natural solutions for environmental challenges

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Environmental Engineer & Director
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Thursday 3rd September 2020

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

Re: Surface Water Quality Monitoring Results & Report for the Tweed Valley Hospital Project
Reporting period: 16th July 2020 to 12th August 2020

1.0 INTRODUCTION

Ecoteam is engaged to undertake monthly and event-based surface water monitoring on behalf of Lendlease Building as part of the early works for the Tweed Valley Hospital Project. This report presents results from the fourteenth round of monthly sampling. This report satisfies requirements of the SSD condition C34. 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, with stormwater discharges potentially containing increased sediment loads, nutrients, total and dissolved metals, hydrocarbons or other contaminants such as pesticides. Baseline water quality data was performed on the 19th & 26th November and 19th 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 (16th July 2020 to 12th August 2020) was 160.4 mm with the highest 24-hour rainfall occurring on 24th of July, being 29.4 mm (Kingscliff BOM Station 058137).

4.0 SAMPLING LOCATIONS

Samples were collected from all five monthly sampling sites (001 – 005). 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 upstream sample sites.

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 (Upstream)	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

ecoteam
natural solutions for environmental challenges

13 Ewing Street,
Lismore, NSW
(02) 66215 123
www.ecoteam.com.au

SITE:	CLIENT.	PROJECT NO.	DATE.
Tweed Valley Hospital Project - Kingscliff	Lendlease Building	SMC009	29/7/19

TITLE:	SCALE AT A4.	DRAWN.	CHECKED.	REVISION.
Monthly Surface Water Sampling Sites	1:8000	SS	LB	A

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

5.0 SAMPLING METHODOLOGY

Sampling was undertaken by [redacted] on Thursday 13th August 2020. In situ physico-chemical measurements were collected using an AquaTROLL multi-parameter probe and Turbidity was measured using a Turbimeter Plus. Oil and Grease was visually assessed. The calibration certificate for the SmarTROLL is included as **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 over night to NATA accredited Envirolab in Sydney. Trip blank samples (013) were sent from Envirolab and transported to all sites and sent back with the field samples. The field blanks samples (014) were assessed at Site 002 and duplicate samples (015) were collected at Site 001 and 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 are 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 collected in situ at monthly sampling sites and in the field blank. Results above guidelines are highlighted.

		Water Quality Objectives (WQOs)		Sample Codes & Results				
Analyte	**Units**	**Estuary**	**Fresh Water**	**WC 001 (Down)**	**NWC 002 (Up)**	**EC 003 (Up)**	**Dam 004 (Down)**	**DD 005 (Down)**
pH		7.0-8.5	6.5-8.5	6.78	6.75	6.43	6.39	5.92
Turbidity	NTU	0.5-10	6.0-50	5.54	16.56	2.06	60.1	6.65
Electrical Conductivity (EC)	µS/cm	125-2,200	125-2,200	1,832.8	585.14	224.07	367.76	180.99
Dissolved Oxygen (DO)	% Saturation	80-110	85-110	50.85	54.77	25.3	5.88	36.89
Temperature	°C	N/A	N/A	15.72	18.58	17.3	16.26	18.99
Oxidation Reduction Potential (ORP)		N/A	N/A	54.4	129.4	182.3	175.9	287.9

When compared to the WQOs for freshwater and estuaries:

- pH was out of the WQO ranges for all sites this sampling round.
- Turbidity was out of the WQO ranges within Sites 002, 003, 004, and 005 this sampling round.
- EC was within the WQO ranges at all 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, Oxides of Nitrogen (NOx), Total Nitrogen, Total Phosphorus (TP) and Filtrable Reactive Phosphorus (FRP) were above the WQOs for some sample sites. Aluminium and Zinc was also outside WQOs. Parameters which 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 13th August 2020. Results above guidelines are highlighted.

		Water Quality Objectives (WQOs)		Sample Codes							
Analyte	**Unit**	**Estuary**	**Fresh Water**	**WC 001 (Down)**	**NWC 002 (Down)**	**EC 003 (Up)**	**Dam 004 (Down)**	**DD 005 (Down)**	**013 Trip**	**014 Field**	**015 Duplicate**
Ammonia	mg/L	0.02	0.015	0.059	0.17	0.026	0.042	0.014	<0.005	<0.005	0.054
Chlorophyll-a	mg/m^3	4	5	<2	2	8	10	<2	<2	<2	<2
Filterable Reactive Phosphorus	mg/L	0.005	0.02	<0.005	<0.005	0.03	<0.005	<0.005	<0.005	<0.005	<0.005
Oxides of Nitrogen	mg/L	0.015	0.040	0.01	0.74	0.06	0.3	4.7	<0.005	<0.005	0.03
Total Nitrogen	mg/L	0.30	0.35	0.6	1.2	0.7	1.1	5.3	<0.1	<0.1	0.7
Total Phosphorus	mg/L	0.030	0.025	<0.02	0.03	0.09	0.53	0.06	<0.02	<0.02	<0.02
Aluminium	µg/L	N/A	55	10	40	160	<10	10	<10	<10	<10
Zinc	µg/L	15	8.0	2	4	6	17	9	<1	<1	3

