# MILLENNIUM MINE

## Groundwater Network Review and Trigger Assessment

Prepared for:

MetRes Pty Ltd

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# PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Level 16, 175 Eagle Street
Brisbane QLD 4000 Australia
(PO Box 26 Spring Hill QLD 4004)
T: +61 7 3858 4800
E: brisbane@slrconsulting.com www.slrconsulting.com

# BASIS OF REPORT



# DOCUMENT CONTROL

| Reference | Date | Prepared | Checked | Authorised |
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# CONTENTS

# CONTENTS



## TABLES



## FIGURES

# CONTENTS

## APPENDICES

# 1 Introduction

Millennium Coal Mine is located approximately 20 kilometres (km) south-east of the township of Moranbah, within the Isaac Regional Council Local Government Area (LGA) in Queensland (Figure 1). The Millennium Mine consists of two mining areas with six contiguous mining leases (ML): the Mavis Downs area (ML 70457, ML 70483 and ML 70485); and the Millennium area (ML 70313, ML 70401, ML 70344), which together form a single operational project, the Millennium Mine.

Millennium Mine operates under Environmental Authority (EA) EPML00819213. Millennium Mine was in care and maintenance between May 2018 and June 2021. Mining recommenced in July 2021 after a change of ownership. Since then, several open cut related mining activities have been commenced in the Mavis Downs and Millennium areas.

Approval was sought and obtained to change the mining method from open cut to underground for an area located in the south-east of ML70547. The portal for the Mavis UG mine will be within the historical Mavis open-cut Pit.

## 1.1 Scope

SLR Consulting Australia Pty Ltd (SLR) has been engaged by MetRes Pty Ltd (MetRes) to produce a Groundwater Monitoring Network Review, for the purpose of identifying possible impacts on groundwater attributed to the mining operations at Millennium Mine, specifically the area identified as Mavis underground (Figure 1). This report addresses Condition D6 of EA EPML00819213.

Condition D6 stipulates:

> For the Mavis underground operations as detailed in Figure 3, an assessment by an appropriately qualified person must be undertaken to determine the following: a) Number and location of groundwater monitoring sites; b) Suitability of the monitoring network; and c) Groundwater contaminant trigger levels.

The scope of this groundwater network suitability assessment includes:

- Review of the number and location of groundwater monitoring sites;
- Assessment of the suitability of the current network to monitor potential impacts on the groundwater environment;
- Review the bore logs of additional sites from the adjacent Carborough Downs mine's monitoring network and assess if the bores are suitable for inclusion in the Groundwater Monitoring Program (GMP) for Mavis underground (UG) mining. If these bores are not suitable for inclusion in the GMP, and the suitability of the current network is deemed insufficient to monitor potential impacts, propose new monitoring bores including bore locations and target depths;
- Recommendation of suitable locations for hydraulic testing; and
- Determination of trigger levels for groundwater quality.


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| Coordinate System: | GDA 1994 MGA Zone 55 |
| Scale: | 1:100,000 at A4 |
| Project Number: | 620.30802 |
| Date: | 12-Apr-2022 |
| Drawn by: | NT |

SLR

**LEGEND**

- Principal Road
- Minor Road
- Railway
- Watercourse
- Mavis Underground
- Millennium Mine

**MILLENNIUM MINE GROUNDWATER MONITORING NETWORK REVIEW**

**Millennium Mine Location and Mining Leases**

**FIGURE 1**

H:\Projects-SLR\620-BNE\620-BNE\620.30802.00000 Millennium Mine Annual report and network\06 SLR Data\01 CADGIS\GIS\MXD\GWMN Review\62030802_F01_Project Location.mxd

## 1.2 Previous Studies

Details on key previous studies that informed this assessment including potential impacts on groundwater attributed to the mining operations at Mavis Downs are provided in Table 1.

Table 1 Previous Studies and Potential Impacts as a Result of the Mining at Millennium Mine

| Report | Description | Potential Impacts and Recommendations |
|---|---|---|
| Groundwater Impact Assessment for Millennium Expansion Project EIS (MatrixPlus, 2010) | A summary of regional and site geology and hydrogeology. This report provides a description of groundwater occurrence and use. Numerical groundwater modelling was undertaken to predict the impacts of the proposed expansion project on regional groundwater levels.<br><br>Mining at Mavis Downs was assessed and modelled as open-cut mining. | Nine landholder bores targeting the Rangal Coal Measures were predicted to be impacted by drawdowns between 0.1m and 27.9m.<br><br>No potential impacts on groundwater quality in the Rangal Coal Measures was predicted.<br><br>Ten monitoring bores were recommended be installed within the Rangal Coal Measures to monitor drawdown. |
| Millennium Mine Supporting documentation to the Environmental Authority (EPML00819213) amendment application Mavis Underground operations - Groundwater Impact Assessment. State considerations (SLR, 2021) | This report provided a conceptualisation of the groundwater assessment based on MatrixPlus (2010) that was updated with newly available data gathered.<br><br>A regional groundwater model was constructed and used to quantify the incremental and cumulative impacts of the mining at Mavis on the groundwater regime. | Predicted impacts on groundwater users resulting from the Mavis UG project are as follows:<br><br>No incremental impacts from Mavis UG were identified. Drawdown is predicted in the Leichardt Seam of the Rangal Coal Measures there are no known groundwater users targeting this aquifer.<br><br>Low potential terrestrial groundwater dependent ecosystems (GDEs) 2 km north of the Project and 4 km south of the Project (between neighbouring mines) are predicted to be impacted by up to 2 m of drawdown in the regolith (Quaternary/Tertiary Alluvium) under the cumulative impact scenario.<br><br>Two landholder bores were identified to be within the predicted water table drawdown extent under the cumulative impact scenario: |

| Report | Description | Potential Impacts and Recommendations |
|---|---|---|
| | | - A drawdown of 17.0m at bore RN105427 screened in the Rewan Group, and<br>- A drawdown of 6.3m at Bore 8 (unregistered landholder bore), screened in the Quaternary Alluvium<br><br>The cumulative impact modelling results indicate that the predicted impacts may stem from surrounding operations rather than the project.<br><br>The installation of two additional monitoring bores (‘Proposed 1’ and ‘Proposed 2’) was recommended to confirm the drawdown extents to the north of the Project. |

# 2 Environmental Setting

This section provides a summary of the environmental setting of Millennium Mine.

## 2.1 Climate

Regional climatic conditions at the Millennium are that of a sub-tropical nature, with higher temperatures, higher rainfall, and higher evaporation occurring in the summer months (December through February).

For the purposes of this assessment, SILO Grid point data at latitude: -22.00, longitude: 148.25 (Queensland Government, 2021) was used to assess long-term climate trends in the vicinity of Millennium. This dataset is interpolated from quality checked observational timeseries data collected at nearby stations by the BoM.

Data spanning January 1970 until April 2021 was used for assessing the long-term trends in the vicinity of the Millennium Mine. Based on this data, the average annual site rainfall is 602 millimetres (mm). The two highest annual rainfalls were recorded for the years 1998 and 2010, with annual rainfalls of 968 mm and 1,133 mm, respectively. The minimum annual rainfall occurred in 1982 with 261 mm.

Long-term rainfall trends, based on the SILO Grid Point Data, are indicated by analysis of the cumulative rainfall deficit/ deviation from the mean (CRD). Positive gradients on this curve (rising limbs) confirm wetter conditions than normal, while negative gradients (falling limbs) indicate dry conditions. Average rainfall conditions are inferred during periods of stable residual mass. Figure 2 shows that, over the past 50 years, the wettest periods occurred during 1973 to 1979, 1988 to 1991, 2007 to 2008, and in 2010. The driest periods were between 1991 to 1998, 2001 to 2006, and 2017 to 2021. As shown by the declining trend in the CRD, Millennium is currently experiencing drier than average conditions.

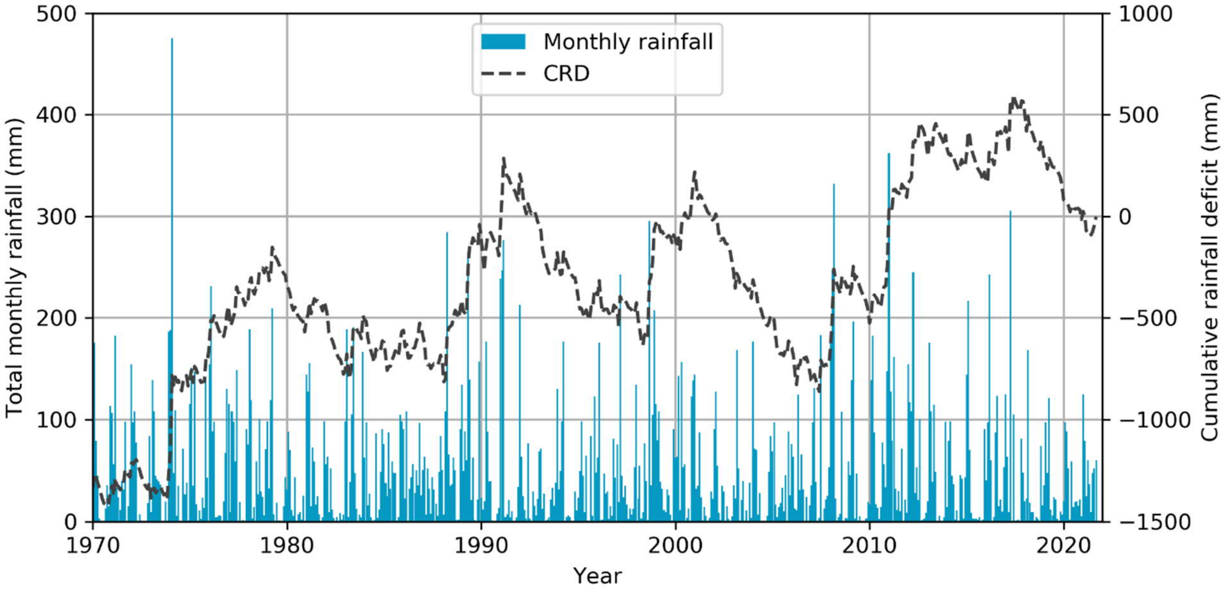



Figure 2 Long-term Monthly Rainfall and Cumulative Rainfall Deficit Curve at the Study Area

## 2.2 Hydrology

Millennium Mine is located in the Isaac River drainage basin sub-area of the wider Fitzroy Drainage Basin. The Isaac River, to the south-west of Millennium, is the major drainage feature of the region and flows in a south-easterly direction. New Chum Creek runs parallel to Millennium Mine, between the existing Millennium and Mavis open cut pits, and is a tributary of the Isaac River. New Chum Creek and Isaac River are classified as third order and sixth order streams respectively, and both are ephemeral, experiencing short periods of flow following high rainfall events over the summer months.

The catchment area of New Chum Creek is approximately 51 km$^2$, with Millennium Mine, as well as Poitrel and Daunia Mines, located within the catchment. The main channel of New Chum Creek typically has a base width of approximately 3 m and a depth of up to 2 m. Although minor waterholes can persist in the channel for several weeks following high rainfall events, there is little to no aquatic vegetation due to the stream being ephemeral, with streamflow expected to occur less than 30% of the time (Peabody, 2020). New Chum Creek has been diverted downstream as part of a neighbouring mining operation at Poitrel Mine.

The south-western part of Millennium Mine drains south to West Creek, another tributary of Isaac River. The West Creek confluence with the Isaac River is approximately 9 km upstream of that of New Chum Creek. West Creek has a catchment area of approximately 22 km$^2$. West Creek acts as an ephemeral minor watercourse.

Surface water in the area is ephemeral and does not have a groundwater baseflow component (SLR, 2021).

## 2.3 Geology

Millennium Mine is located in the Bowen Basin, a basin spanning an extent of approximately 200,000 km$^2$ and one of five major foreland sedimentary basins formed along the eastern side of Australia during the Permian Period. The Bowen Basin extends in a north to south direction from Townsville, Queensland at its northern extent to Moree, New South Wales at its southern extent. In the southern parts, the extent of the Bowen Basin and the Great Artesian Basin (GAB) overlap. The Bowen Basin has two north trending depocentres (a depocenter being the geographic location of the thickest part of any specific geographic unit in a depositional basin), the eastern Taroom Trough and western Denison Trough (Geoscience Australia, 2021). Millennium Mine lies within the Collinsville Shelf, north of the Taroom Trough depocentre.

Basin geology within the Collinsville Shelf includes the basal Permian aged Back Creek Group, which is comprised of generally fine-grained clastic sedimentary rocks deposited in a fluvial to shallow marine environment. The Back Creek Group is conformably overlain by the Blackwater Group, which includes the Rangal Coal Measures, Fort Cooper Coal Measures, and Moranbah Coal Measures. The economic seams of Millennium Mine are contained in the Late Permian Rangal Coal Measures. The Permian strata occur at outcrop on the eastern and western edges of the Basin and are unconformably overlain by the Triassic aged terrestrial sedimentary rocks of the Rewan Group. While not present at the Millennium Mine, isolated pockets of remnant quartzose sandstones of the Middle Triassic Clematis Group are mapped.

The Permian and Triassic units are covered by a thin layer of unconsolidated to semi-consolidated Cainozoic sediments (Tertiary to Quaternary alluvium and colluvium). The alluvial sediments are localised along rivers and creeks (Isaac River). Volcanic intrusions and extrusions are also present within the region.

The bedrock stratigraphy at Millennium Mine typically comprises of Triassic aged deposits, namely the Rewan Formation, which unconformably overlie Permian Coal Measures, inclusive of the Rangal Coal Measures and Fort Cooper Coal Measures. Operations at Millennium Mine extract from the Leichhardt coal seam in the Rangal Coal Measures Formation, whereas Millennium and Vermont coal seams (also within the Rangal Coal Measures) are not targeted by Millennium.

## 2.4 Hydrogeology

For a comprehensive review of the hydrogeology in the vicinity of Millennium Mine, the reader is directed to SLR (2021). In summary, the three main hydrostratigraphic units relevant to Millennium Mine are:

- The Quaternary alluvial sand of the Isaac River Alluvium, located along Isaac River and New Chum Creek. These are predominantly recharged by rainfall and stream flow infiltration during high streamflow events. Typically, they are high-yielding aquifers (albeit of limited areal extent and depth);
- Quaternary/ Tertiary alluvial and colluvial sediments, an unconfined perched aquifer that is predominantly recharged by rainfall; and
- Permian Rangal Coal Measures and Fort Cooper Coal Measures - semi-confined to confined aquifers with most groundwater flow occurring through the higher permeability coal seam layers. These aquifers are predominantly recharged through rainfall where the deposit outcrops at surface, or by leakage from alluvium. The siltstones and sandstones that make up the majority of the interburden are considered to act as confining layers, due to their low permeabilities compared to the coal seams.

A conceptual groundwater model showing the pre-mining and current mining with Millennium and Mavis Pits is shown in Figure 3. With the EA amendment in 2021, the mining at Mavis open-cut is now approved to go underground.

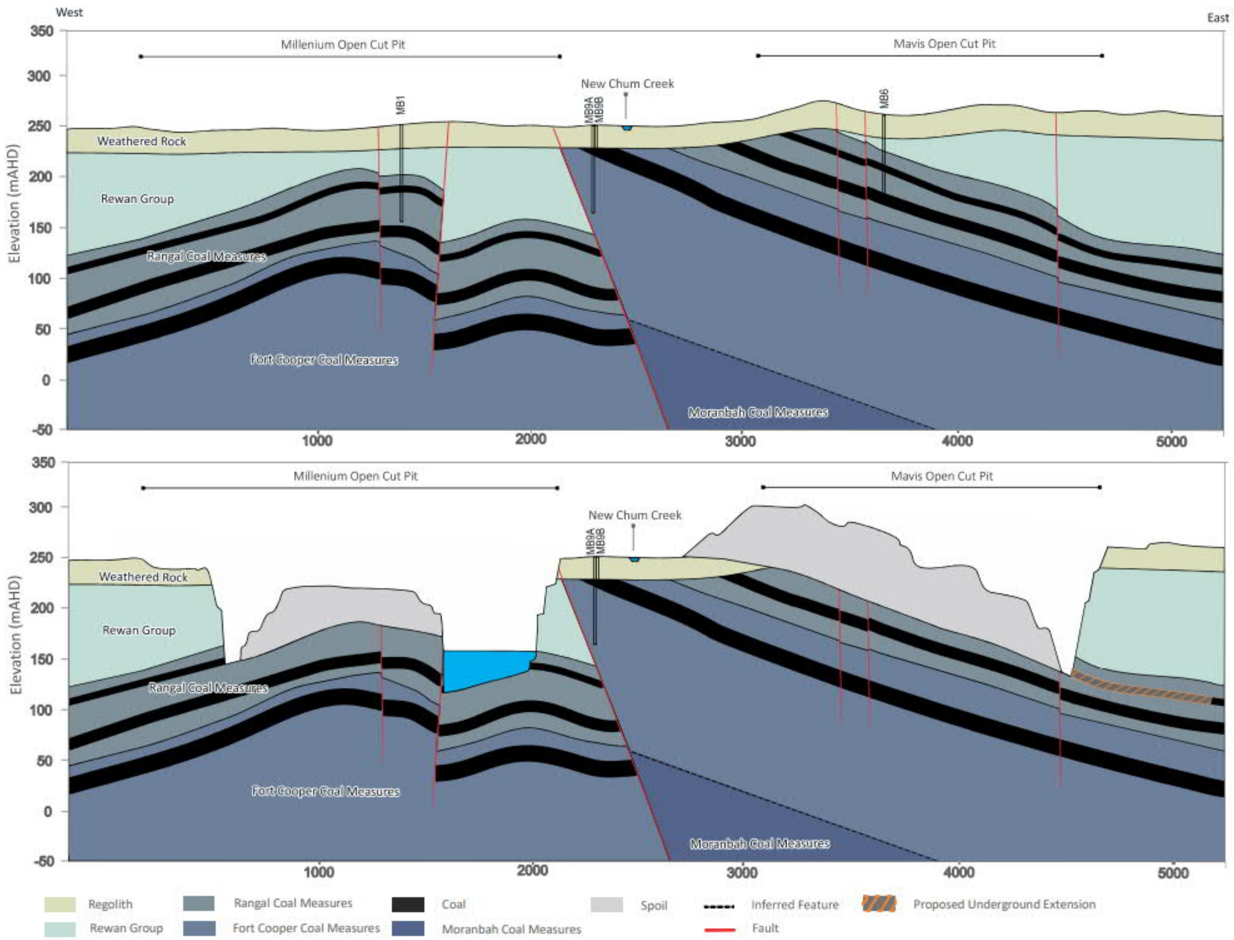



Figure 3 Conceptual Groundwater Model – Pre-Mining (Top) and Current (Bottom)

# 3 Groundwater Network Suitability Assessment

## 3.1 Current Groundwater Monitoring Sites

The current groundwater monitoring network at Millennium Mine available to assess impacts from the Mavis UG mine is as per the current EA EPML00819213. It is comprised of one groundwater bore targeting the Permian Rangal Coal Measures and six groundwater bores targeting the Permian Fort Cooper Coal Measures. Construction details of these groundwater bores is provided in Table 2, including provision of the monitoring data captured. The locations of groundwater bores in relation to Mavis UG area are shown in Figure 4, together with the mapped surface geology.

Table 2 Mavis UG Mine Groundwater monitoring locations and frequency

| Monitoring Site ID | Screened Unit[1] | Ground Elevation (mAHD[2]) | Depth (mBGL[3]) | Screen (mBGL) | Gravel pack (mBGL) | Monitoring Parameters |
|---|---|---|---|---|---|---|
| MB2 | Rangal CM[4] | 262.38 | 90 | 72 - 90 | 69 - 90 | Quarterly SWL[5] |
| MB8A | Fort Cooper CM – Sandstone[6] | 259.1 | 30 | 22 - 28 | 20-30 | Quarterly SWL & Quality |
| MB8B | Fort Cooper CM - Sandstone[6] | 259.1 | 80 | 62 - 74 | 60 - 80 | Quarterly SWL & Quality |
| MB9A | Fort Cooper CM – Coal Seam | 251.8 | 30 | 22 - 30 | 20 - 30 | Quarterly SWL & Quality |
| MB9B | Fort Cooper CM – Sandstone below coal | 251.8 | 80 | 60 - 74 | 58 - 80 | Quarterly SWL & Quality |
| MB10A | Fort Cooper CM – Sandstone | 233.9 | 35 | 27 - 35 | 25.5 - 35 | Quarterly SWL & Quality |
| MB10B | Fort Cooper Coal Measures – Sandstone | 233.9 | 80 | 64 - 76 | 62 - 80 | Quarterly SWL and Quality |

[1]Reflects SLR's understanding of the screened aquifer, rather than the aquifer listed in Table D1 of the current EA EPML00819213

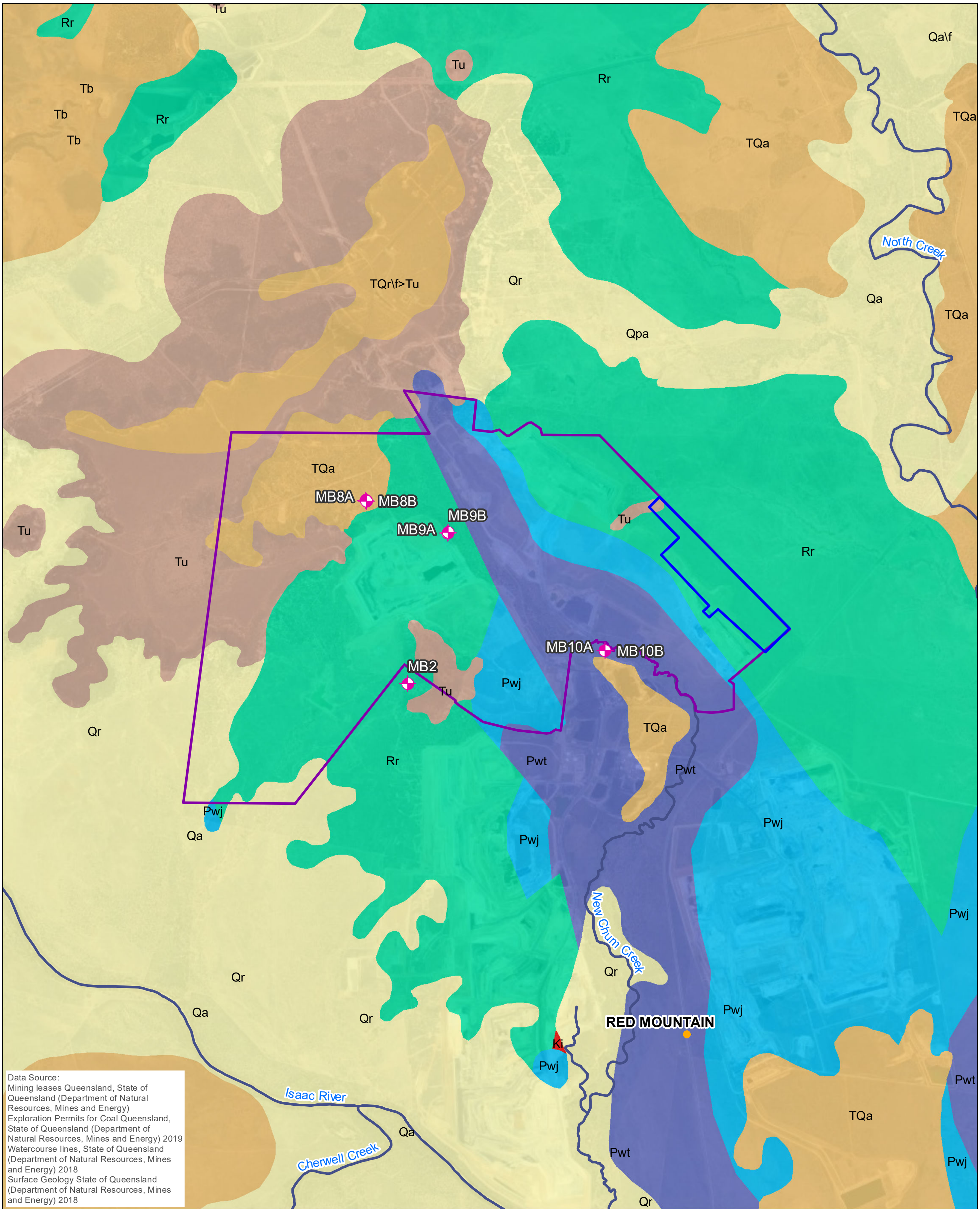
[2]Metres Australian Height Datum

[3]Metres below ground level

[4]Coal Measures

[5]Standing water level

[6] MB8A/B could be either attributed to the Rewan Formation or to the overburden of the Rangal Coal measures, to be confirmed with a site geologist (SLR, 2021)




Data Source:
Mining leases Queensland, State of Queensland (Department of Natural Resources, Mines and Energy)
Exploration Permits for Coal Queensland, State of Queensland (Department of Natural Resources, Mines and Energy) 2019
Watercourse lines, State of Queensland (Department of Natural Resources, Mines and Energy) 2018
Surface Geology State of Queensland (Department of Natural Resources, Mines and Energy) 2018

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SLR

**LEGEND**

- Groundwater Monitoring Bore
- Watercourse
- Mavis Underground
- Millennium Mine

**Surface Geology**

- Tertiary Sandstone (TQ)
- Alluvium (Qa)
- Suttor Formation (Tu)
- Fort Cooper Coal Measures (Pwt)
- Rewan Group (Rr)
- Rangal Coal Measures (Pwj)
- Ki-CQ

**MILLENNIUM MINE GROUNDWATER MONITORING NETWORK REVIEW**

**Location of Groundwater Bores**

**FIGURE 4**

H:\Projects-SLR\620-BNE\620.30802.00000 Millennium Mine Annual report and network\06 SLR Data\01 CADGIS\GIS\MXD\GWMN Review\62030802_F04 Monitoring Bore Network.mxd

## 3.2 Groundwater Network Review

### 3.2.1 Current Groundwater Monitoring Network

The current groundwater monitoring network was revised for its suitability to detect impacts from the Mavis UG operations. The following observations were made:

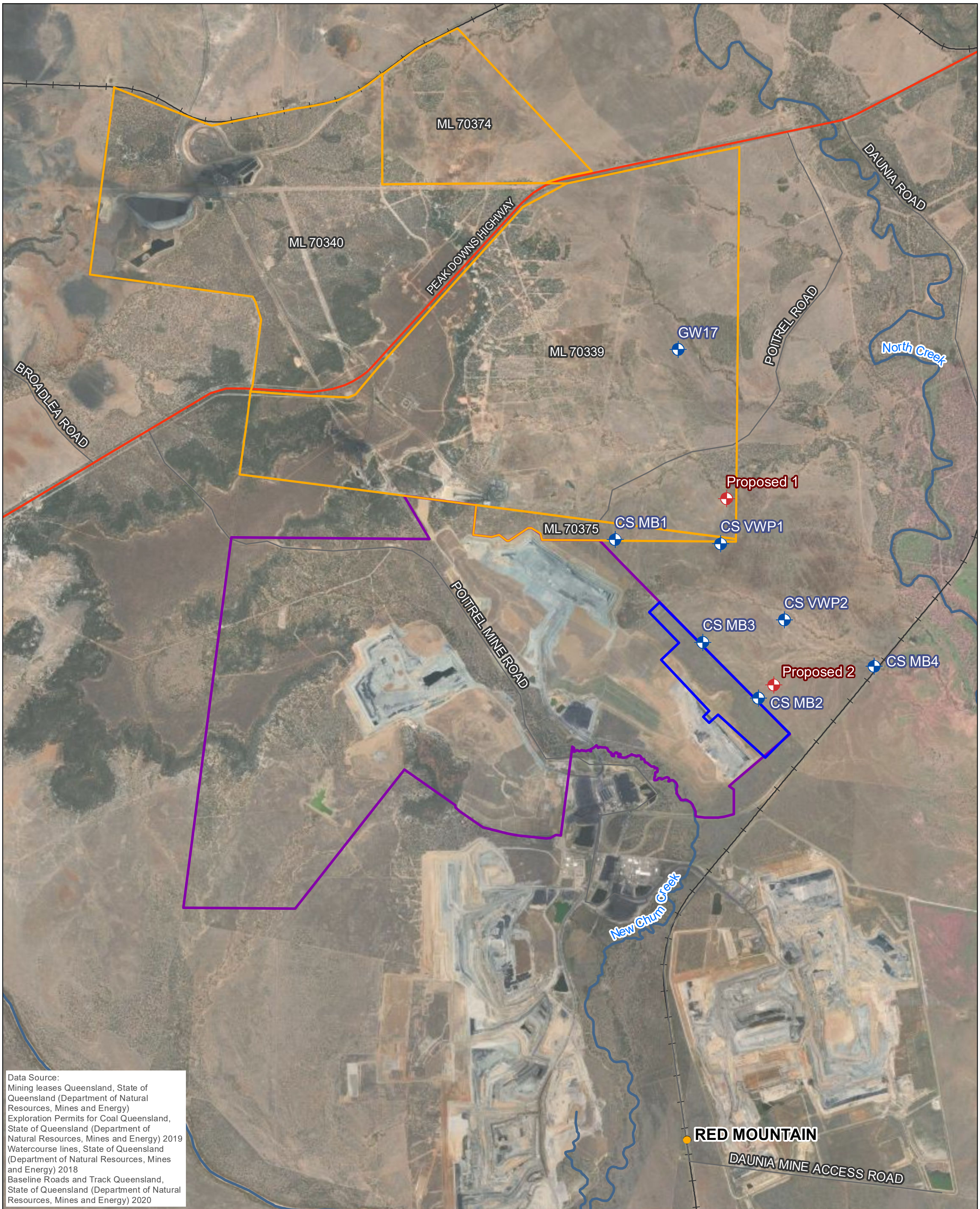
- The data available from the groundwater bores in the current network was assessed as being adequate for monitoring the potential drawdown to the west of Mavis UG mine, in the coal seams and in the sandstone unit below. Monitoring and data capture are recommended to continue for the duration of mining operations at Millennium; and
- Predicted groundwater drawdown impacts from the activities at Mavis UG mine was identified in SLR (2021) and are presented in Table 1. Two groundwater bores are recommended to be located in areas where changes in the groundwater regime can be attributed to the cumulative mining impacts from Millennium and surrounding mines. These areas are:
    - In the Quaternary/Tertiary Alluvium, approximately 2 km north of Mavis UG, on the outside of the Carborough Downs mining lease, within the area designated as a low potential terrestrial GDE associated with North Creek; and
    - In the Rangal Coal Measures (Leichardt Seam) to the east and north Mavis Pit.

### 3.2.2 Carborough Downs Monitoring Network

The Carborough Downs groundwater monitoring network was assessed for suitability for inclusion in the Mavis UG groundwater monitoring network, and if appropriate, to revise and update the proposed bores in SLR (2021).

MetRes has a data sharing agreement in place with Fitzroy Coal, which would allow to share the data from those bores. If monitoring frequencies or analytes differ, MetRes would be responsible for the additional monitoring. Monitoring locations are shown in Figure 5 and available data is provided in Table 3.

The bore construction of the Carborough Downs bores was reviewed to assess the appropriateness for inclusion of these bores in the Mavis UG groundwater monitoring network. A summary of this review is presented in Table 3. It is proposed to replace bores “Proposed 1” and “Proposed 2” with the inclusion of Carborough Downs monitoring bore; CS_MB2 and vibrating wire piezometer (VWP) CS_VWP1 in the Mavis UG groundwater monitoring network, with the rationale further explained in 3.2.2.1 and 3.2.2.2.




Data Source:
Mining leases Queensland, State of Queensland (Department of Natural Resources, Mines and Energy)
Exploration Permits for Coal Queensland, State of Queensland (Department of Natural Resources, Mines and Energy) 2019
Watercourse lines, State of Queensland (Department of Natural Resources, Mines and Energy) 2018
Baseline Roads and Track Queensland, State of Queensland (Department of Natural Resources, Mines and Energy) 2020

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| Coordinate System: | GDA 1994 MGA Zone 55 |
| Scale: | 1:75,000 at A4 |
| Project Number: | 620.30802 |
| Date: | 12-Apr-2022 |
| Drawn by: | NT |

SLR

**LEGEND**

- Carborough Downs Groundwater Monitoring Location
- Proposed Groundwater Monitoring Location (SLR, 2021)
- Principal Road
- Minor Road
- Railway
- Watercourse
- Carborough Downs Mine
- Mavis Underground
- Millennium Mine

**MILLENNIUM MINE GROUNDWATER MONITORING NETWORK REVIEW**

**Carborough Downs Groundwater Monitoring Locations**

**FIGURE 5**

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## Table 3 Carborough Downs groundwater monitoring network

| Monitoring Site ID[1] | Target Aquifer | Depth (mBGL) | Ground Elevation (mAHD) | Comment on Suitability for Inclusion in the Mavis UG Network | Inclusion Proposed |
|---|---|---|---|---|---|
| CS_MB1 | Rangal CM (Leichhardt Seam) | 160 | 254.35 | Located in the area of maximum predicted drawdown of the Leichhardt Seam in both the incremental and cumulative impact scenarios. With CS_MB1 located on the Carborough Downs boundary, CS_MB2 located immediately east of Mavis UG on the boundary, and CS_MB3 located in between CS_MB1 and CS_MB3, CS_MB2 is best positioned to indicate potential drawdown. | No |
| CS_MB2 | Rangal CM (Leichhardt Seam) | 170 | 236.63 | | Yes |
| CS_MB3 | Rangal CM (Leichhardt Seam) | 164 | 249.21 | | No |
| CS_MB4 | Rewan group | 80.5 | 219.68 | Can inform drawdown impact in the Rewan group, however the impact of drawdown on the Rewan group is already observed through CS_VWP1. | No |
| CS_VWP1 | Sensor 1 - Rewan group<br>Sensor 2 - Permian overburden<br>Sensor 3 - Rangal CM (Leichhardt Seam) | 196 | 246.59 | Has the potential to inform on the extent of the drawdown in the Leichhardt Seam of the Rangal CM, due to the depth of Sensor 3 and to the location being to the north of Mavis Pit. It is also well positioned to function as an early indicator of potential impacts to the low potential terrestrial GDE associated with North Creek. As such, this VWP is suitable to indicate potential water level changes in the groundwater regime attributable to Mavis UG mining activities. | Yes |
| CS_VWP2 | Sensor 1 - Rewan group<br>Sensor 2 - Permian overburden<br>Sensor 3 - Rangal CM (Leichhardt Seam) | 244 | 231.64 | Location and construction of this VWP suggests that it has the potential to inform on the extent of the drawdown in the Leichhardt Seam of the Rangal CM. However, in reviewing the CS_VWP2 hydrograph, it appears that the sensors are faulty, and no data is available after mid-2020. | No |
| GW17 | Unknown, likely targeting Tertiary Sandstone or Rewan Group | 25 | 246.00 | Dry from 2010 to 2016 (latest known reported date). Located on an unnamed tributary of North Creek in an area of Brigalow vegetation. Located in a low potential terrestrial GDE that is predicted to be unaffected by incremental and cumulative impacts of the mining at Mavis UG. | No |

1. For the benefit of this document “CS_” has been added to bore names to distinguish Millennium bores from Carborough Downs (Carborough South) bores.

#### 3.2.2.1 CS_VWP1 Rationale

The justification for replacing "Proposed 1" with the Carborough Downs bore CS_VWP1 is that Sensor 1 of the CS_VWP1 piezometer targets the Rewan Group and will act as an early warning system for drawdown at the low potential terrestrial GDE associated with North Creek.

Previously, it was intended that "Proposed 1" was installed in the Quaternary/Tertiary Alluvium of North Creek at an approximate depth of 20 mbgl. As shown in Figure 6, while drawdown is observed in the Permian overburden (Sensor 2) at CS_VWP1 in May 2021, the Rewan group (Sensor 1) and Rangal CM (Leichhardt Seam) (Sensor 2) appear to be unaffected, and it can be assumed that the shallower units are not impacted by drawdown due to mining activities. With CS_VWP1 returning consistent pressures in the Rewan Group, and the likely hydraulic separation of the Quaternary/Tertiary Alluvium and the Rangal Coal Measures by the Rewan Group, this existing VWP is proposed for inclusion in the network in lieu of a new shallower bore at "Proposed 1". As such, the piezometer at CS_VWP1 provides sufficient monitoring in the north, which negates the need to install a bore at "Proposed 1".

The existing Carborough Downs piezometer CS_VWP1 can appropriately indicate potential changes in the groundwater regime attributable to Mavis UG mining activities, and is suitable for inclusion in the Mavis UG groundwater monitoring network. It is recommended to include CS_VWP1, Sensor 1 as a minimum, and all three sensors as an optimum.

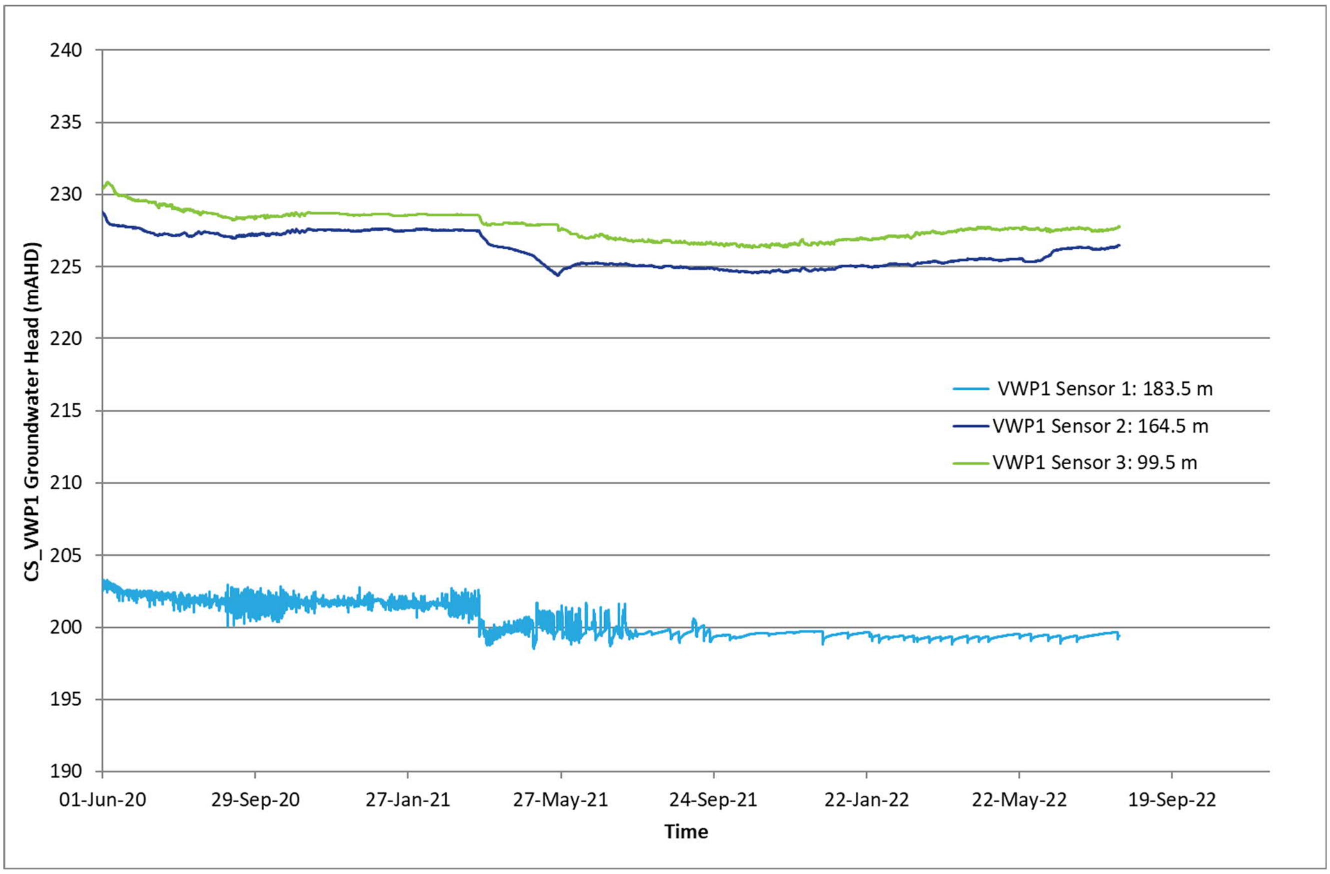



Figure 6 CS_VWP1 Hydrograph (adapted from Fitzroy Coal, September 2022)

#### 3.2.2.2 CS_MB2 Rationale

The justification for replacing “Proposed 2” with the Carborough Downs bore CS_MB2 is that the CS_MB2 bore targets the Leichardt Seam of the Rangal CM for drawdown monitoring, is located close to “Proposed 2” to the east of Mavis Pit, and is suitable for monitoring the water level impacts from mining at Mavis UG. As shown in Figure 7, the observed standing water level at CS_MB2 has slightly increased since mid-2020, peaking at 155 mAHD in late 2022 before stabilising at approximately 152 mAHD in 2021.

Previously, it was intended that “Proposed 2” was to be installed in the Permian Rangal at an approximate depth of 200 m to intersect the Leichhardt Seam. Currently, the CS_MB2 bore is installed at a depth of 164 mbgl with a screen interval of 155 – 158 mbgl. Therefore, bore CS_MB2 can fulfil the same role as “Proposed 2”, which negates the need to install a bore at “Proposed 2”.

The existing Carborough Downs bore CS_MB2 can appropriately indicate potential changes in the groundwater levels attributable to Mavis UG mining activities, and is suitable for inclusion in the Mavis UG groundwater monitoring network.

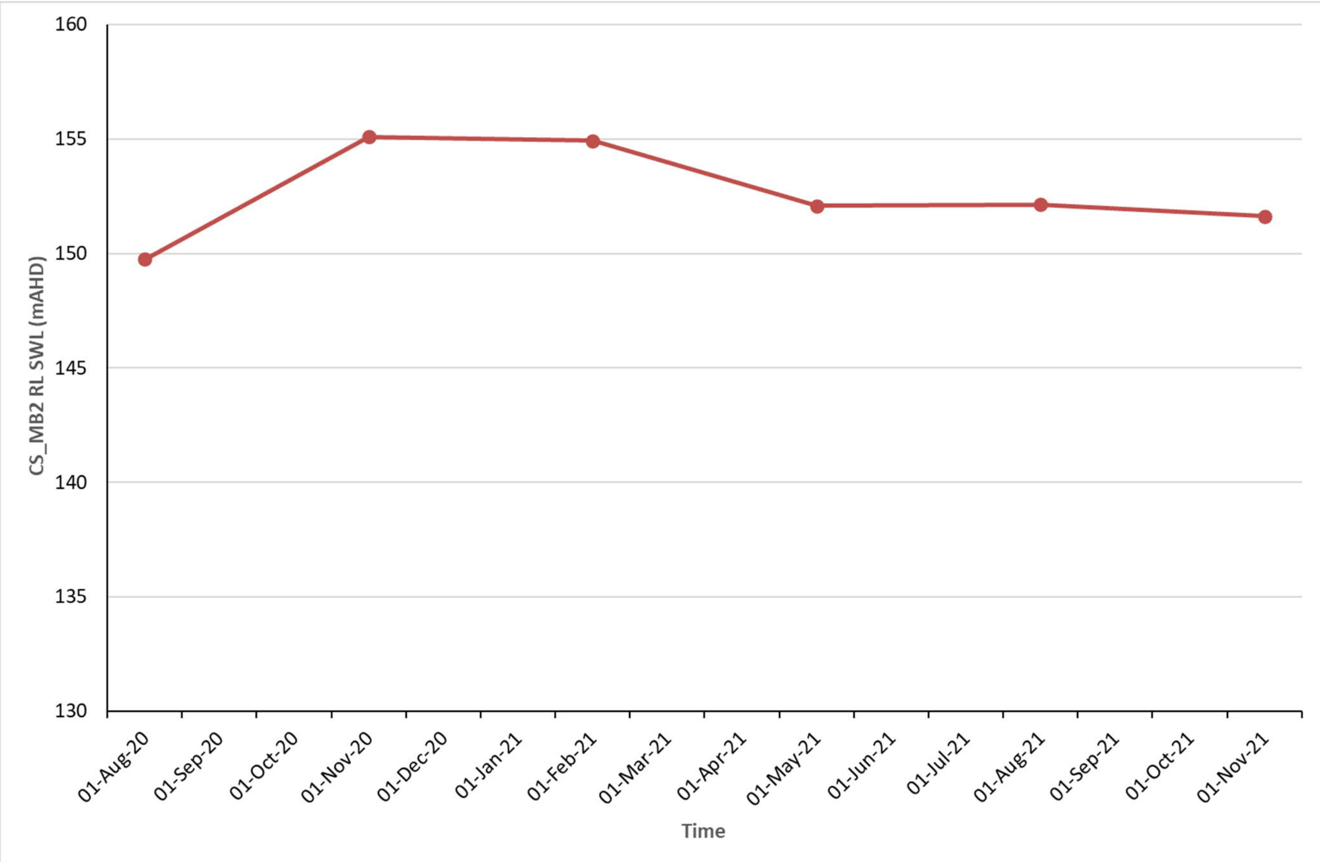



Figure 7 CS_MB2 Hydrograph (adapted from Fitzroy Coal, September 2022)

### 3.2.3 Proposed Groundwater Monitoring Network and GMP

The proposed groundwater monitoring locations for compliance with the EA to assess impacts of the Mavis UG mine are presented in Table 4 and Figure 8. The locations have been based on the assessment of potential impacts (SLR, 2021) as well as the suitability of the current network and Carborough Downs groundwater monitoring network. Table 4 presents the groundwater monitoring names with their depth and target aquifer, and locations are shown on Figure 8.

For the Carborough Downs monitoring bores, CS_MB2 and CS_VWP1, the proposed monitoring frequency is quarterly. These two bores are monitoring water levels only as per their original purpose.

As part of the full water quality monitoring suite, in addition to collecting field parameters electrical conductivity (EC) and pH, water samples will be submitted to a National Association of Testing Authorities (NATA) accredited laboratory for the analysis of:

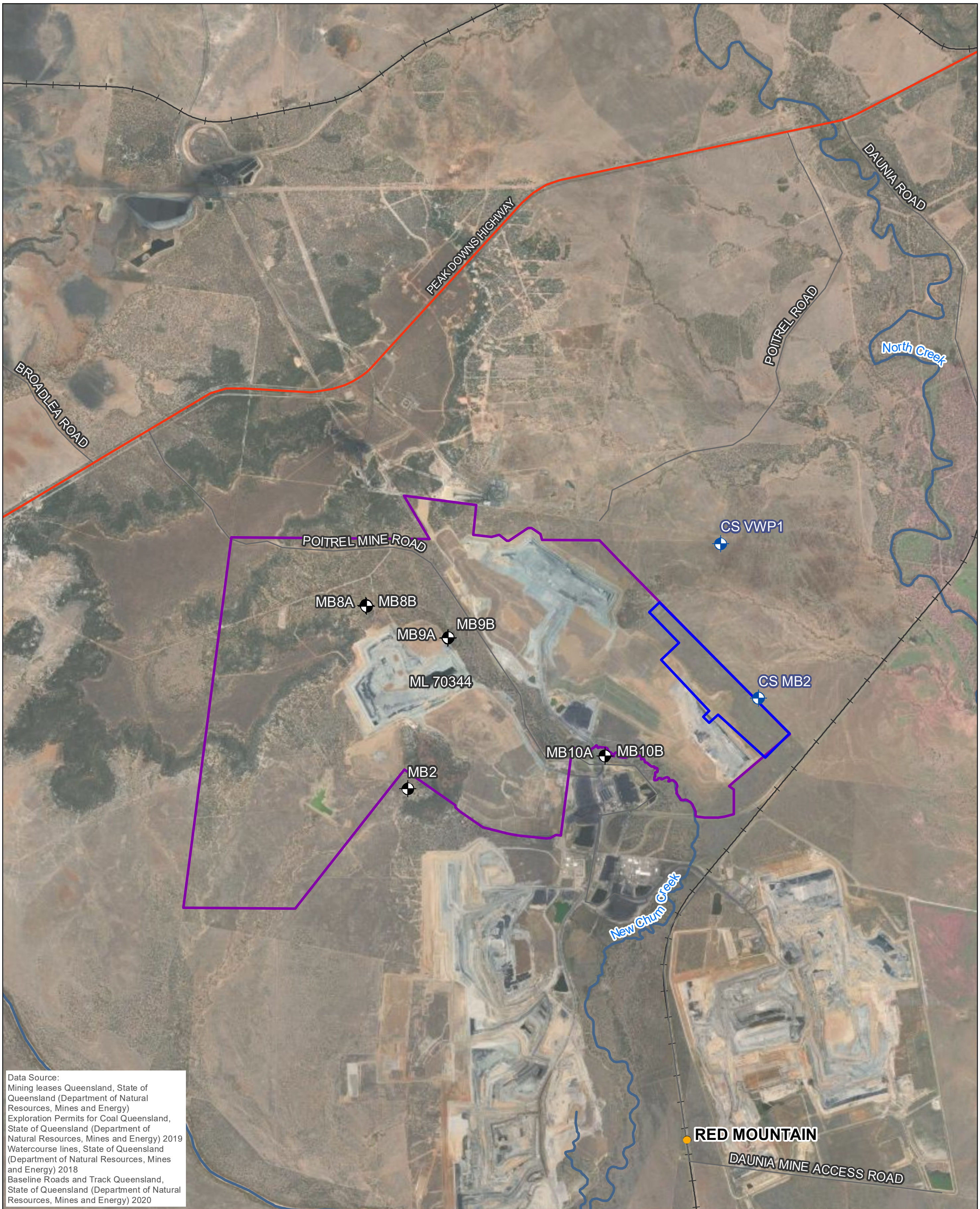
- Physiochemical indicators (total dissolved solids (TDS));
- Major ions (calcium, magnesium, sodium, potassium, chloride, sulphate, bicarbonate, carbonate);
- Total and dissolved metals: iron, silver, arsenic, mercury, antimony, molybdenum and selenium; and
- Total petroleum hydrocarbons (C6-C9, C10-C14, C15-C28 and C29-C36) with silica gel clean-up.

Table 4 Proposed Groundwater Monitoring Program

| Monitoring Site | Latitude (GDA94 Z54) | Longitude (GDA94 Z54) | Bore Depth (mBGL) | Target Aquifer | Status | Sampling[1] |
|---|---|---|---|---|---|---|
| MB2 | 22 10'49"S | 148 14'18"E | 90 | Permian Rangal | Existing | WL & WQ |
| MB8A | 22 00'27"S | 148 14'20"E | 30 | Fort Cooper CM – Sandstone[2] | Existing | WL & WQ |
| MB8B | 22 00'27"S | 148 14'20"E | 80 | Fort Cooper CM – Sandstone[2] | Existing | WL & WQ |
| MB9A | 22 00'34"S | 148 14'43"E | 30 | Moranbah Coal Seam | Existing | WL & WQ |
| MB9B | 22 00'34"S | 148 14'43"E | 80 | Moranbah Coal Measures Sandstone | Existing | WL & WQ |
| MB10A | 22 10'33"S | 148 16'00"E | 35 | Fort Cooper (Sandstone) | Existing | WL & WQ |
| MB10B | 22 10'33"S | 148 16'00"E | 80 | Fort Cooper (Sandstone) | Existing | WL & WQ |
| CS_MB2 | 22° 1' 10"S | 148° 17' 16"E | 170 | Rangal CM (Leichhardt Seam) | Recommended for inclusion | WL only |
| CS_VWP1 | 21° 59' 55"S | 148° 16' 56"E | 196 | Sensor 1 - Rewan group<br>Sensor 2 - Permian overburden<br>Sensor 3 - Rangal CM (Leichhardt Seam) | Recommended for inclusion | WL only |

[1] WL: Water Level, WQ Water quality

[2] The geological model shows the FFCM at 200m depth. As no coal was intersected for the 80m of the deep bores, these two bores could be either in the Rewan or Rangal Coal Measures.




0 1 2 km

| | |
|---|---|
| Coordinate System: | GDA 1994 MGA Zone 55 |
| Scale: | 1:75,000 at A4 |
| Project Number: | 620.30802 |
| Date: | 24-Mar-2022 |
| Drawn by: | NT |

**LEGEND**

- Millennium Mine Groundwater Monitoring Bore
- Carborough Downs Groundwater Monitoring Location
- Principal Road
- Minor Road
- Railway
- Watercourse
- Mavis Underground
- Millennium Mine

**MILLENNIUM MINE GROUNDWATER MONITORING NETWORK REVIEW**

**Proposed EA Compliance Monitoring Bore Locations**

**FIGURE 8**

H:\Projects-SLR\620-BNE\620.30802.00000 Millennium Mine Annual report and network\06 SLR Data\01 CADGIS\GIS\MXD\GWMN Review\62030802_F06_EA ComplianceBore.mxd

## 3.3 Suitability For Hydraulic Testing

During the EA amendment process in 2021, the Department of Environment and Science (DES) requested hydraulic testing be undertaken to determine local aquifer properties. A review of the current and potential future bores showed that MB2 and MB8A are not suitable for testing due to low water levels and dry conditions respectively. Hydraulic testing is not recommended for CS_VWP1. Hydraulic testing is only recommended for the bores detailed in Table 5, where access is available. Based on field records, CS_MB02 has an obstruction in the bore that may make testing impossible.

Table 5 Bores suitable for hydraulic testing

| Monitoring Site ID | Aquifer | Ground Elevation (mAHD) | Depth (mBGL) | Screen (mBGL) | Gravel pack (mBGL) |
|---|---|---|---|---|---|
| MB8B | Fort Cooper CM – Sandstone | 259.1 | 80 | 62 – 74 | 60 – 80 |
| MB9A | Fort Cooper CM – Coal Seam | 251.8 | 30 | 22 – 30 | 20 – 30 |
| MB9B | Fort Cooper CM – Sandstone below coal | 251.8 | 80 | 60 – 74 | 58 – 80 |
| MB10A | Fort Cooper CM – Sandstone | 233.9 | 35 | 27 – 35 | 25.5 – 35 |
| MB10B | Fort Cooper Coal Measures – Sandstone | 233.9 | 80 | 64 – 76 | 62 – 80 |
| CS_MB02 | Rangal CM – Leichhardt Seam | 236.6 | 170 | 161 -164 | 158 – 170 |

## 3.4 Groundwater Sampling Review

A review of the data collected in the groundwater sampling network was undertaken and opportunities for improvements in data collection were identified and are discussed in this section.

It is understood that HydraSleeves are the current sampling methodology used to collect groundwater samples for EA compliance. HydraSleeves sampling is a “grab sample” of water chemistry and is recommended at bores where recharge is too low to maintain laminar flow required for low flow sampling. The correct HydraSleeve sampling method requires a prior knowledge of the screened depths of bores where the sampler is positioned to sample. These screen depths are known for the Millennium monitoring bores (Table 5).

Field data were reviewed for 12 sampling rounds from the current EA compliance bores. The amounts of times each bore recorded a colour or odour is provided in Table 6. Both features may be indicative of stagnant water and the HydraSleeve sampling methodology is not able to collect a representative sample of the aquifer. This can be potentially rectified by airlifting the bores to re-instate a good contact to the aquifer.

Table 6 Groundwater Sampling Field Observations

| Bore | Colour cloudy, slightly dark, dark colour, coal fines present | Odour |
|---|---|---|
| MB8B | 0 | 6 |
| MB9A | 7 | 11 |
| MB9B | 6 | 2 |

| Bore | Colour cloudy, slightly dark, dark colour, coal fines present | Odour |
|---|---|---|
| MB10A | 2 | 2 |
| MB10B | 0 | 1 |

## 3.5 Groundwater Quality Parameters

The current EA groundwater quality trigger limits were developed in the early 2010s. Since then, DES has published the guideline Using monitoring data to assess groundwater quality and potential environmental impacts (DES, 2021), which describes a more modern approach to derive trigger limits based on monitoring data.

The analytes with their current trigger limit and limit type are listed in Table 7. In the last column, a comment has been included on the applicability of the trigger and analytes, in the context of DES (2021). It is proposed to remove trigger limits for major ions (except chloride and sulfate), TDS, total suspended solids (TSS) and chlorine. It is further proposed to add copper and zinc to the analytes list. The trigger limits for the metals will be derived for the dissolved concentrations.

Table 7 Current Groundwater Quality Triggers and proposed changes

| Water Quality Indicator | Unit | Current Trigger (EA) | Current Limit Type | Comment on Applicability |
|---|---|---|---|---|
| Aluminium | mg/L | 0.02 | Maximum | Derive updated trigger limit (Section 4) |
| Antimony | mg/L | 0.002 | Maximum | Derive updated trigger limit (Section 4) |
| Arsenic | mg/L | 0.003 | Maximum | Derive updated trigger limit (Section 4) |
| Chlorine | mg/L | 0.04 | Maximum | Remove from EA, add Chloride instead (see next line) |
| Chloride | mg/L | - | Maximum | Derive updated trigger limit (Section 4) |
| Carbonate (CO3-) | mg/L | 8 | Maximum | Major ions for information only, no compliance level suggested. |
| Total Dissolved Solids | mg/L | 2,200 | Maximum | EC and TDS are commonly related – suggested to use EC only, as there is a regional WQO value available. |
| Electrical Conductivity | µS/cm | 4,000 | Maximum | Derive updated trigger limit (Section 4) |
| Bicarbonate (HCO3) | mg/L | 900 | Maximum | Major ions for information only, no compliance level suggested. |
| Iron | mg/L | 0.3 | Maximum | Derive updated trigger limit (Section 4) |
| Mercury | mg/L | 0.0001 | Maximum | Derive updated trigger limit (Section 4) |
| Molybdenum | mg/L | 0.003 | Maximum | Derive updated trigger limit (Section 4) |
| pH | pH units | 6.5 to 9 | Minimum / Maximum | Derive updated trigger limit (Section 4) |
| Selenium | mg/L | 0.01 | Maximum | Derive updated trigger limit (Section 4) |
| Silver | mg/L | 0.004 | Maximum | Derive updated trigger limit (Section 4) |
| Sulfate (SO4 2-) | mg/L | 70 | Maximum | Derive updated trigger limit (Section 4) |

| Water Quality Indicator | Unit | Current Trigger (EA) | Current Limit Type | Comment on Applicability |
|---|---|---|---|---|
| Total Suspended Solids | mg/L | 30 | Maximum | Remove from EA, TSS is an analyte that is relevant in surface water environments. |
| Total Petroleum Hydrocarbons | mg/L | 0.1 | Maximum | Derive updated trigger limit (Section 4), split into two fractions |
| Copper | mg/L | NA | NA | Not currently in the EA. It is advised that groundwater will be analysed for copper in the future. |
| Zinc | mg/L | NA | NA | Not currently in the EA. It is advised that groundwater will be analysed for copper in the future. |

# 4 Water Quality Trigger Review

## 4.1 Methodology

The scope of work addressed in this groundwater contaminant limits review includes the review of groundwater monitoring data and derivation of proposed revised groundwater quality limits for each EA monitoring bore based on the process outlined in DES (2021):

1. Determine summary statistics (i.e. 20th, 50th, 80th and 95th percentiles) for each bore or group of bores for all indicators using all available data.

2. Identify relevant default toxicant guidelines and relevant WQOs.

3. The 80th percentile of each indicator at each bore should be compared with the guideline and WQO. Use dissolved metal concentrations for default toxicant guideline values (ANZG 2018).

4. If less than 8 samples were available or are greater than the limit of reporting (LoR) the default toxicant guideline is applied.

5. Site specific values are determined using the 80th and 95th percentile at each bore or group of bores if required.

6. Box plots and time series plots should be produced and compared to the default toxicant guidelines, relevant WQOs and site specific values.

7. Determine appropriate site specific limits. The limits are appropriate if they are sufficiently conservative to ensure environmental impact does not occur, but do not result in false non-compliances.

8. Determine an appropriate compliance approach.

9. Evaluate the proposed limits and compliance approach.

The process described above is based on the latest guidelines published by DES (2021), the reference guideline for the analysis of water quality data and derivation of site-specific groundwater limits. It

As described in Section 2 of DES (2021), The guideline "outlines a process to review groundwater quality monitoring data, including (i) the information required to assess groundwater quality, (ii) approaches used to define site-specific groundwater guidelines and (iii) comparisons of measured values with default guidelines, WQOs, site-specific guidelines derived from locally relevant background, reference or baseline groundwater quality data".

This report follows the process to review groundwater quality monitoring data and the adoption of site-specific groundwater limits or an alternative compliance approach as summarised in Section 2 of DES (2021). Each stage, as detailed in DES (2021), is presented in Table 8 along with the corresponding section in this report (or companion reports developed concurrently).

Table 8 DES (2021) Methodology and Corresponding Sections in this Report

| DES (2021) Methodology - Stages | Corresponding Sections in this Report or Companion Report |
|---|---|
| Identify EVs for groundwater and relevant default guidelines and WQOs | Section 4.2 |
| Describe site characteristics | Section 2 |
| Describe bore characteristics | Section 3 |
| Analyse groundwater quality monitoring data | Section 4.3 |
| Identifying site-specific guidelines for groundwater quality, if required | Section 4.4.4 |
| Determine an appropriate compliance approach | Section 4.5 |
| Evaluate site-specific groundwater guidelines, triggers, limits and compliance approach | Section 6 |

## 4.2 Environmental Values and Guidelines

Millennium is located within the Isaac Connors Groundwater Management Area (GMA) (Zone 34) of the Fitzroy Basin under the Water Plan (Fitzroy Basin) 2011 (DES, 2011). The management objective of the Water Plan (Fitzroy Basin) 2011 is to maintain the 20th, 50th and 80th percentiles water quality results in order to preserve or enhance groundwater quality for its recognised uses. These percentiles are available for 'shallow' bores (less than 30m deep) and 'deep' bores (more than 30m deep). In the case of Isaac groundwaters, these values include aquatic ecosystems, irrigation, farm supply/ use, stock watering, primary recreation, drinking water as well as being of cultural and spiritual value.

The identified Environmental Values (EVs) of groundwater most applicable to Millennium (SLR, 2021) are listed Table 9 together with the respective water quality guideline or water quality objective (WQO) that applies to the identified EV.

Table 9 Identified EVs and applicable Water Quality Guidelines

| Identified EV | Applicable Guideline | WQO |
|---|---|---|
| Use of groundwater for domestic and agricultural purposes by landholders within the area | ANZECC Guideline (Stock watering)<br>ANZECC Guideline (Irrigation) | Fitzroy Water plan, WQ1310, Zone 34 |
| Use of groundwater by GDE and potentially (although considered unlikely) groundwater contribution to palustrine wetlands; | Default Toxicant Guideline (ANZG, 2018) | Fitzroy Water plan, WQ1310, Zone 34 |

The guideline value for each proposed analyte is listed in Table 10.

## Table 10 Potentially Applicable Guidelines and WQOs

| Water Quality Guideline | Field pH | Field EC | Sulfate as SO4 | Cl[1] | Al[1] | Sb[1] | As[1] | Cu[1] | Fe[1] | Hg[1] | Mo[1] | Se[1] | Ag[1] | Zn[1] | C6 - C10 Fraction | C10 - C40 Fraction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH Unit | µS/cm | 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 |
| ANZECC Aquatic Ecosystem (95%) Protection Guideline (ANZG, 2018) | 6.0-7.5 | 250 | | | 0.055 | 0.009 | 0.013 | 0.0014 | | 0.0006 | 0.034 | 0.011 | 0.00001 | 0.008 | | |
| ANZECC Stock watering Guidelines | 6.0 - 8.5 | 7500[2] | 1000 | | 5 | | 0.5 | 0.4 | | 0.002 | 0.15 | 0.02 | | 20 | | |
| ANZECC Guidelines – Irrigation short-term | 6.0 - 8.5 | | | | 20 | | 2 | 5 | 10 | 0.002 | 0.05 | 0.05 | | 5 | | |
| ANZECC Guidelines – Irrigation Long-term | 6.0 - 8.5 | | | | 5 | | 0.1 | 0.2 | 0.2 | 0.002 | 0.01 | 0.02 | | 2 | | |
| Fitzroy WQ1310 WQO Zone 34 (shallow) | 7.1-8.1 | 8910 | 318 | 3185 | | | | 0.03 | 0.14 | | | | | 0.06 | | |
| Fitzroy WQ1310 WQO Zone 34 (deep) | 7.4-8.0 | 16000 | 398 | 5905 | | | | 0.03 | 0.246 | | | | | 0.317 | | |
| DES (2013) | | | | | | | | | | | | | | | 20 | 100 |

Notes: [1] Dissolved
2. the stock watering guidelines present salinity values as total dissolved solids (TDS) for different animal species. This has been converted to EC by dividing by 0.67
WQO = Water Quality Objective
ANZECC = Australian and New Zealand Environment and Conservation Council

## 4.3 Water Quality Monitoring Data Analysis

### 4.3.1 Availability

In preparing the data for the trigger limit review, the monitoring network was assessed for suitability. Table 11 lists the EA bores with water quality monitoring with the minimum and maximum date of data available at each bore. Of the six bores recording water quality, five had enough site-specific data to undertake the trigger limit derivation according to DES (2021).

One bore is found dry and therefore no site-specific data is available for the trigger limit assessment. Three bores are not assessed as they are recording water level only.

Table 11 Review of data availability for the trigger assessment

| Monitoring point | Data available from | Data available to | Number of data points | Target aquifer | Monitoring point status |
|---|---|---|---|---|---|
| GW02 | | | NA | RCM | Water Level only |
| GW08A | Jan-2014 | Oct-2022 | 0 | FCCM - Sandstone | Dry since installation |
| GW08B | Jan-2014 | Oct-2022 | 33 | FCCM - Sandstone | Active |
| GW09A | Jan-2014 | Oct-2022 | 33 | FCCM – Coal | Active |
| GW09B | Jan-2014 | Oct-2022 | 34 | FCCM – Sandstone underburden | Active |
| GW10A | Jan-2014 | Oct-2022 | 29 | FCCM - Sandstone | Active |
| GW10B | Jan-2014 | Oct-2022 | 30 | FCCM - Sandstone | Active |
| CS_MB2 | | | NA | | Water Level only |
| CS_VWP1 | | | NA | | Water Level only |

Notes: RCM = Rangal Coal Measures. FCCM: Fort Cooper Coal Measures.

