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Environmental Engineer & Director
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ABN: 82 106 758 123

Monday 12 September 2022

To: [redacted]
Site Engineer, Lendlease
Tweed Valley Hospital Project

Re: Surface Water Quality Monitoring Results and Report for the Tweed Valley Hospital Project
Reporting period: 19 July 2022 to 15 August 2022

1.0 INTRODUCTION

Ecoteam is engaged to undertake monthly and event-based surface water monitoring on behalf of Lendlease Building, as part of the main works for the Tweed Valley Hospital Project. This report presents results from the 38th round of monthly sampling. This report satisfies the requirements of the SSD2 conditions. No controlled or uncontrolled releases from the sediment basins occurred during the reporting period.

2.0 PROJECT AIMS AND SAMPLING OBJECTIVES

The surface water monitoring objectives for the site are to detect changes during construction in receiving water quality resulting from the project. Stormwater discharges potentially contain increased sediment loads, nutrients, total and dissolved metals, hydrocarbons, or other contaminants such as pesticides. Baseline water quality data was performed on 19 and 26 November and 19 December 2018 to record water quality conditions under the existing land use prior to construction (Lendlease Building, 2019).

3.0 WEATHER CONDITIONS

Total rainfall in the period prior to sampling (*19 July 2022 to 15 August 2022*) was 60.4 mm with the highest 24-hour rainfall occurring on 22 July, being 19.6 mm (Kingscliff BOM Station 058137).

4.0 SAMPLING LOCATIONS

Samples were collected from four of the five monthly sampling Sites (001 – 003 and 005). Site 004 has been infilled and has been removed from ongoing sampling rounds. Control samples were also collected and analysed (013 – 015). Sample codes and corresponding sampling locations are shown in **Table 1** and **Figure 1**. Site photos taken on the day of sampling are included in **Appendix A.** During sampling, Site 002 was noted to be flowing South. Therefore, Site 002 will be assessed as an upstream sample site.

Table 1. Monthly sampling sites, control samples, sample codes, and applicable WQOs.

Sample Codes	Sampling Site Name	Short Name	WQOs
001	West Creek (Downstream)	WC	Estuarine
002	North West Creek (Variable)	NWC	Estuarine
003	East Creek (Upstream)	EC	Freshwater
004	Dam (Downstream)	Dam	Freshwater
005	Dam Drain (Downstream)	DD	Freshwater
013	Trip Blank	Trip	NA
014	Field Blank	Field	NA
015	Field Duplicate	Duplicate	NA

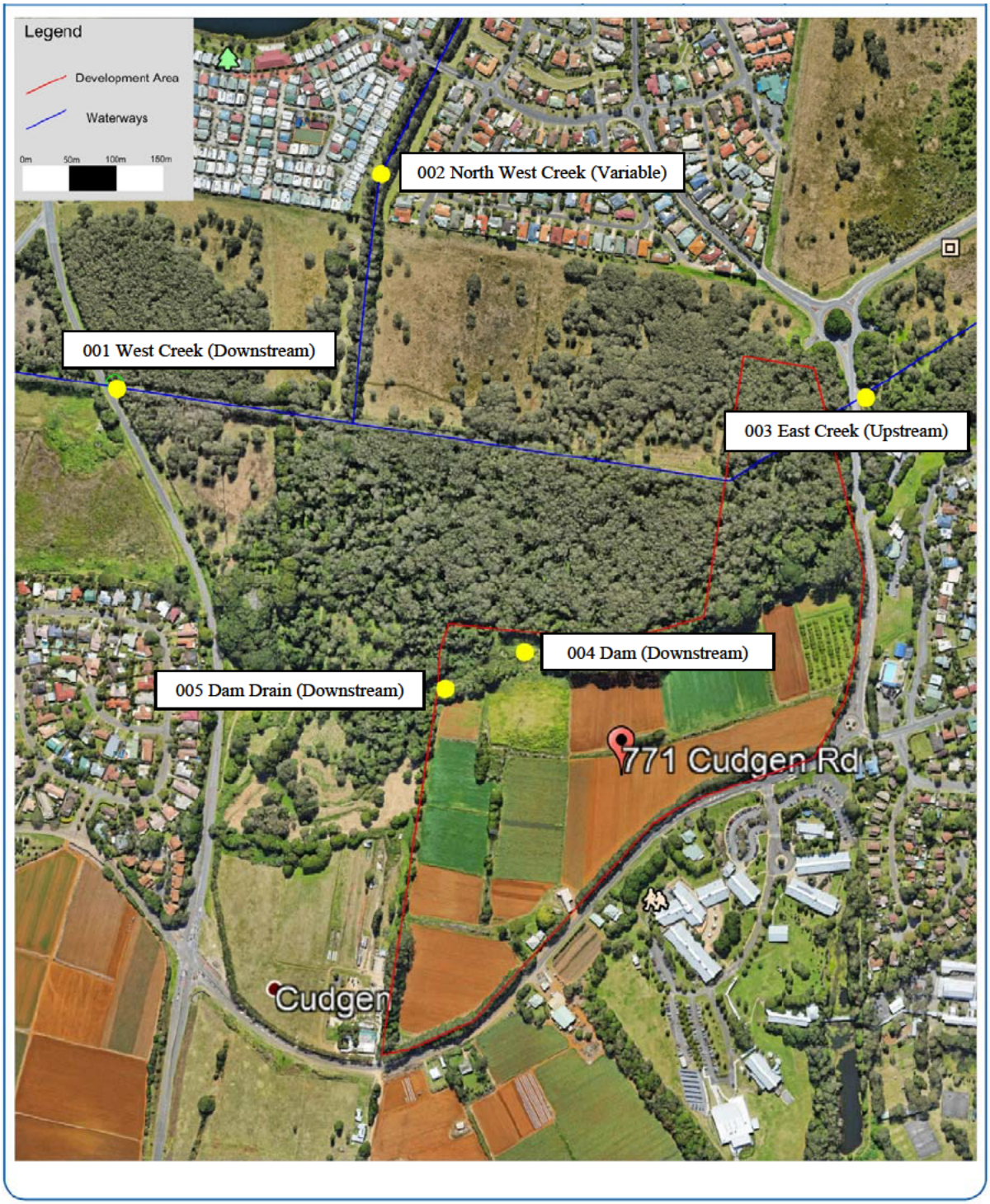

Figure 1. Map of monthly sampling sites (Source: Google Earth).

