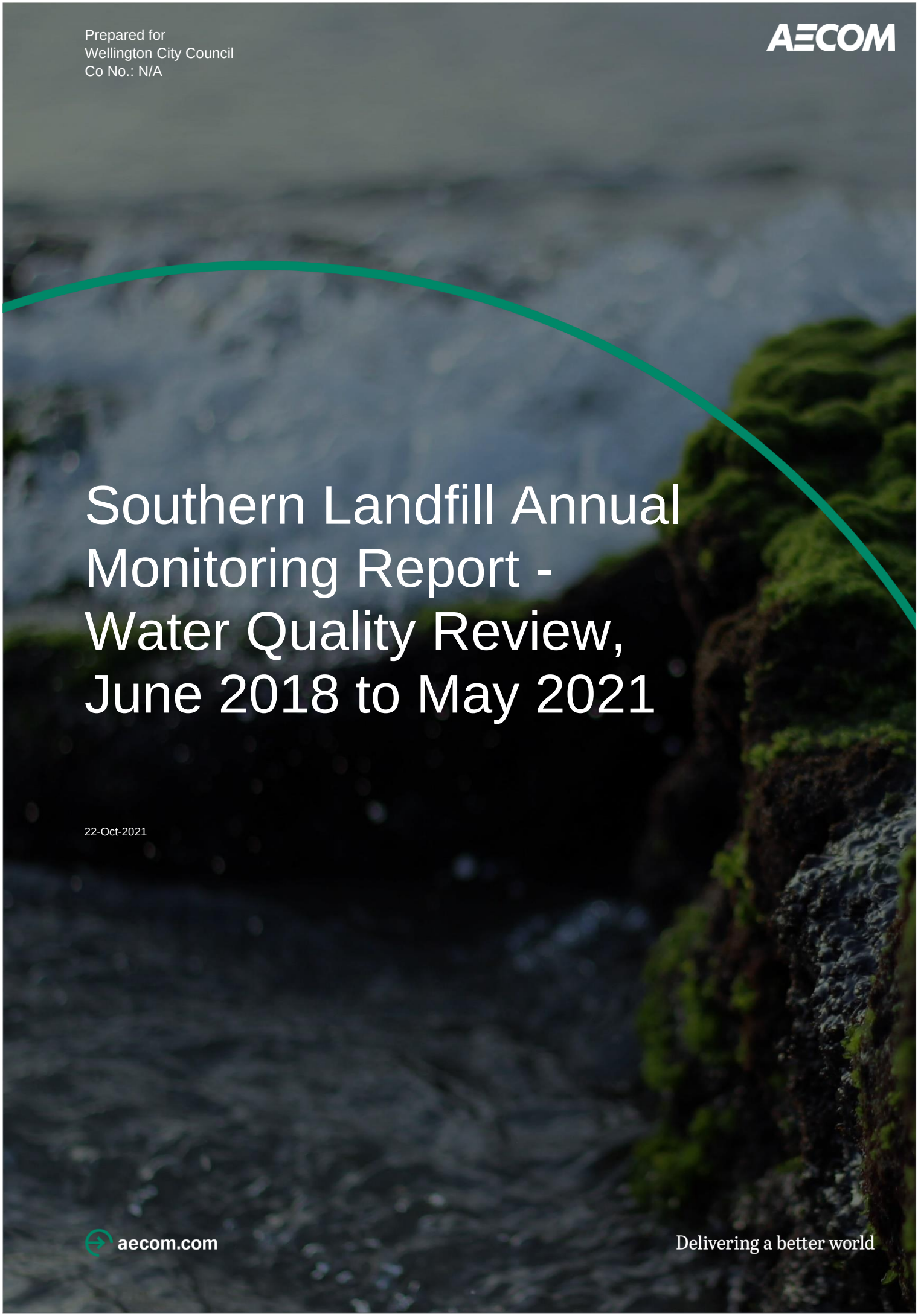
Prepared for
Wellington City Council
Co No.: N/A

AECOM

Southern Landfill Annual Monitoring Report - Water Quality Review, June 2018 to May 2021

22-Oct-2021



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Southern Landfill Annual Monitoring Report - Water Quality Review, June 2018 to May 2021

Client: Wellington City Council

Co No.: N/A

Prepared by

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1.0 Introduction

1.1 Terms of Reference

This report has been prepared for Wellington City Council (WCC) by AECOM New Zealand Limited (AECOM). It presents a summary and interpretation of surface water and groundwater monitoring results obtained by WCC at the Southern Landfill (SLF), Wellington, as required under conditions 25, 26, 27 and 28 of Resource Consent Number WGN940045 (01) (SLF consent). This report takes account of surface water and groundwater monitoring data obtained over the three year period June 2018 to May 2021 and includes a description of the following:

- When sampling events took place;
- Main trends in the data for each sampling event; and
- Likely reasons for 'significant' changes observed in the data between monitoring events.

This report forms an addendum to the 2021 Annual Monitoring report prepared by WCC for Greater Wellington Regional Council (GWRC) as required under condition 29 of the SLF consent.

1.2 SLF Consent Conditions 25, 26, 27 and 28

A summary of the requirements under SLF consent conditions 25, 26, 27 and 28 are provided below. The parameters included in the compliance monitoring are considered to be contaminants of concern for the landfill.

Condition 25:

Monthly monitoring of bores BH2A, BH2B, BH3A (subsequently replaced by BH103A) and BH3B (subsequently replaced by BH103B) and Careys Gully Stream upstream (referred to "Upstr Surface Water 1" in the SLF consent) and downstream (referred to "Dstr Surface Water 2" in the SLF consent) of the landfill for the following parameters:

- pH,
- Conductivity,
- Ammonia Nitrogen (NH_4-N),
- Faecal Coliforms,
- 5-day Biochemical Oxygen Demand (BOD_5),
- Iron; and
- Manganese.

Condition 26:

Six monthly monitoring of bores BH2A, BH2B, BH3A (BH103A) and BH3B (BH103B) and Careys Gully Stream upstream (upstream) and downstream (downstream) of the landfill for the following parameters:

- Chlorides,
- Nitrate Nitrogen,
- Aluminium,
- Boron,
- Arsenic,
- Copper,
- Lead,
- Zinc,

- Nickel,
- Chromium,
- Cadmium; and
- Dissolved Reactive Phosphorous (DRP).

Condition 27:

Six monthly monitoring of Careys Gully Stream upstream (Upstr Surface Water 1) and downstream (Dstr Surface Water 2) of the landfill for the following parameters;

- Freshwater macroinvertebrates; and
- Determination of a Macroinvertebrate Community Index (MCI) value.

Condition 28:

Monthly monitoring of groundwater pressure (groundwater levels) in bores BH2A, BH2B, BH3A (BH103A), BH3B (BH103B), BH4 and BH5 (BH4 and BH5 subsequently replaced by BH6).

1.3 Monitoring Locations and Bore Replacement

The monitoring locations as pictured in the SLF consent are shown by Map 1, presented in **Appendix A**. The monitoring locations are also shown in Figures 3-1 in **Appendix A**, taken from Montgomery Watson New Zealand Limited report Southern Landfill Surface and Groundwater Monitoring Report, June 2001 (MW, 2001), prepared for WCC, by Figure 1 from URS New Zealand Limited (now AECOM) (2013)[1], and by Figure 2.

Upstream (Upstr Surface Water 1) and downstream (Dstr Surface Water 2) surface water sampling locations are also labelled CAREUS and CAREDS, respectively in Figure 3-1. It was reported by MW (2001) that CAREDS (new) was established in October 2000 further downstream after completion of the stormwater tunnel diversion and that it replaces the downstream (CAREDS / Dstr Surface Water 2) locations.

MW (2001) notes that bores BH4 and BH5 were destroyed by landfill development and were replaced in April 2000 by BH6, in agreement with GWRC (Figure 3-1).

In April 2013, new bores BH103A and BH103B were installed to replace the existing bores BH3A and BH3B, which were decommissioned. The installation details of these bores were reported to WCC by URS New Zealand Limited (now AECOM) in May 2013[1]. As these two new bores were installed in equivalent locations and to equivalent depths as the previous bores (BH103A to 6 m and BH103B to 10 m), the consent conditions outlined above in relation to bores BH3A and BH3B were transferred to the two new bores BH103A and BH103B, respectively. Bores BH3A and BH3B were decommissioned by grouting to ground surface. As this report covers the period June 2018 to May 2021 any reference to historical bores BH3A and BH3B have been removed.

1.4 Data Sources

Surface water and groundwater monitoring data for the SLF are obtained by Eurofins Environmental Laboratory Services (ELS) under contract to WCC. This review by AECOM is based directly on the monitoring information provided to AECOM by WCC (July 2010 to June 2011) and from ELS (July 2011 to May 2021), mainly in the form of excel workbooks prepared by ELS and (previously) by WCC.

During this reporting period, ELS collected samples from bore BH6 in general accordance with condition 25 and 26 except during the October 2018 to March 2020 monitoring period, as samples were unable to be collected owing to landslip debris covering the bore. Bore BH6 is not required to be sampled under the SLF consent, except that groundwater pressure data should be collected. The results are presented in this report for comparison purposes only.

[1] Southern Landfill Replacement Monitoring Bores: Bore Completion Report. Report prepared for Wellington City Council, ref 42787950, dated 23 May 2013.

1.5 Faecal Coliform Investigations 2020 - 2021

Investigations were initiated at the SLF by WCC following correspondence with GWRC in March 2020, regarding the presence of elevated counts of faecal coliforms in samples collected from “Carey’s Stream”, downstream of the Stage II SLF toe. These investigations were still ongoing at the conclusion of this reporting period.

2.0 Compliance Summary

2.1 Groundwater Monitoring

Compliance with SLF consent requirements for groundwater monitoring between June 2018 and May 2021 is summarised in **Table 1**. Data tables for each bore, including monitoring dates, are presented in **Appendix B**.

Table 1 Summary of Groundwater Monitoring Results against Consent Requirements

Bore	Resource Consent Requirements			Compliance Summary
	Condition	Monitoring Parameters	Frequency	
BH2A BH2B BH3A (BH103A) BH3B (BH103B)	25	• pH • Conductivity • NH_4-N • Faecal Coliforms • BOD_5 • Iron • Manganese	Monthly	• Fully compliant. • Since June/July 2013 samples have been analysed monthly for chemical oxygen demand; although this is not required by the consent.
BH2A BH2B BH3A (BH103A) BH3B (BH103B)	26	• Chlorides • Nitrate-Nitrogen • Aluminium • Boron • Arsenic • Copper • Lead • Zinc • Nickel • Chromium • Cadmium • Dissolved Reactive Phosphorus	Six Monthly	• Generally compliant. • Six monthly analysis of monitoring parameters not undertaken for two events, June 2019 and December 2019.
BH2A BH2B BH3A (BH103A) BH3B (BH103B) BH4 BH5 (BH6)	28	• Groundwater pressure	Monthly	• Generally compliant. • Bore BH6 was not gauged from October 2018 to March 2020 (bore not accessible as covered by debris from landslip).

2.2 Surface Water Monitoring

Compliance with SLF consent requirements for surface water monitoring between June 2018 and May 2021 is summarised in **Table 2**. Data tables for each sampling location, including monitoring dates, are presented in **Appendix B**.

Table 2 Summary of Surface Water Monitoring Results against Consent Requirements

Surface Water	Resource Consent Requirements			Compliance Summary
	Condition	Monitoring Parameters	Frequency	
Upstream (Upstr Surface Water 1) and downstream (Dstr Surface Water 2)	25	• pH • Conductivity • NH4-N • Faecal Coliforms • BOD_5 • Iron • Manganese	Monthly	• Fully compliant. • Since June 2014 samples have been analysed monthly for chemical oxygen demand and suspended solids; although this is not required by the consent.
Upstream (Upstr Surface Water 1) and downstream (Dstr Surface Water 2)	26	• Chlorides • Nitrate-Nitrogen • Aluminium • Boron • Arsenic • Copper • Lead • Zinc • Nickel • Chromium • Cadmium • Dissolved Reactive Phosphorus	Six Monthly	• Generally compliant. • AECOM notes that six monthly analysis of monitoring parameters not undertaken for two events, June 2019 and December 2019. • Downstream (Dstr Surface Water 2) June 2018 sample not analysed for faecal coliforms. • Nitrate-nitrogen is being analysed on a monthly basis; although this is not required by the consent.
Upstream (Upstr Surface Water 1) and downstream (Dstr Surface Water 2)	27	• Freshwater macro invertebrates • Determination of a MCI value	Six Monthly	• Generally compliant. • Two sampling events not undertaken during December 2019 and June 2020. • One sampling event undertaken during January 2021 instead of December 2020.

3.0 Monitoring Results

3.1 Depth to Groundwater

Groundwater gauging data are presented in the data tables for each bore, included as **Appendix B**, and presented as time series graphs in **Appendix C**. Results are summarised in **Table 3**. The groundwater levels are presented as depths to groundwater and were recorded in metres below top of casing (mb TOC). Overall, no significant trends in groundwater levels were recorded.

Table 3 Summary of Depth to Groundwater Measurements (June 2018 to May 2021)

Bore	Depth to Groundwater (mb TOC)	
	Minimum	Maximum
BH2A	1.4	2.4
BH2B	1.2	2.4
BH103A	2.8	4.8
BH103B*	2.8	7.1
BH6**	0.5	4.1

Note:
mb TOC - metres below top of casing (of bore).
BH6 not gauged from October 2018 to March 2020 as the bore was not accessible (covered by debris from a landslip).
*AECOM notes that groundwater levels recorded in BH103B typically range between 3.9 mb TOC and 4.8 mb TOC, however groundwater levels recorded in January 2020 and February 2020 were reported at 7.1 mb TOC and 2.8 mb TOC, respectively. ELS have been queried regarding these groundwater levels, however AECOM have not yet received a response as of the date of this report.
** AECOM notes that groundwater levels recorded in BH6 typically range between 0.5 mb TOC and 2.0 mb TOC, however the groundwater level recorded in June 2020 was reported at 4.1 mb TOC. ELS have been queried regarding this groundwater level, however AECOM have not yet received a response as of the date of this report.

3.2 Groundwater Analysis

Compliance monitoring results for bores BH2A, BH2B, BH103A and BH103B are summarised in **Table 4** through **Table 7**. Full results are presented in **Appendix B**. Time series graphs of individual constituents for each monitoring bore are presented in **Appendix C**. In summary:

- Contaminants of concern have been recorded within each of the bores over the compliance monitoring period. This would suggest that historic activities at the Carey's Gully Complex may have impacted the groundwater at the toe of the landfill.
- Short term variability in concentrations of contaminants of concern were recorded across all sample locations over the compliance monitoring period.
- A comparison of water quality recorded across the bores indicates that recorded concentrations of key contaminants of concern such as ammonia nitrogen, BOD_5, faecal coliforms, and dissolved manganese are elevated in bore BH103B (and BH103A to a lesser extent).
- Based on a visual analysis of the time series graphs:
  - No significant short-term trends in contaminant concentrations were recorded over the compliance monitoring period.
  - The following parameters illustrate potentially increasing long-term trends (entire dataset), with recent concentrations generally recorded higher than historical values:
    - BH2A: boron.
    - BH2B: conductivity manganese and boron.
    - BH103A: pH and phosphorus.

    - BH103B: chloride.
  - The following parameters illustrate potentially decreasing long-term trends:
    - BH2A: nitrate-nitrogen.
    - BH2B: nitrate-nitrogen.
    - BH103A: conductivity, chloride, nitrate-nitrogen, boron, copper, nickel and .
    - BH103B: conductivity, manganese, aluminium, nickel and phosphorus.
- Faecal coliforms have been periodically recorded at all locations. A review of longer term trends in faecal coliform concentrations (40 individual data points over the period February 2018 through May 2021) using Mann-Kendall statistical analysis indicates no trend in bores BH2A, BH2B, BH103A and BH103B. Mann-Kendall statistical analysis for faecal coliforms are presented in **Appendix D**.
- A review of longer term trends in manganese concentrations (40 individual data points over the period August 2017 through November 2020) using Mann-Kendall statistical analysis indicates either no trend (in bore BH2A), stable (in bore BH2B), probably decreasing (BH103B) or decreasing trends (in bore BH103A). Mann-Kendall statistical analysis for manganese is presented in **Appendix D**.
- Ongoing investigations into the increasing faecal coliform trend at BH103B have been initiated by WCC, these investigations had not concluded within this reporting period.

Table 4 Summary of Groundwater Quality Results for Bore BH2A (June 2018 through May 2021)

Parameter	Recorded Concentration		Comment
	Median	Maximum	
Conductivity at 25°C (mS/m)[2]	84	106	• Spike recorded – September 2018.
Ammonia Nitrogen	0.01	0.03	• Generally less than the MDL. • Spike recorded – June 2018 and December 2019.
Faecal Coliforms (cfu/100ml)	1	110	• Generally less than MDL. • Spike recorded – March 2019, April 2020 and April 2021.
BOD_5 – Total	1	6	• Generally less than the MDL. • Spike recorded – November 2018, June and November 2019.
Manganese - Dissolved	0.01255	0.235	• Spike recorded – September 2018, May 2019 and April 2020.
Chloride	92.35	99	• Period low in June 2018.
Nitrate – Nitrogen	1.945	3.7	• Slight decreasing trend. • Spike recorded – June 2018.
Aluminium – Dissolved	0.003	0.005	• Generally close to or less than the MDL.
Copper - Dissolved	0.0005	0.0012	• Spike recorded – June 2018.
Zinc - Dissolved	0.002	0.002	• Generally less than MDL.
Nickel - Dissolved	0.00085	0.001	• Period low in December 2018.
Dissolved Reactive Phosphorus	0.0175	0.041	• Spike recorded – June 2018.

Note: All values g/m^3 unless otherwise noted; mS/m – milli siemens per metre, cfu/100ml – colony forming units per 100 millilitres. The following parameters have been removed from the table as recorded concentrations were generally below the MDL over the monitoring period and/or no significant change/trends in contaminant concentrations were recorded – iron (dissolved), pH, arsenic (dissolved), boron (dissolved), cadmium (dissolved), chromium (dissolved), and lead (dissolved).

[2]. P:\606X\60629483\500_Deliverables\501_Deliverable_WCC Southern Landfill Annual Report\2020-2021\FINAL\Wellington Southern Landfill Annual Monitoring Report 2020-2021 FINAL.docx
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Table 5 Summary of Groundwater Quality Results for Bore BH2B (June 2018 through May 2021)

Parameter	Recorded Concentration		Comment
	Median	Maximum	
pH (pH units)	6.9	8	• Generally neutral (around pH 7). • Spike recorded – May 2019.
Conductivity at 25°C (mS/m)	102	109	• Period low in June 2018.
Ammonia Nitrogen	0.01	0.15	• Generally less than MDL. • Spike recorded – January and April 2020.
Faecal Coliforms (cfu/100ml)	1	6	• Generally less than the MDL.
BOD_5 – Total	1	6	• Generally less than MDL. • Spike recorded – November 2018, June and November 2019.
Iron – Dissolved	0.01	0.71	• Generally less than MDL. • Spike identified – January, April and November 2020.
Manganese - Dissolved	0.2495	0.473	• Slight overall increase.
Chloride	105	108	• Period low in June 2018.
Nitrate-Nitrogen	1.03	1.59	• Slight decreasing trend to December 2016. • Stable over reporting period. • Period high in June 2018.
Copper - Dissolved	0.0005	0.0039	• Generally less than MDL. • Spike identified – June 2018.
Zinc - Dissolved	0.002	0.003	• Generally less than MDL.
Nickel - Dissolved	0.00135	0.0017	• Period low in June 2018.

Note: All values g/m^3 unless otherwise noted; mS/m – milli siemens per metre, cfu/100ml – colony forming units per 100 millilitres. The following parameters have been removed from the table as recorded concentrations were generally below the MDL over the monitoring period and/or no significant change/trends in contaminant concentrations were recorded –, aluminium (dissolved), arsenic (dissolved), boron (dissolved), cadmium (dissolved), chromium (dissolved), dissolved reactive phosphorus, and lead (dissolved).

Table 6 Summary of Groundwater Quality Results for Bore BH103A (June 2018 through May 2021)

Parameter	Recorded Concentration		Comment
	Median	Maximum	
pH (pH units)	6.7	7.8	• Spike recorded – September 2019. • Slight increasing trend.
Conductivity at 25°C (mS/m)	35.35	98.1	• Decreasing trend. • Historically low values generally recorded from January 2020.
Ammonia Nitrogen	0.0095	0.012	• Generally less than the MDL. • Spike recorded – March 2019, November 2019 and July 2020.
Faecal Coliforms (cfu/100ml)	6.5	90	• Spike recorded – September 2018, October 2018, April 2019 and September 2020.
BOD_5 – Total	1	6	• Generally less than the MDL.
Manganese - Dissolved	0.0035	1.8	• Spike recorded – March 2019, November 2019 and July 2020.
Chloride	46.7	96.5	• Decreasing trend from December 2017. • Historical low in June and December 2020.
Nitrate – Nitrogen	1.715	2.24	• Variable concentrations recorded.
Boron - Dissolved	0.08	0.13	• Decreasing trend from December 2017. • Historical low in June and December 2020.
Copper - Dissolved	0.00065	0.0013	• Decreasing trend. • Historical low in June 2018 and December 2020 (less than the MDL).
Nickel - Dissolved	0.0006	0.0008	• Slight decreasing trend. • Historical low in June and December 2020 (less than the MDL).
Dissolved Reactive Phosphorus	0.042	0.045	• Slight increasing trend overall. • Period low in June 2018.

Note: All values g/m^3 unless otherwise noted; mS/m – milli siemens per metre, cfu/100ml – colony forming units per 100 millilitres. The following parameters have been removed from the table as recorded concentrations were generally below the MDL over the monitoring period and/or no significant change/trends in contaminant concentrations were recorded – iron (dissolved), aluminium (dissolved), arsenic (dissolved), cadmium (dissolved), chromium (dissolved), lead (dissolved), and zinc (dissolved).

Table 7 Summary of Groundwater Quality Results for Bore BH103B (June 2018 through May 2021)

Parameter	Recorded Concentration		Comment
	Median	Maximum	
pH (pH units)	6.6	7.7	• Spike recorded – July 2019.
Conductivity at 25°C (mS/m)	90.15	171	• Variable concentrations recorded but showing a slight decreasing trend over the reporting period.
Ammonia Nitrogen	0.8	2.68	• Variable concentrations recorded but showing a slight decreasing trend since December 2017.
Faecal Coliforms (cfu/100ml)	7	110	• Variable concentrations recorded.
BOD_5 – Total	1	11	• Variable concentrations recorded but showing a slight decrease since November 2017.
Manganese – Dissolved	3.885	11.4	• Variable concentrations recorded.
Chloride	112.5	156	• Variable concentrations recorded.
Nitrate – Nitrogen	0.12	1.01	• Spike recorded – June 2018.
Boron - Dissolved	0.265	0.36	• Variable concentrations recorded.
Arsenic - Dissolved	0.001	0.002	• Low concentrations recorded compared to previous reporting period.
Copper - Dissolved	0.00275	0.0063	• Variable concentrations recorded.
Zinc - Dissolved	0.005	0.008	• Variable concentrations recorded.
Nickel - Dissolved	0.00265	0.0036	• Variable concentrations recorded but overall slight decreasing trend.
Dissolved Reactive Phosphorus	0.0215	0.025	• Variable concentrations recorded.

Note: All values g/m^3 unless otherwise noted; mS/m – milli siemens per metre, cfu/100ml – colony forming units per 100 millilitres. The following parameters have been removed from the table as recorded concentrations were generally below the MDL over the monitoring period and/or no significant change/trends in contaminant concentrations were recorded – iron (dissolved), aluminium (dissolved), cadmium (dissolved), chromium (dissolved), and lead (dissolved).

3.3 Surface Water Analysis

Compliance monitoring results for surface water samples are presented in **Table 8**. Full results are presented in **Appendix B**. Time series graphs of individual constituents for the upstream and downstream monitoring locations of Carey's Stream are presented in **Appendix C**. In summary:

- When comparing analytical results for the upstream and downstream monitoring location, contaminants of concern have generally been recorded at higher concentrations in the downstream monitoring location.
- Recorded concentrations were variable across the period. Based on a visual analysis of the time series graphs, general increasing trends in contaminant concentrations were recorded for conductivity, ammonia nitrogen, BOD_5,iron and nitrate-nitrogen in the downstream monitoring location.
- In December 2018 boron was recorded in the downstream sample location at a concentration which exceeded the ANZG[3] for the protection of 95% of freshwater species. With the exception of this one exceedance all other metals were recorded at concentrations below the ANZG at the downstream sample location.
- Faecal coliforms have been regularly recorded within both upstream and downstream locations. Elevated concentrations were recorded in the downstream monitoring location in July 2018, October 2018 and April 2019. Elevated concentrations were recorded in the upstream monitoring location in February 2020. A review of longer term trends in faecal coliform concentrations (40 individual data points over the period February 2018 through May 2021) using Mann-Kendall statistical analysis indicates either increasing trends in contaminant concentrations in the upstream monitoring location or no trend in contaminant concentrations in the downstream monitoring location. Mann-Kendall statistical analysis for faecal coliforms are presented in **Appendix D**.
- Ongoing investigations into the variable faecal coliform concentrations over time in the downstream monitoring location have been initiated by WCC, these investigations had not concluded within this reporting period.
- A review of longer term trends in manganese concentrations (40 individual data points over the period August 2017 through November 2020) using Mann-Kendall statistical analysis indicates either no trend (the upstream monitoring location) or stable (in the downstream monitoring location). Mann-Kendall statistical analysis for manganese is presented in **Appendix D**.
- Based on the median MCI) values recorded for upstream and downstream of the landfill the quality of the stream would is categorised as "good"[4].

[3] National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2018 (ANZG). Freshwater Trigger Values for Protection of Species (Level of Protection 95%).

[4] Stark and Maxted (2007)[4] provide the following interpretation of New Zealand MCI results: "excellent – clean water" >120, "good - doubtful quality or possible mild pollution" 100-119, "fair - probable moderate pollution" 80-99, "poor - probable severe pollution" <80. Based on the median.

Table 8 Summary of Carey's Gully Surface Water Sampling Results (June 2018 to May 2021)

Parameter	Upstream Concentrations		Downstream Concentrations	
	Median	Maximum	Median	Maximum
pH (pH units)	7.8	7.9	7.8	8.0
Conductivity at 25°C (mS/m)	23.5	26.2	39.2	86.7
Ammonia – Nitrogen	0.01	0.02	0.6	1.29
Faecal Coliforms (cfu/100ml)	88	2,900	60	10,000
BOD_5 – Total	1	6	3	11
Iron – Acid Soluble	0.01	0.05	0.1	2.03
Manganese - Acid Soluble	0.00135	0.0187	0.319	1.11
Chloride	40.25	42.4	42.5	61.2
Nitrate – Nitrogen	0.26	0.43	1.16	2.09
Aluminium - Acid Soluble	0.012	0.022	0.013	0.017
Boron - Acid Soluble	0.03	0.04	0.055	0.38
Arsenic - Acid Soluble	0.001	0.001	0.001	0.002
Copper - Acid Soluble	0.0005	0.0005	0.0005	0.0005
Lead - Acid Soluble	0.0005	0.0005	0.0005	0.0005
Zinc - Acid Soluble	0.002	0.002	0.002	0.002
Nickel - Acid Soluble	0.0005	0.0005	0.0005	0.0005
Chromium - Acid Soluble	0.001	0.001	0.001	0.001
Cadmium - Acid Soluble	0.0002	0.0002	0.0002	0.0002
Dissolved Reactive Phosphorus	0.0095	0.013	0.0105	0.016
MCI	100	108	104	113

Note: All values g/m^3 unless otherwise noted; mS**/**m **–** milli siemens per metre**,** cfu **–** colony forming units per 100 millilitres. MCI – Macroinvertebrate Community Index;

4.0 Discussion

Compliance monitoring was completed in general accordance with resource consent requirements over the period June 2018 through May 2021. However, AECOM notes that:

- Two six monthly sampling rounds were not undertaken, and samples were not collected and analysed for the additional compliance parameters during the months of June 2019 and December 2019;
- Two six monthly macroinvertebrate sampling events were not undertaken during December 2019 and June 2020;
- BH6 could not be gauged for depth to water between the months of October 2018 to March 2020 due to accessibility issues;
- Faecal coliforms were not analysed from the sample collected from the downstream location in June 2018

AECOM understands that WCC has had discussions with ELS regarding the six monthly sampling events and that ELS have since resumed six monthly sampling and analysis from June 2020.

Depth to groundwater was measured between approximately 0.5 to 7.1 m throughout the compliance monitoring period. No significant trends in groundwater level change were recorded over the compliance monitoring period. AECOM notes that groundwater levels recorded in BH103B typically range between 3.9 mb TOC and 4.8 mb TOC, however levels recorded in January 2020 and February 2020 were reported at 7.1 mb TOC and 2.8 mb TOC, respectively. ELS have been queried regarding these groundwater levels, however AECOM have not yet received a response as of the date of this report.

Based on recorded concentrations of key contaminants of concern such as ammonia nitrogen, BOD_5 and faecal coliforms in bore BH103B (and to a lesser extent bore BH103A), as well as the downstream surface water monitoring location; there is evidence to suggest that historic and current activities at the Carey's Gully Complex may be impacting groundwater and the stream at the toe of the landfill. However, it is important to note that with the exception of boron (one sample event over the monitoring period), no exceedances of the ANZG for the protection of 95% of freshwater species were recorded in the downstream monitoring location.

A review of longer term trends in faecal coliform indicates increasing trends in contaminant concentrations in the upstream surface water sample locations. WCC are undertaking additional faecal coliform sampling in parallel with the review of potential sources of the impact. The results of these investigations were still ongoing at the conclusion of this reporting period.

5.0 Limitations

This conclusion and all information in this Report are provided strictly in accordance with and subject to the following limitations and recommendations:

a. This Report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by AECOM for use of any part of this Report in any other context.

b. This conclusion is based solely on the information and findings contained in this Report.

c. This conclusion is based solely on the scope of work agreed between AECOM and Wellington City Council and described in section 1 ("Introduction") of this Report. Specifically, no soil sampling or drilling / excavation activity has been undertaken by AECOM as part of the investigations referred to in this Report.

d. This Report has been prepared for the sole benefit of Wellington City Council and neither the whole nor any part of this Report may be used or relied upon by any party other than Wellington City Council.

e. This Report is dated 22 October2021 and is based on the information reviewed from June 2018 to May 2021 AECOM accepts no responsibility for any events arising from any changes in site conditions or in the information reviewed that have occurred after the completion of the site monitoring.

f. The investigations carried out for the purposes of the Report have been undertaken, and the Report has been prepared, in accordance with normal prudent practice and by reference to applicable environmental regulatory authority and industry standards, guidelines and assessment criteria in existence at the date of this Report.

g. Where this Report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information except as expressly stated in the Report. AECOM assumes no liability for any inaccuracies in or omissions to that information.

h. Except as specifically stated above, AECOM makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development or re-development of the site.

i. Use, development or re-development of the site for any purpose may require planning and other approvals and, in some cases, environmental regulatory authority and accredited site auditor approvals. AECOM offers no opinion as to whether the current use has any or all approvals required, is operating in accordance with any approvals, the likelihood of obtaining any approvals for development or redevelopment of the site, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environmental works.

j. AECOM makes no determination or recommendation regarding a decision to provide or not to provide financing with respect to the site.

k. Except as required by law, no third party may use or rely on, this Report unless otherwise agreed by AECOM in writing. Where such agreement is provided, AECOM will provide a letter of reliance to the agreed third party in the form required by AECOM.

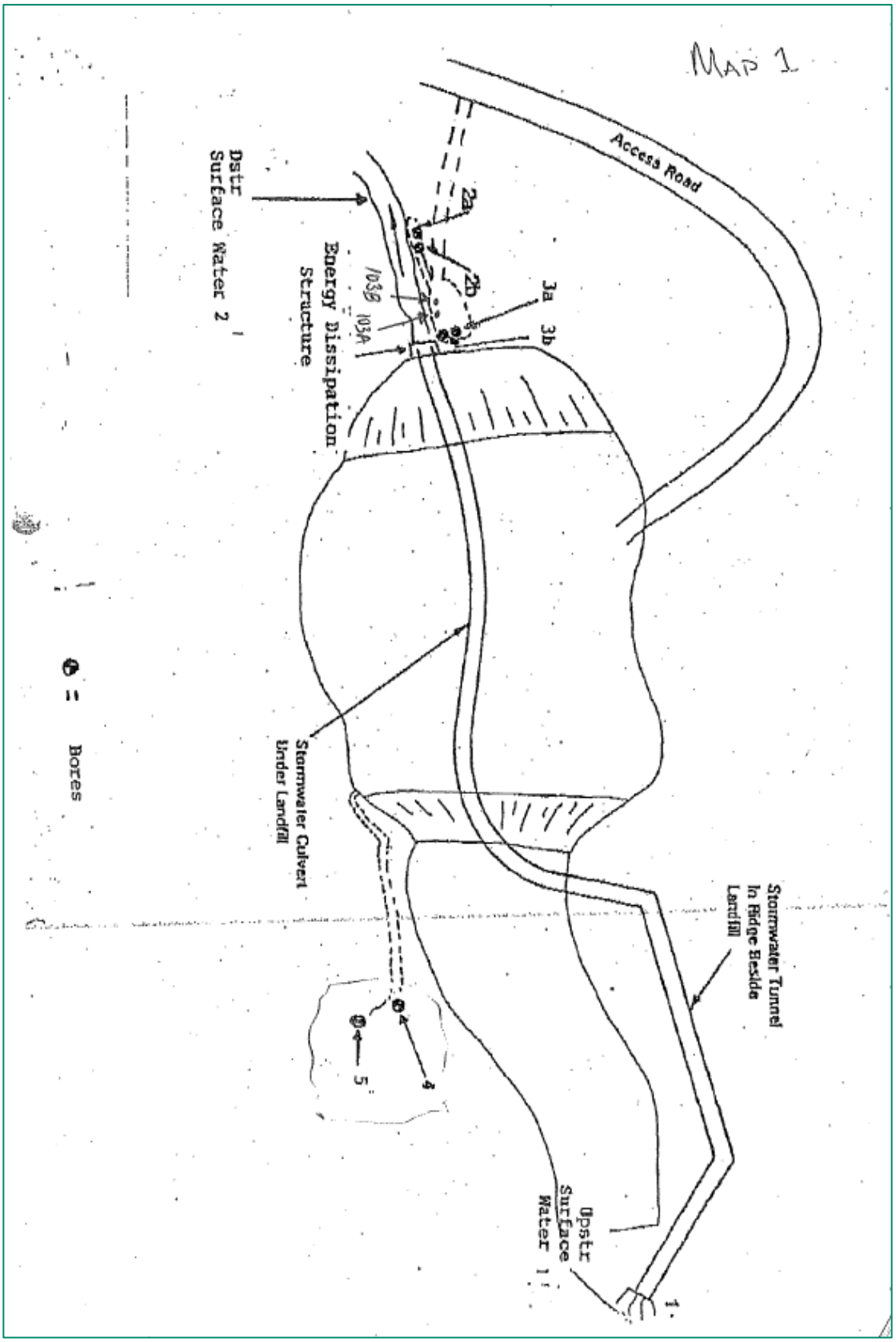
l. To the extent permitted by law, AECOM expressly disclaims and excludes liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this Report. AECOM does not admit that any action, liability or claim may exist or be available to any third party.

