STATE TRANSIT AUTHORITY

JULY 2020

GROUNDWATER MONITORING EVENT - MAY 2020

STA MONA VALE BUS DEPOT, 58 DARLEY STREET, MONA VALE, NSW

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Groundwater Monitoring Event - May 2020
STA Mona Vale Bus Depot, 58 Darley Street, Mona Vale, NSW

State Transit Authority

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ABBREVIATIONS

ANZECC	Australian and New Zealand Environment and Conservation Council
BTEX	Benzene, toluene, ethyl benzene and xylene
COC	Chain of custody
CSM	Conceptual Site Model
DO	Dissolved oxygen
DQI	Data quality indicators
DQO	Data quality objectives
EC	Electrical conductivity
GME	Groundwater Monitoring Event
H_2S	Hydrogen Sulfide
HSL	Health Screening Level
LOR	Limit of Reporting
mAHD	Metres above Australian Height Datum
mBGL	Metres below ground level
mBTOC	Metres below top of casing
MNA	Monitored natural attenuation
MW	Monitoring well
NATA	National Association of Testing Authorities
ND	Not Detected
NEPM	National Environment Protection Measure
NSW EPA	New South Wales Environment Protection Authority
ORP	Oxidation/reduction potential
PAHs	Polycyclic aromatic hydrocarbons
pH	Unit of measurement for acidity and alkalinity
PSH	Phase separated hydrocarbons
QA/QC	Quality assurance / quality control
RPD	Relative Percentage Difference
STA	State Transit Authority
SWL	Standing Water Level
ToC	Top of casing (of monitoring well)
TOC	Total organic carbon
TRH	Total recoverable hydrocarbons (C_{10} to C_{40})
UST	Underground storage tank
vTRH	Volatile total recoverable hydrocarbons (C_6 to C_{10})
WD	Well Depth
WHS	Workplace Health and Safety
WSP	WSP Australia Pty Ltd

1 INTRODUCTION

1.1 BACKGROUND

WSP Australia Pty Ltd (WSP) was commissioned by State Transit Authority (STA) to undertake ongoing groundwater monitoring at the bus depot at 58 Darley Street, Mona Vale, NSW (the site). The site is owned by STA and is currently used as an operational bus depot. The site location and layout are presented on Figures 1 and 2, Appendix A.

The NSW EPA declared the site as significantly contaminated land on 11 November 2014 (declaration number 20141101) and a voluntary management proposal (VMP) and a VMP communications plan were prepared by STA and submitted to the NSW EPA in January 2015. Since that time the site has been managed under the VMP, which under various revisions has consistently had the objective of assessment of the extent of impacts, assessment of the risk of the contamination and removal of the hydrocarbon impact to the extent practicable.

WSP has previously prepared a remediation action plan (RAP) relating to the site (WSP, 2020). The main contamination concern is the presence of a phase separated hydrocarbon (PSH) and the associated dissolved phase hydrocarbon plume that is present in groundwater on the site's western boundary. The PSH and dissolved phase plume extends beyond the site's boundary, beneath neighbouring sites and Taronga Place to the west. The most recent remedial strategy (WSP, 2020) includes a more aggressive fluid pump and treat system (rather that a program of active skimming alone) both onsite and offsite, along with a program of ongoing groundwater monitoring events (GMEs) to assess the plume dynamics and the natural attenuation conditions.

Routine groundwater monitoring has been undertaken on and in the vicinity of the site since 2014. This report represents the results of the routine groundwater monitoring event completed in May 2020 (note the samples occurred on 30 April and 1 May but for simplicity we have referred to the event as the "May 2020 GME").

1.2 OBJECTIVES

The current agreed voluntary management proposal (VMP, approval number 20191731) includes requirements for STA to provide ongoing data on the groundwater quality beneath the site and surrounds through a program of 6 monthly groundwater monitoring events (GMEs).

The key objectives of this GME are to:

- Conduct groundwater gauging of all available groundwater wells to monitor the groundwater flow directions and to estimate extent and apparent thickness of phase separated hydrocarbons (PSH);
- Obtain ongoing data on the groundwater and surface water quality and monitor the influence of natural attenuation processes on the groundwater plume contaminants;
- Provide recommendations to manage groundwater conditions (if required).

2 SCOPE OF WORKS

To meet the project objectives, WSP carried out the following scope of work:

- A Health, Environment and Safety Plan (HESP) was prepared which included Safe Work Method Statement for all tasks;
- 23 wells on Site were gauged during the May 2020 event using an interface probe which can detect the presence of PSH and determine the standing water level (SWL). Where PSH was detected the observed thickness was recorded and the presence was confirmed using dedicated disposable bailers;
- The May 2020 groundwater sampling program focused on the following wells:
  - Offsite Wells: MW08, MW12, MW15, MW16, MW17, MW22, MW26, MW32, MW33, MW35; and
  - Onsite Wells: MW02, MW07, MW28, MW29, MW30.
- Sampling was conducted using a peristaltic pump (low-flow technique) where possible and HydraSleeve samplers in high traffic areas (MW22).
- At each location the fieldwork included:
  - Measurement of groundwater field parameters including pH, dissolved oxygen (DO), electrical conductivity (EC), redox conditions (ORP) and temperature prior to the collection of groundwater samples from the above locations.
  - Comments on odour, sheen presence/absence, colour and flow characteristics at each sampling location.
  - Collection of samples in laboratory prepared sampling bottles, which were then stored on ice and delivered to the laboratory for analysis.
- Chemical analysis included:
  - Primary contaminants of concern (TRH and BTEXN); and
  - Monitored natural attenuation parameters including ionic balance (pH, TDS, Na^{+}, K^{+}, Ca^{2+}, Mg^{2+}, NH_4^{+}, Cl^{-}, SO_4^{2-}, HCO_3^{-}, NO_3^{-}, PO_4^{3-} and F^{-}), dissolved iron (Fe^{2+}), manganese (Mn), Arsenic (As), methane, and biochemical oxygen demand (BOD).
- Analysis of groundwater samples was conducted at a NATA certified laboratory (Envirolab);
- Collection of Quality Assurance/Quality Control (QA/QC) groundwater samples included an intra-laboratory and inter-laboratory duplicates and one trip blank.
- Once results were received, they were compared with the adopted Site criteria; and
- This report has been prepared with reference to the NSW EPA, 2011 *Guidelines for Consultants Reporting on Contaminated Sites* and NEPC, 2013 *National Environment Protection (Assessment of Site Contamination) Measure, 1999* to detail the findings of the groundwater monitoring.

3 DATA QUALITY OBJECTIVES

Development of Data Quality Objectives (DQOs) is a systematic process used to define the type, quantity and quality of data supporting decisions which relate to the environmental condition of a site. The USEPA DQO process has been adopted for this project. The DQOs involved following a series of seven steps. Table 3.1 outlines the seven steps and comments on how the objective will be addressed.

Data quality indicators (DQIs) set qualitative and quantitative compliance measures to ensure the data is reliable. DQIs for the project are provided in Table 3.2.

Table 3.1 Data quality objectives

STEP	OBJECTIVE	COMMENTS
1	State the problem	The problem under consideration is that the site and surrounds contain PSH and TRH in groundwater. Though the concentrations in the dissolved plume surrounding the PSH do not exceed available health or ecological criteria, the extent of the plume, and the thickness and extent of the PSH should continue to be monitored to assess the efficacy of the current skimming (and future total fluids removal) system and whether conditions on the site and surrounds are improving with time.
2	Identify the decision	Is the condition of the site and surrounds improving with time and with implementation of the remediation system? Do groundwater contaminant concentrations exceed risk-based assessment criteria for off-site residential receptors? Are contaminants migrating to surface water receptors?
3	Identify inputs to the decision	The following inputs were considered: — gauging results of PSH thickness and interpreted groundwater contours. — current and historical concentrations of contaminants detected in groundwater and surface water. — relevant groundwater assessment criteria.
4	Defines the study boundary	The study boundaries are the site boundaries and the surrounds to the west of the site that are defined by the available well network.
5	Develop a decision rule	Based on the available site assessment information, elements of the decision rule should be related to the remediation objectives and include: – has the program adequately delineated the extent of groundwater contamination? – has the program adequately assessed the risk posed by the contamination? and – has the program removed PSH from the groundwater to the extent practicable?
6	Specify acceptable limits on decision errors	The quality control assurance plan and compliance with data quality indicators is outlined in Section 10 for groundwater data.
7	Optimise the design for obtaining data	The well network and sampling plan have been determined to be appropriate for the purposes of the assessment and is routinely evaluated through review of the monitoring results.

Table 3.2: Data Quality Indicators

Data quality indicator	Frequency	Criteria
Precision		
Intra-laboratory field duplicates	1/20 samples	<30% RPD[1]
Inter-laboratory field duplicates	1/20 samples	
Laboratory internal duplicates	1/20 samples	<30% RPD
Laboratory method blanks	1/20 samples	< LOR
Trip Spike	Minimum 1 per media	70% to 130%
Trip Blank	Minimum 1 per media	< LOR
Accuracy		
Matrix spikes	1/20 samples	70% to 130%
Rinsate blanks	1 per day per equipment	<LOR
Laboratory blanks	1 per sampling event	<LOR
Representativeness		
Sampling handling storage and transport appropriate for media and analytes	Each batch	Review
Samples analysed within holding times	All Samples	14 days – organics
Comparability		
Standard operating procedures used for sample collection and handling (including decontamination)	All Samples	Review
Standard analytical methods used for all analyses	All Samples	Review
Consistent field conditions, sampling staff and laboratory analysis	All Samples	Review
Limits of reporting appropriate and consistent	All Samples	Review
Completeness		
COCs completed and appropriate	All Samples	Review
Appropriate documentation for testing	All Samples	Review

Notes:

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

4 PREVIOUS INVESTIGATIONS

WSP completed a Contaminated Site Assessment (CSA) for the site in 2012, which identified soil and groundwater impacted with concentrations of Total Recoverable Hydrocarbons (TRH) and Polycyclic Aromatic Hydrocarbons (PAH) exceeding the adopted site criteria for commercial/industrial land-use. WSP concluded that the findings were indicative of the presence of phase-separated hydrocarbons (PSH) potentially sourced from a diesel spill sump pit within the site's refuelling area. WSP also recommended that STA prepare and submit a Contaminated Land Notification Form in accordance with NSW EPA, 2009 *Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*. This notification was submitted to the NSW EPA on 7 February 2012.

Based on the findings of the CSA, WSP was then engaged by STA to conduct further on and off-site delineation of soil and groundwater impact at the site (two separate investigations). WSP concluded that hydrocarbon impact was located within the vicinity of the site's refuelling area and extended in a northerly and westerly direction from this location, corresponding with the determined groundwater flow direction. In addition, WSP confirmed that identified impact was restricted to groundwater and sandy soils immediately above the groundwater table (1m – 2mbgl), which indicated that soil impact was likely to be associated with a groundwater plume rather than spot sources of contamination across the Site (WSP, 2012).

A RAP was prepared for the Site by WSP in May 2013, to address on-going liability and risk associated with the identified hazards and to render the site suitable for on-going commercial/industrial use.

Following preparation of the original RAP in 2013, STA engaged Australian Environmental Services (AES) to carry out targeted remedial works recommended in that document including removal of the Site's diesel spill sump pit, removal of the underground petroleum storage system (UPSS) and installation of an active onsite groundwater skimmer system at the site boundary. STA also engaged Environment and Natural Resource Solutions (ENRS) to implement an on-going groundwater monitoring program that included eight rounds of testing.

The NSW EPA declared the site as significantly contaminated land on 11 November 2014 and a Voluntary Management Proposal (VMP) and a VMP Communications Plan were prepared by STA and submitted to the NSW EPA in January 2015. Since that time the site has been managed under the VMP, which under various revisions has consistently had the objective of assessment of the extent of impacts, assessment of the risk of the contamination and removal of the hydrocarbon impact to the extent practicable.

A revision to the first version of the RAP was prepared in 2015 (WSP, 2015), which updated the criteria to align with the NEPC, 2013 *National Environment Protection (Assessment of Site Contamination) Measure* 1999, summarised various remedial works carried out since 2013 and recommended trialling of various groundwater and PSH remedial technologies, along with ongoing monitoring work. Most of those investigation works had by 2018 been carried out, and STA has implemented a more permanent phase-separated hydrocarbon (PSH) skimming system on the Site and surrounds. Therefore, a further RAP revision was developed in July 2018, and revised and re-released in July 2019, December 2019, and May 2020. The latest RAP (WSP, 2020d) provides a more comprehensive summary of remedial works, aligned with the current plans for site remediation and documents results of assessments carried out to date. The RAP reinforces the need for ongoing PSH removal, with a change following consultation with remediation contractors, to a more aggressive fluid pump and treat system (rather than skimming alone), and the need for ongoing monitoring to demonstrate the plume stability and evidence of natural attenuation.

The most recent GME (WSP, 2020c) found PSH in nine offsite wells north-west of the bus refuelling bay (MW10, MW18, MW19, MW20, MW21, MW25, MW31, MW32 and MW33), ranging from 99 mm to 797 mm. PSH was also found in two onsite wells (MW28 and MW30), ranging from 291 mm to 431 mm. It is likely that PSH is also present in the inaccessible skimmer wells (MW05, MW09, MW13, MW14). Overall the PSH thickness measured remained within historical ranges. The dissolved phase hydrocarbon plume surrounding the PSH impacted area appeared relatively stable and, while not delineated in most directions, the concentrations appeared to attenuate significantly with distance from the PSH affected area.

Available wells in the backfilled sands of the stormwater easement were dry indicating that this potential pathway was not complete at the time of the assessment. No hydrocarbons were detected in the surface waters of the drainage line to the north of the plume, including samples from upgradient, at the site boundary and downgradient of the site.

Clear evidence of biodegradation of hydrocarbons occurring in the groundwater, within dissolved hydrocarbon plume was observed. The range of redox conditions suggested a dynamic system, but in places, the redox conditions appear quite reducing and may indicate that the rate of degradation is limited by the availability of electron acceptors.

An arsenic plume is present in the groundwater beneath the site and surrounds. The source of the plume is uncertain, but the distribution and concentrations appear relatively stable.

WSP considered the site is suitable for its continued use as an operational bus depot and surrounding sites are also suitable for ongoing commercial/industrial use. Based on the current site orientation and activities, the risk posed by the identified contamination to human or ecological receptors was considered low.

5 METHODOLOGY

5.1 GROUNDWATER GAUGING

Monitoring wells were gauged with an interface probe to determine the well depth (WD), standing water levels (SWL), identify the potential presence of PSH and determine the direction/gradient of groundwater flow. A total of 24 wells were gauged as part of the May 2020 GME.

Gauging was conducted within the shortest possible timeframe to minimise variation as a result of water table fluctuations. The interface probe was thoroughly decontaminated between each monitoring well with a phosphate-free detergent (Decon 90) and rinsed with potable water to minimise the risk of cross-contamination.

Where PSH was detected with the interface probe, the inferred thickness was recorded, and the presence was confirmed by a bailer. The thickness of PSH is recorded in Table 6.1, and in Table 1, Appendix B. Thicknesses are also presented in Figure 4, Appendix A along with an inferred extent of PSH.

The extrapolated flow direction from the gauging is presented schematically in the groundwater contours provided in Figure 5 of Appendix A. The groundwater flow direction and contours presented in this figure are based upon the overall gauging dataset. Some monitoring points recorded anomalous level readings which may be attributed to variable recharge across the partially sealed surfaces, the effects of localized skimming activities and possible measurement errors or interferences caused by the PSH presence, and potential for leaking services in the area.

5.2 GROUNDWATER SAMPLING AND ANALYSIS

Samples were collected from 16 monitoring wells. Wells which were sampled were purged using the peristaltic pump with new disposable tubing used at each sample location.

Field parameters (pH, dissolved oxygen, reduction/oxidation (redox), electrical conductivity and temperature) were monitored using a water quality meter, calibrated prior to use. The groundwater was visually assessed for turbidity and evidence of contamination, such as odour or visible hydrocarbon sheen. Groundwater samples were collected following stabilisation of the field physicochemical parameters to ensure that the samples were indicative of groundwater flowing through the well screen.

The calibration certificates for the interface probe and groundwater quality meter are provided in Appendix D.

Field observations and measurements are provided in Section 6.3 of this report, and Table 1 of Appendix B. Copies of field sheets with physiochemical groundwater data obtained during sampling are provided in Appendix C.

5.3 SURFACE WATER SAMPLING

Two surface water samples were collected on 01 May 2020. The sampling locations are shown on Figure 3, Appendix A. Samples from S01 and S03 were collected as a grab sample from the flowing water in the drainage line directly into the laboratory provided sample bottles, with the exception of the samples for metals which were field filtered prior to placing into the nitric acid preserved bottle.

The water quality meter was placed into the flowing drainage line. Field parameters (pH, dissolved oxygen, reduction/oxidation (redox), electrical conductivity and temperature) were monitored using a water quality meter placed directly into the drainage line.

Field observations were recorded and are presented in Section 6.3 and Table 1 of Appendix B. Copies of field sheets with physiochemical groundwater data obtained during sampling are provided in Appendix C.

5.4 SAMPLE STORAGE AND HANDLING

Samples were placed into appropriately preserved bottles. All samples were immediately placed in coolers with ice bricks for transportation to the laboratory.

A chain of custody (CoC) form was filled out with the sampling date, sampler's contact details, sample ID's, and required analyses, and dispatched to the laboratory with the samples.

A copy of the chain of custody documentation is included with laboratory certificates in Appendix E.

5.5 LABORATORY ANALYSIS

Groundwater samples were analysed for identified contaminants of concern (TRH & BTEXN), metals and a suite of monitored natural attenuation (MNA) parameters (pH, TDS, major cations, major anions and nutrients).

Sample analysis was conducted by Envirolab (NATA No. 2901). A set of QA/QC duplicate/triplicate samples were included in the sampling program based on the frequency adopted from the NEPM 2013 guidelines of one duplicate and triplicate sample for every 20 primary samples collected. Secondary quality assurance analysis (inter-laboratory duplicate analysis) was conducted by SGS (NATA No. 2562) in October 2019 and Eurofins (NATA No. 1261) in May 2020. All analyses were undertaken in accordance with NATA accredited methods as detailed on the laboratory certificates of analysis (Appendix E).

6 FIELD FINDINGS

6.1 GROUNDWATER WELL CONDITIONS

The following general observations were made in regards to the condition of wells during gauging:

- MW04, MW06 and MW27 appear to be lost, and MW11 has been abandoned;
- MW36 was dry. Note: MW36 and MW37 are shallow wells installed into the stormwater easement, to the depth of the stormwater culvert to assess if this was a potential conduit for hydrocarbon migration.

6.2 PHASE SEPARATED HYDROCARBONS

All locations where PSH was detected with the interface probe or had been encountered previously were visually confirmed using a disposable plastic bailer. Apparent PSH thicknesses are presented below in Table 6.1. It is likely that PSH is also present in the skimmer wells that were inaccessible at the time (MW09 and MW14).

Table 6.1 Summary of identified PSH (m)

DATE	MW05	MW09	MW10	MW13	MW14	MW18	MW19	MW20	MW21	MW25	MW28	MW30	MW31	MW32	MW33
24/08/2012	0.257	-	-			-	-	-	-	-	-	-	-	-	-
19/11/2012	-	0.3	-			-	-	-	-	-	-	-	-	-	-
30/01/2014	-	0.08	0.55			-	-	-	-	-	-	-	-	-	-
21/06/2014	-	0.41	0.5			-	-	-	-	-	-	-	-	-	-
13/10/2014	-	0.475	0.446			-	-	-	-	-	-	-	-	-	-
11/02/2015	-	0.207	0.181			-	-	-	-	-	-	-	-	-	-
9/12/2015	-	0.295	0.23			0.482	0.265	-	-	-	-	-	-	-	-
12/09/2016	-	0.05	0.235			-	0.174	0.189	0.342	0	-	-	-	-	-
14/02/2017	-	0.447	0.616			-	0.546	0.165	0.593	0	-	-	-	-	-
29/08/2017	-	0.35	0.11			-	0.412	0.267	0.205	0.005	-	-	-	-	-
10/04/2018	-	0.622	0.557			-	0.593	0.617	0.709	0	-	-	-	-	-
18/10/2018	-	-	0.145			0.156	-	0.345	-	0.06	-	-	-	-	-
24/05/2019	-	-	0.463			0.442	0.165	0.468	0.354	0.145	-	-	-	-	-
31/10/2019	-	0.130	0.384			0.284	0.029	0.458	0.271	0.078	-	-	-	-	-
07/02/2020	-	-	0.145			0.446	0.365	0.640	0.415	0.099	0.431	0.291	0.797	0.497	0.123
01/05/2020	0.153	-	0.169	0.006	0.113	0.104	0.11	0.295	0.237	0.064	0	0	0.051	0	0

Notes:

1 0 = PSH not detected

2 - = Well not assessed on that date (or not present at the time).

6.3 GROUNDWATER AND SURAFACE WATER FIELD PARAMETERS

Measured field parameters are provided in Table 6.2, indicating:

- The temperature of groundwater ranged between 16.3 to 25.6 °C;
- pH ranged between 6.65 to 7.37 pH units indicating slightly acidic to neutral groundwater conditions;
- Electrolytic conductivity ranged between 222 to 2,071 µS/cm indicating fresh to slightly saline groundwater conditions;
- Dissolved oxygen ranged between 0.01 ppm and 0.35 ppm which indicates low dissolved oxygen saturation in the measured locations;
- Redox potential ranged between -141.3mV and +151.4mV indicating mildly to strongly anaerobic groundwater conditions in the measured locations;

Table 6.2 Stabilised Field Physiochemical Parameters and Field Observations

WELL ID	STABILISED FIELD PARAMETERS						
	STANDING WATER LEVEL (MBTOC)	PH (FIELD)	REDOX (FIELD)	ELECTRICAL CONDUCTIVITY (FIELD)	TEMPERATURE (FIELD)	DISSOLVED OXYGEN (FIELD)	COMMENTS
Groundwater							
MW01	1.68	7	-72.1	652	16.3	0.04	So little water in well that peri-pump was not running through flow cell effectively. Approx. 400mL purged into flow cell. Well purged dry and unable to sample
MW02	1.57	7.13	-133.9	738	24.5	0.11	-
MW07	1.866	6.84	-82.4	222	18.9	0.04	Turbid, Brown colour, HC sheen
MW08	2.05	7.37	-141.3	1089	21.4	0.03	Clear, with some black roots
MW12	1.71	6.99	-120.7	2071	21.9	0.11	clear, no odour
MW15	1.82	6.8	-56.3	1412	24.9	0.04	-
MW16	1.516	7	151.4	904	25.6	0.28	clear, slight HC odour
MW17	1.765	7.28	19	794	23.2	0.35	-
MW22	3.22	7.29	-77.4	633	22.2	0.03	Brown, slight odour, medium turbidity
MW26	1.554	6.98	-114.9	964	24.6	0.09	High turbidity, brown orange, no sheen, HC Odour
MW28	1.43	7.2	-120.5	720	22.4	0.14	-
MW29	1.939	6.79	-120	858	21.2	0.19	-
MW30	1.6	7.23	-134.6	726	22.1	0.08	-

MW32	2.004	6.65	-120	1056	24.3	0.1	Clear
MW33	1.881	6.91	-114.2	793	23.7	0.01	Clear, slight HC odour
MW35	1.512	7.03	65.6	722	20.9	0.08	Clear, no odour
Surface Water							
S01	-	-	-	-	-	-	Not flowing, insufficient water to collect parameters
S02	-	-	-	-	-	-	Dry
S03	-	-	-	-	-	-	Not flowing, insufficient water to collect parameters

7 ASSESSMENT CRITERIA

WSP has applied guidance from Schedule B1 of NEPM 2013 in selection of site criteria for health (via vapour intrusion and drinking water pathways) and ecological receptors. Guideline values are listed in Table 7.1. The NEPM ecological criteria are based on ANZECC 2000 criteria that have been updated in the ANZG, 2018 guidance.

It is noted that HSLs are only relevant to dissolved phase hydrocarbons, and where the groundwater is more than 2m below the ground surface. Where PSH is present or the groundwater is shallow HSLs should not be used and it should be assumed that HSLs for some contaminants, if present, may be exceeded. However, previous sub-slab vapour assessments (WSP 2017) and recent indoor air vapour assessments (WSP, 2020b) have shown that vapour risk to the indoor air environment is unlikely to be significant. The criteria are presented here, and in results tables, for indicative purposes only.

Application of NEPM ecological criteria as "groundwater" investigation criteria is a conservative approach as the guidelines were derived for receiving waters. The closest downgradient ecological receptor is an open storm water channel located approximately 300 m north-west of the site (down hydraulic gradient). The channel flows into Cahill Creek and then Winnererremy Bay (part of Pittwater) approximately 1 km northwest of the site. As Cahill Creek and Winnererremy Bay are tidal, criteria for marine ecosystems have been adopted.

Table 7.1 Summary of proposed criteria (µg/L)

CONTAMINANT	NEPM, 2013 HSLS FOR VAPOUR INTRUSION COMERCIAL / INDUSTRIAL	NEPM, 2013 HILS FOR DRINKING WATER	NHMRC, 2008 RECREATIONAL CRITERIA (10 × HILS)	NEPM, 2013 GILS FOR MARINE WATER	ANZG, 2018 95% TRIGGER VALUES FOR MARINE WATER
TRH					
F1 (C_6-C_{10} less BTEX)	6,000[(2)]	-	-	-	-
F2 (C_{10}-C_{16} less naphthalene)	Non Limiting[(2)]	-	-	-	-
F3 (>C_{16}-C_{34})	-	-	-	-	-
F4 (>C_{34}-C_{40})	-	-	-	-	-
BTEX					
Benzene	5,000[(2)]	1	10	500	700
Ethylbenzene	Non Limiting[(2)]	300	3,000	-	5
Toluene	Non Limiting[(2)]	800	8,000	-	180
Xylene (o-xylene)	-	-	-	-	350
Xylene (m-xylene)	-	-	-	-	75
Xylene (p-xylene)	-	-	-	-	200
Total Xylene	Non Limiting[(2)]	600	6,000	-	-
PAHs					
Naphthalene	Non Limiting[(2)]	-	-	16	16
Heavy Metals					
Arsenic	-	10	100	-	-

CONTAMINANT	NEPM, 2013 HSLS FOR VAPOUR INTRUSION COMERCIAL / INDUSTRIAL	NEPM, 2013 HILS FOR DRINKING WATER	NHMRC, 2008 RECREATIONAL CRITERIA (10 × HILS)	NEPM, 2013 GILS FOR MARINE WATER	ANZG, 2018 95% TRIGGER VALUES FOR MARINE WATER
Cadmium	-	2	20	0.7	5.5
Chromium	-	50	500	4.4	4.4
Copper	-	2,000	20,000	1.3	1.3
Lead	-	10	100	4.4	4.4
Mercury	-	1	10	0.1	0.4
Nickel	-	20	200	7	70
Zinc	-	-	-	15	15

Notes:

1 HSLs based on Sand texture and groundwater present between 2 and 4 m mBGL.

2 HSL are not directly applicable where groundwater <2 mBGL.

8 ANALYTICAL RESULTS AND DISCUSSION

Summary results for groundwater samples collected during May 2020 are provided in Tables 2 to 4, Appendix B. Tables 2 and 3 also includes historical results from the previous groundwater monitoring program.

Copies of the chain of custody (CoC) documentation and NATA accredited laboratory analytical certificates for the current monitoring event are provided in Appendix E.

8.1 LABORATORY RESULTS

8.1.1 COMPARISON WITH SITE CRITERIA

The following is a summary of the findings of the groundwater analysis from the current sampling event completed in May 2020 compared with the criteria presented in Section 7.

