

Friday 10<sup>th</sup> March 2023

Environmental Engineer & Director

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

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

*Reporting period: 17 January 2023 to 14 February 2023*

**1.0 INTRODUCTION**

Ecoteam is engaged to undertake monthly and event-based surface water monitoring on behalf of Lendlease Building as part of the main works for the Tweed Valley Hospital Project. This report presents results from the 44<sup>th</sup> round of monthly sampling. This report satisfies the requirements of the SSD2 conditions. No controlled or uncontrolled releases from the sediment basins occurred during the reporting period.

**2.0 PROJECT AIMS AND SAMPLING OBJECTIVES**

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

**3.0 WEATHER CONDITIONS**

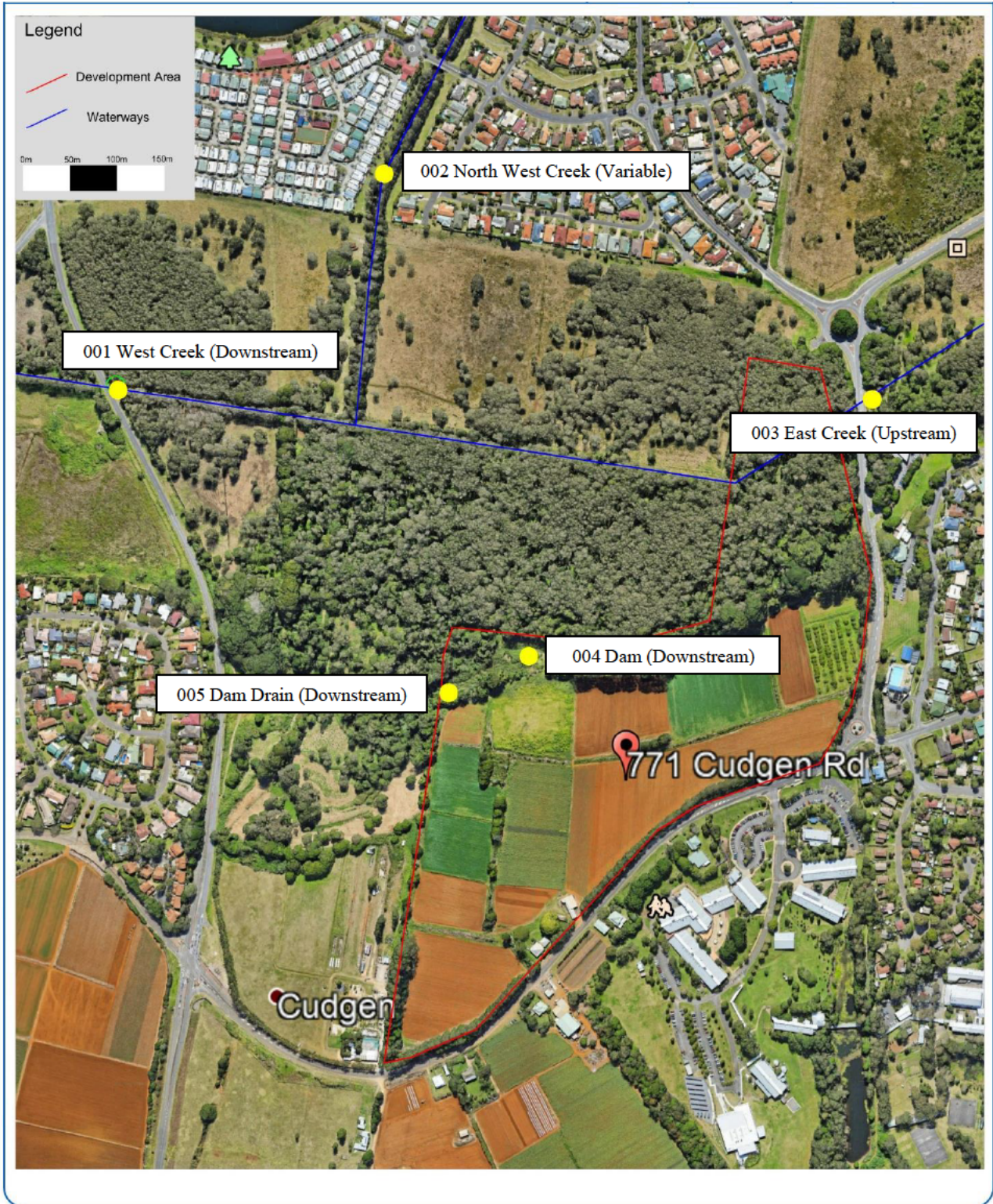
Total rainfall in the period prior to sampling (17 January 2023 to 14 February 2023) was 102.8 mm with the highest 24-hour rainfall occurring on 01<sup>st</sup> February, being 45.4 mm (Kingscliff BOM Station 058137).

