EnergyAustralia
LIGHT THE WAY

Annual Environmental Monitoring Report – Water Management and Monitoring 2020/21

Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project

28 September 2021

Project No: 0553983_MPAR_AEMR_2021_F01

ERM

The business of sustainability

Document details	
Document title	Annual Environmental Monitoring Report – Water Management and Monitoring 2020/21
Document subtitle	Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project
Project No.	0553983_MPAR_AEMR_2021_F01
Date	28 September 2021
Version	Final
Author	Ruel Muldoon, Dana Windle, Gavin Powell
Client Name	EnergyAustralia NSW Pty Ltd

Document history

				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft	00	Ruel Muldoon, Dana Windle	Gavin Powell	Tamie Weaver	09.09.2021	Draft
Draft	01	Ruel Muldoon, Dana Windle	Gavin Powell	Tamie Weaver	17.09.2021	Final draft
Final	00	Ruel Muldoon, Dana Windle	Gavin Powell	Tamie Weaver	28.09.2021	Final

Signature Page

28 September 2021

Annual Environmental Monitoring Report – Water Management and Monitoring 2020/21

Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project

Ruel Muldoon
Environmental Consultant

Dana Windle

Dana Windle
Technical Director - Hydrogeology

Gavin Powell
Project Manager

Dr Tamie Weaver
Partner in Charge and Technical Fellow

Environmental Resources Management Australia Pty Ltd
Level 15 309 Kent Street
SYDNEY NSW 2000

CONTENTS

FIGURES

APPENDIX A MT PIPER CONSENT REQUIREMENTS

APPENDIX B STORMWATER FLOW VOLUME DATA

APPENDIX C ASH REPOSITORY SURVEY

APPENDIX D BRINE COMPOSITION DATA

APPENDIX E SITE WEATHER DATA

APPENDIX F TABULATED SURFACE WATER DATA

APPENDIX G TABULATED GROUNDWATER DATA

APPENDIX H HYDROGRAPHS

APPENDIX I SURFACE WATER TRENDS

APPENDIX J GROUNDWATER TRENDS

APPENDIX K GWSDAT DATA ASSESSMENT METHODOLOGY

APPENDIX L GWSDAT OUTPUTS

APPENDIX M NALCO SAMPLING METHOD AND QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) PROGRAM

List of Tables in Text

List of Figures

Acronyms and Abbreviations

Name	Description
AEMR	Annual Environmental Monitoring Report
AHD	Australian Height Datum
ANZECC	Australia and New Zealand Environment Conservation Council
ANZG	Australia and New Zealand Guidelines
BCA	Brine conditioned ash
CSP	Coal Settling Pond
DPIE	NSW Department of Planning, Industry and Environment
EC	Electrical conductivity
EnergyAustralia	EnergyAustralia NSW Pty Limited
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environment Protection Licence
ERM	Environmental Resources Management Australia Pty Ltd
GWSDAT	Groundwater Spatiotemporal Data Analysis Tool
ha	Hectares
LCC	Lithgow City Council
LDP	Licenced Discharge Point
LLI	Lend Lease Infrastructure
LMP	Licenced Monitoring Point
LNAR	Lamberts North Ash Repository
LOR	Limit of reporting
MF	Micro filtration
mg/L	milligrams per litre
ML	Mega litre
MPAR	Mt Piper Ash Repository
MPPS	Mt Piper Power Station
Nalco	Nalco Water – Ecolab
NFR	Non-filterable Residue, also referred to as Turbidity.

Name	Description
NSW	New South Wales
OEMP	Operational Environmental Management Plan
POEO Act	Protection of the Environment Operations Act (NSW) 1997
QA/QC	Quality Assurance and Quality Control
RL	Relative Level
RO	Reverse Osmosis
SWTP	Springvale Water Treatment Plant
TARPs	Trigger Action Response Plans
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids
WCA	Water conditioned ash
WMP	Water Management and Monitoring Plan
µg/L	micrograms per litre
µS/cm	microsiemens per centimetre

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by EnergyAustralia NSW Pty Limited (EnergyAustralia) to prepare an Annual Environmental Monitoring Report (AEMR) for the Mt Piper Brine Conditioned Fly Ash Co-Placement Project (the Project). The Project is located at the Mount Piper Power Station (MPPS), 350 Boulder Road, Portland, New South Wales (NSW) (the site). Refer to Figure 1 showing the location of the site.

The Project is operated under the conditions of development consent DA80/10060 (Mt Piper Consent). The Mt Piper Consent was originally granted under the *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act) on 1 April 1982 and has since been modified on eight occasions. The Mt Piper Consent, as currently modified (Modification 8, dated 24 July 2019), authorises the MPPS and ancillary activities, including the Mt Piper Ash Repository (MPAR).

This AEMR has been developed in relation to water management and monitoring aspects of the Project in order to satisfy Conditions 44 and 45 of the Mt Piper Consent, and relevant reporting requirements of the Water Management and Monitoring Plan approved for the Project and dated 28 February 2020 (the WMP). This AEMR reports on the water monitoring carried out for the Project from July 2020 to June 2021 (the reporting period) in accordance with the conditions of the Mt Piper Consent. This AEMR will be provided to the Secretary, the NSW Environment Protection Authority (EPA), the Water Division within the NSW Department of Planning, Industry and Environment (DPIE), WaterNSW, and Lithgow City Council (LCC). Appendix A presents a summary of the relevant aspects of this AEMR as required under the Mt Piper Consent and the WMP.

This report should be read in conjunction with the Statement of Limitations presented in Section 10.

1.1 Project Background

The MPPS is located in the western coalfields of NSW about 18 kilometres northwest of Lithgow. The MPPS is owned and operated by EnergyAustralia. The MPPS is regulated by a number of separate development consents and planning approvals under the EP&A Act, including the Mt Piper Consent. The MPPS is also regulated under the conditions of Environment Protection Licence 13007 (EPL) granted under the *Protection of the Environment Operations Act 1997 (NSW)* (the POEO Act). Table 1 lists the approvals which apply to the Project and form the subject of this AEMR.

Table 1: Summary of Approvals

Approval/ Licence	Details/Comments
Mt Piper Consent	Granted by Minister for Planning under the EP&A Act as currently modified The WMP was approved under the conditions of the Mt Piper Consent
EPL No. 13007	EPL held by EnergyAustralia for the MPPS, including the Project.

The Project incorporates brine management and storage facilities on the footprint of the MPPS and the ash emplacement area within the former Western Main Open Cut void adjacent to the operational power generation area. The ash placement area is comprised of the MPAR, which is authorised under the Mt Piper Consent, and the separately approved Lamberts North Ash Repository (LNAR). The MPAR and the LNAR are together referred to as the Ash Repositories. However, this AEMR is limited to the MPAR which was approved under the Mt Piper Consent.

The separately approved Springvale Water Treatment Project (SWTP) is also located on the MPPS footprint but outside of the EPL premises. Both the SWTP and the MPPS contribute brine to the MPAR. The SWTP also contributes solid mixed salts to the MPAR. Key features of the Project area are presented in Figure 2.

The Mt Piper Consent was modified on 3 April 2000 to authorise the co-placement of brine conditioned ash (BCA) in the existing MPAR placement area. This Stage 1 BCA co-placement activity was approved as Modification 4 to the Mt Piper Consent. As required by the conditions imposed as part of Modification 4, an early Water Management Plan was developed and implemented. Due to space limitations in the Stage 1 approval area and to provide for increased brine production due to the upgrade of generating capacity (authorised as Modification 6 to the Mt Piper Consent), a Stage 2 extension to the BCA co-placement area at the MPAR was approved on 23 March 2008 (authorised as Modification 7 to the Mt Piper Consent). A Water Management Plan (*Mt Piper Power Station Brine Conditioned Flyash Co-Placement Extension Water Management and Monitoring Plan* prepared by Connell Wagner and dated 26 September 2008) was prepared and implemented under the conditions of the Mt Piper Consent for the MPAR. This is referred to in this report as the “Prior WMP.”

Following the approval of Modification 8 to the Mt Piper Consent (Condition 43A), the Prior WMP was updated to account for construction and operation of a new 60 ML pond (Settling Pond D) at the MPPS. The current WMP was prepared by ERM and is dated 28 February 2020 (ERM, 2020) (the WMP).

It is noted that a separate and broader investigation of surface and groundwater conditions in the vicinity of the Ash Repositories, including the Mt Piper Brine in Ash Co-Placement area is currently being completed in line with the contingency measures identified in the WMP (the independent assessment). Once the independent assessment is completed, the WMP will be further updated to reflect the key findings and provide further detail on the contingency measures proposed.

1.1.1 Relationship to Other Approvals and Plans

While the MPAR is approved under the Mt Piper Consent, the LNAR is separately approved by project approval 09_0186 granted under Part 3A of the EP&A Act on 16 February 2012 (LNAR Project Approval). The conditions of the LNAR Project Approval require:

- implementation of a separately approved Operational Environmental Management Plan. The currently approved plan is the *Lamberts North Ash Placement Project Operational Environmental Management Plan 2019* prepared by CDM Smith in 2013 and last revised by EnergyAustralia on 2 September 2019 (LNAR Operations Environment Management Plan (OEMP)). The LNAR OEMP includes a Groundwater Management Plan and a Surface Water Management Plan; and
- the carrying out of groundwater and surface water monitoring programs as specified in the LNAR OEMP. The results of the LNAR monitoring are reported in a separate AEMR prepared in accordance with the conditions of the LNAR Project Approval.

As the LNAR is operated in accordance with the separately approved LNAR OEMP under the conditions of the LNAR Project Approval, this AEMR does not cover water management, monitoring and reporting aspects required under the LNAR OEMP.

In addition, the SWTP was separately approved under development consent number SSD-7592 (SWTP Consent) granted under the EP&A Act in 2017.

1.2 Objectives

The objectives of the AEMR are to meet the reporting requirements of the Mt Piper Consent and the WMP for the reporting period.

This includes the requirements of Condition 45 of the Mt Piper Consent which requires that the AEMR include:

- a summary and discussion of all available results and analyses from Water Monitoring Programs (i.e. those contained in the WMP);
- a discussion of the aims of the WMP and to what degree these aims have been attained in the context of results and analyses of the Water Monitoring Programs; and
- actions taken, or intended to be taken, if any, to mitigate any adverse environmental impacts; and to meet the reasonable requirements of the Secretary, EPA, DPIE Water, WaterNSW or the LCC.

The WMP provides that the AEMR is to involve the following scope of works:

- review of surface water and groundwater quality data;
- review of long-term trends in surface water and groundwater concentrations, with reference to statistical assessment of concentration trends and triggers;
- assessment of the data to evaluate potential interactions with the Wangcol Creek water quality[1];
- reporting when the Environmental Goals have not been achieved;
- an interpretation and discussion of results;
- update on the contingency measures currently being implemented in accordance with the WMP; and
- preparation of this report in accordance with the WMP and the Mt Piper Consent.

It is noted that other reporting requirements, including provision of water quality data, form part of the EPL annual return reporting process, with the data also published online as required by regulation. The reporting requirements under the EPL will be provided separately to this AEMR.

1.3 Contacts

The contact details for the key personnel responsible for the environmental management of the Project are listed in Table 2.

Table 2: Contact Details

Contact Person	Organisation	Position	Telephone
Mr Ben Eastwood	EnergyAustralia	NSW Environment Leader	(02) 6354 8111

1.4 Scope of Works

In order to meet the objectives of the AEMR, the following works have been implemented:

- importation of environmental monitoring data provided by EnergyAustralia to the existing ESDAT database for the site;
- export of summary tables for all available water quality and weather data collected by EnergyAustralia from the monitoring conducted in accordance with the WMP;

---

[1] Note: Wangcol Creek is referred to as "Neubecks Creek" in the WMP and some documents relating to the Project. However, WaterNSW has clarified that the creek is properly called "Wangcol Creek". Accordingly, this AEMR refers to the creek as Wangcol Creek.

- export of graphs of selected data collected by EnergyAustralia from the monitoring conducted in accordance with the WMP;
- review of surface water (seven locations), groundwater (25 locations) and leak detection (two locations) monitoring data at the Project area for the reporting period;
- review of changes in water quality data including long-term trends in surface water and groundwater concentrations and water levels;
- assessment of the groundwater data to evaluate potential interactions with Wangcol Creek water quality; and
- preparation of this AEMR to:
  - present an overview of Project operations, including ash placement activities;
  - present findings of the water quality monitoring, including interpretation and discussion of results, in accordance with the WMP;
  - present outcomes of the statistical assessment of water quality data that exceeded Environmental Goals during the reporting period, including a discussion of trigger, action, response plans (TARPs) where implemented;
  - provide an update on the contingency measures currently being implemented at the site in accordance with the WMP; and
  - provide a summary of recommended actions to be taken, if any, to mitigate adverse environmental impacts, and to meet the requirements of the relevant government authorities and the WMP.

This AEMR has been developed with consideration of the ongoing independent assessment of groundwater and surface water conditions in the vicinity of both the MPAR and the LNAR (the independent assessment). Refer to Section 7.5 for further details.

2. OPERATIONS SUMMARY

All ash placement operations for MPPS, including those within the Project area, are undertaken by the contracted specialist in ash placement. Lend Lease Infrastructure (LLI) is the current service provider for EnergyAustralia in all aspects of ash and dust management in relation to the Project, which is currently managed under an 'operate and maintain' contract with EnergyAustralia. Refer to Figure 2 for a site layout plan that present key features of the Project area.

2.1 Site Water Discharge

During the reporting period, discharge from the Coal Settling Pond (CSP) via the Licenced Discharge Point (LDP01) (now known as LDP12 under the recently revised EPL but referred to as LDP01 in this report for consistency with the WMP) was estimated to be approximately 77 Mega Litres (ML). A data summary for LDP01 is presented in this AEMR as the discharges from LDP01 report to the Final Holding Pond (FHP), and downstream to Licenced Monitoring Point (LMP01) which is located on Wangcol Creek, downstream of the FHP. Both LDP01 and LMP01 are included as monitoring points in the WMP. Figure 2 presents the locations of the CSP and the FHP. Figure 5 presents the locations of LDP01 and monitoring point LMP01.

LMP01 was historically referred to as LDP01 within the EPL and used as the upstream monitoring location for the MPAR and the LDP for the MPPS. The LDP was transferred to LDP01 at the CSP as part of the EPL variation 1569404 in January 2019. Records of discharge flow at LDP01 during the reporting period are provided in Appendix B.

2.2 Ash Placement and Geometry

The MPAR is located within the former Western Main Open Cut mine void in the eastern area of the MPPS facility, which is discussed further in Section 3.2.

The MPPS commenced operations in 1993 and since that time water conditioned ash (WCA) has been placed at the MPAR. WCA and BCA have been placed at the MPAR since 2000, with placement of BCA limited to approved areas, as described below. In accordance with the WMP, the conditioning of the ash occurs at the MPPS, and the conditioned ash is then transferred via conveyors or trucks to the MPAR for placement.

The MPAR has approval for development up to a Relative Level (RL) of 980 m Australian Height Datum (AHD), with the upper surface of the ash to be finished with 1 m of WCA, following the contours of the placement plan approved by the LCC in 1990, as replicated in Figure 3. Further, condition 38A of the Mt Piper Consent requires that the placement of BCA may only occur between the levels of RL 946 m AHD and RL 980 m AHD in approved BCA placement areas (Stage 1 and Stage 2 approval areas). Refer to Figure 2 and Figure 3 for representation of the approved MPAR placement area and schematic of external batter placement.

With reference to Appendix C and Figure 4, BCA continued to be deposited across Stage 1 and Stage 2 approval areas for the Project over the reporting period. Based on information supplied by EnergyAustralia, a total of 415,996 tonnes of BCA was placed in the MPAR over the reporting period. Refer to Table 3 for a summary of the Project operations for the reporting period, with comparison to the previous reporting period.

Table 3: Operations Summary for the Project

Activity	Previous Reporting Period (2019-2020)	Current Reporting Period (2020-2021)
Ash delivered (T)	460,942[1]	673,885[2]
WCA placed (T)	0	100,343[1]; 257,889[2]
BCA placed (T)[1]	460,942	415,996
Total ash footprint (ha)	74.22[2]	57.45[1]
Area of repository capped (ha)[2]	42.65	42.65

1 Refers to MPAR only

2 Refers to MPAR and LNAR combined

T – tonnes, ha - hectares

2.3 Brine Composition

Brine from MPPS is derived from the evaporative cooling process in the cooling towers. As water evaporates from the cooling towers, the concentration of salts contained in the circulating water increases, which would eventually impact upon the operation of the cooling system. A portion of the salty water is therefore regularly blown down and replaced with fresh “make up” water.

In addition, the separately approved SWTP also produces brine from the treatment of mine water from dewatering facilities related to mining operation is the region (Figure 1). The separately approved brine and solid mixed salts from the SWTP is integrated with the MPPS water management system and brine from the SWTP is transferred to the MPPS for use in conditioning ash prior to emplacement in the MPAR.

During the reporting period, blowdown water from the cooling towers was transferred to the Mine Water Buffer Pond for treatment by the SWTP or to the EnergyAustralia Reverse Osmosis (RO) brine concentrators and micro filtration (MF) infrastructure. The EnergyAustralia RO and MF system removes salts from the cooling water system, and recycles distillate back into the cooling water cycle. The SWTP brine crystalliser system produces a mixed salt and a dewatered lime salt. Both the EnergyAustralia RO and MF system and the SWTP transfer the brine stream to Brine Waste Pond A and Brine Waste Pond B for temporary storage. This brine is used to condition the fly ash that is placed in approved BCA placement areas.

Monitoring of the brine over time has shown that the concentration of salts in the brine increased between 1999 and 2003-2006 and decreased between 2003-2006 and 2017. The concentration of salts in the brine further decreased between 2017 and 2019/20. Since then, average concentrations in the brine have generally remained stable (within the same order of magnitude) during the current reporting period for the following parameters:

- alkalinity concentrations in the brine increased from an average of 976 mg/L in 2017 to 14,735 mg/L in 2019/20 and have remained stable at 6,067 mg/L in the reporting period;
- silver concentrations decreased from 10 µg/L in 2017 to <1 µg/L in both 2019/20 and the current reporting period;
- chromium concentrations decreased from 1,050 µg/L in 2017 to 50 µg/L in 2019/20 and have remained stable at 40.4 µg/L in the reporting period; and
- iron concentrations decreased from 1,580 µg/L in 2017 to 151 µg/L in 2019/20 and have remained stable at 340 µg/L in the current reporting period.

A summary of the changes in brine composition is provided in Appendix D. Notable changes in average brine constituents from 2019/20 to the reporting period (July 2020 to June 2021) are listed below:

- barium concentrations decreased from 1,000 µg/L in 2017 to 6.43 µg/L in 2019/20, but increased again to 116 µg/L in the current reporting period (order of magnitude increase);
- boron concentrations in the brine decreased from an average of 35,800 µg/L in 2017 and 41,500 µg/L in 2019/20 to 9,570 µg/L in the reporting period (77% decrease);
- manganese concentrations in the brine decreased from an average of 7,210 µg/L in 2017 and 5,170 µg/L in 2019/20 to 231 µg/L in the reporting period (95% decrease); and
- nickel concentrations in the brine decreased from an average of 3,880 µg/L in 2017 to 348 µg/L in 2019/20, but increased again to 1,570 µg/L in the current reporting period.

The changing brine composition may be related to the changed source of water being treated (e.g. with inputs from the SWTP) and also the treatment process at the SWTP which may result in a higher proportion of compounds being removed as solid phase. In addition, ERM understands that further concentration of the brine has been occurring over the reporting period via additional treatment through the EnergyAustralia RO and MF system. This has been implemented as a means of minimising the volume of brine requiring co-placement at the MPAR. Brine composition data has been used to inform the surface water and groundwater results discussions below.

3. ENVIRONMENTAL SETTING

Details of the environmental site setting are presented in the following sections to provide context to the surface water and groundwater assessments presented below.

3.1 Climate

The climate data below was provided by EnergyAustralia and is sourced from a weather station on site at MPPS (see Figure 2). A summary of the climate data is presented in Table 4 and a copy of the data is presented in Appendix E.

Table 4: Local Climate Data for 2020/2021

Month	Rainfall Total (mm)	Min. Temperature (°C)	Max. Temperature (°C)
July 2020	5.7	-4	14
August 2020	8.1	-5	18
September 2020	4.5	-2	22
October 2020	73.8	1	25
November 2020	5.0	4	33
December 2020	86.6	4	35
January 2021	101.1	7	33
February 2021	77.4	9	27
March 2021	165.4	4	28
April 2021	1.0	-1	27
May 2021	22.1	-4	20
June 2021	56.3	-3	16
TOTAL / MIN / MAX	**607**	**-5**	**35**

Data from MPPS Weather Station provided by EnergyAustralia

The total rainfall for the reporting period was 607 mm. This is slightly higher than the total reported rainfall of 513.1 mm for 2019/20 (ERM, 2020a), but is lower than the average annual rainfall between 2012 and 2017, which was reported by Aurecon (2017) to be 756.5 mm/year.

The 2020/21 reporting period was characterised by higher than average rainfall which occurred generally between December 2020 and March 2021. This high rainfall period broke the period of relative drought experienced at the site, and more broadly within NSW, between 2017 and 2020.

3.2 Geology and Hydrogeology

The site is located on the western margin of the Sydney Basin, and the geology is characterised by eastward dipping sedimentary deposits. The sedimentary deposits extend approximately 130 km east towards the NSW coast. Structurally, the western margin of the Sydney Basin is not complex, and no significant faulting or folding structures are present in the region surrounding the site (CDM Smith, 2012).

The site is located at an outcrop of the Illawarra Coal Measures, which have been mined throughout the region. The Narrabeen Group, comprised of sandstones, overlies the Illawarra Coal Measures in the vicinity of the site, forming the surrounding hillsides. The Illawarra Coal Measures host the coal seams that were previously mined out in the vicinity of the site, and overlie the Shoalhaven Group. Some characteristics of these units are listed in Table 5.

Table 5: Local Geological Units

Narrabeen Group	Illawarra Coal Measures	Shoalhaven Group
■ Sandstones, shale and claystone. ■ Up to approximately 800 m thick in parts, although generally absent in the immediate vicinity of the Ash Repositories. ■ Deposition in estuarine/alluvial, fluvial, and fluvial-deltaic environments. ■ Unconformably overlies Illawarra Coal Measures (Danis et al., 2011).	■ Interbedded shale, sandstone, conglomerate, and coal. ■ Dips 1-2 degrees to the east. ■ Outcrops extensively just east of Portland, exposing the Lidsdale and Lithgow coal seams (refer Section 2.3.2) close to the surface with approximately 15-20 m of sandstone overburden (CDM Smith, 2012).	■ Siltstones, lithic sandstones and conglomerate. ■ Marine sediments. ■ Berry Siltstone / Formation (earlier) & Snapper Point Formation (later). ■ Contains sulfide-bearing material and is acid generating in places where exposed via rock cuttings (SKM, 2010).

Groundwater beneath the site is present within the Illawarra Coal Measures, with a regional groundwater flow direction generally to the east in the vicinity of the site (see Figure 6a to Figure 6b). The natural stratigraphy of the Illawarra Coal Measures in the vicinity of the site is generally as follows:

- Bunnyong Sandstone (Long Swamp Formation) – massive sandstone;
- Lidsdale Coal Seam – interbedded high ash coal and shale;
- Blackmans Flat Conglomerate – coarse sandstone and conglomerate;
- Lithgow Coal Seam; and
- Marrangaroo Conglomerate – massive sandstone and conglomerate.

Prior to the placement of ash in the former Western Main Open Cut mine void (now occupied by the MPAR), the bottom of the mine void was covered with mine spoil to a minimum level of 908 m AHD. This was to facilitate groundwater flow from the adjacent areas of the unmined Lithgow coal seam aquifer and mine goaf areas surrounding the Western Main Open Cut mine void (Connell Wagner, 2007). The background groundwater level (water table elevation) prior to the filling of the mine voids and placement of ash was reported to be approximately 910 m AHD.

Historically, groundwater seepage from beneath the MPAR was collected in the Groundwater Collection Basin that was previously located to the east of MPAR (SKM, 2010). In 2012, this basin was filled in with mine spoil and compacted as part of the construction of the adjacent LNAR; the footprint of the former Groundwater Collection Basin is located beneath the LNAR (refer to Figure 2).

The area surrounding the Ash Repositories is characterised by former open cut and below ground coal mining. The below ground mined out areas are variably filled in with goaf, or in some areas remain as voids. Former open cut mines remain as ponds, including within the alignment of Wangcol Creek to the north of MPAR, or have been filled in.

Long term groundwater monitoring at the site indicates that the water table occurs variably in the former below ground mined out areas and open cuts and, away from the Ash Repositories, predominantly in the overlying Bunnyong Sandstone. The water table elevation ranges from approximately 903 m AHD to the southeast up to 918 m AHD to the northeast of the Ash Repositories (refer Figure 6a and Figure 6b). Perched water is present in the southern part of the MPAR.

3.3 Hydrology

The Project site is within the catchment of Wangcol Creek, a tributary of the Coxs River. The site itself sits on the eastern edge of the Great Dividing Range and includes the headwaters of Wangcol Creek.

Locally, Wangcol Creek is present to the north and north-east of the MPAR, approximately 250 m from the active ash placement area at its closest point. Wangcol Creek flows to the east and southeast, and joins the Coxs River approximately 3.2 km east of the site.

Clean water diversion structures divert surface waters around the operational areas of the MPPS, where possible (see Figure 2). Storm water that falls within the operational area of the MPPS is directed to water management and storage infrastructure for use at the Project site.

4. WATER MONITORING AND MANAGEMENT PLAN

The aim of the WMP is to minimise the effect of the placement of ash placement on local natural surface waters and groundwater. The WMP addresses water cycle management associated with the Project. It includes a surface water and groundwater water monitoring program, a requirement for an annual water quality report, and associated TARPs, contingency and strategies for brine reduction as appropriate for the reporting period.

The WMP approved under the Mt Piper Consent outlines the following key elements:

- A water cycle management plan describing the management of surface water run off at the ash repository;
- Brine cycle management including brine minimisation strategies and future mine disposal strategies;
- Water cycle management including the potential uses of multipurpose lined water storages present at the MPPS; and
- Water monitoring program, including surface water and groundwater monitoring, and the Environmental Goals to be adopted.

4.1 Environmental Goals

The Environmental Goals for groundwater and surface water monitoring in the WMP are consistent with those applied to monitoring of the LNAR, as approved in the LNAR OEMP. The Environmental Goals were developed by Aurecon (2009) to account for hardness corrected guideline values, and were presented by CDM Smith (2013).

The Environmental Goals utilise the 95% ecosystem protection values, stock watering, irrigation water or drinking water values based on the Australian and New Zealand Guidelines (ANZG, 2018) water quality guidelines (formerly Australia and New Zealand Environment Conservation Council, ANZECC, 2000), in combination with 90th percentile pre-brine placement local environmental (groundwater/surface water) data, whichever is greater. The local guideline values incorporated into the Environmental Goals are based upon the 90th percentile pre-ash placement water quality results, as measured at surface water quality point WX22 (for surface water) or the former Groundwater Collection Basin (for groundwater).

It is noted that, where the Environmental Goals for groundwater are based on the ANZG (2018) water quality guidelines, these guidelines are applicable to receiving waters and not to groundwater. However, they form an appropriate basis for undertaking a conservative initial screening assessment.

The Environmental Goals adopted for this assessment are presented with the surface water and groundwater data in Appendix F and Appendix G respectively.

5. SURFACE WATER ASSESSMENT

5.1 Objective

The objective of the surface water monitoring program is to identify water quality changes at an early stage so that potential causes can be investigated and, if necessary, effects mitigated. The surface water data is compared between locations and also to the established Environmental Goals to assess changes in water quality and to assess whether the TARPs or contingency measures should be considered and/or implemented.

5.2 Surface Water Monitoring Locations and Frequency

A summary of the surface water monitoring site locations under the WMP is described in Table 6 and presented on Figure 5.

Table 6: Surface Water Monitoring Locations

Site ID	Position	Location Description	Frequency	No. of Samples
LDP01	Upstream	Monitors the storm water in the CSP and discharge from the CSP. It is also described as LDP12 under EPL #13007. Sampling of the CSP is conducted routinely at times when discharge is not occurring. These samples are differentiated as LDP01_CSP (not discharging) and LDP01 (when discharge is occurring).	As required during discharge[1]	58 (LDP01_CSP) 12 (LDP01)
LMP01	Upstream	This monitoring point is located north-west of the MPAR. It is located in an upstream position relative to the Ash Repositories and is the location where flow from the headwaters of Wangcol Creek flow out from the MPPS operational area, downstream of the FHP.	Quarterly	35
NC01	Mid-stream	Located midstream in the monitored area of Wangcol Creek, upstream to the Ash Repositories.	Monthly	11
SW_C	Mid-stream	Located within Wangcol Creek, the monitoring location is located midstream in the monitored area of Wangcol Creek and near groundwater monitoring well D107.	Quarterly	12
SW_E	Mid-stream	Located within Wangcol Creek, downstream of former open cuts "Area D" and "Area E."	Quarterly	12
WX22 / SW_F	Downstream	Located in Wangcol Creek at a stream gauge to the east/down-stream of the Ash Repositories. Also WaterNSW monitoring point 212055.	Monthly	12
SW_G	Downstream	Located within the downstream portion of Wangcol Creek, and downstream of WX22, within a former open cut mine working.	Quarterly	12

[1] *Selected field parameters monitored more regularly*

It is noted that monitoring location NC01 missed one scheduled sampling event in August 2020 during the reporting period. Although surface water from WX22 was sampled 12 times, there were two sampling events completed in November 2020 and the July 2020 sampling event was not completed. The surface water schedule has been impacted by scheduling constraints associated with COVID-19, and the frequency of sampling conducted during the reporting period is considered adequate.

5.3 Surface Water Monitoring Methodology

Surface water quality monitoring was undertaken by Nalco Water – Ecolab (Nalco) on behalf of EnergyAustralia. Details regarding the Nalco sampling method and quality assurance and quality control (QA/QC) program are presented in Appendix M.

5.4 Surface Water Quality Dataset

Surface water samples were obtained by Nalco for field and/or laboratory analysis in accordance with the following monitoring and analysis schedule, as outlined within the WMP:

- electrical conductivity (EC - µS/cm, field measured);
- pH (field measured);
- Total Dissolved Solids (TDS);
- cations and anions (calcium, chloride, fluoride, potassium, sodium, sulfate) (i.e. major and minor ions);
- alkalinity (total alkalinity, bicarbonate alkalinity, phenolphthalein alkalinity);
- total and dissolved metals (aluminium, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, silver, zinc) – field filtered at 0.45 µm for dissolved analysis;
- non-filterable residue (NFR, turbidity, or Total Suspended Solids – TSS);
- total phosphorus; and
- nitrogen, nitrate, nitrite, total kjeldahl nitrogen (TKN).

The trace metals in surface water samples were reported as both total (unfiltered) and dissolved (filtered) samples, except for beryllium and mercury, which were reported as total sample concentrations only.

Evidence of the collection of field QC samples (i.e. rinsate, trip blanks or trip spikes) during the field based programs was not provided. Results of laboratory QC measures including laboratory duplicate, triplicate, internal duplicates, method blanks or spike data were also not presented for review during compilation of this AEMR.

The TSS data for 24 May 2021 at LDP01 was negative in the data set provided by EnergyAustralia and appears to be an erroneous data point.

5.5 Surface Water Results

The surface water field and analytical results obtained for the reporting period are presented alongside the Environmental Goals for surface water in Appendix F and Figure 7. Trend graphs for selected analytes (boron, chloride, manganese, nickel, sulfate and TDS), considered to be indicators of potential changing conditions resulting from the Project, are provided in Appendix I.

5.5.1 Upstream Monitoring Results

Locations LMP01 and LDP01 are considered to be representative of upstream conditions relative to the MPAR in the monitored area of Wangcol Creek.

LDP01 is the licenced discharge point for the MPPS under EPL 13007. The licenced discharge point is located at the CSP, which is a sediment basin for the coal stockpile area. Samples from the CSP are routinely collected prior to discharge events (these are presented as LDP01-CSP). Consequently, the data reported as LDP01-CSP does not represent water quality of the discharge event. Discharge via LDP01 occurs as required following confirmation by laboratory analysis that the water quality is within the approved EPL discharge limits. Samples are collected of the discharge from LDP01 and these are presented as LDP01.

Discharge from LDP01 enters the western clean water drain, which is part of the upstream Wangcol Creek catchment, before flowing into the FHP. The FHP holds storm water from the clean water diversions from around the MPPS, and can be closed in the event of an environmental incident to limit the likelihood of adverse impacts to the downstream surface water environment. The FHP was constructed within Wangcol Creek and it operates as the final pollution control structure before water reaches the “off premises” portion of Wangcol Creek. LMP01 is the sampling location downstream of the FHP.

LDP01 and LMP01 are located upstream of the MPAR and water quality at these locations is not considered to be influenced by activities at the Ash Repositories. However, other aspects of the Project (e.g. brine transfer pipelines and brine waste holding ponds) are located within the catchment upstream of these sampling locations.

Only data for LDP01 (i.e. when discharging) is presented in the following written sections of this report and in Figure 7. Data from both LDP01 and LDP01-CSP (i.e. not discharging) is presented in Appendix F, however assessment of trends and statistical assessment of LDP01 and LDP01-CSP have not been conducted as these locations are not considered to be representative of in-stream conditions. Assessment of trends at LMP01, which receives flow from LDP01, has been conducted as it is considered most appropriate for assessment of potential impacts from the Project on the upstream section of Wangcol Creek.

5.5.1.1 Field Parameters

Field parameters monitored at LMP01 and LDP01 for the reporting period are summarised as follows:

- pH values (field measured) of surface water samples from LMP01 were 7.17 to 9.4. The pH at LMP01 was outside of the range (more alkaline) of the Environmental Goal (6.5 – 8) during some sampling events in July, August, October, January, February, March, April and June of the reporting period. LDP01 pH values were 7.07 to 7.95, all within the range of the Environmental Goal; and
- Field EC values obtained from LMP01 were 160 µS/cm to 568 µS/cm and field EC values from LDP01 were between 307 µS/cm and 492 µS/cm. The reported EC values were generally consistent with TDS concentrations (where reported) and all field EC and laboratory TDS values were below the Environmental Goals for surface water.

5.5.1.2 Major and Minor Ions

Throughout the reporting period, reported concentrations of major ions for which there are Environmental Goals (chloride, fluoride, and sulfate) at LMP01 and LDP01 were below the relevant Environmental Goals for surface water.

Trend graphs for LMP01 show fluctuations of sulfate and chloride over time however the concentrations appear steady and generally within the historical range. High sulfate and chloride results relative to the historical dataset were reported intermittently from July 2019 to January 2020. The spike in concentrations was attributed to brine leak events which occurred in 2019/20 (ERM, 2020a); these were notified to the EPA and rectified.

5.5.1.3 Metals

Throughout the reporting period copper, iron, molybdenum, nickel and selenium were identified on one or more occasions at concentrations above the relevant Environmental Goals for surface water at LMP01 or LDP01 as presented in Appendix F, and summarised in Figure 7.

Silver concentrations were reported below the limit of reporting (of <1 µg/L) for the entire reporting period at both LMP01 and LDP01; however, the limit of reporting exceeds the Environmental Goal for surface water of 0.05 µg/L. Based on the results of previous monitoring, including concentrations of silver in brine (<1 µg/L during 2019/20 and the current reporting period) and groundwater, silver is not considered to represent a constituent of concern for monitoring in accordance with the WMP.

Trend graphs for LMP01 show fluctuations of boron, manganese and nickel over time; the concentrations appear steady and generally within the historical range. Concentrations of boron and manganese were below the Environmental Goals for surface water during the current reporting period.

5.5.2 *Midstream Monitoring Results*

Locations NC01, SW_C and SW_E are considered to represent midstream conditions relative to the MPAR in the monitored area of Wangcol Creek.

Locations NC01 and SW_C are located north of the MPAR along an area of Wangcol Creek that is not known to have been subject to open cut mining operations. SW_E is located further downstream of NC01 and SW_C, to the east of the MPAR and immediately downstream from an area of Wangcol Creek that was historically subject to open cut mining activities.

The surface water field and analytical results obtained from sample points NC01, SW_C and SW_E, for the reporting period are presented in Appendix F, and summarised in Figure 7.

A brief discussion of results is presented in the following subsections.

5.5.2.1 Field Parameters

Field parameters monitored at NC01, SW_C and SW_E for the reporting period are summarised as follows:

- pH (field) values were 6.56 to 7.82, with no results reported outside of the Environmental Goal range for surface water;
- Field EC values reported at NC01, SW_C and SW_E ranged from 146 µS/cm to 590 µS/cm, and field EC values were generally consistent with laboratory TDS results, with no results reported outside of the Environmental Goals for either EC or TDS;
- Trend graphs show TDS concentrations at NC01 and SW_C have remained low and stable. TDS at SW_E showed a spike in concentrations during the 2019/20 reporting period, but TDS concentrations subsequently returned to within the historical range and did not exceed the Environmental Goal in the current reporting period; and
- EC and TDS values at SW_E were generally higher compared to those at NC01 and SW_C.

5.5.2.2 Major and Minor Ions

Throughout the reporting period, major and minor ions including chloride, fluoride, and sulfate were reported at NC01, SW_C and SW_E at concentrations that were below the Environmental Goals for surface water.

Trend graphs for chloride and sulfate are consistent with TDS, and show chloride and sulfate concentrations at NC01 and SW_C have remained low and stable. Consistent with increased TDS and EC values, concentrations of chloride and sulfate in surface water from SW_E spiked during 2019/20, but have returned to concentrations below the Environmental Goals during the current reporting period.

Consistent with EC and TDS, the major ion concentrations at SW_E were generally higher compared to those at NC01 and SW_C.

5.5.2.3 Metals

Throughout the reporting period iron and nickel were identified on one or more occasions at concentrations above the relevant Environmental Goals for surface water at NC01, SW_C and SW_E as presented in Appendix F, and summarised in Figure 7. Consistent with major ion concentrations and TDS and EC values, the nickel concentrations are higher at SW_E, and SW_E accounts for all nickel exceedances from the midstream monitoring locations. Exceedances of total iron were reported at all midstream locations, but filtered iron only exceeded the Environmental Goals at SW_E.

Trend graphs for boron, manganese and nickel are consistent with TDS, and show concentrations of these selected metals at NC01 and SW_C have remained low and stable. Boron, manganese and nickel at SW_E spiked during the 2019/20 reporting period, but decreased to within the historical range during the current reporting period, although nickel concentrations remain above the Environmental Goals for surface water.

5.5.3 Downstream Monitoring Results

Locations WX22 (SW_F) and SW_G are considered to be downstream conditions relative to the MPAR in the monitored area of Wangcol Creek.

Both WX22 and SW_G are located east of the MPAR along an area of Wangcol Creek that is downstream of and, in the case of SW_G, has been subject to open cut mining operations.

The surface water field and analytical results obtained from sample points WX22 (SW_F) and SW_G for the reporting period are presented in Appendix F, and summarised in Figure 7.

A brief discussion of results is presented in the following subsections.

5.5.3.1 Field Parameters

Field parameters monitored at WX22 and SW_G for the reporting period are summarised as follows:

- Field pH values ranged from 6.72 to 7.58 and were within the Environmental Goal range for pH in surface water;
- Field measured EC values ranged from 211 µS/cm to 930 µS/cm and were generally consistent with laboratory determined TDS values. EC and TDS were reported below the respective Environmental Goals for surface water at both locations during the reporting period; and
- Trend graphs for WX22 and SW_G show TDS has fluctuated over time. Concentrations of TDS typically increase during summer months, with TDS exceeding the Environmental Goal for surface water at WX22 during February 2014, February 2018 and most recently in January 2020. The trends at SW_G are similar to those described for WX22; however, monitoring data at SW_G has only been collected since May 2018. TDS remained below the Environmental Goal for surface water during the current reporting period.

5.5.3.2 Major and Minor Ions

Throughout the reporting period, concentrations of cations and anions including chloride, fluoride, and sulfate were reported at WX22 and SW_G at concentrations that were below the relevant Environmental Goals.

Trend graphs for WX22 and SW_G show chloride and sulfate concentrations have fluctuated over time and are consistent with TDS trends (i.e. typically increase during summer months). As per TDS concentrations, chloride and sulfate concentrations were highest during February 2014, February 2018 and January 2020 (in the 2019/20 reporting period), but concentrations of both analytes remained below the Environmental Goals during the current reporting period.

5.5.3.3 Metals

Throughout the reporting period, iron and nickel were identified on one or more occasions at concentrations above the Environmental Goal for surface water at WX22 or SW_G, as presented in Appendix F, and summarised in Figure 7.

Trend graphs for WX22 and SW_G show boron, manganese and nickel concentrations have fluctuated over time and are generally consistent with TDS trends (i.e. concentrations of these selected metals typically increase during summer months). Boron and manganese concentrations were reported below the Environmental Goal for surface water during the current reporting period. Concentrations of nickel fluctuate and exceeded the Environmental Goal periodically throughout the reporting period.

5.6 Summary

Copper, iron, molybdenum, nickel and selenium and pH results were reported to exceed the relevant Environmental Goals for surface water at upstream monitoring locations (LDP01 and LMP01) at times during the reporting period.

However, with the exception of iron concentrations, results from midstream monitoring locations NC01 and SW_C were typically below the Environmental Goals for surface water. Iron concentrations and nickel concentrations were higher and exceeded the Environmental Goals for surface water at midstream monitoring location SW_E. The surface water quality at the midstream locations is improved during the current reporting period, compared to the spikes in concentration that were reported during 2019/20. This may reflect the higher rainfall during the current reporting period compared to 2019/20.

At the downstream monitoring locations (WX22 and SW_G), concentrations of iron and nickel in surface water exceeded the relevant Environmental Goals at times during the reporting period. The concentrations of iron and nickel were similar at the midstream monitoring location SW_E and downstream locations WX22 and SW_G. Compared to the spikes in concentration that were reported during the 2019/20 reporting period, the surface water quality at the downstream locations over the current reporting period is improved. This may reflect the higher rainfall during the current reporting period compared to 2019/20.

Iron concentrations consistently exceeded the Environmental Goals at midstream and downstream monitoring locations, and nickel exceeded the Environmental Goals at and downstream of WX22 during the current reporting period. Iron concentrations are related to background signature of iron in the local environment as a result of the mining history and disturbed geology.

Overall, however, surface water quality has improved in midstream and downstream locations compared to the 2019/20 reporting period, likely due to higher rainfall during the 2020/2021 reporting period. The periodic exceedances of Environmental Goals for pH and selected metals (excluding iron) in upstream surface water were not observed to extend to midstream surface water.

6. GROUNDWATER

6.1 Objective

The objective of the groundwater monitoring program is to identify water quality changes at an early stage so that potential causes can be investigated and, if necessary, effects mitigated. The groundwater data is compared; between locations, to historical data, and to the established Environmental Goals to assess changes in water quality and the extent to which changes may be related to activities associated with the Project.

6.2 Groundwater Monitoring Locations and Frequency

A summary of the groundwater monitoring locations is presented in Table 7 and Figure 5.

Table 7: Groundwater Monitoring Network

Bore ID	Location Description	Screened Material	Frequency	No. of Samples in 2020/21
Within MPAR / mine disturbance area east of MPAR				
B5	Within the MPAR	Fill	Quarterly	0 (blocked)
SW3-D	Within the southeast portion of the MPAR	Fill – clay/silty clay	Quarterly	0 (dry)
MPGM4/D23	Adjacent (south) of the MPAR	Sandstone	Quarterly	0 (damaged)
MPGM4/D10	East (downgradient) of the MPAR, and adjacent to LN Pond 2.	Fill / mine spoil	Quarterly	4
MPGM4/D11	Within the eastern extent of the MPAR.	Fill beneath the ash	Quarterly	2
MPGM4/D19	East (downgradient) of the Ash Repositories	Fill / mine spoil	Quarterly	4
D113	East (downgradient) of the Ash Repositories. Nested (deeper) with D19	Siltstone	Quarterly	4
Within mine disturbance area – south and southeast of MPAR				
MPGM4/D15	South of the Ash Repositories.	Sandstone and/or shale	Quarterly	3
MPGM4/D16	South of the Ash Repositories.	Sandstone and/or shale	Quarterly	4
MPGM4/D17	South of the Ash Repositories.	Sandstone and/or shale	Quarterly	4
MPGM4/D18	South of the Ash Repositories.	Sandstone and/or shale	Quarterly	4
Adjacent MPAR – downgradient				
MPGM4/D1	North-east (downgradient) of the MPAR.	Mudstone, sandstone and coal	Quarterly	4
MPGM4/D9	North-east (downgradient) of the MPAR and adjacent to Wangcol Creek	Alluvial deposits	Quarterly	4

Bore ID	Location Description	Screened Material	Frequency	No. of Samples in 2020/21
D102	North-east (downgradient) of the MPAR and adjacent to Wangcol Creek. Nested (deeper) with D9.	Siltstone	Quarterly	4
D105	East (downgradient) of the MPAR and adjacent Wangcol Creek.	Coal	Quarterly	4
MPGM4/D8	East (downgradient) of the MPAR and adjacent to the northern side of Wangcol Creek.	Alluvial deposits	Quarterly	4
D104	East (downgradient) of the MPAR and adjacent Wangcol Creek.	Sandstone	Quarterly	4
D103	East (downgradient) of the MPAR and adjacent Wangcol Creek.	Coal and/or siltstone	Quarterly	4
MPGM4/D2	East (downgradient) of the MPAR and adjacent Wangcol Creek.	Not known	Quarterly	5
Background and Adjacent MPAR				
MPGM4/D4	Background groundwater monitoring location, north-west (upgradient) of the MPAR.	Fill	Quarterly	5
MPGM4/D5	Background groundwater monitoring location, north-west (upgradient) of the MPAR.	Mudstone/ Sandstone and coal	Quarterly	5
MPGM4/D3	Background groundwater monitoring location, north (cross gradient) of the MPAR.	Sandstone and/or siltstone	Quarterly	4
D107	North (cross gradient) of MPAR and adjacent Wangcol Creek.	Siltstone and/or shale	Quarterly	4
D106	North (cross gradient) of MPAR and adjacent Wangcol Creek.	Weathered sandstone and/or Shale	Quarterly	4
Brine waste pond leak detection bores				
MPGM5/D5	Adjacent (downgradient) Brine Waste Pond A	Not known	Quarterly	5
MPGM5/D6	Adjacent (downgradient) Brine Waste Pond B	Not known	Quarterly	3
MPGM/24 and MPGM/25	Adjacent Settling Pond D (north-west)	Not known	Quarterly	0 (dry)
MPGM/26 and MPGM/27	Adjacent Settling Pond D (south-east)	Not known	Quarterly	0 (dry)

Some bores were sampled and results were reported more frequently than the planned quarterly monitoring. In those cases all data has been adopted in this assessment. Information provided by EnergyAustralia (email 10 September 2021) provided the following clarifications as to why some bores were not sampled as frequently as required. Bores MPGM5/D6 and MPGM4/D15 were not sampled quarterly; during February 2021 MPGM5/D6 did not recharge and no sample could be collected, and for one sampling round access to MPGM4/D15 was blocked due to excavation works.

Bore MPGM4/D11 was only sampled twice; in November 2020 the bore was buried in ash and in April 2021 the top of the extended bore casing was too high to collect a sample. Bores B5, SW3-D and MPGM4/D23 were not sampled during the reporting period because they were blocked (B5), recorded as dry (SW3-D), or damaged and unable to be sampled (MPGM4/D23).

6.3 Groundwater Monitoring Methodology

Groundwater quality monitoring was undertaken by Nalco on behalf of EnergyAustralia. Details regarding the Nalco sampling method and QA/QC program are presented in Appendix M.

6.4 Groundwater Quality Dataset

Nalco collected groundwater samples from 23 groundwater monitoring bores throughout the reporting period. Samples were obtained for field and laboratory analysis in accordance with the following monitoring and analysis schedule:

- depth to water (to m AHD - prior to purging);
- EC (µS/cm, field measured);
- pH (field measured);
- TDS;
- cations and anions (calcium, chloride, fluoride, potassium, sodium, sulfate);
- alkalinity (total alkalinity, bicarbonate alkalinity, phenolphthalein alkalinity); and
- total and dissolved metals (aluminium, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, silver, zinc) – field filtered at 0.45 µm for dissolved metals.

The trace metals in groundwater samples were reported as both total (unfiltered) and dissolved (filtered) samples except for beryllium and mercury, which were reported as total sample concentrations only.

Evidence of the collection of field QC samples (i.e. rinsate, trip blanks or trip spikes) during the field based programs was not provided. Results of laboratory QC measures including laboratory duplicate, triplicate, internal duplicates, method blanks or spike data were also not presented for review during compilation of this AEMR.

The chloride and sulfate concentrations appear to be anomalously low in groundwater from bore D1 during November 2020 compared to the TDS value and the concentrations reported during the remainder of the reporting period. These major ion concentrations may be erroneous, but this is not considered to represent an issue with the overall data interpretation for this bore.

6.5 Groundwater Results

For the purpose of this discussion, the groundwater data review has considered the groundwater monitoring locations (see Figure 5) in five monitoring zones:

- Brine waste pond leak detection bores (MPGM5/D5, MPGM5/D6);
- Bores within MPAR / mine disturbance area east of MPAR (MPGM4/D10, MPGM4/D11, MPGM4/D19, D113);
- Bores within mine disturbance area – south and southeast of MPAR (MPGM4/D15, MPGM4/D16, MPGM4/D17, MPGM4/D18);
- Bores adjacent to MPAR – downgradient (MPGM4/D1, MPGM4/D9, D102, D105, MPGM4/D8, D104, D103, MPGM4/D2); and
- Background bores (MPGM4/D4, MPGM4/D5) and bores adjacent to MPAR – to the north (MPGM4/D3, D107, D106).

Trend graphs for selected analytes (boron, chloride, manganese, nickel, sulfate and TDS) that are considered to be indicators of potential changing conditions resulting from Project activities are provided in Appendix J.

6.5.1 Groundwater Elevations and Inferred Flow Direction

Hydrographs showing groundwater elevations for each bore have been segregated to present graphs for bores in each monitoring zone described above (Appendix H). The hydrographs show that groundwater levels were generally stable during the reporting period, with slight fluctuations in groundwater elevation observed upgradient at bore MPGM4/D5, within the mine disturbance area (bores D16 and D17) and downgradient of MPAR (bores D1, D2 and D9) i.e. generally a lower groundwater elevation in November 2020 and a higher groundwater elevation in April 2021 (after high rainfall and localised flooding in early 2021, Section 3.1). As groundwater elevations were not all measured at the same time, this may influence the observed groundwater level trends.

Based on the data provided by EnergyAustralia, groundwater elevations at bore D11 appear to have decreased by approximately 7 m during the reporting period, from 913.4 m AHD in September 2020 to 906.3 m AHD in June 2021. However, in November 2020, the bore was buried in ash and in April 2021 the top of casing had been extended and was too high to collect a sample from the bore. The apparent decrease in groundwater elevation is therefore considered to be a result of the extended casing (which will need to be re-surveyed) rather than an actual decline in water level.

The groundwater elevation at bore D104 decreased between February and June 2021 by almost 1.5 m, based on the data provided by EnergyAustralia. The elevation of groundwater at bore D11 (including surveying of the top of casing) and bore D104 will continue to be monitored, and trends assessed during the next reporting period.

Consistent with 2019/20 monitoring results, the groundwater elevations at bore D18 fluctuated throughout the reporting period, with a possible correlation to rainfall events. Consistent with data reported during 2019/20, these observations are considered to indicate that the construction of this bore may be compromised.

One groundwater level data point is available for D23 and B5 during the current reporting period, but there was no groundwater level data available for SW3-D. Survey data is not available for bores MPGM5/D5 and MPGM5/D6, so the groundwater levels are reported as metres below top of casing, rather than as groundwater elevations. The presence of water at these locations is not inferred to reflect the regional groundwater table as these bores are installed to approximately 5 m above the water bearing zone targeted by other nearby monitoring bores.

Consistent with previous observations, groundwater elevation contours indicate that regional groundwater flow beneath the MPAR is generally toward the east. The inferred groundwater flow directions have remained relatively consistent throughout the reporting period, as indicated in the seasonal groundwater flow contours presented in Figure 6a and Figure 6b.

6.5.2 Groundwater Quality Upgradient of MPAR (background)

Data obtained from bores MPGM4/D4 and MPGM4/D5 located to the northwest and up hydraulic gradient (background) of the MPAR, are outlined below and compared to the Environmental Goals for groundwater. Bores MPGM4/D4 and MPGM4/D5 are considered to represent background groundwater conditions in the area and, based on their location up hydraulic gradient of MPAR, have not been affected by activities at MPAR. Groundwater monitoring data for the current reporting period is presented in Appendix G, and summarised in Figure 8c. Trend graphs are provided in Appendix J.

6.5.2.1 Field Parameters

Field parameters monitored at these bores for the reporting period are summarised as follows:

- pH values for groundwater from MPGM4/D4 and MPGM4/D5 ranged from 3.39 to 6.05. The pH from bore D4 has been consistently acidic, varying from 3.39 to 3.57 during the reporting period, consistent with the 2019/20 monitoring. Throughout the reporting period the reported pH was generally stable in groundwater from these bores, and consistently lower than the Environmental Goal range for groundwater of 6.5 to 8.0; and
- EC values obtained from field measurements were 750 µS/cm to 1260 µS/cm and remained generally stable throughout the reporting period. TDS values were generally consistent with the field EC. EC and TDS values did not exceed the Environmental Goals for groundwater during the reporting period.

Trend graphs for up gradient (background) bores MPGM4/D4 and MPGM4/D5 show concentrations of TDS in groundwater have been stable and below the Environmental Goal for groundwater through the historical dataset.

6.5.2.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions, including chloride, fluoride, and sulfate were reported for bores MPGM4/D4 and MPGM4/D5. Concentrations were reported below the relevant Environmental Goals for groundwater at both locations throughout the reporting period.

Trend graphs for up gradient (background) bores MPGM4/D4 and MPGM4/D5 show concentrations of chloride and sulfate are consistent with TDS, and have been stable and below the Environmental Goals for groundwater throughout the historical dataset.

6.5.2.3 Metals

Throughout the reporting period arsenic, iron, lead and manganese were identified on one or more occasions at concentrations above the respective Environmental Goal for groundwater at bores MPGM4/D4 and/or MPGM4/D5, as presented in Appendix G and summarised in Figure 8c. Concentrations of metals were generally higher in groundwater from bore MPGM4/D4 (particularly arsenic and lead) when compared to concentrations in groundwater from bore MPGM4/D5. However, manganese concentrations were higher in groundwater from MPGM4/D5 compared to that from MPGM4/D4.

Trend graphs for up gradient (background) bores MPGM4/D4 and MPGM4/D5 show concentrations of boron, manganese and nickel are consistent with TDS values, and have remained stable and below the Environmental Goal for groundwater throughout the historical dataset, with the exception of the consistent exceedances of the Environmental Goal for manganese in groundwater from MPGM4/D5.

6.5.3 Groundwater Quality within MPAR and the Mine Disturbance Area East of MPAR

Data obtained from groundwater bores situated within the MPAR or in the mine disturbance area immediately to the east (D10, D11, D19 and D113) are summarised below and compared to the Environmental Goals for groundwater. Bores SW3-D, B5 and D23 are located within this area, but due to damaged, blocked or dry bores (insufficient water to sample), no groundwater quality data is available for these bores during this reporting period.

Groundwater monitoring data for the current reporting period is presented in Appendix G, and summarised in Figure 8a. Trend graphs showing concentrations versus time for key analytes are provided in Appendix J.

6.5.3.1 Field Parameters

Field parameters monitored at bores within the MPAR or in the mine disturbance area immediately to the east for the reporting period are summarised as follows:

- pH values of groundwater in this area were slightly acidic, ranging from 5.96 to 6.32 throughout the reporting period. Throughout the reporting period, pH values remained generally stable and similar to those reported in 2019/20; however, they were consistently lower than the Environmental Goal range for groundwater of 6.5 to 8.0; and
- EC values obtained from field measurements were 3,930 µS/cm to 9,860 µS/cm, with average values being lower than in previous reporting period. TDS concentrations ranged from 2,970 mg/L to 8,260 mg/L. Both EC and TDS values in groundwater from these bores were consistently above the Environmental Goals for groundwater during the reporting period.

Trend graphs for data from bores within this area show concentrations of TDS in groundwater have fluctuated over time, with a general increase in concentrations to above the Environmental Goal for groundwater occurring from approximately 2010. The TDS concentrations in groundwater within this area no longer appear to be increasing, although they remain above the Environmental Goal for groundwater. TDS concentrations in groundwater from bores D10, D19 and D113 generally show a decreasing trend since mid 2018. Concentrations of TDS in groundwater from bore B5 (which was not sampled during the current reporting period as the bore was blocked) have previously been reported to be approximately five times the TDS of the other groundwater bores in this area, consistent with its elevation above the regional water table (Appendix H), at the base of the MPAR.

6.5.3.2 Major and Minor Ions

Throughout the reporting period, major and minor ions, including chloride, fluoride, and sulfate were analysed in groundwater from D10, D11, D113 and D19. Sulfate concentrations generally exceeded the Environmental Goal for groundwater throughout the reporting period in groundwater from these four bores. Chloride concentrations in groundwater from bore D11 were consistently above the Environmental Goal for groundwater.

Trend graphs for bores within this area show chloride and sulfate concentrations have fluctuated over time. Consistent with TDS trends, chloride and sulfate concentrations increased in concentrations from approximately 2010 to approximately 2017; however, concentrations no longer appear to be increasing. Although concentrations of sulfate typically remain above the Environmental Goals for groundwater, chloride concentrations have decreased to below the Environmental Goals at D10, D19 and D113 since mid-2020.

6.5.3.3 Metals

Throughout the reporting period boron, chromium, copper, iron, lead, manganese, molybdenum and nickel were measured on one or more occasions at concentrations above the relevant Environmental Goals for groundwater in groundwater from bores D10, D11, D19 and D113. These results are presented in Appendix G, and summarised in Figure 8a. The Environmental Goals for groundwater for boron and iron were exceeded in all samples collected.

Trend graphs for bores within this area show boron, manganese and nickel concentrations have fluctuated over time. These selected metals were first reported at concentrations above the Environmental Goals for groundwater before 2010. Concentrations remain above the Environmental Goals on a consistent basis for boron in groundwater from all bores, and for manganese and nickel in D11. Concentrations of boron, manganese and nickel in groundwater appear relatively stable during the current reporting period at all locations, and have decreased since approximately 2019, particularly at bores D10 and D19 and D113.

6.5.4 Groundwater Quality within Mine Disturbance Area South and South-east of MPAR

Data obtained from groundwater bores that are considered to be situated within the mine disturbance area to the south and south-east of the MPAR is summarised below and compared to the groundwater Environmental Goals. Bores in this area include D15, D16, D17 and D18 and are located south to south-east of the Mt Piper Ash Repository. Groundwater monitoring data for the current reporting period is presented in Appendix G, and summarised in Figure 8b. Trend graphs are provided in Appendix J.

6.5.4.1 Field Parameters

Field parameters monitored at these bores situated within the Mt Piper Ash Repository and mine spoil disturbance area for the reporting period are summarised as follows:

- pH values in this area were 5.00 to 6.74 and remained generally stable. However, pH values were consistently lower than the Environmental Goal range for groundwater of 6.5 to 8.0 at all locations, with the exception of D18; and
- EC values obtained from field measurements were 670 µS/cm to 3,520 µS/cm with laboratory TDS concentrations of 378 mg/L to 2,870 mg/L. EC and TDS values were consistently above the Environmental Goals for groundwater in groundwater from bores D15 and D17, however were below the Environmental Goals for groundwater in groundwater from bores D16 and D18, consistent with the 2019/20 monitoring.

Trend graphs for bores within this area show concentrations of TDS in groundwater from bores D15 and D17 have been increasing over time and have been above the groundwater Environmental Goal since mid-2013. Concentrations of TDS in groundwater from bore D16 have been increasing since late 2017, although they remain below the Environmental Goals for groundwater. Concentrations of TDS in groundwater from bore D18 appear stable and remained below the Environmental Goals for groundwater.

6.5.4.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions including chloride, fluoride and sulfate were reported for groundwater from bores D15, D16, D17 and D18. Concentrations of sulfate were generally higher in groundwater from bore D15 and D17, relative to the other locations in this area, and were reported above the Environmental Goal for groundwater at D15 and D17. Chloride was reported below the Environmental Goals in groundwater from all bores. Fluoride was reported to exceed the Environmental Goal for groundwater in groundwater from D18 in November 2020.

Trend graphs for bores within this area show concentrations of chloride and sulfate in groundwater that are consistent with the TDS observations. Concentrations of chloride and sulfate increased in groundwater from bores D15 and D17 from about 2013 to 2019 and sulfate concentrations in groundwater from bore D15 have been consistently above the Environmental Goal for groundwater since monitoring began in 2012, and for D17 since mid-2014. Although concentrations of chloride and sulfate in groundwater at D16 have been increasing since late 2017, the only exceedance of the Environmental Goals for groundwater from this bore occurred for sulfate in April 2019. Concentrations of sulfate and chloride remained below the Environmental Goals in groundwater from D16 during the current reporting period. Concentrations of chloride and sulfate in groundwater at D18 appear stable and remain below the Environmental Goals for groundwater.

6.5.4.3 Metals

Throughout the reporting period chromium, copper, iron, lead, nickel and zinc were identified on one or more occasions at concentrations above the Environmental Goal in groundwater from bores D15 to D18. Results are presented in Appendix G, and summarised in Figure 8b. Bore D15 accounts for the majority of exceedances in this area, consistent with the 2019/20 monitoring.

Trend graphs for bores within this area show that concentrations of boron, manganese and nickel in groundwater are different from the trends for TDS, chloride and sulfate.

Boron concentrations appear to have remained relatively stable, fluctuating within a similar concentration range at each monitoring bore in this area. The exception is for intermittent spikes in boron concentrations at D15 through the historical dataset, including during the 2019/20 reporting period. Concentrations of boron in groundwater from D15 and the other bores in this area were below the Environmental Goal for groundwater during the reporting period.

Concentrations of manganese appear relatively stable, although variable, at each location in this area. The highest manganese concentrations were reported in groundwater from D15 and D17. These were similar in magnitude, and higher than concentrations in groundwater from bores D16 and D18. Manganese concentrations in groundwater from bores D15 and D17 show an overall decreasing trend since approximately mid-2019. Manganese concentrations in groundwater from all bores in this area remained below the Environmental Goal for groundwater throughout the historical dataset and the reporting period.

Concentrations of nickel appear stable, although variable, since at least 2014. Concentrations in groundwater from bore D15 were higher than in groundwater from the other wells in this area and have remained above the Environmental Goal since 2017. However, nickel concentrations in groundwater from D15 have, overall, decreased since 2019 and have continued to decrease during the current reporting period. Concentrations of manganese in groundwater from D16, D17 and D18 appear generally stable since at least 2014 and have remained below the Environmental Goal for groundwater throughout the historical dataset.

6.5.5 Groundwater Quality Adjacent to MPAR (north)

Groundwater data obtained from groundwater bores MPGM4/D3, D106 and D107 adjacent and to the north of the MPAR (cross gradient) are summarised with reference to the Environmental Goals for groundwater below. Groundwater monitoring data for the current reporting period is presented in Appendix G, and summarised in Figure 8c. Trend graphs are provided in Appendix J.

6.5.5.1 Field Parameters

Field parameters monitored at bores adjacent and to the north of the MPAR (cross gradient) for the reporting period are summarised as follows:

- pH values in this area were 5.84 to 6.22, indicating slightly acidic groundwater conditions, and were consistently lower than the Environmental Goal range for groundwater of 6.5 to 8.0 throughout the reporting period; and

- EC values obtained from field measurements ranged from 306 µS/cm to 15,330 µS/cm and were generally consistent with laboratory TDS values reported between 196 mg/L and 14,400 mg/L. Field EC and TDS values were consistently above the Environmental Goals for groundwater at D106 and D107, however values in groundwater from bore MPGM4/D3 remained below the Environmental Goals throughout the reporting period.

Trend graphs show the concentrations of TDS in groundwater from bore MPGM4/D3 has been stable and below the Environmental Goal for groundwater throughout the historical dataset. This is consistent with data from up gradient (background) bores MPGM4/D4 and MPGM4/D5.

Trend graphs for bores D107 and D106 show concentrations of TDS in groundwater are higher and have remained above the Environmental Goal since September 2018, when these bores were first sampled.

6.5.5.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions, including chloride, fluoride and sulfate, were reported for groundwater from MPGM4/D3, D106 and D107. Concentrations of these ions were generally higher in groundwater from bores D106 and D107 when compared to those in groundwater from bore MPGM4/D3. Sulfate and chloride concentrations have consistently been above the Environmental Goals for groundwater in groundwater from bores D106 and D107 since they were first sampled in 2018, while concentrations at bore MPGM4/D3 remained below the Environmental Goals for groundwater. Fluoride concentrations in groundwater from each of these bores were below the Environmental Goal for groundwater.

Consistent with TDS, trend graphs of chloride and sulfate concentrations in groundwater from bore MPGM4/D3 indicate that concentrations have been stable and below the Environmental Goals throughout the historical dataset. This is consistent with up gradient (background) bores MPGM4/D4 and MPGM4/D5.

Also consistent with TDS, trend graphs indicate that chloride and sulfate concentrations in groundwater from bores D107 and D106 have been higher and have remained above the Environmental Goals for groundwater since September 2018 when these bores were first sampled.

6.5.5.3 Metals

Throughout the reporting period boron, chromium, copper, iron, lead, manganese, mercury and nickel were identified on one or more occasions at concentrations above the Environmental Goals in groundwater from bores MPGM4/D3 (chromium, iron, and mercury), D106 and D107. Results are presented in Appendix G, and summarised in Figure 8c. Similar to TDS and major and minor ions, concentrations in groundwater from bore MPGM4/D3, located further upstream were generally lower than concentrations in groundwater from bores D106 and D107. Bores D106 and D107 accounted for the majority of exceedances.

Trend graphs for bores MPGM4/D3, D106 and D107 show concentrations of boron, manganese and nickel are generally consistent with TDS values. Trend graphs for bore MPGM4/D3 show concentrations of these selected metals have been stable and below the Environmental Goals for groundwater through the historical dataset. This is consistent with up gradient (background) bores MPGM4/D4 and MPGM4/D5.

Trend graphs for bore D107 and D106 show concentrations of boron, manganese and nickel in groundwater are higher and have been above the Environmental Goals for groundwater since September 2018 when these bores were first sampled.

6.5.6 Groundwater Quality Adjacent to MPAR and Downgradient

Groundwater data obtained from groundwater bores MPGM4/D1, MPGM4/D9, D102, D105, MPGM4/D8, D104, D103, MPGM4/D2 located adjacent to and down hydraulic gradient of the MPAR are summarised below, with reference to the Environmental Goals for groundwater. Groundwater monitoring data for the current reporting period is presented in Appendix G, and summarised in Figure 8d. Trend graphs are provided in Appendix J.

6.5.6.1 Field Parameters

Field parameters monitored at bores located adjacent to and down hydraulic gradient of the MPAR for the reporting period are summarised as follows:

- pH values in groundwater from these bores ranged from 5.49 to 6.6, indicating slightly acidic groundwater conditions throughout the reporting period. pH levels remained generally stable, however, were consistently lower than the Environmental Goal range for groundwater of 6.5 to 8.0 at all locations throughout the reporting period, with the exception of the pH at bore D2 in July 2020; and
- EC values obtained from field measurements were 211 µS/cm to 10,420 µS/cm. The EC results were comparable to laboratory TDS values reported at 194 mg/L to 9,520 mg/L. Over the reporting period, EC and TDS values were consistently above the Environmental Goals in groundwater from bores MPGM4/D1, MPGM4/D9, D102, D103 and D105. No exceedances of the EC and TDS Environmental Goals for groundwater were reported for groundwater from bores MPGM4/D2, D104 and MPGM4/D8.

Trend graphs show that, in groundwater from most bores in this area, concentrations of TDS in groundwater have been increasing over time, commencing with MPGM4/D1 and MPGM4/D9 since 2011/2012. TDS concentrations in groundwater from MPGM4/D1 have consistently been reported above the Environmental Goal for groundwater since 2013. TDS concentrations in groundwater from MPGM4/D9 were above or near the Environmental Goal from 2013 to early 2018, and have increased since 2018.

Trend graphs for bores D102, D103 and D105 show the concentrations of TDS in groundwater from these bores have remained above the Environmental Goal for groundwater since September 2018 when these bores were first sampled.

Trend graphs for groundwater from bores D104 and MPGM4/D8 show fluctuating although stable TDS concentrations over time; concentrations were below the Environmental Goal throughout the historical dataset.

TDS concentrations in groundwater from bore MPGM4/D2 have decreased since early 2020 and remained stable and below the Environmental Goal during the reporting period.

6.5.6.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions, including chloride, fluoride and sulfate, were reported in groundwater from bores MPGM4/D1, MPGM4/D2, MPGM4/D8, MPGM4/D9, D102, D103, D104 and D105, with concentrations of chloride and sulfate exceeding the Environmental Goals for groundwater throughout the reporting period. One fluoride concentration, measured in groundwater from bore MPGM4/D9 in April 2021, also exceeded the Environmental Goal.

Concentrations of major and minor ions were generally lower in groundwater from bores MPGM4/D2, MPGM4/D8 and D104 when compared to concentrations in groundwater from bores MPGM4/D1, MPGM4/D9, D102, D103 and D105. The difference in groundwater quality between these locations is considered likely to be due to the spatial distribution of these locations relative to the MPAR and related groundwater flow paths.

Sulfate was reported at concentrations above the Environmental Goal in groundwater from bores MPGM4/D1, D102, MPGM4/D9, D103 and D105, except during November 2020 at bore MPGM4/D1 (which may be erroneous, as noted in Section 6.4). No exceedances of the sulfate Environmental Goal for groundwater were reported at bores MPGM4/D2, MPGM4/D8 and D104 during the reporting period.

Chloride was reported at concentrations that were consistently above the Environmental Goal in groundwater from bores MPGM4/D1, D102 and MPGM4/D9, except during November 2020 at bore MPGM4/D1 (which may be erroneous, as noted in Section 6.4). Chloride concentrations in groundwater from D103 were equal to the Environmental Goal in August 2020, and no exceedances of the chloride Environmental Goal were reported in groundwater from bores MPGM4/D2, MPGM4/D8, D103, D104 and D105.

Trend graphs for bores within this area show concentrations of chloride and sulfate in groundwater are consistent with TDS and, in all but bore D8, have been increasing over time, commencing with MPGM4/D1 and MPGM4/D9 near the beginning of 2011. Sulfate has consistently been reported at above the Environmental Goals for groundwater in groundwater from MPGM4/D1 and MPGM4/D9 since early 2013, while chloride has consistently been reported at above the Environmental Goals for groundwater at MPGM4/D1 since early 2015 and MPGM4/D9 since August 2018.

Chloride concentrations in groundwater from MPGM4/D2 generally increased, although fluctuating, until January 2020 when concentrations declined. Similar trends are apparent in sulfate concentrations in groundwater from MPGM4/D2 although sulfate concentrations increased above the Environmental Goal in 2013 and, most recently have declined to concentrations below the Environmental Goal since January 2020. Sulfate and chloride concentrations have been stable in groundwater from MPGM4/D2 since decreasing in early 2020.

Trend graphs for bore D103 show the concentration of sulfate has remained generally stable, above the Environmental Goal since September 2018 when the bore was first sampled. Concentrations of chloride in groundwater from D103 have declined since monitoring commenced, and have been below the Environmental Goal for groundwater since October 2019.

Sulfate concentrations in groundwater from D105 appear to be stable and consistently above the Environmental Goal for groundwater. Chloride concentrations in groundwater from D105 appear to be stable and consistently below the Environmental Goal for groundwater.

Trend graphs for bores D104 and MPGM4/D8 show fluctuating although stable chloride and sulfate concentrations over time, with concentrations of these analytes consistently reported below the Environmental Goals for groundwater through the historical dataset.

6.5.6.3 Metals

Throughout the reporting period boron, copper, iron, lead, manganese, mercury, and nickel were identified on one or more occasions at concentrations above the relevant Environmental Goals for groundwater at the bores located downgradient of MPAR. Results are presented in Appendix G, and summarised in Figure 8d.

Concentrations of metals were generally lower in groundwater from bores MPGM4/D2, MPGM4/D8 and D104, with concentrations highest in groundwater from bores MPGM4/D1, MPGM4/D9, D102, D103 and D105.

Trend graphs show concentrations of boron, manganese and nickel are generally consistent with TDS values. Concentrations of nickel, manganese and boron have remained stable and below the Environmental Goals in groundwater from MPGM4/D8 and D104. In groundwater from MPGM4/D2, concentrations have fluctuated around the Environmental Goals, but have decreased since early 2020 and are stable, below the Environmental Goals for boron, manganese and nickel.

Trend graphs show that concentrations of boron, manganese and nickel in groundwater have increased over time at MPGM4/D1 and MPGM4/D9 to concentrations that remain above the Environmental Goals for groundwater.

Trend graphs for bores D102, D103 and D105 show relatively stable concentrations of boron, manganese and nickel and generally above the Environmental Goal for groundwater since September 2018 when these bores were first sampled. Concentrations of manganese and nickel appear to have declined at D103 since approximately May 2020.

6.5.7 Groundwater Quality Adjacent to Brine Waste Holding Ponds

Groundwater from groundwater bores MPGM5/D5 and MPGM5/D6, adjacent to the Brine Waste Holding Ponds (to the west and upgradient of the MPAR, but downgradient of the Brine Waste Holding Ponds) are summarised with reference to the Environmental Goals for groundwater below. These bores are installed to approximately 10 m below ground level and were constructed for the purpose of leak detection from the Brine Waste Holding Ponds. Therefore, the presence of water at these locations is not inferred to reflect the regional groundwater table. Groundwater monitoring data for the current reporting period is presented in Appendix G, and summarised in Figure 8e. Trend graphs are provided in Appendix J.

6.5.7.1 Field Parameters

Field parameters monitored at bores adjacent to the Brine Waste Holding Ponds for the reporting period are summarised as follows:

- pH values were 5.66 to 6.38, indicating slightly acidic groundwater conditions throughout the reporting period. pH values were consistently below the Environmental Goal range for groundwater of 6.5 – 8.0 in groundwater from both MPGM5/D5 and MPGM5/D6 throughout the reporting period; and
- EC values obtained from field measurements at MPGM5/D5 were 13,550 µS/cm to 23,440 µS/cm, and this was consistent with laboratory TDS values reported at 13,000 mg/L to 23,000 mg/L. EC and TDS values consistently exceeded the Environmental Goals for groundwater at bore MPG5/D5. However, EC values obtained from field measurements at MPGM5/D6 were 1,290 µS/cm to 1,570 µS/cm, also consistent with laboratory TDS values reported at 762 mg/L to 955 mg/L, and did not exceed the Environmental Goals.

Trend graphs show that TDS has historically remained below the Environmental Goals at both bores. Although there was a spike in TDS concentrations at MPGM5/D6 in 2019/20, including concentrations above the Environmental Goals, the TDS of groundwater at this bore has since returned to below the Environmental Goals and consistent with the historic range. Groundwater TDS at MPGM5/D5 also spiked in mid-2019 and, although decreasing, remains above the Environmental Goals and historic range for groundwater. The spike in concentrations are considered to be related to a tear identified in the liner at Brine Waste Pond A which was repaired during the 2019/20 reporting period and notified to the EPA (ERM, 2020a).

6.5.7.2 Major and Minor Ions

Throughout the reporting period, concentrations of major and minor ions, including chloride, fluoride and sulfate were reported at bores MPGM5/D5 and MPGM5/D6. Typically concentrations of chloride and sulfate were higher and above the Environmental Goal in groundwater from bore MPGM5/D5, but were lower and below the Environmental Goal at MPGM5/D6.

Fluoride concentrations were reported below the Environmental Goal at both locations; however, the laboratory limit of reporting (LOR) was raised at MPGM5/D5 above the Environmental Goal for groundwater during July 2020 and November 2020.

Trend graphs show a similar trend for chloride and sulfate as for TDS, i.e. a spike in concentrations in 2019 at both bores, with subsequently decreasing concentrations to either below the Environmental Goals and within the historical range (MPGM5/D6) or remaining above the Environmental Goals and historic range (MPGM5/D5).

6.5.7.3 Metals

Throughout the reporting period boron, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel and selenium were identified on one or more occasions at concentrations above the relevant Environmental Goals for groundwater at bores MPGM5/D5 and MPGM5/D6. Results are presented in Appendix G, and summarised in Figure 8e.

Bore MPGM5/D5 accounts for the majority of exceedances from the leak detection bores, with concentrations generally higher from this location compared to MPGM5/D6.

Trend graphs show a similar trend for boron, manganese and nickel as for TDS, i.e. a spike in concentrations in 2019 at both bores, with subsequently decreasing concentrations to either below the Environmental Goals and within the historical range (MPGM5/D6) or remaining above the Environmental Goals and historic range (MPGM5/D5).

6.6 Summary

6.6.1 Background bores – Up gradient Water Quality

Acidic groundwater and concentrations of metals including arsenic, iron, lead and/or manganese that exceeded the Environmental Goals were identified in groundwater from background bores MPGM4/D4 and MPGM4/D5. As these bores are located up hydraulic gradient, and away, from the MPAR the reported results are not considered to be related to the Project activities. The area surrounding the MPAR has been highly disturbed by historical mining activities, and the low pH in this area has been reported as resulting from oxidation of iron sulfide (Connell Wagner, 2007); the elevated metals are likely associated with this oxidation and acidification mobilising metals into groundwater. Trend graphs presented in Appendix J for key analytes in groundwater including TDS, chloride, sulfate, boron, manganese and nickel show that the concentrations of these analytes have remained relatively stable in this area historically, as well as over the reporting period, consistent with them representing background conditions.

6.6.2 Groundwater Quality within MPAR and the Mine Disturbance Area East of MPAR

Elevated EC and TDS values as well as concentrations of sulfate, chloride (D11 only) and metals including boron, chromium, copper, iron, lead, manganese, molybdenum, nickel and zinc were identified at concentrations at or above the Environmental Goals in groundwater from bores within the MPAR, and in downgradient areas to the east (D10, D11, D19 and D113). pH values in groundwater both within and downgradient of the MPAR were typically below (more acidic than) the Environmental Goal for groundwater. The lower pH values are considered to be consistent with background conditions in the area and may result from historical mine disturbance and/or be related to the regional groundwater quality. On this basis, the pH of groundwater in this area will continue to be monitored but is not discussed further.

Concentrations of iron, lead and manganese in groundwater from the bores at and downgradient of the MPAR were a similar order of magnitude to those in groundwater from the background monitoring wells (MPGM4/D4 and MPGM4/D5). These concentrations are considered to be related to background groundwater conditions.

The reported TDS, EC, sulfate, chloride, boron, chromium, copper, molybdenum and nickel concentrations in groundwater from bores in this area are considered elevated relative to upgradient locations. Connell Wagner (2007) reported elevated levels of sulfate, boron, nickel, zinc, manganese and iron previously in this area based on pre-placement ash data from bore B904 (operational between 1997 and 2000), which may have been influenced by goaf underground mine workings to the south of this area. However, concentrations of sulfate, chloride, boron, nickel and zinc and potentially the other metals indicate a different composition relative to the background bores and pre-placement groundwater data from historical bore B904 (from Aurecon, 2017).

In consideration of the brine composition (refer to Appendix D), which also contains elevated concentrations of these constituents, groundwater in this area has been influenced by leaching of BCA higher in the MPAR into the underlying water table. The leaching of constituents from the BCA placement area to the underlying groundwater is currently subject to review and management as part of the independent assessment.

However, there is evidence of decreasing trends in TDS, chloride, sulfate, boron, nickel and manganese in groundwater from D10, D19 and D113 during 2019/20 and stable trends during the current reporting period.

6.6.3 Groundwater Quality within Mine Disturbance Area South and Southeast of MPAR

Concentrations of analytes including sulfate, chloride and metals were typically lower in groundwater from D18 than in the surrounding bores (D15, D16 and D17) in this area; they (D18 results) were also lower than when compared to background concentrations in groundwater from bores MPGM4/D4 and MPGM4/D5. Based on this information, the integrity of bore D18 may have been compromised, allowing fresh water to enter the borehole from the surface or may be directly connected through mine void or fill to surface water. Groundwater elevations in bore D18 are also more variable than in nearby bores, with more rapid responses to rainfall. Based on this information, water quality in bore D18 is not considered to represent groundwater quality in the area.

Elevated concentrations of iron were consistent in groundwater from bores within this area, except at D18, and were comparable to those reported in groundwater from background bores MPGM4/D4 and MPGM4/D5. These iron concentrations, which exceeded the Environmental Goal, are considered to be consistent with background groundwater conditions.

EC, TDS and sulfate concentrations were higher in groundwater from bores D15 and D17 than in the background bores MPGM4/D4 and MPGM4/D5, and exceeded the Environmental Goals for groundwater. Concentrations of nickel and zinc consistently exceeded the Environmental Goals in groundwater from bore D15, and concentrations of copper, lead, nickel and zinc exceeded the Environmental Goals in groundwater from bore D15 only. Concentrations of zinc and nickel in groundwater from bore D15 were more elevated than other bores and relative to background groundwater conditions.

Concentrations of target analytes in groundwater from bore D16 were below the Environmental Goals for groundwater; however trend graphs presented in Appendix J indicate gradual increases in concentrations of sulfate, chloride and TDS in groundwater from bore D16 since early 2018.

Concentrations of target analytes in groundwater from bore D15 that exceed Environmental Goals are considered to be influenced by activities at the MPAR. Bore D15 appears to be located cross gradient, rather than directly down hydraulic gradient of the MPAR; however, the presence of preferential flow paths associated with former mine workings, and other water management activities are likely to be factors in the apparent distribution of the analytes in groundwater. The seepage of constituents from the BCA placement area to underlying and adjacent groundwater is currently subject to review and management as part of the independent assessment.

6.6.4 Groundwater Quality Adjacent to MPAR (north)

Groundwater quality at bore D3, which is the furthest up hydraulic gradient of the bores adjacent to MPAR was similar to the background groundwater conditions identified at background bores MPGM4/D4 and MPGM4/D5. Iron concentrations were within an order of magnitude of concentrations in the background bores, and the low pH values were also comparable to those in groundwater from MPGM4/D5.

Concentrations of EC, TDS, chloride, sulfate, boron, chromium, copper, iron, lead, manganese and nickel exceeded the Environmental Goals in groundwater from bores D106 and D107, located to the north-east of the MPAR. The iron and a component of the manganese concentrations are considered to be related to background water quality in the area, based on concentrations in groundwater from the background bores MPGM4/D4 and MPGM4/D5, in which concentrations were a similar order of magnitude.

The EC, TDS, chloride, sulfate, boron and nickel concentrations in groundwater from bores D106 and D107 are considered to represent changes to water quality and are not primarily related to background and pre-ash placement conditions. These analytes are present at elevated concentrations in the brine and in groundwater beneath and immediately downgradient of the MPAR, and concentrations of analytes in groundwater from bores D106 and D107 are considered to relate to BCA placement activities at the MPAR. The seepage of constituents from the BCA placement area to underlying and adjacent groundwater is currently subject to review and management as part of the independent assessment.

6.6.5 Groundwater Quality Adjacent to MPAR and Downgradient

Some exceedances of the Environmental Goals for iron were reported in groundwater from bores D8 and D104. These concentrations are considered likely to be related to the background water quality in the area, based on concentrations in groundwater from the background bores MPGM4/D4 and MPGM4/D5, which were higher.

Concentrations of TDS, EC, sulfate, chloride, boron, iron, nickel and/or manganese that exceeded the Environmental Goals were reported in groundwater from bores MPGM4/D1, MPGM4/D9, D102, D103, and D105, located down hydraulic gradient of the MPAR. pH values were also typically below the Environmental Goal range for groundwater. The elevated iron and manganese concentrations and the acidic pH values are considered to represent background groundwater conditions in the area.

The concentrations of EC and TDS, chloride, sulfate, copper, nickel and boron that were above the Environmental Goals are considered to represent changes to water quality and are not primarily related to background and pre-ash placement conditions. These analytes are present at elevated concentrations in the brine used to condition the BCA, and in groundwater beneath and immediately downgradient of the MPAR. Concentrations of these analytes in groundwater from bores MPGM4/D1, MPGM4/D9, D102, D103 and D105 are considered to relate to BCA placement activities at the MPAR. This is currently subject to review and management as part of the independent assessment.

The concentrations of these key analytes in groundwater from MPGM4/D2 during the 2020/21 reporting period have declined compared to the previous reporting period, when apparently increasing concentrations were observed. Except for iron and pH, the concentrations of key analytes were below the Environmental Goal during the current reporting period, and the groundwater in this bore is considered to be representative of groundwater conditions in the area.

The intermittent and irregular exceedances of the Environmental Goals for chromium, copper, lead and mercury in groundwater from bores D103, D105 and MPGM4/D2 that occurred during the 2019/20 reporting period did not occur during the current reporting period.

6.6.6 Groundwater Quality Adjacent to Brine Waste Holding Ponds

Concentrations of EC, TDS, chloride, sulfate, boron, cadmium, copper, nickel and selenium in groundwater from MPGM5/D5 have declined from the previous reporting period, although still exceeding the Environmental Goals. These concentrations are considered to be related to a tear identified in the liner at Brine Waste Pond A, which was repaired during the 2019/20 period and notified to the EPA. Concentrations of these analytes in groundwater from MPGM5/D6 have declined since late 2019 and are consistent with historical concentrations at this bore, remaining below the Environmental Goals during the current reporting period.

7. EARLY WARNING ASSESSMENT

In addition to comparing results with the Environmental Goals for surface water and groundwater, an early warning assessment of the groundwater and surface water monitoring data is required as part of the WMP. This assessment includes assessment of concentration trends through time, including statistical analysis where appropriate.

7.1 Trend Assessment Approach

Trends in target analyte concentrations in groundwater and surface water were assessed through a combination of graphical and statistical tools, primarily Groundwater Spatiotemporal Data Analysis Tool (GWSDAT), prepared by Shell Global Solutions (2012) and freely available for use. Trend plots for groundwater (concentrations in groundwater and groundwater elevations vs time) and surface water (concentrations in surface water vs time) were generated for each individual monitoring location where an exceedance of the adopted Environmental Goal was reported during this reporting period. A time period to include the last two reporting periods was adopted for the statistical assessment. Statistical tools were applied and included the use of the Mann-Kendall method to evaluate trends in target analyte concentrations in groundwater and surface water from each individual monitoring location. Further details of GWSDAT and the data assessment methodology are provided in Appendix K.

7.2 Groundwater Trend Graphs

Trend graphs were created for target analyte concentrations for individual monitoring locations to evaluate temporal trends of solute concentrations. The trend graphs also include adopted Environmental Goals. As discussed in Section 5.5 and Section 6.5, trend graphs for the entire data set are presented for surface water and groundwater in Appendices I and Appendix J respectively.

A descriptions of trends relative to historical concentrations over the last ten years (since 2011) and Environmental Goals is provided in Section 5 (for surface water) and Section 6 (for groundwater).

7.3 Statistical Assessment of Trends

Statistical assessment of trends was completed via GWSDAT using the Mann-Kendall procedure. Trend plots from the statistical assessment are presented in Appendix L, and include data from the beginning of the 2019/20 reporting period, and the statistical trend assessment. The p-value presented in these trend plots indicates the level of statistical significance that can be attributed to the trend. A p-value of less than 0.05 relates to a statistical significance of 95%, i.e. if a trend has a p-value of less than 0.05 there is a 95% level of confidence that the data presents an actual trend and not a random distribution of data. The 95% confidence level has been adopted by ERM as an indicator of statistical significance in trends, and trends with these characteristics are shown in green text in the trend plots. Those that are not statistically significant are shown in red text.

Where no p-value is provided on the graphical outputs, a sufficient number of data points were not available to evaluate the significance of trends through the Mann-Kendall test. Concentrations both above and below the laboratory limit of reporting and with respect to the relevant adopted background concentration (where available) are shown.

Further details on the Mann-Kendall procedure are presented in the Western Australia Department of Environment’s guidance document entitled *Use of Monitored Natural Attenuation for Groundwater Remediation* (2004).

Table 8 presents a summary from the statistical assessment of trends assessed for all locations and analytes reported above the relevant Environmental Goal during the reporting period.

Table 8: Summary of Statistical Assessment for Target Analytes

Monitoring Location	As	B	Cd	Cl	Cr	Cu	F	Fe	Pb	Mn	Hg	Mo	Ni	Se	SO_4	Zn	TDS	EC
Surface Water																		
LMP01	-	Down	NT	Down	NT	Down	-	NT	NT	NT	*	NT	NT	NT	Down	NT	NT	-
NC01	-	Down	*	NT	*	Down	-	Down	NT	NT	*	Down	NT	NT	Down	NT	Down	-
SW_C	-	Down	*	NT	*	NT	-	Down	*	Down	*	NT	Down	NT	Down	NT	Down	-
S_E	-	NT	*	Down	NT	NT	-	NT	*	NT	*	NT	Down	NT	Down	NT	Down	-
WX22	-	Down	NT	Down	NT	NT	-	NT	NT	NT	*	NT	NT	NT	Down	Down	Down	-
SW_G	-	NT	*	NT	*	NT	-	NT	*	NT	*	NT	NT	NT	Down	NT	Down	-
Within MPAR / mine disturbance area east of MPAR																		
B5	Not sampled in current reporting period																	
SW3-D	Not sampled in current reporting period																	
D23	Not sampled in current reporting period																	
D10	NT	Down	Down	Down	NT	NT	NT	NT	NT	NT	*	Up	Down	Down	Down	Down	Down	Down
D11	NT	NT	*	NT	*	*	NT	NT	*	Down	*	*	NT	NT	Down	NT	NT	NT
D19	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	Down	NT	NT	NT	NT
D113	NT	NT	NT	Down	NT	NT	*	Down	NT	Down	NT	NT	Down	NT	Down	Down	Down	NT
Within mine disturbance area – south and southeast of MPAR																		
D15	NT	NT	NT	Down	NT	NT	*	NT	NT	NT	NT	NT	Down	NT	Down	NT	Down	Down
D16	*	NT	*	Up	Up	*	NT	NT	*	NT	*	*	Up	*	NT	NT	Up	Up
D17	Down	NT	*	NT	NT	*	NT	NT	*	Down	*	*	Down	*	NT	NT	NT	NT
D18	NT	NT	NT	NT	Up	Up	NT	NT	NT	NT	*	Up	NT	NT	NT	NT	NT	NT

Monitoring Location	As	B	Cd	Cl	Cr	Cu	F	Fe	Pb	Mn	Hg	Mo	Ni	Se	SO_4	Zn	TDS	EC
Background and Adjacent MPAR – North and Northeast																		
MPGM4/D4	NT	*	Down	Up	NT	NT	NT	Down	NT	NT	*	*	Down	Down	Down	Down	Down	Down
MPGM4/D5	*	NT	*	NT	*	*	NT	NT	*	NT	*	*	Down	NT	Down	Down	NT	Down
MPGM4/D3	*	Down	*	NT	Up	NT	NT	NT	*	NT	NT	*	Up	*	Down	NT	NT	Down
D107	NT	NT	NT	NT	NT	NT	*	NT	NT	NT	*	*	NT	NT	NT	NT	NT	Up
D106	NT	NT	NT	NT	NT	NT	*	NT	NT	Down	NT	*	NT	NT	NT	NT	NT	NT
Adjacent MPAR – downgradient																		
MPGM4/D1	NT	Up	*	NT	*	NT	Up	NT	*	NT	*	*	NT	NT	NT	-	Up	Up
MPGM4/D9	NT	NT	Up	NT	NT	Up	NT	NT	NT	Down	NT	NT	NT	Up	NT	NT	NT	NT
D102	NT	NT	NT	Up	NT	Down	NT	NT	Down	NT	*	*	Up	Down	NT	NT	NT	Up
D105	NT	Up	*	Up	*	*	*	NT	*	NT	*	*	NT	*	NT	NT	NT	Up
MPGM4/D8	*	Down	*	Down	*	NT	Down	NT	NT	NT	*	*	NT	*	Down	NT	Down	Down
D103	NT	Up	*	Down	NT	Down	NT	NT	*	NT	*	*	NT	NT	NT	NT	NT	Down
D104	Down	Up	*	NT	NT	NT	NT	NT	NT	NT	*	*	Up	NT	NT	Up	NT	Up
MPGM4/D2	NT	Down	*	Down	NT	Up	NT	NT	Up	NT	NT	*	Down	NT	Down	Down	Down	Down
Brine waste pond leak detection bores																		
MPGM5/D5	Down	Down	Down	Down	Down	Down	Down	Down	Down	NT	NT	NT	Down	Down	Down	Down	Down	Down
MPGM5/D6	NT	NT	NT	Down	NT	NT	*	NT	NT	NT	NT	*	NT	NT	NT	NT	NT	Down

NT = No statistically significant trend apparent (red text in GWSDAT outputs; Appendix L)

Up = Statistically significant increasing trend (green text in GWSDAT outputs; Appendix L)

Down = Statistically significant decreasing trend (green text in GWSDAT outputs; Appendix L)

- = GWSDAT trend analysis not conducted

** Insufficient data with concentrations above LOR for GWSDAT trend analysis*

x Insufficient data for GWSDAT trend analysis

7.4 Trend Assessment Summary

7.4.1 Surface Water

The statistically significant increasing trends reported during 2019/20 for copper and/or molybdenum in surface water from LMP01 and NC01 were not reported in the current reporting period. The statistically significant increasing trends for boron, nickel, chloride, sulfate, EC and TDS identified in surface water from WX22 were also not reported in the current reporting period.

Although not assessed statistically, visual assessment of pH values at SW_E and WX22 indicate increasing pH values (i.e. less acidic conditions) at these locations.

7.4.2 Groundwater

Statistically significant increasing trends were reported for boron downgradient of the MPAR in groundwater from MPGM4/D1, as well as from D103, D104 and D105.

Within and east of MPAR, groundwater concentration trends were generally stable (no trend) or decreasing, with the only statistically significant increasing trend being for molybdenum at D10. Concentrations of many analytes in groundwater from D10 and D113 reported statistically significant decreasing trends, which may indicate that, immediately downgradient of the MPAR, the concentration of key analytes in groundwater has declined. Although statistical analysis was not completed on pH data, visual analysis indicated increasing pH values in groundwater from some bores.

Analyte concentrations were also generally stable (no trend) or decreasing upgradient of MPAR in the groundwater from background bores, with statistically significant increasing concentrations only reported for selected bores and locations, including chloride at D4 and both chromium and nickel at D3. This is consistent with the location of these bores upgradient of MPAR.

Adjacent to MPAR to the north, EC showed a statistically significant increasing trend at D107, and pH at D106 based on visual analysis.

The majority of statistically significant increasing trends were reported in groundwater from downgradient of MPAR, including multiple increasing trends for selected bores (boron, fluoride, TDS and EC at MPGM4/D1; cadmium, copper and selenium at MPGM4/D9; chloride, nickel and EC at D102; boron, chloride and EC at D105; boron, nickel, zinc and EC at D104). Concentrations were also statistically significant increasing at D103 for boron, and at D2 for copper and lead only. These elevated concentrations and increasing trends are considered to be due to the leaching of these analytes from the BCA placed in the MPAR and subsequent transport of solutes with the regional groundwater. These processes and future management strategies are being further assessed as part of the independent assessment in accordance with contingency measures outlined in the WMP.

Concentrations in groundwater from bore MPGM4/D8, located north of Wangcol Creek, were stable or showed a statistically significant decreasing trend.

Within the mine disturbance areas to the south and south-east of MPAR, concentrations of chloride, chromium, copper, molybdenum, nickel, TDS and/or EC in groundwater from bores D16 and D18 showed some statistically significant increasing trends. Consistent with the 2019/20 report (ERM, 2020a), the presence of preferential flow paths as a result of historical mining disturbance, and other water management activities in the surrounding area are considered to be potential factors contributing to the concentrations trends in groundwater at D16. Stable or statistically significant decreasing trends were reported in groundwater from D15 and D17.

Consistent with the discussion above, statistically significant decreasing trends were noted for many analytes in groundwater from leak detection monitoring bore MPGM5/D5. Trends were stable or decreasing, with the exception of pH, at MPGM5/D6. The improvement of water quality in these bores is consistent with the liner repairs at Brine Waste Pond A undertaken in 2019/20 reporting period.

7.5 Implementation of Contingency and Mitigation Measures

Where increasing trends have been identified, these have been recognised as triggers for action in accordance with the TARPs.

In the case of groundwater to the north-east and hydraulically downgradient of the MPAR, the independent assessment is currently being implemented in line with the contingency measures contained in the WMP to assess the extent to which the MPAR may be contributing to previously reported exceedances, and to identify further contingency measures if necessary. The independent assessment includes a separate and broader investigation of surface water and groundwater conditions in the vicinity of the Ash Repositories. Potential short- and long-term management measures are currently being evaluated as part of the independent assessment.

The statistically significant increasing trends in groundwater at bore D16 are potentially an early warning that operations at the neighbouring coal washery facility (i.e. in areas not controlled or managed by EnergyAustralia) may be influencing the quality of groundwater in the southern extent of the monitoring area.

8. CONCLUSIONS

Based on the review of the surface water and groundwater quality data for the Project obtained in accordance with the WMP for the reporting period, it is considered that the objectives of the AEMR have been met and the following conclusions are drawn:

- Concentrations of target analytes in groundwater have been reported above the Environmental Goal for groundwater at monitoring locations within and downgradient of the MPAR. Elevated levels of key analytes including chloride, sulfate, boron and nickel, are considered to be due to the leaching of these analytes from the BCA placed in MPAR and subsequent transport of solutes with the regional groundwater. The impacted groundwater is migrating from the vicinity of the MPAR toward the alignment of Wangcol Creek, as indicated by the groundwater quality results reported to the east at D106 and D107, to the downgradient at MPGM4/D1, MPGM4/D9, D102 and to a lesser extent at D105 and D103. Groundwater quality generally appears to be improving at MPGM4/D2 based on statistical trend assessment (decreasing trends) and concentrations that are more similar to the background conditions;
- Potential interaction of this impacted groundwater with the surface water of Wangcol Creek was identified during the 2019/20 reporting period (ERM, 2020a). However, the surface water quality indicated by monitoring locations to the northeast of MPAR, including midstream at SW_E and downstream at WX22 and SW_G, were generally improved during the current reporting period. The improved surface water quality, as supported by the decreasing trends for TDS, chloride and/or sulfate at these locations, may reflect the higher rainfall during the current reporting period compared to 2019/20;
- Although concentrations in groundwater currently remain below the Environmental Goals, consistent with the 2019/20 monitoring, concentrations of chloride, nickel, EC and TDS increased in groundwater from D16. The presence of preferential flow paths as a result of historical mining disturbance, and other water management activities in the area may be factors in the trends identified in groundwater from bore D16;
- Concentrations of boron, cadmium, chloride, iron, manganese, nickel, selenium, sulfate, zinc, TDS and/or EC in groundwater to the east to MPAR at D10, D11, D19 and D103 indicate decreasing trends. This may indicate that, immediately downgradient of MPAR, the concentration of key analytes in groundwater has declined; and
- Following repair of the liner at the Brine Waste Ponds, groundwater quality is improved at MPGM5/D6 and is continuing to improve (as shown by decreasing trends) at MPGM5/D5.

Results of the groundwater and surface water monitoring program indicate that groundwater quality in the vicinity of the MPAR and the Brine Waste Ponds is influenced by the Project activities. In portions of Wangcol Creek, surface water quality has historically been shown to be affected, primarily through the flow of groundwater into the creek during periods of low rainfall. This is currently subject to review and management as part of the independent assessment.

Where increasing trends have been identified, these have been recognised as triggers for action in accordance with the TARPs. In the case of groundwater, and historically surface water, to the northeast and down hydraulic gradient of MPAR, the independent assessment, including assessment of potential mitigation measures continues. The outcomes of the independent assessment will inform future AEMRs for the Project and will be reflected in revisions to the WMP, while groundwater elevation and quality will continue to be monitored.

Consistent with the 2019/20 monitoring, the statistically significant increasing trends in groundwater at bore D16 are potentially an early warning that operations at the neighbouring coal washery facility (in areas not controlled or managed by EnergyAustralia) may be influencing the quality of groundwater in the southern extent of the monitoring area. This should be assessed further in consultation with the neighbouring land holder as appropriate.

Consistent with the 2019/20 monitoring, due to bore construction appearing to have been compromised, permanently blocked, or bores repeatedly being dry or inaccessible, it is recommended that monitoring of bores B5, D18, SW3D and D23 be removed from the monitoring program during future revision of the WMP and these bores be decommissioned if damaged.

9. REFERENCES

9.1 Project

Aurecon, 2009. Mt Piper Brine Conditioned Fly Ash Co-Placement Environmental Monitoring Report, Annual Environmental Monitoring Report 2008/09, Revision 2, 10 July 2009.

Aurecon, 2017. Mt Piper Brine Conditioned Fly Ash Co-Placement Environmental Monitoring Report, Annual Environmental Monitoring Report 2016/17, Revision 3, 25 September 2017.

Connell Wagner, 2007, Statement of Environmental Effects, Mount Piper Power Station, Extension of Brine Conditions Ash Placement Area. Prepared by Environmental Services, Pacific Power International for Delta Electricity, 21 June 2007.

Connell Wagner, 2008, Mt Piper Power Station Brine Conditioned Fly ash Co-placement Extension Water Management and Monitoring Plan, Delta Electricity Western, Revision 3, 26 September 2008.

CDM Smith, 2012. Lamberts North Ash Placement Project: Groundwater Modelling Report, prepared for Delta Electricity, 22 November 2012.

CDM Smith, 2013, Lamberts North Ash Placement Project Operation Environmental Management Plan (OEMP), Delta Electricity – Western May 2013, last revised by EnergyAustralia on 2 September 2019.

Danis, A., Danis, C., Lackie, M., O'Neil, C., & Twigg, L. (2011) Deep 3D structure of the Sydney Basin using gravity modelling, Australian Journal of Earth Sciences, 58:5, 517-542, DOI: 10.1080/08120099.2011.565802.

ERM 2020, Water Management and Monitoring Plan – Update for 60 ML Dam, Mt Piper Power Station Brine Conditioned Flyash Co-placement Extension Water Management and Monitoring Plan, EnergyAustralia NSW Pty Ltd, Final, 28 February 2020.

ERM 2020a, Annual Environmental Monitoring Report – Water Management and Monitoring, Mt Piper Power Station Brine Conditioned Fly Ash Co-Placement Project, 29 September 2020.

Sinclair Knight Mertz (SKM) (2010) Mt Piper Power Station Ash Placement Project, Appendix D, Hydrology and Water Quality, 2010.

9.2 General

Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) National Water Quality Management Strategy. Paper No. 4. Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1: The Guidelines (Chapter 1-7).

Australian and New Zealand Governments (ANZG) (2018), Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia, available at www.waterquality.gov.au/anz-guidelines

Shell Global Solutions, 2012: Ground Water Spatio-Temporal Data Analysis (GWSDAT) Tool, Version 2.0. Shell Technology Centre Thornton, UK.

Western Australia Department of Environment, 2004: Use of Monitored Natural Attenuation for Groundwater Remediation.

10. STATEMENT OF LIMITATIONS

This report is based solely on the scope of work described in our proposal P0533074 dated 20/3/20 and confirmed via email on 24/4/20 (Scope of Work) and performed by Environmental Resources Management Australia Pty Ltd (ERM) for EnergyAustralia NSW Pty Ltd (the Client). The Scope of Work was governed by a contract between ERM and the Client (Contract).

No limitation, qualification or caveat set out below is intended to derogate from the rights and obligations of ERM and the Client under the Contract.

The findings of this report are solely based on, and the information provided in this report is strictly limited to that required by, the Scope of Work. Except to the extent stated otherwise, in preparing this report ERM has not considered any question, nor provides any information, beyond that required by the Scope of Work.

This report was prepared between July 2021 and September 2021 and is based on conditions encountered and information reviewed at the time of preparation. The report does not, and cannot, take into account changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with the Client to amend the Scope of Work or has entered into a new engagement to provide a further report.

Unless this report expressly states to the contrary, ERM's Scope of Work was limited strictly to identifying typical environmental conditions associated with the subject site(s) and does not evaluate the condition of any structure on the subject site nor any other issues. Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials or any identified impacted soil or groundwater on the site(s) should not be interpreted as a guarantee that such materials or impacts do not exist.

This report is based on one or more site inspections conducted by ERM personnel, the sampling and analyses described in the report, and information provided by the Client or third parties (including regulatory agencies). All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved. Whilst normal checking of data accuracy was undertaken, except to the extent expressly set out in this report ERM:

- did not, nor was able to, make further enquiries to assess the reliability of the information or independently verify information provided by;
- assumes no responsibility or liability for errors in data obtained from; and
- the Client, any third parties or external sources (including regulatory agencies).

Although the data that has been used in compiling this report is generally based on actual circumstances, if the report refers to hypothetical examples those examples may, or may not, represent actual existing circumstances.

Only the environmental conditions and or potential contaminants specifically referred to in this report have been considered. To the extent permitted by law and except as is specifically stated in this report, ERM makes no warranty or representation about:

- the suitability of the site(s) for any purpose or the permissibility of any use;
- the presence, absence or otherwise of any environmental conditions or contaminants at the site(s) or elsewhere; or
- the presence, absence or otherwise of asbestos, asbestos containing materials or any hazardous materials on the site(s).

Use of the site for any purpose may require planning and other approvals and, in some cases, environmental regulator and accredited site auditor approvals. ERM offers no opinion as to the likelihood of obtaining any such approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environment works.

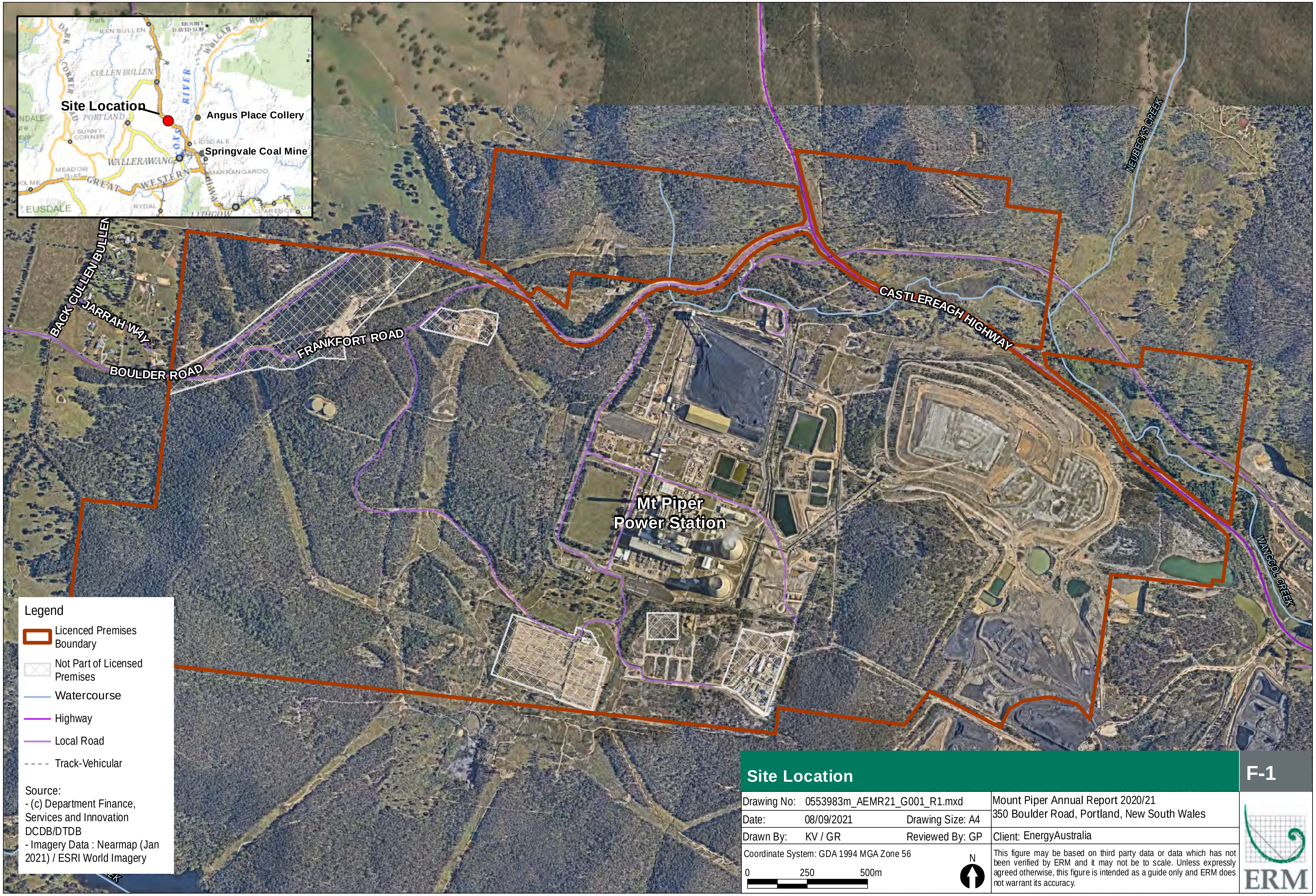
The ongoing use of the site or use of the site for a different purpose may require the management of or remediation of site conditions, such as contamination and other conditions, including but not limited to conditions referred to in this report.

This report should be read in full and no excerpts are to be taken as representative of the whole report. To ensure its contextual integrity, the report is not to be copied, distributed or referred to in part only. No responsibility or liability is accepted by ERM for use of any part of this report in any other context.

Except to the extent that ERM has agreed otherwise with the Client in the Scope of Work or the Contract, this report:

- has been prepared and is intended only for the exclusive use of the Client;
- must not to be relied upon or used by any other party;
- has not been prepared nor is intended for the purpose of advertising, sales, promoting or endorsing any Client interests including raising investment capital, recommending investment decisions, or other publicity purposes;
- does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise in or in relation to the site(s); and
- does not purport to provide, nor should be construed as, legal advice.

FIGURES



Source:
- (c) Department Finance, Services and Innovation DCDB/DTDB
- Imagery Data : Nearmap (Jan 2021) / ESRI World Imagery

Site Location

F-1

Drawing No: 0553983m_AEMR21_G001_R1.mxd

Date: 08/09/2021 Drawing Size: A4

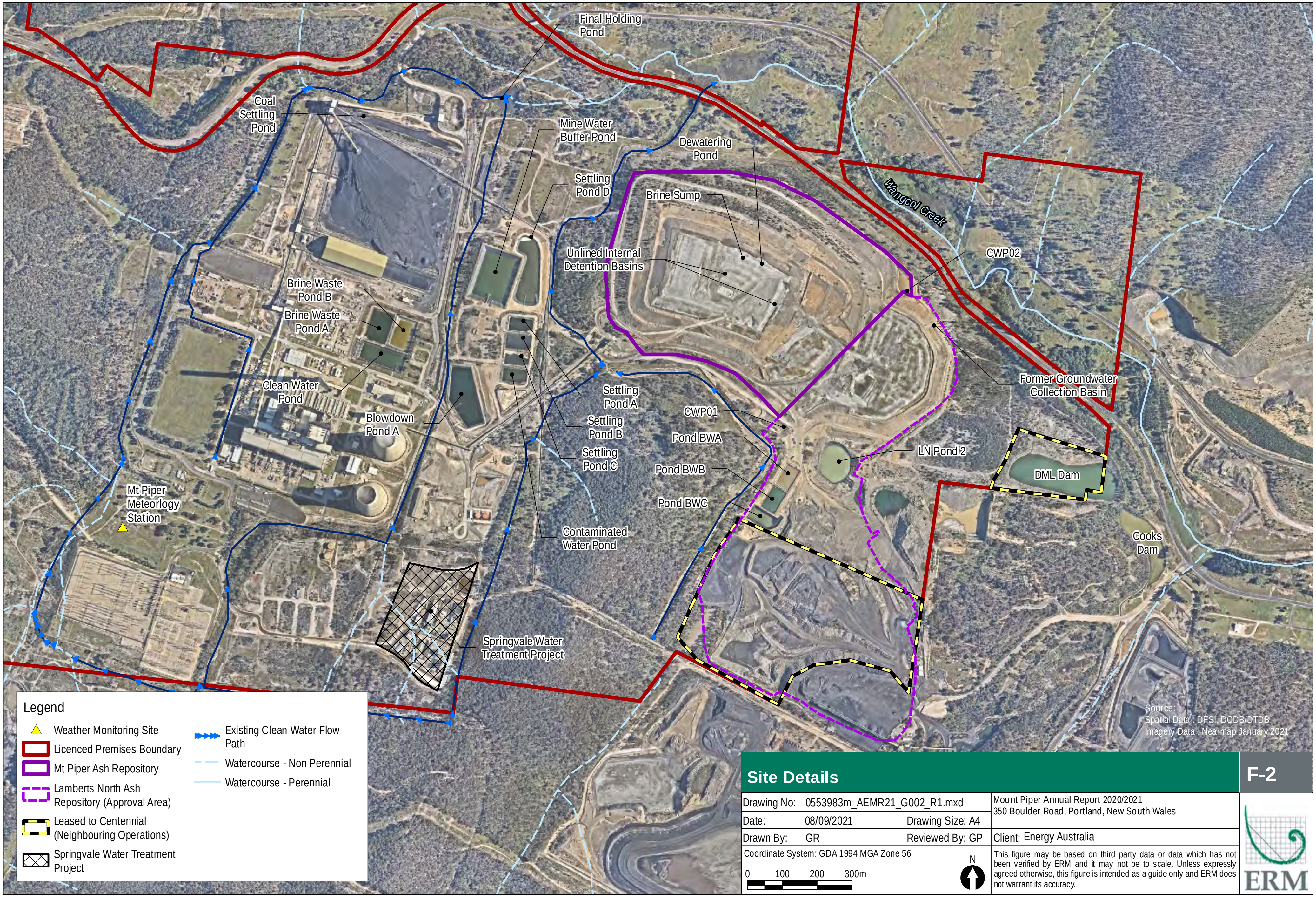
Drawn By: KV / GR Reviewed By: GP

Coordinate System: GDA 1994 MGA Zone 56

Mount Piper Annual Report 2020/21
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.



Source:
Spatial Data : DFSI, DCDB/DTDB
Imagery Data : Nearmap January 2021

Site Details

F-2

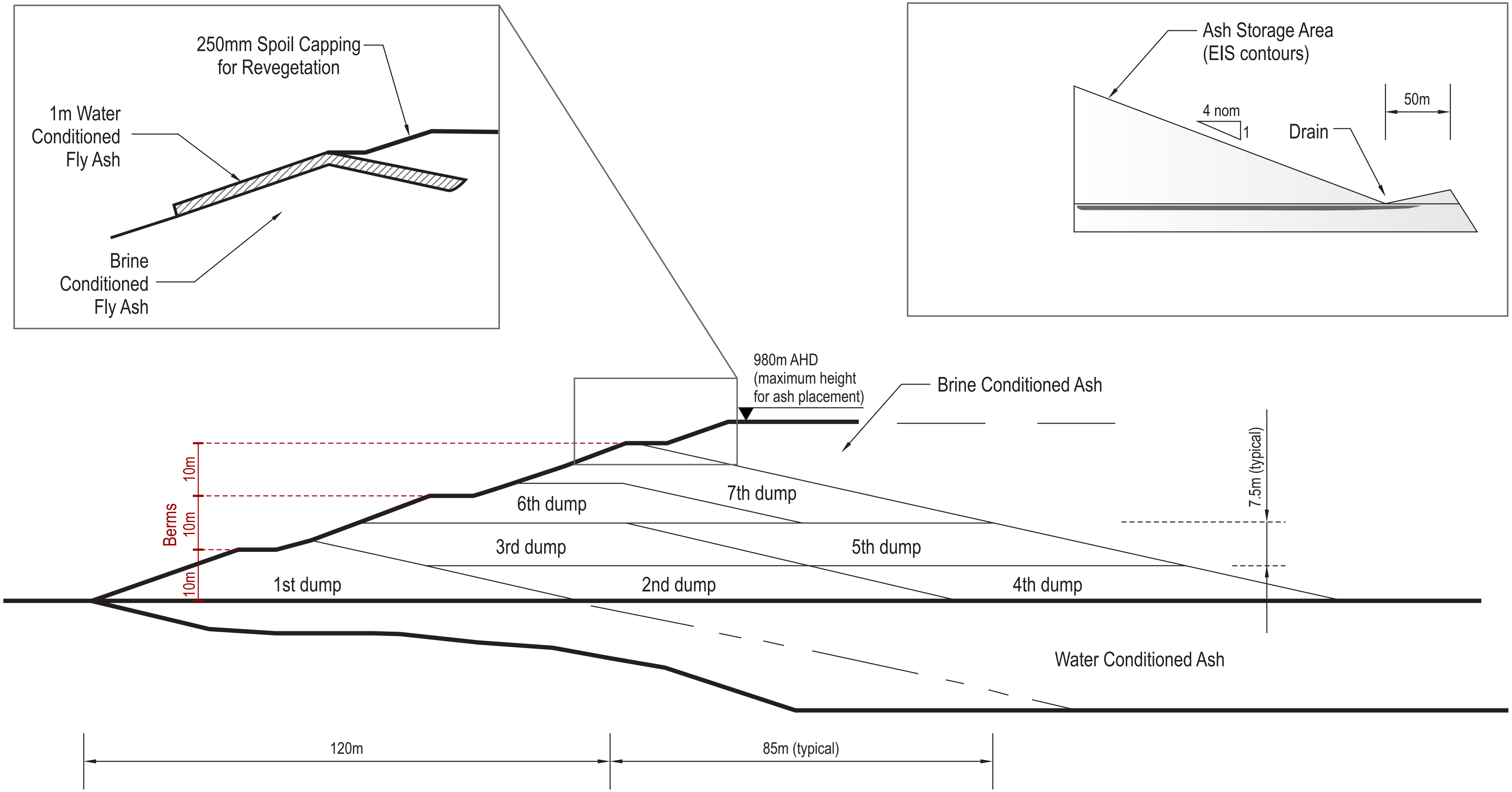
Drawing No: 0553983m_AEMR21_G002_R1.mxd
Date: 08/09/2021 Drawing Size: A4
Drawn By: GR Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: Energy Australia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



Notes:

Details shown are diagrammatical only.

Source:

Connell and Wagner, 2008. Mt Piper Power Station Brine Conditioned Flyash Co-placement Extension Water Management and Monitoring Plan. Prepared for Delta Electricity, September 2008.

Schematic of External Batter Placement

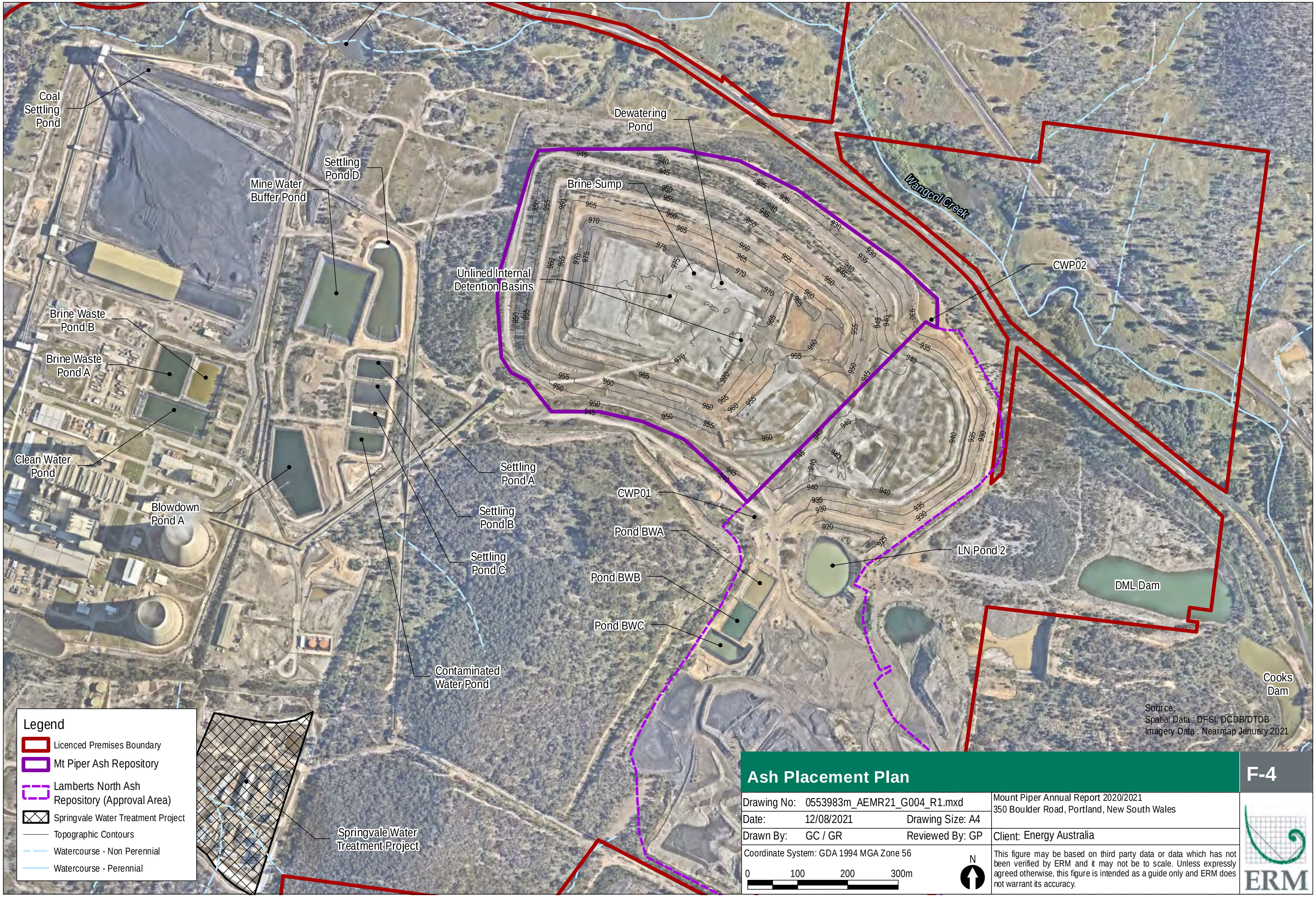
F - 3

Drawing No: 0553983m_AEMR_C001_R1.cdr
Date: 16/08/2021 Drawing size: A4
Drawn by: GC/KV Reviewed by: GP
Drawing Not to Scale

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: Energy Australia

ERM



Source:
Spatial Data : DFSI, DCDB/DTDB
Imagery Data : Nearmap January 2021

Ash Placement Plan

F-4

Drawing No: 0553983m_AEMR21_G004_R1.mxd
Date: 12/08/2021 Drawing Size: A4
Drawn By: GC / GR Reviewed By: GP

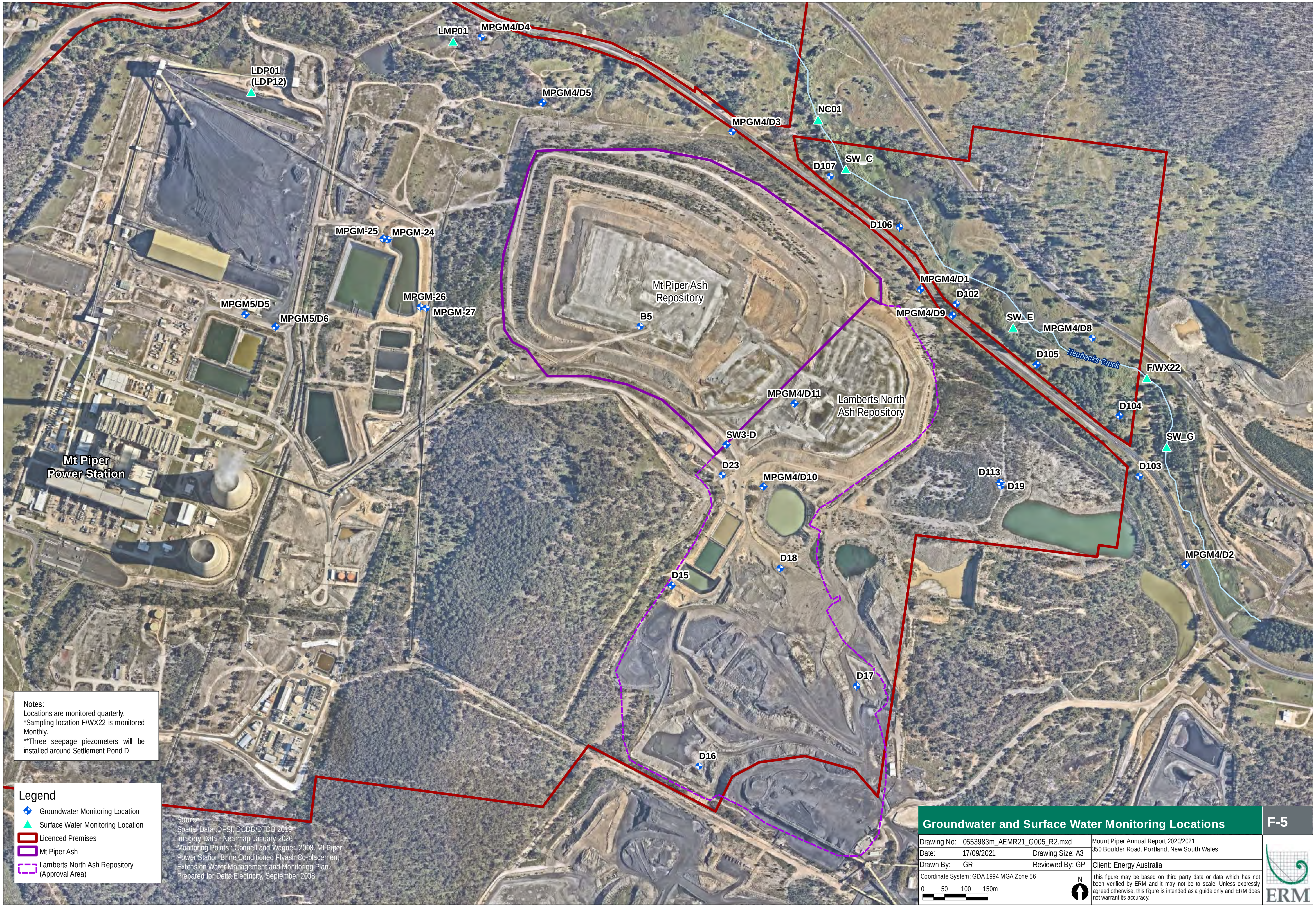
Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: Energy Australia

Coordinate System: GDA 1994 MGA Zone 56

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



Notes:
Locations are monitored quarterly.
*Sampling location F/WX22 is monitored Monthly.
**Three seepage piezometers will be installed around Settlement Pond D

Legend

- ⌖ Groundwater Monitoring Location
- ▲ Surface Water Monitoring Location
- ▭ Licenced Premises
- ▭ Mt Piper Ash
- ⬚ Lamberts North Ash Repository (Approval Area)

Source:
Spatial Data :DFSI, DCDB/DTDB 2019
Imagery Data : Nearmap January 2020
Monitoring Points : Connell and Wagner, 2008. Mt Piper Power Station Brine Conditioned Flyash Co-placement Extension Water Management and Monitoring Plan. Prepared for Delta Electricity, September 2008.

Groundwater and Surface Water Monitoring Locations

F-5

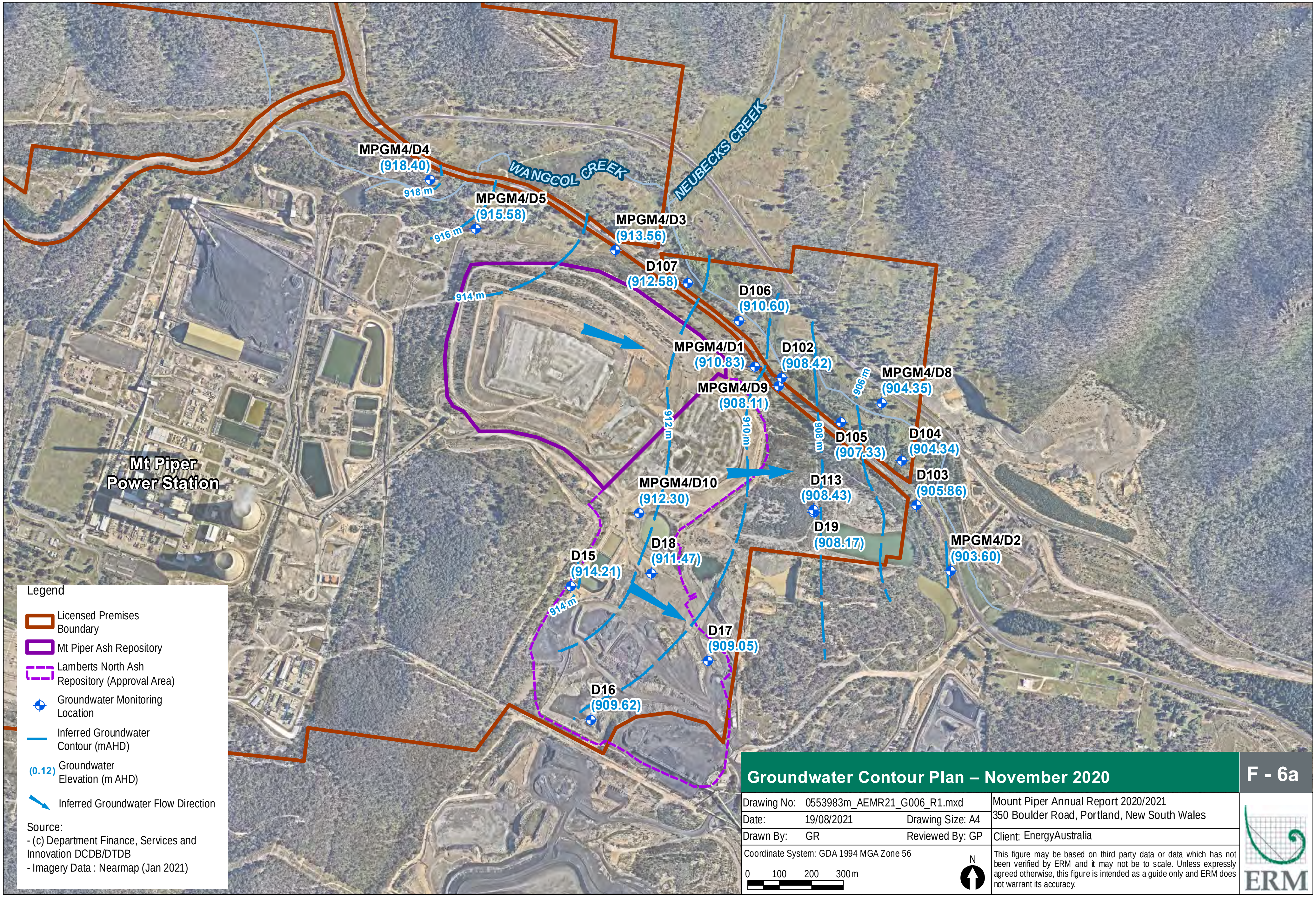
Drawing No: 0553983m_AEMR21_G005_R2.mxd
Date: 17/09/2021 Drawing Size: A3
Drawn By: GR Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: Energy Australia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



Source:
- (c) Department Finance, Services and Innovation DCDB/DTDB
- Imagery Data : Nearmap (Jan 2021)

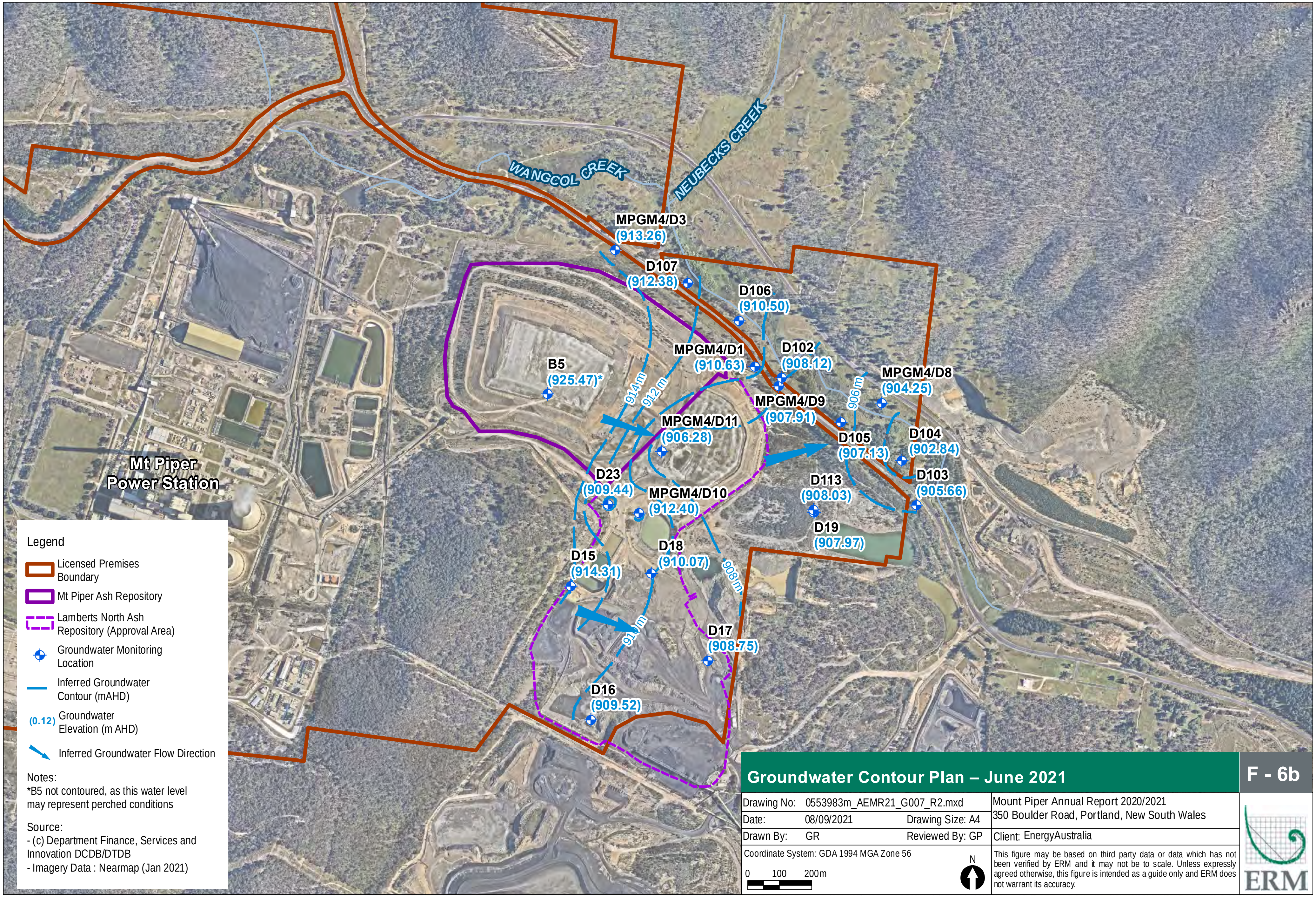
Groundwater Contour Plan – November 2020

F - 6a

Drawing No: 0553983m_AEMR21_G006_R1.mxd
Date: 19/08/2021 Drawing Size: A4
Drawn By: GR Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia

ERM



Legend

- Licensed Premises Boundary
- Mt Piper Ash Repository
- Lamberts North Ash Repository (Approval Area)
- ⊕ Groundwater Monitoring Location
- Inferred Groundwater Contour (mAHD)
- (0.12) Groundwater Elevation (m AHD)
- ↘ Inferred Groundwater Flow Direction

Notes:
*B5 not contoured, as this water level may represent perched conditions

Source:
- (c) Department Finance, Services and Innovation DCDB/DTDB
- Imagery Data : Nearmap (Jan 2021)

Groundwater Contour Plan – June 2021

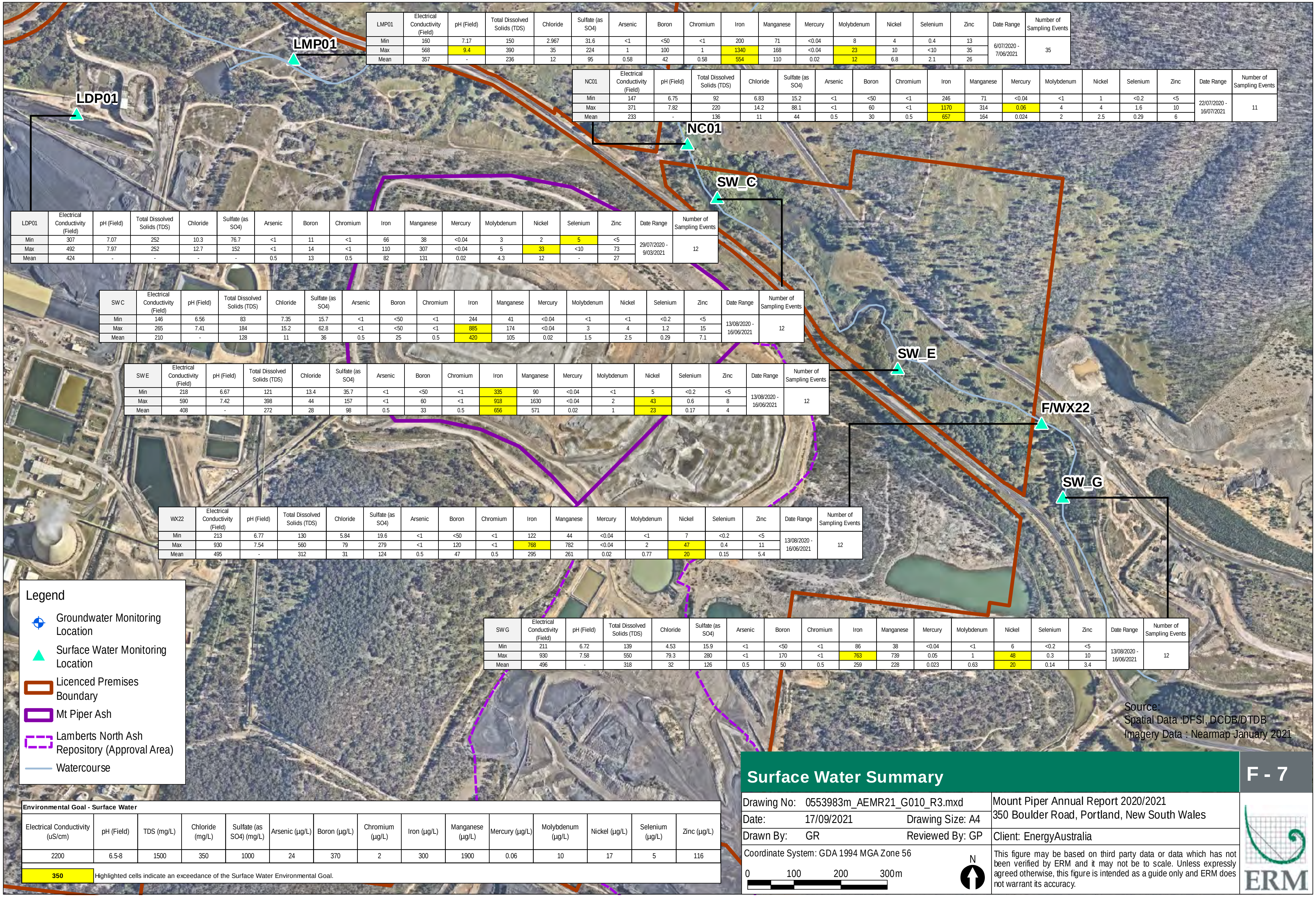
F - 6b

Drawing No: 0553983m_AEMR21_G007_R2.mxd
Date: 08/09/2021 Drawing Size: A4
Drawn By: GR Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

ERM



LMP01	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	160	7.17	150	2.967	31.6	<1	<50	<1	200	71	<0.04	8	4	0.4	13	6/07/2020 - 7/06/2021	35
Max	568	9.4	390	35	224	1	100	1	1340	168	<0.04	23	10	<10	35		
Mean	357	-	236	12	95	0.58	42	0.58	554	110	0.02	12	6.8	2.1	26		

NC01	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	147	6.75	92	6.83	15.2	<1	<50	<1	246	71	<0.04	<1	1	<0.2	<5	22/07/2020 - 16/07/2021	11
Max	371	7.82	220	14.2	88.1	<1	60	<1	1170	314	0.06	4	4	1.6	10		
Mean	233	-	136	11	44	0.5	30	0.5	657	164	0.024	2	2.5	0.29	6		

LDP01	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	307	7.07	252	10.3	76.7	<1	11	<1	66	38	<0.04	3	2	5	<5	29/07/2020 - 9/03/2021	12
Max	492	7.97	252	12.7	152	<1	14	<1	110	307	<0.04	5	33	<10	73		
Mean	424	-	-	-	-	0.5	13	0.5	82	131	0.02	4.3	12	-	27		

SW C	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	146	6.56	83	7.35	15.7	<1	<50	<1	244	41	<0.04	<1	<1	<0.2	<5	13/08/2020 - 16/06/2021	12
Max	265	7.41	184	15.2	62.8	<1	<50	<1	885	174	<0.04	3	4	1.2	15		
Mean	210	-	128	11	36	0.5	25	0.5	420	105	0.02	1.5	2.5	0.29	7.1		

SW E	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	218	6.67	121	13.4	35.7	<1	<50	<1	335	90	<0.04	<1	5	<0.2	<5	13/08/2020 - 16/06/2021	12
Max	590	7.42	398	44	157	<1	60	<1	918	1630	<0.04	2	43	0.6	8		
Mean	408	-	272	28	98	0.5	33	0.5	656	571	0.02	1	23	0.17	4		

WX22	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	213	6.77	130	5.84	19.6	<1	<50	<1	122	44	<0.04	<1	7	<0.2	<5	13/08/2020 - 16/06/2021	12
Max	930	7.54	560	79	279	<1	120	<1	768	782	<0.04	2	47	0.4	11		
Mean	495	-	312	31	124	0.5	47	0.5	295	261	0.02	0.77	20	0.15	5.4		

SW G	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Sulfate (as SO4)	Arsenic	Boron	Chromium	Iron	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	211	6.72	139	4.53	15.9	<1	<50	<1	86	38	<0.04	<1	6	<0.2	<5	13/08/2020 - 16/06/2021	12
Max	930	7.58	550	79.3	280	<1	170	<1	763	739	0.05	1	48	0.3	10		
Mean	496	-	318	32	126	0.5	50	0.5	259	228	0.023	0.63	20	0.14	3.4		

Legend

- ⌖ Groundwater Monitoring Location
- ▲ Surface Water Monitoring Location
- ▭ Licenced Premises Boundary
- ▭ Mt Piper Ash
- ⬚ Lamberts North Ash Repository (Approval Area)
- — Watercourse

Source:
Spatial Data :DFSI, DCDB/DTDB
Imagery Data : Nearmap January 2021

Environmental Goal - Surface Water

Electrical Conductivity (uS/cm)	pH (Field)	TDS (mg/L)	Chloride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Chromium (µg/L)	Iron (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2200	6.5-8	1500	350	1000	24	370	2	300	1900	0.06	10	17	5	116

350	Highlighted cells indicate an exceedance of the Surface Water Environmental Goal.

Surface Water Summary

F - 7

Drawing No: 0553983m_AEMR21_G010_R3.mxd
Date: 17/09/2021 Drawing Size: A4
Drawn By: GR Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

0 100 200 300m

N

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

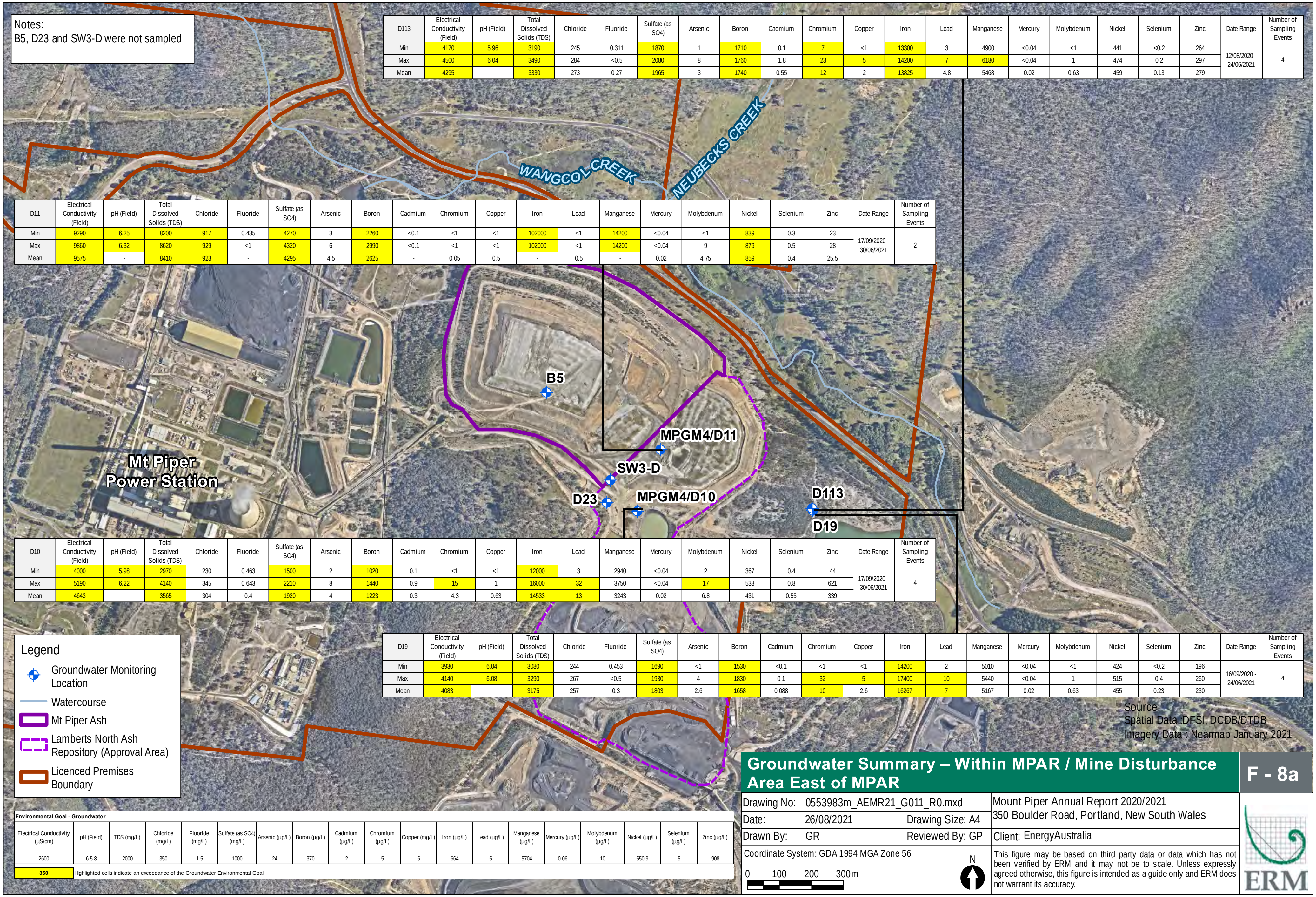
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

Notes:
B5, D23 and SW3-D were not sampled

D113	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	4170	5.96	3190	245	0.311	1870	1	1710	0.1	7	<1	13300	3	4900	<0.04	<1	441	<0.2	264	12/08/2020 - 24/06/2021	4
Max	4500	6.04	3490	284	<0.5	2080	8	1760	1.8	23	5	14200	7	6180	<0.04	1	474	0.2	297		
Mean	4295	-	3330	273	0.27	1965	3	1740	0.55	12	2	13825	4.8	5468	0.02	0.63	459	0.13	279		

D11	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	9290	6.25	8200	917	0.435	4270	3	2260	<0.1	<1	<1	102000	<1	14200	<0.04	<1	839	0.3	23	17/09/2020 - 30/06/2021	2
Max	9860	6.32	8620	929	<1	4320	6	2990	<0.1	<1	<1	102000	<1	14200	<0.04	9	879	0.5	28		
Mean	9575	-	8410	923	-	4295	4.5	2625	-	0.05	0.5	-	0.5	-	0.02	4.75	859	0.4	25.5		



D10	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	4000	5.98	2970	230	0.463	1500	2	1020	0.1	<1	<1	12000	3	2940	<0.04	2	367	0.4	44	17/09/2020 - 30/06/2021	4
Max	5190	6.22	4140	345	0.643	2210	8	1440	0.9	15	1	16000	32	3750	<0.04	17	538	0.8	621		
Mean	4643	-	3565	304	0.4	1920	4	1223	0.3	4.3	0.63	14533	13	3243	0.02	6.8	431	0.55	339		

D19	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	3930	6.04	3080	244	0.453	1690	<1	1530	<0.1	<1	<1	14200	2	5010	<0.04	<1	424	<0.2	196	16/09/2020 - 24/06/2021	4
Max	4140	6.08	3290	267	<0.5	1930	4	1830	0.1	32	5	17400	10	5440	<0.04	1	515	0.4	260		
Mean	4083	-	3175	257	0.3	1803	2.6	1658	0.088	10	2.6	16267	7	5167	0.02	0.63	455	0.23	230		

Legend
- ⊕ Groundwater Monitoring Location
- — Watercourse
- ▭ Mt Piper Ash
- ⬚ Lamberts North Ash Repository (Approval Area)
- ▭ Licenced Premises Boundary

Source:
Spatial Data :DFSI, DCDB/DTDB
Imagery Data : Nearmap January 2021

Environmental Goal - Groundwater

Electrical Conductivity (µS/cm)	pH (Field)	TDS (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (mg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2600	6.5-8	2000	350	1.5	1000	24	370	2	5	5	664	5	5704	0.06	10	550.9	5	908

350 Highlighted cells indicate an exceedance of the Groundwater Environmental Goal

Groundwater Summary – Within MPAR / Mine Disturbance Area East of MPAR

F - 8a

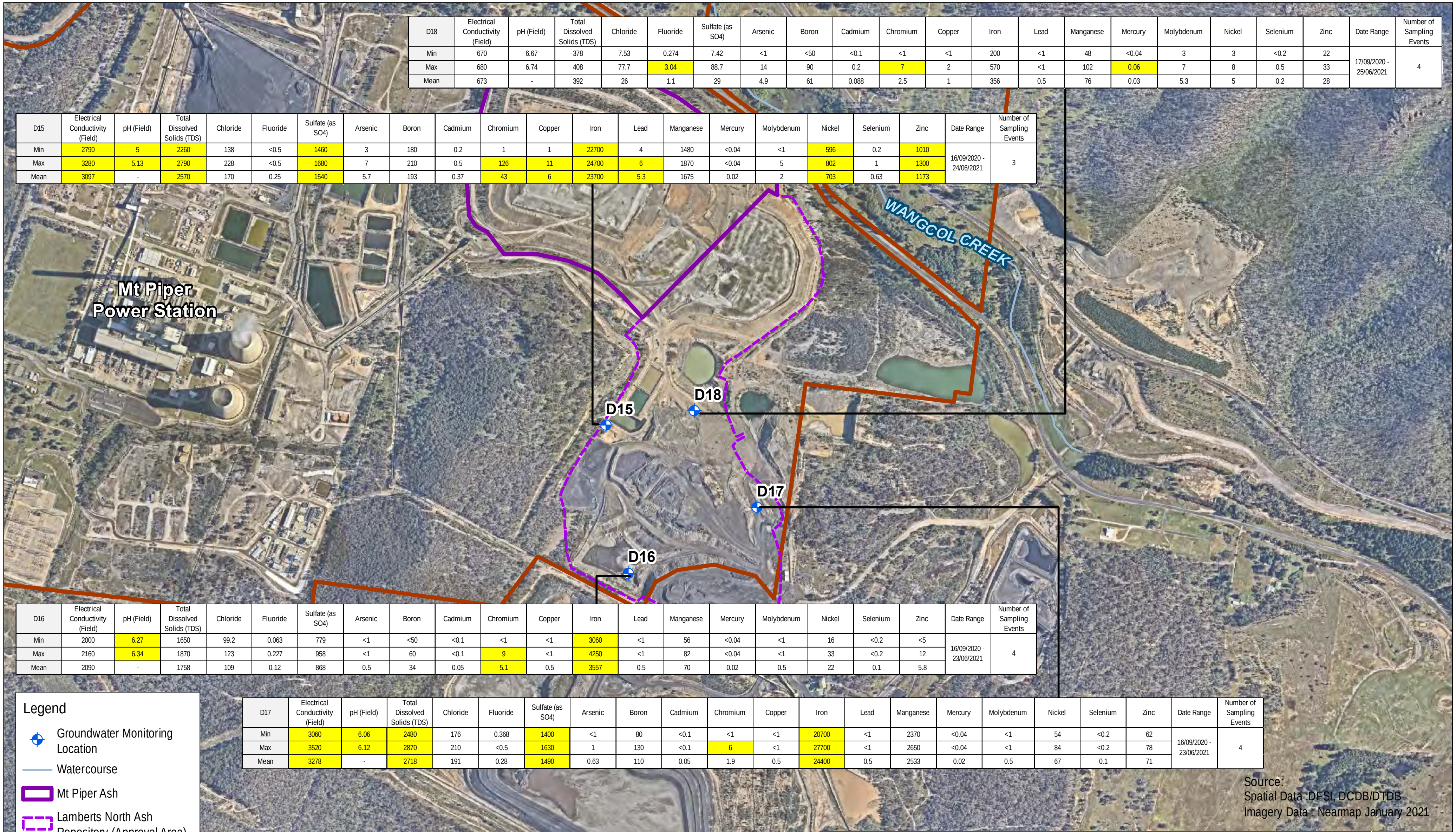
Drawing No: 0553983m_AEMR21_G011_R0.mxd
Date: 26/08/2021 Drawing Size: A4
Drawn By: GR Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia

ERM

Groundwater Summary – Within Mine Disturbance Area South and Southeast of MPAR

F - 8b



D18	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	670	6.67	378	7.53	0.274	7.42	<1	<50	<0.1	<1	<1	200	<1	48	<0.04	3	3	<0.2	22	17/09/2020 - 25/06/2021	4
Max	680	6.74	408	77.7	3.04	88.7	14	90	0.2	7	2	570	<1	102	0.06	7	8	0.5	33		
Mean	673	-	392	26	1.1	29	4.9	61	0.088	2.5	1	356	0.5	76	0.03	5.3	5	0.2	28		

D15	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	2790	5	2260	138	<0.5	1460	3	180	0.2	1	1	22700	4	1480	<0.04	<1	596	0.2	1010	16/09/2020 - 24/06/2021	3
Max	3280	5.13	2790	228	<0.5	1680	7	210	0.5	126	11	24700	6	1870	<0.04	5	802	1	1300		
Mean	3097	-	2570	170	0.25	1540	5.7	193	0.37	43	6	23700	5.3	1675	0.02	2	703	0.63	1173		

D16	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	2000	6.27	1650	99.2	0.063	779	<1	<50	<0.1	<1	<1	3060	<1	56	<0.04	<1	16	<0.2	<5	16/09/2020 - 23/06/2021	4
Max	2160	6.34	1870	123	0.227	958	<1	60	<0.1	9	<1	4250	<1	82	<0.04	<1	33	<0.2	12		
Mean	2090	-	1758	109	0.12	868	0.5	34	0.05	5.1	0.5	3557	0.5	70	0.02	0.5	22	0.1	5.8		

D17	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	3060	6.06	2480	176	0.368	1400	<1	80	<0.1	<1	<1	20700	<1	2370	<0.04	<1	54	<0.2	62	16/09/2020 - 23/06/2021	4
Max	3520	6.12	2870	210	<0.5	1630	1	130	<0.1	6	<1	27700	<1	2650	<0.04	<1	84	<0.2	78		
Mean	3278	-	2718	191	0.28	1490	0.63	110	0.05	1.9	0.5	24400	0.5	2533	0.02	0.5	67	0.1	71		

Legend

- ⌖ Groundwater Monitoring Location
- — Watercourse
- ▭ Mt Piper Ash
- ⬚ Lamberts North Ash Repository (Approval Area)
- ▭ Licenced Premises Boundary

Environmental Goal - Groundwater

Electrical Conductivity (µS/cm)	pH (Field)	TDS (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (mg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2600	6.5-8	2000	350	1.5	1000	24	370	2	5	5	664	5	5704	0.06	10	550.9	5	908

350 Highlighted cells indicate an exceedance of the Groundwater Environmental Goal

Source:
Spatial Data :DFSI, DCDB/DTDB
Imagery Data : Nearmap January 2021

Drawing No: 0553983m_AEMR21_G012_R0.mxd
Date: 13/08/2021 Drawing Size: A4
Drawn By: GR Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

N

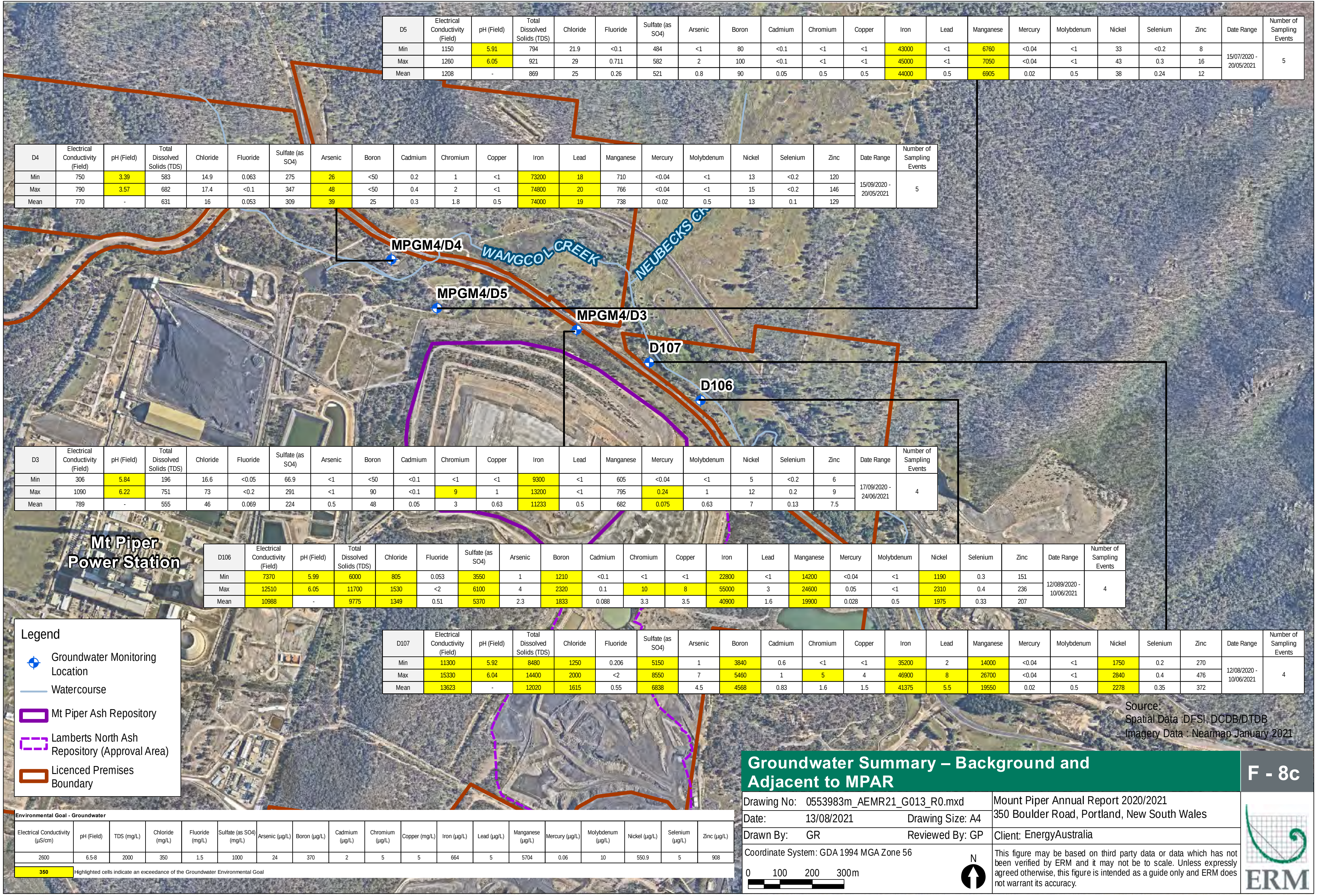
0 100 200 300m

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



D5	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	1150	5.91	794	21.9	<0.1	484	<1	80	<0.1	<1	<1	43000	<1	6760	<0.04	<1	33	<0.2	8	15/07/2020 - 20/05/2021	5
Max	1260	6.05	921	29	0.711	582	2	100	<0.1	<1	<1	45000	<1	7050	<0.04	<1	43	0.3	16		
Mean	1208	-	869	25	0.26	521	0.8	90	0.05	0.5	0.5	44000	0.5	6905	0.02	0.5	38	0.24	12		

D4	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	750	3.39	583	14.9	0.063	275	26	<50	0.2	1	<1	73200	18	710	<0.04	<1	13	<0.2	120	15/09/2020 - 20/05/2021	5
Max	790	3.57	682	17.4	<0.1	347	48	<50	0.4	2	<1	74800	20	766	<0.04	<1	15	<0.2	146		
Mean	770	-	631	16	0.053	309	39	25	0.3	1.8	0.5	74000	19	738	0.02	0.5	13	0.1	129		

D3	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	306	5.84	196	16.6	<0.05	66.9	<1	<50	<0.1	<1	<1	9300	<1	605	<0.04	<1	5	<0.2	6	17/09/2020 - 24/06/2021	4
Max	1090	6.22	751	73	<0.2	291	<1	90	<0.1	9	1	13200	<1	795	0.24	1	12	0.2	9		
Mean	789	-	555	46	0.069	224	0.5	48	0.05	3	0.63	11233	0.5	682	0.075	0.63	7	0.13	7.5		

D106	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	7370	5.99	6000	805	0.053	3550	1	1210	<0.1	<1	<1	22800	<1	14200	<0.04	<1	1190	0.3	151	12/089/2020 - 10/06/2021	4
Max	12510	6.05	11700	1530	<2	6100	4	2320	0.1	10	8	55000	3	24600	0.05	<1	2310	0.4	236		
Mean	10988	-	9775	1349	0.51	5370	2.3	1833	0.088	3.3	3.5	40900	1.6	19900	0.028	0.5	1975	0.33	207		

D107	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	11300	5.92	8480	1250	0.206	5150	1	3840	0.6	<1	<1	35200	2	14000	<0.04	<1	1750	0.2	270	12/08/2020 - 10/06/2021	4
Max	15330	6.04	14400	2000	<2	8550	7	5460	1	5	4	46900	8	26700	<0.04	<1	2840	0.4	476		
Mean	13623	-	12020	1615	0.55	6838	4.5	4568	0.83	1.6	1.5	41375	5.5	19550	0.02	0.5	2278	0.35	372		

Environmental Goal - Groundwater

Electrical Conductivity (µS/cm)	pH (Field)	TDS (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (mg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2600	6.5-8	2000	350	1.5	1000	24	370	2	5	5	664	5	5704	0.06	10	550.9	5	908

350 Highlighted cells indicate an exceedance of the Groundwater Environmental Goal

Source:
Spatial Data :DFSI, DCDB/DTDB
Imagery Data : Nearmap January 2021

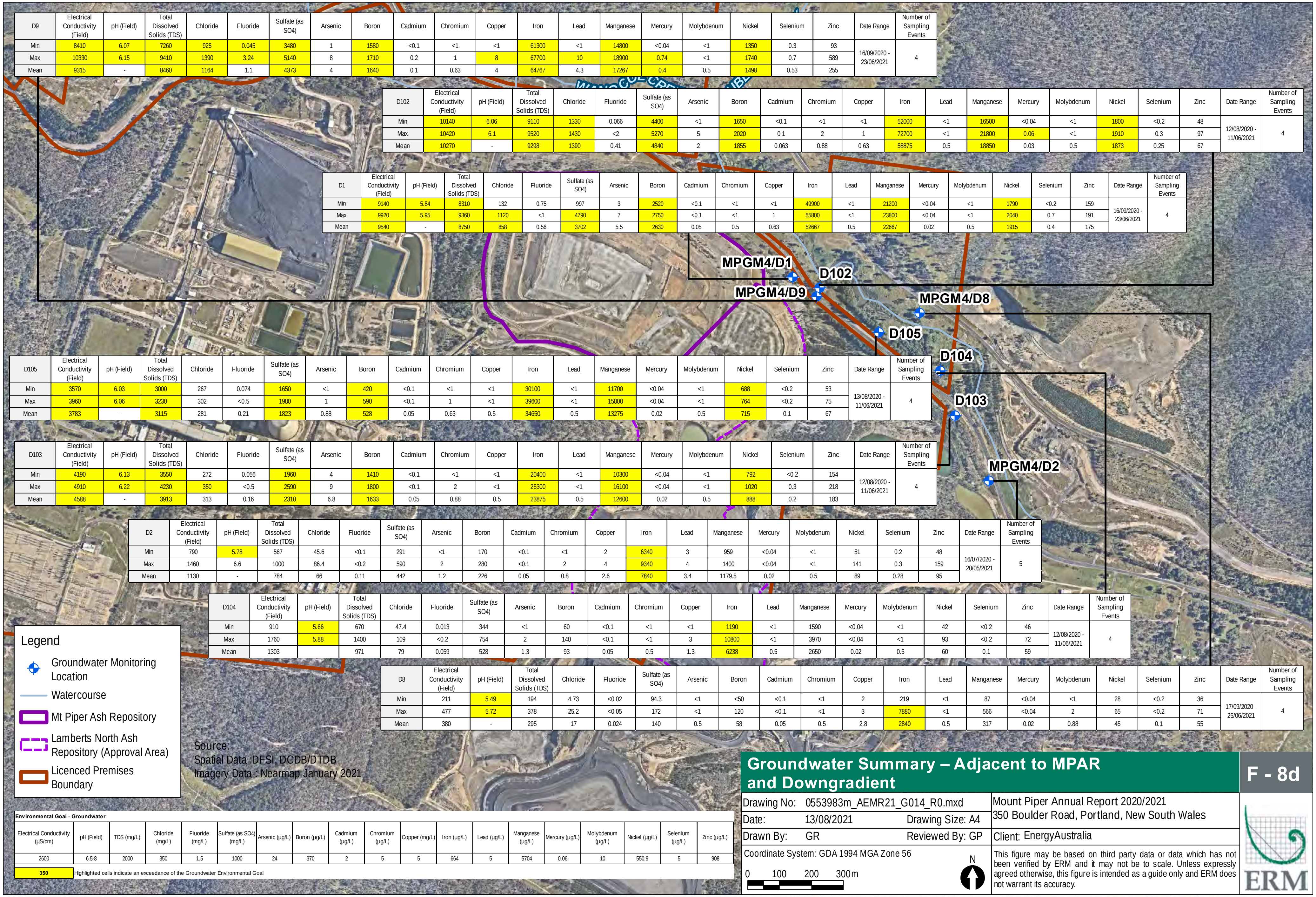
Groundwater Summary – Background and Adjacent to MPAR

F - 8c

Drawing No: 0553983m_AEMR21_G013_R0.mxd
Date: 13/08/2021 Drawing Size: A4
Drawn By: GR Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia

ERM



D9	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	8410	6.07	7260	925	0.045	3480	1	1580	<0.1	<1	<1	61300	<1	14800	<0.04	<1	1350	0.3	93	16/09/2020 - 23/06/2021	4
Max	10330	6.15	9410	1390	3.24	5140	8	1710	0.2	1	8	67700	10	18900	0.74	<1	1740	0.7	589		
Mean	9315	-	8460	1164	1.1	4373	4	1640	0.1	0.63	4	64767	4.3	17267	0.4	0.5	1498	0.53	255		

D102	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	10140	6.06	9110	1330	0.066	4400	<1	1650	<0.1	<1	<1	52000	<1	16500	<0.04	<1	1800	<0.2	48	12/08/2020 - 11/06/2021	4
Max	10420	6.1	9520	1430	<2	5270	5	2020	0.1	2	1	72700	<1	21800	0.06	<1	1910	0.3	97		
Mean	10270	-	9298	1390	0.41	4840	2	1855	0.063	0.88	0.63	58875	0.5	18850	0.03	0.5	1873	0.25	67		

D1	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	9140	5.84	8310	132	0.75	997	3	2520	<0.1	<1	<1	49900	<1	21200	<0.04	<1	1790	<0.2	159	16/09/2020 - 23/06/2021	4
Max	9920	5.95	9360	1120	<1	4790	7	2750	<0.1	<1	1	55800	<1	23800	<0.04	<1	2040	0.7	191		
Mean	9540	-	8750	858	0.56	3702	5.5	2630	0.05	0.5	0.63	52667	0.5	22667	0.02	0.5	1915	0.4	175		

D105	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	3570	6.03	3000	267	0.074	1650	<1	420	<0.1	<1	<1	30100	<1	11700	<0.04	<1	688	<0.2	53	13/08/2020 - 11/06/2021	4
Max	3960	6.06	3230	302	<0.5	1980	1	590	<0.1	1	<1	39600	<1	15800	<0.04	<1	764	<0.2	75		
Mean	3783	-	3115	281	0.21	1823	0.88	528	0.05	0.63	0.5	34650	0.5	13275	0.02	0.5	715	0.1	67		

D103	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	4190	6.13	3550	272	0.056	1960	4	1410	<0.1	<1	<1	20400	<1	10300	<0.04	<1	792	<0.2	154	12/08/2020 - 11/06/2021	4
Max	4910	6.22	4230	350	<0.5	2590	9	1800	<0.1	2	<1	25300	<1	16100	<0.04	<1	1020	0.3	218		
Mean	4588	-	3913	313	0.16	2310	6.8	1633	0.05	0.88	0.5	23875	0.5	12600	0.02	0.5	888	0.2	183		

D2	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	790	5.78	567	45.6	<0.1	291	<1	170	<0.1	<1	2	6340	3	959	<0.04	<1	51	0.2	48	16/07/2020 - 20/05/2021	5
Max	1460	6.6	1000	86.4	<0.2	590	2	280	<0.1	2	4	9340	4	1400	<0.04	<1	141	0.3	159		
Mean	1130	-	784	66	0.11	442	1.2	226	0.05	0.8	2.6	7840	3.4	1179.5	0.02	0.5	89	0.28	95		

D104	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	910	5.66	670	47.4	0.013	344	<1	60	<0.1	<1	<1	1190	<1	1590	<0.04	<1	42	<0.2	46	12/08/2020 - 11/06/2021	4
Max	1760	5.88	1400	109	<0.2	754	2	140	<0.1	<1	3	10800	<1	3970	<0.04	<1	93	<0.2	72		
Mean	1303	-	971	79	0.059	528	1.3	93	0.05	0.5	1.3	6238	0.5	2650	0.02	0.5	60	0.1	59		

D8	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	211	5.49	194	4.73	<0.02	94.3	<1	<50	<0.1	<1	2	219	<1	87	<0.04	<1	28	<0.2	36	17/09/2020 - 25/06/2021	4
Max	477	5.72	378	25.2	<0.05	172	<1	120	<0.1	<1	3	7880	<1	566	<0.04	2	65	<0.2	71		
Mean	380	-	295	17	0.024	140	0.5	58	0.05	0.5	2.8	2840	0.5	317	0.02	0.88	45	0.1	55		

Legend

- ⊕ Groundwater Monitoring Location
- — Watercourse
- ▭ Mt Piper Ash Repository
- ⬚ Lamberts North Ash Repository (Approval Area)
- ▭ Licenced Premises Boundary

Source:
Spatial Data :DFSI, DCDB/DTDB
Imagery Data : Nearmap January 2021

Environmental Goal - Groundwater

Electrical Conductivity (µS/cm)	pH (Field)	TDS (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (mg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2600	6.5-8	2000	350	1.5	1000	24	370	2	5	5	664	5	5704	0.06	10	550.9	5	908

🟨 350	Highlighted cells indicate an exceedance of the Groundwater Environmental Goal

Groundwater Summary – Adjacent to MPAR and Downgradient

F - 8d

Drawing No:	0553983m_AEMR21_G014_R0.mxd		
Date:	13/08/2021	Drawing Size:	A4
Drawn By:	GR	Reviewed By:	GP

Coordinate System: GDA 1994 MGA Zone 56

N

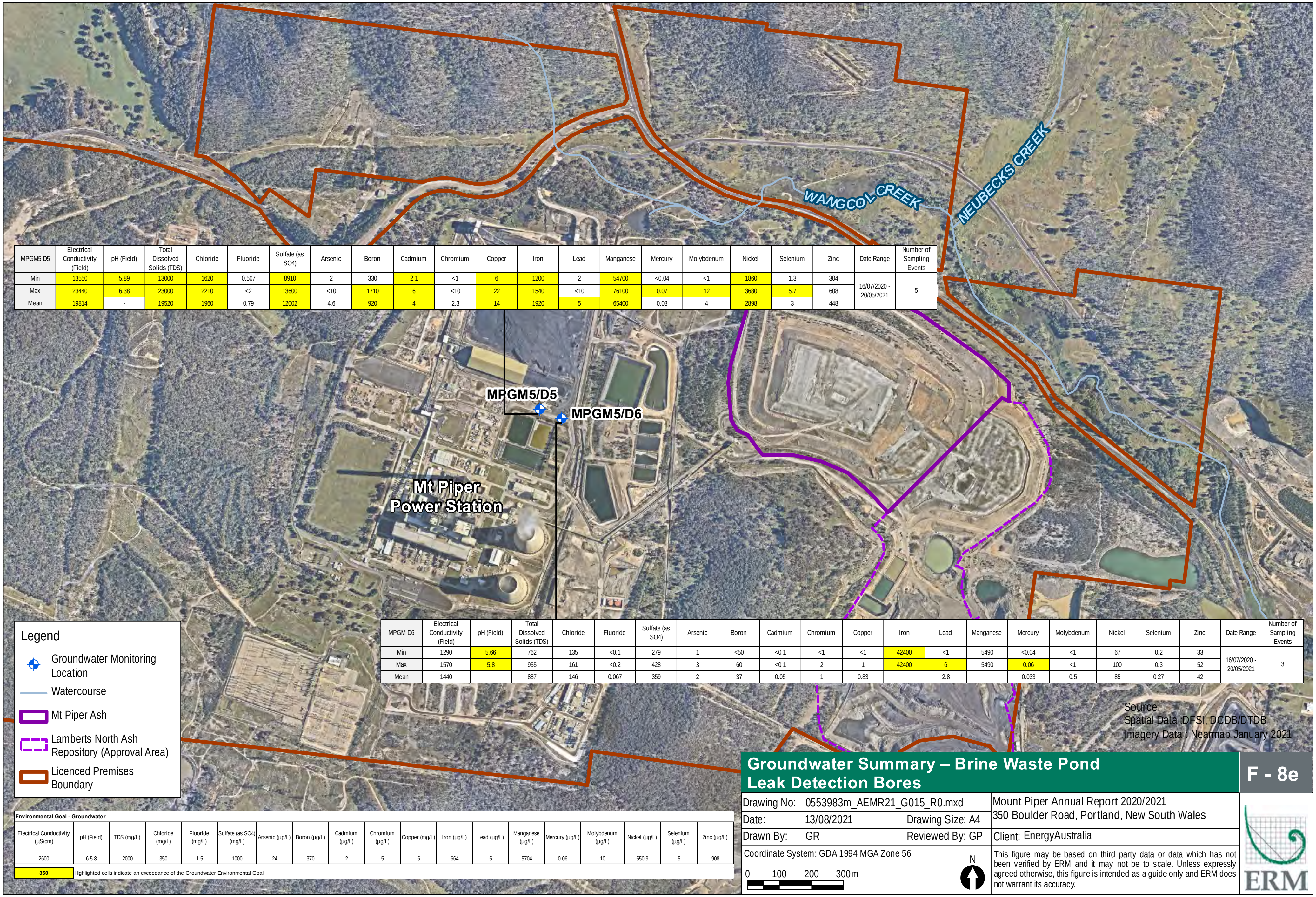
0 100 200 300m

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales

Client: EnergyAustralia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM



MPGM5-D5	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	13550	5.89	13000	1620	0.507	8910	2	330	2.1	<1	6	1200	2	54700	<0.04	<1	1860	1.3	304	16/07/2020 - 20/05/2021	5
Max	23440	6.38	23000	2210	<2	13600	<10	1710	6	<10	22	1540	<10	76100	0.07	12	3680	5.7	608		
Mean	19814	-	19520	1960	0.79	12002	4.6	920	4	2.3	14	1920	5	65400	0.03	4	2898	3	448		

MPGM-D6	Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Chloride	Fluoride	Sulfate (as SO4)	Arsenic	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Zinc	Date Range	Number of Sampling Events
Min	1290	5.66	762	135	<0.1	279	1	<50	<0.1	<1	<1	42400	<1	5490	<0.04	<1	67	0.2	33	16/07/2020 - 20/05/2021	3
Max	1570	5.8	955	161	<0.2	428	3	60	<0.1	2	1	42400	6	5490	0.06	<1	100	0.3	52		
Mean	1440	-	887	146	0.067	359	2	37	0.05	1	0.83	-	2.8	-	0.033	0.5	85	0.27	42		

Source:
Spatial Data :DFSI, DCDB/DTDB
Imagery Data : Nearmap January 2021

Environmental Goal - Groundwater

Electrical Conductivity (µS/cm)	pH (Field)	TDS (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Sulfate (as SO4) (mg/L)	Arsenic (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (mg/L)	Iron (µg/L)	Lead (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Zinc (µg/L)
2600	6.5-8	2000	350	1.5	1000	24	370	2	5	5	664	5	5704	0.06	10	550.9	5	908

350 Highlighted cells indicate an exceedance of the Groundwater Environmental Goal

Groundwater Summary – Brine Waste Pond Leak Detection Bores

F - 8e

Drawing No: 0553983m_AEMR21_G015_R0.mxd
Date: 13/08/2021 Drawing Size: A4
Drawn By: GR Reviewed By: GP
Coordinate System: GDA 1994 MGA Zone 56

Mount Piper Annual Report 2020/2021
350 Boulder Road, Portland, New South Wales
Client: EnergyAustralia

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

APPENDIX A MT PIPER CONSENT REQUIREMENTS

Project Approval Document	Consent Requirements	How addressed by this AEMR
Mt Piper Consent	38 A Notwithstanding the provisions of Condition No. 38, the brine and ash co-placement area may be extended and shall be undertaken generally in accordance with the Statement of Environmental Effects: Mount Piper Power Station Extension of Brine Conditioned Ash Placement Area, prepared by Connell Wagner Pty Ltd and dated June 2007. This includes: (i) The extended area must lie within the existing ash placement area; (ii) Co-placement activities in the proposed extended area must use existing facilities and methods; (iii) The placement of brine conditioned ash may only occur between the levels of RL 946 metres (the end-point of the water conditioned ash layer) and RL 980 metres.	Refer to Appendix C and Section 2 of this report.
	38 B The groundwater and surface water monitoring programs required by Condition No. 40 and 41 apply to the extension of the brine and ash co-placement area, permitted by Condition 38 A.	Refer to relevant conditions below.
	38 C The Applicant must update the Water Management Plan (WMP) required by Condition No. 43, and obtain the approval of the Secretary for the update, prior to undertaking any works permitted by Condition No. 38 A. In determining whether to grant approval, the Secretary must consult with the BCD, WaterNSW, DPIE Water, and Council.	Condition is met by the WMP dated 28 February 2020, as outlined in Section 1 and Section 4 to Section 8 of this report.
	40. The Applicant shall, at least one month prior to the first placement of brine-conditioned flyash, consult with the EPA, DPIE Water and WaterNSW to establish the requirements for Water Monitoring Programs for groundwater and surface water. The Water Monitoring Programs shall: (i) be based on the monitoring programs presented in the Statement of Environmental Effects for this modification; (ii) include water quality testing at a minimum frequency of every three months; (iii) be at the expense of the Applicant.	Condition is met by the WMP dated 28 February 2020, as outlined in Section 1 and Section 4 to Section 8 of this report.
	41. The Applicant shall expand the groundwater and surface water monitoring programs, including, if so required, the establishment of additional groundwater monitoring bores and surface water sampling points, in accordance with any reasonable requirements of the EPA, DPIE Water or WaterNSW.	Condition is met by the WMP dated 28 February 2020, as outlined in Section 1 and Section 4 to Section 8 of this report.