### 4.3.2 Ionic Composition

The proportions of the major anions and cations were used to determine the hydrochemical facies of groundwaters sampled. The anion-cation balance from the Millennium monitoring bores is shown on the Piper diagram in Figure 9, based on the data collected in February 2022. The results indicate that the dominant water type across the network is sodium (Na) - chloride (Cl) type, with the bore MB10A showing a 'mixed type' water signature. Given there is a long standing data set for analysis, potential grouping of bores is not required.

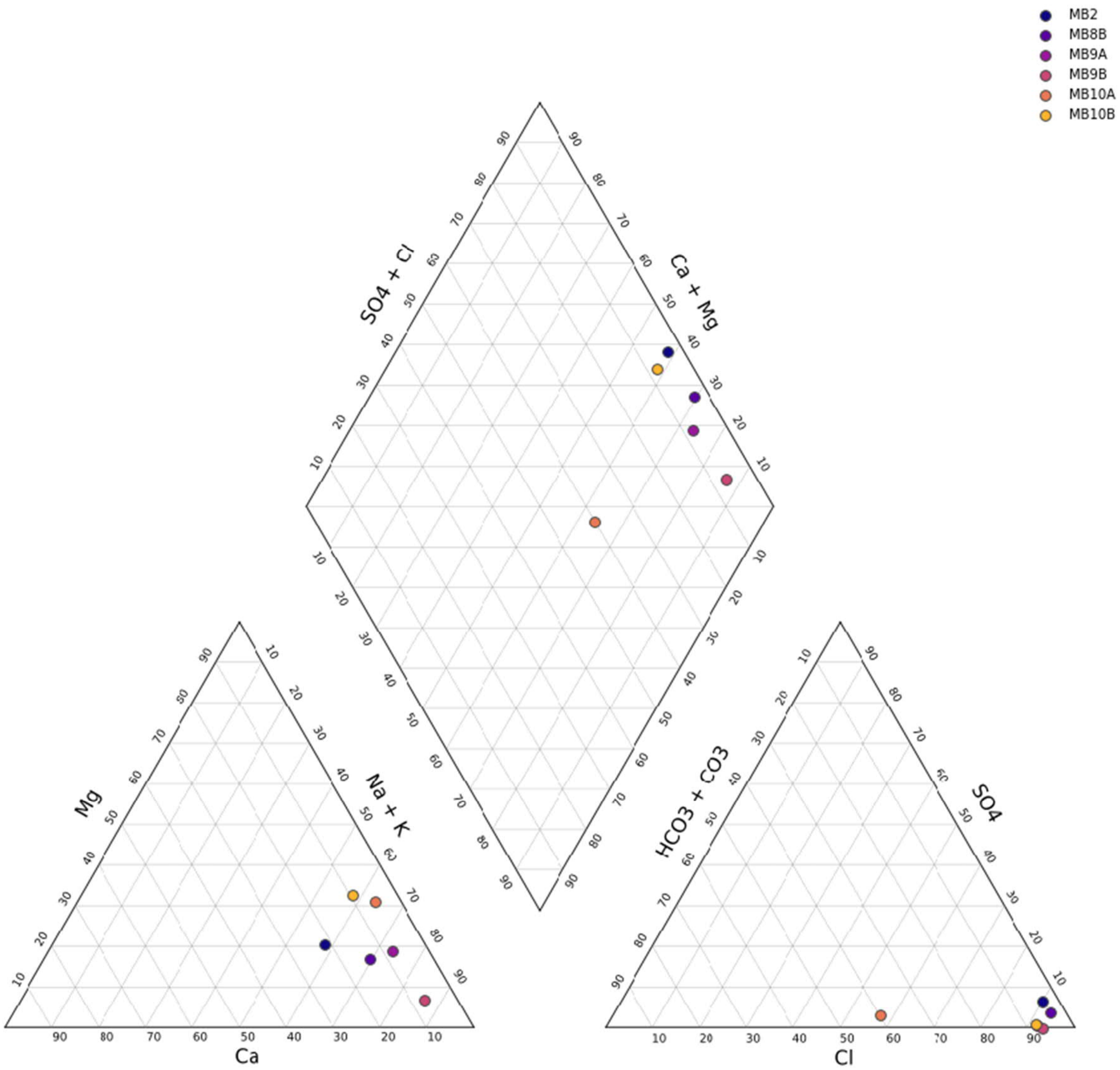



Figure 9 Piper plot for the current EA bores (February 2022)

### 4.3.3 Time Series Analysis

Time series plots for all bores are presented as Appendix A. An example plot from Appendix A is shown here to describe the methodology used to analyse each bore and analyte:

1. Plot time series of the raw data (Figure 10, left), including Mann-Kendall statistics (trends)
2. Plot the boxplot for the raw data to identify statistical outliers (Figure 10, middle)
3. Review the statistical outliers, remove outliers (Section 4.3.4)
4. Plot time series with outliers removed (Figure 10, right)
5. Apply the 80th and 95th percentile of the data set (outlier removed)
6. Analyse trends for the data set (outlier removed), Section 4.3.5.

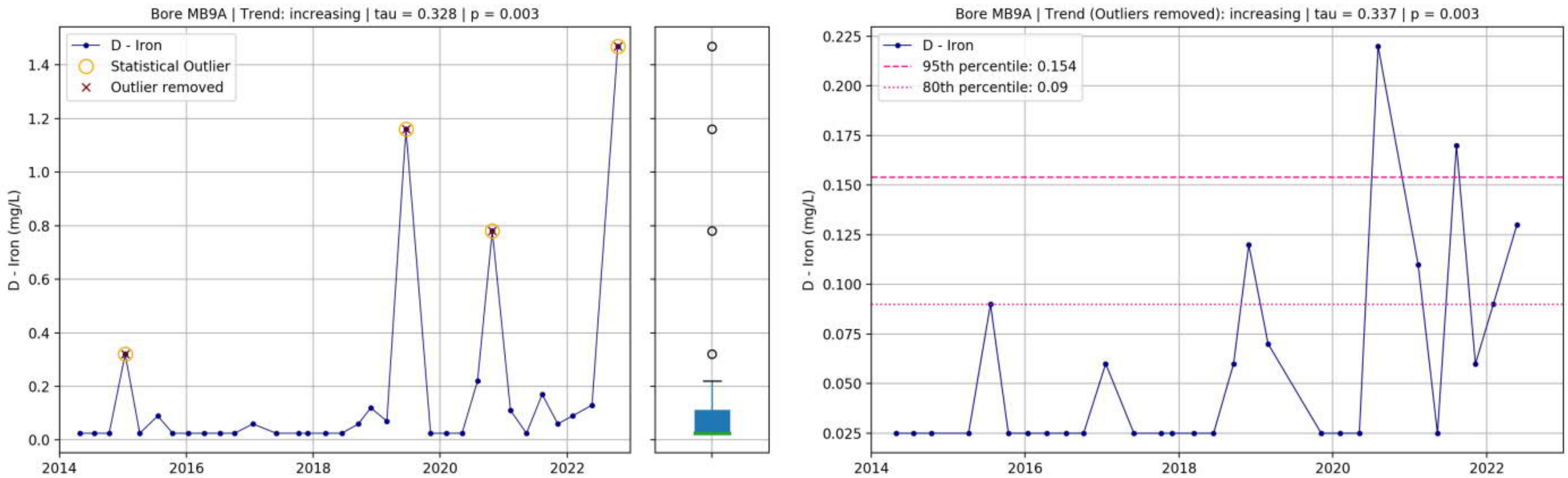



Figure 10 Example for a time series, with outlier identification and trend analysis

### 4.3.4 Outliers

Outliers have been screened statistically using the 1.5-times interquartile range rule (DES, 2021). Any data point that is more than 1.5 times the interquartile range above the third quartile or below the first quartile is identified as a statistical outlier. All statistical outliers were removed to derive trigger limits. This process can remove valid data points, for example, when an analyte is mostly found below the Limit of Reporting (LOR), but has a reading above LOR for single occurrences. However, in order to make the trigger value derivation process repeatable and objective, the automated removal of statistical outliers was applied.

The removed outliers are visualised in Appendix A (refer to Figure 10 for an example). A summary statistic table (i.e. without outliers) is shown in Appendix B.

### 4.3.5 Time Series Trends

The Mann-Kendall statistical trend test was used to detect potential trends in the dataset (once outliers were removed, refer to Section 4.3.4) for all bores where sufficient data is available, with the results shown in Appendix B.

The Mann-Kendal test is used as a first pass check if a dataset contains a statistically significant trend that warrants further analysis to assess if a real trend exists, and therefore the data may be inappropriate to use in the derivation of site-specific triggers. Interpretation of Mann-Kendall results relies on the p-value and the Kendall rank correlation coefficient, tau. A p-value less than 0.05 means that there is statistically significant trend in the data. The Kendall rank correlation coefficient (tau) shows the relation between the variance of data, with a positive tau indicating a positive trend and a negative tau indicating a negative trend. If the p-value is greater than 0.05, no statistically significant trend is present in the data.

Table 12 lists the identified trends per bore and parameter with an assessment whether the identified trend is real or whether some potential outlier data cause the trend. This could be for example higher concentrations at the start of the data record, that decreases and has been stable for a while. The removal of early data would result in no statistical trends and make the data set suited for trigger derivation.

Table 12 Assessment of Identified Statistical Trends

| Bore | Parameter (trend direction) | Trend assessment |
|---|---|---|
| MB08B | Sulfate (increasing) | The time series shows a shift in sulfate concentration from an average of approximately 250 mg/L before 2015 to an average of approximately 450 mg/L after 2015. Since 2015 there is no further trend. Due to the large data set, it is still deemed appropriate to use the percentiles for trigger limit derivation. |
| | Aluminium (increasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| | Antimony (decreasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| | Iron (increasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |

| Bore | Parameter (trend direction) | Trend assessment |
|---|---|---|
| | TPH C6-C10 Fraction (increasing) | Due to this trend, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. It is further recommended to include "silica gel clean up" to the analysis to remove any naturally occurring TPHs from the results. |
| MB09A | Aluminium (increasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| | Iron (increasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| MB09B | Field pH (decreasing) | The time series shows a mild decrease in pH, however within the limits of the freshwater quality guidelines, which have been applied for the triggers. |
| | Field EC (increasing) | The time series shows a shift in EC from an average of approximately 5,500 µS/cm before 2018 to an average of approximately 12,000 µS/cm after 2018. Regional WQO are applied to maintain water quality. |
| | Sulfate (decreasing) | The time series shows very variable sulfate concentrations (either around 6 mg/L or around 65 mg/L. Given the values are well below the regional WQO objectives, it is proposed to use site specific triggers despite the trend. |
| | Chloride (increasing) | The time series shows a shift in chloride concentration from an average of approximately 1,500 mg/L before 2015 to an average of approximately 4,000 mg/L after 2015. WQO will be used as trigger limits to maintain the water quality. |
| | Iron (increasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| | Molybdenum (decreasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| MB10A | Sulfate (decreasing) | The time series shows decreasing trend from 75 mg/L to around 60 mg/L. Given the values are well below the regional WQO objectives, it is proposed to use site specific triggers despite the trend. |
| | Iron (increasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| | Molybdenum (increasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| MB10B | Field pH (decreasing) | The time series shows a mild decrease in pH, however within the limits of the freshwater quality guidelines, which have been applied for the triggers. |
| | Field EC (increasing) | The time series shows an increasing trend in EC, however with the EC below the region WQO, which are applied as trigger limits to maintain water quality. |

| Bore | Parameter (trend direction) | Trend assessment |
|---|---|---|
| | Sulfate (decreasing) | The time series shows decreasing trend from 200 mg/L to around 40 mg/L. Given the values are well below the regional WQO objectives, it is proposed to use site specific triggers despite the trend. |
| | Chloride (increasing) | The time series shows a shift in chloride concentration from an average of approximately 1,500 mg/L before 2015 to an average of approximately 4,000 mg/L after 2015. WQO will be used as trigger limits to maintain the water quality. |
| | Aluminium (increasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| | Iron (increasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| | Molybdenum (decreasing) | Due to a high percentage below LOR, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. |
| | TPH C6-C10 Fraction (decreasing) | Due to this trend, no site-specific triggers to be developed. WQO will be used to triggers to maintain the water quality. It is further recommended to include “silica gel clean up” to the analysis to remove any naturally occurring TPHs from the results. |

## 4.4 Site Specific Limit Derivation

The updated (outliers removed) dataset summary statistics shown in Appendix B were to derive appropriate water quality limits for the EA.

Appendix B summarises all the findings below in table format, as per Figure 11 below. For each of the assessed ten bores, a table is provided with the following:

- Water quality guideline and WQO for each parameter, row 1-8
- Summary statistics (after outlier removal), row 9-20
  - Comparison of the 80$^{th}$ percentile with the guideline (20$^{th}$ and 80$^{th}$ percentile for pH), row 18
- Trigger derivation considerations: number of samples, percentage LOR and trends (row 21-24).
  - If all three rows are blank (ie more than 8 samples, less than 15% of LORs and no trends identified, site specific Limits A and B were derived
  - If any of those rows have an “x” or trend identified, no site specific data could be derived, and the guidelines were applied as Limit B (colour coded according to rows 2-8).

| | | Field pH | Field EC | Sulfate as SO4 | Chloride | Aluminium Dissolved | Antimony Dissolved | Arsenic Dissolved |
|---|---|---|---|---|---|---|---|---|
| | | pH Unit | (µS/cm) | mg/l | mg/l | mg/l | mg/l | mg/l |
| 1 | Water quality Guidelines | | | | | | | |
| 2 | ANZECC Aquatic Ecosystem (95%) Protection Guideline (ANZG 2018) | 6.0-7.5 | 250 | - | | 0.055 | 0.009 | 0.013 |
| 3 | ANZECC Stock watering Guidelines | 6.0 - 8.5 | 7500 | 1000 | | 5 | - | 0.5 |
| 4 | ANZECC Guidelines – Irrigation ST | 6.0 - 8.5 | | | | 20 | | 2 |
| 5 | ANZECC Guidelines – Irrigation LT | 6.0 - 8.5 | | | | 5 | | 0.1 |
| 6 | Fitzroy WQ1310 WQO Zone 34 (shallow) | 7.1-8.1 | 8910 | 318 | 3185 | - | | - |
| 7 | Fitzroy WQ1310 WQO Zone 34 (deep) | 7.4-8.0 | 16000 | 398 | 5905 | | | |
| 8 | DES, 2013 | | | | | | | |
| 9 | Statistics | | | | | | | |
| 10 | Count | 29 | 25 | 33 | 30 | 29 | 28 | 4 |
| 11 | % of values below LOR | 0 | 0 | 0 | 0 | 100 | 79 | 100 |
| 12 | Minimum Date | 30/01/2014 | 14/04/2016 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 25/04/2011 |
| 13 | Maximum Date | 18/10/2022 | 18/10/2022 | 18/10/2022 | 18/10/2022 | 18/10/2022 | 18/10/2022 | 24/05/2022 |
| 14 | Minimum | 6.3 | 19720 | 232 | 7540 | 0.0025 | 0.0005 | 0.0005 |
| 15 | 5th percentile | 6.4 | 20340 | 235 | 7599 | 0.0025 | 0.0005 | 0.0005 |
| 16 | 20th Percentile | 6.7 | 20832 | 250 | 7778 | 0.0025 | 0.0005 | 0.0005 |
| 17 | Median | 6.9 | 21620 | 430 | 8060 | 0.0025 | 0.0005 | 0.0005 |
| 18 | 80th Percentile | 7.1 | 23140 | 470 | 8334 | 0.0035 | 0.0008 | 0.0005 |
| 19 | 95th Percentile | 7.3 | 24240 | 483 | 8520 | 0.005 | 0.00365 | 0.0005 |
| 20 | Maxiumum | 7.4 | 24400 | 503 | 8600 | 0.005 | 0.004 | 0.0005 |
| 21 | Trigger derivation considerations | | | | | | | |
| 22 | Trigger Development not possbile due less than 8 samples | | | | | | | x |
| 23 | Trigger Development not possbile due to more than 15% of values <LOR | | | | | x | x | x |
| 24 | Mann Kendall trend | | | increasing | | increasing | decreasing | |
| 25 | Proposed Trigger limits | | | | | | | |
| 26 | Limit A (80th Percentile) | | 23140 | 470 | 8334 | | | |
| 27 | Limit B (95th Percentile) or applicable guideline | 6.0-7.5 | 24240 | 483 | 8520 | 0.055 | 0.009 | 0.013 |

Figure 11 Example for the trigger derivation tables

### 4.4.1 Number of Relevant Sampling Events

The first step to identifying site-specific guidelines (and therefore limits) for groundwater quality (DES, 2021; Section 5) is to confirm the number of sampling events (data points) available for each bore and analyte. DES (2021) recommends a minimum of 18 samples over at least 12 months but allows using eight or more samples to derive site specific guidelines.

Table 13 shows the number of samples for each bore and analyte in the updated (outliers removed) dataset. The cells highlighted in blue indicate that the data set is too small to derive triggers.

Further, the guideline specifies a maximum limit of 10-15% of values below LOR for a data set to be suitable to derive trigger from. Table 14 lists each bore and analyte with their respective percentage of values below LOR. Highlighted cells indicate that the data set is not suitable for trigger limit derivation (more than 15% of values below LOR) for the particular bore and parameter.

Table 13 Number of Sampling Events for Bores (outliers removed)

| Bore | pH | EC | SO4 | Cl | Al | Sb | As | Cu | Fe | Hg | Mo | Se | Au | Zn | C6 - C10 | C10 - C40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB08B | 29 | 25 | 33 | 30 | 29 | 28 | 25 | 2 | 33 | 31 | 28 | 26 | 29 | 2 | 25 | 28 |
| MB09A | 27 | 30 | 33 | 31 | 31 | 26 | 26 | 2 | 29 | 31 | 31 | 26 | 33 | 2 | 28 | 25 |
| MB09B | 27 | 34 | 34 | 32 | 32 | 34 | 34 | 3 | 33 | 34 | 31 | 27 | 34 | 3 | 25 | 28 |
| MB10A | 28 | 29 | 25 | 27 | 22 | 24 | 28 | 3 | 28 | 28 | 25 | 23 | 29 | 3 | 23 | 24 |
| MB10B | 30 | 28 | 30 | 25 | 25 | 27 | 25 | 3 | 30 | 29 | 24 | 24 | 29 | 3 | 26 | 27 |

### Table 14 Percentage of data points below LOR

| Bore | pH | EC | SO4 | Cl | Al | Sb | As | Cu | Fe | Hg | Mo | Se | Au | Zn | C6 - C10 | C10 - C40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MB08B | 0 | 0 | 0 | 0 | 100 | 79 | 100 | 100 | 48 | 100 | 100 | 100 | 100 | 0 | 68 | 100 |
| MB09A | 0 | 0 | 0 | 0 | 81 | 88 | 100 | 50 | 62 | 100 | 68 | 100 | 100 | 50 | 100 | 100 |
| MB09B | 0 | 0 | 12 | 0 | 59 | 65 | 26 | 100 | 52 | 100 | 0 | 100 | 100 | 67 | 40 | 100 |
| MB10A | 0 | 0 | 0 | 0 | 100 | 100 | 18 | 67 | 43 | 100 | 36 | 100 | 100 | 67 | 100 | 100 |
| MB10B | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 40 | 100 | 83 | 100 | 100 | 67 | 8 | 100 |

### 4.4.2 Proposed Limits and Compliance Approach

The proposed EA compliance approach follows the recommended compliance approach as per DES (2021). The two approaches are:

- A single Limit per parameter (called limit B here), or
- A dual limit (Limit A and Limit B) approach as follows:
  - Limit A: 20$^{th}$ (pH only) and/or 80$^{th}$ percentile of site specific data.
  - Limit B: Reference guideline value or reference WQO or 95$^{th}$ percentile of site data.

Given that for many of the analytes, no site-specific limits can be derived due to the percentage of values below LOR, it is proposed to use only a Limit B approach, to be applied to 3 consecutive samples, i.e. consecutive sampling events show concentrations above the relevant Limit are required to constitute a Limit exceedance in the EA.

Proposed limits based on the assessment provided in Section 4.4 are summarised in Table 15.

### Table 15 Initial Proposed EA Parameter Limits

| Parameter | Bore | Limit B | Limit B justification |
|---|---|---|---|
| pH - Field | MB08B<br>MB09A<br>MB09B<br>MB10A<br>MB10B | 6.0-7.5 | ANZECC 95% protection limit, freshwater |
| Electrical Conductivity - Lab (µS/cm) | MB08B | 24240 | 95th percentile of bore specific dataset |
| | MB09A | 20329 | 95th percentile of bore specific dataset |
| | MB09B | 16000 | WQO Fitzroy WQ1310, Zone 34, deep |
| | MB10A | 3998 | 95th percentile of bore specific dataset |
| | MB10B | 10265 | 95th percentile of bore specific dataset |

| Parameter | Bore | Limit B | Limit B justification |
|---|---|---|---|
| Sulfate (mg/L) | MB08B | 483 | 95th percentile of bore specific dataset |
| | MB09A | 109 | 95th percentile of bore specific dataset |
| | MB09B | 79 | 95th percentile of bore specific dataset |
| | MB10A | 75 | 95th percentile of bore specific dataset |
| | MB10B | 174 | 95th percentile of bore specific dataset |
| Chloride (mg/L) | MB08B | 8520 | 95th percentile of bore specific dataset |
| | MB09A | 6785 | 95th percentile of bore specific dataset |
| | MB09B | 5905 | WQO Fitzroy WQ1310, Zone 34, deep |
| | MB10A | 789 | 95th percentile of bore specific dataset |
| | MB10B | 5905 | WQO Fitzroy WQ1310, Zone 34, deep |
| Aluminium Dissolved (mg/L) | MB08B<br>MB09A<br>MB09B<br>MB10A<br>MB10B | 0.055 | ANZECC 95% protection limit, freshwater |
| Antimony Dissolved (mg/L) | MB08B<br>MB09A<br>MB09B<br>MB10A<br>MB10B | 0.009 | ANZECC 95% protection limit, freshwater |
| Arsenic Dissolved (mg/L) | MB08B<br>MB09A<br>MB09B<br>MB10A<br>MB10B | 0.013 | ANZECC 95% protection limit, freshwater |
| Copper Dissolved (mg/L) | MB08B<br>MB09B<br>MB10A<br>MB10B | 0.0014 | ANZECC 95% protection limit, freshwater |
| | MB09A | 0.0002 | WQO Fitzroy WQ1310, Zone 34, shallow |
| Iron Dissolved (mg/L) | MB09A<br>MB10A | 0.14 | WQO Fitzroy WQ1310, Zone 34, shallow |
| | MB08B<br>MB09B<br>MB10B | 0.246 | WQO Fitzroy WQ1310, Zone 34, deep |

| Parameter | Bore | Limit B | Limit B justification |
|---|---|---|---|
| Mercury Dissolved (mg/L) | MB08B<br>MB09A<br>MB09B<br>MB10A<br>MB10B | 0.0006 | ANZECC 95% protection limit, freshwater |
| Molybdenum Dissolved (mg/L) | MB08B<br>MB09A<br>MB09B<br>MB10A<br>MB10B | 0.034 | ANZECC 95% protection limit, freshwater |
| Selenium Dissolved (mg/L) | MB08B<br>MB09A<br>MB09B<br>MB10A<br>MB10B | 0.011 | ANZECC 95% protection limit, freshwater |
| Silver Dissolved (mg/L) | MB08B<br>MB09A<br>MB09B<br>MB10A<br>MB10B | "Below LOR" | The current LOR is higher than the ANZECC 95% protection limit, freshwater Guideline value for Silver. However, none of the bores has ever recorded a value above LOR. The current water quality will be maintained if the future observations remain below LOR. |
| Zinc Dissolved (mg/L) | MB08A | 0.317 | WQO Fitzroy WQ1310, Zone 34, deep |
| | MB09A<br>MB1A | 0.060 | WQO Fitzroy WQ1310, Zone 34, shallow |
| | MB09B<br>MB10B | 0.008 | ANZECC 95% protection limit, freshwater |
| TRH, C6-C10 Fraction (µg/L) | MB08B<br>MB09A<br>MB09B<br>MB10A<br>MB10B | 20 | DES, 2013 |
| TRH, C10-C40 Fraction (µg/L) | MB08B<br>MB09A<br>MB09B<br>MB10A<br>MB10B | 100 | DES, 2013<br>The guideline suggests TRH values for the C10-C36fraction of 100 µg/L. This was applied to a larger faction here (C10-C40, due to the laboratory values) |

### 4.4.3 Testing of proposed limits

The initial proposed limits presented above have been tested against the historical dataset using the proposed compliance approach (Appendix C). Notable exceedances and proposed changes are documented in Table 16. The final proposed trigger values are presented in Section 5.4, Table 17.

Table 16 Trigger testing results

| Trigger testing | Notes | Changes proposed |
|---|---|---|
| Dissolved Iron | For all bores, the regional WQO was used as trigger Limit B. Four out of the five bores trigger the iron limits.<br>It is likely that the iron concentrations stem from iron bacteria. As recommended in Section 5.2, the bores should be treated and airlifted, which may get rid of the iron bacteria. As those are not related to the mining operations, it is proposed to remove the trigger limit for iron at this stage. | Remove iron from compliance table until cause of iron is identified and resolved |
| Field pH | For pH, the national freshwater guidelines were used for simplicity. Three out of the five bores showed three exceedances in a row, which would be a non-compliance. However, these exceedances occurred in 2014-1016 and the pH has since been stable within the proposed trigger limits | No. |
| TPH C6-C10 Fraction | The trigger limits for these were derived based on Guideline values (DES, 2013). Two of the bores exceed the limits on a few occasions. It is recommended to add "silica gel clean up" to the analysis, which could potentially exclude naturally occurring hydrocarbons.<br>The C6-C10 fraction is related to Gasoline and if exceedances persist, an investigation into the occurrence of the triggers is recommended. | No. |

# 5 Conclusions and Recommendations

## 5.1 Groundwater Monitoring Network

The existing groundwater monitoring network at Millennium Mine, as documented in EA EPML00819213, is deemed to be generally suitable for the purpose of monitoring the variations in groundwater level and quality in a manner that would allow for the early detection of significant groundwater changes, which may be attributed to the mining operations at Millennium Mine. Although, it is noted that significant groundwater changes are not likely to be attributable to mining operations, based on the results of the relevant groundwater impact assessments.

However, to addresses Condition D6 of EA EPML00819213, it is recommended to:

- Expand the coverage of the Mavis UG monitoring network to capture the predicted groundwater drawdown impacts in the areas where potential changes to the groundwater regime can be attributed to Mavis UG mining activities. In particular, the areas related to the low potential terrestrial GDE associated with North Creek and to the Rangal CM (Leichhardt Seam) to the east and north of Mavis Pit should be captured by the Mavis UG monitoring network:
    - Include the piezometer CS_VWP1 and bore CS_MB2 from the Carborough Downs mine groundwater network in the Mavis UG groundwater monitoring network, in order to target the areas listed above; and
    - Undertake logger downloads at CS_VWP1 and manual water level monitoring at CS_MB2 on a quarterly basis.

As part of the full water quality monitoring suite, in addition to collecting field parameters (EC and pH), water samples will be submitted to a NATA accredited laboratory for the analysis of:

- Physiochemical indicators (TDS);
- Major ions (calcium, magnesium, sodium, potassium, chloride, sulphate, bicarbonate and carbonate);
- Total and dissolved metals: aluminium, iron, copper, zinc, silver, arsenic, mercury, antimony, molybdenum and selenium; and
- Total petroleum hydrocarbons (C6-C9, C10-C14, C15-C28 and C29-C36) with silica gel clean-up.

## 5.2 Groundwater Bore Status

Given the Millennium monitoring bores have reported odours and visually disturbed samples (cloudy, particles etc), it is recommended to address the potential for stagnant water by:

- Undertake a downhole camera investigation to confirm bore construction details and check for bore integrity;
- Test and if present, treat the bores for potential iron bacteria occurrence; and
- Re-develop bores by airlifting (this might improve the contact between bore and aquifer).
- These three steps above should be carried out after a sampling round to let the bores recover until the next round of sampling.

## 5.3 Sampling Methodology

DES (2018) states that "Purging or low flow sampling methods are preferred for accurate groundwater sampling. Low flow methods minimise the impact of the sampling method on the aquifer and are more likely to obtain a representative sample, while some high flow pumps can sometimes induce water chemistry changes."

For this site it is understood that low flow sampling might not be feasible. However, it is recommended to attempt low flow sampling for one monitoring round to assess the feasibility.

If the bore recharge is too low to maintain laminar flow required for low flow sampling, it is recommended that Hydrasleeve sampling to remain the preferred method, noting that:

- The bore is properly developed as per Minimum Construction Requirements for Water Bores in Australia (NDULC, 2020);
- It is used to collect groundwater samples directly from the screened interval of a bore without having to purge the bore prior to sample collection (i.e. the screened section must be known);
- Sample collection depth should be noted in the field notes; and
- It is a single-use (disposable) sampler that is not intended for reuse.
- To allow the collection of a representative groundwater sample, the aquifer requires time to re-equilibrate following the installation of the HydraSleeve within the monitoring well. As a bare minimum, it is recommended the well is allowed between 15 minutes to three hours to equilibrate. To optimise efficiency when sampling multiple monitoring wells, it is recommended that all HydraSleeve be first installed in sequential order before beginning the groundwater sampling following the same order or alternatively a new HydraSleeve is installed in the bore after the sampling and remains there between sampling rounds.

## 5.4 Groundwater Quality Triggers

The final proposed water quality trigger limits are presented in Table 17. As per the chosen approach (Section 4.4.2), three consecutive exceedances would result in a non-compliance and trigger an investigation.

## Table 17 Proposed trigger limits

| Water Quality Guideline | Field pH | Field EC | Sulfate as SO4 | Cl[1] | Al[1] | Sb[1] | As[1] | Cu[1] | Hg[1] | Mo[1] | Se[1] | Ag[1] | Zn[1] | C6 - C10 Fraction | C10 - C40 Fraction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH Unit | (µS/cm) | 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) |
| MB08B | 6.0-7.5 | 24240 | 483 | 8520 | 0.055 | 0.009 | 0.013 | 0.0014 | 0.0006 | 0.034 | 0.011 | below LOR | 0.317 | 20 | 100 |
| MB09A | 6.0-7.5 | 20329 | 109 | 6785 | 0.055 | 0.009 | 0.013 | 0.030 | 0.0006 | 0.034 | 0.011 | below LOR | 0.060 | 20 | 100 |
| MB09B | 6.0-7.5 | 16000 | 79 | 5905 | 0.055 | 0.009 | 0.013 | 0.0014 | 0.0006 | 0.034 | 0.011 | below LOR | 0.008 | 20* | 100 |
| MB10A | 6.0-7.5 | 3998 | 75 | 789 | 0.055 | 0.009 | 0.013 | 0.0014 | 0.0006 | 0.034 | 0.011 | below LOR | 0.060 | 20 | 100 |
| MB10B | 6.0-7.5 | 10265 | 174 | 5905 | 0.055 | 0.009 | 0.013 | 0.0014 | 0.0006 | 0.034 | 0.011 | below LOR | 0.008 | 20* | 100 |

Notes: 1: Dissolved metals * will likely be exceeded, investigation recommended.
Shades: no shade: Site specific Limit B, blue shade: Default Guideline values (ANZG, 2018), yellow shade: Fitzroy WQO (GW, Zone 34), grey shade: DES, 2013.

## 5.5 Impacts of proposed changes to the groundwater

The conclusions presented in Section 5.1 to 5.4 are proposed to be included for an EA amendment. All items addressed in this study were stipulated by the current EA Condition D6:

> For the Mavis underground operations [...], an assessment by an appropriately qualified person must be undertaken to determine the following: a) Number and location of groundwater monitoring sites; b) Suitability of the monitoring network; and c) Groundwater contaminant trigger levels.

Table 18 summarises the predicted impacts of the proposed changes to the network and the trigger limits. No impacts to the groundwater system are predicted.

Table 18 Impacts of the proposed network and trigger limit changes

| Condition D6 | Impact |
|---|---|
| Number and location of groundwater monitoring sites | The number of bores was increased by two. In order to avoid any unnecessary disturbance to the groundwater system, the two bores to be included in the network were selected from existing bores of a neighbouring mine. No impacts to the groundwater system are predicted.<br>Millennium Mine has a data sharing agreement in place to receive the data at a regular frequency. |
| Suitability of the monitoring network | The network was reviewed for suitability. Some bores showed signs of the potential presence of iron bacteria and potential sedimentation (turbid samples).<br>It is recommended to undertake downhole camera investigation, check or iron bacterial and to re-develop the existing groundwater monitoring bores to improve the connection to the screened aquifer section.<br>None of these actions are predicted to have an impact on the groundwater system.<br>The airlifting will produce some groundwater to the surface. The water quality in all bores is unimpacted and as such, no impact to the surface environment is predicted. An exception is the salinity, but given this naturally occurring and they are no sensitive receptors near the bores, no impact is predicted. If the airlift water is a concern, it could alternatively be captured. |
| Groundwater contaminant trigger levels. | The groundwater contamination trigger levels were developed based on the DES, 2021 Guideline. Using monitoring data to assess groundwater quality and potential environmental impacts.<br>The methodology allows to set triggers either site based or based on guideline values. This approach results in suitable triggers limits that will pick up any changes in groundwater quality.<br>There are no predicted impacts to groundwater from this change of trigger limits. Rather, they will be more suitable to pick up any impact should they occur. |

# 6 References

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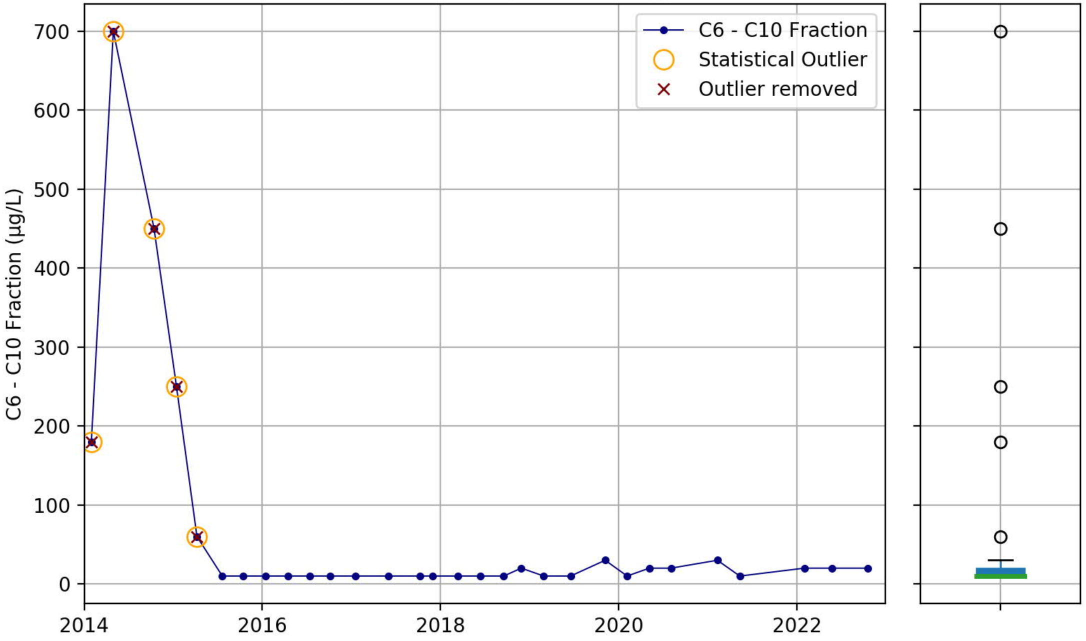
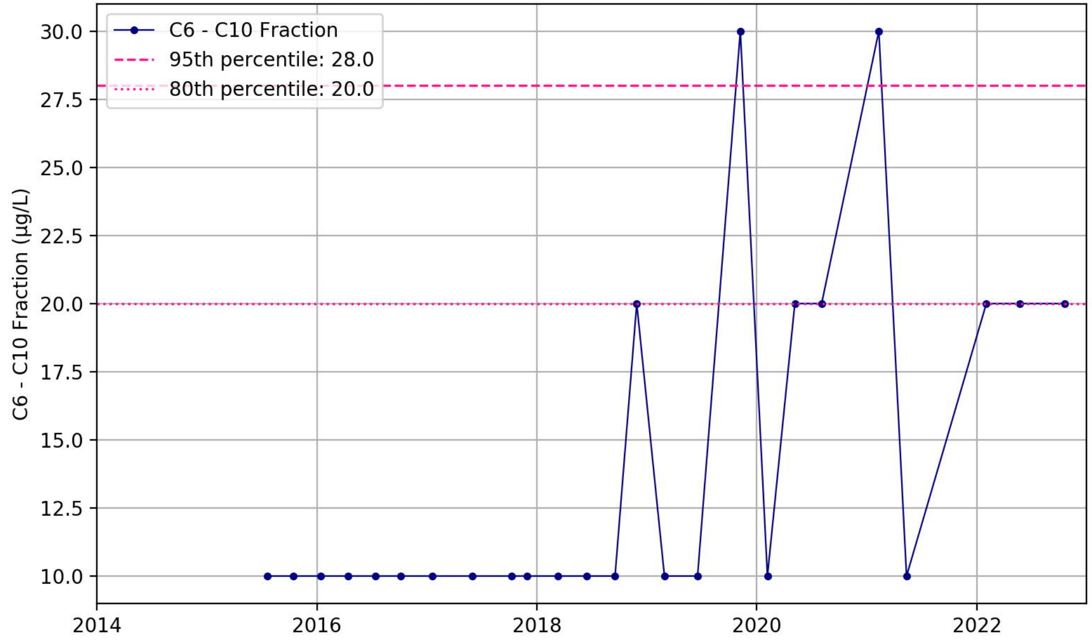
# APPENDIX A

## Time series, trends and outliers

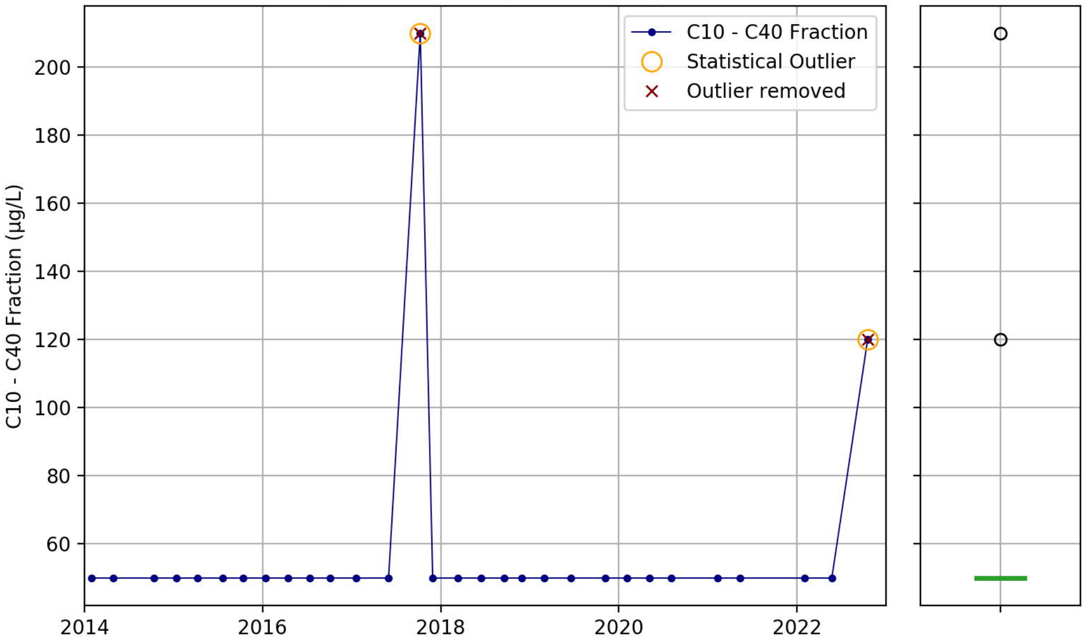
Bore MB8B | Trend: no trend | tau = -0.034 | p = 0.78



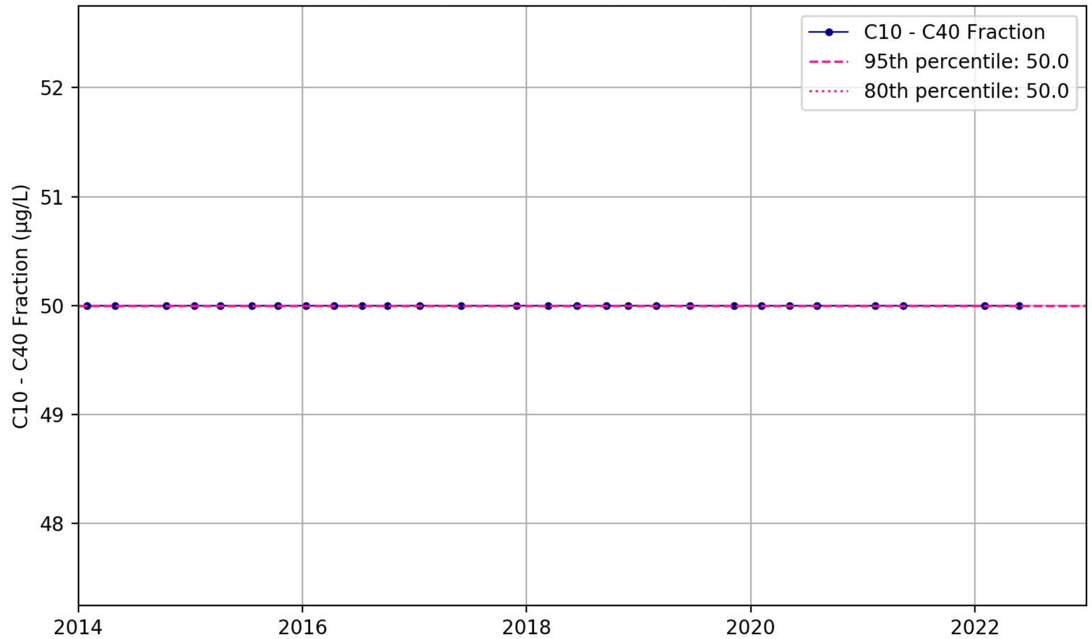

Bore MB8B | Trend (Outliers removed): increasing | tau = 0.38 | p = 0.001

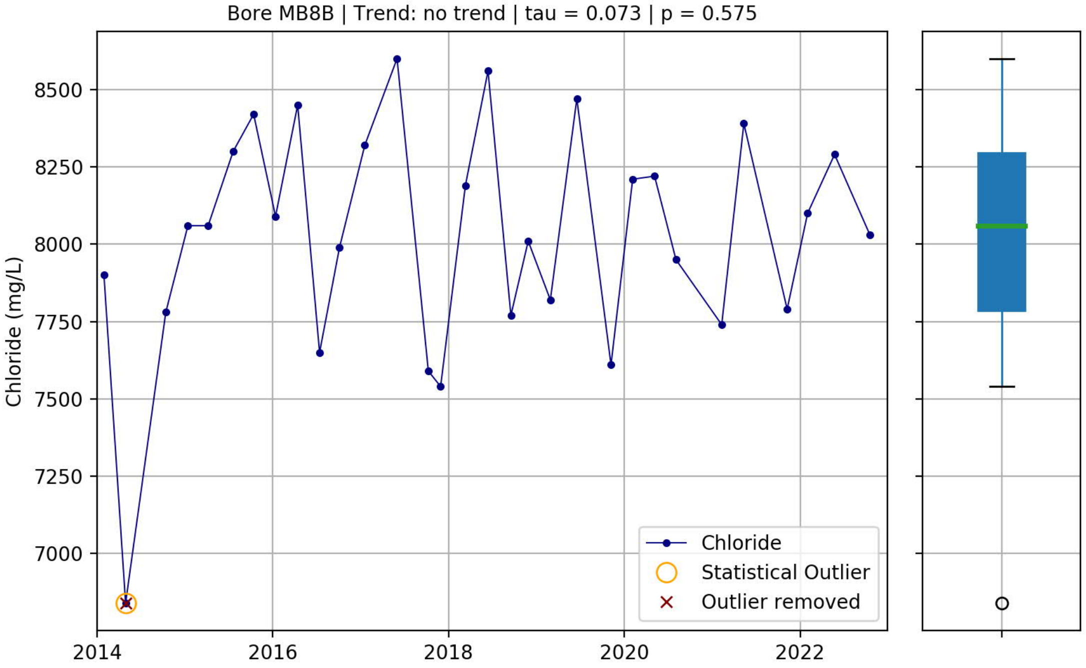


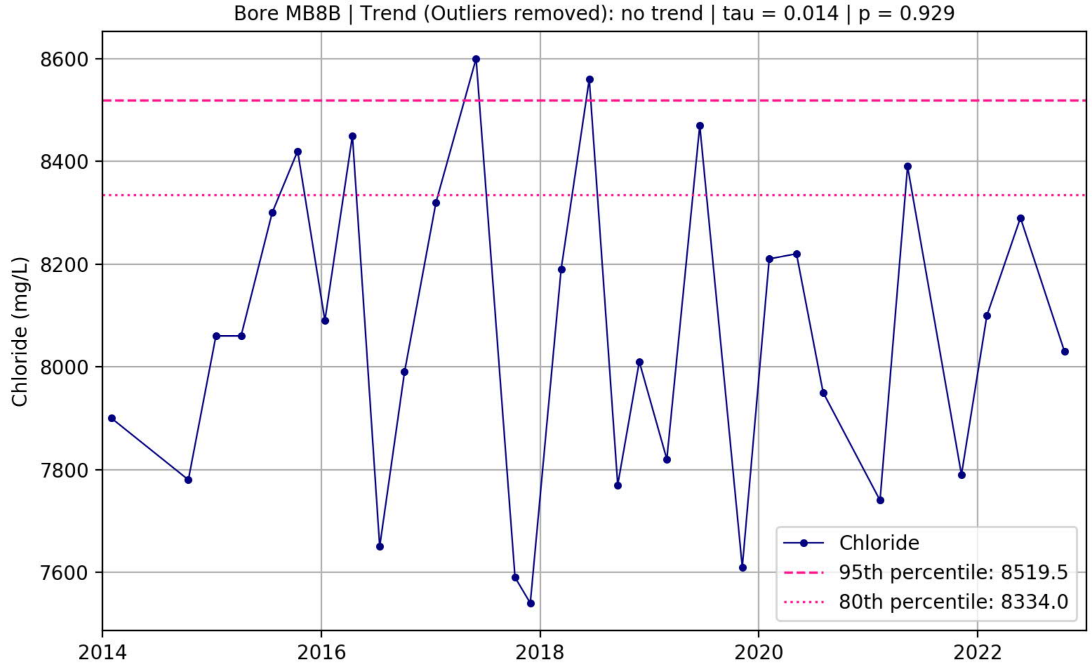

Bore MB8B | Trend: no trend | tau = 0.057 | p = 0.319

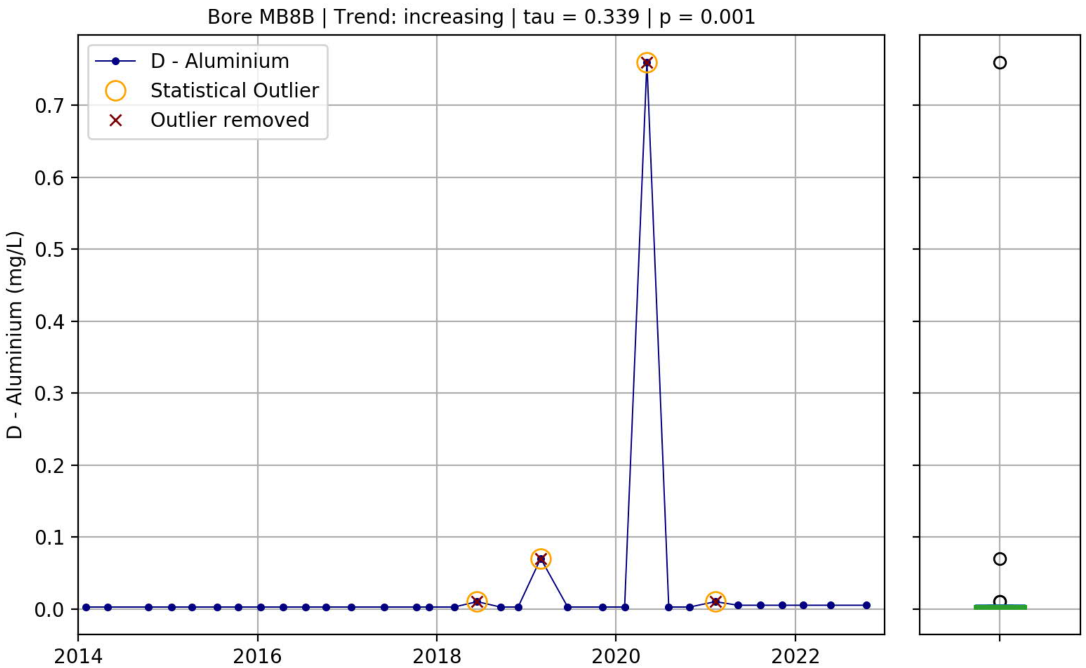


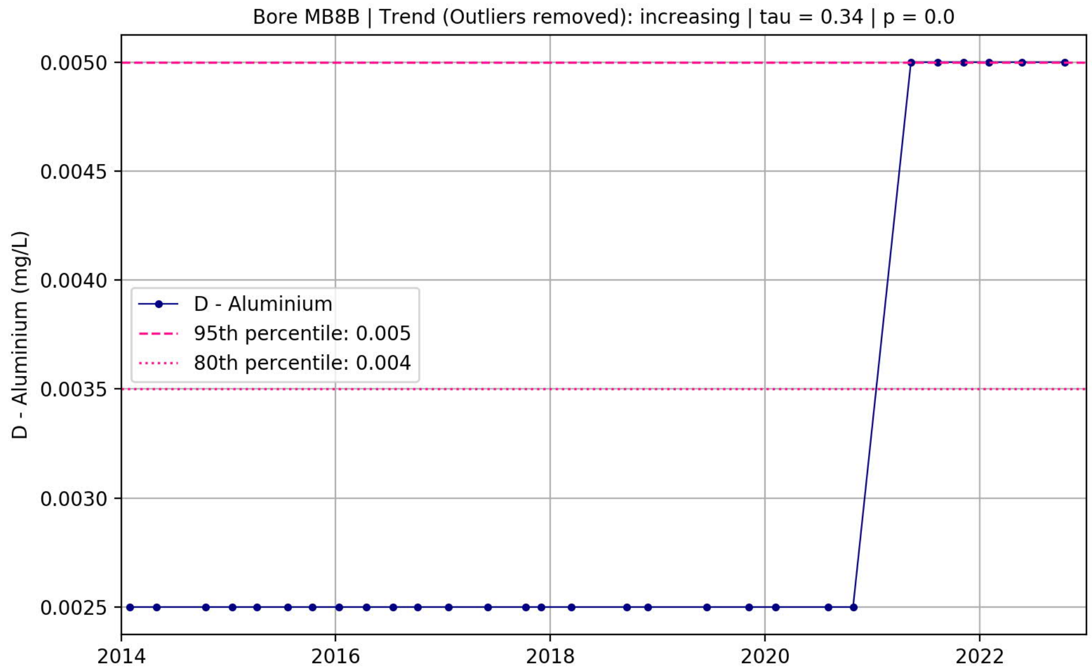

Bore MB8B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0

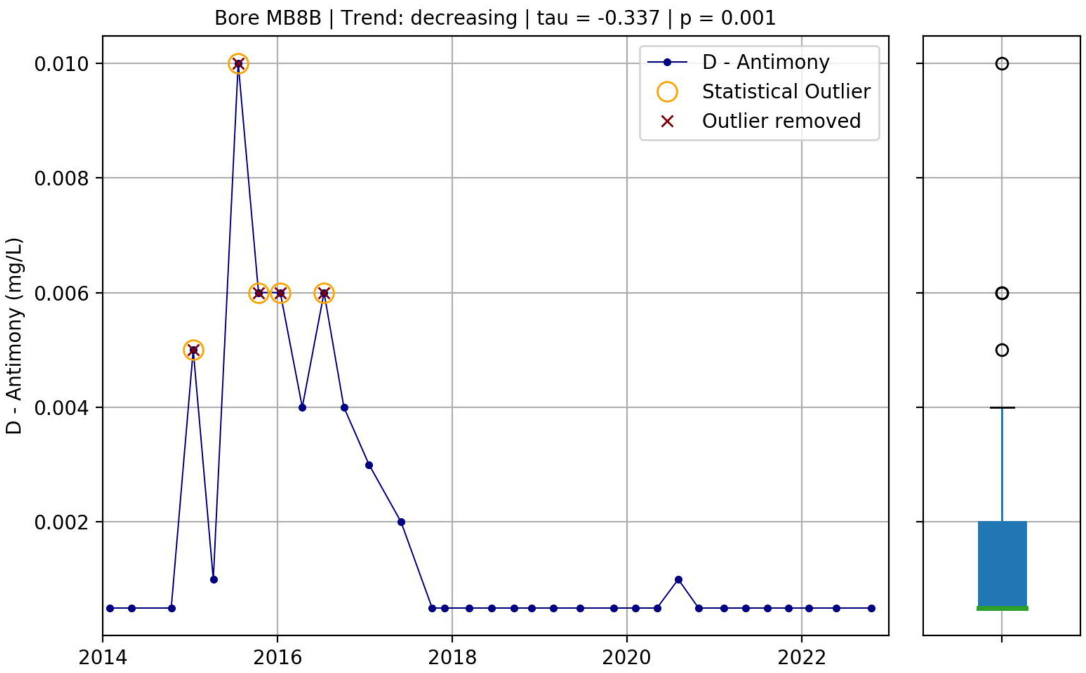


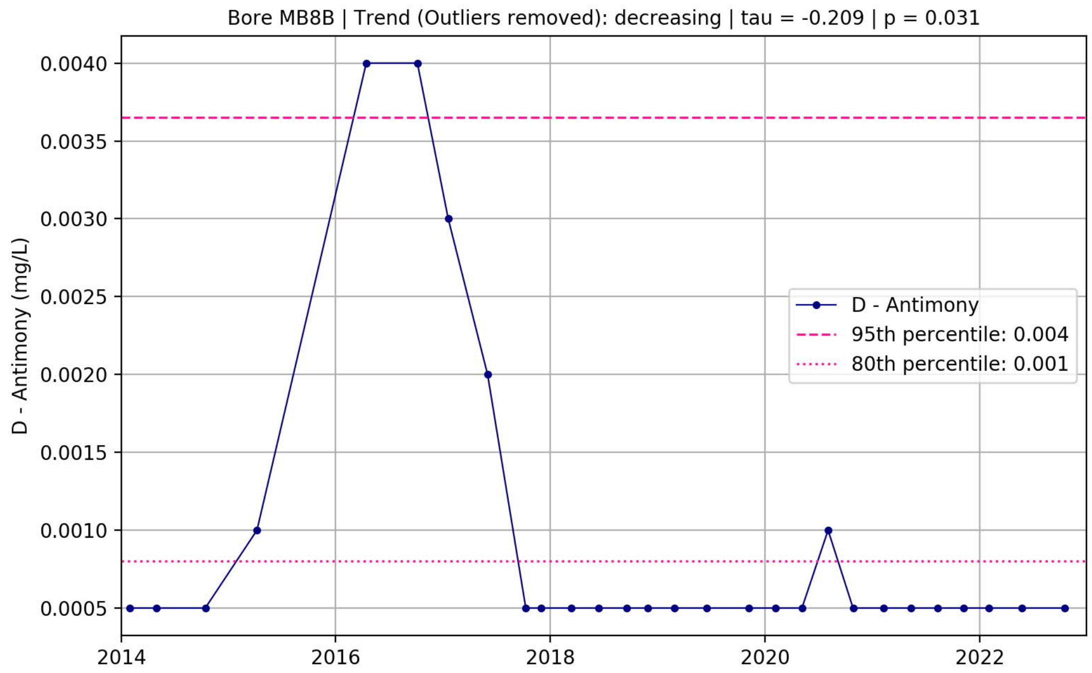

Bore MB8B | Trend: no trend | tau = 0.073 | p = 0.575
Chloride (mg/L)
8500
8250
8000
7750
7500
7250
7000
2014
2016
2018
2020
2022
Chloride
Statistical Outlier
Outlier removed

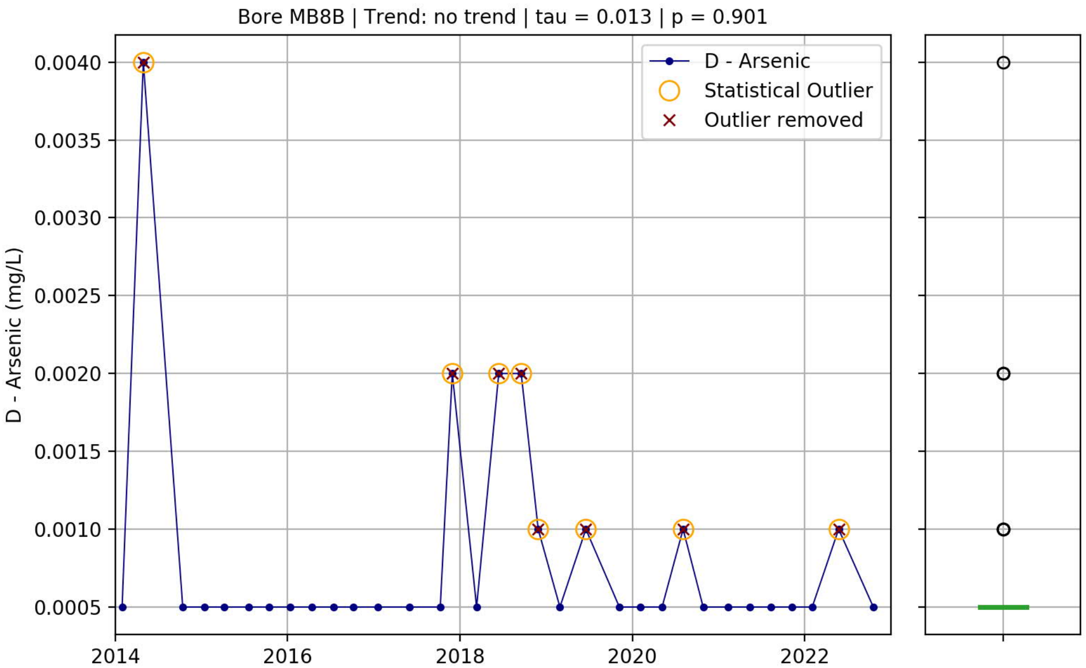

Bore MB8B | Trend (Outliers removed): no trend | tau = 0.014 | p = 0.929
Chloride (mg/L)
8600
8400
8200
8000
7800
7600
2014
2016
2018
2020
2022
Chloride
95th percentile: 8519.5
80th percentile: 8334.0

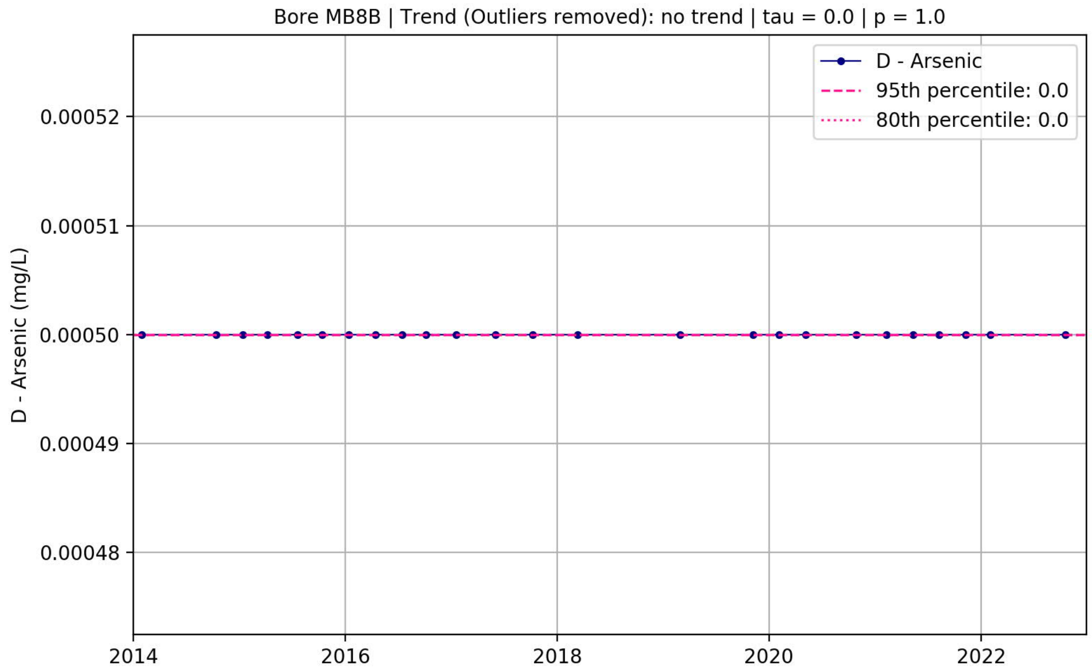

Bore MB8B | Trend: increasing | tau = 0.339 | p = 0.001
D - Aluminium (mg/L)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2014
2016
2018
2020
2022
D - Aluminium
Statistical Outlier
Outlier removed


Bore MB8B | Trend (Outliers removed): increasing | tau = 0.34 | p = 0.0
D - Aluminium (mg/L)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
2014
2016
2018
2020
2022
D - Aluminium
95th percentile: 0.005
80th percentile: 0.004

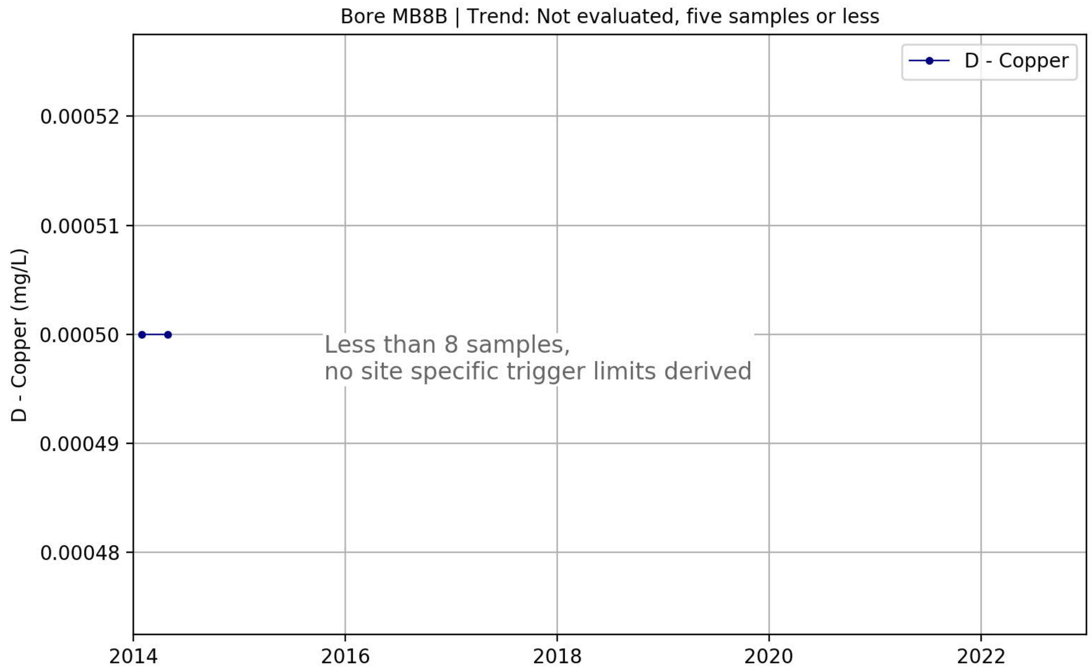

Bore MB8B | Trend: decreasing | tau = -0.337 | p = 0.001
D - Antimony
Statistical Outlier
Outlier removed
D - Antimony (mg/L)
0.010
0.008
0.006
0.004
0.002
2014
2016
2018
2020
2022

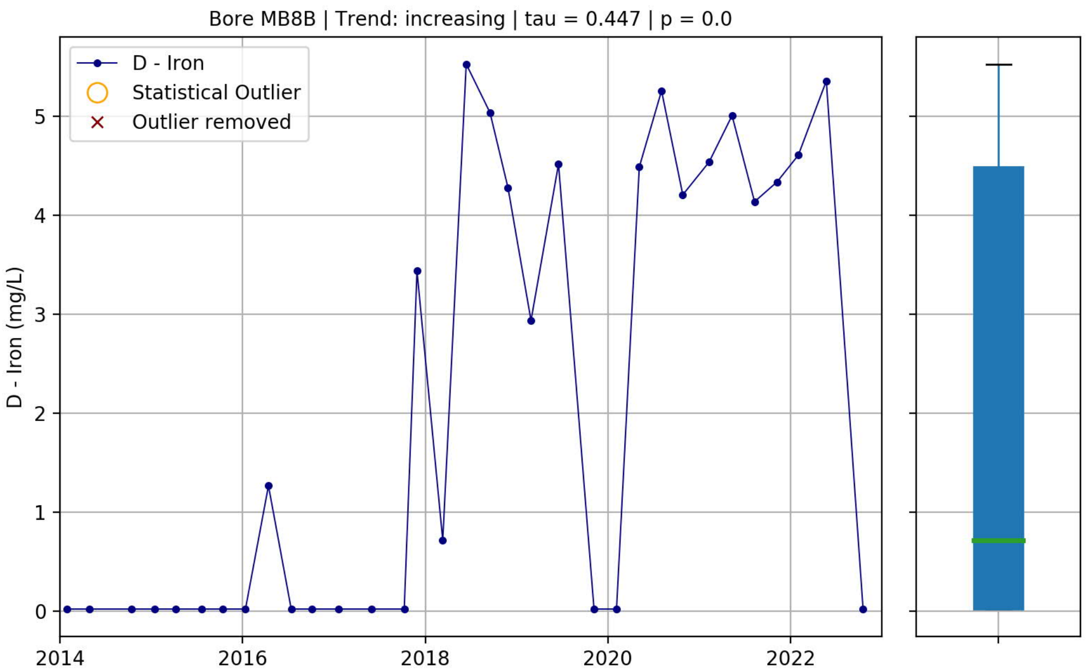

Bore MB8B | Trend (Outliers removed): decreasing | tau = -0.209 | p = 0.031
D - Antimony
95th percentile: 0.004
80th percentile: 0.001
D - Antimony (mg/L)
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
2014
2016
2018
2020
2022

