.5	mg/kg	-	0.6
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
Fluoranthene	0.5	mg/kg	-	1.1
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	-	1.0
Total PAH*	0.5	mg/kg	-	5.5
2-Fluorobiphenyl (surr.)	1	%	-	96
p-Terphenyl-d14 (surr.)	1	%	-	101
% Moisture	1	%	-	16
Heavy Metals				
Arsenic	2	mg/kg	-	< 2
Cadmium	0.4	mg/kg	-	< 0.4
Chromium	5	mg/kg	-	20
Copper	5	mg/kg	-	18
Lead	5	mg/kg	-	27
Mercury	0.1	mg/kg	-	< 0.1
Nickel	5	mg/kg	-	12
Zinc	5	mg/kg	-	40
Acid Sulfate Soils Field pH Test				
pH-F (Field pH test)*	0.1	pH Units	7.7	-
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.7	-
Reaction Ratings ^{S05}		comment	2.0	-

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: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 04, 2019	14 Day
BTEX - Method: LTM-ORG-2150 VOCs in Soils Liquid and other Aqueous Matrices	Sydney	Apr 04, 2019	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 04, 2019	14 Day
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Apr 04, 2019	14 Day
Polycyclic Aromatic Hydrocarbons - Method: LTM-ORG-2130 PAH and Phenols in Soil and Water	Sydney	Apr 04, 2019	14 Days
Metals M8 - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Apr 04, 2019	28 Day
Organochlorine Pesticides - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Apr 04, 2019	14 Day
Organophosphorus Pesticides - Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS	Sydney	Apr 04, 2019	14 Day
Polychlorinated Biphenyls - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Apr 04, 2019	28 Days
NEPM Screen for Soil Classification			
% Clay - Method: LTM-GEN-7040	Brisbane	Apr 05, 2019	0 Day
Conductivity (1:5 aqueous extract at 25°C as rec.) - Method: LTM-INO-4030 Conductivity	Melbourne	Apr 05, 2019	7 Day
pH (units)(1:5 soil:CaCl2 extract at 25°C as rec.) - Method: LTM-GEN-7090 pH in soil by ISE	Sydney	Apr 04, 2019	7 Day
Total Organic Carbon - Method: APHA 5310B Total Organic Carbon	Melbourne	Apr 05, 2019	28 Day
Heavy Metals - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Apr 04, 2019	180 Day
Cation Exchange Capacity - Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage	Melbourne	Apr 08, 2019	180 Days
% Moisture - Method: LTM-GEN-7080 Moisture	Sydney	Apr 04, 2019	14 Day
Acid Sulfate Soils Field pH Test - Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests	Brisbane	Apr 05, 2019	7 Days

Company Name: Cardno (NSW/ACT) Pty Ltd
Address: Level 9, 203 Pacific Highway
St Leonards
NSW 2065

Order No.:
Report #: 649232
Phone: 0294967700
Fax: 02 9499 3902

Received: Apr 4, 2019 5:45 PM
Due: Apr 8, 2019
Priority: 2 Day
Contact Name: Ben Withnall

Project Name: DOWNER BROOKEVALE PEDESTRIAN BRIDGE
Project ID: 80018112

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Acid Sulfate Soils Field pH Test	Eurofins mgt Suite B15	Moisture Set	NEPM Screen for Soil Classification	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271												X
Sydney Laboratory - NATA Site # 18217						X	X		X	X	X	X
Brisbane Laboratory - NATA Site # 20794								X			X	
Perth Laboratory - NATA Site # 23736												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	HA01_0.1-0.2	Apr 04, 2019		Soil	S19-Ap08305	X			X	X	X	X
2	HA01_0.5	Apr 04, 2019		Soil	S19-Ap08306			X				
3	HA01_0.7	Apr 04, 2019		Soil	S19-Ap08307	X						
4	HA02_0.0-0.1	Apr 04, 2019		Soil	S19-Ap08308	X				X		X
5	HA02_0.2	Apr 04, 2019		Soil	S19-Ap08309			X				
6	HA02_0.5	Apr 04, 2019		Soil	S19-Ap08310	X			X	X		
7	HA02_0.7	Apr 04, 2019		Soil	S19-Ap08311					X		X
8	HA03_0.0-0.1	Apr 04, 2019		Soil	S19-Ap08312	X			X	X		X
9	HA03_0.6	Apr 04, 2019		Soil	S19-Ap08313					X	X	

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Sample Detail						Asbestos - WA guidelines	HOLD	Acid Sulfate Soils Field pH Test	Eurofins mgt Suite B15	Moisture Set	NEPM Screen for Soil Classification	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271												X
Sydney Laboratory - NATA Site # 18217						X	X		X	X	X	X
Brisbane Laboratory - NATA Site # 20794								X			X	
Perth Laboratory - NATA Site # 23736												
10	HA04_0.1	Apr 04, 2019		Soil	S19-Ap08314	X			X	X		X
11	HA04_1.0	Apr 04, 2019		Soil	S19-Ap08315					X	X	X
12	HA05_0.1	Apr 04, 2019		Soil	S19-Ap08316	X				X		X
13	HA05_0.3	Apr 04, 2019		Soil	S19-Ap08317				X	X		X
14	HA05_1.0	Apr 04, 2019		Soil	S19-Ap08318			X				
15	QA100	Apr 04, 2019		Soil	S19-Ap08319					X		X
16	HA04_0.7	Apr 04, 2019		Soil	S19-Ap08320		X					
Test Counts						7	1	3	5	11	3	9

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure, April 2011 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. 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 SRA.