5.0 SAMPLING METHODOLOGY `

Sampling was undertaken by [redacted] on Tuesday 16 August 2022. The weather was fine and sunny. In situ, physico-chemical measurements were collected using a Xylem YSI multi-parameter probe, and Turbidity was measured using a Turbimeter Plus turbidity meter. Oil and grease were visually assessed. The calibration certificate for the Xylem YSI is included in **Appendix B**. The Turbimeter Plus is calibrated before each sampling round. Water quality samples were collected at 300 mm below the surface where possible. Samples were collected from the bank using an extension pole.

Samples were filtered and preserved on-site where necessary, stored on ice, and couriered overnight to the NATA-accredited Envirolab in Sydney. Trip blank samples (013) were sent from Envirolab and transported to all sites, then returned to Envirolab with the field samples. The field blank samples (014) were assessed at Site 001. Duplicate samples (015) were collected at Site 001 and were filtered and preserved as required. Field and trip blanks were filled with deionized water and do not represent water quality from the site. A full list of analytes for the project is included in **Appendix C**.

6.0 ASSESSMENT CRITERIA

Water quality results were compared against the Water Quality Objectives (WQO) in the following guidelines.

- *NSW Water Quality Objectives for the Tweed River Catchment for Aquatic Ecosystems* (Tweed 2006) - Trigger criteria for estuaries.
- *Australian and New Zealand guidelines for fresh and marine water quality (ANZECC 2000)* – Trigger values for freshwater (level of protection 95% species).

7.0 RESULTS

7.1 Physico-chemical Results

In situ, physico-chemical sampling results with comparison to WQOs are shown in **Table 2**. There were no surface sheens visible at any sites, therefore oil and grease were not present.

Table 2. Results of physico-chemical parameters. The results above guidelines are highlighted.

		Water Quality Objectives (WQOs)		Sample Codes and Results			
Analyte	**Units**	**Estuary**	**Fresh Water**	**WC 001 (Down)**	**NWC 002 (Up)**	**EC 003 (Up)**	**DD 005 (Down)**
pH		7.0-8.5	6.5-8.5	7.32	7.11	6.92	6.83
Turbidity	*NTU*	0.5-10	6.0-50	5.86	8.73	1.8	0.74
Electrical Conductivity (EC)	*µS/cm*	125-2,200	125-2,200	1297	517	177.7	1445
Dissolved Oxygen (DO)	*% Saturation*	80-110	85-110	56.4	61.6	21.1	20.3
Temperature	*°C*	N/A	N/A	14.5	14.7	15.0	15.5
Oxidation-Reduction Potential (ORP)	*mV*	N/A	N/A	123.1	42.7	93.8	89.7

When compared to the WQOs for freshwater and estuaries:

- pH was within the WQO ranges at all sampling sites this sampling round.
- Turbidity was outside of the WQO ranges at sample sites 003 and 005 this sampling round.
- EC was within the WQO ranges at all sampling sites this sampling round.
- DO concentrations were outside of the expected range at all sampling sites this sampling round. DO was outside the range at comparison sites in background sampling.

7.2 Laboratory Results

Ammonia, Chlorophyll-a, Filterable Reactive Phosphorous (FRP), Oxides of Nitrogen (NOx), Total Nitrogen, and Total Phosphorus (TP) were above the WQOs for some sample sites. Aluminium was also outside WQOs. Parameters that exceeded the WQOs are shown in **Table 3**.

The chain of custody form is included in **Appendix D**. A summary of all lab results with comparison to WQOs is included as **Appendix E**. A full copy of the laboratory results is included as **Appendix F**.

Table 3. Parameters in exceedance of the trigger criteria for sampling conducted. Results above guidelines are highlighted.

		Water Quality Objectives (WQOs)								
Analyte	**Unit**	**Estuary**	**Fresh Water**	WC 001 (Down)	NWC 002 (Down)	EC 003 (Up)	DD 005 (Down)	013 Trip	014 Field	015 Duplicate
Ammonia	mg/L	0.015	0.02	0.24	0.099	0.011	0.017	0.007	0.007	0.22
Oxides of Nitrogen	mg/L	0.015	0.040	0.2	0.65	0.05	2.7	<0.005	<0.005	0.2
Total Nitrogen	mg/L	0.30	0.35	0.9	1.1	0.4	4.1	<0.1	<0.1	0.9
Total Phosphorus	mg/L	0.030	0.025	<0.02	<0.02	0.06	<0.02	<0.02	<0.02	<0.02
Aluminium	µg/L	N/A	55	<10	20	70	<10	<10	<10	20

When compared to the WQOs for Freshwater and Estuaries:

- Ammonia was above the WQOs sampling Sites 001 and 002 this sampling round. Ammonia was above the WQOs at comparison sites in background sampling. Ammonia has increased at sites 001, 003 and decreased at Sites 002 and 005 when compared to the previous month.
- NOx was above the WQOs criteria at all sites this sampling round. NOx has decreased at Sites 001, 003 and 005, and remained the same at Site 002 when compared to the previous month.
- TN was above the WQOs criteria at all sites this sampling round. TN has decreased at Sites 002 and 003, increased at Site 005 and remained the same at 001 when compared to last month. TN was above the WQOs at comparison sites in baseline sampling.
- TP was above the WQOs at Site 003 this sampling round. TP has decreased at all sites when compared to the previous month. TP was above the WQOs at comparison sites in baseline sampling.
- Aluminium was above the WQO at Site 003. This is similar to the previous month. Aluminium has decreased at Sites 002, 003 and 005 and increased at Site 001 this round when compared to last month. Aluminium has been observed at both upstream and downstream sampling sites during past sampling rounds.

- All other metals were within estuarine and freshwater criteria this month.
- Demeton was analysed and returned non-detectable results.
- TRH (C_{10}-C_{40}) was not detected at any sample site.

8.0 Quality Assurance and Quality Control

- Parameters analysed in the Trip Blank (013) and Field Blank (014) were below the laboratory detection limits for all analytes. Nutrients were found in low levels within the Trip and Field Blank;
- however, these represent the deionized water and do not reflect the site condition. The Duplicate Sample (015) was collected at Site 001 and is within acceptable limits for all analytes.

The laboratory QA/QC is included in the results in **Appendix F**. All laboratory QA/QC was within acceptance criteria. Based on the above, the results are considered acceptable for the purposes of the project.