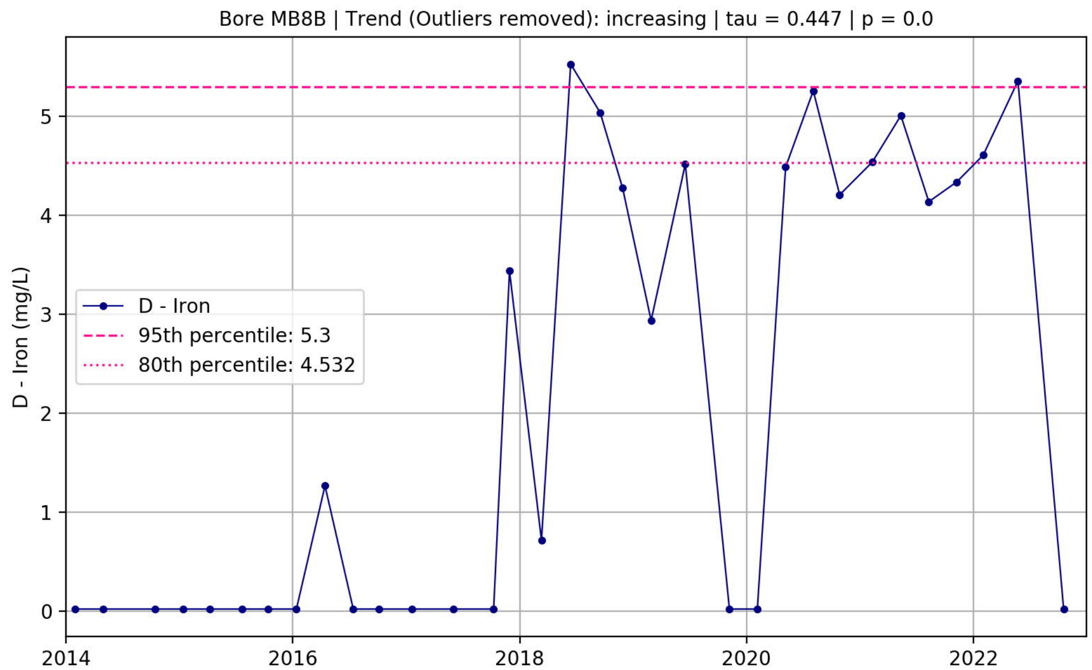

Bore MB8B | Trend: no trend | tau = 0.013 | p = 0.901
D - Arsenic
Statistical Outlier
Outlier removed
D - Arsenic (mg/L)
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
2014
2016
2018
2020
2022

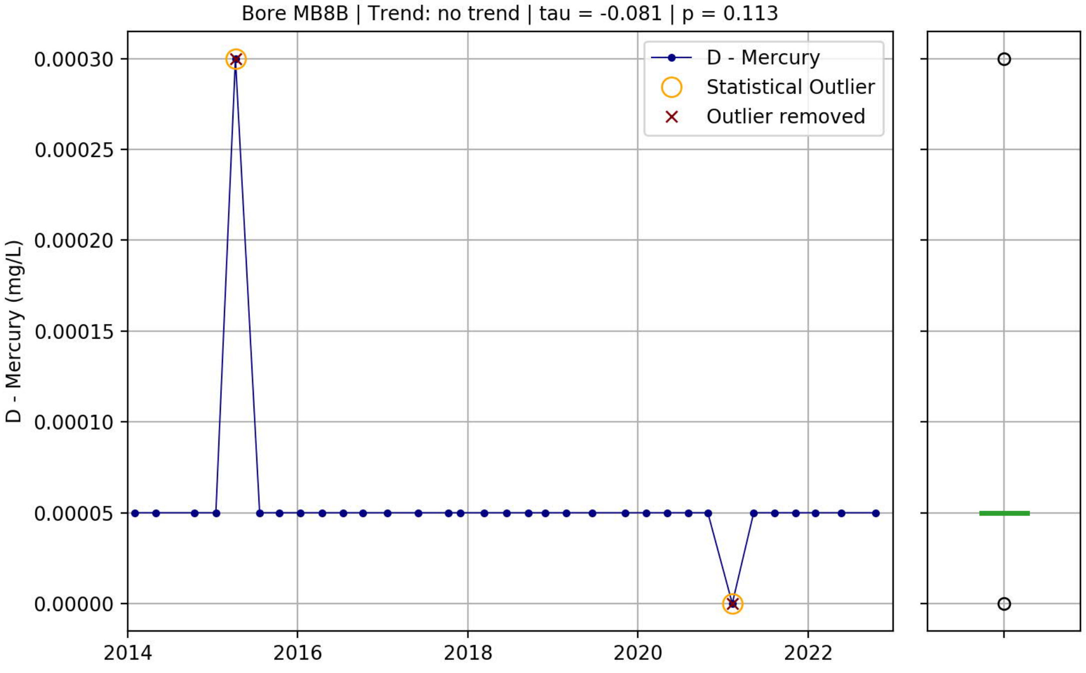

Bore MB8B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Arsenic
95th percentile: 0.0
80th percentile: 0.0
D - Arsenic (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

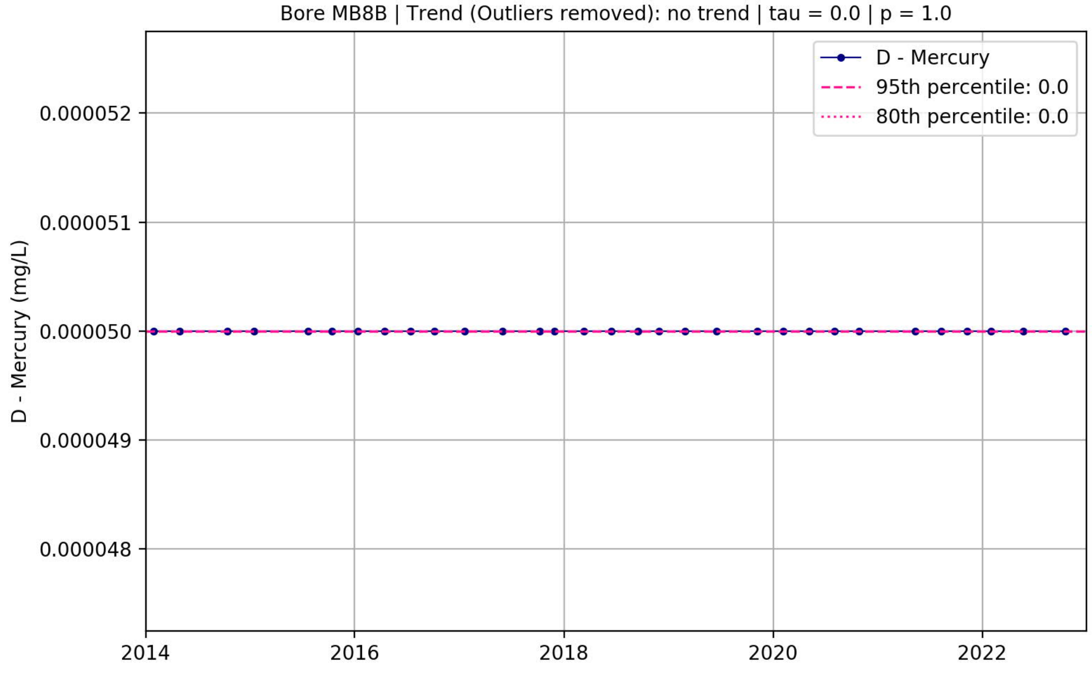

Bore MB8B | Trend: Not evaluated
D - Copper
Statistical Outlier
Outlier removed
D - Copper (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

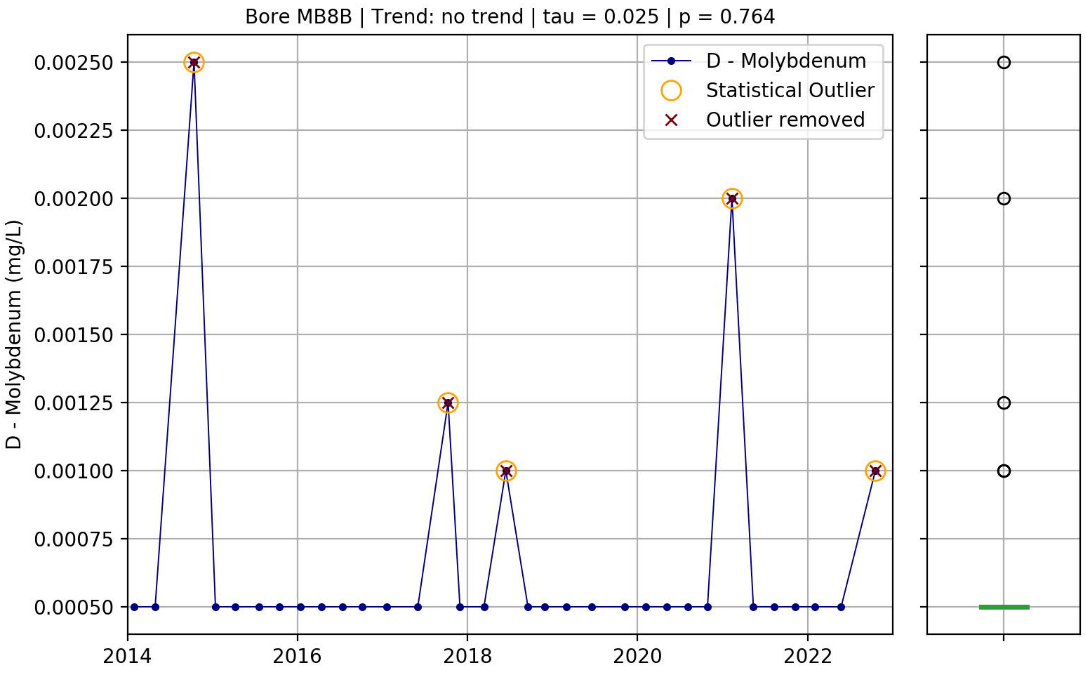

Bore MB8B | Trend: Not evaluated, five samples or less
D - Copper
Less than 8 samples,
no site specific trigger limits derived
D - Copper (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

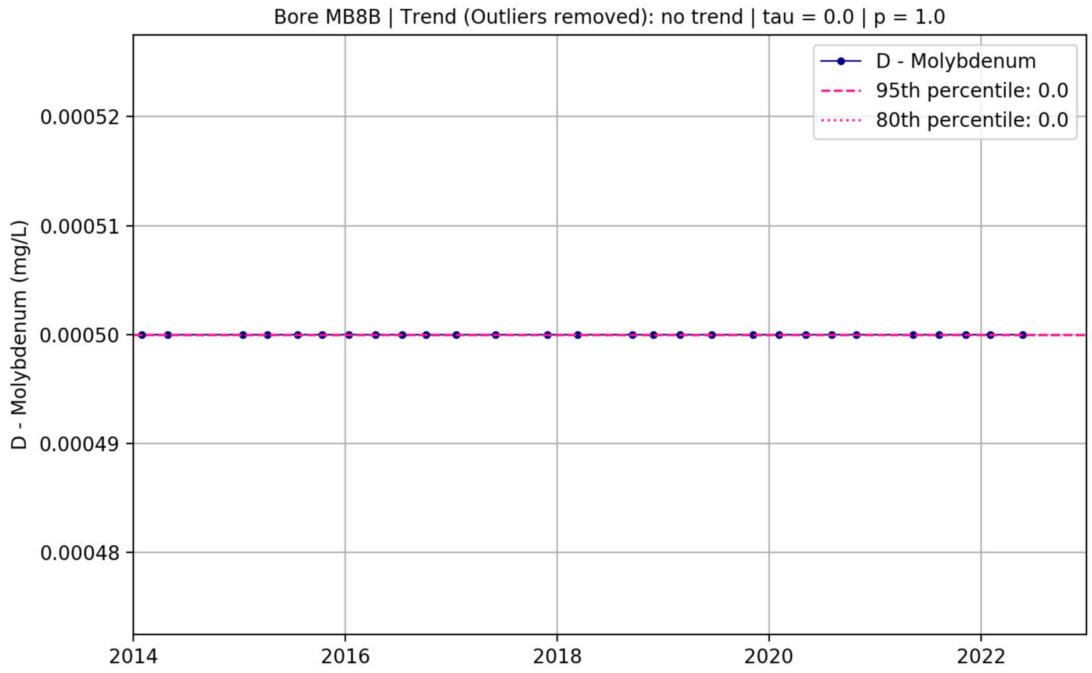

Bore MB8B | Trend: increasing | tau = 0.447 | p = 0.0
D - Iron
Statistical Outlier
Outlier removed
D - Iron (mg/L)
0
1
2
3
4
5
2014
2016
2018
2020
2022

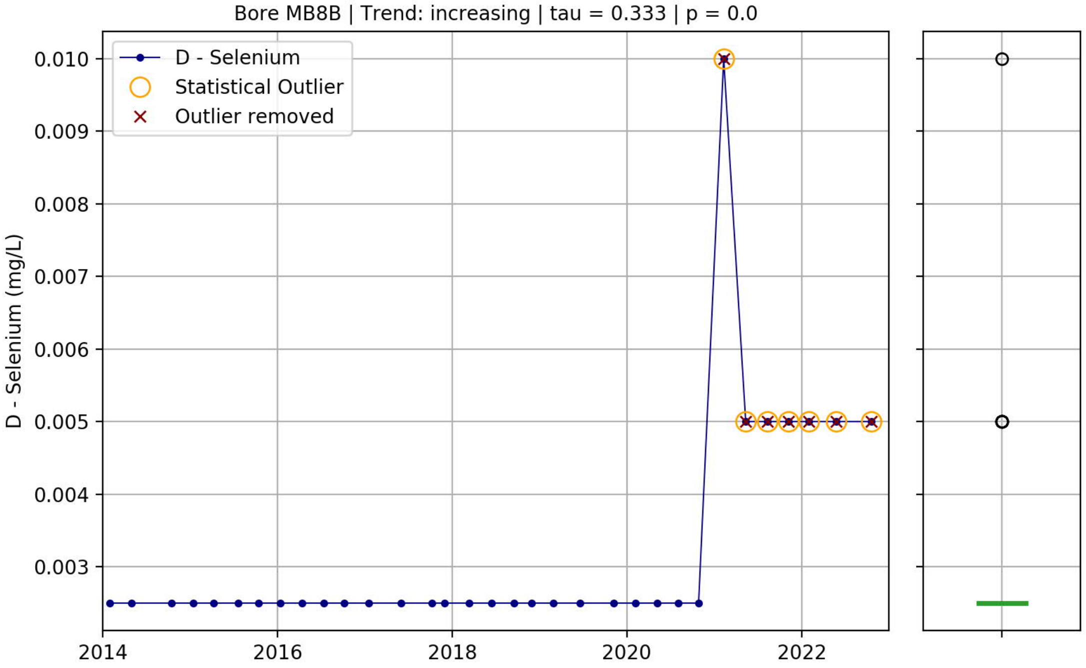

Bore MB8B | Trend (Outliers removed): increasing | tau = 0.447 | p = 0.0
D - Iron
95th percentile: 5.3
80th percentile: 4.532
D - Iron (mg/L)
0
1
2
3
4
5
2014
2016
2018
2020
2022

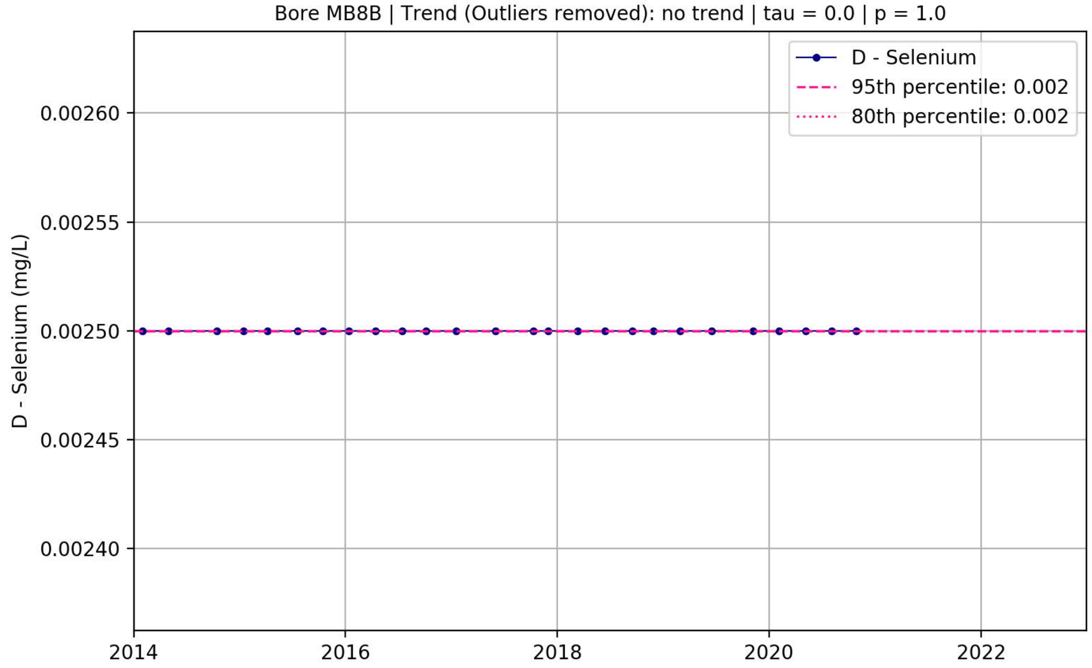

Bore MB8B | Trend: no trend | tau = -0.081 | p = 0.113
D - Mercury
Statistical Outlier
Outlier removed
D - Mercury (mg/L)
0.00030
0.00025
0.00020
0.00015
0.00010
0.00005
0.00000
2014
2016
2018
2020
2022

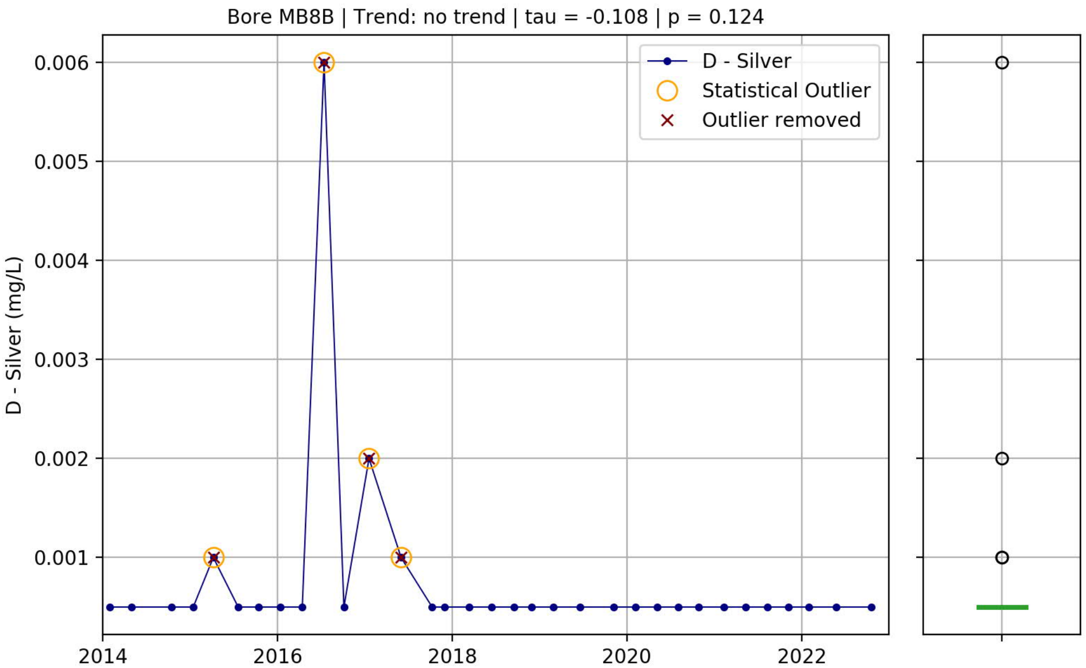

Bore MB8B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Mercury
95th percentile: 0.0
80th percentile: 0.0
D - Mercury (mg/L)
0.000052
0.000051
0.000050
0.000049
0.000048
2014
2016
2018
2020
2022

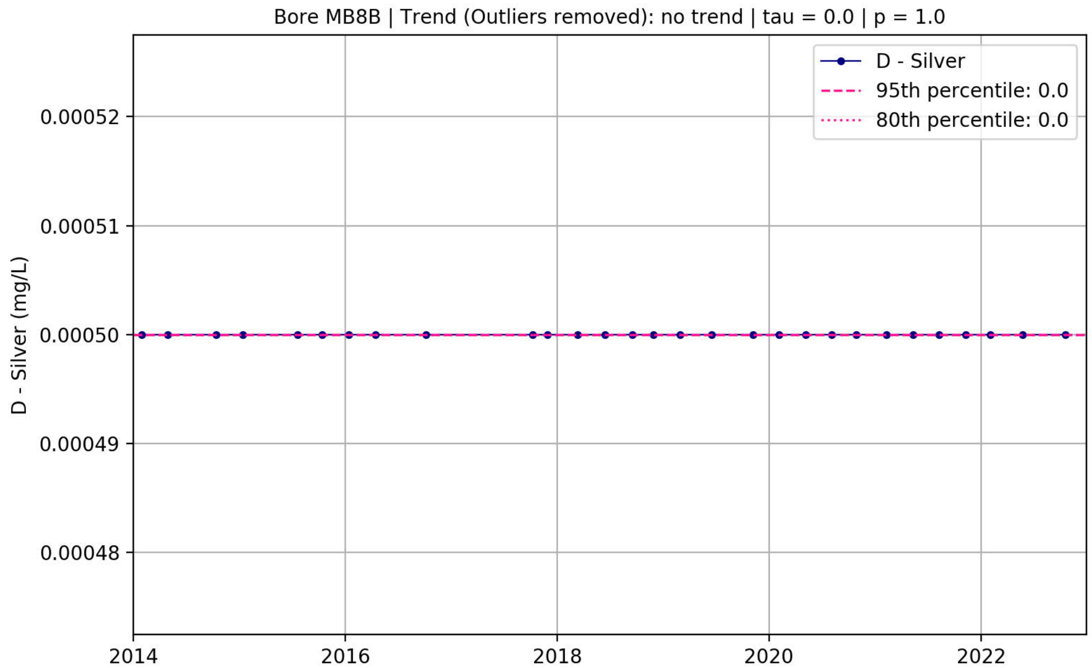

Bore MB8B | Trend: no trend | tau = 0.025 | p = 0.764
D - Molybdenum
Statistical Outlier
Outlier removed
D - Molybdenum (mg/L)
0.00250
0.00225
0.00200
0.00175
0.00150
0.00125
0.00100
0.00075
0.00050
2014
2016
2018
2020
2022

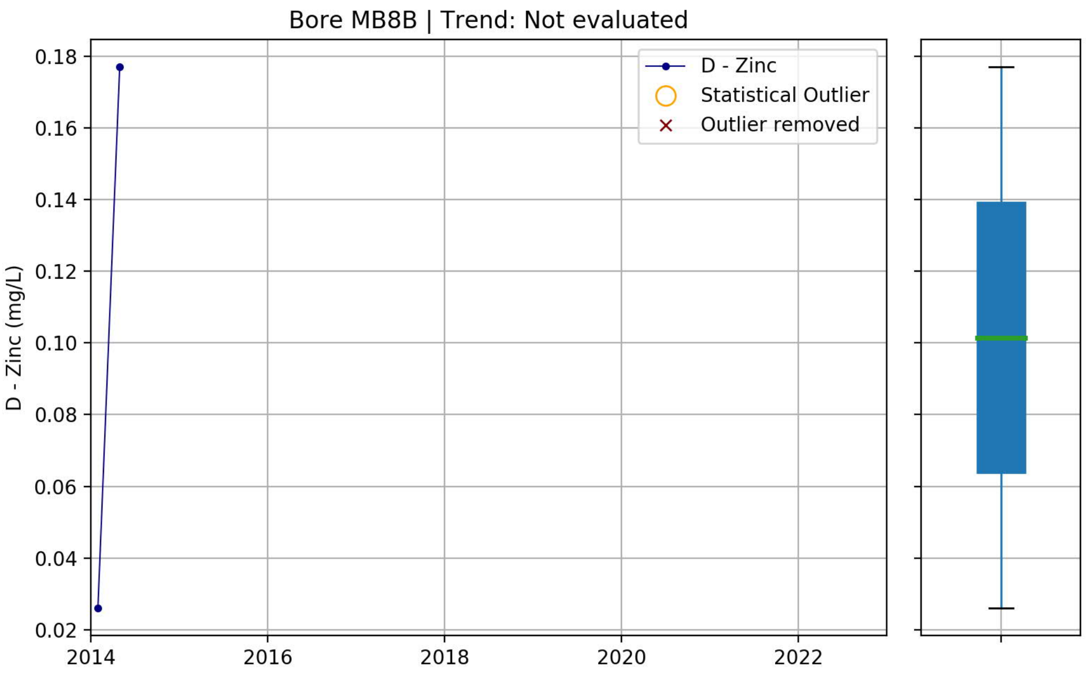

Bore MB8B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Molybdenum
95th percentile: 0.0
80th percentile: 0.0
D - Molybdenum (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

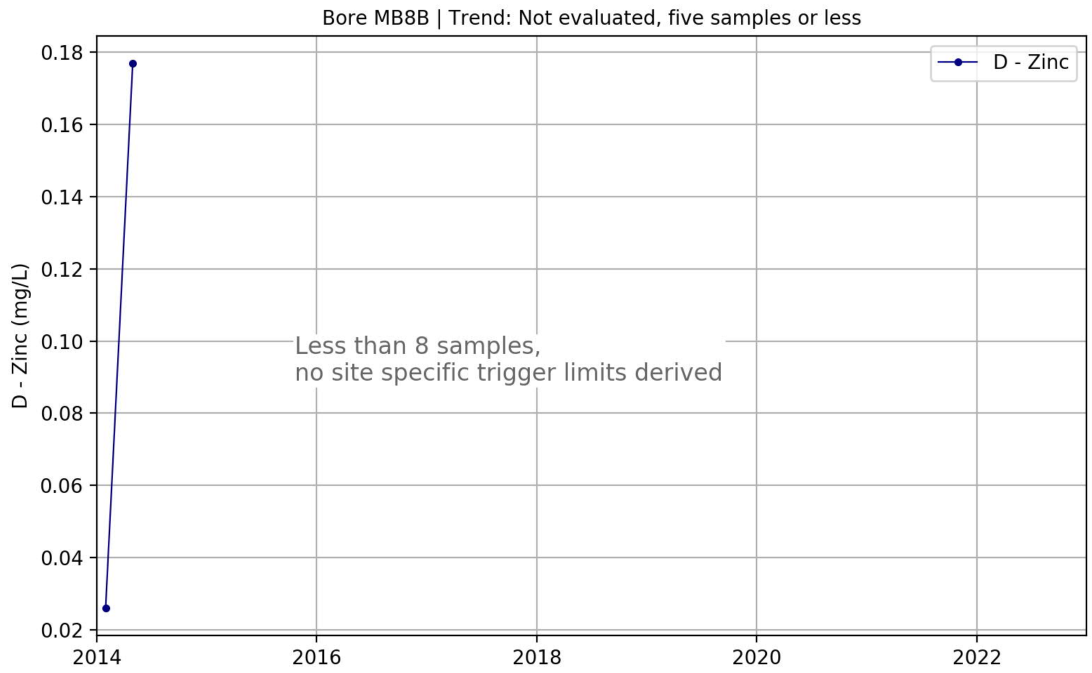

Bore MB8B | Trend: increasing | tau = 0.333 | p = 0.0
D - Selenium
Statistical Outlier
Outlier removed
D - Selenium (mg/L)
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
2014
2016
2018
2020
2022

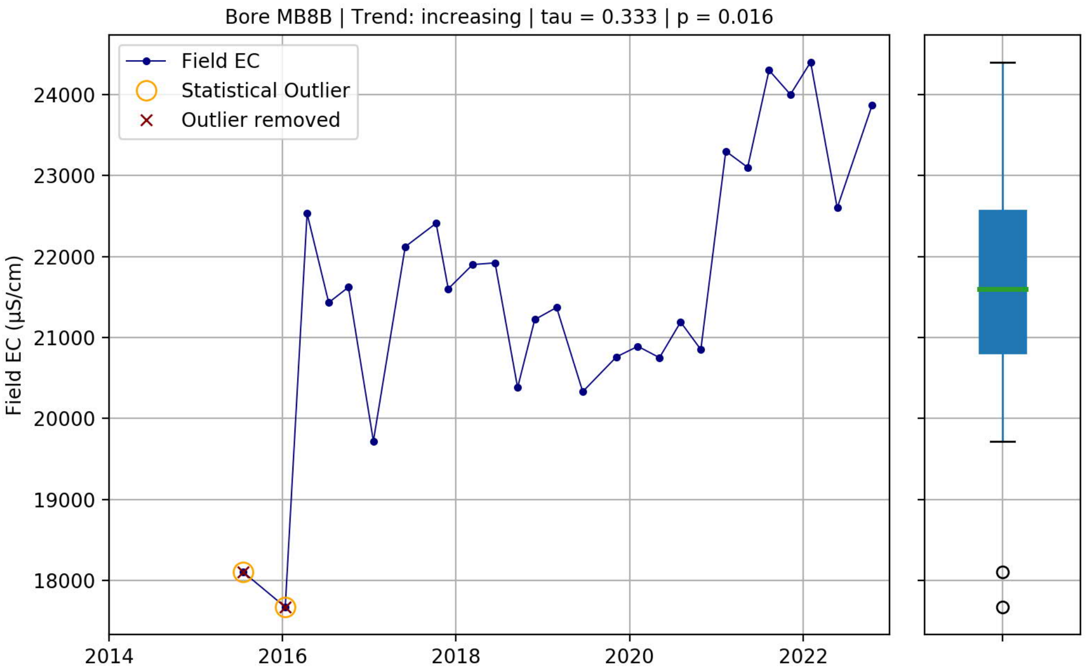

Bore MB8B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Selenium
95th percentile: 0.002
80th percentile: 0.002
D - Selenium (mg/L)
0.00260
0.00255
0.00250
0.00245
0.00240
2014
2016
2018
2020
2022

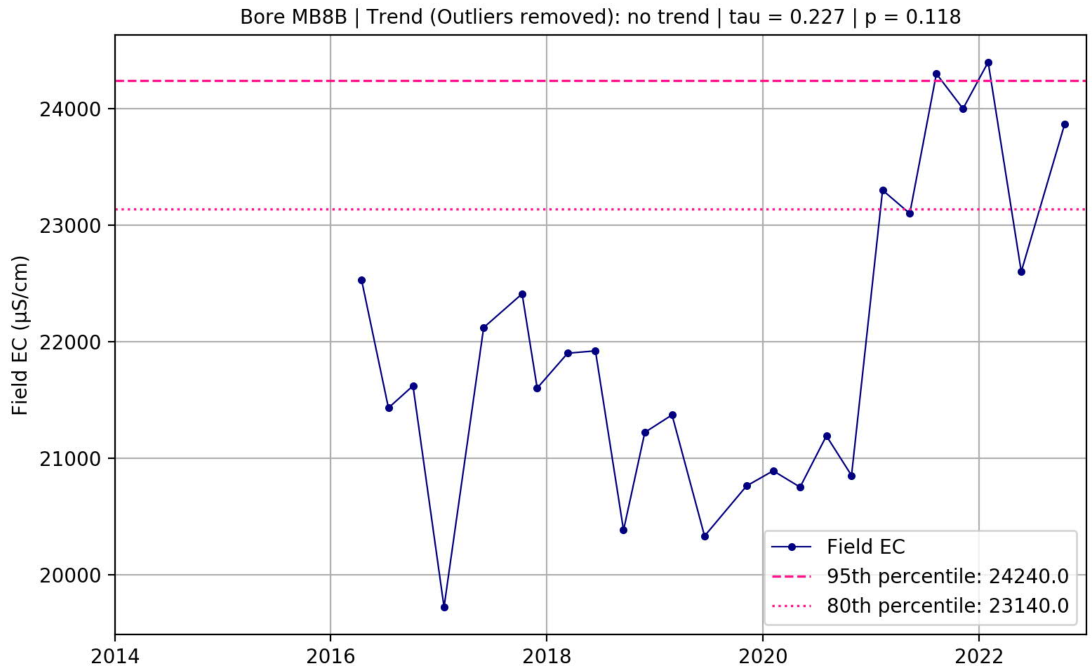

Bore MB8B | Trend: no trend | tau = -0.108 | p = 0.124
D - Silver
Statistical Outlier
Outlier removed
D - Silver (mg/L)
0.006
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022

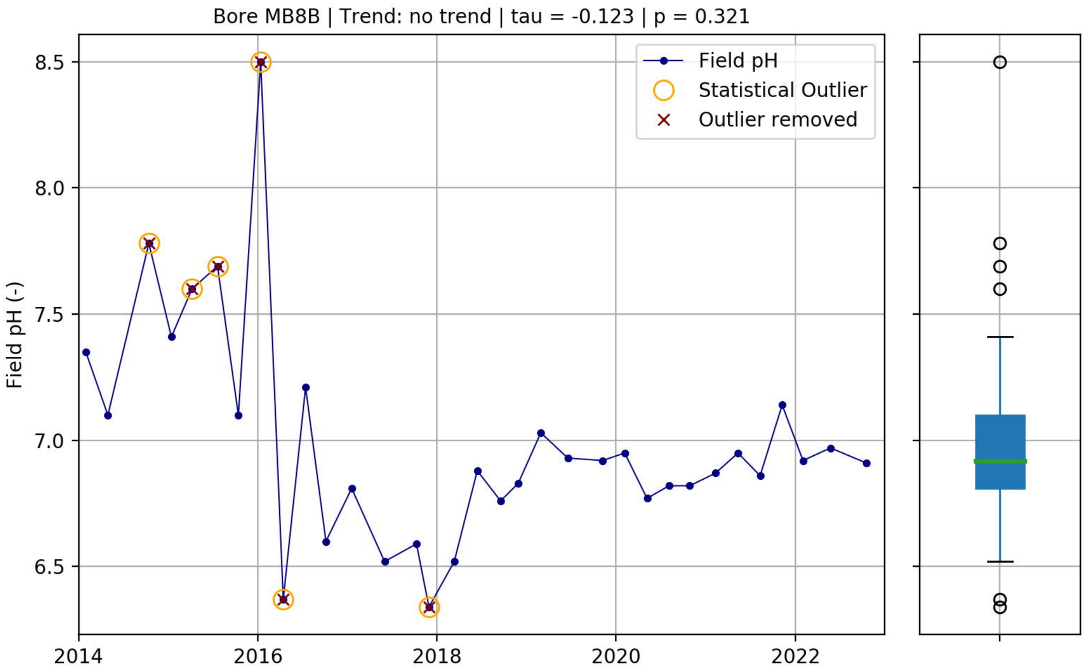

Bore MB8B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Silver
95th percentile: 0.0
80th percentile: 0.0
D - Silver (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

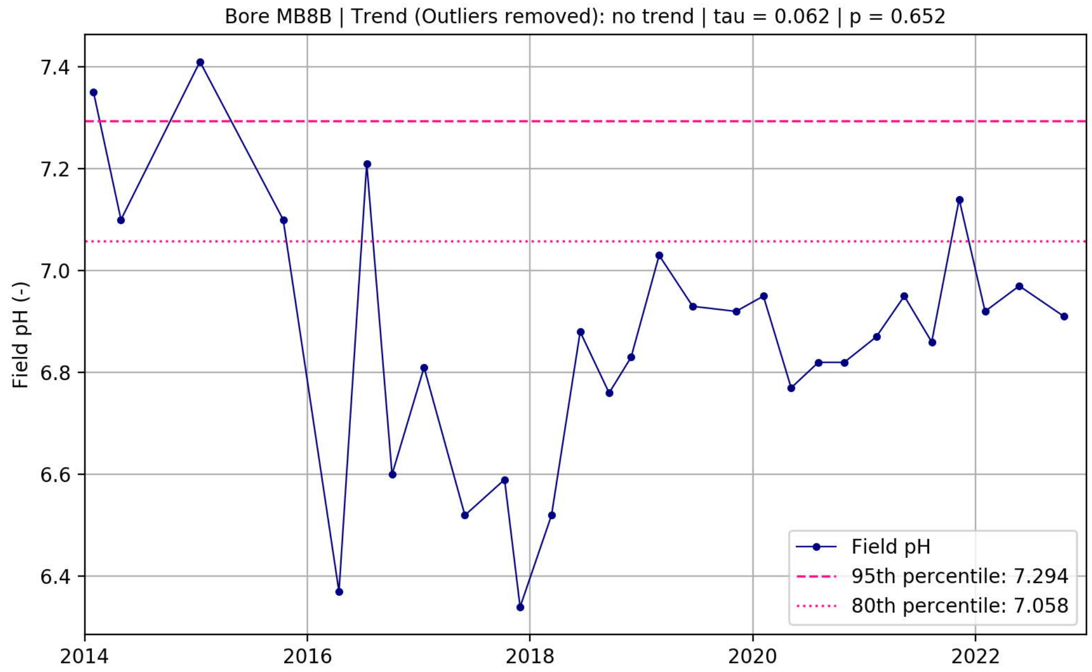

Bore MB8B | Trend: Not evaluated
D - Zinc (mg/L)
D - Zinc
Statistical Outlier
Outlier removed
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
2014
2016
2018
2020
2022

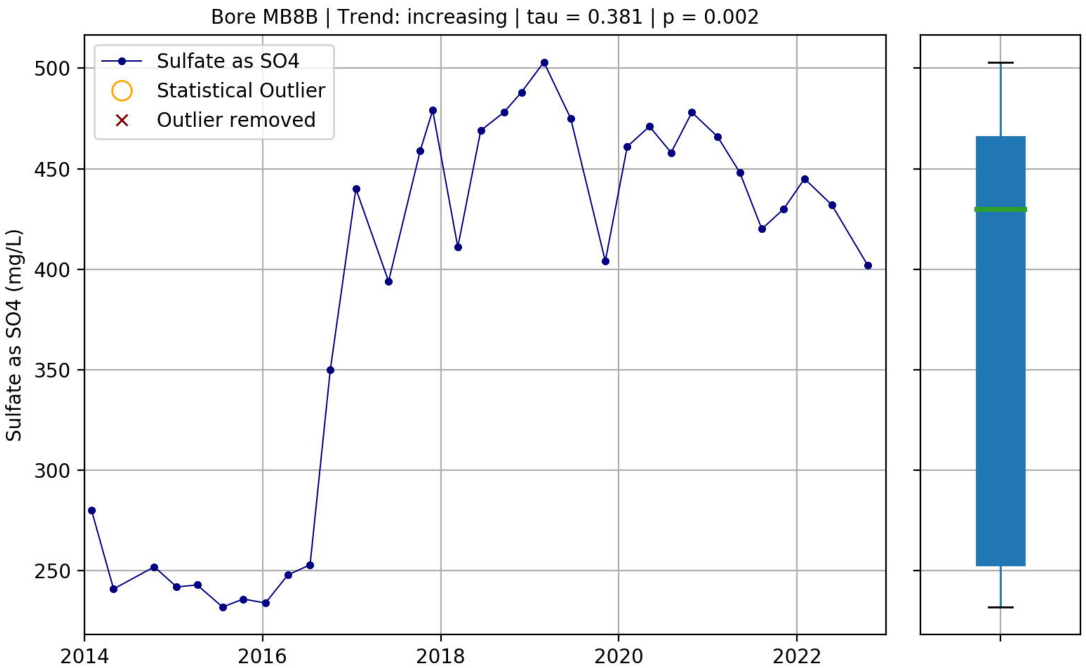

Bore MB8B | Trend: Not evaluated, five samples or less
D - Zinc (mg/L)
D - Zinc
Less than 8 samples,
no site specific trigger limits derived
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
2014
2016
2018
2020
2022

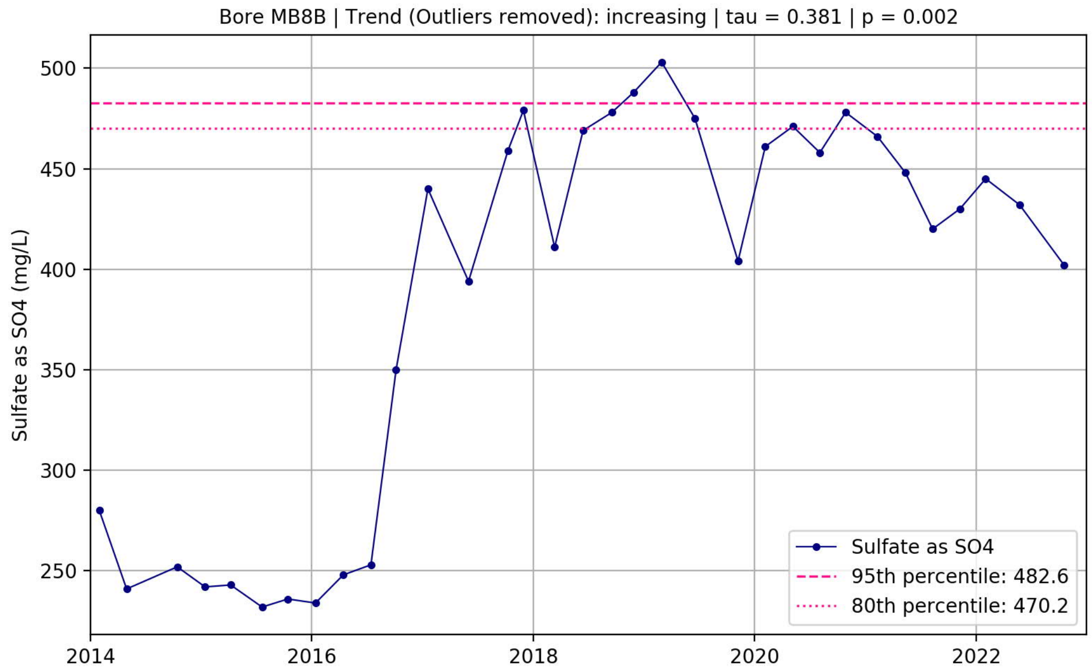

Bore MB8B | Trend: increasing | tau = 0.333 | p = 0.016
Field EC (µS/cm)
Field EC
Statistical Outlier
Outlier removed
24000
23000
22000
21000
20000
19000
18000
2014
2016
2018
2020
2022

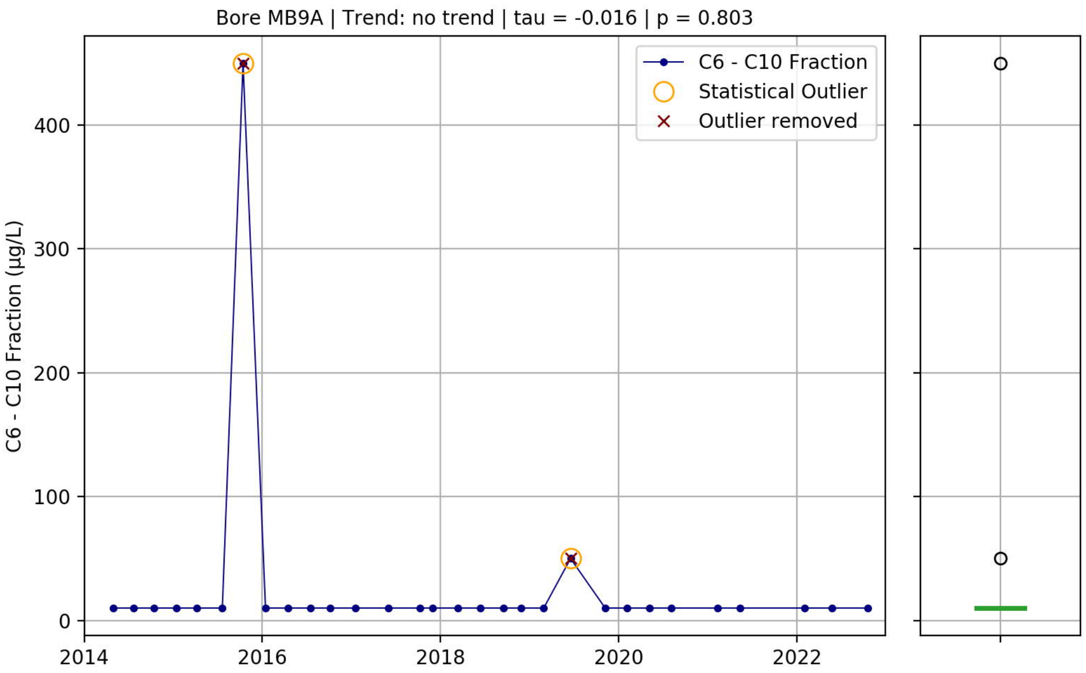

Bore MB8B | Trend (Outliers removed): no trend | tau = 0.227 | p = 0.118
Field EC (µS/cm)
Field EC
95th percentile: 24240.0
80th percentile: 23140.0
24000
23000
22000
21000
20000
2014
2016
2018
2020
2022

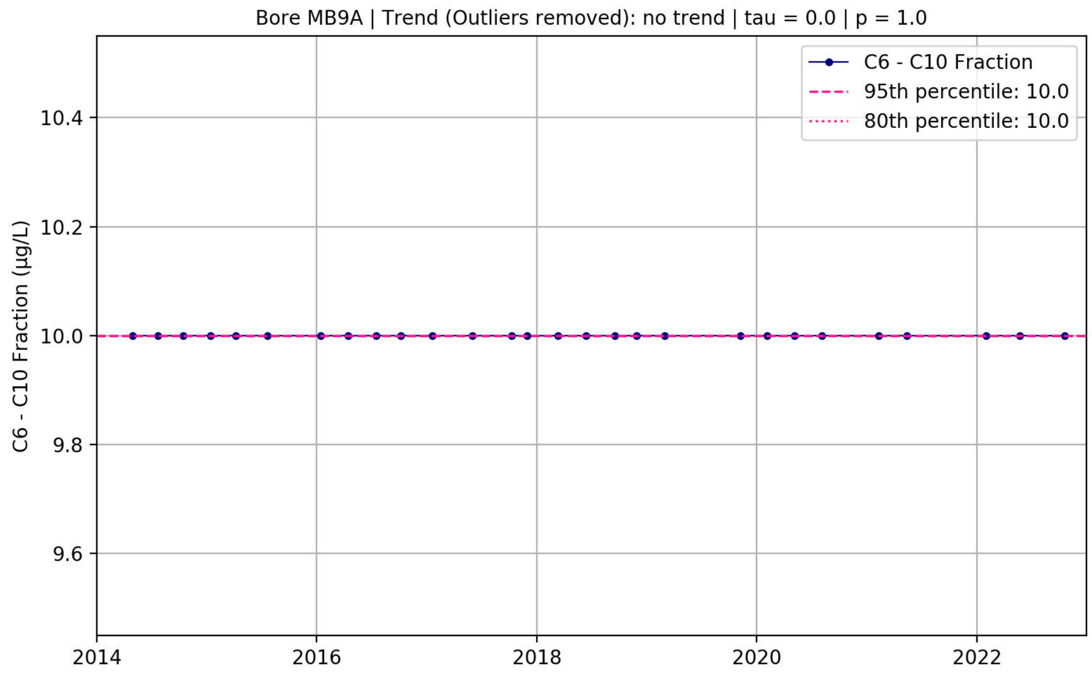

Bore MB8B | Trend: no trend | tau = -0.123 | p = 0.321
Field pH
Statistical Outlier
Outlier removed
Field pH (-)
8.5
8.0
7.5
7.0
6.5
2014
2016
2018
2020
2022

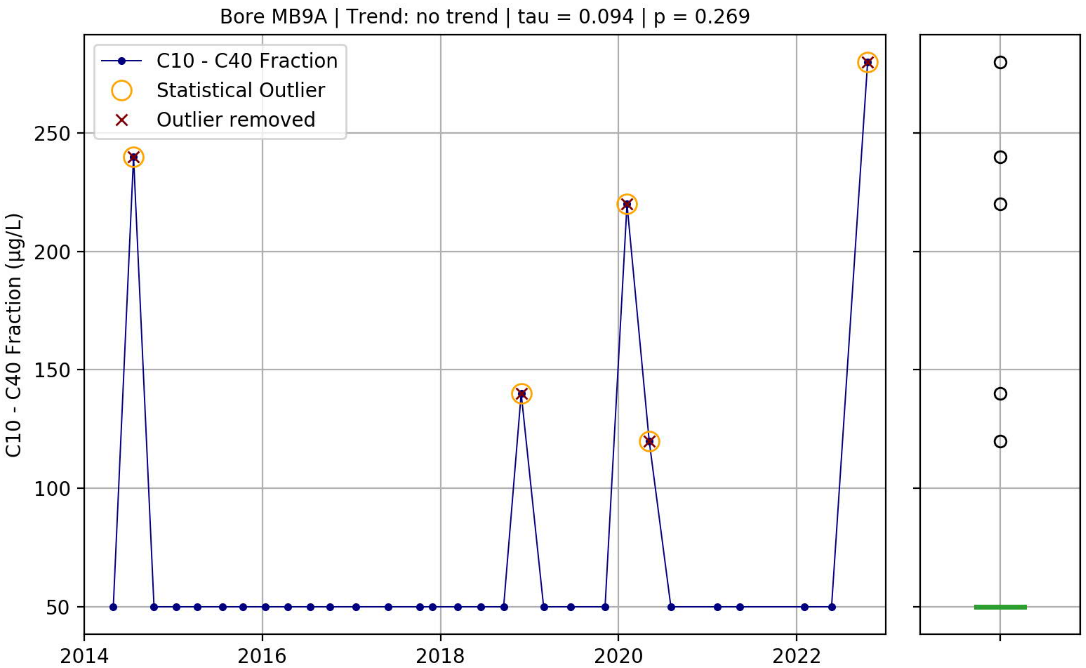

Bore MB8B | Trend (Outliers removed): no trend | tau = 0.062 | p = 0.652
Field pH (-)
7.4
7.2
7.0
6.8
6.6
6.4
Field pH
95th percentile: 7.294
80th percentile: 7.058
2014
2016
2018
2020
2022

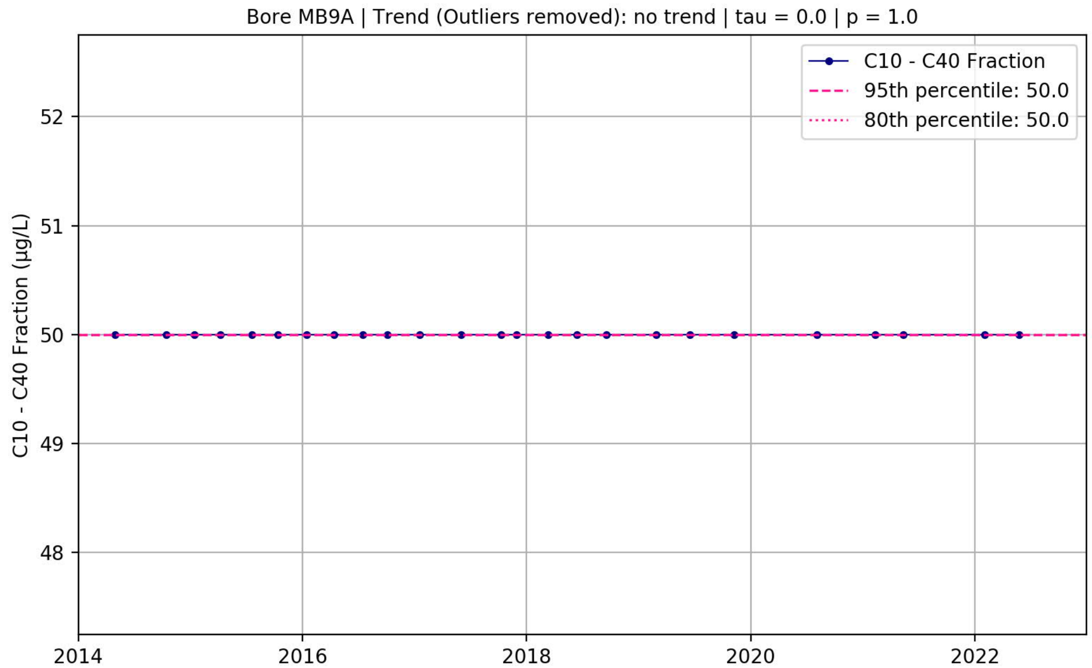

Bore MB8B | Trend: increasing | tau = 0.381 | p = 0.002
Sulfate as SO4
Statistical Outlier
Outlier removed
Sulfate as SO4 (mg/L)
500
450
400
350
300
250
2014
2016
2018
2020
2022

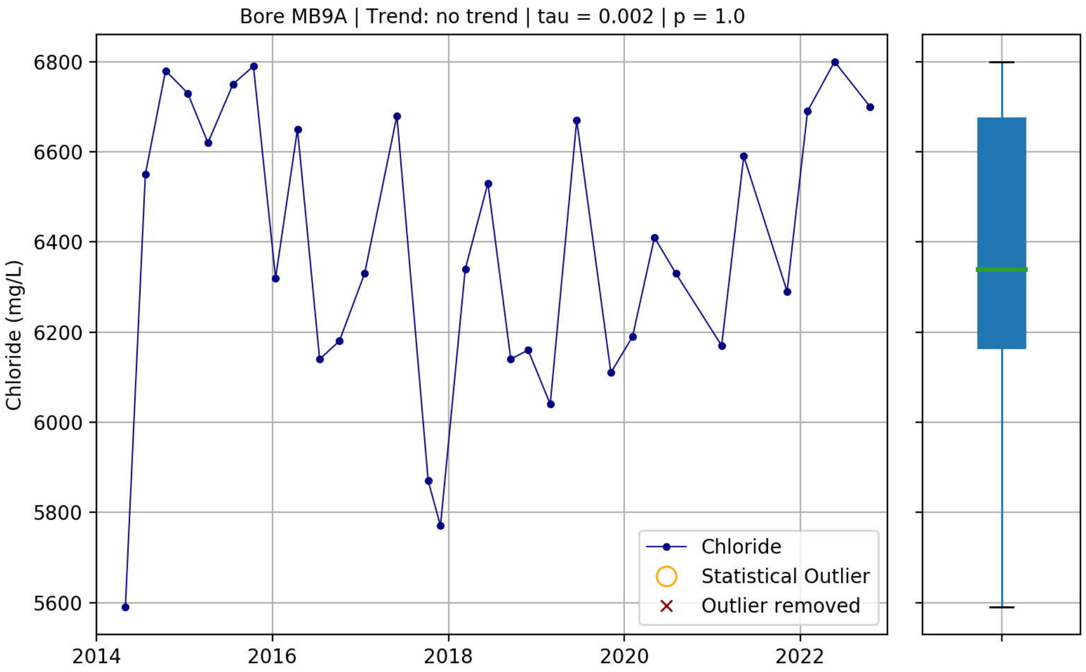

Bore MB8B | Trend (Outliers removed): increasing | tau = 0.381 | p = 0.002
Sulfate as SO4 (mg/L)
500
450
400
350
300
250
Sulfate as SO4
95th percentile: 482.6
80th percentile: 470.2
2014
2016
2018
2020
2022

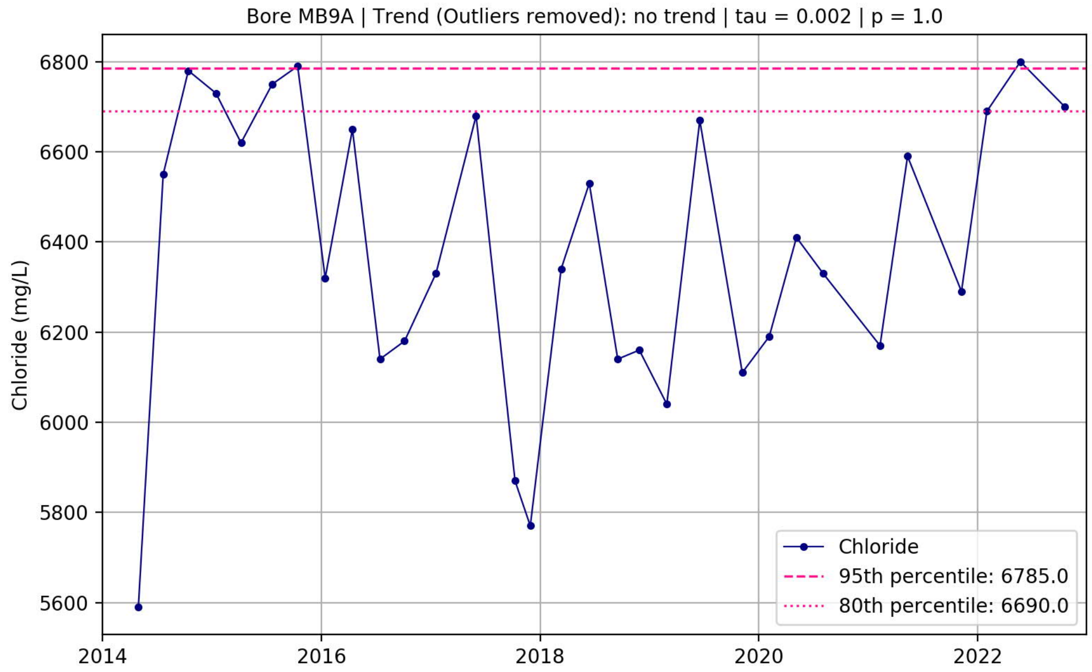

Bore MB9A | Trend: no trend | tau = -0.016 | p = 0.803
C6 - C10 Fraction
Statistical Outlier
Outlier removed
C6 - C10 Fraction (µg/L)
0
100
200
300
400
2014
2016
2018
2020
2022

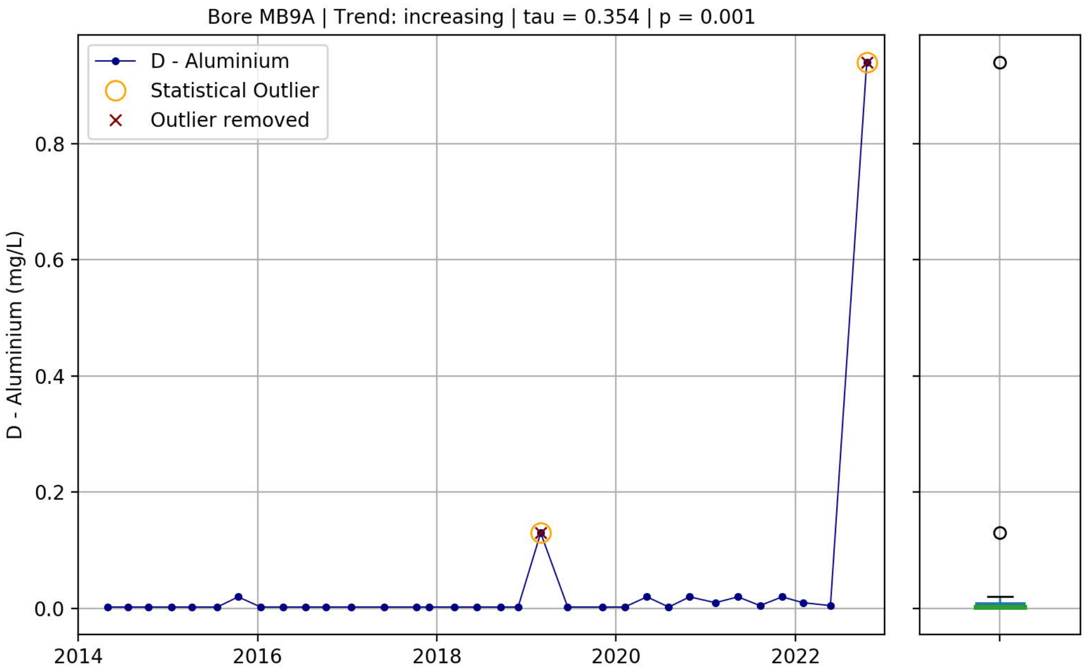

Bore MB9A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
C6 - C10 Fraction
95th percentile: 10.0
80th percentile: 10.0
C6 - C10 Fraction (µg/L)
9.6
9.8
10.0
10.2
10.4
2014
2016
2018
2020
2022

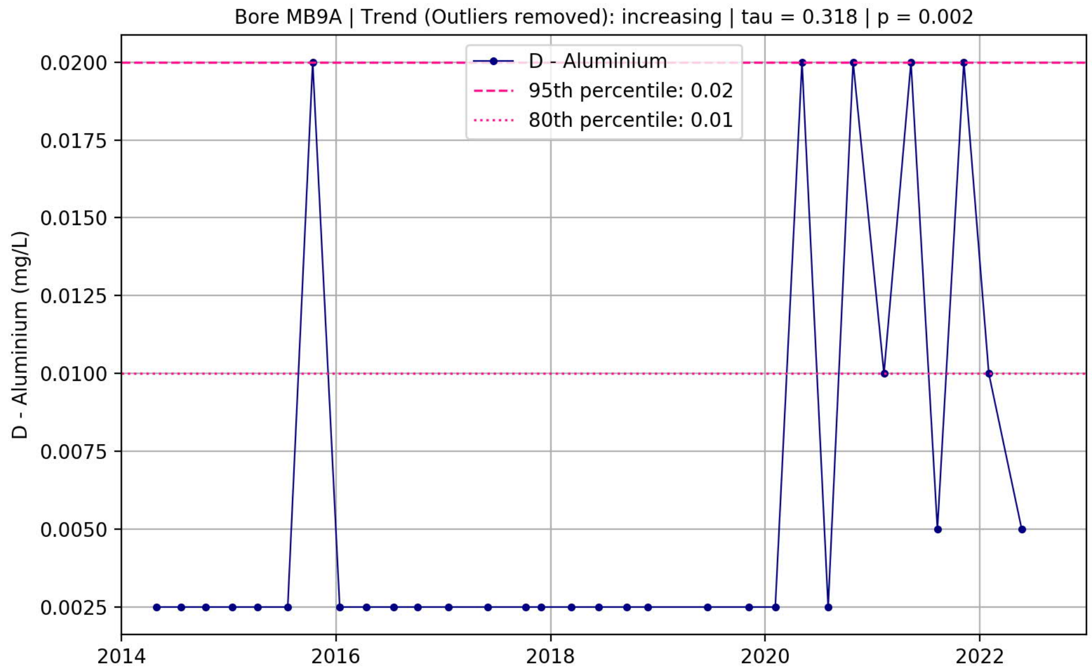

Bore MB9A | Trend: no trend | tau = 0.094 | p = 0.269
C10 - C40 Fraction
Statistical Outlier
Outlier removed
C10 - C40 Fraction (µg/L)
50
100
150
200
250
2014
2016
2018
2020
2022

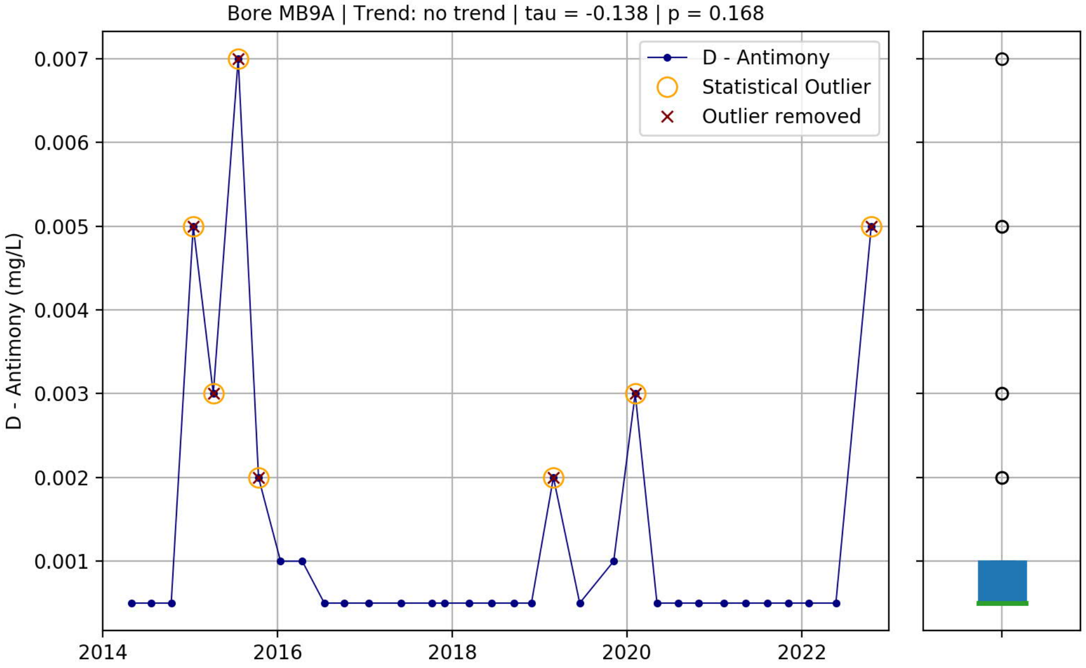

Bore MB9A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
C10 - C40 Fraction
95th percentile: 50.0
80th percentile: 50.0
C10 - C40 Fraction (µg/L)
48
49
50
51
52
2014
2016
2018
2020
2022

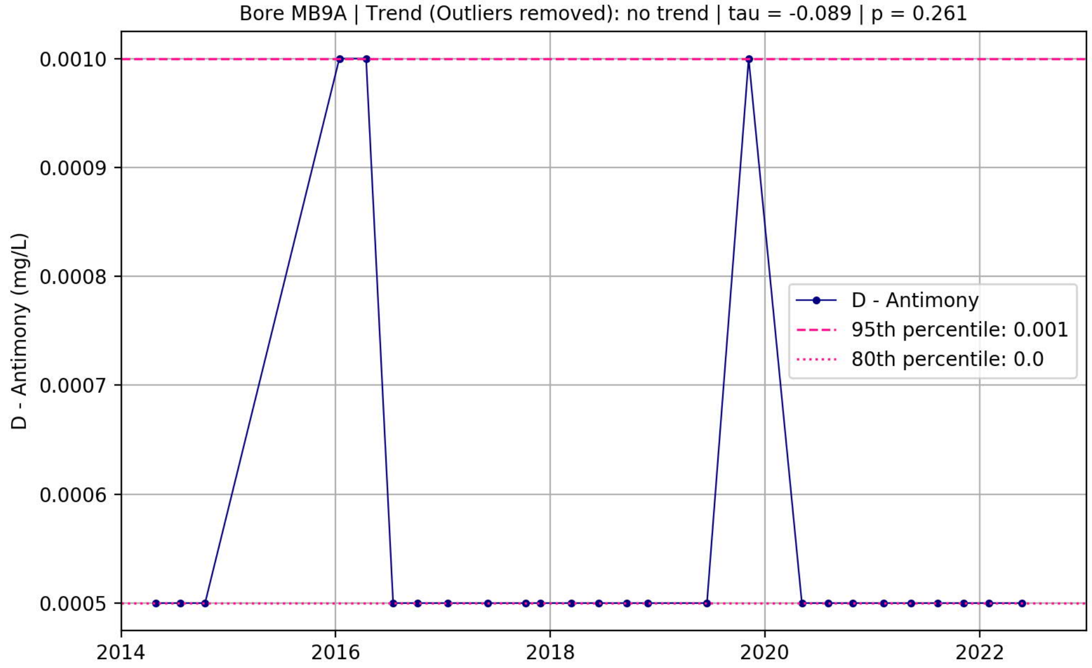

Bore MB9A | Trend: no trend | tau = 0.002 | p = 1.0
Chloride (mg/L)
Chloride
Statistical Outlier
Outlier removed

