SYRINX ENVIRONMENTAL

Tasmania Office
76 York St
Launceston TAS 7250

T +61 (0)8 9227 9355
F +61 (0)8 9227 5033

www.syrinx.net.au
ABN: 39 092 638 410

BURNIE WASTE MANAGEMENT CENTRE

SITE EPN 9161/2
ANNUAL ENVIRONMENTAL REVIEW
AUGUST 2022 – JULY 2023

September 2023

For Burnie City Council

Document Control

Report	**22054RPT005**			
Version	**Date**	**Prepared by**	**Approved**	**Issue Details**
1.0	19.09.23	AC, LS	LS	Issued for approval

Limitations of Report

Syrinx Environmental PL has prepared this report as a professional consultant. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report has not been prepared for the use, perusal or otherwise, by parties other than the Client, the Owner and their nominated consulting advisors without the consent of the Owner. No further information can be added without the consent of the Owner, nor does the report contain sufficient information for purposes of other parties or for other uses. The information contained in this report has been prepared in good faith, and accuracy of data at date of issue has been compiled to the best of our knowledge. However, Syrinx Environmental PL is not responsible for changes in conditions that may affect or alter information contained in this report before, during or after the date of issue.

Syrinx Environmental PL accepts site conditions as an indeterminable factor, creating variations that can never be fully defined by investigation. Measurements and values obtained from sampling and testing are indicative within a limited time frame and unless otherwise specified, should not be accepted as actual realities of conditions on site beyond that time frame.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABBREVIATIONS

The following terms are used in the document.

Abbreviation or acronym	***What it stands for***
AEST	*Australian Eastern Standard Time*
BCC	*Burnie City Council*
BWMC	*Burnie Waste Management Centre*
CFU	*Colony forming unit*
EPA	*Environmental Protection Agency*
EPN	*Environmental Protection Notice*
L02	*Monitoring Location – Stage 2 Leachate*
LOR	*Limit of Reporting*
GW01	*Monitoring Location – Groundwater 1*
GW02	*Monitoring Location – Groundwater 2*
GW03	*Monitoring Location – Groundwater 3*
QA/QC	*Quality Assurance/Quality Control*
SYR	*Syrinx Environmental*
SW01	*Monitoring Location – Surface Water 1*
SW02	*Monitoring Location – Surface Water 2*
SW03	*Monitoring Location – Surface Water 3*

EXECUTIVE SUMMARY

Burnie City Council (BCC) owns and operates the Burnie Waste Management Centre (BWMC) at 289 Mooreville Rd, Burnie Tasmania (hereafter, the Site). The Site operates under the conditions contained within the Environmental Protection Notice 9161/2 (EPN 9161/2) which was issued by the Environmental Protection Authority (EPA) on the 29th of November 2017. EPN 9161/2 contains conditions which govern the monitoring and reporting requirements for the Site. This document presents the findings of the monitoring required for the reporting period October 2022 – July 2023 (water quality and groundwater levels), as well as other requirements of the annual environmental review.

Surface water quality is variable across the Site and generally influenced by offsite inputs. Exceedances of the adopted trigger values occur for nitrate and ammonia (spatially and temporally), and iron and aluminium at various parts of the watercourse. While all concentrations are within their historical norm, nitrogen reduction and iron reduction strategies should be considered across the Site and catchment in general.

Groundwater quality varies greatly across the Site but is ubiquitously characterised by elevated nitrate, aluminium, cadmium, chromium, copper, nickel, and zinc in the upgradient bore (GW03). The downgradient bore (GW01) is of relatively high quality. The concentrations and nature of contamination in the groundwater are comparable to the historic norms and no concerning trends are apparent.

The quality of Stage 2 leachate L02 exceeded the adopted trigger values for TSS in October 2022 and July 2023, and the total iron trigger value in October 2022.

ANNUAL ENVIRONMENTAL REVIEW

1.0 INTRODUCTION

1.1 BACKGROUND

Burnie City Council (BCC) owns and operates the Burnie Waste Management Centre (BWMC) at 289 Mooreville Road, Burnie Tasmania (hereafter referred to as "the Site"). The site is governed by the conditions contained in the Environmental Protection Notice 9161/2 (hereafter, "the EPN") issued by the Environmental Protection Authority (EPA) on the 29th of November 2017 (Appendix 1).

The BWMC includes a landfill site (Stage 1 and Stage 2), a Waste Transfer and Resource Recovery Facility (WTRRF), Recycle/Recovery Loops and associated infrastructure (toll booth, amenities building, tip shop, leachate ponds and pump stations). A treatment wetland system, constructed to treat Stage 1 leachate, is located on the top of the Stage 1 Landfill area. The system is governed by a separate notice (EPN 9421/1) and is discussed within a separate annual report (BWMC Wetland EPN 9421/1 Annual Environmental Review July 2021 – June 2022).

The Site contains both open channel and piped systems to convey stormwater, surface water and leachate across the Site, and groundwater monitoring bores as shown in Figure 1.

1.2 RELATIONSHIP WITH OTHER EPNS AND COMPLIANCE DOCUMENTS

The EPA has issued two Environmental Protection Notices in relation to activities on Site:

- Environmental Protection Notice No. 9161/2, 'Site EPN' which comprises quarterly monitoring (7 locations on site) and annual reporting.
- Environmental Protection Notice No. 9421/1, 'Wetland EPN' which comprises monthly, quarterly, and annual monitoring (4 locations on site), and quarterly and annual reporting related to the operation of a landfill leachate treatment wetland.

This report is a requirement under EPN 9161/2.

1.3 SITE OVERVIEW

This section provides a general description of the hydraulic arrangement on the Site concerning the sampling locations used for monitoring in accordance with the EPN 9161/2 requirements (Figure 1). Note, the Site is bounded by agricultural areas which are likely to impact the surface water quality; this has been discussed in greater detail throughout the document.

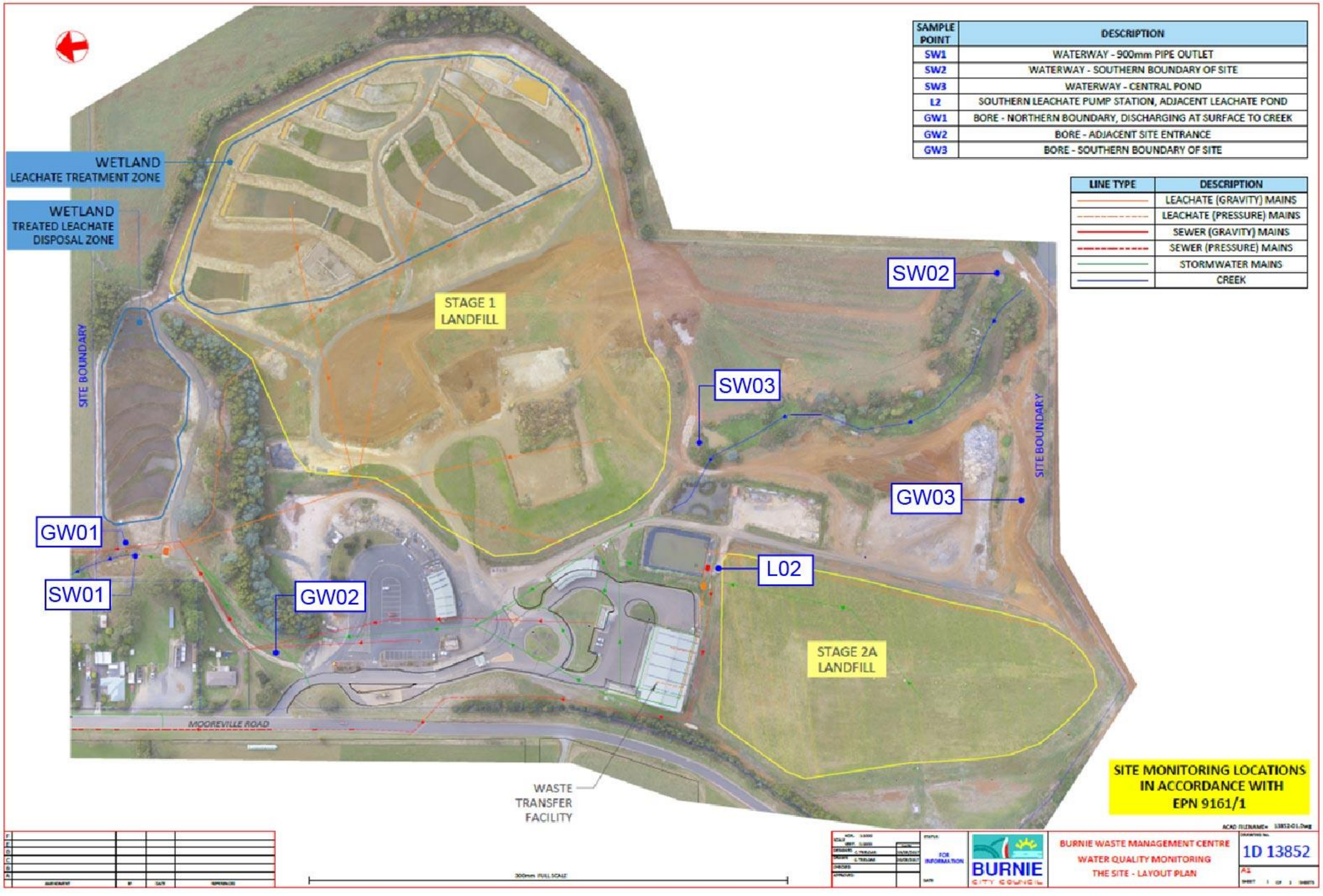


Figure 1: Monitoring locations within the BWMC Site as defined in EPN 9161/2.

Surface Water Flows

Surface water enters the Site across the southern boundary and flows from there (SW02) towards the northern boundary (SW01) where it is discharged into the unnamed tributary of Cooee Creek (Figure 1).

Leachate

Leachate is sampled from the Stage 2A landfill leachate pond (L02) as seen in Figure 1.

Groundwater Wells

Groundwater is sampled from three (3) locations; GW01 (hydraulically down-gradient), GW02 (hydraulically mid-gradient), and GW03 (hydraulically up-gradient), as shown in Figure 1.

1.4 REPORTING PERIOD

This document addresses EPN 9161/2 condition G5 which outlines requirements for annual reporting.

This Condition states that "…*publicly available Annual Environmental Review for the activity must be submitted each year within three months of the end of the reporting period* ". The required reporting period is not stated within the EPN 9161/2.

The term "current reporting period" refers to the period of August 2022 to July 2023. Where the term "previous reporting period" has been used, this refers to the period of August 2021 to July 2022.

2.0 SITE MONITORING SAMPLING PLAN (CONDITIONS G5 1.4)

This Section provides information relevant to the water quality monitoring and groundwater level monitoring undertaken during the reporting period to fulfil Condition G5 1.4 of the EPN.

2.1 SAMPLING PLAN & MONITORING APPROACH (CONDITION M1 1, 2)

Water quality sampling was undertaken at three (3) surface water locations (SW01, SW02, SW03), three (3) groundwater locations (GW01, GW02 & GW03) and one (1) leachate location (L02). The seven monitoring locations are shown in Figure 1.

During the reporting period, the monitoring was completed as outlined below:

- Monitoring Event 1: 25th October 2022
- Monitoring Event 2: 17th January 2023
- Monitoring Event 3: 26th April 2023
- Monitoring Event 4: 19th July 2023

2.2 SAMPLING METHODOLOGY

Sample collection was conducted by qualified and experienced Syrinx Environmental PL (Syrinx) staff in line with the methodology outlined in the Australian / New Zealand Standards for Water Quality Sampling (AS/NZS 5667.1:1998).

2.3 ANALYTICAL LABORATORY DETAILS

The analytical laboratory used to carry out the water quality testing presented in this report was ALS Environmental Services in Springvale, VIC, Australia. ALS is a NATA certified laboratory.

2.4 QUALITY CONTROL / QUALITY ASSURANCE

2.4.1 Duplicate Sampling

A total of four (4) duplicate samples were taken during the reporting period and were analysed for total metals to assess the variability of laboratory results between samples. This met the duplicate sample rate of one duplicate sample per twenty primary samples. As summarised in Table 1, each QA/QC sample analysed was determined to be reflective of the primary sample concentrations, i.e. within ± 30% of the primary result or within ± 50% if the result was within 5 fold the limit of reporting (data provided in Appendix 2).

Table 1. Summary of data from QA/QC samples and an assessment against the primary sample.

Sample location	Date taken	Lab ID	Duplicate data was within ± 30% of primary result? *
DUPE	25/10/2022	EM2221026008	**Yes - PASS**
DUPE	17/01/2023	EM2300618008	**Yes - PASS**
DUPE	26/04/2023	EM2307433008	**Yes - PASS**
DUPE	19/07/2023	EM2313101008	**Yes - PASS**

** Or within ± 50% if result was < 5x the LOR.*

2.4.2 Sample Non-Compliance

The laboratory used for analysis (ALS in Victoria) advised holding time non-compliance for the pH and redox analysis across all sampling events, as these parameters have a short holding time of 6 hours. The holding time non-compliance for these analytes was a result of the overnight transport of samples from Tasmania to the laboratory in Victoria and as such was unavoidable.

3.0 WATER QUALITY MONITORING RESULTS (G5 1.4)

Water quality sampling was conducted every quarter. The following sections include a tabulated summary of water quality data, with a graphical representation included in Appendix . The documentation for the laboratory analysis undertaken is provided in Appendix .

There are no specific water quality trigger limits listed within the EPN, however, data was compared to:

- Burnie City Council Trigger Values - the expected Site-specific values defined by Burnie City Council (taken from the ES&D 2011 May report);
- ANZECC & ARMCANZ Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) (hereafter referred to as the "ANZECC guidelines"); and
- Water and Sewerage Guidelines Schedule 3.

3.1 SURFACE WATER QUALITY RESULTS

Surface water quality laboratory data is shown in Table 2, with parameters that exceeded the ANZECC guidelines and/or BCC Trigger Values highlighted in orange.

During the reporting period, exceedances were recorded for the following parameters:

- Physico-chemical parameters – pH, dissolved oxygen (DO) saturation and total suspended solids (TSS)
- Nutrients – ammonia (as N), nitrate (as N), total nitrogen (TN) and total phosphorus (TP)
- Total metals – aluminium (Al), chromium (Cr), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), nickel (Ni), and zinc (Zn)
- Microbiological – total coliforms.

3.1.1 Physico-chemical Parameters

During the reporting period, most of the monitored physico-chemical parameters were within relevant trigger limits and comparable with the previous reporting period, and hence not of concern (Table 2).

pH - within the expected range at all sites. The field-measured pH was in exceedance (below) the ANZECC & ARMCANZ (2000) and BCC Trigger Value range of 6.5 - 8.0 at SW03 (midway) during all three sampling events in 2023 (Table 2). The January and April 2023 sampling events recorded pH marginally below the lower limit (6.5) and long-term mean from July 2018 - April 2023 (6.64) for this location and are therefore not of concern. The July 2023 field pH result at SW03 (0.82) was due to a probe failure and should be discounted. Laboratory pH was within the expected range for this location.

The exceedance reported at SW02 (5.10) in July 2023 is likely due to the same probe failure as this location was sampled after SW03 and reported a laboratory pH within the expected range.

SW01 (downgradient) reported a laboratory pH of 8.81 in April 2023 (Table 2), although the field pH was within the acceptable range at 7.70 during the same sampling event. Field pH is often the more reliable record due to the very short holding time for measuring pH in the laboratory (see Section 2.4.2). Despite this, the field measurement was the highest pH recorded at SW01 since July 2018. pH has been marginally increasing at this location since sampling began. The mean pH was 6.93 from July 2018 - October 2020 and 7.34 from January 2021 - July 2023.

Total dissolved solids (TDS) - within the expected range at all sites. TDS concentrations were within the freshwater range (< 500 mg/L) across all sampling locations and were comparable to the previous reporting period.

Electrical conductivity (EC) - within the expected range at all sites. EC values were consistently in the freshwater range (mean = 160 µs/cm).

Total suspended solids (TSS) - In exceedance at SW01, SW02, and SW03. TSS was variable across all locations (<1 – 35 mg/L) with all three monitoring locations reporting TSS exceedances at least once during the reporting period (Table 2). As noted in previous annual reports (Syrinx 2022), elevated TSS seems to correspond with elevated total metal concentrations, suggesting that the flushing of detritus/material into the system could be a source of contamination. TSS concentrations have remained within the range of 0 - 48 mg/L at all locations since October 2019.

Total alkalinity – within the historic range. Total alkalinity (the sum of bicarbonate, carbonate, and hydroxide alkalinity) was completely comprised of bicarbonate alkalinity and, whilst concentrations varied between locations, was within the historic range (Table 2).

Table 2. Surface water quality laboratory analytical results

Surface Water Quality																												
Sampling location ID		**SW01**								**SW03**								**SW02**								ANZECC (2000) Aquatic Ecosystems Toxicants	ANZECC (2000) Tables 3.3.2, 3.3.3	BCC Trigger Values (ES&D 2013)
Hydraulic location		**Discharge location (downgradient)**								**Mid-way through Site's watercourse**								**Start of the watercourse (upgradient)**										
Sampling event (Quarterly)		Oct-21	Jan-22	Apr-22	Jul-22	Oct-22	Jan-23	Apr-23	Jul-23	Oct-21	Jan-22	Apr-22	Jul-22	Oct-22	Jan-23	Apr-23	Jul-23	Oct-21	Jan-22	Apr-22	Jul-22	Oct-22	Jan-23	Apr-23	Jul-23			
Analyte	**Units**																											
pH (laboratory)	-	6.79	6.63	6.85	7.30	7.54	6.84	**8.81**	7.20	6.90	6.59	6.74	6.83	6.86	6.83	6.81	6.83	7.30	6.73	6.99	6.91	7.09	7.04	7.53	6.91		6.5 - 8.0	6.5 - 8.0
pH (field)	-	7.53	7.25	7.52	7.73	7.36	7.36	7.70	7.49	7.41	6.67	6.57	6.75	6.82	**6.45**	**6.38**	**0.82**	6.59	7.07	6.94	6.72	7.04	6.82	6.72	**5.10**		6.5 - 8.0	6.5 - 8.0
Temperature	ºC	13.3	16.1	14.4	7.3	13.8	14.9	13.4	8.2	14.6	17.3	11.5	7.5	13.5	16.9	12.0	8.3	15.9	20.2	12.4	6.5	13.3	19.1	14.7	8.8			
Dissolved oxygen	mg/L	7.64	1.76	8.02	11.01	6.42	8.28	7.38	8.38	5.55	3.02	4.10	6.93	4.90	4.06	2.64	4.80	8.86	7.14	4.46	6.85	4.55	4.76	4.86	4.21			
Dissolved oxygen saturation	%	**73.9**	**17.7**	**79.2**	91.6	**62**	**82.1**	**70.7**	**68.6**	**54.6**	**31.6**	**38.1**	**59.7**	**47**	**42**	**24.7**	**40.4**	**89.4**	**79.1**	**41.8**	**57.4**	**43.5**	**52**	**48**	**36.4**		90 - 100	
Electrical Conductivity (field)	µS/cm	232.6	109.4	158.9	133.9	145.5	213.9	218.1	178.2	181.3	172.3	124.2	121.6	142.1	124.7	187.9	153.12	201.3	159.5	151.4	175.9	142.4	219.5	188.5	179.5			
Electrical Conductivity (laboratory)	µS/cm	193	128	185	170	156	180	182	157	165	195	156	165	154	176	153	145	200	180	202	241	162	180	151	163		125 - 2,200	30 - 350
Salinity (field)	ppt	0.11	0.06	0.09	1	0.09	0.13	0.13	0.13	0.09	0.1	0.08	<1	0.09	0.07	0.12	0.11	0.1	0.08	0.1	32	0.09	0.12	0.11	0.12			
Total Dissolved Solids (field)	mg/L	163.78	81.84	132	133.32	122.1	174.9	184.8	173.58	119.5	133.2	110.2	173.6	120.12	97.68	165	153.1	132.66	116.6	132	123.42	120.78	163.02	154.44	170.9			
Total Dissolved Solids (laboratory)	mg/L	105	72	246	112	89	125	83	368	87	122	106	97	78	94	74	163	100	104	140	163	138	112	76	184			1000
Total Suspended Solids	mg/L	<1	**35**	4	1	**13**	**10**	**5**	**23**	<1	**8**	**11**	<1	1	**22**	**10**	**17**	3	3	3	**32**	**34**	**15**	<1	**8**			5
Oxidation Reduction Potential	mV	----	92.3	-20.4	258.0	203.0	279.0	197.0	8.7	----	109.0	-6.0	286.0	188.0	272.0	83.0	8.6	----	95.1	-7.7	264.0	188.0	279.0	114.0	8.9			
Alkalinity (Total)	mg $CaCO_3$/L	33	28	33	32	36	26	39	33	35	44	48	29	41	56	50	30	41	39	66	45	44	55	46	33			
Alkalinity (Bicarbonate)	mg/L	33	28	33	32	36	26	31	33	35	44	48	29	41	56	50	30	41	39	66	45	44	55	46	33			
Alkalinity (Carbonate)	mg/L	<1	<1	<1	<1	<1	<1	8	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			
Alkalinity (Hydroxide)	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1			
Chloride	mg/L	26	10	24	17	17	21	22	19	5	40	20	17	18	19	22	18	21	20	17	23	14	18	17	16			400
Sulfate	mg/L	6	8	5	10	7	5	4	8	6	5	<1	10	3	2	1	5	15	12	7	21	8	2	6	11			400
Dissolved Calcium	mg/L	5	8	6	6	13	4	4	7	4	8	6	4	6	6	4	5	8	9	10	10	6	7	5	8			
Dissolved Magnesium	mg/L	4	3	6	4	8	5	5	4	4	6	5	4	4	5	4	4	5	6	5	5	3	5	4	5			
Dissolved Sodium	mg/L	18	11	18	17	19	18	18	15	16	19	17	17	14	18	15	14	16	20	16	16	11	18	16	14			300
Dissolved Potassium	mg/L	2.00	6.00	2.00	6.00	3.00	2.00	2.00	4.00	<1	9.00	1.00	7.00	5.00	1.00	2.00	5.00	2	2.00	13.00	17.00	13.00	6.00	2.00	6.00			
Total Ammonia (as N)	mg/L	**1.08**	**0.41**	**1.36**	**0.02**	**0.18**	**0.76**	**0.76**	**0.10**	**0.04**	**0.23**	**0.11**	<0.01	<0.01	**0.14**	**0.12**	**0.11**	**0.16**	**0.17**	**0.41**	**1.49**	**1.24**	<0.01	**0.14**	**0.12**	0.9	0.02	0.02
Nitrate (as N)	mg/L	**1.93**	**1.21**	**2.45**	**1.17**	**1.09**	**2.4**	**2.32**	**1.26**	**1.33**	**0.31**	<0.01	**0.81**	**0.57**	0.03	<0.01	**1.38**	**2.05**	**1.15**	<0.01	**1.17**	**0.38**	0.02	**0.85**	**1.96**	0.7	0.04	0.7
Nitrite (as N)	mg/L	0.01	0.02	0.02	0.01	0.02	0.01	0.02	0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.01	0.02	<0.01	0.11	0.04	<0.01	0.02	,		0.04	1.0
Nitrite + Nitrate	mg/L	1.9	1.2	2.5	1.2	1.1	2.4	2.3	1.3	1.33	0.32	<0.01	0.81	0.57	0.03	<0.01	1.4	2.1	1.2	<0.01	1.3	0.42	0.02	0.87	2			
Total Kjeldahl Nitrogen as N	mg/L	1.1	1.2	1.8	0.4	0.9	1.3	0.9	0.6	0.2	1.1	0.4	0.3	0.5	0.5	0.2	0.50	0.5	0.6	1.2	3	2.8	0.6	0.3	0.9			
Organic Nitrogen (calculated)	mg/L	0.02	0.76	0.47	0.4	0.71	0.53	0.14	0.5	0.13	0.85	0.29	0.29	0.53	0.33	-0.12	0.39	0.38	0.46	0.79	1.53	1.54	0.575	0.16	0.78			
Nitrogen (Total)	mg/L	**3.0**	**2.4**	**4.3**	**1.6**	**2.0**	**3.7**	**3.2**	**1.9**	**1.5**	**1.4**	0.4	**1.1**	**1.1**	0.5	0.2	**1.9**	**2.6**	**1.8**	**1.2**	**4.3**	**3.2**	**0.6**	**1.2**	**2.9**		0.5	0.5
Phosphorus (Total)	mg/L	<0.01	**0.2**	0.02	<0.01	**0.08**	<0.01	<0.01	0.04	<0.01	**0.06**	0.01	0.01	0.04	0.01	<0.01	0.04	<0.01	0.03	**0.06**	**0.38**	**0.28**	0.03	<0.01	0.04		0.05	0.05
Total Aluminium	mg/L	0.03	**2.3**	0.01	<0.01	**0.54**	<0.01	0.01	**1.86**	0.03	0.05	0.02	**0.33**	**0.25**	<0.01	0.03	**1.69**	**0.11**	**0.06**	**0.11**	**4.56**	**4.33**	0.02	**0.27**	**0.96**	0.055		0.2
Total Arsenic	mg/L	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.024		
Total Cadmium	mg/L	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002		0.005
Total Chromium	mg/L	<0.001	0.005	<0.001	<0.001	0.003	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	**0.013**	**0.012**	<0.001	<0.001	0.002	0.001 (Cr VI)		0.005
Total Copper	mg/L	<0.001	**0.011**	<0.001	0.001	0.004	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	**0.006**	0.004	<0.001	<0.001	0.001	0.0014		0.001
Total Iron	mg/L	**3.89**	**4.4**	**3.95**	<0.05	**2.62**	0.25	**2.85**	**3.28**	**1.22**	**5.35**	**6.67**	<0.05	**4.51**	0.26	**5.48**	**2.92**	0.45	0.42	**4.56**	0.1	**10.6**	**1.38**	**1.38**	**1.49**			1.0
Total Lead	mg/L	<0.001	**0.011**	<0.001	<0.001	0.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0034		0.004
Total Manganese	mg/L	0.792	0.404	0.896	0.274	0.361	1	0.926	0.324	0.148	1.15	1.54	0.258	0.71	**3.28**	0.878	0.301	0.047	0.042	1.16	0.666	0.5	0.297	0.17	0.164	1.9		1.9
Total Nickel	mg/L	0.007	0.007	0.008	0.001	0.003	0.008	0.007	0.004	<0.001	0.002	<0.001	0.001	0.002	<0.001	<0.001	0.004	<0.001	<0.001	0.002	**0.012**	0.011	<0.001	<0.001	0.003	0.011		0.011
Total Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.005		
Total Tin	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001			
Total Zinc	mg/L	<0.005	**0.035**	0.006	<0.005	**0.013**	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.02**	0.008	<0.005	<0.005	0.006	0.008		0.008
Dissolved Iron	mg/L	3.79	0.07	3.4	<0.05	----	0.15	2.46	0.13	0.63	2.82	1.37	<0.05	----	0.15	1.11	0.14	0.06	<0.05	0.57	0.1	----	0.44	0.06	0.05			
Dissolved Organic Carbon	mg/L	12	27	6	12	14.7	2.1	4.8	4.9	14	14	6	7	7.1	6.3	6.2	3.4	29	28	9	20	11.8	13.4	2.8	9.6			
Chemical Oxygen Demand	mg/L	<10	33	<10	<10	12	<10	<10	31	<10	16	<10	<10	26	<10	<10	29	12	12	16	62	17	14	<10	14			
Total Coliforms	MPN /100mL	----	----	----	----	----	0	----	0	----	----	----	----	----	0	----	0	----	----	----	----	----	0	----	0	1,000		

3.1.2 Nutrients

Total Nitrogen (TN) - within the historic range. TN was in exceedance of the ANZECC & ARMCANZ (2000) stressor (0.5 mg/L) at all surface water locations sampled throughout the reporting period, except for SW03 in January and April 2023 (Table 2). SW02 and SW03 were marginally above the long-term (since October 2017) mean TN concentrations during the current reporting period. SW01 was approximately equal to the long-term mean.

TN was variable across the watercourse and variably increased or decreased from inlet to outlet.

Total ammonia - In exceedance at SW01, SW02, and SW03. The total ammonia (as N) concentration exceeded the BCC Trigger Value of 0.02 mg/L at all of the monitoring locations on all sampling events (except October 2022 at SW03, and January 2023 at SW02) and, in one instance, SW02 exceeded the ANZECC & ARMCANZ trigger value of 0.9 mg/L for toxicants in October 2022 (Table 2). Ammonia was reduced at SW02 from the historic peak (1.49 mg/L) which was recorded in July 2022, with the value falling to 0.005 mg/L in January 2023 and remaining within the typical range of values for the remainder of the reporting period. SW01 and SW03 were within the expected range of values during the reporting period.

When ammonia concentrations are elevated at the inlet (above approximately 1.0 mg/L), nitrification lead to a reduction in ammonia at the outlet and an increase in nitrate concentrations. This does not occur under low ammonia conditions.

Nitrate - In exceedance at SW01, SW02, and SW03. Nitrate concentrations exceeded the ANZECC & ARMCANZ / BCC trigger value (0.7 mg/L) in more than half of the instances during this reporting period and within the expected range (Table 2).

Nitrite - Below, or equal to, trigger values at the three surface water locations sampled.

Total Phosphorus (TP) - In exceedance at SW01 and SW02. TP was above the trigger value (0.05 mg/L) in two instances during this reporting period (October 2022 at SW01 and SW02). TP reduced from the inlet (SW02) to outlet (SW01) in October 2022.

Overall, SW02 (upstream) would receive elevated concentrations of nutrients from the agricultural catchment. These nutrient concentrations would typically reduce at SW03 (midpoint), before increasing again at SW01.

3.1.3 Metal / Metalloids

Consistent with previous reporting periods, SW02 (upstream) had the highest concentrations of metals.

Total Zinc - In exceedance at SW01. Total Zn was in exceedance of the adopted trigger value (0.008 mg/L) in October 2022, having marginally increased from the upgradient location SW02 (Table 2). Within the expected range.

Total Chromium and **total Manganese - In exceedance at SW02 and SW03.** Total Cr and total Mn were in exceedance in only one sampling event in this reporting period (at SW02 in October 2022 and

at SW03 in January 2023, respectively). Total Cr is typically at, or below, the limit of reporting for all three surface water locations. In July 2023, total Cr was slightly elevated at all three surface water locations, although below the BCC Trigger Value. Total Mn was within the expected range during the reporting period.

Total Copper, Lead and Nickel - Below, or equal to, trigger values at the three surface water locations sampled. Total Cu, Pb and Ni did not exceed the trigger values during this reporting period (Table 2).

Total Aluminium - In exceedance at SW01, SW02, and SW03. Total Al was in exceedance of the ANZECC & ARMCANZ (2000) toxicant value at all three sampling sites (Table 2). Site SW02 presented all but one sampling event higher than the trigger value. At SW02, one sampling event (October 2022) was 3 times higher than average since October 2021, however, the following sampling event (January 2023) had the lowest value recorded which was also under the trigger value. Findings are in line with previous reporting periods.

Total Iron - In exceedance at SW01, SW02, and SW03. Total Fe was in exceedance of the BCC trigger value at all sampling events except for January 2023 at SW01 and SW03 (downgradient). The highest sampling event was recorded in October 2022 at the upgradient site SW02 (Table 2), however, they were all within the historical range.

The difference in water quality between the SW01 location compared to the SW02 and SW03 locations highlights the different catchment areas and stormwater sources. The SW02 and SW03 locations predominantly receive agricultural runoff and runoff from grassed and earthen areas within the Site, whilst SW01 receives both the flows from SW02 and SW03 as well as hardstand runoff from the roads associated with the Resource Recovery Centre area of the Site.