When compared to the WQOs for Freshwater and Estuaries:

- Ammonia was above the WQOs at Sites 001, 002, 003 and 004. Ammonia was above the WQOs at comparison sites in background sampling. Ammonia has decreased at Sites 001, 002 and 003, and increased at Sites 004 and 005 when compared to the previous month.
- Chlorophyll-a was above the WQOs criteria at Sites 003 and 004. Chlorophyll-a results were varied across comparison sites in background sampling. Chlorophyll-a has increased at Site 004 when compared to last month.
- FRP was above the WQOs at Site 003. FRP concentrations at all sites were the same as the previous month. FRP results varied across comparison sites in background sampling, though were lowest at Site 005.

- NOx was above the WQOs criteria at Sites 002, 003, 004 and 005. NOx has increased at Sites 002, 003, 004 and 005 when compared to the previous month.
- TN was above the WQOs at all sampling locations. TN has increased at Sites 002 and 004 when compared to the previous month. Total nitrogen was above the WQOs at comparison sites in baseline sampling.
- TP was above the WQOs at Sites 003, 004 and 005. TP was above the WQOs at comparison sites in baseline sampling. TP has increased at Sites 002, 003, 004 and 005 when compared to the previous month.
- Aluminium was above the WQO at Site 003. This is similar to the previous month. Aluminium has been observed at both upstream and downstream sampling sites during past sampling rounds.
- Zinc was above the WQO at Sites 004 and 005. Zinc 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 and Lindane were 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 laboratory detection limits for all analytes.
- 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 moderate rainfall.
- Chlorophyll-a was present above WQOs at Sites 002, 003, and 004. Chlorophyll-a has increased at Site 004 when compared to the previous month. Algal blooms are naturally occurring and are not considered a result of construction activities.
- Nutrients (Ammonia, NOx, TN, TP and FRP) 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. Zinc exceeded the WQOs at Sites 004 and 005 during the month. Metals have been present in upstream and downstream sampling sites in previous sampling rounds. Changes in metals may be due to pH and redox changes, microbial mineralisation and naturally occurring sediment transportation.
- 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 an assessment of this months water quality data, the Tweed Valley Hospital Development construction activities are unlikely to be adversely impacting the downstream water quality. As such, the current soil and erosion controls implemented on site are effective.

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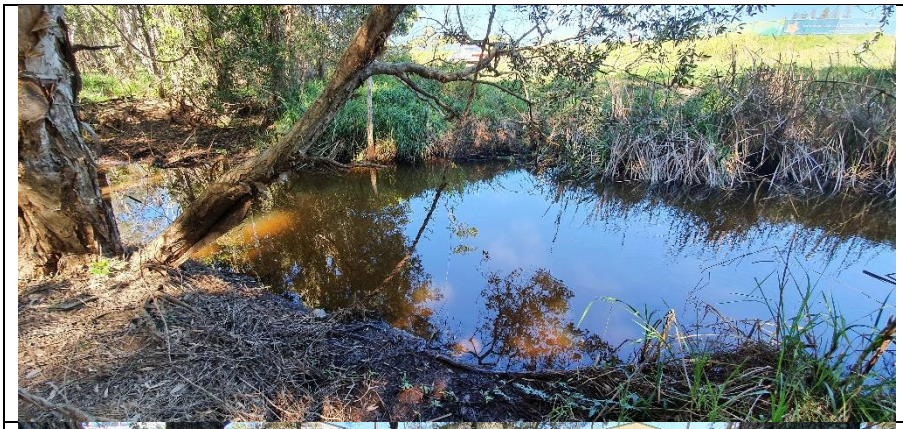
Kind regards,

[redacted]
Environmental Engineer & Director
[redacted]
mob: [redacted]
office: (02) 66-215-123
fax: (02) 66-218-123
ABN: 82 106 758 123

Appendix A. Site Photos

	**Site 001 – West Creek (Downstream) (13/08/2020)**
	**Site 002 –North West Creek (Variable) (13/08/2020)**
	**Site 003 – East Creek (Upstream) (13/08/2020)**
	**Site 004 – Dam (Downstream) (13/08/2020)**

	**Site 005 – Dam Drain (Downstream) (13/08/2020)**

Appendix B. Calibration certificate for AquaTROLL

In-Situ
Innovations in Water Monitoring

Calibration Report

Instrument Details:

Instrument Model:	Aqua TROLL® 400
Full Scale Pressure Range:	0 - 250 ft (0 - 76 m)
Serial Number:	746352
Manufacture Date:	2020-06-08

Calibration Details:

Calibration Result:	PASS
Calibration Date:	2020-05-14
Nominal Range of Applied Temperature:	0 C to +50 C
Temperature Accuracy Specification:	+/-0.1 C from 0 C to +50 C
Nominal Range of Applied Pressure:	0 - 250 feet
Pressure Accuracy Specification:	+/-0.3% FS
Conductivity Calibration:	Pass with a cell constant of 1.00.
Rugged Dissolved Oxygen Calibration:	Pass with an optical phase difference of +/- 2 degrees.
pH/ORP Check:	Pass with mV readings of +/- 5 mV.