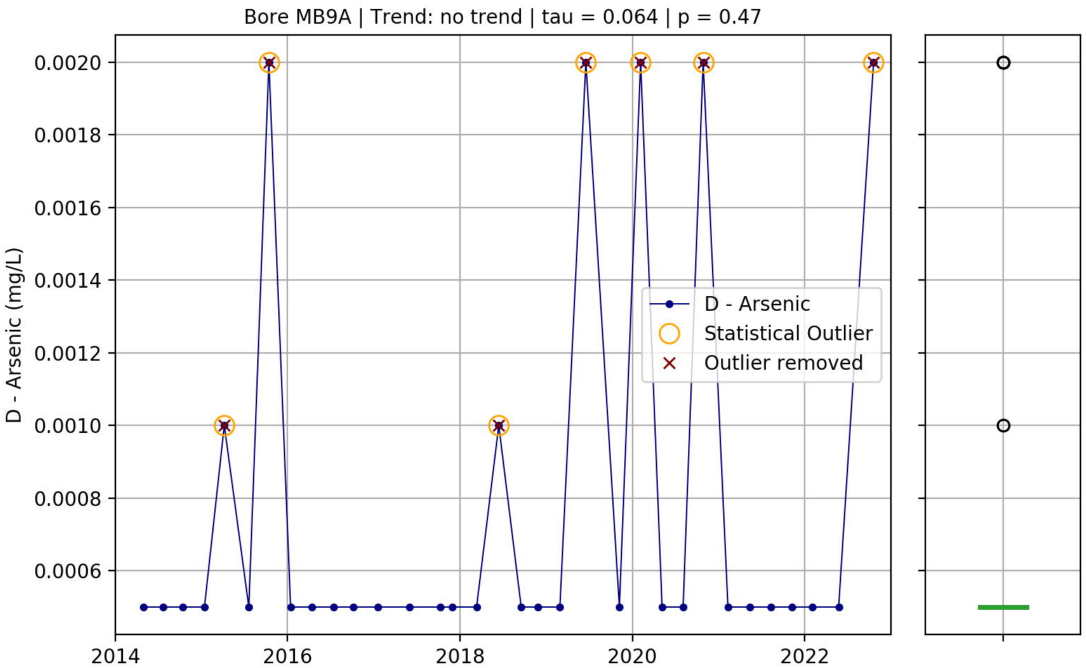

Bore MB9A | Trend (Outliers removed): no trend | tau = 0.002 | p = 1.0
Chloride (mg/L)
Chloride
95th percentile: 6785.0
80th percentile: 6690.0

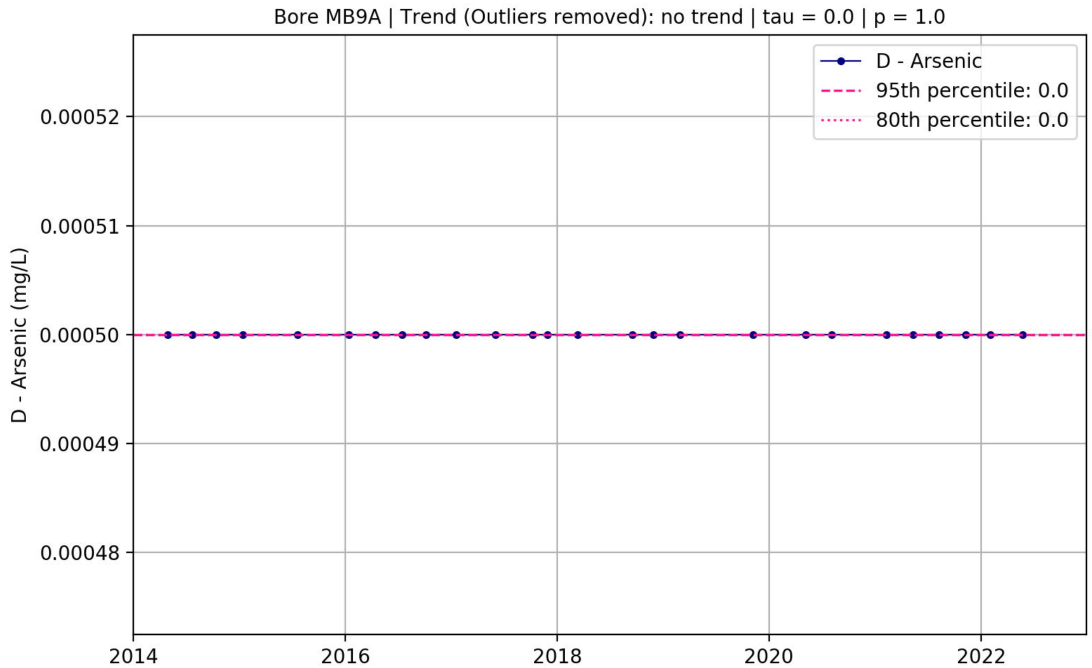

Bore MB9A | Trend: increasing | tau = 0.354 | p = 0.001
D - Aluminium (mg/L)
D - Aluminium
Statistical Outlier
Outlier removed

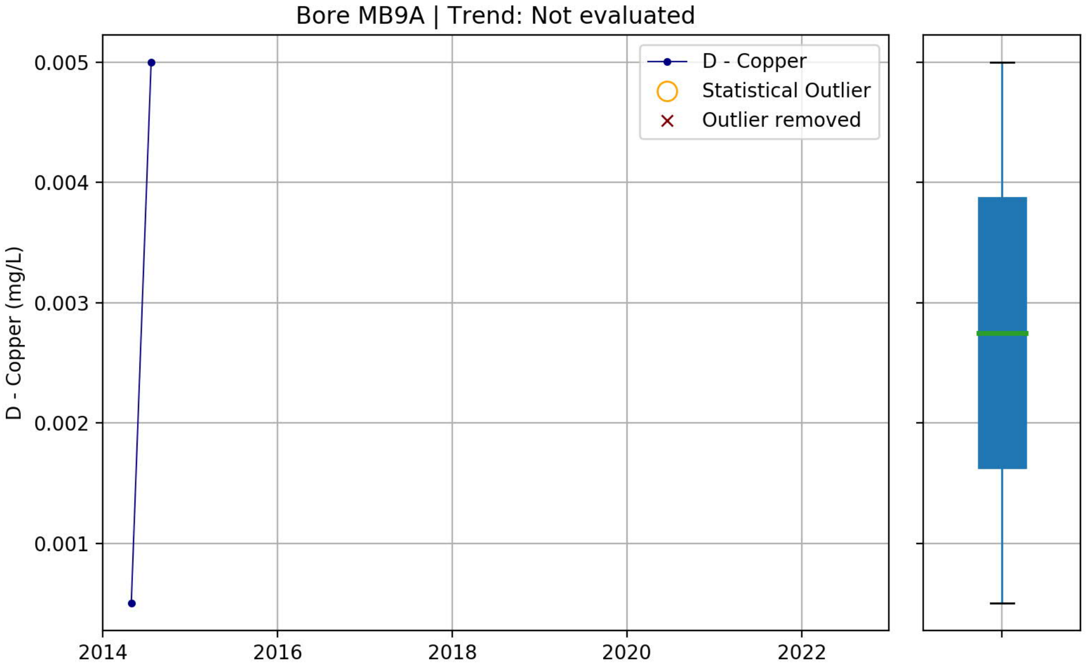

Bore MB9A | Trend (Outliers removed): increasing | tau = 0.318 | p = 0.002
D - Aluminium (mg/L)
D - Aluminium
95th percentile: 0.02
80th percentile: 0.01

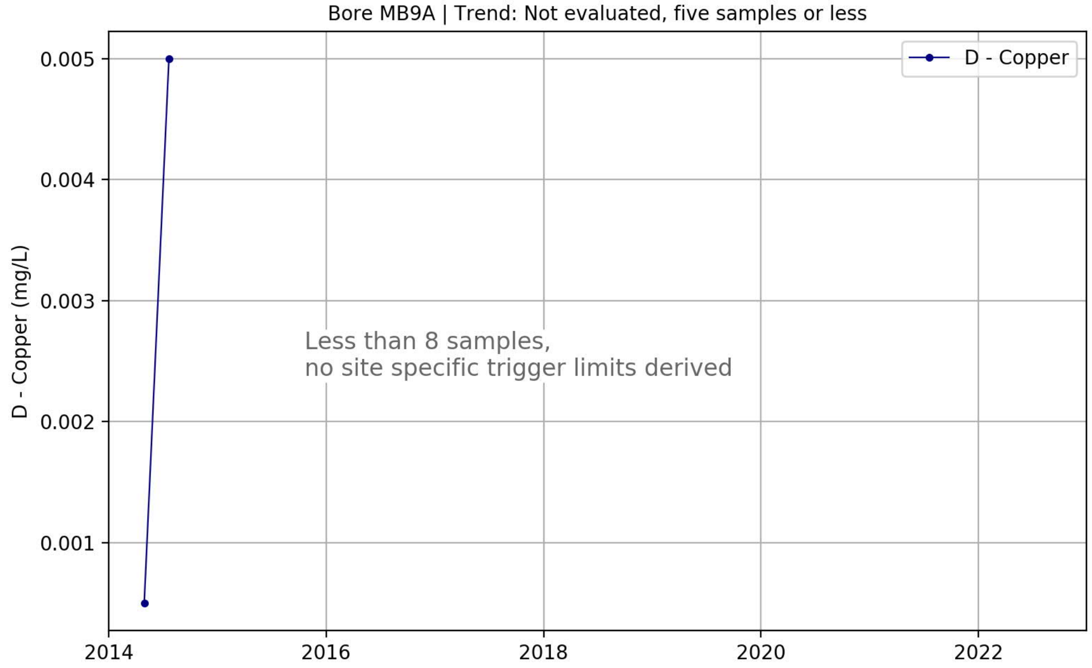

Bore MB9A | Trend: no trend | tau = -0.138 | p = 0.168
D - Antimony (mg/L)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022
D - Antimony
Statistical Outlier
Outlier removed

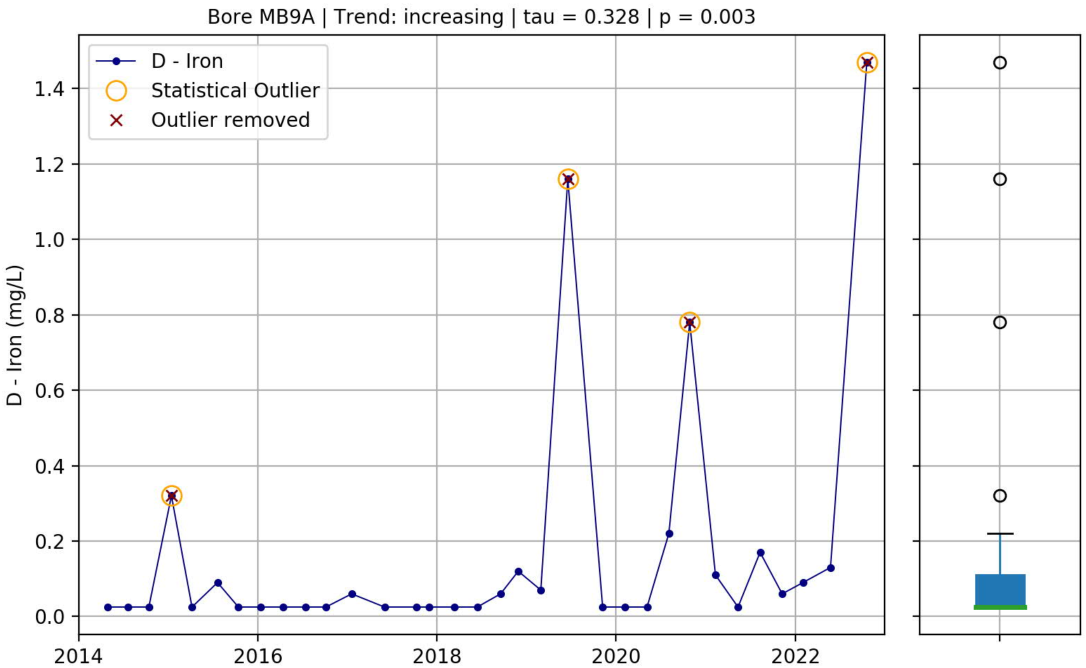

Bore MB9A | Trend (Outliers removed): no trend | tau = -0.089 | p = 0.261
D - Antimony (mg/L)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
2014
2016
2018
2020
2022
D - Antimony
95th percentile: 0.001
80th percentile: 0.0

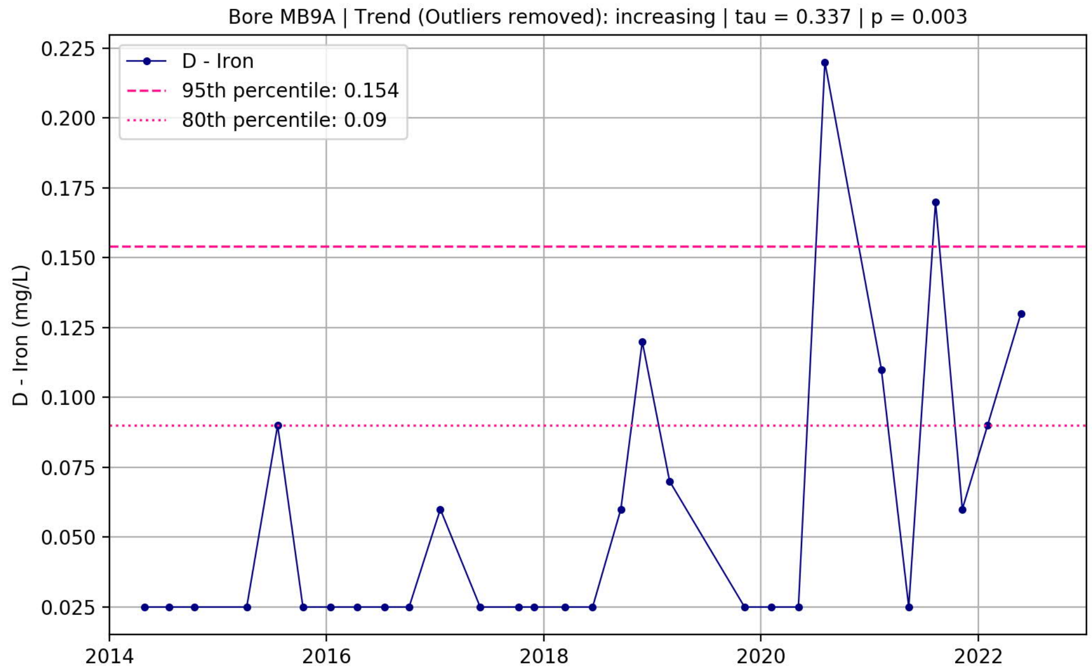

Bore MB9A | Trend: no trend | tau = 0.064 | p = 0.47
D - Arsenic (mg/L)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
2014
2016
2018
2020
2022
D - Arsenic
Statistical Outlier
Outlier removed

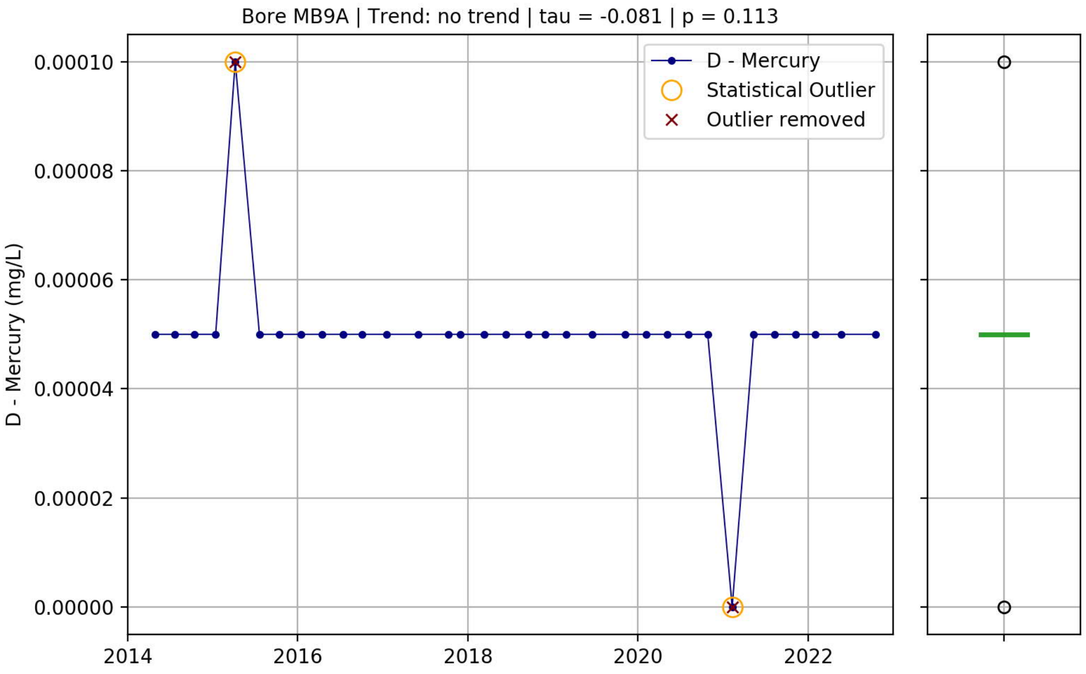

Bore MB9A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Arsenic (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022
D - Arsenic
95th percentile: 0.0
80th percentile: 0.0

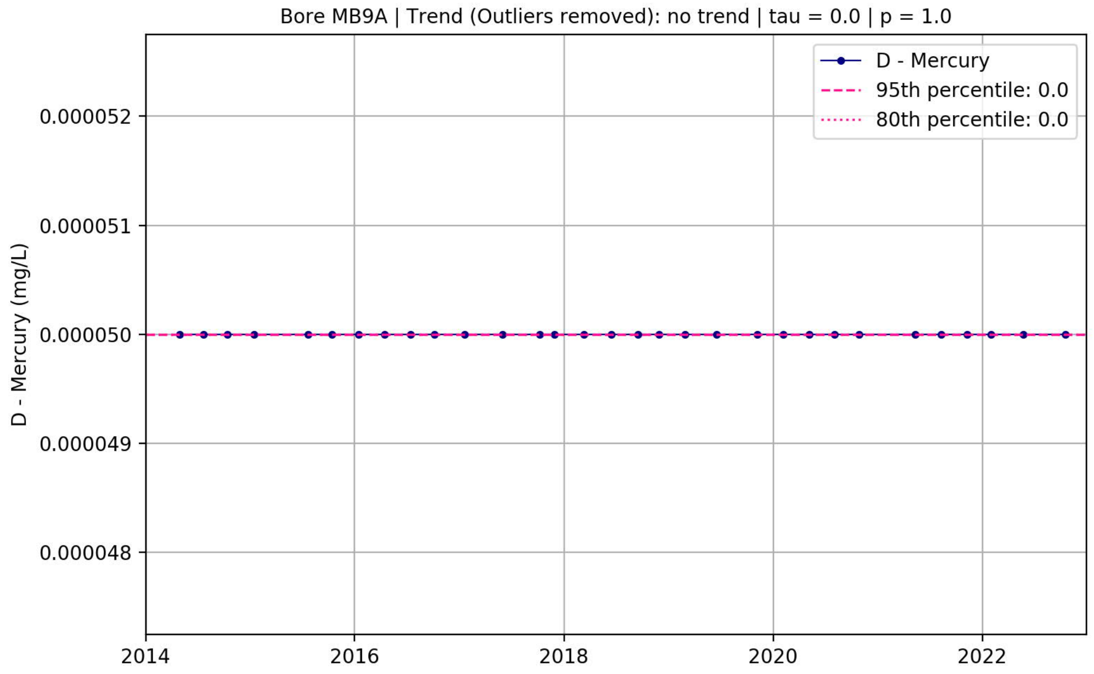

Bore MB9A | Trend: Not evaluated
D - Copper
Statistical Outlier
Outlier removed
D - Copper (mg/L)
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022

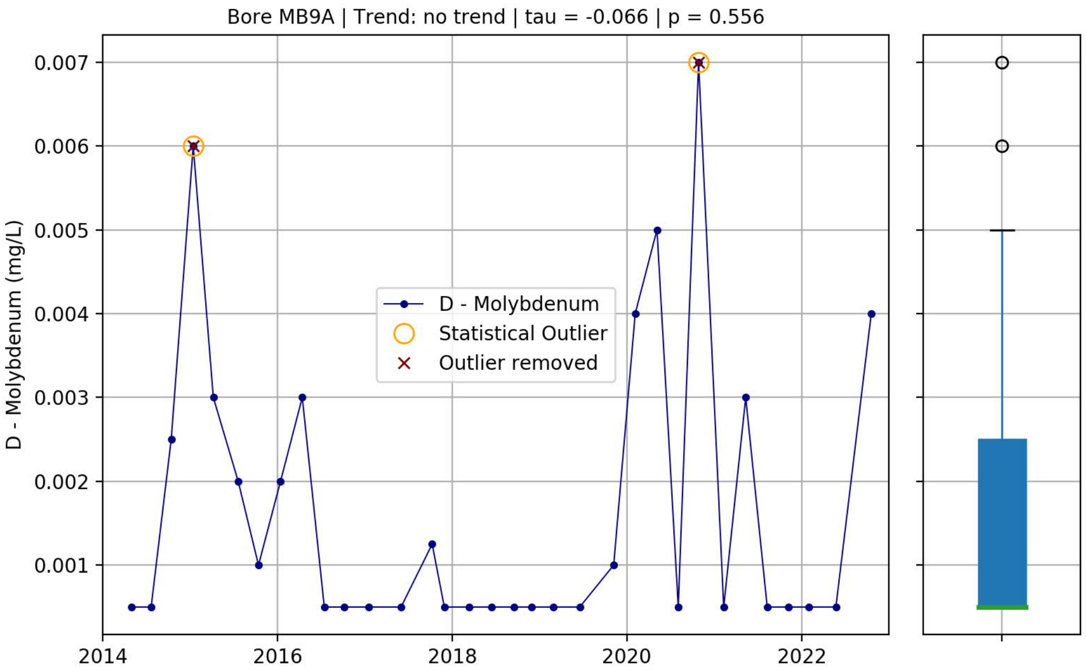

Bore MB9A | Trend: Not evaluated, five samples or less
D - Copper
Less than 8 samples,
no site specific trigger limits derived
D - Copper (mg/L)
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022

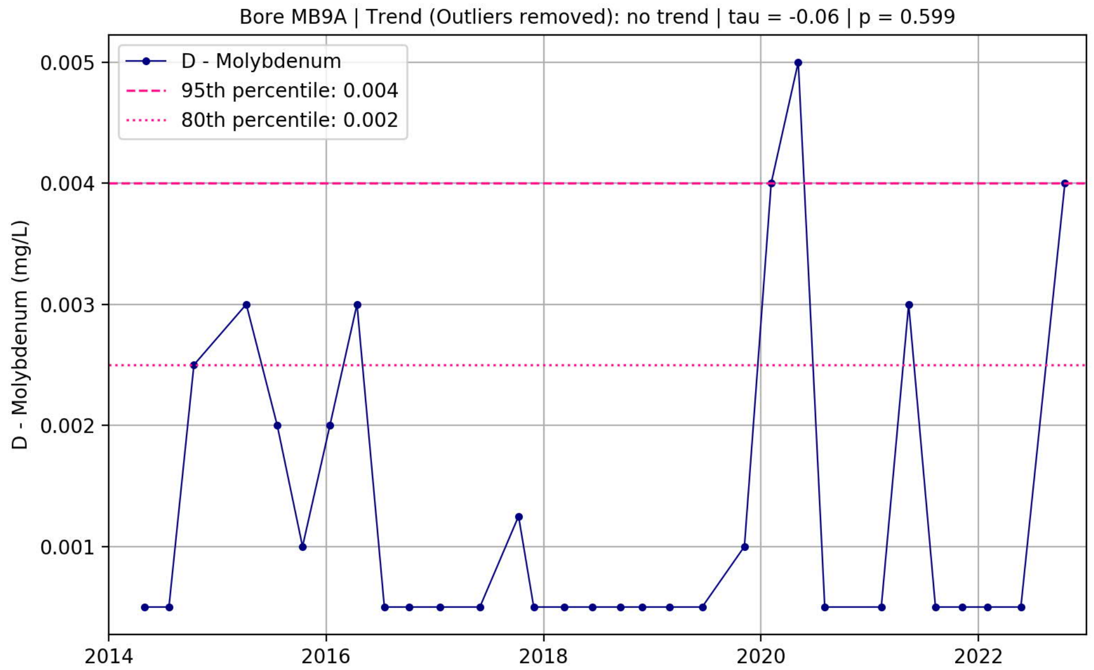

Bore MB9A | Trend: increasing | tau = 0.328 | p = 0.003
D - Iron
Statistical Outlier
Outlier removed
D - Iron (mg/L)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2014
2016
2018
2020
2022

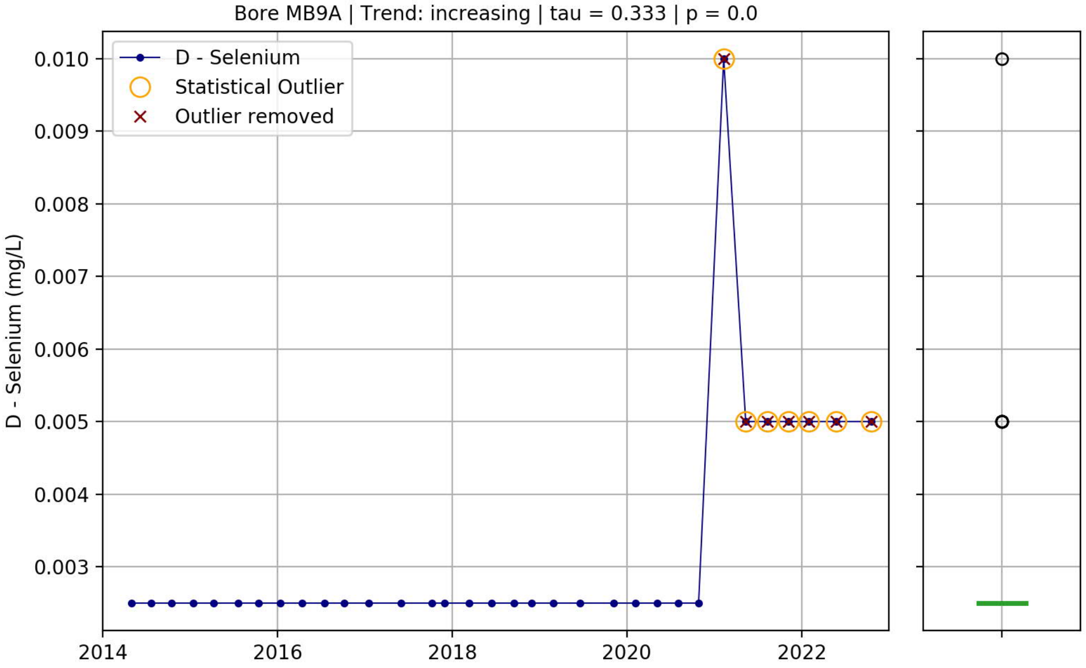

Bore MB9A | Trend (Outliers removed): increasing | tau = 0.337 | p = 0.003
D - Iron
95th percentile: 0.154
80th percentile: 0.09
D - Iron (mg/L)
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
2014
2016
2018
2020
2022

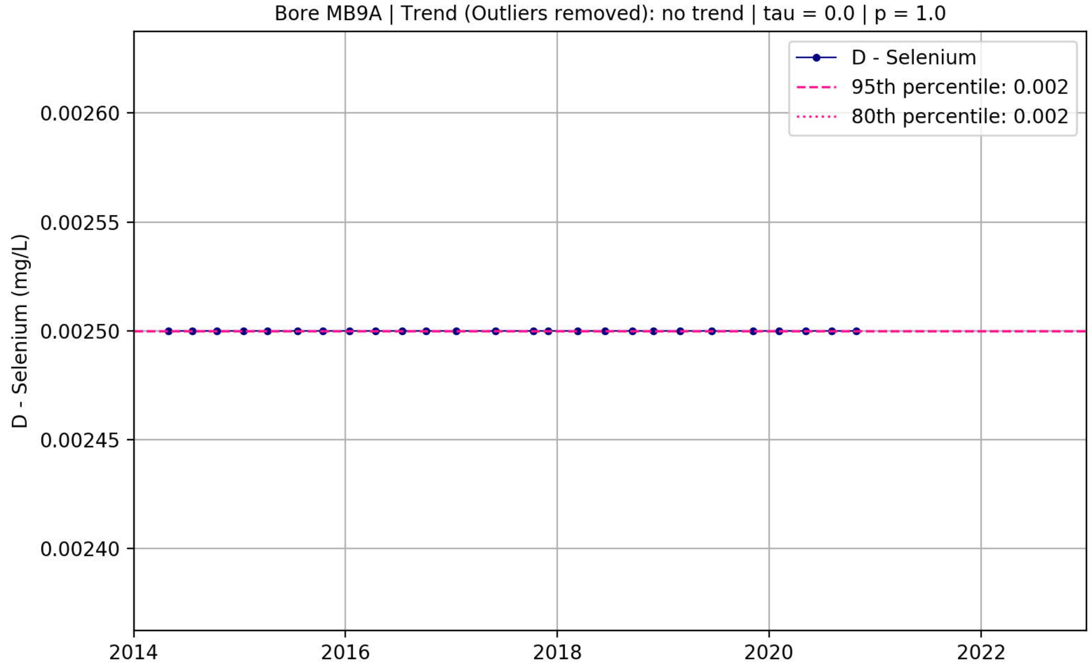

Bore MB9A | Trend: no trend | tau = -0.081 | p = 0.113
D - Mercury
Statistical Outlier
Outlier removed
D - Mercury (mg/L)
0.00010
0.00008
0.00006
0.00004
0.00002
0.00000
2014
2016
2018
2020
2022

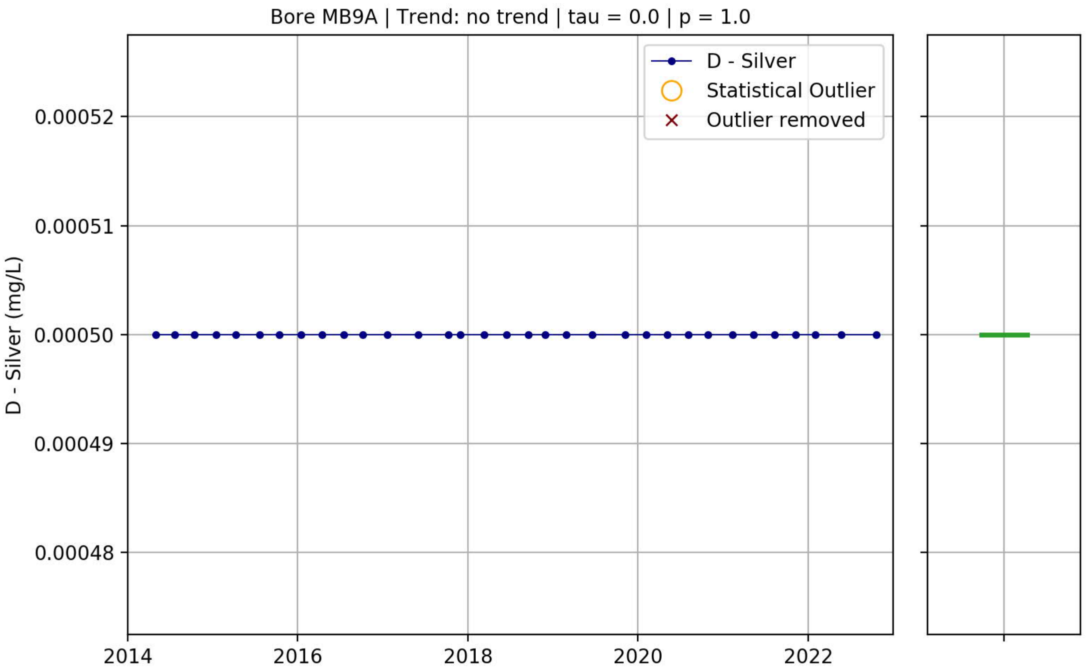

Bore MB9A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Mercury
95th percentile: 0.0
80th percentile: 0.0
D - Mercury (mg/L)
0.000052
0.000051
0.000050
0.000049
0.000048
2014
2016
2018
2020
2022

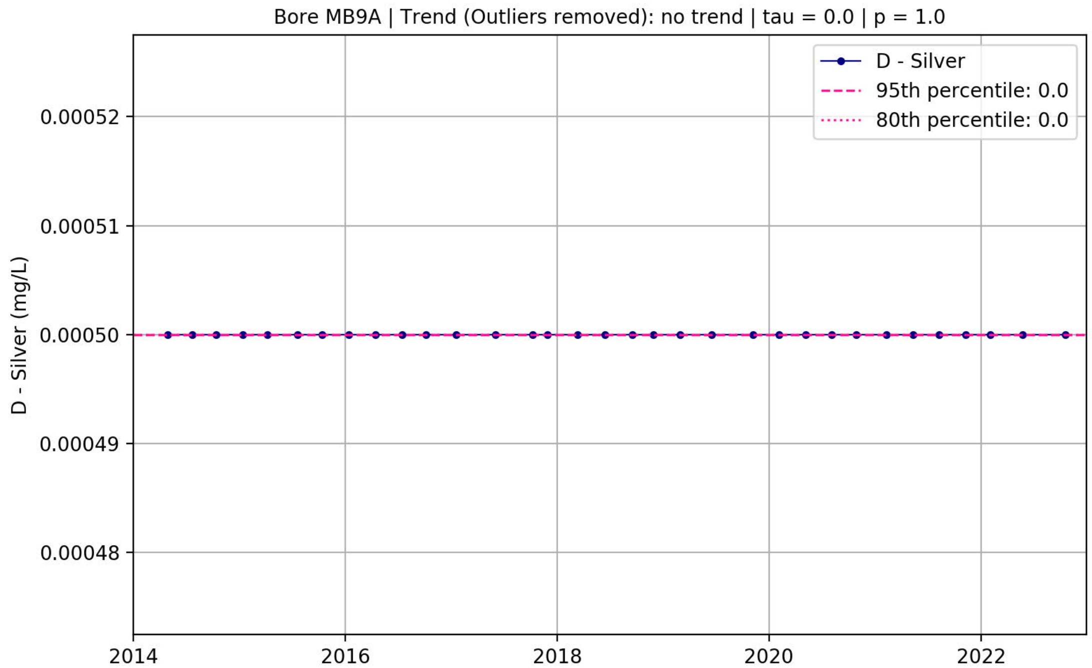

Bore MB9A | Trend: no trend | tau = -0.066 | p = 0.556
D - Molybdenum
Statistical Outlier
Outlier removed
D - Molybdenum (mg/L)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022

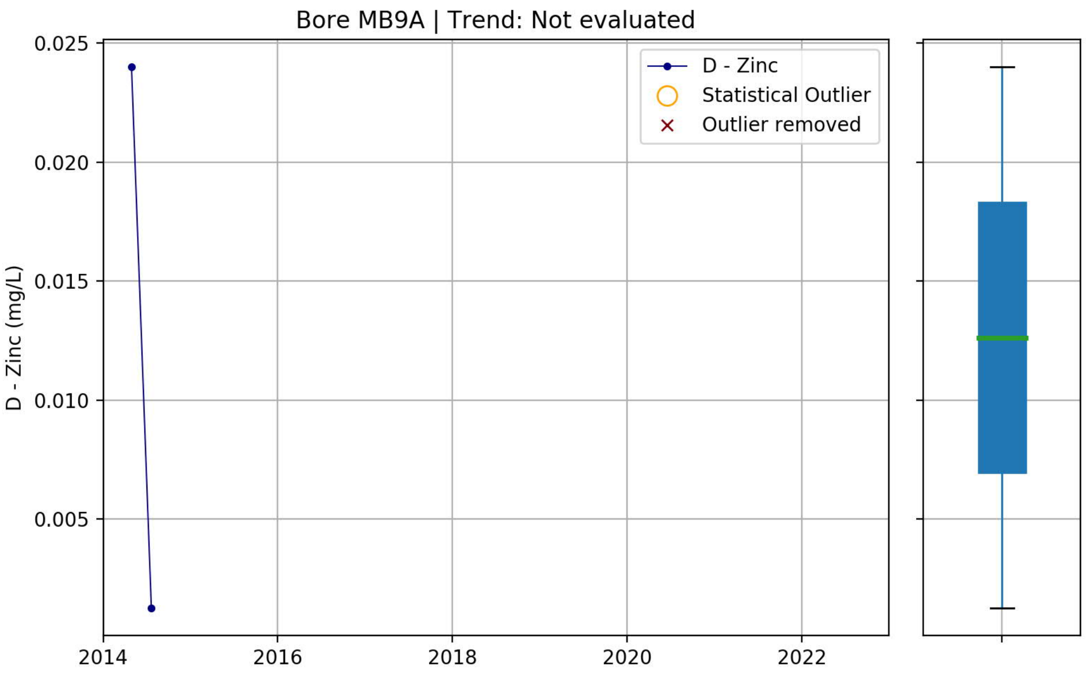

Bore MB9A | Trend (Outliers removed): no trend | tau = -0.06 | p = 0.599
D - Molybdenum
95th percentile: 0.004
80th percentile: 0.002
D - Molybdenum (mg/L)
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022

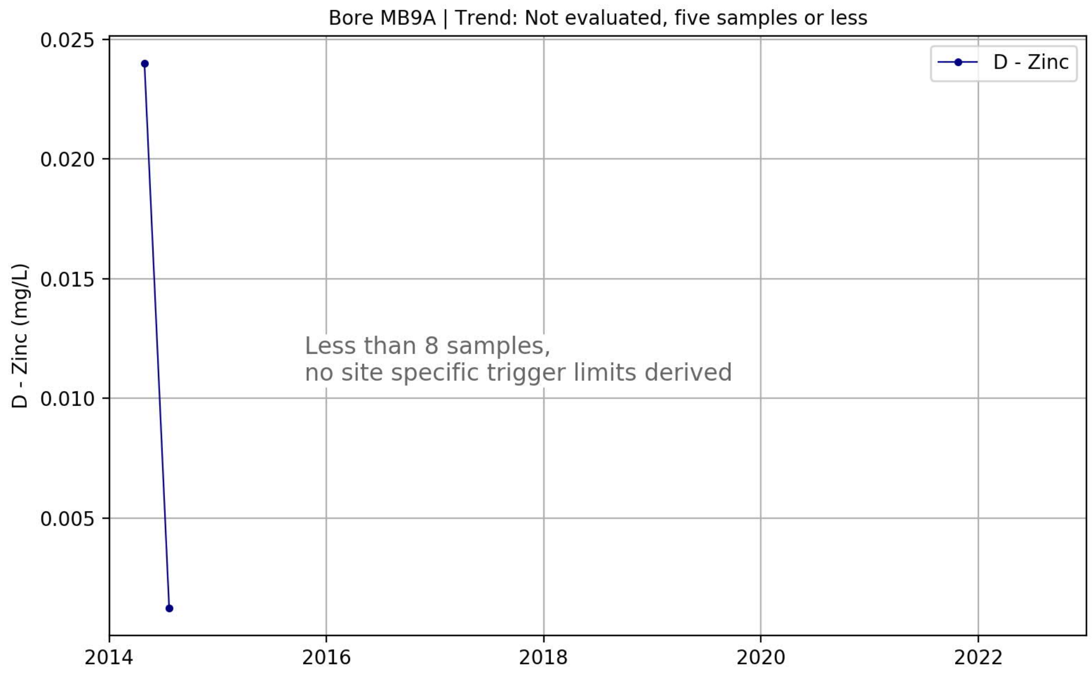

Bore MB9A | Trend: increasing | tau = 0.333 | p = 0.0
D - Selenium
Statistical Outlier
Outlier removed
D - Selenium (mg/L)
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
2014
2016
2018
2020
2022

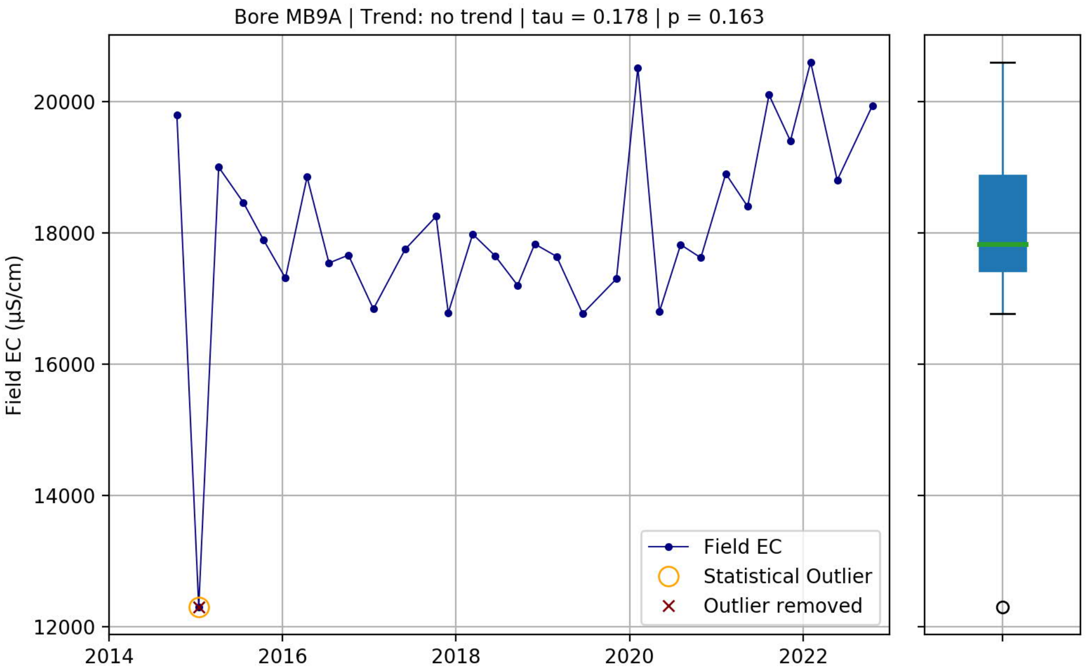

Bore MB9A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Selenium
95th percentile: 0.002
80th percentile: 0.002
D - Selenium (mg/L)
0.00260
0.00255
0.00250
0.00245
0.00240
2014
2016
2018
2020
2022

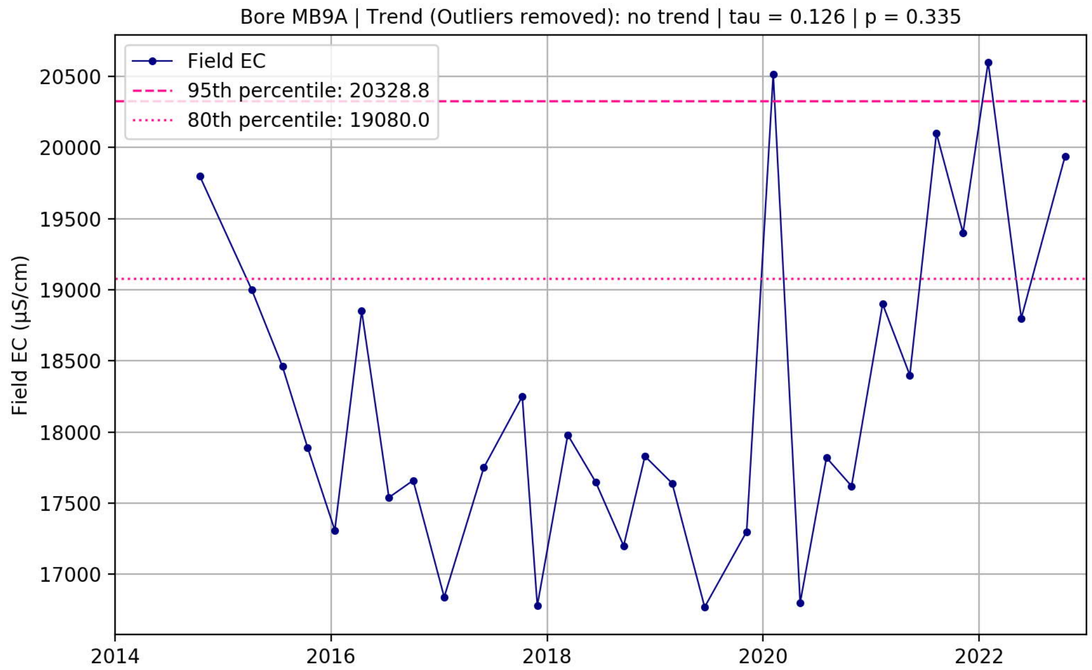

Bore MB9A | Trend: no trend | tau = 0.0 | p = 1.0
D - Silver
Statistical Outlier
Outlier removed
D - Silver (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

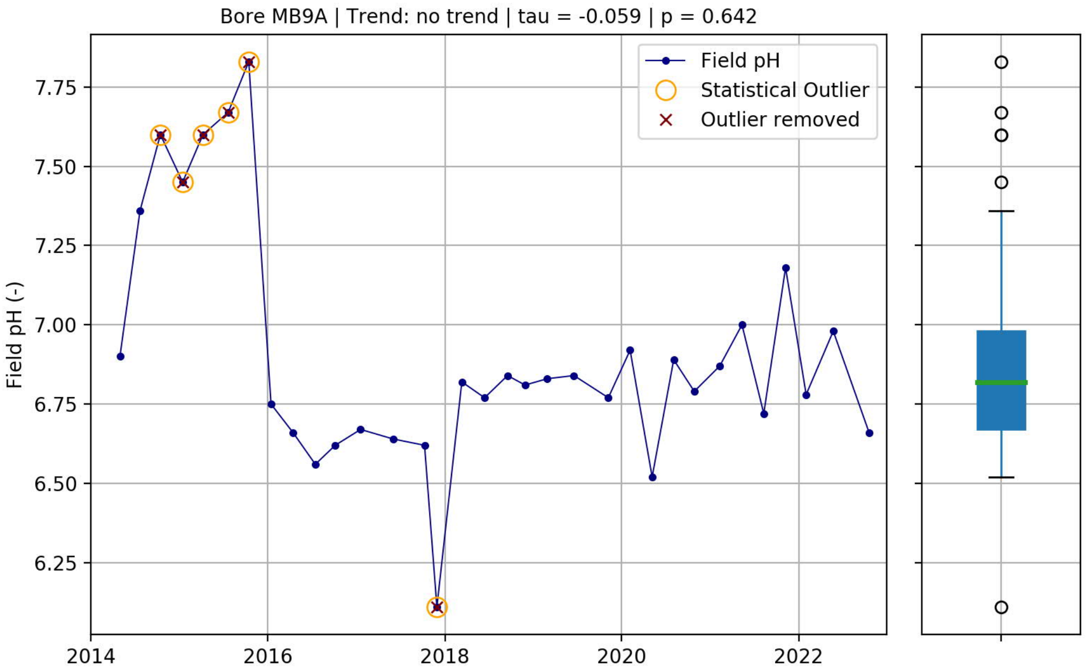

Bore MB9A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Silver
95th percentile: 0.0
80th percentile: 0.0
D - Silver (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

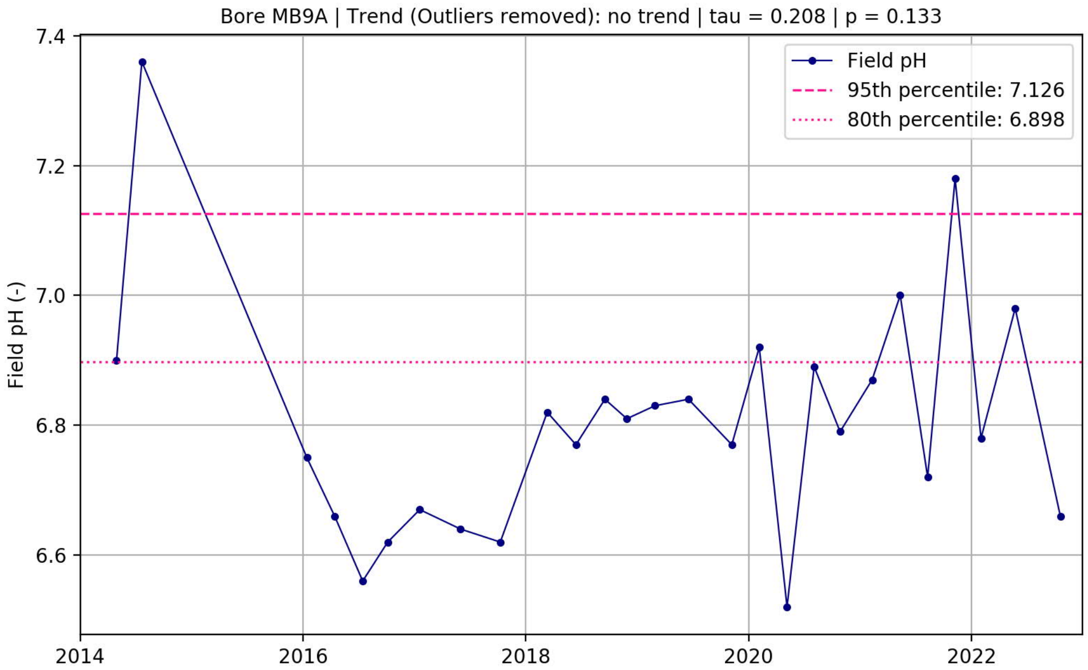

Bore MB9A | Trend: Not evaluated
D - Zinc (mg/L)
0.025
0.020
0.015
0.010
0.005
2014
2016
2018
2020
2022
D - Zinc
Statistical Outlier
Outlier removed

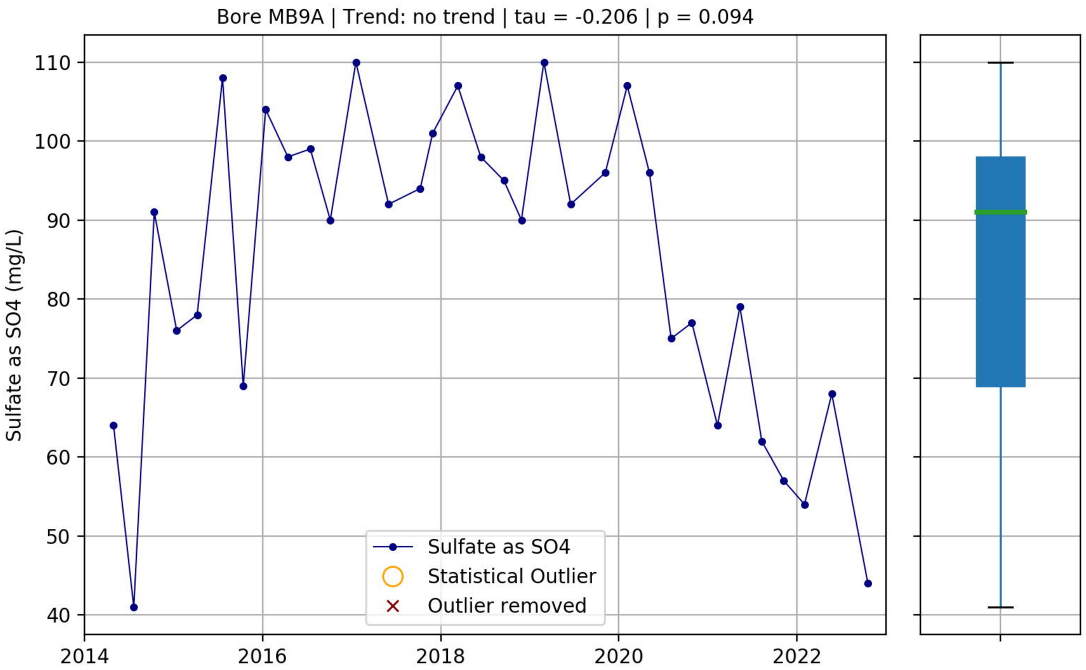

Bore MB9A | Trend: Not evaluated, five samples or less
D - Zinc (mg/L)
0.025
0.020
0.015
0.010
0.005
2014
2016
2018
2020
2022
D - Zinc
Less than 8 samples,
no site specific trigger limits derived

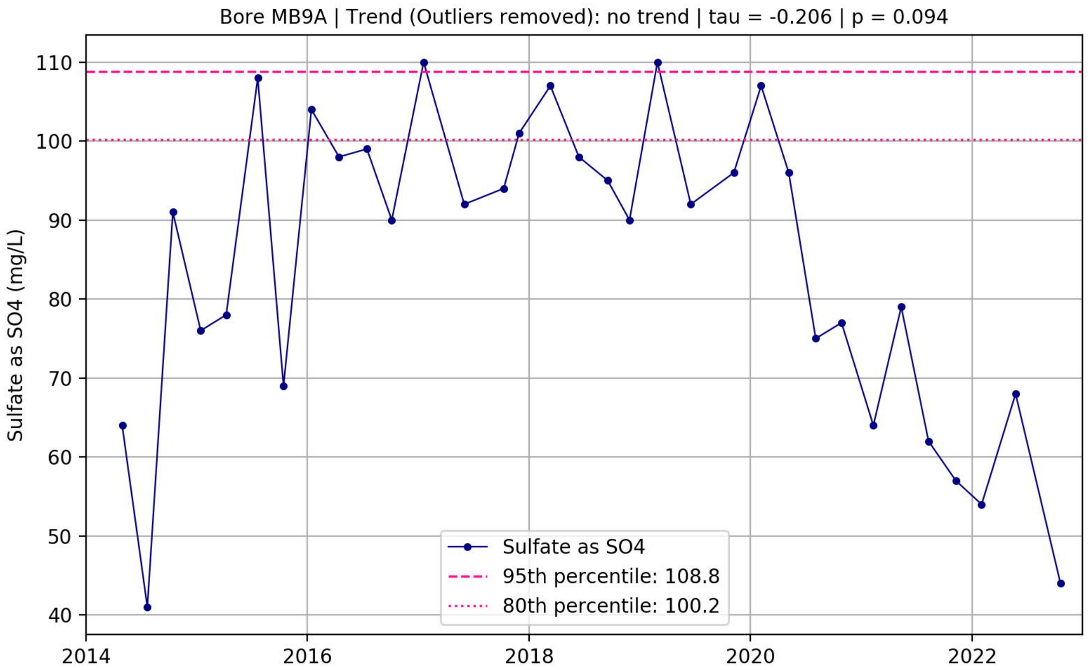

Bore MB9A | Trend: no trend | tau = 0.178 | p = 0.163
Field EC (µS/cm)
20000
18000
16000
14000
12000
2014
2016
2018
2020
2022
Field EC
Statistical Outlier
Outlier removed

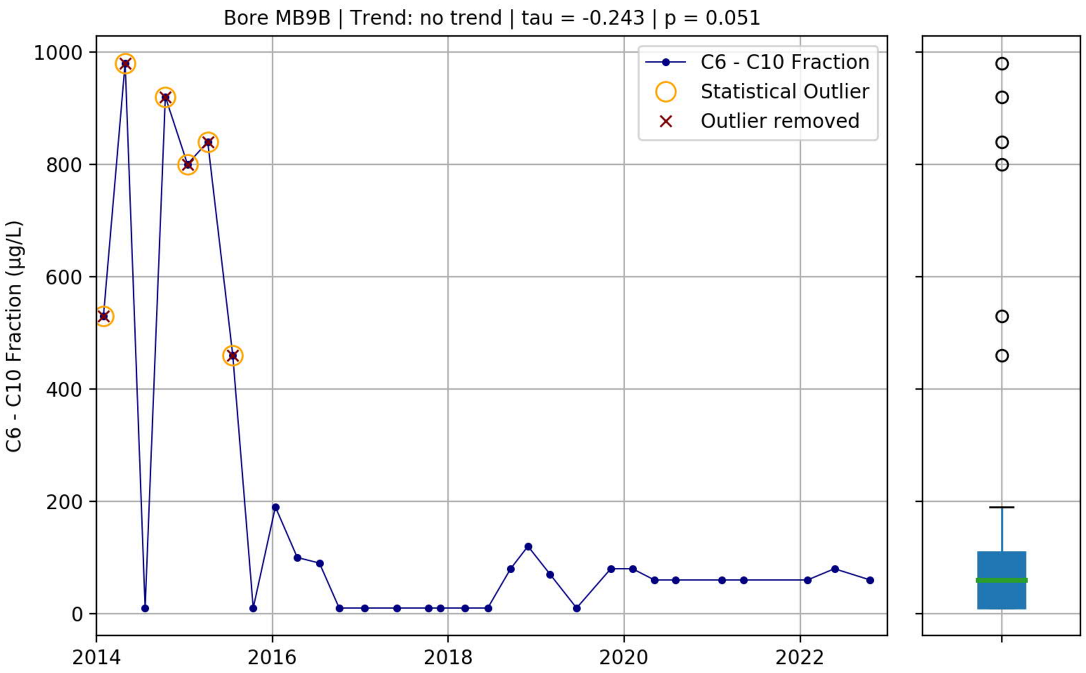

Bore MB9A | Trend (Outliers removed): no trend | tau = 0.126 | p = 0.335
Field EC (µS/cm)
20500
20000
19500
19000
18500
18000
17500
17000
2014
2016
2018
2020
2022
Field EC
95th percentile: 20328.8
80th percentile: 19080.0

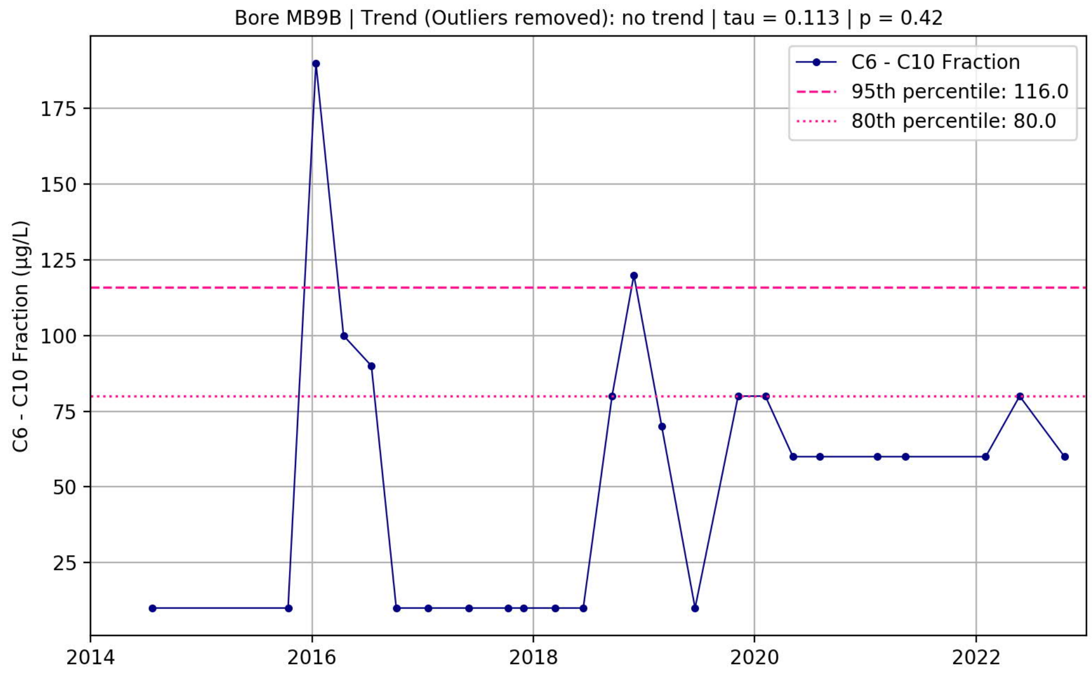

Bore MB9A | Trend: no trend | tau = -0.059 | p = 0.642
Field pH (-)
Field pH
Statistical Outlier
Outlier removed
7.75
7.50
7.25
7.00
6.75
6.50
6.25
2014
2016
2018
2020
2022

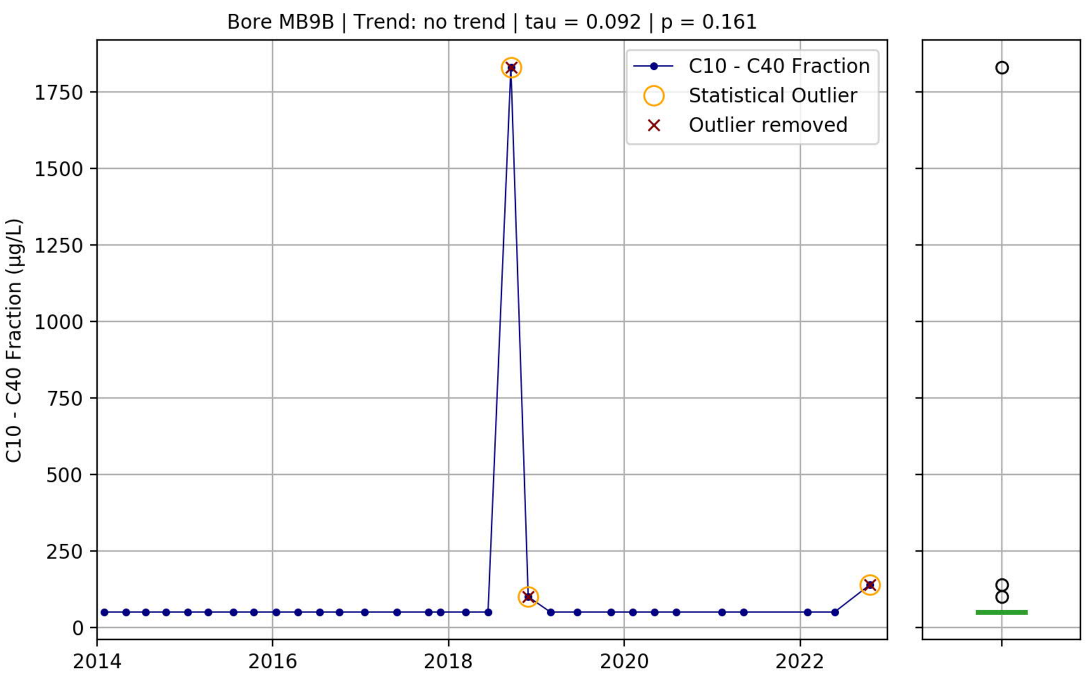

Bore MB9A | Trend (Outliers removed): no trend | tau = 0.208 | p = 0.133
Field pH (-)
Field pH
95th percentile: 7.126
80th percentile: 6.898
7.4
7.2
7.0
6.8
6.6
2014
2016
2018
2020
2022

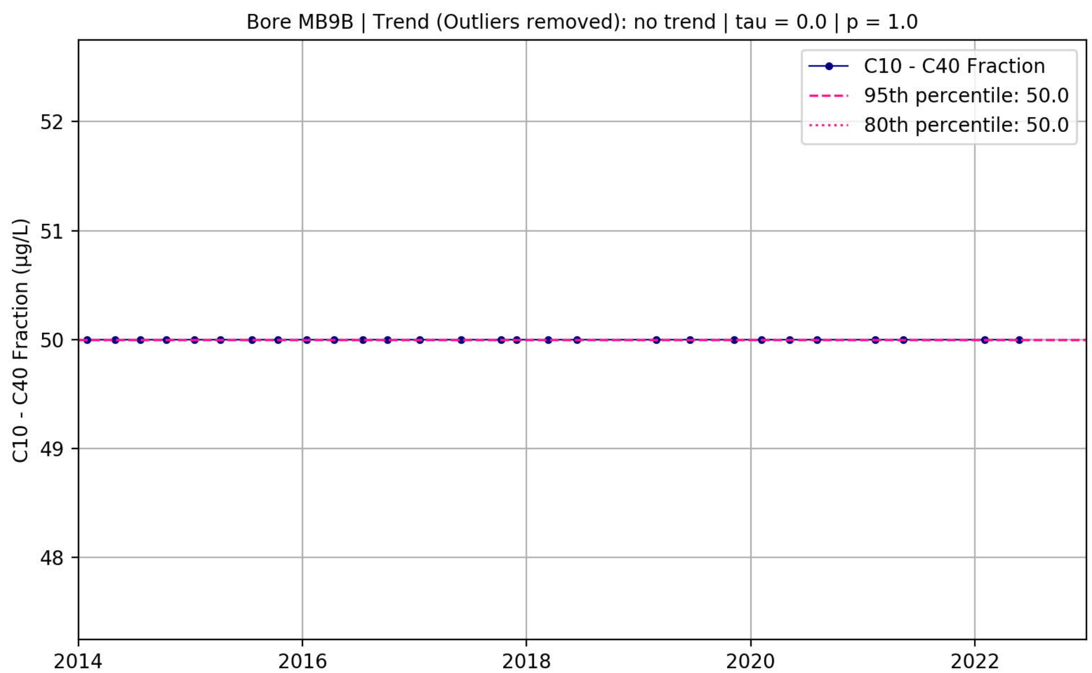

Bore MB9A | Trend: no trend | tau = -0.206 | p = 0.094
Sulfate as SO4 (mg/L)
Sulfate as SO4
Statistical Outlier
Outlier removed
110
100
90
80
70
60
50
40
2014
2016
2018
2020
2022