Project Approval Document	Consent Requirements	How addressed by this AEMR
	43. At least one month prior to the placement of brine-conditioned flyash, or within such further period as the Secretary may agree, the Applicant shall prepare and submit for the approval of the EPA, WaterNSW, DPIE Water, Council, and the Secretary, a Water Management Plan (WMP) which shall include, but not be limited to: (a) Details of the monitoring programs for surface water and groundwater required under conditions 40 and 41. (b) Details of measures to be employed to control surface water run-off from the site. (c) Contingency plans for the mitigation of environmental impacts should run-off or leachate from the site be found to be negatively impacting on natural surface water or groundwater. (d) Brine management objectives and strategies, with specific reference to measures aimed at reducing the volume of brine produced at the Mount Piper Power Station.	Condition is met by the WMP dated 28 February 2020, as outlined in Section 1 and Section 4 to Section 8 of this report.
	43A. The Applicant must update the Water Management Plan required by Condition 43 to the satisfaction of the Secretary, prior to commissioning the storage pond associated with Modification 8. The Applicant must implement the approved Water Management Plan.	Condition is met by the WMP dated 28 February 2020, as outlined in Section 1 and Section 4 to Section 8 of this report.
	44. The Applicant shall provide to the Secretary, EPA, DPIE Water, WaterNSW and Council, an Environmental Monitoring Report (EMR) on a yearly basis, with the first EMR to be submitted no later than six months after the first placement of brine-conditioned flyash onsite. The Applicant shall agree to Council making the Environmental Monitoring Reports available on request for public inspection.	Condition is met by the development of this report in its entirety.
	45. The Environmental Monitoring Report shall include, but not be limited to: (a) a summary and discussion of all available results and analyses from Water Monitoring Programs; (b) a discussion of the aims of the Water Management Plan and to what degree these aims have been attained in the context of results and analyses of the Water Monitoring Programs; (c) actions taken, or intended to be taken, if any, to mitigate any adverse environmental impacts; and to meet the reasonable requirements of the Secretary, EPA, DPIE Water, WaterNSW or Council.	Refer to Section 4 to Section 8, along with Appendix B to Appendix L of this report.
The WMP (ERM, 2020)	Section 5.1 – Environmental Goals The results of all surface water and groundwater monitoring are intended to be assessed relative to the Environmental Goals	Refer to Section 5 (surface water) and Section 6 (groundwater), along with Appendix F to Appendix J of this report.
	Section 5.1.1 – Early Warning Assessment In addition to comparing results with the Environmental Goals for surface water and groundwater an early warning assessment will be conducted. This assessment will include a review of concentration trends through time at each location, including statistical assessment.	Refer to Section 7, along with Appendix H to Appendix L of this report.
	Section 6.1 – Monitoring Locations	Refer to Section 5.2 and Section 6.2 of this report.

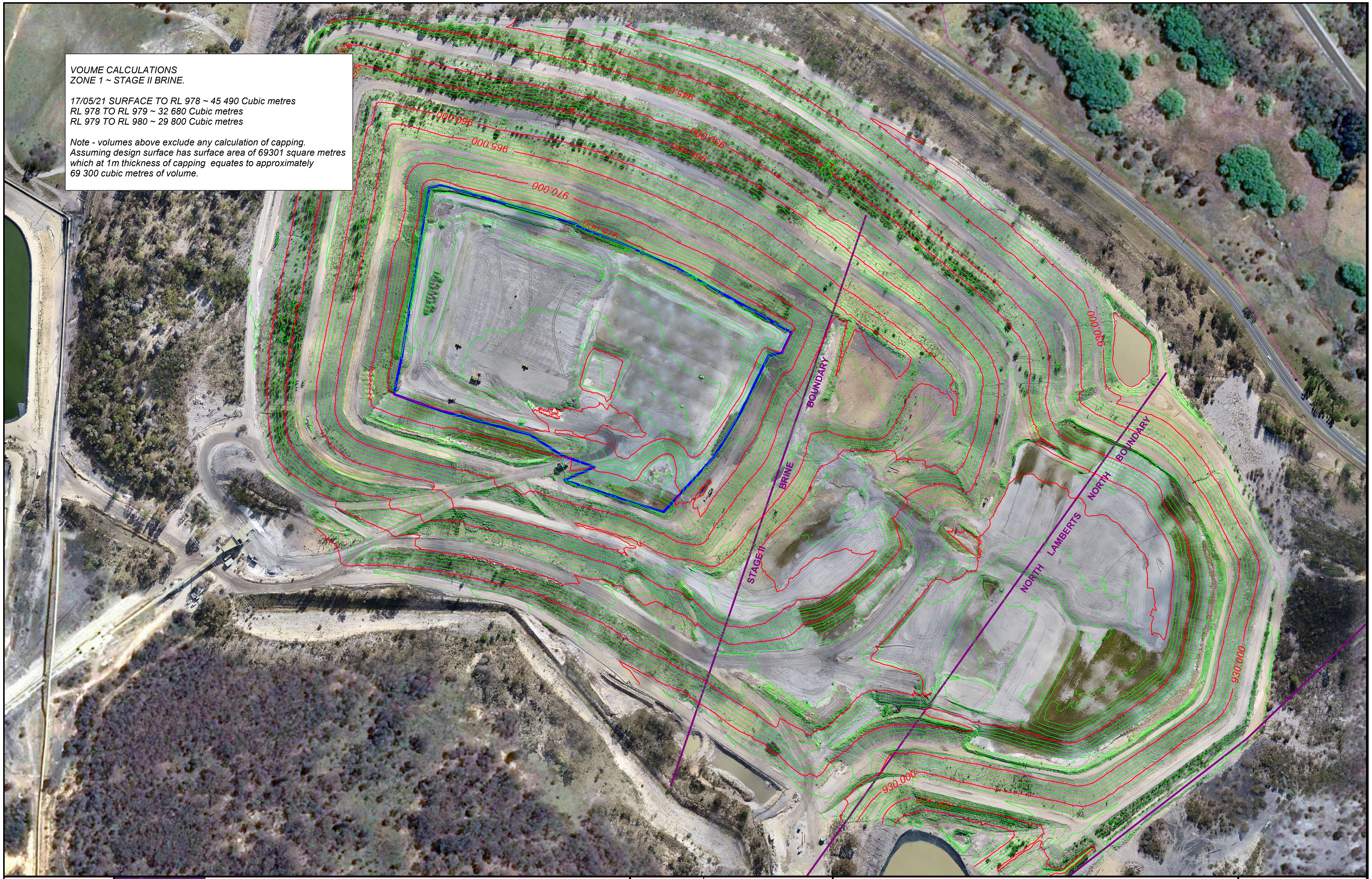
Project Approval Document	Consent Requirements	How addressed by this AEMR
	Section 6.2 – Monitoring Frequency	Refer to Section 5.2 and Section 6.2 of this report.
	Section 6.3 – Monitoring Method	Refer to Section 5.3 and Section 6.3 of this report.
	Section 6.4 – Monitored Parameters	Refer to Section 5.4 and Section 6.4 of this report.
	Section 6.5 – Data Management and Assessment The monitoring data is compared with the existing historical dataset for an assessment of trends related to potential influence of the brine management and BCA placement activities on surface water and groundwater.	Refer to Section 5.5, Section 5.6, Section 6.5, Section 6.6 and Section 7 of this report.
	Section 6.6 – Reporting Requirements The reporting requirements of the WMP form the objectives of this AEMR.	Refer to Section 1.2, Section 5 to Section 8 of this report.
	Section 7.1 – Performance Criteria The key aim of TARPs is the mitigation and control of impacts, ideally through early detection. Therefore, TARPs for groundwater and surface water quality are based on the Environmental Goals for the monitoring program. In addition, long-term trends in surface and groundwater concentrations are assessed using the routine monitoring data and with reference to a statistical assessment of water quality data. Should concentrations at a given location indicate a statistically significant increasing concentration trend in groundwater or surface water, or exceed the relevant Environmental Goal, the triggers are considered to have been exceeded and actions are to be implemented.	Refer to Section 7.5 of this report.
	Section 7.2 – Incident Response An impact to groundwater or surface water is considered to be present when concentrations of a monitoring parameter are recorded above the Environmental Goals. In the event of an impact to groundwater or surface water that is considered to be potentially associated with brine management and/or handling/placement of BCA at MPAR, the WMP outlines an incident response procedure. It is noted that the EPL 13007 outlines separate incident response requirements. The reporting requirements of the EPL will be provided to the regulators separately to this AEMR.	Refer to Section 7.5 of this report.
	Section 7.3 – Contingency Measures Should routine monitoring data suggest that further changes in water quality are being caused by brine management (e.g. brine waste ponds) or other BCA placement and related activities at the MPPS, the WMP outlines contingency items that may be implemented.	Refer to Section 7.5 of this report.

APPENDIX B STORMWATER FLOW VOLUME DATA

Mt Piper Power Station - LDP12 (formerly LDP01) discharge volumes

Date	Kilolitres / day	Start Pump (hh.mm)	Cease Pumping (hh.mm)
29/07/2020	3000	11.00	23.59
30/07/2020	4000	12.01	23.59
31/07/2020	4000	12.01	23.59
1/08/2020	3000	12.01	11.00
12/08/2020	3000	12.00	23.59
13/08/2020	4000	12.01	23.59
14/08/2020	4000	12.01	18.00
18/08/2020	3000	12.00	23.59
19/08/2020	4000	12.01	23.59
20/08/2020	2000	12.01	8.00
26/08/2020	2000	0.75	23.59
27/08/2020	2000	12.01	8.00
22/09/2020	1000	11.30	24.00
23/09/2020	3000	12.01	24.00
24/09/2020	3000	12.01	24
25/09/2020	1000	12.01	8
18/12/2020	2500	11	21
19/12/2020	3000	8	16
20/12/2020	3000	8	16
21/12/2020	3000	8	18
11/01/2021	3000	1600	2400
12/01/2021	4000	12.01	2400
13/01/2021	2000	9	17
14/01/2021	1000	1200	1700
15/01/2021	500	14	1700
11/02/2021	2000	1300	2400
12/02/2021	3000	12	1700
9/03/2021	2000	1400	2400
10/03/2021	2000	12.01	1700
TOTAL	**77000**	**-**	**-**

APPENDIX C ASH REPOSITORY SURVEY



VOUME CALCULATIONS
ZONE 1 ~ STAGE II BRINE.

17/05/21 SURFACE TO RL 978 ~ 45 490 Cubic metres
RL 978 TO RL 979 ~ 32 680 Cubic metres
RL 979 TO RL 980 ~ 29 800 Cubic metres

Note - volumes above exclude any calculation of capping.
Assuming design surface has surface area of 69301 square metres
which at 1m thickness of capping equates to approximately
69 300 cubic metres of volume.

N

CEH SURVEY
CONSULTING LAND, ENGINEERING AND MINING SURVEYORS
"Astrolabe" 1 Rutherford Lane,
LITHGOW 2790
ABN: 68 056 544 551 Office: (02) 6351 2281
Email: survey@ceh.com.au Website: www.ceh.com.au

DATE	17-05-2021
AMENDED	04/06/2021
SURVEYOR	TH/BN
DRAWN	TH/GM
CHECKED	

LEND LEASE SERVICES PTY. LTD.
MOUNT PIPER - ASH PLACEMENT
SURVEY : 17th MAY 2021

SCALE - 1:3500 (A3)
DATUM: MGA (ZONE 56)

DRAWING No:
MPA0521
(as surveyed)

CCAD6 JOB & DWG:
MPA0521 - MPA0521 as survey

APPENDIX D BRINE COMPOSITION DATA

APPENDIX D BRINE COMPOSITION DATA

Brine Composition Average Data

Parameter	Values from 1999 SEE Average[b]	2003 – 2006 Average[b]	July 2017 - Dec 2017 Average[a]	July 2019 – June 2020 Average[c]	July 2020 – June 2021 Average[d]
mg/L (except pH)					
pH	7.9	8.1	7.9	9.3	8.75
Cond (us/cm)	63,664	127,982	88,556	61,320	73,196
TDS	116,650	137,170	118,500	64,257	89,948
Alk (CaCO3)	1,360	1,346	976	14,735	6,067
Cl	19,864	23,889	10,390	7,776	8,270
SO4	49,670	66,767	67,378	28,302	47,395
Na	25,678	30,103	37,400	23,475	28,694
K	4,258	7,362	3,460	1,721	2,518
Ca	645	606	780	696	458
Mg	5,480	9,010	4,010	1,540	2,541
ug/L					
As	409^^^	143	438	522	199
Ag	1.4^^	<50	10	<1	<1
Ba	272*	30	1,000	6.43	116
Be	17^	5.8	-	<10	<10
B	73,560*	115,000	35,800	41,500	9,570
Cd	19+	42	5.3	2.3	3.58
Cr ***	49+	<50	1,050	50	40.4
Cu	7,858*	7,197	12,400	5,991	4,626
F	21,178*	125,656	64,650	55,404	72,630
Fe	833*	-	1,580	151	340
Hg	1.35^^	-	0.04	0.11	0.23
Mn	17,530*	34,000	7,210	5,170	231
Mo	2,600^^	-	-	2,625	2,490
Ni	4,187*	4,017	3,880	348	1,570
Pb	6^^	-	10	<10	11.6
Se	245*	-	130	115	114
Zn	2,020*	-	1,050	2,180	1,373

a. Brine composition data provided by EnergyAustralia on 01 August 2018;

b. Connell Wagner (2007). Statement of Environmental Effects, Mount Piper Power Station, Extension of Brine Conditions Ash Placement Area. Prepared by Environmental Services, Pacific Power International for Delta Electricity, 21 June 2007.

c. data based on Nalco monitoring point reference 1050, EA BC Waste Pond

Notations relate to Average Trace element values, from 1999 Statement of Environmental Effects including:

* mostly 10 – 15 analyses (sources Hodgson, 1999) – AWT, 1996

** EPA (1999a) ^ one analysis ^^ 3 analyses ^^^ 5 analyses + 6 analyses

*** Total chromium reported (CrVI <25ug/l)

d. Brine composition data provided by EnergyAustralia on July 2021 – combined data of BC Waste Pond A & B.

APPENDIX E SITE WEATHER DATA

Month	Jul-20			Aug-20			Sep-20			Oct-20			Nov-20			Dec-20		
Measurement	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain
Date	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm
1	1	13	0	-2.0	14.0	0.0	1.0	14.0	0.0	3.0	15.0	2.6	6.0	16.0	0.0	13.0	35.0	3.3
2	6	14	0	-4.0	16.0	0.0	-1.0	17.0	0.0	1.0	21.0	0.0	7.0	18.0	0.0	13.0	26.0	0.2
3	1	9	0	5.0	14.0	0.0	6.0	21.0	0.0	3.0	24.0	0.0	6.0	22.0	0.0	14.0	25.0	0.0
4	2	7	0.1	0.0	13.0	0.0	10.0	15.0	0.4	6.0	24.0	0.0	5.0	25.0	0.0	12.0	28.0	0.0
5	-2	8	0.0	-1.0	7.0	0.0	1.0	14.0	0.0	10.0	25.0	0.0	8.0	17.0	1.5	7.0	23.0	14.4
6	-3	13	0.0	0.0	11.0	0.0	1.0	14.0	0.0	9.0	22.0	0.0	6.0	18.0	0.0	10.0	20.0	0.2
7	-2	12	0.0	4.0	7.0	1.7	5.0	19.0	0.0	13.0	18.0	0.2	4.0	19.0	0.0	8.0	20.0	0.0
8	3	10	0.0	4.0	10.0	0.0	2.0	20.0	0.0	9.0	16.0	2.2	7.0	17.0	0.0	6.0	17.0	0.0
9	4	12	0.0	2.0	7.0	0.5	6.0	12.0	1.6	7.0	13.0	0.0	7.0	19.0	0.0	4.0	25.0	0.0
10	1	11	0.2	5.0	9.0	1.0	6.0	10.0	0.0	4.0	17.0	0.0	4.0	23.0	0.0	9.0	25.0	0.0
11	4	11	0.7	3.0	11.0	0.0	4.0	14.0	0.0	2.0	19.0	0.0	7.0	25.0	0.0	10.0	14.0	0.0
12	1	9	0.2	4.0	13.0	0.1	4.0	17.0	0.0	6.0	20.0	0.0	11.0	23.0	0.3	10.0	16.0	0.0
13	-1	9	0.3	3.0	14.0	0.4	4.0	16.0	0.0	4.0	23.0	0.0	8.0	18.0	1.2	11.0	19.0	0.2
14	1	10	0.0	1.0	12.0	1.6	3.0	19.0	0.0	6.0	21.0	0.0	7.0	20.0	0.0	13.0	21.0	0.2
15	2	10	0.0	7.0	9.0	0.1	5.0	19.0	0.0	11.0	23.0	0.0	6.0	28.0	0.0	14.0	22.0	2.4
16	0	10	0.0	6.0	8.0	0.0	5.0	19.0	0.0	10.0	20.0	0.0	10.0	29.0	0.0	17.0	25.0	8.1
17	-1	11	0.0	4.0	9.0	0.0	7.0	22.0	0.0	11.0	24.0	2.8	10.0	25.0	0.0	17.0	27.0	0.6
18	-1	11	0.0	4.0	12.0	0.0	9.0	14.0	0.0	10.0	18.0	0.2	13.0	22.0	0.0	13.0	24.0	4.4
19	-2	11	0.0	3.0	11.0	0.7	12.0	18.0	0.0	9.0	19.0	0.0	7.0	28.0	0.0	15.0	16.0	0.0
20	3	10	0.0	4.0	7.0	0.2	10.0	15.0	1.7	10.0	19.0	0.0	13.0	31.0	0.0	13.0	21.0	0.0
21	-2	12	0.0	3.0	8.0	0.5	11.0	22.0	0.0	7.0	21.0	1.6	11.0	31.0	0.0	13.0	18.0	21.0
22	-3	13	0.0	0.0	4.0	1.1	6.0	17.0	0.0	12.0	22.0	0.4	13.0	28.0	0.0	11.0	19.0	3.2
23	-3	14	0.0	1.0	5.0	0.2	3.0	13.0	0.0	9.0	25.0	6.9	11.0	21.0	1.5	10.0	21.0	0.0
24	-4	14	0.0	-2.0	8.0	0.0	4.0	11.0	0.0	12.0	17.0	34.1	9.0	22.0	0.0	12.0	23.0	0.0
25	3	14	0.1	-4.0	9.0	0.0	1.0	12.0	0.6	8.0	12.0	12.2	11.0	23.0	0.0	13.0	19.0	0.0
26	8	9	2.4	-5.0	13.0	0.0	1.0	6.0	0.0	7.0	11.0	5.4	10.0	28.0	0.0	13.0	21.0	0.0
27	6	10	1.3	-4.0	13.0	0.0	2.0	11.0	0.0	7.0	13.0	0.2	14.0	30.0	0.0	11.0	27.0	0.0
28	6	13	0.4	0.0	12.0	0.0	-2.0	14.0	0.0	7.0	17.0	1.0	15.0	33.0	0.1	14.0	27.0	3.0
29	3	13	0.0	-3.0	18.0	0.0	2.0	15.0	0.0	7.0	18.0	2.4	14.0	30.0	0.4	14.0	17.0	24.6
30	1	14	0.0	-1.0	17.0	0.0	4.0	12.0	0.2	5.0	18.0	1.4	12.0	19.0	0.0	13.0	18.0	0.8
31	0	13	0.0	3.0	14.0	0.0				6.0	17.0	0.2				13.0	20.0	0.0
Min	-4	7	0	-5	4	0	-2	6	0	1	11	0	4	16	0	4	14	0
Max	8	14	2.4	7	18	1.7	12	22	1.7	13	25	34.1	15	33	1.5	17	35	24.6
Average	1.03	11.29		1.29	10.81		4.40	15.40		7.45	19.10		9.07	23.60		11.81	21.90	
Total			5.70			8.10			4.50			73.80			5.00			86.60

Month	Jan-21			Feb-21			Mar-21			Apr-21			May-21			Jun-21		
Measurement	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain	Min	Max	Rain
Date	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm	°C	°C	mm
1	11.0	13.0	10.2	14	26	26.8	12	28	0	4	21	0	6	19	0.2	-1	13	0
2	11.0	17.0	0.2	12	23	5.2	8	24	0	8	23	0	6	19	2.7	0	16	0
3	15.0	22.0	8.7	10	22	0	12	20	0	6	24	0	5	20	0.6	5	10	18.7
4	14.0	22.0	40.8	12	25	2.4	10	23	0	8	27	0	9	11	9	4	10	1.4
5	11.0	25.0	0.2	14	27	0.2	13	24	0	8	25	0	9	12	0.4	-2	11	0.4
6	12.0	22.0	2.6	12	20	5.7	12	22	0	12	21	0	11	16	4.6	0	13	0
7	11.0	18.0	1.2	10	25	0.2	13	24	0	13	19	0	9	17	1.2	-3	14	0.2
8	10.0	15.0	0.0	15	21	0	13	25	1.4	12	21	0	7	18	0	3	13	3
9	10.0	20.0	0.2	13	18	0.2	10	26	0	9	22	0	9	16	0.8	-1	4	1
10	7.0	24.0	0.0	9	21	0	14	25	0	6	15	0	5	16	0.2	0	2	10.4
11	9.0	26.0	0.2	13	26	0	16	23	25	5	9	0	7	13	1.6	1	6	0
12	9.0	30.0	0.0	12	26	9.6	15	21	18.8	-1	16	0	7	15	0	4	9	0
13	13.0	28.0	0.0	13	21	9	13	25	1.2	-1	18	0	6	15	0	-2	8	0
14	14.0	30.0	0.0	11	19	0.2	9	17	18.6	5	19	0	7	11	0	-3	12	0
15	10.0	27.0	0.0	11	19	0	8	19	0	8	18	0	2	7	0	0	12	0.2
16	8.0	21.0	0.0	14	21	1.6	10	16	1.2	8	18	0	-4	10	0	-2	15	7.8
17	7.0	25.0	0.0	13	18	2	11	15	2	7	14	0.4	-1	11	0	1	7	1.6
18	10.0	28.0	0.0	12	18	0	13	18	1.4	3	17	0.4	-2	13	0	5	9	0
19	9.0	24.0	0.0	14	22	0.2	13	17	2.4	0	17	0	-3	14	0	5	11	0
20	12.0	19.0	0.0	14	26	0	14	17	7.4	2	15	0	-2	16	0	6	10	0
21	8.0	27.0	0.0	13	27	0	12	16	19.8	1	15	0	-1	13	0	2	11	0
22	12.0	29.0	0.0	11	27	0	13	14	40.8	-1	11	0	1	16	0.2	1	12	0
23	13.0	31.0	0.0	11	18	0.2	14	18	25	1	14	0	-1	16	0.2	4	12	0
24	15.0	33.0	15.6	11	16	0.6	13	18	0.2	0	16	0	7	13	0	9	10	10.6
25	17.0	33.0	0.0	11	21	11.9	10	19	0	1	18	0.2	4	15	0.2	3	10	0.2
26	15.0	30.0	0.0	11	25	0.4	6	19	0.2	0	18	0	6	13	0	4	8	0.2
27	15.0	22.0	0.0	16	24	0.8	6	19	0	1	18	0	3	11	0	0	10	0
28	14.0	18.0	0.0	12	27	0.2	7	19	0	5	18	0	-1	11	0	-2	10	0
29	13.0	19.0	0.2				6	21	0	4	18	0	-2	11	0	6	11	0.2
30	15.0	25.0	20.6				7	20	0	1	18	0	-2	11	0	6	12	0.4
31	13.0	21.0	0.4				4	20	0				-4	15	0.2			
Min	7	13	0	9	16	0	4	14	0	-1	9	0	-4	7	0	-3	2	0
Max	17	33	40.8	16	27	26.8	16	28	40.8	13	27	0.4	11	20	9	9	16	18.7
Average	11.71	24.00		12.29	22.46		10.87	20.39		4.50	18.10		3.32	14.00		1.77	10.37	
Total			101.10			77.40			165.40			1.00			22.10			56.30

APPENDIX F TABULATED SURFACE WATER DATA

			Field Parameters		TDS		Anions / Cations																	Nutrients						Metals																															
			Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Total Suspended Solids (TSS)	Carbonate (as CaCO3)	Total Alkalinity (as CaCO3)	Carbonate Alkalinity (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Phenolphthalein Alkalinity (CaCO3)	Calcium	Calcium (Filtered)	Chloride	Magnesium	Magnesium (Filtered)	Fluoride	Fluoride (Filtered)	Potassium	Potassium (Filtered)	Sodium	Sodium (Filtered)	Sulfate (as SO4)	Nitrate	Nitrite (as NO2-)	Nitrite (as N)	Nitrogen (N) - Kjeldahl	Nitrogen (N)	Phosphorus	Aluminium	Aluminium (Filtered)	Arsenic	Arsenic (Filtered)	Barium	Barium (Filtered)	Beryllium	Boron	Boron (Filtered)	Cadmium	Cadmium (Filtered)	Chromium	Chromium (Filtered)	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Lead (Filtered)	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Molybdenum (Filtered)	Nickel	Nickel (Filtered)	Selenium	Selenium (Filtered)	Silver	Silver (Filtered)	Zinc	Zinc (Filtered)
			uS/cm	pH units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Surface Water			2200	6.5-8	1500									350			1.5	1.5					1000									24	24	700	700	100	370	370	0.85	0.85	2	2	3.5	3.5	300	300	5	5	1900	1900	0.06	10	10	17	17	5	5	0.05	0.05	116	116
Purpose	**LocCode**	**Sampled_Date-Time**																																																											
Upstream	LDP01	29/07/2020	492	7.64	-	4.6	-	-	-	-	-	15	13.4	-	8.88	8.18	-	-	5.82	5.33	74.8	70.5	-	-	-	-	-	-	-	140	<10	<1	<1	14	13	-	<50	<50	0.4	0.4	<1	-	2	<1	66	<2	<1	<1	307	307	<0.04	5	-	33	33	5	5.4	<1	-	73	71
Upstream	LDP01	12/08/2020	454	7.47	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01	13/08/2020	467	7.55	-	9.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01	18/08/2020	476	7.66	-	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01	19/08/2020	491	7.41	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01	22/09/2020	475	7.07	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01	18/12/2020	406	7.49	-	6.333	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01	21/12/2020	421	7.64	-	3.4	-	-	-	-	-	-	-	12.7	-	-	0.123	-	-	-	-	-	152	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01	11/01/2021	307	7.78	-	15.33	-	-	-	-	-	-	-	10.3	-	-	0.08	-	-	-	-	-	78.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01	12/01/2021	317	7.89	-	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01	11/02/2021	353	7.68	-	10.6	-	-	-	-	-	8.2	7.6	-	3.81	3.56	-	-	4.67	3.72	48.5	45.9	-	-	-	-	-	-	-	920	60	<1	<1	11	10	-	<50	<50	<0.1	<0.1	<1	-	<1	<1	70	<50	<1	<1	38	41	<0.04	3	-	2	1	<10	<10	<1	-	6	<5
Upstream	LDP01	9/03/2021	426	7.97	252	6.4	-	-	-	-	-	10.9	11	-	4.59	4.77	-	-	7.54	7.76	75.6	76.8	-	-	-	-	-	-	-	900	20	<1	<1	14	13	-	<50	60	0.1	<0.1	<1	-	<1	<1	110	<50	<1	<1	48	48	<0.04	5	-	2	2	<10	<10	<1	-	<5	<5
	LDP01	**Min.**	**307**	**7.07**	**-**	**2**	**-**	**-**	-	-	-	**8.2**	**7.6**	**10.3**	**3.81**	**3.56**	**0.08**	**-**	**4.67**	**3.72**	**48.5**	**45.9**	**78.7**	-	-	**-**	**-**	-	-	**140**	**<10**	**<1**	**<1**	**11**	**10**	-	**<50**	**<50**	**<0.1**	**<0.1**	**<1**	**-**	**<1**	**<1**	**66**	**<2**	**<1**	**<1**	**38**	**41**	**<0.04**	**3**	**-**	**2**	**1**	**5**	**5.4**	**<1**	**-**	**<5**	**<5**
	LDP01	**Max.**	**492**	**7.97**	**-**	**15.33**	**-**	**-**	-	-	-	**15**	**13.4**	**12.7**	**8.88**	**8.18**	**0.123**	**-**	**7.54**	**7.76**	**75.6**	**76.8**	**152**	-	-	**-**	**-**	-	-	**920**	**60**	**<1**	**<1**	**14**	**13**	-	**<50**	**60**	**0.4**	**0.4**	**<1**	**-**	**2**	**<1**	**110**	**<50**	**<1**	**<1**	**307**	**307**	**<0.04**	**5**	**-**	**33**	**33**	**<10**	**<10**	**<1**	**-**	**73**	**71**
	LDP01	**Average**	**424**	**-**	**-**	**7.3**	**-**	**-**	-	-	-	**11**	**11**		**5.8**	**5.5**		**-**	**6**	**5.6**	**66**	**64**		-	-	**-**	**-**	-	-	**653**	**28**	**0.5**	**0.5**	**13**	**12**	-	**25**	**37**	**0.18**	**0.17**	**0.5**	**-**	**1**	**0.5**	**82**	**17**	**0.5**	**0.5**	**131**	**132**	**0.02**	**4.3**	**-**	**12**	**12**	**-**	**-**	**0.5**	**-**	**27**	**25**
Upstream	LDP01_CSP	6/07/2020	595	7.75	-	-	-	-	-	-	-	-	47.4	9.77	-	-	0.144	-	-	-	-	-	231	270	10	-	-	0.6	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	13/07/2020	571	7.12	-	-	-	-	-	-	-	-	-	8.81	-	-	0.111	-	-	-	-	-	210	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	15/07/2020	576	7.18	-	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	20/07/2020	584	7.84	-	-	-	-	-	-	-	-	-	7.3	-	-	0.088	-	-	-	-	-	191	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	27/07/2020	517	7.6	-	-	-	-	-	-	-	-	-	6.51	-	-	0.108	-	-	-	-	-	180	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	28/07/2020	481	7.42	-	23.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	3/08/2020	564	6.88	-	-	-	-	-	-	-	16	38.4	7.54	9.42	-	0.107	-	5.73	-	81.5	-	165	280	20	-	-	0.5	<0.01	100	<10	<1	<1	14	-	<1	50	60	0.6	-	<1	-	4	<1	57	<2	<1	-	379	365	<0.04	6	-	46	38	5.5	-	<1	-	165	95
Upstream	LDP01_CSP	10/08/2020	416	7.89	-	-	-	-	-	-	-	-	-	5.12	-	-	0.122	-	-	-	-	-	135	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	17/08/2020	491	7.92	-	-	-	-	-	-	-	-	-	6.21	-	-	0.11	-	-	-	-	-	164	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	24/08/2020	516	9.97	-	18	-	-	-	-	-	-	-	7.76	-	-	0.108	-	-	-	-	-	207	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	31/08/2020	617	6.72	-	14.5	-	-	-	-	-	-	-	10.7	-	-	0.121	-	-	-	-	-	300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	7/09/2020	754	4.82	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	14/09/2020	594	7.3	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	18/09/2020	575	7	-	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	21/09/2020	-	-	-	-	-	-	-	-	-	-	-	11.7	-	-	0.091	-	-	-	-	-	177	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	28/09/2020	549	5.93	-	11.8	-	-	-	-	-	-	-	16.7	-	-	0.087	-	-	-	-	-	282	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	6/10/2020	556	8.34	-	34.8	-	-	-	-	-	25.5	55.7	28.1	16	-	0.157	-	5.78	-	65	-	264	340	<10	-	-	0.7	<0.01	330	<10	<1	<1	24	-	<1	<50	<50	1.9	-	<1	-	7	<1	494	<2	<1	-	810	729	-	2	-	85	70	3.5	-	<1	-	311	231
Upstream	LDP01_CSP	12/10/2020	557	6.95	-	1	-	-	-	-	-	-	-	13.5	-	-	0.113	-	-	-	-	-	216	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	19/10/2020	586	8.07	-	2.8	-	-	-	-	-	-	-	18.5	-	-	0.135	-	-	-	-	-	284	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	26/10/2020	419	7.1	-	36.4	-	-	-	-	-	20.6	21	6.34	11	13	<0.05	-	5.23	8.88	48.1	55.6	170	-	-	-	-	-	-	660	10	<1	<1	20	15	-	<50	<50	1.9	1.8	<1	-	3	5	422	6	1	<1	541	518	<0.04	2	-	97	92	4.1	4.1	<1	-	583	529
Upstream	LDP01_CSP	2/11/2020	420	7.03	-	3.6	-	-	-	-	-	16.9	44.7	8.76	9.61	10.3	0.056	-	5.33	5.58	46.9	48.2	198	320	<10	-	-	0.4	<0.01	300	60	<1	<1	14	14	<1	<50	<50	1.1	1.2	<1	-	<1	<1	21	<2	<1	<1	433	432	<0.04	3	-	62	58	3.7	3.5	<1	-	291	256
Upstream	LDP01_CSP	9/11/2020	425	7.51	-	2.667	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	23/11/2020	-	-	-	-	-	-	-	-	-	-	-	7.24	-	-	0.067	-	-	-	-	-	313	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	30/11/2020	444	7.21	-	7.6	-	-	-	-	-	-	-	5.72	-	-	0.117	-	-	-	-	-	199	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	7/12/2020	399	7.78	-	26.5	-	-	-	-	-	27.4	50.4	4.6	14	-	0.063	-	7.42	-	52.2	-	146	420	10	-	-	0.7	<0.02	320	20	<1	<1	18	-	<1	<50	<50	0.7	-	<1	-	1	<1	500	<50	1	-	418	409	-	2	-	31	24	<10	-	<1	-	102	75
Upstream	LDP01_CSP	14/12/2020	412	7.94	-	9	-	-	-	-	-	-	-	4.68	-	-	0.109	-	-	-	-	-	118	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	4/01/2021	329	8.05	-	19.5	-	-	-	-	-	12.1	29	10.6	5.34	-	0.085	-	4.04	-	36.4	-	93.2	340	<10	-	-	0.9	0.06	1230	20	<1	<1	13	-	<1	<50	<50	0.2	-	<1	-	2	<1	610	<50	2	-	222	191	-	4	-	12	9	<10	-	<1	-	29	14
Upstream	LDP01_CSP	6/01/2021	277	7.06	-	42.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	7/01/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	18/01/2021	643	8.22	-	2335	-	-	-	-	-	-	-	24.6	-	-	0.108	-	-	-	-	-	185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	25/01/2021	760	7.63	-	117.2	-	-	-	-	-	-	-	21.2	-	-	0.117	-	-	-	-	-	255	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	1/02/2021	411	8.17	-	188	-	-	-	-	-	16.6	36.2	8.57	6.57	-	0.302	-	6.6	-	52.4	-	128	430	20	-	-	1.6	0.12	3890	10	2	<1	36	-	<1	<50	<50	0.2	-	3	-	5	<1	2630	<50	11	-	186	103	-	5	-	12	4	<10	-	<1	-	66	9
Upstream	LDP01_CSP	8/02/2021	327	8.19	-	666	-	-	-	-	-	-	-	9.22	-	-	0.288	-	-	-	-	-	82.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	9/02/2021	338	7.82	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	15/02/2021	382	8.29	-	346	-	-	-	-	-	-	-	14.3	-	-	0.207	-	-	-	-	-	95	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	22/02/2021	429	8.71	-	25.4	-	-	-	-	-	-	-	29	-	-	0.103	-	-	-	-	-	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	1/03/2021	442	8.38	-	56	-	-	76.38	76.38	0	10.6	25.5	25.5	4.43	-	0.164	-	6.52	-	69.1	-	101	480	<10	-	-	0.7	0.03	990	10	<1	<1	18	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	500	<50	2	-	79	50	-	4	-	4	2	<10	-	<1	-	13	<5
Upstream	LDP01_CSP	8/03/2021	217	8.14	-	10.2	-	-	-	-	-	-	-	31.1	-	-	0.194	-	-	-	-	-	119	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	15/03/2021	306	8.21	-	875	-	-	-	-	-	-	-	25.44	-	-	-	0.216	-	-	-	-	89.22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	18/03/2021	384	7.22	-	24	-	-	-	-	-	8.11	7.65	-	3.11	3.04	-	-	5.98	5.44	60.9	57.4	-	-	-	-	-	-	-	6740	620	<1	<1	13	11	-	<50	<50	<0.1	<0.1	<1	-	<1	<1	150	<50	<1	<1	62	58	<0.04	2	-	3	3	<10	<10	<1	-	<5	<5
Upstream	LDP01_CSP	19/03/2021	377	7.55	-	25.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	22/03/2021	353	8.02	-	30.8	-	-	-	-	-	-	-	35.22	-	-	-	0.142	-	-	-	-	66.34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	23/03/2021	-	-	-	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	25/03/2021	366	7.44	-	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	29/03/2021	436	8.44	-	3	-	-	-	-	-	-	-	42.07	-	-	-	0.119	-	-	-	-	61.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	6/04/2021	620	8.34	-	8.2	-	-	129.6	129.6	0	11.6	27.2	38.4	5	-	0.115	-	8.55	-	99.8	-	117	350	<10	-	-	0.8	0.03	1840	<10	<1	<1	23	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	698	<2	2	-	112	66	-	4	-	4	2	<10	-	<1	-	24	<5
Upstream	LDP01_CSP	12/04/2021	667	8.37	-	202	-	-	-	-	-	-	-	65.21	-	-	-	0.181	-	-	-	-	140.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	19/04/2021	699	8.55	-	14.8	-	-	-	-	-	-	-	37.12	-	-	-	0.224	-	-	-	-	168.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	26/04/2021	756	8.51	-	18	-	-	-	-	-	-	-	42.64	-	-	-	0.208	-	-	-	-	183.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	3/05/2021	793	8.49	-	3.667	-	-	177.9	177.9	0	10.8	26.7	42.8	5.99	-	0.262	-	9.46	-	134	-	195	420	<10	-	-	0.8	<0.01	410	<10	<1	<1	19	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	155	18	<1	-	66	44	-	10	-	4	3	<10	-	<1	-	9	8
Upstream	LDP01_CSP	10/05/2021	712	8.57	-	60	-	-	-	-	-	-	-	30.1	-	-	-	0.285	-	-	-	-	184.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	17/05/2021	700	8.7	-	158	-	-	-	-	-	-	-	50.16	-	-	-	0.26	-	-	-	-	214.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	24/05/2021	705	8.72	-	-0.4	-	-	-	-	-	-	-	-	-	-	-	0.287	-	-	-	-	145.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	31/05/2021	695	8.58	-	18	-	-	-	-	-	-	-	40.13	-	-	-	0.3	-	-	-	-	157.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	7/06/2021	592	8.32	-	228	-	-	119.3	119.3	0	11.9	25	31.3	4.81	-	0.192	-	9.71	-	103	-	136	410	<10	-	-	3.3	0.29	4650	10	2	<1	43	-	<1	<50	<50	0.2	-	2	-	5	<1	4170	<50	15	-	183	67	-	10	-	12	3	<10	-	<1	-	112	6
Upstream	LDP01_CSP	15/06/2021	558	8.35	-	91.67	-	-	-	-	-	-	-	25.08	-	-	-	0.198	-	-	-	-	149.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	21/06/2021	540	8.28	-	246	-	-	-	-	-	-	-	32.1	-	-	-	0.203	-	-	-	-	158.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LDP01_CSP	28/06/2021	521	8.16	-	160	-	-	-	-	-	-	-	20.06	-	-	-	0.208	-	-	-	-	136.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LDP01_CSP	**Min.**	**217**	**4.82**	**-**	**-0.4**	**-**	**-**	**76.38**	**76.38**	**0**	**8.11**	**7.65**	**4.6**	**3.11**	**3.04**	**<0.05**	**0.119**	**4.04**	**5.44**	**36.4**	**48.2**	**61.7**	**270**	**<10**	**-**	**-**	**0.4**	**<0.01**	**100**	**<10**	**<1**	**<1**	**13**	**11**	**<1**	**<50**	**<50**	**<0.1**	**<0.1**	**<1**	**-**	**<1**	**<1**	**21**	**<2**	**<1**	**<1**	**62**	**44**	**<0.04**	**2**	**-**	**3**	**2**	**3.5**	**3.5**	**<1**	**-**	**<5**	**<5**
	LDP01_CSP	**Max.**	**793**	**9.97**	**-**	**2335**	**-**	**-**	**177.9**	**177.9**	**-**	**27.4**	**55.7**	**65.21**	**16**	**13**	**0.302**	**0.3**	**9.71**	**8.88**	**134**	**57.4**	**313**	**480**	**20**	**-**	**-**	**3.3**	**0.29**	**6740**	**620**	**2**	**<1**	**43**	**15**	**<1**	**50**	**60**	**1.9**	**1.8**	**3**	**-**	**7**	**5**	**4170**	**<50**	**15**	**<1**	**810**	**729**	**<0.04**	**10**	**-**	**97**	**92**	**5.5**	**<10**	**<1**	**-**	**583**	**529**
	LDP01_CSP	**Average**	**518**	**-**	**-**	**132**	**-**	**-**	**126**	**126**	**0**	**16**	**33**	**21**	**7.9**	**8.8**	**0.13**	**0.22**	**6.7**	**6.6**	**71**	**54**	**169**	**369**	**8.6**	**-**	**-**	**1**	**0.051**	**1788**	**65**	**0.75**	**0.5**	**21**	**13**	**0.5**	**27**	**28**	**0.58**	**1**	**0.83**	**-**	**2.5**	**0.88**	**867**	**15**	**3**	**0.5**	**291**	**253**	**0.02**	**4.5**	**-**	**31**	**26**	**4.7**	**4.2**	**0.5**	**-**	**142**	**103**

Note: LDP01_CSP is representative sample when not discharging

			Field Parameters		TDS		Anions / Cations																	Nutrients						Metals																																
			Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Total Suspended Solids (TSS)	Carbonate (as CaCO3)	Total Alkalinity (as CaCO3)	Carbonate Alkalinity (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Phenolphthalein Alkalinity (CaCO3)	Calcium	Calcium (Filtered)	Chloride	Magnesium	Magnesium (Filtered)	Fluoride	Fluoride (Filtered)	Potassium	Potassium (Filtered)	Sodium	Sodium (Filtered)	Sulfate (as SO4)	Nitrate	Nitrite (as NO2-)	Nitrite (as N)	Nitrogen (N) - Kjeldahl	Nitrogen (N)	Phosphorus	Aluminium	Aluminium (Filtered)	Arsenic	Arsenic (Filtered)	Barium	Barium (Filtered)	Beryllium	Boron	Boron (Filtered)	Cadmium	Cadmium (Filtered)	Chromium	Chromium (Filtered)	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Lead (Filtered)	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Molybdenum (Filtered)	Nickel	Nickel (Filtered)	Selenium	Selenium (Filtered)	Silver	Silver (Filtered)	Zinc	Zinc (Filtered)
			uS/cm	pH units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Surface Water			2200	6.5-8	1500									350			1.5	1.5					1000									24	24	700	700	100	370	370	0.85	0.85	2	2	3.5	3.5	300	300	5	5	1900	1900	0.06	10	10	17	17	5	5	0.05	0.05	116	116
Purpose	**LocCode**	**Sampled_Date-Time**																																																											
Upstream	LMP01	6/07/2020	380	7.6	-	4	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	13/07/2020	362	7.79	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-	94.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	20/07/2020	360	8	-	12	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-	76	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	23/07/2020	371	7.38	216	7	-	73	-	73	<1	28.8	-	11.2	14.7	-	0.112	-	6.71	-	34.7	-	81.9	40	<10	-	0.3	0.3	0.01	120	10	<1	-	19	-	<1	100	-	0.4	-	<1	-	5	3	292	26	<1	-	120	10	<0.04	23	-	4	-	0.5	-	<1	-	17	10
Upstream	LMP01	27/07/2020	240	9.4	-	54	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	3/08/2020	450	8	-	9	-	-	-	-	-	-	-	10	-	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	10/08/2020	160	7.9	-	54	-	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	17/08/2020	220	8.1	-	13	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	24/08/2020	240	8.9	-	8	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	31/08/2020	480	8	-	<1	-	-	-	-	-	-	-	35	-	-	-	-	-	-	-	-	130	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	7/09/2020	510	8.5	-	5	-	-	-	-	-	-	-	29	-	-	-	-	-	-	-	-	150	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	23/09/2020	364	7.97	224	-	-	-	55	55	<1	23.3	-	8.74	14.4	-	0.103	-	5.04	-	20.8	-	98.5	50	<10	-	-	0.4	0.02	530	20	<1	-	22	-	<1	50	-	0.1	-	<1	-	6	3	783	54	<1	-	76	23	<0.04	12	-	7	-	0.5	-	<1	-	31	14
Upstream	LMP01	28/09/2020	459	7.82	-	-	-	-	-	-	-	-	-	15.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	6/10/2020	427	8.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	12/10/2020	456	7.85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	19/10/2020	456	8.03	-	-	-	-	-	-	-	-	-	12.86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	26/10/2020	196.4	7.59	-	-	-	-	-	-	-	-	-	2.967	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	2/11/2020	-	7.82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	9/11/2020	-	-	-	-	-	-	-	-	-	-	-	10.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	16/11/2020	-	-	-	-	-	-	-	-	-	-	-	2.999	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	18/11/2020	404	7.89	242	-	-	-	60	60	<1	26.1	-	18.2	14.6	-	0.19	-	5.56	-	31.7	-	224	140	<10	-	-	0.3	<0.01	340	10	<1	-	23	-	<1	<50	-	0.1	-	<1	-	5	2	395	20	<1	-	168	50	<0.04	8	-	10	-	1.4	-	<1	-	34	17
Upstream	LMP01	23/11/2020	-	-	-	-	-	-	-	-	-	-	-	4.998	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	7/12/2020	305	7.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	14/12/2020	354	7.8	-	-	-	-	-	-	-	-	-	9.997	-	-	-	-	-	-	-	-	76.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	16/12/2020	379	7.6	234	-	<1	-	107	107	<1	27.8	-	9.08	17.4	-	0.198	-	4.86	-	23.4	-	80.5	20	<10	-	-	0.3	0.01	310	30	<1	<1	23	-	<1	<50	<50	<0.1	-	<1	-	4	2	312	<50	<1	-	136	56	<0.04	11	-	6	4	0.4	-	<1	-	13	9
Upstream	LMP01	21/12/2020	366	7.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	4/01/2021	209	7.59	-	-	-	-	-	-	-	-	-	8.997	-	-	-	-	-	-	-	-	42.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	7/01/2021	184	7.17	154	-	<1	-	58	58	<1	13.7	-	4.66	6.98	-	0.13	-	3.91	-	8.08	-	31.6	110	<10	-	-	0.7	0.06	1190	170	1	<1	21	-	<1	<50	<50	<0.1	-	1	-	6	3	1340	210	2	-	86	43	<0.04	8	-	8	5	<10	-	<1	-	28	9
Upstream	LMP01	11/01/2021	244	7.54	174	-	-	-	-	-	-	-	-	4.013	-	-	-	0.2	-	-	-	-	53.54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	1/02/2021	292	7.62	200	-	-	-	-	-	-	-	-	10.03	-	-	-	0.17	-	-	-	-	65.64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	1/03/2021	419	7.72	250	-	-	-	-	-	-	-	-	12.04	-	-	-	0.21	-	-	-	-	86.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	8/03/2021	453	7.88	238	-	-	-	-	-	-	5.34	-	14.05	2.07	-	-	0.21	10.7	-	250	-	99.16	-	-	-	-	-	-	140	<10	<1	<1	27	-	<1	<50	<50	0.2	-	<1	-	4	2	200	<50	<1	-	71	15	<0.04	8	-	6	6	<10	-	<1	-	35	33
Upstream	LMP01	6/04/2021	568	8.01	354	-	-	-	-	-	-	-	-	19.06	-	-	-	0.18	-	-	-	-	141.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	3/05/2021	535	7.78	390	-	-	-	-	-	-	-	-	18.06	-	-	-	0.16	-	-	-	-	145.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Upstream	LMP01	7/06/2021	230	7.73	150	-	-	-	-	-	-	-	-	12.04	-	-	-	0.105	-	-	-	-	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	LMP01	**Min.**	160	7.17	150	<1	<1	73	55	55	<1	5.34	-	2.967	2.07	-	0.103	0.105	3.91	-	8.08	-	31.6	20	<10	-	0.3	0.3	<0.01	120	<10	<1	<1	19	-	<1	<50	<50	<0.1	-	<1	-	4	2	200	20	<1	-	71	10	<0.04	8	-	4	4	0.4	-	<1	-	13	9
	LMP01	**Max.**	568	9.4	390	54	<1	73	107	107	<1	28.8	-	35	17.4	-	0.198	0.21	10.7	-	250	-	224	140	<10	-	0.3	0.7	0.06	1190	170	1	<1	27	-	<1	100	<50	0.4	-	1	-	6	3	1340	210	2	-	168	56	<0.04	23	-	10	6	<10	-	<1	-	35	33
	LMP01	**Average**	357	-	236	17	-	-	70	71	0.5	21	-	12	12	-	0.15	0.18	6.1	-	61	-	95	72	5	-	-	0.4	0.021	438	41	0.58	0.5	23	-	0.5	42	25	0.15	-	0.58	-	5	2.5	554	60	0.75	-	110	33	0.02	12	-	6.8	5	2.1	-	0.5	-	26	15
Mid-stream	NC01	22/07/2020	371	7.43	220	-	-	84	-	84	<1	22.7	-	12.1	11.8	-	0.139	-	5.57	-	35.3	-	88.1	20	<10	-	0.2	0.2	<0.01	60	20	<1	-	19	-	<1	50	-	<0.1	-	<1	-	2	1	763	174	<1	-	124	111	<0.04	4	-	3	-	<0.2	-	<1	-	6	6
Mid-stream	NC01	24/09/2020	251	6.75	117	-	-	-	52	52	<1	15.4	-	9.68	8.8	-	0.068	-	3.9	-	15.3	-	51.8	240	<10	<0.01	-	0.5	0.05	280	50	<1	-	30	-	<1	60	-	<0.1	-	<1	-	2	1	558	106	<1	-	111	104	<0.04	4	-	3	-	<0.2	-	<1	-	9	7
Mid-stream	NC01	22/10/2020	237	6.75	145	-	-	-	47	47	<1	14.3	-	11.9	8.88	-	0.099	-	4.02	-	19.7	-	51.7	80	<10	<0.01	-	0.3	0.01	340	100	<1	-	33	-	<1	<50	-	<0.1	-	<1	-	1	<1	655	220	<1	-	209	196	<0.04	2	-	3	-	<0.2	-	<1	-	<5	<5
Mid-stream	NC01	19/11/2020	265	7.11	188	-	-	-	42	42	<1	18.6	-	8.98	9.93	-	0.21	-	3.23	-	20.3	-	60.9	<10	<10	<0.01	-	0.2	<0.01	270	20	<1	-	28	-	<1	<50	-	<0.1	-	<1	-	3	<1	695	98	<1	-	277	164	<0.04	3	-	4	-	0.4	-	<1	-	10	5
Mid-stream	NC01	16/12/2020	180	7.02	92	-	<1	-	52	52	<1	11	-	11.1	6.65	-	0.09	-	2.59	-	14.5	-	25.3	<10	<10	<0.01	-	0.4	<0.01	250	70	<1	<1	29	-	<1	<50	<50	<0.1	-	<1	-	3	<1	622	200	<1	-	141	135	<0.04	1	-	2	2	<0.2	-	<1	-	6	<5
Mid-stream	NC01	7/01/2021	147	7.15	101	-	<1	-	53	53	<1	9.9	-	6.83	4.99	-	0.087	-	2.86	-	8.1	-	15.2	20	<10	<0.01	-	0.6	<0.02	440	140	<1	<1	21	-	<1	<50	<50	<0.1	-	<1	-	2	1	1170	250	<1	-	166	<1	0.06	2	-	3	3	0.2	-	<1	-	7	<5
Mid-stream	NC01	17/02/2021	187	7.04	114	-	<1	-	46	46	<1	10.8	-	12.1	6.08	-	0.095	-	3.76	-	16.4	-	21.4	20	<10	-	-	0.1	0.01	170	30	<1	<1	27	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	620	180	<1	-	199	172	<0.04	2	-	2	2	0.3	-	<1	-	<5	5
Mid-stream	NC01	26/03/2021	238	7.34	161	-	<1	-	48	48	<1	15.5	-	14.2	8.25	-	0.096	-	6.11	-	28	-	36.3	60	<10	-	-	0.4	0.02	670	90	<1	<1	23	-	<1	<50	<50	<0.1	-	<1	-	2	<1	1020	160	<1	-	71	55	<0.04	2	-	4	3	1.6	-	<1	-	9	6
Mid-stream	NC01	28/04/2021	307	7.82	150	-	<1	-	56	56	<1	15.5	-	12.7	11.2	-	0.071	-	4.48	-	19	-	62.8	30	<10	-	-	0.2	<0.01	100	20	<1	<1	32	-	<1	<50	<50	<0.1	-	<1	-	1	<1	580	160	<1	-	314	164	<0.04	<1	-	2	1	<0.2	-	<1	-	5	<5
Mid-stream	NC01	20/05/2021	220	7.27	116	-	<1	-	49	49	<1	12.3	-	12.6	8.95	-	0.05	-	3.78	-	17.5	-	45.6	30	<10	-	-	<0.1	<0.01	50	10	<1	<1	28	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	294	100	<1	-	119	116	<0.04	<1	-	1	<1	<0.2	-	<1	-	<5	<5
Mid-stream	NC01	16/06/2021	157	7.04	95	-	<1	-	52	52	<1	9.02	-	12.4	5.5	-	0.066	-	3.6	-	13.8	-	24.3	10	<10	-	-	0.2	<0.01	150	30	<1	<1	22	-	<1	<50	<50	<0.1	-	<1	-	1	<1	246	100	<1	-	72	75	<0.04	<1	-	1	<1	<0.2	-	<1	-	6	6
	NC01	**Min.**	147	6.75	92	-	<1	84	42	42	<1	9.02	-	6.83	4.99	-	0.05	-	2.59	-	8.1	-	15.2	<10	<10	<0.01	0.2	<0.1	<0.01	50	10	<1	<1	19	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	246	98	<1	-	71	<1	<0.04	<1	-	1	<1	<0.2	-	<1	-	<5	<5
	NC01	**Max.**	371	7.82	220	-	<1	84	56	84	<1	22.7	-	14.2	11.8	-	0.21	-	6.11	-	35.3	-	88.1	240	<10	<0.01	0.2	0.6	0.05	670	140	<1	<1	33	-	<1	60	<50	<0.1	-	<1	-	3	1	1170	250	<1	-	314	196	0.06	4	-	4	3	1.6	-	<1	-	10	7
	NC01	**Average**	233	-	136	-	0.5	-	50	53	0.5	14	-	11	8.3	-	0.097	-	4	-	19	-	44	47	5	0.005	-	0.29	0.012	253	53	0.5	0.5	27	-	0.5	30	25	0.05	-	0.5	-	1.6	0.64	657	159	0.5	-	164	118	0.024	2	-	2.5	1.7	0.29	-	0.5	-	6	4.3
Mid-stream	SW_C	13/08/2020	196	7.41	103	-	-	39	-	39	<1	-	-	9.32	5.97	5.89	0.058	-	4.42	4.44	17.1	17	33.8	1540	<10	-	0.4	1.9	0.01	520	160	<1	<1	32	28	-	<50	<50	<0.1	<0.1	<1	<1	2	<1	335	104	<1	<1	41	34	<0.04	3	3	3	3	0.5	0.4	<1	<1	13	10
Mid-stream	SW_C	16/09/2020	219	6.56	138	-	-	39	-	39	<1	-	-	11.1	7.49	-	0.057	-	4.47	4.72	16.2	16.9	36.9	560	<10	-	-	1	<0.01	190	70	<1	<1	37	33	-	<50	<50	<0.1	<0.1	<1	<1	2	1	252	81	<1	<1	82	75	<0.04	2	-	2	2	<0.2	<0.2	<1	-	8	10
Mid-stream	SW_C	21/10/2020	239	7.03	153	-	-	-	48	48	<1	-	-	11.5	8.24	7.91	0.069	-	3.94	3.66	18.8	18.1	51.4	100	<10	<0.01	-	0.3	<0.01	340	140	<1	<1	33	31	-	<50	<50	<0.1	<0.1	<1	<1	<1	<1	399	167	<1	<1	174	133	<0.04	2	-	3	2	<0.2	<0.2	<1	-	8	6
Mid-stream	SW_C	12/11/2020	238	6.95	154	-	-	-	44	44	<1	-	-	9.39	7.25	7.68	0.076	-	3.42	3.5	22.1	22.6	56.4	20	<10	<0.01	-	0.3	<0.01	190	40	<1	<1	28	25	-	<50	<50	<0.1	<0.1	<1	<1	<1	<1	392	118	<1	<1	126	101	<0.04	2	-	3	2	0.6	0.5	<1	-	8	5
Mid-stream	SW_C	27/11/2020	238	6.95	112	-	<1	-	44	44	-	9	-	10.3	5.18	-	0.073	-	2.97	-	14.8	-	23.4	10	<10	<0.01	-	-	-	420	130	<1	<1	29	-	<1	<50	<50	<0.1	-	<1	-	2	2	460	180	<1	-	105	95	<0.04	2	-	3	2	<0.2	-	<1	-	7	6
Mid-stream	SW_C	16/12/2020	182	7.13	99	-	<1	-	48	48	-	10.9	-	11.2	6.58	-	0.09	-	2.59	-	14.3	-	26.8	20	<10	<0.01	-	-	-	210	80	<1	<1	29	-	<1	<50	<50	0.2	-	<1	-	2	1	515	160	<1	-	124	125	<0.04	1	-	2	2	<0.2	-	<1	-	6	7
Mid-stream	SW_C	7/01/2021	146	7.08	99	-	<1	-	48	48	-	8.22	-	7.35	4.22	-	0.082	-	2.5	-	6.97	-	15.7	20	<10	<0.01	-	-	-	460	150	<1	<1	23	-	<1	<50	<50	<0.1	-	<1	-	2	<1	885	230	<1	-	78	90	<0.04	2	-	3	3	0.2	-	<1	-	15	6
Mid-stream	SW_C	17/02/2021	185	7.16	123	-	<1	-	48	48	<1	10.2	-	12.5	5.74	-	0.083	-	3.66	-	15.6	-	22.7	<10	<10	-	-	-	-	130	40	<1	<1	27	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	413	160	<1	-	128	113	<0.04	2	-	4	1	0.3	-	<1	-	6	<5
Mid-stream	SW_C	26/03/2021	242	7.33	162	-	<1	-	47	47	<1	13.3	-	15.2	7.28	-	0.079	-	4.96	-	26	-	37.5	70	<10	-	-	-	-	420	90	<1	<1	20	-	<1	<50	<50	<0.1	-	<1	-	2	<1	546	150	<1	-	59	54	<0.04	1	-	3	3	1.2	-	<1	-	7	5
Mid-stream	SW_C	28/04/2021	265	7.39	184	-	<1	-	52	52	<1	15.4	-	12.7	11.4	-	0.066	-	4.48	-	18.9	-	62.8	<10	<10	-	-	-	-	70	20	<1	<1	30	-	<1	<50	<50	<0.1	-	<1	-	1	<1	336	130	<1	-	162	154	<0.04	<1	-	2	1	<0.2	-	<1	-	<5	9
Mid-stream	SW_C	20/05/2021	216	7.13	130	-	<1	-	48	48	<1	11.5	-	12.8	8.47	-	0.054	-	3.7	-	17.1	-	45.4	<10	<10	-	-	-	-	50	20	<1	<1	29	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	260	100	<1	-	106	103	<0.04	<1	-	<1	<1	<0.2	-	<1	-	<5	<5
Mid-stream	SW_C	16/06/2021	152	6.99	83	-	<1	-	45	45	<1	8.6	-	12.2	5.34	-	0.061	-	3.45	-	13.3	-	23.3	<10	<10	-	-	-	-	130	40	<1	<1	24	-	<1	<50	<50	<0.1	-	<1	-	1	<1	244	130	<1	-	79	65	<0.04	<1	-	1	1	<0.2	-	<1	-	<5	6
	SW_C	**Min.**	146	6.56	83	-	<1	39	44	39	<1	8.22	-	7.35	4.22	5.89	0.054	-	2.5	3.5	6.97	16.9	15.7	<10	<10	<0.01	0.4	0.3	<0.01	50	20	<1	<1	20	25	<1	<50	<50	<0.1	<0.1	<1	<1	<1	<1	244	81	<1	<1	41	34	<0.04	<1	3	<1	<1	<0.2	<0.2	<1	<1	<5	<5
	SW_C	**Max.**	265	7.41	184	-	<1	39	52	52	<1	15.4	-	15.2	11.4	7.91	0.09	-	4.96	4.72	26	22.6	62.8	1540	<10	<0.01	0.4	1.9	0.01	520	160	<1	<1	37	33	<1	<50	<50	0.2	<0.1	<1	<1	2	2	885	230	<1	<1	174	154	<0.04	3	3	4	3	1.2	0.5	<1	<1	15	10
	SW_C	**Average**	210	-	128	-	0.5	-	47	46	0.5	11	-	11	6.9	7.2	0.071	-	3.7	4.1	17	19	36	197	5	0.005	-	0.88	0.0063	261	82	0.5	0.5	28	29	0.5	25	25	0.063	0.05	0.5	0.5	1.3	0.71	420	143	0.5	0.5	105	95	0.02	1.5	-	2.5	1.9	0.29	0.28	0.5	-	7.1	6.3
Mid-stream	SW_E	13/08/2020	218	7.17	121	-	-	39	-	39	<1	-	-	13.6	6.78	6.08	0.088	-	4.23	3.71	20.5	18.3	44.3	1130	<10	-	0.4	1.5	0.01	510	150	<1	<1	17	15	-	<50	<50	<0.1	<0.1	<1	<1	<1	<1	630	185	<1	<1	90	62	<0.04	2	1	5	4	0.2	<0.2	<1	<1	6	<5
Mid-stream	SW_E	16/09/2020	367	6.67	240	-	-	51	-	-	-	-	-	21.5	13.1	-	0.071	-	5.59	4.94	33	30	73	100	<10	-	-	0.3	<0.01	40	<10	<1	<1	20	18	-	<50	<50	<0.1	<0.1	<1	<1	2	<1	335	196	<1	<1	194	168	<0.04	<1	-	14	12	<0.2	<0.2	<1	-	5	6
Mid-stream	SW_E	21/10/2020	571	7.01	334	-	-	-	75	75	<1	-	-	38.5	20.7	18.8	0.105	-	5.41	4.94	51	46.9	157	60	<10	<0.01	-	0.3	<0.01	20	<10	<1	<1	18	18	-	<50	<50	<0.1	<0.1	<1	<1	<1	<1	683	495	<1	<1	557	528	<0.04	<1	-	37	35	<0.2	<0.2	<1	-	<5	8
Mid-stream	SW_E	11/11/2020	377	7.13	298	-	-	-	75	75	<1	-	-	15.4	15.4	13.4	0.069	-	4.52	3.88	39.7	34.4	94.4	<10	<10	<0.01	-	0.2	<0.01	30	<10	<1	<1	17	16	-	<50	<50	<0.1	<0.1	<1	<1	<1	<1	400	242	<1	<1	208	199	<0.04	1	-	13	13	0.3	0.3	<1	-	<5	<5
Mid-stream	SW_E	27/11/2020	377	7.13	398	-	<1	-	107	107	-	28.8	-	39.2	22.4	-	0.113	-	4.83	-	53.3	-	147	<10	<10	<0.01	-	-	-	40	<10	<1	<1	17	-	<1	<50	60	<0.1	-	<1	-	1	1	740	400	<1	-	714	702	<0.04	2	-	43	40	<0.2	-	<1	-	7	8
Mid-stream	SW_E	16/12/2020	590	7.22	352	-	<1	-	109	109	-	28.6	-	44	22.6	-	0.183	-	3.71	-	55	-	139	<10	<10	<0.01	-	-	-	30	<10	<1	<1	14	-	<1	60	60	<0.1	-	<1	-	<1	<1	868	280	<1	-	768	734	<0.04	<1	-	42	41	<0.2	-	<1	-	<5	5
Mid-stream	SW_E	7/01/2021	256	7.3	148	-	<1	-	82	82	-	13.2	-	13.4	7.93	-	0.173	-	2.33	-	14.6	-	35.7	<10	<10	<0.01	-	-	-	100	20	<1	<1	14	-	<1	<50	<50	<0.1	-	<1	-	1	<1	575	280	<1	-	475	487	<0.04	1	-	11	11	<0.2	-	<1	-	<5	5
Mid-stream	SW_E	17/02/2021	447	7.37	302	-	<1	-	110	110	<1	30	-	27.7	18.2	-	0.163	-	5.22	-	41.3	-	73.3	<10	<10	-	-	-	-	50	<10	<1	<1	24	-	<1	<50	50	<0.1	-	<1	-	<1	<1	918	410	<1	-	1630	1570	<0.04	2	-	26	22	<0.2	-	<1	-	<5	<5
Mid-stream	SW_E	26/03/2021	246	7.42	163	-	<1	-	50	50	<1	14.2	-	14.6	8.02	-	0.104	-	4.64	-	23.3	-	39.8	20	<10	-	-	-	-	190	60	<1	<1	16	-	<1	<50	<50	<0.1	-	<1	-	2	1	763	190	<1	-	202	194	<0.04	1	-	6	6	0.6	-	<1	-	<5	8
Mid-stream	SW_E	28/04/2021	489	7.2	332	-	<1	-	67	67	<1	22.8	-	32.5	17.4	-	0.109	-	5.34	-	44	-	125	<10	<10	-	-	-	-	20	<10	<1	<1	21	-	<1	60	50	<0.1	-	<1	-	1	<1	555	410	2	-	731	655	<0.04	<1	-	23	24	<0.2	-	<1	-	5	14
Mid-stream	SW_E	20/05/2021	515	7.03	304	-	<1	-	62	62	<1	23	-	37.1	18.5	-	0.075	-	5.22	-	45.6	-	138	<10	<10	-	-	-	-	<10	<10	<1	<1	18	-	<1	50	<50	<0.1	-	<1	-	<1	<1	794	500	<1	-	847	832	<0.04	<1	-	26	28	<0.2	-	<1	-	<5	<5
Mid-stream	SW_E	16/06/2021	437	7.02	268	-	<1	-	67	67	<1	21.6	-	33.1	16.6	-	0.12	-	5.49	-	44.5	-	113	<10	<10	-	-	-	-	30	<10	<1	<1	14	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	613	600	<1	-	436	407	<0.04	<1	-	26	24	<0.2	-	<1	-	8	5
	SW_E	**Min.**	218	6.67	121	-	<1	39	50	39	<1	13.2	-	13.4	6.78	6.08	0.069	-	2.33	3.71	14.6	18.3	35.7	<10	<10	<0.01	0.4	0.2	<0.01	<10	<10	<1	<1	14	15	<1	<50	<50	<0.1	<0.1	<1	<1	<1	<1	335	185	<1	<1	90	62	<0.04	<1	1	5	4	<0.2	<0.2	<1	<1	<5	<5
	SW_E	**Max.**	590	7.42	398	-	<1	51	110	110	<1	30	-	44	22.6	18.8	0.183	-	5.59	4.94	55	46.9	157	1130	<10	<0.01	0.4	1.5	0.01	510	150	<1	<1	24	18	<1	60	60	<0.1	<0.1	<1	<1	2	1	918	600	2	<1	1630	1570	<0.04	2	1	43	41	0.6	0.3	<1	<1	8	14
	SW_E	**Average**	408	-	272	-	0.5	-	80	77	0.5	23	-	28	16	13	0.11	-	4.7	4.4	39	32	98	113	5	0.005	-	0.58	0.0063	89	23	0.5	0.5	18	17	0.5	33	35	0.05	0.05	0.5	0.5	0.88	0.58	656	349	0.63	0.5	571	545	0.02	1	-	23	22	0.17	0.15	0.5	-	4	5.8

			Field Parameters		TDS		Anions / Cations																
			Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Total Suspended Solids (TSS)	Carbonate (as CaCO3)	Total Alkalinity (as CaCO3)	Carbonate Alkalinity (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Phenolphthalein Alkalinity (CaCO3)	Calcium	Calcium (Filtered)	Chloride	Magnesium	Magnesium (Filtered)	Fluoride	Fluoride (Filtered)	Potassium	Potassium (Filtered)	Sodium	Sodium (Filtered)	Sulfate (as SO4)
			uS/cm	pH units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
ANZECC (2000) or Local Guidelines - Surface Water			2200	6.5-8	1500									350			1.5	1.5					1000
Purpose	**LocCode**	**Sampled_Date-Time**																					
Downstream	SW_G	13/08/2020	265	7.28	139	-	-	40	-	40	<1	-	-	19	8.43	7.94	0.108	-	4.54	4.13	23.8	23	62.3
Downstream	SW_G	16/09/2020	383	6.72	254	-	-	52	-	52	<1	-	-	4.53	14.8	-	0.014	-	5.98	5.4	35.7	32.2	15.9
Downstream	SW_G	21/10/2020	650	7.18	396	-	-	-	74	74	<1	-	-	47.2	22.9	22.9	0.107	-	5.82	5.37	54.8	54	195
Downstream	SW_G	11/11/2020	446	7.3	300	-	-	-	79	79	<1	-	-	22	17.5	16.5	0.085	-	4.53	4.11	44	40.4	107
Downstream	SW_G	27/11/2020	446	7.3	308	-	<1	-	97	97	-	26.2	-	22.7	17.6	-	0.091	-	4.22	-	40.2	-	96.8
Downstream	SW_G	16/12/2020	930	7.39	550	-	<1	-	115	115	-	47.2	-	79.3	36.5	-	0.175	-	4.72	-	89.1	-	280
Downstream	SW_G	7/01/2021	251	7.58	161	-	<1	-	69	69	-	14.8	-	13.2	9.16	-	0.156	-	3.22	-	16.4	-	43.9
Downstream	SW_G	17/02/2021	495	7.56	338	-	<1	-	94	94	<1	32.4	-	32	21.6	-	0.189	-	6.54	-	49.5	-	99.2
Downstream	SW_G	25/03/2021	211	7.16	147	-	<1	-	38	38	<1	12.8	-	12.2	7.13	-	0.105	-	4.51	-	17.7	-	35.9
Downstream	SW_G	28/04/2021	650	7.23	489	-	<1	-	50	50	<1	36.2	-	38.7	23.7	-	0.116	-	5.94	-	49	-	211
Downstream	SW_G	20/05/2021	710	7.07	441	-	<1	-	61	61	<1	36	-	52	26.4	-	<0.1	-	6.06	-	56.1	-	228
Downstream	SW_G	16/06/2021	512	7.23	296	-	<1	-	63	63	<1	26.2	-	37.3	19.3	-	0.121	-	5.97	-	47.3	-	141
	SW_G	**Min.**	**211**	**6.72**	**139**	**-**	**<1**	**40**	**38**	**38**	**<1**	**12.8**	**-**	**4.53**	**7.13**	**7.94**	**0.014**	**-**	**3.22**	**4.11**	**16.4**	**23**	**15.9**
	SW_G	**Max.**	**930**	**7.58**	**550**	**-**	**<1**	**52**	**115**	**115**	**<1**	**47.2**	**-**	**79.3**	**36.5**	**22.9**	**0.189**	**-**	**6.54**	**5.4**	**89.1**	**54**	**280**
	SW_G	**Average**	**496**	**-**	**318**	**-**	**0.5**	**-**	**74**	**69**	**0.5**	**29**	**-**	**32**	**19**	**16**	**0.11**	**-**	**5.2**	**4.8**	**44**	**37**	**126**
Downstream	WX22	13/08/2020	263	7.25	130	-	-	-	40	40	<1	-	-	5.84	8.57	8.14	0.027	-	4.55	4.24	24	23.4	19.6
Downstream	WX22	16/09/2020	387	6.77	242	-	-	52	-	52	<1	22.2	-	23.1	14.7	-	0.074	-	6.03	5.54	35.6	32.3	81.1
Downstream	WX22	21/10/2020	650	7.17	349	-	-	-	71	71	<1	32.1	-	39.4	23.4	-	0.07	-	5.9	-	54.2	-	165
Downstream	WX22	25/11/2020	454	7.23	300	-	<1	-	85	85	<1	25.8	-	21.6	17.2	-	0.058	-	4.05	-	38.5	-	92.7
Downstream	WX22	27/11/2020	454	7.23	308	-	<1	-	98	98	<1	25.1	-	22.8	16.9	-	0.097	-	4.07	-	38.8	-	97.5
Downstream	WX22	16/12/2020	930	7.34	560	-	<1	-	116	116	<1	49.2	-	79	38.3	-	0.173	-	5.03	-	92.6	-	279
Downstream	WX22	7/01/2021	249	7.54	146	-	<1	-	67	67	<1	14.6	-	12.9	8.99	-	0.152	-	3.19	-	16.2	-	42.7
Downstream	WX22	17/02/2021	495	7.54	324	-	<1	-	94	94	<1	27.4	-	33.4	18.6	-	0.179	-	5.6	-	41.3	-	99.3
Downstream	WX22	25/03/2021	213	7.2	145	-	<1	-	38	38	<1	15.3	-	12.4	8.28	-	0.11	-	5.98	-	20	-	37
Downstream	WX22	28/04/2021	649	7.15	475	-	<1	-	52	52	<1	39.7	-	38.8	25.1	-	0.105	-	6.05	-	50.8	-	224
Downstream	WX22	20/05/2021	704	7.12	451	-	<1	-	54	54	<1	35.7	-	50.7	26.3	-	<0.1	-	6.07	-	56	-	224
Downstream	WX22	16/06/2021	497	7.1	294	-	<1	-	64	64	<1	27.6	-	37.7	20.2	-	0.121	-	6.19	-	48.5	-	142
	WX22	**Min.**	**213**	**6.77**	**130**	**-**	**<1**	**52**	**38**	**38**	**<1**	**14.6**	**-**	**5.84**	**8.28**	**8.14**	**0.027**	**-**	**3.19**	**4.24**	**16.2**	**23.4**	**19.6**
	WX22	**Max.**	**930**	**7.54**	**560**	**-**	**<1**	**52**	**116**	**116**	**<1**	**49.2**	**-**	**79**	**38.3**	**8.14**	**0.179**	**-**	**6.07**	**5.54**	**92.6**	**32.3**	**279**
	WX22	**Average**	**495**	**-**	**312**	**-**	**0.5**	**-**	**72**	**70**	**0.5**	**29**	**-**	**31**	**19**	**-**	**0.1**	**-**	**5.1**	**-**	**43**	**-**	**124**

			Nutrients						**Metals**														
			Nitrate	Nitrite (as NO2-)	Nitrite (as N)	Nitrogen (N) - Kjeldahl	Nitrogen (N)	Phosphorus	Aluminium	Aluminium (Filtered)	Arsenic	Arsenic (Filtered)	Barium	Barium (Filtered)	Beryllium	Boron	Boron (Filtered)	Cadmium	Cadmium (Filtered)	Chromium	Chromium (Filtered)	Copper	Copper (Filtered)
			µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Surface Water											24	24	700	700	100	370	370	0.85	0.85	2	2	3.5	3.5
Purpose	**LocCode**	**Sampled_Date-Time**																					
Downstream	SW_G	13/08/2020	1120	<10	-	0.3	1.4	<0.01	480	100	<1	<1	11	10	-	<50	<50	<0.1	<0.1	<1	<1	<1	<1
Downstream	SW_G	16/09/2020	90	<10	-	-	0.3	<0.01	720	<10	<1	<1	21	15	-	170	<50	<0.1	<0.1	<1	<1	2	<1
Downstream	SW_G	21/10/2020	70	<10	<0.01	-	0.3	<0.01	20	<10	<1	<1	19	18	-	<50	<50	<0.1	<0.1	<1	<1	<1	<1
Downstream	SW_G	11/11/2020	<10	<10	<0.01	-	0.2	0.02	20	<10	<1	<1	11	10	-	<50	<50	<0.1	<0.1	<1	<1	<1	<1
Downstream	SW_G	27/11/2020	<10	<10	<0.01	-	-	-	40	<10	<1	<1	12	-	<1	<50	<50	<0.1	-	<1	-	<1	1
Downstream	SW_G	16/12/2020	<10	<10	<0.01	-	-	-	10	<10	<1	<1	20	-	<1	90	80	<0.1	-	<1	-	<1	<1
Downstream	SW_G	7/01/2021	<10	<10	<0.01	-	-	-	320	60	<1	<1	10	-	<1	<50	<50	<0.1	-	<1	-	2	<1
Downstream	SW_G	17/02/2021	<10	<10	-	-	-	-	30	<10	<1	<1	15	-	<1	<50	<50	<0.1	-	<1	-	<1	<1
Downstream	SW_G	25/03/2021	<10	<10	-	-	-	-	300	120	<1	<1	12	-	<1	<50	<50	<0.1	-	<1	-	2	2
Downstream	SW_G	28/04/2021	<10	<10	-	-	-	-	<10	<10	<1	<1	28	-	<1	60	60	<0.1	-	<1	-	<1	<1
Downstream	SW_G	20/05/2021	<10	<10	-	-	-	-	<10	<10	<1	<1	19	-	<1	60	60	<0.1	-	<1	-	<1	<1
Downstream	SW_G	16/06/2021	<10	<10	-	-	-	-	10	<10	<1	<1	13	-	<1	50	<50	<0.1	-	<1	-	<1	<1
	SW_G	**Min.**	**<10**	**<10**	**<0.01**	**0.3**	**0.2**	**<0.01**	**<10**	**<10**	**<1**	**<1**	**10**	**10**	**<1**	**<50**	**<50**	**<0.1**	**<0.1**	**<1**	**<1**	**<1**	**<1**
	SW_G	**Max.**	**1120**	**<10**	**<0.01**	**0.3**	**1.4**	**0.02**	**720**	**120**	**<1**	**<1**	**28**	**18**	**<1**	**170**	**80**	**<0.1**	**<0.1**	**<1**	**<1**	**2**	**2**
	SW_G	**Average**	**110**	**5**	**0.005**	**-**	**0.55**	**0.0088**	**163**	**27**	**0.5**	**0.5**	**16**	**13**	**0.5**	**50**	**35**	**0.05**	**0.05**	**0.5**	**0.5**	**0.88**	**0.67**
Downstream	WX22	13/08/2020	1140	<10	<0.01	-	1.4	<0.01	490	100	<1	<1	12	10	-	<50	<50	<0.1	<0.1	<1	<1	<1	<1
Downstream	WX22	16/09/2020	150	<10	<0.01	-	0.4	<0.01	30	<10	<1	<1	17	15	-	<50	<50	<0.1	<0.1	<1	<1	1	<1
Downstream	WX22	21/10/2020	70	<10	<0.01	-	<0.1	<0.01	20	<10	<1	-	19	-	-	<50	-	<0.1	-	<1	-	<1	<1
Downstream	WX22	25/11/2020	<10	<10	<0.01	-	0.2	<0.1	160	<10	<1	<1	11	-	<1	120	<50	<0.1	-	<1	-	2	1
Downstream	WX22	27/11/2020	<10	<10	<0.01	-	0.2	<0.01	50	10	<1	<1	12	-	<1	<50	<50	<0.1	-	<1	-	<1	1
Downstream	WX22	16/12/2020	<10	<10	<0.01	-	0.3	<0.01	10	<10	<1	<1	20	-	<1	80	80	<0.1	-	<1	-	2	<1
Downstream	WX22	7/01/2021	<10	<10	<0.01	-	0.3	<0.01	270	60	<1	<1	10	-	<1	<50	<50	<0.1	-	<1	-	2	<1
Downstream	WX22	17/02/2021	<10	<10	-	-	<0.1	<0.01	<10	20	<1	<1	14	-	<1	50	<50	<0.1	-	<1	-	<1	<1
Downstream	WX22	25/03/2021	<10	<10	-	-	0.3	0.02	520	130	<1	<1	12	-	<1	<50	<50	<0.1	-	<1	-	1	<1
Downstream	WX22	28/04/2021	20	<10	-	-	0.1	<0.01	10	<10	<1	<1	29	-	<1	60	60	<0.1	-	<1	-	<1	<1
Downstream	WX22	20/05/2021	20	<10	-	-	<0.1	<0.01	20	<10	<1	<1	24	-	<1	60	70	<0.1	-	<1	-	<1	<1
Downstream	WX22	16/06/2021	<10	<10	-	-	0.1	<0.01	<10	<10	<1	<1	12	-	<1	50	<50	<0.1	-	<1	-	<1	<1
	WX22	**Min.**	**<10**	**<10**	**<0.01**	**-**	**<0.1**	**<0.01**	**<10**	**<10**	**<1**	**<1**	**10**	**10**	**<1**	**<50**	**<50**	**<0.1**	**<0.1**	**<1**	**<1**	**<1**	**<1**
	WX22	**Max.**	**1140**	**<10**	**<0.01**	**-**	**1.4**	**<0.1**	**520**	**130**	**<1**	**<1**	**29**	**15**	**<1**	**120**	**80**	**<0.1**	**<0.1**	**<1**	**<1**	**2**	**1**
	WX22	**Average**	**130**	**5**	**0.005**	**-**	**0.3**	**0.01**	**144**	**32**	**0.5**	**0.5**	**16**	**-**	**0.5**	**47**	**39**	**0.05**	**-**	**0.5**	**-**	**1**	**0.59**

			Metals																
			Iron	Iron (Filtered)	Lead	Lead (Filtered)	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Molybdenum (Filtered)	Nickel	Nickel (Filtered)	Selenium	Selenium (Filtered)	Silver	Silver (Filtered)	Zinc	Zinc (Filtered)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Surface Water			300	300	5	5	1900	1900	0.06	10	10	17	17	5	5	0.05	0.05	116	116
Purpose	**LocCode**	**Sampled_Date-Time**																	
Downstream	SW_G	13/08/2020	386	128	<1	<1	43	31	<0.04	1	1	6	6	<0.2	<0.2	<1	<1	<5	<5
Downstream	SW_G	16/09/2020	124	60	<1	<1	44	44	<0.04	<1	-	12	11	<0.2	<0.2	<1	-	<5	<5
Downstream	SW_G	21/10/2020	163	73	<1	<1	157	147	<0.04	<1	-	28	27	<0.2	<0.2	<1	-	<5	<5
Downstream	SW_G	11/11/2020	193	90	<1	<1	65	58	<0.04	<1	-	14	14	0.3	0.2	<1	-	<5	<5
Downstream	SW_G	27/11/2020	220	140	<1	-	217	216	<0.04	1	-	20	17	<0.2	-	<1	-	<5	<5
Downstream	SW_G	16/12/2020	204	60	<1	-	409	395	<0.04	<1	-	48	46	<0.2	-	<1	-	<5	6
Downstream	SW_G	7/01/2021	496	150	<1	-	96	79	<0.04	<1	-	9	9	<0.2	-	<1	-	<5	<5
Downstream	SW_G	17/02/2021	195	60	<1	-	355	321	<0.04	1	-	21	18	0.2	-	<1	-	<5	<5
Downstream	SW_G	25/03/2021	763	210	<1	-	38	38	0.05	<1	-	7	6	0.3	-	<1	-	10	<5
Downstream	SW_G	28/04/2021	86	<50	<1	-	739	673	<0.04	<1	-	26	26	<0.2	-	<1	-	<5	6
Downstream	SW_G	20/05/2021	98	<50	<1	-	460	468	<0.04	<1	-	33	32	<0.2	-	<1	-	<5	6
Downstream	SW_G	16/06/2021	175	100	<1	-	116	100	<0.04	<1	-	21	18	<0.2	-	<1	-	6	5
	SW_G	**Min.**	**86**	**<50**	**<1**	**<1**	**38**	**31**	**<0.04**	**<1**	**1**	**6**	**6**	**<0.2**	**<0.2**	**<1**	**<1**	**<5**	**<5**
	SW_G	**Max.**	**763**	**210**	**<1**	**<1**	**739**	**673**	**0.05**	**1**	**1**	**48**	**46**	**0.3**	**0.2**	**<1**	**<1**	**10**	**6**
	SW_G	**Average**	**259**	**93**	**0.5**	**0.5**	**228**	**214**	**0.023**	**0.63**	**-**	**20**	**19**	**0.14**	**0.13**	**0.5**	**-**	**3.4**	**3.6**
Downstream	WX22	13/08/2020	357	126	<1	<1	44	36	<0.04	1	-	7	6	<0.2	<0.2	<1	-	<5	<5
Downstream	WX22	16/09/2020	147	61	<1	<1	44	41	<0.04	<1	-	12	9	<0.2	<0.2	<1	-	5	<5
Downstream	WX22	21/10/2020	168	77	<1	-	174	165	<0.04	<1	-	28	-	<0.2	-	<1	-	<5	6
Downstream	WX22	25/11/2020	390	70	<1	-	131	123	<0.04	<1	-	16	16	0.2	-	<1	-	6	7
Downstream	WX22	27/11/2020	230	150	<1	-	230	231	<0.04	2	-	18	17	<0.2	-	<1	-	7	6
Downstream	WX22	16/12/2020	236	70	<1	-	444	421	<0.04	<1	-	47	46	<0.2	-	<1	-	5	<5
Downstream	WX22	7/01/2021	514	170	<1	-	95	80	<0.04	<1	-	9	8	<0.2	-	<1	-	<5	<5
Downstream	WX22	17/02/2021	191	180	<1	-	374	376	<0.04	1	-	18	18	0.3	-	<1	-	<5	<5
Downstream	WX22	25/03/2021	768	270	<1	-	69	41	<0.04	1	-	7	6	0.4	-	<1	-	7	<5
Downstream	WX22	28/04/2021	122	<50	<1	-	782	752	<0.04	<1	-	27	28	<0.2	-	<1	-	8	8
Downstream	WX22	20/05/2021	124	<50	<1	-	483	494	<0.04	<1	-	34	32	<0.2	-	<1	-	11	<5
Downstream	WX22	16/06/2021	161	110	<1	-	116	113	<0.04	<1	-	20	20	<0.2	-	<1	-	<5	8
	WX22	**Min.**	**122**	**<50**	**<1**	**<1**	**44**	**36**	**<0.04**	**<1**	**-**	**7**	**6**	**<0.2**	**<0.2**	**<1**	**-**	**<5**	**<5**
	WX22	**Max.**	**768**	**270**	**<1**	**<1**	**782**	**752**	**<0.04**	**2**	**-**	**47**	**46**	**0.4**	**<0.2**	**<1**	**-**	**11**	**8**
	WX22	**Average**	**295**	**111**	**0.5**	**-**	**261**	**251**	**0.02**	**0.77**	**-**	**20**	**19**	**0.15**	**-**	**0.5**	**-**	**5.4**	**4**

APPENDIX G TABULATED GROUNDWATER DATA

				Field Parameters		TDS	Major Anions and Cations														
				Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Carbonate (as CaCO3)	Total Alkalinity (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Phenolphthalein Alkalinity (CaCO3)	Calcium	Calcium (Filtered)	Chloride	Magnesium	Magnesium (Filtered)	Fluoride	Potassium	Potassium (Filtered)	Sodium	Sodium (Filtered)	Sulfate (as SO4)
				uS/cm	pH units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
ANZECC (2000) or Local Guidelines - Groundwater				2600	6.5-8	2000							350			1.5					1000
Purpose	**LocCode**	**Sampled_Date-Time**	**SampleCode**																		
Within MPAR / Mine Disturbance Area East of MPAR	D10	17/09/2020	D10_17 Sep 20_	4000	6.09	2970	-	155	-	-	137	-	230	106	-	<0.5	74.1	-	577	-	1500
Within MPAR / Mine Disturbance Area East of MPAR	D10	26/11/2020	D10_26 Nov 20_	4680	5.98	3780	<1	136	136	-	154	-	345	128	-	<0.5	88.5	-	755	-	2210
Within MPAR / Mine Disturbance Area East of MPAR	D10	17/03/2021	D10_17 Mar 21_	5190	6	4140	<1	171	171	<1	165	-	334	148	-	0.463	106	-	707	-	2070
Within MPAR / Mine Disturbance Area East of MPAR	D10	30/06/2021	D10_30 Jun 21_	4700	6.22	3370	<1	208	208	<1	156	-	308	135	-	0.643	106	-	880	-	1900
	D10	**Min.**		**4000**	**5.98**	**2970**	**<1**	**136**	**136**	**<1**	**137**	**-**	**230**	**106**	**-**	**0.463**	**74.1**	**-**	**577**	**-**	**1500**
	D10	**Max.**		**5190**	**6.22**	**4140**	**<1**	**208**	**208**	**<1**	**165**	**-**	**345**	**148**	**-**	**0.643**	**106**	**-**	**880**	**-**	**2210**
	D10	**Average**		**4643**	**-**	**3565**	**0.5**	**168**	**172**	**-**	**153**	**-**	**304**	**129**	**-**	**0.4**	**94**	**-**	**730**	**-**	**1920**
Within MPAR / Mine Disturbance Area East of MPAR	D11	17/09/2020	D11_17 Sep 20_	9860	6.25	8620	-	125	-	-	550	-	929	432	-	<1	108	-	1480	-	4270
Within MPAR / Mine Disturbance Area East of MPAR	D11	30/06/2021	D11_30 Jun 21_	9290	6.32	8200	<1	188	188	<1	671	-	917	530	-	0.435	130	-	1840	-	4320
	D11	**Min.**		**9290**	**6.25**	**8200**	**<1**	**125**	**188**	**<1**	**550**	**-**	**917**	**432**	**-**	**0.435**	**108**	**-**	**1480**	**-**	**4270**
	D11	**Max.**		**9860**	**6.32**	**8620**	**<1**	**188**	**188**	**<1**	**671**	**-**	**929**	**530**	**-**	**<1**	**130**	**-**	**1840**	**-**	**4320**
	D11	**Average**		**9575**	**-**	**8410**	**-**	**156.5**	**-**	**-**	**610.5**	**-**	**923**	**481**	**-**	**-**	**119**	**-**	**1660**	**-**	**4295**
Within MPAR / Mine Disturbance Area East of MPAR	D19	16/09/2020	D19_16 Sep 20_	4140	6.04	3140	-	155	-	-	121	-	244	108	-	<0.5	73.1	-	568	-	1690
Within MPAR / Mine Disturbance Area East of MPAR	D19	26/11/2020	D19_26 Nov 20_	4140	6.04	3290	<1	167	167	-	134	-	267	121	-	<0.5	77.6	-	641	-	1900
Within MPAR / Mine Disturbance Area East of MPAR	D19	15/04/2021	D19_15 Apr 21_	3930	6.08	3080	<1	164	164	<1	131	-	252	113	-	0.453	71.8	-	557	-	1690
Within MPAR / Mine Disturbance Area East of MPAR	D19	24/06/2021	D19_24 Jun 21_	4120	6.04	3190	<1	181	181	<1	155	-	266	132	-	<0.5	84.1	-	578	-	1930
	D19	**Min.**		**3930**	**6.04**	**3080**	**<1**	**155**	**164**	**<1**	**121**	**-**	**244**	**108**	**-**	**0.453**	**71.8**	**-**	**557**	**-**	**1690**
	D19	**Max.**		**4140**	**6.08**	**3290**	**<1**	**181**	**181**	**<1**	**155**	**-**	**267**	**132**	**-**	**<0.5**	**84.1**	**-**	**641**	**-**	**1930**
	D19	**Average**		**4083**	**-**	**3175**	**0.5**	**167**	**171**	**-**	**135**	**-**	**257**	**119**	**-**	**0.3**	**77**	**-**	**586**	**-**	**1803**
Within MPAR / Mine Disturbance Area East of MPAR	D113	12/08/2020	MPW035292	4500	5.98	3490	-	158	-	<1	143	140	284	123	123	0.311	83.8	85.3	655	658	2080
Within MPAR / Mine Disturbance Area East of MPAR	D113	11/11/2020	D113_11 Nov 20_	4170	5.96	3190	<1	172	172	<1	149	141	245	118	119	<0.5	88	87	590	576	1870
Within MPAR / Mine Disturbance Area East of MPAR	D113	17/02/2021	D113_17 Feb 21_	4170	6.04	3230	<1	164	164	<1	137	-	280	121	-	<0.5	78.3	-	613	-	1890
Within MPAR / Mine Disturbance Area East of MPAR	D113	24/06/2021	D113_24 Jun 21_	4340	5.99	3410	<1	176	176	<1	171	-	281	147	-	<0.5	91.7	-	598	-	2020
	D113	**Min.**		**4170**	**5.96**	**3190**	**<1**	**158**	**164**	**<1**	**137**	**140**	**245**	**118**	**119**	**0.311**	**78.3**	**85.3**	**590**	**576**	**1870**
	D113	**Max.**		**4500**	**6.04**	**3490**	**<1**	**176**	**176**	**<1**	**171**	**141**	**284**	**147**	**123**	**<0.5**	**91.7**	**87**	**655**	**658**	**2080**
	D113	**Average**		**4295**	**-**	**3330**	**0.5**	**168**	**171**	**0.5**	**150**	**-**	**273**	**127**	**-**	**0.27**	**85**	**-**	**614**	**-**	**1965**
Within Mine Disturbance Area S & SE of MPAR	D15	16/09/2020	D15_16 Sep 20_	3280	5.11	2660	-	17	-	-	210	-	145	96.7	-	<0.5	42.5	-	377	-	1480
Within Mine Disturbance Area S & SE of MPAR	D15	26/11/2020	D15_26 Nov 20_	3220	5.13	2790	<1	12	12	-	198	-	228	90.9	-	<0.5	38.7	-	388	-	1680
Within Mine Disturbance Area S & SE of MPAR	D15	24/06/2021	D15_24 Jun 21_	2790	5	2260	<1	16	16	<1	176	-	138	74.8	-	<0.5	38.8	-	335	-	1460
	D15	**Min.**		**2790**	**5**	**2260**	**<1**	**12**	**12**	**<1**	**176**	**-**	**138**	**74.8**	**-**	**<0.5**	**38.7**	**-**	**335**	**-**	**1460**
	D15	**Max.**		**3280**	**5.13**	**2790**	**<1**	**17**	**16**	**<1**	**210**	**-**	**228**	**96.7**	**-**	**<0.5**	**42.5**	**-**	**388**	**-**	**1680**
	D15	**Average**		**3097**	**-**	**2570**	**-**	**15**	**-**	**-**	**195**	**-**	**170**	**87**	**-**	**0.25**	**40**	**-**	**367**	**-**	**1540**
Within Mine Disturbance Area S & SE of MPAR	D16	16/09/2020	D16_16 Sep 20_	2120	6.27	1690	-	199	-	-	275	-	99.2	101	-	<0.2	31.9	-	59.1	-	779
Within Mine Disturbance Area S & SE of MPAR	D16	26/11/2020	D16_26 Nov 20_	2080	6.28	1820	<1	201	201	-	278	-	110	99.3	-	0.063	29.4	-	46.8	-	883
Within Mine Disturbance Area S & SE of MPAR	D16	15/04/2021	D16_15 Apr 21_	2160	6.31	1870	<1	201	201	<1	305	-	123	104	-	0.227	31.6	-	54.2	-	958
Within Mine Disturbance Area S & SE of MPAR	D16	23/06/2021	D16_23 Jun 21_	2000	6.34	1650	<1	217	217	<1	280	-	104	96.3	-	<0.2	31.2	-	41.9	-	850
	D16	**Min.**		**2000**	**6.27**	**1650**	**<1**	**199**	**201**	**<1**	**275**	**-**	**99.2**	**96.3**	**-**	**0.063**	**29.4**	**-**	**41.9**	**-**	**779**
	D16	**Max.**		**2160**	**6.34**	**1870**	**<1**	**217**	**217**	**<1**	**305**	**-**	**123**	**104**	**-**	**0.227**	**31.9**	**-**	**59.1**	**-**	**958**
	D16	**Average**		**2090**	**-**	**1758**	**0.5**	**205**	**206**	**-**	**285**	**-**	**109**	**100**	**-**	**0.12**	**31**	**-**	**51**	**-**	**868**
Within Mine Disturbance Area S & SE of MPAR	D17	16/09/2020	D17_16 Sep 20_	3520	6.12	2800	-	116	-	-	225	-	187	143	-	<0.5	26.4	-	332	-	1400
Within Mine Disturbance Area S & SE of MPAR	D17	26/11/2020	D17_26 Nov 20_	3360	6.06	2870	<1	107	107	-	233	-	210	145	-	<0.5	24.6	-	339	-	1630
Within Mine Disturbance Area S & SE of MPAR	D17	15/04/2021	D17_15 Apr 21_	3170	6.11	2720	<1	138	138	<1	226	-	189	134	-	0.368	24.9	-	294	-	1520
Within Mine Disturbance Area S & SE of MPAR	D17	23/06/2021	D17_23 Jun 21_	3060	6.1	2480	<1	145	145	<1	240	-	176	134	-	<0.5	25.7	-	271	-	1410
	D17	**Min.**		**3060**	**6.06**	**2480**	**<1**	**107**	**107**	**<1**	**225**	**-**	**176**	**134**	**-**	**0.368**	**24.6**	**-**	**271**	**-**	**1400**
	D17	**Max.**		**3520**	**6.12**	**2870**	**<1**	**145**	**145**	**<1**	**240**	**-**	**210**	**145**	**-**	**<0.5**	**26.4**	**-**	**339**	**-**	**1630**
	D17	**Average**		**3278**	**-**	**2718**	**0.5**	**127**	**130**	**-**	**231**	**-**	**191**	**139**	**-**	**0.28**	**25**	**-**	**309**	**-**	**1490**
Within Mine Disturbance Area S & SE of MPAR	D18	17/09/2020	D18_17 Sep 20_	680	6.67	388	-	380	-	-	81	-	7.53	30.2	-	0.457	20.3	-	17.4	-	7.42
Within Mine Disturbance Area S & SE of MPAR	D18	26/11/2020	D18_26 Nov 20_	670	6.67	408	<1	388	388	-	75.9	-	77.7	28.9	-	3.04	18	-	16.4	-	88.7
Within Mine Disturbance Area S & SE of MPAR	D18	15/04/2021	D18_15 Apr 21_	670	6.74	394	<1	362	362	<1	77.5	-	8.77	27.1	-	0.274	18.3	-	17.7	-	11.2
Within Mine Disturbance Area S & SE of MPAR	D18	25/06/2021	D18_25 Jun 21_	670	6.73	378	<1	370	370	<1	83.3	-	8	29	-	0.501	20.2	-	18.5	-	10
	D18	**Min.**		**670**	**6.67**	**378**	**<1**	**362**	**362**	**<1**	**75.9**	**-**	**7.53**	**27.1**	**-**	**0.274**	**18**	**-**	**16.4**	**-**	**7.42**
	D18	**Max.**		**680**	**6.74**	**408**	**<1**	**388**	**388**	**<1**	**83.3**	**-**	**77.7**	**30.2**	**-**	**3.04**	**20.3**	**-**	**18.5**	**-**	**88.7**
	D18	**Average**		**673**	**-**	**392**	**0.5**	**375**	**373**	**-**	**79**	**-**	**26**	**29**	**-**	**1.1**	**19**	**-**	**18**	**-**	**29**
Background and Adjacent to MPAR	D3	17/09/2020	D3_17 Sep 20_	306	5.84	196	-	47	-	-	17.2	-	16.6	11.6	-	<0.05	3.53	-	23.1	-	66.9
Background and Adjacent to MPAR	D3	26/11/2020	D3_26 Nov 20_	850	5.95	664	<1	106	106	-	70.8	-	34.8	41.2	-	<0.1	9.03	-	37.7	-	291
Background and Adjacent to MPAR	D3	17/03/2021	D3_17 Mar 21_	910	6.11	610	<1	127	127	<1	75.7	-	60.8	44	-	<0.2	10	-	49.7	-	259
Background and Adjacent to MPAR	D3	24/06/2021	D3_24 Jun 21_	1090	6.22	751	<1	171	171	<1	90.8	-	73	53.4	-	<0.2	12.9	-	57.8	-	280
	D3	**Min.**		**306**	**5.84**	**196**	**<1**	**47**	**106**	**<1**	**17.2**	**-**	**16.6**	**11.6**	**-**	**<0.05**	**3.53**	**-**	**23.1**	**-**	**66.9**
	D3	**Max.**		**1090**	**6.22**	**751**	**<1**	**171**	**171**	**<1**	**90.8**	**-**	**73**	**53.4**	**-**	**<0.2**	**12.9**	**-**	**57.8**	**-**	**291**
	D3	**Average**		**789**	**-**	**555**	**0.5**	**113**	**135**	**-**	**64**	**-**	**46**	**38**	**-**	**0.069**	**8.9**	**-**	**42**	**-**	**224**

				Field Parameters		TDS	Major Anions and Cations														
				Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Carbonate (as CaCO3)	Total Alkalinity (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Phenolphthalein Alkalinity (CaCO3)	Calcium	Calcium (Filtered)	Chloride	Magnesium	Magnesium (Filtered)	Fluoride	Potassium	Potassium (Filtered)	Sodium	Sodium (Filtered)	Sulfate (as SO4)
				uS/cm	pH units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
ANZECC (2000) or Local Guidelines - Groundwater				2600	6.5-8	2000							350			1.5					1000
Purpose	**LocCode**	**Sampled_Date-Time**	**SampleCode**																		
Background and Adjacent to MPAR	D4	15/07/2020	D4_15 Jul 20_	790	3.4	682	-	<1	-	-	17.5	-	14.9	9.8	-	<0.1	7.69	-	18.4	-	293
Background and Adjacent to MPAR	D4	22/10/2020	D4_22 Oct 20_	770	3.48	632	-	<1	-	-	15.7	-	16.7	8.88	-	<0.1	8.62	-	20.5	-	347
Background and Adjacent to MPAR	D4	12/11/2020	D4_12 Nov 20_	770	3.45	638	-	<1	-	-	15.8	-	15.7	8.43	-	<0.1	7.73	-	20.1	-	275
Background and Adjacent to MPAR	D4	11/02/2021	D4_11 Feb 21_	750	3.57	620	<1	<1	<1	<1	16	-	17.4	10	-	<0.1	7.19	-	17.6	-	320
Background and Adjacent to MPAR	D4	20/05/2021	D4_20 May 21_	770	3.39	583	<1	<1	<1	<1	16.5	-	16.9	9.56	-	0.063	7.98	-	20.3	-	308
	D4	**Min.**		**750**	**3.39**	**583**	**<1**	**<1**	**<1**	**<1**	**15.7**	**-**	**14.9**	**8.43**	**-**	**0.063**	**7.19**	**-**	**17.6**	**-**	**275**
	D4	**Max.**		**790**	**3.57**	**682**	**<1**	**<1**	**<1**	**<1**	**17.5**	**-**	**17.4**	**10**	**-**	**<0.1**	**8.62**	**-**	**20.5**	**-**	**347**
	D4	**Average**		**770**	**-**	**631**	**-**	**0.5**	**-**	**-**	**16**	**-**	**16**	**9.3**	**-**	**0.053**	**7.8**	**-**	**19**	**-**	**309**
Background and Adjacent to MPAR	D5	15/07/2020	D5_15 Jul 20_	1260	5.96	882	-	106	-	-	103	-	29	69.4	-	0.711	9.75	-	29.5	-	582
Background and Adjacent to MPAR	D5	22/10/2020	D5_22 Oct 20_	1230	5.91	921	-	93	-	-	92.8	-	21.9	65.7	-	<0.1	11	-	31.1	-	505
Background and Adjacent to MPAR	D5	12/11/2020	D5_12 Nov 20_	1240	5.95	908	-	96	-	-	107	-	23.9	74.5	-	0.108	11.9	-	36.5	-	530
Background and Adjacent to MPAR	D5	11/02/2021	D5_11 Feb 21_	1150	6.05	842	<1	73	73	<1	89.1	-	25.6	67.4	-	0.233	8.84	-	26.6	-	505
Background and Adjacent to MPAR	D5	20/05/2021	D5_20 May 21_	1160	5.92	794	<1	84	84	<1	97.3	-	25.7	67.6	-	0.182	9.95	-	31.8	-	484
	D5	**Min.**		**1150**	**5.91**	**794**	**<1**	**73**	**73**	**<1**	**89.1**	**-**	**21.9**	**65.7**	**-**	**<0.1**	**8.84**	**-**	**26.6**	**-**	**484**
	D5	**Max.**		**1260**	**6.05**	**921**	**<1**	**106**	**84**	**<1**	**107**	**-**	**29**	**74.5**	**-**	**0.711**	**11.9**	**-**	**36.5**	**-**	**582**
	D5	**Average**		**1208**	**-**	**869**	**-**	**90**	**-**	**-**	**98**	**-**	**25**	**69**	**-**	**0.26**	**10**	**-**	**31**	**-**	**521**
Background and Adjacent to MPAR	D106	12/08/2020	MPW035285	7370	6	6000	-	117	-	<1	473	435	805	375	346	0.053	57.6	52.6	943	874	3550
Background and Adjacent to MPAR	D106	11/11/2020	D106_11 Nov 20_	11,910	5.99	10,600	<1	181	181	<1	594	493	1530	746	604	<1	110	105	1870	1500	6100
Background and Adjacent to MPAR	D106	17/02/2021	D106_17 Feb 21_	12,510	6	11,700	<1	189	189	<1	578	-	1530	665	-	<1	118	-	1840	-	5920
Background and Adjacent to MPAR	D106	10/06/2021	D106_10 Jun 21_	12,160	6.05	10,800	<1	170	170	<1	611	-	1530	722	-	<2	100	-	2100	-	5910
	D106	**Min.**		**7370**	**5.99**	**6000**	**<1**	**117**	**170**	**<1**	**473**	**435**	**805**	**375**	**346**	**0.053**	**57.6**	**52.6**	**943**	**874**	**3550**
	D106	**Max.**		**12510**	**6.05**	**11700**	**<1**	**189**	**189**	**<1**	**611**	**493**	**1530**	**746**	**604**	**<2**	**118**	**105**	**2100**	**1500**	**6100**
	D106	**Average**		**10988**	**-**	**9775**	**0.5**	**164**	**180**	**0.5**	**564**	**-**	**1349**	**627**	**-**	**0.51**	**96**	**-**	**1688**	**-**	**5370**
Background and Adjacent to MPAR	D107	12/08/2020	MPW035286	15,330	5.93	14,400	-	174	-	<1	535	551	2000	740	733	0.206	236	233	2440	2380	8550
Background and Adjacent to MPAR	D107	12/11/2020	D107_12 Nov 20_	13,960	5.92	12,500	<1	202	202	<1	504	442	1570	756	635	<1	232	204	2510	2070	6720
Background and Adjacent to MPAR	D107	17/02/2021	D107_17 Feb 21_	13,900	5.99	12,700	<1	203	203	<1	452	-	1640	641	-	<1	246	-	2360	-	6930
Background and Adjacent to MPAR	D107	10/06/2021	D107_10 Jun 21_	11,300	6.04	8480	<1	207	207	<1	378	-	1250	502	-	<2	191	-	1900	-	5150
	D107	**Min.**		**11300**	**5.92**	**8480**	**<1**	**174**	**202**	**<1**	**378**	**442**	**1250**	**502**	**635**	**0.206**	**191**	**204**	**1900**	**2070**	**5150**
	D107	**Max.**		**15330**	**6.04**	**14400**	**<1**	**207**	**207**	**<1**	**535**	**551**	**2000**	**756**	**733**	**<2**	**246**	**233**	**2510**	**2380**	**8550**
	D107	**Average**		**13623**	**-**	**12020**	**0.5**	**197**	**204**	**0.5**	**467**	**-**	**1615**	**660**	**-**	**0.55**	**226**	**-**	**2303**	**-**	**6838**
Adjacent to MPAR and Downgradient	D1	16/09/2020	D1_16 Sep 20_	9810	5.95	8740	-	127	-	-	591	-	1110	549	-	<1	103	-	1240	-	4510
Adjacent to MPAR and Downgradient	D1	25/11/2020	D1_25 Nov 20_	9920	5.84	9360	<1	116	116	-	584	-	132	530	-	<1	108	-	1390	-	997
Adjacent to MPAR and Downgradient	D1	14/04/2021	D1_14 Apr 21_	9140	5.91	8590	<1	154	154	<1	29.9	-	1120	21	-	0.75	3.95	-	25.8	-	4790
Adjacent to MPAR and Downgradient	D1	23/06/2021	D1_23 Jun 21_	9290	5.92	8310	<1	184	184	<1	510	-	1070	494	-	<1	95.1	-	1340	-	4510
	D1	**Min.**		**9140**	**5.84**	**8310**	**<1**	**116**	**116**	**<1**	**29.9**	**-**	**132**	**21**	**-**	**0.75**	**3.95**	**-**	**25.8**	**-**	**997**
	D1	**Max.**		**9920**	**5.95**	**9360**	**<1**	**184**	**184**	**<1**	**591**	**-**	**1120**	**549**	**-**	**<1**	**108**	**-**	**1390**	**-**	**4790**
	D1	**Average**		**9540**	**-**	**8750**	**0.5**	**145**	**151**	**-**	**429**	**-**	**858**	**399**	**-**	**0.56**	**78**	**-**	**999**	**-**	**3702**
Adjacent to MPAR and Downgradient	D2	16/07/2020	D2_16 Jul 20_	1460	6.6	1000	-	15	-	-	81.1	-	86.4	64.4	-	<0.2	14.8	-	141	-	590
Adjacent to MPAR and Downgradient	D2	22/10/2020	D2_22 Oct 20_	1320	5.78	910	-	8	-	-	68.1	-	84	58.6	-	0.105	15.6	-	119	-	572
Adjacent to MPAR and Downgradient	D2	12/11/2020	D2_12 Nov 20_	1050	5.8	732	-	14	-	-	51.1	-	54.3	38.6	-	<0.1	11.4	-	96.7	-	366
Adjacent to MPAR and Downgradient	D2	12/02/2021	D2_12 Feb 21_	790	5.87	567	<1	30	30	<1	36.1	-	45.6	31.7	-	0.124	8.94	-	66.6	-	291
Adjacent to MPAR and Downgradient	D2	20/05/2021	D2_20 May 21_	1030	5.85	712	<1	14	14	<1	52.4	-	61.4	43.2	-	0.162	12.4	-	93.4	-	390
	D2	**Min.**		**790**	**5.78**	**567**	**<1**	**8**	**14**	**<1**	**36.1**	**-**	**45.6**	**31.7**	**-**	**<0.1**	**8.94**	**-**	**66.6**	**-**	**291**
	D2	**Max.**		**1460**	**6.6**	**1000**	**<1**	**30**	**30**	**<1**	**81.1**	**-**	**86.4**	**64.4**	**-**	**<0.2**	**15.6**	**-**	**141**	**-**	**590**
	D2	**Average**		**1130**	**-**	**784**	**-**	**16**	**-**	**-**	**58**	**-**	**66**	**47**	**-**	**0.11**	**13**	**-**	**103**	**-**	**442**
Adjacent to MPAR and Downgradient	D8	17/09/2020	D8_17 Sep 20_	358	5.58	260	-	14	-	-	25	-	14.4	18	-	<0.05	3.11	-	15.1	-	123
Adjacent to MPAR and Downgradient	D8	26/11/2020	D8_26 Nov 20_	211	5.49	194	<1	12	12	-	15.1	-	4.73	11	-	<0.02	2.36	-	5.72	-	94.3
Adjacent to MPAR and Downgradient	D8	15/04/2021	D8_15 Apr 21_	474	5.72	378	<1	14	14	<1	95.4	-	23.3	81	-	0.037	16.7	-	181	-	169
Adjacent to MPAR and Downgradient	D8	25/06/2021	D8_25 Jun 21_	477	5.53	349	<1	13	13	<1	29.5	-	25.2	21.1	-	<0.05	4.16	-	30.9	-	172
	D8	**Min.**		**211**	**5.49**	**194**	**<1**	**12**	**12**	**<1**	**15.1**	**-**	**4.73**	**11**	**-**	**<0.02**	**2.36**	**-**	**5.72**	**-**	**94.3**
	D8	**Max.**		**477**	**5.72**	**378**	**<1**	**14**	**14**	**<1**	**95.4**	**-**	**25.2**	**81**	**-**	**<0.05**	**16.7**	**-**	**181**	**-**	**172**
	D8	**Average**		**380**	**-**	**295**	**0.5**	**13**	**13**	**-**	**41**	**-**	**17**	**33**	**-**	**0.024**	**6.6**	**-**	**58**	**-**	**140**
Adjacent to MPAR and Downgradient	D9	16/09/2020	D9_16 Sep 20_	8410	6.08	7260	-	126	-	-	629	-	925	488	-	<1	68.5	-	944	-	3480
Adjacent to MPAR and Downgradient	D9	25/11/2020	D9_25 Nov 20_	9900	6.15	9410	<1	78	78	-	665	-	1260	520	-	0.045	79.5	-	1240	-	4600
Adjacent to MPAR and Downgradient	D9	14/04/2021	D9_14 Apr 21_	8620	6.07	7860	<1	122	122	<1	621	-	1080	459	-	3.24	71.1	-	1020	-	4270
Adjacent to MPAR and Downgradient	D9	23/06/2021	D9_23 Jun 21_	10,330	6.1	9310	<1	158	158	<1	665	-	1390	579	-	<1	105	-	1360	-	5140
	D9	**Min.**		**8410**	**6.07**	**7260**	**<1**	**78**	**78**	**<1**	**621**	**-**	**925**	**459**	**-**	**0.045**	**68.5**	**-**	**944**	**-**	**3480**
	D9	**Max.**		**10330**	**6.15**	**9410**	**<1**	**158**	**158**	**<1**	**665**	**-**	**1390**	**579**	**-**	**3.24**	**105**	**-**	**1360**	**-**	**5140**
	D9	**Average**		**9315**	**-**	**8460**	**0.5**	**121**	**119**	**-**	**645**	**-**	**1164**	**512**	**-**	**1.1**	**81**	**-**	**1141**	**-**	**4373**

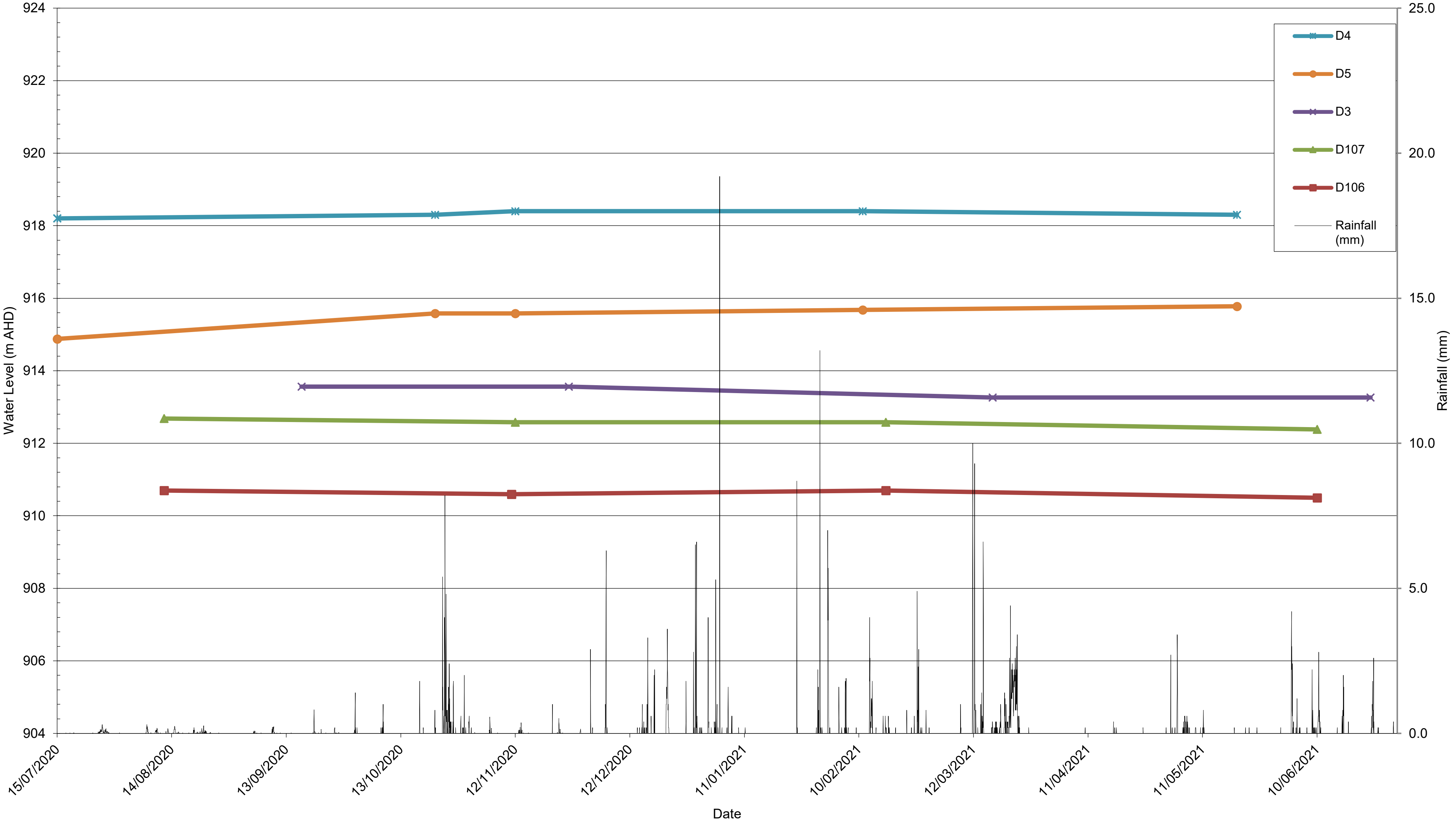
				Field Parameters		TDS	Major Anions and Cations														
				Electrical Conductivity (Field)	pH (Field)	Total Dissolved Solids (TDS)	Carbonate (as CaCO3)	Total Alkalinity (as CaCO3)	Bicarbonate Alkalinity (as CaCO3)	Phenolphthalein Alkalinity (CaCO3)	Calcium	Calcium (Filtered)	Chloride	Magnesium	Magnesium (Filtered)	Fluoride	Potassium	Potassium (Filtered)	Sodium	Sodium (Filtered)	Sulfate (as SO4)
				uS/cm	pH units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
ANZECC (2000) or Local Guidelines - Groundwater				2600	6.5-8	2000							350			1.5					1000
Purpose	**LocCode**	**Sampled_Date-Time**	**SampleCode**																		
Adjacent to MPAR and Downgradient	D102	12/08/2020	MPW035281	10,330	6.08	9340	-	144	-	<1	747	626	1390	560	476	0.089	88.3	73.6	1310	1130	5080
Adjacent to MPAR and Downgradient	D102	11/11/2020	D102_11 Nov 20_	10,420	6.06	9520	<1	141	141	<1	713	612	1430	615	513	0.066	120	96.5	1440	1200	5270
Adjacent to MPAR and Downgradient	D102	18/02/2021	D102_18 Feb 21_	10,140	6.07	9220	<1	125	125	<1	547	-	1330	531	-	<1	90.6	-	1340	-	4400
Adjacent to MPAR and Downgradient	D102	11/06/2021	D102_11 Jun 21_	10,190	6.1	9110	<1	129	129	<1	518	-	1410	551	-	<2	99	-	1430	-	4610
	D102	**Min.**		**10140**	**6.06**	**9110**	**<1**	**125**	**125**	**<1**	**518**	**612**	**1330**	**531**	**476**	**0.066**	**88.3**	**73.6**	**1310**	**1130**	**4400**
	D102	**Max.**		**10420**	**6.1**	**9520**	**<1**	**144**	**141**	**<1**	**747**	**626**	**1430**	**615**	**513**	**<2**	**120**	**96.5**	**1440**	**1200**	**5270**
	D102	**Average**		**10270**	**-**	**9298**	**0.5**	**135**	**132**	**0.5**	**631**	**-**	**1390**	**564**	**-**	**0.41**	**99**	**-**	**1380**	**-**	**4840**
Adjacent to MPAR and Downgradient	D103	12/08/2020	MPW035282	4910	6.13	4230	-	155	-	<1	278	234	350	261	222	0.073	37.5	31.9	592	513	2590
Adjacent to MPAR and Downgradient	D103	11/11/2020	D103_11 Nov 20_	4710	6.14	3980	<1	178	178	<1	256	236	317	254	223	0.056	42.7	35.8	583	516	2390
Adjacent to MPAR and Downgradient	D103	17/02/2021	D103_17 Feb 21_	4540	6.19	3890	<1	162	162	<1	212	-	314	216	-	<0.5	35.2	-	552	-	2300
Adjacent to MPAR and Downgradient	D103	11/06/2021	D103_11 Jun 21_	4190	6.22	3550	<1	188	188	<1	213	-	272	198	-	<0.5	35.5	-	535	-	1960
	D103	**Min.**		**4190**	**6.13**	**3550**	**<1**	**155**	**162**	**<1**	**212**	**234**	**272**	**198**	**222**	**0.056**	**35.2**	**31.9**	**535**	**513**	**1960**
	D103	**Max.**		**4910**	**6.22**	**4230**	**<1**	**188**	**188**	**<1**	**278**	**236**	**350**	**261**	**223**	**<0.5**	**42.7**	**35.8**	**592**	**516**	**2590**
	D103	**Average**		**4588**	**-**	**3913**	**0.5**	**171**	**176**	**0.5**	**240**	**-**	**313**	**232**	**-**	**0.16**	**38**	**-**	**566**	**-**	**2310**
Adjacent to MPAR and Downgradient	D104	12/08/2020	MPW035283	1120	5.74	824	-	51	-	<1	84.2	72.6	65.6	54.4	47.4	0.024	8.65	7.52	78.5	70.6	430
Adjacent to MPAR and Downgradient	D104	11/11/2020	D104_11 Nov 20_	910	5.88	670	<1	52	52	<1	56.1	54.5	47.4	36.9	34.2	0.013	8.29	7.58	86.6	81.2	344
Adjacent to MPAR and Downgradient	D104	18/02/2021	D104_18 Feb 21_	1760	5.76	1400	<1	48	48	<1	113	-	109	82.1	-	<0.2	11.8	-	130	-	754
Adjacent to MPAR and Downgradient	D104	11/06/2021	D104_11 Jun 21_	1420	5.66	990	<1	41	41	<1	106	-	93.6	70.8	-	<0.2	10.7	-	106	-	584
	D104	**Min.**		**910**	**5.66**	**670**	**<1**	**41**	**41**	**<1**	**56.1**	**54.5**	**47.4**	**36.9**	**34.2**	**0.013**	**8.29**	**7.52**	**78.5**	**70.6**	**344**
	D104	**Max.**		**1760**	**5.88**	**1400**	**<1**	**52**	**52**	**<1**	**113**	**72.6**	**109**	**82.1**	**47.4**	**<0.2**	**11.8**	**7.58**	**130**	**81.2**	**754**
	D104	**Average**		**1303**	**-**	**971**	**0.5**	**48**	**47**	**0.5**	**90**	**-**	**79**	**61**	**-**	**0.059**	**9.9**	**-**	**100**	**-**	**528**
Adjacent to MPAR and Downgradient	D105	13/08/2020	MPW035284	3930	6.04	3200	-	160	-	<1	271	251	302	247	232	0.074	27.1	25.5	338	321	1980
Adjacent to MPAR and Downgradient	D105	11/11/2020	D105_11 Nov 20_	3670	6.03	3030	<1	146	146	<1	245	212	272	239	204	<0.5	29.2	25.4	324	279	1840
Adjacent to MPAR and Downgradient	D105	17/02/2021	D105_17 Feb 21_	3960	6.06	3230	<1	146	146	<1	220	-	284	216	-	<0.5	26.3	-	320	-	1820
Adjacent to MPAR and Downgradient	D105	11/06/2021	D105_11 Jun 21_	3570	6.05	3000	<1	149	149	<1	233	-	267	214	-	<0.5	26.8	-	325	-	1650
	D105	**Min.**		**3570**	**6.03**	**3000**	**<1**	**146**	**146**	**<1**	**220**	**212**	**267**	**214**	**204**	**0.074**	**26.3**	**25.4**	**320**	**279**	**1650**
	D105	**Max.**		**3960**	**6.06**	**3230**	**<1**	**160**	**149**	**<1**	**271**	**251**	**302**	**247**	**232**	**<0.5**	**29.2**	**25.5**	**338**	**321**	**1980**
	D105	**Average**		**3783**	**-**	**3115**	**0.5**	**150**	**147**	**0.5**	**242**	**-**	**281**	**229**	**-**	**0.21**	**27**	**-**	**327**	**-**	**1823**
Brine waste pond leak detection bores	MPGM5-D5	16/07/2020	MPGM5-D5_16 Jul 20_	21,890	5.96	20,800	-	420	-	-	332	-	2060	1140	-	<2	134	-	4400	-	13,000
Brine waste pond leak detection bores	MPGM5-D5	22/10/2020	MPGM5-D5_22 Oct 20_	21,790	6.01	23,000	-	570	-	-	526	-	2030	1390	-	0.932	132	-	4690	-	13,600
Brine waste pond leak detection bores	MPGM5-D5	12/11/2020	MPGM5-D5_12 Nov 20_	18,400	6.08	18,600	-	497	-	-	314	-	1880	1070	-	<2	107	-	3450	-	11,800
Brine waste pond leak detection bores	MPGM5-D5	12/02/2021	MPGM5-D5_12 Feb 21_	13,550	5.89	13,000	<1	312	312	<1	360	-	1620	1070	-	0.507	59.4	-	2430	-	8910
Brine waste pond leak detection bores	MPGM5-D5	20/05/2021	MPGM5-D5_20 May 21_	23,440	6.38	22,200	<1	1110	1110	<1	384	-	2210	990	-	<1	193	-	6120	-	12,700
	MPGM5-D5	**Min.**		**13550**	**5.89**	**13000**	**<1**	**312**	**312**	**<1**	**314**	**-**	**1620**	**990**	**-**	**0.507**	**59.4**	**-**	**2430**	**-**	**8910**
	MPGM5-D5	**Max.**		**23440**	**6.38**	**23000**	**<1**	**1110**	**1110**	**<1**	**526**	**-**	**2210**	**1390**	**-**	**<2**	**193**	**-**	**6120**	**-**	**13600**
	MPGM5-D5	**Average**		**19814**	**-**	**19520**	**-**	**582**	**-**	**-**	**383**	**-**	**1960**	**1132**	**-**	**0.79**	**125**	**-**	**4218**	**-**	**12002**
Brine waste pond leak detection bores	MPGM5-D6	16/07/2020	MPGM5-D6_16 Jul 20_	1570	5.68	945	-	113	-	-	20.3	-	161	46.4	-	<0.2	6.38	-	195	-	428
Brine waste pond leak detection bores	MPGM5-D6	22/10/2020	MPGM5-D6_22 Oct 20_	1460	5.66	955	-	110	-	-	19.8	-	141	43.1	-	<0.1	7.3	-	172	-	371
Brine waste pond leak detection bores	MPGM5-D6	20/05/2021	MPGM5-D6_20 May 21_	1290	5.8	762	<1	139	139	<1	17.9	-	135	41.4	-	<0.1	6.14	-	155	-	279
	MPGM5-D6	**Min.**		**1290**	**5.66**	**762**	**<1**	**110**	**139**	**<1**	**17.9**	**-**	**135**	**41.4**	**-**	**<0.1**	**6.14**	**-**	**155**	**-**	**279**
	MPGM5-D6	**Max.**		**1570**	**5.8**	**955**	**<1**	**139**	**139**	**<1**	**20.3**	**-**	**161**	**46.4**	**-**	**<0.2**	**7.3**	**-**	**195**	**-**	**428**
	MPGM5-D6	**Average**		**1440**	**-**	**887**	**-**	**121**	**-**	**-**	**19**	**-**	**146**	**44**	**-**	**0.067**	**6.6**	**-**	**174**	**-**	**359**

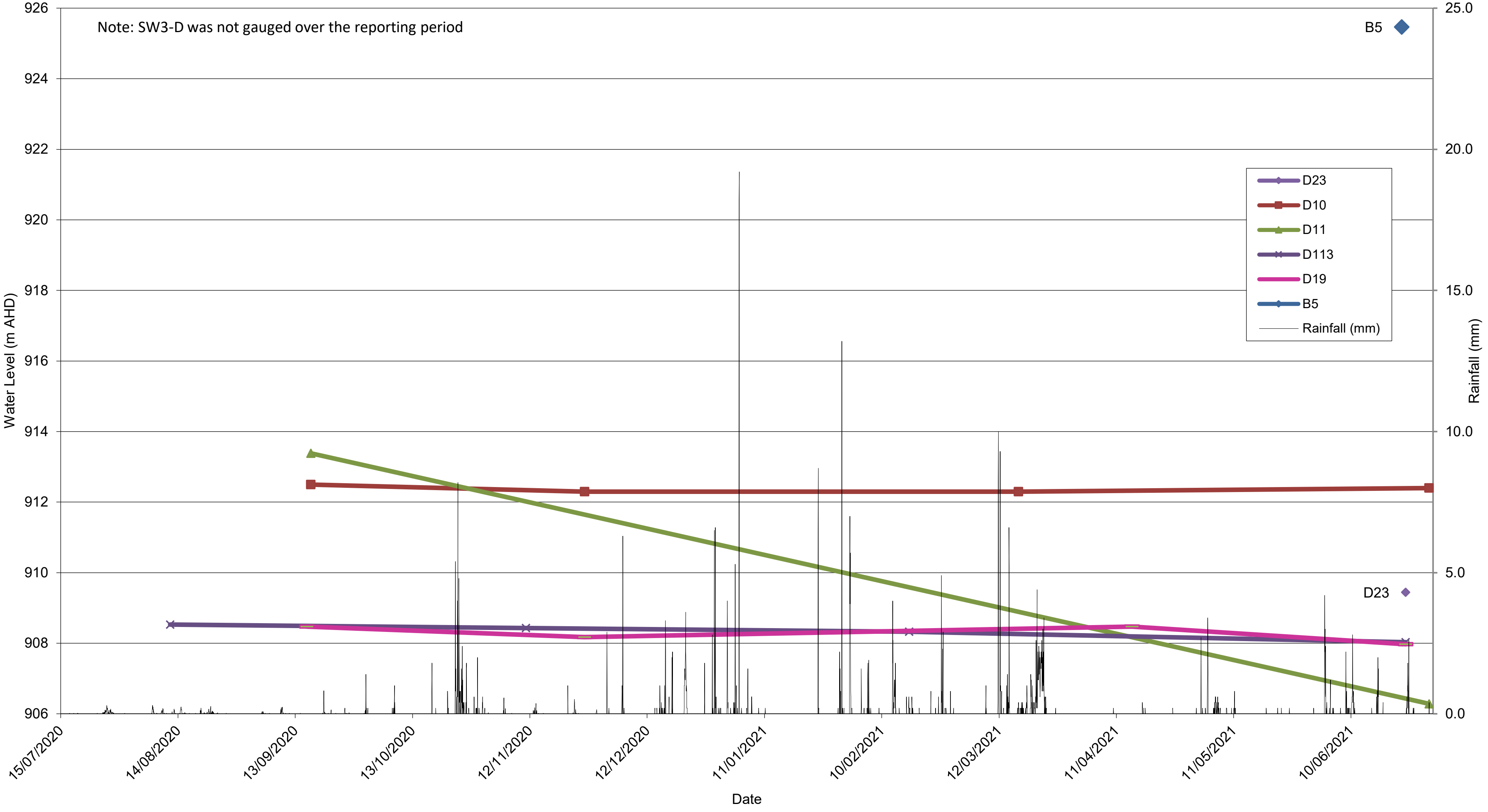
				Metals																															
				Aluminium	Aluminium (Filtered)	Arsenic	Arsenic (Filtered)	Barium	Barium (Filtered)	Beryllium	Boron	Boron (Filtered)	Cadmium	Cadmium (Filtered)	Chromium	Chromium (Filtered)	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Lead (Filtered)	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Molybdenum (Filtered)	Nickel	Nickel (Filtered)	Selenium	Selenium (Filtered)	Silver	Silver (Filtered)	Zinc	Zinc (Filtered)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Groundwater						24	24	700	700	100	370	370	2	2	5	5	5	5	664	664	5	5	5704	5704	0.06	10	10	550.9	550.9	5	5	0.05	0.05	908	908
Purpose	**LocCode**	**Sampled_Date-Time**	**SampleCode**																																
Within MPAR / Mine Disturbance Area East of MPAR	D10	17/09/2020	D10_17 Sep 20_	110	-	2	-	20	-	-	1020	-	0.9	-	<1	-	1	-	-	12,300	32	-	-	2740	<0.04	2	-	367	-	0.6	-	<1	-	621	-
Within MPAR / Mine Disturbance Area East of MPAR	D10	26/11/2020	D10_26 Nov 20_	70	60	8	8	16	-	<1	1150	1120	0.1	-	1	-	<1	<1	15,600	15,300	8	-	3040	2930	<0.04	4	-	425	418	0.8	-	<1	-	391	387
Within MPAR / Mine Disturbance Area East of MPAR	D10	17/03/2021	D10_17 Mar 21_	40	10	4	2	18	-	<1	1440	1400	0.1	-	<1	-	<1	<1	12,000	6850	7	-	3750	3540	<0.04	4	-	538	460	0.4	-	<1	-	299	246
Within MPAR / Mine Disturbance Area East of MPAR	D10	30/06/2021	D10_30 Jun 21_	50	40	2	1	21	-	<1	1280	1140	0.1	-	15	-	<1	<1	16,000	12,900	3	-	2940	2850	<0.04	17	-	394	372	0.4	-	<1	-	44	26
	D10	**Min.**		**40**	**10**	**2**	**1**	**16**	**-**	**<1**	**1020**	**1120**	**0.1**	**-**	**<1**	**-**	**<1**	**<1**	**12000**	**6850**	**3**	**-**	**2940**	**2740**	**<0.04**	**2**	**-**	**367**	**372**	**0.4**	**-**	**<1**	**-**	**44**	**26**
	D10	**Max.**		**110**	**60**	**8**	**8**	**21**	**-**	**<1**	**1440**	**1400**	**0.9**	**-**	**15**	**-**	**1**	**<1**	**16000**	**15300**	**32**	**-**	**3750**	**3540**	**<0.04**	**17**	**-**	**538**	**460**	**0.8**	**-**	**<1**	**-**	**621**	**387**
	D10	**Average**		**68**	**37**	**4**	**3.7**	**19**	**-**	**0.5**	**1223**	**1220**	**0.3**	**-**	**4.3**	**-**	**0.63**	**0.5**	**14533**	**11838**	**13**	**-**	**3243**	**3015**	**0.02**	**6.8**	**-**	**431**	**417**	**0.55**	**-**	**0.5**	**-**	**339**	**220**
Within MPAR / Mine Disturbance Area East of MPAR	D11	17/09/2020	D11_17 Sep 20_	1480	-	3	-	56	-	-	2990	-	<0.1	-	<1	-	<1	-	-	46,700	<1	-	-	14,800	<0.04	<1	-	879	-	0.5	-	<1	-	28	-
Within MPAR / Mine Disturbance Area East of MPAR	D11	30/06/2021	D11_30 Jun 21_	40	<10	6	6	94	-	<1	2260	1980	<0.1	-	<1	-	<1	<1	102,000	83,100	<1	-	14,200	14,000	<0.04	9	-	839	851	0.3	-	<1	-	23	20
	D11	**Min.**		**40**	**<10**	**3**	**6**	**56**	**-**	**<1**	**2260**	**1980**	**<0.1**	**-**	**<1**	**-**	**<1**	**<1**	**102000**	**46700**	**<1**	**-**	**14200**	**14000**	**<0.04**	**<1**	**-**	**839**	**851**	**0.3**	**-**	**<1**	**-**	**23**	**20**
	D11	**Max.**		**1480**	**<10**	**6**	**6**	**94**	**-**	**<1**	**2990**	**1980**	**<0.1**	**-**	**<1**	**-**	**<1**	**<1**	**102000**	**83100**	**<1**	**-**	**14200**	**14800**	**<0.04**	**9**	**-**	**879**	**851**	**0.5**	**-**	**<1**	**-**	**28**	**20**
	D11	**Average**		**760**	**-**	**4.5**	**-**	**75**	**-**	**-**	**2625**	**-**	**-**	**-**	**0.05**	**-**	**0.5**	**-**	**-**	**64900**	**0.5**	**-**	**-**	**14400**	**0.02**	**4.75**	**-**	**859**	**-**	**0.4**	**-**	**0.5**	**-**	**25.5**	**-**
Within MPAR / Mine Disturbance Area East of MPAR	D19	16/09/2020	D19_16 Sep 20_	430	-	3	-	15	-	-	1610	-	0.1	-	6	-	2	-	-	16,800	8	-	-	4990	<0.04	<1	-	426	-	0.4	-	<1	-	223	-
Within MPAR / Mine Disturbance Area East of MPAR	D19	26/11/2020	D19_26 Nov 20_	210	<10	3	1	16	-	<1	1660	1560	0.1	-	2	-	5	<1	14,200	10,900	8	-	5010	4830	<0.04	<1	-	454	445	0.3	-	<1	-	239	218
Within MPAR / Mine Disturbance Area East of MPAR	D19	15/04/2021	D19_15 Apr 21_	10	<10	<1	1	11	-	<1	1530	1620	<0.1	-	<1	-	<1	<1	17,400	12,100	2	-	5050	5220	<0.04	<1	-	424	437	<0.2	-	<1	-	196	223
Within MPAR / Mine Disturbance Area East of MPAR	D19	24/06/2021	D19_24 Jun 21_	340	<10	4	1	17	-	<1	1830	1740	0.1	-	32	-	3	<1	17,200	14,000	10	-	5440	5080	<0.04	1	-	515	450	<0.2	-	<1	-	260	224
	D19	**Min.**		**10**	**<10**	**<1**	**1**	**11**	**-**	**<1**	**1530**	**1560**	**<0.1**	**-**	**<1**	**-**	**<1**	**<1**	**14200**	**10900**	**2**	**-**	**5010**	**4830**	**<0.04**	**<1**	**-**	**424**	**437**	**<0.2**	**-**	**<1**	**-**	**196**	**218**
	D19	**Max.**		**430**	**<10**	**4**	**1**	**17**	**-**	**<1**	**1830**	**1740**	**0.1**	**-**	**32**	**-**	**5**	**<1**	**17400**	**16800**	**10**	**-**	**5440**	**5220**	**<0.04**	**1**	**-**	**515**	**450**	**0.4**	**-**	**<1**	**-**	**260**	**224**
	D19	**Average**		**248**	**5**	**2.6**	**1**	**15**	**-**	**0.5**	**1658**	**1640**	**0.088**	**-**	**10**	**-**	**2.6**	**0.5**	**16267**	**13450**	**7**	**-**	**5167**	**5030**	**0.02**	**0.63**	**-**	**455**	**444**	**0.23**	**-**	**0.5**	**-**	**230**	**222**
Within MPAR / Mine Disturbance Area East of MPAR	D113	12/08/2020	MPW035292	-	-	8	2	18	11	-	1710	1630	1.8	0.1	7	<1	5	<1	14,100	13,600	7	2	6180	5960	<0.04	<1	<1	465	446	<0.2	<0.2	<1	<1	288	277
Within MPAR / Mine Disturbance Area East of MPAR	D113	11/11/2020	D113_11 Nov 20_	170	<10	2	1	13	10	<1	1730	1710	0.1	0.1	7	<1	<1	<1	13,700	11,500	4	3	5270	5120	<0.04	<1	-	441	410	<0.2	0.3	<1	-	267	248
Within MPAR / Mine Disturbance Area East of MPAR	D113	17/02/2021	D113_17 Feb 21_	150	<10	1	<1	14	-	<1	1760	1740	0.2	-	10	-	<1	<1	13,300	13,200	5	-	5520	5390	<0.04	<1	-	474	449	0.2	-	<1	-	297	290
Within MPAR / Mine Disturbance Area East of MPAR	D113	24/06/2021	D113_24 Jun 21_	140	<10	1	1	12	-	<1	1760	1700	0.1	-	23	-	2	<1	14,200	13,200	3	-	4900	5580	<0.04	1	-	457	467	<0.2	-	<1	-	264	271
	D113	**Min.**		**140**	**<10**	**1**	**<1**	**12**	**10**	**<1**	**1710**	**1630**	**0.1**	**0.1**	**7**	**<1**	**<1**	**<1**	**13300**	**11500**	**3**	**2**	**4900**	**5120**	**<0.04**	**<1**	**<1**	**441**	**410**	**<0.2**	**<0.2**	**<1**	**<1**	**264**	**248**
	D113	**Max.**		**170**	**<10**	**8**	**2**	**18**	**11**	**<1**	**1760**	**1740**	**1.8**	**0.1**	**23**	**<1**	**5**	**<1**	**14200**	**13600**	**7**	**3**	**6180**	**5960**	**<0.04**	**1**	**<1**	**474**	**467**	**0.2**	**0.3**	**<1**	**<1**	**297**	**290**
	D113	**Average**		**153**	**5**	**3**	**1.1**	**14**	**-**	**0.5**	**1740**	**1695**	**0.55**	**-**	**12**	**-**	**2**	**0.5**	**13825**	**12875**	**4.8**	**-**	**5468**	**5513**	**0.02**	**0.63**	**-**	**459**	**443**	**0.13**	**-**	**0.5**	**-**	**279**	**272**
Within Mine Disturbance Area S & SE of MPAR	D15	16/09/2020	D15_16 Sep 20_	870	-	7	-	22	-	-	180	-	0.5	-	126	-	11	-	-	25,800	6	-	-	1950	<0.04	5	-	802	-	1	-	<1	-	1300	-
Within Mine Disturbance Area S & SE of MPAR	D15	26/11/2020	D15_26 Nov 20_	810	150	7	2	16	-	2	210	200	0.4	-	2	-	6	<1	24,700	22,800	6	-	1870	1790	<0.04	<1	-	712	688	0.7	-	<1	-	1210	1190
Within Mine Disturbance Area S & SE of MPAR	D15	24/06/2021	D15_24 Jun 21_	340	100	3	2	19	-	1	190	180	0.2	-	1	-	1	<1	22,700	21,900	4	-	1480	1380	<0.04	<1	-	596	529	0.2	-	<1	-	1010	926
	D15	**Min.**		**340**	**100**	**3**	**2**	**16**	**-**	**1**	**180**	**180**	**0.2**	**-**	**1**	**-**	**1**	**<1**	**22700**	**21900**	**4**	**-**	**1480**	**1380**	**<0.04**	**<1**	**-**	**596**	**529**	**0.2**	**-**	**<1**	**-**	**1010**	**926**
	D15	**Max.**		**870**	**150**	**7**	**2**	**22**	**-**	**2**	**210**	**200**	**0.5**	**-**	**126**	**-**	**11**	**<1**	**24700**	**25800**	**6**	**-**	**1870**	**1950**	**<0.04**	**5**	**-**	**802**	**688**	**1**	**-**	**<1**	**-**	**1300**	**1190**
	D15	**Average**		**673**	**-**	**5.7**	**-**	**19**	**-**	**-**	**193**	**-**	**0.37**	**-**	**43**	**-**	**6**	**-**	**23700**	**23500**	**5.3**	**-**	**1675**	**1707**	**0.02**	**2**	**-**	**703**	**-**	**0.63**	**-**	**0.5**	**-**	**1173**	**-**
Within Mine Disturbance Area S & SE of MPAR	D16	16/09/2020	D16_16 Sep 20_	10	-	<1	-	10	-	-	<50	-	<0.1	-	6	-	<1	-	-	3960	<1	-	-	69	<0.04	<1	-	33	-	<0.2	-	<1	-	12	-
Within Mine Disturbance Area S & SE of MPAR	D16	26/11/2020	D16_26 Nov 20_	<10	<10	<1	<1	9	-	<1	60	60	<0.1	-	9	-	<1	<1	3060	2620	<1	-	71	67	<0.04	<1	-	21	16	<0.2	-	<1	-	6	9
Within Mine Disturbance Area S & SE of MPAR	D16	15/04/2021	D16_15 Apr 21_	<10	<10	<1	<1	13	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	4250	3630	<1	-	82	83	<0.04	<1	-	19	20	<0.2	-	<1	-	<5	6
Within Mine Disturbance Area S & SE of MPAR	D16	23/06/2021	D16_23 Jun 21_	<10	<10	<1	<1	8	-	<1	<50	<50	<0.1	-	5	-	<1	<1	3360	3200	<1	-	56	55	<0.04	<1	-	16	13	<0.2	-	<1	-	<5	<5
	D16	**Min.**		**<10**	**<10**	**<1**	**<1**	**8**	**-**	**<1**	**<50**	**<50**	**<0.1**	**-**	**<1**	**-**	**<1**	**<1**	**3060**	**2620**	**<1**	**-**	**56**	**55**	**<0.04**	**<1**	**-**	**16**	**13**	**<0.2**	**-**	**<1**	**-**	**<5**	**<5**
	D16	**Max.**		**10**	**<10**	**<1**	**<1**	**13**	**-**	**<1**	**60**	**60**	**<0.1**	**-**	**9**	**-**	**<1**	**<1**	**4250**	**3960**	**<1**	**-**	**82**	**83**	**<0.04**	**<1**	**-**	**33**	**20**	**<0.2**	**-**	**<1**	**-**	**12**	**9**
	D16	**Average**		**6.3**	**5**	**0.5**	**0.5**	**10**	**-**	**0.5**	**34**	**37**	**0.05**	**-**	**5.1**	**-**	**0.5**	**0.5**	**3557**	**3353**	**0.5**	**-**	**70**	**69**	**0.02**	**0.5**	**-**	**22**	**16**	**0.1**	**-**	**0.5**	**-**	**5.8**	**5.8**
Within Mine Disturbance Area S & SE of MPAR	D17	16/09/2020	D17_16 Sep 20_	30	-	1	-	14	-	-	120	-	<0.1	-	6	-	<1	-	-	13,400	<1	-	-	2850	<0.04	<1	-	84	-	<0.2	-	<1	-	78	-
Within Mine Disturbance Area S & SE of MPAR	D17	26/11/2020	D17_26 Nov 20_	<10	<10	<1	2	11	-	<1	130	130	<0.1	-	<1	-	<1	<1	20,700	16,100	<1	-	2650	2570	<0.04	<1	-	74	72	<0.2	-	<1	-	76	72
Within Mine Disturbance Area S & SE of MPAR	D17	15/04/2021	D17_15 Apr 21_	<10	<10	<1	<1	13	-	<1	110	100	<0.1	-	<1	-	<1	<1	27,700	19,700	<1	-	2580	2570	<0.04	<1	-	57	60	<0.2	-	<1	-	68	67
Within Mine Disturbance Area S & SE of MPAR	D17	23/06/2021	D17_23 Jun 21_	<10	<10	<1	<1	11	-	<1	80	70	<0.1	-	<1	-	<1	<1	24,800	21,200	<1	-	2370	2200	<0.04	<1	-	54	48	<0.2	-	<1	-	62	58
	D17	**Min.**		**<10**	**<10**	**<1**	**<1**	**11**	**-**	**<1**	**80**	**70**	**<0.1**	**-**	**<1**	**-**	**<1**	**<1**	**20700**	**13400**	**<1**	**-**	**2370**	**2200**	**<0.04**	**<1**	**-**	**54**	**48**	**<0.2**	**-**	**<1**	**-**	**62**	**58**
	D17	**Max.**		**30**	**<10**	**1**	**2**	**14**	**-**	**<1**	**130**	**130**	**<0.1**	**-**	**6**	**-**	**<1**	**<1**	**27700**	**21200**	**<1**	**-**	**2650**	**2850**	**<0.04**	**<1**	**-**	**84**	**72**	**<0.2**	**-**	**<1**	**-**	**78**	**72**
	D17	**Average**		**11**	**5**	**0.63**	**1**	**12**	**-**	**0.5**	**110**	**100**	**0.05**	**-**	**1.9**	**-**	**0.5**	**0.5**	**24400**	**17600**	**0.5**	**-**	**2533**	**2548**	**0.02**	**0.5**	**-**	**67**	**60**	**0.1**	**-**	**0.5**	**-**	**71**	**66**
Within Mine Disturbance Area S & SE of MPAR	D18	17/09/2020	D18_17 Sep 20_	30	-	14	-	670	-	-	50	-	0.2	-	<1	-	<1	-	-	1590	<1	-	-	135	0.06	3	-	4	-	<0.2	-	<1	-	22	-
Within Mine Disturbance Area S & SE of MPAR	D18	26/11/2020	D18_26 Nov 20_	50	<10	1	<1	603	-	<1	90	80	<0.1	-	2	-	2	<1	200	<50	<1	-	48	43	<0.04	6	-	5	4	0.5	-	<1	-	33	33
Within Mine Disturbance Area S & SE of MPAR	D18	15/04/2021	D18_15 Apr 21_	20	<10	<1	<1	657	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	299	<50	<1	-	78	78	<0.04	5	-	3	3	<0.2	-	<1	-	23	18
Within Mine Disturbance Area S & SE of MPAR	D18	25/06/2021	D18_25 Jun 21_	60	<10	4	2	586	-	<1	80	<50	<0.1	-	7	-	1	<1	570	130	<1	-	102	94	<0.04	7	-	8	4	<0.2	-	<1	-	32	22
	D18	**Min.**		**20**	**<10**	**<1**	**<1**	**586**	**-**	**<1**	**<50**	**<50**	**<0.1**	**-**	**<1**	**-**	**<1**	**<1**	**200**	**<50**	**<1**	**-**	**48**	**43**	**<0.04**	**3**	**-**	**3**	**3**	**<0.2**	**-**	**<1**	**-**	**22**	**18**
	D18	**Max.**		**60**	**<10**	**14**	**2**	**670**	**-**	**<1**	**90**	**80**	**0.2**	**-**	**7**	**-**	**2**	**<1**	**570**	**1590**	**<1**	**-**	**102**	**135**	**0.06**	**7**	**-**	**8**	**4**	**0.5**	**-**	**<1**	**-**	**33**	**33**
	D18	**Average**		**40**	**5**	**4.9**	**1**	**629**	**-**	**0.5**	**61**	**43**	**0.088**	**-**	**2.5**	**-**	**1**	**0.5**	**356**	**443**	**0.5**	**-**	**76**	**88**	**0.03**	**5.3**	**-**	**5**	**3.7**	**0.2**	**-**	**0.5**	**-**	**28**	**24**
Background and Adjacent to MPAR	D3	17/09/2020	D3_17 Sep 20_	60	-	<1	-	46	-	-	90	-	<0.1	-	<1	-	<1	-	-	80	<1	-	-	44	<0.04	<1	-	5	-	0.2	-	<1	-	9	-
Background and Adjacent to MPAR	D3	26/11/2020	D3_26 Nov 20_	60	<10	<1	<1	32	-	<1	<50	<50	<0.1	-	2	-	<1	<1	9300	5000	<1	-	795	759	<0.04	<1	-	6	5	<0.2	-	<1	-	7	10
Background and Adjacent to MPAR	D3	17/03/2021	D3_17 Mar 21_	110	70	<1	<1	63	-	<1	<50	<50	<0.1	-	<1	-	<1	<1	11,200	7280	<1	-	605	591	<0.04	1	-	5	6	<0.2	-	<1	-	8	11
Background and Adjacent to MPAR	D3	24/06/2021	D3_24 Jun 21_	60	<10	<1	<1	61	-	<1	50	<50	<0.1	-	9	-	1	<1	13,200	9060	<1	-	646	600	0.24	<1	-	12	6	<0.2	-	<1	-	6	<5
	D3	**Min.**		**60**	**<10**	**<1**	**<1**	**32**	**-**	**<1**	**<50**	**<50**	**<0.1**	**-**	**<1**	**-**	**<1**	**<1**	**9300**	**80**	**<1**	**-**	**605**	**44**	**<0.04**	**<1**	**-**	**5**	**5**	**<0.2**	**-**	**<1**	**-**	**6**	**<5**
	D3	**Max.**		**110**	**70**	**<1**	**<1**	**63**	**-**	**<1**	**90**	**<50**	**<0.1**	**-**	**9**	**-**	**1**	**<1**	**13200**	**9060**	**<1**	**-**	**795**	**759**	**0.24**	**1**	**-**	**12**	**6**	**0.2**	**-**	**<1**	**-**	**9**	**11**
	D3	**Average**		**73**	**27**	**0.5**	**0.5**	**51**	**-**	**0.5**	**48**	**25**	**0.05**	**-**	**3**	**-**	**0.63**	**0.5**	**11233**	**5355**	**0.5**	**-**	**682**	**499**	**0.075**	**0.63**	**-**	**7**	**5.7**	**0.13**	**-**	**0.5**	**-**	**7.5**	**7.8**

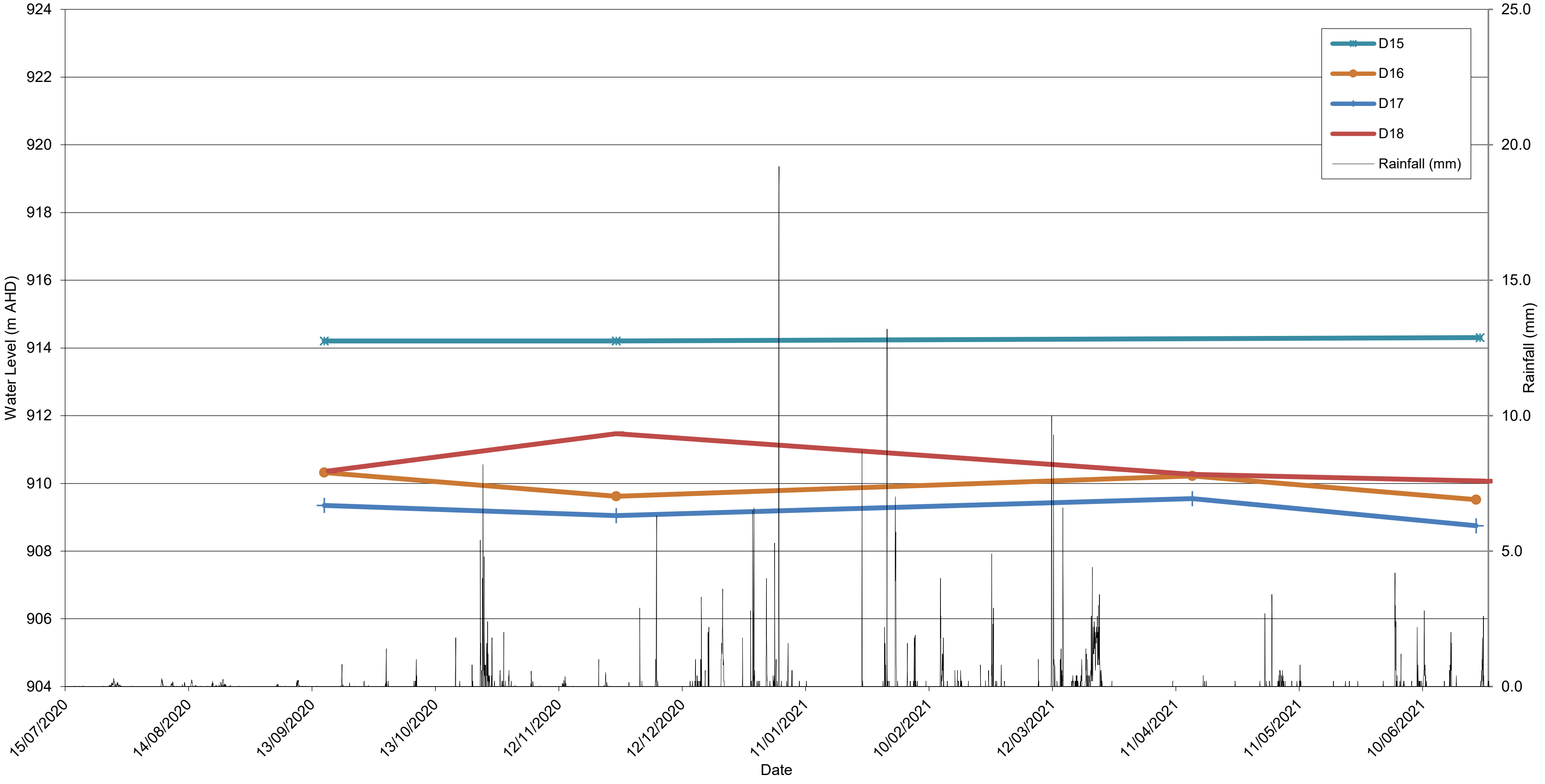
				Metals																															
				Aluminium	**Aluminium (Filtered)**	**Arsenic**	**Arsenic (Filtered)**	**Barium**	**Barium (Filtered)**	**Beryllium**	**Boron**	**Boron (Filtered)**	**Cadmium**	**Cadmium (Filtered)**	**Chromium**	**Chromium (Filtered)**	**Copper**	**Copper (Filtered)**	**Iron**	**Iron (Filtered)**	**Lead**	**Lead (Filtered)**	**Manganese**	**Manganese (Filtered)**	**Mercury**	**Molybdenum**	**Molybdenum (Filtered)**	**Nickel**	**Nickel (Filtered)**	**Selenium**	**Selenium (Filtered)**	**Silver**	**Silver (Filtered)**	**Zinc**	**Zinc (Filtered)**
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Groundwater						24	24	700	700	100	370	370	2	2	5	5	5	5	664	664	5	5	5704	5704	0.06	10	10	550.9	550.9	5	5	0.05	0.05	908	908
Purpose	**LocCode**	**Sampled_Date-Time**	**SampleCode**																																
Background and Adjacent to MPAR	D4	15/07/2020	D4_15 Jul 20_	11,500	-	48	-	13	-	-	<50	-	0.4	-	2	-	<1	-	-	75,000	20	-	-	735	<0.04	<1	-	15	-	<0.2	-	<1	-	146	-
Background and Adjacent to MPAR	D4	22/10/2020	D4_22 Oct 20_	10,700	-	38	-	12	-	-	<50	-	0.4	-	2	-	<1	-	-	54,900	19	-	-	714	<0.04	<1	-	13	-	<0.2	-	<1	-	131	-
Background and Adjacent to MPAR	D4	12/11/2020	D4_12 Nov 20_	9880	-	26	-	11	-	-	<50	-	0.3	-	1	-	<1	-	-	63,100	18	-	-	708	<0.04	<1	-	13	-	<0.2	-	<1	-	121	-
Background and Adjacent to MPAR	D4	11/02/2021	D4_11 Feb 21_	9710	9270	40	37	12	-	2	<50	<50	0.2	-	2	-	<1	<1	74,800	62,100	18	-	710	661	<0.04	<1	-	13	10	<0.2	-	<1	-	120	108
Background and Adjacent to MPAR	D4	20/05/2021	D4_20 May 21_	10,800	10,700	44	43	13	-	2	<50	<50	0.2	-	2	-	<1	1	73,200	65,900	19	-	766	748	<0.04	<1	-	13	12	<0.2	-	<1	-	127	130
	D4	**Min.**		9710	9270	26	37	11	-	2	<50	<50	0.2	-	1	-	<1	<1	73200	54900	18	-	710	661	<0.04	<1	-	13	10	<0.2	-	<1	-	120	108
	D4	**Max.**		11500	10700	48	43	13	-	2	<50	<50	0.4	-	2	-	<1	1	74800	75000	20	-	766	748	<0.04	<1	-	15	12	<0.2	-	<1	-	146	130
	D4	**Average**		10518	-	39	-	12	-	-	25	-	0.3	-	1.8	-	0.5	-	74000	64200	19	-	738	713	0.02	0.5	-	13	-	0.1	-	0.5	-	129	-
Background and Adjacent to MPAR	D5	15/07/2020	D5_15 Jul 20_	30	-	2	-	18	-	-	90	-	<0.1	-	<1	-	<1	-	-	51,800	<1	-	-	9180	<0.04	<1	-	43	-	0.3	-	<1	-	15	-
Background and Adjacent to MPAR	D5	22/10/2020	D5_22 Oct 20_	20	-	<1	-	17	-	-	90	-	<0.1	-	<1	-	<1	-	-	23,000	<1	-	-	6360	<0.04	<1	-	41	-	0.3	-	<1	-	8	-
Background and Adjacent to MPAR	D5	12/11/2020	D5_12 Nov 20_	20	-	<1	-	15	-	-	90	-	<0.1	-	<1	-	<1	-	-	20,200	<1	-	-	7120	<0.04	<1	-	38	-	<0.2	-	<1	-	8	-
Background and Adjacent to MPAR	D5	11/02/2021	D5_11 Feb 21_	30	20	<1	<1	16	-	1	80	70	<0.1	-	<1	-	<1	<1	45,000	20,100	<1	-	6760	6390	<0.04	<1	-	33	29	0.3	-	<1	-	11	9
Background and Adjacent to MPAR	D5	20/05/2021	D5_20 May 21_	20	20	<1	<1	18	-	1	100	110	<0.1	-	<1	-	<1	<1	43,000	32,600	<1	-	7050	7020	<0.04	<1	-	36	32	0.2	-	<1	-	16	11
	D5	**Min.**		20	20	<1	<1	15	-	1	80	70	<0.1	-	<1	-	<1	<1	43000	20100	<1	-	6760	6360	<0.04	<1	-	33	29	<0.2	-	<1	-	8	9
	D5	**Max.**		30	20	2	<1	18	-	1	100	110	<0.1	-	<1	-	<1	<1	45000	51800	<1	-	7050	9180	<0.04	<1	-	43	32	0.3	-	<1	-	16	11
	D5	**Average**		24	-	0.8	-	17	-	-	90	-	0.05	-	0.5	-	0.5	-	44000	29540	0.5	-	6905	7214	0.02	0.5	-	38	-	0.24	-	0.5	-	12	-
Background and Adjacent to MPAR	D106	12/08/2020	MPW035285	-	-	2	1	36	33	-	1210	1180	<0.1	<0.1	2	<1	<1	<1	22,800	19,800	1	<1	14,200	14,100	<0.04	<1	<1	1190	1180	0.3	0.2	<1	<1	151	150
Background and Adjacent to MPAR	D106	11/11/2020	D106_11 Nov 20_	100	<10	1	<1	23	23	<1	1620	1640	0.1	<0.1	<1	<1	8	<1	41,900	33,600	2	<1	19,800	19,500	<0.04	<1	-	2100	2020	0.3	<0.2	<1	-	213	180
Background and Adjacent to MPAR	D106	17/02/2021	D106_17 Feb 21_	110	<10	2	<1	27	-	<1	2320	2400	0.1	-	<1	-	<1	<1	43,900	38,000	<1	-	24,600	23,700	<0.04	<1	-	2310	2200	0.3	-	<1	-	236	225
Background and Adjacent to MPAR	D106	10/06/2021	D106_10 Jun 21_	1420	<10	4	<1	31	-	<1	2180	2150	0.1	-	10	-	5	<1	55,000	25,300	3	-	21,000	20,400	0.05	<1	-	2300	2270	0.4	-	<1	-	226	195
	D106	**Min.**		100	<10	1	<1	23	23	<1	1210	1180	<0.1	<0.1	<1	<1	<1	<1	22800	19800	<1	<1	14200	14100	<0.04	<1	<1	1190	1180	0.3	<0.2	<1	<1	151	150
	D106	**Max.**		1420	<10	4	1	36	33	<1	2320	2400	0.1	<0.1	10	<1	8	<1	55000	38000	3	<1	24600	23700	0.05	<1	<1	2310	2270	0.4	0.2	<1	<1	236	225
	D106	**Average**		543	5	2.3	0.63	29	-	0.5	1833	1843	0.088	-	3.3	-	3.5	0.5	40900	29175	1.6	-	19900	19425	0.028	0.5	-	1975	1918	0.33	-	0.5	-	207	188
Background and Adjacent to MPAR	D107	12/08/2020	MPW035286	-	-	6	5	23	22	-	5460	5270	1	0.9	5	<1	4	<1	46,900	45,200	7	4	26,700	25,400	<0.04	<1	<1	2840	2720	0.4	0.4	<1	<1	476	454
Background and Adjacent to MPAR	D107	12/11/2020	D107_12 Nov 20_	<10	<10	1	<1	18	18	<1	3840	3940	0.8	0.7	<1	<1	<1	<1	43,900	36,500	2	<1	17,800	17,400	<0.04	<1	-	2270	2180	0.4	0.4	<1	-	344	316
Background and Adjacent to MPAR	D107	17/02/2021	D107_17 Feb 21_	10	<10	7	5	20	-	<1	5020	5200	0.9	-	<1	-	<1	<1	39,500	38,200	8	-	19,700	19,300	<0.04	<1	-	2250	2200	0.4	-	<1	-	399	405
Background and Adjacent to MPAR	D107	10/06/2021	D107_10 Jun 21_	20	<10	4	<1	19	-	<1	3950	4010	0.6	-	<1	-	1	<1	35,200	6800	5	-	14,000	14,200	<0.04	<1	-	1750	1770	0.2	-	<1	-	270	256
	D107	**Min.**		<10	<10	1	<1	18	18	<1	3840	3940	0.6	0.7	<1	<1	<1	<1	35200	6800	2	<1	14000	14200	<0.04	<1	<1	1750	1770	0.2	0.4	<1	<1	270	256
	D107	**Max.**		20	<10	7	5	23	22	<1	5460	5270	1	0.9	5	<1	4	<1	46900	45200	8	4	26700	25400	<0.04	<1	<1	2840	2720	0.4	0.4	<1	<1	476	454
	D107	**Average**		12	5	4.5	2.8	20	-	0.5	4568	4605	0.83	-	1.6	-	1.5	0.5	41375	31675	5.5	-	19550	19075	0.02	0.5	-	2278	2218	0.35	-	0.5	-	372	358
Adjacent to MPAR and Downgradient	D1	16/09/2020	D1_16 Sep 20_	300	-	6	-	37	-	-	2660	-	<0.1	-	<1	-	1	-	-	36,100	<1	-	-	26,100	<0.04	<1	-	2040	-	0.7	-	<1	-	191	-
Adjacent to MPAR and Downgradient	D1	25/11/2020	D1_25 Nov 20_	220	<10	7	3	30	-	<1	2520	2460	<0.1	-	<1	-	<1	<1	52,300	40,800	<1	-	23,000	22,600	<0.04	<1	-	2010	1980	0.4	-	<1	-	188	174
Adjacent to MPAR and Downgradient	D1	14/04/2021	D1_14 Apr 21_	10	<10	3	5	25	-	<1	2750	2840	<0.1	-	<1	-	<1	<1	55,800	48,700	<1	-	23,800	23,000	<0.04	<1	-	1790	1790	0.4	-	<1	-	163	176
Adjacent to MPAR and Downgradient	D1	23/06/2021	D1_23 Jun 21_	80	<10	6	6	23	-	<1	2590	2310	<0.1	-	<1	-	<1	<1	49,900	47,800	<1	-	21,200	20,100	<0.04	<1	-	1820	1820	<0.2	-	<1	-	159	159
	D1	**Min.**		10	<10	3	3	23	-	<1	2520	2310	<0.1	-	<1	-	<1	<1	49900	36100	<1	-	21200	20100	<0.04	<1	-	1790	1790	<0.2	-	<1	-	159	159
	D1	**Max.**		300	<10	7	6	37	-	<1	2750	2840	<0.1	-	<1	-	1	<1	55800	48700	<1	-	23800	26100	<0.04	<1	-	2040	1980	0.7	-	<1	-	191	176
	D1	**Average**		153	5	5.5	4.7	29	-	0.5	2630	2537	0.05	-	0.5	-	0.63	0.5	52667	43350	0.5	-	22667	22950	0.02	0.5	-	1915	1863	0.4	-	0.5	-	175	170
Adjacent to MPAR and Downgradient	D2	16/07/2020	D2_16 Jul 20_	470	-	1	-	36	-	-	280	-	<0.1	-	<1	-	2	-	-	11,000	3	-	-	2330	<0.04	<1	-	141	-	0.2	-	<1	-	76	-
Adjacent to MPAR and Downgradient	D2	22/10/2020	D2_22 Oct 20_	700	-	2	-	29	-	-	230	-	<0.1	-	<1	-	2	-	-	4630	4	-	-	1600	<0.04	<1	-	104	-	0.3	-	<1	-	159	-
Adjacent to MPAR and Downgradient	D2	12/11/2020	D2_12 Nov 20_	780	-	<1	-	20	-	-	200	-	<0.1	-	2	-	2	-	-	3070	3	-	-	1320	<0.04	<1	-	73	-	0.3	-	<1	-	114	-
Adjacent to MPAR and Downgradient	D2	12/02/2021	D2_12 Feb 21_	750	600	<1	<1	18	-	<1	170	160	<0.1	-	<1	-	4	3	6340	4270	4	-	959	907	<0.04	<1	-	51	44	0.3	-	<1	-	48	45
Adjacent to MPAR and Downgradient	D2	20/05/2021	D2_20 May 21_	650	440	2	1	32	-	<1	250	250	<0.1	-	<1	-	3	2	9340	7800	3	-	1400	1370	<0.04	<1	-	75	76	0.3	-	<1	-	80	55
	D2	**Min.**		470	440	<1	<1	18	-	<1	170	160	<0.1	-	<1	-	2	2	6340	3070	3	-	959	907	<0.04	<1	-	51	44	0.2	-	<1	-	48	45
	D2	**Max.**		780	600	2	1	36	-	<1	280	250	<0.1	-	2	-	4	3	9340	11000	4	-	1400	2330	<0.04	<1	-	141	76	0.3	-	<1	-	159	55
	D2	**Average**		670	-	1.2	-	27	-	-	226	-	0.05	-	0.8	-	2.6	-	7840	6154	3.4	-	1179.5	1505	0.02	0.5	-	89	-	0.28	-	0.5	-	95	-
Adjacent to MPAR and Downgradient	D8	17/09/2020	D8_17 Sep 20_	210	-	<1	-	40	-	-	60	-	<0.1	-	<1	-	3	-	-	31	<1	-	-	206	<0.04	2	-	36	-	<0.2	-	<1	-	42	-
Adjacent to MPAR and Downgradient	D8	26/11/2020	D8_26 Nov 20_	490	450	<1	<1	27	-	<1	<50	<50	<0.1	-	<1	-	3	2	420	180	<1	-	87	72	<0.04	<1	-	28	27	<0.2	-	<1	-	36	37
Adjacent to MPAR and Downgradient	D8	15/04/2021	D8_15 Apr 21_	170	40	<1	<1	52	-	<1	<50	<50	<0.1	-	<1	-	2	2	7880	140	<1	-	566	518	<0.04	<1	-	65	57	<0.2	-	<1	-	70	69
Adjacent to MPAR and Downgradient	D8	25/06/2021	D8_25 Jun 21_	120	<10	<1	<1	35	-	<1	120	60	<0.1	-	<1	-	3	2	219	<50	<1	-	299	269	<0.04	<1	-	50	45	<0.2	-	<1	-	71	59
	D8	**Min.**		120	<10	<1	<1	27	-	<1	<50	<50	<0.1	-	<1	-	2	2	219	31	<1	-	87	72	<0.04	<1	-	28	27	<0.2	-	<1	-	36	37
	D8	**Max.**		490	450	<1	<1	52	-	<1	120	60	<0.1	-	<1	-	3	2	7880	180	<1	-	566	518	<0.04	2	-	65	57	<0.2	-	<1	-	71	69
	D8	**Average**		248	165	0.5	0.5	39	-	0.5	58	37	0.05	-	0.5	-	2.8	2	2840	94	0.5	-	317	266	0.02	0.88	-	45	43	0.1	-	0.5	-	55	55
Adjacent to MPAR and Downgradient	D9	16/09/2020	D9_16 Sep 20_	100	-	1	-	33	-	-	1580	-	<0.1	-	<1	-	<1	-	-	35,100	<1	-	-	18,300	0.12	<1	-	1350	-	0.7	-	<1	-	93	-
Adjacent to MPAR and Downgradient	D9	25/11/2020	D9_25 Nov 20_	820	<10	8	<1	48	-	<1	1660	1580	0.2	-	1	-	8	<1	67,700	25,300	10	-	18,100	17,000	0.7	<1	-	1740	1680	0.7	-	<1	-	589	62
Adjacent to MPAR and Downgradient	D9	14/04/2021	D9_14 Apr 21_	170	<10	2	2	33	-	<1	1710	1610	<0.1	-	<1	-	<1	<1	61,300	47,400	<1	-	18,900	18,900	<0.04	<1	-	1400	1390	0.4	-	<1	-	102	78
Adjacent to MPAR and Downgradient	D9	23/06/2021	D9_23 Jun 21_	390	<10	5	<1	30	-	<1	1610	1620	0.1	-	<1	-	7	<1	65,300	45,400	6	-	14,800	17,500	0.74	<1	-	1500	1750	0.3	-	<1	-	237	76
	D9	**Min.**		100	<10	1	<1	30	-	<1	1580	1580	<0.1	-	<1	-	<1	<1	61300	25300	<1	-	14800	17000	<0.04	<1	-	1350	1390	0.3	-	<1	-	93	62
	D9	**Max.**		820	<10	8	2	48	-	<1	1710	1620	0.2	-	1	-	8	<1	67700	47400	10	-	18900	18900	0.74	<1	-	1740	1750	0.7	-	<1	-	589	78
	D9	**Average**		370	5	4	1	36	-	0.5	1640	1603	0.1	-	0.63	-	4	0.5	64767	38300	4.3	-	17267	17925	0.4	0.5	-	1498	1607	0.53	-	0.5	-	255	72