Appendix A

Figures

Appendix A Figures

Map 1



MW 2001 Figure 3-1 Location of surface water and groundwater monitoring sites

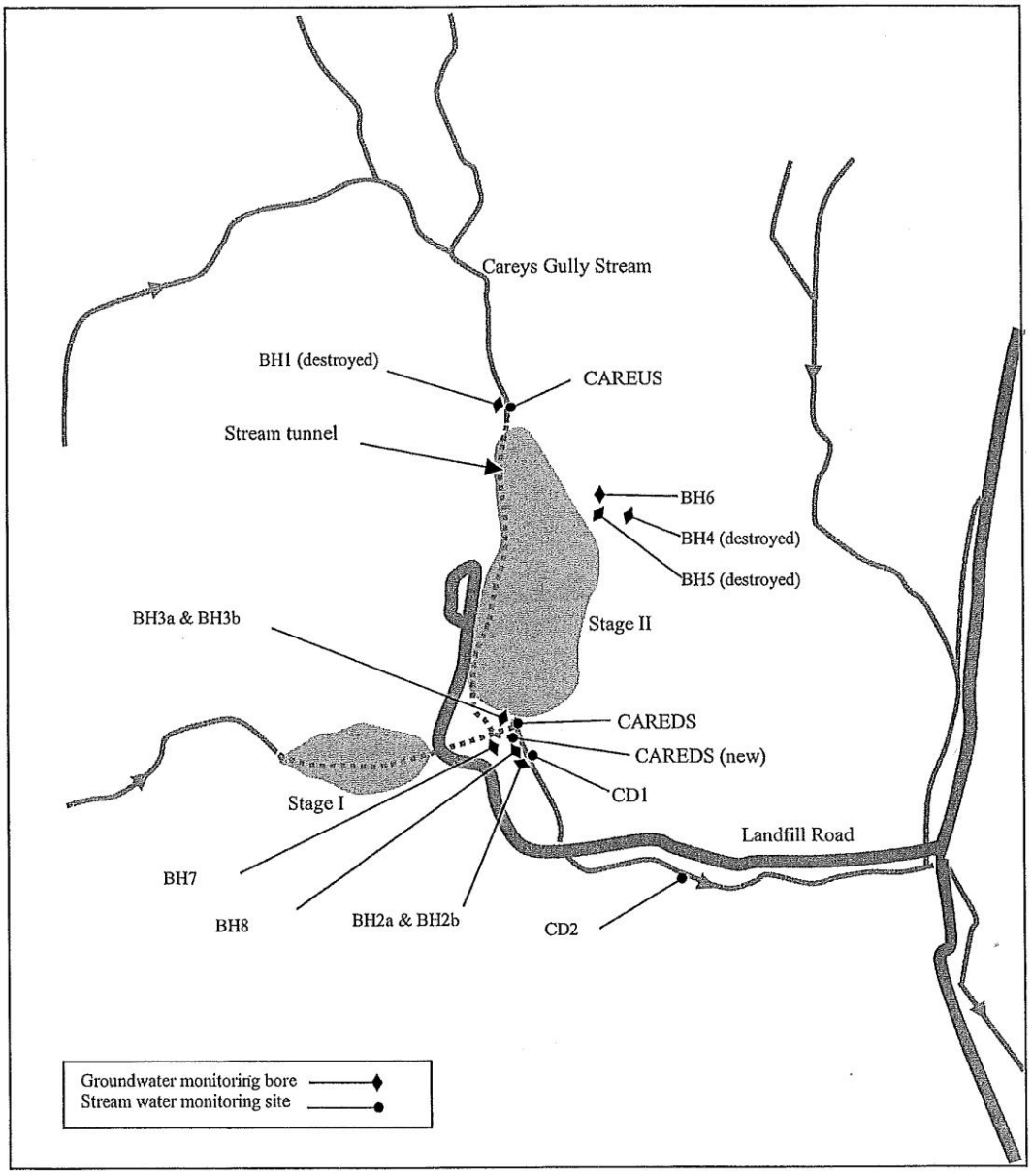
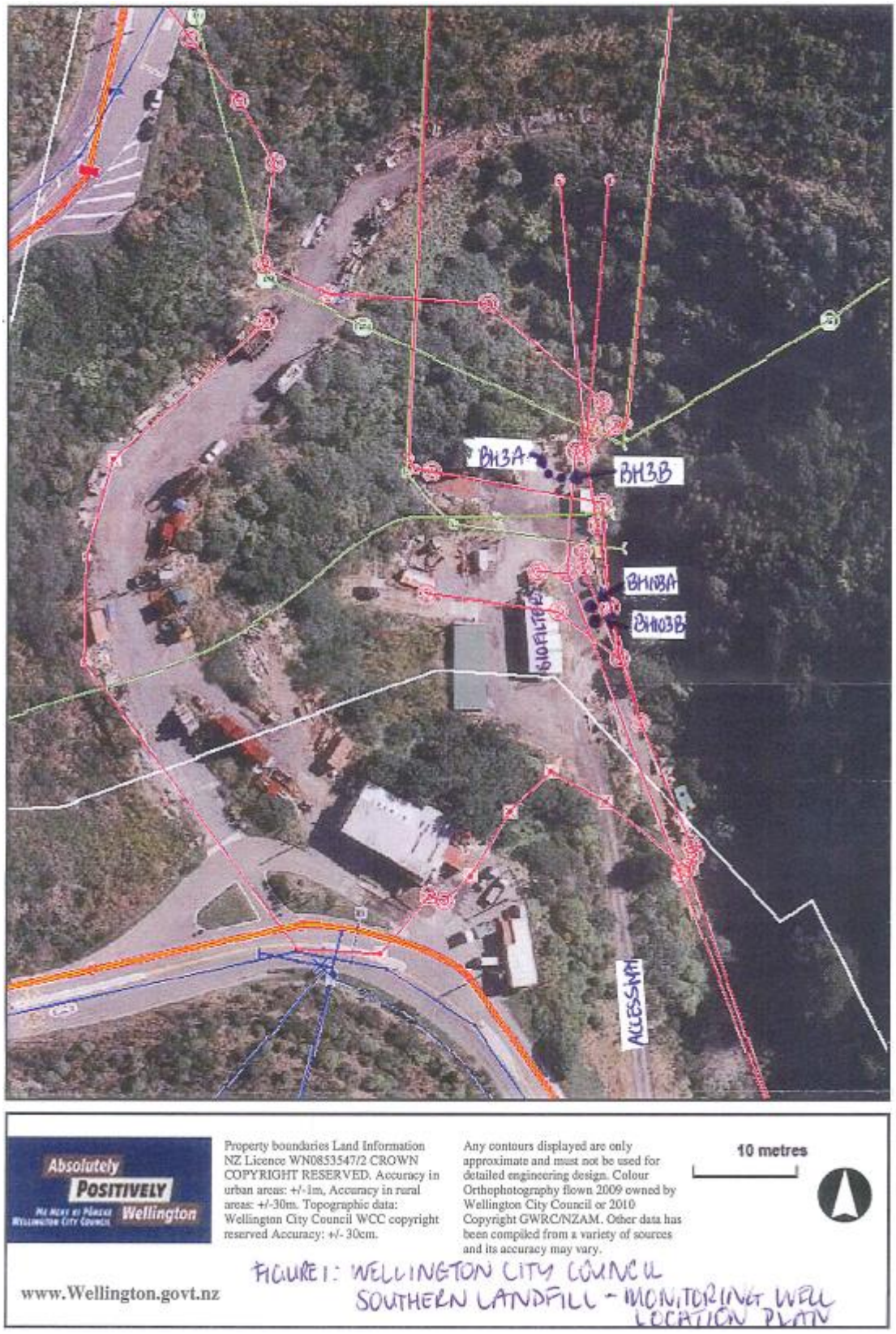


Figure 1 Wellington City Council Southern Landfill – Monitoring Well Location Plan



ISO A3 297mm x 420mm

Last saved by: SERGEY.SOKOLOV (2020-07-28) Last Plotted: 2020-02-05
Filename: \\nzwlg1fp001.au.aecomnet.com\projects\606X\60629483\900_CAD_GIS\920_GIS\02_Maps\Sample_Location_Plan.mxd

AECOM

PROJECT

WCC SOUTHERN LANDFILL ANNUAL MONITORING REPORT - WATER QUALITY REVIEW

CLIENT

Absolutely Positively **Wellington** City Council
Me Heke Ki Pōneke

CONSULTANT

AECOM New Zealand Limited
www.aecom.com

SPATIAL REFERENCE

Scale: 1:4,000 (A3 size)

40 20 0 40 80 120 160 m

Map features depicted in terms of NZTM 2000 projection.

Data Sources:
Cadastral Boundaries – LINZ NZ Cadastral Dataset

PROJECT MANAGEMENT

Approved	KS	Date	03/08/2020
Checked	KS	Date	28/07/2020
Designed	SS	Date	28/07/2020
Drawn	SS	Date	28/07/2020

ISSUE/REVISION

Rev	Date	Description
A	03/08/2020	FINAL

KEY PLAN

PROJECT NUMBER

60629483

SHEET TITLE

SAMPLE LOCATION PLAN

MAP NUMBER

FIGURE 2

Appendix B

Data Tables

Appendix B Data Tables

AECOM

Client Name: Wellington City Council
Project Name: Southern Landfill 2020/2021 Annual Monitoring Report
Project No: 60629483

SOUTHERN LANDFILL - UPSTREAM MONITORING OF CAREY'S STREAM

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	24/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Acid Soluble	g/m³	0.01						0.013					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Acid Soluble	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	6	1	3	1	1	3	1
26	Boron - Acid Soluble	g/m³	0.03						0.03					
26	Cadmium - Acid Soluble	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	15	15	15	15	15	15	15	15	28	15	15
26	Chloride	g/m³	42.4						40.5					
26	Chromium - Acid Soluble	g/m³	0.001						0.001					
25	Conductivity at 25°C	mS/m	22.7	23.3	22.7	23.5	18.4	20.6	22.7	24.8	26.1	25.4	20.5	23.5
26	Copper - Acid Soluble	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.013						0.01					
25	Faecal Coliforms	cfu/100ml	4	4	84	120	4	88	65	36	110	150	80	20
25	Iron - Acid Soluble	g/m³	0.01	0.01	0.01	0.01	0.05	0.01	0.02	0.02	0.01	0.02	0.03	0.01
26	Lead - Acid Soluble	g/m³	0.0005						0.0005					
25	Manganese - Acid Soluble	g/m³	0.0033	0.0086	0.0013	0.0006	0.0032	0.0008	0.0061	0.0053	0.0048	0.0034	0.0016	0.0024
26	Nickel - Acid Soluble	g/m³	0.0005						0.0005					
26	Nitrate - Nitrogen	g/m³	0.4	0.43	0.32	0.26	0.29	0.2	0.24	0.28	0.35	0.28	0.25	0.31
25	pH		7.6	7.7	7.7	7.8	7.7	7.3	7.8	7.8	7.7	7.8	7.9	7.8
Other	Suspended Solids - Total	g/m³	6	6	6	6	6	5	6	6	6	6	6	6
26	Zinc - Acid Soluble	g/m³	0.002						0.002					

Condition	Description	Measure	13/06/2019	29/07/2019	30/08/2019	24/09/2019	25/10/2019	8/11/2019	19/12/2019	29/01/2020	28/02/2020	27/03/2020	17/04/2020	21/05/2020
26	Aluminium - Acid Soluble	g/m³												
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
26	Arsenic - Acid Soluble	g/m³												
25	BOD5 - Total	g/m³	6	1	3	1	3	6	6	1	6	1	3	1
26	Boron - Acid Soluble	g/m³												
26	Cadmium - Acid Soluble	g/m³												
Other	Chemical Oxygen Demand	g/m³	15	16	45	15	15	15	40	27	15	15	15	15
26	Chloride	g/m³												
26	Chromium - Acid Soluble	g/m³												
25	Conductivity at 25°C	mS/m	23.3	22.0	22.6	23.0	21.3	23.7	18.7	25.3	26.1	26.2	26.0	25.2
26	Copper - Acid Soluble	g/m³												
26	Dissolved Reactive Phosphorus	g/m³												
25	Faecal Coliforms	cfu/100ml	73	220	4	16	24	230	500	260	2900	100	150	340
25	Iron - Acid Soluble	g/m³	0.05	0.01	0.01	0.03	0.01	0.03	0.03	0.01	0.01	0.01	0.01	0.02
26	Lead - Acid Soluble	g/m³												
25	Manganese - Acid Soluble	g/m³	0.0045	0.0005	0.001	0.0065	0.0014	0.0187	0.0021	0.0013	0.003	0.0008	0.0009	0.0013
26	Nickel - Acid Soluble	g/m³												
26	Nitrate - Nitrogen	g/m³	0.3	0.38	0.32	0.25	0.21	0.23	0.25	0.23	0.25	0.3	0.22	0.29
25	pH		7.8	7.8	7.8	7.8	7.7	7.6	7.6	7.8	7.8	7.8	7.9	7.9
Other	Suspended Solids - Total	g/m³	6	6	6	6	6	6	5	6	6	6	6	6
26	Zinc - Acid Soluble	g/m³												

Condition	Description	Measure	26/06/2020	30/07/2020	27/08/2020	28/09/2020	21/10/2020	26/11/2020	18/12/2020	20/01/2020	18/02/2021	18/03/2021	29/04/2021	28/05/2021
26	Aluminium - Acid Soluble	g/m³	0.022						0.011					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Acid Soluble	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	3	1	1	1	3	1	1	1	1	1	1	1
26	Boron - Acid Soluble	g/m³	0.04						0.03					
26	Cadmium - Acid Soluble	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	15	15	15	15	20	15	25	15	18	21	22
26	Chloride	g/m³	36.9						40					
26	Chromium - Acid Soluble	g/m³	0.001						0.001					
25	Conductivity at 25°C	mS/m	20.3	23.8	24.5	19.0	23.5	21.0	22.9	24.1	24.9	26.0	26.0	25.6
26	Copper - Acid Soluble	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.009						0.005					
25	Faecal Coliforms	cfu/100ml	88	290	28	12	100	88	380	150	77	69	300	32
25	Iron - Acid Soluble	g/m³	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Acid Soluble	g/m³	0.0005						0.0005					
25	Manganese - Acid Soluble	g/m³	0.002	0.0005	0.0006	0.0022	0.0012	0.0012	0.0007	0.0008	0.0006	0.0013	0.0031	0.0005
26	Nickel - Acid Soluble	g/m³	0.0005						0.0005					
26	Nitrate - Nitrogen	g/m³	0.28	0.33	0.26	0.21	0.17	0.19	0.2	0.18	0.23	0.26	0.27	0.27
25	pH		7.6	7.7	7.8	7.5	7.7	7.6	7.9	7.8	7.7	7.8	7.8	7.7
Other	Suspended Solids - Total	g/m³	6	6	6	6	6	6	6	6	6	3	6	5
26	Zinc - Acid Soluble	g/m³	0.002						0.002					

Notes:
Values in red were reported below the detection limit.

AECOM

Client Name: Wellington City Council
Project Name: Southern Landfill 2020/2021 Annual Monitoring Report
Project No: 60629483

SOUTHERN LANDFILL - DOWNSTREAM MONITORING OF CAREY'S STREAM

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	24/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Acid Soluble	g/m³	0.008						0.017					
25	Ammonia Nitrogen	g/m³	0.49	0.89	0.53	0.52	0.44	0.49	1.05	0.95	1.08	0.76	1	0.84
26	Arsenic - Acid Soluble	g/m³	0.001						0.002					
25	BOD5 - Total	g/m³	1	6	2	3	2	9	4	5	6	3	11	6
26	Boron - Acid Soluble	g/m³	0.01						0.38					
26	Cadmium - Acid Soluble	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	33	15	19	15	15	19	28	15	55	42	15
26	Chloride	g/m³	45.3						61.2					
26	Chromium - Acid Soluble	g/m³	0.001						0.001					
25	Conductivity at 25°C	mS/m	30.5	79.5	33.1	35.5	38.8	62.7	76.1	74.4	72.4	74.0	37.4	68.2
26	Copper - Acid Soluble	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.011						0.016					
25	Faecal Coliforms	cfu/100ml		2500	35	120	5900	8	4	4	270	230	10000	58
25	Iron - Acid Soluble	g/m³	0.04	0.35	0.05	0.05	0.52	0.26	0.39	0.59	0.43	0.8	2.03	0.36
26	Lead - Acid Soluble	g/m³	0.0005						0.0005					
25	Manganese - Acid Soluble	g/m³	0.213	0.961	0.3	0.319	0.215	0.694	1.02	1.11	1.05	1.05	0.453	0.835
26	Nickel - Acid Soluble	g/m³	0.0005						0.0005					
26	Nitrate - Nitrogen	g/m³	0.59	1.85	0.73	0.86	1.18	1.22	1.41	1.15	1.28	1.15	0.8	1.34
25	pH		7.6	7.9	7.7	7.6	7.7	7.5	7.6	8.0	7.5	8.0	7.5	7.8
Other	Suspended Solids - Total	g/m³	6	7	6	6	73	5	6	6	6	29	62	6
26	Zinc - Acid Soluble	g/m³	0.002						0.002					

Condition	Description	Measure	13/06/2019	29/07/2019	30/08/2019	24/09/2019	25/10/2019	8/11/2019	19/12/2019	29/01/2020	28/02/2020	27/03/2020	17/04/2020	21/05/2020
26	Aluminium - Acid Soluble	g/m³												
25	Ammonia Nitrogen	g/m³	0.83	1.29	1.22	1.08	0.57	0.68	0.24	0.22	0.12	0.1	0.49	0.81
26	Arsenic - Acid Soluble	g/m³												
25	BOD5 - Total	g/m³	6	6	8	4	3	6	3	1	1	1	3	1
26	Boron - Acid Soluble	g/m³												
26	Cadmium - Acid Soluble	g/m³												
Other	Chemical Oxygen Demand	g/m³	15	49	48	15	15	15	44	31	45	15	15	15
26	Chloride	g/m³												
26	Chromium - Acid Soluble	g/m³												
25	Conductivity at 25°C	mS/m	71.5	86.7	74.7	75.2	30.4	37.4	22.6	39.9	40.4	37.8	40.0	38.8
26	Copper - Acid Soluble	g/m³												
26	Dissolved Reactive Phosphorus	g/m³												
25	Faecal Coliforms	cfu/100ml	4	48	16	80	38	230	200	110	32	170	12	400
25	Iron - Acid Soluble	g/m³	0.24	0.27	0.36	0.36	0.07	0.08	0.07	0.1	0.06	0.1	0.04	0.1
26	Lead - Acid Soluble	g/m³												
25	Manganese - Acid Soluble	g/m³	0.822	0.811	0.977	0.885	0.274	0.404	0.147	0.314	0.232	0.227	0.303	0.39
26	Nickel - Acid Soluble	g/m³												
26	Nitrate - Nitrogen	g/m³	1.44	2.09	1.4	1.39	0.4	0.68	0.35	1.18	1.3	1.19	0.89	0.6
25	pH		8	7.9	7.8	7.7	7.6	7.9	6.8	7.8	8.0	7.9	8.0	7.9
Other	Suspended Solids - Total	g/m³	6	6	6	6	6	6	6	6	6	6	6	6
26	Zinc - Acid Soluble	g/m³												

Condition	Description	Measure	26/06/2020	30/07/2020	27/08/2020	28/09/2020	21/10/2020	26/11/2020	18/12/2020	20/01/2021	18/02/2021	18/03/2021	29/04/2021	28/05/2021
26	Aluminium - Acid Soluble	g/m³	0.017						0.009					
25	Ammonia Nitrogen	g/m³	0.45	1.23	0.69	0.54	0.74	0.63	0.66	0.52	0.37	0.22	0.24	0.13
26	Arsenic - Acid Soluble	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	3	1	3	5	3	2	2	2	1	1	1	1
26	Boron - Acid Soluble	g/m³	0.06						0.05					
26	Cadmium - Acid Soluble	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	17	15	15	15	15	22	26	34	15	15	21	15
26	Chloride	g/m³	39.9						45.2					
26	Chromium - Acid Soluble	g/m³	0.001						0.001					
25	Conductivity at 25°C	mS/m	25.7	37.1	39.5	24.3	35	28.3	33.4	37.9	38.9	42.2	40.4	39.8
26	Copper - Acid Soluble	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.005						0.01					
25	Faecal Coliforms	cfu/100ml	210	8	32	320	27	120	170	140	60	31	28	12
25	Iron - Acid Soluble	g/m³	0.16	0.07	0.06	0.12	0.07	0.1	0.06	0.07	0.09	0.05	0.05	0.03
26	Lead - Acid Soluble	g/m³	0.0005						0.0005					
25	Manganese - Acid Soluble	g/m³	0.256	0.485	0.392	0.247	0.319	0.201	0.248	0.327	0.254	0.207	0.24	0.209
26	Nickel - Acid Soluble	g/m³	0.0005						0.0005					
26	Nitrate - Nitrogen	g/m³	0.32	0.42	1.17	0.35	0.63	0.48	0.65	0.99	1.3	1.5	1.26	1.56
25	pH		7.4	7.7	7.8	7.4	7.7	7.4	7.9	7.8	7.6	8.0	7.9	7.9
Other	Suspended Solids - Total	g/m³	6	6	6	6	6	6	6	6	6	10	6	6
26	Zinc - Acid Soluble	g/m³	0.002						0.002					

Notes:
Values in red were reported below the detection limit.

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	28/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Dissolved	g/m³	0.004						0.002					
25	Ammonia Nitrogen	g/m³	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	6	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.12						0.12					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	22	15	26	25	15	19	29	15	15	15	18	24
26	Chloride	g/m³	59.2						99					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear	Clear	Clear, floating solids	Clear		Clear	Clear		Clear			
25	Conductivity at 25°C	mS/m	64.7	74.4	88.8	106	89.6	87.7	88.3	88.6	85.4	87.2	85.8	84.9
26	Copper - Dissolved	g/m³	0.0012						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.041						0.019					
25	Faecal Coliforms	cfu/100ml	1	1	1	4	3	1	1	1	1	96	12	1
25	Iron - Dissolved	g/m³	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0018	0.0128	0.0271	0.235	0.0287	0.03	0.0267	0.0342	0.0299	0.0345	0.0207	0.219
26	Nickel - Dissolved	g/m³	0.0009						0.0007					
26	Nitrate - Nitrogen	g/m³	3.7						1.96					
25	pH		6.4	7.1	6.7	7	6.8	6.6	6.7	6.7	6.7	6.8	6.9	7.1
Other	Water Level of Bore	Metres	1.8	1.5	1.8	1.8	1.7	1.7	1.5	1.8	1.7	1.6	1.4	1.7
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	No Rain	Much Rain	Much Rain	No Rain
26	Zinc - Dissolved	g/m³	0.002						0.002					

Condition	Description	Measure	13/06/2019	29/07/2019	30/08/2019	24/09/2019	25/10/2019	8/11/2019	19/12/2019	29/01/2020	28/02/2020	27/03/2020	17/04/2020	21/05/2020
26	Aluminium - Dissolved	g/m³												
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³												
25	BOD5 - Total	g/m³	6	1	1	1	1	6	1	1	1	1	1	1
26	Boron - Dissolved	g/m³												
26	Cadmium - Dissolved	g/m³												
Other	Chemical Oxygen Demand	g/m³	15	28	15	132	15	15	69	29	15	15	15	15
26	Chloride	g/m³												
26	Chromium - Dissolved	g/m³												
Other	Comments													
25	Conductivity at 25°C	mS/m	85	84.2	84.6	84.4	84.7	84.2	84.4	82.6	84.8	83.8	83.4	82.5
26	Copper - Dissolved	g/m³												
26	Dissolved Reactive Phosphorus	g/m³												
25	Faecal Coliforms	cfu/100ml	1	1	1	1	1	1	4	1	1	1	110	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³												
25	Manganese - Dissolved	g/m³	0.0085	0.0065	0.0093	0.0058	0.0081	0.0108	0.0322	0.0081	0.0097	0.0137	0.0884	0.0135
26	Nickel - Dissolved	g/m³												
26	Nitrate - Nitrogen	g/m³												
25	pH		7	6.9	6.9	7.8	7.2	7	7.1	7.4	7.4	6.7	6.8	6.7
Other	Water Level of Bore	Metres	1.5	1.8	1.6	2	1.5	2.2	2.1	2	1.8	2.4	2	1.8
Other	Weather - 24 hr		No Rain	No Rain	No Rain	Some Rain	Some Rain	No Rain	Some Rain	Some Rain	No Rain	Some Rain	Some Rain	No Rain
26	Zinc - Dissolved	g/m³												

Condition	Description	Measure	26/06/2020	30/07/2020	27/08/2020	28/09/2020	21/10/2020	26/11/2020	18/12/2020	20/01/2021	18/02/2021	18/03/2021	29/04/2021	28/05/2021
26	Aluminium - Dissolved	g/m³	0.005						0.002					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	1	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.14						0.15					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	19	68	15	56	24	32	18	38	15	19	21	15
26	Chloride	g/m³	91.8						92.9					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments								-			Water Clarity: Clear	Water Clarity: Clear	Water Clarity: Trace/Cloudy
25	Conductivity at 25°C	mS/m	81.4	82.2	81.6	82.1	82	81.2	82.4	82.5	82.8	82.7	81.5	81.7
26	Copper - Dissolved	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.016						0.01					
25	Faecal Coliforms	cfu/100ml	1	1	1	1	2	3	1	7	1	1	33	5
25	Iron - Dissolved	g/m³	0.04	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0184	0.0098	0.0087	0.0167	0.0081	0.01	0.0081	0.0106	0.0102	0.0127	0.0124	0.0122
26	Nickel - Dissolved	g/m³	0.001						0.0008					
26	Nitrate - Nitrogen	g/m³	1.93						1.77					
25	pH		6.8	7	6.7	6.8	6.7	6.6	7.1	6.7	6.7	7	6.7	6.9
Other	Water Level of Bore	Metres	2.1	1.6	1.9	1.7	1.8	1.4	1.7	1.8	1.7	1.9	1.4	1.8
Other	Weather - 24 hr		No Rain	No Rain	Some Rain	Much Rain	Some Rain	Much Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	No Rain
26	Zinc - Dissolved	g/m³	0.002						0.002					

Notes:
Values in red were reported below the detection limit.

AECOM

Client Name: Wellington City Council
Project Name: Southern Landfill 2020/2021 Annual Monitoring Report
Project No: 60629483

SOUTHERN LANDFILL - BH2B MONITORING RESULTS

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	28/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Dissolved	g/m³	0.002						0.002					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	6	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.06						0.17					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	25	15	24	22	15	15	23	18	15	17	15	15
26	Chloride	g/m³	32.1						108					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear	Clear	Clear, floating solids	Clear		Clear	Clear		Clear			
25	Conductivity at 25°C	mS/m	41.3	91.4	107	89.2	107	106	107	106	91.6	109	108	104
26	Copper - Dissolved	g/m³	0.0039						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.012						0.017					
25	Faecal Coliforms	cfu/100ml	1	1	1	1	1	1	1	1	1	1	1	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0059	0.0018	0.266	0.0208	0.272	0.293	0.244	0.253	0.404	0.322	0.293	0.0129
26	Nickel - Dissolved	g/m³	0.0007						0.0012					
26	Nitrate - Nitrogen	g/m³	1.59						1.03					
25	pH		6.8	6.9	6.6	7.2	7.1	6.7	6.7	7	6.5	6.7	7.1	8
Other	Water Level of Bore	Metres	1.3	1.2	1.5	1.4	1.3	1.5	1.8	1.7	1.4	1.4	1.4	1.5
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	Much Rain	Much Rain	No Rain
26	Zinc - Dissolved	g/m³	0.003						0.002					

Condition	Description	Measure	13/06/2019	29/07/2019	30/08/2019	24/09/2019	25/10/2019	8/11/2019	19/12/2019	29/01/2020	28/02/2020	27/03/2020	17/04/2020	21/05/2020
26	Aluminium - Dissolved	g/m³												
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15	0.01	0.01	0.11	0.01
26	Arsenic - Dissolved	g/m³												
25	BOD5 - Total	g/m³	6	1	1	1	1	6	1	1	1	1	1	1
26	Boron - Dissolved	g/m³												
26	Cadmium - Dissolved	g/m³												
Other	Chemical Oxygen Demand	g/m³	15	26	15	15	15	15	56	33	15	15	44	15
26	Chloride	g/m³												
26	Chromium - Dissolved	g/m³												
Other	Comments													
25	Conductivity at 25°C	mS/m	103	103	102	102	102	107	106	61.4	108	101	101	104
26	Copper - Dissolved	g/m³												
26	Dissolved Reactive Phosphorus	g/m³												
25	Faecal Coliforms	cfu/100ml	1	1	1	1	1	1	2	1	1	1	6	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.17	0.02	0.01	0.71	0.01
26	Lead - Dissolved	g/m³												
25	Manganese - Dissolved	g/m³	0.231	0.251	0.26	0.224	0.243	0.341	0.473	0.403	0.37	0.262	0.302	0.309
26	Nickel - Dissolved	g/m³												
26	Nitrate - Nitrogen	g/m³												
25	pH		7.2	6.9	7.5	7.3	7.1	6.9	7.1	6.9	7.6	7.3	6.7	6.6
Other	Water Level of Bore	Metres	1.4	1.5	1.7	1.5	2.4	2.2	2.3	2.3	1.7	2.3	1.8	1.3
Other	Weather - 24 hr		No Rain	No Rain	No Rain	Some Rain	Some Rain	No Rain	Some Rain	Some Rain	No Rain	Some Rain	Some Rain	No Rain
26	Zinc - Dissolved	g/m³												

Condition	Description	Measure	26/06/2020	30/07/2020	27/08/2020	28/09/2020	21/10/2020	26/11/2020	18/12/2020	20/01/2021	18/02/2021	18/03/2021	29/04/2021	28/05/2021
26	Aluminium - Dissolved	g/m³	0.002						0.002					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	1	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.19						0.19					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	18	15	15	15	15	35	19	15	15	16	26	21
26	Chloride	g/m³	105						105					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments								Some sediment post-flush			Water Clarity: Clear	Water Clarity: Clear	Water Clarity: Clear
25	Conductivity at 25°C	mS/m	100	99.2	102	97.4	101	99.1	100	99.9	98.9	106	99.6	98.7
26	Copper - Dissolved	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.014						0.013					
25	Faecal Coliforms	cfu/100ml	1	1	1	1	1	1	1	1	1	1	1	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.33	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.238	0.208	0.308	0.228	0.248	0.222	0.21	0.242	0.222	0.335	0.231	0.231
26	Nickel - Dissolved	g/m³	0.0017						0.0015					
26	Nitrate - Nitrogen	g/m³	1.03						1.03					
25	pH		6.8	7.2	6.7	6.6	6.7	6.6	7	6.7	6.7	7	6.7	6.8
Other	Water Level of Bore	Metres	2.2	2.1	1.7	1.6	1.5	1.8	1.4	1.4	1.5	1.7	1.8	1.5
Other	Weather - 24 hr		No Rain	No Rain	Some Rain	Much Rain	Some Rain	Much Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	No Rain
26	Zinc - Dissolved	g/m³	0.002						0.002					

Notes:
Values in red were reported below the detection limit.

AECOM

Client Name: Wellington City Council
Project Name: Southern Landfill 2020/2021 Annual Monitoring Report
Project No: 60629483

SOUTHERN LANDFILL - BOREHOLE BH3A/BH103A MONITORING RESULTS

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	24/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Dissolved	g/m³	0.002						0.012					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.42	0.01	0.13
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	6	6	1	6	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.12						0.13					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	15	15	21	15	15	28	26	15	34	15	15
26	Chloride	g/m³	96.5						73					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments			Clear	Brown, floating solids	Brown		Cloudy	Brownish		Clear			
25	Conductivity at 25°C	mS/m	64.4	69.3	54	61.8	52.4	51.5	74.4	98.1	19.6	43.5	33.6	66.3
26	Copper - Dissolved	g/m³	0.0005						0.0013					
26	Dissolved Reactive Phosphorus	g/m³	0.021						0.042					
25	Faecal Coliforms	cfu/100ml	1	1	7	45	80	14	33	1	21	2	90	26
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.04	0.02	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0207	0.0019	0.0055	0.0014	0.002	0.0163	0.004	0.0086	0.0025	0.579	0.0012	0.0061
26	Nickel - Dissolved	g/m³	0.0008						0.0007					
26	Nitrate - Nitrogen	g/m³	1.92						2.24					
25	pH		6.7	6.5	6.7	6.6	6.6	6.6	6.5	6.6	6.8	6.7	6.7	7
Other	Water Level of Bore	Metres	4.8	4.7	4.8	4.8	4.1	4.5	4.4	4.7	3.5	4.1	3.8	4.2
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	Much Rain	Much Rain	No Rain
26	Zinc - Dissolved	g/m³	0.002						0.002					

Condition	Description	Measure	13/06/2019	29/07/2019	30/08/2019	24/09/2019	25/10/2019	8/11/2019	19/12/2019	29/01/2020	28/02/2020	27/03/2020	17/04/2020	21/05/2020
26	Aluminium - Dissolved	g/m³												
25	Ammonia Nitrogen	g/m³	0.09	0.1	0.03	0.03	0.02	0.3	0.01	0.01	0.01	0.01	0.03	0.01
26	Arsenic - Dissolved	g/m³												
25	BOD5 - Total	g/m³	6	1	6	1	1	6	1	1	1	6	1	1
26	Boron - Dissolved	g/m³												
26	Cadmium - Dissolved	g/m³												
Other	Chemical Oxygen Demand	g/m³	15	30	16	23	15	19	48	25	15	15	15	15
26	Chloride	g/m³												
26	Chromium - Dissolved	g/m³												
Other	Comments													
25	Conductivity at 25°C	mS/m	83.5	86	58.2	70.4	68.2	91.4	37.1	20.8	19	19.2	19.4	19.1
26	Copper - Dissolved	g/m³												
26	Dissolved Reactive Phosphorus	g/m³												
25	Faecal Coliforms	cfu/100ml	1	20	1	1	3	1	18	1	1	1	7	7
25	Iron - Dissolved	g/m³	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³												
25	Manganese - Dissolved	g/m³	0.0109	0.0294	0.0388	0.0103	0.0094	0.643	0.0174	0.0017	0.0026	0.003	0.0022	0.0013
26	Nickel - Dissolved	g/m³												
26	Nitrate - Nitrogen	g/m³												
25	pH		6.7	7.8	6.8	7	6.7	6.5	7	6.6	7	6.7	6.7	6.6
Other	Water Level of Bore	Metres	4.5	4.5	4.2	4.3	4.3	4.4	4.2	4.2	3	3.8	4.1	4.1
Other	Weather - 24 hr		No Rain	No Rain	No Rain	Some Rain	Some Rain	No Rain	Some Rain	Some Rain	No Rain	Some Rain	Some Rain	No Rain
26	Zinc - Dissolved	g/m³												

Condition	Description	Measure	26/06/2020	30/07/2020	27/08/2020	28/09/2020	21/10/2020	26/11/2020	18/12/2020	20/01/2021	18/02/2021	18/03/2021	29/04/2021	28/05/2021
26	Aluminium - Dissolved	g/m³	0.008						0.011					
25	Ammonia Nitrogen	g/m³	0.01	0.54	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	6	1	1	1	1	1	1	1	6	3	1	6
26	Boron - Dissolved	g/m³	0.04						0.03					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	17	16	15	15	22	15	15	25	15	18	15
26	Chloride	g/m³	20.4						17.1					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments								-			Water Clarity: Clear	Water Clarity: Clear	Water Clarity: Cloudy
25	Conductivity at 25°C	mS/m	24	71.4	18.5	21.7	18.7	18.7	16.9	19.4	20.5	18.9	17.9	17.9
26	Copper - Dissolved	g/m³	0.0008						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.042						0.045					
25	Faecal Coliforms	cfu/100ml	16	1	6	54	20	21	12	3	7	1	1	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0007	1.8	0.0015	0.002	0.0076	0.0005	0.0041	0.0015	0.0063	0.0021	0.0011	0.001
26	Nickel - Dissolved	g/m³	0.0005						0.0005					
26	Nitrate - Nitrogen	g/m³	1.51						0.37					
25	pH		6.7	6.9	6.9	6.7	6.7	6.8	7.1	6.6	6.6	6.8	6.7	7
Other	Water Level of Bore	Metres	2.8	3.6	3.8	4.1	4	3.6	3.6	3.9	3.7	4	3.3	3.5
Other	Weather - 24 hr		No Rain	No Rain	Some Rain	Much Rain	Some Rain	Much Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	No Rain
26	Zinc - Dissolved	g/m³	0.002						0.002					

Notes:
Values in red were reported below the detection limit.

AECOM

Client Name: Wellington City Council
Project Name: Southern Landfill 2020/2021 Annual Monitoring Report
Project No: 60629483

SOUTHERN LANDFILL - BOREHOLE BH3B/BH103B MONITORING RESULTS

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	24/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Dissolved	g/m³	0.002						0.003					
25	Ammonia Nitrogen	g/m³	0.01	0.01	1.9	1.72	0.24	1.46	2.21	2.56	0.01	0.01	0.64	1.47
26	Arsenic - Dissolved	g/m³	0.001						0.002					
25	BOD5 - Total	g/m³	1	1	11	11	1	6	3	3	1	1	9	6
26	Boron - Dissolved	g/m³	0.17						0.36					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	19	15	40	43	15	35	34	48	15	15	43	40
26	Chloride	g/m³	104						156					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear	Clear	Light brown, floating solids	Cloudy		Clear	Clear		Clear			
25	Conductivity at 25°C	mS/m	46.1	44.5	154	163	63.6	130	157	171	23.3	21.8	82.9	83.8
26	Copper - Dissolved	g/m³	0.0005						0.0015					
26	Dissolved Reactive Phosphorus	g/m³	0.023						0.025					
25	Faecal Coliforms	cfu/100ml	1	1	7	22	29	28	6	1	1	17	62	11
25	Iron - Dissolved	g/m³	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.04	0.01	0.01	0.01	0.02
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.38	0.0068	9.63	8.87	2.13	6.61	7.25	10.2	0.0158	0.0011	2.68	5.04
26	Nickel - Dissolved	g/m³	0.0019						0.0036					
26	Nitrate - Nitrogen	g/m³	1.01						0.18					
25	pH		7	6.8	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.6	6.8	6.6
Other	Water Level of Bore	Metres	4.7	4.5	4.8	4.8	4.5	4.7	4.5	4.7	4.2	4.1	4.1	4.2
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	Much Rain	Much Rain	No Rain
26	Zinc - Dissolved	g/m³	0.003						0.006					

Condition	Description	Measure	13/06/2019	29/07/2019	30/08/2019	24/09/2019	25/10/2019	8/11/2019	19/12/2019	29/01/2020	28/02/2020	27/03/2020	17/04/2020	21/05/2020
26	Aluminium - Dissolved	g/m³												
25	Ammonia Nitrogen	g/m³	2.27	2.51	2.68	2.68	2.38	2.49	0.76	0.01	0.02	0.28	0.55	0.89
26	Arsenic - Dissolved	g/m³												
25	BOD5 - Total	g/m³	1	3	6	1	2	6	3	1	1	1	1	6
26	Boron - Dissolved	g/m³												
26	Cadmium - Dissolved	g/m³												
Other	Chemical Oxygen Demand	g/m³	19	43	70	19	33	37	63	19	24	15	15	32
26	Chloride	g/m³												
26	Chromium - Dissolved	g/m³												
Other	Comments													
25	Conductivity at 25°C	mS/m	154	164	169	164	166	169	88.9	28.1	23	46.9	68	90
26	Copper - Dissolved	g/m³												
26	Dissolved Reactive Phosphorus	g/m³												
25	Faecal Coliforms	cfu/100ml	4	6	2	2	7	3	110	98	37	7	4	12
25	Iron - Dissolved	g/m³	0.03	0.02	0.05	0.04	0.05	0.04	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³												
25	Manganese - Dissolved	g/m³	8.86	10.3	11.4	9.58	10	11	3.7	0.0029	0.077	1.05	2.52	3.89
26	Nickel - Dissolved	g/m³												
26	Nitrate - Nitrogen	g/m³												
25	pH		6.9	7.7	7	6.8	7	6.6	7.1	6.9	7.2	6.6	6.6	6.5
Other	Water Level of Bore	Metres	4.3	4.4	4.1	4.3	4.3	4.3	4.6	7.1	2.8	4.2	4.4	4.3
Other	Weather - 24 hr		No Rain	No Rain	No Rain	Some Rain	Some Rain	No Rain	Some Rain	Some Rain	No Rain	Some Rain	Some Rain	No Rain
26	Zinc - Dissolved	g/m³												

Condition	Description	Measure	26/06/2020	30/07/2020	27/08/2020	28/09/2020	21/10/2020	26/11/2020	18/12/2020	20/01/2021	18/02/2021	18/03/2021	29/04/2021	28/05/2021
26	Aluminium - Dissolved	g/m³	0.007						0.004					
25	Ammonia Nitrogen	g/m³	1.23	0.01	0.75	0.54	0.82	0.09	0.84	1.25	0.7	1.25	0.78	0.56
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	2	1	1	1	1	1	1	3	2	1	1	3
26	Boron - Dissolved	g/m³	0.31						0.22					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	36	20	41	23	23	33	36	43	30	36	28	16
26	Chloride	g/m³	121						86.3					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments								-			Water Clarity: Cloudy	Water Clarity: Cloudy Trace	Water Clarity: Clear
25	Conductivity at 25°C	mS/m	123	17.2	97.3	74.2	94.7	34	90.3	151	118	133	77.2	65.3
26	Copper - Dissolved	g/m³	0.0063						0.004					
26	Dissolved Reactive Phosphorus	g/m³	0.02						0.015					
25	Faecal Coliforms	cfu/100ml	29	4	1	35	5	32	12	8	98	1	1	2
25	Iron - Dissolved	g/m³	0.02	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.04	0.02	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	5.1	0.0013	2.85	2.5	3.95	0.286	3.88	6.93	3.11	7.51	3.89	2.13
26	Nickel - Dissolved	g/m³	0.0034						0.0019					
26	Nitrate - Nitrogen	g/m³	0.03						0.06					
25	pH		6.6	7.1	6.5	6.5	6.6	6.4	6.9	6.5	6.6	6.9	6.5	6.7
Other	Water Level of Bore	Metres	4.2	4.1	4.3	4	4.1	3.9	4.1	4.2	4.3	4.3	4.2	4.2
Other	Weather - 24 hr		No Rain	No Rain	Some Rain	Much Rain	Some Rain	Much Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	No Rain
26	Zinc - Dissolved	g/m³	0.008						0.004					

Notes:
Values in red were reported below the detection limit.

