Edwards Blasche Group Pty Ltd ABN 54 085 829 250
Environmental Geoscience
Occupational Hygiene
Technical Consultants

STAGE 2 DETAILED SITE INVESTIGATION (DSI)

(Including Stage 1 PSI information)

Proposed Development 'The Boathouse' Governor Phillip Park Palm Beach NSW 2108

Part of Lot 7005 in DP 1117451

Prepared for:
Blue Pacific Constructions Pty Ltd

(Report ID : EBG-02853.Stage2.DSI.09.20.R01)

Issued 9 October 2010
Revised 9 February 2021

CONTENTS

ATTACHMENTS:

APPENDIX A: FIGURES / PLANS

- Site Location (Figure No 1: 02853-F01)
- Investigation Area & Borehole Locations (Figure No 2: 02853-F02)
- PID Calibration Certificate

APPENDIX B: SUMMARY OF RESULTS

APPENDIX C: BOREHOLE LOGS

APPENDIX D: CHAIN OF CUSTODY AND LABORATORY RESULTS

Abbreviations	
ACM	Asbestos Cement Material
mAHD	metres Australian Height Datum
As	Arsenic
B(a)P	Benzo (a) pyrene (a component of PAHs)
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BH	Borehole
Cd	Cadmium
Cr	Chromium
EPA (NSW)	Environmental Protection Agency (NSW)
DECCW(NSW)	Dept. Environment, Climate Change & Water (NSW)
Hg	Mercury
MAH	Mono Aromatic Hydrocarbons
NEHF	National Environment Health Forum
Ni	Nickel
OCPs	Organochlorin pesticides
OPPs	Organophosphate Pesticides
PCBs	Poly Cyclic Biphenyls
PAH	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PID	Photo Ionisation Detector
QA/QC	Quality Assurance and Quality Control
RAP	Remedial Action Plan
RPD	Relative Percentage Difference
TCLP	Toxicity Characteristics Leaching Procedure
TRH	Total Recoverable Hydrocarbons
UST	Underground storage tank
VOCs	Volatile Organic Compounds

Distribution:	PDF Copies to: 1. Blue Pacific Constructions Pty Ltd
Investigation & Reporting conducted by: **Michael Edwards** *RPGeo CEnvP (CL Specialist)* *Registered Professional Geoscientist (No.10093)* *Certified Environmental Practitioner – Contaminated Land Specialist (No.0832)* *Licensed Asbestos Assessor (WorkCover NSW Lic No. LAA001125)* ***ENVIRONMENTAL & ENGINEERING GEOLOGIST***	Signed:
	Issued: 9 October 2020 Revision: 9 February 2021

EXECUTIVE SUMMARY

ES-1. Background

REVISION NOTE – 9 February 2021: *EBG Environmental has reviewed the revised plans dated 30 January 2021, and confirm that these updates do not change the outcome and recommendations within this Stage 2 Detailed Site Investigation.*

This investigation was authorized by Peter Heber from Blue Pacific Constructions Pty Ltd. The on-site sampling was conducted on 23 September 2020. To assess the site EBG Environmental was requested to carry out a Stage 2 Detailed Site (environmental) Investigation. The scope was to undertake the investigation on part of Lot 7005 DP 1117451. The site is currently a Reserve Trust managed by the LGA, and the investigation was undertaken on a small portion of the large lot and DP currently being used by The Boathouse restaurant. The following scope of works were undertaken:

- Identify potential areas where contamination may have occurred from current and historical activities;
- Assess the potential for soils to have been impacted by current and historical activities; and
- Assess the suitability of the site for the construction works, based on its current condition and the findings of this investigation.

On 23 September 2020, soil sampling was carried out on the site to fulfil the requirements of a Stage 2 Detailed Site Investigation (DSI)

Sampling Procedure:

The subject of this investigation is a small part of the total Lot and DP. The investigation area is between 1000 and 2000 square metres. As such according to EPA NSW *Sampling Design Guidelines* (Sept 1995), a minimum of 7 sampling points are required to characterise the site (based on a 95% confidence to detect a hot spot with a 19.9 metre circumference for a site up to 2000 sq/m). A sample was taken of each stratigraphic layer down to natural soils (generally two samples). The locations of the boreholes are shown in *Figure 2 - 02853-F02 (Appendix A)*.

ES-2. Discussion

ES-2.1 General

- The seven-step DQO process (defined in Section 5) as outlined in the *NEPM 2013* was employed to assess the property in regard to contamination of the soil.
- The soil sample laboratory analysis results were assessed against the relevant *guidelines* listed in the *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)* May 2013.
    - *Recreational C (HIL C) - Public open spaces such as parks, playgrounds, playing fields (eg: ovals), secondary schools and footpaths.*
    - *Site Specific - Ecological Investigation Levels (EILs) - derived from Schedule B1 of NEPM (2013) – 'National parks & areas of high conservation value'.*
    - *Generic - Ecological Screening Levels (EIL) - NEPM 2013 – B(1): Table 1B(6) ESLs for TPH fractions F1 - F4, BTEX and benzo(a)pyrene in soil.*

- *Generic – Management Limits : Petroleum Hydrocarbons - NEPM 2013 – B(1): Table 1 B(7): Management Limits for TPH fractions F1-F4 in soil*

- The soil sample laboratory analysis results confirm that metals (x8), PAH, TRH, BTEX, OCPs and PCBs analysis results did not exceed the relevant criteria in accordance with the *NEPM 2013*. (ie: Listed in Section 7). The PID readings did not exceed the action level of 30ppm (see borelogs in Appendix C).
- No asbestos containing materials were observed and none are expected.
- The total concentration analysis results confirm that the *yellow/brown road base type material (Borehole 4) and mixed sandy fill,* (varying depth 0.1 – 0.2 metres), fall within the criteria for General Solid Waste classification as per Table 1 of the *Waste Classification Guidelines (Part 1 : Classifying Waste – DECC NSW (Nov 2014).* NOTE: The classification is for disposal purposes only.
- An assessment of the sub-soil for PASS (potential acid sulfate soils) has been undertaken by Crozier Geotechnical. Please refer to relevant report.

ES-3 Recommendations

ES-3.1 Suitability of the Site for the Proposed Development

This report is in accordance with:

- *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)*, (1999 amended 2013
- *State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)*
- *EPA NSW Guidelines for Consultants Reporting on Contaminated Sites* (November 1997),

It is the opinion of EBG that with respect to the investigations carried out within this report, the site is suitable for the proposed development:

- *Re-building the superstructure on the wharf below the mean high water mark*
- *Construction of an amenities and service building along southern boundaries (adjacent golf course boundary fence).*

The recommendation above is given with the understanding that the 'condition' below is undertaken:

ES-3.2 Condition : Imported Fill

All excavations shall be backfilled with clean validated virgin excavated natural material (VENM) (See 10.2.2)

SECTION 1: INTRODUCTION

1.1 Authorization

This investigation was authorized by Peter Heber from Blue Pacific Constructions Pty Ltd. The on-site sampling was conducted on 23 September 2020.

1.2 Scope of Work - Consultants Brief

To assess the site EBG Environmental was requested to carry out a Stage 2 Detailed Site (environmental) Investigation. The scope was to undertake the investigation on part of Lot 7005 DP 1117451.

The site is currently Reserve Trust managed by the LGA and the investigation was undertaken on a small portion of the large lot and DP currently being used by The Boathouse restaurant. The investigation area was assessed to be between 1000-2000 square metres and entailed:

- Identify potential areas of contamination from current and historical activities;
- Assess the potential for soils to have been impacted by current and historical activities; and
- Assess the suitability of the site for the construction works, based on its current condition and the findings of this investigation.

On 23 September 2020, soil sampling was carried out on the site to fulfil the requirements of a Stage 2 Detailed Site Investigation (DSI) as documented within this report.

REVISION NOTE – 9 February 2021: *EBG Environmental has reviewed the revised plans dated 30 January 2021, and confirm that these updates do not change the outcome and recommendations within this Stage 2 Detailed Site Investigation.*

1.3 Limitations of the Report

Within the guidelines set down for this investigation, every effort has been made to give an accurate assessment of the property identified in this document. EBG Environmental does not accept any responsibility for any contamination that may exist in the area now or in the future. EBG Environmental accepts no liability for the use of this document by any other person other than the client. This report must not be produced except in full and must not be amended in any way. This report is based on current and historical information available at the time of writing.

SECTION 2: PHYSICAL & SITE INFORMATION

2.1 Site Identification

ADDRESS	The Boathouse Governor Phillip Park Palm Beach NSW 2108
LOCAL GOVERNMENT AUTHORITY	Northern Beaches Council
LOT & DEPOSITED PLAN	Part of 7005 DP 1117451
PARISH	Narrabeen
COUNTY	Cumberland
COUNCIL LAND ZONING	R2 – Low Density Residential
SITE AREA	Part of Lot 7005 DP 1117451 (Less than 1,000 sqm)

2.2 Soil Landscape & Geology

Soil Landscapes:

Soils Landscapes Data Source : NSW Office of Environment and Heritage. Creative Commons 3.0 © Commonwealth of Australia:

http://creativecommons.org/licenses/by/3.0/au/deed.en

The site is located within a 'residual' soil landscape group. Soils Landscapes Data Source : NSW Office of Environment and Heritage

Woy Woy Landscape Group (AEww) : Aeolian - Described as:

- Landscape: Level to gently undulating non-tidal beach ridges on marine sands. Local relief <3m, slopes <5%. Water table at a depth of <200 cm. Progressive beach ridges in sheltered bays. Extensively cleared closed-scrub and low eucalypt woodland.
- Soil: Siliceous sands and occasional Podzols on sandy rises, Humus Podzols in poorly drained areas, Calcareous sands bear beaches.

Soil Landscapes of the Sydney 1:100 000 sheet, Chapman, G.A and Murphy, C.L (1989). Soil Conservation Service of NSW, Sydney.

Geology:

Geological Data Source : NSW Department of Industry, Resources & Energy

Geological unit/s relevant to the site:

- Sands: Qhb – Coarse quartz sand, varying amounts of shell fragments, Qhd – Medium to fine grained marine sand with podsols.
- Shales – Newport Formation & Garie Formation: Interbedded laminate, shale and quartz, to lithic quartz sandstone: Minor red claystone north of Hawkesbury River. Clay pellet sandstone (Garie Fm) south of Hawkesbury River.
- The Hawkesbury Sandstone (Rh) comprises medium to coarse grained sandstone with minor shale and laminate lenses. It is of fluvial origin with limited lacustrine and wind induced deposition with numerous braided alluvial channel fills.

2.3 Topography and Hydrogeology

The property elevation ranges between the 0 and 2 metre AHD. The property is located immediately adjacent to Pittwater, just inside the heads associated with Barrenjoey Lighthouse.

A registered groundwater bore with relevant 'standing water level SWL' is located 1,060 metres south of the site (GW105823).

Groundwater Bore No.	GW105823
Licence No	10BL162946
Owner Type	Private
Purpose	Domestic
Standing water Level	2.0 metres
Date Completed	15/03/2004
Bore Depth	4.00 metres
Driller's Log	
	0.00m-0.30m topsoil 0.30m-2.80m sand, yellow 2.80m-4.00m sand, yellow with small shells

2.4 Acid Sulfate Soil Risk

Crozier Geotechnical has undertaken an Acid Sulfate Soil investigation for the site (Crozier Project: 2015-251, Sept 2020). Soil samples were taken and analysed for SPOCAS to determine if the soil is PASS (potential acid sulfate soil). Section 3.3 of the report states:

> *The soils are sandy and therefore would be considered as Coarse Texture – sands to loamy sands with clay contents ≤5% as per Table 4.4 – Acid Sulphate Soils Management Authority Committee (ASSMAC) – Acid Sulphate Soils Manual.*
> *The results of the testing show that the tested soils below the water table (with varying Reduced Levels of R.L. -0.50m and -2.90m) are not considered Acid Sulphate or Potential Acid Sulphate Soils. Previous testing identified the soils above the water table were also not AASS or PASS.*
> *As such, in line with the ASSMAC guidelines there is no requirement for an Acid Sulphate Management Plan based on the proposed works (as per the supplied design drawings).*

2.5 Zoned Land Use

Pittwater Local Environmental Plan 2014: The site is within the:

- RE1 – Public Recreation

2.6 Dryland Salinity

The land is not located in an area of dryland salinity. Dryland salinity shall not be an issue affecting the site.

2.7 SafeWork NSW Site Search (Dangerous Goods on Premises)

A search of the Stored Chemical Information Database (SCID) and the microfiche records held by Safework NSW was not carried out.

2.8 EPA PFAS* Investigation Program

The NSW Environment Protection Authority (EPA) is undertaking an investigation program to assess the legacy of *per- and poly- fluoroalkyl substances (PFAS) use across NSW. PFAS are a group of chemicals that include perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). They have many specialty applications and are widely used in a range of products in Australia and internationally. PFAS are an emerging contaminant, which means that their ecological and/or human health effects are unclear. The EPA is investigating to better understand the extent of PFAS use and contamination in NSW. This

will enable the EPA to be better prepared to respond if any health and environmental impacts become known. No records were noted within the buffer zone of 1 KM of the site.

2.9 Title and Air Photo Discussion

08.09.1881	Purchased by the Crown (Her Most Gracious Majesty Queen Victoria) For Light House and Customs
17.05.1929	Crown Reserve No. 61140 for Public Recreation
01.11.1991	Establishment of Reserve Trust Governor Phillip Park (R 56217, R 61140 & R 64483) Reserve Trust Council of the Shire of Warringah appointed to manage reserve trust
05.01.2010	Folio Identifier created in the name of the State of New South Wales

2.10 EPA NSW Contaminated Land Database

A search of the OE&H contaminated land database was carried out via the internet for the LGA of Northern Beaches. There are no records on the database relating to the suburb of Palm Beach.

2.11 Proposed Development

The development proposal comprises the renovation of The Boathouse restaurant and the construction of amenities along the southern boundary with the golf course.

2.12 LGA Planning Certificate 10.7(2)

The land (formerly owned by the Crown) is currently a reserve managed by Northern Beaches Council. The application for a copy of the Planning Certificate is currently being undertaken (not available prior to issue of this report).

SECTION 3: SITE INSPECTION

The site inspection was carried out on the 23 September 2020.

4.1 Building Condition, Current Occupier and Use

The site consists of a part of Lot 7005 DP 1117451. The whole lot (Reserve Trust Governor Phillip Park) is a long piece of land running adjacent to the beach of Pittwater. The inspection and investigation was undertaken on a part of this land (as shown in Appendix A Figure 2). The site infrastructure consist of a timber restaurant and boat shed (and attached jetty). Adjacent to the restaurant (and running along south boundary) are a number of ancillary buildings. A central small building is used to store petroleum products.

4.2 Surrounding Land Use

The surrounding landuse is predominantly public reserve, carpark and beach.

