Waste Management Plan

Wentworth Point New High School

Date: 30 May 2023

Document Details

Title	Construction Waste Management Plan
Client	The Crown in right of the State of New South Wales, acting through the NSW Department of Education
Document Reference Number	RCo-ENV-PLN-002
Principal Contractor	Roberts Co
Roberts Co Project No.	20016
Principal Contractor ABN	68 627 689 418
Project Address	3 Burroway Road, Wentworth Point NSW 2127

Document Authorisation

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30/05/2023	30/05/2023	30/05/2023
Date	**Date**	**Date**

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1 DOCUMENT CONTROL

All changes made to the Project Construction Waste Management Plan are recorded in the amendment table below. The version number and date of revision for the current document revision are shown in the footer of the document.

1.1 Revision History

Revision	Date	Description of changes	Prepared by	Approved by
0	12/09/22	For Review	Gavin Finlayson	Adam Greentree
1	01/11/22	Initial Review	Gerhard Nelson	Adam Greentree
2	14/02/2023	Construction Waste storage and recycling areas	Gerhard Nelson	Adam Greentree
3	30/05/23	Add Remediation Action Plan to Appendices	Adam Greentree	Adam Greentree

1.2 Management reviews

Review date	Details	Reviewed by
12/09/22	Issued For Review	Adam Greentree
14/02/23	Quarterly Review	Gerhard Nelson
30/05/23	Add Remediation Action Plan to Appendices	Adam Greentree

1.3 Controlled copies

Name	Position	Date	Revision

2 DEFINITIONS AND ABBREVIATION

Term/Abbreviation	Definition
CWMP	Construction Waste Management Plan
HSE	Health, Safety and Environment
EPA	Environment Protection Authority
OEH	Office of Environment and Heritage
RCo	Roberts Co
The Project	Wentworth Point New High School

Table 01 – Terms of reference, definitions and abbreviations.

3 PURPOSE AND APPLICATION

This Construction Waste Management Plan (CWMP) for Wentworth Point New High School ("**The Project**") describes the Roberts Co system for managing and minimising waste impacts of its activities, meeting its legislative and contractual obligations. In particular, the plan has been developed to address requirements of Condition B17 from the project conditions of approval.

DA Consent No.	Consent Condition of Approval
SSD-11802230	B17

Table 02 – Development Application – Condition of Approval

3.1 Project Scope

The Project will incorporate the following:

A multi-level, multi-purpose, integrated high school building containing:

- Collaborative general and specialist learning units with a combination of enclosed and open spaces;
- Four level central library, with primary school library located on ground floor and high school library on
- Laboratories and workshops;
- Staff workplaces;
- Canteens;
- Outdoor learning play and recreational areas (both covered and uncovered).
- Associated site landscaping and public domain improvements;
- Construction of ancillary infrastructure and utilities as required.

4 OBJECTIVES AND TARGETS

4.1 Objectives

The objective of this CWMP is to ensure that all risks associated with construction waste management are considered and managed effectively during construction.

This CWMP seeks to ensure that construction waste is managed effectively to prevent any negative environmental impact on the surrounding environment or receiving resource recovery and waste facilities.

This CWMP aims to satisfy the following objectives:

– Address the requirements of planning approval condition B17;
– Address the requirements of the relevant environmental legislation as it applies to this project;
– Summarise potential impacts on the environment from the proposed works, and;
– Document environmental procedures to control potential environmental impacts.

4.2 Targets

The following targets have been identified in terms of waste management for the project;

– Waste products are recovered and reused on site where reasonable and practical;
– Undertaken recovery / recycling of all recyclable materials such as concrete, steel, aluminium, paper and plastics. This may be undertaken on site or at an offsite recovery facility;
– All residual waste products are sent to appropriately licensed destinations for recycling, reuse, treatment or disposal;
– No contamination incident occurring as a result of waste storage, transport or disposal;
– No rejection of loads by the receiving facility for non-compliant wastes;
– Regulated wastes stored, transported, tracked and disposed of as per regulated waste legislation;
– No construction waste/litter to leave the site in an uncontrolled manner;
– Documentation of the intended management of wastes e.g., avoid, reduce, reuse, recycle or dispose to ensure waste is managed in accordance with accepted standards and appropriately implemented waste control measures, and;
– Implementation of waste minimisation initiatives where practical.

5 LEGAL AND OTHER REQUIREMENTS

The waste legislation and regulatory framework relevant to the appropriate jurisdiction can be found in via the following links:

NSW	Waste Avoidance and Resource Recovery 2001 (WARR)1

Website Links

NSW www.legislation.nsw.gov.au/view/html/inforce/current/act-2001-058

VIC www.sustainability.vic.gov.au/about-us/our-mission/our-strategies/statewide-waste-and-resource-recovery-infrastructure-plan-swrrip

5.1 Environmental Legislation (Acts)

All material that is imported to or exported from the Wentworth Point New High School will be undertaken in strict accordance with the requirements of the following;

NSW	Protection of the Environment Operations (POEO) Act 1997

This includes:

– Ensuring waste is classified appropriately and in accordance with relevant guidelines;

– Waste materials are disposed of correctly at the appropriately licensed facilities, and;

– Other materials are removed to facilities lawfully able to accept such materials.

5.2 Environmental Regulations

The proposed works shall be undertaken in accordance with the following regulations;

NSW	Protection of the Environment Operations (Waste) Regulations 2014

5.3 Waste Classification Guidelines, Part 1: Classifying Waste

All wastes generated and proposed to be disposed off-site shall be assessed, classified and managed in accordance with this guideline.

5.4 Asbestos Regulations

Asbestos containing materials shall be undertaken in accordance with the requirements of the:

NSW	– Work, Health and Safety Act 2011 – Work, Health and Safety Regulation 2017 – Code of Practice - How to safely remove Asbestos, December 2011 – Waste Classification Guidelines: Part 1: Classifying Waste (DECC 2008)

6 WASTE CLASSIFICATION

Waste is generally classified on the basis of its potential harm to the environment. A summary of the waste classification requirements is provided below.

6.1 NSW

Waste Classification	Description
Special Waste	– Special waste includes asbestos waste and waste tyres. – Asbestos waste means any material or material that contains the fibrous form of mineral silicates. – Waste Tyres is any used, rejected or unwanted tyres including shredded or tyre pieces.
Liquid Waste	– Liquid waste means any waste that: – Has an angle of repose of less than 5 degrees, or – Becomes free-flowing at or below 60 degrees Celsius or when it is transported, or – Is not generally capable of being picked up by a spade or shovel.
General Solid Waste (putrescible)	– Household waste that contains putrescible organics waste from litter bins collected by local councils.
General Solid Waste (non-putrescible)	– Glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal – Paper or cardboard – Grit, sediment, litter and gross pollutants from stormwater treatment devices, stormwater management systems that has no free liquids – Garden & wood waste – Containers previously containing dangerous goods, as defined under the Australian Code for the Transport of Dangerous Goods by Road and Rail, where residues have been appropriately removed by washing or vacuuming drained – Oil filters (mechanically crushed), rags and oil-absorbent materials that only contain non-volatile petroleum hydrocarbons and have no free liquids – Drained motor oil containers that do not contain free liquids

Waste Classification	Description
	– Synthetic fibre waste from fibreglass, polyesters and other plastics and is packaged securely to prevent dust emissions, that is confirmed as not being asbestos waste – Virgin excavated natural material – Building and demolition waste – Asphalt waste, including asphalt from road construction and waterproofing works – Cured concrete waste from batch plants – Fully cured and set thermosetting polymers and fibre-reinforcing resins, glues, paints, coatings and inks

Table 03 – Waste Classifications (NSW)

Further details on the classification of waste can be found in the OEH's Waste Classification Guidelines 2008.

7 WASTE MANAGEMENT

7.1 Waste Sources

The following information in this section outlines the anticipated waste and management options to address the generated waste. All waste will be removed progressively with minimal amount stored on site.

Waste that is not removed immediately will be stored in designated areas in proprietary storage facilities until it is reused or removed.

Waste will be classified according to the OEH Waste Classification Guidelines (2008).

Waste Category	Waste Generated	Classification
Waste produced from the demolition of the existing structures and roadways	– Concrete – Asphalt / bitumen – Steel – Brick – Internal fittings	General Solid
Waste from on-site maintenance and servicing of plant and equipment – note minor servicing only. Major servicing to be completed off site. (non-liquid)	– Drained and crushed oil filters and grease tubes – Used and defective parts – Oil soaked rags – Used oil absorbent materials	General Solid
Waste from crib sheds and office areas	– Food scraps, waste wrappers, waste-paper towels	General Solid Putrescible
Office and packaging waste (non-liquid)	– Paper, cardboard, glass, plastic (no food scraps etc)	General Solid

Waste Category	Waste Generated	Classification
Waste from construction activities (non-liquid)	– Waste is not contaminated or mixed with any other type of waste and does not contain asbestos – Plasterboard – Concrete pour residues – Aggregates – Damaged and off cuts of PVC pipes – Rejected or defective precast concrete – Steel waste – Used Geotextile – Timber waste	General Solid
Any waste that meets the criteria for assessment as dangerous goods under the Australian Code for the Transport of Dangerous Goods by Road and Rail	– Poisonous (toxic) substances and corrosive substances – Non-sag epoxy mortar binder – Synthetic rubber-based adhesive – Epoxy resins – Batteries	Hazardous

Table 05 – Sources of Waste

7.2 Waste Minimisation and Recycling

The following strategies will be implemented on site to minimise the generation of waste:

– Include project waste strategy in the project induction;

– Establishment of a combined waste collection system by a reputable service provider;

– Appropriate quantities of materials will be ordered to minimise wastage;

– Quality of materials supplied will be controlled to reduce rework and problems due to quality and additional material consumption;

– Prefabricated elements used where practical and reasonable;

– Establishment of comingled recycling receptacles for packaging and food container waste;

– Waste steel will be separated and disposed of into the steel recycling bin provided on site;

– Form work will be reused as often as possible;

– Waste timber and formwork will be sent to a recycling facility;

– Waste concrete will be sent to a recycling facility;

– Any green waste is to be mulched and removed from site. Where possible, with regard to the species, it is to be reused for landscaping purposes off site, and;

– Recycling of general waste such as paper, cardboard, aluminium cans and similar materials from offices and site facilities. Source separation will be provided for these facilities as shown below.

7.3 Waste Storage and Handling

During demolition and excavation, waste will be removed by a suitably licensed contractor and sent to pre-approved waste and resource recovery facilities. The handling, storage and transport of hazardous materials and waste shall be in accordance with Roberts Co Project Work, Health and Safety Management Plan, the National Code of Practice, the relevant Safety Data Sheet (SDS) on the product and the hazardous materials management procedures.

During construction, Roberts Co will provide the appropriate bins required dependent on the stage of the project including (but not limited to skip bins tipper bins, wheelie / Otto bins, recycling bins and food scrap bins throughout the duration of the project.

The type of bin will be required for the various activities being carried out;

– 240L bins will be utilised during the structure phase on the decks to be fed into 1.5m3 site bins;
– 240L bins during typical floor services and fit out stages to be fed into 1.5m3 site bins;
– 240L bins during the finishes to completion to be fed into 1.5m3 site bins; and
– The bins above will be progressively fed into 15m3 Marrells throughout the project.

Storage of waste oils and chemicals shall be in a purpose built secured bunded area. The capacity of the bunded area is to be at least 110% of the chemical stored within. An emergency response spill kit shall be located adjacent to the bunded area.

All storage containers and locations for the various waste streams shall be clearly labelled to ensure that mixing of wastes is avoided.

All material removed during the de-silting of drainage structures and sediment structures shall be disposed of in an approved disposal area on site.

Where spoil material is to be removed from the site for offsite disposal, Roberts Co must ensure that the waste is classified in accordance with the OEH Waste Classification Guidelines.

Figure 1 –Excavation storage and recycling areas.

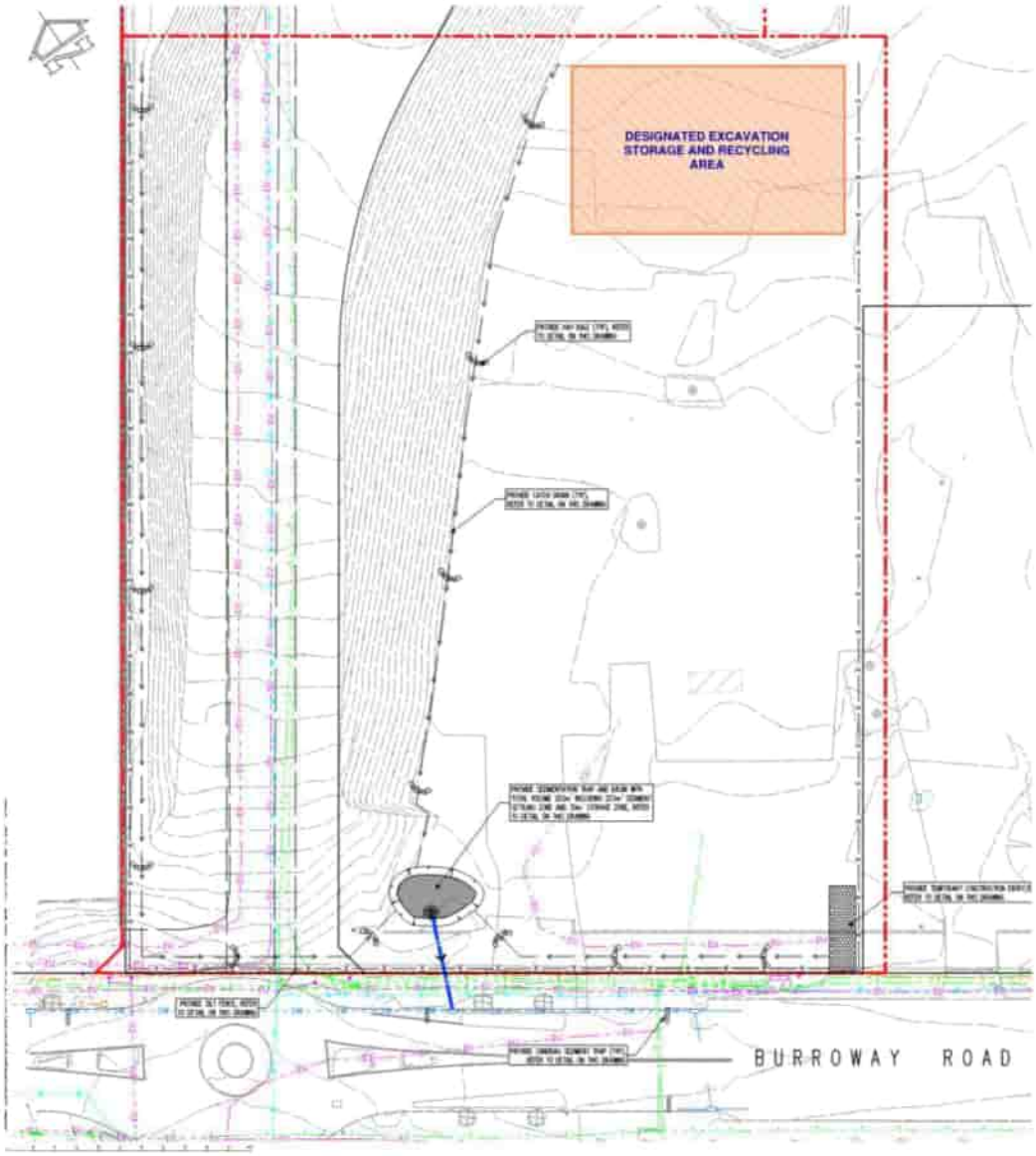
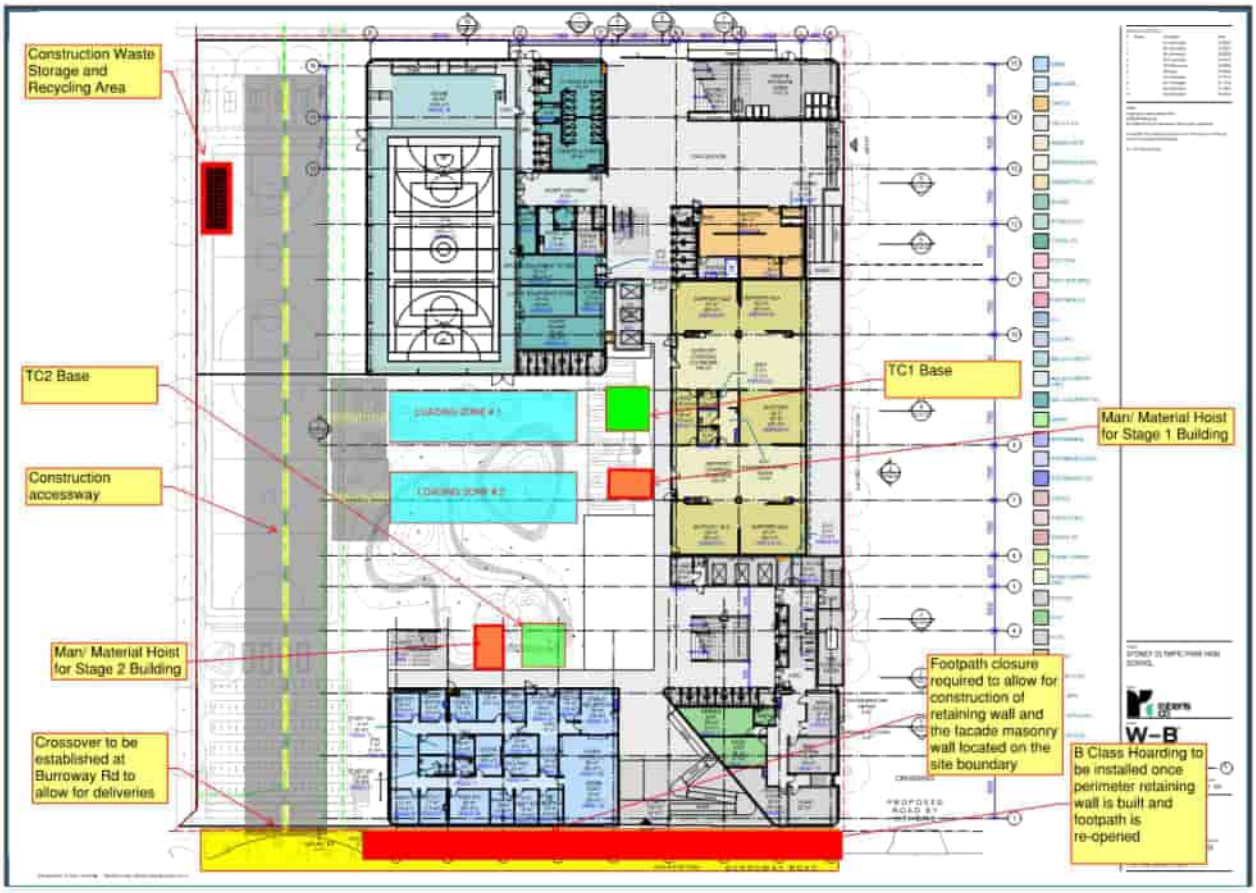


Figure 2 – Construction Waste storage and recycling areas.



7.4 Waste Forecast – Construction Phase

The objectives during demolition, excavation and construction waste management are to;

– Reduce the demand for waste disposal during demolition and construction;

– Maximise resource recovery through reuse and recycling;

– Assist in achieving Federal and Local Government waste minimisation targets in accordance with overarching regulations and plans;

– Document wastes that may be generated as part of the demolition and construction works (identification and proposed disposal method and destination), and;

– Aim to be awarded 2 credit points for Waste Management as stipulated under Green Star Office version 3. Two credit points are awarded where 90% of waste, by weight, generated on-site during the construction phase is re-used or recycled.

The above target will be achieved through maintained and consistent reuse and recycling efforts throughout the entire construction phase. Other construction and demolition related issues such as impact of the development on surrounding land used and public streets are addressed in the Construction Management Plan.

7.5 Types and quantities of waste

The following estimates of waste type and quantities have been made based on the anticipated extent of demolition and construction works. Demolition and Construction waste generation data has been provided by RCo based on similar projects of comparable type and size.

7.5.1 Excavation types and quantities of waste materials

There is no demolition associated with this project.

Table 05 identifies the types of materials likely to be generated during excavation. Accurate records of amount, type and destination of waste materials will be recorded and retained throughout the scope of works.

Material types	Anticipated Quantities
Soil (ENM)	450 m3
Soil (GSW)	1,500 m3
Concrete, Bricks, Tiles,	2,500 m3

Table 05 - Proposed waste material types and estimated generation.

7.5.2 Construction types and quantities of waste materials

An indicative forecast of generated waste generated throughout the construction activities is located in table 06 below. The table (06) represents the waste material type, estimated volumes calculated in recyclable percentages. The anticipated recycling and reuse rate for construction waste is 90% as per the project waste objective target set out in section 7.4 of this plan.

The estimated generation of construction waste is based on an average of 170m3 per month over a 18-month construction duration. Therefore, an estimated waste total of 3,060 m3 will be generated with the following estimated breakdown of waste type.

Waste Material types	Percentage (Approx.)
Heavy Recyclable Materials (soil, dirt, sand, rubble, brick, concrete, tiles, marble, stone)	28%
Light Recyclable Materials (cardboard, paper, plastic, plasterboard)	24%
Metals (ferrous, non-ferrous)	13%
Recyclable Timber / Green Waste	25%
Land Fill Waste	10%
Total Recycled Waste	90%

Table 06 - Waste Management and Resource Recovery Plan. A 90% recycling and reuse rate is expected.

8 WASTE RECORDS

Records of waste disposal must be maintained. All material that leaves the site must be classified and its disposal or recovery location recorded. Waste records are recorded on a central register.

Where any external waste contractors are used by Roberts Co, a copy of the relevant environment protection licence and disposal forms shall be obtained and verified.

All records will be filed, stored, and archived in accordance with the Roberts Co project filing index. In any case, records will be maintained for a minimum of four (4) years.

9 APPENDICES

Appendix 01 – Remediation Action Plan

Refer to document entitled ‘Remediation Action Plan Addendum’ revision 2 dated 1 March 2022 by Geosyntec.

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Remediation Action Plan Addendum

7-9 Burroway Road, Wentworth Point, NSW 2127

RobertsCo
1 March 2022

21067 RAP Addendum

Geosyntec consultants

Quality Management

Document Distribution

Issue/Revision	Issue 1	Revision 1	Revision 2
Remarks	DRAFT	DRAFT	FINAL
Date	13 January 2022	18 February 2022	1 March 2022
Prepared by	Edward Munnings	Edward Munnings	Edward Munnings
Signature	DRAFT	DRAFT	
Reviewed by	Peter Moore	Peter Moore	Peter Moore
Signature	DRAFT	DRAFT	
File reference	AU121067 Draft RAP Addendum 13Jan21	21067 Draft RAP Addendum 18Feb22	21067 Final RAP Addendum 1Mar22
Distribution	• RobertsCo • Geosyntec Electronic File	• RobertsCo • Geosyntec Electronic File	• RobertsCo • Geosyntec Electronic File

This report was prepared in accordance with the scope of services set out in the contract between Geosyntec Consultants Pty Ltd (ABN 23 154 745 525) and the client.

Geosyntec Consultants Pty Ltd
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Executive Summary

Geosyntec Consultants Pty Ltd (Geosyntec) was engaged by RobertsCo Pty Ltd (the Client), as the Environmental Consultant for the Sydney Olympic Park High School (SOPHS) redevelopment project, located on 7-9 Burroway Road, Wentworth Point, NSW (the project site). The main role of the Environmental Consultant is to facilitate the delivery of investigation, remediation and validation activities to render the site suitable for the proposed end use. A Remediation Action Plan (RAP) Addendum is required to document recent Data Gap Investigation (DGI) works and present any required amendments to the existing Parsons Brinckerhoff (PB) 2015 RAP based on the findings of the DGI, prior to commencement of the main remediation and development works. The site location is presented in Figure 1 and the site layout is presented in Figure 2, Appendix A.

The site is legally identified as part of Lots 202, 203 and 204, DP 1216628, and occupies an area of approximately 0.95 ha. The proposed redevelopment is understood to include school buildings and open space areas within the development footprint, and is consistent with the definition of 'HIL C' as presented in Schedule B1 of National Environment Protection (Assessment of Site Contamination) Measure (1999) as amended in 2013 (NEPM 2013), which includes public open space land use and secondary schools.

Mr Andrew Lau from JBS&G, an NSW EPA accredited Contaminated Land Auditor (the Auditor), has been appointed by Schools Infrastructure NSW to conduct an audit of the proposed school development with respect to land contamination. This is to ensure that the investigations and any remedial works are undertaken in accordance with the requirements of the NSW Contaminated Land Management Act (1997) so that the land is fit for purpose.

The site is impacted with contaminants associated with previous light industrial land use, filling, hazardous building materials, and suspected petroleum storage and infrastructure.

A Remediation Action Plan (RAP) was prepared by Parsons Brinckerhoff (PB) in 2015 for a portion of land identified as Area 1 (part of a wider area known as Stage 1), which included the site:

- Parsons Brinckerhoff (January 2015) Detailed Remediation Action Plan – Infrastructure Delivery Wentworth Point Development (Ref: 2207004B-RES-REP-001 RevC), referred to herein as the PB (2015) RAP.

The PB (2015) RAP specifically related to infrastructure delivery, including the construction of Ridge Road, which is located in the western portion of the site. The Auditor previously endorsed the PB (2015) RAP, with the endorsement relating to the intent of the RAP at that time i.e., Infrastructure Delivery, as the high school land use had not been determined at that time.