**4.0 SAMPLING LOCATIONS**

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

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

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



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

## 5.0 SAMPLING METHODOLOGY

Sampling was undertaken by [REDACTED] on Tuesday 15 February 2023. The weather was overcast. In situ, physico-chemical measurements were collected using a AquaTROLL multi-parameter probe, and Turbidity was measured using a Turbimeter Plus turbidity meter. Oil and grease were visually assessed. The calibration certificate for the AquaTROLL is included in **Appendix B**. The Turbimeter Plus is calibrated before each sampling round. Water quality samples were collected at 300 mm below the surface where possible. Samples were collected from the bank using an extension pole.

Samples were filtered and preserved on-site where necessary, stored on ice, and couriered overnight to the NATA-accredited Envirolab in Sydney. Trip blank samples (013) were sent from Envirolab and transported to all sites, then returned to Envirolab with the field samples. The field blank samples (014) were assessed at Site 003. Duplicate samples (015) were collected at Site 005 and were filtered and preserved as required. Field and trip blanks were filled with deionized water and do not represent water quality from the site. A full list of analytes for the project is included in **Appendix C**.

## 6.0 ASSESSMENT CRITERIA

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

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

## 7.0 RESULTS

### 7.1 Physico-chemical Results

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

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

| Analyte                                    | Units               | Water Quality Objectives (WQOs) |             | Sample Codes and Results |                |             |               |
|--|---------------------|---------------------------------|-------------|--------------------------|----------------|-------------|---------------|
|  |                     | Estuary                         | Fresh Water | WC 001 (Down)            | NWC 002 (Down) | EC 003 (Up) | DD 005 (Down) |
| <i>pH</i>                                  |                     | 7.0-8.5                         | 6.5-8.5     | 7.13                     | 6.82           | 6.11        | 6.08          |
| <i>Turbidity</i>                           | <i>NTU</i>          | 0.5-10                          | 6.0-50      | 114                      | 7.5            | 3.89        | 7.47          |
| <i>Electrical Conductivity (EC)</i>        | <i>µS/cm</i>        | 125-2,200                       | 125-2,200   | 364.12                   | 250.24         | 114.94      | 137.69        |
| <i>Dissolved Oxygen (DO)</i>               | <i>% Saturation</i> | 80-110                          | 85-110      | 36.08                    | 20.81          | 8.58        | 4.09          |
| <i>Temperature</i>                         | <i>°C</i>           | N/A                             | N/A         | 25.54                    | 26.22          | 25.68       | 24.64         |
| <i>Oxidation-Reduction Potential (ORP)</i> | <i>mV</i>           | N/A                             | N/A         | 222.6                    | 93.3           | 238.6       | 128.9         |

When compared to the WQOs for freshwater and estuaries:

- pH was outside the WQO range at sample Sites 002, 003 and 005 this sampling round.
- Turbidity was outside of the WQO ranges at sample Sites 001 and 003 this sampling round.
- EC concentrations outside of the WQO ranges at sample Site 003 this sampling round.
- DO concentrations were outside of the expected range at all sampling sites this sampling round. DO was outside the range at comparison sites in background sampling.

## 7.2 Laboratory Results

Ammonia, Chlorophyll-a, Filterable Reactive Phosphorous (FRP), Oxides of Nitrogen (NO<sub>x</sub>), Total Nitrogen, Total Phosphorus, Aluminium, Lead and Zinc were above the WQOs for some sample sites shown in **Table 3**.