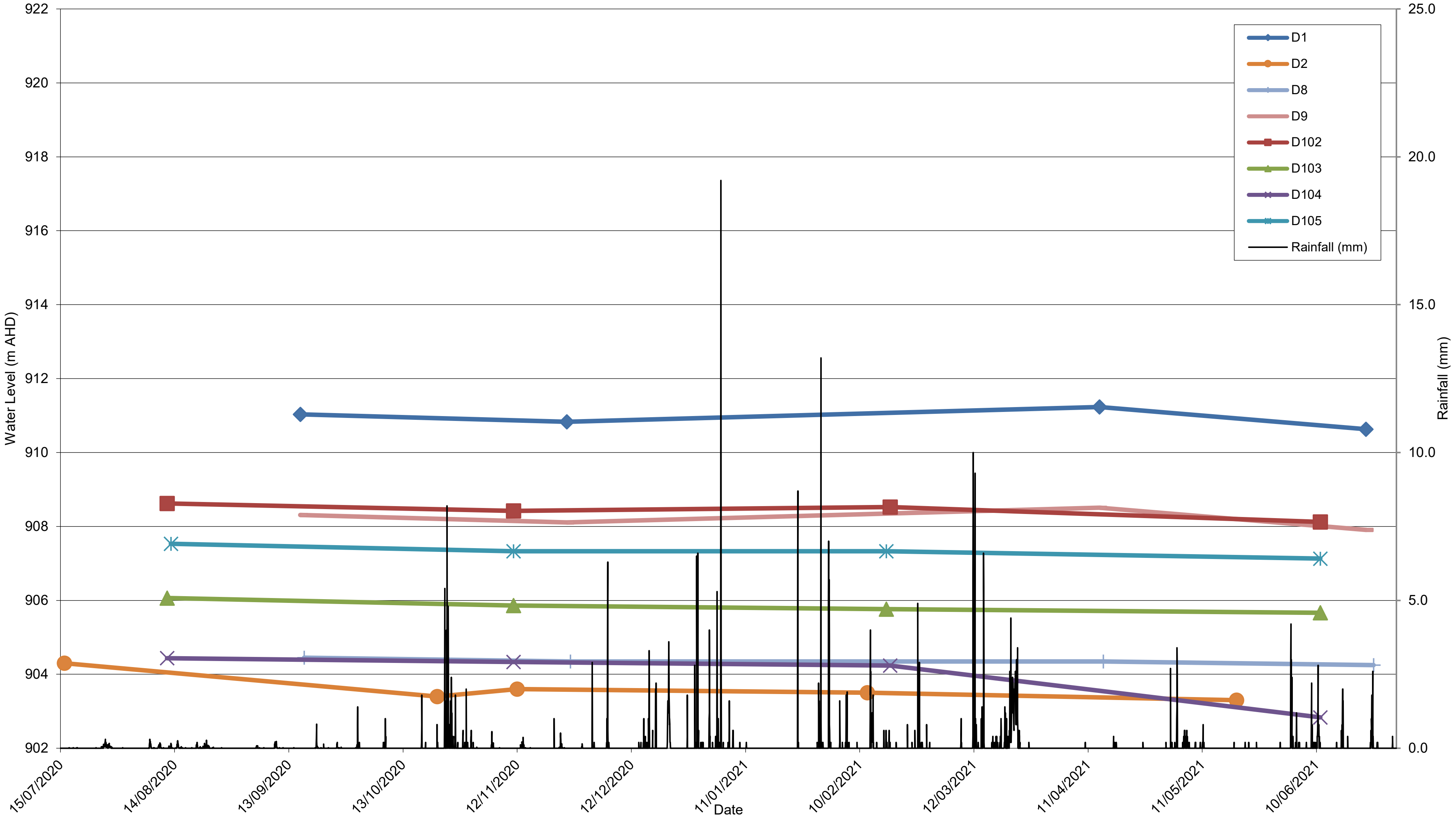
				Metals																															
				Aluminium	Aluminium (Filtered)	Arsenic	Arsenic (Filtered)	Barium	Barium (Filtered)	Beryllium	Boron	Boron (Filtered)	Cadmium	Cadmium (Filtered)	Chromium	Chromium (Filtered)	Copper	Copper (Filtered)	Iron	Iron (Filtered)	Lead	Lead (Filtered)	Manganese	Manganese (Filtered)	Mercury	Molybdenum	Molybdenum (Filtered)	Nickel	Nickel (Filtered)	Selenium	Selenium (Filtered)	Silver	Silver (Filtered)	Zinc	Zinc (Filtered)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ANZECC (2000) or Local Guidelines - Groundwater						24	24	700	700	100	370	370	2	2	5	5	5	5	664	664	5	5	5704	5704	0.06	10	10	550.9	550.9	5	5	0.05	0.05	908	908
Purpose	**LocCode**	**Sampled_Date-Time**	**SampleCode**																																
Adjacent to MPAR and Downgradient	D102	12/08/2020	MPW035281	-	-	5	4	30	28	-	1880	1790	<0.1	<0.1	<1	<1	<1	<1	72,700	72,300	<1	<1	21,800	21,100	<0.04	<1	<1	1880	1830	0.3	<0.2	<1	<1	66	61
Adjacent to MPAR and Downgradient	D102	11/11/2020	D102_11 Nov 20_	40	<10	2	1	26	26	<1	1650	1700	<0.1	<0.1	<1	<1	<1	<1	58,800	35,100	<1	<1	16,500	16,300	<0.04	<1	-	1800	1720	0.3	0.2	<1	-	48	41
Adjacent to MPAR and Downgradient	D102	18/02/2021	D102_18 Feb 21_	90	<10	<1	<1	30	-	<1	2020	2000	0.1	-	<1	-	<1	<1	52,000	46,900	<1	-	19,900	19,200	0.06	<1	-	1900	1800	0.3	-	<1	-	97	92
Adjacent to MPAR and Downgradient	D102	11/06/2021	D102_11 Jun 21_	20	<10	<1	<1	26	-	<1	1870	1530	<0.1	-	2	-	1	<1	52,000	25,000	<1	-	17,200	14,000	<0.04	<1	-	1910	1620	<0.2	-	<1	-	56	41
	D102	**Min.**		**20**	**<10**	**<1**	**<1**	**26**	**26**	**<1**	**1650**	**1530**	**<0.1**	**<0.1**	**<1**	**<1**	**<1**	**<1**	**52000**	**25000**	**<1**	**<1**	**16500**	**14000**	**<0.04**	**<1**	**<1**	**1800**	**1620**	**<0.2**	**<0.2**	**<1**	**<1**	**48**	**41**
	D102	**Max.**		**90**	**<10**	**5**	**4**	**30**	**28**	**<1**	**2020**	**2000**	**0.1**	**<0.1**	**2**	**<1**	**1**	**<1**	**72700**	**72300**	**<1**	**<1**	**21800**	**21100**	**0.06**	**<1**	**<1**	**1910**	**1830**	**0.3**	**0.2**	**<1**	**<1**	**97**	**92**
	D102	**Average**		**50**	**5**	**2**	**1.5**	**28**	**-**	**0.5**	**1855**	**1755**	**0.063**	**-**	**0.88**	**-**	**0.63**	**0.5**	**58875**	**44825**	**0.5**	**-**	**18850**	**17650**	**0.03**	**0.5**	**-**	**1873**	**1743**	**0.25**	**-**	**0.5**	**-**	**67**	**59**
Adjacent to MPAR and Downgradient	D103	12/08/2020	MPW035282	-	-	6	6	26	24	-	1630	1520	<0.1	<0.1	<1	<1	<1	<1	25,100	24,100	<1	<1	16,100	15,500	<0.04	<1	<1	1020	977	0.2	<0.2	<1	<1	218	210
Adjacent to MPAR and Downgradient	D103	11/11/2020	D103_11 Nov 20_	310	<10	4	<1	22	19	<1	1410	1460	<0.1	<0.1	2	<1	<1	<1	24,700	15,800	<1	<1	11,200	10,800	<0.04	<1	-	876	812	0.3	<0.2	<1	-	154	119
Adjacent to MPAR and Downgradient	D103	17/02/2021	D103_17 Feb 21_	340	<10	9	4	25	-	<1	1800	1820	<0.1	-	<1	-	<1	<1	25,300	20,500	<1	-	12,800	12,200	<0.04	<1	-	862	800	0.2	-	<1	-	196	179
Adjacent to MPAR and Downgradient	D103	11/06/2021	D103_11 Jun 21_	580	<10	8	1	26	-	<1	1690	1580	<0.1	-	<1	-	<1	<1	20,400	9950	<1	-	10,300	9970	<0.04	<1	-	792	762	<0.2	-	<1	-	162	137
	D103	**Min.**		**310**	**<10**	**4**	**<1**	**22**	**19**	**<1**	**1410**	**1460**	**<0.1**	**<0.1**	**<1**	**<1**	**<1**	**<1**	**20400**	**9950**	**<1**	**<1**	**10300**	**9970**	**<0.04**	**<1**	**<1**	**792**	**762**	**<0.2**	**<0.2**	**<1**	**<1**	**154**	**119**
	D103	**Max.**		**580**	**<10**	**9**	**6**	**26**	**24**	**<1**	**1800**	**1820**	**<0.1**	**<0.1**	**2**	**<1**	**<1**	**<1**	**25300**	**24100**	**<1**	**<1**	**16100**	**15500**	**<0.04**	**<1**	**<1**	**1020**	**977**	**0.3**	**<0.2**	**<1**	**<1**	**218**	**210**
	D103	**Average**		**410**	**5**	**6.8**	**2.9**	**25**	**-**	**0.5**	**1633**	**1595**	**0.05**	**-**	**0.88**	**-**	**0.5**	**0.5**	**23875**	**17588**	**0.5**	**-**	**12600**	**12118**	**0.02**	**0.5**	**-**	**888**	**838**	**0.2**	**-**	**0.5**	**-**	**183**	**161**
Adjacent to MPAR and Downgradient	D104	12/08/2020	MPW035283	-	-	2	2	25	22	-	60	60	<0.1	<0.1	<1	<1	<1	<1	6290	5260	<1	<1	2350	2270	<0.04	<1	<1	42	36	<0.2	<0.2	<1	<1	49	47
Adjacent to MPAR and Downgradient	D104	11/11/2020	D104_11 Nov 20_	260	<10	<1	<1	36	37	<1	60	60	<0.1	<0.1	<1	<1	3	3	1190	21	<1	<1	1590	1610	<0.04	<1	-	46	45	<0.2	<0.2	<1	-	68	65
Adjacent to MPAR and Downgradient	D104	18/02/2021	D104_18 Feb 21_	180	<10	2	<1	27	-	<1	140	160	<0.1	-	<1	-	<1	<1	10,800	8780	<1	-	3970	3820	<0.04	<1	-	93	91	<0.2	-	<1	-	72	58
Adjacent to MPAR and Downgradient	D104	11/06/2021	D104_11 Jun 21_	20	<10	<1	<1	19	-	<1	110	100	<0.1	-	<1	-	1	<1	6670	3930	<1	-	2690	2740	<0.04	<1	-	59	61	<0.2	-	<1	-	46	47
	D104	**Min.**		**20**	**<10**	**<1**	**<1**	**19**	**22**	**<1**	**60**	**60**	**<0.1**	**<0.1**	**<1**	**<1**	**<1**	**<1**	**1190**	**21**	**<1**	**<1**	**1590**	**1610**	**<0.04**	**<1**	**<1**	**42**	**36**	**<0.2**	**<0.2**	**<1**	**<1**	**46**	**47**
	D104	**Max.**		**260**	**<10**	**2**	**2**	**36**	**37**	**<1**	**140**	**160**	**<0.1**	**<0.1**	**<1**	**<1**	**3**	**3**	**10800**	**8780**	**<1**	**<1**	**3970**	**3820**	**<0.04**	**<1**	**<1**	**93**	**91**	**<0.2**	**<0.2**	**<1**	**<1**	**72**	**65**
	D104	**Average**		**153**	**5**	**1.3**	**0.88**	**27**	**-**	**0.5**	**93**	**95**	**0.05**	**-**	**0.5**	**-**	**1.3**	**1.1**	**6238**	**4498**	**0.5**	**-**	**2650**	**2610**	**0.02**	**0.5**	**-**	**60**	**58**	**0.1**	**-**	**0.5**	**-**	**59**	**54**
Adjacent to MPAR and Downgradient	D105	13/08/2020	MPW035284	-	-	1	1	26	25	-	530	510	<0.1	<0.1	<1	<1	<1	<1	36,200	35,000	<1	<1	15,800	15,400	<0.04	<1	<1	764	738	<0.2	<0.2	<1	<1	74	74
Adjacent to MPAR and Downgradient	D105	11/11/2020	D105_11 Nov 20_	20	<10	<1	<1	23	22	<1	420	440	<0.1	<0.1	<1	<1	<1	<1	32,700	19,900	<1	<1	11,700	11,000	<0.04	<1	-	709	664	<0.2	<0.2	<1	-	53	37
Adjacent to MPAR and Downgradient	D105	17/02/2021	D105_17 Feb 21_	60	<10	1	1	25	-	<1	570	600	<0.1	-	<1	-	<1	<1	39,600	33,300	<1	-	13,800	13,200	<0.04	<1	-	697	656	<0.2	-	<1	-	75	63
Adjacent to MPAR and Downgradient	D105	11/06/2021	D105_11 Jun 21_	140	<10	1	<1	23	-	<1	590	560	<0.1	-	1	-	<1	<1	30,100	15,100	<1	-	11,800	11,400	<0.04	<1	-	688	675	<0.2	-	<1	-	64	55
	D105	**Min.**		**20**	**<10**	**<1**	**<1**	**23**	**22**	**<1**	**420**	**440**	**<0.1**	**<0.1**	**<1**	**<1**	**<1**	**<1**	**30100**	**15100**	**<1**	**<1**	**11700**	**11000**	**<0.04**	**<1**	**<1**	**688**	**656**	**<0.2**	**<0.2**	**<1**	**<1**	**53**	**37**
	D105	**Max.**		**140**	**<10**	**1**	**1**	**26**	**25**	**<1**	**590**	**600**	**<0.1**	**<0.1**	**1**	**<1**	**<1**	**<1**	**39600**	**35000**	**<1**	**<1**	**15800**	**15400**	**<0.04**	**<1**	**<1**	**764**	**738**	**<0.2**	**<0.2**	**<1**	**<1**	**75**	**74**
	D105	**Average**		**73**	**5**	**0.88**	**0.75**	**24**	**-**	**0.5**	**528**	**528**	**0.05**	**-**	**0.63**	**-**	**0.5**	**0.5**	**34650**	**25825**	**0.5**	**-**	**13275**	**12750**	**0.02**	**0.5**	**-**	**715**	**683**	**0.1**	**-**	**0.5**	**-**	**67**	**57**
Brine waste pond leak detection bores	MPGM5-D5	16/07/2020	MPGM5-D5_16 Jul 20_	300	-	<10	-	44	-	-	890	-	3.7	-	<10	-	14	-	-	295	<10	-	-	84,700	<0.04	<10	-	3460	-	5.7	-	<10	-	531	-
Brine waste pond leak detection bores	MPGM5-D5	22/10/2020	MPGM5-D5_22 Oct 20_	360	-	6	-	47	-	-	1020	-	4.6	-	2	-	17	-	-	563	5	-	-	69,600	<0.04	<1	-	2910	-	3	-	<1	-	453	-
Brine waste pond leak detection bores	MPGM5-D5	12/11/2020	MPGM5-D5_12 Nov 20_	310	-	4	-	45	-	-	650	-	3.5	-	1	-	12	-	-	764	4	-	-	62,700	<0.04	2	-	2580	-	2.3	-	<1	-	343	-
Brine waste pond leak detection bores	MPGM5-D5	12/02/2021	MPGM5-D5_12 Feb 21_	250	10	2	2	42	-	<1	330	340	2.1	-	<1	-	6	6	1200	640	2	-	54,700	51,700	<0.04	<1	-	1860	1820	1.3	-	<1	-	304	295
Brine waste pond leak detection bores	MPGM5-D5	20/05/2021	MPGM5-D5_20 May 21_	180	<10	6	6	48	-	<1	1710	1580	6	-	3	-	22	20	1540	1180	9	-	76,100	75,500	0.07	12	-	3680	3420	2.5	-	<1	-	608	577
	MPGM5-D5	**Min.**		**180**	**<10**	**2**	**2**	**42**	**-**	**<1**	**330**	**340**	**2.1**	**-**	**<1**	**-**	**6**	**6**	**1200**	**295**	**2**	**-**	**54700**	**51700**	**<0.04**	**<1**	**-**	**1860**	**1820**	**1.3**	**-**	**<1**	**-**	**304**	**295**
	MPGM5-D5	**Max.**		**360**	**10**	**<10**	**6**	**48**	**-**	**<1**	**1710**	**1580**	**6**	**-**	**<10**	**-**	**22**	**20**	**1540**	**1180**	**<10**	**-**	**76100**	**84700**	**0.07**	**12**	**-**	**3680**	**3420**	**5.7**	**-**	**<10**	**-**	**608**	**577**
	MPGM5-D5	**Average**		**280**	**-**	**4.6**	**-**	**45**	**-**	**-**	**920**	**-**	**4**	**-**	**2.3**	**-**	**14**	**-**	**1920**	**688**	**5**	**-**	**65400**	**68840**	**0.03**	**4**	**-**	**2898**	**-**	**3**	**-**	**1.4**	**-**	**448**	**-**
Brine waste pond leak detection bores	MPGM5-D6	16/07/2020	MPGM5-D6_16 Jul 20_	120	-	2	-	24	-	-	<50	-	<0.1	-	<1	-	1	-	-	43,600	2	-	-	8370	0.06	<1	-	100	-	0.3	-	<1	-	52	-
Brine waste pond leak detection bores	MPGM5-D6	22/10/2020	MPGM5-D6_22 Oct 20_	90	-	1	-	23	-	-	<50	-	<0.1	-	<1	-	<1	-	-	30,200	<1	-	-	6050	<0.04	<1	-	89	-	0.2	-	<1	-	42	-
Brine waste pond leak detection bores	MPGM5-D6	20/05/2021	MPGM5-D6_20 May 21_	340	<10	3	2	29	-	<1	60	50	<0.1	-	2	-	1	<1	42,400	41,100	6	-	5490	5560	<0.04	<1	-	67	64	0.3	-	<1	-	33	29
	MPGM5-D6	**Min.**		**90**	**<10**	**1**	**2**	**23**	**-**	**<1**	**<50**	**50**	**<0.1**	**-**	**<1**	**-**	**<1**	**<1**	**42400**	**30200**	**<1**	**-**	**5490**	**5560**	**<0.04**	**<1**	**-**	**67**	**64**	**0.2**	**-**	**<1**	**-**	**33**	**29**
	MPGM5-D6	**Max.**		**340**	**<10**	**3**	**2**	**29**	**-**	**<1**	**60**	**50**	**<0.1**	**-**	**2**	**-**	**1**	**<1**	**42400**	**43600**	**6**	**-**	**5490**	**8370**	**0.06**	**<1**	**-**	**100**	**64**	**0.3**	**-**	**<1**	**-**	**52**	**29**
	MPGM5-D6	**Average**		**183**	**-**	**2**	**-**	**25**	**-**	**-**	**37**	**-**	**0.05**	**-**	**1**	**-**	**0.83**	**-**	**-**	**38300**	**2.8**	**-**	**-**	**6660**	**0.033**	**0.5**	**-**	**85**	**-**	**0.27**	**-**	**0.5**	**-**	**42**	**-**

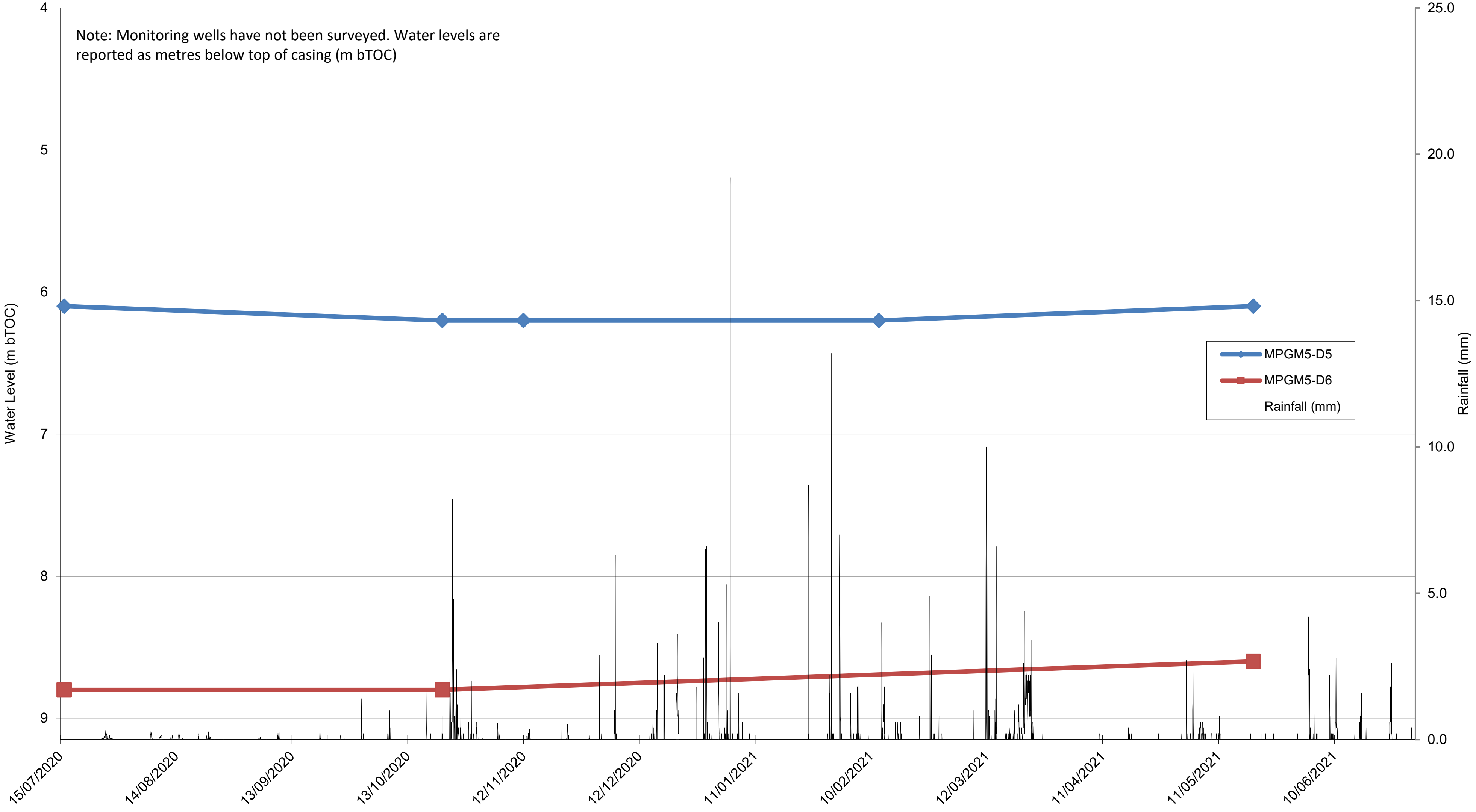
APPENDIX H HYDROGRAPHS


924
922
920
918
916
914
912
910
908
906
904
Water Level (m AHD)
25.0
20.0
15.0
10.0
5.0
0.0
Rainfall (mm)
D4
D5
D3
D107
D106
Rainfall (mm)
15/07/2020
14/08/2020
13/09/2020
13/10/2020
12/11/2020
12/12/2020
11/01/2021
10/02/2021
12/03/2021
11/04/2021
11/05/2021
10/06/2021
Date

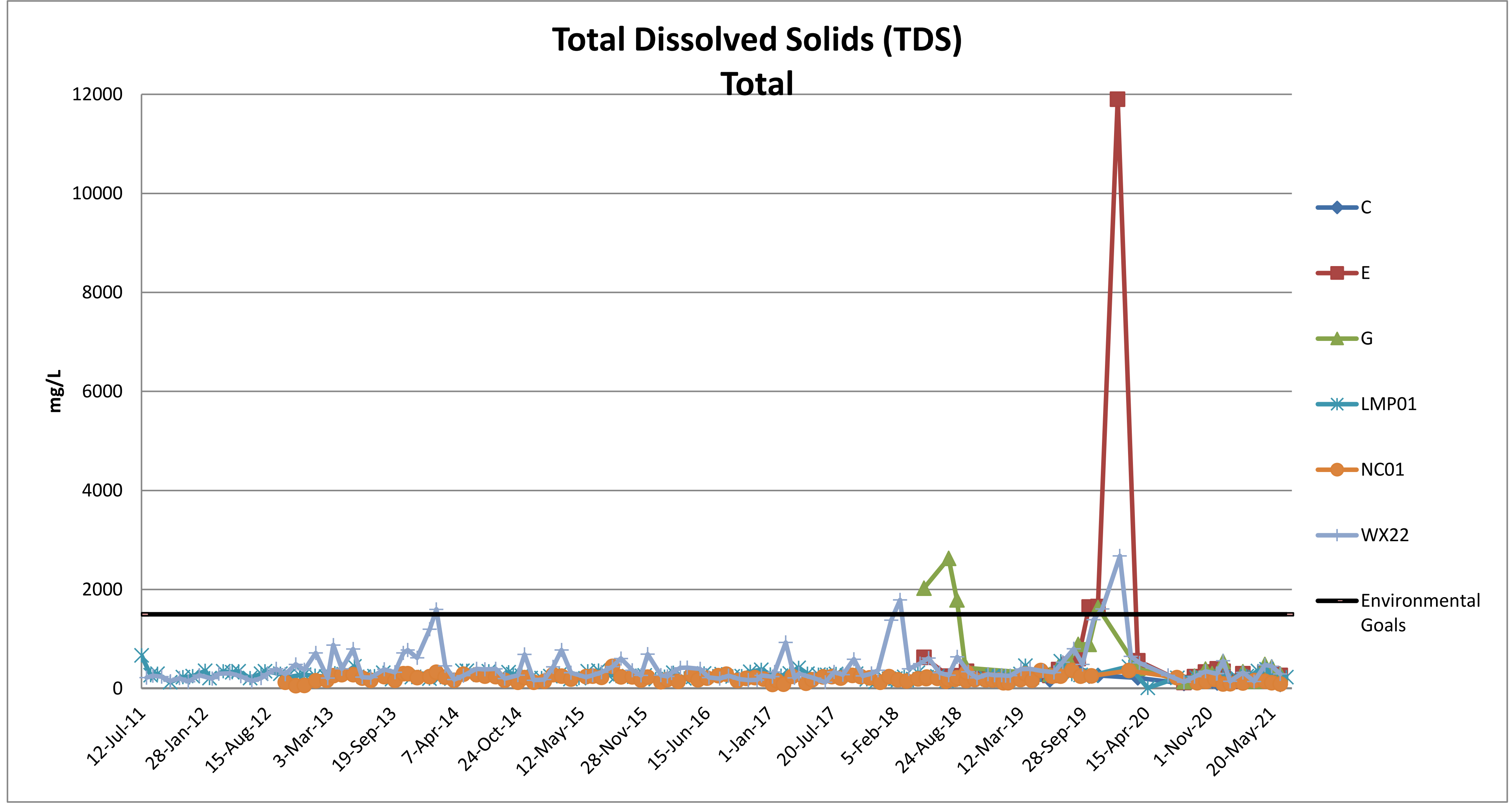

Note: SW3-D was not gauged over the reporting period
B5
D23
D23
D10
D11
D113
D19
B5
Rainfall (mm)
Water Level (m AHD)
Rainfall (mm)
Date
926
924
922
920
918
916
914
912
910
908
906
25.0
20.0
15.0
10.0
5.0
0.0
15/07/2020
14/08/2020
13/09/2020
13/10/2020
12/11/2020
12/12/2020
11/01/2021
10/02/2021
12/03/2021
11/04/2021
11/05/2021
10/06/2021

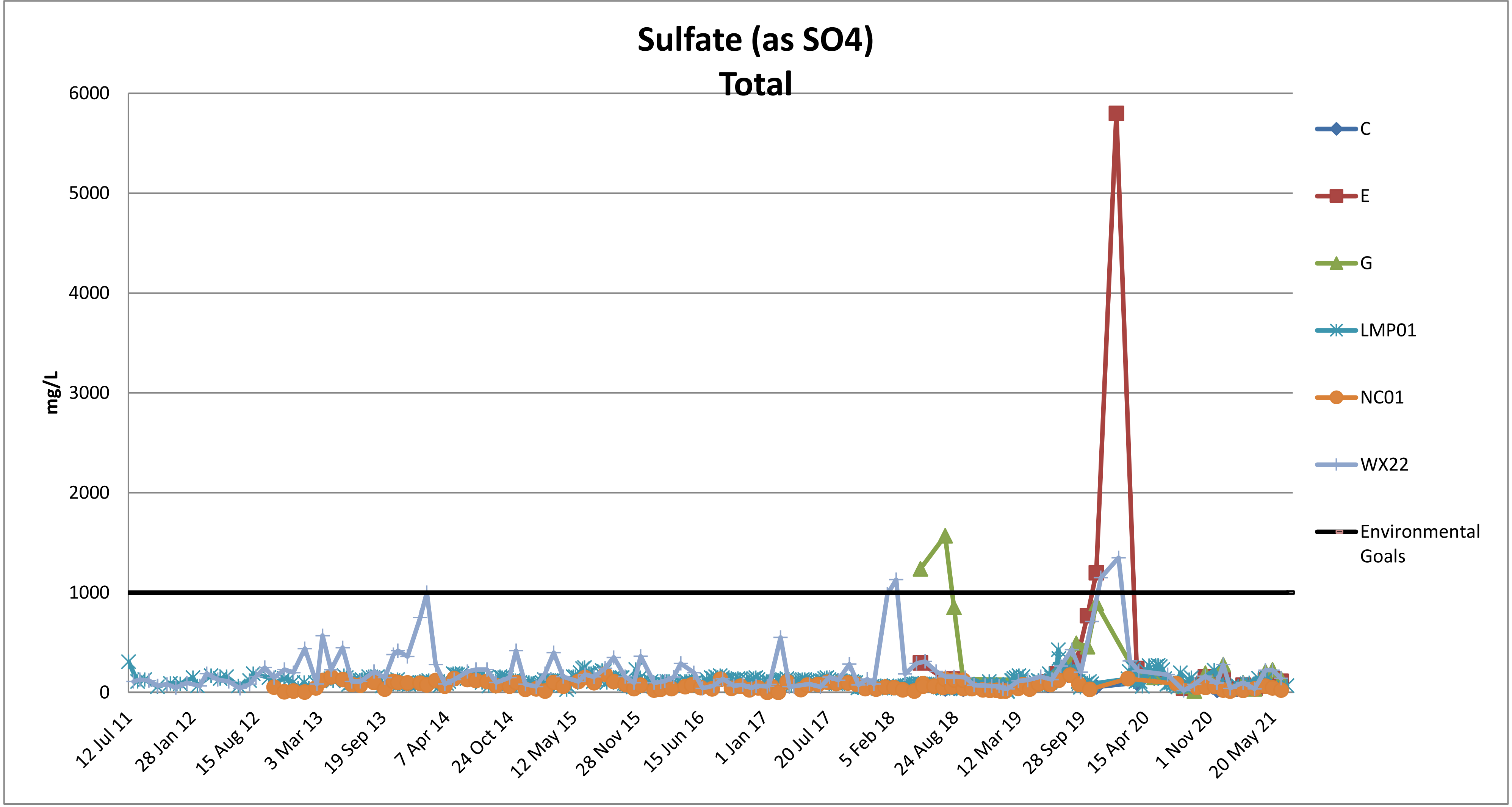

924
922
920
918
916
914
912
910
908
906
904
Water Level (m AHD)
25.0
20.0
15.0
10.0
5.0
0.0
Rainfall (mm)
D15
D16
D17
D18
Rainfall (mm)
15/07/2020
14/08/2020
13/09/2020
13/10/2020
12/11/2020
12/12/2020
11/01/2021
10/02/2021
12/03/2021
11/04/2021
11/05/2021
10/06/2021
Date

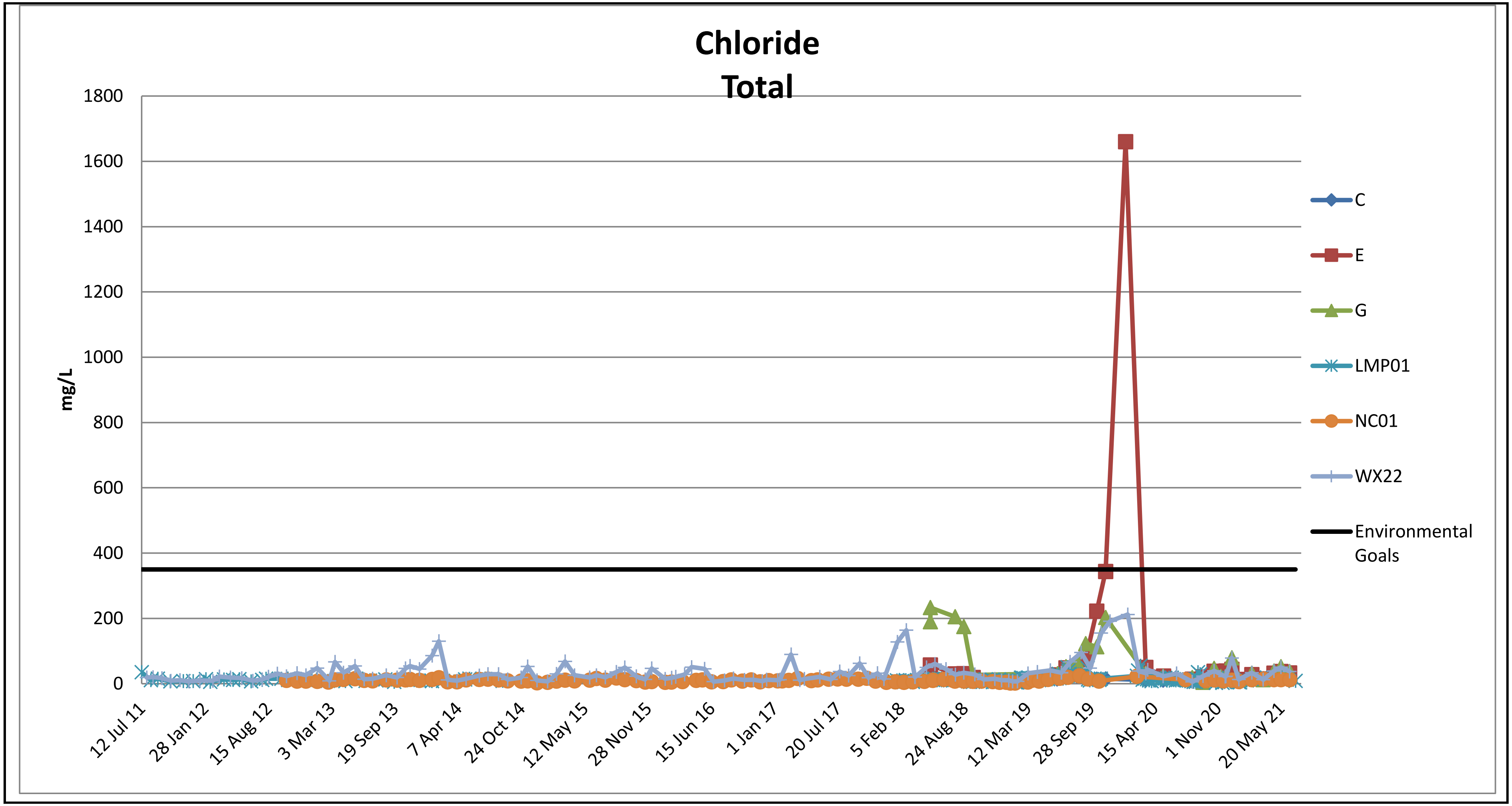

922
920
918
916
914
912
910
908
906
904
902
Water Level (m AHD)
25.0
20.0
15.0
10.0
5.0
0.0
Rainfall (mm)
15/07/2020
14/08/2020
13/09/2020
13/10/2020
12/11/2020
12/12/2020
11/01/2021
10/02/2021
12/03/2021
11/04/2021
11/05/2021
10/06/2021
Date
D1
D2
D8
D9
D102
D103
D104
D105
Rainfall (mm)

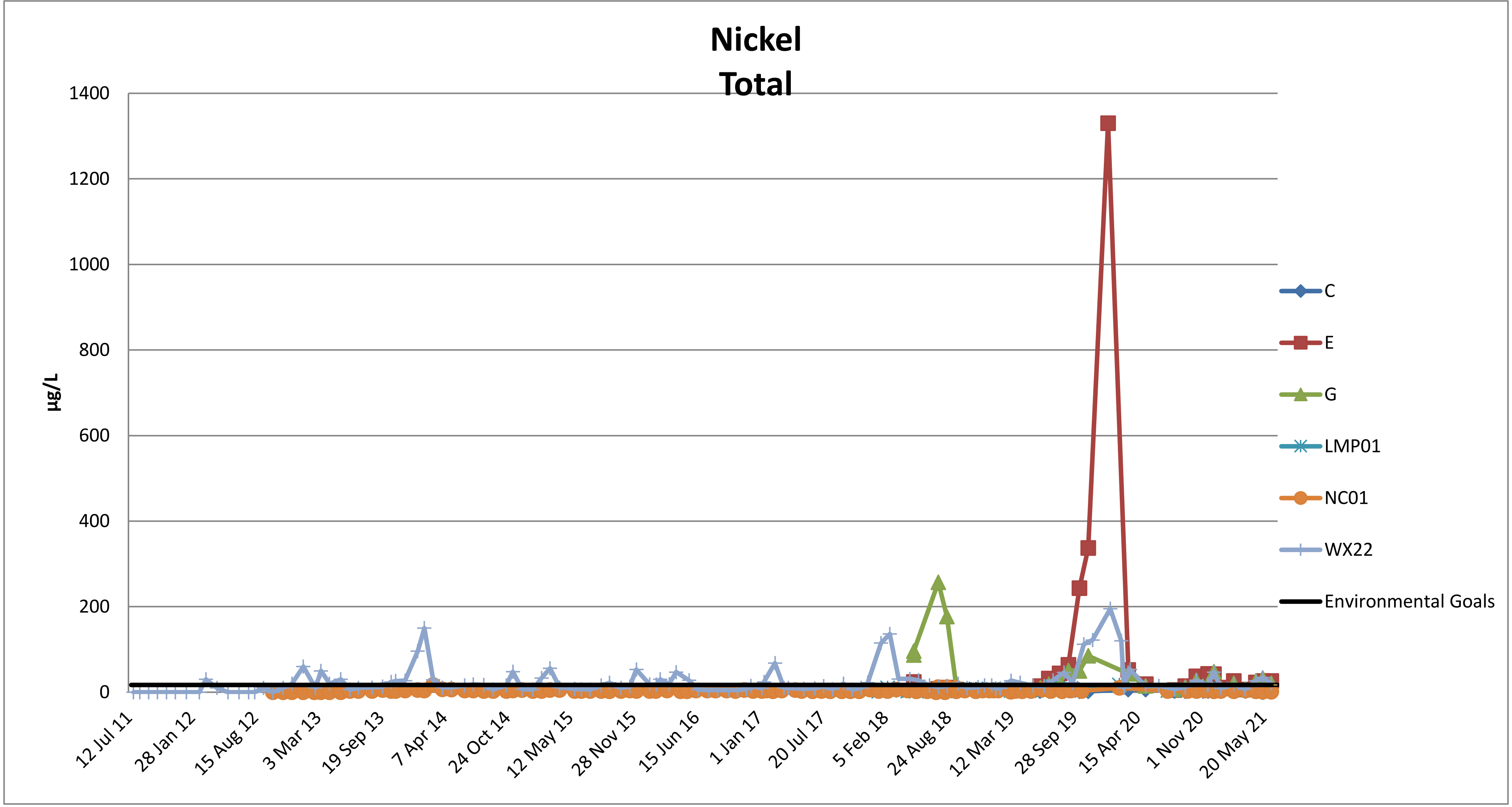

Note: Monitoring wells have not been surveyed. Water levels are reported as metres below top of casing (m bTOC)
Water Level (m bTOC)
Rainfall (mm)
4
5
6
7
8
9
25.0
20.0
15.0
10.0
5.0
0.0
MPGM5-D5
MPGM5-D6
Rainfall (mm)
15/07/2020
14/08/2020
13/09/2020
13/10/2020
12/11/2020
12/12/2020
11/01/2021
10/02/2021
12/03/2021
11/04/2021
11/05/2021
10/06/2021

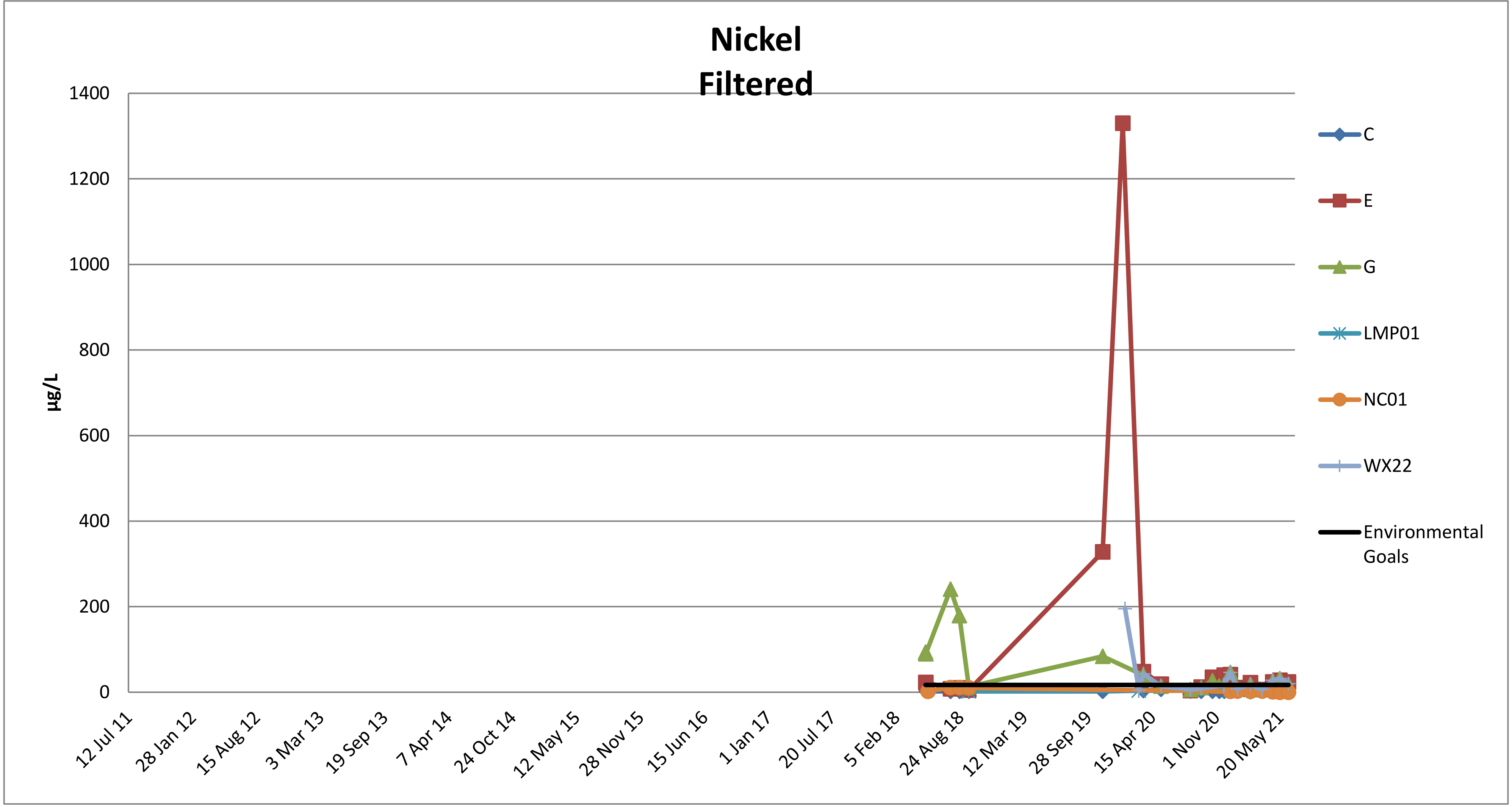
APPENDIX I SURFACE WATER TRENDS

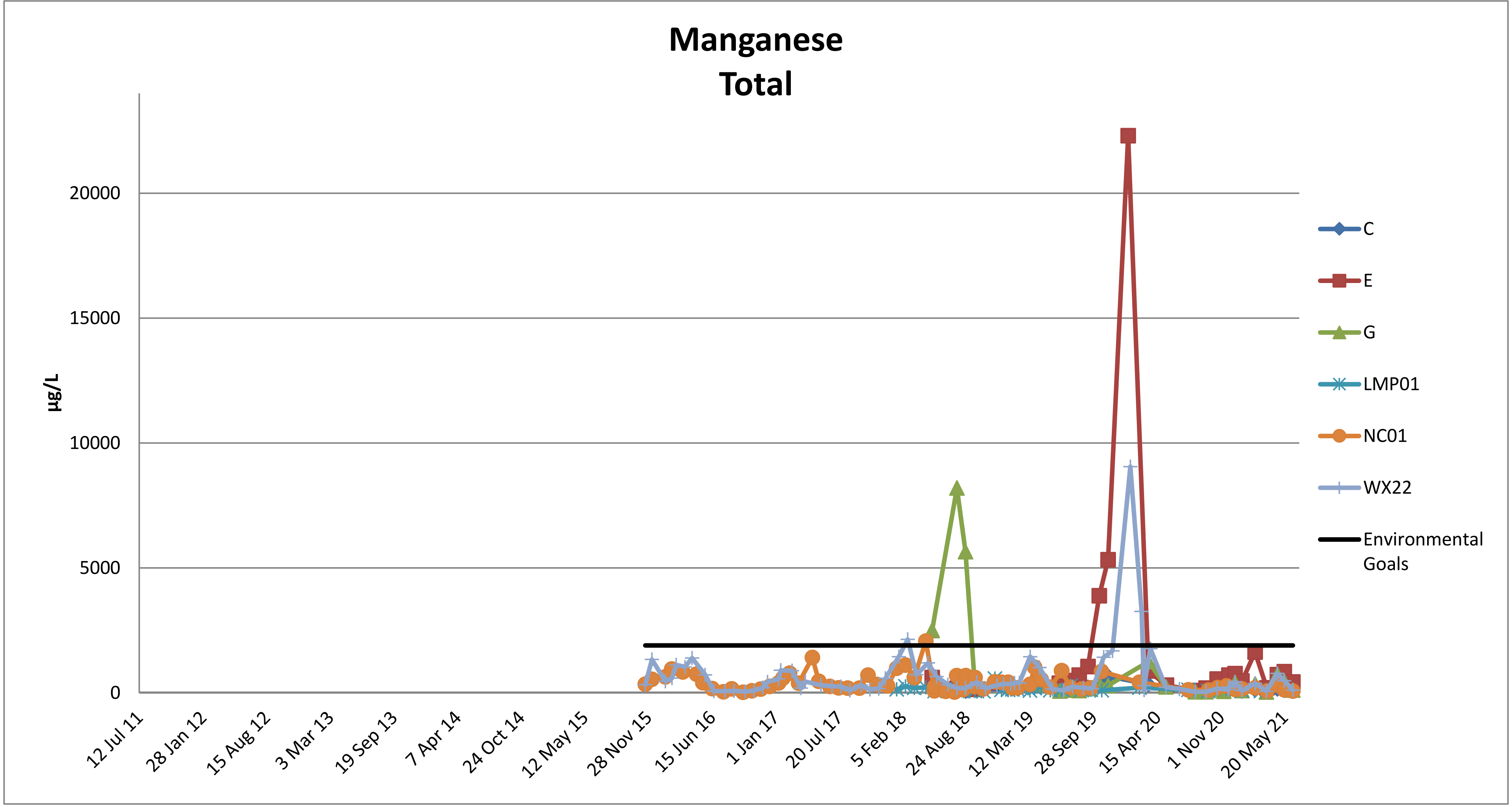

Total Dissolved Solids (TDS)
Total
mg/L
12000
10000
8000
6000
4000
2000
0
12-Jul-11
28-Jan-12
15-Aug-12
3-Mar-13
19-Sep-13
7-Apr-14
24-Oct-14
12-May-15
28-Nov-15
15-Jun-16
1-Jan-17
20-Jul-17
5-Feb-18
24-Aug-18
12-Mar-19
28-Sep-19
15-Apr-20
1-Nov-20
20-May-21
C
E
G
LMP01
NC01
WX22
Environmental Goals

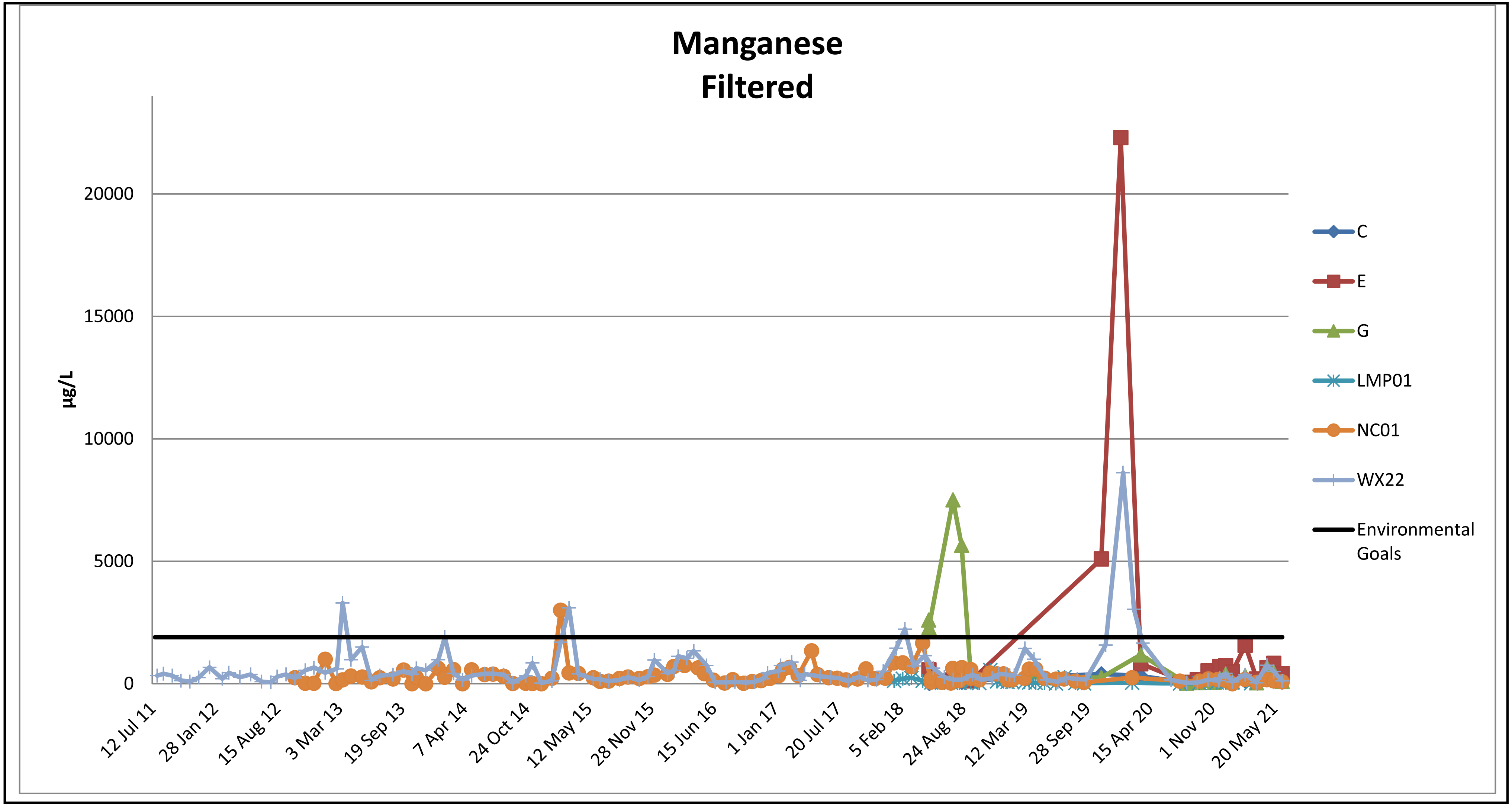

Sulfate (as SO4)
Total
mg/L
6000
5000
4000
3000
2000
1000
0
12 Jul 11
28 Jan 12
15 Aug 12
3 Mar 13
19 Sep 13
7 Apr 14
24 Oct 14
12 May 15
28 Nov 15
15 Jun 16
1 Jan 17
20 Jul 17
5 Feb 18
24 Aug 18
12 Mar 19
28 Sep 19
15 Apr 20
1 Nov 20
20 May 21
C
E
G
LMP01
NC01
WX22
Environmental Goals

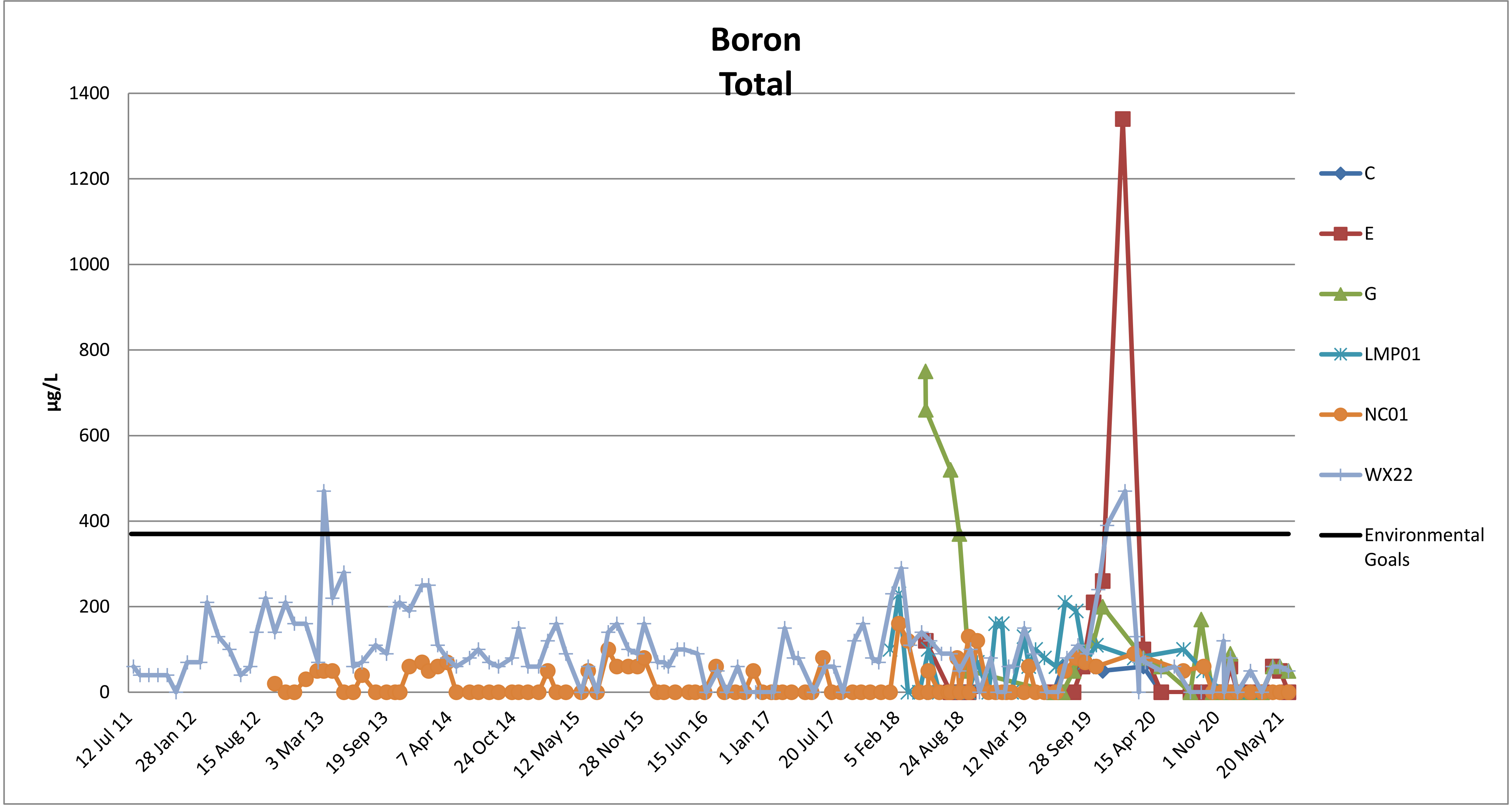

Chloride
Total
mg/L
1800
1600
1400
1200
1000
800
600
400
200
0
12 Jul 11
28 Jan 12
15 Aug 12
3 Mar 13
19 Sep 13
7 Apr 14
24 Oct 14
12 May 15
28 Nov 15
15 Jun 16
1 Jan 17
20 Jul 17
5 Feb 18
24 Aug 18
12 Mar 19
28 Sep 19
15 Apr 20
1 Nov 20
20 May 21
C
E
G
LMP01
NC01
WX22
Environmental Goals

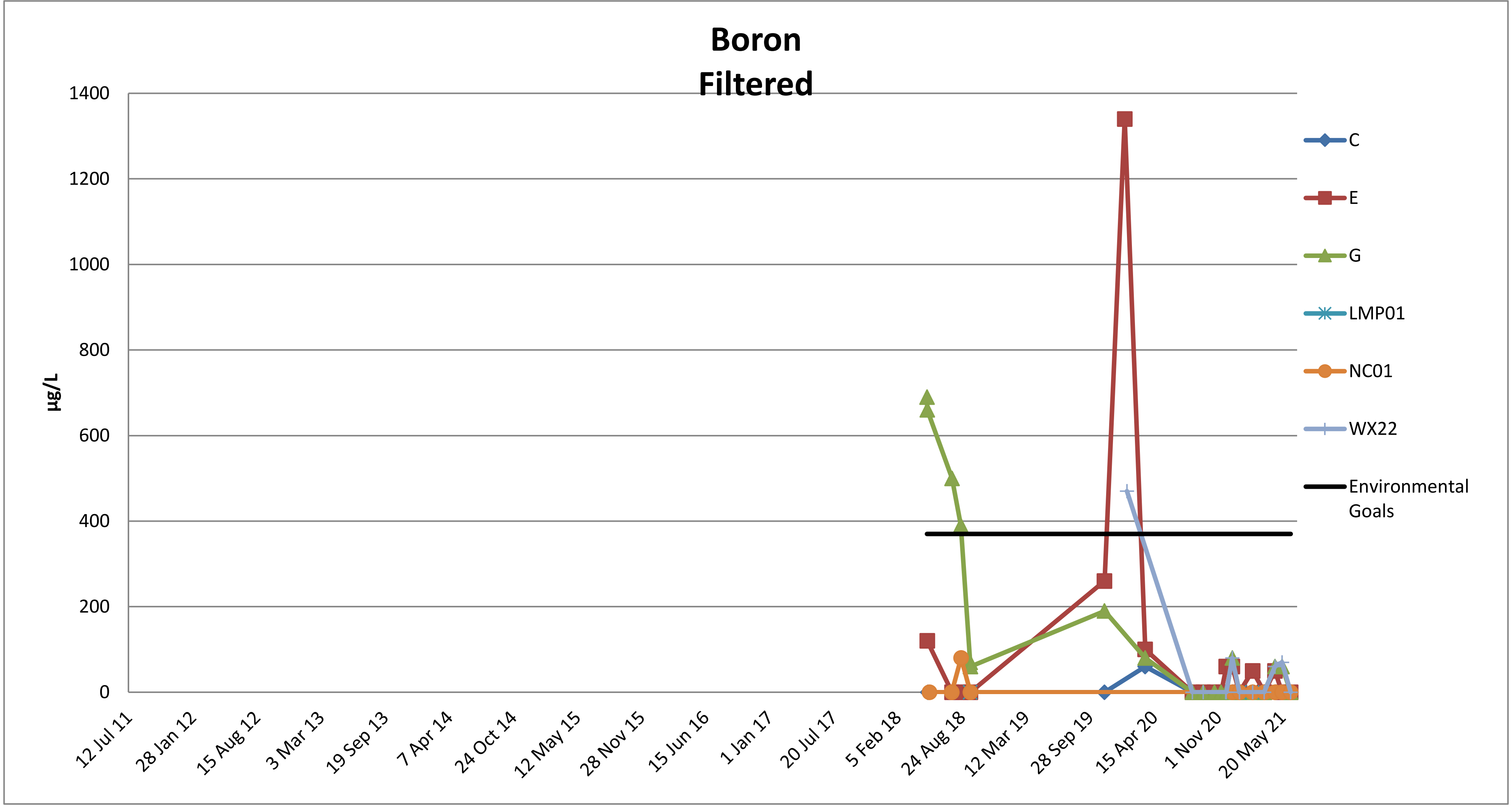

Nickel
Total
µg/L
1400
1200
1000
800
600
400
200
0
12 Jul 11
28 Jan 12
15 Aug 12
3 Mar 13
19 Sep 13
7 Apr 14
24 Oct 14
12 May 15
28 Nov 15
15 Jun 16
1 Jan 17
20 Jul 17
5 Feb 18
24 Aug 18
12 Mar 19
28 Sep 19
15 Apr 20
1 Nov 20
20 May 21
C
E
G
LMP01
NC01
WX22
Environmental Goals


Nickel
Filtered
µg/L
1400
1200
1000
800
600
400
200
0
12 Jul 11
28 Jan 12
15 Aug 12
3 Mar 13
19 Sep 13
7 Apr 14
24 Oct 14
12 May 15
28 Nov 15
15 Jun 16
1 Jan 17
20 Jul 17
5 Feb 18
24 Aug 18
12 Mar 19
28 Sep 19
15 Apr 20
1 Nov 20
20 May 21
C
E
G
LMP01
NC01
WX22
Environmental Goals

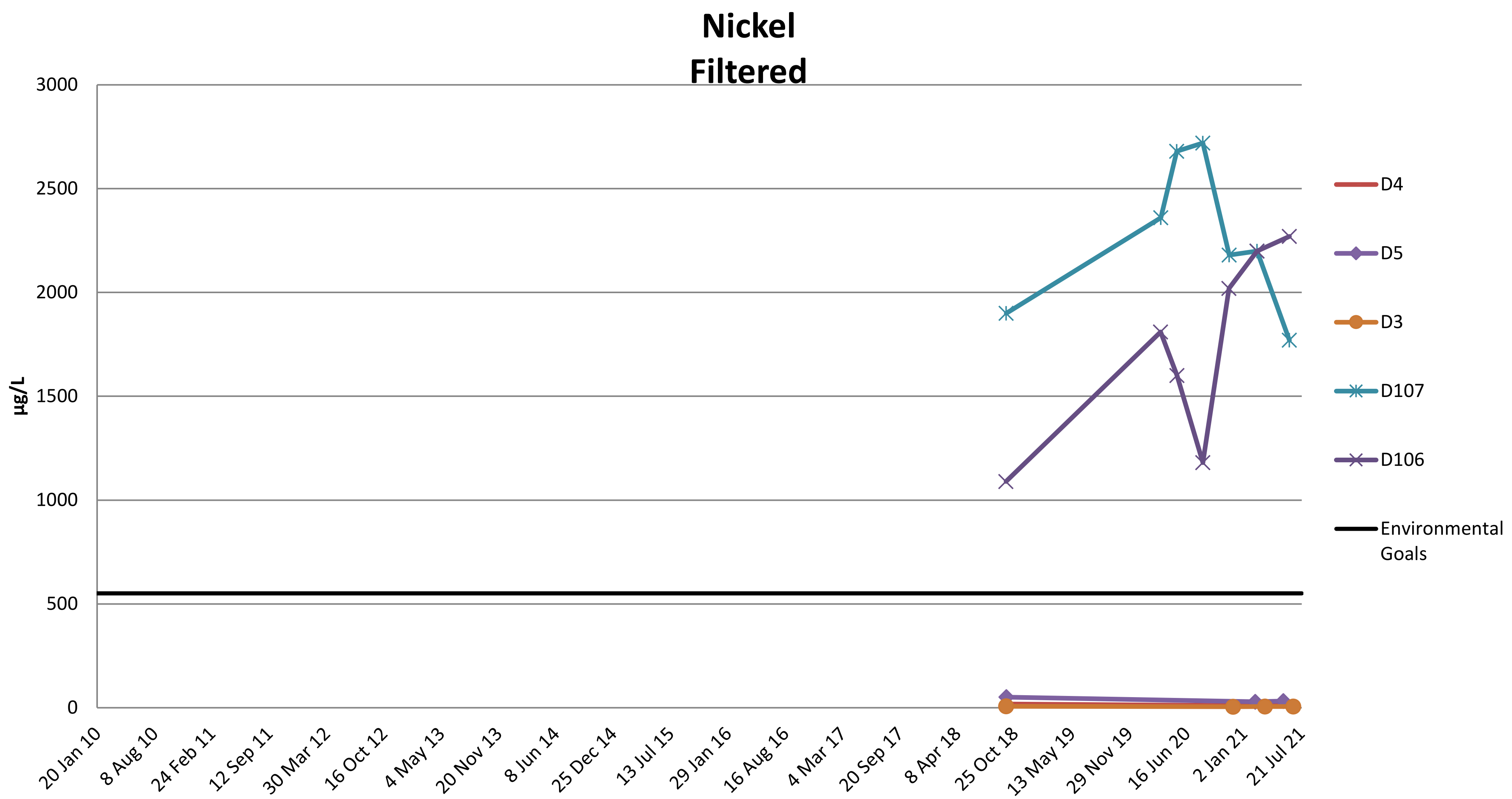

Manganese
Total
µg/L
20000
15000
10000
5000
0
12 Jul 11
28 Jan 12
15 Aug 12
3 Mar 13
19 Sep 13
7 Apr 14
24 Oct 14
12 May 15
28 Nov 15
15 Jun 16
1 Jan 17
20 Jul 17
5 Feb 18
24 Aug 18
12 Mar 19
28 Sep 19
15 Apr 20
1 Nov 20
20 May 21
C
E
G
LMP01
NC01
WX22
Environmental Goals

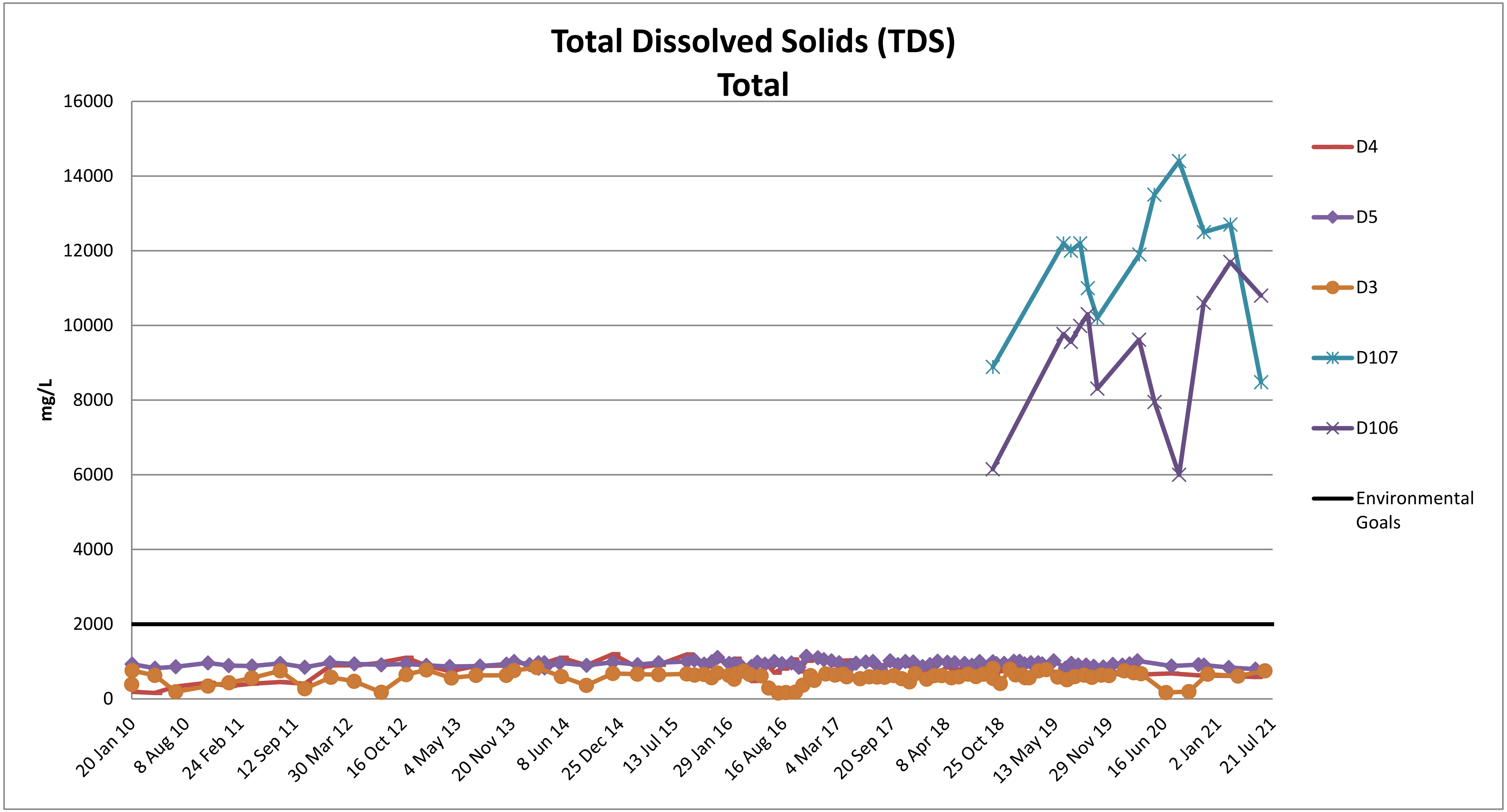

Manganese
Filtered
µg/L
0
5000
10000
15000
20000
12 Jul 11
28 Jan 12
15 Aug 12
3 Mar 13
19 Sep 13
7 Apr 14
24 Oct 14
12 May 15
28 Nov 15
15 Jun 16
1 Jan 17
20 Jul 17
5 Feb 18
24 Aug 18
12 Mar 19
28 Sep 19
15 Apr 20
1 Nov 20
20 May 21
C
E
G
LMP01
NC01
WX22
Environmental Goals

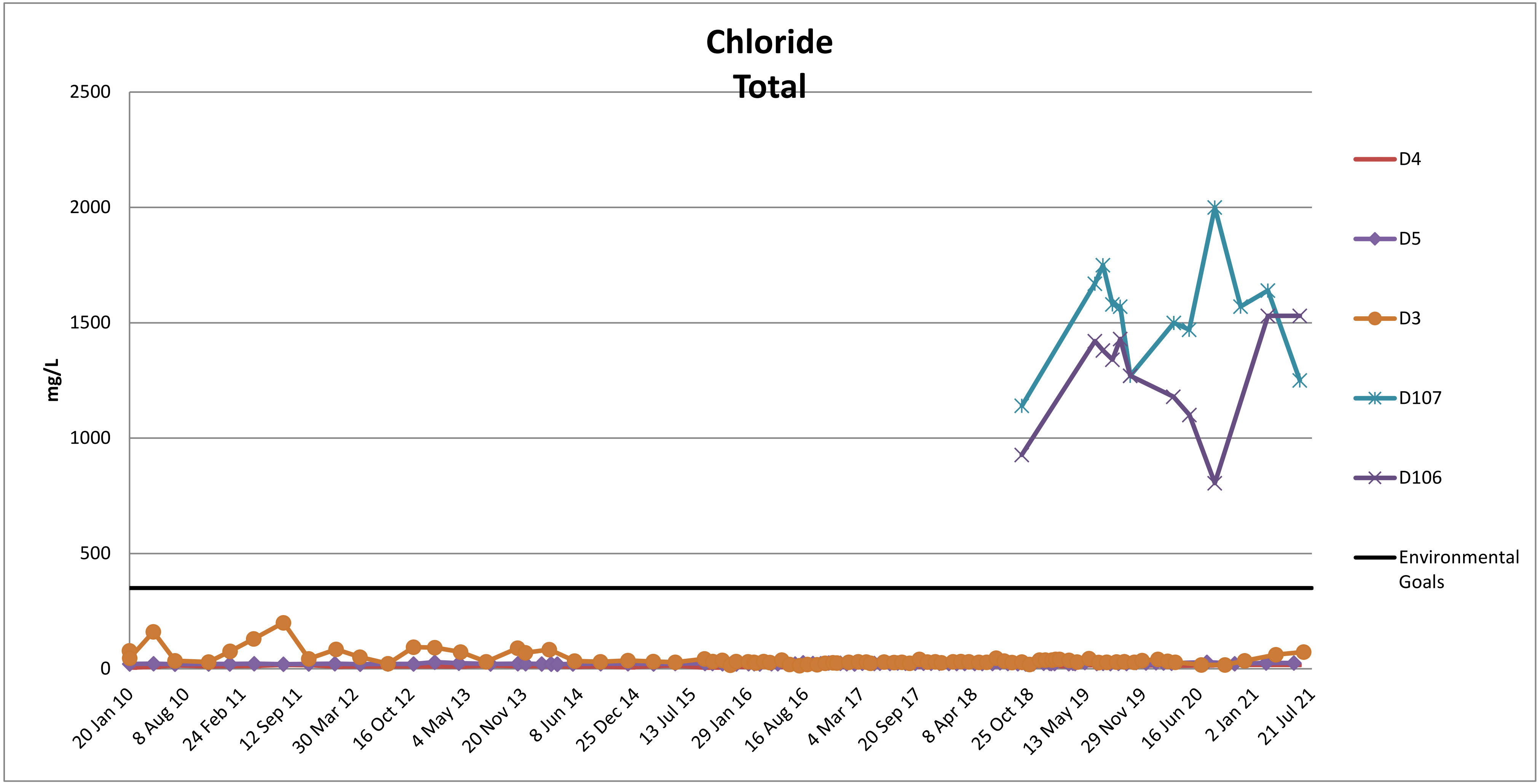

Boron
Total
µg/L
1400
1200
1000
800
600
400
200
0
12 Jul 11
28 Jan 12
15 Aug 12
3 Mar 13
19 Sep 13
7 Apr 14
24 Oct 14
12 May 15
28 Nov 15
15 Jun 16
1 Jan 17
20 Jul 17
5 Feb 18
24 Aug 18
12 Mar 19
28 Sep 19
15 Apr 20
1 Nov 20
20 May 21
C
E
G
LMP01
NC01
WX22
Environmental Goals

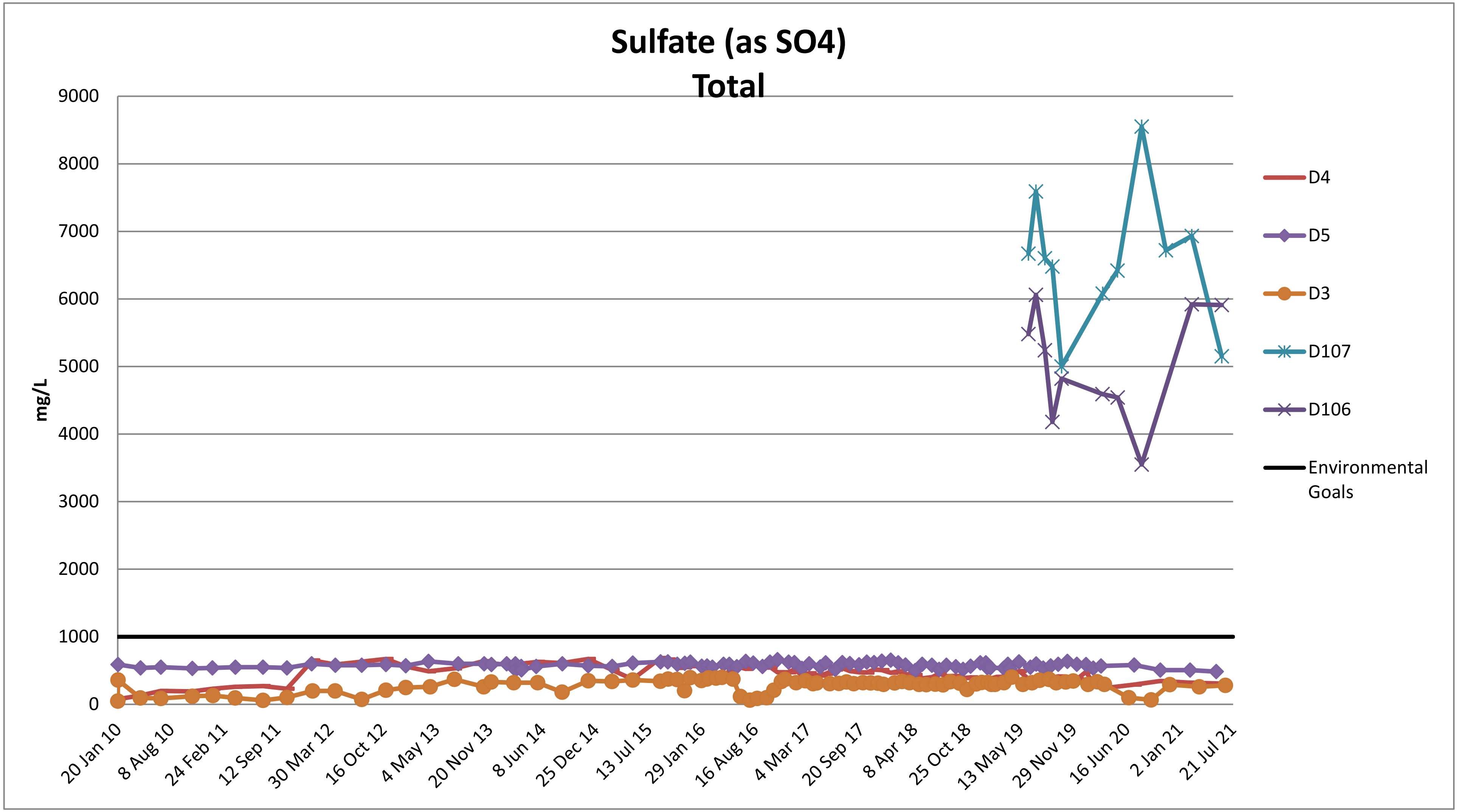

Boron
Filtered
µg/L
1400
1200
1000
800
600
400
200
0
12 Jul 11
28 Jan 12
15 Aug 12
3 Mar 13
19 Sep 13
7 Apr 14
24 Oct 14
12 May 15
28 Nov 15
15 Jun 16
1 Jan 17
20 Jul 17
5 Feb 18
24 Aug 18
12 Mar 19
28 Sep 19
15 Apr 20
1 Nov 20
20 May 21
C
E
G
LMP01
NC01
WX22
Environmental Goals

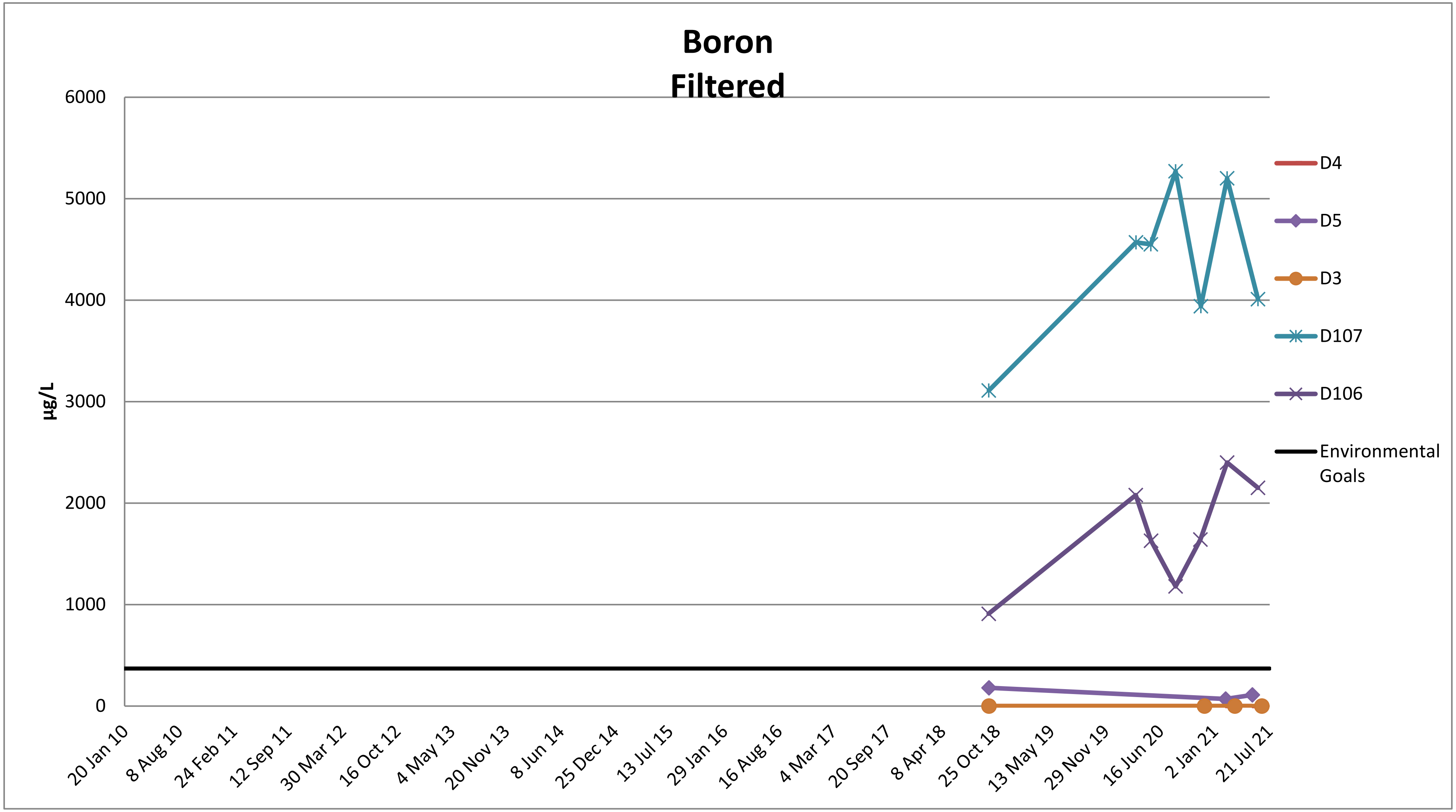
APPENDIX J GROUNDWATER TRENDS

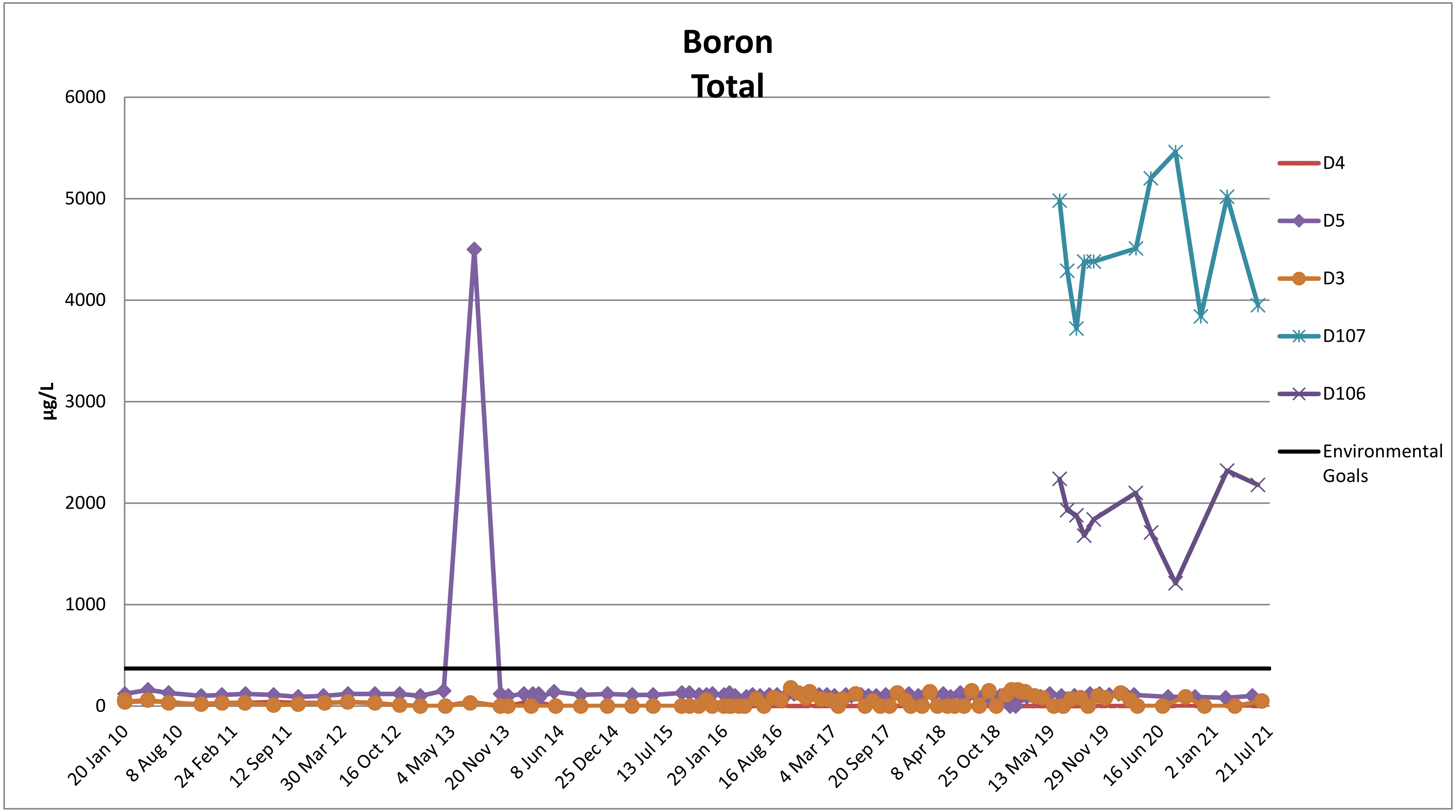

Nickel
Filtered
3000
2500
2000
1500
1000
500
0
µg/L
20 Jan 10
8 Aug 10
24 Feb 11
12 Sep 11
30 Mar 12
16 Oct 12
4 May 13
20 Nov 13
8 Jun 14
25 Dec 14
13 Jul 15
29 Jan 16
16 Aug 16
4 Mar 17
20 Sep 17
8 Apr 18
25 Oct 18
13 May 19
29 Nov 19
16 Jun 20
2 Jan 21
21 Jul 21
D4
D5
D3
D107
D106
Environmental Goals

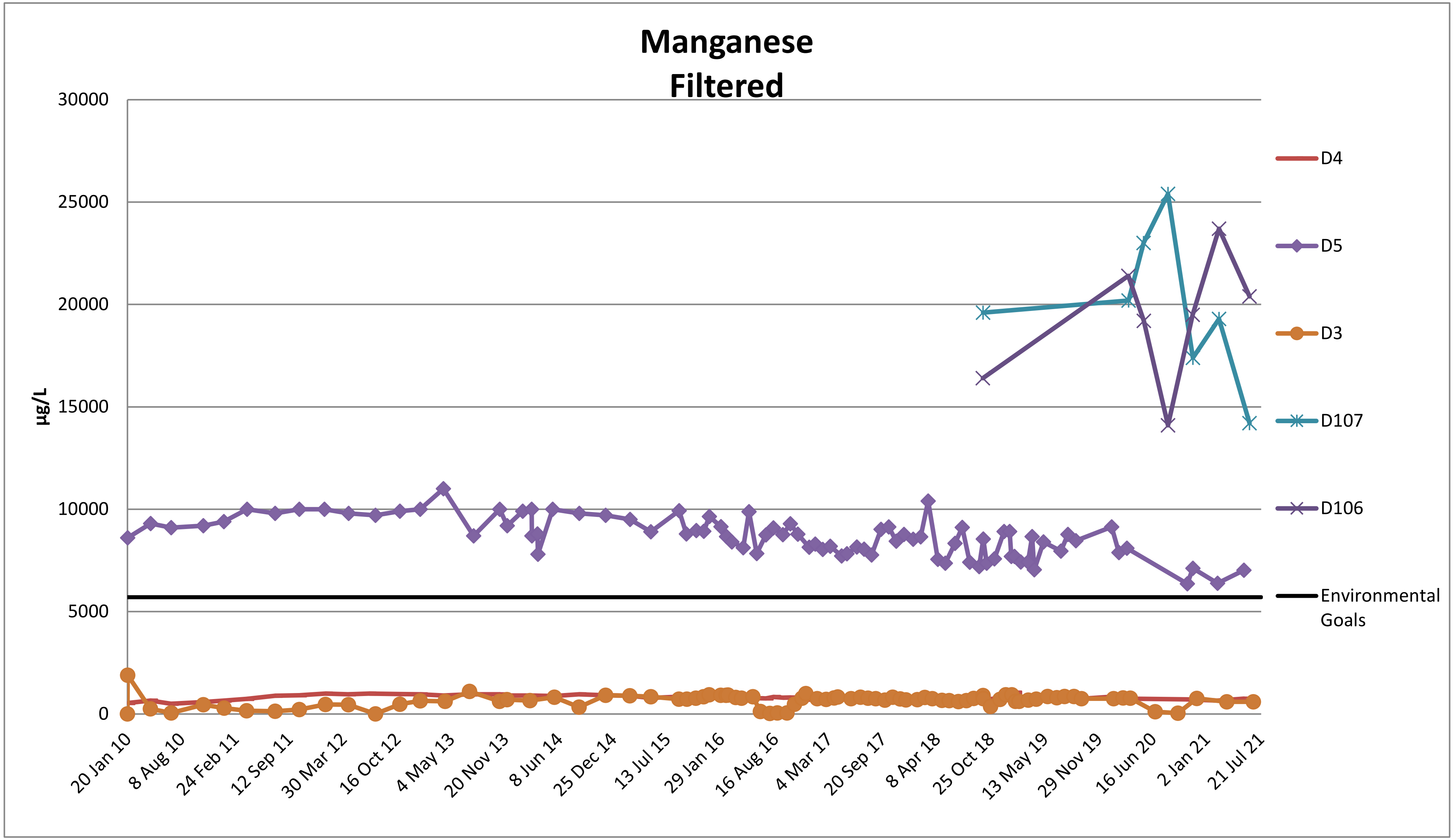

Total Dissolved Solids (TDS)
Total
16000
14000
12000
10000
8000
6000
4000
2000
0
mg/L
20 Jan 10
8 Aug 10
24 Feb 11
12 Sep 11
30 Mar 12
16 Oct 12
4 May 13
20 Nov 13
8 Jun 14
25 Dec 14
13 Jul 15
29 Jan 16
16 Aug 16
4 Mar 17
20 Sep 17
8 Apr 18
25 Oct 18
13 May 19
29 Nov 19
16 Jun 20
2 Jan 21
21 Jul 21
D4
D5
D3
D107
D106
Environmental Goals

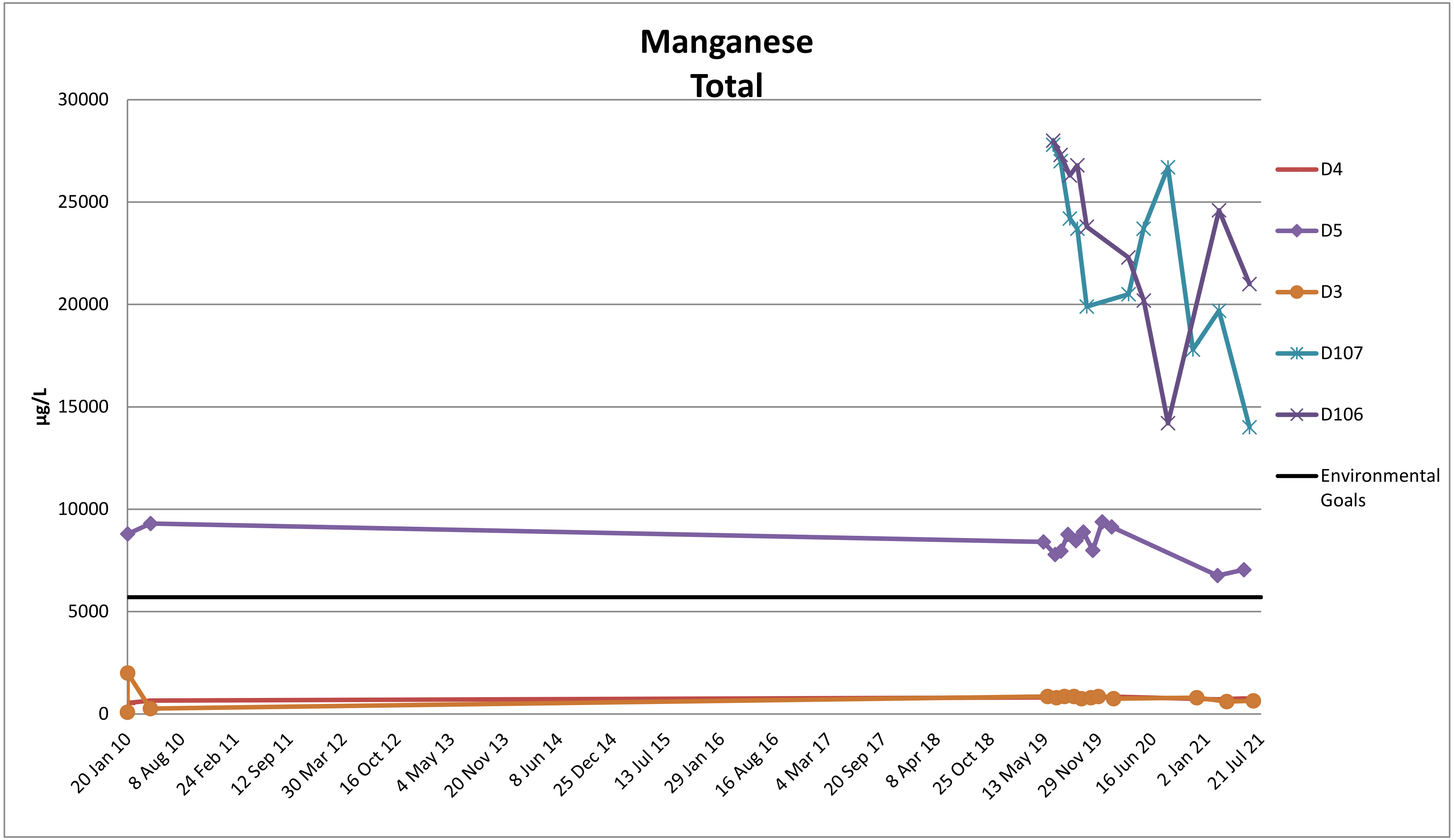

Chloride
Total
mg/L
2500
2000
1500
1000
500
0
20 Jan 10
8 Aug 10
24 Feb 11
12 Sep 11
30 Mar 12
16 Oct 12
4 May 13
20 Nov 13
8 Jun 14
25 Dec 14
13 Jul 15
29 Jan 16
16 Aug 16
4 Mar 17
20 Sep 17
8 Apr 18
25 Oct 18
13 May 19
29 Nov 19
16 Jun 20
2 Jan 21
21 Jul 21
D4
D5
D3
D107
D106
Environmental Goals

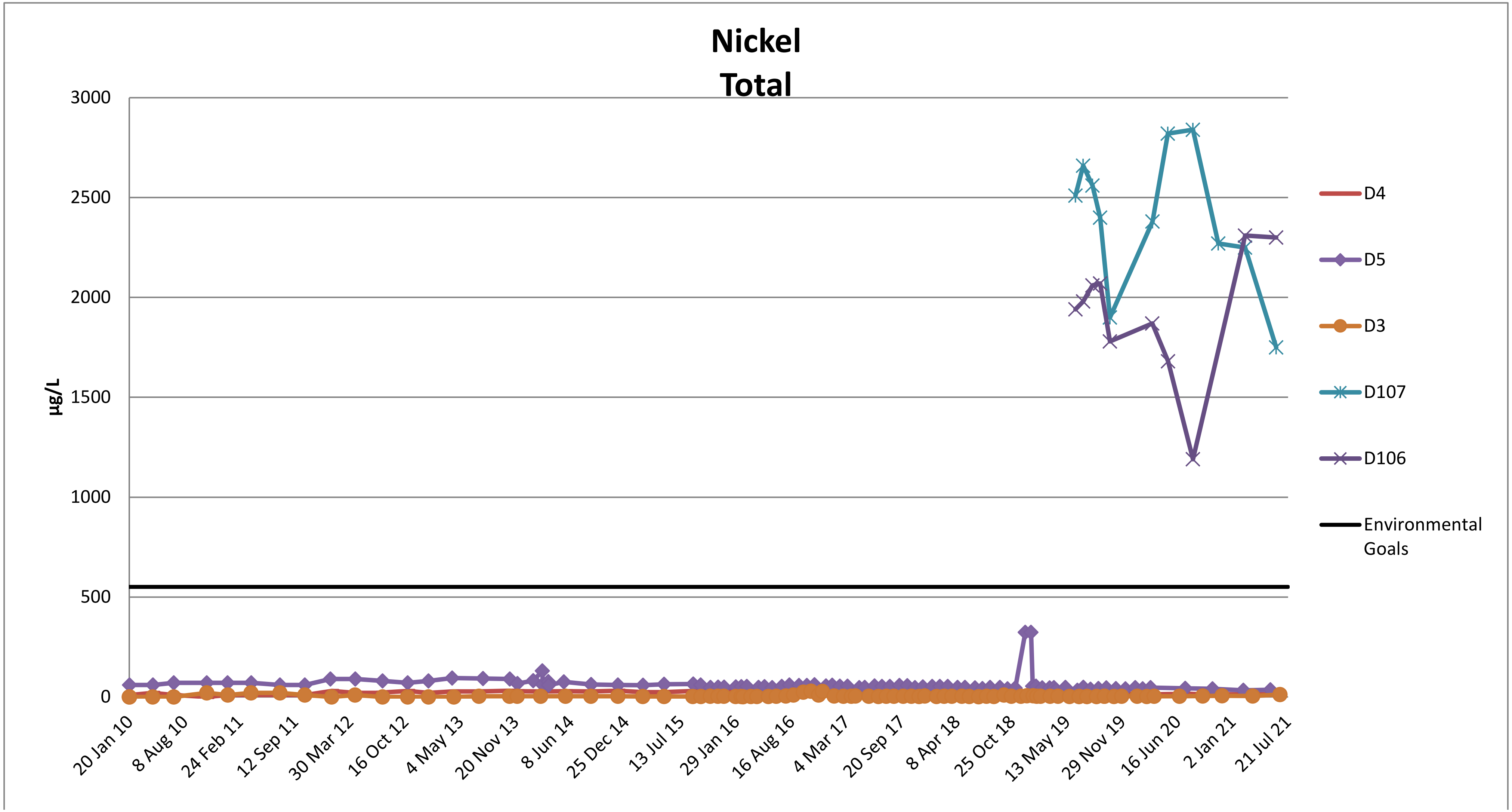

Sulfate (as SO4)
Total
mg/L
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
20 Jan 10
8 Aug 10
24 Feb 11
12 Sep 11
30 Mar 12
16 Oct 12
4 May 13
20 Nov 13
8 Jun 14
25 Dec 14
13 Jul 15
29 Jan 16
16 Aug 16
4 Mar 17
20 Sep 17
8 Apr 18
25 Oct 18
13 May 19
29 Nov 19
16 Jun 20
2 Jan 21
21 Jul 21
D4
D5
D3
D107
D106
Environmental Goals

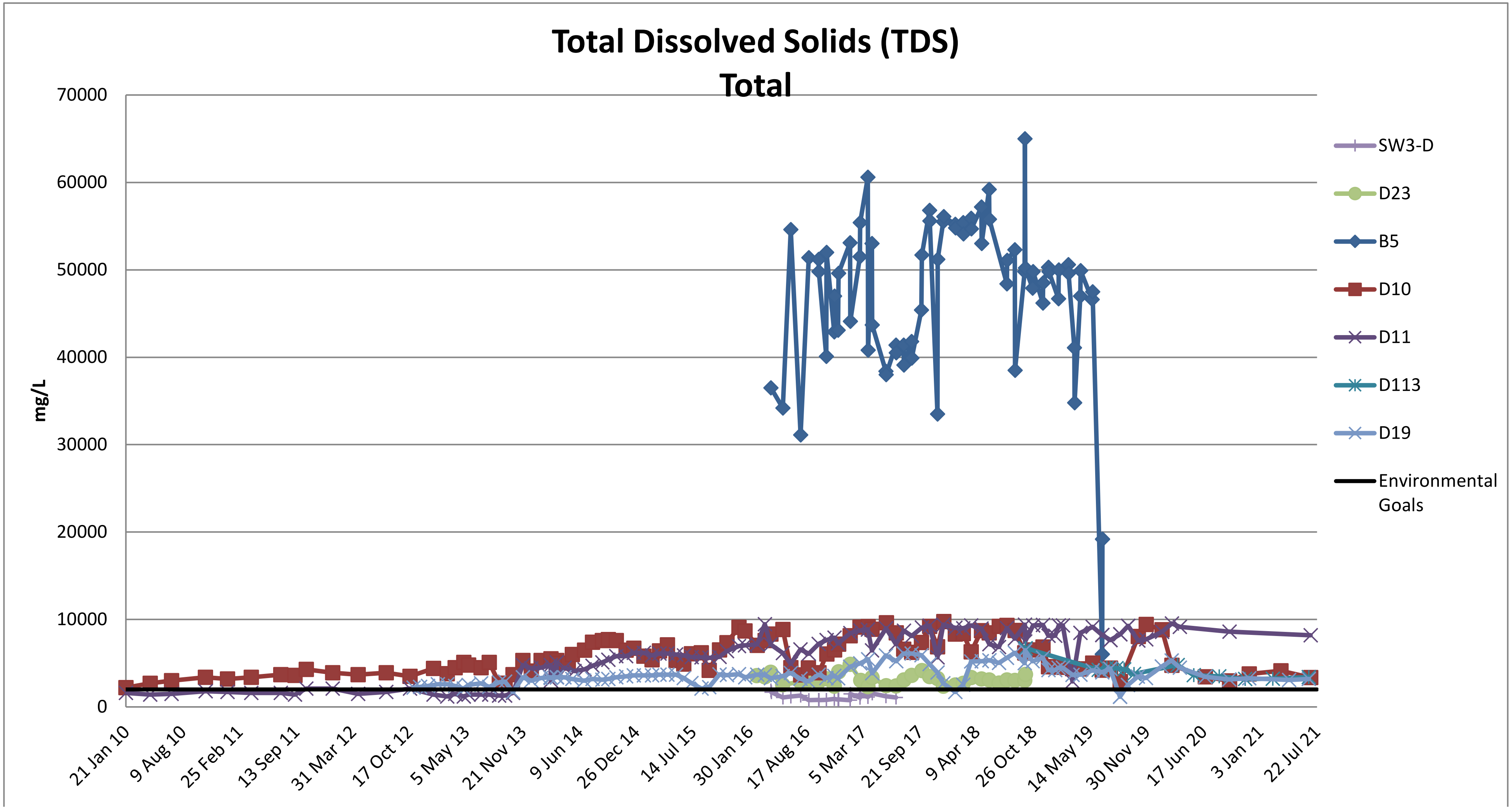

Boron
Filtered
µg/L
6000
5000
4000
3000
2000
1000
0
20 Jan 10
8 Aug 10
24 Feb 11
12 Sep 11
30 Mar 12
16 Oct 12
4 May 13
20 Nov 13
8 Jun 14
25 Dec 14
13 Jul 15
29 Jan 16
16 Aug 16
4 Mar 17
20 Sep 17
8 Apr 18
25 Oct 18
13 May 19
29 Nov 19
16 Jun 20
2 Jan 21
21 Jul 21
D4
D5
D3
D107
D106
Environmental Goals

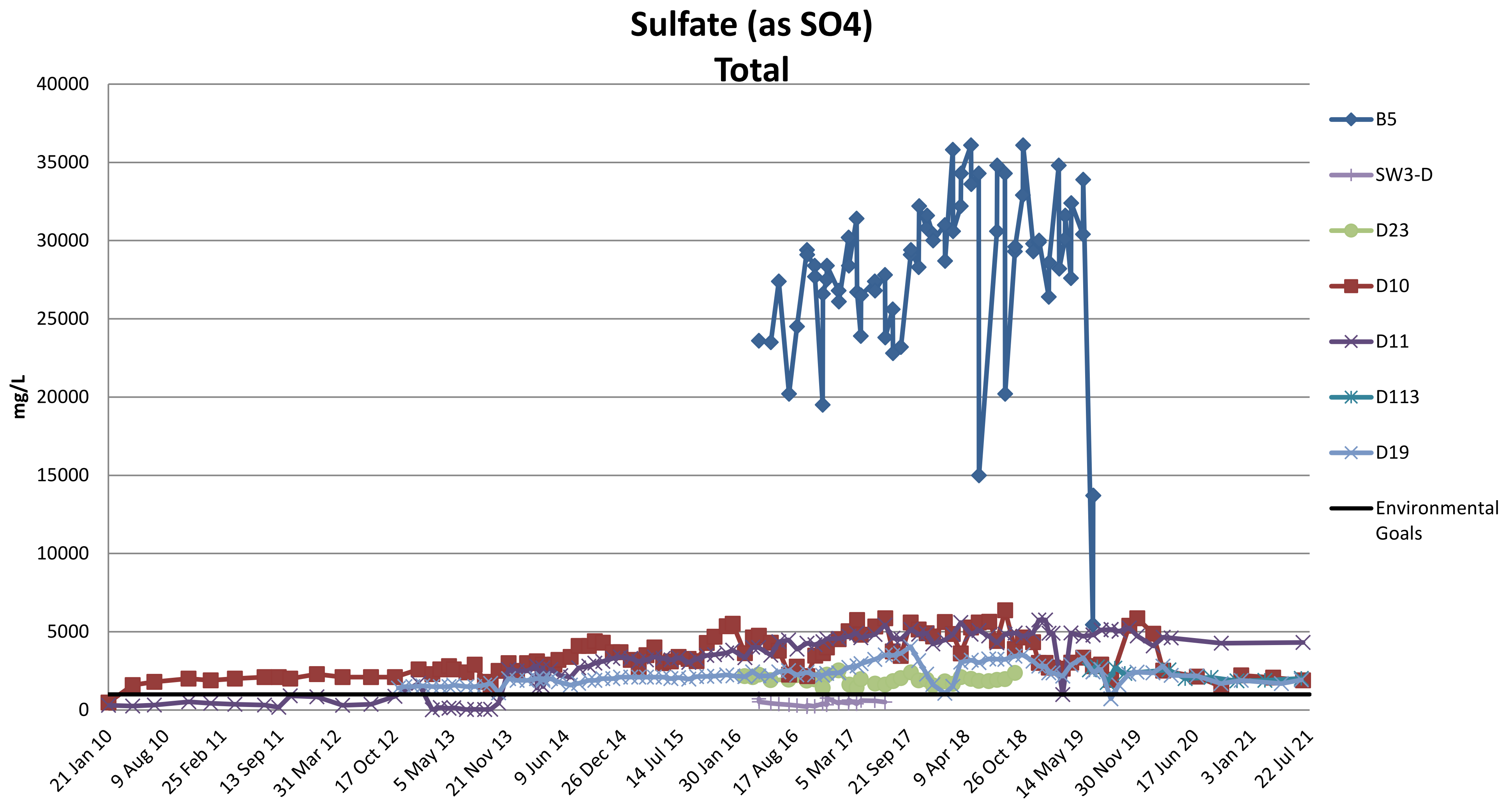

Boron
Total
µg/L
6000
5000
4000
3000
2000
1000
0
20 Jan 10
8 Aug 10
24 Feb 11
12 Sep 11
30 Mar 12
16 Oct 12
4 May 13
20 Nov 13
8 Jun 14
25 Dec 14
13 Jul 15
29 Jan 16
16 Aug 16
4 Mar 17
20 Sep 17
8 Apr 18
25 Oct 18
13 May 19
29 Nov 19
16 Jun 20
2 Jan 21
21 Jul 21
D4
D5
D3
D107
D106
Environmental Goals

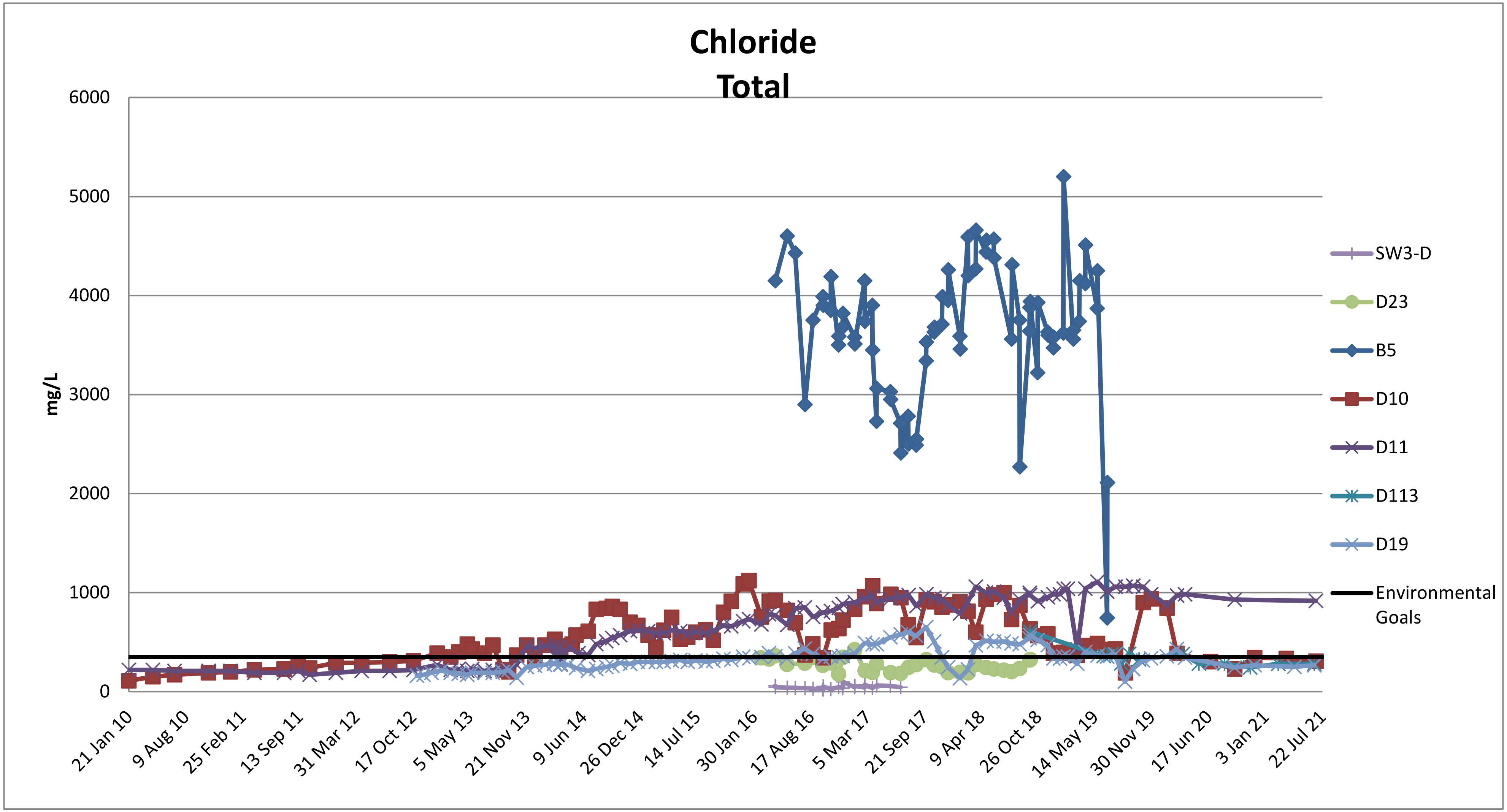

Manganese
Filtered
µg/L
30000
25000
20000
15000
10000
5000
0
20 Jan 10
8 Aug 10
24 Feb 11
12 Sep 11
30 Mar 12
16 Oct 12
4 May 13
20 Nov 13
8 Jun 14
25 Dec 14
13 Jul 15
29 Jan 16
16 Aug 16
4 Mar 17
20 Sep 17
8 Apr 18
25 Oct 18
13 May 19
29 Nov 19
16 Jun 20
2 Jan 21
21 Jul 21
D4
D5
D3
D107
D106
Environmental Goals

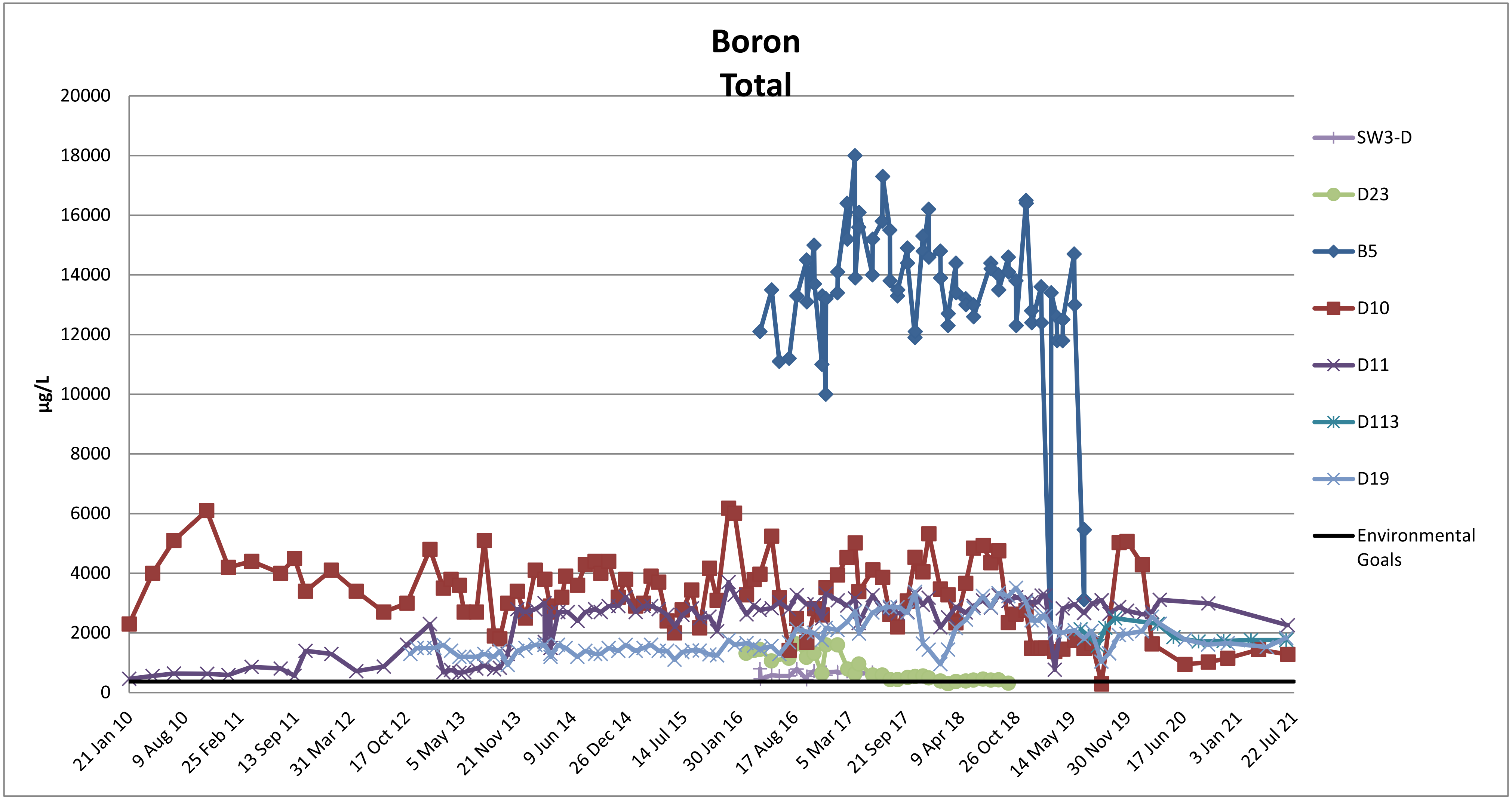

Manganese
Total
µg/L
30000
25000
20000
15000
10000
5000
0
20 Jan 10
8 Aug 10
24 Feb 11
12 Sep 11
30 Mar 12
16 Oct 12
4 May 13
20 Nov 13
8 Jun 14
25 Dec 14
13 Jul 15
29 Jan 16
16 Aug 16
4 Mar 17
20 Sep 17
8 Apr 18
25 Oct 18
13 May 19
29 Nov 19
16 Jun 20
2 Jan 21
21 Jul 21
D4
D5
D3
D107
D106
Environmental Goals

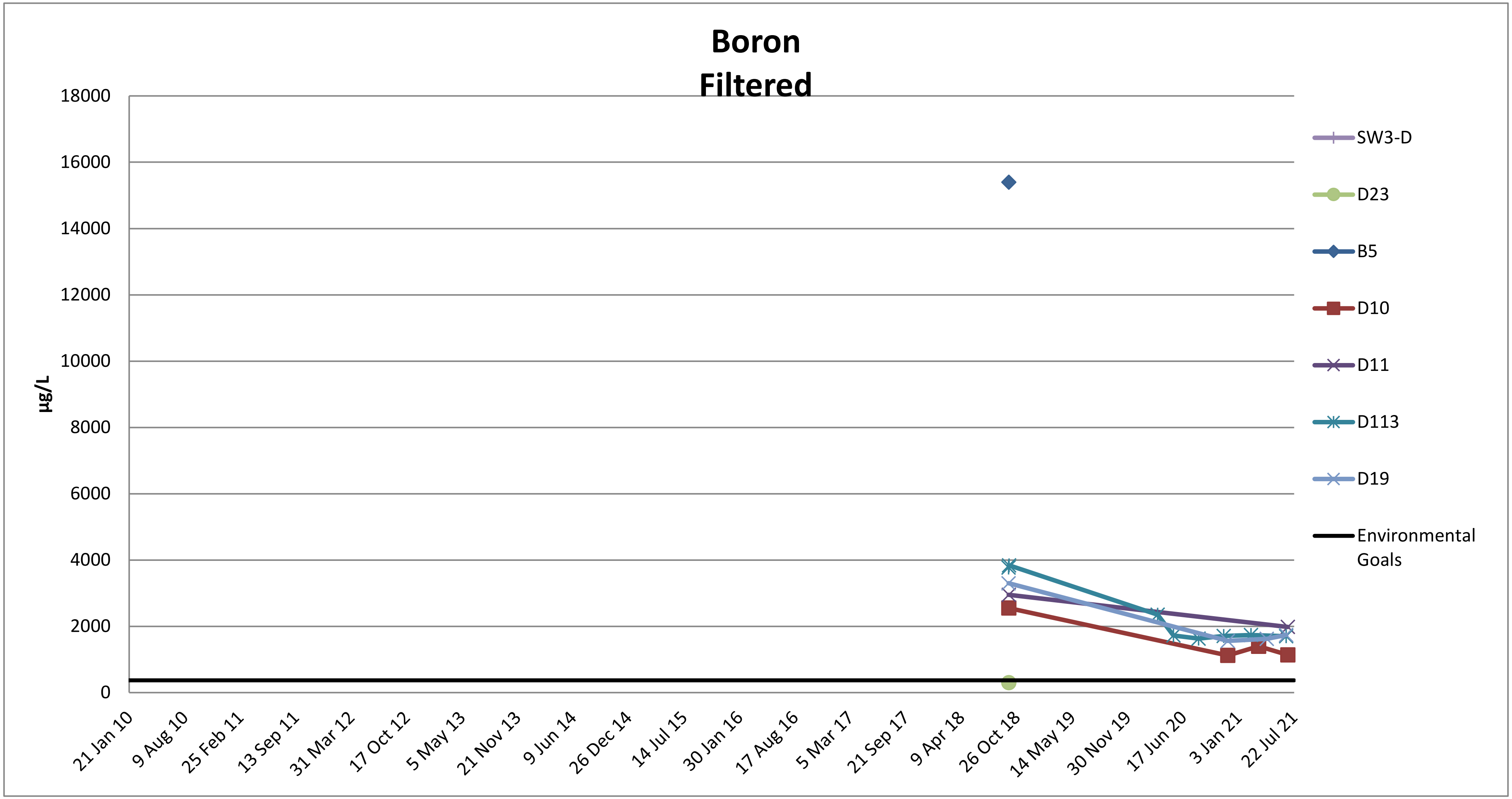

Nickel
Total
µg/L
3000
2500
2000
1500
1000
500
0
20 Jan 10
8 Aug 10
24 Feb 11
12 Sep 11
30 Mar 12
16 Oct 12
4 May 13
20 Nov 13
8 Jun 14
25 Dec 14
13 Jul 15
29 Jan 16
16 Aug 16
4 Mar 17
20 Sep 17
8 Apr 18
25 Oct 18
13 May 19
29 Nov 19
16 Jun 20
2 Jan 21
21 Jul 21
D4
D5
D3
D107
D106
Environmental Goals

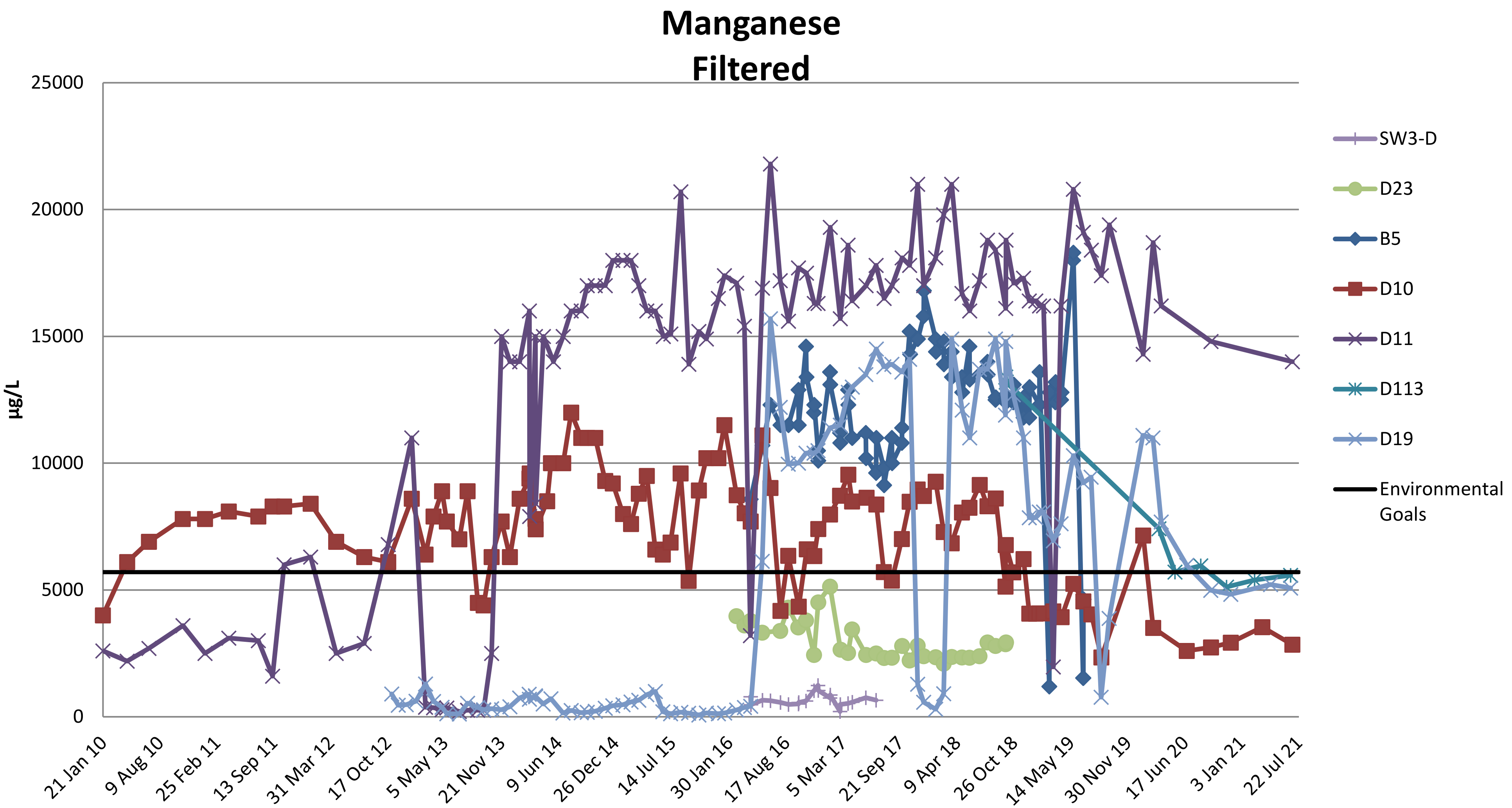

Total Dissolved Solids (TDS)
Total
mg/L
70000
60000
50000
40000
30000
20000
10000
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
SW3-D
D23
B5
D10
D11
D113
D19
Environmental Goals

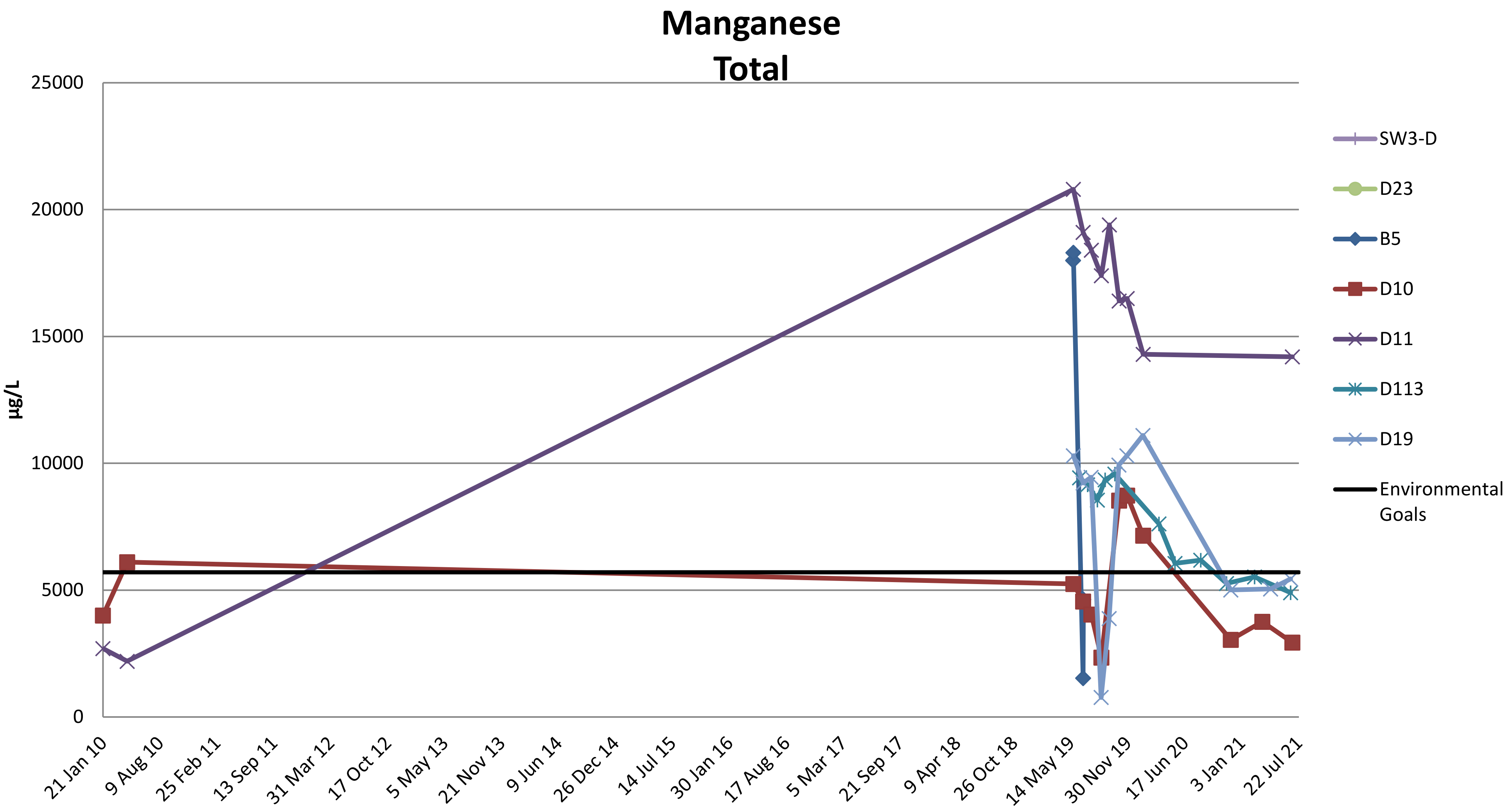

Sulfate (as SO4)
Total
mg/L
40000
35000
30000
25000
20000
15000
10000
5000
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
B5
SW3-D
D23
D10
D11
D113
D19
Environmental Goals

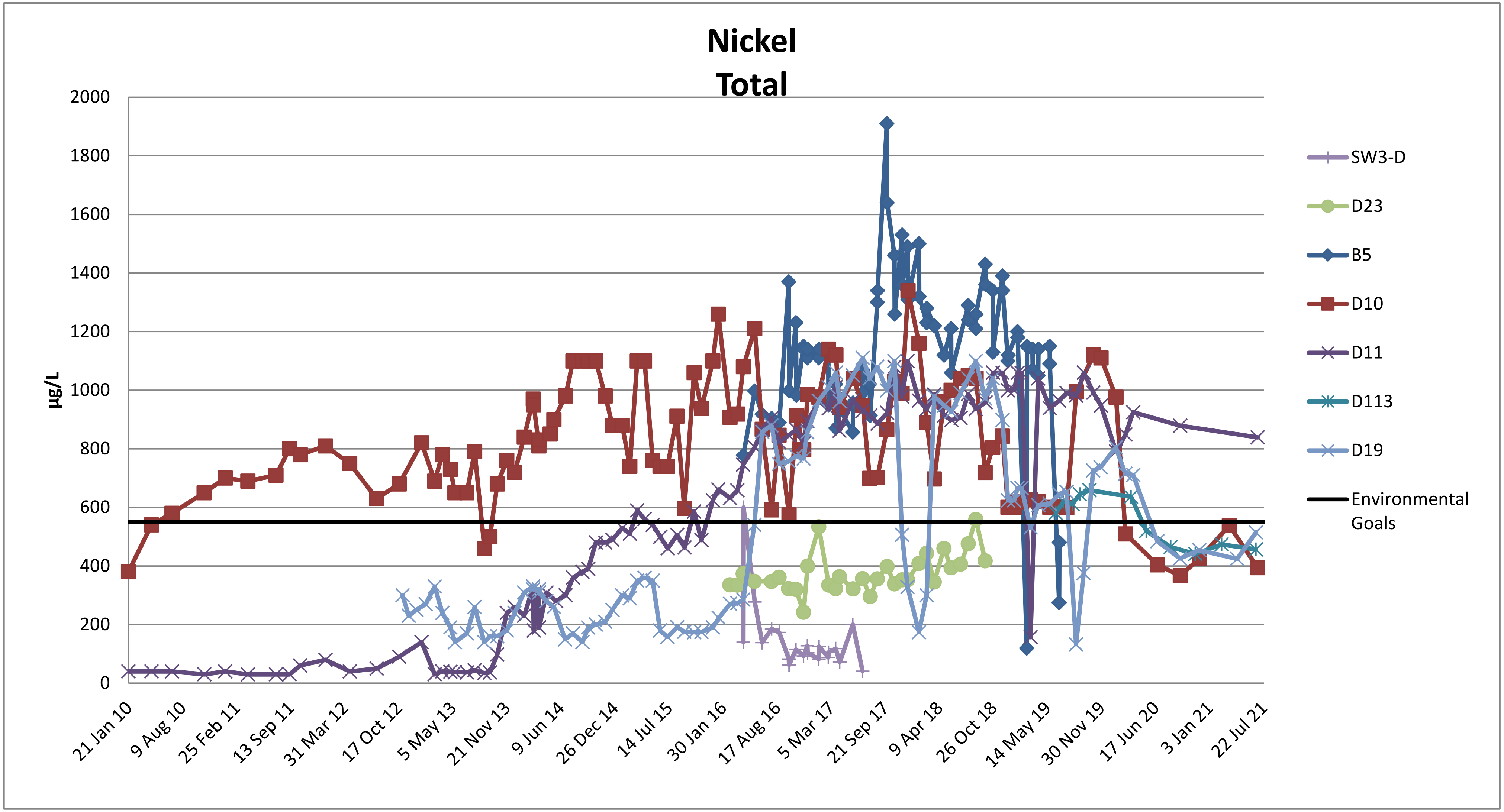

Chloride
Total
mg/L
6000
5000
4000
3000
2000
1000
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
SW3-D
D23
B5
D10
D11
D113
D19
Environmental Goals

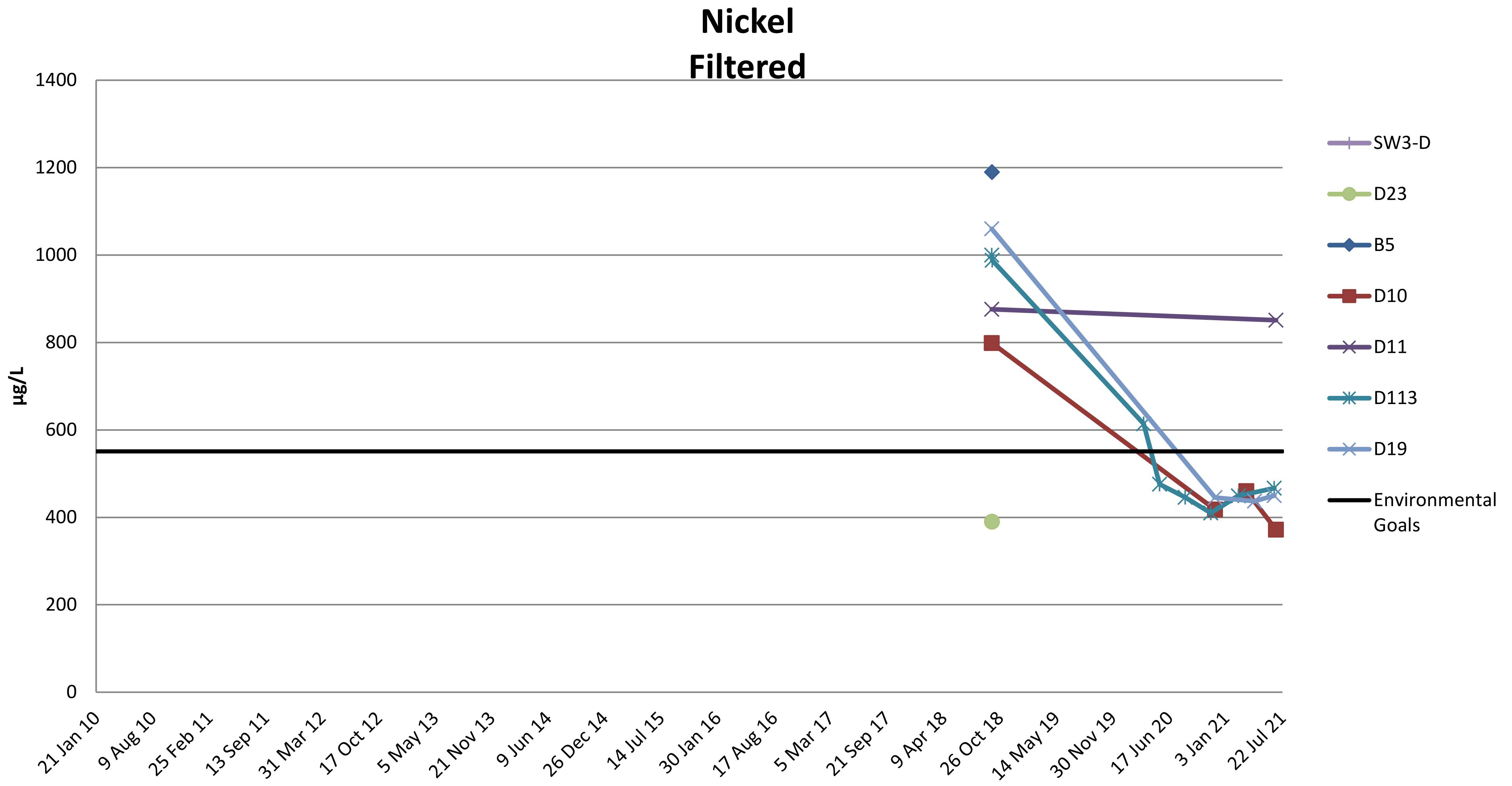

Boron
Total
µg/L
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
SW3-D
D23
B5
D10
D11
D113
D19
Environmental Goals

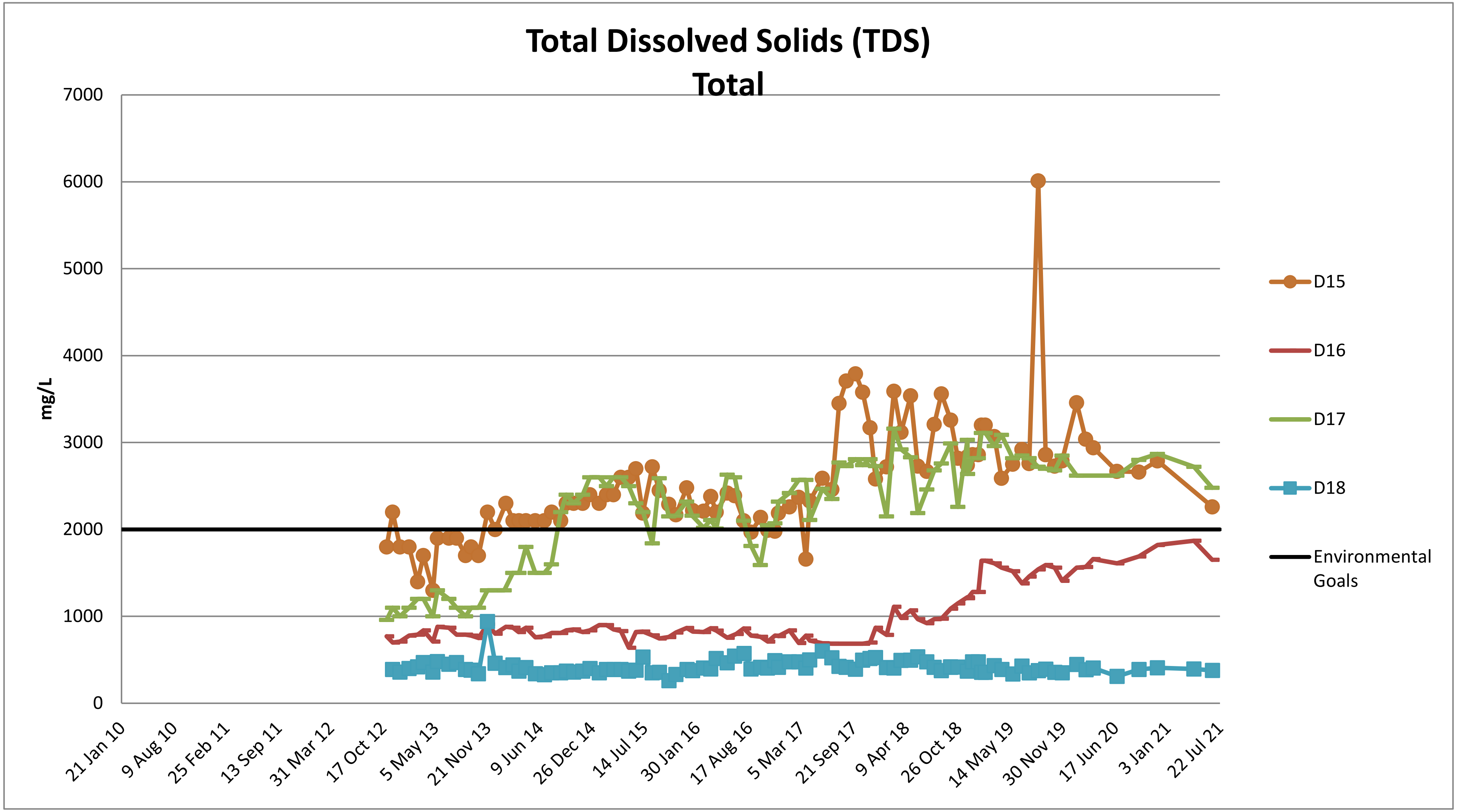

Boron
Filtered
µg/L
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
SW3-D
D23
B5
D10
D11
D113
D19
Environmental Goals

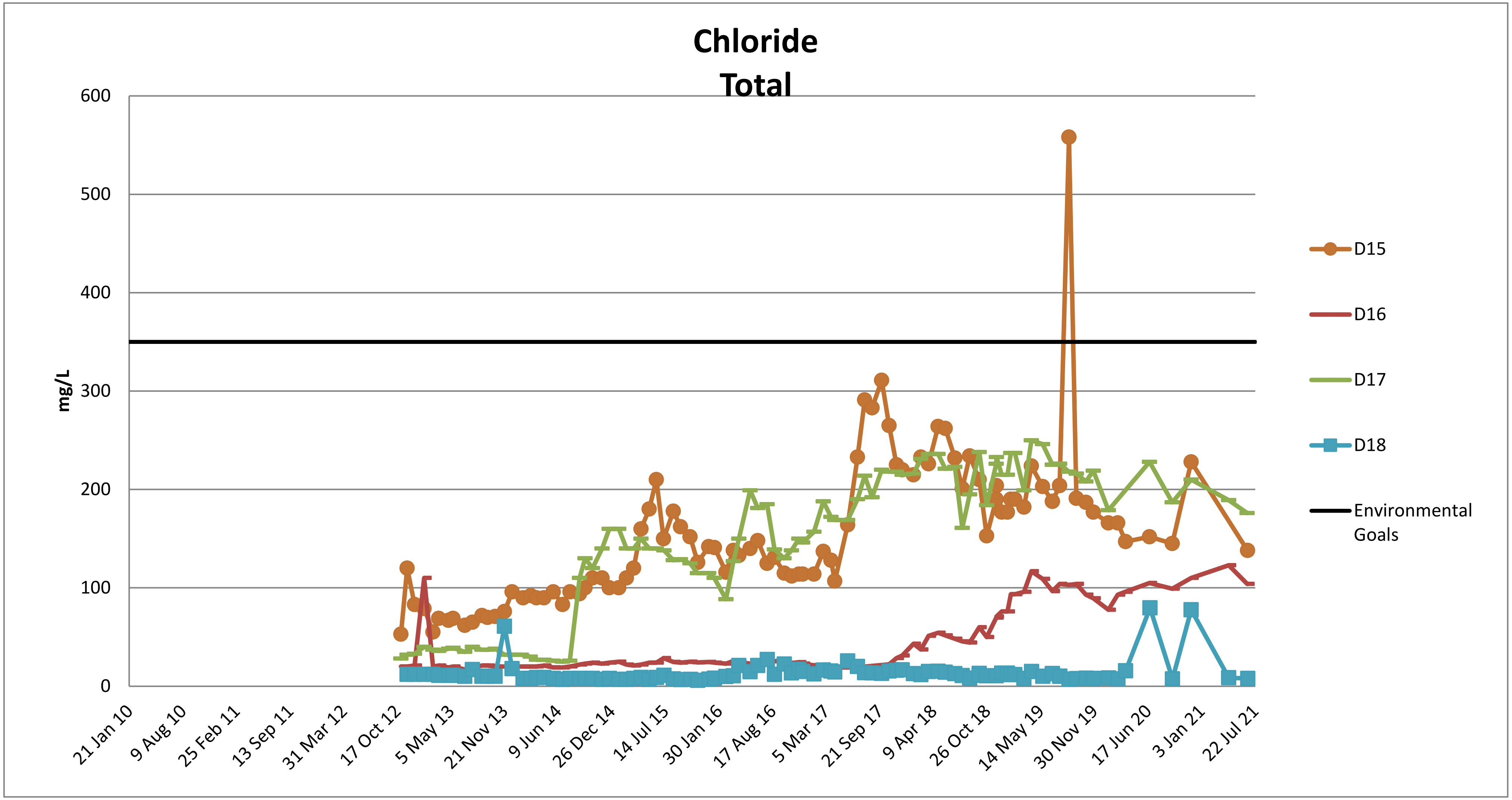

Manganese
Filtered
µg/L
25000
20000
15000
10000
5000
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
SW3-D
D23
B5
D10
D11
D113
D19
Environmental Goals

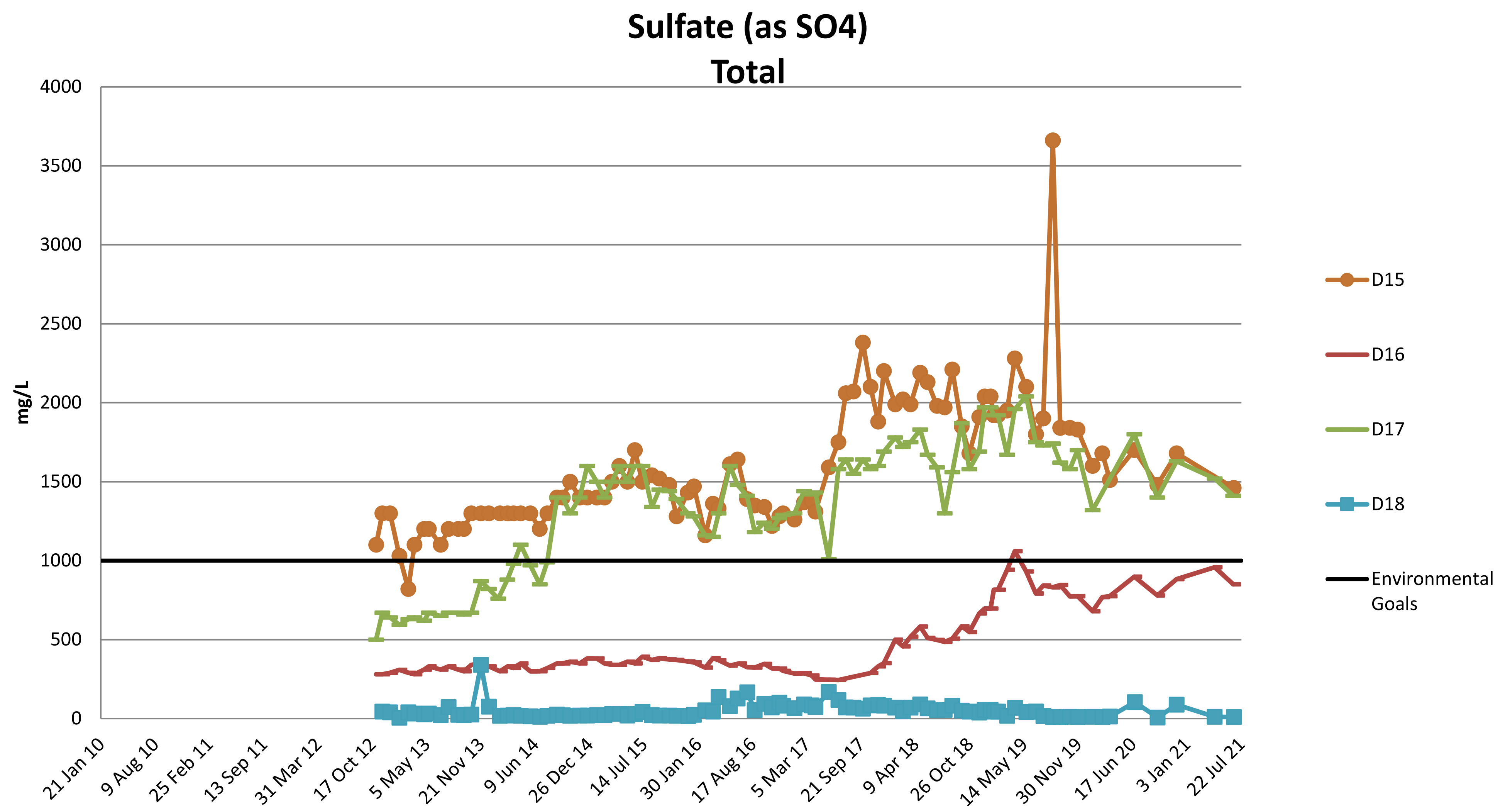

Manganese
Total
µg/L
25000
20000
15000
10000
5000
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
SW3-D
D23
B5
D10
D11
D113
D19
Environmental Goals

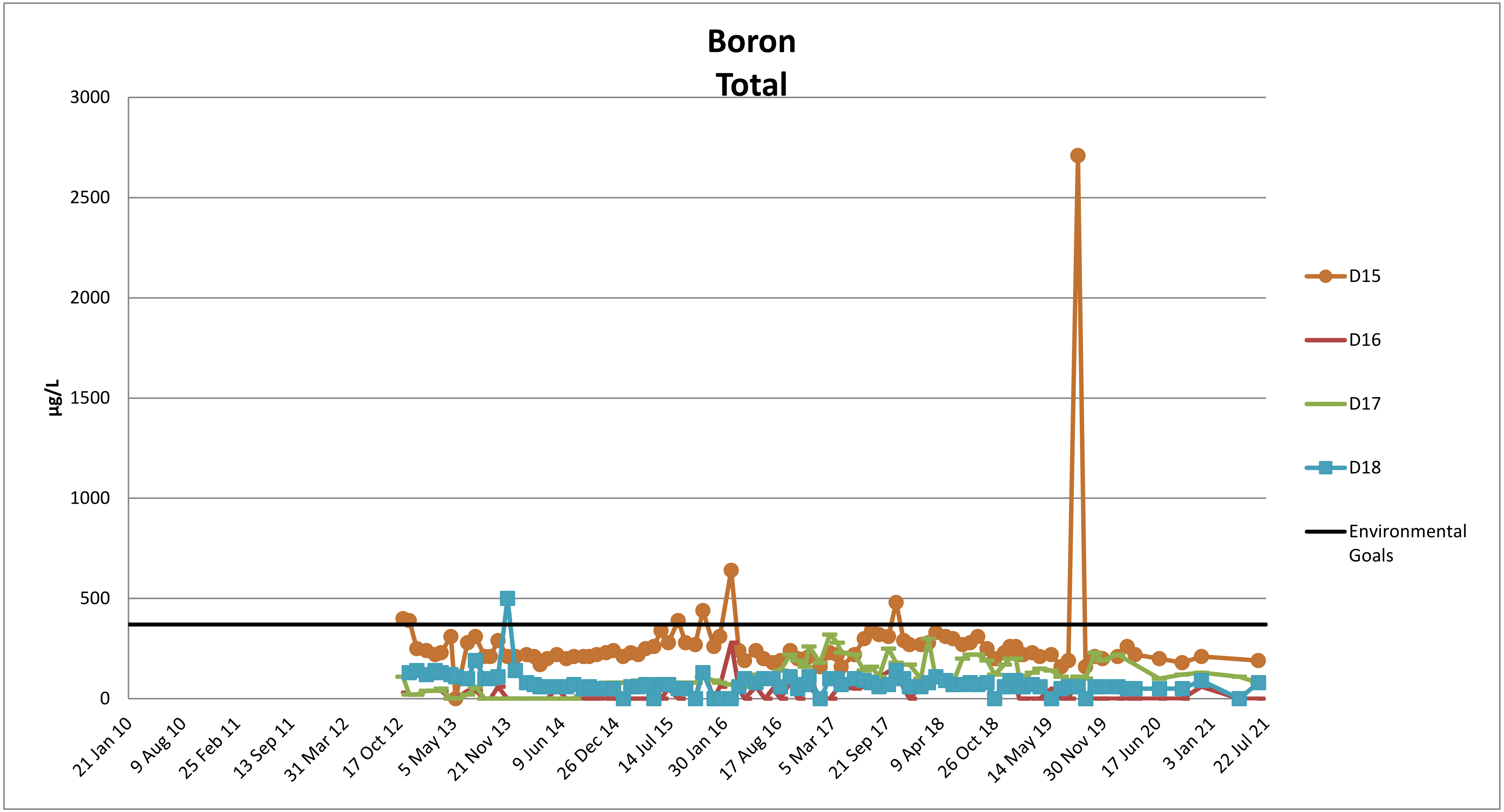

Nickel
Total
µg/L
2000
1800
1600
1400
1200
1000
800
600
400
200
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
SW3-D
D23
B5
D10
D11
D113
D19
Environmental Goals

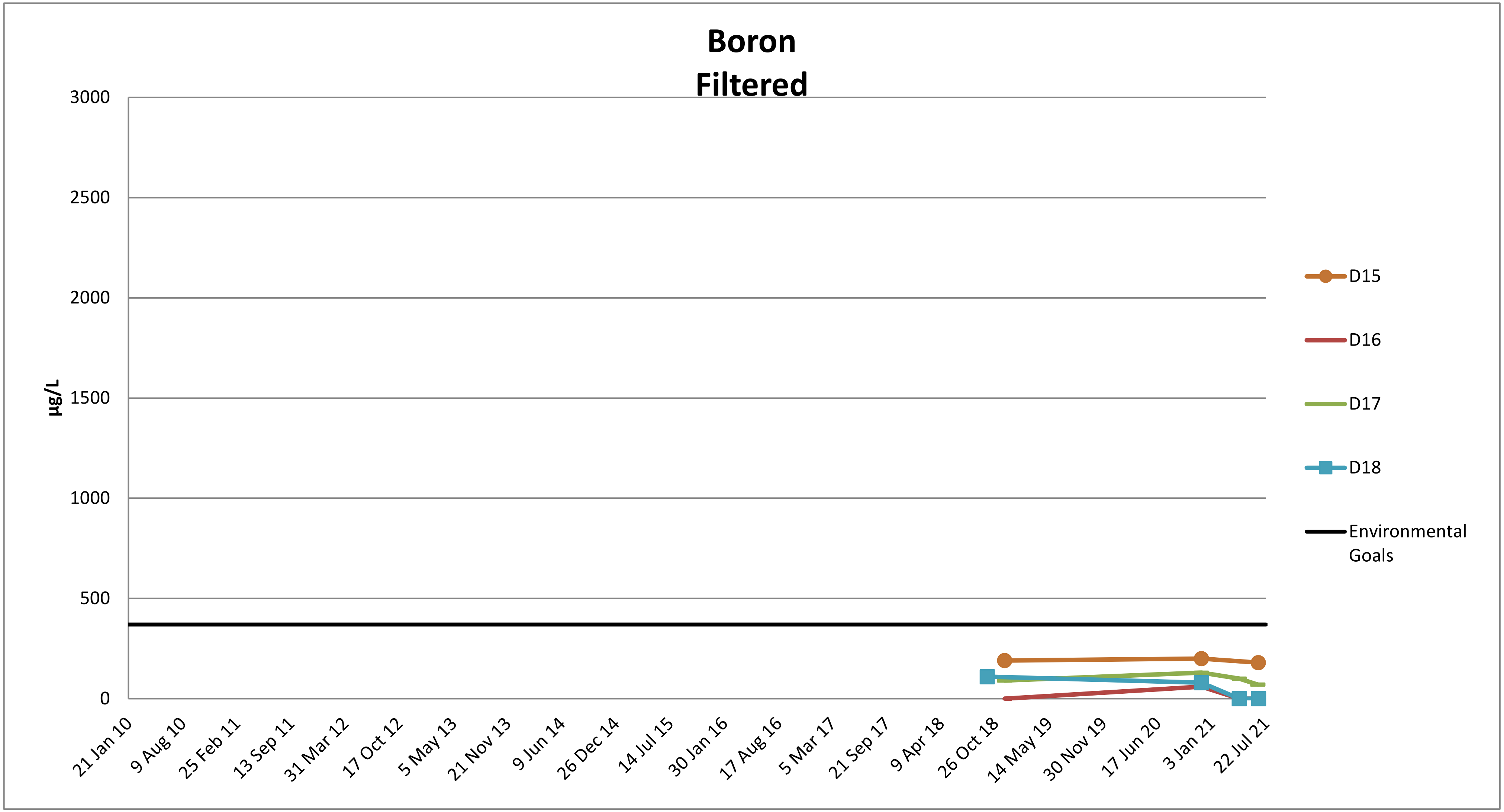

Nickel
Filtered
µg/L
1400
1200
1000
800
600
400
200
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
SW3-D
D23
B5
D10
D11
D113
D19
Environmental Goals

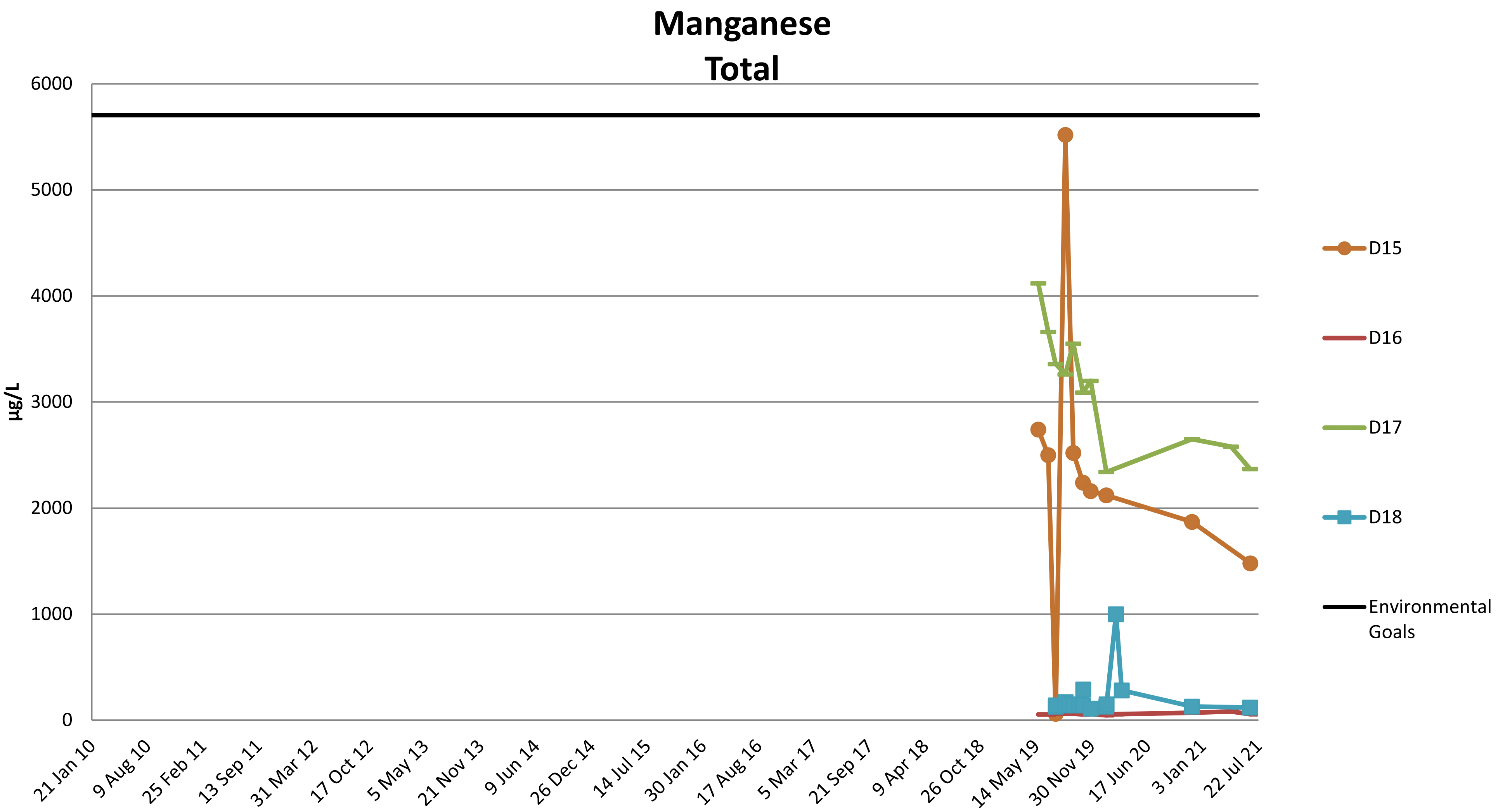

Total Dissolved Solids (TDS)
Total
mg/L
7000
6000
5000
4000
3000
2000
1000
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
D15
D16
D17
D18
Environmental Goals

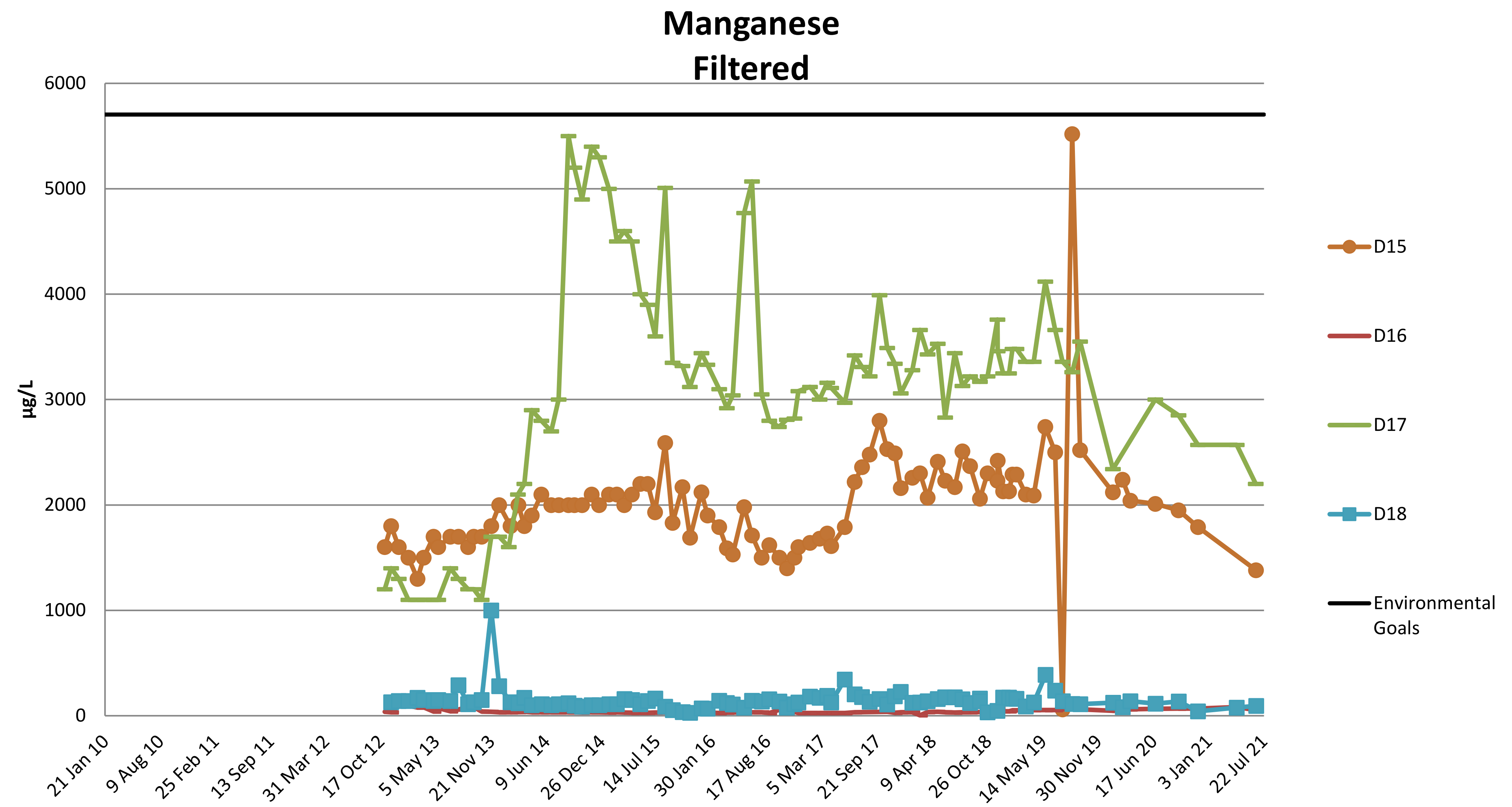

Chloride
Total
mg/L
600
500
400
300
200
100
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
D15
D16
D17
D18
Environmental Goals

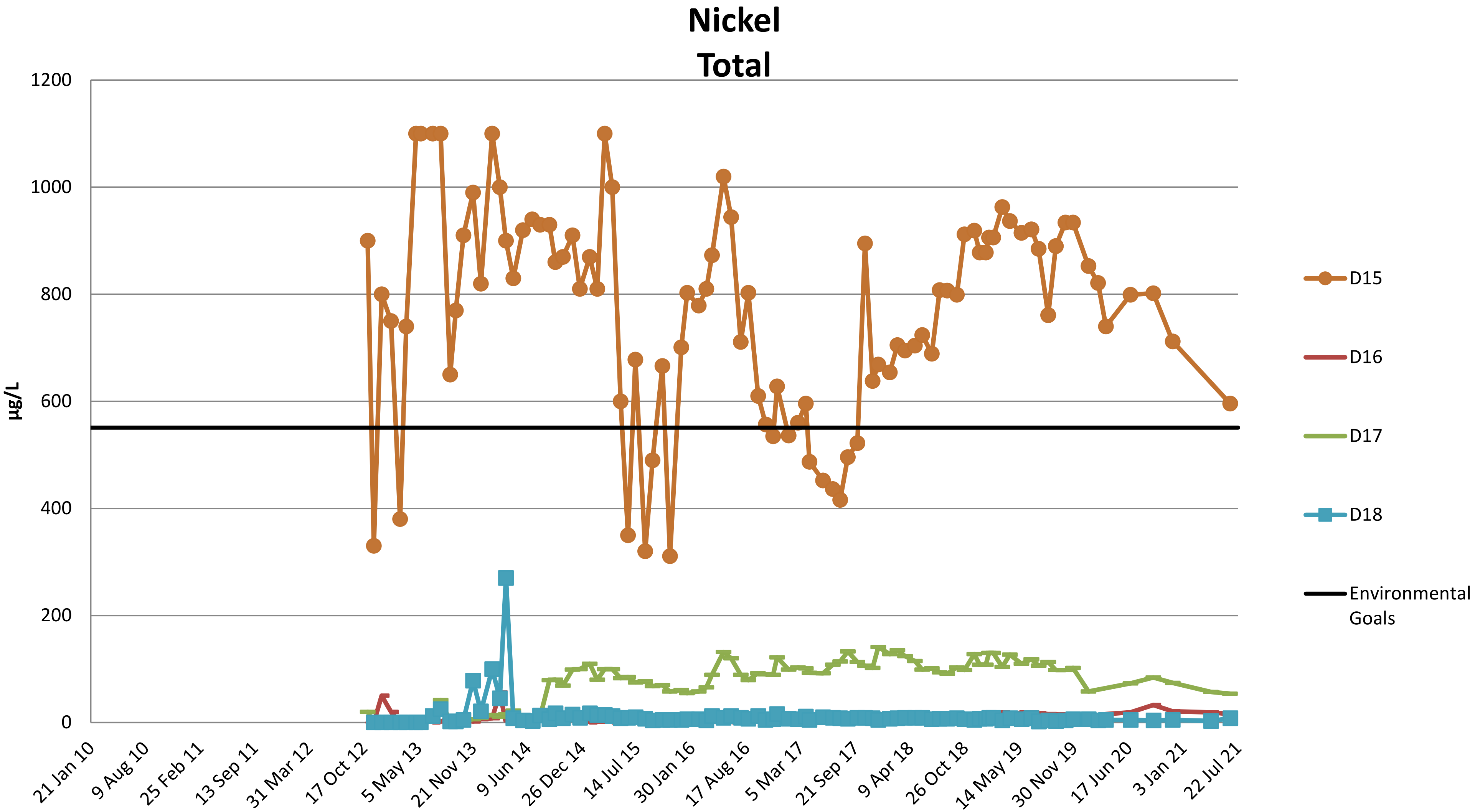

Sulfate (as SO4)
Total
mg/L
4000
3500
3000
2500
2000
1500
1000
500
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
D15
D16
D17
D18
Environmental Goals

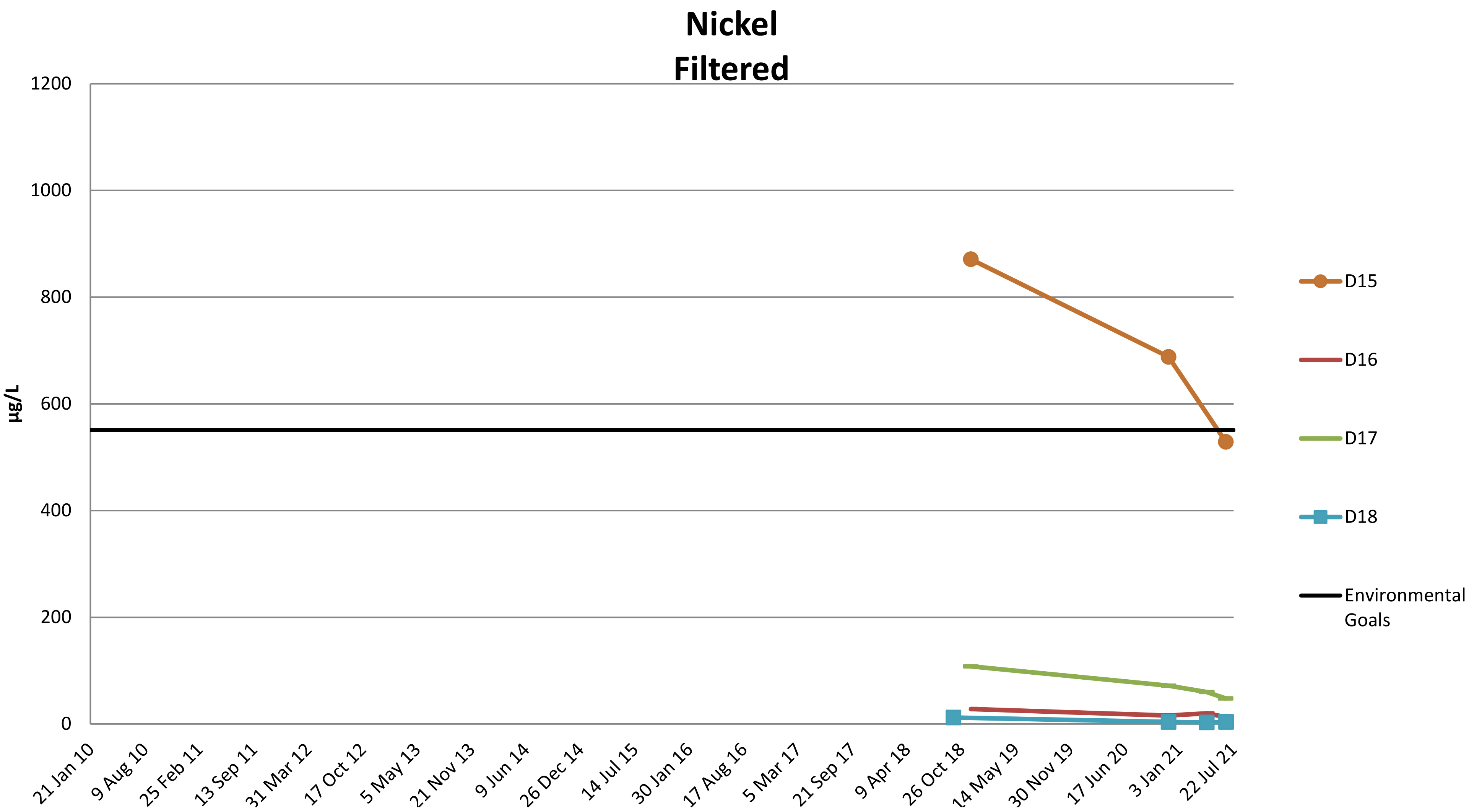

Boron
Total
µg/L
3000
2500
2000
1500
1000
500
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
D15
D16
D17
D18
Environmental Goals

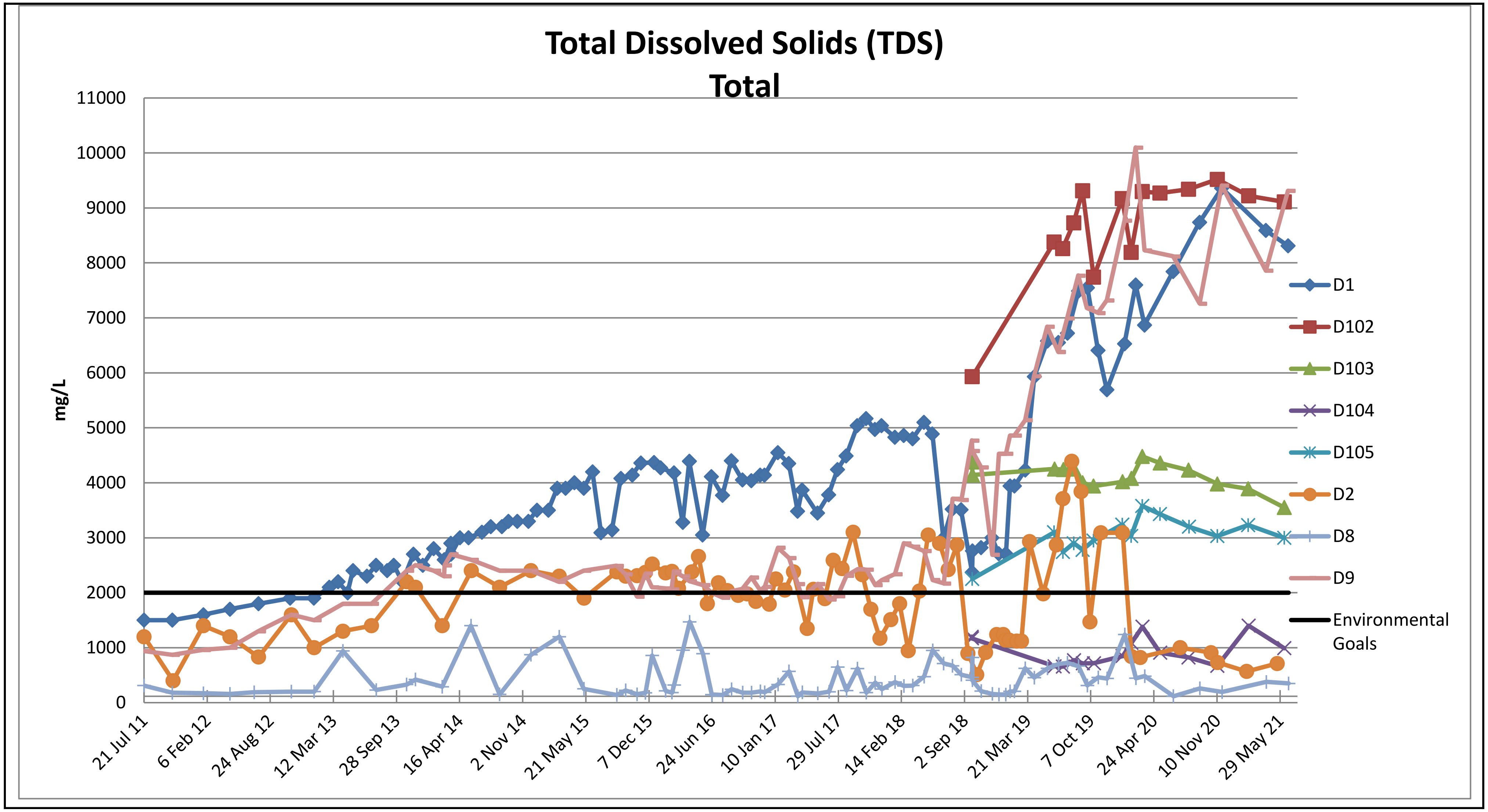

Boron
Filtered
µg/L
3000
2500
2000
1500
1000
500
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
D15
D16
D17
D18
Environmental Goals