NEPM (2013) health screening criteria (vapour intrusion pathway):

- Concentrations of TRH and BTEXN in groundwater samples were reported below applicable vapour heath screening levels (HSLs) for commercial/industrial (D) sites in groundwater;

NEPM (2013) Groundwater Investigation Levels (GILs) for Drinking Waters:

- Arsenic concentrations exceeded the adopted NEPM (2013) drinking water criteria of 10 µg/L at MW02 (14 µg/L), MW07 (66 µg/L), MW08 (12 µg/L), MW16 (84 µg/L), MW22 (23 µg/L), MW26 (46 µg/L), MW28 (20 µg/L), MW29 (120 µg/L), MW30 (20 µg/L), and MW33 (24 µg/L).

NEPM (2013) Groundwater Investigation Levels (GILs) for Marine Waters:

- Arsenic concentrations exceeded the adopted NEPM (2013) GIL of 13 µg/L at MW02 (14 µg/L), MW07 (66 µg/L), MW16 (84 µg/L), MW22 (23 µg/L), MW26 (46 µg/L), MW28 (20 µg/L), MW29 (120 µg/L), MW30 (20 µg/L), and MW33 (24 µg/L).
- Copper concentrations exceeded the adopted NEPM (2013) GIL of 1.3 µg/L in MW35 (9 µg/L) S01 (9 µg/L) and S03 (11 µg/L).
- Zinc concentrations exceeded the adopted NEPM (2013) GIL of 15 µg/L in S01 (46 µg/L) and S03 (62 µg/L).
- Nitrate concentrations exceeded the ANZECC (2000) Trigger Values (95% species protection) for Marine Ecosystems (0.16 mg/L) at MW17 (1.5 mg/L) and MW32 (0.28 mg/L).

ANZG (2018) Trigger Values (95% species protection) for Marine Ecosystems

- Arsenic concentrations exceeded the adopted NEPM (2013) GIL of 13 µg/L at MW02 (14 µg/L), MW07 (66 µg/L), MW16 (84 µg/L), MW22 (23 µg/L), MW26 (46 µg/L), MW28 (20 µg/L), MW29 (120 µg/L), MW30 (20 µg/L), and MW33 (24 µg/L).
- Copper concentrations exceeded the adopted ANZG (2018) GIL of 1.3 µg/L in S01 (9 µg/L) and S03 (11 µg/L).
- Zinc concentrations exceeded the adopted ANZG (2018) GIL of 15 µg/L in S01 (46 µg/L) and S03 (62 µg/L).

8.1.2 COMPARISON WITH PREVIOUS GROUNDWATER RESULTS

During the May 2020 monitoring event, PSH was generally detected in the same locations as has been previously detected. The notable exception was that some of the new wells that had PSH detected in February did not have it detected in May 2020 (MW28, MW30, MW32 and MW33). The thickness of the PSH, where present continues to fluctuate over a relatively wide range in the various impacted wells and PSH recorded was a thickness within historical ranges. This current round the general thickness was less than the previous event in most locations.

Table 2 in Appendix B presents a summary of historical results over time. The results continue to confirm that the dissolved phase plume is dominated by F2 and F3 hydrocarbon fractions with very minor F1 and trace or non-detect BTEX. It is noted that while the PSH impact remains it will continue to feed the dissolved plume and so while the dissolved plume may reach a stable (steady-state) condition, it will not attenuate until the PSH extents declines. Whilst PSH was not observed in MW28, MW30, MW32 and MW33 at this event, the dissolved concentrations in MW30 and MW33 in particular were elevated and may indicated near saturated conditions.

Arsenic appears relatively ubiquitous beneath the main plume. The source is unknown and possibly unrelated to the bus depot use, although it is noted that there is a correlation between locations with PSH or high dissolved phase hydrocarbons and elevated arsenic. It is possible that the redox conditions beneath the plume are favouring dissolution of the arsenic from the solid phase to the groundwater, possibly through dissolution of iron minerals in the sandy soils as discussed in the RAP (WSP, 2020). Generally, the trends appear relatively stable.

8.1.3 SURFACE WATER SAMPLING RESULTS

The stormwater sampling was completed on 01 May 2020 where according to the Bureau of meteorology approximately 14 mm of rain fell. No sheen or odour was noted nor evidence of groundwater discharge.

The results indicated that no detectable hydrocarbons were present. This provides a line of evidence that despite the proximity of the PSH to the stormwater easement, it is unlikely that the contamination is leaking into the system putting the ecology of the creek or downstream receptors at risk.

The depth of the stormwater culvert at sampling point, S02, is 1.198 mBGL. MW36, which was installed adjacent to the stormwater culvert and S02, is installed to a depth of 1.266 mBGL. Both MW36 and S02 were observed to be dry during the GME. Therefore, standing water level is below the stormwater culvert and the likelihood of groundwater discharge to the stormwater culvert is considered unlikely.

8.2 MONITORED NATURAL ATTENUATION

Natural attenuation is a reduction in contaminant concentration and mass by naturally occurring physical, chemical or biological processes in groundwater. Monitored natural attenuation (MNA) is the assessment of natural attenuation processes to determine whether they are taking place at a sufficient rate to mitigate the environmental impacts of a contaminant (DEP, 2004).

WSP has adopted a ‘lines of evidence’ approach to assessing whether natural attenuation processes are acting at a sufficient rate to mitigate any environmental impacts associated with the hydrocarbon plumes identified on-site.

These lines of evidence include;

- Assessment of PSH thickness and changes in plume areas;
- Assessment of dissolved phase hydrocarbon concentrations; and
- Assessment of geochemical parameters as MNA indicators.

8.2.1 PSH THICKNESS AND DISTRIBUTION

Apparent PSH thickness during the May 2020 round of monitoring were generally consistent with previous mentoring, with some locations showing a slight decrease. Historical data demonstrates that at each location, there is a relatively wide range of fluctuations in PSH thickness. Overall there has been no appreciable improvement in the PSH condition on the site. The well network is unable to delineate the longitudinal spread of the plume to the north west at this point in time. The absence of PSH in the new wells MW28, MW30, MW32 and MW33 where PSH was previously detected warrants further investigation. It may be that the groundwater in the vicinity took some time to re-establish equilibrium following the drilling works. Conditions in these wells will continue to be assessed on a 6 monthly basis.

The inferred plume, based on the May 2020 data is shown on Figure 4, along with gauging measurements of PSH thickness in the wells.

8.2.2 DISSOLVED PHASE CONCENTRATIONS

Based on the information presented in Section 8.1, the dissolved concentrations of hydrocarbons in sampled locations appears relatively consistent with historical data, with minor fluctuations in various wells.

The spatial distribution of dissolved phase hydrocarbons is consistent with previous sampling events, suggesting that the dissolved phase plume is relatively stable, or very gradually deteriorating on the north western periphery. As discussed in Section 8 improvement in the dissolved phase concentrations and extent are only likely to occur once the PSH extent declines as the dissolved plume is fed by the PSH.

8.2.3 GEOCHEMICAL PARAMETERS

A typical natural attenuation process involves petroleum hydrocarbons acting as electron donors in oxidation-reduction reactions resulting in biodegradation of hydrocarbon molecules. Monitoring the concentrations of specific electron acceptors in the groundwater can indicate whether natural attenuation processes are taking place within a dissolved phase hydrocarbon plume (DEP, 2004). Natural attenuation parameters are presented in Table 4 in Appendix B.

Important chemical parameters which may indicate natural attenuation processes are occurring include:

- Alkalinity (as bicarbonate) resulting from an increase in CO_2 (a by-product of microbial respiration), expected to increase within the plume;
- Decline in redox potential as oxygen sources (electron acceptors) are depleted, resulting in:
  - Decrease in dissolved oxygen – initially (until depleted) the most readily available electron acceptor in the aquifer;
  - Decrease in nitrate concentrations and corresponding increase in ammonia (a reduced form of nitrogen); and
  - If redox drops substantially then decrease in sulphate and corresponding increase in H_2S odours and dissolved methane.

The following conclusions can be made with respect to natural attenuation processes across the site;

- Recorded redox results are low both within and outside of the plume, and the strongest reducing conditions are generally associated with hydrocarbon presence; this indicates microbial degradation processes are acting on the plume;
- Sulphate was generally present across the site and surrounds at varying concentrations. The lowest sulphate results were in well immediately downgradient of the PSH plume, but highest in locations cross gradient from the plume; these results are further evidence for microbial degradation occurring, but given that the sulphate is low downgradient of the plume, it may indicate that electron acceptors are limited.

- Dissolved methane was present in all wells within the dissolved plume but most elevated in MW07 and MW29 (upgradient of the PSH) and MW16 (downgradient of the PSH). Methane was absent in background location MW17).

Overall, there are strong correlations between natural attenuation indicators and the plume footprint. The range of natural attenuation parameter concentrations indicates that the system is in a dynamic state, and generally, there are sufficient electron acceptors available to stimulate microbial degradation. However, the rate of degradation may be limited to some extent, particularly where strongly reducing sulphate reduction and methanogenesis conditions appear to be present.

8.3 SUMMARY OF RISK

A conceptual site model is presented in the RAP (WSP, 2020). In summary, the CSM found that under the current land use of the site and surrounds the identified contaminants present a low risk to human receptors. In the event of excavation or earthworks which expose impacted soils or groundwater, there is a moderate risk to human health via ingestion or dermal contact with contaminated soils or groundwater which would require management under a Construction Environmental Management Plan (CEMP) and site-specific safe work method statements (SWMS). An EMP has been prepared for the site and surrounds to assist in the management of these risks.

Vapour risk has been shown via sub-slab measurement to be acceptably low.

The contaminants present a low to moderate risk to on-site and offsite ecological receptors. Given the industrial nature of the site setting and using of surrounding properties, the local ecology is not considered to require high protection measures. The existing gardens and trees over the area of the plume appear to be healthy and unstressed by the hydrocarbon impact to the underlying groundwater.

Risks to more distant downgradient human and ecological receptors are unlikely given the low toxicity of the PSH constituents (except for naphthalene – which was not recorded ecological criteria during this monitoring round) and the evidence for microbial degradation occurring. Monitoring wells beyond the extent of the PSH impacted area of the plume, to the west, indicate that dissolve phase concentrations attenuate with distance. It is, however, possible that the hydrocarbons may migrate more rapidly via preferential pathways provided by local services. The recent additional well installation work included drilling two bores into backfill materials surrounding the stormwater culvert to the north of the plume (MW36 and MW37). At the time of the May sampling event MW36 was dry, with MW37 recording hydrocarbon concentrations less than laboratory detection limits. This indicates that the potential for accelerated migration via this pathway is incomplete and unlikely to be significant. In addition, the depth of the stormwater culvert at sampling point, S02, is 1.198 mBGL. MW36, which was installed adjacent to the stormwater culvert and S02, is installed to a depth of 1.266 mBGL. Both MW36 and S02 were observed to be dry during the GME. Therefore, standing water level is below the stormwater culvert and the likelihood of groundwater discharge to the stormwater culvert is considered unlikely. Ongoing monitoring of the wells will be required, however, across a wider range of seasonal conditions. Wells around the sewer main that passes beneath the plume is unknow at this stage due to access constraints.

Inorganic contamination of the groundwater, primarily an arsenic plume, is present beneath the site and surrounds. This is unlikely to relate the Bus Depot activities and maybe a more regional issue possibly related to historical agricultural or turf production. There does, however, appear to be a correlation between hydrocarbon impacted locations and elevated arsenic possibly indicating that the low redox conditions induced by the plume may be solubilizing arsenic from the solid phase minerals. This solubilisation may be a secondary effect of the low redox firstly affecting the iron chemistry in the aquifer, solubilizing iron and thus reducing the capacity of the aquifer, in the vicinity of the hydrocarbon plume, to sorb arsenic to iron minerals.

Risks presented by the arsenic plume are unlikely to preclude general industrial use of the site and surrounds but would be of concern during excavations works. However, the precautions required under the EMP for minimising dermal and ingestion risks presented by the hydrocarbons during construction works would assist in managing this risk as well.

Ecological risk associated with the arsenic is unknown as the extent of the plume is uncertain as is the origin of the arsenic. The risk to residents some distance from the site is also uncertain, however, given the shallow groundwater

downgradient of the site is unlikely to be used for potable supply the risk is likely to be of a recreational exposure scenario. Results from the groundwater in the vicinity of the site have generally been lower than health-based recreational criteria.

The results of this latest groundwater monitoring event continue to support the above.

9 QUALITY ASSURANCE/ QUALITY CONTROL

Field quality control procedures included rigorous sample collection, decontamination procedures and sample documentation. WSP implemented QA/QC procedures during groundwater sampling by collecting representative QA/QC samples for laboratory analysis. Following this analysis, laboratory and sampling data quality objectives were assessed and reported in terms of data precision, accuracy and completeness.

All field instruments were calibrated prior to use. Calibration certificates are included in Appendix B.

The following QA/QC samples were collected in the field and analysed:

- QA01 and QA02 are intra-laboratory duplicates of primary groundwater samples MW12 and MW07; QA01A and QA02A are inter-laboratory duplicates of these primary groundwater samples taken during the May 2020 monitoring round;
- Trip Blank is a trip blank sample analysed to assess the potential for cross-contamination resulting from sample storage, handling and transport; Trip Spike is a trip spike sample analysed to assess the potential for loss of volatile contaminants from the samples during storage, handling and transport; taken during the May 2020 monitoring round.
- Laboratory QA/QC included chain-of-custody documentation, sample integrity and holding times, use of acceptable NATA-registered laboratory methods and laboratory QA/QC results (refer to laboratory certificates provided in Appendix E).

Table 5 in Appendix B presents the results of various data quality indicators. The following comments are made as a summary regarding the quality of the analytical components of this project:

- Sample integrity and container requirements were documented as acceptable, though temperature upon receipt at the laboratory was not ideal (16.5°C). Nevertheless, the samples were received on the final day of sampling, and the trip spikes showed acceptable recovery indicating volatile losses in transit were unlikely to be a concern;
- All sample holding times and other QA/QC criteria for volatile contaminants were deemed acceptable;
- All other holding time compliances were documented as acceptable
- Field pHs were similar to lab pHs (ratio between 0.96 and 1.05) as shown in see Table 4;
- Field ECs were generally similar to lab ECs (ratio between 0.82 and 1.26) except for the results for MW07 (3.83) which was unexpectedly high as shown in see Table 4;
- The charge balance between cations and anions was generally less than 10% as shown in see Table 4, with the exception of the result from MW32. The results show that the testing generally included all significant ions and that the analysis of those ions balanced.
- Relative Percentage Differences (RPDs) between the primary samples and both the intra-laboratory and inter-laboratory duplicates were generally within the acceptable ranges. Result's that exceeded 30% relative difference were recorded in two results from one of the inter-laboratory duplicate pairs (MW07/QA02A) with a maximum RPD of 51.4 recorded. This deviation is relatively minor and may be due to slight differences in lab methods.
- Trip blank and trip spike results were acceptable (provided in Table 5, Appendix B);
- The laboratories (Envirolab and SGS) were NATA accredited for all analyses undertaken;
- All laboratory QA/QC method blanks and field blanks were found to be within acceptable limits.

In summary, the QAQC data is determined to be of sufficient quality to ensure the validity of the conclusions reached for this assessment and characterisation of the site from a contamination perspective.

10 CONCLUSIONS AND RECOMMENDATIONS

Based on the results presented in this report, WSP provides the following conclusions and recommendations:

- PSH was recorded in three offsite wells north-west of the bus refuelling bay (MW10, MW18, MW19, MW20, MW21, MW25 and MW31), ranging from 51 mm to 237 mm. PSH was also found in three onsite well (MW05, MW13 and MW14) ranging from 6mm to 169 mm. Apparent PSH thickness generally decreased during the May 2020 round of monitoring; however, the historical data demonstrates that at each location, there is a relatively wide range of fluctuations in PSH thickness.
- The dissolved phase hydrocarbon plume surrounding the PSH impacted area appears relatively stable and, while not delineated in most directions, the concentrations appear to attenuate significantly with distance from the PSH affected area.
- Available wells in the backfilled sands of the stormwater easement were dry or had non detect hydrocarbons indicating that this potential pathway is not complete at the time of this assessment.
- No hydrocarbons were detected in the surface waters of the drainage line to the north of the plume, including samples from upgradient, at the site boundary and downgradient of the site.
- There is clear evidence of biodegradation of hydrocarbons occurring in the groundwater, within dissolved hydrocarbon plume. The range of redox conditions suggest a dynamic system, but in places, the redox conditions appear quite reducing and may indicate that the rate of degradation is limited by the availability of electron acceptors.
- An arsenic plume is present in the groundwater beneath the site and surrounds. The source of the plume is uncertain, but the distribution and concentrations appear relatively stable.
- The site is considered suitable for its continued use as an operational bus depot. Surrounding sites are also suitable for ongoing commercial/industrial use. Based on the current site orientation and activities, the risk posed by the identified contamination to human or ecological receptors is considered low. In the event of excavation or earthworks which expose impacted soils or groundwater, there is an increased risk to human health via ingestion and dermal contact with contaminated material which would require management through occupational exposure controls in accordance with health and safety legislation. In addition, an EMP has been prepared for the site and surrounds to assist in management of these risks (WSP, 2020e).

WSP recommends that:

- Implementation of the PSH removal system in accordance with Section 5.4 of the RAP (WSP, 2020d),
- Groundwater conditions should continue to be assessed in accordance with Section 6.2 of the RAP,

11 REFERENCES

- ANZECC/ARMCANZ (2018), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.
- Australian Government Bureau of Meteorology, 2019 *Australian Groundwater Explorer (*www.bom.gov.au*)* Accessed 23/07/2019
- CRC Care, 2013 Technical Report No 23 Petroleum hydrocarbon vapour intrusion assessment: Australian guidance.
- ENRS, 2018 *Groundwater Monitoring Event (GME) Report – April 2018*
- National Environment Protection Council (2013) *National Environment Protection Measure 2013 – Assessment of Site Contamination.* Schedule B(1): Guideline on the Investigation Levels for Soil and Groundwater;
- WSP, 2017a *Soil Vapour Assessment - STA Bus Depot 58 Darley Street, Mona Vale NSW*
- *WSP, 2017b Environmental Management Plan - Mona Vale Bus Depot 58 Darley Street, Mona Vale NSW Rev B, dated April 2017*
- WSP, 2019a *Groundwater Monitoring Event – October 2018 STA Mona Vale Bus Depot 58 Darley Street, Mona Vale, NSW* (report dated January 2019)
- WSP, 2019b *Remediation Action Plan (Revised 2019) State Transit Bus Depot, 58 Darley Street Mona Vale, New South Wales* (dated December 2019)
- *WSP,* 2020a *Factual Record of Well Installation Works, Mona Vale Bus Depot, 58 Darley Street, Mona Vale, NSW* (report dated March 2020)
- WSP, 2020b *Offsite Vapour Intrusion Assessment, STA Mona Vale* (report dated March 2020)
- WSP, 2020c *Groundwater Monitoring Event - Oct 2019 and Feb 2020 STA Mona Vale Bus Depot, 58 Darley Street, Mona Vale, NSW* (report dated May 2020)
- WSP 2020d *Remediation Action Plan (Revised 2020) State Transit Bus Depot, 58 Darley Street Mona Vale, New South Wales* (report dated May 2020)
- WSP, 2020e *Environmental Management Plan, Mona Vale Bus Depot - 58 Darley St, Mona Vale NSW* (Report dated June 2020)

12 LIMITATIONS

This Report is provided by WSP Australia Pty Limited (WSP) for State Transit Authority (Client) in response to specific instructions from the Client and in accordance with WSP's proposal dated 27 August (Agreement).

PERMITTED PURPOSE

This Report is provided by WSP for the purpose described in the Agreement, and no responsibility is accepted by WSP for the use of the Report in whole or in part, for any other purpose (Permitted Purpose).

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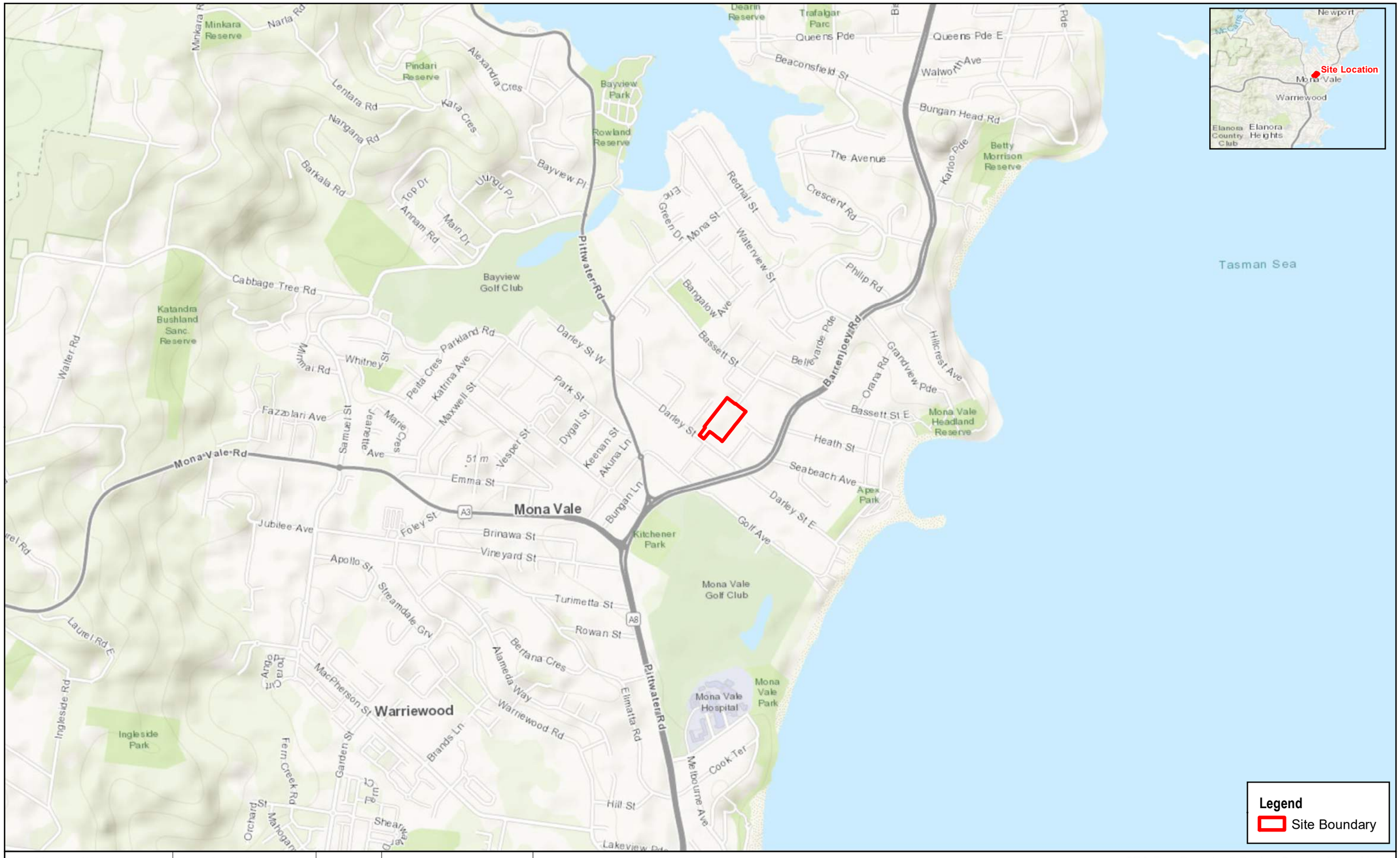
APPENDIX A

FIGURES



Map: PS111744_GIS_001_A1	Author: David.Naiken		0 200 400 m 1:15,000
Date: 11-May-20	Approved by: Sarah.Klocke		Coordinate system: GDA 1994 MGA Zone 56 Scale ratio correct when printed at A3

Data Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

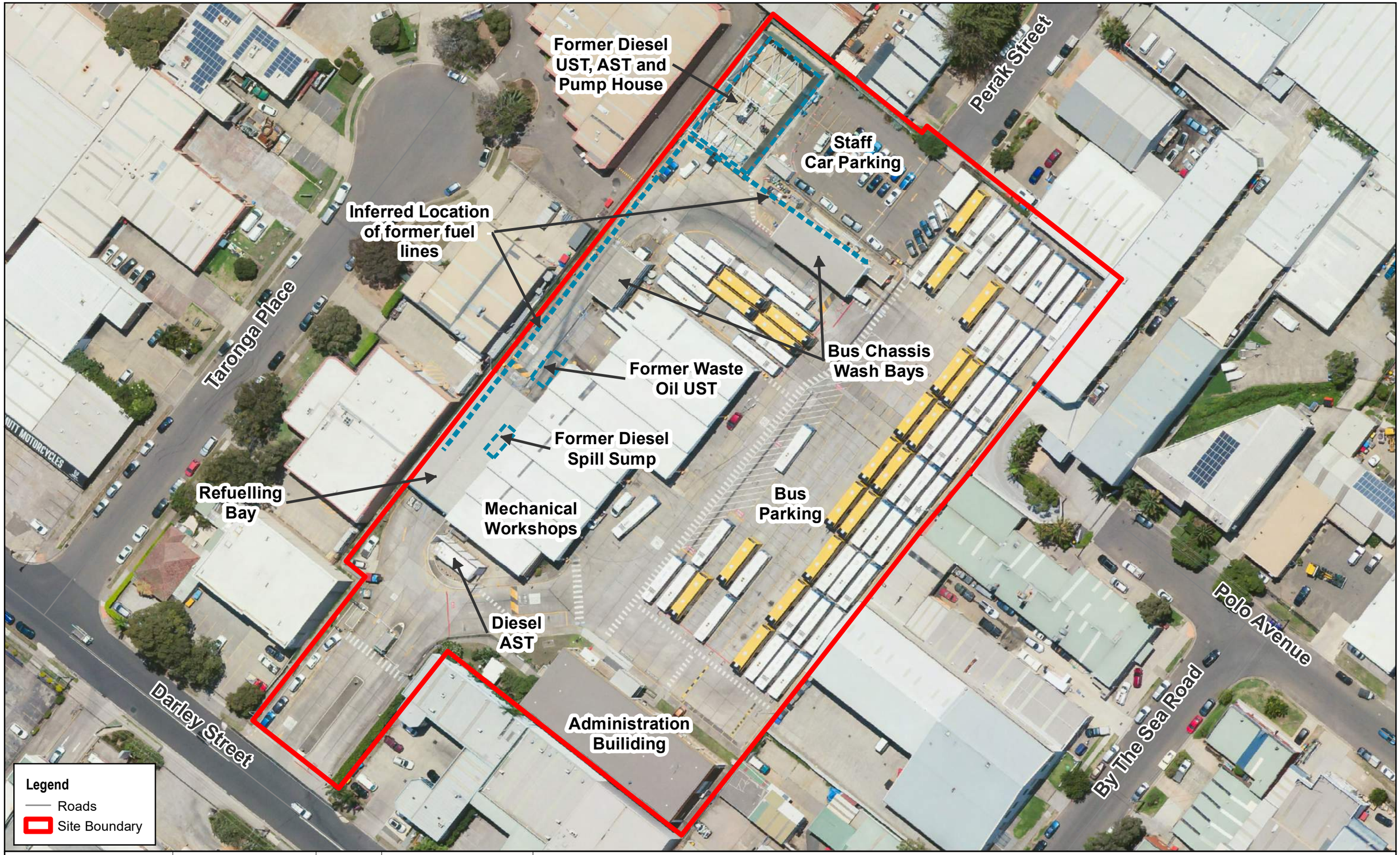
STA Bus Depot, 58 Darley Street - Mona Vale
GME - Oct 2019 - Feb 2020

Figure 1
Site Location

Map: PS111744_GIS_002_A1	Author: David.Naiken		0 10 20 m 1:1,200
Date: 11-May-20	Approved by: Sarah.Klocke		
Data Source: Metromap, Aerial Imagery, 2020			Coordinate system: GDA 1994 MGA Zone 56 Scale ratio correct when printed at A3