Post-Calibration Check:

Parameter	Applied (PSI)	Reported (PSI)	Deviation (PSI)
Pressure	7	7.005	-0.005
Pressure	65	64.991	0.009
Pressure	123	122.995	0.005
Pressure	84.333	84.346	-0.013
Pressure	45.667	45.692	-0.025
Pressure	7	7.002	-0.002

Calibration Procedures and Equipment Used:

Automated calibration procedures used.
Calibrated in 900, 9000, & 90000 µS/cm conductivity standards.
Manu MENSOR Model 8100 Serial No 570135
Manu HART Model 1504 Serial No B42917
Manu instrulab Model 406 Serial No 1-31154

Notes:

1. Standards used in the calibration are traceable to the National Institute of Standards and Technology.
2. This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.
3. A calibration interval of 12 to 18 months is recommended.
4. The post-calibration data is collected at nominal +15C.
5. 1.0 PSI = 6.894757 kPa.

WWW.IN-SITU.COM
221 East Lincoln Avenue, Fort Collins, CO 80524 USA
Toll Free: 800.446.7488 Tel: 970.498.1500 Fax: 970.498.1598

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)

Appendix D. Chain of Custody Form

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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 Pe[redacted]
Project Mg[redacted]
Sampler:
Address: 13 Ewing Street
Lismore NSW 2480
Phone: 02 6621 5123 Mob: [redacted]
Email: [redacted]

Testing rquirements - 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):
SMC009.14 - Tweed Valley Hospital
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.

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Depth	Date sampled	Type of sample	TRH/BTEXN	Dissolved Metals + low level silver (0.00005 mg/L)	OC/OP + toxaphene + demeton LOW LEVEL		TSS	TDS	Cations + Hardness	Ammonia	Chlorphyll-a	Phosphate (FRP)	Nitrate	Nox	Total N	Total P	Cr6+- AsIII & V HOLD	Provide as much information about the sample as you can
1	001 - WC	300 mm	13/08/2020	Water	X	X	X		X	X	X	X	X	X	X	X	X	X		
2	002 - NWC	150 mm	13/08/2020	Water	X	X	X		X	X	X	X	X	X	X	X	X	X		
3	003 - EC	300 mm	13/08/2020	Water	X	X	x		X	X	X	X	X	X	X	X	X	X		
4	004 - Dam	300 mm	13/08/2020	Water	X	X	x		X	X	X	X	X	X	X	X	X	X		
5	005 - Dam Drain	150 mm	13/08/2020	Water	X	X	x		X	X	X	X	X	X	X	X	X	X		
6	013	300 mm	13/08/2020	Water	X	X	X		X	X	X	X	X	X	X	X	X	X		
7	014	300 mm	13/08/2020	Water	X	X	X		X	X	X	X	X	X	X	X	X	X		
8	015	300 mm	13/08/2020	Water	X	X	X		X	X	X	X	X	X	X	X	X	X		

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

Relinquished by (Company):	Ecoteam	Received by (Company):	ELS Syd
Print Name:	[redacted]	Print Name:	K. Lore
Date & Time:	13/08/2020- 15:30	Date & Time:	14/08/2020 10:00
Signature:		Signature:	

Lab Use Only

Job number:	299070	Cooling:	Ice / Ice pack / None
Temperature:	11-3	Security seal:	Intact / Broken / None
TAT Req - SAME day / 1 / 2 / 3 / 4 / STD			

COC 15:10.