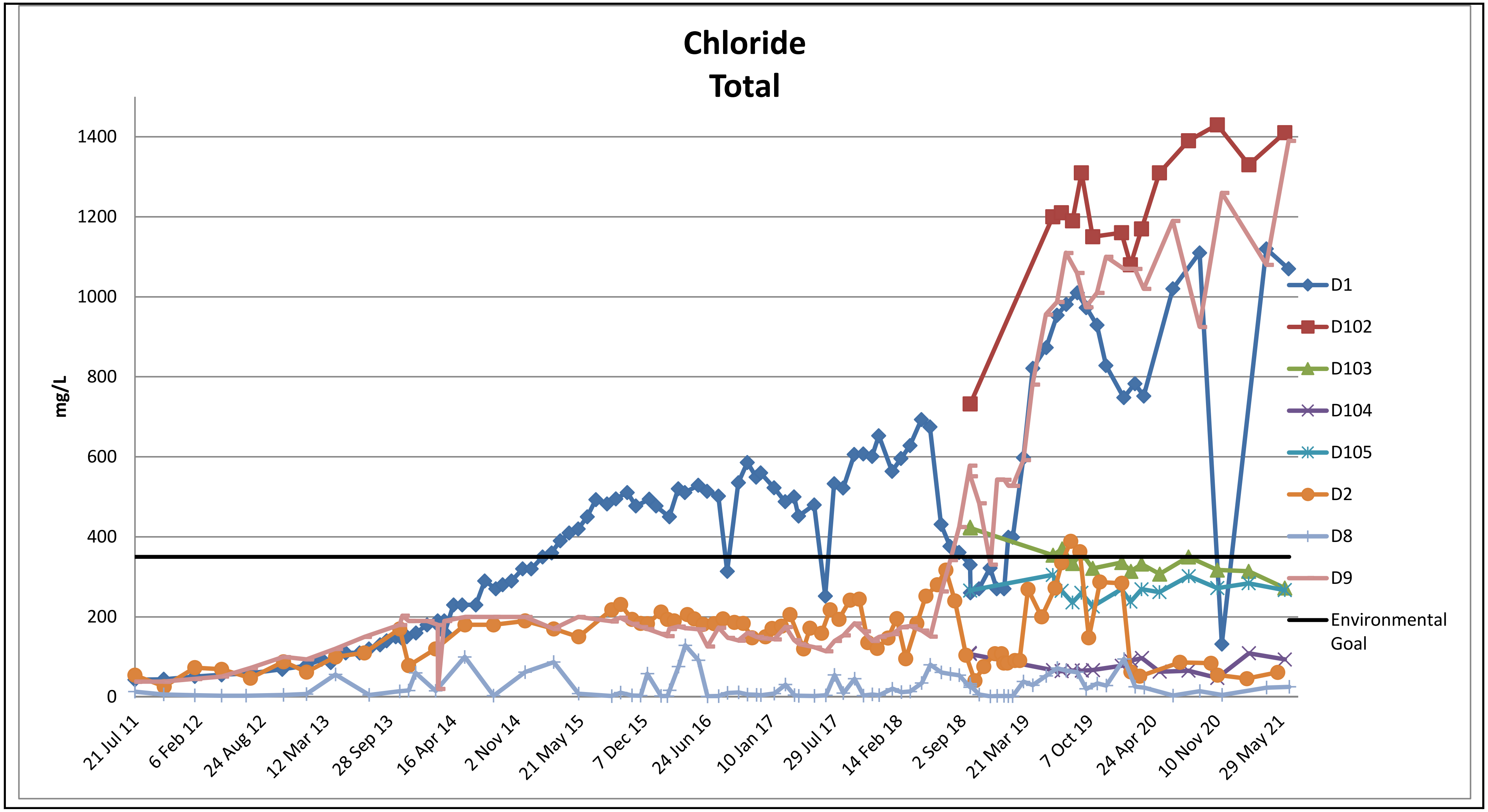

Manganese
Total
µg/L
6000
5000
4000
3000
2000
1000
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
D15
D16
D17
D18
Environmental Goals

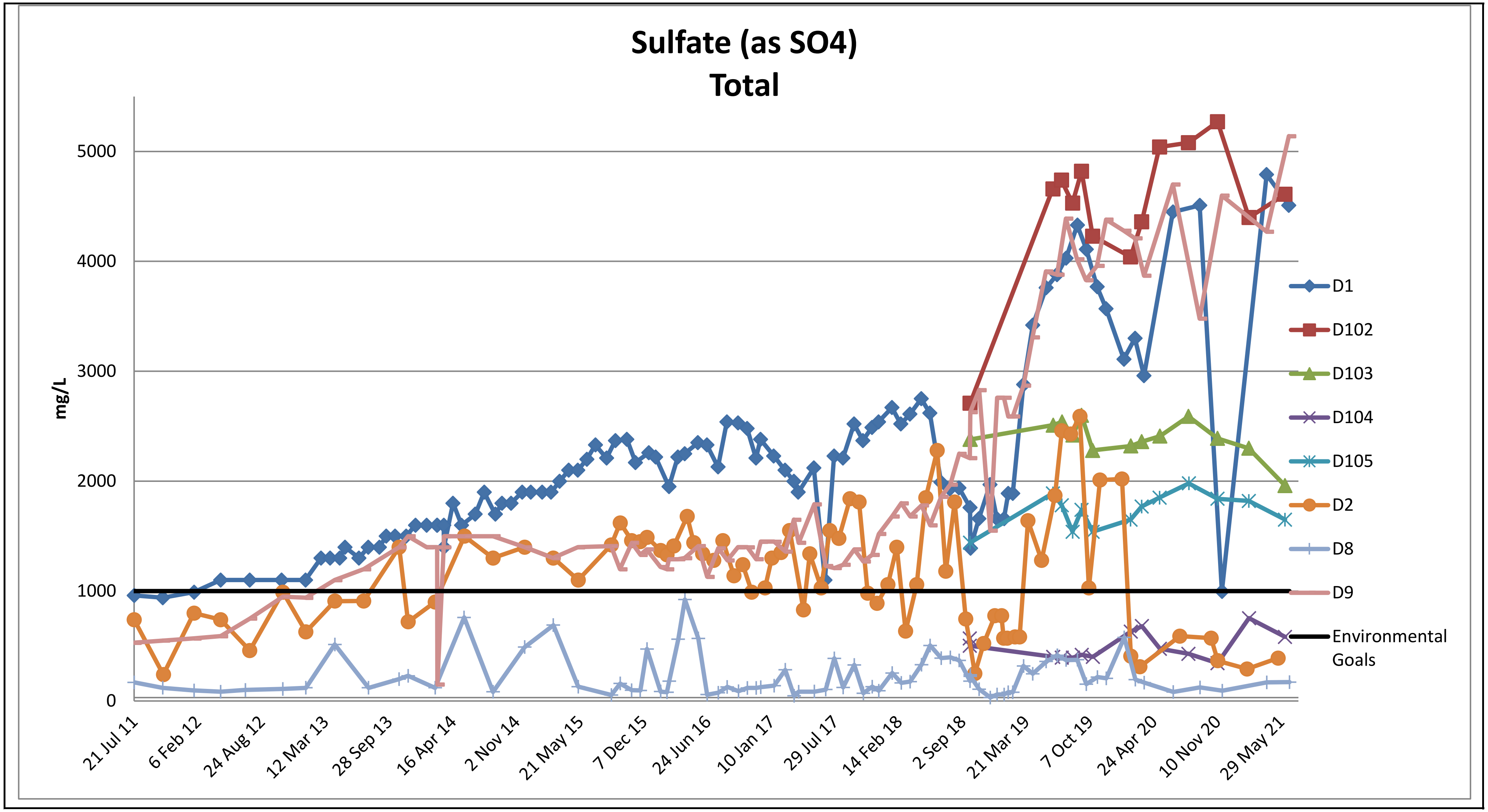

Manganese
Filtered
µg/L
6000
5000
4000
3000
2000
1000
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
D15
D16
D17
D18
Environmental Goals

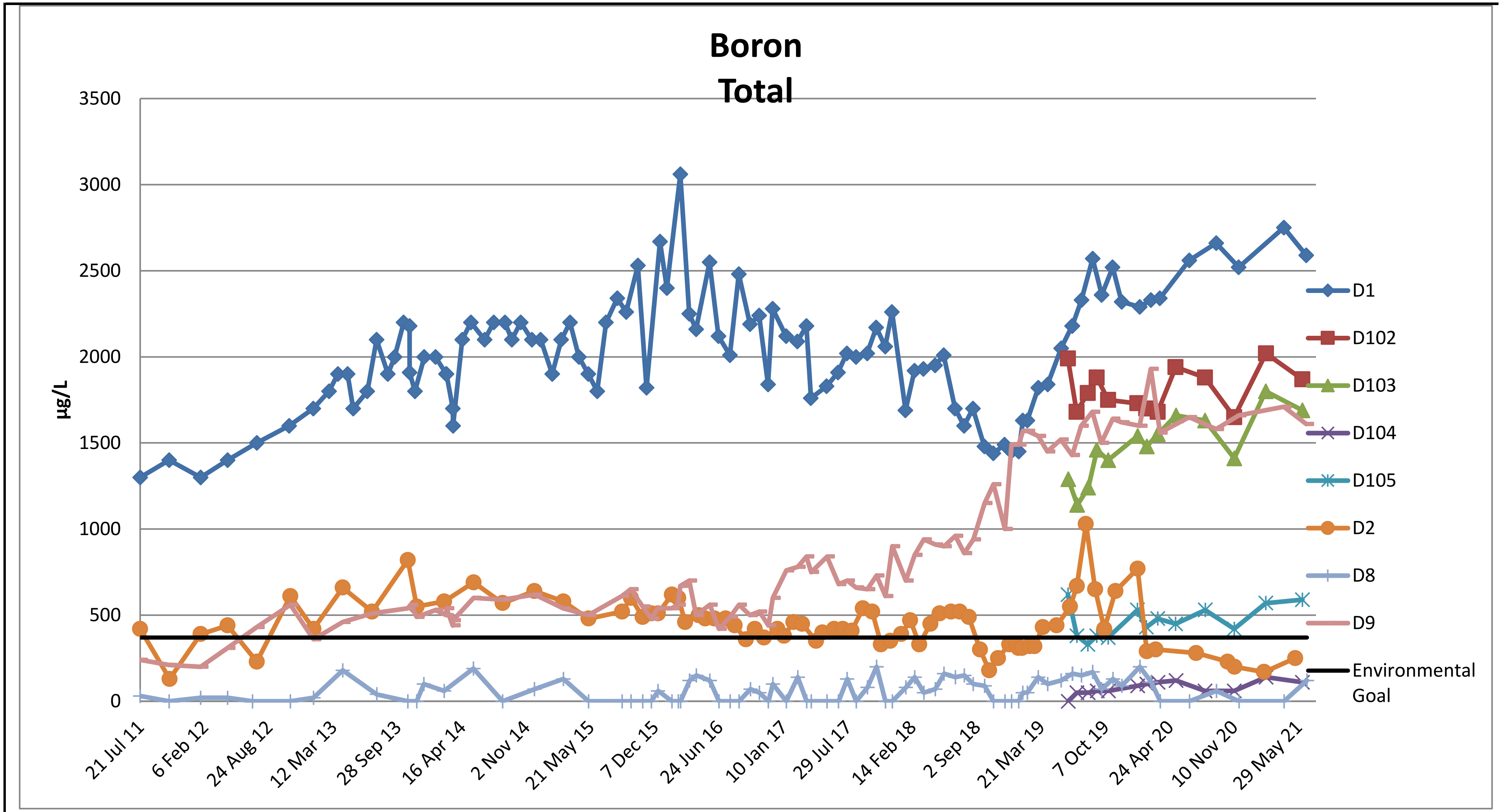

Nickel
Total
1200
1000
800
600
400
200
0
µg/L
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
D15
D16
D17
D18
Environmental Goals

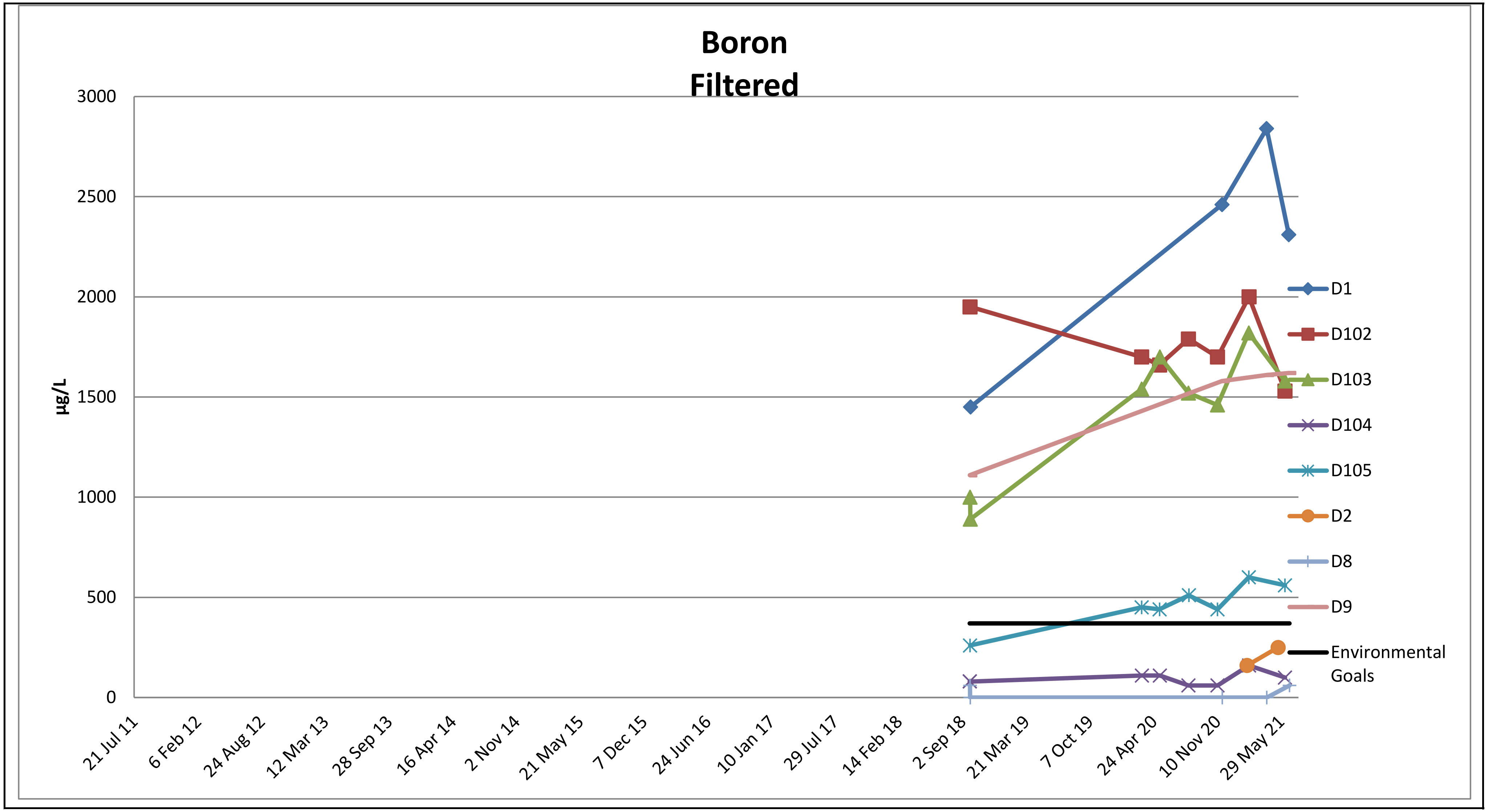

Nickel
Filtered
μg/L
1200
1000
800
600
400
200
0
21 Jan 10
9 Aug 10
25 Feb 11
13 Sep 11
31 Mar 12
17 Oct 12
5 May 13
21 Nov 13
9 Jun 14
26 Dec 14
14 Jul 15
30 Jan 16
17 Aug 16
5 Mar 17
21 Sep 17
9 Apr 18
26 Oct 18
14 May 19
30 Nov 19
17 Jun 20
3 Jan 21
22 Jul 21
D15
D16
D17
D18
Environmental Goals

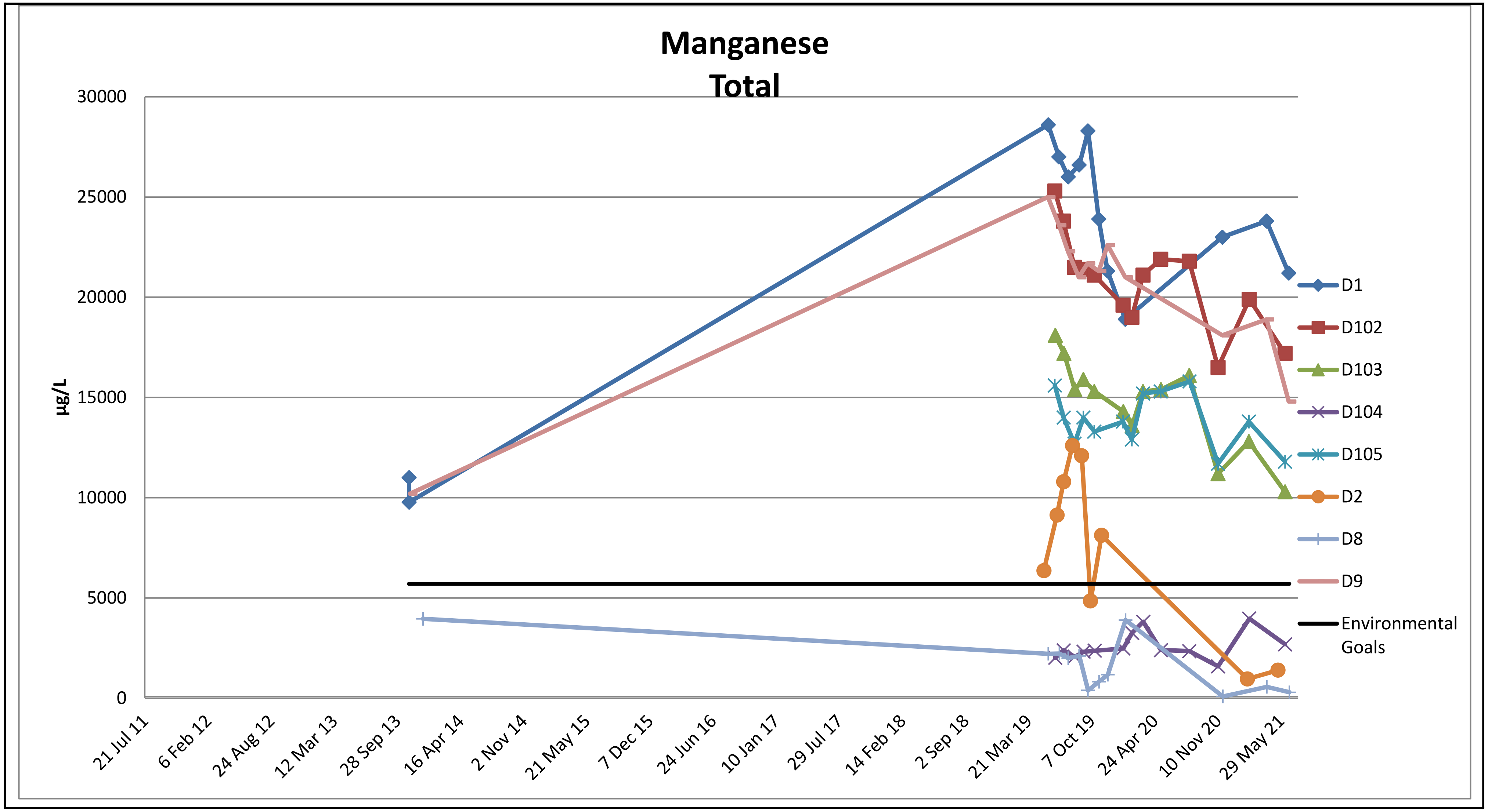

Total Dissolved Solids (TDS)
Total
mg/L
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
21 Jul 11
6 Feb 12
24 Aug 12
12 Mar 13
28 Sep 13
16 Apr 14
2 Nov 14
21 May 15
7 Dec 15
24 Jun 16
10 Jan 17
29 Jul 17
14 Feb 18
2 Sep 18
21 Mar 19
7 Oct 19
24 Apr 20
10 Nov 20
29 May 21
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goals


Chloride
Total
mg/L
1400
1200
1000
800
600
400
200
0
21 Jul 11
6 Feb 12
24 Aug 12
12 Mar 13
28 Sep 13
16 Apr 14
2 Nov 14
21 May 15
7 Dec 15
24 Jun 16
10 Jan 17
29 Jul 17
14 Feb 18
2 Sep 18
21 Mar 19
7 Oct 19
24 Apr 20
10 Nov 20
29 May 21
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal

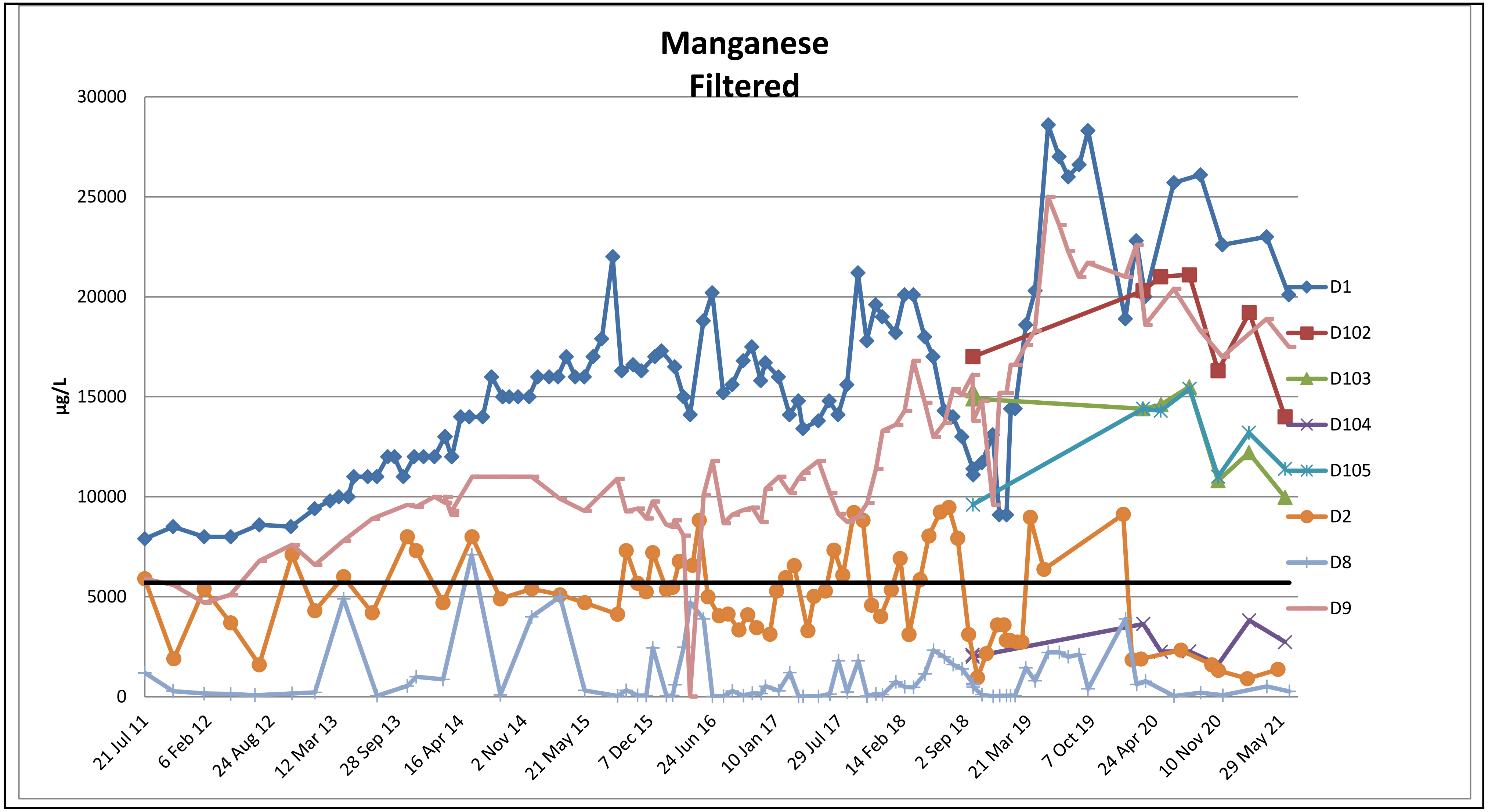

Sulfate (as SO4)
Total
mg/L
5000
4000
3000
2000
1000
0
21 Jul 11
6 Feb 12
24 Aug 12
12 Mar 13
28 Sep 13
16 Apr 14
2 Nov 14
21 May 15
7 Dec 15
24 Jun 16
10 Jan 17
29 Jul 17
14 Feb 18
2 Sep 18
21 Mar 19
7 Oct 19
24 Apr 20
10 Nov 20
29 May 21
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goals

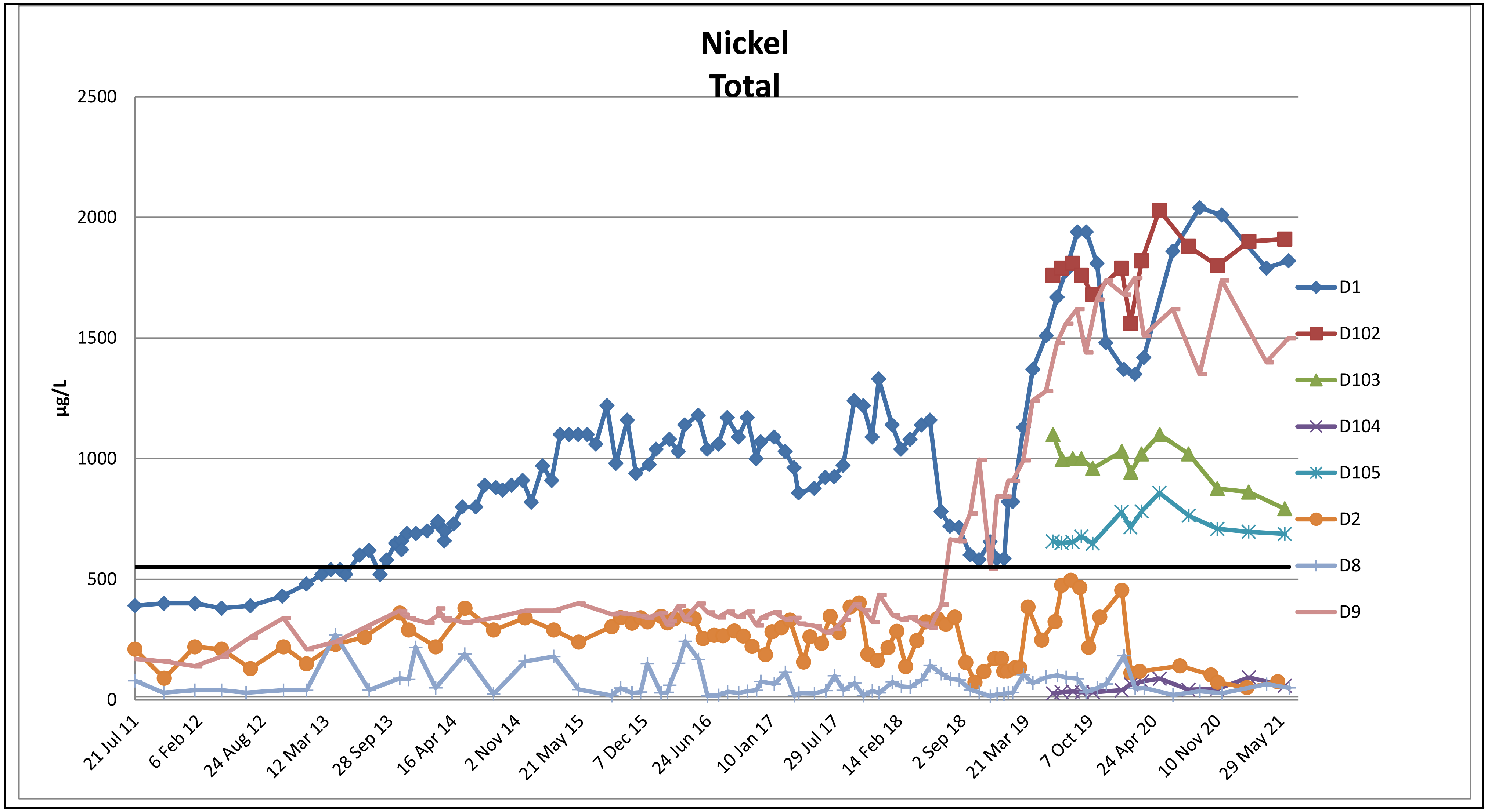

Boron
Total
µg/L
3500
3000
2500
2000
1500
1000
500
0
21 Jul 11
6 Feb 12
24 Aug 12
12 Mar 13
28 Sep 13
16 Apr 14
2 Nov 14
21 May 15
7 Dec 15
24 Jun 16
10 Jan 17
29 Jul 17
14 Feb 18
2 Sep 18
21 Mar 19
7 Oct 19
24 Apr 20
10 Nov 20
29 May 21
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goal

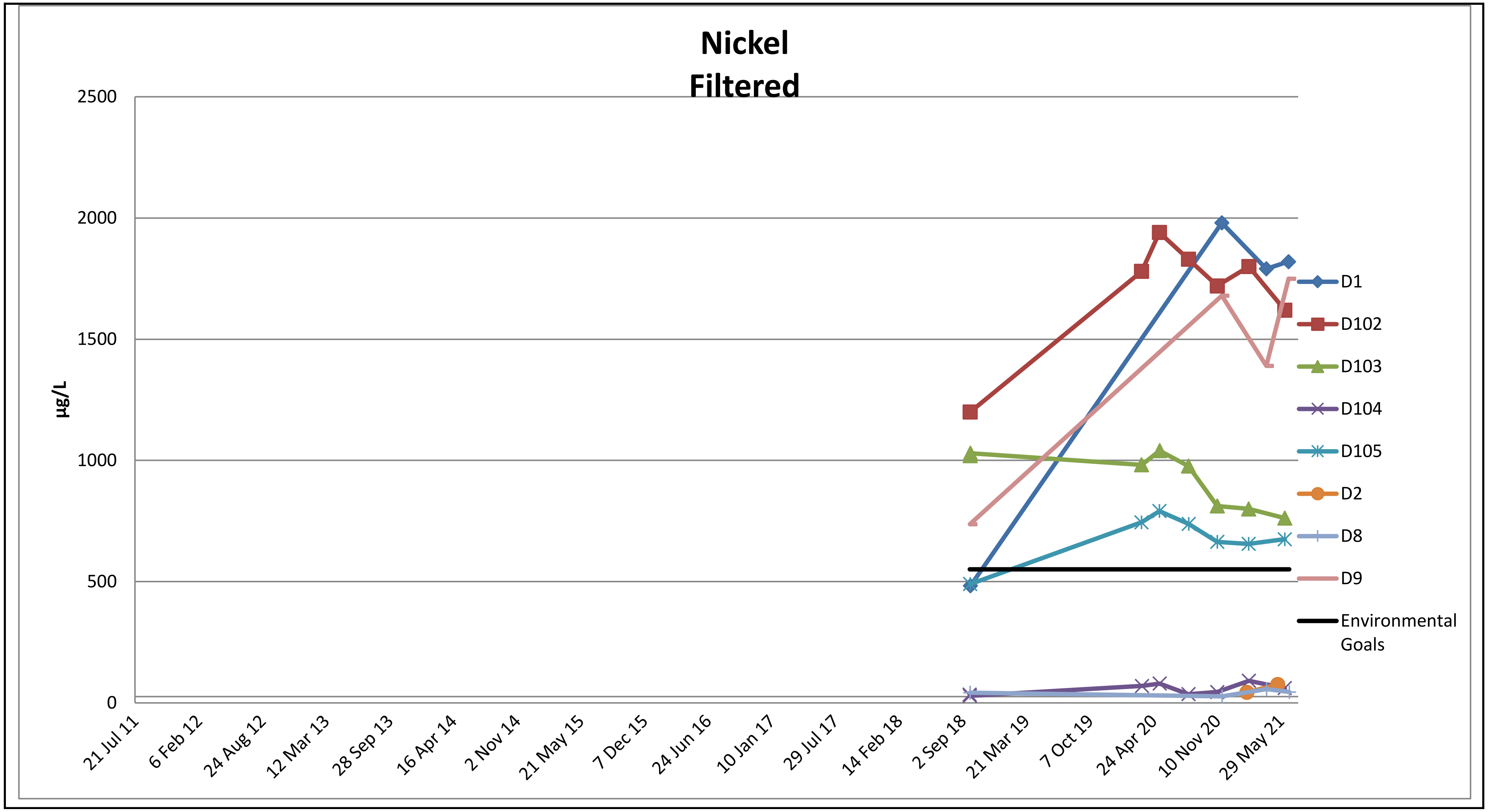

Boron
Filtered
µg/L
3000
2500
2000
1500
1000
500
0
21 Jul 11
6 Feb 12
24 Aug 12
12 Mar 13
28 Sep 13
16 Apr 14
2 Nov 14
21 May 15
7 Dec 15
24 Jun 16
10 Jan 17
29 Jul 17
14 Feb 18
2 Sep 18
21 Mar 19
7 Oct 19
24 Apr 20
10 Nov 20
29 May 21
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goals

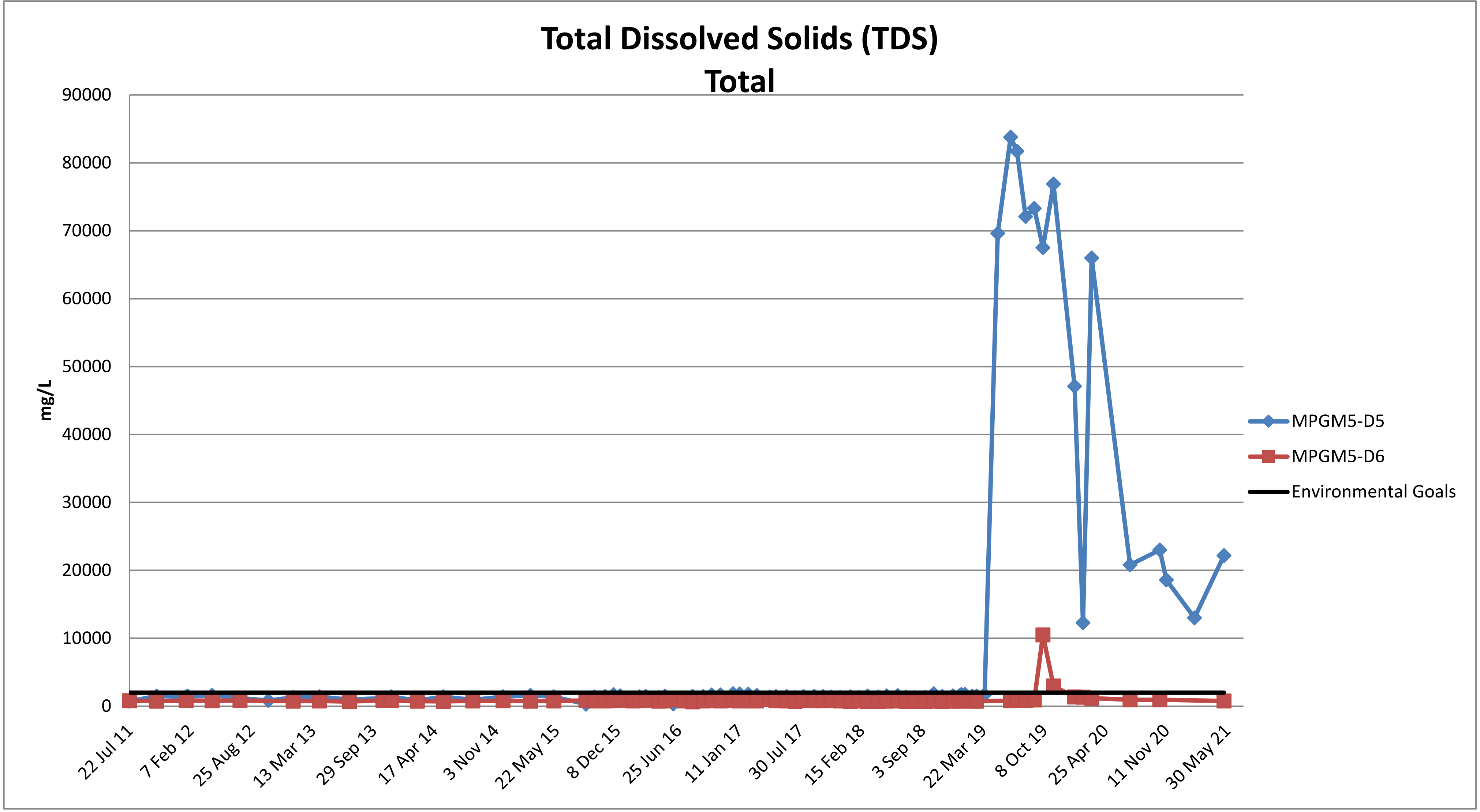

Manganese
Total
30000
25000
20000
15000
10000
5000
0
µg/L
21 Jul 11
6 Feb 12
24 Aug 12
12 Mar 13
28 Sep 13
16 Apr 14
2 Nov 14
21 May 15
7 Dec 15
24 Jun 16
10 Jan 17
29 Jul 17
14 Feb 18
2 Sep 18
21 Mar 19
7 Oct 19
24 Apr 20
10 Nov 20
29 May 21
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goals

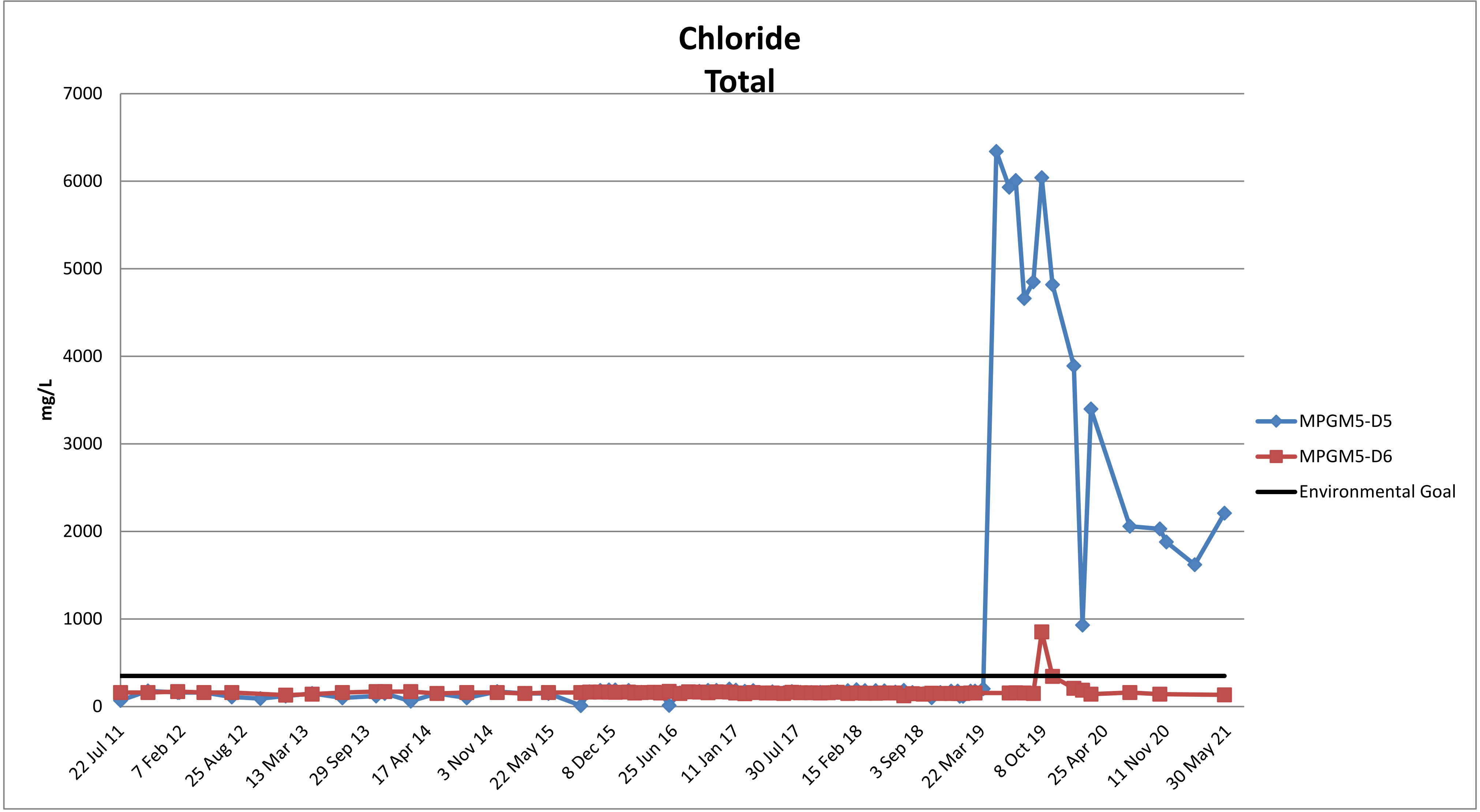
]

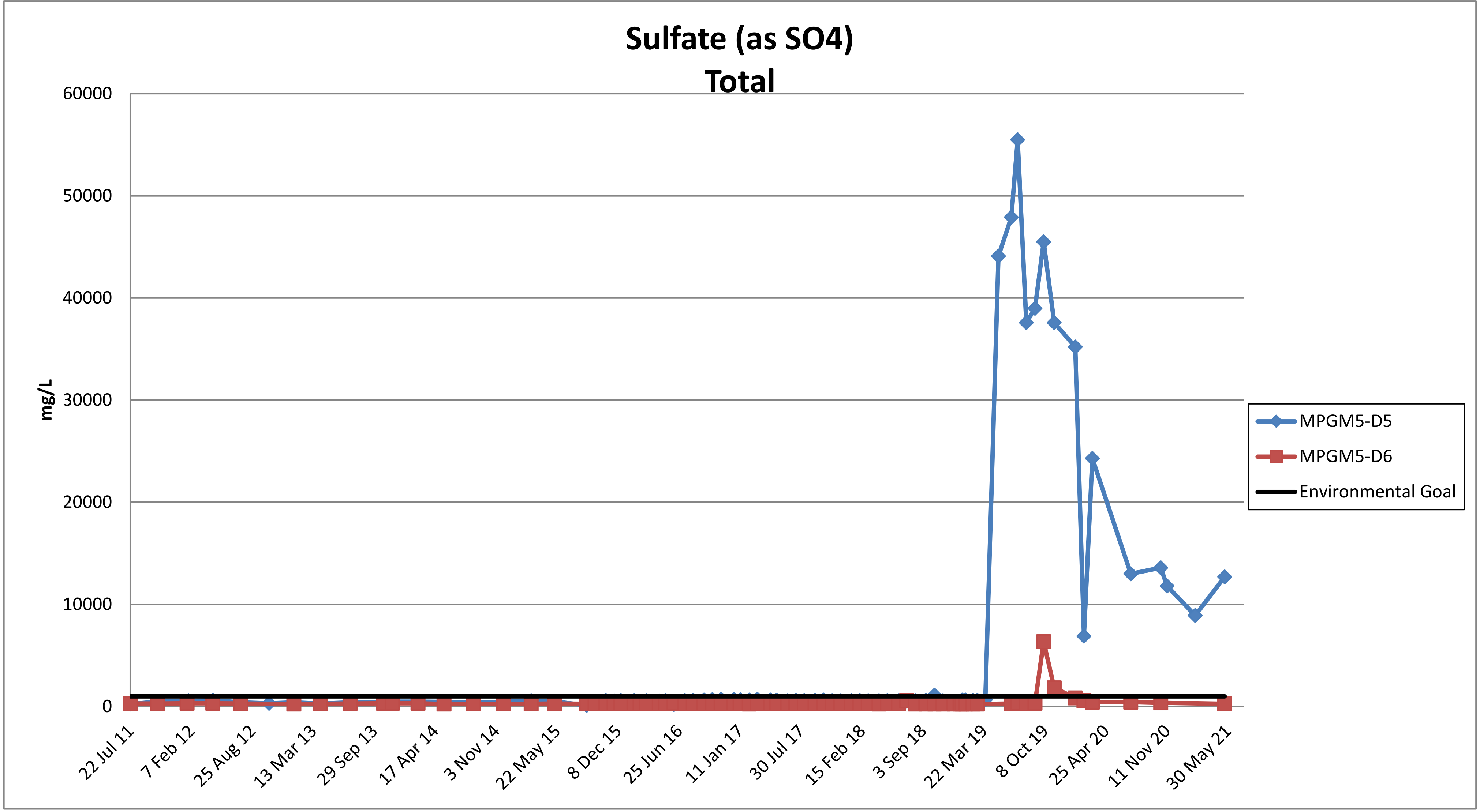

Manganese
Filtered
µg/L
30000
25000
20000
15000
10000
5000
0
21 Jul 11
6 Feb 12
24 Aug 12
12 Mar 13
28 Sep 13
16 Apr 14
2 Nov 14
21 May 15
7 Dec 15
24 Jun 16
10 Jan 17
29 Jul 17
14 Feb 18
2 Sep 18
21 Mar 19
7 Oct 19
24 Apr 20
10 Nov 20
29 May 21
D1
D102
D103
D104
D105
D2
D8
D9

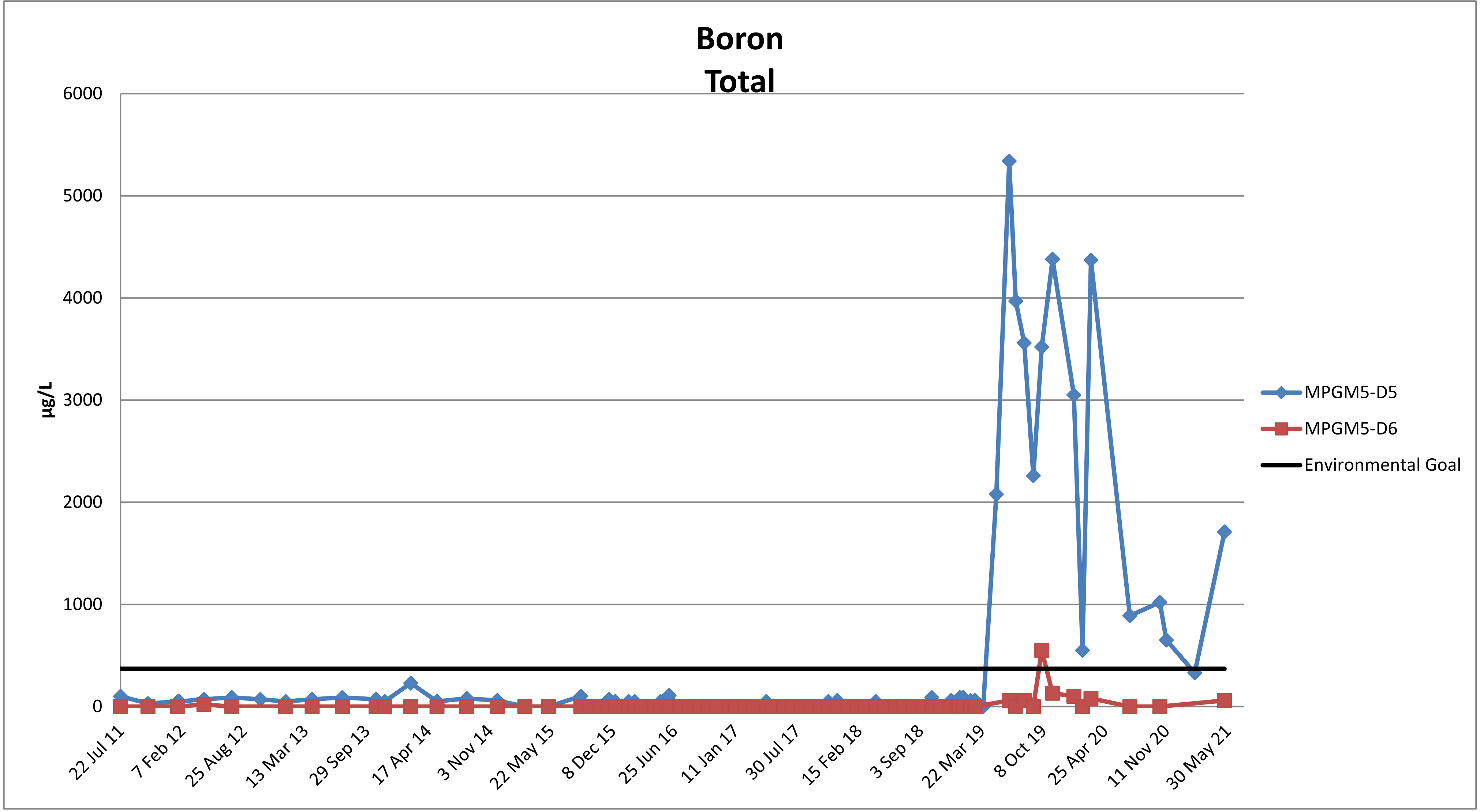

Nickel
Total
µg/L
2500
2000
1500
1000
500
0
21 Jul 11
6 Feb 12
24 Aug 12
12 Mar 13
28 Sep 13
16 Apr 14
2 Nov 14
21 May 15
7 Dec 15
24 Jun 16
10 Jan 17
29 Jul 17
14 Feb 18
2 Sep 18
21 Mar 19
7 Oct 19
24 Apr 20
10 Nov 20
29 May 21
D1
D102
D103
D104
D105
D2
D8
D9

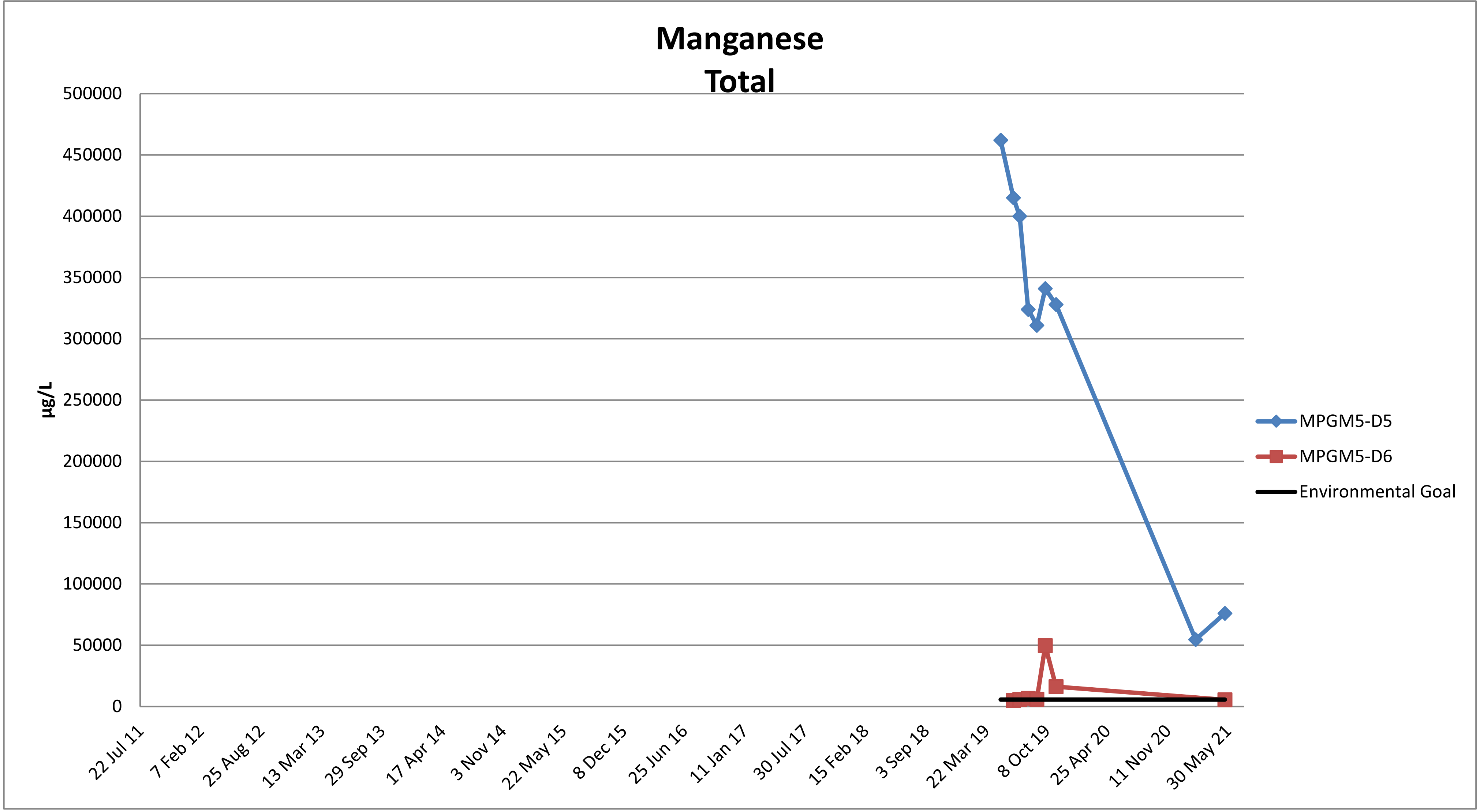

Nickel
Filtered
µg/L
2500
2000
1500
1000
500
0
21 Jul 11
6 Feb 12
24 Aug 12
12 Mar 13
28 Sep 13
16 Apr 14
2 Nov 14
21 May 15
7 Dec 15
24 Jun 16
10 Jan 17
29 Jul 17
14 Feb 18
2 Sep 18
21 Mar 19
7 Oct 19
24 Apr 20
10 Nov 20
29 May 21
D1
D102
D103
D104
D105
D2
D8
D9
Environmental Goals

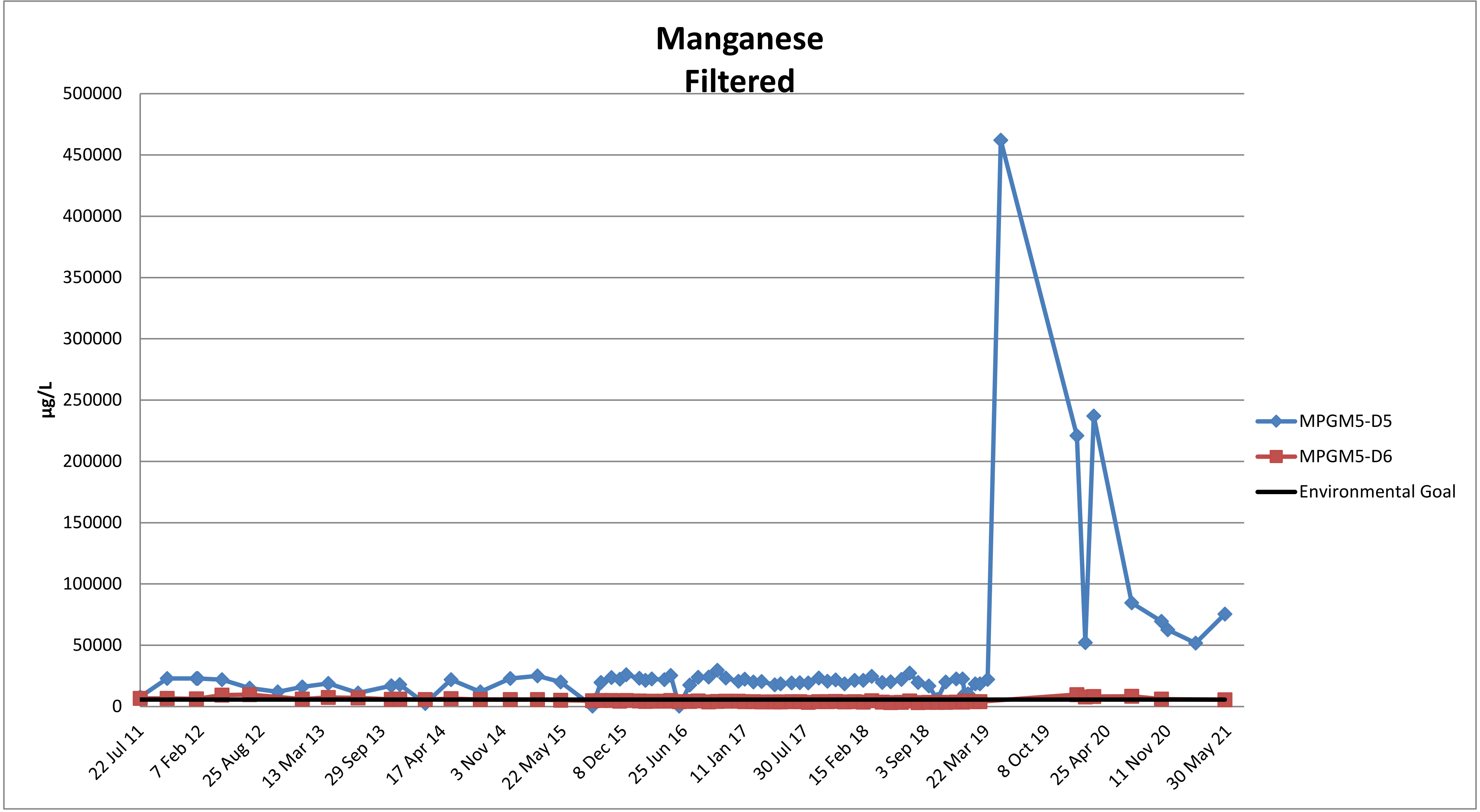

Total Dissolved Solids (TDS)
Total
mg/L
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
22 Jul 11
7 Feb 12
25 Aug 12
13 Mar 13
29 Sep 13
17 Apr 14
3 Nov 14
22 May 15
8 Dec 15
25 Jun 16
11 Jan 17
30 Jul 17
15 Feb 18
3 Sep 18
22 Mar 19
8 Oct 19
25 Apr 20
11 Nov 20
30 May 21
MPGM5-D5
MPGM5-D6
Environmental Goals

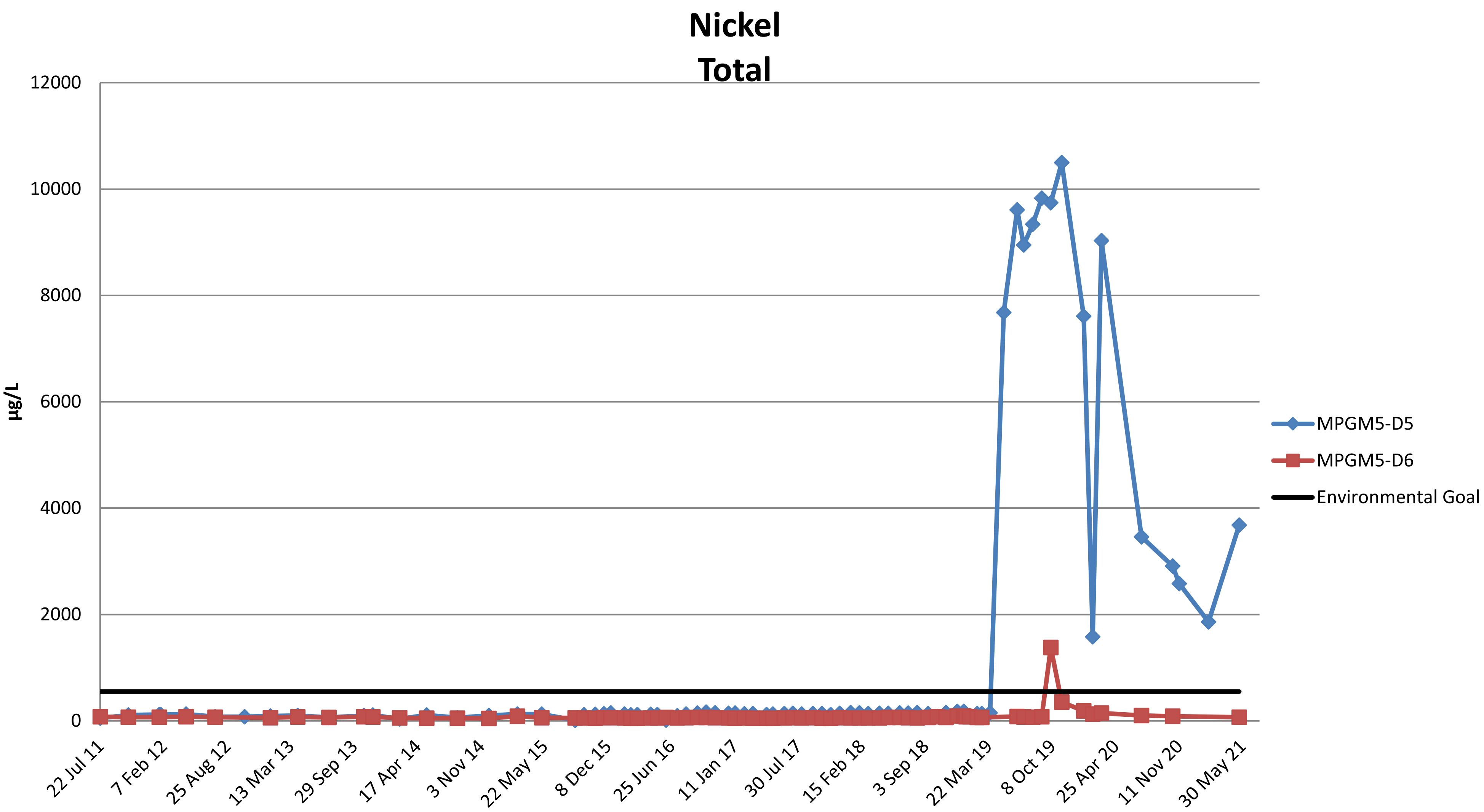

Chloride
Total
mg/L
7000
6000
5000
4000
3000
2000
1000
0
22 Jul 11
7 Feb 12
25 Aug 12
13 Mar 13
29 Sep 13
17 Apr 14
3 Nov 14
22 May 15
8 Dec 15
25 Jun 16
11 Jan 17
30 Jul 17
15 Feb 18
3 Sep 18
22 Mar 19
8 Oct 19
25 Apr 20
11 Nov 20
30 May 21
MPGM5-D5
MPGM5-D6
Environmental Goal


Sulfate (as SO4)
Total
mg/L
60000
50000
40000
30000
20000
10000
0
22 Jul 11
7 Feb 12
25 Aug 12
13 Mar 13
29 Sep 13
17 Apr 14
3 Nov 14
22 May 15
8 Dec 15
25 Jun 16
11 Jan 17
30 Jul 17
15 Feb 18
3 Sep 18
22 Mar 19
8 Oct 19
25 Apr 20
11 Nov 20
30 May 21
MPGM5-D5
MPGM5-D6
Environmental Goal


Boron
Total
µg/L
6000
5000
4000
3000
2000
1000
0
22 Jul 11
7 Feb 12
25 Aug 12
13 Mar 13
29 Sep 13
17 Apr 14
3 Nov 14
22 May 15
8 Dec 15
25 Jun 16
11 Jan 17
30 Jul 17
15 Feb 18
3 Sep 18
22 Mar 19
8 Oct 19
25 Apr 20
11 Nov 20
30 May 21
MPGM5-D5
MPGM5-D6
Environmental Goal


Manganese
Total
µg/L
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
22 Jul 11
7 Feb 12
25 Aug 12
13 Mar 13
29 Sep 13
17 Apr 14
3 Nov 14
22 May 15
8 Dec 15
25 Jun 16
11 Jan 17
30 Jul 17
15 Feb 18
3 Sep 18
22 Mar 19
8 Oct 19
25 Apr 20
11 Nov 20
30 May 21
MPGM5-D5
MPGM5-D6
Environmental Goal


Manganese
Filtered
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
µg/L
22 Jul 11
7 Feb 12
25 Aug 12
13 Mar 13
29 Sep 13
17 Apr 14
3 Nov 14
22 May 15
8 Dec 15
25 Jun 16
11 Jan 17
30 Jul 17
15 Feb 18
3 Sep 18
22 Mar 19
8 Oct 19
25 Apr 20
11 Nov 20
30 May 21
MPGM5-D5
MPGM5-D6
Environmental Goal


Nickel
Total
µg/L
12000
10000
8000
6000
4000
2000
0
22 Jul 11
7 Feb 12
25 Aug 12
13 Mar 13
29 Sep 13
17 Apr 14
3 Nov 14
22 May 15
8 Dec 15
25 Jun 16
11 Jan 17
30 Jul 17
15 Feb 18
3 Sep 18
22 Mar 19
8 Oct 19
25 Apr 20
11 Nov 20
30 May 21
MPGM5-D5
MPGM5-D6
Environmental Goal

APPENDIX K GWSDAT DATA ASSESSMENT METHODOLOGY

K.1 GWSDAT DATA ASSESSMENT METHODOLOGY

For data processing and the production of the trend evaluation outputs presented in the *Annual Environmental Monitoring Report – Water Management and Monitoring,* ERM used the Shell Ground Water Spatio-Temporal Data Analysis Tool (Shell Global Solutions, 2012). The Shell Ground Water Spatio-Temporal Data Analysis Tool (GWSDAT) is a free-ware application developed to analyse historical trends (both spatially and temporally) of groundwater solute concentrations, but can also be adapted to analyse historical trends for surface water solute concentrations.

Trend analysis of the laboratory analytical data was completed using the Mann-Kendall procedure. The Mann-Kendall method is a non-parametric method and does not require assumptions about the underlying data distribution. The Mann Kendall test is based on the relative magnitude of the data rather than the actual measured values, and is a tool commonly used in the statistical assessment of trends over time for the purpose of evaluating trends in groundwater data.

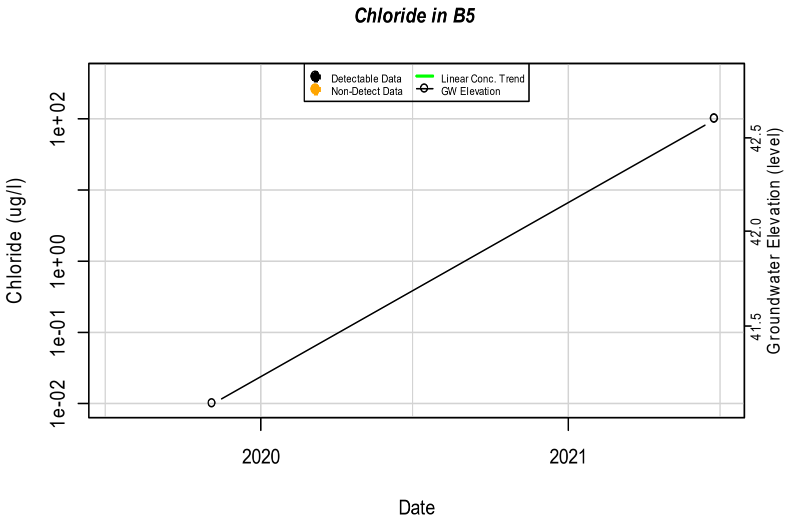
The p-value presented in the monitoring bore trend plots indicates the level of statistical significance that can be attributed to the trend, with a p-value less than 0.05 indicating a statistically significant trend. A p-value of less than 0.05 relates to a statistical significance of 95%, i.e. if a trend has a p-value of less than 0.05 there is a 95% level of confidence that the data presents an actual trend and not a random distribution of data. Trends with these characteristics, which are considered by the program to be statistically significant, are shown in green text in the trend plots in Appendix L; those that are not statistically significant are shown in red text.

Where no p-value is given on the graphical outputs, a sufficient number of data points were not available to evaluate the significance of trends through the Mann-Kendall test. Concentrations both above and below the laboratory limit of reporting are shown.

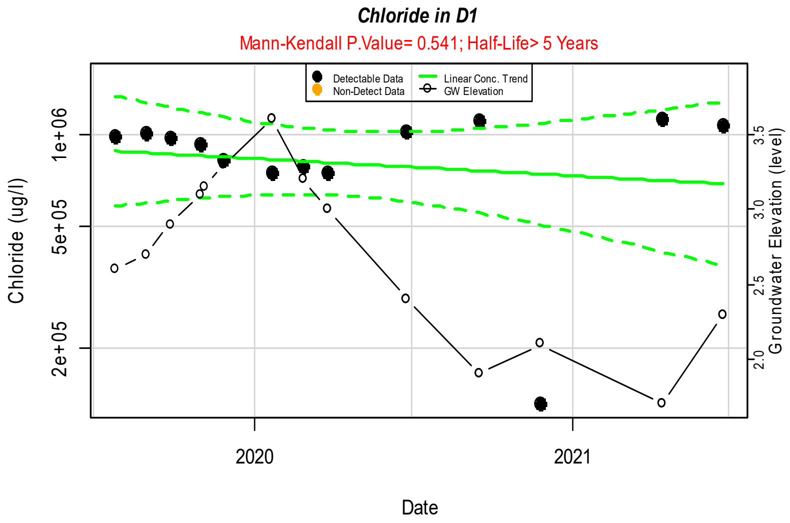
It is noted that for the EC and pH trend plots, concentrations are shown as mg/L although the data shown are actually in µS/cm and pH standard units, respectively. This is because of a limitation of the GWSDAT program.

In addition to the Mann-Kendall test, a linear trend analysis is represented on the plots (using a green line). The trend displays a linear time series trend estimate to the log of historical solute concentrations. Due to different monitoring bores being tested at varying frequencies throughout history, some locations did not have sufficient data points to graphically represent either linear or non-linear trends.

APPENDIX L GWSDAT OUTPUTS

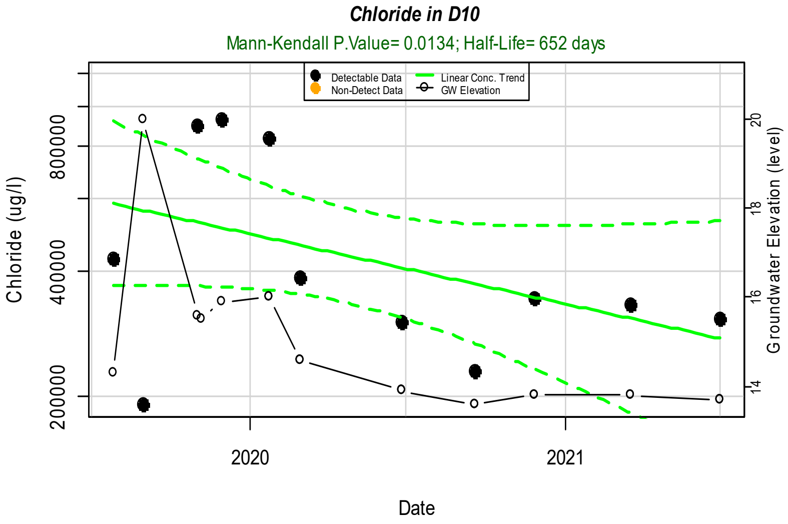


Chloride in B5



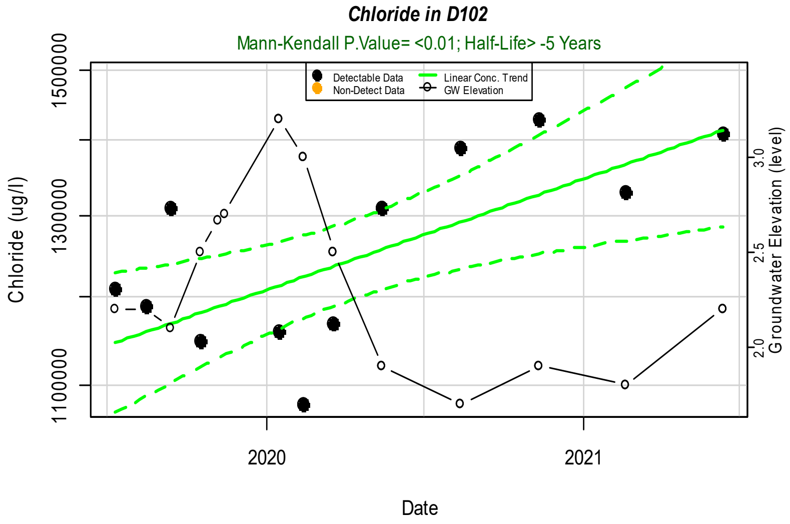
Chloride in D1

Mann-Kendall P.Value= 0.541; Half-Life> 5 Years



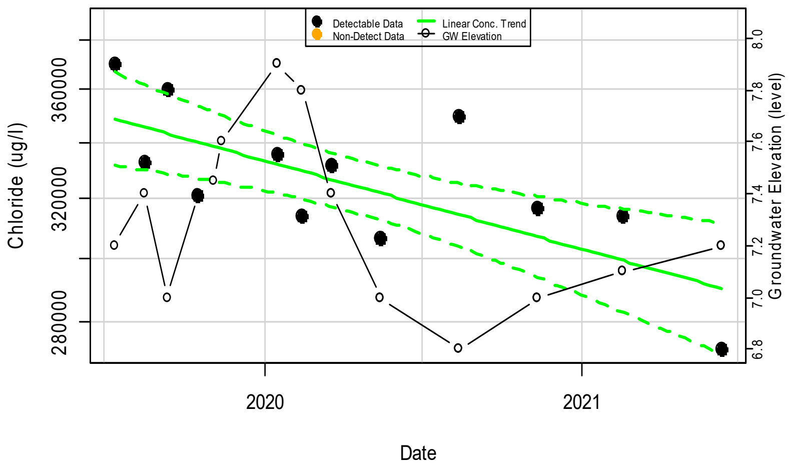
Chloride in D10

Mann-Kendall P.Value= 0.0134; Half-Life= 652 days



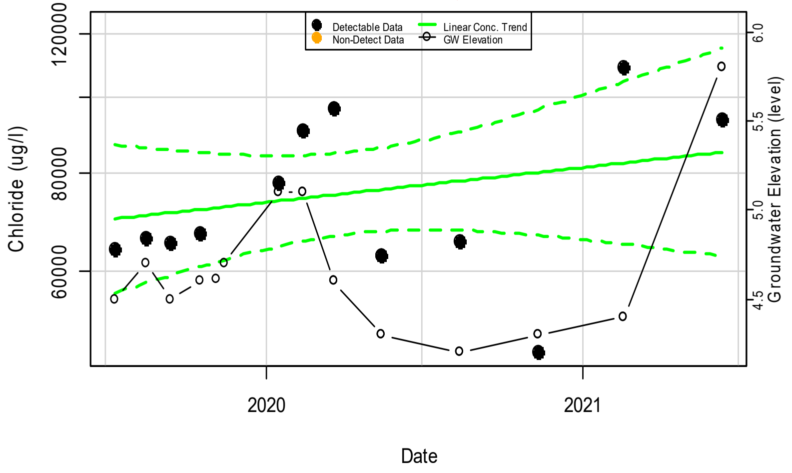
Chloride in D102

Mann-Kendall P.Value= <0.01; Half-Life> -5 Years



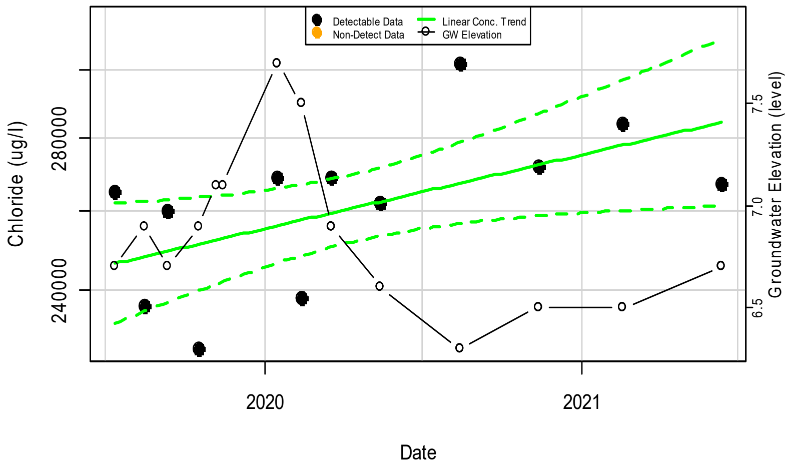
Chloride in D103

Mann-Kendall P.Value= 0.0106; Half-Life> 5 Years



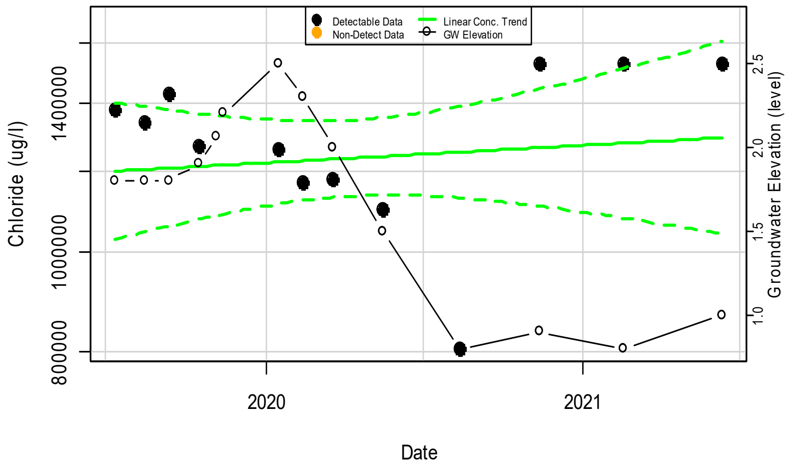
Chloride in D104

Mann-Kendall P.Value= 0.559; Half-Life> -5 Years



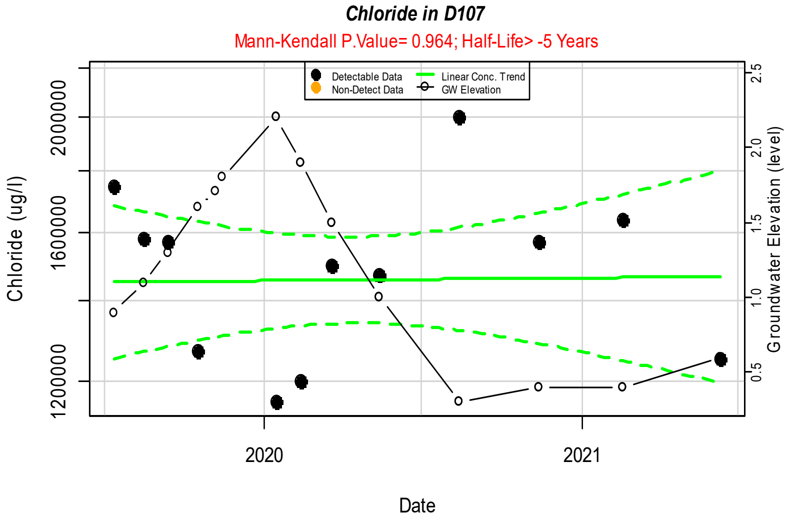
Chloride in D105

Mann-Kendall P.Value= 0.0224; Half-Life> -5 Years



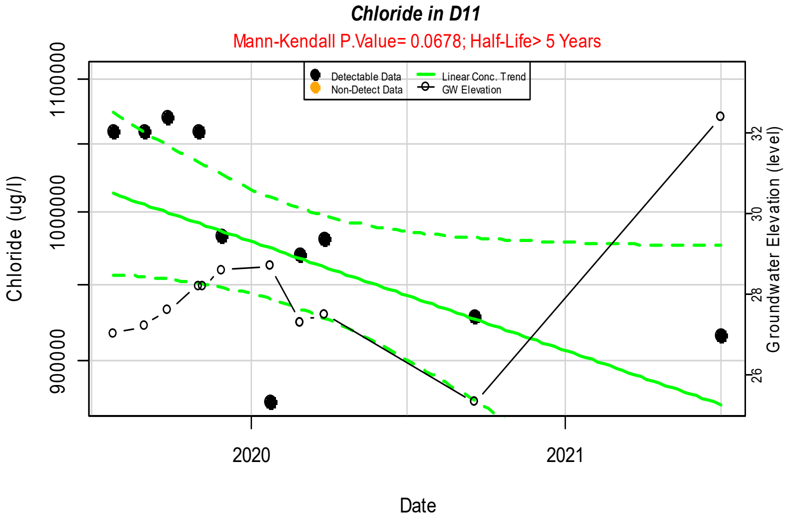
Chloride in D106

Mann-Kendall P.Value= 0.295; Half-Life> -5 Years



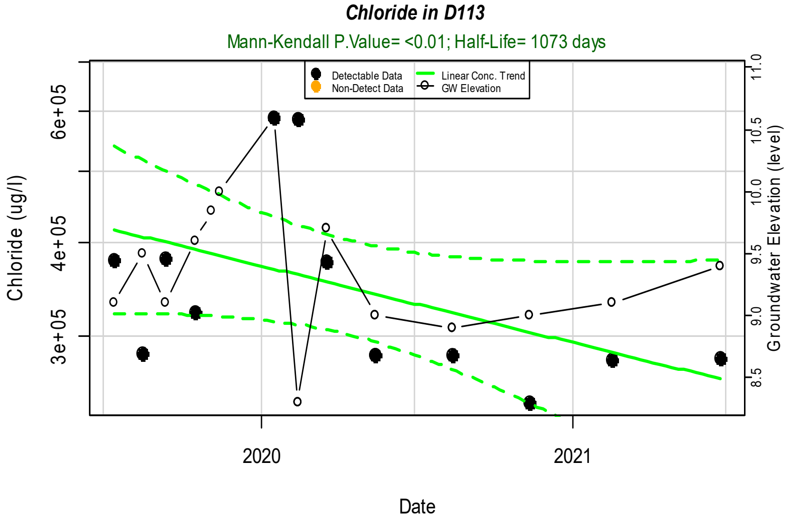
Chloride in D107

Mann-Kendall P.Value= 0.964; Half-Life> -5 Years



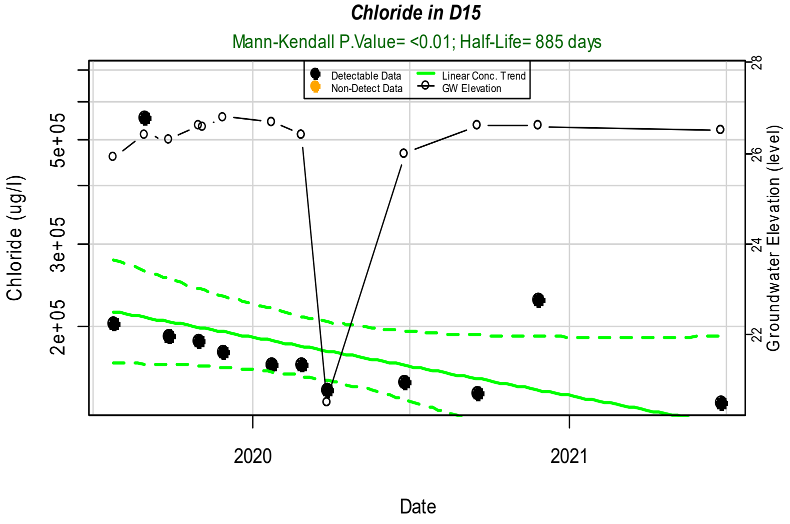
Chloride in D11

Mann-Kendall P.Value= 0.0678; Half-Life> 5 Years



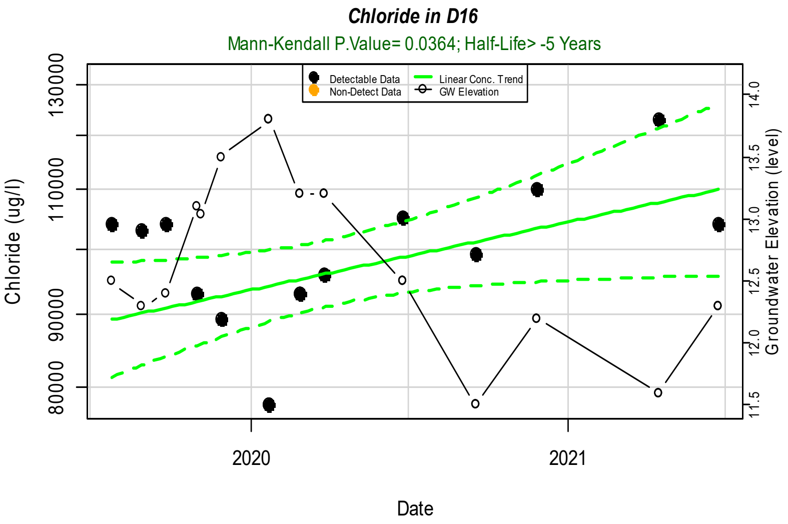
Chloride in D113

Mann-Kendall P.Value= <0.01; Half-Life= 1073 days



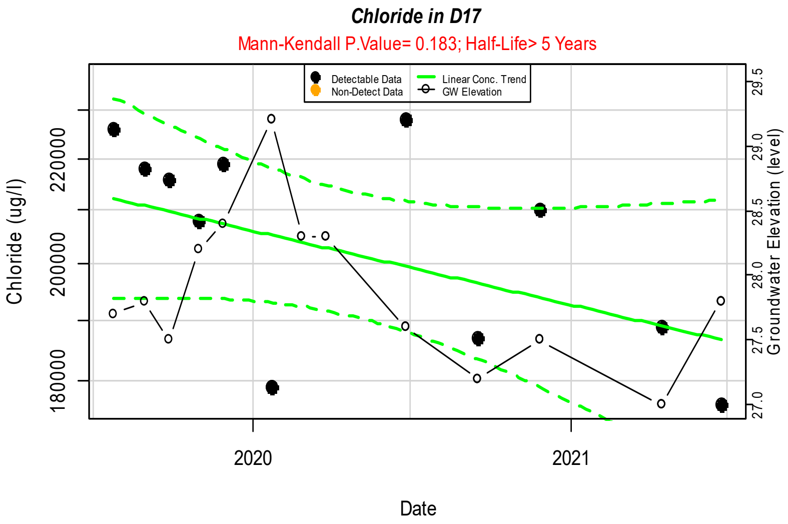
Chloride in D15

Mann-Kendall P.Value= <0.01; Half-Life= 885 days



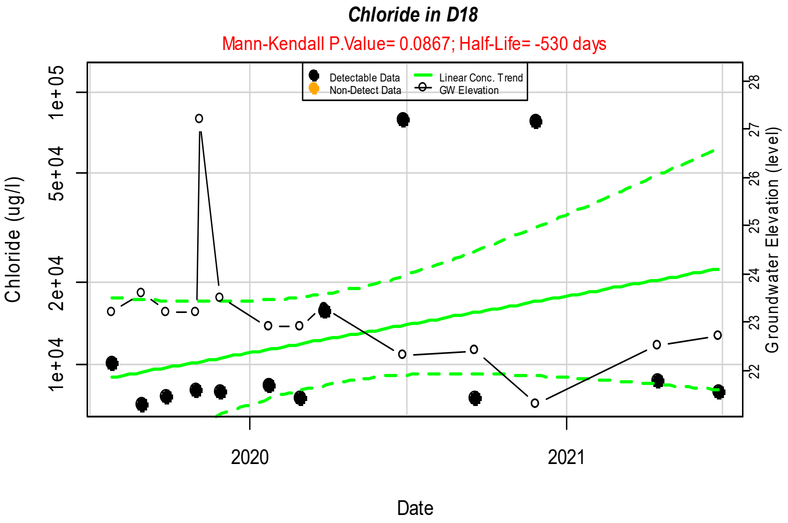
Chloride in D16

Mann-Kendall P.Value= 0.0364; Half-Life> -5 Years



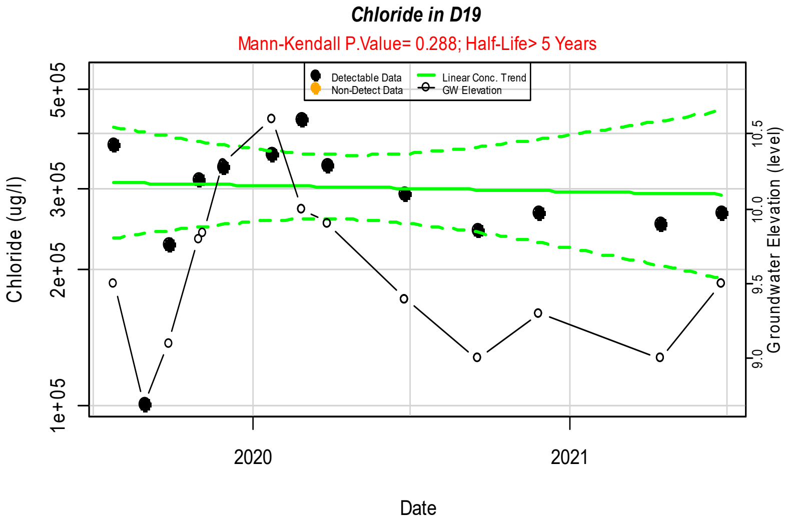
Chloride in D17

Mann-Kendall P.Value= 0.183; Half-Life> 5 Years



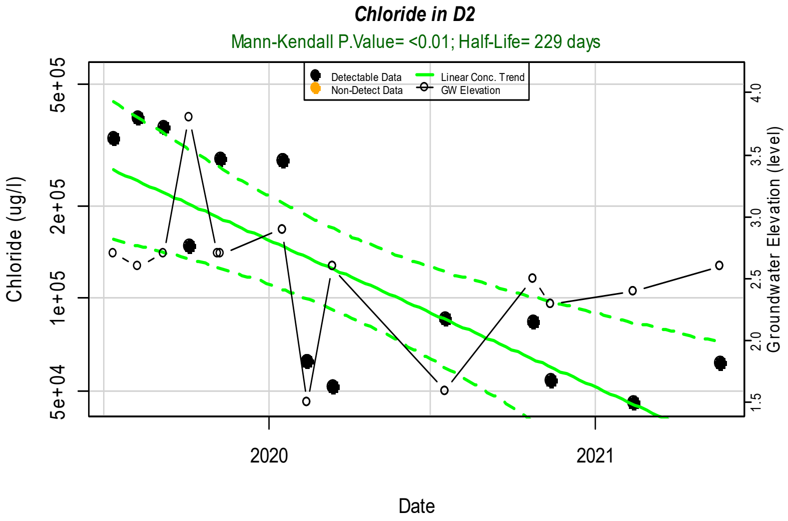
Chloride in D18

Mann-Kendall P.Value= 0.0867; Half-Life= -530 days

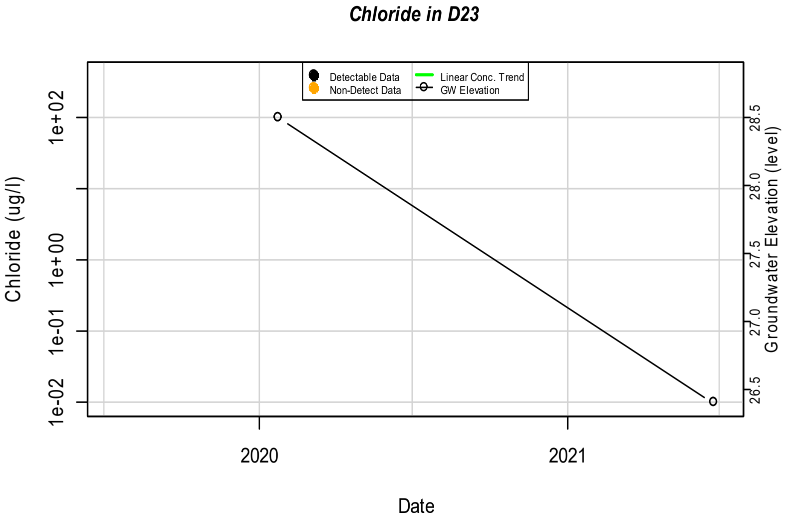


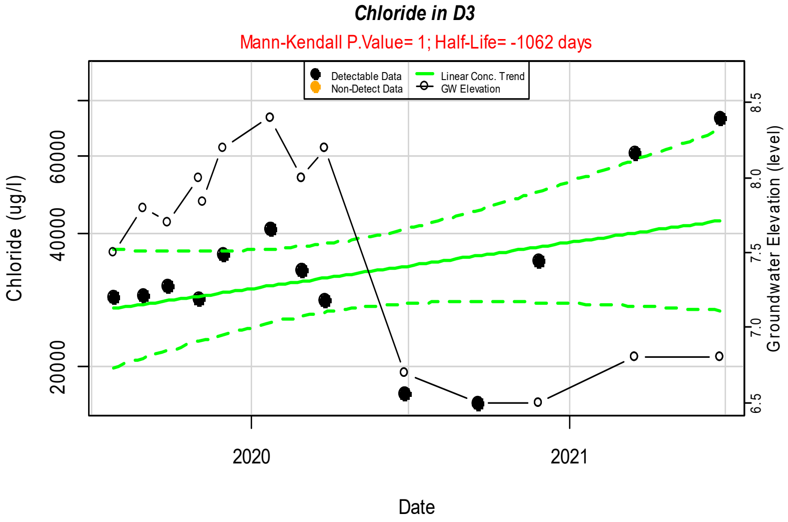
Chloride in D19

Mann-Kendall P.Value= 0.288; Half-Life> 5 Years

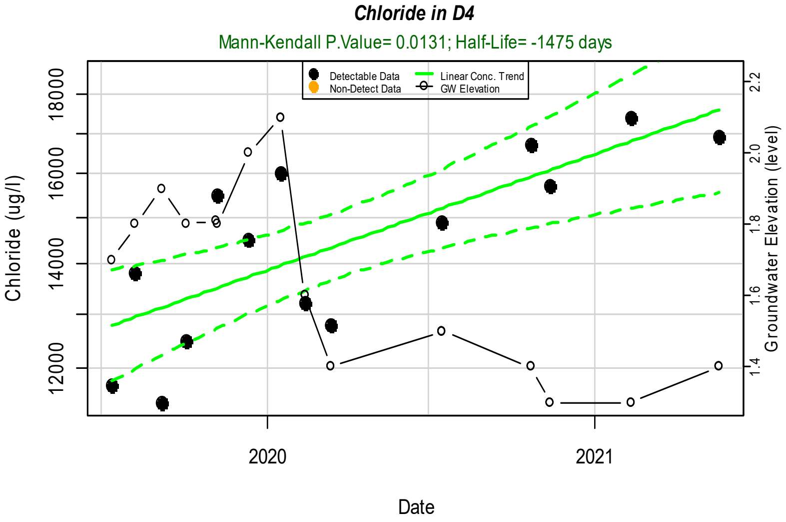

Chloride in D2

Mann-Kendall P.Value= <0.01; Half-Life= 229 days

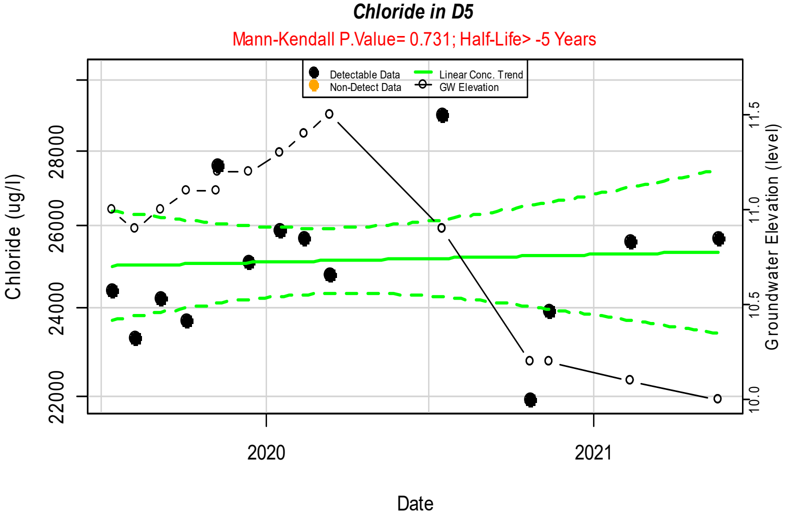

Chloride in D23


Chloride in D3

Mann-Kendall P.Value= 1; Half-Life= -1062 days

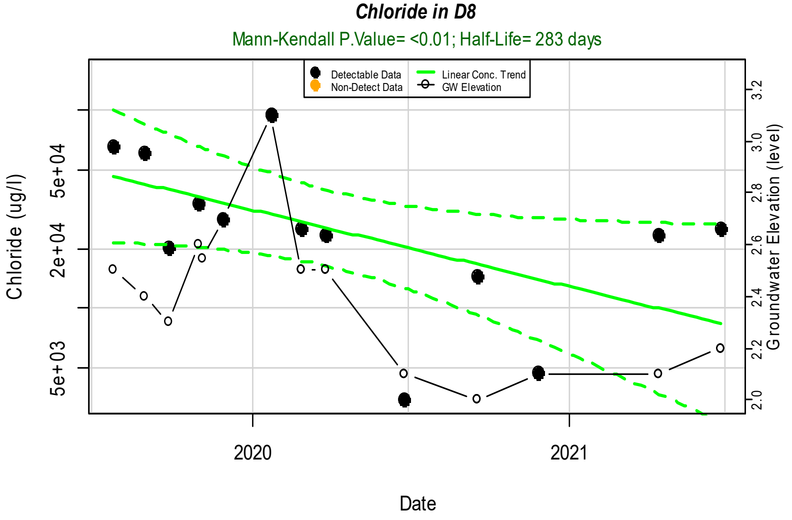

Chloride in D4

Mann-Kendall P.Value= 0.0131; Half-Life= -1475 days



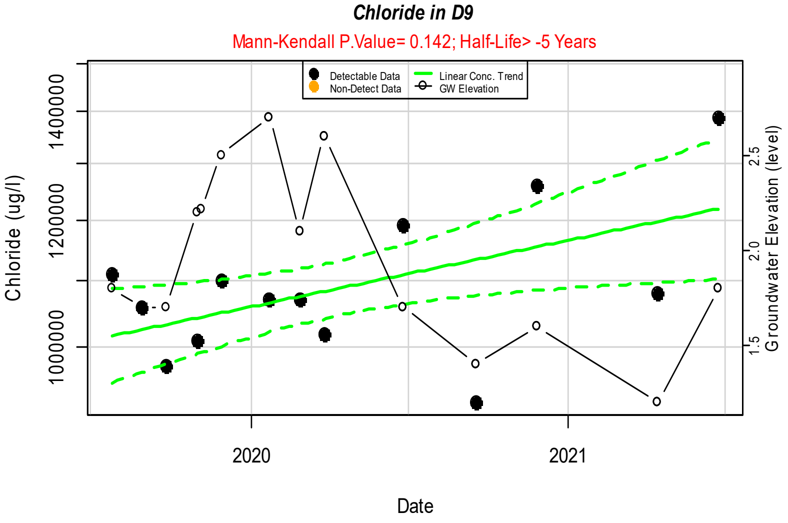
Chloride in D5

Mann-Kendall P.Value= 0.731; Half-Life> -5 Years



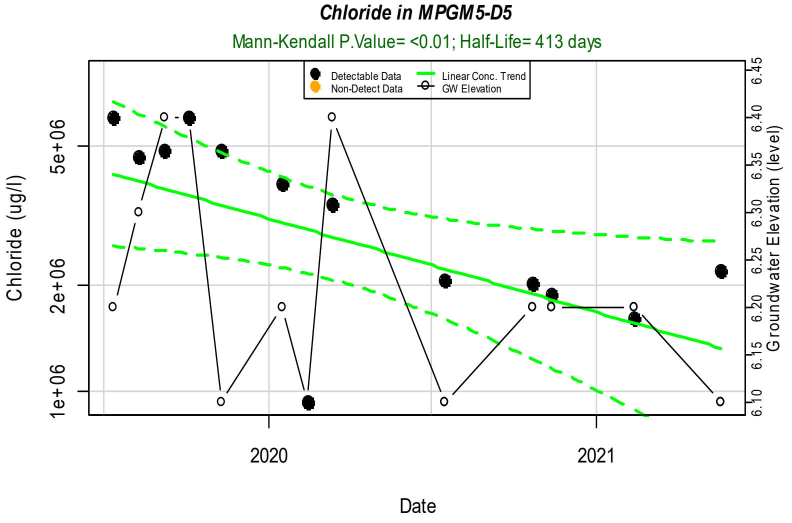
Chloride in D8

Mann-Kendall P.Value= <0.01; Half-Life= 283 days



Chloride in D9

Mann-Kendall P.Value= 0.142; Half-Life> -5 Years

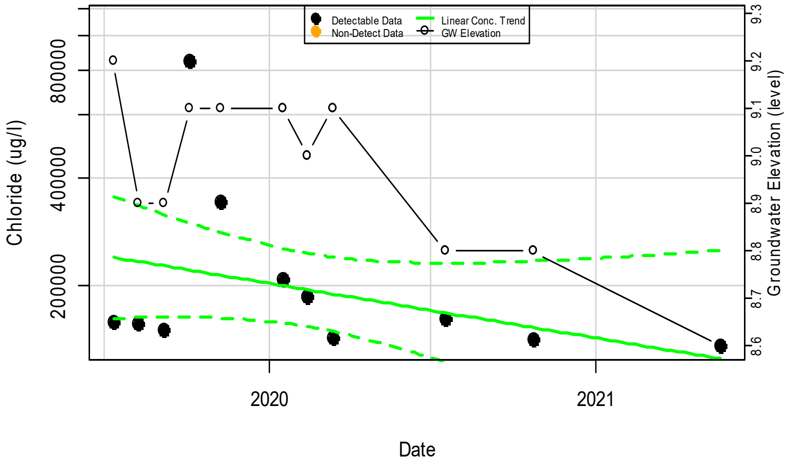


Chloride in MPGM5-D5

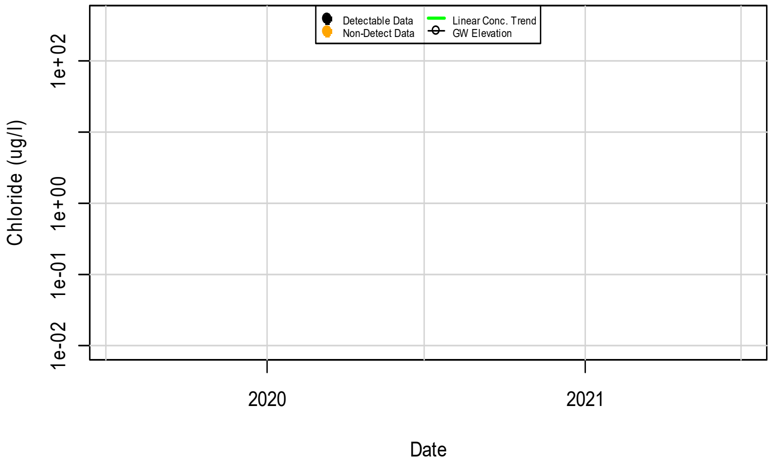
Mann-Kendall P.Value= <0.01; Half-Life= 413 days

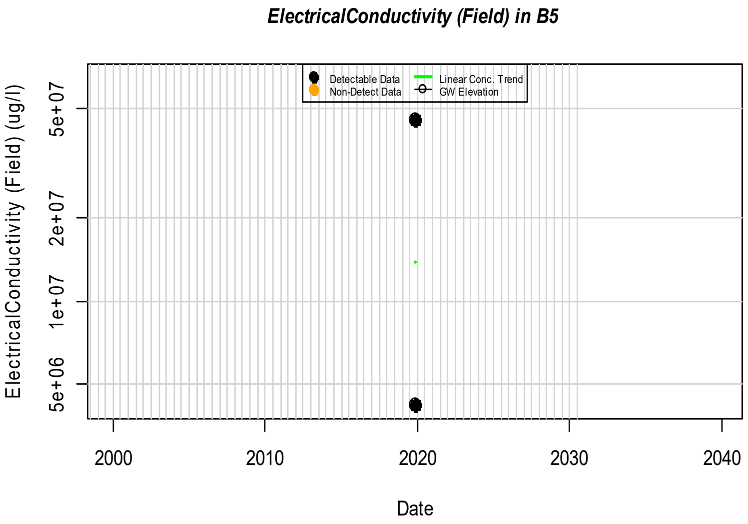
Chloride in MPGM5-D6

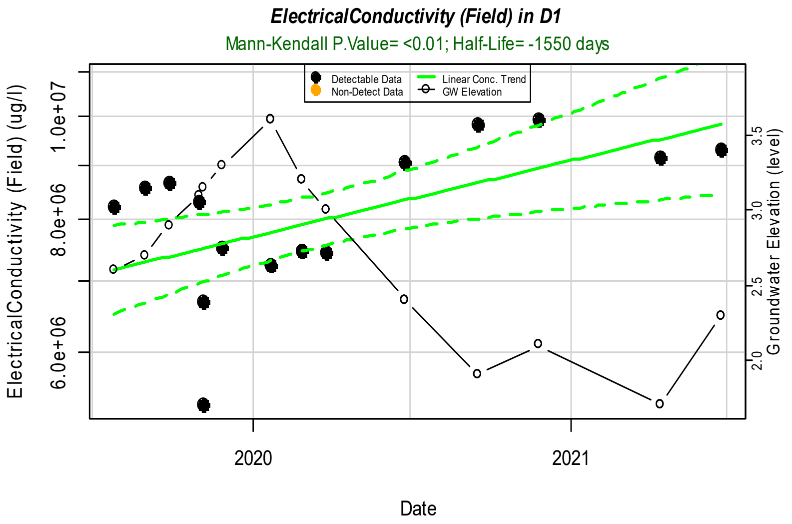
Mann-Kendall P.Value= 0.0134; Half-Life= 718 days

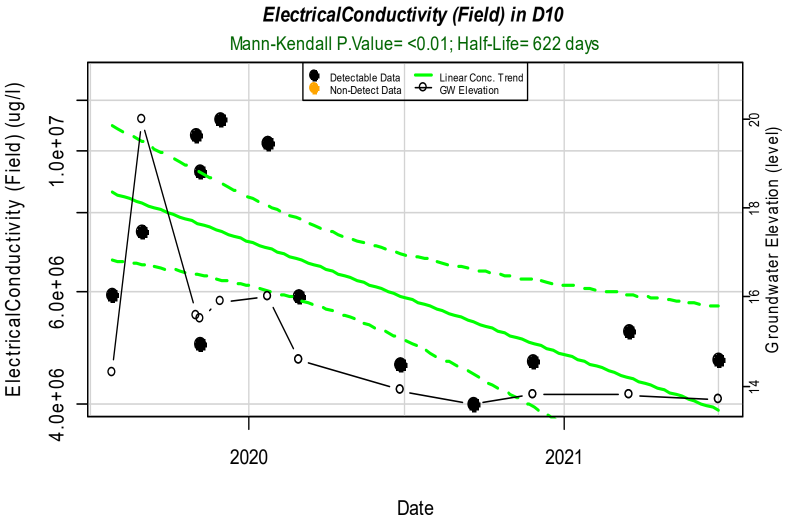


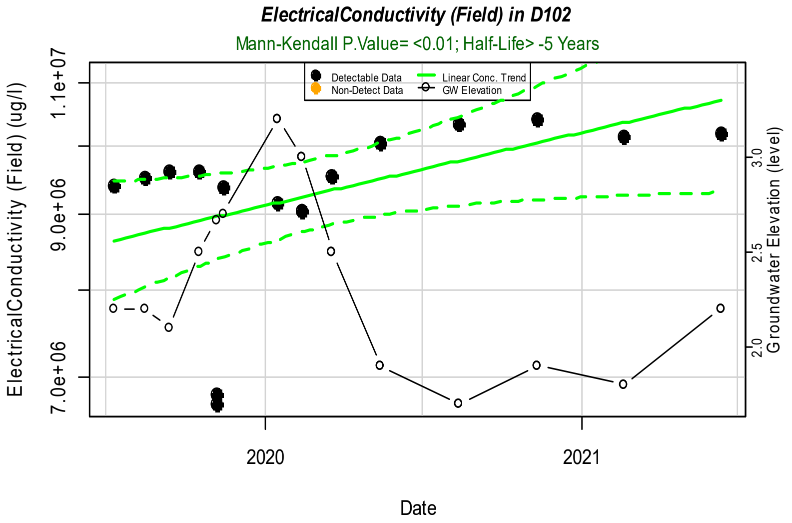
Chloride in SW3-D

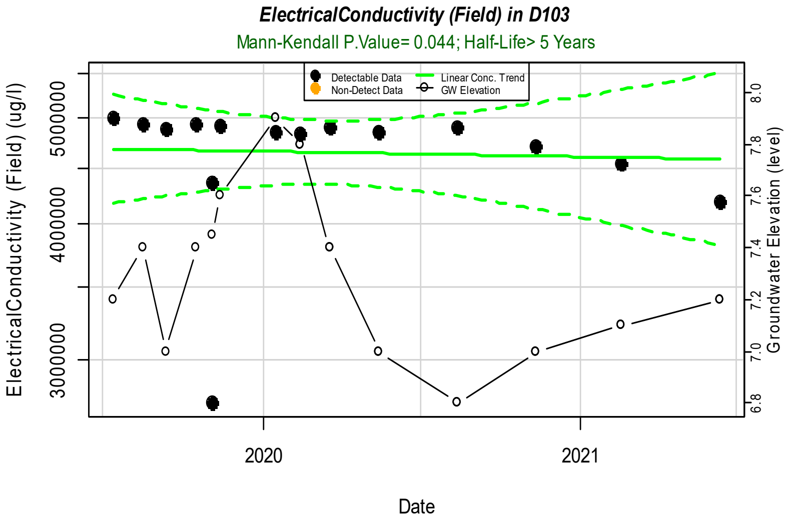


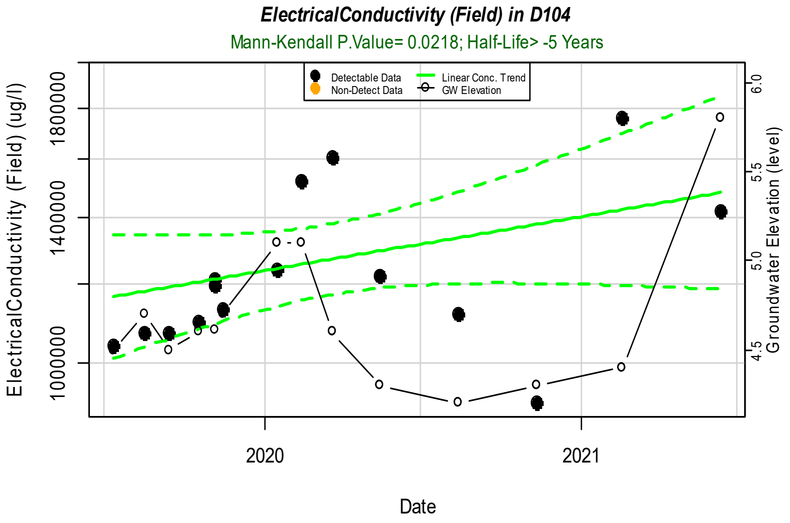

ElectricalConductivity (Field) in B5
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
ElectricalConductivity (Field) (ug/l)
5e+07
2e+07
1e+07
5e+06
2000
2010
2020
2030
2040
Date

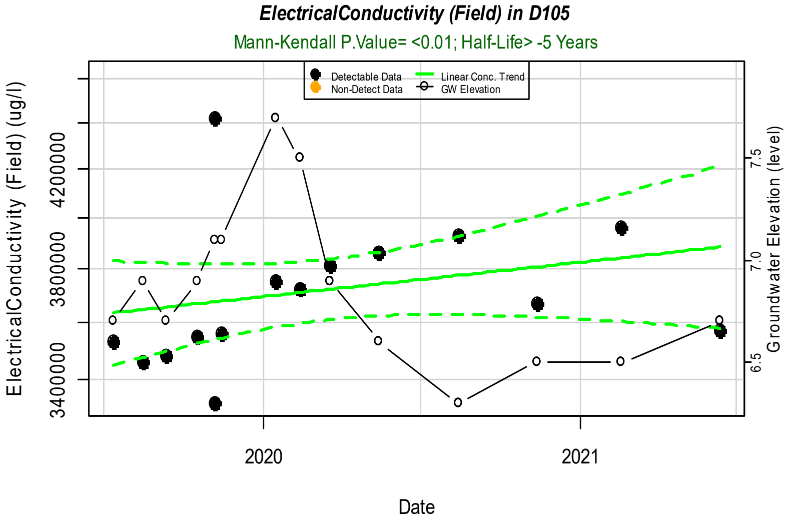

ElectricalConductivity (Field) in D1
Mann-Kendall P.Value= <0.01; Half-Life= -1550 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
ElectricalConductivity (Field) (ug/l)
1.0e+07
8.0e+06
6.0e+06
Groundwater Elevation (level)
3.5
3.0
2.5
2.0
2020
2021
Date

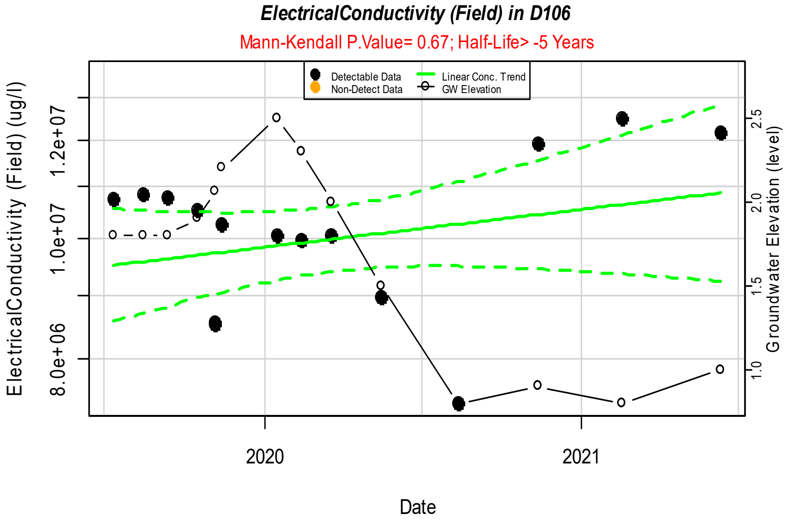

ElectricalConductivity (Field) in D10
Mann-Kendall P.Value= <0.01; Half-Life= 622 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
ElectricalConductivity (Field) (ug/l)
1.0e+07
6.0e+06
4.0e+06
Groundwater Elevation (level)
20
18
16
14
2020
2021
Date

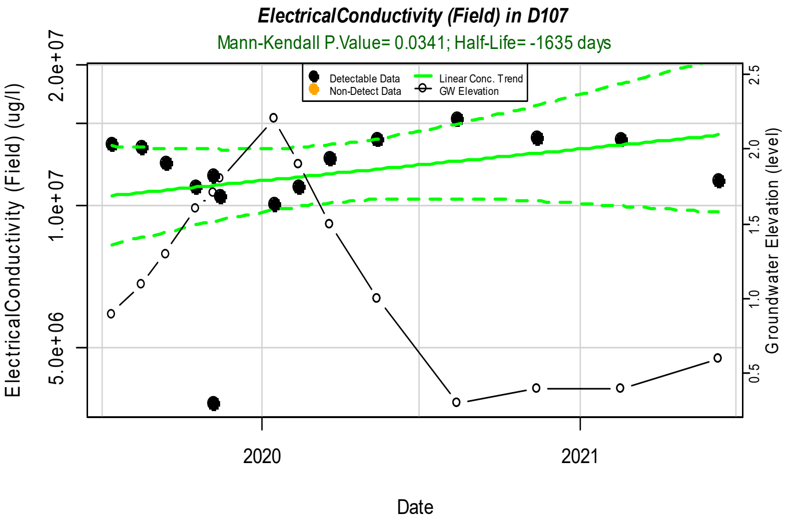

ElectricalConductivity (Field) in D102
Mann-Kendall P.Value= <0.01; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
ElectricalConductivity (Field) (ug/l)
1.1e+07
9.0e+06
7.0e+06
Groundwater Elevation (level)
3.0
2.5
2.0
2020
2021
Date


ElectricalConductivity (Field) in D103
Mann-Kendall P.Value= 0.044; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
ElectricalConductivity (Field) (ug/l)
3000000
4000000
5000000
Groundwater Elevation (level)
6.8
7.0
7.2
7.4
7.6
7.8
8.0
2020
2021
Date


ElectricalConductivity (Field) in D104
Mann-Kendall P.Value= 0.0218; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
ElectricalConductivity (Field) (ug/l)
1000000
1400000
1800000
Groundwater Elevation (level)
4.5
5.0
5.5
6.0
2020
2021
Date

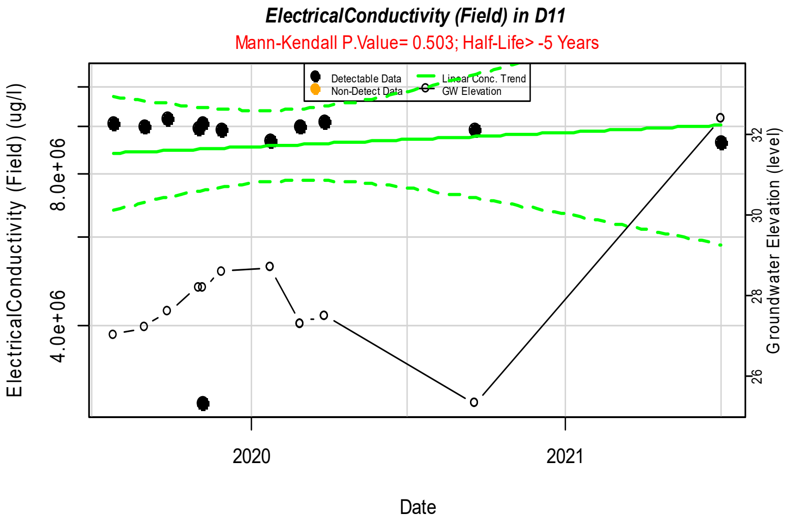

ElectricalConductivity (Field) in D105
Mann-Kendall P.Value= <0.01; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
ElectricalConductivity (Field) (ug/l)
3400000
3800000
4200000
Groundwater Elevation (level)
6.5
7.0
7.5
2020
2021
Date


ElectricalConductivity (Field) in D106
Mann-Kendall P.Value= 0.67; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
ElectricalConductivity (Field) (ug/l)
8.0e+06
1.0e+07
1.2e+07
Groundwater Elevation (level)
1.0
1.5
2.0
2.5
2020
2021
Date



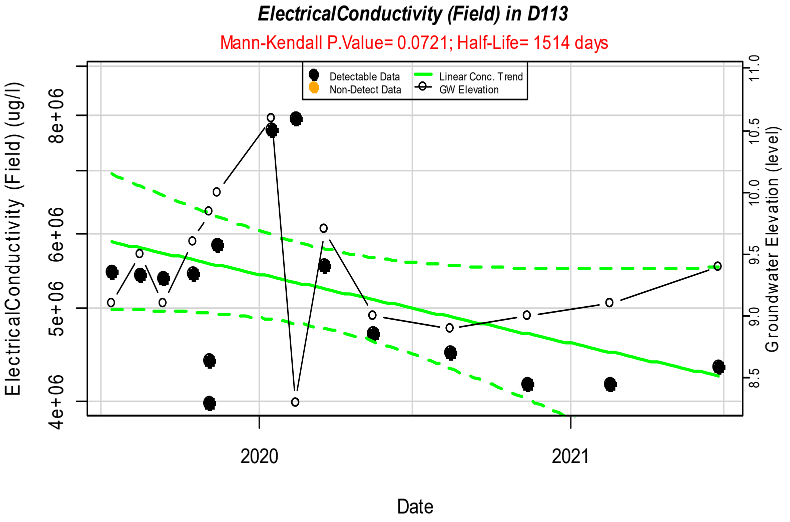
ElectricalConductivity (Field) in D107

Mann-Kendall P.Value= 0.0341; Half-Life= -1635 days



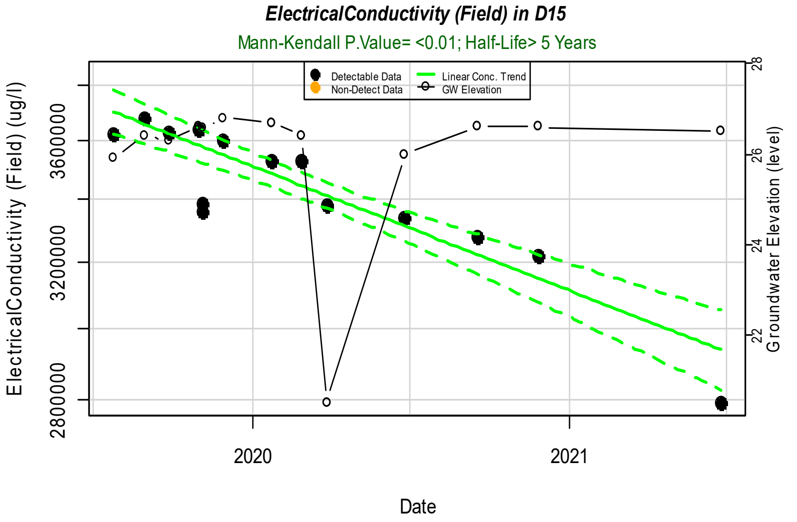
ElectricalConductivity (Field) in D11

Mann-Kendall P.Value= 0.503; Half-Life> -5 Years



ElectricalConductivity (Field) in D113

Mann-Kendall P.Value= 0.0721; Half-Life= 1514 days

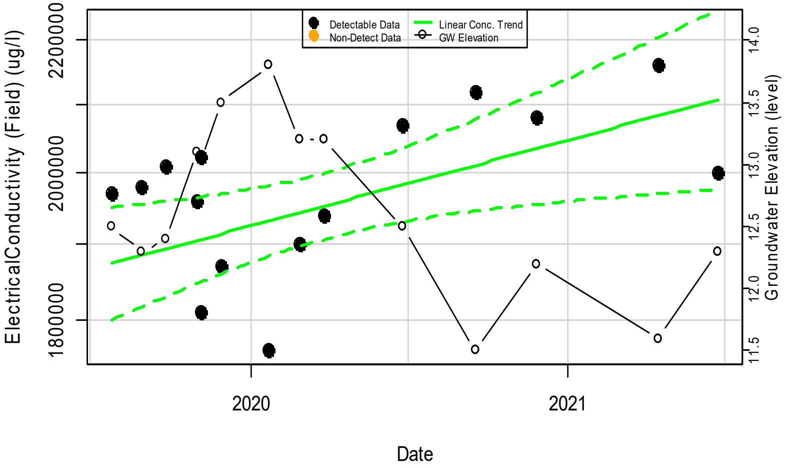


ElectricalConductivity (Field) in D15

Mann-Kendall P.Value= <0.01; Half-Life> 5 Years

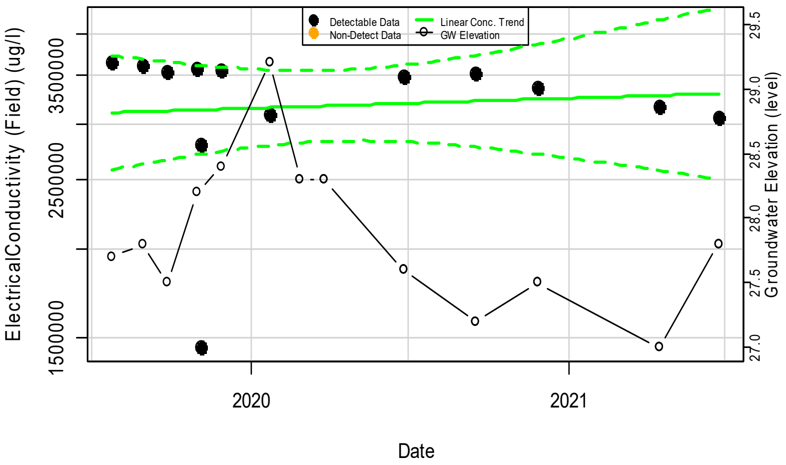
ElectricalConductivity (Field) in D16

Mann-Kendall P.Value= 0.0155; Half-Life> -5 Years



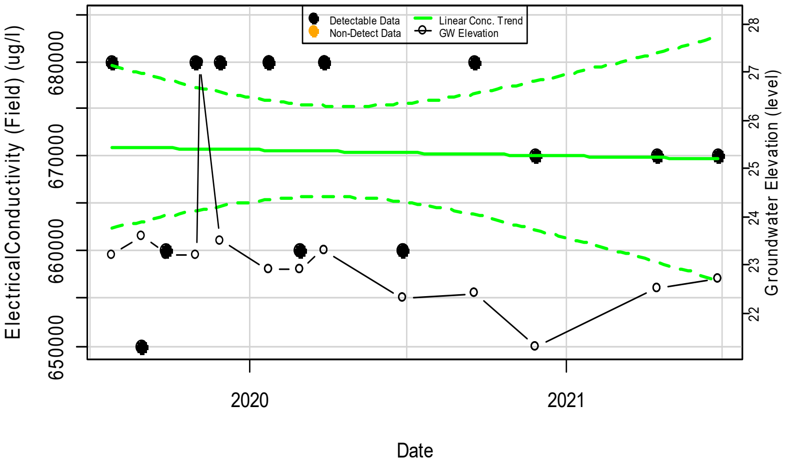
ElectricalConductivity (Field) in D17

Mann-Kendall P.Value= 0.113; Half-Life> -5 Years



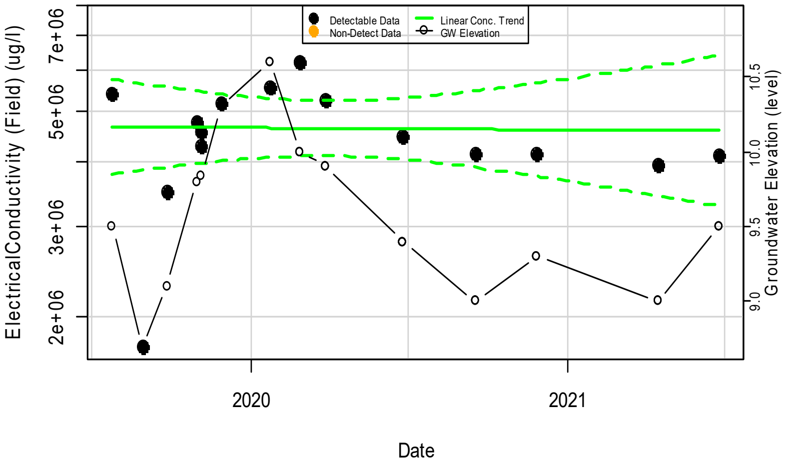
ElectricalConductivity (Field) in D18

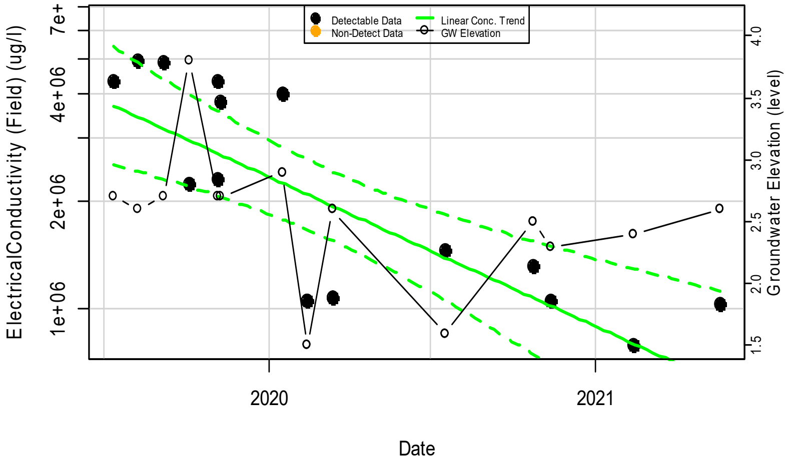
Mann-Kendall P.Value= 0.691; Half-Life> 5 Years



ElectricalConductivity (Field) in D19

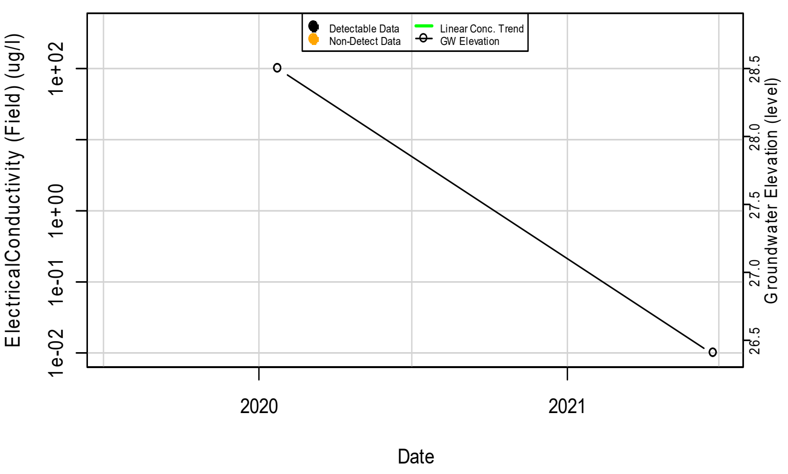
Mann-Kendall P.Value= 0.362; Half-Life> 5 Years



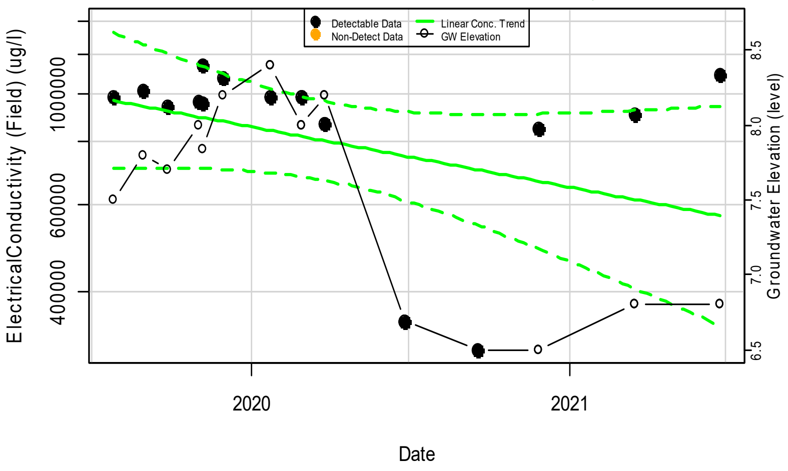


ElectricalConductivity (Field) in D2

Mann-Kendall P.Value= <0.01; Half-Life= 263 days

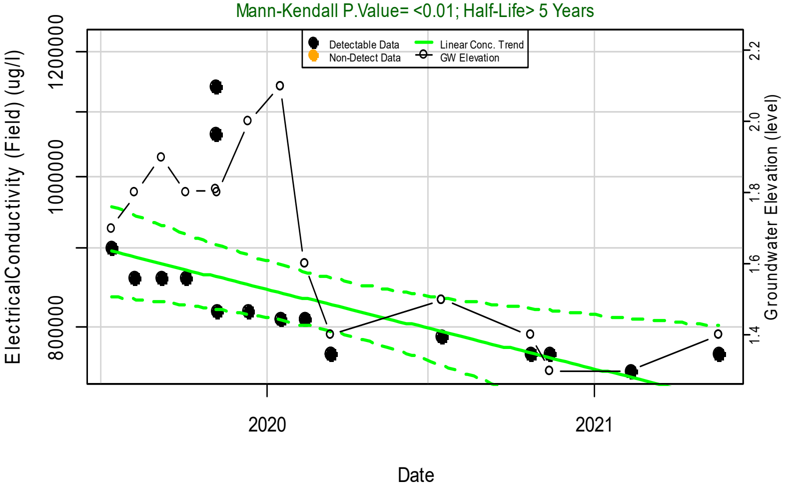


ElectricalConductivity (Field) in D23



ElectricalConductivity (Field) in D3

Mann-Kendall P.Value= 0.0178; Half-Life= 914 days

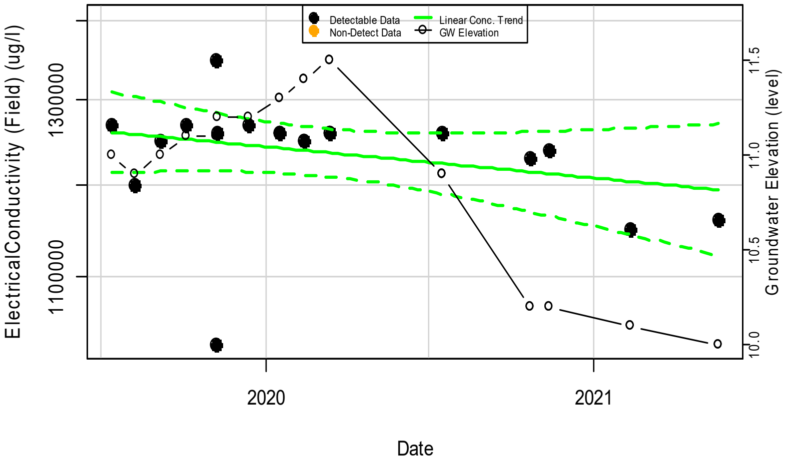


ElectricalConductivity (Field) in D4

Mann-Kendall P.Value= <0.01; Half-Life> 5 Years

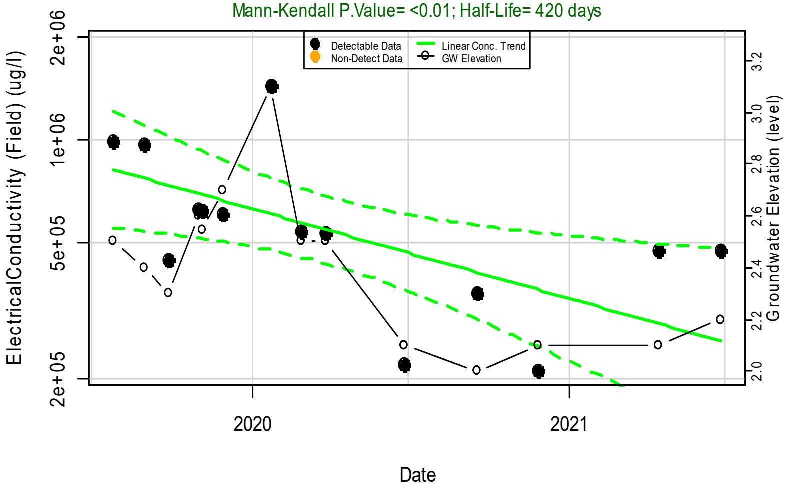
ElectricalConductivity (Field) in D5

Mann-Kendall P.Value= 0.0407; Half-Life> 5 Years



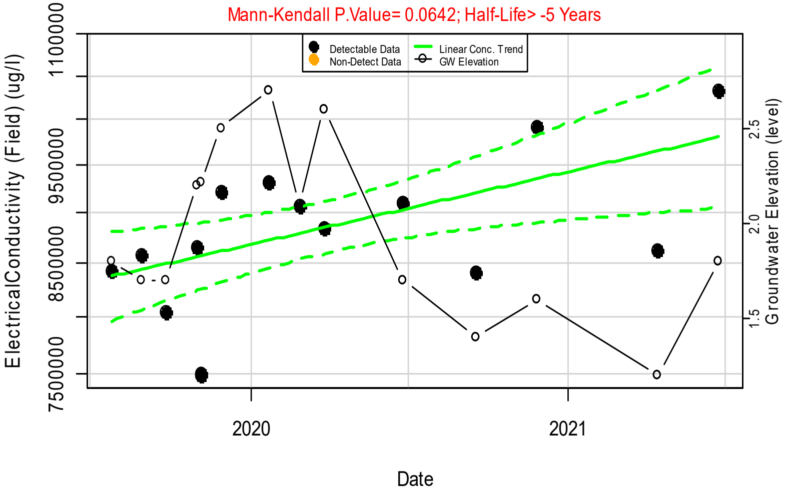
ElectricalConductivity (Field) in D8

Mann-Kendall P.Value= <0.01; Half-Life= 420 days



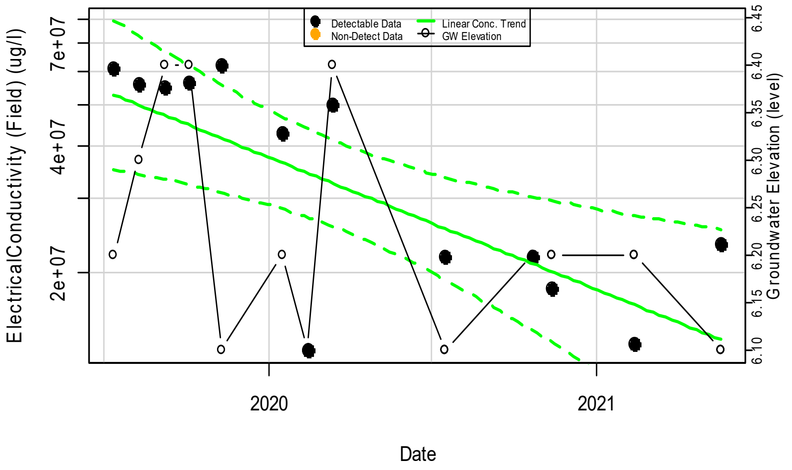
ElectricalConductivity (Field) in D9

Mann-Kendall P.Value= 0.0642; Half-Life> -5 Years



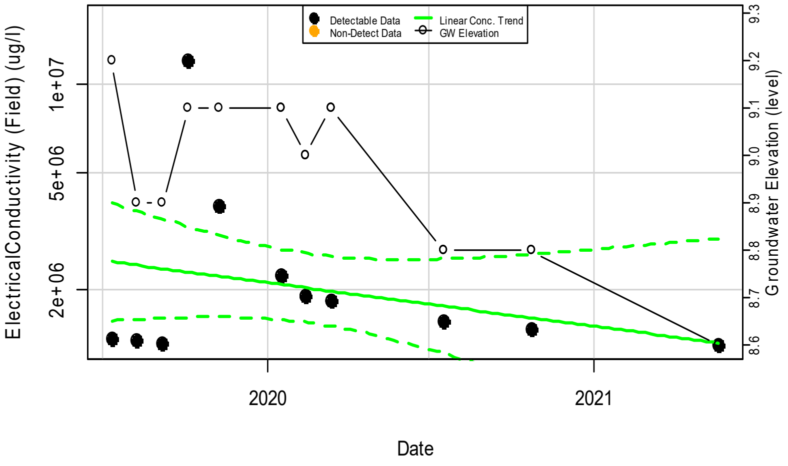
ElectricalConductivity (Field) in MPGM5-D5

Mann-Kendall P.Value= <0.01; Half-Life= 352 days

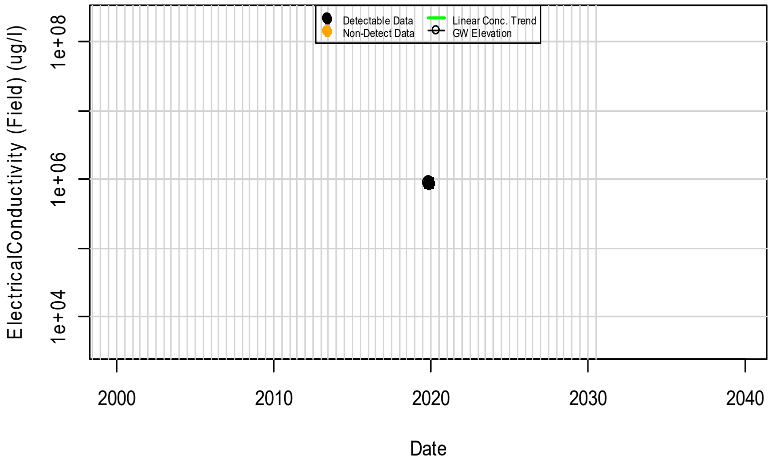


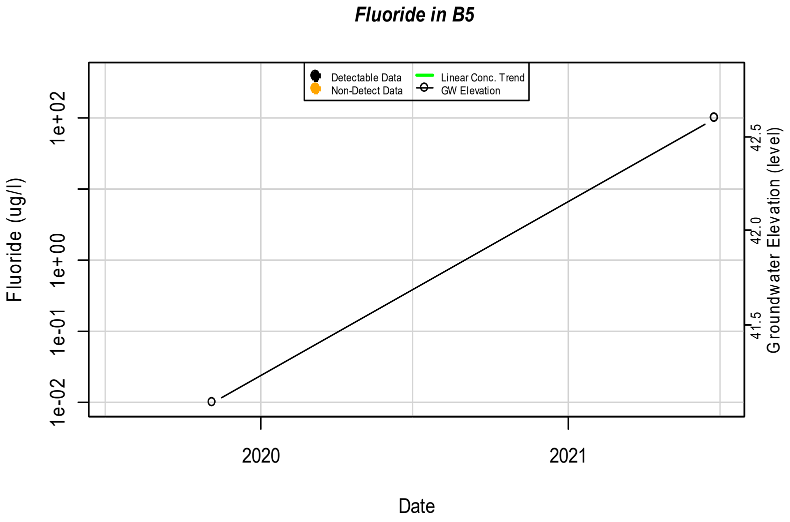
ElectricalConductivity (Field) in MPGM5-D6

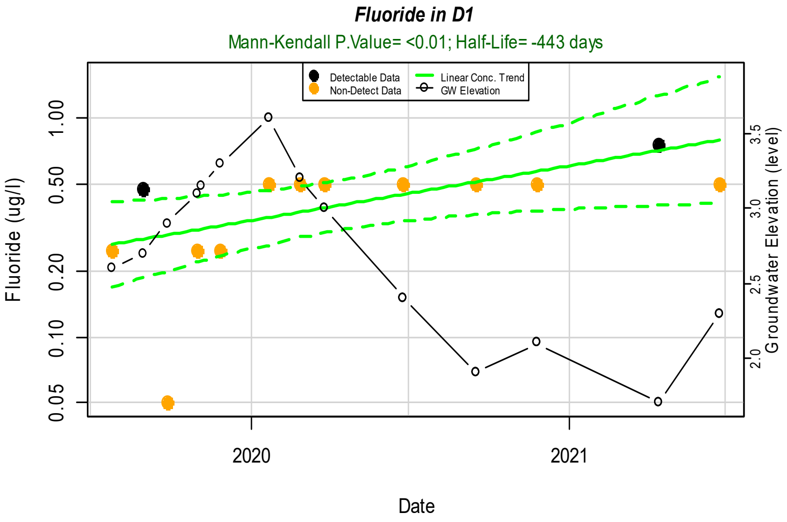
Mann-Kendall P.Value= 0.044; Half-Life= 743 days



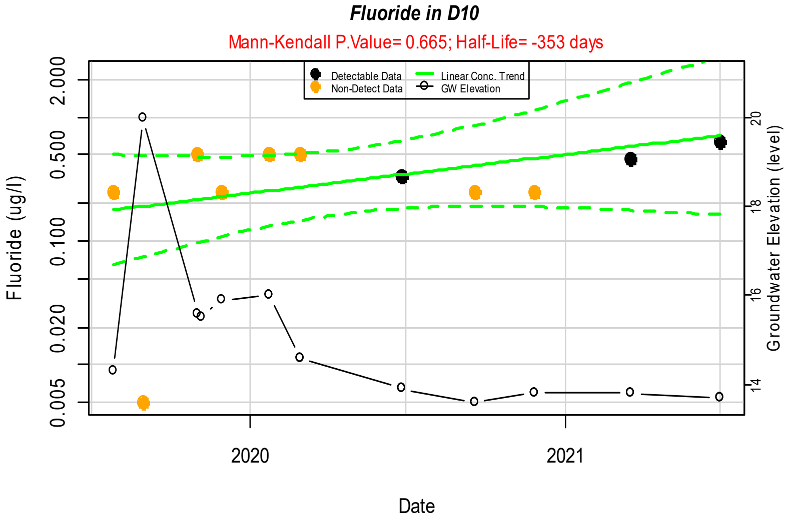
ElectricalConductivity (Field) in SW3-D



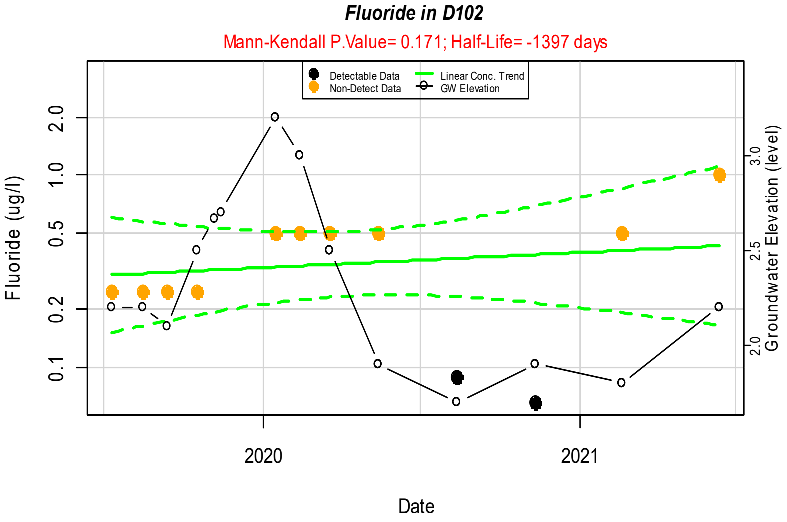

Fluoride in B5


Fluoride in D1

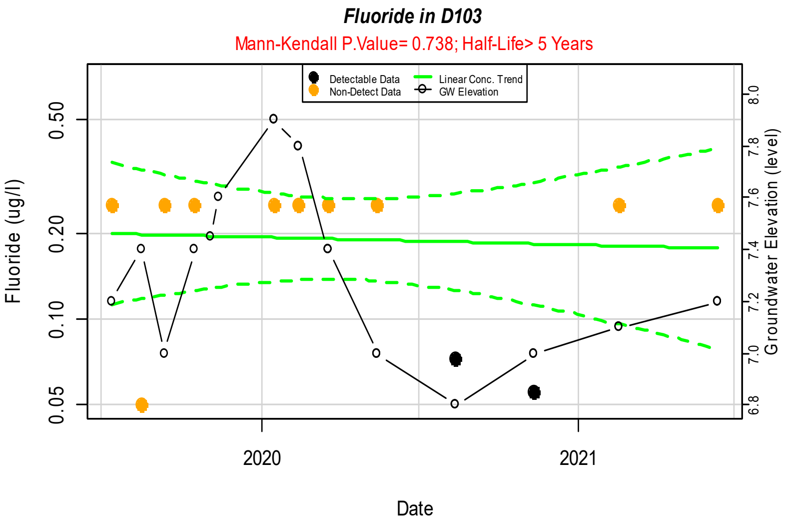
Mann-Kendall P.Value= <0.01; Half-Life= -443 days


Fluoride in D10

Mann-Kendall P.Value= 0.665; Half-Life= -353 days

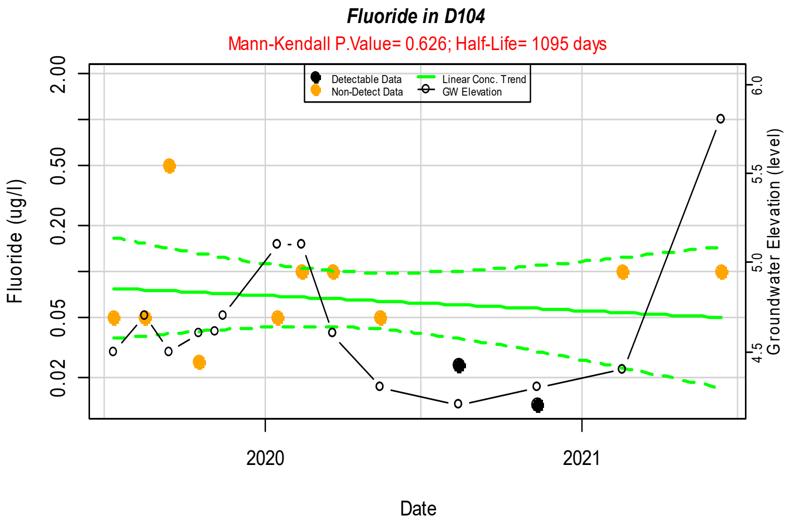

Fluoride in D102

Mann-Kendall P.Value= 0.171; Half-Life= -1397 days



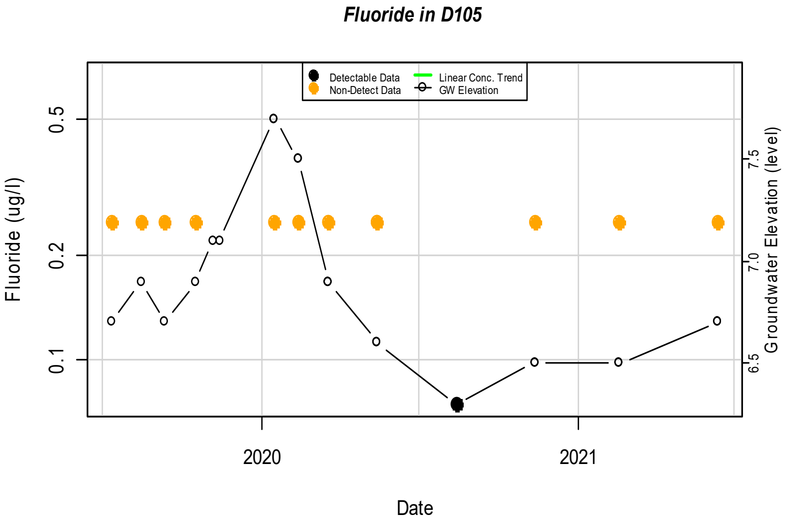
Fluoride in D103

Mann-Kendall P.Value= 0.738; Half-Life> 5 Years

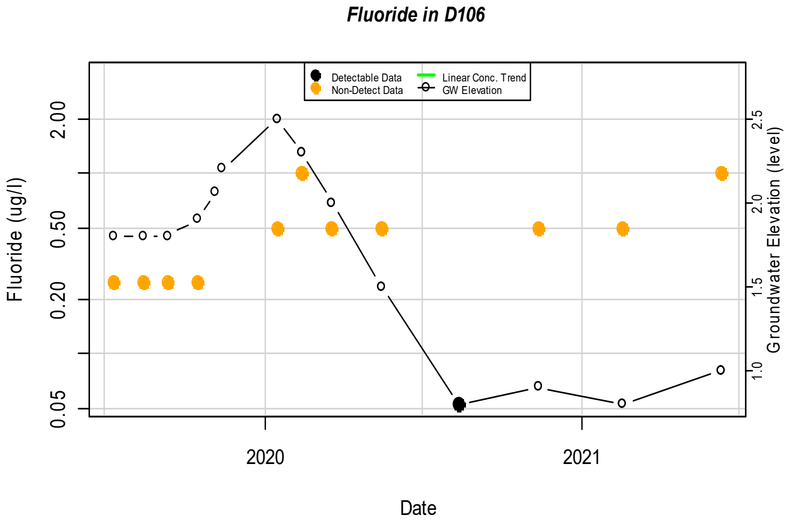


Fluoride in D104

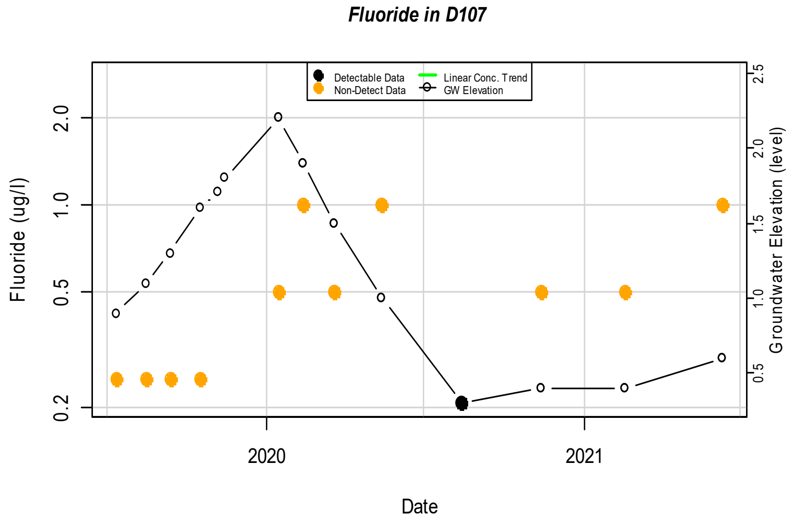
Mann-Kendall P.Value= 0.626; Half-Life= 1095 days

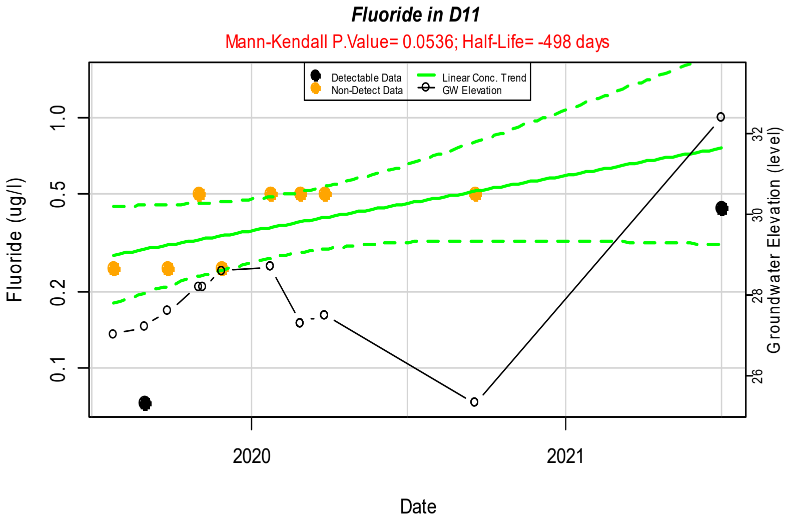


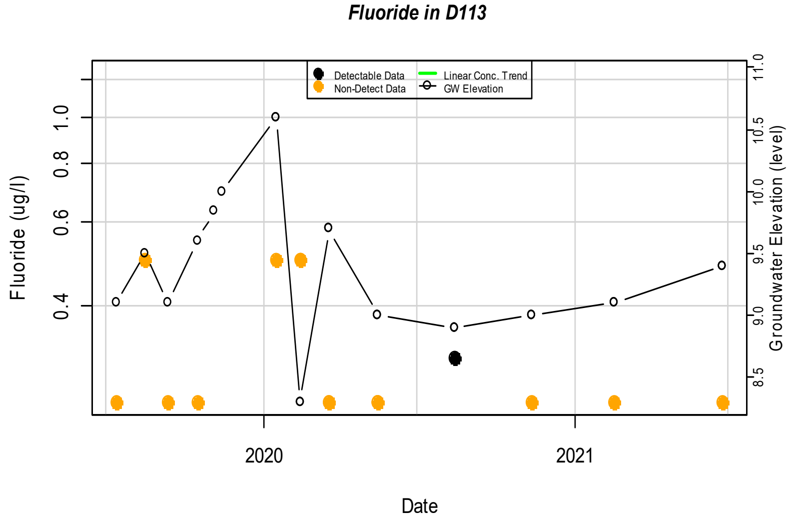
Fluoride in D105

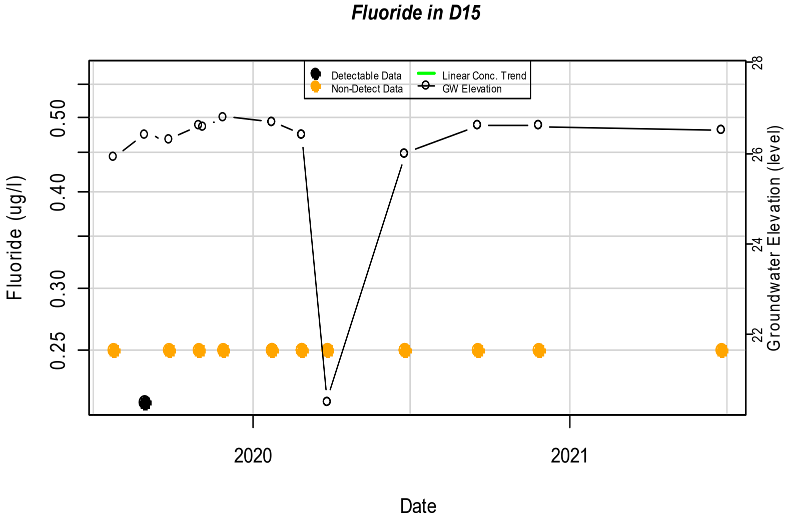


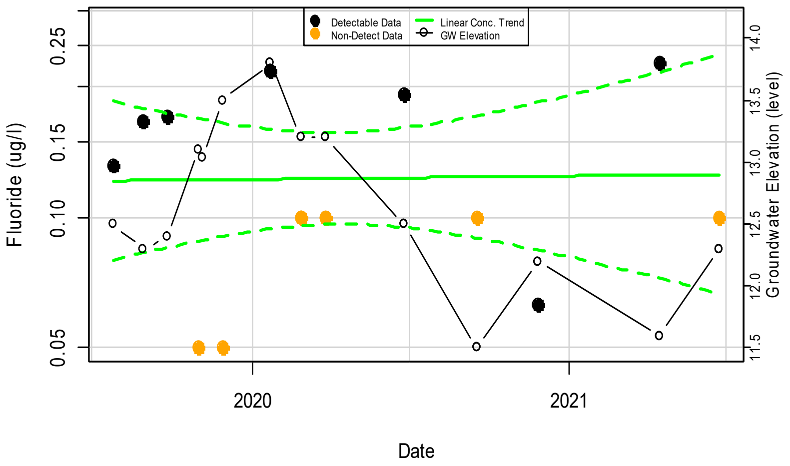
Fluoride in D106


Fluoride in D107
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Fluoride (ug/l)
0.2
0.5
1.0
2.0
Groundwater Elevation (level)
0.5
1.0
1.5
2.0
2.5
2020
2021
Date


Fluoride in D11
Mann-Kendall P.Value= 0.0536; Half-Life= -498 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Fluoride (ug/l)
0.1
0.2
0.5
1.0
Groundwater Elevation (level)
26
28
30
32
2020
2021
Date

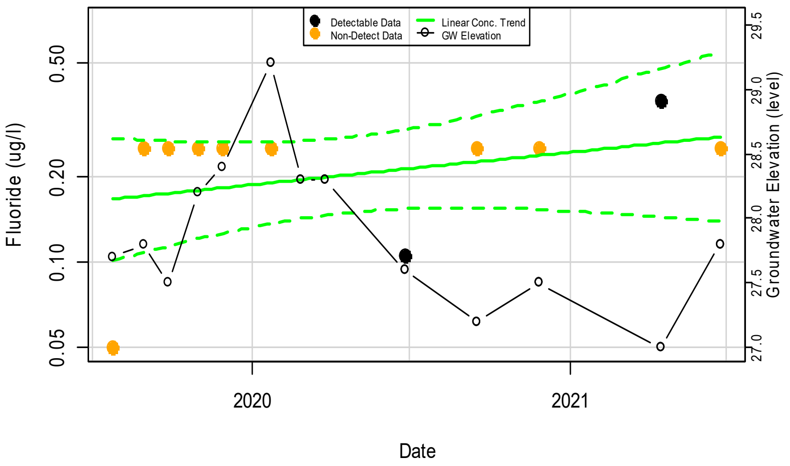

Fluoride in D113
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Fluoride (ug/l)
0.4
0.6
0.8
1.0
Groundwater Elevation (level)
8.5
9.0
9.5
10.0
10.5
11.0
2020
2021
Date


Fluoride in D15
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Fluoride (ug/l)
0.25
0.30
0.40
0.50
Groundwater Elevation (level)
22
24
26
28
2020
2021
Date