3.1.4 Microbiological Parameters

The fraction of faecal coliforms dropped compared to the previous reporting period with only SW01 exceeding the 1,000 CFU/100mL trigger value in October 2022 (Table 2). Although it was registered an improvement from the last reporting period, over the Site's history total coliforms have fluctuated drastically with no emergent trends.

3.2 GROUNDWATER QUALITY RESULTS

Groundwater quality laboratory data is shown in Table 3 with parameters that exceeded the ANZECC guidelines highlighted in orange. Exceedances for this reporting period included nitrate, aluminium, chromium, copper, nickel, and zinc. This is the same pattern as the previous reporting period.

3.2.1 Nutrients

Nitrate - In exceedance at GW01, GW02, and GW03. Nitrate was the only form of nitrogen in groundwater to exceed the ANZECC trigger values during the reporting period and was elevated in all groundwater sampling locations and all monitoring events (Table 3). Nitrate concentrations were highest upgradient GW03 (mean = 7.19 mg/L) and lowest downgradient GW01 (mean = 1.63 mg/L), indicative of an off-site (agricultural) source.

Table 3. Groundwater quality laboratory analytical results.

Groundwater Quality																									
Sampling location ID		**GW01**								**GW02**								**GW03**							ANZECC (2000) Toxicants
Hydraulic location		**Hydraulic low point of the Site (downgradient)**								**Between GW03 and GW01, closer to GW01**								**Hydraulic high point of the Site (upgradient)**							
Sampling event (Quarterly)		**Oct-21**	**Jan-22**	**Apr-22**	**Jul-22**	**Oct-22**	**Jan-23**	**Apr-23**	**Jul-23**	**Oct-21**	**Jan-22**	**Apr-22**	**Jul-22**	**Oct-22**	**Jan-23**	**Apr-23**	**Jul-23**	**Oct-21**	**Jan-22**	**Apr-22**	**Jul-22**	**Oct-22**	**Jan-23**	**Apr-23**	**Jul-23**	
Analyte	**Units**																								
pH (laboratory)	-	7.16	6.94	7.34	7.06	7.04	7.00	7.04	7.84	5.75	6.69	6.04	6.07	6.12	5.67	6.27	6.54	5.71	5.88	6.03	5.80	5.69	5.75	6.05	6.52	
pH (field)	-	7.60	6.64	6.77	(blank)	6.98	7.11	7.51	6.77	6.52	6.95	5.47	6.5	6.20	5.55	6.48	----	6.73	5.59	6.01	5.88	5.88	5.85	5.49	----	
Temperature	ºC	14.7	16.1	15.0	13.3	15.0	16.8	14.7	12.2	14.5	20.4	15.0	14.8	14.3	15.1	15.1	----	13.9	15.8	13.3	13.0	13.4	13.5	14.7	----	
Dissolved Oxygen	mg/L	2.07	1.76	1.79	2.40	5.91	2.43	3.84	1.58	4.81	6.03	3.74	5.59	7.48	4.41	5.29	----	8.45	7.95	8.41	7.90	7.36	8.61	7.12	----	
Dissolved Oxygen saturation	%	20.40	17.70	17.60	23.00	58.70	24.70	38.30	14.70	47.38	68.07	37.63	55.47	72.90	44.20	53.20	----	82.65	79.60	81.77	75.87	70.50	82.80	69.80	----	
Electrical Conductivity (field)	µS/cm	570	417	219	402	415	320	603	587	111	123	87	109	93	73	179	----	168	114	112	123	124	91	226	----	
Electrical Conductivity (laboratory)	µS/cm	509	525	516	495	500	520	493	484	111	139	104	120	107	107	101	100	158	149	145	175	144	148	139	141	
Salinity (field)	ppt	0.28	0.24	0.13	0.25	0.25	0.19	0.37	0.38	0.05	0.06	0.05	----	0.06	0.04	0.08	----	0.08	0.07	0.07	----	0.08	0.05	0.11	----	
Total Dissolved Solids (field)	mg/L	376	331	179	340	339	267	495	515	74	89	71	89	77	59	145	----	111	95	95	105	105	77	149	----	
Total Dissolved Solids (laboratory)	mg/L	295	292	322	281	272	293	312	367	74	92	52	96	69	73	74	145	110	92	103	112	96	101	84	171	
Oxidation Reduction Potential	mV	----	112	-4.3	248	195	284	45	7.6	----	97.1	-13.3	295	184	302	106	7.49	----	106	32.4	335	187	306	126	7.07	
Alkalinity (Total)	mg $CaCO_3$/L	176	155	191	162	----	170	----	171	8	32	8	14	----	----	----	----	4	5	5	5	----	----	----	----	
Alkalinity (Bicarbonate)	mg/L	176	155	191	162	----	170	----	171	8	32	8	14	----	----	----	----	4	5	5	5	----	----	----	----	
Alkalinity (Carbonate)	mg/L	<1	<1	<1	<1	----	<1	----	<1	<1	<1	<1	<1	----	----	----	----	<1	<1	<1	<1	----	----	----	----	
Alkalinity (Hydroxide)	mg/L	<1	<1	<1	<1	----	<1	----	<1	<1	<1	<1	<1	----	----	----	----	<1	<1	<1	<1	----	----	----	----	
Chloride	mg/L	46	52	46	46	48	47	50	44	25	4	15	14	----	----	----	----	18	17	17	14	----	----	----	----	
Sulfate	mg/L	3	3	3	3	3	2	3	3	4	16	2	3	3	<1	2	2	2	1	1	1	2	1	2	1	
Dissolved Calcium	mg/L	35	43	44	35	35	37	36	36	2	10	2	4	4	2	2	3	2	3	3	3	5	3	3	3	
Dissolved Magnesium	mg/L	24	26	27	26	23	25	24	27	3	3	3	4	3	3	3	4	4	4	4	4	5	4	4	5	
Dissolved Sodium	mg/L	24	28	24	25	23	25	23	24	10	14	11	11	9	11	10	10	14	19	14	15	15	15	14	14	
Dissolved Potassium	mg/L	3	4	4	4	4	4	4	3	<1	4	<1	1	2	<1	<1	<1	2	2	2	2	2	2	2	2	
Total Ammonia (as N)	mg/L	0.02	0.05	0.07	<0.01	<0.01	0.06	<0.01	0.02	0.04	0.03	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	0.07	0.15	<0.01	<0.01	0.08	<0.01	<0.01	0.9
Nitrate (as N)	mg/L	**2.04**	**1.66**	**1.76**	**1.77**	**1.75**	**1.62**	**1.51**	**1.62**	**3.47**	**1.42**	**3.13**	**2.33**	**2.09**	**3.03**	**2.84**	**2.78**	**8.18**	**6.95**	**7.12**	**7.02**	**7.39**	**7.19**	**7.01**	**7.17**	0.7
Nitrite (as N)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Nitrite + Nitrate	mg/L	2.04	1.66	1.76	1.77	1.75	1.62	1.51	1.62	3.47	1.42	3.13	2.33	2.09	3.03	2.84	2.78	8.18	6.95	7.12	7.02	7.39	7.19	7.01	7.17	
Total Kjeldahl Nitrogen as N	mg/L	0.4	0.3	0.3	0.2	0.4	0.6	0.4	0.3	0.7	1	0.5	0.2	0.3	0.7	0.5	0.6	0.8	0.8	0.7	0.5	0.8	0.8	0.6	1.2	
Organic Nitrogen (Calculated)	mg/L	0.34	0.34	0.34	0.23	0.45	0.52	0.395	----	0.69	0.98	0.47	0.17	0.31	0.665	0.495	----	0.78	0.85	0.68	0.48	0.81	0.73	0.595	----	
Nitrogen (Total)	mg/L	2.4	2.0	2.1	2.0	2.2	2.2	1.9	1.9	4.2	2.4	3.6	2.5	2.4	3.7	3.3	3.4	9.0	7.8	7.8	7.5	8.2	8.0	7.6	8.4	
Phosphorus (Total)	mg/L	0.08	0.12	0.06	0.09	0.14	0.12	0.16	0.11	<0.01	0.09	0.02	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.03	0.03	0.02	0.02	0.04	<0.01	<0.01	
Total Aluminium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.090**	**0.660**	**0.210**	**0.570**	**0.240**	**0.060**	**0.310**	**0.180**	**0.100**	**0.290**	**0.170**	**0.820**	**0.120**	0.040	**0.060**	0.020	0.055
Total Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.024
Total Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	**0.0002**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
Total Chromium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	**0.002**	<0.001	<0.001	<0.001	<0.001	**0.003**	**0.003**	**0.003**	**0.006**	**0.003**	**0.002**	**0.002**	**0.002**	0.001 (Cr VI)
Total Copper	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.008**	<0.001	**0.003**	**0.002**	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	**0.003**	<0.001	<0.001	<0.001	<0.001	0.0014
Total Iron	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.09	0.68	0.26	<0.05	0.23	<0.05	0.44	0.16	0.15	0.48	0.22	<0.05	0.15	<0.05	0.11	<0.05	
Total Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.0034
Total Manganese	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.02	0.014	0.033	0.027	0.009	0.028	0.039	0.018	0.006	0.013	0.007	0.019	0.005	0.005	0.005	0.003	1.9
Total Nickel	mg/L	0.002	0.002	0.001	0.002	0.002	0.002	0.001	<0.001	0.010	0.005	0.010	0.009	0.006	0.009	0.010	0.009	**0.011**	**0.013**	**0.012**	**0.013**	**0.011**	**0.012**	**0.011**	**0.012**	0.011
Total Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.005
Total Tin	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.003	<0.001	
Total Zinc	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.011**	**0.015**	**0.013**	**0.026**	**0.009**	**0.092**	**0.018**	**0.018**	**0.016**	**0.022**	0.007	**0.033**	**0.01**	**0.025**	0.006	**0.012**	0.008
Dissolved Aluminium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.03	0.03	0.02	0.03	0.040	0.030	0.030	0.02	<0.01	0.01	0.01	**0.06**	0.010	<0.01	<0.01	0.055
Dissolved Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.024
Dissolved Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
Dissolved Trivalent Chromium	mg/L	<0.01	<0.001	<0.01	<0.001	<0.001	----	<0.01	<0.01	<0.01	<0.001	<0.01	<0.001	<0.001	----	<0.01	<0.01	<0.01	0.002	<0.01	0.002	0.002	----	<0.01	<0.01	
Dissolved Hexavalent Chromium	mg/L	<0.01	<0.001	<0.01	<0.001	<0.01	----	<0.01	<0.01	<0.01	<0.001	<0.01	<0.001	<0.01	----	<0.01	<0.01	<0.01	<0.001	<0.01	<0.001	<0.01	----	<0.01	<0.01	0.001
Dissolved Copper	mg/L	**0.003**	<0.001	<0.001	<0.001	0.001	**0.002**	**0.002**	<0.001	<0.001	**0.008**	0.001	**0.002**	**0.002**	0.001	**0.002**	<0.001	0.001	<0.001	0.001	**0.002**	<0.001	**0.005**	0.001	0.001	0.0014
Dissolved Iron	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.23	<0.05	<0.05	<0.05	
Dissolved Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0034
Dissolved Manganese	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.019	0.002	0.022	0.015	0.007	0.021	0.019	0.015	0.004	0.006	0.004	0.003	0.092	0.003	0.003	0.005	1.9
Dissolved Nickel	mg/L	0.002	0.002	0.001	0.002	0.002	0.002	0.002	<0.001	0.007	0.003	0.010	0.008	0.005	0.010	0.010	0.008	**0.011**	0.010	**0.011**	**0.011**	0.010	**0.012**	**0.012**	0.010	0.011
Dissolved Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.005
Dissolved Tin	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	
Dissolved Zinc	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.008**	<0.005	**0.02**	**0.014**	**0.008**	**0.022**	**0.012**	**0.012**	**0.013**	**0.008**	0.007	**0.011**	**0.008**	**0.014**	**0.01**	**0.018**	0.008
Dissolved Organic Carbon	mg/L	----	19.9	13.2	1.5	12.7	7.3	5.8	6.8	19	26	5	6	13	18	7	14	9	2	25	4	21	12	7	5	
Chemical Oxygen Demand	mg/L	<10	<10	<10	<10	<10	<10	<10	<10	<10	60	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	

3.2.2 Metal / metalloids

Aluminium, Chromium, Copper, Nickel and Zinc - In exceedance at GW01, GW02, and GW03. Metal exceedances above the adopted trigger values occurred for aluminium, chromium, copper, nickel and zinc parameters in the upgradient bore (GW03; Table 3). GW02 showed a similar metal profile to GW03, albeit generally reduced in concentration, but still with exceedances for total aluminium, copper, zinc, and dissolved copper and zinc. Only two exceedances (dissolved copper in January and April 2023) were recorded at the downgradient bore (GW01). However, the concentration of copper decreased in July 2023 under the trigger value, so it is not of concern.

The decrease in metals / metalloid concentrations in groundwater from up-gradient to down-gradient is consistent with an off-site source of contamination.

3.3 LEACHATE QUALITY RESULTS

The laboratory data for the Stage 2 landfill leachate quality is shown in Table 4, and has been compared to the Water and Sewerage Guidelines Schedule 3. The use of this guideline is considered appropriate as leachate from the L02 sample location is sent to the sewerage system for treatment.

In general, the water quality at L02 is of acceptable quality when compared to the Water and Sewerage Guidelines, except for the exceedances listed below:

Total Iron - In exceedance at in October 2022. In October 2022, the total Fe trigger value (100 mg/L) was exceeded at 174 mg/L (Table 4). This is unusual as L02 is reliably compliant with the adopted guideline values and corresponds with a spike in TSS during the sampling event.

Total Suspended Solid - In exceedance in October 2022 and July 2023. TSS was marginally above the Guideline value in October 2022, although within the BCC expected values (Table 4). In July 2023 all analytes were once again compliant with the Guideline values except for TSS at 2,950 mg/L (Table 4). It is unclear what the cause of this spike was. There were no major rainfall events in the lead up to the sampling event and all other analytes were within or below the BCC expected range. Field observations at L02 in July 2023 reported an orange sediment and slight odour, which are typical observations for the location.

TSS is typically at very low concentrations (mean = 70 mg/L from October 2017 - April 2023). The latest result is anomalous and if the high concentrations persist, further investigation will be warranted.

Overall, the quality of water at L02 is not of concern with the majority of analytes falling below the Guideline limits.

Table 4. Leachate quality laboratory analytical results

Leachate Quality											
Location		**L02**								Water and Sewerage Guidelines Schedule 3	BCC Expected Values (L02)
Sampling event (Quarterly)		**Oct-21**	**Jan-22**	**Apr-22**	**Jul-22**	**Oct-22**	**Jan-23**	**Apr-23**	**Jul-23**		
Analyte	**Units**										
pH (laboratory)	-	6.95	6.55	7.25	6.86	6.7	6.76	7.15	7.65	6.0 - 10.0	4.5 - 7.5
pH (field)	-	7.58	6.27	6.58	6.6	6.65	6.47	6.52	6.54		
Temperature	ºC	16.8	18.9	15.1	11.2	14.6	16.7	16.9	11		
Dissolved oxygen	mg/L	4.48	3.86	4.89	6.78	9.42	3.86	4.37	5.02		
Dissolved oxygen saturation	%	46.4	41.6	48.6	62.7	92.4	40.0	45.2	46.3		
Electrical Conductivity (field)	µS/cm	385.2	278.3	476.5	236.0	19.0	692.0	615.0	634.0		
Electrical Conductivity (laboratory)	µS/cm	544	356	555	542	514	587	499	556		
Salinity	ppt	0.19	0.15	0.29	32	0.01	0.41	0.36	0.42		
Total Dissolved Solids (field)	mg/L	255.42	207.9	388.08	211.86	15.84	541.2	481.8	561		
Total Dissolved Solids (laboratory)	mg/L	266	201	262	373	206	270	240	374	10,000	
Total Suspended Solids	mg/L	36	211	85	32	**653**	57	30	**2950**	600	200 - 2,000
Oxidation Reduction Potential	mV	----	113.0	-12.4	310.0	198.0	294.0	52.5	7.3		
Alkalinity (Total)	mg $CaCO_3$/L	203	90	181	175	171	182	160	186		1000 - 10,000
Alkalinity (Bicarbonate)	mg/L	203	90	181	175	171	182	160	186		
Alkalinity (Carbonate)	mg/L	<1	<1	<1	<1	<1	<1	<1	<1		
Alkalinity (Hydroxide)	mg/L	<1	<1	<1	<1	<1	<1	<1	<1		
Chloride	mg/L	39	34	52	45	36	48	52	47		200 - 3,000
Sulfate	mg/L	9	14	9	13	10	6	8	16	1,500	50 - 1,000
Cyanide Total	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004	----	<0.004	----	5	
Dissolved Calcium	mg/L	38	22	26	29	----	31	16	32		
Dissolved Magnesium *	mg/L	10	9	12	13	----	11	10	14		50 - 1,500 (total)
Dissolved Sodium *	mg/L	30	26	42	39	----	36	37	37		200 - 2500
Dissolved Potassium *	mg/L	12	14	16	15	----	14	12	15		200 - 1,000 (total)
Ammonia (As N)	mg/L	10.9	5.16	10.7	12.8	13.7	14.6	14.5	11.6	100	10 - 800
Nitrate (As N)	mg/L	0.4	0.47	0.13	0.55	0.32	0.46	1.12	0.49		
Nitrite (As N)	mg/L	0.01	0.03	0.07	<0.01	0.02	0.03	0.01	0.02		5 - 40
Nitrite + Nitrate	mg/L	0.41	0.5	0.2	0.55	0.34	0.49	1.13	0.51		
Total Kjeldahl Nitrogen As N	mg/L	10.5	5.8	15.7	13.1	15.1	15.2	15.5	11.8		
Organic Nitrogen (Calculated)	mg/L	10.49	0	0	0.25	1.36	0.61	1	----		
Nitrogen (Total)	mg/L	10.9	6.3	15.9	13.6	15.4	15.7	16.63	12.3		10 - 800
Phosphorus (Total)	mg/L	0.03	0.61	1.06	0.25	0.11	0.19	<0.01	0.84	50	5 - 1,000
Total Aluminium	mg/L	0.04	6.06	1.07	0.37	11.8	<0.01	0.06	20.8	100	
Total Arsenic	mg/L	0.002	0.004	0.022	0.002	0.013	<0.001	0.001	0.003		
Total Cadmium	mg/L	0.0001	0.0002	0.0001	<0.0001	0.0006	<0.0001	<0.0001	0.0002	2	
Total Chromium	mg/L	<0.001	0.019	0.009	0.002	0.045	<0.001	<0.001	0.058	10	
Total Copper	mg/L	<0.001	0.026	0.006	0.005	0.068	<0.001	<0.001	0.024	10	
Total Iron	mg/L	19.1	71.9	**189**	34.8	**174**	27	13.6	44.6	100	50 -1,200
Total Lead	mg/L	<0.001	0.037	0.014	0.004	0.105	<0.001	0.001	0.009	10	
Total Manganese	mg/L	1.74	1.48	2.31	2.22	2.71	2.19	1.37	3.7	10	
Total Nickel	mg/L	0.004	0.024	0.012	0.006	0.043	0.004	0.004	0.042	10	
Total Selenium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Total Tin	mg/L	0.002	0.003	0.002	<0.001	0.003	<0.001	<0.001	<0.001		
Total Zinc	mg/L	0.02	0.206	0.192	0.039	0.558	0.01	0.044	0.11	10	
Dissolved Iron	mg/L	17.5	6.21	4.7	<0.05	----	22.2	4.58	10		
Dissolved Trivalent Chromium	mg/L	----	----	----	----	----	----	----	<0.01		
Dissolved Hexavalent Chromium	mg/L	----	----	----	----	----	----	----	<0.01		
Dissolved Organic Carbon	mg/L	16	21	20	15	9.5	37.4	9.7	9		
Chemical Oxygen Demand	mg/L	<10	205	200	38	<10	29	15	143	1500	3,000 - 6,000
Total Coliforms	CFU / 100 mL	1	16000	46000	83	98	24000	<10	1300		

3.4 GROUNDWATER LEVELS (CONDITION M1 2)

The EPN 9161/2 requires monitoring of groundwater levels at the GW02 and GW03 locations. Groundwater levels were obtained using an electronic groundwater dipper immediately before collecting the water quality samples. The results of the groundwater level measurements are presented in

Figure 2 while tabulated data are contained in Appendix . Groundwater level data before October 2017 have been provided by BCC.

The groundwater levels measured during this reporting period were generally consistent with the historical groundwater levels and well within the expected range as shown in

Figure 2. Groundwater levels fluctuate seasonally, decreasing during summer and autumn (January and April) before increasing in winter and spring (July and October. This pattern followed the expected seasonal trends typical of a superficial aquifer, where infiltration of rainfall increases the groundwater level, and a decline in groundwater level coincides with a relative absence of rainfall. The average groundwater level has increased marginally at both GW02 and GW03 since 2007, while the variability between sampling events (standard deviation) is decreasing (

Figure 2)

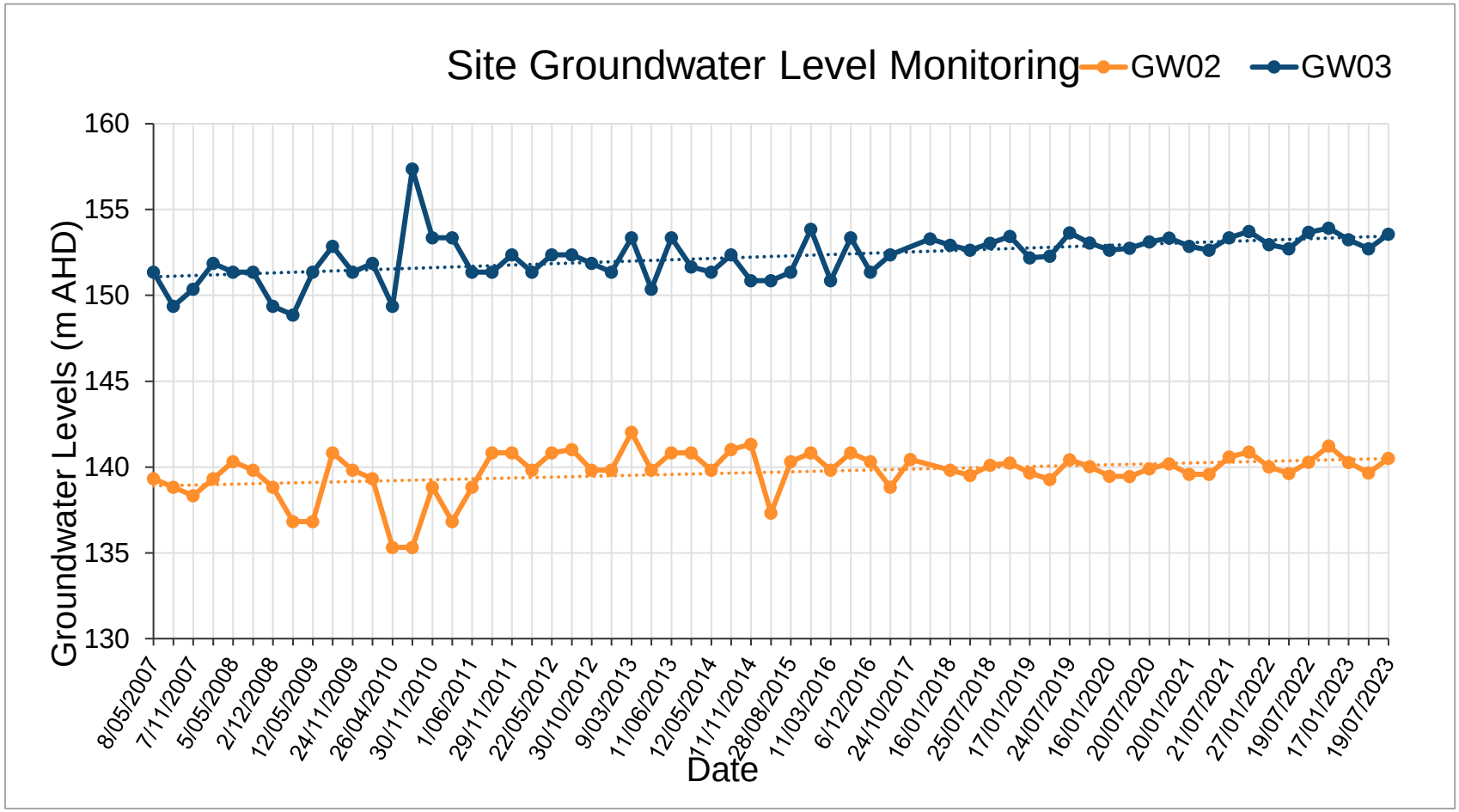


Figure 2. Groundwater levels in mAHD for GW02 and GW03 locations.

4.0 ENVIRONMENTAL PERFORMANCE

4.1 PUBLIC COMPLAINTS (EPN CONDITION G5 1.2)

No public complaints were received during the reporting period.

4.2 DETAILS OF INCIDENTS OR NON-COMPLIANCE WITH THE EPN (EPN CONDITION G5 1.3)

No environmental incidents occurred during the reporting period.

4.3 SUMMARY OF THE POST CLOSURE MAINTENANCE PROGRAM (EPN CONDITION G5 1.5)

A summary of the post closure maintenance program is provided in previous Annual Reports.

4.4 SUMMARY OF COMMUNITY CONSULTATION / COMMUNICATION (CONDITION G5 1.7)

No community consultation or communication was required or conducted during the reporting period.

5.0 CONCLUSIONS & RECOMMENDATIONS

5.1 CONCLUSIONS

Surface water quality is characterised by multiple exceedances of the adopted trigger values of nutrients (mainly ammonia and nitrate) and metals; however, the source appears to be predominantly from the wider agricultural catchment and not from within the site. Most parameters have considerable variation in magnitude and between monitoring locations and events. SW01 at the discharge point typically has higher levels of nitrate and ammonia than the other two sampling locations. Iron concentrations are consistently elevated at all locations, while aluminium is persistent at SW02. While all concentrations are within their historical norm, nitrogen reduction and iron reduction strategies should be considered across the Site and catchment in general.

Groundwater quality is the poorest at the upgradient sampling location (GW03), which had nitrate and metal exceedances, and steadily improves in quality downgradient (GW01). GW01 was essentially free of exceedances. Upstream abatement or increased stewardship of nitrogen-based fertiliser application would be key to reducing the highly mobile nitrates from entering the Site's groundwater.

An anomalously high TSS value at L02 will be further investigated if the concentration remains elevated in future sampling events.

5.2 RECOMMENDATIONS

1. Improve areas adjacent to the Site's watercourse and the watercourse itself using stormwater management/treatment techniques to consistently improve the surface water quality across the Site before discharge to the environment.

2. Closely monitor water quality at L02 to assess if elevated TSS and iron levels persist.

REFERENCES

Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand (2000). National Water Quality Management Strategy No. 7 – Australian Guidelines for Water Quality Monitoring and Reporting.

Australian/New Zealand Standard (AS/NZS 5667.1:1998). Water Quality – Sampling: Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.

Environmental Service & Design (2011). Burnie Waste Management Centre Quarterly Water Monitoring Report. May 2011.

Syrinx Environmental (2022). Site EPN 9161/2 Annual Environmental Review August 2021 – July 2022

Water and Sewerage Industry (General) Regulations (2009).