AECOM

Client Name: Wellington City Council
Project Name: Southern Landfill 2020/2021 Annual Monitoring Report
Project No: 60629483

SOUTHERN LANDFILL - BOREHOLE BH6 MONITORING RESULTS

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	24/09/02018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Dissolved	g/m³	0.009											
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01								
26	Arsenic - Dissolved	g/m³	0.001											
25	BOD5 - Total	g/m³	1	1	1	1								
26	Boron - Dissolved	g/m³	0.03											
26	Cadmium - Dissolved	g/m³	0.0002											
Other	Chemical Oxygen Demand	g/m³	15	15	15	17								
26	Chloride	g/m³	101											
26	Chromium - Dissolved	g/m³	0.001											
Other	Comments		Clear	Clear	Light brown, floating solids	Clear	No sample collected - Bore covered by landslip, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore still covered by landslip, not accessible	No sample collected	No sample collected - Bore covered, not accessible	No sample collected	No sample collected - Bore covered, not accessible
25	Conductivity at 25°C	mS/m	55.2	56.4	57.7	57.3								
26	Copper - Dissolved	g/m³	0.0005											
26	Dissolved Reactive Phosphorus	g/m³	0.025											
25	Faecal Coliforms	cfu/100ml	2	1	1	1								
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01								
26	Lead - Dissolved	g/m³	0.0005											
25	Manganese - Dissolved	g/m³	0.0043	0.0092	0.0258	0.0278								
26	Nickel - Dissolved	g/m³	0.0019											
26	Nitrate - Nitrogen	g/m³	0.32											
25	pH		6.1	6.3	6.6	6.6								
Other	Water Level of Bore	Metres	1.3	1	2	0.7								
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	No Rain								
26	Zinc - Dissolved	g/m³	0.008											

Condition	Description	Measure	13/06/2019	29/07/2019	30/08/2019	24/09/2019	25/10/2019	8/11/2019	19/12/2019	29/01/2020	28/02/2020	27/03/2020	17/04/2020	21/05/2020
26	Aluminium - Dissolved	g/m³												
25	Ammonia Nitrogen	g/m³											0.01	0.02
26	Arsenic - Dissolved	g/m³												
25	BOD5 - Total	g/m³											1	6
26	Boron - Dissolved	g/m³												
26	Cadmium - Dissolved	g/m³												
Other	Chemical Oxygen Demand	g/m³											15	15
26	Chloride	g/m³												
26	Chromium - Dissolved	g/m³												
Other	Comments		No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible		
25	Conductivity at 25°C	mS/m											36.6	43.2
26	Copper - Dissolved	g/m³												
26	Dissolved Reactive Phosphorus	g/m³												
25	Faecal Coliforms	cfu/100ml											60	72
25	Iron - Dissolved	g/m³											0.05	0.03
26	Lead - Dissolved	g/m³												
25	Manganese - Dissolved	g/m³											0.0711	0.0264
26	Nickel - Dissolved	g/m³												
26	Nitrate - Nitrogen	g/m³												
25	pH												6.1	6.2
Other	Water Level of Bore	Metres											1.8	1.3
Other	Weather - 24 hr												Some Rain	No Rain
26	Zinc - Dissolved	g/m³												

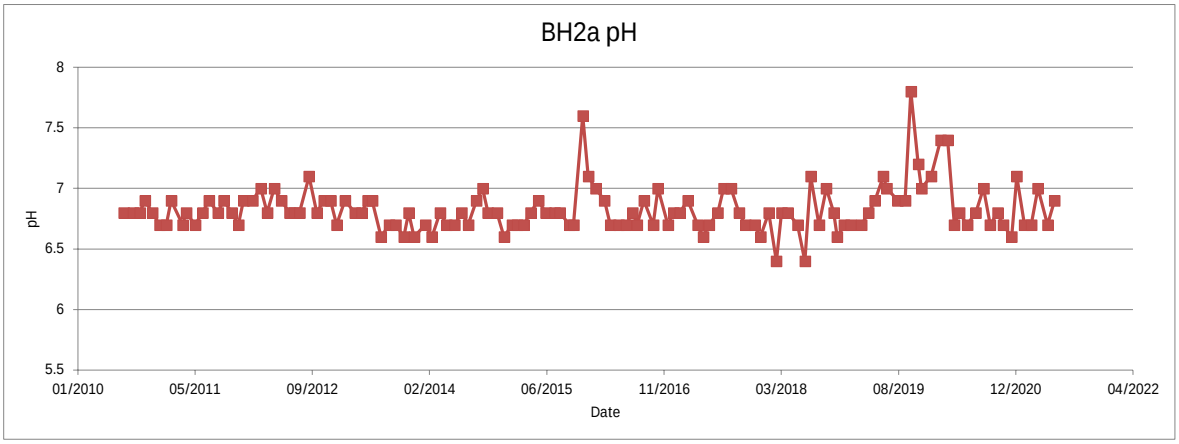
Condition	Description	Measure	26/06/2020	30/07/2020	27/08/2020	28/09/2020	21/10/2020	26/11/2020	18/12/2020	20/01/2021	18/02/2021	18/03/2021	29/04/2021	28/05/2021
26	Aluminium - Dissolved	g/m³	0.014						0.011					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	6	1	1	1	1	1	1	1	6	3	1	6
26	Boron - Dissolved	g/m³	0.04						0.03					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	15	15	15	15	27	19	28	29	18	24	29
26	Chloride	g/m³	93.4						91.8					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments								-			Water Clarity: Cloudy	Water Clarity: Cloudy Trace	Water Clarity: Trace Yellow
25	Conductivity at 25°C	mS/m	57.9	53.7	30.8	51.6	51	53.1	53.7	54.9	24.3	35.6	40.2	24.3
26	Copper - Dissolved	g/m³	0.0005						0.0011					
26	Dissolved Reactive Phosphorus	g/m³	0.016						0.014					
25	Faecal Coliforms	cfu/100ml	22	10	330	36	22	240	180	56	110	8	11	430
25	Iron - Dissolved	g/m³	0.01	0.02	0.01	0.05	0.02	0.01	0.01	0.01	0.7	0.01	0.03	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.033	0.0141	0.0072	0.0176	0.0167	0.017	0.03	0.0355	0.0204	0.0308	0.451	0.0562
26	Nickel - Dissolved	g/m³	0.0021						0.0029					
26	Nitrate - Nitrogen	g/m³	0.01						0.1					
25	pH		6.5	6.5	6.2	6.2	6.4	6.1	6.6	6.5	6.1	6.4	5.9	6.1
Other	Water Level of Bore	Metres	4.1	1.2	0.9	0.5	0.8	0.6	0.8	1	1.1	0.9	0.8	0.9
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	Much Rain	Some Rain	Much Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	No Rain
26	Zinc - Dissolved	g/m³	0.005						0.009					

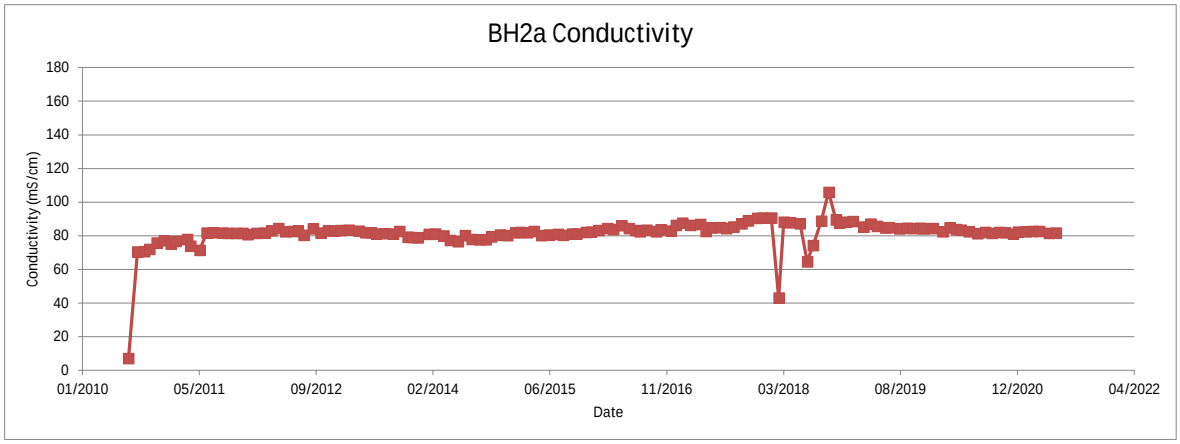
Notes:
Values in red were reported below the detection limit.

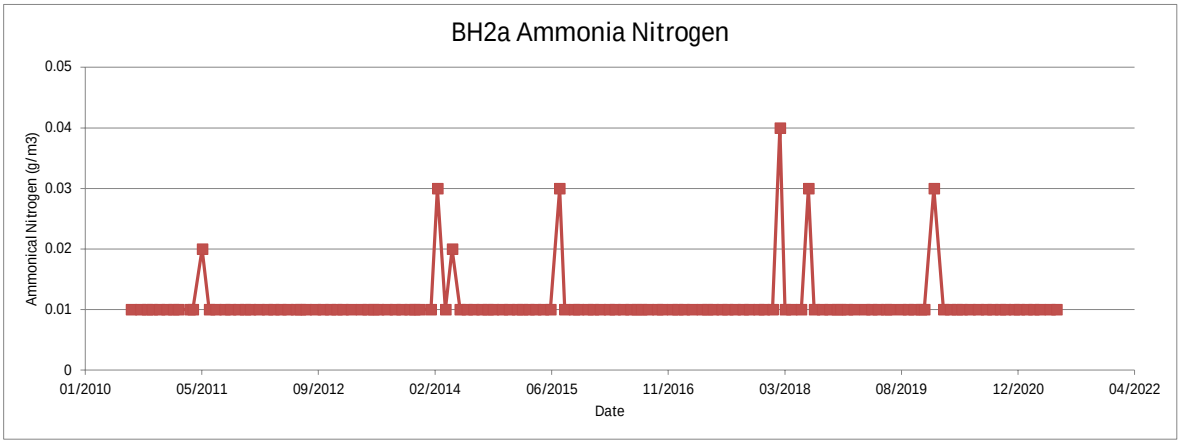
Appendix C

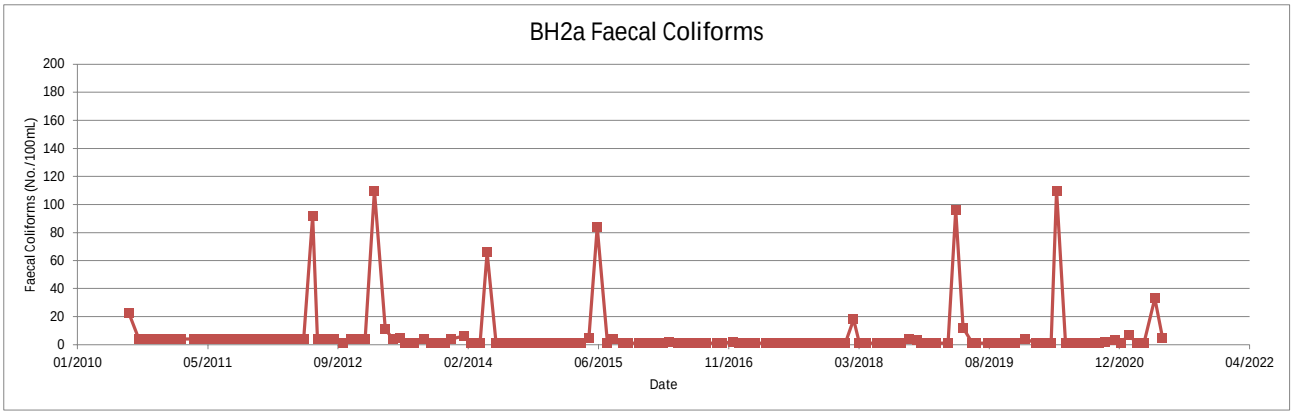
Time Series Graphs

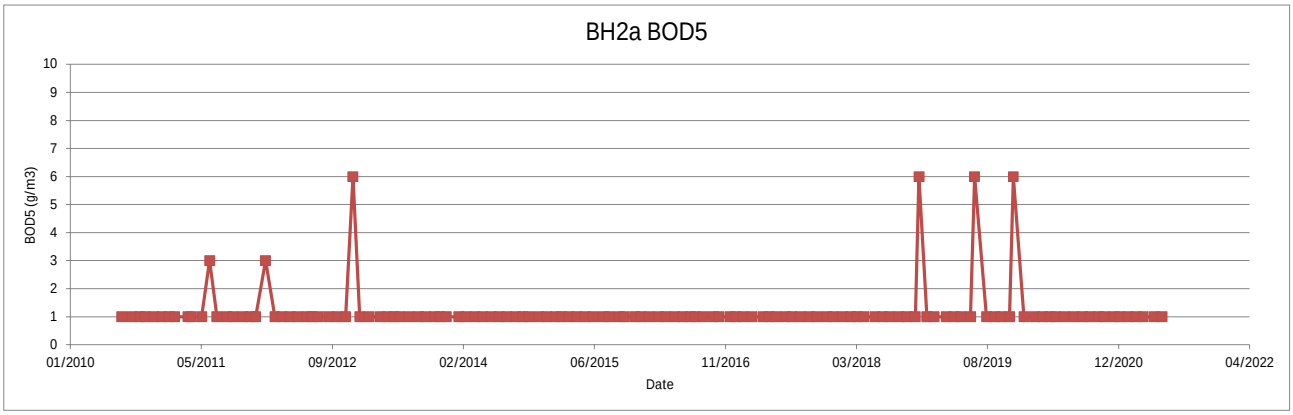
Appendix C Time Series Graphs

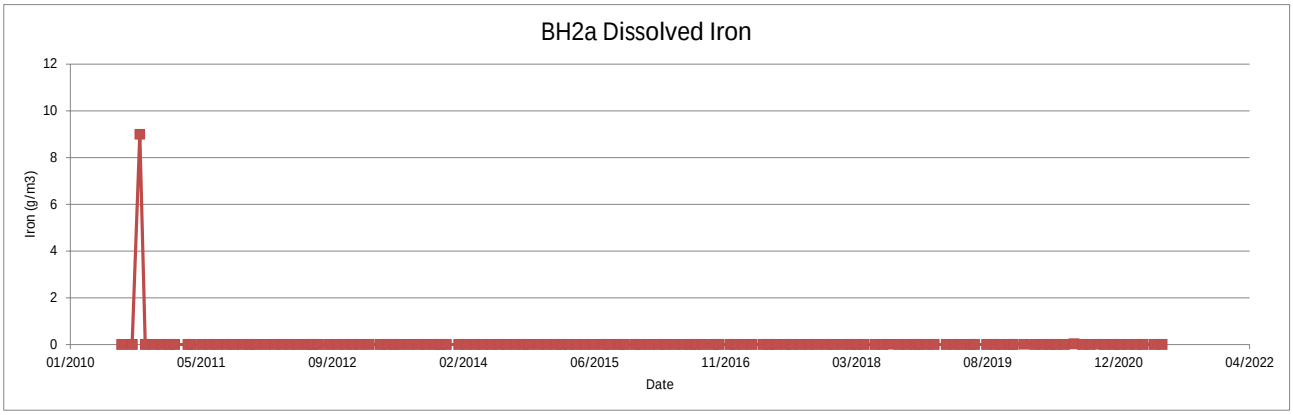

BH2a pH
pH
8
7.5
7
6.5
6
5.5
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

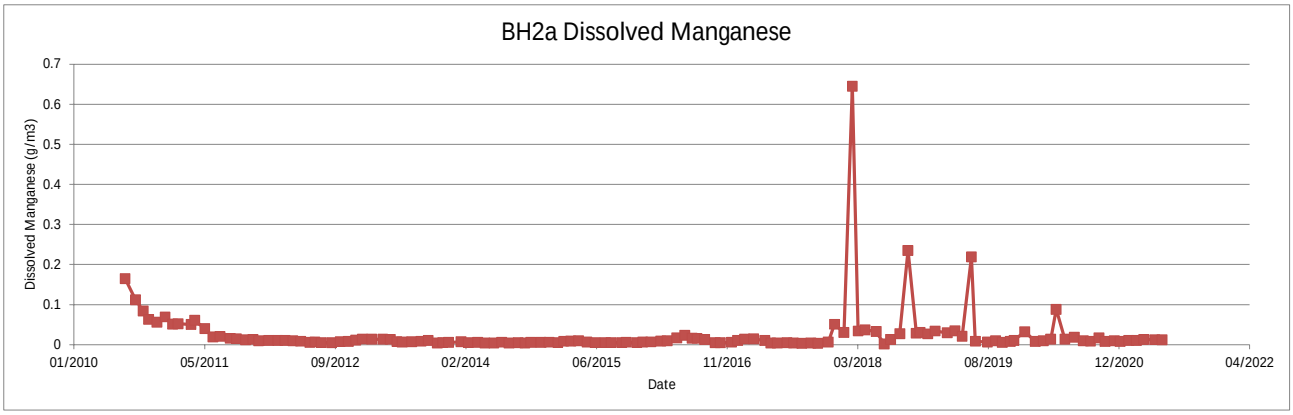

BH2a Conductivity
Conductivity (mS/cm)
180
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

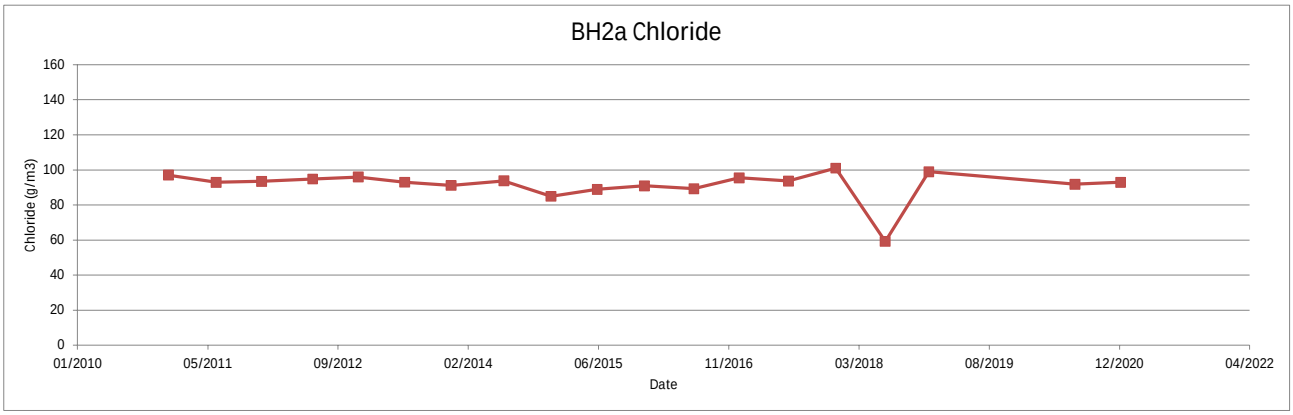

BH2a Ammonia Nitrogen
Ammonical Nitrogen (g/m3)
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

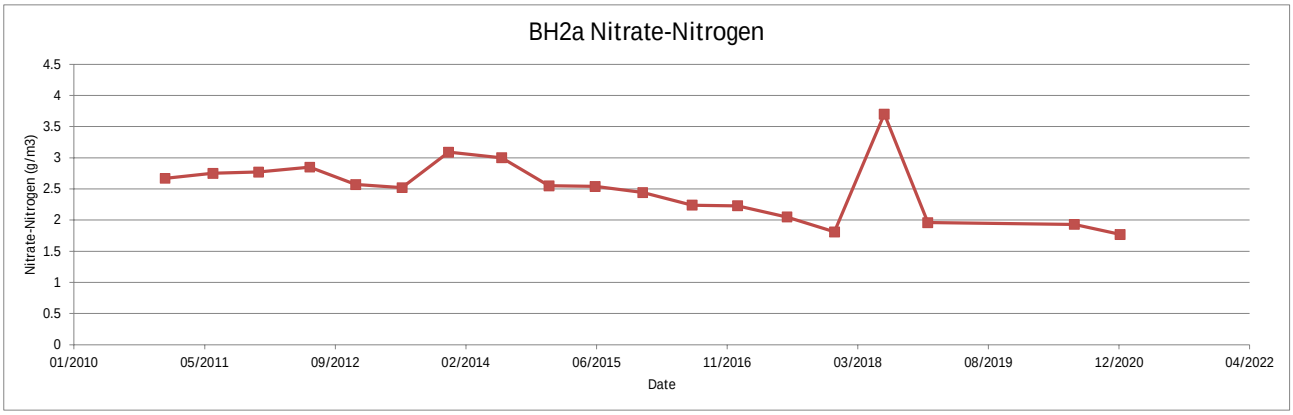

BH2a Faecal Coliforms
Faecal Coliforms (No./100mL)
200
180
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

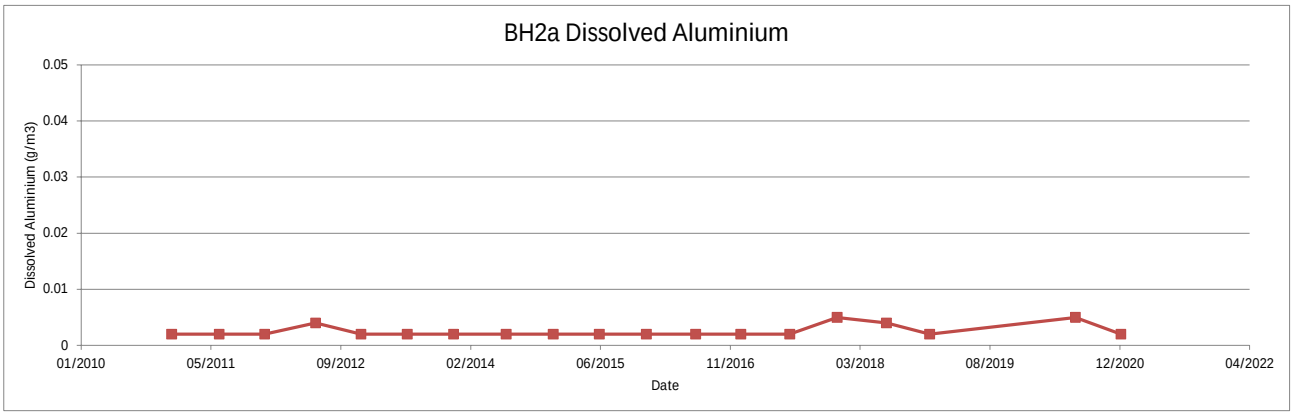

BH2a BOD5
BOD5 (g/m3)
10
9
8
7
6
5
4
3
2
1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

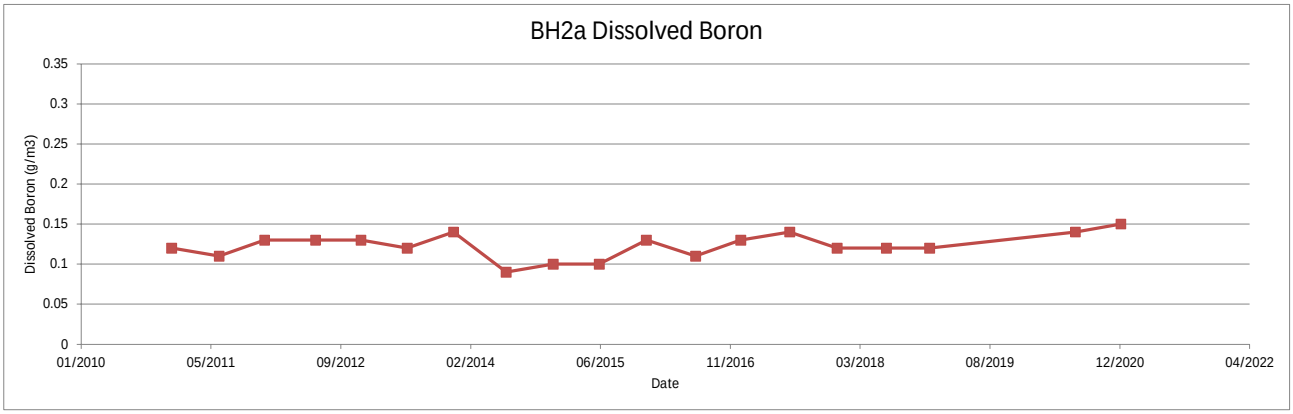

BH2a Dissolved Iron
Iron (g/m3)
12
10
8
6
4
2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

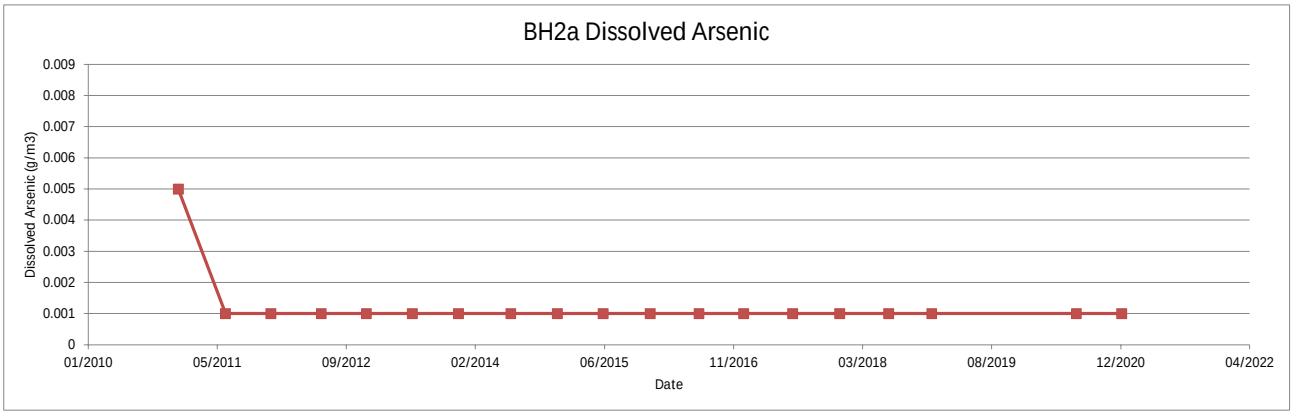

BH2a Dissolved Manganese
Dissolved Manganese (g/m3)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

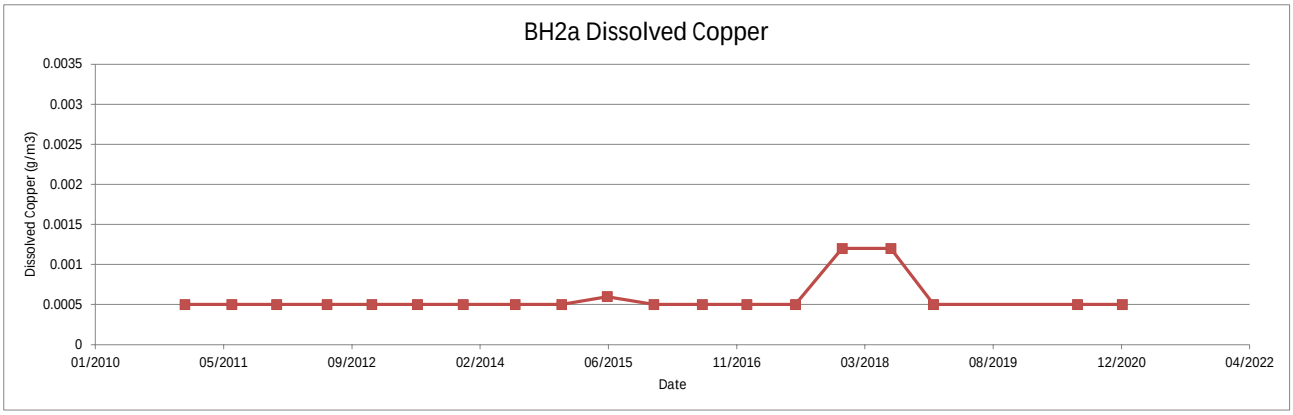

BH2a Chloride
Chloride (g/m3)
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

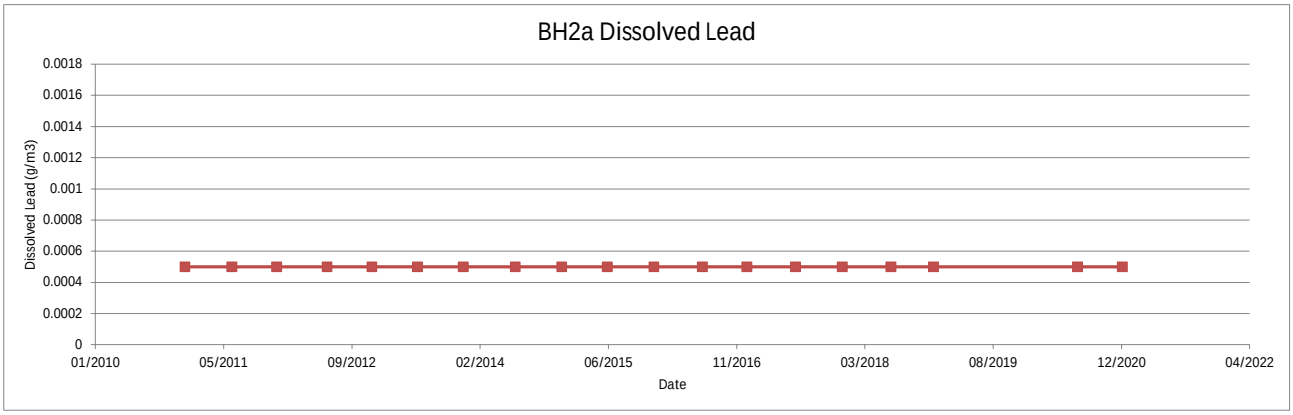

BH2a Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

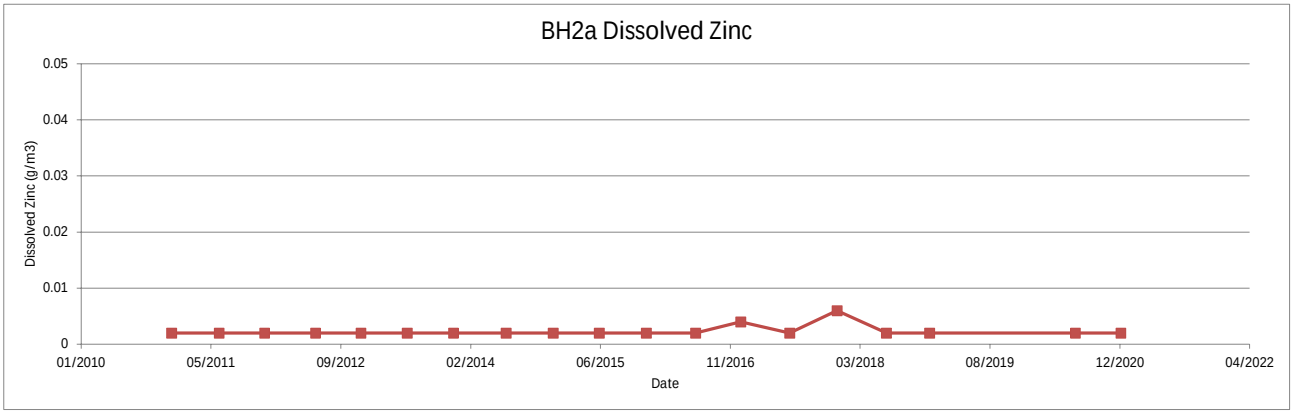

BH2a Dissolved Aluminium
Dissolved Aluminium (g/m3)
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

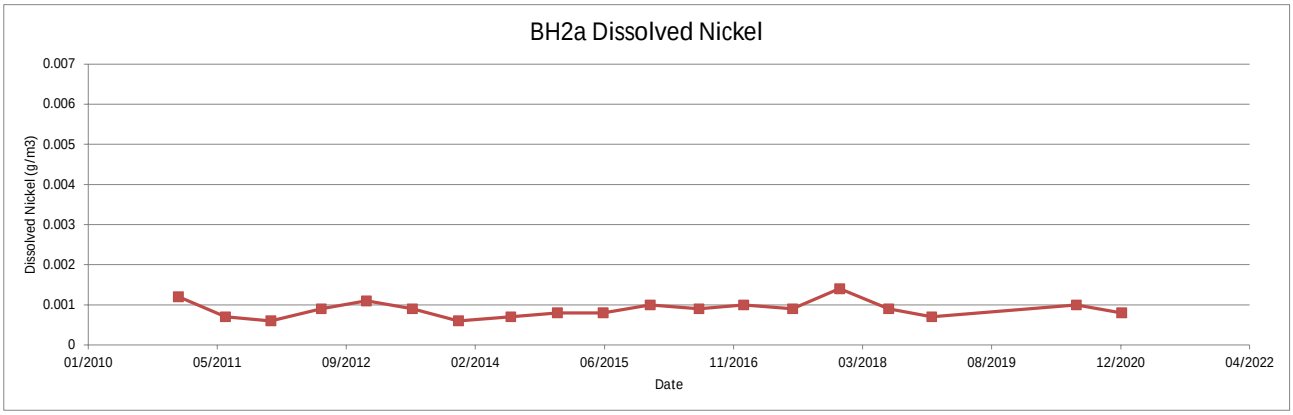

BH2a Dissolved Boron
Dissolved Boron (g/m3)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

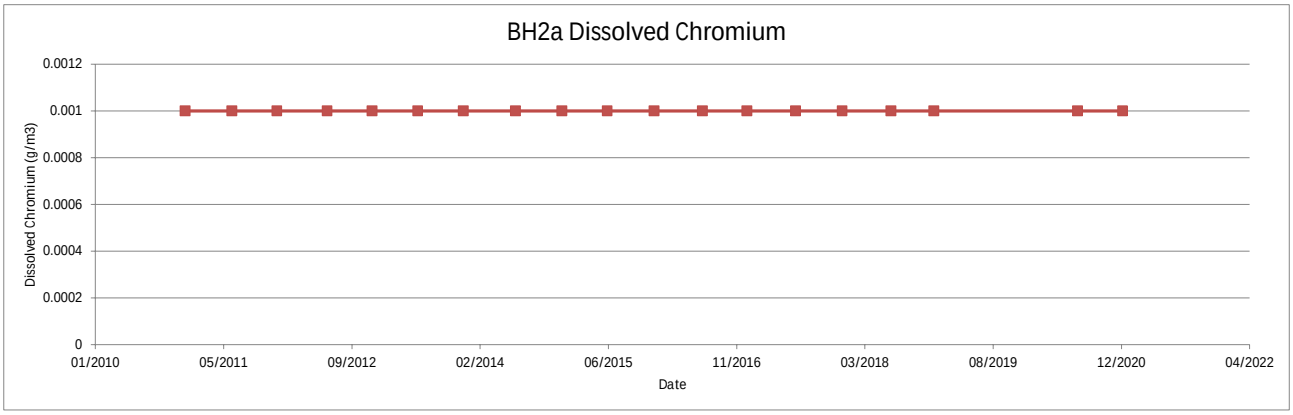

BH2a Dissolved Arsenic
Dissolved Arsenic (g/m3)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

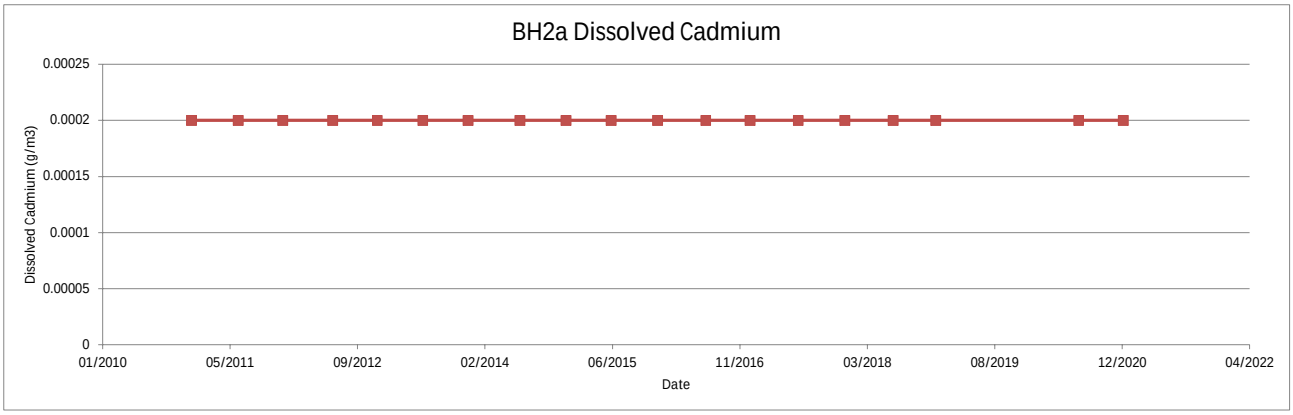

BH2a Dissolved Copper
Dissolved Copper (g/m3)
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