In 2019, Stage 1 remediation works were undertaken on the wider peninsula site which involved the placement of a cap on part of the area occupied by the proposed school site. The capping works were undertaken by Landcom with Zoic Environmental being the environmental consultant and Mr Andrew Lau appointed as the NSW EPA accredited Site Auditor for these works. Details of the capping works were presented in the following document:

- Zoic Environmental (March 2020) Interim Validation Report Early Works Package Headland Park Wentworth Point Development, 7, 9 and 11 Burroway Road, Wentworth Point, NSW 2127 (Ref: 18170 EW VAL).

The report confirms the placement of capping material in the same configuration that is presently located in this area with the completed works being endorsed by the Site Auditor pertaining to infrastructure delivery (Ridge Road), in accordance with the PB (2015) RAP. These works are referred to as the 'Zoic 2019-2020' remediation works'.

When the high school development was confirmed for the site, Geosyntec recommended that the PB (2015) RAP be used as the basis for any remediation works that are proposed to be undertaken

on the site in the future, given that the risk overall profile for the area had not changed and that under NEPM 2013 the site still falls into same land use category (HSL C as presented in Schedule B1). It is understood that rather than preparing an entirely new RAP for remediation of the site, it was requested that a RAP Addendum be prepared to document the site-specific remediation and validation requirements to be followed in conjunction with the PB (2015) RAP capping strategy during the main remediation works, to make the site suitable for the proposed High School use. It is understood that this approach has been endorsed by the Auditor.

Prior to the commencement of the early works, Geosyntec prepared a Sampling Analysis and Quality Plan (SAQP) (Geosyntec (19 November 2021) Sampling Analysis and Quality Plan – Sydney Olympic Park High School). The SAQP details the DGI works and validation works required to be undertaken in accordance with the Auditor endorsed RAP to ensure that the site is suitable to the proposed land use. The Geosyntec (2021) SAQP was endorsed by the Auditor.

This RAP Addendum Report documents the DGI works completed alongside the early works component of the proposed development, in accordance with the Auditor endorsed Geosyntec (2021) SAQP, and presents required amendments / additions to the PB (2015) RAP based on the DGI findings. The DGI included the following scope of work:

- Excavation of test pits in locations of former underground storage tanks (USTs) and other infrastructure, including two UST locations, former Mechanics Pit which was uncovered during excavation works and a former Wash Bay.
- Confirmation of groundwater conditions with sampling from existing wells at the site.
- Confirmation of landfill gas conditions with monitoring from existing wells at the site.
- Assessment of tidal influences on ground gas at the site through collection of continuous water level and ground gas data.

Key findings of the DGI are presented below:

- UST Location 1, UST Location 2 and the Former Mechanic Pit Location have been identified as areas requiring remediation due to the presence of remnant infrastructure, observations of hydrocarbon odour and sheen during test pitting, and several exceedances of adopted site suitability criteria for total recoverable hydrocarbons. Remediation requirements are outlined in Section 11.
- The Former Wash Bay Location was not identified as an area requiring remediation, with no observations of contamination made during investigation activities, and no exceedances of adopted HSL C criteria for secondary school grounds.
- Groundwater at the site does not require remediation, with chemical results considered to be representative of regional conditions given that much of the wider peninsula comprises former landfilled areas.
- The gas screening value (GSV) using data from the DGI was calculated to be 1.34 L/hr (Max. Methane (15.1%v/v) x Max. BH Flow (8.9 L/hr), which gives a characteristic situation (CS) of CS3 (moderate risk). This is within the historical range for the site (CS2 to CS4) and therefore the current design assumptions for the gas mitigation system detailed in the Draft Design and Verification Plan (DVP) for CS4 can be retained.
- Ground gas concentrations appeared to be primarily affected by diurnal effects, with no clear correlation between tidal cycles and standing water level or landfill gas. It is therefore concluded that tidal activity does not affect ground gas behaviour at the site.

Amendments / Additions to the PB (2015) RAP

Based on the findings of the DGI and the layout of the proposed development, Geosyntec presented RAP Amendments in Section 11 of this report, including the following:

- Validation Criteria Updates;
- Remediation Requirements of USTs and Other Infrastructure;
- A Validation Works Sampling and Analysis Plan;
- Requirements for the Reinstatement of Marker and Capping Layer Following Excavations;
- Management Measures for the Previously Placed Cap in the Western Portion of the Site; and
- Discussion of Ground Gas Protection System (GGPS)

Following remediation and validation activities, a long term environmental management plan (EMP) will be prepared for the site which will document ongoing management requirements for the entire site including the GGPS.

On the basis of the DGI results, the site can be made suitable for the proposed high school development, providing that the requirements of the 2015 PB (2015) RAP and this RAP Addendum are implemented.

Geosyntec consultants

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1 Introduction

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Mr Andrew Lau from JBS&G, an NSW EPA accredited Contaminated Land Auditor (the Auditor), has been appointed by Schools Infrastructure NSW to conduct an audit of the proposed school development with respect to land contamination. This is to ensure that the investigations and any remedial works are undertaken in accordance with the requirements of the NSW Contaminated Land Management Act (1997) so that the land is fit for purpose.

1.1 Background

The site is impacted with contaminants associated with previous light industrial land use, filling, hazardous building materials, and petroleum storage and infrastructure.

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In 2019, Stage 1 remediation works were undertaken on the wider peninsula site which involved the placement of a cap on part of the area occupied by the proposed school site. The capping works were undertaken by Landcom with Zoic Environmental being the environmental consultant and Mr Andrew Lau appointed as the NSW EPA accredited Site Auditor for these works. Details of the capping works were presented in the following document:

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When the high school development was confirmed for the site, Geosyntec recommended that the PB (2015) RAP be used as the basis for any remediation works that are proposed to be undertaken on the site in the future, given that the risk overall profile for the area had not changed and that under NEPM 2013 the site still falls into same land use category (HIL C as presented in Schedule B1). It is understood that rather than preparing an entirely new RAP for remediation of the site, it was requested that a RAP Addendum be prepared to document the site-specific remediation and validation requirements to be followed in conjunction with the PB (2015) RAP capping strategy during the main remediation works, to make the site suitable for the proposed High School use. It is understood that this approach has been endorsed by the Auditor.

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This RAP Addendum Report documents the DGI works completed alongside the early works component of the proposed development, in accordance with the Auditor endorsed Geosyntec (2021) SAQP, and presents required amendments / additions to the PB (2015) RAP based on the DGI findings.

1.2 Proposed Development

The proposed redevelopment is understood to include school buildings and open space areas within the development footprint. The proposed building layout is presented in Figure 3, Appendix A.

The early works component of the proposed development, completed during November and December 2021, involved removal of the previous concrete slab to facilitate the DGI works and undertaking the investigative works, followed by placement of a high visibility marker layer and capping layer consisting of material previously placed on the west of the site (known as Ridge Road) as part of the Zoic 2019-2020 remediation works.

1.3 Objective

The objective of the DGI works were to close out previously identified data gaps relating to the contamination status of the site and inform any amendments to the PB (2015) RAP, to allow the site to be remediated and made suitable for the proposed intended use as a high school.

1.4 Scope of Work

To achieve the objective, the following has been completed in accordance with the (2021) SAQP:

- Excavation of test pits in locations of former underground storage tanks (USTs) and other infrastructure, including two UST locations and former Wash Bay. During these excavations, an unidentified Mechanics Pit was uncovered which was then also included in the DGI.
- An assessment of the presence of Asbestos Containing Material across the project site.
- Confirmation of groundwater conditions with sampling from existing wells at the site.
- Confirmation of landfill gas conditions with monitoring from existing wells at the site.

- Assessment of tidal influences on ground gas at the site through collection of continuous water level and ground gas data.

1.5 Regulatory Framework

Field activities and reporting were carried out in general accordance with the following guidelines and regulations:

- NEPC (1999) National Environment Protection (Assessment of Site Contamination) Measure, Schedule A and Schedules B(1)-B(9). National Environment Protection Council, Adelaide, as amended in April 2013 [referred to herein as NEPM (2013)].
- NSW Department of Urban Affairs and Planning (1998) Managing Land Contamination: Planning Guidelines: SEPP 55 Remediation of Land, August 1998.
- NSW EPA (2020) Consultants Reporting on Contaminated Land - Contaminated Land Guidelines.
- Contaminated Land Management Act 1997.
- Environmental Planning and Assessment Act (EPA Act) 1979 / State Environmental Planning Policy No. 55 (2020): Remediation of Land (SEPP 55).
- NSW EPA (1995) Contaminated Sites: Sampling Design Guidelines. NSW EPA, Sydney.
- NSW EPA (2014) Waste Classification Guidelines: Part A – Classifying Waste.
- Safe Work Australia (2019a) How to Manage and Control Asbestos in the Workplace.
- Safe Work Australia (2019b) How to Safely Remove Asbestos Code of Practice.
- WA DoH (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.
- Work Health and Safety Act (2011) and Regulations (2017).

2 Site Identification and Conditions

2.1 Site Identification

The site location is shown in Figure 1, with the site layout plan in Figure 2, Appendix A. Information in the following section was sourced from the Zoic Environmental Pty Ltd (Zoic) (2019) SAQP – Headland Park (File reference: 18170 SAQP Peninsula Park Landcom 19Feb19 Final) for 7, 9 and 11 Burroway Road, Wentworth Point, NSW 2127, which encompassed the site. The site identification and land use details include:

Table 2.1: Site Identification

Title	Details
Street Address:	Part of 7-9 Burroway Road, Wentworth Point, NSW 2127
Property Description:	Part of Lots 202, 203 and 204, DP 1216628
Current Site Ownership:	NSW Department of Education
Geographical Coordinates:	Lat: -33.823734° Long: 151.080786°
Property Size:	Approximately 0.95 hectares
Local Government Area:	City of Parramatta Council (formerly Auburn City Council)
Zoning – Existing:	B1 Neighbourhood Centre, R4 High Density Residential and RE1 Public Recreation (Auburn Local Environmental Plan (ALEP) 2010 and Draft Parramatta Local Environmental Plan 2020)

2.2 Surrounding Land Use

Land uses immediately adjoining the Site are described as follows:

Table 2.3: Immediate Site Surrounds

Title	Details
North:	Vacant land comprising part of the proposed Wentworth Point Peninsula Park redevelopment area followed by Parramatta River.
East:	Vacant land comprising part of the Wentworth Point Marina and Rowing Club redevelopment area followed by Homebush Bay.
South:	Burroway Road followed by a construction site.
West:	Wentworth Point Public School followed by Marina Square Shopping Mall.

In addition to the above, it is noted that several former landfill areas are located around the Wentworth Point area in which the site is located. These were generally active between the 1950s and 1980s

3 Environmental Setting of the Site

3.1 Site Condition

The site condition is based on published information and a review of past reports and is presented in Table 3.1.

Table 3.1: General Site Conditions

Title	Details
Topography and Drainage:	The site is less than 10m Australian Height Datum (AHD). In general, the site is relatively level and has been subjected to historical filling associated with land reclamation which has altered topography. Surface water is expected to infiltrate into unsealed areas or consist of overland flow and ultimately drain to the Parramatta River or Homebush Bay which are located to the north and east of the site respectively.
Site Surface & Vegetation:	The site surface consists of concrete slabs in the centre and eastern portions, and previously placed VENM material in the western portion. Vegetation at the site comprises some trees and shrubs growing between the concrete slabs and some grasses growing on the VENM material.
Condition of Buildings & Roads:	There are currently no buildings or roads onsite.
Relevant Local Sensitive Environments:	Local sensitive receiving environments include Parramatta River and Homebush Bay, located away from the northern and eastern boundaries respectively.
Condition of the site since issue of 2020 Interim Audit Advice	By the completion of the Zoic 2019-2020 Remediation and Validation works, the western portion of the site has been capped with a minimum thickness of 500mm VENM in accordance with the PB (2015) RAP. No changes occurred at the site, including the validated western portion and existing hardstand in the remainder of the site, between the completion of the Zoic 2019-2020 works and the commencement of early works in October 2021, other than the placement and removal of some construction offices on existing hardstand areas and the appearance of some weeds across the site surface (See Figure 6, Appendix A). The composition of the capping material imported as VENM has not changed since its placement in 2019.

3.2 Geology, Hydrogeology and Hydrology

The geology, hydrogeology and hydrology is summarised in Table 3.2. This information has been extracted from PB (2015) RAP.

Title	Details
Geology Map Conditions:	Section 2.4.2 in the PB (2015) RAP states that the Sydney 1:100,000 scale Geological Series Sheet 9130 indicates that the site is underlain by fluvial soils of the Birrong Soil Landscape Group.
Soil Map Conditions:	Table 2.2 in the PB (2015) RAP provides a summary of the ground conditions at the site: • The site is underlain by a layer of fill at depths ranging between 0-2.4m below ground level (bgl). The composition of the fill is variable across the site comprising clay, gravelly sand, sand, clayey sand, sandy clay, gravels, and anthropogenic materials including crushed sandstone, shale, brick, concrete and terracotta.

Title	Details
	Varying amounts of slag, seashells, charcoal, and blue metal gravels were also observed. • Beneath the fill layer lies a layer of natural soils comprising grey, dark grey, and black clays, sand and sandy clay. The natural materials were reported as soft and wet and were representative of either dredged materials from adjacent Parramatta River, salt march or mangrove bed materials. The depths of this layer range between 1-4.8m deep. • The natural soils are underlain by a highly weathered, grey sandstone, which was encountered at 4.4-4.8mbgl.
Acid Sulfate Soils:	Section 2.4.2 in the PB (2015) RAP states that the Prospect/Parramatta River 1:25,000 Acid Sulfate Soils Risk Map indicates that the site is classified as 'Disturbed Terrain' that includes filled areas that occur during the reclamation of low lying swamps for urban development. Other activities that result in the classification of a disturbed terrain include dredging, heavy ground disturbance through urban development and/or construction of dams or levees.
Depth to Groundwater:	Standing water levels at the site as informed by the PB (2015) RAP which indicates groundwater is encountered between 0.6-3.7m bgl with an average of 1.7m bgl.
Direction and Rate of Groundwater Flow:	Table 2.4 in the PB (2015) RAP states that the direction of groundwater flow onsite was inferred to the northwest and northeast towards Parramatta River and Homebush Bay, respectively.
Summary of Monitoring Wells & Use of Water Abstraction:	Section 2.4.2.1 in the PB (2015) RAP provides a summary of the registered bore search results completed by GHD in 2009. The search of NSW Department of Primary Industries Office of Water All Groundwater Map identified six (6) licenced bores within 1km of the site boundaries. Four of the bores are located to the north of Parramatta River and are therefore not considered relevant to the site. Two wells were south of Parramatta River and are detailed below: • Registered bore GW067978 – located east of Homebush Bay and registered for irrigation purposes. The bore was installed in 1992, to a total depth of 180 m. Groundwater was encountered in the sandstone bedrock aquifer in multiple water bearing zones including: 65-65.1m (indicative of freshwater conditions); 71.4-71.5m (indicative of saline conditions); 78.4-83m in the sandstone bedrock (indicative of highly saline conditions); and 91.2-102m (indicative of highly saline conditions). • Registered bore GW107955 – located at 1 Bennelong Road and registered for monitoring purposes. The bore was installed to a total depth of 5m. No further details regarding the depth to groundwater or the geology encountered was available for this bore.
Nearest Water Body:	The closest receiving water body from the site is the adjoining Parramatta River and Homebush Bay to the north and east of the site, respectively.

4 Data Quality Objectives

The data quality objective (DQO) process is a systematic planning tool based on the scientific method for establishing criteria for data quality and for developing data collection designs. The DQO defines the experimental process required to test a hypothesis.

The DQO process has been developed to ensure that efforts relating to data collection are cost effective, by eliminating unnecessary, duplicative or overly precise data whilst at the same time, ensuring the data collected is of sufficient quality and quantity to support defensible decision making.

It is recognised that the most efficient way to accomplish these goals is to establish criteria for defensible decision making before data collection begins and develop a data collection design based on these criteria. By using the DQO process to plan the investigation effort, the relevant parties can improve the effectiveness, efficiency and defensibility of a decision in a resource and cost effective manner.

4.1 Guidance Documents

DQOs have been developed to detail the type of data that is needed to meet the overall objectives of this project (refer to Section 1.2), including the Data Gap Investigation and Validation Strategy. The DQOs have been developed in general accordance with guidelines made or approved by NSW EPA.

4.2 Process for DQO Development

The DQO process consists of seven steps, which are designed to clarify the study objectives, define the appropriate type of data and specify tolerable levels of potential decision errors. The seven-step DQO process adopted for the works is as follows:

- Step 1 – Defining the Problem. The first step in the DQO process is to 'define the problem' that has initiated the investigation;
- Step 2 – Identify the Decision. The second step in the process is to define the decision statement that the study will attempt to resolve;
- Step 3 – Identify Inputs to the Decision. In this step, the different types of information needed to resolve the decision statement are identified;
- Step 4 – Define the Study Boundaries;
- Step 5 – Develop a Decision Rule;
- Step 6 – Specify Limits on Decision Errors; and
- Step 7 – Optimise the Design for obtaining the Data.

4.3 Step 1 – Defining the Problem

4.3.1 Concise Description of the Problem

The site has been planned to be redeveloped into Sydney Olympic Park High School, including school buildings and a play area. Previous investigations have identified contaminated soil, potential petroleum (diesel) storage infrastructure and a wash down area, asbestos, and potential acid sulfate soils that require management.

Data Gap Investigation

The problem is previously identified data gaps require additional investigation in order to:

- Confirm hazardous ground gas ratings to inform the design of the gas mitigation system.
- Assess potential for tidal influences on ground gas at the site.
- Locate suspected underground storage tanks (USTs) and identify any associated contamination and whether any remedial works are required.
- Confirm groundwater conditions at the site and assess risk towards Parramatta River and Homebush Bay.

Validation Strategy

The problem is how the site will be remediated to address the identified potential health and environmental risks in relation to the identified contamination and if the remediation can be integrated into the proposed redevelopment works and construction methodologies to avoid large scale disturbance or generation of significant quantities of waste requiring offsite disposal.

The matters considered within the validation strategy are:

- What work is required (i.e., survey data) to validate the remediation strategy?
- How many soil samples should be collected to suitably validate any reuse of the cut-to-fill materials onsite?
- What sampling design (i.e. locations, layout, frequency) should be used to achieve the DQOs?

It is noted that Section 7.5.3 in the PB (2015) RAP states that 'cut-to-fill material' and/or spoil material for reuse (below the cap) will require to be validated in order to evaluate its suitability for reuse onsite. Section 6.4.7 in the PB (2015) RAP states that any fill material generated during piling works for the construction of retaining walls, service excavation or stormwater drains should be validated for reuse onsite, and if suitable, reused beneath the capping layer.

However, Section 4.1 in the PB (2015) RAP states that, 'based on the proposed remediation strategy that will provide a cap over the identified contaminated fill, exposure to the identified COPCs in the material below the cap is considered to be mitigated by the presence of the cap. Hence, separate remediation criteria for material below the cap was not presented'.

On this basis, any cut-to-fill material to be placed under the cap is not proposed to be validated as part of the validation works, with the exception of the following (if required as part of the development):

- Construction of earth retaining walls associated with the proposed new roads and pavements where the walls can be constructed using 'a profile of validated, clean onsite cut-to-fill material (compacted in controlled layers), and imported material to provide stability'. Any cut-to-fill materials to be used for the construction of earth retaining walls will be validated as per the requirements outlined in the PB (2015) RAP.
- Any other situations where reuse of cut-to-fill materials or spoil above the cap is proposed.

The above deviation from the PB (2015) RAP has been approved by the Site Auditor (email dated 29 October 2018) as part of the previous remediation works across the wider Stage 1 Area.

Section 6.6.2 in the PB (2015) RAP states that field pH measurements of excavated material will need to be undertaken to determine whether treatment / neutralisation is required prior to reuse or disposal. This will be conducted by the appointed Principal Contractor.

4.4 Step 2 – Identify the Decision

Based on the decision-making process for assessing urban redevelopment sites detailed in Appendix A of NSW EPA (2017) Guidelines for the NSW Site Auditor Scheme (3rd edition) and modified to relate to the specific redevelopment requirements for the proposed Data Gap Investigation, remediation and validation works, the following decisions are required to be made:

Data Gap Investigation

- Are hazardous ground gas ratings within the historical range between CS2 and CS4? Do landfill gas concentrations pose a risk to human health?
- Does tidal activity influence ground gas behaviour at the site?
- Are USTs or other infrastructure present? Do chemical concentrations in soil adjacent to these pose a risk to future site users/environment?
- Do chemical concentrations in site groundwater pose a risk to environmental receptors?

Validation Strategy

- Will chemical concentrations in excavated spoil and/or site soils intended to be reused as fill onsite pose a risk to future site users/environment following removal of infrastructure and impacted soils in the UST, wash bay and mechanical pit areas?
- Is the spoil/soil material (including material from removal of the USTs, Mechanics Pit and Wash bay) to be disposed offsite classified in accordance with waste classification guidelines?
- Does the imported material used for the capping layer comply with VENM/ENM criteria?
- Has the site been adequately capped?

4.5 Step 3 – Identification of Inputs into the Decision

4.5.1 List of Informational Inputs Needed to Resolve the Decision Statement

The information inputs required include:

Data Gap Investigation

- Relevant historical data from previous reports
- Conceptual site model presented in Section 4
- Observations made during the proposed field works
- Results from manual and continuous ground gas monitoring of existing wells at the site.
- Results from a level logger deployed at the site.
- The locations of USTs and the former infrastructure (i.e. the former wash bay) were determined by correlating known locations from a previous GHD investigation with historical aerial photographs which will be investigated using test pits / trenching. Visual inspection of trenching excavations in potential UST and wash bay locations, and results from soils collected from trenches if USTs are identified. Note that USTs are not permitted to be removed as part of the approved early works.
- Adopted site criteria being NEPM 2013 Health Investigation/Screening Levels for Secondary Schools Land Use (HIL/HSL-C (outdoor areas)/HSL-A/B (building footprints) for soils, Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) (2018) Default Guideline Values for Marine Waters with 95% protection level and PFAS National

Environmental Management Plan (2020) (NEMP 2020) Human Health (non-potable and recreational uses) and Ecological (slightly to moderately disturbed ecosystem) criteria.

Validation Strategy

- Results from the validation and waste classification works, including chemical results from samples collected from the UST, Mechanics Pit and Wash bay areas.
- Visual inspection of site areas, soils and ground works during remediation on a regular basis (including photographic records) (including the UST, Mechanics Pit and Wash bay areas).
- Adopted site criteria being NEPM 2013 Health Investigation/Screening Levels for Secondary Schools Land Use (HIL/HSL-C).
- Information obtained from VENM / ENM source sites (e.g., VENM certificates, ENM classification documentation), and results from the VENM / ENM sampling works.
- Pre-and post-survey data to confirm capping thickness.

4.5.2 List of Environmental Variables or Characteristics that will be Measured

Data Gap Investigation

The Data Gap Investigation will require the following parameters to be measured:

- Landfill gas concentrations (i.e. methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulfide) will be determined using an appropriately calibrated landfill gas analyser, and Biosystems Gas Flux (or similar) for one location, to be selected based on initial hand-held landfill gas monitoring results. Atmospheric pressure, flow rate and pressure differential will also be recorded.
- Groundwater level will be recorded continuously for a set period of time covering several tidal cycles using a level logger for in well location, to be selected based on initial results, representativeness of ground gas conditions at the site and proximity to Parramatta River.
- Soil samples from trenching excavations near any identified USTs or other infrastructure will be analysed for total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylene (BTEX) and polycyclic aromatic hydrocarbons (PAH). Selected soil samples may be analysed for PFAS as a screening measure.
- Groundwater samples from selected existing wells will be analysed for 8 heavy metals, ammonia, phenols and per-and-poly fluoroalkyl substances (PFAS).

Validation Strategy

The PB (2015) RAP has presented the following characteristics, which will be measured:

- **Cut-to-fill material and other excavated materials generated from the site for onsite reuse**: Representative soil samples will be analysed for: heavy metals (arsenic, cadmium, chromium, copper, iron, lead, nickel, zinc), total recoverable hydrocarbons (TRHs), benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAHs) and asbestos (ACM and 500ml). ASLP will be conducted for metals and PAHs where necessary. We note that the PB (2015) RAP has proposed the SPOCAS test for ASS analysis, however, Geosyntec considers the chromium reducible sulfur suite (CRS) test is a more reliable indicator for ASS presence.
- **Material requiring offsite disposal:** Representative soil samples will be analysed for: heavy metals, total petroleum hydrocarbons (TPHs), BTEX, PAHs, CRS test and asbestos (presence

/ absence only). The specific contaminant concentrations (SCCs) and toxicity characteristics leaching procedure (TCLP) data will determine waste classification.

- **Capping material**: The following information will be reviewed prior to material importation as we understand that there is a net deficit of soil available on the site to complete capping:
  - Relevant VENM certificate or ENM assessment provided by the source site/s
  - Published site history information such as historical aerial photography and NSW EPA records
  - Visual inspection at the source site/s to confirm the material meets the definition of VENM or ENM
  - Regular visual inspection of the material at arrival
  - Representative soil samples will be collected and confirmed as VENM/ENM by testing for: heavy metals, TPH, BTEX, PAHs, electrical conductivity (EC) and pH, in accordance with the requirements under the Excavated Natural Material Resource Recovery Order 2014.
  - The above findings will be presented to the Site Auditor. Material will not be imported onsite for use without prior approval by the Site Auditor.
- **Survey data** will be collected prior to, and post installation of the capping layer to confirm capping layer thickness.
- Regular site inspections during remediation works. **Photographic records** (e.g., during installation of marker layer) will be collected and included in the Validation Report.

