MEMO

Date: 02 September 2020

To: Andrew Grime (Arup Senior Engineer)

From: Shae Miller-White

Pages: 12 inc. this page (excluding attachments)
Regarding: Surface water quality – Event 1 summary

Level 2, 27-31 Troode Street West Perth WA 6005 T +61 8 9211 1111

Fremantle Swan River Crossing - Surface Water Quality Monitoring Event #1

Background

Arup on behalf of Main Roads Western Australia (MRWA), has commissioned RPS Australia West Pty Ltd (RPS) to provide environmental services to support the Swan River Crossing (SRC) project development. The works include the replacement of the Fremantle Traffic Bridge and the improvement/duplication of the Fremantle Rail Bridge. As detailed within the *Preliminary Environmental Impact Assessment* (MRWA, 2020), surface water quality has the potential to be impacted during new bridge construction and demolition of the old structure. As such, a baseline assessment of the surface water quality will be completed to inform a future Construction Environment Management Plan (CEMP) monitoring program. The sampling program is initially scoped to be undertaken monthly for five months.

This memo provides details on the surface water monitoring Event #1, completed in August 2020.

Sampling locations

The program includes collection of surface water samples from five locations. Further details on sampling locations are presented in Figure A and Table 1. For sampling event #1, this was reduced to 2 locations while the project decided on the preferred location for the other 3 sampling locations.

Table 1: Surface water sampling locations summary

Sampling point	Swan River Bathymetry ^{1,2} (m)	Commentary
WS1	~4.0-6.01	Central channel (northern side)Sample collected from Fremantle Traffic Bridge northern access point
WS2	~4.0-6.01	 Central channel (southern side) Sample collected from Fremantle Traffic Bridge southern access point
WS3	~2.0-4.0 ¹	Northern shoreline
WS4	~4.0-5.0 ¹	Southern shorelineSmall craft pen jetty
WS5	~2.0-6.0²	Southern shorelinePublic jettyBackground location

Notes: 1 Results of a geophysical survey of the portions of the site was undertaken in 2012 (Marine & Earth Sciences, 2012), which was used inform the Arup reports (Arup, 2013a and 2013b)

2 Swan and Canning Rivers navigation chart 1:25,000. April 2014, Edition 7. Department of Transport https://www.transport.wa.gov.au/imarine/coastaldata/nauticalcharts/pdfs/WA898 swan and canning rivers.pdf.

Sampling program schedule overview

The proposed SWQS sampling program schedule is presented in Table 2.

Table 2: Sampling program

Event	Sampling locations	Event Date	Date Completed	Status
Event - 1	WS2, WS4	August 2020	7/8/2020	Completed – this round
Event - 2	WS1-WS5	September 2020	-	TBC
Event - 3	WS1-WS5	October 2020	-	TBC
Event - 4	WS1-WS5	November 2020	-	TBC
Event - 5	WS1-WS5	December 2020	-	TBC

Notes: To be completed (TBC)

Surface water sampling methodology

Surface water sampling was conducted in accordance with the following relevant guidance:

- Department of Water and Environmental Regulation, Assessment and Management of Contaminated Sites Contaminated Sites Guidelines (DER, 2014)
- National Environment Protection (Assessment of Site Contamination) Measure 1999, Schedule B General Guidelines for the Assessment of Site Contamination (NEPM, 2013)
- Water Quality—Sampling. Part 1: Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples (Standards Australia, 1998. AS/NZS 5667.1:1998)
- Water Quality—Sampling. Part 6: Guidance on sampling of rivers and streams (Standards Australia, 1998. AS/NZS 5667.6:1998)
- Water Quality—Sampling. Part 9: Guidance on sampling from marine waters (Standards Australia, 1998. AS/NZS 5667.9:1998)
- Heads of EPAs Australia and New Zealand (HEPA), PFAS National Environmental Management Plan, Version 2.0 (HEPA, 2020).

Each Swan River surface water sample was collected using a Niskin Flask as detailed below:

- Where the water column was >2 m, the following two depths were targeted:
 - Sample 1 (shallow sample): collected at ~1 m below surface level
 - Sample 2 (deep sample): collected ~1 m above riverbed level.

Field observations were collected during each sampling event and included commentary on weather conditions, tides and vessel movement within the Fremantle port and surrounding waters.

Analysis Program

All samples were analysed for the following analytical suite:

• Dissolved metals and metalloids: aluminium, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, and zinc.

- Total metals: aluminium and iron.
- Major anions: sulfate (SO₄²⁻), chloride (Cl⁻), alkalinity (hydroxide OH⁻, carbonate CO₃²⁻, bicarbonate HCO₃⁻).
- Major cations: sodium, potassium, calcium, magnesium.
- Nutrients: total and reactive phosphorus, total nitrogen, total Kjeldahl nitrogen (TKN), total ammonia (NH₄-N + NH₃-N), nitrates and nitrites (NO_X-N).
- Sulfide (S²⁻)
- Total dissolved solids (TDS)
- Total suspended solids (TSS)
- Turbidity
- Hydrocarbons: Total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylene (BTEX) and polycyclic aromatic hydrocarbons (PAH)
- Organochlorine Pesticides (OCP)
- Per-poly fluoroalkyl substances (PFAS)
- Dissolved organic carbon (DOC)
- Chlorophyll-A and Phaeophytin-A.

Water column profiles for temperature, salinity (electrical conductivity (EC)), pH and dissolved oxygen were also collected at each sampling location.

Surface water assessment levels

All analytes were compared against relevant Water Quality Australia 2019 guidelines, nominally (95%species protection) as follows:

- Water Quality Australia (WQA, 2019)
 - Marine Water Guidelines (MWG) 95% species protection level
 - Estuary water (for nutrients and pH only).
- Recreational Water Guidelines (RWG)
- PFAS National Environmental Management Plan. (HEPA, 2020).
 - Marine Guidelines 99% species protection level¹
 - Recreational Water
- Treatment and management of soil and water in acid sulfate soil landscapes (DER, June 2015b).

¹ The 99% species protection value is considered to most appropriate as PFAS is known bioaccumulate in aquatic organisms.

Guideline levels for ASS surface water quality (ASS)

Site conditions

Site conditions noted during the monitoring Event #1 are summarised within Table 3.

Table 3: Site conditions

Items	Commentary
Weather conditions (during sampling event)	Fine, slightly overcast with moderate east, north-east winds (25-30 km/hr)
Rainfall (noted during the previous week)	A total of 15 mm of rain was measured at the Perth Station (Number: 9225) In the week prior to sampling
Tide condition and direction	Incoming tide.Closest peak: High tide (10.31 am / 1.04 m)
Fremantle Port and Swan River vessel activities	 WS2: Low general harbour traffic during sampling WS4: Two tugboats located adjacent to sampling location on small craft jetty. Two large cargo ships moored at the Port. No movement during sampling. Low general harbour traffic.

Monitoring Results Discussion

Results have been tabulated and are present in Tables A to E, with laboratory reporting presented in Appendix A. Further commentary on specific analytes is provided below.

Field parameters

Field parameters were measured throughout the water column prior to sampling at each location. The water column profiles are presented in surface water sampling logs at the rear of the report (Appendix B), with field parameters of sampling depths summarised in Table 4.

Table 4: Sampling location field parameters

Sample Location	Depth (m)	Temp (°C)	рН	EC (μS/cm) ¹	Redox (mV)	DO (%sat)¹
WS2-S	1.0	16.7	8.70	50,710	181	77.4
WS2-D	4.5	16.8	8.19	50,966	179	77.6
WS4-S	1.0	16.7	8.27	50,809	106	78.3
WS4-D	3.5	16.8	8.27	50,966	109	77.2

Notes:1 denotes Dissolved Oxygen (DO)

Physical parameters were noted to be relatively consistent throughout the profile i.e. alkaline, saline and in an oxidising state. These conditions are consistent with the significant flushing that occurs as result of daily tidal movement of marine waters. RPS did note the following minor trends and guideline exceedances:

- Trends:
 - pH marginally decreased with depth at WS2.
 - DO concentrations were noted to decrease at the base of the profile at WS4.

- Guideline exceedances:
 - pH exceeded the MWG (7.5-8.5 pH units) in one of the four samples collected (WS2-S, 8.70 pH units).

Acid sulfate soil parameters

Acid sulfate soil (ASS) parameters observed during Event #1 can be summarised as follows:

- Total acidity was significantly below the ASS guideline (>40 mg/L) in all samples and ranged from below limit of reporting (LOR) (<5 mg/L) at WS4-D to 7 mg/L at WS2-D.
- Sulfide concentrations exceeded the ASS guideline (>0.5 mg/L) in all samples with a mean of 0.8 mg/L and a range of 0.7 mg/L (WS4-S and WS4-D) to 0.9 mg/L (WS2-S). These conditions are considered consistent with marine water quality.
- Sulfate was significantly above the recreational water guideline (500 mg/L) and ranged from 2,800 mg/L (WS2-S, WS2-D and WS4-D) to 3,100 mg/L (WS4-S). However, again these conditions are considered consistent with marine water quality.
- Total alkalinity results were relatively consistent throughout the two sampling locations and ranged from 120 mg/L (WS2-S and WS2-D) to 130 mg/L (WS4-S and WS4-D).

Solids

- TDS concentrations appeared to be correlated to total alkalinity results and range from 39,000 mg/L (WS2-S and WS2-D) to 40,000 mg/L (WS4-S and WS4-D).
- TSS ranged from 5 mg/L (WS2-D) to 21 mg/L (WS4-D) with a mean of 13 observed over the four samples.
- Turbidity results were consistent over the two locations with a concentration of 0.6 NTU² observed at the shallow locations and 0.5 NTU observed at the deep.

Nutrients

Nutrients analytical results observed during Event #1 can be summarised as follows:

- Total phosphorus and nitrogen oxides (NO_x-N) concentrations were below their relevant LOR in all samples.
- Reactive phosphorus marginally exceeded the MWG (0.005 mg/L) in one of the four samples collected (WS4-S, 0.006 mg/L). The remaining three samples were below the LOR (0.005 mg/L).
- All other nitrogen and phosphorus species were below relevant MWG and RWG assessment criteria.

Chlorophyll

All Chlorophyll "A" sample results were significantly below the MWG (0.003 mg/L) with a concentration of 0.0004 mg/L (WS2-S and WS4-D) or 0.0005 mg/L (WS2-D and WS4-S) observed.

Low concentrations of Phaeophytin "A" were detected within all surface water samples with concentrations ranging from 0.0005 mg/L (WS2-S, WS2-D and WS4-S) to 0.0006 mg/L (WS4-D).

² NTU: Nephelometric Turbidity unit, i.e. the unit used to measure the turbidity of a fluid or the presence of suspended particles in water.

Metals and metalloids

Metal analytical results observed during Event #1 can be summarised as follows:

- Dissolved metals:
 - No relevant dissolved metal guideline exceedances were noted.
 - With the exception of molybdenum, silver and zinc, all analysed dissolved metals were below their relevant LOR.
- Total metals:
 - Total aluminium was marginally above the LOR (0.01 mg/L) in two of the four samples with 0.02 mg/L (WS4-S) and 0.03 mg/L (WS2-D) observed.
 - Total iron concentrations marginally exceeded the LOR (0.01 mg/L) in two of the four samples (WS2-S, 0.02 mg/L and WS4-S, 0.03 mg/L).

Hydrocarbons

All hydrocarbon results (BTEX, TRH and PAH) were below their relevant LOR in all samples analysed.

Pesticides

All organochlorine pesticides results were below their relevant LOR in all samples analysed.

PFAS

PFAS analytical results observed during Event #1 can be summarised as follows:

- Perfluorooctanesulfonate (PFOS) exceeded the 99% species protection MWG (0.00023 μg/L) in all samples, ranging from 0.0003 μg/L (WS4-D) to 0.0006 μg/L (WS2-S and WS4-S). However, concentrations were significantly below the 95% species protection guideline (0.13 μg/L).
- Minor detections of Perfluorohexanesulfonic acid (PFHxS) and Perfluorooctanoic acid (PFOA) were observed marginally above their relevant LOR. However, PFOA concentrations were significantly below all relevant guidelines.
- Total PFAS were relatively consistent between all locations and ranged from 0.006 μ g/L (WS4-D) to 0.0010 μ g/L (WS2-S, WS2-D and WS4-S).

Quality Control and Quality Assurance

To maintain a high level of Quality Control and Quality Assurance (QAQC) sampling and analysis was undertaken with reference to relevant guidelines (DER, 2014, NEPM, 2013 and HEPA, 2020) and *Australian Standard 4482.1:1997* (Standards Australia, 2005). Strict hygiene procedures were applied throughout to assure a high level of sample integrity and quality was maintained, including the decontamination of all sampling equipment between sampling locations to prevent possible cross-contamination.

In accordance with HEPA 2020 guidance, one field duplicate was collected per 10 primary samples. In addition, one field blank, trip blank and field rinsate was collected per day of sampling. The results are presented in Tables F to N and summarised as follows:

• A total of 116 of the 118 (98%) analyte tests performed on the field duplicate sample had a Relative Percentage Difference (RPD) within 30% of the original samples indicating the sampling and analysis procedures applied by RPS and the laboratory were generally reproducible. In both instances the exceedances are considered insignificant as concentrations of both the primary and duplicate sample are less than 5× LOR. In such instances the elevated RPD merely indicates that analytical precision decreases as concentrations approach the LOR.

- As a result of minor residual surface water particulates being present following decontamination, the following detections were noted within the field rinsate sample (WR1):
 - Cadmium concentrations (0.0001 mg/L) were equal to the LOR.
 - Turbidity concentrations (0.2 NTU) were marginally above the LOR (0.1 NTU).
 - PFOA concentrations (0.0003 μg/L) were marginally above the LOR (0.0002 μg/L).
- Turbidity results within the field blank sample (0.2 NTU) were noted above LOR (0.1 NTU), indicating
 that this may be representative of the deionised water quality utilised for the QAQC sampling i.e. field
 blank and rinsate.
- All internal laboratory QAQC procedures (method blanks, matrix spikes, laboratory control standards, internal duplicates) were within acceptable limits with the exception of the following:
 - Sample reference 248325-4:
 - Analysis: Zinc dissolved
 - o Comment: 80% RPD fails internal acceptance criteria.
- All samples were analysed within the recommended holding time for each analyte with the exception of Chlorophyll "A" and Phaeophytin "A" which states that no extract or analyse dates where provided. As such, the holding times could not be calculated.

The conclusion of the QAQC assessment indicates that sampling and analysis was generally reproducible and complied with accepted standards. As such, the data collected is considered representative of the site and suitable for the data assessment undertaken.

Conclusions

Surface water monitoring Event #1 was completed on 7 August 2020. Due to access approval restrictions, samples were only collected from a total of two of the five locations (WS2 and WS4), with a shallow and deep sample collected at each.

A review of the analytical data collected indicates that the site waters were alkaline, saline and in an oxidising state. Minor exceedances of the field and ASS parameters assessment criteria were noted (pH, DO, sulfide and sulfate), however, RPS advises that these conditions are consistent with the marine environment present at the mouth of the Swan River.

A minor exceedance of reactive phosphorus MWG (0.005 mg/L) was noted within one of the four samples (WS4-S, 0.006 mg/L). However, this is considered an anomaly as the remaining three samples were below the limit of reporting.