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

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

|                                |                   | Water Quality Objectives (WQOs) |             |               |                |             |               |          |           |               |
|--------------------------------|-------------------|---------------------------------|-------------|---------------|----------------|-------------|---------------|----------|-----------|---------------|
| Analyte                        | Unit              | Estuary                         | Fresh Water | WC 001 (Down) | NWC 002 (Down) | EC 003 (Up) | DD 005 (Down) | 013 Trip | 014 Field | 015 Duplicate |
| Ammonia                        | mg/L              | 0.015                           | 0.02        | 0.008         | 0.012          | 0.18        | 0.014         | <0.005   | <0.005    | <0.005        |
| Chlorophyll-a                  | mg/m <sup>3</sup> | 4                               | 5           | 2             | 22             | 2           | <1            | <1       | <1        | 20            |
| Filterable Reactive Phosphorus | mg/L              | 0.005                           | 0.02        | <0.005        | <0.005         | 0.069       | 0.006         | <0.005   | <0.005    | <0.005        |
| Oxides of Nitrogen             | mg/L              | 0.015                           | 0.040       | 0.09          | 0.04           | 0.04        | 1.7           | 0.03     | <0.005    | 1.7           |
| Total Nitrogen                 | mg/L              | 0.30                            | 0.35        | 0.3           | 0.5            | 0.8         | 1.9           | <0.1     | <0.1      | 1.9           |
| Total Phosphorus               | mg/L              | 0.030                           | 0.025       | 0.09          | 0.09           | 0.29        | 0.06          | <0.02    | <0.02     | 0.06          |
| Aluminium                      | µg/L              | N/A                             | 55          | 20            | 20             | 100         | 20            | <10      | <20       | 20            |
| Lead                           | µg/L              | 4.4                             | 3.4         | <1            | 12             | <1          | 1             | <1       | <1        | <1            |
| Zinc                           | µg/L              | 15                              | 8.0         | 2             | 7              | 8           | 4             | <1       | <1        | 4             |

When compared to the WQOs for Freshwater and Estuaries:

- Ammonia was above the WQOs at sample Site 003 this sampling round. Ammonia was above the WQOs at comparison sites in background sampling. Ammonia has increased at sample Site 003 and decreased at all other sites when compared to the previous month.
- Chlorophyll-a was above the WQOs at sample Sites 002 and the duplicate sample taken from Site 005 this sampling round. Chlorophyll-a has remained the same at sample Site 001 and decreased at all other sample Sites when compared to the previous month.
- Filterable Reactive Phosphorus was above WQOs at sample Site 003 this sampling round. Filterable Reactive Phosphorus has increased at sample Sites 003 and 005, remained the same at sample Site 002 and decreased at Site 001 when compared to the previous month.

- NO<sub>x</sub> was above the WQOs criteria at all sample sites this sampling round. NO<sub>x</sub> has increased at sample Site 001 and decreased at all other sample sites when compared to the previous month.
- TN was above the WQOs criteria at all sites this sampling round. TN has increased at sample Site 003 and decreased at all other sample sites when compared to last month. TN was above the WQOs at comparison sites in baseline sampling.
- TP was above the WQOs criteria at all sample sites this sampling round. TP has increased at all sample Sites when compared to the previous month.
- Aluminium was above the WQOs criteria at sample Site 003 this sampling round. Aluminium has increased at all sample Sites when compared to the previous month.
- Lead was above the WQOs criteria at sample Site 002 this sampling round. Lead has increased at sample Site 002 and remained the same at all other sample Sites when compared to the previous month.
- Zinc was above the WQOs criteria at sample Site 003 this sampling round. Zinc has increased at sample Sites 002 and 003, remained the same at Site 001, and decreased at sample Site 005 when compared to the previous month.
- All other metals were within estuarine and freshwater criteria this month.
- Demeton was analysed and returned non-detectable results.
- TRH (C<sub>10</sub>-C<sub>40</sub>) was not detected at any sample site.