STA Bus Depot, 58 Darley Street - Mona Vale
GME - Oct 2019 - Feb 2020

Figure 2
Site and Surrounds



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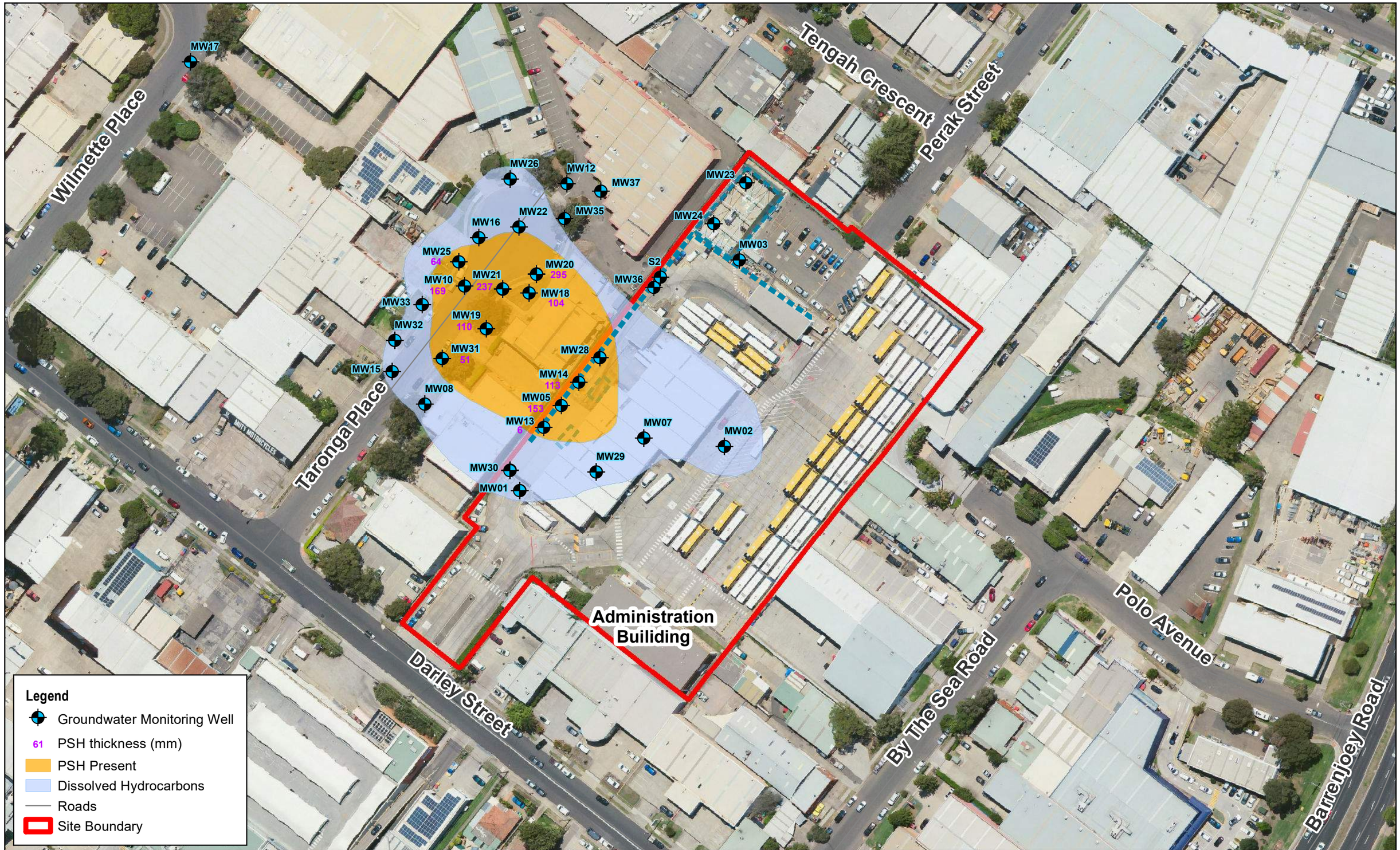
Data Source: Metromap, Aerial Imagery, 2020			

STA Bus Depot, 58 Darley Street - Mona Vale
GME - Oct 2019 - Feb 2020

Figure 3
Site Current and Historical Features



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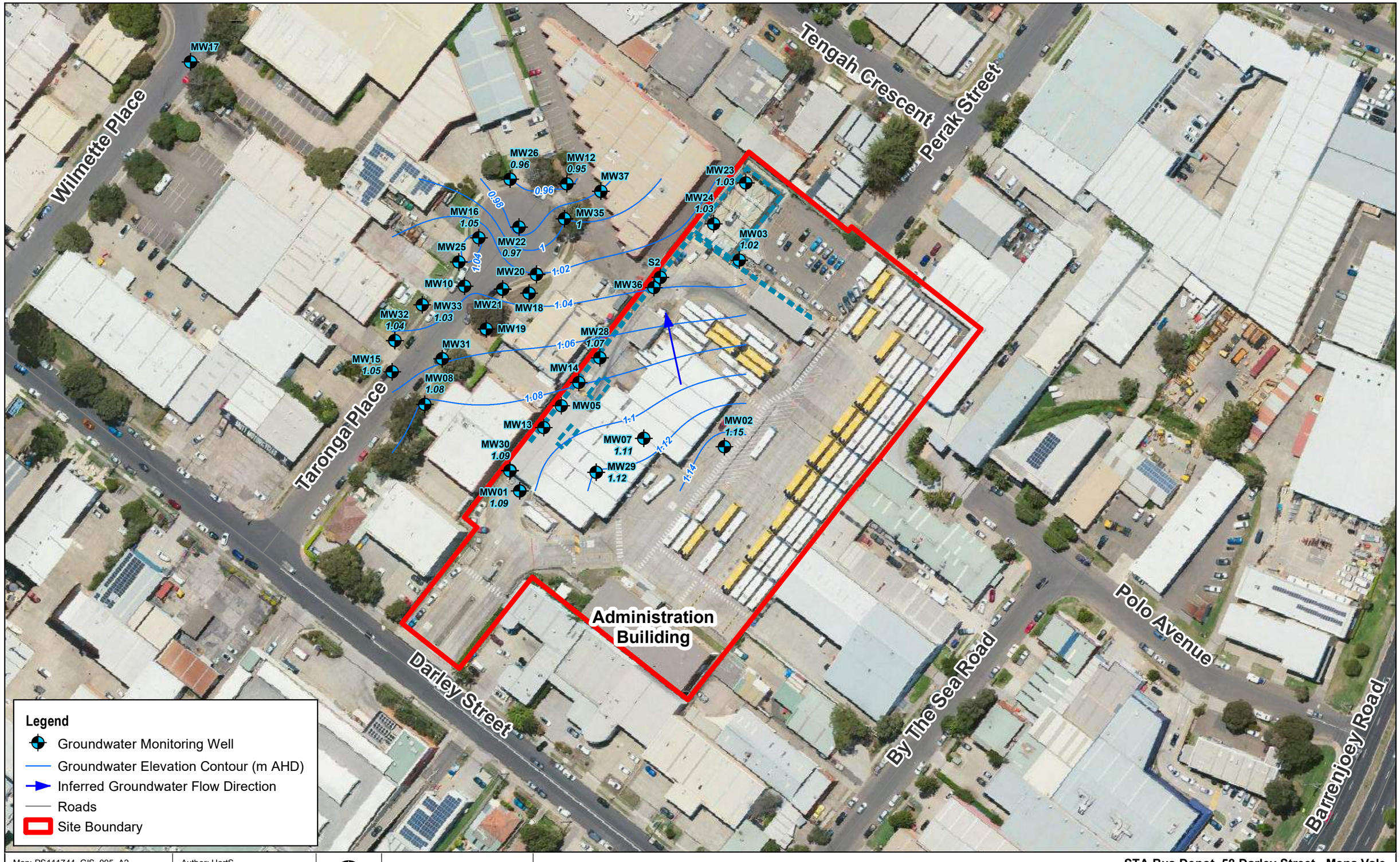
Date: 7/15/2020	Approved by: Sarah.Klocke		Coordinate system: GDA 1994 MGA Zone 56 Scale ratio correct when printed at A3
Data Source: Metromap, Aerial Imagery, 2020			

STA Bus Depot, 58 Darley Street - Mona Vale
GME - Oct 2019 - Feb 2020

Figure 4
Groundwater Results - Hydrocarbons



Map: PS111744_GIS_005_A2	Author: HartS		0 10 20 m 1:1,200
Date: 7/9/2020	Approved by: Sarah.Klocke		Coordinate system: GDA 1994 MGA Zone 56 Scale ratio correct when printed at A3
Data Source: Metromap, Aerial Imagery, 2020			

STA Bus Depot, 58 Darley Street - Mona Vale
GME - Oct 2019 - Feb 2020

Figure 5
Inferred groundwater flow

APPENDIX B

ANALYTICAL RESULTS SUMMARY

Appendix B - Table 1 Summary of Field Data

State Transit Authority
Groundwater Monitoring
58 Darley Street, Mona Vale NSW

							Gau\ging Data			Field Parameters						
							Standing Water Level (mBTOC)	PSH thickness (m)	Adjusted Standing Water Level (mAHD)	pH (Field)	Redox (Field)	Electrical Conductivity (Field)	Temperature (Field)	Dissolved Oxyven (Field)	Well headspace PID	Comments
Units										pH units	mV	µS/cm	°C	ppm	ppm	
Laboratory PQL										0.01	0.01	1	0.1	0.01	0.1	
Well ID	Easting	Northing	Ground (mAHD)	TOC (mBGL)	TOC (mAHD)	Date										
MW01	-	-	2.85	0.063	2.787	10-01-12	-	0	-	7.21	29.8	911	25.7	0.07	-	-
MW01	-	-	2.85	0.063	2.787	24-08-12	-	0	-	7.06	-28.3	640	17.2	0.1	-	-
MW01	-	-	2.85	0.063	2.787	19-10-18	1.70	0	1.08	6.8	-127.7	846	20.1	3.1	-	clear, no odour
MW01	-	-	2.85	0.058	2.792	23-05-19	1.81	0	0.99	6.11	-81.4	824	23.2	0	35.6	Clear, colourless, slight HC odour
MW01	-	-	2.85	0.058	2.792	31-10-19	1.75	0	1.05	6.91	-127.8	839	23.2	0	-	Clear, colourless, odourless
MW01	-	-	2.85	0.058	2.792	06-02-20	1.81	0	0.99	-	-	-	-	-	-	Gauge only
MW01	343028.490	6272627.098	2.861	0.069	2.781	01-05-20	1.687	0	1.09	7.00	-72.1	652	16.3	4.24	-	Well purged dry and unable to sample
MW02			2.73	0.071	2.659	10-01-12	-	0	-	7.03	367.7	909	25.7	0.16	-	-
MW02	-	-	2.73	0.071	2.659	24-08-12	-	0	-	6.96	-24	737	18.9	0.12	-	-
MW02	-	-	2.73	0.071	2.659	19-10-18	1.58	0	1.08	-	-	-	-	-	-	Guage only
MW02	-	-	2.73	0.051	2.679	23-05-19	1.66	0	1.02	7.15	-141.6	600	24.4	0	1.2	Clear, colourless, odourless
MW02	-	-	2.73	0.051	2.679	31-10-19	1.60	0	1.08	7.29	-156.9	546	24	0.3	-	Clear, colourless, odourless
MW02	-	-	2.73	0.051	2.679	06-02-20	1.66	0	1.02	-	-	-	-	-	-	Gauge only
MW02	343098.340	6272642.155	2.762	0.054	2.708	01-05-20	1.557	0	1.15	7.13	-133.9	738	24.5	0.11	-	-
MW03			2.51	0.04	2.47	10-01-12	-	0	-	6.99	173.6	1413	25.4	-	-	-
MW03	-	-	2.51	0.04	2.47	24-08-12	-	0	-	6.94	-22.6	1349	19.2	0.32	-	-
MW03	-	-	2.51	0.04	2.47	19-10-18	1.68	0	0.80	7.04	-75.4	924	21.2	0.25	-	clear, no odour
MW03	-	-	2.51	0.051	2.459	23-05-19	1.77	0	0.69	5.33	37.8	899	23.4	0	0.2	Clear, colourless, odourless
MW03	-	-	2.51	0.051	2.459	06-02-20			2.46	-	-	-	-	-	-	Inaccessible - Under new bus port
MW03	343103.394	6272705.772	2.808	-	2.706	01-05-20	1.683	0	1.02	-	-	-	-	-	-	Gauge only
MW04			2.78	-	-	10-01-12	-	0	-	7.33	55.2	55.2	22.7	0.16	-	-
MW04	-	-	2.78	-	-	24-08-12	-	0	-	7.07	-28.9	784	17.4	0.15	-	-
MW04	-	-	2.78	-	-	06-02-20	-		-							-
MW05			2.57	-	-	24-08-12	-	0.257	-	-	-	-	-	-	-	
MW05	-	-	2.57	-	-	06-02-20	-	-	-							-
MW05	343042.618	6272656.105	2.653	-	-	01-05-20	1.614	0.153	1.17	-	-	-	-	-	-	
MW06	-	-	2.92	-	-	24-08-12	-	0	-	7.44	-50.1	456	16.8	1.67	-	-
MW07	-	-	3	0.142	2.858	24-08-12		0	2.86	6.81	-15.8	738	18.5	0.19	-	-
MW07	-	-	3	0.142	2.858	19-10-18	1.853	0	1.01	6.97	-158.1	757	18.9	0.11	-	clear, slight HC odour
MW07	-	-	3.13	0.142	2.988	23-05-19	1.964	0	1.02	6.72	-127.3	852	21.7	0	1.1	Clear, colourless, slight HC odour
MW07	-	-	3.13	0.142	2.988	31-10-19	1.902	0	1.09	6.88	-115.8	762	20.0	0.29	-	-
MW07	-	-	3.13	0.142	2.988	06-02-20	1.873	0	1.12	-	-	-	-	-	-	Gauge only
MW07	343070.781	6272644.938	3.111	0.139	2.972	01-05-20	1.864	0	1.11	6.84	82.4	2220	18.9	10.56 (2)	-	Turbid, Brown colour, HC sheen
MW08	-	-	3.04	-	-	19-11-12	-	0	-	6.89	-129.6	113	21.2	0.67	-	-
MW08	342996	62772656	3.04	-	-	30-01-14	-	0	-	-	-	-	-	-	-	Dry
MW08-B	342996.15	6272656.64	3.22	-	-	21-06-14	-	0	-	7.14	-88	1000	20.8	0.01	-	-
MW08-B	342996.15	6272656.64	3.22	-	-	13-10-14	-	0	-	7.21	-114	915	18.4	0.38	-	-
MW08-B	342996.15	6272656.64	3.22	-	-	11-02-15	-	0	-	7.08	-187	1087	21.2	0.18	-	-
MW08-B	342996.15	6272656.64	3.22	-	-	09-12-15	-	0	-	7.19	-182	903	20.8	1.49	-	-
MW08-B	342996.15	6272656.64	3.22	0.08	3.14	19-10-18	2.07	0	1.07	-	-	-	-	-	-	Insufficient water for all samples
MW08-B	342996.15	6272656.64	3.22	-	-	23-05-19	-	-	-	-	-	-	-	-	1.1	Insufficient water for all samples
MW08	342996.15	6272656.64	3.22	0.08	3.14	31-10-19	-	-	-	-	-	-	-	-	-	Dry at 2.04 m
MW08	342996.15	6272656.64	3.22	0.08	3.14	06-02-20	2.05	0	1.09	-	-	-	-	-	-	Gauge only, Dry
MW08	342996.063	6272656.704	3.218	0.08	3.135	01-05-20	2.052	0	1.08	7.37	-141.3	1089	21.4	0.35	-	Clear, with some black roots
MW09	-	-	2.89	-	-	19-11-12	-	0.3	-	-	-	-	-	-	-	
MW09	343030.91	6272672.59	3.01	-	-	30-01-14	-	0.08	-	6.3	-81	953	23.2	-	-	
MW09	343030.91	6272672.59	3.01	-	-	21-06-14	-	0.41	-	7.05	-127	715	20	0.15	-	
MW09	343030.91	6272672.59	3.01	-	-	13-10-14	-	0.475	-	6.73	-128	708	16.9	0.83	-	
MW09	343030.91	6272672.59	3.01	-	-	11-02-15	-	0.207	-	7.1	-160	563	23	0.25	-	
MW09	343030.91	6272672.59	3.01	-	-	09-12-15	-	0.295	-	7.17	-251	702	21.2	0.3	-	
MW09	343030.91	6272672.59	3.01	-	-	12-09-16	-	0.05	-	7.81	-237	483	17 .8	0.93	-	
MW09	343030.91	6272672.59	3.01	-	-	14-02-17	-	0.447	-	7.14	-136.5	750.63	24.1	0.37	-	
MW09	343030.91	6272672.59	3.01	-	-	29-08-17	-	0.35	-	6.96	-283	745	19.4	-	-	
MW09	343030.91	6272672.59	3.01	-	-	10-04-18	-	0.622	-	7.09	-251	728	24.1	-	-	
MW09	343030.91	6272672.59	3.01	-	-	19-10-18	-	-	-	-	-	-	-	-	-	Inacessible
MW09	343030.91	6272672.59	3.01	-	-	23-05-19	-	-	-	-	-	-	-	-	-	Inacessible
MW09	343030.91	6272672.59	3.01	-	-	31-10-19	2.00	0.13	-	-	-	-	-	-	-	PSH present so not sampled
MW09	343030.91	6272672.59	3.01	-	-	06-02-20	-	-	-	-	-	-	-	-	-	Inacessible
MW09	343030.91	6272672.59	3.01	-	-	01-05-20	-	-	-	-	-	-	-	-	-	Inacessible
MW10	-	-	-	-	-	02-04-13	-	0.02	-	6.97	-146	761	26.8	1.25	-	
MW10	343009.73	6272696.86	2.81	-	-	30-01-14	-	0.55	-	6.66	-85	890	26.2	-	-	
MW10	343009.73	6272696.86	2.81	-	-	21-06-14	-	0.5	-	7.02	-135	717	22.1	0.07	-	
MW10	343009.73	6272696.86	2.81	-	-	13-10-14	-	0.446	-	7.37	-148	747	20	0.38	-	
MW10	343009.73	6272696.86	2.81	-	-	11-02-15	-	0.181	-	6.98	-171	846	26.1	0.11	-	
MW10	343009.73	6272696.86	2.81	-	-	09-12-15	-	0.23	-	6.96	-223	740	24.4	0.41	-	
MW10	343009.73	6272696.86	2.81	-	-	12-09-16	-	0.235	-	7.41	-232	605	20.8	0.62	-	
MW10	343009.73	6272696.86	2.81	-	-	14-02-17	-	0.616	-	7.02	-187.3	294.24	26	0.03	-	
MW10	343009.73	6272696.86	2.81	-	-	29-08-17	-	0.11	-	6.7	-289	833	21.3	-	-	
MW10	343009.73	6272696.86	2.81	-	-	10-04-18	-	0.557	-	7.2	-172	927	21.7	-	-	
MW10	343009.73	6272696.86	2.81	0.08	2.73	18-10-18	1.71	0.145	1.14	-	-	-	-	-	-	IP malfunction, PSH measured with bailer
MW10	343009.73	6272696.86	2.81	0.08	2.73	23-05-19	2.23	0.463	0.88	-	-	-	-	-	76.7	PSH present so not sampled
MW10	343009.73	6272696.86	2.81	0.08	2.73	31-10-19	2.13	0.384	0.92	-	-	-	-	-	-	PSH present so not sampled
MW10	343009.73	6272696.86	2.81	0.08	2.73	06-02-20	2.01	0.145	0.84	-	-	-	-	-	-	Gauge only
MW10	343009.661	6272696.901	2.781	0.08	2.683	01-05-20	1.850	0.169	0.97	-	-	-	-	-	-	Gauge only
MW11	-	-	2.67	-	-	19-11-12	-	0	-	7.6	-170.3	793	21.5	0.57	-	-
MW11	343048.97	6272701.3	2.77	-	-	30-01-14	-	0	-	6.8	-96	848	25.2	-	-	-
MW11	343048.97	6272701.3	2.77	-	-	21-06-14	-	0	-	6.94	-120	730	20.5	0.23	-	-
MW11	343048.97	6272701.3	2.77	-	-	13-10-14	-	0	-	6.79	-157	668	18.9	0.14	-	-
MW11	343048.97	6272701.3	2.77	-	-	11-02-15	-	0	-	6.9	-157	774	24.9	0.14	-	-
MW11	343048.97	6272701.3	2.77	-	-	09-12-15	-	0	-	6.98	-214	637	23.3	0.32	-	Abandoned after this date
MW12	-	-	2.6	-	-	19-11-12	-	0	-	7.2	169.3	115	19.6	0.01	-	-
MW12	3403044	6272732	2.71	-	-	30-01-14	-	0	-	-	-	-	-	-	-	-
MW12-B	343044.64	6272731.85	2.68	-	-	21-06-14	-	0	-	7.55	-76	1066	18.8	1.08	-	-
MW12-B	343044.64	6272731.85	2.68	-	-	13-10-14	-	0	-	7.16	-195	2300	17.6	0.17	-	-
MW12-B	343044.64	6272731.85	2.68	-	-	11-02-15	-	0	-	7.14	-194	1247	22.6	0.07	-	-
MW12-B	343044.64	6272731.85	2.68	-	-	09-12-15	-	0	-	7.11	-201	1300	21.5	0.33	-	-
MW12-B	3403044	6272732	2.68	0.085	2.595	18-10-18	1.54	0	1.06	7.1	-165.3	3687	18.3	2.37	-	Clear, faint H2S odour, free flowing
MW12-B	3403044	6272732	2.68	0.085	2.595	23-05-19	1.74	0	0.85	7.17	-155.4	2688	20.9	0.13	1.4	Clear, colourless, odourless
MW12-B	3403044	6272732	2.68	0.085	2.595	31-10-19	1.67	0	0.93	7.06	-117	1688	19.9	0.1	-	-
MW12-B	3403044	6272732	2.68	0.085	2.595	06-02-20	1.74	0	0.86	-	-	-	-	-	-	Gauge only
MW12-B	343044.548	6272731.9	2.681	0.084	2.597	30-04-20	1.643	0	0.95	6.99	120.7	2071	21.9	0.11	-	clear, no odour
MW13	343036.657	6272648.752	2.684	-	-	01-05-20	1.509	0.006	1.18	-	-	-	-	-	-	Gauge only
MW14	343048.648	6272664.038	2.605	-	-	01-05-20	1.513	0.113	1.19							
MW15	342984.96	6272667.61	3.01	-	-	30-01-14	-	0	-	7.09	69	909	28.2	-	-	-
MW15	342984.96	6272667.61	3.01	-	-	21-06-14	-	0	-	6	-19	1025	22.2	0.2	-	-
MW15	342984.96	6272667.61	3.01	-	-	13-10-14	-	0	-	6.96	6	1012	20.6	0.2	-	-
MW15	342984.96	6272667.61	3.01	-	-	11-02-15	-	0	-	6.84	-12	962	27.5	0.13	-	-
MW15	342984.96	6272667.61	3.01	-	-	09-12-15	-	0	-	6.96	47	768	25	0.55	-	-
MW15	342984.96	6272667.61	3.01	0.154	2.856	18-10-18	1.836	0	1.02	-	-	-	-	-	-	Guage only
MW15	342984.96	6272667.61	3.01	0.135	2.875	23-05-19	1.938	0	0.94	6.56	33.5	1261	24.8	1.1	2.8	Clear, colourless, odourless
MW15	342984.96	6272667.61	3.01	0.135	2.875	31-10-19	1.89	0	0.99	6.81	19.1	1302	23.7	0	-	-
MW15	342984.96	6272667.61	3.01	0.135	2.875	06-02-20	1.94	0	0.94	-	-	-	-	-	-	Gauge only
MW15	342984.957	6272667.696	3.004	0.138	2.866	30-04-20	1.820	0	1.05	6.8	-56.3	1412	24.9	6.84	-	
MW16	343014.6	6272713.36	2.62	-	-	02-11-13	-	0	-	-	-	-	-	-	-	-

Appendix B - Table 1 Summary of Field Data

State Transit Authority
Groundwater Monitoring
58 Darley Street, Mona Vale NSW

	Gau\ging Data			Field Parameters						
	Standing Water Level (mBTOC)	PSH thickness (m)	Adjusted Standing Water Level (mAHD)	pH (Field)	Redox (Field)	Electrical Conductivity (Field)	Temperature (Field)	Dissolved Oxyven (Field)	Well headspace PID	Comments
Units				pH units	mV	µS/cm	°C	ppm	ppm	
Laboratory PQL				0.01	0.01	1	0.1	0.01	0.1	

