

Monday 13<sup>th</sup> January 2020

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

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**Re: Surface Water Quality Monitoring Results & Report for the Tweed Valley Hospital Project**

*Reporting period: 21<sup>st</sup> November 2019 to 18<sup>th</sup> December 2019*

**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 partially satisfies the 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 19<sup>th</sup> & 26<sup>th</sup> November and 19<sup>th</sup> 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 (16<sup>th</sup> November to 17<sup>th</sup> December) was 66.23 mm with the highest rainfall occurring on 1<sup>st</sup> of December, being 21.4 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). 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



SITE: Tweed Valley Hospital Project - Kingscliff		Lendlease Building CLIENT.	SMC009 PROJECT NO.	29/7/19 DATE.
TITLE: Monthly Surface Water Sampling Sites		1:8000 SCALE AT A4.	SS DRAWN.	LB CHECKED.
				A REVISION.

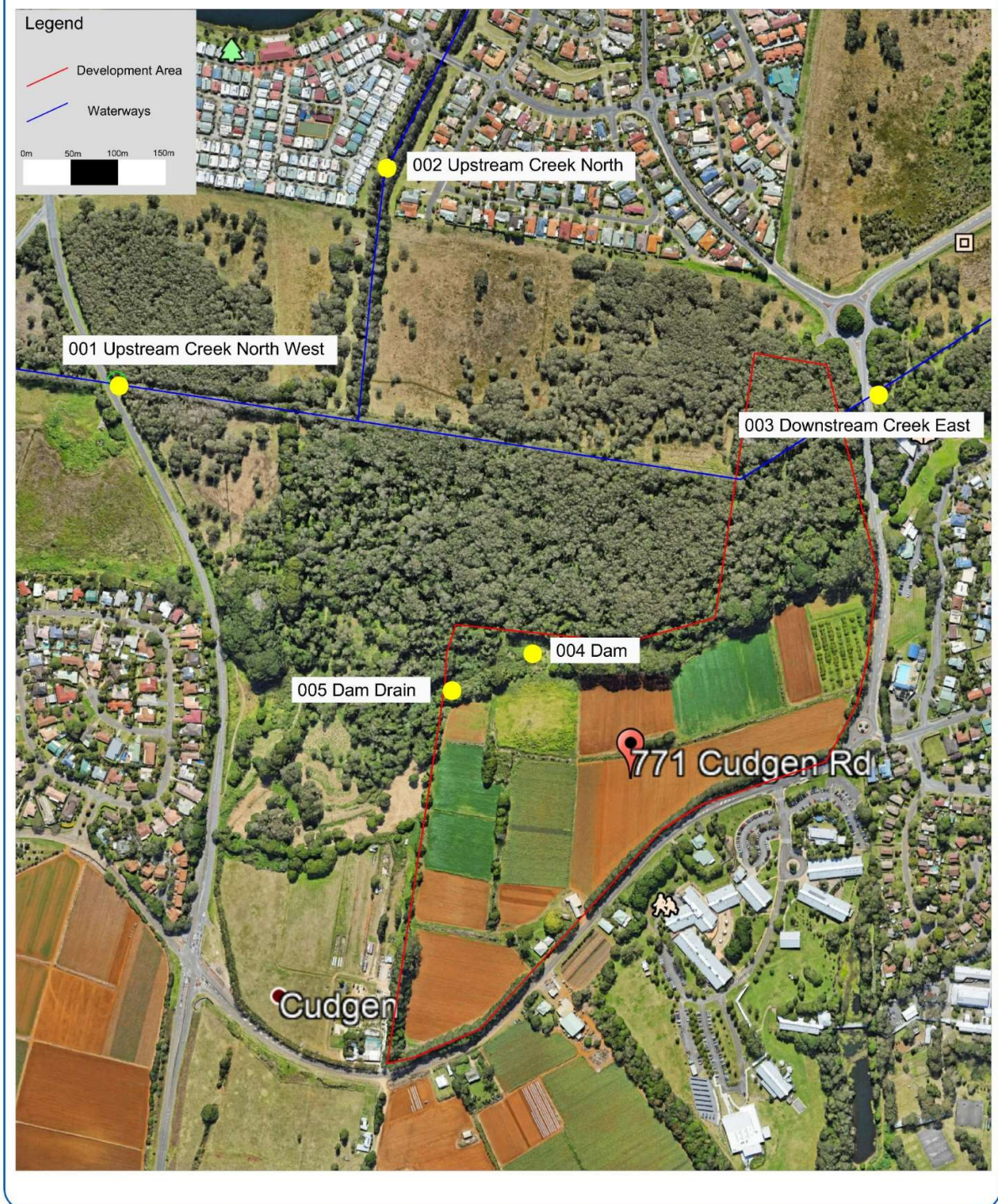


Figure 1. Map of monthly sampling sites (Source: Google Earth)



## 5.0 SAMPLING METHODOLOGY

Sampling was undertaken by [REDACTED] on Wednesday 18<sup>th</sup> December 2019. In situ physico-chemical measurements were collected using a SmarTROLL multi-parameter probe and TSS 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 002 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. A surface sheen was visible at Site 005 which was potentially of microbial origin. Water was visibly stagnant due to low rainfall and an organic odour was especially apparent at site 005.

**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	USNW0 02	DSE 003	Dam 004	DD 005
pH		6.5-8.5	7.0-8.5	6.92	7.23	7.16	6.97	6.71
Turbidity	NTU	6.0-50	0.5-10	50.8	2.48	5.70	20.0	205
Electrical Conductivity (EC)	µS/cm	125-2,200	125-2,200	2,784.4	431.0	317.3	513.0	280.4