4.5.3 Identification of Site Criteria for Each Medium of Concern

Data Gap Investigation

The criteria that will be adopted for the data gap investigation works are outlined below:

- NSW EPA (2020) Hazardous Ground Gas Guidelines will be adopted with respect to assessment of landfill gas. This will include consideration of gas concentration, flow rate, gas screening values, characteristic gas situation and prevailing atmospheric pressure.
- It is considered that use of SafeWork NSW (2018) Workplace Exposure Standards for Airborne Contaminants is appropriate for use in the Gas Monitoring Well Network beneath the site. It should be noted that the recorded concentrations are taken within the ground and the criteria are designed to be applied to the atmosphere thus adding a further layer of conservatism. Where site users and construction workers are present in these areas, it is considered unlikely that they would be exposed to concentrations in the ground or that their exposure time will be greater than 8hrs per day and consequently the adopted criteria would also be protective of their health.
  - SafeWork NSW (2018) TWA screening criteria for hydrogen sulfide: 10 ppm
  - SafeWork NSW (2018) TWA screening criteria for carbon monoxide: 30 ppm
  - Additionally, AS2865 – 1995 Safe Working in a Confined Space guidelines will used for oxygen (>19.5%v/v).
- Soil samples collected from UST / diesel infrastructure trenches will be compared to NEPM (2013) Health Investigation Levels (HIL) and Health Screening Levels (HSL) for C – Secondary Schools for sandy soil (0 to <1m depths) given the proposed land use and NEPM (2013) Management Limits for Total Petroleum Hydrocarbons for residential, parkland and public open space use for coarse soil.
- Groundwater samples will be compared to Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) (2018) Default Guideline Values for Marine Waters with 95%

protection level and PFAS National Environmental Management Plan (2020) (NEMP 2020) Human Health (non-potable and recreational uses) and Ecological (slightly to moderately disturbed ecosystem) criteria.

- Any contact with potential acid sulfate soils will be assessed in accordance with NSW Acid Sulfate Soils Management Advisory Committee (1998) Acid Sulfate Soil Assessment Guidelines (AASSMAC 1998) where required.
- Aesthetic considerations will also be taken into account during investigation activities, particularly the presence of hydrocarbon sheens and/or odours in groundwater.

Validation Strategy

The criteria that will be adopted for the validation works are outlined below:

- For spoil/soil intended for onsite reuse, the material will be compared to:
  - NEPM (2013) Health Investigation Levels (HIL) C.
  - Health Screening Levels (HSL) A/B as required by NEPM (2013) for assessment of secondary schools, for sand soil.
  - NEPM (2013) Management Limits for Total Petroleum Hydrocarbons for residential, parkland and public open space use for coarse soil.
- Where soils are to be placed below the cap, an assessment of risk towards potential receptors will also be made in addition to comparison against the above criteria, given that the cap will act as a barrier to underlying fill soils.
- Any soils proposed to be used for tree planting, landscaping or garden bed areas will be assessed against NEPM (2013) Ecological Investigation and Screening Levels (EILs and ESLs). Ecological criteria will only be applicable to soils present within the top 2m of these locations.
- Material to be disposed offsite will be compared to NSW EPA (2014) Waste Classification Guidelines – Part 1, Classifying Waste and Part 4 Acid Sulfate Soils (where required) to determine the materials' waste classification and inform disposal options.
- Capping material will be assessed as described in Table 7.1 of the SAQP. Validation samples will be collected in general accordance with the NSW EPA (2014) The Excavated Natural Material Order. If ENM materials are used, the results will be compared to the criteria presented in the NSW EPA (2014) The Excavated Natural Material Order.
- Capping thickness will be determined from pre-and post-capping survey data to ensure compliance with the approved capping design requirements as described in Section 6 and the PB (2015) RAP. Any changes to the final capping design are required to be reviewed and endorsed by the appointed Site Auditor prior to implementation.

Ecological criteria are not considered relevant as the site is expected to be capped with concrete hardstand or clean topsoil. Given the presence of the marker layer, it is anticipated that only trees with shallow roots will be planted onsite. If large trees are required to be planted in any area of the site, modifications to the depth of the capping layer will need to be considered.

4.5.4 Identification of Analytical Methods that are required for Chemicals of Potential Concern so that Assessment can be made Relative to the Site Criteria

The table below outlines the analytical methods of the NATA accredited primary laboratory Eurofins.

Table 5.1 Summary of Soil Analytical Methods

Analyte	Soil	LOR (mg/kg)
Asbestos	AS4964-2004 (Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia May 2009)	0.001%w/w
Mercury	US EPA 7470/1	0.1 mg/kg
Other Metals	US EPA 6010, 6020	0.1-5 mg/kg
Acid Sulfate Soils	ASSL Methods Guidelines Version 2.1	Various
TRH	P&T GC/MS GC/FID (USEPA 8260/8000) NEPM 2013 Schedule B3	20-100 mg/kg
SVOC	GC/MS (USEPA 8270) NEPM 2013 Schedule B3	0.5-5 mg/kg
VOC	P&T GC/MS USEPA 8260 NEPM 2013 Schedule B3	0.5-1 mg/kg

Table 5.2: Groundwater Analytical Methods

Analyte	Analytical Method	LOR (µg/L)
TPH	P&T GC/MS GC/FID (USEPA 8260/8000)	10-100
PAH	Capillary GC/MS in SIM (USEPA SW 846 - 8270B)	1-2
Mercury	Cold Vapour AAS (USEPA 7471A)	0.05
Metals	ICP-OES (USEPA 200.7)	0.1-1.0
VOCs	P&T GC-MS (USEPA 8260B)	1-2
PFAS	LC-MS/MS (USEPA Method 537.1-169) NEMP (2020) 2.0	0.01-0.02

4.6 Step 4 – Defining the Study Boundaries

4.6.1 Detailed Description of the Spatial and Temporal Boundaries of the Problem

The lateral boundary of the remediation area is presented in Figure 2, Appendix A.

The vertical study boundary is nominated to extend to the required depth for the cut-to-fill program for the redevelopment, or by the maximum depth of UST trenching excavations (maximum target depth 4m below existing ground level (bgl) or at interception of groundwater which is anticipated to be at approximately 3m bgl or shallower, beyond which deeper excavation may not be possible due to test pit collapse).

4.7 Step 5 –Developing Decision Rules

The decision rules adopted to answer the decisions outlined in Section 5.4 are summarised in the following table:

Table 5.3 Summary of Decision Rules

No.	Decision to be Made	Decision Rule
Data Gap Investigation		
1	Are hazardous ground gas ratings within the historical range between CS2 and CS4? Do landfill gas concentrations pose a risk to human health?	If concentrations of landfill gas generate ratings are between CS2 and CS4 inclusive, then YES, ratings are within the historical range and the current design assumptions for the gas mitigation system will likely be retained. If ratings fall outside this range, then the answer is NO. If the rating is greater than CS4, then the current design assumptions must be reconsidered. Landfill gas will be assessed in accordance with NSW EPA (2020) Guidelines for the Assessment and Management of Sites Affected by Hazardous Ground Gases, including consideration of landfill gas concentrations, flow rates, gas screening values and characteristic gas situations. If results are less than the adopted site criteria then the decision is no, and landfill gas does not pose a risk.
2	Does tidal activity influence ground gas behaviour at the site?	If ground gas parameters are correlated with tidal movements, then the answer is YES, otherwise, the answer is NO.
3	Are USTs or other infrastructure present? Do chemical concentrations in soil adjacent to USTs or other infrastructure pose a risk to future site users/environment?	Observations during trenching will determine presence/absence of USTs and other infrastructure. If the soil analytical results are less than the adopted site criteria then the decision is no, and soil contaminant concentrations do not pose a risk. If results are above the adopted criteria, then the answer is YES.
4	Do chemical concentrations in site groundwater pose a risk to environmental receptors?	If the groundwater analytical results are less than the adopted site criteria then the decision is no, and groundwater contaminant concentrations do not pose a risk. If results are above the adopted criteria, then the answer is YES.
Validation Strategy		
1	Will chemical concentrations in spoil/site soil intended to be reused as fill pose a risk to future site users/environment following removal of infrastructure and impacted soils in the UST, wash bay and mechanical pit areas?	For the spoil/site soil, to determine suitability for secondary school use, the following criteria will be adopted with respect to the decision-making process: • If the soil results are less than the adopted site criteria (HIL/HSL C / HSL A/B and TPH Management Limits for residential, parkland and public open space/secondary schools) then the decision is no and the remediation strategy is acceptable. • If soils are above the criteria, a qualitative risk review will be undertaken to assess whether these soils represent an unacceptable risk to human health or the environment if placed under the cap.
2	Does the imported material used for the capping layer comply with VENM/ENM criteria?	Where relevant documentation provided by the source site, site history review, visual observations from inspections and chemical analysis indicate compliance with VENM/ENM criteria then the decision is yes. Otherwise the decision is no. Where the decision is yes, the material is appropriate to be used on site. Where the decision is no, the material must not be used onsite. In addition to the above, no materials can be imported onsite for use with prior approval by the Site Auditor.
3	Has the site been adequately capped?	If the survey data indicates that there is a capping layer of minimum of 500mm then the answer is yes. Otherwise the answer is no.

4.8 Step 6 – Specify the Limits on Decision Errors

4.8.1 Decision-maker's Tolerable Decision Error Rates Based on Consideration of the Consequences of Making an Incorrect Decision

The pre-determined data quality indicators (DQI's) established for the project, for both the Data Gap Investigation and Validation Strategy, are discussed below in relation to precision, accuracy, representativeness, comparability and completeness (PARCC parameters) as required by Step 6 of the DQO process.

Table 6.4 DQO and DQI

DQO	Frequency	Data Quality Indicator
Precision		
Intra-laboratory field duplicates	1/20 samples soil; 1/20 samples groundwater.	30% RPD[1]
Inter-laboratory field duplicates	1/20 samples soil; 1/20 samples groundwater.	
Laboratory duplicates	1/20 samples	30% RPD[1]
Laboratory method blanks	1/20 samples	< LOR
Accuracy		
Matrix spikes	1/20 samples	70 to 130%R for metals and inorganics
Laboratory control spike	1/20 samples	60-140%R for organics
Surrogate spike	1/20 samples	10-140%R for sVOC and speciated phenols
Representativeness		
Sampling handling storage and transport appropriate for media and analytes	All samples	Yes
Rinsate Blanks	1 per equipment per day (if applicable)	<LOR
Trip Blank	1 per sample batch soil; 1 per sample batch groundwater.	<LOR
Trip Spike	1 per sample batch soil; 1 per sample batch groundwater.	60-140%R for organics
Samples extracted and analysed within holding times.	All samples	Hold Times: 14 days - organics 6 months – inorganics
Leak testing of ground gas wells	N/A	Leak testing of existing wells was conducted as part of previous investigations and is therefore not proposed for this data gap investigation.
Response zones of ground gas wells unflooded	All wells	All wells to be gauged as part of gas monitoring works to ensure response zone remains unflooded to allow for

DQO	Frequency	Data Quality Indicator
		drawing of surrounding gases from the soil formation
Comparability		
Standard operating procedures used for sample collection and handling (including decontamination)	All samples	Yes
Standard analytical methods used for all analyses	All samples	Yes
Consistent field conditions, sampling staff and laboratory analysis	All samples	Yes
Limits of reporting appropriate and consistent	All samples	Yes
Completeness		
Soil description and COCs completed and appropriate	All samples	Yes
Appropriate documentation for testing	All samples	Yes
Data set to be 95% complete after validation	All samples	Yes

1 - If the RPD between duplicates is greater than the pre-determined data quality indicator, a judgment will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

4.9 Step 7 – Optimise the Design

4.9.1 The Optimum Manner in which to Collect the Data Required to meet the Objectives for the Assessment and which will meet the Project DQOs

With consideration to NSW EPA (1995) Sampling Design Guidelines; the review of existing environmental data; and, the evaluation of operational decision rules, a resource-effective sampling and analysis plan is presented in Section 7 of the report, for both the Data Gap Investigation and Validation Strategy.

5 Sampling and Analysis Plan

This section provides details of the proposed sampling and analysis plan from the Geosyntec (2021) SAQP, outlining methodologies to be adopted to ensure that the proposed Data Gap Investigation works meet the requirements of guidelines made or approved by NSW EPA. A sampling and analysis plan for remaining validation works is presented in Section 11 as part of the RAP Amendments.

Table 6.1: Sampling and Analysis Plan

Sampling Item	Data Gap Investigation - Sampling and Analysis Plan
Sampling Pattern / Density Rationale:	The locations of USTs have been determined by correlating known locations from a previous GHD investigation with historical aerial photographs which will be investigated using test pits. Targeted soil samples are proposed to be collected from trenching excavations if USTs or other infrastructure are found. Four test pits will be dug around the perimeter of each UST if possible and the wash bay site to the depth of groundwater which is shallow (2-3m below ground level) . Samples will be collected at a rate of 2 samples per test pit, or one sample per identified soil horizon including fill and natural soils. Samples will also be targeted towards identified potential contamination. These locations will be surveyed using a GPS coordinates to allow subsequent location following completion of the early works. Ground gas monitoring is proposed to be conducted from each of the previously installed Greencap (2021) wells (GG1 to GG9). From the perspective of the eventual gas design and technical specification, the proposed buildings have been divided into three parts, namely the sports hall which is covered by wells GG1 and GG2, the eastern school building which is covered by wells GG3 to GG7 inclusive and the southwestern school building which is covered by wells GG8 and GG9. The number of existing wells is considered sufficient to characterise the ground gas regime for each of these footprints when the historical ground gas results from GHD, those from Greencap and those proposed within the SAQP are considered as a whole. Section 3.4.2 of the NSW (2020) Hazardous Ground Gas Guidelines states that the number and density of boreholes required on a particular site will be a matter of professional judgement and that it should take into account the sensitivity of the land use (secondary school), the nature of the source (regional filling), heterogeneity of the ground conditions (at least 2 wells per building to account for heterogeneity) and robustness of the CSM (based on the previous investigation and to be confirmed by the Data Gap Investigation). Groundwater monitoring is proposed to be conducted from four of the previously installed Greencap (2021) wells with enough water column to facilitate low flow sampling methods (Hydrasleeves) (GG2, GG5, GG6 and GG8). Where groundwater is encountered in locations with identified USTs, and contamination is apparent (sheen, odour), grab samples of groundwater will also be taken directly from test pits for screening purposes.
Soil Sampling Devices / Techniques	Samples will be collected by appropriately trained and experienced Geosyntec Environmental Scientists in accordance with standard operating procedures based on NEPM (2013), AS4482.1-2005, AS4482.2-1999 and other relevant guidelines made or approved by NSW EPA as appropriate.
Sampling Depths	Soil samples from UST test pits will be taken from depths observed to be potentially contaminated (e.g. if odour or staining are observed), or in the absence of indicators of contamination they will be taken from depths which align with the sides and base of the UST.
Selection of Samples for Analysis:	Soil that is observed having visual or olfactory indicators of contamination and/or have PID screening values above background levels will be selected. In lieu of soil displaying the above characteristics, a representative sample will be obtained as outlined in the sampling density rationale above.

Sampling Item	Data Gap Investigation - Sampling and Analysis Plan
Sample Splitting Techniques	Soil samples will be split into two parts with minimal disturbance or mixing to reduce loss of volatiles. One part will form the primary sample and the second part will be placed into a zip lock bag for PID screening. Where a duplicate or triplicate sample is required, a similar procedure will be adopted but the sample will be split into three or four parts respectively.
Sample Container Selection:	Soil and groundwater sample containers will be supplied by the laboratory and generally comprise glass jars / bottles with integrated Teflon seals to prevent loss of volatiles. Approved containers will be used for collection of groundwater PFAS samples.
Decontamination Procedures:	Where possible disposable / dedicated sampling equipment will be used.
Sample Handling and Preservation Procedures:	Soil samples will be logged using the USCS and details of any discolouration, staining, odours or other indicators of contamination noted. Samples will be placed into laboratory supplied containers using a clean pair of nitrile gloves. Acid sulfate soil samples will be placed in snap lock bags and the air removed.
PFAS-specific Sampling and Analysis considerations	Sampling and analysis will be conducted in accordance with NEMP (2018), with specific consideration given to the following elements: • No Teflon coated products will be used during sampling. • Eurofins is NATA accredited for the analysis of PFAS using an in house method based on USEPA 537 and ASTM D7359-D8.
Field Calibration and Screening Protocols	Calibrated field instruments will be supplied by an environmental equipment supplier. Measurement of background concentrations in ambient air will be conducted prior to each reading to account for sensor drift. The result will be record on a field data sheet along with date, location details (batch details) and depth. For PID sampling, a small hole will be punched into the zip lock bag sample. The tip of the PID will be inserted into the bag and the maximum concentration noted on the borehole record sheet. The Biosystems Gas Flux (or similar) will be pre-calibrated upon receipt from the supplier and will be checked to ensure it is functioning properly with a fully charged battery or reliable power source prior to deployment.
Groundwater Monitoring Well Sampling	Groundwater sampling of four existing Greencap (2021) wells will be conducted by an appropriately trained and experienced Geosyntec Environmental Scientist in accordance with a standard operating procedure based on EPA Victoria (2000) Water Sampling Guidelines. Standing water levels will be determined using an interface probe, which can also detect the thickness of any NAPL if present. Hydrasleeves suitable for PFAS sample collection will be installed in the wells to be within the water column for at least 48 hours. Field parameters including DO, temperature, pH, EC and ORP will be measured during sample collection after 48 hours of hydrasleeves being installed. Where hydrasleeve sampling is not possible, low flow sampling methods (i.e. peristaltic pump) will be used. Well Purge Data Record Sheets will be completed for each well, which detail the sampling date, project number, operator, well ID, weather, gauge data (including depth to water and depth to bottom and depth to product if present), water quality data and general comments. Relevant onsite and offsite wells will be gauged and surveyed to estimate the hydraulic gradient in the area.
Landfill Gas Monitoring	Monitoring will be conducted in accordance with NSW (2020) Hazardous Ground Gas Guidelines.

Sampling Item	Data Gap Investigation - Sampling and Analysis Plan
	Landfill gas detectors (e.g. GA5000 or similar) will be used to collect measurements of methane, carbon dioxide, carbon monoxide, hydrogen sulfide and oxygen in landfill gas wells. An initial gas monitoring event will be completed from each of the Greencap wells. A Biosystems Gas Flux (or similar) or similar will then be deployed in the location with the highest result based on historical results and the confirmatory first round of handheld ground gas monitoring for the continuous measurement of gas concentrations and borehole pressure. An additional handheld gas monitoring event will be completed during continuous monitoring at the site (from all wells), during falling atmospheric pressure for reference purposes. When the historical data and the data to be collected during the Data Gap Investigation are considered as a whole, the monitoring period is considered to be sufficient for characterisation of ground gas conditions at the site. Additionally, as per section 3.4.6 of the NSW EPA Hazardous Ground Gas guidelines, continuous monitoring equipment (CME) can reduce the number of monitoring events through the overall time period required. CME will allow the investigation obtain data from a variety of meteorological conditions, including capture of likely worst case meteorological scenarios as defined in the NSW (2020) Hazardous Ground Gas Guidelines.

6 Evaluation of QA/QC

6.1.1 Field QA/QC Sampling

The methodology for obtaining QA/QC samples was conducted as follows:

Duplicate Samples

In accordance with NEPM (2013), at least 5% of soil samples and groundwater samples were duplicates collected in the field for analysis at the primary laboratory. They were collected from the same sampling point and divided into two separate and unrelated sample containers for analysis at the same laboratory (intra-laboratory precision).

- Soil duplicate: DUP1 (soil) = TS2-1_0.4-0.6
- Groundwater duplicate: DUP1 (water) = GG01

Triplicate Split Samples

At least 5% of soil samples and groundwater samples were duplicates collected in the field for analysis at the secondary laboratory. They were collected from the same sampling point and divided into two separate and unrelated sample containers for analysis at the secondary laboratory (inter-laboratory precision).

- Soil triplicate = TRIP1 (soil) = TS2-1_0.4-0.6
- Groundwater triplicate = TRIP1 (water) = GG01

Trip Spike and Trip Blank

Trip spike samples are held during field sampling to assess loss of volatile from samples during transit, while trip blanks are collected to assess whether contamination may have been introduced to samples during shipping and field handling activities.

Trip spike and trip blank were not tested as part of the soil sampling event.

Given that soil sampling was conducted for screening purposes to assist with determining remediation requirements, the absence of trip spike and blank are not considered affect the outcome of the assessment, and the data is considered fit for purpose. Additionally, given that samples were collected based on standard procedures including zero headspace and tight seal of the sample jar lid, and that concentrations of volatile compounds were generally noted to be close to the laboratory detection limits, the loss of volatile compounds is considered unlikely.

One trip blank was tested during groundwater sampling activities:

- Groundwater trip blank = tripblank

No trip spike was tested as part of the groundwater sampling event. Given that all volatile results were reported below their respective laboratory limits of detection, it is considered that loss of volatile is unlikely to have occurred during laboratory transit.

6.1.2 QA/QC Results

Field QA/QC

Soil samples were taken with clean disposable nitrile gloves directly from the auger flights with care taken to collect soil that had not come in contact with the auger stem. Samples were then placed in laboratory-supplied sample containers with Teflon sealed lid, with zero headspace and tight seal.

Groundwater samples were collected using clean dedicated tubing at each well to prevent any potential cross contamination and were placed into laboratory supplied containers. Field filtering for metal analysis was not conducted in the field and was requested to be undertaken by the laboratory.

Groundwater trip blank results were below laboratory detection limits indicating low likelihood of cross contamination of samples.

The QA/QC results for soil and groundwater duplicate (intra-laboratory) and triplicate (inter-laboratory) samples are summarised below with results presented in Appendix F.

Based on the information referenced above, it was concluded that the data is of an acceptable quality to achieve the objectives of this study, with the following comments:

a. Relative Percent Differences (RPDs) calculated for inter-laboratory samples for TRH >C16-34 are indicative of heterogeneous composition within the fill material.
b. Relative Percent Differences (RPDs) calculated for inter-laboratory and intra-laboratory samples for arsenic, copper and nickel are likely a result of concentrations being close to the laboratory detection limit.

Laboratory QA/QC

Samples were received and analysed by the primary and secondary laboratories with attempt to cool samples evident and within sample holding times. Soil samples were received by the laboratory on the same day as sampling, and as such there was insufficient time for temperatures lower than 10-14°C to be reached inside the eskies.

Laboratory limits of reporting (LOR) for PAHs were raised form <0.1mg/kg to <1mg/kg for soil samples TS2-1_1.0-1.2, TS2-2_1.0-1.2 and TS2-4_1.2-1.4 due to interferences from analytes other than those being tested. Raised LOR were below adopted criteria, and were relatively low in comparison to detections of some PAHs in the samples, and therefore, this is not considered to affect the outcome of the assessment.

Some matrix spikes were not able to be completed due to high concentrations of analytes in some samples causing interference. Those which were able to be completed without interference, however, reported percentage recoveries within the acceptable range.

Detailed QA/QC results are presented on the laboratory testing certificates presented in Appendix C and summarised in Table G-1 in Appendix G.

7 Site Assessment Criteria

The proposed redevelopment is understood to include school buildings and open space areas within the development footprint.

Therefore, the criteria adopted for the site comprised criteria for secondary school and open space land use as outlined below.

7.1 Assessment Criteria for Soil

Soil analytical results were assessed against the guidelines listed below, with the adopted soil criteria summarised in Table 7.1:

- NEPM (2013) Health Investigation Levels (HIL) C.
- Health Screening Levels (HSL) C and A/B as required by NEPM (2013) for assessment of secondary schools, for sandy soil. HSL C applies to secondary school grounds, and HSL A/B applies to secondary school buildings.
- NEPM (2013) Management Limits for Total Petroleum Hydrocarbons for residential, parkland and public open space use for coarse soil.

Ecological criteria are not considered relevant as the site is expected to be capped with additional material followed by concrete hardstand or clean topsoil to facilitate construction of the school.

Table 7.1: Adopted Soil Site Suitability Criteria (mg/kg)

NEPM (2013) Soil Site Suitability Criteria	HIL C – Public Open Space / Recreational (mg/kg)	Soil HSL A/B Low – High Density Residential (Secondary School Buildings) for Sand Soil, 0 to <1m (mg/kg)	Soil HSL C Low – Recreational (Secondary School Grounds) for Sand Soil, 0 to <1m (mg/kg)	Hydrocarbon Management Limits for Residential, Parkland and Public Open Space, Coarse Soil Type
TRH				
F1	-	45	NL	700
F2	-	110	NL	1,000
F3 (>C16-C34)	-	-	-	2,500
F4 (>C34-C40)	-	-	-	10,000
BTEX				
Benzene	-	0.5	NL	-
Toluene	-	160	NL	-
Ethylbenzene	-	55	NL	-
Xylenes (Total)	-	40	NL	-
PAHs				
Naphthalene	-	3	NL	-
Benzo(a)pyrene	3	-	-	-
Total PAHs	300	-	-	-
Heavy Metals				
Arsenic	300	-	-	-
Cadmium	90	-	-	-

NEPM (2013) Soil Site Suitability Criteria	HIL C – Public Open Space / Recreational (mg/kg)	Soil HSL A/B Low – High Density Residential (Secondary School Buildings) for Sand Soil, 0 to <1m (mg/kg)	Soil HSL C Low – Recreational (Secondary School Grounds) for Sand Soil, 0 to <1m (mg/kg)	Hydrocarbon Management Limits for Residential, Parkland and Public Open Space, Coarse Soil Type
Chromium (VI)	300	-	-	-
Copper	17000	-	-	-
Lead	600	-	-	-
Mercury	80	-	-	-
Nickel	1200	-	-	-
Zinc	30000	-	-	-
OCPs				
DDT+DDE+DDD	400	-	-	-
DDT	-	-	-	-
Aldrin and dieldrin	10	-	-	-
Chlordane	70	-	-	-
Endosulfan	340	-	-	-
Endrin	20	-	-	-
Heptachlor	10	-	-	-
HCB	10	-	-	-
PCBs				
PCBs	1	-	-	-
Asbestos				
Asbestos	Presence			

7.2 Waste Classification

Given that excavation and disposal of soils from identified UST and other infrastructure locations may be required as part of the main remediation works, soil results were also compared against NSW Environment Protection Authority (EPA) Waste Classification Criteria found in the NSW EPA (2014) Waste Classification Guidelines Part 1: Classifying Waste. Chemical assessment was required as the material included a mixture of soil and anthropogenic inclusions. Waste Classification CT1, SCC1 and TCLP1 criteria for General Solid Waste are displayed in Table 7.2. The relevant Waste Classification are listed below:

- NSW EPA Waste Classification CT1 Criteria for General Solid Waste
- NSW EPA Waste Classification TCLP1 and SCC1 Criteria for General Solid Waste

Table 6.2. Waste Classification Criteria for General Solid Waste.