Well ID	Easting	Northing	Ground (mAHD)	TOC (mBGL)	TOC (mAHD)	Date										
MW16	343014.6	6272713.36	2.62	-	-	30-01-14	-	0	-	6.7	-101	835	28.8	-	-	-
MW16	343014.6	6272713.36	2.62	-	-	21-06-14	-	0	-	6.82	-95	822	21.9	1.6	-	-
MW16	343014.6	6272713.36	2.62	-	-	13-10-14	-	0	-	6.28	-105	938	21.5	0.32	-	-
MW16	343014.6	6272713.36	2.62	-	-	11-02-15	-	0	-	6.94	-149	850	28.3	0.23	-	-
MW16	343014.6	6272713.36	2.62	-	-	09-12-15	-	0	-	6.87	-139	801	26.2	1.14	-	-
MW16	343014.6	6272713.36	2.62	0.139	2.481	18-10-18	1.512	0	0.97	6.89	-149.1	759	22.8	0.11	-	clear, faint sweet odour, free flowing
MW16	343014.6	6272713.36	2.62	0.08	2.54	23-05-19	1.603	0	0.94	6.51	-108.3	784	25	0	0.8	Clear, colourless, odourless
MW16	343014.6	6272713.36	-	-	-	31-10-19	1.56	0	-	6.99	-169.4	724	23.5	0.11	-	-
MW16	343014.6	6272713.36	2.62	0.139	2.481	06-02-20	1.602	0	-	-	-	-	-	-	-	Gauge only
MW16	343014.532	6272713.402	2.615	0.079	2.536	30-04-20	1.491	0	1.05	7.00	151.4	904	25.6	0.28	-	clear, slight HC odour
MW17	342916.14	6272773.34	2.656	-	-	02-11-13	-	0	-	-	-	-	-	-	-	-
MW17	342916.14	6272773.34	2.656	-	-	30-01-14	-	0	-	6.69	88	787	25.5	-	-	-
MW17	342916.14	6272773.34	2.656	-	-	21-06-14	-	0	-	6.29	54	792	20.4	0.23	-	-
MW17	342916.14	6272773.34	2.656	-	-	13-10-14	-	0	-	6.77	42	691	20.2	0.33	-	-
MW17	342916.14	6272773.34	2.656	-	-	11-02-15	-	0	-	6.14	30	674	25.1	0.17	-	-
MW17	342916.14	6272773.34	2.656	-	-	09-12-15	-	0	-	7.37	23	656	23.6	1.09	-	-
MW17	342916.14	6272773.34	2.656	0.102	2.554	19-10-18	1.803	0	0.75	7.42	88.6	743	21.9	2.28	-	-
MW17	342916.14	6272773.34	2.656	0.102	2.554	23-05-19	1.884	0	0.67	7.25	27.6	788	23.1	0.09	1.1	Clear, colourless, odourless
MW17	342916.14	6272773.34	2.656	0.102	2.554	31-10-19	1.848	0	0.71	7.2	23.8	940	21.7	0.08	-	-
MW17	342916.14	6272773.34	2.656	0.102	2.554	06-02-20	-	-	-	-	-	-	-	-	-	-
MW17	342916.076	6272773.415	2.687	0.091	2.596	01-05-20	1.747	0	0.85	7.28	19	794	23.2	0.35	-	
MW18	343033.19	6272695.48	-	-	-	09-12-15	-	0.482	-	7.01	-220	785	23.2	0.56	-	-
MW18	343033.19	6272695.48	-	0.074	-	19-10-18	1.738	0.156	-	-	-	-	-	-	-	IP malfunction, PSH measured with bailer
MW18	343033.19	6272695.48	-	0.06	-	23-05-19	2.248	0.442	-	-	-	-	-	-	68	PSH present so not sampled
MW18	343033.19	6272695.48	-	0.06	-	31-10-19	2.054	0.284	-	-	-	-	-	-	-	PSH present so not sampled
MW18	343033.19	6272695.48	-	0.06	-	06-02-20	2.251	0.446	-	-	-	-	-	-	-	Gauge only
MW18	343031.656	6272694.545	2.826	0.053	2.773	01-05-20	1.816	0.104								
MW19	343017.09	6272682.25	3.08	-	-	09-12-15	-	0.265	-	7.12	-246	693	20.9	0.37	-	-
MW19	343017.09	6272682.25	3.08	-	-	12-09-16	-	0.174	-	7.9	-286	674	19.1	1.23	-	-
MW19	343017.09	6272682.25	3.08	-	-	14-02-17	-	0.546	-	7.66	-145	707.84	23.44	2.13	-	-
MW19	343017.09	6272682.25	3.08	-	-	29-08-17	-	0.412	-	6.94	-184	750	20.8	-	-	-
MW19	343017.09	6272682.25	3.08	-	-	10-04-18	-	0.593	-	7	-200	698	20.1	-	-	-
MW19	343017.09	6272682.25	3.08	0.088	2.992	19-10-18	-	-	-	-	-	-	-	-	-	Remediation system prevents sampling
MW19	343017.09	6272682.25	3.08	0.08	3	23-05-19	2.23	0.165	0.91	-	-	-	-	-	49.2	PSH present so not sampled
MW19	343017.09	6272682.25	3.08	0.08	3	31-10-19	2.07	0.29	1.17	-	-	-	-	-	-	PSH present so not sampled
MW19	343017.09	6272682.25	3.08	0.08	3	06-02-20	2.39	0.37	0.92	-	-	-	-	-	-	Gauge only
MW19	343017.022	6272682.364	3.071	0.064	3.007	01-05-20	2.041	0.11	1.06							
MW20	342034.94	6272702.51	2.69	-	-	12-09-16	-	0.189	-	6.99	-252	671	19.7	0.53	-	-
MW20	342034.94	6272702.51	2.69	-	-	14-02-17	-	0.165	-	6.94	-127.8	909.1	24	0.22	-	-
MW20	342034.94	6272702.51	2.69	-	-	29-08-17	-	0.267	-	6.86	-267	776	20.5	-	-	-
MW20	342034.94	6272702.51	2.69	-	-	10-04-18	-	0.617	-	7.25	-257	794	24.6	-	-	-
MW20	342034.94	6272702.51	2.69	0.08	2.61	19-10-18	1.548	0.345	1.35	-	-	-	-	-	-	IP malfunction, PSH measured with bailer
MW20	342034.94	6272702.51	2.69	0.07	2.62	23-05-19	2.122	0.468	0.89	-	-	-	-	-	80.5	PSH present so not sampled
MW20	342034.94	6272702.51	2.69	0.07	2.62	31-10-19	2.053	0.458	0.95	-	-	-	-	-	-	PSH present so not sampled
MW20	342034.94	6272702.51	2.69	0.07	2.62	06-02-20	2.245	0.64	0.91	-	-	-	-	-	-	Gauge only
MW20	343034.233	6272700.868	2.687	0.069	2.618	01-05-20	1.843	0.295	1.02							
MW21	343029.12	6272699.84	2.79	-	-	12-09-16	-	0.342	-	7.13	-227	705	20.9	0.79	-	-
MW21	343029.12	6272699.84	2.79	-	-	14-02-17	-	0.593	-	7.12	-139.5	887.49	24.8	0.2	-	-
MW21	343029.12	6272699.84	2.79	-	-	29-08-17	-	0.205	-	6.91	-187	796	21.7	-	-	-
MW21	343029.12	6272699.84	2.79	-	-	10-04-18	-	0.709	-	7.11	-164	712	25.6	-	-	-
MW21	343029.12	6272699.84	2.79	0.092	2.698	19-10-18	1.68	-	-	-	-	-	-	-	-	Remediation system prevents sampling
MW21	343029.12	6272699.84	2.79	0.08	2.71	23-05-19	1.774	0.354	1.23	-	-	-	-	-	51	PSH present so not sampled
MW21	343029.12	6272699.84	2.79	0.08	2.71	31-10-19	1.986	0.271	0.95	-	-	-	-	-	-	PSH present so not sampled
MW21	343029.12	6272699.84	2.79	0.08	2.71	06-02-20	2.12	0.415	0.93	-	-	-	-	-	-	Gauge only
MW21	343022.694	6272695.845	2.776	0.081	2.695	01-05-20	1.890	0.237								
MW22	343028.28	6272731.99	2.67	-	-	12-09-16	-	0	-	7.03	-170	748	20.7	0.82	-	-
MW22	343028.28	6272731.99	2.67	-	-	14-02-17	-	0	-	6.89	-154.4	901.83	27.7	0.1	-	-
MW22	343028.28	6272731.99	2.67	-	-	29-08-17	-	0	-	7.01	-208	794	21.1	-	-	-
MW22	343028.28	6272731.99	2.67	-	-	10-04-18	-	0	-	7.08	-185	902	27.3	-	-	-
MW22	343028.28	6272731.99	2.67	0.091	2.579	18-10-18	1.61	0	0.97	7.09	-132.4	920	22.6	0.75	-	Sweet odour. Sampled by hydrasleeve
MW22	343028.28	6272731.99	2.67	0.085	2.585	23-05-19	1.70	0	0.88	6.88	-78	950	23.3	0.98	3	Faint HC, slightly turbid
MW22	343028.28	6272731.99	2.67	0.085	2.585	01-11-19	1.66	0	0.92	6.95	-141.4	920	22.6	0.06	-	Nil Turbidity, colourless, odourless
MW22	343028.28	6272731.99	2.67	0.085	2.585	06-02-20	1.72	0	0.86	-	-	-	-	-	-	Gauge only
MW22	343028.216	6272717.102	2.64	0.078	2.562	30-04-20	1.596	0	0.97	7.29	-77.4	633	22.2	3.09	-	Brown, slight odour, medium turbidity
MW23	343105.75	6272731.99	2.5	-	-	29-08-17		0	-	7	-223	817	19.4	-	-	-
MW23	343105.75	6272731.99	2.5	-	-	10-04-18		0	-	6.99	-177	976	15.1	-	-	-
MW23	343105.75	6272731.99	2.5	0.073	2.427	19-10-18	1.339	0	1.09	-	-	-	-	-	-	Guage only
MW23	343105.75	6272731.99	2.5	0.088	2.412	24-05-19	1.44	0	0.97	6.93	-73.3	911	21.1	0	0.3	Clear, colourless, odourless
MW23	343105.75	6272731.99	2.5	0.088	2.412	06-02-20	-	-	-	-	-	-	-	-	-	Inaccessible - Under new bus port
MW23	343105.686	6272732.072	2.45	0.088	2.372	01-05-20	1.341	0	1.03	-	-	-	-	-	-	Guage only
MW24	343094.78	6272718.13	2.54	-	-	29-08-17	-	0	-	7.28	-191	887	20.6	-	-	-
MW24	343094.78	6272718.13	2.54	-	-	10-04-18	-	0	-	7.07	-102	765	25.3	-	-	-
MW24	343094.78	6272718.13	2.54	0.085	2.455	19-10-18	1.37	0	1.09	7.19	-101.1	829	20.5	0.11	-	clear, no odour
MW24	343094.78	6272718.13	2.54	0.089	2.451	24-05-19	1.48	0	0.97	6.48	-51.3	818	23.1	0	0.2	Clear, colourless, odourless
MW24	343094.78	6272718.13	2.54	0.089	2.451	06-02-20	-	-	-	-	-	-	-	-	-	Inaccessible - Under new bus port
MW24	343094.701	6272718.205	2.495	0.089	2.415	01-05-20	1.388	0	1.03	-	-	-	-	-	-	Guage only
MW25	343007.79	6272705.16	2.75	-	-	12-09-16	-	0	-	7.3	-196	692	21	0.53	-	-
MW25	343007.79	6272705.16	2.75	-	-	14-02-17	-	0	-	7.16	-131.9	812.02	25.2	0.09	-	-
MW25	343007.79	6272705.16	2.75	-	-	29-08-17	-	0.005	-	7.13	-198	804	21.5	-	-	-
MW25	343007.79	6272705.16	2.75	-	-	10-04-18	-	0	-	7.24	-197	786	26	-	-	thin film
MW25	343007.79	6272705.16	2.75	0.116	2.634	19-10-18	1.654	0.06	1.03	-	-	-	-	-	-	IP malfunction, PSH measured with bailer
MW25	343007.79	6272705.16	2.75	0.08	2.67	23-05-19	1.905	0.145	0.89	-	-	-	-	-	52.2	PSH present so not sampled
MW25	343007.79	6272705.16	2.75	0.08	2.67	31-10-19	1.78	0.058	0.94	-	-	-	-	-	-	PSH present so not sampled
MW25	343007.79	6272705.16	2.75	0.08	2.67	06-02-20	1.904	0.099	0.85	-	-	-	-	-	-	Gauge only
MW25	343007.702	6272705.231	2.763	0.08	2.666	01-05-20	1.707	0.064	1.01	-	-	-	-	-	-	PSH present so not sampled
MW26	343025.25	6272733.38	2.58	-	-	12-09-16	-	0	-	7.05	-192	711	19.7	0.75	-	-
MW26	343025.25	6272733.38	2.58	-	-	14-02-17	-	0	-	6.94	-139.2	868.81	26.5	0.07	-	-
MW26	343025.25	6272733.38	2.58	-	-	29-08-17	-	0	-	7.02	-207	825	20.5	-	-	-
MW26	343025.25	6272733.38	2.58	-	-	10-04-18	-	0	-	7.01	-110	895	26.8	-	-	-
MW26	343025.25	6272733.38	2.58	0.088	2.492	19-10-18	1.564	0	0.93	7.04	-139.3	908	21	0.1	-	clear, slight H2S odour
MW26	343025.25	6272733.38	2.58	0.078	2.502	23-05-19	1.654	0	0.85	6.98	-142.2	965	24.5	0	1.1	light brown, slightly turbid, odourless
MW26	343025.25	6272733.38	2.58	0.078	2.502	31-10-19	1.623	0	0.88	6.97	-133.3	876	21.1	0.16	-	Clear, colourless, odourless
MW26	343025.25	6272733.38	2.58	0.078	2.502	06-02-20	1.671	0	0.83	-	-	-	-	-	-	Gauge only
MW26	343025.201	6272733.419	2.593	0.079	2.514	30-04-20	1.554	0	0.96	6.98	114.9	964	24.6	0.09	-	Turbid, brown-orange, no sheen, HC Odour
MW27	-	-	-	-	-	06-02-20	-	-	-	-	-	-	-	-	-	Inaccessible - Under new bus port
MW28	-	-	-	-	-	07-02-20	2.085	0.431	-	7.14	126.8	722	20.2	0.04	-	strong odour, turbid, brown
MW28	343055.852	6272672.366	2.554	0.053	2.501	01-05-20	1.431	0	1.07	7.20	-120.5	817	22.4	0.14	-	
MW29	-	-	-	-	-	07-02-20	1.804	0	-	6.94	76.4	926	21.4	0	-	very strong odour
MW29	343054.576	6272633.403	3.125	0.065	3.06	01-05-20	1.939	0	1.12	6.79	-120	858	21.2	0.19	-	
MW30	-	-	-	-	-	07-02-20	1.995	0.291	-	6.19	-92.1	855	19.9	0	-	strong odour, turbid, brown
MW30	343025.122	6272633.926	2.767	0.073	2.694	01-05-20	1.600	0	1.09	7.23	-134.6	726	22.1	0.08	-	
MW31	-	-	-	-	-	07-02-20	2.486	0.797	-	6.65	-132.1	839	20.9	0	-	strong odour, highly turbid, brown, sheen
MW31	343002.044	6272672.118	3.051		2.921	01-05-20	1.903	0.051								
MW32	-	-	-	-	-	07-02-20	2.302	0.497	-	7.17	-173.9	2665	20.2	0	-	odour, highly turbid, brown
MW32	342985.813	6272678.267	3.182	0.134	3.048	30-04-20	2.004	0	1.04	6.65	120	1056	24.3	0.1		Clear
MW33	-	-	-	-	-	07-02-20	1.908	0.123	-	6.92	38.1	921	20.4	0.01	-	strong odour, highly turbid, brown
MW33	342995.208	6272690.515	3.023	0.114	2.909	30-04-20	1.881	0	1.03	6.91	-114.2	793	23.7	0.14		Clear, slight HC odour

Appendix B - Table 1 Summary of Field Data

State Transit Authority
Groundwater Monitoring
58 Darley Street, Mona Vale NSW

							Gau\ging Data			Field Parameters						
							Standing Water Level (mBTOC)	PSH thickness (m)	Adjusted Standing Water Level (mAHD)	pH (Field)	Redox (Field)	Electrical Conductivity (Field)	Temperature (Field)	Dissolved Oxyven (Field)	Well headspace PID	Comments
Units										pH units	mV	µS/cm	°C	ppm	ppm	
Laboratory PQL										0.01	0.01	1	0.1	0.01	0.1	
Well ID	Easting	Northing	Ground (mAHD)	TOC (mBGL)	TOC (mAHD)	Date										
MW35	-	-	-	-	-	07-02-20	1.785	0	-	7.53	-151.8	658	20.9	0.02	-	-
MW35	343043.816	6272719.883	2.592	0.08	2.512	30-04-20	1.512	0	1.00	7.03	65.6	722	20.9	8.62		Clear, no odour
MW36 [1]	-	-	-	-	-	07-02-20	-	-	-	-	-	-	-	-	-	Dry
MW36 [1]	343074.303	6272696.487	2.606	-	-	01-05-20	-	-	-	-	-	-	-	-	-	Dry
MW37 [1]	-	-	-	-	-	07-02-20	-	-	-	-	-	-	-	-	-	Dry
MW37 [1]	343056.214	6272729.368	2.742	-	2.647	01-05-20	1.678	-	-	7.11	113.1	840	20.5	0.08	-	Moderate turbidity, No odour
S01	-	-	-	-	-	07-02-20	-	-	-	7.81	124.9	2769	18.0	3.22	-	Surface water samples - upstream of site
S01	-	-	-	-	2.359	30-04-20	-	-	-	-	-	-	-	-	-	
S02	-	-	-	-	-	07-02-20	-	-	-	7.81	138.2	2941	17.9	3.50	-	Surface water samples - onsite
S02	343076.457	6272699.985	2.460	-	2.359	30-04-20	-	-	-	-	-	-	-	-	-	Dry
S03	-	-	-	-	-	07-02-20	-	-	-	7.97	137.1	2731	17.3	3.70	-	Surface water sample - downstream of site
S03	-	-	-	-	-	30-04-20	-	-	-	-	-	-	-	-	-	

TOC = Top of Casing
mAHD = metres above the Australian Height Datum
mTOC = metres below Top of Casing
mBGL = metres below ground level
1. Wells installed adjacent to underground service trench
2. Result outside of likely range, possible instrument or transcription error.

			Heavy Metals								TPH		TRH				BTEX						PAHs		
			Arsenic - Dissolved	Cadmium - Dissloved	Chromium - Dissolved	Copper - Dissolved	Lead - Dissolved	Mercury - Dissolved	Nickel - Dissolved	Zinc - Dissolved	TRH C6-C9	TRH C10-C36	F1 TRH C6-C10	F2 TRH >C10-C16	F3 TRH >C16-C34	F4 TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-xylene	Total xylene	Naphthalene	Benzo(a)pyrene	Total PAH
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Laboratory PQL			1	0.1	1	1	1	0.1	1	1	10	125	10	50	100	100	1	1	1	2	1	3	1	1	0.1
NEPM Groundwater HSLs for Vapour Intrusion (Sand - 2m - <4m)													6000	NL			5000	NL	NL	NL	NL	NL	NL		
NEPM GIL Drinking Water			10	2	50	2000	10	1	20								1	800	300			600			
NEPM GIL Marine Waters			13*	0.7	4.4	1.3	4.4	0.1	7	15							500			200*	350*		50		
ANZG 2018 - Marine (95% species protection)			13*	5.5	4.4	1.3	4.4	0.4	70	15							700	180	5	200*	350*		70		
Lab Report.	Well ID	Date																							
67411	MW01	10-01-12	11	<0.1	<1	<1	<1	<0.05	<1	<1	<10	4900	-	-	-	-	<1	<1	<1	<2	<1	<3	33	<1	68
77958	MW01	24-08-12	-	-	-	-	-	-	-	-	<10	1280	-	-	-	-	<1	<1	<1	<2	<1	<3	3	<1	13
203543	MW01	19-10-18	44	<0.1	<1	<1	<1	<0.05	<1	5	<10	3600	29	1900	1600	<100	<1	<1	<1	<2	<1	-	16	-	-
218279	MW01	23-05-19	11	<0.1	<1	<1	<1	<0.05	<1	4	<10	680	25	440	220	<100	<1	<1	<1	<2	<1	<3	3	-	-
229899	MW01	31-10-19	23	<0.1	<1	<1	<1	<0.05	<1	4	<10	510	<10	310	190	<100	<1	<1	<1	<2	<1	<3	<1	-	-
67411	MW02	10-01-12	41	<0.1	<1	<1	<1	<0.05	2	<1	<10	<250	-	-	-	-	<1	<1	<1	<2	<1	<3	<1	<1	ND
77958	MW02	24-08-12	-	-	-	-	-	-	-	-	<10	<250	-	-	-	-	<1	<1	<1	<2	<1	<3	<1	<1	ND
218279	MW02	23-05-19	18	<0.1	<1	<1	<1	<0.05	<1	3	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
229899	MW02	31-10-19	11	<0.1	<1	<1	<1	<0.05	<1	3	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW02	01-05-20	14	-	-	-	-	-	-	-	<10	61	<10	79	<100	<100	<1	<1	<1	<2	<1	<3	15	-	-
67411	MW03	10-01-12	5	<0.1	<1	<1	<1	<0.05	2	<1	<10	<250	-	-	-	-	<1	<1	<1	<2	<1	<3	<1	<1	ND
77958	MW03	24-08-12	-	-	-	-	-	-	-	-	<10	<250	-	-	-	-	<1	<1	<1	<2	<1	<3	<1	<1	ND
203543	MW03	19-10-18	4	<0.1	<1	<1	<1	<0.05	1	7	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	-	<1	-	-
218279	MW03	23-05-19	3	<0.1	<1	<1	<1	<0.05	1	4	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
67411	MW04	10-01-12	4	<0.1	<1	<1	<1	<0.05	<1	<1	<10	<250	-	-	-	-	<1	<1	<1	<2	<1	<3	<1	<1	ND
77958	MW04	24-08-12	-	-	-	-	-	-	-	-	<10	<250	-	-	-	-	<1	<1	<1	<2	<1	<3	<1	<1	ND
-	MW05	24-08-12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
77958	MW06	24-08-12	-	-	-	-	-	-	-	-	<10	<250	-	-	-	-	<1	<1	<1	<2	<1	<3	<1	<1	ND
77958	MW07	24-08-12	-	-	-	-	-	-	-	-	41	2110	-	-	-	-	4	<1	<1	<2	<1	<3	140	<1	156
203543	MW07	19-10-18	74	<0.1	<1	<1	<1	<0.05	<1	5	16	4800	38	2700	2100	<100	<1	<1	<1	<2	<1	-	44	-	-
218279	MW07	23-05-19	98	<0.1	<1	<1	<1	<0.05	<1	3	<10	1220	33	720	450	<100	<1	<1	<1	<2	<1	<3	45	-	-
229899	MW07	31-10-19	65	<0.1	<1	<1	<1	<0.05	<1	3	<10	1310	<10	700	570	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW07	01-05-20	66	-	-	-	-	-	-	-	12	8,300	43	4,400	3,900	<100	<1	<1	<1	<2	<1	<3	42	-	-
81841	MW08	19-11-12	-	-	-	-	-	-	-	-	<10	1070	-	-	-	-	<1	<1	<1	<2	<1	<3	8	<1	16
112083	MW08	21-06-14	5	<0.1	2	5	3	<0.05	4	16	<10	570	12	290	220	<100	<1	<1	<1	<2	<1	<3	1	-	-
117589	MW08	13-10-14	2	<0.1	<1	<1	<1	<0.05	2	3	<10	<125	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
123376	MW08	11-02-15	5	<0.1	<1	<1	<1	<0.05	1	2	<10	495	<10	<50	410	<100	<1	5	<1	<2	<1	<3	<1	-	-
138949	MW08	09-12-15	5	<0.1	<1	<1	<1	<0.05	<1	<1	<10	290	<10	150	200	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW08	01-05-20	12	-	-	-	-	-	-	-	<10	6,390	<10	2,100	4,400	<100	<1	<1	<1	<2	<1	<3	4	-	-
104302	MW09	30-01-14	6	<0.1	<1	<1	<1	<0.05	13	3	27	44600	88	22000	21000	<100	<1	<1	<1	<2	<1	<3	600	-	-
112083	MW09	21-06-14	42	<0.1	<1	<1	<1	<0.05	5	5	38	19150	64	9500	9000	<100	<1	<1	<1	<2	<1	<3	78	-	-
117589	MW09	13-10-14	64	<0.1	<1	<1	<1	<0.05	4	7	27	48850	51	24000	24000	<100	1	<1	<1	<2	<1	<3	89	-	-
123376	MW09	11-02-15	53	<0.1	<1	<1	<1	<0.05	4	1	38	174340	80	85000	81000	<100	<1	<1	<1	<2	<1	<3	180	-	-
138949	MW09	09-12-15	67	<0.1	<1	<1	<1	<0.05	1	<1	22	6600	55	4100	2600	<100	<1	<1	<1	<2	<1	<3	150	-	-
153522	MW09	12-09-16	57	<0.1	<1	<1	<1	<0.05	<1	<1	19	13400	66	6100	7200	<100	<1	<1	<1	<2	<1	<3	190	-	-
161939	MW09	14-02-17	54	<0.1	<1	<1	<1	<0.05	<1	3	25	56100	68	30000	26000	<100	<1	<1	<1	<2	<1	<3	120	-	-
174472	MW09	29-08-17	26	<0.1	<1	<1	<1	<0.05	1	1	16	9200	39	4600	4600	<100	<1	<1	<1	<2	<1	<3	86	-	-
189182	MW09	10-04-18	36	<0.1	<1	<1	<1	<0.05	3	<1	33	29400	100	17000	13000	<100	<1	<1	<1	<2	<1	<3	120	-	-
81841	MW10	02-04-13	-	-	-	-	-	-	-	-	<10	5650	-	-	-	-	1	<1	<1	<2	<1	<3	46	<1	92
104302	MW10	30-01-14	4	<0.1	<1	<1	<1	<0.05	6	4	22	17980	65	8000	9500	<100	2	<1	<1	<2	<1	<3	190	-	-
112083	MW10	21-06-14	25	<0.1	<1	<1	<1	<0.05	1	5	23	36620	41	19000	17000	<100	<1	<1	<1	<2	<1	<3	86	-	-
117589	MW10	13-10-14	30	<0.1	<1	<1	<1	<0.05	2	2	21	36550	43	19000	17000	<100	1	<1	<1	<2	<1	<3	83	-	-
123376	MW10	11-02-15	38	<0.1	<1	<1	<1	<0.05	1	2	15	18950	46	8900	9500	<100	1	<1	<1	<2	<1	<3	120	-	-
138949	MW10	09-12-15	35	<0.1	<1	<1	<1	<0.05	1	2	11	12400	37	6900	5900	<100	<1	<1	<1	<2	<1	<3	68	-	-
153522	MW10	12-09-16	31	<0.1	<1	<1	<1	<0.05	1	<1	15	8500	47	3800	4800	<100	<1	<1	<1	<2	<1	<3	120	-	-
161939	MW10	14-02-17	51	<0.1	<1	<1	<1	<0.05	<1	1	<10	28900	<10	14000	13000	<100	<1	<1	<1	<2	<1	<3	140	-	-
174472	MW10	29-08-17	39	<0.1	<1	<1	<1	<0.05	1	1	28	9300	67	4600	4600	<100	<1	<1	<1	<2	<1	<3	140	-	-
189182	MW10	10-04-18	50	<0.1	<1	<1	<1	<0.05	1	1	10	76000	53	44000	35000	<100	<1	<1	<1	<2	<1	<3	94	-	-
229899	MW10	31-10-19	32	<0.1	<1	<1	<1	<0.05	2	3	<10	690	<10	360	300	<100	<1	<1	<1	<2	<1	<3	<1	-	-
81841	MW11	19-11-12	-	-	-	-	-	-	-	-	<10	490	-	-	-	-	<1	<1	<1	<2	<1	<3	18	<1	22
104302	MW11	30-01-14	10	<0.1	<1	<1	<1	<0.05	5	4	<10	1080	27	720	400	<100	<1	<1	<1	<2	<1	<3	<1	-	-
112083	MW11	21-06-14	100	<0.1	<1	<1	<1	<0.05	1	7	10	1280	28	770	380	<100	<1	<1	<1	<2	<1	<3	13	-	-
117589	MW11	13-10-14	120	<0.1	<1	<1	<1	<0.05	5	5	29	408	78	150	200	<100	<1	<1	<1	<2	<1	<3	18	-	-
123376	MW11	11-02-15	220	<0.1	<1	<1	<1	<0.05	2	2	<10	1310	42	810	450	<100	<1	<1	<1	<2	<1	<3	<1	-	-
138949	MW11	09-12-15	140	<0.1	<1	<1	<1	<0.05	1	<1	<10	1210	41	960	280	<100	<1	<1	<1	<2	<1	<3	5	-	-
81841	MW12	19-11-12	-	-	-	-	-	-	-	-	<10	<250	-	-	-	-	<1	<1	<1	<2	<1	<3	<1	<1	ND
104302	MW12	30-01-14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
112083	MW12	21-06-14	11	<0.1	1	1	2	<0.05	1	11	22	<125	25	<50	<100	<100	<1	2	<1	<2	<1	<3	<1	-	-
117589	MW12	13-10-14	6	<0.1	<1	<1	<1	<0.05	<1	<1	<10	<125	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
123376	MW12	11-02-15	6	<0.1	<1	<1	<1	<0.05	2	2	<10	<125	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-