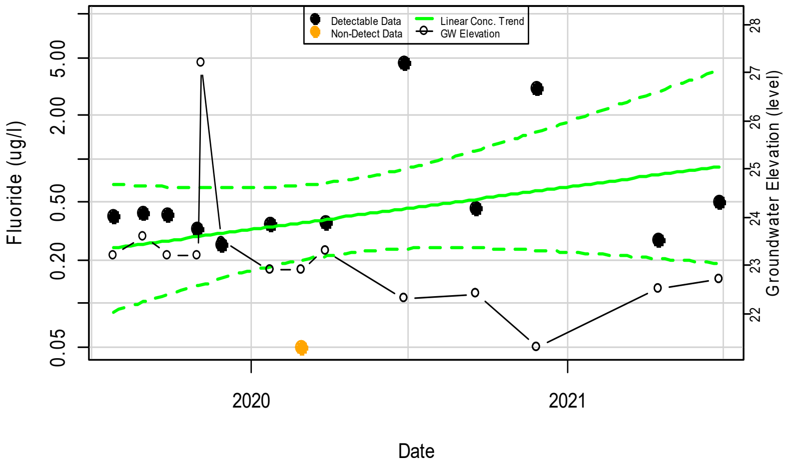
Fluoride in D16

Mann-Kendall P.Value= 1; Half-Life> -5 Years



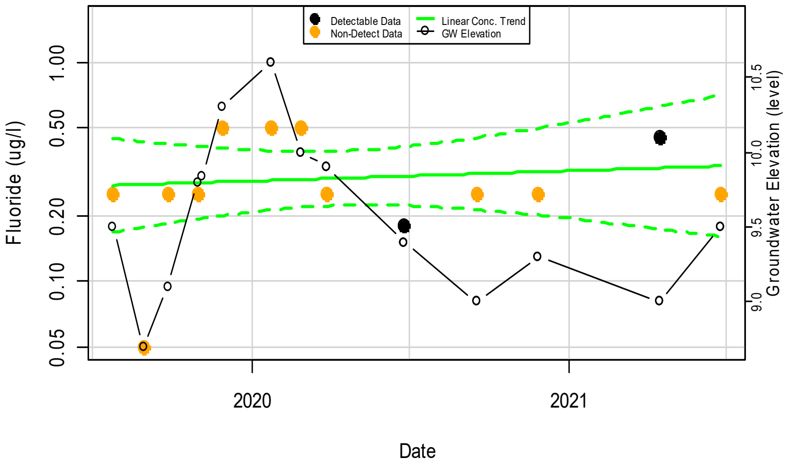
Fluoride in D17

Mann-Kendall P.Value= 0.328; Half-Life= -964 days



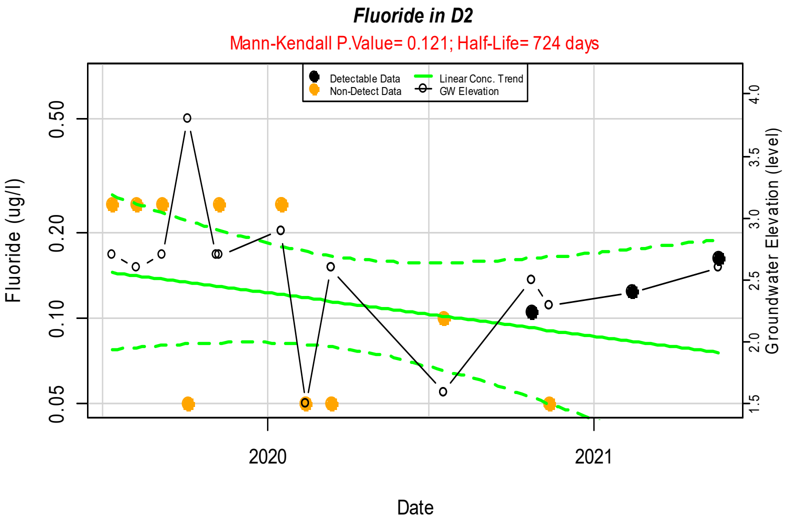
Fluoride in D18

Mann-Kendall P.Value= 0.224; Half-Life= -376 days

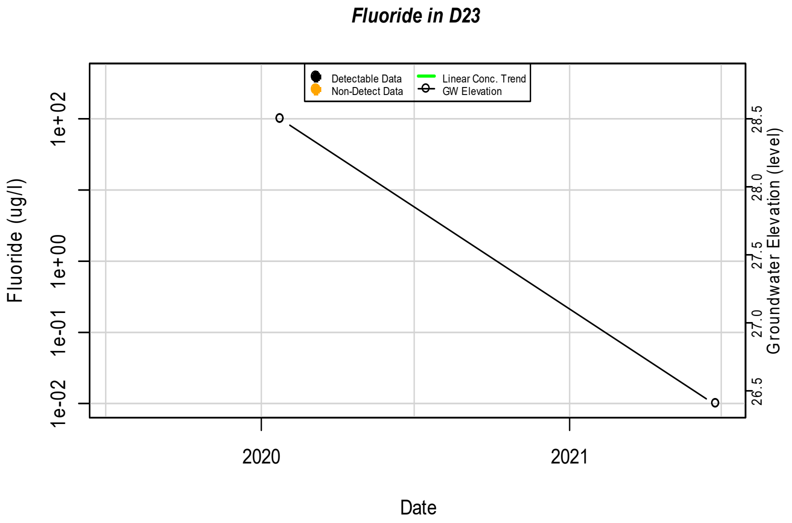


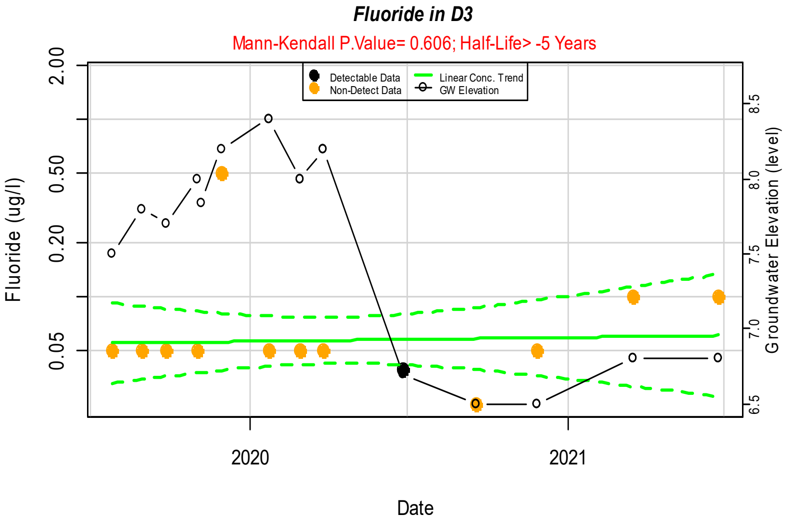
Fluoride in D19

Mann-Kendall P.Value= 0.597; Half-Life> -5 Years

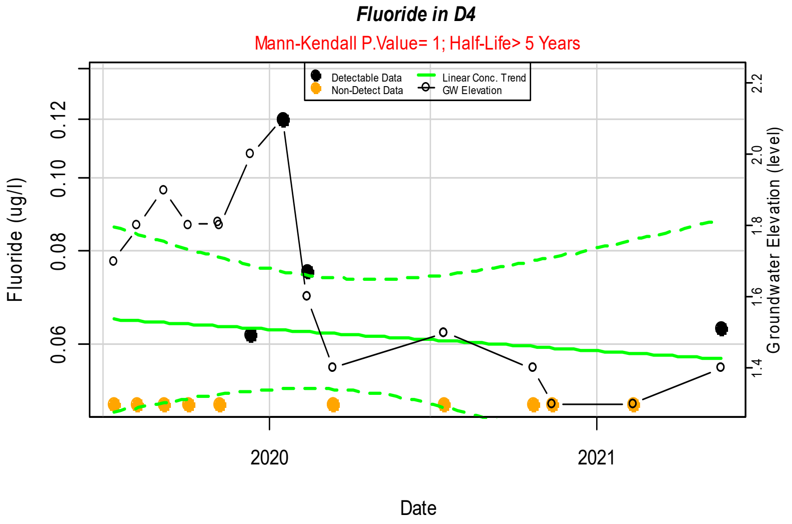

Fluoride in D2

Mann-Kendall P.Value= 0.121; Half-Life= 724 days

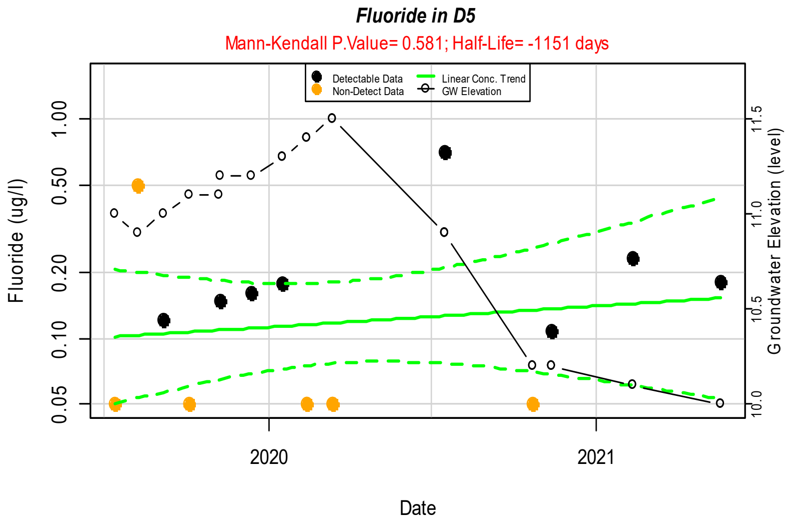

Fluoride in D23


Fluoride in D3

Mann-Kendall P.Value= 0.606; Half-Life> -5 Years

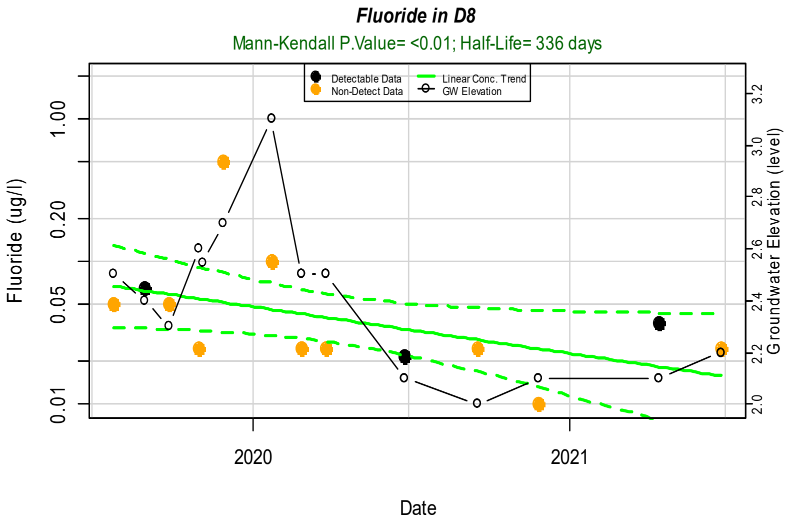

Fluoride in D4

Mann-Kendall P.Value= 1; Half-Life> 5 Years



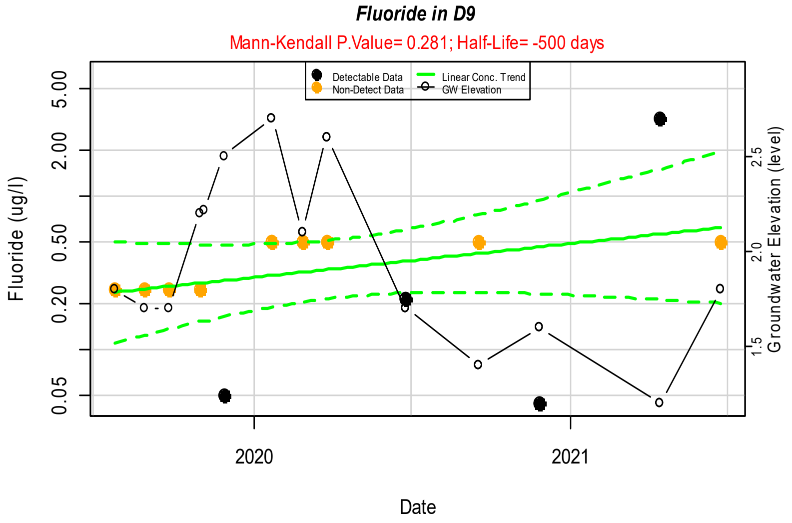
Fluoride in D5

Mann-Kendall P.Value= 0.581; Half-Life= -1151 days



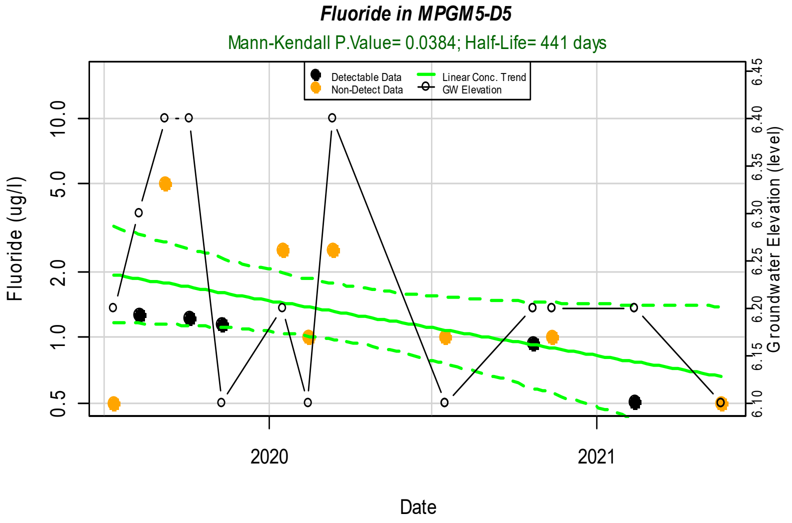
Fluoride in D8

Mann-Kendall P.Value= <0.01; Half-Life= 336 days



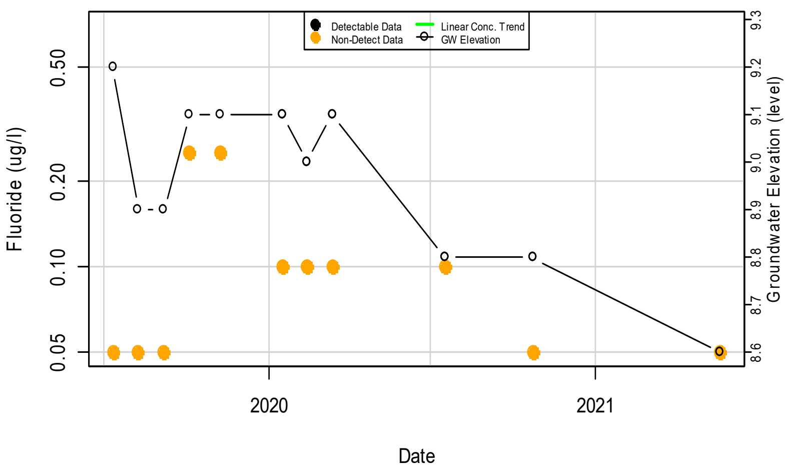
Fluoride in D9

Mann-Kendall P.Value= 0.281; Half-Life= -500 days

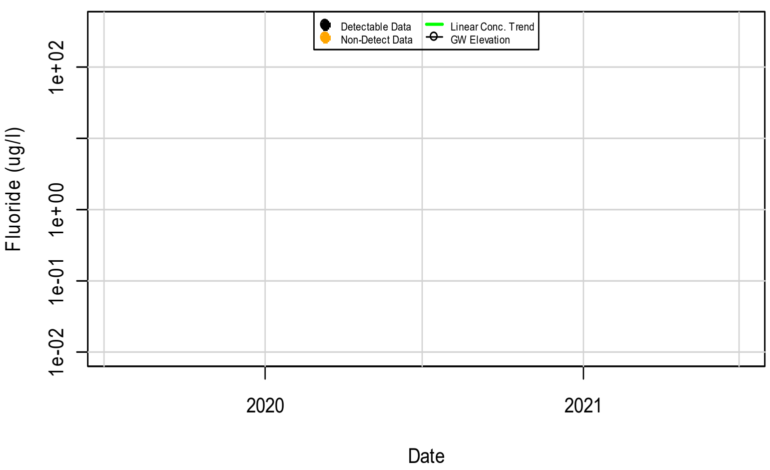


Fluoride in MPGM5-D5

Mann-Kendall P.Value= 0.0384; Half-Life= 441 days

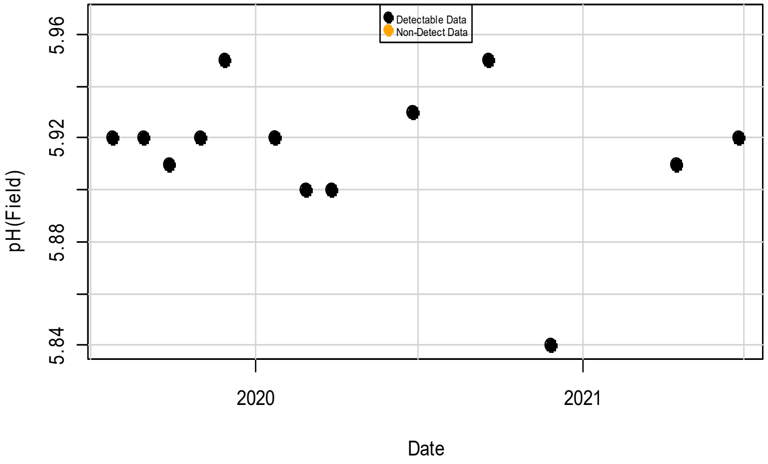


Fluoride in MPGM5-D6

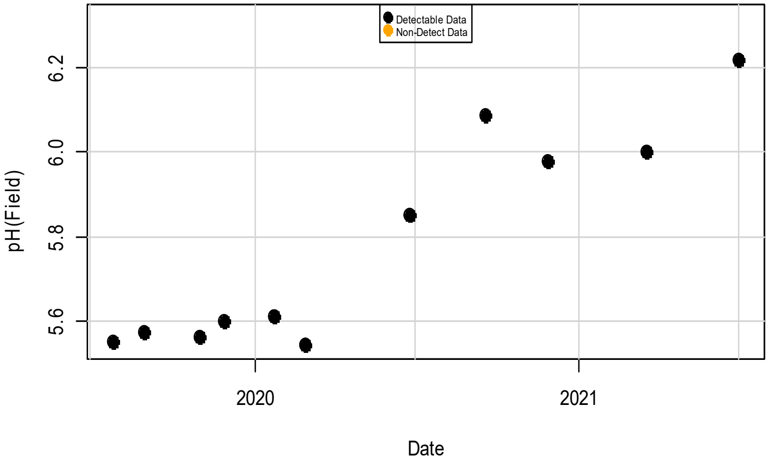


Fluoride in SW3-D

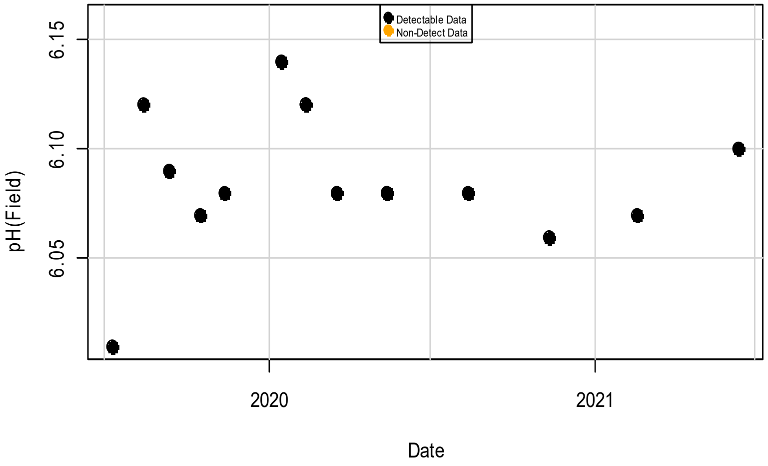
pH(Field) in D1



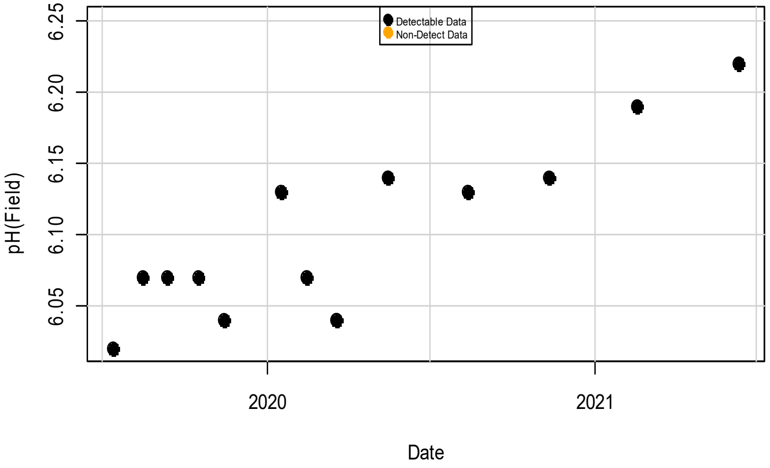
pH(Field) in D10

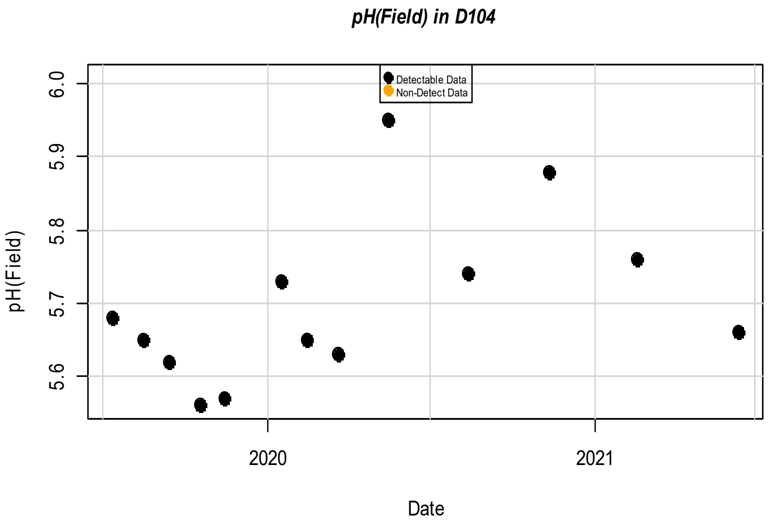


pH(Field) in D102

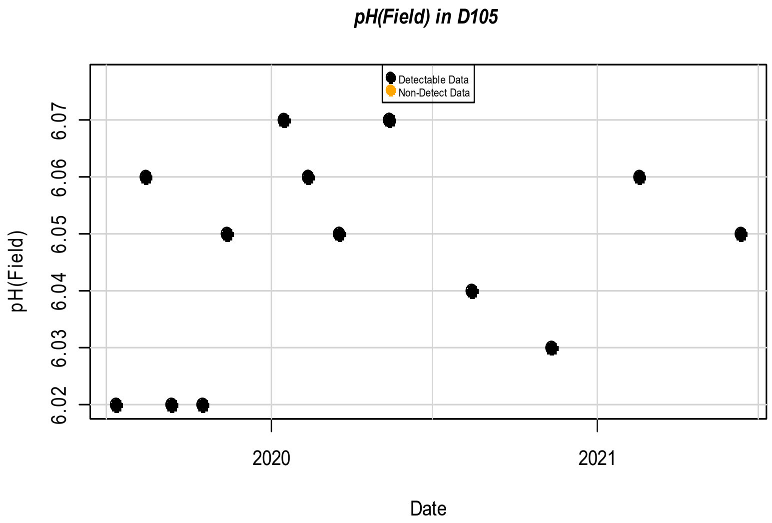


pH(Field) in D103

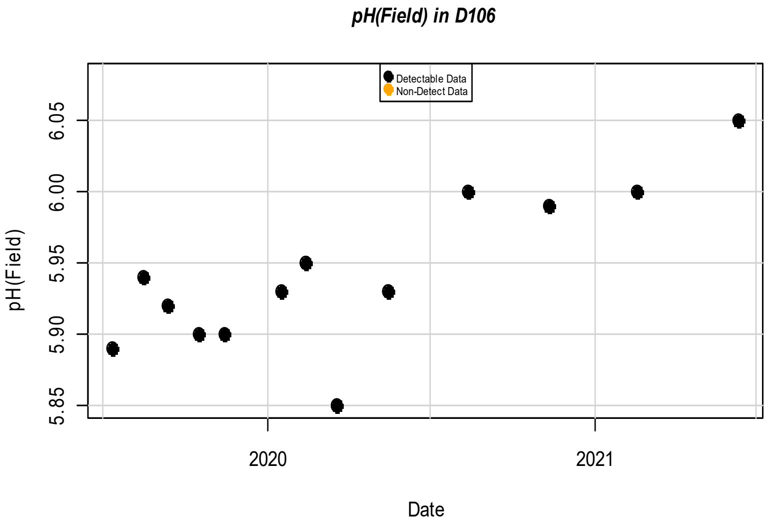




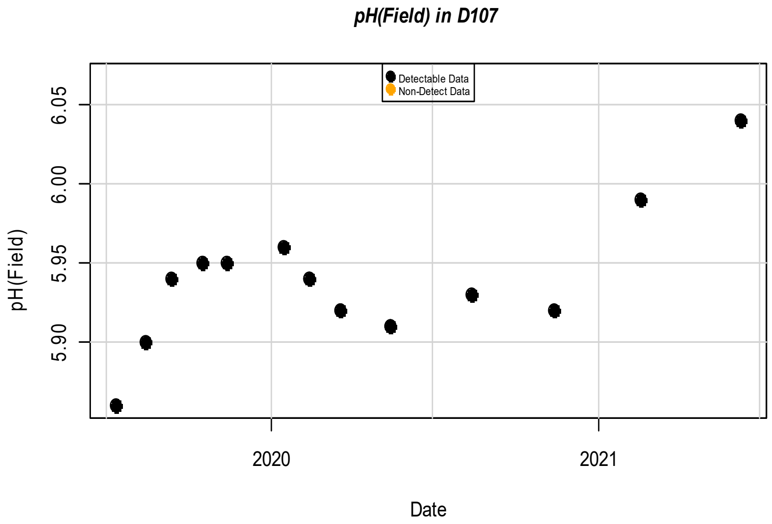
pH(Field) in D104



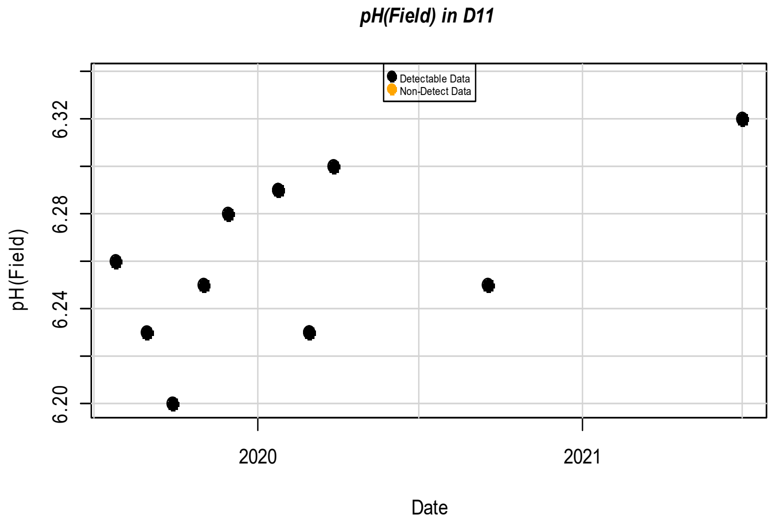
pH(Field) in D105



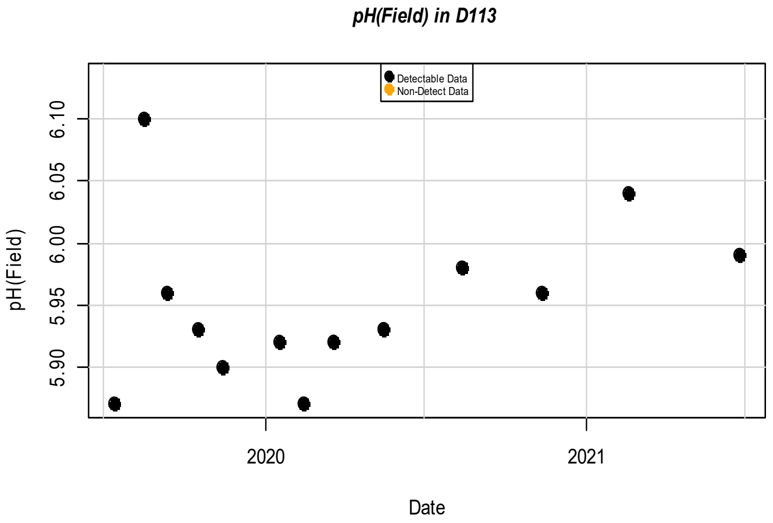
pH(Field) in D106



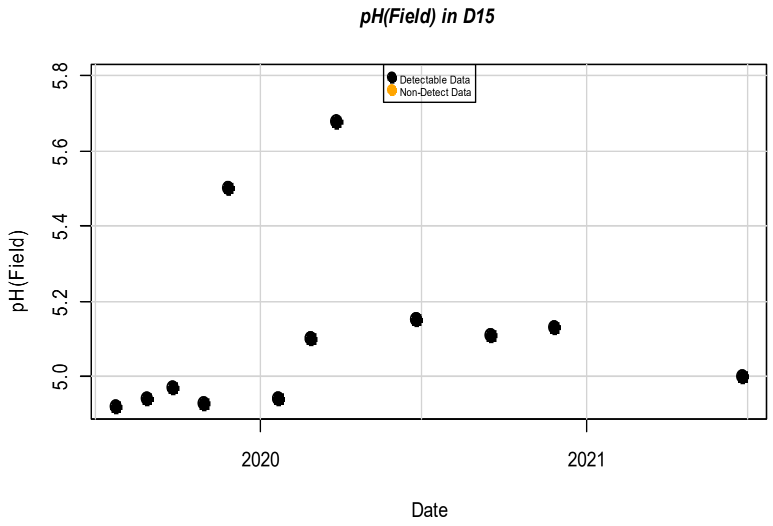
pH(Field) in D107



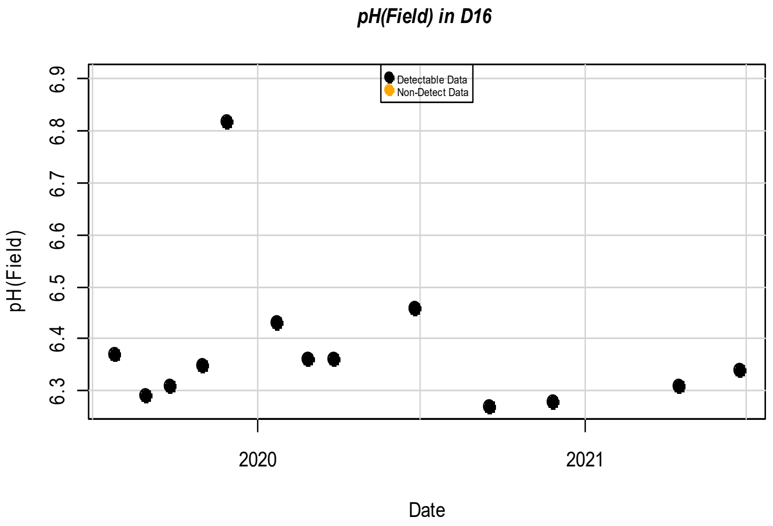
pH(Field) in D11



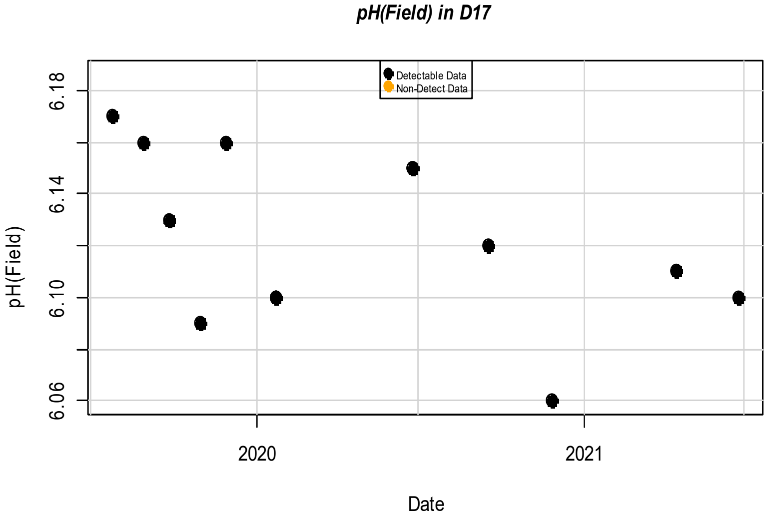
pH(Field) in D113



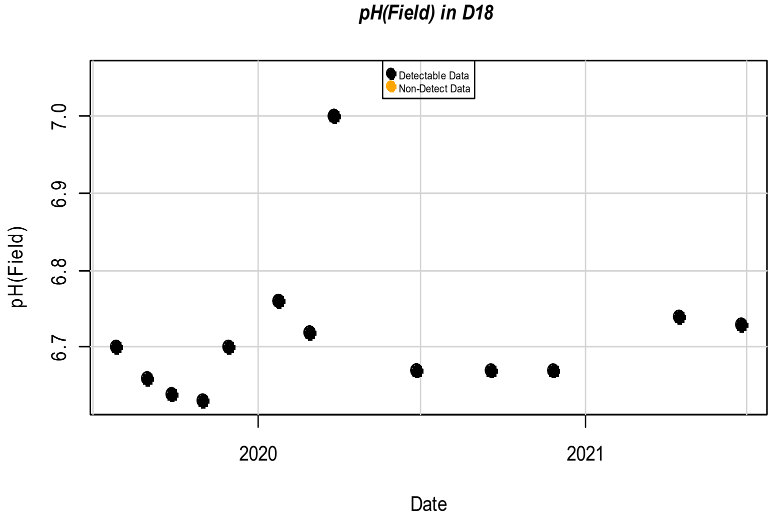
pH(Field) in D15



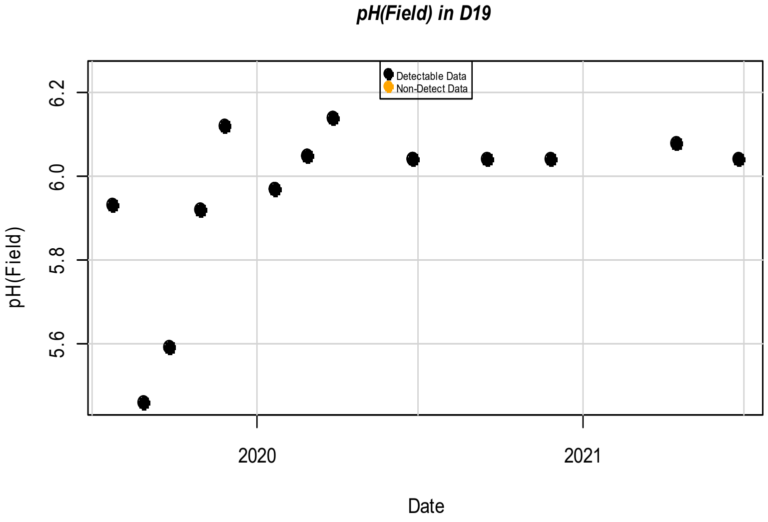
pH(Field) in D16



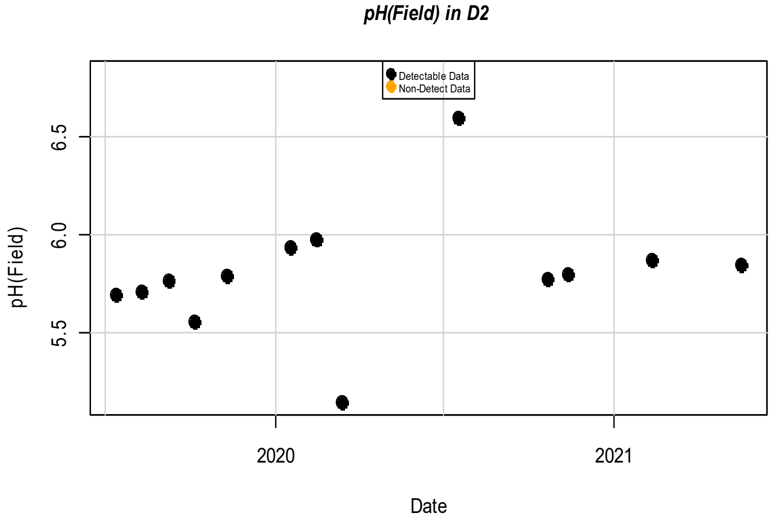
pH(Field) in D17



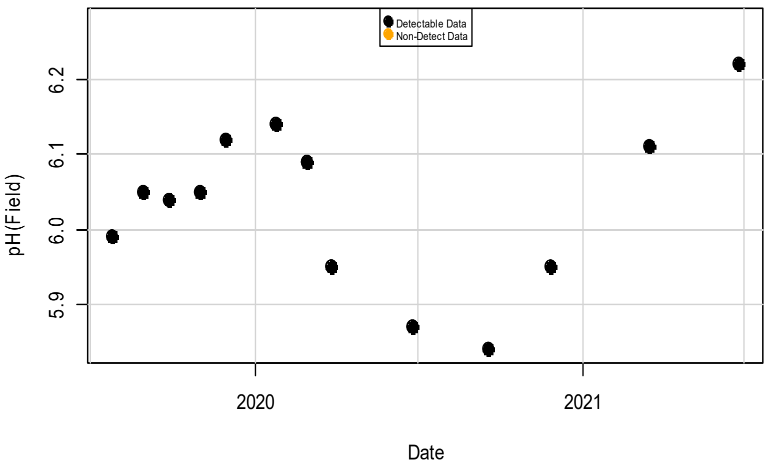
pH(Field) in D18

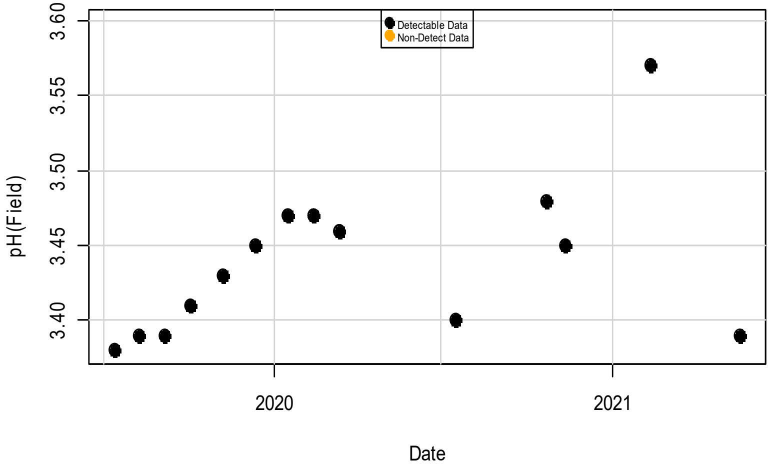


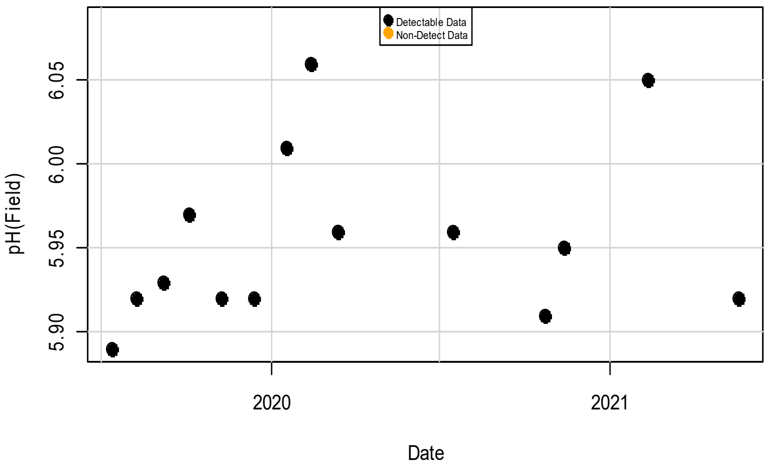
pH(Field) in D19

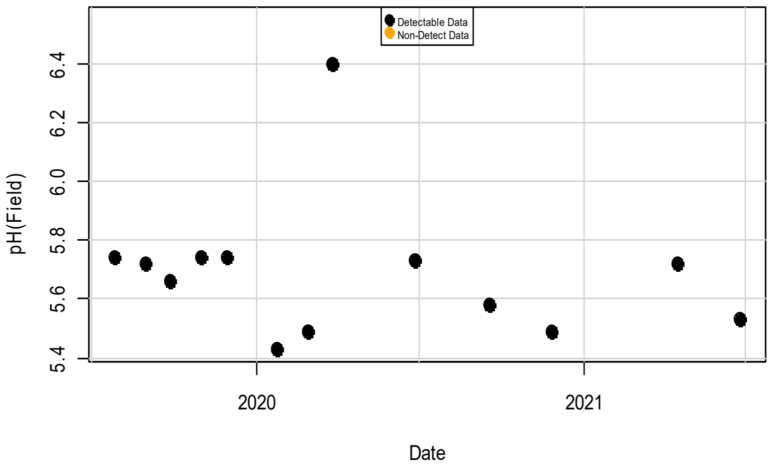


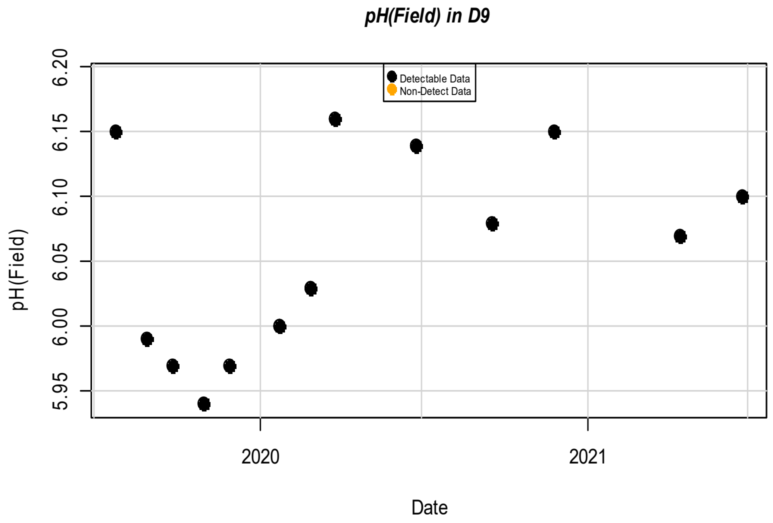
pH(Field) in D2

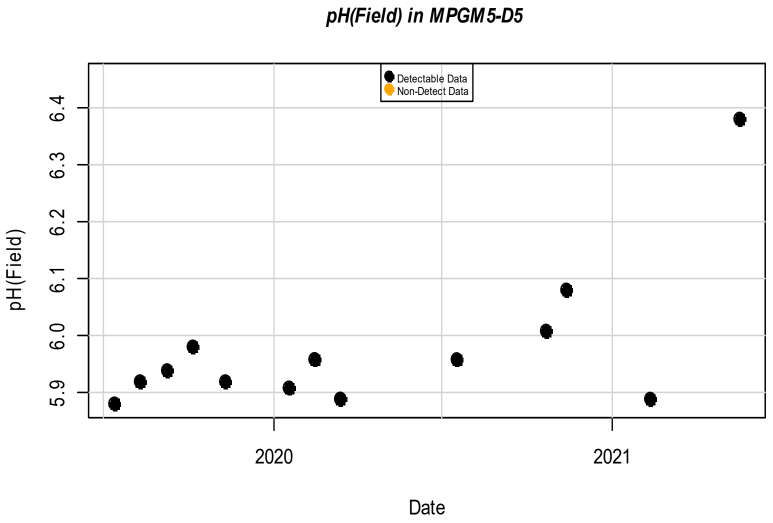

pH(Field) in D3

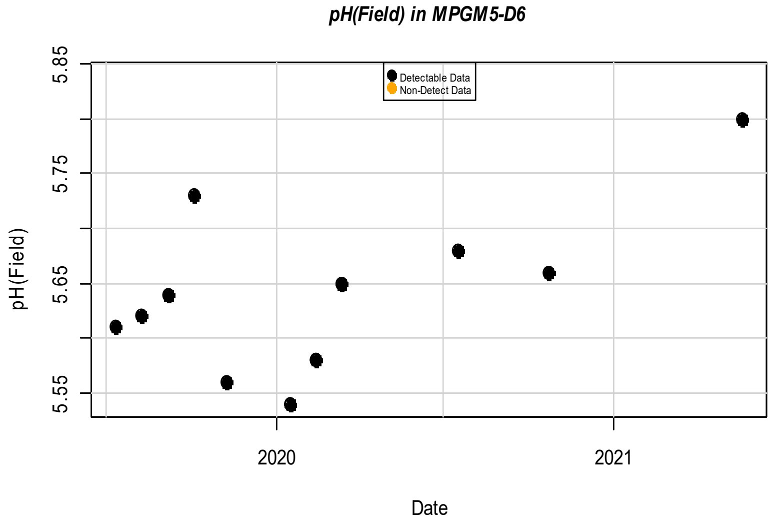

pH(Field) in D4

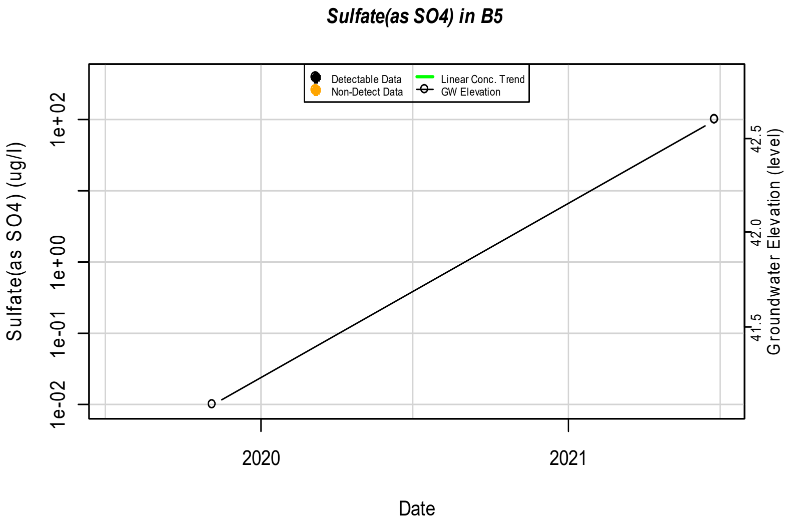

pH(Field) in D5


pH(Field) in D8

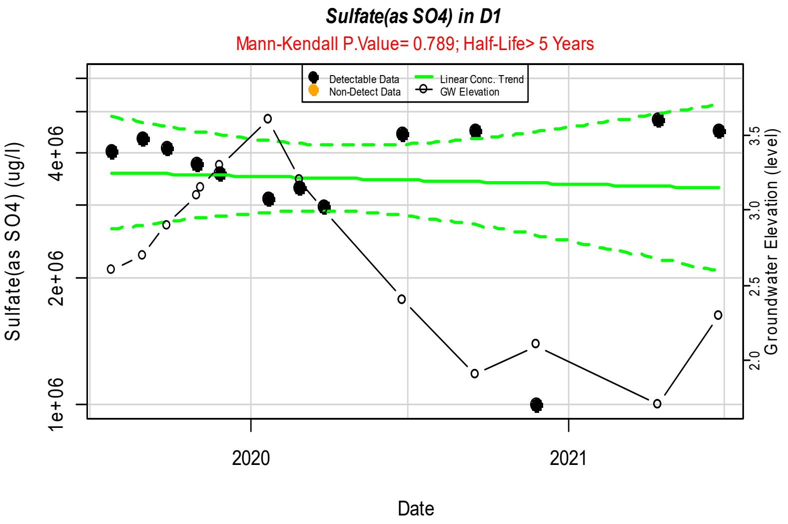

pH(Field) in D9
Detectable Data
Non-Detect Data
pH(Field)
6.20
6.15
6.10
6.05
6.00
5.95
2020
2021
Date


pH(Field) in MPGM5-D5
Detectable Data
Non-Detect Data
pH(Field)
6.4
6.3
6.2
6.1
6.0
5.9
2020
2021
Date


pH(Field) in MPGM5-D6
Detectable Data
Non-Detect Data
pH(Field)
5.85
5.75
5.65
5.55
2020
2021
Date

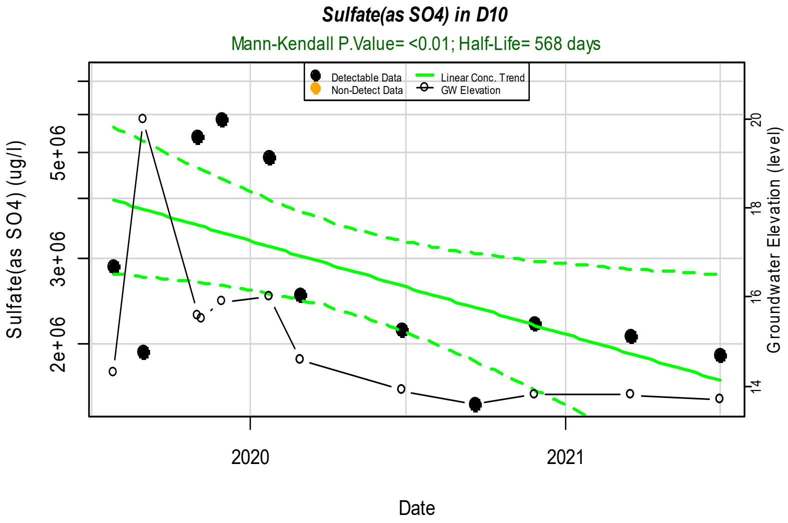


Sulfate(as SO4) in B5



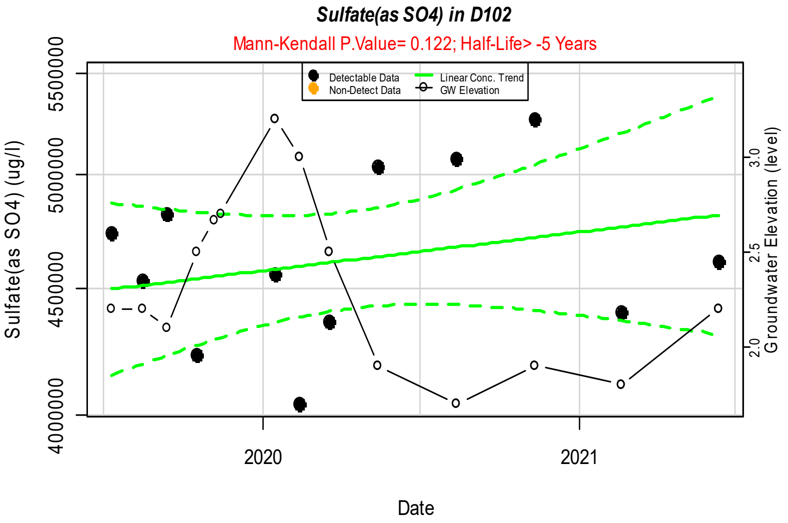
Sulfate(as SO4) in D1

Mann-Kendall P.Value= 0.789; Half-Life> 5 Years



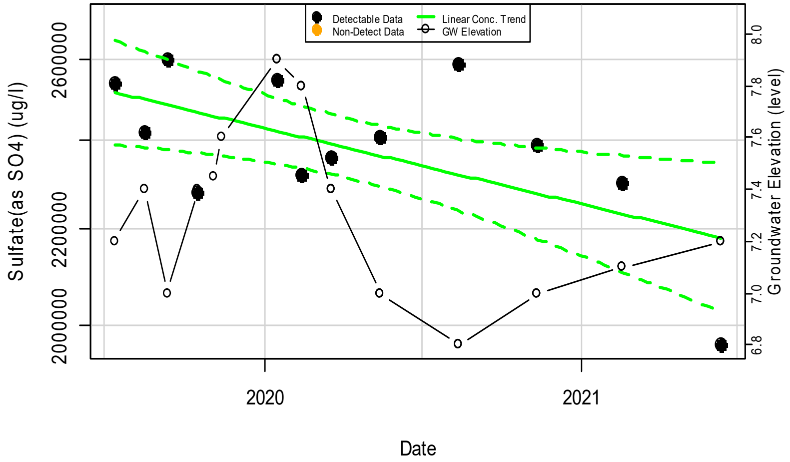
Sulfate(as SO4) in D10

Mann-Kendall P.Value= <0.01; Half-Life= 568 days



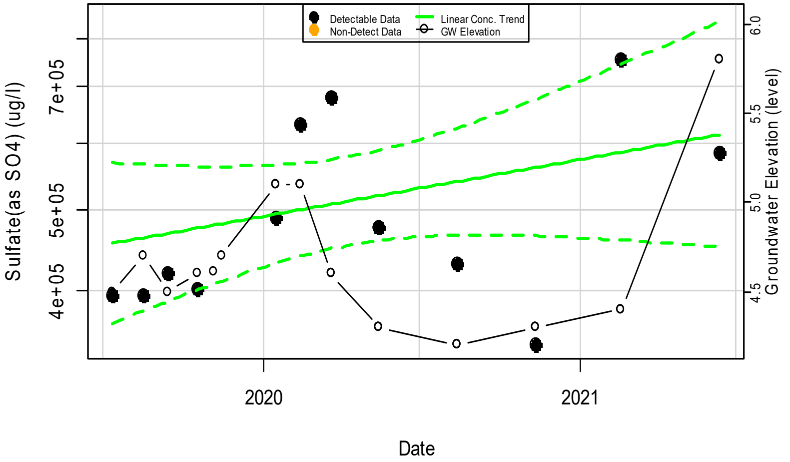
Sulfate(as SO4) in D102

Mann-Kendall P.Value= 0.122; Half-Life> -5 Years



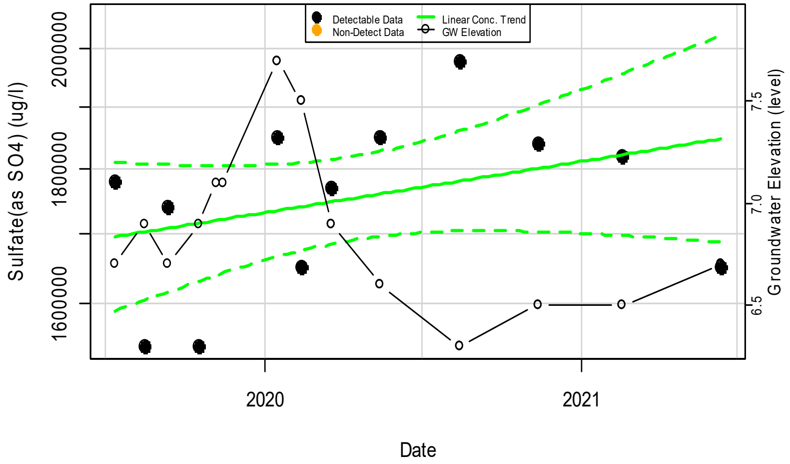
Sulfate(as SO4) in D103

Mann-Kendall P.Value= 0.316; Half-Life> 5 Years



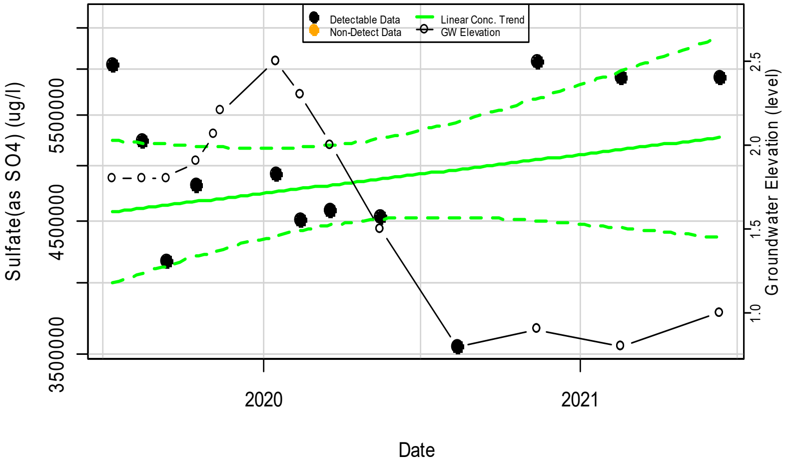
Sulfate(as SO4) in D104

Mann-Kendall P.Value= 0.181; Half-Life= -1627 days



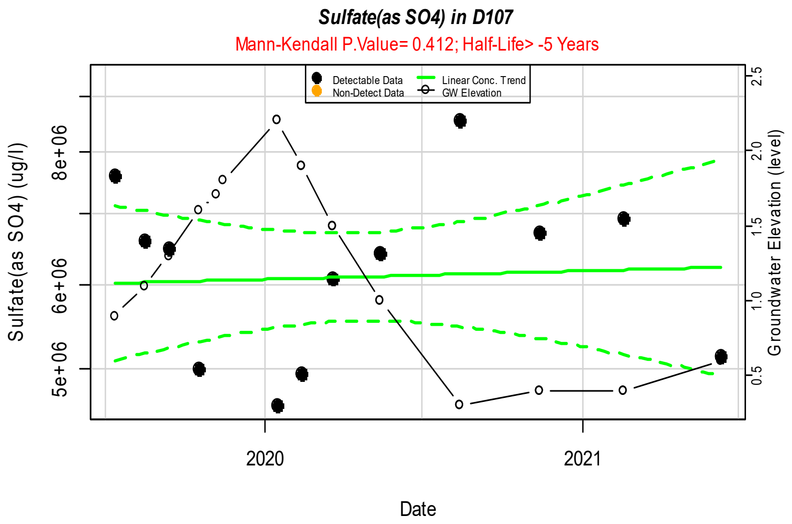
Sulfate(as SO4) in D105

Mann-Kendall P.Value= 0.0982; Half-Life> -5 Years



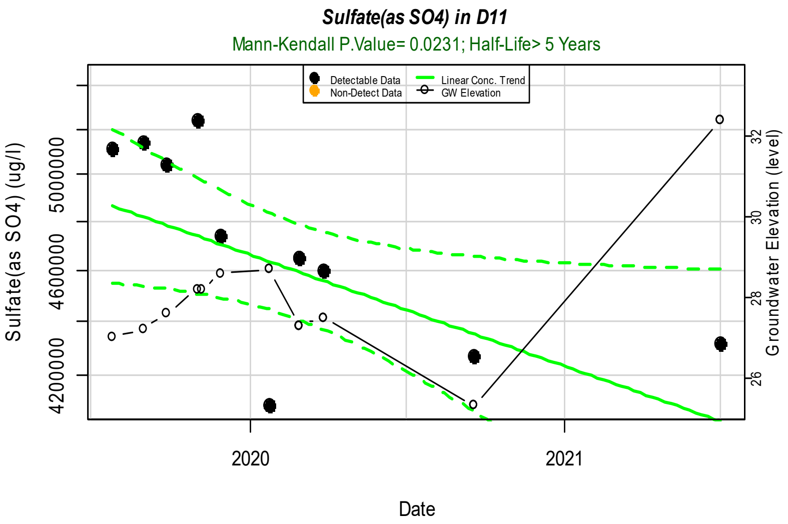
Sulfate(as SO4) in D106

Mann-Kendall P.Value= 0.933; Half-Life> -5 Years



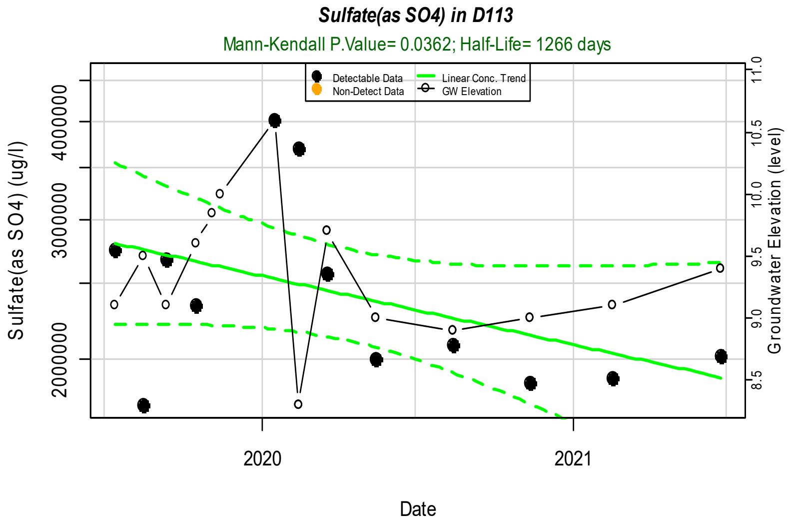
Sulfate(as SO4) in D107

Mann-Kendall P.Value= 0.412; Half-Life> -5 Years



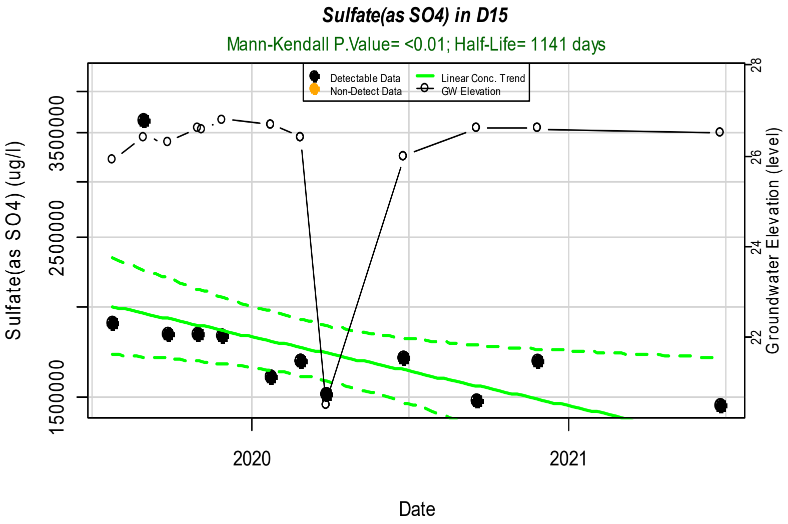
Sulfate(as SO4) in D11

Mann-Kendall P.Value= 0.0231; Half-Life> 5 Years



Sulfate(as SO4) in D113

Mann-Kendall P.Value= 0.0362; Half-Life= 1266 days

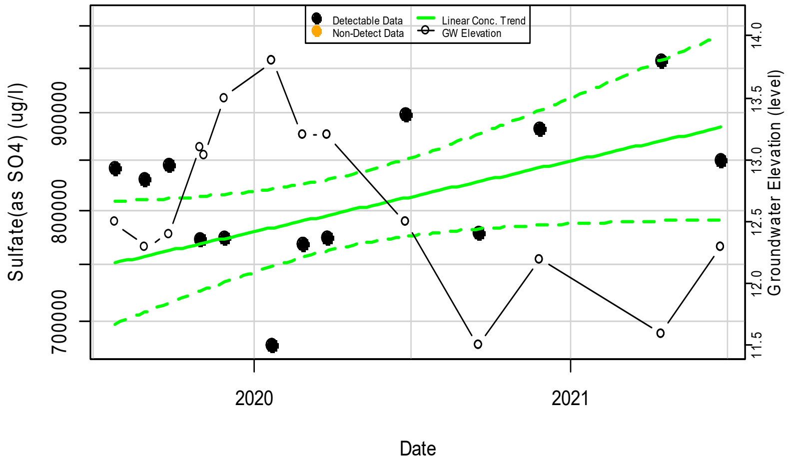


Sulfate(as SO4) in D15

Mann-Kendall P.Value= <0.01; Half-Life= 1141 days

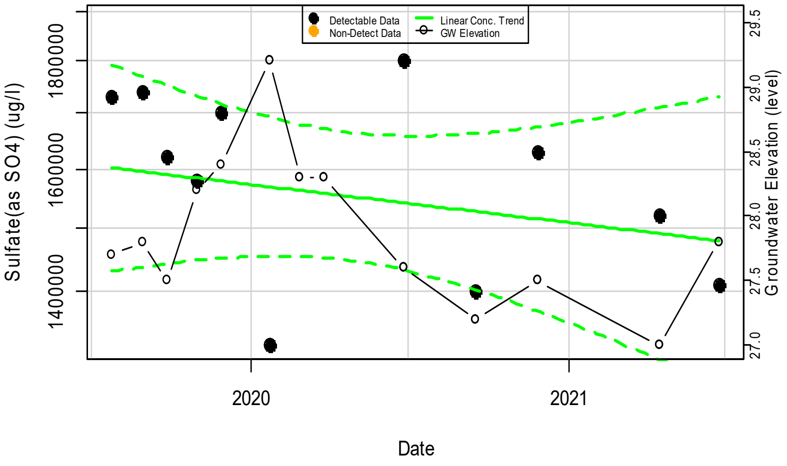
Sulfate(as SO4) in D16

Mann-Kendall P.Value= 0.0653; Half-Life> -5 Years



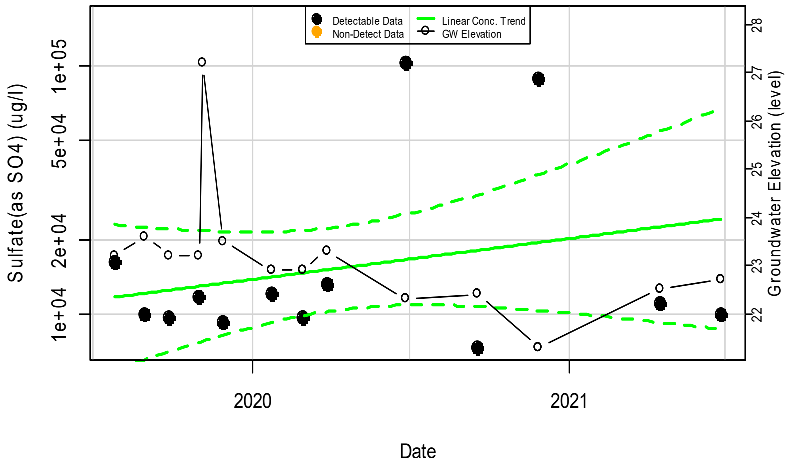
Sulfate(as SO4) in D17

Mann-Kendall P.Value= 0.437; Half-Life> 5 Years



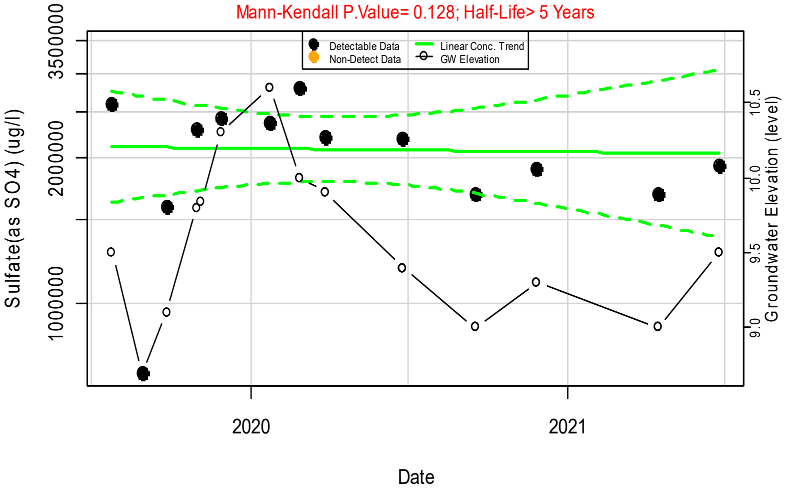
Sulfate(as SO4) in D18

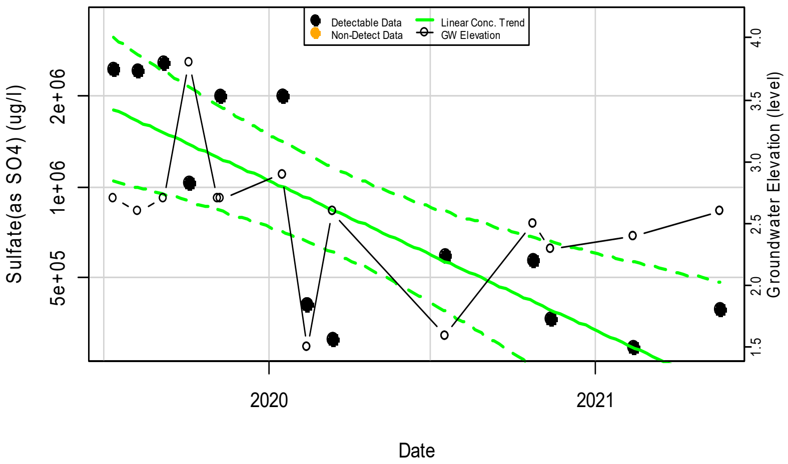
Mann-Kendall P.Value= 0.293; Half-Life= -671 days



Sulfate(as SO4) in D19

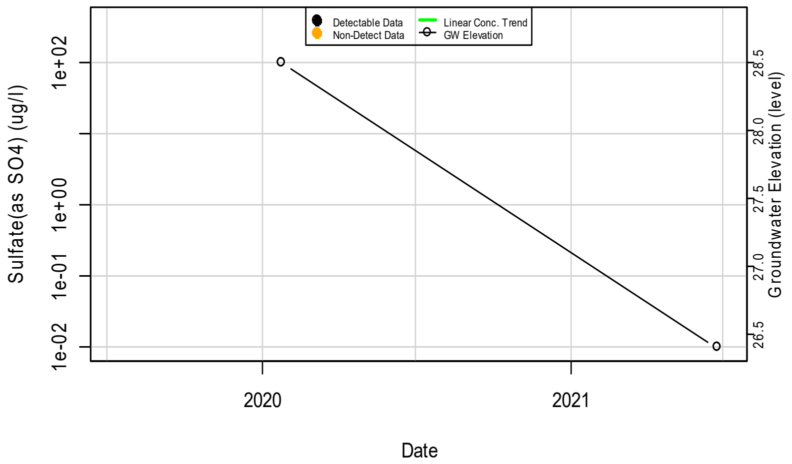
Mann-Kendall P.Value= 0.128; Half-Life> 5 Years



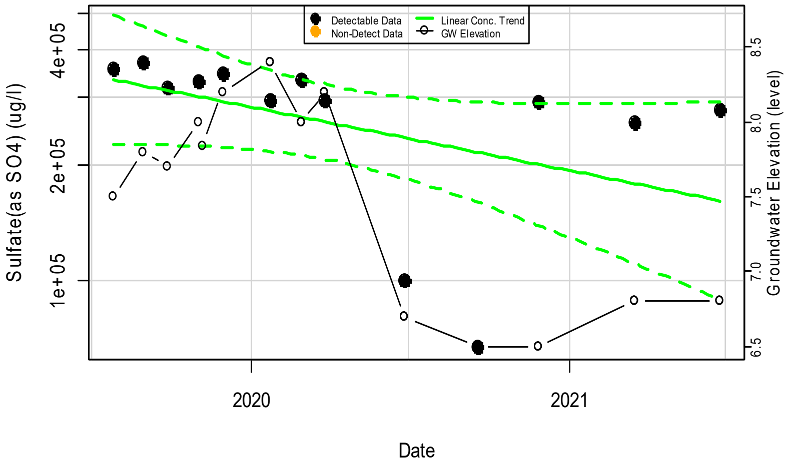


Sulfate(as SO4) in D2

Mann-Kendall P.Value= <0.01; Half-Life= 221 days

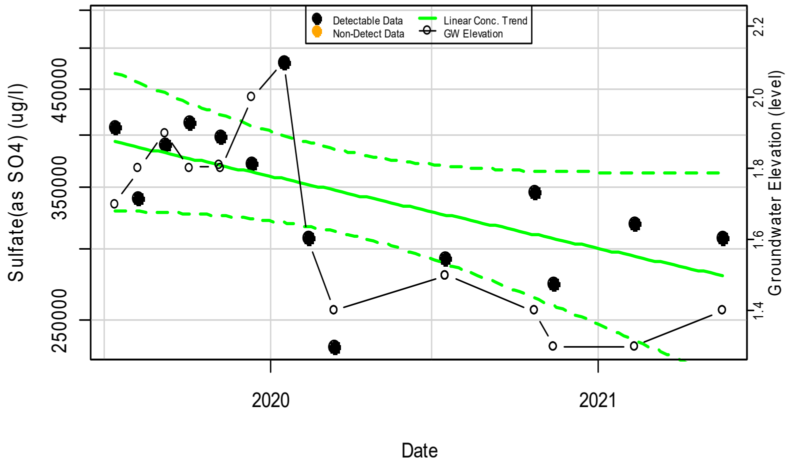


Sulfate(as SO4) in D23



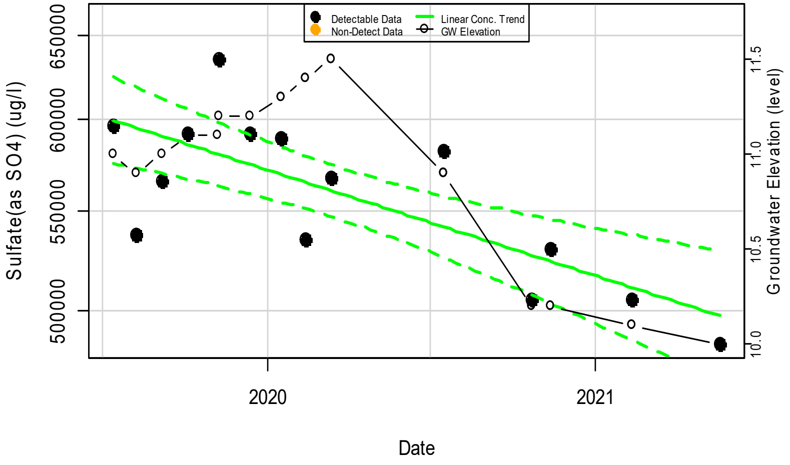
Sulfate(as SO4) in D3

Mann-Kendall P.Value= <0.01; Half-Life= 665 days



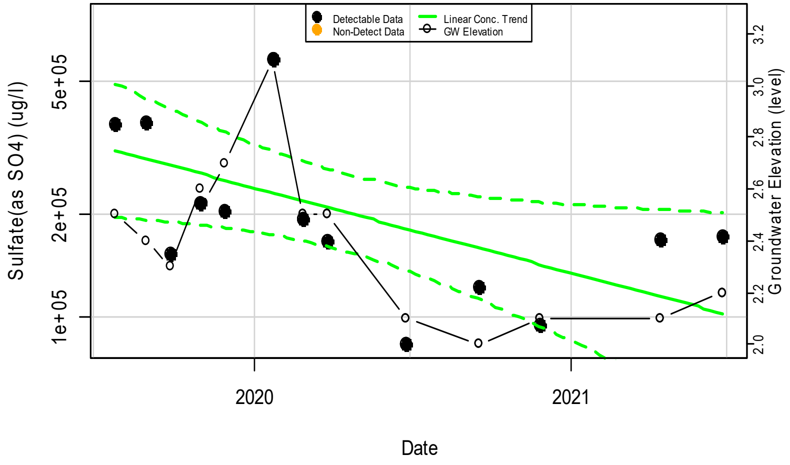
Sulfate(as SO4) in D4

Mann-Kendall P.Value= 0.0354; Half-Life= 1386 days



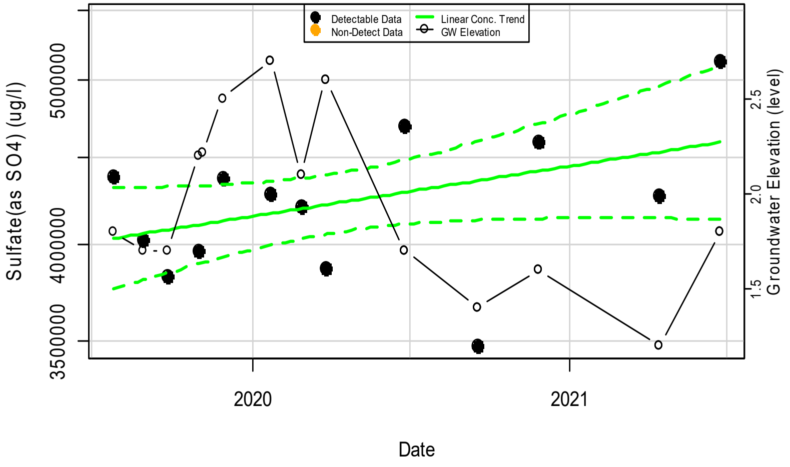
Sulfate(as SO4) in D5

Mann-Kendall P.Value= <0.01; Half-Life> 5 Years



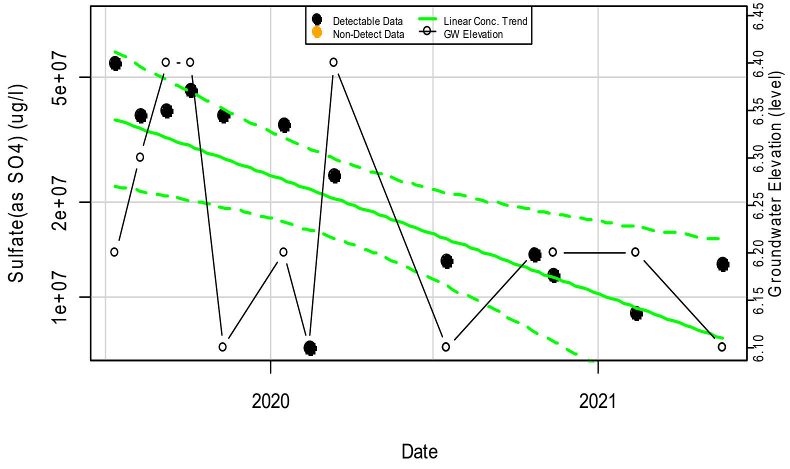
Sulfate(as SO4) in D8

Mann-Kendall P.Value= <0.01; Half-Life= 438 days



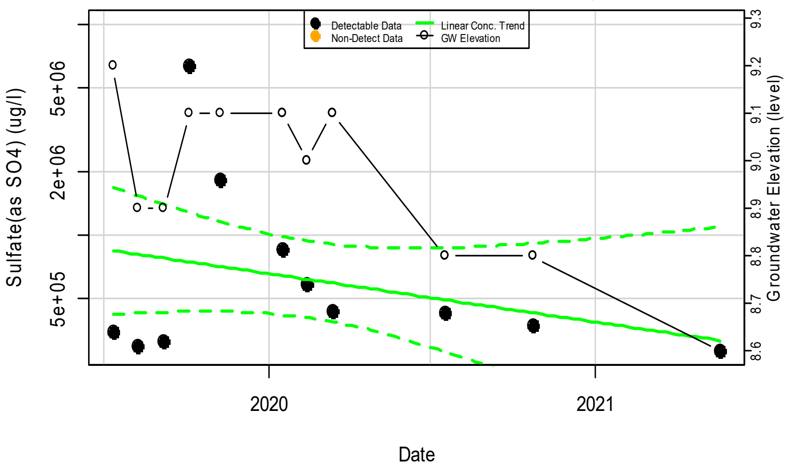
Sulfate(as SO4) in D9

Mann-Kendall P.Value= 0.524; Half-Life> -5 Years



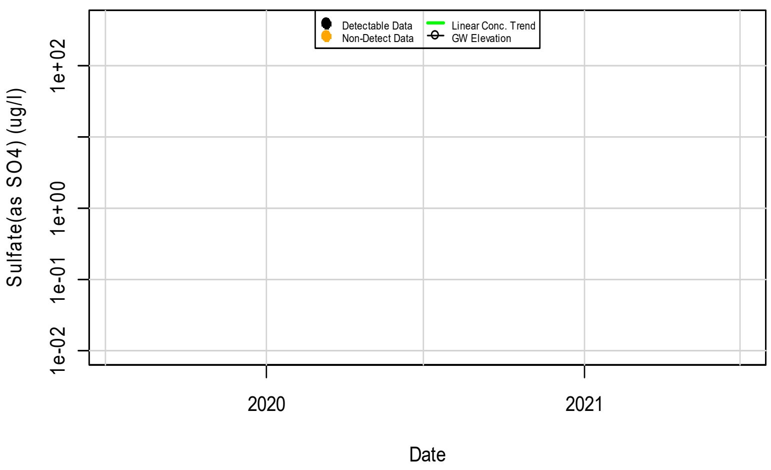
Sulfate(as SO4) in MPGM5-D5

Mann-Kendall P.Value= <0.01; Half-Life= 293 days

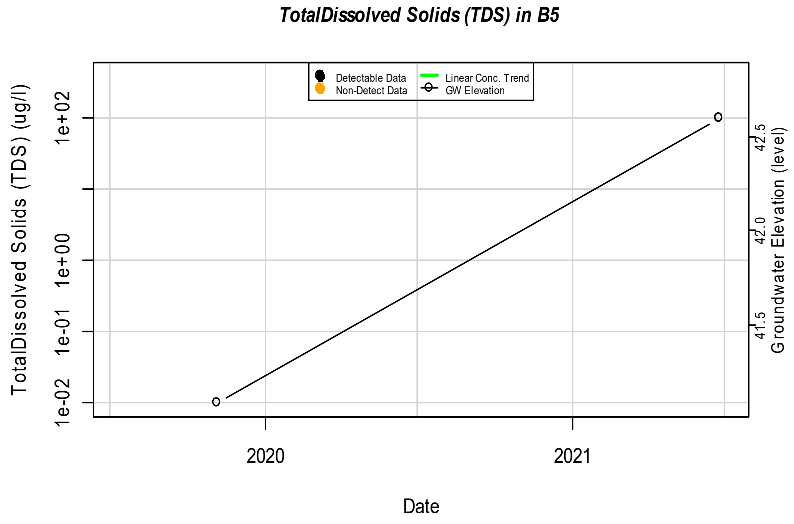


Sulfate(as SO4) in MPGM5-D6

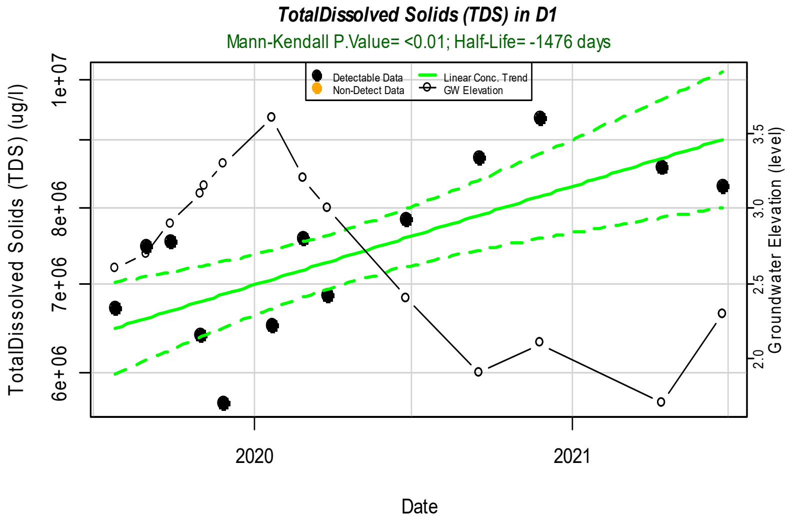
Mann-Kendall P.Value= 0.0819; Half-Life= 479 days



Sulfate(as SO4) in SW3-D

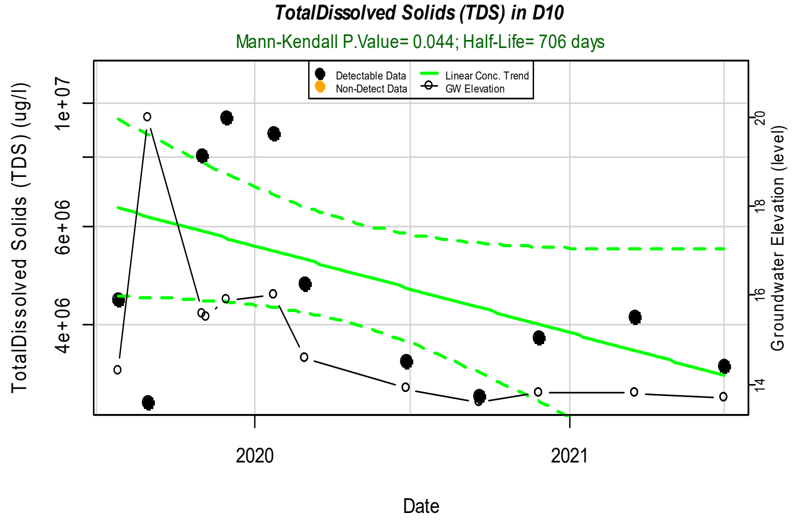


TotalDissolved Solids (TDS) in B5



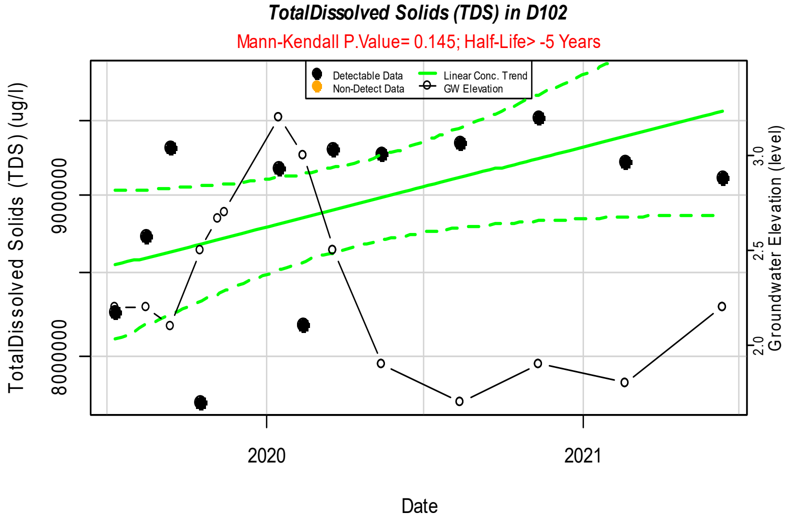
TotalDissolved Solids (TDS) in D1

Mann-Kendall P.Value= <0.01; Half-Life= -1476 days



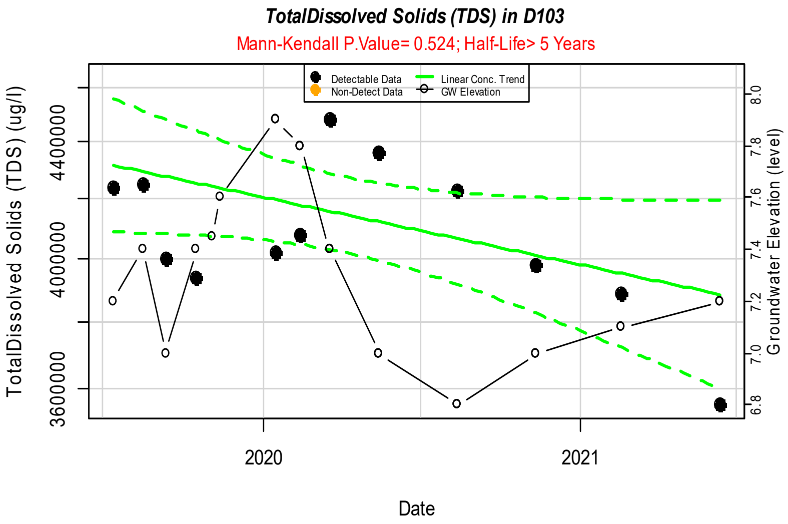
TotalDissolved Solids (TDS) in D10

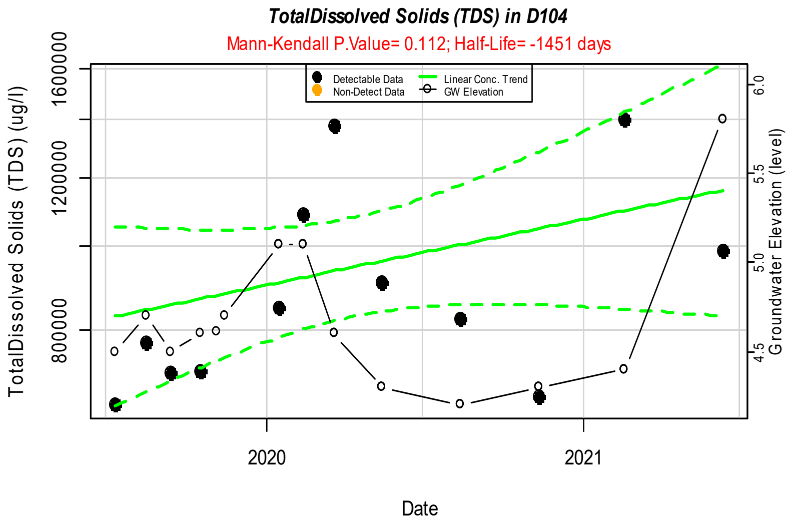
Mann-Kendall P.Value= 0.044; Half-Life= 706 days

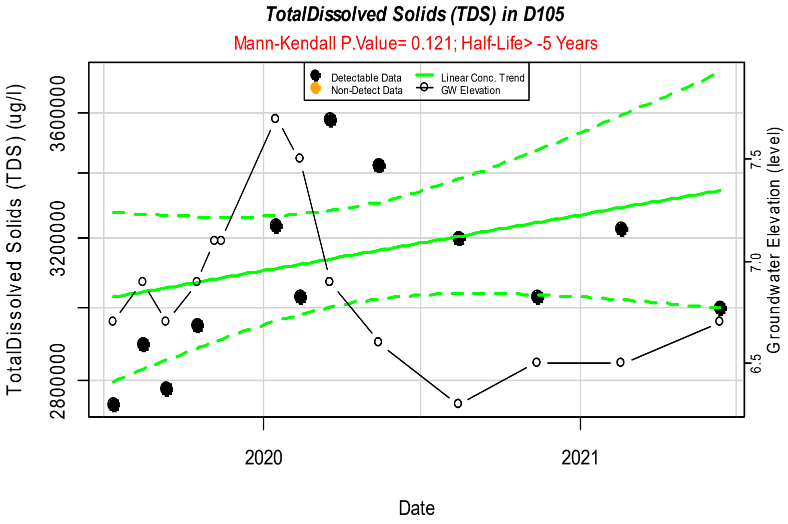


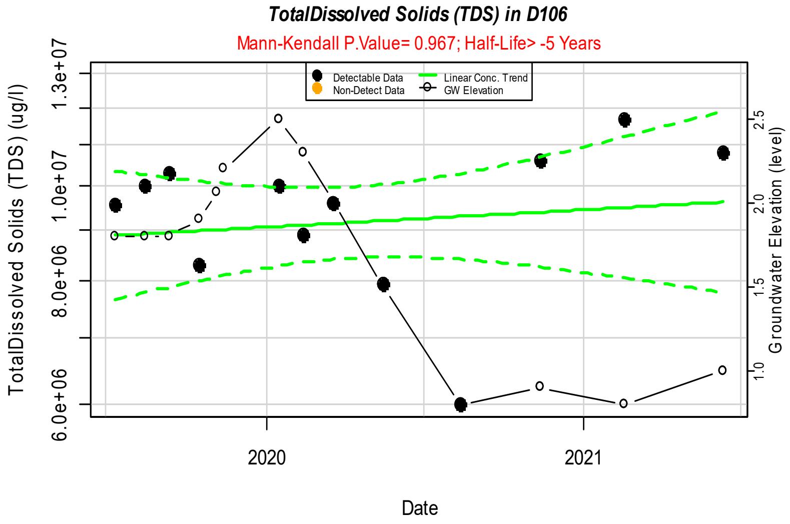
TotalDissolved Solids (TDS) in D102

Mann-Kendall P.Value= 0.145; Half-Life> -5 Years


TotalDissolved Solids (TDS) in D103
Mann-Kendall P.Value= 0.524; Half-Life> 5 Years

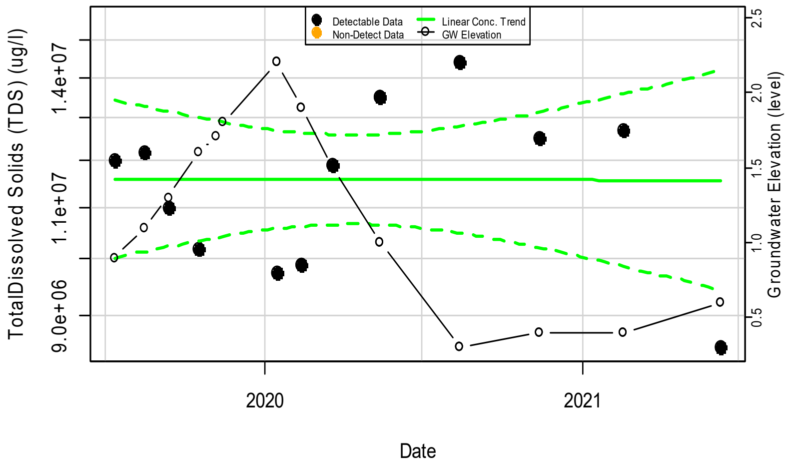

TotalDissolved Solids (TDS) in D104
Mann-Kendall P.Value= 0.112; Half-Life= -1451 days


TotalDissolved Solids (TDS) in D105
Mann-Kendall P.Value= 0.121; Half-Life> -5 Years


TotalDissolved Solids (TDS) in D106
Mann-Kendall P.Value= 0.967; Half-Life> -5 Years

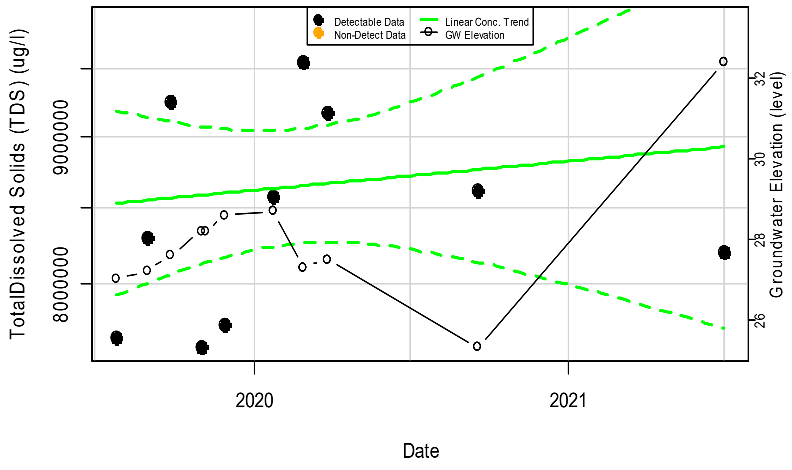
TotalDissolved Solids (TDS) in D107

Mann-Kendall P.Value= 0.236; Half-Life> 5 Years



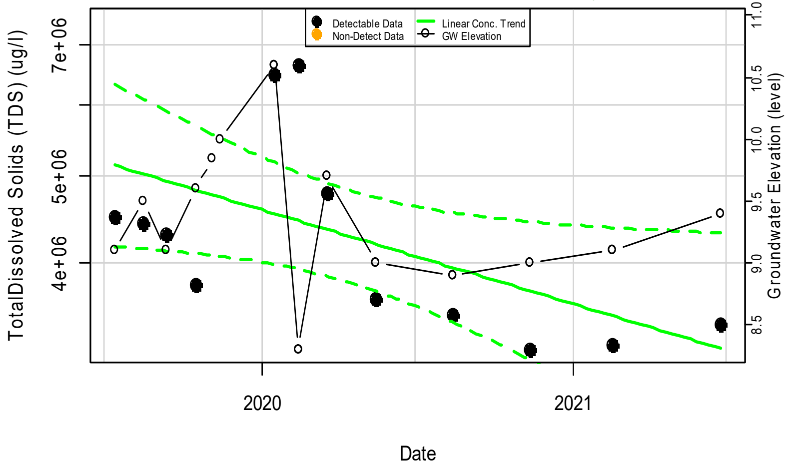
TotalDissolved Solids (TDS) in D11

Mann-Kendall P.Value= 0.117; Half-Life> -5 Years



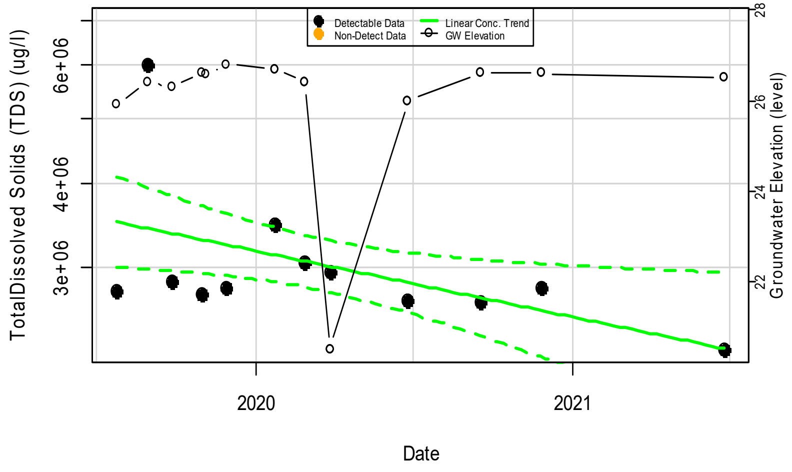
TotalDissolved Solids (TDS) in D113

Mann-Kendall P.Value= <0.01; Half-Life= 1043 days



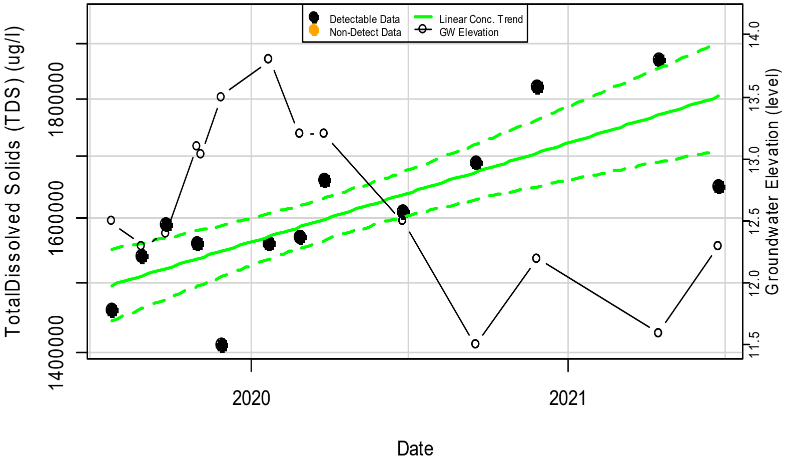
TotalDissolved Solids (TDS) in D15

Mann-Kendall P.Value= 0.0191; Half-Life= 1119 days



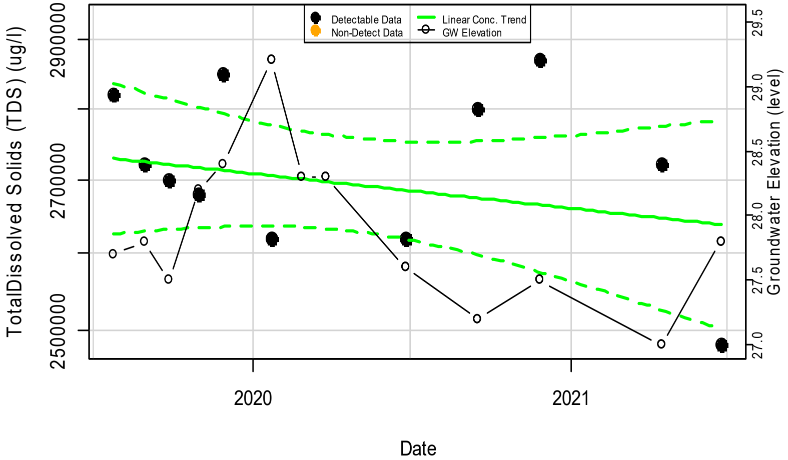
TotalDissolved Solids (TDS) in D16

Mann-Kendall P.Value= <0.01; Half-Life> -5 Years



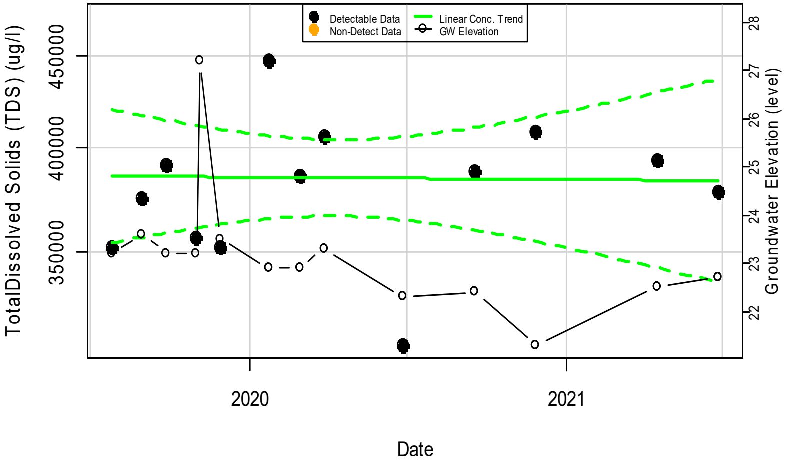
TotalDissolved Solids (TDS) in D17

Mann-Kendall P.Value= 0.282; Half-Life> 5 Years



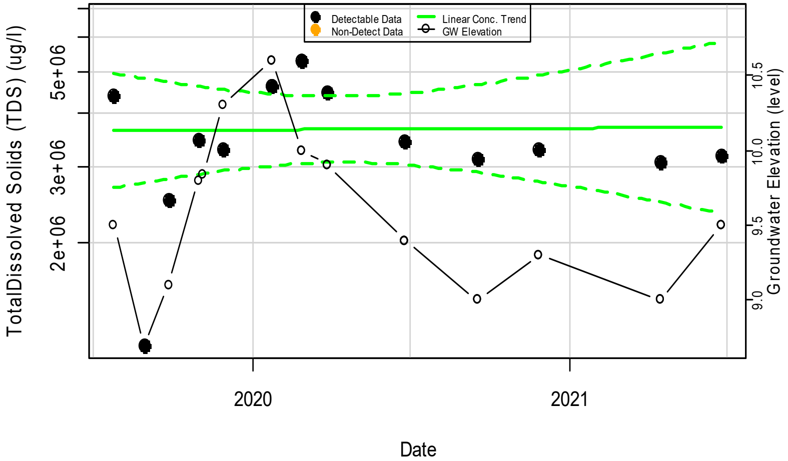
TotalDissolved Solids (TDS) in D18

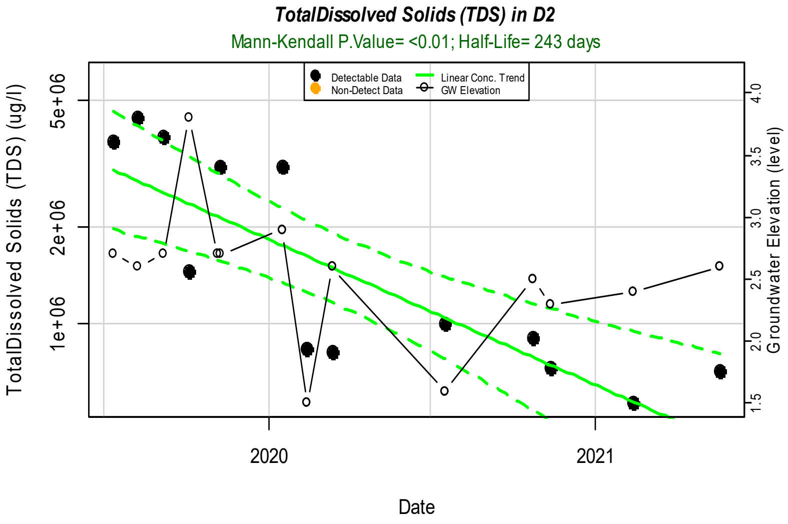
Mann-Kendall P.Value= 0.742; Half-Life> 5 Years



TotalDissolved Solids (TDS) in D19

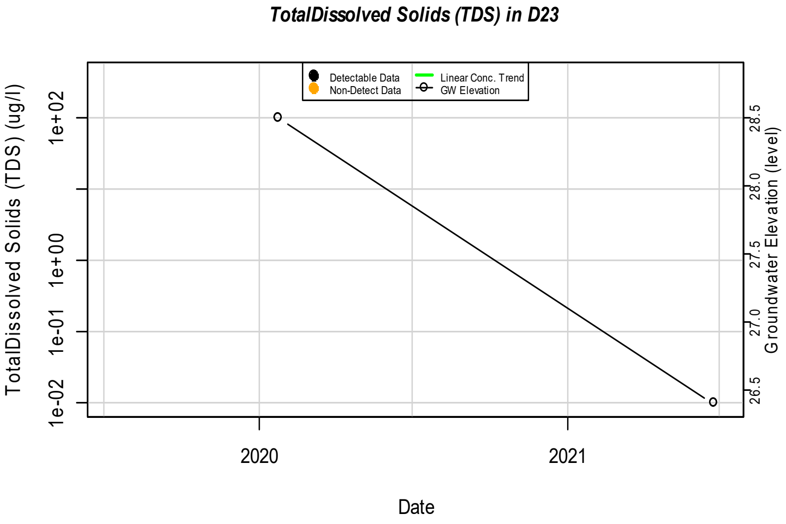
Mann-Kendall P.Value= 0.479; Half-Life> -5 Years



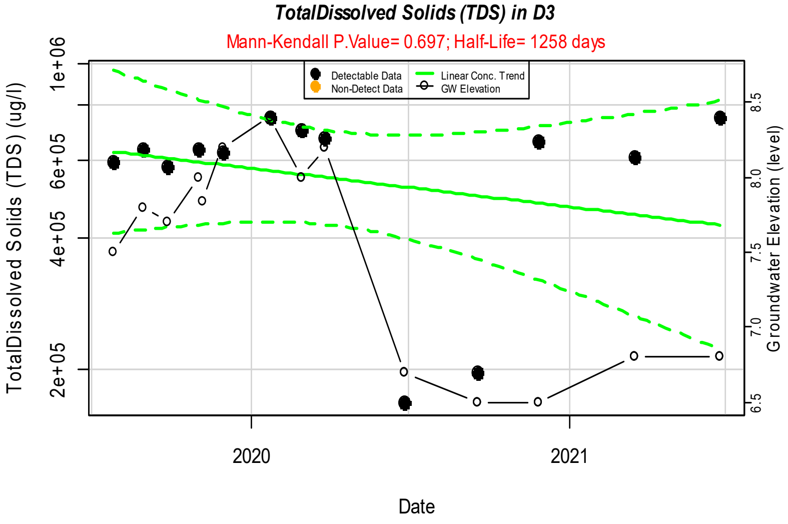


TotalDissolved Solids (TDS) in D2

Mann-Kendall P.Value= <0.01; Half-Life= 243 days

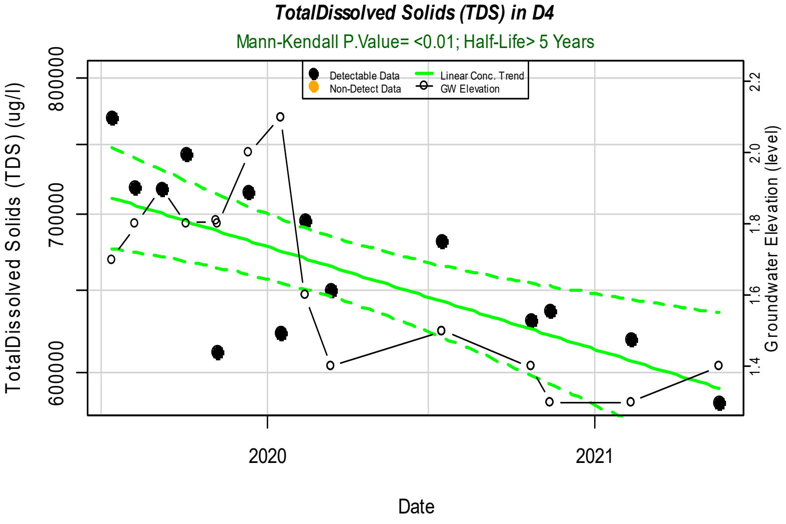


TotalDissolved Solids (TDS) in D23



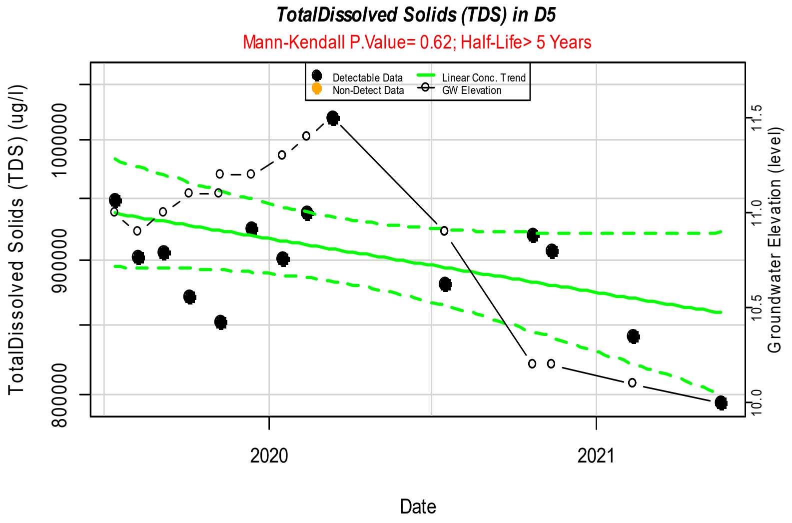
TotalDissolved Solids (TDS) in D3

Mann-Kendall P.Value= 0.697; Half-Life= 1258 days



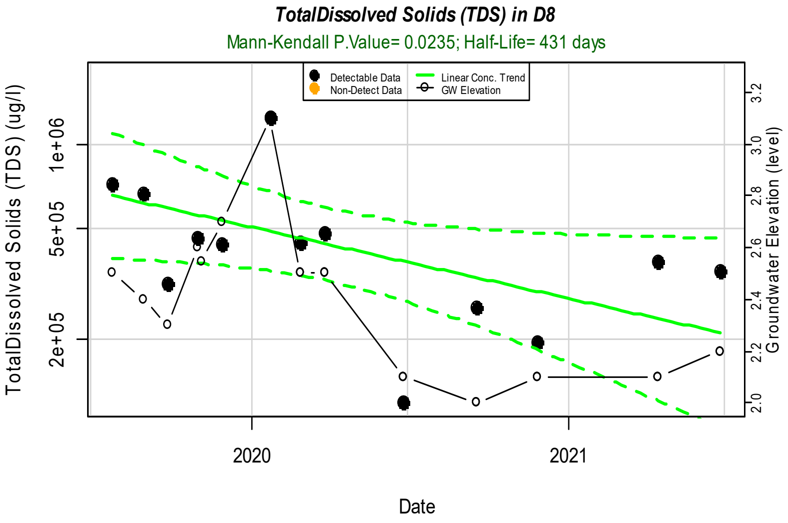
TotalDissolved Solids (TDS) in D4

Mann-Kendall P.Value= <0.01; Half-Life> 5 Years



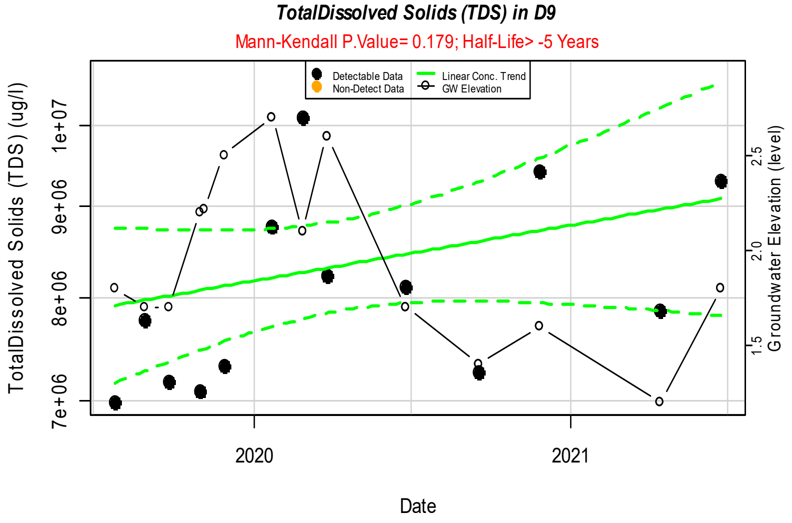
TotalDissolved Solids (TDS) in D5

Mann-Kendall P.Value= 0.62; Half-Life> 5 Years



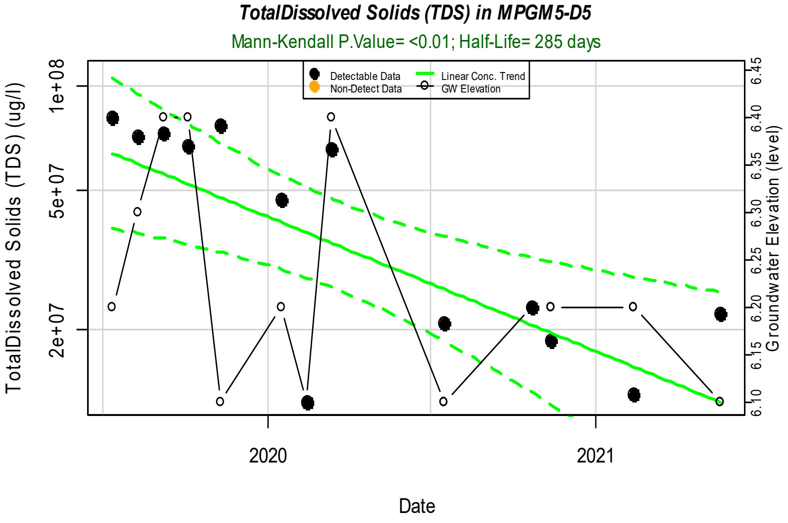
TotalDissolved Solids (TDS) in D8

Mann-Kendall P.Value= 0.0235; Half-Life= 431 days



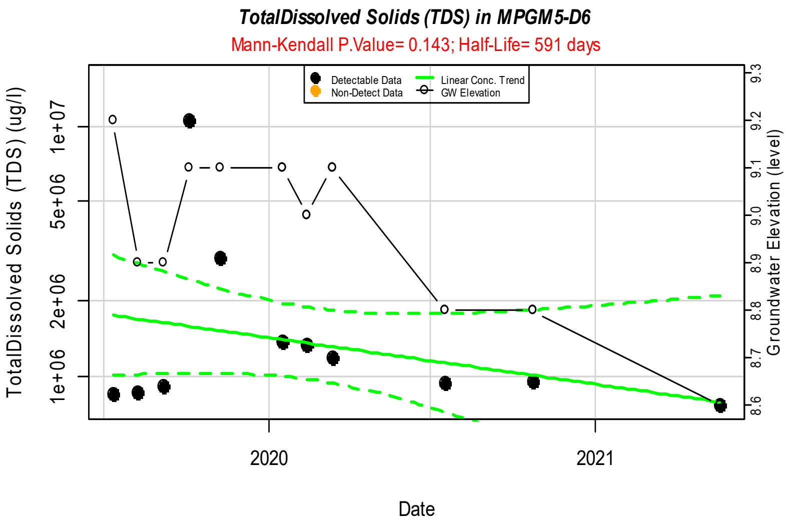
TotalDissolved Solids (TDS) in D9

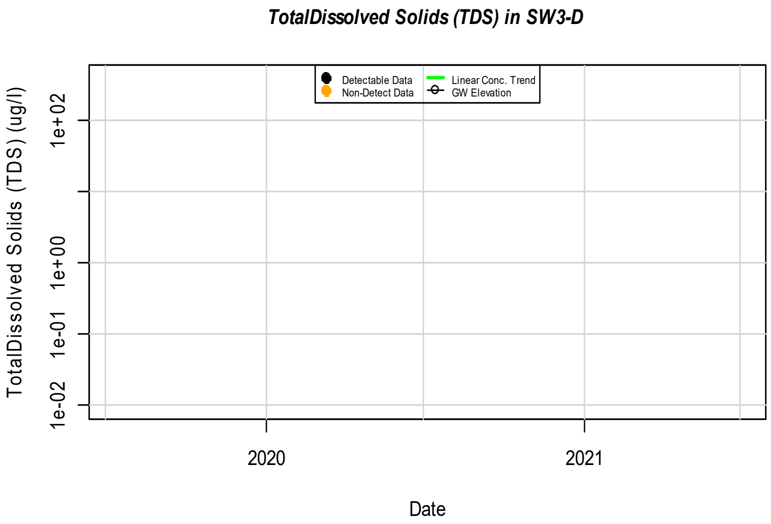
Mann-Kendall P.Value= 0.179; Half-Life> -5 Years

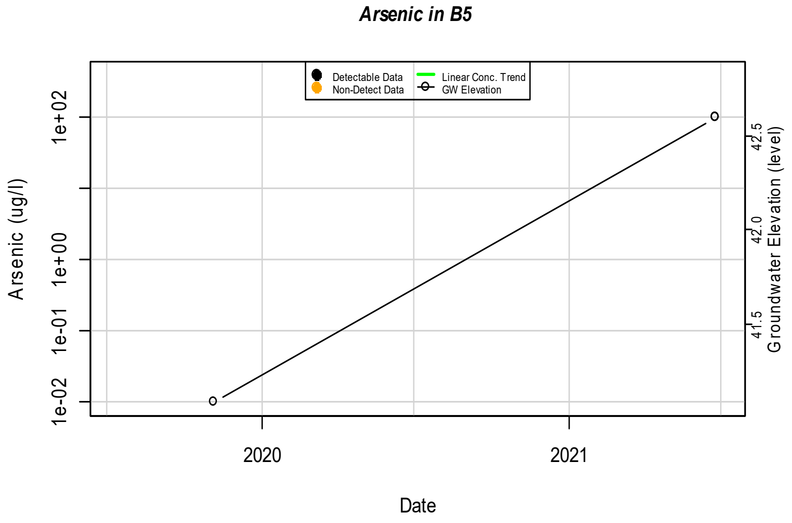


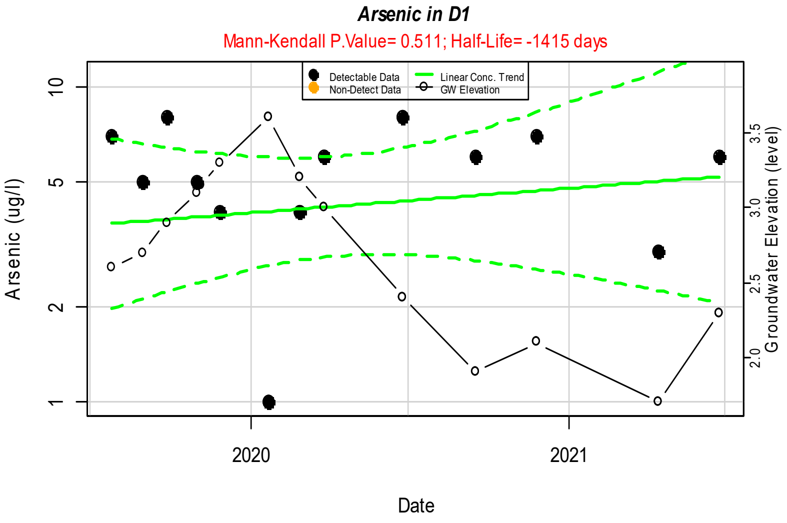
TotalDissolved Solids (TDS) in MPGM5-D5

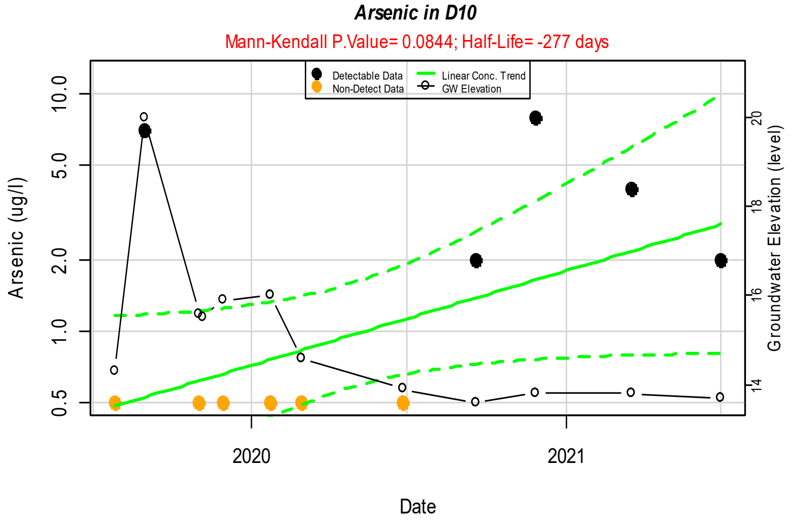
Mann-Kendall P.Value= <0.01; Half-Life= 285 days

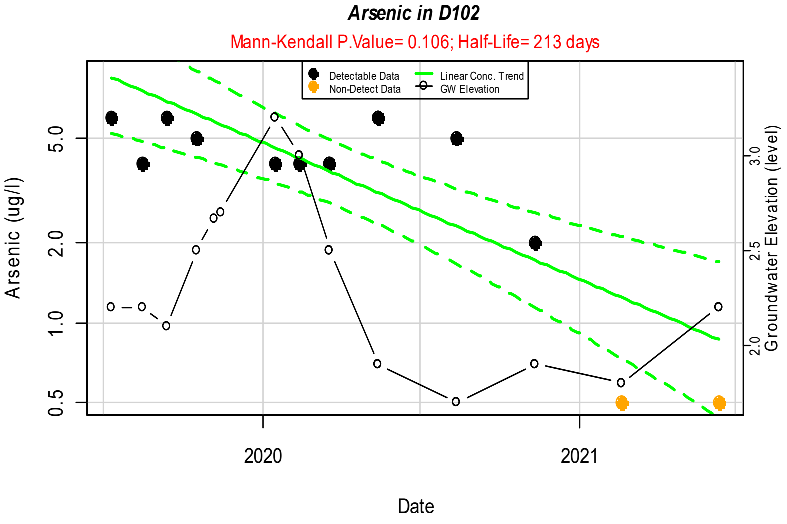

TotalDissolved Solids (TDS) in MPGM5-D6
Mann-Kendall P.Value= 0.143; Half-Life= 591 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
TotalDissolved Solids (TDS) (ug/l)
1e+06
2e+06
5e+06
1e+07
Groundwater Elevation (level)
8.6
8.7
8.8
8.9
9.0
9.1
9.2
9.3
2020
2021
Date


TotalDissolved Solids (TDS) in SW3-D
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
TotalDissolved Solids (TDS) (ug/l)
1e-02
1e-01
1e+00
1e+02
2020
2021
Date


Arsenic in B5
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Arsenic (ug/l)
1e-02
1e-01
1e+00
1e+02
Groundwater Elevation (level)
41.5
42.0
42.5
2020
2021
Date

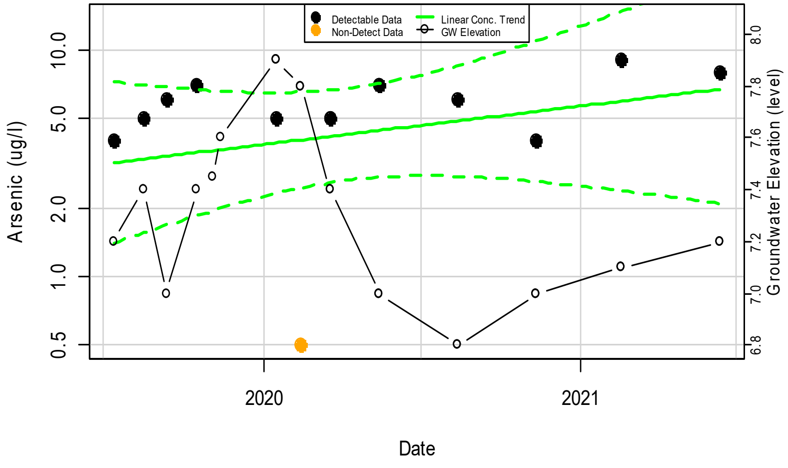

Arsenic in D1
Mann-Kendall P.Value= 0.511; Half-Life= -1415 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Arsenic (ug/l)
1
2
5
10
Groundwater Elevation (level)
2.0
2.5
3.0
3.5
2020
2021
Date


Arsenic in D10
Mann-Kendall P.Value= 0.0844; Half-Life= -277 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Arsenic (ug/l)
0.5
1.0
2.0
5.0
10.0
Groundwater Elevation (level)
14
16
18
20
2020
2021
Date


Arsenic in D102
Mann-Kendall P.Value= 0.106; Half-Life= 213 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Arsenic (ug/l)
0.5
1.0
2.0
5.0
Groundwater Elevation (level)
2.0
2.5
3.0
2020
2021
Date

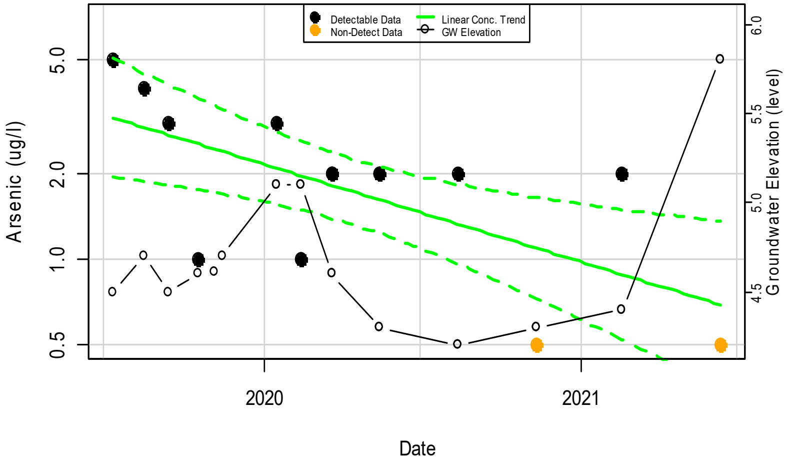
Arsenic in D103

Mann-Kendall P.Value= 0.0705; Half-Life= -651 days



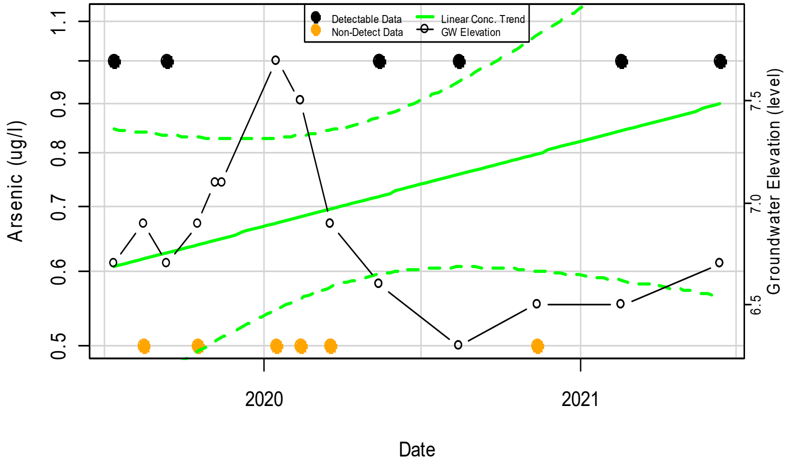
Arsenic in D104

Mann-Kendall P.Value= 0.0271; Half-Life= 322 days



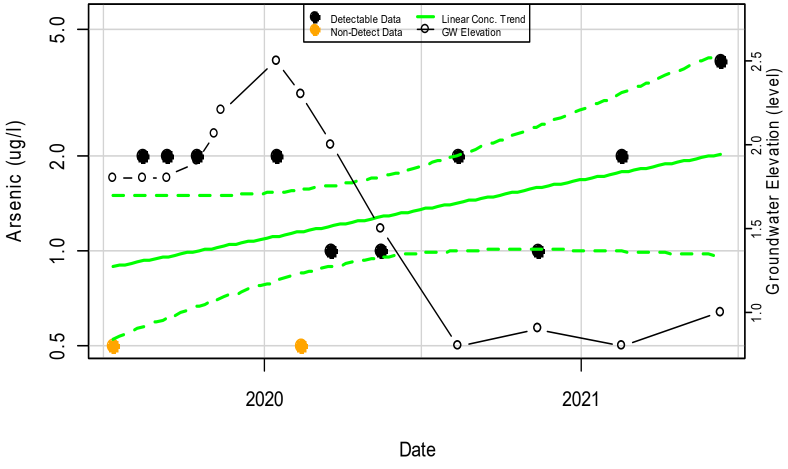
Arsenic in D105

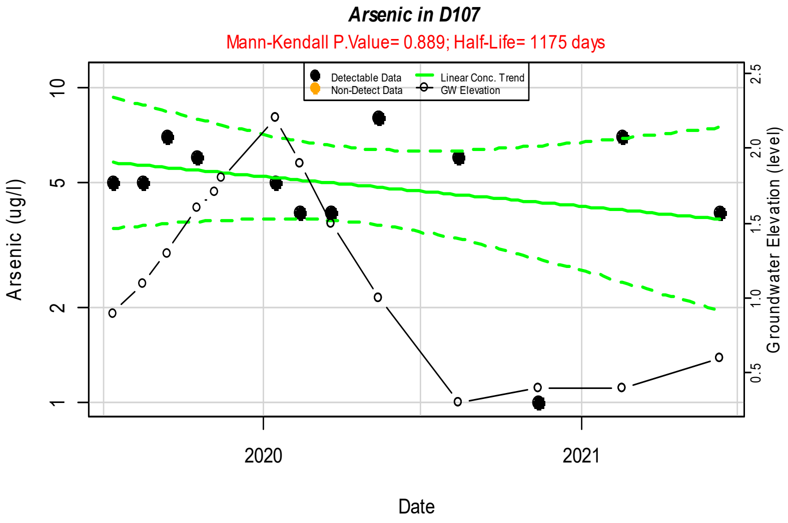
Mann-Kendall P.Value= 0.187; Half-Life= -1227 days



Arsenic in D106

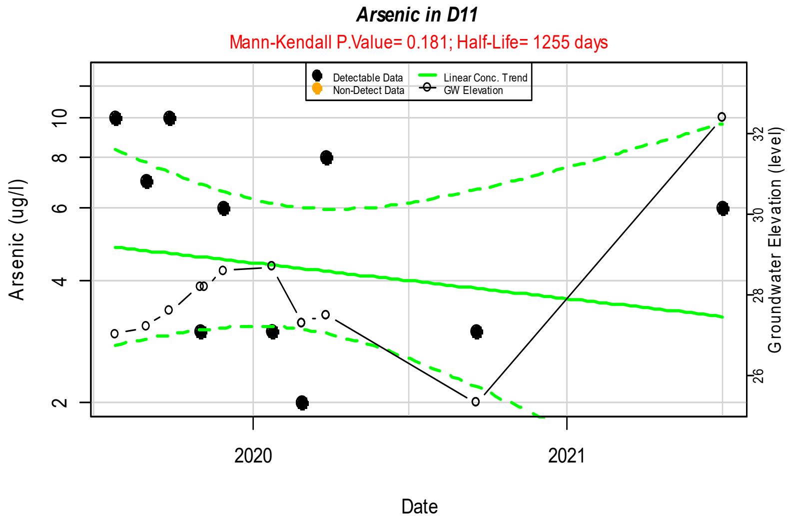
Mann-Kendall P.Value= 0.328; Half-Life= -592 days





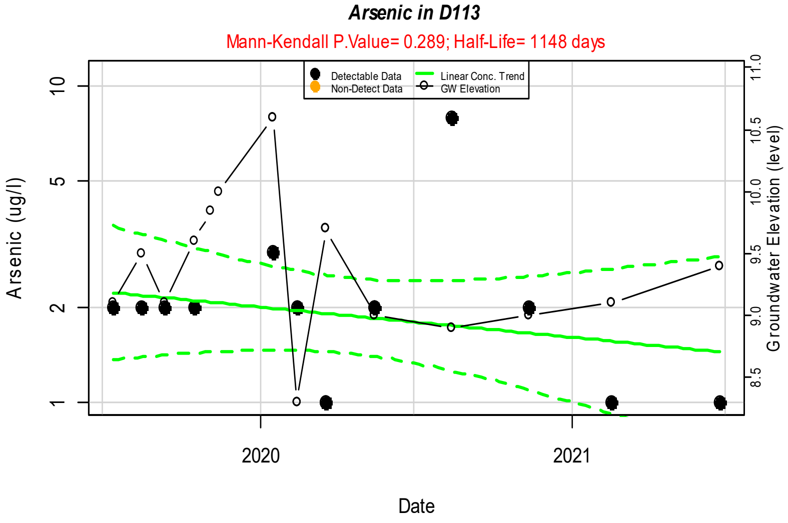
Arsenic in D107

Mann-Kendall P.Value= 0.889; Half-Life= 1175 days



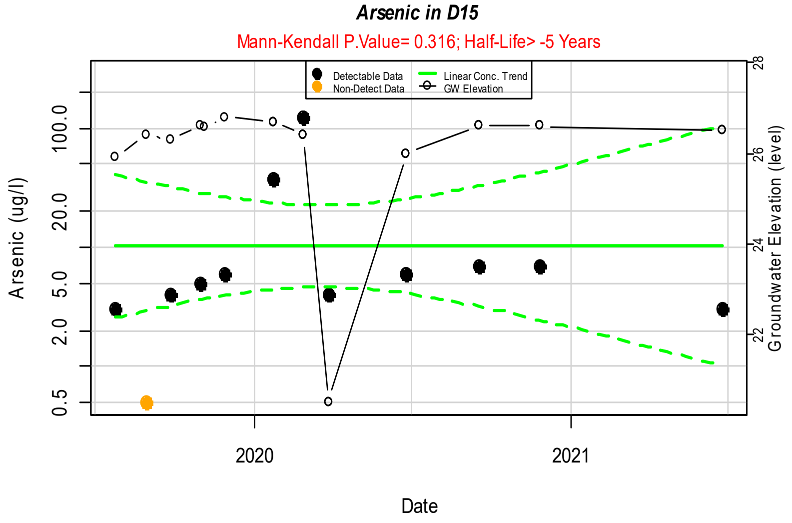
Arsenic in D11

Mann-Kendall P.Value= 0.181; Half-Life= 1255 days



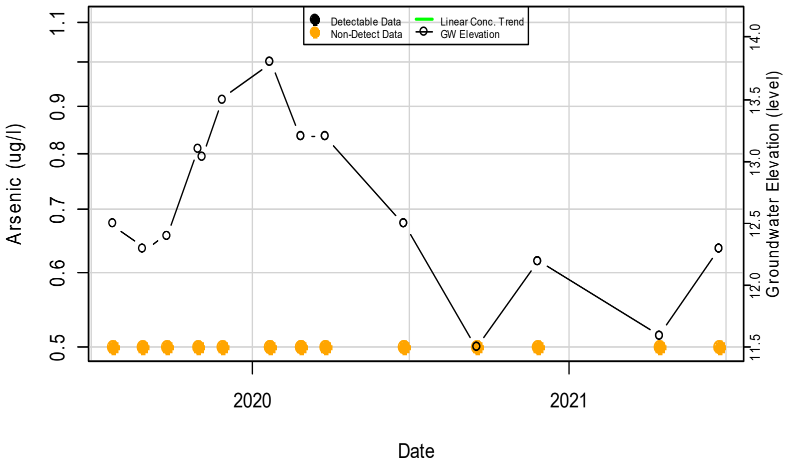
Arsenic in D113

Mann-Kendall P.Value= 0.289; Half-Life= 1148 days

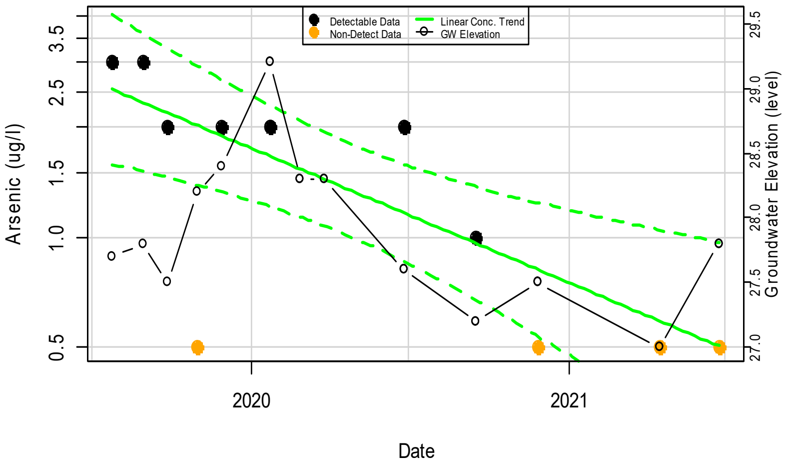


Arsenic in D15

Mann-Kendall P.Value= 0.316; Half-Life> -5 Years

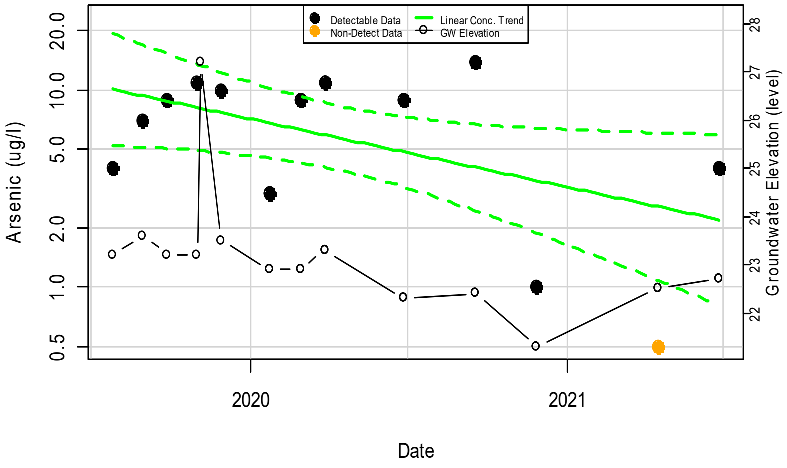


Arsenic in D16



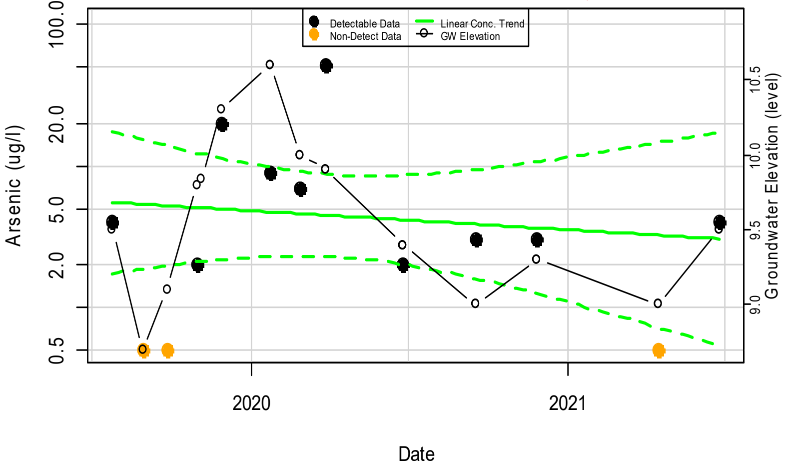
Arsenic in D17

Mann-Kendall P.Value= <0.01; Half-Life= 301 days



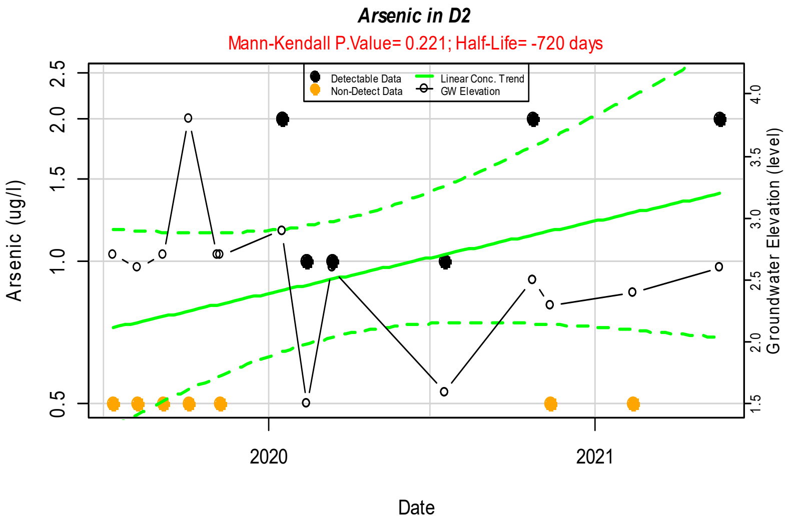
Arsenic in D18

Mann-Kendall P.Value= 0.894; Half-Life= 319 days

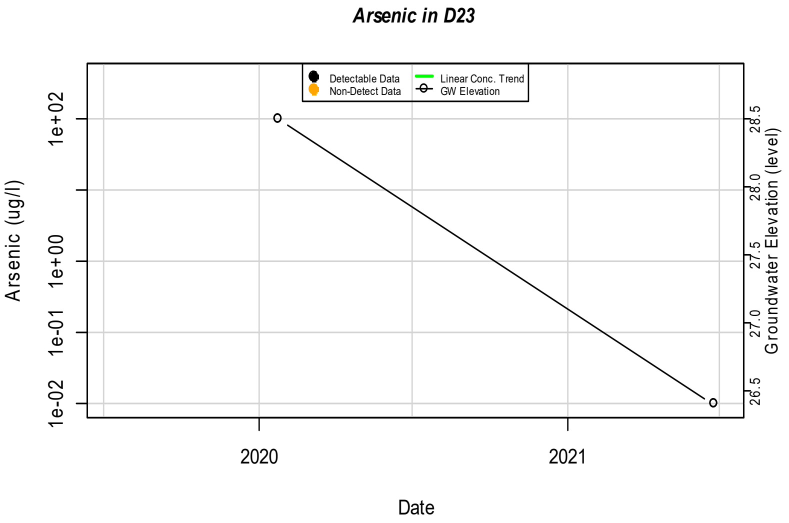


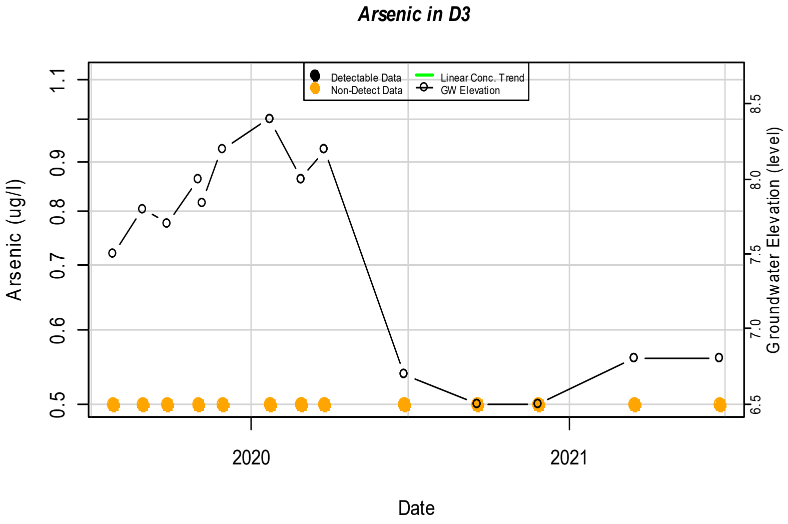
Arsenic in D19

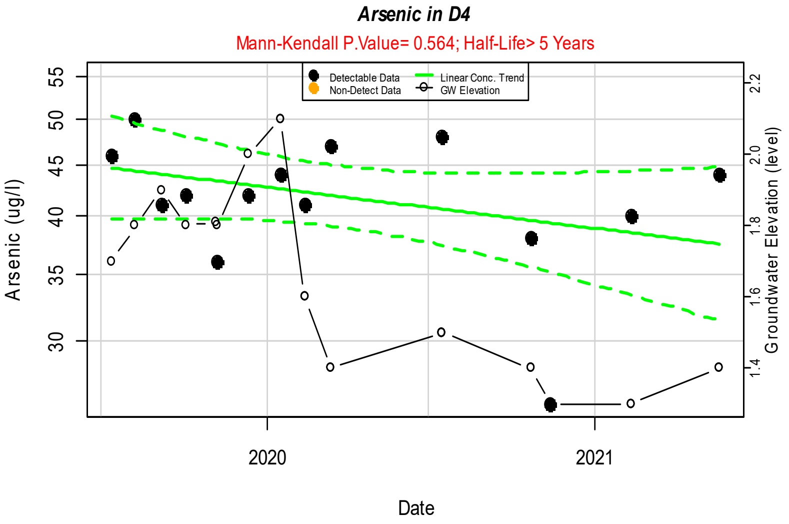
Mann-Kendall P.Value= 0.803; Half-Life= 820 days


Arsenic in D2

Mann-Kendall P.Value= 0.221; Half-Life= -720 days

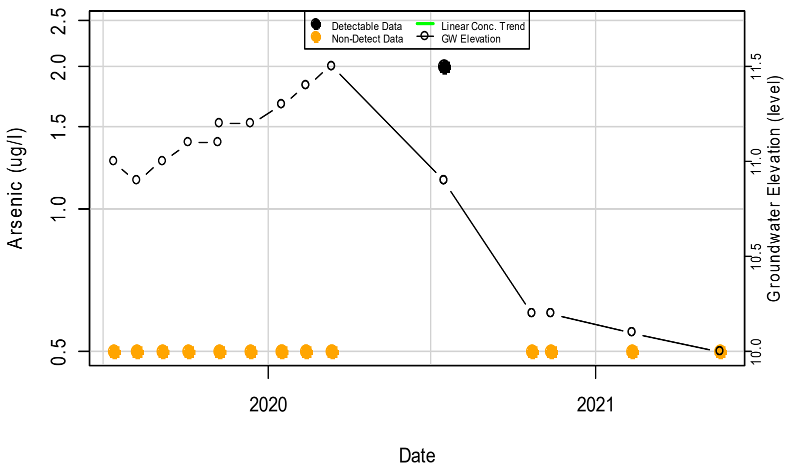

Arsenic in D23


Arsenic in D3

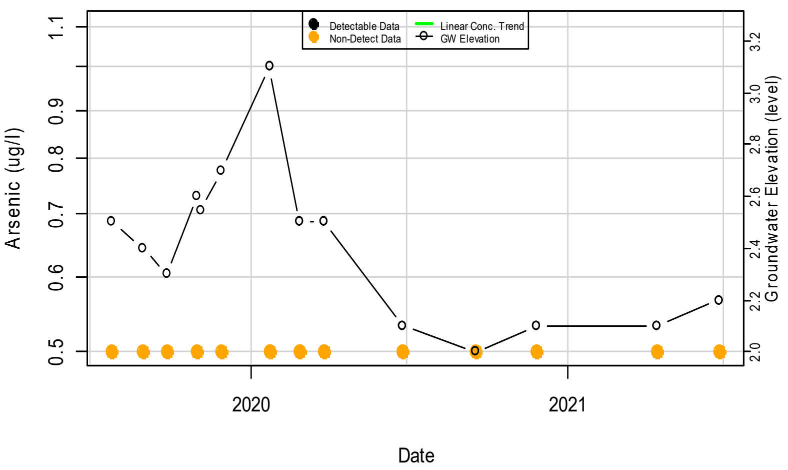

Arsenic in D4

Mann-Kendall P.Value= 0.564; Half-Life> 5 Years

Arsenic in D5

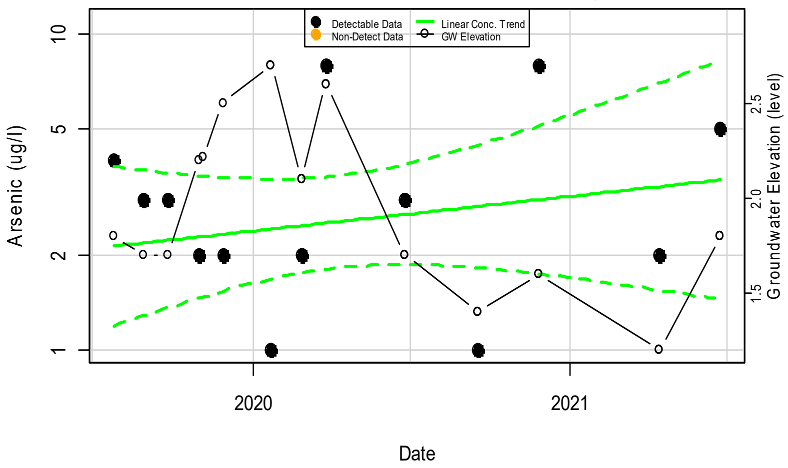


Arsenic in D8



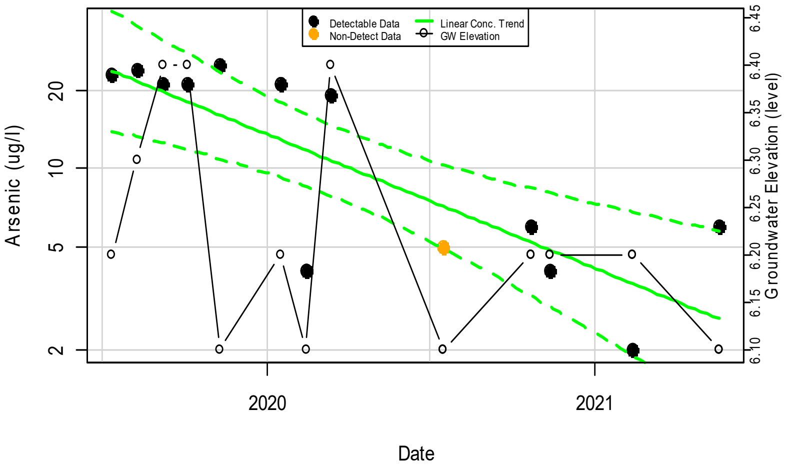
Arsenic in D9

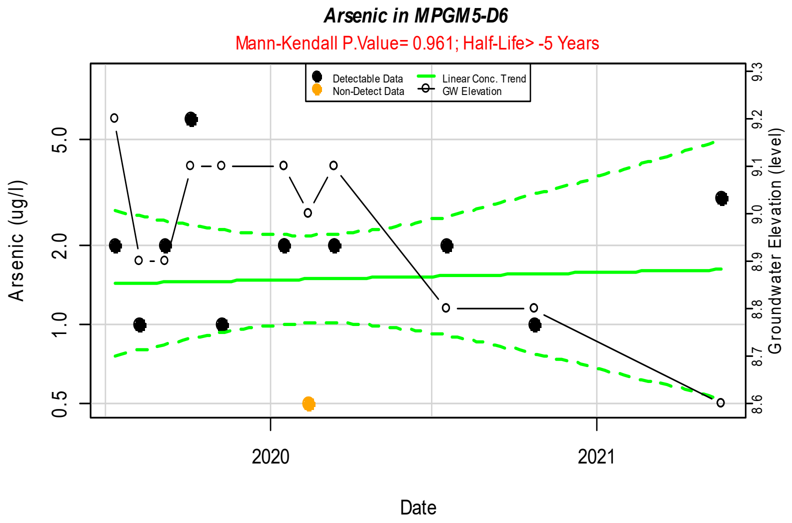
Mann-Kendall P.Value= 0.514; Half-Life= -1003 days

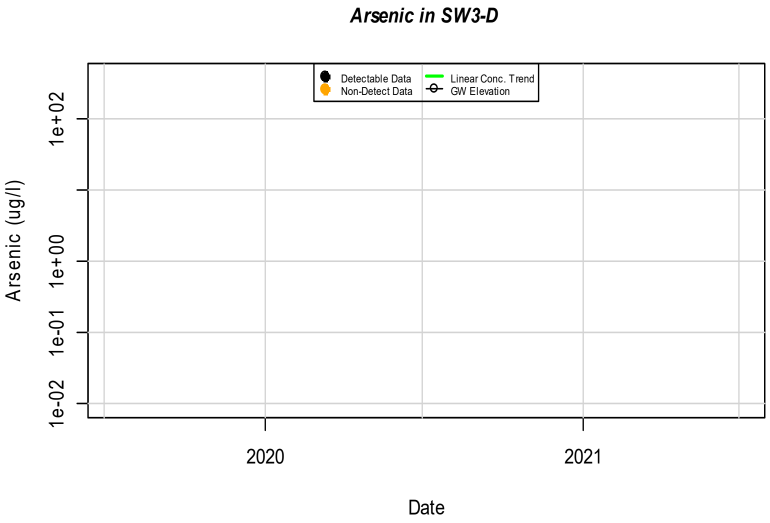


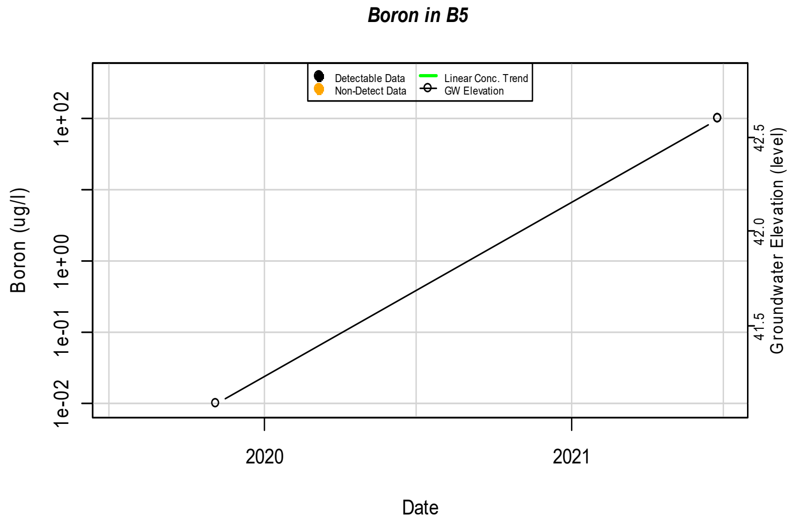
Arsenic in MPGM5-D5

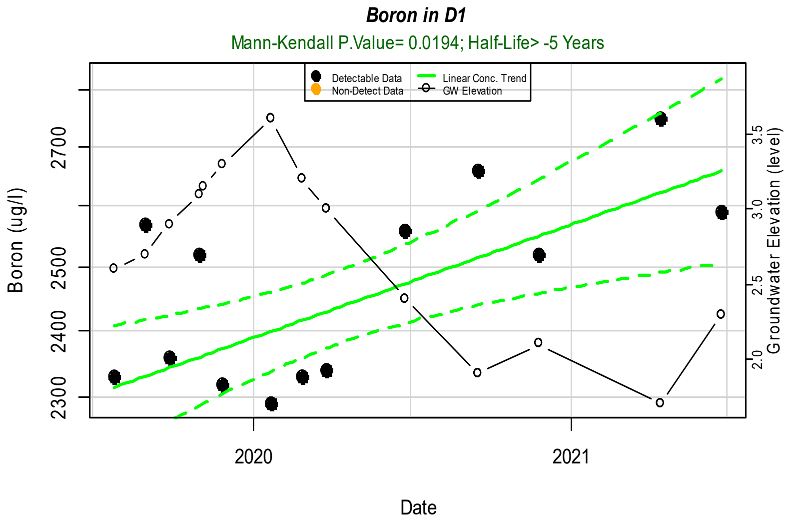
Mann-Kendall P.Value= <0.01; Half-Life= 214 days



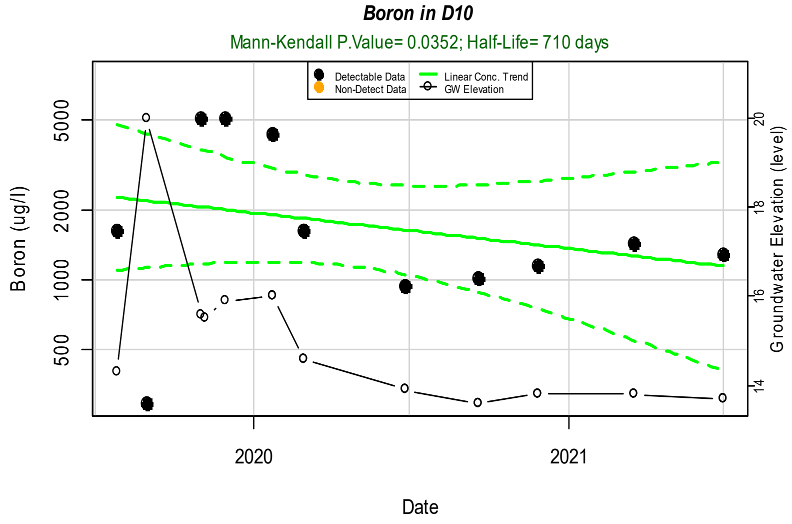

Arsenic in MPGM5-D6
Mann-Kendall P.Value= 0.961; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Arsenic (ug/l)
0.5
1.0
2.0
5.0
Groundwater Elevation (level)
8.6
8.7
8.8
8.9
9.0
9.1
9.2
9.3
2020
2021
Date


Arsenic in SW3-D
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Arsenic (ug/l)
1e-02
1e-01
1e+00
1e+02
2020
2021
Date

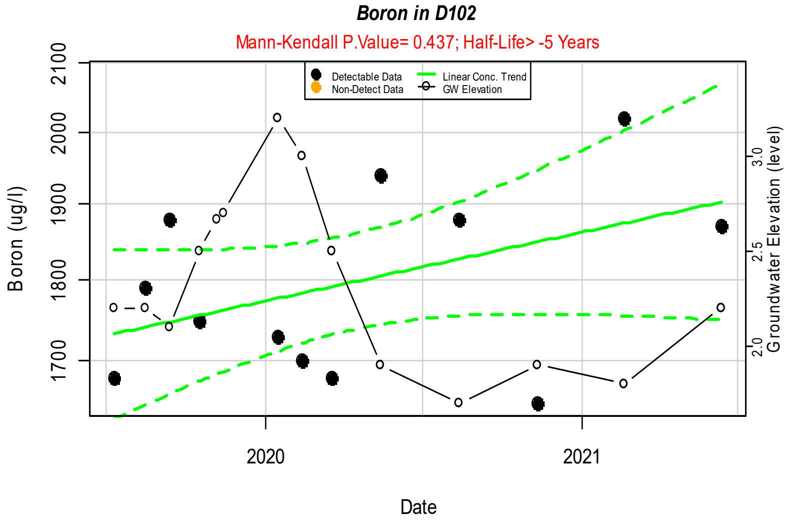

Boron in B5


Boron in D1

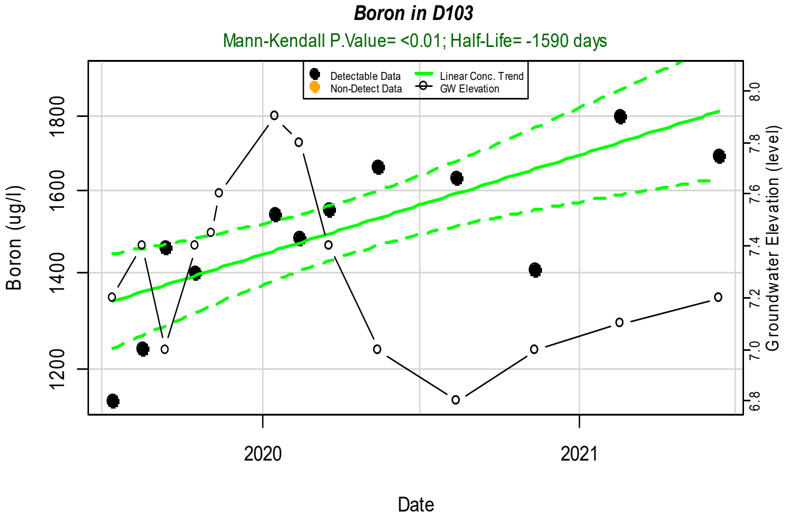
Mann-Kendall P.Value= 0.0194; Half-Life> -5 Years

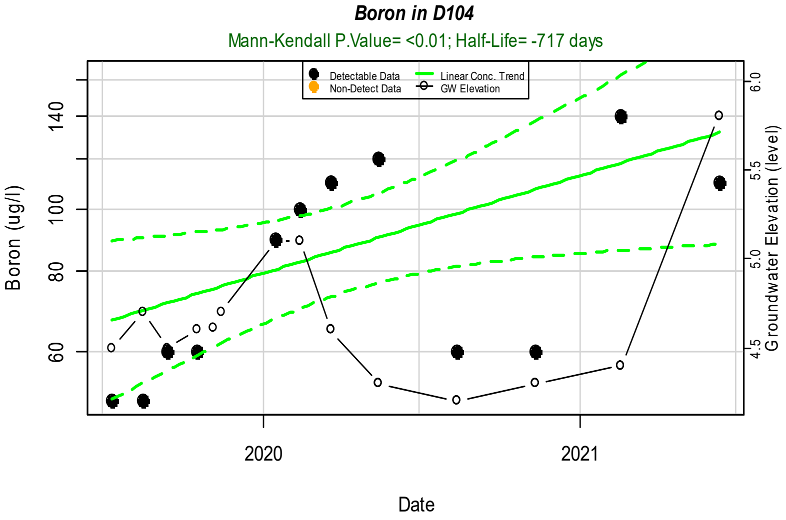

Boron in D10

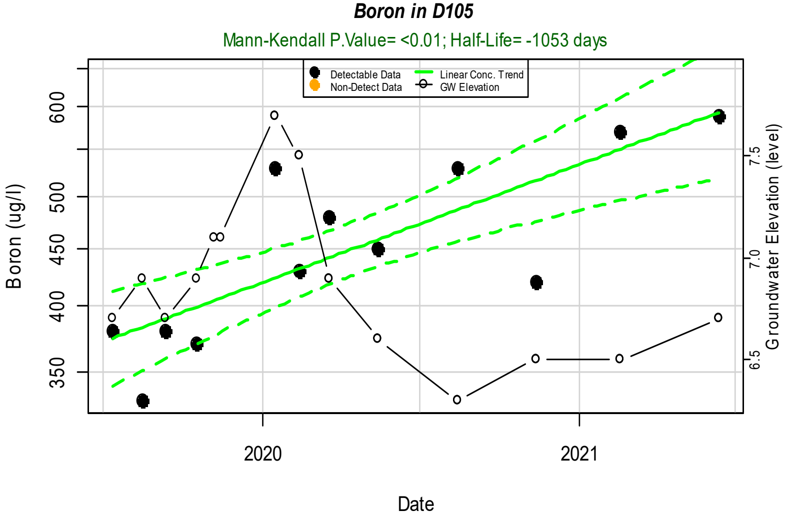
Mann-Kendall P.Value= 0.0352; Half-Life= 710 days

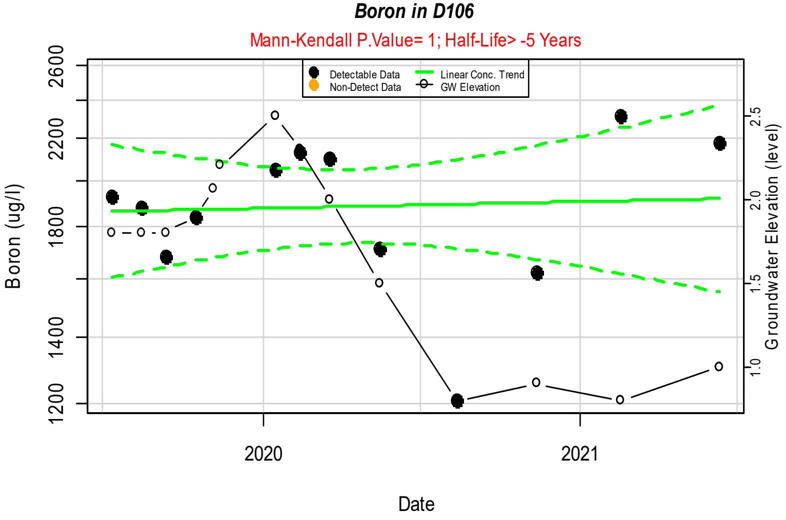

Boron in D102

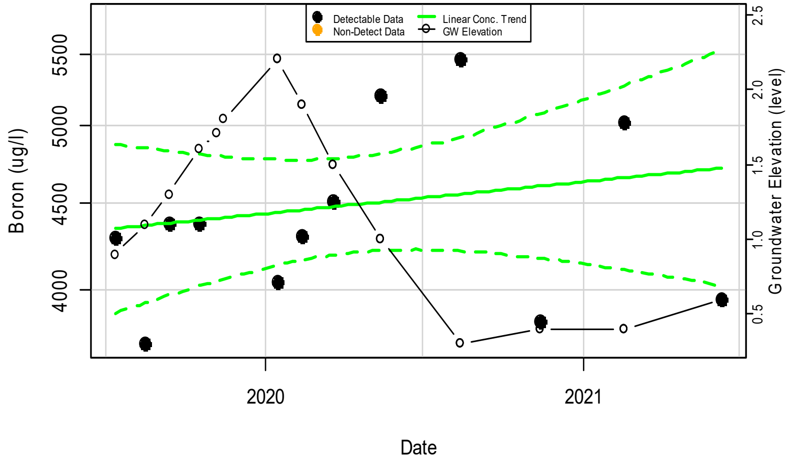
Mann-Kendall P.Value= 0.437; Half-Life> -5 Years


Boron in D103
Mann-Kendall P.Value= <0.01; Half-Life= -1590 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Boron (ug/l)
1200
1400
1600
1800
Groundwater Elevation (level)
6.8
7.0
7.2
7.4
7.6
7.8
8.0
2020
2021
Date

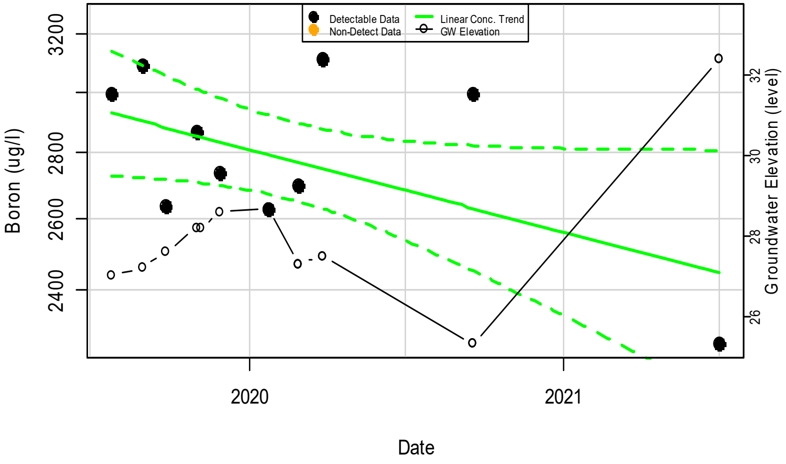

Boron in D104
Mann-Kendall P.Value= <0.01; Half-Life= -717 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Boron (ug/l)
60
80
100
140
Groundwater Elevation (level)
4.5
5.0
5.5
6.0
2020
2021
Date


Boron in D105
Mann-Kendall P.Value= <0.01; Half-Life= -1053 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Boron (ug/l)
350
400
450
500
600
Groundwater Elevation (level)
6.5
7.0
7.5
2020
2021
Date

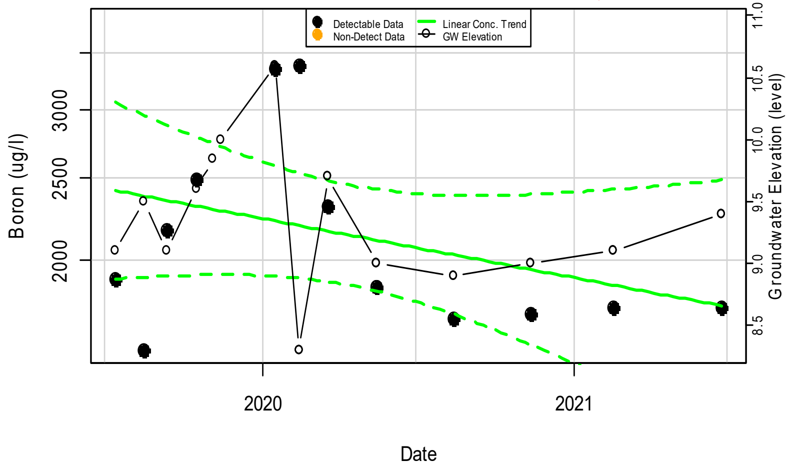

Boron in D106
Mann-Kendall P.Value= 1; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Boron (ug/l)
1200
1400
1800
2200
2600
Groundwater Elevation (level)
1.0
1.5
2.0
2.5
2020
2021
Date


Boron in D107

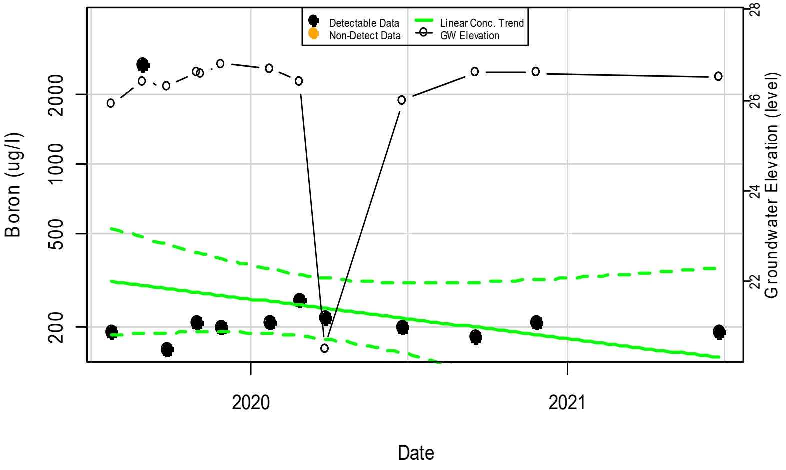
Mann-Kendall P.Value= 0.0754; Half-Life> -5 Years


Boron in D11

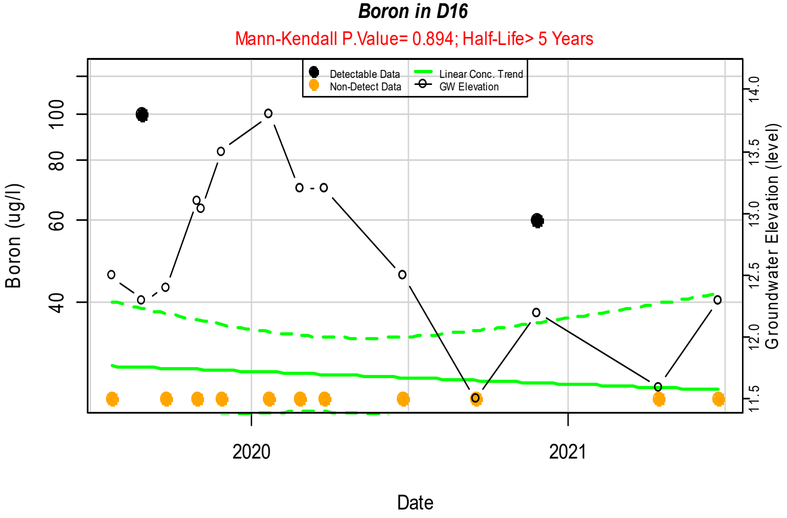
Mann-Kendall P.Value= 0.84; Half-Life> 5 Years

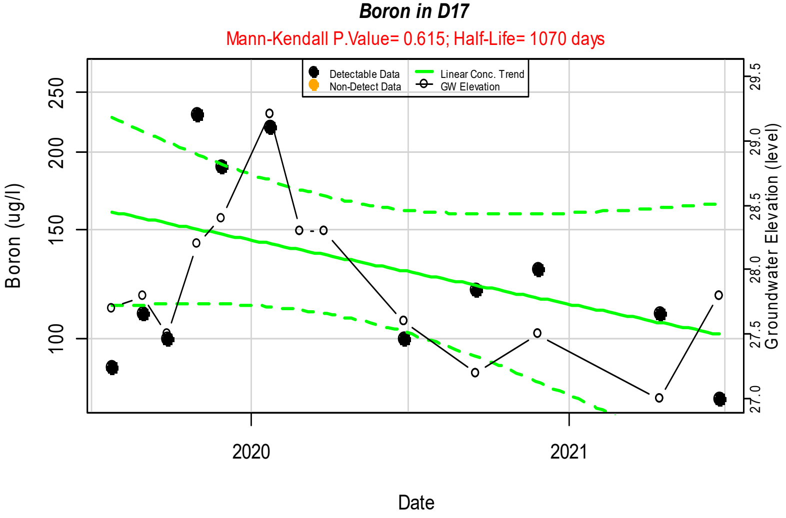

Boron in D113

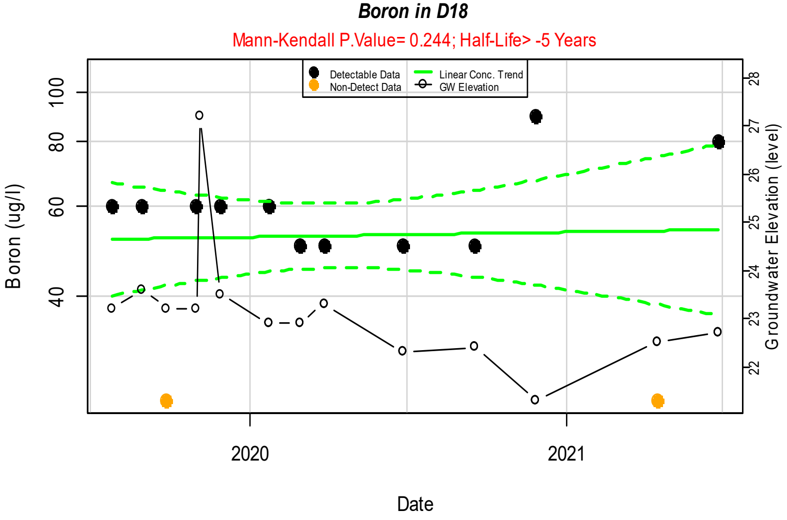
Mann-Kendall P.Value= 0.0754; Half-Life= 1589 days

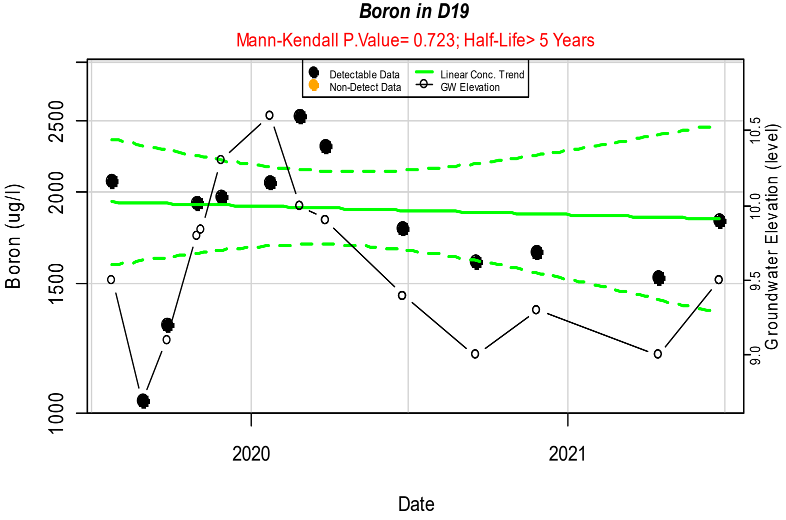

Boron in D15

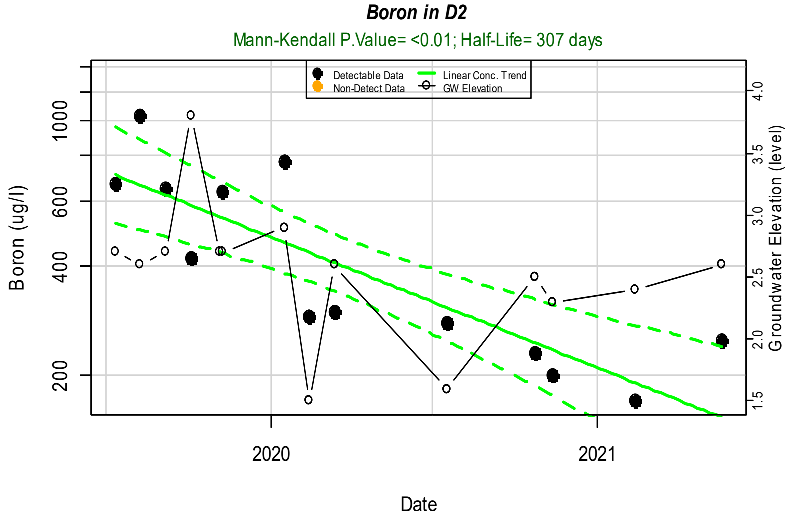
Mann-Kendall P.Value= 0.698; Half-Life= 644 days


Boron in D16
Mann-Kendall P.Value= 0.894; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Boron (ug/l)
40
60
80
100
Groundwater Elevation (level)
11.5
12.0
12.5
13.0
13.5
14.0
2020
2021
Date


Boron in D17
Mann-Kendall P.Value= 0.615; Half-Life= 1070 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Boron (ug/l)
100
150
200
250
Groundwater Elevation (level)
27.0
27.5
28.0
28.5
29.0
29.5
2020
2021
Date

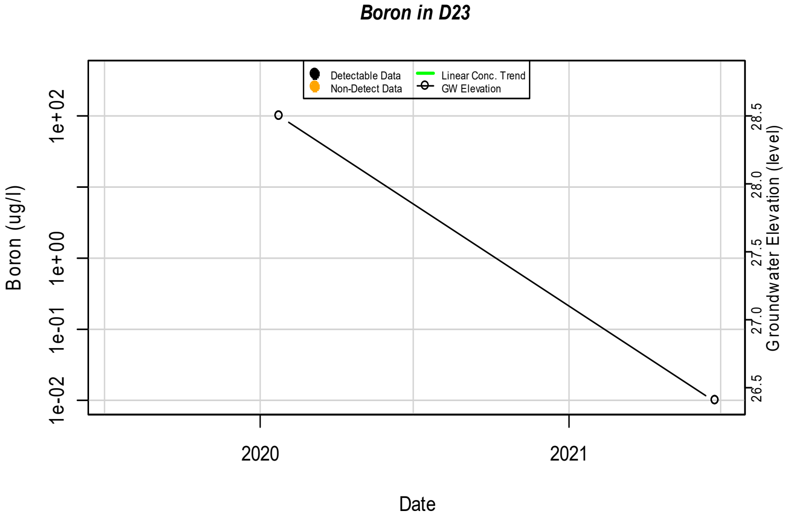

Boron in D18
Mann-Kendall P.Value= 0.244; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Boron (ug/l)
40
60
80
100
Groundwater Elevation (level)
22
23
24
25
26
27
28
2020
2021
Date


Boron in D19
Mann-Kendall P.Value= 0.723; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Boron (ug/l)
1000
1500
2000
2500
Groundwater Elevation (level)
9.0
9.5
10.0
10.5
2020
2021
Date

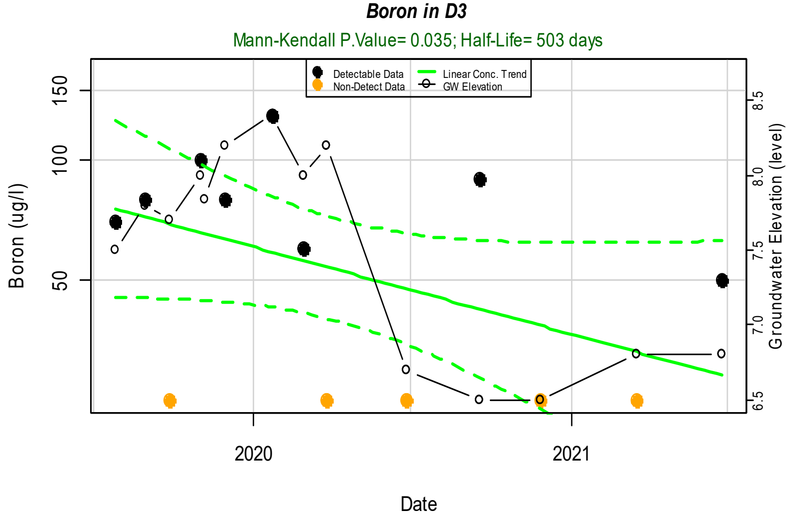


Boron in D2

Mann-Kendall P.Value= <0.01; Half-Life= 307 days

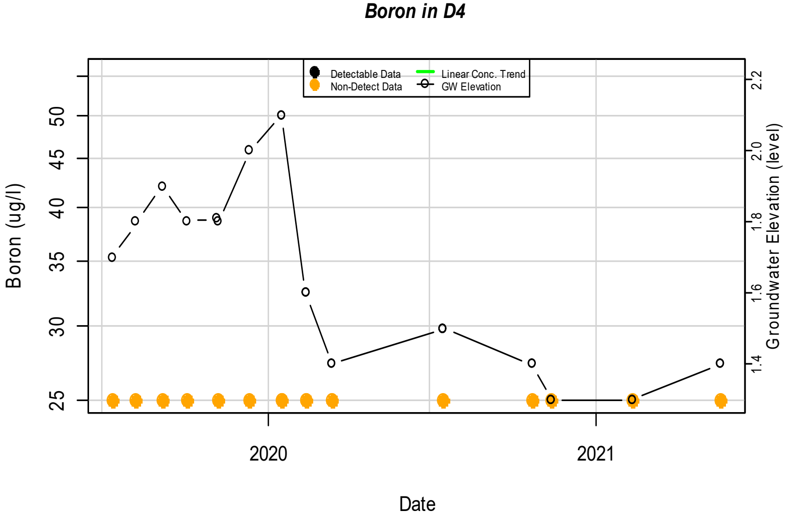


Boron in D23



Boron in D3

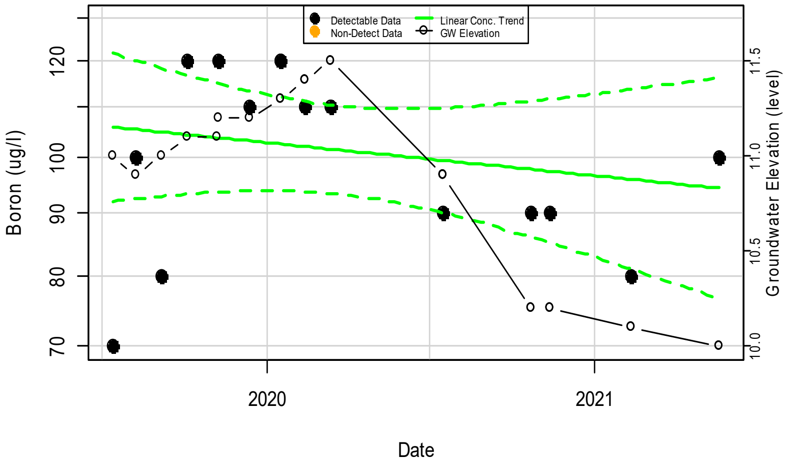
Mann-Kendall P.Value= 0.035; Half-Life= 503 days



Boron in D4

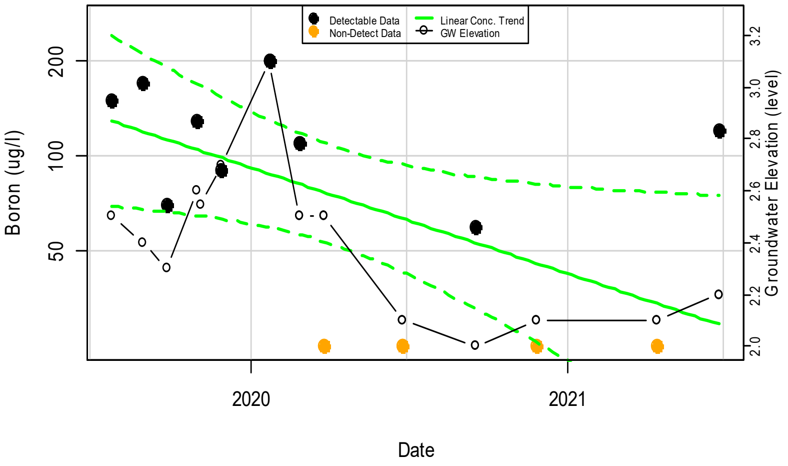
Boron in D5

Mann-Kendall P.Value= 0.225; Half-Life> 5 Years



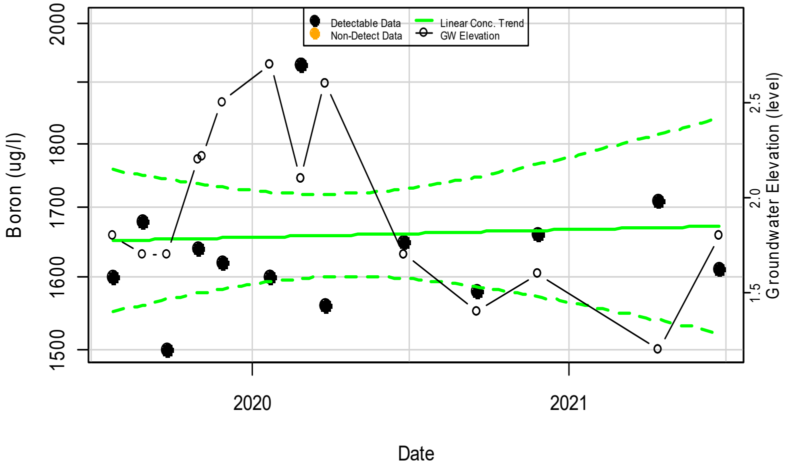
Boron in D8

Mann-Kendall P.Value= 0.0131; Half-Life= 329 days



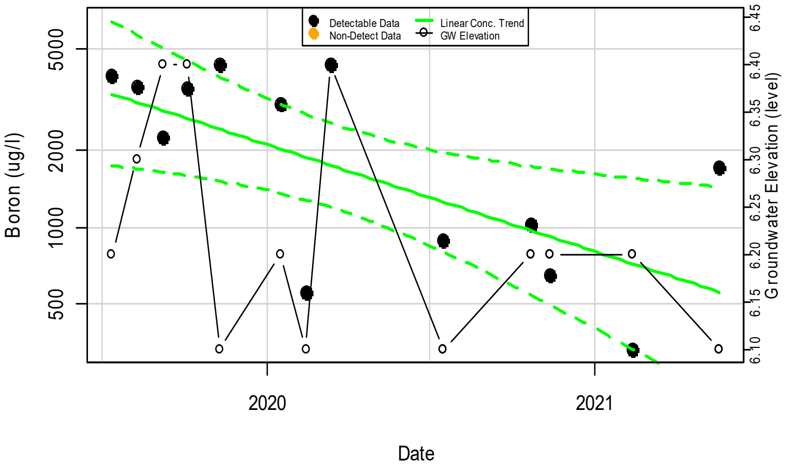
Boron in D9

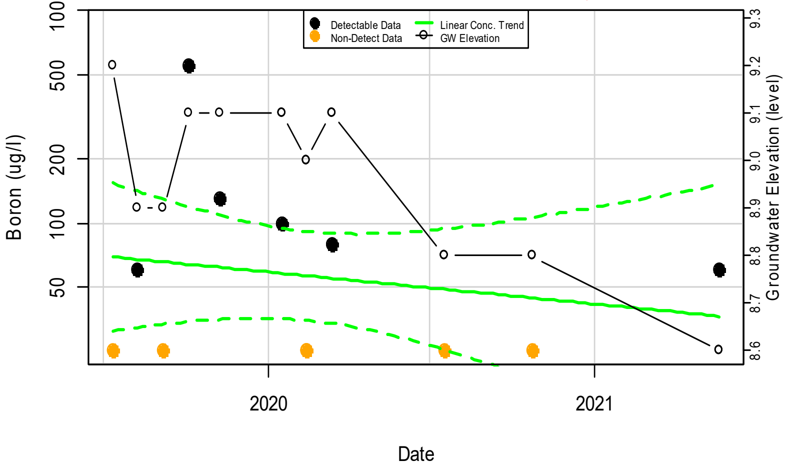
Mann-Kendall P.Value= 0.546; Half-Life> -5 Years



Boron in MPGM5-D5

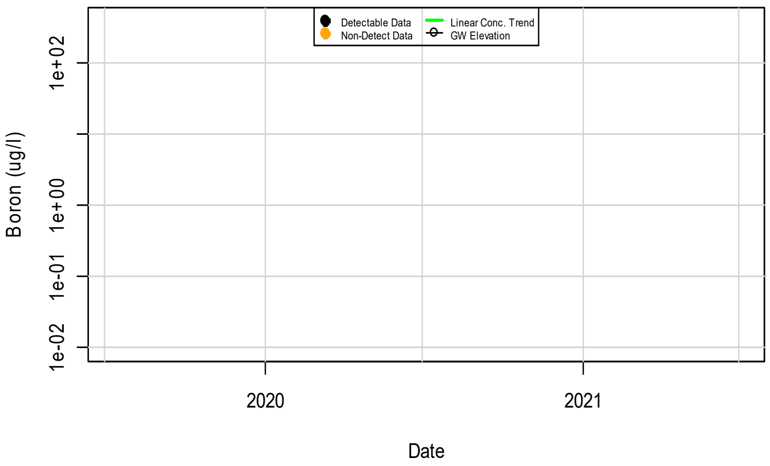
Mann-Kendall P.Value= 0.035; Half-Life= 262 days



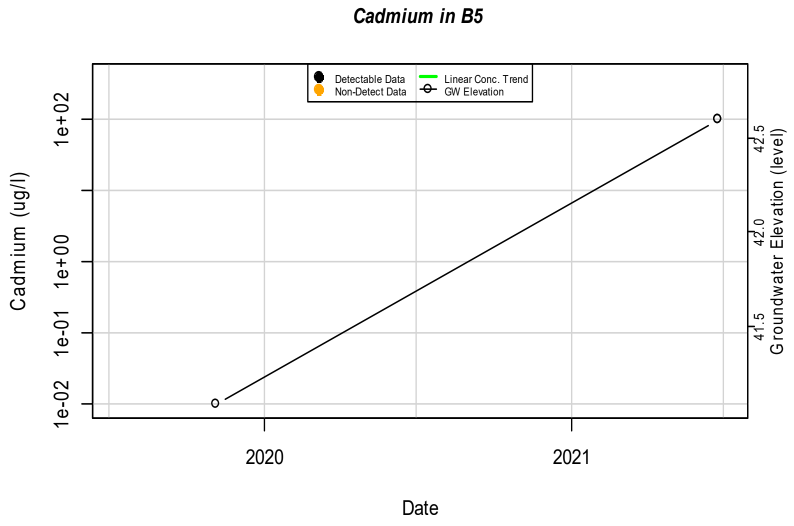


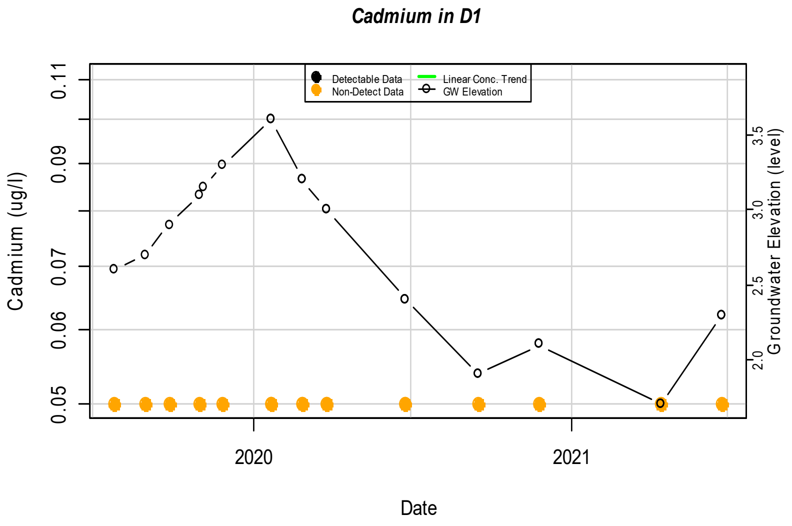
Boron in MPGM5-D6

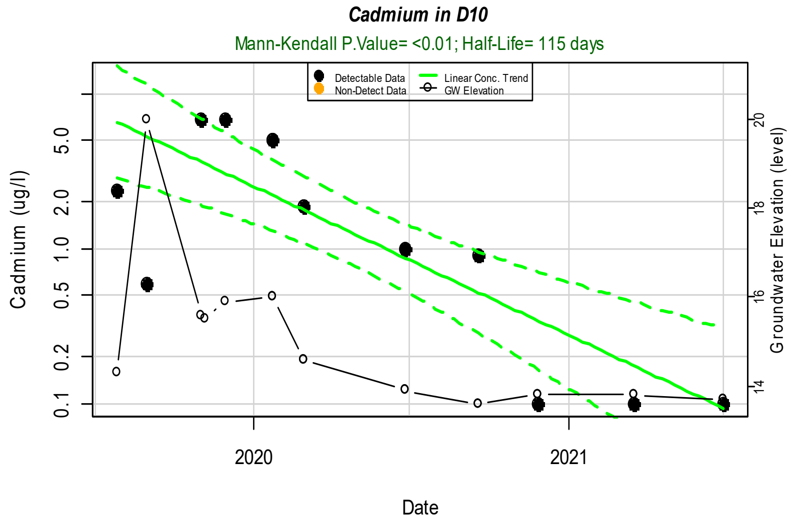
Mann-Kendall P.Value= 0.271; Half-Life= 731 days

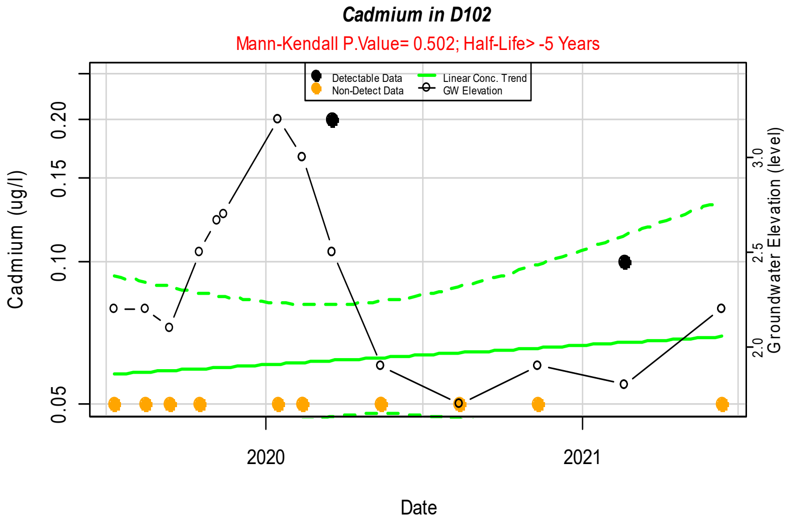


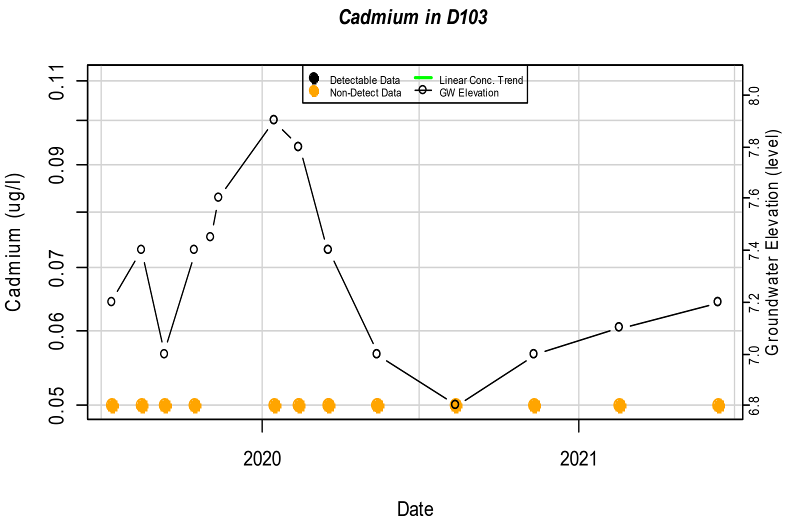
Boron in SW3-D

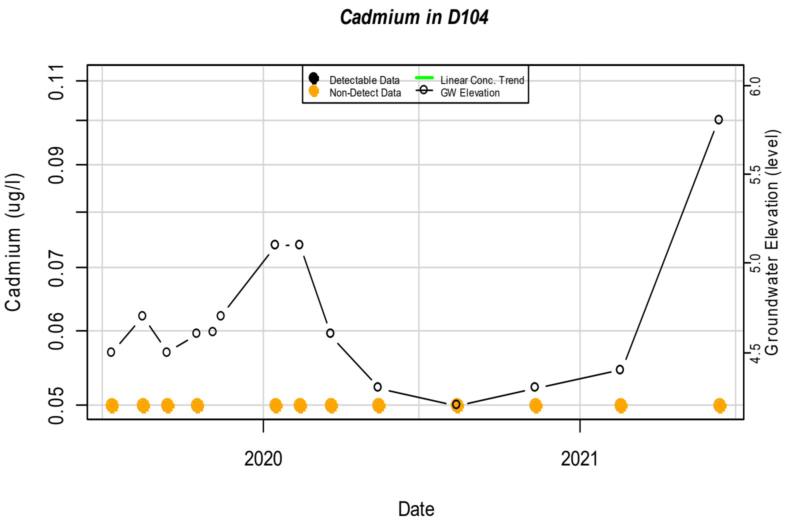

Cadmium in B5
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
1e+02
1e+00
1e-01
1e-02
Groundwater Elevation (level)
42.5
42.0
41.5
2020
2021
Date