NSW EPA (2014) General Solid Waste	CT1 (mg/kg)	CT2 (mg/kg)
TPH		
TPH $C_6 - C_9$ Fraction	650	2,600
TPH $C_{10} - C_{36}$ Fraction	10,000	40,000

NSW EPA (2014) General Solid Waste	CT1 (mg/kg)	CT2 (mg/kg)
BTEX		
Benzene	10	40
Toluene	288	1,152
Ethylbenzene	600	2,400
Xylenes (Total)	1,000	40
PAHs		
Benzo (a) Pyrene	0.8	3.2
Total PAHs	200	800
Heavy Metals		
Arsenic	100	400
Cadmium	20	80
Chromium (VI)	100	400 (as CrVI)
Lead	100	400
Mercury	4	16
Nickel	40	160
PCBs		
Total PCBs	50	50
Pesticides		
Total Pesticides	250	1000

7.3 Assessment Criteria for Groundwater

Groundwater analytical results were assessed against the guidelines listed below, with adopted groundwater criteria summarised in Table 7.3:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) (2018) Default Guideline Values for Marine Waters with 95% protection level, noted to be generally consistent with NEPM (2013) Groundwater Investigation Levels (GILs) for Marine Waters taken from Table 1C.
- NEPM (2013) Groundwater HSLs: HSL A/B Residential use (required for secondary school buildings) for sandy soil taken from Table 1A(4).
- PFAS National Environmental Management Plan (2020) (NEMP 2020) Human Health (non-potable and recreational uses) and Ecological (slightly to moderately disturbed ecosystem) criteria.
- Consideration of aesthetic impacts to groundwater on site during sampling activities with respect to maintaining visual amenity.

Table 6.3. Adopted Groundwater Site Suitability Criteria

NEPM (2013) Groundwater Site Suitability Criteria	ANZG 95% toxicant criteria for Marine Waters / NEPM (2013) GILs for Marine Waters (µg/L)	Groundwater HSL A&B for 2m to <4m Depth and Sand Soil Type (µg/L)
Benzene	700 (ANZG) / 500 (NEPM)	800
Toluene	180	NL

NEPM (2013) Groundwater Site Suitability Criteria	ANZG 95% toxicant criteria for Marine Waters / NEPM (2013) GILs for Marine Waters (µg/L)	Groundwater HSL A&B for 2m to <4m Depth and Sand Soil Type (µg/L)
Ethylbenzene	80	NL
Xylenes (o)	75 (ANZG-unknown protection level) / 350 (NEPM)	NL
Xylenes (m+p)	200 (NEPM – as p-xylene only)	NL
Xylenes (Total)	-	NL
Naphthalene	70 (ANZG) / 50 (NEPM)	NL
F1	-	1000
F2	-	1000
Arsenic	13 / 24*	-
Cadmium	55 (ANZG) / 7 (NEPM)	-
Chromium	27 / 4.4**	-
Copper	1.3	-
Lead	4.4	-
Mercury	0.4 (ANZG) / 0.1 (NEPM)	-
Nickel	70 (ANZG) / 7 (ANZG)	-
Zinc	15	-
Benzo(a)pyrene	0.2	-
Naphthalene	16	-
Anthracene	0.4	-
Fluoranthene	1.4	-
Phenanthrene	2	-

*ANZG 0.013mg/L = AsV ; 0.024mg/L = AsIII
** ANZG/NEPM 27 µg/L = CrIII unknown protection level ; 4.4 µg/L = CrVI

Table 8.2 PFAS NEMP 2020 Criteria Values

Parameter	Health-based Guidance Values (Non-Potable and Recreational Use) (µg/L)	Aquatic Ecosystem: Freshwater/Marine Guideline Values 95% Species Protection* (µg/L)
PFOS	-	0.13
PFOA	10	220
PFOS + PFHxS	2	-

*Note 3 of Table 5 in NEMP (2020) states 'The WQG advise that the 99% level of protection be used for ...slightly to moderately disturbed systems. This approach is generally adopted for chemicals that bioaccumulate and biomagnify in wildlife.'

Given that NEMP (2020) criteria have been applied as a screening measure only, the 95% Species Protection Guideline Values have been adopted.

7.4 Assessment of Ground Gas

NSW EPA (2020) Hazardous Ground Gas Guidelines will be adopted with respect to assessment of landfill gas. This will include consideration of gas concentration, flow rate, gas screening values, characteristic gas situation and prevailing atmospheric pressure.

It is considered that use of SafeWork NSW (2018) Workplace Exposure Standards for Airborne Contaminants is appropriate for use in the Gas Monitoring Well Network beneath the site. It should be noted that the recorded concentrations are taken within the ground and the criteria are designed to be applied to the atmosphere thus adding a further layer of conservatism. Where site users and construction workers are present in these areas, it is considered unlikely that they would be exposed to concentrations in the ground or that their exposure time will be greater than 8hrs per day and consequently the adopted criteria would also be protective of their health.

- SafeWork NSW (2018) TWA screening criteria for hydrogen sulfide: 10 ppm
- SafeWork NSW (2018) TWA screening criteria for carbon monoxide: 30 ppm
- Additionally, AS2865 – 1995 Safe Working in a Confined Space guidelines will used for oxygen (>19.5%v/v).

8 Field Observations and Laboratory Results

8.1 Subsurface Observations & Soil Laboratory Results

The key observations made during the works conducted are summarised as follows:

- Surface conditions consisted of areas of exposed site soils where the concrete slab had been removed and areas of crushed sandstone where the capping layer had been placed.
- A summary of ground conditions from each of the investigation areas is presented below. Detailed ground conditions are documented in test pit logs presented in Appendix H and results summary tables are presented in Appendix B. A photographic log is presented in Appendix J.

Table 9.1: USTs and Former Infrastructure Preliminary Findings

Location	Field Observations	Laboratory	Notes
UST Location 1 30 November 2021	Three (3) test pits (TS1-1, TS1-2 and TS1-3) to the north, west and south of the UST location. A slab was located to the east on the adjoining property preventing construction of a test pit. Encountered soils comprised either sand or silty clay fill from surface to approx. 0.4-0.6 m below ground level (mbgl), underlain by fill sands to end depth (1 mbgl). Soil samples were collected from the first fill layer and the underlying sand fill layer for each test pit (TL 6 soil samples). Hydrocarbon odour was noted from approximately 0.4-0.6m below ground level (mbgl), with sheen noted in encountered water seepage. One grab sample of water was collected.	Exceedances of adopted site screening criteria are listed below: • TRH >C10-16 in TS1-3_0.2-0.4 (590mg/kg) and TS1-3_0.6-0.8 (120mg/kg) above adopted HSL criteria. Exceedances of adopted preliminary waste classification criteria are listed below: • BaP in TS1-2_0.8-1.0 (0.84mg/kg) above CT1 criteria for GSW. The grab sample was analysed for BTEX. No exceedances of adopted criteria were recorded for the water grab sample.	This has been identified as a location requiring remediation as part of the main works. Location has been recorded to allow tank removal during main remediation works. Temporarily left in situ beneath geotextile marker and capping material. Survey location shown in Figure 9, grid 7A.
UST Location 2 3 December 2021	Four (4) test pits (TS2-1, TS2-2, TS2-3 and TS2-4) to the north, west, south and east of the UST location. Encountered soils comprised either clayey sand or sandy clay fill from surface to approx. 1.0 mbgl, underlain by fill sands to end depth (2.0 mbgl). Soil samples were collected from the first fill layer and the underlying sand fill layer for each test pit (TL 8 soil samples). Hydrocarbon odour was noted from approximately 0.4-0.6m below ground level (mbgl), with sheen noted in encountered water seepage. One grab sample of water was collected.	Exceedances of adopted site screening criteria are listed below: • TRH >C10-16 in TS2-1_1.0-1.2 (530mg/kg), TS2-2_1.0-1.2 (1300mg/kg), TS2-4_1.2-1.4 (950mg/kg) above adopted HSL criteria, and management limit criteria for TS2-2_1.0-1.2. Exceedances of adopted preliminary waste classification criteria are listed below: • BaP in TS2-2_0.4-0.6 (2.1mg/kg) and TS2-3_1.2-1.4 (2.2mg/kg) above CT1 criteria for GSW. The grab sample was analysed for BTEX. No exceedances of adopted criteria were recorded for the water grab sample.	This has been identified as a location requiring remediation as part of the main works. Location has been recorded to allow tank removal during main remediation works. Temporarily left in situ beneath geotextile marker and capping material. Survey location shown in Figure 9, grid 4G.
Former Wash Bay Location 1 December 2021	Two test pits in this location, one in the north (WB1) and one in the south (WB2). Encountered soils comprised sandy clay fill from surface to end depth (1.0 mbgl).	Exceedances of adopted site screening criteria are listed below: • TRH >C10-16 in WB1_0-0.2 (600mg/kg) above adopted HSL A/B criteria. Given that the Wash Bay area is not located	This is not identified as a location requiring remediation. Location has been recorded. Location

Location	Field Observations	Laboratory	Notes
	Soil samples were collected from near surface and at depth for each test pit (TL 4 samples).	in a proposed building footprint area, HSL A/B does not apply. Exceedances of adopted preliminary waste classification criteria are listed below: BaP in WB1_0-0.2 (0.84mg/kg) and WB2_0.8-1.0 (2.2mg/kg) above CT1 criteria for GSW.	shown in Figure 9 in yellow.
Former Mechanic Pit Location 24 November 2021	Identified during concrete pull. One test pit in this location. Encountered soils comprised a mixture of gravel, sand, silt and clay fill with inclusions of demolition waste (incl. bricks and concrete) from surface to end depth (1.0 mbgl). Soil samples were collected form near surface and at depth (TL 3 samples). Hydrocarbon odour was noted from approximately 0.4-0.6m below ground level (mbgl), with sheen noted in encountered water seepage. One grab sample of water was collected.	Exceedances of adopted site screening criteria are listed below: • TRH >C6-10 in VEX1-3 (51mg/kg) above adopted HSL criteria. • TRH >C10-16 in VEX1-2 (700mg/kg) and VEX1-3 (910mg/kg) above adopted HSL criteria. • TRH >C16-34 in VEX1-2 (18000mg/kg) and VEX1-3 (4300mg/kg) above adopted management limit criteria. Exceedances of adopted preliminary waste classification criteria are listed below: • TPH C10-C36 in VEX1-2 (20,000mg/kg) above CT1 criteria for GSW. The grab sample was analysed for BTEX, TRH and PAH. No exceedances of adopted criteria were recorded for the water grab sample, however concentrations of hydrocarbons indicated impacts from the former mechanics pit.	This has been identified as a location requiring remediation as part of the main works. Location has been recorded. Some soils removed from within the pit have been tested and confirmed as Restricted Solid Waste (RSW) and will be removed as part of remediation works. Survey location shown in Figure 8, as 'contaminated area'.

8.1.1 Asbestos Observations During Marker Layer Inspections

During site surface inspections prior to placement of the marker layer and cap as part of the early works area, three asbestos-containing fibre cement fragments material (ACM) were observed on the surface in the northeast of the site on exposed fill soils. The fragments were confirmed to contain asbestos by a licenced asbestos assessor and were removed from the site with a surface clearance certificate issued by a Licensed Asbestos Assessor prior to placement of the marker layer. The locations of the observed fragments are shown in Figure 5, Appendix A.

It is noted that historical investigations also identified ACM in soils at the site, specifically the west and centre of the site. ACM will still be present in underlying soils beneath the marker layer across the site.

8.2 Groundwater Observations & Laboratory Results

8.2.1 Groundwater Observations

The following section presents an overview of field observations of groundwater encountered during groundwater sampling activities. Copies of field observations sheets are provided in Appendix I.

- Standing water levels were measured between 0.72m bgl in GG09 and 1.75 GG01.
- No phase separated hydrocarbon (PSH) or hydrocarbon sheen was observed during groundwater sampling.
- Groundwater quality field parameters are summarised below: in Table 8.2.

Table 9.2 Groundwater Physiochemical Parameters

Well ID	Temp (°C)	pH	Redox (mV)	Dissolved Oxygen (ppm)	Conductivity (mS/cm)	Comments
GG01	22.6	9.42	-128.1	14.3	4.386	Clear to slightly turbid, no odour or sheen noted
GG05	21.9	9.77	-98.6	0.62	1.397	no odour or sheen noted
GG06	23.8	8.87	-71.2	0.08	1.255	Clear to slightly turbid, no odour or sheen noted
GG09	20.9	8.02	-119.4	0.34	0.869	Clear to turbid, no odour or sheen noted

Groundwater conditions were slightly alkaline to alkaline (pH 8.02 to 9.77). Reducing conditions were recorded in all groundwater wells. Electrical conductivity ranged between 0.869 mS/cm and 4.386 mS/cm, indicating brackish groundwater conditions.

8.2.2 Groundwater Results

Groundwater results from sampled wells GG01, GG05, GG06 and GG09, were either below laboratory detection limits or adopted criteria, with the following exceptions:

- Copper in GG01, GG05 and GG06 at concentrations ranging between 0.002 mg/L and 0.008 mg/L, above the adopted ANZG (2018) marine 95% protection default guideline value of 0.0013 mg/L.
- Ammonia in GG01 and GG05 at concentrations of 5.3 mg/L and 2.3 mg/L, respectively, above the adopted ANZG (2018) marine 95% protection default guideline value of 0.91 mg/L.

Metals concentrations are considered to be representative of background concentrations for heavily urbanised areas of Sydney.

The presence of ammonia can be attributed to either landfill conditions in the wider area or from the degradation of buried vegetation as the area was formerly covered in mangroves. It is noted that higher pH levels result in higher ammonia concentrations, and lower pH levels result in higher ammonium concentrations, with the concentrations of ammonia and ammonium directly proportional to pH.. Above pH 9 most ammonium converts to ammonia. Stabilised pH in GG01 and GG05, wells with the highest ammonia concentrations, were pH 9.42 and 9.77 respectively. This suggests that the higher ammonia concentrations are attributable to the higher pH (>9) in these locations, with concentrations reflective of localised pH conditions rather than reflecting conditions throughout groundwater at the site.

Per-and-poly fluoroalkyl substances (PFAS) were detected in all sampled wells. Concentrations were comparable between all tested locations (PFOS 0.13 – 0.51 µg/L, PFOA 0.02 – 0.08 µg/L, PFHxS 0.02 – 0.12 µg/L), including upgradient (GG09) and downgradient (GG01) locations. This suggests that migration of PFAS onto the site from adjoining areas is likely and that the recorded PFAS concentrations in groundwater are likely representative of regional conditions given that much of the peninsula area is former landfill.

8.2.3 Groundwater Continuous SWL Results

A level logger and barometric pressure logger were deployed in well GG2 on 22 November 2021 at 10:00am and retrieved on 8 December 2021 at 1:30pm, with a total deployment period of two weeks and three days. Raw pressure data was converted to produce submergence levels, which were then adjusted to provide standing water level (SWL) values. SWL ranged between 1.87 mbgl (22.11.21, 10:00am) and 1.64 mbgl (30.11.21, 12:30pm). Groundwater sampling on 1 December 2021 required temporary removal of the level logger, which resulted in several non-representative readings, which were removed from the dataset for the purpose of chart generation.

Comparison of continuous SWL data from against tidal data for Wentworth Point (Transport for NSW Tides 2021-2022 chart, converted for location within Paramatta River) did not reveal any obvious tidal influence on groundwater at the site, however comparison against daily rainfall (BOM Sydney Olympic Park Weather Station) did identify that SWL decrease (i.e. water level rose) following rainfall events, and decrease (i.e. water level fell) during subsequent periods of now rainfall. Charts comparing SWL against tides for Wentworth Point are presented in Appendix B.

8.3 Ground Gas Observations and Results

The following section presents an overview of field observations and weather conditions encountered during the ground gas monitoring activities. Gas monitoring results are provided in Appendix B and calibration certificates are presented in Appendix D.

8.3.1 Atmospheric Conditions

Falling atmospheric pressure may be associated with movement/egress of gas from the ground surface. As recommended in NSW EPA (2020), a worst-case meteorological scenario is to be determined by a fifth percentile three-hour pressure decrease based on a two-year (April 2019 to March 2021) data set for Bureau of Meteorology (BOM) weather station at Sydney Airport (No.066037). The data identifies a pressure drop of 2.3mb in a 3-hour period.

Landfill gas monitoring using hand-held instruments was conducted on 16 November 2021. Daily weather observations are readily available online and are presented for 9am and 3pm (a 6-hour period) in Appendix E and thus monitoring for the worst-case scenario event was to be timed in an effort to achieve a 4.6mb or greater drop over a 6-hour period for hand-held monitoring. Atmospheric conditions during continuous monitoring were able to be assessed against a 2.3mb decrease over a 3-hour due to the availability of hourly data.

Hand-held Landfill Gas Monitoring:

- 12:00pm to 2:00pm on 16 November 2021: 9am (1015.9mb) and 3pm (1017.1mb) = 1.2 mb increase.

Worst-case scenario conditions did not eventuate during the hand-held monitoring round.

Continuous Monitoring:

A Gas Flux unit was deployed in well GG1 on 16 November 2021at 4:50pm and retrieved on 6 January 2022 at 1:15pm, with a total deployment period of seven weeks and two days. The Gas Flux unit collected continuous (hourly) data for methane, carbon dioxide, oxygen, carbon monoxide, hydrogen sulfide, borehole flow and barometric pressure. It is noted that during the deployment of the Gas Flux unit in well GG1, 'worst-case meteorological scenario' conditions eventuated on several occasions (based on site specific 3-hourly barometric pressure data collected by the Gas Flux unit). The greatest five pressure drops are summarised below:

- 18 November 2021 – 11:58pm (1020.79mb) and 15:03pm (1017.43) = 3.36 mb decrease.

- 19 November 2021 – 12:19am (1015.51 mb) and 3:23am (1011.67 mb) = 3.84 mb decrease.
- 25 November 2021 – 12:15pm (1012.15mb) and 3:20pm (1008.79mb) = 3.36 mb decrease.
- 7 December 2021 – 11:31am (1014.07mb) and 2:35pm (1010.71mb) = 3.36 mb decrease.
- 9 December 2021 – 12:27am (1015.51mb) and 3:32am (1011.19mb) = 4.32 mb decrease.

Pressure drops recorded by the Gas Flux unit were generally consistent with those reported by BOM weather station at Sydney Airport.

8.3.2 Ground Gas Results

A summary of landfill gas monitoring results collected as part of the DGI is presented in Appendix B. The results can be summarised as follows:

- Standing water levels were recorded between 0.49m bgl (GG10 and GG12) and 1.94m bgl (GG2). No full flooding of response zones was recorded, with unflooded response zones ranging between 0.14m (GG12) and 1.24m (GG2), enabling screening of ground gas conditions in the surrounding geology for all monitored wells.
- Methane concentrations above the adopted NSW (2020) criteria of 1% v/v were recorded in GG1 (4.2%v/v), GG4 (2.3%v/v) and GG10 (15.1%v/v). Methane concentrations are summarised below in Table 9.4.
- Borehole gas flow ranged between <0.1 and 0.3 L/hr (GG3 and GG10). A negative flow of -0.6 L/hr was also noted in GG1.
- Carbon concentrations above the adopted NSW (2020) criteria of 5%v/v were recorded in GG1 (6.0%v/v), GG3 (7.2%v/v), GG4 (6.0%v/v), GG5 (6.2%v/v) and GG6 (5.6%v/v). Carbon dioxide concentrations are summarised below in Table 9.4.
- Oxygen concentrations below the minimum 19.5%v/v guideline presented in AS2865 – 1995 Safe Working in a Confined Space were recorded in all wells. Oxygen concentrations are summarised below in Table 9.4.
- Hydrogen sulfide was recorded at concentrations ranging from <1 to 3 ppm, below the SafeWork NSW (2018) TWA screening criteria of 10 ppm.
- Carbon monoxide was recorded at concentrations ranging from <1 to 3 ppm below the SafeWork NSW (2018) TWA screening criteria of 30 ppm.
- The Gas Flux unit deployed in well GG1 successfully collected hourly ground gas data between 16 November 2021 and 6 January 2021. A graphical representation of the results is presented in Appendix B and the spreadsheet of downloaded data can be provided on request. Concentrations of methane ranged from below detection limits (<0.01%v/v) to 2.74%v/v. Methane concentrations peaked in the period immediately following deployment and gradually decreased over the following two days before stabilising at <0.01%v/v by 12:00pm on 18 November 2021. Between 18 November 2021 and the end of the deployment period (6 January 2021), concentrations fluctuated between <0.01%v/v and 0.05%v/v.
- Following the stabilisation period (2 days after deployment), carbon dioxide ranged between 7.39%v/v and 10.52%v/v, oxygen ranged between 0.60%v/v and 2.74%v/v, hydrogen sulfide ranged between <0.01 and 0.67ppm, and carbon monoxide ranged between 0.01 and 1.62ppm.
- Borehole flow in GG01 ranged between 0 L/hr and 8.9 L/hr, with the maximum flow recorded on 18 November 2021 at 3pm during a worst-case scenario pressure drop event (3.36mb decrease over 3 hours).
- No odour was noted during monitoring activities.

Table 9.4: Ground Gas Results Summary

Well ID	Methane (%v/v)	Carbon Dioxide (%v/v)	Oxygen (%v/v)	Borehole Flow (L/hr)
Adopted Criteria	**1%v/v**	**5%v/v**	**<19.5%v/v**	**N/A**
GG01	**4.2**	**6**	**0.8**	-0.6
GG01 (Continuous Max.)	**2.7**	**10.5**	**0.6**	8.9
GG02	0.8	4.7	**0**	0.1
GG03	0	**7.2**	**6.2**	0.3
GG04	**2.3**	**6**	**0**	0.1
GG05	0	**6.2**	**0.1**	0
GG06	0	**5.6**	**0**	0
GG07	0.5	**5.6**	**0**	0.2
GG08	0.1	2	**0**	0
GG09	0.3	2.7	**0**	0
GG10	**15.1**	0.1	**0.1**	0.3
GG11	Not Monitored			
GG12	0	4.6	**3.5**	0.1

9 Conceptual Site Model

The conceptual site model (CSM) has been adapted from the PB (2015) RAP which pertains to the site exclusively, and has been updated based on the DGI findings. The CSM incorporates site setting details, measures contamination concentrations, the geology, hydrogeology and surrounding land use in order to identify potentially significant source-pathway-receptor (SPR) linkages in relation to potential risks to human health and the environment.

9.1 Sources

The primary sources of the contaminants of potential concern (COPCs) were identified as the following:

- Fill material contaminated with heavy metals, benzo(a)pyrene, total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAHs) and asbestos (bonded and friable).
- Hazardous ground gases generated by underlying filled organic materials and decaying organic matter in underlying sediments, including bulk gases such as methane, carbon dioxide, carbon monoxide and hydrogen sulfide as well as volatile organic compounds (VOCs) in the form of soil vapour.
- Former petroleum / diesel storage infrastructure including Underground Storage Tanks (USTs), Mechanics Pit and Wash Bay, potentially containing or leaking total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylene (BTEX) and polycyclic aromatic hydrocarbons (PAHs).
- Soils comprising iron sulfides. The predominant ASS sulfidic mineral is pyrite (FeS2), an iron disulfide. The subsequent exposure of oxygen and water leads to the generation of sulfuric acid.

9.2 Pathways

For an exposure to occur, a complete pathway must exist between the source of contamination and the receptor. Where the exposure pathway is incomplete, there is no exposure, and hence no risk.

An exposure pathway consists of the following elements:

- Source (e.g. spills, leaks, etc.).
- Release mechanism (e.g. leaching, volatilisation).
- Transport media (e.g. soil, groundwater, sediment, surface water, air).
- Exposure point, where the receptor comes in contact with the contamination (e.g. groundwater from an extraction bore, vapours inside a building or in ambient air).
- Exposure route (e.g. inhalation, ingestion, dermal contact).

Where the pathway for chemical from the source to the receptor is incomplete, there is no incremental risk due to the presence of that contamination.

Preferential Pathways

Preferential migration pathways typically includes more permeable granular material around existing sub-surface utilities that allows greater migration of impacted groundwater or soil gas / vapour when compared to the site geology. Preferential migration pathways for hazardous ground gas ingress into proposed buildings may include areas around foundations or service entries. The

potential effects of preferential migration pathways will need to be considered in any subsequent stages of assessment as more site specific data becomes available.

A review of the possible exposure pathways was provided in the PB (2015) RAP and was based on the proposed future use as high density residential development. This has been adapted for the site which is proposed for secondary school and outdoor open space uses as defined in NEPM (2013).

The primary pathways by which future site users could be exposed to the source of contamination on the site are considered to be:

- Direct contact (including accidental ingestion) with contaminated soil
- Inhalation of dust derived from contaminated soil (including asbestos fibres)
- Inhalation or explosion of hazardous ground gas during earthworks or due to accumulation in enclosed spaces.
- Migration of hazardous ground gases through potential preferential pathways in the fill into future site buildings, and subsequent inhalation due to accumulation in enclosed spaces or potential ignition and explosion.