Dissolved Oxygen (DO)	% Saturation	85-110	80-110	47.9	58.8	55.2	10.7	3.8
Temperature	°C	N/A	N/A	24.10	24.08	23.87	23.31	22.0
Oxidation Reduction Potential (ORP)		N/A	N/A	115.1	77.0	78.8	-37.3	-25.8

When compared to the WQOs for freshwater and estuaries:

- pH was within range for both criteria this sampling round.
- Turbidity was outside estuarine criteria at Site 001 and freshwater criteria at Site 005 this sampling round.
- EC was outside the estuarine criteria at Site 001 this sampling round, similar to last 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, Filterable Reactive Phosphorus (FRP), Total Nitrogen (TN) and Total Phosphorus (TP) were above the WQOs for all sample sites. Chlorophyll-a was above the WQOs for Site 002 only. Some metals (Aluminium, cobalt, copper, lead and zinc) were also outside WQOs for some sites. 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 18<sup>th</sup> December 2019. Results above guidelines are highlighted.**

		Water Quality Objectives (WQOs)		Sample Codes								
Analyte	Unit	Fresh Water	Estuary	USW 001	USNW0 002	DSE 003	Dam 004	DD 005	013 Trip	014 Field	015 Duplicate	
Nutrients												
Ammonia	mg/L	0.02	0.015	0.080	0.057	0.090	0.31	3.0	<0.005	<0.005	0.065	
Chlorophyll-a	µg/L	5	4	50	4	170	2	760	<1	<1	2	
Filterable Reactive Phosphorus (FRP)	µg/L	0.02	0.005	<0.005	0.033	0.19	0.32	0.28	<0.005	<0.005	0.033	
Oxides of Nitrogen(NO <sub>x</sub> )	µg/L	0.04	0.015	0.01	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	
Total Nitrogen (TN)	µg/L	0.35	0.30	0.6	0.5	0.9	0.9	6.0	<0.1	<0.1	0.5	
Total Phosphorus (TP)	µg/L	0.025	0.030	0.08	0.1	0.6	0.5	5.2	<0.05	<0.05	0.3	
Aluminium	µg/L	55	N/A	10	10	100	40	1,600	<10	<10	10	
Cobalt	µg/L	N/A	1.0	3	<1	<1	<1	11	<1	<1	<1	
Copper	µg/L	1.4	1.3	<1	1	4	<1	2	<1	<1	<1	
Lead	µg/L	3.4	4.4	<1	13	54	<1	<1	<1	<1	<1	
Zinc	µg/L	8.0	15	6	4	24	1	24	<1	<1	<1	