Form 302_V004 Issue date: 21 May 2019 Page 1 of 1

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	Dam 004	DD 005	013 Trip	014 Field	015 Duplicate
Total Suspended Solids (TSS)	mg/L	N/A	N/A	6	6	11	120	<5	<5	<5	6
Total Dissolved Solids (TDS)	mg/L	N/A	N/A	1,300	400	160	250	100	<5	<5	1,200
Major Cations (dissolved) & Hardness											
Sodium	mg/L	NA	NA	160	61	30	110	26	<0.5	<0.5	160
Potassium	mg/L	NA	NA	7.3	3.2	1.4	5.6	1.1	<0.5	<0.5	7.4
Calcium	mg/L	NA	NA	200	42	13	21	4.6	<0.5	<0.5	200
Magnesium	mg/L	NA	NA	50	15	5.5	15	5.0	<0.5	<0.5	50
Hardness mg$CaCO_3$/L			NA	690	700	160	54	110	32	<3	710
Nutrients											
Ammonia	mg/L	0.015	0.02	0.059	0.17	0.026	0.042	0.014	<0.005	<0.005	0.054
Chlorophyll-a	mg/m^3	4	5	<2	2	8	10	<2	<2	<2	<2
Filterable Reactive Phosphorus	mg/L	0.005	0.02	<0.005	<0.005	0.03	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate	mg/L	N/A	N/A	0.01	0.73	0.055	0.31	4.7	<0.005	<0.005	0.02
Oxides of Nitrogen	mg/L	0.015	0.040	0.01	0.74	0.06	0.3	4.7	<0.005	<0.005	0.03
Total Nitrogen	mg/L	0.30	0.35	0.6	1.2	0.7	1.1	5.3	<0.1	<0.1	0.7
Total Phosphorus	mg/L	0.030	0.025	<0.02	0.03	0.09	0.53	0.06	<0.02	<0.02	<0.02
Metals – All metals are Dissolved Metals											
Aluminium	µg/L	N/A	55	10	40	160	<10	10	<10	<10	<10
Arsenic	µg/L	N/A	13	<1	<1	<1	<1	<1	<1	<1	<1
Boron	µg/L	N/A	370	200	100	30	100	50	<20	<20	210
Cadmium	µg/L	5.5	0.2	<0.1	<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	<1
Copper	µg/L	1.3	1.4	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L	1.0	N/A	1	1	<1	<1	<1	<1	<1	1
Lead	µg/L	4.4	3.4	<1	<1	<1	<1	<1	<1	<1	<1
Manganese	µg/L	N/A	1,900	190	220	23	140	60	<1	<1	190
Mercury	µg/L	0.4	0.6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	70	11	<1	1	<1	<1	<1	<1	<1	<1
Selenium	µg/L	N/A	11	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	µg/L	15	8.0	2	4	6	17	9	<1	<1	3
Silver	µg/L	1.4	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

		Water Quality Objectives (WQOs)		Sample Codes							
Analyte	**Unit**	**Estuary**	**Fresh Water**	WC 001	NWC 002	EC 003	Dam 004	DD 005	013 Trip	014 Field	015 Duplicate
Hydrocarbons											
Toluene	mg/L	0.70	0.95	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	mg/L	N/A	N/A	<2	<2	<2	<2	<2	<2	<2	<2
Xylene	mg/L	N/A	N/A	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	mg/L	N/A	0.55	<10	<10	<10	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	mg/L	0.07	0.016	<50	<50	<50	<50	<50	<50	<50	<50
TRH C_{10} - C_{16}	mg/L	N/A	N/A	<100	<100	<100	<100	<100	<100	<100	<100
TRH C_{16} - C_{34}	mg/L	N/A	N/A	<100	<100	<100	<100	<100	<100	<100	<100
TRH >C_{34} - C_{40}	mg/L	N/A	N/A	<10	<10	<10	<10	<10	<10	<10	<10
TRH C_6-C_{10} less BTEX (F1)	mg/L	N/A	N/A	<50	<50	<50	<50	<50	<50	<50	<50
TRH >C_{10}-C_{16} less Naphthalene (F2)	mg/L	N/A	N/A	<50	<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	<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	<0.006
Aldrin	µg/L	N/A	N/A	<0.01	<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	<0.01
Chlordane	µg/L	N/A	0.08	<0.01	<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	<0.01
Endosulfan	µg/L	0.01	0.2	<0.01	<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	<0.01
Heptachlor	µg/L	N/A	0.09	<0.01	<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	<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	<0.02
Chlorpyriphos		0.009	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Demeton-S	µg/L	N/A	N/A	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Diazinon	µg/L	N/A	0.01	<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	<0.15
Fenitrothion	µg/L	N/A	0.2	<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	<0.05

Appendix F. Full Laboratory Results

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CERTIFICATE OF ANALYSIS 249070

Client Details

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

Sample Details

Your Reference	**SMC009.14 - Tweed Valley Hospital**
Number of Samples	8 water
Date samples received	14/08/2020
Date completed instructions received	14/08/2020

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	21/08/2020

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Results Approved By

[redacted] Team Leader, Inorganics
[redacted], Senior Chemist
[redacted], Senior Chemist
[redacted] Metals Supervisor
[redacted], Senior Chemist
[redacted] Organics Supervisor

Authorised By

[redacted] Laboratory Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		249070-1	249070-2	249070-3	249070-4	249070-5
Your Reference	UNITS	001 - WC	002 - NWC	003 - EC	004 - Dam	005 - Dam Drain
Depth		300	150	300	300	150
Date Sampled		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water	water	water
Date extracted	-	18/08/2020	18/08/2020	18/08/2020	18/08/2020	18/08/2020
Date analysed	-	18/08/2020	18/08/2020	18/08/2020	18/08/2020	18/08/2020
TRH C_6 - C_9	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10	<10	<10
Benzene	µg/L	<1	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1	<1	<1
Surrogate Dibromofluoromethane	%	121	126	126	127	127
Surrogate toluene-d8	%	95	98	95	97	96
Surrogate 4-BFB	%	82	83	83	82	82