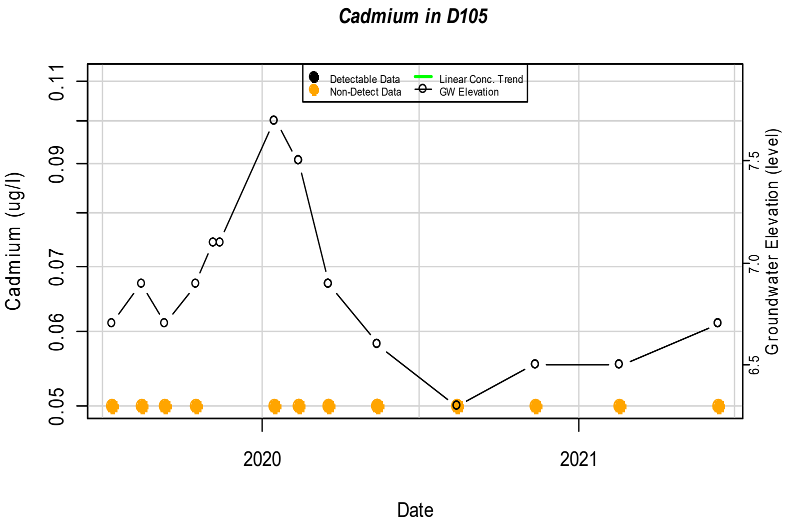

Cadmium in D1
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
0.11
0.09
0.07
0.06
0.05
Groundwater Elevation (level)
3.5
3.0
2.5
2.0
2020
2021
Date

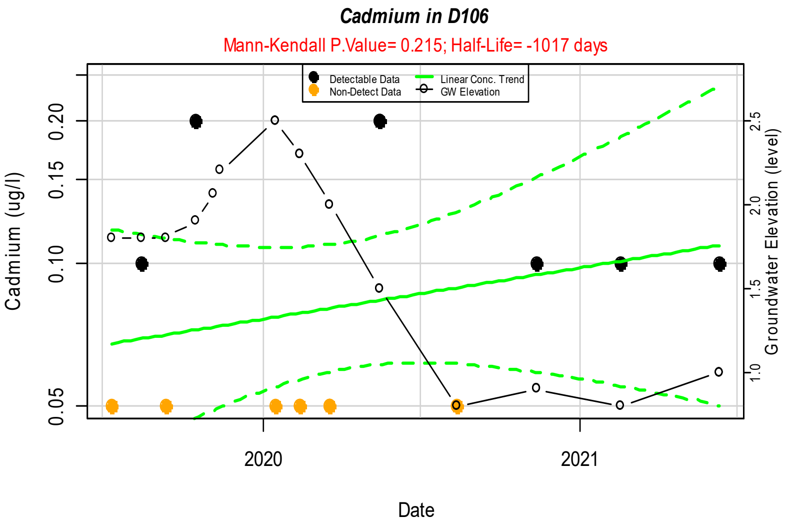

Cadmium in D10
Mann-Kendall P.Value= <0.01; Half-Life= 115 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
5.0
2.0
1.0
0.5
0.2
0.1
Groundwater Elevation (level)
20
18
16
14
2020
2021
Date


Cadmium in D102
Mann-Kendall P.Value= 0.502; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
0.20
0.15
0.10
0.05
Groundwater Elevation (level)
3.0
2.5
2.0
2020
2021
Date

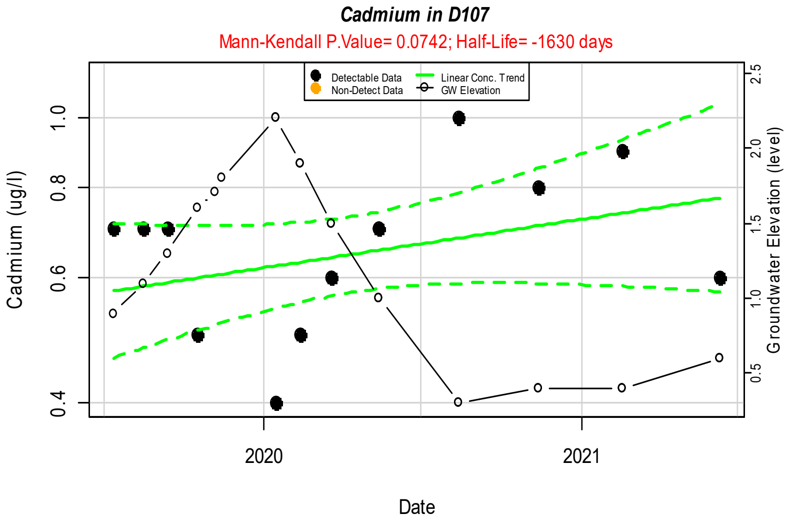

Cadmium in D103

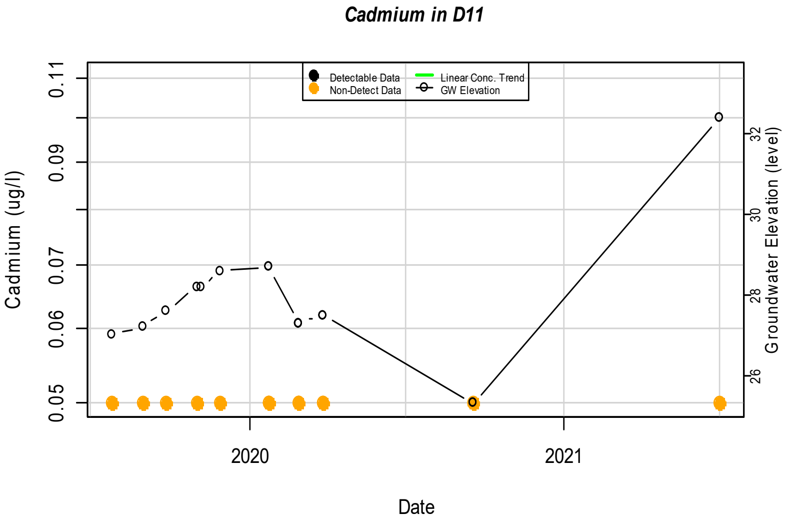

Cadmium in D104

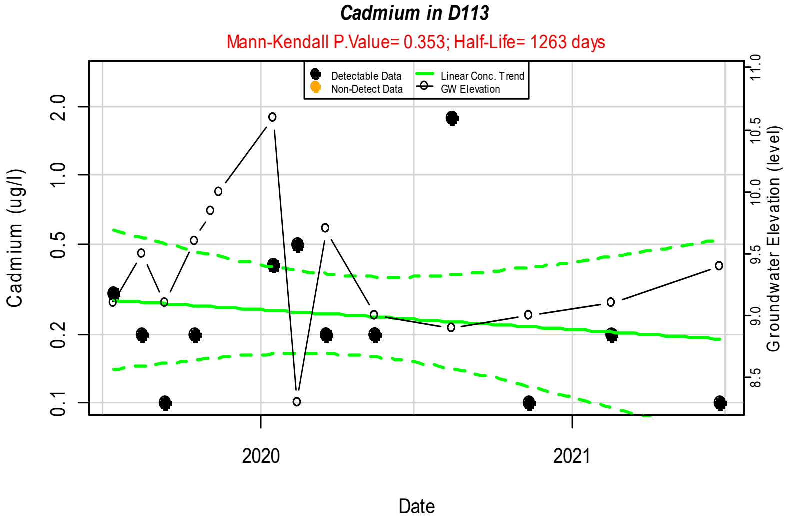

Cadmium in D105

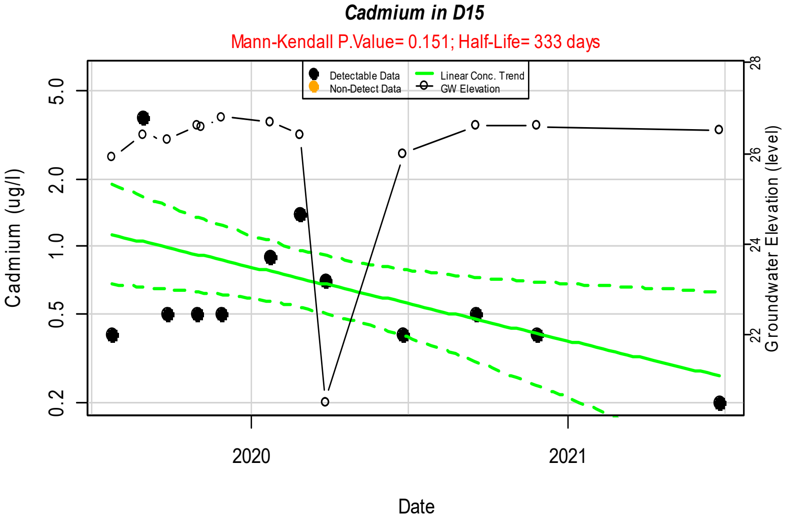

Cadmium in D106

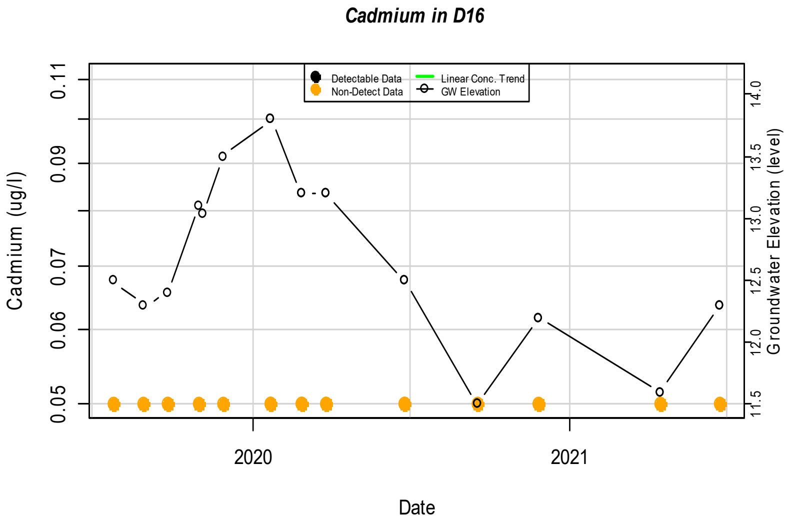
Mann-Kendall P.Value= 0.215; Half-Life= -1017 days

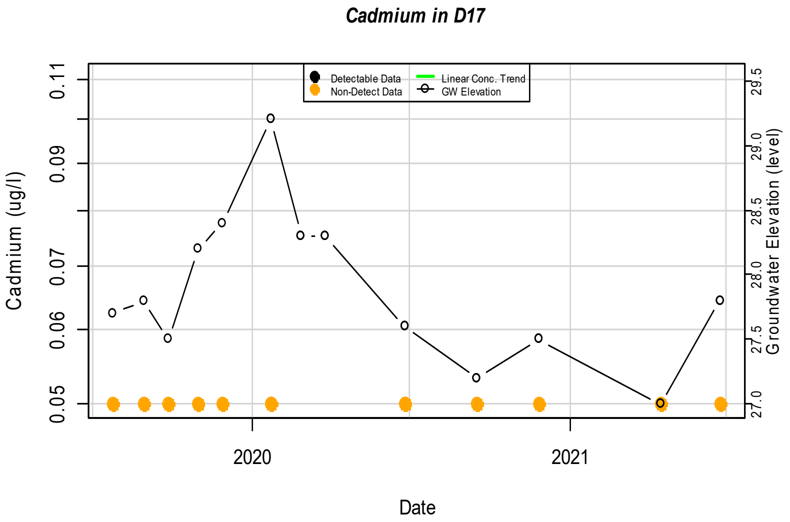

Cadmium in D107
Mann-Kendall P.Value= 0.0742; Half-Life= -1630 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
0.4
0.6
0.8
1.0
Groundwater Elevation (level)
0.5
1.0
1.5
2.0
2.5
2020
2021
Date

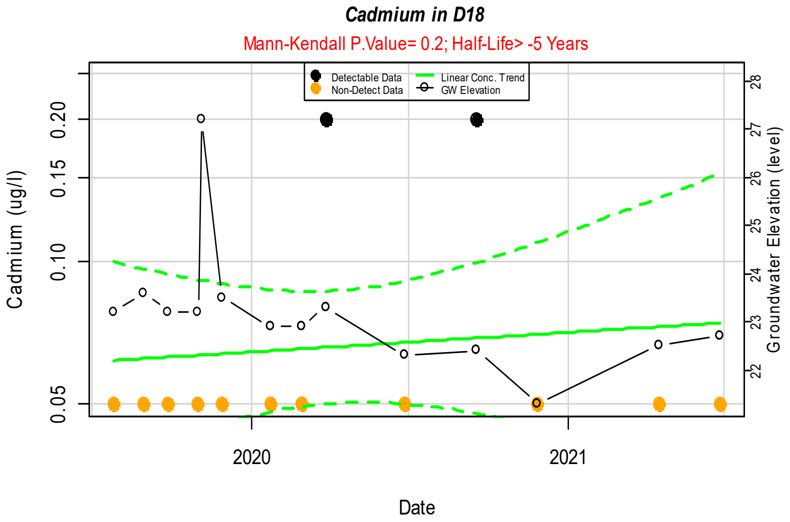

Cadmium in D11
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
0.05
0.06
0.07
0.09
0.11
Groundwater Elevation (level)
26
28
30
32
2020
2021
Date

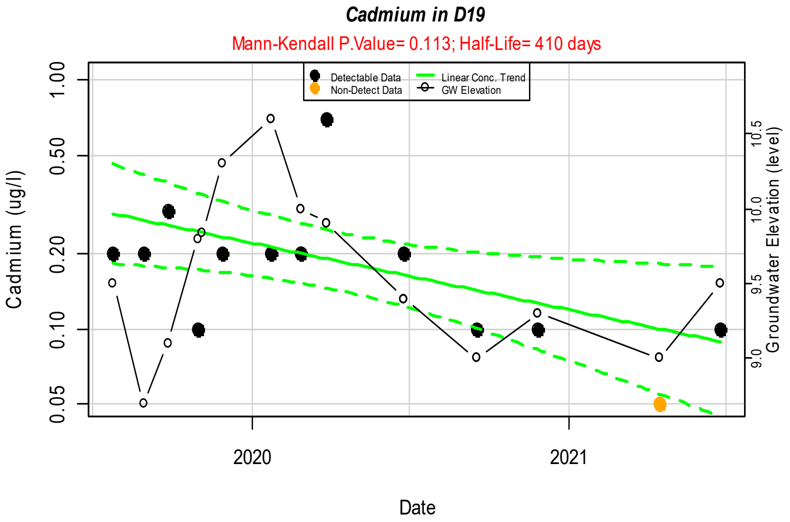

Cadmium in D113
Mann-Kendall P.Value= 0.353; Half-Life= 1263 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
0.1
0.2
0.5
1.0
2.0
Groundwater Elevation (level)
8.5
9.0
9.5
10.0
10.5
11.0
2020
2021
Date

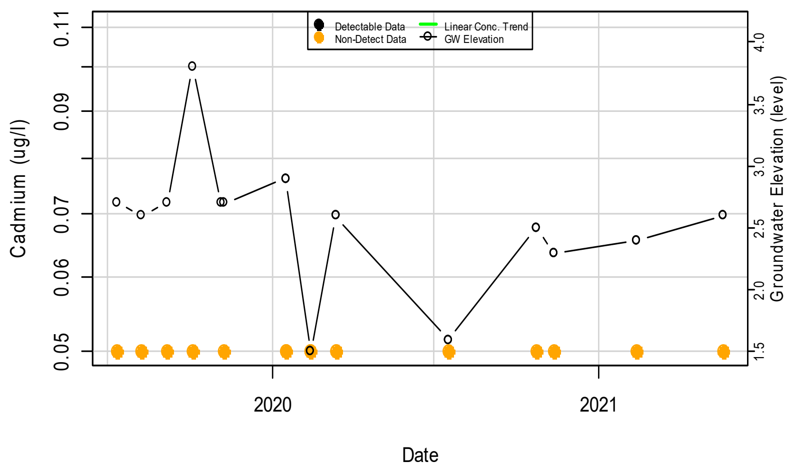

Cadmium in D15
Mann-Kendall P.Value= 0.151; Half-Life= 333 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
0.2
0.5
1.0
2.0
5.0
Groundwater Elevation (level)
22
24
26
28
2020
2021
Date

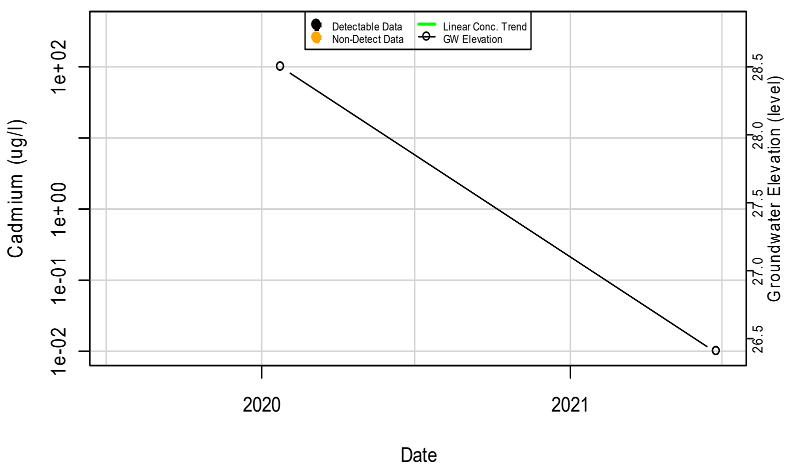

Cadmium in D16
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
0.05
0.06
0.07
0.09
0.11
Groundwater Elevation (level)
11.5
12.0
12.5
13.0
13.5
14.0
2020
2021
Date

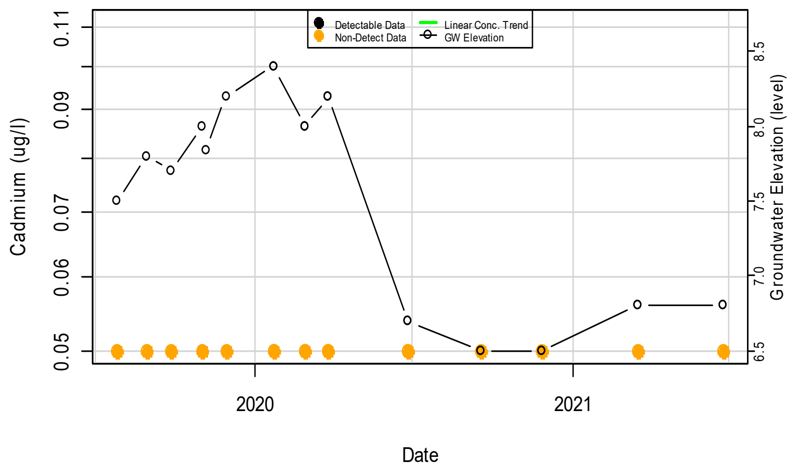

Cadmium in D17
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
0.05
0.06
0.07
0.09
0.11
Groundwater Elevation (level)
27.0
27.5
28.0
28.5
29.0
29.5
2020
2021
Date

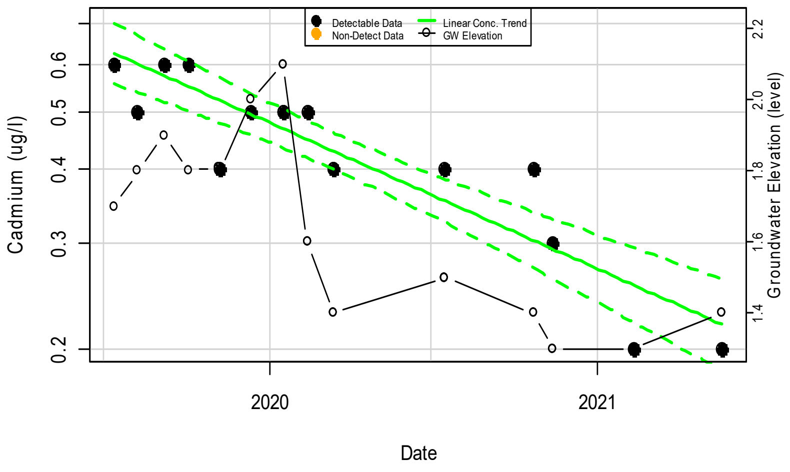

Cadmium in D18
Mann-Kendall P.Value= 0.2; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
0.05
0.10
0.15
0.20
Groundwater Elevation (level)
22
23
24
25
26
27
28
2020
2021
Date


Cadmium in D19
Mann-Kendall P.Value= 0.113; Half-Life= 410 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Cadmium (ug/l)
0.05
0.10
0.20
0.50
1.00
Groundwater Elevation (level)
9.0
9.5
10.0
10.5
2020
2021
Date

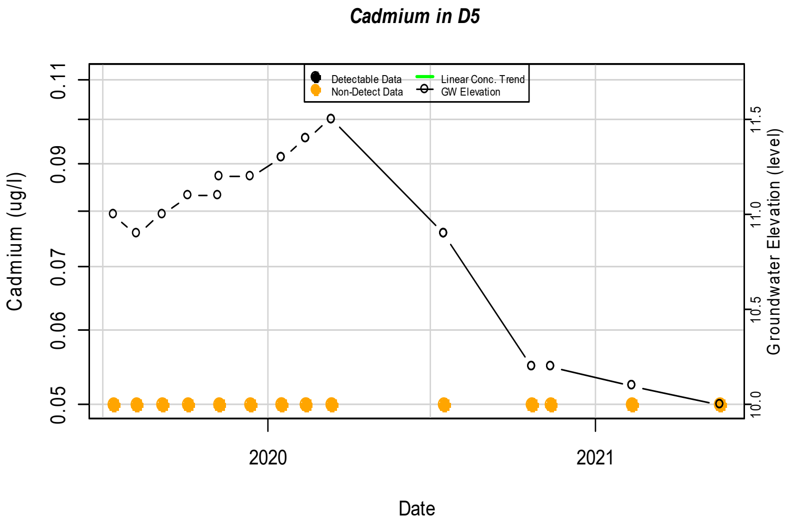

Cadmium in D2

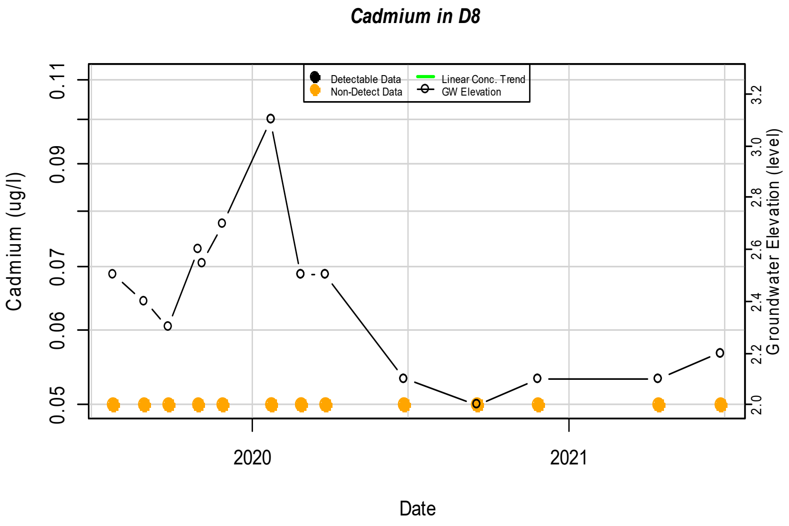

Cadmium in D23

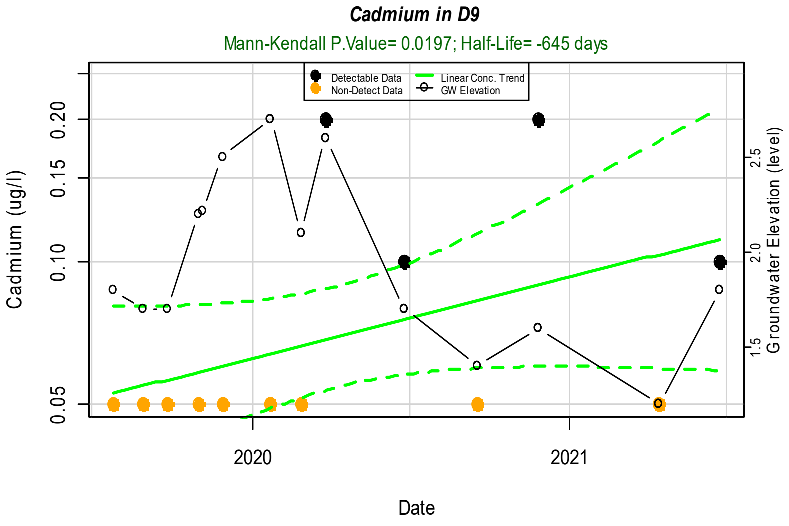

Cadmium in D3


Cadmium in D4

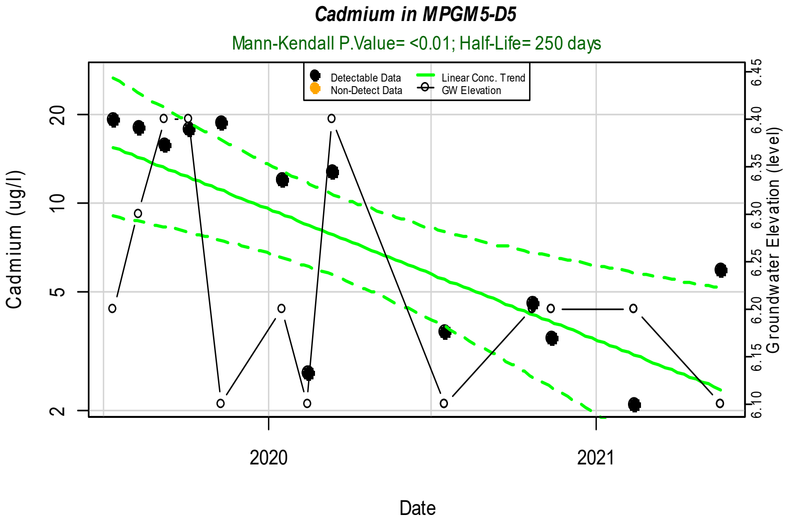
Mann-Kendall P.Value= <0.01; Half-Life= 450 days


Cadmium in D5

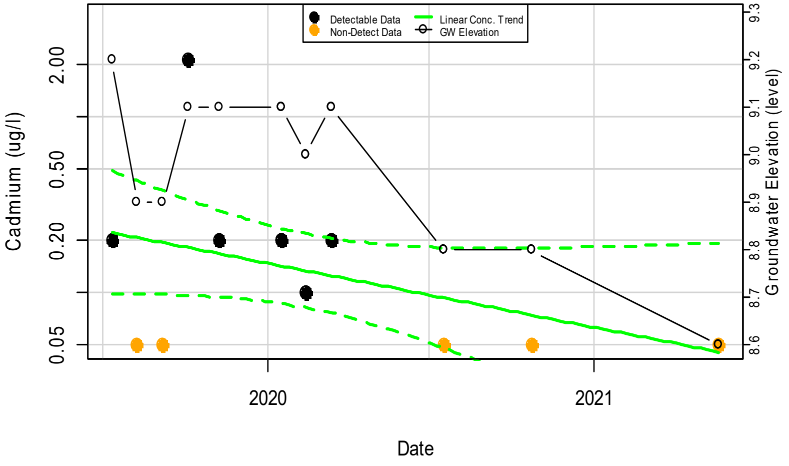

Cadmium in D8


Cadmium in D9

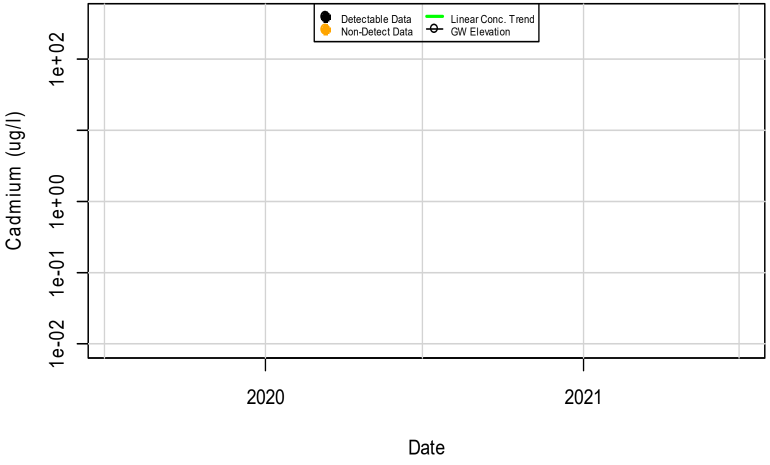
Mann-Kendall P.Value= 0.0197; Half-Life= -645 days

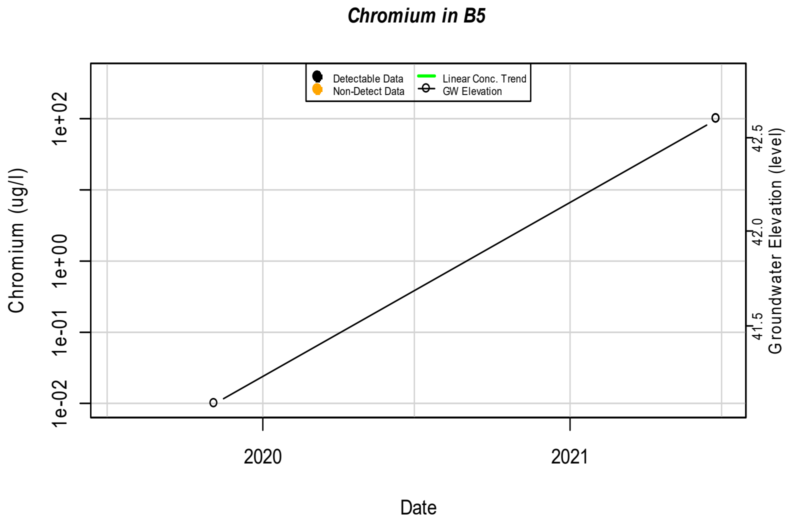

Cadmium in MPGM5-D5

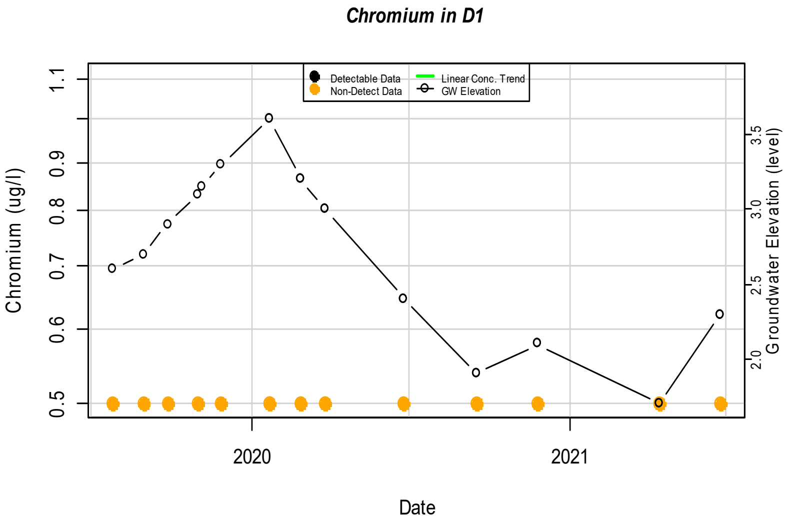
Mann-Kendall P.Value= <0.01; Half-Life= 250 days

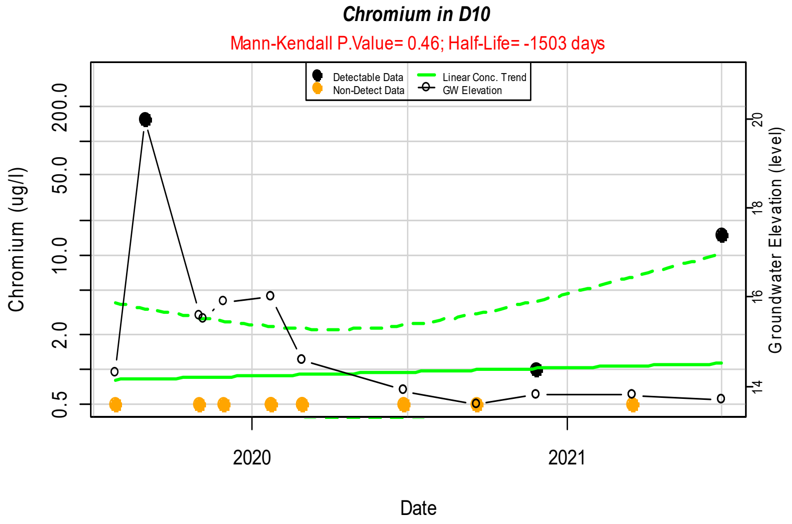

Cadmium in MPGM5-D6

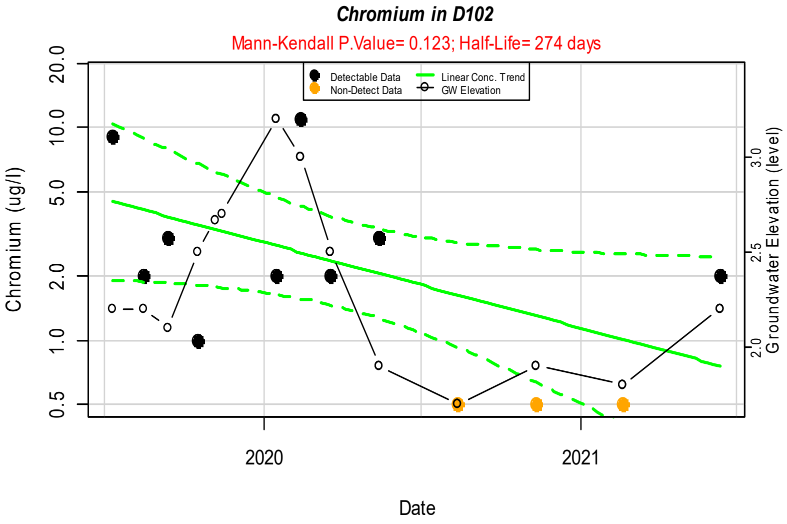
Mann-Kendall P.Value= 0.131; Half-Life= 301 days

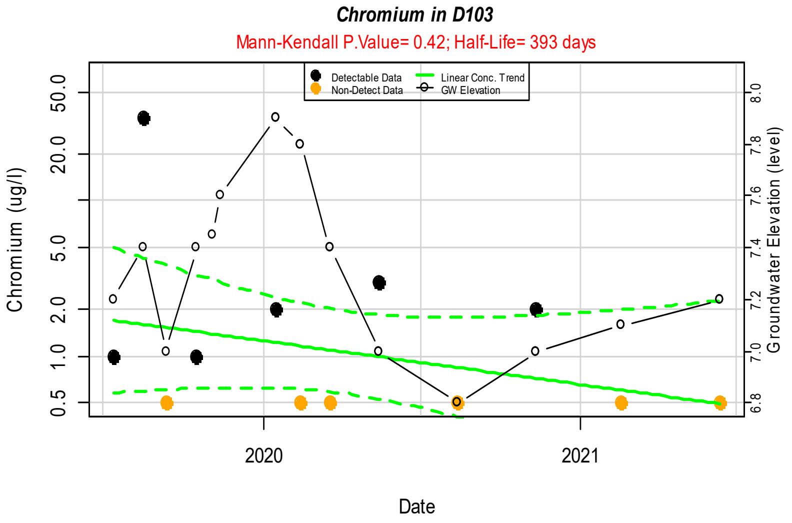

Cadmium in SW3-D


Chromium in B5
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Chromium (ug/l)
1e+02
1e+00
1e-01
1e-02
Groundwater Elevation (level)
42.5
42.0
41.5
2020
2021
Date


Chromium in D1
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Chromium (ug/l)
1.1
0.9
0.8
0.7
0.6
0.5
Groundwater Elevation (level)
3.5
3.0
2.5
2.0
2020
2021
Date

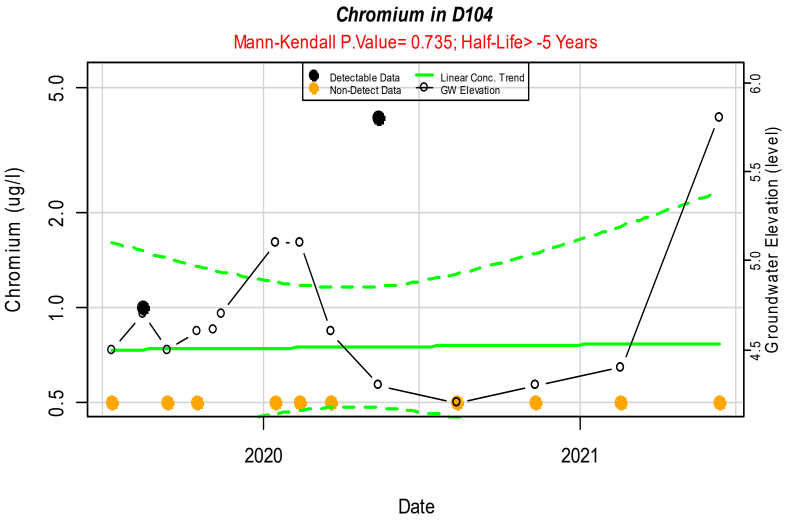

Chromium in D10
Mann-Kendall P.Value= 0.46; Half-Life= -1503 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Chromium (ug/l)
200.0
50.0
10.0
2.0
0.5
Groundwater Elevation (level)
20
18
16
14
2020
2021
Date


Chromium in D102
Mann-Kendall P.Value= 0.123; Half-Life= 274 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Chromium (ug/l)
20.0
10.0
5.0
2.0
1.0
0.5
Groundwater Elevation (level)
3.0
2.5
2.0
2020
2021
Date



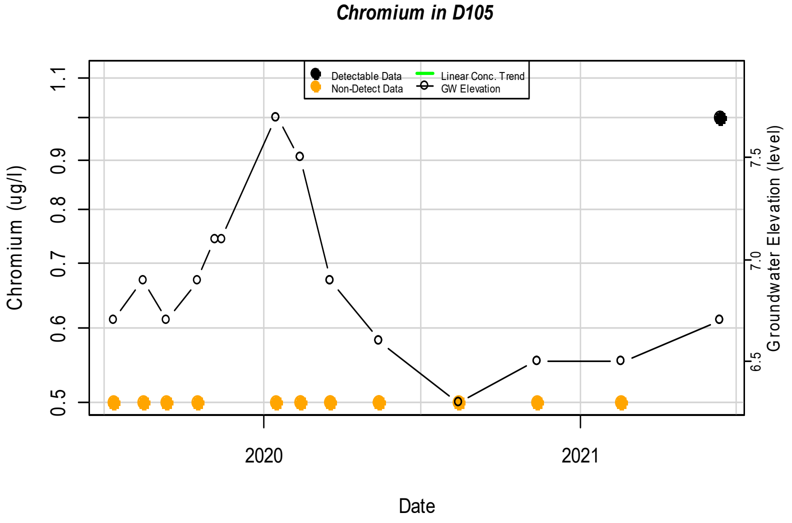
Chromium in D103

Mann-Kendall P.Value= 0.42; Half-Life= 393 days

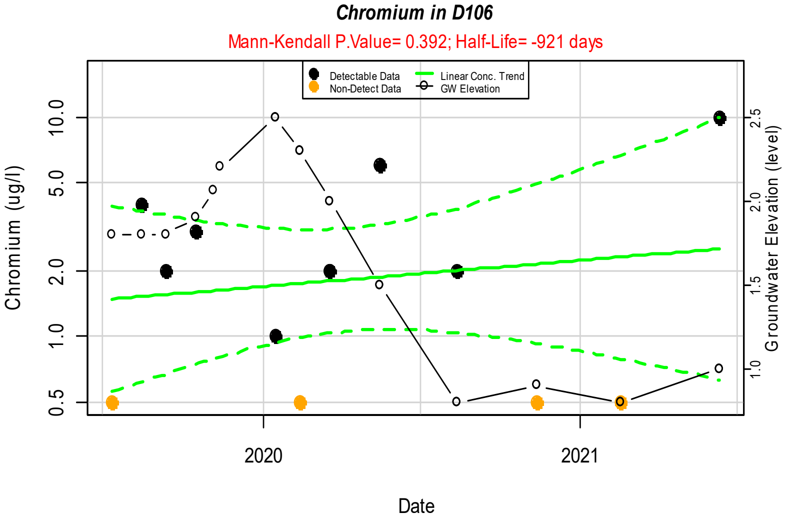


Chromium in D104

Mann-Kendall P.Value= 0.735; Half-Life> -5 Years

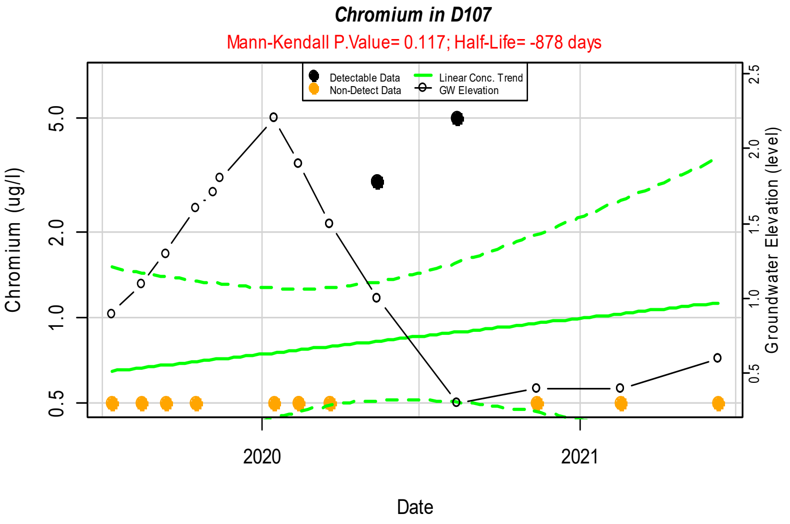


Chromium in D105



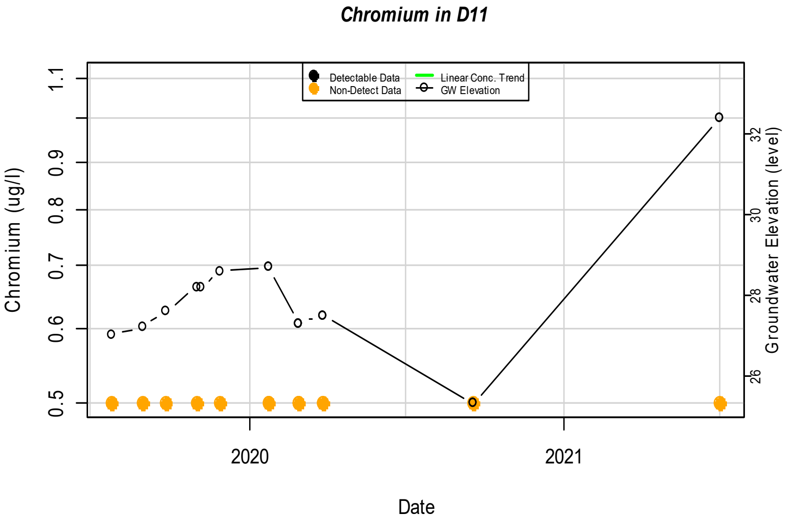
Chromium in D106

Mann-Kendall P.Value= 0.392; Half-Life= -921 days

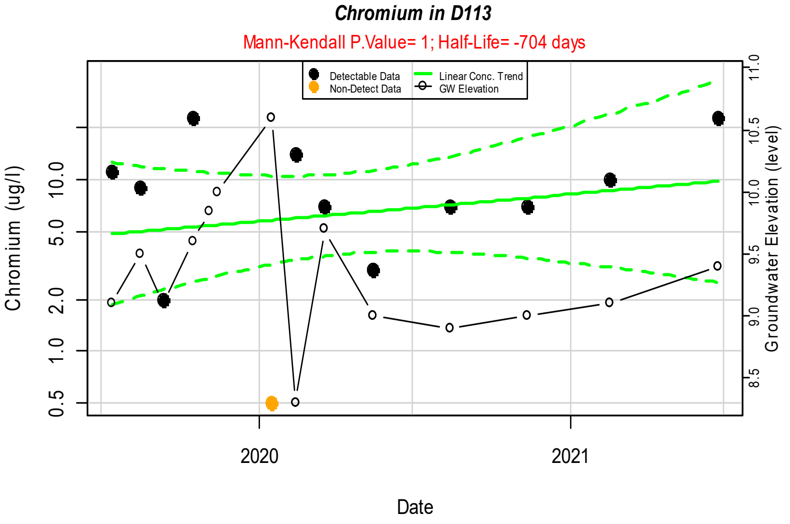


Chromium in D107

Mann-Kendall P.Value= 0.117; Half-Life= -878 days

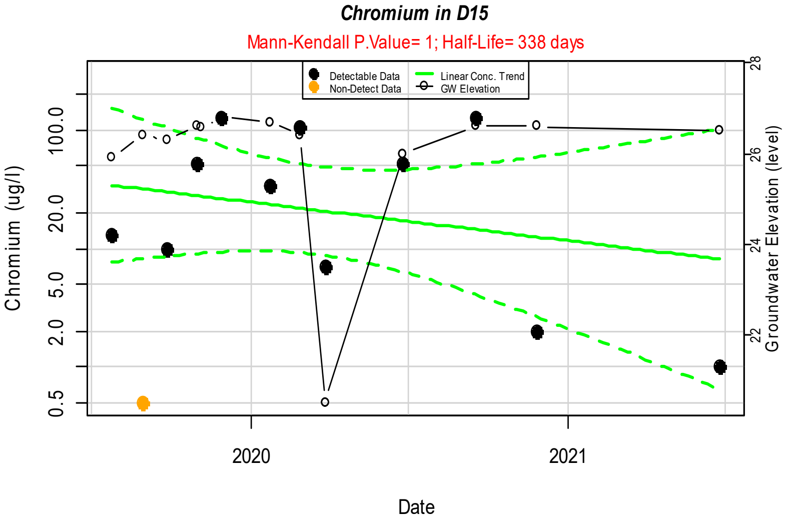


Chromium in D11



Chromium in D113

Mann-Kendall P.Value= 1; Half-Life= -704 days

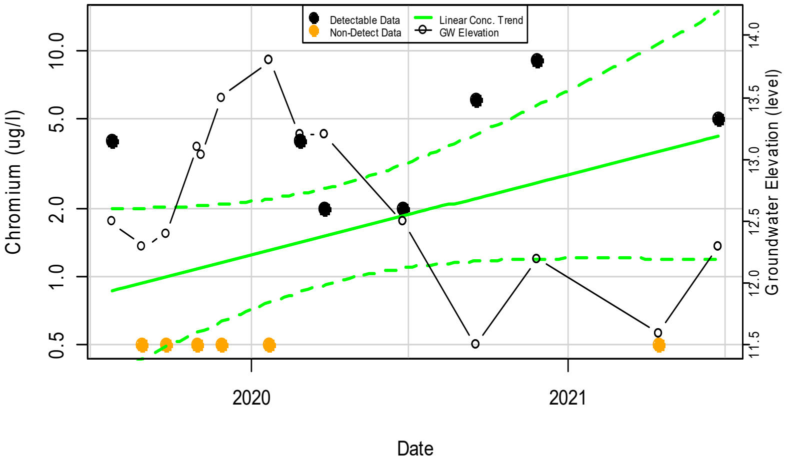


Chromium in D15

Mann-Kendall P.Value= 1; Half-Life= 338 days

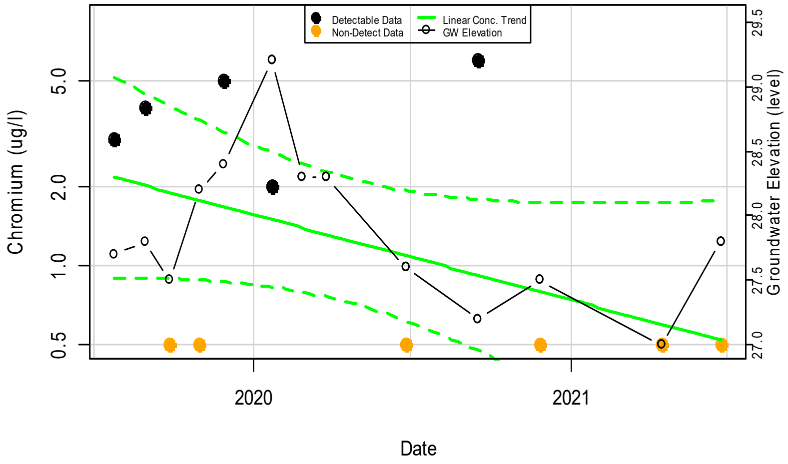
Chromium in D16

Mann-Kendall P.Value= 0.0261; Half-Life= -308 days



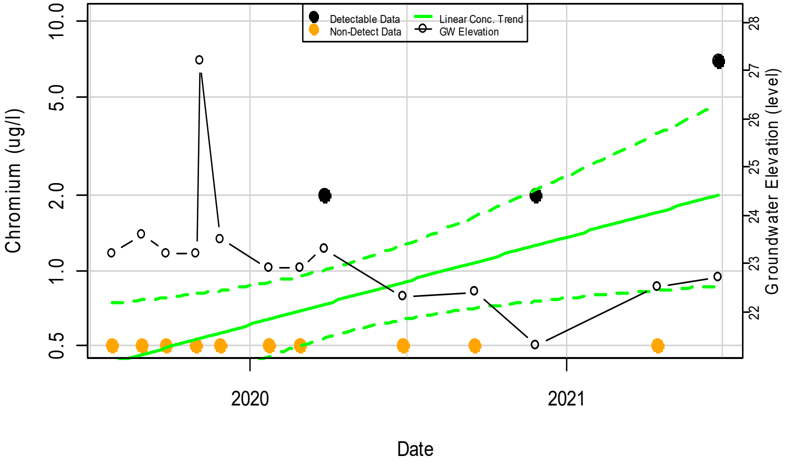
Chromium in D17

Mann-Kendall P.Value= 0.153; Half-Life= 341 days



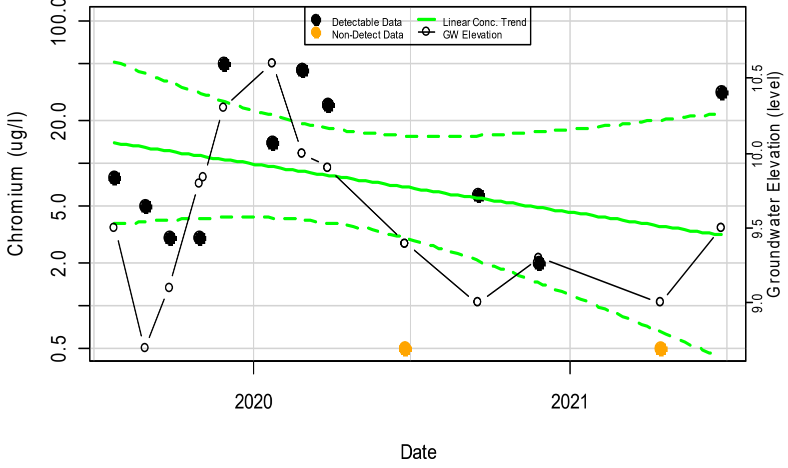
Chromium in D18

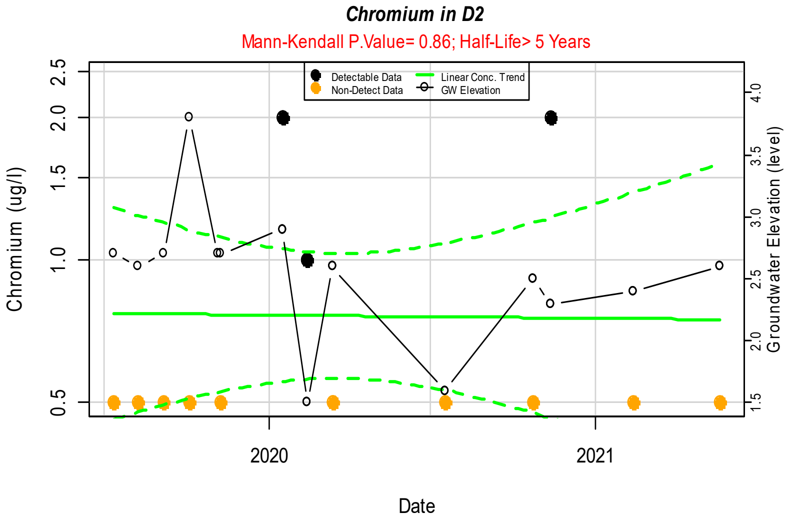
Mann-Kendall P.Value= 0.0236; Half-Life= -313 days



Chromium in D19

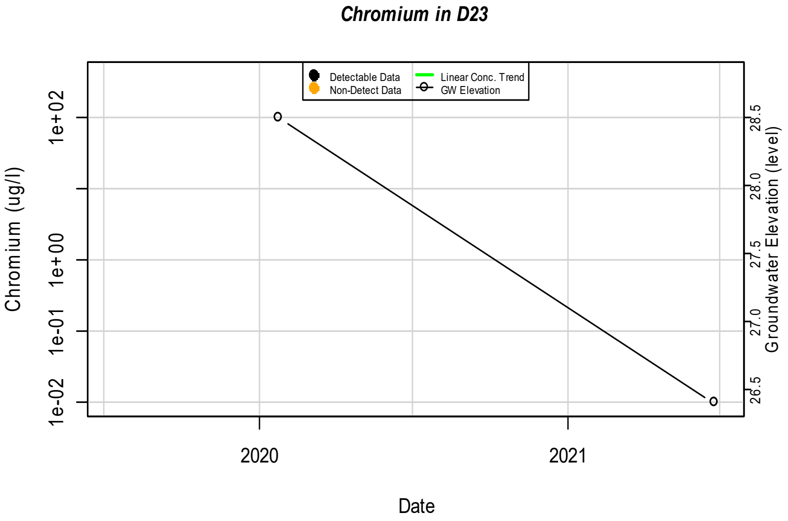
Mann-Kendall P.Value= 0.595; Half-Life= 324 days



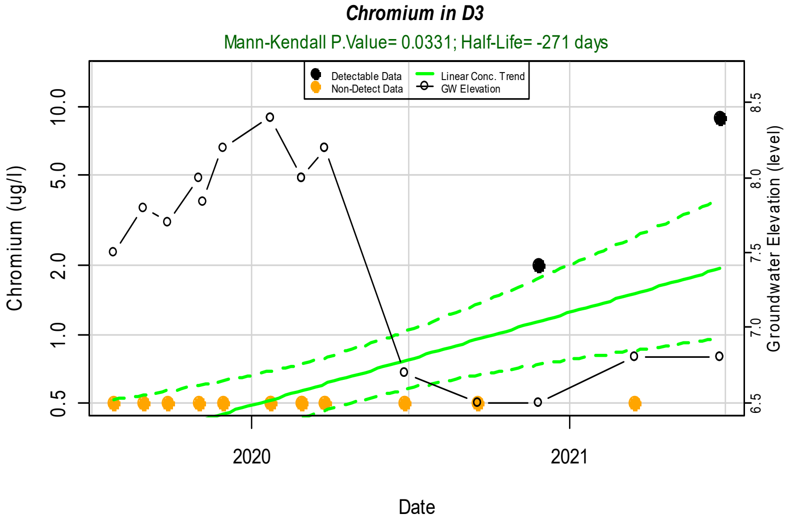


Chromium in D2

Mann-Kendall P.Value= 0.86; Half-Life> 5 Years

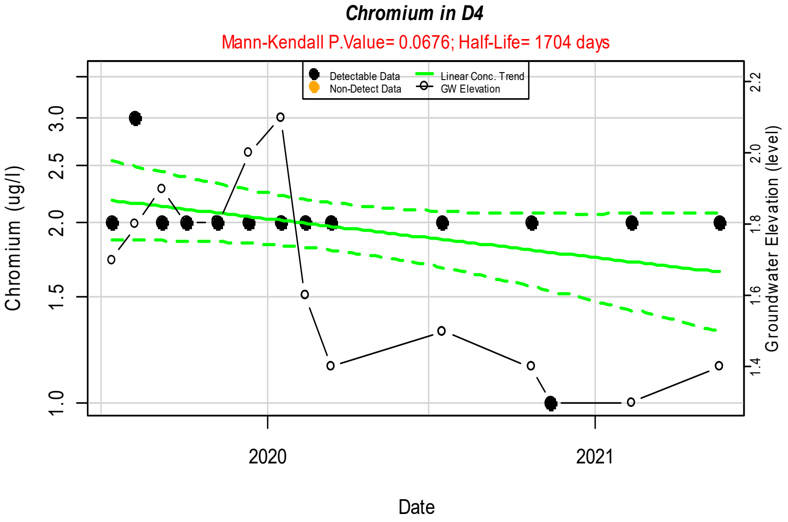


Chromium in D23



Chromium in D3

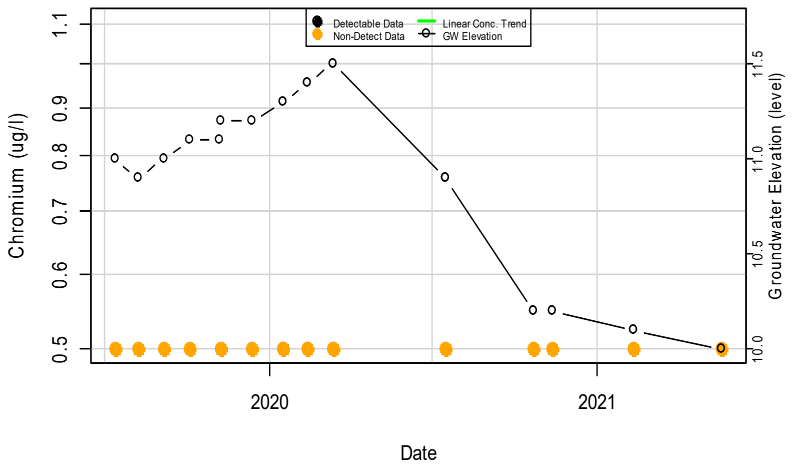
Mann-Kendall P.Value= 0.0331; Half-Life= -271 days



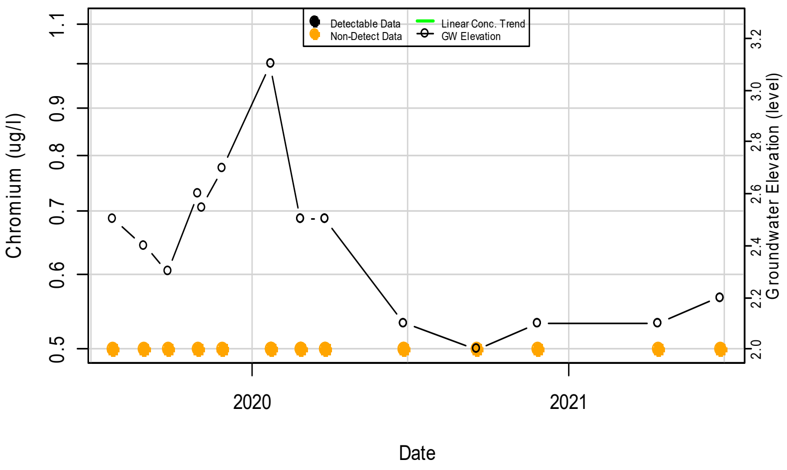
Chromium in D4

Mann-Kendall P.Value= 0.0676; Half-Life= 1704 days

Chromium in D5

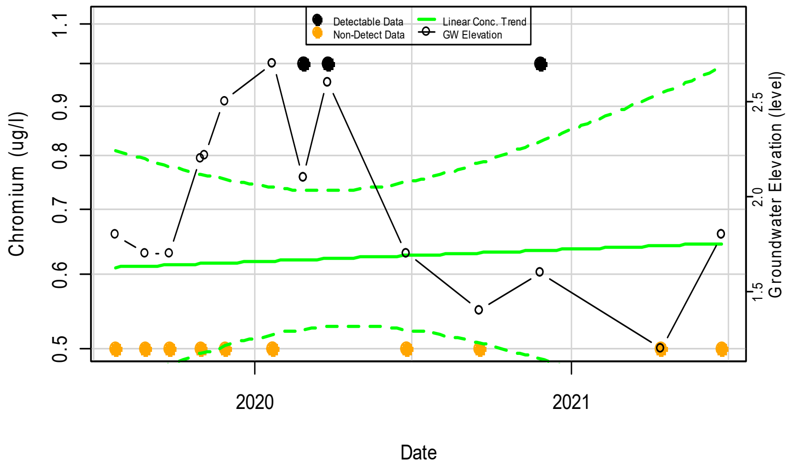


Chromium in D8



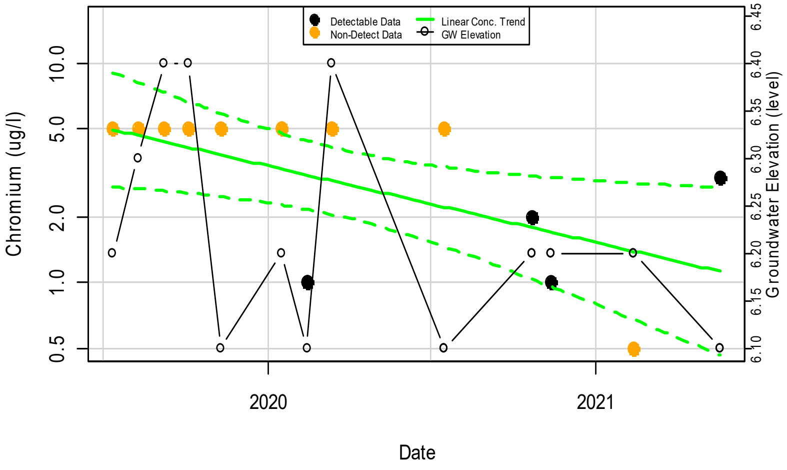
Chromium in D9

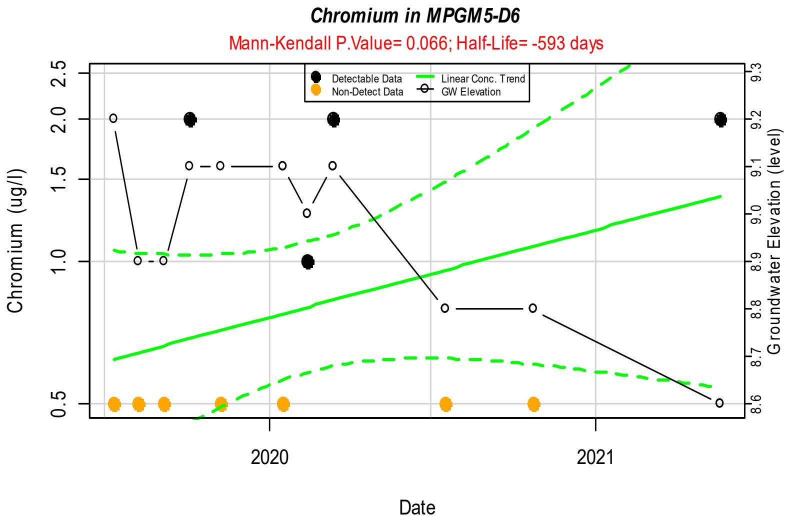
Mann-Kendall P.Value= 0.311; Half-Life> -5 Years

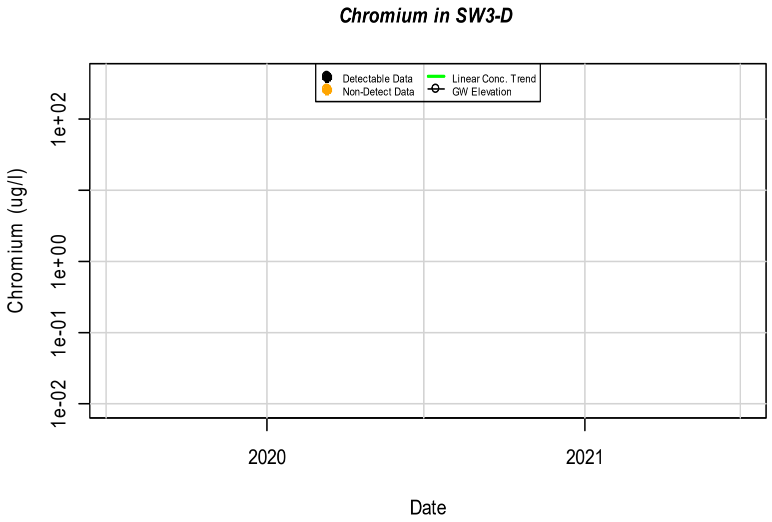


Chromium in MPGM5-D5

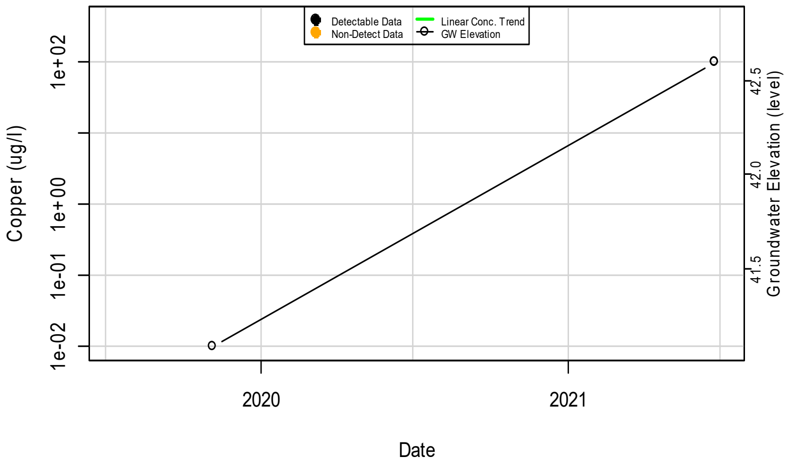
Mann-Kendall P.Value= 0.0157; Half-Life= 317 days




Chromium in MPGM5-D6
Mann-Kendall P.Value= 0.066; Half-Life= -593 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Chromium (ug/l)
0.5
1.0
1.5
2.0
2.5
Groundwater Elevation (level)
8.6
8.7
8.8
8.9
9.0
9.1
9.2
9.3
2020
2021
Date

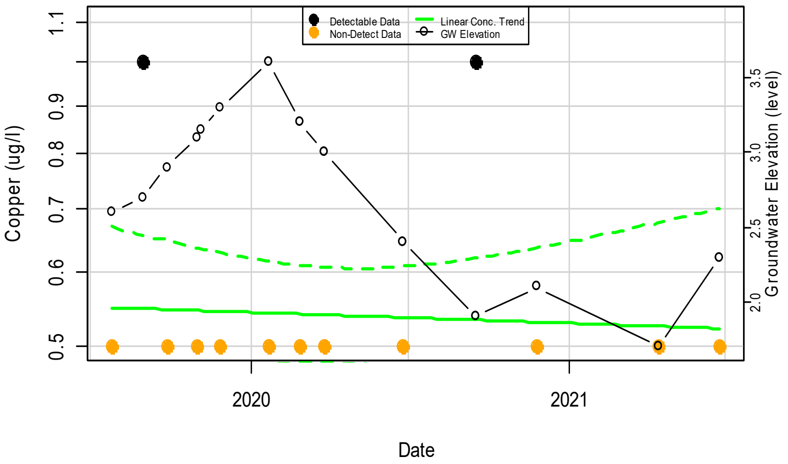

Chromium in SW3-D
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Chromium (ug/l)
1e-02
1e-01
1e+00
1e+02
2020
2021
Date

Copper in B5



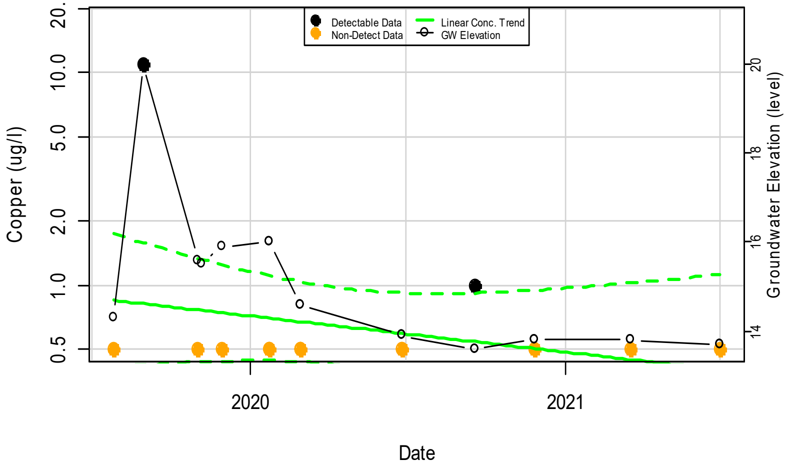
Copper in D1

Mann-Kendall P.Value= 0.832; Half-Life> 5 Years



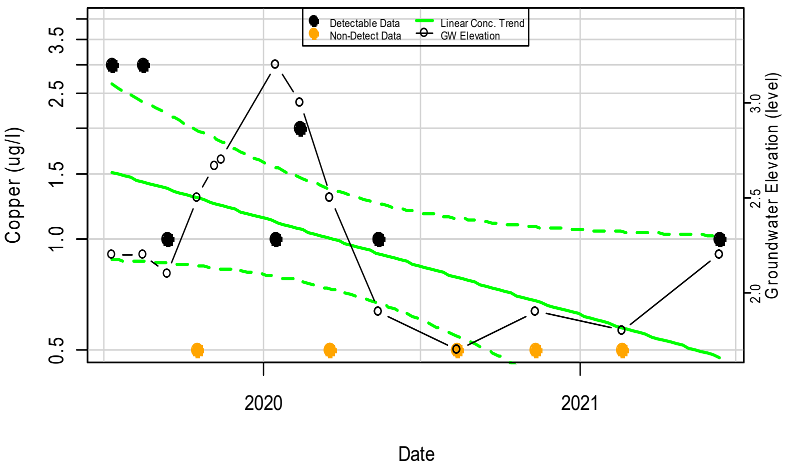
Copper in D10

Mann-Kendall P.Value= 0.75; Half-Life= 650 days



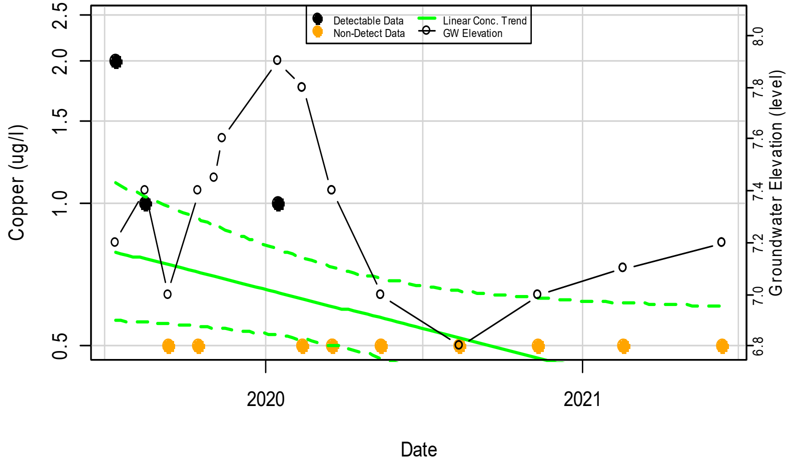
Copper in D102

Mann-Kendall P.Value= 0.0382; Half-Life= 419 days



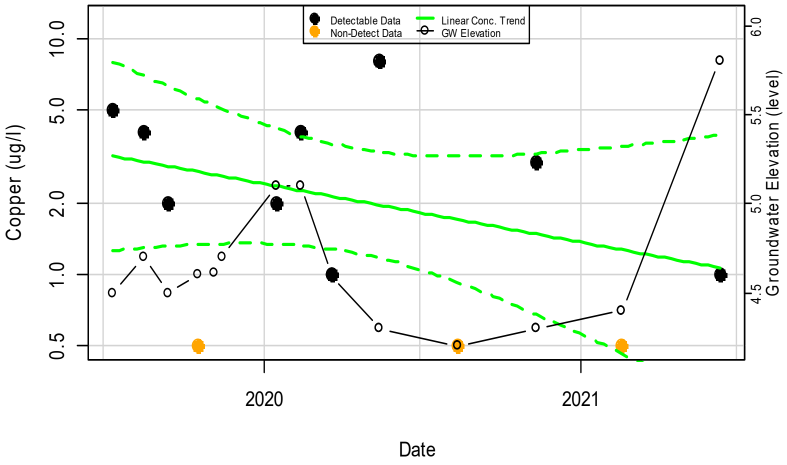
Copper in D103

Mann-Kendall P.Value= 0.0156; Half-Life= 656 days

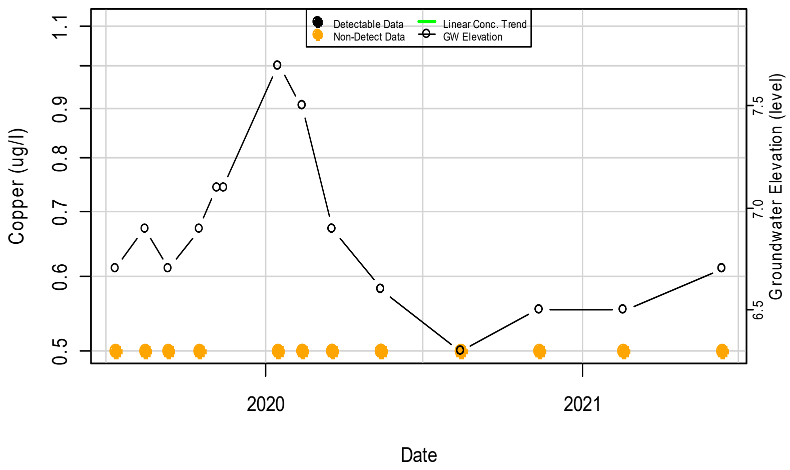


Copper in D104

Mann-Kendall P.Value= 0.423; Half-Life= 447 days

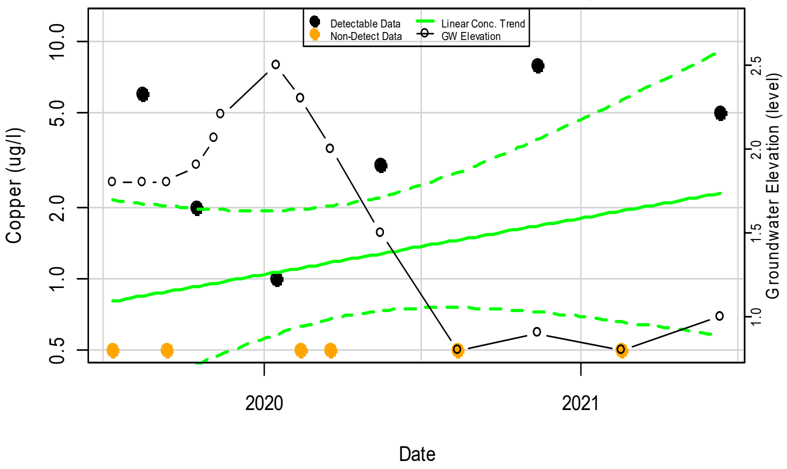


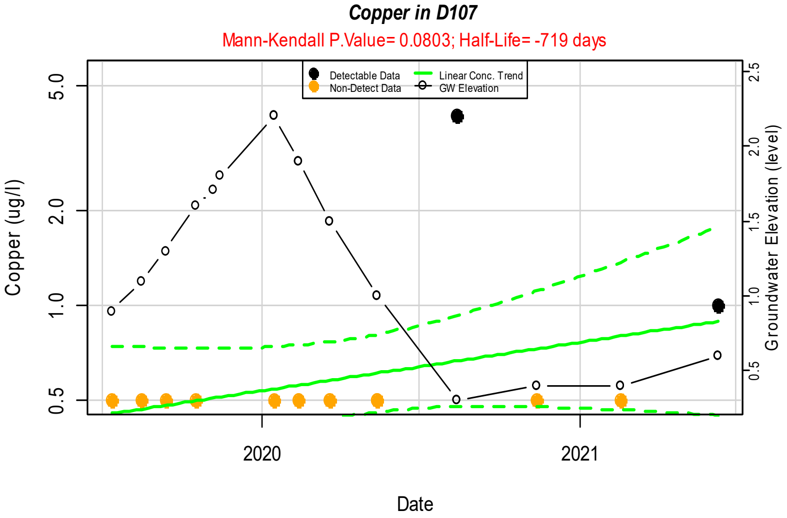
Copper in D105



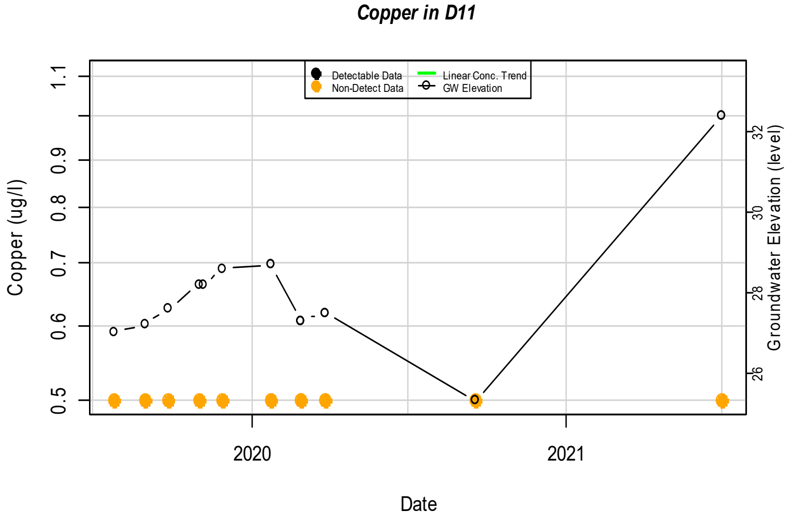
Copper in D106

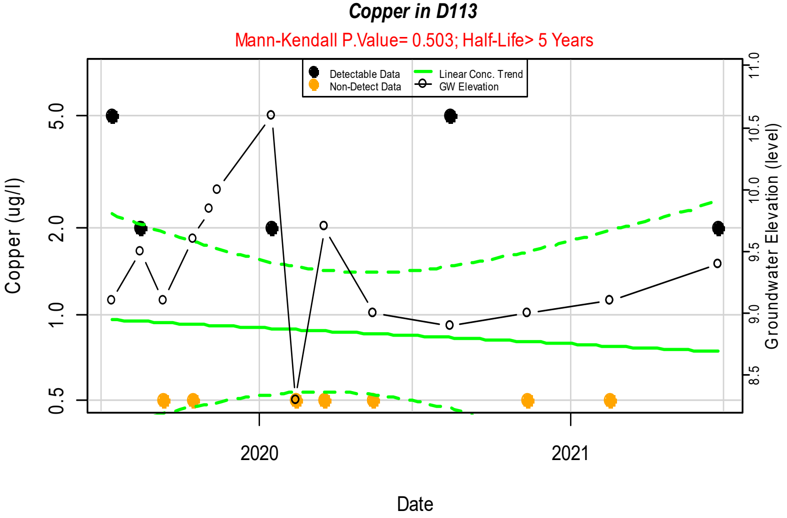
Mann-Kendall P.Value= 0.319; Half-Life= -462 days



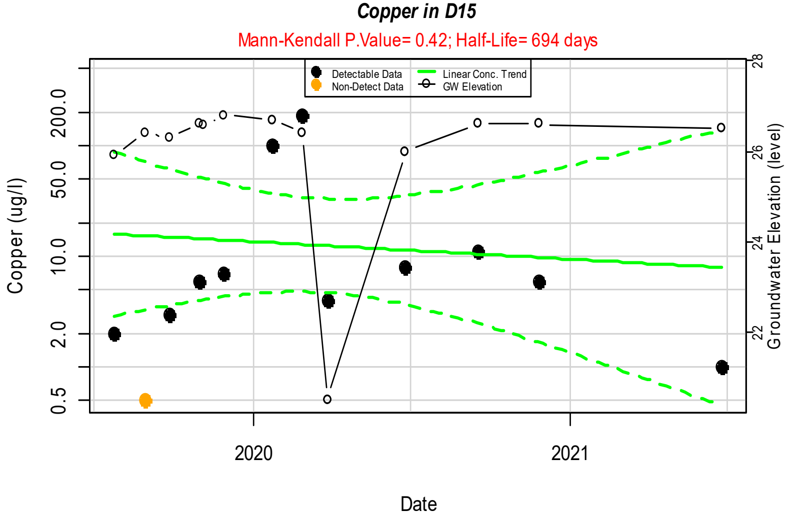

Copper in D107

Mann-Kendall P.Value= 0.0803; Half-Life= -719 days

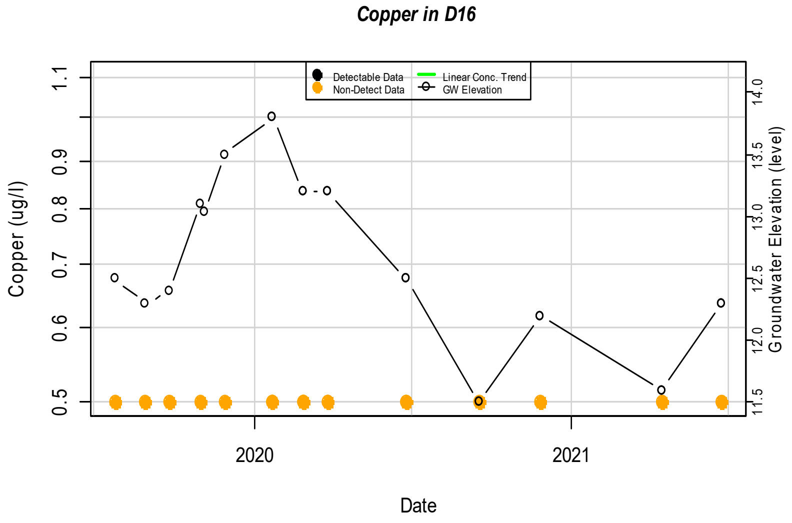

Copper in D11

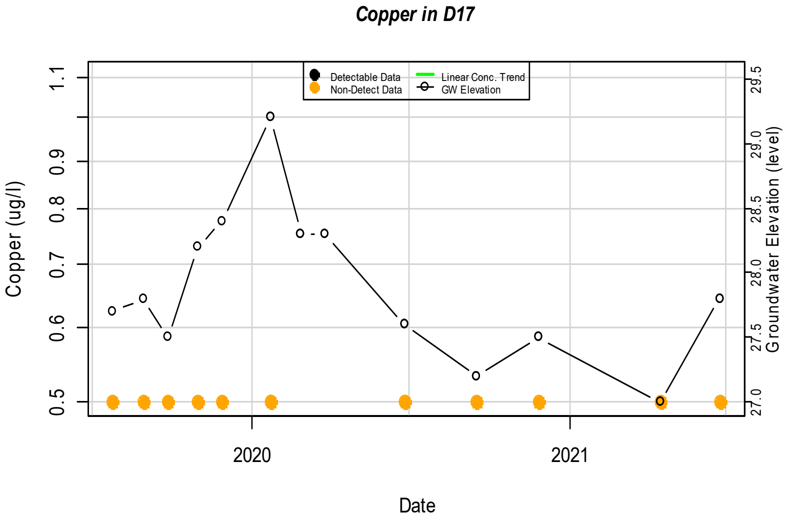

Copper in D113

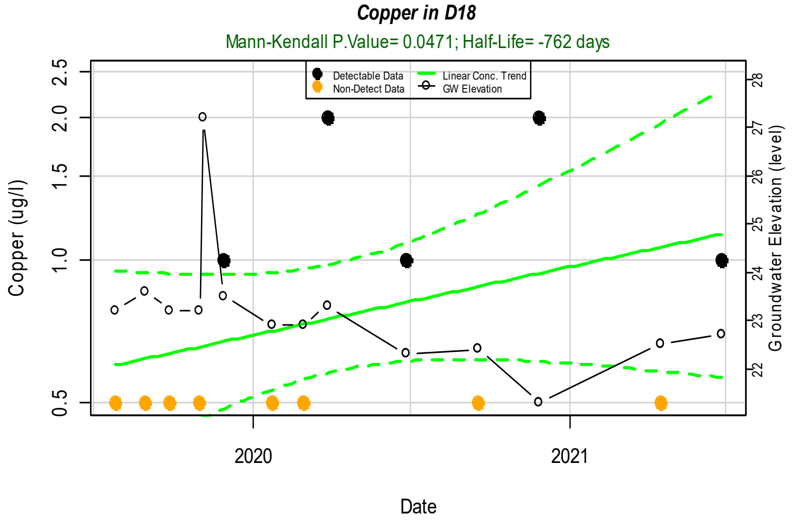
Mann-Kendall P.Value= 0.503; Half-Life> 5 Years


Copper in D15

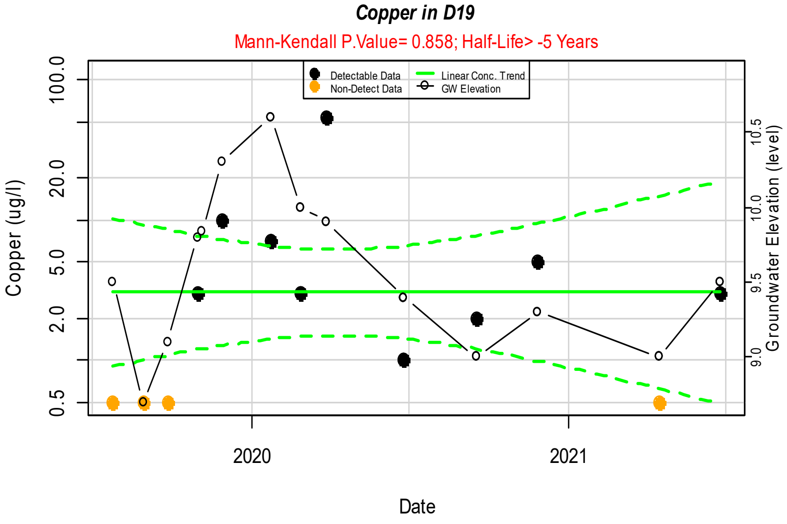
Mann-Kendall P.Value= 0.42; Half-Life= 694 days


Copper in D16

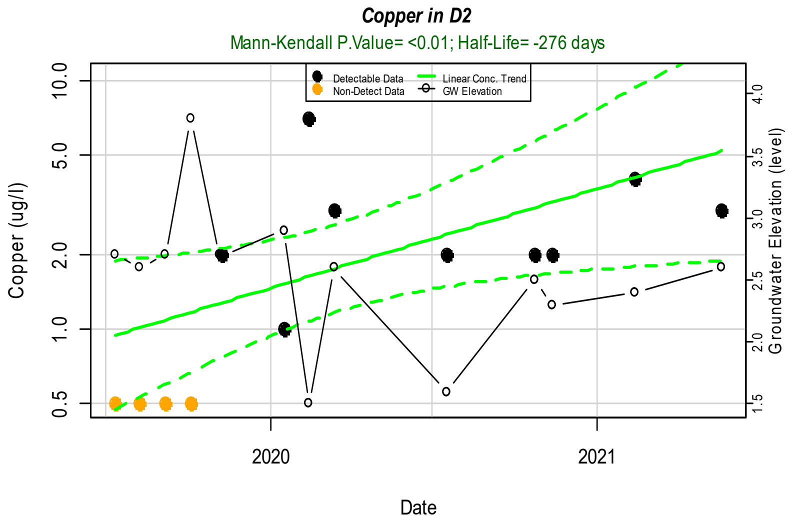

Copper in D17


Copper in D18

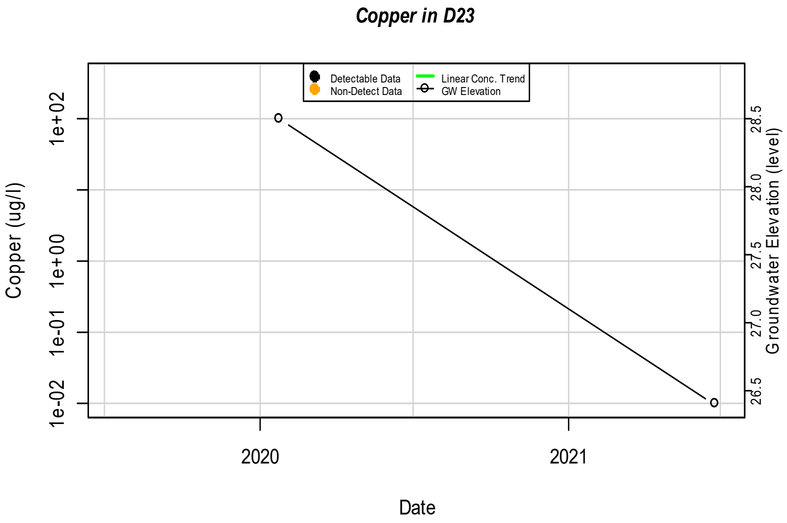
Mann-Kendall P.Value= 0.0471; Half-Life= -762 days

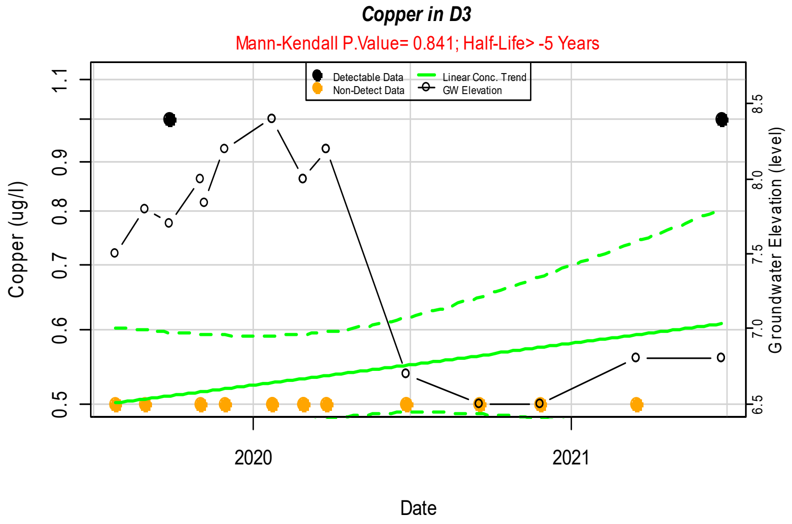

Copper in D19

Mann-Kendall P.Value= 0.858; Half-Life> -5 Years

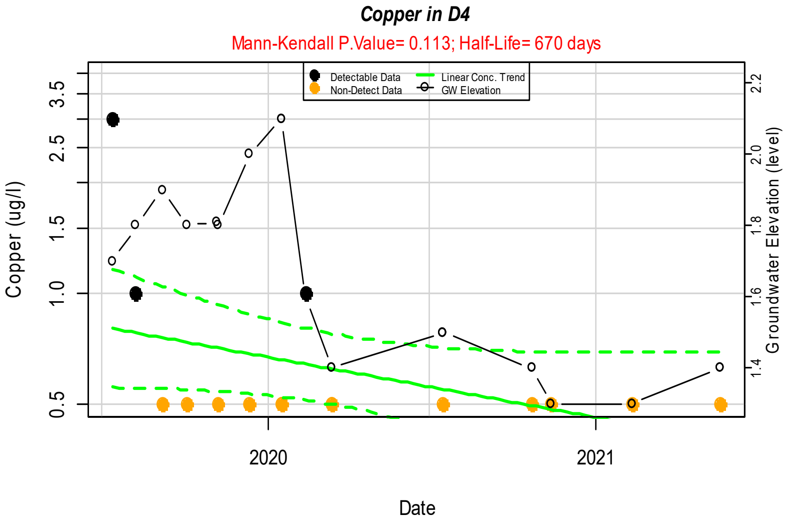

Copper in D2

Mann-Kendall P.Value= <0.01; Half-Life= -276 days

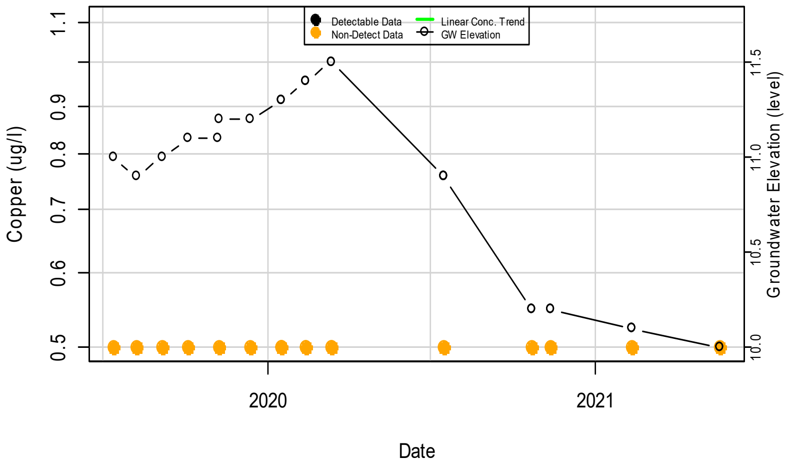

Copper in D23


Copper in D3

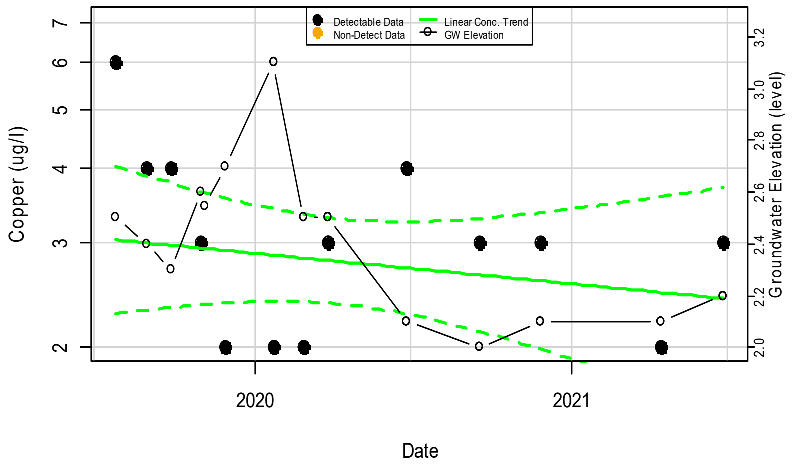
Mann-Kendall P.Value= 0.841; Half-Life> -5 Years


Copper in D4

Mann-Kendall P.Value= 0.113; Half-Life= 670 days

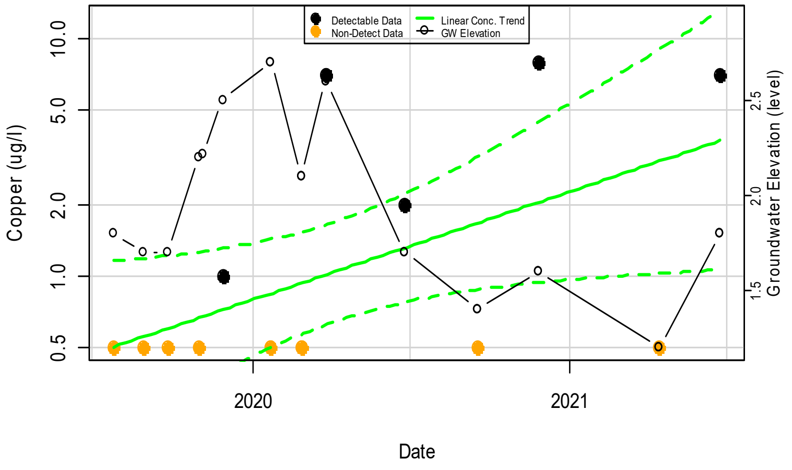


Copper in D5



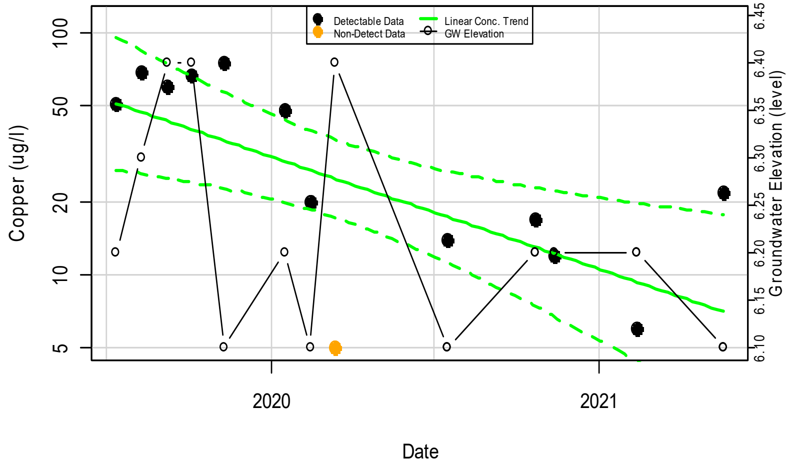
Copper in D8

Mann-Kendall P.Value= 0.735; Half-Life> 5 Years



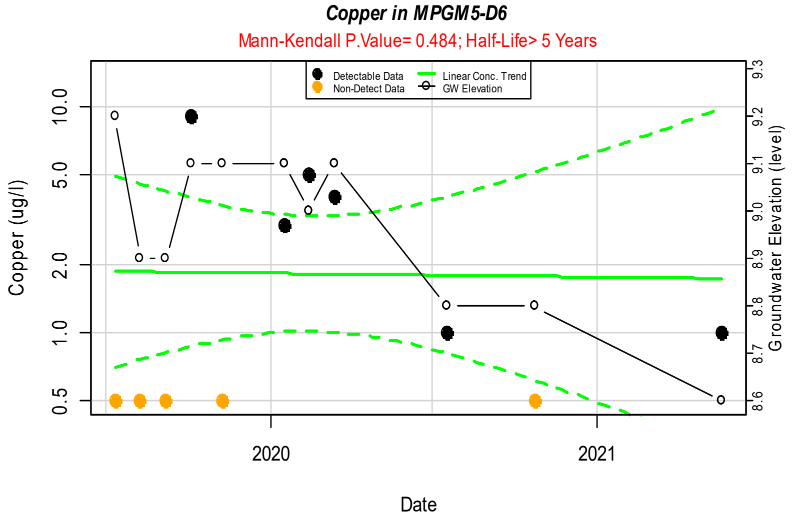
Copper in D9

Mann-Kendall P.Value= 0.0216; Half-Life= -242 days



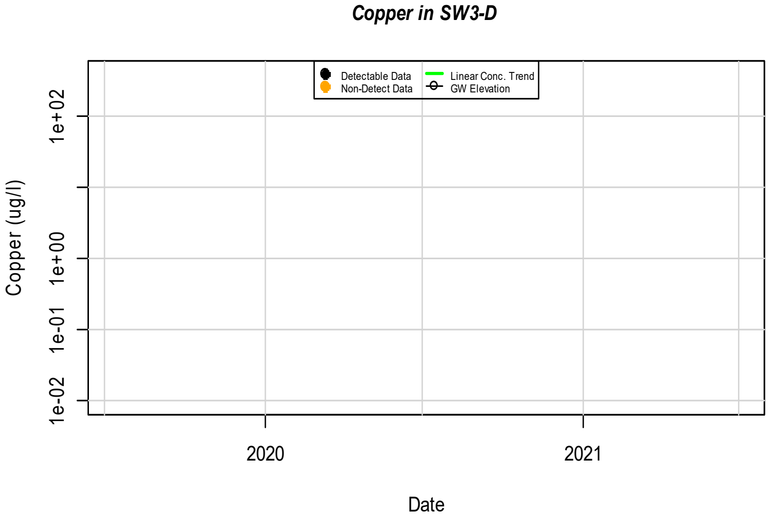
Copper in MPGM5-D5

Mann-Kendall P.Value= <0.01; Half-Life= 237 days

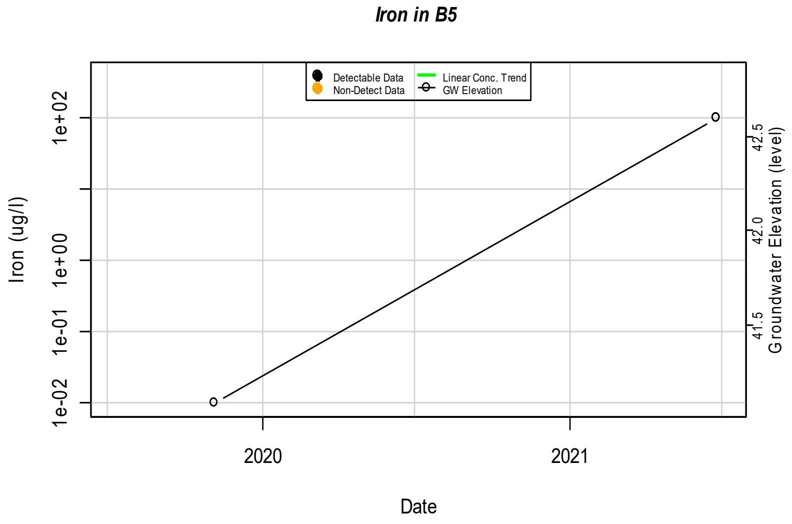


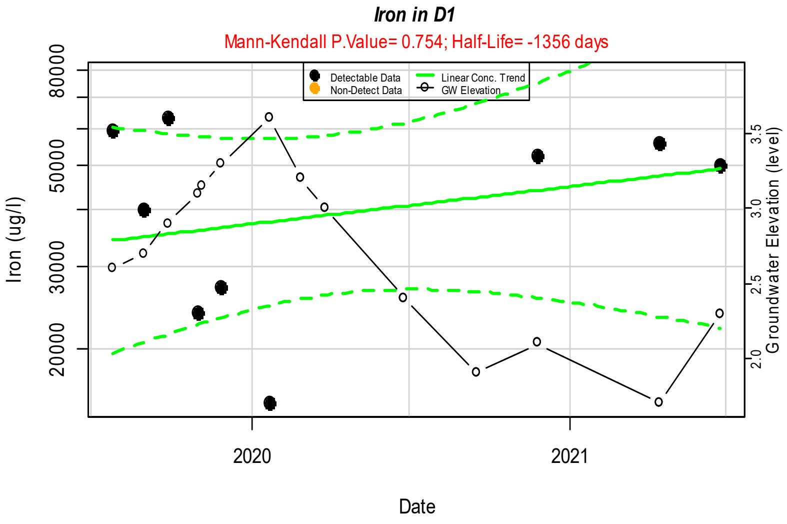
Copper in MPGM5-D6

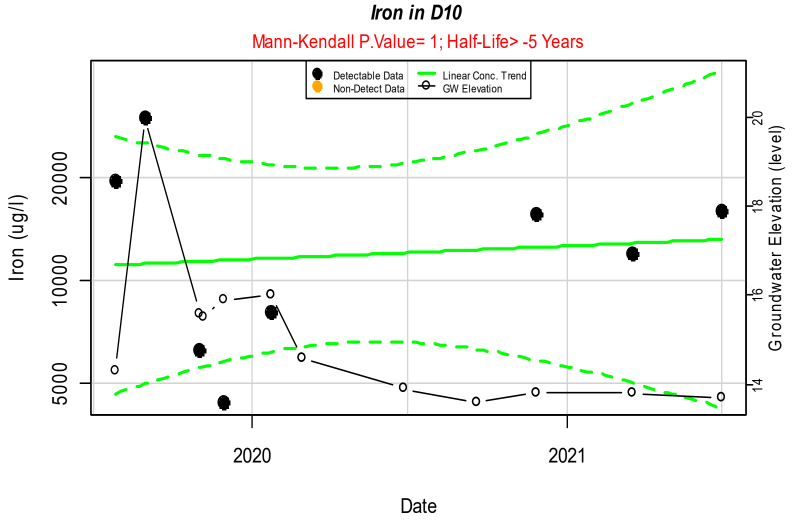
Mann-Kendall P.Value= 0.484; Half-Life> 5 Years

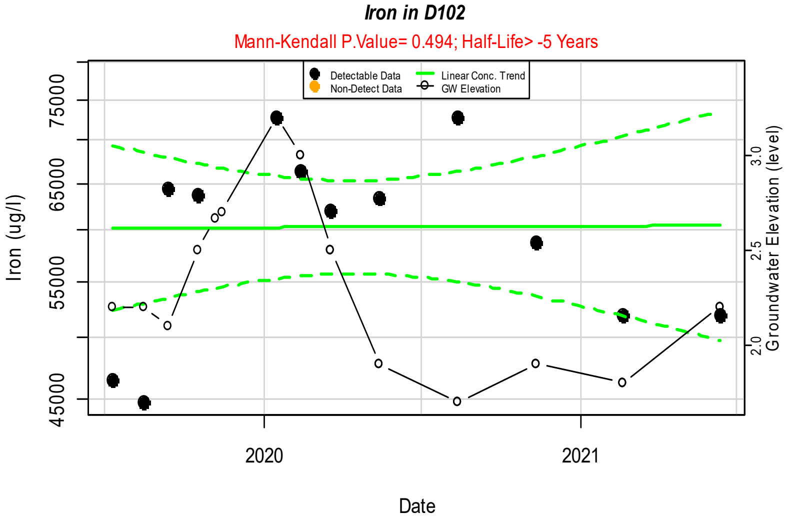


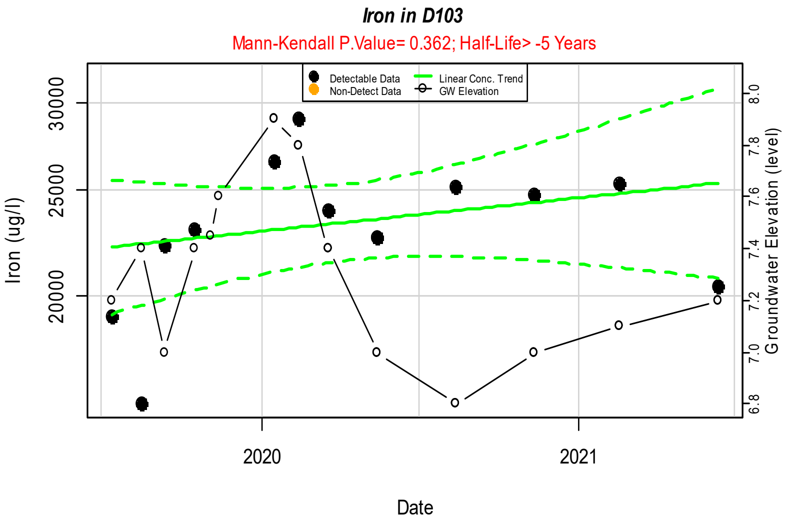
Copper in SW3-D


Iron in B5
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
1e+02
1e+00
1e-01
1e-02
Groundwater Elevation (level)
42.5
42.0
41.5
2020
2021
Date


Iron in D1
Mann-Kendall P.Value= 0.754; Half-Life= -1356 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
80000
50000
30000
20000
Groundwater Elevation (level)
3.5
3.0
2.5
2.0
2020
2021
Date

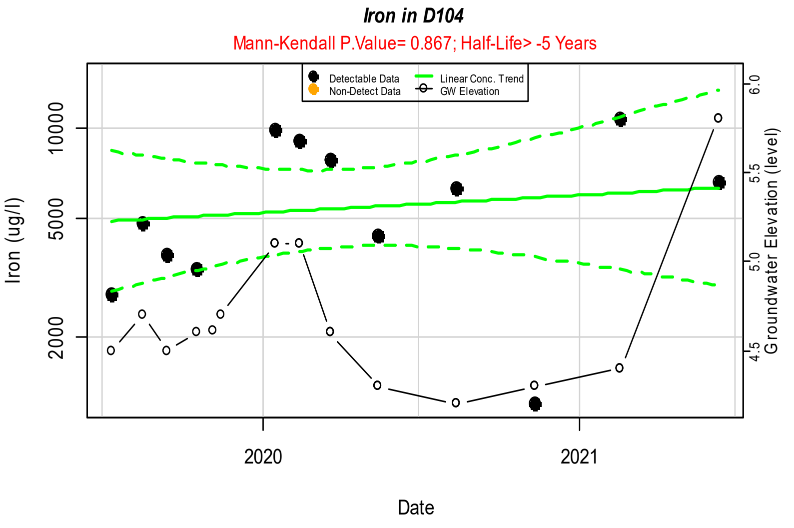

Iron in D10
Mann-Kendall P.Value= 1; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
20000
10000
5000
Groundwater Elevation (level)
20
18
16
14
2020
2021
Date


Iron in D102
Mann-Kendall P.Value= 0.494; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
75000
65000
55000
45000
Groundwater Elevation (level)
3.0
2.5
2.0
2020
2021
Date



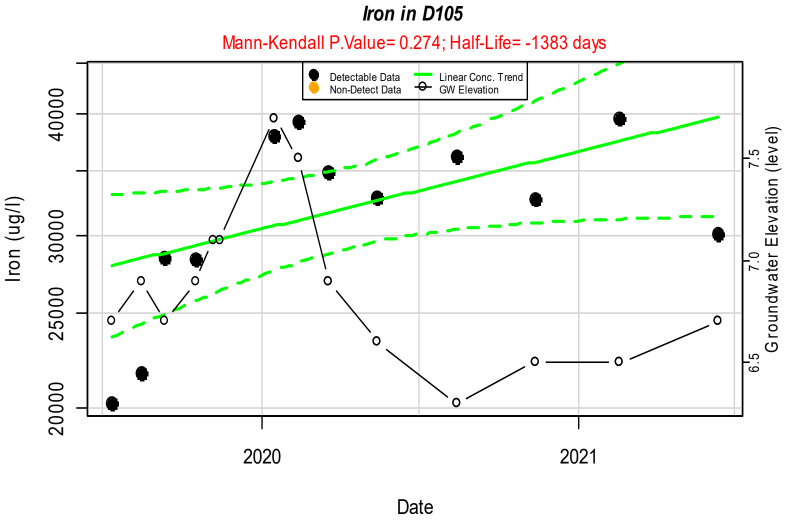
Iron in D103

Mann-Kendall P.Value= 0.362; Half-Life> -5 Years



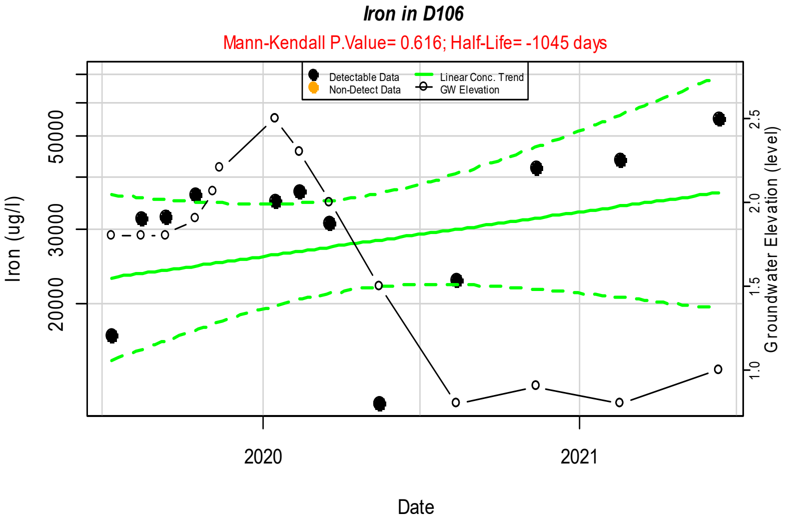
Iron in D104

Mann-Kendall P.Value= 0.867; Half-Life> -5 Years



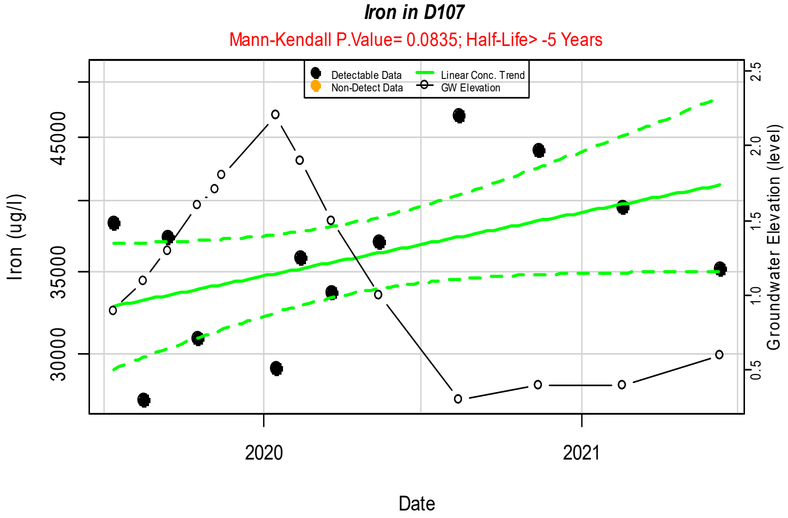
Iron in D105

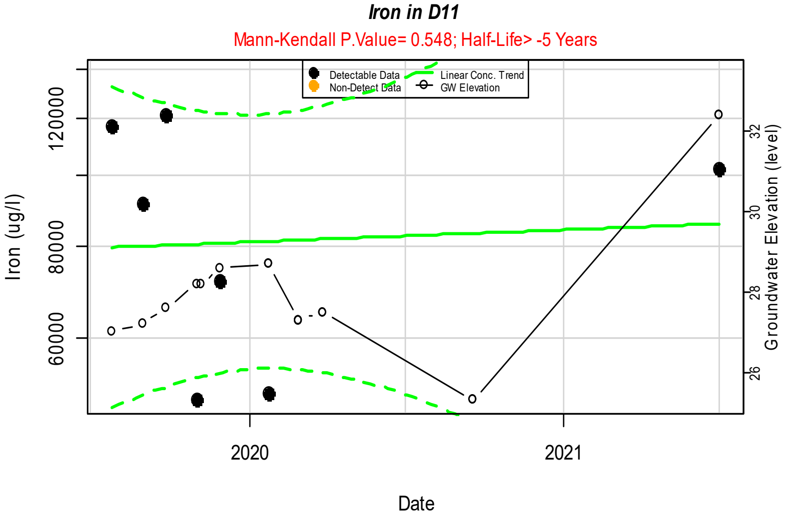
Mann-Kendall P.Value= 0.274; Half-Life= -1383 days

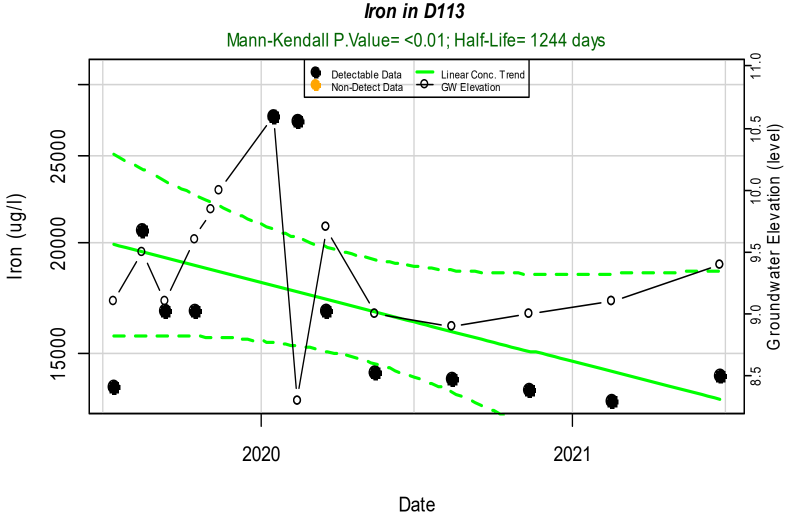


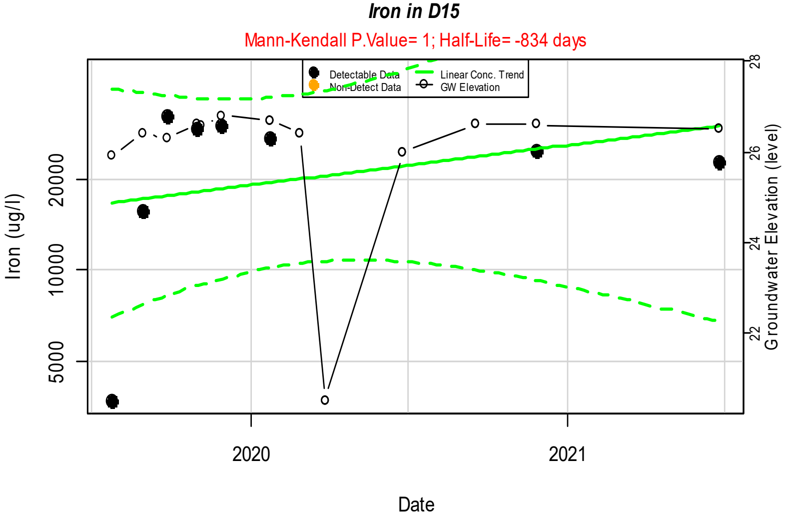
Iron in D106

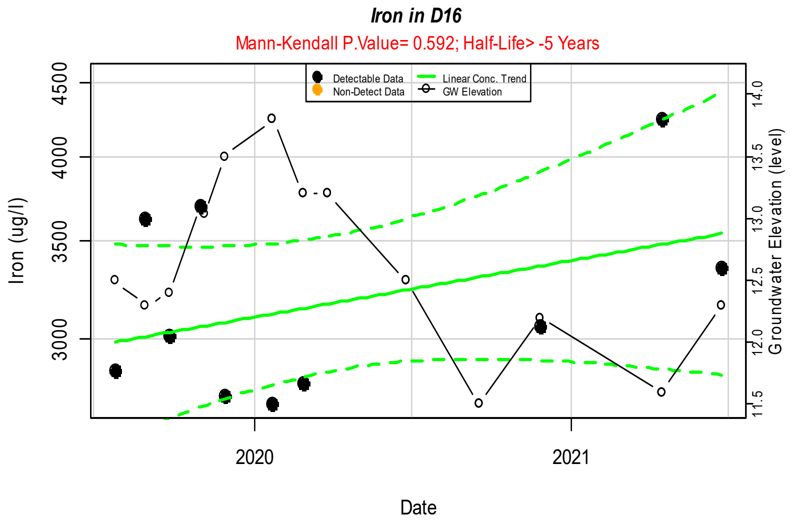
Mann-Kendall P.Value= 0.616; Half-Life= -1045 days

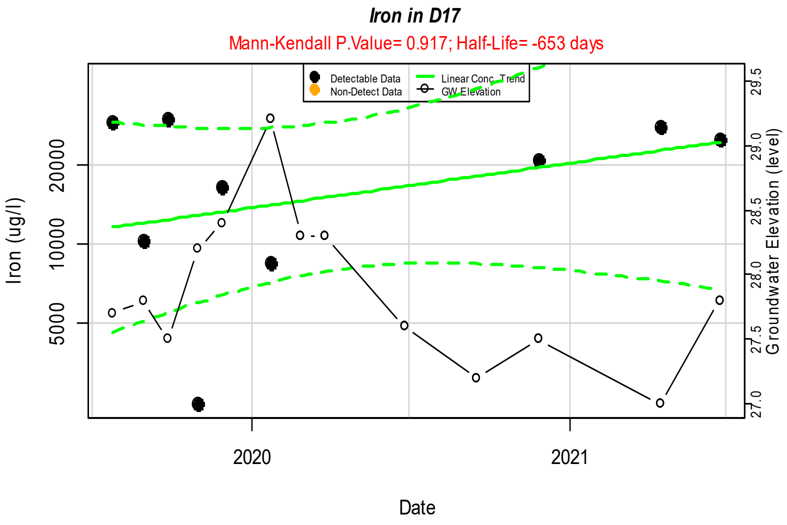

Iron in D107
Mann-Kendall P.Value= 0.0835; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
45000
35000
30000
Groundwater Elevation (level)
0.5
1.0
1.5
2.0
2.5
2020
2021
Date

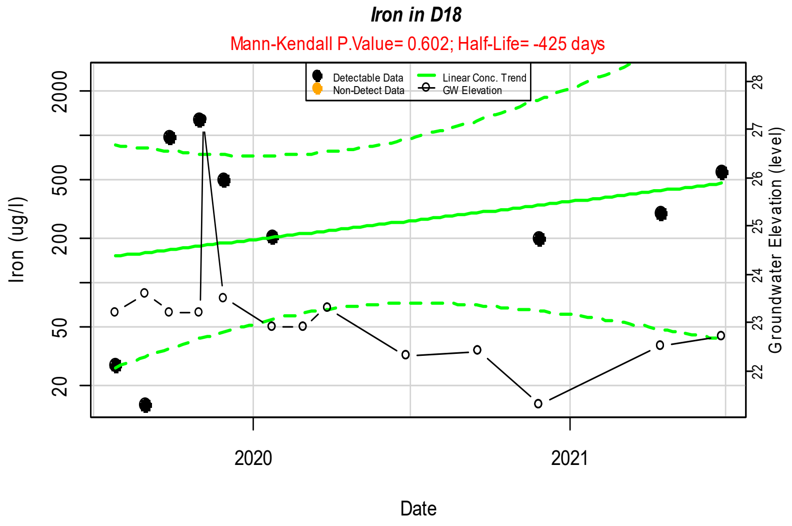

Iron in D11
Mann-Kendall P.Value= 0.548; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
120000
80000
60000
Groundwater Elevation (level)
26
28
30
32
2020
2021
Date

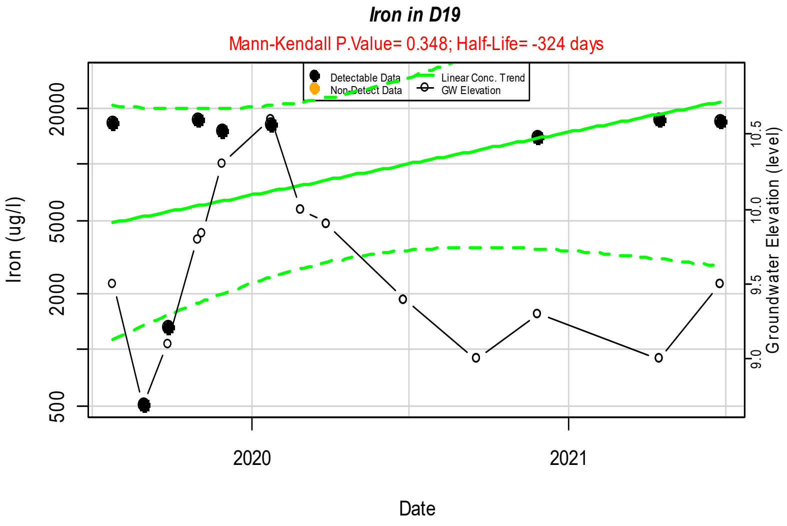

Iron in D113
Mann-Kendall P.Value= <0.01; Half-Life= 1244 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
25000
20000
15000
Groundwater Elevation (level)
8.5
9.0
9.5
10.0
10.5
11.0
2020
2021
Date

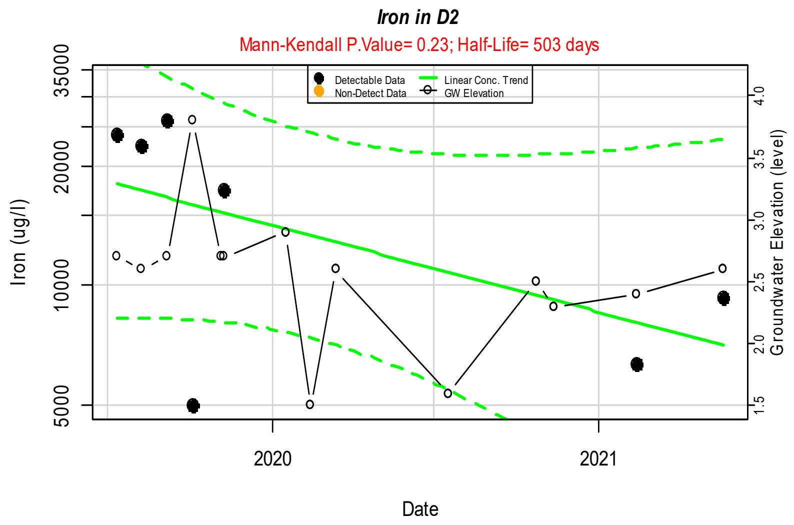

Iron in D15
Mann-Kendall P.Value= 1; Half-Life= -834 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
20000
10000
5000
Groundwater Elevation (level)
22
24
26
28
2020
2021
Date


Iron in D16
Mann-Kendall P.Value= 0.592; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
3000
3500
4000
4500
Groundwater Elevation (level)
11.5
12.0
12.5
13.0
13.5
14.0
2020
2021
Date


Iron in D17
Mann-Kendall P.Value= 0.917; Half-Life= -653 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
5000
10000
20000
Groundwater Elevation (level)
27.0
27.5
28.0
28.5
29.0
29.5
2020
2021
Date

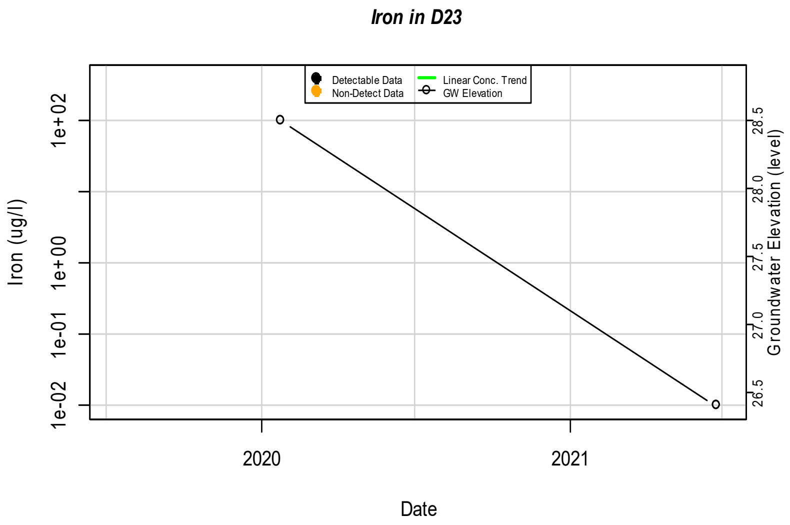

Iron in D18
Mann-Kendall P.Value= 0.602; Half-Life= -425 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
20
50
200
500
2000
Groundwater Elevation (level)
22
23
24
25
26
27
28
2020
2021
Date


Iron in D19
Mann-Kendall P.Value= 0.348; Half-Life= -324 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
500
2000
5000
20000
Groundwater Elevation (level)
9.0
9.5
10.0
10.5
2020
2021
Date

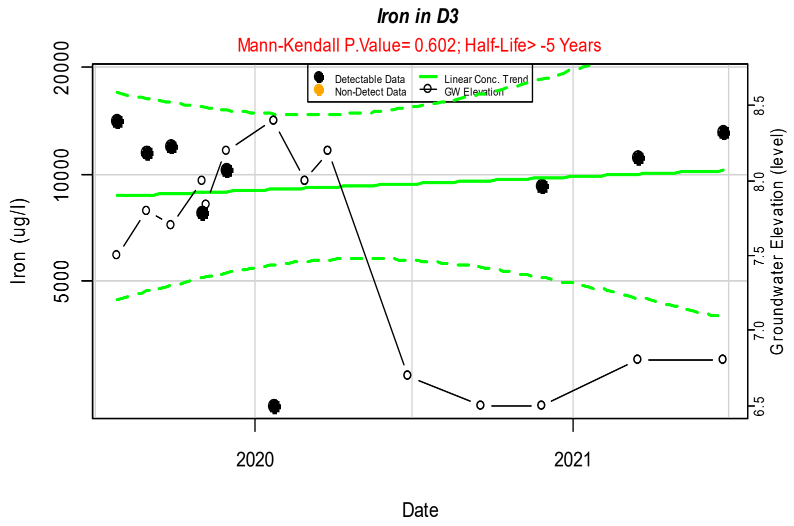


Iron in D2

Mann-Kendall P.Value= 0.23; Half-Life= 503 days

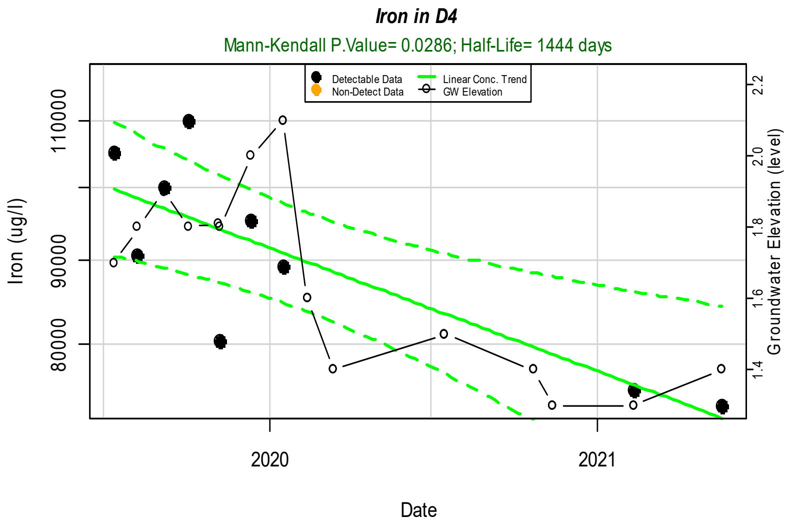


Iron in D23



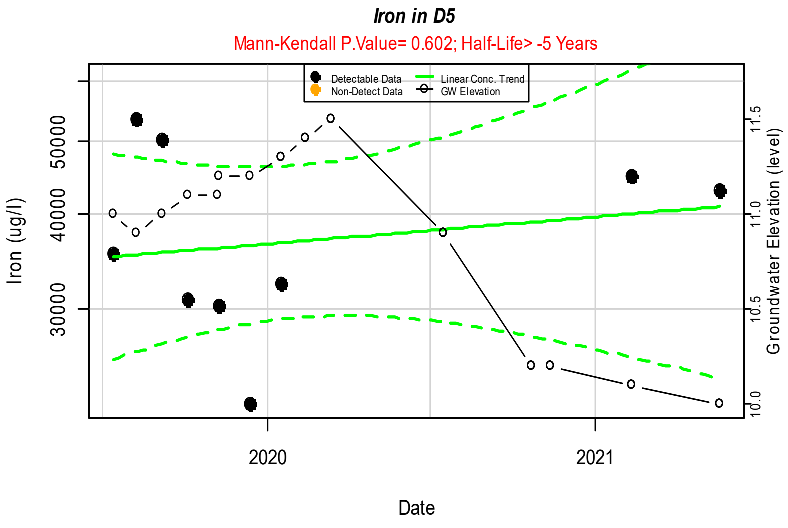
Iron in D3

Mann-Kendall P.Value= 0.602; Half-Life> -5 Years



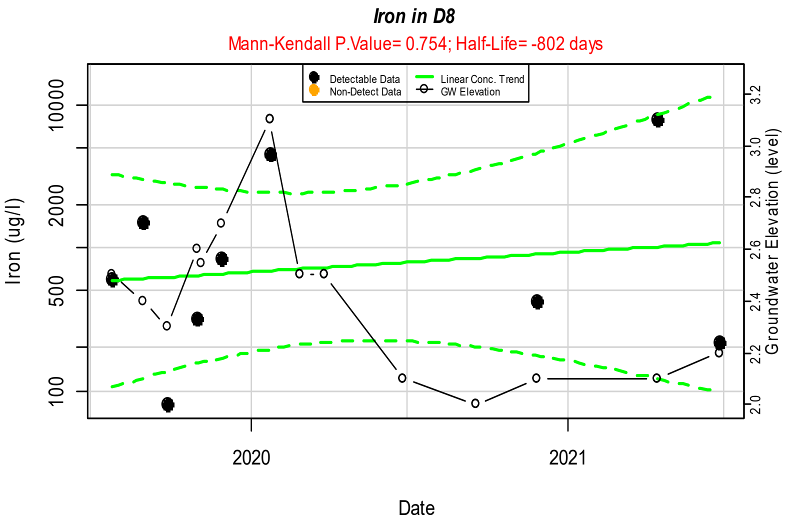
Iron in D4

Mann-Kendall P.Value= 0.0286; Half-Life= 1444 days



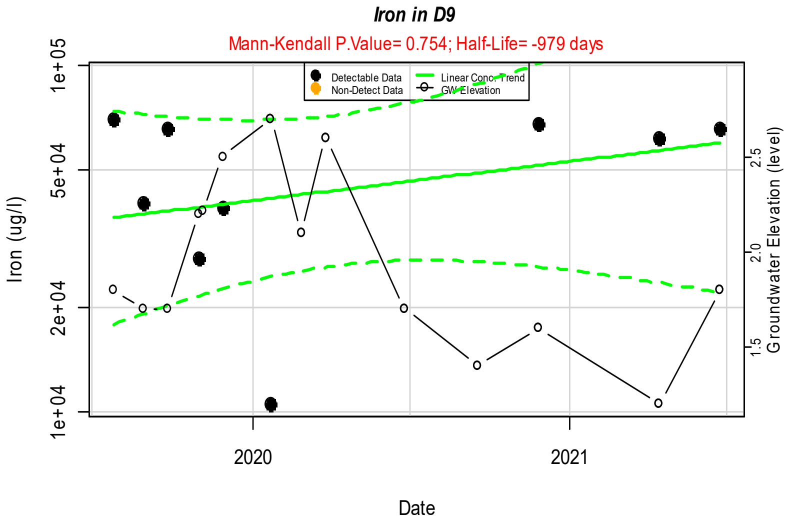
Iron in D5

Mann-Kendall P.Value= 0.602; Half-Life> -5 Years



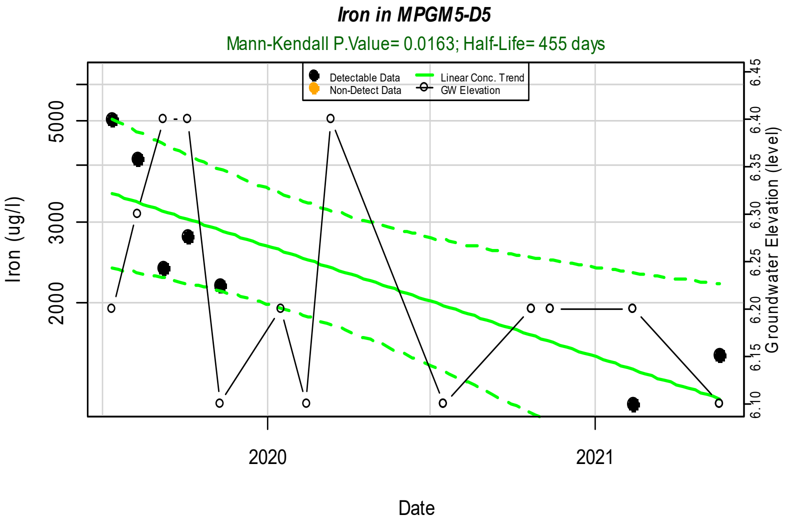
Iron in D8

Mann-Kendall P.Value= 0.754; Half-Life= -802 days



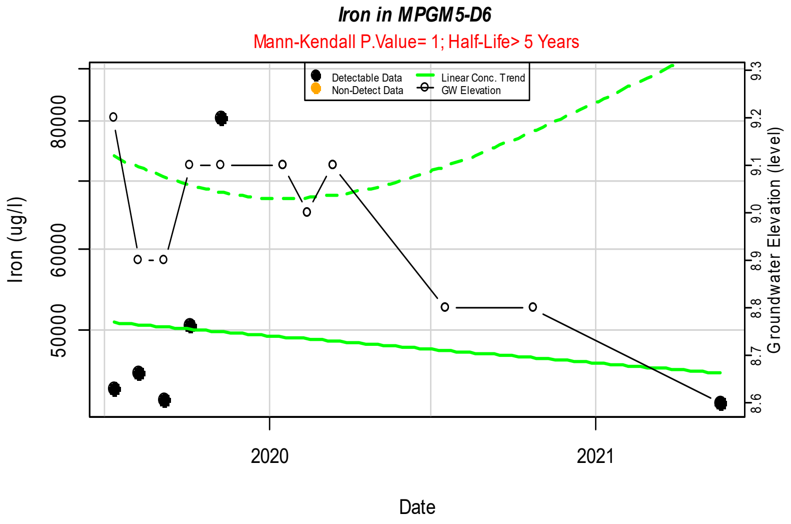
Iron in D9

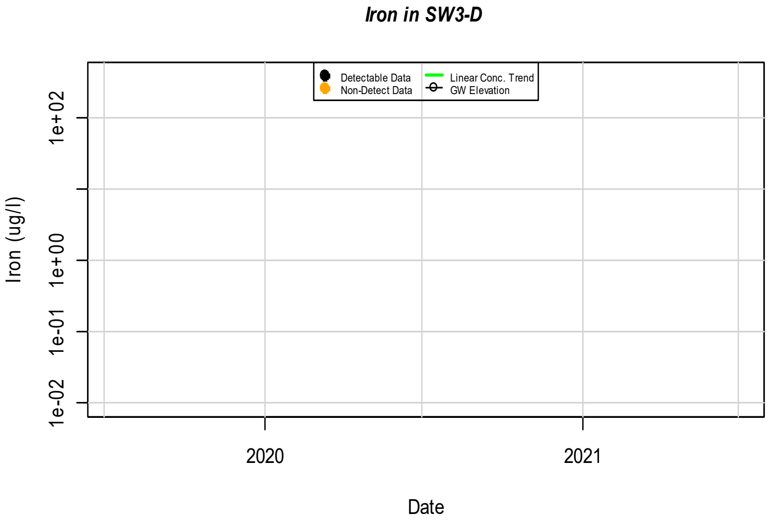
Mann-Kendall P.Value= 0.754; Half-Life= -979 days

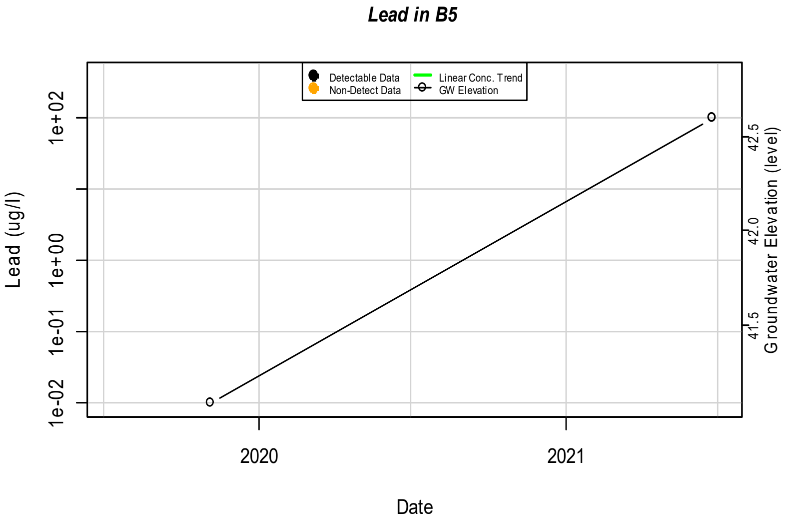


Iron in MPGM5-D5

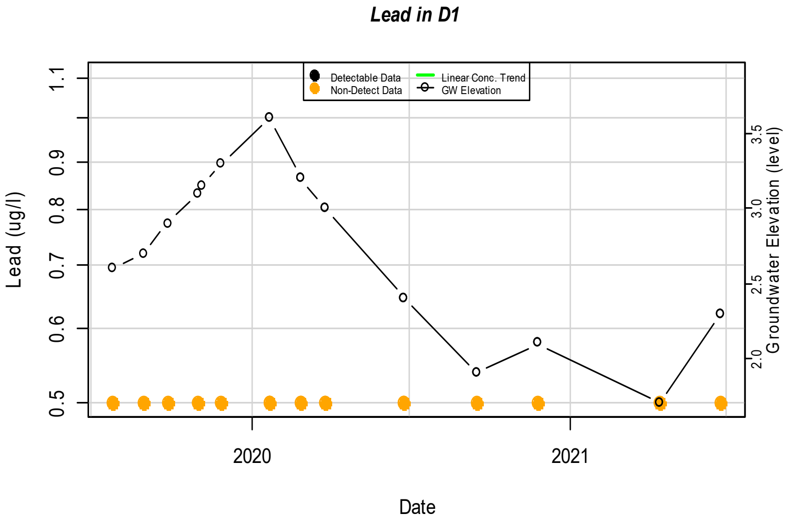
Mann-Kendall P.Value= 0.0163; Half-Life= 455 days


Iron in MPGM5-D6
Mann-Kendall P.Value= 1; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
80000
60000
50000
Groundwater Elevation (level)
9.3
9.2
9.1
9.0
8.9
8.8
8.7
8.6
2020
2021
Date

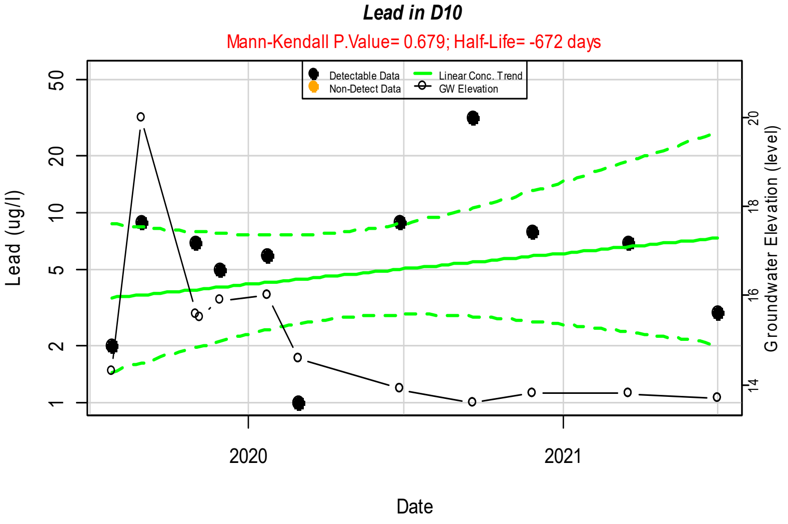

Iron in SW3-D
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Iron (ug/l)
1e+02
1e+00
1e-01
1e-02
2020
2021
Date



Lead in B5

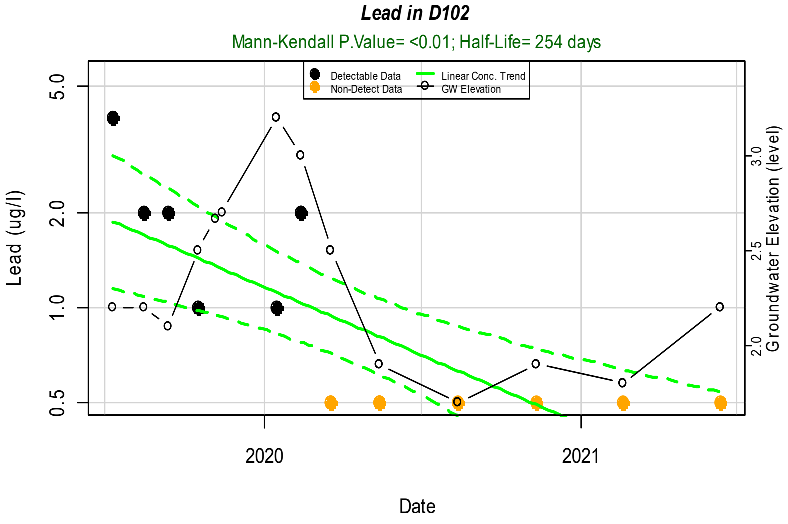


Lead in D1



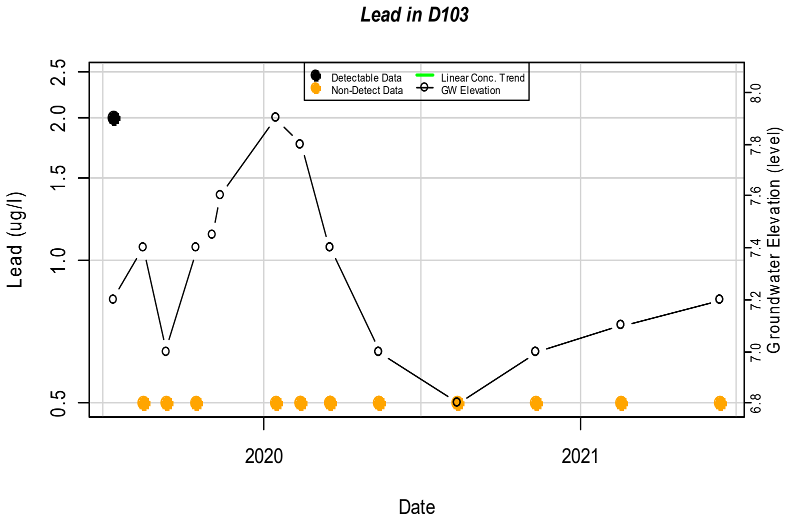
Lead in D10

Mann-Kendall P.Value= 0.679; Half-Life= -672 days

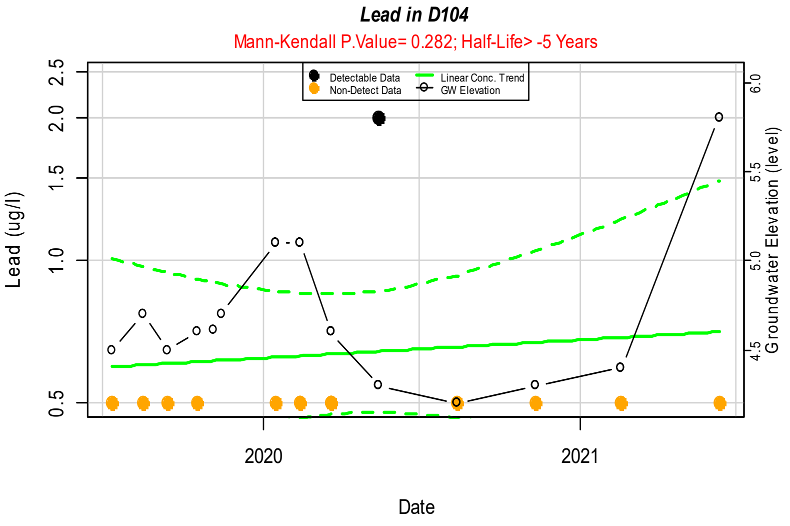


Lead in D102

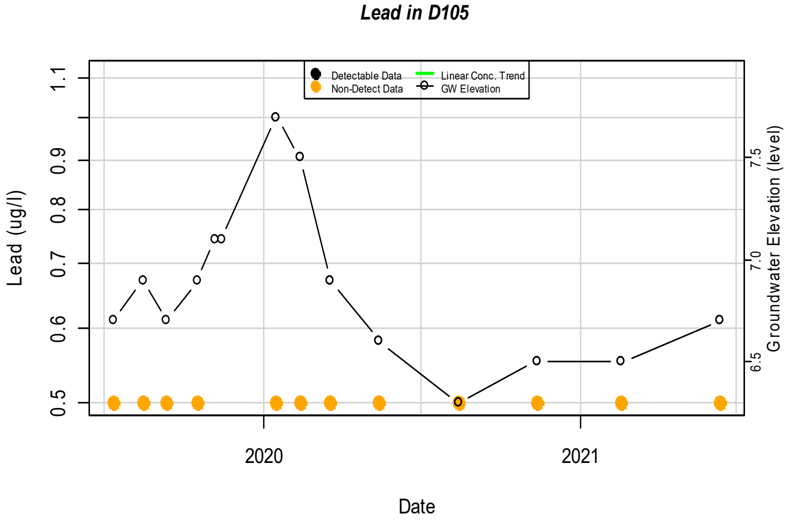
Mann-Kendall P.Value= <0.01; Half-Life= 254 days



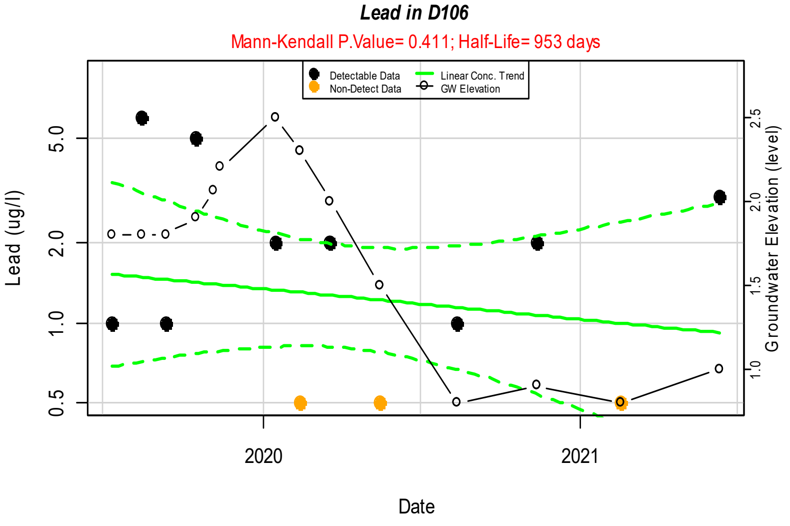
Lead in D103
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Lead (ug/l)
0.5
1.0
1.5
2.0
2.5
Groundwater Elevation (level)
6.8
7.0
7.2
7.4
7.6
7.8
8.0
2020
2021
Date



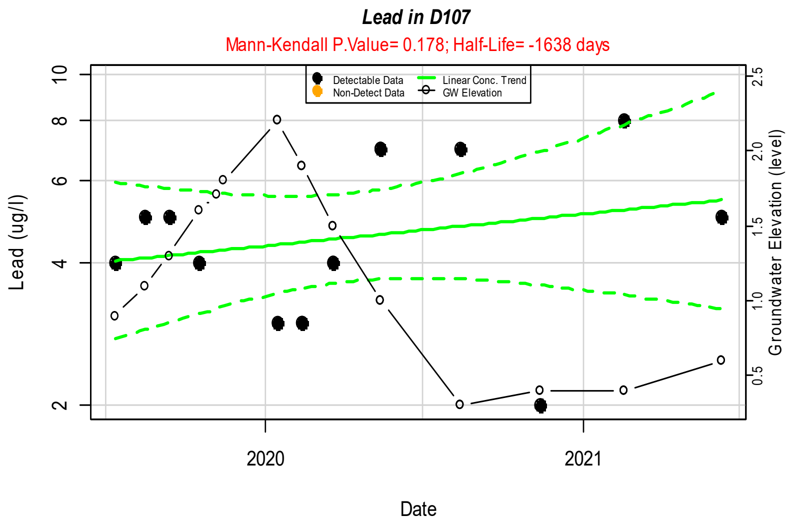
Lead in D104
Mann-Kendall P.Value= 0.282; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Lead (ug/l)
0.5
1.0
1.5
2.0
2.5
Groundwater Elevation (level)
4.5
5.0
5.5
6.0
2020
2021
Date



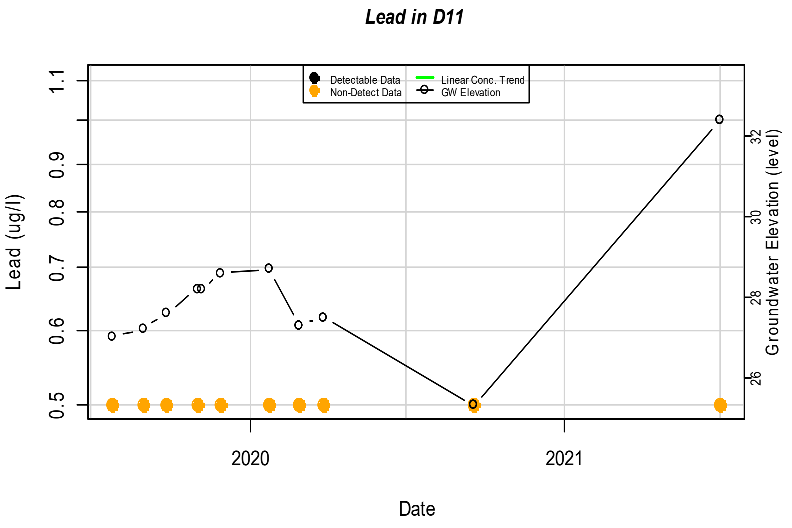
Lead in D105
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Lead (ug/l)
0.5
0.6
0.7
0.8
0.9
1.1
Groundwater Elevation (level)
6.5
7.0
7.5
2020
2021
Date

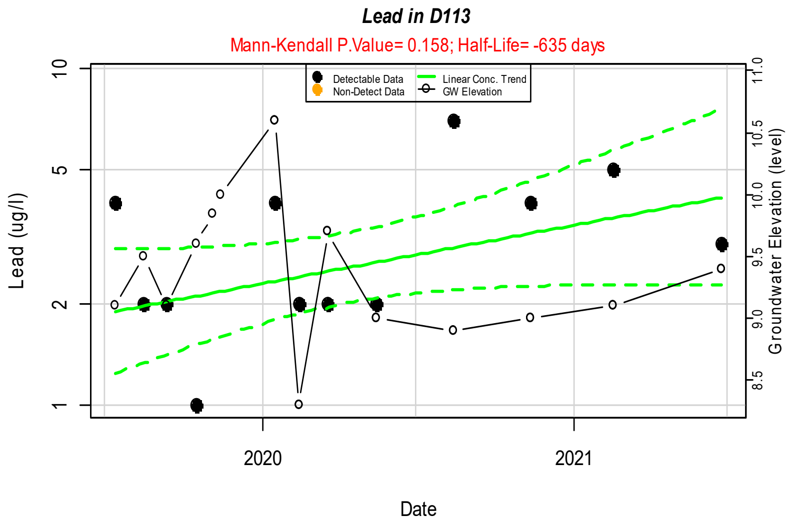


Lead in D106
Mann-Kendall P.Value= 0.411; Half-Life= 953 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Lead (ug/l)
0.5
1.0
2.0
5.0
Groundwater Elevation (level)
1.0
1.5
2.0
2.5
2020
2021
Date

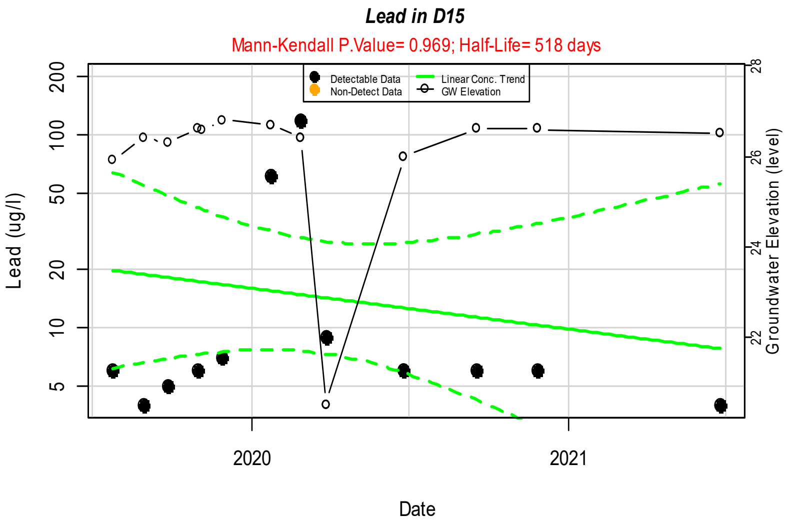

Lead in D107

Mann-Kendall P.Value= 0.178; Half-Life= -1638 days

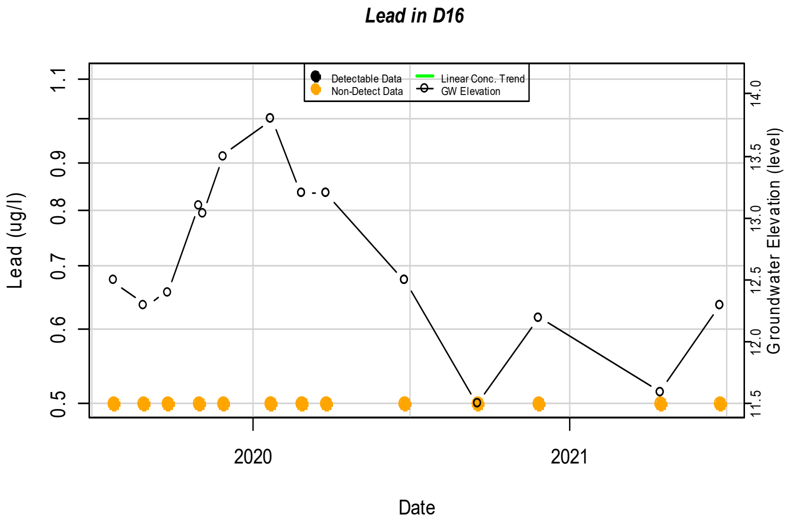

Lead in D11


Lead in D113

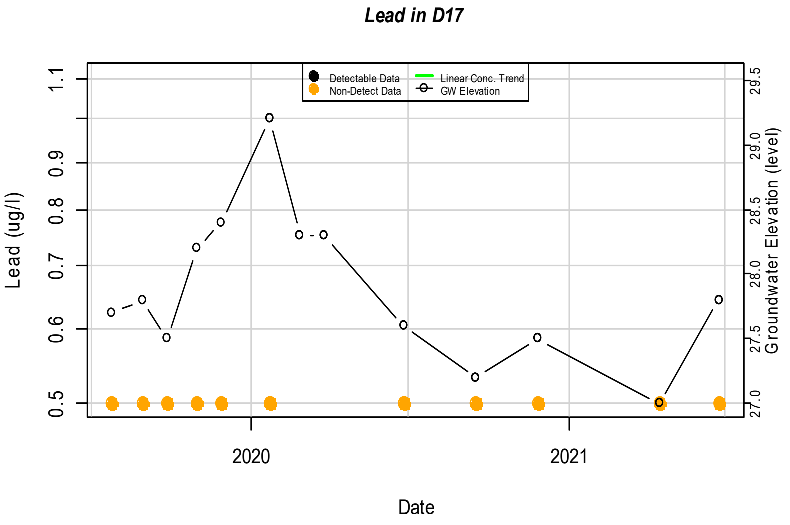
Mann-Kendall P.Value= 0.158; Half-Life= -635 days


Lead in D15

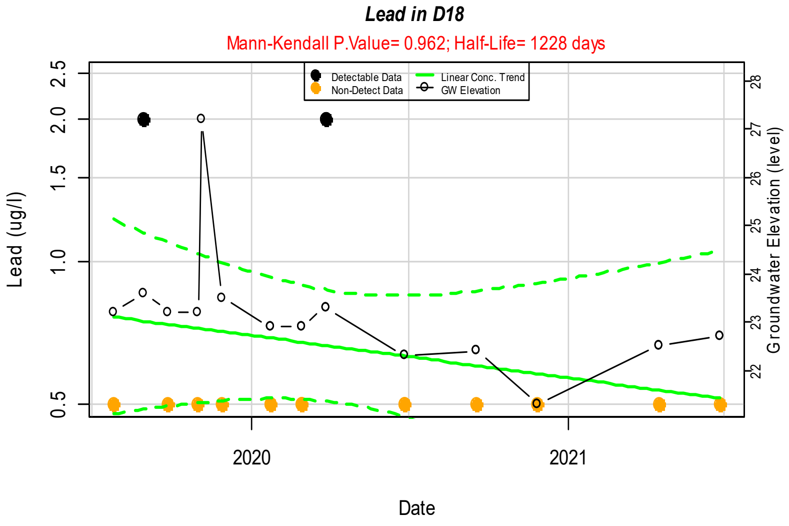
Mann-Kendall P.Value= 0.969; Half-Life= 518 days



Lead in D16

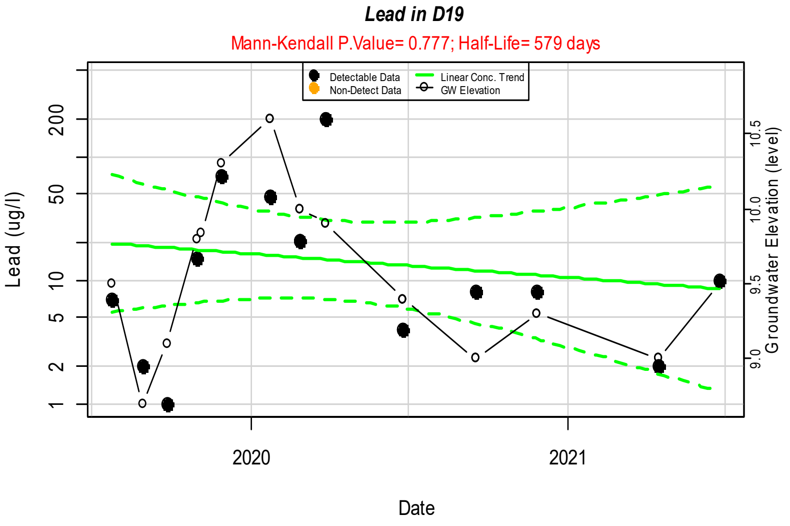


Lead in D17



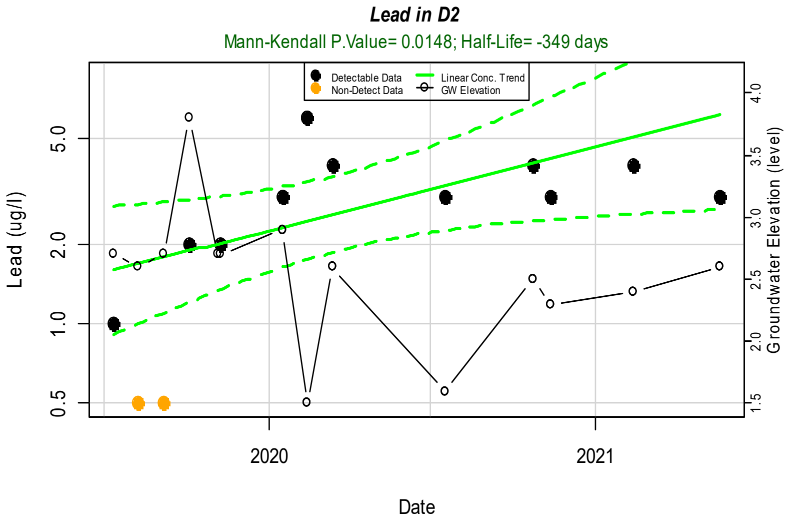
Lead in D18

Mann-Kendall P.Value= 0.962; Half-Life= 1228 days



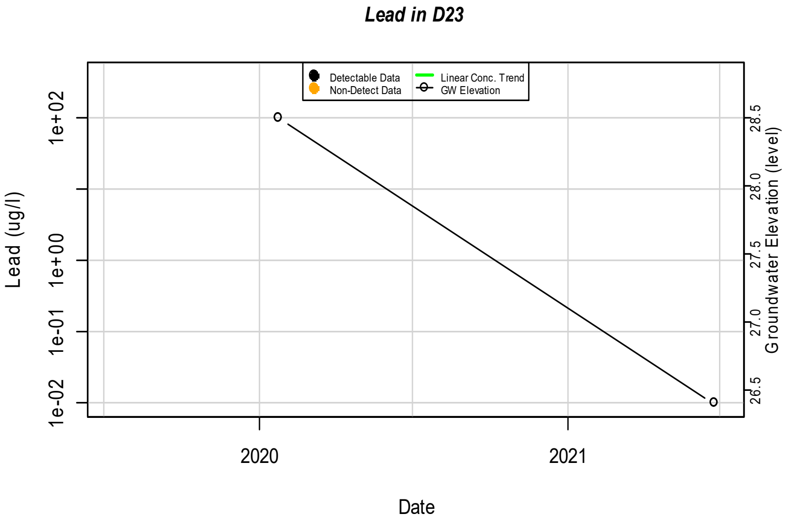
Lead in D19

Mann-Kendall P.Value= 0.777; Half-Life= 579 days

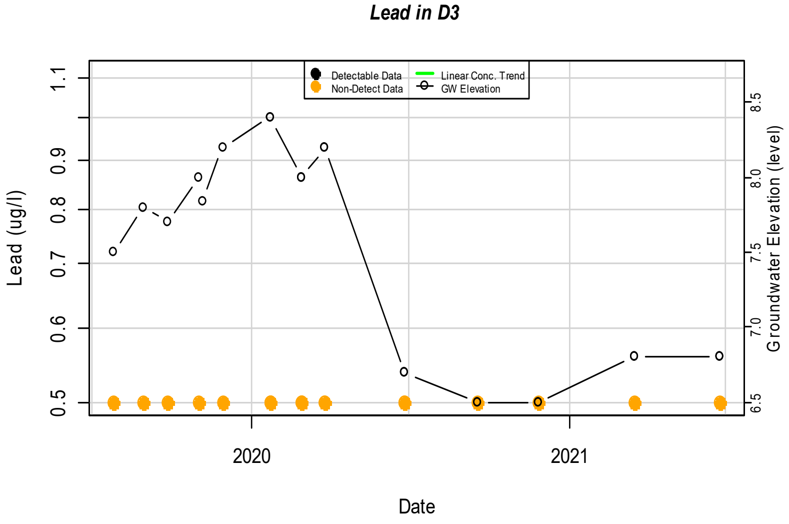


Lead in D2

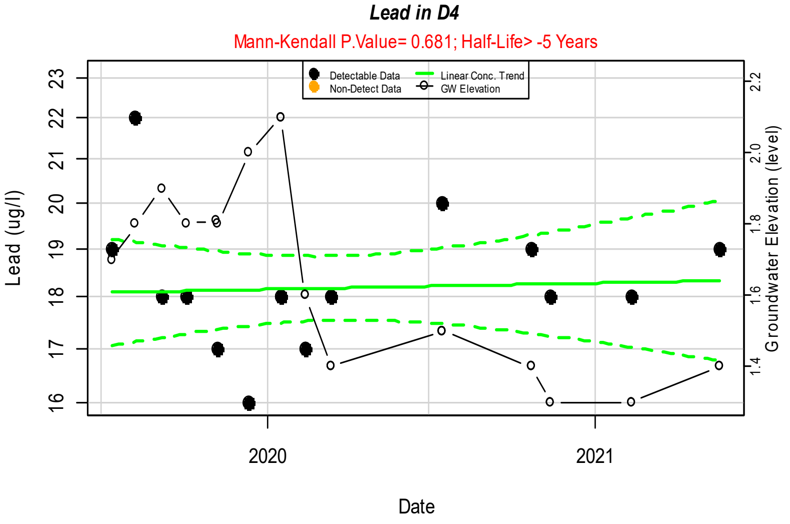
Mann-Kendall P.Value= 0.0148; Half-Life= -349 days



Lead in D23

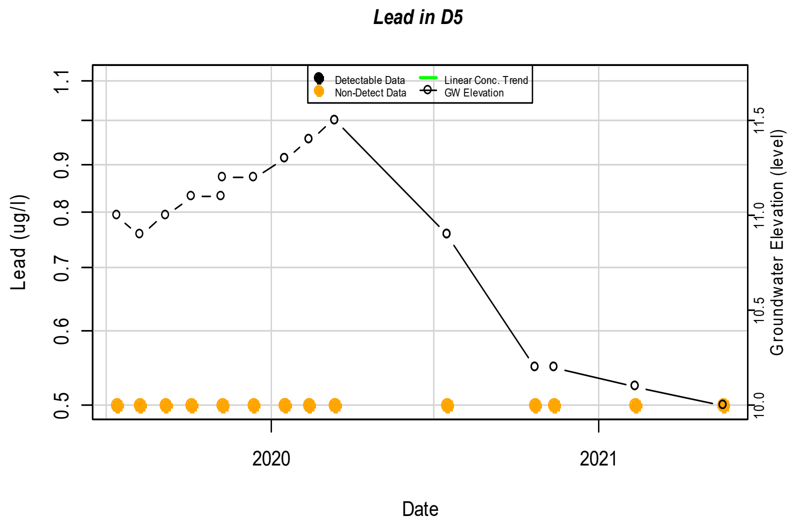


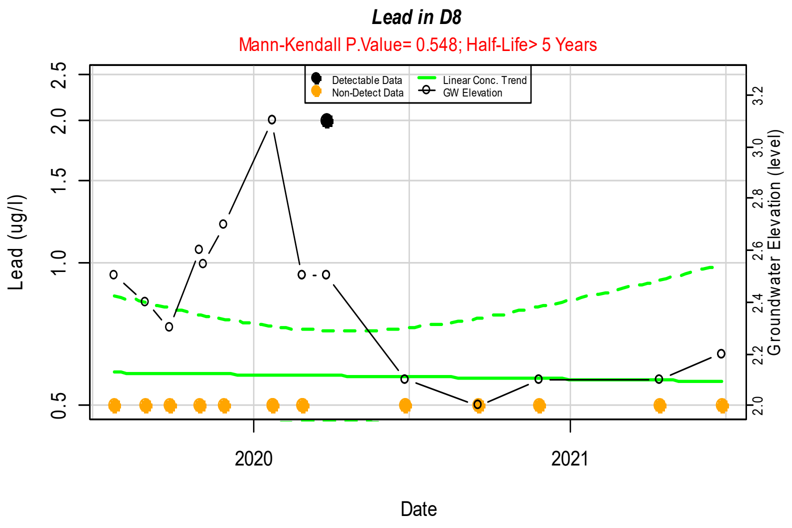
Lead in D3



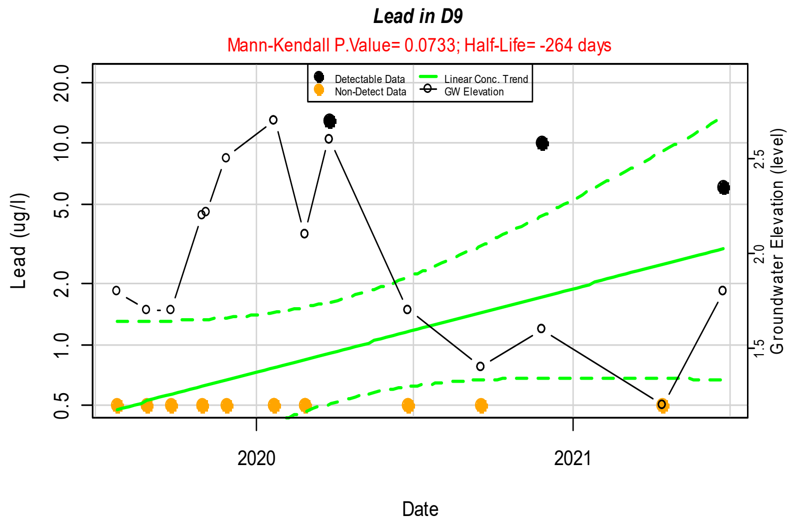
Lead in D4

Mann-Kendall P.Value= 0.681; Half-Life> -5 Years

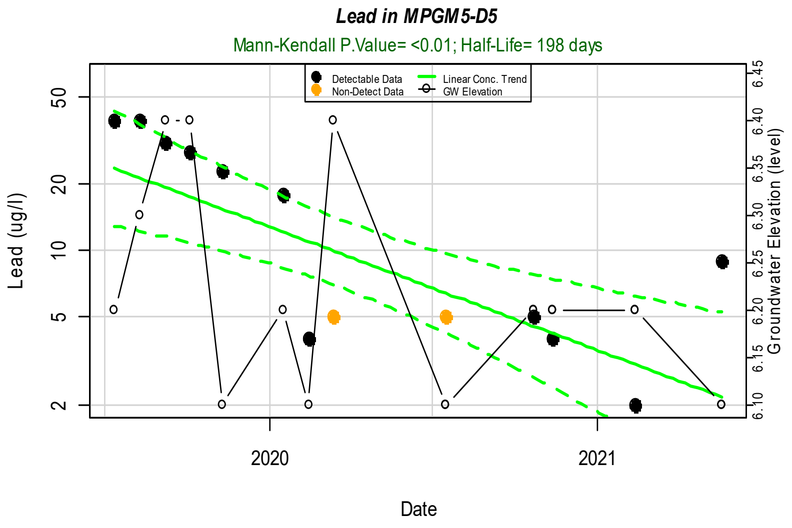

Lead in D5


Lead in D8

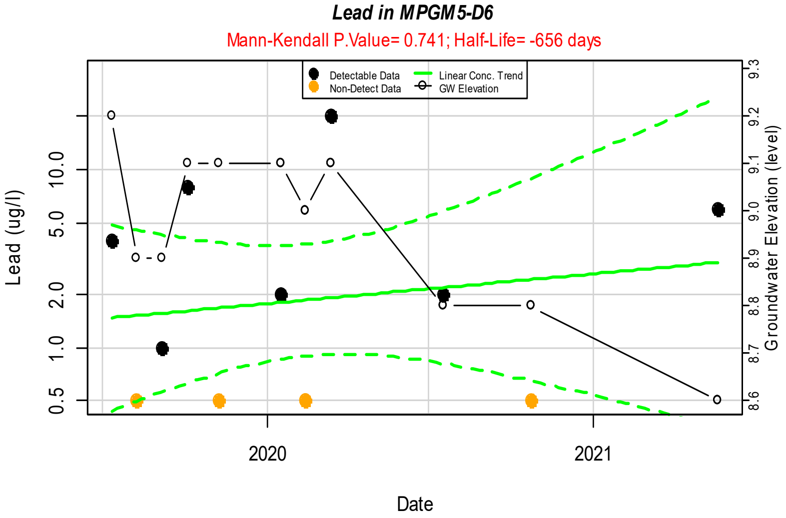
Mann-Kendall P.Value= 0.548; Half-Life> 5 Years

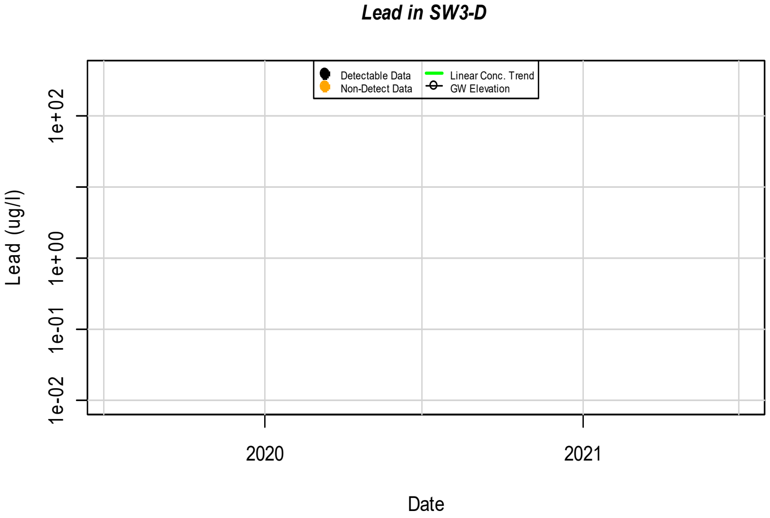

Lead in D9

Mann-Kendall P.Value= 0.0733; Half-Life= -264 days

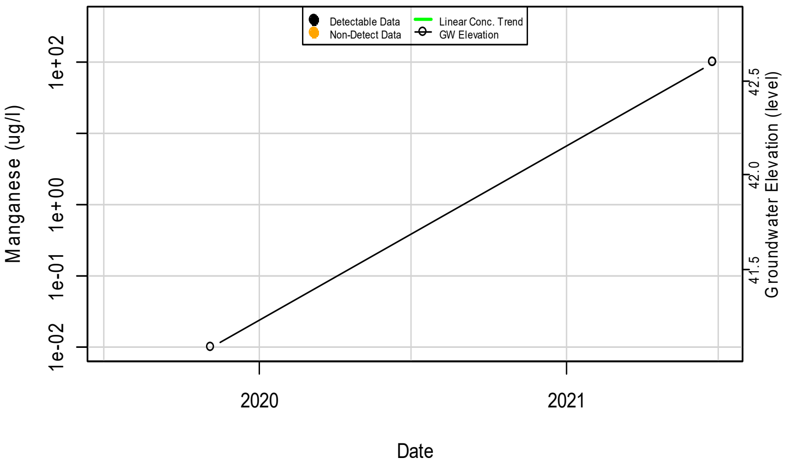

Lead in MPGM5-D5

Mann-Kendall P.Value= <0.01; Half-Life= 198 days


Lead in MPGM5-D6
Mann-Kendall P.Value= 0.741; Half-Life= -656 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Lead (ug/l)
0.5
1.0
2.0
5.0
10.0
Groundwater Elevation (level)
8.6
8.7
8.8
8.9
9.0
9.1
9.2
9.3
2020
2021
Date

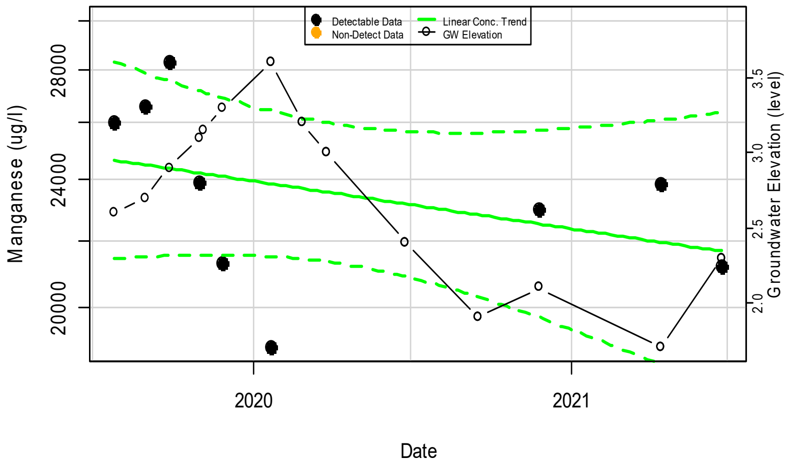

Lead in SW3-D
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Lead (ug/l)
1e-02
1e-01
1e+00
1e+02
2020
2021
Date