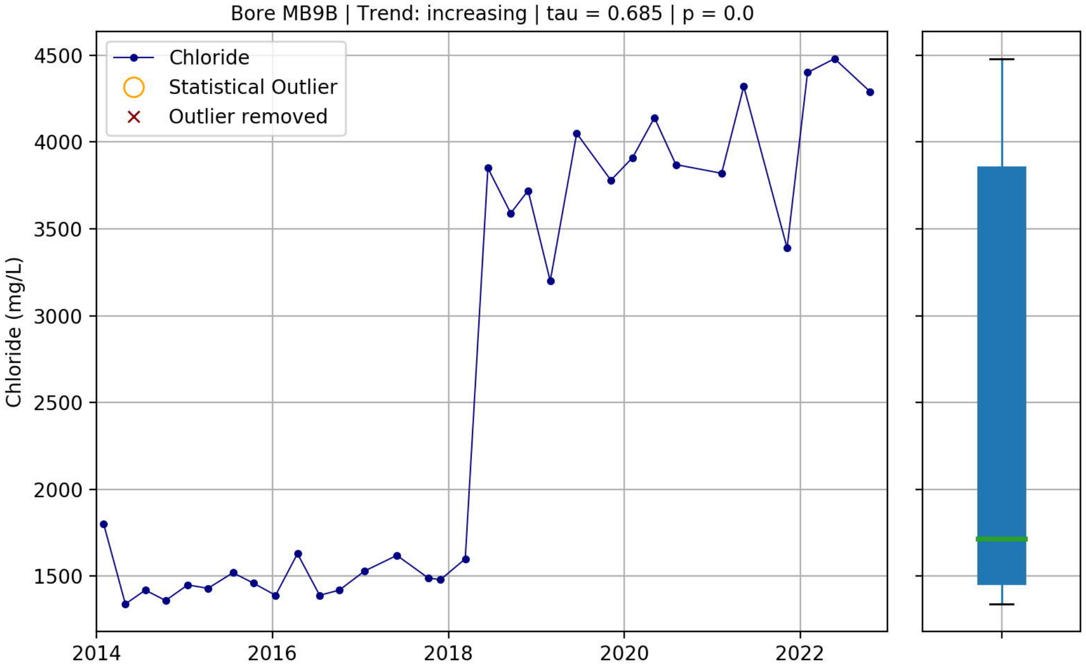

Bore MB9A | Trend (Outliers removed): no trend | tau = -0.206 | p = 0.094
Sulfate as SO4 (mg/L)
Sulfate as SO4
95th percentile: 108.8
80th percentile: 100.2
110
100
90
80
70
60
50
40
2014
2016
2018
2020
2022

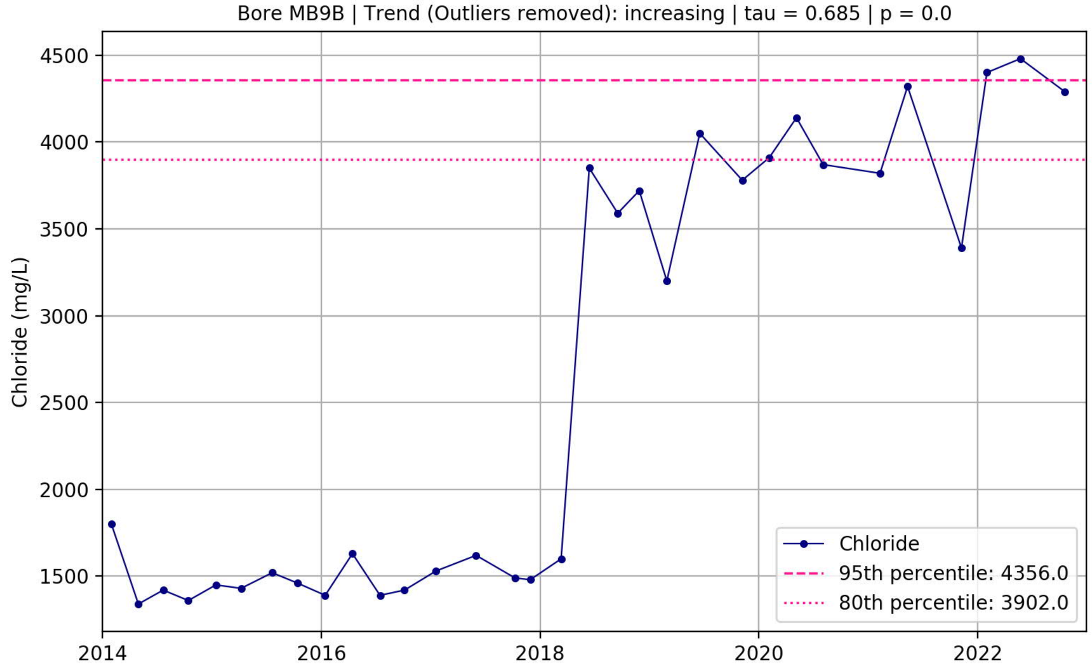

Bore MB9B | Trend: no trend | tau = -0.243 | p = 0.051
C6 - C10 Fraction (µg/L)
C6 - C10 Fraction
Statistical Outlier
Outlier removed

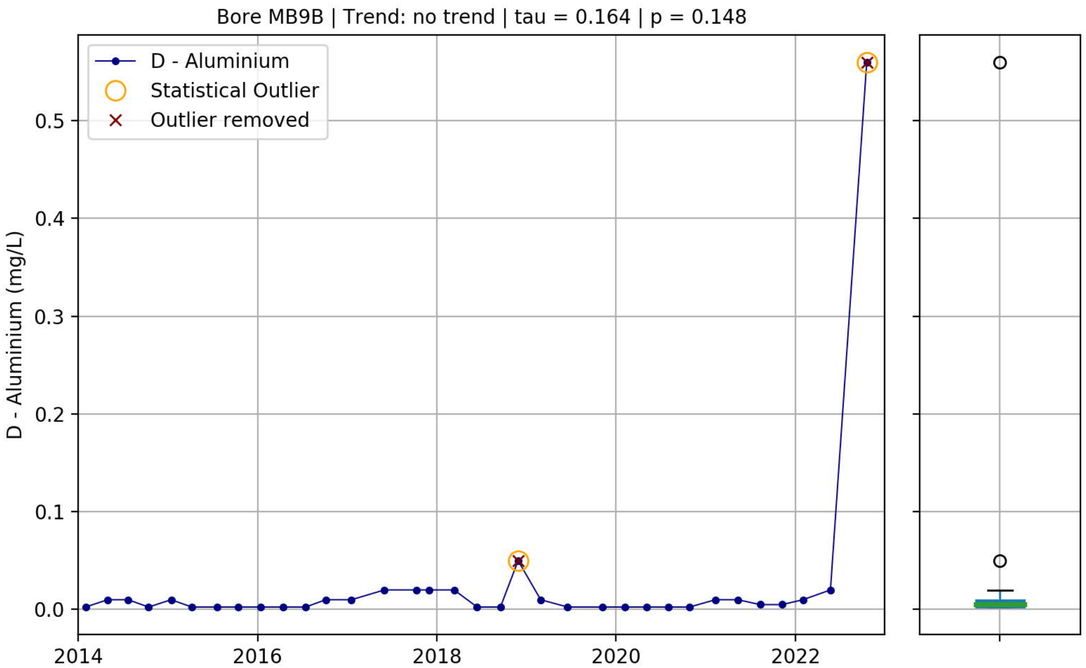

Bore MB9B | Trend (Outliers removed): no trend | tau = 0.113 | p = 0.42
C6 - C10 Fraction (µg/L)
C6 - C10 Fraction
95th percentile: 116.0
80th percentile: 80.0

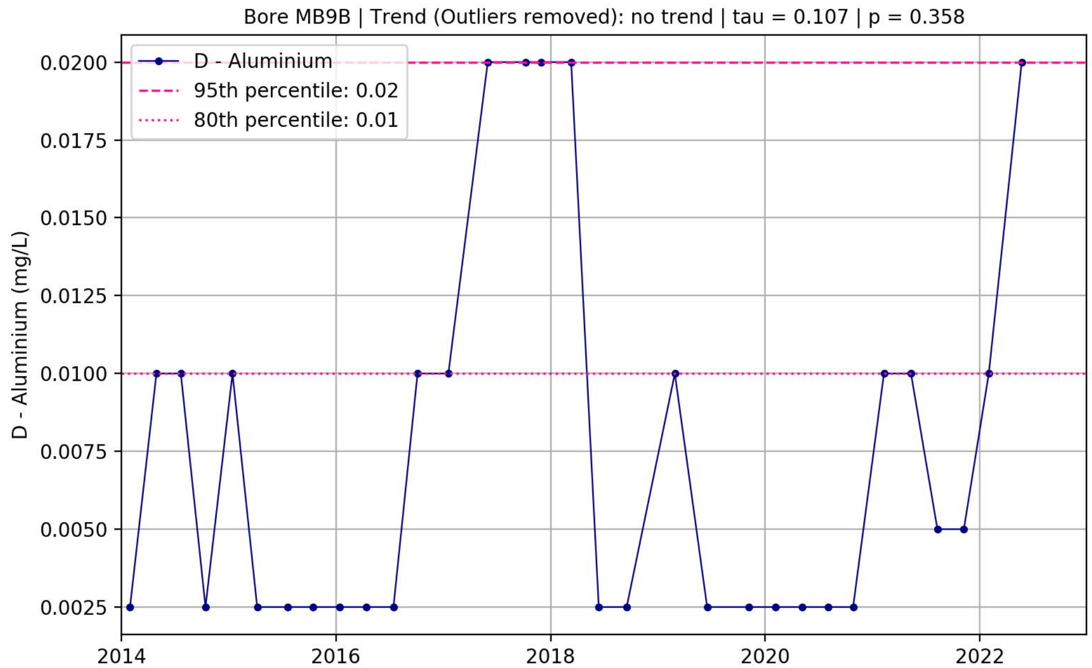

Bore MB9B | Trend: no trend | tau = 0.092 | p = 0.161
C10 - C40 Fraction (µg/L)
C10 - C40 Fraction
Statistical Outlier
Outlier removed

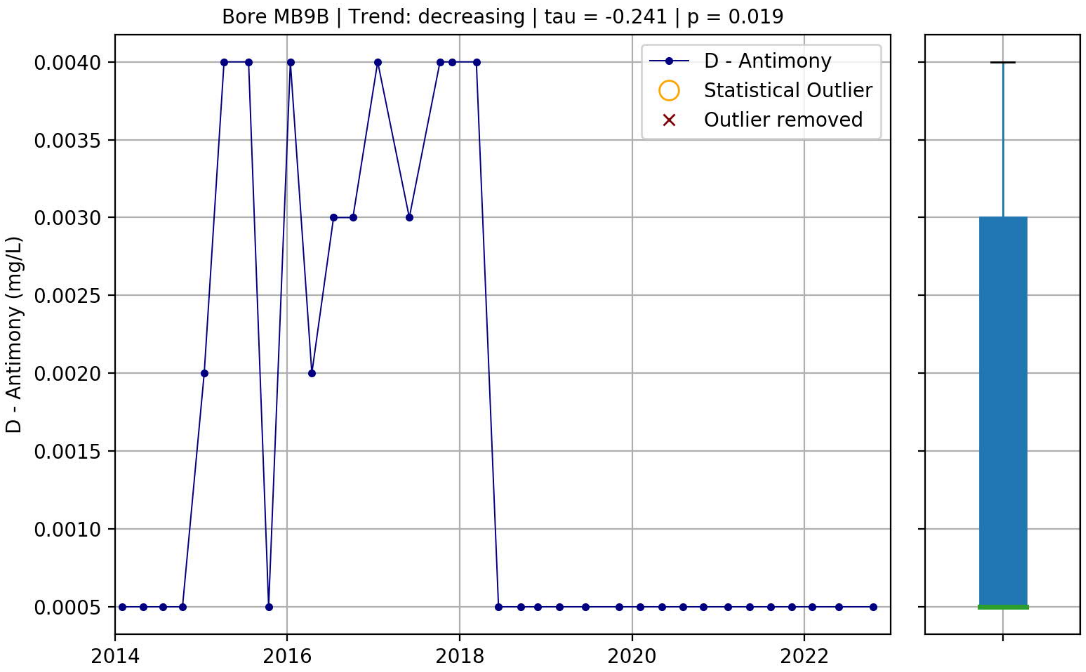

Bore MB9B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
C10 - C40 Fraction (µg/L)
C10 - C40 Fraction
95th percentile: 50.0
80th percentile: 50.0

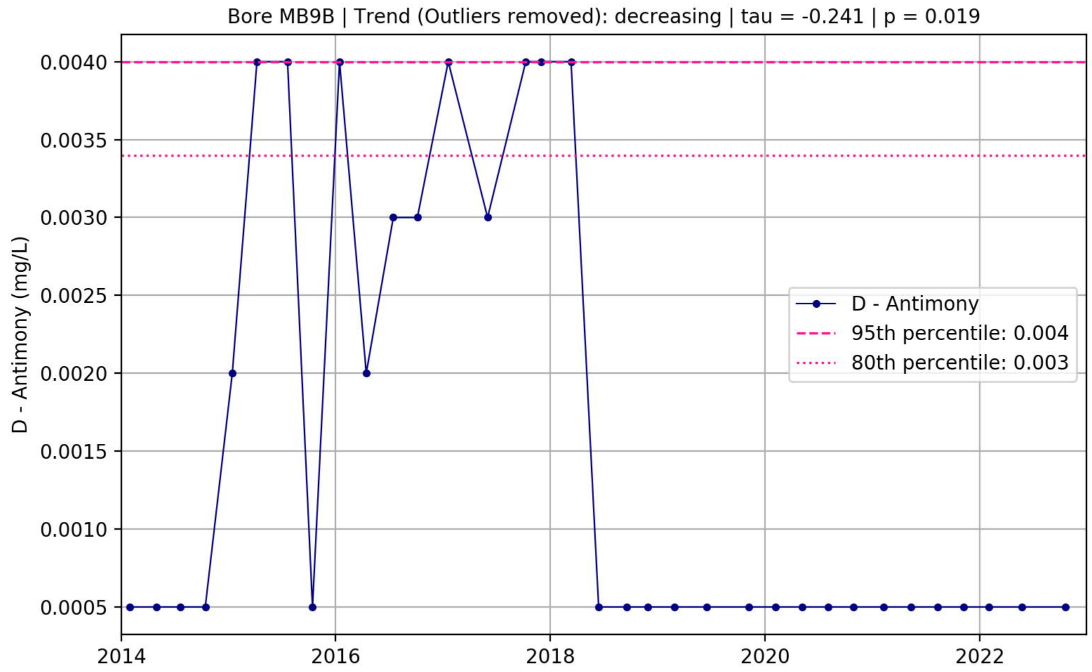

Bore MB9B | Trend: increasing | tau = 0.685 | p = 0.0
Chloride
Statistical Outlier
Outlier removed
Chloride (mg/L)

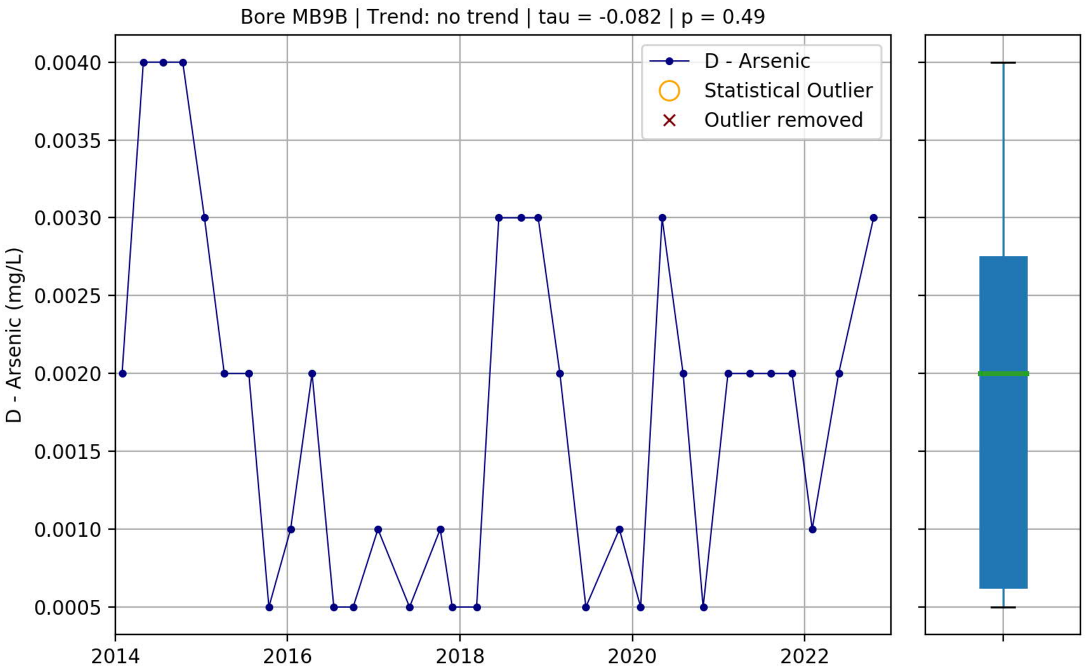

Bore MB9B | Trend (Outliers removed): increasing | tau = 0.685 | p = 0.0
Chloride
95th percentile: 4356.0
80th percentile: 3902.0
Chloride (mg/L)

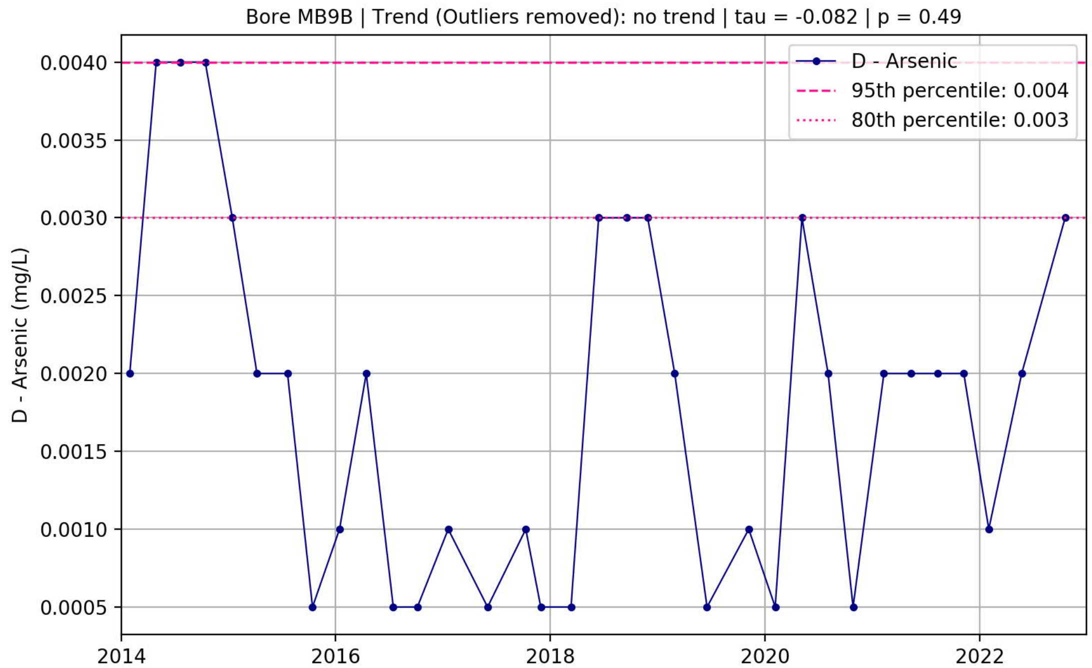

Bore MB9B | Trend: no trend | tau = 0.164 | p = 0.148
D - Aluminium
Statistical Outlier
Outlier removed
D - Aluminium (mg/L)

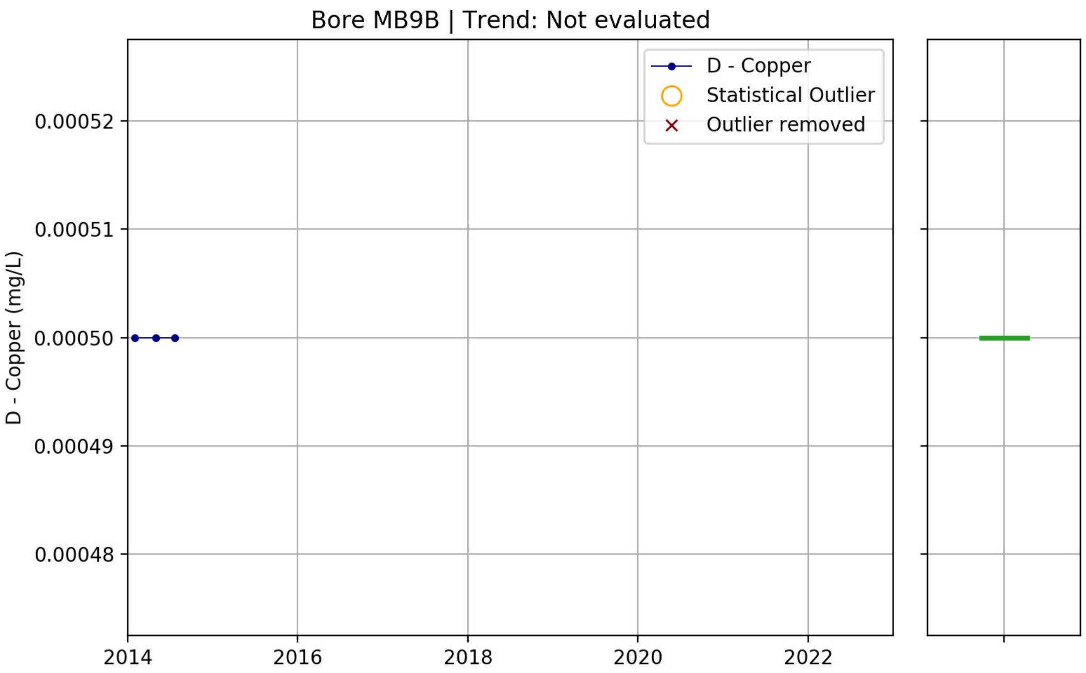

Bore MB9B | Trend (Outliers removed): no trend | tau = 0.107 | p = 0.358
D - Aluminium
95th percentile: 0.02
80th percentile: 0.01
D - Aluminium (mg/L)

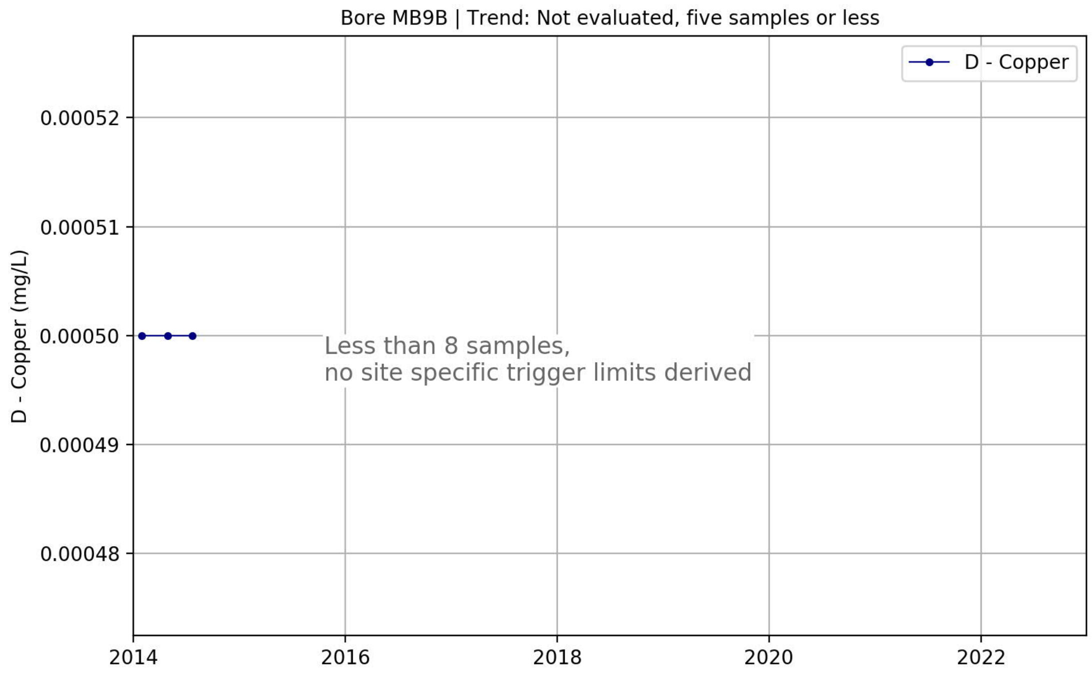

Bore MB9B | Trend: decreasing | tau = -0.241 | p = 0.019
D - Antimony (mg/L)
D - Antimony
Statistical Outlier
Outlier removed
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
0.0040
2014
2016
2018
2020
2022

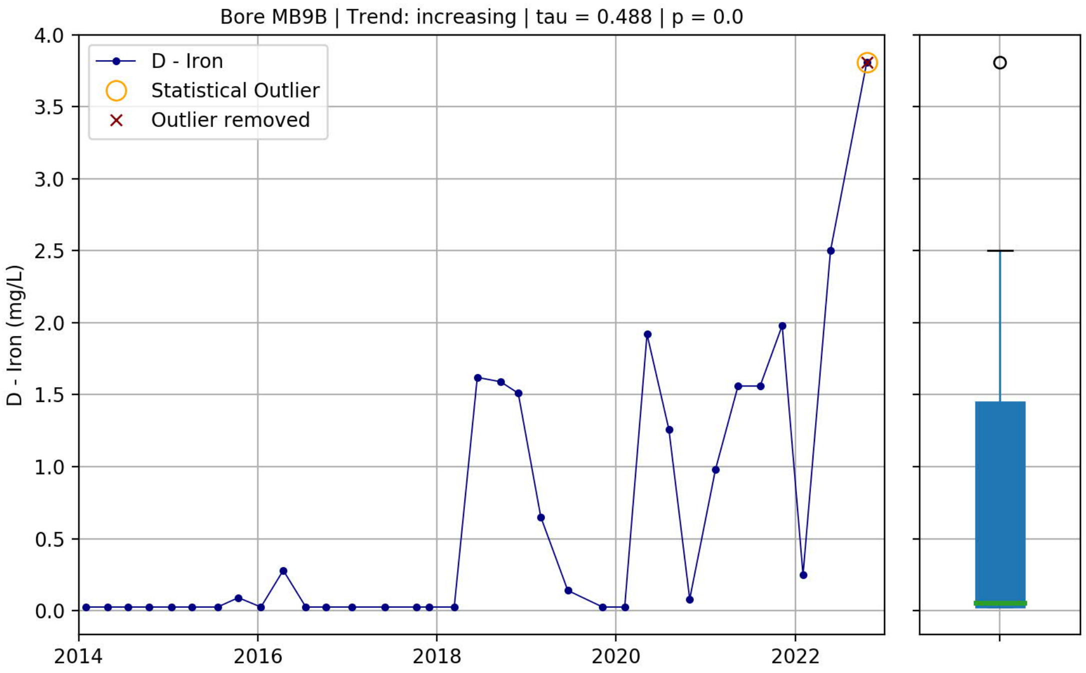

Bore MB9B | Trend (Outliers removed): decreasing | tau = -0.241 | p = 0.019
D - Antimony (mg/L)
D - Antimony
95th percentile: 0.004
80th percentile: 0.003
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
0.0040
2014
2016
2018
2020
2022

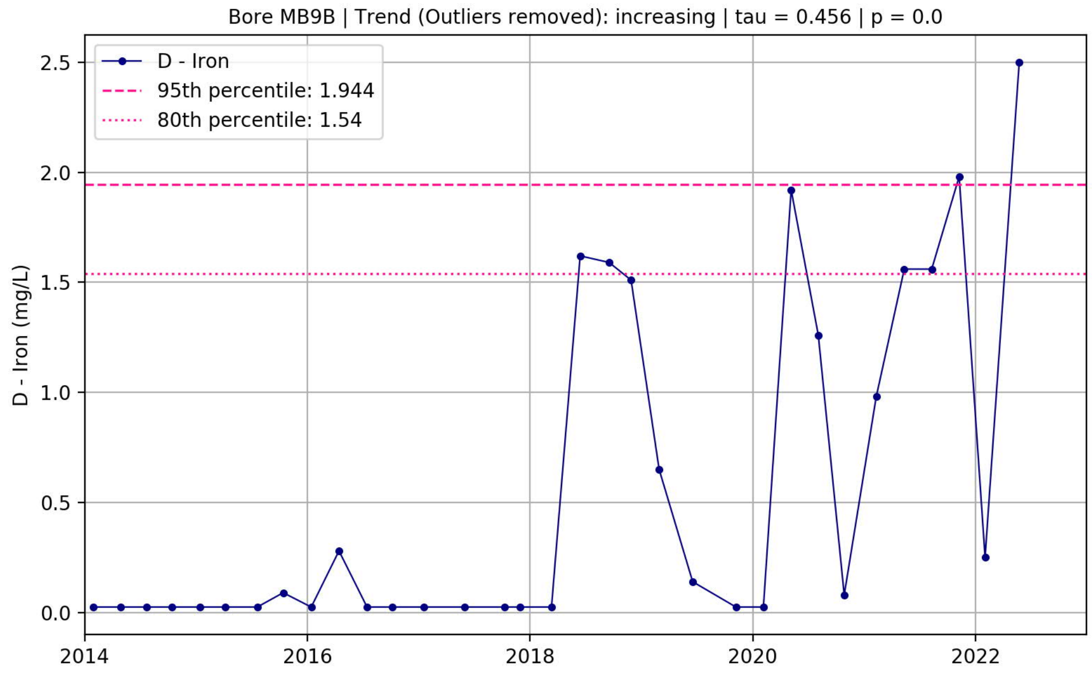

Bore MB9B | Trend: no trend | tau = -0.082 | p = 0.49
D - Arsenic (mg/L)
D - Arsenic
Statistical Outlier
Outlier removed
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
0.0040
2014
2016
2018
2020
2022

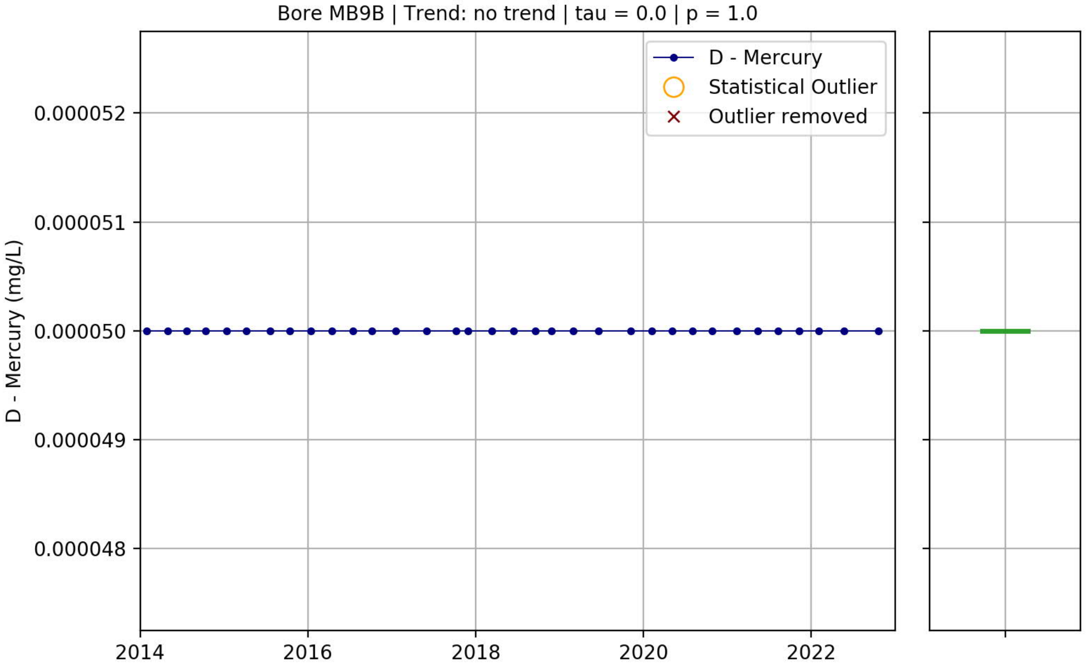

Bore MB9B | Trend (Outliers removed): no trend | tau = -0.082 | p = 0.49
D - Arsenic (mg/L)
D - Arsenic
95th percentile: 0.004
80th percentile: 0.003
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
0.0040
2014
2016
2018
2020
2022

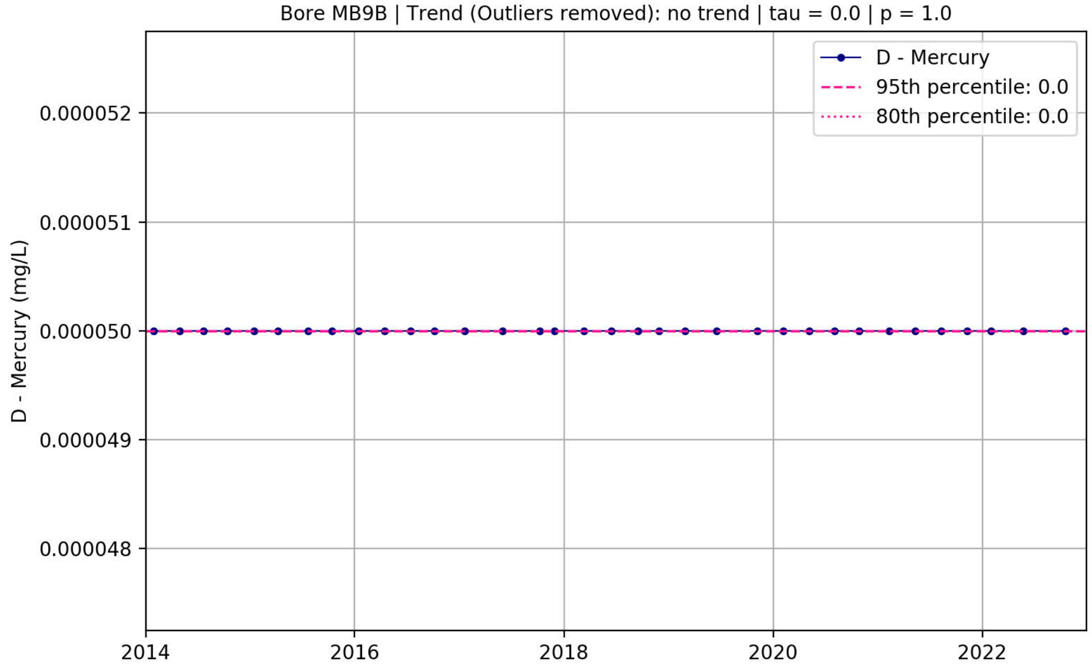

Bore MB9B | Trend: Not evaluated
D - Copper
Statistical Outlier
Outlier removed
D - Copper (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

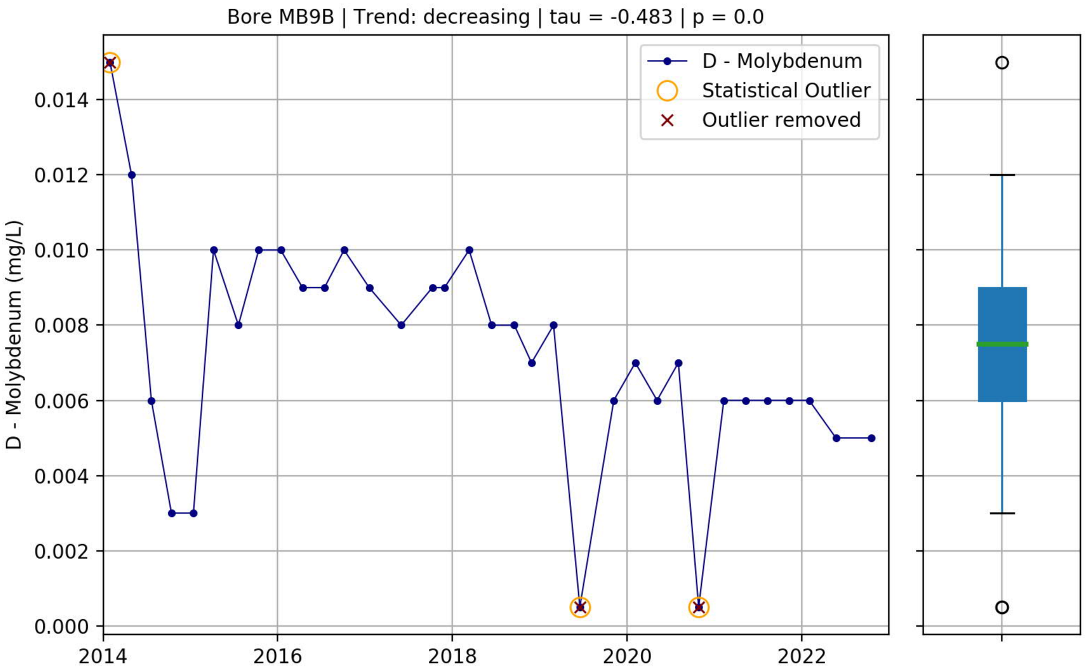

Bore MB9B | Trend: Not evaluated, five samples or less
D - Copper
Less than 8 samples,
no site specific trigger limits derived
D - Copper (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

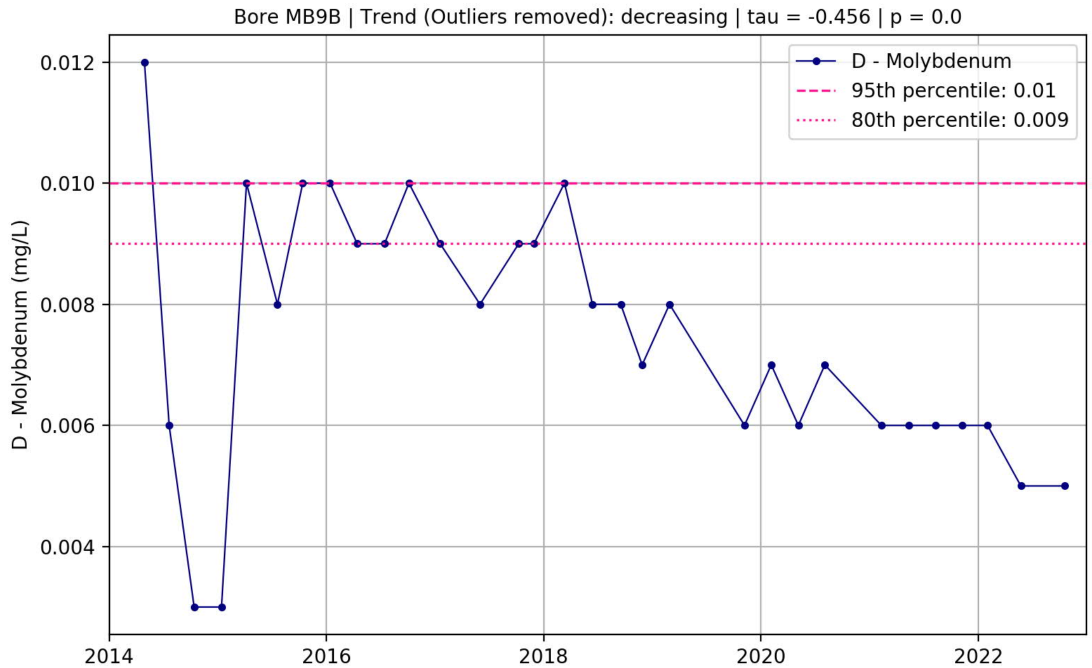

Bore MB9B | Trend: increasing | tau = 0.488 | p = 0.0
D - Iron
Statistical Outlier
Outlier removed
D - Iron (mg/L)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2014
2016
2018
2020
2022


Bore MB9B | Trend (Outliers removed): increasing | tau = 0.456 | p = 0.0
D - Iron
95th percentile: 1.944
80th percentile: 1.54
D - Iron (mg/L)
2.5
2.0
1.5
1.0
0.5
0.0
2014
2016
2018
2020
2022

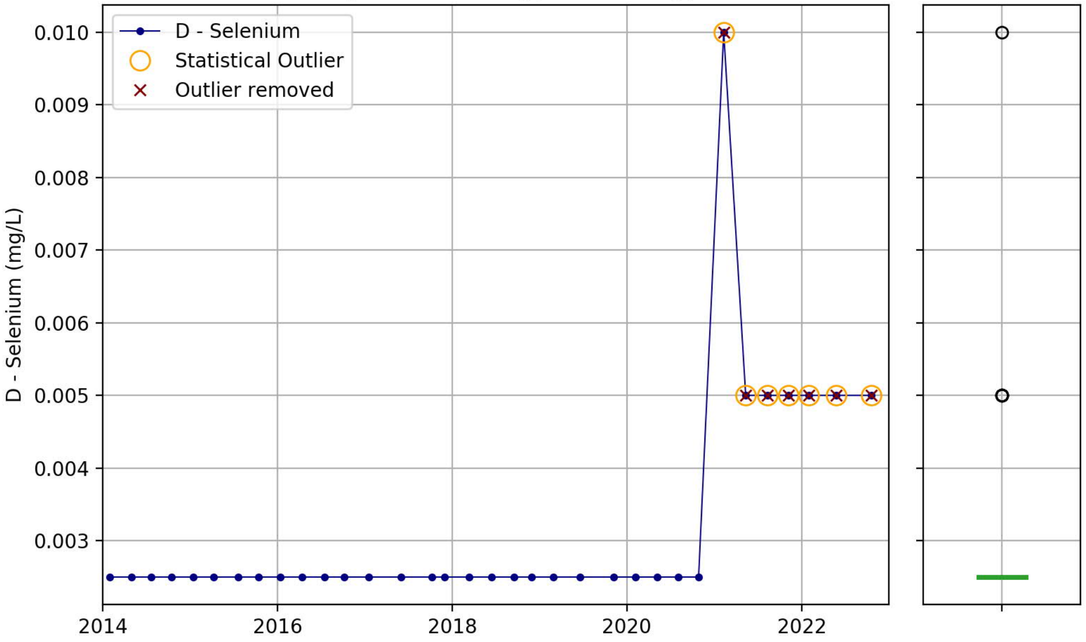

Bore MB9B | Trend: no trend | tau = 0.0 | p = 1.0
D - Mercury
Statistical Outlier
Outlier removed
D - Mercury (mg/L)
0.000052
0.000051
0.000050
0.000049
0.000048
2014
2016
2018
2020
2022


Bore MB9B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Mercury
95th percentile: 0.0
80th percentile: 0.0
D - Mercury (mg/L)
0.000052
0.000051
0.000050
0.000049
0.000048
2014
2016
2018
2020
2022

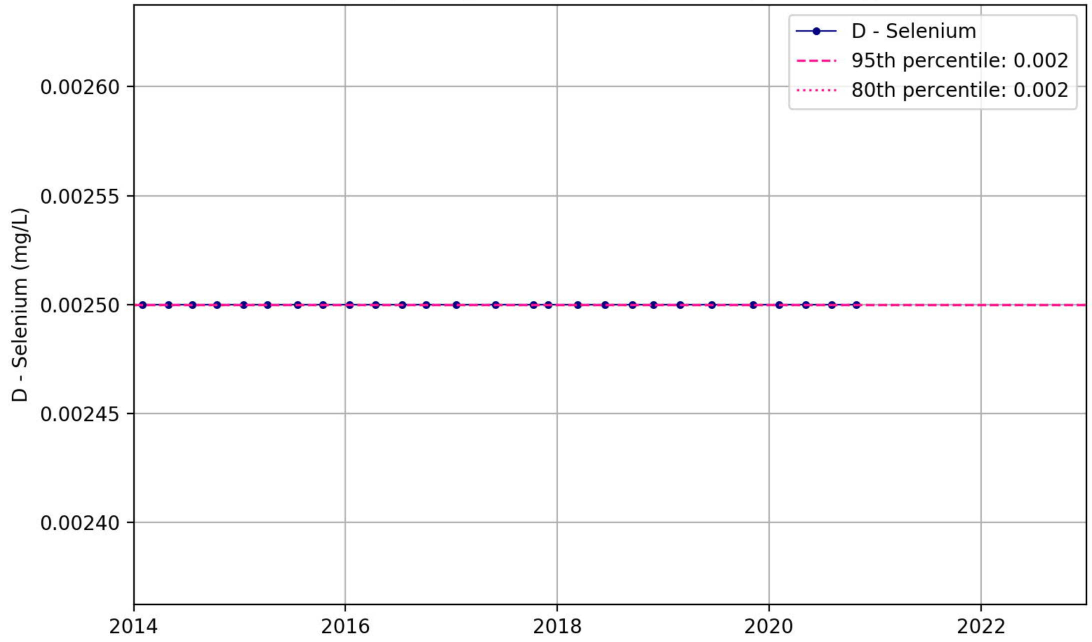

Bore MB9B | Trend: decreasing | tau = -0.483 | p = 0.0
D - Molybdenum
Statistical Outlier
Outlier removed
D - Molybdenum (mg/L)
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
2014
2016
2018
2020
2022


Bore MB9B | Trend (Outliers removed): decreasing | tau = -0.456 | p = 0.0
D - Molybdenum
95th percentile: 0.01
80th percentile: 0.009
D - Molybdenum (mg/L)
0.012
0.010
0.008
0.006
0.004
2014
2016
2018
2020
2022

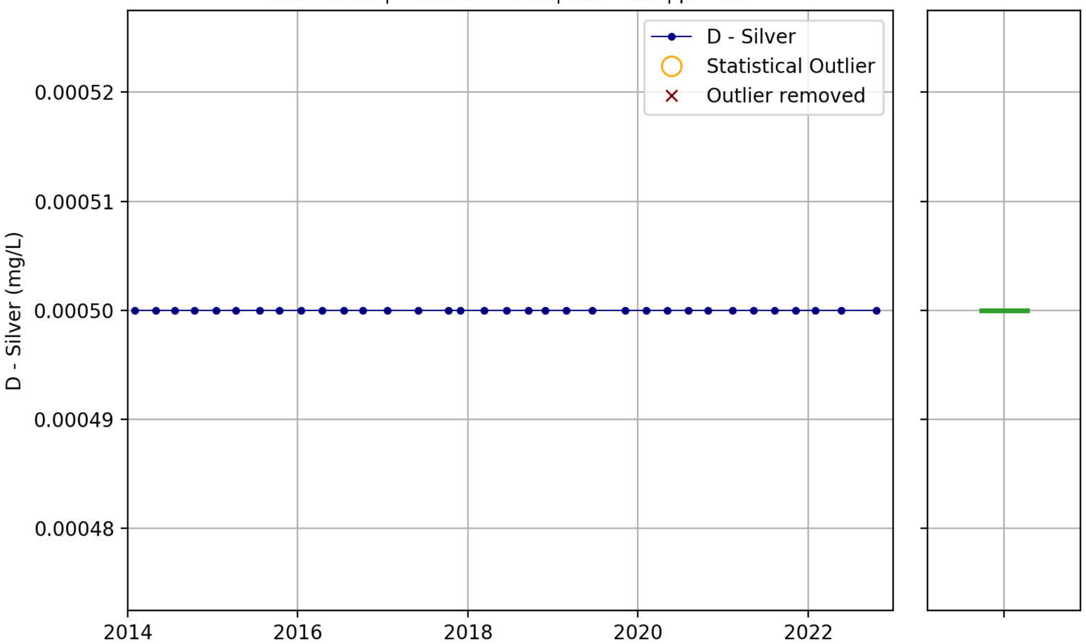
Bore MB9B | Trend: increasing | tau = 0.326 | p = 0.0



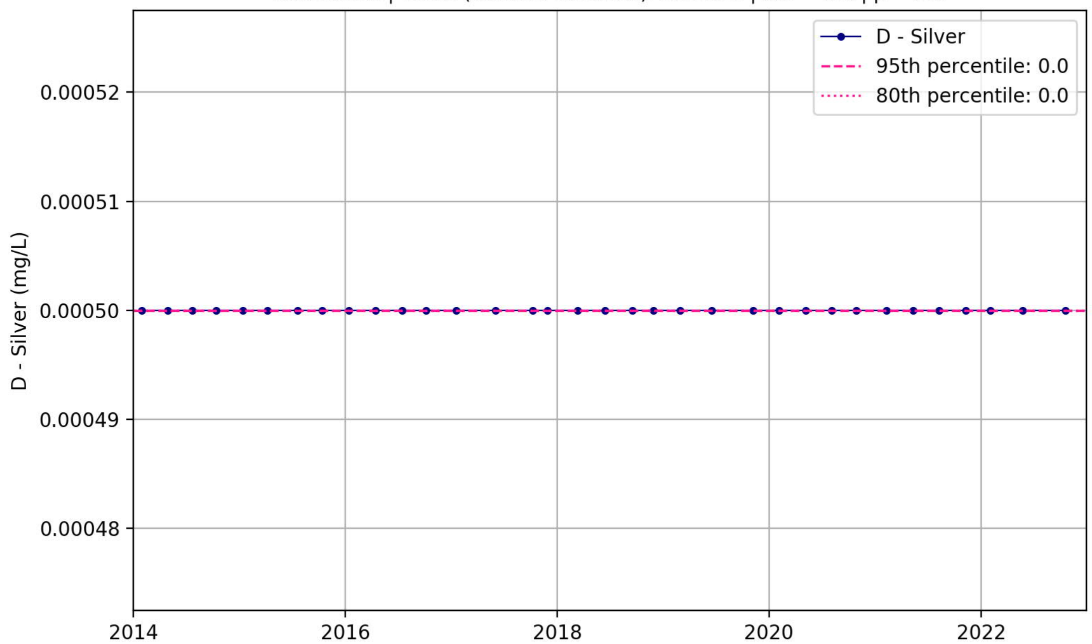

Bore MB9B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0

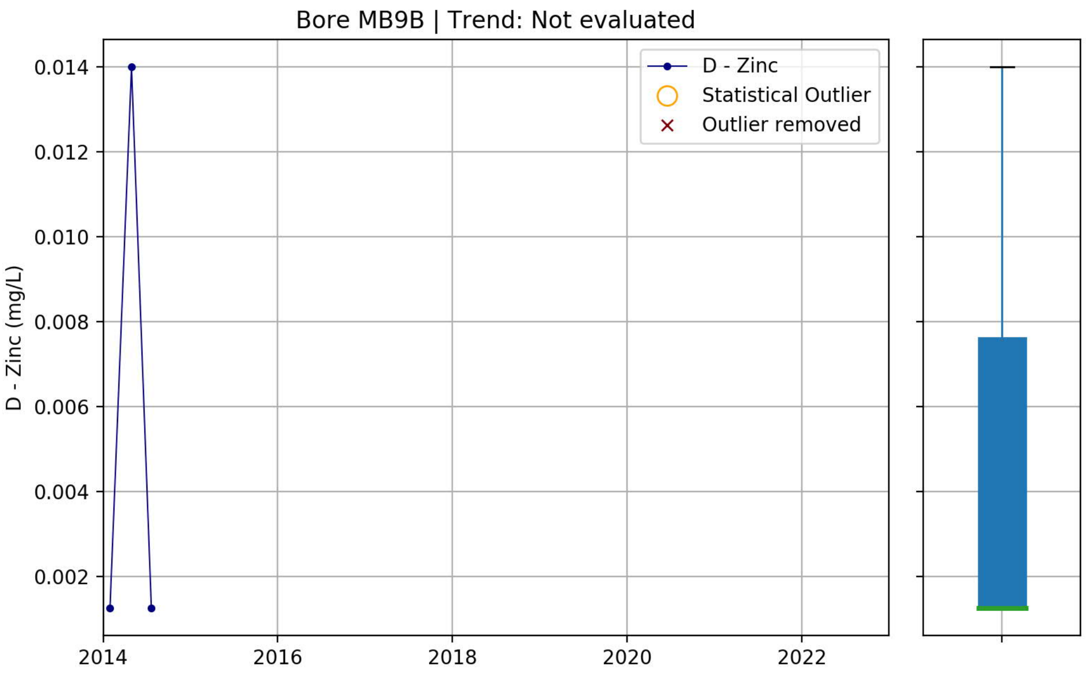


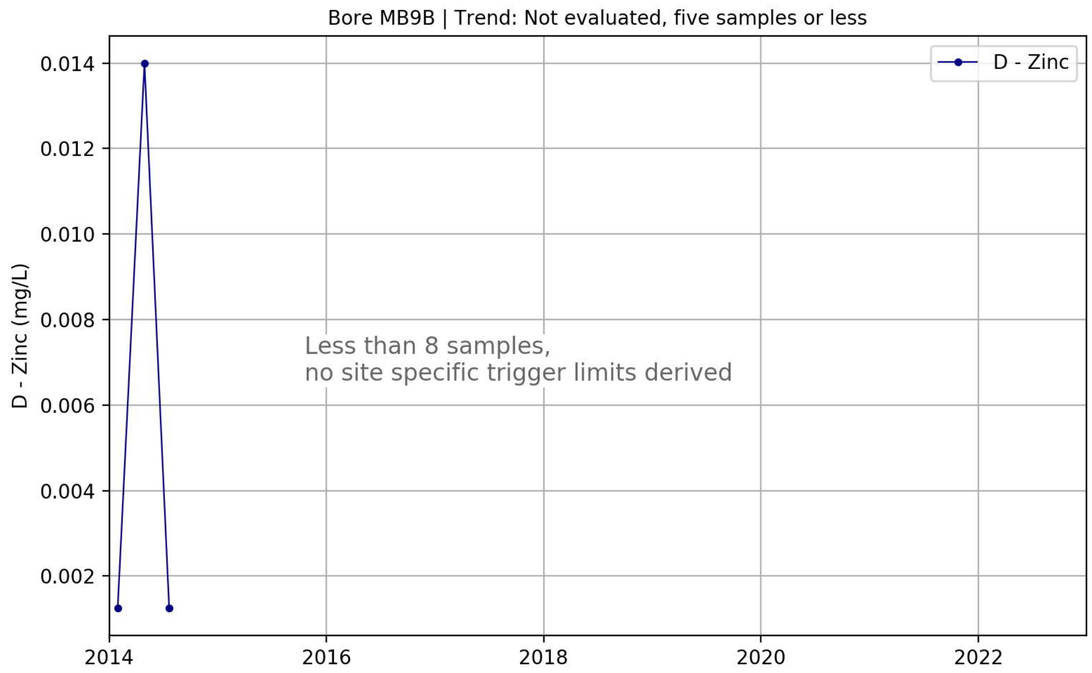

Bore MB9B | Trend: no trend | tau = 0.0 | p = 1.0

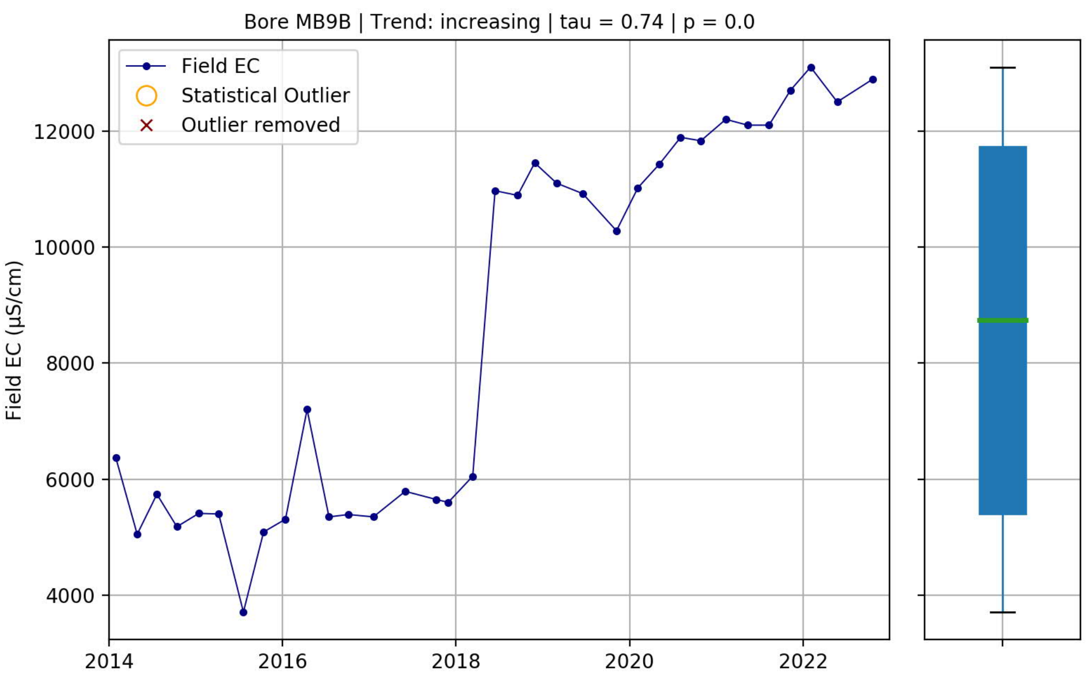


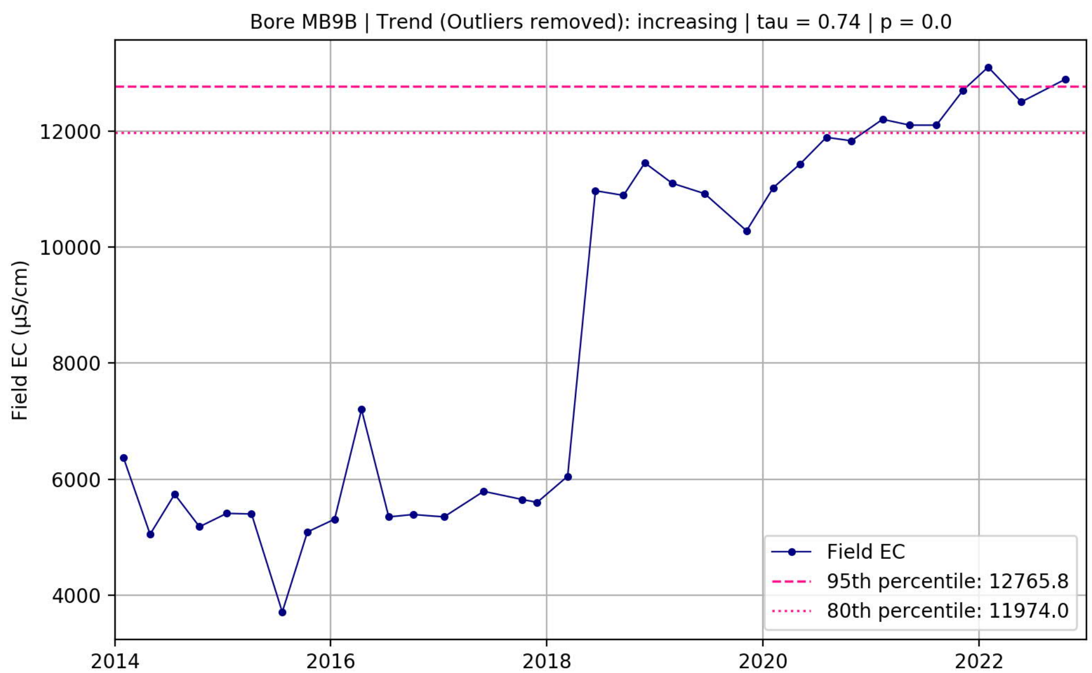

Bore MB9B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0

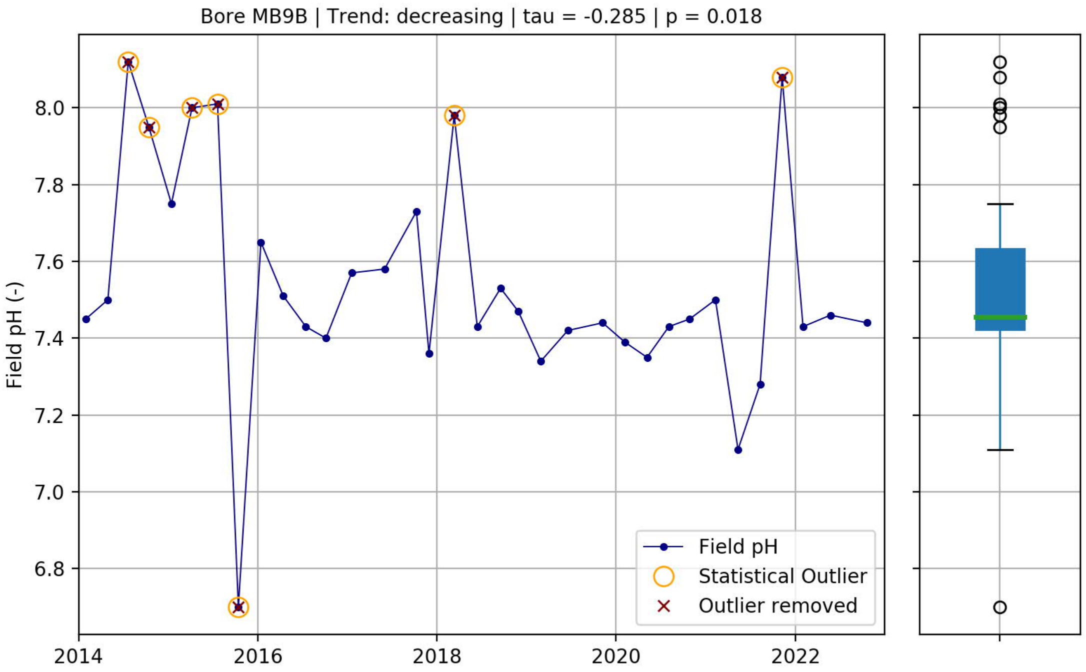


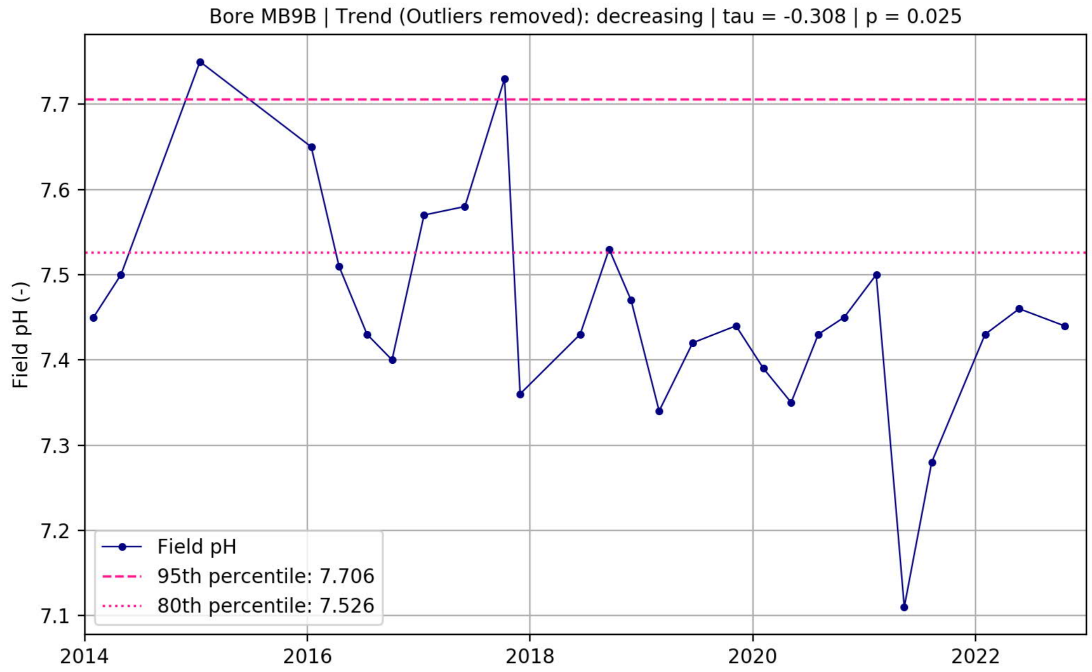

Bore MB9B | Trend: Not evaluated
D - Zinc
Statistical Outlier
Outlier removed
D - Zinc (mg/L)
0.014
0.012
0.010
0.008
0.006
0.004
0.002
2014
2016
2018
2020
2022

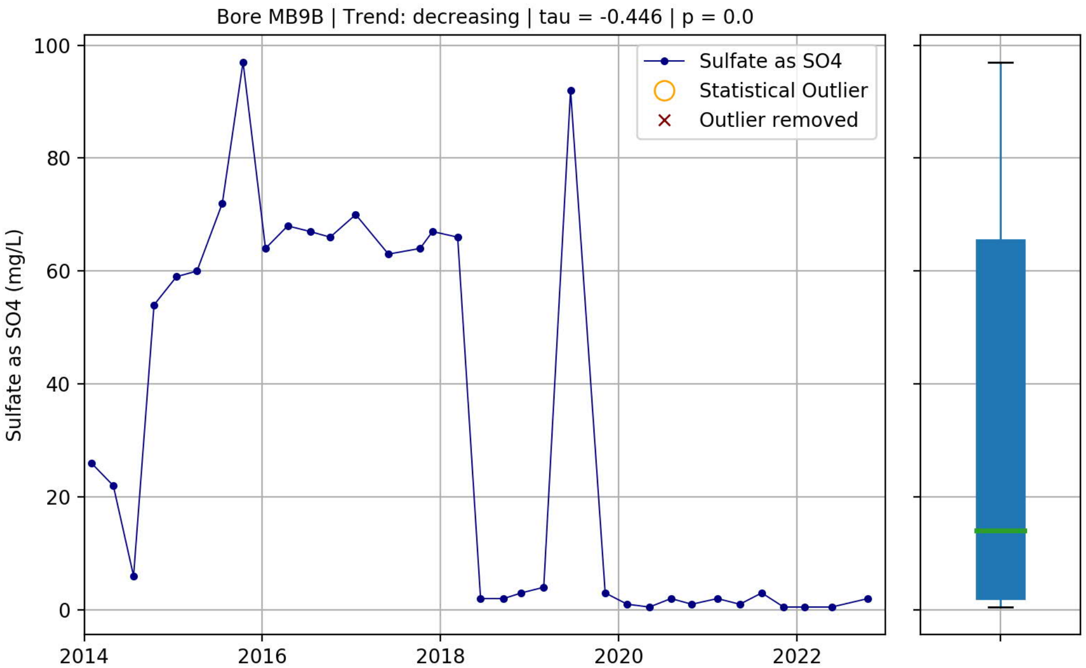

Bore MB9B | Trend: Not evaluated, five samples or less
D - Zinc
Less than 8 samples,
no site specific trigger limits derived
D - Zinc (mg/L)
0.014
0.012
0.010
0.008
0.006
0.004
0.002
2014
2016
2018
2020
2022