			Heavy Metals								TPH		TRH				BTEX						PAHs		
			Arsenic - Dissolved	Cadmium - Dissolved	Chromium - Dissolved	Copper - Dissolved	Lead - Dissolved	Mercury - Dissolved	Nickel - Dissolved	Zinc - Dissolved	TRH C6-C9	TRH C10-C36	F1 TRH C6-C10	F2 TRH >C10-C16	F3 TRH >C16-C34	F4 TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-xylene	Total xylene	Naphthalene	Benzo(a)pyrene	Total PAH
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Laboratory PQL			1	0.1	1	1	1	0.1	1	1	10	125	10	50	100	100	1	1	1	2	1	3	1	1	0.1
NEPM Groundwater HSLs for Vapour Intrusion (Sand - 2m - <4m)													6000	NL			5000	NL	NL	NL	NL	NL	NL		
NEPM GIL Drinking Water			10	2	50	2000	10	1	20								1	800	300			600			
NEPM GIL Marine Waters			13*	0.7	4.4	1.3	4.4	0.1	7	15							500			200*	350*		50		
ANZG 2018 - Marine (95% species protection)			13*	5.5	4.4	1.3	4.4	0.4	70	15							700	180	5	200*	350*		70		
Lab Report.	Well ID	Date																							
138949	MW12	09-12-15	5	<0.1	<1	<1	<1	<0.05	1	1	<10	<100	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
203543	MW12	18-10-18	3	<0.1	<1	<1	<1	<0.05	<1	4	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
218279	MW12	23-05-19	2	<0.1	<1	<1	<1	<0.05	<1	5	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
229899	MW12	31-10-19	3	<0.1	<1	<1	<1	<0.05	<1	6	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW12	30-04-20	8	-	-	-	-	-	-	-	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
100305	MW15	02-11-13	<1	0.1	2	8	2	<0.05	2	110	<10	680	<10	290	380	<100	<1	<1	<1	<2	<1	<3	<1	<1	2.3
104302	MW15	30-01-14	<1	<0.1	<1	1	<1	<0.05	14	11	<10	470	<10	290	200	<100	<1	<1	<1	<2	<1	<3	16	-	-
112083	MW15	21-06-14	<1	<0.1	<1	1	<1	<0.05	3	7	<10	245	<10	58	130	<100	<1	<1	<1	<2	<1	<3	<1	-	-
117589	MW15	13-10-14	<1	<0.1	<1	<1	<1	<0.05	3	2	<10	<125	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
123376	MW15	11-02-15	<1	<0.1	<1	1	<1	<0.05	1	3	<10	<125	<10	<50	120	<100	<1	<1	<1	<2	<1	<3	<1	-	-
138949	MW15	09-12-15	<1	<0.1	<1	1	<1	<0.05	<1	<1	<10	<100	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
218279	MW15	23-05-19	<1	<0.1	<1	<1	<1	<0.05	<1	3	<10	1558	<10	170	1400	<100	<1	<1	<1	<2	<1	<3	<1	-	-
229899	MW15	31-10-19	<1	<0.1	<1	<1	<1	<0.05	<1	4	<10	2400	<10	140	2,300	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW15	30-04-20	<1	-	-	-	-	-	-	-	<10	2,400	<10	93	2,300	<100	<1	<1	<1	<2	<1	<3	<1	-	-
100305	MW16	02-11-13	17	<0.1	<1	<1	1	<0.05	15	25	15	3890	17	1500	2300	<100	1	<1	<1	<2	<1	<3	<1	<1	1.4
104302	MW16	30-01-14	8	<0.1	<1	<1	<1	<0.05	21	8	15	4640	33	1700	2900	<100	<1	<1	<1	<2	<1	<3	34	-	-
112083	MW16	21-06-14	37	<0.1	<1	<1	<1	<0.05	10	5	27	3300	37	1300	1900	<100	<1	<1	<1	<2	<1	<3	4	-	-
117589	MW16	13-10-14	33	<0.1	<1	<1	<1	<0.05	11	22	22	2740	39	810	1900	<100	<1	<1	<1	<2	<1	<3	3	-	-
123376	MW16	11-02-15	46	<0.1	<1	<1	<1	<0.05	14	2	19	2010	34	890	990	<100	<1	<1	<1	<2	<1	<3	1	-	-
138949	MW16	09-12-15	42	<0.1	2	<1	<1	<0.05	9	1	12	2470	19	1200	1300	<100	<1	<1	<1	<2	<1	<3	2	-	-
203543	MW16	18-10-18	41	<0.1	<1	<1	<1	<0.05	8	4	27	1340	41	570	870	<100	<1	<1	<1	<2	<1	<3	<1	-	-
218279	MW16	23-05-19	60	<0.1	<1	<1	<1	<0.05	7	3	<10	2030	<10	950	1100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
229899	MW16	31-10-19	71	<0.1	<1	<1	<1	<0.05	6	4	23	2350	34	990	1,300	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW16	30-04-20	84	-	-	-	-	-	-	-	22	3,810	39	1,500	2,300	<100	<1	<1	<1	<2	<1	<3	<1	-	-
100305	MW17	02-11-13	3	<0.1	1	2	<1	<0.05	3	9	<10	<125	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	<1	-
104302	MW17	30-01-14	2	<0.1	<1	2	<1	<0.05	9	8	<10	<125	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
112083	MW17	21-06-14	2	<0.1	<1	3	1	<0.05	7	43	<10	2540	<10	1200	1300	<100	<1	<1	<1	<2	<1	<3	5	-	-
117589	MW17	13-10-14	2	<0.1	<1	3	<1	<0.05	2	16	<10	<125	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
123376	MW17	11-02-15	2	<0.1	<1	3	<1	<0.05	9	27	<10	<125	<10	<50	100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
138949	MW17	09-12-15	2	<0.1	<1	2	<1	<0.05	<1	3	<10	<100	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	1	-	-
203543	MW17	19-10-18	2	<0.1	<1	1	<1	<0.05	<1	4	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	>1	-	-
218279	MW17	23-05-19	2	<0.1	<1	<1	<1	<0.05	<1	3	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
229899	MW17	31-10-19	2	<0.1	<1	1	<1	<0.05	<1	4	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW17	01-05-20	2	-	-	-	-	-	-	-	<10	180	<10	92	110	<100	<1	<1	<1	<2	<1	<3	3	-	-
138949	MW18	09-12-15	27	<0.1	<1	<1	<1	<0.05	3	2	<10	9000	<10	5400	3900	<100	<1	<1	<1	<2	<1	<3	16	-	-
138949	MW19	09-12-15	36	<0.1	<1	<1	<1	<0.05	<1	2	<10	4100	18	2700	1600	<100	<1	1	1	<2	1	<3	53	-	-
153522	MW19	12-09-16	37	<0.1	<1	<1	<1	<0.05	<1	<1	<10	1680	27	500	1200	<100	<1	<1	<1	<2	<1	<3	44	-	-
161939	MW19	14-02-17	28	<0.1	<1	<1	<1	<0.05	<1	2	20	65000	63	35000	30000	<100	<1	<1	1	<2	<1	<3	100	-	-
174472	MW19	29-08-17	25	<0.1	<1	<1	<1	0.2	<1	1	18	10700	50	5300	5400	<100	<1	<1	<1	<2	<1	<3	74	-	-
189182	MW19	10-04-18	26	<0.1	<1	<1	<1	<0.05	<1	2	23	11800	64	6900	5200	<100	<1	<1	<1	<2	<1	<3	89	-	-
153522	MW20	12-09-16	36	<0.1	<1	<1	<1	<0.05	3	<1	10	43720	40	22000	22000	<100	<1	<1	<1	<2	<1	<3	140	-	-
161939	MW20	14-02-17	59	<0.1	<1	<1	<1	<0.05	3	1	23	7600	49	4100	3400	<100	<1	<1	<1	<2	<1	<3	82	-	-
174472	MW20	29-08-17	35	<0.1	<1	<1	<1	<0.05	2	1	37	21400	78	12000	9800	<100	<1	<1	<1	<2	<1	<3	130	-	-
189182	MW20	10-04-18	45	<0.1	<1	<1	<1	<0.05	2	<1	27	46000	87	27000	20000	<100	<1	<1	<1	<2	<1	<3	200	-	-
153522	MW21	12-09-16	17	<0.1	<1	<1	<1	<0.05	3	<1	<10	3440	25	1500	1900	<100	<1	<1	<1	<2	<1	<3	94	-	-
161939	MW21	14-02-17	14	<0.1	<1	<1	<1	<0.05	3	3	<10	426840	22	230000	200000	280	<1	<1	<1	<2	<1	<3	130	-	-
174472	MW21	29-08-17	17	<0.1	<1	<1	<1	<0.05	3	1	16	12800	33	6300	6500	<100	<1	<1	<1	<2	<1	<3	47	-	-
189182	MW21	10-04-18	22	<0.1	<1	<1	<1	<0.05	2	1	<10	43000	50	25000	20000	<100	<1	<1	<1	<2	<1	<3	94	-	-
153522	MW22	12-09-16	40	<0.1	<1	<1	<1	<0.05	3	2	<10	680	<10	250	430	<100	<1	<1	<1	<2	<1	<3	<1	-	-
161939	MW22	14-02-17	66	<0.1	<1	<1	<1	<0.05	2	3	11	690	20	390	270	<100	<1	<1	<1	<2	<1	<3	8	-	-
174472	MW22	29-08-17	60	<0.1	<1	<1	<1	<0.05	2	2	16	690	35	390	280	<100	<1	<1	<1	<2	<1	<3	12	-	-
189182	MW22	10-04-18	37	<0.1	<1	<1	<1	<0.05	2	1	<10	300	<10	220	<100	<100	<1	<1	<1	<2	<1	<3	2	-	-
203543	MW22	18-10-18	57	<0.1	<1	<1	<1	<0.05	3	16	11	1230	28	470	710	<100	<1	<1	<1	<2	<1	<3	7	-	-
218279	MW22	23-05-19	49	<0.1	<1	<1	<1	<0.05	3	5	<10	870	26	510	360	<100	<1	<1	<1	<2	<1	<3	2	-	-
242120	MW22	30-04-20	23	-	-	-	-	-	-	-	<10	270	<10	190	140	<100	<1	<1	<1	<2	<1	<3	<1	-	-
174472	MW23	29-08-17	4	<0.1	<1	<1	<1	<0.05	<1	2	<10	100	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
189182	MW23	10-04-18	3	<0.1	<1	<1	<1	<0.05	<1	2	<10	<100	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
218279	MW23	23-05-19	2	<0.1	<1	<1	<1	<0.05	<1	5	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
174472	MW24	29-08-17	6	<0.1	<1	<1	<1	<0.05	<1	1	<10	100	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
189182	MW24	10-04-18	6	<0.1	<1	<1	<1	<0.05	<1	<1	<10	<100	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
203543	MW24	19-10-18	4	<0.1	<1	<1	<1	<0.05	<1	7	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-

			Heavy Metals								TPH		TRH				BTEX						PAHs		
			Arsenic - Dissolved	Cadmium - Dissloved	Chromium - Dissolved	Copper - Dissolved	Lead - Dissolved	Mercury - Dissolved	Nickel - Dissolved	Zinc - Dissolved	TRH C6-C9	TRH C10-C36	F1 TRH C6-C10	F2 TRH >C10-C16	F3 TRH >C16-C34	F4 TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-xylene	Total xylene	Naphthalene	Benzo(a)pyrene	Total PAH
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Laboratory PQL			1	0.1	1	1	1	0.1	1	1	10	125	10	50	100	100	1	1	1	2	1	3	1	1	0.1
NEPM Groundwater HSLs for Vapour Intrusion (Sand - 2m - <4m)													6000	NL			5000	NL	NL	NL	NL	NL	NL		
NEPM GIL Drinking Water			10	2	50	2000	10	1	20								1	800	300			600			
NEPM GIL Marine Waters			13*	0.7	4.4	1.3	4.4	0.1	7	15							500			200*	350*		50		
ANZG 2018 - Marine (95% species protection)			13*	5.5	4.4	1.3	4.4	0.4	70	15							700	180	5	200*	350*		70		
Lab Report.	Well ID	Date																							
218279	MW24	23-05-19	4	<0.1	<1	<1	<1	<0.05	<1	4	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1		
153522	MW25	12-09-16	8	<0.1	<1	<1	<1	<0.05	<1	<1	<10	380	<10	97	320	<100	<1	<1	<1	<2	<1	<3	1	-	-
161939	MW25	14-02-17	8	<0.1	<1	<1	<1	<0.05	<1	1	<10	450	<10	150	290	<100	<1	<1	<1	<2	<1	<3	<1	-	-
174472	MW25	29-08-17	8	<0.1	<1	<1	<1	<0.05	<1	2	<10	1390	<10	690	710	<100	<1	<1	<1	<2	<1	<3	6	-	-
189182	MW25	10-04-18	11	<0.1	<1	<1	<1	<0.05	1	1	12	4700	20	2700	2100	<100	<1	<1	<1	<2	<1	<3	30	-	-
153522	MW26	12-09-16	47	<0.1	<1	<1	<1	<0.05	2	2	<10	407	<10	150	270	<100	<1	<1	<1	<2	<1	<3	<1	-	-
161939	MW26	14-02-17	41	<0.1	<1	<1	<1	<0.05	1	1	<10	297	<10	170	110	<100	<1	<1	<1	<2	<1	<3	<1	-	-
174472	MW26	29-08-17	48	<0.1	<1	<1	<1	<0.05	2	2	12	500	23	290	210	<100	<1	<1	<1	<2	<1	<3	<1	-	-
189182	MW26	10-04-18	46	<0.1	<1	<1	<1	<0.05	1	<1	10	300	15	220	<100	<100	<1	<1	<1	<2	<1	<3	1	-	-
203543	MW26	19-10-18	40	<0.1	<1	<1	<1	<0.05	2	3	12	560	28	260	260	240	<1	<1	<1	<2	<1	<3	<1	-	-
218279	MW26	23-05-19	46	<0.1	<1	<1	<1	<0.05	2	3	<10	460	<10	280	180	<100	<1	<1	<1	<2	<1	<3	<1	-	-
229899	MW26	31-10-19	42	<0.1	<1	<1	<1	<0.05	2	2	<10	370	<10	290	250	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW26	30-04-20	46	-	-	-	-	-	-	-	<10	370	<10	160	140	<100	<1	<1	<1	<2	<1	<3	<1	-	-
236498	MW28	07-02-20	28	<0.1	<1	<1	<1	<0.05	2	3	<10	1830	<10	830	970	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW28	01-05-20	20	-	-	-	-	-	-	-	<10	202	<10	130	<100	<100	<1	<1	<1	<2	<1	<3	1	-	-
236498	MW29	07-02-20	8	<0.1	<1	<1	<1	<0.05	2	1	<10	8100000	<10	4000000	3000000	20000	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW29	01-05-20	120	-	-	-	-	-	-	-	34	17,500	78	10,000	7,000	<100	<1	<1	<1	<2	<1	<3	21	-	-
236498	MW30	07-02-20	7	<0.1	<1	<1	<1	<0.05	<1	<1	20	51110	67	28000	22000	110	<1	<1	<1	<2	1	1	4	-	-
242120	MW30	01-05-20	20	-	-	-	-	-	-	-	<10	3,380	<10	1,800	1,600	<100	<1	<1	<1	<2	<1	<3	<1	-	-
236498	MW31	07-02-20	4	<0.1	<1	<1	<1	<0.05	<1	<1	<10	2600000	26	2000000	1000000	<10,000	<1	<1	<1	<2	<1	<3	210	-	-
236498	MW32	07-02-20	1	<0.1	<1	2	<1	<0.05	<1	1	<10	11420	<10	5100	6200	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW32	30-04-20	2	-	-	-	-	-	-	-	<10	9,000	<10	3,500	5,700	<100	<1	<1	<1	<2	<1	<3	<1	-	-
236498	MW33	07-02-20	2	<0.1	<1	1	<1	<0.05	<1	2	<10	101110	<10	52000	47000	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW33	30-04-20	24	-	-	-	-	-	-	-	<10	5,750	<10	2,100	3,800	<100	<1	<1	<1	<2	<1	<3	4	-	-
242120	MW35	30-04-20	6	-	-	-	-	-	-	-	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	MW37	30-04-20	5	-	-	-	-	-	-	-	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-

			Heavy Metals								TPH		TRH				BTEX						PAHs		
			Arsenic - Dissolved	Cadmium - Dissolved	Chromium - Dissolved	Copper - Dissolved	Lead - Dissolved	Mercury - Dissolved	Nickel - Dissolved	Zinc - Dissolved	TRH C6-C9	TRH C10-C36	F1 TRH C6-C10	F2 TRH >C10-C16	F3 TRH >C16-C34	F4 TRH >C34-C40	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-xylene	Total xylene	Naphthalene	Benzo(a)pyrene	Total PAH
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Laboratory PQL			1	0.1	1	1	1	0.1	1	1	10	125	10	50	100	100	1	1	1	2	1	3	1	1	0.1
NEPM Groundwater HSLs for Vapour Intrusion (Sand - 2m - <4m)													6000	NL			5000	NL	NL	NL	NL	NL	NL		
NEPM GIL Drinking Water			10	2	50	2000	10	1	20								1	800	300			600			
NEPM GIL Marine Waters			13*	0.7	4.4	1.3	4.4	0.1	7	15							500			200*	350*		50		
ANZECC 2018 - Marine (95% species protection)			13*	5.5	4.4	1.3	4.4	0.4	70	15							700	180	5	200*	350*		70		
Lab Report.	Well ID	Date																							
236498	S01	07-02-20	3	<0.1	2	10	1	<0.5	<1	42	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
242120	S01	01-05-20	1	<0.1	<1	9	2	<0.05	4	46	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
236489	S02	07-02-20	3	<0.1	2	11	1	<0.5	<1	40	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
236498	S03	07-02-20	2	<0.1	1	10	<1	<0.05	<1	40	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-
212420	S03	01-05-20	1	<0.1	<1	11	1	<0.05	5	62	<10	<250	<10	<50	<100	<100	<1	<1	<1	<2	<1	<3	<1	-	-

			Miscellaneous										MNA Indicators (mg/L)														
			Electrical Conductivity (Lab)	Electrical Conductivity (field)	Electrical Conductivity (lab : field) ratio	pH (Lab)	pH (Field)	pH (lab : field) ratio	Total Dissolved Solids	EC:TDS Ratio	Dissolved Iron	Disolved Manganese	Methane	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Sodium (Filtered)	Ammonia (as N)	Bicarbonate Alkalinity as CaCO3	Carbonate alkalinity as CaCO3	Hydroxide	Chloride	Fluoride	Sulfate	Nitrate (as N)	Nitrite (as N)	Phosphate (as P)	Alkalinity (total)
Units			µS/cm	µS/cm	µS/cm	pH Units	pH Units	%	mg/L		mg/L	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Laboratory PQL			2	0.1		0.1	0.01	0.1	2		0.05	0.05	5	0.1	0.1	0.2	0.1	0.01	5	1	5	1	0.02	1	0.005	0.005	0.005	5
NEPM Groundwater HILs for Drinking Water			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	500	11.3	0.91	-	-
ANZG 2018 - Marine (95% species protection)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.91	-	-	-	-	-	-	2.4	-	-	-
NEPM GIL Marine Waters			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.91	-	-	-	-	-	-	0.16	-	-	-
Lab Report.	Well ID	Date																										
242120	MW12	30-04-20	1,700	2071	0.820859	7.3	6.99	1.044349	1100	1.55	3	0.069	25	160	41	9.1	180	-	440	<5	<5	270	0.5	80	0.02	-	<0.005	440
242120	MW15	30-04-20	1,300	1412	0.92068	7.1	6.8	1.044118	870	1.49	0.05	0.28	30	170	25	7.1	100	-	430	<5	<5	160	<0.1	80	0.13	-	0.008	430
242120	MW16	30-04-20	810	904	0.896018	7.2	7	1.028571	470	1.72	14	0.03	1500	130	14	5.4	19	-	420	<5	<5	23	0.3	<1	<0.005	-	<0.005	420
242120	MW22	30-04-20	690	633	1.090047	7	7.29	0.960219	410	1.68	5	0.15	1300	110	11	4.3	21	-	360	<5	<5	24	0.3	6	<0.005	-	<0.005	360
242120	MW26	30-04-20	890	964	0.923237	7	6.98	1.002865	540	1.65	9	0.037	440	150	16	5.5	32	-	570	<5	<5	37	0.4	13	<0.005	-	<0.005	570
242120	MW02	01-05-20	690	738	0.934959	7.2	7.13	1.009818	380	1.815	5.5	0.021	270	110	10	7	23	-	360	<5	<5	22	0.4	9	<0.005	-	<0.005	360
242120	MW07	01-05-20	850	222	3.828829	7	6.84	1.023392	490	1.73	17	0.034	3200	170	7.1	4.5	18	-	550	<5	<5	25	0.3	3	<0.005	-	<0.005	550
242120	MW08	01-05-20	1100	1089	1.010101	7.3	7.37	0.990502	670	1.64	5.1	0.25	310	180	14	3	75	-	400	<5	<5	100	0.3	26	0.055	-	<0.005	400
242120	MW17	01-05-20	810	794	1.020151	7.5	7.28	1.03022	510	1.59	<10	0.099	<5	140	13	3.8	28	-	320	<5	<5	47	0.1	35	1.5	-	0.11	320
242120	MW28	01-05-20	810	720	1.125	7.2	7.2	1	500	1.62	5.7	0.04	13	140	16	3.3	17	-	410	<5	<5	22	0.4	22	<0.005	-	<0.005	410
242120	MW29	01-05-20	860	858	1.002331	6.8	6.79	1.001473	510	1.69	23	0.068	4400	170	7	4.4	20	-	480	<5	<5	23	0.2	<1	<0.005	-	<0.005	480
242120	MW30	01-05-20	760	726	1.046832	7.3	7.23	1.009682	440	1.73	4.4	0.055	2000	110	12	5	37	-	340	<5	<5	50	0.3	23	<0.005	-	<0.005	340
242120	MW32	01-05-20	1100	1056	1.041667	7	6.65	1.052632	760	1.45	0.74	0.28	32	190	22	3.9	43	-	700	<5	<5	79	0.2	58	0.28	-	0.008	700
242120	MW33	01-05-20	740	793	0.933165	7.1	6.91	1.027496	460	1.61	16	0.13	980	130	13	2.3	12	-	410	<5	<5	16	0.2	2	<0.005	-	<0.005	410
242120	MW35	01-05-20	1100	722	1.523546	7.3	7.03	1.038407	670	1.64	75	0.049	70	150	21	6.7	68	-	430	<5	<5	120	0.4	32	<0.005	-	<0.005	430
242120	MW37	01-05-20	880	840	1.047619	7.5	7.11	1.054852	480	1.83	3.3	0.098	1600	96	16	5.7	73	-	340	<5	<5	80	0.6	9	0.04	-	<0.005	340

			Cations (milliequivalents)				Anions (milliequivalents)								Ionic Balance and Ratios							
			Calcium	Magnesium	Potassium	Sodium	Bicarbonate	Carbonate	Hydroxide	Chloride	Fluoride	Sulfate	Nitrate	Phosphate	Sum Cations	Sum Anions	Ionic Balance	Alkalinity:Sum of Anions	NO3:Sum of Anions	NH4:Sum of Cations	SO4:Sum Anions	Leachate:Native cations (L:N)
Units			meq	meq	meq	meq	meq	meq	meq	meq	meq	meq	meq	meq	meq	meq	%	%	%	%	%	%
Laboratory PQL																						
NEPM Groundwater HILs for Drinking Water			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZG 2018 - Marine (95% species protection)			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM GIL Marine Waters			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lab Report.	Well ID	Date																				
242120	MW12	30-04-20	7.98	3.37	0.23	7.83	8.79	0.00	0.00	7.62	0.03	1.67	0.00	0.00	19.42	18.10	4%	49%	0%	-	9%	1%
242120	MW15	30-04-20	8.48	2.06	0.18	4.35	8.59	0.00	0.00	4.51	0.00	1.67	0.01	0.00	15.07	14.78	1%	58%	0%	-	11%	1%
242120	MW16	30-04-20	6.49	1.15	0.14	0.83	8.39	0.00	0.00	0.65	0.02	0.00	0.00	0.00	8.60	9.06	-3%	93%	0%	-	0%	2%
242120	MW22	30-04-20	5.49	0.91	0.11	0.91	7.19	0.00	0.00	0.68	0.02	0.12	0.00	0.00	7.42	8.01	-4%	90%	0%	-	2%	2%
242120	MW26	30-04-20	7.49	1.32	0.14	1.39	11.39	0.00	0.00	1.04	0.02	0.27	0.00	0.00	10.33	12.73	-10%	90%	0%	-	2%	1%
242120	MW02	01-05-20	5.49	0.82	0.18	1.00	7.19	0.00	0.00	0.62	0.00	0.19	0.00	0.00	7.49	8.00	-3%	90%	0%	-	2%	2%
242120	MW07	01-05-20	8.48	0.58	0.12	0.78	10.99	0.00	0.00	0.71	0.02	0.06	0.00	0.00	9.97	11.77	-8%	93%	0%	-	1%	1%
242120	MW08	01-05-20	8.98	1.15	0.08	3.26	7.99	0.00	0.00	2.82	0.02	0.54	0.00	0.00	13.47	11.37	8%	70%	0%	-	5%	1%
242120	MW17	01-05-20	6.99	1.07	0.10	1.22	6.39	0.00	0.00	1.33	0.01	0.73	0.11	0.02	9.37	8.58	4%	74%	1%	-	8%	2%
242120	MW28	01-05-20	6.99	1.32	0.08	0.74	8.19	0.00	0.00	0.62	0.02	0.46	0.00	0.00	9.13	9.29	-1%	88%	0%	-	5%	1%
242120	MW29	01-05-20	8.48	0.58	0.11	0.87	9.59	0.00	0.00	0.65	0.01	0.00	0.00	0.00	10.04	10.25	-1%	94%	0%	-	0%	1%
242120	MW30	01-05-20	5.49	0.99	0.13	1.61	6.79	0.00	0.00	1.41	0.02	0.48	0.00	0.00	8.21	8.70	-3%	78%	0%	-	6%	2%
242120	MW32	01-05-20	9.48	1.81	0.10	1.87	13.99	0.00	0.00	2.23	0.01	1.21	0.02	0.00	13.26	17.46	-14%	80%	0%	-	7%	1%
242120	MW33	01-05-20	6.49	1.07	0.06	0.52	8.19	0.00	0.00	0.45	0.01	0.04	0.00	0.00	8.14	8.70	-3%	94%	0%	-	0%	1%
242120	MW35	01-05-20	7.49	1.73	0.17	2.96	8.59	0.00	0.00	3.38	0.02	0.67	0.00	0.00	12.34	12.66	-1%	68%	0%	-	5%	1%
242120	MW37	01-05-20	4.79	1.32	0.15	3.18	6.79	0.00	0.00	2.26	0.03	0.19	0.00	0.00	9.43	9.27	1%	73%	0%	-	2%	2%

Inorganic QA/QC DQIs				
Well ID	Lab pH : Field pH	Lab EC : Field EC	Lab EC : TDS	Ionic Balance %
MW02	1.01	0.93	1.82	4%
MW07	1.02	3.83	1.73	1%
MW08	0.99	1.01	1.64	-3%
MW12	1.04	0.82	1.55	-4%
MW15	1.04	0.92	1.49	-10%
MW16	1.03	0.90	1.72	-3%
MW17	1.03	1.02	1.59	-8%
MW22	0.96	1.09	1.68	8%
MW26	1.00	0.92	1.65	4%
MW28	1.00	1.13	1.62	-1%
MW29	1.00	1.00	1.69	-1%
MW30	1.01	1.05	1.73	-3%
MW32	1.05	1.04	1.45	-14%
MW33	1.03	0.93	1.61	-3%
MW35	1.04	1.52	1.64	-1%
MW37	1.05	1.05	1.83	1%

Trip Blank and Trip Spike		
Analyte	TB1	TS1
TRH C6 - C10	<10	-
TRH C6 - C10 Less BTEX	<10	-
Toluene	<1	106%
Ethylbenzene	<1	105%
m+p-xylene	<2	104%
o-xylene	<1	107%
Naphthalene	<1	-

Intra Laboratory Duplicate Anlaysis May 2020								
Analyte	Units	LOR	MW12	QA01	RPD	MW07	QA02	RPD
TRH C6 - C9	µg/L	10	<10	<10	-	12	<10	-
TRH C6 - C10	µg/L	10	<10	<10	-	43	32	29.3
Benzene	µg/L	1	<1	<1	-	<1	<0.5	-
Toluene	µg/L	1	<1	<1	-	<1	<0.5	-
Ethylbenzene	µg/L	1	<1	<1	-	<1	<0.5	-
m+p-xylene	µg/L	2	<2	<2	-	<2	<1	-
o-xylene	µg/L	1	<1	<1	-	<1	<0.5	-
Naphthalene	µg/L	1	<1	<1	-	<1	47	-
TRH C10 - C14	µg/L	50	<50	<50	-	2200	1800	20.0
TRH C15 - C28	µg/L	100	<100	<100	-	6100	4800	23.9
TRH C29 - C36	µg/L	100	<100	<100	-	<100	<100	-
TRH >C10 - C16	µg/L	50	<50	<50	-	4400	3500	22.8
TRH >C16 - C34	µg/L	100	<100	<100	-	3900	3100	22.9
TRH >C34 - C40	µg/L	100	<100	<100	-	<100	<100	-