vTRH(C6-C10)/BTEXN in Water				
Our Reference		249070-6	249070-7	249070-8
Your Reference	UNITS	013	014	015
Depth		300	300	300
Date Sampled		13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water
Date extracted	-	18/08/2020	18/08/2020	18/08/2020
Date analysed	-	18/08/2020	18/08/2020	18/08/2020
TRH C_6 - C_9	µg/L	<10	<10	<10
TRH C_6 - C_{10}	µg/L	<10	<10	<10
TRH C_6 - C_{10} less BTEX (F1)	µg/L	<10	<10	<10
Benzene	µg/L	<1	<1	<1
Toluene	µg/L	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1
m+p-xylene	µg/L	<2	<2	<2
o-xylene	µg/L	<1	<1	<1
Naphthalene	µg/L	<1	<1	<1
Surrogate Dibromofluoromethane	%	127	127	129
Surrogate toluene-d8	%	96	95	95
Surrogate 4-BFB	%	82	81	83

svTRH (C10-C40) in Water						
Our Reference		249070-1	249070-2	249070-3	249070-4	249070-5
Your Reference	UNITS	001 - WC	002 - NWC	003 - EC	004 - Dam	005 - Dam Drain
Depth		300	150	300	300	150
Date Sampled		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water	water	water
Date extracted	-	19/08/2020	19/08/2020	19/08/2020	19/08/2020	19/08/2020
Date analysed	-	20/08/2020	20/08/2020	20/08/2020	20/08/2020	21/08/2020
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	%	90	95	92	96	103

svTRH (C10-C40) in Water				
Our Reference		249070-6	249070-7	249070-8
Your Reference	UNITS	013	014	015
Depth		300	300	300
Date Sampled		13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water
Date extracted	-	19/08/2020	19/08/2020	19/08/2020
Date analysed	-	21/08/2020	21/08/2020	21/08/2020
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 Naphthalene (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	%	131	102	105

OCPs in Water - Low Level						
Our Reference		249070-1	249070-2	249070-3	249070-4	249070-5
Your Reference	UNITS	001 - WC	002 - NWC	003 - EC	004 - Dam	005 - Dam Drain
Depth		300	150	300	300	150
Date Sampled		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water	water	water
Date extracted	-	19/08/2020	19/08/2020	19/08/2020	19/08/2020	19/08/2020
Date analysed	-	20/08/2020	20/08/2020	20/08/2020	20/08/2020	20/08/2020
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	%	96	93	99	99	104

OCPs in Water - Low Level				
Our Reference		249070-6	249070-7	249070-8
Your Reference	UNITS	013	014	015
Depth		300	300	300
Date Sampled		13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water
Date extracted	-	19/08/2020	19/08/2020	19/08/2020
Date analysed	-	20/08/2020	20/08/2020	20/08/2020
alpha-BHC	µg/L	<0.01	<0.01	<0.01
HCB	µg/L	<0.01	<0.01	<0.01
beta-BHC	µg/L	<0.01	<0.01	<0.01
gamma-BHC	µg/L	<0.01	<0.01	<0.01
Heptachlor	µg/L	<0.01	<0.01	<0.01
delta-BHC	µg/L	<0.01	<0.01	<0.01
Aldrin	µg/L	<0.01	<0.01	<0.01
Heptachlor Epoxide	µg/L	<0.01	<0.01	<0.01
gamma-Chlordane	µg/L	<0.01	<0.01	<0.01
alpha-Chlordane	µg/L	<0.01	<0.01	<0.01
Endosulfan I	µg/L	<0.01	<0.01	<0.01
pp-DDE	µg/L	<0.01	<0.01	<0.01
Dieldrin	µg/L	<0.01	<0.01	<0.01
Endrin	µg/L	<0.01	<0.01	<0.01
Endosulfan II	µg/L	<0.01	<0.01	<0.01
pp-DDD	µg/L	<0.01	<0.01	<0.01
Endrin Aldehyde	µg/L	<0.01	<0.01	<0.01
pp-DDT	µg/L	<0.006	<0.006	<0.006
Endosulfan Sulphate	µg/L	<0.01	<0.01	<0.01
Methoxychlor	µg/L	<0.01	<0.01	<0.01
Surrogate TCMX	%	93	79	97

OP in water LL ANZECCF/ADWG						
Our Reference		249070-1	249070-2	249070-3	249070-4	249070-5
Your Reference	UNITS	001 - WC	002 - NWC	003 - EC	004 - Dam	005 - Dam Drain
Depth		300	150	300	300	150
Date Sampled		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water	water	water
Date extracted	-	19/08/2020	19/08/2020	19/08/2020	19/08/2020	19/08/2020
Date analysed	-	20/08/2020	20/08/2020	20/08/2020	20/08/2020	20/08/2020
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	%	96	93	99	99	104