4.3 Surface Condition and Vegetation

The restaurant / boatshed consists a single commercial construction of various materials with a corrugated metal roof. The remaining areas of the restaurant are grassed, gardens, paved or concreted. The vegetation appears to be in good condition with no areas of stress located. No odours or hydrocarbon style staining were located.

4.4 Underground Tanks and Associated Services

No underground fuel tanks were located during the inspection.

4.5 Fill Material

The exact nature of the sub-surface material is not known. The land in question is located adjacent to the water and restaurant, on a slightly elevated embankment.

There is no indication that significant amounts of fill has been imported onto the block.

4.6 Chemical and Waste Storage

Chemical storage facilities and petroleum storage units were located along the southern boundary.

SECTION 4: CONCEPTUAL SITE MODEL

4.1 Potential Receptors

The site inspection revealed a number of potential receptors for off-site migration of potential contamination:

- Pittwater beach and waters located immediately adjacent (west).
- Public reserve and recreation area to the east.

4.2 Potential Sources and Contaminants of Concern

HISTORICAL ACTIVITY	CONTAMINATING ACTIVITY	CONTAMINANTS OF CONCERN	LIKELIHOOD
Vacant land – prior to 1940s	Fill	Rubbish	Possible – however this would have occurred years ago and the current surface is clean with vegetation cover.
Fill material	Imported fill	Ash or building waste (common fill within Sydney) (PAH)	Unlikely – the site appears to follow the natural elevation for the regional area.
Commercial Building/s	Use of asbestos or lead paint	Asbestos, lead	Possible – but this is common to all residential buildings and identified and dealt with prior to demolition.
Storage facilities along southern boundary	Leakage / overflow	Hydrocarbons, cleaning chemicals	Possible – investigated during Stage 2 DSI.

4.3 Potentially Affected Media (PCM)

The potentially contaminated media on site are:

- Soil/Fill material – may have been impacted due to hydrocarbon storage facilities on site.
- Groundwater – suspected to be relatively saline and tidal (possibly around 2.0 m deep).

4.4 Potential Exposure Pathways

PATHWAY	CONTAMINANTS	LIKELIHOOD
Airborne contaminant particles	Heavy metals, volatile components	Possible - fuel spills
Dermal contact	Heavy metals, hydrocarbons etc	Unlikely – no PCM located
Airborne vapours	Volatile contaminants	Possible - fuel spills

4.5 Human and Ecological Receptors

TYPE	RECEPTORS	LIKELIHOOD
HUMAN	Current and future occupants and landholders	Possible - fuel spills
	Construction and maintenance workers particularly involved in potential excavation works	Unlikely
	Adjoining golf course	Unlikely
ECOLOGICAL	Pittwater – building located directly above	Possible - fuel spills
	Adjacent residential (including adjacent child care centre)	Unlikely – no PCM located
	Adjacent gardens, trees and scrubs	Unlikely – no PCM located

4.6 Assessment of Data Gaps

DATA GAPS	COMMENTS
Status of soil with respect to fill material under concrete and buildings	Status unknown with respect to historical contaminating activities (hydrocarbon storage). Significant quantities of imported fill not considered likely.
Groundwater sampling	Groundwater encountered during excavation should be assessed if identified.

SECTION 5: DATA QUALITY OBJECTIVES (DQO) & ASSESSMENT

5.1 Data Quality Objectives (DQO)

5.1.1 Outline of DQO Process

The EPA NSW *Guidelines for the NSW Site Auditor Scheme* (2nd Edition – April 2006) describes the DQO process thus:

> *The process used to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of the site. The DQOs provide a systematic approach for defining the criteria that a data collection design should satisfy, including when, where and how to collect samples or measurements; determination of tolerable decision error rates; and the number of samples or measurements that should be collected.*

The DQOs are achieved by employing a seven-step process:

Table 3

	STEP	SECTION
1	Define the Problem	Section 4.1.2 1.2 Consultants Brief & Scope of Works
2	Identify the Decisions	Section 6.1.3 Sections 2 : Physical & Site Info Section 2.11: Proposed Development Sections 6.1: Purpose and Aims
3	Identify the Inputs to the Decision	Section 4.1.4 Sections 4 & 5: Section 7: Soil Contaminant Threshold Concentrations Sections 8: Soil Laboratory Results
4	Define the Study Boundaries	Section 4.1.5 2.1 Site Identification 2.2 Soil Landscape & Geology Section 2 : Physical & Site Info
5	Develop a Decision Rule	Section 4.1.6 Section 2.12: Proposed Development Section 5: Data Quality Objectives (DQO) & Assessment
6	Specify Limits of Decision Errors	Section 5: Data Quality Objectives (DQO) & Assessment
7	Optimise the Design for Obtaining Data	Section 4.1.8 Section 2.11: Proposed Development Sections 6: Soil Sampling – Aims & Methodology

5.1.2 Step 1 - Define the Problem

As there is a possibility that the past land uses may have impacted on the sub-soil, a Stage 2 DSI soil sampling programme and analysis was carried out.

See:

- *Section 5.1.2*
- *1.2 Consultants Brief & Scope of Works*

5.1.3 Step 2 - Identify the Decisions

The primary decision statement that this report shall attempt to resolve is:

> Analysed samples taken from the property shall be assessed against the maximum criteria from the landuse as defined by *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)* 1999 (Amended 2013*) for Commercial / Industrial D Landuse.* By using the results and guidelines the consultant shall make a decision if the property is suitable for the proposed landuse, and if not, the appropriate management or remediation necessary to achieve this end.

See:

- *Section 5.1.3*
- *Sections 2 : Physical Settings*
- *Section 2.11: Proposed Development*
- *Section 6.1: Purpose and Aims*

5.1.4 Step 3 – Identify the Inputs to the Decision

The primary inputs used to assess the contamination were:

- Define the site boundaries by the use of survey maps and site inspection.
- Review of the site history and site conditions, including the geology, hydrogeology and topography.
- Assessing contamination identified with the Phase 2 report to facilitate the remediation procedures.
- Using appropriate soil sampling procedures to ensure correct representative data.
- Using correct analytical methods (NATA etc) with quantitation limits below the site assessment criteria.

See:

- Section 5.1.4
- Sections 4 & 5

- Section 7: Soil Contaminant Threshold Concentrations
- Sections 8: Soil Laboratory Results

5.1.5 Step 4 – Define the Study Boundaries

The boundaries of the site are documented in *2.1 Site Identification*. The sub surface study boundaries within the above site boundary shall be within the fill down to natural material.

See:

- Section 5.1.5
- 2.1 Site Identification
- 2.2 Soil Landscape & Geology
- Section 2 : Physical & Site Info

5.1.6 Step 5 – Develop a Decision Rule

The purpose of this step was to define the parameter of interest, specify the action level and combine the outputs of the previous steps into an "if …….., then….." decision rule that defines the conditions that would cause the decision maker to choose alternative actions. The following decision rules may be applied:

- Comparison of the results of the validation samples to the criteria (ie: '**If** the results are above criteria **then** remediation may be necessary')
- **If** field QA/QC samples (blanks, spikes etc) are found to contain chemicals of concern **then** further action extra sampling, investigation of procedure shall be undertaken.
- **If** the laboratory QA/QC samples (matrix spikes, reagent blanks) fall outside the acceptance criteria (See 2.7 - DQI) **then** the laboratory shall be contacted, and/or the *samples shall be re-analysed.*

See:

- *Section 5.1.6*
- *Section 2.11: Proposed Development*
- *Section 5: Data Quality Objectives (DQO) & Assessment*

5.1.7 Step 6 – Specify Acceptable Limits on Decision Errors – Data Quality Indicators (DQIs)

The project DQIs address 'Step 6', and have been established to set acceptance limits on field and laboratory data collected as part of the investigation:

Table 4

DQI	FIELD	LABORATORY	ACCEPTANCE LIMITS
Accuracy	Procedures standard Rinsate blanks	Analysis of: Rinsate blanks Matrix spike Lab control sample Lab duplicate <5xPQL Lab duplicate >5xPQL	As per Envirolab Procedures Not detect 70 to 130% 70 to 130% Any RPD is acceptable 0-50% RPD is acceptable
Precision	Standard procedures appropriate to job and applied Collection of split (Inter-lab) duplicate and field (Intra-lab) duplicate	Analysis of: Field (Intra-lab) duplicate Split (Inter-lab) duplicate	 0-50% RPD is acceptable 0-50% RPD is acceptable
Represent-ativeness	Correct material sampled as per RAP or ESA All material needing to be sampled was sampled	All samples analysed in accordance with 'Chain of Custody'	
Compara-bility	Correct sampling protocol applied Sampler appropriately trained Similar climate conditions	Standard procedures used for all labs Similar analytical methods employed by all labs involved	As per NATA requirements As per EBG and DECCW requirements
Complete-ness	All critical locations sampled Samples collected from surface or depth where appropriate	All samples analysed according to procedures Correct methods employed Correct PQLs employed Chain of custody requirements acted upon Lab holding times appropriate	As per appropriate regulations and guidelines

- PQLs – Practical Quantitation Limits
- RPD – Relative Percentage Difference
- RAP – Remedial Action Plan

5.1.8 Step 7 - Optimise the Design for Obtaining Data

EPA (2006) - *Identify the most resource-effective sampling and analysis design for general data that are expected to satisfy the DQOs.*

This is documented in:

- Section 5.1.8
- Section 2.11: Proposed Development
- Sections 6: Soil Sampling – Aims & Methodology

5.2 Data Quality Assessment – Field QA/QC

5.2.1 Soil Sampling

- All sampling (digging) equipment was washed with 'Decon 90' and water. The equipment was then rinsed with distilled water between each sampling to avoid cross contamination.
- The samples were collected using a clean disposable nitrile glove.
- The jars and bottles were sealed with a teflon lid and stored and transported in a temperature insulated container cooled with 'ice-bricks'.
- The container was transported to a NATA registered laboratory and analysed as described.
- The relevant "Chain of Custody Form" is included in Appendix D.
- All washed, teflon lidded jars were obtained from Envirolab.
- Each container was labelled with a unique job and sample No.
- All soil samples were transported to Envirolab Services under refrigerated conditions, using Chain-of-Custody procedures.
- Inter-laboratory duplicate sample was forwarded to Envirolab Services Pty Ltd (Sydney) and then onto ALS (Sydney) for inter-laboratory QA/QC analysis.
- The laboratory analyses were conducted on discrete un-composited samples.

5.2.2 Intra-Laboratory Duplicate

An intra-laboratory duplicate is a QC sample that is used to determine the precision associated with all or part of the sample collection. Field duplicates are two independent samples that are collected from the same point at the same time and used to assess the homogeneity and reproducibility of the sampling technique. The precision, or reproducibility is measured from the differences observed in the analysis of duplicate samples. The precision, or reproducibility is measured from the differences observed in the analysis of duplicate samples.

1 Intra-laboratory duplicate was collected and analysis undertaken. This complies with NEPM 2013 frequency requirement of 5% (ie: 1 in 20 primary samples):

- Sample 02853/BH1/DupIntra was a field duplicate of primary sample 02853/BH1/0.25

Where samples are analysed in duplicate, the quality of the results is assessed by calculating the relative percent difference (RPD) between the reported and repeated results.

The RPD is calculated as follow:

$$RPD = 200 * |X_1 - X_2| / X_1 + X_2$$

Where X_1 and X_2 are the results obtained for the samples and its duplicate, and $|X_1 - X_2|$ is the absolute difference between the duplicate samples.

A relative level of difference up to 50% is considered acceptable. Where the results are below the detection limits a calculation was not possible. All RPDs for the samples were below 50%.

Table 5

Analyte - METALS	Units	02853/BH1/0.25	02853/BH1/ Dup Intra	% RPD
Arsenic	mg/kg	6	6	0%
Cadmium	mg/kg	<0.4	<0.4	-
Chromium	mg/kg	7	7	0%
Copper	mg/kg	16	20	22%
Lead	mg/kg	45	50	11
Mercury	mg/kg	<0.1	<0.1	-
Nickel	mg/kg	3	3	0%
Zinc	mg/kg	77	86	11%

5.2.3 Inter-Laboratory Duplicate

An inter laboratory duplicate is a sample taken from the same point and the same time as the other samples and analysed by a separate and independent laboratory. This provides some degree of confidence that the analyses conducted by the main laboratory has been undertaken according to acceptable reproducible standards. Where samples are analysed in duplicate, the quality of the results is assessed by calculating the relative percent difference (RPD) between the primary, and duplicate laboratory results.

1 Inter-laboratory duplicate was collected and analysis undertaken. This complies with NEPM 2013 frequency requirement of 5% (ie: 1 in 20 primary samples)

- Sample 02853/BH2/Dup Inter (a duplicate of sample 02853/BH2/0.4) was the field duplicate as described above.

The 'inter-laboratory' sample was sent to Envirolab Melbourne laboratories and analysed for heavy metals.

Where samples are analysed in duplicate, the quality of the results is assessed by calculating the relative percent difference (RPD) between the primary and duplicate laboratory results.

The RPD is calculated as follows:

$$RPD = 200 * X1 - X2 / X1 + X2$$

Where X1 and X2 are the results obtained for the samples and its duplicate, and X1 - X2 is the absolute difference between the duplicate samples. Some RPDs could not be calculated. A relative level of difference up to 50% is considered acceptable. Where the results are below the detection limits a calculation was not possible. All RPDs for the samples were below (or near) 50%.

Table 6

Analyte - METALS	Units	02853/BH2/0.4	02853/BH2/ Dup Inter	% RPD
Arsenic	mg/kg	<4	<4	-
Cadmium	mg/kg	<0.4	<0.4	-
Chromium	mg/kg	4	4	0%
Copper	mg/kg	1	2	66%
Lead	mg/kg	3	4	29%
Mercury	mg/kg	<0.1	<0.1	-
Nickel	mg/kg	1	1	0%
Zinc	mg/kg	5	5	0%

5.2.4 Equipment Rinsate Samples

An equipment rinsate sample is a sample of demineralised water that is poured over or through field sampling equipment that is considered ready to collect. The purpose of the rinsate is to assess the adequacy of the decontamination process and/or the cleanliness of the sampling equipment. The sample may also provide information ensuring that there is no cross contamination of the substances from the sampling equipment used.

One rinsate water sample (02853/RIN) was collected. This was analysed for heavy metals. The analysis revealed that all analytes were below the detectable limits and confirmed that adequate equipment decontamination procedures were undertaken.

5.2.5 Trip Blank

A laboratory prepared clean glass jar is filled with clean soil supplied by the analysing laboratory and is stored within the sample 'esky' and transported to the laboratory with the other samples. The purpose of the trip blank is to detect any sample contamination due to transport activities. One Trip Blank sample (02853/TB) was analysed for BTEX+C6-C9. The results were all below detection and confirm that the sample(s) were not compromised by volatile hydrocarbons during transport.

5.2.6 Laboratory Prepared Soil - Trip Spike

A laboratory prepared trip spike was prepared by Envirolab Services, transported with the other samples and submitted with the sample batch (sample 02853/TS). This consisted of a sample

spiked with a known concentration of BTEX. The purpose of this sample was to quantify the loss of volatiles during transit and analysis. The acceptable percentage recovery of the spike shall be 70 - 130% of the known concentration.