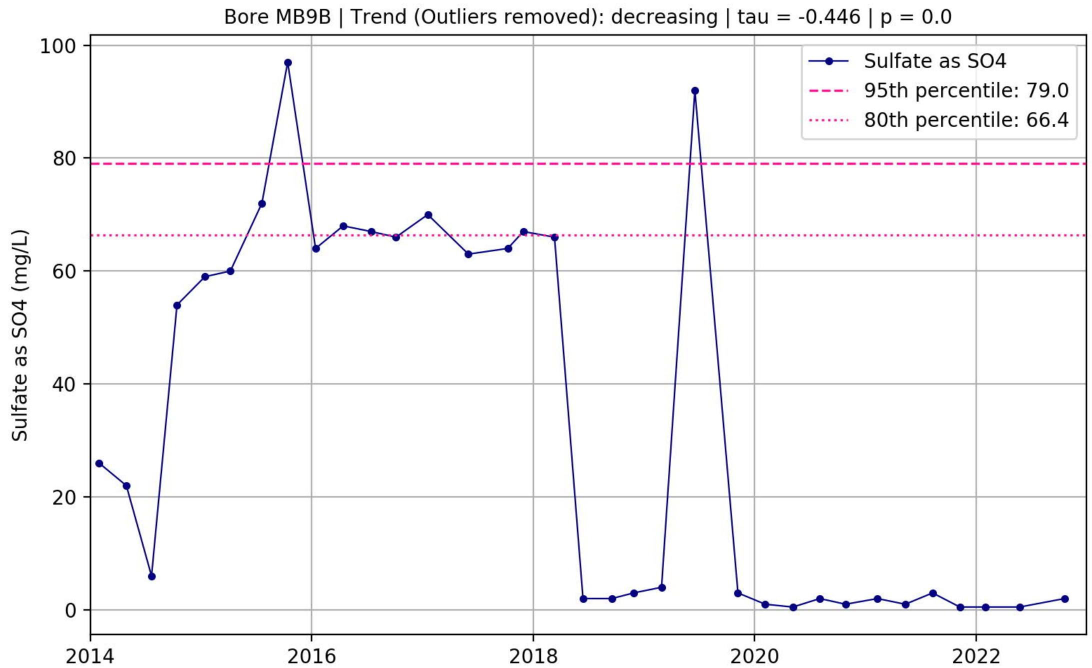

Bore MB9B | Trend: increasing | tau = 0.74 | p = 0.0
Field EC
Statistical Outlier
Outlier removed
Field EC (µS/cm)
12000
10000
8000
6000
4000
2014
2016
2018
2020
2022


Bore MB9B | Trend (Outliers removed): increasing | tau = 0.74 | p = 0.0
Field EC
95th percentile: 12765.8
80th percentile: 11974.0
Field EC (µS/cm)
12000
10000
8000
6000
4000
2014
2016
2018
2020
2022

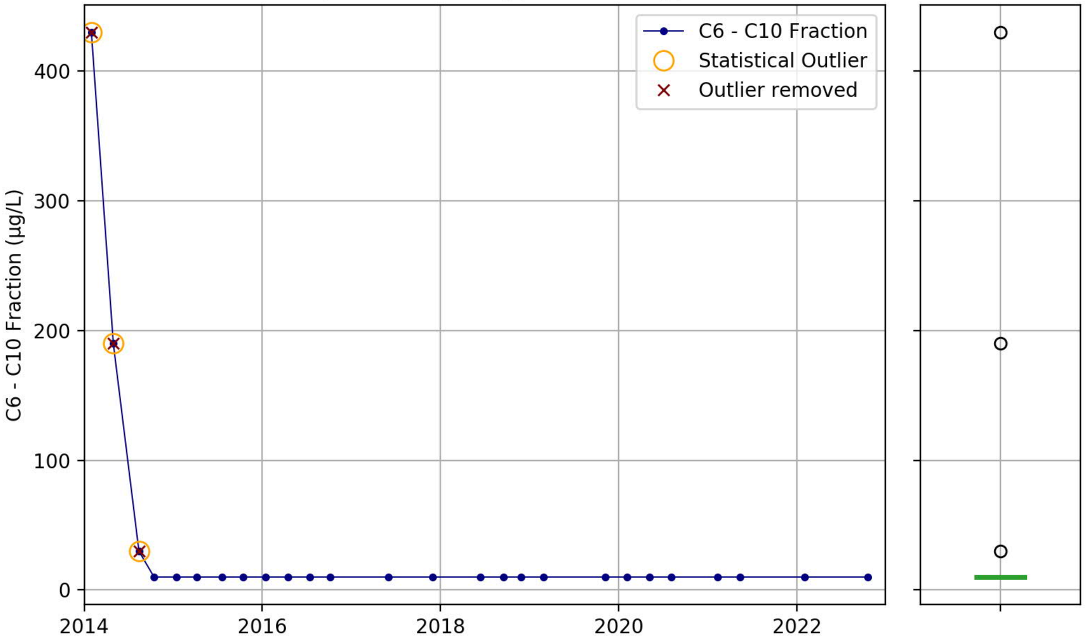

Bore MB9B | Trend: decreasing | tau = -0.285 | p = 0.018
Field pH (-)
Field pH
Statistical Outlier
Outlier removed
2014
2016
2018
2020
2022


Bore MB9B | Trend (Outliers removed): decreasing | tau = -0.308 | p = 0.025
Field pH (-)
Field pH
95th percentile: 7.706
80th percentile: 7.526
2014
2016
2018
2020
2022

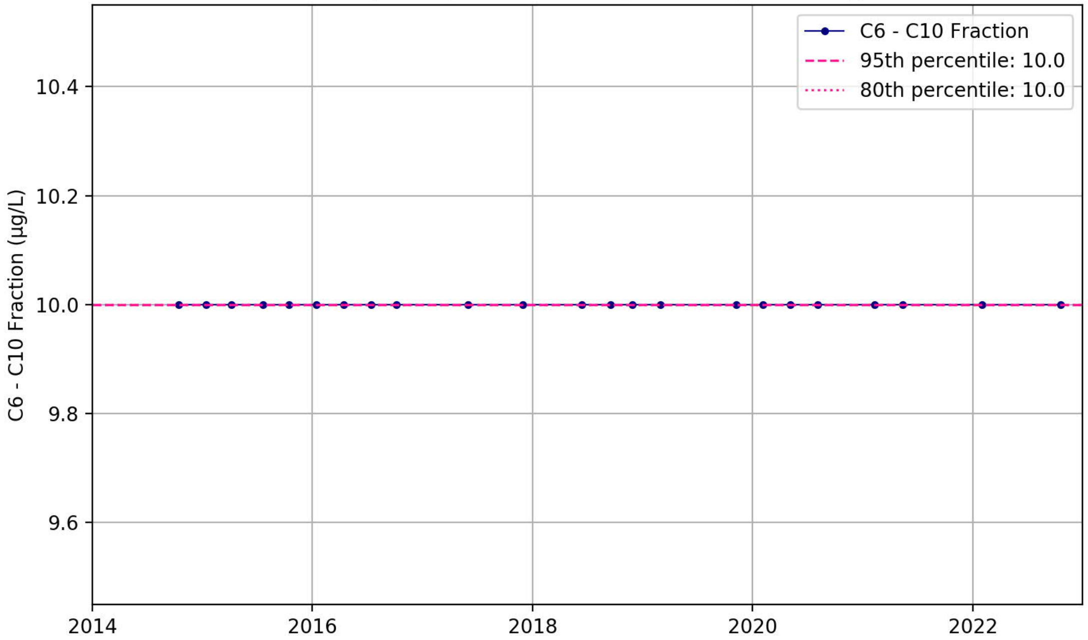

Bore MB9B | Trend: decreasing | tau = -0.446 | p = 0.0
Sulfate as SO4 (mg/L)
Sulfate as SO4
Statistical Outlier
Outlier removed
2014
2016
2018
2020
2022


Bore MB9B | Trend (Outliers removed): decreasing | tau = -0.446 | p = 0.0
Sulfate as SO4 (mg/L)
Sulfate as SO4
95th percentile: 79.0
80th percentile: 66.4
2014
2016
2018
2020
2022

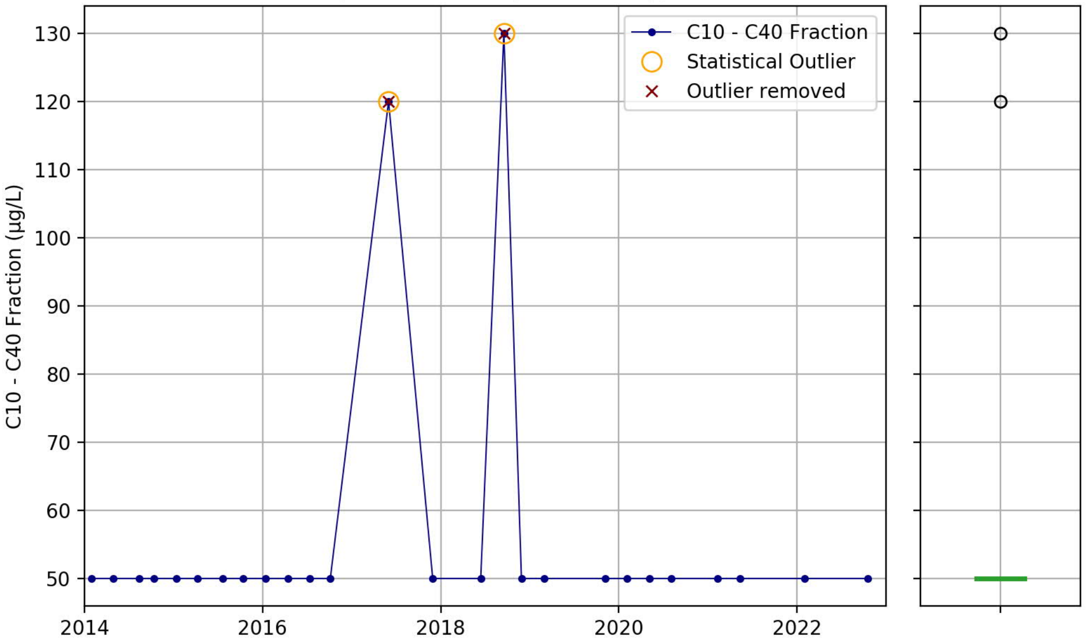
Bore MB10A | Trend: decreasing | tau = -0.222 | p = 0.005



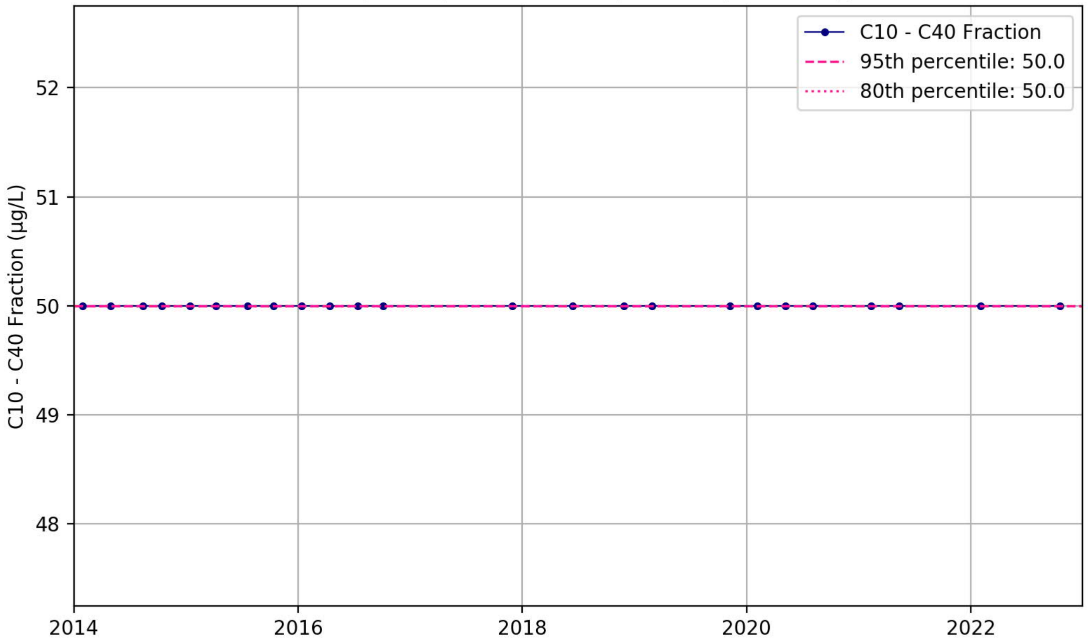

Bore MB10A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0

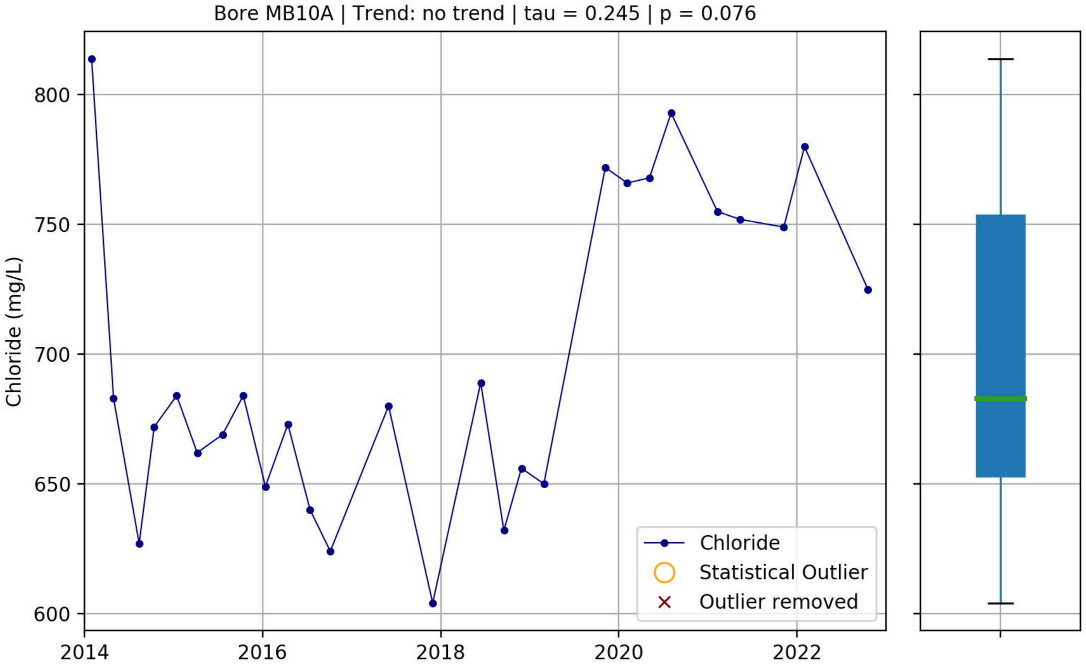


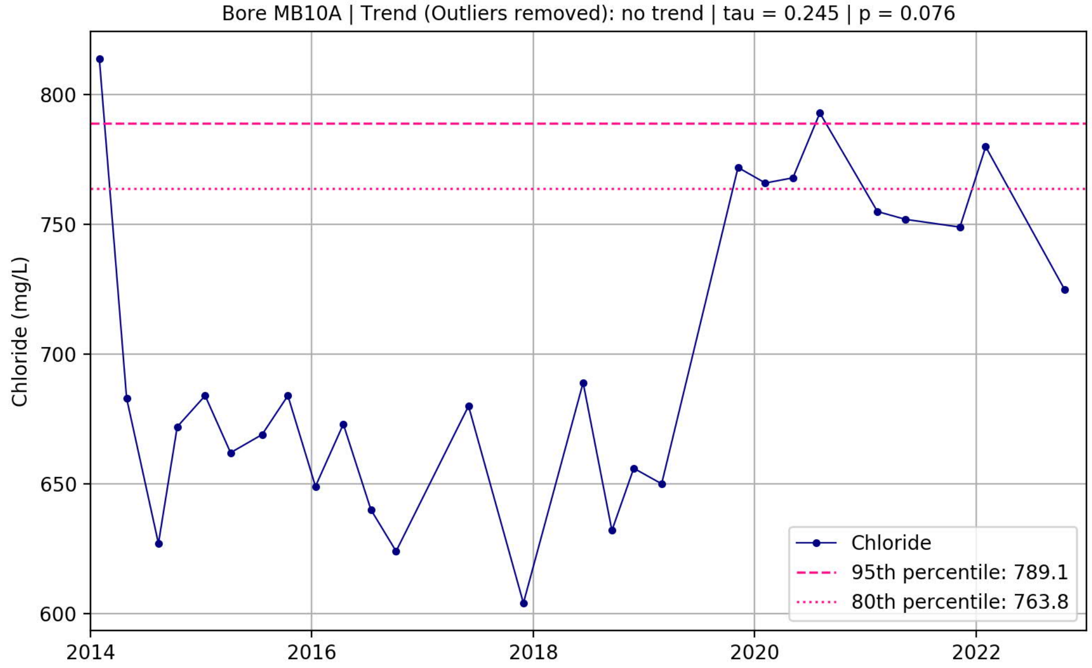

Bore MB10A | Trend: no trend | tau = 0.015 | p = 0.848

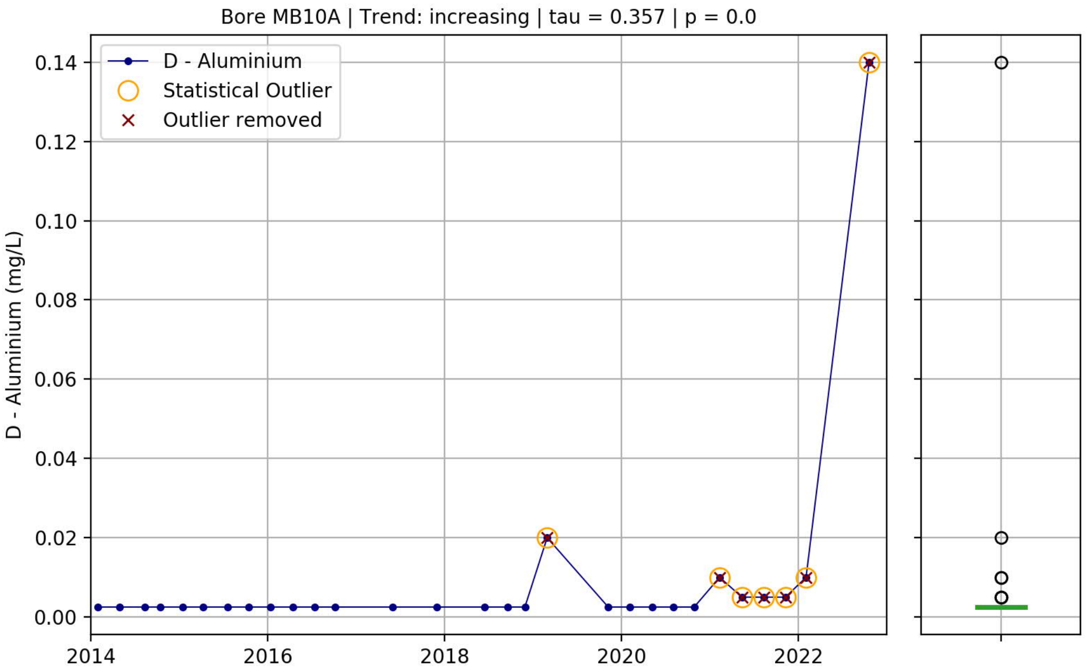


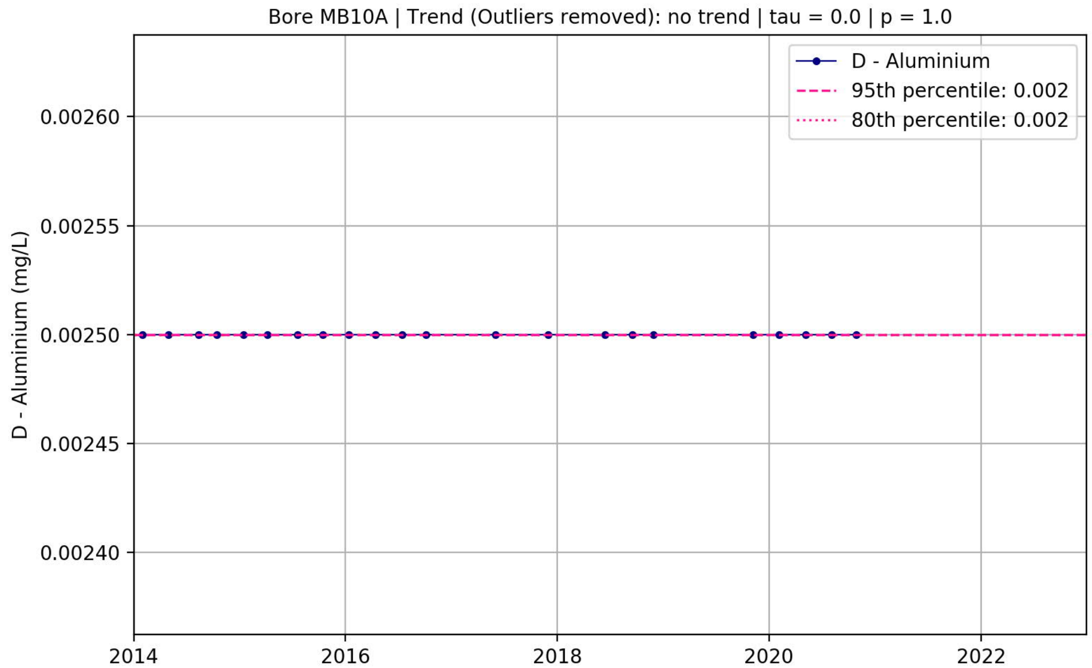

Bore MB10A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0

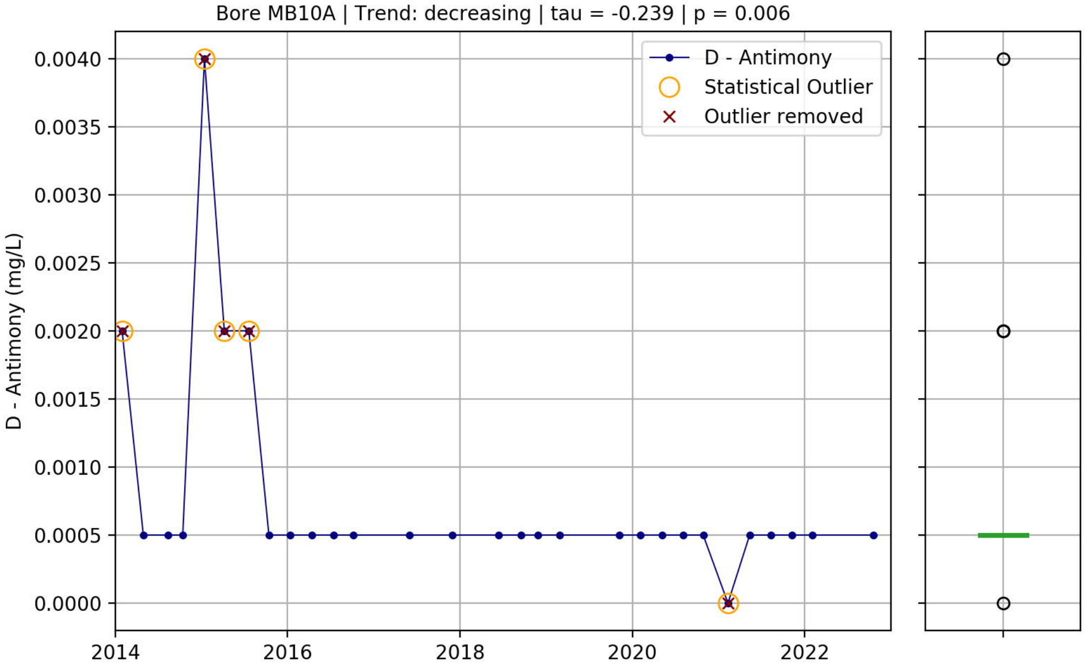


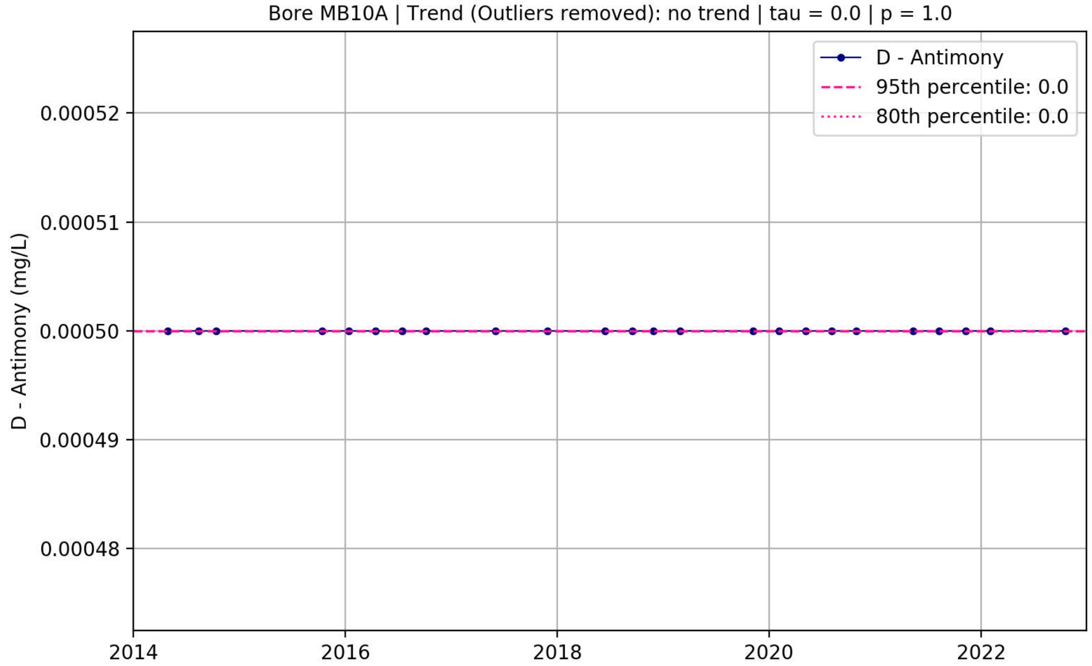

Bore MB10A | Trend: no trend | tau = 0.245 | p = 0.076
Chloride (mg/L)
Chloride
Statistical Outlier
Outlier removed

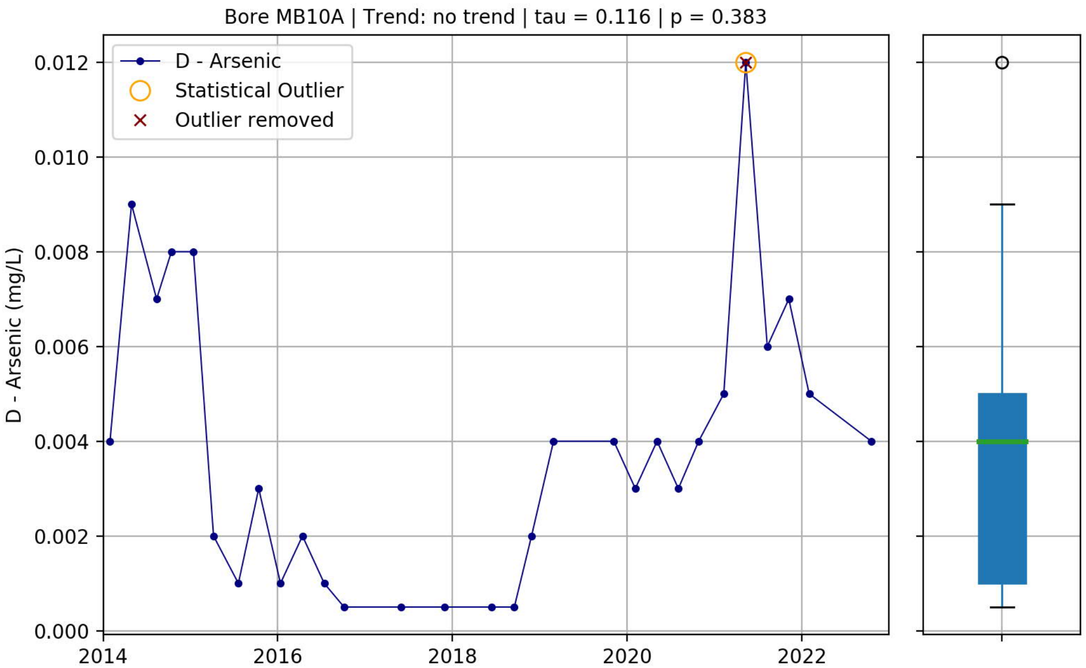

Bore MB10A | Trend (Outliers removed): no trend | tau = 0.245 | p = 0.076
Chloride (mg/L)
Chloride
95th percentile: 789.1
80th percentile: 763.8

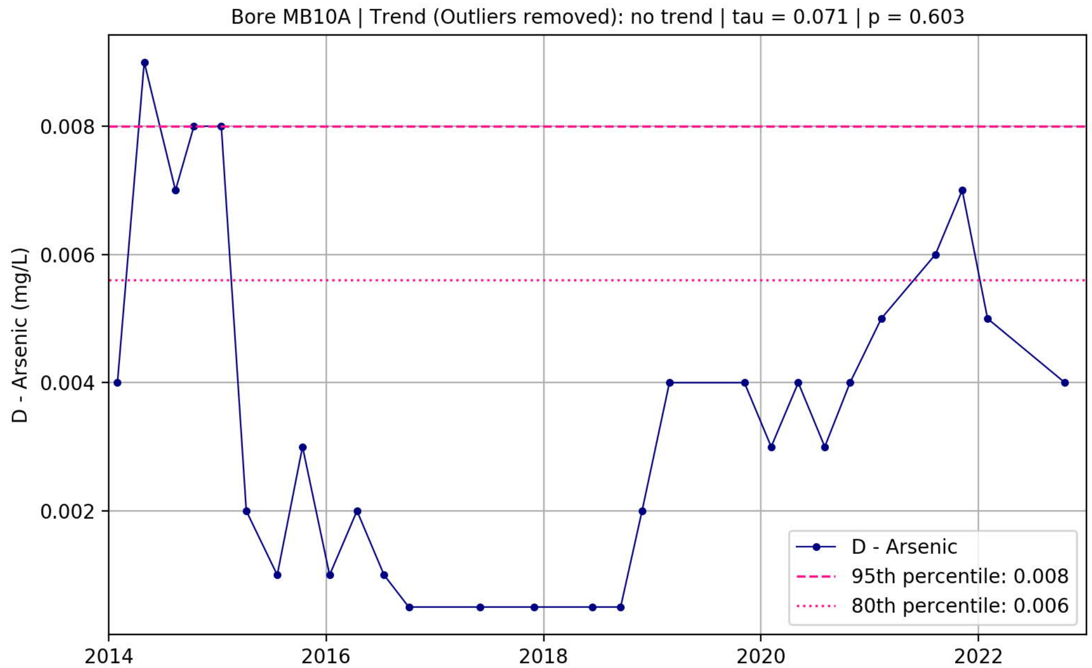

Bore MB10A | Trend: increasing | tau = 0.357 | p = 0.0
D - Aluminium (mg/L)
D - Aluminium
Statistical Outlier
Outlier removed


Bore MB10A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Aluminium (mg/L)
D - Aluminium
95th percentile: 0.002
80th percentile: 0.002

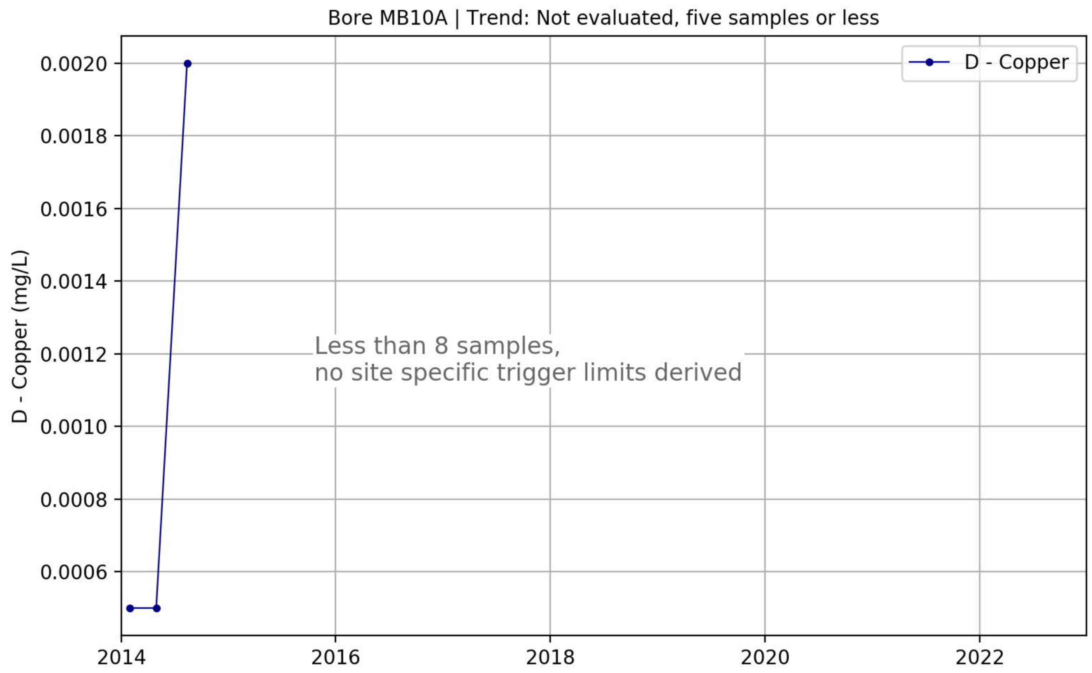

Bore MB10A | Trend: decreasing | tau = -0.239 | p = 0.006
D - Antimony (mg/L)
D - Antimony
Statistical Outlier
Outlier removed
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
2014
2016
2018
2020
2022

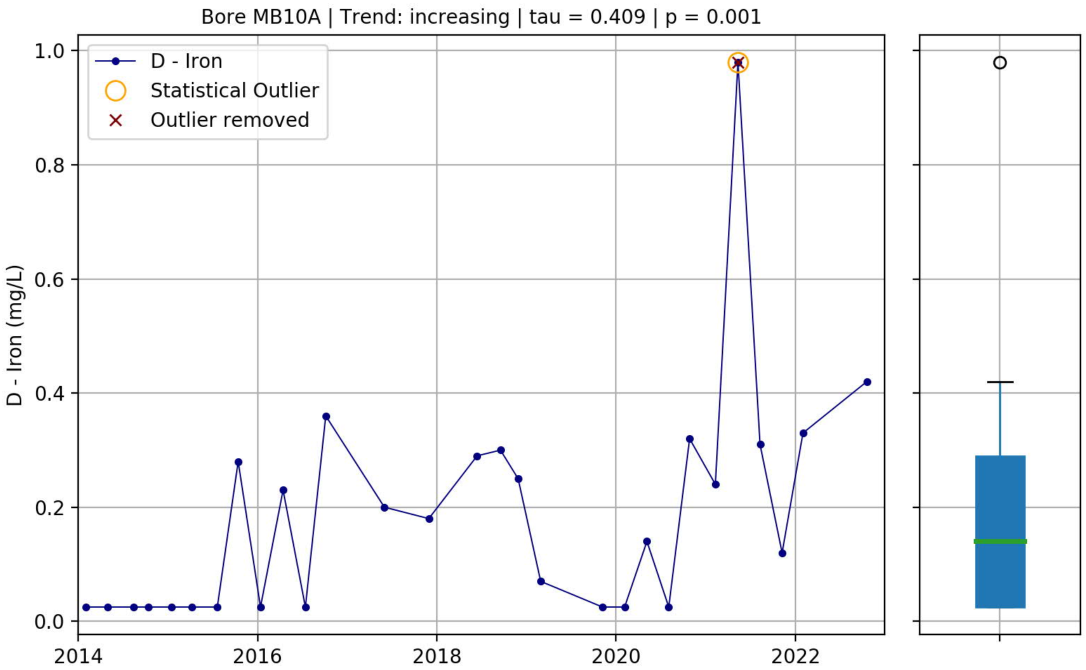

Bore MB10A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Antimony (mg/L)
D - Antimony
95th percentile: 0.0
80th percentile: 0.0
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

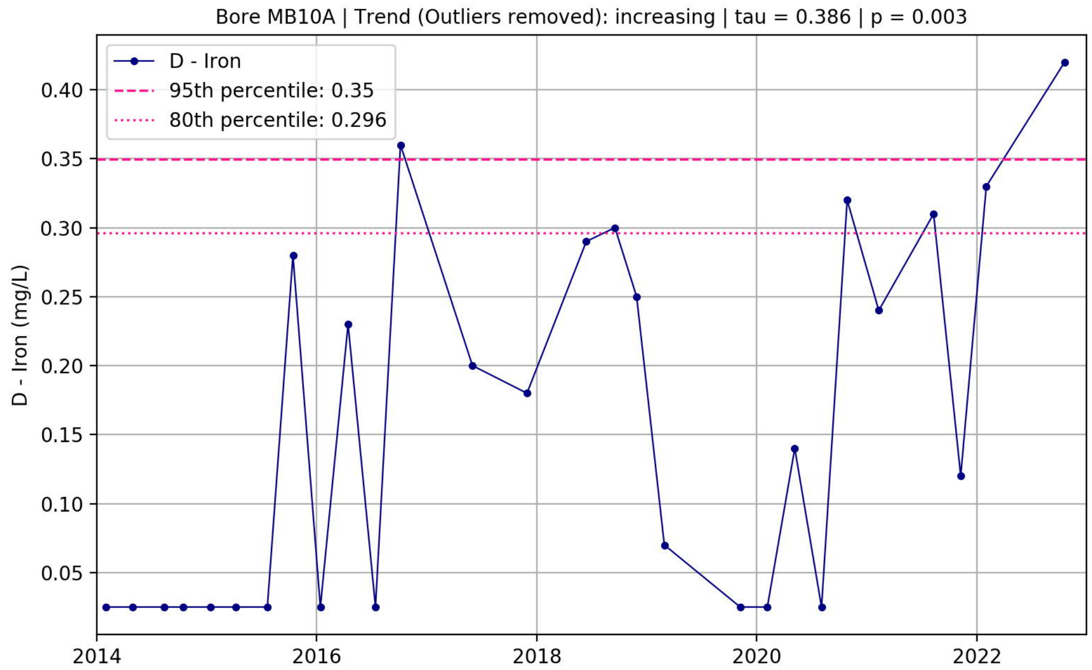

Bore MB10A | Trend: no trend | tau = 0.116 | p = 0.383
D - Arsenic (mg/L)
D - Arsenic
Statistical Outlier
Outlier removed
0.012
0.010
0.008
0.006
0.004
0.002
0.000
2014
2016
2018
2020
2022

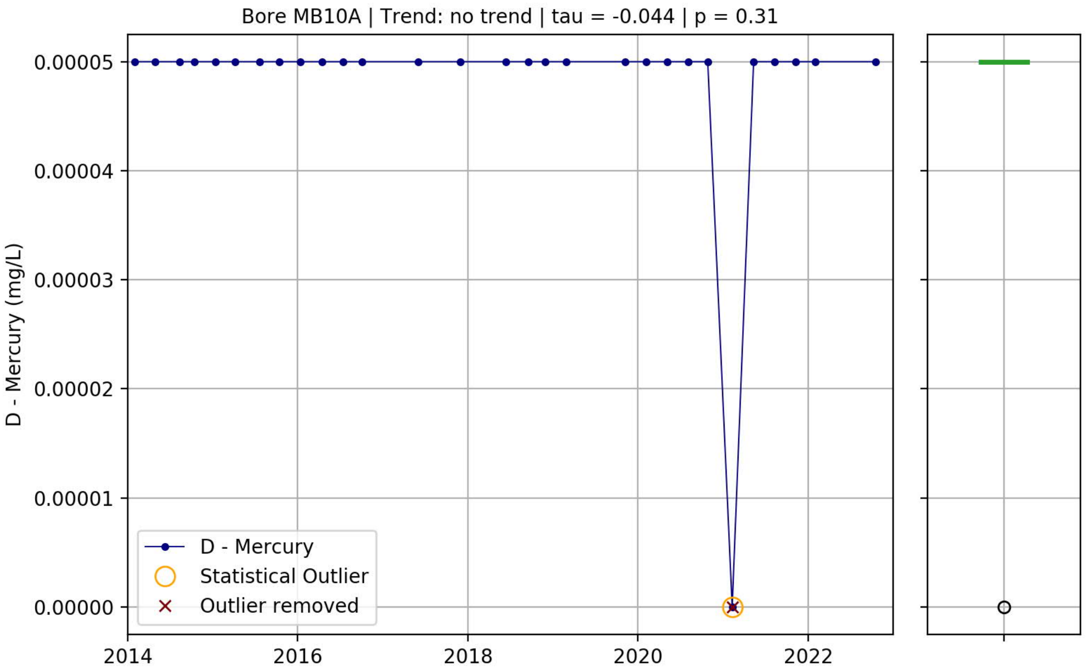

Bore MB10A | Trend (Outliers removed): no trend | tau = 0.071 | p = 0.603
D - Arsenic (mg/L)
D - Arsenic
95th percentile: 0.008
80th percentile: 0.006
0.008
0.006
0.004
0.002
2014
2016
2018
2020
2022

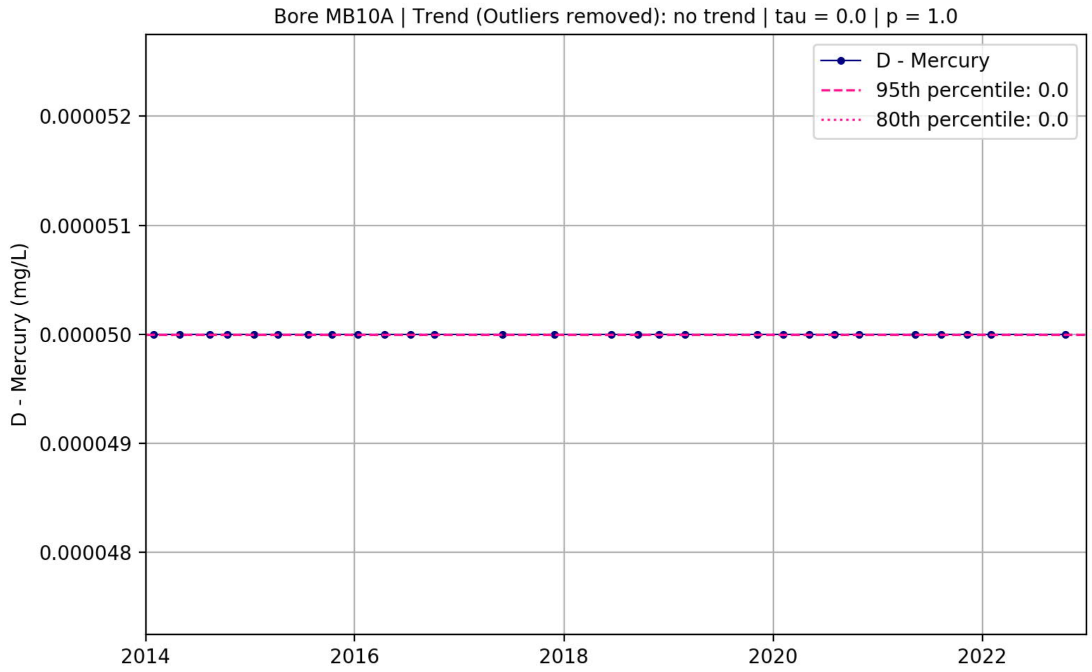

Bore MB10A | Trend: Not evaluated
D - Copper
Statistical Outlier
Outlier removed
D - Copper (mg/L)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
2014
2016
2018
2020
2022

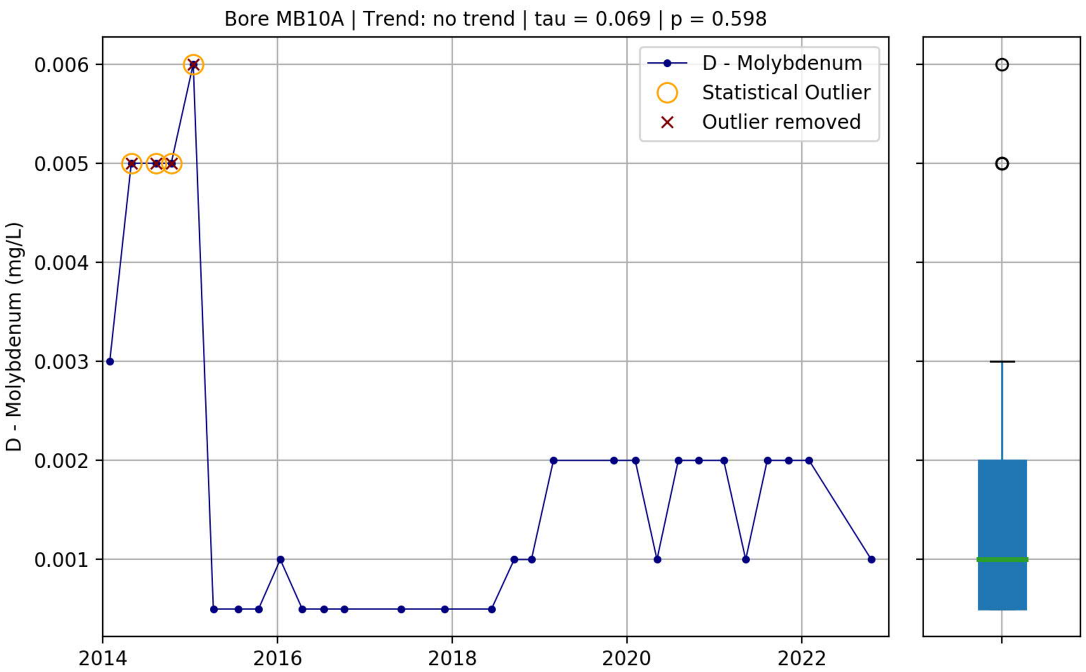

Bore MB10A | Trend: Not evaluated, five samples or less
D - Copper
Less than 8 samples,
no site specific trigger limits derived
D - Copper (mg/L)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
2014
2016
2018
2020
2022

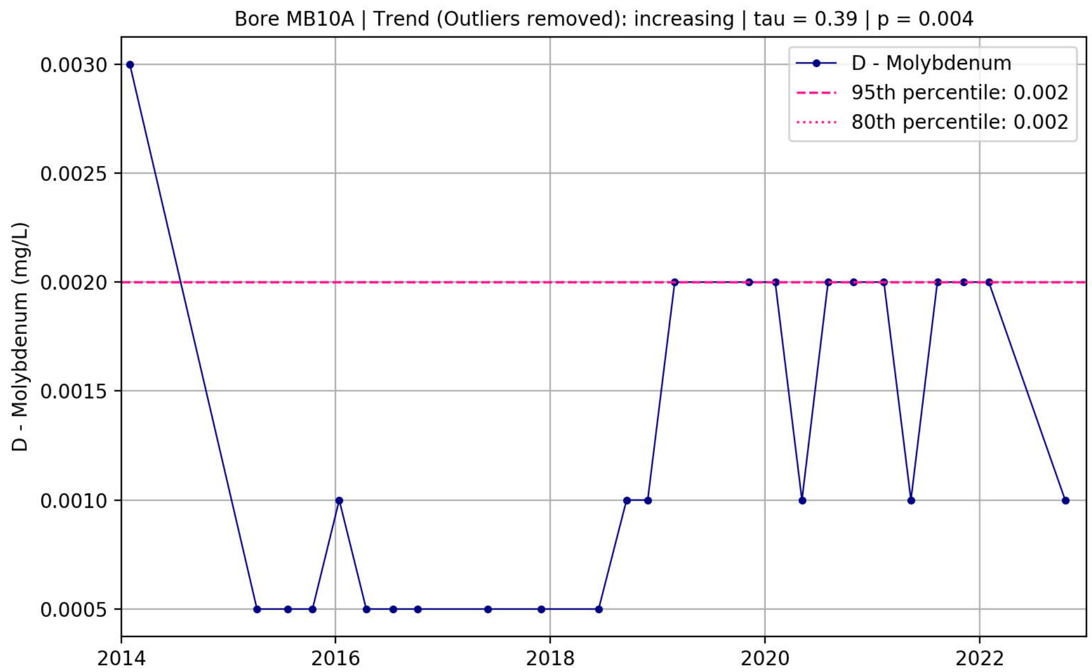

Bore MB10A | Trend: increasing | tau = 0.409 | p = 0.001
D - Iron
Statistical Outlier
Outlier removed
D - Iron (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
2014
2016
2018
2020
2022

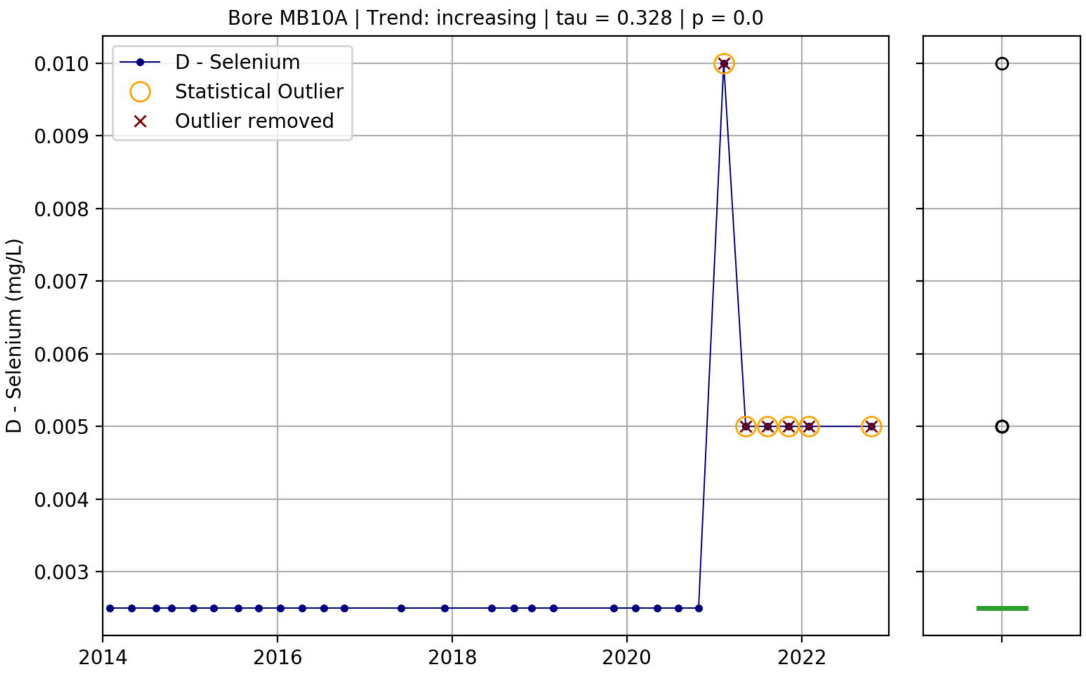

Bore MB10A | Trend (Outliers removed): increasing | tau = 0.386 | p = 0.003
D - Iron
95th percentile: 0.35
80th percentile: 0.296
D - Iron (mg/L)
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
2014
2016
2018
2020
2022

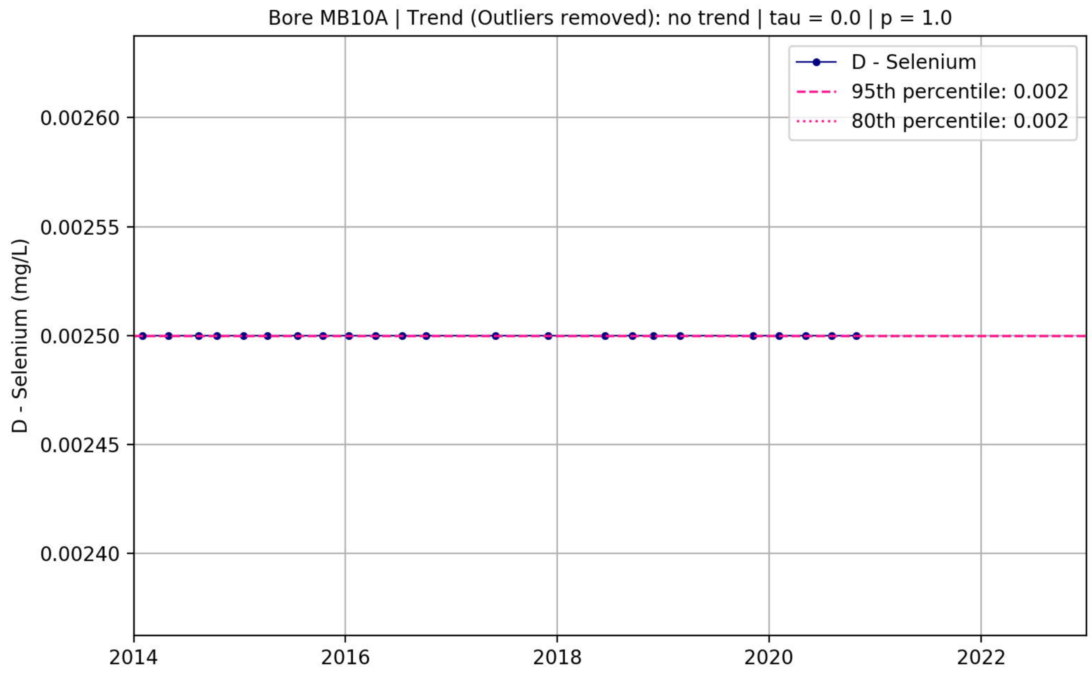

Bore MB10A | Trend: no trend | tau = -0.044 | p = 0.31
D - Mercury (mg/L)
D - Mercury
Statistical Outlier
Outlier removed

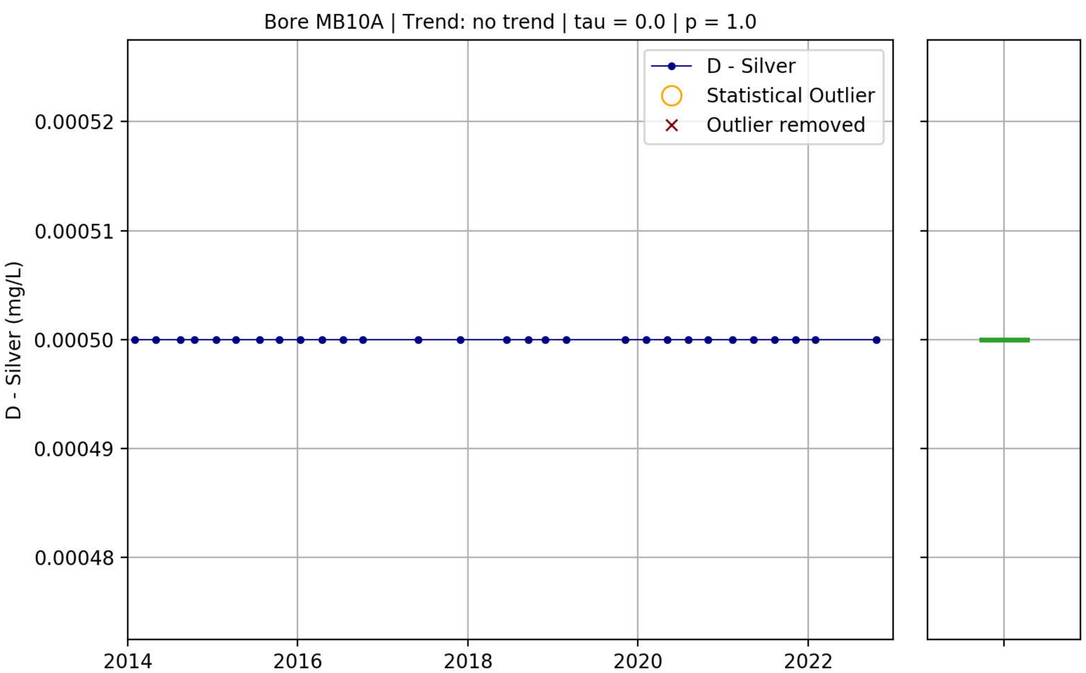

Bore MB10A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Mercury (mg/L)
D - Mercury
95th percentile: 0.0
80th percentile: 0.0

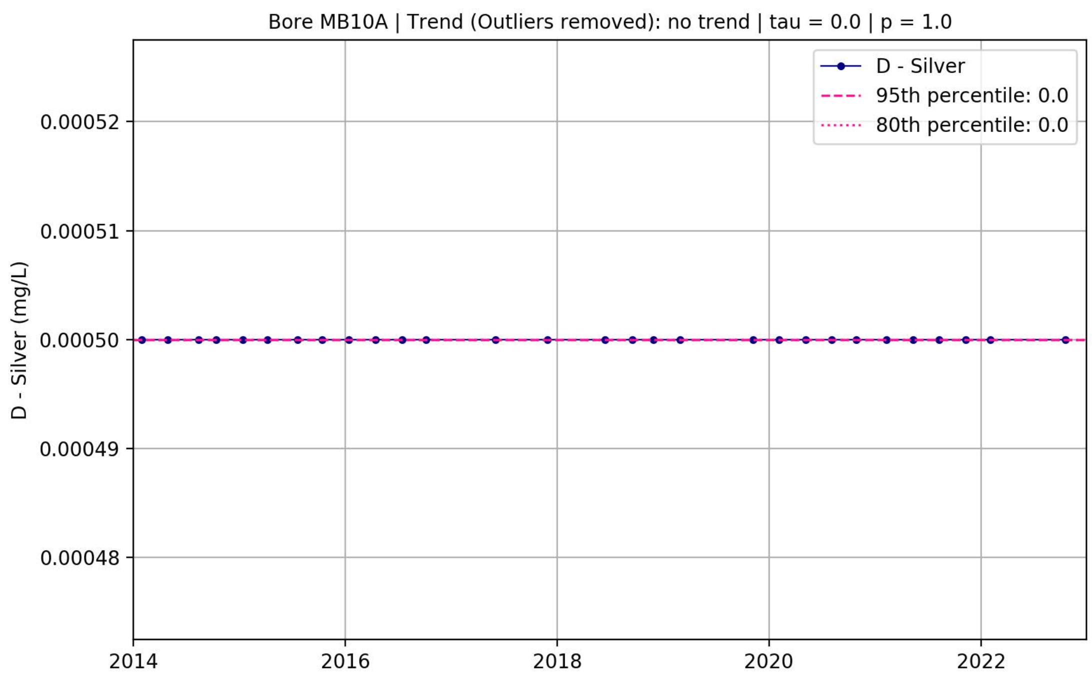

Bore MB10A | Trend: no trend | tau = 0.069 | p = 0.598
D - Molybdenum (mg/L)
D - Molybdenum
Statistical Outlier
Outlier removed


Bore MB10A | Trend (Outliers removed): increasing | tau = 0.39 | p = 0.004
D - Molybdenum (mg/L)
D - Molybdenum
95th percentile: 0.002
80th percentile: 0.002

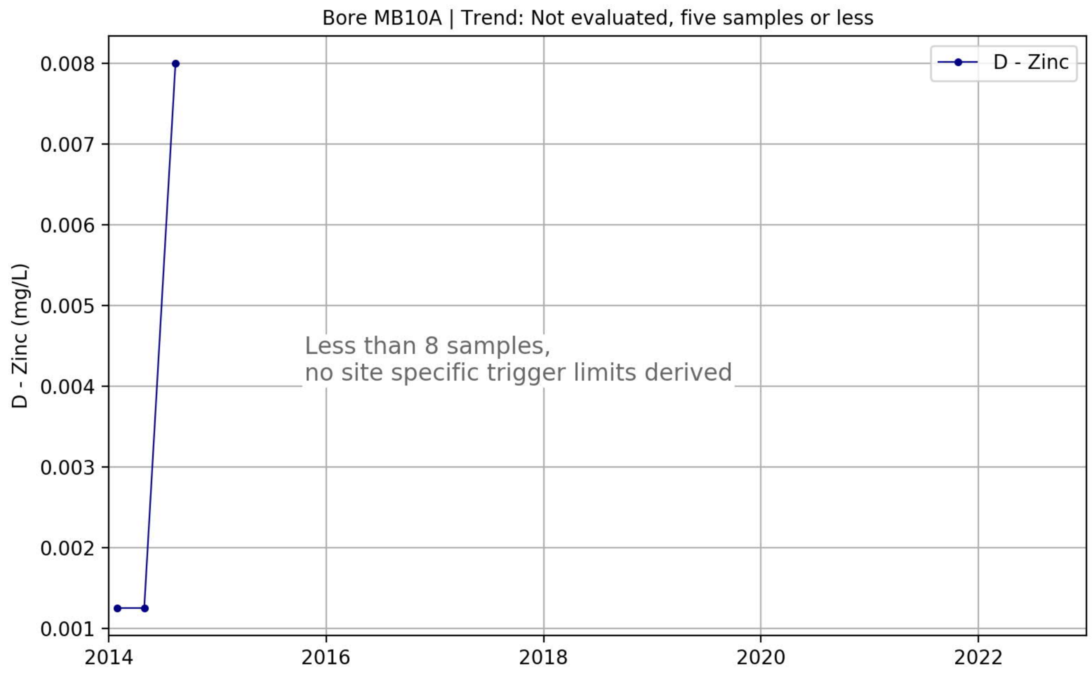

Bore MB10A | Trend: increasing | tau = 0.328 | p = 0.0
D - Selenium
Statistical Outlier
Outlier removed
D - Selenium (mg/L)
0.010
0.009
0.008
0.007
0.006
0.005
0.004
0.003
2014
2016
2018
2020
2022

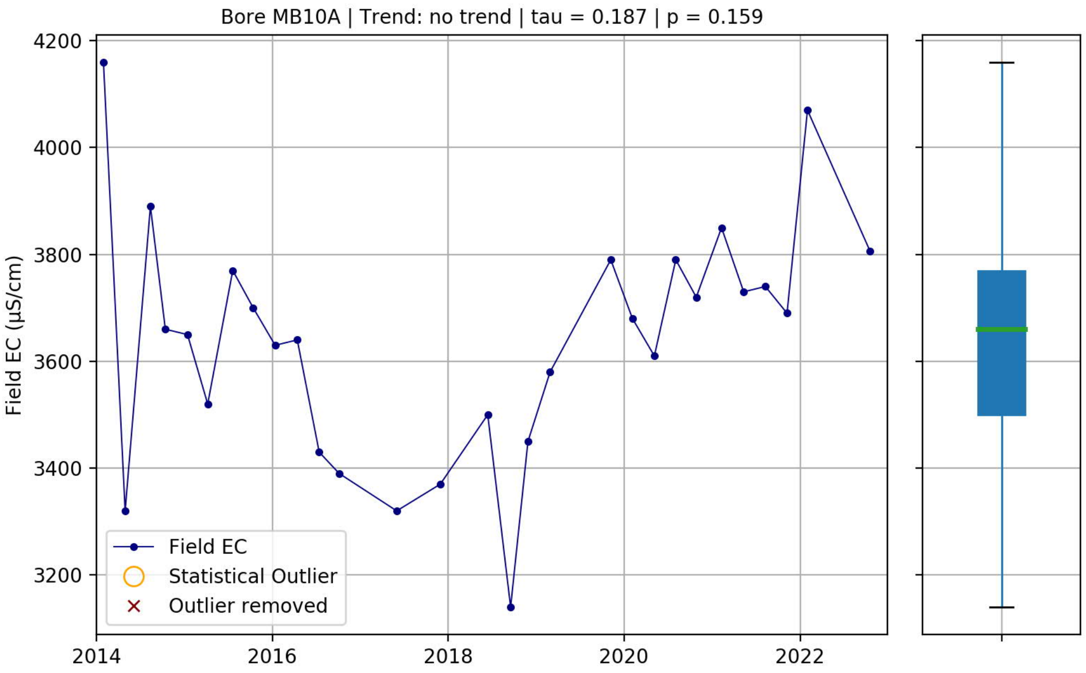

Bore MB10A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Selenium
95th percentile: 0.002
80th percentile: 0.002
D - Selenium (mg/L)
0.00260
0.00255
0.00250
0.00245
0.00240
2014
2016
2018
2020
2022

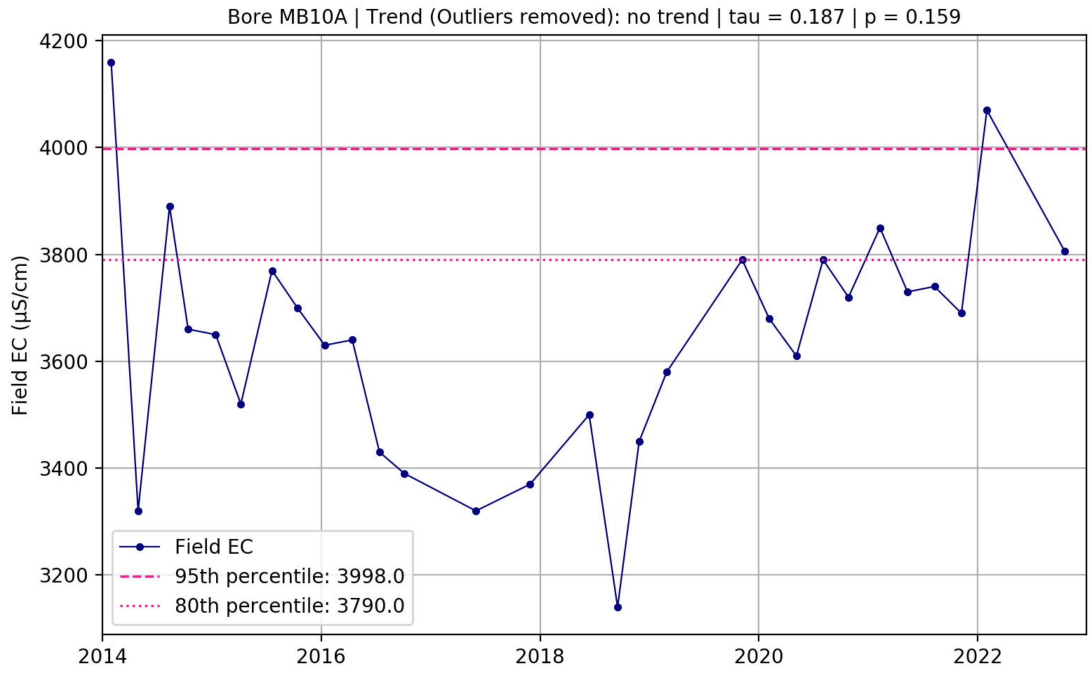

Bore MB10A | Trend: no trend | tau = 0.0 | p = 1.0
D - Silver
Statistical Outlier
Outlier removed
D - Silver (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