Minor detections of PFAS (PFHxS, PFOS and PFOA), were detected within all samples. The 99% species protection PFOS MWG (0.00023 mg/L) was exceeded in all samples, however, was significantly below the 95% species protection MWG (0.13 mg/L). No exceedances of any other relevant MWG of RWG were noted.

We trust that this is to your satisfaction, should you have any queries please contact Alan Foley or the undersigned.



Shae Miller-White

Supervising Scientist - Contamination and Acid Sulfate Soils shae.miller-white@rpsgroup.com.au +61 8 9288 0850

Enc. Tables

Figure A - Water quality sampling locations

Appendix A – Laboratory reports

Appendix B – Surface water sampling logs

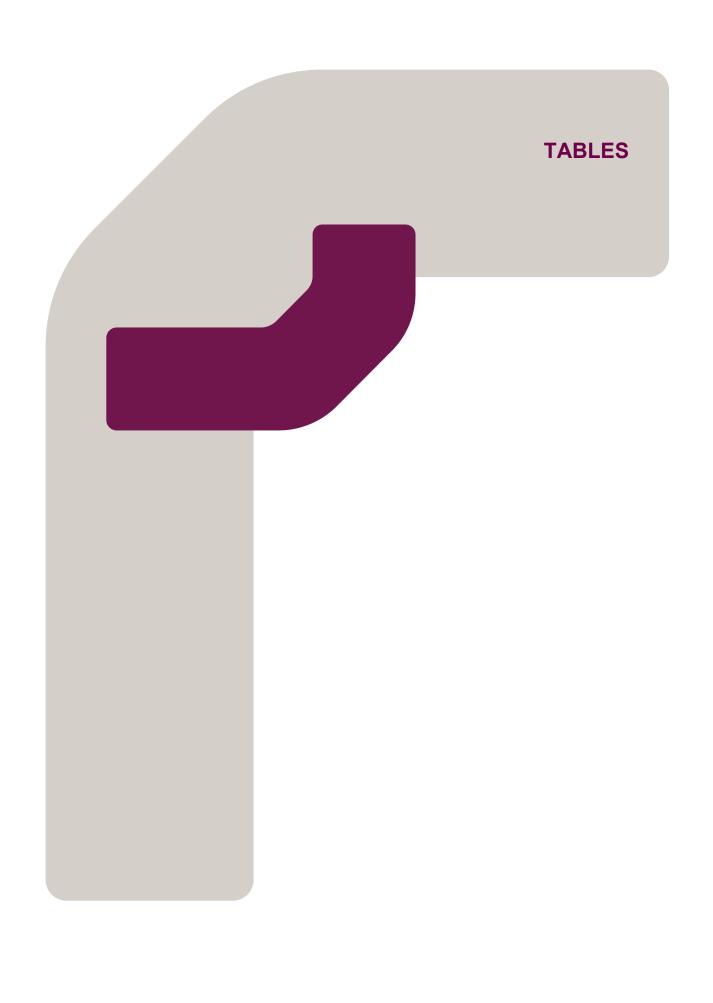


Table A

Surface Water Results: Field Paremeters, ASS, Cations, Nutrients and Miscellaneous

MGG-E (Marine Water Esturary Guideline) for slightly - moderately disturbed systems, RWG (Recreational Water Guidelines), ASS (Acid Sulfate Soils) Standing Advice from DWER on dewatering trigger values taken from ASS Guideline Series (2015), - (No Guideline), --- not tested, LOR (Limit of Reporting),* value for hexavalent chromium, # dulpicate value used due to RPD (%) failure

- Guideline values have been adopted from the following guidance documentation:

 Treatment and Management of Soil and Water in Acid Sulfate Soil Landscapes (DER 2015b)
 - Assessment and Management of Contamianted Sites (DER 2014)
 - Freshwater and Marine Water Quality Guidelines Chapter 3 (ANZECC/ARMCANZ 2000)
 - Water Quality Australia (WQA, 2019)

All results expressed as mg/L except for pH (pH units), ratios (unitless), Redox mV (mili Volts), turbidity (NTU) and EC (µS/cm) a) Values for estuary environments - Table 3.3.6 ANZECC/ARMCANZ 2000 Freshwater and Marine WQ Guidelines Chapter 3

- b) Values based on the sample having a pH ~8.2 (ANZECC/ARMCANZ 2000)
- f) Values based on Austalina Government, National Health and Medical Research Council, Guideline for Managing Risks in Recreational Water (NHMRC, 2008) g) Recreational water guideline values based on drinking water guidelines NHMRC & ARMCANZ (2011) Australian Drinking Water Guidelines

Denotes less than LOR

			F	ield Paran	neters				Acid	Sulfate S	oil Param	eters			ASS F	Ratios		Cat	tions				Nutr	ients			N	liscellaneou	IS
Sample II) Date	Trigger	Hd	E.C	Redox	DO	Total Acidity (CaCO3)	Total Alkalinity (CaCO3)	TDS	TSS	Turbidity	Sulfide	Sulfate	Chloride	Acidity: Alkalinity	Sulfate: Chloride	Calcium	Magnesium	Potassium	Sodium	Total P	Reactive P	Total N	TKN	NH ₃ -N	N-×ON	Dissolved Organic Carbon (DOC)	Chlorophyll "a"	Phaeophytin "a"
		Units	pH units	μS/cm	mV	%sat	mg/L	mg/L	mg/L	mg/L	NTU	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	mg/L
		MWG-E	7.5-8.5	-	-	90-110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03 ^a	0.005 ^a	0.75 ^a	-	0.62 ^b	0.045 ^a		0.003 ^a	-
		RWG	6.5-8.5 ^c	-	-	>80°	-	-	-	-	-	-	500 ^d	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		ASS	<6	-	-	-	>40	-	-	-	-	>0.5	-	-	>1	>0.5	-	-	-	-	-	-	-	-	-	-	-	-	-
		LOR	0.01	10	1	0.01	1	1	10	5	0.1	0.1	1	1	-	-	1	1	1	1	0.01	0.01	0.1	0.1	0.01	0.01	1	0.0001	0.0002
WS2-S	7/08/2020		8.70	50,710	181.4	105	6	120	39,000	9	0.6	0.9	2800	20,000	0.05	0.14	420	1300	370	12000	<0.05	<0.005	0.1	0.093	0.007	<0.005	<1	0.0004	0.0005
WS2-D	7/08/2020		8.19	50,966	179.4	105	7	120	39,000	5	0.5	0.8	2800	20,000	0.06	0.14	410	1300	360	11000	<0.05	<0.005	0.1	0.093	0.007	<0.005	<1	0.0005	0.0005
WS4-S	7/08/2020		8.27	50,809	106.3	106	6	130	40,000	16	0.6	0.7	3100	21,000	0.05	0.15	400	1300	370	11000	<0.05	0.006	0.2	0.192	0.008	<0.005	1	0.0005	0.0005
WS4-D	7/08/2020		8.27	50,996	108.4	105	<5	130	40,000	21	0.5	0.7	2800	20,000	0.04	0.14	420	1300	380	12000	<0.05	<0.005	0.1	0.093	0.007	<0.005	<1	0.0004	0.0006



Table B Surface Water Results: Metals

Definitions:

MGG-E (Marine Water Esturary Guideline) for slightly - moderately disturbed systems, RWG (Recreational Water Guidelines), ASS (Acid Sulfate Soils) Standing Advice from DWER on dewatering trigger values taken from ASS Guideline Series (2015),

- (No Guideline), --- not tested, LOR (Limit of Reporting),* value for hexavalent chromium, #dulpicate value used due to RPD (%) failure

Notes:

Guideline values have been adopted from the following guidance documentation:

- Treatment and Management of Soil and Water in Acid Sulfate Soil Landscapes (DER 2015b)
- Assessment and Management of Contamianted Sites (DER 2014)
- Freshwater and Marine Water Quality Guidelines Chapter 3 (ANZECC/ARMCANZ 2000)
- Water Quality Australia (WQA, 2019)

All results expressed as mg/L except for pH (pH units), ratios (unitless), Redox mV (mili Volts), turbidity (NTU) and EC (µS/cm)

- a) Chemicals for which possible bioaccumulation and secondary poisoning should be considered
- b) Recreational water guideline values based on drinking water guidelines NHMRC & ARMCANZ (2011) Australian Drinking Water Guidelines

 Denotes less than LOR

				ı	ı				Dis	solved Me	etals & Metal	loids							Total I	Metals
Sample ID	Date	Trigger	Aluminium	Antimony	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Molybdenum	Nickel	Lead	Selenium	Silver	Zinc	Total Aluminium	Total Iron
		Units	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	mg/L	mg/L	mg/L
		MWG-E	-	-	-	-	0.001	-	0.0013	-	0.0001 ^a	-	-	-	0.0044	-	0.0014	-	-	-
		RWG	-	0.003 ^b	0.007 ^b	0.002 ^b	-	0.05 ^b	2 ^b	-	0.001 ^b	0.5 ^b	-	0.02 ^b	0.01 ^b	0.01 ^b	-	-	-	-
		ASS	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LOR	0.01	0.002	0.001	0.0001	0.002	0.001	0.002	0.05	0.00005	0.001	0.001	0.001	0.001	0.01	0.00005	0.001	0.01	0.01
WS2-S	7/08/2020		<0.02	<0.002	<0.002	<0.0002	<0.002	<0.002	<0.002	<0.02	<0.00005	<0.01	0.012	<0.002	<0.002	<0.002	<0.0001	0.003	<0.02	<0.02
WS2-D	7/08/2020		<0.02	<0.002	<0.002	<0.0002	<0.002	<0.002	<0.002	<0.02	<0.00005	<0.01	0.012	<0.002	<0.002	<0.002	<0.0001	0.007	0.03	0.02
WS4-S	7/08/2020		<0.02	<0.002	<0.002	<0.0002	<0.002	<0.002	<0.002	<0.02	<0.00005	<0.01	0.012	<0.002	<0.002	<0.002	0.0002	0.004	0.02	0.03
WS4-D	7/08/2020		<0.02	<0.002	<0.002	<0.0002	<0.002	<0.002	<0.002	<0.02	<0.00005	<0.01	0.012	<0.002	<0.002	<0.002	<0.0001	0.003	<0.02	<0.02



Table C

Surface Water Results: MTBE, BTEX and TRH

Definitions:

MGG (Marine Water Guideline) for slightly - moderately disturbed systems, RWG (Recreational Water Guidelines)

LOR (Limits of Reporting), '- denotes no guideline. --- denotes not tested. ^ denotes guideline for hexavalent chromium has been adopted, analysis results are for total chromium.

denotes aesthetic guideline has been applied in the absence of a health based guideline.

All values in mg/L unless specified otherwise All guideline values are adopted from:

- National Environment Protection (Assessment of Site Contamination) Measure 1999, Guideline on Investigation Levels for Soil and Groundwater (NEPC 2013)

- National Environment Protection (Assessment of Site Contamination) Measure 1999, Guideline on Investigation Levels for S
 Assessment and Management of Contaminated Sites (DWER 2014)
 Health screening for petroleum hydrocarbons in soil and groundwater Part 2: Application document (CRC Care 2011)
 a) Value may not protect key test species from chronic toxicity, refer to chapter eight of ANZECC & ARMCANZ (2000)
 b) Recreational water guideline values based on drinking water guidelines NHMRC & ARMCANZ (2011) Australian Drinking Water Guidelines
 Table uses colour coding for data interpretation, avoid black and white reproduction.

 | Denotes < LOR|

			MTBE			BTEX				TRI	Н								Po	olycyclic A	romatic Hy	drocarbo	าร						
Sample ID	Date	Trigger	МТВЕ	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-xylene	F1: C6-C10 minus BTEX	F2: C>10-C16 minus N	F3: C>16-C34	F4: C>34-C40	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b,j+k)fluoranth ene	Benzo(a)pyrene	Indeno(1,2,3- c,d)pyrene	Dibenzo(a,h)anthrace ne	Benzo(g,h,i)perylene	Total Carcinogenic PAHs	Total Positive PAHs
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		MWG		0.50 ^a	-	-	-	-	-	-	-	-	0.05	-	-	-	-		-		-	-		-	-	-	-		-
		RWG	-	0.001 ^b	0.8 ^b	0.3 ^b	0.	6 ^b	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00001 ^b	-	-	-	-	-
		LOR	0.001	0.001	0.001	0.001	0.002	0.001	0.01	0.05	0.1	0.1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0005	0.0001
WS2-S	7/08/2020		<1	<1	<1	<1	<2	<1	<10	<50	<100	<100	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001
WS2-D	7/08/2020		<1	<1	<1	<1	<2	<1	<10	<50	<100	<100	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001
WS4-S	7/08/2020		<1	<1	<1	<1	<2	<1	<10	<50	<100	<100	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001
WS4-D	7/08/2020		<1	<1	<1	<1	<2	<1	<10	<50	<100	<100	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001

Table D Surface Water Results - OC/OP Pesticides

Definitions:

MGG (Marine Water Guideline) for slightly - moderately disturbed systems, RWG (Recreational Water Guidelines)

- denotes no guideline. --- denotes not tested. ^ denotes guideline for hexavalent chromium has been adopted, analysis results are for total chromium.

denotes aesthetic guideline has been applied in the absence of a health based guideline.

Notes

All values in mg/L unless specified otherwise

All guideline values are adopted from:

- National Environment Protection (Assessment of Site Contamination) Measure 1999, Guideline on Investigation Levels for Soil and Groundwater (NEPC 2013)
- Assessment and Management of Contaminated Sites (DWER 2014)
- a) Chemicals for which possible bioaccumulation and secondary poisoning effects should be considered. Refer to section 8.3.3.4 and 8.3.5.7 of ANZECC & ARMCANZ (2000)
- b) Recreational water guideline values based on drinking water guidelines NHMRC & ARMCANZ (2011) Australian Drinking Water Guidelines
- Where applicable, the following groundwater characterisitcs have been applied based on, groundwater depth 2 m to <4 mbgl

Table uses colour coding for data interpretation, avoid black and white reproduction.

denotes <LOR

												Organo	ochlorine Pe	esticides									
Sample ID	Date	Trigger	Aldrin	Aldrin + Dieldrin	а-ВНС	р-внс	d-ВНС	g-BHC (Lindane)	a-Chlordane	g-Chlordane	ООО	DDE	рот	DDD + DDE + DDT	Dieldrin	a-Endosulfan	b-Endosulfan	Endosulfan sulphate	Endrin	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
			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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
		MWG	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000	005 ^a	-	0.000004 ^a	-	-	-	-
		RWG	-	-	-	-	-	0.01 ^b	0.0	02 ^b	-	-	0.009 ^b	-	-	0.0	2 ^b	-	-	-	0.0003 ^b	-	-
		LOR	0.00001	0.00002	0.00005	0.00005	0.00005	0.00005	0.00001	0.00001	0.00001	0.00001	0.000006	0.00003	0.00001	0.00002	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002
WS2-S	7/08/2020		<0.00001	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.000006	<0.00003	<0.00001	<0.00002	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002
WS2-D	7/08/2020		<0.00001	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.000006	<0.00003	<0.00001	<0.00002	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002
WS4-S	7/08/2020												<0.000006									<0.00001	
WS4-D	7/08/2020		<0.00001	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.000006	<0.00003	<0.00001	<0.00002	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002

Table E

Surface Water Results: Per- and Poly-Fluoroalkyl Substances

Definitions:

LOR (Limits of Reporting), MWG (Interim Marine Water Guideline) -99 (99% species protection level) -95 (95% species protection level), RWG (Recreational Water Guidelines) - denotes no guideline. --- denotes not tested.

