[redacted]
Environmental Engineer & Director
[redacted]
mob: [redacted]
office: [redacted]
fax: [redacted]
ABN: 82 106 758 123

Monday 10th February 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: 19th December 2019 to 16th January 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 sixth 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 month prior to sampling (19th December 2019 to 16th January 2020) was 60.2 mm with the highest rainfall occurring on 25th of December, being 23.6 mm (Kingscliff BOM Station 058137).

4.0 SAMPLING LOCATIONS

Samples were collected from four monthly sampling sites (001 – 004). No water was present in sample site 005. Control samples were also collected and analysed (013 – 015). Samples from 001 and 002 are not downstream of the Tweed Valley Hospital site and are taken for comparison. 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.**

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

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

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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

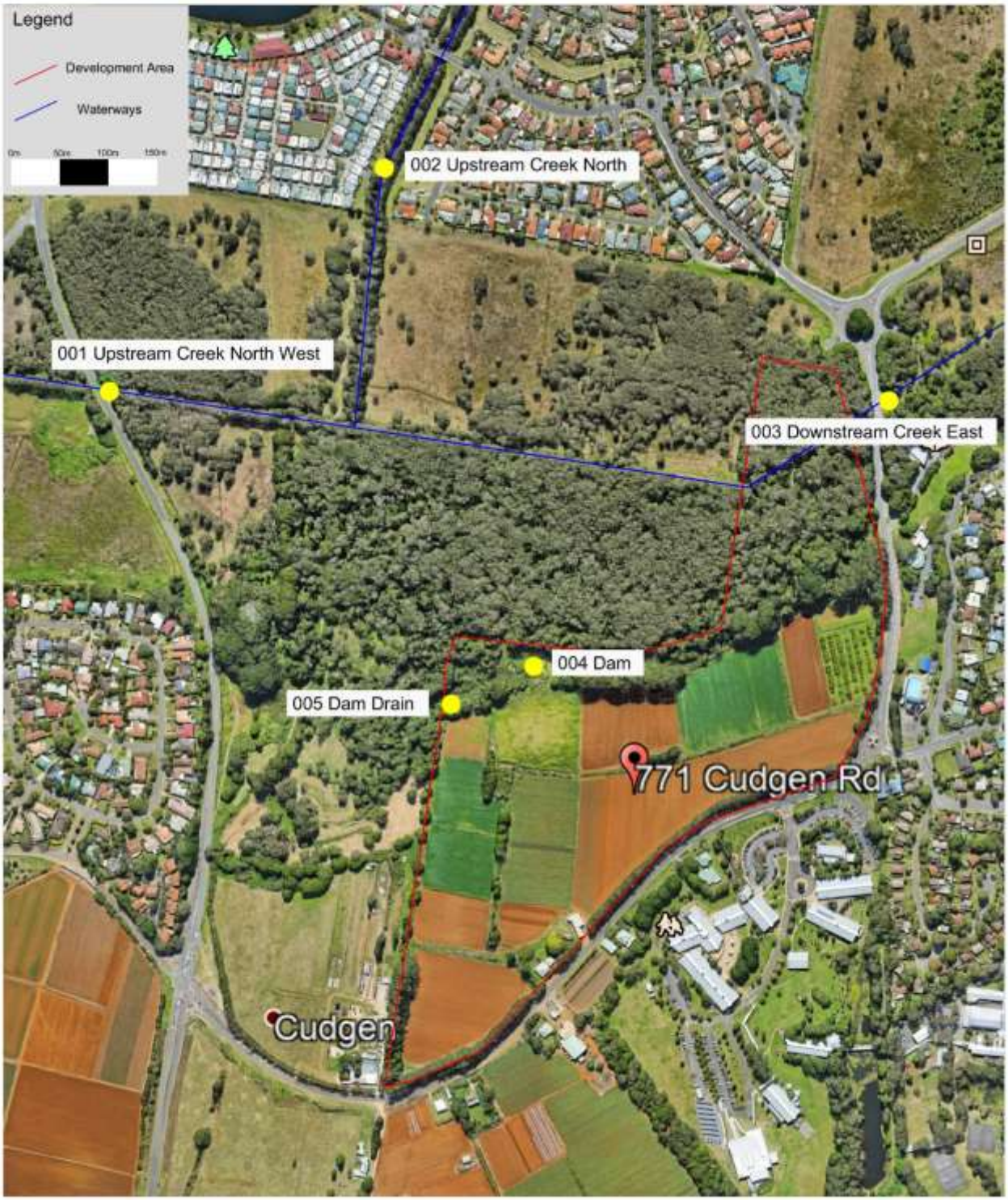


Figure 1. Map of monthly sampling sites (Source: Google Earth)

5.0 SAMPLING METHODOLOGY

Sampling was undertaken by [redacted] on Wednesday 16th January 2019. In situ physico-chemical measurements were collected using a SmarTROLL 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. A trip blank was sent from EnviroLab and transported to all sites and sent back with the field samples. The field blank and duplicate samples were collected at Site 001 and filtered and preserved as required. 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 which may indicate presence of Oil and Grease. Water was visibly stagnant due to low rainfall.

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**	**Fresh Water**	**Estuary**	**USW 001**	**USNW002**	**DSE 003**	**Dam 004**	**DD 005**
pH		6.5-8.5	7.0-8.5	7.08	7.47	6.91	6.94	-
Turbidity	NTU	6.0-50	0.5-10	6.11	3.55	7.15	6.79	-
Electrical Conductivity (EC)	µS/cm	125-2,200	125-2,200	1859.8	304.3	194.8	453.1	-
Dissolved Oxygen (DO)	% Saturation	85-110	80-110	41.8	71.5	5.1	2.78	-
Temperature	°C	N/A	N/A	23.87	27.2	25.01	23.31	-
Oxidation Reduction Potential (ORP)		N/A	N/A	97.6	47.3	33	-21.0	-

When compared to the WQOs for freshwater and estuaries:

- pH was within range for all sites this sampling round.
- Turbidity was within range for all sites this sampling round.
- EC within range for all sites this sampling round.
- DO concentrations at all sampling sites were outside the range for both criteria. DO was outside the range at comparison sites in background sampling.

7.2 Laboratory Results

Ammonia, Chlorophyll-a, Filterable Reactive Phosphorus (FRP), Oxides of Nitrogen (NOx), Total Nitrogen and Total Phosphorus (TP) were above the WQOs for some sample sites. Some metals (Aluminium and zinc) were also outside WQOs at Site 003. 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 18th December 2019. Results above guidelines are highlighted.