The potential pathway by which the environment could be exposed to contamination is via the lateral migration of dissolved contaminants in shallow groundwater and subsequent discharge to surface water environment. Excavation of soil comprising iron sulfides may lead to the generation of sulfuric acid and leaching of metals which may be released to the nearby waterbodies.

9.3 Receptors

Given the proposed high school land use, the receptors of interest (onsite) include:

- Site users including students, staff and visitors
- Site workers (during bulk earthworks phase)
- Intrusive maintenance workers (post development)
- Users of adjacent areas, including the existing school playing field to the west and future playing field proposed to be located to the north although this area will be entirely capped
- Eventual site vegetation / plants as part of landscaping at the site
- Groundwater below the site which is considered to flow towards Parramatta River (ecological receptors) which is located to the north of the site
- Homebush Bay which is located to the east of the site (ecological receptors)

With respect to human receptors, direct contact with site soils following completion and opening of the school is considered very unlikely for site users (students, staff and visitors) and users of adjacent areas under normal circumstances, and thus no complete SPR linkage is considered to exist.

Hazardous ground gas pathways, including preferential pathways, will be considered as part of the design and implementation of gas mitigation measures. In line with the NSW (2020) Hazardous Ground Gas Guidelines, such gas mitigation measures are required to include multiple lines of contingency to prevent ingress of gas into site buildings, with built-in conservatism proportionate to the risk-rating. The eventual gas mitigation system will also be subject to verification testing and third-party audit as part of the validation process.

Onsite ecological receptors (vegetation/plants forming part of eventual landscaping at the site) are considered unlikely to have direct contact with potential contamination in site soils or groundwater

given that they would be planted in imported growing medium underlain by up to 2m of VENM, both of which will be validated against ecological criteria prior to import to the site.

With respect to the surface water receptors, Parramatta River and Homebush Bay, the surface water assessment completed by GHD in 2013 titled 'Report for Homebush Bay West Surface Water Investigation' concluded that there was 'no evidence of a significant pollutant linkage in respect of petroleum hydrocarbons in groundwater between the Stage 1 area and surface water quality in the adjacent Parramatta River'. Given these previous findings, that no petroleum hydrocarbon groundwater contamination has been identified in any of the tested groundwater wells including downgradient locations and the distance of over 100m between the site and Parramatta River, surface water ecosystems are not considered to have a potentially complete SPR linkage.

9.4 Potentially Complete SPR Linkages

The following scenarios are considered to present potentially complete SPR linkages:

- Direct contact (including accidental ingestion) with contaminated soil for site workers (during bulk earthworks phase) and intrusive maintenance workers (post development)
- Inhalation of dust derived from contaminated soil (including asbestos fibres) and hazardous ground gas for site workers (during bulk earthworks phase) and intrusive maintenance workers (post development). Explosion risk is also presented by hazardous ground gases.
- Migration of hazardous ground gases through potential preferential pathways in the fill into future site buildings, and subsequent inhalation due to accumulation in enclosed spaces or potential ignition and explosion represents a potentially complete SPR linkage if left unmitigated, however it is noted that this pathway will be removed by the eventual landfill gas protection system required to be design for the site in accordance with NSW (2020) hazardous Ground Gas Guidelines.
- Disturbance of soil sufides with the subsequent release of acid and metals into the surface waterbodies during bulk excavation and piling works.

10 Discussion

Discussion of the Data Gap Investigation findings is presented below.

10.1 USTs and Other Infrastructure

UST Location 1, UST Location 2 and the Former Mechanic Pit Location have been identified as areas requiring remediation due to the presence of remnant infrastructure, observations of hydrocarbon odour and sheen during test pitting, and several exceedances of adopted site suitability criteria for total recoverable hydrocarbons. Remediation requirements are outlined below in Section 11.

Preliminary waste classification of soils from these locations finds that soils currently have a classification of special waste (asbestos) - restricted solid waste due to several exceedances of CT1 criteria for benzo (a) pyrene and total petroleum hydrocarbons, and due to previous asbestos finds in the subsurface of the site. Confirmatory chemical testing including toxicity characteristic leachate procedure (TCLP) and silica gel clean up testing may lower the current waste classification of the soils to special waste (asbestos) - general solid waste (GSW) if results are favourable.

The Former Wash Bay Location was not identified as an area requiring location, with no observations of contamination made during investigation activities, and no exceedances of adopted HSL C criteria for secondary school grounds, given the wash bay area is located in a proposed school outdoor area.

10.2 Groundwater

Groundwater at the site does not require remediation, with chemical results considered to be representative of regional conditions given that much of the wider peninsula comprises former landfilled areas.

10.3 Ground Gas

Gas Rating

The gas screening value (GSV) using data from the DGI was calculated to be 1.34 L/hr (Max. Methane (15.1%v/v) x Max. BH Flow (8.9 L/hr), which gives a characteristic situation (CS) of CS3 (moderate risk). This is within the historical range for the site (CS2 to CS4) and therefore the current design assumptions for the gas mitigation system detailed in the Draft Design and Verification Plan (DVP) for CS4 can be retained.

Tidal Influence

Several charts have been generated including comparison between tidal cycle, rainfall, standing water level and ground gas concentrations at the site, which are presented in Appendix B. Ground gas concentrations (based on carbon dioxide, given that other gases were not present at concentrations high enough to provide meaningful indication of conditions) appeared to be primarily affected by diurnal effects, with no clear correlation to tidal cycles or standing water level. It is therefore concluded that tidal activity does not affect ground gas behaviour at the site.

11 RAP Amendments

Based on the findings of the DGI and the layout of the proposed development, Geosyntec recommends the following updates to the PB (2015) RAP for implementation during the remaining remediation and validation activities in order to make the site suitable for the proposed high school use. Validation works will be conducted in consideration of the locations of landscaped areas, proposed service trenches and piling locations, design plans for which are presented as Figures 7-9, 10 and 11, respectively.

11.1 Validation Criteria Update

Given that the proposed layout of the proposed high school development has been finalised, validation criteria for BTEX and TRH (health screening levels (HSL)) specific to the location of buildings and outdoor areas can be adopted, given that NEPM (2013) allocates separate criteria for secondary school buildings as opposed to secondary school grounds (outdoor areas).

HSL validation criteria will be adopted as follows, in accordance with NEPM (2013):

- School Building Footprints: HSL A/B
- School Grounds (outdoor areas): HSL C

Proposed building footprints are shown in Figures 3, 7 and 8. All other validation criteria will remain the same as those presented in the PB (2015) RAP.

11.2 Remediation of USTs and Other Infrastructure

Given the identification of former USTs and other infrastructure, an update to the PB (2015) RAP detailing specific remediation requirements for these areas is needed.

Remediation of UST Location 1, UST Location 2 and the Former Mechanic Pit Location is required as part of the main remediation works for the site based on the findings of the DGI. Remediation of these areas will include:

- Excavation of remaining infrastructure and impacted soils
- Waste classification and offsite disposal of excavated soils if unsuitable to be placed under the cap
- Validation of the remaining in-situ soils from the walls and base of the excavation
- Back-filling of the resulting excavation with validated imported fill
- Inclusion of the backfilled excavations beneath the final caping layer

Specific remediation and validation activities relating to the above (e.g. waste classification, validation of imported soils, validation of capping layer) will be conducted in accordance with the PB (2015) RAP, noting that if site-won fill soils are to be used beneath the cap, an assessment of risk towards potential receptors will also be made in addition to comparison against adopted criteria, given that the cap will act as a barrier to underlying fill soils.

11.3 Validation Works Sampling and Analysis Plan

A sampling and analysis plan for these activities is presented below in Table 11.1, which has been adapted from the sampling and analysis plan for validation works presented in the Auditor Endorsed Geosyntec (2021) SAQP:

Table 11.1 Validation Works – Sampling and Analysis Plan

Sampling Item	Validation Works - Sampling and Analysis Plan
Sampling Pattern / Density Rationale:	**Spoil / cut-to-fill material for onsite reuse** A minimum of one sample per 100m^3 will be collected in order to evaluate its suitability for reuse onsite. The number of samples required are not known at this stage, as it is understood that the cut and fill plan is currently being reviewed. The number of samples required to be collected for spoil material generated via piling, trenching and/or excavation works for the retention basins cannot be determined at this stage, as the volumes of material are unknown. However, the proposed sampling frequency of 1:100m^3 is considered to be adequate to determine reuse suitability. **VENM/ENM material** A minimum frequency of three samples for volumes less than 500 tonnes to verify the quality of the material, which aligns with the NSW EPA (2014) Excavated Natural Material Order. **Waste Classification** Materials that require offsite disposal will have one sample collected per source type (if there are distinct sources), or one sample per 250m^3 subject to a minimum of three samples. For soil stockpiles with a volume less than 200m^3, the sampling frequency will be one sample per 25m^3 in accordance with the NEPM (2013). **USTs and Mechanics Pit** As part of validation of the USTs and Mechanics Pit, samples will be collected from the walls and base of the excavation following removal works in accordance with NSW EPA technical guidelines.
Soil Sampling Devices / Techniques	Samples will be collected by appropriately trained and experienced Geosyntec Environmental Scientists in accordance with standard operating procedures based on NEPM (2013), AS4482.1-2005, AS4482.2-1999 and other relevant guidelines made or approved by NSW EPA as appropriate. Soil samples will be collected using clean nitrile gloves taken from material not in direct contact with the sampling equipment e.g. excavator bucket. Soil samples will be collected by gloved hand from stockpiled materials.
Sampling Depths	Given the proposed bulk excavation works, it is anticipated that soil samples will mostly collect from either site surface or from stockpiles. Excavated spoil generated from piling is also likely to be sampled on site surface.
Selection of Samples for Analysis:	Soil that is observed having visual or olfactory indicators of contamination and/or have PID screening values above background levels will be selected. In lieu of soil displaying the above characteristics, a representative sample will be obtained as outlined in the sampling density rationale above.
Sample Splitting Techniques	Soil samples will be split into two parts with minimal disturbance or mixing to reduce loss of volatiles. One part will form the primary sample and the second part will be placed into a zip lock bag for PID screening. Where a duplicate or triplicate sample is required, a similar procedure will be adopted but the sample will be split into three or four parts respectively.
Sample Container Selection:	Soil and groundwater sample containers will be supplied by the laboratory and generally comprise glass jars / bottles with integrated Teflon seals to prevent loss of volatiles. Approved containers will be used for collection of groundwater PFAS samples.
Decontamination Procedures:	Where possible disposable / dedicated sampling equipment will be used. Reusable sampling equipment will be decontaminated between sampling events. The decontamination procedure will comprise brushing off loose soil / debris; scrubbing using a Decon 90 solution; rinsing with water; and, drying.
Sample Handling and Preservation Procedures:	Soil samples will be logged using the USCS and details of any discolouration, staining, odours or other indicators of contamination noted. Samples will be placed into laboratory supplied containers using a clean pair of nitrile gloves. Acid sulfate soil samples will be placed in snap lock bags and the air removed. Asbestos samples will be placed in double snap lock bags provided by laboratory. All sampling containers will be labelled with the project number, date, sampler initials and sample depth. The containers will be placed into a chilled Esky and transported to the laboratory under chain of custody procedures to ensure that extraction can occur within holding times.

Sampling Item	Validation Works - Sampling and Analysis Plan
Field Calibration and Screening Protocols	Calibrated field instruments will be supplied by an environmental equipment supplier. Measurement of background concentrations in ambient air will be conducted prior to each reading to account for sensor drift. The result will be record on a field data sheet along with date, location details (batch details) and depth. For PID sampling, a small hole will be punched into the zip lock bag sample. The tip of the PID will be inserted into the bag and the maximum concentration noted on the borehole record sheet.

11.4 Reinstatement of Marker and Capping Layer Following Excavations

There are numerous cases in which excavation through the temporary capping and marker layer placed as part of the early works may be required during the main remediation works, such as services installation, for piling and remediation of the USTs and Mechanics Pit. Such excavations through the capping and marker layer may cause underlying potentially contaminated soils to be exposed. The following management measures should be implemented where excavations breach the capping and marker layer:

- Soils will be managed in accordance with Geosyntec (2021) CEMP Environmental Controls (Section 4 of CEMP), including appropriate stockpiling and classification of soils to be disposed of offsite.
- When the purpose of the excavation is completed, and any associated validation sampling has been conducted the marker layer and cap must be reinstated to meet the requirements of the capping strategy presented in the PB (2015) RAP, including placement of new marker with overlapping to provide continuity with adjoining marker, and backfilling with VENM.
- Where piles are used, no reinstatement will be required as the pile will occupy the diameter of the hole drilled with direct connection to adjoining marker layer.
- At the completion of final capping works, a final site surface survey will be conducted which will enable verification that the cap meets the minimum required thickness.

11.5 Management of Previously Placed Cap in the Western Portion of the Site

The minimum capping thickness of 500mm was exceeded in the western portion of the site along the proposed roadway (Ridge Road) as part of the Zoic 2019-2020 remediation works. It was understood at that time that the surplus imported VENM would be used for capping across the remainder of the site. Given that material from Ridge Road will be moved to achieve this, it is essential that management measures are implemented to ensure the requirement of a 500mm cap is maintained within in this previously validated area.

11.5.1 Use of Surplus Material During Early Works

The use of this surplus material commenced with the early works, with spreading across the remainder of the site to form a temporary cap to facilitate the main remediation works (as documented in the Geosyntec (2022) Interim Validation Report). During the scraping of surplus material from Ridge Road and placement across other areas of the site as part of the recent early works, care was taken to ensure that sufficient cap remained in the previously validated Ridge Road portion, with the level of Ridge Road still notably higher than the surrounding areas of the site.

11.5.2 Management of Previously Placed Cap During Main Remediation Works

There is no intention to excavate through the existing cap in the previously validated western portion of the site and therefore the integrity of the previously placed is unlikely to be compromised as part of planned remediation activities. However, in the event that excavations are required in this area, the procedures outlined above in Section 11.3 must be implemented to ensure that the remedial requirements presented in the PB (2014) RAP are still met, and the cap in the western portion of the site is not compromised. At the completion of final capping works, final survey data from the western portion of the site will be compared to Zoic (2019-2020) marker layer survey data in this area to ensure that a minimum 500mm of cap remains at the completion of remedial works.

11.6 Ground Gas Mitigation

Ground gas risks at the site are to be managed by the ground gas protection measures proposed to be incorporated into the school development. The remediation strategy items in the PB (2015) RAP relating to the Stage 1 area which includes the site currently only refers to levelling and capping activities. Ground gas protection measures are discussed for buildings proposed for the Stage 2 area, but not Stage 1 where the site is located, given that the end use of the site had not yet been determined at that time. An update to the PB (2015) RAP discussing the proposed ground gas mitigation system for the development is therefore required.

Geosyntec has prepared a draft Ground Gas Protection System (GGPS) Design and Verification Plan (DVP) for the site which includes design assumptions in line with the characteristic situation CS4 which was previously generated for the site, and confirmed to be appropriate by the DGI findings. The DVP is currently undergoing review by the Auditor. Once Auditor endorsement has been obtained, the DVP will be finalised and implemented. GGPS measures will be incorporated into the construction of the school buildings and the system will be validated in accordance with the DVP. Validation of the system will be documented in a separate GGPS validation report. At completion of the development, two validation reports will be prepared, one for remediation and validation of the school grounds excluding the building footprints and one for the GGPS.

Following remediation and validation activities, a long term environmental management plan (EMP) will be prepared for the site which will document ongoing management requirements for the entire site including the GGPS.

11.7 Management Plan

Once the entire site has been remediated in accordance with the PB (2015) RAP and this RAP Addendum and has achieved Auditor sign off, a Long-Term Environmental Management Plan (LTEMP) is required for the ongoing site management.

The LTEMP must include as a minimum, a background of site contamination history, outline of remediation works completed, provisions/protocols for excavation within the cap, provisions/protocol for excavation below the marker layer, and provisions/protocols for any environmental monitoring.

11.8 Conclusion

On the basis of the DGI results, the site can be made suitable for the proposed high school development, providing that the requirements of the 2015 PB (2015) RAP and this RAP Addendum are implemented.

12 References

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NSW EPA (2017) Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd edition). NSW EPA, Sydney.

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WA DoH (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

13 Limitations

This report has been prepared by Geosyntec Consultants Pty Ltd ("Geosyntec") for use by the Client who commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the Client and other parties. The findings of this report are based on the scope of work outlined in Section 1. The report has been prepared specifically for the Client for the purposes of the commission, and use by any explicitly nominated third party in the agreement between Geosyntec and the Client. No warranties, express or implied, are offered to any third parties and no liability will be accepted for use or interpretation of this report by any third party (other than where specifically nominated in an agreement with the Client).

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Geosyntec's assessment was limited strictly to identifying environmental conditions associated with the subject property area as identified in the scope of work and does not include evaluation of any other issues.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigation.

This report does not comment on any regulatory obligations based on the findings. This report relates only to the objectives stated and does not relate to any other work conducted for the Client.

The absence of any identified hazardous or toxic materials on the site should not be interpreted as a guarantee that such materials do not exist on the site.

All conclusions regarding the site are the professional opinions of the Geosyntec personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Geosyntec has not independently verified and assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Geosyntec, or developments resulting from situations outside the scope of this project.

Geosyntec is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The Client acknowledges that this report is for its exclusive use.

Appendix A Figures

LEGEND

Approximate Site Boundary

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Six Maps.

Approx. 200 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 1: Site Location Plan

Site Address: 7-9 Burroway Road, Wentworth Point, NSW

Client: RobertsCo Pty Ltd

Job Number: 21067

Date: November 2021

Geosyntec consultants

LEGEND

- Approximate Site Boundary
- Portion of the site previously validated and capped as part of the wider Zoic (2019) Stage 1 validation works
- Portion of the site capped as part of the 2021 early works prior to commencement of the main remediation works

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Nearmap.

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 2: Site Layout Plan – Previously Capped Area from Zoic (2019) Works

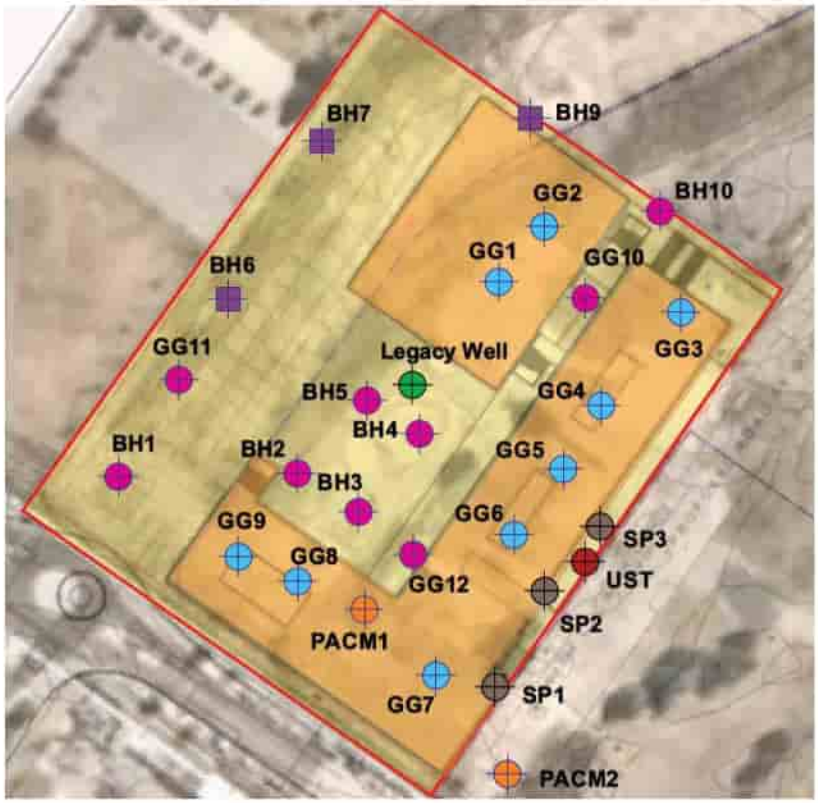
Site Address: 7-9 Burroway Road, Wentworth Point, NSW

Client: RobertsCo Pty Ltd

Job Number: 21067

Date: November 2021

Geosyntec consultants



LEGEND

Approximate Site Boundary

Location of Proposed SOPHS Buildings

Location of Greencap (2021) Groundwater / Ground Gas Well

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Greencap (2021) DSI.

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 3: Site Layout Plan – GW/LFG Well Locations & Proposed Building Footprint

Site Address: 7-9 Burroway Road, Wentworth Point, NSW

Client: RobertsCo Pty Ltd

Job Number: 21067

Date: November 2021

Geosyntec consultants

LEGEND

- Approximate Site Boundary
- Portion of the site previously validated and capped as part of the wider Zoic (2019) Stage 1 validation works
- Portion of the site capped as part of the 2021 early works prior to commencement of the main remediation works
- Approximate Location of former mechanic pit area
- Approximate Location of former wash bay
- Approximate Test Pit Location
- Approximate location of Sampled Groundwater Well
- Approximate Location of USTs

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Nearmap.

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 4: Site Layout Plan – Locations of USTs and Other Infrastructure

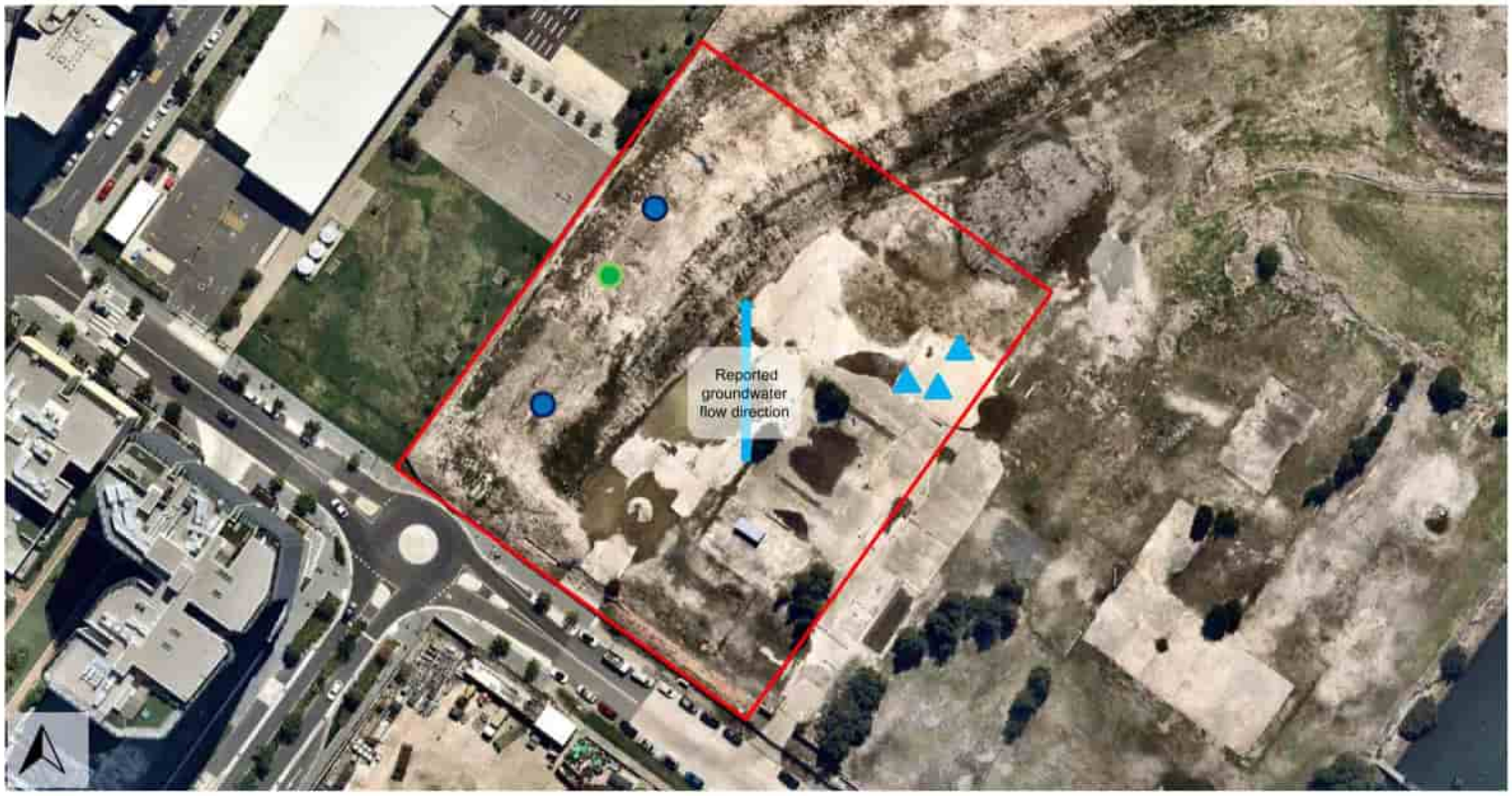
Site Address: 7-9 Burroway Road, Wentworth Point, NSW

Client: RobertsCo Pty Ltd

Job Number: 21067

Date: November 2021

Geosyntec consultants



LEGEND

- Approximate Site Boundary
- Dust and VOC Monitoring Location
- Airborne Fibre Monitoring Location
- Approximate Locations of observed ACM

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Nearmap.

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 - AHD

Figure 5: Site Layout Plan – Air Monitoring Locations & ACM Locations

Site Address: 7-9 Burroway Road, Wentworth Point, NSW

Client: RobertsCo Pty Ltd

Job Number: 21067

Date: November 2021

Geosyntec consultants

LEGEND

Figure 6: Aerial Imagery - Completion of prev. Zoic Works (Sep 2019) & Pre-works (Oct 2021)

Site Address: 7-9 Burroway Road, Wentworth Point, NSW

Approx. 20 m

Datum: GDA 1994 MGA Zone 56 - AHD

Client: RobertsCo Pty Ltd

Job Number: 21067

Date: November 2021

This product has been created to support the main report and is not suitable for other purposes. Image courtesy of Nearmap.