Notes:

All values in µg/L unless specified otherwise

Table uses colour coding for data interpretation, avoid black and white reproduction.

All guideline values are adopted from:

- PFAS National Environmental Managament Plan Version 2.0 (HEPA 2020)

- Australian Drinking Water Guidelines NRMMC (2011)

Denotes <LOR

				Per	fluoroalkyl	Sulfonic A	cids						Perfluoroa	lkyl Carbo	xylic Acids							Perfluor	oalkyl Sulfo	namides			(n:2) F	luorotelom	er Sulfonic	Acids	F	PFAS Sums	
Sample ID	Date	Trigger	Perfluorobutanesulfonic acid	Perfluoropentanesulfonic acid	Perfluorohexanesulfonic acid	Perfluoroheptanesulfonic acid	Perfluorooctanesulfonate PFOS	Perfluorodecanesulfonic acid	Perfluorobutanoic acid	Perfluoropentanoic acid	Perfluorohexanoic acid	Perfluoroheptanoic acid	Perfluorooctanoic acid PFOA	Perfluorononanoic acid	Perfluorodecanoic acid	Perfluoroundecanoic acid	Perfluorododecanoic acid	Perfluorotridecanoic acid	Perfluorotetradecanoic acid	Perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamide	N-Ethyl perfluorooctanesulfon-amide	N-Me perfluorooctanesulfonamid- oethanol	N-Et perfluorooctanesulfonamid-oethanol	MePerfluorooctanesulf- amid oacetic acid	EtPerfluorooctanesulf- amid oacetic acid	4:2FTSA	6:2FTSA	8:2FTSA	10:2 FTSA	Total Positive PFHxS & PFOS	Total Positive PFOS & PFOA	Total Positive PFAS
			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	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L
		MWG-99	-	-	-	-	0.00023	-	-	-	-	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		MWG-95	-	-	-	-	0.13	-	-	-	-	-	220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		RWG	-	-	2	-	2	-	-	-	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	_
		LOR	0.0004	0.001	0.0002	0.001	0.0002	0.002	0.002	0.002	0.0004	0.0004	0.0002	0.001	0.002	0.002	0.005	0.01	0.05	0.01	0.005	0.01	0.005	0.05	0.002	0.002	0.001	0.0004	0.0004	0.002	0.0002	0.0002	0.0002
WS2-S	7/08/2020		<0.0004	<0.001	0.0004	<0.001	0.0006	<0.002	<0.002	<0.002	<0.0004	<0.0004	0.0002	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.0010	0.0008	
WS2-D	7/08/2020		<0.0004	<0.001	0.0005	<0.001	0.0005	<0.002	<0.002	<0.002	<0.0004	<0.0004	0.0002	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.0010	0.0007	0.0010
WS4-S	7/08/2020		<0.0004	<0.001	0.0004	<0.001	0.0006	<0.002	<0.002	<0.002	<0.0004	<0.0004	0.0002	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.0010	0.0008	0.0010
WS4-D	7/08/2020		<0.0004	<0.001	0.0003	<0.001	0.0003	<0.002	<0.002	<0.002	<0.0004	<0.0004	<0.0002	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.0006	0.0003	0.0006

Table F

Surface Water QAQC Results (RPD Assessment): ASS, Cations, Nutrients and Miscellaneous

LOR 1° (Limit of Reporting, Primary Laboratory). --- denotes not tested. # denoted not calculated.

Notes:

All values in mg/L unless specified otherwise Table uses colour coding for data interpretation, avoid black and white reproduction.

denotes <LOR (primary laboratory) denotes <5x LOR (primary laboratory)

denotes exceedance of acceptance criteria (30%) where samples <5x LOR denotes exceedance of acceptance criteria (30%) where sample(s) >5x LOR

						Acid	Sulfate S	oil Param	eters				Cat	ions				Nutr	ients				Miscellaneou	ıs
Sample ID	Sample Type	Date	Trigger	Total Acidity (CaCO3)	Total Alkalinity (CaCO3)	трѕ	TSS	Turbidity	Sulfide	Sulfate	Chloride	Calcium	Magnesium	Potassium	Sodium	Total P	Reactive P	Total N	TKN	N- ₃ -N	N-×ON	Dissolved Organic Carbon (DOC)	Chlorophyll "a"	Phaeophytin "a"
			Units	mg/L	mg/L	mg/L	mg/L	NTU	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	
			LOR	1	1	10	5	0.1	0.1	1	1	1	1	1	1	0.01	0.01	0.1	0.1	0.01	0.01	1	0.0001	0.0002
WS2-S	Primary	7/08/2020		6	120	39,000	9	0.6	0.9	2800	20,000	420	1300	370	12000	<0.05	<0.005	0.1	0.093	0.007	<0.005	<1	0.0004	0.0005
WZ1	Duplicate	7708/2020		7	120	39,000	6	0.6	0.8	2800	20,000	420	1300	370	11000	<0.05	<0.005	0.1	0.091	0.009	<0.005	<1	0.0005	0.0003
	RPD %			15	0	0	40	0	12	0	0	0	0	0	9	0	0	0	2	25	0	0	22	50



Table G **Surface Water QAQC Results (RPD Assessment): Metals**

Definitions:

LOR 1° (Limit of Reporting, Primary Laboratory). --- denotes not tested. # denoted not calculated.

Notes:

All values in mg/L unless specified otherwise

Table uses colour coding for data interpretation, avoid black and white reproduction.

denotes <LOR (primary laboratory)

denotes <5x LOR (primary laboratory)

denotes exceedance of acceptance criteria (30%) where samples <5x LOR

denotes exceedance of acceptance criteria (30%) where sample(s) >5x LOR

										Dis	solved Me	etals & Metal	loids							Total	Metals
Sample ID	Sample Type	Date	Trigger	Aluminium	Antimony	Arsenic	Cadmium	Cobalt	Chromium	Copper	Iron	Mercury	Manganese	Molybdenum	Nickel	Lead	Selenium	Silver	Zinc	Total Aluminium	Total Iron
			Units	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	mg/L	mg/L	mg/L
			LOR	0.01	0.001	0.001	0.0001	0.002	0.001	0.02	0.05	0.00005	0.001	0.001	0.001	0.001	0.01	0.00005	0.001	0.01	0.05
WS2-S	Primary	7/08/2020		<0.02	<0.002	<0.002	<0.0002	<0.002	<0.002	<0.002	<0.02	<0.00005	<0.01	0.012	<0.002	<0.002	<0.002	<0.0001	0.003	<0.02	<0.02
WZ1	Duplicate	110012020		<0.02	<0.002	<0.002	<0.0002	<0.002	<0.002	<0.002	<0.02	<0.00005	<0.01	0.013	<0.002	<0.002	<0.002	<0.0001	0.004	0.03	0.02
	RPD %			0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	29	40	0



Table H

Surface Water QAQC Results (RPD Assessment): MTBE, BTEX and TRH

Definitions:LOR 1° (Limit of Reporting, Primary Laboratory). --- denotes not tested. # denoted not calculated.

Notes:

All values in mg/L unless specified otherwise
Table uses colour coding for data interpretation, avoid black and white reproduction.

denotes <LOR (primary laboratory)
denotes <5x LOR (primary laboratory)
denotes exceedance of acceptance criteria (30%) where samples <5x LOR
denotes exceedance of acceptance criteria (30%) where sample(s) >5x LOR

				MTBE			BTEX				TR	Н								Po	olycyclic A	romatic H	ydrocarbor	ns						
Sample ID	Sample type	MTBE									F2: C>10-C16 minus N	F3: C>16-C34	F4: C>34-C40	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b,j+k)fluoranth ene	Benzo(a)pyrene	Indeno(1,2,3- c,d)pyrene	Dibenzo(a,h)anthrace ne	Benzo(g,h,i)perylene	Total Carcinogenic PAHs	Total Positive PAHs
				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	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			LOR	0.001	0.001	0.001	0.001	0.002	0.001	0.01	0.05	0.1	0.1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0005	0.0001
WS2-S	Primary	7/08/2020		<1	<1	<1	<1	<2	<1	<10	<50	<100	<100	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001
WZ1	Duplicate	110012020		<1	<1	<1	<1	<2	<1	<10	<50	<100	<100	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001
	RPD %			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table I

Surface Water QAQC Results (RPD Assessment): OC/OP Pesticides

LOR 1° (Limit of Reporting, Primary Laboratory). --- denotes not tested. # denoted not calculated.

Notes:

All values in mg/L unless specified otherwise

Table uses colour coding for data interpretation, avoid black and white reproduction.

denotes <LOR (primary laboratory)

denotes <5x LOR (primary laboratory)

denotes exceedance of acceptance criteria (30%) where samples <5x LOR denotes exceedance of acceptance criteria (30%) where sample(s) >5x LOR

												0	rganochlori	ine Pestici	des								
Sample ID	Sample type	Date	Trigger	Aldrin	а-ВНС	р-внс	d-В НС	g-BHC (Lindane)	a-Chlordane	g-Chlordane	000	DDE	рот	DDD + DDE + DDT	Dieldrin	a-Endosulfan	b-Endosulfan	Endosulfan sulphate	Endrin	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor
				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	mg/L	mg/L	mg/L	mg/L	mg/L
			LOR	0.00001	0.00005	0.00005	0.00005	0.00005	0.00001	0.00001	0.00001	0.00001	0.000006	0.00003	0.00001	0.00002	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002
WS2-S	Primary	7/08/2020		<0.00001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.000006	<0.00003	<0.00001	<0.00002	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002
WZ1	Duplicate	1700/2020		<0.00001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00001	<0.00001	<0.00001	<0.00001	<0.000006	<0.00003	<0.00001	<0.00002	<0.00002	<0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00002
	RPD %			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table J Surface Water QAQC Results (RPD Assessment): Per- and Poly-Fluoroalkyl Substances

es: alues in mg/L		therwise erpretation, avoid denotes <lor (i<br="">denotes <5x LO denotes exceed</lor>		reproduction. /) tory) ce criteria (30	0%) where s 0%) where s	samples <5x sample(s) >5	x LOR																											
					Per	fluoroalkyl	Sulfonic Ac	ids						Perfluoroa	Ikyl Carbo	xylic Acids							Perfluoro	alkyl Sulfo	onamides			(n:2) F	luorotelon	ner Sulfonio	Acids	·	PFAS Sum	
Sample ID	Sample type	Date	Trigger	Perfluorobutanes ulfonic acid	Perfluoropentanesulfonic acid	, Perfluorohexanes ulfonic acid	, Perfluoroheptanesulfonic acid	, Perfluorooctanesulfonate PFOS	, Perfluorodecanesulfonic acid	, Perfluorobutanoic acid	, Perfluoropentanoic acid	Perfluorohexanoic acid	Perfluoroheptanoic acid	, Perfluorooctanoic acid PFOA	Perfluorononanoic acid	, Perfluorodecanoic acid	, Perfluoroundecanoic acid	Perfluorododecanoic acid	Perfluorotridecanoic acid	Perfluorotetradecanoic acid	Perfluorooctane sulfonamide	. N-Methyl perfluorooctane sulfonamide	N-Ethyl perfluorooctanesulfon-amide	N-Me perfluorooctanesulfonamid- cethanol	N-Et perfluorooctanesulfonamid- oethanol	. MePerfluorooctanesulf- amid oacetic acid	. EtPerfluorooctanes ulf- amid oacetic acid	42 FTSA	. 6:2 FTSA	8:2 FTSA	, 10:2 FTSA	, Total Positive PFHxS & PFOS	Total Positive PFOS & PFOA	Total Positive PFAS
			LOR	ug/L 0.0004	μg/L 0.001	μg/L 0.0002	μq/L 0.001	μg/L 0.0002	μg/L 0.002	ug/L 0.002	μg/L 0.002	μg/L 0.0004	μg/L 0.0004	μg/L 0.0002	μα/L 0.001	μg/L 0.002	μα/L 0.002	μg/L 0.005	μα/L 0.01	μg/L 0.05	μg/L 0.01	μg/L 0.005	ДQ/L 0.01	μg/L 0.005	μg/L 0.05	μg/L 0.002	μg/L 0.002	μg/L 0.001	μq/L 0.0004	0.0004	μg/L 0.002	μg/L 0.0002	μg/L 0.0002	μq/ 0.00
!-S	Primary	7/08/2020		<0.0004	<0.001	0.0005	<0.001	0.0005	<0.002	<0.002	<0.002	<0.0004	<0.0004	0.0002	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.001	0.0007	0.00
	Duplicate	7100/2020		<0.0004	<0.001	0.0004	<0.001	0.0006	<0.002	<0.002	<0.002	<0.0004	<0.0004	0.0002	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	<0.001	<0.0004	<0.0004	<0.002	0.001	0.0008	0.00
	RPD %			0	0	22	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0

Table K Surface Water QAQC Results (Rinsate, Field Blank and Trip-Blank): Metals and Turbidity

Definitions:

LOR 1° (Limit of Reporting, Primary Laboratory), --- denotes not tested.

Notes:

All values in mg/L unless specified otherwise

Table uses colour coding for data interpretation, avoid black and white reproduction.

denotes <LOR (primary laboratory)
denotes exceedance of acceptance criteria > LOR

										Dis	solved Me	etals & Metal	loids							Total I	Metals	ASS
Sample ID	Sample Type	Date	Trigger Units		mg/L	mg/L	Cadmium J/D	Cobalt Cobalt	mg/L	mg/L	u o <u>J</u> mg/L	mg/L	m S Manganese	molybdenum T	Nickel Mg/L	mg/L	mg/L	mg/L Silver	mg/L	a G Total Aluminium ↑	g Total Iron	Z Turbidity
			LOR	0.01	0.001	0.001	0.0001	0.001	0.001	0.001	0.01	0.00005	0.005	0.001	0.001	0.001	0.001	0.00005	0.001	0.01	0.01	0.1
Rinsates																						
WR1	Water	7/08/2020		<0.01	<0.001	<0.001	0.0001	<0.001	<0.001	<0.001	<0.01	<0.00005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.01	<0.01	0.2
Field Blank																						
WB1	Water	7/08/2020		<0.01	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	<0.00005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.01	<0.01	0.2



Table L

Surface Water QAQC Results (Rinsate, Field Blank and Trip-Blank): MTBE, BTEX and TRH

Definitions:LOR 1° (Limit of Reporting, Primary Laboratory), --- denotes not tested.