		Water Quality Objectives (WQOs)		Sample Codes							
Analyte	Unit	Fresh Water	Estuary	USW 001	USNW 0002	DSE 003	Dam 004	DD 005	013 Trip	014 Field	015 Duplicate
Nutrients											
Ammonia	mg/L	0.02	0.015	<0.005	<0.005	0.37	0.22	-	<0.005	<0.005	0.005
Chlorophyll-a	mg/m^3	5	4	30	30	50	20	-	<5	<5	6
Filterable Reactive Phosphorus	mg/L	0.02	0.005	<0.005	0.007	0.15	0.30	-	<0.005	<0.005	0.005
Oxides of Nitrogen	mg/L	0.040	0.015	0.03	0.006	<0.005	<0.005	-	<0.005	<0.005	0.03
Total Nitrogen	mg/L	0.35	0.30	0.6	0.4	0.8	0.7		<0.1	<0.1	0.6
Total Phosphorus	mg/L	0.025	0.030	0.06	0.2	0.3	0.4	-	<0.05	<0.05	0.06
Aluminium	µg/L	55	N/A	10	10	80	<10	-	<10	<10	<10
Zinc	µg/L	8.0	15	8	3	10	3	-	<1	<1	4
TRH >C_{16} - C_{34}	µg/L	N/A	N/A	<100	100	<100	<100	-	100	<100	<100

When compared to the WQOs for Freshwater and Estuaries:

- Ammonia was above the WQOs at sampling locations 003 and 004, ammonia was above the WQOs at comparison sites in background sampling.
- Chlorophyll-a was above the WQOs criteria at all sites. Chlorophyll-a results were varied across comparison sites in background sampling. Chlorophyll-a has increased at site 002 and 003 but

decreased at Sites 001 and 003 when compared to last month. Algal blooms can occur due to changes in nutrients, temperature and stable low flow conditions.

- FRP was above the WQOs criteria at Site 002, 003 and 004. FRP has reduced at site 001. FRP results varied across comparison sites in background sampling though were lowest at Site 005.
- NOx was above the WQOs criteria at Site 001. NOx has reduced at Sites 001 when compared to the previous month.
- TN above the WQOs at all sampling locations. Total nitrogen concentrations are similar to the previous month. Total nitrogen was above the WQOs at comparison sites in baseline sampling.
- TP was above the WQOs at all sampling locations, similar to the previous month. TP was above the WQOs at comparison sites in baseline sampling.
- Aluminium was above the WQO at site 003. Zinc was above the WQO at site 003. These metals have decreased from the previous month.
- 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 detected at Site 002 (Upstream Creek (North West)). This sample was retested using silica gel clean-up. The results from THR with silica gel clean-up exhibited undetectable concentrations of TRH. Therefore, the TRH detected during the initial sampling is of natural occurrence. This also correlates with a dry period with no flow and potential microbial activity.

8.0 Quality Assurance and Quality Control

Trip blank and field blank samples were analysed.

- All results for the Field Blank and Trip Blank were well within WQOs.
- Parameters analysed in the Trip Blank (013) were below laboratory detection limits.
- Parameters analysed in the Field Blank (014) are all below detectable limits.
- 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

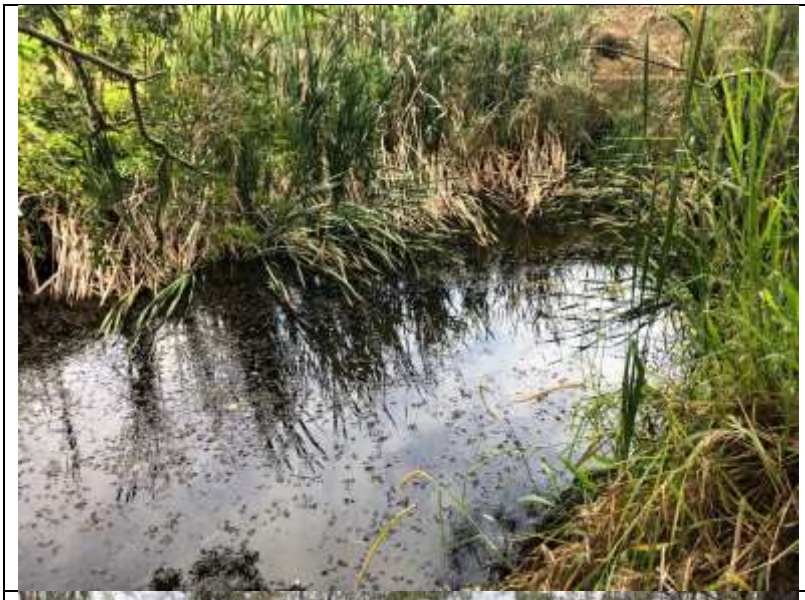
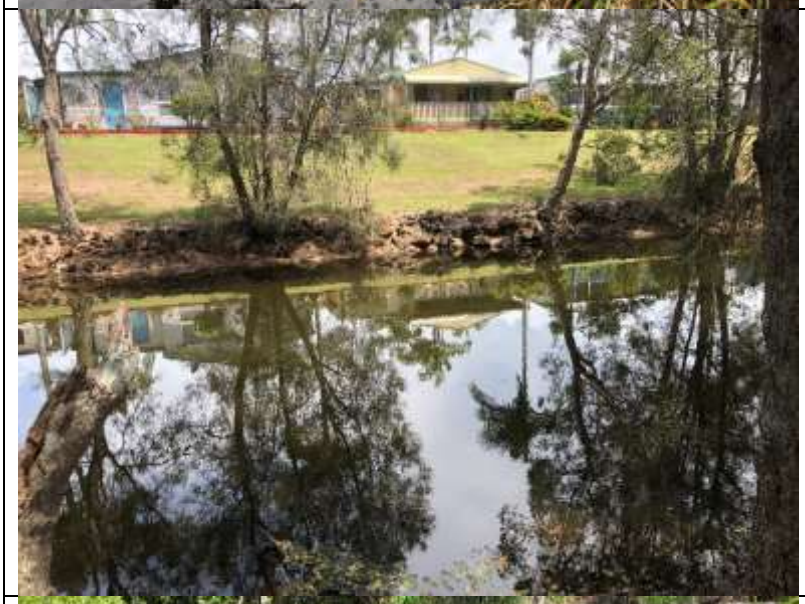
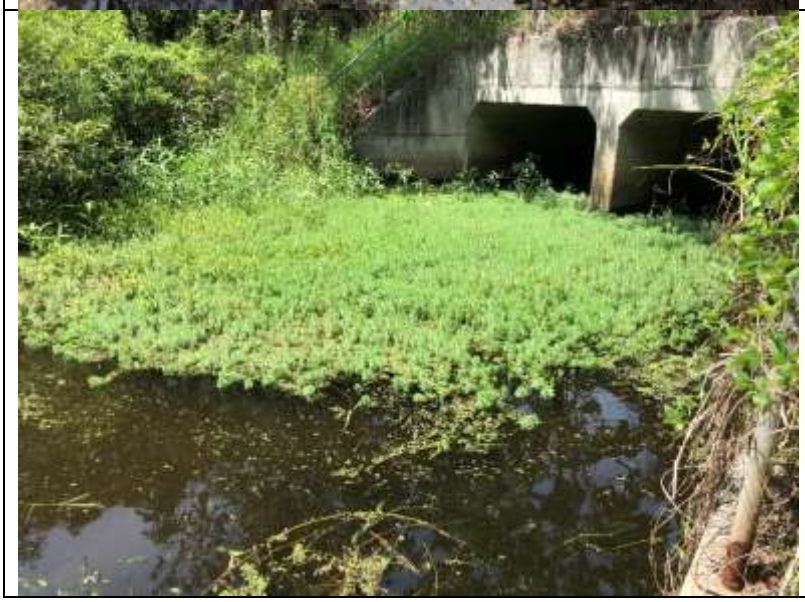
- The month had low rainfall, similar to the previous months. As such, impacts to the water system downstream of the site are unlikely.
- Nutrients were high and exceed some water quality parameters for some sites.
- Aluminium and Zinc exceed WQOs at some sites during the month. These metals have increased from the previous month. This may be due to pH and redox changes or microbial mineralisation.
- TRH was detected at Site 002. TRH was not detected with silica gel clean-up indicating it is of natural/biogenic occurrence.
- Based on the aforementioned increases to nutrients and minerals at all sampling sites, including sites 001 and 002 in the previous month which are not downstream of the construction activities, the Tweed Valley Hospital Development construction activities are not adversely impacting the downstream water system. As such, the current soil and erosion controls implemented on site are effective.