## 8.0 Quality Assurance and Quality Control

- Parameters analysed in the Trip Blank (013) and Field Blank (014) were below the laboratory detection limits for all analytes except for silver which was found in the trip and field blank. Silver is used to make demineralised water and the laboratory has confirmed this is due to laboratory procedures and not a result of contamination.
- The Duplicate Sample (015) was collected at Site 005 and is within acceptable limits for all analytes except for Chlorophyll-a which typically has variation.
- The laboratory QA/QC is included in the results in **Appendix F**. All laboratory QA/QC was within acceptance criteria.

## 9.0 Summary of Results and Recommendations

- The month had moderate rainfall.
- Nutrients (Ammonia, NO<sub>x</sub>, TN, and TP) and Chlorophyll-a 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 was above the WQOs criteria at sample Site 003 this sampling round. Lead exceeded WQOs at Site 002 this month but was not present at the direct downstream sample locations indicating it was isolated to Site 002. Metals have been present in upstream and downstream sampling sites in previous sampling rounds. Elevation in metals may be due to pH and redox changes, microbial mineralisation, and naturally occurring sediment transportation. Changes in metal concentrations are also likely following heavy rainfall events. Lead present at
- Elevated nutrients and metals have been observed at all sampling locations including upstream and downstream sites in previous months and during baseline sampling. Therefore, based on the assessment of the January/February water quality data, the Tweed Valley Hospital Project construction activities are unlikely to be adversely impacting the downstream water quality. As such, the current soil and erosion controls implemented on site are considered to be effective.

Kind regards,





██████████

**Environmental Engineer & Director**

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## Appendix A. Site Photos

|  |  |  |
|--|--|--|
|  |    | <p><b>Site 001 –<br/>West Creek<br/>(Downstream)<br/>(15/02/2023))</b></p>         |
|  |   | <p><b>Site 002 –<br/>North-west<br/>Creek<br/>(Upstream)<br/>(15/02/2023))</b></p> |
|  |  | <p><b>Site 003 –<br/>East Creek<br/>(Upstream)<br/>(15/02/2023))</b></p>           |
|  |  | <p><b>Site 005 –<br/>Dam Drain<br/>(Downstream)<br/>(15/02/2023))</b></p>          |

## Appendix B. Calibration certificate for Aqua troll

### Calibration Report

Instrument Aqua TROLL 500  
Serial Number 757823  
Created 21/11/2022

Sensor **Turbidity**  
Serial Number 754060  
Last Calibrated Factory Defaults

Sensor **RDO**  
Serial Number 754373  
Last Calibrated 10/07/2022

Calibration Details

Slope 1  
Offset -0.10 mg/L

Pre Measurement

RDO Concentration 8.74 mg/L

Post Measurement

RDO Concentration 8.75 mg/L

Sensor **pH/ORP**  
Serial Number 742301  
Last Calibrated 21/11/2022

Calibration Details

Calibration Point 1

pH of Buffer 4.01 pH  
pH mV 96.0 mV  
Temperature 29.11 °C

Pre Measurement

pH 4.22 pH  
pH mV 96.0 mV

Post Measurement

pH 4.01 pH  
pH mV 97.4 mV

Calibration Point 2

pH of Buffer 6.99 pH  
pH mV -71.3 mV  
Temperature 30.21 °C

Pre Measurement

pH 7.11 pH  
pH mV -71.6 mV

Post Measurement

pH 6.99 pH  
pH mV -72.6 mV

Slope and Offset 1

Slope -56.17 mV/pH  
Offset -71.9 mV

ORP

ORP Solution Zobell's  
Offset 55.0 mV  
Temperature 30.27 °C  
Pre Measurement 167.7 mV  
Post Measurement 222.2 mV

Sensor **Conductivity**  
Serial Number 756927  
Last Calibrated 10/07/2022

Calibration Details

TDS Conversion Factor (ppm) 0.65  
Cell Constant 0.873  
Reference Temperature 20.00 °C



## 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)<br>Arsenic (V) (filtered) |
| Chromium (filtered)            | Chromium (CrVI) (filtered)                         |