9.0 Summary of Results and Recommendations

- The month had low to moderate rainfall.
- Nutrients (Ammonia, NOx, TN, and TP) were high and exceeded some water quality parameters for some sites. This includes upstream and downstream sites in past sampling events. Exceedances in nutrients are therefore considered of natural occurrence.
- Aluminium exceeded WQOs at Site 003 during the month. Metals have been present in upstream and downstream sampling sites in previous sampling rounds. Elevation in metals may be due to pH and redox changes, microbial mineralisation, and naturally occurring sediment transportation. Changes in metal concentrations are also likely following heavy rainfall events.
- Elevated nutrients and metals have been observed at all sampling locations including upstream and downstream sites in previous months and during baseline sampling. Therefore, based on the assessment of the July/August water quality data, the Tweed Valley Hospital Project construction activities are unlikely to be adversely impacting the downstream water quality. As such, the current soil and erosion controls implemented on site are considered to be effective.

Kind regards,

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Environmental Engineer & Director
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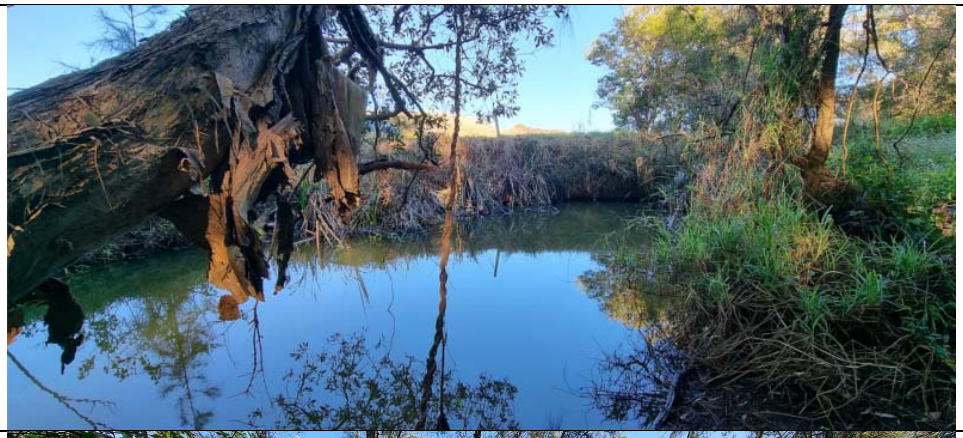
ABN: 82 106 758 123

Appendix A. Site Photos

	**Site 001 – West Creek (Upstream) (16/08/2022)**
	**Site 002 – North-west Creek** (Upstream) **(16/08/2022)**
	**Site 003 – East Creek (Upstream) (16/08/2022)**
	**Site 005 – Dam Drain (Downstream) (16/08/2022)**

Appendix B. Calibration certificate for Xylem YSI multi-parameter probe

KENNARDS HIRE

EQUIPMENT CERTIFICATION REPORT

PGN9003871 WATER QUALITY METER - MULTIFUNCTION

Plant Number: 1089690

SENSOR	CONCENTRATION	SPAN 1	SPAN 2	TRACEABILITY	PASS
pH	pH 7.00 / pH 4.00	7.00 pH	4.00 pH	377339 380327	☑
Conductivity	2.76 mS/cm @ 25°C	2.76 mS/cm		377099	☑
Dissolved Oxygen	Sodium Sulphite / Air	0.0% in Sodium Sulphite	% Saturation in Air	12110	☑
ORP	240mV @ 25°C	240mV	-	7035	☑

Battery Status 100 %	Temperature 21 °C
	Electrodes Cleaned and Checked

Note: Calibration solution traceability information is available upon request.

Please clean/decontaminate instrument and accessories before returning. A minimum 'Cleaning Fee' $55.00 (Inc GST) may apply if instrument is returned contaminated.

Checked By: R. Krockow Date: 9/8/22 Signed: RK

Accessories List:

User's Manual & USB	pH Sensor	Conductivity Sensor
Dissolved Oxygen Sensor with Wetting Cap	Redox (ORP) Sensor with Wetting Cap	Flow Cell 500ml
Comm Cable	Testing Cap	Storage Cap

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Appendix C. Full List of Sampling Analytes

3.7 Proposed Surface Water Quality Sampling Parameters

A summary of the proposed sampling analytes is provided below:

Field

- pH
- Turbidity
- Electrical Conductivity (EC)
- Dissolved Oxygen (DO)
- Temperature
- Oxidation Reduction Potential (ORP)
- Oil and grease

Laboratory

- Total Suspended Solids (TSS)
- Total Dissolved Solids (TDS)
- Major Cations & Hardness
- Ammonia
- Chlorophyll-a
- Filterable Reactive Phosphorus
- Nitrate
- Oxides of Nitrogen
- Total Nitrogen
- Total Phosphorus
- Aluminium (pH > 6.5) filtered
- Arsenic (filtered)
- Boron (filtered)
- Cadmium (filtered)
- Chromium (filtered)
- Copper (filtered)
- Cobalt (filtered)
- Lead (filtered)
- Manganese (filtered)
- Mercury (filtered)
- Nickel (filtered)
- Selenium (filtered)
- Silver (filtered)
- Zinc (filtered)
- Benzene
- Toluene
- Ethylbenzene
- Xylene - Total
- Naphthalene
- Total Recoverable Hydrocarbons (TRH)
- Organochlorine Pesticides (OCP)
  - 4.4'-DDE
  - 4.4'-DDT
  - Aldrin
  - g-BHC (Lindane)
  - Chlordane
  - Dieldrin
  - Endosulfan
  - Endrin
  - Heptachlor
  - Toxaphene
- Organophosphorus Pesticides (OPP)
  - Azinphos-methyl
  - Chlorpyrifos
  - Demeton-S
  - Diazinon
  - Dimethoate
  - Fenitrothion
  - Malathion

If a sample returns detectable concentrations of the analytes presented in Table 1, additional analyses may be required to enable comparison against additional trigger criteria or trace potential sources of contaminants. It is cost prohibitive to analyse these parameters unless required.