Notes: All values in m Table uses co	of Reporting, Ping/L unless specilour coding for denotes <lor denotes="" exceed<="" th=""><th>cified otherwis data interpreta (primary labo</th><th>se ation, avoid bla ratory)</th><th>ck and whi</th><th></th><th>ction.</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></lor>	cified otherwis data interpreta (primary labo	se ation, avoid bla ratory)	ck and whi		ction.																								
		dance or deed	ptarios sinona	MTBE			BTEX				TRI	1								Р	olycyclic A	romatic H	lydrocarbor	ns						
Sample ID	Sample type	Date	Trigger	ш б Е Ш тg/L	Benzene Mg/L	eu en lo	Ethylbenzene	mg/L	o-xylene mg/L	B F1: C6-C10 minus	7/ F2: C>10-C16 minus N	T F3: C>16-C34	B F4: C>34-C40	S Naphthalene	Acenaphthylene	Acenaphthene	Eluorene Ma/F	B Phenanthrene	Anthracene	T/b Fluoranthene	mg/L	Benzo(a)anthracene	D Chrysene	Benzo(b,j+k)fluoranth © ene	Benzo(a)pyrene	a Indeno(1,2,3- © c,d)pyrene	∃ Dibenzo(a,h)anthracen	Benzo(g,h,i)perylene	a Total Carcinogenic □ PAHs	Total Positive PAHs
Dinastas			LOR	0.001	0.001	0.001	0.001	0.002	0.001	0.01	0.05	0.1	0.1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0005	0.0001
Rinsates	lue .	07/0/000		1					0.004								0.0004						0.0004						2 2225	0.0004
	Water	07/0/2020		<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.01	<0.05	<0.1	<0.1	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001		
WB1 Trip-Blank	Water	07/0/2020		<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.01	<0.05	<0.1	<0.1	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001
WTB1	Water	07/0/2020		<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.01																				

Table M

Surface Water QAQC Results (Rinsate, Field Blank and Trip-Blank): OC/OP Pesticides

Definitions

LOR 1° (Limit of Reporting, Primary Laboratory), --- denotes not tested.

Notes:

All values in mg/L unless specified otherwise

Table uses colour coding for data interpretation, avoid black and white reproduction.

denotes <LOR (primary laboratory)

denotes exceedance of acceptance criteria > LOR

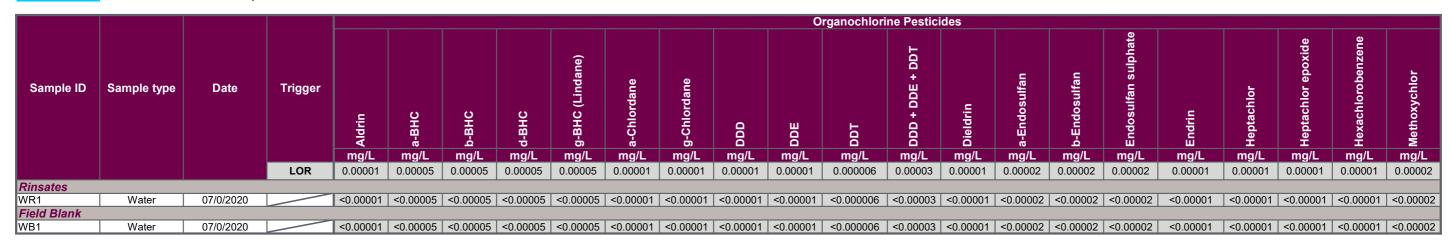


Table N

Surface Water QAQC Results (Rinsate, Field Blank and Trip-Blank): Per- and Poly-Fluoroalkyl Substances

den	notes exceedance	e of acceptance																															
			Citeria > LOIX		Per	fluoroalkyl	Sulfonic A	cids						Perfluoroa	lkyl Carbo	xylic Acids							Perfluor	oalkyl Sulfo	namides			(n:2) FI	luorotelom	ner Sulfonio	c Acids	i i	PFAS Sum
mple ID S	Sample type	Date	Trigger	Perfluorobutanesulfonic acid	Perfluoropentanesulfonic acid	Perfluorohexanesulfonic acid	Perfluoroheptanesulfonic acid	Perfluorooctanesulfonate PFOS	Perfluorodecanesulfonic acid	Perfluorobutanoic acid	Perfluoropentanolc acid	Perfluorohexanoic acid	Perfluoroheptanoic acid	Perfluorooctanoic acid PFOA	Perfluorononanoic acid	Perfluorodecanoic acid	Perfluoroundecanoic acid	Perfluorododecanoic acid	Perfluorotride canoic acid	Perfluorotetradecanoic acid	Perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamide	N-Ethyl perfluorooctanesulfon-amide	N-Me perfluorooctanesulfonamid- oethanol	N-Et perfluorooctanesulfonamid- oethanol	Me Perfluorooctanes ulf-amid oacetic acid	EtPerfluorooctanesulf- amid oacetic acid	4:2 FTSA	6:2 FTSA	8:2 FTSA	10:2 FTSA	Total Positive PFHxS & PFOS	Total Positive PFOS & PFOA
			LOR	μg/L 0.0004	μg/L 0.001	μg/L 0.0002	μg/L 0.001	µg/L 0.0002	μg/L 0.002	μg/L 0.002	μg/L 0.002	μg/L 0.0004	μg/L 0.0004	μg/L 0.0002	μg/L 0.001	μg/L 0.002	μg/L 0.002	μg/L 0.005	μg/L 0.01	μg/L 0.05	μg/L 0.01	μg/L 0.005	μg/L 0.01	μg/L 0.005	μg/L 0.05	μg/L 0.002	μg/L 0.002	μg/L 0.001	μg/L 0.0004	μg/L 0.0004	μg/L 0.002	μg/L 0.0002	μg/L 0.0002
tes Wat	otor	7/08/2020		<0.0004	<0.001	<0.0002	<0.001	<0.0002	<0.002	<0.002	<0.002	<0.0004	<0.0004	0.0003	<0.001	<0.002	<0.002	<0.005	<0.01	<0.05	<0.01	<0.005	<0.01	<0.005	<0.05	<0.002	<0.002	<0.001	<0.0004	<0.0004	<0.003	<0.0002	0.0003

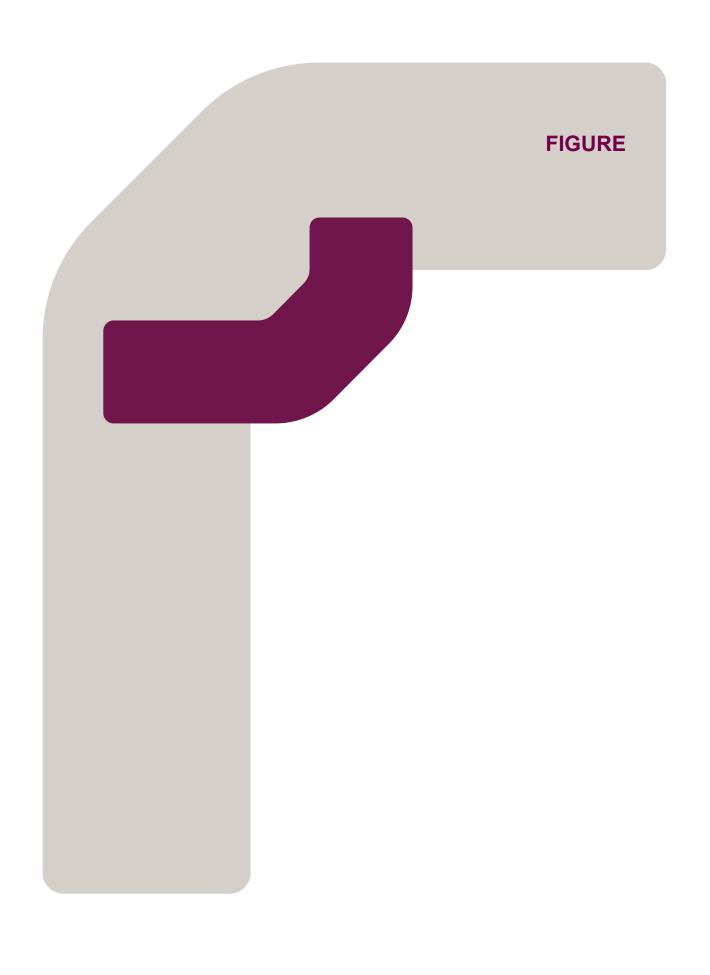




Figure A
Swan River crossing
Water quality sampling locations

Document Path: G:\Jobs\C20078 - MRWA SR Bridge\Figures C20078-004\C20078-004_G_001_Fig A Proposed WQ Sampling_200629.mxd





Appendix A Laboratory reports

CHAIN OF CUSTODY



Site: $5W$	Frewak#4	0.	Ana	lytical su	ites			L	evel 2, 27-31 Troode Street /est Perth WA 6005
Project reference:			丰	H, AS	FAS			T	el: (618) 9211 1111 ax: (618) 9211 1122
Scientist(s)	Zak L + Sh	ae MW	mor	T. H	d (6				ax. (010) 9211 1122
Sample type(s):	Water		er 5	itity	0-90			Page numb	er:
Report to:	ak L + Shai	e kin	Wat	AH,	DH (0			Turnaround	d time:
Invoice to:	west.accountspayat		hly	ls,	- E			Quote num	ber:
Sample I.D.	Date collected	Number of jars / bottles / bags	Monthly Water 5 month	Metals, Turbitity, TRH, BTEX, PAH, OCP PFAS	ВТЕХ, ТКН (С6-С9), РFA			Remarks	
WROHD	7/8/20	16	X						
WROTED	7/8/20	16	X					Analysis as p	er Quote 20P194v2
								Please	solved
Wads-s	7/8/20	16	×					for di	ssolved
Wads_s	7/8/20	16	×					weto	els.
WRI WBI WTBI	7/5/20	14		×				Please	report results others labelled
WBI	7/8/20	K		X				fac b	HE Khalland
WTBI	7/8/20 7/8/20	5			×			4100	5 5/1)
wZJ	101	J .	X					as	3-3/-0
	21/4/		1					6100	4-5/-D bottles labelled +-5/-D
								2128	botto labelino
			1					(1)00	4 S / D
								as	1 = 1 = 1
The second secon									₹5_S/-D
								wac	3-31-1
Total number of bot			╛.		. 4				
Primary destination Relinquished by:				d by: G v		Secondary destination: Relinquished by:		eived by:	1
	Eat L	D						anisation:	14 mol 6
Organisation:	14 120	Ti	me:	178/10	770	Organisation: Date:	Dat Tim		Laboratorles Job No 248325 Date Rec - 7/8/12/20 Time Rec - 12:55
Time:	3:00			(, ,		Time:		1	Date Rec - 7/8/2020
					No Land St. St.				Time Race 1-2 55
									Rec By = 1
									Rec By - G m TAT Reg - SAME 1/2/3/
									Temp - cool / ambient



Envirolab Services (WA) Pty Ltd trading as MPL Laboratories

ABN 53 140 099 207 16-18 Hayden Court Myaree WA 6154 ph 08 9317 2505 fax 08 9317 4163 lab@mpl.com.au www.mpl.com.au

CERTIFICATE OF ANALYSIS 248325

Client Details	
Client	RPS Australia West Pty Ltd
Attention	Zak Langtry
Address	Level 2, 27-31 Troode St, WEST PERTH, WA, 6005

Sample Details	
Your Reference	EEC20078.004 - SW Fremantle
Number of Samples	8 Water
Date samples received	07/08/2020
Date completed instructions received	07/08/2020

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	21/08/2020
Date of Issue	31/08/2020
Reissue Details	This report replaces R01 created on 31/08/2020 due to: Correction in Test Schedule
NATA Accreditation Number 2901.	This document shall not be reproduced except in full.
Accredited for compliance with ISO/	IEC 17025 - Testing. Tests not covered by NATA are denoted with *

Results Approved By

Heram Halim, Operations Manager Travis Carey, Organics - Team Leader **Authorised By**

Michael Kubiak, Laboratory Manager



vTRH(C6-C10)/MBTEXN in water							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-5
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WR1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Date analysed	-		10/08/2020	10/08/2020	10/08/2020	10/08/2020	10/08/2020
TRH C ₆ - C ₉	μg/L	10	<10	<10	<10	<10	<10
TRH C ₆ - C ₁₀	μg/L	10	<10	<10	<10	<10	<10
TRH C ₆ -C ₁₀ less BTEX (F1)	μg/L	10	<10	<10	<10	<10	<10
MTBE	μg/L	1	<1	<1	<1	<1	<1
Benzene	μg/L	1	<1	<1	<1	<1	<1
Toluene	μg/L	1	<1	<1	<1	<1	<1
Ethylbenzene	μg/L	1	<1	<1	<1	<1	<1
m+p-xylene	μg/L	2	<2	<2	<2	<2	<2
o-xylene	μg/L	1	<1	<1	<1	<1	<1
Naphthalene	μg/L	1	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%		101	102	105	106	101
Surrogate toluene-d8	%		99	99	98	99	98
Surrogate 4-BFB	%		101	104	101	105	102

vTRH(C6-C10)/MBTEXN in water					
Our Reference			248325-6	248325-7	248325-8
Your Reference	UNITS	PQL	WB1	WTB1	WZ1
Date Sampled			07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water
Date analysed	-		10/08/2020	10/08/2020	10/08/2020
TRH C ₆ - C ₉	μg/L	10	<10	<10	<10
TRH C ₆ - C ₁₀	μg/L	10	<10	<10	<10
TRH C ₆ -C ₁₀ less BTEX (F1)	μg/L	10	<10	<10	<10
МТВЕ	μg/L	1	<1	<1	<1
Benzene	μg/L	1	<1	<1	<1
Toluene	μg/L	1	<1	<1	<1
Ethylbenzene	μg/L	1	<1	<1	<1
m+p-xylene	μg/L	2	<2	<2	<2
o-xylene	μg/L	1	<1	<1	<1
Naphthalene	μg/L	1	<1	<1	<1
Surrogate Dibromofluoromethane	%		98	96	100
Surrogate toluene-d8	%		100	98	96
Surrogate 4-BFB	%		105	102	103

OCP in water				
Our Reference			248325-5	248325-6
Your Reference	UNITS	PQL	WR1	WB1
Date Sampled			07/08/2020	07/08/2020
Type of sample			Water	Water
Date extracted	-		14/08/2020	14/08/2020
Date analysed	-		16/08/2020	16/08/2020
Hexachlorobenzene (HCB)	μg/L	0.2	<0.2	<0.2
a-BHC	μg/L	0.2	<0.2	<0.2
b-BHC	μg/L	0.2	<0.2	<0.2
Lindane (g-BHC)	μg/L	0.2	<0.2	<0.2
d-BHC	μg/L	0.2	<0.2	<0.2
Heptachlor	μg/L	0.2	<0.2	<0.2
Aldrin	μg/L	0.2	<0.2	<0.2
Heptachlor Epoxide	μg/L	0.2	<0.2	<0.2
g-Chlordane	μg/L	0.2	<0.2	<0.2
a-Chlordane	μg/L	0.2	<0.2	<0.2
a-Endosulphan	μg/L	0.2	<0.2	<0.2
p,p'-DDE	μg/L	0.2	<0.2	<0.2
Dieldrin	μg/L	0.2	<0.2	<0.2
Endrin	μg/L	0.2	<0.2	<0.2
p,p'-DDD	μg/L	0.2	<0.2	<0.2
b-Endosulphan	μg/L	0.2	<0.2	<0.2
Endrin Aldehyde	μg/L	0.2	<0.2	<0.2
Endosulfan Sulphate	μg/L	0.2	<0.2	<0.2
p,p'-DDT	μg/L	0.2	<0.2	<0.2
Endrin Ketone	μg/L	0.2	<0.2	<0.2
Methoxychlor	μg/L	0.2	<0.2	<0.2
Surrogate 2-chlorophenol-d4	%		71	71

svTRH(C10-C40) in water							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-5
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WR1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Date extracted	-		10/08/2020	10/08/2020	10/08/2020	10/08/2020	10/08/2020
Date analysed	-		10/08/2020	10/08/2020	10/08/2020	10/08/2020	10/08/2020
TRH C ₁₀ - C ₁₄	μg/L	50	<50	<50	<50	<50	<50
TRH C ₁₅ - C ₂₈	μg/L	100	<100	<100	<100	<100	<100
TRH C ₂₉ - C ₃₆	μg/L	100	<100	<100	<100	<100	<100
TRH >C ₁₀ - C ₁₆	μg/L	50	<50	<50	<50	<50	<50
TRH >C ₁₀ -C ₁₆ less N (F2)	μg/L	50	<50	<50	<50	<50	<50
TRH >C ₁₆ - C ₃₄	μg/L	100	<100	<100	<100	<100	<100
TRH >C ₃₄ - C ₄₀	μg/L	100	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%		92	84	81	86	81

svTRH(C10-C40) in water				
Our Reference			248325-6	248325-8
Your Reference	UNITS	PQL	WB1	WZ1
Date Sampled			07/08/2020	07/08/2020
Type of sample			Water	Water
Date extracted	-		10/08/2020	10/08/2020
Date analysed	-		10/08/2020	10/08/2020
TRH C ₁₀ - C ₁₄	μg/L	50	<50	<50
TRH C ₁₅ - C ₂₈	μg/L	100	<100	<100
TRH C ₂₉ - C ₃₆	μg/L	100	<100	<100
TRH >C ₁₀ - C ₁₆	μg/L	50	<50	<50
TRH >C ₁₀ -C ₁₆ less N (F2)	μg/L	50	<50	<50
TRH >C ₁₆ - C ₃₄	μg/L	100	<100	<100
TRH >C ₃₄ - C ₄₀	μg/L	100	<100	<100
Surrogate o-Terphenyl	%		76	82