Manganese in B5



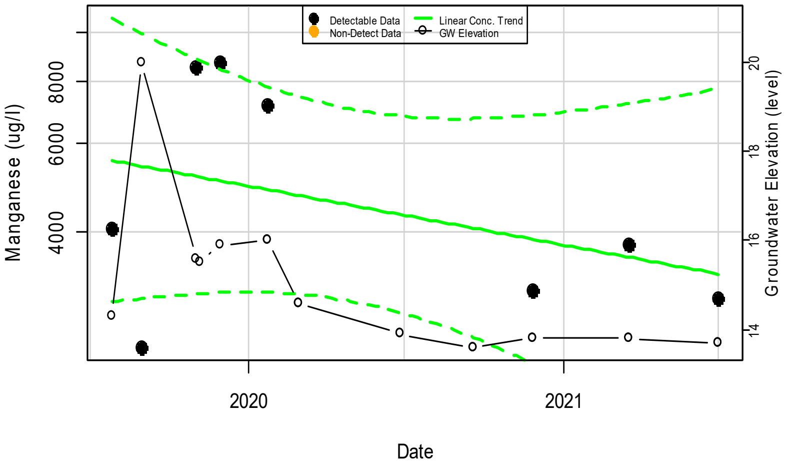
Manganese in D1

Mann-Kendall P.Value= 0.0763; Half-Life> 5 Years



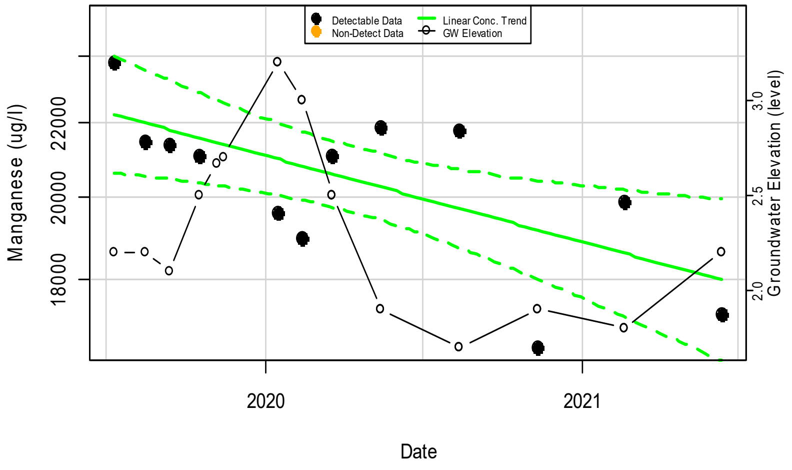
Manganese in D10

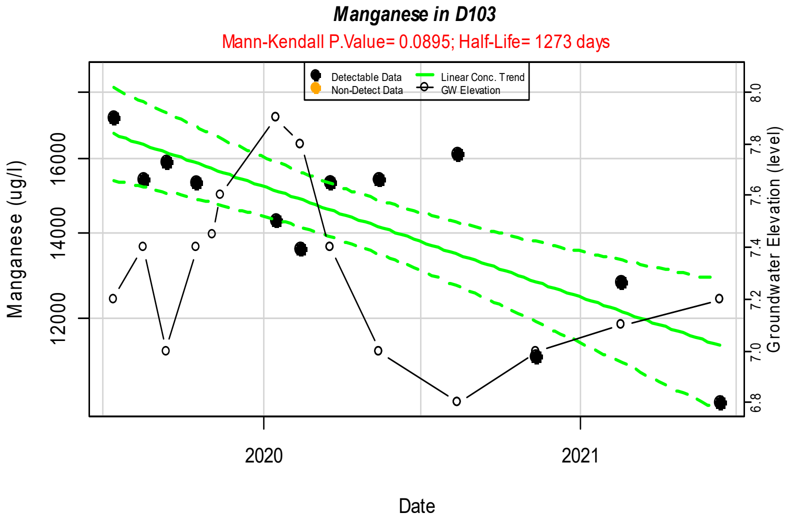
Mann-Kendall P.Value= 0.536; Half-Life= 935 days



Manganese in D102

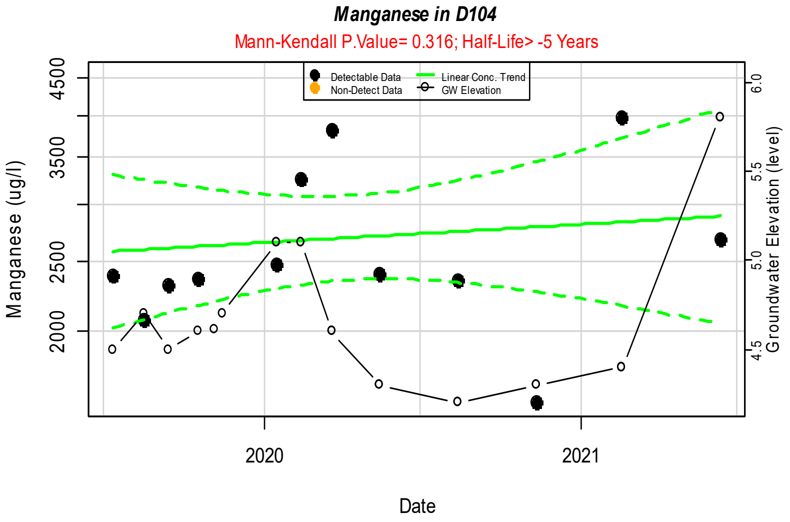
Mann-Kendall P.Value= 0.235; Half-Life> 5 Years





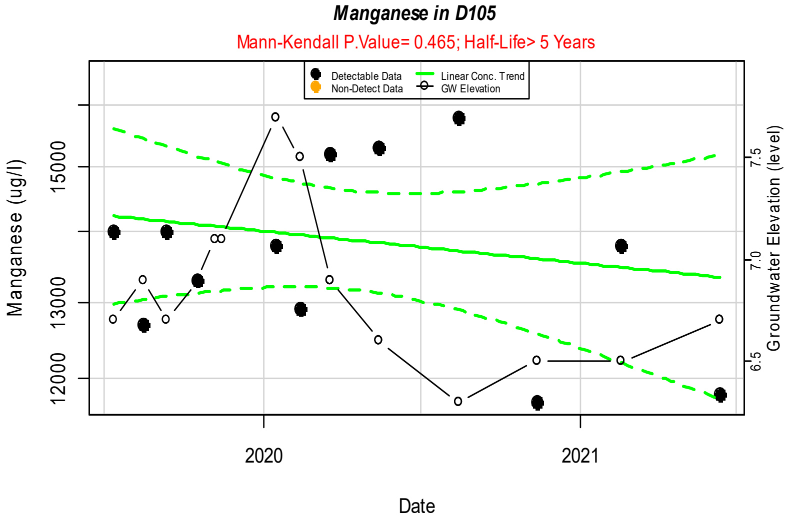
Manganese in D103

Mann-Kendall P.Value= 0.0895; Half-Life= 1273 days



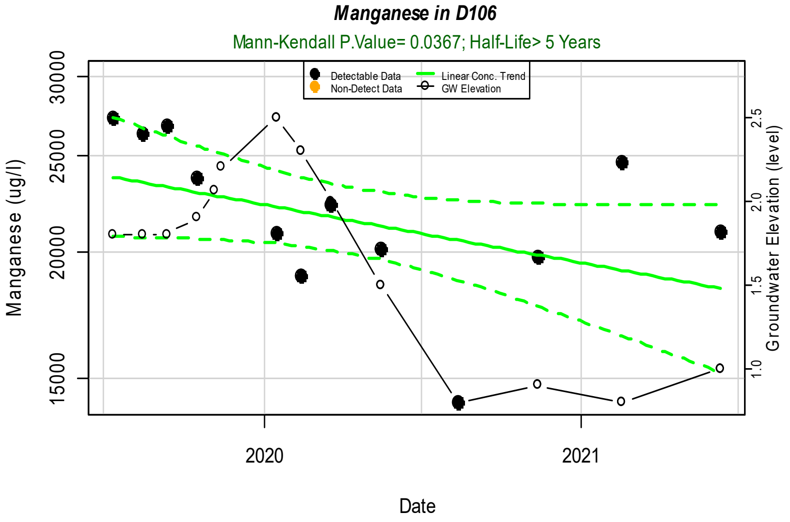
Manganese in D104

Mann-Kendall P.Value= 0.316; Half-Life> -5 Years



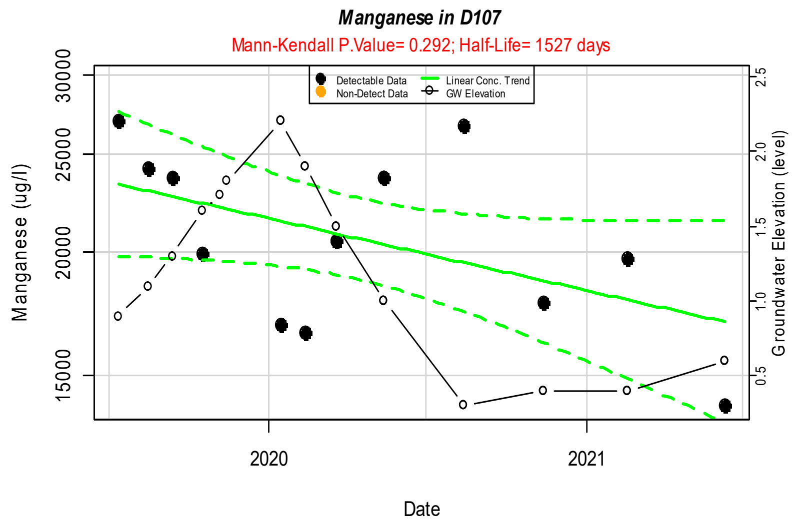
Manganese in D105

Mann-Kendall P.Value= 0.465; Half-Life> 5 Years

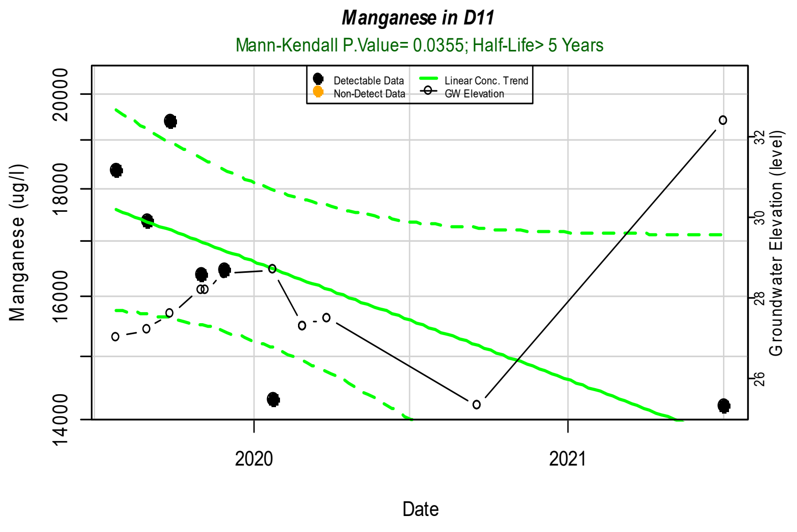


Manganese in D106

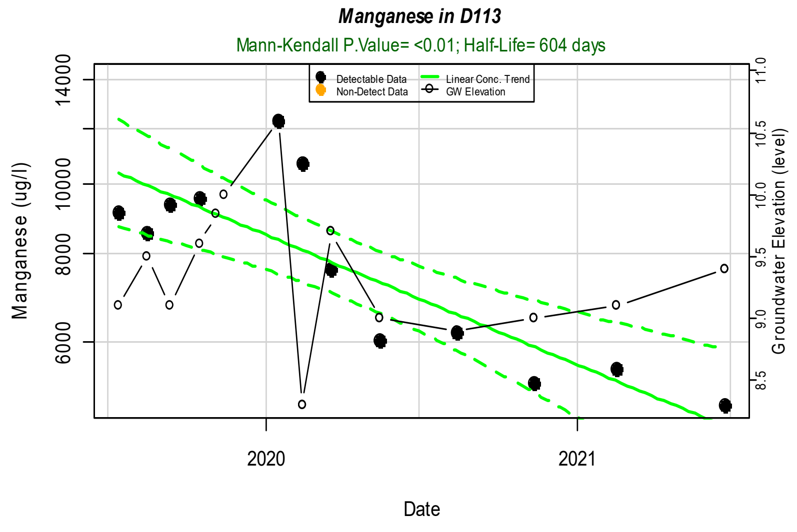
Mann-Kendall P.Value= 0.0367; Half-Life> 5 Years


Manganese in D107

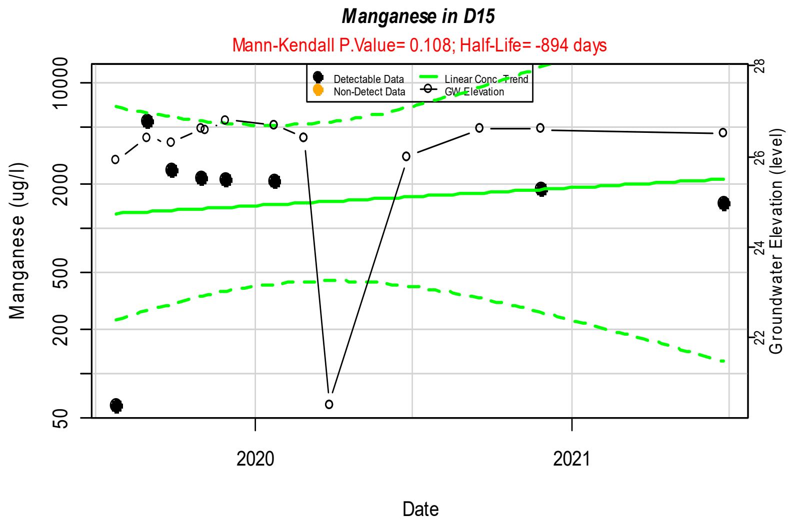
Mann-Kendall P.Value= 0.292; Half-Life= 1527 days


Manganese in D11

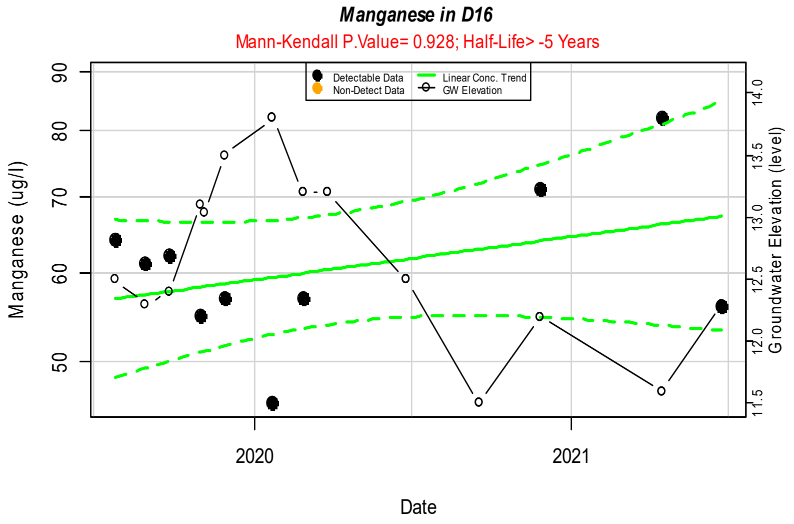
Mann-Kendall P.Value= 0.0355; Half-Life> 5 Years


Manganese in D113

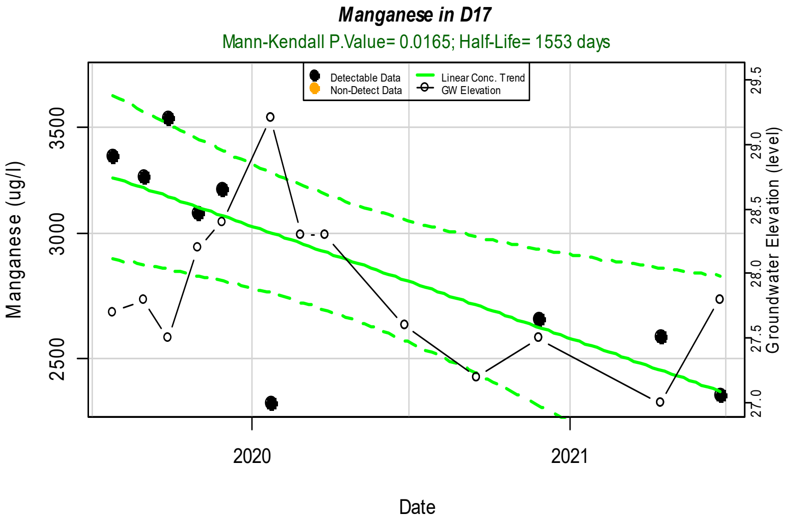
Mann-Kendall P.Value= <0.01; Half-Life= 604 days


Manganese in D15

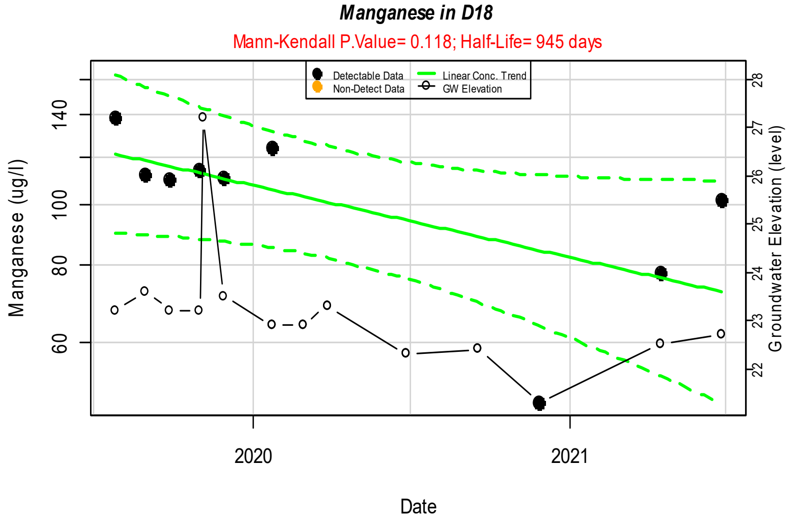
Mann-Kendall P.Value= 0.108; Half-Life= -894 days


Manganese in D16

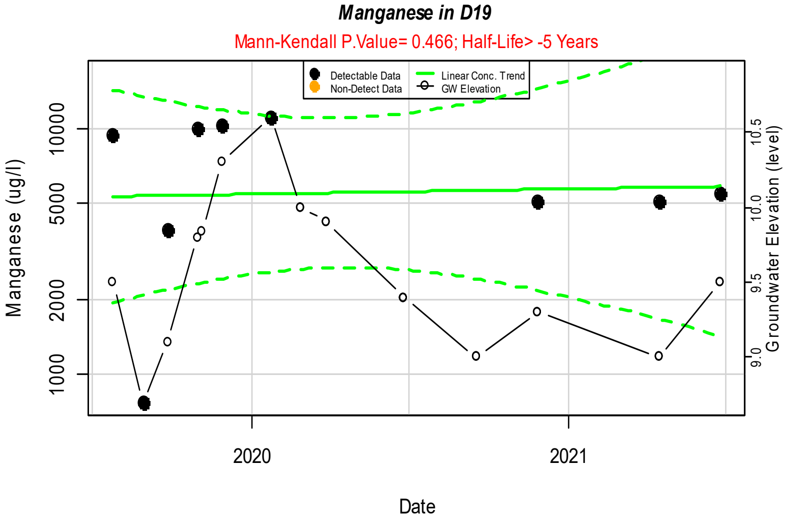
Mann-Kendall P.Value= 0.928; Half-Life> -5 Years


Manganese in D17

Mann-Kendall P.Value= 0.0165; Half-Life= 1553 days


Manganese in D18

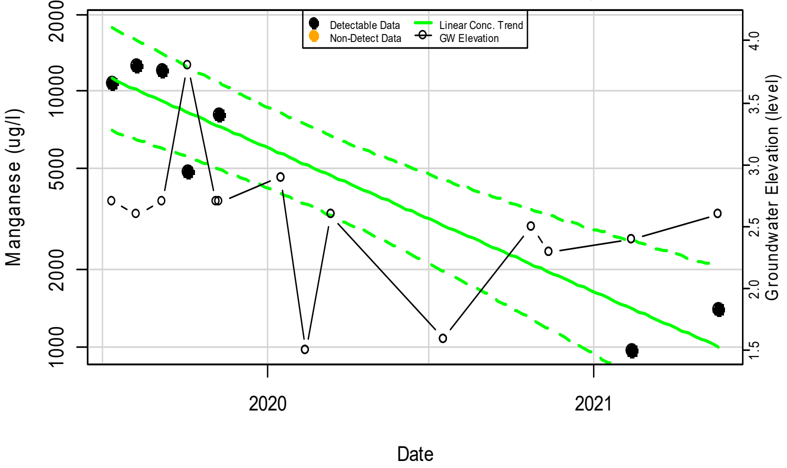
Mann-Kendall P.Value= 0.118; Half-Life= 945 days


Manganese in D19

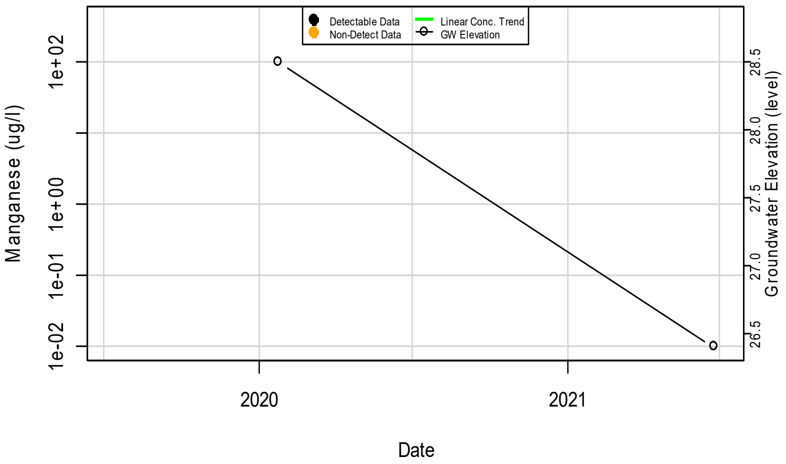
Mann-Kendall P.Value= 0.466; Half-Life> -5 Years

Manganese in D2

Mann-Kendall P.Value= 0.0715; Half-Life= 194 days

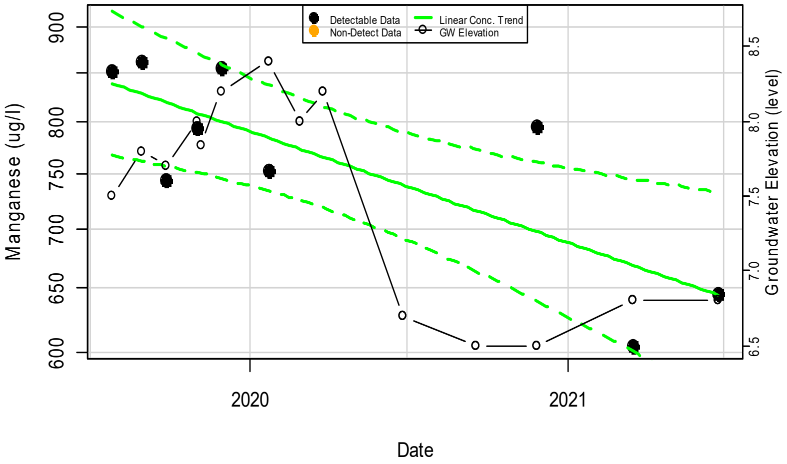


Manganese in D23



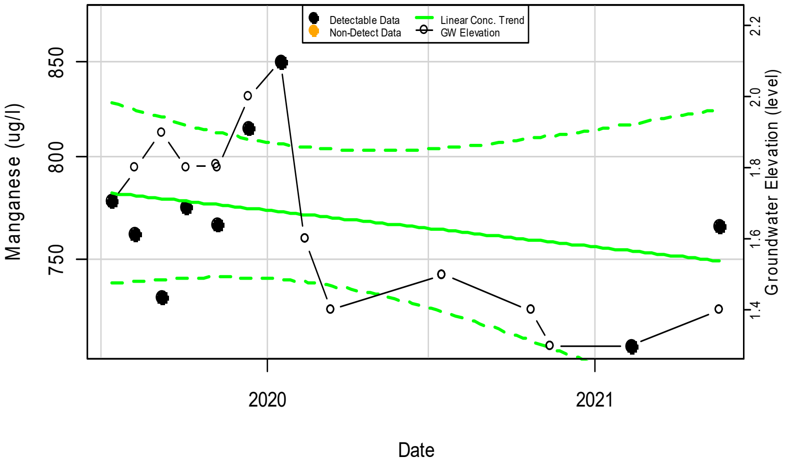
Manganese in D3

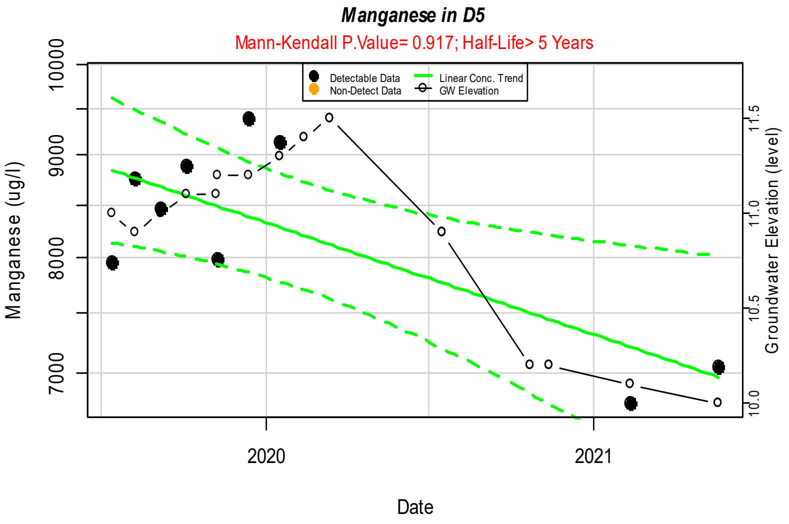
Mann-Kendall P.Value= 0.118; Half-Life> 5 Years

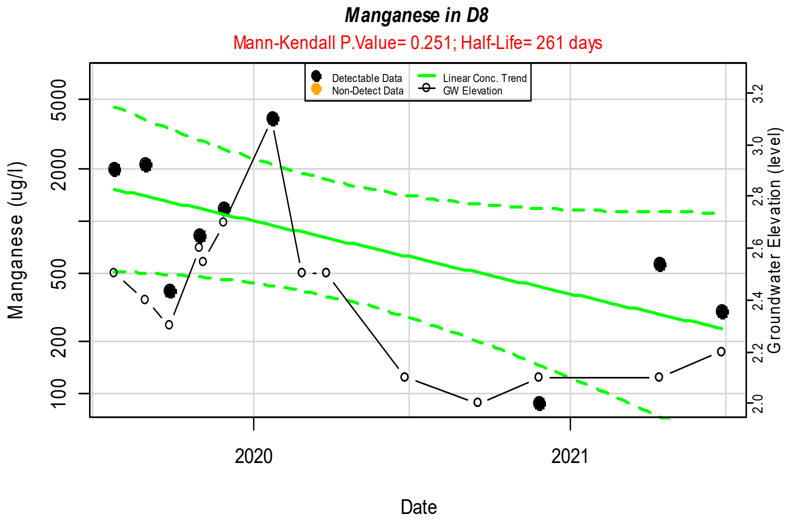


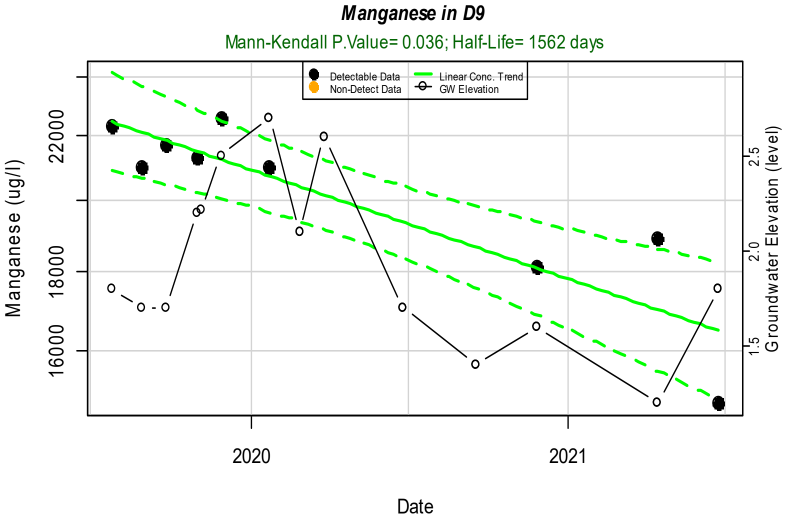
Manganese in D4

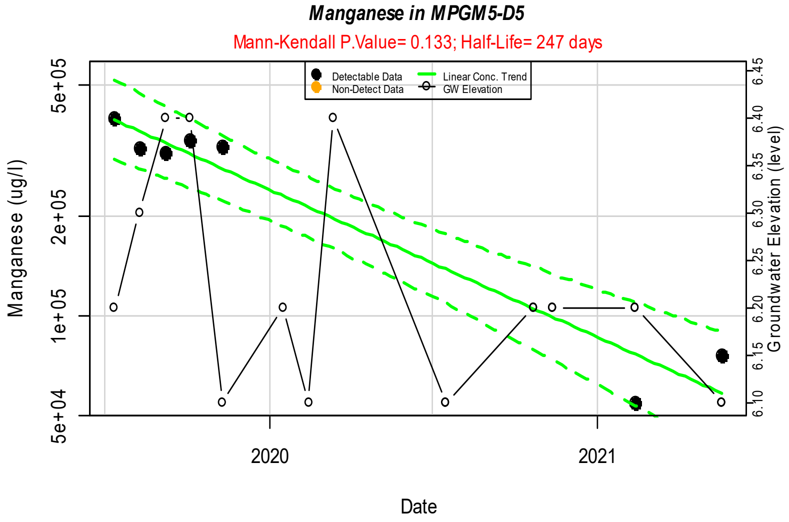
Mann-Kendall P.Value= 1; Half-Life> 5 Years

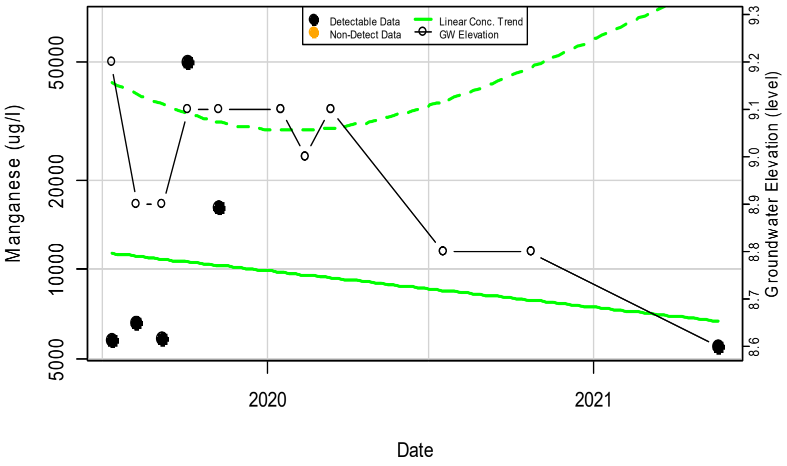



Manganese in D5
Mann-Kendall P.Value= 0.917; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Manganese (ug/l)
7000
8000
9000
10000
Groundwater Elevation (level)
10.0
10.5
11.0
11.5
2020
2021
Date


Manganese in D8
Mann-Kendall P.Value= 0.251; Half-Life= 261 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Manganese (ug/l)
100
200
500
2000
5000
Groundwater Elevation (level)
2.0
2.2
2.4
2.6
2.8
3.0
3.2
2020
2021
Date

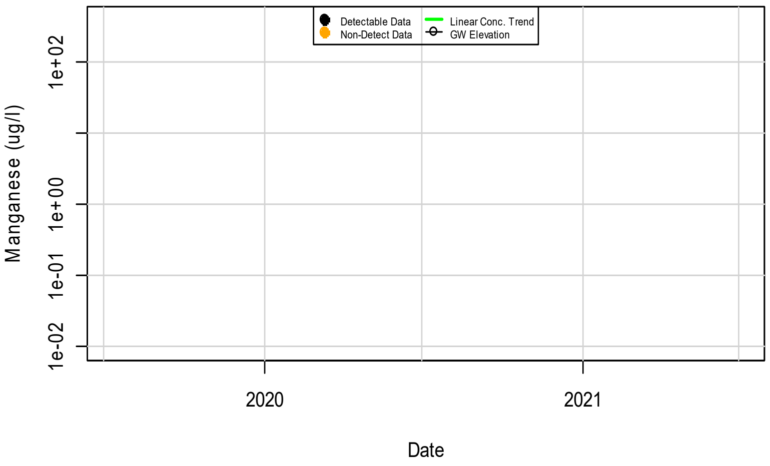

Manganese in D9
Mann-Kendall P.Value= 0.036; Half-Life= 1562 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Manganese (ug/l)
16000
18000
22000
Groundwater Elevation (level)
1.5
2.0
2.5
2020
2021
Date


Manganese in MPGM5-D5
Mann-Kendall P.Value= 0.133; Half-Life= 247 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Manganese (ug/l)
5e+04
1e+05
2e+05
5e+05
Groundwater Elevation (level)
6.10
6.15
6.20
6.25
6.30
6.35
6.40
6.45
2020
2021
Date

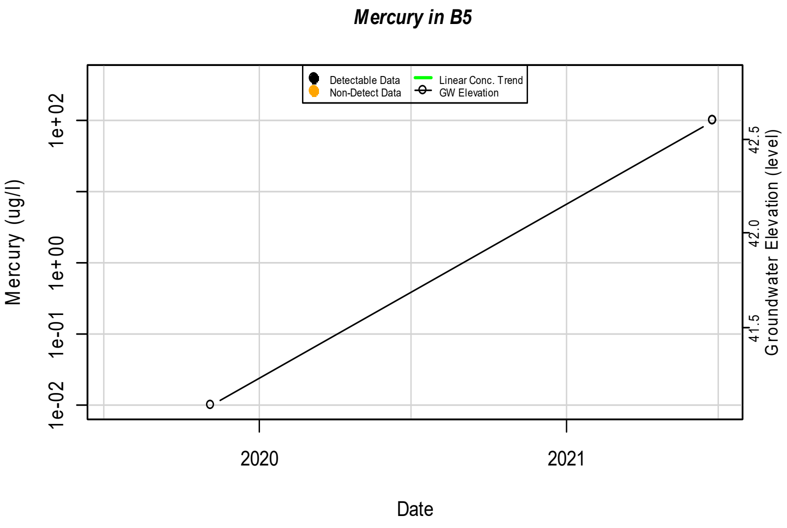


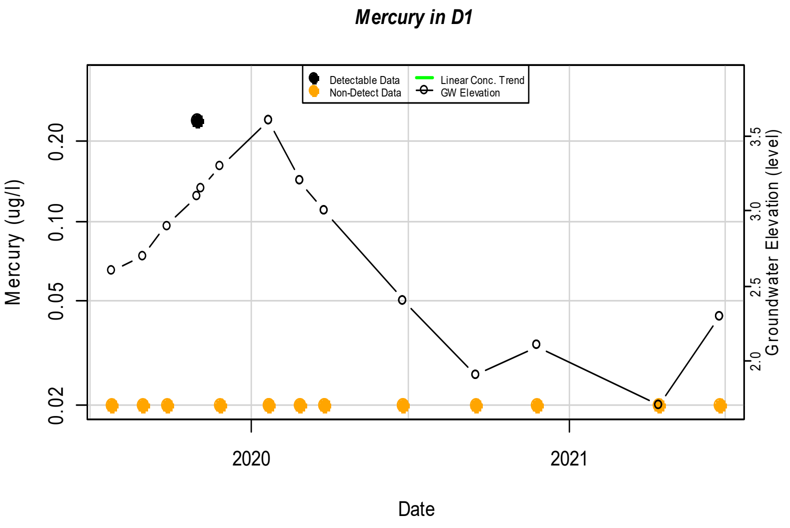
Manganese in MPGM5-D6

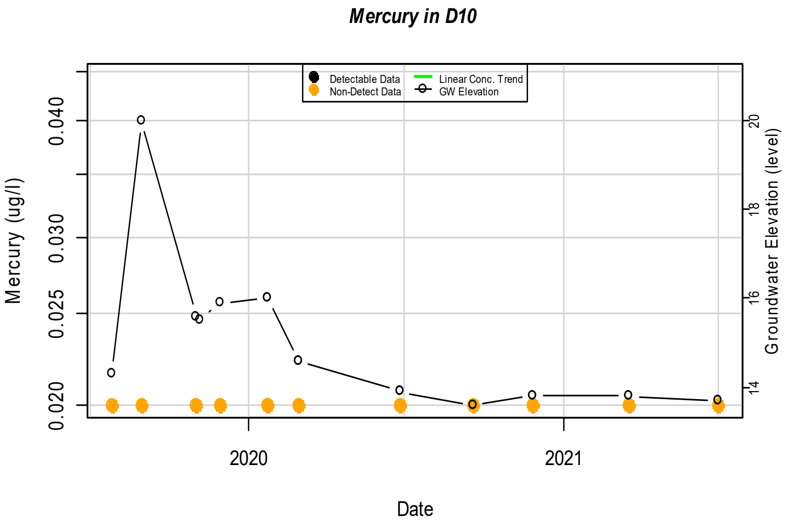
Mann-Kendall P.Value= 1; Half-Life= 898 days

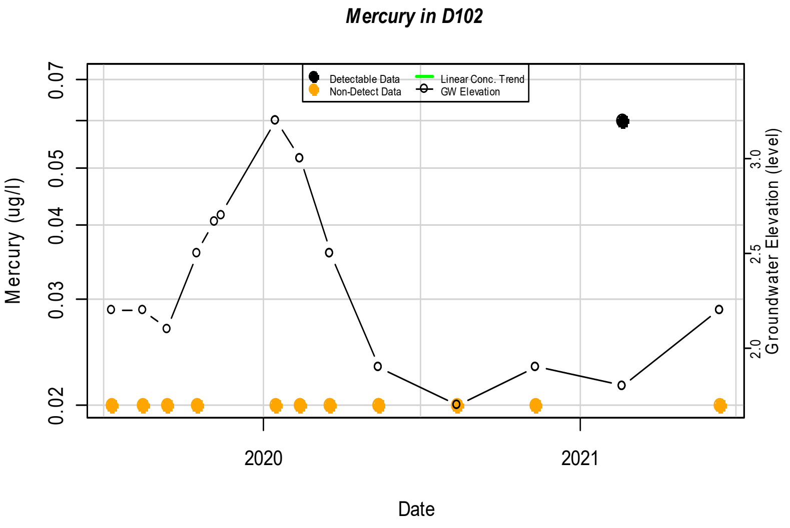


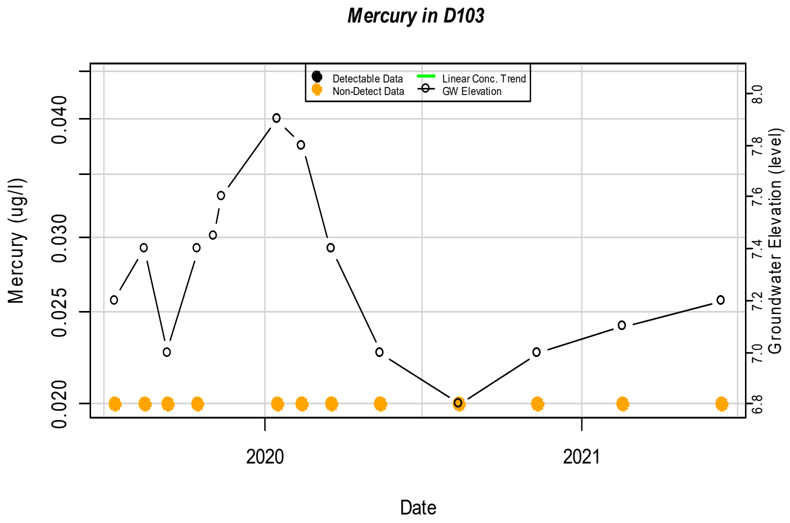
Manganese in SW3-D

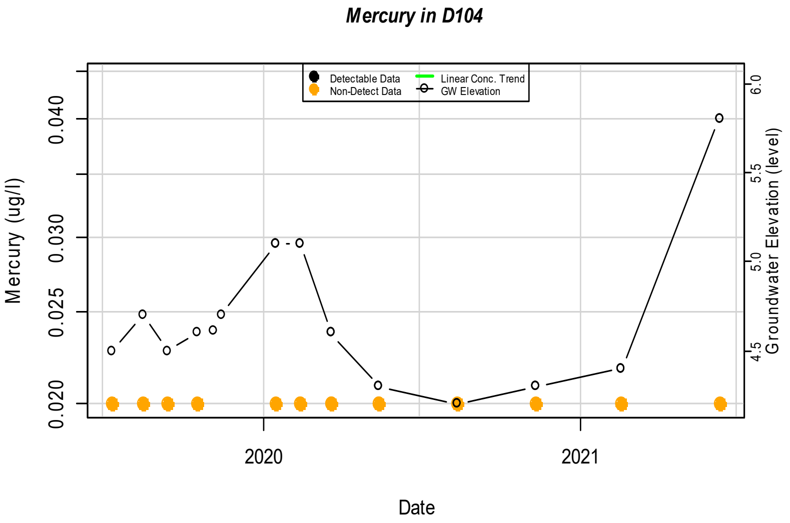

Mercury in B5

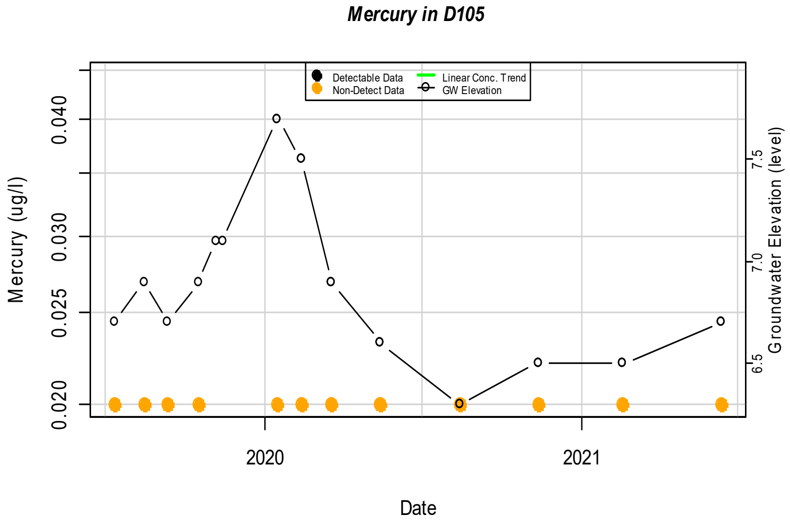

Mercury in D1

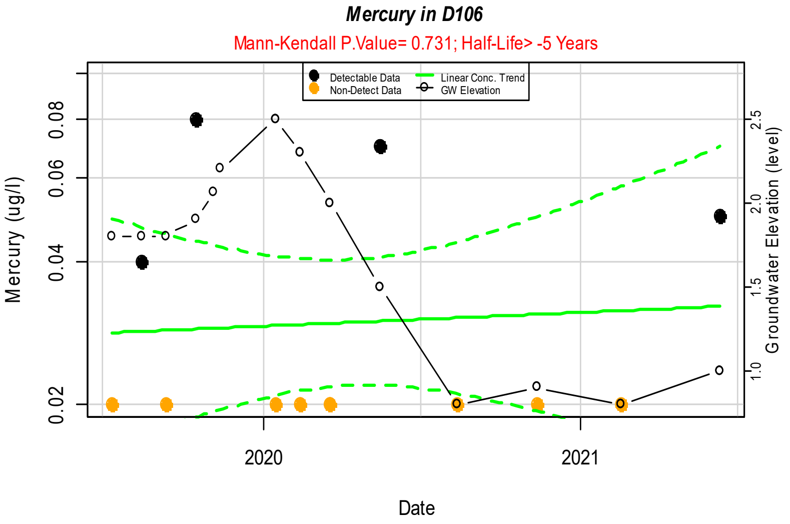

Mercury in D10

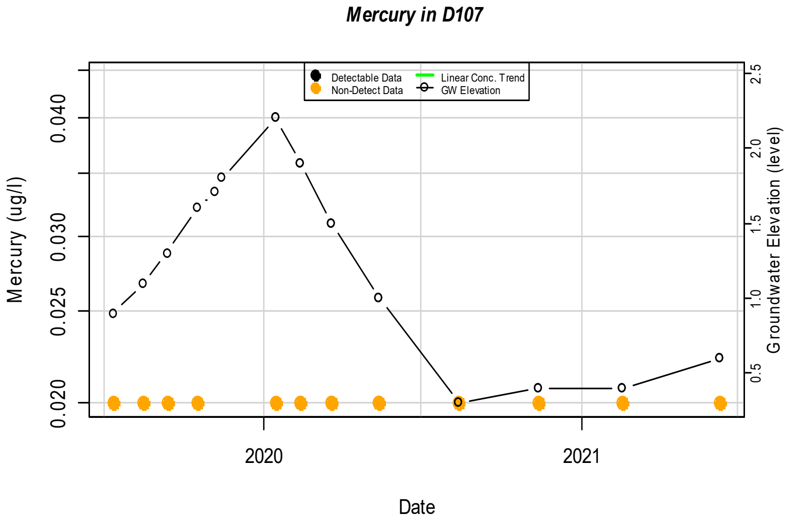

Mercury in D102

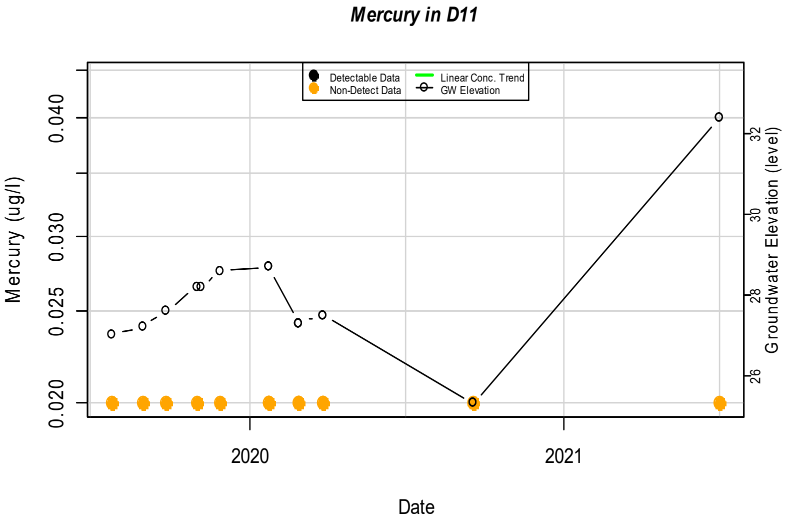

Mercury in D103
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Mercury (ug/l)
0.020
0.025
0.030
0.040
Groundwater Elevation (level)
6.8
7.0
7.2
7.4
7.6
7.8
8.0
2020
2021
Date

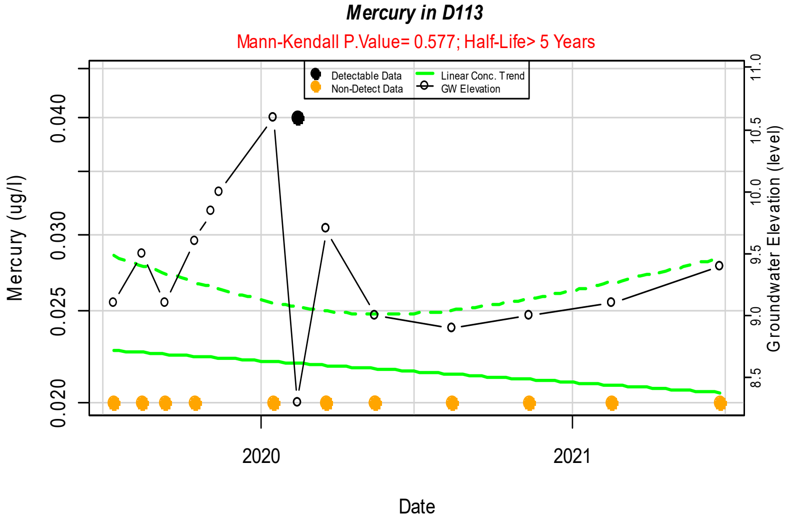

Mercury in D104
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Mercury (ug/l)
0.020
0.025
0.030
0.040
Groundwater Elevation (level)
4.5
5.0
5.5
6.0
2020
2021
Date

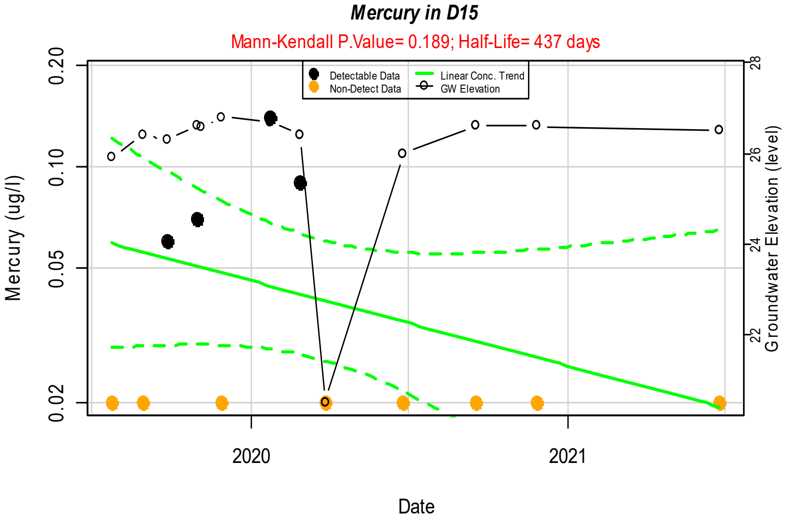

Mercury in D105
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Mercury (ug/l)
0.020
0.025
0.030
0.040
Groundwater Elevation (level)
6.5
7.0
7.5
2020
2021
Date


Mercury in D106
Mann-Kendall P.Value= 0.731; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Mercury (ug/l)
0.02
0.04
0.06
0.08
Groundwater Elevation (level)
1.0
1.5
2.0
2.5
2020
2021
Date

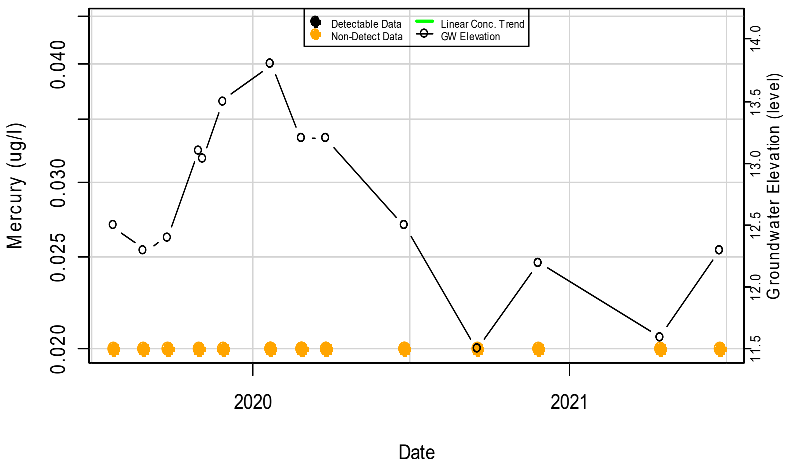

Mercury in D107
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Mercury (ug/l)
0.020
0.025
0.030
0.040
Groundwater Elevation (level)
0.5
1.0
1.5
2.0
2.5
2020
2021
Date


Mercury in D11
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Mercury (ug/l)
0.020
0.025
0.030
0.040
Groundwater Elevation (level)
26
28
30
32
2020
2021
Date

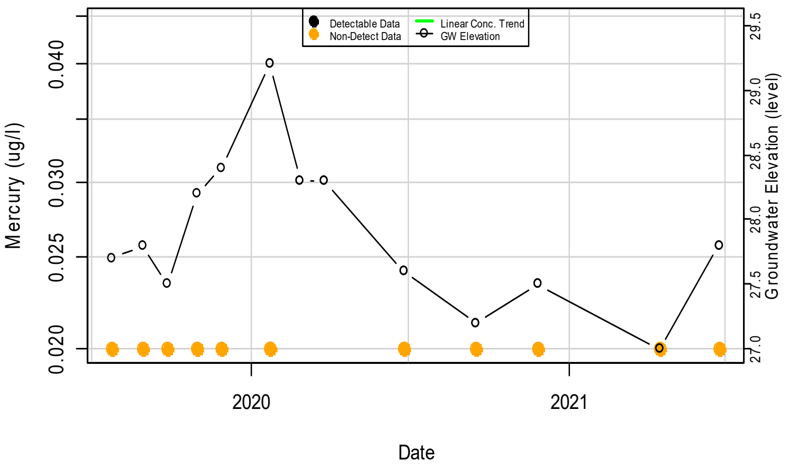

Mercury in D113
Mann-Kendall P.Value= 0.577; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Mercury (ug/l)
0.020
0.025
0.030
0.040
Groundwater Elevation (level)
8.5
9.0
9.5
10.0
10.5
11.0
2020
2021
Date


Mercury in D15
Mann-Kendall P.Value= 0.189; Half-Life= 437 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Mercury (ug/l)
0.02
0.05
0.10
0.20
Groundwater Elevation (level)
22
24
26
28
2020
2021
Date

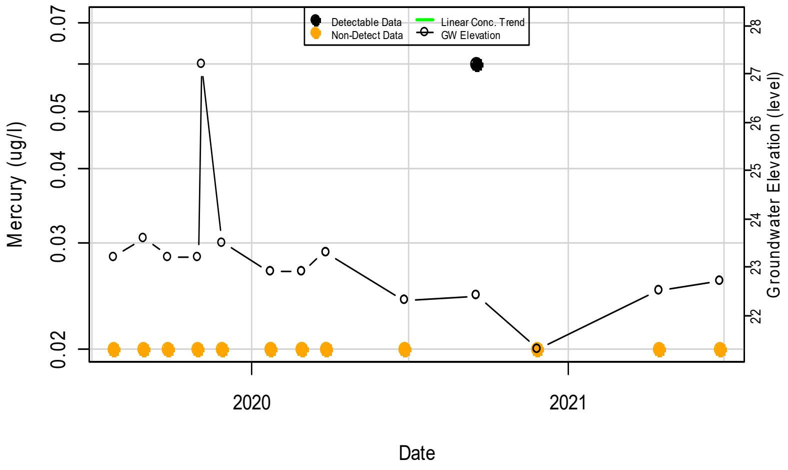
Mercury in D16



Mercury in D17

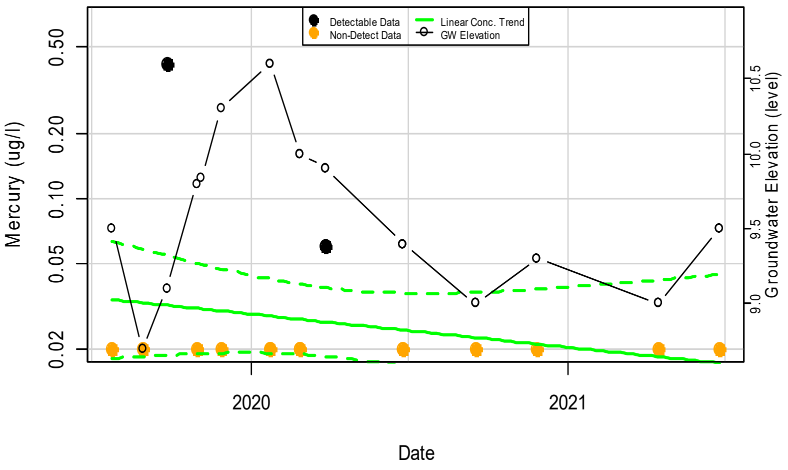


Mercury in D18



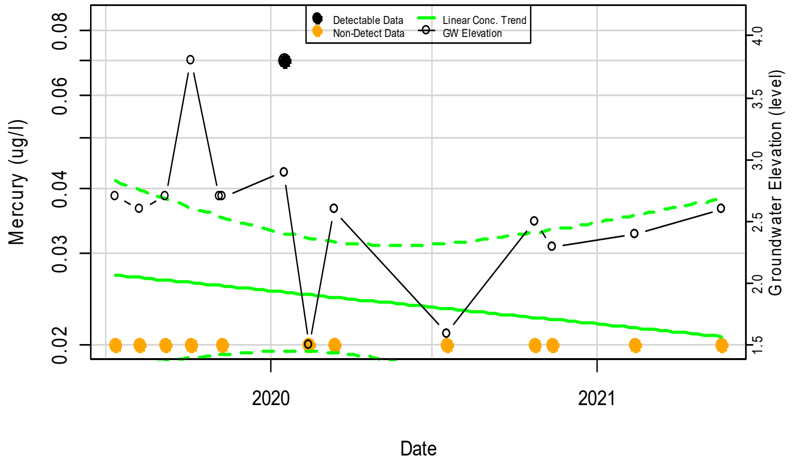
Mercury in D19

Mann-Kendall P.Value= 0.78; Half-Life= 717 days

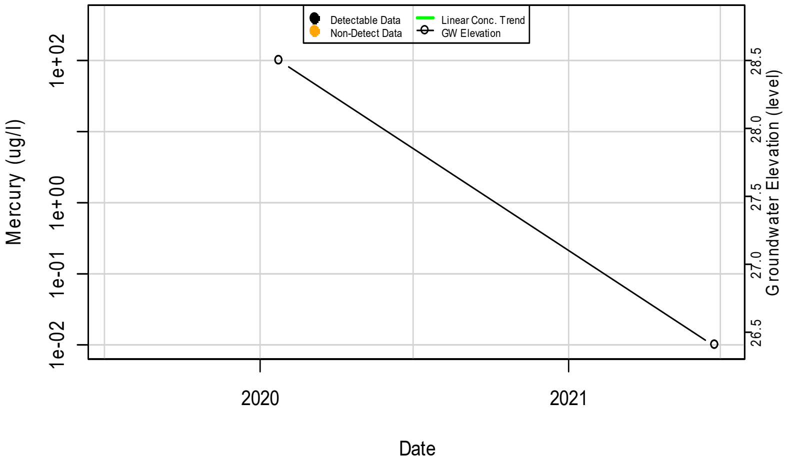


Mercury in D2

Mann-Kendall P.Value= 0.405; Half-Life= 1739 days

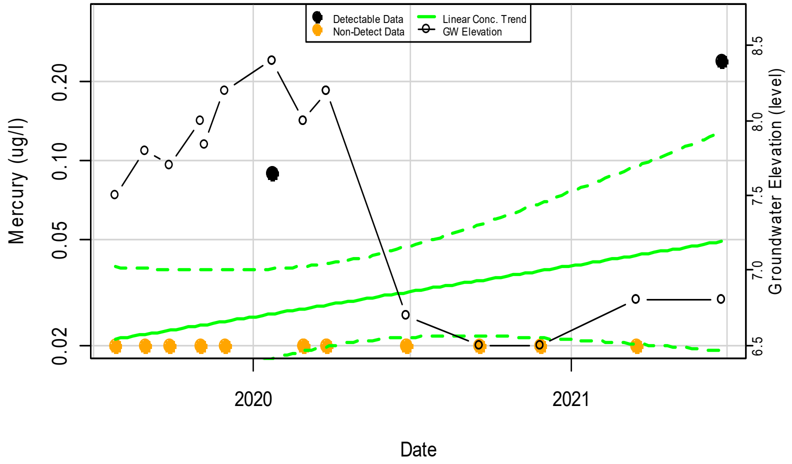


Mercury in D23

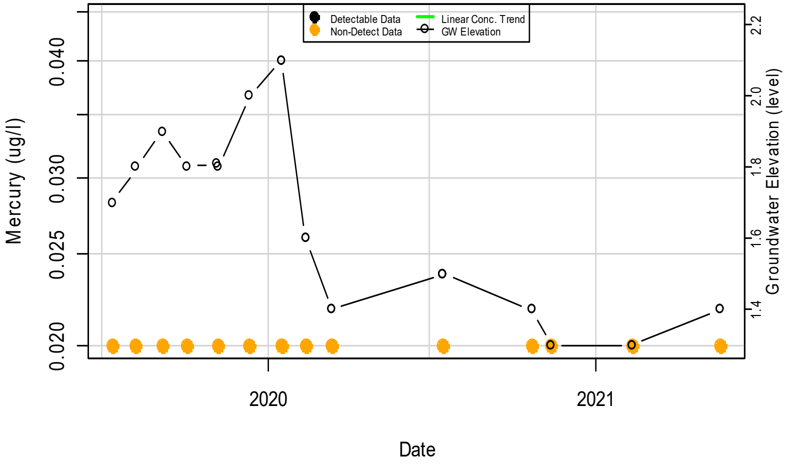


Mercury in D3

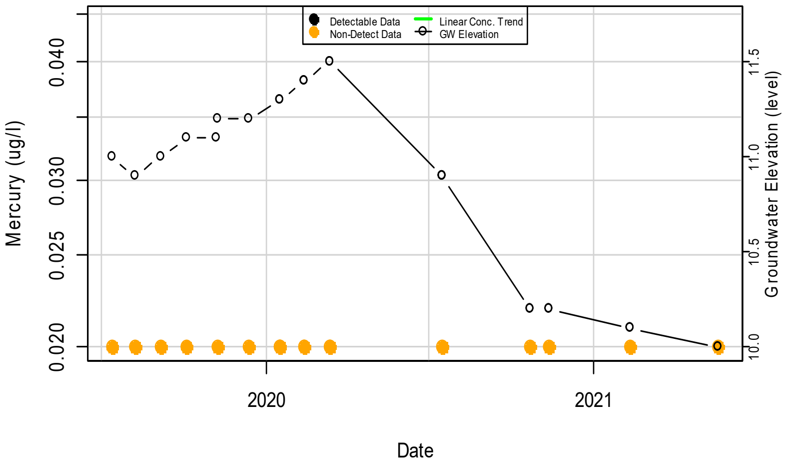
Mann-Kendall P.Value= 0.92; Half-Life= -570 days



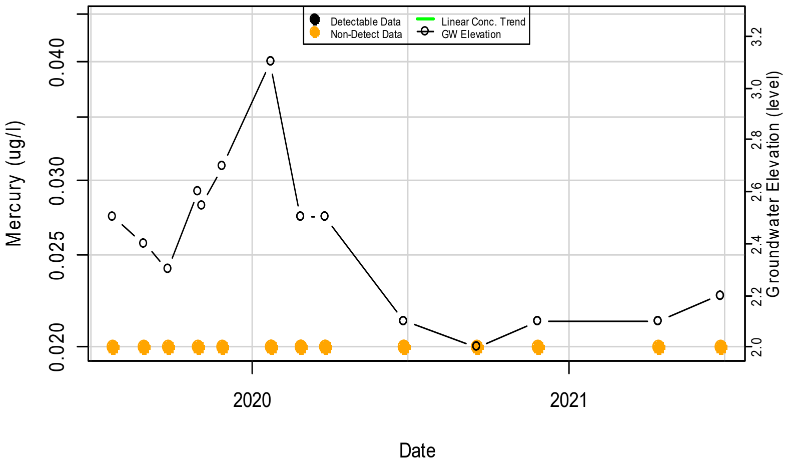
Mercury in D4



Mercury in D5

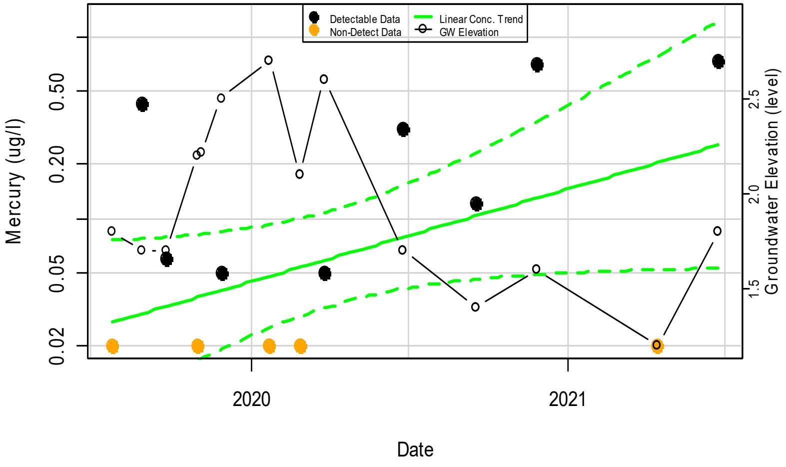


Mercury in D8



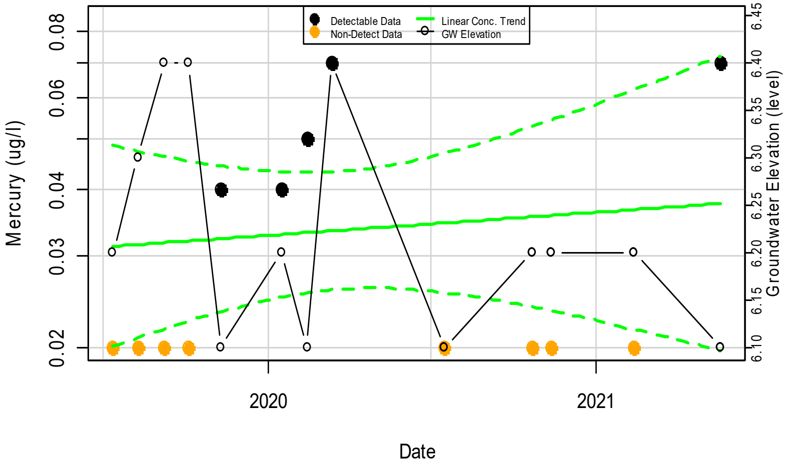
Mercury in D9

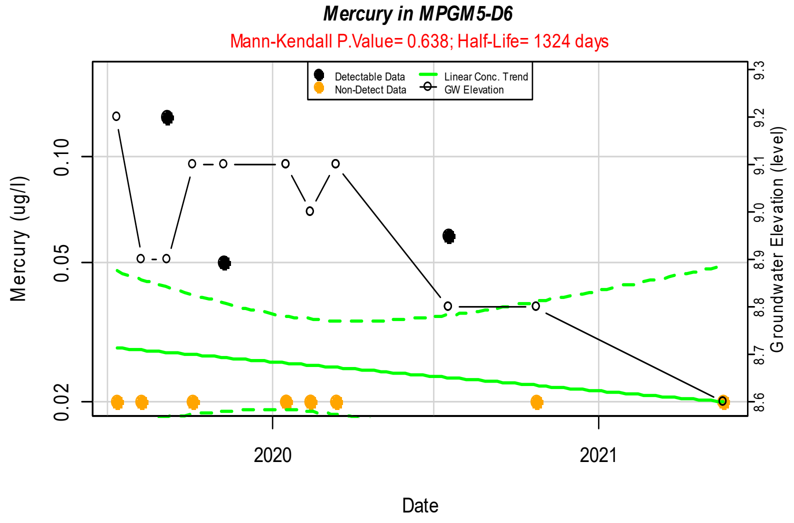
Mann-Kendall P.Value= 0.0722; Half-Life= -216 days

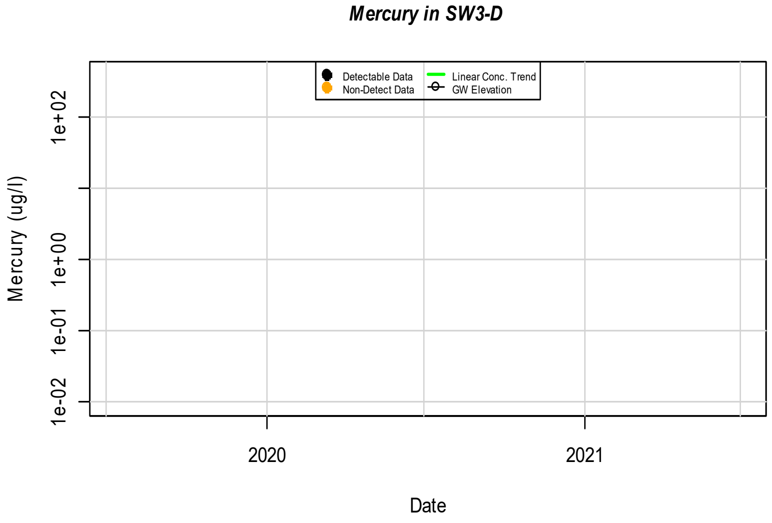


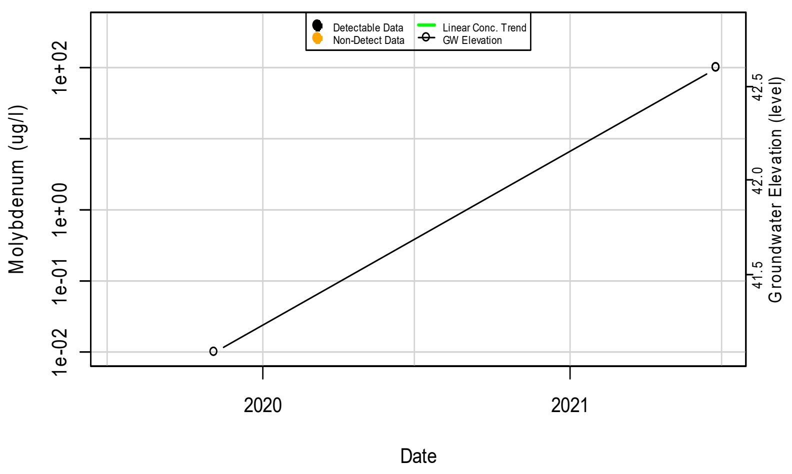
Mercury in MPGM5-D5

Mann-Kendall P.Value= 0.105; Half-Life> -5 Years

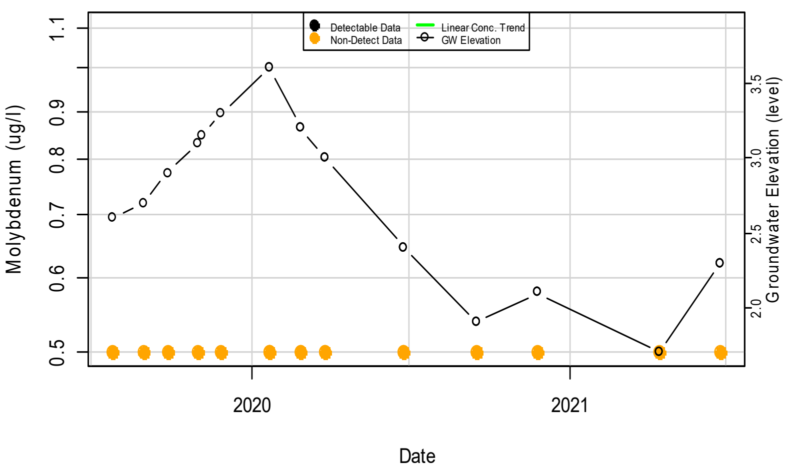



Mercury in MPGM5-D6
Mann-Kendall P.Value= 0.638; Half-Life= 1324 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Mercury (ug/l)
0.02
0.05
0.10
Groundwater Elevation (level)
8.6
8.7
8.8
8.9
9.0
9.1
9.2
9.3
2020
2021
Date

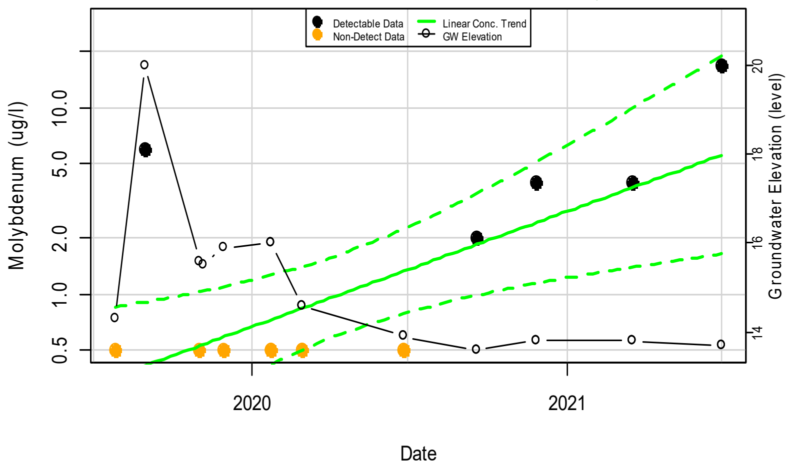

Mercury in SW3-D
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Mercury (ug/l)
1e-02
1e-01
1e+00
1e+02
2020
2021
Date



Molybdenum in B5

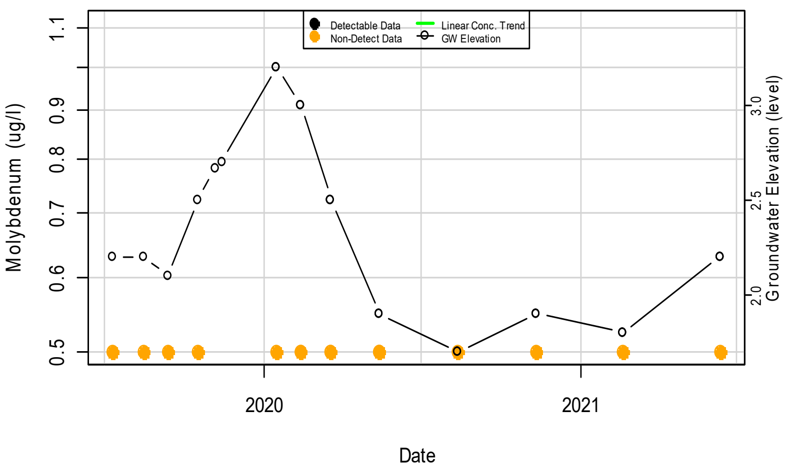


Molybdenum in D1

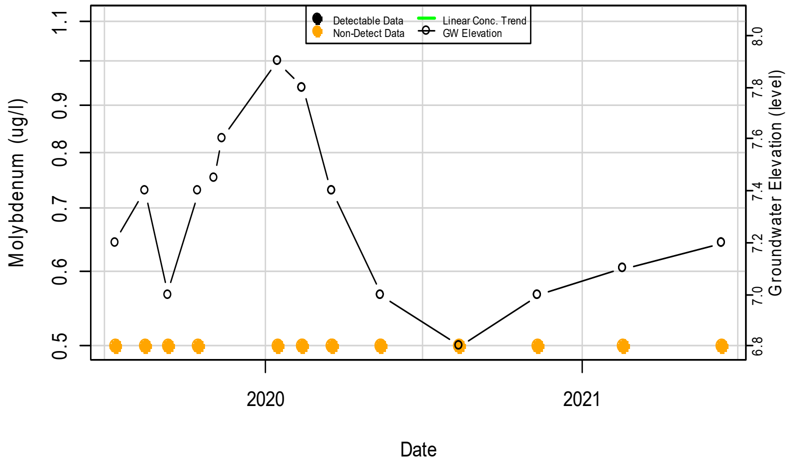


Molybdenum in D10

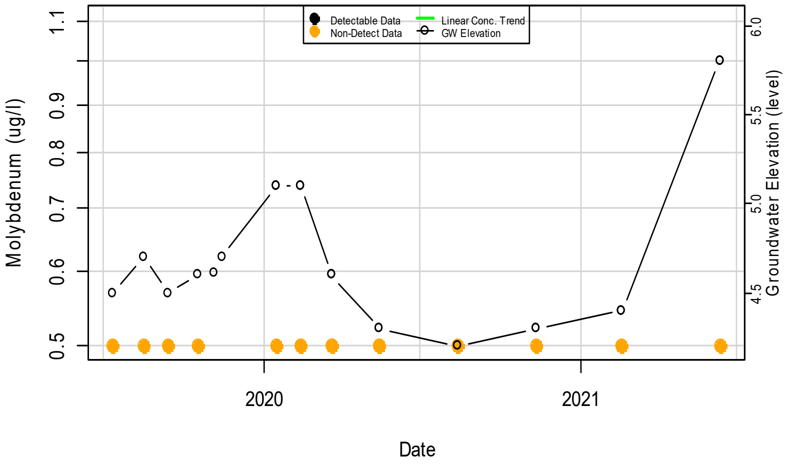
Mann-Kendall P.Value= 0.0394; Half-Life= -178 days



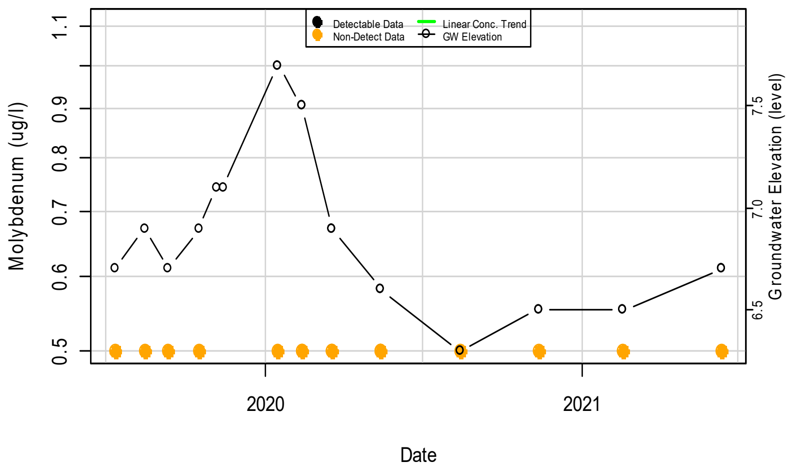
Molybdenum in D102



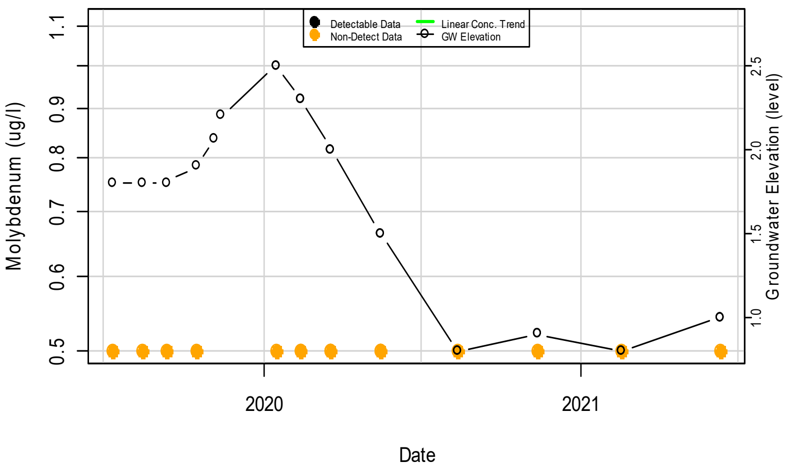
Molybdenum in D103



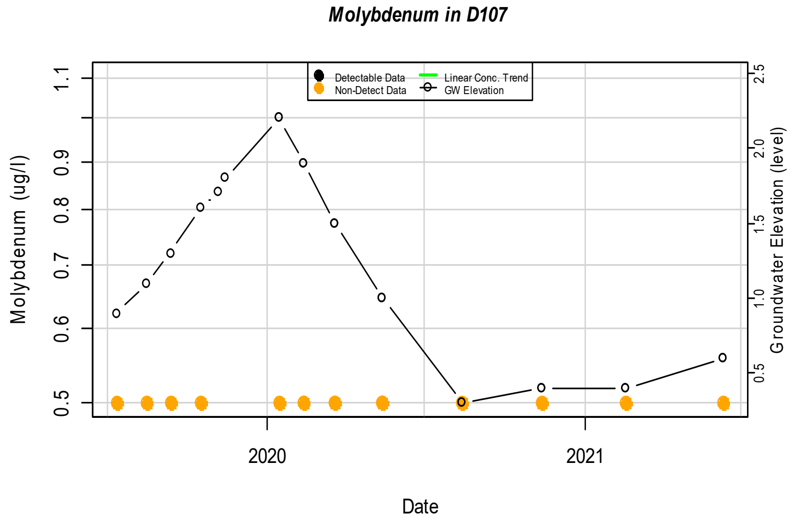
Molybdenum in D104



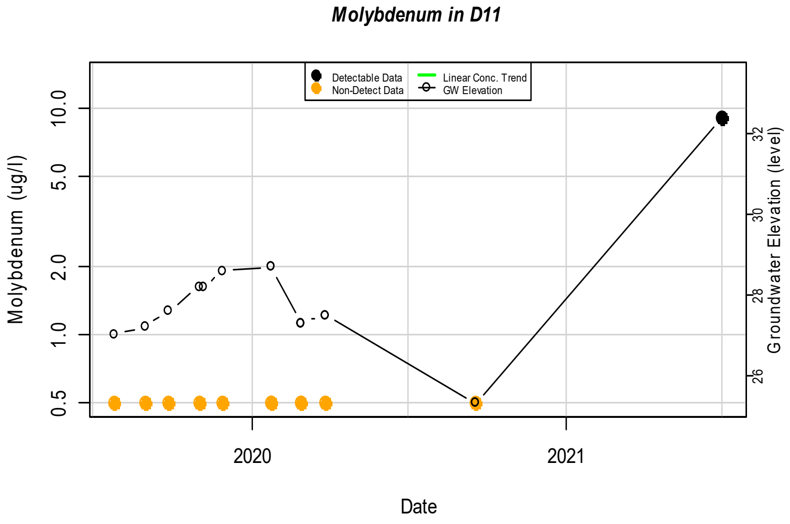
Molybdenum in D105



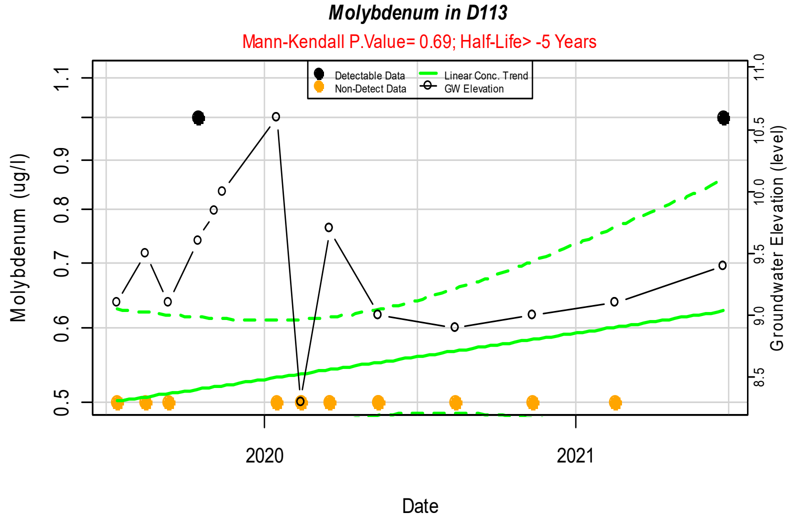
Molybdenum in D106



Molybdenum in D107

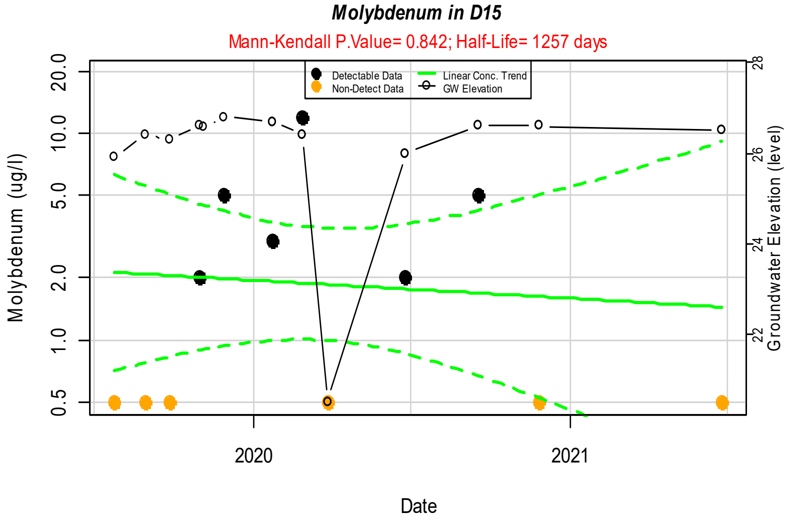


Molybdenum in D11



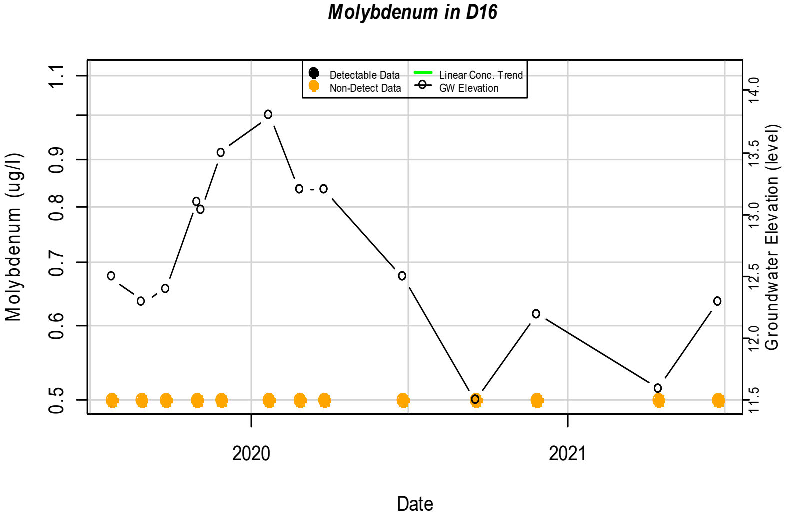
Molybdenum in D113

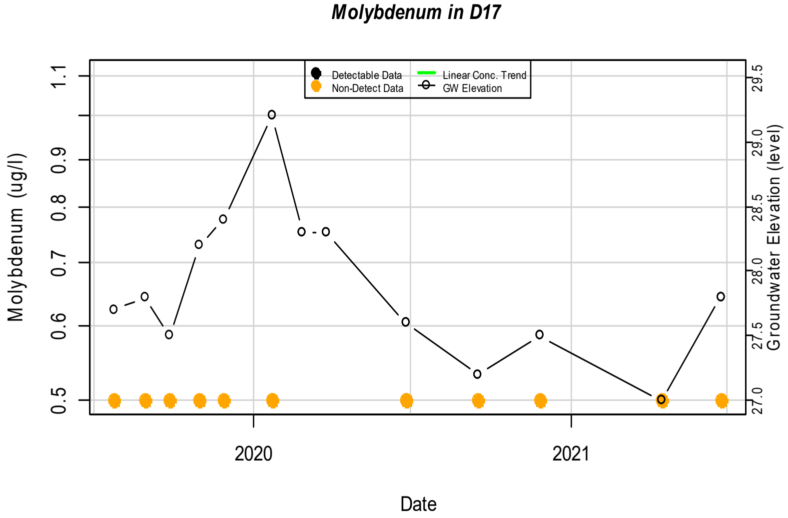
Mann-Kendall P.Value= 0.69; Half-Life> -5 Years

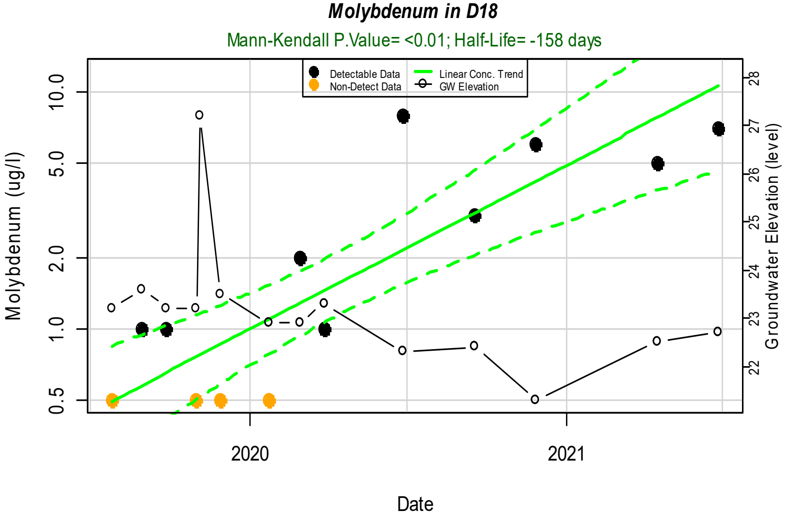


Molybdenum in D15

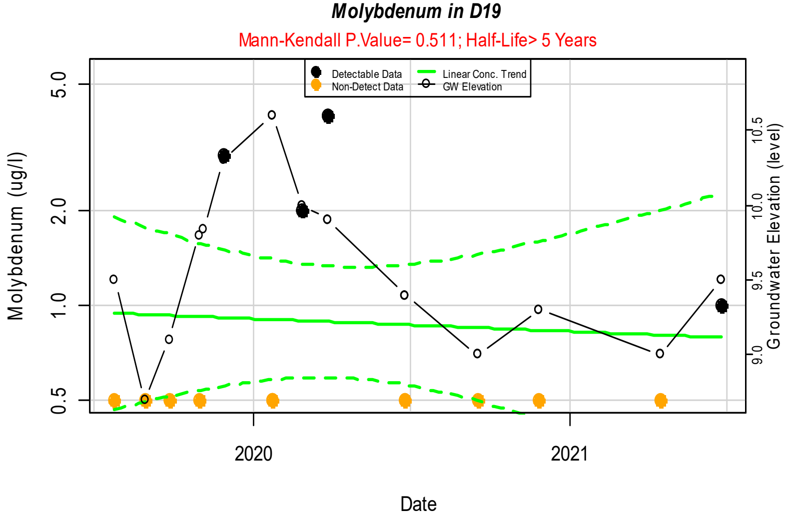
Mann-Kendall P.Value= 0.842; Half-Life= 1257 days


Molybdenum in D16


Molybdenum in D17

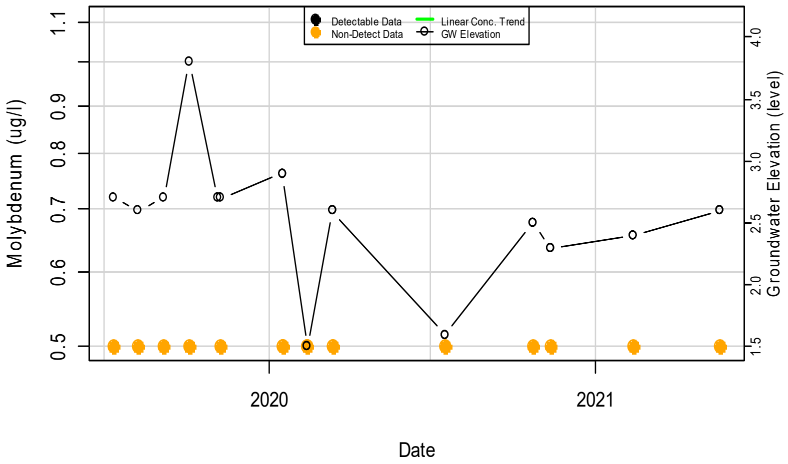

Molybdenum in D18

Mann-Kendall P.Value= <0.01; Half-Life= -158 days

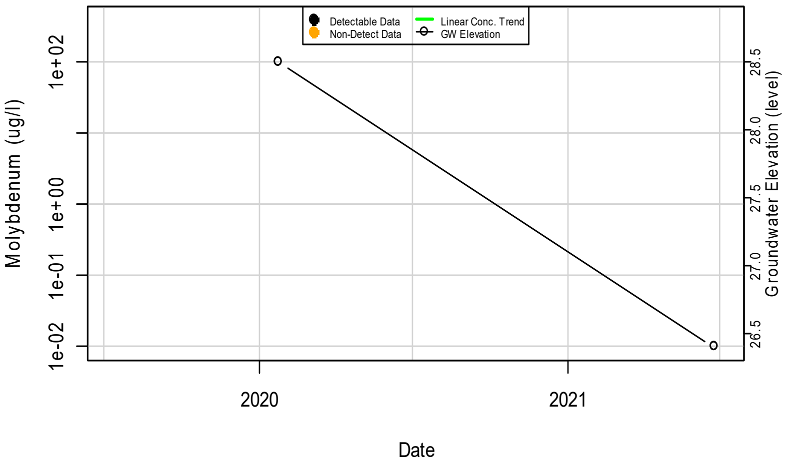

Molybdenum in D19

Mann-Kendall P.Value= 0.511; Half-Life> 5 Years

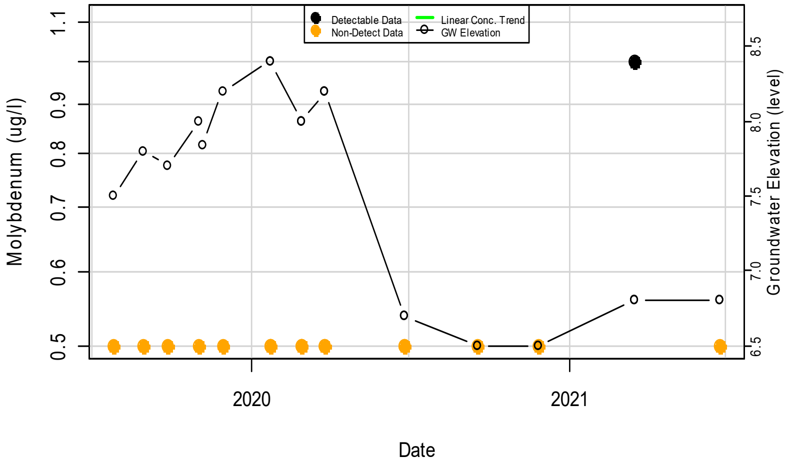
Molybdenum in D2



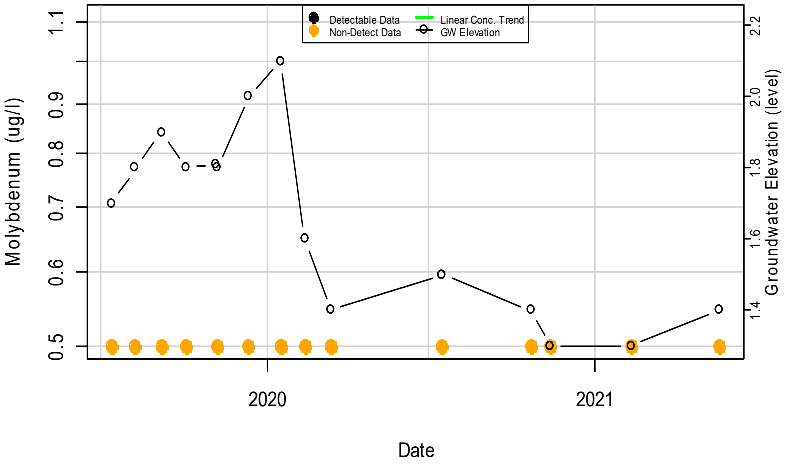
Molybdenum in D23

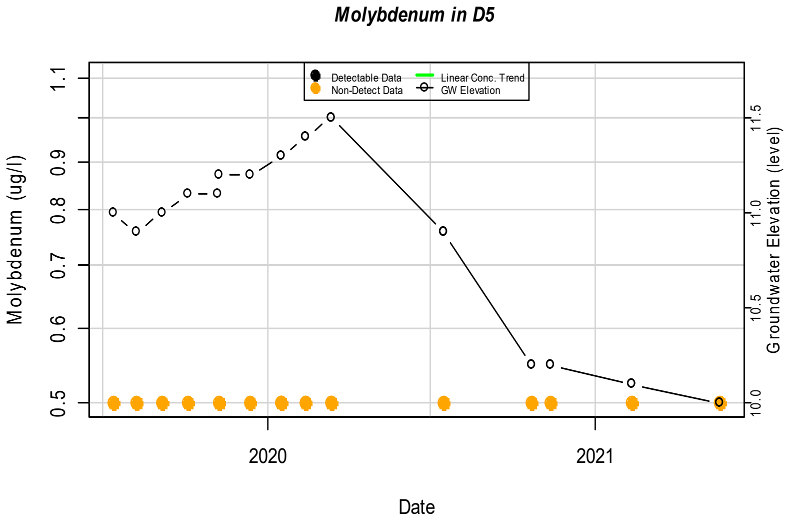


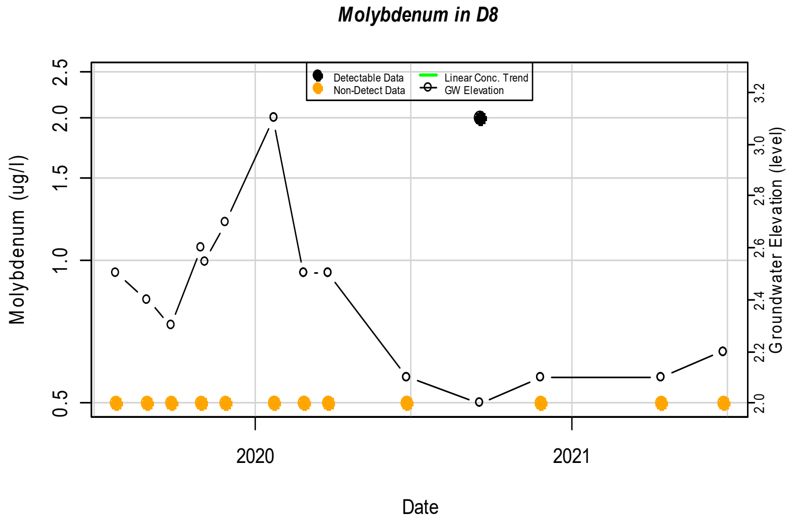
Molybdenum in D3

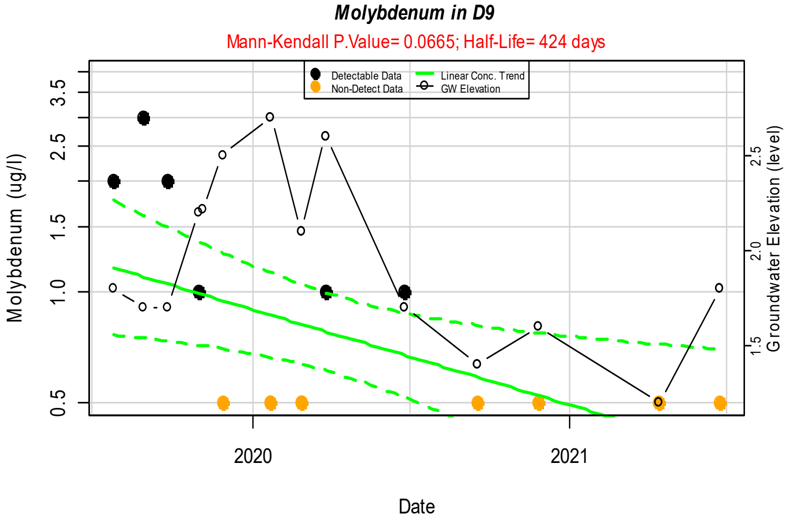


Molybdenum in D4

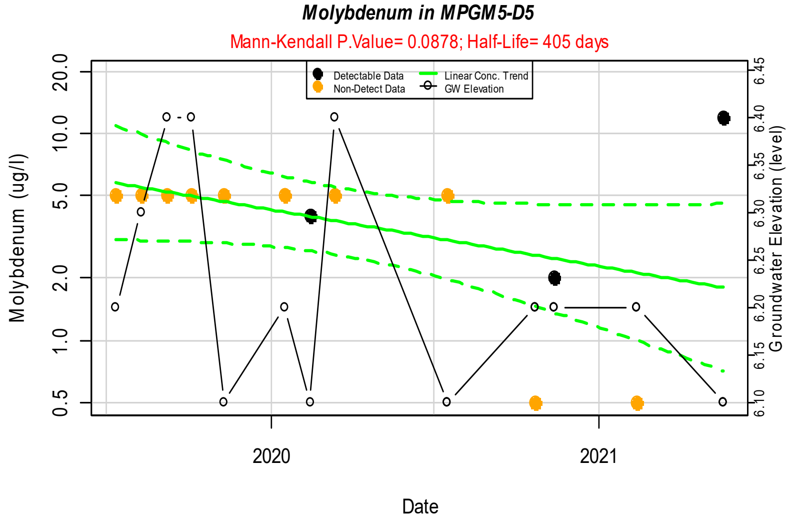



Molybdenum in D5

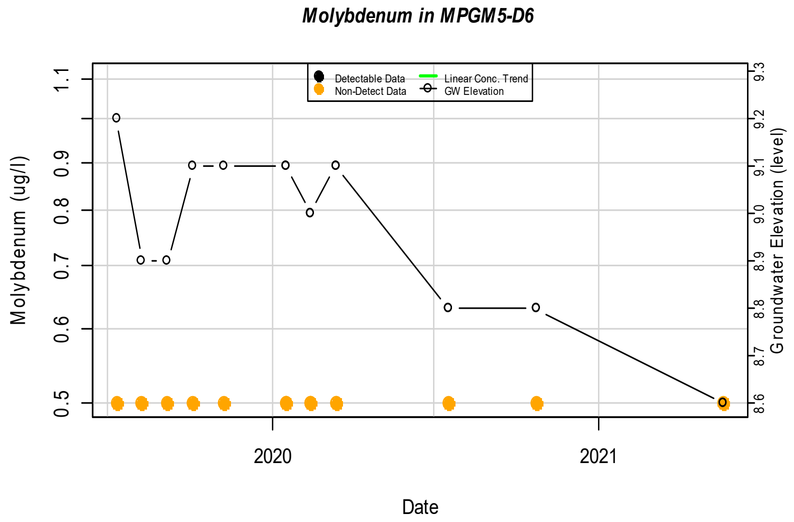

Molybdenum in D8

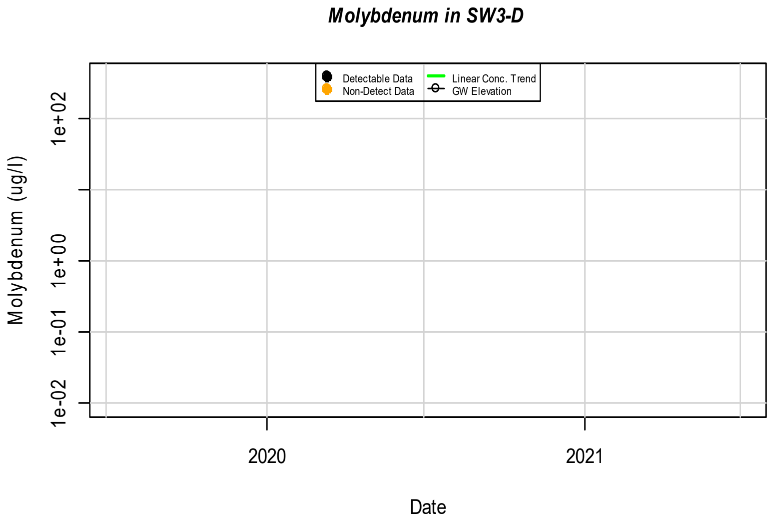

Molybdenum in D9

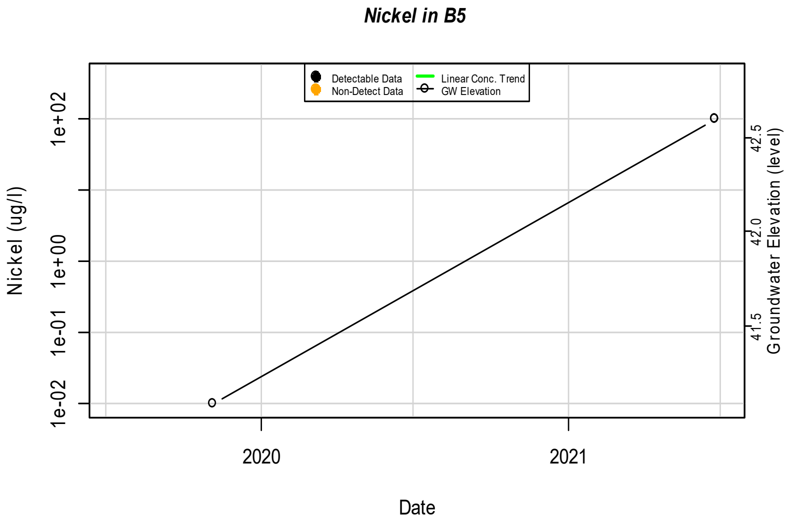
Mann-Kendall P.Value= 0.0665; Half-Life= 424 days


Molybdenum in MPGM5-D5

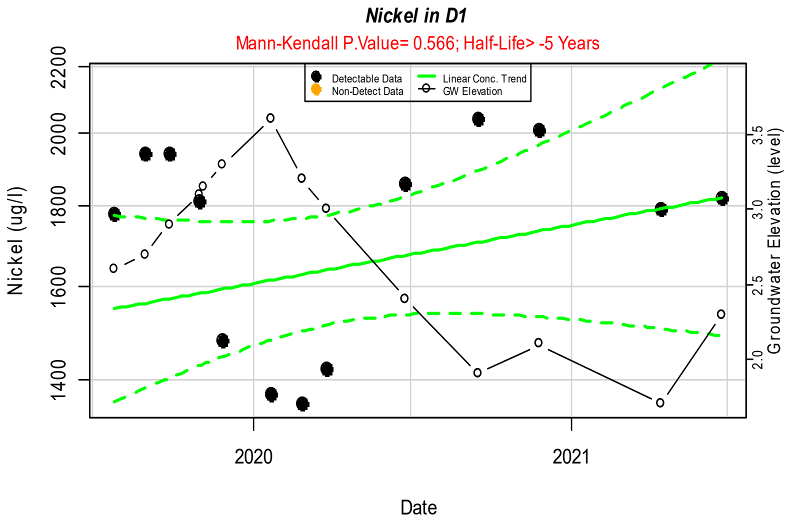
Mann-Kendall P.Value= 0.0878; Half-Life= 405 days


Molybdenum in MPGM5-D6


Molybdenum in SW3-D

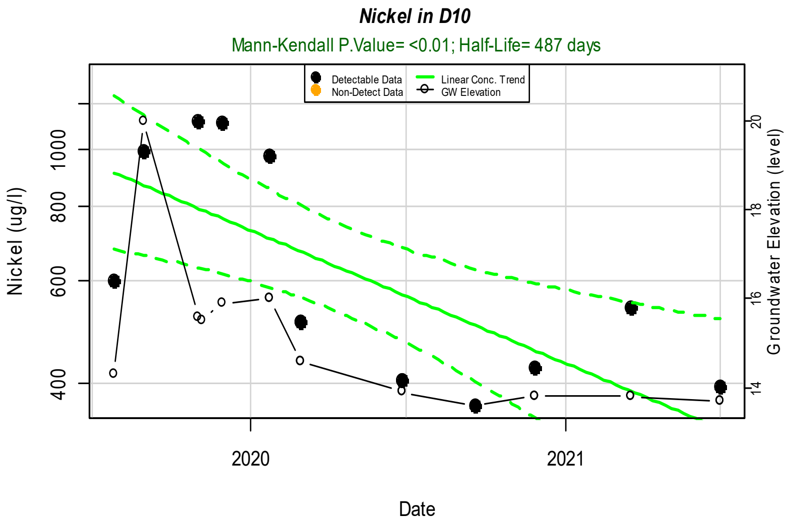


Nickel in B5



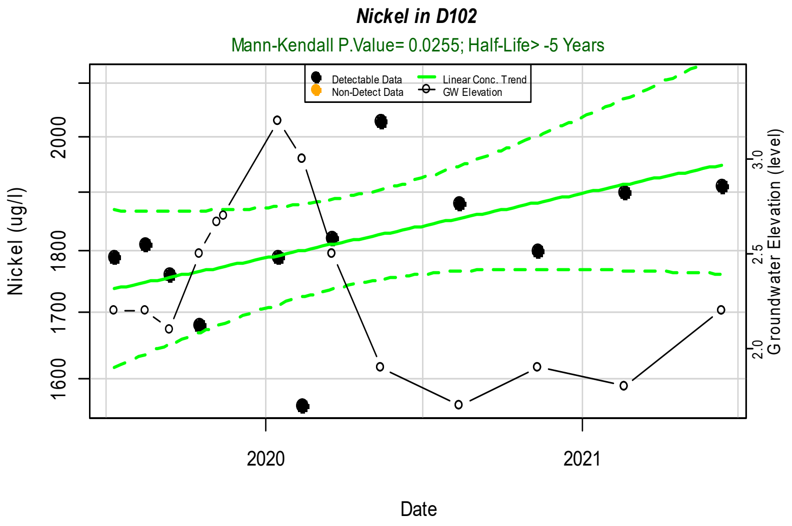
Nickel in D1

Mann-Kendall P.Value= 0.566; Half-Life> -5 Years



Nickel in D10

Mann-Kendall P.Value= <0.01; Half-Life= 487 days

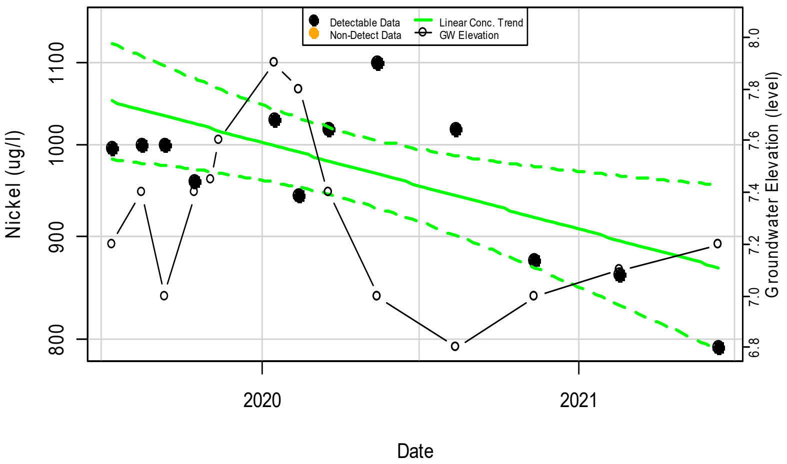


Nickel in D102

Mann-Kendall P.Value= 0.0255; Half-Life> -5 Years

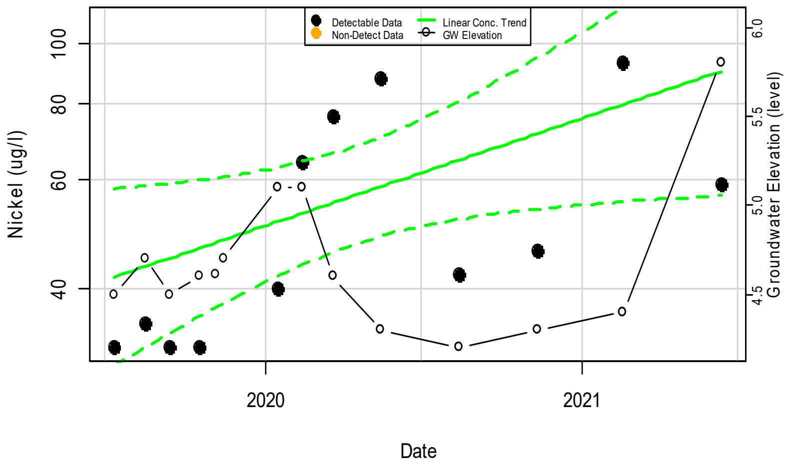
Nickel in D103

Mann-Kendall P.Value= 0.647; Half-Life> 5 Years



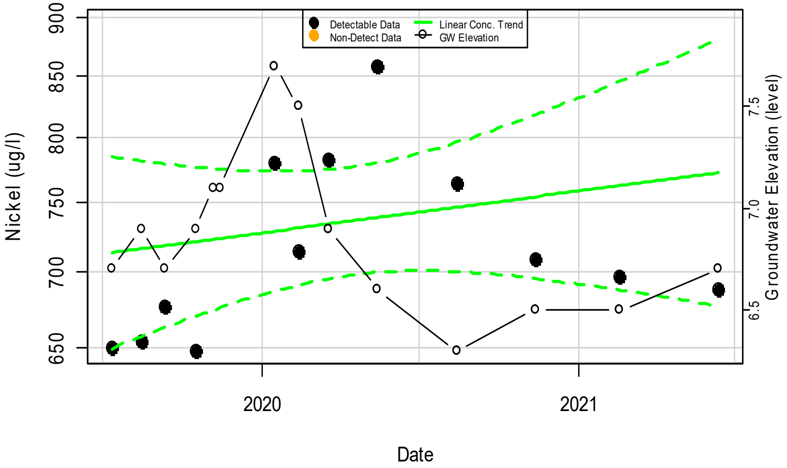
Nickel in D104

Mann-Kendall P.Value= <0.01; Half-Life= -631 days



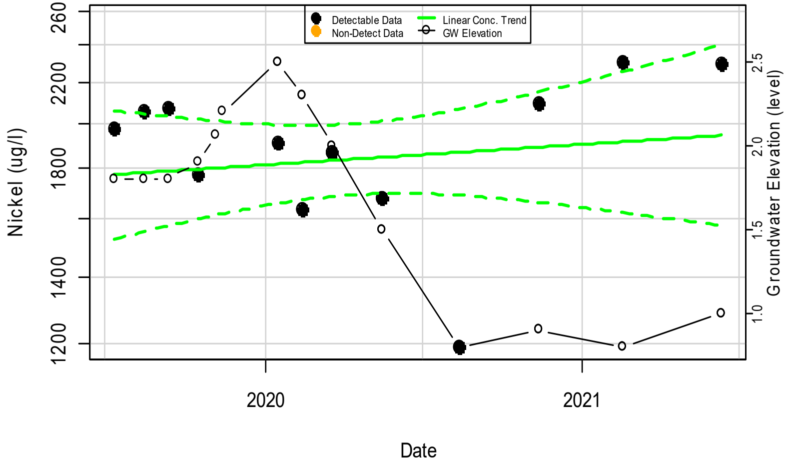
Nickel in D105

Mann-Kendall P.Value= 0.145; Half-Life> -5 Years



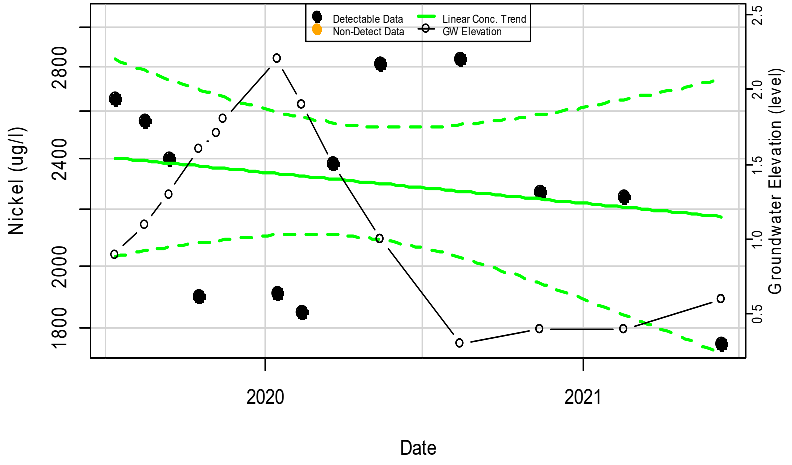
Nickel in D106

Mann-Kendall P.Value= 0.933; Half-Life> -5 Years



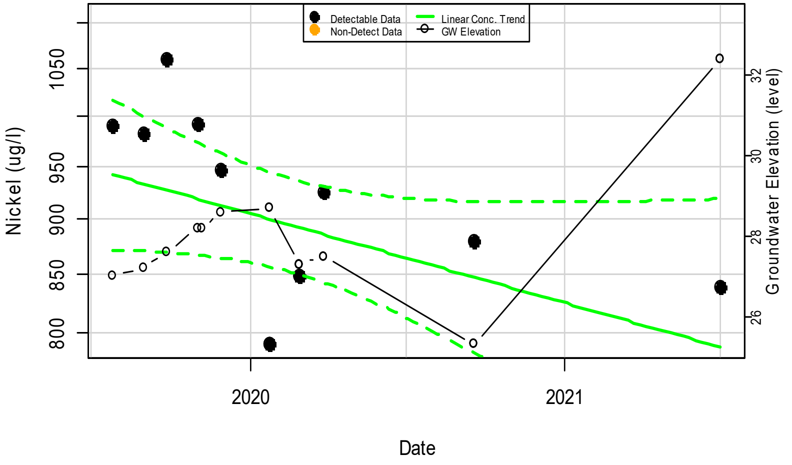
Nickel in D107

Mann-Kendall P.Value= 0.927; Half-Life> 5 Years



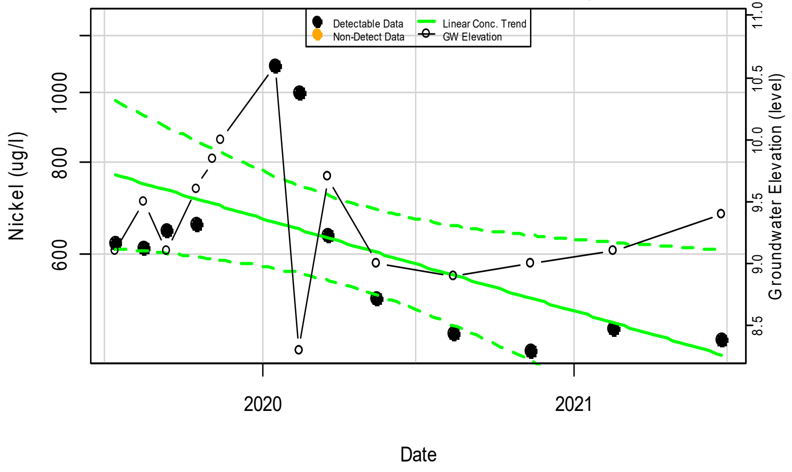
Nickel in D11

Mann-Kendall P.Value= 0.143; Half-Life> 5 Years



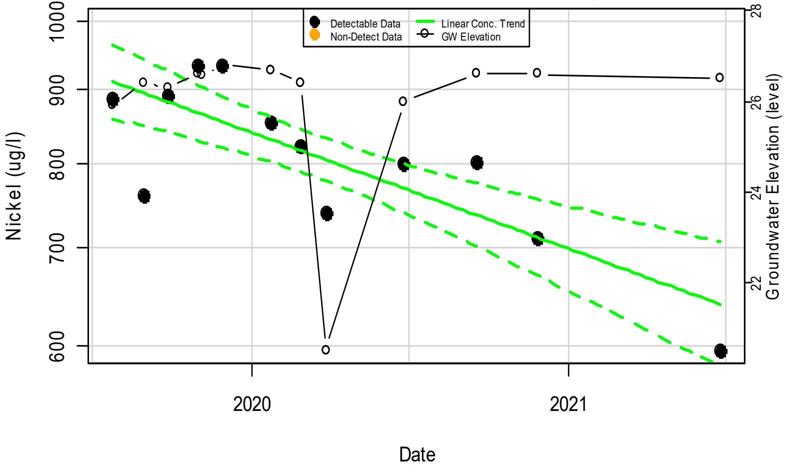
Nickel in D113

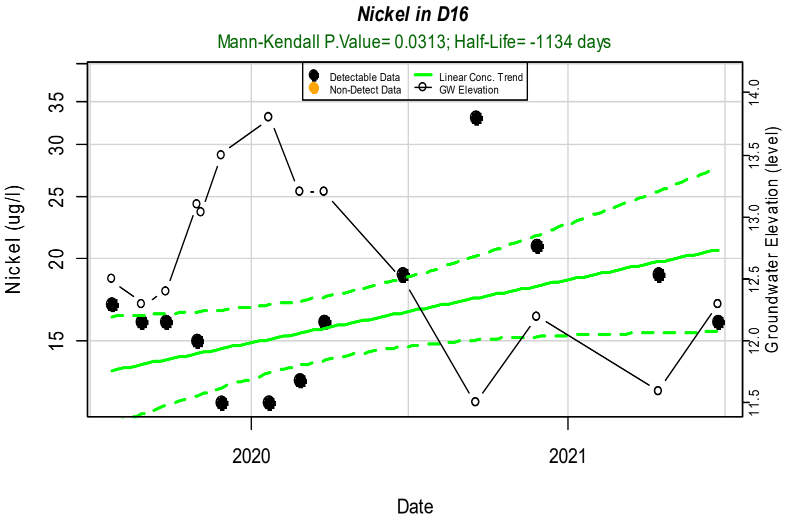
Mann-Kendall P.Value= <0.01; Half-Life= 865 days

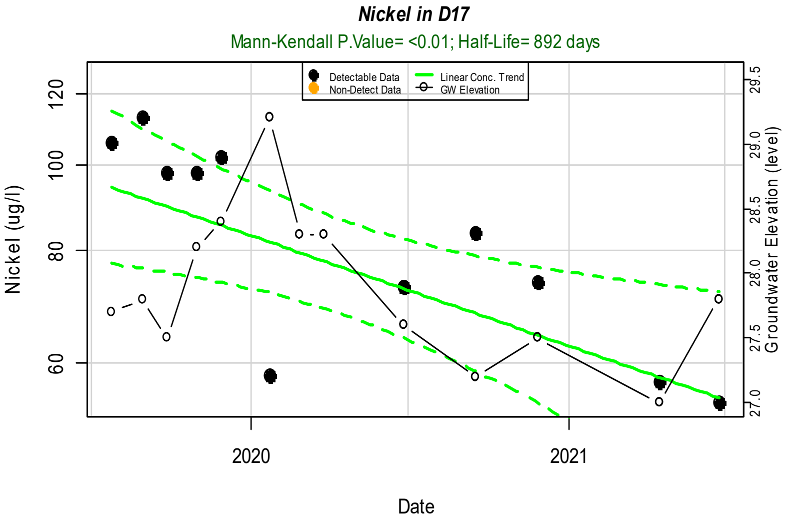


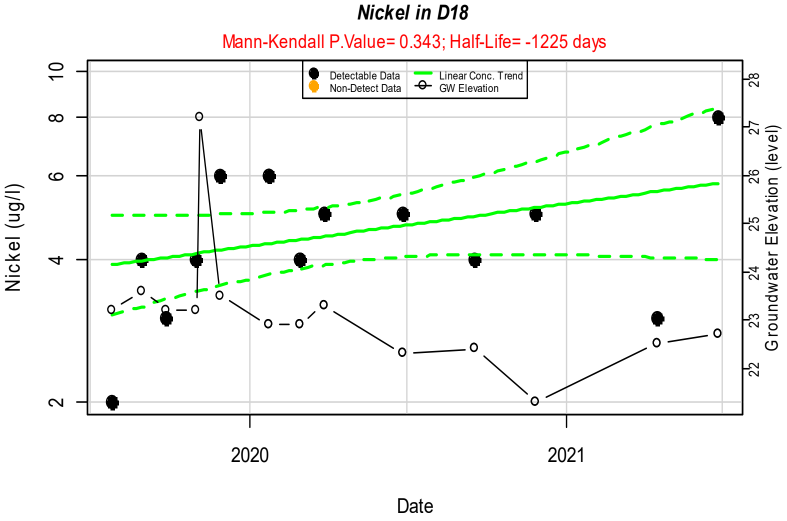
Nickel in D15

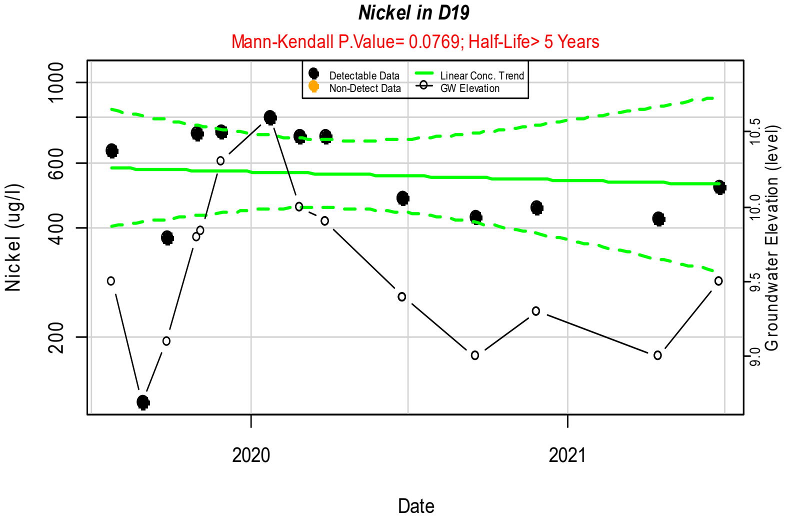
Mann-Kendall P.Value= <0.01; Half-Life= 1387 days




Nickel in D16
Mann-Kendall P.Value= 0.0313; Half-Life= -1134 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Nickel (ug/l)
15
20
25
30
35
Groundwater Elevation (level)
11.5
12.0
12.5
13.0
13.5
14.0
2020
2021
Date

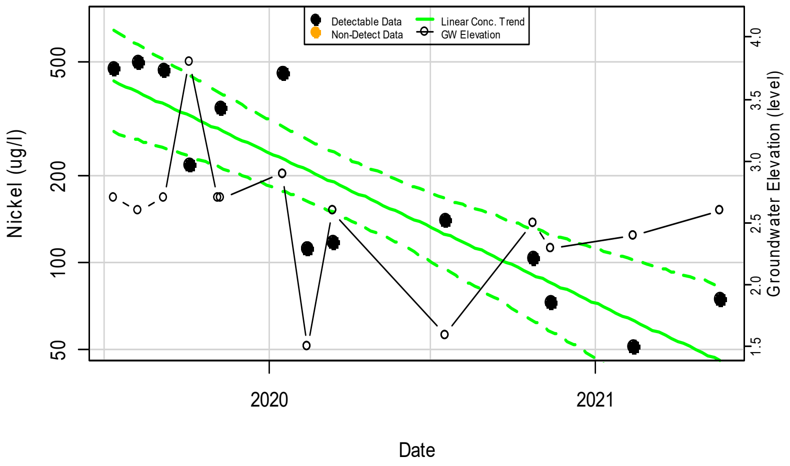

Nickel in D17
Mann-Kendall P.Value= <0.01; Half-Life= 892 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Nickel (ug/l)
60
80
100
120
Groundwater Elevation (level)
27.0
27.5
28.0
28.5
29.0
29.5
2020
2021
Date


Nickel in D18
Mann-Kendall P.Value= 0.343; Half-Life= -1225 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Nickel (ug/l)
2
4
6
8
10
Groundwater Elevation (level)
22
23
24
25
26
27
28
2020
2021
Date

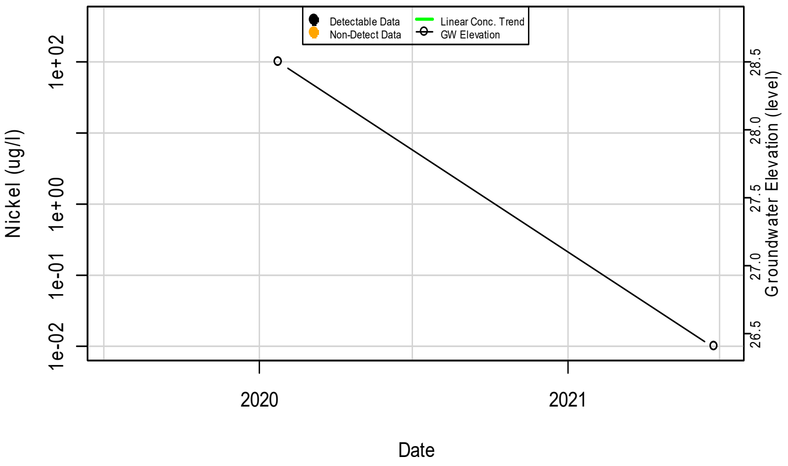

Nickel in D19
Mann-Kendall P.Value= 0.0769; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Nickel (ug/l)
200
400
600
800
1000
Groundwater Elevation (level)
9.0
9.5
10.0
10.5
2020
2021
Date

Nickel in D2

Mann-Kendall P.Value= <0.01; Half-Life= 210 days

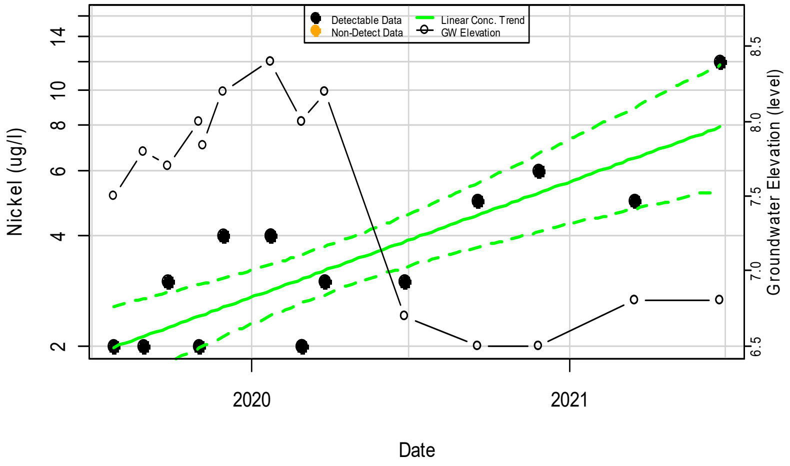


Nickel in D23



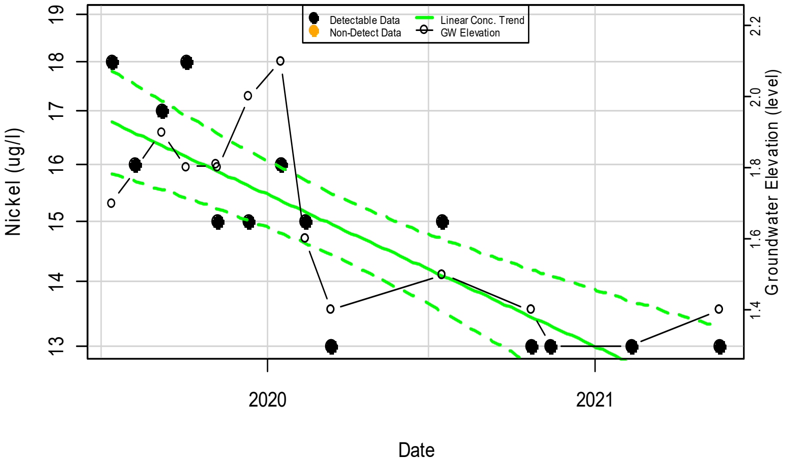
Nickel in D3

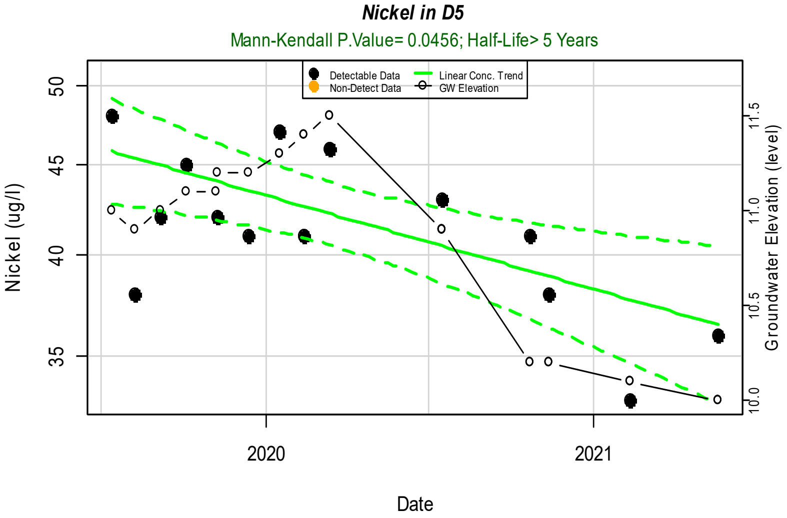
Mann-Kendall P.Value= <0.01; Half-Life= -350 days



Nickel in D4

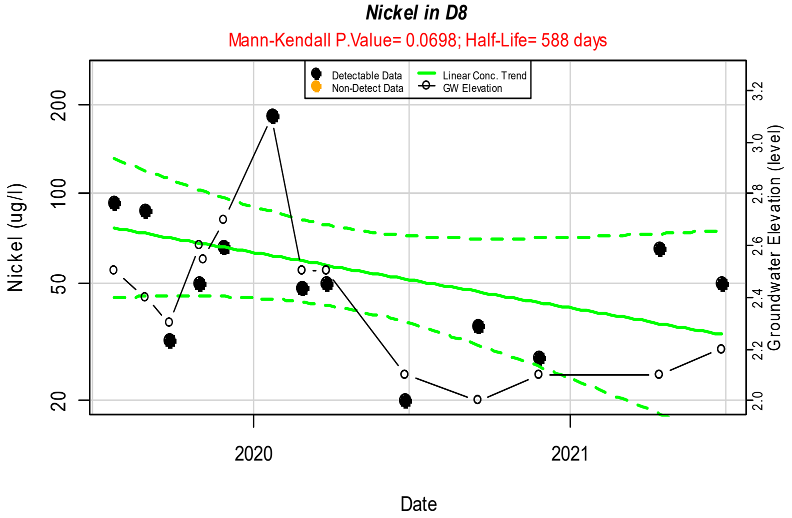
Mann-Kendall P.Value= <0.01; Half-Life= 1461 days





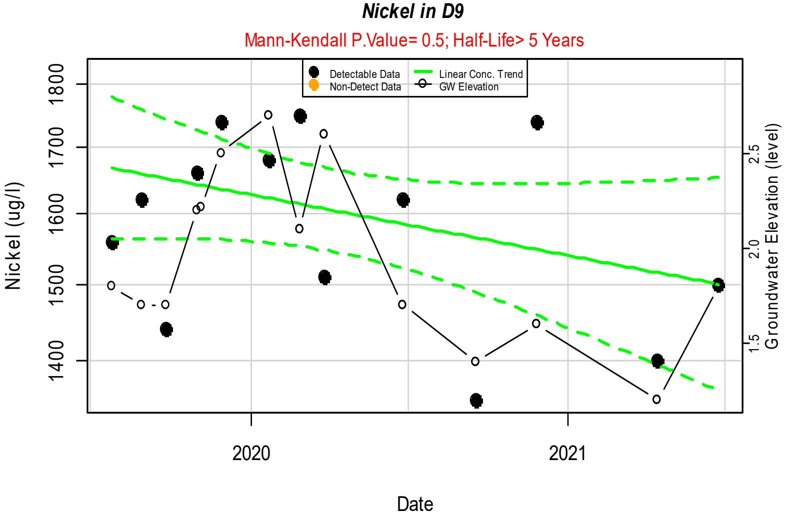
Nickel in D5

Mann-Kendall P.Value= 0.0456; Half-Life> 5 Years



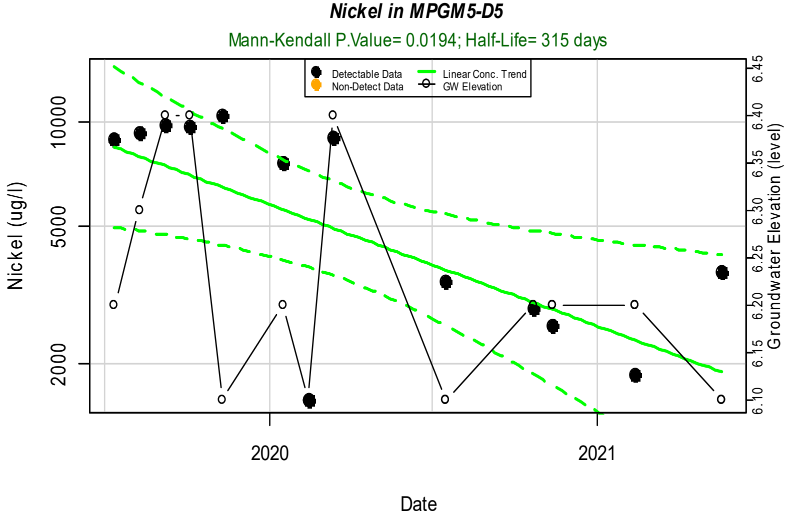
Nickel in D8

Mann-Kendall P.Value= 0.0698; Half-Life= 588 days



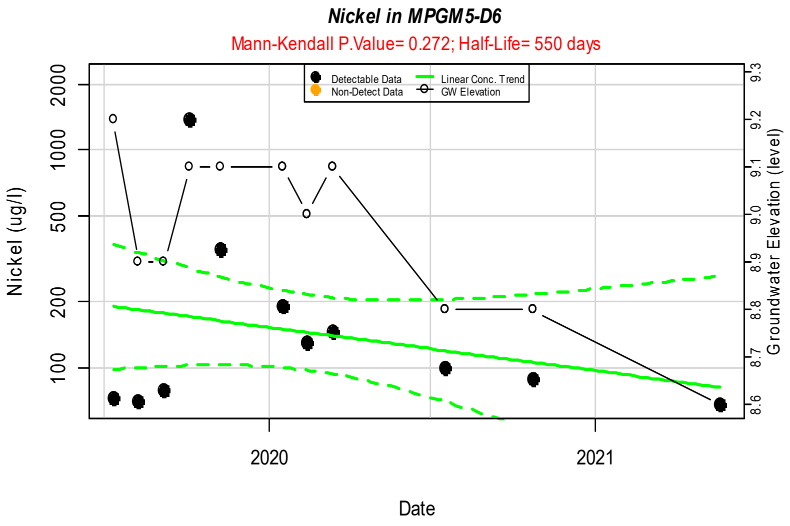
Nickel in D9

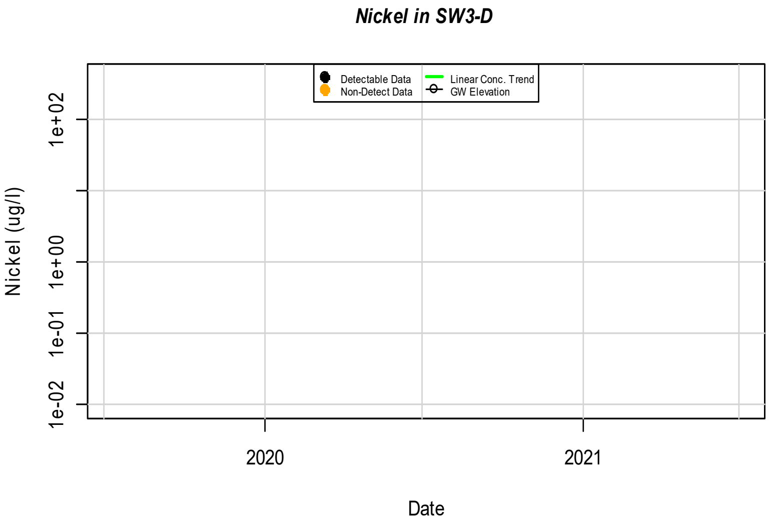
Mann-Kendall P.Value= 0.5; Half-Life> 5 Years

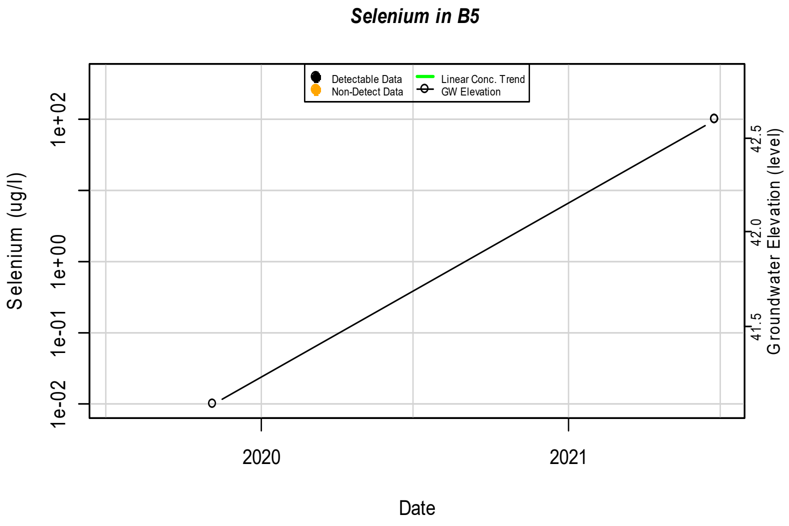


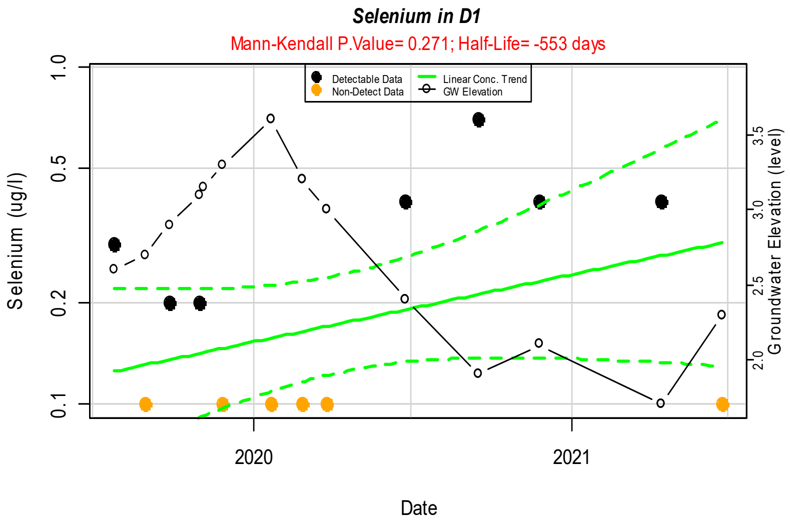
Nickel in MPGM5-D5

Mann-Kendall P.Value= 0.0194; Half-Life= 315 days

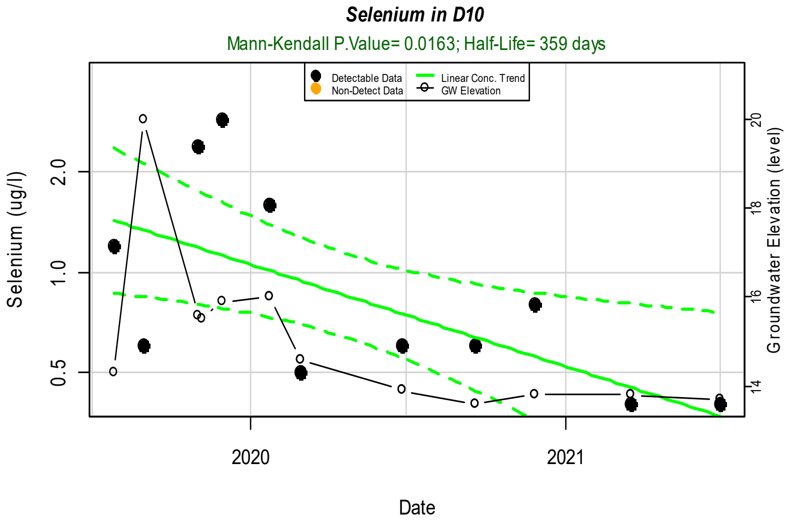

Nickel in MPGM5-D6
Mann-Kendall P.Value= 0.272; Half-Life= 550 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Nickel (ug/l)
2000
1000
500
200
100
Groundwater Elevation (level)
9.3
9.2
9.1
9.0
8.9
8.8
8.7
8.6
2020
2021
Date


Nickel in SW3-D
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Nickel (ug/l)
1e+02
1e+00
1e-01
1e-02
2020
2021
Date

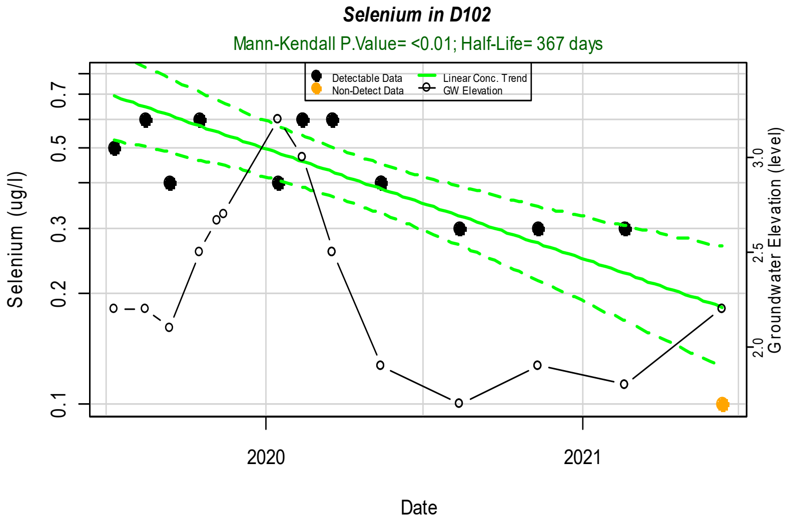

Selenium in B5


Selenium in D1

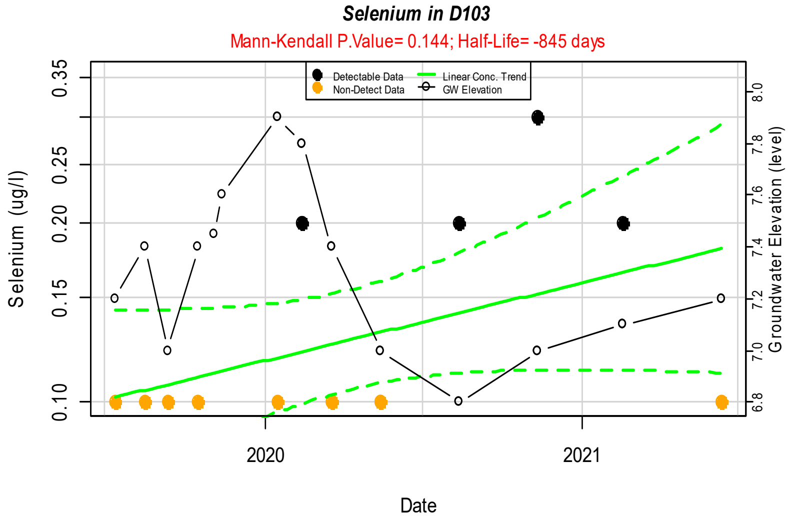
Mann-Kendall P.Value= 0.271; Half-Life= -553 days

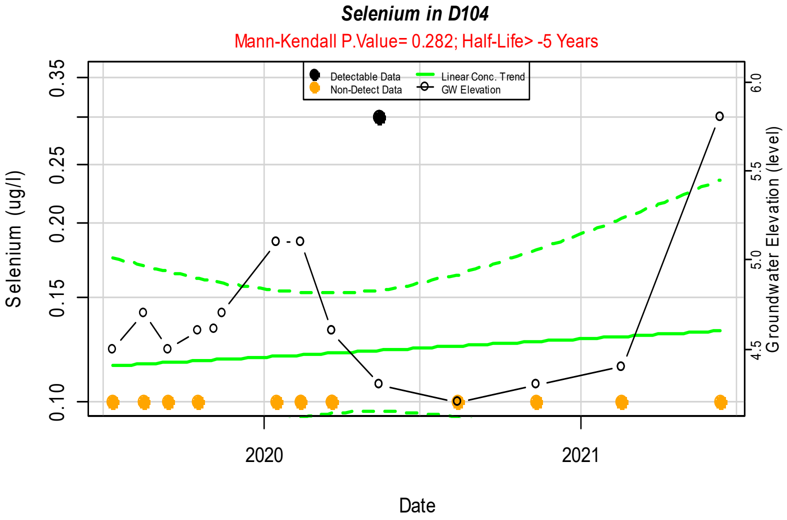

Selenium in D10

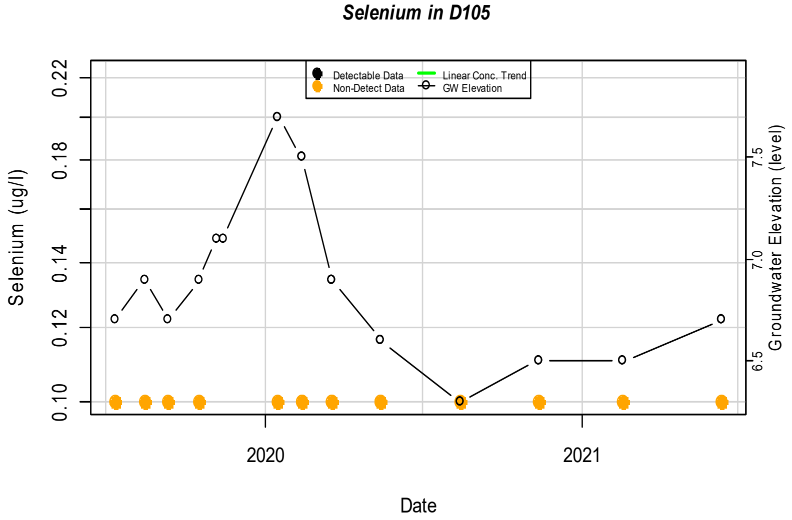
Mann-Kendall P.Value= 0.0163; Half-Life= 359 days

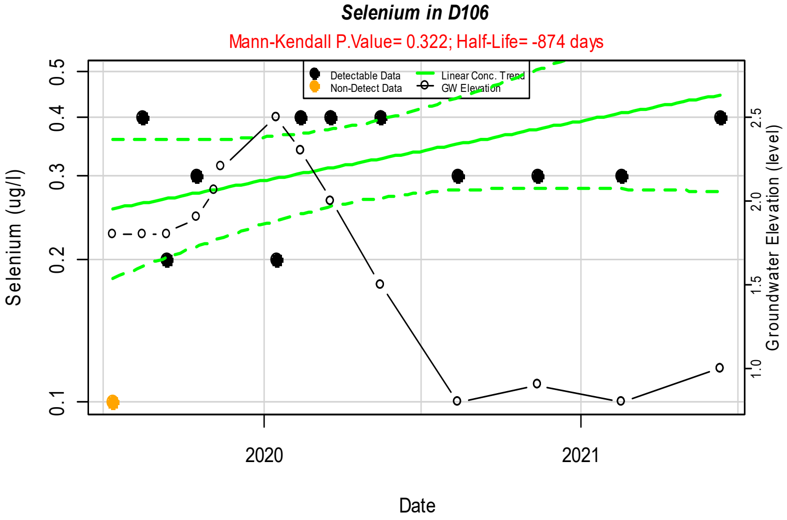

Selenium in D102

Mann-Kendall P.Value= <0.01; Half-Life= 367 days


Selenium in D103
Mann-Kendall P.Value= 0.144; Half-Life= -845 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Selenium (ug/l)
0.10
0.15
0.20
0.25
0.35
Groundwater Elevation (level)
6.8
7.0
7.2
7.4
7.6
7.8
8.0
2020
2021
Date

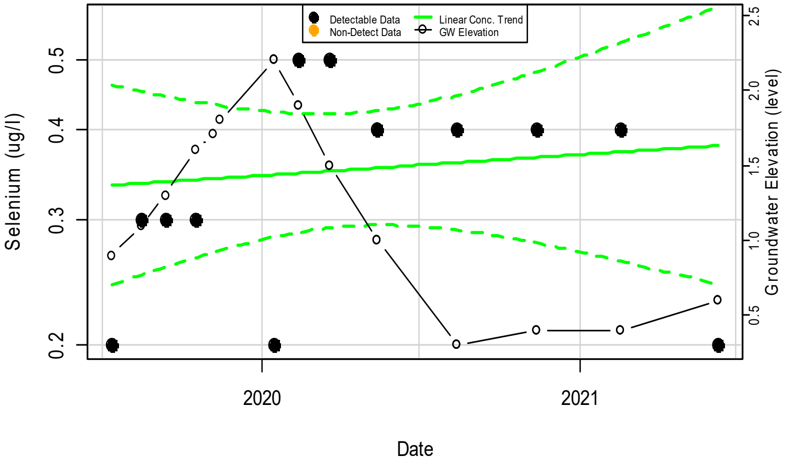

Selenium in D104
Mann-Kendall P.Value= 0.282; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Selenium (ug/l)
0.10
0.15
0.20
0.25
0.35
Groundwater Elevation (level)
4.5
5.0
5.5
6.0
2020
2021
Date


Selenium in D105
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Selenium (ug/l)
0.10
0.12
0.14
0.18
0.22
Groundwater Elevation (level)
6.5
7.0
7.5
2020
2021
Date


Selenium in D106
Mann-Kendall P.Value= 0.322; Half-Life= -874 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Selenium (ug/l)
0.1
0.2
0.3
0.4
0.5
Groundwater Elevation (level)
1.0
1.5
2.0
2.5
2020
2021
Date

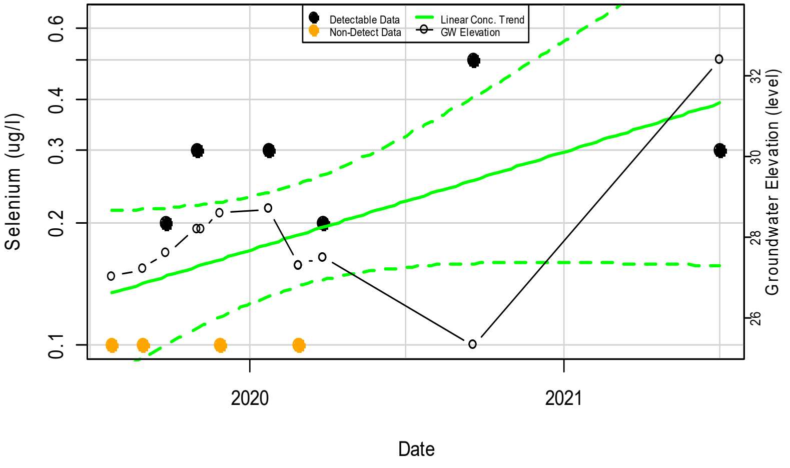
Selenium in D107

Mann-Kendall P.Value= 0.569; Half-Life> -5 Years



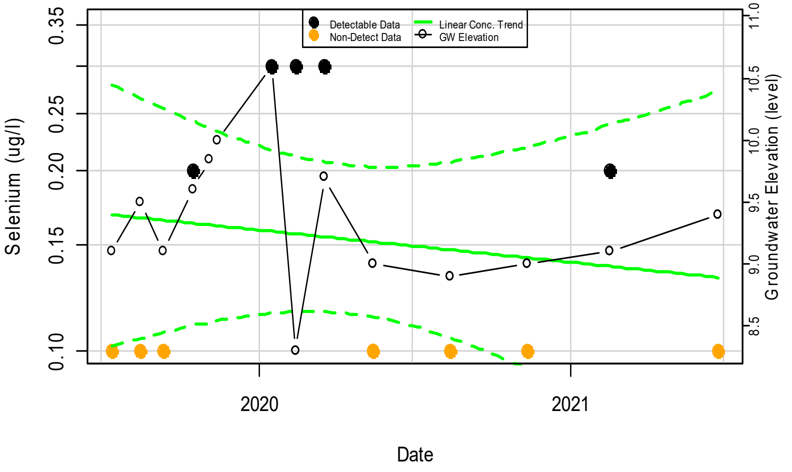
Selenium in D11

Mann-Kendall P.Value= 0.202; Half-Life= -457 days



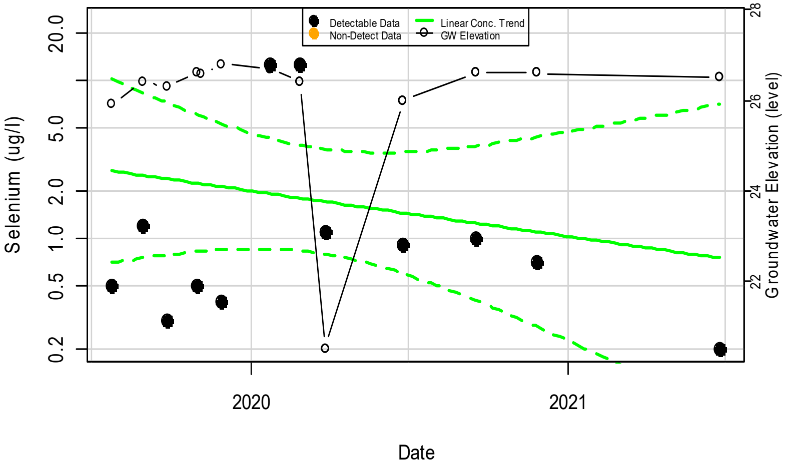
Selenium in D113

Mann-Kendall P.Value= 0.608; Half-Life> 5 Years

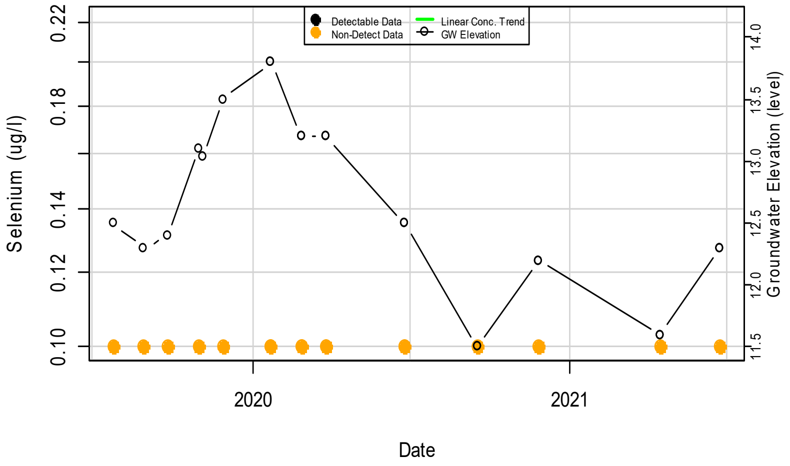


Selenium in D15

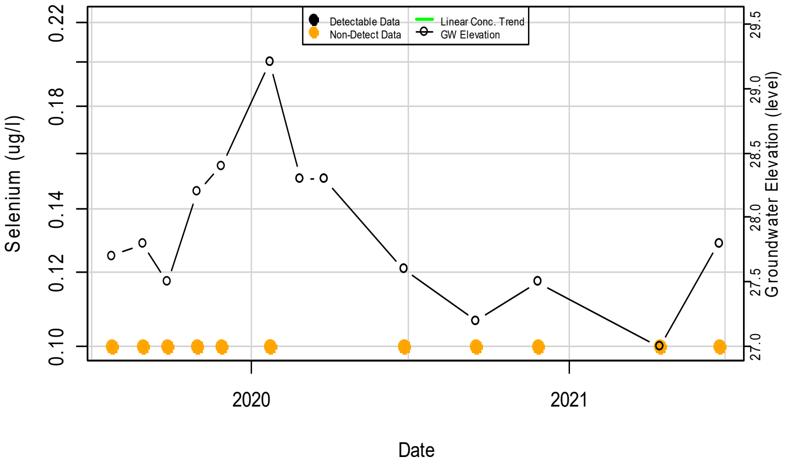
Mann-Kendall P.Value= 0.337; Half-Life= 384 days



Selenium in D16

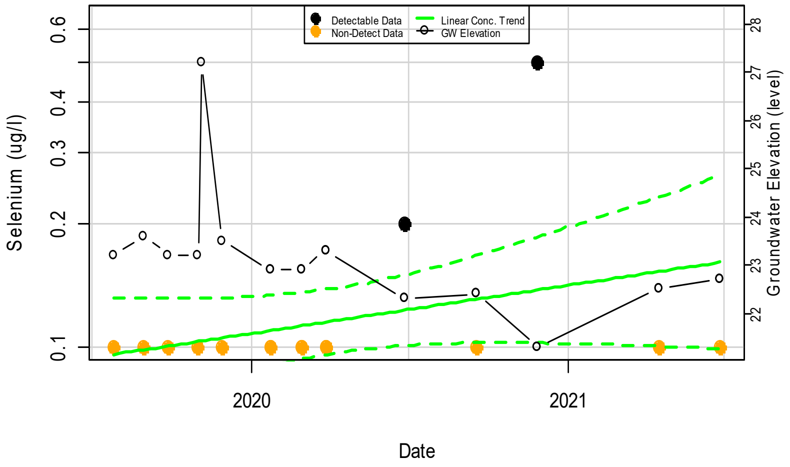


Selenium in D17



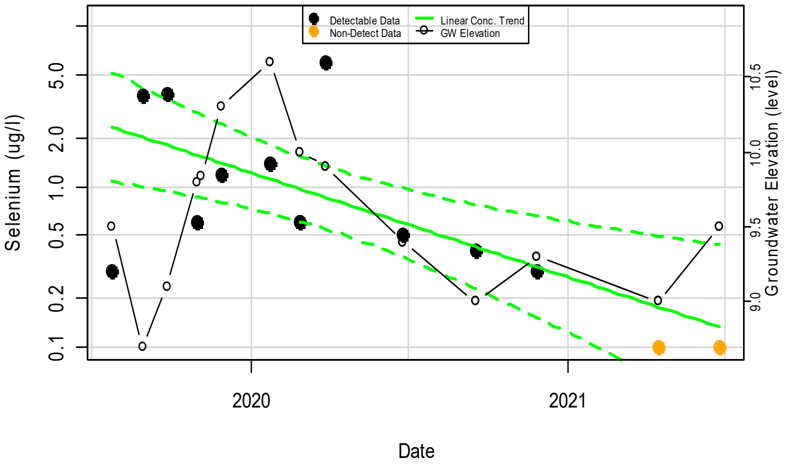
Selenium in D18

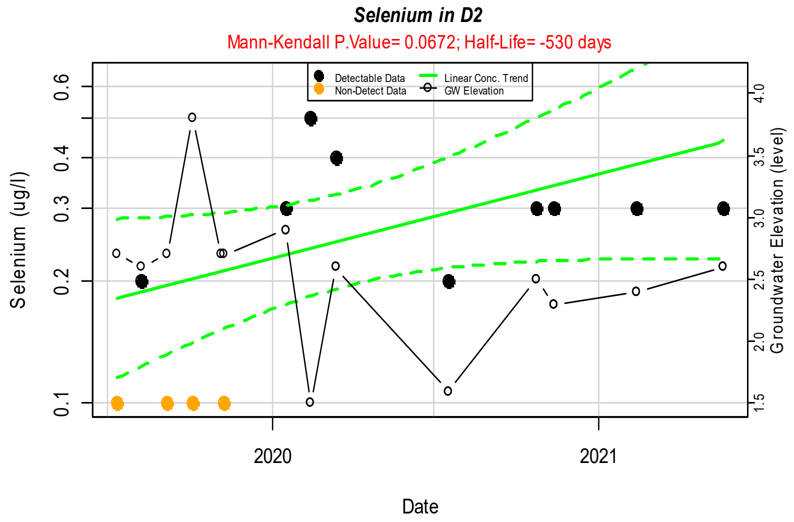
Mann-Kendall P.Value= 0.0564; Half-Life= -934 days

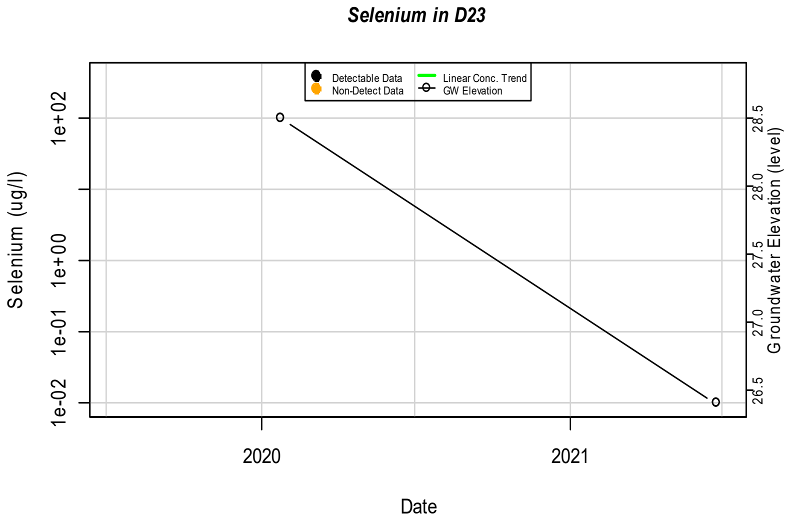


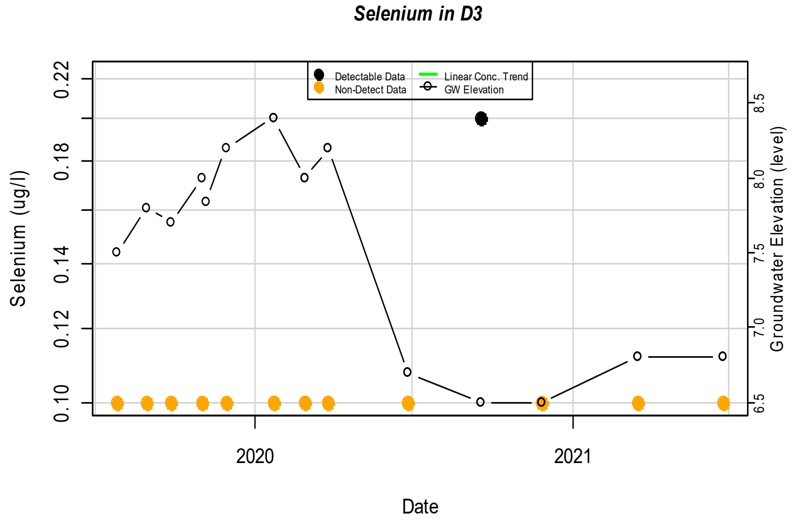
Selenium in D19

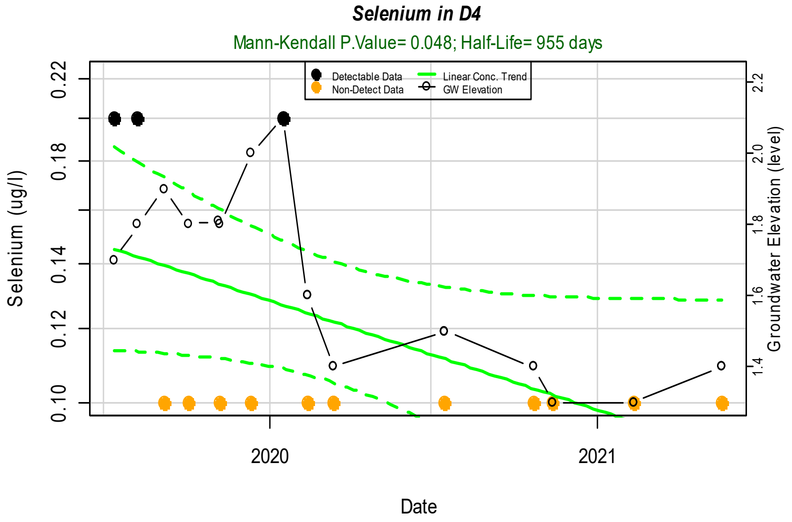
Mann-Kendall P.Value= 0.0116; Half-Life= 169 days

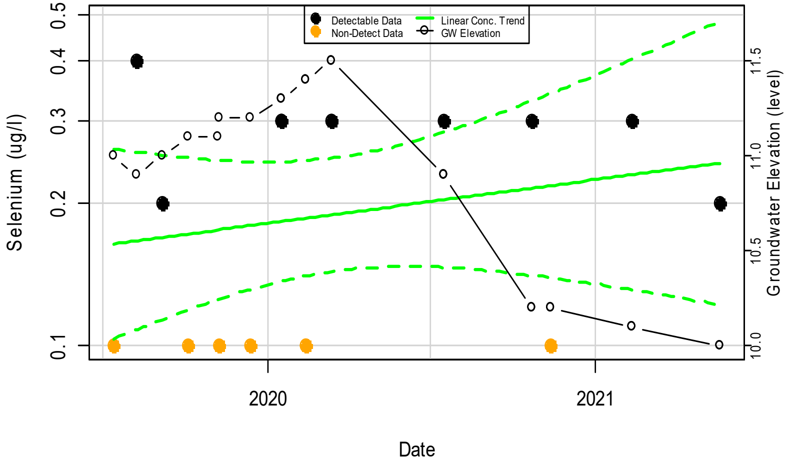



Selenium in D2
Mann-Kendall P.Value= 0.0672; Half-Life= -530 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Selenium (ug/l)
0.1
0.2
0.3
0.4
0.6
Groundwater Elevation (level)
1.5
2.0
2.5
3.0
3.5
4.0
2020
2021
Date


Selenium in D23
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Selenium (ug/l)
1e-02
1e-01
1e+00
1e+02
Groundwater Elevation (level)
26.5
27.0
27.5
28.0
28.5
2020
2021
Date

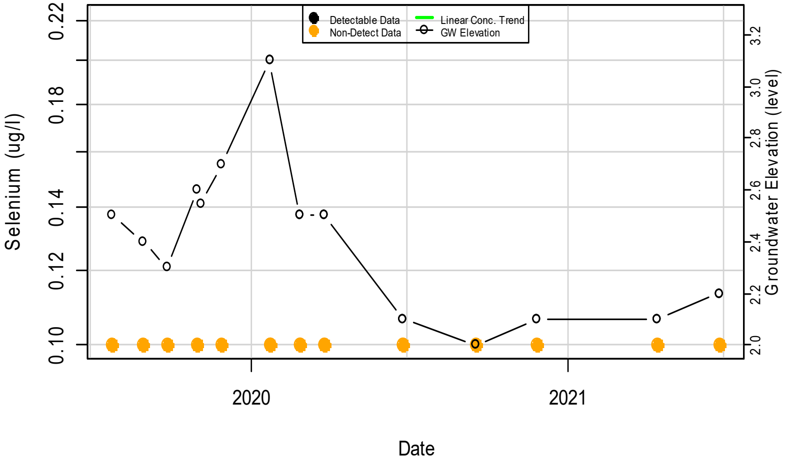

Selenium in D3
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Selenium (ug/l)
0.10
0.12
0.14
0.18
0.22
Groundwater Elevation (level)
6.5
7.0
7.5
8.0
8.5
2020
2021
Date


Selenium in D4
Mann-Kendall P.Value= 0.048; Half-Life= 955 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Selenium (ug/l)
0.10
0.12
0.14
0.18
0.22
Groundwater Elevation (level)
1.4
1.6
1.8
2.0
2.2
2020
2021
Date

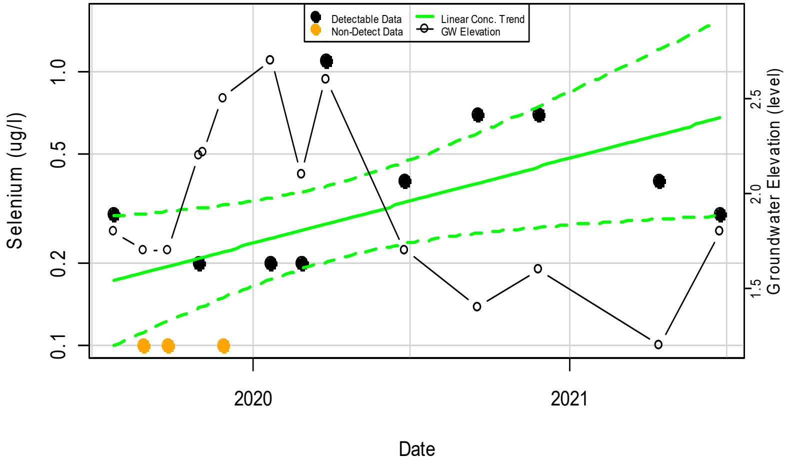


Selenium in D5

Mann-Kendall P.Value= 0.507; Half-Life= -1195 days

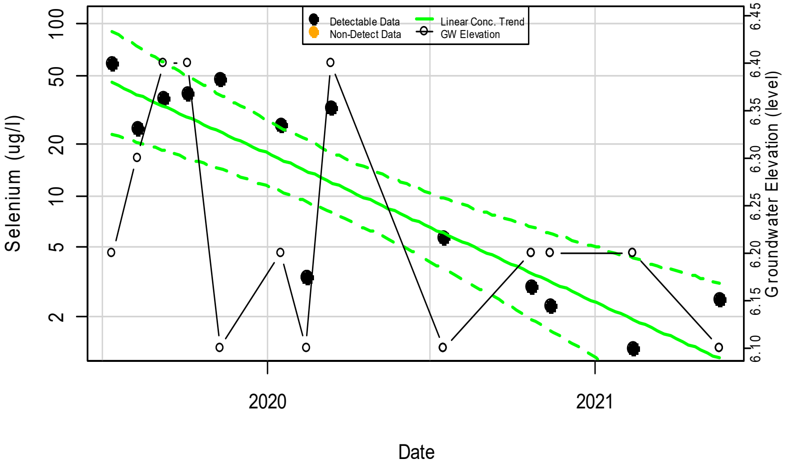


Selenium in D8



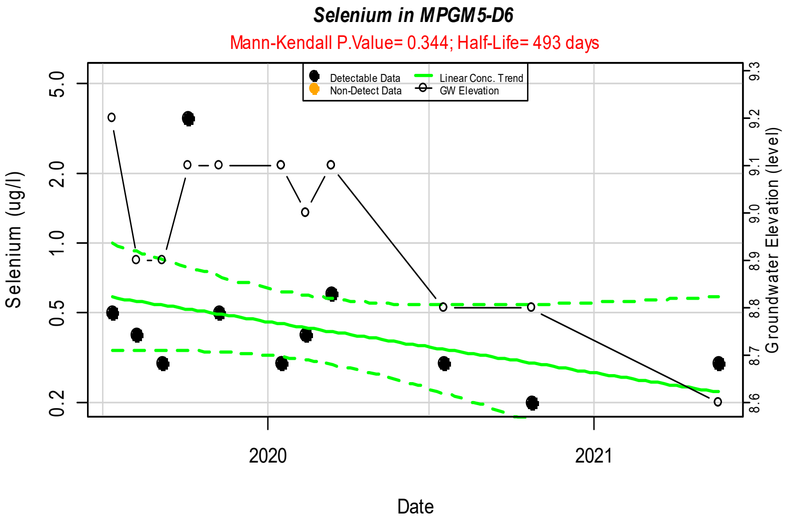
Selenium in D9

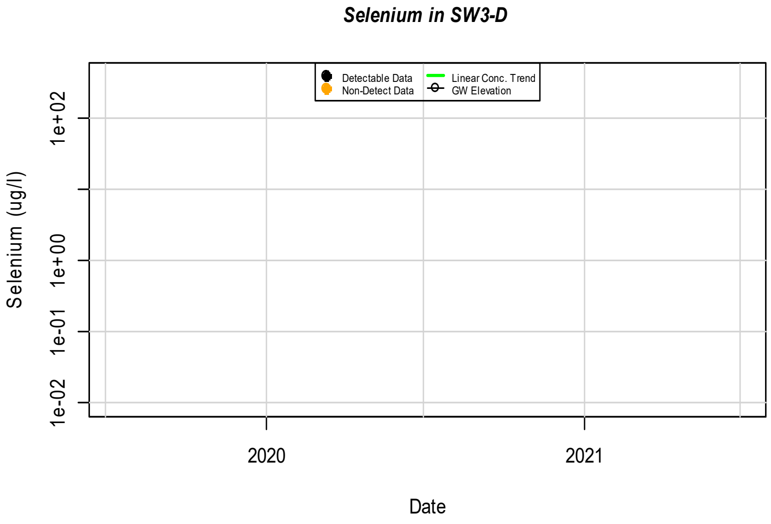
Mann-Kendall P.Value= <0.01; Half-Life= -354 days

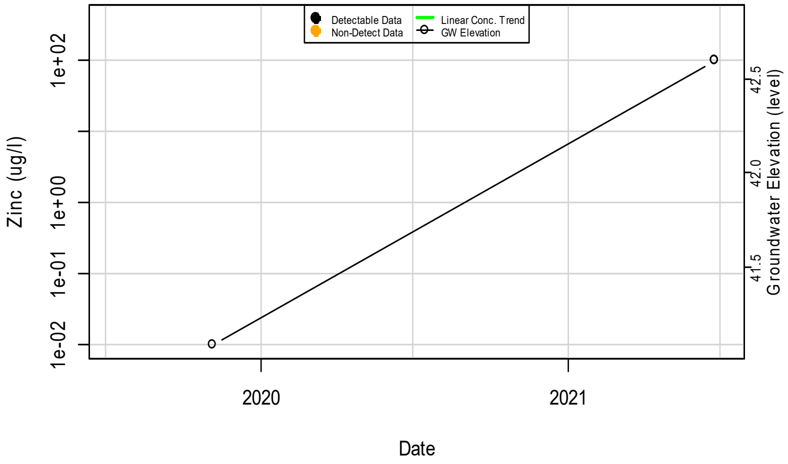


Selenium in MPGM5-D5

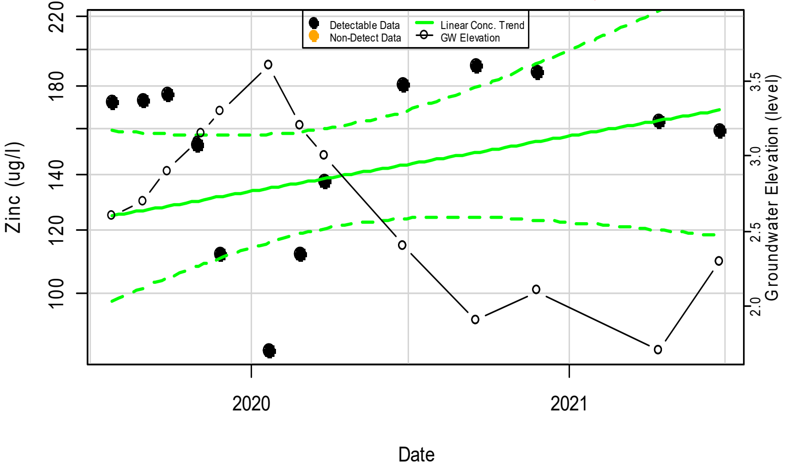
Mann-Kendall P.Value= <0.01; Half-Life= 128 days