Table 1 Additional Analysis Requirements

Analyte	Additional Analysis
Total Recoverable Hydrocarbons	TRH Silica-gel Clean-up
Arsenic (filtered)	Arsenic (III) (filtered) Arsenic (V) (filtered)
Chromium (filtered)	Chromium (CrVI) (filtered)

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Appendix D. Chain of Custody Form

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ENVIROLAB ENVIROLAB mpl

CHAIN OF CUSTODY - Client

ENVIROLAB GROUP - National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
Ph: 02 9910 6200 / sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
Ph: 08 9317 2505 / lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
Ph: 03 9763 2500 / melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
Ph: 08 7087 6800 / adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
Ph: 07 3266 9532 / brisbane@envirolab.com.au

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

Client: Ecoteam
Contact Person: [redacted]
Project Mgr: [redacted]
Sampler: [redacted]
Address: 13 Ewing Street
Lismore NSW 2480
Phone: 02 6621 5123 Mob: [redacted]
Email: [redacted]

Testing requirements - Chlorophyll-a <4 mg/m3, Total Phosphorus <0.025 mg/L, Silver <0.05 ug/L, Low level OCPs and OPPs

Client Project Name / Number / Site etc (ie report title): SMC009.38 - Tweed Valley Hospital Project
PO No.:
Envirolab Quote No. : 19SY228_Rev 1
Date results required:
Or choose: standard / same day / 1 day / 2 day / 3 day
Note: Inform lab in advance if urgent turnaround is required - surcharges apply
Additional report format: esdat / equis /
Lab Comments:
Metals: :Al, As, B, Cd, Cr, Cu, Co, Pb, Mn, Hg, Ni, Se, Ag, Z.
Cations: Na/K/Ca/Mg. Please hold Cr6 and AsIII/V until initial dissolved metals results are back.

Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TRH/BTEXN	Dissolved Metals	OC/OP + toxaphene + demeton	TSS	TDS	Cations + Hardness	Ammonia	Cholorophyll-a	Phosphate (FRP)	Nitrate	Nox	Total N	Total P	Cr6+- HOLD	AsIII & V - HOLD	Comments: Provide as much information about the sample as you can
1	001 - USW	300 mm	16-Aug	Water	X	X	X	X	X	X	X	X	X	X	X	X	X			ENVIROLAB Envirolab Services 12 Ashley St Chatswood NSW
2	002 - USNW	150 mm	16-Aug	Water	X	X	X	X	X	X	X	X	X	X	X	X	X			Ph: (02) 9910 ...
3	003 - DSE	300 mm	16-Aug	Water	X	X	X	X	X	X	X	X	X	X	X	X	X			Job No: 303265
4	005 - Dam Drain	150 mm	16-Aug	Water	X	X	X	X	X	X	X	X	X	X	X	X	X			Date Received: 17/08/22
5	013	300 mm	16-Aug	Water	X	X	X	X	X	X	X	X	X	X	X	X	X			Time Received: 1000
6	014	300 mm	16-Aug	Water	X	X	X	X	X	X	X	X	X	X	X	X	X			Received By: CR
7	015	300 mm	16-Aug	Water	X	X	X	X	X	X	X	X	X	X	X	X	X			Temp: Cool/Ambient
																				Cooling: Ice/Icepack
																				Security: Intact/Broken/None
																				04°C

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

Relinquished by (Company):	Ecoteam	Received by (Company): ELS Sydney		**Lab Use Only**	
Print Name:	[redacted]	Print Name: CRoseman		Job number: 303265	Cooling: Ice / Ice pack / None
Date & Time:	16/08/2022	Date & Time: 17/08/22 1000		Temperature: 04°C	Security seal: Intact / Broken / None
Signature:	[redacted]	Signature:		TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Appendix E. Summary of Lab Results compared to WQOs

		Water Quality Objectives (WQOs)		Sample Codes							
Analyte	**Unit**	**Estuary**	**Fresh Water**	WC 001	NWC 002	EC 003	DD 005		013 Trip	014 Field	015 Duplicate
Total Suspended Solids (TSS)	mg/L	N/A	N/A	<5	<5	<5	<5		<5	<5	<5
Total Dissolved Solids (TDS)	mg/L	N/A	N/A	1200	420	130	86		<5	<5	1300
Major Cations (dissolved) and Hardness											
Sodium	mg/L	N/A	N/A	72	54	25	20		<0.5	<0.5	70
Potassium	mg/L	N/A	N/A	7.0	4	2	1		<0.5	<0.5	6.9
Calcium	mg/L	N/A	N/A	250	53	12	4		<0.5	<0.5	250
Magnesium	mg/L	N/A	N/A	38	14	4	5		<0.5	<0.5	38
Hardness mg$CaCO_3$/L		N/A	N/A	790	190	46	29		<3	<3	790
Nutrients											
Ammonia	mg/L	0.015	0.02	0.24	0.099	0.011	0.017		0.007	0.007	0.22
Chlorophyll-a	mg/m^3	4	5	<1	<1	2	<1		<1	<1	1
Filterable Reactive Phosphorus	mg/L	0.005	0.02	<0.005	<0.005	0.01	<0.005		<0.005	<0.005	<0.005
Nitrate	mg/L	N/A	N/A	0.16	0.65	0.053	2.7		<0.005	<0.005	0.17
Oxides of Nitrogen	mg/L	0.015	0.040	0.2	0.65	0.05	2.7		<0.005	<0.005	0.2
Total Nitrogen	mg/L	0.30	0.35	0.9	1.1	0.4	4.1		<0.1	<0.1	0.9
Total Phosphorus	mg/L	0.030	0.025	<0.02	<0.02	0.06	<0.02		<0.02	<0.02	<0.02
Metals – All metals are Dissolved Metals											
Aluminium	µg/L	N/A	55	<10	20	70	<10		<10	<10	20
Arsenic	µg/L	N/A	13	<1	<1	<1	<1		<1	<1	<1
Boron	µg/L	N/A	370	200	100	40	50		<20	<20	100
Cadmium	µg/L	5.5	0.2	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
Chromium	µg/L	4.4	1.0	<1	<1	<1	<1		<1	<1	<1
Copper	µg/L	1.3	1.4	<1	<1	<1	<1		<1	<1	<1
Cobalt	µg/L	1.0	N/A	1	<1	<1	<1		<1	<1	<1
Lead	µg/L	4.4	3.4	<1	<1	1	<1		<1	<1	<1
Manganese	µg/L	N/A	1,900	430	130	48	20		<1	<1	410
Mercury	µg/L	0.4	0.6	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	<0.05
Nickel	µg/L	70	11	2	<1	<1	<1		<1	<1	2
Selenium	µg/L	N/A	11	<1	<1	<1	<1		<1	<1	<1
Zinc	µg/L	15	8.0	2	3	3	5		<1	<1	<1
Silver	µg/L	1.4	0.05	<0.05	<0.05	<0.05	0.76		<0.05	<0.05	0.07