PAHs in Water							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-5
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WR1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Date extracted	-		14/08/2020	14/08/2020	14/08/2020	14/08/2020	14/08/2020
Date analysed	-		16/08/2020	16/08/2020	16/08/2020	16/08/2020	16/08/2020
Naphthalene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	μg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	μg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	μg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate p-Terphenyl-D ₁₄	%		77	73	81	80	83

PAHs in Water				
Our Reference			248325-6	248325-8
Your Reference	UNITS	PQL	WB1	WZ1
Date Sampled			07/08/2020	07/08/2020
Type of sample			Water	Water
Date extracted	-		14/08/2020	14/08/2020
Date analysed	-		16/08/2020	16/08/2020
Naphthalene	μg/L	0.1	<0.1	<0.1
Acenaphthylene	μg/L	0.1	<0.1	<0.1
Acenaphthene	μg/L	0.1	<0.1	<0.1
Fluorene	μg/L	0.1	<0.1	<0.1
Phenanthrene	μg/L	0.1	<0.1	<0.1
Anthracene	μg/L	0.1	<0.1	<0.1
Fluoranthene	μg/L	0.1	<0.1	<0.1
Pyrene	μg/L	0.1	<0.1	<0.1
Benzo(a)anthracene	μg/L	0.1	<0.1	<0.1
Chrysene	μg/L	0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	μg/L	0.2	<0.2	<0.2
Benzo(a)pyrene	μg/L	0.1	<0.1	<0.1
Indeno(1,2,3-c,d)pyrene	μg/L	0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	μg/L	0.1	<0.1	<0.1
Benzo(g,h,i)perylene	μg/L	0.1	<0.1	<0.1
Benzo(a)pyrene TEQ	μg/L	0.5	<0.5	<0.5
Total +ve PAH's	μg/L	0.1	<0.1	<0.1
Surrogate p-Terphenyl-D ₁₄	%		78	81

Low Level OCP in water							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-8
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WZ1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Date extracted	-		14/08/2020	14/08/2020	14/08/2020	14/08/2020	14/08/2020
Date analysed	-		16/08/2020	16/08/2020	16/08/2020	16/08/2020	16/08/2020
Hexachlorobenzene (HCB)	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
a-BHC	μg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lindane (g-BHC)	μg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
b-BHC	μg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
d-BHC	μg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
g-Chlordane	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
a-Chlordane	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
a-Endosulfan	μg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
pp-DDE	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dieldrin	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
pp-DDD	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
b-Endosulfan	μg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
pp-DDT	μg/L	0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Endosulfan Sulphate	μg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Methoxychlor	μg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Surrogate 2-chlorophenol-d4	%		71	71	88	85	77

Miscellaneous Inorganics							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-5
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WR1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Date prepared	-		07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Date analysed	-		07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Total Dissolved Solids (grav)	mg/L	5	40,000	40,000	39,000	39,000	[NA]
Total Suspended Solids	mg/L	5	16	21	9	5	[NA]
Turbidity	NTU	0.1	0.6	0.5	0.6	0.5	0.2
Dissolved Organic Carbon	mg/L	1	1	<1	<1	<1	[NA]
Acidity as CaCO ₃	mg/L	5	6	<5	6	7	[NA]
Sulphide in water*	mg/L	0.5	0.7	0.7	0.9	0.8	[NA]

Miscellaneous Inorganics				
Our Reference			248325-6	248325-8
Your Reference	UNITS	PQL	WB1	WZ1
Date Sampled			07/08/2020	07/08/2020
Type of sample			Water	Water
Date prepared	-		07/08/2020	07/08/2020
Date analysed	-		07/08/2020	07/08/2020
Total Dissolved Solids (grav)	mg/L	5	[NA]	39,000
Total Suspended Solids	mg/L	5	[NA]	6
Turbidity	NTU	0.1	0.2	0.6
Dissolved Organic Carbon	mg/L	1	[NA]	<1
Acidity as CaCO ₃	mg/L	5	[NA]	7
Sulphide in water*	mg/L	0.5	[NA]	0.8

Ionic Balance							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-8
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WZ1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Date prepared	-		07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Date analysed	-		07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Calcium - Dissolved	mg/L	0.5	400	420	420	410	420
Potassium - Dissolved	mg/L	0.5	370	380	370	360	370
Magnesium - Dissolved	mg/L	0.5	1,300	1,300	1,300	1,300	1,300
Sodium - Dissolved	mg/L	0.5	11,000	12,000	12,000	11,000	11,000
Bicarbonate HCO ₃ as CaCO ₃	mg/L	5	130	130	120	120	120
Carbonate CO ₃ ²⁻ as CaCO ₃	mg/L	5	<5	<5	<5	<5	<5
Hydroxide OH⁻ as CaCO₃	mg/L	5	<5	<5	<5	<5	<5
Total Alkalinity as CaCO ₃	mg/L	5	130	130	120	120	120
Chloride	mg/L	1	21,000	20,000	20,000	20,000	20,000
Sulphate	mg/L	1	3,100	2,800	2,800	2,800	2,800
Ionic Balance	%		-2.7	1.3	2.0	-0.64	1.1
Hardness as CaCO₃	mg/L	3	6,300	6,600	6,600	6,400	6,600

Nutrients in Water							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-8
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WZ1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Date prepared	-		07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Date analysed	-		07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Total Nitrogen	mg/L	0.1	0.2	0.1	0.1	0.1	0.1
NOx as N	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ammonia as N	mg/L	0.005	0.008	0.007	0.007	0.007	0.009
Total Phosphorus	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phosphate as P	mg/L	0.005	0.006	<0.005	<0.005	<0.005	<0.005

Dissolved Metals in Water							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-5
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WR1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Date prepared	-		11/08/2020	11/08/2020	11/08/2020	11/08/2020	11/08/2020
Date analysed	-		11/08/2020	11/08/2020	11/08/2020	11/08/2020	11/08/2020
Silver-Dissolved Ultra Low	mg/L	0.00005	0.0002	<0.0001	<0.0001	<0.0001	<0.00005
Aluminium-Dissolved	mg/L	0.01	<0.02	<0.02	<0.02	<0.02	<0.01
Arsenic-Dissolved	mg/L	0.001	<0.002	<0.002	<0.002	<0.002	<0.001
Cadmium-Dissolved	mg/L	0.0001	<0.0002	<0.0002	<0.0002	<0.0002	0.0001
Cobalt-Dissolved	mg/L	0.001	<0.002	<0.002	<0.002	<0.002	<0.001
Chromium-Dissolved	mg/L	0.001	<0.002	<0.002	<0.002	<0.002	<0.001
Copper-Dissolved	mg/L	0.001	<0.002	<0.002	<0.002	<0.002	<0.001
Iron-Dissolved	mg/L	0.01	<0.02	<0.02	<0.02	<0.02	<0.01
Mercury-Dissolved	mg/L	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Manganese-Dissolved	mg/L	0.005	<0.01	<0.01	<0.01	<0.01	<0.005
Molybdenum-Dissolved	mg/L	0.001	0.012	0.012	0.012	0.012	<0.001
Nickel-Dissolved	mg/L	0.001	<0.002	<0.002	<0.002	<0.002	<0.001
Lead-Dissolved	mg/L	0.001	<0.002	<0.002	<0.002	<0.002	<0.001
Antimony-Dissolved	mg/L	0.001	<0.002	<0.002	<0.002	<0.002	<0.001
Selenium-Dissolved	mg/L	0.001	<0.002	<0.002	<0.002	<0.002	<0.001
Zinc-Dissolved	mg/L	0.001	0.004	0.003	0.003	0.007	<0.001

Dissolved Metals in Water				
Our Reference			248325-6	248325-8
Your Reference	UNITS	PQL	WB1	WZ1
Date Sampled			07/08/2020	07/08/2020
Type of sample			Water	Water
Date prepared	-		11/08/2020	11/08/2020
Date analysed	-		11/08/2020	11/08/2020
Silver-Dissolved Ultra Low	mg/L	0.00005	<0.00005	<0.0001
Aluminium-Dissolved	mg/L	0.01	<0.01	<0.02
Arsenic-Dissolved	mg/L	0.001	<0.001	<0.002
Cadmium-Dissolved	mg/L	0.0001	<0.0001	<0.0002
Cobalt-Dissolved	mg/L	0.001	<0.001	<0.002
Chromium-Dissolved	mg/L	0.001	<0.001	<0.002
Copper-Dissolved	mg/L	0.001	<0.001	<0.002
Iron-Dissolved	mg/L	0.01	<0.01	<0.02
Mercury-Dissolved	mg/L	0.00005	<0.00005	<0.00005
Manganese-Dissolved	mg/L	0.005	<0.005	<0.01
Molybdenum-Dissolved	mg/L	0.001	<0.001	0.013
Nickel-Dissolved	mg/L	0.001	<0.001	<0.002
Lead-Dissolved	mg/L	0.001	<0.001	<0.002
Antimony-Dissolved	mg/L	0.001	<0.001	<0.002
Selenium-Dissolved	mg/L	0.001	<0.001	<0.002
Zinc-Dissolved	mg/L	0.001	<0.001	0.004

Total Metals in water							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-5
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WR1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Date digested	-		11/08/2020	11/08/2020	11/08/2020	11/08/2020	11/08/2020
Date analysed	-		11/08/2020	11/08/2020	11/08/2020	11/08/2020	11/08/2020
Aluminium-Total	mg/L	0.01	0.02	<0.02	<0.02	0.03	<0.01
Iron-Total	mg/L	0.01	0.03	<0.02	<0.02	0.02	<0.01

Total Metals in water				
Our Reference			248325-6	248325-8
Your Reference	UNITS	PQL	WB1	WZ1
Date Sampled			07/08/2020	07/08/2020
Type of sample			Water	Water
Date digested	-		11/08/2020	11/08/2020
Date analysed	-		11/08/2020	11/08/2020
Aluminium-Total	mg/L	0.01	<0.01	0.03
Iron-Total	mg/L	0.01	<0.01	0.02

PFAS in water TRACE Extended							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-5
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WR1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Date prepared	-		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Date analysed	-		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Perfluorobutanesulfonic acid	μg/L	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Perfluoropentanesulfonic acid	μg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluorohexanesulfonic acid	μg/L	0.0002	0.0004	0.0003	0.0005	0.0004	<0.0002
Perfluoroheptanesulfonic acid	μg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluorooctanesulfonate PFOS	μg/L	0.0002	0.0006	0.0003	0.0005	0.0006	<0.0002
Perfluorodecanesulfonic acid	μg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorobutanoic acid	μg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluoropentanoic acid	μg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorohexanoic acid	μg/L	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Perfluoroheptanoic acid	μg/L	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Perfluorooctanoic acid PFOA	μg/L	0.0002	0.0002	<0.0002	0.0002	0.0002	0.0003
Perfluorononanoic acid	μg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluorodecanoic acid	μg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluoroundecanoic acid	μg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorododecanoic acid	μg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Perfluorotridecanoic acid	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorotetradecanoic acid	μg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4:2 FTS	μg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
6:2 FTS	μg/L	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
8:2 FTS	μg/L	0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
10:2 FTS	μg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Perfluorooctane sulfonamide	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N-Methyl perfluorooctane sulfonamide	μg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
N-Ethyl perfluorooctanesulfon -amide	μg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
N-Me perfluorooctanesulfonamid -oethanol	μg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
N-Et perfluorooctanesulfonamid -oethanol	μg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MePerfluorooctanesulf- amid oacetic acid	μg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
EtPerfluorooctanesulf- amid oacetic acid	μg/L	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Surrogate ¹³ C ₈ PFOS	%		95	101	93	106	98
Surrogate ¹³ C ₂ PFOA	%		103	102	99	100	99
Extracted ISTD ¹³ C ₃ PFBS	%		115	110	105	114	115
Extracted ISTD ¹⁸ O ₂ PFHxS	%		120	108	104	110	114
Extracted ISTD ¹³ C ₄ PFOS	%		79	61	68	66	82
Extracted ISTD ¹³ C ₄ PFBA	%		95	92	84	97	127

PFAS in water TRACE Extended							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-5
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WR1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Extracted ISTD ¹³ C ₃ PFPeA	%		132	122	116	122	129
Extracted ISTD 13 C ₂ PFHxA	%		111	103	102	106	110
Extracted ISTD ¹³ C ₄ PFHpA	%		130	120	114	120	134
Extracted ISTD ¹³ C ₄ PFOA	%		121	105	104	109	114
Extracted ISTD 13 C ₅ PFNA	%		131	112	114	118	125
Extracted ISTD ¹³ C ₂ PFDA	%		89	72	76	80	95
Extracted ISTD ¹³ C ₂ PFUnDA	%		59	49	59	58	67
Extracted ISTD ¹³ C ₂ PFDoDA	%		57	58	54	54	64
Extracted ISTD 13 C ₂ PFTeDA	%		52	39	39	42	76
Extracted ISTD ¹³ C ₂ 4:2FTS	%		157	135	137	144	129
Extracted ISTD ¹³ C ₂ 6:2FTS	%		197	164	154	175	177
Extracted ISTD ¹³ C ₂ 8:2FTS	%		156	126	127	131	138
Extracted ISTD 13 C ₈ FOSA	%		76	58	62	65	78
Extracted ISTD d ₃ N MeFOSA	%		44	38	44	42	54
Extracted ISTD d ₅ N EtFOSA	%		45	38	43	41	55
Extracted ISTD d ₇ N MeFOSE	%		52	43	47	47	57
Extracted ISTD d ₉ N EtFOSE	%		47	40	45	43	56
Extracted ISTD d ₃ N MeFOSAA	%		64	54	62	59	73
Extracted ISTD d ₅ N EtFOSAA	%		65	58	62	65	69
Total Positive PFHxS & PFOS	μg/L	0.0002	0.001	0.0006	0.001	0.001	<0.0002
Total Positive PFOS & PFOA	μg/L	0.0002	0.0008	0.0003	0.0007	0.0008	0.0003
Total Positive PFAS	μg/L	0.0002	0.001	0.0006	0.001	0.001	0.0003