APPENDICES

APPENDIX 1 ENVIRONMENTAL PROTECTION NOTICE 9161/2

APPENDIX 2 LABORATORY ANALYTICAL DATA

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2300618**	Page	: 1 of 8
Client	: **SYRINX ENVIRONMENTAL PL**	Laboratory	: Environmental Division Melbourne
Contact	: ERICA	Contact	: Hannah White
Address	: 76 YORK STREET LAUNCESTON TAS	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +61-3-8549 9600
Project	: 22054	Date Samples Received	: 18-Jan-2023 11:25
Order number	: ----	Date Analysis Commenced	: 18-Jan-2023
C-O-C number	: ----	Issue Date	: 30-Jan-2023 13:58
Sampler	: Syrinx		
Site	: ----		
Quote number	: ME-495-22		
No. of samples received	: 8		
No. of samples analysed	: 8		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Arenie Vijayaratnam	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Laboratory Coordinator	WRG Subcontracting, Springvale, VIC
Jarwis Nheu	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- E.coli and Faecal Coliforms by MPN (MM301) is conducted by ALS Scoresby NATA accreditation no. 992, site no. 989.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- EG020-T : EM2300620 #6 Poor duplicate precision for total metals due to sample matrix. Confirmed by re-digestion and re-analysis.
- ED093F : EM2300618 #4 results for dissolved cations have been confirmed by re-preparation and re-analysis.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium, sodium and iron for sample #4.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SW01	SW02	SW03	L02	GW01
			Sampling date / time	17-Jan-2023 10:00	17-Jan-2023 10:40	17-Jan-2023 10:30	17-Jan-2023 11:10	17-Jan-2023 09:55
Compound	CAS Number	LOR	Unit	EM2300618-001	EM2300618-002	EM2300618-003	EM2300618-004	EM2300618-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.84	7.04	6.83	6.76	7.00
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	180	180	176	587	520
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	125	112	94	270	293
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	1	mg/L	10	15	22	57	2
EA075: Redox Potential								
Redox Potential	----	0.1	mV	279	279	272	294	284
pH Redox	----	0.01	pH Unit	6.84	7.04	6.83	6.74	7.00
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	26	55	56	182	170
Total Alkalinity as CaCO3	----	1	mg/L	26	55	56	182	170
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5	2	2	6	2
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	21	18	19	48	47
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	4	7	6	31	37
Magnesium	7439-95-4	1	mg/L	5	5	5	11	25
Sodium	7440-23-5	1	mg/L	18	18	18	36	25
Potassium	7440-09-7	1	mg/L	2	6	1	14	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	----	----	----	----	<0.01
Arsenic	7440-38-2	0.001	mg/L	----	----	----	----	<0.001
Cadmium	7440-43-9	0.0001	mg/L	----	----	----	----	<0.0001
Chromium	7440-47-3	0.001	mg/L	----	----	----	----	<0.001
Copper	7440-50-8	0.001	mg/L	----	----	----	----	0.002
Lead	7439-92-1	0.001	mg/L	----	----	----	----	<0.001
Manganese	7439-96-5	0.001	mg/L	----	----	----	----	<0.001
Nickel	7440-02-0	0.001	mg/L	----	----	----	----	0.002
Selenium	7782-49-2	0.01	mg/L	----	----	----	----	<0.01

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SW01	SW02	SW03	L02	GW01
			Sampling date / time	17-Jan-2023 10:00	17-Jan-2023 10:40	17-Jan-2023 10:30	17-Jan-2023 11:10	17-Jan-2023 09:55
Compound	CAS Number	LOR	Unit	EM2300618-001	EM2300618-002	EM2300618-003	EM2300618-004	EM2300618-005
				Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued								
Tin	7440-31-5	0.001	mg/L	----	----	----	----	<0.001
Zinc	7440-66-6	0.005	mg/L	----	----	----	----	<0.005
Iron	7439-89-6	0.05	mg/L	**0.15**	**0.44**	**0.15**	**22.2**	<0.05
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	<0.01	**0.02**	<0.01	<0.01	<0.01
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**1.00**	**0.297**	**3.28**	**2.19**	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.008**	<0.001	<0.001	**0.004**	**0.002**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	**0.010**	<0.005
Iron	7439-89-6	0.05	mg/L	**0.25**	**1.38**	**0.26**	**27.0**	<0.05
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	----	----	----	<0.0001
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	----	----	----	----	<0.0001
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.76**	<0.01	**0.14**	**14.6**	**0.06**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.01**	<0.01	<0.01	**0.03**	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**2.40**	**0.02**	**0.03**	**0.46**	**1.62**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**2.41**	**0.02**	**0.03**	**0.49**	**1.62**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.3**	**0.6**	**0.5**	**15.2**	**0.6**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**3.7**	**0.6**	**0.5**	**15.7**	**2.2**
EK067G: Total Phosphorus as P by Discrete Analyser								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	SW01	SW02	SW03	L02	GW01
				Sampling date / time	17-Jan-2023 10:00	17-Jan-2023 10:40	17-Jan-2023 10:30	17-Jan-2023 11:10	17-Jan-2023 09:55
					EM2300618-001	EM2300618-002	EM2300618-003	EM2300618-004	EM2300618-005
					Result	Result	Result	Result	Result
EK067G: Total Phosphorus as P by Discrete Analyser - Continued									
Total Phosphorus as P	----	0.01	mg/L		<0.01	**0.03**	**0.01**	**0.19**	**0.12**
EK071FG: Dissolved Reactive Phosphorus as P by DA									
Dissolved Reactive Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**0.10**
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**1.22**	**1.65**	**1.70**	**5.12**	**4.76**
ø **Total Cations**	----	0.01	meq/L		**----**	**----**	**----**	**5.57**	**----**
ø **Total Cations**	----	0.01	meq/L		**1.44**	**1.70**	**1.52**	**----**	**5.09**
ø **Ionic Balance**	----	0.01	%		**----**	**----**	**----**	**4.21**	**----**
ø **Ionic Balance**	----	0.01	%		**----**	**----**	**----**	**----**	**3.34**
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	0.2	mg/L		**2.1**	**13.4**	**6.3**	**37.4**	**7.3**
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		<10	**14**	<10	**29**	<10
MM301: E.coli & Faecal Coliforms MPN									
Escherichia coli	----	0	MPN/100mL		**0**	**340**	**120**	**17000**	**----**
Faecal Coliforms	----	0	MPN/100mL		**0**	**370**	**130**	**24000**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GW02	GW03	DUPE	----	----
			Sampling date / time	17-Jan-2023 10:10	17-Jan-2023 10:55	17-Jan-2023 09:55	----	----
Compound	CAS Number	LOR	Unit	EM2300618-006	EM2300618-007	EM2300618-008	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.67**	**5.75**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**107**	**148**	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**73**	**101**	----	----	----
EA075: Redox Potential								
Redox Potential	----	0.1	mV	**302**	**306**	----	----	----
pH Redox	----	0.01	pH Unit	**5.67**	**5.75**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	**1**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**2**	**3**	----	----	----
Magnesium	7439-95-4	1	mg/L	**3**	**4**	----	----	----
Sodium	7440-23-5	1	mg/L	**11**	**15**	----	----	----
Potassium	7440-09-7	1	mg/L	<1	**2**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.04**	**0.01**	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.002**	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.001**	**0.005**	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.021**	**0.003**	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.010**	**0.012**	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.022**	**0.014**	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.06**	**0.04**	**0.01**	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.002**	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GW02	GW03	DUPE	----	----
			Sampling date / time	17-Jan-2023 10:10	17-Jan-2023 10:55	17-Jan-2023 09:55	----	----
Compound	CAS Number	LOR	Unit	EM2300618-006	EM2300618-007	EM2300618-008	--------	--------
				Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS - Continued								
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L	**0.028**	**0.005**	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L	**0.009**	**0.012**	**0.002**	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L	**0.092**	**0.025**	**0.005**	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	<0.05	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	**0.08**	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**3.03**	**7.19**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**3.03**	**7.19**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.7**	**0.8**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**3.7**	**8.0**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	**0.04**	----	----	----
EK071FG: Dissolved Reactive Phosphorus as P by DA								
Dissolved Reactive Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	0.2	mg/L	**18.2**	**11.7**	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)								
Chemical Oxygen Demand	----	10	mg/L	<10	<10	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP002: Dissolved Organic Carbon (DOC)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2221026**	Page	: 1 of 8
Client	: **SYRINX ENVIRONMENTAL PL**	Laboratory	: Environmental Division Melbourne
Contact	: ERICA	Contact	: Hannah White
Address	: 76 YORK STREET LAUNCESTON TAS	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +61-3-8549 9600
Project	: 22054	Date Samples Received	: 26-Oct-2022 11:40
Order number	: ----	Date Analysis Commenced	: 26-Oct-2022
C-O-C number	: ----	Issue Date	: 05-Nov-2022 21:57
Sampler	: Syrinx		
Site	: ----		
Quote number	: ME-495-22		
No. of samples received	: 8		
No. of samples analysed	: 8		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Arenie Vijayaratnam	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Laboratory Coordinator	WRG Subcontracting, Springvale, VIC
Jarwis Nheu	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- E.coli and Faecal Coliforms by MPN (MM301) is conducted by ALS Scoresby NATA accreditation no. 992, site no. 989.
- It is recognised that total metals is less than dissolved metals for sample #5 and #7. However, the difference is within experimental variation of the methods.
- EG020-T/F : EM2221026 #7 results for total/dissolved metals have been confirmed by re-digestion and re-analysis.
- Samples have been conducted outside of the recommended analytical holding times for SS and TDS. Results should be scrutinised accordingly.
- EA015H: EM2221026: #2 - TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EA015H: EM2221026 #3-4: Sample has been confirmed for total dissolved solids by re-preparation and re-analysis.TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EK067G: EM2220914 #1 Poor duplicate precision for Total phosphorus due to sample heterogeneity. Confirmed by re-extraction and re-analysis.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SW01	SW02	SW03	L02	GW01
			Sampling date / time	25-Oct-2022 11:45	25-Oct-2022 13:00	25-Oct-2022 12:50	25-Oct-2022 13:50	25-Oct-2022 11:35
Compound	CAS Number	LOR	Unit	EM2221026-001	EM2221026-002	EM2221026-003	EM2221026-004	EM2221026-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.54	7.09	6.86	6.70	7.04
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	156	162	154	514	500
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	89	----	78	206	----
Total Dissolved Solids @180°C	----	10	mg/L	----	138	----	----	272
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	1	mg/L	13	34	1	653	1
EA075: Redox Potential								
Redox Potential	----	0.1	mV	203	188	188	198	195
pH Redox	----	0.01	pH Unit	7.78	7.14	6.85	6.72	6.85
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	36	44	41	171	----
Total Alkalinity as CaCO3	----	1	mg/L	36	44	41	171	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	7	8	3	10	3
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	17	14	18	36	48
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	13	6	6	----	35
Magnesium	7439-95-4	1	mg/L	8	3	4	----	23
Sodium	7440-23-5	1	mg/L	19	11	14	----	23
Potassium	7440-09-7	1	mg/L	3	13	5	----	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	----	----	----	----	<0.01
Arsenic	7440-38-2	0.001	mg/L	----	----	----	----	<0.001
Cadmium	7440-43-9	0.0001	mg/L	----	----	----	----	<0.0001
Copper	7440-50-8	0.001	mg/L	----	----	----	----	0.001
Lead	7439-92-1	0.001	mg/L	----	----	----	----	<0.001
Manganese	7439-96-5	0.001	mg/L	----	----	----	----	<0.001
Nickel	7440-02-0	0.001	mg/L	----	----	----	----	0.002
Selenium	7782-49-2	0.01	mg/L	----	----	----	----	<0.01

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SW01	SW02	SW03	L02	GW01
				Sampling date / time	25-Oct-2022 11:45	25-Oct-2022 13:00	25-Oct-2022 12:50	25-Oct-2022 13:50	25-Oct-2022 11:35
Compound	CAS Number	LOR	Unit		EM2221026-001	EM2221026-002	EM2221026-003	EM2221026-004	EM2221026-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Tin	7440-31-5	0.001	mg/L		----	----	----	----	<0.001
Zinc	7440-66-6	0.005	mg/L		----	----	----	----	<0.005
Iron	7439-89-6	0.05	mg/L		----	----	----	----	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.54**	**4.33**	**0.25**	**11.8**	<0.01
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	**0.013**	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	**0.0006**	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.003**	**0.012**	<0.001	**0.045**	<0.001
Copper	7440-50-8	0.001	mg/L		**0.004**	**0.004**	<0.001	**0.068**	<0.001
Lead	7439-92-1	0.001	mg/L		**0.002**	<0.001	<0.001	**0.105**	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.361**	**0.500**	**0.710**	**2.71**	<0.001
Nickel	7440-02-0	0.001	mg/L		**0.003**	**0.011**	**0.002**	**0.043**	**0.002**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	**0.003**	<0.001
Zinc	7440-66-6	0.005	mg/L		**0.013**	**0.008**	<0.005	**0.558**	<0.005
Iron	7439-89-6	0.05	mg/L		**2.62**	**10.6**	**4.51**	**174**	<0.05
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		----	----	----	----	<0.0001
EG049G LL-F: Dissolved Trivalent Chromium - Low Level									
Trivalent Chromium	16065-83-1	0.001	mg/L		----	----	----	----	<0.001
EG050T: Total Hexavalent Chromium									
Hexavalent Chromium	18540-29-9	0.01	mg/L		----	----	----	----	<0.01
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	<0.004
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.18**	**1.24**	<0.01	**13.7**	<0.01
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.02**	**0.04**	<0.01	**0.02**	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.09**	**0.38**	**0.57**	**0.32**	**1.75**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.11**	**0.42**	**0.57**	**0.34**	**1.75**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SW01	SW02	SW03	L02	GW01
				Sampling date / time	25-Oct-2022 11:45	25-Oct-2022 13:00	25-Oct-2022 12:50	25-Oct-2022 13:50	25-Oct-2022 11:35
Compound	CAS Number	LOR	Unit		EM2221026-001	EM2221026-002	EM2221026-003	EM2221026-004	EM2221026-005
					Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.9**	**2.8**	**0.5**	**15.1**	**0.4**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**2.0**	**3.2**	**1.1**	**15.4**	**2.2**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.08**	**0.28**	**0.04**	**0.11**	**0.14**
EK071FG: Dissolved Reactive Phosphorus as P by DA									
Dissolved Reactive Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**0.14**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**0.14**
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	0.2	mg/L		**14.7**	**11.8**	**7.1**	**9.5**	**12.7**
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		**12**	**17**	**26**	<10	<10
MM301: E.coli & Faecal Coliforms MPN									
Escherichia coli	----	1	MPN/100mL		**>24000**	**63**	**450**	**98**	**----**
Faecal Coliforms	----	1	MPN/100mL		**>24000**	**74**	**500**	**98**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW02	GW03	DUPE	----	----
				Sampling date / time	25-Oct-2022 12:10	25-Oct-2022 13:25	25-Oct-2022 11:35	----	----
Compound	CAS Number	LOR	Unit		EM2221026-006	EM2221026-007	EM2221026-008	--------	--------
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**6.12**	**5.69**	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**107**	**144**	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**69**	**96**	----	----	----
EA075: Redox Potential									
Redox Potential	----	0.1	mV		**184**	**187**	----	----	----
pH Redox	----	0.01	pH Unit		**5.95**	**5.54**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**3**	**2**	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**4**	**5**	----	----	----
Magnesium	7439-95-4	1	mg/L		**3**	**5**	----	----	----
Sodium	7440-23-5	1	mg/L		**9**	**15**	----	----	----
Potassium	7440-09-7	1	mg/L		**2**	**2**	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.03**	**0.06**	----	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.002**	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.007**	**0.092**	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.005**	**0.010**	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Tin	7440-31-5	0.001	mg/L		**0.003**	**0.001**	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.008**	**0.008**	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	**0.23**	----	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.24**	**0.12**	<0.01	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.003**	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		**0.002**	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW02	GW03	DUPE	----	----
				Sampling date / time	25-Oct-2022 12:10	25-Oct-2022 13:25	25-Oct-2022 11:35	----	----
Compound	CAS Number	LOR	Unit		EM2221026-006	EM2221026-007	EM2221026-008	--------	--------
					Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS - Continued									
Manganese	7439-96-5	0.001	mg/L		**0.009**	**0.005**	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L		**0.006**	**0.011**	**0.002**	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Tin	7440-31-5	0.001	mg/L		**0.004**	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L		**0.009**	**0.010**	<0.005	----	----
Iron	7439-89-6	0.05	mg/L		**0.23**	**0.15**	<0.05	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EG049G LL-F: Dissolved Trivalent Chromium - Low Level									
Trivalent Chromium	16065-83-1	0.001	mg/L		<0.001	**0.002**	----	----	----
EG050T: Total Hexavalent Chromium									
Hexavalent Chromium	18540-29-9	0.01	mg/L		<0.01	<0.01	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	<0.01	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**2.09**	**7.39**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**2.09**	**7.39**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.3**	**0.8**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**2.4**	**8.2**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.02**	----	----	----
EK071FG: Dissolved Reactive Phosphorus as P by DA									
Dissolved Reactive Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	----	----	----
EP002: Dissolved Organic Carbon (DOC)									

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Sample ID	GW02	GW03	DUPE	----	----
				Sampling date / time	25-Oct-2022 12:10	25-Oct-2022 13:25	25-Oct-2022 11:35	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EM2221026-006**	**EM2221026-007**	**EM2221026-008**	**--------**	**--------**
					Result	Result	Result	----	----
EP002: Dissolved Organic Carbon (DOC) - Continued									
Dissolved Organic Carbon	----	0.2	mg/L		**13.1**	**20.9**	**----**	**----**	**----**
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		<10	<10	**----**	**----**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP002: Dissolved Organic Carbon (DOC)

CERTIFICATE OF ANALYSIS

Work Order	: **EM2307433**	Page	: 1 of 8
Client	: **SYRINX ENVIRONMENTAL PL**	Laboratory	: Environmental Division Melbourne
Contact	: ERICA	Contact	: Hannah White
Address	: 76 YORK STREET LAUNCESTON TAS	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +61-3-8549 9600
Project	: 22054	Date Samples Received	: 28-Apr-2023 11:15
Order number	: ----	Date Analysis Commenced	: 28-Apr-2023
C-O-C number	: ----	Issue Date	: 09-May-2023 18:25
Sampler	: Syrinx		
Site	: ----		
Quote number	: ME-495-22		
No. of samples received	: 8		
No. of samples analysed	: 8		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Arenie Vijayaratnam	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Laboratory Coordinator	WRG Subcontracting, Springvale, VIC
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Jarwis Nheu	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- E.coli and Faecal Coliforms by MPN (MM301) is conducted by ALS Scoresby NATA accreditation no. 992, site no. 989.
- It is recognised that total phosphorous is less than dissolved phosphorous for sample #5. However, the difference is within experimental variation of the methods.
- EG020F+T: It is recognised that total metals is less than dissolved metals for sample EM2307433#1, #2, #5, #6 and #7. However, the difference is within experimental variation of the methods.
- EG055G: EM2307336 #1, Poor matrix spike recovery for ammonia due to sample matrix. Confirmed by re-extraction and re-analysis.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SW01	SW02	SW03	L02	GW01
			Sampling date / time	26-Apr-2023 10:30	26-Apr-2023 11:30	26-Apr-2023 11:15	26-Apr-2023 12:15	26-Apr-2023 10:15
Compound	CAS Number	LOR	Unit	EM2307433-001	EM2307433-002	EM2307433-003	EM2307433-004	EM2307433-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.81	7.53	6.81	7.15	7.04
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	182	151	153	499	493
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	83	76	74	240	312
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	1	mg/L	5	<1	10	30	<1
EA075: Redox Potential								
Redox Potential	----	0.1	mV	197	114	83.0	52.5	45.0
pH Redox	----	0.01	pH Unit	7.99	7.88	7.66	6.80	7.02
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	8	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	31	46	50	160	----
Total Alkalinity as CaCO3	----	1	mg/L	39	46	50	160	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	4	6	1	8	3
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	22	17	22	52	50
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	4	5	4	16	36
Magnesium	7439-95-4	1	mg/L	5	4	4	10	24
Sodium	7440-23-5	1	mg/L	18	16	15	37	23
Potassium	7440-09-7	1	mg/L	2	2	2	12	4
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	----	----	----	----	<0.01
Arsenic	7440-38-2	0.001	mg/L	----	----	----	----	<0.001
Cadmium	7440-43-9	0.0001	mg/L	----	----	----	----	<0.0001
Copper	7440-50-8	0.001	mg/L	----	----	----	----	0.002
Lead	7439-92-1	0.001	mg/L	----	----	----	----	<0.001
Manganese	7439-96-5	0.001	mg/L	----	----	----	----	<0.001
Nickel	7440-02-0	0.001	mg/L	----	----	----	----	0.002
Selenium	7782-49-2	0.01	mg/L	----	----	----	----	<0.01

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SW01	SW02	SW03	L02	GW01
				Sampling date / time	26-Apr-2023 10:30	26-Apr-2023 11:30	26-Apr-2023 11:15	26-Apr-2023 12:15	26-Apr-2023 10:15
Compound	CAS Number	LOR	Unit		EM2307433-001	EM2307433-002	EM2307433-003	EM2307433-004	EM2307433-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Tin	7440-31-5	0.001	mg/L		----	----	----	----	<0.001
Zinc	7440-66-6	0.005	mg/L		----	----	----	----	<0.005
Iron	7439-89-6	0.05	mg/L		**2.46**	**0.06**	**1.11**	**4.58**	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.01**	**0.27**	**0.03**	**0.06**	<0.01
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	**0.001**	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	**0.001**	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.926**	**0.170**	**0.878**	**1.37**	<0.001
Nickel	7440-02-0	0.001	mg/L		**0.007**	<0.001	<0.001	**0.004**	**0.001**
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	**0.044**	<0.005
Iron	7439-89-6	0.05	mg/L		**2.85**	**1.38**	**5.48**	**13.6**	<0.05
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		----	----	----	----	<0.0001
EG049F: Dissolved Trivalent Chromium									
Trivalent Chromium	16065-83-1	0.01	mg/L		----	----	----	----	<0.01
EG050F: Dissolved Hexavalent Chromium									
Hexavalent Chromium	18540-29-9	0.01	mg/L		----	----	----	----	<0.01
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	<0.004
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.76**	**0.14**	**0.12**	**14.5**	<0.01
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.02**	**0.02**	<0.01	**0.01**	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**2.32**	**0.85**	<0.01	**1.12**	**1.51**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**2.34**	**0.87**	<0.01	**1.13**	**1.51**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SW01	SW02	SW03	L02	GW01
				Sampling date / time	26-Apr-2023 10:30	26-Apr-2023 11:30	26-Apr-2023 11:15	26-Apr-2023 12:15	26-Apr-2023 10:15
Compound	CAS Number	LOR	Unit		EM2307433-001	EM2307433-002	EM2307433-003	EM2307433-004	EM2307433-005
					Result	Result	Result	Result	Result
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser - Continued									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.9**	**0.3**	**0.2**	**15.5**	**0.4**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**3.2**	**1.2**	**0.2**	**16.6**	**1.9**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.03**	**0.03**	**0.02**	**0.04**	**0.11**
EK071FG: Dissolved Reactive Phosphorus as P by DA									
Dissolved Reactive Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**0.16**
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	**0.16**
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	0.2	mg/L		**4.8**	**2.8**	**6.2**	**9.7**	**5.8**
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		<10	<10	<10	**15**	<10
MM301: E.coli & Faecal Coliforms MPN									
Escherichia coli	----	1	MPN/100mL		**0**	**91**	**42**	<10	**----**
Faecal Coliforms	----	1	MPN/100mL		**0**	**96**	**51**	<10	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW02	GW03	DUPE	----	----
				Sampling date / time	26-Apr-2023 10:45	26-Apr-2023 11:45	26-Apr-2023 10:15	----	----
Compound	CAS Number	LOR	Unit		EM2307433-006	EM2307433-007	EM2307433-008	--------	--------
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**6.27**	**6.05**	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**101**	**139**	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**74**	**84**	----	----	----
EA075: Redox Potential									
Redox Potential	----	0.1	mV		**106**	**126**	----	----	----
pH Redox	----	0.01	pH Unit		**6.41**	**5.93**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**2**	**2**	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**2**	**3**	----	----	----
Magnesium	7439-95-4	1	mg/L		**3**	**4**	----	----	----
Sodium	7440-23-5	1	mg/L		**10**	**14**	----	----	----
Potassium	7440-09-7	1	mg/L		<1	**2**	----	----	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.03**	<0.01	----	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	----	----	----
Copper	7440-50-8	0.001	mg/L		**0.002**	**0.001**	----	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L		**0.019**	**0.003**	----	----	----
Nickel	7440-02-0	0.001	mg/L		**0.010**	**0.012**	----	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	----	----	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L		**0.012**	**0.010**	----	----	----
Iron	7439-89-6	0.05	mg/L		<0.05	<0.05	----	----	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**0.31**	**0.06**	**0.06**	----	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.002**	**0.003**	----	----
Copper	7440-50-8	0.001	mg/L		**0.001**	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW02	GW03	DUPE	----	----
				Sampling date / time	26-Apr-2023 10:45	26-Apr-2023 11:45	26-Apr-2023 10:15	----	----
Compound	CAS Number	LOR	Unit		EM2307433-006	EM2307433-007	EM2307433-008	--------	--------
					Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS - Continued									
Manganese	7439-96-5	0.001	mg/L		**0.039**	**0.005**	**0.005**	----	----
Nickel	7440-02-0	0.001	mg/L		**0.010**	**0.011**	**0.011**	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Tin	7440-31-5	0.001	mg/L		<0.001	**0.003**	**0.003**	----	----
Zinc	7440-66-6	0.005	mg/L		**0.018**	**0.006**	**0.007**	----	----
Iron	7439-89-6	0.05	mg/L		**0.44**	**0.11**	**0.12**	----	----
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	----	----	----
EG049F: Dissolved Trivalent Chromium									
Trivalent Chromium	16065-83-1	0.01	mg/L		<0.01	<0.01	----	----	----
EG050F: Dissolved Hexavalent Chromium									
Hexavalent Chromium	18540-29-9	0.01	mg/L		<0.01	<0.01	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	<0.01	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**2.84**	**7.01**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**2.84**	**7.01**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.5**	**0.6**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**3.3**	**7.6**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.02**	**0.09**	----	----	----
EK071FG: Dissolved Reactive Phosphorus as P by DA									
Dissolved Reactive Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW02	GW03	DUPE	----	----
				Sampling date / time	26-Apr-2023 10:45	26-Apr-2023 11:45	26-Apr-2023 10:15	----	----
Compound	CAS Number	LOR	Unit		EM2307433-006	EM2307433-007	EM2307433-008	--------	--------
					Result	Result	Result	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	0.2	mg/L		**6.5**	**6.5**	**----**	**----**	**----**
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		<10	<10	**----**	**----**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP002: Dissolved Organic Carbon (DOC)

CERTIFICATE OF ANALYSIS

Work Order	: **EM2313101**	Page	: 1 of 8
Client	: **SYRINX ENVIRONMENTAL PL**	Laboratory	: Environmental Division Melbourne
Contact	: ERICA	Contact	: Hannah White
Address	: 76 YORK STREET LAUNCESTON TAS	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +61-3-8549 9600
Project	: 22054	Date Samples Received	: 20-Jul-2023 12:30
Order number	: ----	Date Analysis Commenced	: 20-Jul-2023
C-O-C number	: ----	Issue Date	: 27-Jul-2023 22:02
Sampler	: SW + TI		
Site	: ----		
Quote number	: EM23SYRENV001		
No. of samples received	: 8		
No. of samples analysed	: 8		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Arenie Vijayaratnam	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Laboratory Coordinator	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Laboratory Coordinator	WRG Subcontracting, Springvale, VIC
Jarwis Nheu	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Tahlia Freeman	Instrument Operator	Melbourne Inorganics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- E.coli and Faecal Coliforms by MPN (MM301) is conducted by ALS Scoresby NATA accreditation no. 992, site no. 989.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- It is recognised that total phosphorus is less than dissolved phosphorus for sample #5. However, the difference is within experimental variation of the methods.
- It is recognised that total metals are less than dissolved metalsfor samples 7. However, the difference is within experimental variation of the methods.
- EG020F+T: It is recognised that the total metals are less than the dissolved metals for sample EM2313101 #7. However, the difference is within the experimental variation of the method.
- TDS by method EA015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EA015H: EM2313101 #1-3,6-7,14 TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity, sulfate and NOx; and major cations - calcium, magnesium, potassium and sodium for #2.
- Ionic balances were calculated using: major anions - chloride, alkalinity, sulfate; and major cations - calcium, magnesium, potassium, sodium and ammonia for #4.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SW01	SW02	SW03	L02	GW01
			Sampling date / time	19-Jul-2023 09:50	19-Jul-2023 11:00	19-Jul-2023 10:35	19-Jul-2023 11:55	19-Jul-2023 09:45
Compound	CAS Number	LOR	Unit	EM2313101-001	EM2313101-002	EM2313101-003	EM2313101-004	EM2313101-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.20**	**6.91**	**6.83**	**7.65**	**7.84**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**157**	**163**	**145**	**556**	**484**
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**368**	**184**	**163**	**374**	**367**
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	1	mg/L	**23**	**8**	**17**	**2950**	**2**
EA075: Redox Potential								
Redox Potential	----	0.1	mV	**69.9**	**81.0**	**89.6**	**91.5**	**99.6**
pH Redox	----	0.01	pH Unit	**8.73**	**8.87**	**8.58**	**7.32**	**7.60**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**33**	**33**	**30**	**186**	**171**
Total Alkalinity as CaCO3	----	1	mg/L	**33**	**33**	**30**	**186**	**171**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**8**	**11**	**5**	**16**	**3**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**19**	**16**	**18**	**47**	**44**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**7**	**8**	**5**	**32**	**36**
Magnesium	7439-95-4	1	mg/L	**4**	**5**	**4**	**14**	**27**
Sodium	7440-23-5	1	mg/L	**15**	**14**	**14**	**37**	**24**
Potassium	7440-09-7	1	mg/L	**4**	**6**	**5**	**15**	**3**
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	**0.02**	**0.03**	**0.01**	<0.01
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	**0.310**	**0.155**	**0.292**	**3.08**	<0.001
Nickel	7440-02-0	0.001	mg/L	**0.001**	<0.001	<0.001	**0.006**	<0.001

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SW01	SW02	SW03	L02	GW01
				Sampling date / time	19-Jul-2023 09:50	19-Jul-2023 11:00	19-Jul-2023 10:35	19-Jul-2023 11:55	19-Jul-2023 09:45
Compound	CAS Number	LOR	Unit		EM2313101-001	EM2313101-002	EM2313101-003	EM2313101-004	EM2313101-005
					Result	Result	Result	Result	Result
EG020F: Dissolved Metals by ICP-MS - Continued									
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	<0.005	**0.017**	<0.005
Iron	7439-89-6	0.05	mg/L		**0.13**	**0.05**	**0.14**	**10.0**	<0.05
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**1.86**	**0.96**	**1.69**	**20.8**	<0.01
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	**0.003**	<0.001
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	**0.0002**	<0.0001
Chromium	7440-47-3	0.001	mg/L		**0.004**	**0.002**	**0.003**	**0.058**	<0.001
Copper	7440-50-8	0.001	mg/L		**0.002**	**0.001**	**0.001**	**0.024**	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	**0.009**	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.324**	**0.164**	**0.301**	**3.70**	<0.001
Nickel	7440-02-0	0.001	mg/L		**0.004**	**0.003**	**0.004**	**0.042**	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.006**	<0.005	**0.110**	<0.005
Iron	7439-89-6	0.05	mg/L		**3.28**	**1.49**	**2.92**	**44.6**	<0.05
EG049F: Dissolved Trivalent Chromium									
Trivalent Chromium	16065-83-1	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EG049T: Total Trivalent Chromium									
Trivalent Chromium	16065-83-1	0.01	mg/L		<0.01	<0.01	<0.01	**0.06**	<0.01
EG050F: Dissolved Hexavalent Chromium									
Hexavalent Chromium	18540-29-9	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EG050T: Total Hexavalent Chromium									
Hexavalent Chromium	18540-29-9	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	<0.004	<0.004	<0.004
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.10**	**0.12**	**0.11**	**11.6**	**0.02**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.02**	**0.04**	**0.02**	**0.02**	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.26**	**1.96**	**1.38**	**0.49**	**1.62**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SW01	SW02	SW03	L02	GW01
				Sampling date / time	19-Jul-2023 09:50	19-Jul-2023 11:00	19-Jul-2023 10:35	19-Jul-2023 11:55	19-Jul-2023 09:45
Compound	CAS Number	LOR	Unit		EM2313101-001	EM2313101-002	EM2313101-003	EM2313101-004	EM2313101-005
					Result	Result	Result	Result	Result
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		1.28	2.00	1.40	0.51	1.62
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.6	0.9	0.5	11.8	0.3
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		1.9	2.9	1.9	12.3	1.9
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.04	0.04	0.04	0.84	0.11
EK071FG: Dissolved Reactive Phosphorus as P by DA									
Dissolved Reactive Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	0.14
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	0.14
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		----	1.48	----	----	----
ø Total Anions	----	0.01	meq/L		1.36	----	1.21	5.38	4.72
ø Total Cations	----	0.01	meq/L		----	----	----	5.57	----
ø Total Cations	----	0.01	meq/L		1.43	1.57	1.32	----	5.14
ø Ionic Balance	----	0.01	%		----	2.94	----	1.75	----
ø Ionic Balance	----	0.01	%		2.55	----	4.13	----	4.25
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	0.2	mg/L		4.9	9.6	3.4	9.0	6.8
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		31	14	29	143	<10
MM301: E.coli & Faecal Coliforms MPN									
Escherichia coli	----	1	MPN/100mL		280	77	150	1100	----
Faecal Coliforms	----	1	MPN/100mL		290	81	150	1300	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	GW02	GW03	Dupe	----	----
			Sampling date / time	19-Jul-2023 10:10	19-Jul-2023 11:30	19-Jul-2023 09:40	----	----
Compound	CAS Number	LOR	Unit	EM2313101-006	EM2313101-007	EM2313101-008	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.54**	**6.52**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**100**	**141**	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**145**	**171**	----	----	----
EA075: Redox Potential								
Redox Potential	----	0.1	mV	**134**	**107**	----	----	----
pH Redox	----	0.01	pH Unit	**7.49**	**7.07**	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**2**	**1**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**3**	**3**	----	----	----
Magnesium	7439-95-4	1	mg/L	**4**	**5**	----	----	----
Sodium	7440-23-5	1	mg/L	**10**	**14**	----	----	----
Potassium	7440-09-7	1	mg/L	<1	**2**	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.03**	<0.01	----	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.002**	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	**0.001**	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	----	----	----
Manganese	7439-96-5	0.001	mg/L	**0.015**	**0.005**	----	----	----
Nickel	7440-02-0	0.001	mg/L	**0.008**	**0.010**	----	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	----	----	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.012**	**0.018**	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----
EG020T: Total Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.18**	**0.02**	<0.01	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	<0.001	**0.002**	<0.001	----	----
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW02	GW03	Dupe	----	----
				Sampling date / time	19-Jul-2023 10:10	19-Jul-2023 11:30	19-Jul-2023 09:40	----	----
Compound	CAS Number	LOR	Unit		EM2313101-006	EM2313101-007	EM2313101-008	--------	--------
					Result	Result	Result	----	----
EG020T: Total Metals by ICP-MS - Continued									
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Manganese	7439-96-5	0.001	mg/L		**0.018**	**0.003**	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L		**0.009**	**0.012**	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Zinc	7440-66-6	0.005	mg/L		**0.018**	**0.012**	<0.005	----	----
Iron	7439-89-6	0.05	mg/L		**0.16**	<0.05	<0.05	----	----
EG049F: Dissolved Trivalent Chromium									
Trivalent Chromium	16065-83-1	0.01	mg/L		<0.01	<0.01	----	----	----
EG049T: Total Trivalent Chromium									
Trivalent Chromium	16065-83-1	0.01	mg/L		<0.01	<0.01	----	----	----
EG050F: Dissolved Hexavalent Chromium									
Hexavalent Chromium	18540-29-9	0.01	mg/L		<0.01	<0.01	----	----	----
EG050T: Total Hexavalent Chromium									
Hexavalent Chromium	18540-29-9	0.01	mg/L		<0.01	<0.01	----	----	----
EK026SF: Total CN by Segmented Flow Analyser									
Total Cyanide	57-12-5	0.004	mg/L		<0.004	<0.004	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	<0.01	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**2.78**	**7.17**	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**2.78**	**7.17**	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**0.6**	**1.2**	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**3.4**	**8.4**	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	----	----	----
EK071FG: Dissolved Reactive Phosphorus as P by DA									
Dissolved Reactive Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	GW02	GW03	Dupe	----	----
				Sampling date / time	19-Jul-2023 10:10	19-Jul-2023 11:30	19-Jul-2023 09:40	----	----
Compound	CAS Number	LOR	Unit		EM2313101-006	EM2313101-007	EM2313101-008	--------	--------
					Result	Result	Result	----	----
EK071FG: Dissolved Reactive Phosphorus as P by DA - Continued									
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	0.2	mg/L		**14.4**	**4.8**	----	----	----
EP026SP: Chemical Oxygen Demand (Spectrophotometric)									
Chemical Oxygen Demand	----	10	mg/L		<10	<10	----	----	----