Geosyntec consultants

URBIS

Angel Place, Level 8, 123 Pitt Street | Sydney NSW 2000, Australia | T61 2 8233 9900
URBIS Pty Ltd | ABN 50 105 256 228

CLIENT
ROBERTS CO

KEY PLAN

DISCLAIMER

REV	DESCRIPTION	DRAWN	CHK	DATE
E	... (30.10.24)	YY	MK	31/10/24
D	... (30.10.24)	YY	MK	30/10/24
C	... (25.10.24)	YY	MK	31/10/24
B	... (30.10.24)	YY	MK	30/10/24
A	... (08.10.24)	YY	MK	31/10/24

PROJECT NAME & ADDRESS
SYDNEY OLYMPIC PARK
NEW HIGH SCHOOL

PROJECT DIRECTOR: MK

DRAWING TITLE
SITE PLAN

STAGE	PROJECT NO.
DETAILED DESIGN	P0033179

SCALE
1:500 @ A1 1:1000 @ A3

DRAWING NO. REVISION
SOPHS-UR-LA-L0-L002 E

URBIS

ROBERTS CO

DISCLAIMER

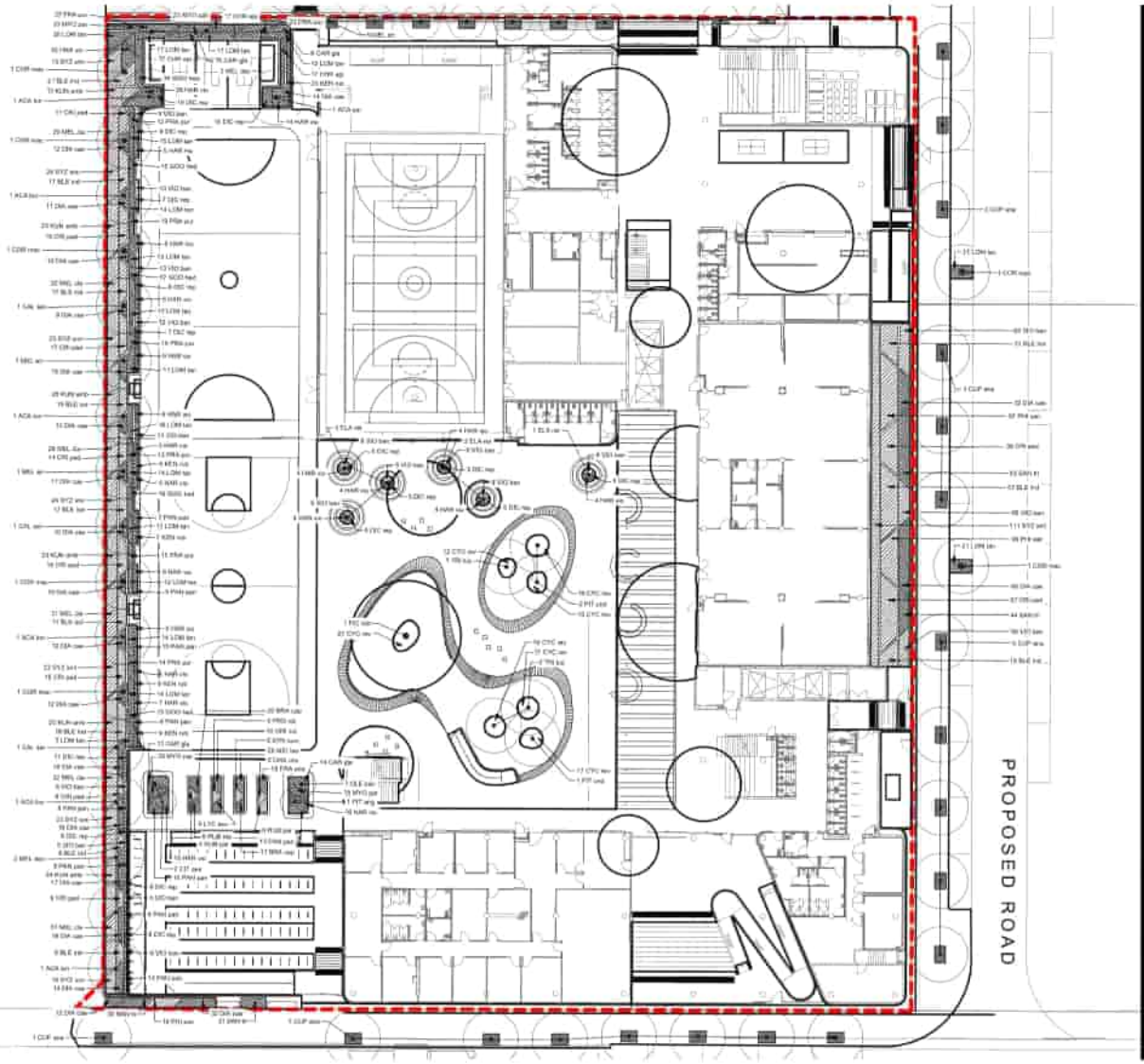
SYDNEY OLYMPIC PARK
NEW HIGH SCHOOL

FINISHES PLAN
GROUND FLOOR

DETAILED DESIGN

P0033179

SOPHS-UR-LA-L0-L201 E



URBIS

Angel Place, Level 8, 123 Pitt Street | Sydney NSW 2000
Australia | t 61 2 8233 9900
URBIS Pty Ltd | ABN 50 105 256 228

CLIENT
ROBERTS CO

KEY PLAN

REV	DESCRIPTION	DRWN	CHK	DATE
C	ISSUE FOR INFORMATION	TH	MR	15/11/2021
B	ISSUE FOR INFORMATION	TH	MR	05/11/2021
A	ISSUE FOR INFORMATION	TH	MR	15/10/2021

PROJECT NAME & ADDRESS
SYDNEY OLYMPIC PARK
NEW HIGH SCHOOL

PROJECT DIRECTOR: MR

DRAWING TITLE
PLANTING PLAN
GROUND FLOOR

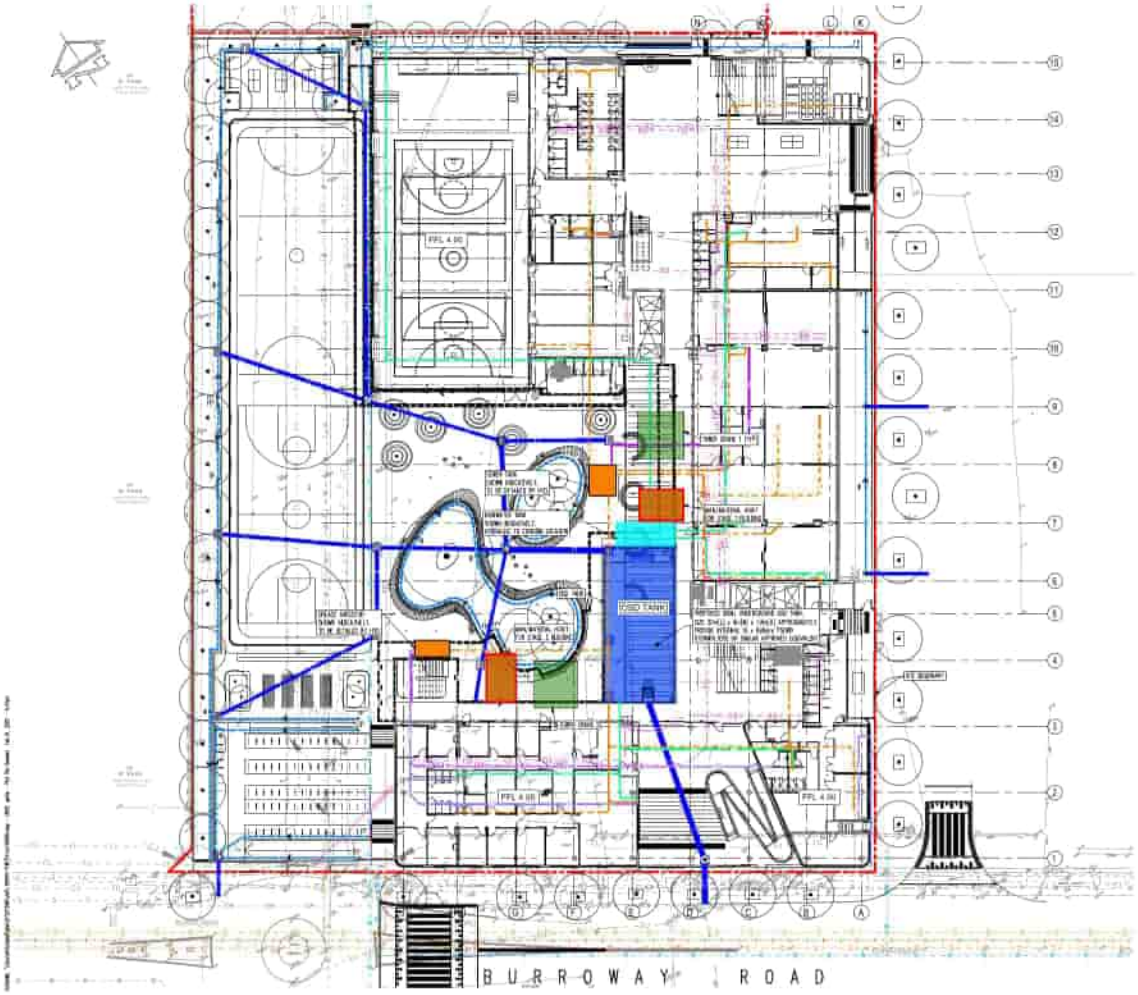
STAGE
DETAILED DESIGN

PROJECT NO.
P0033179

SCALE
1:200 @ A1 1:400 @ A3

DRAWING NO.
SOPHS-UR-LA-L0-L501 C

REVISION
C



EXISTING SERVICES LEGEND

- Existing gas
- Existing water
- Existing underground electrical
- Existing electrical overhead
- Existing communications
- Existing rail
- Existing stormwater

PROPOSED SERVICES LEGEND

- Hydraulic (Typical Type)
- Electrical (Typical Class)
- Proposed water (from tank)
- Proposed water (from hyd.)
- Proposed gas (from hyd.)
- Trade waste (from hyd.)
- Vent (from hyd.)
- Ancillary hydrology (from hyd.)
- Hydrant stormwater (from hyd.)
- Underground electrical (from elec.)
- Proposed stormwater pipe

NOTE:
- COORDINATION OF SERVICES UNDER BUILDINGS INCLUDING CARPARK GAS REQUIREMENTS BY OTHERS.
- REFER TO SITE PLAN FOR RETAINING WALLS.
- NO SERVICES CLASH DETECTION HAS BEEN UNDERTAKEN
- NO GROUND IMPROVEMENT (SETTLEMENT) SYSTEM IS SHOWN.

0 2.5 5 7.5 10 12.5 15 17.5 20m
SCALE 1:250 @ A1

ISSUE FOR TENDER ONLY

NOT TO BE USED FOR CONSTRUCTION

B ISSUE FOR TENDER	M. JH	13.01.22	
A ISSUE FOR TENDER	M. JH	20.12.21	
No. DESCRIPTION	DRN	CHK	DATE

ARCHITECT
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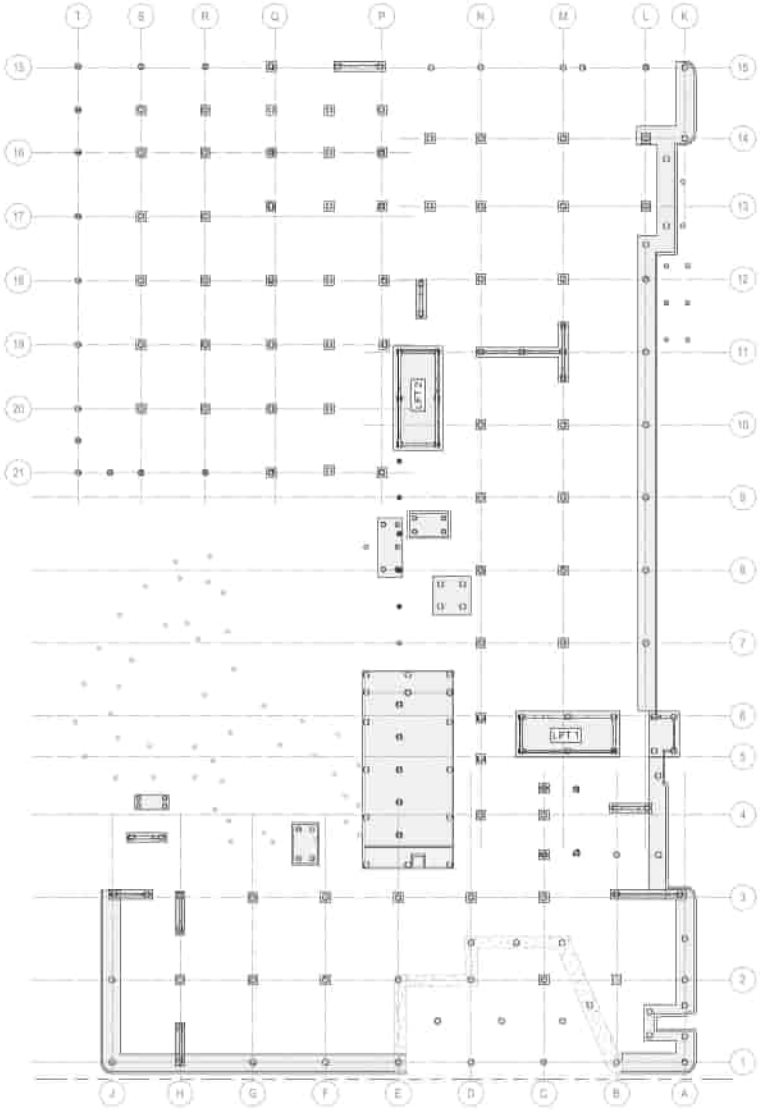
ENGINEER
TTW Structural Civil Traffic Façade
SYDNEY NSW 2000 | Level 6, 70 Pitt Street, Sydney, NSW 2000

PROJECT
SYDNEY OLYMPIC PARK HIGH SCHOOL (SOPHS)
7-9 BURROWAY ROAD,
WENTWORTH POINT NSW 2127

DRAWING NAME
IN-GROUND SERVICES PLAN

TTW JOB No. 211000

SCALE @ A1: 1:250
DRAWN BY: JH
AUTHORISED BY:
DRAWING No: SOPHS-TTW-CV-LG-00004
REVISION: B
File No Created: Feb 01 2022 - 4:55pm



FOOTING OVERALL PLAN

Scale 1 : 200

1. REFER TO 'I' AND 'J' SERIES PLANS FOR DETAILED LAYOUTS

Rev	Description	Date
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	[illegible]	[illegible]

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL AND OTHER CONSULTANTS DRAWINGS AND SPECIFICATIONS

NOTES ON DRAWING NO. 0001

Key Plan

Project
SYDNEY OLYMPIC PARK HIGH SCHOOL

Client
roberts co

Structural & Civil Engineer
TTW Structural Civil Traffic Façade

Level 2 9439 5366 | 16 to 20 Mary Street South Sydney NSW 2000

Project No
211266

Drawn | Co-Ordinated | Scale (Full) | Scale (Half)
MA | CBH | A1 | As Indicated

Drawn Title
FOOTING OVERALL PLAN

Drawing Number
SOPHS-TTW-ST- 1000

Revision
5

Status
PRELIMINARY

NOT FOR CONSTRUCTION

Appendix B Result Summary Tables and Charts

Soil Results - BTEX, TRH / TPH, Lead

Geosyntec consultants

	BTEX							TRH							TPH					Metals
	Naphthalene (oxic)	Toluene	Ethylbenzene	m&p-Xylene	o-Xylene (m & o)	Xylenes (sol)	Xylenes Total	C6-C10 Fraction (F1)	TRH C10-C16 (F2) excess (NEPM)	C10-C16 Fraction (F2)	C10-C16 Fraction (F2) (minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (sum)	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	>C10-C36 Fraction (sum)	Lead
	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
EQL	1	0.2	0.5	1	1	2	3	25	50	50	50	100	100	50	25	50	100	100	50	1
NEPM 2013 Table 1B(7) Recuperation Limit for Res / Parkland & Public Open Spa								700				2,500								
NEPM 2013 Table 1B(7) Recuperation Limit for Commercial / Industrial								700				10,000	10,000							
NEPM 2013 Table 1B(6) Soil HSL for Vapour Intrusion, Sand, 0 to <1m, Res		75	3	95			95													
NEPM 2013 Table 1B(5) Soil HSL for Direct Contact, Res	5	370	140	210			230		370		1,100									
NEPM 2013 Table 1B(3) HILs Res D 2m																				300
Field ID	Date																			
TS1_1_0.0-0.4	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50	2
TS1_1_0.6-0.8	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50	3
TS1_2_0.0-0.4	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50	8
TS1_2_0.6-0.8	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50	23
TS1_3_0.0-0.4	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	50	100	150	<50	<25	<50	<100	<100	<50	710
TS1_3_0.6-0.8	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	120	120	<100	<100	120	<25	87	<100	<100	84	2
TS2_1_0.0-0.2	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50	13
DUP1 (TS2_1_0.0-0.2)	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	<100	<100	<50	<25	<50	<100	<100	<50	14
TS2_1_0.2-0.3	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	25	28	830	830	820	<100	1,200	<25	280	780	<100	1,200	16
TS2_2_0.4-0.6	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	1,100	<100	1,100	<25	190	1,100	<100	1,300	71
TS2_2_0.6-1.2	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	1,300	1,300	1,100	<100	2,400	<25	340	1,900	<100	2,300	7
TS2_3_0.4-0.6	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	430	430	1,100	<100	1,500	<25	170	1,300	<100	1,500	12
TS2_3_0.6-1.0	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	81	81	1,100	<100	1,200	<25	170	1,100	<100	1,300	34
TS2_4_0.4-0.6	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	1,100	<100	1,100	<25	170	1,100	<100	1,300	10
TS2_4_0.6-1.0	30/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	850	850	1,200	<100	2,100	<25	410	1,700	<100	2,100	18
SED1_0	25/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	33	31	780	780	12,000	9,900	23,000	<25	390	9,900	6,700	17,000	-
SED1_1	25/11/2021	<1	<0.2	<0.5	<2	<2	<2	<3	33	33	810	810	2,800	990	4,200	<25	330	3,800	1,900	6,000	-
SED1_0.0-0.2	1/12/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	880	880	870	<100	870	<25	270	600	180	850	-
SED1_0.6-1.0	1/12/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	<100	<100	<100	<25	<50	<100	<100	<50	-
SED2_0.0-0.4	1/12/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	<100	<100	<100	<25	<50	<100	<100	<50	-
SED2_0.6-1.0	1/12/2021	<1	<0.2	<0.5	<2	<2	<2	<3	<25	<25	<50	<50	<100	<100	<100	<25	<50	<100	<100	<50	-

Soil Results - PAH

		PAHs																		
		Benzo(b+j)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(a)pyrene TEQ calc (zero)	Benzo(a)pyrene TEQ calc(half)	Benzo(a)pyrene TEQ calc(PQL)	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of positives)
		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
EQL		0.1	0.1	0.1	0.1	0.1	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.05
NEPM 2013 Table 1B(7) Management Limits in Res / Parkland, Coarse Soil																				
NSW 2014 General Solid Waste CT1 (No Leaching)							0.8													
NSW 2014 Restricted Solid Waste CT2 (No Leaching)							[illegible]													
NEPM 2013 Table 1A(3) Res C Soil HSL for Vapour Intrusion, Sand, 0 to <1m																				
NEPM 2013 Table 1A(3) Res A/B Soil HSL for Vapour Intrusion, Sand, 0 to <1m																	[illegible]			
NEPM 2013 Table 1A(1) HILs Res C Soil								3	3	3										300
Field ID	Date																			
TS1-1_0.2-0.4	30/11/2021	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05
TS1-1_0.6-0.8	30/11/2021	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05
TS1-2_0.2-0.4	30/11/2021	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05
TS1-2_0.8-1.0	30/11/2021	0.9	<0.1	<0.1	0.2	0.6	[illegible]	1	1.1	1.1	0.4	0.7	<0.1	1.1	<0.1	0.2	<0.1	0.5	1.3	6.6
TS1-3_0.2-0.4	30/11/2021	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.1	<0.1	0.2
TS1-3_0.6-0.8	30/11/2021	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05
TS2-1_0.4-0.6	30/11/2021	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05
DUP1 (TS2-1_0.6-0.8)	30/11/2021	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05
TS2-1_1.0-1.2	30/11/2021	0.4	<1	<1	<1	0.3	0.2	<0.5	<0.3	<0.5	0.1	0.2	<0.1	0.4	<1	<0.1	<1	<1	0.6	2.1
TS2-2_0.4-0.6	30/11/2021	1.1	<0.1	0.1	0.2	1.5	[illegible]	1.7	1.7	1.7	0.8	1.3	0.1	1.5	<0.1	0.6	<0.1	0.6	1.7	11
TS2-2_1.0-1.2	30/11/2021	<0.2	2.9	<1	1.7	0.1	0.98	<0.5	<0.3	<0.5	<0.1	0.2	<0.1	6.4	4.2	<0.1	<1	3.8	6.8	16
TS2-3_0.4-0.6	30/11/2021	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05
TS2-3_1.2-1.4	30/11/2021	2.1	<0.2	0.4	1.0	1.3	[illegible]	2.8	2.8	2.8	3.8	1.6	0.1	3.6	0.3	0.8	0.2	1.9	3.1	25
TS2-4_0.4-0.6	30/11/2021	<0.2	<0.1	<0.1	<0.1	<0.1	0.1	<0.5	<0.3	<0.5	<0.1	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.67
TS2-4_1.2-1.4	30/11/2021	0.8	<1	<1	<1	0.4	0.53	0.6	0.7	0.7	4.2	0.5	<0.1	1	<1	0.2	<1	<1	1.2	4.4
VEX1.2	25/11/2021	<0.2	<0.1	<0.1	0.2	<0.1	<0.05	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.6	0.3	0.5	1.6
VEX1-3	25/11/2021	0.2	<0.1	<0.1	0.2	0.2	0.2	<0.5	<0.3	<0.5	0.1	0.2	<0.1	0.4	0.3	<0.1	0.4	0.8	0.6	3.3
WW1_0-0.2	1/12/2021	1	<0.1	<0.1	0.3	0.7	0.86	1	1.1	1.1	0.3	0.6	<0.1	1.5	<0.1	0.3	<0.1	0.3	1.2	6.9
WW1_0.8-1.0	1/12/2021	<0.2	<0.1	<0.1	<0.1	<0.1	<0.05	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05
WW2_0.2-0.4	1/12/2021	<0.2	<0.1	<0.1	<0.1	<0.1	0.06	<0.5	<0.3	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.06
WW2_0.8-1.0	1/12/2021	1.6	<0.1	0.2	4.4	1.6	[illegible]	2.8	2.8	2.9	3.8	1.3	0.1	3.0	0.1	0.6	<0.1	1.3	2.4	16

Groundwater Results - BTEX, TRH

Geosyntec consultants

	BTEX						TRH				
	Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)
	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
0.QL	0.001	1	1	1	2	1	10	10	50	100	100
ANZG (2018) Marine Water 95% LOSP Toxicant DGVs	0.07	700	180	80							
NEPM(2013) Table 1C(1)1, Marine Waters	0.05	500									
NEPM 2013 Table 1A(4) Bot HSL B & B GW for Vapour Intrusion, Sand, <=2m, <4m		900						1,000			
NEPM 2013 Table 1A(4) Bot HSL C GW for Vapour Intrusion, Sand, >=2m, <4m											

Field ID	Date										
GGD1	1/12/2021	<0.001	<1	<1	<1	<2	<1	<10	<10	<50	<100	<100
DUP 1 (GGD1)	1/12/2021	<0.001	<1	<1	<1	<2	<1	<10	<10	<50	<100	<100
GGD5	1/12/2021	<0.001	<1	<1	<1	<2	<1	<10	<10	<50	<100	<100
GGD6	1/12/2021	<0.001	<1	<1	<1	<2	<1	<10	<10	<50	<100	<100
GGD9	1/12/2021	<0.001	<1	<1	<1	<2	<1	<10	<10	<50	<100	<100
Tripblank	1/12/2021	<0.001	<1	<1	<1	<2	<1	<10	<10	-	-	-

Groundwater Results - Metals, Phenols, Ammonia

	Metals								Phenols	Inorganics
	Arsenic (filtered)	Cadmium (filtered)	Chromium (III+VI) (filtered)	Copper (filtered)	Lead (filtered)	Mercury (filtered)	Nickel (filtered)	Zinc (filtered)	Phenolics Total	Ammonia as N
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L
ESL	0.001	0.0001	0.001	0.002	0.001	0.00005	0.001	0.001	50	0.005
ANZG (2018) Marine Water 95% LOSP Toxicant DGVs	0.013 / 0.024*	0.0055	0.0274 / 0.0044**	0.0013	0.0044	0.0004	0.07	0.015		0.91
NEPM(2013) Table 1C.5(1), Marine Waters	0.013 / 0.024*	0.0055	0.0274 / 0.0044**	0.0013	0.0044	0.0004	0.07	0.015		
Field ID	**Date**									
GG01	**1/12/2021**	0.002	<0.0001	<0.001	0.002	<0.001	<0.00005	0.001	<0.001	<50	5.3
DUP 1 (GG01)	**1/12/2021**	0.002	<0.0001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	-	-
GG05	**1/12/2021**	0.004	<0.0001	<0.001	0.008	<0.001	<0.00005	<0.001	<0.001	<50	2.3
GG08	**1/12/2021**	0.002	<0.0001	<0.001	0.002	<0.001	<0.00005	0.002	<0.001	<50	0.11
GG09	**1/12/2021**	0.001	<0.0001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	<50	0.76
Triplblank	**1/12/2021**	-	-	-	-	-	-	-	-	-	-