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.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****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	US Department of Defense Quality Systems Manual Version 5.2 2018
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 5.2 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. 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.
2. 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.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. 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.
6. 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.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. 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							
Conductivity (1:5 aqueous extract at 25°C as rec.)	uS/cm	< 10			10	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	
Iron	mg/kg	< 20			20	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	
Method Blank							
Heavy Metals							
Iron (%)	%	< 0.01			0.01	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	78			70-130	Pass	
TRH C10-C14	%	75			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	81			70-130	Pass	
Toluene	%	87			70-130	Pass	
Ethylbenzene	%	85			70-130	Pass	
m&p-Xylenes	%	84			70-130	Pass	
o-Xylene	%	89			70-130	Pass	
Xylenes - Total	%	85			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	103			70-130	Pass	
TRH C6-C10	%	73			70-130	Pass	
TRH >C10-C16	%	80			70-130	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	100			70-130	Pass	
Acenaphthylene	%	92			70-130	Pass	
Anthracene	%	94			70-130	Pass	
Benz(a)anthracene	%	97			70-130	Pass	
Benzo(a)pyrene	%	95			70-130	Pass	
Benzo(b&j)fluoranthene	%	89			70-130	Pass	
Benzo(g,h,i)perylene	%	92			70-130	Pass	
Benzo(k)fluoranthene	%	103			70-130	Pass	
Chrysene	%	96			70-130	Pass	
Dibenz(a,h)anthracene	%	97			70-130	Pass	
Fluoranthene	%	97			70-130	Pass	
Fluorene	%	100			70-130	Pass	
Indeno(1,2,3-cd)pyrene	%	97			70-130	Pass	
Naphthalene	%	94			70-130	Pass	
Phenanthrene	%	90			70-130	Pass	
Pyrene	%	93			70-130	Pass	
LCS - % Recovery							

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Organochlorine Pesticides									
4.4'-DDD			%	103			70-130	Pass	
4.4'-DDE			%	96			70-130	Pass	
4.4'-DDT			%	91			70-130	Pass	
a-BHC			%	103			70-130	Pass	
Aldrin			%	98			70-130	Pass	
b-BHC			%	93			70-130	Pass	
d-BHC			%	105			70-130	Pass	
Dieldrin			%	94			70-130	Pass	
Endosulfan I			%	96			70-130	Pass	
Endosulfan II			%	98			70-130	Pass	
Endosulfan sulphate			%	96			70-130	Pass	
Endrin			%	92			70-130	Pass	
Endrin aldehyde			%	85			70-130	Pass	
Endrin ketone			%	91			70-130	Pass	
g-BHC (Lindane)			%	101			70-130	Pass	
Heptachlor			%	99			70-130	Pass	
Heptachlor epoxide			%	100			70-130	Pass	
Hexachlorobenzene			%	97			70-130	Pass	
Methoxychlor			%	87			70-130	Pass	
LCS - % Recovery									
Organophosphorus Pesticides									
Diazinon			%	78			70-130	Pass	
Mevinphos			%	89			70-130	Pass	
LCS - % Recovery									
Polychlorinated Biphenyls									
Aroclor-1260			%	86			70-130	Pass	
LCS - % Recovery									
Total Organic Carbon			%	94			70-130	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic			%	98			70-130	Pass	
Cadmium			%	97			70-130	Pass	
Chromium			%	96			70-130	Pass	
Copper			%	96			70-130	Pass	
Iron			%	99			70-130	Pass	
Lead			%	100			70-130	Pass	
Mercury			%	103			70-130	Pass	
Nickel			%	101			70-130	Pass	
Zinc			%	100			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Organochlorine Pesticides				Result 1					
4.4'-DDD	S19-Ap07125	NCP	%	103			70-130	Pass	
4.4'-DDE	S19-Ap07125	NCP	%	95			70-130	Pass	
4.4'-DDT	S19-Ap07125	NCP	%	88			70-130	Pass	
a-BHC	S19-Ap07125	NCP	%	104			70-130	Pass	
Aldrin	S19-Ap07125	NCP	%	99			70-130	Pass	
b-BHC	S19-Ap07125	NCP	%	98			70-130	Pass	
d-BHC	S19-Ap07125	NCP	%	105			70-130	Pass	
Dieldrin	S19-Ap07125	NCP	%	97			70-130	Pass	
Endosulfan I	S19-Ap07125	NCP	%	96			70-130	Pass	
Endosulfan II	S19-Ap07125	NCP	%	96			70-130	Pass	
Endosulfan sulphate	S19-Ap07125	NCP	%	92			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endrin	S19-Ap07125	NCP	%	96			70-130	Pass	
Endrin aldehyde	S19-Ap07125	NCP	%	73			70-130	Pass	
Endrin ketone	S19-Ap07125	NCP	%	86			70-130	Pass	
g-BHC (Lindane)	S19-Ap07125	NCP	%	97			70-130	Pass	
Heptachlor	S19-Ap07125	NCP	%	100			70-130	Pass	
Heptachlor epoxide	S19-Ap07125	NCP	%	99			70-130	Pass	
Hexachlorobenzene	S19-Ap07125	NCP	%	98			70-130	Pass	
Methoxychlor	S19-Ap07125	NCP	%	86			70-130	Pass	
Spike - % Recovery									
Polychlorinated Biphenyls				Result 1					
Aroclor-1260	S19-Ap03260	NCP	%	85			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S19-Ap03650	NCP	%	98			70-130	Pass	
Acenaphthylene	S19-Ap03650	NCP	%	92			70-130	Pass	
Anthracene	S19-Ap03650	NCP	%	90			70-130	Pass	
Benz(a)anthracene	S19-Ap03650	NCP	%	99			70-130	Pass	
Benzo(a)pyrene	S19-Ap03650	NCP	%	93			70-130	Pass	
Benzo(b&j)fluoranthene	S19-Ap03650	NCP	%	107			70-130	Pass	
Benzo(g,h,i)perylene	S19-Ap03650	NCP	%	94			70-130	Pass	
Benzo(k)fluoranthene	S19-Ap03650	NCP	%	84			70-130	Pass	
Chrysene	S19-Ap03650	NCP	%	94			70-130	Pass	
Dibenz(a,h)anthracene	S19-Ap03650	NCP	%	101			70-130	Pass	
Fluoranthene	S19-Ap03650	NCP	%	102			70-130	Pass	
Fluorene	S19-Ap03650	NCP	%	97			70-130	Pass	
Indeno(1,2,3-cd)pyrene	S19-Ap03650	NCP	%	102			70-130	Pass	
Naphthalene	S19-Ap03650	NCP	%	93			70-130	Pass	
Phenanthrene	S19-Ap03650	NCP	%	91			70-130	Pass	
Pyrene	S19-Ap03650	NCP	%	95			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S19-Ap08313	CP	%	100			70-130	Pass	
Cadmium	S19-Ap08313	CP	%	96			70-130	Pass	
Chromium	S19-Ap08313	CP	%	92			70-130	Pass	
Copper	S19-Ap08313	CP	%	96			70-130	Pass	
Lead	S19-Ap08313	CP	%	96			70-130	Pass	
Mercury	S19-Ap08313	CP	%	93			70-130	Pass	
Nickel	S19-Ap08313	CP	%	97			70-130	Pass	
Zinc	S19-Ap08313	CP	%	85			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					
TRH C6-C9	S19-Ap08314	CP	%	79			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	S19-Ap08314	CP	%	81			70-130	Pass	
Toluene	S19-Ap08314	CP	%	86			70-130	Pass	
Ethylbenzene	S19-Ap08314	CP	%	86			70-130	Pass	
m&p-Xylenes	S19-Ap08314	CP	%	85			70-130	Pass	
o-Xylene	S19-Ap08314	CP	%	89			70-130	Pass	
Xylenes - Total	S19-Ap08314	CP	%	86			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	S19-Ap08314	CP	%	89			70-130	Pass	
TRH C6-C10	S19-Ap08314	CP	%	78			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 C10-C14	S19-Ap08315	CP	%	111			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16	S19-Ap08315	CP	%	115			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Organochlorine Pesticides				Result 1	Result 2	RPD			
Chlordanes - Total	S19-Ap08305	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
4,4'-DDD	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4,4'-DDE	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
4,4'-DDT	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
a-BHC	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Aldrin	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
b-BHC	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
d-BHC	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Dieldrin	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan I	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan II	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endosulfan sulphate	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin aldehyde	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Endrin ketone	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
g-BHC (Lindane)	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Heptachlor epoxide	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Hexachlorobenzene	S19-Ap08305	CP	mg/kg	< 0.05	< 0.05	<1	30%	Pass	
Methoxychlor	S19-Ap08305	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
Toxaphene	S19-Ap08305	CP	mg/kg	< 1	< 1	<1	30%	Pass	
Duplicate									
Polychlorinated Biphenyls				Result 1	Result 2	RPD			
Aroclor-1016	S19-Ap08305	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1221	S19-Ap08305	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Aroclor-1232	S19-Ap08305	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1242	S19-Ap08305	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1248	S19-Ap08305	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1254	S19-Ap08305	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Aroclor-1260	S19-Ap08305	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25°C as rec.)	S19-Ap03055	NCP	uS/cm	310	310	1.1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S19-Ap08433	NCP	mg/kg	4.4	4.1	8.0	30%	Pass	
Cadmium	S19-Ap08433	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S19-Ap08433	NCP	mg/kg	17	15	12	30%	Pass	
Copper	S19-Ap08433	NCP	mg/kg	24	26	5.0	30%	Pass	
Iron	S19-Ap08433	NCP	mg/kg	14000	14000	2.0	30%	Pass	
Lead	S19-Ap08433	NCP	mg/kg	56	53	5.0	30%	Pass	
Mercury	S19-Ap08433	NCP	mg/kg	0.2	0.2	3.0	30%	Pass	
Nickel	S19-Ap08433	NCP	mg/kg	9.2	8.0	14	30%	Pass	
Zinc	S19-Ap08433	NCP	mg/kg	93	79	17	30%	Pass	