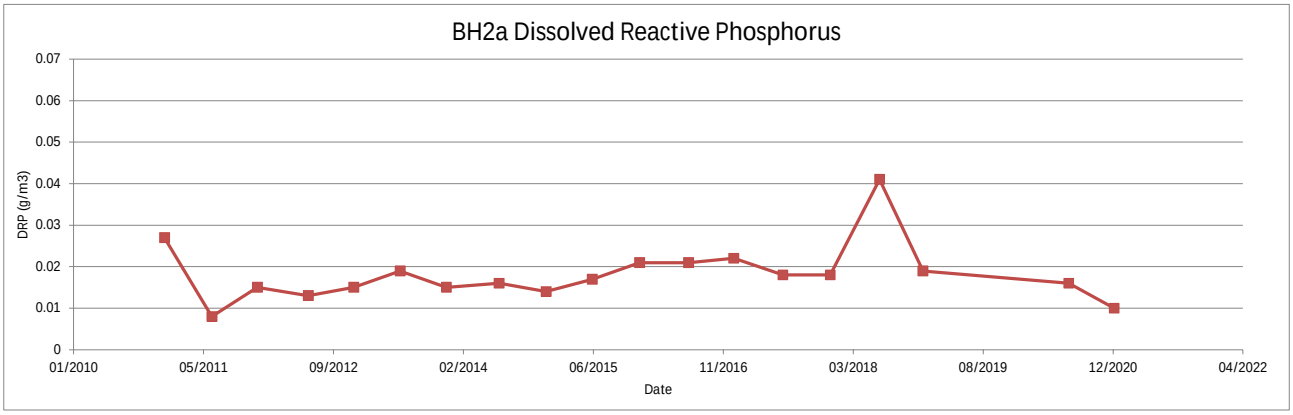

BH2a Dissolved Lead
Dissolved Lead (g/m3)
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

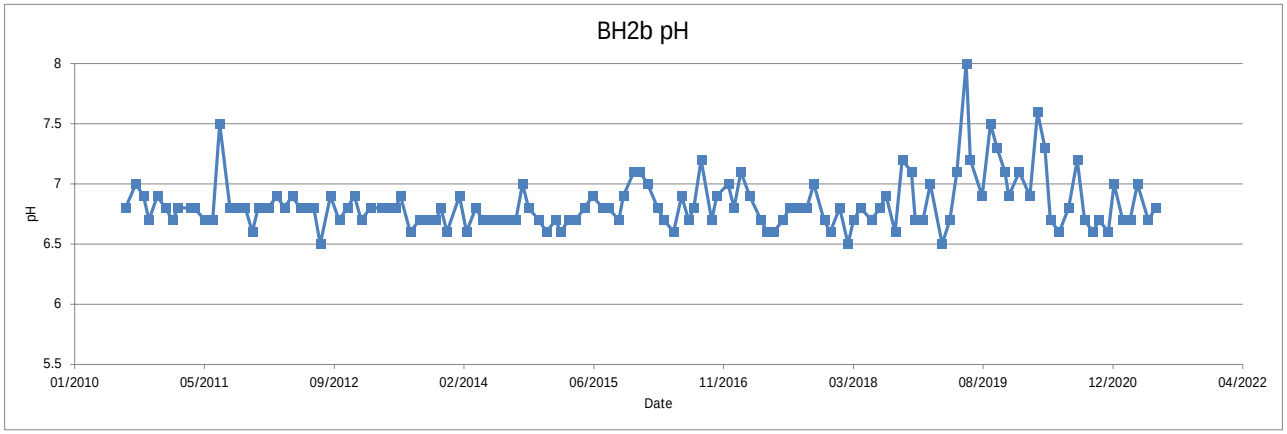

BH2a Dissolved Zinc
Dissolved Zinc (g/m3)
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

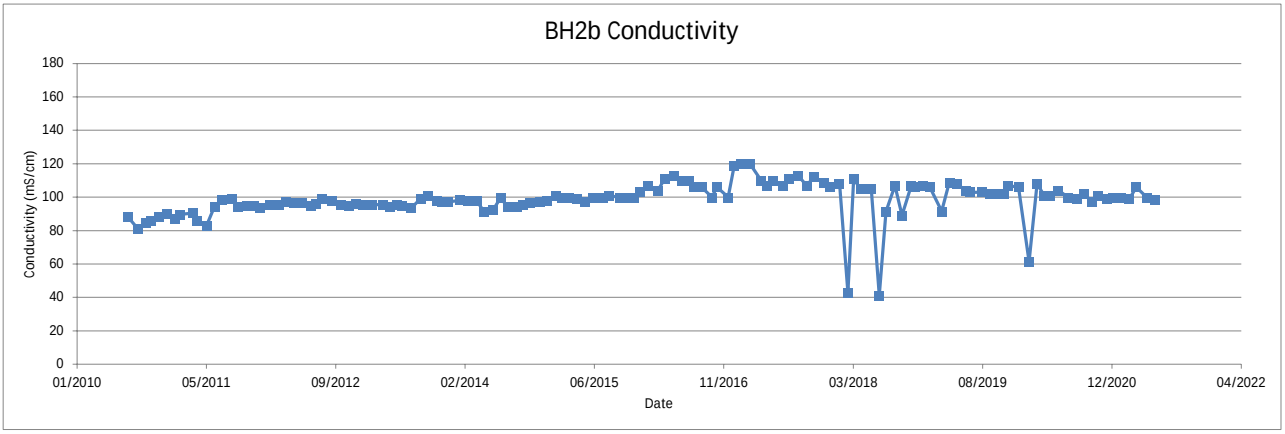

BH2a Dissolved Nickel
Dissolved Nickel (g/m3)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

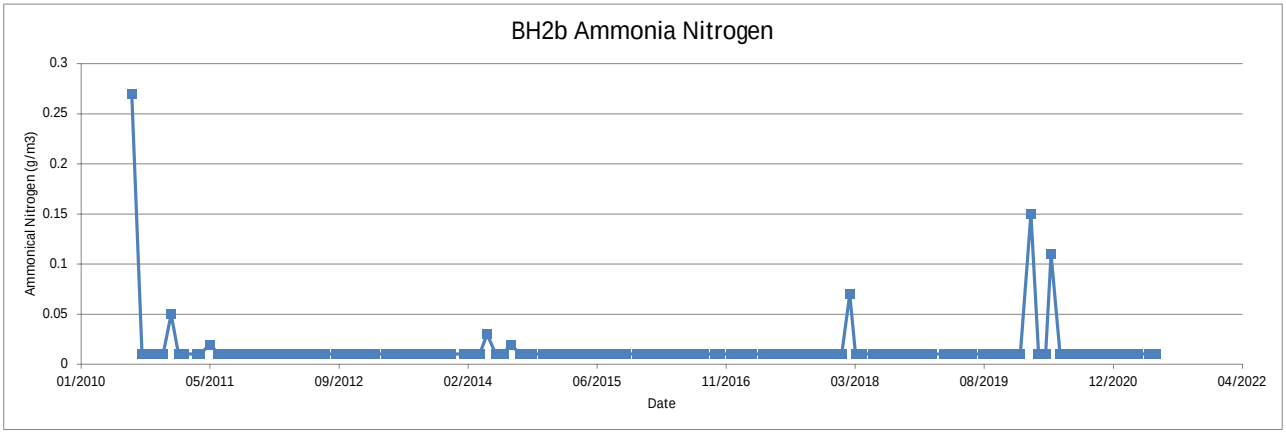

BH2a Dissolved Chromium
Dissolved Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

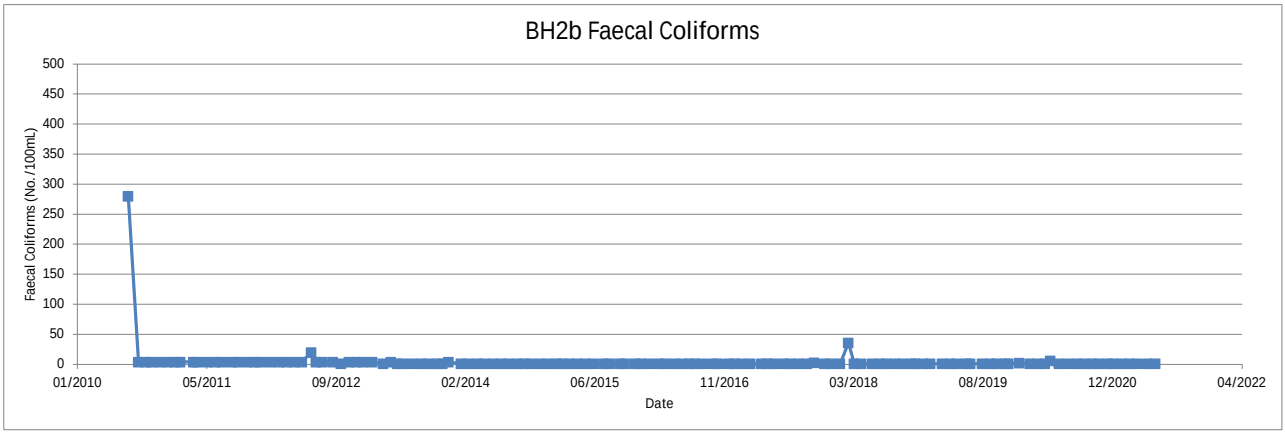

BH2a Dissolved Cadmium
Dissolved Cadmium (g/m3)
0.00025
0.0002
0.00015
0.0001
0.00005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

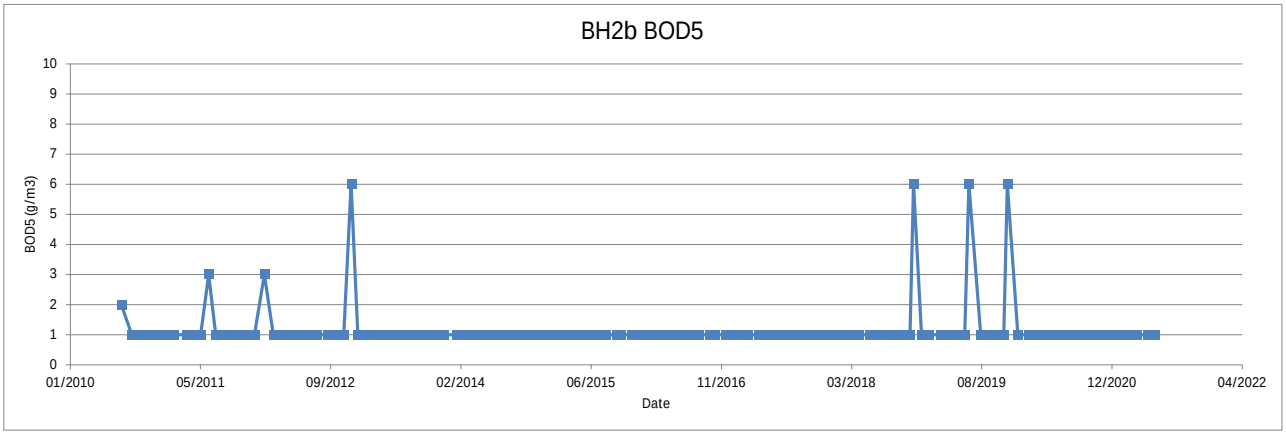

BH2a Dissolved Reactive Phosphorus
DRP (g/m3)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

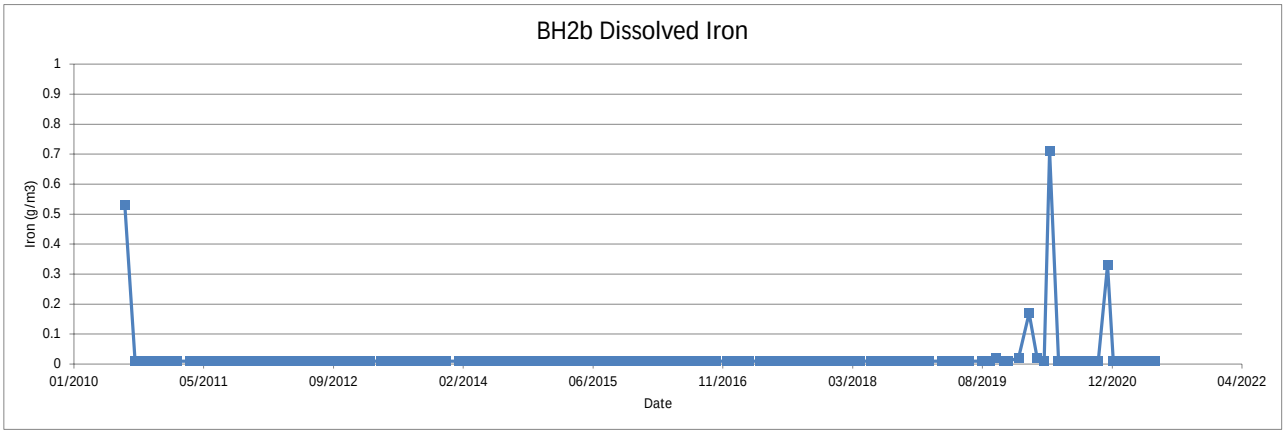

BH2b pH
pH
8
7.5
7
6.5
6
5.5
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

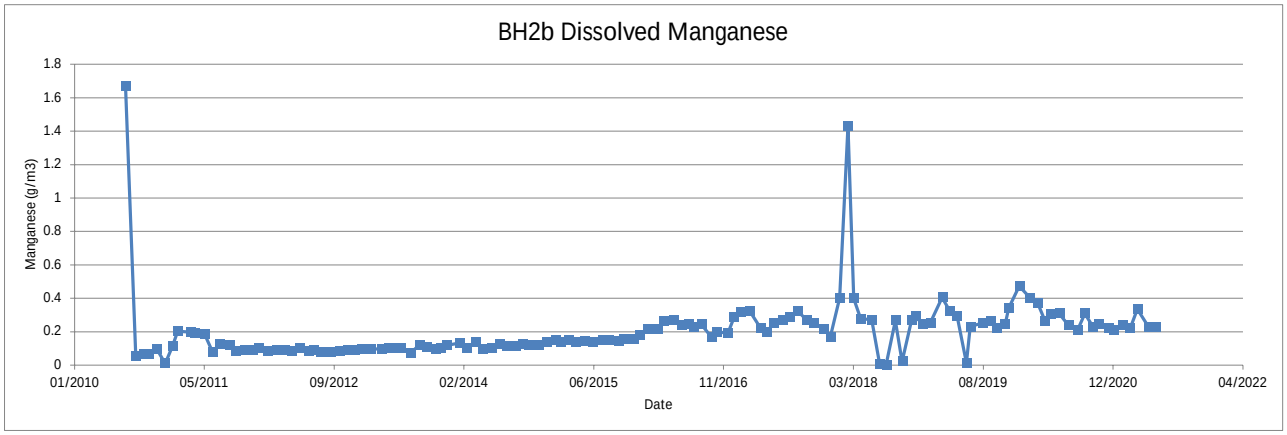

BH2b Conductivity
Conductivity (mS/cm)
180
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

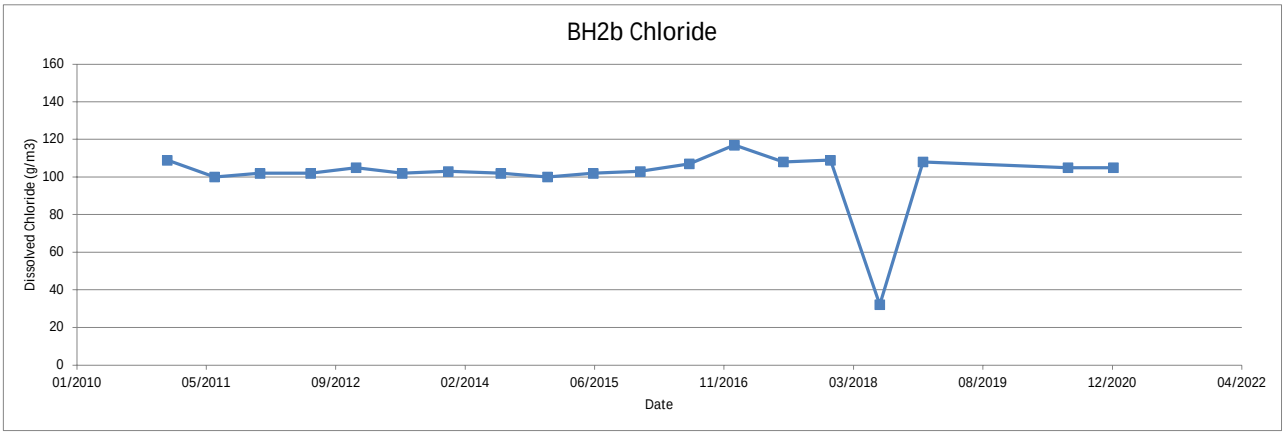

BH2b Ammonia Nitrogen
Ammonical Nitrogen (g/m3)
0.3
0.25
0.2
0.15
0.1
0.05
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

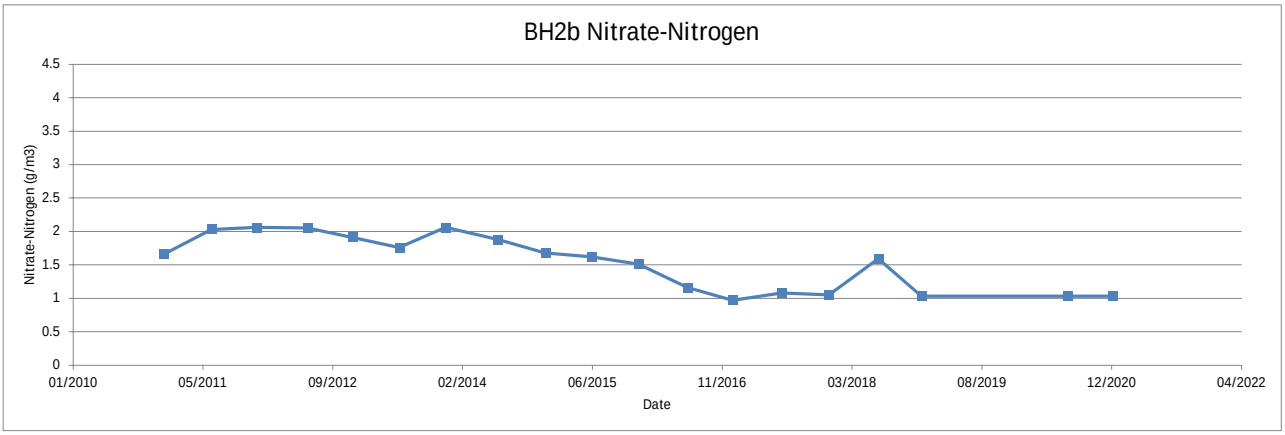

BH2b Faecal Coliforms
Faecal Coliforms (No./100mL)
500
450
400
350
300
250
200
150
100
50
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

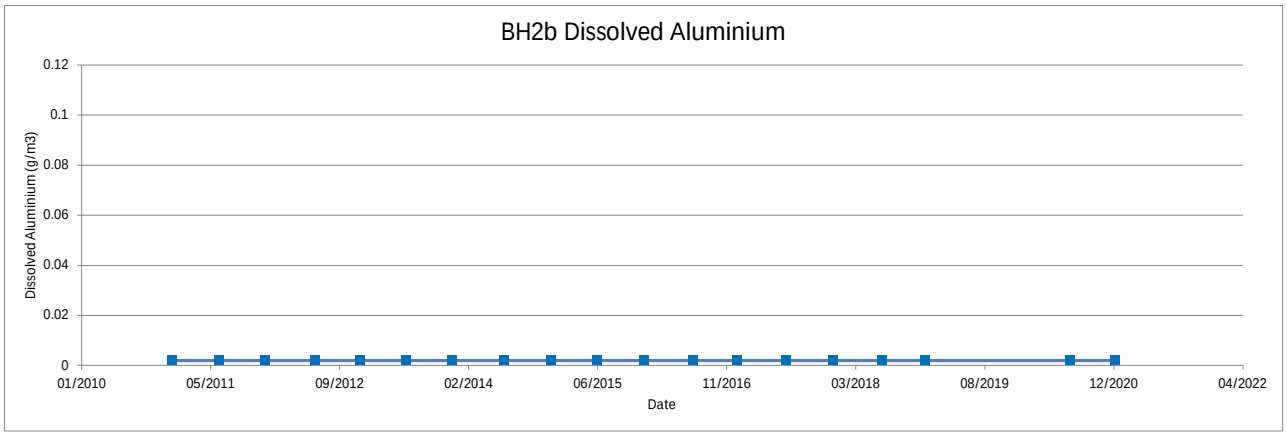

BH2b BOD5
BOD5 (g/m3)
10
9
8
7
6
5
4
3
2
1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

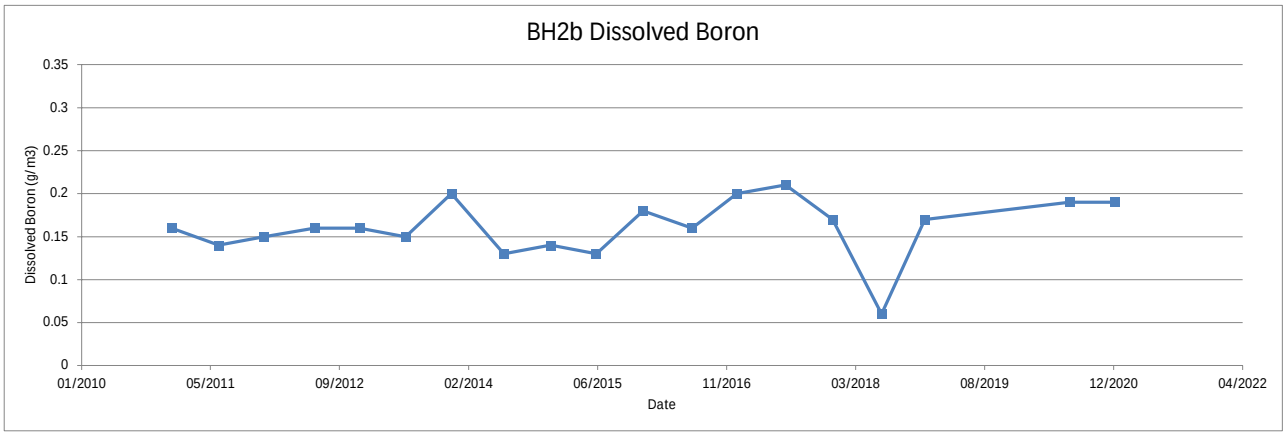

BH2b Dissolved Iron
Iron (g/m3)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

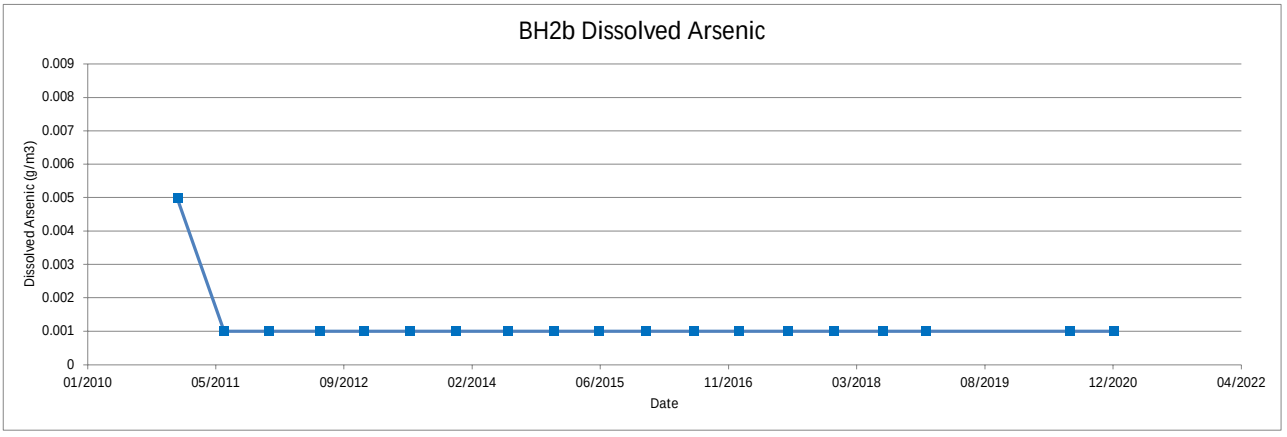

BH2b Dissolved Manganese
Manganese (g/m3)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

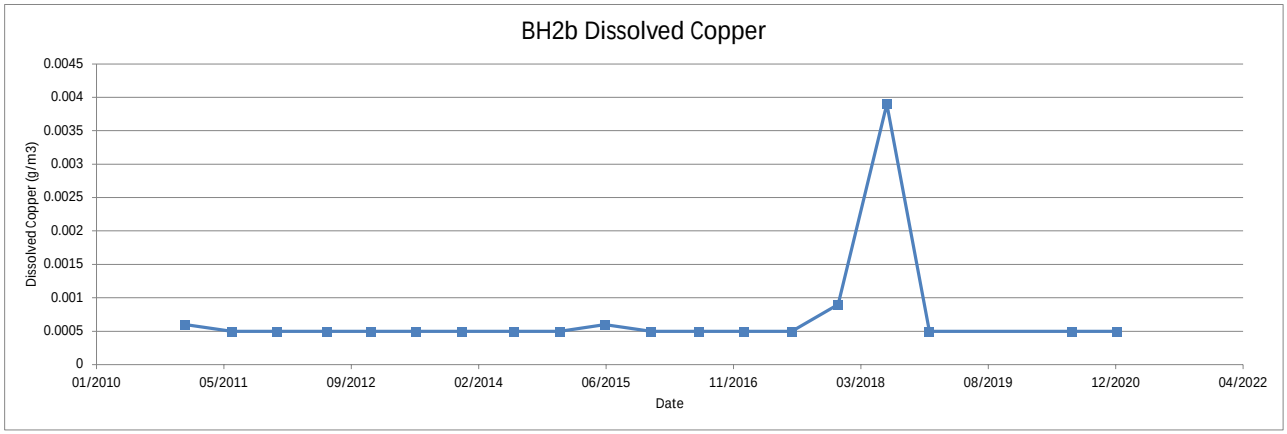

BH2b Chloride
Dissolved Chloride (g/m3)
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

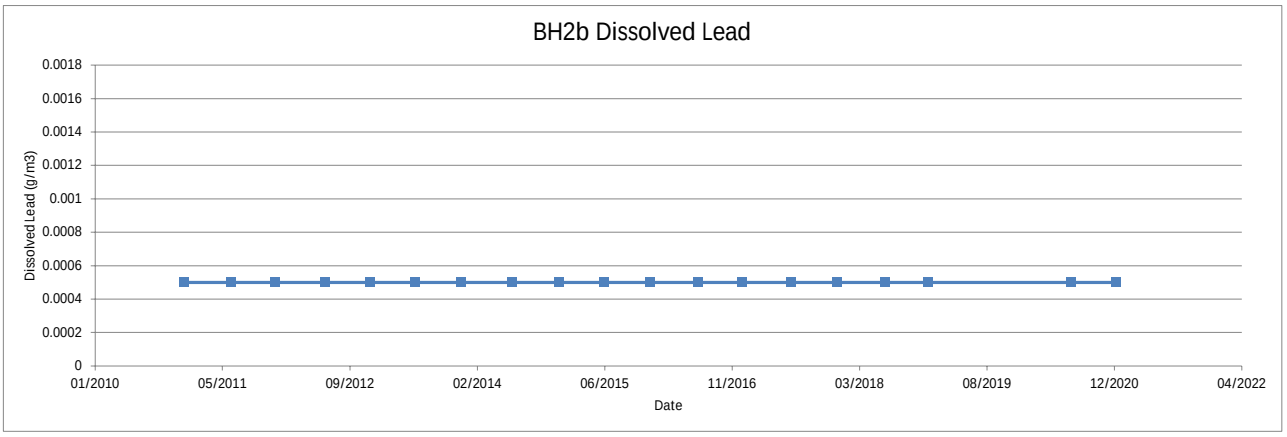

BH2b Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

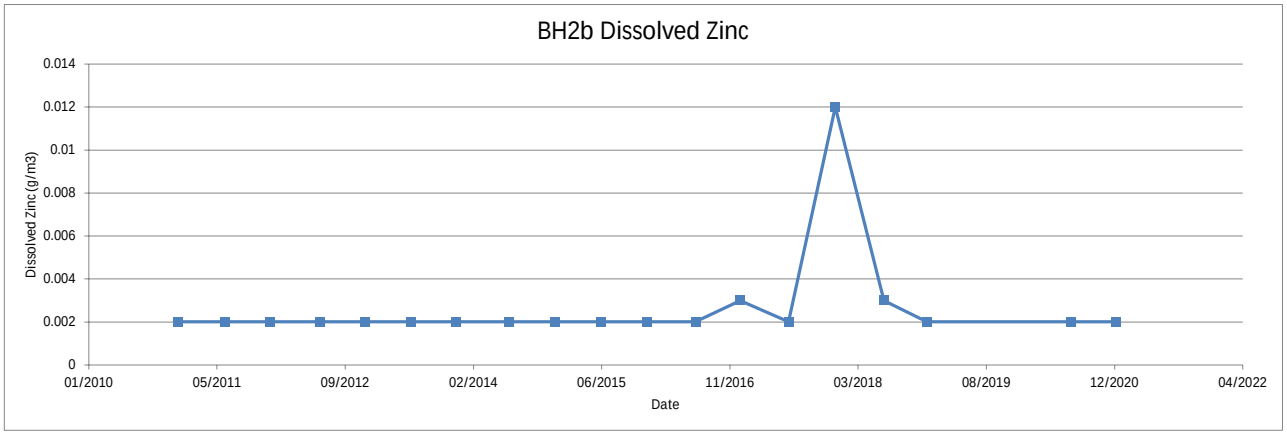

BH2b Dissolved Aluminium
Dissolved Aluminium (g/m3)
0.12
0.1
0.08
0.06
0.04
0.02
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

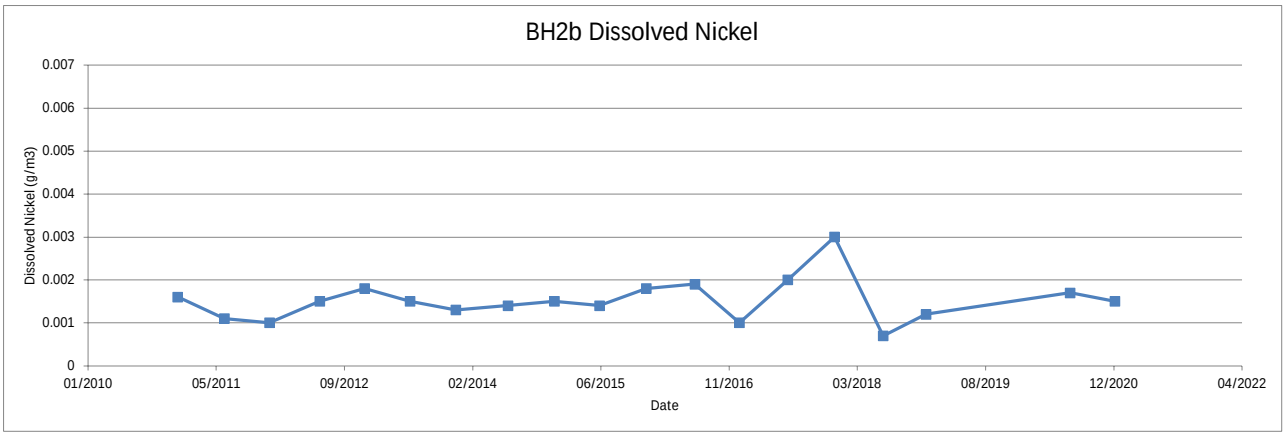

BH2b Dissolved Boron
Dissolved Boron (g/m3)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

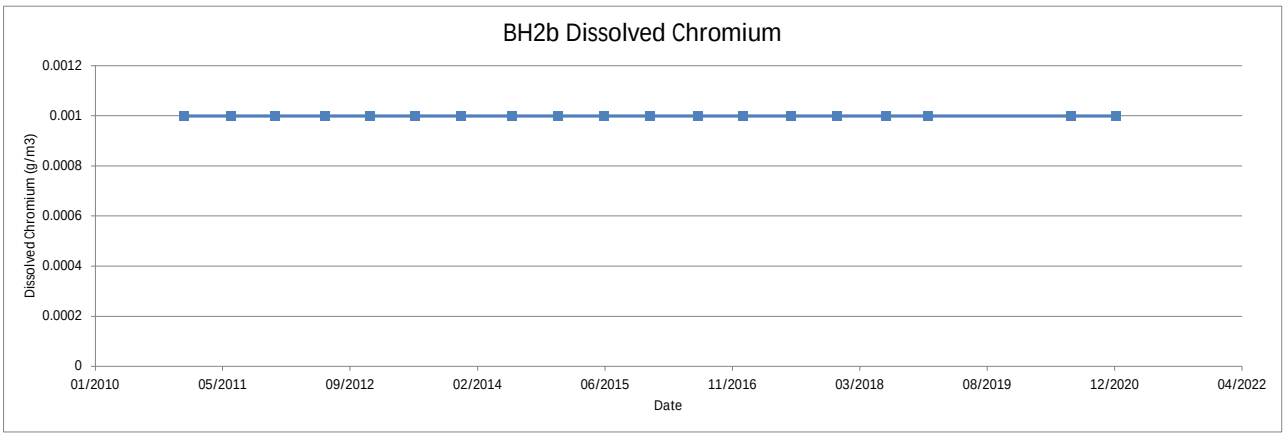

BH2b Dissolved Arsenic
Dissolved Arsenic (g/m3)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

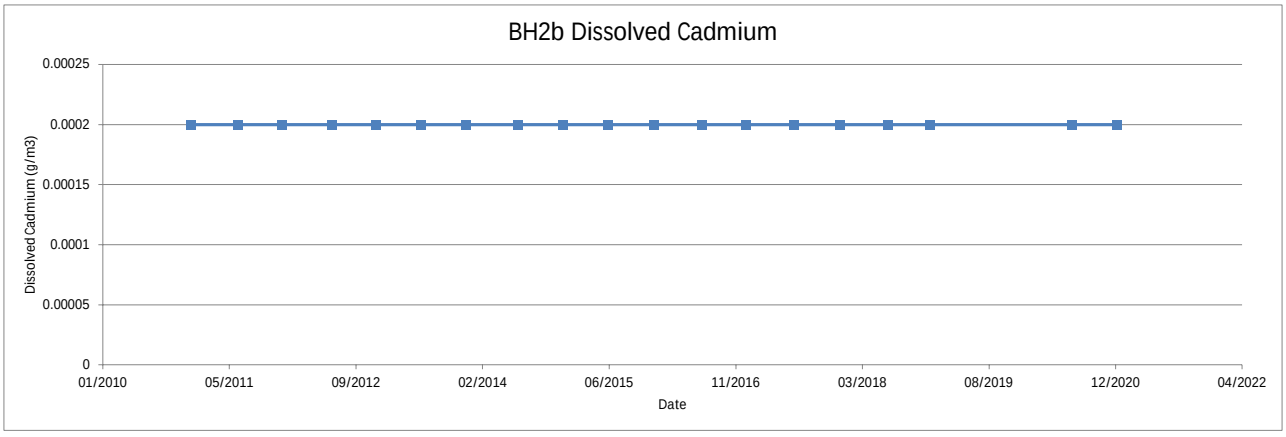

BH2b Dissolved Copper
Dissolved Copper (g/m3)
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

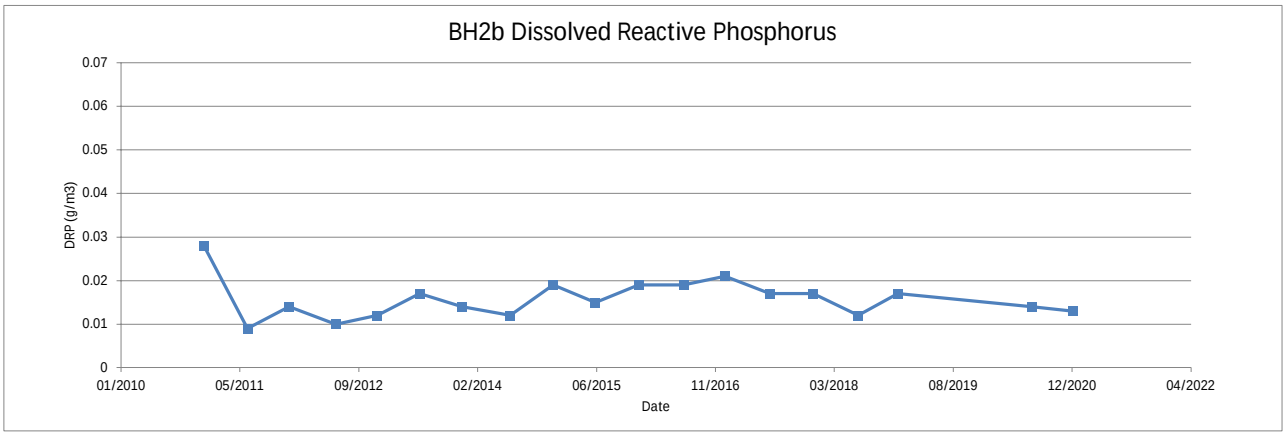

BH2b Dissolved Lead
Dissolved Lead (g/m3)
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

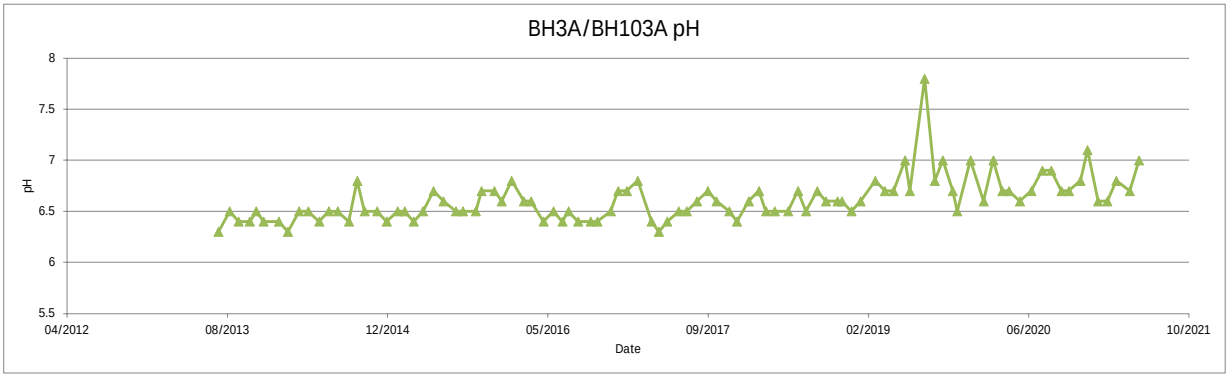

BH2b Dissolved Zinc
Dissolved Zinc (g/m3)
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