## Appendix D. Chain of Custody Form

| [Copyright and Confidential]<br>                                      |                                 |        |              |                | <h3 style="margin: 0;">CHAIN OF CUSTODY - Client</h3> <p style="margin: 0;"><b>ENVIROLAB GROUP - National phone number 1300 424 344</b></p>                        |                  |                              |     |     |  |         |               |                 |         | Sydney Lab - EnviroLab Services<br>12 Ashley St, Chatswood, NSW 2067<br>Ph: 02 9910 6200 / sydney@envirolab.com.au<br><br>Perth Lab - MPL Laboratories<br>16-18 Hayden Cr, Myaree, WA 6154<br>Ph: 08 9317 2505 / lab@mpl.com.au<br><br>Melbourne Lab - EnviroLab Services<br>25 Research Drive, Croydon South, VIC 3136<br>Ph: 03 9763 2500 / melbourne@envirolab.com.au<br><br>Adelaide Office - EnviroLab Services<br>7a The Parade, Norwood, SA 5067<br>Ph: 08 7087 6800 / adelaide@envirolab.com.au<br><br>Brisbane Office - EnviroLab Services<br>20s, 10-20 Depot St, Banyo, QLD 4014<br>Ph: 07 3266 9532 / brisbane@envirolab.com.au<br><br>Darwin Office - EnviroLab Services<br>Unit 7, 17 Willes Rd, Berrimah, NT 0820<br>Ph: 08 8967 1201 / darwin@envirolab.com.au |         |         |             |                  |   |
|--|---------------------------------|--------|--------------|----------------|--|------------------|------------------------------|-----|-----|--|---------|---------------|-----------------|---------|--|---------|---------|-------------|------------------|---|
| Client: Ecoteam  |                                 |        |              |                | Client Project Name / Number / Site etc (ie report title):   |                  |                              |     |     |  |         |               |                 |         |  |         |         |             |                  |   |
| Contact Person: [REDACTED]   |                                 |        |              |                | SMC009.44 - Tweed Valley Hospital Project  |                  |                              |     |     |  |         |               |                 |         |  |         |         |             |                  |   |
| Project Mgr: [REDACTED]  |                                 |        |              |                | PO No.:  |                  |                              |     |     |  |         |               |                 |         |  |         |         |             |                  |   |
| Sampler: [REDACTED]  |                                 |        |              |                | EnviroLab Quote No. : 19SY228_Rev 1  |                  |                              |     |     |  |         |               |                 |         |  |         |         |             |                  |   |
| Address: 13 Ewing Street<br>Lismore NSW 2480   |                                 |        |              |                | Date results required:   |                  |                              |     |     |  |         |               |                 |         |  |         |         |             |                  |   |
|  |                                 |        |              |                | Or choose: standard / same day / 1 day / 2 day / 3 day<br>Note: Inform lab in advance if urgent turnaround is required - surcharges apply                          |                  |                              |     |     |  |         |               |                 |         |  |         |         |             |                  |   |
| Phone: 02 6621 5123 Mob: [REDACTED]  |                                 |        |              |                | Additional report format: esdat / equis /  |                  |                              |     |     |  |         |               |                 |         |  |         |         |             |                  |   |