Analyte	Unit	Water Quality Objectives (WQOs)		Sample Codes							
		Estuary	Fresh Water	WC 001	NWC 002	EC 003	DD 005		013 Trip	014 Field	015 Duplicate
Hydrocarbons											
Toluene	mg/L	0.70	0.95	<1	<1	<1	<1		<1	<1	<1
Ethylbenzene	mg/L	N/A	N/A	<1	<1	<1	<1		<1	<1	<1
Xylene	mg/L	N/A	N/A	<1	<1	<1	<1		<1	<1	<1
Naphthalene	mg/L	N/A	0.55	<1	<1	<1	<1		<1	<1	<1
TRH C_6 - C_{10}	mg/L	0.07	0.016	<10	<10	<10	<10		<10	<10	<10
TRH C_{10} - C_{16}	mg/L	N/A	N/A	<50	<50	<50	<50		<50	<50	<50
TRH C_{16} - C_{34}	mg/L	N/A	N/A	<100	<100	<100	<100		<100	<100	<100
TRH >C_{34} - C_{40}	mg/L	N/A	N/A	<100	<100	<100	<100		<100	<100	<100
TRH C_6-C_{10} less BTEX (F1)	mg/L	N/A	N/A	<10	<10	<10	<10		<10	<10	<10
TRH >C_{10}-C_{16} less Naphthalene (F2)	mg/L	N/A	N/A	<50	<50	<50	<50		<50	<50	<50
Organochlorine Pesticides (OCP)											
4.4'-DDE	µg/L	N/A	N/A	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
4.4'-DDT	µg/L	N/A	0.01	<0.006	<0.006	<0.006	<0.006		<0.006	<0.006	<0.006
Aldrin	µg/L	N/A	N/A	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
g-BHC	µg/L	N/A	0.2	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Chlordane	µg/L	N/A	0.08	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Dieldrin	µg/L	N/A	N/A	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Endosulfan	µg/L	0.01	0.2	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Endrin	µg/L	0.02	0.008	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Heptachlor	µg/L	N/A	0.09	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Toxaphene	µg/L	N/A	0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Organophosphorus Pesticides (OPP)											
Azinphos-methyl	µg/L	N/A	0.02	<0.02	<0.02	<0.02	<0.02		<0.02	<0.02	<0.02
Chlorpyriphos	µg/L	0.009	0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Demeton-S	µg/L	N/A	N/A	<5	<5	<5	<5		<5	<5	<5
Diazinon	µg/L	N/A	0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Dimethoate	µg/L	N/A	0.15	<0.15	<0.15	<0.15	<0.15		<0.15	<0.15	<0.15
Fenitrothion	µg/L	N/A	0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Malathion	µg/L	N/A	0.05	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	<0.05

Appendix F. Full Laboratory Results

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CERTIFICATE OF ANALYSIS 303265

Client Details

Client	Ecoteam
Attention	[redacted]
Address	13 Ewing Street, Lismore, NSW, 2480

Sample Details

Your Reference	**SMC009.38 - Tweed Valley Hospital Project**
Number of Samples	7 Water
Date samples received	17/08/2022
Date completed instructions received	17/08/2022

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	25/08/2022
Date of Issue	25/08/2022

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Results Approved By

[redacted], Group Technical Manager
[redacted], Organics and LC Supervisor
[redacted], Senior Chemist
[redacted], Organic Instruments Team Leader
[redacted], Senior Chemist

Authorised By

[redacted], Laboratory Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		303265-1	303265-2	303265-3	303265-4	303265-5
Your Reference	UNITS	001-USW	002 - USNW	003 - DSE	005 - Dam Drain	013
Depth		300	150	300	150	300
Date Sampled		16/08/2022	16/08/2022	16/08/2022	16/08/2022	16/08/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	17/08/2022	17/08/2022	17/08/2022	17/08/2022	17/08/2022
Date analysed	-	18/08/2022	18/08/2022	18/08/2022	18/08/2022	18/08/2022
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	105	103	103	99	95
Surrogate toluene-d8	%	95	95	95	95	95
Surrogate 4-BFB	%	100	99	101	100	100

vTRH(C6-C10)/BTEXN in Water			
Our Reference		303265-6	303265-7
Your Reference	UNITS	014	015
Depth		300	300
Date Sampled		16/08/2022	16/08/2022
Type of sample		Water	Water
Date extracted	-	17/08/2022	17/08/2022
Date analysed	-	18/08/2022	18/08/2022
TRH C_6 - C_9	µg/L	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10
Benzene	µg/L	<1	<1
Toluene	µg/L	<1	<1
Ethylbenzene	µg/L	<1	<1
m+p-xylene	µg/L	<2	<2
o-xylene	µg/L	<1	<1
Naphthalene	µg/L	<1	<1
Surrogate Dibromofluoromethane	%	99	99
Surrogate toluene-d8	%	96	94
Surrogate 4-BFB	%	99	101

svTRH (C10-C40) in Water						
Our Reference		303265-1	303265-2	303265-3	303265-4	303265-5
Your Reference	UNITS	001-USW	002 - USNW	003 - DSE	005 - Dam Drain	013
Depth		300	150	300	150	300
Date Sampled		16/08/2022	16/08/2022	16/08/2022	16/08/2022	16/08/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
Date analysed	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
TRH C_{10} - C_{14}	µg/L	<50	<50	<50	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100	<100	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100	<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	<50	<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50	<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100	<100	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	81	74	74	80	76

svTRH (C10-C40) in Water			
Our Reference		303265-6	303265-7
Your Reference	UNITS	014	015
Depth		300	300
Date Sampled		16/08/2022	16/08/2022
Type of sample		Water	Water
Date extracted	-	19/08/2022	19/08/2022
Date analysed	-	19/08/2022	19/08/2022
TRH C_{10} - C_{14}	µg/L	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100
Surrogate o-Terphenyl	%	82	86

OCPs in Water - Low Level						
Our Reference		303265-1	303265-2	303265-3	303265-4	303265-5
Your Reference	UNITS	001-USW	002 - USNW	003 - DSE	005 - Dam Drain	013
Depth		300	150	300	150	300
Date Sampled		16/08/2022	16/08/2022	16/08/2022	16/08/2022	16/08/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
Date analysed	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
alpha-BHC	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
HCB	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
beta-BHC	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
gamma-BHC	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
delta-BHC	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Aldrin	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
gamma-Chlordane	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
alpha-Chlordane	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan I	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
pp-DDE	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Dieldrin	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Endosulfan II	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
pp-DDD	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin Aldehyde	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
pp-DDT	µg/L	<0.006	<0.006	<0.006	<0.006	<0.006
Endosulfan Sulphate	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Methoxychlor	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Surrogate TCMX	%	81	73	77	80	87