PFAS in water TRACE Extended			249225 6	249225 7	249225.0
Our Reference	LINUTO	BOL	248325-6	248325-7	248325-8
Your Reference	UNITS	PQL	WB1	WTB1	WZ1
Date Sampled			07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water
Date prepared	-		13/08/2020	13/08/2020	13/08/2020
Date analysed	-		13/08/2020	13/08/2020	13/08/2020
Perfluorobutanesulfonic acid	μg/L	0.0004	<0.0004	<0.0004	<0.0004
Perfluoropentanesulfonic acid	μg/L	0.001	<0.001	<0.001	<0.001
Perfluorohexanesulfonic acid	μg/L	0.0002	<0.0002	<0.0002	0.0004
Perfluoroheptanesulfonic acid	μg/L	0.001	<0.001	<0.001	<0.001
Perfluorooctanesulfonate PFOS	μg/L	0.0002	<0.0002	<0.0002	0.0006
Perfluorodecanesulfonic acid	μg/L	0.002	<0.002	<0.002	<0.002
Perfluorobutanoic acid	μg/L	0.002	<0.002	<0.002	<0.002
Perfluoropentanoic acid	μg/L	0.002	<0.002	<0.002	<0.002
Perfluorohexanoic acid	μg/L	0.0004	<0.0004	<0.0004	<0.0004
Perfluoroheptanoic acid	μg/L	0.0004	<0.0004	<0.0004	<0.0004
Perfluorooctanoic acid PFOA	μg/L	0.0002	<0.0002	<0.0002	0.0002
Perfluorononanoic acid	μg/L	0.001	<0.001	<0.001	<0.001
Perfluorodecanoic acid	μg/L	0.002	<0.002	<0.002	<0.002
Perfluoroundecanoic acid	μg/L	0.002	<0.002	<0.002	<0.002
Perfluorododecanoic acid	μg/L	0.005	<0.005	<0.005	<0.005
Perfluorotridecanoic acid	μg/L	0.01	<0.01	<0.01	<0.01
Perfluorotetradecanoic acid	μg/L	0.05	<0.05	<0.05	<0.05
4:2 FTS	μg/L	0.001	<0.001	<0.001	<0.001
6:2 FTS	μg/L	0.0004	<0.0004	<0.0004	<0.0004
8:2 FTS	μg/L	0.0004	<0.0004	<0.0004	<0.0004
10:2 FTS	μg/L	0.002	<0.002	<0.002	<0.002
Perfluorooctane sulfonamide	μg/L	0.01	<0.01	<0.01	<0.01
N-Methyl perfluorooctane sulfonamide	μg/L	0.005	<0.005	<0.005	<0.005
N-Ethyl perfluorooctanesulfon -amide	μg/L	0.01	<0.01	<0.01	<0.01
N-Me perfluorooctanesulfonamid -oethanol	μg/L	0.005	<0.005	<0.005	<0.005
N-Et perfluorooctanesulfonamid -oethanol	μg/L	0.05	<0.05	<0.05	<0.05
MePerfluorooctanesulf- amid oacetic acid	μg/L	0.002	<0.002	<0.002	<0.002
EtPerfluorooctanesulf- amid oacetic acid	μg/L	0.002	<0.002	<0.002	<0.002
Surrogate ¹³ C ₈ PFOS	%		108	95	96
Surrogate ¹³ C ₂ PFOA	%		98	98	97
Extracted ISTD ¹³ C ₃ PFBS	%		114	119	119
Extracted ISTD ¹⁸ O ₂ PFHxS	%		112	113	115
Extracted ISTD ¹³ C ₄ PFOS	%		78	83	74
Extracted ISTD ¹³ C ₄ PFBA	%		125	127	99

PFAS in water TRACE Extended					
Our Reference			248325-6	248325-7	248325-8
Your Reference	UNITS	PQL	WB1	WTB1	WZ1
Date Sampled			07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water
Extracted ISTD ¹³ C ₃ PFPeA	%		127	124	131
Extracted ISTD ¹³ C ₂ PFHxA	%		113	111	110
Extracted ISTD ¹³ C ₄ PFHpA	%		133	129	124
Extracted ISTD ¹³ C ₄ PFOA	%		118	114	115
Extracted ISTD ¹³ C ₅ PFNA	%		122	132	118
Extracted ISTD 13 C ₂ PFDA	%		89	93	82
Extracted ISTD ¹³ C ₂ PFUnDA	%		65	66	57
Extracted ISTD ¹³ C ₂ PFDoDA	%		57	65	56
Extracted ISTD ¹³ C ₂ PFTeDA	%		83	78	40
Extracted ISTD ¹³ C ₂ 4:2FTS	%		128	126	151
Extracted ISTD ¹³ C ₂ 6:2FTS	%		165	176	181
Extracted ISTD ¹³ C ₂ 8:2FTS	%		142	133	137
Extracted ISTD ¹³ C ₈ FOSA	%		77	79	69
Extracted ISTD d ₃ N MeFOSA	%		48	53	46
Extracted ISTD d ₅ N EtFOSA	%		48	54	46
Extracted ISTD d ₇ N MeFOSE	%		56	61	49
Extracted ISTD d ₉ N EtFOSE	%		50	56	48
Extracted ISTD d ₃ N MeFOSAA	%		71	73	66
Extracted ISTD d ₅ N EtFOSAA	%		60	62	60
Total Positive PFHxS & PFOS	μg/L	0.0002	<0.0002	<0.0002	0.001
Total Positive PFOS & PFOA	μg/L	0.0002	<0.0002	<0.0002	0.0008
Total Positive PFAS	μg/L	0.0002	<0.0002	<0.0002	0.001

Chlorophyll a & Phaeophytin a							
Our Reference			248325-1	248325-2	248325-3	248325-4	248325-8
Your Reference	UNITS	PQL	WS4_S	WS4_D	WS2_S	WS2_D	WZ1
Date Sampled			07/08/2020	07/08/2020	07/08/2020	07/08/2020	07/08/2020
Type of sample			Water	Water	Water	Water	Water
Chlorophyll a	μg/L	0.1	0.5	0.4	0.4	0.5	0.5
Phaeophytin a	μg/L	0.2	0.5	0.6	0.5	0.5	0.3

Method ID	Methodology Summary
Ext-058	Analysed by The Marine and Freshwater Research Laboratory, accreditation number 10603
INORG-005	Acidity - determined by titration based on APHA latest edition, Method 2310 B. Soils reported from a 1:5 water extract unless otherwise specified.
INORG-006	Alkalinity - determined titrimetrically based on APHA latest edition, Method 2320-B. Soils reported from a 1:5 water extract unless otherwise specified.
INORG-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180±10°C
INORG-019	Suspended Solids - determined gravimetrically by filtration of the sample. The solids are dried at 104±5°C
INORG-022	Turbidity - measured nephelometrically using a turbidimeter, in accordance with APHA latest edition, 2130 B.
INORG-040	Ion Balance Calculation: Cations in water by ICP-OES; Anions in water by IC; Alkalinity in water by Titration using APHA methods.
INORG-051	Determination of sulphide by titration and/or colourimetric determination. Note, the Sulphide is termed as Total Sulphide given any Sulphide contained in any sediment present may also included in the determination.
INORG-055	NOx - determined colourimetrically. Soils are analysed from a water extract.
INORG-057	Ammonia by colourimetric analysis based on APHA latest edition 4500-NH3 F.
INORG-060	Phosphate- determined colourimetrically. Soils are analysed from a water extract.
INORG-081	Anions - a range of anions are determined by Ion Chromatography based on APHA latest edition Method 4110-B. Soils and other sample types reported from a water extract unless otherwise specified (standard soil extract ratio 1:5).
INORG-110	Total Nitrogen by high temperature catalytic combustion with chemiluminescence detection. Dissolved/Total Carbon and Dissolved/Total Organic and Inorganic Carbon by high temperature catalytic combustion with NDIR
METALS-008	Hardness calculated from Calcium and Magnesium as per APHA latest edition 2340B.
METALS-020	Determination of various metals by ICP-AES.
METALS-021	Determination of Mercury by Cold Vapour AAS.
	For urine samples total Mercury is determined, however, mercury in urine is almost entirely in the inorganic form (CDC).
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-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.

 MPL Reference:
 248325

 Revision No:
 R02

Method ID	Methodology Summary
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS/GC-MSMS. Benzo(a)pyrene TEQ as per NEPM draft B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated after SPE. Analysis is undertaken with LC-MS/MS.
	PFAS results include the sum of branched and linear isomers where applicable.
	Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components.
	Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

QUALITY CONTR	OL: vTRH(C	6-C10)/N	IBTEXN in water			Du	plicate		Spike Red	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date analysed	-			10/08/2020	[NT]		[NT]	[NT]	10/08/2020	
TRH C ₆ - C ₉	μg/L	10	Org-023	<10	[NT]		[NT]	[NT]	106	
TRH C ₆ - C ₁₀	μg/L	10	Org-023	<10	[NT]		[NT]	[NT]	105	
МТВЕ	μg/L	1	Org-023	<1	[NT]		[NT]	[NT]	[NT]	
Benzene	μg/L	1	Org-023	<1	[NT]		[NT]	[NT]	107	
Toluene	μg/L	1	Org-023	<1	[NT]		[NT]	[NT]	110	
Ethylbenzene	μg/L	1	Org-023	<1	[NT]		[NT]	[NT]	101	
m+p-xylene	μg/L	2	Org-023	<2	[NT]		[NT]	[NT]	104	
o-xylene	μg/L	1	Org-023	<1	[NT]		[NT]	[NT]	101	
Naphthalene	μg/L	1	Org-023	<1	[NT]		[NT]	[NT]	[NT]	
Surrogate Dibromofluoromethane	%		Org-023	98	[NT]		[NT]	[NT]	102	
Surrogate toluene-d8	%		Org-023	98	[NT]		[NT]	[NT]	101	
Surrogate 4-BFB	%		Org-023	101	[NT]		[NT]	[NT]	100	

QUAL	ITY CONTRO	L: OCP ir	water			Du	plicate		Spike Rec	overy %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	
Date extracted	-			14/08/2020	6	14/08/2020	14/08/2020		14/08/2020	
Date analysed	-			16/08/2020	6	16/08/2020	16/08/2020		16/08/2020	
Hexachlorobenzene (HCB)	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
a-BHC	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	94	
b-BHC	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
Lindane (g-BHC)	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
d-BHC	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
Heptachlor	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	102	
Aldrin	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	87	
Heptachlor Epoxide	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	93	
g-Chlordane	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
a-Chlordane	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
a-Endosulphan	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
p,p'-DDE	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	82	
Dieldrin	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	77	
Endrin	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
p,p'-DDD	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	99	
b-Endosulphan	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
Endrin Aldehyde	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
Endosulfan Sulphate	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	99	
p,p'-DDT	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
Endrin Ketone	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
Methoxychlor	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0	[NT]	
Surrogate 2-chlorophenol-d4	%		Org-022/025	84	6	71	70	1	72	

QUALITY COM			Du	plicate		Spike Re	covery %			
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	248325-8
Date extracted	-			10/08/2020	2	10/08/2020	10/08/2020		10/08/2020	10/08/2020
Date analysed	-			10/08/2020	2	10/08/2020	10/08/2020		10/08/2020	10/08/2020
TRH C ₁₀ - C ₁₄	μg/L	50	Org-020	<50	2	<50	<50	0	113	84
TRH C ₁₅ - C ₂₈	μg/L	100	Org-020	<100	2	<100	<100	0	114	100
TRH C ₂₉ - C ₃₆	μg/L	100	Org-020	<100	2	<100	<100	0	113	102
TRH >C ₁₀ - C ₁₆	μg/L	50	Org-020	<50	2	<50	<50	0	117	88
TRH >C ₁₆ - C ₃₄	μg/L	100	Org-020	<100	2	<100	<100	0	112	100
TRH >C ₃₄ - C ₄₀	μg/L	100	Org-020	<100	2	<100	<100	0	121	109
Surrogate o-Terphenyl	%		Org-020	80	2	84	77	9	96	80

QUALIT	Y CONTROL	: PAHs ir	n Water			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	248325-1
Date extracted	-			16/08/2020	6	14/08/2020	14/08/2020		16/08/2020	16/08/2020
Date analysed	-			19/08/2020	6	16/08/2020	16/08/2020		19/08/2020	19/08/2020
Naphthalene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0	60	61
Acenaphthylene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0		
Acenaphthene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0		
Fluorene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0	78	85
Phenanthrene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0	80	82
Anthracene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0		
Fluoranthene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0	81	81
Pyrene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0	74	76
Benzo(a)anthracene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0		
Chrysene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0	88	90
Benzo(b,j+k)fluoranthene	μg/L	0.2	Org-022/025	<0.2	6	<0.2	<0.2	0		
Benzo(a)pyrene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0	94	74
Indeno(1,2,3-c,d)pyrene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0		
Dibenzo(a,h)anthracene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0		
Benzo(g,h,i)perylene	μg/L	0.1	Org-022/025	<0.1	6	<0.1	<0.1	0		
Surrogate p-Terphenyl-D ₁₄	%		Org-022/025	78	6	78	84	7	81	83

QUALITY C	ONTROL: Lo	w Level O	CP in water			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	248325-1
Date extracted	-			16/08/2020	[NT]		[NT]	[NT]	16/08/2020	16/08/2020
Date analysed	-			19/08/2020	[NT]		[NT]	[NT]	19/08/2020	19/08/2020
Hexachlorobenzene (HCB)	μg/L	0.01	Org-022/025	<0.01	[NT]		[NT]	[NT]		[NT]
a-BHC	μg/L	0.05	Org-022/025	<0.05	[NT]		[NT]	[NT]	94	95
Lindane (g-BHC)	μg/L	0.05	Org-022/025	<0.05	[NT]		[NT]	[NT]		[NT]
b-BHC	μg/L	0.05	Org-022/025	<0.05	[NT]		[NT]	[NT]	101	99
Heptachlor	μg/L	0.01	Org-022/025	<0.01	[NT]		[NT]	[NT]	102	114
d-BHC	μg/L	0.05	Org-022/025	<0.05	[NT]		[NT]	[NT]		[NT]
Aldrin	μg/L	0.01	Org-022/025	<0.01	[NT]		[NT]	[NT]	87	86
Heptachlor Epoxide	μg/L	0.01	Org-022/025	<0.01	[NT]		[NT]	[NT]	94	122
g-Chlordane	μg/L	0.01	Org-022/025	<0.01	[NT]		[NT]	[NT]		[NT]
a-Chlordane	μg/L	0.01	Org-022/025	<0.01	[NT]		[NT]	[NT]		[NT]
a-Endosulfan	μg/L	0.02	Org-022/025	<0.02	[NT]		[NT]	[NT]		[NT]
pp-DDE	μg/L	0.01	Org-022/025	<0.01	[NT]		[NT]	[NT]	82	88
Dieldrin	μg/L	0.01	Org-022/025	<0.01	[NT]		[NT]	[NT]	77	72
Endrin	μg/L	0.01	Org-022/025	<0.01	[NT]		[NT]	[NT]		[NT]
pp-DDD	μg/L	0.01	Org-022/025	<0.01	[NT]		[NT]	[NT]	99	104
b-Endosulfan	μg/L	0.02	Org-022/025	<0.02	[NT]		[NT]	[NT]		[NT]
pp-DDT	μg/L	0.006	Org-022/025	<0.006	[NT]		[NT]	[NT]		[NT]
Endosulfan Sulphate	μg/L	0.02	Org-022/025	<0.02	[NT]		[NT]	[NT]	99	107
Methoxychlor	μg/L	0.02	Org-022/025	<0.02	[NT]		[NT]	[NT]		[NT]
Surrogate 2-chlorophenol-d4	%		Org-022/025	75	[NT]		[NT]	[NT]	65	72