Duplicate								
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD		
pH-F (Field pH test)*	S19-Ap08306	CP	pH Units	8.3	8.3	pass	30%	Pass
Reaction Ratings*	S19-Ap08306	CP	comment	3.0	3.0	pass	30%	Pass
Duplicate								
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD		
Acenaphthene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Acenaphthylene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Anthracene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benz(a)anthracene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(a)pyrene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(b&j)fluoranthene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(g,h,i)perylene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Benzo(k)fluoranthene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Chrysene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Dibenz(a,h)anthracene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Fluoranthene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Fluorene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Indeno(1,2,3-cd)pyrene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Naphthalene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Phenanthrene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Pyrene	S19-Ap08304	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD		
TRH C6-C9	S19-Ap08312	CP	mg/kg	< 20	< 20	<1	30%	Pass
Duplicate								
BTEX				Result 1	Result 2	RPD		
Benzene	S19-Ap08312	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Toluene	S19-Ap08312	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Ethylbenzene	S19-Ap08312	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
m&p-Xylenes	S19-Ap08312	CP	mg/kg	< 0.2	< 0.2	<1	30%	Pass
o-Xylene	S19-Ap08312	CP	mg/kg	< 0.1	< 0.1	<1	30%	Pass
Xylenes - Total	S19-Ap08312	CP	mg/kg	< 0.3	< 0.3	<1	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
Naphthalene	S19-Ap08312	CP	mg/kg	< 0.5	< 0.5	<1	30%	Pass
TRH C6-C10	S19-Ap08312	CP	mg/kg	< 20	< 20	<1	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
% Moisture	S19-Ap08313	CP	%	17	15	10	30%	Pass
Duplicate								
Cation Exchange Capacity				Result 1	Result 2	RPD		
Cation Exchange Capacity	S19-Ap08313	CP	meq/100g	29	29	1.0	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD		
TRH C10-C14	S19-Ap08314	CP	mg/kg	< 20	< 20	<1	30%	Pass
TRH C15-C28	S19-Ap08314	CP	mg/kg	85	120	36	30%	Fail
TRH C29-C36	S19-Ap08314	CP	mg/kg	84	100	19	30%	Pass
Duplicate								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD		
TRH >C10-C16	S19-Ap08314	CP	mg/kg	< 50	< 50	<1	30%	Pass
TRH >C16-C34	S19-Ap08314	CP	mg/kg	140	190	30	30%	Pass
TRH >C34-C40	S19-Ap08314	CP	mg/kg	< 100	< 100	<1	30%	Pass