OCPs in Water - Low Level			
Our Reference		303265-6	303265-7
Your Reference	UNITS	014	015
Depth		300	300
Date Sampled		16/08/2022	16/08/2022
Type of sample		Water	Water
Date extracted	-	19/08/2022	19/08/2022
Date analysed	-	19/08/2022	19/08/2022
alpha-BHC	µg/L	<0.01	<0.01
HCB	µg/L	<0.01	<0.01
beta-BHC	µg/L	<0.01	<0.01
gamma-BHC	µg/L	<0.01	<0.01
Heptachlor	µg/L	<0.01	<0.01
delta-BHC	µg/L	<0.01	<0.01
Aldrin	µg/L	<0.01	<0.01
Heptachlor Epoxide	µg/L	<0.01	<0.01
gamma-Chlordane	µg/L	<0.01	<0.01
alpha-Chlordane	µg/L	<0.01	<0.01
Endosulfan I	µg/L	<0.01	<0.01
pp-DDE	µg/L	<0.01	<0.01
Dieldrin	µg/L	<0.01	<0.01
Endrin	µg/L	<0.01	<0.01
Endosulfan II	µg/L	<0.01	<0.01
pp-DDD	µg/L	<0.01	<0.01
Endrin Aldehyde	µg/L	<0.01	<0.01
pp-DDT	µg/L	<0.006	<0.006
Endosulfan Sulphate	µg/L	<0.01	<0.01
Methoxychlor	µg/L	<0.01	<0.01
Surrogate TCMX	%	82	90

OP in water LL ANZECCF/ADWG						
Our Reference		303265-1	303265-2	303265-3	303265-4	303265-5
Your Reference	UNITS	001-USW	002 - USNW	003 - DSE	005 - Dam Drain	013
Depth		300	150	300	150	300
Date Sampled		16/08/2022	16/08/2022	16/08/2022	16/08/2022	16/08/2022
Type of sample		Water	Water	Water	Water	Water
Date extracted	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
Date analysed	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
Dichlorovos	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.15	<0.15	<0.15	<0.15	<0.15
Diazinon	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorpyriphos-methyl	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Methyl Parathion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Malathion	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorpyriphos	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Parathion	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Surrogate TCMX	%	81	73	77	80	87

OP in water LL ANZECCF/ADWG			
Our Reference		303265-6	303265-7
Your Reference	UNITS	014	015
Depth		300	300
Date Sampled		16/08/2022	16/08/2022
Type of sample		Water	Water
Date extracted	-	19/08/2022	19/08/2022
Date analysed	-	19/08/2022	19/08/2022
Dichlorovos	µg/L	<0.2	<0.2
Dimethoate	µg/L	<0.15	<0.15
Diazinon	µg/L	<0.01	<0.01
Chlorpyriphos-methyl	µg/L	<0.2	<0.2
Methyl Parathion	µg/L	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2
Malathion	µg/L	<0.05	<0.05
Chlorpyriphos	µg/L	<0.01	<0.01
Parathion	µg/L	<0.01	<0.01
Bromophos ethyl	µg/L	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.02	<0.02
Surrogate TCMX	%	82	90

Miscellaneous Organics - water						
Our Reference		303265-1	303265-2	303265-3	303265-4	303265-5
Your Reference	UNITS	001-USW	002 - USNW	003 - DSE	005 - Dam Drain	013
Depth		300	150	300	150	300
Date Sampled		16/08/2022	16/08/2022	16/08/2022	16/08/2022	16/08/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	17/08/2022	17/08/2022	17/08/2022	17/08/2022	17/08/2022
Date analysed	-	17/08/2022	17/08/2022	17/08/2022	17/08/2022	17/08/2022
Toxaphene*	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Demeton-O	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Demeton-S	µg/L	<5	<5	<5	<5	<5
Surrogate p-Terphenyl-d_{14}	%	111	97	107	116	115

Miscellaneous Organics - water			
Our Reference		303265-6	303265-7
Your Reference	UNITS	014	015
Depth		300	300
Date Sampled		16/08/2022	16/08/2022
Type of sample		Water	Water
Date prepared	-	17/08/2022	17/08/2022
Date analysed	-	17/08/2022	17/08/2022
Toxaphene*	µg/L	<0.2	<0.2
Demeton-O	µg/L	<0.2	<0.2
Demeton-S	µg/L	<5	<5
Surrogate p-Terphenyl-d_{14}	%	108	120

HM in water - dissolved						
Our Reference		303265-1	303265-2	303265-3	303265-4	303265-5
Your Reference	UNITS	001-USW	002 - USNW	003 - DSE	005 - Dam Drain	013
Depth		300	150	300	150	300
Date Sampled		16/08/2022	16/08/2022	16/08/2022	16/08/2022	16/08/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	18/08/2022	18/08/2022	18/08/2022	18/08/2022	18/08/2022
Date analysed	-	18/08/2022	18/08/2022	18/08/2022	18/08/2022	18/08/2022
Aluminium-Dissolved	µg/L	<10	20	70	<10	<10
Arsenic-Dissolved	µg/L	<1	<1	<1	<1	<1
Boron-Dissolved	µg/L	200	100	40	50	<20
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1	<1	<1
Cobalt-Dissolved	µg/L	1	<1	<1	<1	<1
Lead-Dissolved	µg/L	<1	<1	1	<1	<1
Manganese-Dissolved	µg/L	430	130	48	20	<1
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	2	<1	<1	<1	<1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1
Silver-Dissolved	µg/L	<0.05	<0.05	<0.05	0.76	<0.05
Zinc-Dissolved	µg/L	2	3	3	5	<1

HM in water - dissolved			
Our Reference		303265-6	303265-7
Your Reference	UNITS	014	015
Depth		300	300
Date Sampled		16/08/2022	16/08/2022
Type of sample		Water	Water
Date prepared	-	18/08/2022	18/08/2022
Date analysed	-	18/08/2022	18/08/2022
Aluminium-Dissolved	µg/L	<10	20
Arsenic-Dissolved	µg/L	<1	<1
Boron-Dissolved	µg/L	<20	100
Cadmium-Dissolved	µg/L	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1
Copper-Dissolved	µg/L	<1	<1
Cobalt-Dissolved	µg/L	<1	1
Lead-Dissolved	µg/L	<1	<1
Manganese-Dissolved	µg/L	<1	410
Mercury-Dissolved	µg/L	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	2
Selenium-Dissolved	µg/L	<1	<1
Silver-Dissolved	µg/L	<0.05	0.07
Zinc-Dissolved	µg/L	<1	<1