The recovery percentages for the trip spike BTEX were respectively 87%, 92%, 103%, 101% (m+p-Xylene), and 118% (o-Xylene). The recoveries were within the acceptable range of 70 - 130%. The volatile loss was considered acceptable.

5.3 Data Quality Assessment – Laboratory QA/QC

5.3.1 NATA Registration of Laboratories

The analysis of the primary samples was undertaken by Envirolab Services (Sydney), and the analysis of the secondary samples (inter-lab duplicate) was analysed by Envirolab Services (Melbourne). These laboratories are accredited by the National Association of Testing Authorities, NATA. The Laboratories maintain an extensive NATA accreditation, and methodology testing and development is performed in accordance with NATA requirements. NATA accreditation includes compliance with ISO Guide 25 "General Requirements for the Technical Competence of Testing Laboratories".

Laboratories meeting the requirements of this guide comply, for calibration and testing activities, with the relevant requirements for the ISO 9000 series of standards, including those of the model described in ISO 9002 (AS 3902 is the Australian equivalent) when they are acting as suppliers producing calibration and test results.

All analyses are performed in accordance with Australian Standards ("AS"), American Public Health Association ("APHA"), US-EPA or other standards meeting the NEPM 2013 criteria.

5.3.2 Objectives of Analysis Laboratory Quality Assurance Procedures

All laboratories used in this project utilized their own QA procedures for analysis. The objectives of the laboratory internal QA programme was to provide data on the accuracy and precision of the analytical results.

A description of the methods is listed below:

Reagent Blank: Sample free agents carried through the preparation / digestion procedure and analysed at the beginning of every sample batch analysis. For larger projects, a reagent blank is prepared and analysed with every 20 samples.

Matrix Spike Duplicates: Sample replicates spiked with identical concentrations of target analyte(s). The spiking occurs during the sample preparation and prior to the extraction /

digestion procedure. They are used to document the precision and bias of a method in a given sample matrix. Where there is not enough sample available to prepare a spiked sample, another known soil/sand or water may be used. (It is usual for a duplicate spiked sample to be prepared at least every 20 samples).

Surrogate Spike: Added to all samples requiring analysis for organics (where relevant) prior to extraction. Used to determine the extraction efficiency. They are organic compounds which are similar to the target analyte(s) in chemical composition and behaviour in the analytical process, but which are not normally found in environmental samples.

Internal Standard: Added to all samples requiring analysis for organics (where relevant) after extraction process; the compounds serve to give a standard of retention time and response, which is invariant from run to run with the instruments.

Duplicate: A separate portion of a sample being analysed which is treated the same as the other samples in the batch. Usually a duplicate is prepared at least every 20 samples.

Control Standards: Prepared from a source independent of the calibration standards. At least one control standard is included in each run to confirm calibration validity.

Laboratory Reporting: For laboratories with appropriate QA, the reagent blank, duplicates, matrix spikes and surrogate spikes are reported along with the results. The targeted recovery range for the laboratory spikes, controls and surrogates shall be 70% to 130% of the known addition.

5.3.3 Review of Laboratory QA/QC

The primary laboratory used for chemical analysis of the validation samples was Envirolab Services. Envirolab Services are a NATA accredited laboratory. All laboratory QA/QC results are attached.

The conclusions from the results of the QA/QC data are:

- The results for the method blanks indicate that all were less than the PQL. The blanks are sample free agents carried through the preparation/extraction/digestion procedure and analysed at the beginning of every batch analysis. The results indicate that no significant contamination had occurred during the laboratory analysis.
- All matrix spike % recoveries were between 70% and 130%.

The figures indicate that the laboratory analysis process was accurate and that any method bias from the sample matrix was not significant.

The laboratory QA/QC data as supplied for each analysis confirm acceptable precision and accuracy of the analytical result for Envirolab.

5.3.4 Data Completeness Evaluation

Completeness is a quality assurance/quality control term and is defined as the measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions.

The goals for this project shall be 95% completeness. Completeness is assessed or calculated with respect to the following equation:

$$C = 100 \times (V/N)$$

where: C = percent completeness

V = number of measurements judged valid

N = total number of measurements.

1. Sample Collection: 13 primary soil samples and 5 QA/QC samples were collected as specified within the proposal. All samples were delivered to the laboratory successfully using appropriate Chain of Custody procedures. The remaining samples held.

2. Sample Analysis: All primary and the QA/QC sample were successfully analysed and results received from Envirolab Services.

3. Duplicate/Primary Sample Assessment: The data completeness was calculated on the duplicate, where the high (>50%) samples were discarded.

Most RPDs were less than 50% for the intra and inter laboratory duplicate.

With respect to the above comments, all the valid data expected to be obtained, was able to be used to assess the 'completeness of data'.

In Summary: *Data Completeness was 100%.*

SECTION 6: SOIL SAMPLING – AIMS AND METHODOLOGY

6.1 Purpose and Aims

The subject of this investigation is a small part of the total Lot and DP. The investigation area is between 1000 and 2000 square metres. As such according to EPA NSW *Sampling Design Guidelines* (Sept 1995), a minimum of 7 sampling points are required to characterise the site (based on a 95% confidence to detect a hot spot with a 19.9 metre circumference for a site up to 2000 sq/m). A sample was taken of each stratigraphic layer down to natural soils (generally two samples).

6.2 Sampling Procedure

The locations of the soil boreholes are shown in *Figure 2 - 02853-F02 (Appendix A)*.

6.2.1 Soil Primary Samples

7 exploratory boreholes were undertaken using a hydraulic solid flight augur on 23 September 2020. The samples were sent to the primary laboratory (Envirolab Sydney). The samples were analysed for:

ANALYSIS FREQUENCY	ANALYTE	ANALYTE ABBREVIATION
All samples	Heavy metals x8	As, Cd, Cu, Cr, Ni, Hg & Zn
Selected samples	Polycyclic Aromatic Hydrocarbons	PAHs
Selected samples	Total Recoverable Hydrocarbons	TRHs
Selected samples	Benzene, Toluene, Ethylbenzene, Xylene	BTEX
Selected samples	Polychlorinated biphenyl	PCBs
Selected samples	Organochlorine pesticides	OCPs
Selected sample	Acidity	pH
Selected samples	Volatile Organic Compounds	VOCs

6.2.2 QA/QC

1. One intra-laboratory QA/QC sample was taken as a duplicate of the respective primary sample. This was sent to the same laboratory (Envirolab Sydney) as the primary sample for analysis.

2. One inter-laboratory QA/QC sample was taken as a duplicate of the respective primary sample. This were sent to a secondary laboratory (Envirolab - Melbourne) for analysis.

3. One equipment water rinsate QA/QC sample was taken and analysed.

4. One trip blank was analysed. This is a laboratory prepared clean glass jar is filled with clean soil supplied by the analysing laboratory and is stored within the sample 'esky' and transported to the laboratory with the other samples.
5. Trip Spike was analysed for volatile loss.

6.3 Sampling Method

- All sampling equipment was washed with 'Decon 90' and water. The equipment was then rinsed with distilled water between each sampling to avoid cross contamination.
- All samples were collected using a clean disposable nitrile glove.
- The jars and bottles were sealed with a teflon lid and stored and transported in a temperature insulated container.
- The container was transported to a NATA registered laboratory and analysed as described.
- The relevant "Chain of Custody Form" is included in the appendix.
- All washed, teflon lidded jars were obtained from Envirolab.
- Each container was labelled with a unique job and sample No.

6.4 Sample Details and Borehole Locations

NO	SAMPLE ID#	BH	DEPTH (m)	SUB-SOIL CONDITIONS	ANALYSIS
1	02853/BH1/0.25	1	0.25	SAND – orange course sand	Metalsx8, PAH, TRH+BTEX, pH
2	02853/BH1/Dup Intra#1	1	0.25	Intra laboratory duplicate of 02853/BH1/0.25	Metalsx8
3	02853/BH1/1.0	1	1.0	SAND – orange course beach sand	Metalsx8
4	02853/BH2/0.4	2	0.4	SAND – grey course sand	Metalsx8, PAH, TRH+BTEX, OCP+PCB, pH
5	02853/BH2/Dup Inter	2	0.4	Inter laboratory duplicate of 02853/BH2/0.4	Metalsx8
6	02853/BH2/1.5	2	1.5	SAND – grey course sand	Metalsx8
7	02853/BH3/0.5	3	0.5	SAND – orange course sand	Metalsx8, PAH, TRH+BTEX, OCP+PCB
8	02853/BH3/1.5	3	1.5	SAND – orange course sand	Metalsx8
9	02853/BH4/1.0	4	1.0	FILL – Silty gravel, roadbase style clay	Metalsx8, PAH, TRH+BTEX
10	02853/BH4/2.5	4	2.5	SAND – orange course sand	Metalsx8
11	02853/BH5/0.5	5	0.5	FILL – Garden silty / soil	Metalsx8
12	02853/BH6/0.3	6	0.3	SAND – orange course sand	Metalsx8, PAH, TRH+BTEX, pH
13	02853/BH6/1.0	6	1.0	SAND – orange course sand	Metalsx8
14	02853/BH7/0.3	7	0.3	FILL – Dark brown garden soil	Metalsx8, PAH, TRH+BTEX
15	02853/BH7/1.0	7	1.0	SAND – orange course sand	Metalsx8

SECTION 7: SOIL CONTAMINANT THRESHOLD CONCENTRATIONS - ACCEPTANCE CRITERIA

7.1 Health Investigation Levels (HILs)

The sample results were assessed against the soil contaminant threshold concentrations set at levels appropriate to the proposed landuse. Considering the location of 'The Boathouse' on recreational land and immediately adjacent to an important and ecologically sensitive waterway, *HIL C Recreational* would be appropriate. The results are therefore assessed against the Health Investigation Levels (HILs) listed in the *National Environment Protection (Assessment of Site Contamination) Measure (NEPM*) – Schedule B1 (1999 amended 2013).

HIL C:

- *Public open spaces such as parks, playgrounds, playing fields (eg: ovals), secondary schools and footpaths.*

Table 1A(1) – NEPM 2013

	Health Investigation Levels - HILs			
Substance All values in mg/kg	**HIL A Residential A**	**HIL B Residential B**	**HIL C Recreational**	**HIL D Commercial/ Industrial**
Metals & metalloids (NEPM 2013)				
Arsenic	100	500	**300**	3 000
Beryllium	60	90	**90**	500
Cadmium	20	150	**90**	900
Chromium (VI)	100	500	**300**	3600
Cobalt	100	600	**300**	4000
Copper	6,000	30,000	**17,000**	240,000
Lead	300	1,200	**600**	1 500
Manganese	3,800	14,000	**19,000**	60,000
Mercury (inorganic)	40	120	**80**	730
Nickel	400	1,200	**1,200**	6,000
Zinc	7,400	60,000	**30,000**	400,000
Organics				
Aldrin + Dieldrin	6	10	**10**	45
Chlordane	50	90	**70**	530
DDT+DDD+DDE	240	600	**400**	3,600
PAHs (total)	300	400	**300**	4,000
Benzo(a)pyrene TEQ	3	4	**3**	40
Other (NEPM 2013)				
Phenol	3000	45,000	**40,000**	240,000
PCBs	1	1	**1**	7

7.2 Site Specific - Ecological Investigation Levels (EILs)

Levels have been derived for selected metals and organic compounds and are applicable for assessing risk to terrestrial ecosystems (NEPM, 2013). EILs depend on specific soil physiochemical properties and land use scenarios and generally apply to the top 2 m of soil, which corresponds to the root zone and habitation zone of many species. The EIL is determined for a contaminant based on the sum of the ambient background concentration (ABC) and an added contaminant limit (ACL). The ABC of a contaminant is the soil concentration in a specific locality that is the sum of naturally occurring background levels and the contaminants levels that have been introduced from diffuse or non-point sources (e.g. motor vehicle emissions). The ACL is the added concentration (above the ABC) of a contaminant above which further appropriate investigation and evaluation of the impact on ecological values is required.

The EIL is calculated using the formula : EIL = ABC + ACL.

The adopted EIL, derived from *Schedule B1 of NEPM (2013)* and the Excel Spreadsheet – *eil-calculation-spreadsheet-December-2010(1)* are shown below. The following site specific data and assumptions have been used to determine the EILs:

- a protection level of 80%.
- the EILs will apply to the top 2 m.
- considering the historical site use/fill, the contamination is considered as “aged” (>2 years);

ABCs have been derived using the Interactive (Excel) Calculation Spreadsheet using input parameters of NSW and for high for traffic volumes.

Site specific pH values have been used to calculate the input parameter for the Interactive (Excel) Calculation Spreadsheet. The average pH value for filling samples was used, being a pH of 8.9 (based on measured pH values between 8.4 and 9.1);

Analytical Parameters:

pH – average of 8.4 & 9.1	8.9
Cation Exchange Capacity (CEC) – meq/100g	10 (Assessed ave. sand and silty sand)
Clays in Soil %	Est 1%

The above CEC value of 10 and the average pH of 8.9 has been used for the input parameters in the Excel Spreadsheet – *eil-calculation-spreadsheet-December-2010(1)*.

Table 9

Derived Ecological Investigation Levels (EIL) in mg/kg for *National parks and areas of high conservation value*		
METALS		
	FRESH	AGED
Arsenic	50	100
Copper	120	210
Nickel	80	170
Chromium III	230	410
Lead	270	110
Zinc	190	480
PAH		
Naphthalene	170	170
OCP		
DDT	180	180

7.3 Generic - Ecological Screening Levels (EIL)

NEPM 2013 – B(1): Table 1B(6) ESLs for TPH fractions F1 - F4, BTEX and benzo(a)pyrene in soil

CHEMICAL	Soil texture	ESLs (mg/kg dry soil)		
		Areas of ecological significance	Urban residential and public open space	Commercial and industrial
F1 C_6-C_{10}	*Coarse*	125*	180*	215*
F2 >C_{10}-C_{16}	*Fine*	25*	120*	170*
F3 >C_{16}-C_{34}	*Coarse*	-	300	1700
	Fine	-	1300	2500
F4 >C_{34}-C_{40}	*Coarse*	-	2800	3300
	Fine	-	5600	6600
Benzene	*Coarse*	10	50	75
	Fine	10	65	95
Toluene	*Coarse*	10	85	135
	Fine	65	105	135
Ethylbenzene	*Coarse*	1.5	70	165
	Fine	40	125	185
Xylenes	*Coarse*	10	105	180
	Fine	1.6	45	95
Benzo(a)pyrene	*Coarse*	0.7	0.7	0.7
	Fine	0.7	0.7	0.7

Notes:

(1) ESLs are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability.

(2) '-' indicates that insufficient data was available to derive a value.

(3) To obtain F1, subtract the sum of BTEX concentrations from C_6-C_{10} fraction and subtract naphthalene from >C_{10}-C_{16} to obtain F2.