Inter Laboratory Duplicate Anlaysis May 2020								
Analyte	Units	LOR	MW12	QA01A	RPD	MW07	QA02A	RPD
TRH C6 - C9	µg/L	10	<10	<40	-	12	<400	-
TRH C6 - C10	µg/L	10	<10	<50	-	43	<500	-
Benzene	µg/L	1	<1	<0.5	-	<1	<5	-
Toluene	µg/L	1	<1	<0.5	-	<1	<5	-
Ethylbenzene	µg/L	1	<1	<0.5	-	<1	<5	-
m+p-xylene	µg/L	2	<2	<1	-	<2	<10	-
o-xylene	µg/L	1	<1	<0.5	-	<1	<5	-
Naphthalene	µg/L	1	<1	<0.5	-	<1	130	-
TRH C10 - C14	µg/L	50	<50	<50	-	2200	1500	37.8
TRH C15 - C28	µg/L	100	<100	<200	-	6100	4900	21.8
TRH C29 - C36	µg/L	100	<100	<200	-	<100	770	-
TRH >C10 - C16	µg/L	50	<50	<60	-	4400	2600	51.4
TRH >C16 - C34	µg/L	100	<100	<500	-	3900	4400	12.0
TRH >C34 - C40	µg/L	100	<100	<500	-	<100	<500	-

APPENDIX C

FIELD SHEETS

wsp

Contaminated Land Management

Standard Form 3.2.1: Groundwater Gauging Record

Job number:	PS111774
Client:	STA
Site location:	58 Darley Street, Mona Vale NSW
Date:	30.04.20
Person onsite:	AW, UH

Well ID	Location	Depth to water (mBTOC)	Depth to LNAPL (mBTOC)	LNAPL thickness (m)	Total well depth (mBTOC)	Comments
MW26		1.554			3.52	
~~MW24~~ MW25		1.707	1.643	0.056	4.68	No Photo
MW16		1.491	-	-	2.20	Blockage in well.
MW33		1.881			3.950	
MW32		2.004			3.926	HC odour
MW15	1.820 →	~~1.806~~		2.753 →	~~1.828~~	
MW12		1.643			4.10	
MW37		1.678			2.03	
MW35		1.512			4.02	
MW22		1.596			3.22	
MW20		1.843	1.548		3.57	
MW18		1.816	1.712		3.88	
MW21		1.890	1.653		3.80	
MW19		~~1.931~~ 2.041	1.931		4.66	
M31		1.903	1.852		3.31	
MW16		1.850	1.681			
Project manager:		SHJ				

Contaminated Land Management

Standard Form 3.2.1: Groundwater Gauging Record

Job number:	PS111744
Client:	STA
Site location:	Mona Vale
Date:	1/5/20
Person onsite:	AW + LOH

Well ID	Location	Depth to water (mBTOC)	Depth to LNAPL (mBTOC)	LNAPL thickness (m)	Total well depth (mBTOC)	Comments
MW23	onsite	1.341	—	—	2.974	
MW24		1.388	—	—	3.879	
SO2		—	—	—	1.198	
MW36		—	—	—	1.266	
MW03		1.683			2.864	
MW28		1.431	-	—	3.725	
MW30		1.600			3.675	
MW01		1.687			2.884	Strong HC odo
MW29		1.939			3.35	"
MW07		1.864			3.29	
MW02		1.557			2.70	
MW14		1.513	1.400		2.05	Top of
MW05		1.614	1.461		2.51	Top of ga
MW13		1.509	1.503		2.24	not top of casing
MW06	offsite	2.052			2.16	Garage
MW17		1.747			2.74	
	→ access via Hallstrom Pl.					
SO3	height of wall = 1.42 . water low to dry. puddles.					
SO1		1.000			1.30	
(access via Kennards Hire + self storage — Polo Ave.						
Project manager:		SHJ				

Version: A	Reviewer: M. Hannan	Date:	Approver: C. Faull	Date: 8/12/14

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW32
Client:	STA	**Sampling date:**	30.04.20
Site location:	Mona Vale	**Sampler:**	AW, LDH

Casing Diameter (mm): 50mm	**Depth to groundwater from TOC Before Sampling (m):** 2.004
Depth to LNAPL (mm): -	**Depth to groundwater from TOC After Sampling (m):** 2.013
LNAPL thickness (mm): -	**Initial Pump Speed (Purging):**
Method/pump type: peri	**Initial Pump Speed (Sampling):**
Start time (2400 hr):	**Pump depth (from base of well):**
Well depth from TOC (m): 3.926	**Actual purge volume (L):**
Well condition:	**Did well purge 'dry'?** Y / (N) **If yes, volume (L)?**
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
	2L	2.034	6.90	24.1	871	127.7	0.15	clear
	4 ~~2L~~ L	2.034	6.65	24.3	1056	120.0	0.10	
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:	**Calibration date:**
Did field parameters stabilise? (Yes) / No / NA	**Was the well dry purged** Yes / (No)

Sampling details:		**Analysis required:**	
Method/pump type:		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?: Yes / (No)		VOC	Nutrients
Primarily Sample ID:		PAH	Other
Were samples filtered? (Yes) / No		**QC samples collected?** Yes / (No)	
Preservations:		**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist:	**Project manager:**

Version: A	**Reviewer: M. Hannan**	**Date:**	**Approver: C. Faull**	**Date: 8/12/14**

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW33
Client:	STA	**Sampling date:**	30.04.20
Site location:	Mona Vale	**Sampler:**	AW

Casing Diameter (mm):	50m	**Depth to groundwater from TOC Before Sampling (m):**	1.88
Depth to LNAPL (mm):	—	**Depth to groundwater from TOC After Sampling (m):**	1.88
LNAPL thickness (mm):	—	**Initial Pump Speed (Purging):**	
Method/pump type:	Peri Pump.	**Initial Pump Speed (Sampling):**	
Start time (2400 hr):	9:11	**Pump depth (from base of well):**	
Well depth from TOC (m):	3.95	**Actual purge volume (L):**	
Well condition:	Good	**Did well purge 'dry'?** Y / N **If yes, volume (L)?**	
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)	

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
9.22	1	1.891	6.94	23.6	803	-105.9	0.45	Clear
9.24	2	1.893	6.91	23.7	793	-114.2	0.14	~~EE~~ O slight HC O.
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:		**Calibration date:**	
Did field parameters stabilise?	Yes / No / NA	**Was the well dry purged**	Yes / No

Sampling details:		**Analysis required:**	
Method/pump type:		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?:	Yes / No	VOC	Nutrients
Primarily Sample ID:		PAH	Other
Were samples filtered?	Yes / No	**QC samples collected?**	Yes / No
Preservations:		**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist:	AW	**Project manager:**	SH

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW26
Client:	STA	**Sampling date:**	30.04.20
Site location:	Manurewa	**Sampler:**	AW

Casing Diameter (mm):	50	**Depth to groundwater from TOC Before Sampling (m):**	1.554
Depth to LNAPL (mm):	–	**Depth to groundwater from TOC After Sampling (m):**	1.562
LNAPL thickness (mm):	–	**Initial Pump Speed (Purging):**	
Method/pump type:	Peri	**Initial Pump Speed (Sampling):**	
Start time (2400 hr):	7.47	**Pump depth (from base of well):**	
Well depth from TOC (m):	3.52	**Actual purge volume (L):**	
Well condition:	good – ants nest.	**Did well purge 'dry'?** Y / (N) **If yes, volume (L)?**	
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)	

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
7:50 ~~7:47~~	1		6.98	24.6	964	114.9	0.09	High Turbidity, Brown – No sheen, HC odour orange
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:	YSI	**Calibration date:**	
Did field parameters stabilise?	(Yes) / No / NA	**Was the well dry purged** Yes / (No)	

Sampling details:		**Analysis required:**	
Method/pump type:		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?:	Yes / (No)	VOC	Nutrients
Primarily Sample ID:		PAH	Other
Were samples filtered?	(Yes) / No	**QC samples collected?**	Yes / (No)
Preservations:		**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist:	AW	**Project manager:**	SK

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111774	**Well ID:**	MW35
Client:	STA	**Sampling date:**	30.04.20
Site location:	Mona Vale	**Sampler:**	

Casing Diameter (mm): 50m	**Depth to groundwater from TOC Before Sampling (m):** 1.512
Depth to LNAPL (mm): —	**Depth to groundwater from TOC After Sampling (m):**
LNAPL thickness (mm): —	**Initial Pump Speed (Purging):**
Method/pump type: Peri Pump	**Initial Pump Speed (Sampling):**
Start time (2400 hr):	**Pump depth (from base of well):**
Well depth from TOC (m): 4.02	**Actual purge volume (L):**
Well condition: Good	**Did well purge 'dry'?** Y / (N) **If yes, volume (L)?**
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
11:58	1L.	1.542	7.00	21.5	738	51.7	8.31	Clear, no odour
	2L	1.544	7.05	21.3	843	51.1	8.54	
		1.546	7.03	20.9	727	(5.6	8.62)	
						—		
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:	**Calibration date:**
Did field parameters stabilise? (Yes) / No / NA	**Was the well dry purged** Yes (No)
Sampling details:	**Analysis required:**
Method/pump type:	TRH / Phenols
Tubing material:	TRH silica gel / Metals *(see COC for list)*
Sampling equipment:	BTEXN / MNA
Hydrocarbon sheen observed?: Yes / No	VOC / Nutrients
Primarily Sample ID: MW35	PAH / Other
Were samples filtered? (Yes) / No	**QC samples collected?** Yes / (No)
Preservations:	**If yes – QC Sample IDs:**

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist: AW	**Project manager:** SR

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW15
Client:	STA	**Sampling date:**	30/4/20
Site location:	Manabale	**Sampler:**	AW

Casing Diameter (mm):	50mm	**Depth to groundwater from TOC Before Sampling (m):**	1.82
Depth to LNAPL (mm):	–	**Depth to groundwater from TOC After Sampling (m):**	1.81
LNAPL thickness (mm):	–	**Initial Pump Speed (Purging):**	High
Method/pump type:	Peri	**Initial Pump Speed (Sampling):**	low
Start time (2400 hr):	~~1020~~	**Pump depth (from base of well):**	
Well depth from TOC (m):	2.753	**Actual purge volume (L):**	
Well condition:	Good	**Did well purge 'dry'?** Y / N **If yes, volume (L)?**	
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)	

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colou odour, sheen, pump rate et
10.16	1	1.846	6.84	24.7	1387	-54.4	0.3	
10.20	~~2~~ 2	1.856	6.82	25.0	1417	-56.5	~~6.59~~	
	3		6.80	24.9	1412	-56.3	6.84	
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:		**Calibration date:**	
Did field parameters stabilise? Yes / No / NA		**Was the well dry purged** Yes / No	
Sampling details:		**Analysis required:**	
Method/pump type:		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?: Yes / No		VOC	Nutrients
Primarily Sample ID:		PAH	Other
Were samples filtered? Yes / No		**QC samples collected?** Yes / No	
Preservations:		**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist: AW	**Project manager:** SH

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Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111774	**Well ID:**	MW12
Client:	STA	**Sampling date:**	30.04.20
Site location:	Manavale	**Sampler:**	

Casing Diameter (mm): 50m	**Depth to groundwater from TOC Before Sampling (m):** 1.643
Depth to LNAPL (mm): —	**Depth to groundwater from TOC After Sampling (m):** 1.694
LNAPL thickness (mm): —	**Initial Pump Speed (Purging):**
Method/pump type: Peri Pump	**Initial Pump Speed (Sampling):**
Start time (2400 hr):	**Pump depth (from base of well):**
Well depth from TOC (m): 4.10	**Actual purge volume (L):**
Well condition: Good	**Did well purge 'dry'?** Y / (N) **If yes, volume (L)?**
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
10:48	1L	1.669	6.95	21.7	2693	-88.7	0.70	Clear, no odour
	2L	1.7008	6.98	21.9	2384	106.4	0.13	
10:53	3L	1.714	6.99	21.9	2071	120.7	0.11	
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:	**Calibration date:**
Did field parameters stabilise? (Yes) / No / NA	**Was the well dry purged** Yes / (No)

Sampling details:		**Analysis required:**	
Method/pump type:		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?: Yes / No		VOC	Nutrients
Primarily Sample ID:	MW12	PAH	Other
Were samples filtered? (Yes) / No		**QC samples collected?** (Yes) / No	
Preservations:		**If yes – QC Sample IDs:**	QA01 / QA01A

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist: AW	**Project manager:** SK

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW16
Client:	STA	**Sampling date:**	30.04.20
Site location:	Monavale	**Sampler:**	AW

Casing Diameter (mm):	~~100~~ 50	**Depth to groundwater from TOC Before Sampling (m):**	
Depth to LNAPL (mm):	—	**Depth to groundwater from TOC After Sampling (m):**	1.51
LNAPL thickness (mm):	—	**Initial Pump Speed (Purging):**	
Method/pump type:	Peri Pump	**Initial Pump Speed (Sampling):**	
Start time (2400 hr):	8:34	**Pump depth (from base of well):**	
Well depth from TOC (m):		**Actual purge volume (L):**	
Well condition:		**Did well purge 'dry'?** Y / N **If yes, volume (L)?**	
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)	

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
8:50	2L		7.09	25.6	904	151.4	~~0.28~~ 0.28	Clear, Slight HC odo
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:		**Calibration date:**	
Did field parameters stabilise?	(Yes) / No / NA	**Was the well dry purged**	Yes / (No)

Sampling details:		**Analysis required:**	
Method/pump type:		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?:	Yes / No	VOC	Nutrients
Primarily Sample ID:		PAH	Other
Were samples filtered?	(Yes) / No	**QC samples collected?**	Yes / (No)
Preservations:		**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist: AW	**Project manager:** SR

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111774	**Well ID:**	MW37
Client:	STA	**Sampling date:**	30.04.20
Site location:	Manavale	**Sampler:**	

Casing Diameter (mm):	50mm	**Depth to groundwater from TOC Before Sampling (m):**	1.678
Depth to LNAPL (mm):	—	**Depth to groundwater from TOC After Sampling (m):**	1.672
LNAPL thickness (mm):	—	**Initial Pump Speed (Purging):**	
Method/pump type:	Peri Pump	**Initial Pump Speed (Sampling):**	
Start time (2400 hr):		**Pump depth (from base of well):**	
Well depth from TOC (m):	2.03	**Actual purge volume (L):**	
Well condition:	Good	**Did well purge 'dry'?** Y / (N) **If yes, volume (L)?**	
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)	

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
11:30	1L	1.738	7.15	20.4	936	88.5	0.42	No odour, moderate turbid,
11:33	2L	1.726	7.12	20.5	864	108.1	0.11	
11:35	3L	1.722	7.11	20.5	840	113.1	0.08	
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:		**Calibration date:**	
Did field parameters stabilise? (Yes) / No / NA		**Was the well dry purged** Yes / (No)	
Sampling details:		**Analysis required:**	
Method/pump type:		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?: Yes / No		VOC	Nutrients
Primarily Sample ID:	MW37	PAH	Other
Were samples filtered? (Yes) / No		**QC samples collected?** Yes / (No)	
Preservations:		**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist: AW	**Project manager:** SL

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111774	**Well ID:**	MW22
Client:	STA	**Sampling date:**	30.4.
Site location:	Manvale	**Sampler:**	

Casing Diameter (mm): 50 mm	**Depth to groundwater from TOC Before Sampling (m):** 1.596
Depth to LNAPL (mm): —	**Depth to groundwater from TOC After Sampling (m):**
LNAPL thickness (mm): —	**Initial Pump Speed (Purging):**
Method/pump type: Hydrasleeve.	**Initial Pump Speed (Sampling):**
Start time (2400 hr):	**Pump depth (from base of well):**
Well depth from TOC (m): 3.22	**Actual purge volume (L):**
Well condition: Good	**Did well purge 'dry'?** Y / N **If yes, volume (L)?**
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
			~~7.41~~ 7.29	22.2	633	-77.4	3.09	Brown Slight bdour mod turbd
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:	**Calibration date:**
Did field parameters stabilise? (Yes) / No / NA	**Was the well dry purged** Yes / (No)

Sampling details:		**Analysis required:**	
Method/pump type: Hydrasleeve		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?: Yes / No		VOC	Nutrients
Primarily Sample ID:		PAH	Other
Were samples filtered? (Yes) / No		**QC samples collected?** Yes (No)	
Preservations:		**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist: AW	**Project manager:** SK

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW02
Client:	STA	**Sampling date:**	1.5.20
Site location:	Mona Vale	**Sampler:**	

Casing Diameter (mm):	50.	**Depth to groundwater from TOC Before Sampling (m):**	
Depth to LNAPL (mm):	–	**Depth to groundwater from TOC After Sampling (m):**	1.546
LNAPL thickness (mm):	–	**Initial Pump Speed (Purging):**	
Method/pump type:	Peri pump	**Initial Pump Speed (Sampling):**	
Start time (2400 hr):	10:39	**Pump depth (from base of well):**	
Well depth from TOC (m):		**Actual purge volume (L):**	
Well condition:		**Did well purge 'dry'?** Y / N **If yes, volume (L)?**	
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)	

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
	1	1.567	7.12	24.8	812	−135.9	0.14	
	2	1.564	7.13	24.6	748	−128.2	0.11	
		1.569	7.13	24.5	738	−133.9	0.11	
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:		**Calibration date:**	
Did field parameters stabilise? Yes / No / NA		**Was the well dry purged** Yes / No	
Sampling details:		**Analysis required:**	
Method/pump type:		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?: Yes / No		VOC	Nutrients
Primarily Sample ID:		PAH	Other
Were samples filtered? Yes / No		**QC samples collected?** Yes / No	
Preservations:		**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist:	**Project manager:**

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW28
Client:	STA	**Sampling date:**	1/5/20
Site location:	Mona Vale	**Sampler:**	AW

Casing Diameter (mm):	50m	**Depth to groundwater from TOC Before Sampling (m):**	1.43
Depth to LNAPL (mm):	—	**Depth to groundwater from TOC After Sampling (m):**	1.445
LNAPL thickness (mm):	—	**Initial Pump Speed (Purging):**	
Method/pump type:	Peri	**Initial Pump Speed (Sampling):**	
Start time (2400 hr):	8.06	**Pump depth (from base of well):**	
Well depth from TOC (m):	3.725	**Actual purge volume (L):**	
Well condition:	Covered	**Did well purge 'dry'?** Y / N **If yes, volume (L)?**	
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)	

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
8:08	1	1.444	7.40	22.1	820	-95.7	0.65	
8.10	2	1.433	7.26	22.4	816	-111.1	0.26	
	3	1.441	7.20	22.4	817	-120.5	0.14	
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:		**Calibration date:**	
Did field parameters stabilise?	(Yes) / No / NA	**Was the well dry purged**	Yes / (No)
Sampling details:		**Analysis required:**	
Method/pump type:		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?:	Yes / No	VOC	Nutrients
Primarily Sample ID:		PAH	Other
Were samples filtered?	(Yes) / No	**QC samples collected?**	Yes / (No)
Preservations:		**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist:	AW	**Project manager:**	SK

wsp

Contaminated Land Manag

Standard Form 3.2.2.
Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW29
Client:	STA	**Sampling date:**	1.5.20
Site location:	Manukau	**Sampler:**	

Casing Diameter (mm):	50mm	**Depth to groundwater from TOC Before Sampling (m):**	1.939
Depth to LNAPL (mm):	–	**Depth to groundwater from TOC After Sampling (m):**	1.946
LNAPL thickness (mm):	–	**Initial Pump Speed (Purging):**	
Method/pump type:	Peri Pump	**Initial Pump Speed (Sampling):**	
Start time (2400 hr):		**Pump depth (from base of well):**	
Well depth from TOC (m):	3.35	**Actual purge volume (L):**	
Well condition:		**Did well purge 'dry'?** Y / N **If yes, volume (L)?**	
Bore volume:		(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)	

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
9.23	1	954	6.82	21.7	874	-111.5	0.25	
	2	954	6.81	21.5	865	-116.0	0.20	
	3		6.79	21.2	858	-120	0.19	
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:		**Calibration date:**	
Did field parameters stabilise? Yes / No / NA		**Was the well dry purged** Yes / No	
Sampling details:		**Analysis required:**	
Method/pump type:		TRH	Phenols
Tubing material:		TRH silica gel	Metals *(see COC for list)*
Sampling equipment:		BTEXN	MNA
Hydrocarbon sheen observed?: (Yes) / No		VOC	Nutrients
Primarily Sample ID:		PAH	Other
Were samples filtered? Yes / No		**QC samples collected?** Yes / No	
Preservations:		**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Slight HC odour

Field scientist:	**Project manager:**

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW30
Client:	STA	**Sampling date:**	1/5/20
Site location:	Manukau	**Sampler:**	

Casing Diameter (mm): 50	**Depth to groundwater from TOC Before Sampling (m):** 1.6
Depth to LNAPL (mm): –	**Depth to groundwater from TOC After Sampling (m):** 1.60
LNAPL thickness (mm): –	**Initial Pump Speed (Purging):**
Method/pump type: Peri Pump	**Initial Pump Speed (Sampling):**
Start time (2400 hr):	**Pump depth (from base of well):**
Well depth from TOC (m): 3.675	**Actual purge volume (L):**
Well condition: Good	**Did well purge 'dry'?** Y / N **If yes, volume (L)?**
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.
8.39	1		7.26	22.1	724	-127.2	0.10	
8.41	2		7.23	22.1	726	-134.6	0.08	
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:	**Calibration date:**
Did field parameters stabilise? Yes / No / NA	**Was the well dry purged** Yes / No
Sampling details:	**Analysis required:**
Method/pump type:	TRH / Phenols
Tubing material:	TRH silica gel / Metals *(see COC for list)*
Sampling equipment:	BTEXN / MNA
Hydrocarbon sheen observed?: Yes / No	VOC / Nutrients
Primarily Sample ID:	PAH / Other
Were samples filtered? Yes / No	**QC samples collected?** Yes / No
Preservations:	**If yes – QC Sample IDs:**

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist:	**Project manager:**

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW07
Client:	STA	**Sampling date:**	01.05.26
Site location:	Moranbah	**Sampler:**	

Casing Diameter (mm): 50m	**Depth to groundwater from TOC Before Sampling (m):** 1.864
Depth to LNAPL (mm): –	**Depth to groundwater from TOC After Sampling (m):** 1.861
LNAPL thickness (mm): –	**Initial Pump Speed (Purging):**
Method/pump type: Peri	**Initial Pump Speed (Sampling):**
Start time (2400 hr): 9.51	**Pump depth (from base of well):**
Well depth from TOC (m): 3.29	**Actual purge volume (L):**
Well condition:	**Did well purge 'dry'?** Y / (N) **If yes, volume (L)?**
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc
9:53	1L	1.864	6.89	18.9	2.3	84.2	10.72	Sheen, clear
	2L	1.866	6.84	18.9	2.2	82.4	10.56	Turbid, brown.
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:	**Calibration date:**
Did field parameters stabilise? (Yes) / No / NA	**Was the well dry purged** Yes / (No)

Sampling details:	**Analysis required:**	
Method/pump type:	TRH	Phenols
Tubing material:	TRH silica gel	Metals *(see COC for list)*
Sampling equipment:	BTEXN	MNA
Hydrocarbon sheen observed? (Yes) / No	VOC	Nutrients
Primarily Sample ID:	PAH	Other
Were samples filtered? (Yes) / No	**QC samples collected?** (Yes) / No	
Preservations:	**If yes – QC Sample IDs:** QA02 / QA02A	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist: AW	**Project manager:** SK

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW8
Client:	STA	**Sampling date:**	1.5.20
Site location:	Mount Wells	**Sampler:**	

Casing Diameter (mm):	**Depth to groundwater from TOC Before Sampling (m):**
Depth to LNAPL (mm):	**Depth to groundwater from TOC After Sampling (m):** 2.052
LNAPL thickness (mm):	**Initial Pump Speed (Purging):**
Method/pump type:	**Initial Pump Speed (Sampling):**
Start time (2400 hr):	**Pump depth (from base of well):**
Well depth from TOC (m):	**Actual purge volume (L):**
Well condition:	**Did well purge 'dry'?** Y / N **If yes, volume (L)?**
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
	2		7.04	21.7	1102	-142.2	0.54	orange/brown
	3		7.37	21.4	1089	-141.3	0.35	clear w black rocks.
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:	**Calibration date:**
Did field parameters stabilise? (Yes) / No / NA	**Was the well dry purged** Yes / (No)

Sampling details:	**Analysis required:**	
Method/pump type:	TRH	Phenols
Tubing material:	TRH silica gel	Metals *(see COC for list)*
Sampling equipment:	BTEXN	MNA
Hydrocarbon sheen observed?: Yes / (No)	VOC	Nutrients
Primarily Sample ID:	PAH	Other
Were samples filtered? (Yes) / No	**QC samples collected?** Yes / (No)	
Preservations:	**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist:	**Project manager:**

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS117744	**Well ID:**	MW17
Client:	STA	**Sampling date:**	01.05.20
Site location:	Mona Vale	**Sampler:**	

Casing Diameter (mm):	**Depth to groundwater from TOC Before Sampling (m):**
Depth to LNAPL (mm):	**Depth to groundwater from TOC After Sampling (m):** 1.743
LNAPL thickness (mm):	**Initial Pump Speed (Purging):**
Method/pump type:	**Initial Pump Speed (Sampling):**
Start time (2400 hr):	**Pump depth (from base of well):**
Well depth from TOC (m):	**Actual purge volume (L):**
Well condition:	**Did well purge 'dry'?** Y / (N) **If yes, volume (L)?**
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
1:32	1L	1.763	7.39	23.3	800	23.4	1.65	
1:35	2L		7.34	23.2	796	21.0	0.65	
1:38	3L	1.765	7.28	23.2	794	19.0	0.35	
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:	**Calibration date:**
Did field parameters stabilise? Yes / No / NA	**Was the well dry purged** Yes / No

Sampling details:	**Analysis required:**	
Method/pump type:	TRH	Phenols
Tubing material:	TRH silica gel	Metals *(see COC for list)*
Sampling equipment:	BTEXN	MNA
Hydrocarbon sheen observed?: Yes / No	VOC	Nutrients
Primarily Sample ID:	PAH	Other
Were samples filtered? (Yes) / No	**QC samples collected?** Yes / No	
Preservations:	**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist:	**Project manager:**

wsp

Contaminated Land Management

Standard Form 3.2.2: Groundwater Sampling Record

Job number:	PS111744	**Well ID:**	MW01
Client:	STA	**Sampling date:**	1.5.20
Site location:	Manukau	**Sampler:**	

Casing Diameter (mm): 50mm	**Depth to groundwater from TOC Before Sampling (m):** 1.678
Depth to LNAPL (mm): –	**Depth to groundwater from TOC After Sampling (m):**
LNAPL thickness (mm): –	**Initial Pump Speed (Purging):**
Method/pump type: Peri	**Initial Pump Speed (Sampling):**
Start time (2400 hr): 8.58	**Pump depth (from base of well):**
Well depth from TOC (m): 2.884	**Actual purge volume (L):**
Well condition: fair	**Did well purge 'dry'?** Y / N **If yes, volume (L)?**
Bore volume:	(1 bore volume = 2L/m for 50 mm well or 8L/m for 100 mm well)

Purging and Water Quality Parameters:

Time (min)	Purged Vol (L)	DTW (mBTOC)	pH (units)	Temp (°C)	EC (uS/cm)	Redox (mV)	DO (ppm)	Comments (turbidity, colour, odour, sheen, pump rate etc.).
			7.0	16.3	6.52	-72.1	4.24	
								So little water in well. pump was not running through flow cell effectively.
								~400mL purged into flow cell → purged dry unable to sample
Stabilisation Range:		- 0.1 m	+/-0.05	+/- 3%	+/-10mV	+/- 10%	+/- 0.2°C	

Water quality meter ID:	**Calibration date:**
Did field parameters stabilise? Yes / (No) / NA	**Was the well dry purged** (Yes) / No

Sampling details:	**Analysis required:**	
Method/pump type:	TRH	Phenols
Tubing material:	TRH silica gel	Metals *(see COC for list)*
Sampling equipment:	BTEXN	MNA
Hydrocarbon sheen observed?: Yes / No	VOC	Nutrients
Primarily Sample ID:	PAH	Other
Were samples filtered? Yes / No	**QC samples collected?** Yes / No	
Preservations:	**If yes – QC Sample IDs:**	

Other comments and observations (i.e. photos, objects in well/blockages, variances to sampling procedure):