Selenium in MPGM5-D6
Mann-Kendall P.Value= 0.344; Half-Life= 493 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Selenium (ug/l)
0.2
0.5
1.0
2.0
5.0
Groundwater Elevation (level)
8.6
8.7
8.8
8.9
9.0
9.1
9.2
9.3
2020
2021
Date


Selenium in SW3-D
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Selenium (ug/l)
1e-02
1e-01
1e+00
1e+02
2020
2021
Date

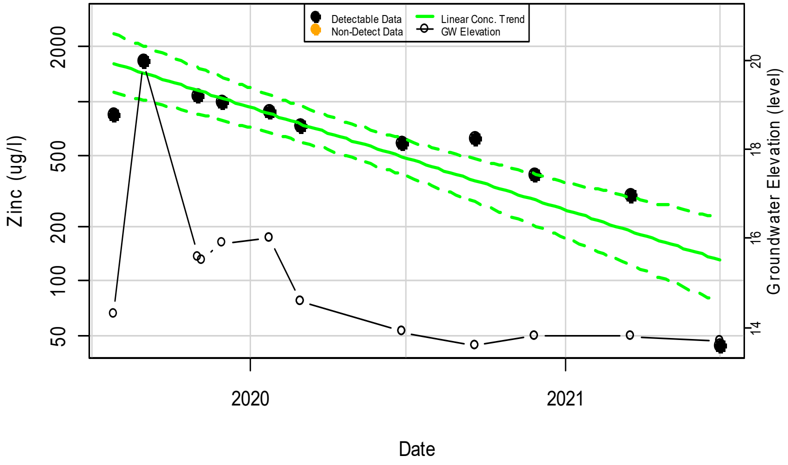


Zinc in B5



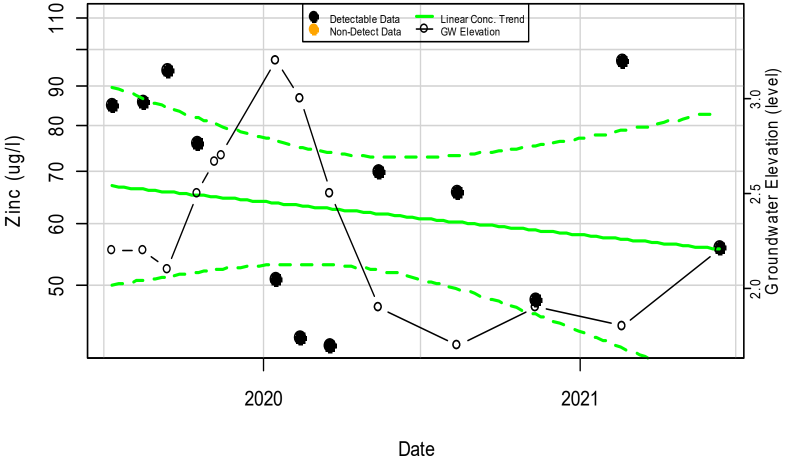
Zinc in D1

Mann-Kendall P.Value= 0.168; Half-Life= -1619 days



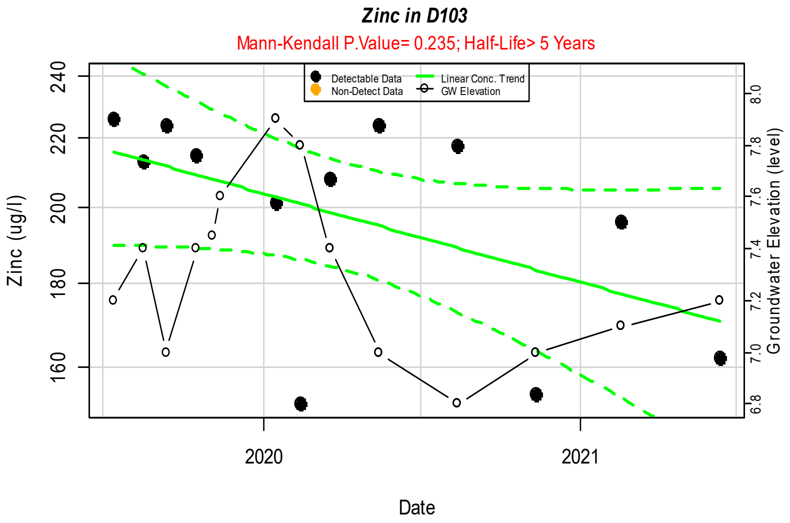
Zinc in D10

Mann-Kendall P.Value= <0.01; Half-Life= 194 days

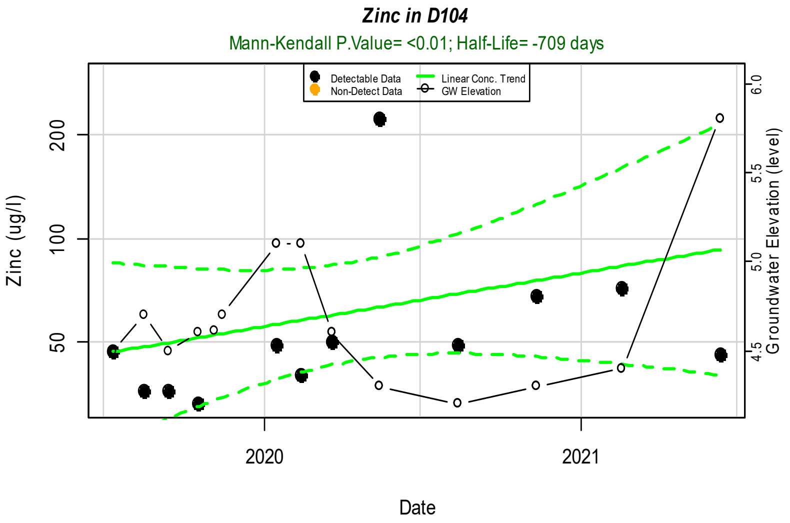


Zinc in D102

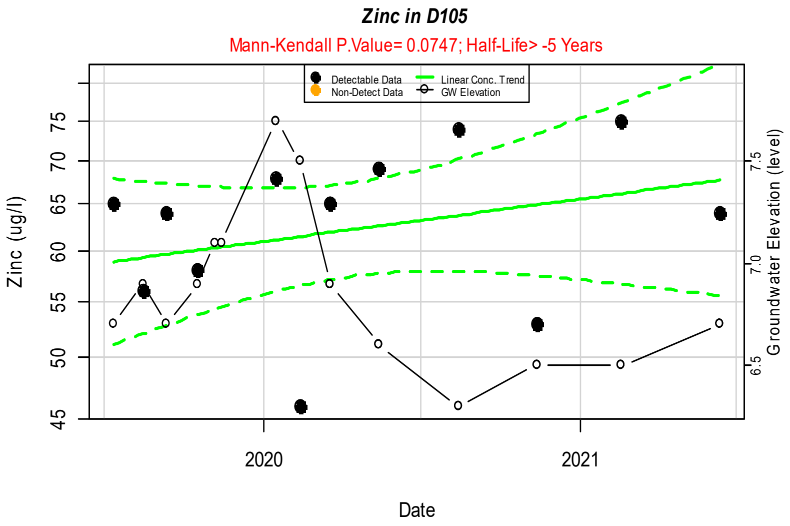
Mann-Kendall P.Value= 0.362; Half-Life> 5 Years


Zinc in D103

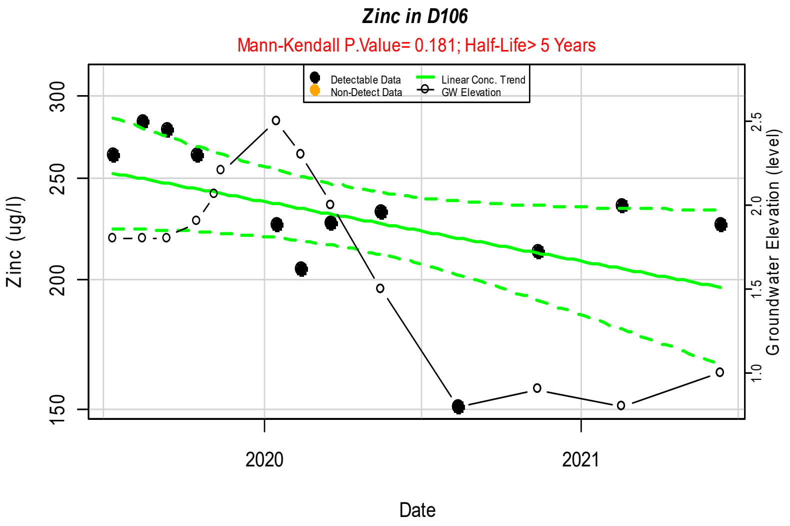
Mann-Kendall P.Value= 0.235; Half-Life> 5 Years


Zinc in D104

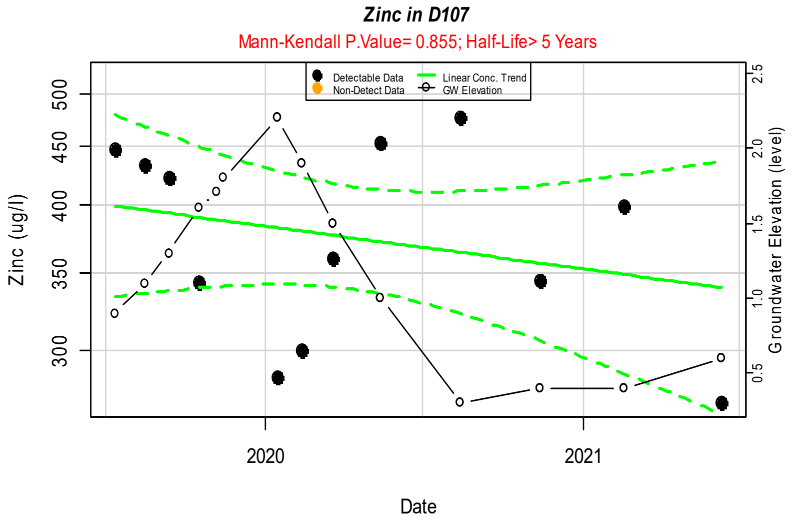
Mann-Kendall P.Value= <0.01; Half-Life= -709 days


Zinc in D105

Mann-Kendall P.Value= 0.0747; Half-Life> -5 Years

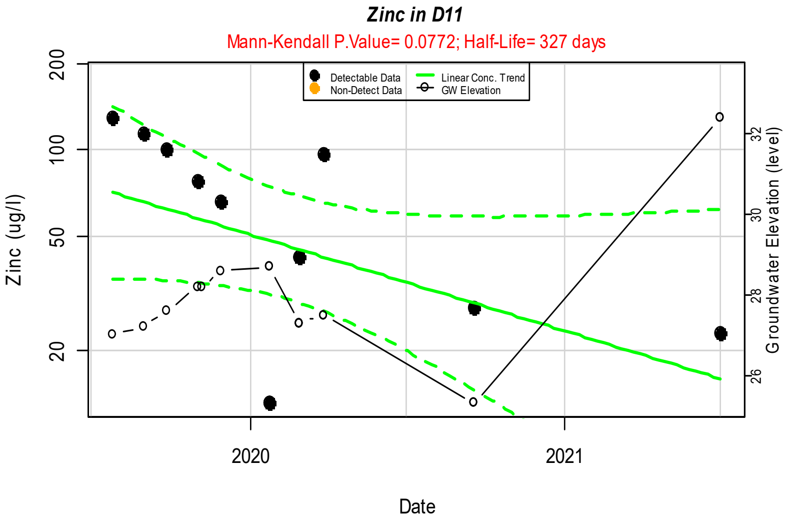

Zinc in D106

Mann-Kendall P.Value= 0.181; Half-Life> 5 Years



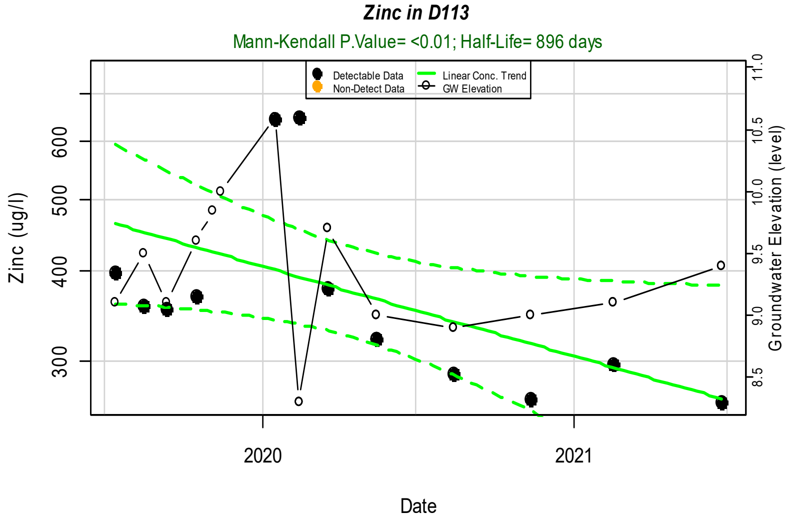
Zinc in D107

Mann-Kendall P.Value= 0.855; Half-Life> 5 Years



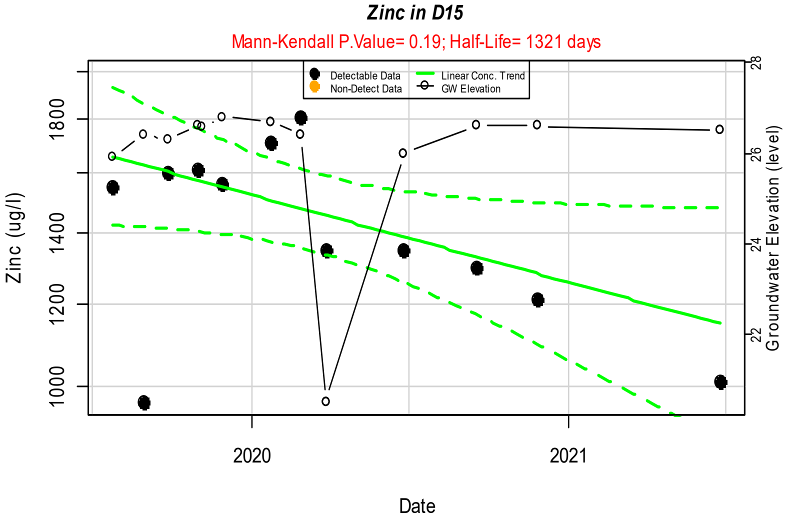
Zinc in D11

Mann-Kendall P.Value= 0.0772; Half-Life= 327 days



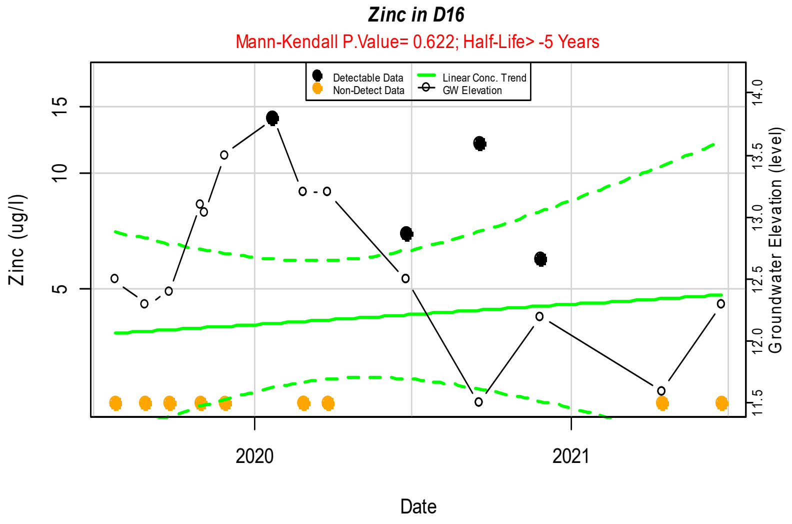
Zinc in D113

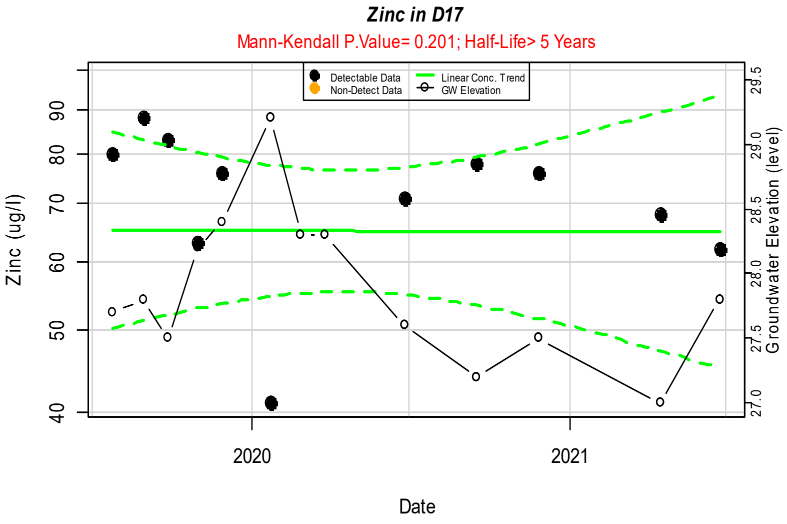
Mann-Kendall P.Value= <0.01; Half-Life= 896 days

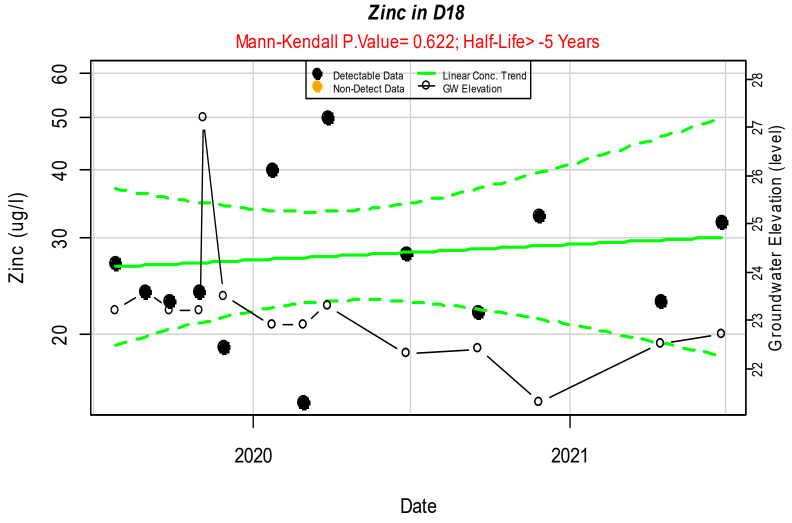


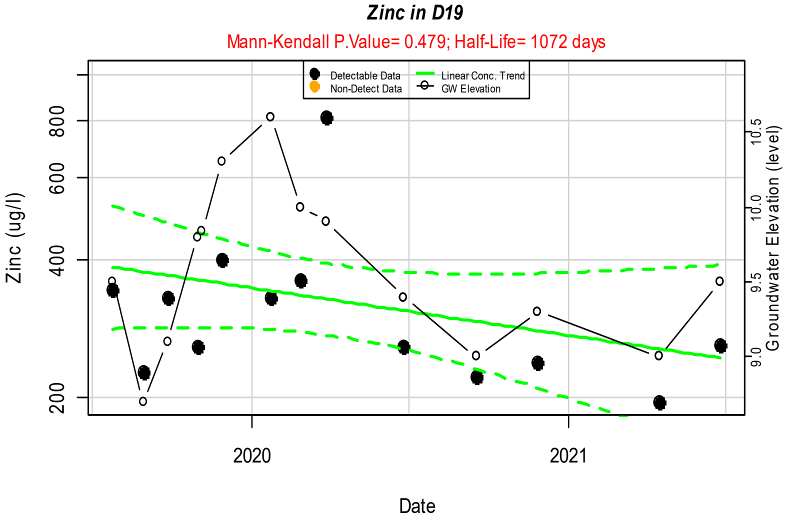
Zinc in D15

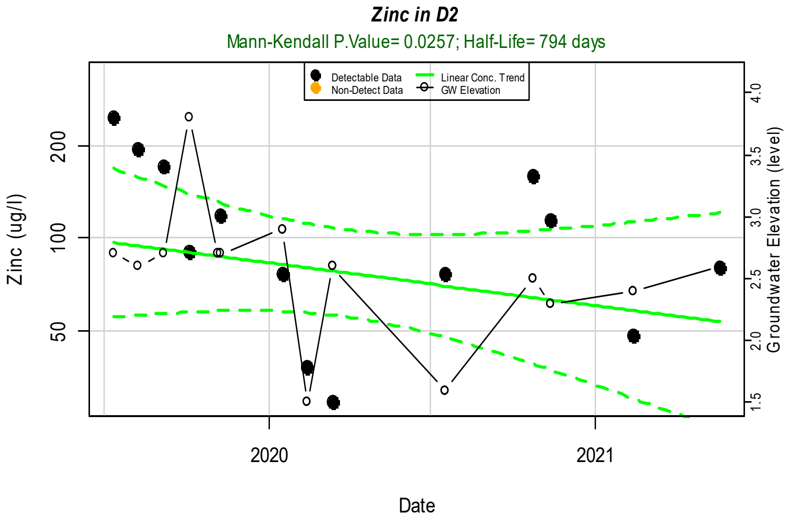
Mann-Kendall P.Value= 0.19; Half-Life= 1321 days


Zinc in D16
Mann-Kendall P.Value= 0.622; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Zinc (ug/l)
5
10
15
Groundwater Elevation (level)
11.5
12.0
12.5
13.0
13.5
14.0
2020
2021
Date


Zinc in D17
Mann-Kendall P.Value= 0.201; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Zinc (ug/l)
40
50
60
70
80
90
Groundwater Elevation (level)
27.0
27.5
28.0
28.5
29.0
29.5
2020
2021
Date

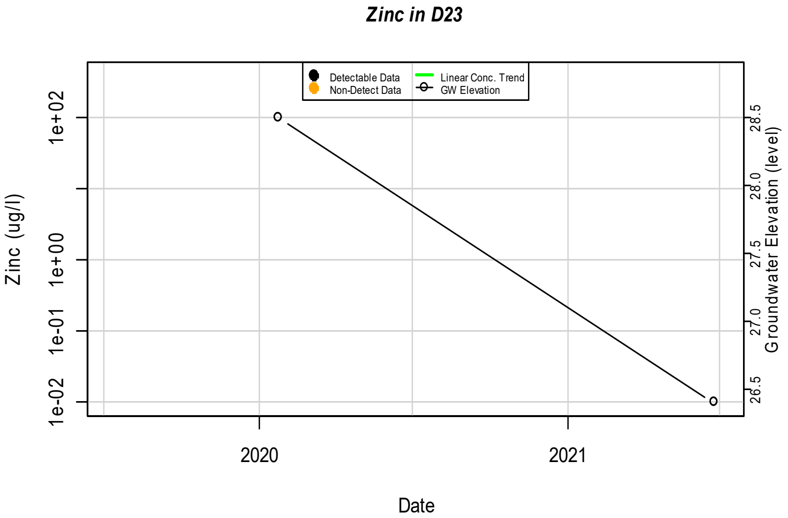

Zinc in D18
Mann-Kendall P.Value= 0.622; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Zinc (ug/l)
20
30
40
50
60
Groundwater Elevation (level)
22
23
24
25
26
27
28
2020
2021
Date


Zinc in D19
Mann-Kendall P.Value= 0.479; Half-Life= 1072 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
GW Elevation
Zinc (ug/l)
200
400
600
800
Groundwater Elevation (level)
9.0
9.5
10.0
10.5
2020
2021
Date

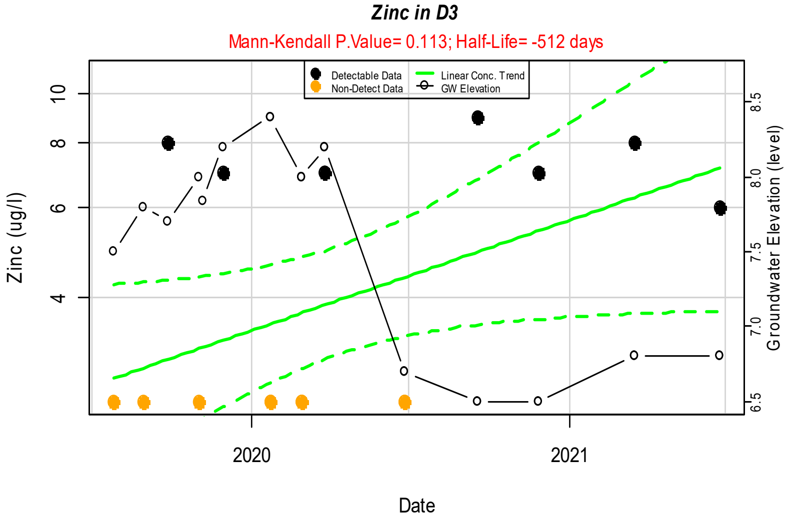


Zinc in D2

Mann-Kendall P.Value= 0.0257; Half-Life= 794 days

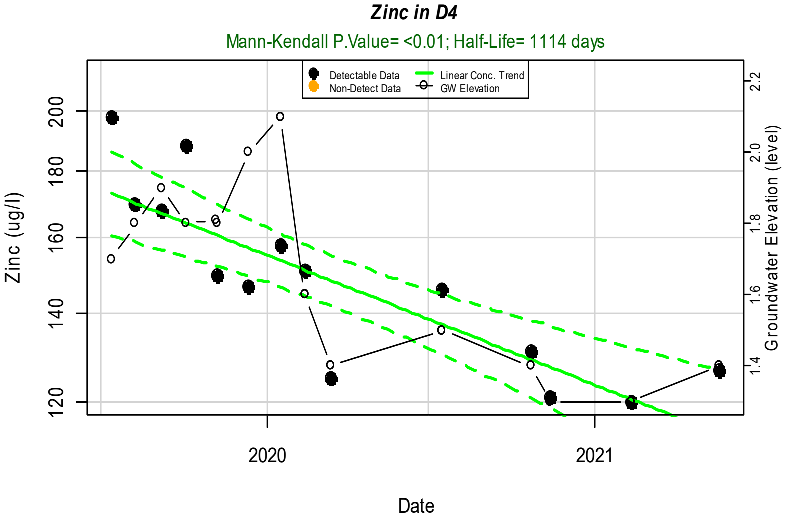


Zinc in D23



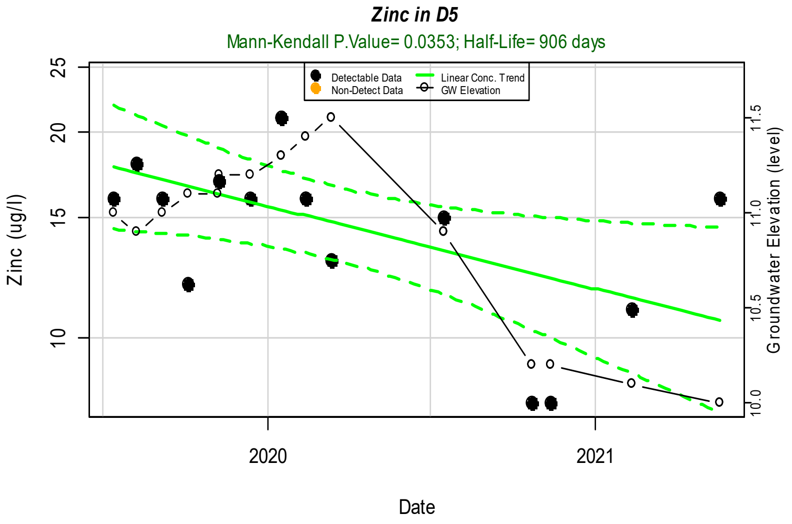
Zinc in D3

Mann-Kendall P.Value= 0.113; Half-Life= -512 days



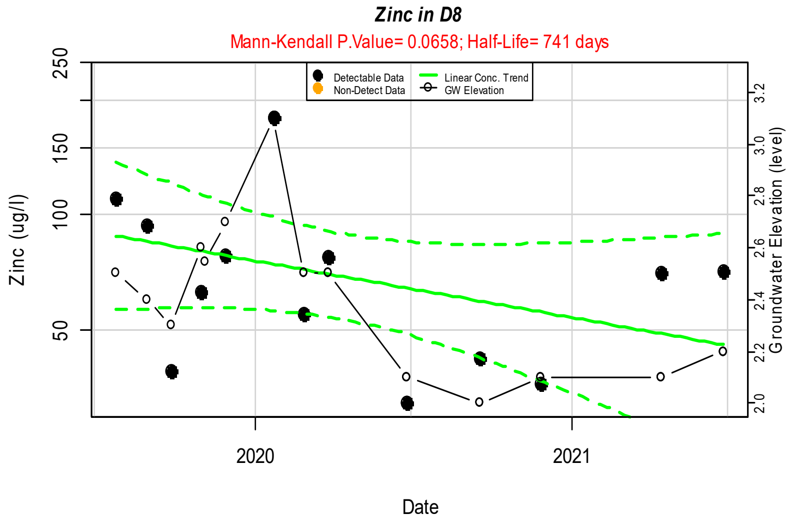
Zinc in D4

Mann-Kendall P.Value= <0.01; Half-Life= 1114 days



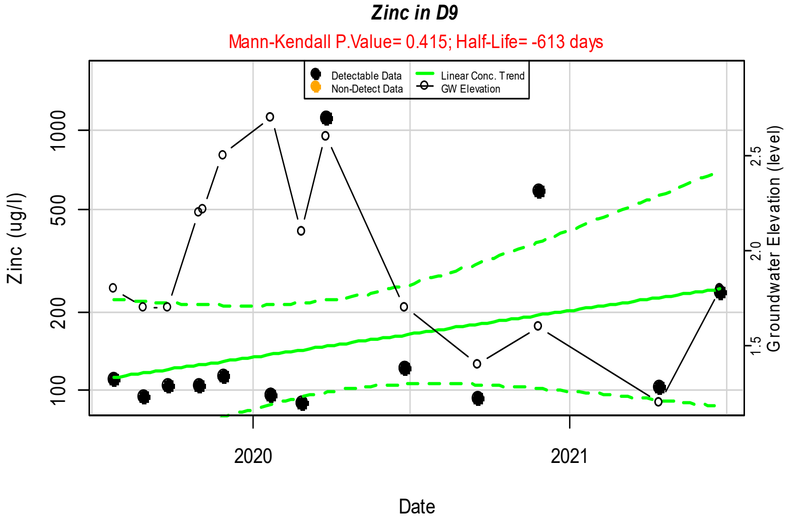
Zinc in D5

Mann-Kendall P.Value= 0.0353; Half-Life= 906 days



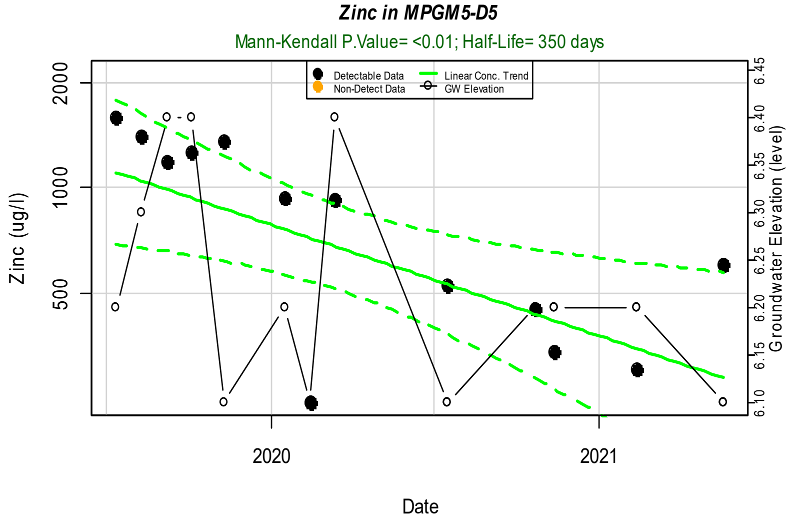
Zinc in D8

Mann-Kendall P.Value= 0.0658; Half-Life= 741 days



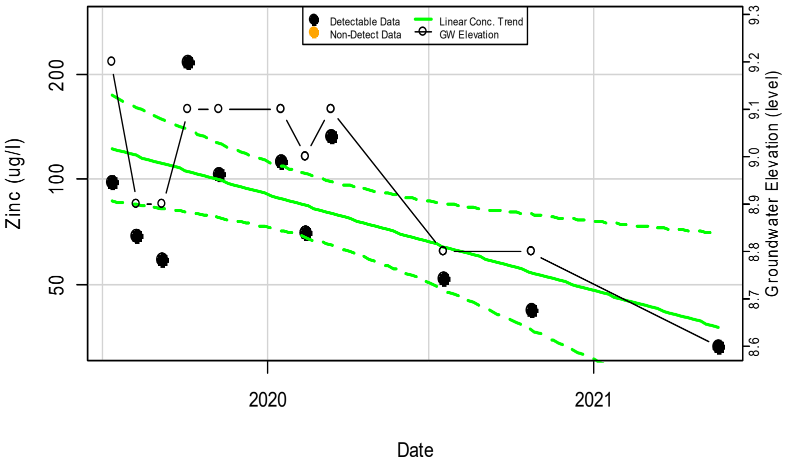
Zinc in D9

Mann-Kendall P.Value= 0.415; Half-Life= -613 days



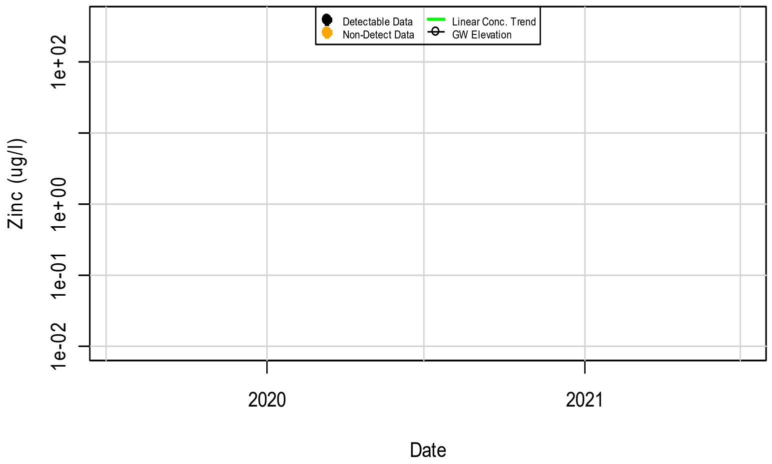
Zinc in MPGM5-D5

Mann-Kendall P.Value= <0.01; Half-Life= 350 days

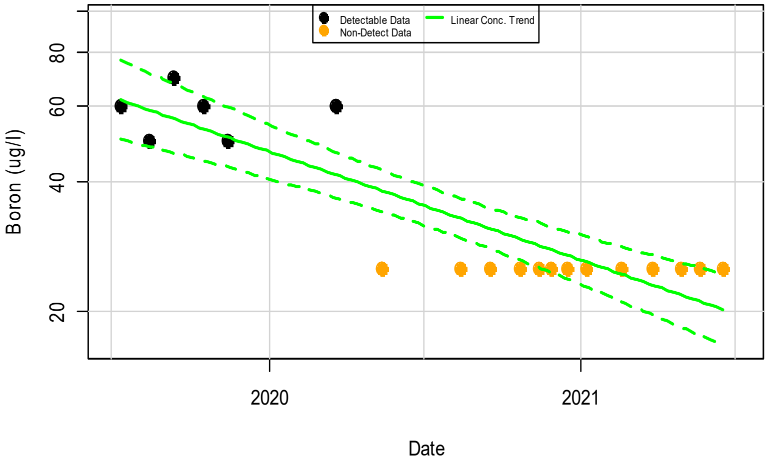


Zinc in MPGM5-D6

Mann-Kendall P.Value= 0.272; Half-Life= 400 days

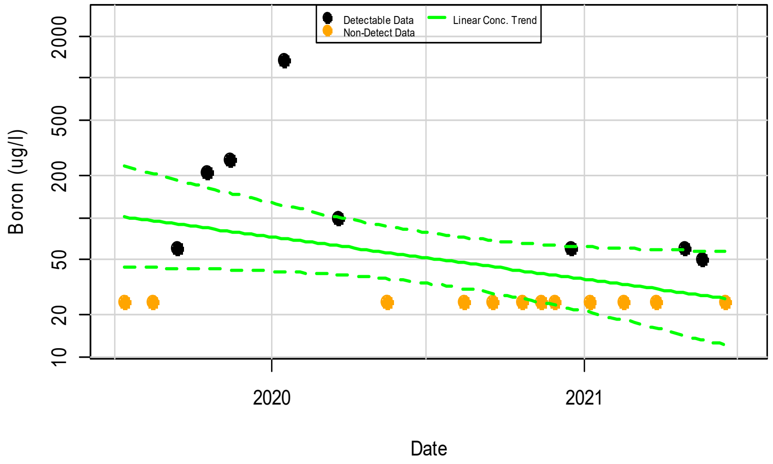


Zinc in SW3-D



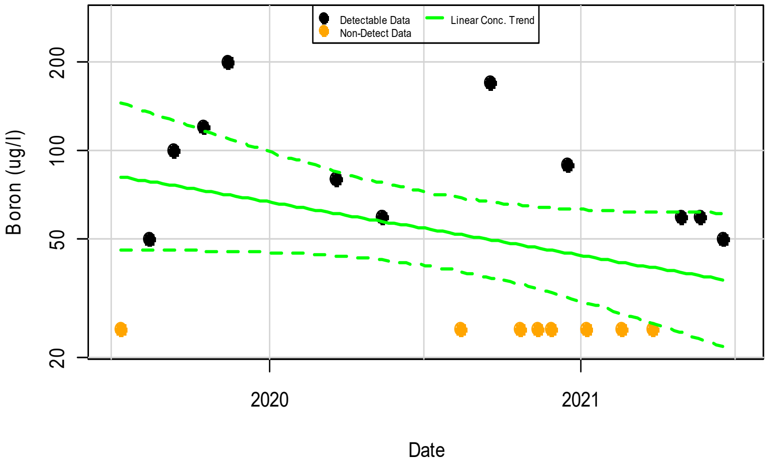
Boron in C

Mann-Kendall P.Value= <0.01; Half-Life= 435 days



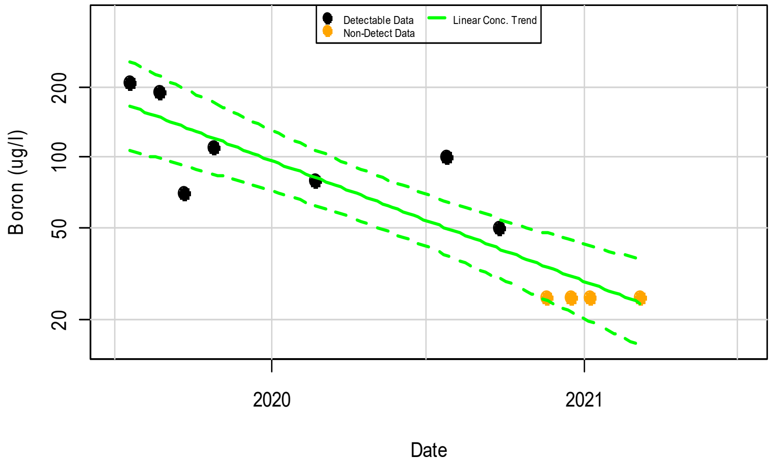
Boron in E

Mann-Kendall P.Value= 0.0993; Half-Life= 364 days



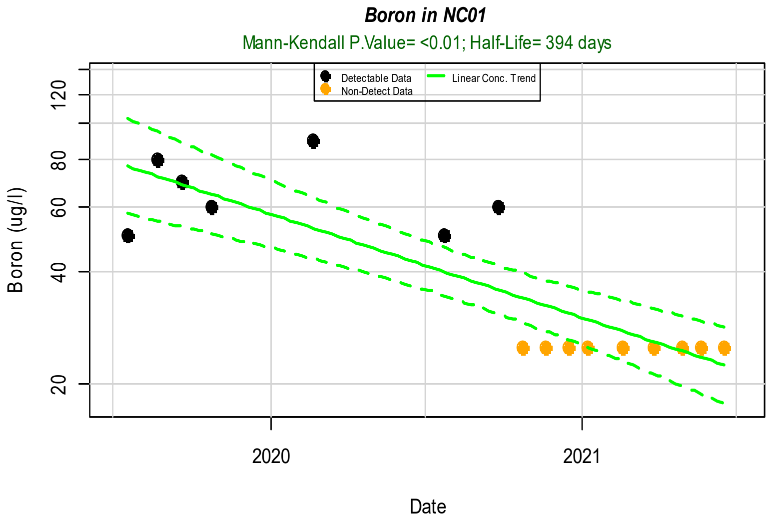
Boron in G

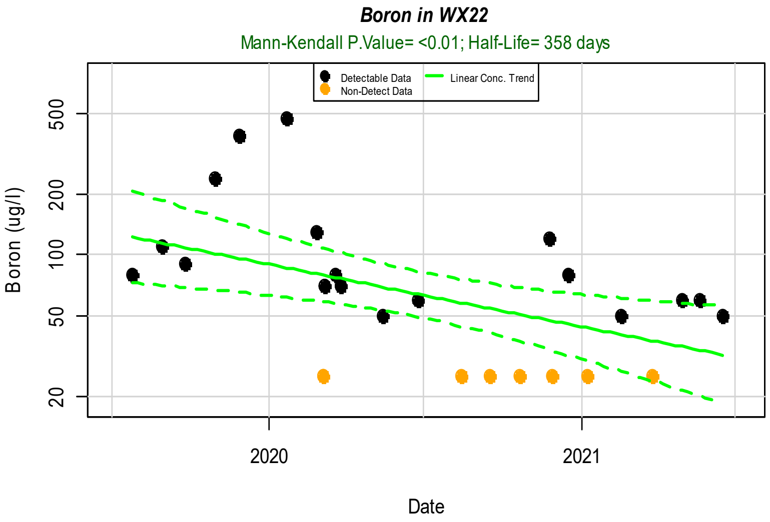
Mann-Kendall P.Value= 0.0906; Half-Life= 610 days

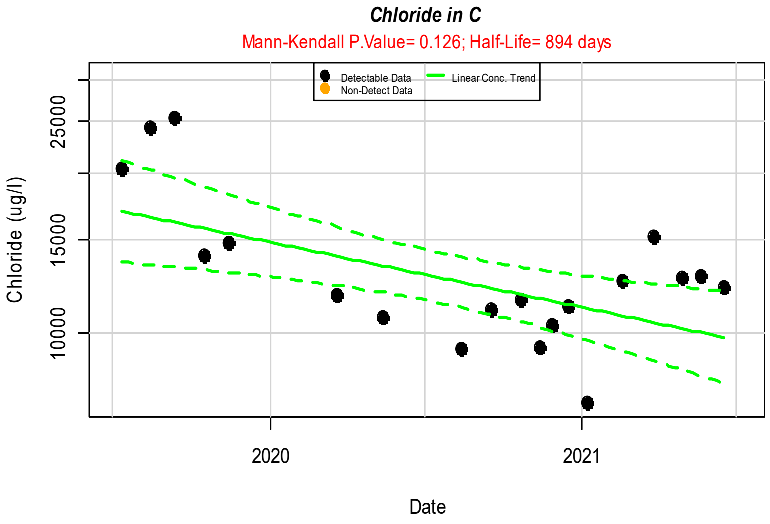


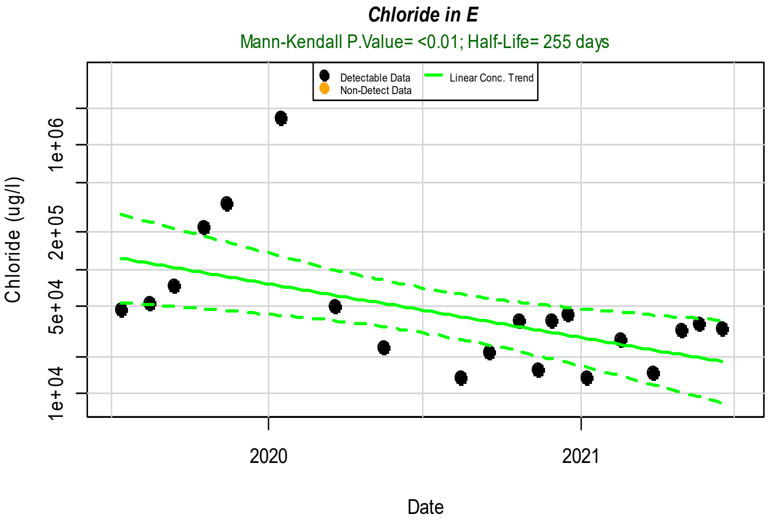
Boron in LMP01

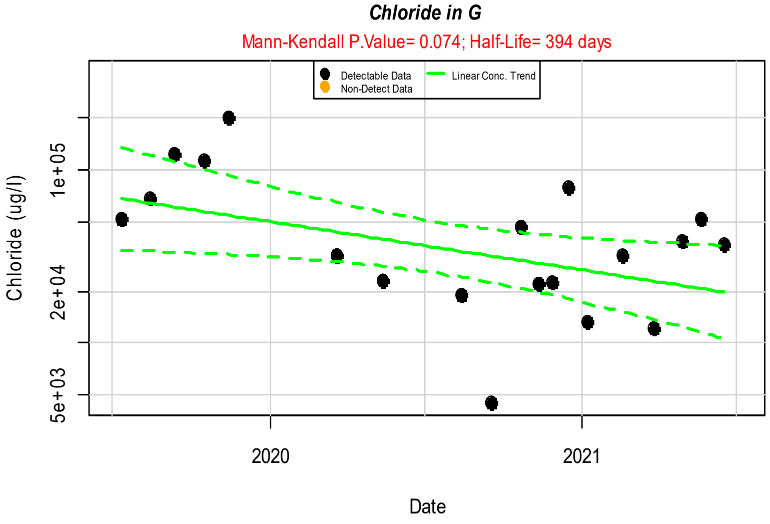
Mann-Kendall P.Value= <0.01; Half-Life= 213 days

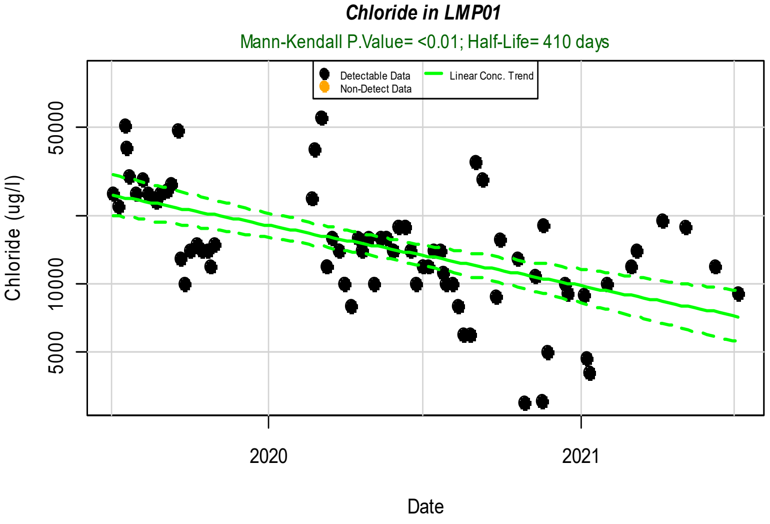

Boron in NC01
Mann-Kendall P.Value= <0.01; Half-Life= 394 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Boron (ug/l)
120
80
60
40
20
2020
2021
Date

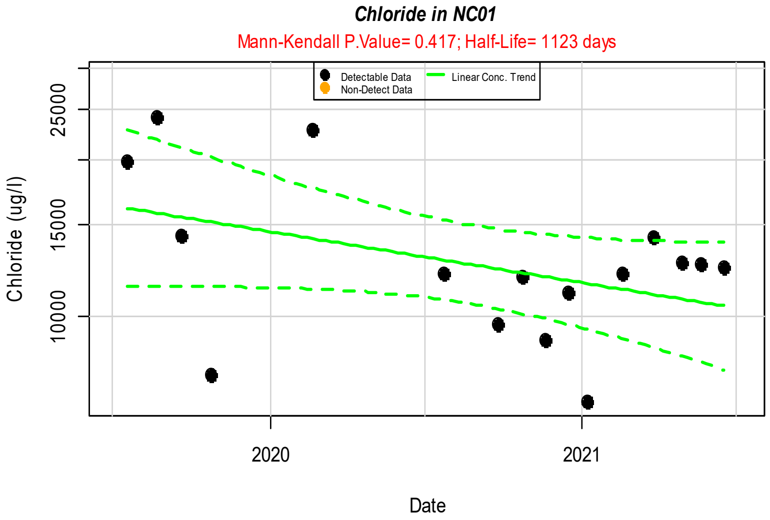

Boron in WX22
Mann-Kendall P.Value= <0.01; Half-Life= 358 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Boron (ug/l)
500
200
100
50
20
2020
2021
Date


Chloride in C
Mann-Kendall P.Value= 0.126; Half-Life= 894 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Chloride (ug/l)
25000
15000
10000
2020
2021
Date


Chloride in E
Mann-Kendall P.Value= <0.01; Half-Life= 255 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Chloride (ug/l)
1e+06
2e+05
5e+04
1e+04
2020
2021
Date

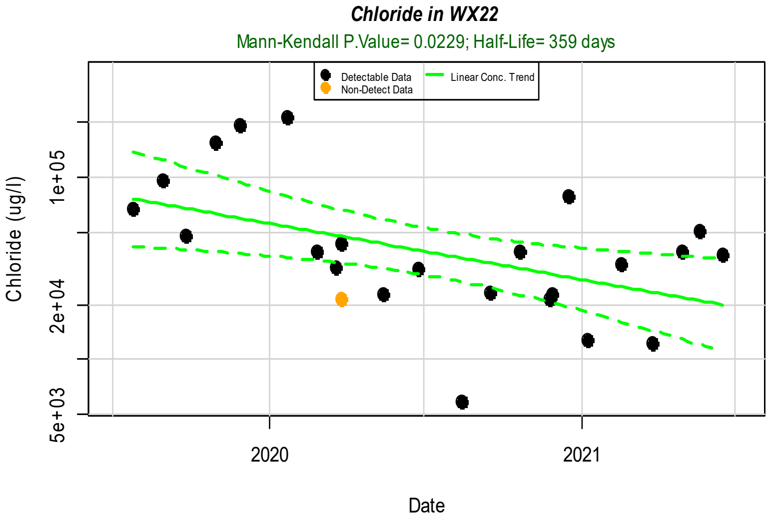

Chloride in G
Mann-Kendall P.Value= 0.074; Half-Life= 394 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Chloride (ug/l)
1e+05
2e+04
5e+03
2020
2021
Date


Chloride in LMP01
Mann-Kendall P.Value= <0.01; Half-Life= 410 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Chloride (ug/l)
50000
10000
5000
2020
2021
Date



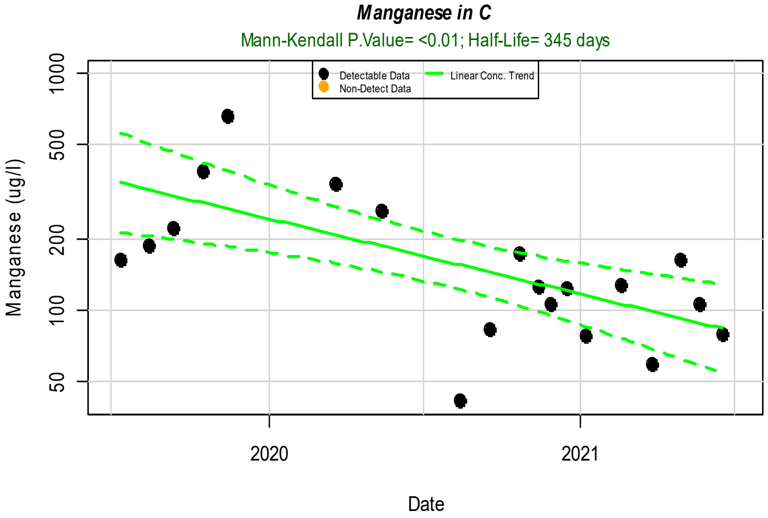
Chloride in NC01

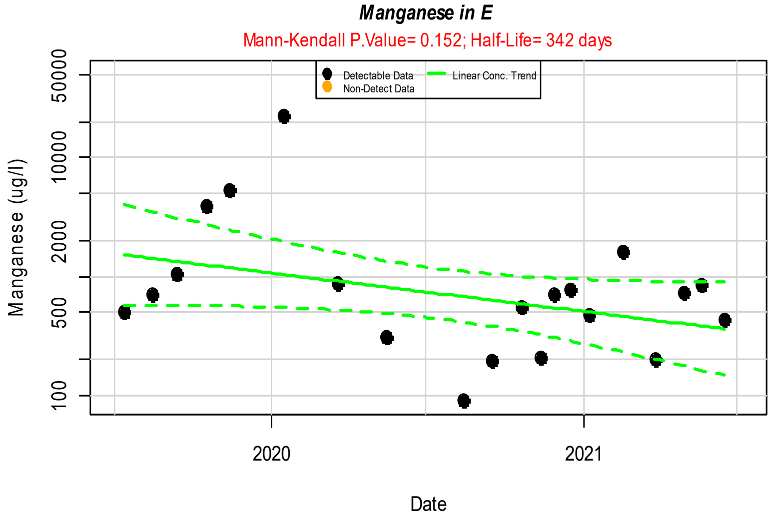
Mann-Kendall P.Value= 0.417; Half-Life= 1123 days

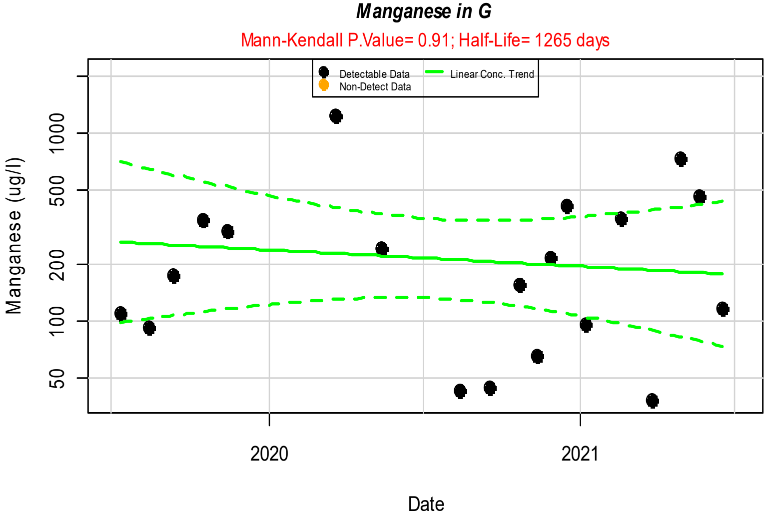


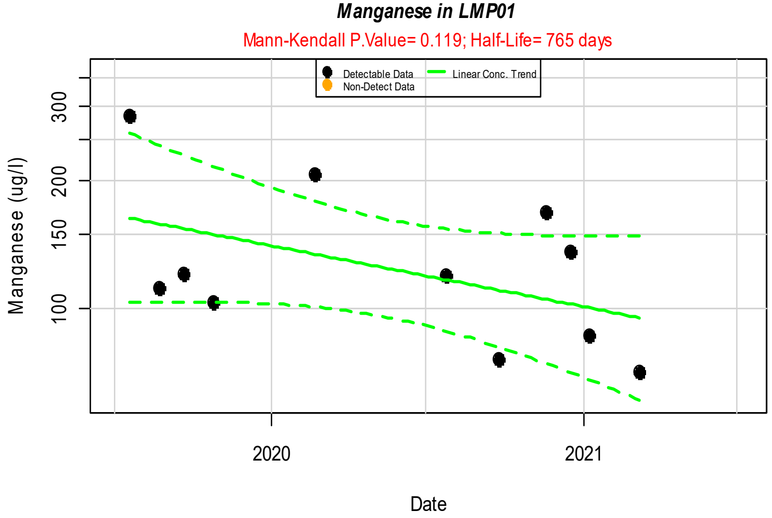
Chloride in WX22

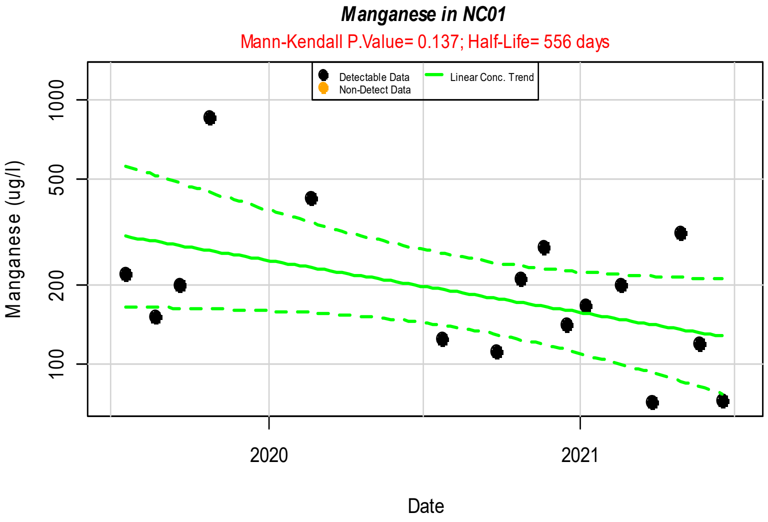
Mann-Kendall P.Value= 0.0229; Half-Life= 359 days

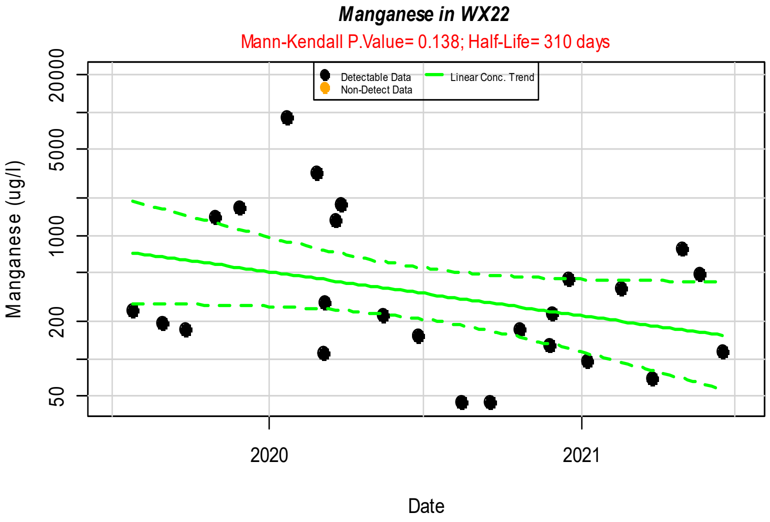

Manganese in C
Mann-Kendall P.Value= <0.01; Half-Life= 345 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Manganese (ug/l)
1000
500
200
100
50
2020
2021
Date

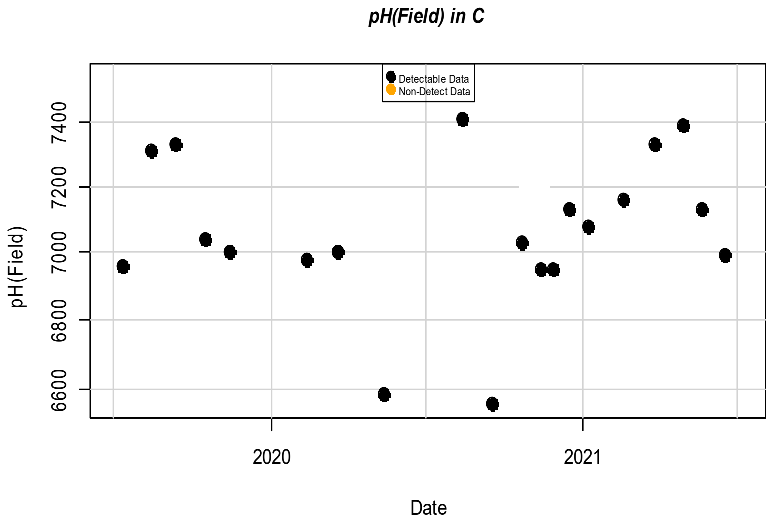

Manganese in E
Mann-Kendall P.Value= 0.152; Half-Life= 342 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Manganese (ug/l)
50000
10000
2000
500
100
2020
2021
Date


Manganese in G
Mann-Kendall P.Value= 0.91; Half-Life= 1265 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Manganese (ug/l)
1000
500
200
100
50
2020
2021
Date

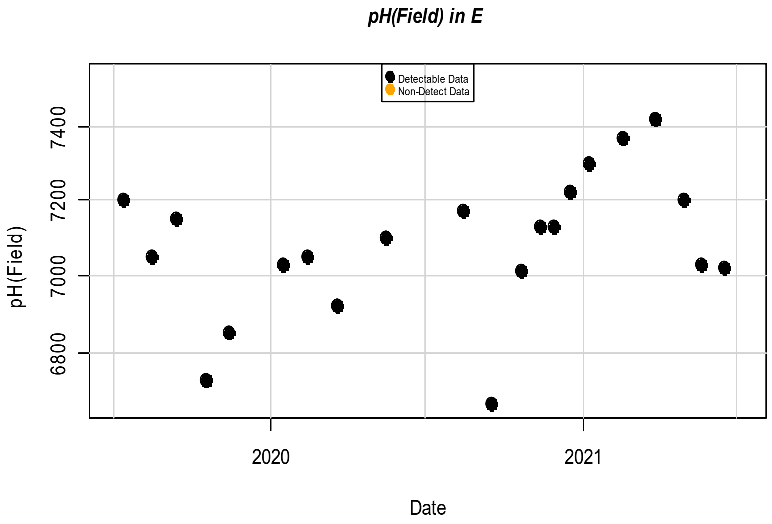

Manganese in LMP01
Mann-Kendall P.Value= 0.119; Half-Life= 765 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Manganese (ug/l)
300
200
150
100
2020
2021
Date


Manganese in NC01
Mann-Kendall P.Value= 0.137; Half-Life= 556 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Manganese (ug/l)
1000
500
200
100
2020
2021
Date

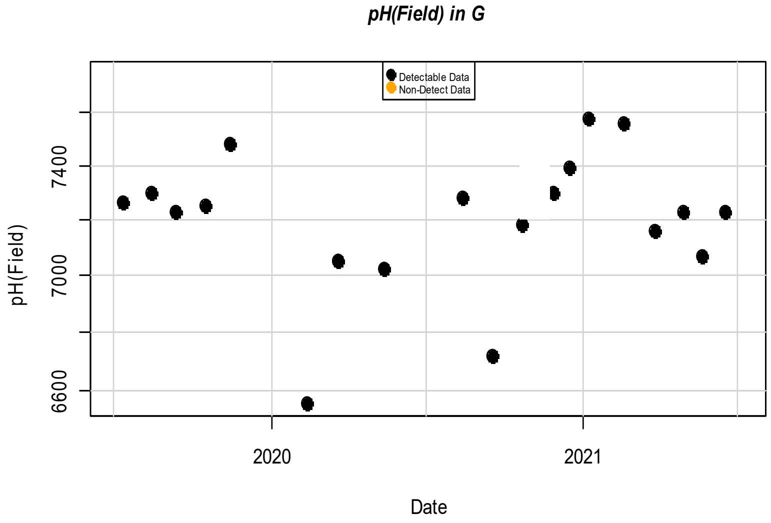

Manganese in WX22
Mann-Kendall P.Value= 0.138; Half-Life= 310 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Manganese (ug/l)
20000
5000
1000
200
50
2020
2021
Date



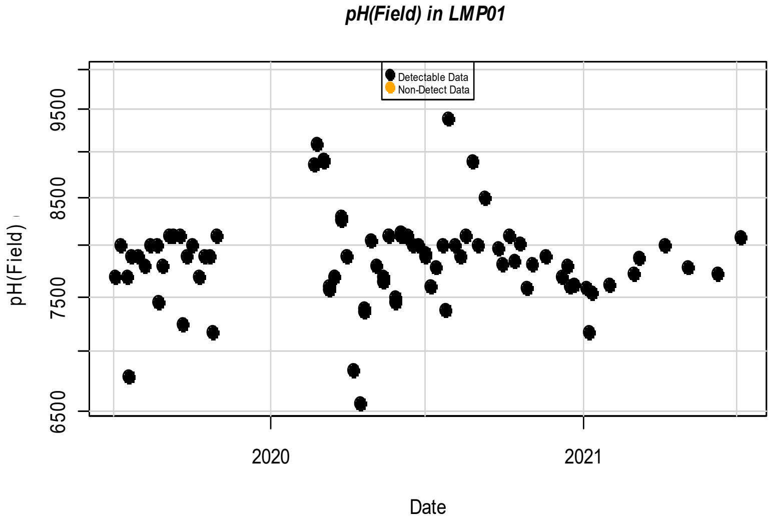
pH(Field) in C



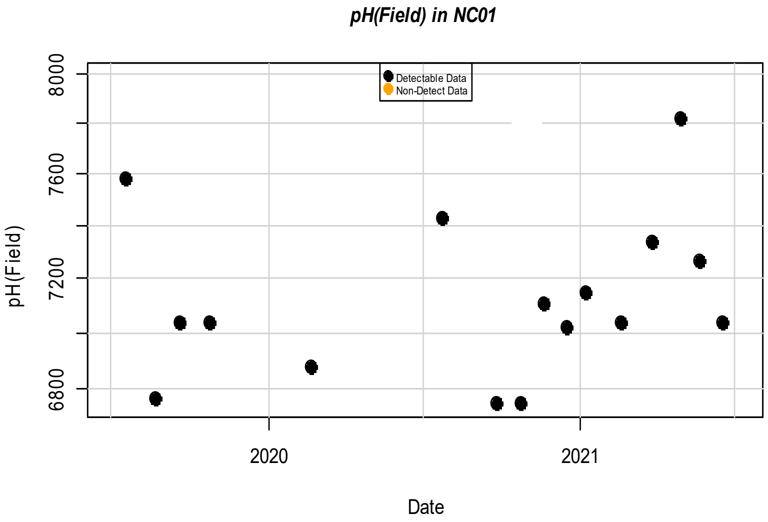
pH(Field) in E

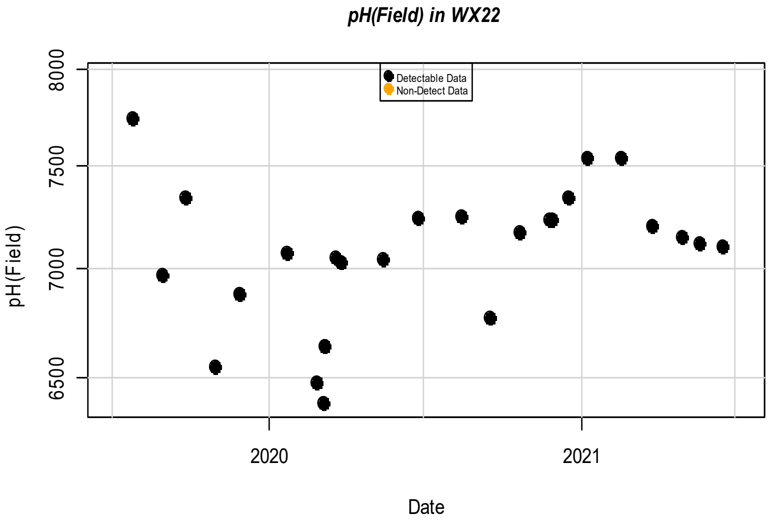


pH(Field) in G



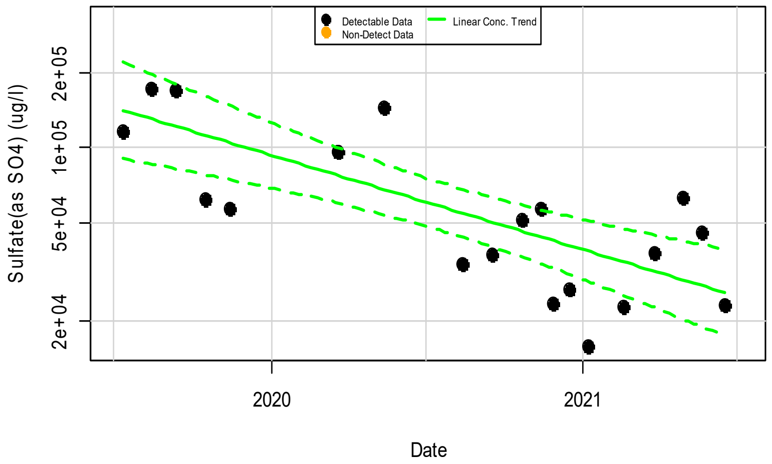
pH(Field) in LMP01


pH(Field) in NC01
Detectable Data
Non-Detect Data
pH(Field)
8000
7600
7200
6800
2020
2021
Date


pH(Field) in WX22
Detectable Data
Non-Detect Data
pH(Field)
8000
7500
7000
6500
2020
2021
Date

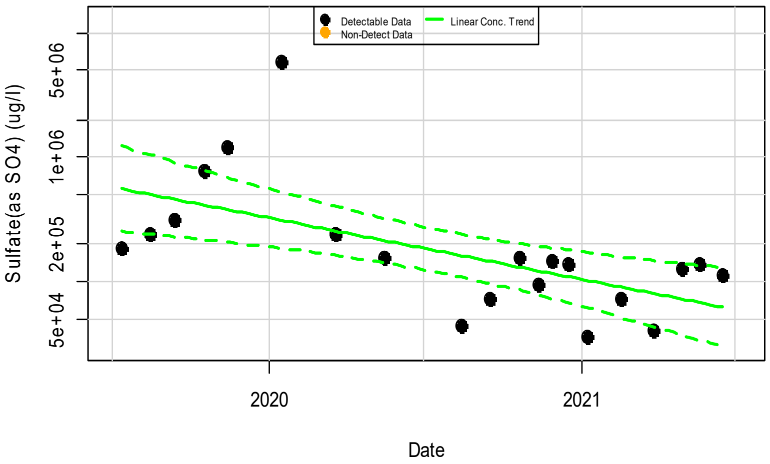
Sulfate(as SO4) in C

Mann-Kendall P.Value= <0.01; Half-Life= 289 days



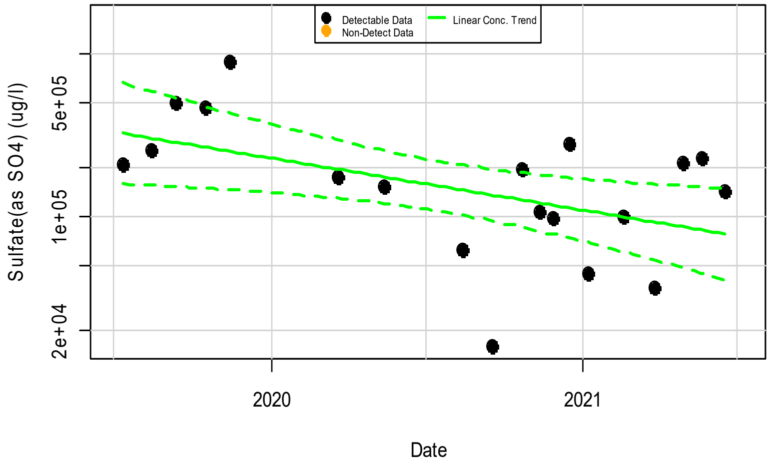
Sulfate(as SO4) in E

Mann-Kendall P.Value= <0.01; Half-Life= 223 days



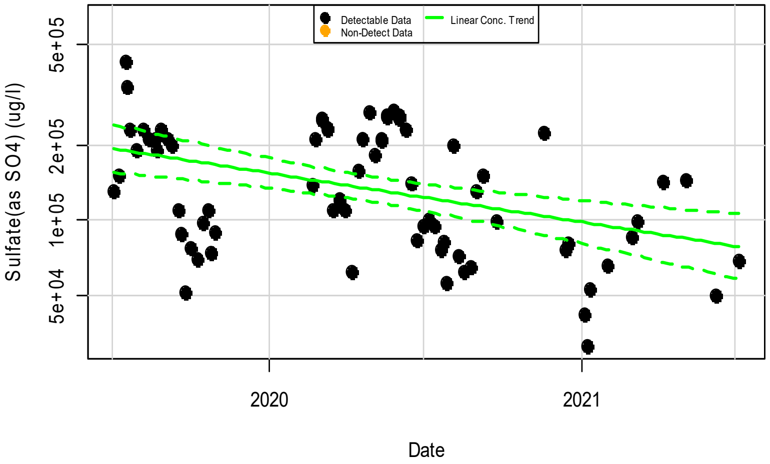
Sulfate(as SO4) in G

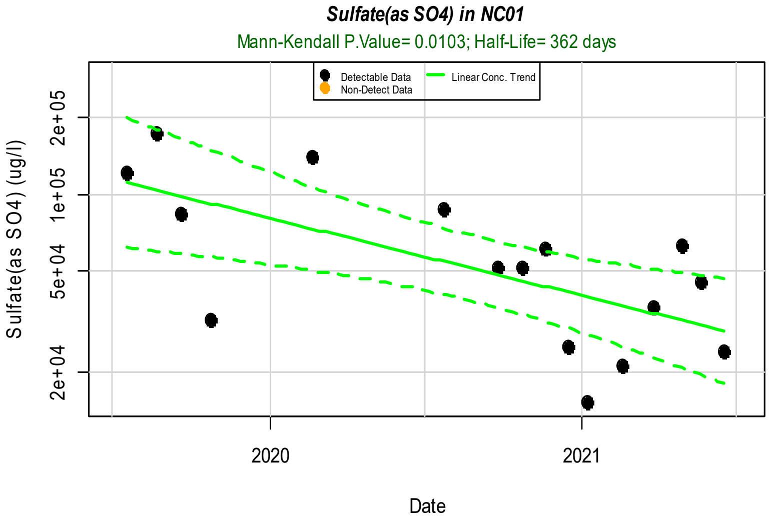
Mann-Kendall P.Value= 0.0273; Half-Life= 345 days

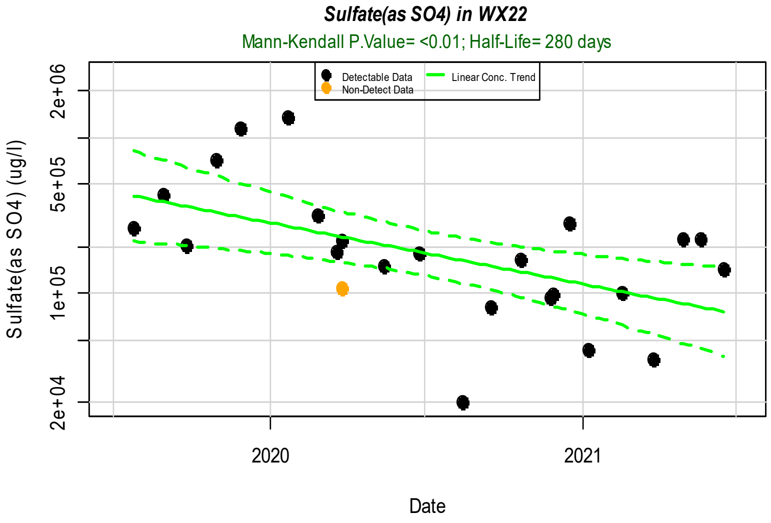


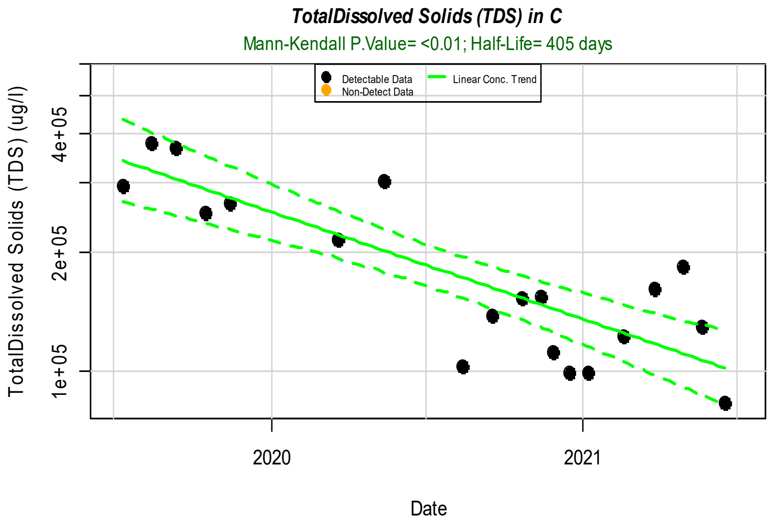
Sulfate(as SO4) in LMP01

Mann-Kendall P.Value= <0.01; Half-Life= 566 days



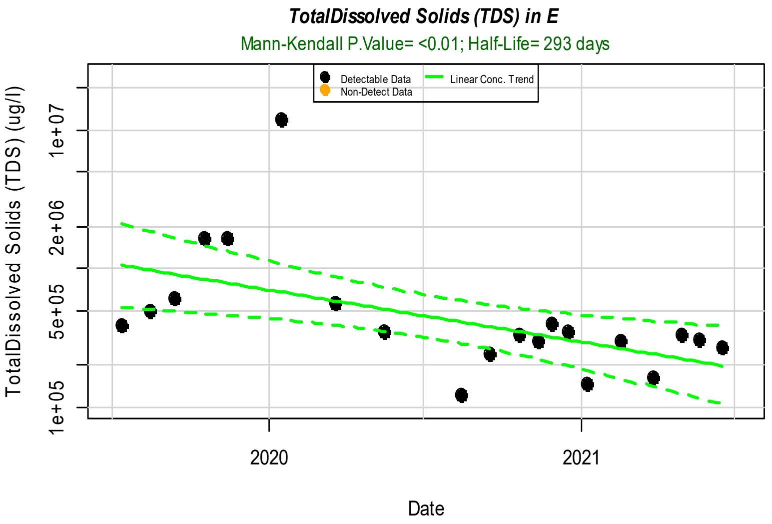

Sulfate(as SO4) in NC01
Mann-Kendall P.Value= 0.0103; Half-Life= 362 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Sulfate(as SO4) (ug/l)
2e+05
1e+05
5e+04
2e+04
2020
2021
Date


Sulfate(as SO4) in WX22
Mann-Kendall P.Value= <0.01; Half-Life= 280 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Sulfate(as SO4) (ug/l)
2e+06
5e+05
1e+05
2e+04
2020
2021
Date



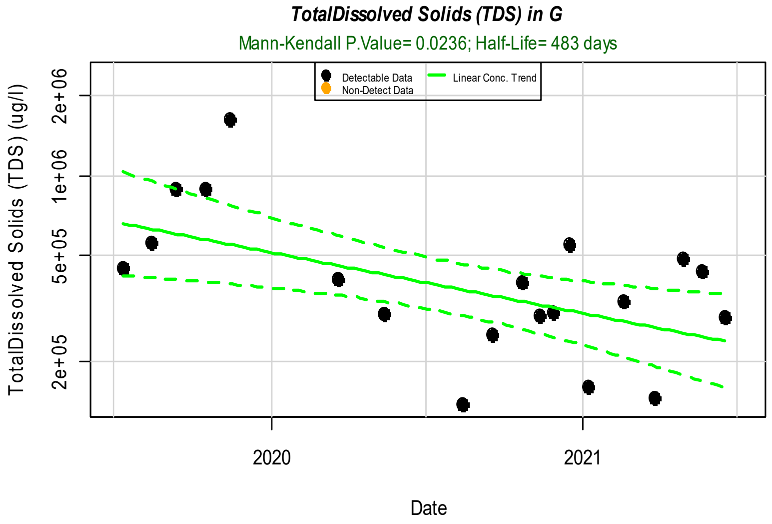
TotalDissolved Solids (TDS) in C

Mann-Kendall P.Value= <0.01; Half-Life= 405 days



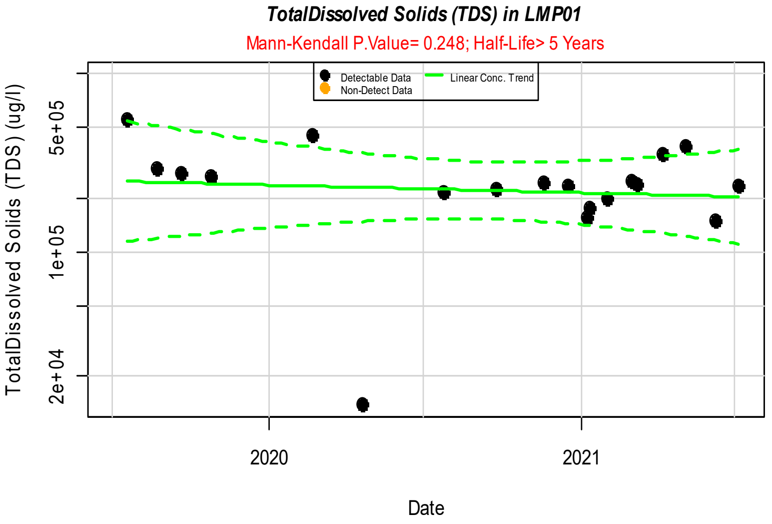
TotalDissolved Solids (TDS) in E

Mann-Kendall P.Value= <0.01; Half-Life= 293 days



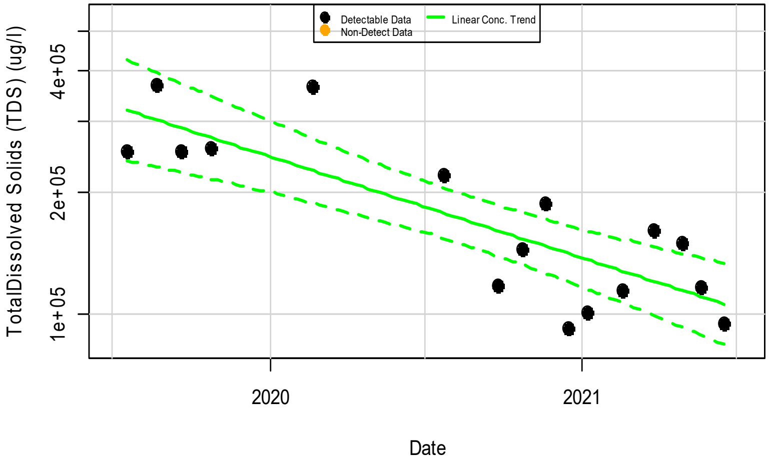
TotalDissolved Solids (TDS) in G

Mann-Kendall P.Value= 0.0236; Half-Life= 483 days



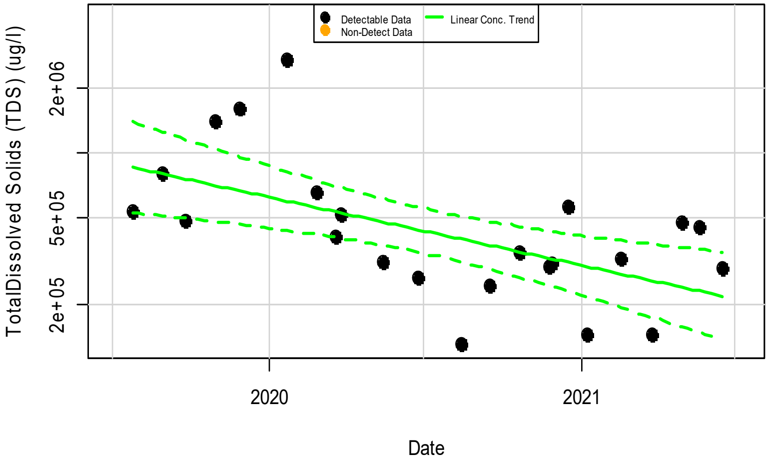
TotalDissolved Solids (TDS) in LMP01

Mann-Kendall P.Value= 0.248; Half-Life> 5 Years



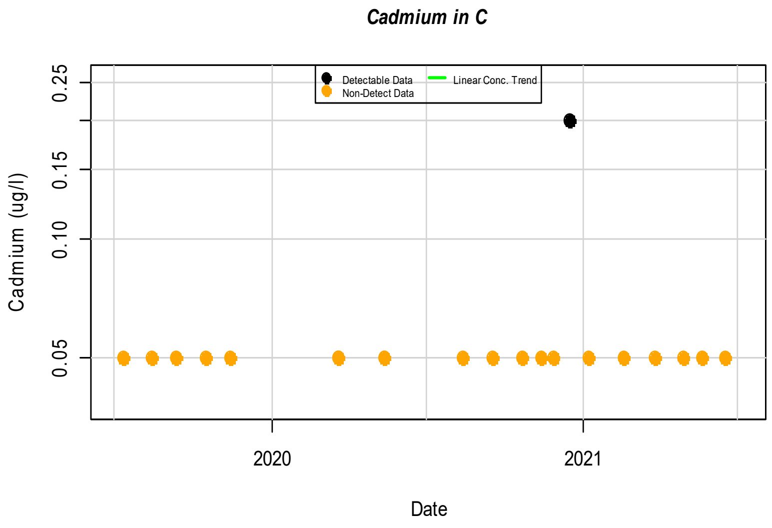
TotalDissolved Solids (TDS) in NC01

Mann-Kendall P.Value= <0.01; Half-Life= 440 days

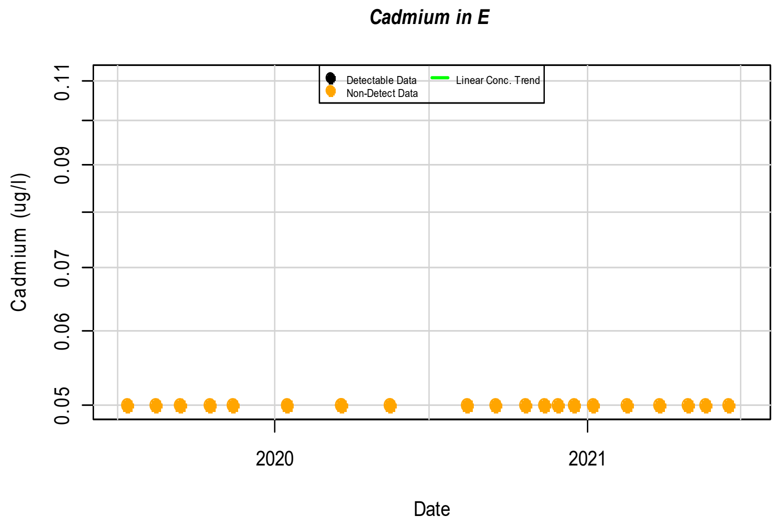


TotalDissolved Solids (TDS) in WX22

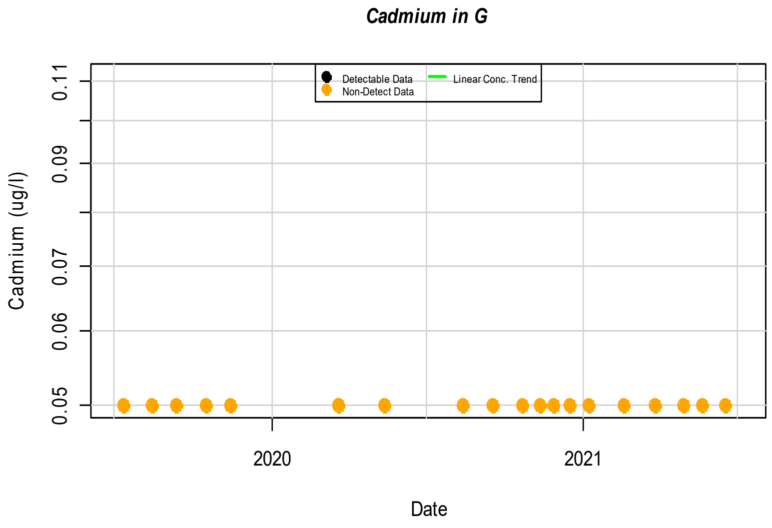
Mann-Kendall P.Value= <0.01; Half-Life= 351 days



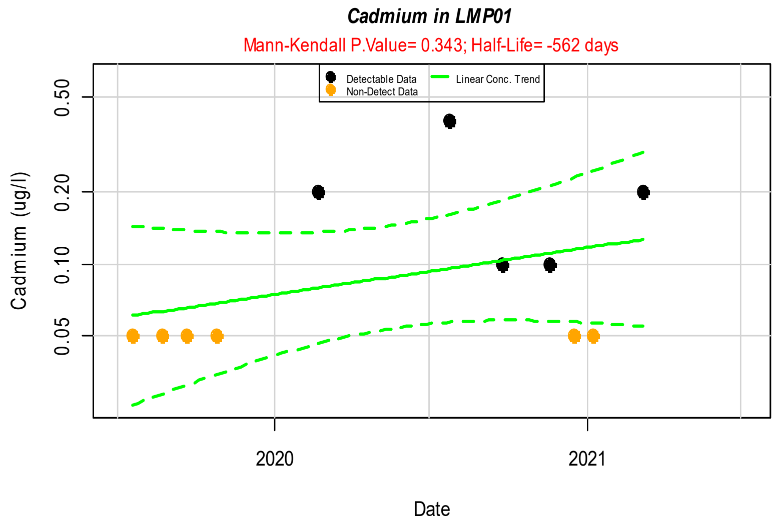
Cadmium in C



Cadmium in E

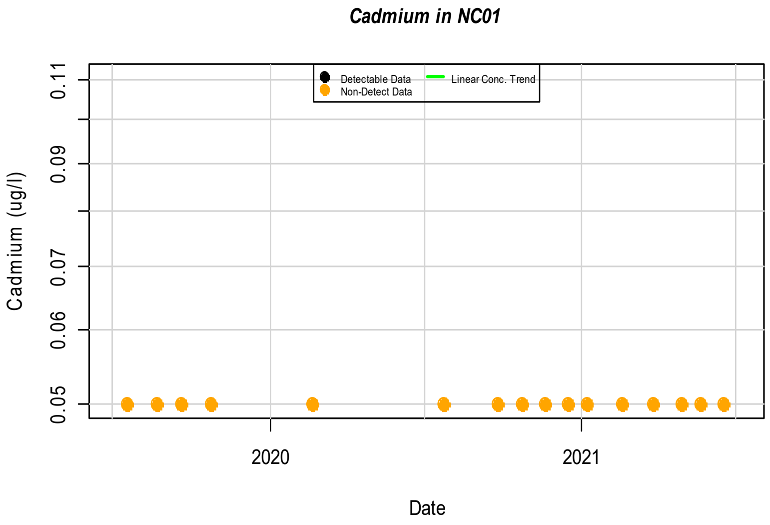


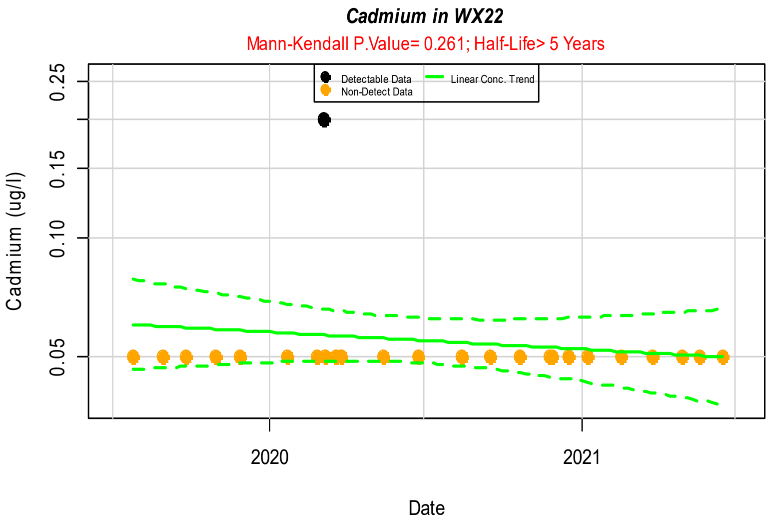
Cadmium in G

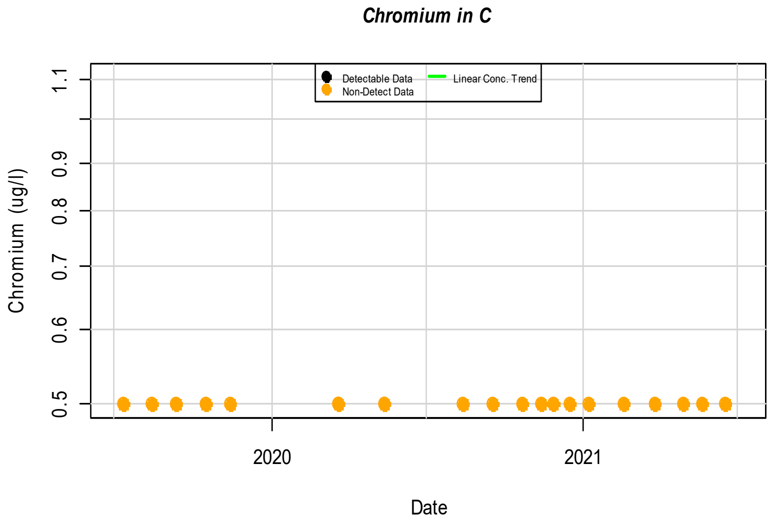


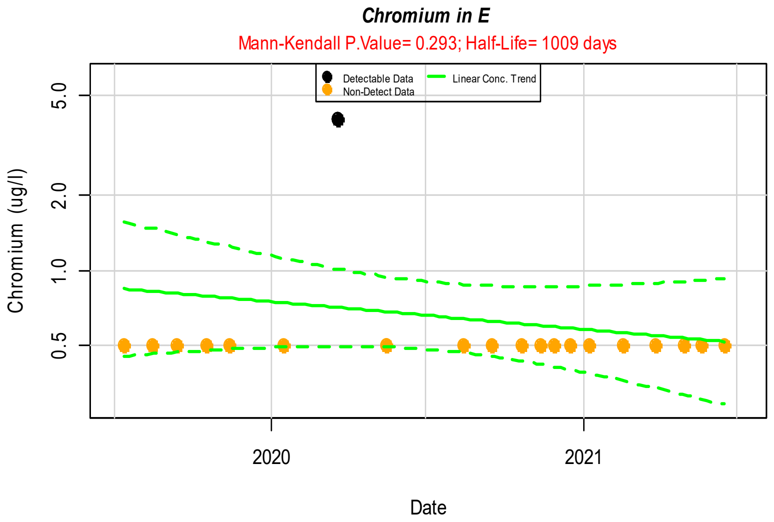
Cadmium in LMP01

Mann-Kendall P.Value= 0.343; Half-Life= -562 days

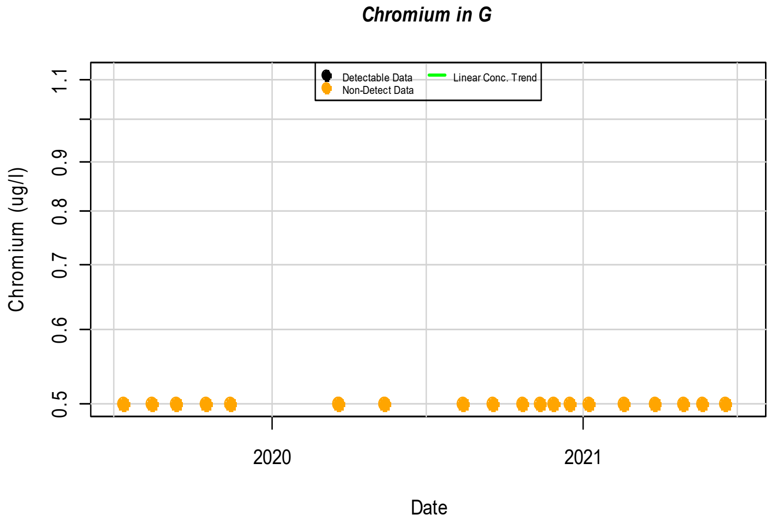

Cadmium in NC01
Detectable Data
Non-Detect Data
Linear Conc. Trend
Cadmium (ug/l)
0.11
0.09
0.07
0.06
0.05
2020
2021
Date

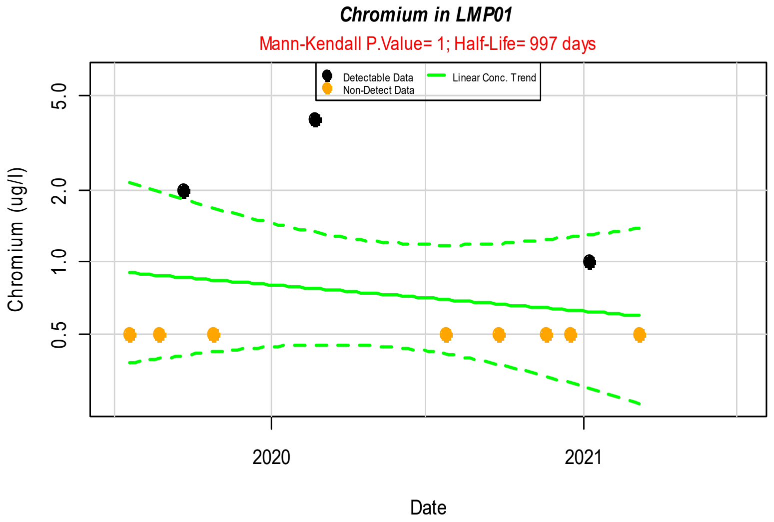

Cadmium in WX22
Mann-Kendall P.Value= 0.261; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
Cadmium (ug/l)
0.25
0.15
0.10
0.05
2020
2021
Date


Chromium in C

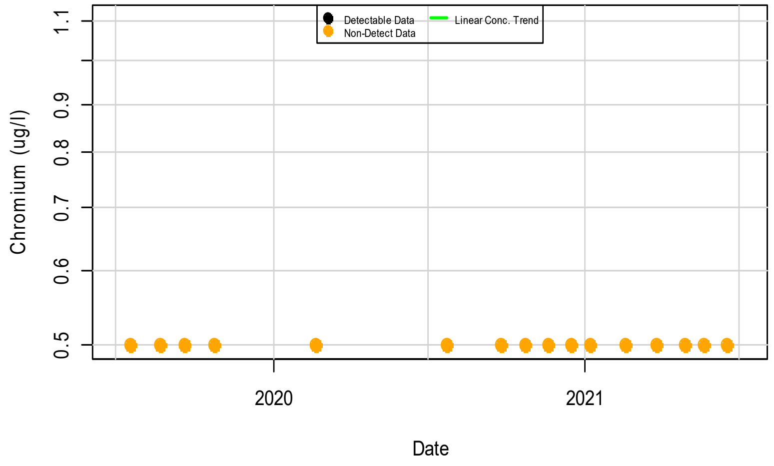

Chromium in E

Mann-Kendall P.Value= 0.293; Half-Life= 1009 days

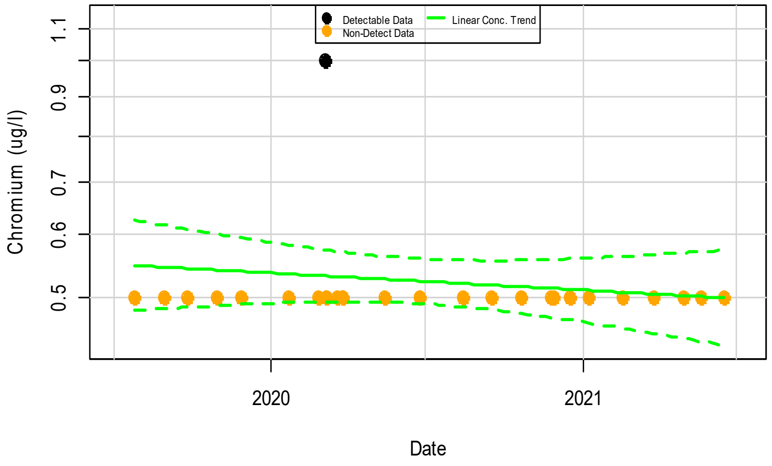

Chromium in G


Chromium in LMP01

Mann-Kendall P.Value= 1; Half-Life= 997 days



Chromium in NC01

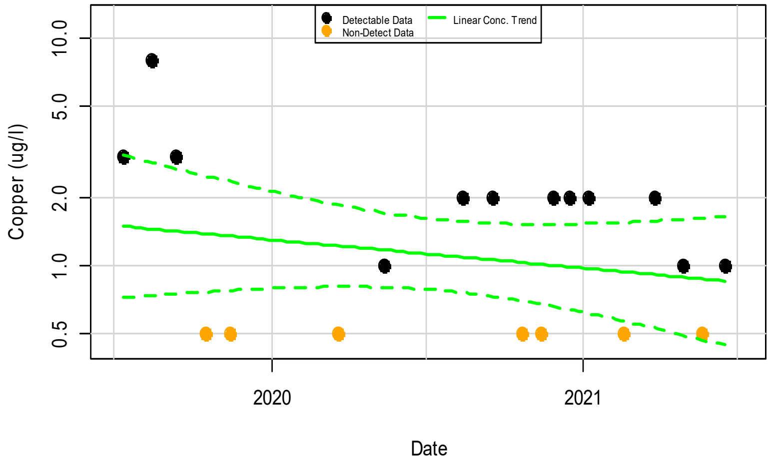


Chromium in WX22

Mann-Kendall P.Value= 0.261; Half-Life> 5 Years

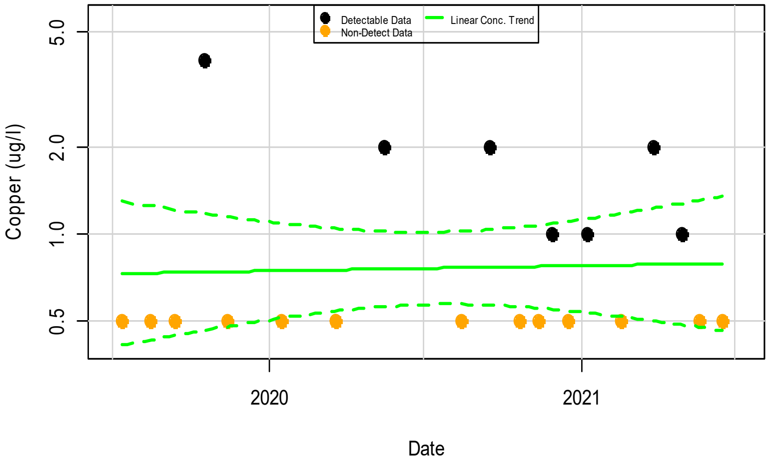
Copper in C

Mann-Kendall P.Value= 0.676; Half-Life= 884 days



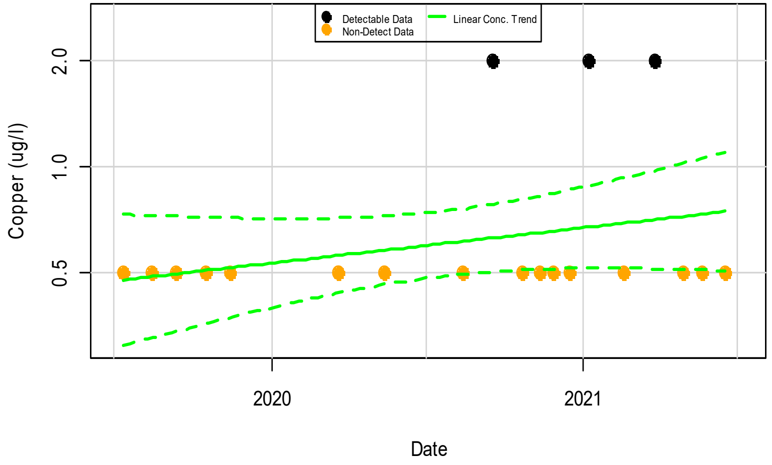
Copper in E

Mann-Kendall P.Value= 0.571; Half-Life> -5 Years



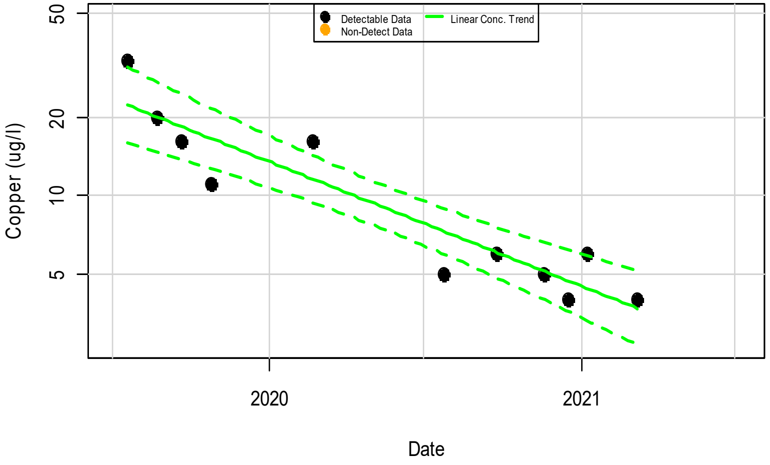
Copper in G

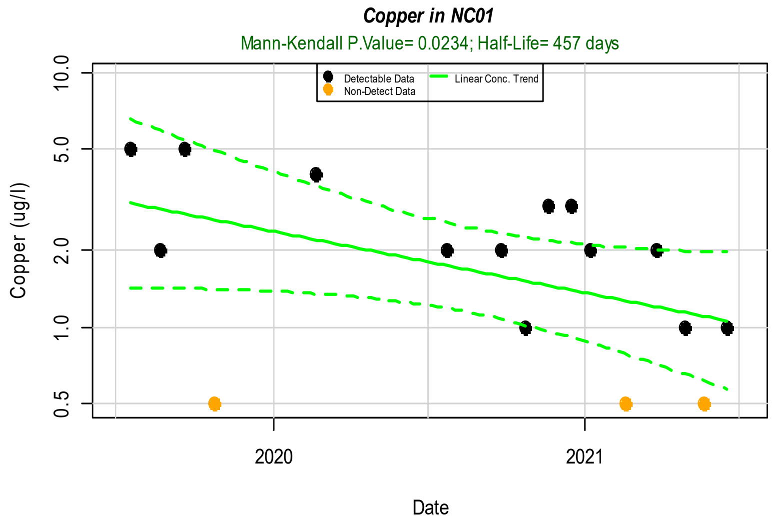
Mann-Kendall P.Value= 0.213; Half-Life= -1098 days

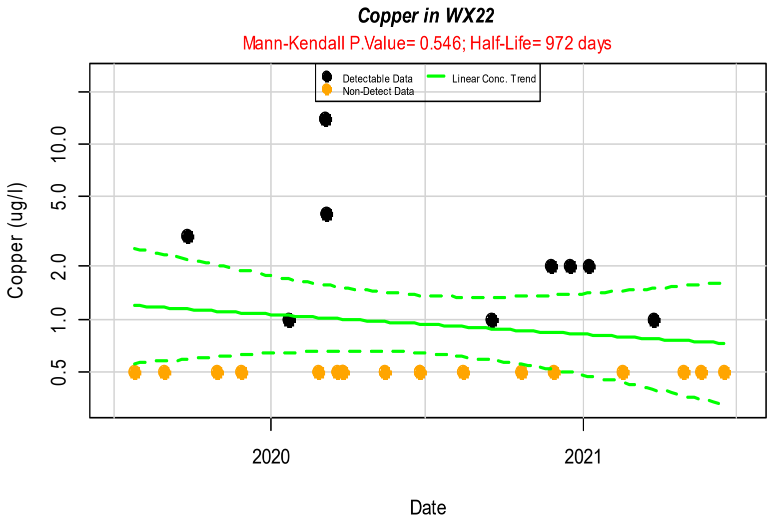


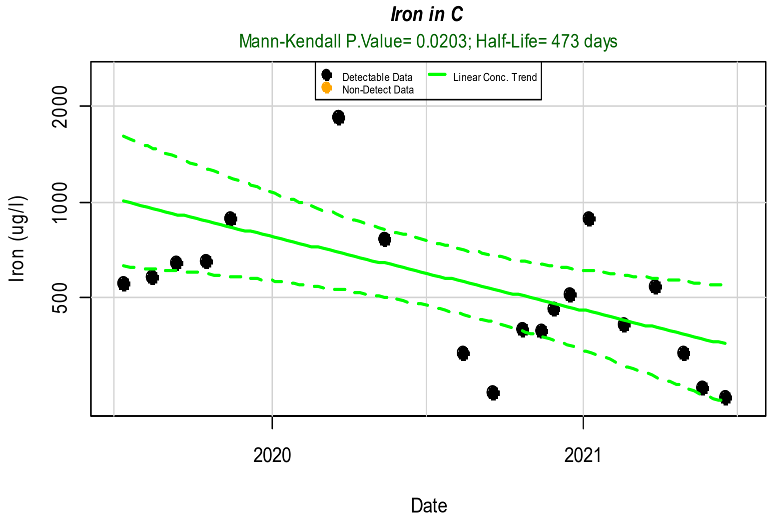
Copper in LMP01

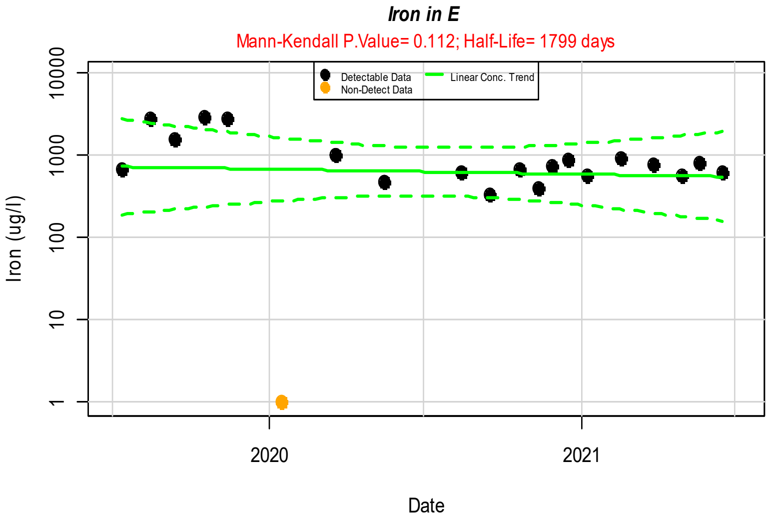
Mann-Kendall P.Value= <0.01; Half-Life= 231 days

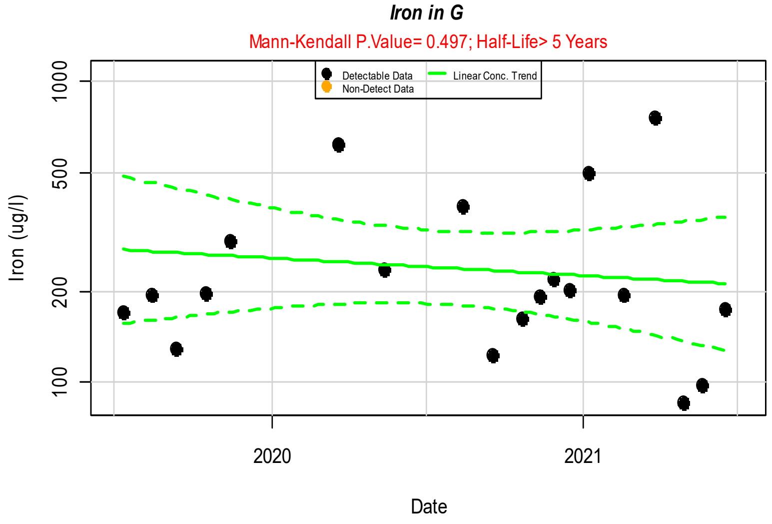


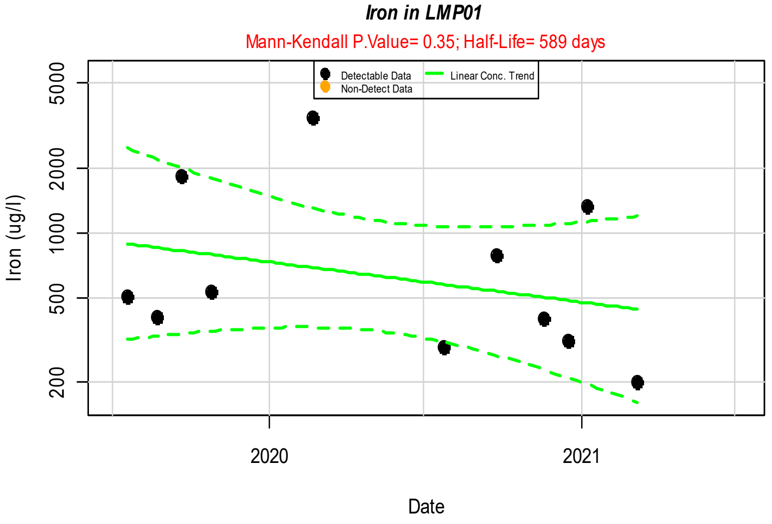

Copper in NC01
Mann-Kendall P.Value= 0.0234; Half-Life= 457 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Copper (ug/l)
10.0
5.0
2.0
1.0
0.5
2020
2021
Date

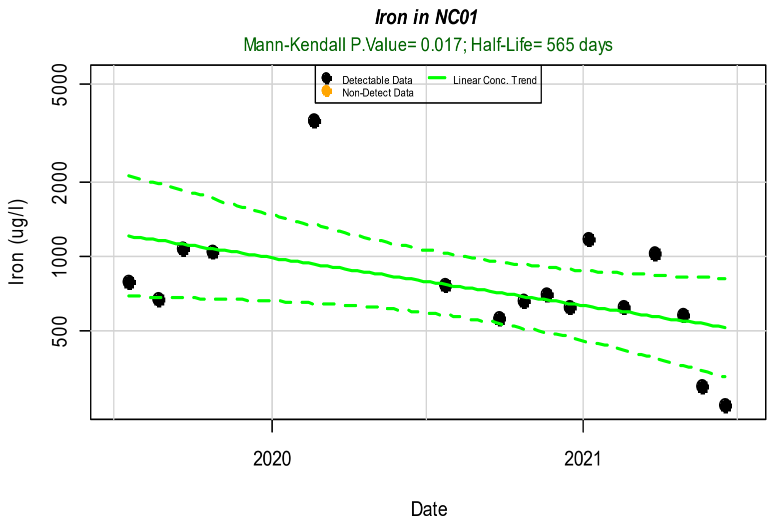

Copper in WX22
Mann-Kendall P.Value= 0.546; Half-Life= 972 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Copper (ug/l)
10.0
5.0
2.0
1.0
0.5
2020
2021
Date

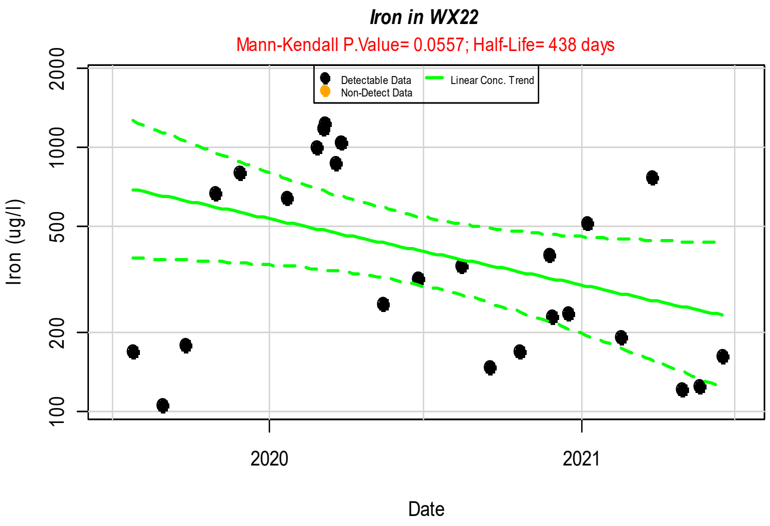

Iron in C
Mann-Kendall P.Value= 0.0203; Half-Life= 473 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Iron (ug/l)
2000
1000
500
2020
2021
Date

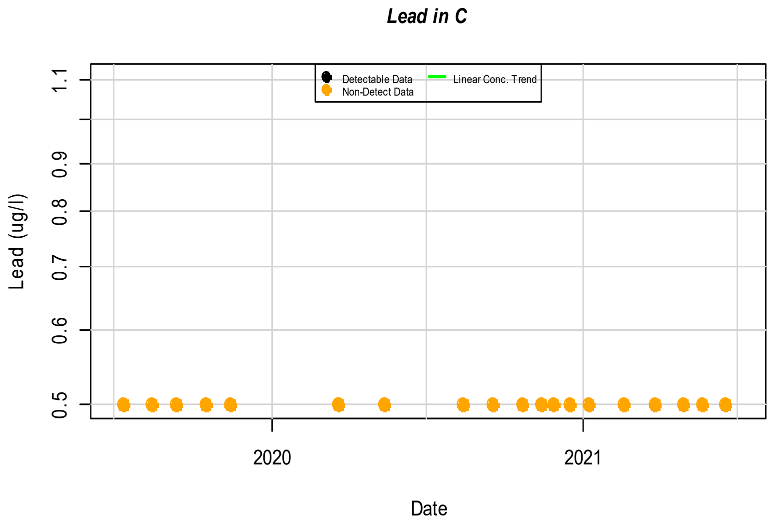

Iron in E
Mann-Kendall P.Value= 0.112; Half-Life= 1799 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Iron (ug/l)
10000
1000
100
10
1
2020
2021
Date

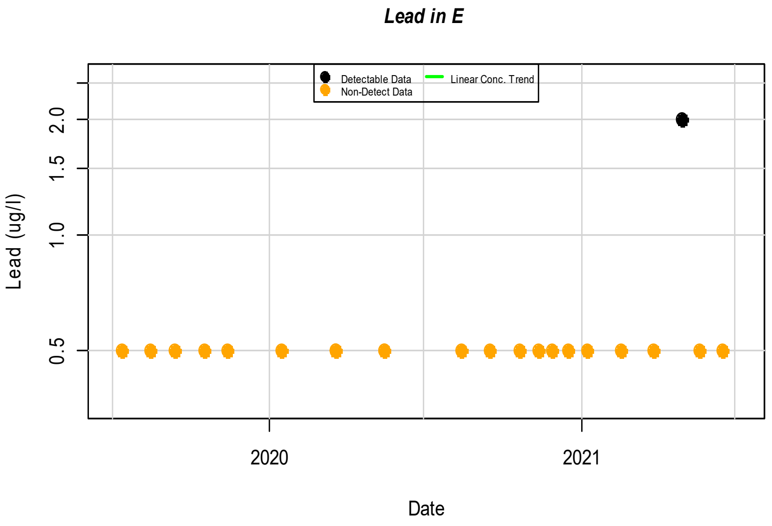

Iron in G
Mann-Kendall P.Value= 0.497; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
Iron (ug/l)
1000
500
200
100
2020
2021
Date

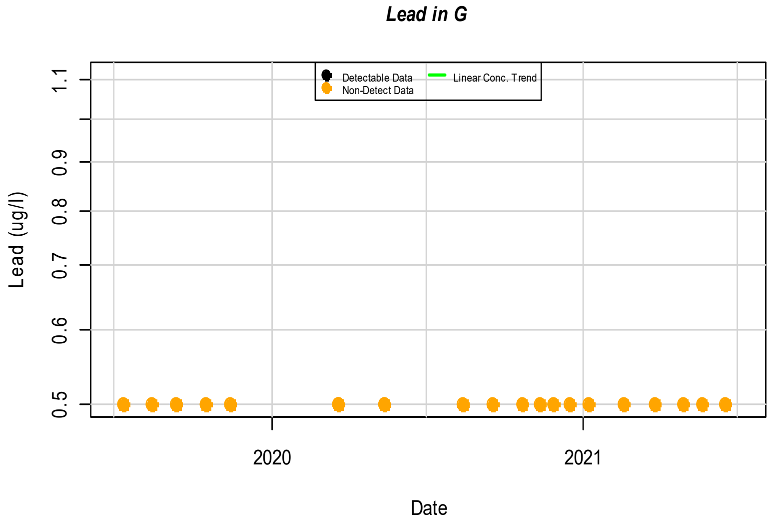

Iron in LMP01
Mann-Kendall P.Value= 0.35; Half-Life= 589 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Iron (ug/l)
5000
2000
1000
500
200
2020
2021
Date

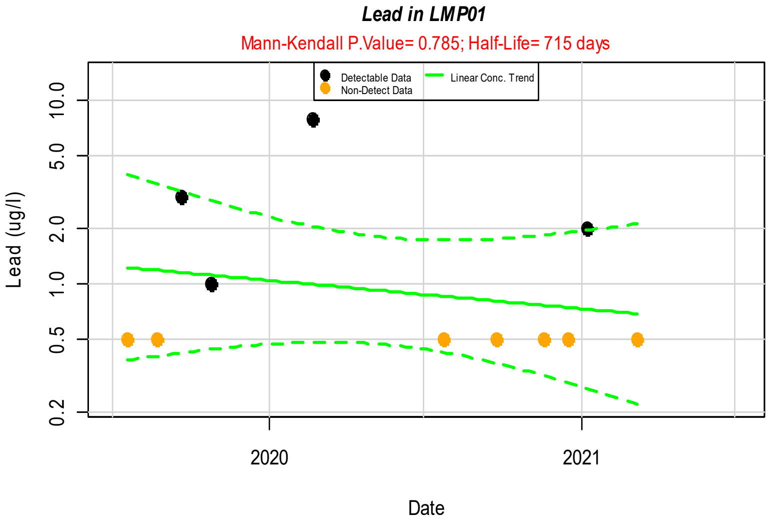

Iron in NC01
Mann-Kendall P.Value= 0.017; Half-Life= 565 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Iron (ug/l)
5000
2000
1000
500
2020
2021
Date

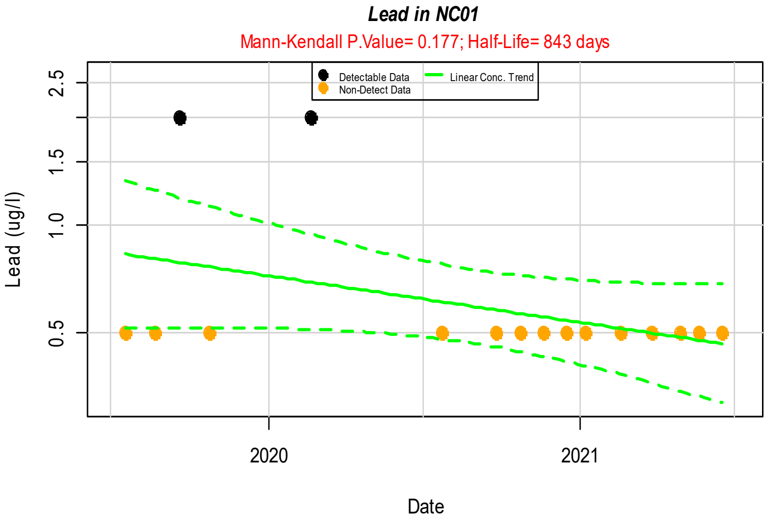

Iron in WX22
Mann-Kendall P.Value= 0.0557; Half-Life= 438 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Iron (ug/l)
2000
1000
500
200
100
2020
2021
Date


Lead in C

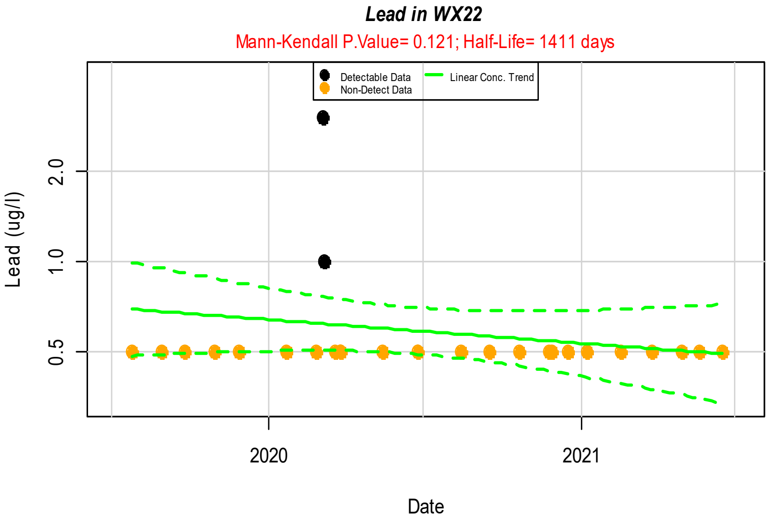

Lead in E


Lead in G

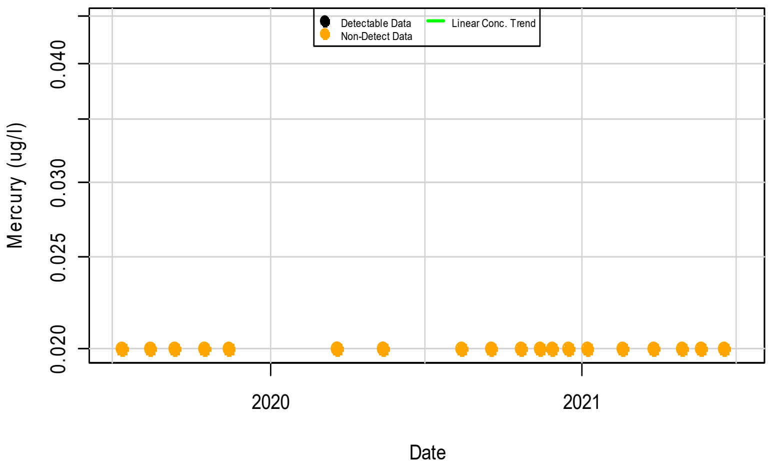

Lead in LMP01

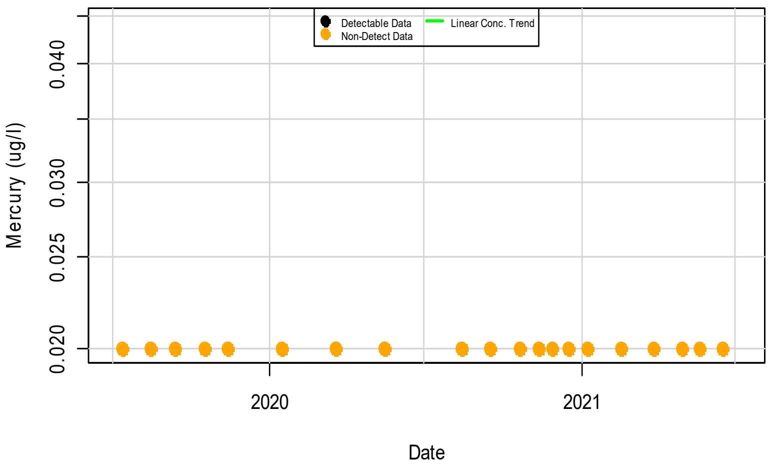

Lead in NC01

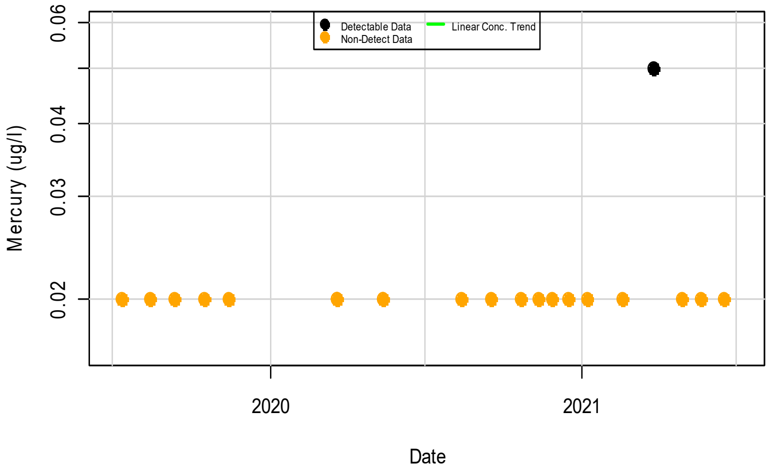
Mann-Kendall P.Value= 0.177; Half-Life= 843 days

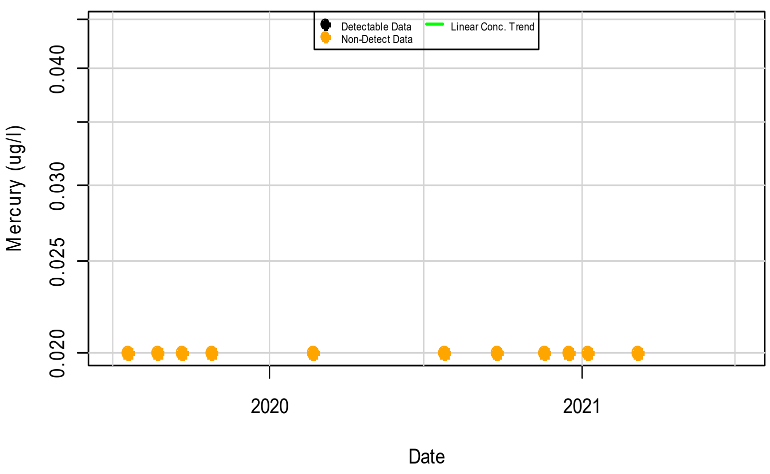

Lead in WX22

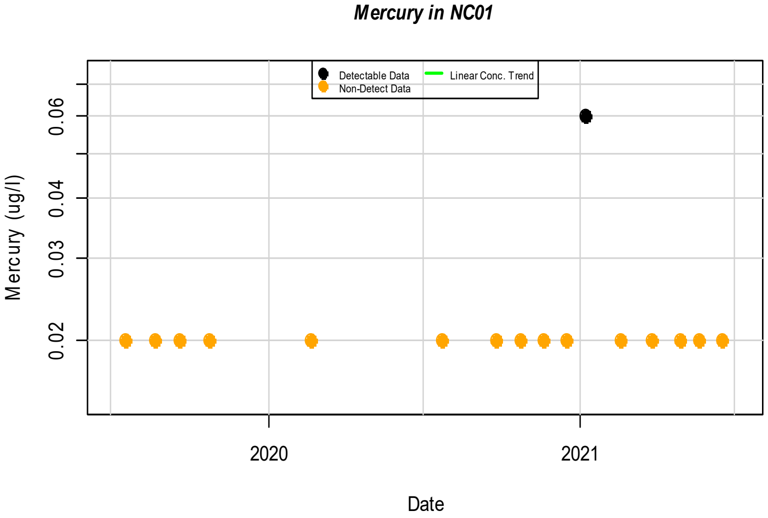
Mann-Kendall P.Value= 0.121; Half-Life= 1411 days

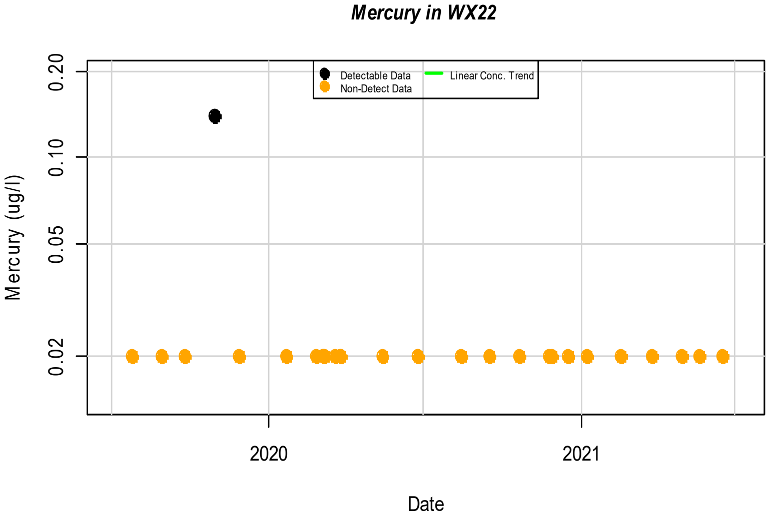

Mercury in C

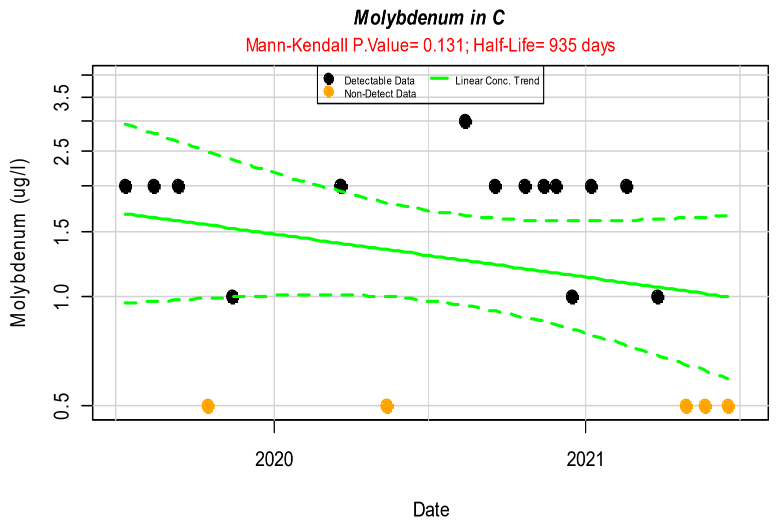

Mercury in E


Mercury in G


Mercury in LMP01

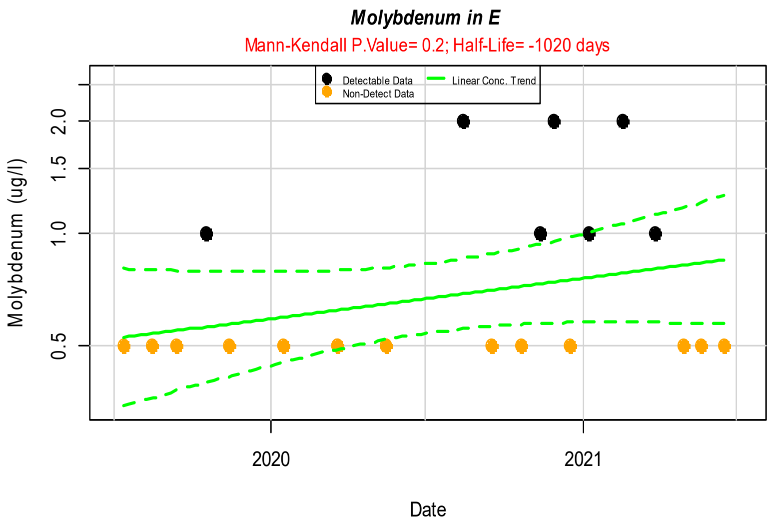

Mercury in NC01
Detectable Data
Non-Detect Data
Linear Conc. Trend
Mercury (ug/l)
0.02
0.03
0.04
0.06
2020
2021
Date


Mercury in WX22
Detectable Data
Non-Detect Data
Linear Conc. Trend
Mercury (ug/l)
0.02
0.05
0.10
0.20
2020
2021
Date



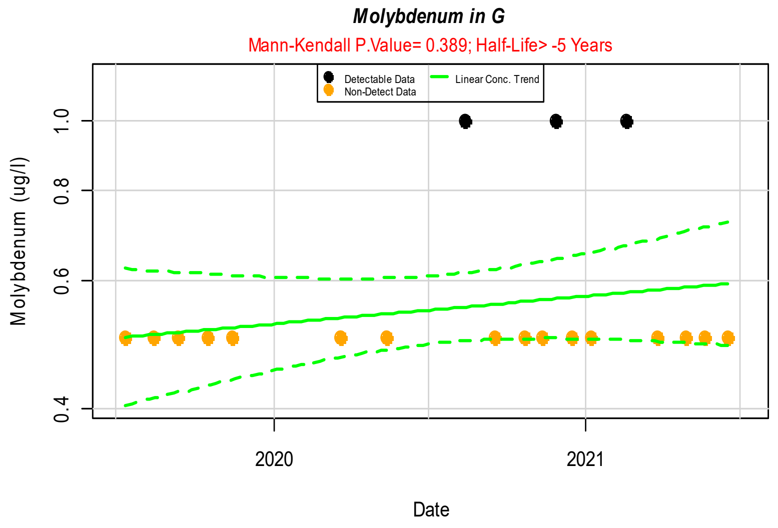
Molybdenum in C

Mann-Kendall P.Value= 0.131; Half-Life= 935 days



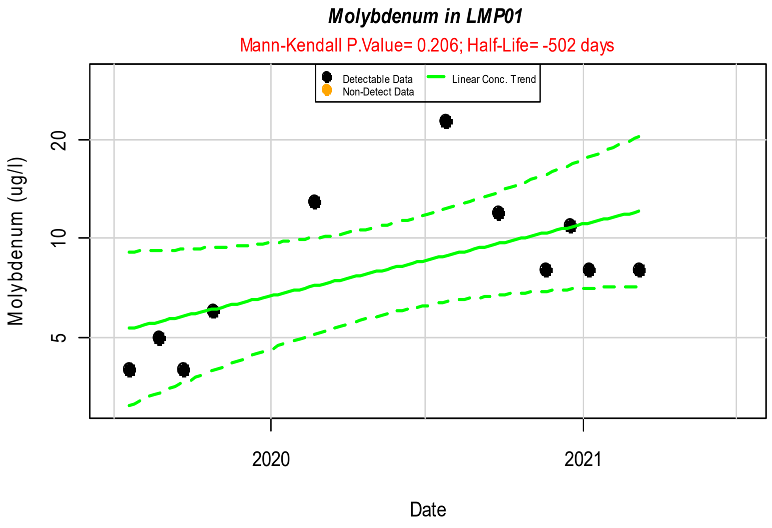
Molybdenum in E

Mann-Kendall P.Value= 0.2; Half-Life= -1020 days



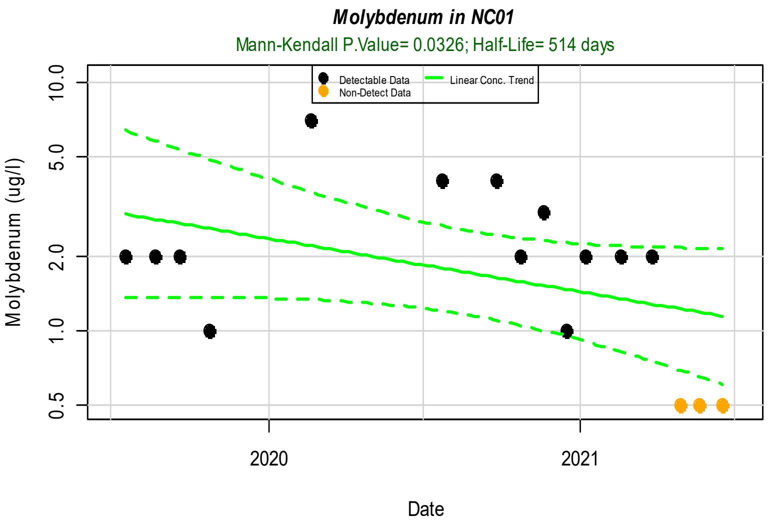
Molybdenum in G

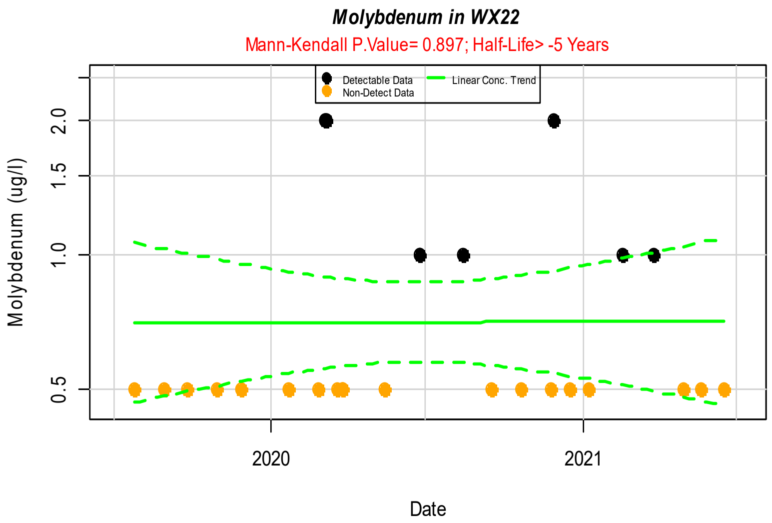
Mann-Kendall P.Value= 0.389; Half-Life> -5 Years

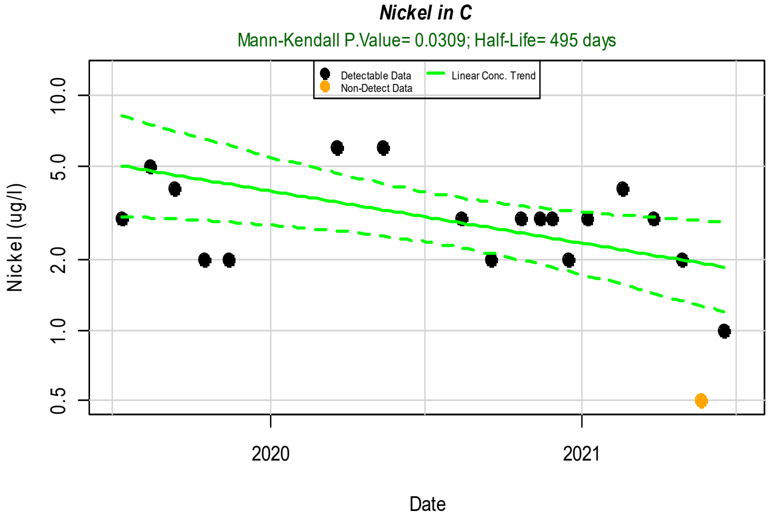


Molybdenum in LMP01

Mann-Kendall P.Value= 0.206; Half-Life= -502 days

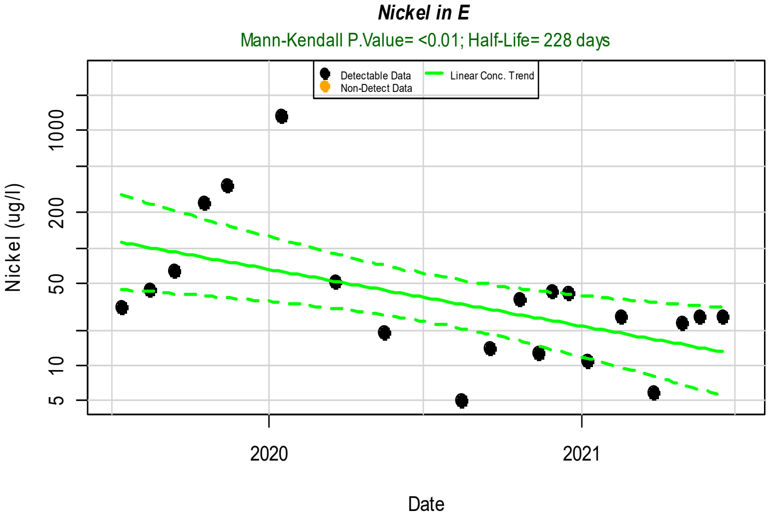

Molybdenum in NC01
Mann-Kendall P.Value= 0.0326; Half-Life= 514 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Molybdenum (ug/l)
10.0
5.0
2.0
1.0
0.5
2020
2021
Date


Molybdenum in WX22
Mann-Kendall P.Value= 0.897; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
Molybdenum (ug/l)
2.0
1.5
1.0
0.5
2020
2021
Date



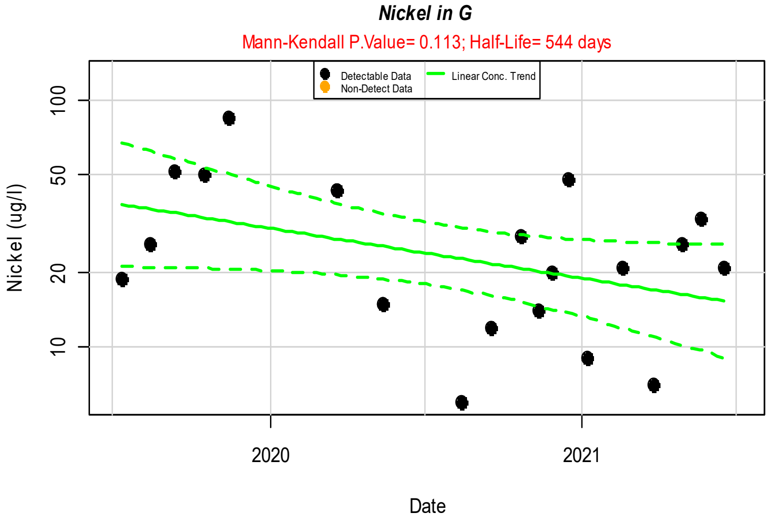
Nickel in C

Mann-Kendall P.Value= 0.0309; Half-Life= 495 days



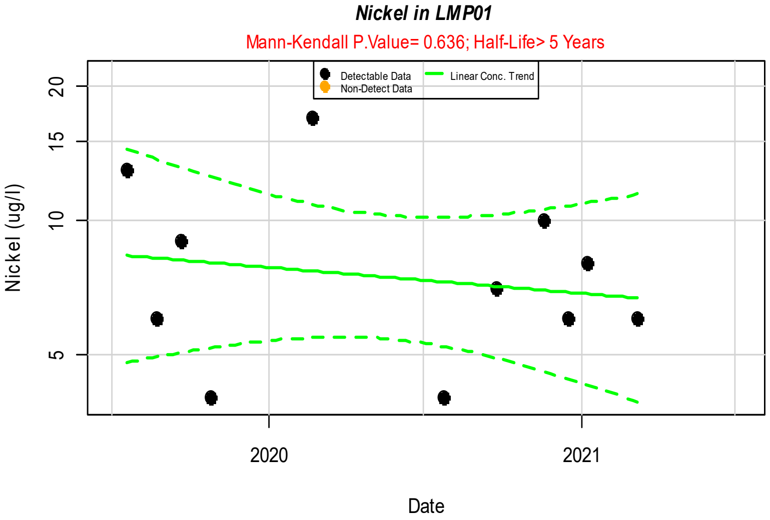
Nickel in E

Mann-Kendall P.Value= <0.01; Half-Life= 228 days



Nickel in G

Mann-Kendall P.Value= 0.113; Half-Life= 544 days

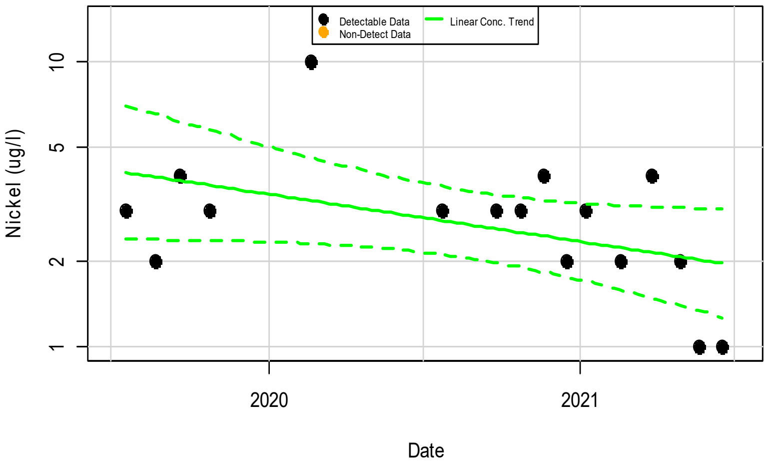


Nickel in LMP01

Mann-Kendall P.Value= 0.636; Half-Life> 5 Years

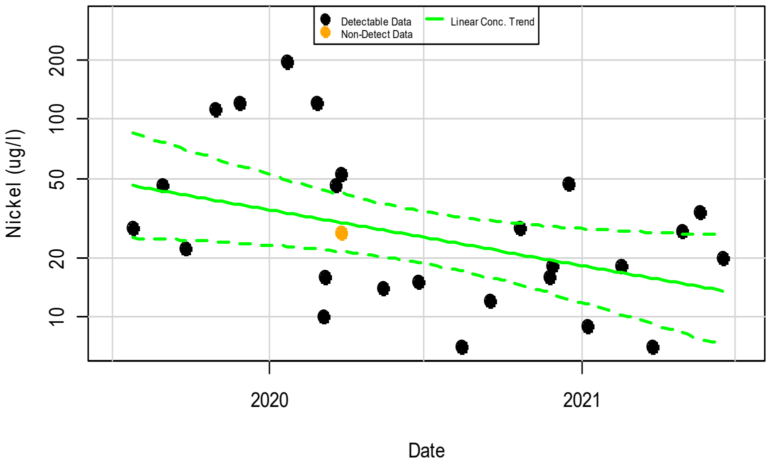
Nickel in NC01

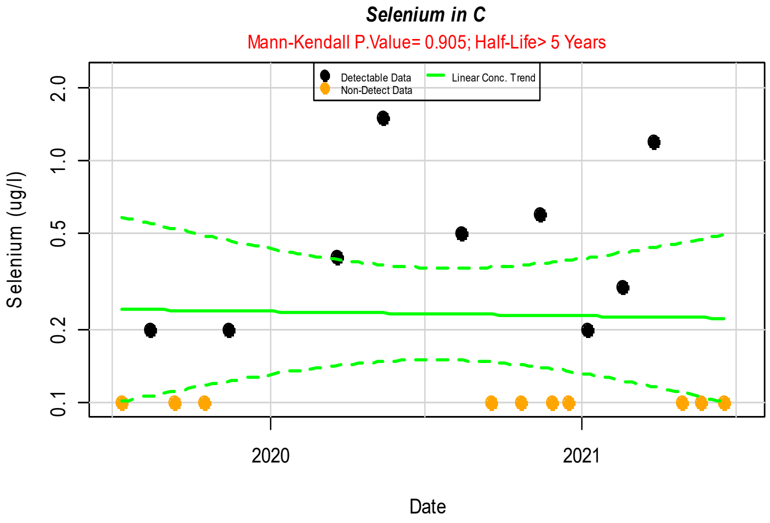
Mann-Kendall P.Value= 0.0598; Half-Life= 663 days

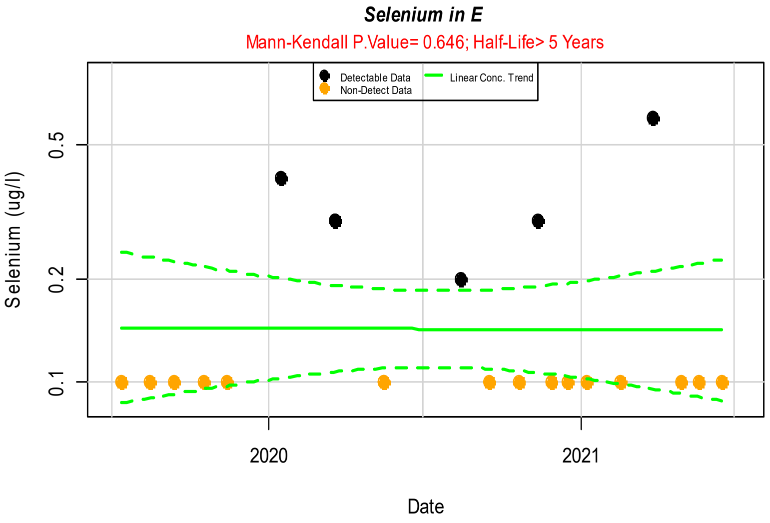


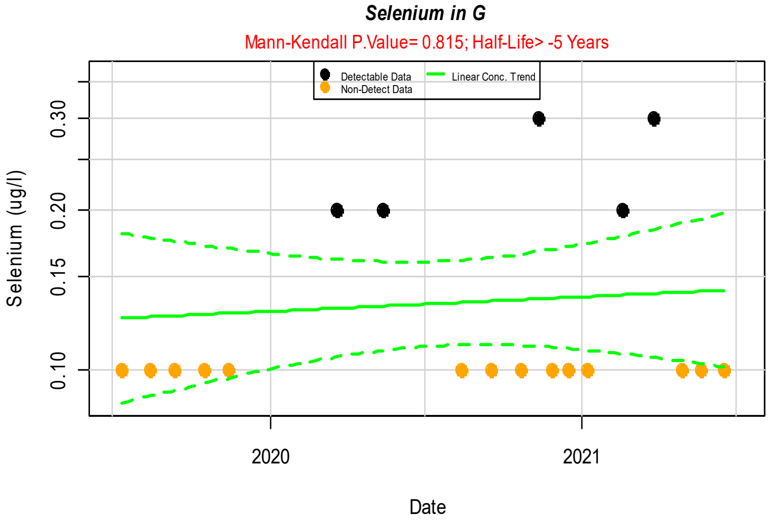
Nickel in WX22

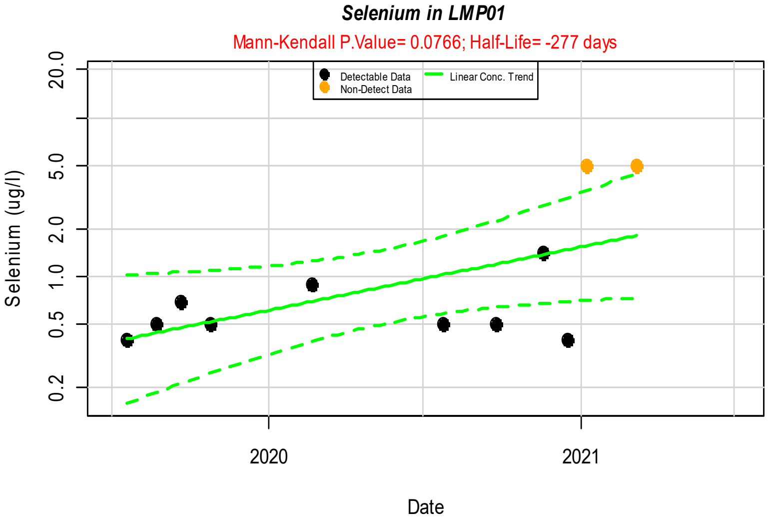
Mann-Kendall P.Value= 0.0998; Half-Life= 391 days

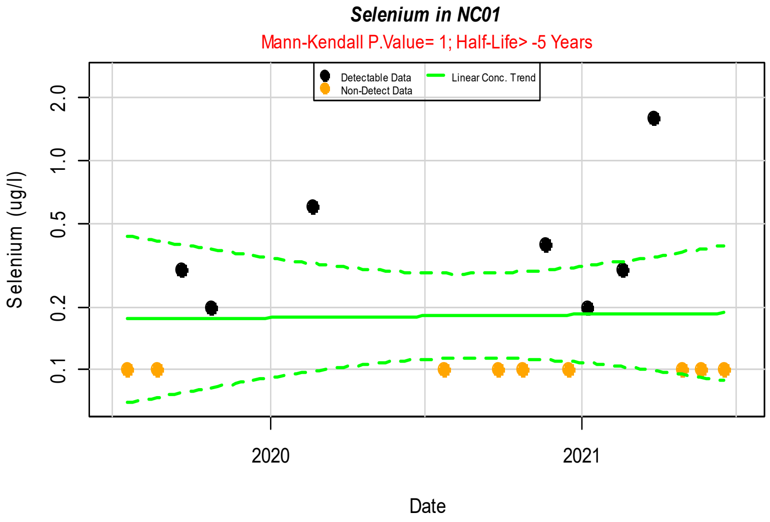



Selenium in C
Mann-Kendall P.Value= 0.905; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
Selenium (ug/l)
0.1
0.2
0.5
1.0
2.0
2020
2021
Date


Selenium in E
Mann-Kendall P.Value= 0.646; Half-Life> 5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
Selenium (ug/l)
0.1
0.2
0.5
2020
2021
Date

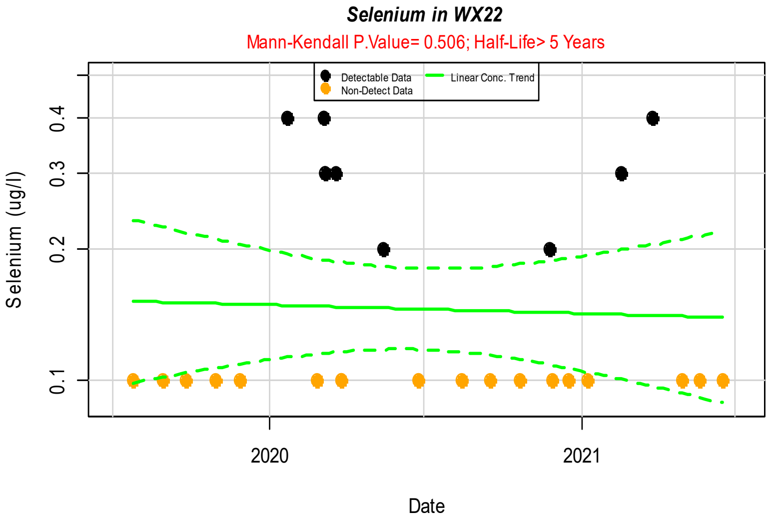

Selenium in G
Mann-Kendall P.Value= 0.815; Half-Life> -5 Years
Detectable Data
Non-Detect Data
Linear Conc. Trend
Selenium (ug/l)
0.10
0.15
0.20
0.30
2020
2021
Date


Selenium in LMP01
Mann-Kendall P.Value= 0.0766; Half-Life= -277 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Selenium (ug/l)
0.2
0.5
1.0
2.0
5.0
20.0
2020
2021
Date



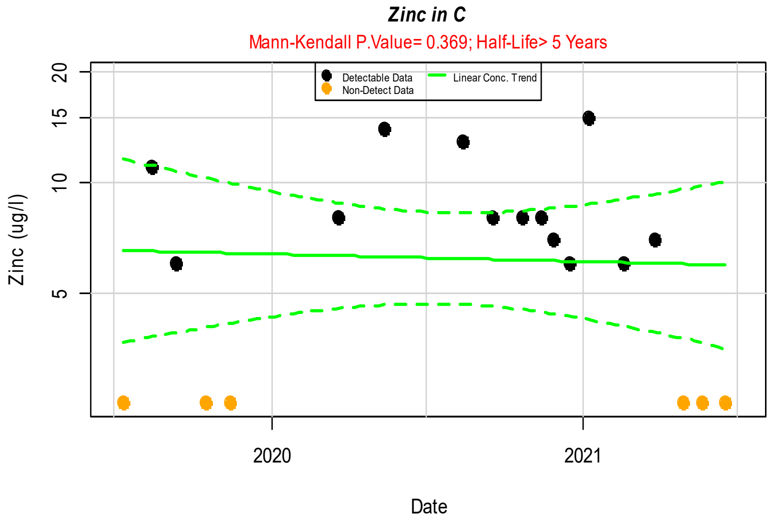
Selenium in NC01

Mann-Kendall P.Value= 1; Half-Life> -5 Years



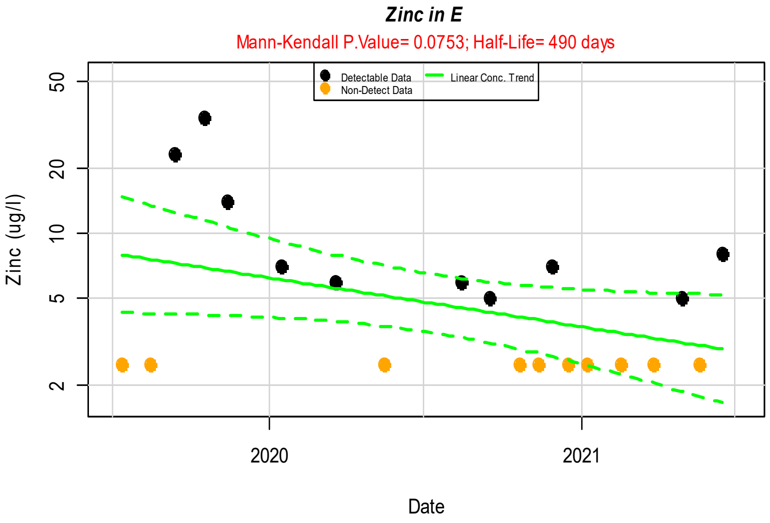
Selenium in WX22

Mann-Kendall P.Value= 0.506; Half-Life> 5 Years



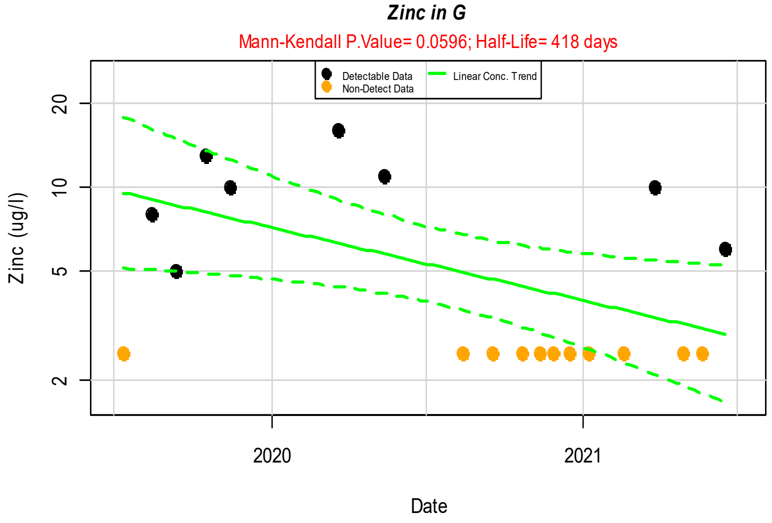
Zinc in C

Mann-Kendall P.Value= 0.369; Half-Life> 5 Years



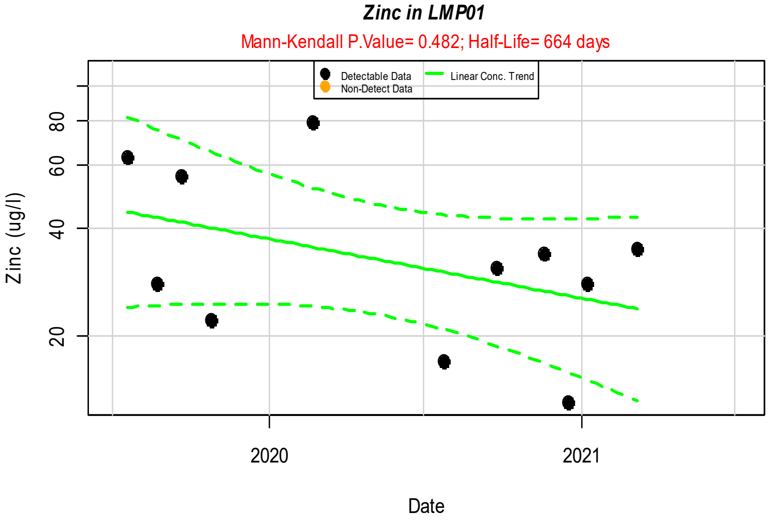
Zinc in E

Mann-Kendall P.Value= 0.0753; Half-Life= 490 days



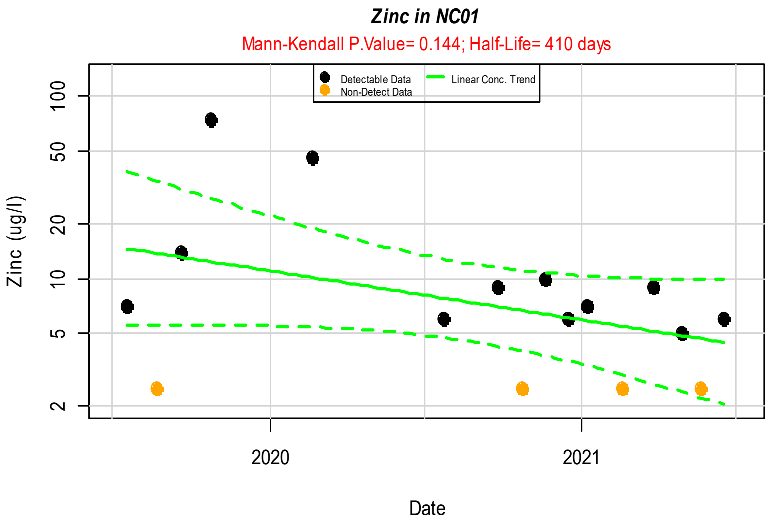
Zinc in G

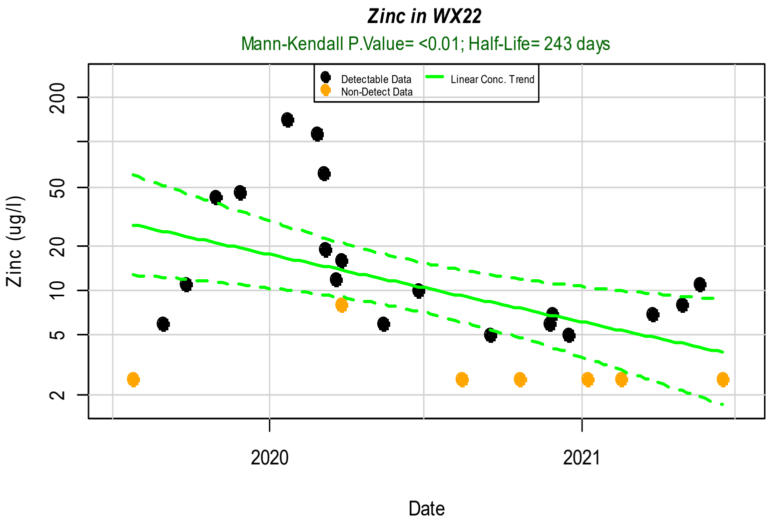
Mann-Kendall P.Value= 0.0596; Half-Life= 418 days



Zinc in LMP01

Mann-Kendall P.Value= 0.482; Half-Life= 664 days


Zinc in NC01
Mann-Kendall P.Value= 0.144; Half-Life= 410 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Zinc (ug/l)
100
50
20
10
5
2
2020
2021
Date


Zinc in WX22
Mann-Kendall P.Value= <0.01; Half-Life= 243 days
Detectable Data
Non-Detect Data
Linear Conc. Trend
Zinc (ug/l)
200
50
20
10
5
2
2020
2021
Date

APPENDIX M NALCO SAMPLING METHOD AND QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) PROGRAM

CA12119 Total Suspended Solids

1. SCOPE & APPLICATION

This document describes determination of total suspended solids in water samples. It is applicable to the Global Analytical and Microbiological (GAM) Services laboratory, Mount Piper site.

2. REFERENCES

a) APHA Standard Methods, for the Examination of Water and Waste Water - Method 2540D

3. DEFINITIONS

Suspended Solids: The particulate material retained on a glass fibre filter and dried to constant weight at a specified temperature. Suspended solids may also be called “Non-Filtrable Residues”, or “NFR”.

Type 1 water: Ultrapure Milli-Q Water as per ASTM D1193-6.

D.I. Water: De-Ionised Water

Blank sample: D.I water sample

4. THEORY

The method for total suspended solids is based on Standard Methods, for the Examination of Water and Waste Water.

A well mixed sample is filtered through a weighed standard glass-fibre filter, the residue is collected on the filter and dried to a constant weight at 103 - 105 °C. The increase in weight of the filter represents the total suspended solids.

5. INTERFERENCES

- Exclude large floating particles or submerged agglomerates of non-homogeneous materials from the sample if it is determined that their inclusion is not representative.
- Limit sample size to no greater than 200 mg residue as excessive residue on the filter may form a water-entrapping crust. In samples where this is the case, reduce the volume filtered.
- Samples with high total dissolved solids need to be thoroughly washed to ensure removal of dissolved material.
- Prolonged filtration times resulting from filter clogging may produce high results owing to increased colloidal materials captured on the clogged filter.

6. SAFETY NOTES

- General PPE - Labcoat, safety glasses, gloves, protective footwear.

7. EQUIPMENT

- Whatman GF/C filter paper 47mm / 47mm No. 393 Glass Microfiber Filter papers or equivalent
- Tweezers
- Drying oven at 103 - 105 °C
- Filtration apparatus
- Vacuum source
- Desiccator
- Analytical balance capable of weighing 0.1mg
- Pipette with 10mL or 5mL volume capacity and wide bore pipette tips. CAUTION: 1 mL pipette tips are not to be used.
- Baking trays
- Magnetic Stirrer
- Measuring Cylinder “A grade”: 50mL, 100mL, 250 mL, 500mL capacity

8. INSTRUMENT SETTINGS

None.

9. REAGENTS

- Type 1 water
- D.I Water

10. STANDARDS

None.

11. SAMPLE PRESERVATION

- Use resistant glass or plastic bottle, provided that the material in suspension does not adhere to container walls.
- Begin analysis as soon as possible, preferably within 24hrs of sampling and no more than 7 days.

12. PROCEDURE

12.1 Preparation of Filter Papers

The glass fibre filter papers shall be prepared as follows:

a) Set up filtration apparatus.
b) Turn vacuum pump on.
c) Place filter paper on filtration apparatus wrinkle side up.
d) Apply vacuum and wash with a minimum of 3 successive 20 mL portions of type 1 water; Continue applying vacuum until all traces of water is removed.
e) Discard washings.
f) Remove filter paper from filtration apparatus and transfer to a baking tray.
g) Dry in an oven at 103 – 105°C for a minimum of 2 hours.
h) Cool in desiccator for a minimum of one hour.
i) Store in desiccator until needed.

Note: Study conducted has shown that the use of a wash bottle to distribute the Type 1 water to prepare the filter papers, is delivering sufficient volumes of Type 1 water as directed in the APHA.

12.2 Sample Analysis

a) Check the spirit level of the balance (ensure that the bubble is within the circle) before proceeding. Refer to A-6.10 if adjustment is required.
b) Place filter paper on balance pan.
c) Record the initial weight of filter paper.
d) Place filter paper in allocated position of numbered grid template (typically made of cardboard) in sample site order.
e) Set up filtration apparatus.
f) Turn vacuum pump on.
g) Place filter paper on filtration apparatus wrinkle side up and apply vacuum.
h) Select sample volume according to Table 1. Mount Piper site typically filters large volumes e.g. 250mL and 500mL.

Table 1

Visual Appearance	Sample Volume (mL)
Clear – low turbidity	200-500
Hazy – medium turbidity	100-150
Very Hazy – high turbidity	10-50
Opaque – very high turbidity	<10

i) If sample bottle contains no air gap, invert the bottle several times and remove 5 mL to create an air gap to allow for more thorough mixing;
    I. For sample volumes > 10 mL:

      i. Vigorously shake the sample and sub-sample a suitable aliquot into a measuring cylinder and transfer it into the filtration apparatus.
      ii. Thoroughly rinse the measuring cylinder and filter paper with with a minimum of three successive 10 mL volumes of D.I water.
   II. For sample volumes < 10 mL or samples with rapidly settling solids:
      i. Vigorously shake the sample and with continuous stirring using a magnetic stirrer, sub-sample a suitable aliquot using a pipette or automatic pipette.
      ii. Wash the filter paper with a minimum of three successive 10 mL volumes of D.I water.

j) Samples with high total dissolved solids require additional washing to ensure removal of dissolved material. Allow for complete drainage between washings.
k) Check the cups to ensure they are clean before moving on to next sample. Extra washing of cups is necessary when previous samples have had ash in them.
l) Record the aliquot.
m) Remove filter paper with sample residue carefully and place back on allocated position of labelled grid template.
n) A blank sample is to prepared using D.I water.
o) Dry the filter papers in a 103 – 105°C oven for minimum of one hour.
p) Cool in a desiccator for a minimum of one hour.
q) Place filter paper on balance pan.
r) Record the final weight of filter paper. As some evaporation residues readily absorb water rapid weighing is essential.
s) Perform duplicates according to Quality Control (Table 1 in Section 14).
t) Once the result has been calculated, reported and authorised, the filter paper may be discarded.

Note: The 1 hour drying period has been validated and shown to achieve constant weight after 1 hour of drying. The repeated drying and cooling of the glass fiber filters as described in Reference (a) is not necessary.

13. TROUBLESHOOTING

Refer to Quality control section and A-2.24 Control of non-conforming test and calibration work. It may be necessary to record an additional comment via addition of a WAT_COMM test code. If unsure, consult senior chemist.

13.1 Sample Matrix Interferences

In the case where a sample matrix is difficult to filter, the following actions shall be taken as necessary:

a) A lesser volume shall be chosen based on the filterability of the sample if the limit of reporting is raised for the result above < 2 mg/L. The following WAT_COMM and test comment shall be added: “Limit of reporting raised for Suspended Solids due to sample matrix.”

b) If the sample cannot be tested because of the sample matrix:
   I. The test shall be cancelled.
   II. The following WAT_COMM and test comment shall be added: “Suspended Solids could not be determined due to sample matrix.”.

14. QUALITY CONTROL

The following quality control is carried out, as outlined in Table 2.

Table 2: Quality Control

QC Parameter	Frequency	Limits	Action QC Criteria Not Satisfied
Blank	One per batch	< 1 mg/L (LOR)	a) Consult senior staff
Duplicate	Every 10 samples or per batch	Results ≤ LOR, allowed RPD between duplicates is 200%. Results ≤5 times LOR, allowed RPD between duplicates is 100%. Results 5-10 times LOR allowed RPD between duplicates is 50%. Results >10 times LOR allowed RPD between duplicates is 20%.	a) Refer to interference section. b) Consult senior staff.

15. CALCULATIONS

15.1 Total Suspended Solids

Calculate the result as milligrams per litre, as follows:

$$\text{Suspended solids mg/L} = \frac{((W_2 - W_1) \times 1000)}{V}$$

Where:

W_1 = Weight of filter (in grams)
W_2 = Weight of filter plus dried residue (in grams)
V = Sample Volume (L)

15.2 Relative Percent Difference (RPD %)

Relative Percent Difference (RPD %) is calculated using the following formula:

$$\frac{(D_1 - D_2) \text{ X } 100}{((D_1 + D_2)/2)}$$

Where:

D_1 = First Sample Value (mg/L)

D_2 = Duplicate Value (mg/L)

16. REPORTING

The limit of reporting is 1 mg/L.

The results shall be entered directly into LIMS wherever possible. If this is not possible for any reason, the data shall be recorded on the electronic worksheet (Attachment 1) which is saved on the shared network drive.

The results shall be entered in LIMS as follows:

a) Log into LIMS and select the “Workstation Backlog” workflow.
a) Select “GRAVIMTRC” in the workstation column of the table.
b) Under “Template Name” select SS_MP. This will now generate a new Suspended Solids batch. Record this batch number if using Attachment 1.
c) Open the selected batch by selecting the batch name.
d) Save the batch.
e) Select the “Samples” tab and add a QC sample duplicate (RPD) every 10 samples.
f) Save the batch.
g) Select the “Results” tab and fill out all the information required. Once completed, each field must be authorized by clicking on the “Authorized” button (on bottom right of results tab).
h) Save the batch.
i) Select the “Samples” tab and the “Options” menu.
j) Select “Result Entry by Sample” and select “SS” from the drop-down box.
k) Record data for samples and save.
l) Calculate all duplicates and save.
m) The results and QC samples will be authorized by a staff member who is approved to do so and they will close the batch.

17. UNCERTAINTY OF MEASUREMENT

The following uncertainty of measurement has been calculated for total suspended solids analysis:

Total Suspended Solids	U = ± 24.886 %

18. ATTACHMENTS

- Attachment 1 - Suspended Solids Record Sheet

19. APPENDIX

None

NALCO
An Ecolab Company

Unit 12, 2 Eden Park Drive
Macquarie Park 2113
Phone: +61 (0) 2 8870 8434

ABN: 41 000 424 788

Ecolab/Nalco Global Analytical & Microbiological Services

Quality assurance/quality control program (2021)

The laboratory's Quality assurance/quality control program ensures that sampling activities and analytical data is accurate, reliable and acceptable.

The Quality assurance/quality control program consists of both internal and external measures.

Internal

- Laboratory instrumentation and field equipment are calibrated at the correct intervals, as prescribed in the relevant NATA 'General equipment table'.
- Regular preventative maintenance is carried out on all key laboratory instrumentation and field equipment.
- Trip blanks (where appropriate) are supplied to monitor contamination.
- Certified reference materials are analysed routinely.
- Duplicate analysis is conducted to check precision.
- Laboratory blanks are analysed to monitor contamination.
- Quality control checks on media are performed.
- All records and subsequent reports are systematically checked.
- Quality control charts are used to statistically monitor trends in data.
- The laboratory is regularly internally audited.

External

- Ecolab Global Analytical & Microbiological Services participates in regular chemical and microbiological external proficiency testing programs as well as NATA audits as per their surveillance program.

Sampling and data collection

- All sampling is performed by trained personnel in accordance with procedure A-2.18 and relevant parts of Australian Standard 5667, for which NATA accreditation is held.
- Site measurements (DO, pH, turbidity, temperature and conductivity) and sampling observations (water depth) are recorded and reported in accordance with procedure CA12125.

Sample bottles

- Pre-labeled sample containers are used for routine sampling and testing.
- The sample bottles are prepared so that samples are preserved in accordance with Australian Standard 5667.1:1998 and Standard Methods for the Examination of Water and Wastewater, 22nd Edition (APHA).

Delivery of samples

- Eskies and freezer packs are used to maintain the integrity of the samples during transport from the sampling sites to our Global Analytical & Microbiological Services Laboratory.

ERM has over 160 offices across the following countries and territories worldwide

Argentina
Australia
Belgium
Brazil
Canada
Chile
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
Myanmar
The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Russia
Senegal
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
Thailand
UAE
UK
US
Vietnam

ERM Sydney
Level 15
309 Kent Street
Sydney NSW 2000

T: +61 2 8584 8888
F: +61 2 9299 7502

www.erm.com

The business of sustainability