| Email: [REDACTED]  |                                 |        |              |                | Lab Comments:  |                  |                              |     |     |  |         |               |                 |         |  |         |         |             |                  |   |
| Testing requirements - Chlorophyll-a <4 mg/m3, Total Phosphorus <0.025 mg/L, Silver <0.05 ug/L, Low level OCPs and OPPs                                |                                 |        |              |                | Metals: Al, As, B, Cd, Cr, Cu, Co, Pb, Mn, Hg, Ni, Se, Ag, Z.<br>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/BTEX   | Dissolved Metals | OC/OP + toxaphene + dieldrin | 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 | 15-Feb       | Water          | X  | X                | X                            | X   | X   | X  | X       | X             | X               | X       | X  | X       | X       |             |                  |   |
| 2  | 002 - USNW                      | 150 mm | 15-Feb       | Water          | X  | X                | X                            | X   | X   | X  | X       | X             | X               | X       | X  | X       | X       |             |                  |   |
| 3  | 003 - DSE                       | 300 mm | 15-Feb       | Water          | X  | X                | X                            | X   | X   | X  | X       | X             | X               | X       | X  | X       | X       |             |                  |   |
| 4  | 005 - Dam Drain                 | 150 mm | 15-Feb       | Water          | X  | X                | X                            | X   | X   | X  | X       | X             | X               | X       | X  | X       | X       |             |                  |   |
| 5  | 013                             | 300 mm | 15-Feb       | Water          | X  | X                | X                            | X   | X   | X  | X       | X             | X               | X       | X  | X       | X       |             |                  |   |
| 6  | 014                             | 300 mm | 15-Feb       | Water          | X  | X                | X                            | X   | X   | X  | X       | X             | X               | X       | X  | X       | X       |             |                  |   |
| 7  | 015                             | 300 mm | 15-Feb       | 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): ELS SYD   |                  |                              |     |     | Lab Use Only                             |         |               |                 |         |  |         |         |             |                  |   |
| Print Name: [REDACTED]   |                                 |        |              |                | Print Name: [REDACTED]   |                  |                              |     |     | Job number: 316673                       |         |               |                 |         | Cooling: Ice / Ice pack / None   |         |         |             |                  |   |
| Date & Time: 15/02/2023  |                                 |        |              |                | Date & Time: 16/02/23 @ 1340   |                  |                              |     |     | Temperature: 16.7°C                      |         |               |                 |         | Security seal: Intact / Broken / None  |         |         |             |                  |   |
| Signature: [REDACTED]  |                                 |        |              |                | Signature: [REDACTED]  |                  |                              |     |     | TAT Req - SAME day / 1 / 2 / 3 / 4 / STD |         |               |                 |         |  |         |         |             |                  |   |