*0.013mg/L = AsV ; 0.024mg/L = AsIII

** 0.0274 / 0.027mg/L = CrIII unknown protection level ; 0.0044mg/L = CrVI

Groundwater Results - PAHs

		PAH																
		Benzo(b+j+k)fluoranthene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ	PAHs (Sum of positives)
		mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L
EQL		0.001	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.005	0.001
ANZG (2018) Marine Water 99% pCHP Toxicant DGVs					0.4		0.1				1.4			50	2			
NEPM(2013) Table 1C GILs, Marine Waters														50				
NEPM 2013 Table 1A(4) Res HSL A & B GW for Vapour Intrusion, Sand 2m to <4m																		
[illegible]																		
Field ID	Date																	
GG01	1/12/2021	<0.001	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.005	0
DUP 1 (GG01)	1/12/2021	<0.001	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.005	0
GG05	1/12/2021	<0.001	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.005	0
GG06	1/12/2021	<0.001	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.005	0
GG09	1/12/2021	<0.001	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.005	0
Tripblank	1/12/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Groundwater Results - PFAS

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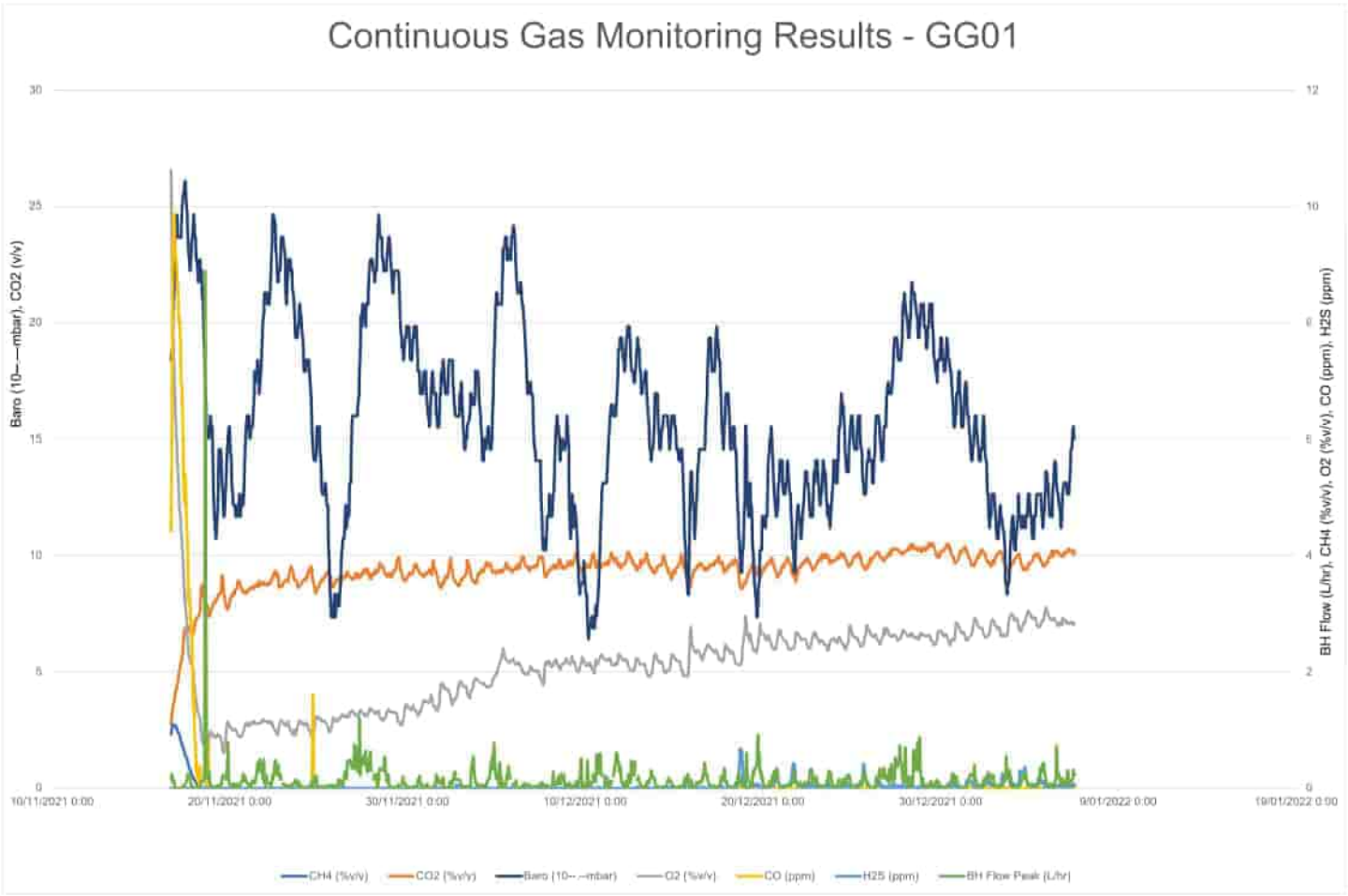
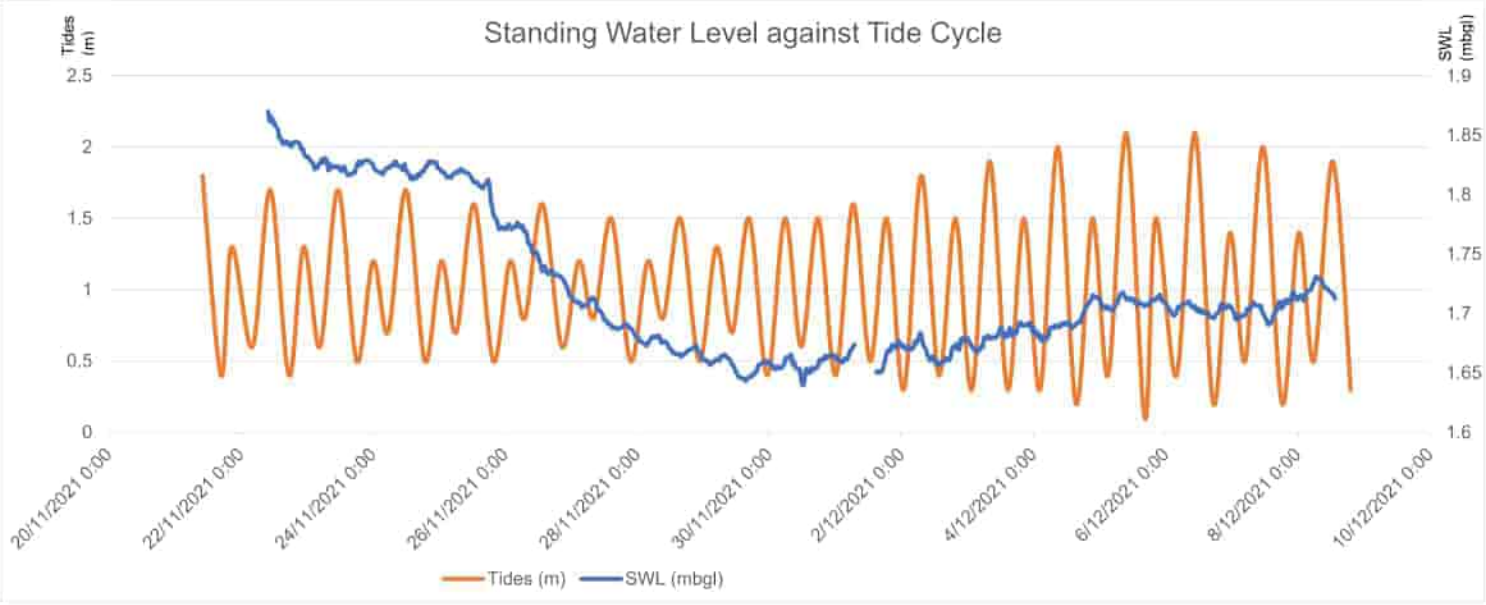
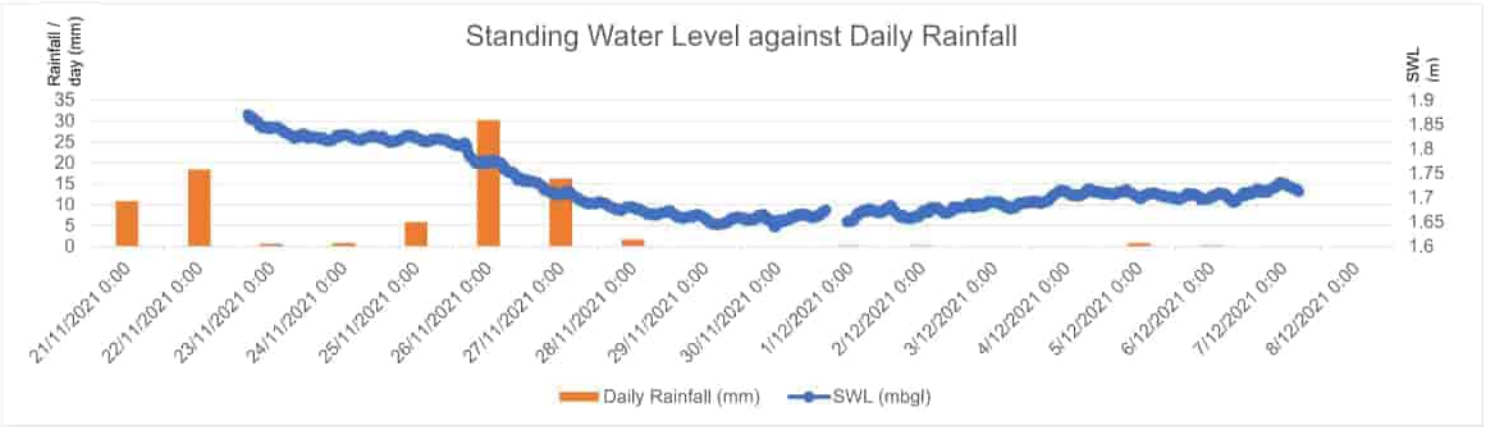
		Perfluoroalkane Carboxylic Acids	[n:2] Fluorotelomer Sulfonic Acids		Perfluoroalkane Sulfonic Acids		PFAS		
		Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Sum of PFHxS and PFOS	Sum of PFAS	Sum of PFAS (PFOS + PFOA)
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
PFAS NEMP 2020 Interim Marine WPC		0.22				0.13			
PFAS NEMP 2020 Interim Marine WPC		19				0.00023			
Field ID	Date								
GG01	1/12/2021	0.08	<0.01	<0.02	0.08	0.13	0.21	0.29	0.21
DUP 1 (GG01)	1/12/2021	-	-	-	-	-	-	-	-
GG05	1/12/2021	0.02	<0.01	<0.02	0.07	0.52	0.59	0.61	0.54
GG06	1/12/2021	0.03	<0.01	<0.02	0.02	0.02	0.04	0.07	0.05
GG08	1/12/2021	0.02	<0.01	<0.02	0.12	0.09	0.21	0.23	0.11
Tripblank	1/12/2021	-	-	-	-	-	-	-	-

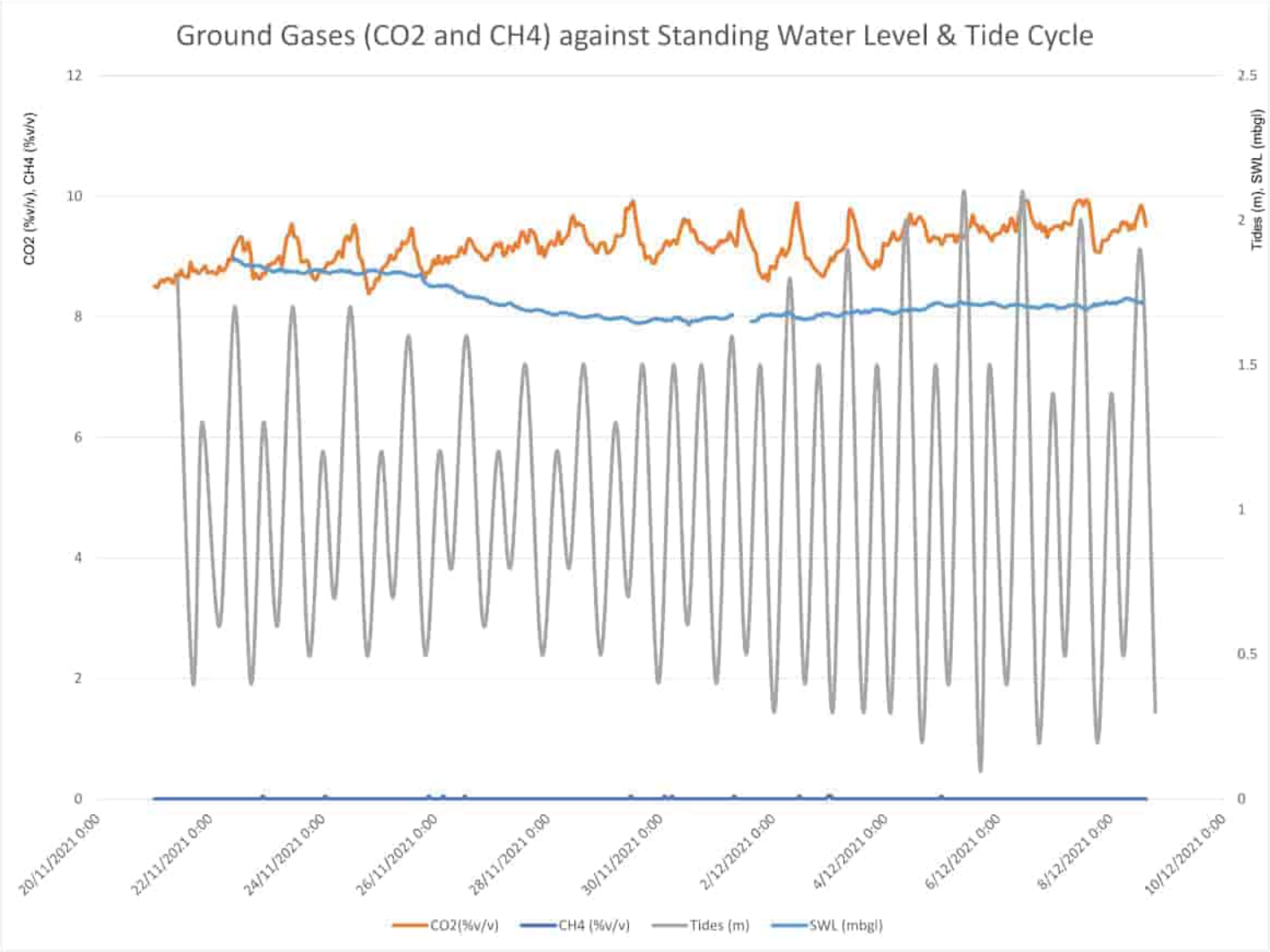
Date:	16.11.21				
Start time:	12:00pm	**Start Pressure (GA5000):**	1018mb	**Sydney Airport Weather Station Pressure (BOM) 9am:**	1015.9
End time:	2:00pm	**End Pressure (GA5000):**	1018mb	**Sydney Airport Weather Station Pressure (BOM) 3pm:**	1017.1
		Pressure Change:	0mb (neutral)	**Pressure Change (6 hrs):**	+1.2mb

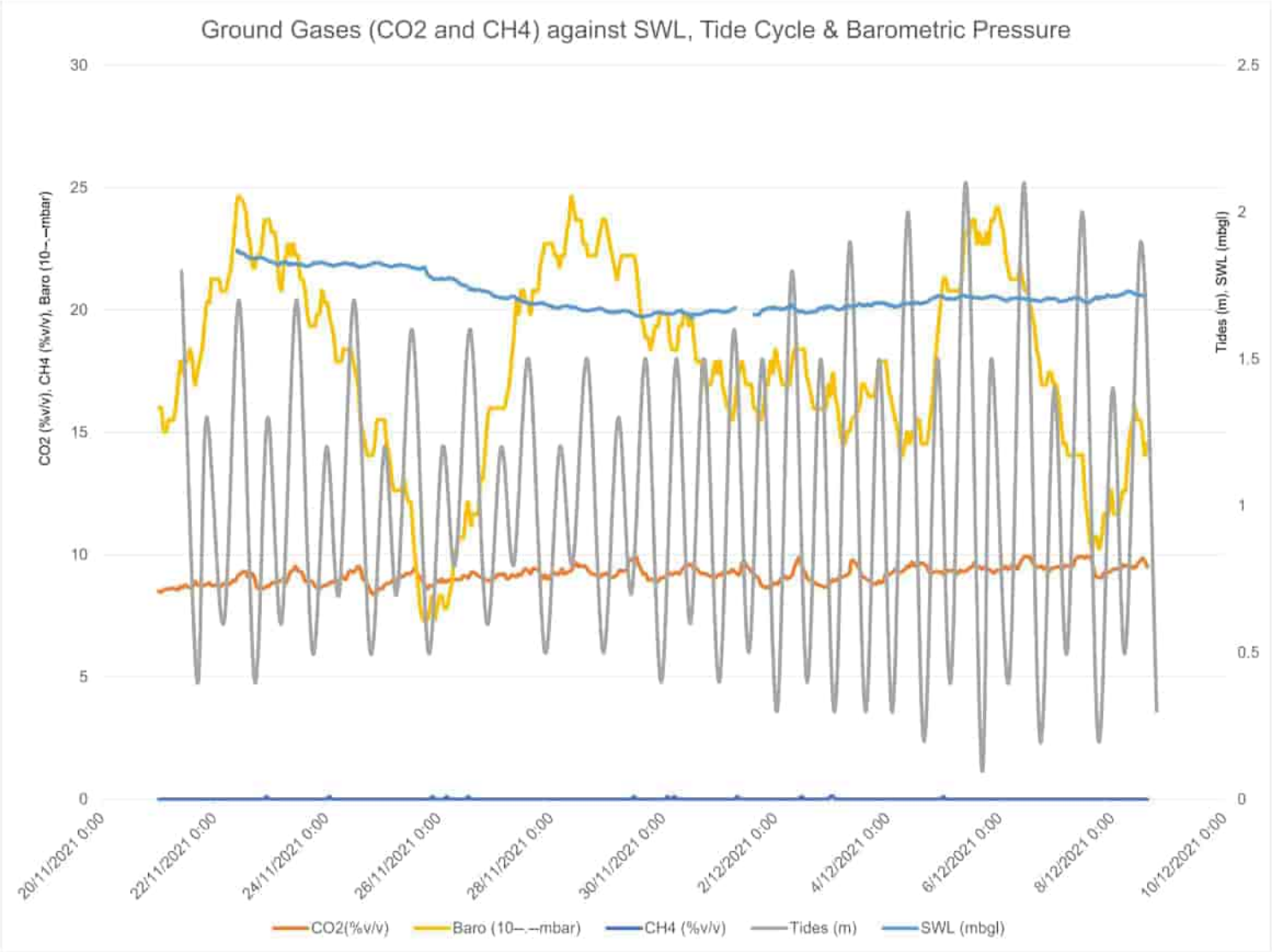
Parameter	Accuracy												
Well #		GG1	GG2	GG3	GG4	GG5	GG6	GG7	GG8	GG9	GG10	GG11	GG12
Date		16.11.21	16.11.21	16.11.21	16.11.21	16.11.21	16.11.21	16.11.21	16.11.21	16.11.21	16.11.21	16.11.21	16.11.21
Round #		1	1	1	1	1	1	1	1	1	1	1	1
Methane (%v/v)	GA5000: +/- 3%@60% GFM: 0.2%@5%, 1.0%@30%, 3.0%@100%	4.2	0.8	0	2.3	0	0	0.5	0.1	0.3	15.1	-	0
Carbon Dioxide (%v/v)	GA5000: +/- 3%@40% GFM: 0.1%@10%, 3.0%@50%	6	4.7	7.2	6	6.2	5.6	5.6	2	2.7	0.1	-	4.6
Oxygen (%v/v)	GA5000: 0.2% GFM: 0.5%	0.8	0	6.2	0	0.1	0	0	0	0	0.1	-	3.5
Hydrogen Sulphide (ppm)	GA5000: 20 GFM: 5% of fs	0	2	2	2	2	2	2	2	1	3	-	3
Carbon Monoxide (ppm)	GA5000: 20 GFM: 5% of fs	0	1	2	1	3	2	1	1	2	2	-	3
Borehole Flow (L/hr)	GA5000: 0.5-3 GFM: 0.1 L/hr	-0.6	0.1	0.3	0.1	0	0	0.2	0	0	0.3	-	0.1
Borehole Pressure (Pa)	GA5000: 3 GFM: +300/-100Pa	-4	-0.03	0.1	0.1	-0.07	-0.07	0.02	0	0	0.15	-	-0.03
Slotted Section (m bgl) (Greencap (2021) DSI)	Not applicable	0.7 - 1.5	0.7 - 3.5	0.5 - 1.0	0.7 - 1.5	0.7 - 6.0	0.7 - 2.0	0.7 - 1.5	0.7 - 2.5	0.7 - 1.2	0.3 - 0.5	0.3 - 0.5	0.35 - 0.55
TL Well Depth (m bgl) (Greencap (2021) DSI)	Not applicable	1.5	3.5	1	1.5	6	2	1.5	2.5	1.2	0.5	0.5	0.55
TL Depth of Drilled Borehole (m bgl) (Greencap (2021) DSI)	Top of casing	2.5	3.5	3.9	1.7	8	2.3	1.6	3	1.2	3	0.5	3
Screened Soil Horizon (Greencap (2021) DSI)	Not applicable	Fill: 0.2 - 1.2 Fill?/Natural?: 1.2 - 2.6	Fill: 0.2 - 1.2 Fill?/Natural?: 1.2 - 2.6	Fill: 0 - 1.5 Fill?/Natural?: 1.5 - 2.7	Fill: 0.2 - 1.0 Fill?/Natural?: 1.0 - 1.5	Fill: 0.15 - 3.0 Fill?/Natural?: 3.0 - 6.0	Fill: 0.15 - 0.9 Fill?/Natural?: 0.9 - 2.3	Fill: 0 - 0.9 Fill?/Natural?: 0.9 - 1.6	Fill: 0 - 0.5 Fill?/Natural?: 0.5 - 2.6	Fill: 0 - 0.8 Fill?/Natural?: 0.8 - 1.2	Fill: 0.2 - 1.8 Fill?/Natural?: 1.8 - 2.5	Fill: 0 - 0.3 Fill?/Natural?: 0.3 - 0.5	Fill: 0.25 - 1.5 Fill?/Natural?: 1.5 - 2.3
Stickup (m)	Not applicable	0	0	0	0	0	0	0	0	0	0	0	0
SWL (m toc)	m Bgl toc	1.38	1.94	0.84	1.35	1.31	1.3	1.13	0.91	0.9	0.48	-	0.48
Additional Comments	Not applicable	Water pooled inside gatic cover	Water pooled inside gatic cover	-	-	-	-	-	-	-	-	Not sampled	-


Continuous Gas Monitoring Results - GG01
Baro (10-- --mbar), CO2 (v/v)
BH Flow (L/hr), CH4 (%v/v), O2 (%v/v), CO (ppm), H2S (ppm)
30
25
20
15
10
5
0
12
10
8
6
4
2
0
10/11/2021 0:00
20/11/2021 0:00
30/11/2021 0:00
10/12/2021 0:00
20/12/2021 0:00
30/12/2021 0:00
9/01/2022 0:00
19/01/2022 0:00
CH4 (%v/v)
CO2 (%v/v)
Baro (10-- --mbar)
O2 (%v/v)
CO (ppm)
H2S (ppm)
BH Flow Peak (L/hr)


Standing Water Level against Tide Cycle
Tides (m)
SWL (mbgl)
2.5
2
1.5
1
0.5
0
1.9
1.85
1.8
1.75
1.7
1.65
1.6
20/11/2021 0:00
22/11/2021 0:00
24/11/2021 0:00
26/11/2021 0:00
28/11/2021 0:00
30/11/2021 0:00
2/12/2021 0:00
4/12/2021 0:00
6/12/2021 0:00
8/12/2021 0:00
10/12/2021 0:00
Tides (m)
SWL (mbgl)


Standing Water Level against Daily Rainfall
Rainfall / day (mm)
SWL (m)
35
30
25
20
15
10
5
0
1.9
1.85
1.8
1.75
1.7
1.65
1.6
21/11/2021 0:00
22/11/2021 0:00
23/11/2021 0:00
24/11/2021 0:00
25/11/2021 0:00
26/11/2021 0:00
27/11/2021 0:00
28/11/2021 0:00
29/11/2021 0:00
30/11/2021 0:00
1/12/2021 0:00
2/12/2021 0:00
3/12/2021 0:00
4/12/2021 0:00
5/12/2021 0:00
6/12/2021 0:00
7/12/2021 0:00
8/12/2021 0:00
Daily Rainfall (mm)
SWL (mbgl)


Ground Gases (CO2 and CH4) against Standing Water Level & Tide Cycle
CO2 (%v/v), CH4 (%v/v)
Tides (m), SWL (mbgl)
12
10
8
6
4
2
0
2.5
2
1.5
1
0.5
0
20/11/2021 0:00
22/11/2021 0:00
24/11/2021 0:00
26/11/2021 0:00
28/11/2021 0:00
30/11/2021 0:00
2/12/2021 0:00
4/12/2021 0:00
6/12/2021 0:00
8/12/2021 0:00
10/12/2021 0:00
CO2(%v/v)
CH4 (%v/v)
Tides (m)
SWL (mbgl)