QUALITY COI	NTROL: Mis	cellaneou	s Inorganics			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			07/08/2020	1	07/08/2020	07/08/2020		07/08/2020	
Date analysed	-			07/08/2020	1	07/08/2020	07/08/2020		07/08/2020	
Total Dissolved Solids (grav)	mg/L	5	INORG-018	<5	1	40000	[NT]		103	
Total Suspended Solids	mg/L	5	INORG-019	<5	1	16	[NT]		98	
Turbidity	NTU	0.1	INORG-022	<0.1	1	0.6	0.6	0	108	
Dissolved Organic Carbon	mg/L	1	INORG-110	<1	1	1	[NT]		99	
Acidity as CaCO ₃	mg/L	5	INORG-005	<5	1	6	7	15	99	
Sulphide in water*	mg/L	0.5	INORG-051	<0.5	1	0.7	[NT]		103	[NT]

QUALIT	Y CONTRO	L: Ionic B	alance			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			07/08/2020	1	07/08/2020	07/08/2020		07/08/2020	
Date analysed	-			07/08/2020	1	07/08/2020	07/08/2020		07/08/2020	
Calcium - Dissolved	mg/L	0.5	METALS-020	<0.5	1	400	410	2	100	
Potassium - Dissolved	mg/L	0.5	METALS-020	<0.5	1	370	370	0	101	
Magnesium - Dissolved	mg/L	0.5	METALS-020	<0.5	1	1300	1300	0	102	
Sodium - Dissolved	mg/L	0.5	METALS-020	<0.5	1	11000	11000	0	101	
Bicarbonate HCO ₃ as CaCO ₃	mg/L	5	INORG-006	<5	1	130	120	8	104	
Carbonate CO ₃ ²⁻ as CaCO ₃	mg/L	5	INORG-006	<5	1	<5	<5	0	104	
Total Alkalinity as CaCO ₃	mg/L	5	INORG-006	<5	1	130	120	8	104	
Chloride	mg/L	1	INORG-081	<1	1	21000	[NT]		106	
Sulphate	mg/L	1	INORG-081	<1	1	3100	[NT]		107	
Hardness as CaCO₃	mg/L	3	METALS-008	<3	1	6300	6400	2	[NT]	

QUALITY	CONTROL:	Nutrients	in Water			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	248325-2
Date prepared	-			07/08/2020	1	07/08/2020	07/08/2020		07/08/2020	07/08/2020
Date analysed	-			07/08/2020	1	07/08/2020	07/08/2020		07/08/2020	07/08/2020
Total Nitrogen	mg/L	0.1	INORG-110	<0.1	1	0.2	[NT]		102	[NT]
NOx as N	mg/L	0.005	INORG-055	<0.005	1	<0.005	<0.005	0	104	99
Ammonia as N	mg/L	0.005	INORG-057	<0.005	1	0.008	0.008	0	93	114
Total Phosphorus	mg/L	0.05	METALS-020	<0.05	1	<0.05	[NT]		110	[NT]
Phosphate as P	mg/L	0.005	INORG-060	<0.005	1	0.006	0.005	18	120	108

QUALITY	CONTROL:	Nutrients	in Water			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	3	07/08/2020	07/08/2020			
Date analysed	-			[NT]	3	07/08/2020	07/08/2020			
Total Nitrogen	mg/L	0.1	INORG-110	[NT]	3	0.1	[NT]			
NOx as N	mg/L	0.005	INORG-055	[NT]	3	<0.005	[NT]			
Ammonia as N	mg/L	0.005	INORG-057	[NT]	3	0.007	[NT]			
Total Phosphorus	mg/L	0.05	METALS-020	[NT]	3	<0.05	<0.05	0		
Phosphate as P	mg/L	0.005	INORG-060	[NT]	3	<0.005	[NT]			

QUALITY CO	ONTROL: Dis	solved Me	tals in Water			Du	plicate		Spike Red	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date prepared	-			11/08/2020	4	11/08/2020	11/08/2020		11/08/2020	
Date analysed	-			11/08/2020	4	11/08/2020	11/08/2020		11/08/2020	
Silver-Dissolved Ultra Low	mg/L	0.00005	METALS-022	<0.00005	4	<0.0001	<0.0001	0	99	
Aluminium-Dissolved	mg/L	0.01	METALS-022	<0.01	4	<0.02	<0.02	0	98	
Arsenic-Dissolved	mg/L	0.001	METALS-022	<0.001	4	<0.002	<0.002	0	101	
Cadmium-Dissolved	mg/L	0.0001	METALS-022	<0.0001	4	<0.0002	<0.0002	0	98	
Cobalt-Dissolved	mg/L	0.001	METALS-022	<0.001	4	<0.002	<0.002	0	96	
Chromium-Dissolved	mg/L	0.001	METALS-022	<0.001	4	<0.002	<0.002	0	96	
Copper-Dissolved	mg/L	0.001	METALS-022	<0.001	4	<0.002	<0.002	0	93	
Iron-Dissolved	mg/L	0.01	METALS-022	<0.01	4	<0.02	<0.02	0	103	
Mercury-Dissolved	mg/L	0.00005	METALS-021	<0.00005	4	<0.00005	[NT]		101	
Manganese-Dissolved	mg/L	0.005	METALS-022	<0.005	4	<0.01	<0.01	0	95	
Molybdenum-Dissolved	mg/L	0.001	METALS-022	<0.001	4	0.012	0.012	0	100	
Nickel-Dissolved	mg/L	0.001	METALS-022	<0.001	4	<0.002	<0.002	0	94	
Lead-Dissolved	mg/L	0.001	METALS-022	<0.001	4	<0.002	<0.002	0	96	
Antimony-Dissolved	mg/L	0.001	METALS-022	<0.001	4	<0.002	<0.002	0	102	
Selenium-Dissolved	mg/L	0.001	METALS-022	<0.001	4	<0.002	<0.002	0	96	
Zinc-Dissolved	mg/L	0.001	METALS-022	<0.001	4	0.007	0.003	80	96	

QUALITY C	ONTROL: T	otal Meta	ls in water			Spike Re	covery %			
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Date digested	-			11/08/2020	3	11/08/2020	10/08/2020		11/08/2020	
Date analysed	-			11/08/2020	3	11/08/2020	10/08/2020		11/08/2020	
Aluminium-Total	mg/L	0.01	METALS-022	<0.01	3	<0.02	<0.02	0	92	
Iron-Total	mg/L	0.01	METALS-022	<0.01	3	<0.02	<0.02	0	96	[NT]

QUALITY CONTR	OL: PFAS i	n water TI	RACE Extended			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	248325-2
Date prepared	-			13/08/2020	1	13/08/2020	13/08/2020		13/08/2020	13/08/2020
Date analysed	-			13/08/2020	1	13/08/2020	13/08/2020		13/08/2020	13/08/2020
Perfluorobutanesulfonic acid	μg/L	0.0004	Org-029	<0.0004	1	<0.0004	<0.0004	0	93	102
Perfluoropentanesulfonic acid	μg/L	0.001	Org-029	<0.001	1	<0.001	<0.001	0	92	98
Perfluorohexanesulfonic acid	μg/L	0.0002	Org-029	<0.0002	1	0.0004	0.0006	40	93	95
Perfluoroheptanesulfonic acid	μg/L	0.001	Org-029	<0.001	1	<0.001	<0.001	0	91	95
Perfluorooctanesulfonate PFOS	μg/L	0.0002	Org-029	<0.0002	1	0.0006	0.0006	0	98	109
Perfluorodecanesulfonic acid	μg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	83	91
Perfluorobutanoic acid	μg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	93	98
Perfluoropentanoic acid	μg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	95	95
Perfluorohexanoic acid	μg/L	0.0004	Org-029	<0.0004	1	<0.0004	<0.0004	0	98	103
Perfluoroheptanoic acid	μg/L	0.0004	Org-029	<0.0004	1	<0.0004	<0.0004	0	96	102
Perfluorooctanoic acid PFOA	μg/L	0.0002	Org-029	<0.0002	1	0.0002	0.0003	40	101	107
Perfluorononanoic acid	μg/L	0.001	Org-029	<0.001	1	<0.001	<0.001	0	100	102
Perfluorodecanoic acid	μg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	104	115
Perfluoroundecanoic acid	μg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	113	118
Perfluorododecanoic acid	μg/L	0.005	Org-029	<0.005	1	<0.005	<0.005	0	102	119
Perfluorotridecanoic acid	μg/L	0.01	Org-029	<0.01	1	<0.01	<0.01	0	93	106
Perfluorotetradecanoic acid	μg/L	0.05	Org-029	<0.05	1	<0.05	<0.05	0	103	93
4:2 FTS	μg/L	0.001	Org-029	<0.001	1	<0.001	<0.001	0	105	108
6:2 FTS	μg/L	0.0004	Org-029	<0.0004	1	<0.0004	<0.0004	0	106	107
8:2 FTS	μg/L	0.0004	Org-029	<0.0004	1	<0.0004	<0.0004	0	106	103
10:2 FTS	μg/L	0.002	Org-029	<0.001	1	<0.002	<0.002	0	104	97
Perfluorooctane sulfonamide	μg/L	0.01	Org-029	<0.01	1	<0.01	<0.01	0	97	95
N-Methyl perfluorooctane sulfonamide	μg/L	0.005	Org-029	<0.005	1	<0.005	<0.005	0	123	130
N-Ethyl perfluorooctanesulfon -amide	μg/L	0.01	Org-029	<0.01	1	<0.01	<0.01	0	123	126
N-Me perfluorooctanesulfonamid -oethanol	μg/L	0.005	Org-029	<0.005	1	<0.005	<0.005	0	105	120
N-Et perfluorooctanesulfonamid -oethanol	μg/L	0.05	Org-029	<0.05	1	<0.05	<0.05	0	102	110
MePerfluorooctanesulf- amid oacetic acid	μg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	110	117
EtPerfluorooctanesulf- amid oacetic acid	μg/L	0.002	Org-029	<0.002	1	<0.002	<0.002	0	102	123
Surrogate ¹³ C ₈ PFOS	%		Org-029	92	1	95	95	0	92	103
Surrogate ¹³ C ₂ PFOA	%		Org-029	96	1	103	101	2	98	102
Extracted ISTD ¹³ C ₃ PFBS	%		Org-029	119	1	115	98	16	118	108

QUALITY CONTR	ROL: PFAS ir	n water T	RACE Extended			Du	plicate		Spike Re	ecovery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	248325-2
Extracted ISTD ¹⁸ O ₂ PFHxS	%		Org-029	112	1	120	99	19	113	109
Extracted ISTD ¹³ C ₄ PFOS	%		Org-029	81	1	79	66	18	90	71
Extracted ISTD ¹³ C ₄ PFBA	%		Org-029	122	1	95	84	12	120	89
Extracted ISTD ¹³ C ₃ PFPeA	%		Org-029	126	1	132	112	16	121	121
Extracted ISTD ¹³ C ₂ PFHxA	%		Org-029	106	1	111	95	16	109	106
Extracted ISTD ¹³ C ₄ PFHpA	%		Org-029	123	1	130	106	20	128	120
Extracted ISTD ¹³ C ₄ PFOA	%		Org-029	114	1	121	96	23	108	104
Extracted ISTD ¹³ C ₅ PFNA	%		Org-029	113	1	131	102	25	105	119
Extracted ISTD ¹³ C ₂ PFDA	%		Org-029	91	1	89	77	14	86	77
Extracted ISTD ¹³ C ₂ PFUnDA	%		Org-029	74	1	59	59	0	67	61
Extracted ISTD ¹³ C ₂ PFDoDA	%		Org-029	59	1	57	62	8	47	61
Extracted ISTD ¹³ C ₂ PFTeDA	%		Org-029	97	1	52	56	7	93	48
Extracted ISTD ¹³ C ₂ 4:2FTS	%		Org-029	134	1	157	125	23	118	140
Extracted ISTD ¹³ C ₂ 6:2FTS	%		Org-029	145	1	197	164	18	133	165
Extracted ISTD ¹³ C ₂ 8:2FTS	%		Org-029	130	1	156	140	11	115	133
Extracted ISTD ¹³ C ₈ FOSA	%		Org-029	86	1	76	63	19	77	66
Extracted ISTD d ₃ N MeFOSA	%		Org-029	69	1	44	44	0	44	46
Extracted ISTD d ₅ N EtFOSA	%		Org-029	68	1	45	44	2	43	46
Extracted ISTD d ₇ N MeFOSE	%		Org-029	72	1	52	46	12	65	50
Extracted ISTD d ₉ N EtFOSE	%		Org-029	64	1	47	45	4	60	50

QUALITY CONTR	ROL: PFAS ir	n water TI	RACE Extended			Du		Spike Recovery %		
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	248325-2
Extracted ISTD d ₃ N MeFOSAA	%		Org-029	79	1	64	59	8	73	65
Extracted ISTD d ₅ N EtFOSAA	%		Org-029	73	1	65	64	2	69	62