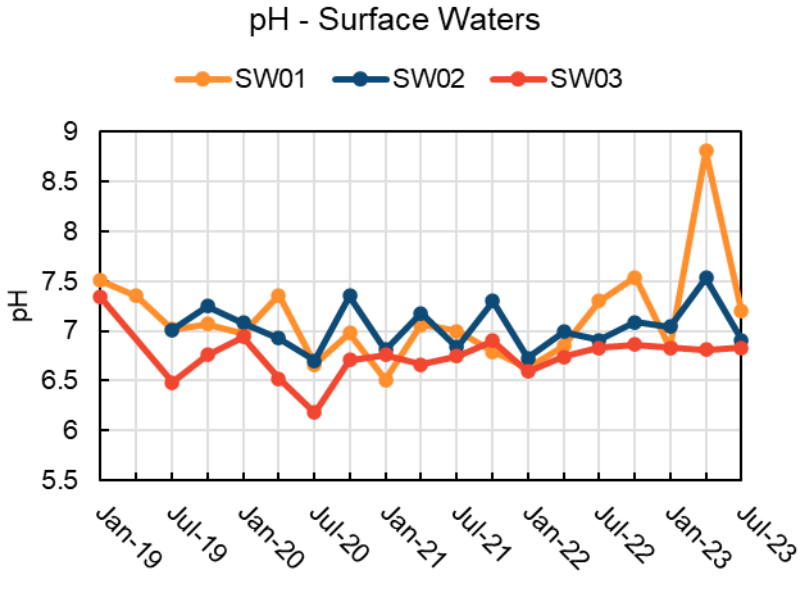
Inter-Laboratory Testing

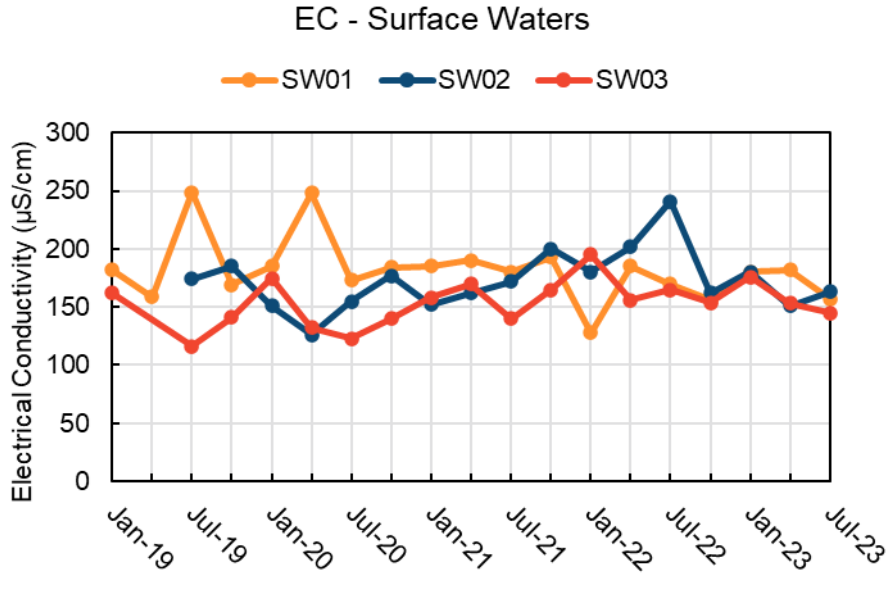
Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

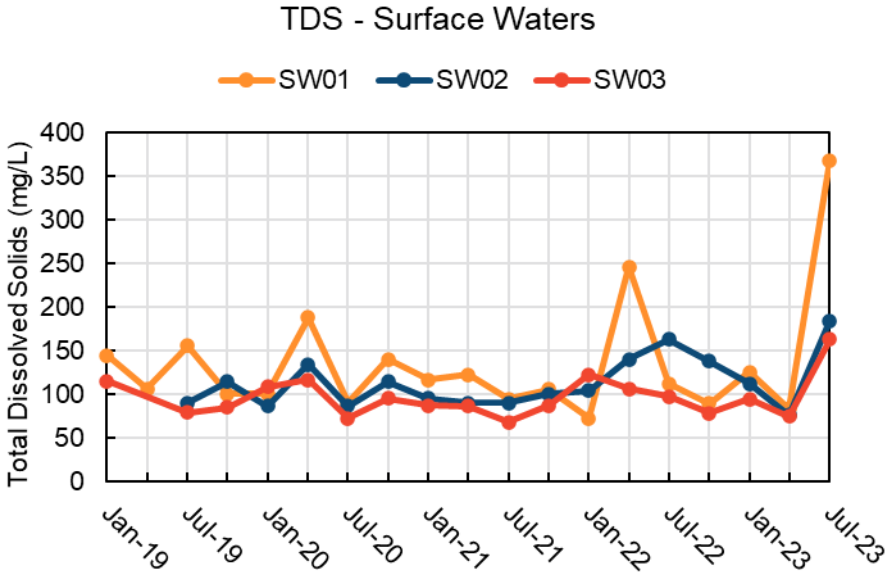
(WATER) EP002: Dissolved Organic Carbon (DOC)

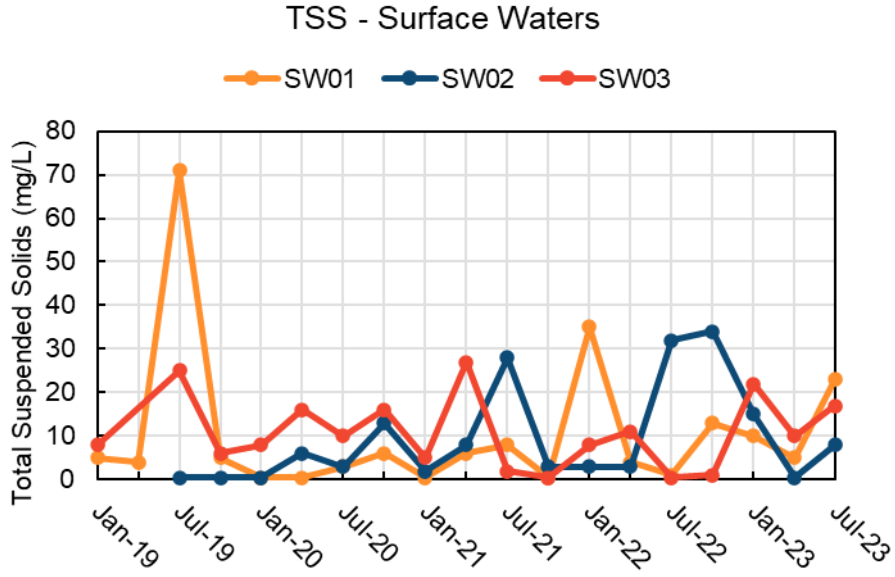
APPENDIX 3 MONITORING DATA IN GRAPHICAL FORMAT

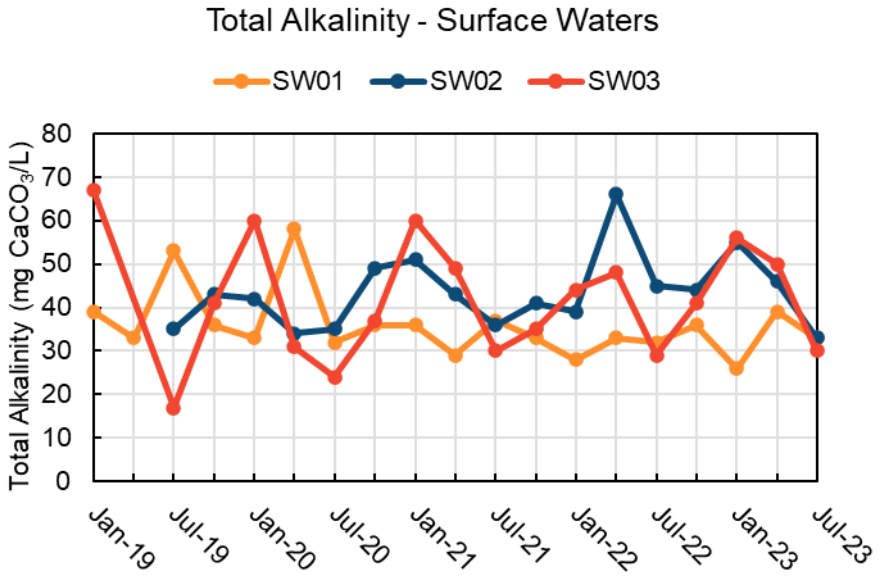
Surface water quality (SW01, SW02, SW03)

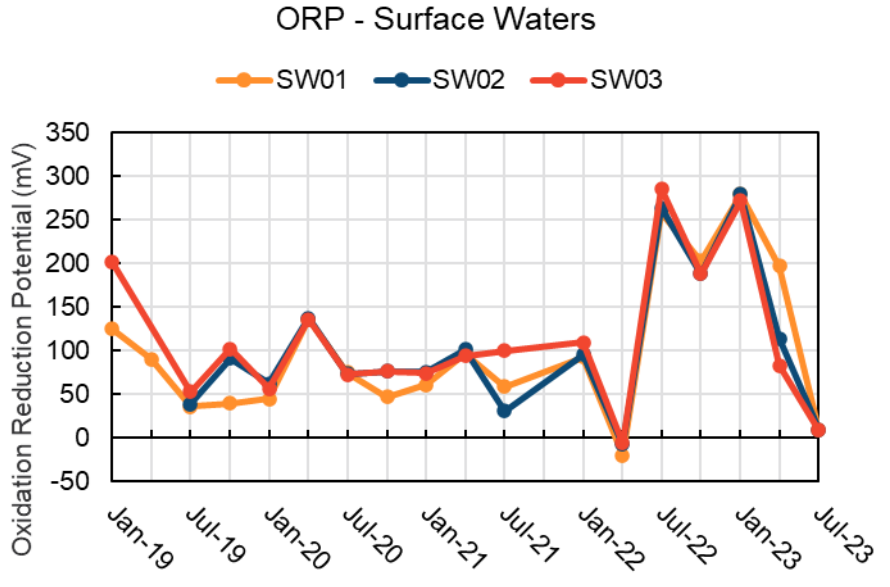


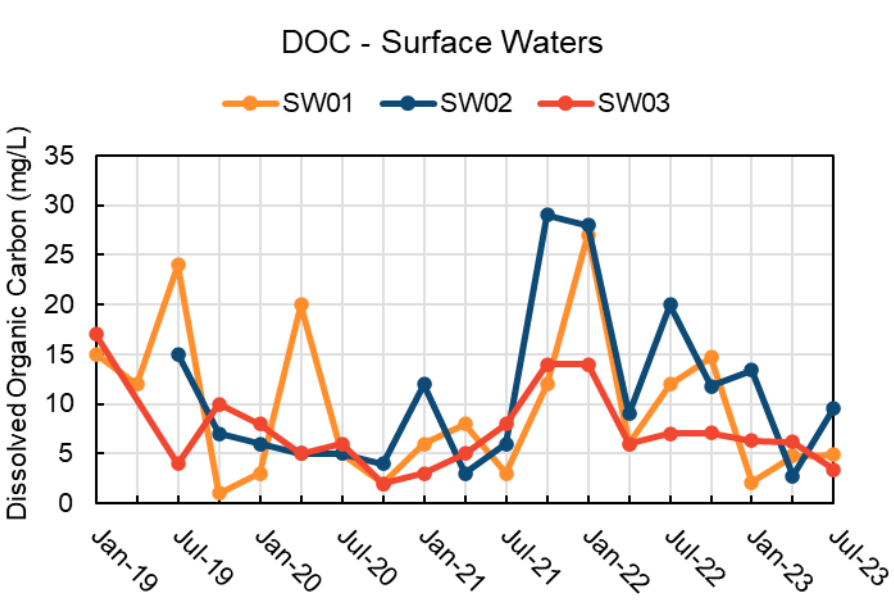


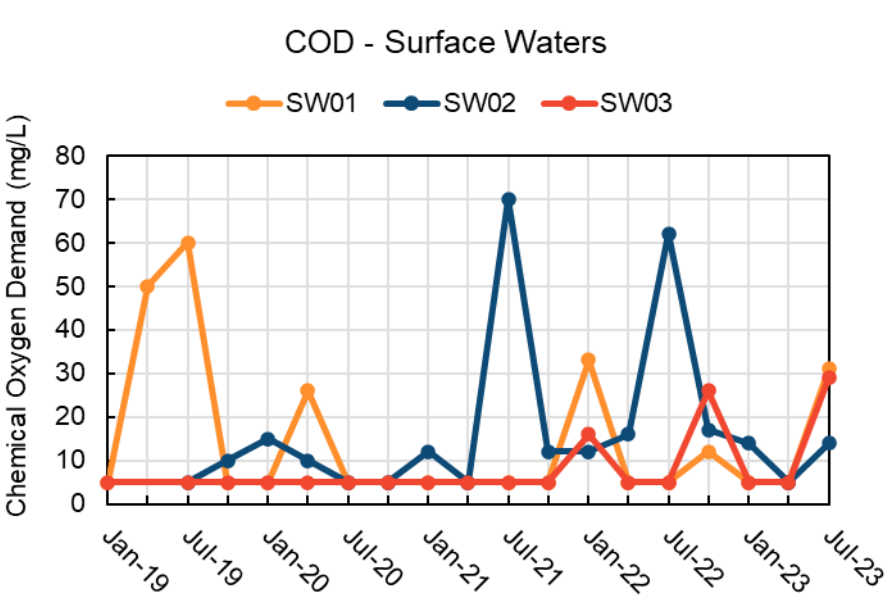


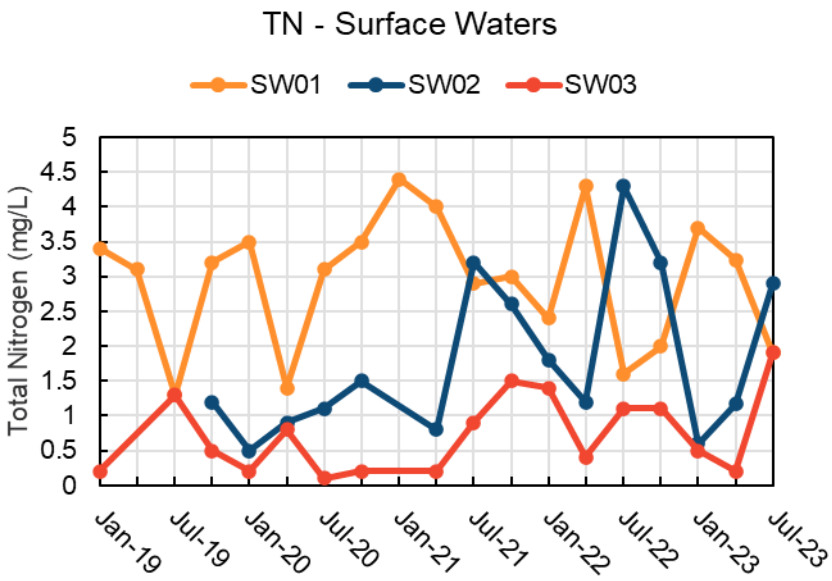


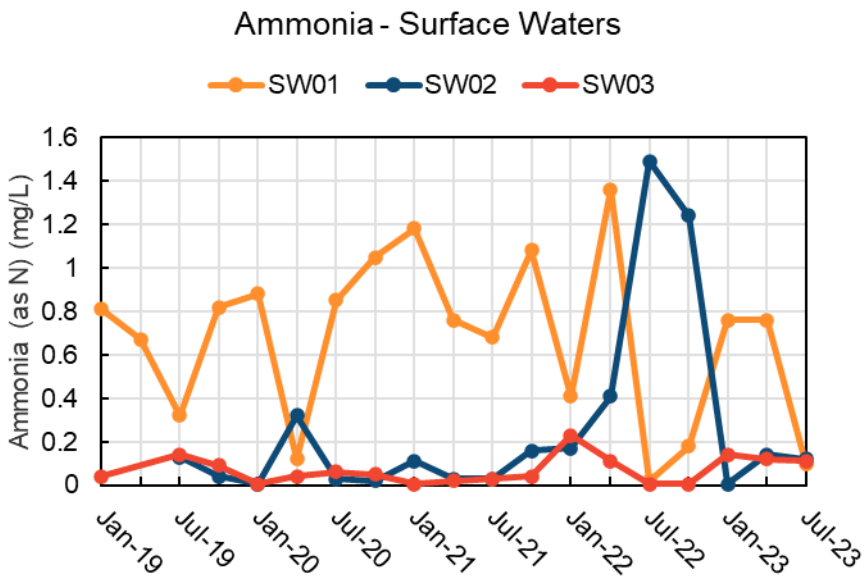


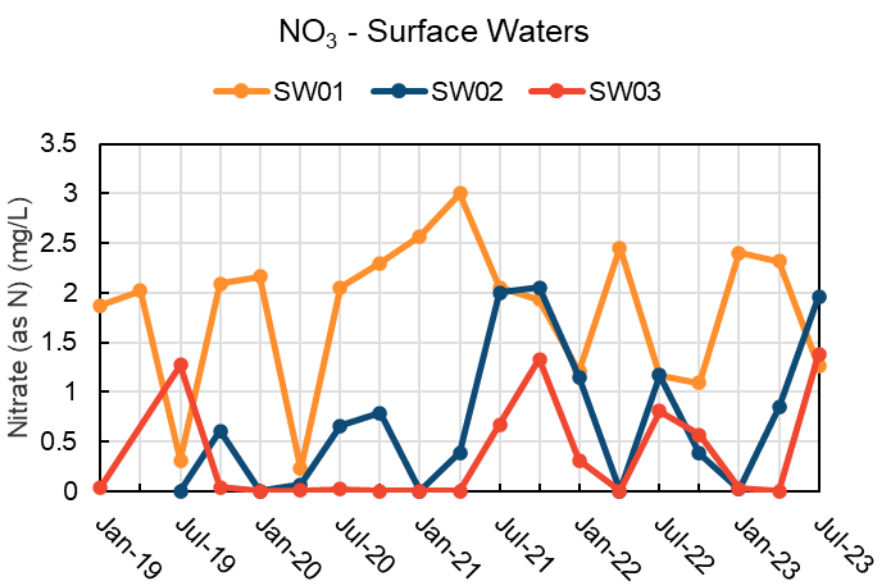


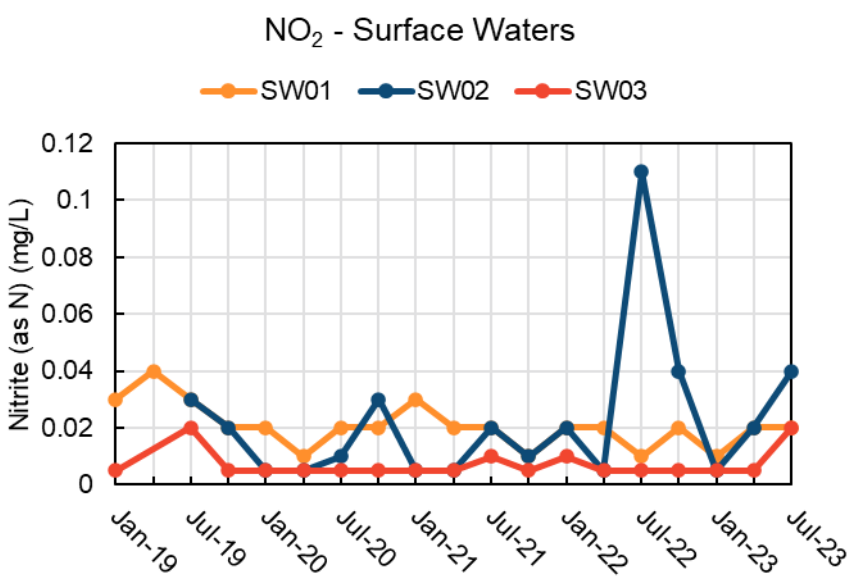


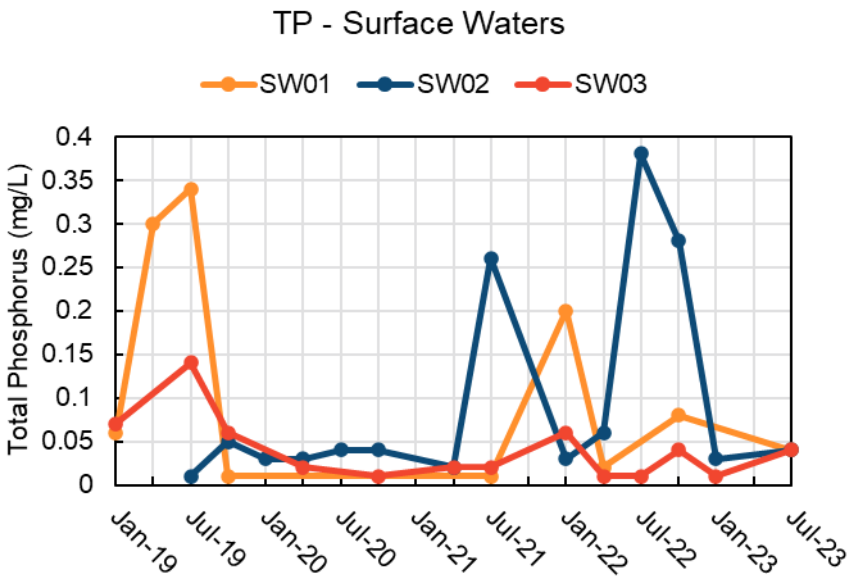


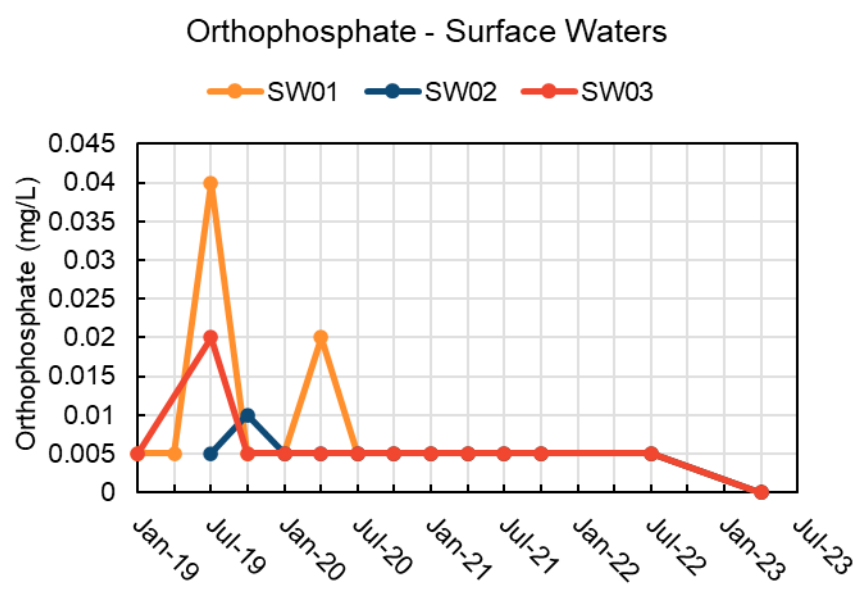

TN - Surface Waters
SW01
SW02
SW03
Total Nitrogen (mg/L)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

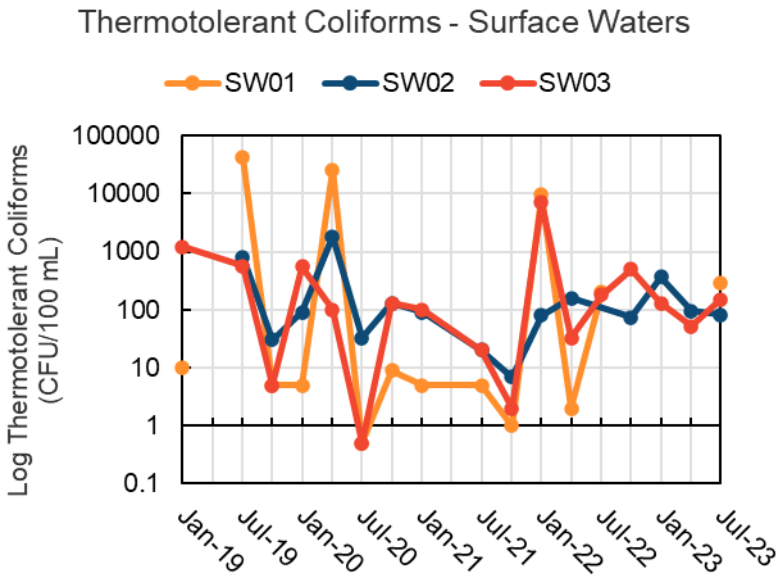

Ammonia - Surface Waters
SW01
SW02
SW03
Ammonia (as N) (mg/L)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

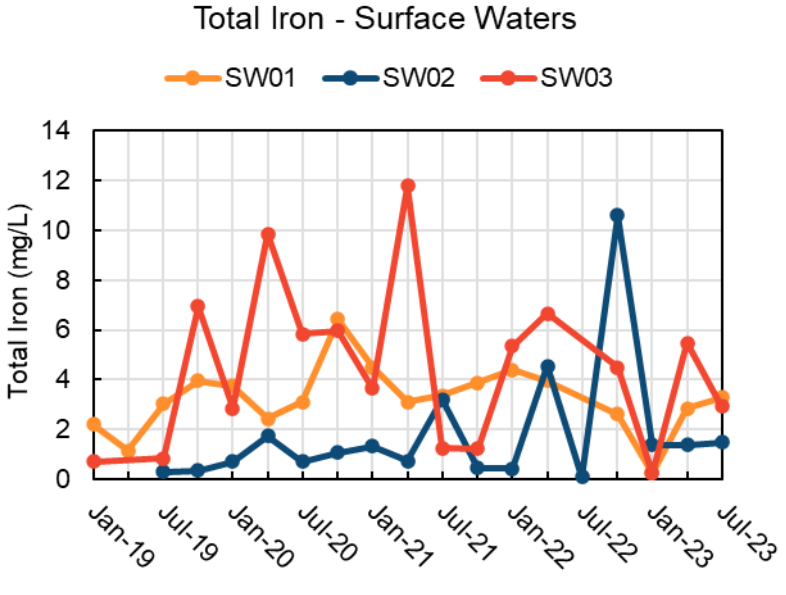

NO3 - Surface Waters
SW01
SW02
SW03
Nitrate (as N) (mg/L)
0
0.5
1
1.5
2
2.5
3
3.5
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

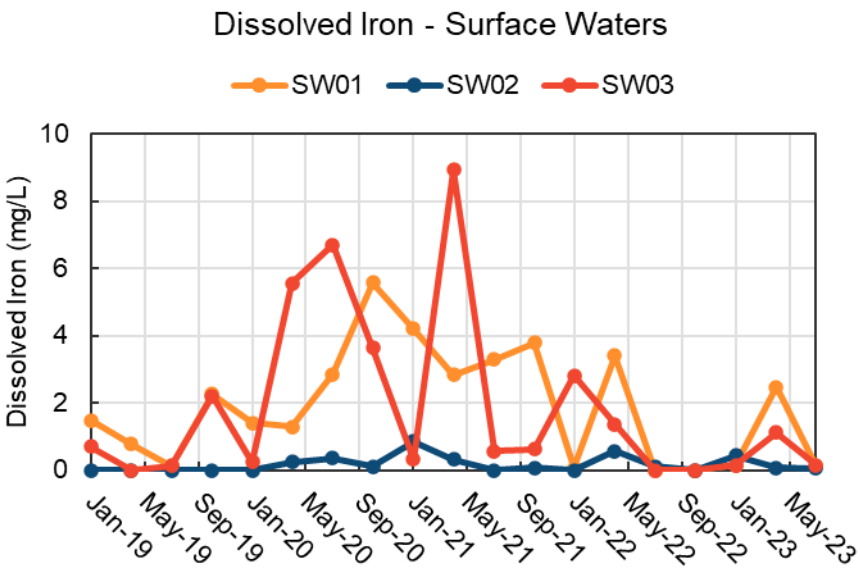

NO2 - Surface Waters
SW01
SW02
SW03
Nitrite (as N) (mg/L)
0
0.02
0.04
0.06
0.08
0.1
0.12
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

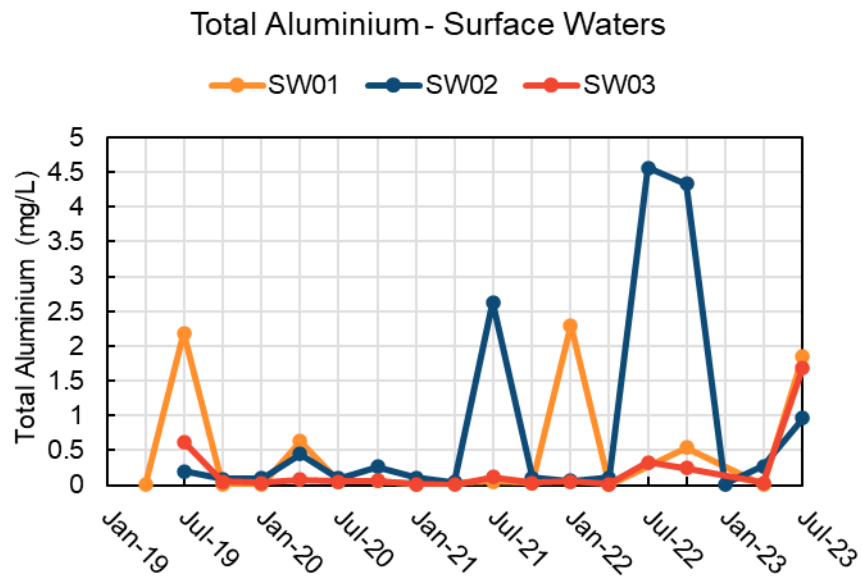

TP - Surface Waters
SW01
SW02
SW03
Total Phosphorus (mg/L)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