Q15

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.
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised By

Nibha Vaidya	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
Emily Rosenberg	Senior Analyst-Metal (VIC)
Gabriele Cordero	Senior Analyst-Inorganic (NSW)
Gabriele Cordero	Senior Analyst-Metal (NSW)
Jonathon Angell	Senior Analyst-Inorganic (QLD)
Julie Kay	Senior Analyst-Inorganic (VIC)
Myles Clark	Senior Analyst-SPOCAS (QLD)
Nibha Vaidya	Senior Analyst-Asbestos (NSW)



Glenn Jackson General 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.

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: Ben Withnall
Report 649232-AID
Project Name DOWNER BROOKEVALE PEDESTRIAN BRIDGE
Project ID 80018112
Received Date Apr 04, 2019
Date Reported Apr 05, 2019

Methodology:

Asbestos Fibre
 Identification

Conducted in accordance with the Australian Standard AS 4964 – 2004: Method for the Qualitative Identification of Asbestos in Bulk Samples and in-house Method LTM-ASB-8020 by polarised light microscopy (PLM) and dispersion staining (DS) techniques.

NOTE: Positive Trace Analysis results indicate the sample contains detectable respirable fibres.

Unknown Mineral
 Fibres

Mineral fibres of unknown type, as determined by PLM with DS, may require another analytical technique, such as Electron Microscopy, to confirm unequivocal identity.

NOTE: While Actinolite, Anthophyllite and Tremolite asbestos may be detected by PLM with DS, due to variability in the optical properties of these materials, AS4964 requires that these are reported as UMF unless confirmed by an independent technique.

Subsampling Soil
 Samples

The whole sample submitted is first dried and then passed through a 10mm sieve followed by a 2mm sieve. All fibrous matter greater than 10mm, greater than 2mm as well as the material passing through the 2mm sieve are retained and analysed for the presence of asbestos. If the sub 2mm fraction is greater than approximately 30 to 60g then a sub-sampling routine based on ISO 3082:2009(E) is employed.

NOTE: Depending on the nature and size of the soil sample, the sub-2 mm residue material may need to be sub-sampled for trace analysis, in accordance with AS 4964-2004.

Bonded asbestos-
 containing material
 (ACM)

The material is first examined and any fibres isolated for identification by PLM and DS. Where required, interfering matrices may be removed by disintegration using a range of heat, chemical or physical treatments, possibly in combination. The resultant material is then further examined in accordance with AS 4964 - 2004.

NOTE: Even after disintegration it may be difficult to detect the presence of asbestos in some asbestos-containing bulk materials using PLM and DS. This is due to the low grade or small length or diameter of the asbestos fibres present in the material, or to the fact that very fine fibres have been distributed intimately throughout the materials. Vinyl/asbestos floor tiles, some asbestos-containing sealants and mastics, asbestos-containing epoxy resins and some ore samples are examples of these types of material, which are difficult to analyse.

Limit of Reporting

The performance limitation of the AS 4964 (2004) method for non-homogeneous samples is around 0.1 g/kg (equivalent to 0.01% (w/w)). Where no asbestos is found by PLM and DS, including Trace Analysis, this is considered to be at the nominal reporting limit of 0.01% (w/w).

The NEPM screening level of 0.001% (w/w) is intended as an on-site determination, not a laboratory Limit of Reporting (LOR), per se. Examination of a large sample size (e.g. 500 mL) may improve the likelihood of detecting asbestos, particularly AF, to aid assessment against the NEPM criteria. Gravimetric determinations to this level of accuracy are outside of AS 4964 and hence NATA Accreditation does not cover the performance of this service (non-NATA results shown with an asterisk).

NOTE: NATA News March 2014, p.7, states in relation to AS 4964: "This is a qualitative method with a nominal reporting limit of 0.01 % " and that currently in Australia "there is no validated method available for the quantification of asbestos". This report is consistent with the analytical procedures and reporting recommendations in the NEPM and the WA DoH.

Project Name DOWNER BROOKEVALE PEDESTRIAN BRIDGE
Project ID 80018112
Date Sampled Apr 04, 2019
Report 649232-AID

Client Sample ID	Eurofins mgt Sample No.	Date Sampled	Sample Description	Result
HA01_0.1-0.2	19-Ap08305	Apr 04, 2019	Approximate Sample 531g Sample consisted of: Brown fine-grained sandy soil, rocks and organic debris	No asbestos detected at the reporting limit of 0.001% w/w.* Synthetic mineral fibre detected. Organic fibre detected. No respirable fibres detected.
HA01_0.7	19-Ap08307	Apr 04, 2019	Approximate Sample 750g Sample consisted of: Brown fine-grained sandy soil, rocks and organic debris	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
HA02_0.0-0.1	19-Ap08308	Apr 04, 2019	Approximate Sample 575g Sample consisted of: Brown fine-grained sandy soil, rocks and organic debris	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
HA02_0.5	19-Ap08310	Apr 04, 2019	Approximate Sample 612g Sample consisted of: Brown fine-grained sandy soil, rocks and organic debris	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
HA03_0.0-0.1	19-Ap08312	Apr 04, 2019	Approximate Sample 668g Sample consisted of: Brown fine-grained sandy soil and rocks	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.
HA04_0.1	19-Ap08314	Apr 04, 2019	Approximate Sample 653g Sample consisted of: Brown fine-grained sandy soil, rocks and organic debris	AF: Chrysotile asbestos detected in fibre cement fragments and in the form of loose fibre bundles. Approximate raw weight of AF = 0.44g* Estimated asbestos content in AF = 0.035g* Total estimated asbestos concentration in AF = 0.0054% w/w* Organic fibre detected. No respirable fibres detected.