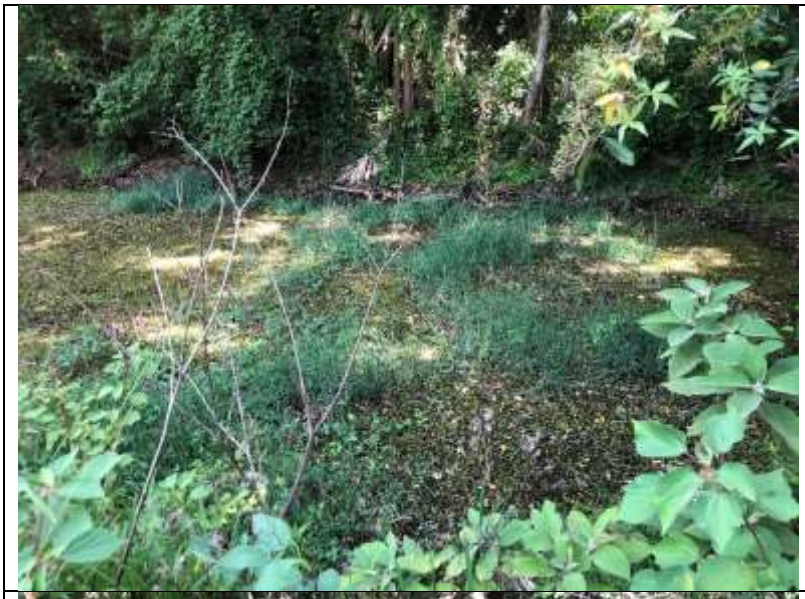
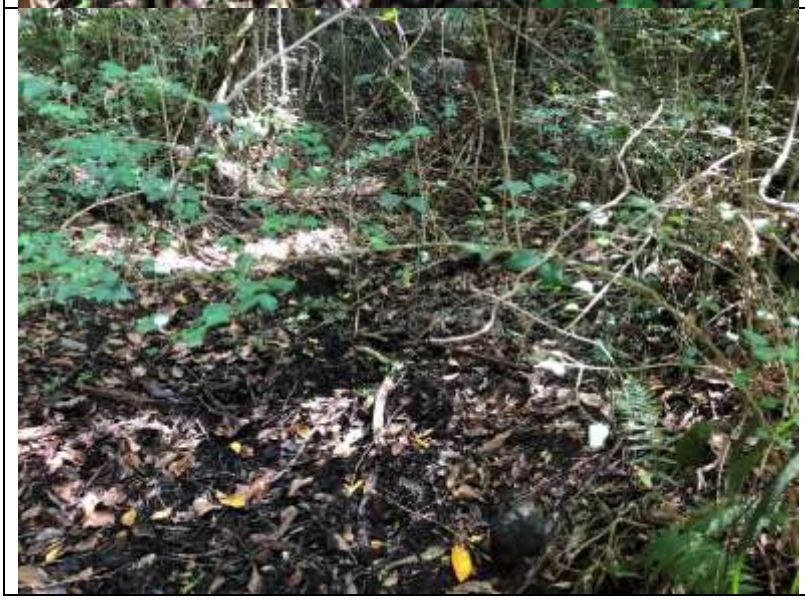
If you require additional information, please do not hesitate to ask.

Kind regards,

[redacted]
Environmental Engineer & Director
[redacted]
mob: [redacted]
office: [redacted]
fax: [redacted]
ABN: 82 106 758 123

Appendix A. Site Photos

	**Site 001 – Upstream Creek West (16/01/2020)**
	**Site 002 – Upstream Creek North West (16/01/2020)**
	**Site 003 – Downstream Creek East (16/01/2020)**

	**Site 004 – Dam (16/01/2020)**
	**Site 005 – Dam Drain (16/01/2020) Note: No water was present at the site**
	

Appendix B. Calibration certificate for SmarTROLL

ThermoFisher SCIENTIFIC

Thermo Fisher Scientific Australia Pty Ltd
ABN 52 058 390 917
5 Caribbean Drive
Scoresby VIC 3179
Phone: 1 300 735 295
Fax: 03 9763 1169

ELECTROCHEMICAL INSTRUMENT MAINTENANCE & CALIBRATION REPORT

Customer:	Ecotechnology Australia PTY Ltd
Address:	13 Ewing st Lismore NSW 2480
Attention:	Stefanie Stanley

Make:	In-Situ	Lab.ID/Assett No.	NA	Calibration Date:	16-08-2019
Model:	smarTROLL	Customer O/No.	Stefanie	Next Calibration:	08-2020
Serial No:	371986	Location:	NA	Call Number:	SV1907240018

Service and Safety Checks	Pass/Fail
Consult operator regarding performance/problems	Pass
Check general operation, note additional problems	Pass
Electrical safety if applicable to AS/NZS 3760:2003	N/A
Initialization Procedure	Pass
Instrument Condition	Pass