7.4 Generic – Management Limits : Petroleum Hydrocarbons

NEPM 2013 – B(1): Table 1 B(7) Management Limits for TPH fractions F1-F4 in soil

TPH fraction	Soil texture	Management Limits[1] (mg/kg dry soil)	
		Residential, parkland and public open space	Commercial and industrial
F1[2] C_6- C_{10}	*Coarse*	700	700
	Fine	800	800
F2[2] >C_{10}-C_{16}	*Coarse*	1000	1000
	Fine	1000	1000
F3 >C_{16}-C_{34}	*Coarse*	2500	3500
	Fine	3500	5000
F4 >C_{34}-C_{40}	*Coarse*	10 000	10 000
	Fine	10 000	10 000

[1] Management limits are applied after consideration of relevant ESLs and HSLs

[2] Separate management limits for BTEX and naphthalene are not available hence these should not be subtracted from the relevant fractions to obtain F1 and F2.

SECTION 8 : SOIL - LABORATORY ANALYSIS RESULTS

See *Appendix B : Summary of Results.*

8.1 Metals

8.1.1 Metals - Health Investigation Levels (HILs)

All metal (x8) results were generally above detection levels but did not exceed the Health Investigation Levels for *Recreational (HIL C).*

8.1.2 Metals – Derived Ecological Investigation Levels (EILs)

All metal (x8) analysis results did not exceed the *Derived Ecological Investigation Levels (EIL) in mg/kg for National parks and areas of high conservation value* as calculated in Section 7.2.

8.2 Petroleum Hydrocarbons (TRH & BTEX)

All TRH and BTEX were below detection levels. The TRH+BTEX results did not exceed the Health Investigation Levels *Recreational (HIL C)* and *Ecological Investigation Levels* (EILs) criteria or the *Management Limits* for TRH.

8.3 Polyaromatic Hydrocarbons (PAH)

Most Benzo-a-pyrene TEQ and total PAH levels were below detection levels. The results did not exceed the Health Investigation Levels *Recreational (HIL C)* and *Ecological Investigation Levels* (EILs) criteria.

8.4 Organochlorine Pesticides (OCPs)

The OCPs were below detection levels, and as such results did not exceed the *Recreational (HIL C)* and *Ecological Investigation Levels* (EILs for DDT) criteria.

8.5 Polychlorinated Biphenyls (PCBs)

The PCBs were below detection levels, and as such results did not exceed the *Recreational (HIL C)* criteria.

8.6 Acidity (pH)

The pH varied with levels from 8.4 and 9.1 pH Units.

8.7 Photo-ionisation Detector (PID)

A PID was used to assess the soil for volatile compounds. The readings were well below the 30ppm action level. The PID readings are given tabled in the borehole logs (Appendix C).

SECTION 9: CLASSIFICATION OF EXCAVATION MATERIAL

9.1 Background

The samples taken during this investigation were used to classify the soil in accordance with the *Waste Classification Guidelines (Part 1 : Classifying Waste – Department of Environment & Climate Change NSW (Nov 2014).* The soil classification shall be used to dispose of the any excavated soil at an EPA licenced waste facility.

- The inspection revealed that the yellow/brown road base type material (Borehole 4) and mixed sandy fill extended from surface down to 0.1-0.2 metres (varying depths).
- Minor amounts of gravel and pebbles associated with covering road base.
- Asbestos fragments were not observed during the soil sampling.

9.2 Waste Classification

- The PAH, TRH, BTEX, OCPs and PCBs results were near or below detection limits.
- No asbestos containing materials observed..
- No indication of hydrocarbon sheen or significant oil staining was observed;
- No odour was noted during the investigation.
- The reported analytes above 'detection limit' concentrations were compared to the criteria outlined in: Tables 1: in the *Waste Classification Guidelines (Part 1 : Classifying Waste – Department of Environment & Climate Change NSW (Nov 2014).*

Results Compared to Maximum Concentrations in Soil for General Solid Classification (See Envirolab Services Certificate of Analysis #252089 in Appendix D).

-	Maximum values for *leachable concentration* and *specific contaminant concentration* when used together				Site soil sample analysis results	
	General Solid Waste Criteria				Maximum Reported Concentration from the primary sample analysis	
Analytes (in mg/kg)	**Soil - Total Concentration without TCLP CT1 (mg/kg)**	**Leachate TCLP 1 (mg/L)**	**Soil - Total Concentration with TCLP SCC1 (mg/kg)**		**Analysed Soil Total Conc. (mg/kg) without TCLP**	**Analysed Leachate (mg/L)**
Arsenic	100	5	500		22	-
Cadmium	20	1.0	100		<0.4	-
Chromium V1	100	5	1900		23	-
Lead	100	5	1500		64	-
Mercury	4	0.2	50		0.4	-
Nickel	40	2	1050		8	-
Benzo(a)pyrene	0.8	0.04	10		0.1	-
C10-C36 Hydrocarbons	NA	10,000	NA		ND	-
Scheduled Chems (incl. aldrin&dieldrin)	NA	<50	NA		ND	-

The top '*yellow/brown road base type material (Borehole 4) and mixed sandy fill (extending down to depth around 0.1-0.2 m).* The total concentration analysis confirm that the material fall within the criteria for *GENERAL SOLID WASTE* classification as per Table 1 of the *Waste Classification Guidelines (Part 1 : Classifying Waste – Department of Environment & Climate Change NSW (Nov 2014).*

NOTE: The classification is for disposal purposes only.

VENM (Virgin Excavated Natural Material): Sub-surface deeper undisturbed orange and grey natural sand located beneath the '*mixed sandy fill'* (deeper than 0.1-0.2 metres varying over the site), shall be classified as *Virgin Excavated Natural Material (VENM)* as per DECC NSW *Fact Sheet: Virgin excavated natural material* and *Waste Classification Guidelines (Part 1 : Classifying Waste – Department of Environment & Climate Change NSW* (April 2008).

SECTION 10: DISCUSSION & RECOMMENDATIONS

10.1 Discussion

- The seven-step DQO process (defined in Section 5) as outlined in the *NEPM 2013* was employed to assess the property in regard to contamination of the soil.
- The soil sample laboratory analysis results were assessed against the relevant *guidelines* listed in the *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)* May 2013.
    - *Recreational C (HIL C) - Public open spaces such as parks, playgrounds, playing fields (eg: ovals), secondary schools and footpaths.*
    - *Site Specific - Ecological Investigation Levels (EILs) - derived from Schedule B1 of NEPM (2013) – 'National parks and areas of high conservation value'.*
    - *Generic - Ecological Screening Levels (EIL) - NEPM 2013 – B(1): Table 1B(6) ESLs for TPH fractions F1 - F4, BTEX and benzo(a)pyrene in soil.*
    - *Generic – Management Limits : Petroleum Hydrocarbons - NEPM 2013 – B(1): Table 1 B(7): Management Limits for TPH fractions F1-F4 in soil*
- The soil sample laboratory analysis results confirm that metals (x8), PAH, TRH, BTEX, OCPs and PCBs analysis results did not exceed the above criteria in accordance with the *NEPM 2013*. (ie: Listed in Section 7). The PID readings did not exceed the action level of 30ppm (see borelogs in Appendix C).
- No asbestos containing materials were observed and none are expected.
- The total concentration analysis results confirm that the *yellow/brown road base type material (Borehole 4) and mixed sandy fill,* (varying depth 0.1 – 0.2 metres), fall within the criteria for General Solid Waste classification as per Table 1 of the *Waste Classification Guidelines (Part 1 : Classifying Waste – DECC NSW (Nov 2014).* NOTE: The classification is for disposal purposes only.
- An assessment of the sub-soil for PASS (potential acid sulfate soils) has been undertaken by Crozier Geotechnical. Please refer to relevant report.

10.2 Recommendations

10.2.1 Suitability of the Site for the Proposed Development

This report is in accordance with:

- *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)*, (1999 amended 2013
- *State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)*
- *EPA NSW Guidelines for Consultants Reporting on Contaminated Sites* (November 1997),

It is the opinion of EBG that with respect to the investigations carried out within this report, **the site is suitable for the proposed development:**

- *Re-building the superstructure on the wharf below the mean high water mark*
- *Construction of an amenities and service building along southern boundaries (adjacent golf course boundary fence).*

The recommendation above is given with the understanding that the **'condition'** below is undertaken:

10.2.2 Condition : Imported Soil - VENM

Any imported fill shall be sampled prior to importation and shall conform to VENM (virgin excavated natural material) as per EPA NSW Waste Classification Guidelines - Part 1 : Classifying Waste (Nov 2014).

- **VENM with Documentation:** Backfill material shall be (virgin) excavated natural material (VENM) sourced from a reputable soil / landscaping supplier or excavation contractor. This shall be accompanied by suitable documentation verifying the material is VENM. The documentation shall be provided by a suitably qualified Environmental or Engineering Consultant.
- **VENM without Documentation:** Backfill material without suitable VENM documentation shall be validated using a frequency of one (1) sample for every twenty five cubic metres ($25m^3$). Each discrete sample analysed shall consist of a composite of these 5 sub-samples collected and mixed in a stainless steel tray. Each sample shall be analysed for the full suite of analytes listed in the EPA Waste Classification Guidelines, Part 1: Classifying Waste (DEC 2014) (Waste Classification Guidelines).

Approval for the importation of the fill material to the site is to be provided only after the analytical results show the material to be clean fill is received.

The imported material delivered to the site must be inspected prior to backfilling to ensure that it is consistent with the material originally sampled. These observations should be documented in the validation assessment report. A verification sample should be taken from the delivered material and analysed for the suite of contaminants as per the guidelines. The results of the analysis should be compared to the sample results from the original sample.

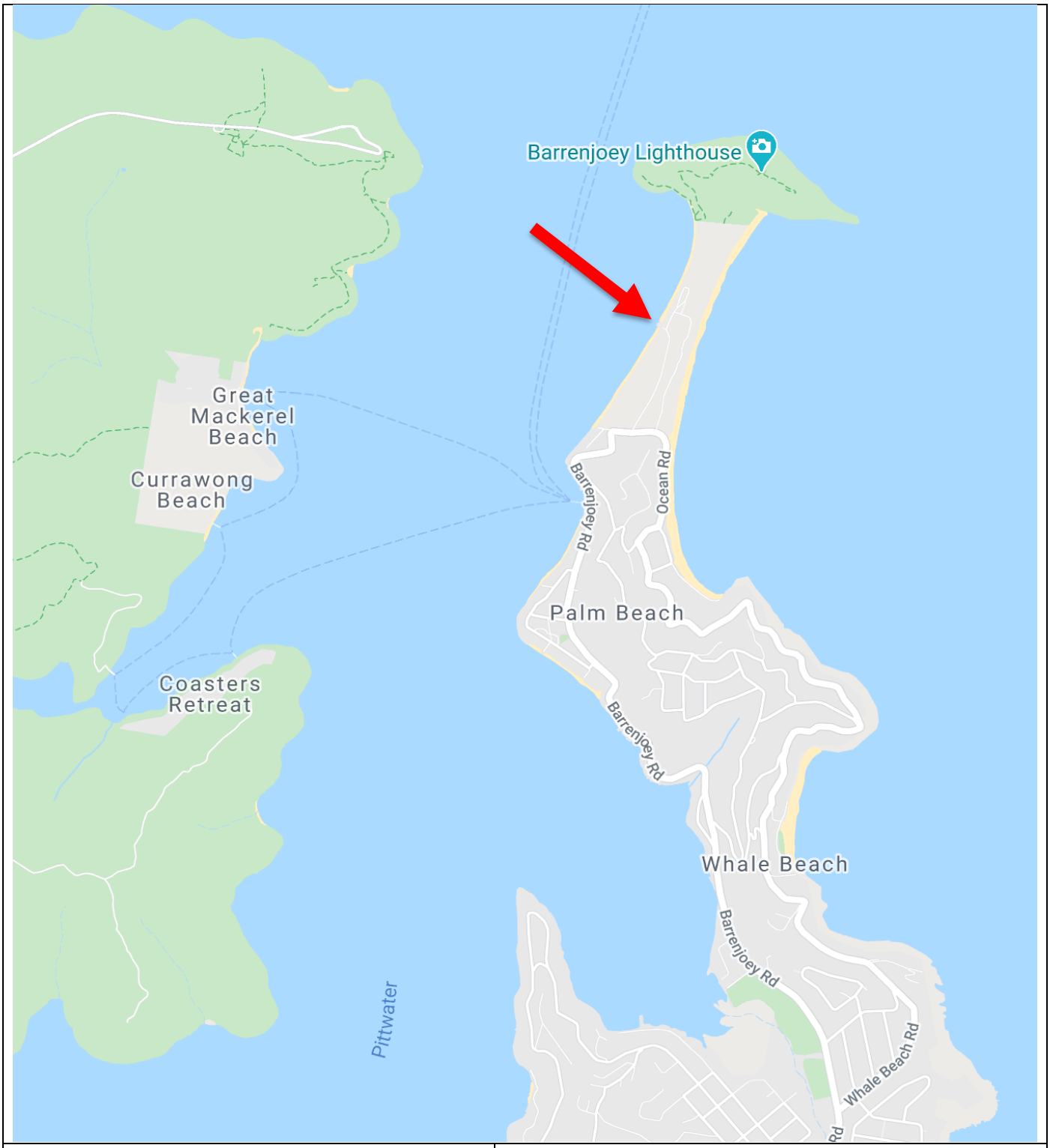
If during any development excavation, any visual staining or unidentified odour is encountered, work should cease within the area until it has been assessed by a qualified environmental professional.