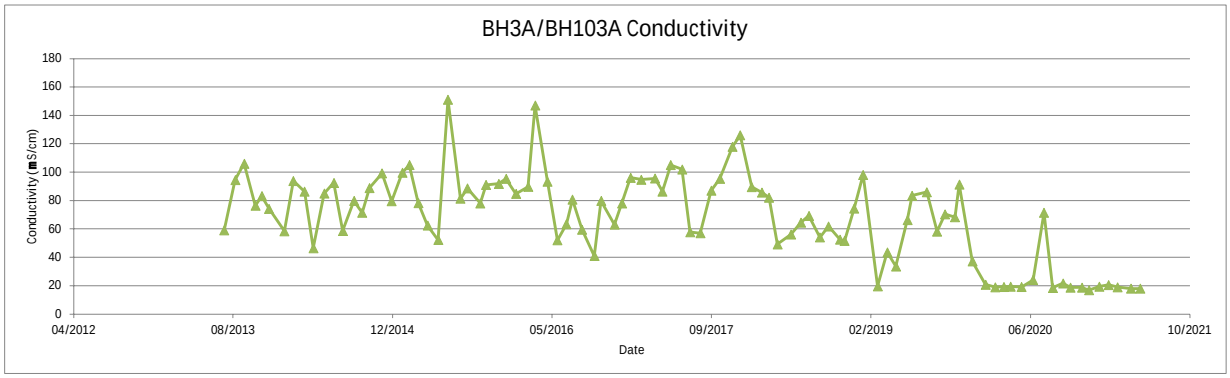

BH2b Dissolved Nickel
Dissolved Nickel (g/m3)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

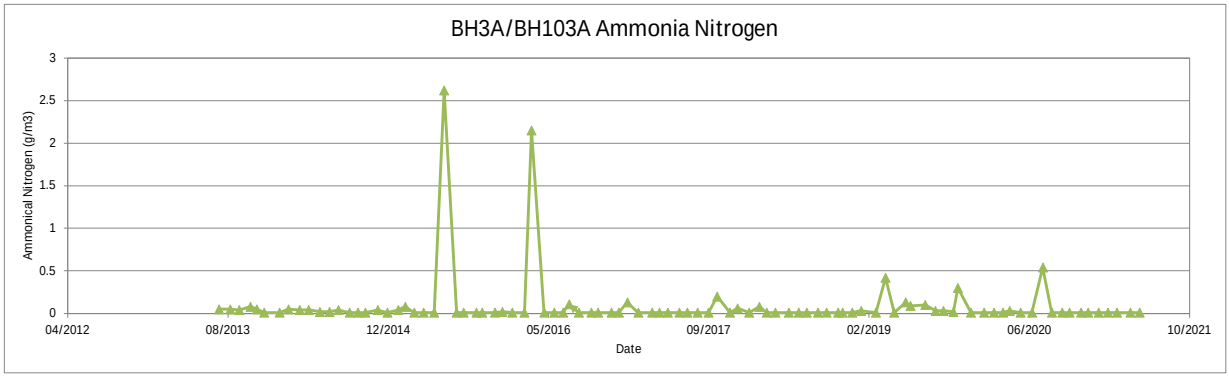

BH2b Dissolved Chromium
Dissolved Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

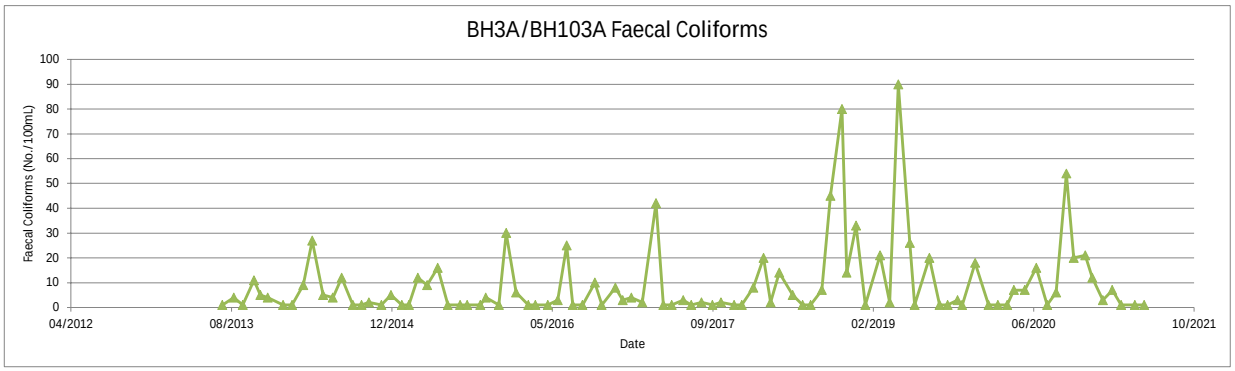

BH2b Dissolved Cadmium
Dissolved Cadmium (g/m3)
0.00025
0.0002
0.00015
0.0001
0.00005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

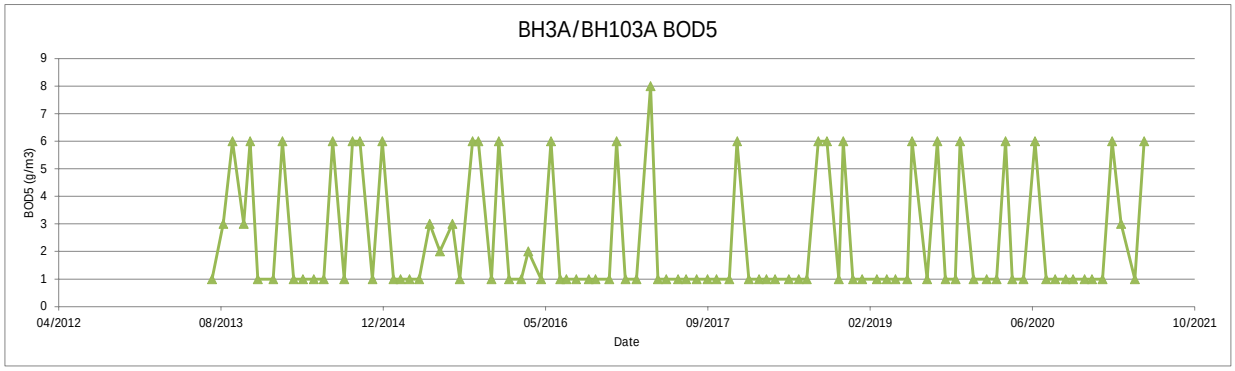

BH2b Dissolved Reactive Phosphorus
DRP (g/m3)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

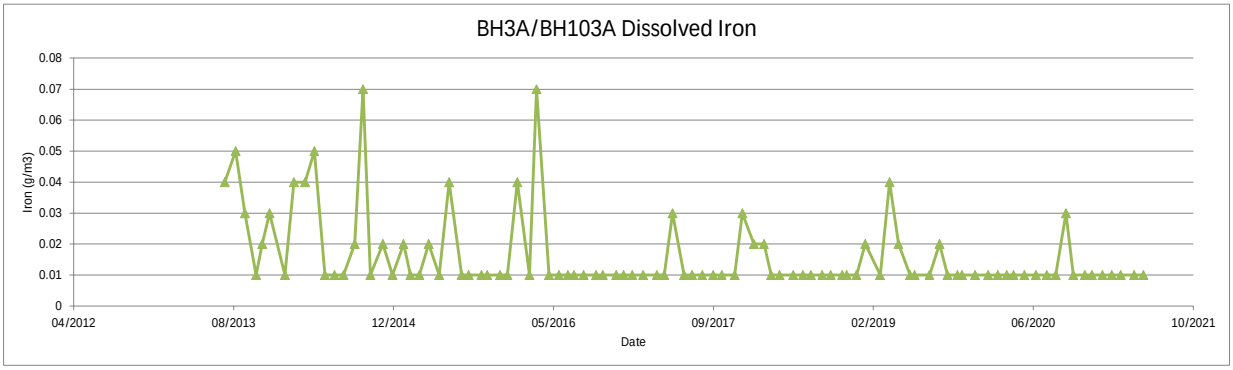

BH3A/BH103A pH
pH
8
7.5
7
6.5
6
5.5
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

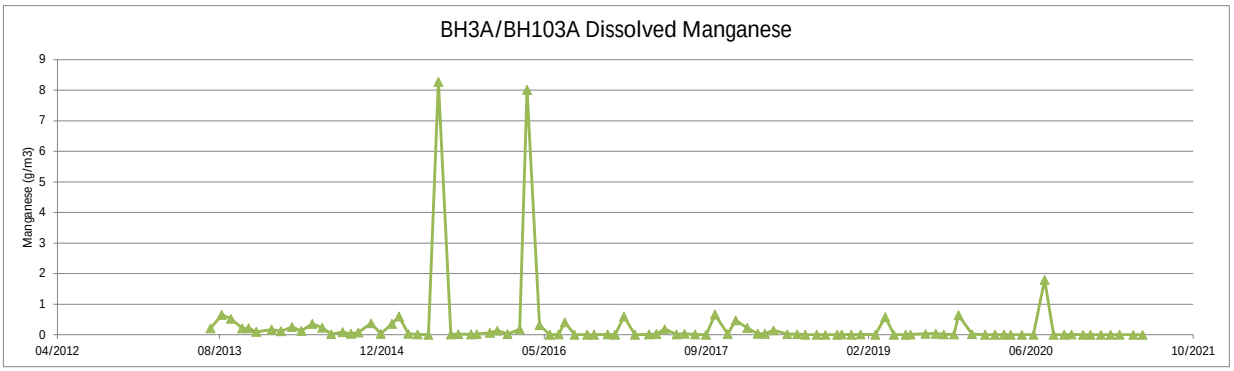

BH3A/BH103A Conductivity
Conductivity (mS/cm)
180
160
140
120
100
80
60
40
20
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

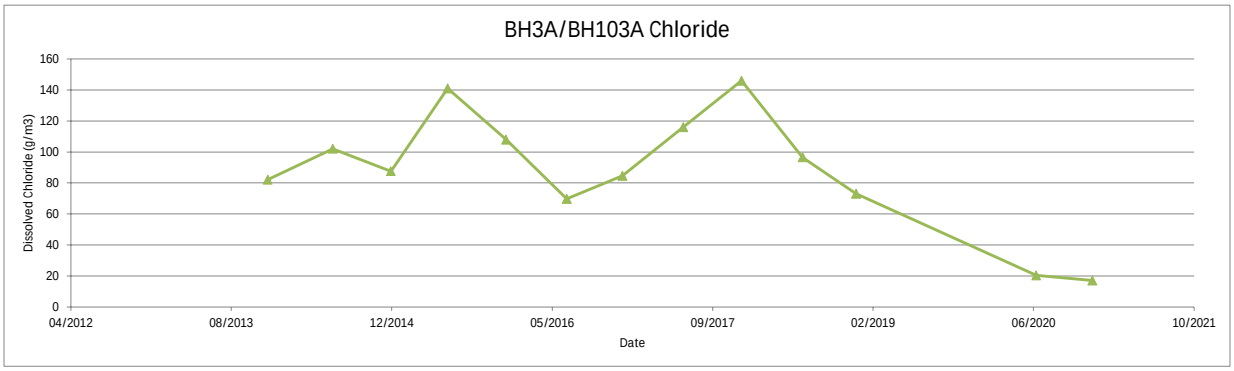

BH3A/BH103A Ammonia Nitrogen
Ammonical Nitrogen (g/m3)
3
2.5
2
1.5
1
0.5
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

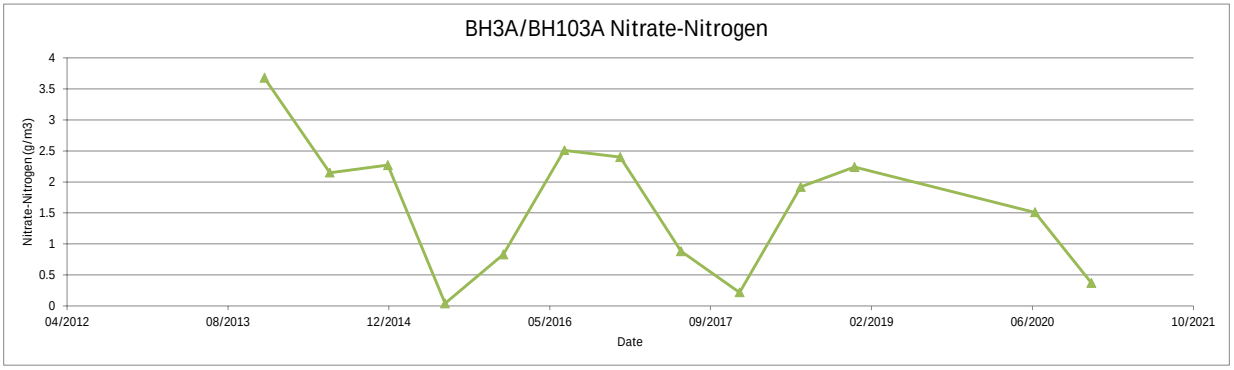

BH3A/BH103A Faecal Coliforms
Faecal Coliforms (No./100mL)
100
90
80
70
60
50
40
30
20
10
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

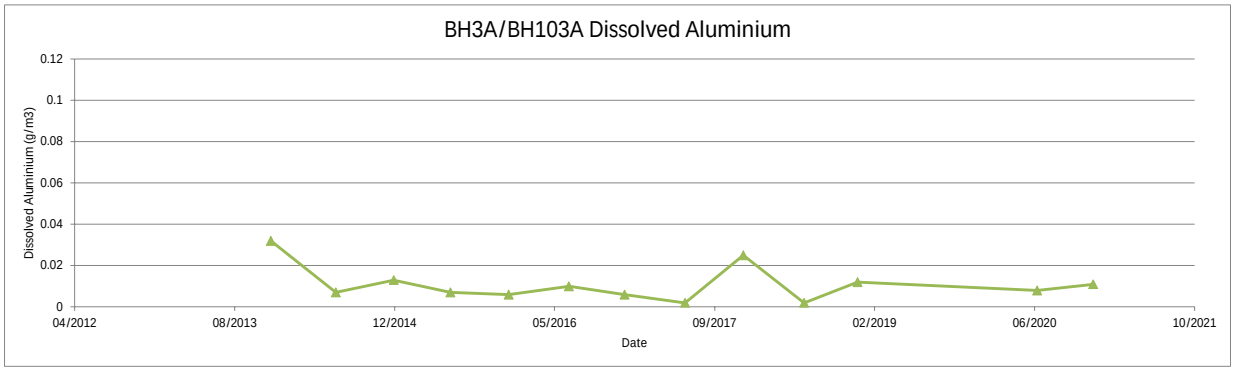

BH3A/BH103A BOD5
BOD5 (g/m3)
9
8
7
6
5
4
3
2
1
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

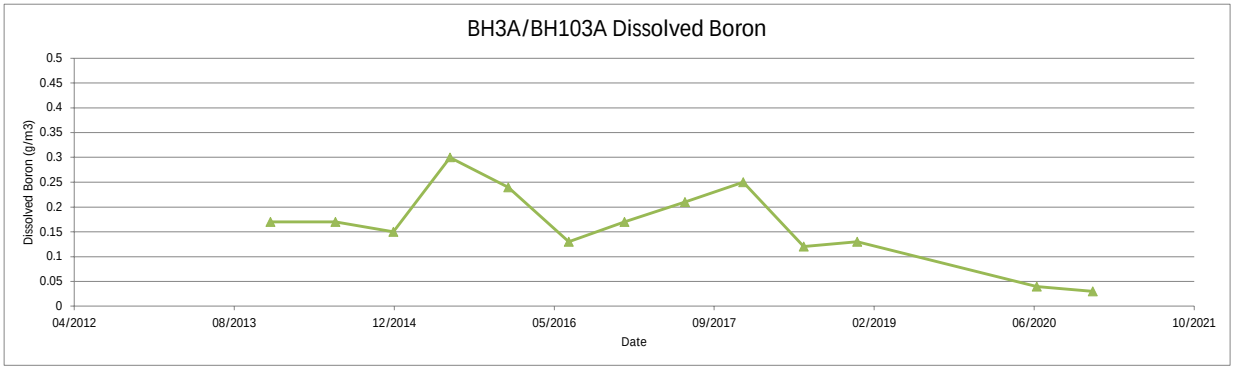

BH3A/BH103A Dissolved Iron
Iron (g/m3)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

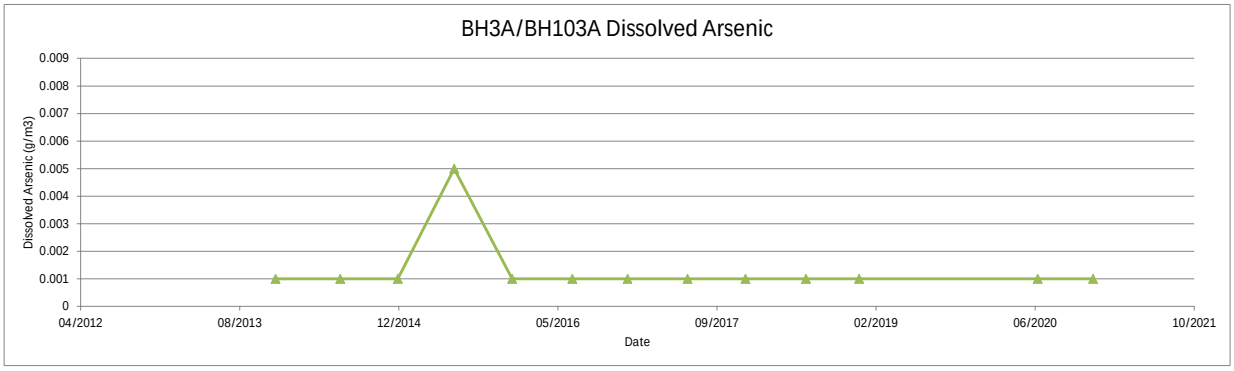

BH3A/BH103A Dissolved Manganese
Manganese (g/m3)
0
1
2
3
4
5
6
7
8
9
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021

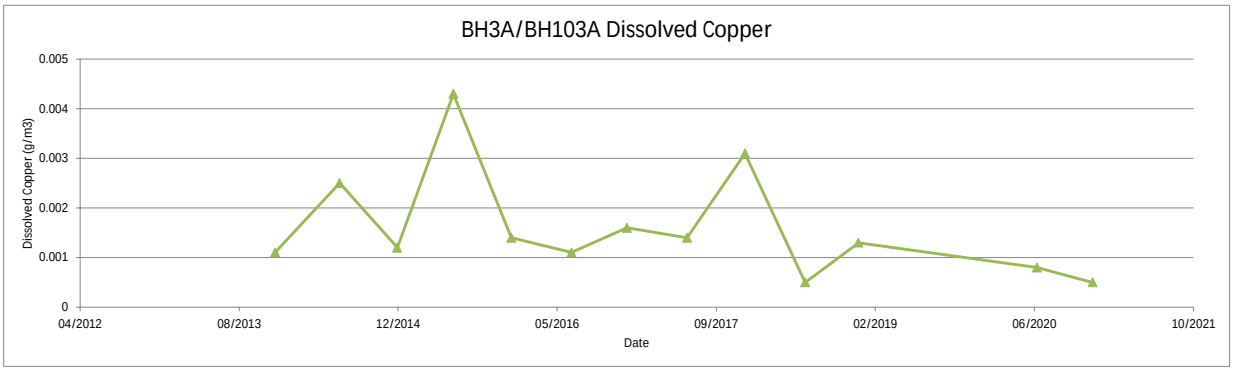

BH3A/BH103A Chloride
Dissolved Chloride (g/m3)
0
20
40
60
80
100
120
140
160
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

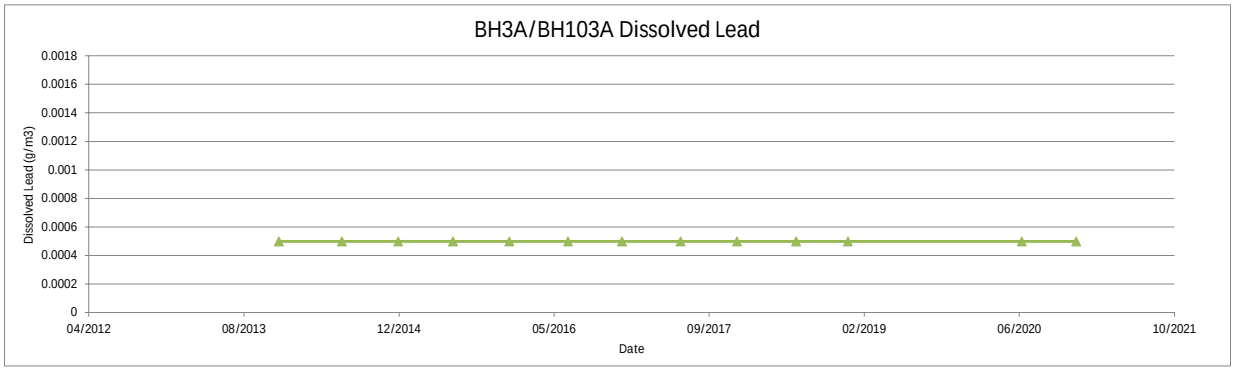

BH3A/BH103A Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
0
0.5
1
1.5
2
2.5
3
3.5
4
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

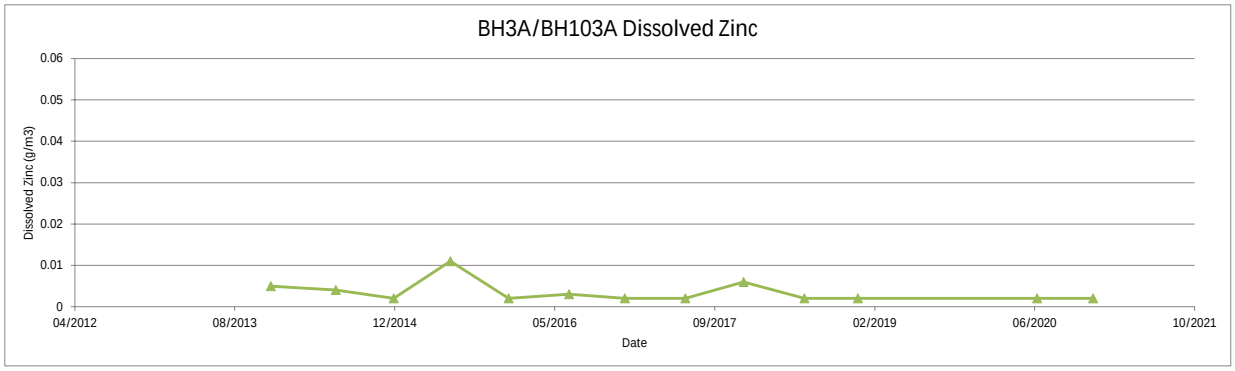

BH3A/BH103A Dissolved Aluminium
Dissolved Aluminium (g/m3)
0.12
0.1
0.08
0.06
0.04
0.02
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

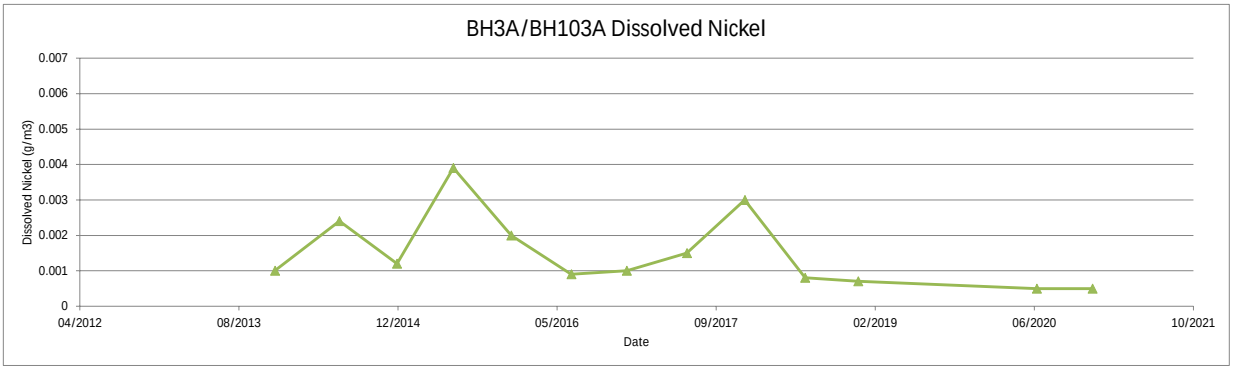

BH3A/BH103A Dissolved Boron
Dissolved Boron (g/m3)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

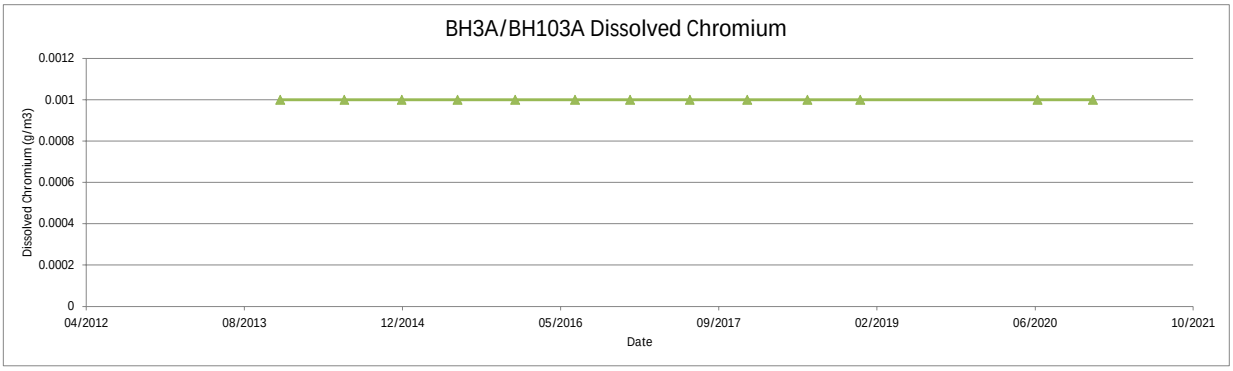

BH3A/BH103A Dissolved Arsenic
Dissolved Arsenic (g/m3)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

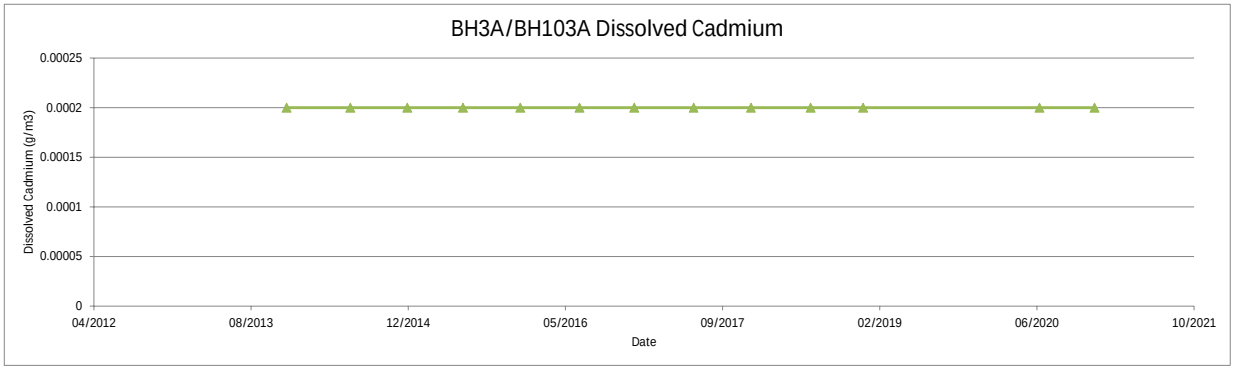

BH3A/BH103A Dissolved Copper
Dissolved Copper (g/m3)
0.005
0.004
0.003
0.002
0.001
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

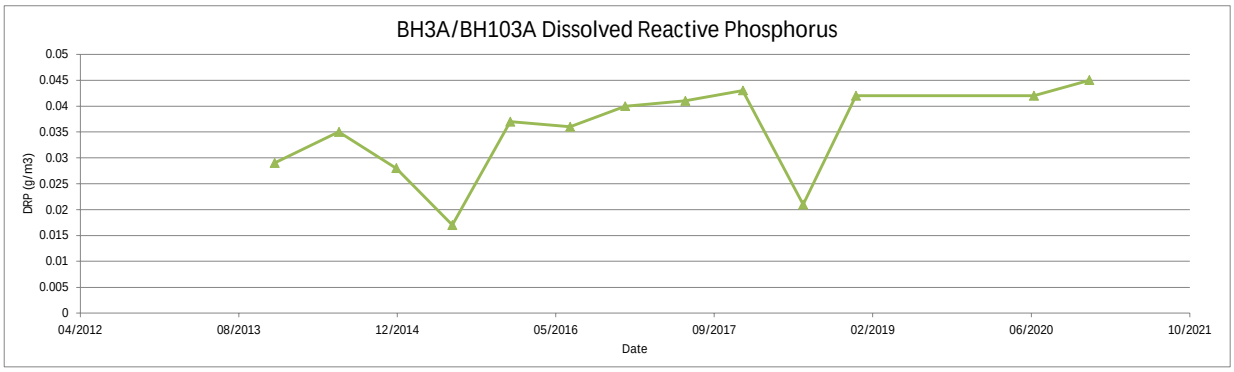

BH3A/BH103A Dissolved Lead
Dissolved Lead (g/m3)
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

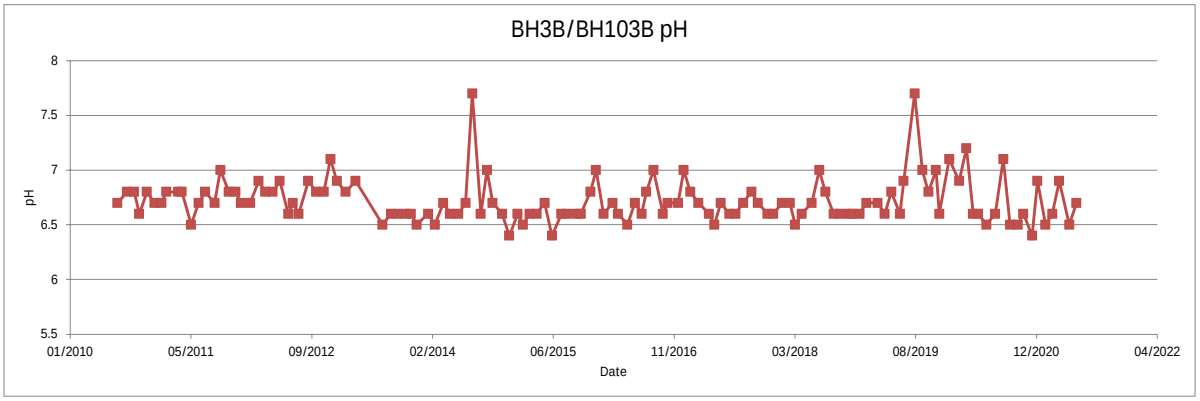

BH3A/BH103A Dissolved Zinc
Dissolved Zinc (g/m3)
0.06
0.05
0.04
0.03
0.02
0.01
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

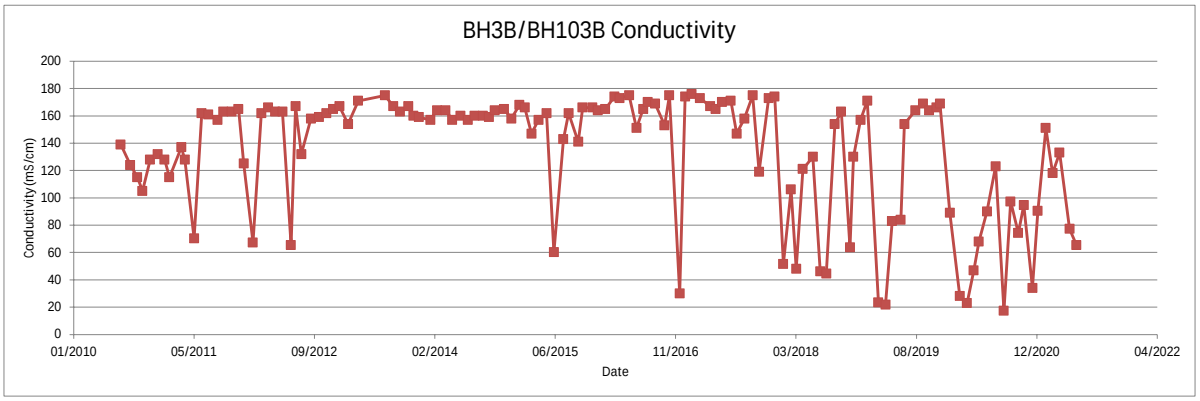

BH3A/BH103A Dissolved Nickel
Dissolved Nickel (g/m3)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

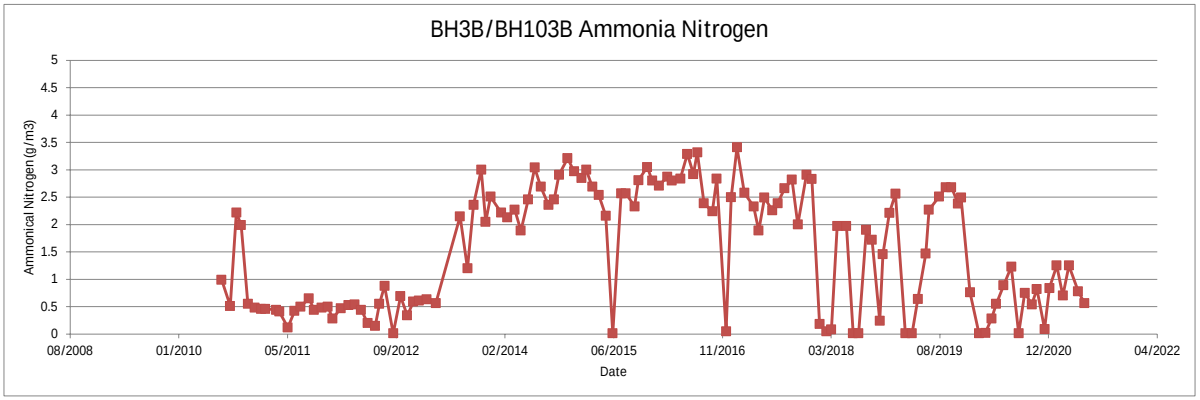

BH3A/BH103A Dissolved Chromium
Dissolved Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

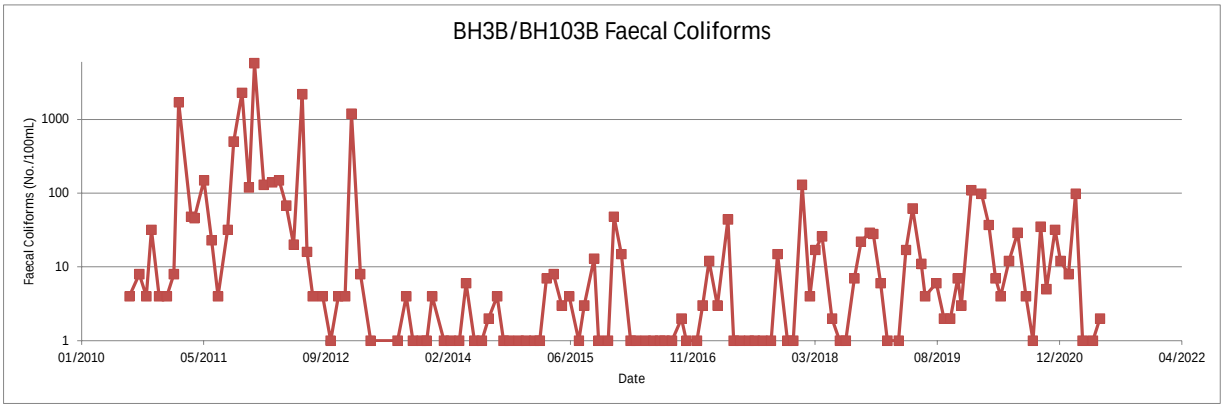

BH3A/BH103A Dissolved Cadmium
Dissolved Cadmium (g/m3)
0.00025
0.0002
0.00015
0.0001
0.00005
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

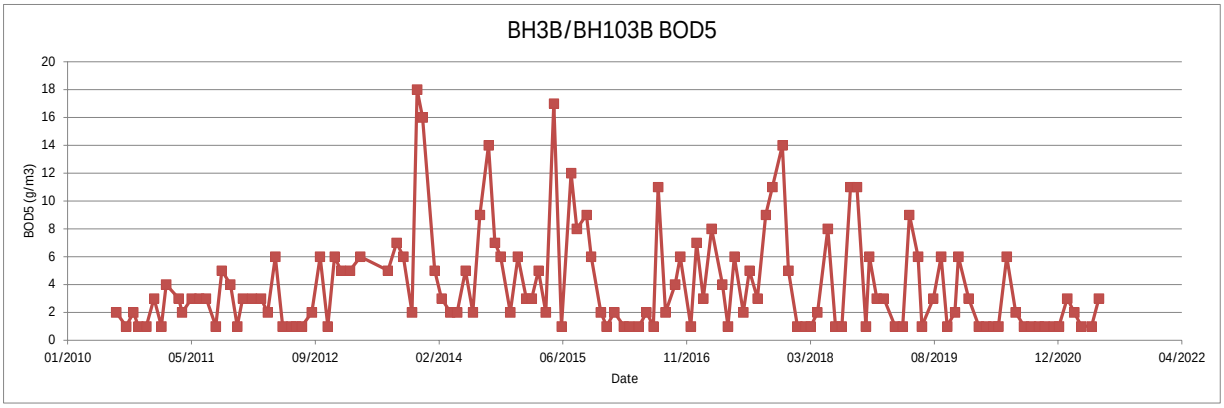

BH3A/BH103A Dissolved Reactive Phosphorus
DRP (g/m3)
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
10/2021
Date

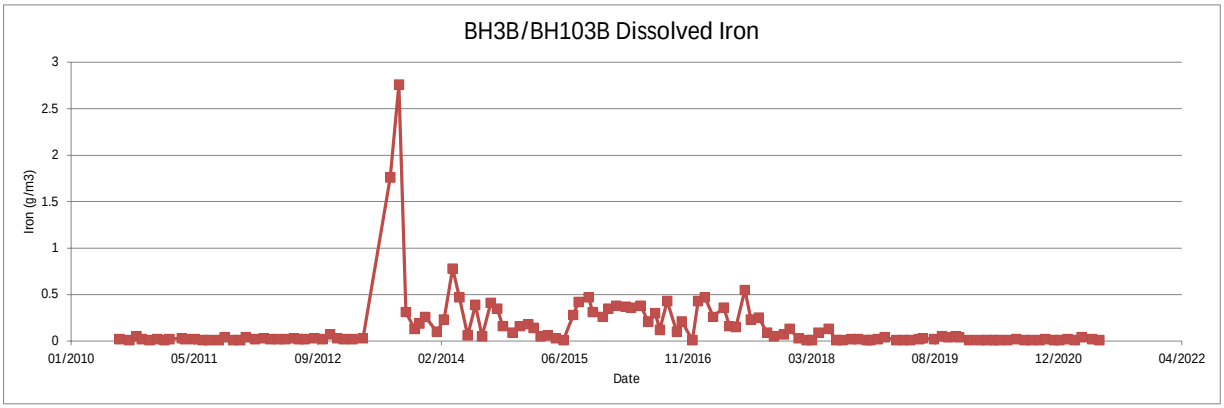

BH3B/BH103B pH
pH
8
7.5
7
6.5
6
5.5
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