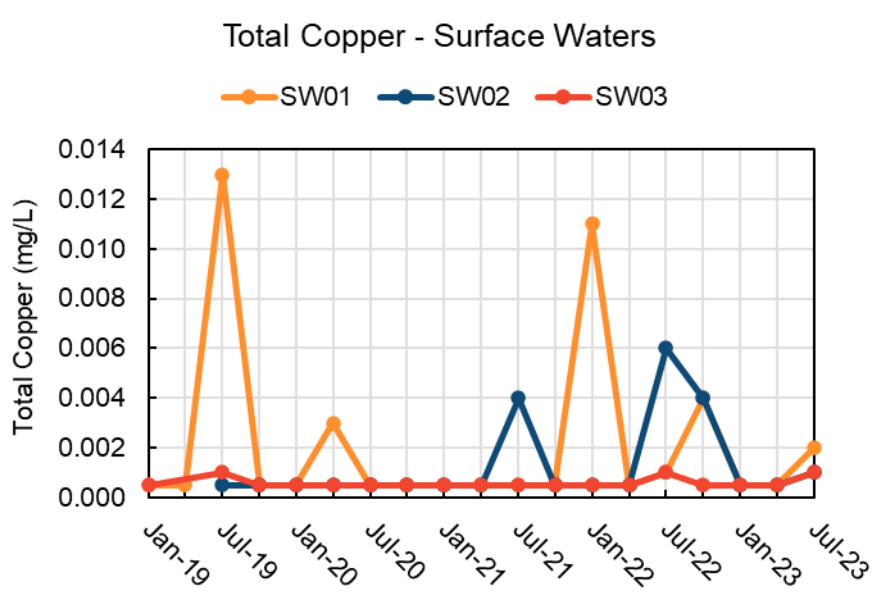

Orthophosphate - Surface Waters
SW01
SW02
SW03
Orthophosphate (mg/L)
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

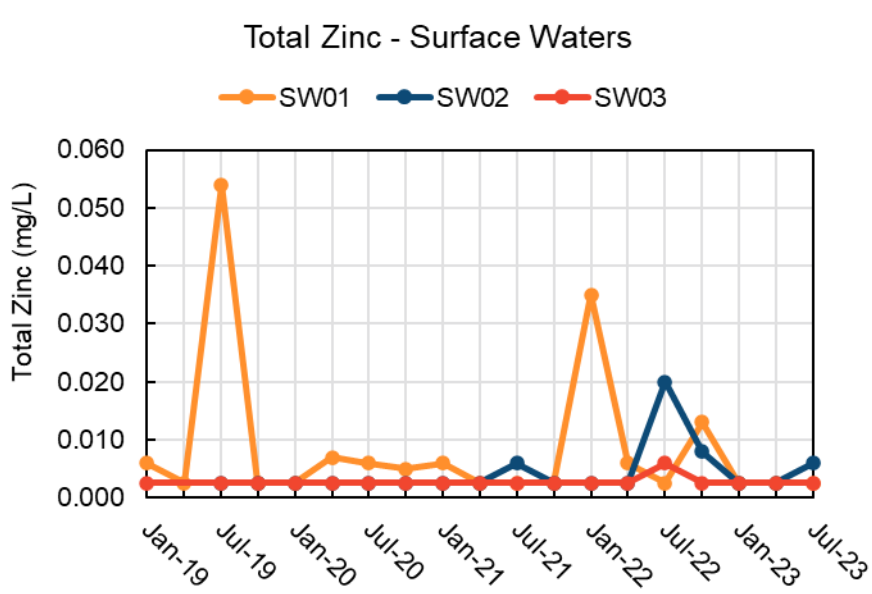

Thermotolerant Coliforms - Surface Waters
SW01
SW02
SW03
Log Thermotolerant Coliforms (CFU/100 mL)
0.1
1
10
100
1000
10000
100000
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

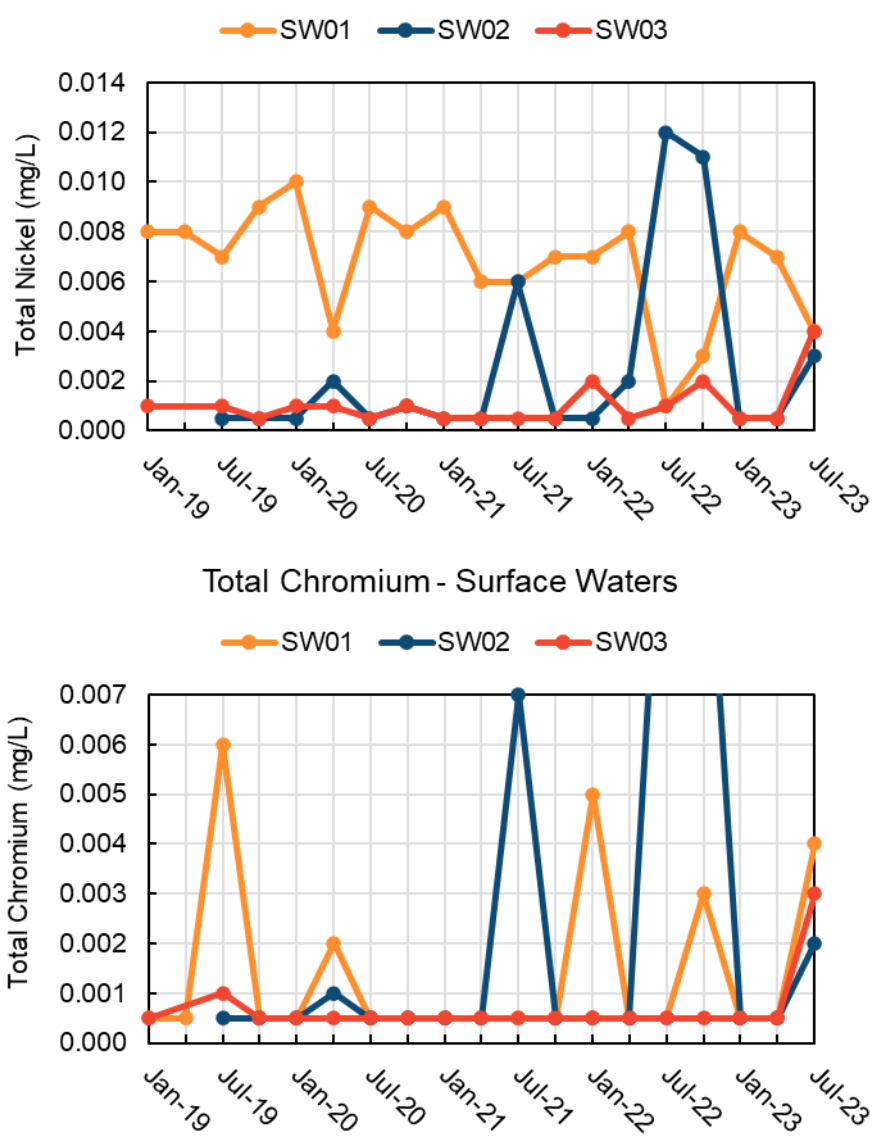

Total Iron - Surface Waters
SW01
SW02
SW03
Total Iron (mg/L)
0
2
4
6
8
10
12
14
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

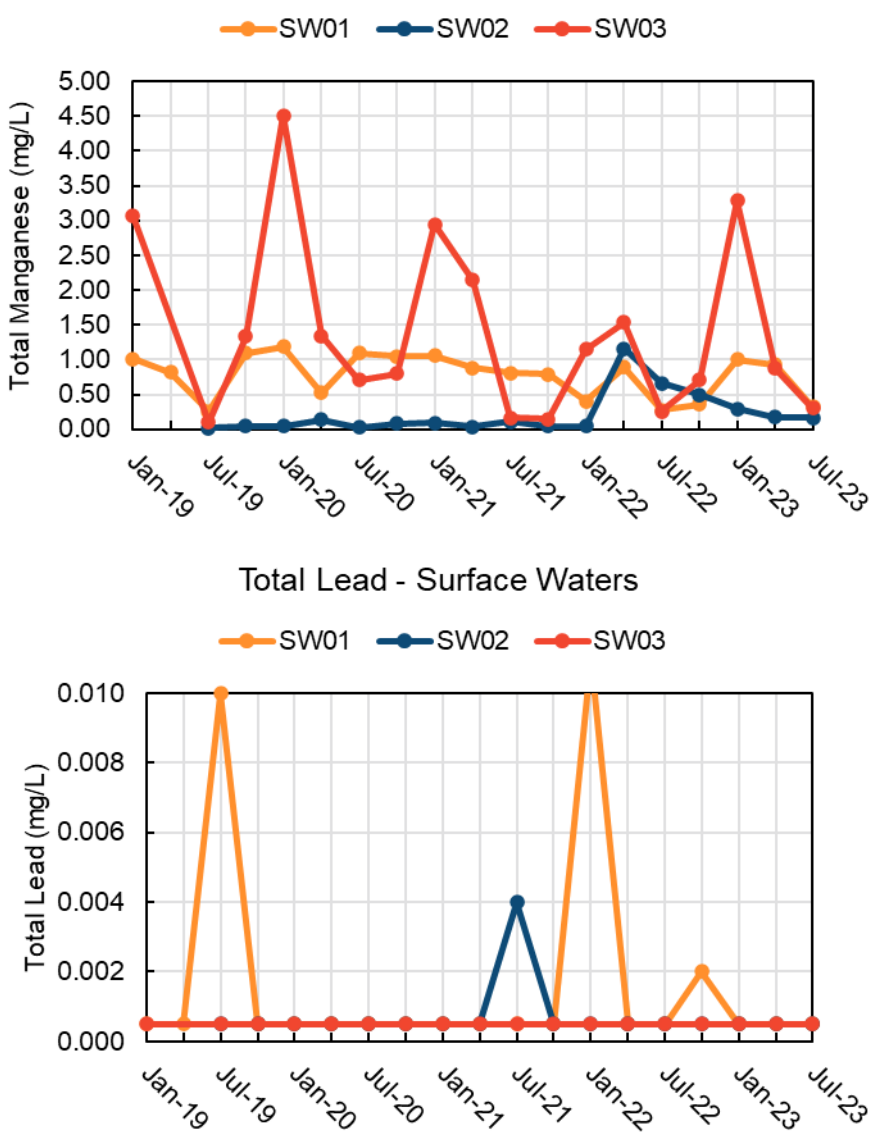

Dissolved Iron - Surface Waters
SW01
SW02
SW03
Dissolved Iron (mg/L)
10
8
6
4
2
0
Jan-19
May-19
Sep-19
Jan-20
May-20
Sep-20
Jan-21
May-21
Sep-21
Jan-22
May-22
Sep-22
Jan-23
May-23


Total Aluminium - Surface Waters
SW01
SW02
SW03
Total Aluminium (mg/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23


Total Copper - Surface Waters
SW01
SW02
SW03
Total Copper (mg/L)
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

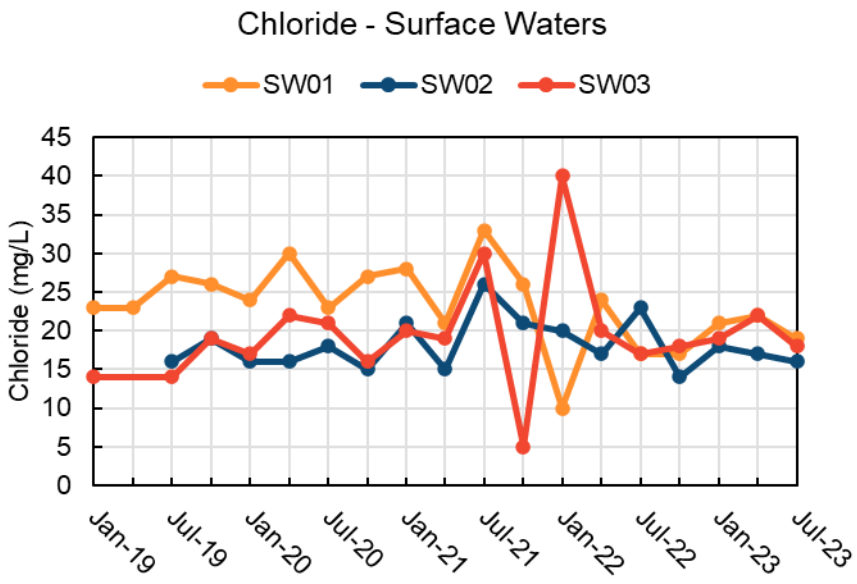

Total Zinc - Surface Waters
SW01
SW02
SW03
Total Zinc (mg/L)
0.060
0.050
0.040
0.030
0.020
0.010
0.000
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

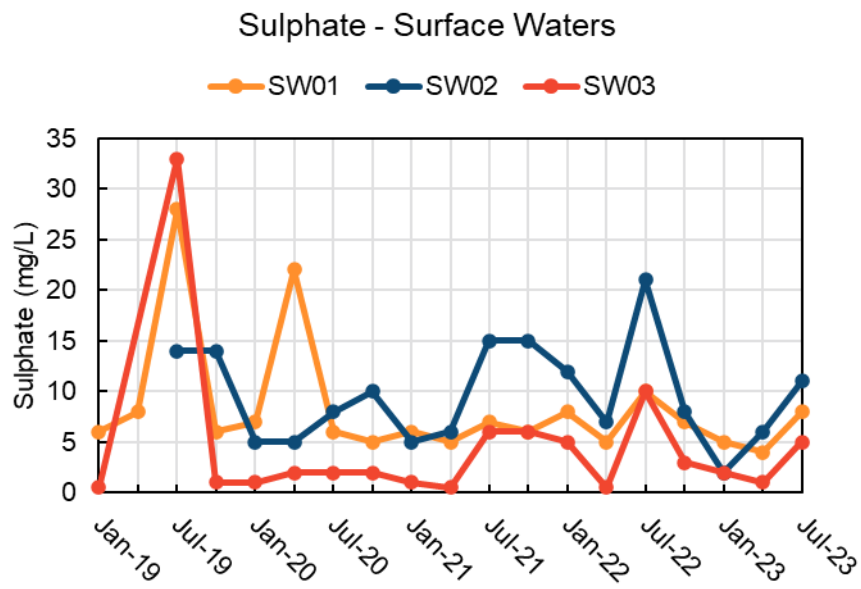

Total Nickel - Surface Waters
SW01
SW02
SW03
Total Nickel (mg/L)
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

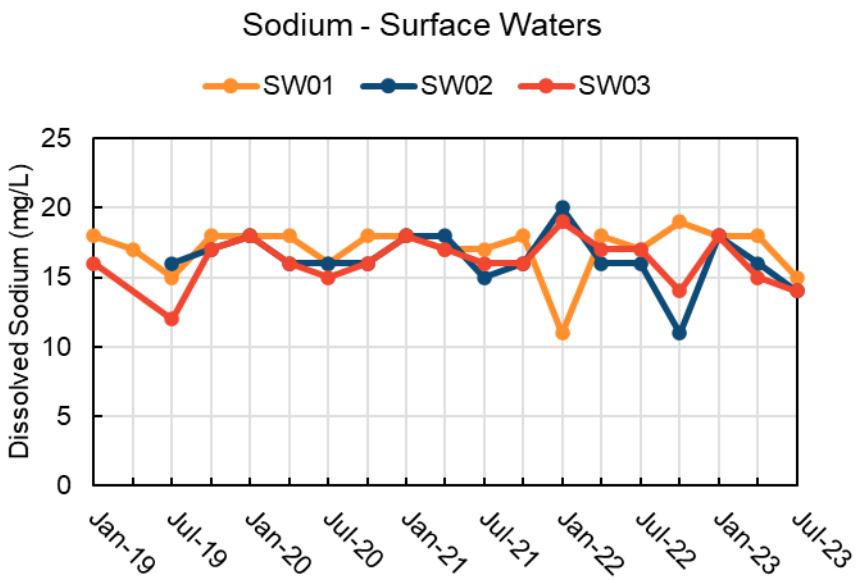

Total Manganese - Surface Waters
SW01
SW02
SW03
Total Manganese (mg/L)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

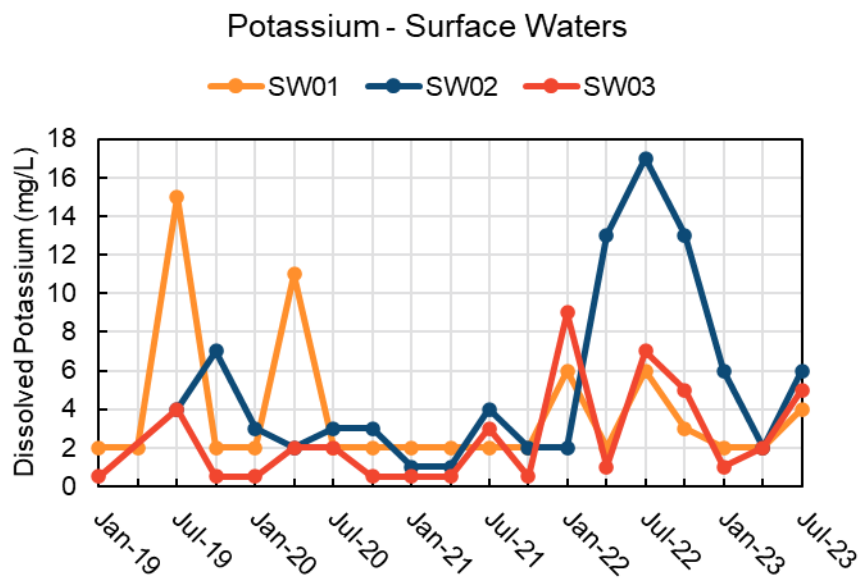
Total Chromium - Surface Waters
SW01
SW02
SW03
Total Chromium (mg/L)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

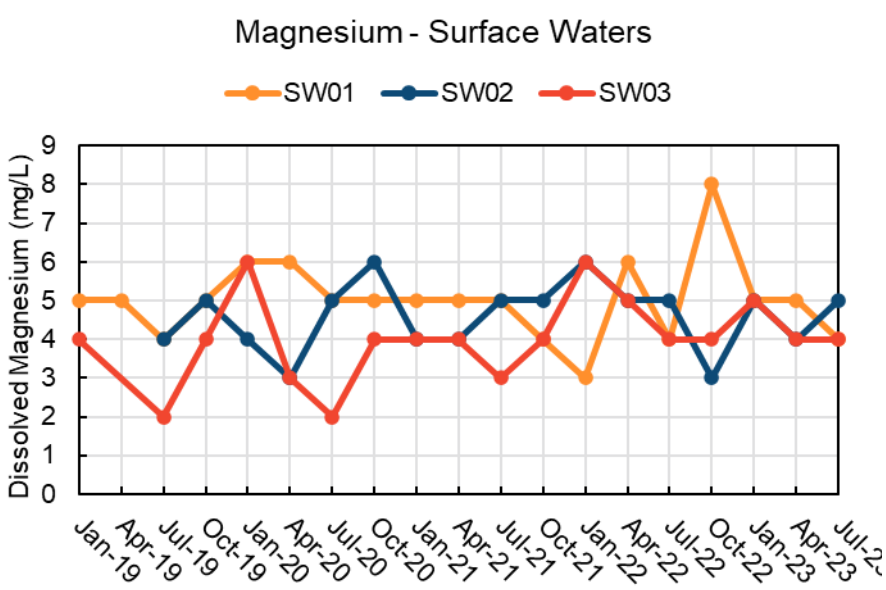
Total Lead - Surface Waters
SW01
SW02
SW03
Total Lead (mg/L)
0.010
0.008
0.006
0.004
0.002
0.000
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

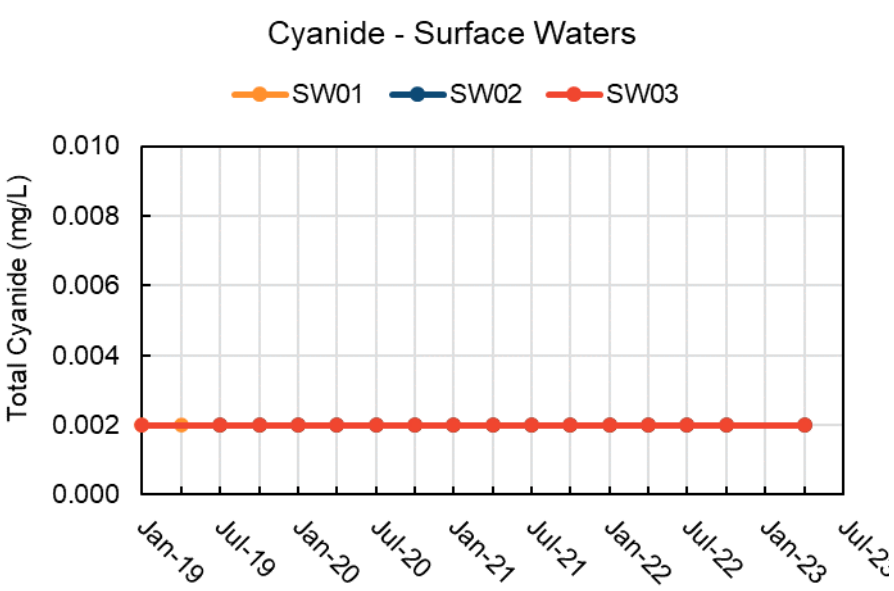

Chloride - Surface Waters
SW01
SW02
SW03
Chloride (mg/L)
45
40
35
30
25
20
15
10
5
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23


Sulphate - Surface Waters
SW01
SW02
SW03
Sulphate (mg/L)
35
30
25
20
15
10
5
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

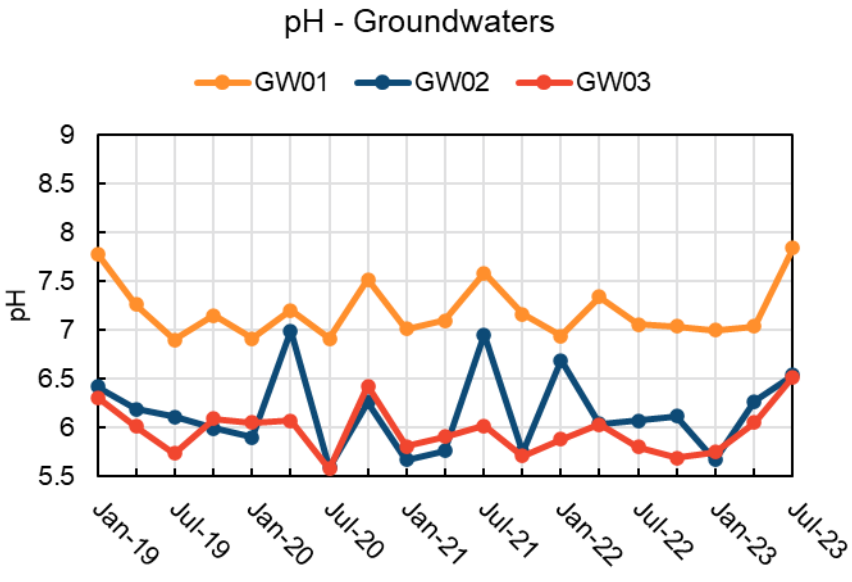

Sodium - Surface Waters
SW01
SW02
SW03
Dissolved Sodium (mg/L)
25
20
15
10
5
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

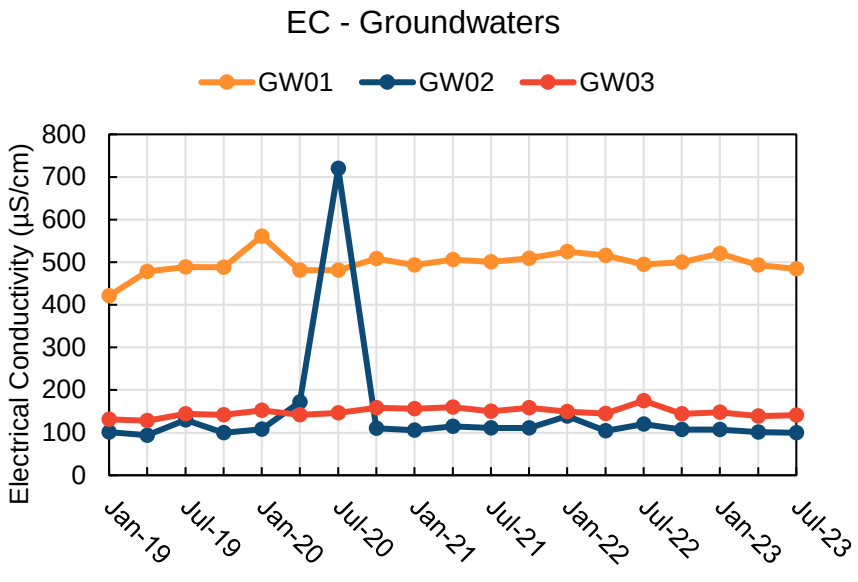

Potassium - Surface Waters
SW01
SW02
SW03
Dissolved Potassium (mg/L)
18
16
14
12
10
8
6
4
2
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

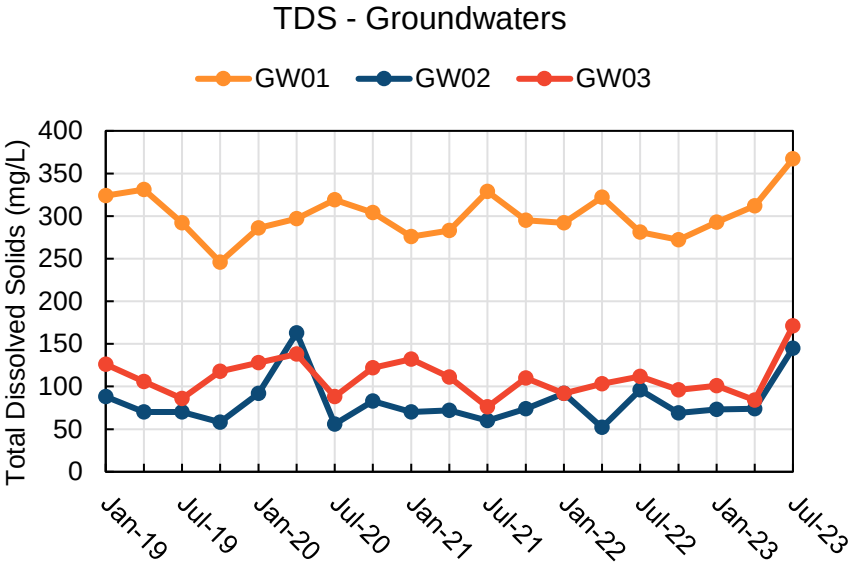

Magnesium - Surface Waters
SW01
SW02
SW03
Dissolved Magnesium (mg/L)
9
8
7
6
5
4
3
2
1
0
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Jan-21
Apr-21
Jul-21
Oct-21
Jan-22
Apr-22
Jul-22
Oct-22
Jan-23
Apr-23

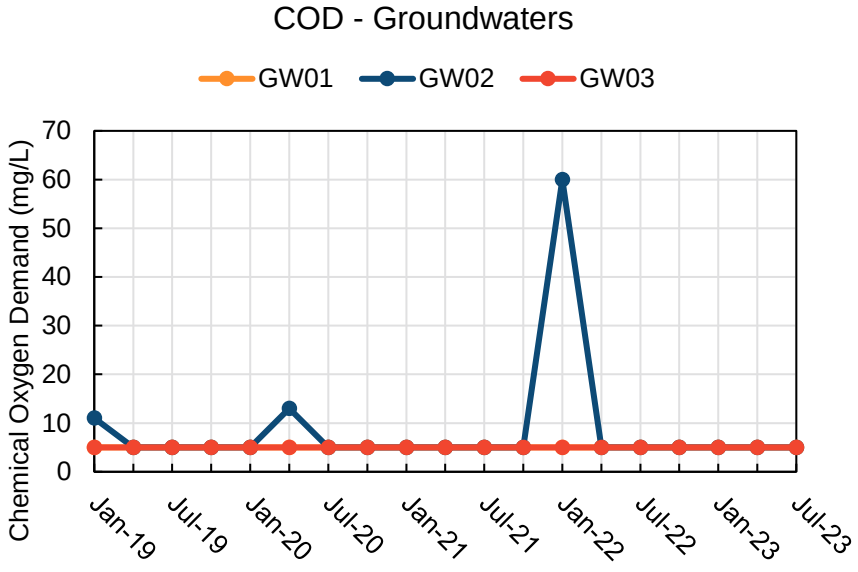

Cyanide - Surface Waters
SW01
SW02
SW03
Total Cyanide (mg/L)
0.010
0.008
0.006
0.004
0.002
0.000
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23

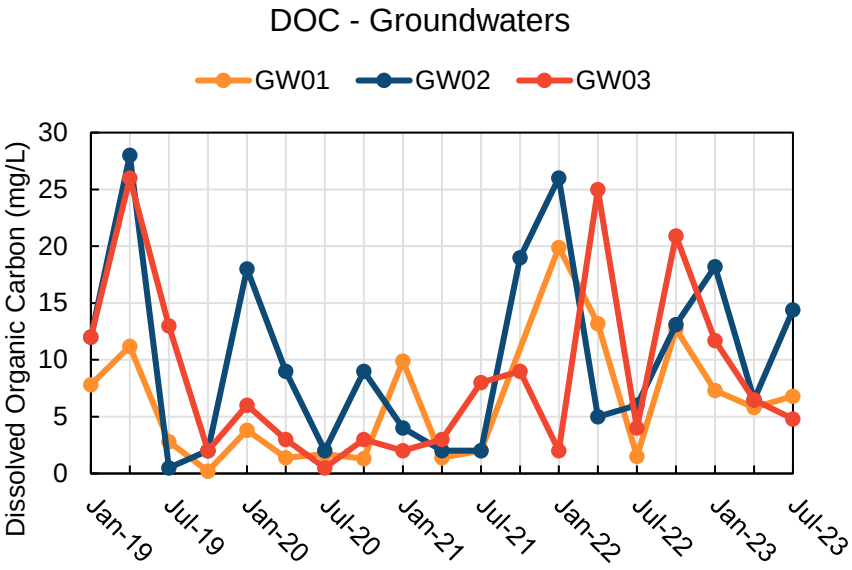
Ground water quality (GW01, GW02, GW03)