SECTION 11: REFERENCES AND LEGISLATION

- *Sydney, Geological Map of NSW, 1:100 000 Geological Series Sheet 9130*, Edition 1, NSW Dept. of Mineral Resources, 1983.
- *Guideline on Investigation Levels for Soil & Groundwater : Schedule B1 – National Environment Protection (Assessment of Site Contamination) Measure (NEPM)*, (1999 amended 2013).
- NSW *Contaminated Land Management Act* 2008 No.11.
- *Managing Land Contamination – Planning Guidelines SEPP 55 – Remediation of Land* – Dept. of Urban Affairs & Planning and EPA NSW 1998.
- *Waste Classification Guidelines (Part 1 : Classifying Waste – Department of Environment & Climate Change NSW (Nov 2014)*
- General approvals of immobilisation' by EPA: '*Ash, ash-contaminated natural excavated materials or coal-contaminated natural excavated materials'.* Approval Number: 1999/05
- *Australian and New Zealand Guidelines from the Protection of Aquatic Organisms – 95% Protection of Species for Fresh and Marine Water* (ANZECC 2000).
- EPA NSW *Sampling Design Guidelines* September 1995.
- *Virgin excavated natural material (DECC 2008/447)* Fact Sheet 2008.
- *DEC NSW Guidelines for Assessing Former Orchards & Market Gardens* June 2005.
- EPA NSW *Guidelines for Consultants Reporting on Contaminated Sites* 1997 Reprinted August 2011
- *Work Health and Safety Act 2011 (WHS Act)* and *Work Health and Safety Regulation 2011 (WHS Regulation)*

APPENDIX A: FIGURES / PLANS

- Site Location (Figure No 1: 02853-F01)
- Investigation Area & Borehole Locations (Figure No 2: 02853-F02)
- PID Calibration Certificate



LEGEND:

- SITE LOCATION

EBG Environmental Geoscience

FIG NO.	FIGURE NO. 1 : 02853-F01	LOCATION	'THE BOATHOUSE' GOVERNOR PHILLIP PARK PALM BEACH NSW 2108
SOURCE	NEARMAP - IMAGERY 2016 CNES / ASTRIUM, DIGITALGLOBE	CLIENT	BLUE PACIFIC CONSTRUCTIONS PTY LTD
DRAWN	M.E	PROJECT	STAGE 2 DETAILED SITE INVESTIGATION
APPROVED	M.E	TITLE	SITE LOCATION

LEGEND:

◎ SL-# - SAMPLING LOCATIONS

EBG Environmental Geoscience

FIG NO.	FIGURE NO. 2 : 02853.F02	LOCATION	'THE BOATHOUSE' GOVERNOR PHILLIP PARK PALM BEACH NSW 2108
SOURCE	NEARMAP - IMAGERY 2016 CNES / ASTRIUM, DIGITALGLOBE	CLIENT	BLUE PACIFIC CONSTRUCTIONS PTY LTD
DRAWN	M.E	PROJECT	STAGE 2 DETAILED SITE INVESTIGATION
APPROVED	M.E	TITLE	BOREHOLE LOCATIONS

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-105511

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6 ev			
Alarms	Beeper	✓	**Low**	**High**	**TWA**	**STEL**
	Settings	✓	50ppm	100ppm		
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		92ppm Isobutylene	NATA	SY245		93.4ppm

Calibrated by: **Eloise Carroll**

Calibration date: **21/09/2020**

Next calibration due: **20/03/2021**

APPENDIX B:

SUMMARY OF RESULTS

APPENDIX B: Summary of Results - Stage 2 DSI : 'The Boathouse', Gov Phillip Pk, Palm Beach NSW (EBG-02853.Stage2.DSI.09.20)
SUMMARY RESULTS – SAMPLING 23 September 2020

		METALS (mg/kg)									PAH (mg/kg)		OTHER (mg/mg)						
		As	Cd	Cr	Cu	Pb	Hg	Ni	Zn		Tot. PAH	BaP TEQ							
NEPM HIL A		3000	900	3600	240K	1500	730	6000	400K		4000	40	PCB	OCP	VOCs	pH			
BH	DEPTH																		
1	0.25	6	<0.4	7	16	45	<0.1	3	77		<0.05	<0.05	-	-	-				
1	DupIntra	6	<0.4	7	20	50	<0.1	3	86		-	-	-	-	-				
1	1.0	4	<0.4	3	2	2	<0.1	<1	4		-	-	-	-	-				
2	0.4	<4	<0.4	4	1	3	<0.1	1	5		0.05	<0.05	<DI	<DL	-				
2	Dup Inter	<4	<0.4	4	2	4	<0.1	1	6		-	-	-	-	-				
2	1.5	4	<0.4	3	<1	14	<0.1	1	3		-	-	-	-	-				
3	0.5	7	<0.4	6	6	25	<0.1	3	21		<0.05	<0.05	<DL	<DL	-				
3	1.5	5	<0.4	3	<1	2	<0.1	<1	4		-	-	-	-	<DL				
4	1.0	<4	<0.4	10	7	18	<0.1	4	19		<0.05	<0.05	-	-	-				
4	2.5	6	<0.4	5	2	2	<0.1	2	5		-	-	-	-	<DL				
5	0.5	22	<0.4	23	59	17	<0.1	6	380		-	-	-	-	-				
6	0.3	7	<0.4	8	22	64	<0.1	6	55		<0.05	<0.05	-	-	-				
6	1.0	8	<0.4	3	2	3	<0.1	<1	4		-	-	-	-	-				
7	0.3	<4	<0.4	12	8	15	<0.1	8	14		<0.05	<0.05	-	-	-				
7	1.0	6	<0.4	3	<1	1	<0.1	<1	2		-	-0	-	-	-				
RIN	ug/L	1	<0.1	<1	<1	<1	<0.0001	<1	<5										

DL - Detection Limit ND – Not detected

PETROLEUM HYDROCARBONS																	
		BTEX (benzene, toluene, ethylbenzene, xylene)+Naphthalene (mg/kg)							TRH (total recoverable hydrocarbons) (mg/kg)								
BH	DEPTH (m)	F1	B	T	E	X	N		C6-C9	C6-C10	C10-C14	C15-C28	C29-C36	F2	C16-C34 (F3)	C34-C40 (F4)	Total TRH C10-C40
1	0.25	<25	<0.2	<0.5	<1	<3	<1		<50	<100	<100	<50	<50	<100	<100	<50	<50
2	0.4	<25	<0.2	<0.5	<1	<3	<1		<50	<100	<100	<50	<50	<100	<100	<50	<50
3	0.5	<25	<0.2	<0.5	<1	<3	<1		<50	<100	<100	<50	<50	<100	<100	<50	<50
4	1.0	<25	<0.2	<0.5	<1	<3	<1		<50	<100	<100	<50	<50	<100	<100	<50	<50
5	1.0	<25	<0.2	<0.5	<1	<3	<1		<50	<100	<100	<50	<50	<100	<100	<50	<50
6	0.3	<25	<0.2	<0.5	<1	<3	<1		<50	<100	<100	<50	<50	<100	<100	<50	<50
7	0.3	<25	<0.2	<0.5	<1	<3	<1		<50	<100	<100	<50	<50	<100	<100	<50	<50
	TB	<25	<0.2	<0.5	<1	<3	<1										
	TS	-	87%	92%	103%	101% 118%	-										

APPENDIX C:

BOREHOLE LOGS

EBG Environmental Geoscience
(Edwards Blasche Group Pty Ltd ABN 54 085 829 250)

Environmental Borehole Log

Client: Blue Pacific Constructions
Project: Stage 2 Detailed Site Investigation
Location: The Boathouse, Gov Phillip Pk, Palm Beach
Rpt ID: EBG-02853.Stage2.DSI.09.20

Borehole No: 1
Sheet: 1
Date: 23.09.20
Logged By: ME

RL	Depth (m)	Graphic Log	Description of Strata	Sampling & In Situ Testi: Type	Depth	Sample	Results & Comments	Moisture		Observations & Sampling Details
-	0.1		CONCRETE TILE		0.1				-	
-	0.2				0.2		PID: 0.2 ppm		-	02853/BH1/0.25
-	0.3				0.3				-	02853/BH1/Dup Intra
-	0.4		SAND - orange course sand		0.4				-	
-	0.5				0.5		D		-	
-	0.6				0.6				-	
-	0.7				0.7				-	
-	0.8				0.8				-	
-	0.9				0.9				-	
-	**1**				1				-	02853/BH1/1.0
-	1.1				1.1				-	
-	1.2				1.2				-	
-	1.3		END		1.3				-	
-	1.4				1.4				-	
-	1.5				1.5				-	
-	1.6				1.6				-	
-	1.7				1.7				-	
-	1.8				1.8				-	
-	1.9				1.9				-	
-	**2**				2				-	
-	2.1				2.1				-	
-	2.2				2.2				-	
-	2.3				2.3				-	
-	2.4				2.4				-	
-	2.5				2.5				-	
-	2.6				2.6				-	
-	2.7				2.7				-	
-	2.8				2.8				-	
-	2.9				2.9				-	
-	**3**				3				-	
-	3.1				3.1				-	
-	3.2				3.2				-	
-	3.3				3.3				-	
-	3.4				3.4				-	
-	3.5				3.5				-	
-	3.6				3.6				-	
-	3.7				3.7				-	
-	3.8				3.8				-	
-	3.9				3.9				-	
-	**4**				4				-	
-	4.1				4.1				-	
-	4.2				4.2				-	
-	4.3				4.3				-	
-	4.4				4.4				-	
-	4.5				4.5				-	
-	4.6				4.6				-	
-	4.7				4.7				-	
-	4.8				4.8				-	
-	4.9				4.9				-	
-	**5**				5				-	

WEATHERING	NOTES			CONSISTENCY / DENSITY INDEX	
Fr - fresh	US - undisturbed sample	MOISTURE	STRENGTH	fb - friable	vs - very soft
SW - slightly weathered	DS - disturbed sample	D - dry	els - ext low	vl - very loose	s - soft
MW - mod weathered	N - stan. pen. test	M - moist	vls- very low	l - loose	ff - firm
HW - highly weathered	NS - spt + sample	W - wet	ls - low	md - med dense	st - stiff
EW - extremely weathered	NC - cone pntmeter		ms - med	d - dense	vst - very stiff
			hs - high	d - dense	h - hard
			vhs - very high	vd - very dense	
			ehs - ext high		

EBG Environmental Geoscience
(Edwards Blasche Group Pty Ltd ABN 54 085 829 250)

Environmental Borehole Log

Client: Blue Pacific Constructions
Project: Stage 2 Detailed Site Investigation
Location: The Boathouse, Gov Phillip Pk, Palm Beach
Rpt ID: EBG-02853.Stage2.DSI.09.20

Borehole No: 2
Sheet: 1
Date: 23.09.20
Logged By: ME

RL	Depth (m)	Graphic Log	Description of Strata	Sampling & In Situ Testi: Type	Depth	Sample	Results & Comments	Moisture		Observations & Sampling Details
-	0.1		BITUMEN		0.1				-	
-	0.2				0.2				-	
-	0.3				0.3				-	
-	0.4				0.4		PID: 0.9 ppm		-	02853/BH2/0.4
-	0.5		SAND - course grey sand		0.5				-	02853/BH2/DUP INTER
-	0.6				0.6		D		-	
-	0.7				0.7				-	
-	0.8				0.8				-	
-	0.9				0.9				-	
-	**1**				1				-	
-	1.1				1.1				-	
-	1.2				1.2				-	
-	1.3				1.3				-	
-	1.4				1.4				-	
-	1.5				1.5				-	02853/BH2/1.5
-	1.6				1.6		M		-	
-	1.7		END		1.7				-	
-	1.8				1.8				-	
-	1.9				1.9				-	
-	**2**				2				-	
-	2.1				2.1				-	
-	2.2				2.2				-	
-	2.3				2.3				-	
-	2.4				2.4				-	
-	2.5				2.5				-	
-	2.6				2.6				-	
-	2.7				2.7				-	
-	2.8				2.8				-	
-	2.9				2.9				-	
-	**3**				3				-	
-	3.1				3.1				-	
-	3.2				3.2				-	
-	3.3				3.3				-	
-	3.4				3.4				-	
-	3.5				3.5				-	
-	3.6				3.6				-	
-	3.7				3.7				-	
-	3.8				3.8				-	
-	3.9				3.9				-	
-	**4**				4				-	
-	4.1				4.1				-	
-	4.2				4.2				-	
-	4.3				4.3				-	
-	4.4				4.4				-	
-	4.5				4.5				-	
-	4.6				4.6				-	
-	4.7				4.7				-	
-	4.8				4.8				-	
-	4.9				4.9				-	
-	**5**				5				-	

WEATHERING	NOTES			CONSISTENCY / DENSITY INDEX	
Fr - fresh	US - undisturbed sample	MOISTURE	STRENGTH	fb - friable	vs - very soft
SW - slightly weathered	DS - disturbed sample	D - dry	els - ext low	vl - very loose	s - soft
MW - mod weathered	N - stan. pen. test	M - moist	vls- very low	l - loose	ff - firm
HW - highly weathered	NS - spt + sample	W - wet	ls - low	md - med dense	st - stiff
EW - extremely weathered	NC - cone pntmeter		ms - med	d - dense	vst - very stiff
			hs - high	d - dense	h - hard
			vhs - very high	vd - very dense	
			ehs - ext high		

EBG Environmental Geoscience
(Edwards Blasche Group Pty Ltd ABN 54 085 829 250)

Environmental Borehole Log

Client: Blue Pacific Constructions
Project: Stage 2 Detailed Site Investigation
Location: The Boathouse, Gov Phillip Pk, Palm Beach
Rpt ID: EBG-02853.Stage2.DSI.09.20

Borehole No: 3
Sheet: 1
Date: 23.09.20
Logged By: ME

RL	Depth (m)	Graphic Log	Description of Strata	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Moisture		Observations & Sampling Details
-	0.1		BITUMEN / GRAVEL		0.1				-	
-	0.2				0.2				-	
-	0.3				0.3				-	
-	0.4				0.4				-	
-	0.5				0.5		PID: 0.8 ppm		-	02853/BH3/0.5
-	0.6				0.6				-	
-	0.7		SAND - course orange sand		0.7		D		-	
-	0.8				0.8				-	
-	0.9				0.9				-	
-	1				1				-	
-	1.1				1.1				-	
-	1.2				1.2				-	
-	1.3				1.3				-	
-	1.4				1.4				-	
-	1.5				1.5		M		-	02853/BH3/1.5
-	1.6				1.6				-	
-	1.7		END		1.7				-	
-	1.8				1.8				-	
-	1.9				1.9				-	
-	2				2				-	
-	2.1				2.1				-	
-	2.2				2.2				-	
-	2.3				2.3				-	
-	2.4				2.4				-	
-	2.5				2.5				-	
-	2.6				2.6				-	
-	2.7				2.7				-	
-	2.8				2.8				-	
-	2.9				2.9				-	
-	3				3				-	
-	3.1				3.1				-	
-	3.2				3.2				-	
-	3.3				3.3				-	
-	3.4				3.4				-	
-	3.5				3.5				-	
-	3.6				3.6				-	
-	3.7				3.7				-	
-	3.8				3.8				-	
-	3.9				3.9				-	
-	4				4				-	
-	4.1				4.1				-	
-	4.2				4.2				-	
-	4.3				4.3				-	
-	4.4				4.4				-	
-	4.5				4.5				-	
-	4.6				4.6				-	
-	4.7				4.7				-	
-	4.8				4.8				-	
-	4.9				4.9				-	
-	5				5				-	

WEATHERING	NOTES			CONSISTENCY / DENSITY INDEX	
Fr - fresh	US - undisturbed sample	MOISTURE	STRENGTH	fb - friable	vs - very soft
SW - slightly weathered	DS - disturbed sample	D - dry	els - ext low	vl - very loose	s - soft
MW - mod weathered	N - stan. pen. test	M - moist	vls- very low	l - loose	ff - firm
HW - highly weathered	NS - spt + sample	W - wet	ls - low	md - med dense	st - stiff
EW - extremely weathered	NC - cone pntmeter		ms - med	d - dense	vst - very stiff
			hs - high	d - dense	h - hard
			vhs - very high	vd - very dense	
			ehs - ext high		

EBG Environmental Geoscience
(Edwards Blasche Group Pty Ltd ABN 54 085 829 250)