When compared to the WQOs for Freshwater and Estuaries:

- Ammonia was above the WQOs for both criteria at all sampling locations, ammonia was above the WQOs at comparison sites in background sampling.
- Chlorophyll-a was above the WQOs criteria at Site 001, 003, 004 and 005. Chlorophyll-a results were varied across comparison sites in background sampling. Chlorophyll-a has increased at site 003, 004 and 005 when compared to last month.
- FRP was above the WQOs criteria at Site 002, 003, 004 and 005. FRP has reduced at site 001. FRP results varied across comparison sites in background sampling though were lowest at Site 005.
- NOx was below the WQOs for all sites. NOx was non-detectable in sites 002, 003, 004 and 005. NOx has reduced from the previous month.
- TN was above the WQOs for both criteria at all sampling locations. Total nitrogen has increased at sites 004 and 005 and decreased at site 001 and 003 when compared to the previous month. Total nitrogen was above the WQOs at comparison sites in baseline sampling.
- TP was above the WQOs for both criteria at all sampling locations. TP has increases at sites 002 and 003 and decreased at site 001, 004 and 005, when compared to the previous month. TP was above the WQOs at comparison sites in baseline sampling.
- Aluminium was above the WQO at site 003 and 005. Cobalt was above the WQO at site 001. Copper was above the WQO at site 003. Lead was above the WQO at site 002 and 003. Zinc was above the WQO at site 003 and 005. These metals have increased 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<sub>10</sub>-C<sub>40</sub>) was detected at Site 005 (Dam Drain). This sample was retested using silica gel clean-up. The results from TRH 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.
- Toluene was also found in Site 005 (13 mg/L). Biogenic toluene is common in wetland environments during microbial degradation of organic compounds. Low rainfall and confirmed associated biogenic hydrocarbons (silica gel clean-up) correspond with natural occurrences of biogenic toluene.

## 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 002 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 prior to sampling had higher rainfall than previous months. This followed a period of very low rainfall. As such, impacts to the water system downstream of the site are unlikely.
- Nutrients were high and exceed some water quality parameters for all sites.
- Aluminium, Cobalt, Copper, Lead 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 005. 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 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 as is required by the BDAR.

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

Kind regards,

██████████  
**Environmental Engineer & Director**

██████████  
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ABN: 82 106 758 123



## Appendix A. Site Photos



**Site 001 – Upstream Creek West  
(18/12/2019)**



**Site 002 – Upstream Creek North West  
(18/12/2019)**



**Site 003 – Downstream Creek East  
(18/12/2019)**





**Site 004 – Dam  
(18/12/2019)**



**Site 005 – Dam Drain  
(18/12/2019)**



## Appendix B. Calibration certificate for SmarTROLL

<b>ThermoFisher</b> 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	<b>ELECTROCHEMICAL INSTRUMENT MAINTENANCE &amp; CALIBRATION REPORT</b>	
	Customer: Ecotechnology Australia PTY Ltd Address: 13 Ewing st Lismore NSW 2480  Attention: <span style="background-color: black; color: black;">[REDACTED]</span>	

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	Check and Adjust	Pass/Fail
Consult operator regarding performance/problems	Pass	Probes, leads and connectors	Pass
Check general operation, note additional problems	Pass	Keypad / user controls	Pass
Electrical safety if applicable to AS/NZS 3760:2003	N/A	Power supply / battery voltage and condition	Pass
Initialization Procedure	Pass	Probe(s) performance (response slow or acceptable)	Acceptable
Instrument Condition	Pass	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

[REDACTED]

Date

16<sup>th</sup> 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)