Client Sample ID	Eurofins mgt Sample No.	Date Sampled	Sample Description	Result
HA05_0.1	19-Ap08316	Apr 04, 2019	Approximate Sample 635g Sample consisted of: Brown fine-grained sandy soil, rocks and organic debris	No asbestos detected at the reporting limit of 0.001% w/w.* Organic fibre detected. No respirable fibres detected.

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
Asbestos - LTM-ASB-8020	Sydney	Apr 04, 2019	Indefinite

Company Name: Cardno (NSW/ACT) Pty Ltd
Address: Level 9, 203 Pacific Highway
St Leonards
NSW 2065

Order No.:
Report #: 649232
Phone: 0294967700
Fax: 02 9499 3902

Received: Apr 4, 2019 5:45 PM
Due: Apr 8, 2019
Priority: 2 Day
Contact Name: Ben Withnall

Project Name: DOWNER BROOKEVALE PEDESTRIAN BRIDGE
Project ID: 80018112

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Acid Sulfate Soils Field pH Test	Eurofins mgt Suite B15	Moisture Set	NEPM Screen for Soil Classification	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271												X
Sydney Laboratory - NATA Site # 18217						X	X		X	X	X	X
Brisbane Laboratory - NATA Site # 20794								X			X	
Perth Laboratory - NATA Site # 23736												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	HA01_0.1-0.2	Apr 04, 2019		Soil	S19-Ap08305	X			X	X	X	X
2	HA01_0.5	Apr 04, 2019		Soil	S19-Ap08306			X				
3	HA01_0.7	Apr 04, 2019		Soil	S19-Ap08307	X						
4	HA02_0.0-0.1	Apr 04, 2019		Soil	S19-Ap08308	X				X		X
5	HA02_0.2	Apr 04, 2019		Soil	S19-Ap08309			X				
6	HA02_0.5	Apr 04, 2019		Soil	S19-Ap08310	X			X	X		
7	HA02_0.7	Apr 04, 2019		Soil	S19-Ap08311					X		X
8	HA03_0.0-0.1	Apr 04, 2019		Soil	S19-Ap08312	X			X	X		X
9	HA03_0.6	Apr 04, 2019		Soil	S19-Ap08313					X	X	

Company Name: Cardno (NSW/ACT) Pty Ltd
Address: Level 9, 203 Pacific Highway
St Leonards
NSW 2065

Order No.:
Report #: 649232
Phone: 0294967700
Fax: 02 9499 3902

Received: Apr 4, 2019 5:45 PM
Due: Apr 8, 2019
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Contact Name: Ben Withnall

Project Name: DOWNER BROOKEVALE PEDESTRIAN BRIDGE
Project ID: 80018112

Eurofins | mgt Analytical Services Manager : Nibha Vaidya

Sample Detail						Asbestos - WA guidelines	HOLD	Acid Sulfate Soils Field pH Test	Eurofins mgt Suite B15	Moisture Set	NEPM Screen for Soil Classification	Eurofins mgt Suite B7
Melbourne Laboratory - NATA Site # 1254 & 14271												X
Sydney Laboratory - NATA Site # 18217						X	X		X	X	X	X
Brisbane Laboratory - NATA Site # 20794								X			X	
Perth Laboratory - NATA Site # 23736												
10	HA04_0.1	Apr 04, 2019		Soil	S19-Ap08314	X			X	X		X
11	HA04_1.0	Apr 04, 2019		Soil	S19-Ap08315					X	X	X
12	HA05_0.1	Apr 04, 2019		Soil	S19-Ap08316	X				X		X
13	HA05_0.3	Apr 04, 2019		Soil	S19-Ap08317				X	X		X
14	HA05_1.0	Apr 04, 2019		Soil	S19-Ap08318			X				
15	QA100	Apr 04, 2019		Soil	S19-Ap08319					X		X
16	HA04_0.7	Apr 04, 2019		Soil	S19-Ap08320		X					
Test Counts						7	1	3	5	11	3	9

Internal Quality Control Review and Glossary

General

1. QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. Samples were analysed on an 'as received' basis.
4. 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.

Units

% w/w: weight for weight basis	grams per kilogram
Filter loading:	fibres/100 graticule areas
Reported Concentration:	fibres/mL
Flowrate:	L/min

Terms

Dry	Sample is dried by heating prior to analysis
LOR	Limit of Reporting
COC	Chain of Custody
SRA	Sample Receipt Advice
ISO	International Standards Organisation
AS	Australian Standards
WA DOH	Reference document for the NEPM. Government of Western Australia, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (2009), including supporting document Recommended Procedures for Laboratory Analysis of Asbestos in Soil (2011)
NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 2013 (as amended)
ACM	Asbestos Containing Materials. Asbestos contained within a non-asbestos matrix, typically presented in bonded and/or sound condition. For the purposes of the NEPM, ACM is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
AF	Asbestos Fines. Asbestos containing materials, including friable, weathered and bonded materials, able to pass a 7mm x 7mm sieve. Considered under the NEPM as equivalent to "non-bonded / friable".
FA	Fibrous Asbestos. Asbestos containing materials in a friable and/or severely weathered condition. For the purposes of the NEPM, FA is generally restricted to those materials that do not pass a 7mm x 7mm sieve.
Friable	Asbestos-containing materials of any size that may be broken or crumbled by hand pressure. For the purposes of the NEPM, this includes both AF and FA. It is outside of the laboratory's remit to assess degree of friability.
Trace Analysis	Analytical procedure used to detect the presence of respirable fibres in the matrix.