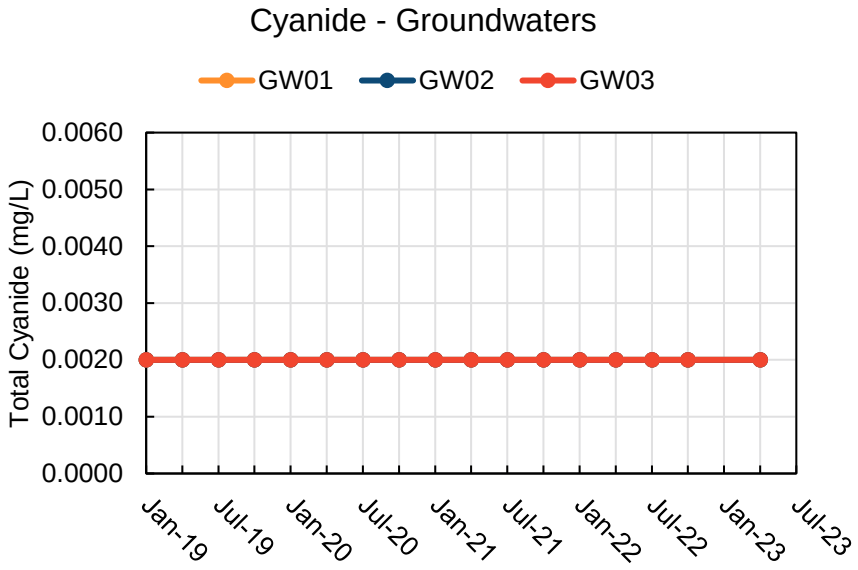


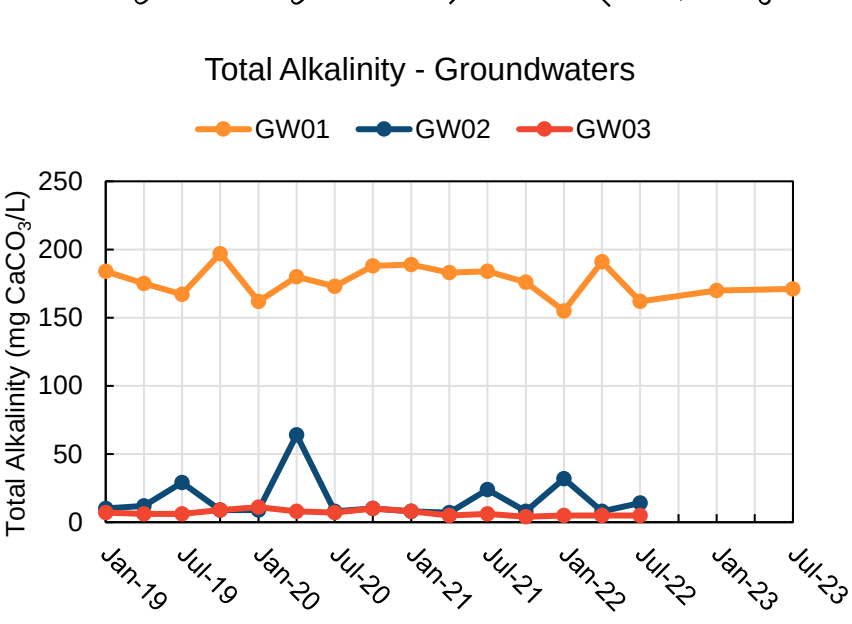


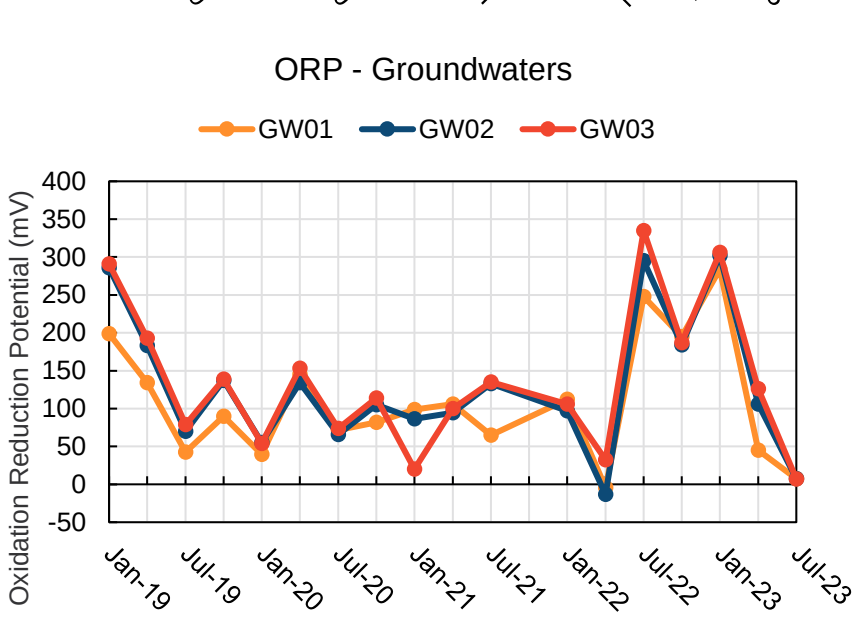


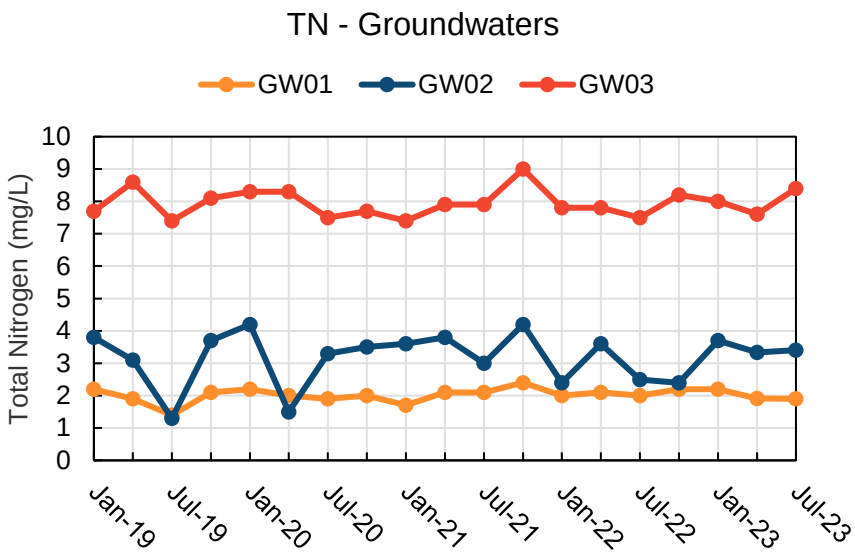


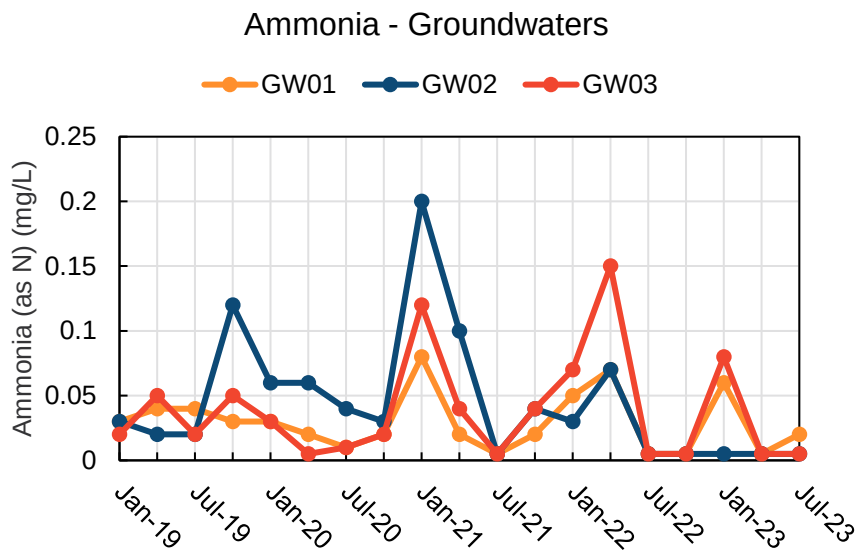


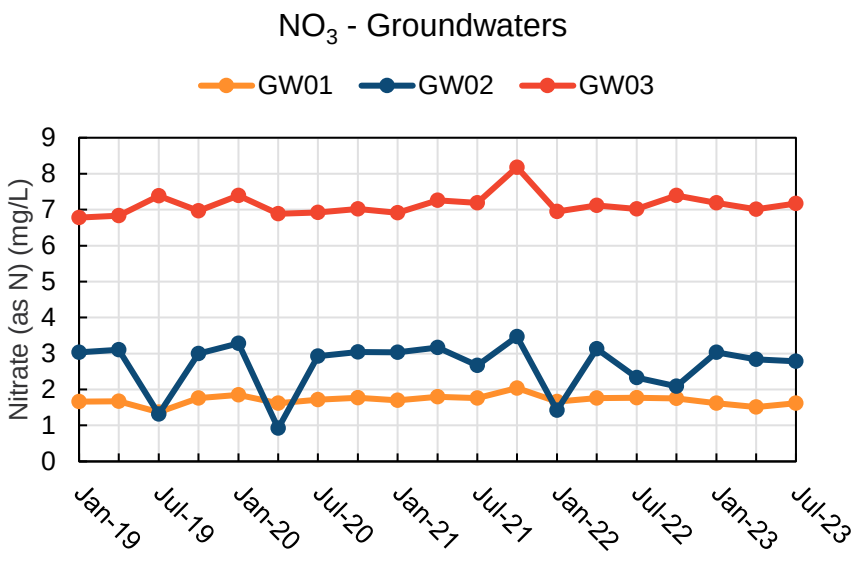


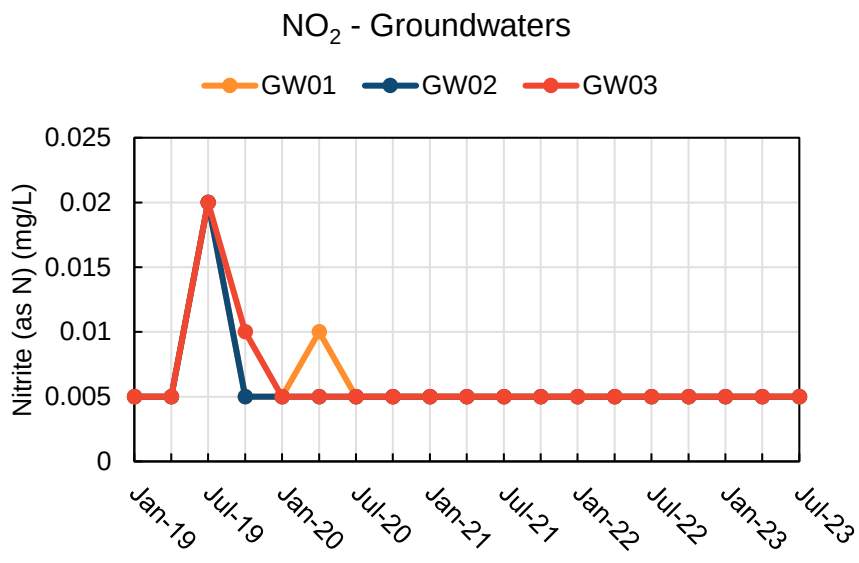


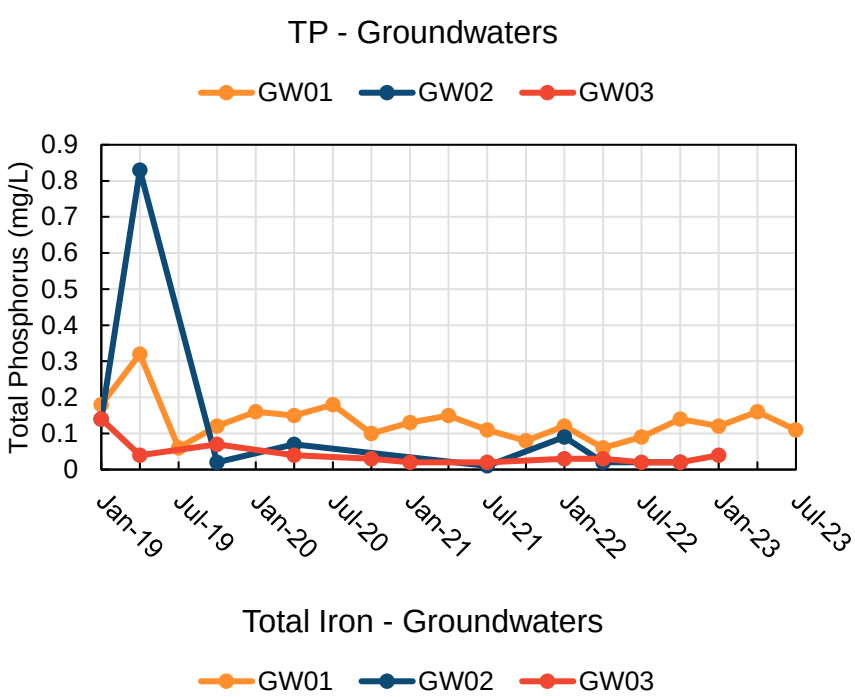


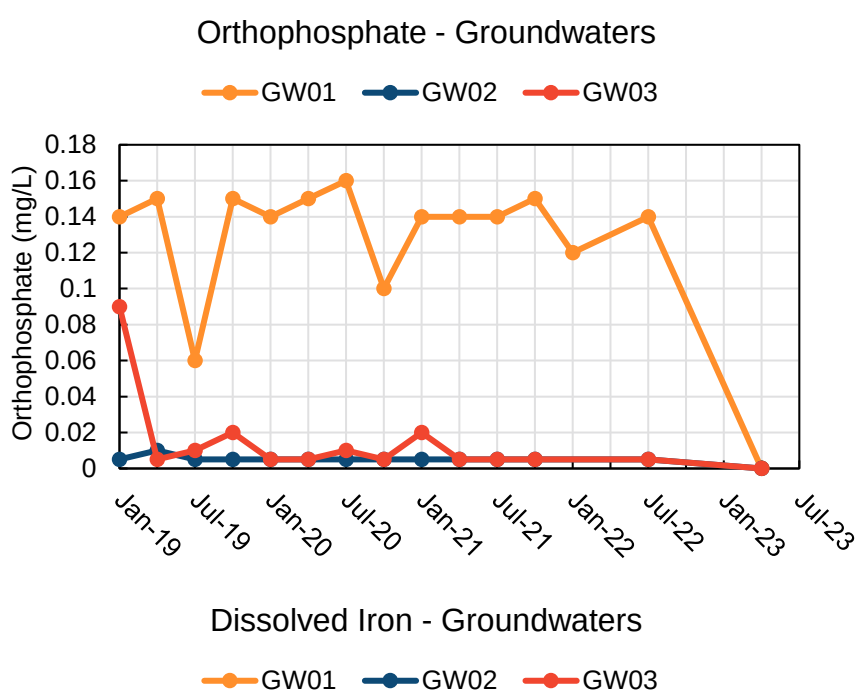

TN - Groundwaters
GW01
GW02
GW03
Total Nitrogen (mg/L)
0
1
2
3
4
5
6
7
8
9
10
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

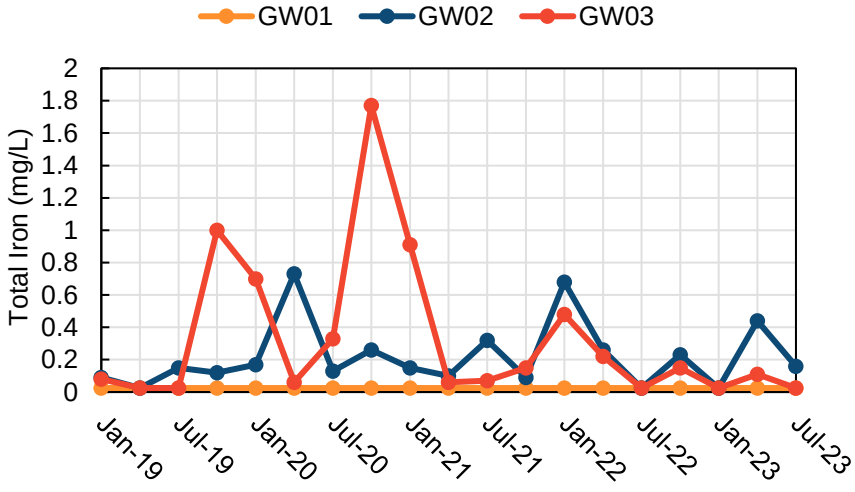

Ammonia - Groundwaters
GW01
GW02
GW03
Ammonia (as N) (mg/L)
0
0.05
0.1
0.15
0.2
0.25
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

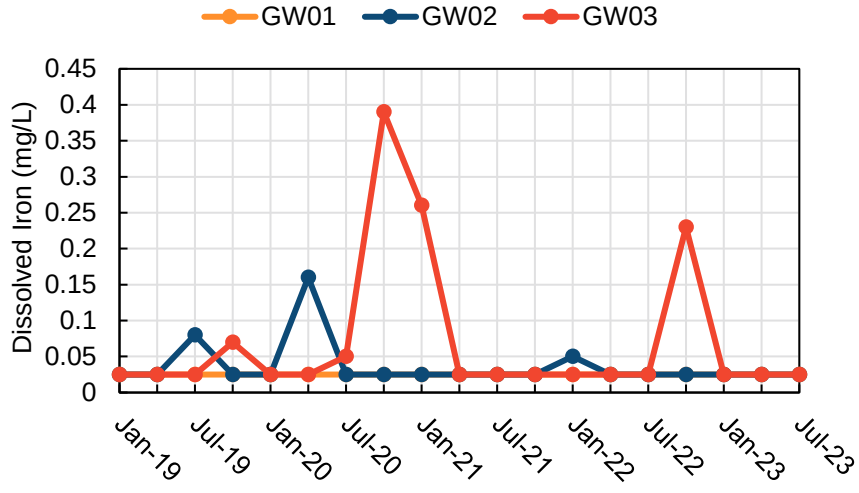

NO3 - Groundwaters
GW01
GW02
GW03
Nitrate (as N) (mg/L)
0
1
2
3
4
5
6
7
8
9
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

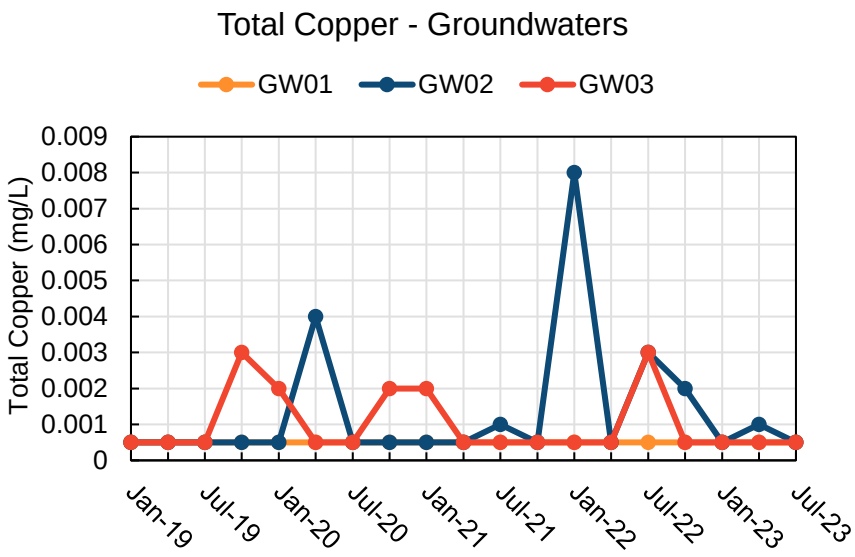

NO2 - Groundwaters
GW01
GW02
GW03
Nitrite (as N) (mg/L)
0
0.005
0.01
0.015
0.02
0.025
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

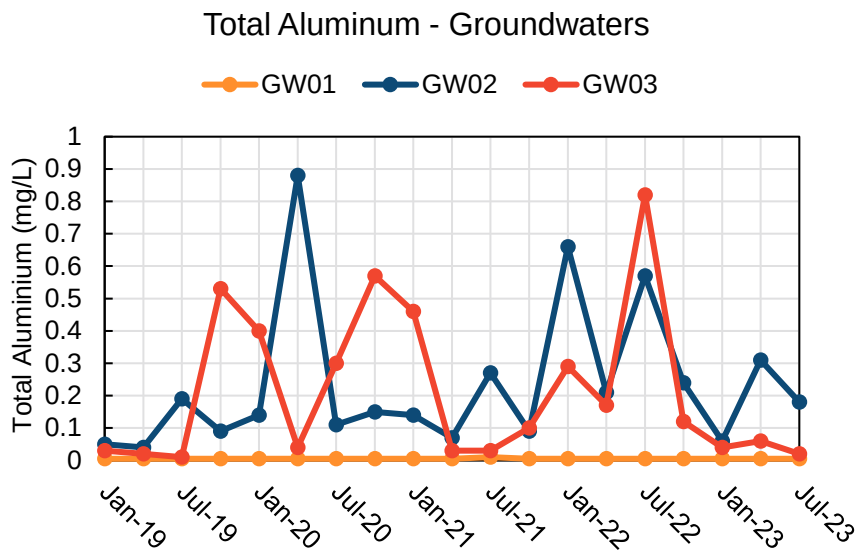

TP - Groundwaters
GW01
GW02
GW03
Total Phosphorus (mg/L)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

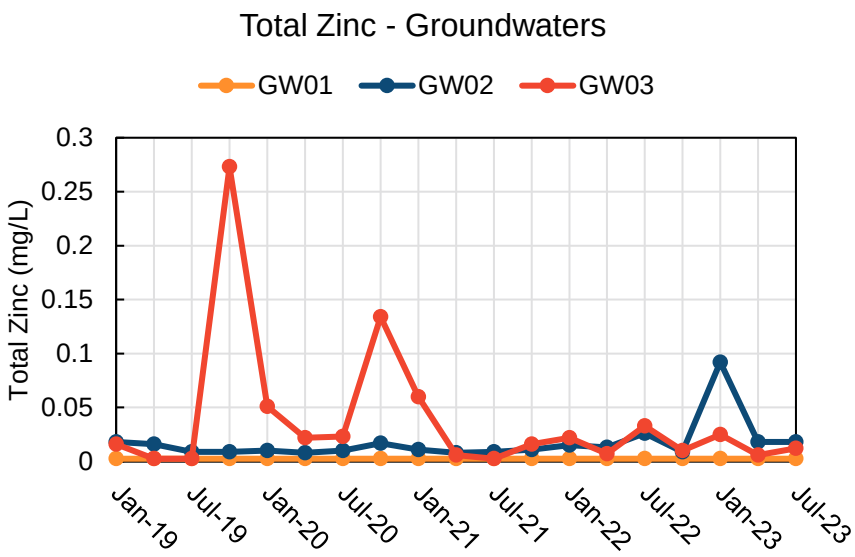

Orthophosphate - Groundwaters
GW01
GW02
GW03
Orthophosphate (mg/L)
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

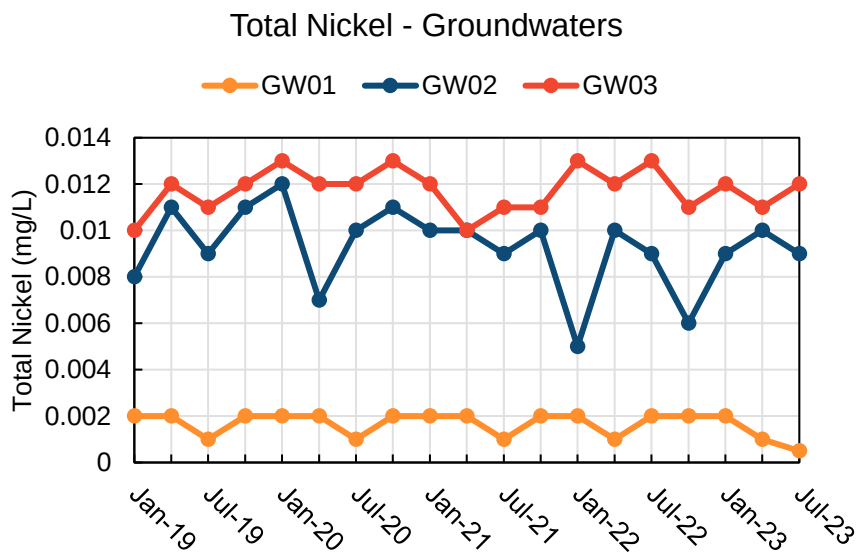

Total Iron - Groundwaters
GW01
GW02
GW03
Total Iron (mg/L)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

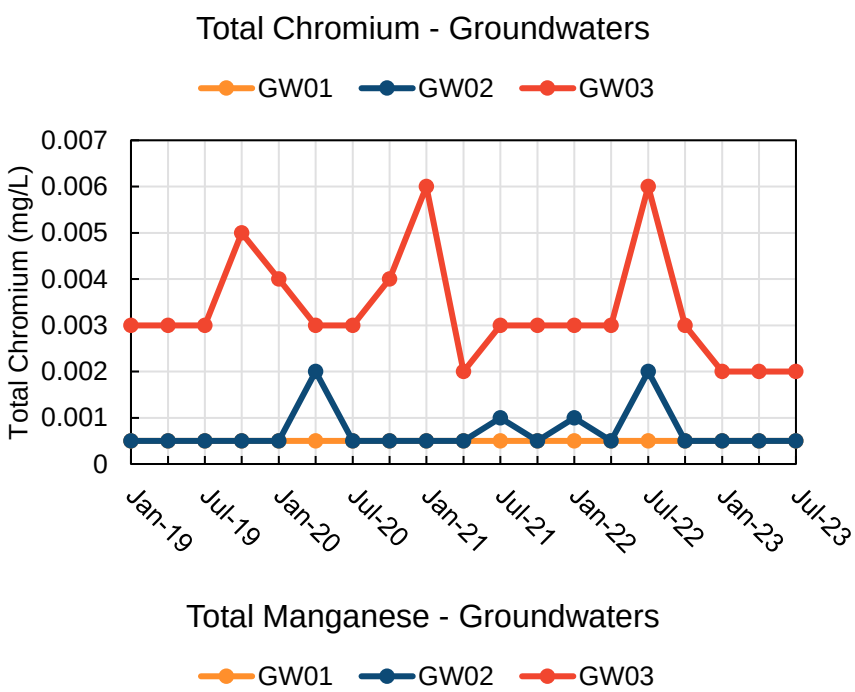

Dissolved Iron - Groundwaters
GW01
GW02
GW03
Dissolved Iron (mg/L)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

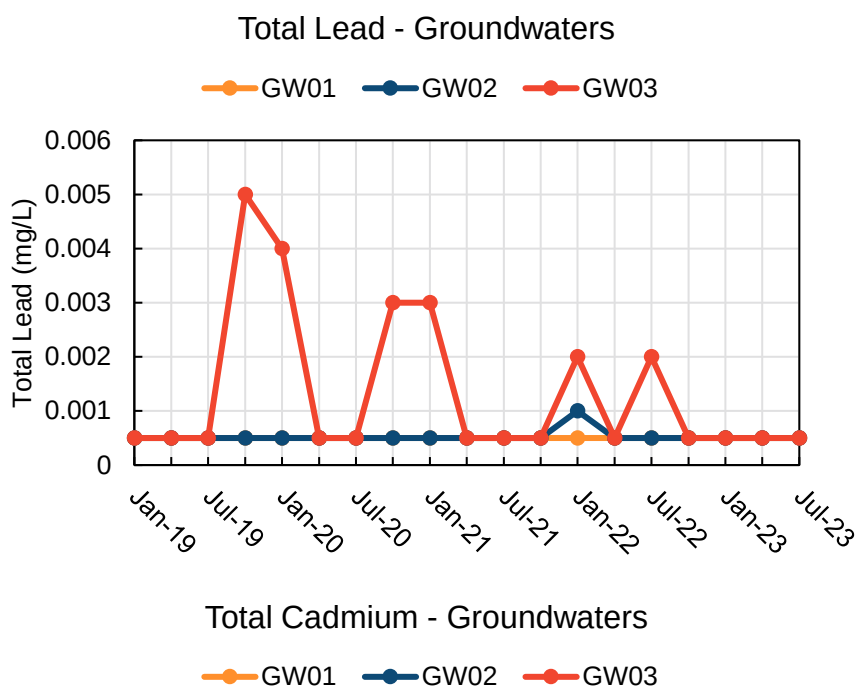

Total Copper - Groundwaters
GW01
GW02
GW03
Total Copper (mg/L)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

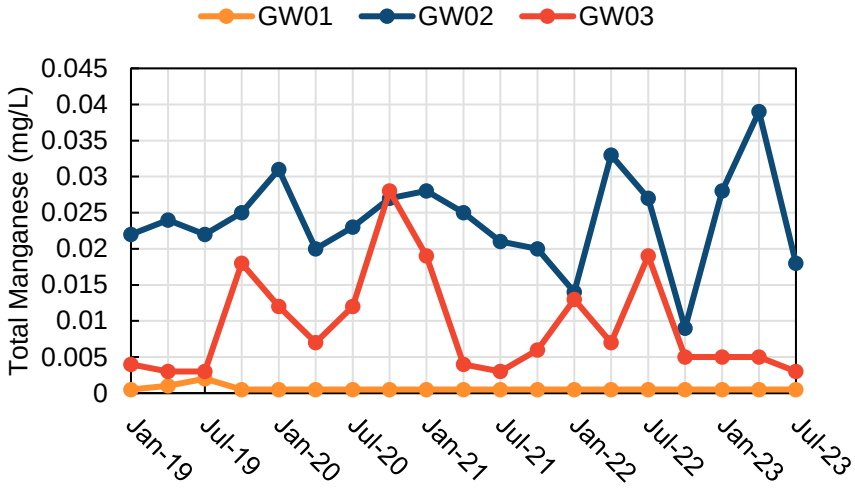

Total Aluminum - Groundwaters
GW01
GW02
GW03
Total Aluminium (mg/L)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

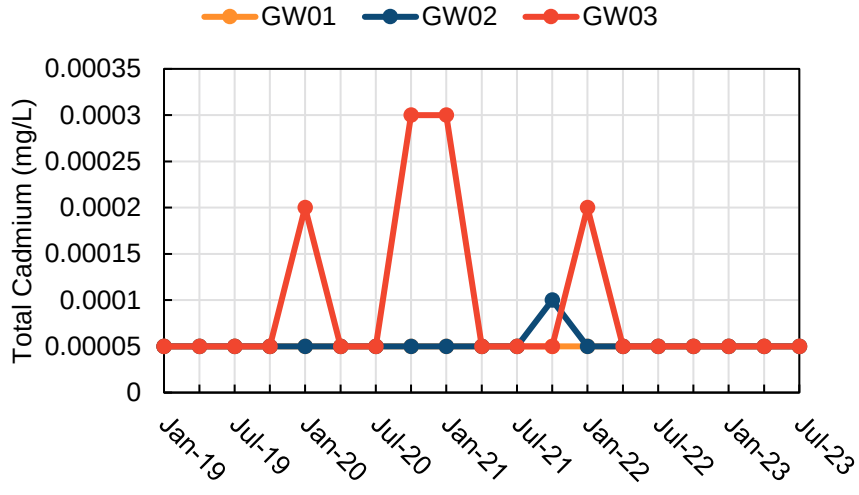

Total Zinc - Groundwaters
GW01
GW02
GW03
Total Zinc (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

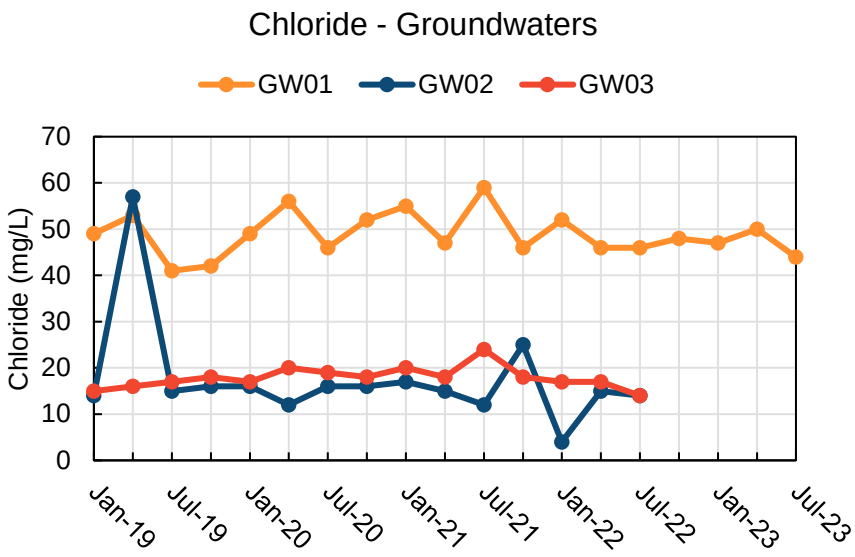

Total Nickel - Groundwaters
GW01
GW02
GW03
Total Nickel (mg/L)
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

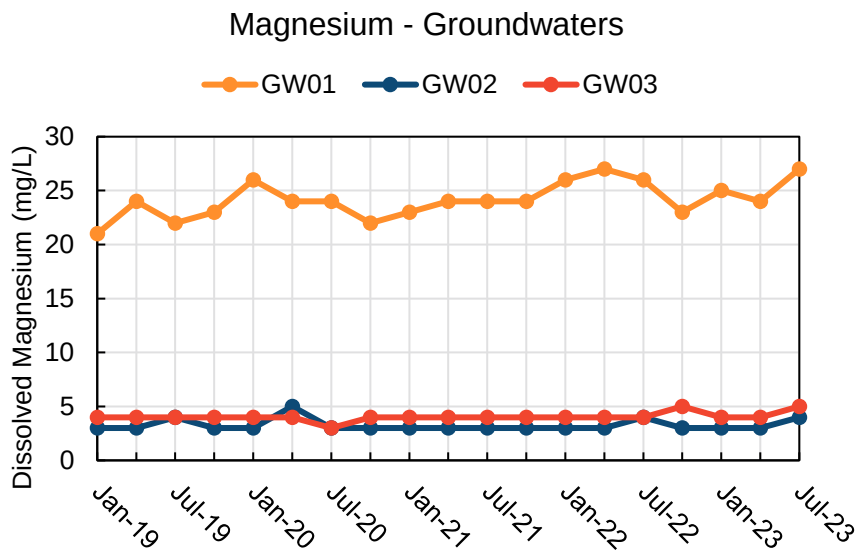

Total Chromium - Groundwaters
GW01
GW02
GW03
Total Chromium (mg/L)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