Check and Adjust	Pass/Fail
Probes, leads and connectors	Pass
Keypad / user controls	Pass
Power supply / battery voltage and condition	Pass
Probe(s) performance (response slow or acceptable)	Acceptable
Internal and external cleaning	Pass

Calibration/ Accuracy Tests

	Standard Type	Serial Number (if applicable)	Standard Value ± Variation	Displayed Value	Standard Value ± Variation	Displayed Value	Standard Value ± Variation	Displayed Value	Pass/ Fail
✔	pH		7.00 ± 0.02	7.02	4.00 ± 0.02	4.00			Pass
✔	mV (pH)		0.0 +/- 30	-11.0	175.5 +/- 30	157.2			Pass
✔	Slope (pH)		-59.1 +/- 3	-56.16					Pass
✔	DO		8.8mg/L @21.5oC	8.83mg/L @21.28oC	0.0	0.08			Pass
	ISE								
✔	ORP		218mV	218mV					Pass
✔	Conductivity		1413us/cm	1414us/cm					Pass
	TDS								
✔	Temp C		21.27	21.28					Pass

Reference Instruments Used

Make	Model / Part Number	Serial / Batch Number	Expiry / Reference #
Thermo Scientific	Temp360	4006227	Jan 2020
Thermo Scientific	ECBU4BTC1LIT	099/01	Feb 2022
Thermo Scientific	ECBU7BTC1LIT	099/01	Feb 2022
Thermo Scientific	ECCON1413BT	099/01	Feb 2022
TPS	Sodium Sulphite for Zero DO	5928	Mar 2020
Thermo Scientific	ORP Standard 967901	VR1	Sept 2019

General Comments and Recommendations on Instrument Condition, Location Details and Parts Used in Service

Instrument inspected and noted operation. Noted corrosion on pH/ORP connection pins on probe and meter. Cleaned and installed new pH/ORP probe. Instrument calibrated and confirmed operation.
DO cap expires in 201 days. Sensor calibrated and achieved slope of 1.0304
ORP sensor calibrated and achieved offset of 3.6
Conductivity cell constant after calibration :0.8786.

Engineer's Name	Date
Sivanayson	16th Aug 2019

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

[Copyright and Confidential]

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: [redacted] Mob: [redacted]
Email: lise@ecoteam.com.au

Client Project Name / Number / Site etc (ie report title): SMC009 - Tweed Valley Hospital
PO No.:
Envirolab Quote No. : 19SY228
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	OC/OP + toxaphene + demeton	TSS	TDS	Cations + Hardness	Ammonia	Cholorphyll-a	Phosphate (FRP)	Nitrate	Nox	Total N	Total P	Cr6+- HOLD	AsIII & V - HOLD	Provide as much information about the sample as you can
1	001 - USW	300 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X			
2	002 - USNW	300mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X			
3	003 - DSE	300 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X			
4	004 - Dam	300 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X			
5	013	300 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X			
6	014	300 mm		Water	X	X	X	X	X	X	X	X	X	X	X	X	X			
7	015	300 mm		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):	[redacted]
Print Name:	[redacted]	Print Name:	
Date & Time:	16/01/2019 15:00	Date & Time:	[redacted]
Signature:	[redacted]	Signature:	

Lab Use Only

Job number: 234739
Temperature: 10.8
Cooling: (Ice) / Ice pack / None
Security seal: (Intact) / Broken / None
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**	**Fresh Water**	**Estuary**	USW 001	USN W002	DSE 003	Dam 004	DD 005	013 Trip	014 Field	015 Duplicate
Total Suspended Solids (TSS)	mg/L	N/A	N/A	<5	6	14	14		<5	<5	6
Total Dissolved Solids (TDS)	mg/L	N/A	N/A	1,500	160	120	290		1,500	<5	1,500
Major Cations (dissolved) & Hardness											
Sodium	mg/L	NA	NA	160	24	21	53		<0.5	<0.5	170
Potassium	mg/L	NA	NA	12	4.2	3.0	11		<0.5	<0.5	12
Calcium	mg/L	NA	NA	210	31	12	22		<0.5	<0.5	200
Magnesium	mg/L	NA	NA	80	5.5	4.1	12		<0.5	<0.5	78
Hardness mg$CaCO_3$/L		NA	NA	850	100	47	110		<3	<3	830
Nutrients											
Ammonia	mg/L	0.02	0.015	<0.005	<0.005	0.37	0.22		<0.005	<0.005	0.005
Chlorophyll-a	mg/L	5	4	30	30	50	20		<1	<1	6
Filterable Reactive Phosphorus	mg/L	0.02	0.005	<0.005	0.007	0.15	0.30		<0.005	<0.005	0.005
Nitrate	mg/L	N/A	N/A	0.03	<0.005	<0.005	<0.005		<0.005	<0.005	0.03
Oxides of Nitrogen	mg/L	0.040	0.015	0.03	0.006	<0.005	<0.005		<0.005	<0.005	0.03
Total Nitrogen	mg/L	0.35	0.30	0.6	0.4	0.8	0.7		<0.1	<0.1	0.6
Total Phosphorus	mg/L	0.025	0.030	0.06	0.2	0.3	0.4		<0.1	<0.1	0.06
Metals – All metals are Dissolved Metals											
Aluminium	µg/L	55	N/A	10	10	80	<10		<10	<10	<10
Arsenic	µg/L	13	N/A	<1	<1	2	<1		<1	<1	<1
Boron	µg/L	370	N/A	400	70	30	210		<20	<20	340
Cadmium	µg/L	0.2	5.5	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
Chromium	µg/L	1.0	4.4	<1	<1	<1	<1		<1	<1	<1
Cobalt	µg/L	N/A	1.0	<1	<1	1	<1		<1	<1	<1
Copper	µg/L	1.4	1.3	<1	<1	<1	<1		<1	<1	<1
Lead	µg/L	3.4	4.4	<1	<1	<1	<1		<1	<1	<1
Manganese	µg/L	1,900	N/A	410	37	90	1,200		<5	<5	360
Mercury	µg/L	0.6	0.4	<0.05	<0.05	<0.05	<0.05		<0.05	<0.05	<0.05
Nickel	µg/L	11	70	1	<1	<1	<1		<1	<1	1
Selenium	µg/L	11	N/A	<1	<1	<1	<1		<1	<1	<1
Silver	µg/L	0.05	1.4	<1	<1	<1	<1		<1	<1	<1
Zinc	µg/L	8.0	15	8	3	10	3		<1	<1	4