Environmental Borehole Log

Client: Blue Pacific Constructions
Project: Stage 2 Detailed Site Investigation
Location: The Boathouse, Gov Phillip Pk, Palm Beach
Rpt ID: EBG-02853.Stage2.DSI.09.20

Borehole No: 4
Sheet: 1
Date: 23.09.20
Logged By: ME

RL	Depth (m)	Graphic Log	Description of Strata	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Moisture	Observations & Sampling Details
-	0.1				0.1			-	
-	0.2				0.2			-	
-	0.3		FILL / ROADBASE - silty clay with cravel		0.3			-	
-	0.4				0.4			-	
-	0.5				0.5			-	
-	0.6				0.6			-	
-	0.7				0.7			-	
-	0.8				0.8			-	
-	0.9				0.9			-	0
-	**1**				1		PID: 0.4 ppm	-	02853/BH4/1.0
-	1.1				1.1			-	
-	1.2				1.2			-	
-	1.3				1.3			-	
-	1.4				1.4			-	
-	1.5				1.5			-	
-	1.6				1.6			-	
-	1.7		SAND - orange course sand		1.7			-	
-	1.8				1.8			-	
-	1.9				1.9			-	
-	**2**				2			-	
-	2.1				2.1			-	
-	2.2				2.2			-	
-	2.3				2.3			-	
-	2.4				2.4			-	
-	2.5				2.5			-	02853/BH4/2.5
-	2.6				2.6			-	
-	2.7		END		2.7			-	
-	2.8				2.8			-	
-	2.9				2.9			-	
-	**3**				3			-	
-	3.1				3.1			-	
-	3.2				3.2			-	
-	3.3				3.3			-	
-	3.4				3.4			-	
-	3.5				3.5			-	
-	3.6				3.6			-	
-	3.7				3.7			-	
-	3.8				3.8			-	
-	3.9				3.9			-	
-	**4**				4			-	
-	4.1				4.1			-	
-	4.2				4.2			-	
-	4.3				4.3			-	
-	4.4				4.4			-	
-	4.5				4.5			-	
-	4.6				4.6			-	
-	4.7				4.7			-	
-	4.8				4.8			-	
-	4.9				4.9			-	
-	**5**				5			-	

WEATHERING	NOTES			CONSISTENCY / DENSITY INDEX	
Fr - fresh	US - undisturbed sample	MOISTURE	STRENGTH	fb - friable	vs - very soft
SW - slightly weathered	DS - disturbed sample	D - dry	els - ext low	vl - very loose	s - soft
MW - mod weathered	N - stan. pen. test	M - moist	vls- very low	l - loose	ff - firm
HW - highly weathered	NS - spt + sample	W - wet	ls - low	md - med dense	st - stiff
EW - extremely weathered	NC - cone pntmeter		ms - med	d - dense	vst - very stiff
			hs - high	d - dense	h - hard
			vhs - very high	vd - very dense	
			ehs - ext high		

EBG Environmental Geoscience
(Edwards Blasche Group Pty Ltd ABN 54 085 829 250)

Environmental Borehole Log

Client: Blue Pacific Constructions
Project: Stage 2 Detailed Site Investigation
Location: The Boathouse, Gov Phillip Pk, Palm Beach
Rpt ID: EBG-02853.Stage2.DSI.09.20

Borehole No: 5
Sheet: 1
Date: 23.09.20
Logged By: ME

RL	Depth (m)	Graphic Log	Description of Strata	Sampling & In Situ Testi: Type	Depth	Sample	Results & Comments	Moisture		Observations & Sampling Details
-	0.1		FILL / GARDEN SOIL silty sand incl. rocks		0.1				-	
-	0.2				0.2				-	
-	0.3				0.3		D		-	
-	0.4				0.4				-	
-	0.5				0.5		PID: 0.3 ppm		-	02853/BH5/0.5
-	0.6				0.6				-	
-	0.7				0.7				-	
-	0.8		END		0.8				-	
-	0.9				0.9				-	
-	**1**				1				-	
-	1.1				1.1				-	
-	1.2				1.2				-	
-	1.3				1.3				-	
-	1.4				1.4				-	
-	1.5				1.5				-	
-	1.6				1.6				-	
-	1.7				1.7				-	
-	1.8				1.8				-	
-	1.9				1.9				-	
-	**2**				2				-	
-	2.1				2.1				-	
-	2.2				2.2				-	
-	2.3				2.3				-	
-	2.4				2.4				-	
-	2.5				2.5				-	
-	2.6				2.6				-	
-	2.7				2.7				-	
-	2.8				2.8				-	
-	2.9				2.9				-	
-	**3**				3				-	
-	3.1				3.1				-	
-	3.2				3.2				-	
-	3.3				3.3				-	
-	3.4				3.4				-	
-	3.5				3.5				-	
-	3.6				3.6				-	
-	3.7				3.7				-	
-	3.8				3.8				-	
-	3.9				3.9				-	
-	**4**				4				-	
-	4.1				4.1				-	
-	4.2				4.2				-	
-	4.3				4.3				-	
-	4.4				4.4				-	
-	4.5				4.5				-	
-	4.6				4.6				-	
-	4.7				4.7				-	
-	4.8				4.8				-	
-	4.9				4.9				-	
-	**5**				5				-	

WEATHERING	NOTES			CONSISTENCY / DENSITY INDEX	
Fr - fresh	US - undisturbed sample	MOISTURE	STRENGTH	fb - friable	vs - very soft
SW - slightly weathered	DS - disturbed sample	D - dry	els - ext low	vl - very loose	s - soft
MW - mod weathered	N - stan. pen. test	M - moist	vls- very low	l - loose	ff - firm
HW - highly weathered	NS - spt + sample	W - wet	ls - low	md - med dense	st - stiff
EW - extremely weathered	NC - cone pntmeter		ms - med	d - dense	vst - very stiff
			hs - high	d - dense	h - hard
			vhs - very high	vd - very dense	
			ehs - ext high		

EBG Environmental Geoscience
(Edwards Blasche Group Pty Ltd ABN 54 085 829 250)

Environmental Borehole Log

Client: Blue Pacific Constructions
Project: Stage 2 Detailed Site Investigation
Location: The Boathouse, Gov Phillip Pk, Palm Beach
Rpt ID: EBG-02853.Stage2.DSI.09.20

Borehole No: 6
Sheet: 1
Date: 23.09.20
Logged By: ME

RL	Depth (m)	Graphic Log	Description of Strata	Sampling & In Situ Testi: Type	Depth	Sample	Results & Comments	Moisture		Observations & Sampling Details
-	0.1		BITUMEN		0.1				-	
-	0.2				0.2				-	
-	0.3				0.3		PID: 1.1 ppm		-	02853/BH3/0.3
-	0.4				0.4				-	
-	0.5		SAND - orange course sand		0.5		D		-	
-	0.6				0.6				-	
-	0.7				0.7				-	
-	0.8				0.8				-	
-	0.9				0.9				-	
-	**1**				1		M		-	02853/BH3/1.0
-	1.1		END		1.1				-	
-	1.2				1.2				-	
-	1.3				1.3				-	
-	1.4				1.4				-	
-	1.5				1.5				-	
-	1.6				1.6				-	
-	1.7				1.7				-	
-	1.8				1.8				-	
-	1.9				1.9				-	
-	**2**				2				-	
-	2.1				2.1				-	
-	2.2				2.2				-	
-	2.3				2.3				-	
-	2.4				2.4				-	
-	2.5				2.5				-	
-	2.6				2.6				-	
-	2.7				2.7				-	
-	2.8				2.8				-	
-	2.9				2.9				-	
-	**3**				3				-	
-	3.1				3.1				-	
-	3.2				3.2				-	
-	3.3				3.3				-	
-	3.4				3.4				-	
-	3.5				3.5				-	
-	3.6				3.6				-	
-	3.7				3.7				-	
-	3.8				3.8				-	
-	3.9				3.9				-	
-	**4**				4				-	
-	4.1				4.1				-	
-	4.2				4.2				-	
-	4.3				4.3				-	
-	4.4				4.4				-	
-	4.5				4.5				-	
-	4.6				4.6				-	
-	4.7				4.7				-	
-	4.8				4.8				-	
-	4.9				4.9				-	
-	**5**				5				-	

WEATHERING	NOTES			CONSISTENCY / DENSITY INDEX	
Fr - fresh	US - undisturbed sample	MOISTURE	STRENGTH	fb - friable	vs - very soft
SW - slightly weathered	DS - disturbed sample	D - dry	els - ext low	vl - very loose	s - soft
MW - mod weathered	N - stan. pen. test	M - moist	vls- very low	l - loose	ff - firm
HW - highly weathered	NS - spt + sample	W - wet	ls - low	md - med dense	st - stiff
EW - extremely weathered	NC - cone pntmeter		ms - med	d - dense	vst - very stiff
			hs - high	d - dense	h - hard
			vhs - very high	vd - very dense	
			ehs - ext high		

EBG Environmental Geoscience
(Edwards Blasche Group Pty Ltd ABN 54 085 829 250)

Environmental Borehole Log

Client: Blue Pacific Constructions
Project: Stage 2 Detailed Site Investigation
Location: The Boathouse, Gov Phillip Pk, Palm Beach
Rpt ID: EBG-02853.Stage2.DSI.09.20

Borehole No: 7
Sheet: 1
Date: 23.09.20
Logged By: ME

RL	Depth (m)	Graphic Log	Description of Strata	Sampling & In Situ Testi: Type	Depth	Sample	Results & Comments	Moisture		Observations & Sampling Details
-	0.1		GRASS		0.1				-	
-	0.2				0.2		D		-	
-	0.3		FILL - dark grey soil		0.3		PID: 0.1 ppm		-	02853/BH3/0.3
-	0.4				0.4				-	
-	0.5				0.5				-	
-	0.6				0.6				-	
-	0.7				0.7				-	
-	0.8		SAND - course orange sand		0.8		D		-	
-	0.9				0.9				-	
-	**1**				1				-	02853/BH3/1.0
-	1.1		END		1.1				-	
-	1.2				1.2				-	
-	1.3				1.3				-	
-	1.4				1.4				-	
-	1.5				1.5				-	
-	1.6				1.6				-	
-	1.7				1.7				-	
-	1.8				1.8				-	
-	1.9				1.9				-	
-	**2**				2				-	
-	2.1				2.1				-	
-	2.2				2.2				-	
-	2.3				2.3				-	
-	2.4				2.4				-	
-	2.5				2.5				-	
-	2.6				2.6				-	
-	2.7				2.7				-	
-	2.8				2.8				-	
-	2.9				2.9				-	
-	**3**				3				-	
-	3.1				3.1				-	
-	3.2				3.2				-	
-	3.3				3.3				-	
-	3.4				3.4				-	
-	3.5				3.5				-	
-	3.6				3.6				-	
-	3.7				3.7				-	
-	3.8				3.8				-	
-	3.9				3.9				-	
-	**4**				4				-	
-	4.1				4.1				-	
-	4.2				4.2				-	
-	4.3				4.3				-	
-	4.4				4.4				-	
-	4.5				4.5				-	
-	4.6				4.6				-	
-	4.7				4.7				-	
-	4.8				4.8				-	
-	4.9				4.9				-	
-	**5**				5				-	

WEATHERING	NOTES			CONSISTENCY / DENSITY INDEX	
Fr - fresh	US - undisturbed sample	MOISTURE	STRENGTH	fb - friable	vs - very soft
SW - slightly weathered	DS - disturbed sample	D - dry	els - ext low	vl - very loose	s - soft
MW - mod weathered	N - stan. pen. test	M - moist	vls- very low	l - loose	ff - firm
HW - highly weathered	NS - spt + sample	W - wet	ls - low	md - med dense	st - stiff
EW - extremely weathered	NC - cone pntmeter		ms - med	d - dense	vst - very stiff
			hs - high	d - dense	h - hard
			vhs - very high	vd - very dense	
			ehs - ext high		

APPENDIX D:
CHAIN OF CUSTODY
AND LABORATORY RESULTS

EBG Environmental Geoscience, 85 Rose St, PO Box 284, Annandale 2038 Ph: 02 9555 7892 Fax: 02 9555 9296

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

CHAIN OF CUSTODY FORM

Sheet 1 of 2 Job No: 252089

Date Received: 25/9/20
Time Received: 1030
Received By: JM.
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Investigator (name, address, ph & fax nos.) Contact person: MEdwards

Site: The Boathouse. Gov. Phillip Pk, Palm Beach NSW

Laboratory (name, address, ph & fax nos.) Contact person: Envirolab

Courier (name, address, ph & fax nos.) Contact person:

Sample ID	Laboratory ID	Container	Sampling Date	Sampling Time	Sample matrix: WATER	SOIL	SLUDGE	OTHER (SPECIFY)	COMPOSITE	Sample preservation: ICE	HNO3/HCl	UNPRESERVED	OTHER (SPECIFY)	Analysis: Combo 3	Heavy Metals x8	OCP+PCB	VOCs	pH
02853/	BH1/0.25	-1												X				X
02853/	BH1/1.0	-2													X			
02853/	BH2/0.4	-3												X		X		X
02853/	BH2/1.5	-4													X			
02853/	BH3/0.5	-5												X		X		
02853/	BH3/1.5	-6													X		X	X
02853/	BH4/1.0	-7												X				
02853/	BH4/2.5	-8													X		X	
028.53/	BH5/0.5	-9													X			
02853/	BH6/0.3	-10												X				X

Investigator: I attest that the proper field sampling procedures were used during the collection of these samples.

Sampler name: (print & signature) MEdwards (Date) 23/9/20

Relinquished by: (print & signature)	Date	Time	Received by: (print & signature)	Date	Time
	24/9			25/9/20	1030
Relinquished by: (print & signature)	Date	Time	Received by: (print & signature)	Date	Time
Relinquished by: (print & signature)	Date	Time	Received by: (print & signature)	Date	Time

EBG Environmental Geoscience
Edwards Blasche Group Pty Ltd ABN 54 085 829 250
Occupational Hygiene Technical Consultants

ELS #252089.

CHAIN OF CUSTODY FORM

Sheet 2 of 2

Investigator (name, address, ph & fax nos.) Contact person:	Sample matrix						Sample preservation					Analysis							
Site: The Boathouse, Gov. Phillip Pk, Palm Beach, NSW																			
Laboratory (name, address, ph & fax nos.) Contact person: Envirolab																			
Courier (name, address, ph & fax nos.) Contact person:																			

Sample ID	Laboratory ID	Container	Sampling Date	Sampling Time	WATER	SOIL	SLUDGE	OTHER (SPECIFY)	COMPOSITE		ICE	HNO3/HCl	UNPRESERVED	OTHER (SPECIFY)		Combo 3	Heavy Metals x8	Ocp + PCB	VOC's	pH	BTEX+TRH (C6-C9)	% Loss	
02853/BH6/1.0	-11		23/9/20			X											X						
02853/BH7/0.3	-12					X										X							
02853/BH7/1.0	-13					X											X						
02853/RIN	-14				X												X						
02853/TB	-15					X															X		
02853/TS	-16					X																X	
02853/BH1/Dup Intra-17.						X																	

Investigator: I attest that the proper field sampling procedures were used during the collection of these samples.