OP in water LL ANZECCF/ADWG				
Our Reference		249070-6	249070-7	249070-8
Your Reference	UNITS	013	014	015
Depth		300	300	300
Date Sampled		13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water
Date extracted	-	19/08/2020	19/08/2020	19/08/2020
Date analysed	-	20/08/2020	20/08/2020	20/08/2020
Dichlorovos	µg/L	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.15	<0.15	<0.15
Diazinon	µg/L	<0.01	<0.01	<0.01
Chlorpyriphos-methyl	µg/L	<0.2	<0.2	<0.2
Methyl Parathion	µg/L	<0.2	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2	<0.2
Malathion	µg/L	<0.05	<0.05	<0.05
Chlorpyriphos	µg/L	<0.01	<0.01	<0.01
Parathion	µg/L	<0.01	<0.01	<0.01
Bromophos ethyl	µg/L	<0.2	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.02	<0.02	<0.02
Surrogate TCMX	%	93	79	97

Miscellaneous Organics - water						
Our Reference		249070-1	249070-2	249070-3	249070-4	249070-5
Your Reference	UNITS	001 - WC	002 - NWC	003 - EC	004 - Dam	005 - Dam Drain
Depth		300	150	300	300	150
Date Sampled		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water	water	water
Date prepared	-	19/08/2020	19/08/2020	19/08/2020	19/08/2020	19/08/2020
Date analysed	-	20/08/2020	20/08/2020	20/08/2020	20/08/2020	20/08/2020
Toxaphene*	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Demeton S	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
Surrogate p-Terphenyl-d14	%	94	93	97	97	101

Miscellaneous Organics - water				
Our Reference		249070-6	249070-7	249070-8
Your Reference	UNITS	013	014	015
Depth		300	300	300
Date Sampled		13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water
Date prepared	-	19/08/2020	19/08/2020	19/08/2020
Date analysed	-	20/08/2020	20/08/2020	20/08/2020
Toxaphene*	µg/L	<0.2	<0.2	<0.2
Demeton S	µg/L	<0.2	<0.2	<0.2
Demeton O	µg/L	<0.2	<0.2	<0.2
Surrogate p-Terphenyl-d14	%	89	80	94

HM in water - dissolved						
Our Reference		249070-1	249070-2	249070-3	249070-4	249070-5
Your Reference	UNITS	001 - WC	002 - NWC	003 - EC	004 - Dam	005 - Dam Drain
Depth		300	150	300	300	150
Date Sampled		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water	water	water
Date prepared	-	18/08/2020	18/08/2020	18/08/2020	18/08/2020	18/08/2020
Date analysed	-	18/08/2020	18/08/2020	18/08/2020	18/08/2020	18/08/2020
Aluminium-Dissolved	µg/L	10	40	160	<10	10
Arsenic-Dissolved	µg/L	<1	<1	<1	<1	<1
Boron-Dissolved	µg/L	200	100	30	100	50
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	190	220	23	140	60
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	1	<1	<1	<1
Selenium-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	2	4	6	17	9
Silver-Dissolved	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05

HM in water - dissolved				
Our Reference		249070-6	249070-7	249070-8
Your Reference	UNITS	013	014	015
Depth		300	300	300
Date Sampled		13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water
Date prepared	-	18/08/2020	18/08/2020	18/08/2020
Date analysed	-	18/08/2020	18/08/2020	18/08/2020
Aluminium-Dissolved	µg/L	<10	<10	<10
Arsenic-Dissolved	µg/L	<1	<1	<1
Boron-Dissolved	µg/L	<20	<20	210
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1
Cobalt-Dissolved	µg/L	<1	<1	1
Lead-Dissolved	µg/L	<1	<1	<1
Manganese-Dissolved	µg/L	<1	<1	190
Mercury-Dissolved	µg/L	<0.05	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	<1	<1
Selenium-Dissolved	µg/L	<1	<1	<1
Zinc-Dissolved	µg/L	<1	<1	3
Silver-Dissolved	µg/L	<0.05	<0.05	<0.05

Metals in Waters - Acid extractable						
Our Reference		249070-1	249070-2	249070-3	249070-4	249070-5
Your Reference	UNITS	001 - WC	002 - NWC	003 - EC	004 - Dam	005 - Dam Drain
Depth		300	150	300	300	150
Date Sampled		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water	water	water
Date prepared	-	18/08/2020	18/08/2020	18/08/2020	18/08/2020	18/08/2020
Date analysed	-	19/08/2020	19/08/2020	19/08/2020	19/08/2020	19/08/2020
Phosphorus - Total	mg/L	<0.02	0.03	0.09	0.53	0.06

Metals in Waters - Acid extractable				
Our Reference		249070-6	249070-7	249070-8
Your Reference	UNITS	013	014	015
Depth		300	300	300
Date Sampled		13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water
Date prepared	-	18/08/2020	18/08/2020	18/08/2020
Date analysed	-	19/08/2020	19/08/2020	19/08/2020
Phosphorus - Total	mg/L	<0.02	<0.02	<0.02