Analyte	Unit	Water Quality Objectives (WQOs)		Sample Codes							
		Fresh Water	Estuary	USW 001	USN W002	DSE 003	Dam 004	DD 005	013 Trip	014 Field	015 Duplicate
Hydrocarbons											
Benzene	µg/L	950	700	<1	<1	<1	<1		<1	<1	<1
Toluene	µg/L	N/A	N/A	<1	<1	<1	<1		<1	<1	<1
Ethylbenzene	µg/L	N/A	N/A	<1	<1	<1	<1		<1	<1	<1
Xylene	µg/L	550	N/A	<2	<2	<2	<2		<2	<2	<2
Naphthalene	µg/L	16	70	<1	<1	<1	<1		<1	<1	<1
TRH C_{10} - C_{14}	µg/L	N/A	N/A	<50	<50	<50	<50		<50	<50	<50
TRH C_{15} - C_{28}	µg/L	N/A	N/A	<100	<100	<100	<100		<100	<100	<100
TRH C_{29} - C_{36}	µg/L	N/A	N/A	<100	<100	<100	<100		<100	<100	<100
TRH >C_{10} - C_{16}	µg/L	N/A	N/A	<50	<50	<50	<50		<50	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	N/A	N/A	<50	<50	<50	<50		<50	<50	<50
TRH >C_{16} - C_{34}	µg/L	N/A	N/A	<100	100	<100	<100		100	<100	<100
TRH >C_{34} - C_{40}	µg/L	N/A	N/A	<100	<100	<100	<100		<100	<100	<100
Organochlorine Pesticides (OCP)											
4.4'-DDE	µg/L	N/A	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
4.4'-DDT	µg/L	0.01	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Aldrin	µg/L	N/A	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
g-BHC Lindane	µg/L	0.2	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Chlordane	µg/L	0.08	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Dieldrin	µg/L	N/A	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Endosulfan	µg/L	0.2	0.01	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Endrin	µg/L	0.008	0.02	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Heptachlor	µg/L	0.09	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Toxaphene	µg/L	0.2	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Organophosphorus Pesticides (OPP)											
Azinphos-methyl	µg/L	0.02	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Chlorpyriphos	µg/L	0.01	0.009	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Demeton-S	µg/L	N/A	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Diazinon	µg/L	0.01	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Dimethoate	µg/L	0.15	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Fenitrothion	µg/L	0.2	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2
Malathion	µg/L	0.05	N/A	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2

Appendix F. Full Laboratory Results

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CERTIFICATE OF ANALYSIS 234739

Client Details

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

Sample Details

Your Reference	**SMC009 - Tweed Valley Hospital 9.7**
Number of Samples	7 water
Date samples received	17/01/2020
Date completed instructions received	17/01/2020

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	24/01/2020
Date of Issue	24/01/2020

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Results Approved By

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

Authorised By

[redacted]

[redacted], Laboratory Manager

vTRH(C6-C10)/BTEXN in Water						
Our Reference		234739-1	234739-2	234739-3	234739-4	234739-5
Your Reference	UNITS	001 USW	002 USNW	003 DSE	004 DAM	013
Depth		300 mm	300 mm	300 mm	300 mm	300 mm
Type of sample		water	water	water	water	water
Date extracted	-	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020
Date analysed	-	22/01/2020	22/01/2020	22/01/2020	22/01/2020	22/01/2020
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	%	104	104	102	104	104
Surrogate toluene-d8	%	99	98	98	97	98
Surrogate 4-BFB	%	99	98	97	103	97

vTRH(C6-C10)/BTEXN in Water			
Our Reference		234739-6	234739-7
Your Reference	UNITS	014	015
Depth		300 mm	300 mm
Type of sample		water	water
Date extracted	-	21/01/2020	21/01/2020
Date analysed	-	22/01/2020	22/01/2020
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	%	104	105
Surrogate toluene-d8	%	97	99
Surrogate 4-BFB	%	97	98

svTRH (C10-C40) in Water						
Our Reference		234739-1	234739-2	234739-3	234739-4	234739-5
Your Reference	UNITS	001 USW	002 USNW	003 DSE	004 DAM	013
Depth		300 mm	300 mm	300 mm	300 mm	300 mm
Type of sample		water	water	water	water	water
Date extracted	-	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
Date analysed	-	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020
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	%	78	69	77	71	71

svTRH (C10-C40) in Water			
Our Reference		234739-6	234739-7
Your Reference	UNITS	014	015
Depth		300 mm	300 mm
Type of sample		water	water
Date extracted	-	20/01/2020	20/01/2020
Date analysed	-	21/01/2020	21/01/2020
TRH C_{10} - C_{14}	µg/L	<50	<50
TRH C_{15} - C_{28}	µg/L	<100	<100
TRH C_{29} - C_{36}	µg/L	<100	<100
TRH >C_{10} - C_{16}	µg/L	<50	<50
TRH >C_{10} - C_{16} less Naphthalene (F2)	µg/L	<50	<50
TRH >C_{16} - C_{34}	µg/L	<100	<100
TRH >C_{34} - C_{40}	µg/L	<100	<100
Surrogate o-Terphenyl	%	71	83

Organochlorine Pesticides in Water						
Our Reference		234739-1	234739-2	234739-3	234739-4	234739-5
Your Reference	UNITS	001 USW	002 USNW	003 DSE	004 DAM	013
Depth		300 mm	300 mm	300 mm	300 mm	300 mm
Type of sample		water	water	water	water	water
Date extracted	-	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
Date analysed	-	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020
alpha-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
HCB	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate TCMX	%	89	87	92	99	75

Organochlorine Pesticides in Water			
Our Reference		234739-6	234739-7
Your Reference	UNITS	014	015
Depth		300 mm	300 mm
Type of sample		water	water
Date extracted	-	20/01/2020	20/01/2020
Date analysed	-	21/01/2020	21/01/2020
alpha-BHC	µg/L	<0.2	<0.2
HCB	µg/L	<0.2	<0.2
beta-BHC	µg/L	<0.2	<0.2
gamma-BHC	µg/L	<0.2	<0.2
Heptachlor	µg/L	<0.2	<0.2
delta-BHC	µg/L	<0.2	<0.2
Aldrin	µg/L	<0.2	<0.2
Heptachlor Epoxide	µg/L	<0.2	<0.2
gamma-Chlordane	µg/L	<0.2	<0.2
alpha-Chlordane	µg/L	<0.2	<0.2
Endosulfan I	µg/L	<0.2	<0.2
pp-DDE	µg/L	<0.2	<0.2
Dieldrin	µg/L	<0.2	<0.2
Endrin	µg/L	<0.2	<0.2
Endosulfan II	µg/L	<0.2	<0.2
pp-DDD	µg/L	<0.2	<0.2
Endrin Aldehyde	µg/L	<0.2	<0.2
pp-DDT	µg/L	<0.2	<0.2
Endosulfan Sulphate	µg/L	<0.2	<0.2
Methoxychlor	µg/L	<0.2	<0.2
Surrogate TCMX	%	72	98