QUALITY CONTR	OL: PFAS i	n water Ti	RACE Extended			Du	plicate		Spike Re	covery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	8	13/08/2020	13/08/2020		[NT]	
Date analysed	-			[NT]	8	13/08/2020	13/08/2020		[NT]	
Perfluorobutanesulfonic acid	μg/L	0.0004	Org-029	[NT]	8	<0.0004	<0.0004	0	[NT]	
Perfluoropentanesulfonic acid	μg/L	0.001	Org-029	[NT]	8	<0.001	<0.001	0	[NT]	
Perfluorohexanesulfonic acid	μg/L	0.0002	Org-029	[NT]	8	0.0004	0.0004	0	[NT]	
Perfluoroheptanesulfonic acid	μg/L	0.001	Org-029	[NT]	8	<0.001	<0.001	0	[NT]	
Perfluorooctanesulfonate PFOS	μg/L	0.0002	Org-029	[NT]	8	0.0006	0.0004	40	[NT]	
Perfluorodecanesulfonic acid	μg/L	0.002	Org-029	[NT]	8	<0.002	<0.002	0	[NT]	
Perfluorobutanoic acid	μg/L	0.002	Org-029	[NT]	8	<0.002	<0.002	0	[NT]	
Perfluoropentanoic acid	μg/L	0.002	Org-029	[NT]	8	<0.002	<0.002	0	[NT]	
Perfluorohexanoic acid	μg/L	0.0004	Org-029	[NT]	8	<0.0004	<0.0004	0	[NT]	
Perfluoroheptanoic acid	μg/L	0.0004	Org-029	[NT]	8	<0.0004	<0.0004	0	[NT]	
Perfluorooctanoic acid PFOA	μg/L	0.0002	Org-029	[NT]	8	0.0002	0.0002	0	[NT]	
Perfluorononanoic acid	μg/L	0.001	Org-029	[NT]	8	<0.001	<0.001	0	[NT]	
Perfluorodecanoic acid	μg/L	0.002	Org-029	[NT]	8	<0.002	<0.002	0	[NT]	
Perfluoroundecanoic acid	μg/L	0.002	Org-029	[NT]	8	<0.002	<0.002	0	[NT]	
Perfluorododecanoic acid	μg/L	0.005	Org-029	[NT]	8	<0.005	<0.005	0	[NT]	
Perfluorotridecanoic acid	μg/L	0.01	Org-029	[NT]	8	<0.01	<0.01	0	[NT]	
Perfluorotetradecanoic acid	μg/L	0.05	Org-029	[NT]	8	<0.05	<0.05	0	[NT]	
4:2 FTS	μg/L	0.001	Org-029	[NT]	8	<0.001	<0.001	0	[NT]	
6:2 FTS	μg/L	0.0004	Org-029	[NT]	8	<0.0004	<0.0004	0	[NT]	
8:2 FTS	μg/L	0.0004	Org-029	[NT]	8	<0.0004	<0.0004	0	[NT]	
10:2 FTS	μg/L	0.002	Org-029	[NT]	8	<0.002	<0.002	0	[NT]	
Perfluorooctane sulfonamide	μg/L	0.01	Org-029	[NT]	8	<0.01	<0.01	0	[NT]	
N-Methyl perfluorooctane sulfonamide	μg/L	0.005	Org-029	[NT]	8	<0.005	<0.005	0	[NT]	
N-Ethyl perfluorooctanesulfon -amide	μg/L	0.01	Org-029	[NT]	8	<0.01	<0.01	0	[NT]	
N-Me perfluorooctanesulfonamid -oethanol	μg/L	0.005	Org-029	[NT]	8	<0.005	<0.005	0	[NT]	
N-Et perfluorooctanesulfonamid -oethanol	μg/L	0.05	Org-029	[NT]	8	<0.05	<0.05	0	[NT]	
MePerfluorooctanesulf- amid oacetic acid	μg/L	0.002	Org-029	[NT]	8	<0.002	<0.002	0	[NT]	
EtPerfluorooctanesulf- amid oacetic acid	μg/L	0.002	Org-029	[NT]	8	<0.002	<0.002	0	[NT]	
Surrogate ¹³ C ₈ PFOS	%		Org-029	[NT]	8	96	93	3	[NT]	
Surrogate ¹³ C ₂ PFOA	%		Org-029	[NT]	8	97	100	3	[NT]	
Extracted ISTD ¹³ C ₃ PFBS	%		Org-029	[NT]	8	119	115	3	[NT]	

QUALITY CONTE	ROL: PFAS ir	n water T	RACE Extended			Du	plicate		Spike Re	ecovery %
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Extracted ISTD ¹⁸ O ₂ PFHxS	%		Org-029	[NT]	8	115	110	4		[NT]
Extracted ISTD ¹³ C ₄ PFOS	%		Org-029	[NT]	8	74	84	13		[NT]
Extracted ISTD ¹³ C ₄ PFBA	%		Org-029	[NT]	8	99	99	0		[NT]
Extracted ISTD ¹³ C ₃ PFPeA	%		Org-029	[NT]	8	131	125	5		[NT]
Extracted ISTD ¹³ C ₂ PFHxA	%		Org-029	[NT]	8	110	105	5		[NT]
Extracted ISTD ¹³ C ₄ PFHpA	%		Org-029	[NT]	8	124	123	1		[NT]
Extracted ISTD ¹³ C ₄ PFOA	%		Org-029	[NT]	8	115	112	3		[NT]
Extracted ISTD ¹³ C ₅ PFNA	%		Org-029	[NT]	8	118	126	7		[NT]
Extracted ISTD ¹³ C ₂ PFDA	%		Org-029	[NT]	8	82	88	7		[NT]
Extracted ISTD ¹³ C ₂ PFUnDA	%		Org-029	[NT]	8	57	62	8		[NT]
Extracted ISTD ¹³ C ₂ PFDoDA	%		Org-029	[NT]	8	56	67	18		[NT]
Extracted ISTD ¹³ C ₂ PFTeDA	%		Org-029	[NT]	8	40	38	5		[NT]
Extracted ISTD ¹³ C ₂ 4:2FTS	%		Org-029	[NT]	8	151	136	10		[NT]
Extracted ISTD ¹³ C ₂ 6:2FTS	%		Org-029	[NT]	8	181	184	2		[NT]
Extracted ISTD ¹³ C ₂ 8:2FTS	%		Org-029	[NT]	8	137	152	10		[NT]
Extracted ISTD ¹³ C ₈ FOSA	%		Org-029	[NT]	8	69	73	6		[NT]
Extracted ISTD d ₃ N MeFOSA	%		Org-029	[NT]	8	46	54	16		[NT]
Extracted ISTD d ₅ N EtFOSA	%		Org-029	[NT]	8	46	51	10		[NT]
Extracted ISTD d ₇ N MeFOSE	%		Org-029	[NT]	8	49	55	12		[NT]
Extracted ISTD d ₉ N EtFOSE	%		Org-029	[NT]	8	48	54	12		[NT]

QUALITY CONTR	ROL: PFAS ir	n water Tl	RACE Extended		Duplicate					Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]	
Extracted ISTD d ₃ N MeFOSAA	%		Org-029	[NT]	8	66	74	11		[NT]	
Extracted ISTD d ₅ N EtFOSAA	%		Org-029	[NT]	8	60	70	15	[NT]	[NT]	

Result Definiti	ons
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

 MPL Reference:
 248325

 Revision No:
 R02

Quality Control	ol 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.

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.

MPL Reference: 248325 Page | 38 of 39

Revision No: R02

Report Comments

PFAS analysis conducted by Envirolab Services. Report 248822.

For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

PFAS_W_EXT1_TR: PFDoDA, MeFOSA and EtFOSA Extracted Internal Standards are outside of global acceptance criteria (50-150%) for LCS. However they are within analyte specific acceptance criteria.

Chlorophyll a and Phaeophytin a analysis conducted by Marine and Freshwater Research Laboratory. Report MPL20-15.

MPL Reference: 248325

Revision No: R02

Page | 39 of 39





ABN 53 140 099 207 16-18 Hayden Court Myaree WA 6154 ph 08 9317 2505 fax 08 9317 4163 lab@mpl.com.au www.mpl.com.au

DATA QUALITY ASSESSMENT SUMMARY

Report Details	
Envirolab Report Reference	<u>248325</u>
Client ID	RPS Australia West Pty Ltd
Project Reference	EEC20078.004 - SW Fremantle
Date Issued	31/08/2020

QC DATA

All laboratory QC data was within the Envirolab Group's specifications except:

QC Specification E	Exceptions		
QC Type	Reference	Analysis	Comments
Precision (as %RPD)	248325-4	Zinc-Dissolved	80% RPD fails internal acceptance criteria

See Report 248325-[R02] for QA/QC details

HOLDING TIME COMPLIANCE EVALUATION

All preservation / holding times (based on AS/ASPHA/ISO/NEPM/USEPA reference documents and standards) are compliant except:

Holding Time Exceedances					
Analysis	Sample No	Date Sampled	Date Extracted	Date Analysed	Accepted
Chlorophyll a & Phaeophytin a					
Chlorophyll a	248325-1	07/08/2020			##
Phaeophytin a	248325-1	07/08/2020			##
Chlorophyll a	248325-2	07/08/2020			##
Phaeophytin a	248325-2	07/08/2020			##
Chlorophyll a	248325-3	07/08/2020			##
Phaeophytin a	248325-3	07/08/2020			##
Chlorophyll a	248325-4	07/08/2020			##
Phaeophytin a	248325-4	07/08/2020			##
Chlorophyll a	248325-8	07/08/2020			##
Phaeophytin a	248325-8	07/08/2020			##

Holding Table Comments

No Extract or Analysed Dates were provided. Holding Times cannot be calculated.

Certain analyses have had their recommended technical holding times elongated by filtering and/or freezing on receipt at the laboratory (e.g. BOD, chlorophyll/Pheophytin, nutrients and acid sulphate soil tests).







ABN 53 140 099 207 16-18 Hayden Court Myaree WA 6154 ph 08 9317 2505 fax 08 9317 4163 lab@mpl.com.au www.mpl.com.au

COMPLIANCE TO QC FREQUENCY (NEPM)

Internal laboratory QC rate complies with NEPM requirements (LCS/MB/MS 1 in 20, Duplicates 1 in 10 samples). Note, samples are batched together with other sample consignments in order to assign QC sample frequency.

QC Evaluation	
Duplicate(s) was performed as per NEPM frequency	✓
Laboratory Control Sample(s) were analysed with the samples received	✓
A Method Blank was performed with the samples received	✓
Matrix spike(s) was performed as per NEPM frequency (Not Applicable for Air samples)	✓

Refer to Certificate of Analysis for all Quality Control data.

MEMO

Appendix B Surface water sampling logs

MULTI-PARAMETER METER CALIBRATION RECORD



Project number: EEC20078.004

Site location: Fremantle Ports

2-4-	-117		-11.4		FO hoffen of		T %C		D.O		Dadan		Colombias
Date	pH 7 Pre-cal	Post-cal	pH 4 Pre-cal	Post-cal	EC buffer µs/ Pre-cal	cm Post-cal	Temp. °C Pre-cal	Post-cal	D.O. ppm Zero	Air	Redox Temp. °C	Measurement	Scientist
7/08/2020	6.77	7.00	3.24	4.00	1422	1413	16.9	17.0	-0.30%	9.22	16.9	238.1	ZL
7700/2020	0.77	7.00	0.24	4.00	11963	12880	10.0	17.0	0.0070	0.22	10.0	200.1	
					11903	12880							
ulti-parameter m	neter details		Solution	Batch / lot	Expiry date		on, for Ag/AgC	saturated KCI ele	ectrode	Calibration no	tes:		
anufacturer:	YSI		pH 4 buffer	345197	Nov-	T °C	mV	T °C	mV				

262

251

25

30

229

218

Aug-20 10

15

341437

EC buffer

Zobell B

Serial number:

SURFACE WATER SAMPLING LOG



Project number: EEC20078.004	Sampling method: Nisken Flask
Site name: Fremantle Ports - Surface Water	0.45 micron filter used (Y/N): Lab filter
Sampling area: Fremantle Railway Bridge	Sample preservation (ice/esky): Yes
Sampling location: WS2	QAQC samples: WZ1 at WQ04_S
Scientist: Shae Miller-White, Zak Langtry	Tide (High/Low): High
Date: 07/08/2020	Tide Height (m): 1.04
Weather: Fair	Water Colomn (m): 5.50

Sample I.D.	E/N	Depth (m)	Time	Odour (Y/N):	Staining (Y/N):	Sheen (Y/N):	Appearance	Colour	Temp. (°C)	рН	E.C. (µS/cm)	Redox. (mV)	D.O. (ppm)	D.O. (% sat)
	382418 / 6454259	0.0	10:45:00	No	No	No	Clear	Colourless	16.7	7.88	50442	180.8	7.65	106.0
	382418 / 6454259	0.5	10:47:00	No	No	No	Clear	Colourless	16.7	7.56	50678	181.0	7.56	104.9
WS2_S	382418 / 6454259	1.0	10:48:00	No	No	No	Clear	Colourless	16.7	8.70	50710	181.4	7.53	104.5
	382418 / 6454259	1.5	10:49:00	No	No	No	Clear	Colourless	16.7	8.09	50798	181.3	7.57	105.2
	382418 / 6454259	2.0	10:50:00	No	No	No	Clear	Colourless	16.8	8.09	50794	181.0	7.60	105.8
	382418 / 6454259	2.5	10:52:00	No	No	No	Clear	Colourless	16.8	8.13	50914	180.6	7.52	104.7
	382418 / 6454259	3.0	10:54:00	No	No	No	Clear	Colourless	16.8	8.14	50925	180.3	7.48	104.2
	382418 / 6454259	3.5	10:55:00	No	No	No	Clear	Colourless	16.8	8.16	50909	180.1	7.47	104.0
	382418 / 6454259	4.0	10:56:00	No	No	No	Clear	Colourless	16.8	8.16	50921	179.9	7.47	104.0
WS2_D	382418 / 6454259	4.5	10:58:00	No	No	No	Clear	Colourless	16.8	8.19	50966	179.4	7.53	104.9
	382418 / 6454259	5.0	10:59:00	No	No	No	Clear	Colourless	16.8	8.18	50968	179.3	7.44	103.7
	382418 / 6454259	5.5	11:00:00	No	No	No	Clear	Colourless	16.8	8.17	50944	179	7.27	101.3

Additional details / comments:

Other: Low harbour traffic.

SURFACE WATER SAMPLING LOG



Project number: EEC20078.004	Sampling method: Nisken Flask
Site name: Fremantle Ports - Surface Water	0.45 micron filter used (Y/N): Lab filter
Sampling area: Fremantle Port - Jetty	Sample preservation (ice/esky): Yes
Sampling location: WS4	QAQC samples:
Scientist: Shae Miller-White, Zak Langtry	Tide (High/Low): High
Date: 07/08/2020	Tide Height (m): 1.04
Weather: Fair	Water Colomn (m): 4.50

Sample I.D.	E/N	Depth (m)	Time	Odour (Y/N):	Staining (Y/N):	Sheen (Y/N):	Appearance	Colour	Temp. (°C)	рН	E.C. (µS/cm)	Redox. (mV)	D.O. (ppm)	D.O. (% sat)
	382269 / 6454227	0.0	9:35:00	No	No	No	Clear	Colourless	16.7	8.30	50815	107.0	7.51	104.34
	382269 / 6454227	0.5	9:36:00	No	No	No	Clear	Colourless	16.7	8.28	50856	106.4	7.60	105.61
WS4_S	382269 / 6454227	1.0	9:38:00	No	No	No	Clear	Colourless	16.7	8.27	50809	106.3	7.62	105.86
	382269 / 6454227	1.5	9:40:00	No	No	No	Clear	Colourless	16.8	8.27	50874	106.5	7.46	103.88
	382269 / 6454227	2.0	9:41:00	No	No	No	Clear	Colourless	16.8	8.26	50925	107.1	7.46	103.91
	382269 / 6454227	2.5	9:42:00	No	No	No	Clear	Colourless	16.8	8.27	50943	107.6	7.49	104.34
	382269 / 6454227	3.0	9:43:00	No	No	No	Clear	Colourless	16.8	8.27	50974	108.0	7.48	104.22
WS4_D	382269 / 6454227	3.5	9:44:00	No	No	No	Clear	Colourless	16.8	8.27	50996	108.4	7.50	104.51
	382269 / 6454227	4.0	9:45:00	No	No	No	Clear	Colourless	16.8	8.26	51009	108.9	7.57	105.50
	382269 / 6454227	4.5	9:46:00	No	No	No	Clear	Colourless	16.8	8.26	51018	109.6	7.52	104.80

Additional details / comments:

Other: Two tug boats one on each side of the jetty. Two large cargo ships are being loaded out in the port. Low harbour traffic.