Field scientist:	**Project manager:**

APPENDIX D

CALIBRATION CERTIFICATES

Multi Parameter Water Meter

airmet

Air-Met Scientific Pty Ltd
1300 137 067

Instrument **YSI Quatro Pro Plus**
Serial No. **18G103307**

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
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:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 10.00		pH 10.00		332474	pH 9.81
2. pH 7.00		pH 7.00		330737	pH 6.98
3. pH 4.00		pH 4.00		330734	pH 4.08
4. mV		227.4mV		346052/342074	226.9mV
5. EC		2.76mS		333787	2.74mS
6. D.O		0.00ppm		1904288592	0.00ppm
7. Temp		23.4°C		MultiTherm	23.1°C

Calibrated by: **Sarah Lian**

Calibration date: **29/04/2020**

Next calibration due: **29/05/2020**

Oil / Water Interface Meter

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Instrument Geotech Interface Meter (30M)
Serial No. 4441

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check Connectors	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: Remy Tarasin

Calibration date: 28/04/2020

Next calibration due: 27/06/2020

APPENDIX E

LABORATORY TRANSCRIPTS

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 242120

Client Details

Client	WSP Australia Pty Limited
Attention	Sarah Klocke
Address	GPO Box 5394, Sydney, NSW, 2001

Sample Details

Your Reference	**PS111744**
Number of Samples	24 Water
Date samples received	01/05/2020
Date completed instructions received	04/05/2020

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	11/05/2020
Date of Issue	11/05/2020

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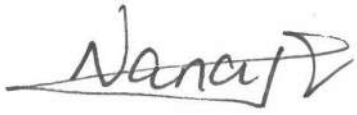
Results Approved By
Chris Guo, Senior Chemist, Air
Hannah Nguyen, Senior Chemist
Jaimie Loa-Kum-Cheung, Metals Supervisor
Josh Williams, Senior Chemist
Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		242120-1	242120-2	242120-3	242120-4	242120-5
Your Reference	UNITS	MW17	MW08	MW07	MW30	MW29
Date Sampled		01/05/2020	01/05/2020	01/05/2020	01/05/2020	01/05/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	06/05/2020	06/05/2020	06/05/2020	06/05/2020	06/05/2020
TRH C_6 - C_9	µg/L	<10	<10	12	<10	34
TRH C_6 - C_{10}	µg/L	<10	<10	43	<10	78
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	43	<10	78
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	3	4	42	<1	21
Surrogate Dibromofluoromethane	%	103	103	101	103	101
Surrogate toluene-d8	%	97	100	99	97	98
Surrogate 4-BFB	%	106	105	104	108	112

vTRH(C6-C10)/BTEXN in Water						
Our Reference		242120-6	242120-7	242120-8	242120-9	242120-10
Your Reference	UNITS	MW02	MW28	MW22	MW32	MW33
Date Sampled		01/05/2020	01/05/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	06/05/2020	07/05/2020	07/05/2020	07/05/2020	07/05/2020
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	15	1	<1	<1	4
Surrogate Dibromofluoromethane	%	100	100	103	104	102
Surrogate toluene-d8	%	98	97	101	99	98
Surrogate 4-BFB	%	107	109	104	106	107

vTRH(C6-C10)/BTEXN in Water						
Our Reference		242120-11	242120-12	242120-13	242120-14	242120-15
Your Reference	UNITS	MW26	MW15	MW12	MW37	MW16
Date Sampled		30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	07/05/2020	07/05/2020	07/05/2020	07/05/2020	07/05/2020
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	22
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	39
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	39
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	101	103	103	102	101
Surrogate toluene-d8	%	99	101	100	99	100
Surrogate 4-BFB	%	108	105	108	108	112

vTRH(C6-C10)/BTEXN in Water						
Our Reference		242120-16	242120-17	242120-18	242120-19	242120-20
Your Reference	UNITS	MW35	S01	S03	QA01	QA02
Date Sampled		30/04/2020	01/05/2020	01/05/2020	30/04/2020	01/05/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	05/05/2020	05/05/2020	05/05/2020	06/05/2020	06/05/2020
Date analysed	-	07/05/2020	07/05/2020	07/05/2020	07/05/2020	07/05/2020
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	32
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	32
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	47
Surrogate Dibromofluoromethane	%	99	96	98	115	122
Surrogate toluene-d8	%	98	98	100	96	96
Surrogate 4-BFB	%	108	106	108	108	103

vTRH(C6-C10)/BTEXN in Water					
Our Reference	UNITS	242120-21	242120-22	242120-23	242120-24
Your Reference		RB01	RB02	Trip Spike	Trip Blank
Date Sampled		30/04/2020	01/05/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water
Date extracted	-	06/05/2020	06/05/2020	05/05/2020	05/05/2020
Date analysed	-	07/05/2020	07/05/2020	06/05/2020	06/05/2020
TRH C_6 - C_9	µg/L	<10	<10	[NA]	<10
TRH C_6 - C_{10}	µg/L	<10	<10	[NA]	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	[NA]	<10
Benzene	µg/L	<1	<1	112%	<1
Toluene	µg/L	<1	<1	106%	<1
Ethylbenzene	µg/L	<1	<1	105%	<1
m+p-xylene	µg/L	<2	<2	104%	<2
o-xylene	µg/L	<1	<1	107%	<1
Naphthalene	µg/L	<1	<1	[NA]	<1
Surrogate Dibromofluoromethane	%	117	114	91	93
Surrogate toluene-d8	%	98	97	100	98
Surrogate 4-BFB	%	108	109	106	108

svTRH (C10-C40) in Water						
Our Reference		242120-1	242120-2	242120-3	242120-4	242120-5
Your Reference	UNITS	MW17	MW08	MW07	MW30	MW29
Date Sampled		01/05/2020	01/05/2020	01/05/2020	01/05/2020	01/05/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	05/05/2020	05/05/2020	05/05/2020	06/05/2020	06/05/2020
TRH C_{10} - C_{14}	µg/L	<50	810	2,200	880	4,500
TRH C_{15} - C_{28}	µg/L	180	5,300	6,100	2,500	13,000
TRH C_{29} - C_{36}	µg/L	<100	280	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	95	2,100	4,500	1,800	10,000
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	92	2,100	4,400	1,800	10,000
TRH >C_{16} - C_{34}	µg/L	110	4,400	3,900	1,600	7,000
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	123	#	#	#	#

svTRH (C10-C40) in Water						
Our Reference		242120-6	242120-7	242120-8	242120-9	242120-10
Your Reference	UNITS	MW02	MW28	MW22	MW32	MW33
Date Sampled		01/05/2020	01/05/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	06/05/2020	06/05/2020	06/05/2020	06/05/2020	06/05/2020
TRH C_{10} - C_{14}	µg/L	61	62	120	1,200	850
TRH C_{15} - C_{28}	µg/L	<100	140	150	7,800	4,900
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	94	130	190	3,500	2,100
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	79	130	190	3,500	2,100
TRH >C_{16} - C_{34}	µg/L	<100	<100	140	5,700	3,800
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	120	130	109	#	#

svTRH (C10-C40) in Water						
Our Reference		242120-11	242120-12	242120-13	242120-14	242120-15
Your Reference	UNITS	MW26	MW15	MW12	MW37	MW16
Date Sampled		30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	06/05/2020	06/05/2020	06/05/2020	06/05/2020	06/05/2020
TRH C_{10} - C_{14}	µg/L	160	<50	<50	<50	710
TRH C_{15} - C_{28}	µg/L	210	2,300	<100	<100	3,100
TRH C_{29} - C_{36}	µg/L	<100	100	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	160	93	<50	<50	1,500
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	160	93	<50	<50	1,500
TRH >C_{16} - C_{34}	µg/L	140	2,300	<100	<100	2,300
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	127	#	111	117	#

svTRH (C10-C40) in Water						
Our Reference		242120-16	242120-17	242120-18	242120-19	242120-20
Your Reference	UNITS	MW35	S01	S03	QA01	QA02
Date Sampled		30/04/2020	01/05/2020	01/05/2020	30/04/2020	01/05/2020
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	06/05/2020	06/05/2020	06/05/2020	06/05/2020	06/05/2020
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50	1,800
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100	4,800
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50	3,600
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50	3,500
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100	3,100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	113	117	106	99	#

svTRH (C10-C40) in Water			
Our Reference		242120-21	242120-22
Your Reference	UNITS	RB01	RB02
Date Sampled		30/04/2020	01/05/2020
Type of sample		Water	Water
Date extracted	-	05/05/2020	05/05/2020
Date analysed	-	06/05/2020	06/05/2020
TRH C_{10} - C_{14}	µg/L	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100
Surrogate o-Terphenyl	%	126	87

HM in water - dissolved						
Our Reference		242120-1	242120-2	242120-3	242120-4	242120-5
Your Reference	UNITS	MW17	MW08	MW07	MW30	MW29
Date Sampled		01/05/2020	01/05/2020	01/05/2020	01/05/2020	01/05/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Arsenic-Dissolved	µg/L	2	12	66	20	120
Iron-Dissolved	µg/L	<10	5,100	17,000	4,400	23,000
Manganese-Dissolved	µg/L	99	250	34	55	68

HM in water - dissolved						
Our Reference		242120-6	242120-7	242120-8	242120-9	242120-10
Your Reference	UNITS	MW02	MW28	MW22	MW32	MW33
Date Sampled		01/05/2020	01/05/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Arsenic-Dissolved	µg/L	14	20	23	2	24
Iron-Dissolved	µg/L	5,500	5,700	5,000	740	16,000
Manganese-Dissolved	µg/L	21	40	150	280	130

HM in water - dissolved						
Our Reference		242120-11	242120-12	242120-13	242120-14	242120-15
Your Reference	UNITS	MW26	MW15	MW12	MW37	MW16
Date Sampled		30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Arsenic-Dissolved	µg/L	46	<1	8	5	84
Iron-Dissolved	µg/L	9,000	50	3,000	3,300	14,000
Manganese-Dissolved	µg/L	37	280	69	98	30

HM in water - dissolved				
Our Reference		242120-16	242120-17	242120-18
Your Reference	UNITS	MW35	S01	S03
Date Sampled		30/04/2020	01/05/2020	01/05/2020
Type of sample		Water	Water	Water
Date prepared	-	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	05/05/2020	05/05/2020	05/05/2020
Arsenic-Dissolved	µg/L	6	1	1
Cadmium-Dissolved	µg/L	[NA]	<0.1	<0.1
Chromium-Dissolved	µg/L	[NA]	<1	<1
Copper-Dissolved	µg/L	[NA]	9	11
Lead-Dissolved	µg/L	[NA]	2	1
Mercury-Dissolved	µg/L	[NA]	<0.05	<0.05
Nickel-Dissolved	µg/L	[NA]	4	5
Zinc-Dissolved	µg/L	[NA]	46	62
Iron-Dissolved	µg/L	7,500	[NA]	[NA]
Manganese-Dissolved	µg/L	49	[NA]	[NA]

Metals in Water - Dissolved						
Our Reference		242120-1	242120-2	242120-3	242120-4	242120-5
Your Reference	UNITS	MW17	MW08	MW07	MW30	MW29
Date Sampled		01/05/2020	01/05/2020	01/05/2020	01/05/2020	01/05/2020
Type of sample		Water	Water	Water	Water	Water
Date digested	-	07/05/2020	07/05/2020	07/05/2020	07/05/2020	07/05/2020
Date analysed	-	08/05/2020	08/05/2020	08/05/2020	08/05/2020	08/05/2020
Silicon*- Dissolved	mg/L	4.6	6.4	7.7	5.6	8.9

Metals in Water - Dissolved						
Our Reference		242120-6	242120-7	242120-8	242120-9	242120-10
Your Reference	UNITS	MW02	MW28	MW22	MW32	MW33
Date Sampled		01/05/2020	01/05/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date digested	-	07/05/2020	07/05/2020	07/05/2020	07/05/2020	07/05/2020
Date analysed	-	08/05/2020	08/05/2020	08/05/2020	08/05/2020	08/05/2020
Silicon*- Dissolved	mg/L	4.5	5.0	4.1	9.8	7.6

Metals in Water - Dissolved						
Our Reference		242120-11	242120-12	242120-13	242120-14	242120-15
Your Reference	UNITS	MW26	MW15	MW12	MW37	MW16
Date Sampled		30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date digested	-	07/05/2020	07/05/2020	07/05/2020	07/05/2020	07/05/2020
Date analysed	-	08/05/2020	08/05/2020	08/05/2020	08/05/2020	08/05/2020
Silicon*- Dissolved	mg/L	5.5	7.8	6.4	5.1	8.1

Metals in Water - Dissolved		
Our Reference		242120-16
Your Reference	UNITS	MW35
Date Sampled		30/04/2020
Type of sample		Water
Date digested	-	07/05/2020
Date analysed	-	08/05/2020
Silicon*- Dissolved	mg/L	5.9

Ion Balance						
Our Reference		242120-1	242120-2	242120-3	242120-4	242120-5
Your Reference	UNITS	MW17	MW08	MW07	MW30	MW29
Date Sampled		01/05/2020	01/05/2020	01/05/2020	01/05/2020	01/05/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/05/2020	04/05/2020	04/05/2020	04/05/2020	04/05/2020
Date analysed	-	04/05/2020	04/05/2020	04/05/2020	04/05/2020	04/05/2020
Calcium - Dissolved	mg/L	140	180	170	110	170
Potassium - Dissolved	mg/L	3.8	3.0	4.5	5.0	4.4
Sodium - Dissolved	mg/L	28	75	18	37	20
Magnesium - Dissolved	mg/L	13	14	7.1	12	7.0
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	320	400	550	340	480
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	320	400	550	340	480
Sulphate, SO4	mg/L	35	26	3	23	<1
Chloride, Cl	mg/L	47	100	25	50	23
Ionic Balance	%	4.0	7.0	-9.0	-2.0	-2.0

Ion Balance						
Our Reference		242120-6	242120-7	242120-8	242120-9	242120-10
Your Reference	UNITS	MW02	MW28	MW22	MW32	MW33
Date Sampled		01/05/2020	01/05/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/05/2020	04/05/2020	04/05/2020	04/05/2020	04/05/2020
Date analysed	-	04/05/2020	04/05/2020	04/05/2020	04/05/2020	04/05/2020
Calcium - Dissolved	mg/L	110	140	110	190	130
Potassium - Dissolved	mg/L	7.0	3.3	4.3	3.9	2.3
Sodium - Dissolved	mg/L	23	17	21	43	12
Magnesium - Dissolved	mg/L	10	16	11	22	13
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	360	410	360	700	410
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	360	410	360	700	410
Sulphate, SO4	mg/L	9	33	6	58	2
Chloride, Cl	mg/L	22	22	24	79	16
Ionic Balance	%	-3.0	-2.0	-5.0	-14	-2.0

Ion Balance						
Our Reference		242120-11	242120-12	242120-13	242120-14	242120-15
Your Reference	UNITS	MW26	MW15	MW12	MW37	MW16
Date Sampled		30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/05/2020	4/05/2020	4/05/2020	4/05/2020	04/05/2020
Date analysed	-	04/05/2020	4/05/2020	4/05/2020	4/05/2020	04/05/2020
Calcium - Dissolved	mg/L	150	170	160	96	130
Potassium - Dissolved	mg/L	5.5	7.1	9.1	5.7	5.4
Sodium - Dissolved	mg/L	32	100	180	73	19
Magnesium - Dissolved	mg/L	16	25	41	16	14
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	570	430	440	340	420
Carbonate Alkalinity as $CaCO_3$	mg/L	<5	<5	<5	<5	<5
Total Alkalinity as $CaCO_3$	mg/L	570	430	440	340	420
Sulphate, SO4	mg/L	13	80	80	9	<1
Chloride, Cl	mg/L	37	160	270	80	23
Ionic Balance	%	-10	2.0	3.0	1.0	-3.0

Ion Balance		
Our Reference		242120-16
Your Reference	UNITS	MW35
Date Sampled		30/04/2020
Type of sample		Water
Date prepared	-	4/05/2020
Date analysed	-	4/05/2020
Calcium - Dissolved	mg/L	150
Potassium - Dissolved	mg/L	6.7
Sodium - Dissolved	mg/L	68
Magnesium - Dissolved	mg/L	21
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	<5
Bicarbonate Alkalinity as $CaCO_3$	mg/L	430
Carbonate Alkalinity as $CaCO_3$	mg/L	<5
Total Alkalinity as $CaCO_3$	mg/L	430
Sulphate, SO4	mg/L	32
Chloride, Cl	mg/L	120
Ionic Balance	%	0

Miscellaneous Inorganics						
Our Reference		242120-1	242120-2	242120-3	242120-4	242120-5
Your Reference	UNITS	MW17	MW08	MW07	MW30	MW29
Date Sampled		01/05/2020	01/05/2020	01/05/2020	01/05/2020	01/05/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/05/2020	04/05/2020	04/05/2020	04/05/2020	04/05/2020
Date analysed	-	04/05/2020	04/05/2020	04/05/2020	04/05/2020	04/05/2020
pH	pH Units	7.5	7.3	7.0	7.3	6.8
Electrical Conductivity	µS/cm	810	1,100	850	760	860
Total Dissolved Solids (grav)	mg/L	510	670	490	440	510
Nitrate as N in water	mg/L	1.5	0.055	<0.005	<0.005	<0.005
Fluoride, F	mg/L	0.1	0.3	0.3	0.3	0.2
Phosphate as P in water	mg/L	0.11	<0.005	<0.005	<0.005	<0.005
BOD	mg/L	<5	<5	21	<5	9
Ferrous Iron	mg/L	<0.05	5.9	18	4.8	23

Miscellaneous Inorganics						
Our Reference		242120-6	242120-7	242120-8	242120-9	242120-10
Your Reference	UNITS	MW02	MW28	MW22	MW32	MW33
Date Sampled		01/05/2020	01/05/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/05/2020	04/05/2020	04/05/2020	04/05/2020	04/05/2020
Date analysed	-	04/05/2020	04/05/2020	04/05/2020	04/05/2020	04/05/2020
pH	pH Units	7.2	7.2	7.0	7.0	7.1
Electrical Conductivity	µS/cm	690	810	690	1,100	740
Total Dissolved Solids (grav)	mg/L	380	500	410	760	460
Nitrate as N in water	mg/L	<0.005	<0.005	<0.005	0.28	<0.005
Fluoride, F	mg/L	0.4	0.4	0.3	0.2	0.2
Phosphate as P in water	mg/L	<0.005	<0.005	<0.005	0.008	<0.005
BOD	mg/L	<5	<5	<5	<5	<5
Ferrous Iron	mg/L	5.3	5.7	5.9	0.45	16

Miscellaneous Inorganics						
Our Reference		242120-11	242120-12	242120-13	242120-14	242120-15
Your Reference	UNITS	MW26	MW15	MW12	MW37	MW16
Date Sampled		30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	04/05/2020	04/05/2020	04/05/2020	04/05/2020	04/05/2020
Date analysed	-	04/05/2020	04/05/2020	04/05/2020	04/05/2020	04/05/2020
pH	pH Units	7.0	7.1	7.3	7.5	7.2
Electrical Conductivity	µS/cm	890	1,300	1,700	880	810
Total Dissolved Solids (grav)	mg/L	540	870	1,100	480	470
Nitrate as N in water	mg/L	<0.005	0.13	0.02	0.04	<0.005
Fluoride, F	mg/L	0.4	<0.1	0.5	0.6	0.3
Phosphate as P in water	mg/L	<0.005	0.008	<0.005	<0.005	<0.005
BOD	mg/L	<5	<5	<5	<5	<5
Ferrous Iron	mg/L	9.0	<0.05	3.1	3.1	13

Miscellaneous Inorganics		
Our Reference		242120-16
Your Reference	UNITS	MW35
Date Sampled		30/04/2020
Type of sample		Water
Date prepared	-	04/05/2020
Date analysed	-	04/05/2020
pH	pH Units	7.3
Electrical Conductivity	µS/cm	1,100
Total Dissolved Solids (grav)	mg/L	670
Nitrate as N in water	mg/L	<0.005
Fluoride, F	mg/L	0.4
Phosphate as P in water	mg/L	<0.005
BOD	mg/L	<5
Ferrous Iron	mg/L	7.5

Dissolved Gases in Water						
Our Reference		242120-1	242120-2	242120-3	242120-4	242120-5
Your Reference	UNITS	MW17	MW08	MW07	MW30	MW29
Date Sampled		01/05/2020	01/05/2020	01/05/2020	01/05/2020	01/05/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Methane	µg/L	<5	310	3,200	2,000	4,400

Dissolved Gases in Water						
Our Reference		242120-6	242120-7	242120-8	242120-9	242120-10
Your Reference	UNITS	MW02	MW28	MW22	MW32	MW33
Date Sampled		01/05/2020	01/05/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Methane	µg/L	270	13	1,300	32	980

Dissolved Gases in Water						
Our Reference		242120-11	242120-12	242120-13	242120-14	242120-15
Your Reference	UNITS	MW26	MW15	MW12	MW37	MW16
Date Sampled		30/04/2020	30/04/2020	30/04/2020	30/04/2020	30/04/2020
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Date analysed	-	05/05/2020	05/05/2020	05/05/2020	05/05/2020	05/05/2020
Methane	µg/L	440	30	25	1,600	1,500

Dissolved Gases in Water		
Our Reference		242120-16
Your Reference	UNITS	MW35
Date Sampled		30/04/2020
Type of sample		Water
Date prepared	-	05/05/2020
Date analysed	-	05/05/2020
Methane	µg/L	70

Method ID	Methodology Summary
AT-006	Dissolved gases determined by GC-FID using method USEPA SOP RSK175
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-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-006	Alkalinity - determined titrimetrically in accordance with APHA latest edition, 2320-B.
Inorg-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C.
Inorg-026	Fluoride determined by ion selective electrode (ISE) in accordance with APHA latest edition, 4500-F-C.
Inorg-040	The concentrations of the major ions (mg/L) are converted to milliequivalents and summed. The ionic balance should be within +/- 10% ie total anions = total cations +/-10%.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-076	Ferrous Iron is determined colourimetrically by discrete analyser. Waters samples are filtered on receipt prior to analysis.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.
Inorg-091	BOD - Analysed in accordance with APHA latest edition 5210 D and in house INORG-091.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
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-023	Water samples are analysed directly 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.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			06/05/2020	8	05/05/2020	07/05/2020		05/05/2020	[NT]
Date analysed	-			07/05/2020	8	07/05/2020	08/05/2020		06/05/2020	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	8	<10	<10	0	125	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	8	<10	<10	0	125	[NT]
Benzene	µg/L	1	Org-023	<1	8	<1	<1	0	121	[NT]
Toluene	µg/L	1	Org-023	<1	8	<1	<1	0	127	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	8	<1	<1	0	123	[NT]
m+p-xylene	µg/L	2	Org-023	<2	8	<2	<2	0	128	[NT]
o-xylene	µg/L	1	Org-023	<1	8	<1	<1	0	125	[NT]
Naphthalene	µg/L	1	Org-023	<1	8	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	104	8	103	115	11	84	[NT]
Surrogate toluene-d8	%		Org-023	95	8	101	96	5	101	[NT]
Surrogate 4-BFB	%		Org-023	107	8	104	116	11	101	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W4	[NT]
Date extracted	-			[NT]	10	05/05/2020	07/05/2020		05/05/2020	[NT]
Date analysed	-			[NT]	10	07/05/2020	08/05/2020		07/05/2020	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	[NT]	10	<10	<10	0	127	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	[NT]	10	<10	<10	0	127	[NT]
Benzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	126	[NT]
Toluene	µg/L	1	Org-023	[NT]	10	<1	<1	0	129	[NT]
Ethylbenzene	µg/L	1	Org-023	[NT]	10	<1	<1	0	125	[NT]
m+p-xylene	µg/L	2	Org-023	[NT]	10	<2	<2	0	128	[NT]
o-xylene	µg/L	1	Org-023	[NT]	10	<1	<1	0	126	[NT]
Naphthalene	µg/L	1	Org-023	[NT]	10	4	3	29	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	[NT]	10	102	113	10	86	[NT]
Surrogate toluene-d8	%		Org-023	[NT]	10	98	97	1	101	[NT]
Surrogate 4-BFB	%		Org-023	[NT]	10	107	115	7	102	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	14	05/05/2020	08/05/2020		[NT]	[NT]
Date analysed	-			[NT]	14	07/05/2020	09/05/2020		[NT]	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	[NT]	14	<10	<10	0	[NT]	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	[NT]	14	<10	<10	0	[NT]	[NT]
Benzene	µg/L	1	Org-023	[NT]	14	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	[NT]	14	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	[NT]	14	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	[NT]	14	<2	<2	0	[NT]	[NT]
o-xylene	µg/L	1	Org-023	[NT]	14	<1	<1	0	[NT]	[NT]
Naphthalene	µg/L	1	Org-023	[NT]	14	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	[NT]	14	102	117	14	[NT]	[NT]
Surrogate toluene-d8	%		Org-023	[NT]	14	99	96	3	[NT]	[NT]
Surrogate 4-BFB	%		Org-023	[NT]	14	108	110	2	[NT]	[NT]

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	20	06/05/2020	08/05/2020		[NT]	[NT]
Date analysed	-			[NT]	20	07/05/2020	09/05/2020		[NT]	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	[NT]	20	<10	11	10	[NT]	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	[NT]	20	32	31	3	[NT]	[NT]
Benzene	µg/L	1	Org-023	[NT]	20	<1	<1	0	[NT]	[NT]
Toluene	µg/L	1	Org-023	[NT]	20	<1	<1	0	[NT]	[NT]
Ethylbenzene	µg/L	1	Org-023	[NT]	20	<1	<1	0	[NT]	[NT]
m+p-xylene	µg/L	2	Org-023	[NT]	20	<2	<2	0	[NT]	[NT]
o-xylene	µg/L	1	Org-023	[NT]	20	<1	<1	0	[NT]	[NT]
Naphthalene	µg/L	1	Org-023	[NT]	20	47	62	28	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	[NT]	20	122	123	1	[NT]	[NT]
Surrogate toluene-d8	%		Org-023	[NT]	20	96	99	3	[NT]	[NT]
Surrogate 4-BFB	%		Org-023	[NT]	20	103	107	4	[NT]	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	242120-5
Date extracted	-			05/05/2020	4	05/05/2020	05/05/2020		05/05/2020	05/05/2020
Date analysed	-			05/05/2020	4	06/05/2020	06/05/2020		05/05/2020	06/05/2020
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	4	880	720	20	108	72
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	4	2500	1900	27	105	92
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	4	<100	<100	0	82	81
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	4	1800	1400	25	108	72
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	4	1600	1100	37	105	92
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	4	<100	<100	0	82	81
Surrogate o-Terphenyl	%		Org-020	88	4	#	#		78	#

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	242120-20
Date extracted	-			[NT]	14	05/05/2020	05/05/2020		05/05/2020	05/05/2020
Date analysed	-			[NT]	14	06/05/2020	06/05/2020		05/05/2020	06/05/2020
TRH C_{10} - C_{14}	µg/L	50	Org-020	[NT]	14	<50	<50	0	110	#
TRH C_{15} - C_{28}	µg/L	100	Org-020	[NT]	14	<100	<100	0	113	75
TRH C_{29} - C_{36}	µg/L	100	Org-020	[NT]	14	<100	<100	0	92	102
TRH >C_{10} - C_{16}	µg/L	50	Org-020	[NT]	14	<50	<50	0	110	#
TRH >C_{16} - C_{34}	µg/L	100	Org-020	[NT]	14	<100	<100	0	113	75
TRH >C_{34} - C_{40}	µg/L	100	Org-020	[NT]	14	<100	<100	0	92	102
Surrogate o-Terphenyl	%		Org-020	[NT]	14	117	118	1	124	#