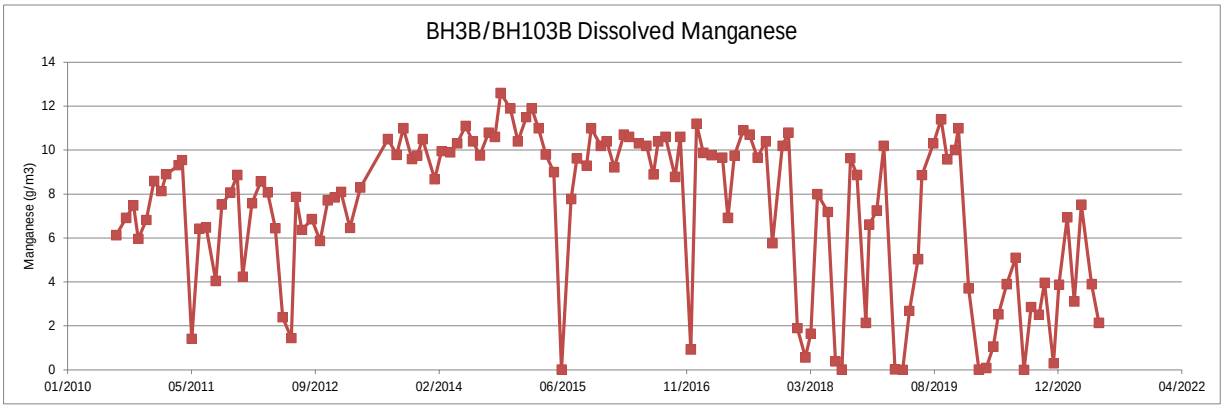

BH3B/BH103B Conductivity
Conductivity (mS/cm)
200
180
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

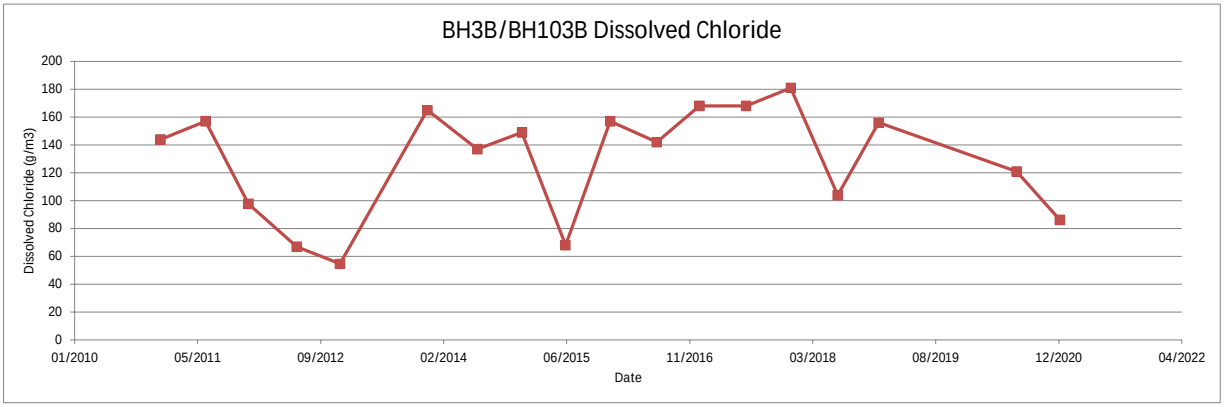

BH3B/BH103B Ammonia Nitrogen
Ammonical Nitrogen (g/m3)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
08/2008
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

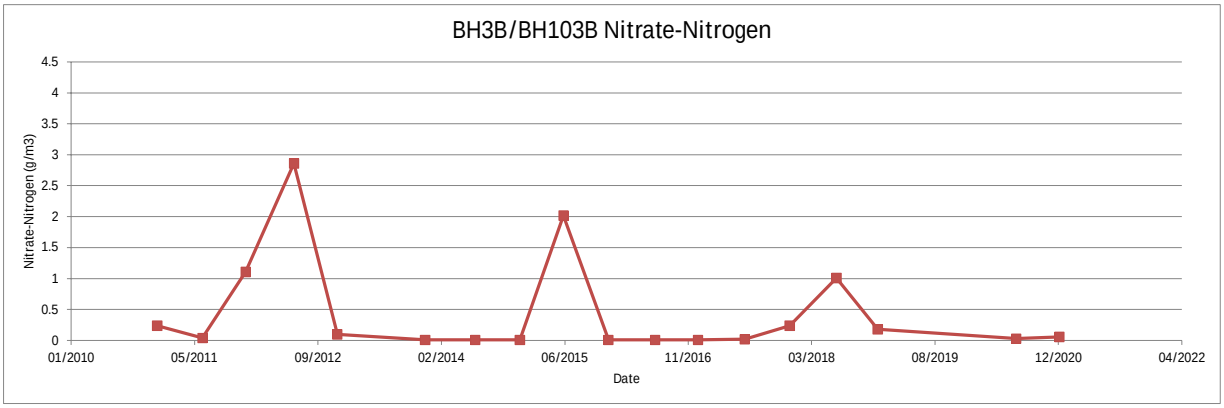

BH3B/BH103B Faecal Coliforms
Faecal Coliforms (No./100mL)
1000
100
10
1
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

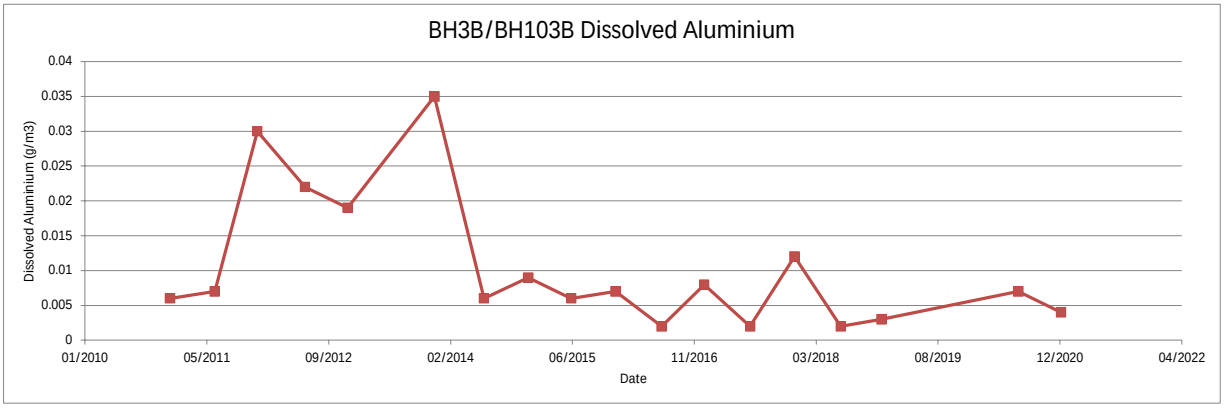

BH3B/BH103B BOD5
BOD5 (g/m3)
20
18
16
14
12
10
8
6
4
2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

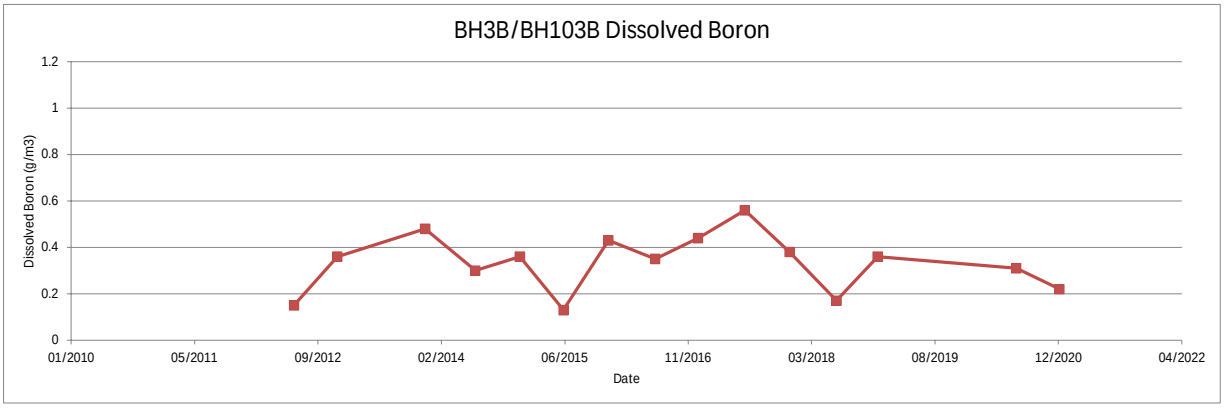

BH3B/BH103B Dissolved Iron
Iron (g/m3)
3
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

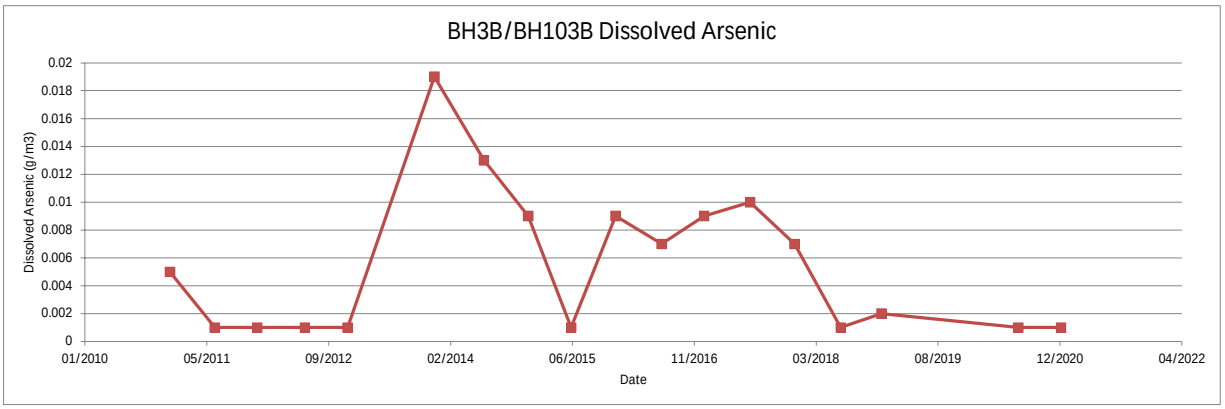

BH3B/BH103B Dissolved Manganese
Manganese (g/m3)
0
2
4
6
8
10
12
14
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022

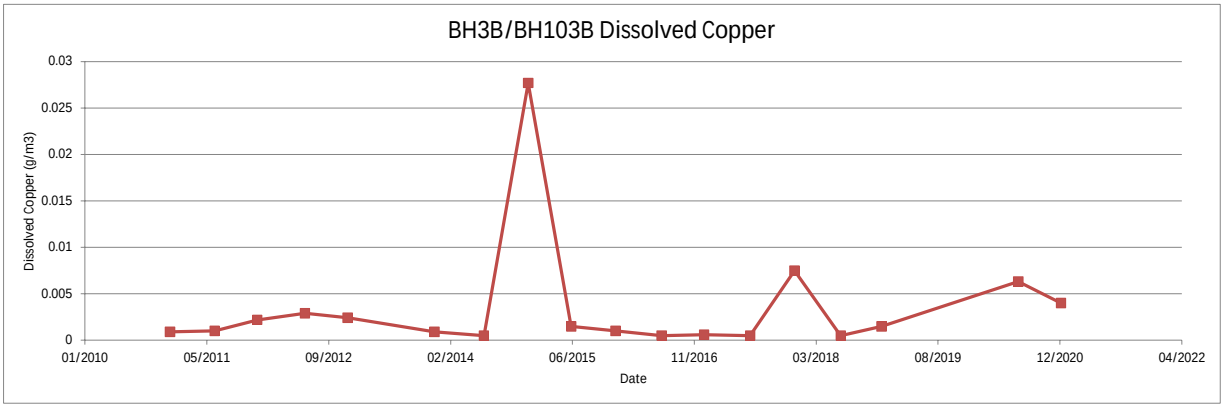

BH3B/BH103B Dissolved Chloride
Dissolved Chloride (g/m3)
0
20
40
60
80
100
120
140
160
180
200
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

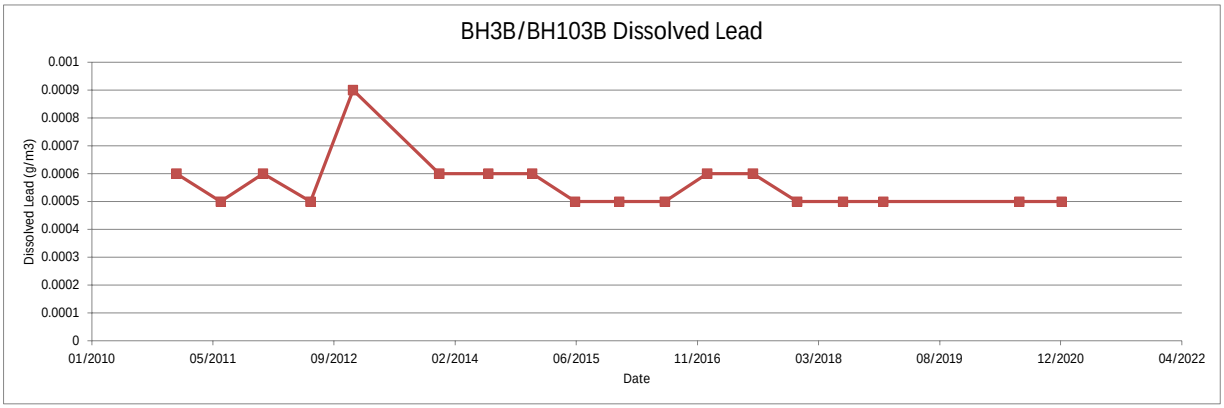

BH3B/BH103B Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

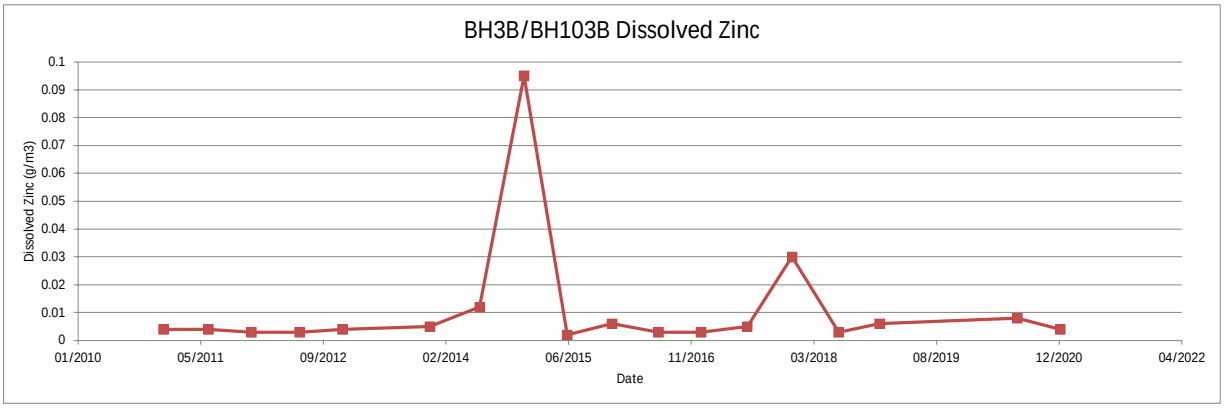

BH3B/BH103B Dissolved Aluminium
Dissolved Aluminium (g/m3)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

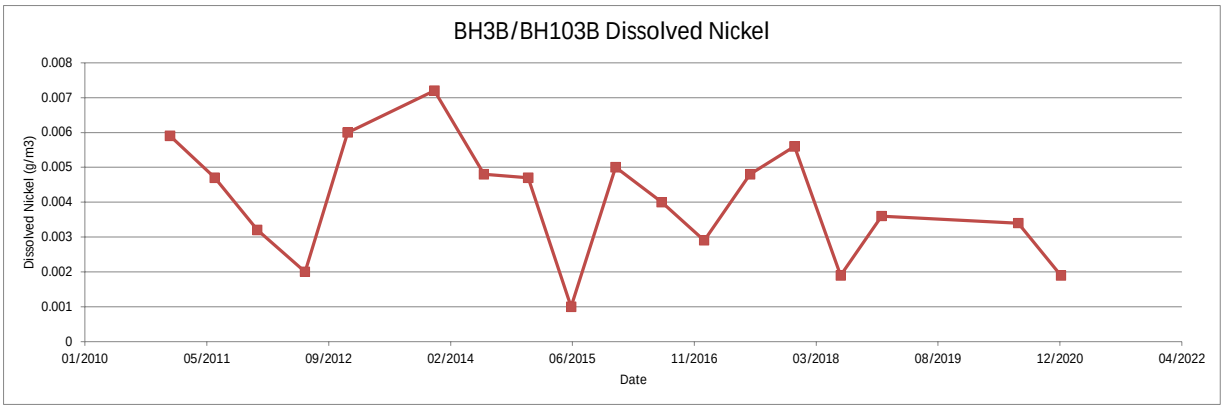

BH3B/BH103B Dissolved Boron
Dissolved Boron (g/m3)
1.2
1
0.8
0.6
0.4
0.2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

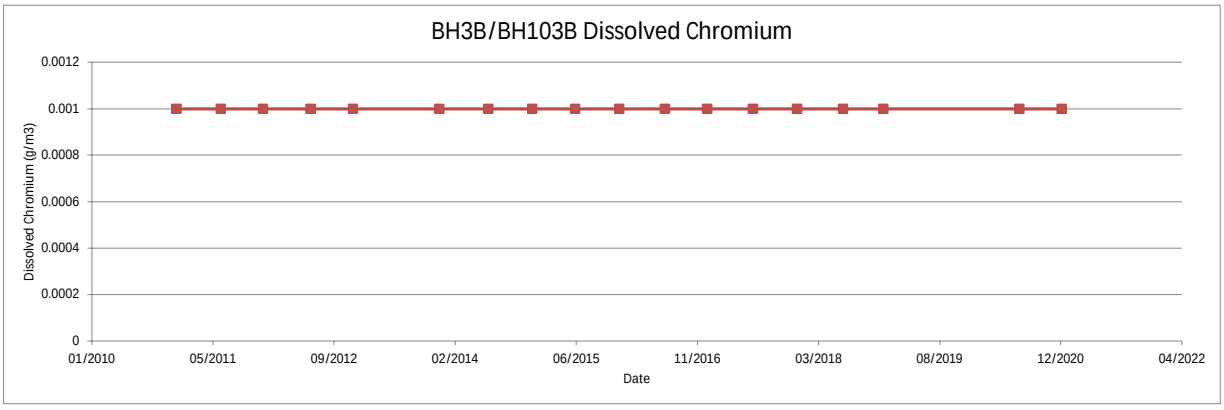

BH3B/BH103B Dissolved Arsenic
Dissolved Arsenic (g/m3)
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

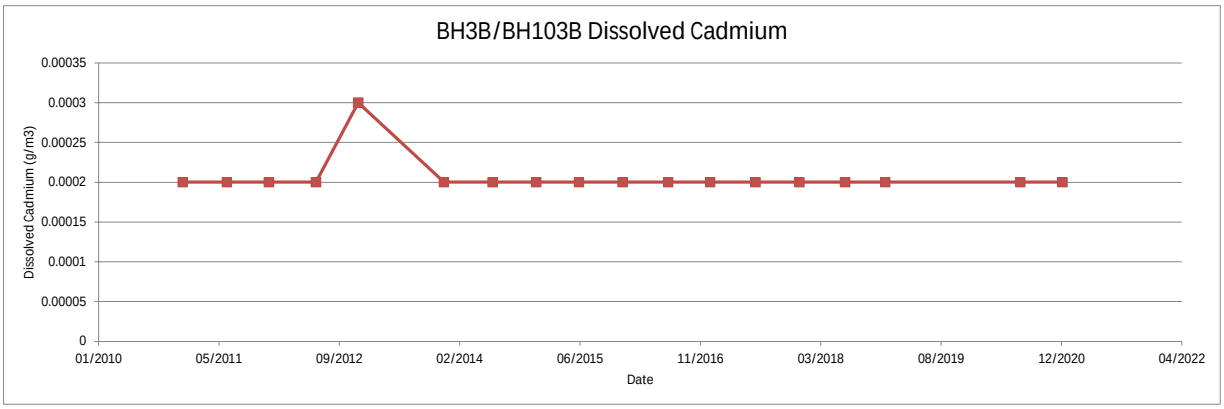

BH3B/BH103B Dissolved Copper
Dissolved Copper (g/m3)
0.03
0.025
0.02
0.015
0.01
0.005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

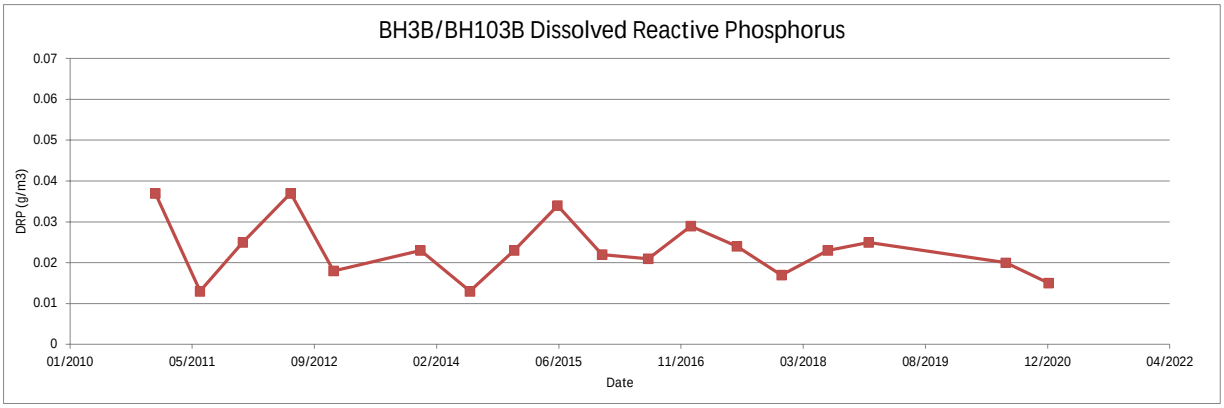

BH3B/BH103B Dissolved Lead
Dissolved Lead (g/m3)
0.001
0.0009
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

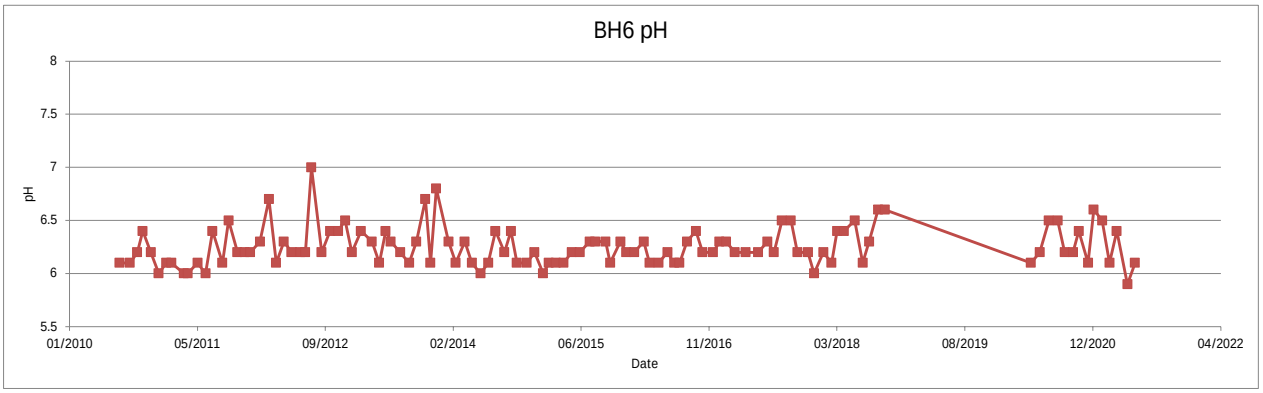

BH3B/BH103B Dissolved Zinc
Dissolved Zinc (g/m3)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

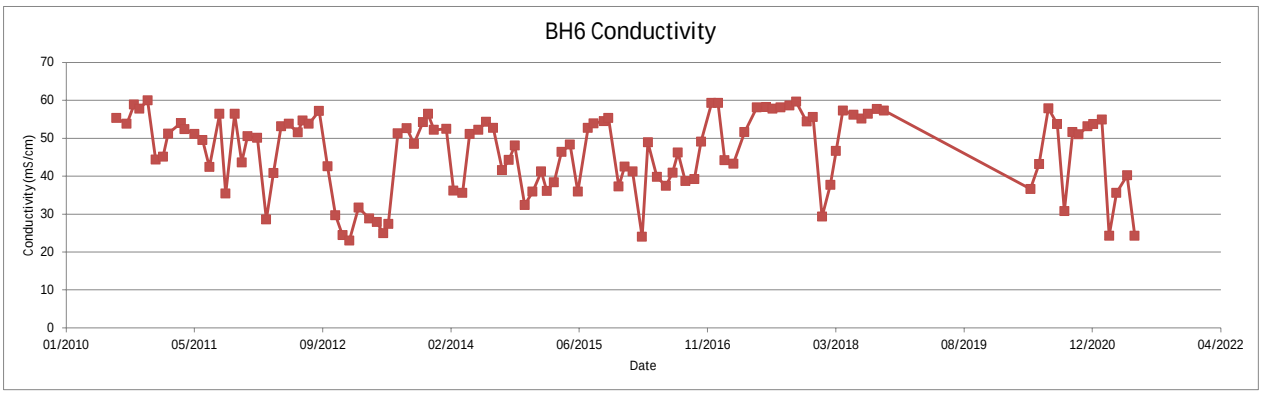

BH3B/BH103B Dissolved Nickel
Dissolved Nickel (g/m3)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

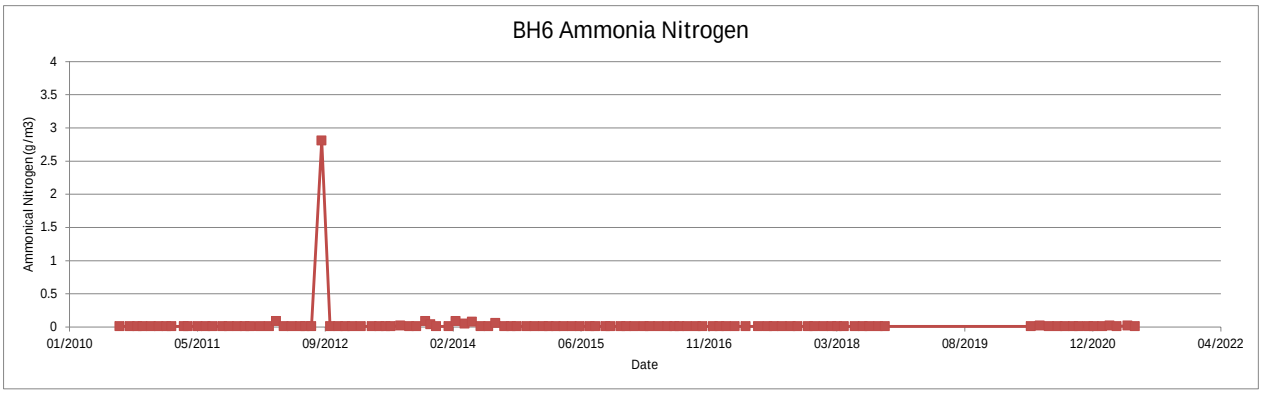

BH3B/BH103B Dissolved Chromium
Dissolved Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

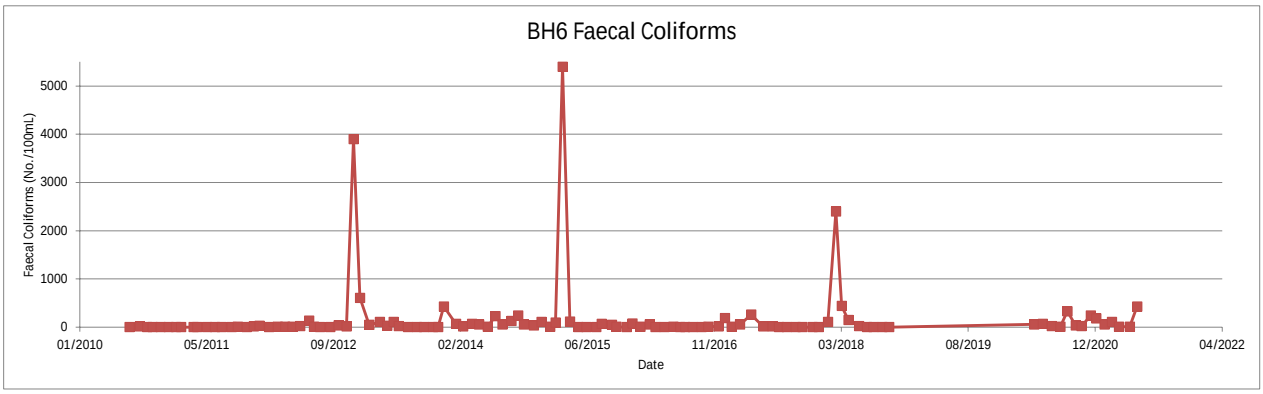

BH3B/BH103B Dissolved Cadmium
Dissolved Cadmium (g/m3)
0.00035
0.0003
0.00025
0.0002
0.00015
0.0001
0.00005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

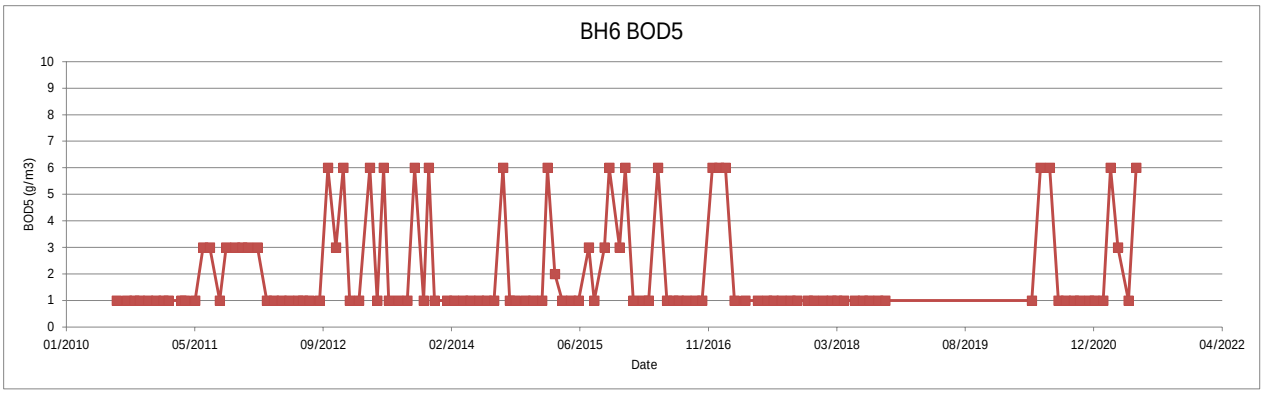

BH3B/BH103B Dissolved Reactive Phosphorus
DRP (g/m3)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

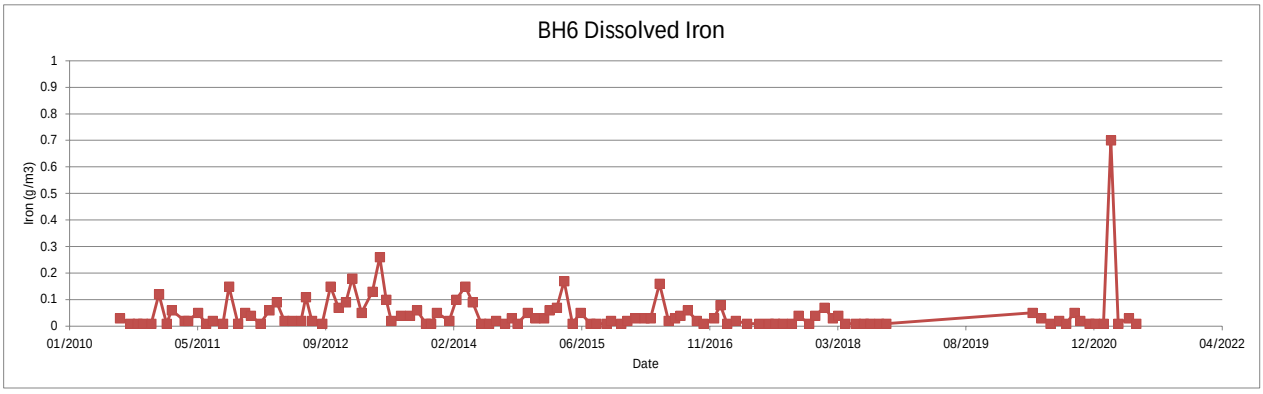

BH6 pH
pH
8
7.5
7
6.5
6
5.5
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

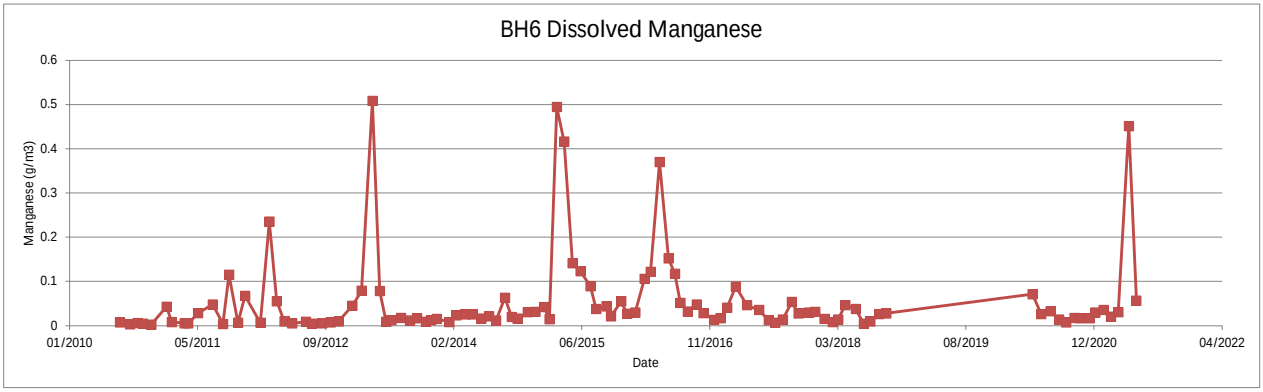

BH6 Conductivity
Conductivity (mS/cm)
70
60
50
40
30
20
10
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

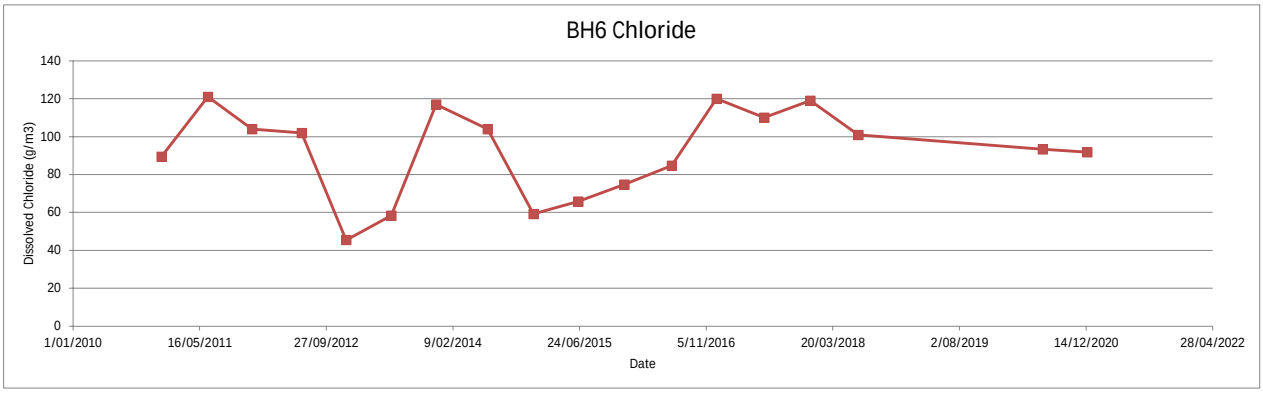

BH6 Ammonia Nitrogen
Ammonical Nitrogen (g/m3)
4
3.5
3
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

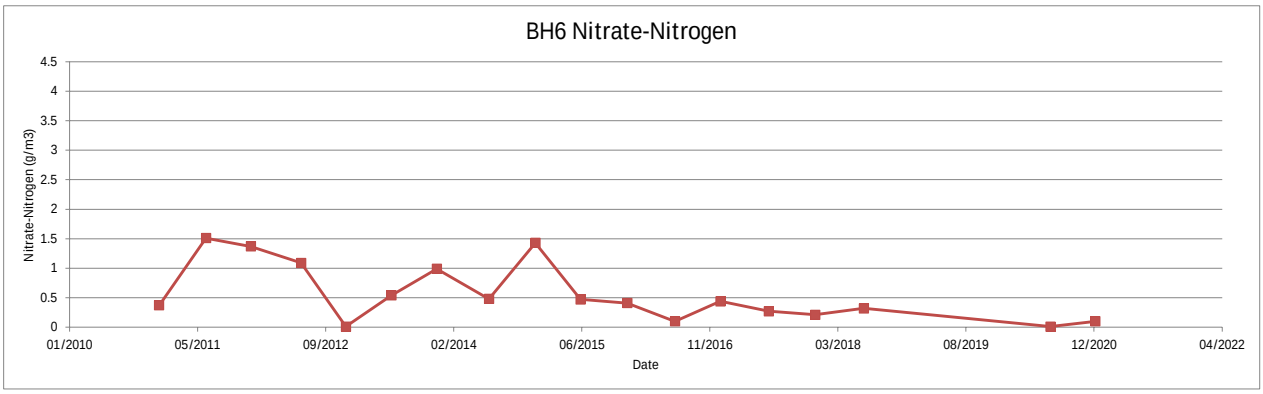

BH6 Faecal Coliforms
Faecal Coliforms (No./100mL)
5000
4000
3000
2000
1000
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