Cations in water Dissolved						
Our Reference		249070-1	249070-2	249070-3	249070-4	249070-5
Your Reference	UNITS	001 - WC	002 - NWC	003 - EC	004 - Dam	005 - Dam Drain
Depth		300	150	300	300	150
Date Sampled		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water	water	water
Date digested	-	18/08/2020	18/08/2020	18/08/2020	18/08/2020	18/08/2020
Date analysed	-	19/08/2020	19/08/2020	19/08/2020	19/08/2020	19/08/2020
Sodium - Dissolved	mg/L	160	61	30	110	26
Potassium - Dissolved	mg/L	7.3	3.2	1.4	5.6	1.1
Calcium - Dissolved	mg/L	200	42	13	21	4.6
Magnesium - Dissolved	mg/L	50	15	5.5	15	5.0
Hardness	mgCaCO 3 /L	700	160	54	110	32

Cations in water Dissolved				
Our Reference		249070-6	249070-7	249070-8
Your Reference	UNITS	013	014	015
Depth		300	300	300
Date Sampled		13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water
Date digested	-	18/08/2020	18/08/2020	18/08/2020
Date analysed	-	19/08/2020	19/08/2020	19/08/2020
Sodium - Dissolved	mg/L	<0.5	<0.5	160
Potassium - Dissolved	mg/L	<0.5	<0.5	7.4
Calcium - Dissolved	mg/L	<0.5	<0.5	200
Magnesium - Dissolved	mg/L	<0.5	<0.5	50
Hardness	mgCaCO 3 /L	<3	<3	710

Miscellaneous Inorganics						
Our Reference		249070-1	249070-2	249070-3	249070-4	249070-5
Your Reference	UNITS	001 - WC	002 - NWC	003 - EC	004 - Dam	005 - Dam Drain
Depth		300	150	300	300	150
Date Sampled		13/08/2020	13/08/2020	13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water	water	water
Date prepared	-	14/08/2020	14/08/2020	14/08/2020	14/08/2020	14/08/2020
Date analysed	-	14/08/2020	14/08/2020	14/08/2020	14/08/2020	14/08/2020
Total Suspended Solids	mg/L	6	6	11	120	<5
Total Dissolved Solids (grav)	mg/L	1,300	400	160	250	100
Ammonia as N in water	mg/L	0.059	0.17	0.026	0.042	0.014
Chlorophyll a	mg/m^3	<2	2	8	10	<2
Phosphate as P in water	mg/L	<0.005	<0.005	0.03	<0.005	<0.005
Nitrate as N in water	mg/L	0.01	0.73	0.055	0.31	4.7
NOx as N in water	mg/L	0.01	0.74	0.06	0.3	4.7
Total Nitrogen in water	mg/L	0.6	1.2	0.7	1.1	5.3

Miscellaneous Inorganics				
Our Reference		249070-6	249070-7	249070-8
Your Reference	UNITS	013	014	015
Depth		300	300	300
Date Sampled		13/08/2020	13/08/2020	13/08/2020
Type of sample		water	water	water
Date prepared	-	14/08/2020	14/08/2020	14/08/2020
Date analysed	-	14/08/2020	14/08/2020	14/08/2020
Total Suspended Solids	mg/L	<5	<5	6
Total Dissolved Solids (grav)	mg/L	<5	<5	1,200
Ammonia as N in water	mg/L	<0.005	<0.005	0.054
Chlorophyll a	mg/m^3	<2	<2	<2
Phosphate as P in water	mg/L	<0.005	<0.005	<0.005
Nitrate as N in water	mg/L	<0.005	<0.005	0.02
NOx as N in water	mg/L	<0.005	<0.005	0.03
Total Nitrogen in water	mg/L	<0.1	<0.1	0.7

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-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-W2	[NT]
Date extracted	-			18/08/2020	2	18/08/2020	18/08/2020		18/08/2020	[NT]
Date analysed	-			18/08/2020	2	18/08/2020	18/08/2020		18/08/2020	[NT]
TRH C_6 - C_9	µg/L	10	Org-023	<10	2	<10	<10	0	100	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-023	<10	2	<10	<10	0	100	[NT]
Benzene	µg/L	1	Org-023	<1	2	<1	<1	0	107	[NT]
Toluene	µg/L	1	Org-023	<1	2	<1	<1	0	100	[NT]
Ethylbenzene	µg/L	1	Org-023	<1	2	<1	<1	0	93	[NT]
m+p-xylene	µg/L	2	Org-023	<2	2	<2	<2	0	99	[NT]
o-xylene	µg/L	1	Org-023	<1	2	<1	<1	0	101	[NT]
Naphthalene	µg/L	1	Org-023	<1	2	<1	<1	0	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-023	111	2	126	115	9	95	[NT]
Surrogate toluene-d8	%		Org-023	97	2	98	97	1	97	[NT]
Surrogate 4-BFB	%		Org-023	80	2	83	83	0	107	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	[NT]
Date extracted	-			19/08/2020	[NT]	[NT]	[NT]	[NT]	19/08/2020	[NT]
Date analysed	-			20/08/2020	[NT]	[NT]	[NT]	[NT]	20/08/2020	[NT]
TRH C_{10} - C_{14}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	89	[NT]
TRH C_{15} - C_{28}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	79	[NT]
TRH C_{29} - C_{36}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	87	[NT]
TRH >C_{10} - C_{16}	µg/L	50	Org-020	<50	[NT]	[NT]	[NT]	[NT]	89	[NT]
TRH >C_{16} - C_{34}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	79	[NT]
TRH >C_{34} - C_{40}	µg/L	100	Org-020	<100	[NT]	[NT]	[NT]	[NT]	87	[NT]
Surrogate o-Terphenyl	%		Org-020	117	[NT]	[NT]	[NT]	[NT]	70	[NT]