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
N/A	Not applicable

Asbestos Counter/Identifier:

Laxman Dias Senior Analyst-Asbestos (NSW)

Authorised by:

Sayeed Abu Senior Analyst-Asbestos (NSW)



Glenn Jackson
General 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](#).

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CHAIN OF CUSTODY AND ANALYSIS REQUEST

Page 1 of 1

Contact Person: Ben Withnall
 Telephone Number: 94958188
 Alternative Contact: Sam Levi
 Telephone Number: 94958160
 Sampler: BW
 Email Address (results and invoice): ben.withnall@cardno.com.au; sam.levi@cardno.com.au
 Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065

Project Name: Downer Brookevale Pedestrian Bridge
 Project Number: 80018112
 PO No.:
 Project Specific Quote No.:
 Date results required: 1 Day TAT
 Report format: electronic

649232

Sample information						Analysis Required														Comments
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix	B7*1 - TRH/IBTEXN/PAH/Metals 8	B15 OCP/OPP/PCB	ASS FIELD SCREEN PHF/PHFOX	ASBESTOS %W/W	R21 (PH, CEC, CLAY etc)	HOLD									
HA01_0.1-0.2		2	Ice	4/04/2019	Soil	X	X		X	X										
HA01_0.5		3	Ice	4/04/2019	Soil			X												
HA01_0.7		2	Ice	4/04/2019	Soil				X											
HA02_0.0-0.1		2	Ice	4/04/2019	Soil	X			X											
HA02_0.2		1	Ice	4/04/2019	Soil			X												
HA02_0.5		2	Ice	4/04/2019	Soil		X		X											
HA02_0.7		3	Ice	4/04/2019	Soil	X														
HA03_0.0-0.1		2	Ice	4/04/2019	Soil	X	X		X											
HA03_0.6		1	Ice	4/04/2019	Soil					X										
HA04_0.1		3	Ice	4/04/2019	Soil	X	X		X											
HA04_0.7		1	Ice	4/04/2019	Soil															
HA04_1.0		2	Ice	4/04/2019	Soil	X				X										
HA05_0.1		2	Ice	4/04/2019	Soil	X			X											
HA05_0.3		1	Ice	4/04/2019	Soil	X	X													
HA05_1.0		1	Ice	4/04/2019	Soil			X												
QA100		1	Ice	4/04/2019	Soil	X														
QA200		1	Ice	4/04/2019	Soil						X									PLEASE SEND TO ALS

Relinquished by: Ben Withnall (name / company) Cardno Date & Time: 04/04/19: 16:00 Signature: BW	Received by: <i>[Signature]</i> (name / company) <i>[Signature]</i> Date & Time: <i>[Signature]</i> Signature: <i>[Signature]</i>	Relinquished by: (name / company) Date & Time: Signature:	Received by: (name / company) Date & Time: Signature:	Relinquished by: (name / company) Date & Time: Signature:	Received by: (name / company) Date & Time: Signature:
Received by: (name / company) Date & Time: Signature:	Relinquished by: (name / company) Date & Time: Signature:	Received by: (name / company) Date & Time: Signature:	Relinquished by: (name / company) Date & Time: Signature:	Lab use: Samples Received: Cool or Ambient (circle one) Temperature Received at: (if applicable) Transported by: Hand delivered / courier	

Sample Receipt Advice

Company name: **Cardno (NSW/ACT) Pty Ltd**
Contact name: **Ben Withnall**
Project name: **DOWNER BROOKEVALE PEDESTRIAN BRIDGE**
Project ID: **80018112**
COC number: **Not provided**
Turn around time: **2 Day**
Date/Time received: **Apr 4, 2019 5:45 PM**
Eurofins | mgt reference: **649232**

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.
- ☒ Split sample sent to requested external lab.
- ☒ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

QA200 sample (1 x Jar) forwarded to ALS.

Contact notes

If you have any questions with respect to these samples please contact:

Nibha Vaidya on Phone : +61 (2) 9900 8415 or by e.mail: NibhaVaidya@eurofins.com

Results will be delivered electronically via e.mail to Ben Withnall - ben.withnall@cardno.com.au.

Note: A copy of these results will also be delivered to the general Cardno (NSW/ACT) Pty Ltd email address.

CERTIFICATE OF ANALYSIS

Work Order : **ES1910544**
Client : **CARDNO (NSW/ACT) PTY LTD**
Contact : **MR BEN WITHNALL**
Address : **Level 9 The Forum 203 Pacific Highway**
St Leonards NSW 2065
Telephone : **+61 2 9495 8188**
Project : **80018112 Downer Brookevale Pedestrian Bridge**
Order number :
C-O-C number :
Sampler : **BEN WITHNALL**
Site :
Quote number : **EN/222 - Secondary Work**
No. of samples received : **1**
No. of samples analysed : **1**

Page : 1 of 6
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 05-Apr-2019 12:15
Date Analysis Commenced : 05-Apr-2019
Issue Date : 09-Apr-2019 12:06