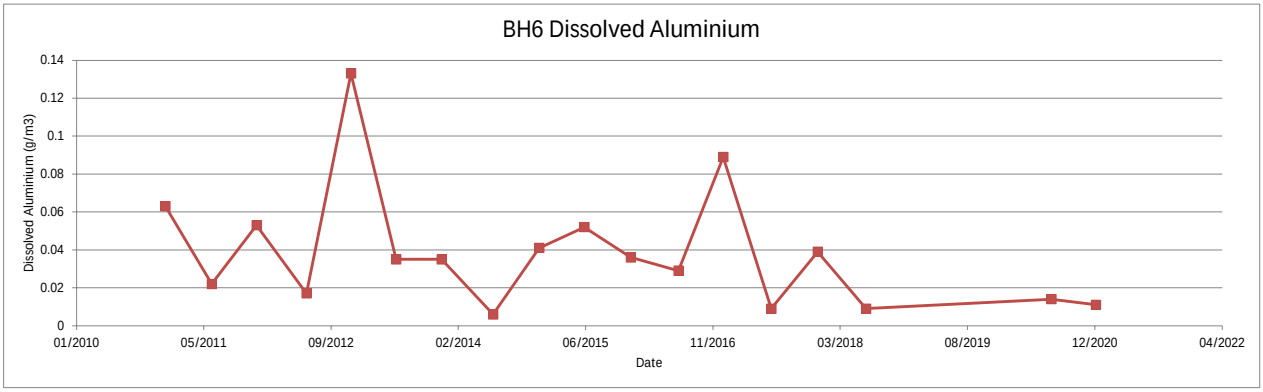

BH6 BOD5
BOD5 (g/m3)
10
9
8
7
6
5
4
3
2
1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

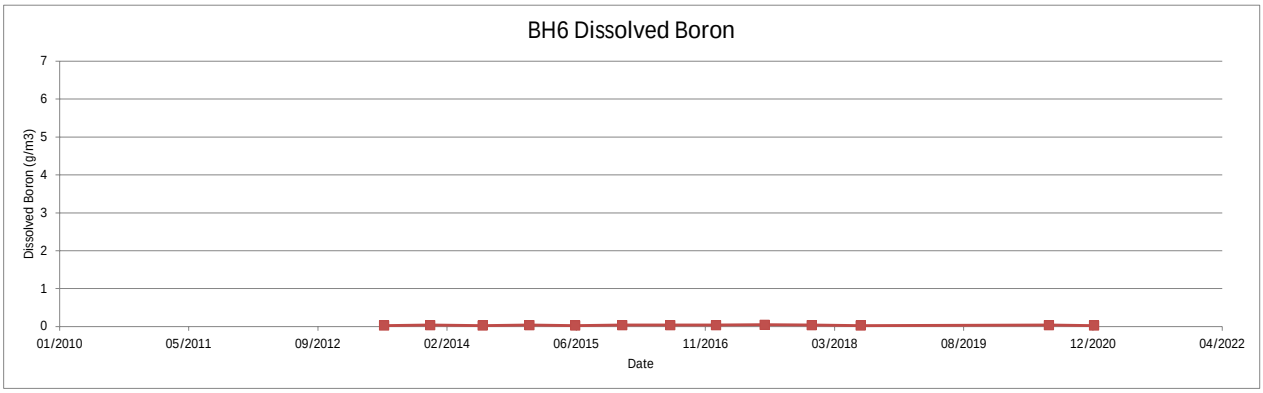

BH6 Dissolved Iron
Iron (g/m3)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

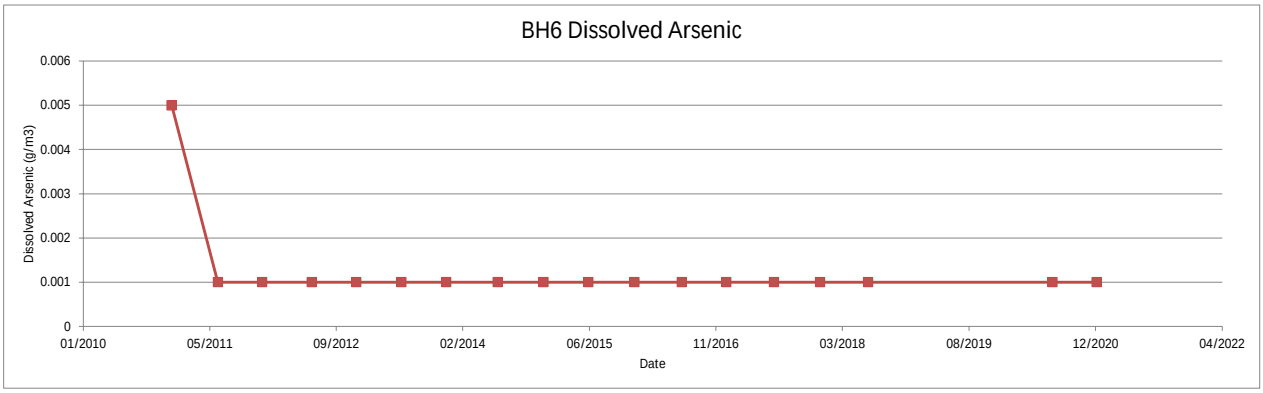

BH6 Dissolved Manganese
Manganese (g/m3)
0.6
0.5
0.4
0.3
0.2
0.1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

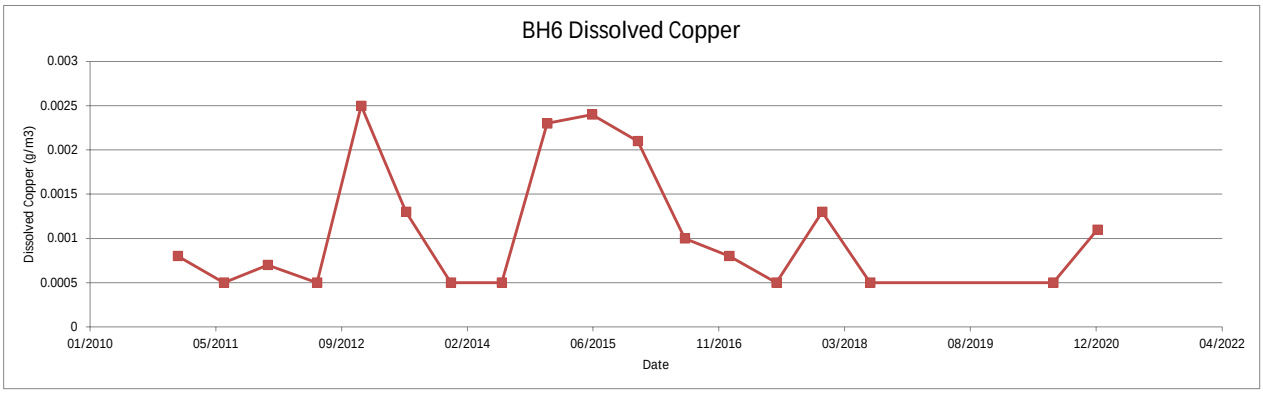

BH6 Chloride
Dissolved Chloride (g/m3)
140
120
100
80
60
40
20
0
1/01/2010
16/05/2011
27/09/2012
9/02/2014
24/06/2015
5/11/2016
20/03/2018
2/08/2019
14/12/2020
28/04/2022
Date

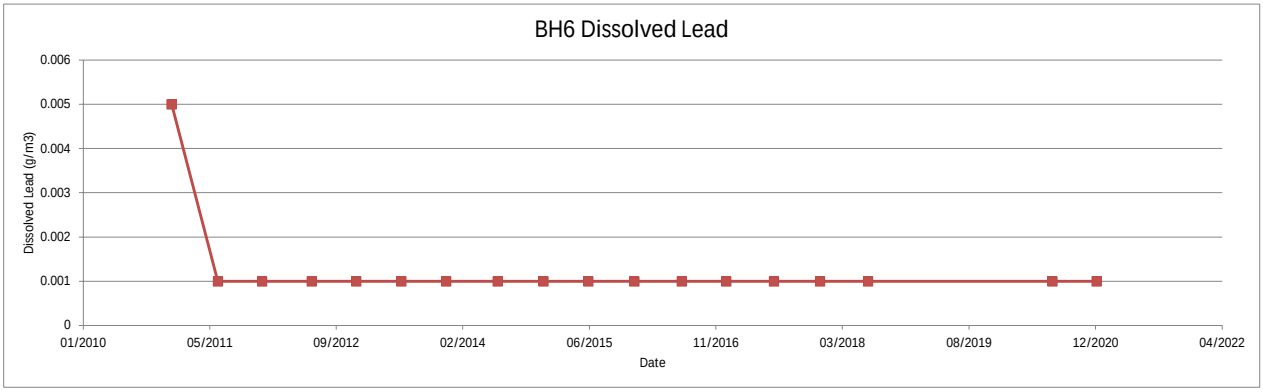

BH6 Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

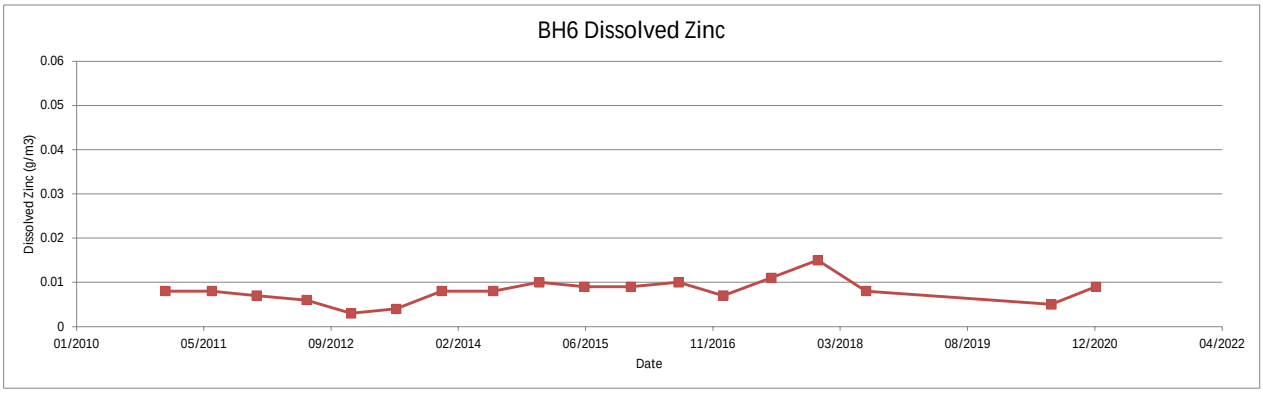

BH6 Dissolved Aluminium
Dissolved Aluminium (g/m3)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

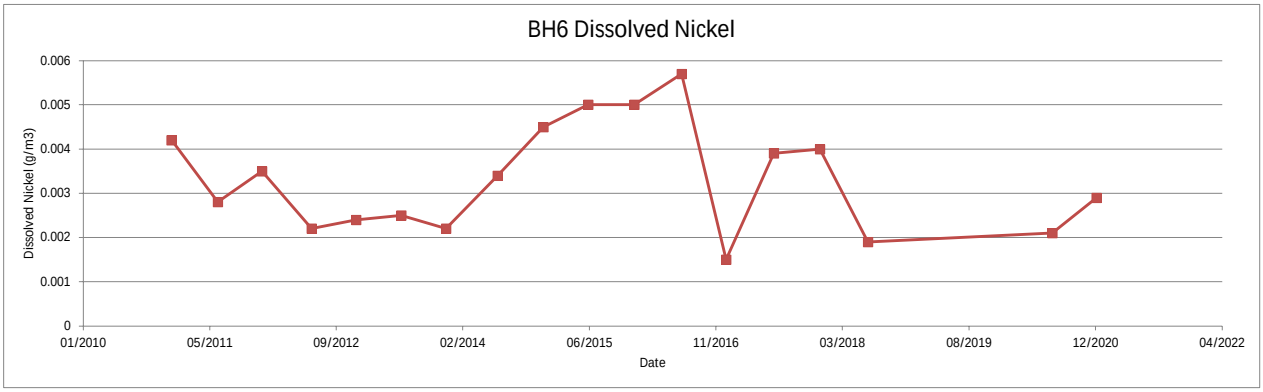

BH6 Dissolved Boron
Dissolved Boron (g/m3)
7
6
5
4
3
2
1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

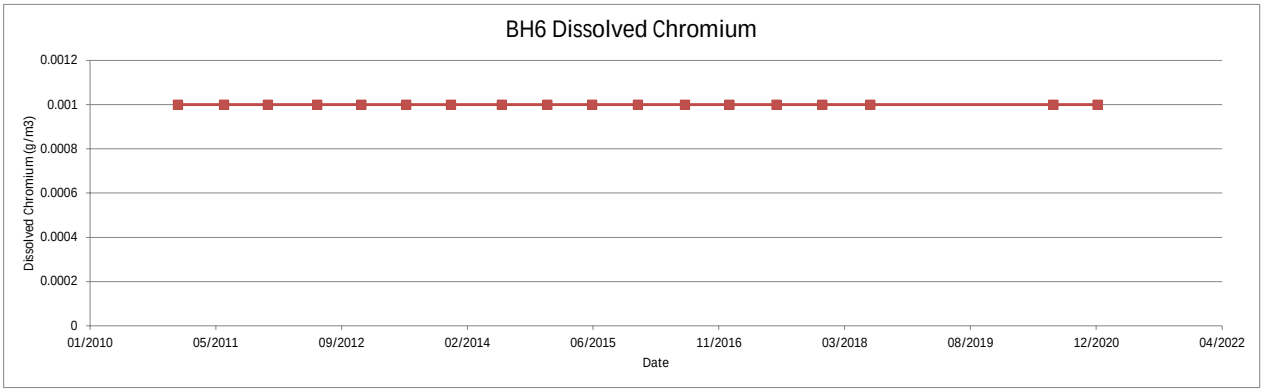

BH6 Dissolved Arsenic
Dissolved Arsenic (g/m3)
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

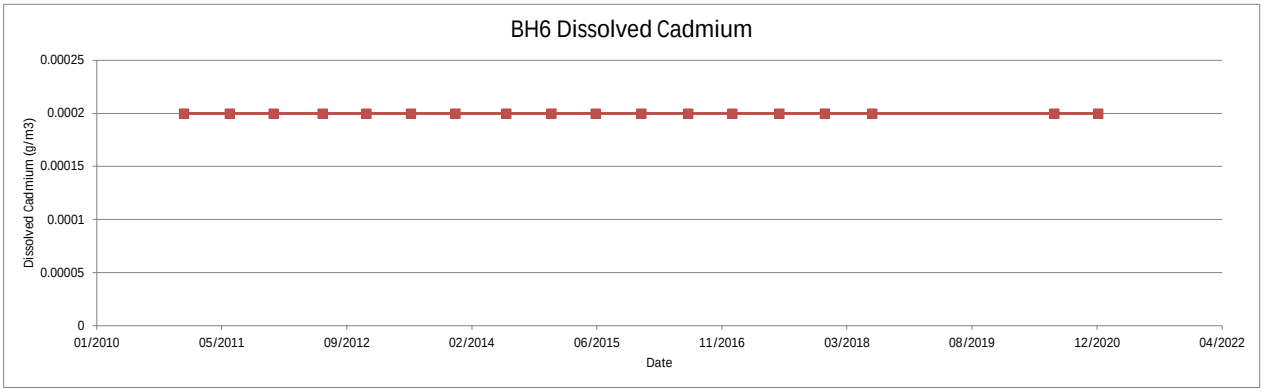

BH6 Dissolved Copper
Dissolved Copper (g/m3)
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

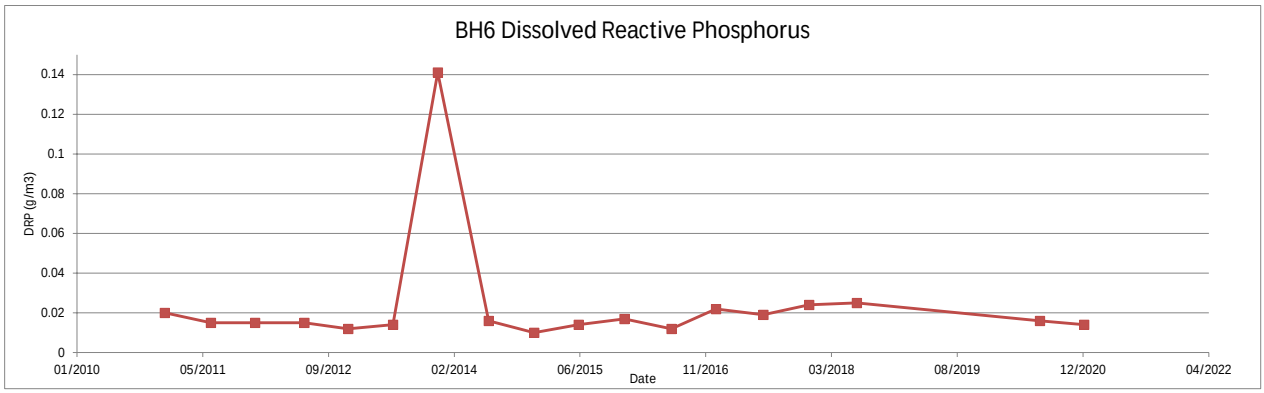

BH6 Dissolved Lead
Dissolved Lead (g/m3)
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

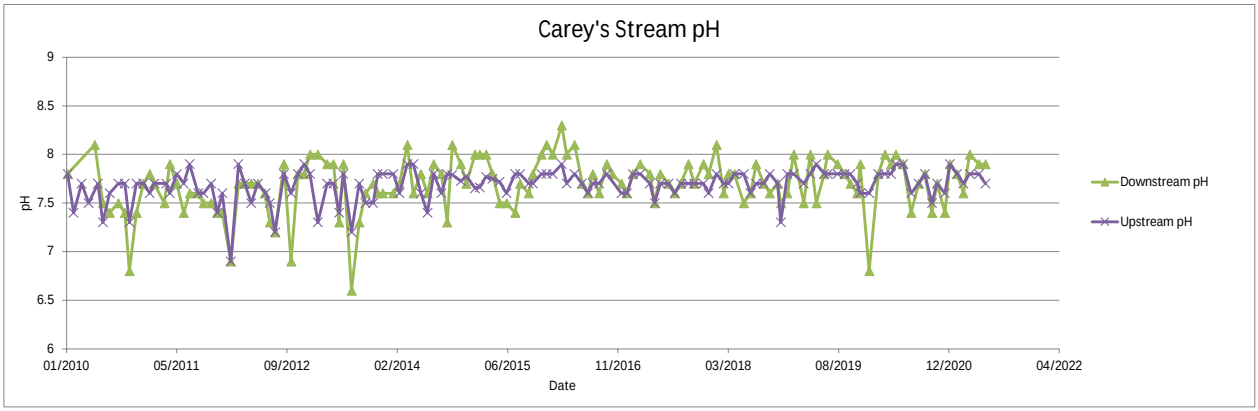

BH6 Dissolved Zinc
Dissolved Zinc (g/m3)
0.06
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

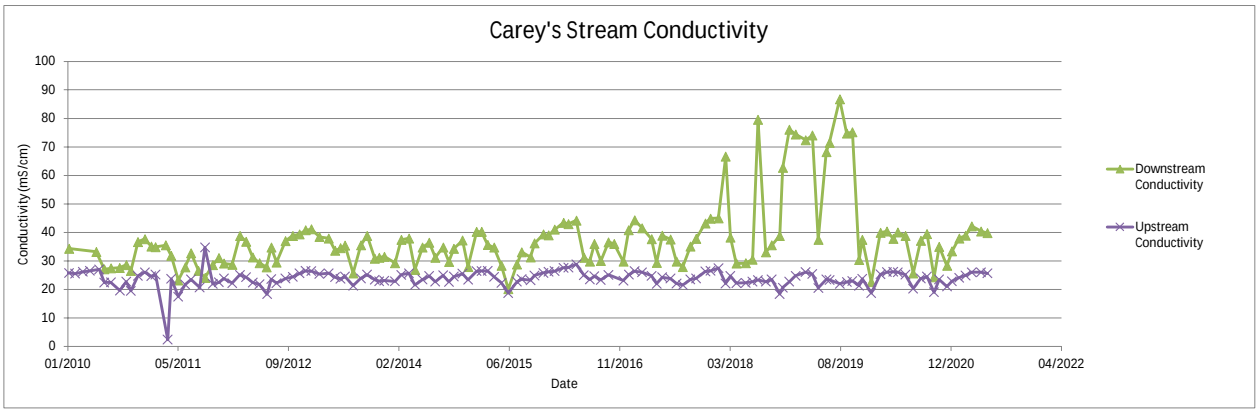

BH6 Dissolved Nickel
Dissolved Nickel (g/m3)
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

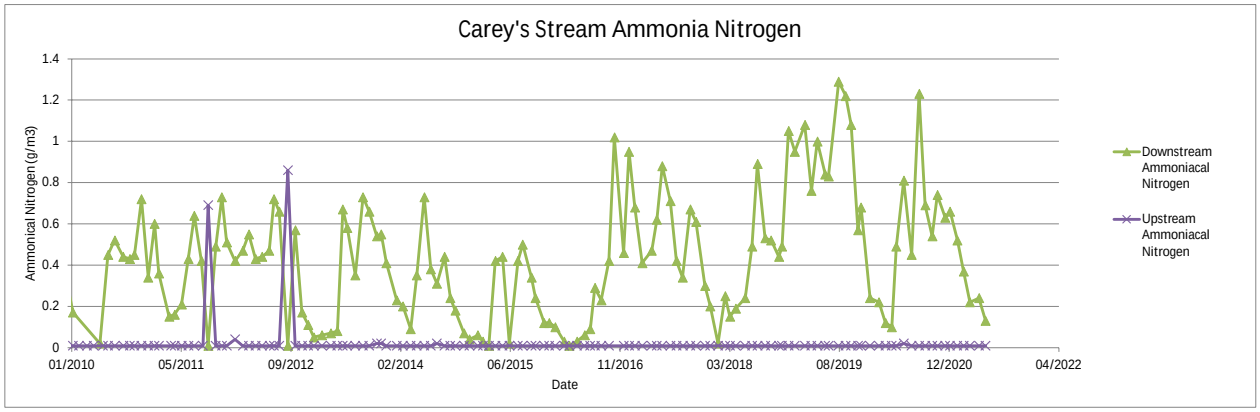

BH6 Dissolved Chromium
Dissolved Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

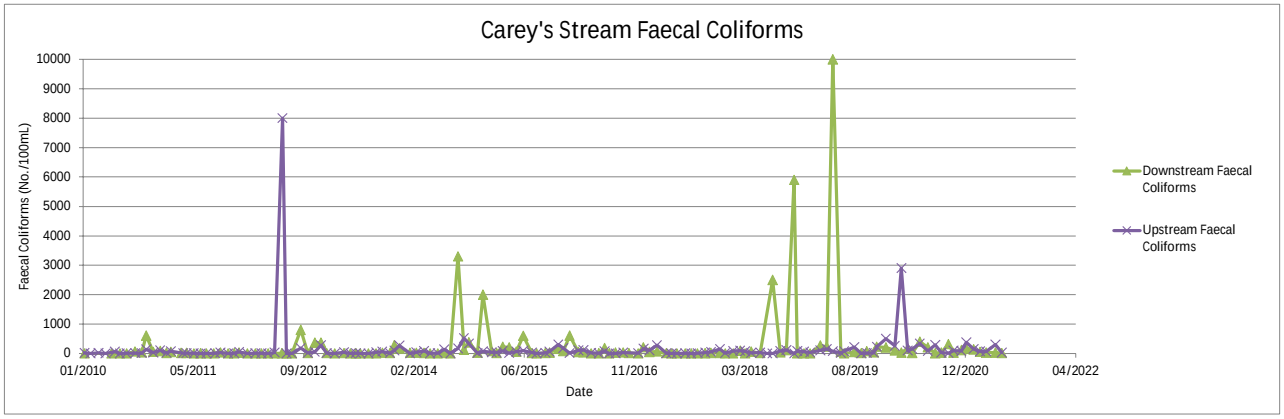

BH6 Dissolved Cadmium
Dissolved Cadmium (g/m3)
0.00025
0.0002
0.00015
0.0001
0.00005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

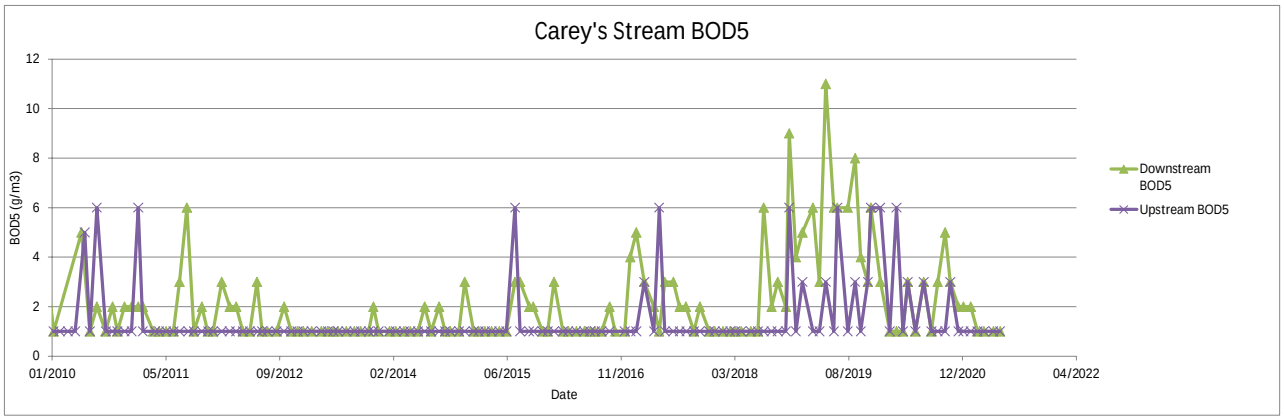

BH6 Dissolved Reactive Phosphorus
DRP (g/m3)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date

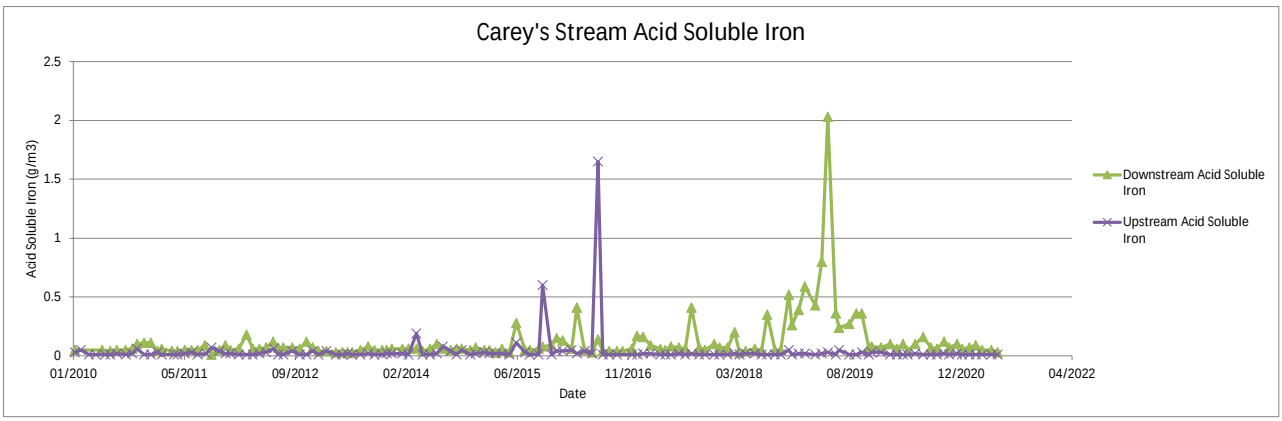

Carey's Stream pH
pH
9
8.5
8
7.5
7
6.5
6
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream pH
Upstream pH

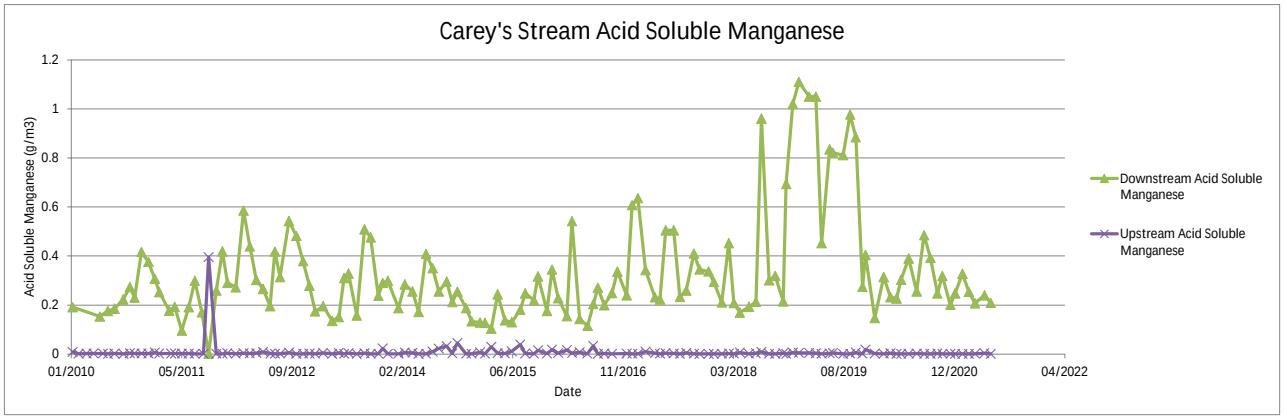

Carey's Stream Conductivity
Conductivity (mS/cm)
100
90
80
70
60
50
40
30
20
10
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Conductivity
Upstream Conductivity

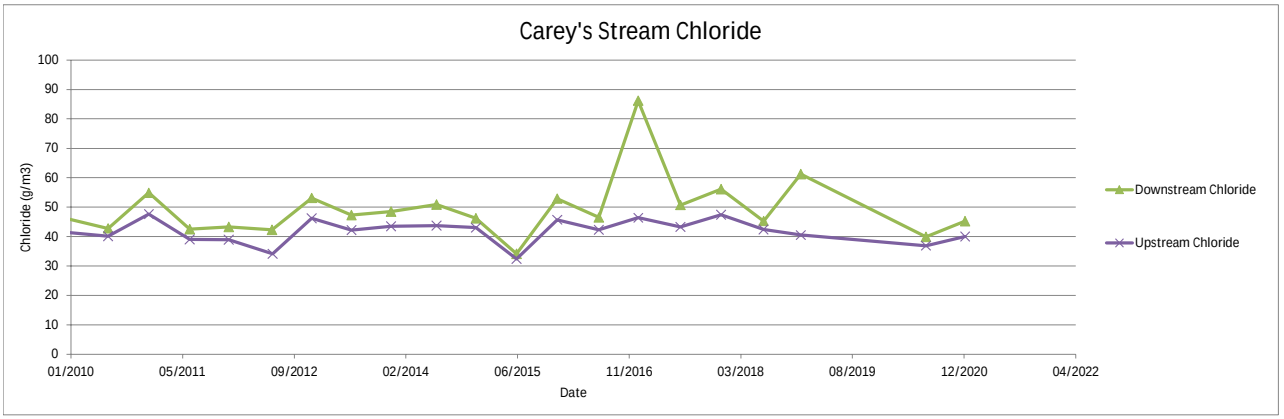

Carey's Stream Ammonia Nitrogen
Ammonical Nitrogen (g/m3)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Ammoniacal Nitrogen
Upstream Ammoniacal Nitrogen

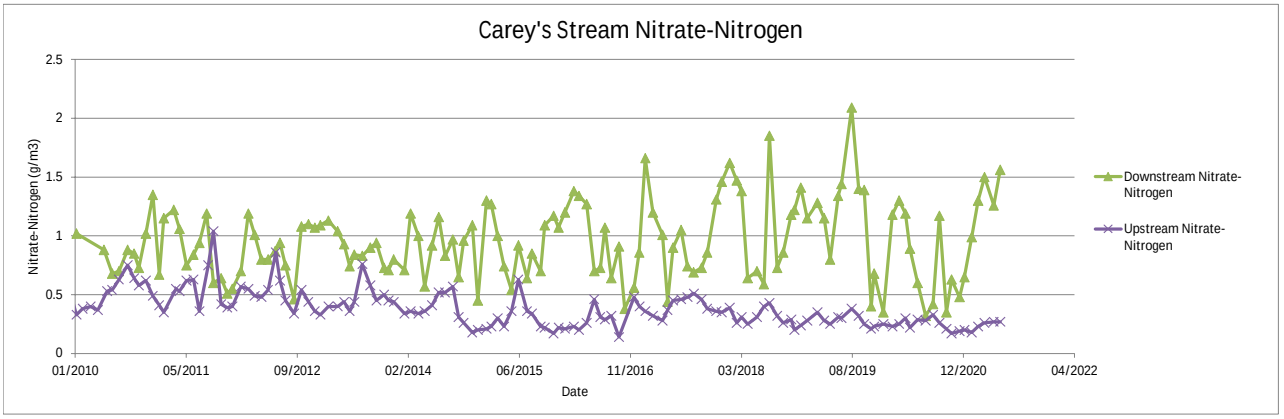

Carey's Stream Faecal Coliforms
Faecal Coliforms (No./100mL)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Faecal Coliforms
Upstream Faecal Coliforms

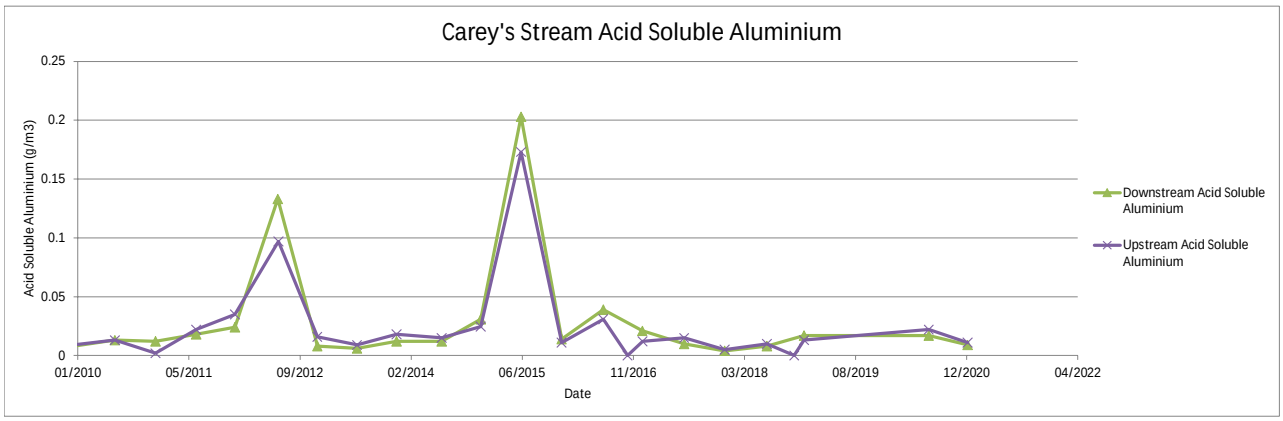

Carey's Stream BOD5
BOD5 (g/m3)
12
10
8
6
4
2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream BOD5
Upstream BOD5

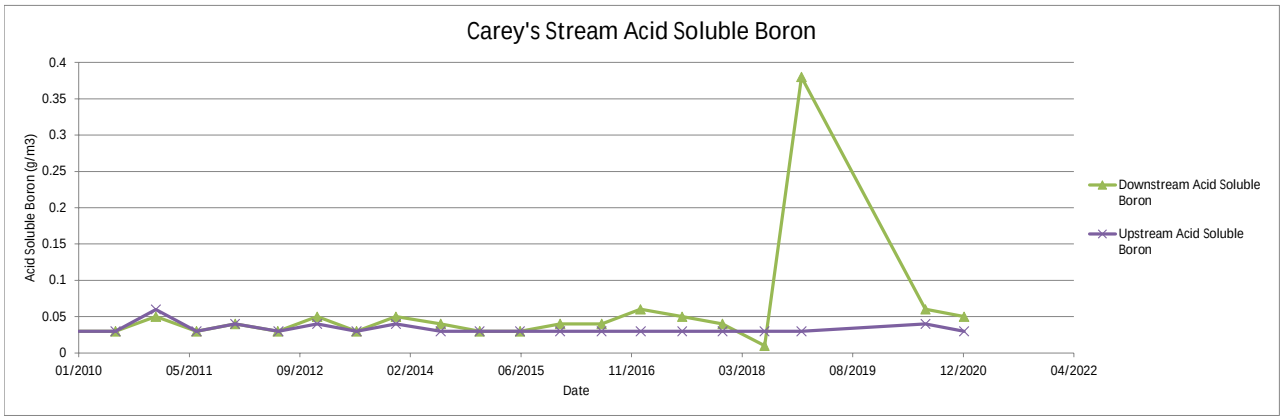

Carey's Stream Acid Soluble Iron
Acid Soluble Iron (g/m3)
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Iron
Upstream Acid Soluble Iron

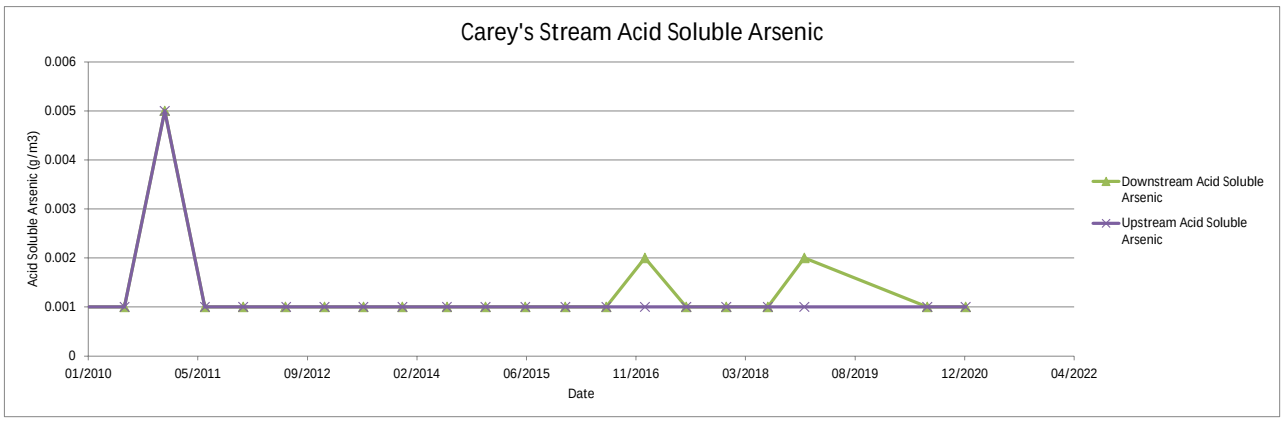

Carey's Stream Acid Soluble Manganese
Acid Soluble Manganese (g/m3)
1.2
1
0.8
0.6
0.4
0.2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Manganese
Upstream Acid Soluble Manganese