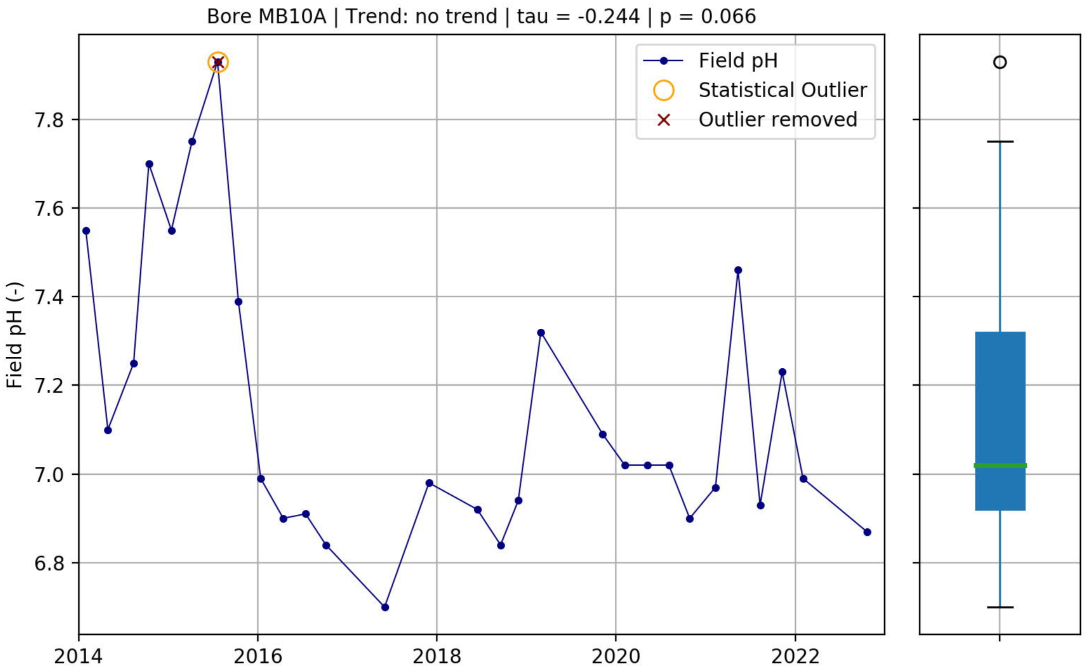

Bore MB10A | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Silver
95th percentile: 0.0
80th percentile: 0.0
D - Silver (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

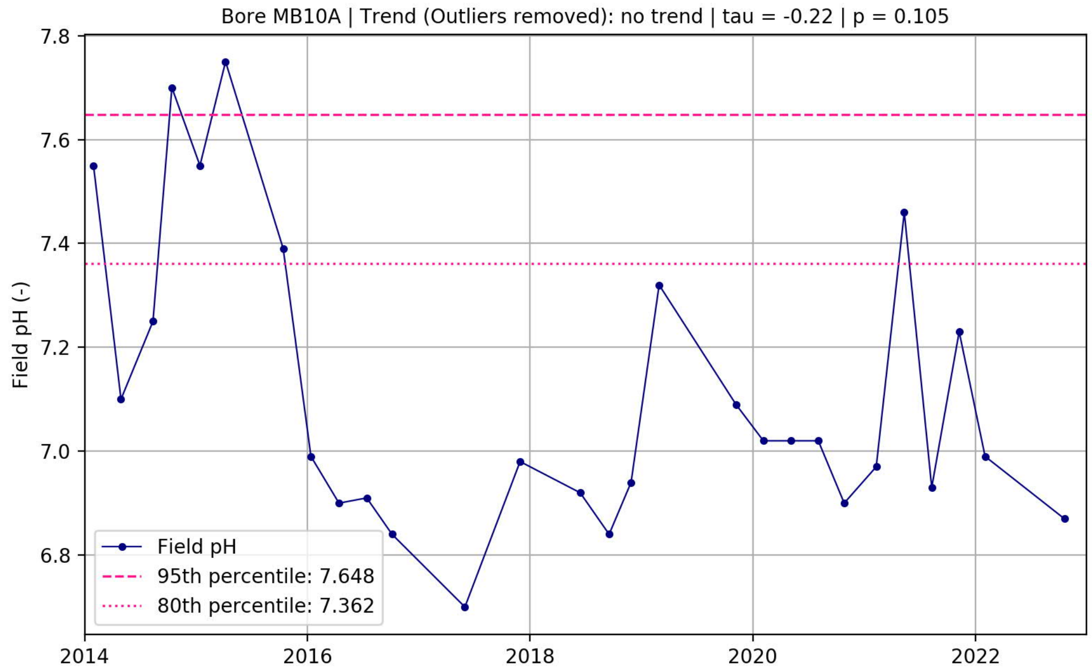

Bore MB10A | Trend: Not evaluated
D - Zinc (mg/L)
D - Zinc
Statistical Outlier
Outlier removed
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022

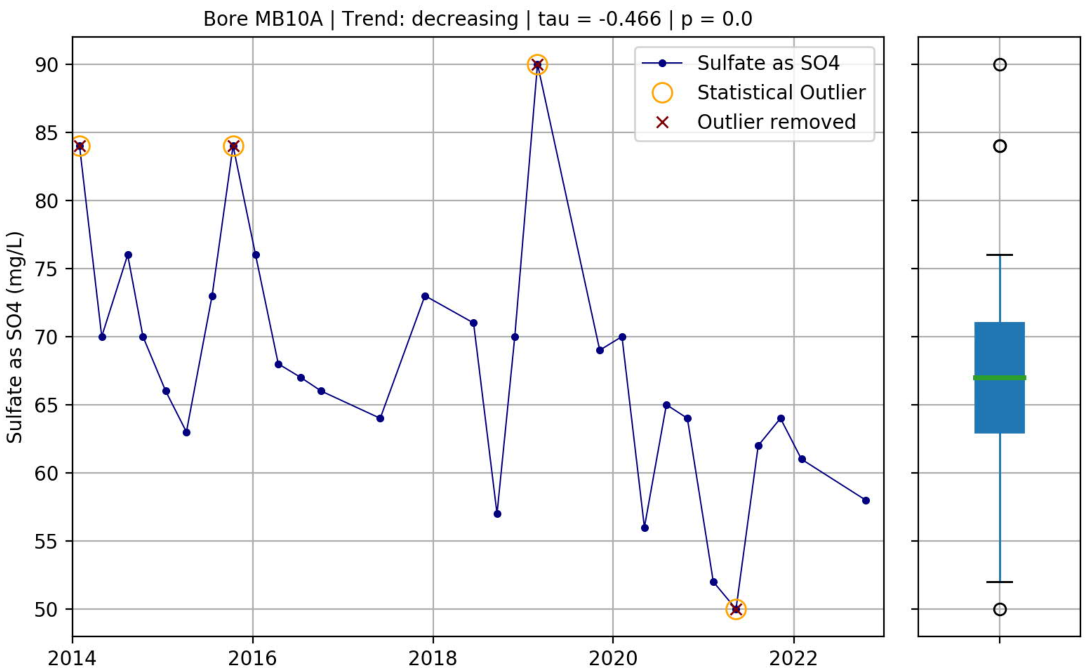

Bore MB10A | Trend: Not evaluated, five samples or less
D - Zinc (mg/L)
D - Zinc
Less than 8 samples,
no site specific trigger limits derived
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022

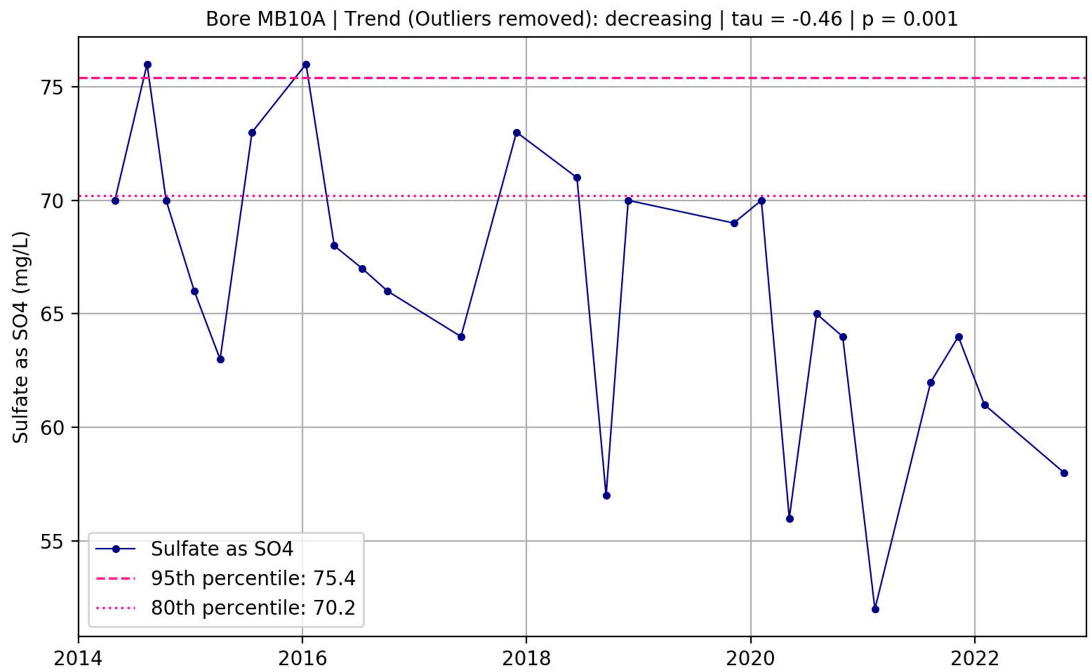

Bore MB10A | Trend: no trend | tau = 0.187 | p = 0.159
Field EC (µS/cm)
Field EC
Statistical Outlier
Outlier removed
4200
4000
3800
3600
3400
3200
2014
2016
2018
2020
2022


Bore MB10A | Trend (Outliers removed): no trend | tau = 0.187 | p = 0.159
Field EC (µS/cm)
Field EC
95th percentile: 3998.0
80th percentile: 3790.0
4200
4000
3800
3600
3400
3200
2014
2016
2018
2020
2022

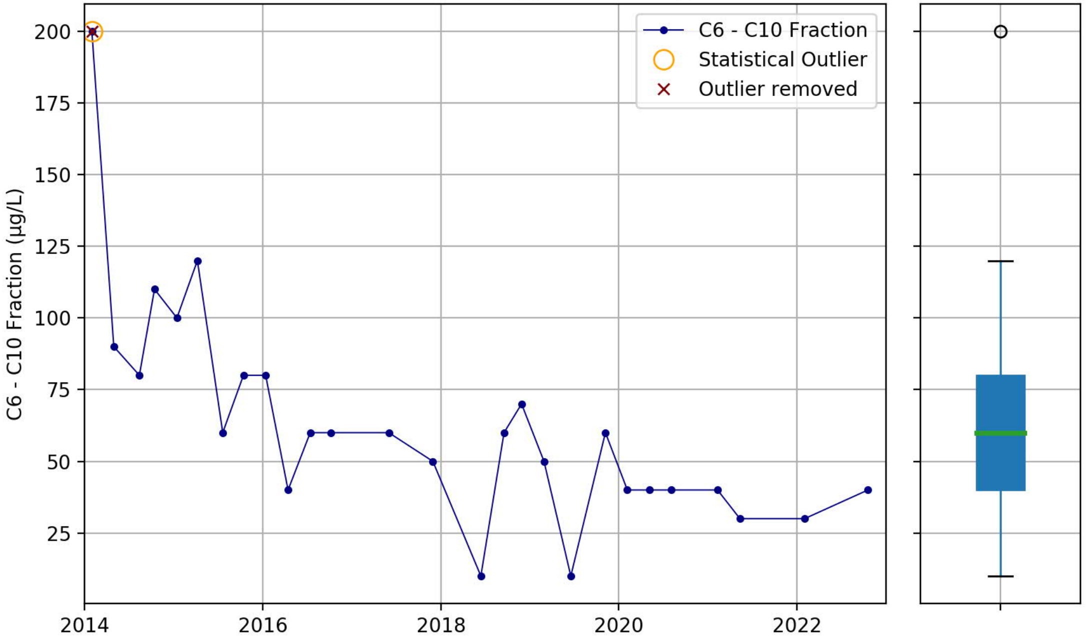

Bore MB10A | Trend: no trend | tau = -0.244 | p = 0.066
Field pH
Statistical Outlier
Outlier removed
Field pH (-)
7.8
7.6
7.4
7.2
7.0
6.8
2014
2016
2018
2020
2022


Bore MB10A | Trend (Outliers removed): no trend | tau = -0.22 | p = 0.105
Field pH
95th percentile: 7.648
80th percentile: 7.362
Field pH (-)
7.8
7.6
7.4
7.2
7.0
6.8
2014
2016
2018
2020
2022

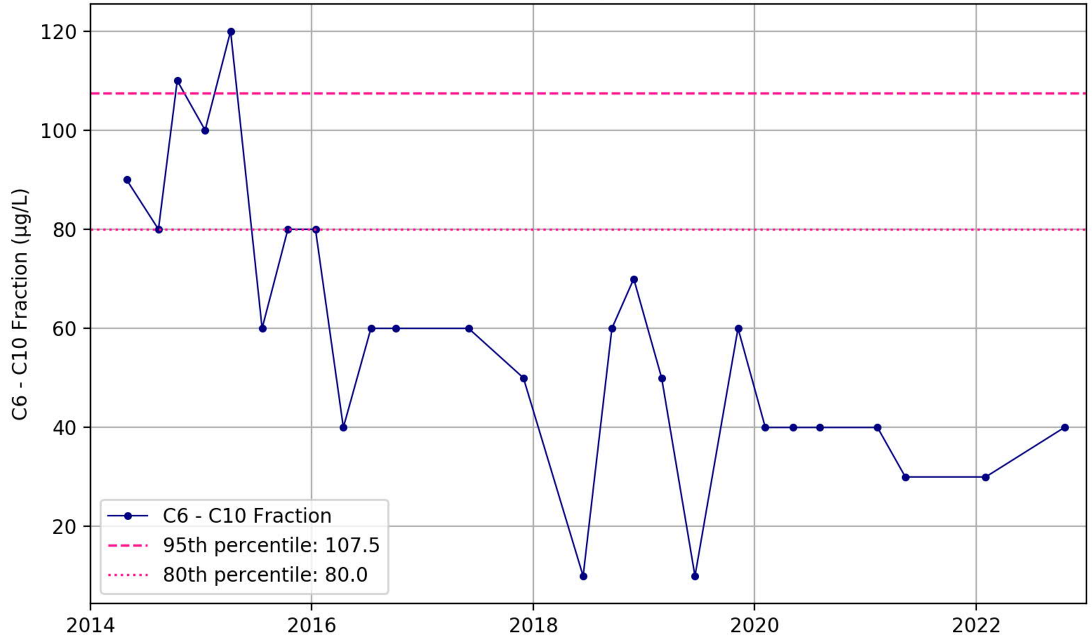

Bore MB10A | Trend: decreasing | tau = -0.466 | p = 0.0
Sulfate as SO4
Statistical Outlier
Outlier removed
Sulfate as SO4 (mg/L)
90
85
80
75
70
65
60
55
50
2014
2016
2018
2020
2022


Bore MB10A | Trend (Outliers removed): decreasing | tau = -0.46 | p = 0.001
Sulfate as SO4
95th percentile: 75.4
80th percentile: 70.2
Sulfate as SO4 (mg/L)
75
70
65
60
55
2014
2016
2018
2020
2022

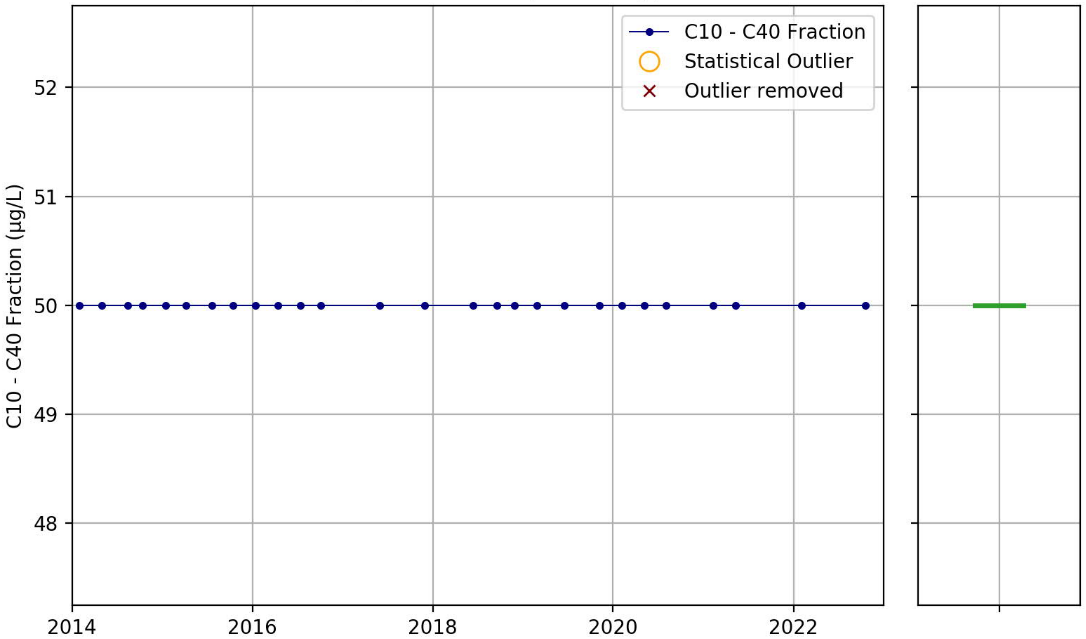
Bore MB10B | Trend: decreasing | tau = -0.624 | p = 0.0



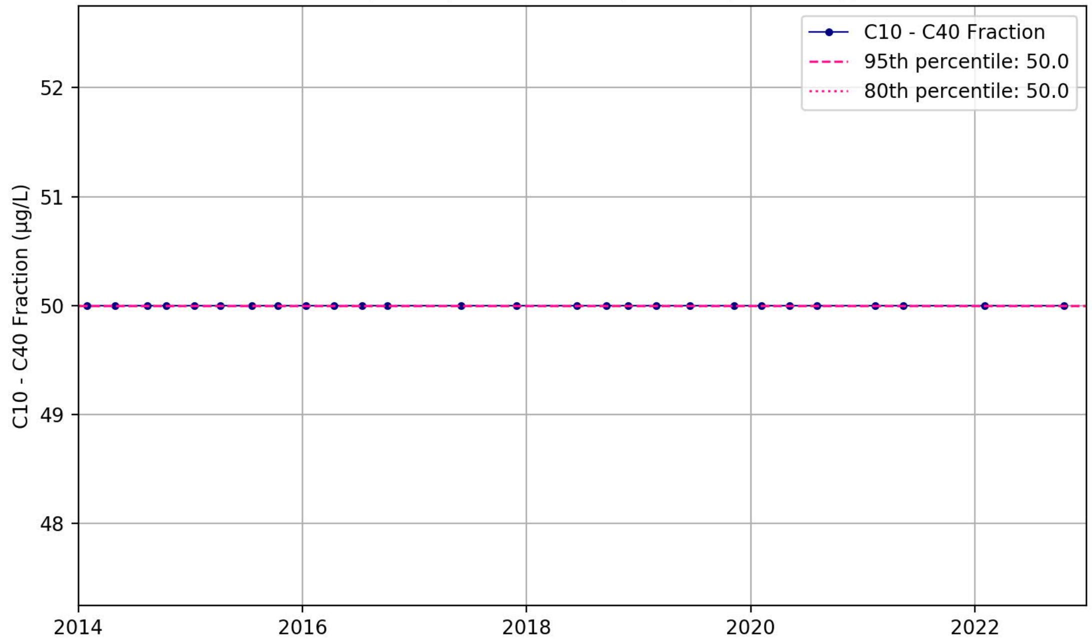

Bore MB10B | Trend (Outliers removed): decreasing | tau = -0.594 | p = 0.0

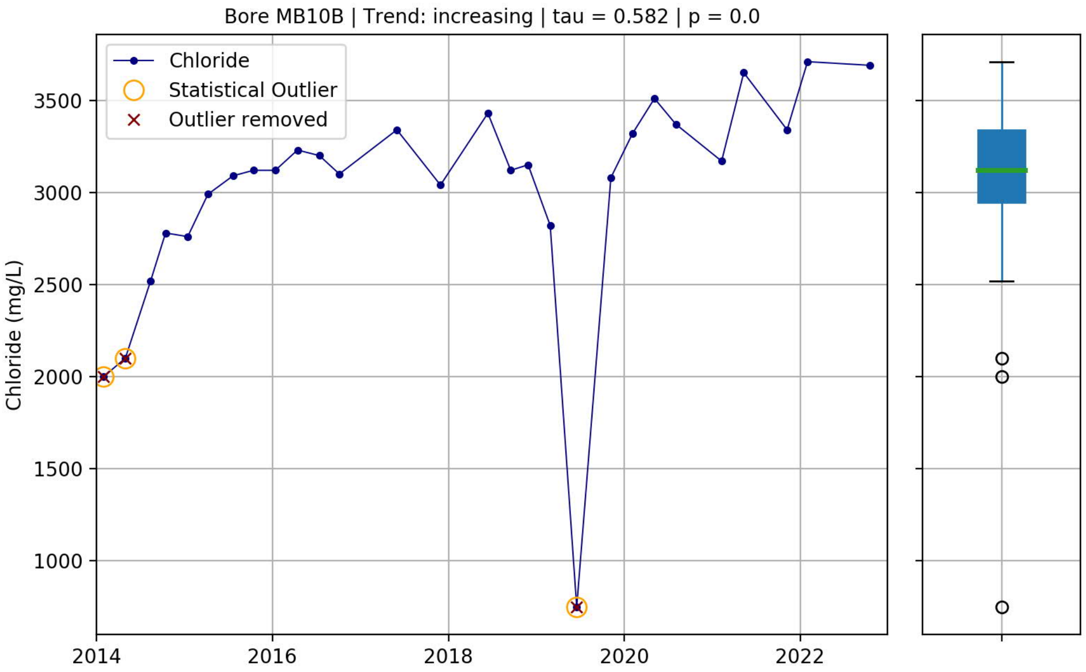


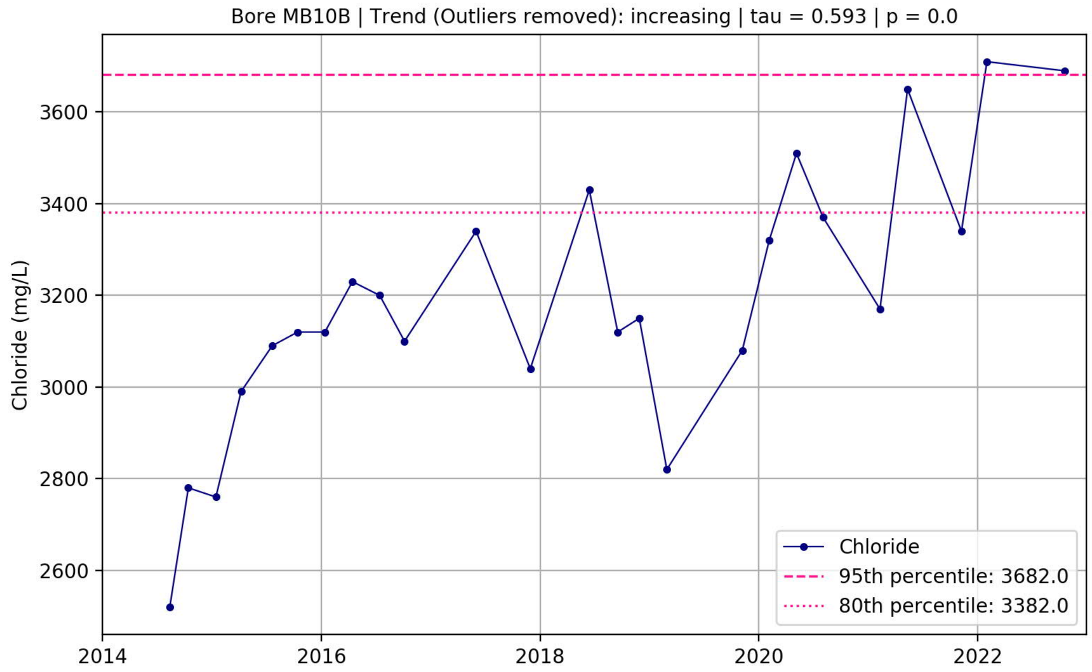

Bore MB10B | Trend: no trend | tau = 0.0 | p = 1.0

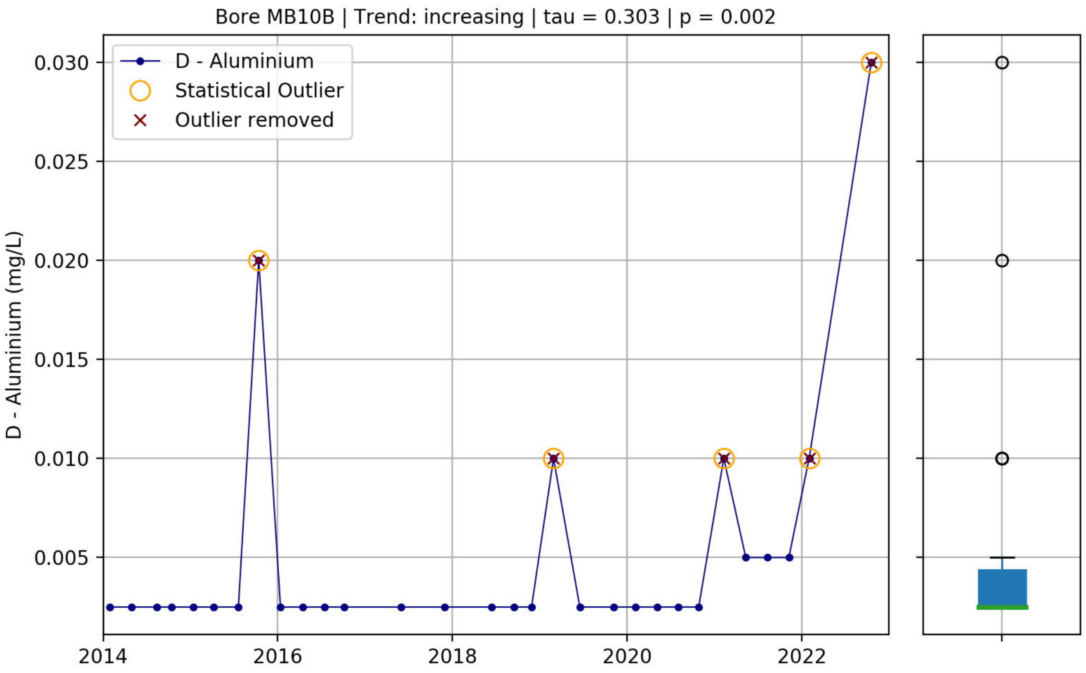


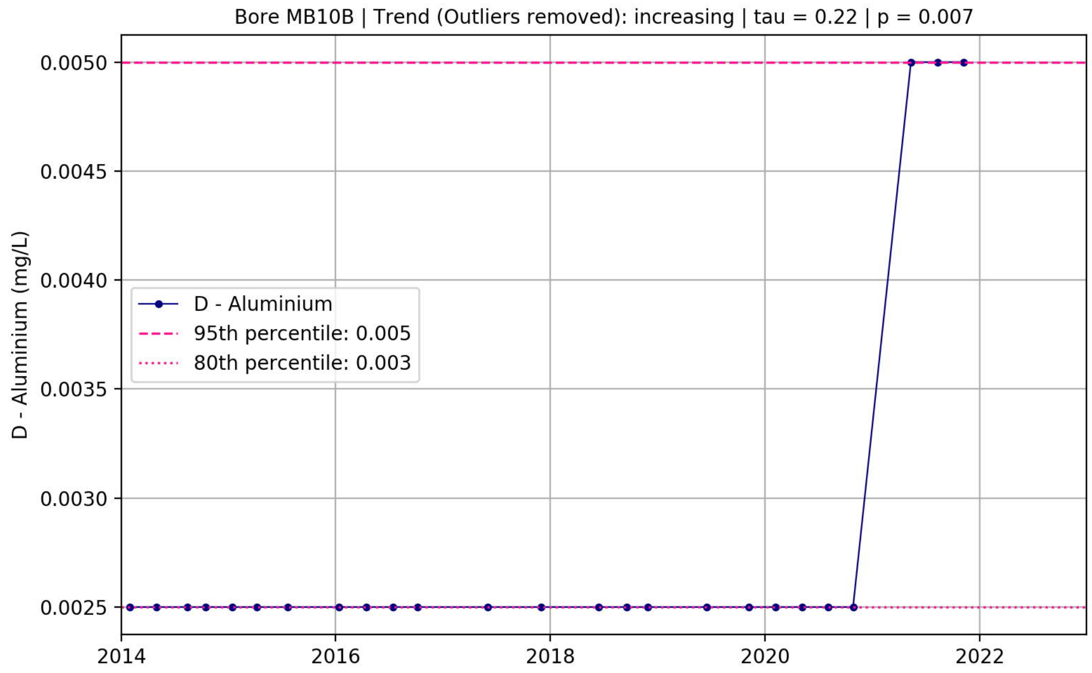

Bore MB10B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0

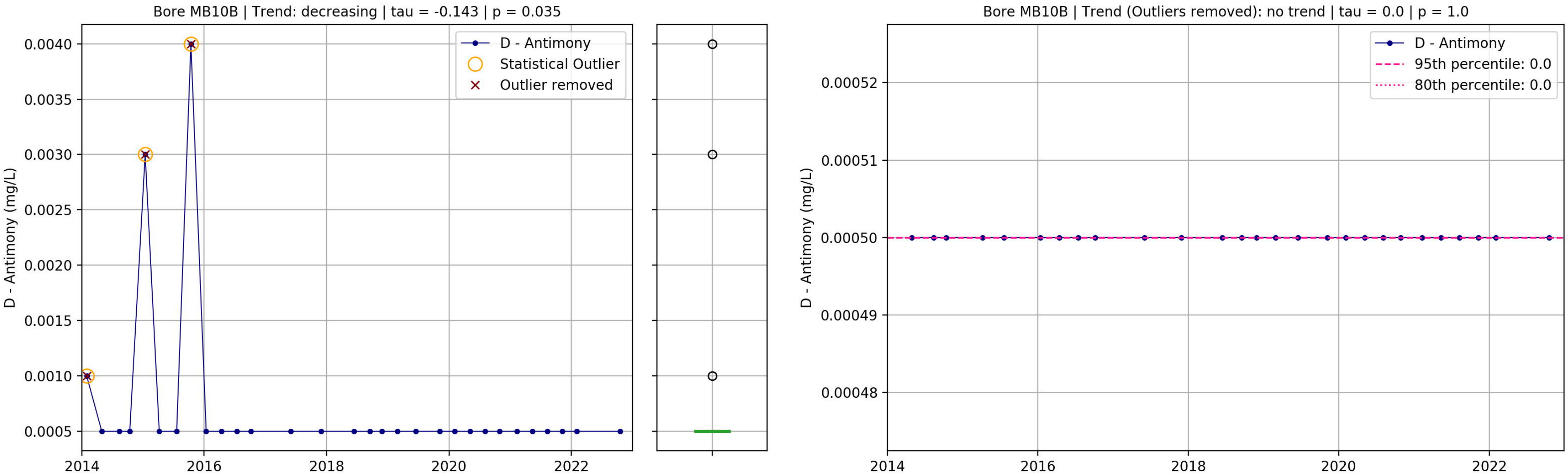


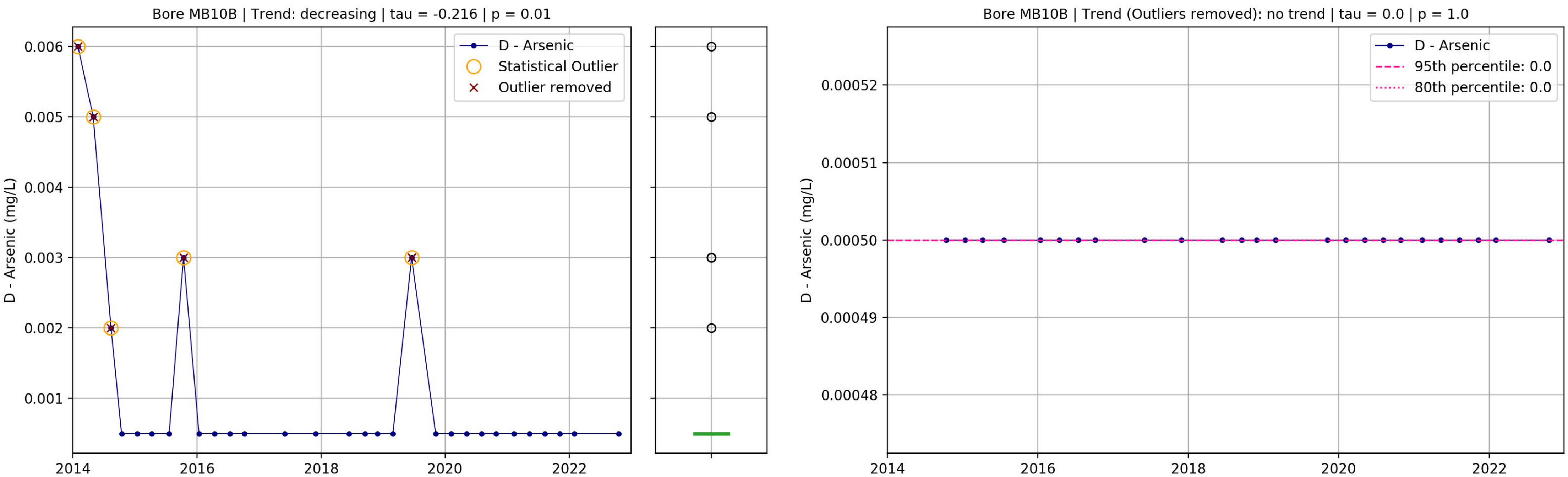

Bore MB10B | Trend: increasing | tau = 0.582 | p = 0.0
Chloride
Statistical Outlier
Outlier removed
Chloride (mg/L)
3500
3000
2500
2000
1500
1000
2014
2016
2018
2020
2022

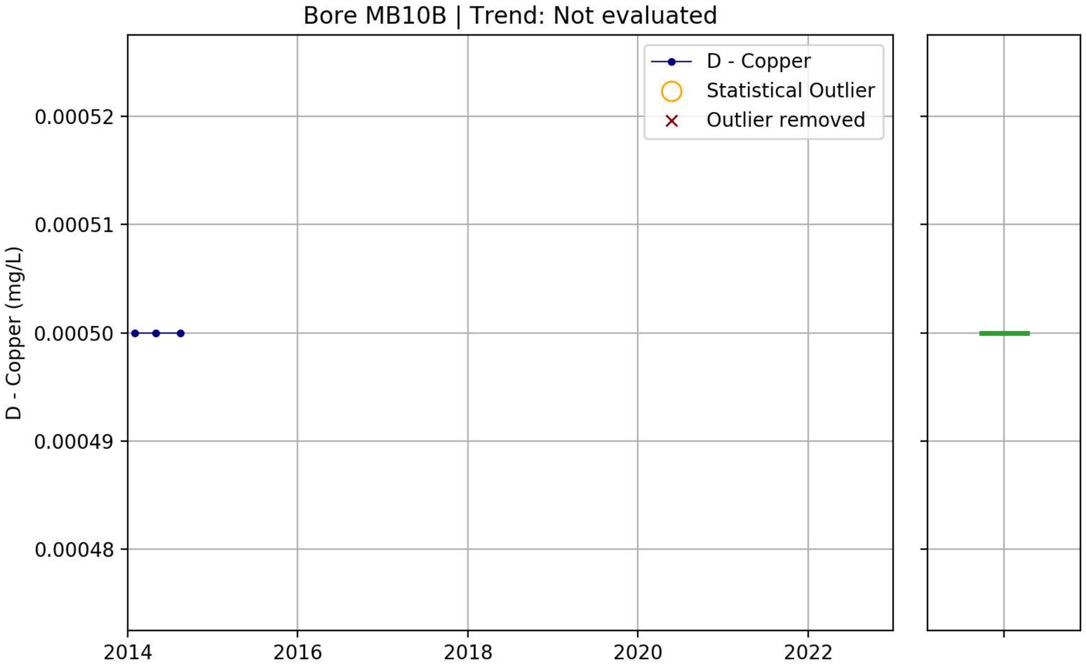

Bore MB10B | Trend (Outliers removed): increasing | tau = 0.593 | p = 0.0
Chloride (mg/L)
3600
3400
3200
3000
2800
2600
Chloride
95th percentile: 3682.0
80th percentile: 3382.0
2014
2016
2018
2020
2022

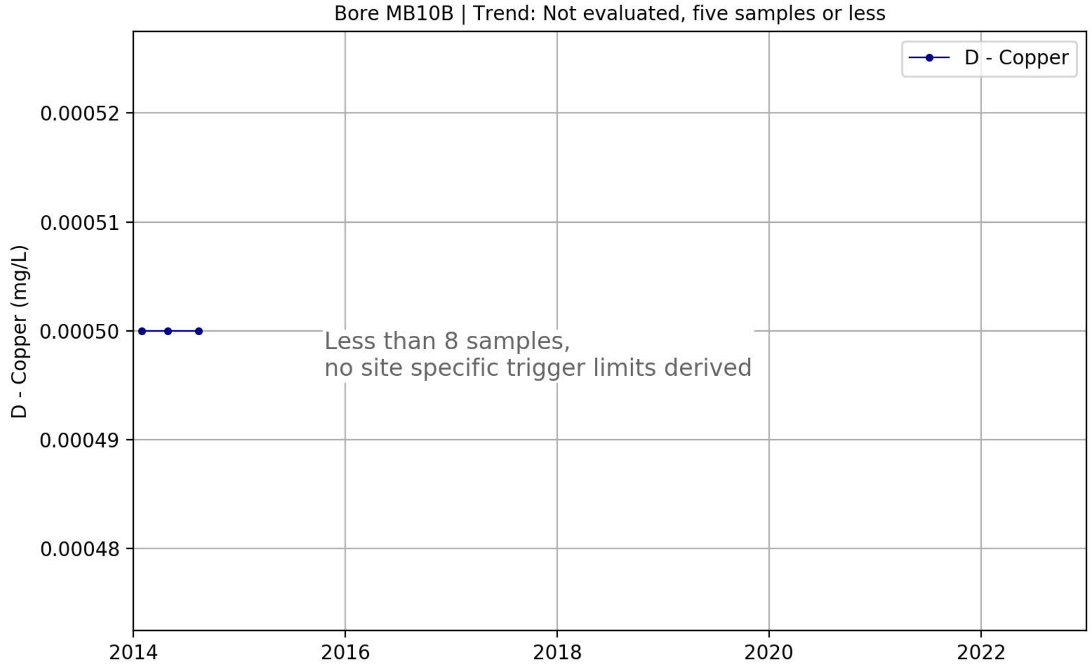

Bore MB10B | Trend: increasing | tau = 0.303 | p = 0.002
D - Aluminium
Statistical Outlier
Outlier removed
D - Aluminium (mg/L)
0.030
0.025
0.020
0.015
0.010
0.005
2014
2016
2018
2020
2022

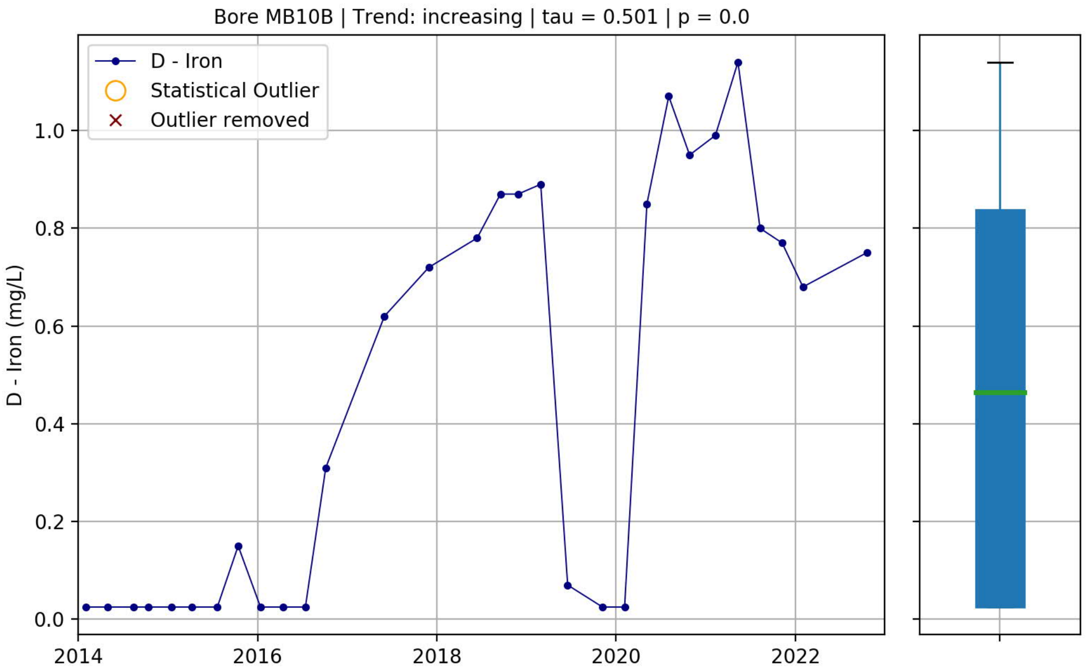

Bore MB10B | Trend (Outliers removed): increasing | tau = 0.22 | p = 0.007
D - Aluminium (mg/L)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
D - Aluminium
95th percentile: 0.005
80th percentile: 0.003
2014
2016
2018
2020
2022

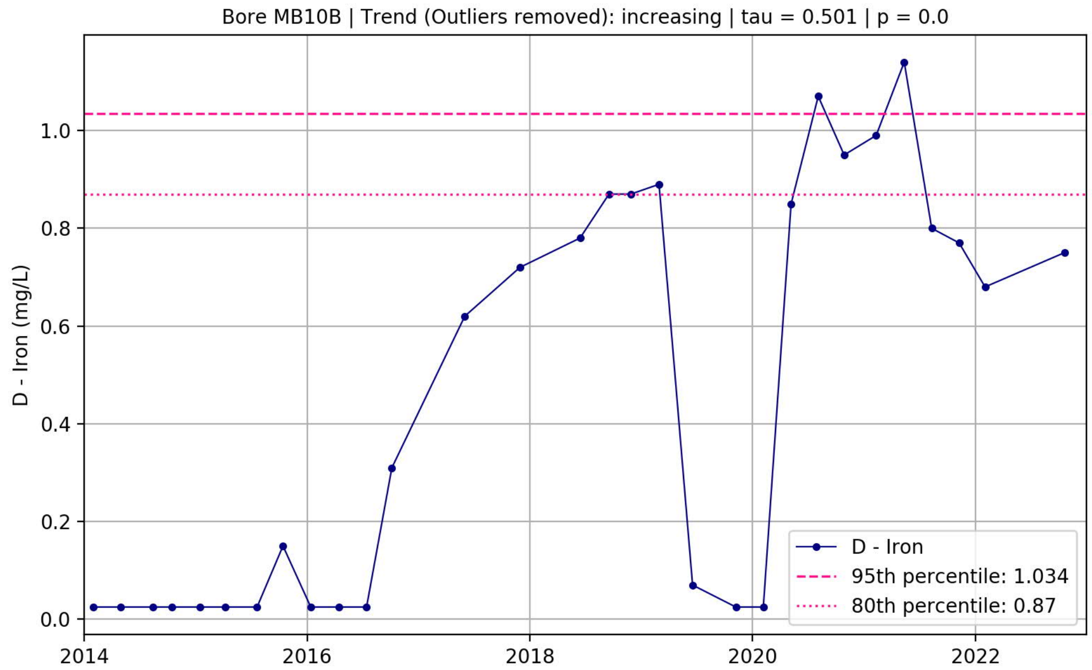

Bore MB10B | Trend: decreasing | tau = -0.143 | p = 0.035
D - Antimony
Statistical Outlier
Outlier removed
D - Antimony (mg/L)
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
2014
2016
2018
2020
2022
Bore MB10B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Antimony
95th percentile: 0.0
80th percentile: 0.0
D - Antimony (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048

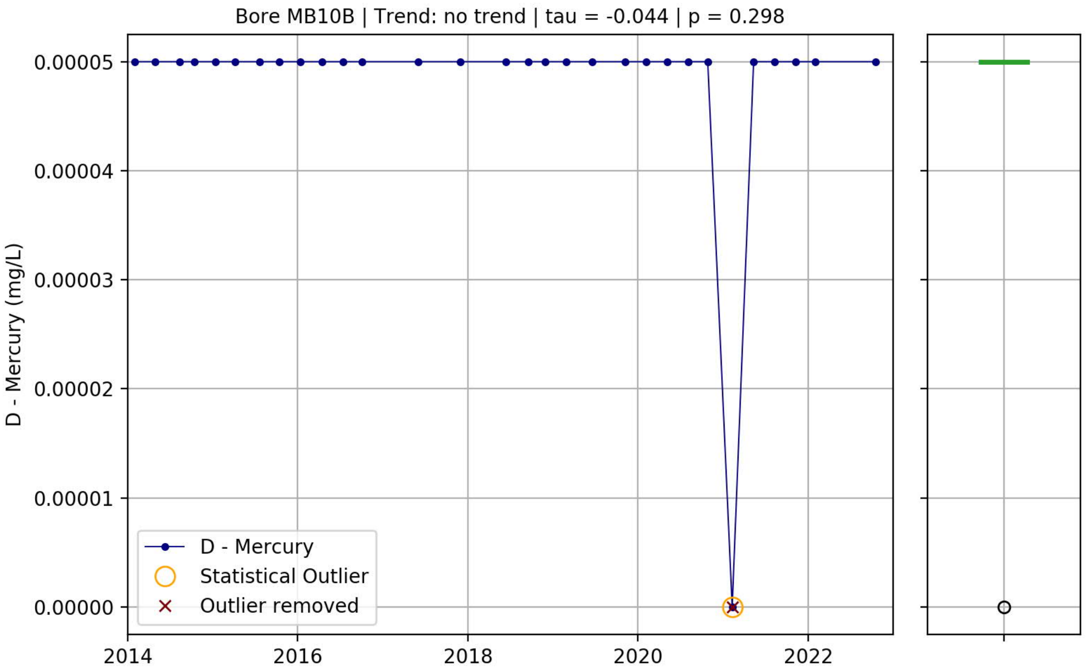

Bore MB10B | Trend: decreasing | tau = -0.216 | p = 0.01
D - Arsenic
Statistical Outlier
Outlier removed
D - Arsenic (mg/L)
0.006
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022
Bore MB10B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Arsenic
95th percentile: 0.0
80th percentile: 0.0
D - Arsenic (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048

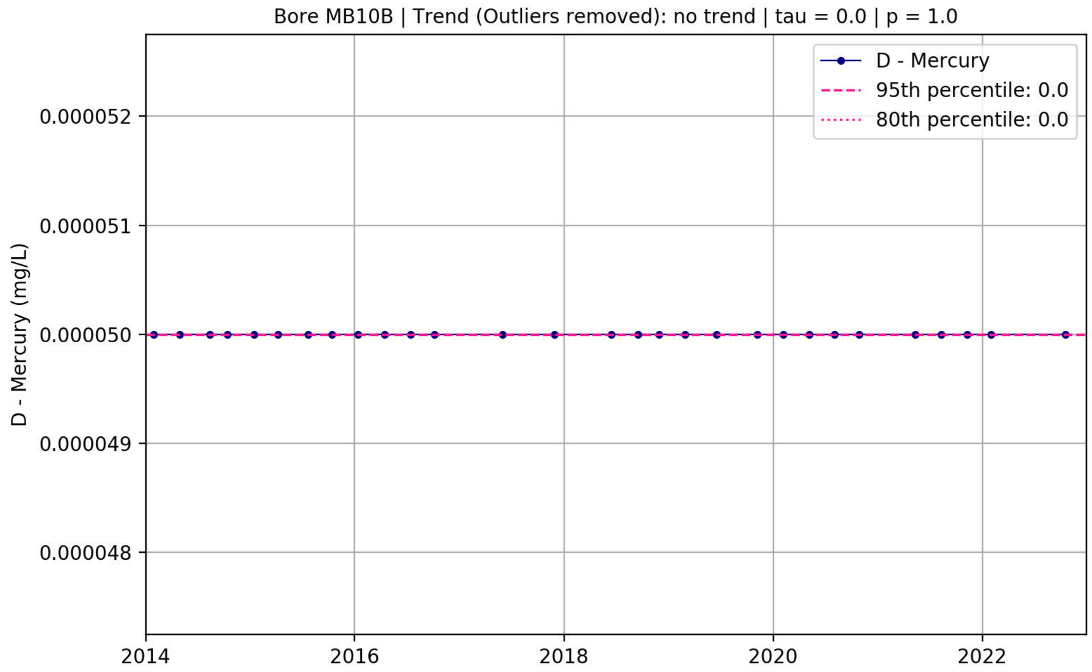

Bore MB10B | Trend: Not evaluated
D - Copper
Statistical Outlier
Outlier removed
D - Copper (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

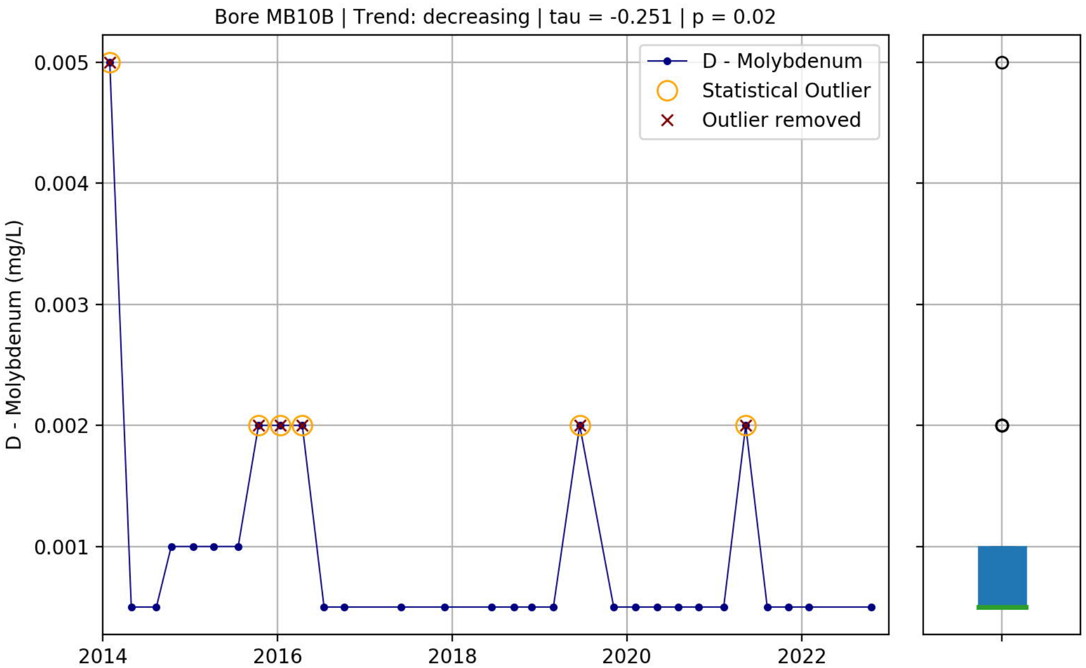

Bore MB10B | Trend: Not evaluated, five samples or less
D - Copper
Less than 8 samples,
no site specific trigger limits derived
D - Copper (mg/L)
0.00052
0.00051
0.00050
0.00049
0.00048
2014
2016
2018
2020
2022

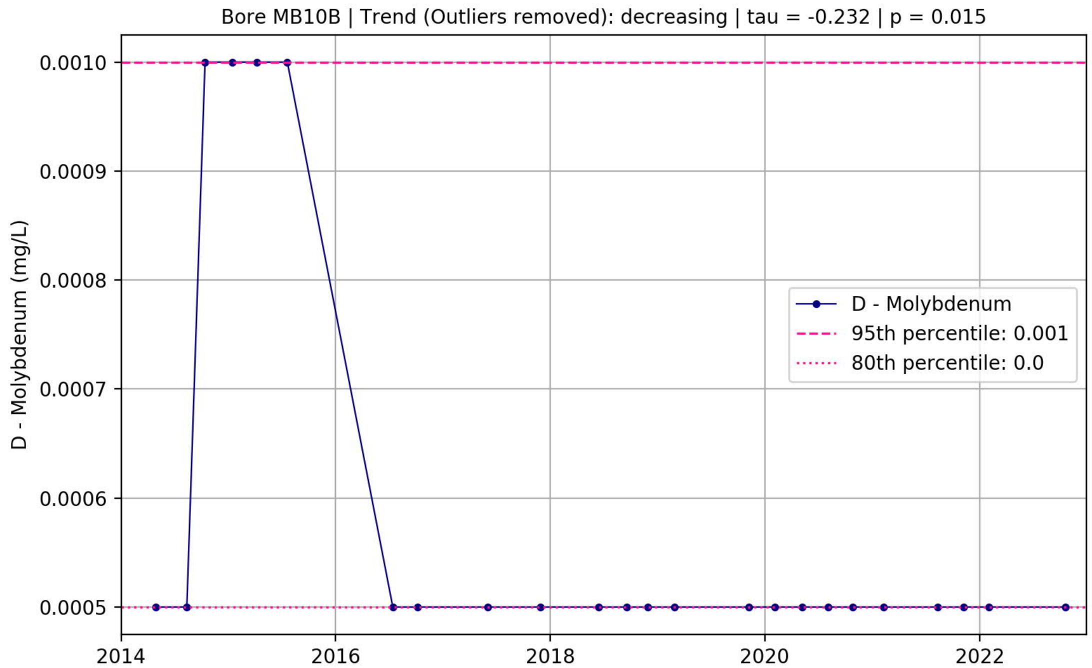

Bore MB10B | Trend: increasing | tau = 0.501 | p = 0.0
D - Iron
Statistical Outlier
Outlier removed
D - Iron (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
2014
2016
2018
2020
2022


Bore MB10B | Trend (Outliers removed): increasing | tau = 0.501 | p = 0.0
D - Iron
95th percentile: 1.034
80th percentile: 0.87
D - Iron (mg/L)
1.0
0.8
0.6
0.4
0.2
0.0
2014
2016
2018
2020
2022

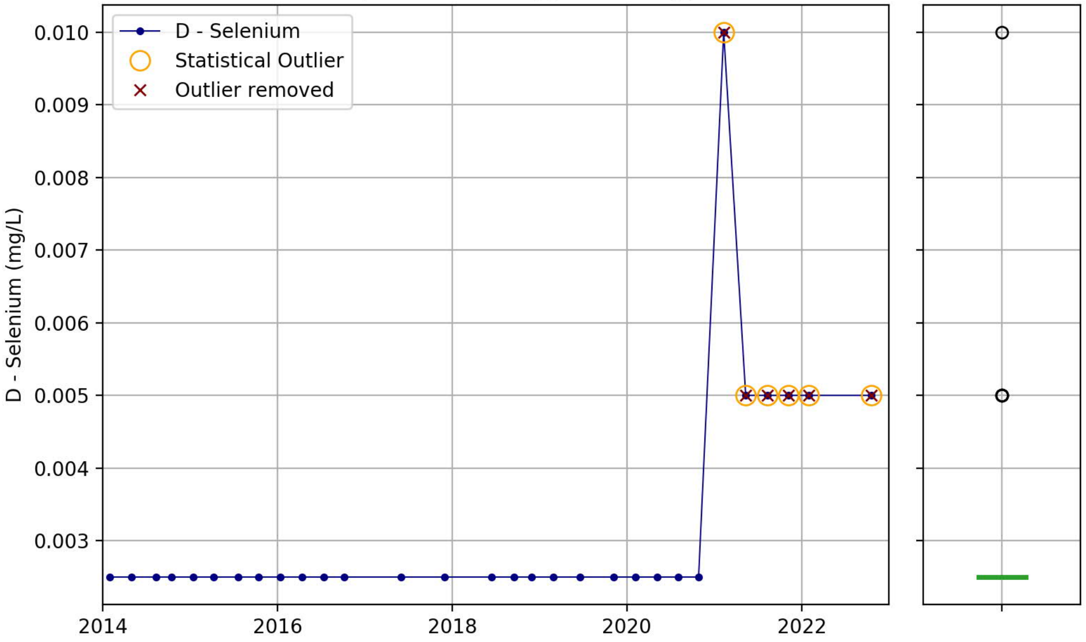

Bore MB10B | Trend: no trend | tau = -0.044 | p = 0.298
D - Mercury (mg/L)
0.00005
0.00004
0.00003
0.00002
0.00001
0.00000
2014
2016
2018
2020
2022
D - Mercury
Statistical Outlier
Outlier removed


Bore MB10B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0
D - Mercury (mg/L)
0.000052
0.000051
0.000050
0.000049
0.000048
2014
2016
2018
2020
2022
D - Mercury
95th percentile: 0.0
80th percentile: 0.0

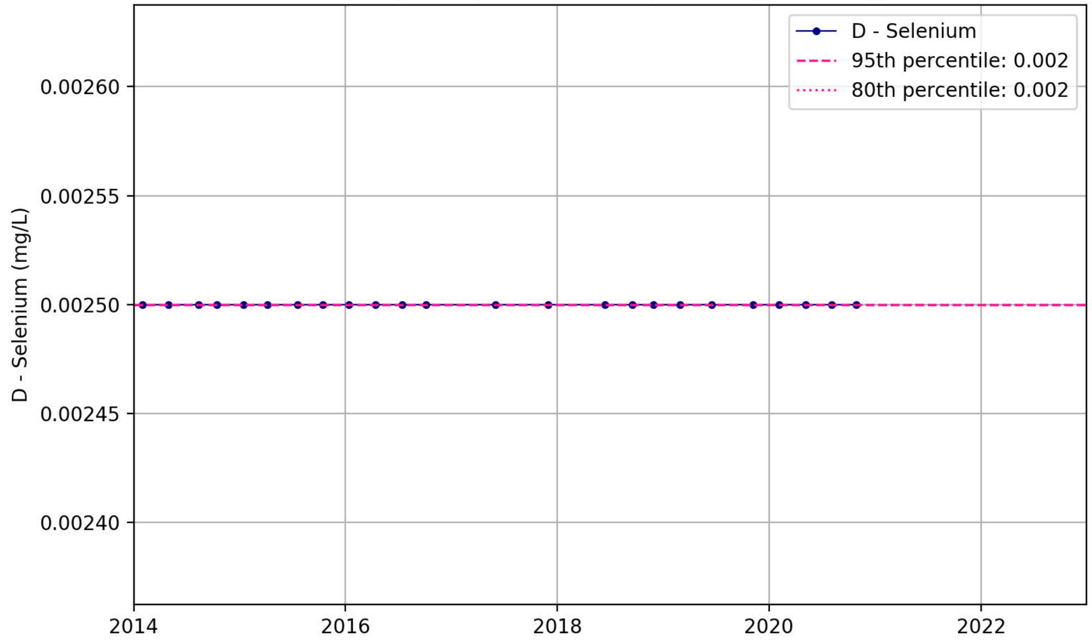

Bore MB10B | Trend: decreasing | tau = -0.251 | p = 0.02
D - Molybdenum (mg/L)
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022
D - Molybdenum
Statistical Outlier
Outlier removed


Bore MB10B | Trend (Outliers removed): decreasing | tau = -0.232 | p = 0.015
D - Molybdenum (mg/L)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
2014
2016
2018
2020
2022
D - Molybdenum
95th percentile: 0.001
80th percentile: 0.0

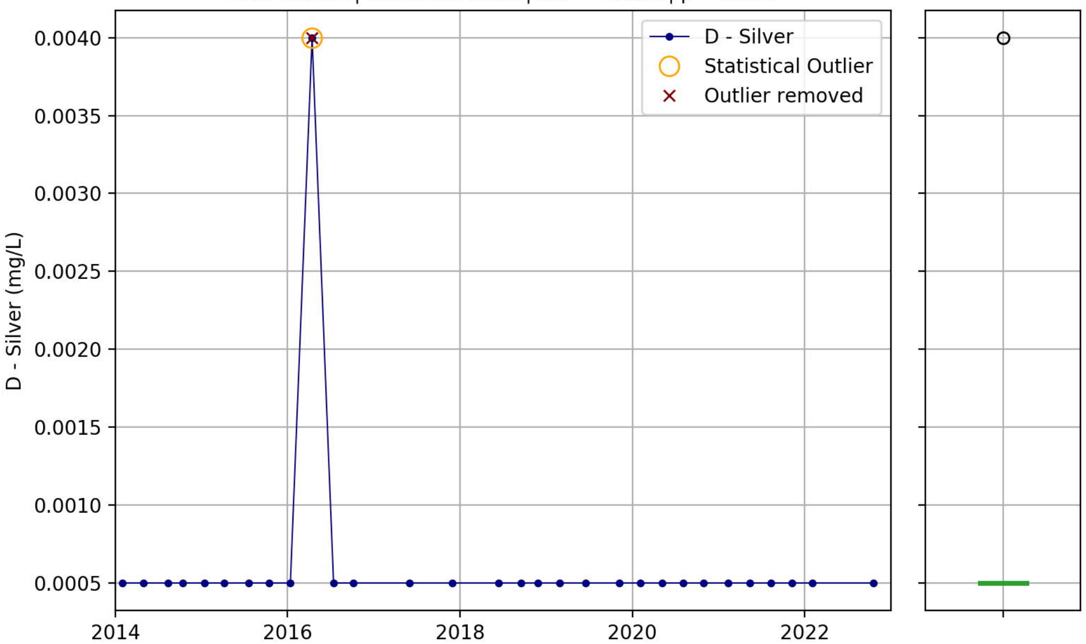
Bore MB10B | Trend: increasing | tau = 0.32 | p = 0.0