## Appendix E. Summary of Lab Results compared to WQOs

| Analyte   |                   | Water Quality Objectives (WQOs) |             | Sample Codes |          |        |        |  |          |           |               |
|---|-------------------|---------------------------------|-------------|--------------|----------|--------|--------|--|----------|-----------|---------------|
|   |                   | Estuary                         | Fresh Water | WC 001       | NW C00 2 | EC 003 | DD 005 |  | 013 Trip | 014 Field | 015 Duplicate |
| Total Suspended Solids (TSS)                    | mg/L              | N/A                             | N/A         | 36           | 8        | <5     | 9      |  | <5       | <5        | 14            |
| Total Dissolved Solids (TDS)                    | mg/L              | N/A                             | N/A         | 300          | 190      | 99     | 120    |  | <5       | <5        | 110           |
| <b>Major Cations (dissolved) and Hardness</b>   |                   |                                 |             |              |          |        |        |  |          |           |               |
| Sodium  | mg/L              | N/A                             | N/A         | 32           | 31       | 19     | 23     |  | <0.5     | <0.5      | 22            |
| Potassium                                       | mg/L              | N/A                             | N/A         | 3            | 3        | 2      | 3      |  | <0.5     | <0.5      | 3             |
| Calcium   | mg/L              | N/A                             | N/A         | 39           | 19       | 5.7    | 3      |  | <0.5     | <0.5      | 3             |
| Magnesium                                       | mg/L              | N/A                             | N/A         | 7.4          | 5.9      | 2      | 4      |  | <0.5     | <0.5      | 4             |
| Hardness mgCaCO <sub>3</sub> /L                 |                   | N/A                             | N/A         | 130          | 71       | 24     | 25     |  | <3       | <3        | 25            |
| <b>Nutrients</b>                                |                   |                                 |             |              |          |        |        |  |          |           |               |
| Ammonia   | mg/L              | 0.015                           | 0.02        | 0.008        | 0.012    | 0.18   | 0.014  |  | <0.005   | <0.005    | <0.005        |
| Chlorophyll-a                                   | mg/m <sup>3</sup> | 4                               | 5           | 2            | 22       | 2      | <1     |  | <1       | <1        | 20            |
| Filterable Reactive Phosphorus                  | mg/L              | 0.005                           | 0.02        | <0.005       | <0.005   | 0.069  | 0.006  |  | <0.005   | <0.005    | <0.005        |
| Nitrate   | mg/L              | N/A                             | N/A         | 0.086        | 0.04     | 0.04   | 1.7    |  | 0.03     | <0.005    | 1.7           |
| Oxides of Nitrogen                              | mg/L              | 0.015                           | 0.040       | 0.09         | 0.04     | 0.04   | 1.7    |  | 0.03     | <0.005    | 1.7           |
| Total Nitrogen                                  | mg/L              | 0.30                            | 0.35        | 0.3          | 0.5      | 0.8    | 1.9    |  | <0.1     | <0.1      | 1.9           |
| Total Phosphorus                                | mg/L              | 0.030                           | 0.025       | 0.09         | 0.09     | 0.29   | 0.06   |  | <0.02    | <0.02     | 0.06          |
| <b>Metals – All metals are Dissolved Metals</b> |                   |                                 |             |              |          |        |        |  |          |           |               |
| Aluminium                                       | µg/L              | N/A                             | 55          | 20           | 20       | 100    | 20     |  | <10      | <10       | 20            |
| Arsenic   | µg/L              | N/A                             | 13          | <1           | <1       | <1     | <1     |  | <1       | <1        | <1            |
| Boron   | µg/L              | N/A                             | 370         | 50           | 70       | 20     | 40     |  | <20      | <20       | 40            |
| Cadmium   | µg/L              | 5.5                             | 0.2         | <0.1         | <0.1     | <0.1   | <0.1   |  | <0.1     | <0.1      | <0.1          |
| Chromium  | µg/L              | 4.4                             | 1.0         | <1           | <1       | <1     | <1     |  | <1       | <1        | <1            |
| Copper  | µg/L              | 1.3                             | 1.4         | <1           | <1       | <1     | <1     |  | <1       | <1        | <1            |
| Cobalt  | µg/L              | 1.0                             | N/A         | <1           | <1       | <1     | <1     |  | <1       | <1        | <1            |
| Lead  | µg/L              | 4.4                             | 3.4         | <1           | 12       | <1     | 1      |  | <1       | <1        | <1            |
| Manganese                                       | µg/L              | N/A                             | 1,900       | 60           | 110      | 41     | 46     |  | <1       | <1        | 42            |
| Mercury   | µg/L              | 0.4                             | 0.6         | <0.05        | <0.05    | <0.05  | <0.05  |  | <0.05    | <0.05     | <0.05         |
| Nickel  | µg/L              | 70                              | 11          | <1           | <1       | <1     | <1     |  | <1       | <1        | <1            |
| Selenium  | µg/L              | N/A                             | 11          | <1           | <1       | <1     | <1     |  | <1       | <1        | <1            |
| Zinc  | µg/L              | 15                              | 8.0         | 2            | 7        | 8      | 4      |  | <1       | <1        | 4             |
| Silver  | µg/L              | 1.4                             | 0.05        | <0.05        | <0.05    | <0.05  | <0.05  |  | 0.58     | 0.56      | <0.05         |