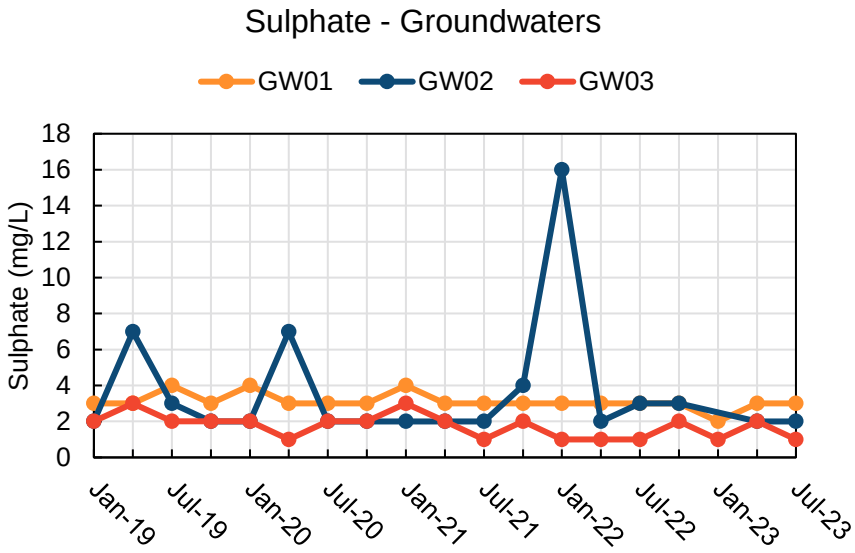

Total Lead - Groundwaters
GW01
GW02
GW03
Total Lead (mg/L)
0.006
0.005
0.004
0.003
0.002
0.001
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

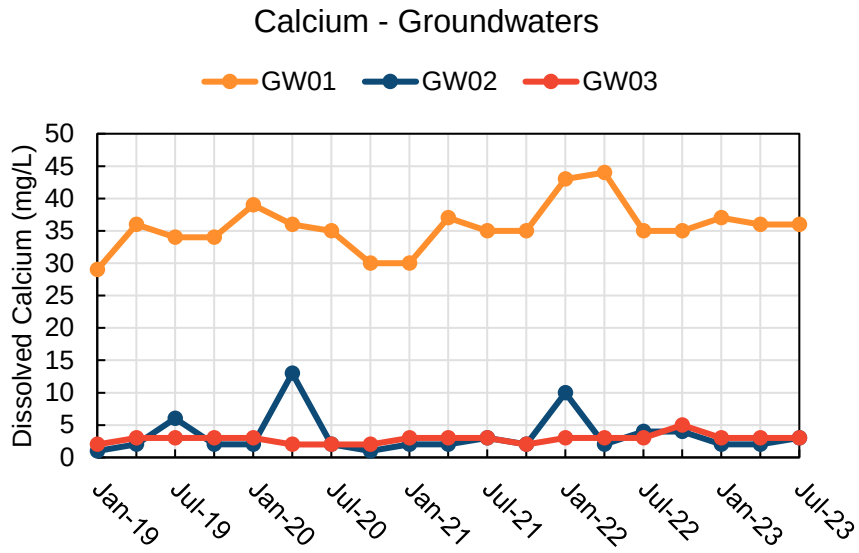

Total Manganese - Groundwaters
GW01
GW02
GW03
Total Manganese (mg/L)
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

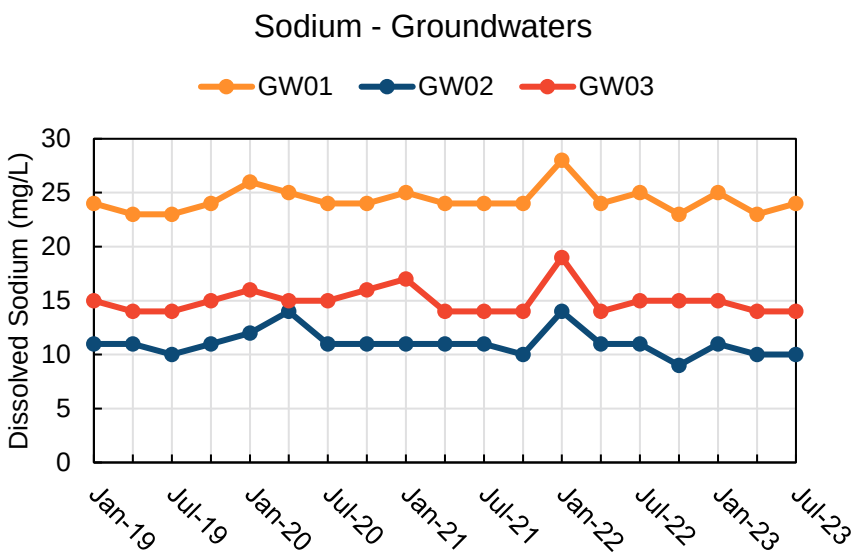

Total Cadmium - Groundwaters
GW01
GW02
GW03
Total Cadmium (mg/L)
0.00035
0.0003
0.00025
0.0002
0.00015
0.0001
0.00005
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

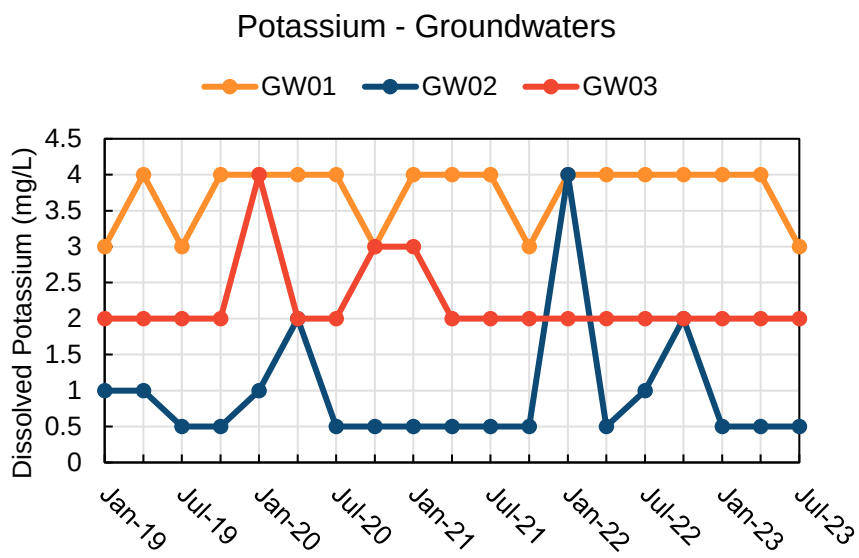

Chloride - Groundwaters
GW01
GW02
GW03
Chloride (mg/L)
0
10
20
30
40
50
60
70
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23


Magnesium - Groundwaters
GW01
GW02
GW03
Dissolved Magnesium (mg/L)
0
5
10
15
20
25
30
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

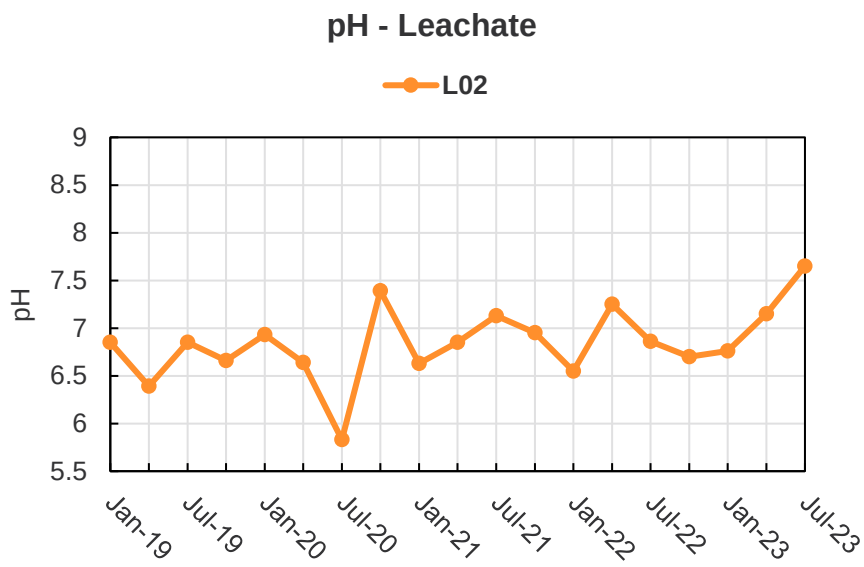

Sulphate - Groundwaters
GW01
GW02
GW03
Sulphate (mg/L)
0
2
4
6
8
10
12
14
16
18
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

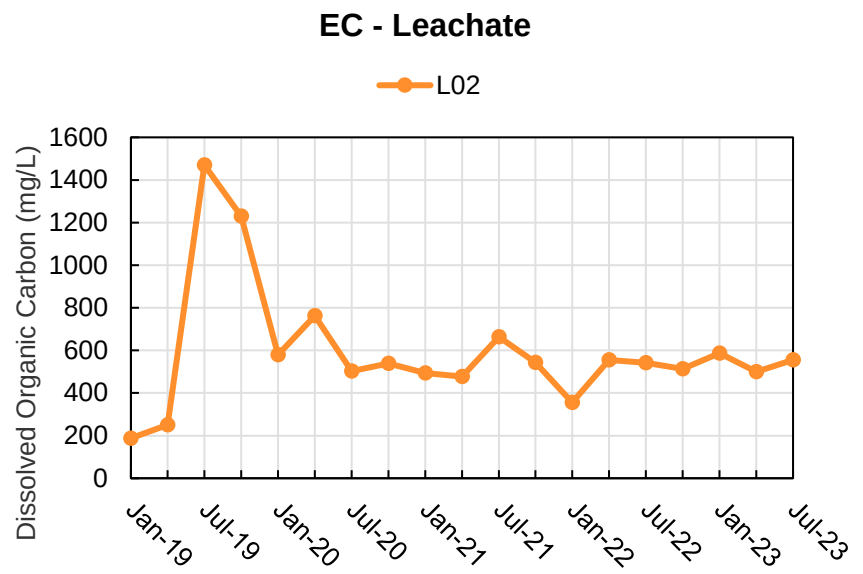

Calcium - Groundwaters
GW01
GW02
GW03
Dissolved Calcium (mg/L)
0
5
10
15
20
25
30
35
40
45
50
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

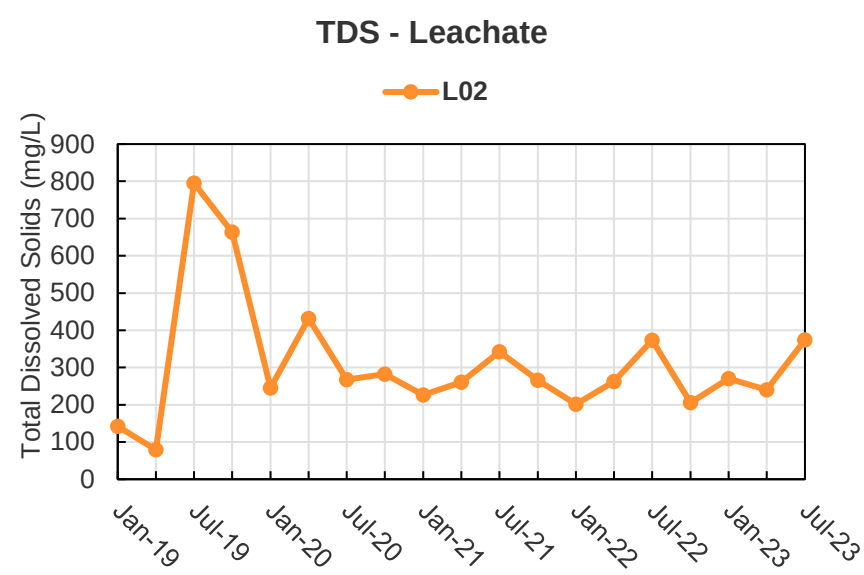

Sodium - Groundwaters
GW01
GW02
GW03
Dissolved Sodium (mg/L)
0
5
10
15
20
25
30
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

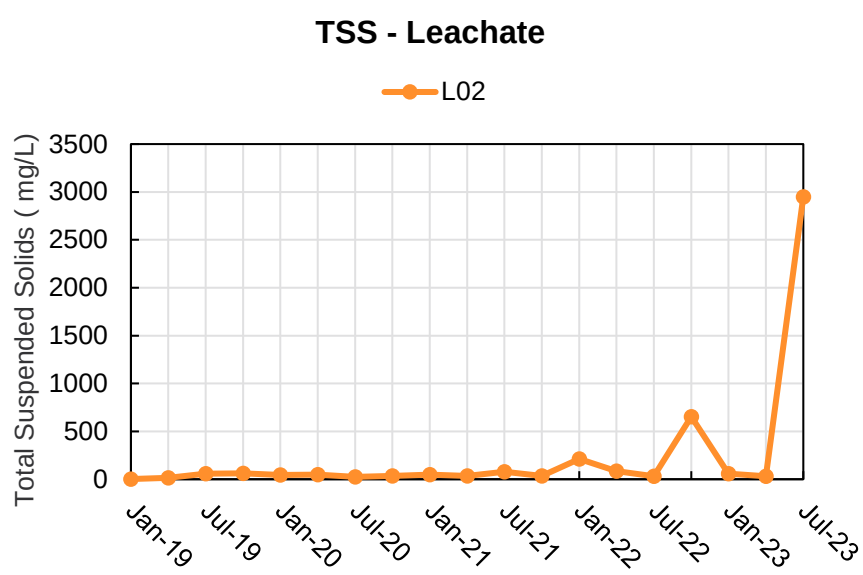

Potassium - Groundwaters
GW01
GW02
GW03
Dissolved Potassium (mg/L)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

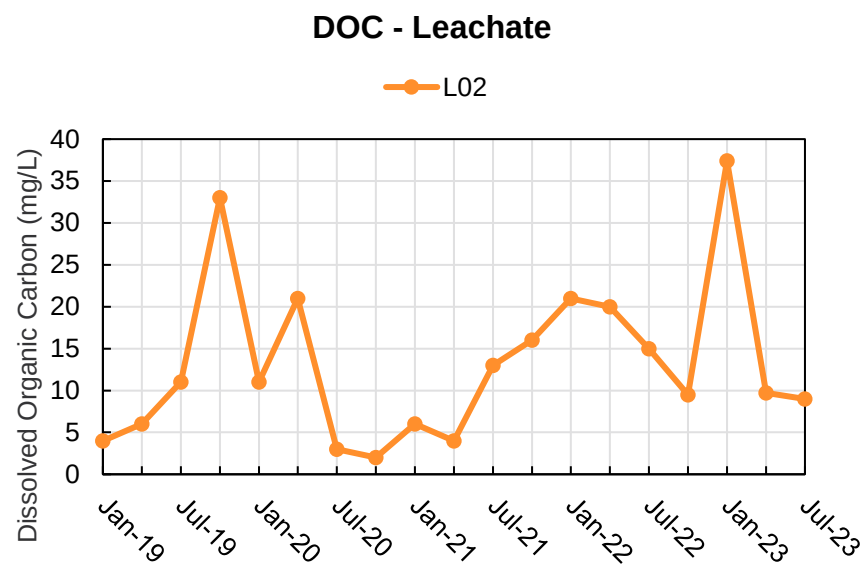
Leachate water quality (L02)