Metals in Waters - Acid extractable						
Our Reference		303265-1	303265-2	303265-3	303265-4	303265-5
Your Reference	UNITS	001-USW	002 - USNW	003 - DSE	005 - Dam Drain	013
Depth		300	150	300	150	300
Date Sampled		16/08/2022	16/08/2022	16/08/2022	16/08/2022	16/08/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	24/08/2022	24/08/2022	24/08/2022	24/08/2022	24/08/2022
Date analysed	-	25/08/2022	25/08/2022	25/08/2022	25/08/2022	25/08/2022
Phosphorus - Total	mg/L	<0.02	<0.02	0.06	<0.02	<0.02

Metals in Waters - Acid extractable			
Our Reference		303265-6	303265-7
Your Reference	UNITS	014	015
Depth		300	300
Date Sampled		16/08/2022	16/08/2022
Type of sample		Water	Water
Date prepared	-	24/08/2022	24/08/2022
Date analysed	-	25/08/2022	25/08/2022
Phosphorus - Total	mg/L	<0.02	<0.02

Cations in water Dissolved						
Our Reference		303265-1	303265-2	303265-3	303265-4	303265-5
Your Reference	UNITS	001-USW	002 - USNW	003 - DSE	005 - Dam Drain	013
Depth		300	150	300	150	300
Date Sampled		16/08/2022	16/08/2022	16/08/2022	16/08/2022	16/08/2022
Type of sample		Water	Water	Water	Water	Water
Date digested	-	23/08/2022	23/08/2022	23/08/2022	23/08/2022	23/08/2022
Date analysed	-	25/08/2022	25/08/2022	25/08/2022	25/08/2022	25/08/2022
Sodium - Dissolved	mg/L	72	54	25	20	<0.5
Potassium - Dissolved	mg/L	7.0	4	2	1	<0.5
Calcium - Dissolved	mg/L	250	53	12	4	<0.5
Magnesium - Dissolved	mg/L	38	14	4	5	<0.5
Hardness	mgCaCO3/L	790	190	46	29	<3

Cations in water Dissolved			
Our Reference		303265-6	303265-7
Your Reference	UNITS	014	015
Depth		300	300
Date Sampled		16/08/2022	16/08/2022
Type of sample		Water	Water
Date digested	-	23/08/2022	23/08/2022
Date analysed	-	25/08/2022	25/08/2022
Sodium - Dissolved	mg/L	<0.5	70
Potassium - Dissolved	mg/L	<0.5	6.9
Calcium - Dissolved	mg/L	<0.5	250
Magnesium - Dissolved	mg/L	<0.5	38
Hardness	mgCaCO3/L	<3	790

Miscellaneous Inorganics						
Our Reference		303265-1	303265-2	303265-3	303265-4	303265-5
Your Reference	UNITS	001-USW	002 - USNW	003 - DSE	005 - Dam Drain	013
Depth		300	150	300	150	300
Date Sampled		16/08/2022	16/08/2022	16/08/2022	16/08/2022	16/08/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	17/08/2022	17/08/2022	17/08/2022	17/08/2022	17/08/2022
Date analysed	-	17/08/2022	17/08/2022	17/08/2022	17/08/2022	17/08/2022
Total Suspended Solids	mg/L	<5	<5	<5	<5	<5
Total Dissolved Solids (grav)	mg/L	1,200	420	130	86	<5
Ammonia as N in water	mg/L	0.24	0.099	0.011	0.017	0.007
Chlorophyll a	mg/m^3	<1	<1	2	<1	<1
Phosphate as P in water	mg/L	<0.005	<0.005	0.01	<0.005	<0.005
Nitrate as N in water	mg/L	0.16	0.65	0.053	2.7	<0.005
NOx as N in water	mg/L	0.2	0.65	0.05	2.7	<0.005
Total Nitrogen in water	mg/L	0.9	1.1	0.4	4.1	<0.1

Miscellaneous Inorganics			
Our Reference		303265-6	303265-7
Your Reference	UNITS	014	015
Depth		300	300
Date Sampled		16/08/2022	16/08/2022
Type of sample		Water	Water
Date prepared	-	17/08/2022	17/08/2022
Date analysed	-	17/08/2022	17/08/2022
Total Suspended Solids	mg/L	<5	<5
Total Dissolved Solids (grav)	mg/L	<5	1,300
Ammonia as N in water	mg/L	0.007	0.22
Chlorophyll a	mg/m^3	<1	1
Phosphate as P in water	mg/L	<0.005	<0.005
Nitrate as N in water	mg/L	<0.005	0.17
NOx as N in water	mg/L	<0.005	0.2
Total Nitrogen in water	mg/L	<0.1	0.9

Method ID	Methodology Summary
Inorg-018	Total Dissolved Solids - determined gravimetrically. The solids are dried at 180+/-10°C.
Inorg-019	Suspended Solids - determined gravimetricially by filtration of the sample. The samples are dried at 104+/-5°C.
Inorg-055	Nitrate - determined colourimetrically. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
Inorg-055/062/127	Total Nitrogen - Calculation sum of TKN and oxidised Nitrogen. Alternatively analysed by combustion and chemiluminescence.
Inorg-057	Ammonia - determined colourimetrically, based on APHA latest edition 4500-NH3 F. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a KCl extraction.
Inorg-060	Phosphate determined colourimetrically based on EPA365.1 and APHA latest edition 4500 P E. Waters samples are filtered on receipt prior to analysis. Soils are analysed following a water extraction.
INORG-119	Chlorophyll A based on APHA 10200 H latest edition.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Metals-022	Determination of various metals by ICP-MS.
Org-020	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-022	Determination of VOCs sampled onto coconut shell charcoal sorbent tubes, that can be desorbed using carbon disulphide, and analysed by GC-MS.
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-023	Water samples are analysed directly by purge and trap GC-MS.
Org-023	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			17/08/2022	1	17/08/2022	18/08/2022		17/08/2022	[NT]
Date analysed	-			18/08/2022	1	18/08/2022	19/08/2022		18/08/2022	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	1	<10	<10	0	114	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	1	<10	<10	0	114	[NT]
Benzene	µg/L	1	Org-023	<1	1	<1	<1	0	114	[NT]
Toluene	µg/L	1	Org-023	<1	1	<1	<1	0	113	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	1	<1	<1	0	113	[NT]
m+p-xylene	µg/L	2	Org-023	<2	1	<2	<2	0	115	[NT]
o-xylene	µg/L	1	Org-023	<1	1	<1	<1	0	114	[NT]
Naphthalene	µg/L	1	Org-023	<1	1	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	96	1	105	95	10	94	[NT]
Surrogate toluene-d8	%		Org-023	95	1	95	92	3	101	[NT]
Surrogate 4-BFB	%		Org-023	99	1	100	103	3	100	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			19/08/2022	[NT]	[NT]	[NT]	[NT]	19/08/2022	[NT]
Date analysed	-			19/08/2022	[NT]	[NT]	[NT]	[NT]	19/08/2022	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	103	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	116	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	86	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	103	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	116	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	86	[NT]
Surrogate o-Terphenyl	%		Org-020	76	[NT]	[NT]	[NT]	[NT]	80	[NT]