Sampler name: *(print & signature)* MEdwards **(Date)** 23/9/20

Relinquished by: *(print & signature)*	Date	Time	Received by: *(print & signature)*	Date	Time
	29/9			25/9/20	10:30.
Relinquished by: *(print & signature)*	Date	Time	Received by: *(print & signature)*	Date	Time
Relinquished by: *(print & signature)*	Date	Time	Received by: *(print & signature)*	Date	Time

EBG Environmental Geoscience, 85 Rose St, PO Box 284, Annandale 2038 Ph: 02 9555 7892 Fax: 02 9555 8296

EBG Environmental Geoscience
Edwards Blasche Group Pty Ltd ABN 54 085 829 250
Environmental Geoscience Occupational Hygiene Technical Consultants

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

SAMPLE RECEIPT ADVICE

Client Details

Client	Edwards Blasche Group
Attention	Michael Edwards

Sample Login Details

Your reference	02853, The Boathouse, Gov. Phillip Pk, Palm Beach
Envirolab Reference	252089
Date Sample Received	25/09/2020
Date Instructions Received	25/09/2020
Date Results Expected to be Reported	02/10/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	16 Soil, 1 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	10.2
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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

Analysis Underway, details on the following page:

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

Sample ID	VOCs in soil	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	PCBsin Soil	Acid Extractable metalsin soil	Misc Inorg - Soil	Metals in Water - Dissolved
02853/BH1/0.25		✓	✓	✓			✓	✓	
02853/BH1/1.0							✓		
02853/BH2/0.4		✓	✓	✓	✓	✓	✓	✓	
02853/BH2/1.5							✓		
02853/BH3/0.5		✓	✓	✓	✓	✓	✓		
02853/BH3/1.5	✓						✓	✓	
02853/BH4/1.0		✓	✓	✓			✓		
02853/BH4/2.5	✓						✓		
02853/BH5/0.5							✓		
02853/BH6/0.3		✓	✓	✓			✓	✓	
02853/BH6/1.0							✓		
02853/BH7/0.3		✓	✓	✓			✓		
02853/BH7/1.0							✓		
02853/RIN									✓
02853/TB		✓							
02853/TS		✓							
02853/BH1/DupIntra							✓		

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.

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

CERTIFICATE OF ANALYSIS 252089

Client Details

Client	Edwards Blasche Group
Attention	Michael Edwards
Address	47 QuinalupSt, GWANDALAN, NSW, 2259

Sample Details

Your Reference	**02853, The Boathouse, Gov. Phillip Pk, Palm Beach**
Number of Samples	16 Soil, 1 Water
Date samples received	25/09/2020
Date completed instructions received	25/09/2020

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	02/10/2020
Date of Issue	01/10/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By
Diego Bigolin, Team Leader, Inorganics
Hannah Nguyen, Senior Chemist
Manju Dewendrage, Chemist
Steven Luong, Organics Supervisor

Authorised By

Nancy Zhang, Laboratory Manager

VOCs in soil			
Our Reference		252089-6	252089-8
Your Reference	UNITS	02853/BH3/1.5	02853/BH4/2.5
Type of sample		Soil	Soil
Date extracted	-	28/09/2020	28/09/2020
Date analysed	-	28/09/2020	28/09/2020
Dichlorodifluoromethane	mg/kg	<1	<1
Chloromethane	mg/kg	<1	<1
Vinyl Chloride	mg/kg	<1	<1
Bromomethane	mg/kg	<1	<1
Chloroethane	mg/kg	<1	<1
Trichlorofluoromethane	mg/kg	<1	<1
1,1-Dichloroethene	mg/kg	<1	<1
trans-1,2-dichloroethene	mg/kg	<1	<1
1,1-dichloroethane	mg/kg	<1	<1
cis-1,2-dichloroethene	mg/kg	<1	<1
bromochloromethane	mg/kg	<1	<1
chloroform	mg/kg	<1	<1
2,2-dichloropropane	mg/kg	<1	<1
1,2-dichloroethane	mg/kg	<1	<1
1,1,1-trichloroethane	mg/kg	<1	<1
1,1-dichloropropene	mg/kg	<1	<1
Cyclohexane	mg/kg	<1	<1
carbon tetrachloride	mg/kg	<1	<1
Benzene	mg/kg	<0.2	<0.2
dibromomethane	mg/kg	<1	<1
1,2-dichloropropane	mg/kg	<1	<1
trichloroethene	mg/kg	<1	<1
bromodichloromethane	mg/kg	<1	<1
trans-1,3-dichloropropene	mg/kg	<1	<1
cis-1,3-dichloropropene	mg/kg	<1	<1
1,1,2-trichloroethane	mg/kg	<1	<1
Toluene	mg/kg	<0.5	<0.5
1,3-dichloropropane	mg/kg	<1	<1
dibromochloromethane	mg/kg	<1	<1
1,2-dibromoethane	mg/kg	<1	<1
tetrachloroethene	mg/kg	<1	<1
1,1,1,2-tetrachloroethane	mg/kg	<1	<1
chlorobenzene	mg/kg	<1	<1
Ethylbenzene	mg/kg	<1	<1
bromoform	mg/kg	<1	<1

VOCs in soil			
Our Reference		252089-6	252089-8
Your Reference	UNITS	02853/BH3/1.5	02853/BH4/2.5
Type of sample		Soil	Soil
m+p-xylene	mg/kg	<2	<2
styrene	mg/kg	<1	<1
1,1,2,2-tetrachloroethane	mg/kg	<1	<1
o-Xylene	mg/kg	<1	<1
1,2,3-trichloropropane	mg/kg	<1	<1
isopropylbenzene	mg/kg	<1	<1
bromobenzene	mg/kg	<1	<1
n-propyl benzene	mg/kg	<1	<1
2-chlorotoluene	mg/kg	<1	<1
4-chlorotoluene	mg/kg	<1	<1
1,3,5-trimethyl benzene	mg/kg	<1	<1
tert-butyl benzene	mg/kg	<1	<1
1,2,4-trimethyl benzene	mg/kg	<1	<1
1,3-dichlorobenzene	mg/kg	<1	<1
sec-butyl benzene	mg/kg	<1	<1
1,4-dichlorobenzene	mg/kg	<1	<1
4-isopropyl toluene	mg/kg	<1	<1
1,2-dichlorobenzene	mg/kg	<1	<1
n-butyl benzene	mg/kg	<1	<1
1,2-dibromo-3-chloropropane	mg/kg	<1	<1
1,2,4-trichlorobenzene	mg/kg	<1	<1
hexachlorobutadiene	mg/kg	<1	<1
1,2,3-trichlorobenzene	mg/kg	<1	<1
Surrogate Dibromofluorometha	%	108	108
Surrogate aaa-Trifluorotoluene	%	79	72
Surrogate Toluene-d_8	%	98	99
Surrogate 4-Bromofluorobenzene	%	102	101

vTRH(C6-C10)/BTEXN in Soil						
Our Reference		252089-1	252089-3	252089-5	252089-7	252089-10
Your Reference	UNITS	02853/BH1/0.25	02853/BH2/0.4	02853/BH3/0.5	02853/BH4/1.0	02853/BH6/0.3
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Date analysed	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020	28/09/2020
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	%	80	78	85	80	78

vTRH(C6-C10)/BTEXN in Soil				
Our Reference		252089-12	252089-15	252089-16
Your Reference	UNITS	02853/BH7/0.3	02853/TB	02853/TS
Type of sample		Soil	Soil	Soil
Date extracted	-	28/09/2020	28/09/2020	28/09/2020
Date analysed	-	28/09/2020	28/09/2020	29/09/2020
TRH C_6 - C_9	mg/kg	<25	<25	[NA]
TRH C_6 - C_{10}	mg/kg	<25	<25	[NA]
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25	[NA]
Benzene	mg/kg	<0.2	<0.2	87%
Toluene	mg/kg	<0.5	<0.5	92%
Ethylbenzene	mg/kg	<1	<1	103%
m+p-xylene	mg/kg	<2	<2	101%
o-Xylene	mg/kg	<1	<1	118%
naphthalene	mg/kg	<1	<1	[NA]
Total +ve Xylenes	mg/kg	<3	<3	[NA]
Surrogate aaa-Trifluorotoluene	%	93	95	133

svTRH (C10-C40) in Soil						
Our Reference		252089-1	252089-3	252089-5	252089-7	252089-10
Your Reference	UNITS	02853/BH1/0.25	02853/BH2/0.4	02853/BH3/0.5	02853/BH4/1.0	02853/BH6/0.3
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Date analysed	-	28/09/2020	29/09/2020	29/09/2020	29/09/2020	29/09/2020
TRH C_{10} - C_{14}	mg/kg	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	mg/kg	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{10} -C_{16}	mg/kg	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH >C_{16} -C_{34}	mg/kg	<100	<100	<100	<100	<100
TRH >C_{34} -C_{40}	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	89	93	93	98	91

svTRH (C10-C40) in Soil		
Our Reference		252089-12
Your Reference	UNITS	02853/BH7/0.3
Type of sample		Soil
Date extracted	-	28/09/2020
Date analysed	-	29/09/2020
TRH C_{10} - C_{14}	mg/kg	<50
TRH C_{15} - C_{28}	mg/kg	<100
TRH C_{29} - C_{36}	mg/kg	<100
TRH >C_{10} -C_{16}	mg/kg	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	mg/kg	<50
TRH >C_{16} -C_{34}	mg/kg	<100
TRH >C_{34} -C_{40}	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	91

PAHs in Soil						
Our Reference		252089-1	252089-3	252089-5	252089-7	252089-10
Your Reference	UNITS	02853/BH1/0.25	02853/BH2/0.4	02853/BH3/0.5	02853/BH4/1.0	02853/BH6/0.3
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Date analysed	-	29/09/2020	29/09/2020	29/09/2020	29/09/2020	29/09/2020
Naphthalene	mg/kg	0.2	<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	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.2
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	0.2
Benzo(a)pyrene	mg/kg	0.05	<0.05	<0.05	<0.05	0.1
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<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	<0.1	0.1
Total +ve PAH's	mg/kg	0.3	<0.05	<0.05	<0.05	1.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	86	95	94	96	98

PAHs in Soil		
Our Reference		252089-12
Your Reference	UNITS	02853/BH7/0.3
Type of sample		Soil
Date extracted	-	28/09/2020
Date analysed	-	29/09/2020
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	94

Organochlorine Pesticides in soil			
Our Reference		252089-3	252089-5
Your Reference	UNITS	02853/BH2/0.4	02853/BH3/0.5
Type of sample		Soil	Soil
Date extracted	-	28/09/2020	28/09/2020
Date analysed	-	29/09/2020	29/09/2020
alpha-BHC	mg/kg	<0.1	<0.1
HCB	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate TCMX	%	95	92

PCBs in Soil			
Our Reference		252089-3	252089-5
Your Reference	UNITS	02853/BH2/0.4	02853/BH3/0.5
Type of sample		Soil	Soil
Date extracted	-	28/09/2020	28/09/2020
Date analysed	-	29/09/2020	29/09/2020
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate TCMX	%	95	92

Acid Extractable metals in soil						
Our Reference		252089-1	252089-2	252089-3	252089-4	252089-5
Your Reference	UNITS	02853/BH1/0.25	02853/BH1/1.0	02853/BH2/0.4	02853/BH2/1.5	02853/BH3/0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Date analysed	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Arsenic	mg/kg	6	4	<4	4	7
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	7	3	4	3	6
Copper	mg/kg	16	2	1	<1	6
Lead	mg/kg	45	2	3	14	25
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Nickel	mg/kg	3	<1	1	1	3
Zinc	mg/kg	77	4	5	3	21

Acid Extractable metals in soil						
Our Reference		252089-6	252089-7	252089-8	252089-9	252089-10
Your Reference	UNITS	02853/BH3/1.5	02853/BH4/1.0	02853/BH4/2.5	02853/BH5/0.5	02853/BH6/0.3
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Date analysed	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Arsenic	mg/kg	5	<4	6	22	7
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	3	10	5	23	8
Copper	mg/kg	<1	7	2	59	22
Lead	mg/kg	2	18	2	17	64
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	0.4
Nickel	mg/kg	<1	4	2	6	6
Zinc	mg/kg	4	19	5	380	55

Acid Extractable metals in soil					
Our Reference		252089-11	252089-12	252089-13	252089-17
Your Reference	UNITS	02853/BH6/1.0	02853/BH7/0.3	02853/BH7/1.0	02853/BH1/DupIntra
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Date analysed	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Arsenic	mg/kg	8	<4	6	6
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	3	12	3	7
Copper	mg/kg	2	8	<1	20
Lead	mg/kg	3	15	1	50
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	<1	8	<1	3
Zinc	mg/kg	4	14	2	86

Moisture						
Our Reference		252089-1	252089-2	252089-3	252089-4	252089-5
Your Reference	UNITS	02853/BH1/0.25	02853/BH1/1.0	02853/BH2/0.4	02853/BH2/1.5	02853/BH3/0.5
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Date analysed	-	29/09/2020	29/09/2020	29/09/2020	29/09/2020	29/09/2020
Moisture	%	11	6.4	6.9	9.6	5.8

Moisture						
Our Reference		252089-6	252089-7	252089-8	252089-9	252089-10
Your Reference	UNITS	02853/BH3/1.5	02853/BH4/1.0	02853/BH4/2.5	02853/BH5/0.5	02853/BH6/0.3
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Date analysed	-	29/09/2020	29/09/2020	29/09/2020	29/09/2020	29/09/2020
Moisture	%	6.5	11	27	22	3.8

Moisture					
Our Reference		252089-11	252089-12	252089-13	252089-17
Your Reference	UNITS	02853/BH6/1.0	02853/BH7/0.3	02853/BH7/1.0	02853/BH1/DupIntra
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	28/09/2020	28/09/2020	28/09/2020	28/09/2020
Date analysed	-	29/09/2020	29/09/2020	29/09/2020	29/09/2020
Moisture	%	5.7	6.6	5.4	6.3

Misc Inorg - Soil					
Our Reference		252089-1	252089-3	252089-6	252089-10
Your Reference	UNITS	02853/BH1/0.25	02853/BH2/0.4	02853/BH3/1.5	02853/BH6/0.3
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	29/09/2020	29/09/2020	29/09/2020	29/09/2020
Date analysed	-	29/09/2020	29/09/2020	29/09/2020	29/09/2020
pH 1:5 soil:water	pH Units	8.4	8.9	9.0	9.1

Metals in Water - Dissolved		
Our Reference	UNITS	252089-14
Your Reference		02853/RIN
Type of sample		Water
Date digested	-	28/09/2020
Date analysed	-	28/09/2020
Arsenic - Dissolved	mg/L	<0.05
Cadmium - Dissolved	mg/L	<0.01
Chromium - Dissolved	mg/L	<0.01
Copper - Dissolved	mg/L	<0.01
Lead - Dissolved	mg/L	<0.03
Mercury - Dissolved	mg/L	<0.0005
Nickel - Dissolved	mg/L	<0.02
Zinc - Dissolved	mg/L	<0.02

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
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-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-021	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-MS/GC-MSMS. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.