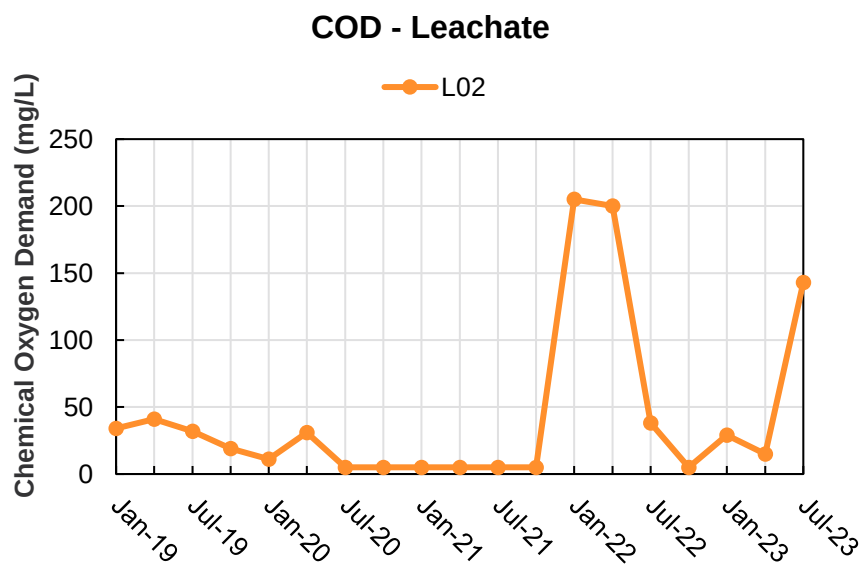


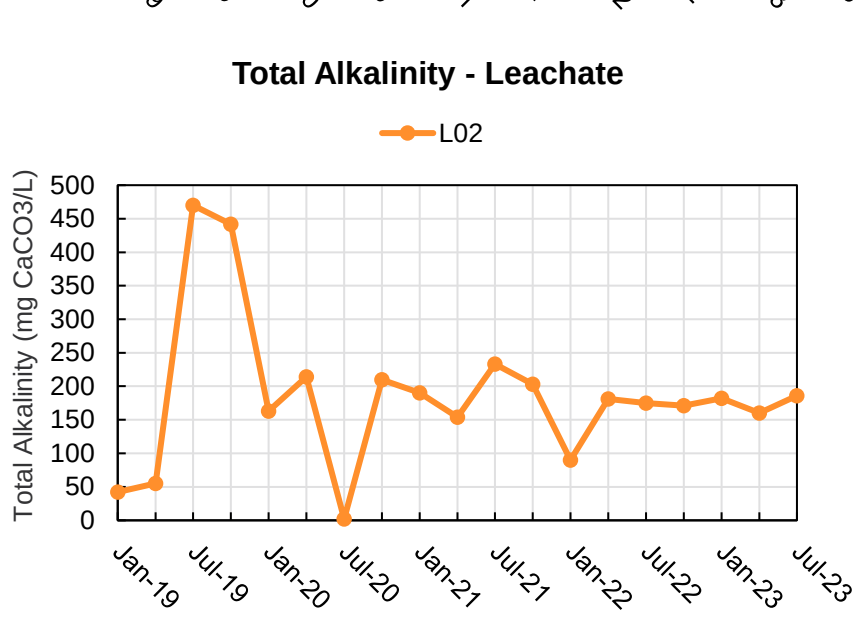


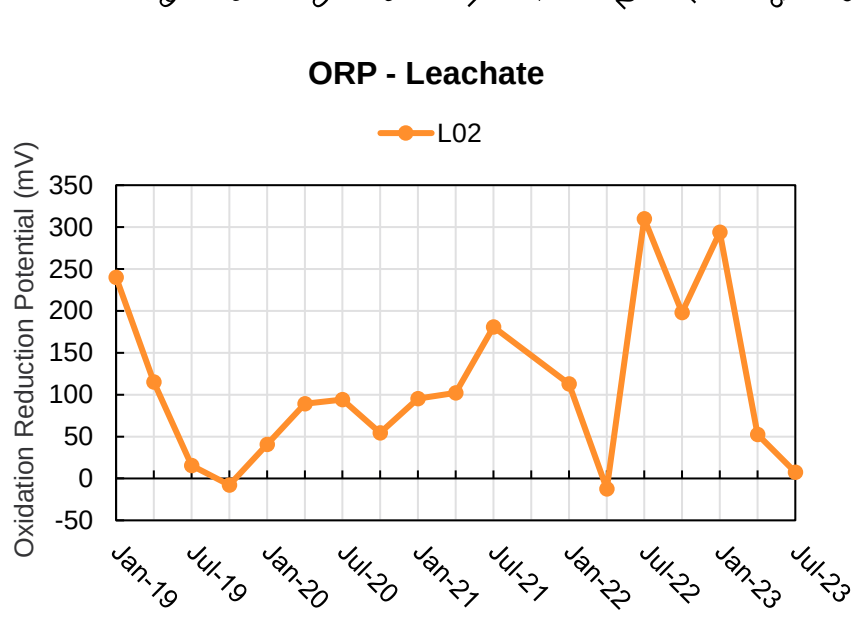




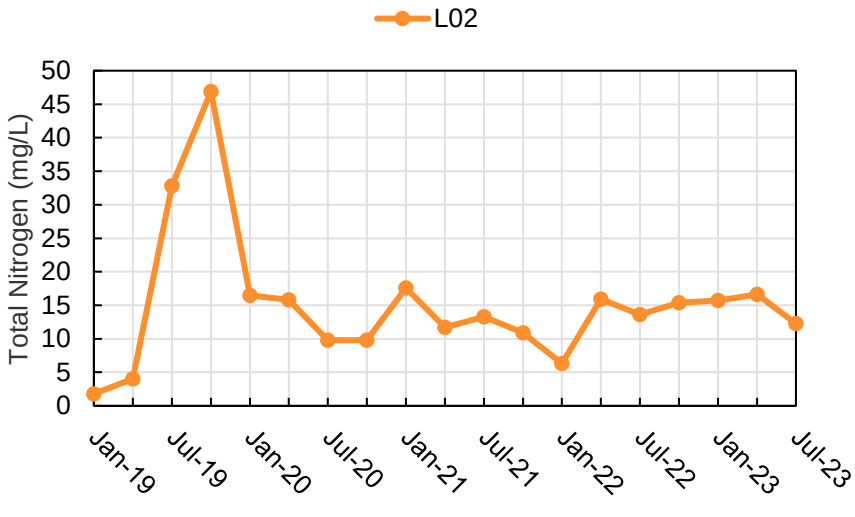




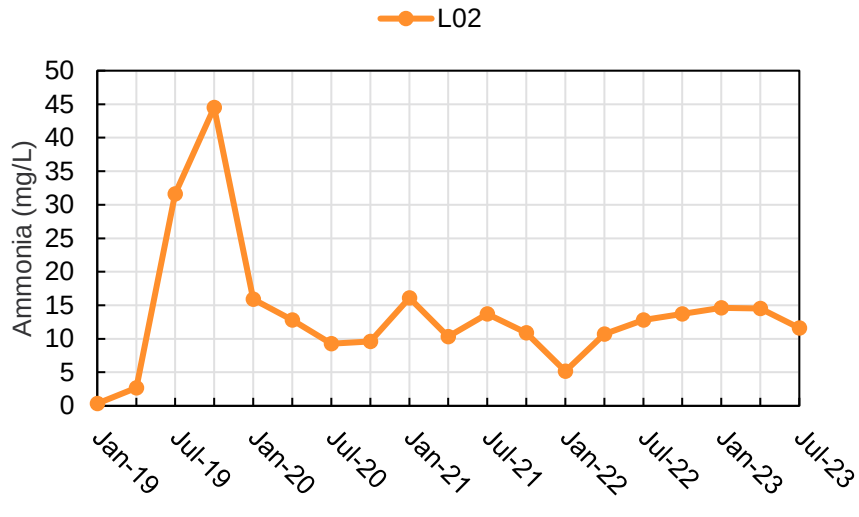




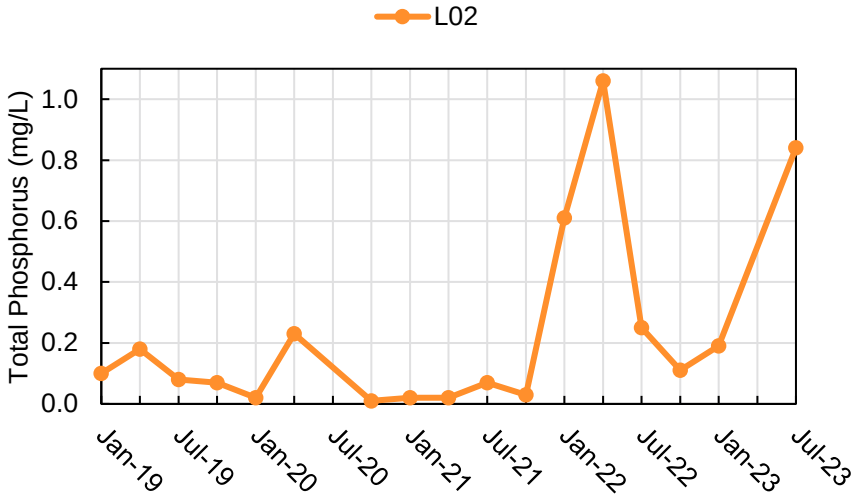
TN - Leachate



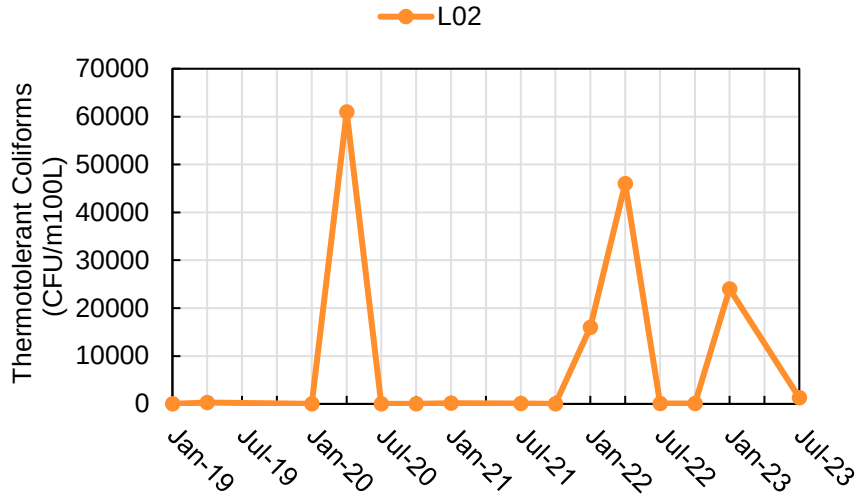
Ammonia - Leachate



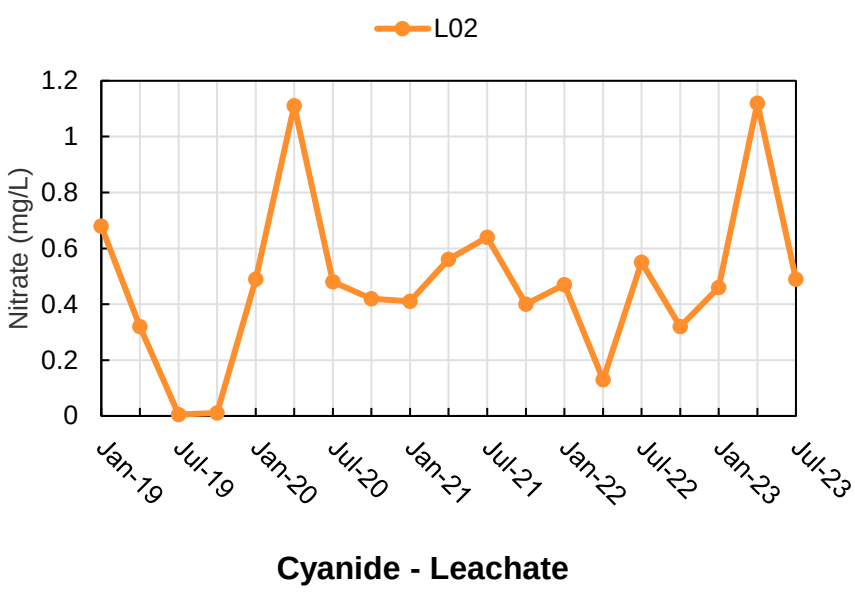
TP - Leachate



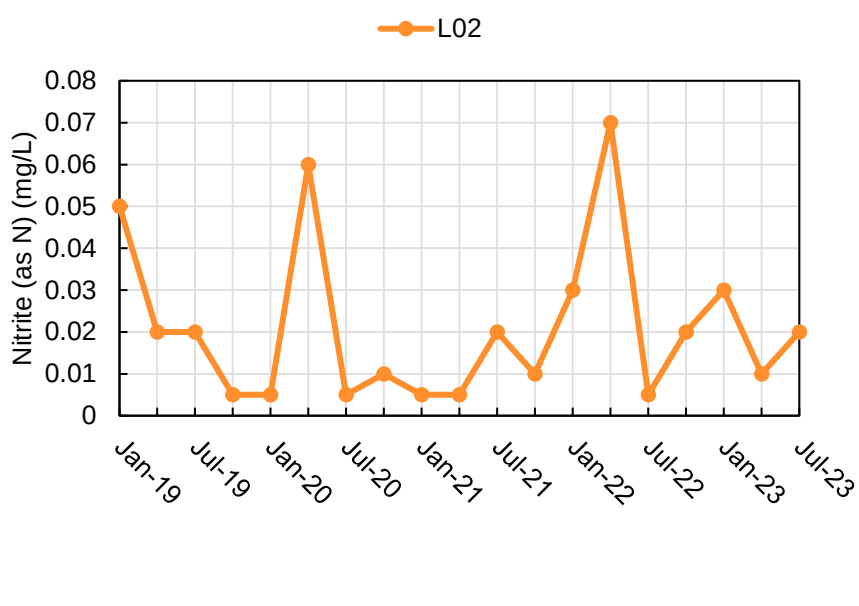
Thermotolerant Coliforms - Leachate



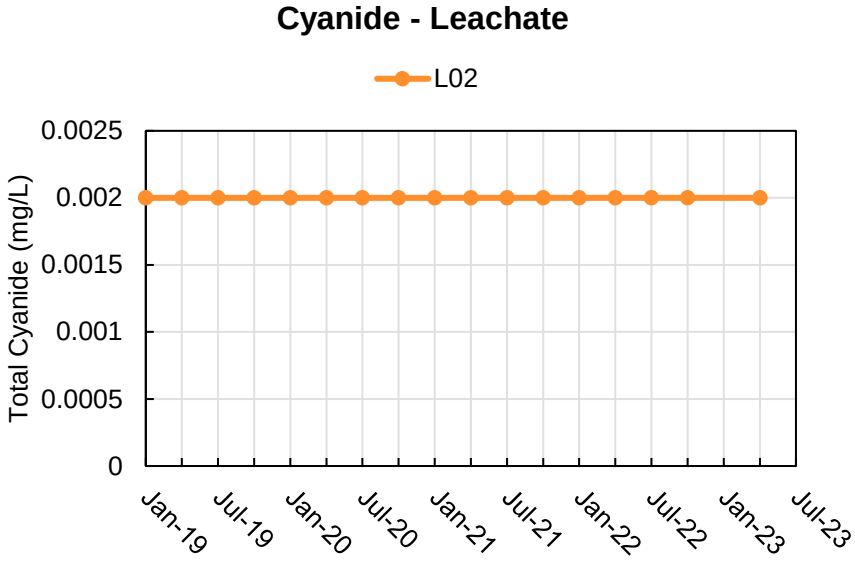
NO_3 - Leachate

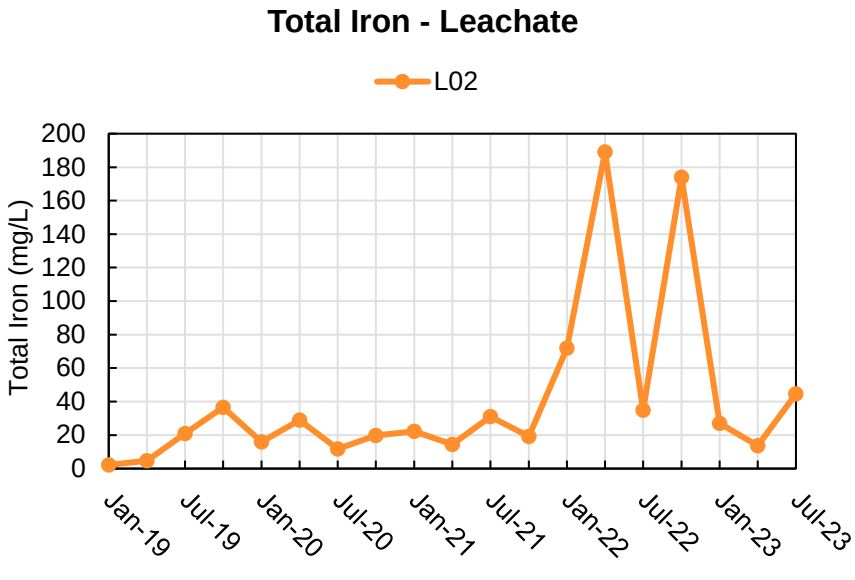


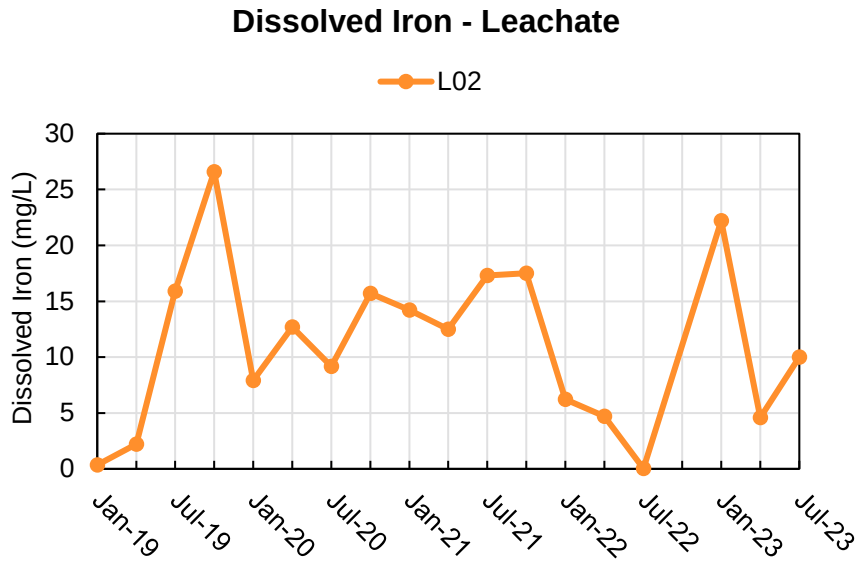
NO_2 - Leachate

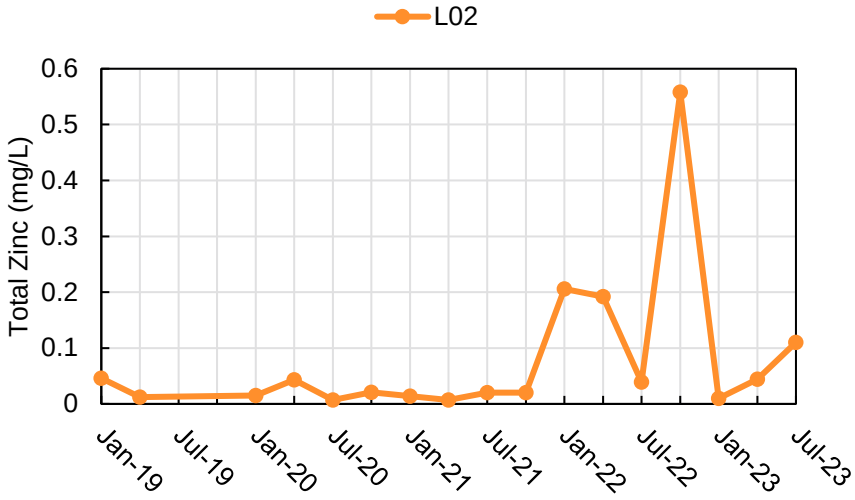


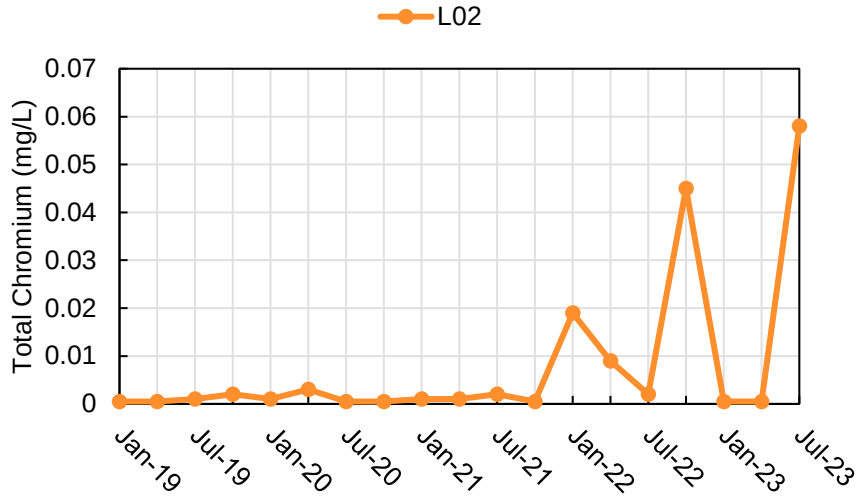
Cyanide - Leachate

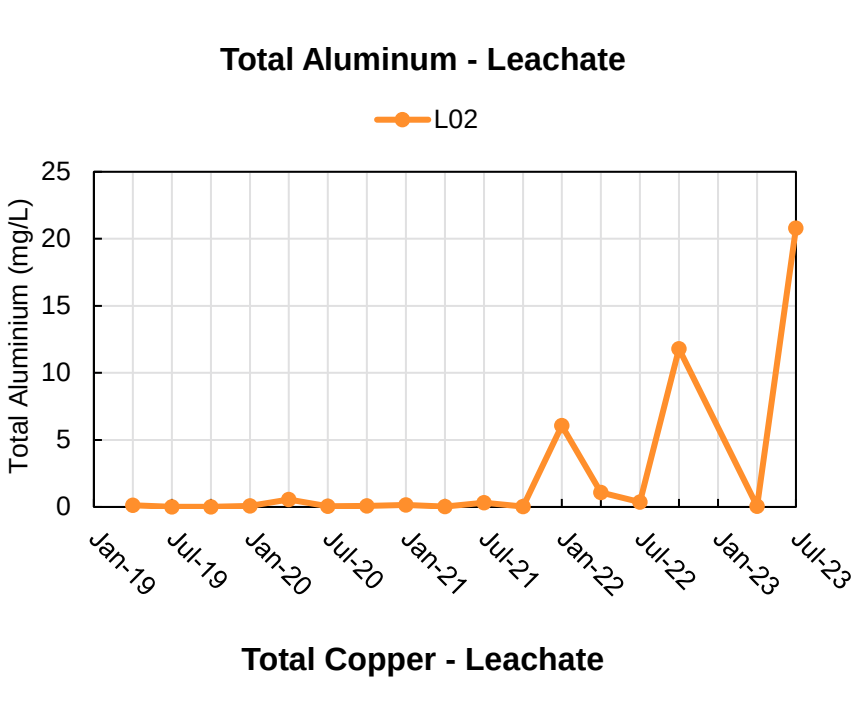


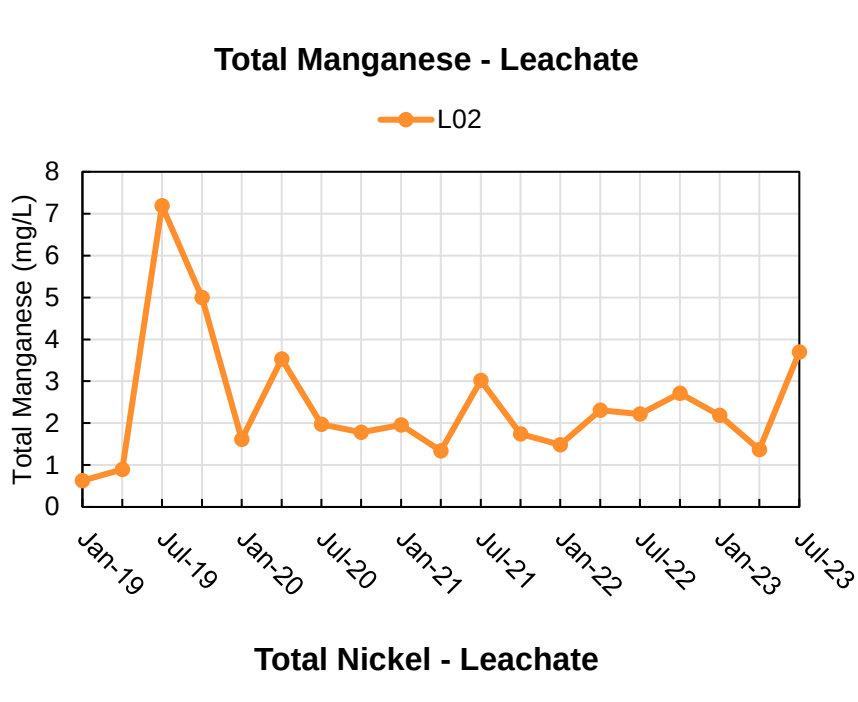

Total Iron - Leachate
L02
Total Iron (mg/L)
0
20
40
60
80
100
120
140
160
180
200
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

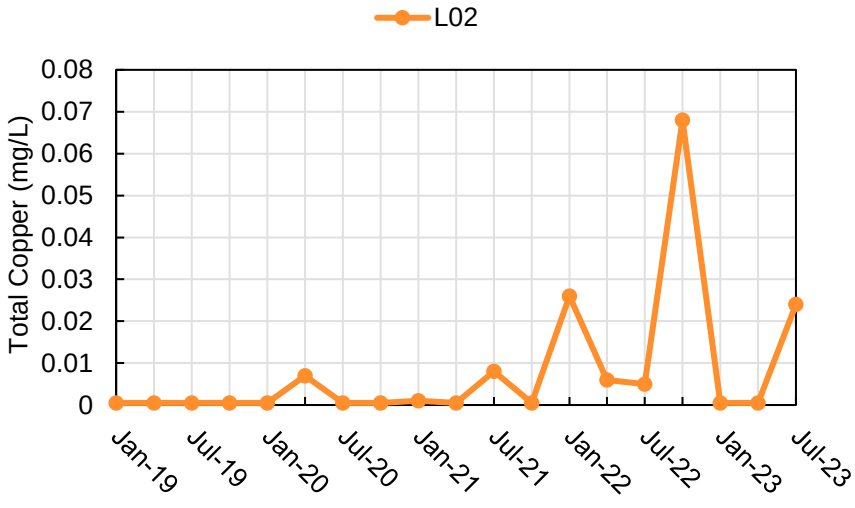

Dissolved Iron - Leachate
L02
Dissolved Iron (mg/L)
0
5
10
15
20
25
30
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

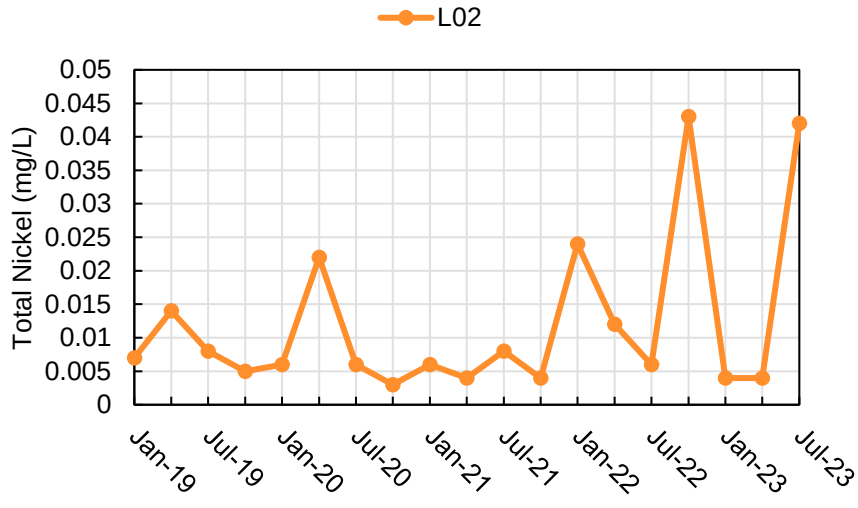

Total Zinc - Leachate
L02
Total Zinc (mg/L)
0
0.1
0.2
0.3
0.4
0.5
0.6
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

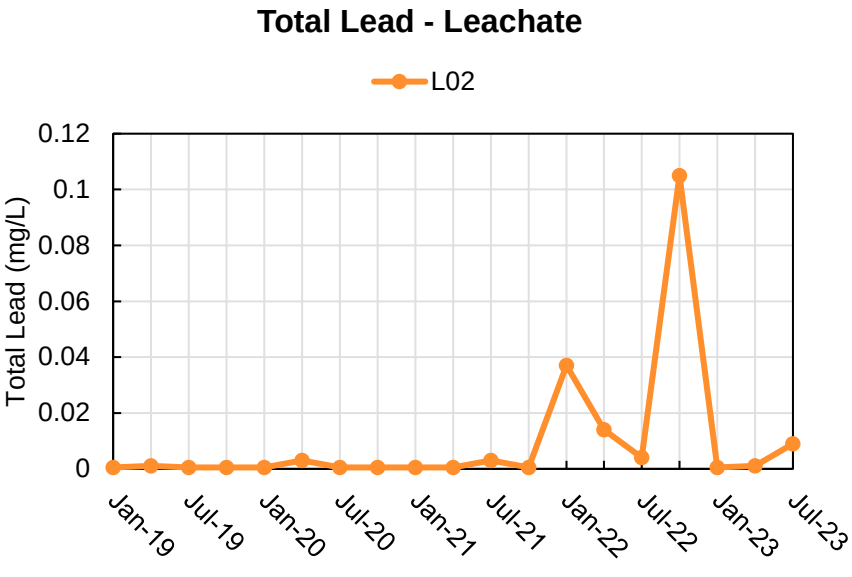

Total Chromium - Leachate
L02
Total Chromium (mg/L)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

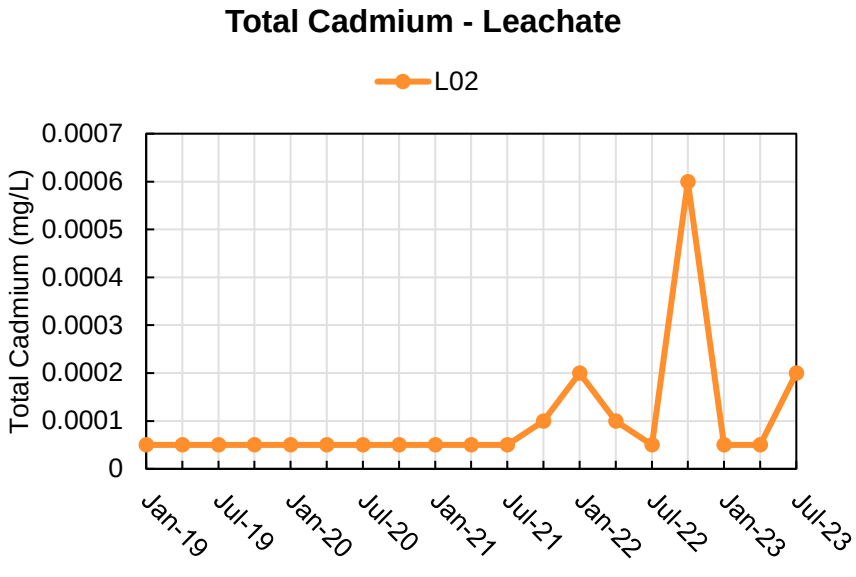

Total Aluminum - Leachate
L02
Total Aluminium (mg/L)
0
5
10
15
20
25
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

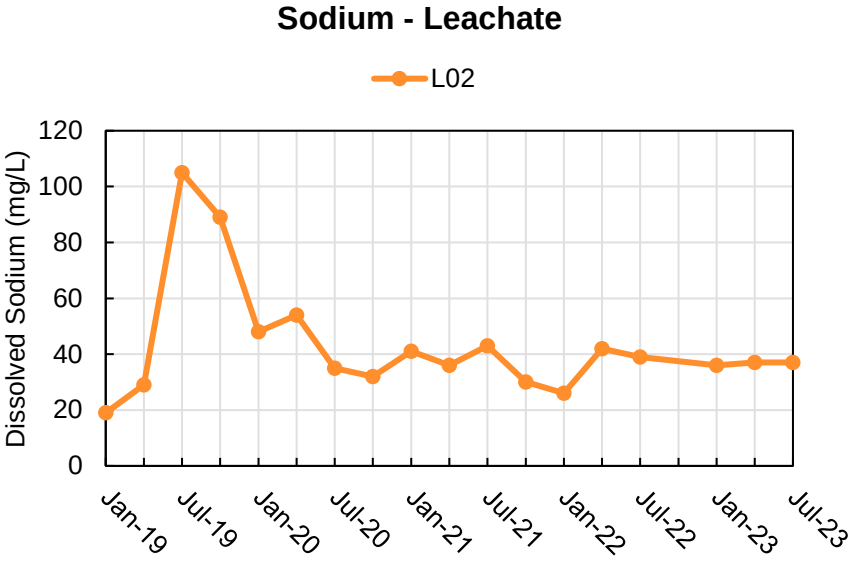

Total Manganese - Leachate
L02
Total Manganese (mg/L)
0
1
2
3
4
5
6
7
8
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

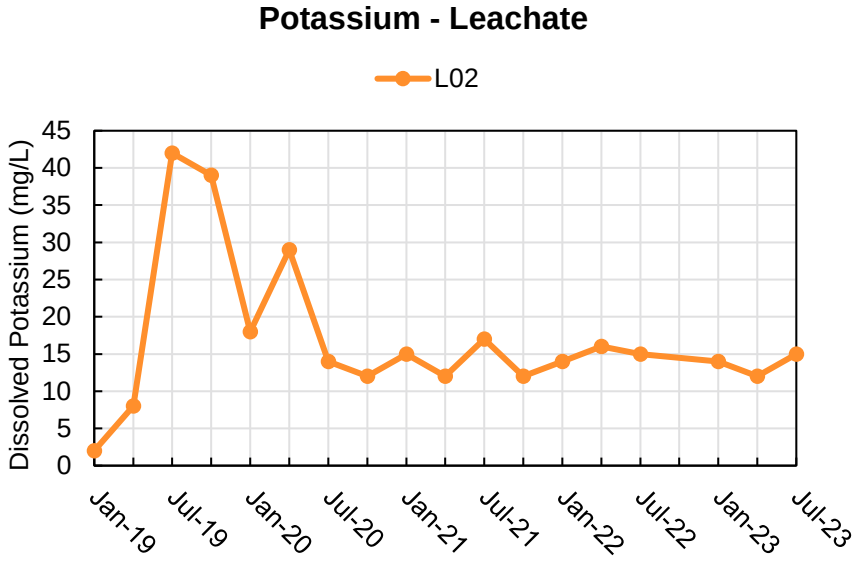

Total Copper - Leachate
L02
Total Copper (mg/L)
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

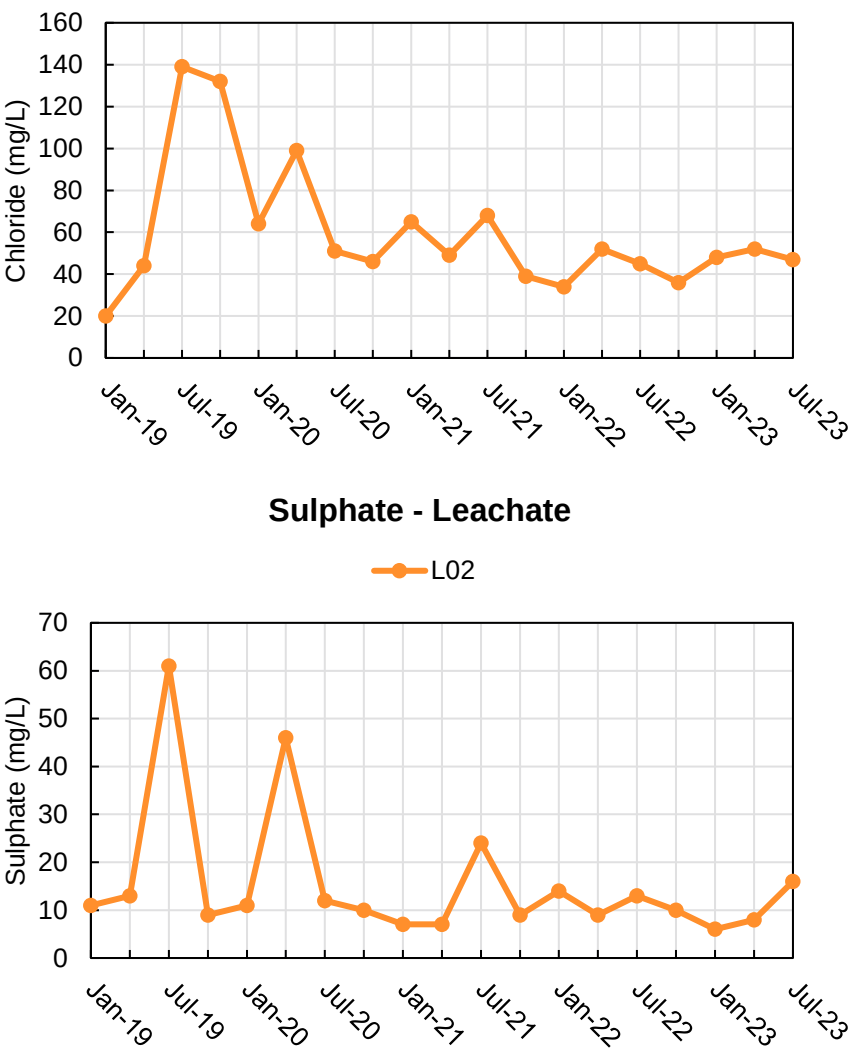

Total Nickel - Leachate
L02
Total Nickel (mg/L)
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045
0.05
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

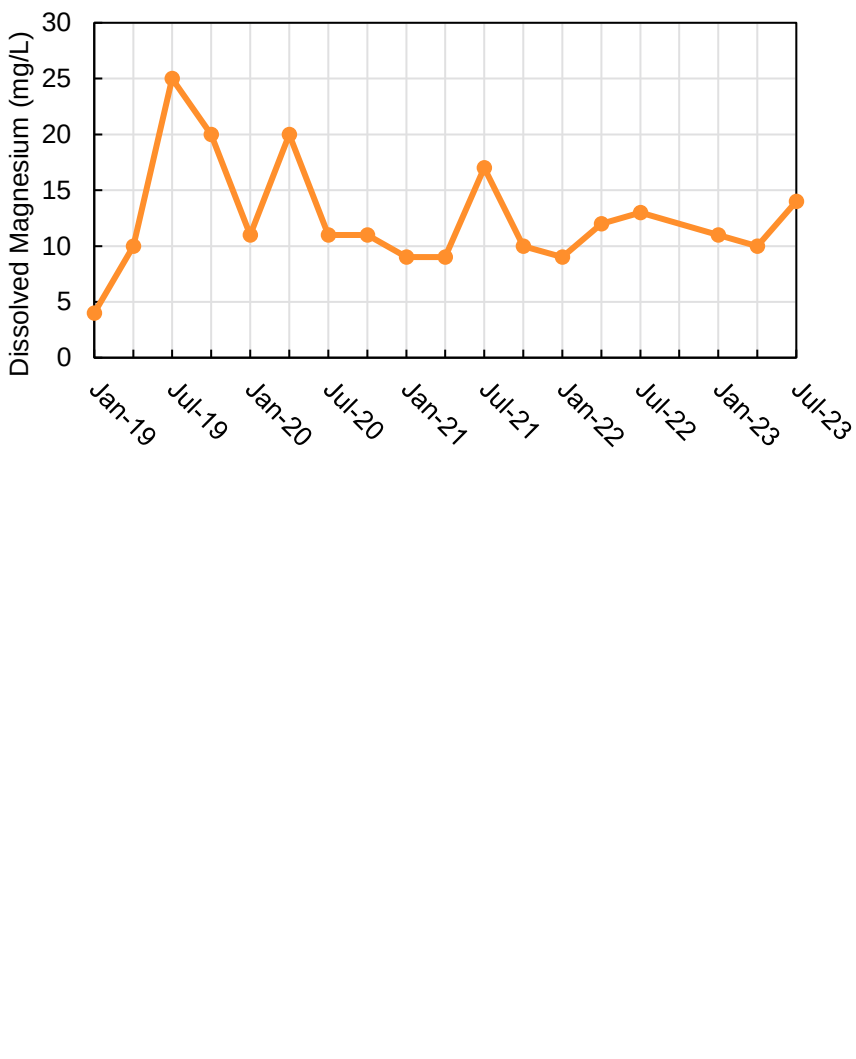

Total Lead - Leachate
L02
Total Lead (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23


Total Cadmium - Leachate
L02
Total Cadmium (mg/L)
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23


Sodium - Leachate
L02
Dissolved Sodium (mg/L)
120
100
80
60
40
20
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23


Potassium - Leachate
L02
Dissolved Potassium (mg/L)
45
40
35
30
25
20
15
10
5
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23


Chloride - Leachate
L02
Chloride (mg/L)
160
140
120
100
80
60
40
20
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23


Magnesium - Leachate
L02
Dissolved Magnesium (mg/L)
30
25
20
15
10
5
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

Sulphate - Leachate
L02
Sulphate (mg/L)
70
60
50
40
30
20
10
0
Jan-19
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23

APPENDIX 4 TABULATED GROUNDWATER LEVELS

	GROUNDWATER MONITORING WELLS				
	GW02		GW03		
	Ground RL (m AHD)	143.62	Ground RL (m AHD)	160.96	
	Top of Casing (m AHD)	144.82	Top of Casing (m AHD)	161.36	
	Total Well Depth (m TOC)	28	Total Well Depth (m TOC)	18	
DATE	Standing Groundwater level (m below TOC)	GW02 (m AHD)	Standing Groundwater level (m below TOC)	GW03 (m AHD)	Hydraulic Head between GW03 and GW02 (m)
8/05/2007	5.5	139.32	10	151.36	12.04
7/08/2007	6	138.82	12	149.36	10.54
7/11/2007	6.5	138.32	11	150.36	12.04
30/01/2008	5.5	139.32	9.5	151.86	12.54
5/05/2008	4.5	140.32	10	151.36	11.04
5/08/2008	5	139.82	10	151.36	11.54
2/12/2008	6	138.82	12	149.36	10.54
4/02/2009	8	136.82	12.5	148.86	12.04
12/05/2009	8	136.82	10	151.36	14.54
18/08/2009	4	140.82	8.5	152.86	12.04
24/11/2009	5	139.82	10	151.36	11.54
23/02/2010	5.5	139.32	9.5	151.86	12.54
26/04/2010	9.5	135.32	12	149.36	14.04
9/08/2010	9.5	135.32	4	157.36	22.04
30/11/2010	6	138.82	8	153.36	14.54
1/03/2011	8	136.82	8	153.36	16.54
1/06/2011	6	138.82	10	151.36	12.54
27/09/2011	4	140.82	10	151.36	10.54
29/11/2011	4	140.82	9	152.36	11.54
21/02/2012	5	139.82	10	151.36	11.54
22/05/2012	4	140.82	9	152.36	11.54
13/08/2012	3.8	141.02	9	152.36	11.34
30/10/2012	5	139.82	9.5	151.86	12.04
11/02/2013	5	139.82	10	151.36	11.54
6/05/2013	5	139.82	11	150.36	10.54
9/03/2013	2.8	142.02	8	153.36	11.34
11/06/2013	4	140.82	8	153.36	12.54
12/02/2014	4	140.82	9.7	151.66	10.84
12/05/2014	5	139.82	10	151.36	11.54
28/08/2014	3.8	141.02	9	152.36	11.34
11/11/2014	3.5	141.32	10.5	150.86	9.54
14/04/2015	7.5	137.32	10.5	150.86	13.54
28/08/2015	4.5	140.32	10	151.36	11.04
11/11/2015	4	140.82	7.5	153.86	13.04
11/03/2016	5	139.82	10.5	150.86	11.04
22/08/2016	4	140.82	8	153.36	12.54
6/12/2016	4.5	140.32	10	151.36	11.04
24/05/2017	6	138.82	9	152.36	13.54
24/10/2017	4.38	140.44			
15/11/2017			8.06	153.3	
16/01/2018	5.01	139.81	8.44	152.92	13.11
17/04/2018	5.31	139.51	8.73	152.63	13.12
25/07/2018	4.72	140.10	8.32	153.04	12.94
16/10/2018	4.58	140.24	7.93	153.43	13.19
17/01/2019	5.16	139.66	9.17	152.19	12.53
22/04/2019	5.55	139.27	9.07	152.29	13.02
24/07/2019	4.40	140.42	7.71	153.65	13.23
16/10/2019	4.80	140.02	8.30	153.06	13.04
16/01/2020	5.35	139.47	8.72	152.64	13.17
22/04/2020	5.37	139.45	8.61	152.75	13.3
20/07/2020	4.93	139.89	8.24	153.12	13.23
26/10/2020	4.63	140.19	8.02	153.34	13.15
20/01/2021	5.24	139.58	8.50	152.86	13.28
21/04/2021	5.25	139.57	8.73	152.63	13.06
21/07/2021	4.24	140.58	8.00	153.36	12.78
20/10/2021	3.95	140.87	7.64	153.72	12.85
27/01/2022	4.81	140.01	8.40	152.96	12.95
26/04/2022	5.20	139.62	8.64	152.72	13.10
19/07/2022	4.54	140.28	7.69	153.67	13.39

PLEASE QUOTE
Your Ref:
Our Ref: 34/12/5; 7629573; 23/27537

Enquiries: Joshua Boon (JB:JYC)

80 Wilson Street, Burnie Tasmania
PO Box 973, Burnie TAS 7320

ABN: 29 846 979 690
Phone: (03) 6430 5700
Email: burnie@burnie.tas.gov.au
Web: www.burnie.tas.gov.au

We value your feedback on our service.
Tell us about it at www.burnie.tas.gov.au/feedback

BURNIE
CITY COUNCIL

4 October 2023

Mr Wes Ford
Director
Environment Protection Authority Tasmania
GPO Box 1550
HOBART TAS 7001

Email: enquiries@epa.tas.gov.au; tanya.mijak@epa.tas.gov.au
A hard copy will not be sent unless requested

Dear Mr Ford

BURNIE WASTE MANAGEMENT CENTRE – SITE
ANNUAL ENVIRONMENTAL REVIEW 2022/2023

Burnie City Council commissioned Syrinx Environmental to undertake the Annual Environmental Review 2022/2023 in accordance with EPN 9161/2 applicable to the Burnie Waste Management Centre – Site.

The annual review report is ***attached*** and will be placed on Council's website.

This review covers the matters listed in EPN 9161/2, in particular Condition G5 – Annual Environmental Review. I look forward to receiving your advice that this review will satisfy Condition G5 of EPN 9161/2.

Please refer initial feedback and discussion regarding this report to Mr Raymond Mee, Manager Works (03) 6430 5853 or email: rmee@burnie.tas.gov.au

Yours faithfully

Belinda Lynch
ACTING GENERAL MANAGER

Enc: BWMC Site EPN9161/2 – Annual Environmental Review 2022/2023