OP Pesticides in Water						
Our Reference		234739-1	234739-2	234739-3	234739-4	234739-5
Your Reference	UNITS	001 USW	002 USNW	003 DSE	004 DAM	013
Depth		300 mm	300 mm	300 mm	300 mm	300 mm
Type of sample		water	water	water	water	water
Date extracted	-	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
Date analysed	-	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020
Dichlorvos	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Dimethoate	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Diazinon	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyriphos-methyl	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	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyriphos	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Parathion	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
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	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate TCMX	%	89	87	92	99	75

OP Pesticides in Water			
Our Reference		234739-6	234739-7
Your Reference	UNITS	014	015
Depth		300 mm	300 mm
Type of sample		water	water
Date extracted	-	20/01/2020	20/01/2020
Date analysed	-	21/01/2020	21/01/2020
Dichlorvos	µg/L	<0.2	<0.2
Dimethoate	µg/L	<0.2	<0.2
Diazinon	µg/L	<0.2	<0.2
Chlorpyriphos-methyl	µg/L	<0.2	<0.2
Ronnel	µg/L	<0.2	<0.2
Fenitrothion	µg/L	<0.2	<0.2
Malathion	µg/L	<0.2	<0.2
Chlorpyriphos	µg/L	<0.2	<0.2
Parathion	µg/L	<0.2	<0.2
Bromophos ethyl	µg/L	<0.2	<0.2
Ethion	µg/L	<0.2	<0.2
Azinphos-methyl (Guthion)	µg/L	<0.2	<0.2
Surrogate TCMX	%	72	98

Miscellaneous Organics - water						
Our Reference		234739-1	234739-2	234739-3	234739-4	234739-5
Your Reference	UNITS	001 USW	002 USNW	003 DSE	004 DAM	013
Depth		300 mm	300 mm	300 mm	300 mm	300 mm
Type of sample		water	water	water	water	water
Date prepared	-	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
Date analysed	-	21/01/2020	21/01/2020	21/01/2020	21/01/2020	21/01/2020
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	%	89	87	92	99	76

Miscellaneous Organics - water			
Our Reference		234739-6	234739-7
Your Reference	UNITS	014	015
Depth		300 mm	300 mm
Type of sample		water	water
Date prepared	-	20/01/2020	20/01/2020
Date analysed	-	21/01/2020	21/01/2020
Toxaphene*	µg/L	<0.2	<0.2
Demeton S	µg/L	<0.2	<0.2
Demeton O	µg/L	<0.2	<0.2
Surrogate p-Terphenyl-d14	%	75	90

HM in water - dissolved						
Our Reference	UNITS	234739-1	234739-2	234739-3	234739-4	234739-5
Your Reference		001 USW	002 USNW	003 DSE	004 DAM	013
Depth		300 mm	300 mm	300 mm	300 mm	300 mm
Type of sample		water	water	water	water	water
Date prepared	-	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
Date analysed	-	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
Aluminium-Dissolved	µg/L	10	10	80	<10	<10
Arsenic-Dissolved	µg/L	<1	<1	2	<1	<1
Boron-Dissolved	µg/L	400	70	30	210	<20
Cadmium-Dissolved	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1	<1	<1	<1
Cobalt-Dissolved	µg/L	<1	<1	1	<1	<1
Copper-Dissolved	µg/L	<1	<1	<1	<1	<1
Lead-Dissolved	µg/L	<1	<1	<1	<1	<1
Manganese-Dissolved	µg/L	410	37	90	1,200	<5
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
Silver-Dissolved	µg/L	<1	<1	<1	<1	<1
Zinc-Dissolved	µg/L	8	3	10	3	<1

HM in water - dissolved			
Our Reference		234739-6	234739-7
Your Reference	UNITS	014	015
Depth		300 mm	300 mm
Type of sample		water	water
Date prepared	-	20/01/2020	20/01/2020
Date analysed	-	20/01/2020	20/01/2020
Aluminium-Dissolved	µg/L	<10	<10
Arsenic-Dissolved	µg/L	<1	<1
Boron-Dissolved	µg/L	<20	340
Cadmium-Dissolved	µg/L	<0.1	<0.1
Chromium-Dissolved	µg/L	<1	<1
Cobalt-Dissolved	µg/L	<1	<1
Copper-Dissolved	µg/L	<1	<1
Lead-Dissolved	µg/L	<1	<1
Manganese-Dissolved	µg/L	<5	360
Mercury-Dissolved	µg/L	<0.05	<0.05
Nickel-Dissolved	µg/L	<1	1
Selenium-Dissolved	µg/L	<1	<1
Silver-Dissolved	µg/L	<1	<1
Zinc-Dissolved	µg/L	<1	4

Metals in Waters - Acid extractable						
Our Reference		234739-1	234739-2	234739-3	234739-4	234739-5
Your Reference	UNITS	001 USW	002 USNW	003 DSE	004 DAM	013
Depth		300 mm	300 mm	300 mm	300 mm	300 mm
Type of sample		water	water	water	water	water
Date prepared	-	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
Date analysed	-	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
Phosphorus - Total	mg/L	0.06	0.2	0.3	0.4	<0.05

Metals in Waters - Acid extractable			
Our Reference		234739-6	234739-7
Your Reference	UNITS	014	015
Depth		300 mm	300 mm
Type of sample		water	water
Date prepared	-	20/01/2020	20/01/2020
Date analysed	-	20/01/2020	20/01/2020
Phosphorus - Total	mg/L	<0.05	0.06

Cations in water Dissolved						
Our Reference		234739-1	234739-2	234739-3	234739-4	234739-5
Your Reference	UNITS	001 USW	002 USNW	003 DSE	004 DAM	013
Depth		300 mm	300 mm	300 mm	300 mm	300 mm
Type of sample		water	water	water	water	water
Date digested	-	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
Date analysed	-	20/01/2020	20/01/2020	20/01/2020	20/01/2020	20/01/2020
Sodium - Dissolved	mg/L	160	24	21	53	<0.5
Potassium - Dissolved	mg/L	12	4.2	3.0	11	<0.5
Calcium - Dissolved	mg/L	210	31	12	22	<0.5
Magnesium - Dissolved	mg/L	80	5.5	4.1	12	<0.5
Hardness	mgCaCO 3 /L	850	100	47	110	<3