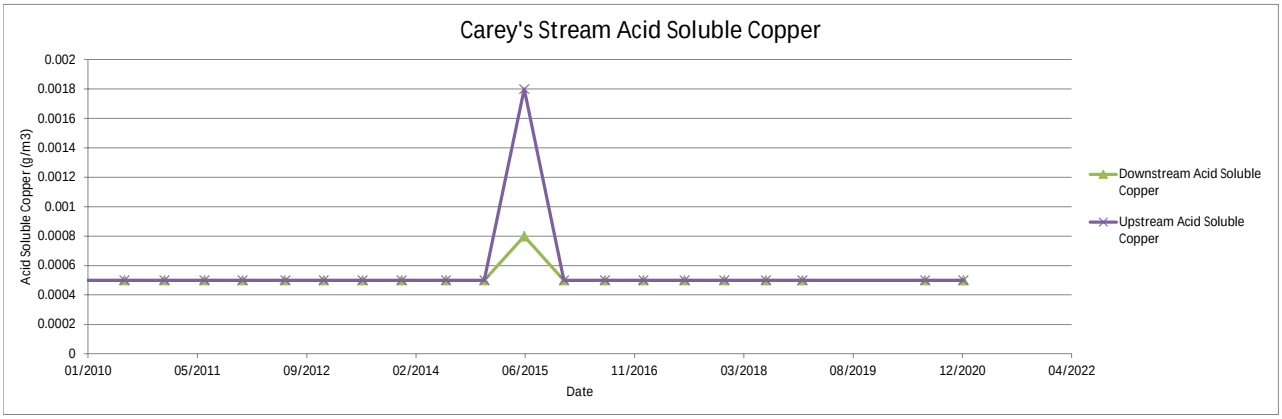

Carey's Stream Chloride
Chloride (g/m3)
100
90
80
70
60
50
40
30
20
10
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Chloride
Upstream Chloride

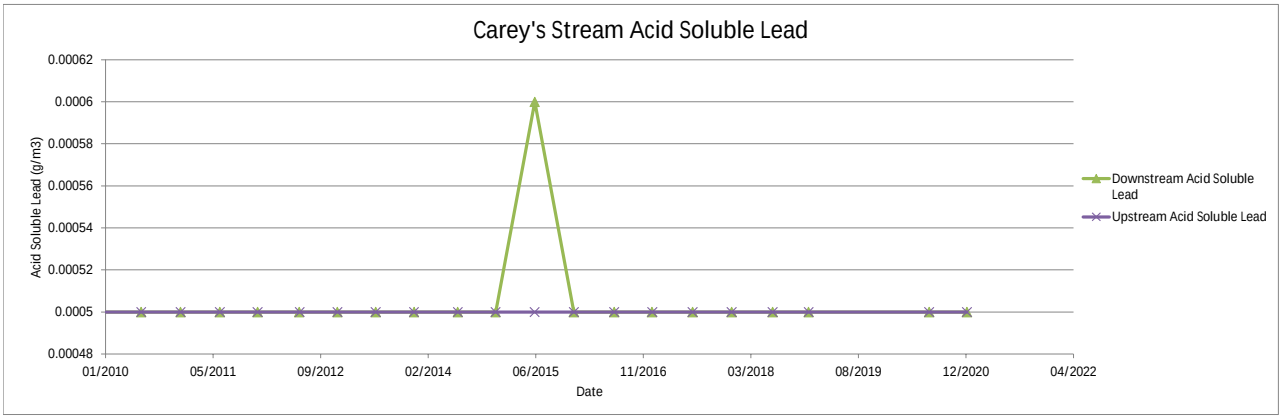

Carey's Stream Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Nitrate-Nitrogen
Upstream Nitrate-Nitrogen

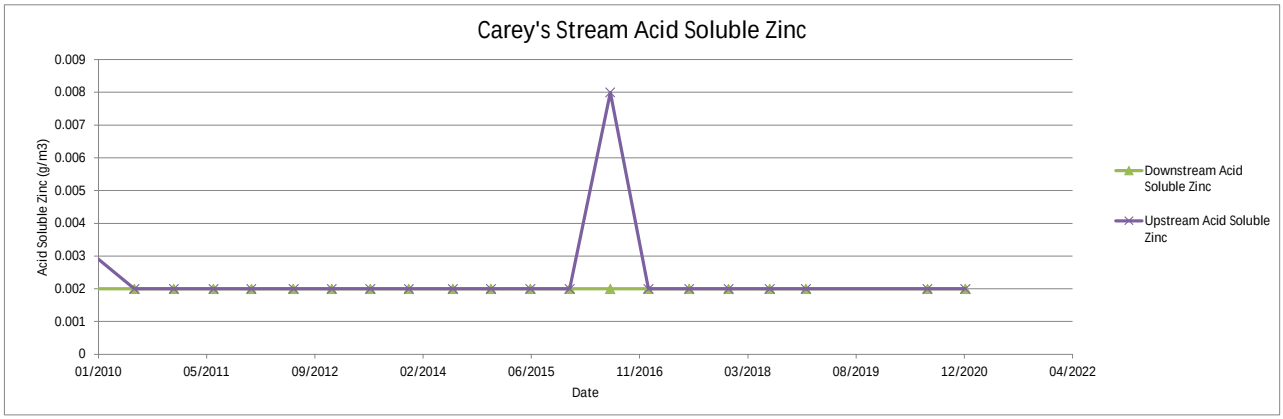

Carey's Stream Acid Soluble Aluminium
Acid Soluble Aluminium (g/m3)
0.25
0.2
0.15
0.1
0.05
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Aluminium
Upstream Acid Soluble Aluminium

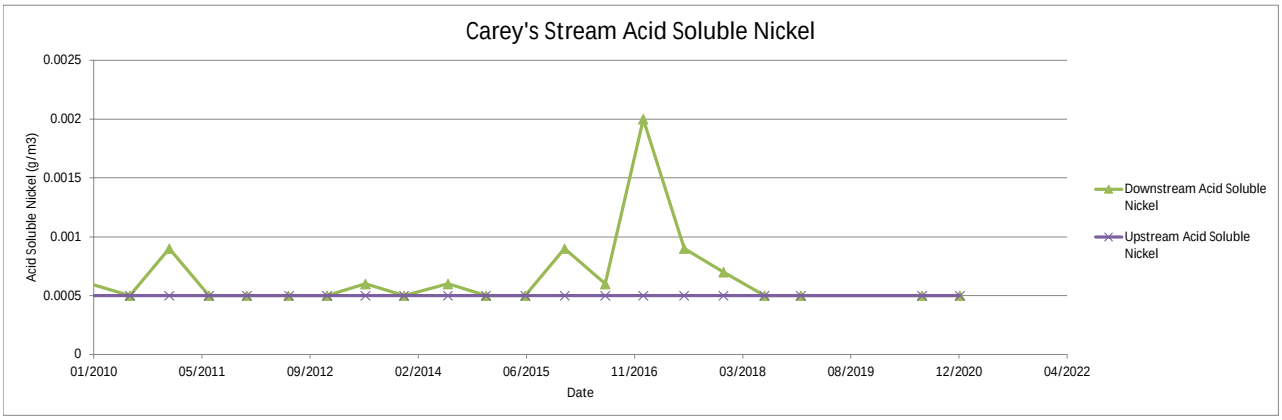

Carey's Stream Acid Soluble Boron
Acid Soluble Boron (g/m3)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Boron
Upstream Acid Soluble Boron

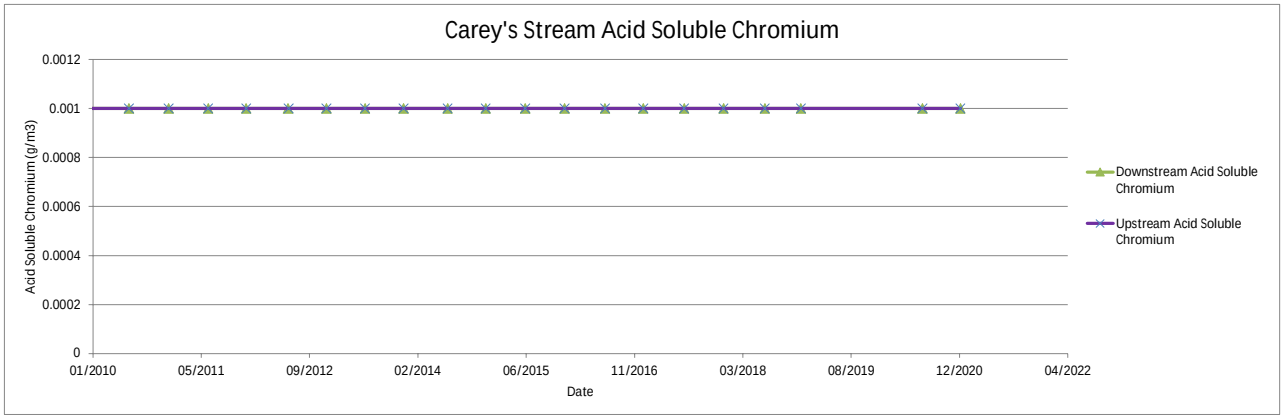

Carey's Stream Acid Soluble Arsenic
Acid Soluble Arsenic (g/m3)
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Arsenic
Upstream Acid Soluble Arsenic

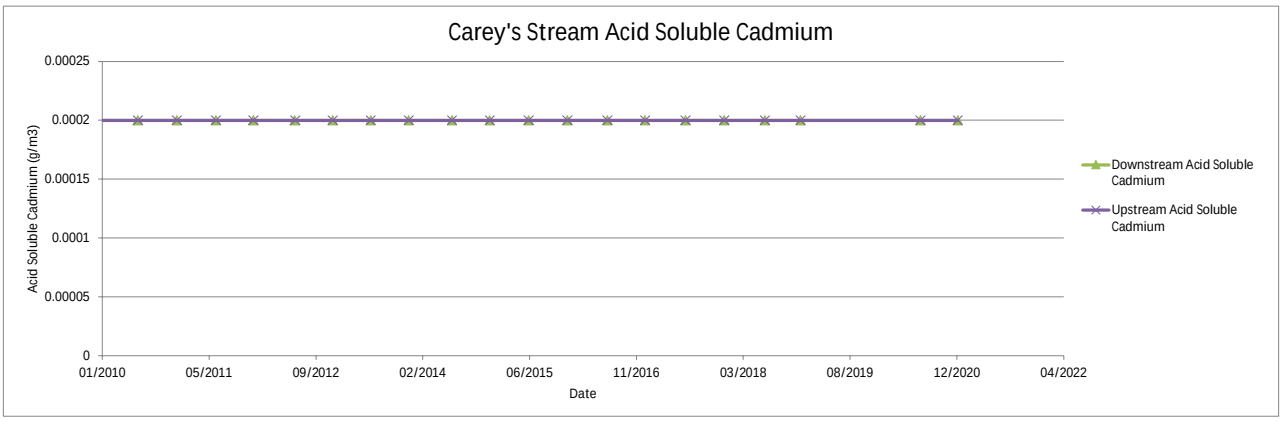

Carey's Stream Acid Soluble Copper
Acid Soluble Copper (g/m3)
0.002
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Copper
Upstream Acid Soluble Copper

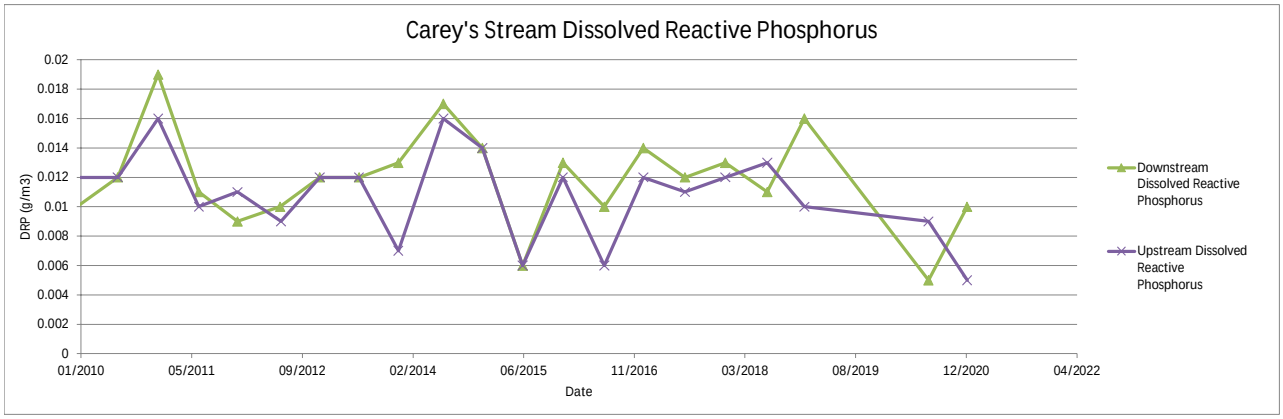

Carey's Stream Acid Soluble Lead
Acid Soluble Lead (g/m3)
0.00062
0.0006
0.00058
0.00056
0.00054
0.00052
0.0005
0.00048
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Lead
Upstream Acid Soluble Lead

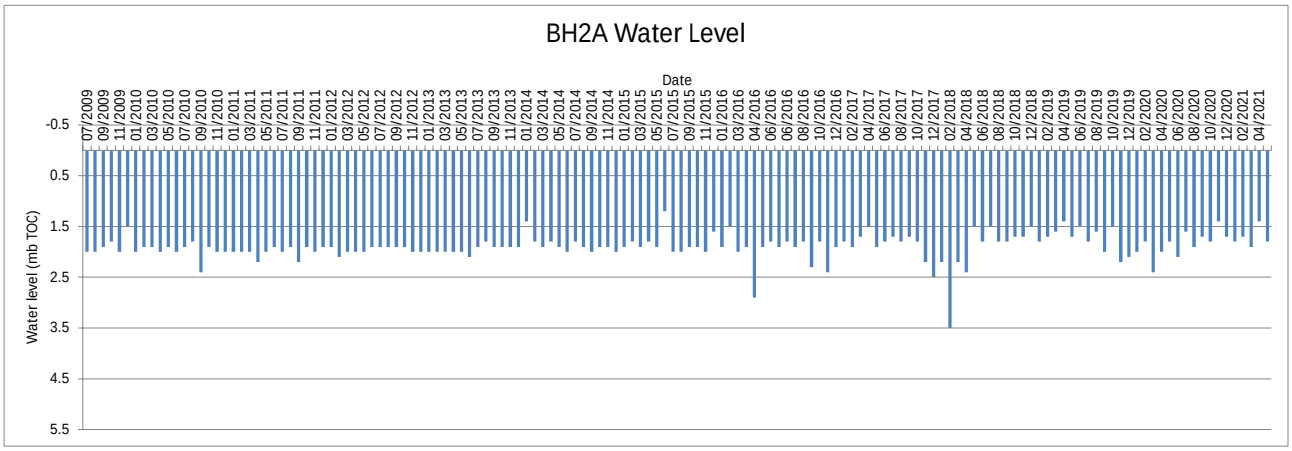

Carey's Stream Acid Soluble Zinc
Acid Soluble Zinc (g/m3)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Zinc
Upstream Acid Soluble Zinc

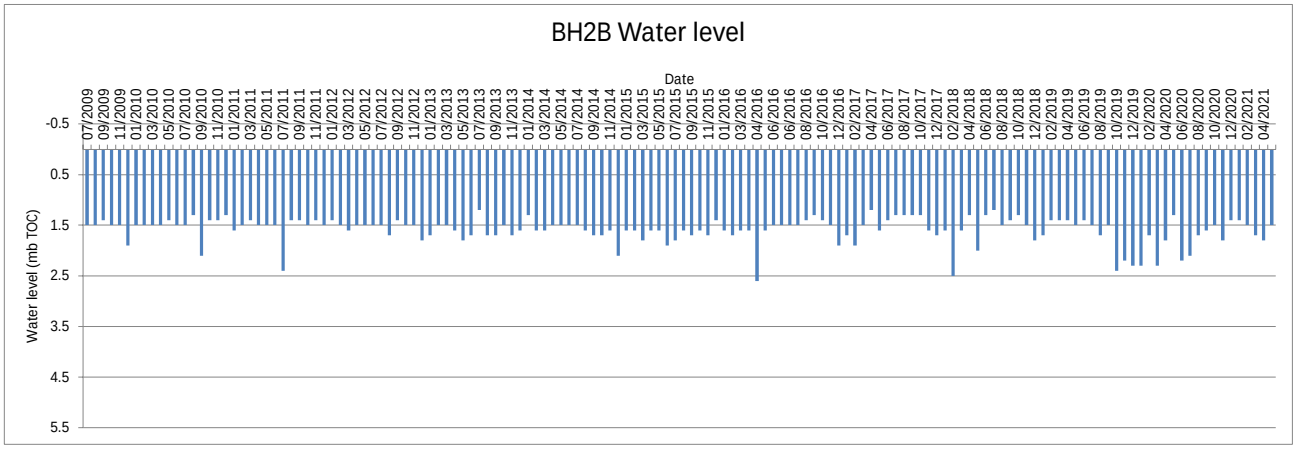

Carey's Stream Acid Soluble Nickel
Acid Soluble Nickel (g/m3)
0.0025
0.002
0.0015
0.001
0.0005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Nickel
Upstream Acid Soluble Nickel

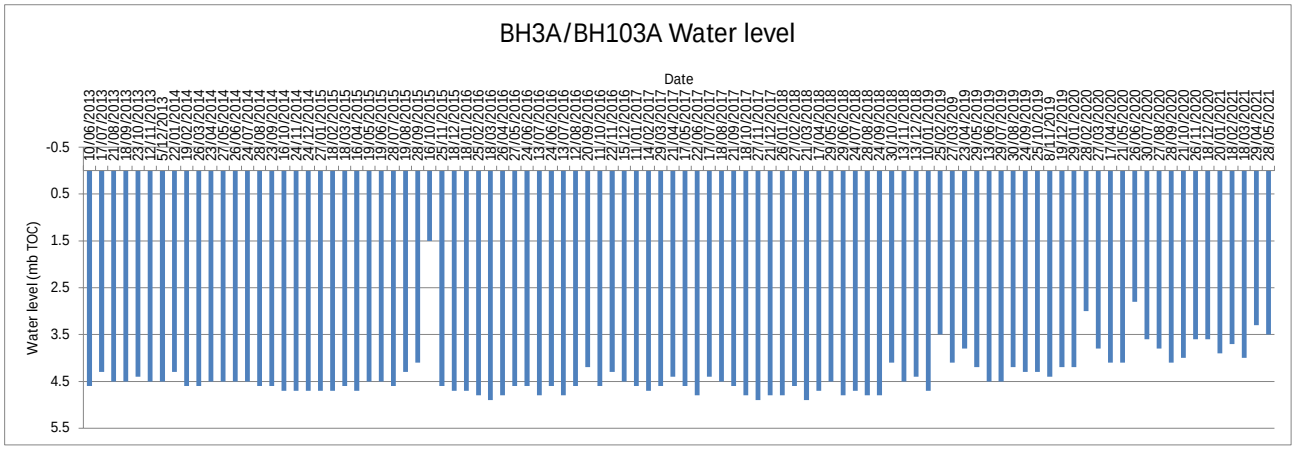

Carey's Stream Acid Soluble Chromium
Acid Soluble Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Chromium
Upstream Acid Soluble Chromium

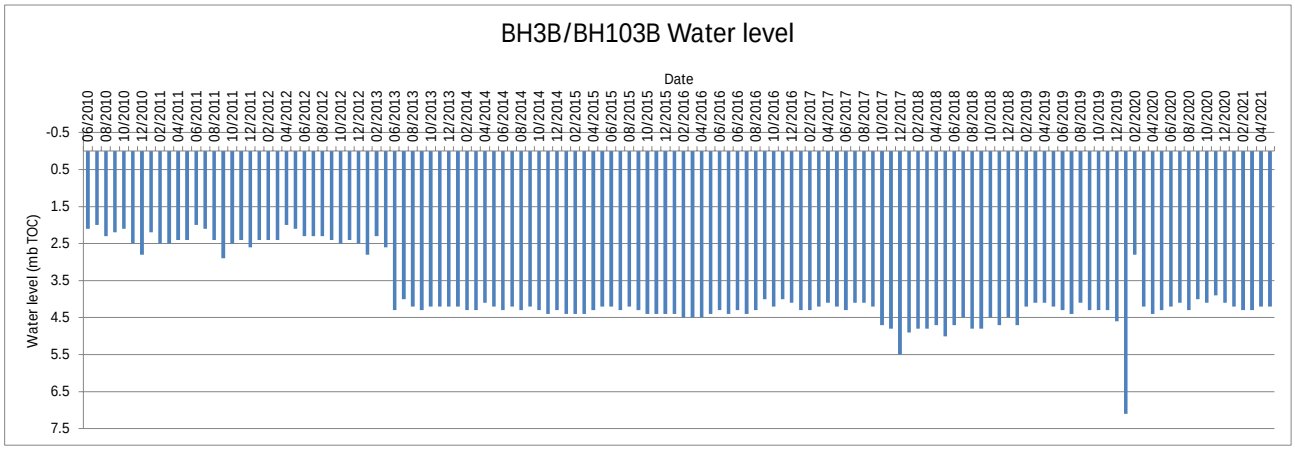

Carey's Stream Acid Soluble Cadmium
Acid Soluble Cadmium (g/m3)
0.00025
0.0002
0.00015
0.0001
0.00005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Acid Soluble Cadmium
Upstream Acid Soluble Cadmium


Carey's Stream Dissolved Reactive Phosphorus
DRP (g/m3)
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
04/2022
Date
Downstream Dissolved Reactive Phosphorus
Upstream Dissolved Reactive Phosphorus


BH2A Water Level
Date
Water level (mb TOC)
-0.5
0.5
1.5
2.5
3.5
4.5
5.5


BH2B Water level
Date
Water level (mb TOC)
-0.5
0.5
1.5
2.5
3.5
4.5
5.5


BH3A/BH103A Water level
Date
Water level (mb TOC)
-0.5
0.5
1.5
2.5
3.5
4.5
5.5


BH3B/BH103B Water level
Date
Water level (mb TOC)
-0.5
0.5
1.5
2.5
3.5
4.5
5.5
6.5
7.5
06/2010
08/2010
10/2010
12/2010
02/2011
04/2011
06/2011
08/2011
10/2011
12/2011
02/2012
04/2012
06/2012
08/2012
10/2012
12/2012
02/2013
06/2013
08/2013
10/2013
12/2013
02/2014
04/2014
06/2014
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10/2014
12/2014
02/2015
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02/2016
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12/2016
02/2017
04/2017
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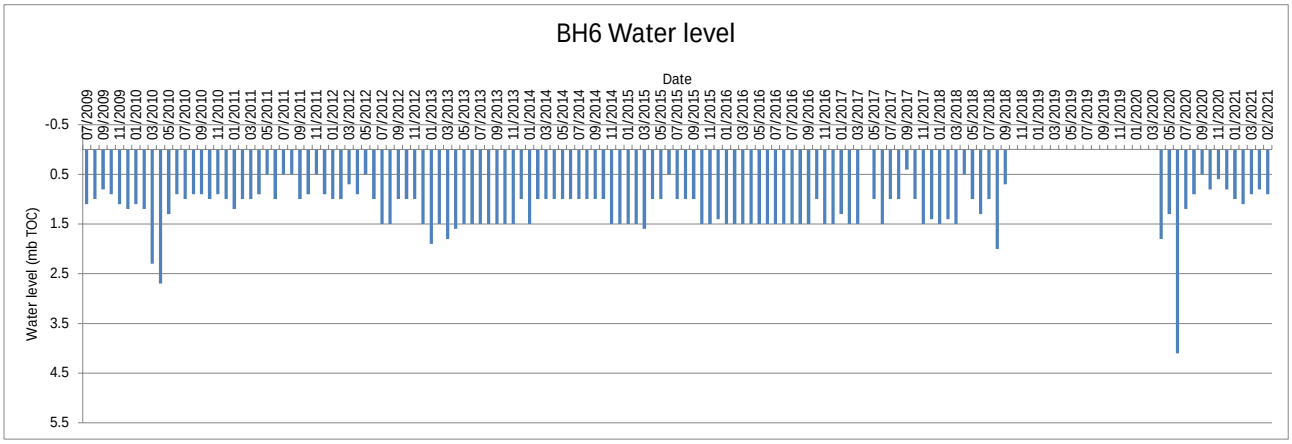
08/2017
10/2017
12/2017
02/2018
04/2018
06/2018
08/2018
10/2018
12/2018
02/2019
04/2019
06/2019
08/2019
10/2019
12/2019
02/2020
04/2020
06/2020
08/2020
10/2020
12/2020
02/2021
04/2021


BH6 Water level
Date
Water level (mb TOC)
-0.5
0.5
1.5
2.5
3.5
4.5
5.5
07/2009
09/2009
11/2009
01/2010
03/2010
05/2010
07/2010
09/2010
11/2010
01/2011
03/2011
05/2011
07/2011
09/2011
11/2011
01/2012
03/2012
05/2012
07/2012
09/2012
11/2012
01/2013
03/2013
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03/2015
05/2015
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09/2015
11/2015
01/2016
03/2016
05/2016
07/2016
09/2016
11/2016
01/2017
03/2017
05/2017
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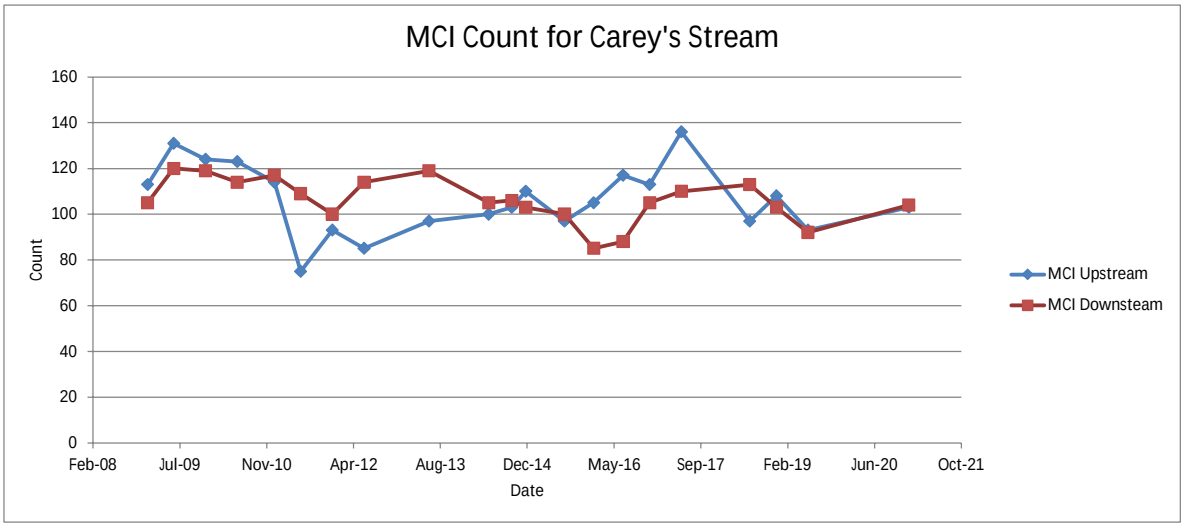

MCI Count for Carey's Stream
160
140
120
100
80
60
40
20
0
Count
Feb-08
Jul-09
Nov-10
Apr-12
Aug-13
Dec-14
May-16
Sep-17
Feb-19
Jun-20
Oct-21
Date
MCI Upstream
MCI Downsteam

Appendix D

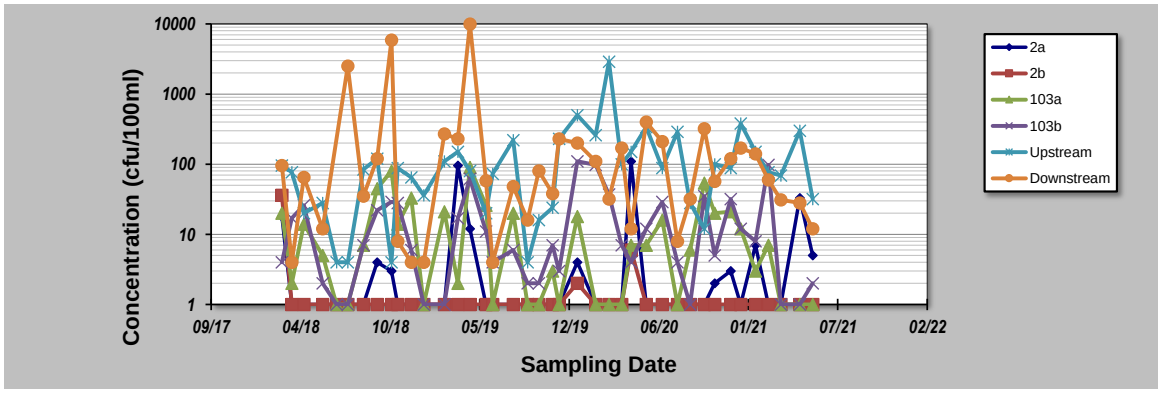
Mann-Kendall Statistical Analysis

Appendix D Mann-Kendall Statistical Analysis

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	14-Jun-21	Job ID:	60629483
Facility Name:	Southern Landfill	Constituent:	Faecal Coliforms
Conducted By:	AECOM New Zealand	Concentration Units:	cfu/100ml

Sampling Point ID:	2a	2b	103a	103b	Upstream	Downstream
Sampling Event	Sampling Date	FAECAL COLIFORMS CONCENTRATION (cfu/100ml)					
1	27-Feb-18	18	36	20	4	96	96
2	21-Mar-18	1	1	2	17	77	4
3	17-Apr-18	1	1	14	26	20	65
4	29-May-18	1	1	5	2	28	12
5	29-Jun-18	1	1	1	1	4	
6	24-Jul-18	1	1	1	1	4	2500
7	28-Aug-18	1	1	7	7	84	35
8	28-Sep-18	4	1	45	22	120	120
9	30-Oct-18	3	1	80	29	4	5900
10	13-Nov-18	1	1	14	28	88	8
11	13-Dec-18	1	1	33	6	65	4
12	10-Jan-19	1	1	1	1	36	4
13	25-Feb-19	1	1	21	1	110	270
14	27-Mar-19	96	1	2	17	150	230
15	23-Apr-19	12	1	90	62	80	10000
16	29-May-19	1	1	26	11	20	58
17	13-Jun-19	1	1	1	4	73	4
18	29-Jul-19	1	1	20	6	220	48
19	30-Aug-19	1	1	1	2	4	16
20	24-Sep-19	1	1	1	2	16	80
21	25-Oct-19	1	1	3	7	24	38
22	8-Nov-19	1	1	1	3	230	230
23	19-Dec-19	4	2	18	110	500	200
24	29-Jan-20	1	1	1	98	260	110
25	28-Feb-20	1	1	1	37	2900	32
26	27-Mar-20	1	1	1	7	100	170
27	17-Apr-20	110	6	7	4	150	12
28	21-May-20	1	1	7	12	340	400
29	26-Jun-20	1	1	16	29	88	210
30	30-Jul-20	1	1	1	4	290	8
31	27-Aug-20	1	1	6	1	28	32
32	28-Sep-20	1	1	54	35	12	320
33	21-Oct-20	2	1	20	5	100	57
34	26-Nov-20	3	1	21	32	88	120
35	18-Dec-20	1	1	12	12	380	170
36	20-Jan-21	7	1	3	8	150	140
37	18-Feb-21	1	1	7	98	77	60
38	18-Mar-21	1	1	1	1	69	31
39	29-Apr-21	33	1	1	1	300	28
40	28-May-21	5	1	1	2	32	12
Coefficient of Variation:		2.81	2.75	1.46	1.46	2.45	3.30
Mann-Kendall Statistic (S):		64	-22	-92	25	178	-1
Confidence Factor:		76.7%	59.6%	85.4%	61.0%	98.1%	50.0%
Concentration Trend:		No Trend	No Trend	No Trend	No Trend	Increasing	No Trend



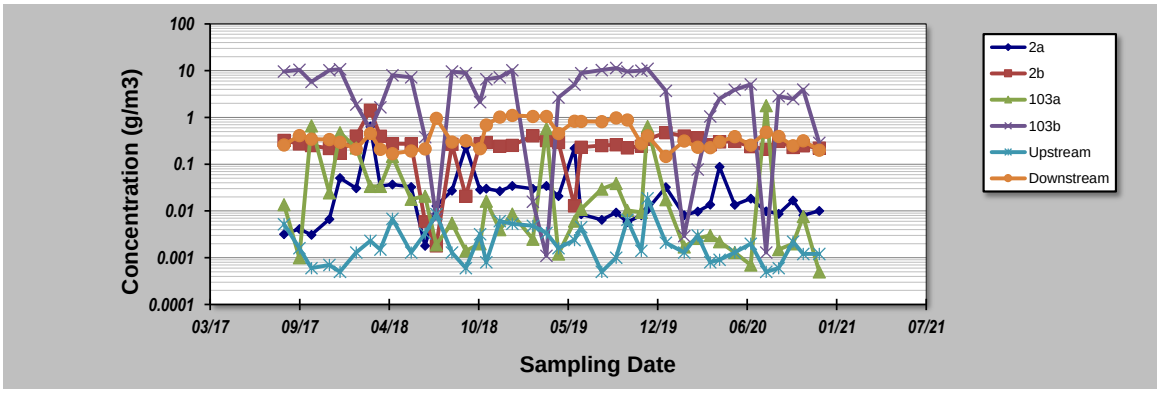
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	11-Dec-20	Job ID:	60629483
Facility Name:	Southern Landfill	Constituent:	Manganese
Conducted By:	AECOM New Zealand	Concentration Units:	g/m3

Sampling Point ID:	2a	2b	103a	103b	Upstream	Downstream
Sampling Event	Sampling Date	MANGANESE CONCENTRATION (g/m3)					
1	18-Aug-17	0.0032	0.323	0.0136	9.66	0.0052	0.259
2	21-Sep-17	0.0041	0.271	0.001	10.4	0.0016	0.41
3	18-Oct-17	0.0031	0.252	0.662	5.76	0.0006	0.345
4	27-Nov-17	0.0067	0.217	0.0246	10.2	0.0007	0.337
5	21-Dec-17	0.0508	0.171	0.473	10.8	0.0005	0.294
6	26-Jan-18	0.0308	0.403	0.224	1.89	0.0013	0.211
7	27-Feb-18	0.645	1.43	0.0337	0.564	0.0023	0.453
8	21-Mar-18	0.034	0.398	0.0338	1.65	0.0015	0.208
9	17-Apr-18	0.0371	0.275	0.147	8	0.0068	0.169
10	29-May-18	0.0328	0.273	0.0179	7.19	0.0013	0.193
11	29-Jun-18	0.0018	0.0059	0.0207	0.38	0.0033	0.213
12	24-Jul-18	0.0128	0.0018	0.0019	0.0068	0.0086	0.961
13	28-Aug-18	0.0271	0.266	0.0055	9.63	0.0013	0.3
14	28-Sep-18	0.235	0.0208	0.0014	8.87	0.0006	0.319
15	30-Oct-18	0.0287	0.272	0.002	2.13	0.0032	0.215
16	13-Nov-18	0.03	0.293	0.0163	6.61	0.0008	0.694
17	13-Dec-18	0.0267	0.244	0.004	7.25	0.0061	1.02
18	10-Jan-19	0.0342	0.253	0.0086	10.2	0.0053	1.11
19	25-Feb-19	0.0299	0.404	0.0025	0.0158	0.0048	1.05
20	27-Mar-19	0.0345	0.322	0.579	0.0011	0.0034	1.05
21	23-Apr-19	0.0207	0.293	0.0012	2.68	0.0016	0.453
22	29-May-19	0.219	0.0129	0.0061	5.04	0.0024	0.835
23	13-Jun-19	0.0085	0.231	0.0109	8.86	0.0045	0.822
24	29-Jul-19	0.0065	0.251	0.0294	10.3	0.0005	0.811
25	30-Aug-19	0.0093	0.26	0.0388	11.4	0.001	0.977
26	24-Sep-19	0.0058	0.224	0.0103	9.58	0.0065	0.885
27	25-Oct-19	0.0081	0.243	0.0094	10	0.0014	0.274
28	8-Nov-19	0.0108	0.341	0.643	11	0.0187	0.404
29	19-Dec-19	0.0322	0.473	0.0174	3.7	0.0021	0.147
30	29-Jan-20	0.0081	0.403	0.0017	0.0029	0.0013	0.314
31	28-Feb-20	0.0097	0.37	0.0026	0.077	0.003	0.232
32	27-Mar-20	0.0137	0.262	0.003	1.05	0.0008	0.227
33	17-Apr-20	0.0884	0.302	0.0022	2.52	0.0009	0.303
34	21-May-20	0.0135	0.309	0.0013	3.89	0.0013	0.39
35	26-Jun-20	0.0184	0.238	0.0007	5.1	0.002	0.256
36	30-Jul-20	0.0098	0.208	1.8	0.0013	0.0005	0.485
37	27-Aug-20	0.0087	0.308	0.0015	2.85	0.0006	0.392
38	28-Sep-20	0.0167	0.228	0.002	2.5	0.0022	0.247
39	21-Oct-20	0.0081	0.248	0.0076	3.95	0.0012	0.319
40	26-Nov-20	0.01	0.222	0.0005	0.286	0.0012	0.201
Coefficient of Variation:		2.37	0.74	2.68	0.79	1.16	0.65
Mann-Kendall Statistic (S):		-79	-36	-223	-137	-75	-7
Confidence Factor:		81.7%	65.7%	99.6%	94.4%	80.5%	52.8%
Concentration Trend:		No Trend	Stable	Decreasing	Prob. Decreasing	No Trend	Stable



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