QUALITY CONTROL: OCPs in Water - Low Level					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			19/08/2022	[NT]	[NT]	[NT]	[NT]	19/08/2022	[NT]
Date analysed	-			19/08/2022	[NT]	[NT]	[NT]	[NT]	19/08/2022	[NT]
alpha-BHC	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	94	[NT]
HCB	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
beta-BHC	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	96	[NT]
gamma-BHC	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Heptachlor	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	73	[NT]
delta-BHC	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Aldrin	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	101	[NT]
Heptachlor Epoxide	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	106	[NT]
gamma-Chlordane	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
alpha-Chlordane	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan I	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDE	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	102	[NT]
Dieldrin	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	98	[NT]
Endrin	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	88	[NT]
Endosulfan II	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDD	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	106	[NT]
Endrin Aldehyde	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
pp-DDT	µg/L	0.006	Org-022	<0.006	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	100	[NT]
Methoxychlor	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	86	[NT]	[NT]	[NT]	[NT]	78	[NT]

QUALITY CONTROL: OP in water LL ANZECCF/ADWG						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			19/08/2022	[NT]	[NT]	[NT]	[NT]	19/08/2022	[NT]
Date analysed	-			19/08/2022	[NT]	[NT]	[NT]	[NT]	19/08/2022	[NT]
Dichlorovos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	80	[NT]
Dime hoate	µg/L	0.15	Org-022/025	<0.15	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Diazinon	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Methyl Para hion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ronnel	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	91	[NT]
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	95	[NT]
Malathion	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	99	[NT]
Chlorpyriphos	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	106	[NT]
Parathion	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	87	[NT]
Bromophos ethyl	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Ethion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	74	[NT]
Azinphos-methyl (Guthion)	µg/L	0.02	Org-022/025	<0.02	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	86	[NT]	[NT]	[NT]	[NT]	78	[NT]

QUALITY CONTROL: Miscellaneous Organics - water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date prepared	-			17/08/2022	[NT]	[NT]	[NT]	[NT]	17/08/2022	[NT]
Date analysed	-			17/08/2022	[NT]	[NT]	[NT]	[NT]	17/08/2022	[NT]
Toxaphene*	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Demeton-O	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Demeton-S	µg/L	5	Org-022/025	<5	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate p-Terphenyl-d_{14}	%		Org-022/025	108	[NT]	[NT]	[NT]	[NT]	108	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date prepared	-			18/08/2022	1	18/08/2022	18/08/2022		18/08/2022	[NT]
Date analysed	-			18/08/2022	1	18/08/2022	18/08/2022		18/08/2022	[NT]
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	<10	<10	0	102	[NT]
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	105	[NT]
Boron-Dissolved	µg/L	20	Metals-022	<20	1	200	200	0	105	[NT]
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	106	[NT]
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	98	[NT]
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	106	[NT]
Cobalt-Dissolved	µg/L	1	Metals-022	<1	1	1	1	0	99	[NT]
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	101	[NT]
Manganese-Dissolved	µg/L	1	Metals-022	<1	1	430	420	2	99	[NT]
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0 05	0	102	[NT]
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	2	2	0	104	[NT]
Selenium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	104	[NT]
Silver-Dissolved	µg/L	0.05	Metals-022	<0.05	1	<0.05	<0 05	0	101	[NT]
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	2	2	0	104	[NT]

QUALITY CONTROL: Metals in Waters - Acid extractable						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	303265-2
Date prepared	-			24/08/2022	4	24/08/2022	24/08/2022		24/08/2022	24/08/2022
Date analysed	-			25/08/2022	4	25/08/2022	25/08/2022		25/08/2022	25/08/2022
Phosphorus - Total	mg/L	0.02	Metals-020	<0.02	4	<0.02	<0 02	0	90	95

QUALITY CONTROL: Cations in water Dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	303265-2
Date digested	-			23/08/2022	1	23/08/2022	23/08/2022		23/08/2022	23/08/2022
Date analysed	-			25/08/2022	1	25/08/2022	25/08/2022		25/08/2022	25/08/2022
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	72	73	1	94	101
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	7.0	7.2	3	89	88
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	250	260	4	100	96
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	38	39	3	99	101
Hardness	mgCaCO 3/L	3	Metals-020	[NT]	1	790	810	2	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	303265-2
Date prepared	-			17/08/2022	1	17/08/2022	17/08/2022		17/08/2022	17/08/2022
Date analysed	-			17/08/2022	1	17/08/2022	17/08/2022		17/08/2022	17/08/2022
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	<5	[NT]		111	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	1200	[NT]		89	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.24	0.24	0	90	[NT]
Chlorophyll a	mg/m^3	1	INORG-119	<1	1	<1	[NT]		92	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	<0.005	0	105	124
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.16	0.16	0	94	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.2	0.2	0	102	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	0.9	[NT]		90	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	2	17/08/2022	17/08/2022		[NT]	[NT]
Date analysed	-			[NT]	2	17/08/2022	17/08/2022		[NT]	[NT]
Total Suspended Solids	mg/L	5	Inorg-019	[NT]	2	<5	[NT]		[NT]	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	[NT]	2	420	[NT]		[NT]	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	[NT]	2	0.099	[NT]		[NT]	[NT]
Chlorophyll a	mg/m^3	1	INORG-119	[NT]	2	<1	[NT]		[NT]	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	[NT]	2	<0.005	[NT]		[NT]	[NT]
Nitrate as N in water	mg/L	0.005	Inorg-055	[NT]	2	0.65	[NT]		[NT]	[NT]
NOx as N in water	mg/L	0.005	Inorg-055	[NT]	2	0.65	[NT]		[NT]	[NT]
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	[NT]	2	1.1	1.2	9	[NT]	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

Miscellaneous Organics - water - The recovery of LCS and matrix spike cannot be reported due to the fact they are not in the list of analytes requested. However, the non-reported analytes within the LCS and matrix spike had acceptable recoveries.