QUALITY CONTROL: OCPs in Water - Low Level					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			19/08/2020	[NT]	[NT]	[NT]	[NT]	19/08/2020	[NT]
Date analysed	-			20/08/2020	[NT]	[NT]	[NT]	[NT]	20/08/2020	[NT]
alpha-BHC	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	101	[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]	90	[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]	86	[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]	94	[NT]
Heptachlor Epoxide	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	87	[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]	76	[NT]
Endrin	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	101	[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]	97	[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]	81	[NT]
Methoxychlor	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	103	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: OP in water LL ANZECCF/ADWG						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date extracted	-			19/08/2020	[NT]	[NT]	[NT]	[NT]	19/08/2020	[NT]
Date analysed	-			20/08/2020	[NT]	[NT]	[NT]	[NT]	20/08/2020	[NT]
Dichlorovos	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	82	[NT]
Dimethoate	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 Parathion	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]	104	[NT]
Fenitrothion	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	82	[NT]
Malathion	µg/L	0.05	Org-022/025	<0.05	[NT]	[NT]	[NT]	[NT]	71	[NT]
Chlorpyriphos	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	97	[NT]
Parathion	µg/L	0.01	Org-022/025	<0.01	[NT]	[NT]	[NT]	[NT]	79	[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]	92	[NT]
Azinphos-methyl (Guthion)	µg/L	0.02	Org-022/025	<0.02	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate TCMX	%		Org-022/025	103	[NT]	[NT]	[NT]	[NT]	100	[NT]

QUALITY CONTROL: Miscellaneous Organics - water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	[NT]
Date prepared	-			19/08/2020	[NT]	[NT]	[NT]	[NT]	19/08/2020	[NT]
Date analysed	-			20/08/2020	[NT]	[NT]	[NT]	[NT]	20/08/2020	[NT]
Toxaphene*	µg/L	0.2	Org-022/025	<0.2	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Demeton S	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]
Surrogate p-Terphenyl-d14	%		Org-022/025	98	[NT]	[NT]	[NT]	[NT]	102	[NT]

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W3	249070-2
Date prepared	-			18/08/2020	1	18/08/2020	18/08/2020		18/08/2020	18/08/2020
Date analysed	-			18/08/2020	1	18/08/2020	18/08/2020		18/08/2020	18/08/2020
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	10	10	0	102	86
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	96	98
Boron-Dissolved	µg/L	20	Metals-022	<20	1	200	210	5	87	107
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	94	94
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	101	98
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	102	95
Cobalt-Dissolved	µg/L	1	Metals-022	<1	1	1	1	0	101	97
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	102	100
Manganese-Dissolved	µg/L	1	Metals-022	<1	1	190	190	0	97	#
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	104	102
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	99	92
Selenium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	97	102
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	2	2	0	98	96
Silver-Dissolved	µg/L	0.05	Metals-022	<0.05	1	<0.05	<0.05	0	92	81

QUALITY CONTROL: Metals in Waters - Acid extractable						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	249070-2
Date prepared	-			18/08/2020	1	18/08/2020	18/08/2020		18/08/2020	18/08/2020
Date analysed	-			19/08/2020	1	19/08/2020	19/08/2020		19/08/2020	19/08/2020
Phosphorus - Total	mg/L	0.02	Metals-020	<0.02	1	<0.02	0.02	0	92	99

QUALITY CONTROL: Cations in water Dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	249070-2
Date digested	-			18/08/2020	1	18/08/2020	18/08/2020		18/08/2020	18/08/2020
Date analysed	-			19/08/2020	1	19/08/2020	19/08/2020		19/08/2020	19/08/2020
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	160	160	0	102	#
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	7.3	7.2	1	97	93
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	200	200	0	100	92
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	50	50	0	100	97
Hardness	mgCaCO 3 /L	3		[NT]	1	700	700	0	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	249070-2
Date prepared	-			14/08/2020	1	14/08/2020	14/08/2020		14/08/2020	14/08/2020
Date analysed	-			14/08/2020	1	14/08/2020	14/08/2020		14/08/2020	14/08/2020
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	6	<5	18	98	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	1300	1200	8	82	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	0.059	0.058	2	110	84
Chlorophyll a	mg/m^3	2	INORG-119	<2	1	<2	[NT]		85	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	<0.005	0	105	101
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.01	0.01	0	99	110
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.01	0.01	0	101	110
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	0.6	0.6	0	99	100

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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

Report Comments

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

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

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.