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	19	05/05/2020	05/05/2020		[NT]	[NT]
Date analysed	-			[NT]	19	06/05/2020	06/05/2020		[NT]	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	[NT]	19	<50	<50	0	[NT]	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	[NT]	19	<50	<50	0	[NT]	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	[NT]	19	<100	<100	0	[NT]	[NT]
Surrogate o-Terphenyl	%		Org-020	[NT]	19	99	129	26	[NT]	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	242120-2
Date prepared	-			05/05/2020	1	05/05/2020	05/05/2020		05/05/2020	05/05/2020
Date analysed	-			05/05/2020	1	05/05/2020	05/05/2020		05/05/2020	05/05/2020
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	2	2	0	97	90
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	102	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	101	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	[NT]	[NT]	[NT]	[NT]	100	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	104	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	[NT]	[NT]	[NT]	[NT]	106	[NT]
Iron-Dissolved	µg/L	10	Metals-022	<10	1	<10	<10	0	110	#
Manganese-Dissolved	µg/L	5	Metals-022	<5	1	99	100	1	103	#

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	05/05/2020	05/05/2020		[NT]	[NT]
Date analysed	-			[NT]	11	05/05/2020	05/05/2020		[NT]	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	[NT]	11	46	46	0	[NT]	[NT]
Iron-Dissolved	µg/L	10	Metals-022	[NT]	11	9000	9000	0	[NT]	[NT]
Manganese-Dissolved	µg/L	5	Metals-022	[NT]	11	37	36	3	[NT]	[NT]

QUALITY CONTROL: Metals in Water - Dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	242120-2
Date digested	-			07/05/2020	1	07/05/2020	07/05/2020		07/05/2020	07/05/2020
Date analysed	-			08/05/2020	1	08/05/2020	08/05/2020		08/05/2020	08/05/2020
Silicon*- Dissolved	mg/L	0.2	Metals-020	<0.2	1	4.6	4.6	0	108	102

QUALITY CONTROL: Metals in Water - Dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date digested	-			[NT]	11	07/05/2020	07/05/2020		[NT]	[NT]
Date analysed	-			[NT]	11	08/05/2020	08/05/2020		[NT]	[NT]
Silicon*- Dissolved	mg/L	0.2	Metals-020	[NT]	11	5.5	5.5	0	[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	242120-2
Date prepared	-			04/05/2020	1	04/05/2020	04/05/2020		04/05/2020	05/05/2020
Date analysed	-			04/05/2020	1	04/05/2020	04/05/2020		04/05/2020	05/05/2020
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	140	130	7	99	#
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	3.8	3.8	0	99	102
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	28	27	4	86	#
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	13	13	0	97	98
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	320	330	3	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	<5	<5	0	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	<5	1	320	330	3	109	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	<1	1	35	35	0	102	91
Chloride, Cl	mg/L	1	Inorg-081	<1	1	47	47	0	90	82
Ionic Balance	%		Inorg-040	[NT]	1	4.0	1.0	120	[NT]	[NT]

QUALITY CONTROL: Ion Balance						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	10	04/05/2020	04/05/2020		[NT]	[NT]
Date analysed	-			[NT]	10	04/05/2020	04/05/2020		[NT]	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	[NT]	10	130	[NT]		[NT]	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	[NT]	10	2.3	[NT]		[NT]	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	[NT]	10	12	[NT]		[NT]	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	[NT]	10	13	[NT]		[NT]	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	[NT]	10	<5	<5	0	[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	[NT]	10	410	410	0	[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	[NT]	10	<5	<5	0	[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	[NT]	10	410	410	0	[NT]	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	[NT]	10	2	2	0	[NT]	[NT]
Chloride, Cl	mg/L	1	Inorg-081	[NT]	10	16	16	0	[NT]	[NT]
Ionic Balance	%		Inorg-040	[NT]	10	-2.0	[NT]		[NT]	[NT]

QUALITY CONTROL: Ion Balance					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	04/05/2020	04/05/2020		[NT]	[NT]
Date analysed	-			[NT]	11	04/05/2020	04/05/2020		[NT]	[NT]
Calcium - Dissolved	mg/L	0.5	Metals-020	[NT]	11	150	150	0	[NT]	[NT]
Potassium - Dissolved	mg/L	0.5	Metals-020	[NT]	11	5.5	5.6	2	[NT]	[NT]
Sodium - Dissolved	mg/L	0.5	Metals-020	[NT]	11	32	31	3	[NT]	[NT]
Magnesium - Dissolved	mg/L	0.5	Metals-020	[NT]	11	16	16	0	[NT]	[NT]
Hydroxide Alkalinity (OH^-) as $CaCO_3$	mg/L	5	Inorg-006	[NT]	11	<5	[NT]		[NT]	[NT]
Bicarbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	[NT]	11	570	[NT]		[NT]	[NT]
Carbonate Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	[NT]	11	<5	[NT]		[NT]	[NT]
Total Alkalinity as $CaCO_3$	mg/L	5	Inorg-006	[NT]	11	570	[NT]		[NT]	[NT]
Sulphate, SO4	mg/L	1	Inorg-081	[NT]	11	13	[NT]		[NT]	[NT]
Chloride, Cl	mg/L	1	Inorg-081	[NT]	11	37	[NT]		[NT]	[NT]
Ionic Balance	%		Inorg-040	[NT]	11	-10	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	242120-2
Date prepared	-			04/05/2020	1	04/05/2020	04/05/2020		04/05/2020	05/05/2020
Date analysed	-			04/05/2020	1	04/05/2020	04/05/2020		04/05/2020	05/05/2020
pH	pH Units		Inorg-001	[NT]	1	7.5	7.4	1	103	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	<1	1	810	810	0	103	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	510	500	2	100	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	1.5	1.5	0	104	104
Fluoride, F	mg/L	0.1	Inorg-026	<0.1	1	0.1	0.1	0	100	100
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	0.11	0.11	0	105	120
BOD	mg/L	5	Inorg-091	<5	1	<5	[NT]		92	[NT]
Ferrous Iron	mg/L	0.05	Inorg-076	<0.05	1	<0.05	<0.05	0	99	77

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	10	04/05/2020	04/05/2020		[NT]	[NT]
Date analysed	-			[NT]	10	04/05/2020	04/05/2020		[NT]	[NT]
pH	pH Units		Inorg-001	[NT]	10	7.1	7.0	1	[NT]	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	[NT]	10	740	730	1	[NT]	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	[NT]	10	460	450	2	[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	10	<0.005	<0.005	0	[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	10	0.2	0.2	0	[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	[NT]	10	<0.005	<0.005	0	[NT]	[NT]
BOD	mg/L	5	Inorg-091	[NT]	10	<5	[NT]		[NT]	[NT]
Ferrous Iron	mg/L	0.05	Inorg-076	[NT]	10	16	[NT]		[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	04/05/2020	04/05/2020		[NT]	[NT]
Date analysed	-			[NT]	11	04/05/2020	04/05/2020		[NT]	[NT]
pH	pH Units		Inorg-001	[NT]	11	7.0	[NT]		[NT]	[NT]
Electrical Conductivity	µS/cm	1	Inorg-002	[NT]	11	890	[NT]		[NT]	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	[NT]	11	540	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	11	<0.005	[NT]		[NT]	[NT]
Fluoride, F	mg/L	0.1	Inorg-026	[NT]	11	0.4	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	[NT]	11	<0.005	[NT]		[NT]	[NT]
BOD	mg/L	5	Inorg-091	[NT]	11	<5	[NT]		[NT]	[NT]
Ferrous Iron	mg/L	0.05	Inorg-076	[NT]	11	9.0	8.9	1	[NT]	[NT]

QUALITY CONTROL: Dissolved Gases in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			05/05/2020	1	05/05/2020	05/05/2020		05/05/2020	[NT]
Date analysed	-			05/05/2020	1	05/05/2020	05/05/2020		05/05/2020	[NT]
Methane	µg/L	5	AT-006	<5	1	<5	<5	0	93	[NT]

QUALITY CONTROL: Dissolved Gases in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	11	05/05/2020	05/05/2020		[NT]	[NT]
Date analysed	-			[NT]	11	05/05/2020	05/05/2020		[NT]	[NT]
Methane	µg/L	5	AT-006	[NT]	11	440	440	0	[NT]	[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

Holding time exceedance - BOD, pH, NO3, PO4

8 HM in water - dissolved - # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

TRH Water(C10-C40) NEPM - # Percent recovery for the surrogate is not possible to report due to interference from analytes (other than those being tested) in samples 242120-2, 3, 4, 4d, 5, 5ms, 9, 10, 12, 15, 20, 20ms.

Ion Balance - # Percent recovery is not possible to report due to the high concentration of the element/s in the sample/s. However an acceptable recovery was obtained for the LCS.

Ferrous iron results are slightly higher than dissolved Iron for sample #2,3,4 and 8, but results are within the uncertainity of the two methods.

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	**WSP Australia Pty Ltd**	**Client Project Name and Number:**	**PS111744**
Project Mgr:	**Sarah Klocke**		
Sampler:	**Amy wray**	**PO No.:**	**PS111744**
Address:	**Level 27, Ernst & Young Centre 680 George Street**	**Envirolab Services Quote No. :**	
		Date results required:	**Standard TAT**
Email:	sarah.klocke@wsp.com , amy.wray@wsp.com	**Or choose: standard / 1 day / 2 day / 3 day**	
Phone:	**0448429676** **Fax:**	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	

Envirolab Services
12 Ashley St, Chatswood, NSW, 2067

Phone: 02 9910 6200
Fax: 02 9910 6201

E-mail: ahie@envirolabservices.com.au

Contact: Aileen Hie

Sample information				Tests Required														Comments
Envirolab Sample ID	**Client Sample ID**	**Date sampled**	**Type of sample**	**TRH/BTEXN**	**SWA (pH, EC, TDS, Ionic Balance (Ca, K, Mg, Na, Hardness, CO3, HCO3, OH, Total Alkalinity, Cl, SO4), NO3, Fe, Mn, Si**	**F**	**P04**	**BOD**	**Methane**	**Ferrous Iron**	**dissolved arsnic**							**Provide as much information about the sample as you can**
	MW17	1/05/2020	Water	x	x	x	x	x	x	x	x							**Please filter metals where noted on bottles, Subsample as required.**
	MW08	1/05/2020	Water	x	x	x	x	x	x	x	x							
	MW07	1/05/2020	Water	x	x	x	x	x	x	x	x							
	MW30	1/05/2020	Water	x	x	x	x	x	x	x	x							
	MW29	1/05/2020	Water	x	x	x	x	x	x	x	x							
	MW02	1/05/2020	Water	x	x	x	x	x	x	x	x							
	MW28	1/05/2020	Water	x	x	x	x	x	x	x	x							
	MW22	30/04/2020	Water	x	x	x	x	x	x	x	x							
	MW32	30/04/2020	Water	x	x	x	x	x	x	x	x							
	MW33	30/04/2020	Water	x	x	x	x	x	x	x	x							
	MW26	30/04/2020	Water	x	x	x	x	x	x	x	x							
	MW15	30/04/2020	Water	x	x	x	x	x	x	x	x							
	MW12	30/04/2020	Water	x	x	x	x	x	x	x	x							
	MW37	30/04/2020	Water	x	x	x	x	x	x	x	x							
	MW16	30/04/2020			x	x	x	x	x	x	x							

Relinquished by (company):	**WSP Australia Pty Ltd**	**Received by (company):**	
Print Name:	**Amy Wray**	**Print Name:**	
Date & Time:	1/05/2020	**Date & Time:**	
Signature:		**Signature:**	

Samples Received: Cool or Ambient (circle one)
Temperature Recieved at: (if applicable)
Transported by: Hand delivered / courier

Page No:

CHAIN OF CUSTODY - Client

ENVIROLAB SERVICES

Client:	**WSP Australia Pty Ltd**	**Client Project Name and Number:**	**PS111744**
Project Mgr:	**Sarah Klocke**		
Sampler:	**Amy wray**	**PO No.:**	**PS111744**
Address:	**Level 27, Ernst & Young Centre 680 George Street**	**Envirolab Services Quote No. :**	
		Date results required:	**Standard TAT**
Email:	sarah.klocke@wsp.com , amy.wray@wsp.com	**Or choose: standard / 1 day / 2 day / 3 day**	
Phone:	**0448429676** **Fax:**	*Note: Inform lab in advance if urgent turnaround is required - surcharge applies*	

Envirolab Services
12 Ashley St, Chatswood, NSW, 2067

Phone: 02 9910 6200
Fax: 02 9910 6201

E-mail: ahie@envirolabservices.com.au

Contact: Aileen Hie

Sample information				Tests Required													Comments
Envirolab Sample ID	**Client Sample ID**	**Date sampled**	**Type of sample**	**TRH/BTEXN**	**SWA (pH, EC, TDS, Ionic Balance (Ca, K, Mg, Na, Hardness, CO3, HCO3, OH, Total Alkalinity, Cl, SO4), NO3, Fe, Mn, Si**	**F**	**P04**	**BOD**	**Methane**	**Ferrous Iron**	**dissolved arsnic**	**TRH/BTEXN/8 Metals**	**TRH/BTEXN**					**Provide as much information about the sample as you can**
	MW35	30/04/2020	Water	x	x	x	x	x	x	x	x							
	S01	1/05/2020	Water	x								X						
	S03	1/05/2020	Water	x								X						
	QA01	30/04/2020	Water	x									X					
	QA01A	30/04/2020	Water	x									X					**Please forward to SGS**
	QA02	1/05/2020	Water	x									X					
	QA02A	1/05/2020	Water	x									X					**Please forward to SGS**
	RB01	30/04/2020	Water	x									X					
	RB02	1/05/2020	Water	x									X					
	Trip Spike		Water	x									X					
	Trip Blank		Water	x									X					

Relinquished by (company):	**WSP Australia Pty Ltd**	**Received by (company):**	**Samples Received: Cool or Ambient (circle one)**
Print Name:	**Amy Wray**	**Print Name:**	**Temperature Recieved at: (if applicable)**
Date & Time:	1/05/2020	**Date & Time:**	**Transported by: Hand delivered / courier**
Signature:		**Signature:**	**Page No:**

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Sarah Klocke
Client	WSP AUSTRALIA PTY LIMITED
Address	Level 1, 121 Marcus Clarke Street Canberra ACT 2600
Telephone	02 6201 9600
Facsimile	02 9272 5101
Email	sarah.klocke@wspgroup.com
Project	**PS111744**
Order Number	**PS111744**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE205811 R0**
Date Received	4/5/2020
Date Reported	11/5/2020

COMMENTS

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

VOC/VPH - The Limit of Reporting (LOR) has been raised due to interferences from the sample matrix.

SIGNATORIES

Ly Kim HA
Organic Section Head

VOCs in Water [AN433] Tested: 6/5/2020

PARAMETER	UOM	LOR	QA01A WATER - 30/4/2020 SE205811.001	QA02A WATER - 1/5/2020 SE205811.002
Benzene	µg/L	0.5	<0.5	<5.0↑
Toluene	µg/L	0.5	<0.5	<5.0↑
Ethylbenzene	µg/L	0.5	<0.5	<5.0↑
m/p-xylene	µg/L	1	<1	<10↑
o-xylene	µg/L	0.5	<0.5	<5.0↑
Total Xylenes	µg/L	1.5	<1.5	<15↑
Total BTEX	µg/L	3	<3	<30↑
Naphthalene	µg/L	0.5	<0.5	**130**

Volatile Petroleum Hydrocarbons in Water [AN433] Tested: 6/5/2020

PARAMETER	UOM	LOR	QA01A WATER - 30/4/2020 SE205811.001	QA02A WATER - 1/5/2020 SE205811.002
TRH C6-C9	µg/L	40	<40	<400↑
Benzene (F0)	µg/L	0.5	<0.5	<5.0↑
TRH C6-C10	µg/L	50	<50	<500↑
TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<500↑

TRH (Total Recoverable Hydrocarbons) in Water [AN403] Tested: 5/5/2020

PARAMETER	UOM	LOR	QA01A WATER - 30/4/2020 SE205811.001	QA02A WATER - 1/5/2020 SE205811.002
TRH C10-C14	µg/L	50	<50	**1500**
TRH C15-C28	µg/L	200	<200	**4900**
TRH C29-C36	µg/L	200	<200	**770**
TRH C37-C40	µg/L	200	<200	<200
TRH >C10-C16	µg/L	60	<60	**2600**
TRH >C10-C16 - Naphthalene (F2)	µg/L	60	<60	**2500**
TRH >C16-C34 (F3)	µg/L	500	<500	**4400**
TRH >C34-C40 (F4)	µg/L	500	<500	<500
TRH C10-C40	µg/L	320	<320	**7200**

METHOD	METHODOLOGY SUMMARY
AN403	Total Recoverable Hydrocarbons: Determination of Hydrocarbons by gas chromatography after a solvent extraction. Detection is by flame ionisation detector (FID) that produces an electronic signal in proportion to the combustible matter passing through it. Total Recoverable Hydrocarbons (TRH) are routinely reported as four alkane groupings based on the carbon chain length of the compounds: C6-C9, C10-C14, C15-C28 and C29-C36 and in recognition of the NEPM 1999 (2013), >C10-C16 (F2), >C16-C34 (F3) and >C34-C40 (F4). Where F2 is corrected for Naphthalene, the VOC data for Naphthalene is used.
AN403	Additionally, the volatile C6-C9/C6-C10 fractions may be determined by a purge and trap technique and GC/MS because of the potential for volatiles loss. Total Recoveerable Hydrocarbons - Silica (TRH-Silica) follows the same method of analysis after silica gel cleanup of the solvent extract. Aliphatic/Aromatic Speciation follows the same method of analysis after fractionation of the solvent extract over silica with differential polarity of the eluent solvents.
AN403	The GC/FID method is not well suited to the analysis of refined high boiling point materials (ie lubricating oils or greases) but is particularly suited for measuring diesel, kerosene and petrol if care to control volatility is taken. This method will detect naturally occurring hydrocarbons, lipids, animal fats, phenols and PAHs if they are present at sufficient levels, dependent on the use of specific cleanup/fractionation techniques. Reference USEPA 3510B, 8015B.
AN433	VOCs and C6-C9 Hydrocarbons by GC-MS P&T: VOC`s are volatile organic compounds. The sample is presented to a gas chromatograph via a purge and trap (P&T) concentrator and autosampler and is detected with a Mass Spectrometer (MSD). Solid samples are initially extracted with methanol whilst liquid samples are processed directly. References: USEPA 5030B, 8020A, 8260.

FOOTNOTES

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

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

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

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

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

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

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

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

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

STATEMENT OF QA/QC PERFORMANCE

SE205811 R0

CLIENT DETAILS

Contact	Sarah Klocke
Client	WSP AUSTRALIA PTY LIMITED
Address	Level 1, 121 Marcus Clarke Street Canberra ACT 2600
Telephone	02 6201 9600
Facsimile	02 9272 5101
Email	sarah.klocke@wspgroup.com
Project	**PS111744**
Order Number	**PS111744**
Samples	2

LABORATORY DETAILS

Manager	Huong Crawford
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE205811 R0**
Date Received	04 May 2020
Date Reported	11 May 2020

COMMENTS

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

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

All Data Quality Objectives were met (within the SGS Alexandria Environmental laboratory).

SAMPLE SUMMARY

HOLDING TIME SUMMARY

SE205811 R0

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

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

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

TRH (Total Recoverable Hydrocarbons) in Water — Method: ME-(AU)-[ENV]AN403

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
QA01A	SE205811.001	LB198757	30 Apr 2020	04 May 2020	07 May 2020	05 May 2020	14 Jun 2020	08 May 2020
QA02A	SE205811.002	LB198757	01 May 2020	04 May 2020	08 May 2020	05 May 2020	14 Jun 2020	08 May 2020

VOCs in Water — Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
QA01A	SE205811.001	LB198860	30 Apr 2020	04 May 2020	07 May 2020	06 May 2020	15 Jun 2020	07 May 2020
QA02A	SE205811.002	LB198860	01 May 2020	04 May 2020	08 May 2020	06 May 2020	15 Jun 2020	07 May 2020

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
QA01A	SE205811.001	LB198860	30 Apr 2020	04 May 2020	07 May 2020	06 May 2020	15 Jun 2020	07 May 2020
QA02A	SE205811.002	LB198860	01 May 2020	04 May 2020	08 May 2020	06 May 2020	15 Jun 2020	07 May 2020

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

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

VOCs in Water

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

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	QA01A	SE205811.001	%	40 - 130%	96
	QA02A	SE205811.002	%	40 - 130%	110
d4-1,2-dichloroethane (Surrogate)	QA01A	SE205811.001	%	40 - 130%	106
	QA02A	SE205811.002	%	40 - 130%	99
d8-toluene (Surrogate)	QA01A	SE205811.001	%	40 - 130%	101
	QA02A	SE205811.002	%	40 - 130%	104

Volatile Petroleum Hydrocarbons in Water

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

Parameter	Sample Name	Sample Number	Units	Criteria	Recovery %
Bromofluorobenzene (Surrogate)	QA01A	SE205811.001	%	40 - 130%	96
	QA02A	SE205811.002	%	40 - 130%	110
d4-1,2-dichloroethane (Surrogate)	QA01A	SE205811.001	%	60 - 130%	106
	QA02A	SE205811.002	%	60 - 130%	99
d8-toluene (Surrogate)	QA01A	SE205811.001	%	40 - 130%	101
	QA02A	SE205811.002	%	40 - 130%	104

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

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

TRH (Total Recoverable Hydrocarbons) in Water — Method: ME-(AU)-[ENV]AN403

Sample Number	Parameter	Units	LOR	Result
LB198757.001	TRH C10-C14	µg/L	50	<50
	TRH C15-C28	µg/L	200	<200
	TRH C29-C36	µg/L	200	<200
	TRH C37-C40	µg/L	200	<200

VOCs in Water — Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB198860.001	Monocyclic Aromatic Hydrocarbons	Benzene	µg/L	0.5	<0.5
		Toluene	µg/L	0.5	<0.5
		Ethylbenzene	µg/L	0.5	<0.5
		m/p-xylene	µg/L	1	<1
		o-xylene	µg/L	0.5	<0.5
	Polycyclic VOCs	Naphthalene	µg/L	0.5	<0.5
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	96
		d8-toluene (Surrogate)	%	-	106
		Bromofluorobenzene (Surrogate)	%	-	92

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result
LB198860.001		TRH C6-C9	µg/L	40	<40
	Surrogates	d4-1,2-dichloroethane (Surrogate)	%	-	96
		d8-toluene (Surrogate)	%	-	106
		Bromofluorobenzene (Surrogate)	%	-	92

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

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

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

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

TRH (Total Recoverable Hydrocarbons) in Water — Method: ME-(AU)-[ENV]AN403

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE205802.001	LB198757.026		TRH C10-C14	µg/L	50	0	0	200	0
			TRH C15-C28	µg/L	200	1182	1081	48	9
			TRH C29-C36	µg/L	200	300	244	104	21
			TRH C37-C40	µg/L	200	0	0	200	0
			TRH C10-C40	µg/L	320	1482	1325	53	11
		TRH F Bands	TRH >C10-C16	µg/L	60	0	0	200	0
			TRH >C16-C34 (F3)	µg/L	500	1420	1278	67	11
			TRH >C34-C40 (F4)	µg/L	500	0	0	200	0

VOCs in Water — Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE205811.001	LB198860.020	Monocyclic	Benzene	µg/L	0.5	<0.5	0	200	0
		Aromatic	Toluene	µg/L	0.5	<0.5	0	200	0
			Ethylbenzene	µg/L	0.5	<0.5	0	200	0
			m/p-xylene	µg/L	1	<1	0	200	0
			o-xylene	µg/L	0.5	<0.5	0	200	0
		Polycyclic	Naphthalene	µg/L	0.5	<0.5	0.2617660428	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	11	9.9773877346	30	6
			d8-toluene (Surrogate)	µg/L	-	10	9.8677237867	30	2
			Bromofluorobenzene (Surrogate)	µg/L	-	9.6	9.6870589246	30	1

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

Original	Duplicate		Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE205777.001	LB198860.019		TRH C6-C10	µg/L	50	<50	<50	200	0
			TRH C6-C9	µg/L	40	<40	<40	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	10.2	10.3	30	1
			d8-toluene (Surrogate)	µg/L	-	10.2	9.8	30	4
			Bromofluorobenzene (Surrogate)	µg/L	-	10.0	9.2	30	8
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	<0.5	200	0
			TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	<50	200	0
SE205811.001	LB198860.020		TRH C6-C10	µg/L	50	<50	0	200	0
			TRH C6-C9	µg/L	40	<40	0	200	0
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	11	9.9773877346	30	6
			d8-toluene (Surrogate)	µg/L	-	10	9.8677237867	30	2
			Bromofluorobenzene (Surrogate)	µg/L	-	9.6	9.6870589246	30	1
		VPH F Bands	Benzene (F0)	µg/L	0.5	<0.5	0	200	0
			TRH C6-C10 minus BTEX (F1)	µg/L	50	<50	0	200	0

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

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

TRH (Total Recoverable Hydrocarbons) in Water — Method: ME-(AU)-[ENV]AN403

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB198757.002		TRH C10-C14	µg/L	50	1000	1200	60 - 140	85
		TRH C15-C28	µg/L	200	1300	1200	60 - 140	109
		TRH C29-C36	µg/L	200	1400	1200	60 - 140	120
	TRH F Bands	TRH >C10-C16	µg/L	60	1200	1200	60 - 140	96
		TRH >C16-C34 (F3)	µg/L	500	1500	1200	60 - 140	124
		TRH >C34-C40 (F4)	µg/L	500	690	600	60 - 140	115

VOCs in Water — Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB198860.002	Monocyclic	Benzene	µg/L	0.5	52	45.45	60 - 140	114
	Aromatic	Toluene	µg/L	0.5	48	45.45	60 - 140	106
		Ethylbenzene	µg/L	0.5	51	45.45	60 - 140	111
		m/p-xylene	µg/L	1	100	90.9	60 - 140	114
		o-xylene	µg/L	0.5	50	45.45	60 - 140	109
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	12	10	60 - 140	117
		d8-toluene (Surrogate)	µg/L	-	8.9	10	70 - 130	89
		Bromofluorobenzene (Surrogate)	µg/L	-	10	10	70 - 130	101

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

Sample Number		Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB198860.002		TRH C6-C10	µg/L	50	930	946.63	60 - 140	98
		TRH C6-C9	µg/L	40	810	818.71	60 - 140	98
	Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	12	10	60 - 140	117
		d8-toluene (Surrogate)	µg/L	-	8.9	10	70 - 130	89
		Bromofluorobenzene (Surrogate)	µg/L	-	10	10	70 - 130	101
	VPH F Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	630	639.67	60 - 140	98

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

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

VOCs in Water — Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Original	Spike	Recovery%
SE205805.015	LB198860.021	Monocyclic	Benzene	µg/L	0.5	0	45.45	115
		Aromatic	Toluene	µg/L	0.5	0	45.45	119
			Ethylbenzene	µg/L	0.5	0	45.45	115
			m/p-xylene	µg/L	1	0	90.9	116
			o-xylene	µg/L	0.5	0	45.45	116
		Polycyclic	Naphthalene	µg/L	0.5	0	-	-
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	9.66318158213	-	102
			d8-toluene (Surrogate)	µg/L	-	9.87989366294	-	104
			Bromofluorobenzene (Surrogate)	µg/L	-	10.33871421501	-	96

Volatile Petroleum Hydrocarbons in Water — Method: ME-(AU)-[ENV]AN433

QC Sample	Sample Number		Parameter	Units	LOR	Result	Original	Spike	Recovery%
SE205805.015	LB198860.021		TRH C6-C10	µg/L	50	890	0	946.63	93
			TRH C6-C9	µg/L	40	770	0	818.71	94
		Surrogates	d4-1,2-dichloroethane (Surrogate)	µg/L	-	10.2	9.66318158213	-	102
			d8-toluene (Surrogate)	µg/L	-	10.4	9.87989366294	-	104
			Bromofluorobenzene (Surrogate)	µg/L	-	9.6	10.33871421501	-	96
		VPH F	Benzene (F0)	µg/L	0.5	52	0	-	-
		Bands	TRH C6-C10 minus BTEX (F1)	µg/L	50	570	0	639.67	89

MATRIX SPIKE DUPLICATES

SE205811 R0

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

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

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

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

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

No matrix spike duplicates were required for this job.

Samples analysed as received.

Solid samples expressed on a dry weight basis.

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

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.

①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.