Method ID	Methodology Summary
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: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	252089-8
Date extracted	-			28/09/2020	6	28/09/2020	28/09/2020		28/09/2020	28/09/2020
Date analysed	-			28/09/2020	6	28/09/2020	28/09/2020		28/09/2020	28/09/2020
Dichlorodifluoromethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
Chloromethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
Vinyl Chloride	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
Bromomethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
Chloroethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
Trichlorofluoromethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,1-Dichloroethene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
trans-1,2-dichloroethene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,1-dichloroethane	mg/kg	1	Org-023	<1	6	<1	<1	0	103	66
cis-1,2-dichloroethene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
bromochloromethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
chloroform	mg/kg	1	Org-023	<1	6	<1	<1	0	113	73
2,2-dichloropropane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,2-dichloroethane	mg/kg	1	Org-023	<1	6	<1	<1	0	99	81
1,1,1-trichloroethane	mg/kg	1	Org-023	<1	6	<1	<1	0	104	88
1,1-dichloropropene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
Cyclohexane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
carbon tetrachloride	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
Benzene	mg/kg	0.2	Org-023	<0.2	6	<0.2	<0.2	0	[NT]	[NT]
dibromomethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,2-dichloropropane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
trichloroethene	mg/kg	1	Org-023	<1	6	<1	<1	0	91	65
bromodichloromethane	mg/kg	1	Org-023	<1	6	<1	<1	0	122	88
trans-1,3-dichloropropene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
cis-1,3-dichloropropene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,1,2-trichloroethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
Toluene	mg/kg	0.5	Org-023	<0.5	6	<0.5	<0.5	0	[NT]	[NT]
1,3-dichloropropane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
dibromochloromethane	mg/kg	1	Org-023	<1	6	<1	<1	0	121	75
1,2-dibromoethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
tetrachloroethene	mg/kg	1	Org-023	<1	6	<1	<1	0	118	72
1,1,1,2-tetrachloroethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
chlorobenzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
Ethylbenzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
bromoform	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
m+p-xylene	mg/kg	2	Org-023	<2	6	<2	<2	0	[NT]	[NT]
styrene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,1,2,2-tetrachloroethane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]

QUALITY CONTROL: VOCs in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	252089-8
o-Xylene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,2,3-trichloropropane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
isopropylbenzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
bromobenzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
n-propyl benzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
2-chlorotoluene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
4-chlorotoluene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,3,5-trimethyl benzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
tert-butyl benzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,2,4-trimethyl benzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,3-dichlorobenzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
sec-butyl benzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,4-dichlorobenzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
4-isopropyl toluene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,2-dichlorobenzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
n-butyl benzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,2-dibromo-3-chloropropane	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,2,4-trichlorobenzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
hexachlorobutadiene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
1,2,3-trichlorobenzene	mg/kg	1	Org-023	<1	6	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluorometha	%		Org-023	97	6	108	103	5	108	110
Surrogate aaa-Trifluorotoluene	%		Org-023	105	6	79	99	22	123	80
Surrogate Toluene-d_8	%		Org-023	101	6	98	98	0	104	101
Surrogate 4-Bromofluorobenzene	%		Org-023	101	6	102	104	2	108	102

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	252089-5
Date extracted	-			28/09/2020	3	28/09/2020	28/09/2020		28/09/2020	28/09/2020
Date analysed	-			28/09/2020	3	28/09/2020	28/09/2020		28/09/2020	28/09/2020
TRH C_6 - C_9	mg/kg	25	Org-023	<25	3	<25	<25	0	81	101
TRH C_6 - C_{10}	mg/kg	25	Org-023	<25	3	<25	<25	0	81	101
Benzene	mg/kg	0.2	Org-023	<0.2	3	<0.2	<0.2	0	73	105
Toluene	mg/kg	0.5	Org-023	<0.5	3	<0.5	<0.5	0	77	116
Ethylbenzene	mg/kg	1	Org-023	<1	3	<1	<1	0	83	106
m+p-xylene	mg/kg	2	Org-023	<2	3	<2	<2	0	85	111
o-Xylene	mg/kg	1	Org-023	<1	3	<1	<1	0	88	110
naphthalene	mg/kg	1	Org-023	<1	3	<1	<1	0	[NT]	[NT]
Surrogate aaa-Trifluorotoluene	%		Org-023	97	3	78	72	8	80	116

QUALITY CONTROL: svTRH (C10-C40) in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	252089-5
Date extracted	-			28/09/2020	3	28/09/2020	28/09/2020		28/09/2020	28/09/2020
Date analysed	-			28/09/2020	3	29/09/2020	29/09/2020		28/09/2020	29/09/2020
TRH C_{10} - C_{14}	mg/kg	50	Org-020	<50	3	<50	<50	0	108	107
TRH C_{15} - C_{28}	mg/kg	100	Org-020	<100	3	<100	<100	0	81	79
TRH C_{29} - C_{36}	mg/kg	100	Org-020	<100	3	<100	<100	0	92	97
TRH >C_{10} -C_{16}	mg/kg	50	Org-020	<50	3	<50	<50	0	108	107
TRH >C_{16} -C_{34}	mg/kg	100	Org-020	<100	3	<100	<100	0	81	79
TRH >C_{34} -C_{40}	mg/kg	100	Org-020	<100	3	<100	<100	0	92	97
Surrogate o-Terphenyl	%		Org-020	92	3	93	92	1	73	73

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	252089-5
Date extracted	-			28/09/2020	3	28/09/2020	28/09/2020		28/09/2020	28/09/2020
Date analysed	-			29/09/2020	3	29/09/2020	29/09/2020		29/09/2020	29/09/2020
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	94	88
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	89	100
Fluorene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	98	90
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	89	90
Anthracene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	96	94
Pyrene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	93	92
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	102	91
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	3	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	3	<0.05	<0.05	0	100	87
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	102	3	95	99	4	89	95

QUALITY CONTROL: Organochlorine Pesticides in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	252089-5
Date extracted	-			28/09/2020	3	28/09/2020	28/09/2020		28/09/2020	28/09/2020
Date analysed	-			29/09/2020	3	29/09/2020	29/09/2020		29/09/2020	29/09/2020
alpha-BHC	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	83	71
HCB	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
beta-BHC	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	83	75
gamma-BHC	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Heptachlor	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	80	90
delta-BHC	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aldrin	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	92	78
Heptachlor Epoxide	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	80	82
gamma-Chlordane	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
alpha-chlordane	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Endosulfan I	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
pp-DDE	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	82	84
Dieldrin	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	113	103
Endrin	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	93	102
Endosulfan II	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
pp-DDD	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	74	76
Endrin Aldehyde	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
pp-DDT	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Endosulfan Sulphate	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	87	73
Methoxychlor	mg/kg	0.1	Org-022/025	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	96	3	95	93	2	95	90

QUALITY CONTROL: PCBs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	252089-5
Date extracted	-			28/09/2020	3	28/09/2020	28/09/2020		28/09/2020	28/09/2020
Date analysed	-			29/09/2020	3	29/09/2020	29/09/2020		29/09/2020	29/09/2020
Aroclor 1016	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1221	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1232	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1242	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1248	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Aroclor 1254	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	80	80
Aroclor 1260	mg/kg	0.1	Org-021	<0.1	3	<0.1	<0.1	0	[NT]	[NT]
Surrogate TCMX	%		Org-021	96	3	95	93	2	95	90

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-6	252089-5
Date prepared	-			28/09/2020	3	28/09/2020	28/09/2020		28/09/2020	28/09/2020
Date analysed	-			28/09/2020	3	28/09/2020	28/09/2020		28/09/2020	28/09/2020
Arsenic	mg/kg	4	Metals-020	<4	3	<4	<4	0	95	97
Cadmium	mg/kg	0.4	Metals-020	<0.4	3	<0.4	<0.4	0	93	82
Chromium	mg/kg	1	Metals-020	<1	3	4	6	40	95	90
Copper	mg/kg	1	Metals-020	<1	3	1	2	67	99	109
Lead	mg/kg	1	Metals-020	<1	3	3	4	29	103	93
Mercury	mg/kg	0.1	Metals-021	<0.1	3	<0.1	<0.1	0	92	105
Nickel	mg/kg	1	Metals-020	<1	3	1	3	100	99	89
Zinc	mg/kg	1	Metals-020	<1	3	5	7	33	93	73

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	17	28/09/2020	28/09/2020		[NT]	[NT]
Date analysed	-			[NT]	17	28/09/2020	28/09/2020		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	17	6	6	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	17	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	17	7	7	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	17	20	17	16	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	17	50	49	2	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	17	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	17	3	3	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	17	86	82	5	[NT]	[NT]

QUALITY CONTROL: Misc Inorg - Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			29/09/2020	6	29/09/2020	29/09/2020		29/09/2020	[NT]
Date analysed	-			29/09/2020	6	29/09/2020	29/09/2020		29/09/2020	[NT]
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	6	9.0	9.0	0	99	[NT]

QUALITY CONTROL: Metals in Water - Dissolved					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date digested	-			28/09/2020	[NT]	[NT]	[NT]	[NT]	28/09/2020	[NT]
Date analysed	-			28/09/2020	[NT]	[NT]	[NT]	[NT]	28/09/2020	[NT]
Arsenic - Dissolved	mg/L	0.05	Metals-020	<0.05	[NT]	[NT]	[NT]	[NT]	103	[NT]
Cadmium - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	96	[NT]
Chromium - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	99	[NT]
Copper - Dissolved	mg/L	0.01	Metals-020	<0.01	[NT]	[NT]	[NT]	[NT]	101	[NT]
Lead - Dissolved	mg/L	0.03	Metals-020	<0.03	[NT]	[NT]	[NT]	[NT]	106	[NT]
Mercury - Dissolved	mg/L	0.0005	Metals-021	<0.0005	[NT]	[NT]	[NT]	[NT]	109	[NT]
Nickel - Dissolved	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	103	[NT]
Zinc - Dissolved	mg/L	0.02	Metals-020	<0.02	[NT]	[NT]	[NT]	[NT]	99	[NT]

Result Definitions

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

Quality Control Definitions

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

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

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Dissolved Metals: no filtered, preserved sample was received for sample 252089-14, therefore the unpreserved sample was filtered through 0.45µm filter at the lab. Note: there is a possibility some elements may be underestimated.

ELS: 252089.

EBG Environmental Geoscience, 85 Rose St, PO Box 284, Annandale 2038 Ph: 02 9555 7892 Fax: 02 9555 8296

EBG Environmental Geoscience
Edwards Blasche Group Pty Ltd ABN 54 085 829 250
Environmental Geoscience Occupational Hygiene Technical Consultants

CHAIN OF CUSTODY FORM

Sheet 1 of 1

Investigator (name, address, ph & fax nos.) M Edwards
Contact person:

Site The Boathouse Gov. Phillip Pk; Palm Beach NSW

Laboratory (name, address, ph & fax nos.) Inter lab Sample.
Contact person:

Courier (name, address, ph & fax nos.)
Contact person:

Sample ID	Laboratory ID	Container	Sampling Date	Sampling Time	WATER	SOIL	SLUDGE	OTHER (SPECIFY)	COMPOSITE	ICE	HNO3/HCl	UNPRESERVED	OTHER (SPECIFY)	Metals x 8
02853/BH2/D/P Inter/			23/9/20			X				X				X

ENVIROLAB
Envirolab Services
25 Research Drive
Croydon South VIC 3136
Ph: (03) 9763 2500
~~Job No:~~ 22598
Date Received: 29/9/20
~~Time Received:~~ 3pm
Received By: KS
Temp: Cool/Ambient 14.9°C
Cooling: ice/icepack
Security: Intact/Broken/None

Investigator: I attest that the proper field sampling procedures were used during the collection of these samples.

Sampler name: (print & signature) M Edwards (Date) ~~23~~ 28/9/20

Relinquished by: (print & signature)	Date	Time	Received by: (print & signature)	Date	Time
[signature]	24 ~~23~~/9		[signature]	23 25/9/20	1030
Phay	28/9	1350	KS of ELS (Melb)	29/9/20	3pm

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Edwards Blasche Group ACN
Attention	Michael Edwards

Sample Login Details

Your reference	The Boathouse Gov. Phillip Pk, Palm Beach NSW
Envirolab Reference	22698
Date Sample Received	29/09/2020
Date Instructions Received	29/09/2020
Date Results Expected to be Reported	05/10/2020

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	14.9
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

Sample ID	Acid Extractable metalsin soil
02853/BH2/DUP Inter	✓

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.

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 22698

Client Details

Client	Edwards Blasche Group ACN
Attention	Michael Edwards
Address	PO Box 284, 243 Annandale,, Annandale, NSW, 2038

Sample Details

Your Reference	**The Boathouse Gov. Phillip Pk, Palm Beach NSW**
Number of Samples	1 Soil
Date samples received	29/09/2020
Date completed instructions received	29/09/2020

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.

Report Details

Date results requested by	05/10/2020
Date of Issue	02/10/2020

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

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

Results Approved By
Chris De Luca, Operations Manager

Authorised By

Pamela Adams, Laboratory Manager

Acid Extractable metals in soil		
Our Reference		22698-1
Your Reference	UNITS	02853/BH2/DUP Inter
Date Sampled		23/09/2020
Type of sample		Soil
Date digested	-	01/10/2020
Date analysed	-	02/10/2020
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	4
Copper	mg/kg	2
Lead	mg/kg	4
Mercury	mg/kg	<0.1
Nickel	mg/kg	1
Zinc	mg/kg	6

Moisture		
Our Reference		22698-1
Your Reference	UNITS	02853/BH2/DUP Inter
Date Sampled		23/09/2020
Type of sample		Soil
Date prepared	-	1/10/2020
Date analysed	-	2/10/2020
Moisture	%	6.8

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105 deg C for a minimum of 12 hours.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	22698-1
Date digested	-			01/10/2020	[NT]	[NT]	[NT]	[NT]	01/10/2020	01/10/2020
Date analysed	-			02/10/2020	[NT]	[NT]	[NT]	[NT]	02/10/2020	02/10/2020
Arsenic	mg/kg	4	Metals-020 ICP-AES	<4	[NT]	[NT]	[NT]	[NT]	99	104
Cadmium	mg/kg	0.4	Metals-020 ICP-AES	<0.4	[NT]	[NT]	[NT]	[NT]	99	90
Chromium	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	98	94
Copper	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	100	102
Lead	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	98	96
Mercury	mg/kg	0.1	Metals-021 CV-AAS	<0.1	[NT]	[NT]	[NT]	[NT]	116	120
Nickel	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	97	89
Zinc	mg/kg	1	Metals-020 ICP-AES	<1	[NT]	[NT]	[NT]	[NT]	97	91

Result Definitions

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

Quality Control Definitions

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

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

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.