### Appendix D. Chain of Custody Form

<p>[Copyright and Confidential]</p> <p><b>CHAIN OF CUSTODY - Client</b></p> <p><b>ENVIROLAB GROUP - National phone number 1300 424 344</b></p>					<p>Sydney Lab - Envirolab Services 12 Ashley St, Chatswood, NSW 2067 Ph: 02 9910 6200 / sydney@envirolab.com.au</p> <p>Perth Lab - MPL Laboratories 16-18 Hayden Crt, Myaree, WA 6154 Ph: 08 9317 2505 / lab@mpl.com.au</p> <p>Melbourne Lab - Envirolab Services 25 Research Drive, Croydon South, VIC 3136 Ph: 03 9763 2500 / melbourne@envirolab.com.au</p> <p>Adelaide Office - Envirolab Services 7a The Parade, Norwood, SA 5067 Ph: 08 7087 6800 / adelaide@envirolab.com.au</p> <p>Brisbane Office - Envirolab Services 20a, 10-20 Depot St, Banyo, QLD 4014 Ph: 07 3266 9532 / brisbane@envirolab.com.au</p> <p>Darwin Office - Envirolab Services Unit 7, 17 Willes Rd, Berrimah, NT 0820 Ph: 08 8967 1201 / darwin@envirolab.com.au</p>																				
Client: Ecoteam					Client Project Name / Number / Site etc (ie report title):																				
Contact Person: [REDACTED]					SMC009 - Tweed Valley Hospital - 9-6																				
Project Mgr: [REDACTED]					PO No.:																				
Sampler: [REDACTED]					Envirolab Quote No. : 19SY228																				
Address: 13 Ewing Street Lismore NSW 2480					Date results required:																				
Phone: 02 6621 5123      Mob: [REDACTED]					Or choose: <b>standard / same day / 1 day / 2 day / 3 day</b>																				
Email: [REDACTED]					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 + toluene + dmeton	TSS	TDS	Cations + Hardness	Ammonia	Chlorophyll-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	17/12/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X								
2	002 - USNW	150 mm	17/12/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X								
3	003 - DSE	300 mm	17/12/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X								
4	004 - Dam	300 mm	17/12/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X								
5	005 - Dam Drain	150 mm	17/12/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X								
6	013 T	300 mm	17/12/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X								
7	014 F	300 mm	17/12/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X								
8	015 D	300 mm	17/12/2019	Water	X	X	X	X	X	X	X	X	X	X	X	X	X								
<input type="checkbox"/> 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): <u>ELS</u>					<b>Lab Use Only</b>															
Print Name: [REDACTED]					Print Name: [REDACTED]					Job number:					Cooling: Ice / Ice pack / None										
Date & Time: 17/12/19 15:20 pm					Date & Time: 18/12/19 16:33					Temperature:					Security seal: Intact / Broken / None										
Signature: [REDACTED]					Signature: [REDACTED]					TAT Req - SAME day / 1 / 2 / 3 / 4 / STD															

**Envirolab Services**  
 12 Ashley St  
 Chatswood NSW 2067  
 Ph: (02) 9910 6200  
 Job No: 233487  
 Date Received: 18/12/19  
 Time Received: 16:33  
 Received by: [REDACTED]  
 Temp: [REDACTED]  
 Cooling: [REDACTED]  
 Security: Intact/Broken/None