Cations in water Dissolved			
Our Reference		234739-6	234739-7
Your Reference	UNITS	014	015
Depth		300 mm	300 mm
Type of sample		water	water
Date digested	-	20/01/2020	20/01/2020
Date analysed	-	20/01/2020	20/01/2020
Sodium - Dissolved	mg/L	<0.5	170
Potassium - Dissolved	mg/L	<0.5	12
Calcium - Dissolved	mg/L	<0.5	200
Magnesium - Dissolved	mg/L	<0.5	78
Hardness	mgCaCO 3 /L	<3	830

Miscellaneous Inorganics						
Our Reference		234739-1	234739-2	234739-3	234739-4	234739-5
Your Reference	UNITS	001 USW	002 USNW	003 DSE	004 DAM	013
Depth		300 mm	300 mm	300 mm	300 mm	300 mm
Type of sample		water	water	water	water	water
Date prepared	-	17/01/2020	17/01/2020	17/01/2020	17/01/2020	17/01/2020
Date analysed	-	17/01/2020	17/01/2020	17/01/2020	17/01/2020	17/01/2020
Total Suspended Solids	mg/L	<5	6	14	14	<5
Total Dissolved Solids (grav)	mg/L	1,500	160	120	290	<5
Ammonia as N in water	mg/L	<0.005	<0.005	0.37	0.22	<0.005
Chlorophyll a	mg/m^3	30	30	50	20	<1
Phosphate as P in water	mg/L	<0.005	0.007	0.15	0.30	<0.005
Nitrate as N in water	mg/L	0.03	<0.005	<0.005	<0.005	<0.005
NOx as N in water	mg/L	0.03	0.006	<0.005	<0.005	<0.005
Total Nitrogen in water	mg/L	0.6	0.4	0.8	0.7	<0.1

Miscellaneous Inorganics			
Our Reference		234739-6	234739-7
Your Reference	UNITS	014	015
Depth		300 mm	300 mm
Type of sample		water	water
Date prepared	-	17/01/2020	17/01/2020
Date analysed	-	17/01/2020	17/01/2020
Total Suspended Solids	mg/L	<5	6
Total Dissolved Solids (grav)	mg/L	<5	1,500
Ammonia as N in water	mg/L	<0.005	0.005
Chlorophyll a	mg/m^3	<1	6
Phosphate as P in water	mg/L	<0.005	0.005
Nitrate as N in water	mg/L	<0.005	0.03
NOx as N in water	mg/L	<0.005	0.03
Total Nitrogen in water	mg/L	<0.1	0.6

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-003	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-012/017	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS.
Org-013	Water samples are analysed directly by purge and trap GC-MS.
Org-016	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.
SEO-005	OC/OP/PCB - Determination of a suite of Organchlorine Pesticides, Chlorinated Organo-phosphorus Pesticides and Polychlorinated Biphenyls (PCB's) by sonication extraction using dichloromethane for waters or acetone / hexane for soils followed by Gas Chromatographic separation with Electron Capture Detection (GC/ECD). The surrogate spike used is 2,4,5,6-Tetrachloro-m-xylene.

QUALITY CONTROL: vTRH(C6-C10)/BTEXN in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			21/01/2020	[NT]	[NT]	[NT]	[NT]	21/01/2020	[NT]
Date analysed	-			22/01/2020	[NT]	[NT]	[NT]	[NT]	22/01/2020	[NT]
TRH C_6 - C_9	µg/L	10	Org-016	<10	[NT]	[NT]	[NT]	[NT]	112	[NT]
TRH C_6 - C_{10}	µg/L	10	Org-016	<10	[NT]	[NT]	[NT]	[NT]	112	[NT]
Benzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Toluene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	108	[NT]
Ethylbenzene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	115	[NT]
m+p-xylene	µg/L	2	Org-016	<2	[NT]	[NT]	[NT]	[NT]	115	[NT]
o-xylene	µg/L	1	Org-016	<1	[NT]	[NT]	[NT]	[NT]	118	[NT]
Naphthalene	µg/L	1	Org-013	<1	[NT]	[NT]	[NT]	[NT]	[NT]	[NT]
Surrogate Dibromofluoromethane	%		Org-016	103	[NT]	[NT]	[NT]	[NT]	95	[NT]
Surrogate toluene-d8	%		Org-016	98	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate 4-BFB	%		Org-016	99	[NT]	[NT]	[NT]	[NT]	110	[NT]

QUALITY CONTROL: svTRH (C10-C40) in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	234739-2
Date extracted	-			20/01/2020	1	20/01/2020	20/01/2020		20/01/2020	20/01/2020
Date analysed	-			21/01/2020	1	21/01/2020	21/01/2020		21/01/2020	21/01/2020
TRH C_{10} - C_{14}	µg/L	50	Org-003	<50	1	<50	<50	0	89	85
TRH C_{15} - C_{28}	µg/L	100	Org-003	<100	1	<100	<100	0	98	93
TRH C_{29} - C_{36}	µg/L	100	Org-003	<100	1	<100	<100	0	97	99
TRH >C_{10} - C_{16}	µg/L	50	Org-003	<50	1	<50	<50	0	89	85
TRH >C_{16} - C_{34}	µg/L	100	Org-003	<100	1	<100	<100	0	98	93
TRH >C_{34} - C_{40}	µg/L	100	Org-003	<100	1	<100	<100	0	97	99
Surrogate o-Terphenyl	%		Org-003	87	1	78	71	9	130	69

QUALITY CONTROL: Organochlorine Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	234739-2
Date extracted	-			20/01/2020	1	20/01/2020	20/01/2020		20/01/2020	20/01/2020
Date analysed	-			21/01/2020	1	21/01/2020	21/01/2020		21/01/2020	21/01/2020
alpha-BHC	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	80	100
HCB	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
beta-BHC	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	82	110
gamma-BHC	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Heptachlor	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	82	102
delta-BHC	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Aldrin	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	94	110
Heptachlor Epoxide	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	84	102
gamma-Chlordane	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
alpha-Chlordane	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endosulfan I	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDE	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	80	106
Dieldrin	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	88	100
Endrin	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	84	100
Endosulfan II	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDD	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	92	83
Endrin Aldehyde	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
pp-DDT	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Endosulfan Sulphate	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	98	92
Methoxychlor	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	[NT]	1	89	81	9	96	92

QUALITY CONTROL: OP Pesticides in Water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	234739-2
Date extracted	-			20/01/2020	1	20/01/2020	20/01/2020		20/01/2020	20/01/2020
Date analysed	-			21/01/2020	1	21/01/2020	21/01/2020		21/01/2020	21/01/2020
Dichlorvos	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	88	114
Dimethoate	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Diazinon	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Chlorpyriphos-methyl	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Ronnel	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	82	105
Fenitrothion	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	80	116
Malathion	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	79	97
Chlorpyriphos	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	76	118
Parathion	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	88	104
Bromophos ethyl	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Ethion	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	82	82
Azinphos-methyl (Guthion)	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate TCMX	%		Org-012/017	[NT]	1	89	81	9	96	92