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Edwandy Fadjjar	Organic Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Sanjeshni Jyoti	Senior Chemist Volatiles	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID		QA200	----	----	----	----
Client sampling date / time		04-Apr-2019 00:00		----	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1910544-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	31.5	----	----	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	<5	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	10	----	----	----	----
Copper	7440-50-8	5	mg/kg	16	----	----	----	----
Lead	7439-92-1	5	mg/kg	56	----	----	----	----
Nickel	7440-02-0	2	mg/kg	3	----	----	----	----
Zinc	7440-66-6	5	mg/kg	51	----	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	----	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	----	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	----	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	----	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	----	----	----
Fluoranthene	206-44-0	0.5	mg/kg	1.8	----	----	----	----
Pyrene	129-00-0	0.5	mg/kg	1.7	----	----	----	----
Benzo(a)anthracene	56-55-3	0.5	mg/kg	0.8	----	----	----	----
Chrysene	218-01-9	0.5	mg/kg	0.8	----	----	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	1.2	----	----	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	----	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	1.0	----	----	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	0.6	----	----	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	----	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	0.8	----	----	----	----
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	8.7	----	----	----	----
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	1.3	----	----	----	----
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	1.6	----	----	----	----
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.8	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	QA200	----	----	----	----
Client sampling date / time					04-Apr-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1910544-001	-----	-----	-----	-----
				Result	----	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons - Continued									
C10 - C14 Fraction	----	50	mg/kg		<50	----	----	----	----
C15 - C28 Fraction	----	100	mg/kg		<100	----	----	----	----
C29 - C36 Fraction	----	100	mg/kg		<100	----	----	----	----
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	----	----	----	----
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	----	----	----	----
>C10 - C16 Fraction	----	50	mg/kg		<50	----	----	----	----
>C16 - C34 Fraction	----	100	mg/kg		<100	----	----	----	----
>C34 - C40 Fraction	----	100	mg/kg		<100	----	----	----	----
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	----	----	----	----
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	----	----	----	----
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	----	----
Toluene	108-88-3	0.5	mg/kg		<0.5	----	----	----	----
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	----	----	----	----
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	----	----	----	----
^ Sum of BTEX	----	0.2	mg/kg		<0.2	----	----	----	----
^ Total Xylenes	----	0.5	mg/kg		<0.5	----	----	----	----
Naphthalene	91-20-3	1	mg/kg		<1	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		93.3	----	----	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%		87.1	----	----	----	----
2,4,6-Tribromophenol	118-79-6	0.5	%		57.2	----	----	----	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		96.7	----	----	----	----
Anthracene-d10	1719-06-8	0.5	%		90.7	----	----	----	----
4-Terphenyl-d14	1718-51-0	0.5	%		105	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		90.9	----	----	----	----
Toluene-D8	2037-26-5	0.2	%		85.7	----	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	QA200	----	----	----	----
				Client sampling date / time	04-Apr-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1910544-001	-----	-----	-----	-----
					Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates - Continued									
4-Bromofluorobenzene	460-00-4	0.2	%		90.9	----	----	----	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	63	123
2-Chlorophenol-D4	93951-73-6	66	122
2,4,6-Tribromophenol	118-79-6	40	138
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	70	122
Anthracene-d10	1719-06-8	66	128
4-Terphenyl-d14	1718-51-0	65	129
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	73	133
Toluene-D8	2037-26-5	74	132
4-Bromofluorobenzene	460-00-4	72	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1910544	Page	: 1 of 4
Client	: CARDNO (NSW/ACT) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WITHNALL	Telephone	: +61-2-8784 8555
Project	: 80018112 Downer Brookevale Pedestrian Bridge	Date Samples Received	: 05-Apr-2019
Site	: ----	Issue Date	: 09-Apr-2019
Sampler	: BEN WITHNALL	No. of samples received	: 1
Order number	:	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) QA200	04-Apr-2019	----	----	----	08-Apr-2019	18-Apr-2019	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) QA200	04-Apr-2019	05-Apr-2019	01-Oct-2019	✓	06-Apr-2019	01-Oct-2019	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) QA200	04-Apr-2019	05-Apr-2019	02-May-2019	✓	08-Apr-2019	02-May-2019	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM)) QA200	04-Apr-2019	08-Apr-2019	18-Apr-2019	✓	08-Apr-2019	18-May-2019	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) QA200	04-Apr-2019	08-Apr-2019	18-Apr-2019	✓	08-Apr-2019	18-Apr-2019	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080) QA200	04-Apr-2019	08-Apr-2019	18-Apr-2019	✓	08-Apr-2019	18-Apr-2019	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) QA200	04-Apr-2019	08-Apr-2019	18-Apr-2019	✓	08-Apr-2019	18-Apr-2019	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	1	100.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	1	100.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	1	100.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl ₂) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl ₂ which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015A Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM amended 2013.
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3) (Method 502 and 507)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260B. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM amended 2013.
Preparation Methods	Method	Matrix	Method Descriptions
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na ₂ SO ₄ and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.



Telephone : + 61-2-8794 8555



CHAIN OF CUSTODY AND ANALYSIS REQUEST

Page 1 of 1

Contact Person: Ben Withnall		Project Name: Downer Brookvale Pedestrian Bridge	
Telephone Number: 94958188		Project Number: 80018112	
Alternative Contact: Sam Levi		PO No.:	
Telephone Number: 94958180		Project Specific Quote No. : Cardio Rates	
Sampler: BW		Date results required: 1 Day TAT	
Email Address (results and invoice): ben.withnall@cardno.com.au, sam.levi@cardno.com.au		Report format: electronic	
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065			

Sample information				Analysis Required						Comments		
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix	TRH, BTEX, MS, PAHs	OC/OP/PCB	ASS FIELD SCREEN	PHF/PHFOX		ASBESTOS %W/W	R21 (PH, CEC, CLAY etc)
QA200		1	Ice	4/04/2019	Soil	X						

Relinquished by: (name / company) Ben Withnall Cardno	Received by: (name / company) Ben Withnall Cardno	Relinquished by: (name / company) Ben Withnall Cardno	Received by: (name / company) Ben Withnall Cardno
Date & Time: 04/04/19 16:00	Date & Time: 4/4/19	Date & Time: 4/4/19	Date & Time: 4/4/19
Signature: BW	Signature: Ben Withnall	Signature: Ben Withnall	Signature: Ben Withnall
Relinquished by: (name / company) Sup ALS Crane Nest	Received by: (name / company) Sup ALS Crane Nest	Relinquished by: (name / company) Sup ALS Crane Nest	Received by: (name / company) Sup ALS Crane Nest
Date & Time: 5/4/19 12:15pm	Date & Time: 5/4/19 12:15pm	Date & Time: 5/4/19 12:15pm	Date & Time: 5/4/19 12:15pm
Signature: [Signature]	Signature: [Signature]	Signature: [Signature]	Signature: [Signature]