Ground Gases (CO2 and CH4) against SWL, Tide Cycle & Barometric Pressure
CO2 (%v/v), CH4 (%v/v), Baro (10-.--mbar)
Tides (m), SWL (mbgl)
30
25
20
15
10
5
0
2.5
2
1.5
1
0.5
0
20/11/2021 0:00
22/11/2021 0:00
24/11/2021 0:00
26/11/2021 0:00
28/11/2021 0:00
30/11/2021 0:00
2/12/2021 0:00
4/12/2021 0:00
6/12/2021 0:00
8/12/2021 0:00
10/12/2021 0:00
CO2(%v/v)
Baro (10-.--mbar)
CH4 (%v/v)
Tides (m)
SWL (mbgl)

Appendix C Laboratory Certificates

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 424 344

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Darwin Office - Envirolab Services
Unit 7, 17 Willes Rd, Berrimah, NT 0820
Ph: 08 8967 1201 / darwin@envirolab.com.au

Client: Geosyntec	Client Project Name / Number / Site etc (ie report title): 31067 - Wentworth Point
Contact Person: Hayden Davies	
Project Mgr: Peter Moore	PO No.:
Sampler: Hayden Davies	Envirolab Quote No.:
Address: Suite 1, level 9, 189 Kent street, Sydney 2000	Date results required: Standard Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: 92518070 Mob: 0451021812	Additional report format: esdat / equis /
Email: hayden.davies@geosyntec.com Peter.moore@geosyntec.com edward.munnings@geosyntec.com	Lab Comments:

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled		Combo 2	TRH/BTEX	PAHs												Provide as much information about the sample as you can
1	TS1-1_0.2-0.4		30/11/2021		x														
2	TS1-1_0.6_0.8		30/11/2021		x														
3	TS1-2_0.2-0.4		30/11/2021		x														
4	TS1-2_0.8-1.0		30/11/2021		x														
5	TS1-3_0.2-0.4		30/11/2021		x														
6	TS1-3_0.6-0.8		30/11/2021		x														
7	TS2-1_0.4-0.6		30/11/2021		x														
8	TS2-1_1.0-1.2		30/11/2021		x														
9	TS2-2_0.4-0.6		30/11/2021		x														
10	TS2-2_1.0-1.2		30/11/2021		x														
11	TS2-3_0.4-0.6		30/11/2021		x														
12	TS2-3_1.2-1.4		30/11/2021		x														
13	TS2-4_0.4-0.6		30/11/2021		x														
14	TS2-4_1.2-1.4		30/11/2021		x														
15	DUP1		30/11/2021		x														
~	TRIP1		30/11/2021		x														Please forward to courier (Sydney/Melbourne)
16	WB1_0-0.2		1/12/2021			x	x												
17	WB1_0.8-1.0		1/12/2021			x	x												
18	WB2_0.2-0.4		1/12/2021			x	x												
19	WB2_0.8-1.0		1/12/2021			x	x												

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Geosyntec	Received by (Company): ELS Syd	Lab Use Only	
Print Name: Hayden Davies	Print Name: K - Lucas	Job number: 258429 D	Cooling: Ice / Ice pack / None
Date & Time: 1/12/2021	Date & Time: 1615 01-12-2021	Temperature: 14	Security seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

extras

20	TS1_GW	30/11	x	
21	TS2_GW	30/11	x	

updated COC 2/12

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CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 424 344

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284290

Client: Geosyntec	Client Project Name / Number / Site etc (to report ID's): 21067 - Wentworth Point
Contact Person: Hayden Davies	PO No.:
Project Mgr: Peter Moore	Envirolab Quote No.:
Samplers: Hayden Davies	Date results required: Standard
Address: Suite 1, level 9, 189 Kent street, Sydney 2000	Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: 92518070 Mob: 0451021512	Additional report format: excel / equis /
Email: hayden.davies@geosyntec.com Peter.moore@geosyntec.com edward.mannings@geosyntec.com	Lab Comments:

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled		Combo 2	TRH/BTEX	PAHs	TRH/VTEDN											Comments: Provide as much information about the sample as you can
1	TS1-1_0.2-0.4		30/11/2021		x														
2	TS1-1_0.6_0.8		30/11/2021		x														
3	TS1-2_0.2-0.4		30/11/2021		x														
4	TS1-2_0.8-1.0		30/11/2021		x														
5	TS1-3_0.2-0.4		30/11/2021		x														
6	TS1-3_0.6-0.8		30/11/2021		x														
7	TS2-1_0.4-0.6		30/11/2021		x														
8	TS2-1_1.0-1.2		30/11/2021		x														
9	TS2-2_0.4-0.6		30/11/2021		x														
10	TS2-2_1.0-1.2		30/11/2021		x														
11	TS2-3_0.4-0.6		30/11/2021		x														
12	TS2-3_1.2-1.4		30/11/2021		x														
13	TS2-4_0.4-0.6		30/11/2021		x														
14	TS2-4_1.2-1.4		30/11/2021		x														
15	DUP1		30/11/2021		x														
—	TRIP1		30/11/2021		x														
16	WB1_0-0.2		1/12/2021			x	x												Please forward to eurofins (TRH/BTEX/PAHs/Lead
17	WB1_0.8-1.0		1/12/2021			x	x												
18	WB2_0.2-0.4		1/12/2021			x	x												
19	WB2_0.8-1.0		1/12/2021			x	x												
20	TS1-GW		1/12/2021					x											
21	TS2-GW		1/12/2021					x											

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Geosyntec	Received by (Company):	*Lab Use Only*	
Print Name: Hayden Davies	Print Name:	Job number:	Cooling: Ice / Ice pack / None
Date & Time 1/12/2021	Date & Time:	Temperature:	Security seal: Intact / Broken / None
Signature:	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Envirolab Services Pty Ltd
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SAMPLE RECEIPT ADVICE

Client Details	
Client	Geosyntec
Attention	Hayden Davies, Peter Moore, Edward Munnings

Sample Login Details	
Your reference	2107 - Wentworth Point
Envirolab Reference	284290
Date Sample Received	01/12/2021
Date Instructions Received	01/12/2021
Date Results Expected to be Reported	08/12/2021

Sample Condition	
Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	19 Soil, 2 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	14
Cooling Method	Ice
Sampling Date Provided	YES

Comments
Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

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Sample ID	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Acid Extractable metals in soil	BTEX in Water
TS1-1_0.2-0.4	✓	✓	✓	✓	
TS1-1_0.6-0.8	✓	✓	✓	✓	
TS1-2__0.2-0.4	✓	✓	✓	✓	
TS1-2_0.8-1.0	✓	✓	✓	✓	
TS1-3__0.2-0.4	✓	✓	✓	✓	
TS1-3_0.6-0.8	✓	✓	✓	✓	
TS2-1_0.4-0.6	✓	✓	✓	✓	
TS2-1_1.0-1.2	✓	✓	✓	✓	
TS2-2_0.4-0.6	✓	✓	✓	✓	
TS2-2_1.0-1.2	✓	✓	✓	✓	
TS2-3_0.4-0.6	✓	✓	✓	✓	
TS2-3_1.2-1.4	✓	✓	✓	✓	
TS2-4_0.4-0.6	✓	✓	✓	✓	
TS2-4_1.2-1.4	✓	✓	✓	✓	
DUP1	✓	✓	✓	✓	
WB1_0-0.2	✓	✓	✓		
WB1_0.8-1.0	✓	✓	✓		
WB2_0.2-0.4	✓	✓	✓		
WB2_0.8-1.0	✓	✓	✓		
TS1-GW					✓
TS2-GW					✓

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

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

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CERTIFICATE OF ANALYSIS 284290

Client Details

Client	Geosyntec
Attention	Hayden Davies, Peter Moore, Edward Munnings
Address	Suite 1, Level 9, 189 Kent Street, Sydney, NSW, 2000

Sample Details

Your Reference	**2107 - Wentworth Point**
Number of Samples	19 Soil, 2 Water
Date samples received	01/12/2021
Date completed instructions received	01/12/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	08/12/2021
Date of Issue	06/12/2021

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

Results Approved By
Dragana Tomas, Senior Chemist
Liam Timmins, Chemist
Manju Dewendrage, Prep Team Leader
Thomas Lovatt, Chemist

Authorised By

Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		284290-1	284290-2	284290-3	284290-4	284290-5
Your Reference	UNITS	TS1-1_0.2-0.4	TS1-1_0.6-0.8	TS1-2_0.2-0.4	TS1-2_0.8-1.0	TS1-3_0.2-0.4
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	03/12/2021	03/12/2021	03/12/2021	03/12/2021	03/12/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	95	99	115	100	105

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		284290-6	284290-7	284290-8	284290-9	284290-10
Your Reference	UNITS	TS1-3_0.6-0.8	TS2-1_0.4-0.6	TS2-1_1.0-1.2	TS2-2_0.4-0.6	TS2-2_1.0-1.2
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	03/12/2021	03/12/2021	03/12/2021	03/12/2021	03/12/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	30	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	30	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	107	106	101	106	104

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		284290-11	284290-12	284290-13	284290-14	284290-15
Your Reference	UNITS	TS2-3_0.4-0.6	TS2-3_1.2-1.4	TS2-4_0.4-0.6	TS2-4_1.2-1.4	DUP1
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	03/12/2021	03/12/2021	03/12/2021	03/12/2021	03/12/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	95	97	101	102	96

vTRH(C6-C10)/BTEXN in Soil					
Our Reference		284290-16	284290-17	284290-18	284290-19
Your Reference	UNITS	WB1_0-0.2	WB1_0.8-1.0	WB2_0.2-0.4	WB2_0.8-1.0
Date Sampled		1/12/2021	1/12/2021	1/12/2021	1/12/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	03/12/2021	03/12/2021	03/12/2021	03/12/2021
TRH C_6 - C_9	mg/kg	<25	<25	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1
Naphthalene	mg/kg	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<3	<3	<3	<3
Surrogate aaa-Trifluorotoluene	%	103	110	103	106

svTRH (C10-C40) in Soil						
Our Reference		284290-1	284290-2	284290-3	284290-4	284290-5
Your Reference	UNITS	TS1-1_0.2-0.4	TS1-1_0.6-0.8	TS1-2_0.2-0.4	TS1-2_0.8-1.0	TS1-3_0.2-0.4
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	03/12/2021	03/12/2021	03/12/2021	03/12/2021	03/12/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	450
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	260
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	<50	<50	<50	710
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	590
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	590
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	150
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	740
Surrogate o-Terphenyl	%	90	94	87	84	98

svTRH (C10-C40) in Soil						
Our Reference		284290-6	284290-7	284290-8	284290-9	284290-10
Your Reference	UNITS	TS1-3_0.6-0.8	TS2-1_0.4-0.6	TS2-1_1.0-1.2	TS2-2_0.4-0.6	TS2-2_1.0-1.2
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	03/12/2021	03/12/2021	03/12/2021	03/12/2021	03/12/2021
TRH C_{10} - C_{14}	mg/kg	87	<50	200	<50	560
TRH C_{15} - C_{28}	mg/kg	<100	<100	960	<100	1,900
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	90	<50	1,200	<50	2,400
TRH >C_{10} -C_{16}	mg/kg	120	<50	530	<50	1,300
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	120	<50	530	<50	1,300
TRH >C_{16} -C_{34}	mg/kg	<100	<100	620	<100	1,100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	120	<50	1,200	<50	2,400
Surrogate o-Terphenyl	%	95	89	#	81	#

svTRH (C10-C40) in Soil						
Our Reference		284290-11	284290-12	284290-13	284290-14	284290-15
Your Reference	UNITS	TS2-3_0.4-0.6	TS2-3_1.2-1.4	TS2-4_0.4-0.6	TS2-4_1.2-1.4	DUP1
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	03/12/2021	03/12/2021	03/12/2021	03/12/2021	03/12/2021
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	410	<50
TRH C_{15} - C_{28}	mg/kg	<100	170	<100	1,700	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	<50	170	<50	2,100	<50
TRH >C_{10} -C_{16}	mg/kg	<50	61	<50	950	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	61	<50	950	<50
TRH >C_{16} -C_{34}	mg/kg	<100	140	<100	1,200	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	200	<50	2,100	<50
Surrogate o-Terphenyl	%	83	100	77	#	79

svTRH (C10-C40) in Soil					
Our Reference		284290-16	284290-17	284290-18	284290-19
Your Reference	UNITS	WB1_0-0.2	WB1_0.8-1.0	WB2_0.2-0.4	WB2_0.8-1.0
Date Sampled		1/12/2021	1/12/2021	1/12/2021	1/12/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	03/12/2021	03/12/2021	03/12/2021	03/12/2021
TRH C_{10} - C_{14}	mg/kg	270	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	500	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	140	<100	<100	<100
Total +ve TRH (C10-C36)	mg/kg	910	<50	<50	<50
TRH >C_{10} -C_{16}	mg/kg	600	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	600	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	270	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	870	<50	<50	<50
Surrogate o-Terphenyl	%	93	87	80	85

PAHs in Soil						
Our Reference		284290-1	284290-2	284290-3	284290-4	284290-5
Your Reference	UNITS	TS1-1_0.2-0.4	TS1-1_0.6-0.8	TS1-2_0.2-0.4	TS1-2_0.8-1.0	TS1-3_0.2-0.4
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	0.5	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	1.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	1.3	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	0.6	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	0.7	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	0.9	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	0.84	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	0.4	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	6.6	0.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	1.0	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	1.1	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	1.1	<0.5
Surrogate p-Terphenyl-d14	%	94	93	88	86	87

PAHs in Soil						
Our Reference	UNITS	284290-6	284290-7	284290-8	284290-9	284290-10
Your Reference		TS1-3_0.6-0.8	TS2-1_0.4-0.6	TS2-1_1.0-1.2	TS2-2_0.4-0.6	TS2-2_1.0-1.2
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Naphthalene	mg/kg	<0.1	<0.1	<1	<0.1	<1
Acenaphthylene	mg/kg	<0.1	<0.1	<1	0.2	<1
Acenaphthene	mg/kg	<0.1	<0.1	<1	<0.1	2.9
Fluorene	mg/kg	<0.1	<0.1	<1	<0.1	4.2
Phenanthrene	mg/kg	<0.1	<0.1	<1	0.6	3.9
Anthracene	mg/kg	<0.1	<0.1	<1	0.2	3.7
Fluoranthene	mg/kg	<0.1	<0.1	0.4	2.5	0.4
Pyrene	mg/kg	<0.1	<0.1	0.6	2.7	0.6
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.2	1.5	0.1
Chrysene	mg/kg	<0.1	<0.1	0.2	1.3	0.2
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	0.3	2.1	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.2	2.1	0.08
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	0.6	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	0.2	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.1	0.8	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	2.1	15	16
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	2.7	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	2.7	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	2.7	<0.5
Surrogate p-Terphenyl-d14	%	91	89	85	87	90

PAHs in Soil						
Our Reference		284290-11	284290-12	284290-13	284290-14	284290-15
Your Reference	UNITS	TS2-3_0.4-0.6	TS2-3_1.2-1.4	TS2-4_0.4-0.6	TS2-4_1.2-1.4	DUP1
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Naphthalene	mg/kg	<0.1	0.1	<0.1	<1	<0.1
Acenaphthylene	mg/kg	<0.1	0.4	<0.1	<1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<1	<0.1
Fluorene	mg/kg	<0.1	0.3	<0.1	<1	<0.1
Phenanthrene	mg/kg	<0.1	1.9	<0.1	<1	<0.1
Anthracene	mg/kg	<0.1	1.0	<0.1	<1	<0.1
Fluoranthene	mg/kg	<0.1	3.6	0.2	1	<0.1
Pyrene	mg/kg	<0.1	3.5	0.2	1.2	<0.1
Benzo(a)anthracene	mg/kg	<0.1	1.9	<0.1	0.4	<0.1
Chrysene	mg/kg	<0.1	1.6	0.1	0.5	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	2.3	<0.2	0.6	<0.2
Benzo(a)pyrene	mg/kg	<0.05	2.2	0.1	0.53	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	0.6	<0.1	0.2	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.8	<0.1	0.2	<0.1
Total +ve PAH's	mg/kg	<0.05	20	0.67	4.4	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	2.8	<0.5	0.6	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	2.8	<0.5	0.7	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	2.8	<0.5	0.7	<0.5
Surrogate p-Terphenyl-d14	%	90	88	85	87	87

PAHs in Soil					
Our Reference	UNITS	284290-16	284290-17	284290-18	284290-19
Your Reference		WB1_0-0.2	WB1_0.8-1.0	WB2_0.2-0.4	WB2_0.8-1.0
Date Sampled		1/12/2021	1/12/2021	1/12/2021	1/12/2021
Type of sample		Soil	Soil	Soil	Soil
Date extracted	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	0.2
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	0.1
Phenanthrene	mg/kg	0.5	<0.1	<0.1	1.0
Anthracene	mg/kg	0.2	<0.1	<0.1	0.4
Fluoranthene	mg/kg	1.3	<0.1	<0.1	3.0
Pyrene	mg/kg	1.2	<0.1	<0.1	2.9
Benzo(a)anthracene	mg/kg	0.7	<0.1	<0.1	1.6
Chrysene	mg/kg	0.6	<0.1	<0.1	1.3
Benzo(b,j+k)fluoranthene	mg/kg	1	<0.2	<0.2	2.0
Benzo(a)pyrene	mg/kg	0.84	<0.05	0.06	2.2
Indeno(1,2,3-c,d)pyrene	mg/kg	0.2	<0.1	<0.1	0.6
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	0.2
Benzo(g,h,i)perylene	mg/kg	0.3	<0.1	<0.1	0.8
Total +ve PAH's	mg/kg	6.9	<0.05	0.06	16
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.0	<0.5	<0.5	2.8
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.1	<0.5	<0.5	2.8
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.1	<0.5	<0.5	2.8
Surrogate p-Terphenyl-d14	%	84	86	86	86

Acid Extractable metals in soil						
Our Reference		284290-1	284290-2	284290-3	284290-4	284290-5
Your Reference	UNITS	TS1-1_0.2-0.4	TS1-1_0.6-0.8	TS1-2_0.2-0.4	TS1-2_0.8-1.0	TS1-3_0.2-0.4
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Lead	mg/kg	2	1	6	25	8

Acid Extractable metals in soil						
Our Reference		284290-6	284290-7	284290-8	284290-9	284290-10
Your Reference	UNITS	TS1-3_0.6-0.8	TS2-1_0.4-0.6	TS2-1_1.0-1.2	TS2-2_0.4-0.6	TS2-2_1.0-1.2
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Lead	mg/kg	1	17	16	71	2

Acid Extractable metals in soil						
Our Reference		284290-11	284290-12	284290-13	284290-14	284290-15
Your Reference	UNITS	TS2-3_0.4-0.6	TS2-3_1.2-1.4	TS2-4_0.4-0.6	TS2-4_1.2-1.4	DUP1
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Date analysed	-	02/12/2021	02/12/2021	02/12/2021	02/12/2021	02/12/2021
Lead	mg/kg	12	34	10	18	14

Moisture						
Our Reference		284290-1	284290-2	284290-3	284290-4	284290-5
Your Reference	UNITS	TS1-1_0.2-0.4	TS1-1_0.6-0.8	TS1-2_0.2-0.4	TS1-2_0.8-1.0	TS1-3_0.2-0.4
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	2/12/2021	2/12/2021	2/12/2021	2/12/2021	2/12/2021
Date analysed	-	3/12/2021	3/12/2021	3/12/2021	3/12/2021	3/12/2021
Moisture	%	10	15	13	10	15

Moisture						
Our Reference		284290-6	284290-7	284290-8	284290-9	284290-10
Your Reference	UNITS	TS1-3_0.6-0.8	TS2-1_0.4-0.6	TS2-1_1.0-1.2	TS2-2_0.4-0.6	TS2-2_1.0-1.2
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	2/12/2021	2/12/2021	2/12/2021	2/12/2021	2/12/2021
Date analysed	-	3/12/2021	3/12/2021	3/12/2021	3/12/2021	3/12/2021
Moisture	%	17	16	12	17	12

Moisture						
Our Reference		284290-11	284290-12	284290-13	284290-14	284290-15
Your Reference	UNITS	TS2-3_0.4-0.6	TS2-3_1.2-1.4	TS2-4_0.4-0.6	TS2-4_1.2-1.4	DUP1
Date Sampled		30/11/2021	30/11/2021	30/11/2021	30/11/2021	30/11/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	2/12/2021	2/12/2021	2/12/2021	2/12/2021	2/12/2021
Date analysed	-	3/12/2021	3/12/2021	3/12/2021	3/12/2021	3/12/2021
Moisture	%	8.4	11	15	24	5.0

Moisture					
Our Reference		284290-16	284290-17	284290-18	284290-19
Your Reference	UNITS	WB1_0-0.2	WB1_0.8-1.0	WB2_0.2-0.4	WB2_0.8-1.0
Date Sampled		1/12/2021	1/12/2021	1/12/2021	1/12/2021
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	2/12/2021	2/12/2021	2/12/2021	13/01/1900 12:43:12 PM
Date analysed	-	3/12/2021	3/12/2021	3/12/2021	3/12/2021
Moisture	%	18	16	10	20

BTEX in Water			
Our Reference		284290-20	284290-21
Your Reference	UNITS	TS1-GW	TS2-GW
Date Sampled		1/12/2021	1/12/2021
Type of sample		Water	Water
Date extracted	-	02/12/2021	02/12/2021
Date analysed	-	03/12/2021	03/12/2021
Benzene	µg/L	<1	<1
Toluene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1
m+p-xylene	µg/L	3	<2
o-xylene	µg/L	2	<1
Surrogate Dibromofluoromethane	%	100	100
Surrogate toluene-d8	%	99	99
Surrogate 4-BFB	%	106	106

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	284290-2
Date extracted	-			02/12/2021	1	02/12/2021	02/12/2021		02/12/2021	02/12/2021
Date analysed	-			03/12/2021	1	03/12/2021	03/12/2021		03/12/2021	03/12/2021
TRH C_6 - C_9	mg/kg	25	Org-023	<25	1	<25	<25	0	106	94
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	1	<25	<25	0	106	94
Benzene	mg/kg	0.2	Org-023	<0.2	1	<0.2	<0.2	0	94	83
Toluene	mg/kg	0.5	Org-023	<0.5	1	<0.5	<0.5	0	98	87
Ethylbenzene	mg/kg	1	Org-023	<1	1	<1	<1	0	111	98
m+p-xylene	mg/kg	2	Org-023	<2	1	<2	<2	0	114	102
o-Xylene	mg/kg	1	Org-023	<1	1	<1	<1	0	103	92
Naphthalene	mg/kg	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	109	1	95	96	1	110	95

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	02/12/2021	02/12/2021		[NT]	[NT]
Date analysed	-			[NT]	11	03/12/2021	03/12/2021		[NT]	[NT]
TRH C_6 - C_9	mg/kg	25	Org-023	[NT]	11	<25	<25	0	[NT]	[NT]
TRH C_6 - C_{10}	mg/kg	25	Org-023	[NT]	11	<25	<25	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	[NT]	11	<0.5	<0.5	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	[NT]	11	<2	<2	0	[NT]	[NT]
o-Xylene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Naphthalene	mg/kg	1	Org-023	[NT]	11	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	[NT]	11	95	107	12	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	284290-2
Date extracted	-			03/12/2021	1	02/12/2021	02/12/2021		03/12/2021	02/12/2021
Date analysed	-			03/12/2021	1	03/12/2021	03/12/2021		03/12/2021	03/12/2021
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	1	<50	<50	0	99	71
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	1	<100	<100	0	96	84
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	1	<100	<100	0	73	107
TRH >C_{10}-C_{16}	mg/kg	50	Org-020	<50	1	<50	<50	0	99	71
TRH >C_{16}-C_{34}	mg/kg	100	Org-020	<100	1	<100	<100	0	96	84
TRH >C_{34}-C_{40}	mg/kg	100	Org-020	<100	1	<100	<100	0	73	107
Surrogate o-Terphenyl	%		Org-020	85	1	90	81	11	100	94

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	02/12/2021	02/12/2021		[NT]	[NT]
Date analysed	-			[NT]	11	03/12/2021	03/12/2021		[NT]	[NT]
TRH C_{10} - C_{14}	mg/kg	50	Org-020	[NT]	11	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH >C_{10}-C_{16}	mg/kg	50	Org-020	[NT]	11	<50	<50	0	[NT]	[NT]
TRH >C_{16}-C_{34}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
TRH >C_{34}-C_{40}	mg/kg	100	Org-020	[NT]	11	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	11	83	84	1	[NT]	[NT]

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	284290-2
Date extracted	-			02/12/2021	1	02/12/2021	02/12/2021		02/12/2021	02/12/2021
Date analysed	-			02/12/2021	1	02/12/2021	02/12/2021		02/12/2021	02/12/2021
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	103	92
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	91	93
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	107	109
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	104	102
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	90	90
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	99	97
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	95	91
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	<0.05	<0.05	0	108	106
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	91	1	94	96	2	92	91

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	11	02/12/2021	02/12/2021		[NT]	[NT]
Date analysed	-			[NT]	11	02/12/2021	02/12/2021		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	11	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	11	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	11	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	11	90	89	1	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-7	284290-2
Date prepared	-			02/12/2021	1	02/12/2021	02/12/2021		02/12/2021	02/12/2021
Date analysed	-			02/12/2021	1	02/12/2021	02/12/2021		02/12/2021	02/12/2021
Lead	mg/kg	1	Metals-020	<1	1	2	1	67	96	100

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	02/12/2021	02/12/2021		[NT]	[NT]
Date analysed	-			[NT]	11	02/12/2021	02/12/2021		[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	11	12	11	9	[NT]	[NT]