QUALITY CONTROL: Miscellaneous Organics - water						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	234739-2
Date prepared	-			20/01/2020	1	20/01/2020	20/01/2020		20/01/2020	20/01/2020
Date analysed	-			21/01/2020	1	21/01/2020	21/01/2020		21/01/2020	21/01/2020
Toxaphene*	µg/L	0.2	SEO-005	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Demeton S	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Demeton O	µg/L	0.2	Org-012/017	<0.2	1	<0.2	<0.2	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-012/017	100	1	89	81	9	90	92

QUALITY CONTROL: HM in water - dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W2	234739-2
Date prepared	-			20/01/2020	1	20/01/2020	20/01/2020		20/01/2020	20/01/2020
Date analysed	-			20/01/2020	1	20/01/2020	20/01/2020		20/01/2020	20/01/2020
Aluminium-Dissolved	µg/L	10	Metals-022	<10	1	10	<10	0	116	116
Arsenic-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	108	109
Boron-Dissolved	µg/L	20	Metals-022	<20	1	400	400	0	113	112
Cadmium-Dissolved	µg/L	0.1	Metals-022	<0.1	1	<0.1	<0.1	0	108	109
Chromium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	114	113
Cobalt-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	118	116
Copper-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	118	115
Lead-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	114	114
Manganese-Dissolved	µg/L	5	Metals-022	<5	1	410	420	2	107	106
Mercury-Dissolved	µg/L	0.05	Metals-021	<0.05	1	<0.05	<0.05	0	97	98
Nickel-Dissolved	µg/L	1	Metals-022	<1	1	1	1	0	114	113
Selenium-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	110	110
Silver-Dissolved	µg/L	1	Metals-022	<1	1	<1	<1	0	108	105
Zinc-Dissolved	µg/L	1	Metals-022	<1	1	8	9	12	110	109

QUALITY CONTROL: Metals in Waters - Acid extractable						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	234739-2
Date prepared	-			20/01/2020	1	20/01/2020	20/01/2020		20/01/2020	20/01/2020
Date analysed	-			20/01/2020	1	20/01/2020	20/01/2020		20/01/2020	20/01/2020
Phosphorus - Total	mg/L	0.05	Metals-020	<0.05	1	0.06	0.06	0	102	104

QUALITY CONTROL: Cations in water Dissolved						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	234739-2
Date digested	-			20/01/2020	1	20/01/2020	20/01/2020		20/01/2020	20/01/2020
Date analysed	-			20/01/2020	1	20/01/2020	20/01/2020		20/01/2020	20/01/2020
Sodium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	160	170	6	99	86
Potassium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	12	12	0	98	95
Calcium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	210	200	5	108	105
Magnesium - Dissolved	mg/L	0.5	Metals-020	<0.5	1	80	79	1	108	110
Hardness	mgCaCO 3 /L	3		[NT]	1	850	830	2	[NT]	[NT]

QUALITY CONTROL: Miscellaneous Inorganics						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	234739-2
Date prepared	-			17/01/2020	1	17/01/2020	17/01/2020		17/01/2020	17/01/2020
Date analysed	-			17/01/2020	1	17/01/2020	17/01/2020		17/01/2020	17/01/2020
Total Suspended Solids	mg/L	5	Inorg-019	<5	1	<5	[NT]		92	[NT]
Total Dissolved Solids (grav)	mg/L	5	Inorg-018	<5	1	1500	[NT]		87	[NT]
Ammonia as N in water	mg/L	0.005	Inorg-057	<0.005	1	<0.005	<0.005	0	115	94
Chlorophyll a	mg/m^3	1	INORG-119	<1	1	30	[NT]		95	[NT]
Phosphate as P in water	mg/L	0.005	Inorg-060	<0.005	1	<0.005	<0.005	0	112	104
Nitrate as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.03	0.03	0	94	82
NOx as N in water	mg/L	0.005	Inorg-055	<0.005	1	0.03	0.03	0	98	86
Total Nitrogen in water	mg/L	0.1	Inorg-055/062/127	<0.1	1	0.6	0.7	15	88	83

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.

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

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.

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CERTIFICATE OF ANALYSIS 234739-A

Client Details

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

Sample Details

Your Reference	**SMC009 - Tweed Valley Hospital 9.7**
Number of Samples	7 water
Date samples received	17/01/2020
Date completed instructions received	28/01/2020

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	04/02/2020
Date of Issue	04/02/2020

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Results Approved By
[redacted], Senior Chemist

Authorised By
[redacted]
[redacted], Laboratory Manager

sTPH in Water (C10-C40) NEPM Silica gel		
Our Reference		234739-A-2
Your Reference	UNITS	002 USNW
Depth		300 mm
Type of sample		water
Date extracted	-	30/01/2020
Date analysed	-	31/01/2020
TPH C_{10} - C_{14}	µg/L	<50
TPH C_{15} - C_{28}	µg/L	<100
TPH C_{29} - C_{36}	µg/L	<100
TPH >C_{10} - C_{16}	µg/L	<50
TPH >C_{16} - C_{34}	µg/L	<100
TPH >C_{34} - C_{40}	µg/L	<100
Surrogate o-Terphenyl	%	83

Method ID	Methodology Summary
Org-003	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.

QUALITY CONTROL: sTPH in Water (C10-C40) NEPM Silica gel						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	[NT]
Date extracted	-			30/01/2020	[NT]	[NT]	[NT]	[NT]	30/01/2020	[NT]
Date analysed	-			31/01/2020	[NT]	[NT]	[NT]	[NT]	31/01/2020	[NT]
TPH C_{10} - C_{14}	µg/L	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	89	[NT]
TPH C_{15} - C_{28}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	115	[NT]
TPH C_{29} - C_{36}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	104	[NT]
TPH >C_{10} - C_{16}	µg/L	50	Org-003	<50	[NT]	[NT]	[NT]	[NT]	89	[NT]
TPH >C_{16} - C_{34}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	115	[NT]
TPH >C_{34} - C_{40}	µg/L	100	Org-003	<100	[NT]	[NT]	[NT]	[NT]	104	[NT]
Surrogate o-Terphenyl	%		Org-003	81	[NT]	[NT]	[NT]	[NT]	108	[NT]

Result Definitions

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

Quality Control Definitions

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

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

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

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

Laboratory Acceptance Criteria

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

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

Spikes for Physical and Aggregate Tests are not applicable.

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

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

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

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

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

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

Measurement Uncertainty estimates are available for most tests upon request.

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

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