Lab use: Samples Received (circle one) Temperature Received at: 13.1 (if applicable)	Transported by: Hand delivered / Courier
--	--

CERTIFICATE OF ANALYSIS

Work Order : **ES1910925**
Client : **CARDNO (NSW/ACT) PTY LTD**
Contact : **MR BEN WITHNALL**
Address : **Level 9 The Forum 203 Pacific Highway**
St Leonards NSW 2065
Telephone : **+61 2 9495 8188**
Project : **80018112 Downer Brookevale Pedestrian Bridge**
Order number : **----**
C-O-C number : **----**
Sampler : **BW**
Site : **----**
Quote number : **EN/222 - Secondary Work**
No. of samples received : **1**
No. of samples analysed : **1**

Page : 1 of 5
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 09-Apr-2019 16:15
Date Analysis Commenced : 09-Apr-2019
Issue Date : 10-Apr-2019 16:44



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a,h)anthracene (1.0), Benzo(g,h,i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	QA200	----	----	----	----
				Client sampling date / time	04-Apr-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		ES1910925-001	-----	-----	-----	-----
				Result	----	----	----	----	----
EN33: TCLP Leach									
Initial pH	----	0.1	pH Unit		8.6	----	----	----	----
After HCl pH	----	0.1	pH Unit		1.4	----	----	----	----
Extraction Fluid Number	----	1	-		1	----	----	----	----
Final pH	----	0.1	pH Unit		5.5	----	----	----	----



Analytical Results

Sub-Matrix: **TCLP LEACHATE**
 (Matrix: **WATER**)

Client sample ID

				QA200	----	----	----	----
Client sampling date / time				04-Apr-2019 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES1910925-001	-----	-----	-----	-----
Result				----	----	----	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	----	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	1.0	%	17.5	----	----	----	----
2-Chlorophenol-D4	93951-73-6	1.0	%	46.1	----	----	----	----
2,4,6-Tribromophenol	118-79-6	1.0	%	39.8	----	----	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	1.0	%	66.2	----	----	----	----
Anthracene-d10	1719-06-8	1.0	%	76.1	----	----	----	----
4-Terphenyl-d14	1718-51-0	1.0	%	71.0	----	----	----	----



Surrogate Control Limits

Sub-Matrix: TCLP LEACHATE

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	44
2-Chlorophenol-D4	93951-73-6	14	94
2,4,6-Tribromophenol	118-79-6	17	125
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	20	104
Anthracene-d10	1719-06-8	27	113
4-Terphenyl-d14	1718-51-0	32	112

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: ES1910925	Page	: 1 of 4
Client	: CARDNO (NSW/ACT) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR BEN WITHNALL	Telephone	: +61-2-8784 8555
Project	: 80018112 Downer Brookevale Pedestrian Bridge	Date Samples Received	: 09-Apr-2019
Site	: ----	Issue Date	: 10-Apr-2019
Sampler	: BW	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
PAH/Phenols (GC/MS - SIM)	0	8	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
PAH/Phenols (GC/MS - SIM)	0	8	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EN33: TCLP Leach							
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN33a) QA200	04-Apr-2019	09-Apr-2019	18-Apr-2019	✔	----	----	----

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM)) QA200	09-Apr-2019	10-Apr-2019	16-Apr-2019	✔	10-Apr-2019	20-May-2019	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Reaular	Actual	Expected	Evaluation	
Method Blanks (MB)							
TCLP for Non & Semivolatile Analytes	EN33a	1	2	50.00	9.09	✔	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Reaular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	8	0.00	10.00	✖	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	0	8	0.00	5.00	✖	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (2013) Schedule B(3)
Preparation Methods	Method	Matrix	Method Descriptions
TCLP for Non & Semivolatile Analytes	EN33a	SOIL	In house QWI-EN/33 referenced to USEPA SW846-1311: The TCLP procedure is designed to determine the mobility of both organic and inorganic analytes present in wastes. The standard TCLP leach is for non-volatile and Semivolatile test parameters.
Separatory Funnel Extraction of Liquids	ORG14	SOIL	In house: Referenced to USEPA SW 846 - 3510B 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM (2013) Schedule B(3) . ALS default excludes sediment which may be resident in the container.

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#1



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CHAIN OF CUSTODY AND ANALYSIS REQUEST

Page 1 of 1

Contact Person: Ben Withnall		Project Name: Downer Brookvale Pedestrian Bridge	
Telephone Number: 94958188		Project Number: 80018112	
Alternative Contact: Sam Levi		PO No.:	
Telephone Number: 94958160		Project Specific Quote No.: Cardno Rates	
Sampler: BW		Date results required: 1 Day TAT	
Email Address (results and invoice): ben.withnall@cardno.com.au, sam.levi@cardno.com.au		Report format: electronic	
Address: Level 9 - The Forum, 203 Pacific Highway, St Leonards, New South Wales 2065			

Sample Information				Analysis Required										Comments		
Cardno Sample ID	Laboratory Sample ID	No. Containers	Preservation	Date sampled	Matrix											
QA200		1	Ice	4/04/2019	Soil	TAT										

Relinquished by: Ben Withnall		Received by:		Relinquished by:	
(name / company)	Cardno	(name / company)		(name / company)	
Date & Time: 09/04/2019: 13:15		Date & Time:		Date & Time:	
Signature: BW		Signature:		Signature:	
Relinquished by: 		Relinquished by:		Relinquished by:	
(name / company)		(name / company)		(name / company)	
Date & Time: 9/4/19		Date & Time:		Date & Time:	
Signature: 		Signature:		Signature:	

Lab use:

Sample Received: Cool or Ambient (circle one)

Temperature Received at: (if applicable)

Transported by: Hand delivered / courier

Environmental Division
Sydney
Work Order Reference
ES1910925