| Analyte   | Unit | Water Quality Objectives (WQOs) |             | Sample Codes |          |        |        |  |          |           |               |
|---|------|---------------------------------|-------------|--------------|----------|--------|--------|--|----------|-----------|---------------|
|   |      | Estuary                         | Fresh Water | WC 001       | NW C00 2 | EC 003 | DD 005 |  | 013 Trip | 014 Field | 015 Duplicate |
| <b>Hydrocarbons</b>   |      |                                 |             |              |          |        |        |  |          |           |               |
| Toluene   | mg/L | 0.70                            | 0.95        | <1           | <1       | <1     | <1     |  | <1       | <1        | <1            |
| Ethylbenzene  | mg/L | N/A                             | N/A         | <1           | <1       | <1     | <1     |  | <1       | <1        | <1            |
| Xylene  | mg/L | N/A                             | N/A         | <1           | <1       | <1     | <1     |  | <1       | <1        | <1            |
| Naphthalene   | mg/L | N/A                             | 0.55        | <1           | <1       | <1     | <1     |  | <1       | <1        | <1            |
| TRH C <sub>6</sub> - C <sub>10</sub>                        | mg/L | 0.07                            | 0.016       | <10          | <10      | <10    | <10    |  | <10      | <10       | <10           |
| TRH C <sub>10</sub> - C <sub>16</sub>                       | mg/L | N/A                             | N/A         | <50          | <50      | <50    | <50    |  | <50      | <50       | <50           |
| TRH C <sub>16</sub> - C <sub>34</sub>                       | mg/L | N/A                             | N/A         | <100         | <100     | <100   | <100   |  | <100     | <100      | <100          |
| TRH >C <sub>34</sub> - C <sub>40</sub>                      | mg/L | N/A                             | N/A         | <100         | <100     | <100   | <100   |  | <100     | <100      | <100          |
| TRH C <sub>6</sub> -C <sub>10</sub> less BTEX (F1)          | mg/L | N/A                             | N/A         | <10          | <10      | <10    | <10    |  | <10      | <10       | <10           |
| TRH >C <sub>10</sub> -C <sub>16</sub> less Naphthalene (F2) | mg/L | N/A                             | N/A         | <50          | <50      | <50    | <50    |  | <50      | <50       | <50           |
| <b>Organochlorine Pesticides (OCP)</b>                      |      |                                 |             |              |          |        |        |  |          |           |               |
| 4,4'-DDE  | µg/L | N/A                             | N/A         | <0.01        | <0.01    | <0.01  | <0.01  |  | <0.01    | <0.01     | <0.01         |
| 4,4'-DDT  | µg/L | N/A                             | 0.01        | <0.006       | <0.006   | <0.006 | <0.006 |  | <0.006   | <0.006    | <0.006        |
| Aldrin  | µg/L | N/A                             | N/A         | <0.01        | <0.01    | <0.01  | <0.01  |  | <0.01    | <0.01     | <0.01         |
| g-BHC   | µg/L | N/A                             | 0.2         | <0.01        | <0.01    | <0.01  | <0.01  |  | <0.01    | <0.01     | <0.01         |
| Chlordane   | µg/L | N/A                             | 0.08        | <0.01        | <0.01    | <0.01  | <0.01  |  | <0.01    | <0.01     | <0.01         |
| Dieldrin  | µg/L | N/A                             | N/A         | <0.01        | <0.01    | <0.01  | <0.01  |  | <0.01    | <0.01     | <0.01         |
| Endosulfan  | µg/L | 0.01                            | 0.2         | <0.01        | <0.01    | <0.01  | <0.01  |  | <0.01    | <0.01     | <0.01         |
| Endrin  | µg/L | 0.02                            | 0.008       | <0.01        | <0.01    | <0.01  | <0.01  |  | <0.01    | <0.01     | <0.01         |
| Heptachlor  | µg/L | N/A                             | 0.09        | <0.01        | <0.01    | <0.01  | <0.01  |  | <0.01    | <0.01     | <0.01         |
| Toxaphene   | µg/L | N/A                             | 0.2         | <2           | <2       | <2     | <2     |  | <2       | <2        | <2            |
| <b>Organophosphorus Pesticides (OPP)</b>                    |      |                                 |             |              |          |        |        |  |          |           |               |
| Azinphos-methyl   | µg/L | N/A                             | 0.02        | <0.02        | <0.02    | <0.02  | <0.02  |  | <0.02    | <0.02     | <0.02         |
| Chlorpyrifos  | µg/L | 0.009                           | 0.01        | <0.01        | <0.01    | <0.01  | <0.01  |  | <0.01    | <0.01     | <0.01         |
| Demeton-S   | µg/L | N/A                             | N/A         | <5           | <5       | <5     | <5     |  | <5       | <5        | <5            |
| Diazinon  | µg/L | N/A                             | 0.01        | <0.01        | <0.01    | <0.01  | <0.01  |  | <0.01    | <0.01     | <0.01         |
| Dimethoate  | µg/L | N/A                             | 0.15        | <0.15        | <0.15    | <0.15  | <0.15  |  | <0.15    | <0.15     | <0.15         |
| Fenitrothion  | µg/L | N/A                             | 0.2         | <0.2         | <0.2     | <0.2   | <0.2   |  | <0.2     | <0.2      | <0.2          |
| Malathion   | µg/L | N/A                             | 0.05        | <0.05        | <0.05    | <0.05  | <0.05  |  | <0.05    | <0.05     | <0.05         |

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