## 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	16	<5	10	12	3,800	<5	<5	<5	
Total Dissolved Solids (TDS)	mg/L	N/A	N/A	2,000	200	160	260	160	<5	<5	200	
<b>Major Cations (dissolved) &amp; Hardness</b>												
Sodium	mg/L	NA	NA	210	27	28	52	22	<0.5	<0.5	28	
Potassium	mg/L	NA	NA	16	4.9	5.6	11	6.0	<0.5	<0.5	4.9	
Calcium	mg/L	NA	NA	220	36	14	16	7.7	<0.5	<0.5	37	
Magnesium	mg/L	NA	NA	92	6.9	5.1	11	6.1	<0.5	<0.5	6.9	
Hardness mgCaCO <sub>3</sub> /L		NA	NA	920	120	56	84	44	<3	<3	120	
<b>Nutrients</b>												
Ammonia	mg/L	0.02	0.015	0.080	0.057	0.090	0.31	3.0	<0.005	<0.005	0.065	
Chlorophyll-a	mg/L	0.005	0.004	50	4	170	2	760	<1	<1	2	
Filterable Reactive Phosphorus	mg/L	0.02	0.005	<0.005	0.033	0.19	0.32	0.28	<0.005	<0.005	0.033	
Nitrate	mg/L	N/A	N/A	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Oxides of Nitrogen	mg/L	0.040	0.015	0.01	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	
Total Nitrogen	mg/L	0.35	0.30	0.6	0.5	0.9	0.9	6.0	<0.1	<0.1	0.5	
Total Phosphorus	mg/L	0.025	0.030	0.08	0.1	0.6	0.5	5.2	<0.05	<0.05	0.3	
<b>Metals – All metals are Dissolved Metals</b>												
Aluminium	µg/L	55	N/A	10	10	100	40	1,600	<10	<10	10	
Arsenic	µg/L	13	N/A	<1	<1	<1	<1	<1	<1	<1	<1	
Boron	µg/L	370	N/A	400	80	30	200	70	<20	<20	70	
Cadmium	µg/L	0.2	5.5	<0.1	<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	<1	
Cobalt	µg/L	N/A	1.0	3	<1	<1	<1	11	<1	<1	<1	
Copper	µg/L	1.4	1.3	<1	1	4	<1	2	<1	<1	<1	
Lead	µg/L	3.4	4.4	<1	13	54	<1	<1	<1	<1	<1	
Manganese	µg/L	1,900	N/A	1,200	97	140	1,300	980	<5	<5	110	
Mercury	µg/L	0.6	0.4	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	11	70	3	8	4	<1	5	<1	<1	<1	
Selenium	µg/L	11	N/A	<1	<1	<1	<1	<1	<1	<1	<1	
Silver	µg/L	0.05	1.4	<1	<1	<1	<1	<1	<1	<1	<1	
Zinc	µg/L	8.0	15	6	4	24	1	24	<1	<1	<1	



		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	
<b>Hydrocarbons</b>												
Benzene	µg/L	950	700	<1	<1	<1	<1	<1	<1	<1	<1	
Toluene	µg/L	N/A	N/A	<1	<1	<1	<1	13	<1	<1	<1	
Ethylbenzene	µg/L	N/A	N/A	<1	<1	<1	<1	<1	<1	<1	<1	
Xylene	µg/L	550	N/A	<2	<2	<2	<2	<2	<2	<2	<2	
Naphthalene	µg/L	16	70	<1	<1	<1	<1	<1	<1	<1	<1	
Total Recoverable Hydrocarbons (TRH)	µg/L	N/A	N/A	<50	<50	<50	<50	<50*	<50	<50	<50	
<b>Organochlorine Pesticides (OCP)</b>												
4,4'-DDE	µg/L	N/A	N/A	<0.2	<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	<0.2	
Aldrin	µg/L	N/A	N/A	<0.2	<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	<0.2	
Chlordane	µg/L	0.08	N/A	<0.2	<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	<0.2	
Endosulfan	µg/L	0.2	0.01	<0.2	<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	<0.2	
Heptachlor	µg/L	0.09	N/A	<0.2	<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	<0.2	
<b>Organophosphorus Pesticides (OPP)</b>												
Azinphos-methyl	µg/L	0.02	N/A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Chlorpyrifos	µg/L	0.01	0.009	<0.2	<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	<0.2	
Diazinon	µg/L	0.01	N/A	<0.2	<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	<0.2	
Fenitrothion	µg/L	0.2	N/A	<0.2	<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	<0.2	

## **Appendix F. Full Laboratory Results**