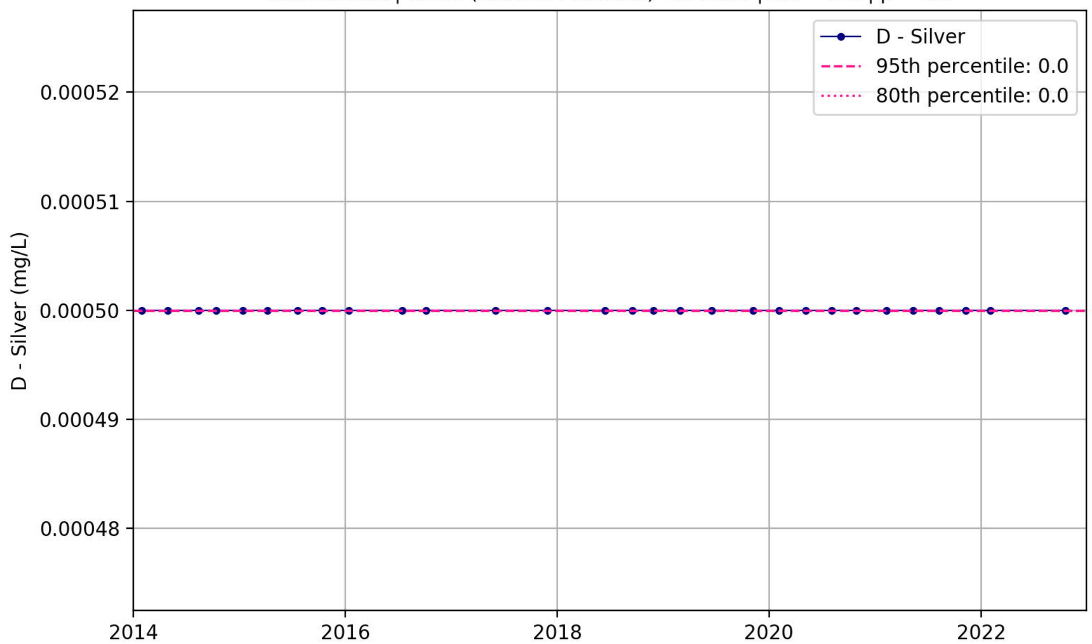

Bore MB10B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0



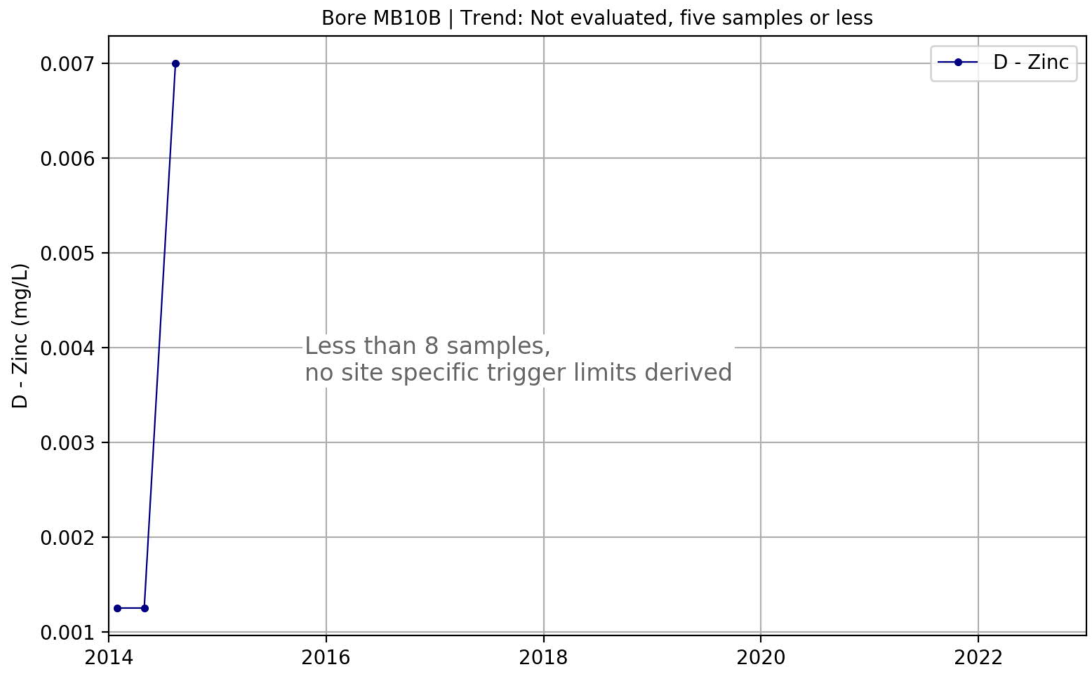

Bore MB10B | Trend: no trend | tau = -0.025 | p = 0.563

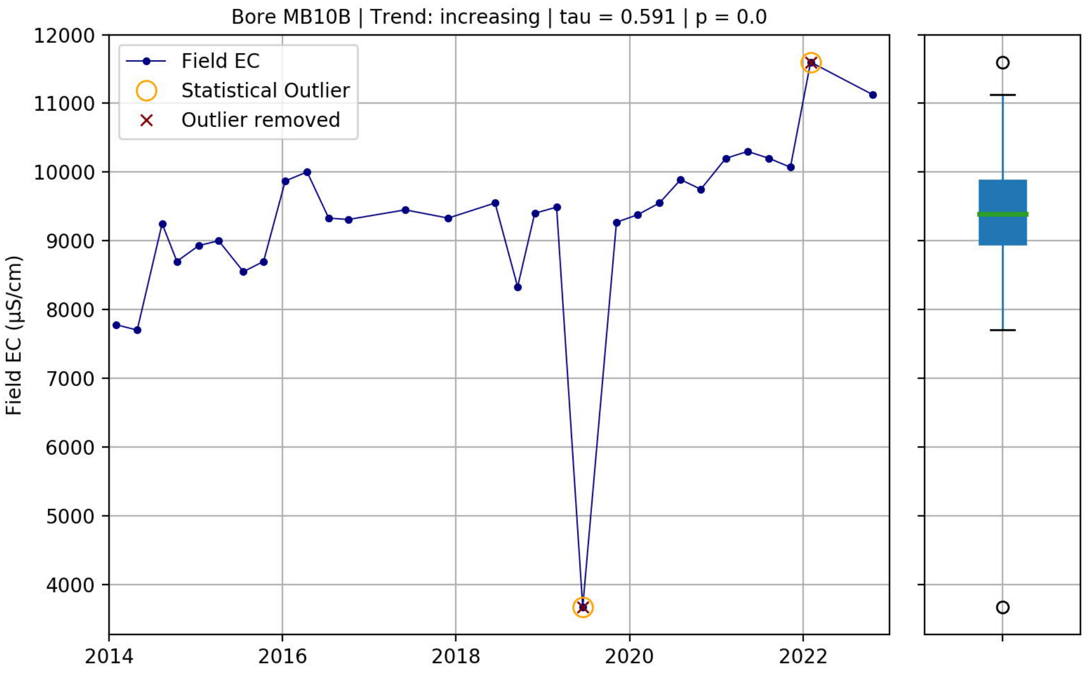


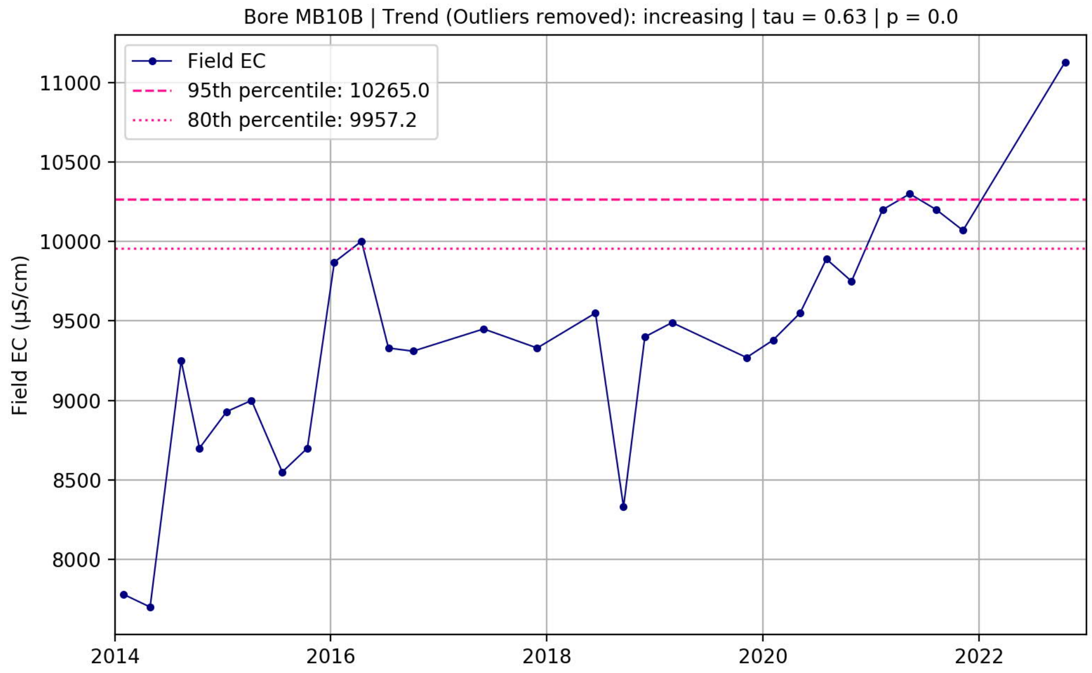

Bore MB10B | Trend (Outliers removed): no trend | tau = 0.0 | p = 1.0

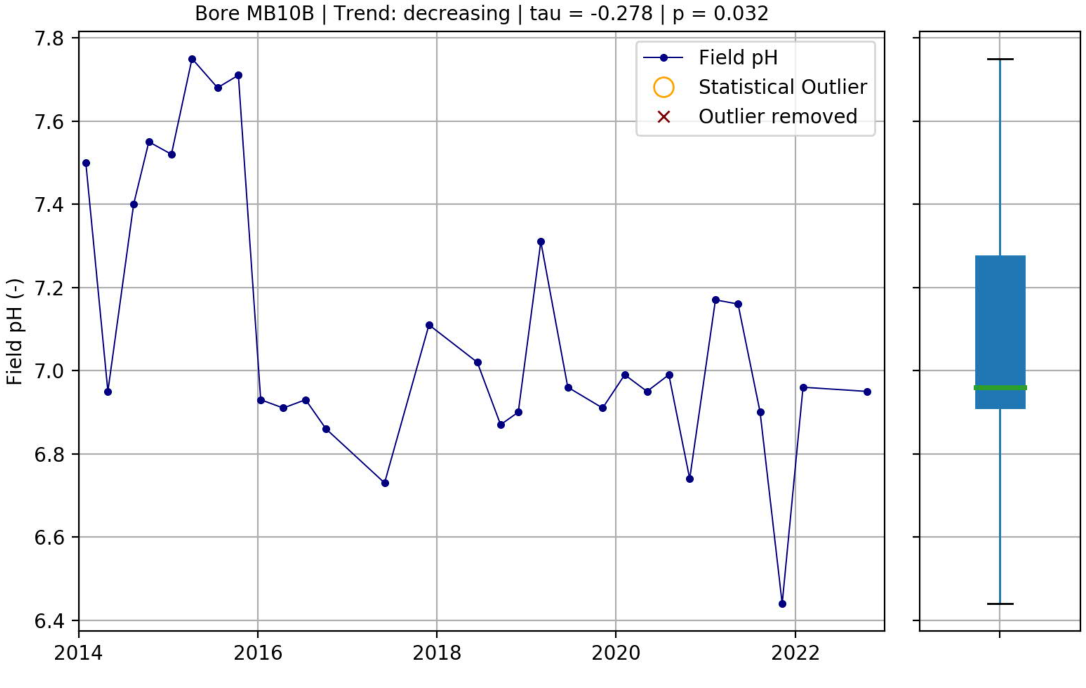


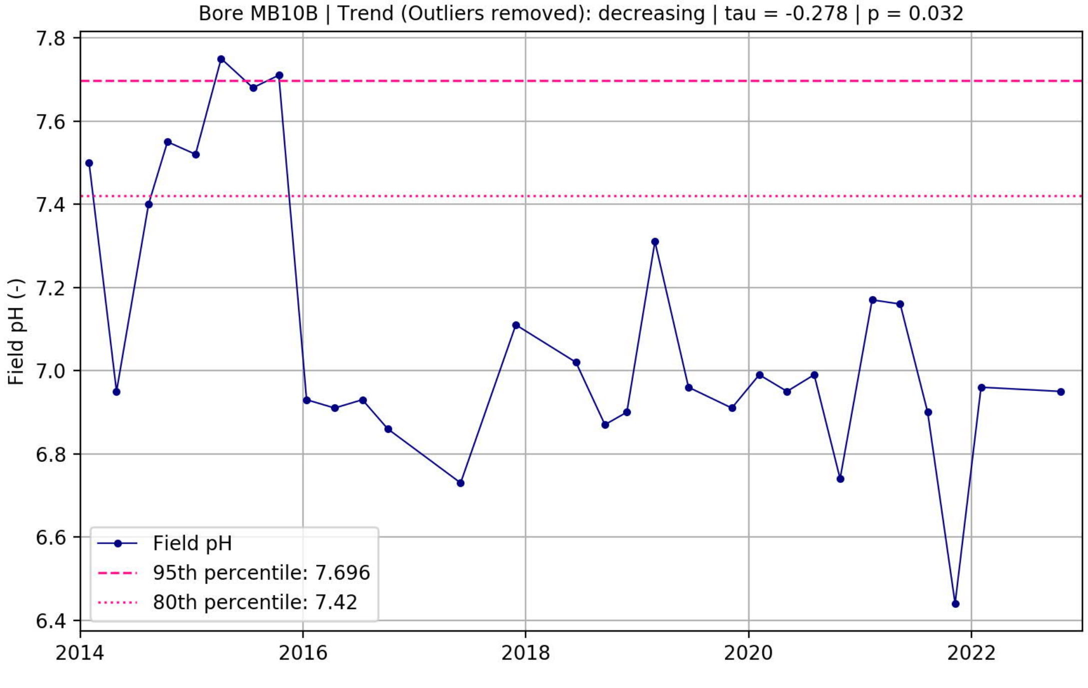

Bore MB10B | Trend: Not evaluated
D - Zinc
Statistical Outlier
Outlier removed
D - Zinc (mg/L)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022

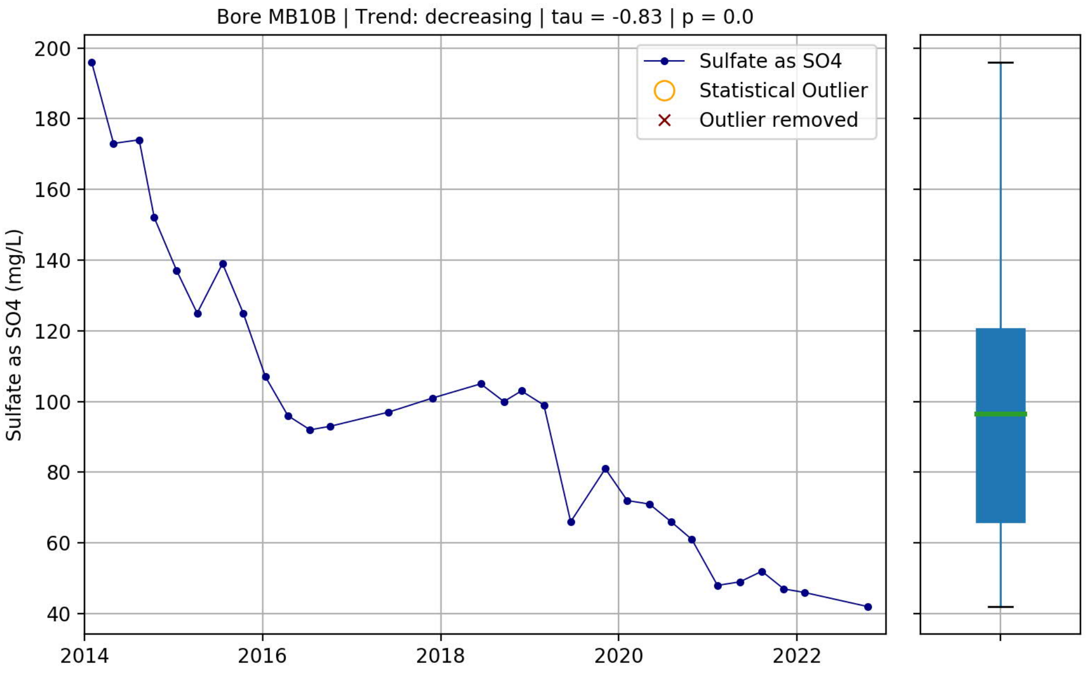

Bore MB10B | Trend: Not evaluated, five samples or less
D - Zinc
Less than 8 samples,
no site specific trigger limits derived
D - Zinc (mg/L)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
2014
2016
2018
2020
2022

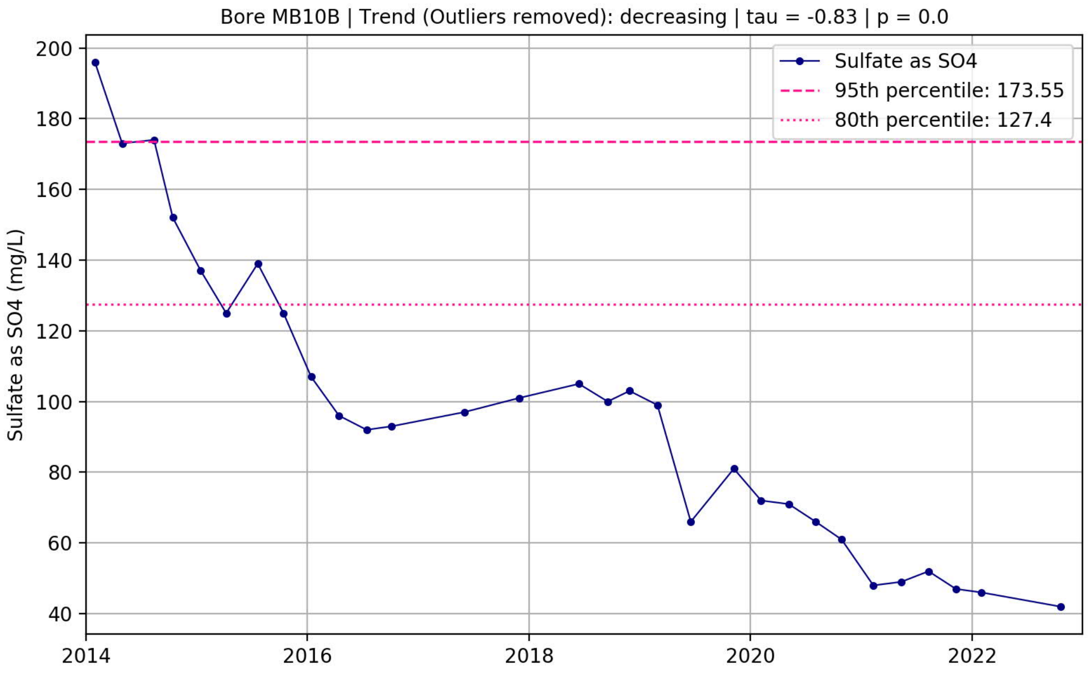

Bore MB10B | Trend: increasing | tau = 0.591 | p = 0.0
Field EC
Statistical Outlier
Outlier removed
Field EC (µS/cm)
12000
11000
10000
9000
8000
7000
6000
5000
4000
2014
2016
2018
2020
2022


Bore MB10B | Trend (Outliers removed): increasing | tau = 0.63 | p = 0.0
Field EC
95th percentile: 10265.0
80th percentile: 9957.2
Field EC (µS/cm)
11000
10500
10000
9500
9000
8500
8000
2014
2016
2018
2020
2022


Bore MB10B | Trend: decreasing | tau = -0.278 | p = 0.032
Field pH
Statistical Outlier
Outlier removed
Field pH (-)


Bore MB10B | Trend (Outliers removed): decreasing | tau = -0.278 | p = 0.032
Field pH
95th percentile: 7.696
80th percentile: 7.42
Field pH (-)


Bore MB10B | Trend: decreasing | tau = -0.83 | p = 0.0
Sulfate as SO4
Statistical Outlier
Outlier removed
Sulfate as SO4 (mg/L)


Bore MB10B | Trend (Outliers removed): decreasing | tau = -0.83 | p = 0.0
Sulfate as SO4
95th percentile: 173.55
80th percentile: 127.4
Sulfate as SO4 (mg/L)

# APPENDIX B

## Summary statistics and trigger derivation

**MB08B**

| | Field pH | Field EC | Sulfate as SO4 | Chloride | Aluminium Dissolved | Antimony Dissolved | Arsenic Dissolved | Copper - Dissolved | Iron Dissolved | Mercury Dissolved | Molybdenum Dissolved | Selenium Dissolved | Silver Dissolved | Zinc Dissolved | C6 - C10 Fraction | C10 - C40 Fraction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH Unit | (µS/cm) | 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) |
| Water quality Guidelines | | | | | | | | | | | | | | | | |
| ANZECC Aquatic Ecosystem (95%) Protection Guideline (ANZG 2018) | 6.0-7.5 | 250 | - | | 0.055 | 0.009 | 0.013 | 0.0014 | - | 0.0006 | 0.034 | 0.011 | 0.00001 | 0.008 | | |
| ANZECC Stock watering Guidelines | 6.0 - 8.5 | 7500 | 1000 | | 5 | - | 0.5 | 0.4 | - | 0.002 | 0.15 | 0.02 | - | 20 | | |
| ANZECC Guidelines – Irrigation ST | 6.0 - 8.5 | | | | 20 | | 2 | 5 | 10 | 0.002 | 0.05 | 0.05 | | 5 | | |
| ANZECC Guidelines – Irrigation LT | 6.0 - 8.5 | | | | 5 | | 0.1 | 0.2 | 0.2 | 0.002 | 0.01 | 0.02 | | 2 | | |
| Fitzroy WQ1310 WQO Zone 34 (shallow) | 7.1-8.1 | 8910 | 318 | 3185 | - | | - | 0.03 | 0.14 | - | - | - | | 0.06 | | |
| Fitzroy WQ1310 WQO Zone 34 (deep) | 7.4-8.0 | 16000 | 398 | 5905 | | | | 0.03 | 0.246 | | | | | 0.317 | | |
| DES, 2013 | | | | | | | | | | | | | | | 20 | 100 |
| Statistics | | | | | | | | | | | | | | | | |
| Count | 29 | 25 | 33 | 30 | 29 | 28 | 25 | 2 | 33 | 31 | 28 | 26 | 29 | 2 | 25 | 28 |
| % of values below LOR | 0 | 0 | 0 | 0 | 100 | 79 | 100 | 100 | 48 | 100 | 100 | 100 | 100 | 0 | 68 | 100 |
| Minimum Date | 30/01/2014 | 14/04/2016 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 21/07/2015 | 30/01/2014 |
| Maximum Date | 18/10/2022 | 18/10/2022 | 18/10/2022 | 18/10/2022 | 18/10/2022 | 18/10/2022 | 18/10/2022 | 30/04/2014 | 18/10/2022 | 18/10/2022 | 24/05/2022 | 27/10/2020 | 18/10/2022 | 30/04/2014 | 18/10/2022 | 24/05/2022 |
| Minimum | 6.3 | 19720 | 232 | 7540 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.026 | 10 | 50 |
| 5th percentile | 6.4 | 20340 | 235 | 7599 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.03355 | 10 | 50 |
| 20th Percentile | 6.7 | 20832 | 250 | 7778 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.0562 | 10 | 50 |
| Median | 6.9 | 21620 | 430 | 8060 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.72 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.1015 | 10 | 50 |
| 80th Percentile | 7.1 | 23140 | 470 | 8334 | 0.0035 | 0.0008 | 0.0005 | 0.0005 | 4.53 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.1468 | 20 | 50 |
| 95th Percentile | 7.3 | 24240 | 483 | 8520 | 0.005 | 0.00365 | 0.0005 | 0.0005 | 5.30 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.16945 | 28 | 50 |
| Maxiumum | 7.4 | 24400 | 503 | 8600 | 0.005 | 0.004 | 0.0005 | 0.0005 | 5.53 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.177 | 30 | 50 |
| Trigger derivation considerations | | | | | | | | | | | | | | | | |
| Trigger Development not possbile due less than 8 samples | | | | | | | | x | | | | | | x | | |
| Trigger Development not possbile due to more than 15% of values <LOR | | | | | x | x | x | x | x | x | x | x | x | | x | x |
| Mann Kendall trend | | | increasing | | increasing | decreasing | | | increasing | | | | | | increasing | |
| Proposed Trigger limits | | | | | | | | | | | | | | | | |
| Limit A (80th Percentile) | | 23140 | 470 | 8334 | | | | | | | | | | | | |
| Limit B (95th Percentile) or applicable guideline | 6.0-7.5 | 24240 | 483 | 8520 | 0.055 | 0.009 | 0.013 | 0.001 | 0.246 | 0.0006 | 0.034 | 0.011 | below LOR | 0.317 | 20 | 100 |

## MB09A

| | Field pH | Field EC | Sulfate as SO4 | Chloride | Aluminium Dissolved | Antimony Dissolved | Arsenic Dissolved | Copper - Dissolved | Iron Dissolved | Mercury Dissolved | Molybdenum Dissolved | Selenium Dissolved | Silver Dissolved | Zinc Dissolved | C6 - C10 Fraction | C10 - C40 Fraction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH Unit | (µS/cm) | 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) |
| Water quality Guidelines | | | | | | | | | | | | | | | | |
| ANZECC Aquatic Ecosystem (95%) Protection Guideline (ANZG 2018) | 6.0-7.5 | 250 | - | | 0.055 | 0.009 | 0.013 | 0.0014 | - | 0.0006 | 0.034 | 0.011 | 0.00001 | 0.008 | | |
| ANZECC Stock watering Guidelines | 6.0 - 8.5 | 7500 | 1000 | | 5 | - | 0.5 | 0.4 | - | 0.002 | 0.15 | 0.02 | - | 20 | | |
| ANZECC Guidelines – Irrigation ST | 6.0 - 8.5 | | | | 20 | | 2 | 5 | 10 | 0.002 | 0.05 | 0.05 | | 5 | | |
| ANZECC Guidelines – Irrigation LT | 6.0 - 8.5 | | | | 5 | | 0.1 | 0.2 | 0.2 | 0.002 | 0.01 | 0.02 | | 2 | | |
| Fitzroy WQ1310 WQO Zone 34 (shallow) | 7.1-8.1 | 8910 | 318 | 3185 | - | | - | 0.03 | 0.14 | - | - | - | | 0.06 | | |
| Fitzroy WQ1310 WQO Zone 34 (deep) | 7.4-8.0 | 16000 | 398 | 5905 | | | | 0.03 | 0.246 | | | | | 0.317 | | |
| DES, 2013 | | | | | | | | | | | | | | | 20 | 100 |
| Statistics | | | | | | | | | | | | | | | | |
| Count | 27 | 30 | 33 | 31 | 31 | 26 | 26 | 2 | 29 | 31 | 31 | 26 | 33 | 2 | 28 | 25 |
| % of values below LOR | 0 | 0 | 0 | 0 | 81 | 88 | 100 | 50 | 62 | 100 | 68 | 100 | 100 | 50 | 100 | 100 |
| Minimum Date | 30/04/2014 | 14/10/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 | 30/04/2014 |
| Maximum Date | 19/10/2022 | 19/10/2022 | 19/10/2022 | 19/10/2022 | 24/05/2022 | 24/05/2022 | 24/05/2022 | 22/07/2014 | 24/05/2022 | 19/10/2022 | 19/10/2022 | 27/10/2020 | 19/10/2022 | 22/07/2014 | 19/10/2022 | 24/05/2022 |
| Minimum | 6.5 | 16770 | 41 | 5590 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.00125 | 10 | 50 |
| 5th percentile | 6.6 | 16789 | 50 | 5820 | 0.0025 | 0.0005 | 0.0005 | 0.000725 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.0023875 | 10 | 50 |
| 20th Percentile | 6.7 | 17308 | 66 | 6140 | 0.0025 | 0.0005 | 0.0005 | 0.0014 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.0058 | 10 | 50 |
| Median | 6.8 | 17860 | 91 | 6340 | 0.0025 | 0.0005 | 0.0005 | 0.00275 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.012625 | 10 | 50 |
| 80th Percentile | 6.9 | 19080 | 100 | 6690 | 0.01 | 0.0005 | 0.0005 | 0.0041 | 0.09 | 0.00005 | 0.0025 | 0.0025 | 0.0005 | 0.01945 | 10 | 50 |
| 95th Percentile | 7.3 | 20329 | 109 | 6785 | 0.02 | 0.001 | 0.0005 | 0.004775 | 0.15 | 0.00005 | 0.004 | 0.0025 | 0.0005 | 0.0228625 | 10 | 50 |
| Maxiumum | 7.5 | 20600 | 110 | 6800 | 0.02 | 0.001 | 0.0005 | 0.005 | 0.22 | 0.00005 | 0.005 | 0.0025 | 0.0005 | 0.024 | 10 | 50 |
| Trigger derivation considerations | | | | | | | | | | | | | | | | |
| Trigger Development not possbile due less than 8 samples | | | | | | | | x | | | | | | x | | |
| Trigger Development not possbile due to more than 15% of values <LOR | | | | | x | x | x | x | x | x | x | x | x | x | x | x |
| Mann Kendall trend | | | | | increasing | | | | increasing | | | | | | | |
| Proposed Trigger limits | | | | | | | | | | | | | | | | |
| Limit A (80th Percentile) | | 19080 | 100 | 6690 | | | | | | | | | | | | |
| Limit B (95th Percentile) or applicable guideline | 6.0-7.5 | 20329 | 109 | 6785 | 0.055 | 0.009 | 0.013 | 0.030 | 0.14 | 0.0006 | 0.034 | 0.011 | below LOR | 0.060 | 20 | 100 |

## MB09B

| | Field pH | Field EC | Sulfate as SO4 | Chloride | Aluminium Dissolved | Antimony Dissolved | Arsenic Dissolved | Copper - Dissolved | Iron Dissolved | Mercury Dissolved | Molybdenum Dissolved | Selenium Dissolved | Silver Dissolved | Zinc Dissolved | C6 - C10 Fraction | C10 - C40 Fraction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH Unit | (µS/cm) | 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) |
| Water quality Guidelines | | | | | | | | | | | | | | | | |
| ANZECC Aquatic Ecosystem (95%) Protection Guideline (ANZG 2018) | 6.0-7.5 | 250 | - | | 0.055 | 0.009 | 0.013 | 0.0014 | - | 0.0006 | 0.034 | 0.011 | 0.00001 | 0.008 | | |
| ANZECC Stock watering Guidelines | 6.0 - 8.5 | 7500 | 1000 | | 5 | - | 0.5 | 0.4 | - | 0.002 | 0.15 | 0.02 | - | 20 | | |
| ANZECC Guidelines – Irrigation ST | 6.0 - 8.5 | | | | 20 | | 2 | 5 | 10 | 0.002 | 0.05 | 0.05 | | 5 | | |
| ANZECC Guidelines – Irrigation LT | 6.0 - 8.5 | | | | 5 | | 0.1 | 0.2 | 0.2 | 0.002 | 0.01 | 0.02 | | 2 | | |
| Fitzroy WQ1310 WQO Zone 34 (shallow) | 7.1-8.1 | 8910 | 318 | 3185 | - | | - | 0.03 | 0.14 | - | - | - | | 0.06 | | |
| Fitzroy WQ1310 WQO Zone 34 (deep) | 7.4-8.0 | 16000 | 398 | 5905 | | | | 0.03 | 0.246 | | | | | 0.317 | | |
| DES, 2013 | | | | | | | | | | | | | | | 20 | 100 |
| Statistics | | | | | | | | | | | | | | | | |
| Count | 27 | 34 | 34 | 32 | 32 | 34 | 34 | 3 | 33 | 34 | 31 | 27 | 34 | 3 | 25 | 28 |
| % of values below LOR | 0 | 0 | 12 | 0 | 59 | 65 | 26 | 100 | 52 | 100 | 0 | 100 | 100 | 67 | 40 | 100 |
| Minimum Date | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/04/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 22/07/2014 | 30/01/2014 |
| Maximum Date | 19/10/2022 | 19/10/2022 | 19/10/2022 | 19/10/2022 | 24/05/2022 | 19/10/2022 | 19/10/2022 | 22/07/2014 | 24/05/2022 | 19/10/2022 | 19/10/2022 | 27/10/2020 | 19/10/2022 | 22/07/2014 | 19/10/2022 | 24/05/2022 |
| Minimum | 7.1 | 3710 | 1 | 1340 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.003 | 0.0025 | 0.0005 | 0.00125 | 10 | 50 |
| 5th percentile | 7.3 | 5076 | 1 | 1377 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.004 | 0.0025 | 0.0005 | 0.00125 | 10 | 50 |
| 20th Percentile | 7.4 | 5374 | 2 | 1434 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.006 | 0.0025 | 0.0005 | 0.00125 | 10 | 50 |
| Median | 7.4 | 8740 | 14 | 1715 | 0.00375 | 0.0005 | 0.002 | 0.0005 | 0.025 | 0.00005 | 0.008 | 0.0025 | 0.0005 | 0.00125 | 60 | 50 |
| 80th Percentile | 7.5 | 11974 | 66 | 3902 | 0.01 | 0.0034 | 0.003 | 0.0005 | 1.54 | 0.00005 | 0.009 | 0.0025 | 0.0005 | 0.0089 | 80 | 50 |
| 95th Percentile | 7.7 | 12766 | 79 | 4356 | 0.02 | 0.004 | 0.004 | 0.0005 | 1.94 | 5E-05 | 0.01 | 0.0025 | 0.0005 | 0.012725 | 116 | 50 |
| Maxiumum | 7.8 | 13100 | 97 | 4480 | 0.02 | 0.004 | 0.004 | 0.0005 | 2.5 | 0.00005 | 0.012 | 0.0025 | 0.0005 | 0.014 | 190 | 50 |
| Trigger derivation considerations | | | | | | | | | | | | | | | | |
| Trigger Development not possbile due less than 8 samples | | | | | | | | x | | | | | | x | | |
| Trigger Development not possbile due to more than 15% of values <LOR | | | | | x | x | x | x | x | x | | x | x | x | x | x |
| Mann Kendall trend | decreasing | increasing | decreasing | increasing | | | | | increasing | | decreasing | | | | | |
| Proposed Trigger limits | | | | | | | | | | | | | | | | |
| Limit A (80th Percentile) | | | 66 | | | | | | | | | | | | | |
| Limit B (95th Percentile) or applicable guideline | 6.0-7.5 | 16000 | 79 | 5905 | 0.055 | 0.009 | 0.013 | 0.0014 | 0.246 | 0.0006 | 0.034 | 0.011 | below LOR | 0.008 | 20 | 100 |

## MB10A

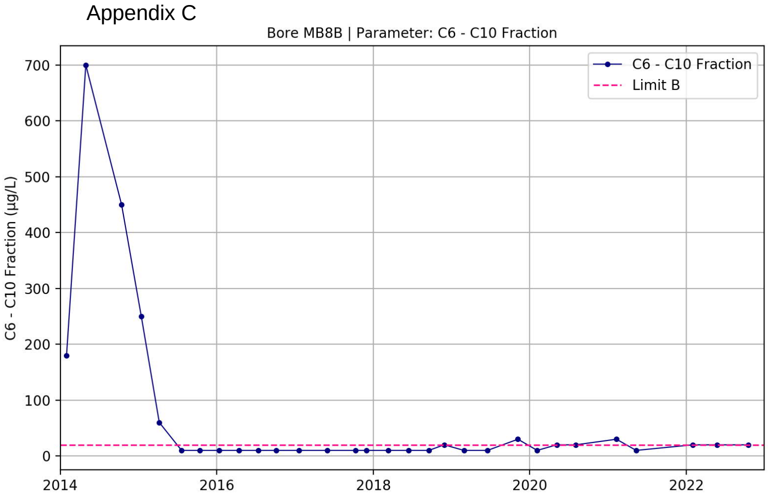
| | Field pH | Field EC | Sulfate as SO4 | Chloride | Aluminium Dissolved | Antimony Dissolved | Arsenic Dissolved | Copper - Dissolved | Iron Dissolved | Mercury Dissolved | Molybdenum Dissolved | Selenium Dissolved | Silver Dissolved | Zinc Dissolved | C6 - C10 Fraction | C10 - C40 Fraction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH Unit | (µS/cm) | 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) |
| Water quality Guidelines | | | | | | | | | | | | | | | | |
| ANZECC Aquatic Ecosystem (95%) Protection Guideline (ANZG 2018) | 6.0-7.5 | 250 | - | | 0.055 | 0.009 | 0.013 | 0.0014 | - | 0.0006 | 0.034 | 0.011 | 0.00001 | 0.008 | | |
| ANZECC Stock watering Guidelines | 6.0 - 8.5 | 7500 | 1000 | | 5 | - | 0.5 | 0.4 | - | 0.002 | 0.15 | 0.02 | - | 20 | | |
| ANZECC Guidelines – Irrigation ST | 6.0 - 8.5 | | | | 20 | | 2 | 5 | 10 | 0.002 | 0.05 | 0.05 | | 5 | | |
| ANZECC Guidelines – Irrigation LT | 6.0 - 8.5 | | | | 5 | | 0.1 | 0.2 | 0.2 | 0.002 | 0.01 | 0.02 | | 2 | | |
| Fitzroy WQ1310 WQO Zone 34 (shallow) | 7.1-8.1 | 8910 | 318 | 3185 | - | | - | 0.03 | 0.14 | - | - | - | | 0.06 | | |
| Fitzroy WQ1310 WQO Zone 34 (deep) | 7.4-8.0 | 16000 | 398 | 5905 | | | | 0.03 | 0.246 | | | | | 0.317 | | |
| DES, 2013 | | | | | | | | | | | | | | | 20 | 100 |
| Statistics | | | | | | | | | | | | | | | | |
| Count | 28 | 29 | 25 | 27 | 22 | 24 | 28 | 3 | 28 | 28 | 25 | 23 | 29 | 3 | 23 | 24 |
| % of values below LOR | 0 | 0 | 0 | 0 | 100 | 100 | 18 | 67 | 43 | 100 | 36 | 100 | 100 | 67 | 100 | 100 |
| Minimum Date | 30/01/2014 | 30/01/2014 | 30/04/2014 | 30/01/2014 | 30/01/2014 | 30/04/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 14/10/2014 | 30/01/2014 |
| Maximum Date | 19/10/2022 | 19/10/2022 | 19/10/2022 | 19/10/2022 | 27/10/2020 | 19/10/2022 | 19/10/2022 | 13/08/2014 | 19/10/2022 | 19/10/2022 | 19/10/2022 | 27/10/2020 | 19/10/2022 | 13/08/2014 | 19/10/2022 | 19/10/2022 |
| Minimum | 6.7 | 3140 | 52 | 604 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.00125 | 10 | 50 |
| 5th percentile | 6.8 | 3320 | 56 | 625 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.00125 | 10 | 50 |
| 20th Percentile | 6.9 | 3442 | 62 | 649 | 0.0025 | 0.0005 | 0.001 | 0.0005 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.00125 | 10 | 50 |
| Median | 7.0 | 3660 | 66 | 683 | 0.0025 | 0.0005 | 0.0035 | 0.0005 | 0.13 | 0.00005 | 0.001 | 0.0025 | 0.0005 | 0.00125 | 10 | 50 |
| 80th Percentile | 7.4 | 3790 | 70 | 764 | 0.0025 | 0.0005 | 0.0056 | 0.0014 | 0.30 | 0.00005 | 0.002 | 0.0025 | 0.0005 | 0.0053 | 10 | 50 |
| 95th Percentile | 7.6 | 3998 | 75 | 789 | 0.0025 | 0.0005 | 0.008 | 0.00185 | 0.35 | 0.00005 | 0.002 | 0.0025 | 0.0005 | 0.007325 | 10 | 50 |
| Maxiumum | 7.8 | 4160 | 76 | 814 | 0.0025 | 0.0005 | 0.009 | 0.002 | 0.42 | 0.00005 | 0.003 | 0.0025 | 0.0005 | 0.008 | 10 | 50 |
| Trigger derivation considerations | | | | | | | | | | | | | | | | |
| Trigger Development not possbile due less than 8 samples | | | | | | | | x | | | | | | x | | |
| Trigger Development not possbile due to more than 15% of values <LOR | | | | | x | x | x | x | x | x | x | x | x | x | x | x |
| Mann Kendall trend | | | decreasing | | | | | | increasing | | increasing | | | | | |
| Proposed Trigger limits | | | | | | | | | | | | | | | | |
| Limit A (80th Percentile) | | 3790 | 70 | 764 | | | | | | | | | | | | |
| Limit B (95th Percentile) or applicable guideline | 6.0-7.5 | 3998 | 75 | 789 | 0.055 | 0.009 | 0.013 | 0.0014 | 0.14 | 0.0006 | 0.034 | 0.011 | below LOR | 0.060 | 20 | 100 |

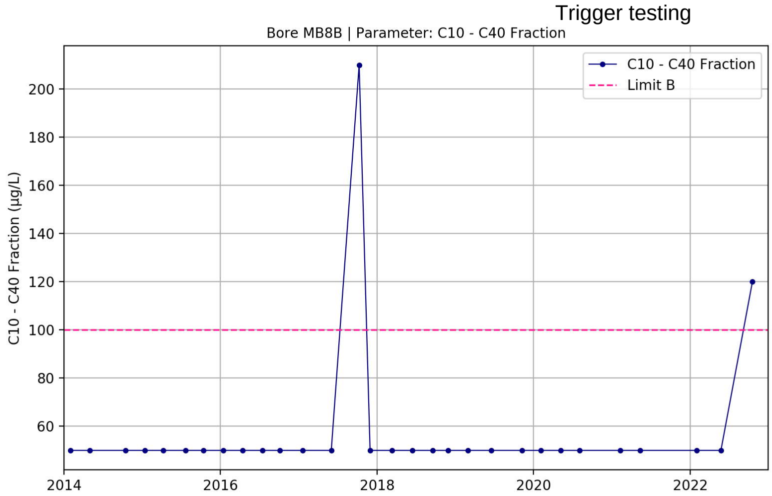
## MB10B

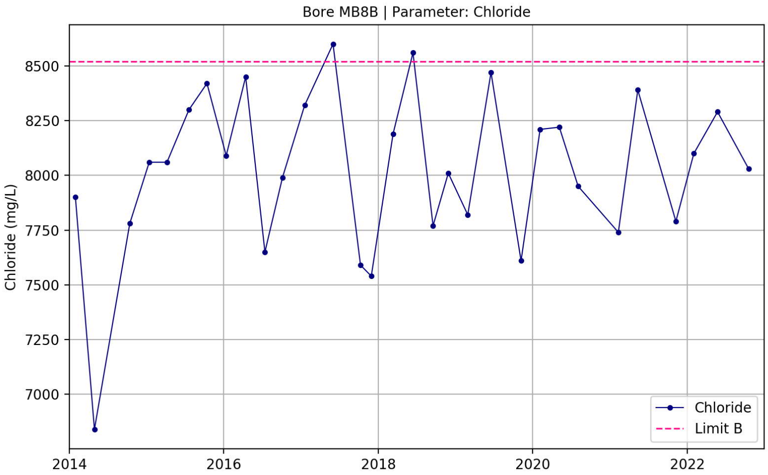
| | Field pH | Field EC | Sulfate as SO4 | Chloride | Aluminium Dissolved | Antimony Dissolved | Arsenic Dissolved | Copper - Dissolved | Iron Dissolved | Mercury Dissolved | Molybdenum Dissolved | Selenium Dissolved | Silver Dissolved | Zinc Dissolved | C6 - C10 Fraction | C10 - C40 Fraction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH Unit | (µS/cm) | 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) |
| Water quality Guidelines | | | | | | | | | | | | | | | | |
| ANZECC Aquatic Ecosystem (95%) Protection Guideline (ANZG 2018) | 6.0-7.5 | 250 | - | | 0.055 | 0.009 | 0.013 | 0.0014 | - | 0.0006 | 0.034 | 0.011 | 0.00001 | 0.008 | | |
| ANZECC Stock watering Guidelines | 6.0 - 8.5 | 7500 | 1000 | | 5 | - | 0.5 | 0.4 | - | 0.002 | 0.15 | 0.02 | - | 20 | | |
| ANZECC Guidelines – Irrigation ST | 6.0 - 8.5 | | | | 20 | | 2 | 5 | 10 | 0.002 | 0.05 | 0.05 | | 5 | | |
| ANZECC Guidelines – Irrigation LT | 6.0 - 8.5 | | | | 5 | | 0.1 | 0.2 | 0.2 | 0.002 | 0.01 | 0.02 | | 2 | | |
| Fitzroy WQ1310 WQO Zone 34 (shallow) | 7.1-8.1 | 8910 | 318 | 3185 | - | | - | 0.03 | 0.14 | - | - | - | | 0.06 | | |
| Fitzroy WQ1310 WQO Zone 34 (deep) | 7.4-8.0 | 16000 | 398 | 5905 | | | | 0.03 | 0.246 | | | | | 0.317 | | |
| DES, 2013 | | | | | | | | | | | | | | | 20 | 100 |
| Statistics | | | | | | | | | | | | | | | | |
| Count | 30 | 28 | 30 | 25 | 25 | 27 | 25 | 3 | 30 | 29 | 24 | 24 | 29 | 3 | 26 | 27 |
| % of values below LOR | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 40 | 100 | 83 | 100 | 100 | 67 | 8 | 100 |
| Minimum Date | 30/01/2014 | 30/01/2014 | 30/01/2014 | 13/08/2014 | 30/01/2014 | 30/04/2014 | 14/10/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/04/2014 | 30/01/2014 | 30/01/2014 | 30/01/2014 | 30/04/2014 | 30/01/2014 |
| Maximum Date | 19/10/2022 | 19/10/2022 | 19/10/2022 | 19/10/2022 | 08/11/2021 | 19/10/2022 | 19/10/2022 | 13/08/2014 | 19/10/2022 | 19/10/2022 | 19/10/2022 | 27/10/2020 | 19/10/2022 | 13/08/2014 | 19/10/2022 | 19/10/2022 |
| Minimum | 6.4 | 7700 | 42 | 2520 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.00125 | 10 | 50 |
| 5th percentile | 6.7 | 7973 | 46 | 2764 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.00125 | 15 | 50 |
| 20th Percentile | 6.9 | 8792 | 59 | 3030 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.025 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.00125 | 40 | 50 |
| Median | 7.0 | 9390 | 97 | 3150 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.465 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.00125 | 60 | 50 |
| 80th Percentile | 7.4 | 9957 | 127 | 3382 | 0.0025 | 0.0005 | 0.0005 | 0.0005 | 0.87 | 0.00005 | 0.0005 | 0.0025 | 0.0005 | 0.0047 | 80 | 50 |
| 95th Percentile | 7.7 | 10265 | 174 | 3682 | 0.005 | 0.0005 | 0.0005 | 0.0005 | 1.03 | 0.00005 | 0.001 | 0.0025 | 0.0005 | 0.006425 | 107.5 | 50 |
| Maxiumum | 7.8 | 11129 | 196 | 3710 | 0.005 | 0.0005 | 0.0005 | 0.0005 | 1.14 | 0.00005 | 0.001 | 0.0025 | 0.0005 | 0.007 | 120 | 50 |
| Trigger derivation considerations | | | | | | | | | | | | | | | | |
| Trigger Development not possbile due less than 8 samples | | | | | | | | x | | | | | | x | | |
| Trigger Development not possbile due to more than 15% of values <LOR | | | | | x | x | x | x | x | x | x | x | x | x | | x |
| Mann Kendall trend | decreasing | increasing | decreasing | increasing | increasing | | | | increasing | | decreasing | | | | decreasing | |
| Proposed Trigger limits | | | | | | | | | | | | | | | | |
| Limit A (80th Percentile) | | 9957 | 127 | | | | | | | | | | | | | |
| Limit B (95th Percentile) or applicable guideline | 6.0-7.5 | 10265 | 174 | 5905 | 0.055 | 0.009 | 0.013 | 0.0014 | 0.246 | 0.0006 | 0.034 | 0.011 | below LOR | 0.008 | 20 | 100 |

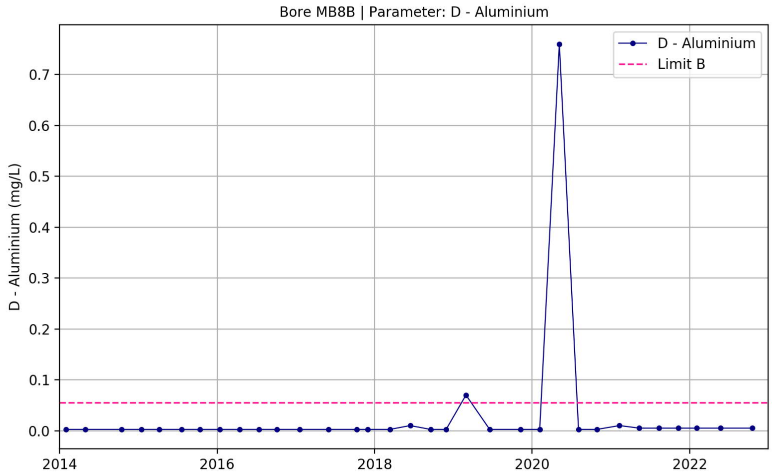
# APPENDIX C

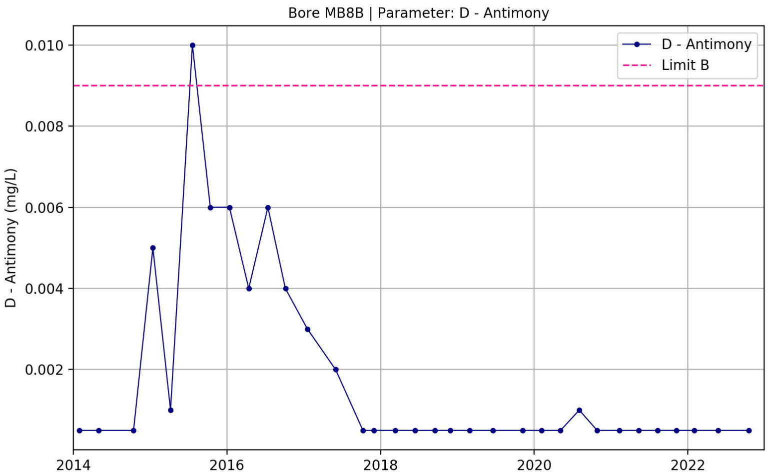
## Trigger testing on original data set

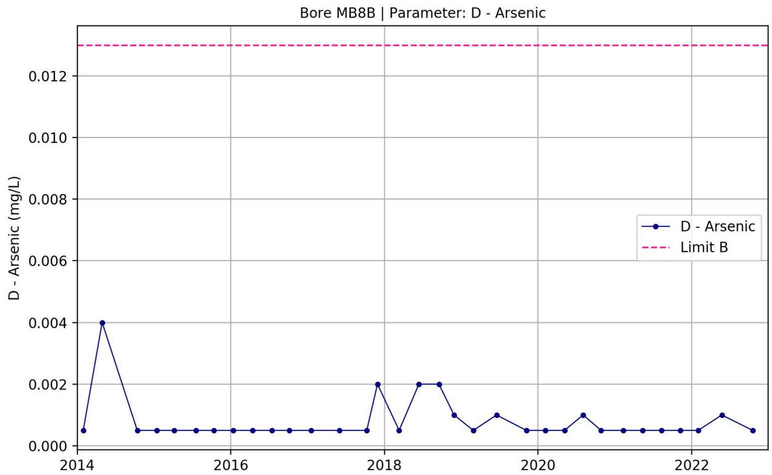

Bore MB8B | Parameter: C6 - C10 Fraction
C6 - C10 Fraction
Limit B
C6 - C10 Fraction (µg/L)
0
100
200
300
400
500
600
700
2014
2016
2018
2020
2022

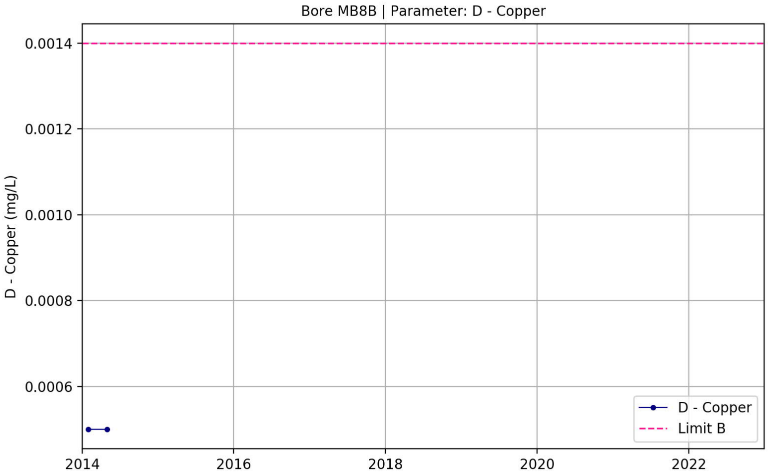

Bore MB8B | Parameter: C10 - C40 Fraction
C10 - C40 Fraction
Limit B
C10 - C40 Fraction (µg/L)
60
80
100
120
140
160
180
200
2014
2016
2018
2020
2022

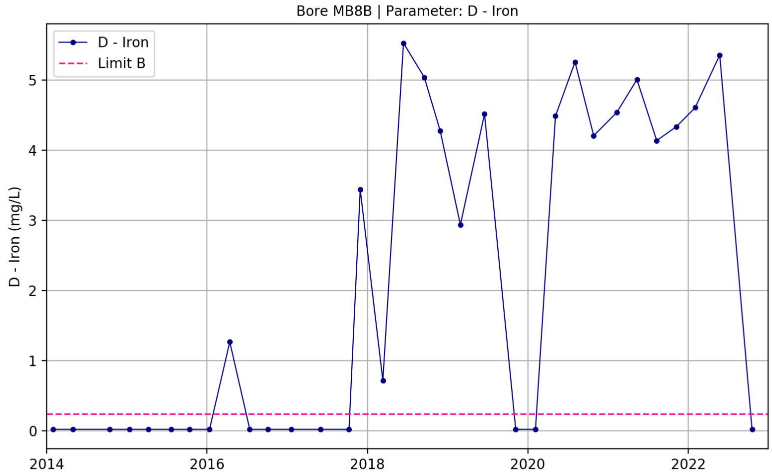

Bore MB8B | Parameter: Chloride
Chloride
Limit B
Chloride (mg/L)
7000
7250
7500
7750
8000
8250
8500
2014
2016
2018
2020
2022

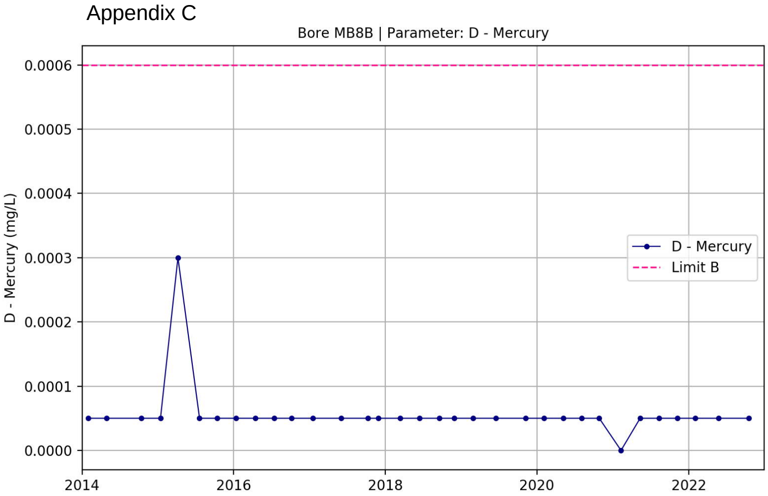

Bore MB8B | Parameter: D - Aluminium
D - Aluminium
Limit B
D - Aluminium (mg/L)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
2014
2016
2018
2020
2022

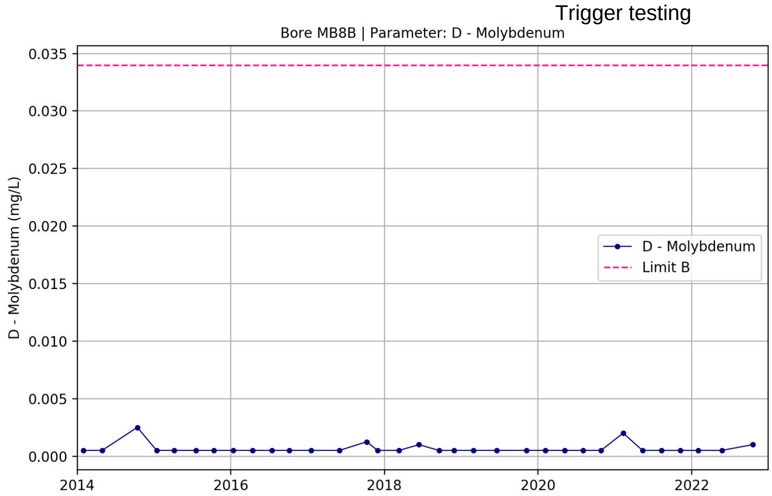

Bore MB8B | Parameter: D - Antimony
D - Antimony
Limit B
D - Antimony (mg/L)
0.002
0.004
0.006
0.008
0.010
2014
2016
2018
2020
2022

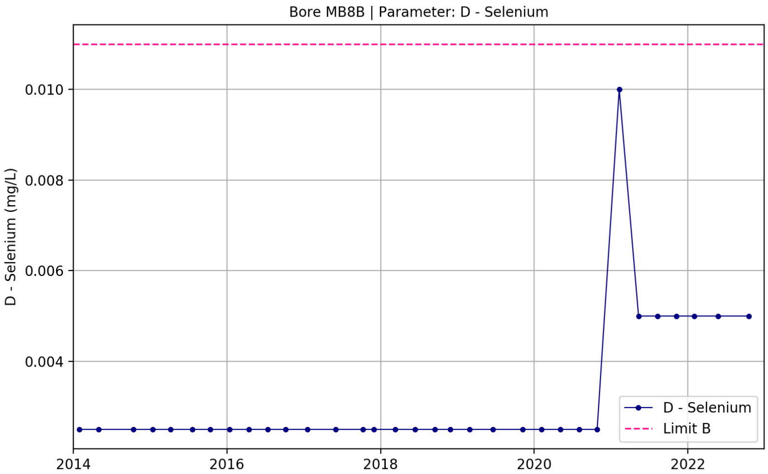

Bore MB8B | Parameter: D - Arsenic
D - Arsenic
Limit B
D - Arsenic (mg/L)
0.000
0.002
0.004
0.006
0.008
0.010
0.012
2014
2016
2018
2020
2022

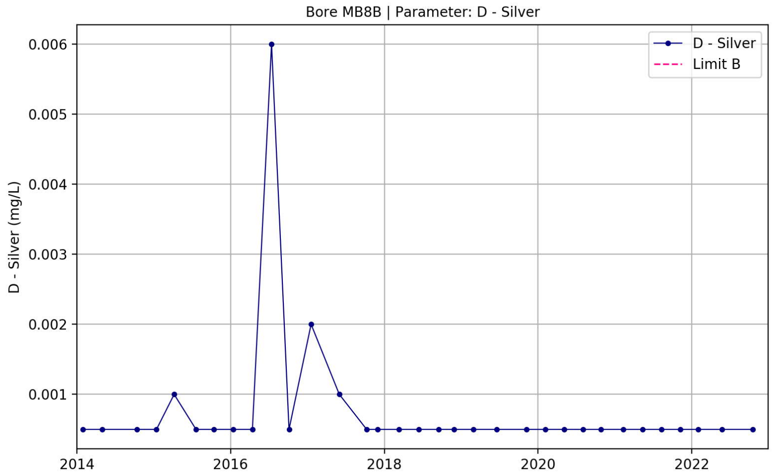

Bore MB8B | Parameter: D - Copper
D - Copper
Limit B
D - Copper (mg/L)
0.0006
0.0008
0.0010
0.0012
0.0014
2014
2016
2018
2020
2022

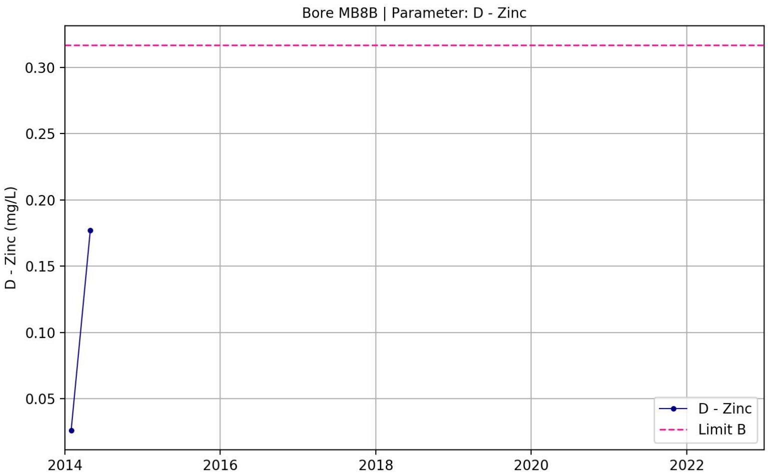

Bore MB8B | Parameter: D - Iron
D - Iron
Limit B
D - Iron (mg/L)
0
1
2
3
4
5
2014
2016
2018
2020
2022

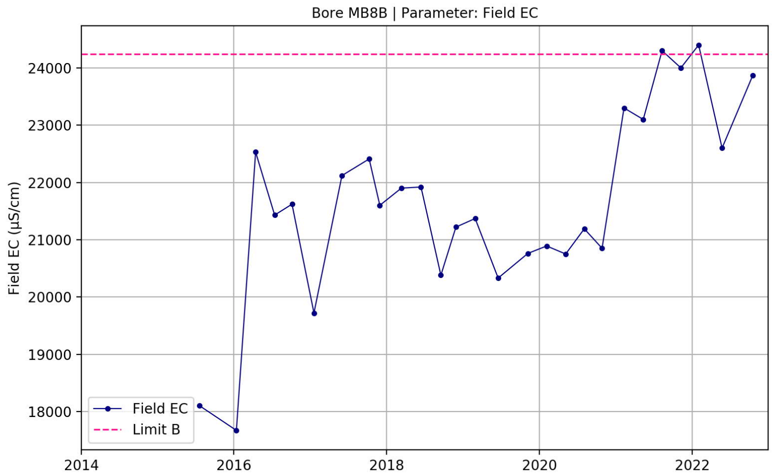

Bore MB8B | Parameter: D - Mercury
D - Mercury (mg/L)
0.0000
0.0001
0.0002
0.0003
0.0004
0.0005
0.0006
2014
2016
2018
2020
2022
D - Mercury
Limit B

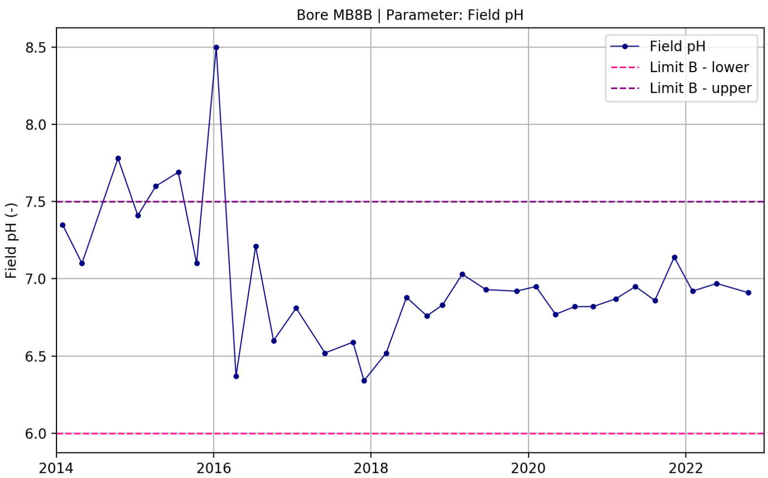

Bore MB8B | Parameter: D - Molybdenum
D - Molybdenum (mg/L)
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
2014
2016
2018
2020
2022
D - Molybdenum
Limit B

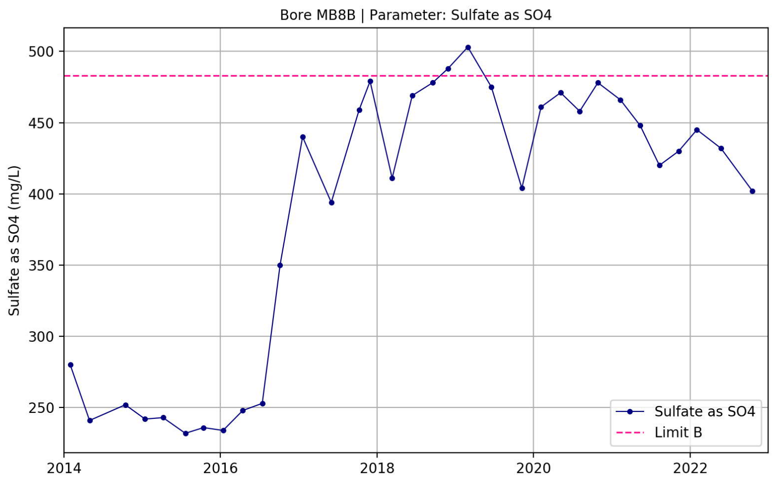

Bore MB8B | Parameter: D - Selenium
D - Selenium (mg/L)
0.004
0.006
0.008
0.010
2014
2016
2018
2020
2022
D - Selenium
Limit B

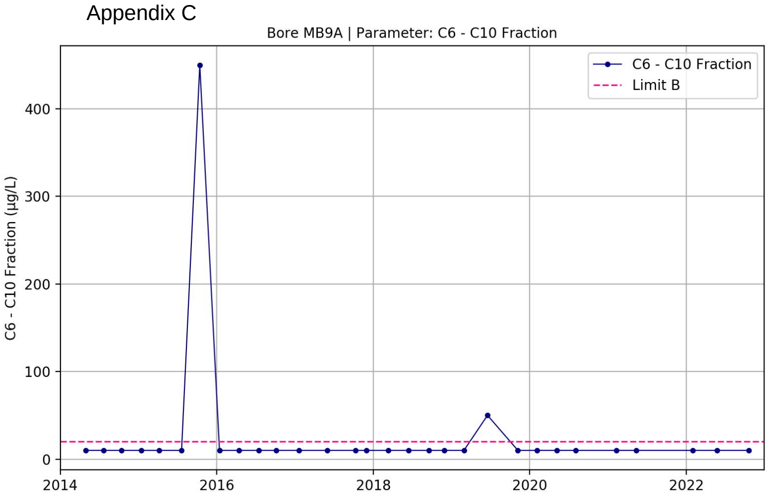

Bore MB8B | Parameter: D - Silver
D - Silver (mg/L)
0.001
0.002
0.003
0.004
0.005
0.006
2014
2016
2018
2020
2022
D - Silver
Limit B

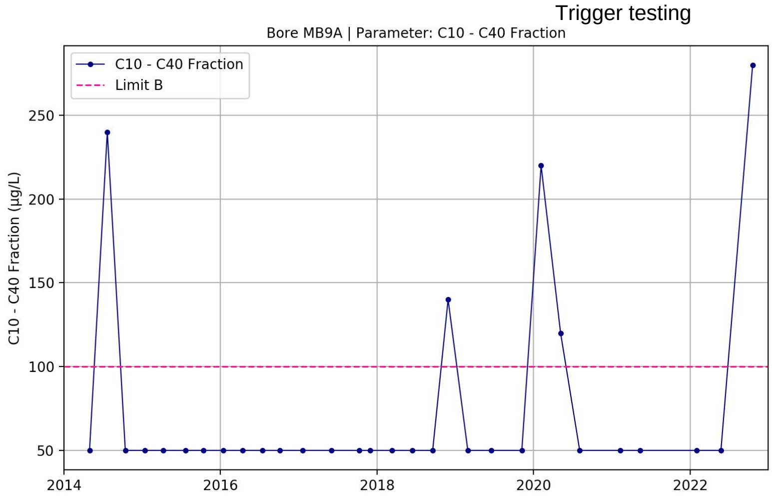

Bore MB8B | Parameter: D - Zinc
D - Zinc (mg/L)
0.05
0.10
0.15
0.20
0.25
0.30
2014
2016
2018
2020
2022
D - Zinc
Limit B

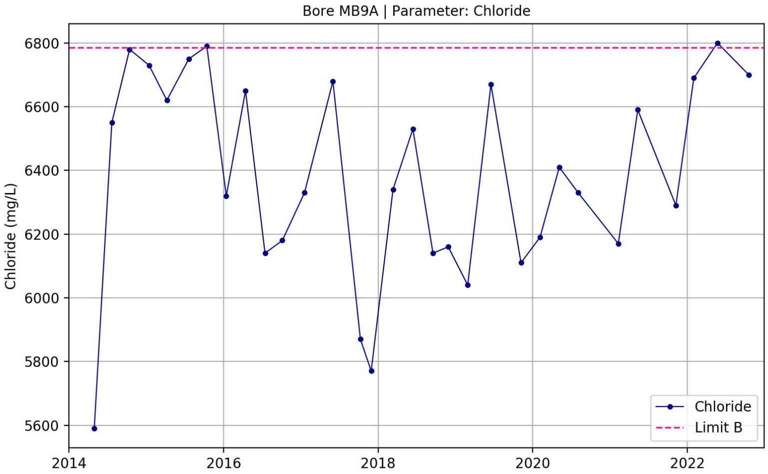

Bore MB8B | Parameter: Field EC
Field EC (µS/cm)
18000
19000
20000
21000
22000
23000
24000
2014
2016
2018
2020
2022
Field EC
Limit B

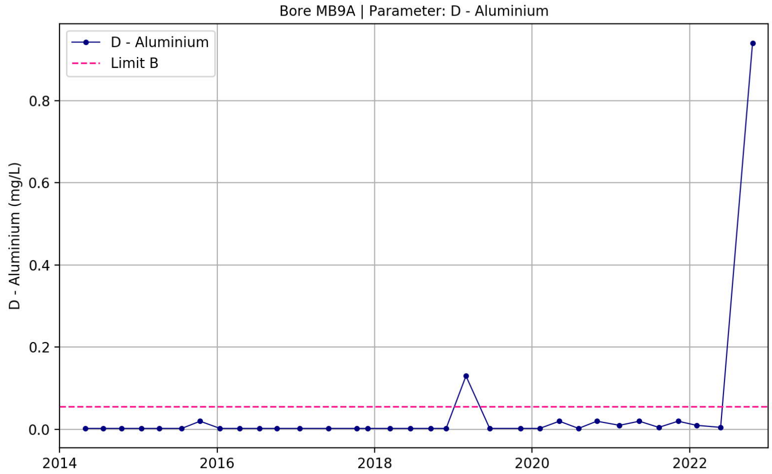

Bore MB8B | Parameter: Field pH
Field pH (-)
6.0
6.5
7.0
7.5
8.0
8.5
2014
2016
2018
2020
2022
Field pH
Limit B - lower
Limit B - upper

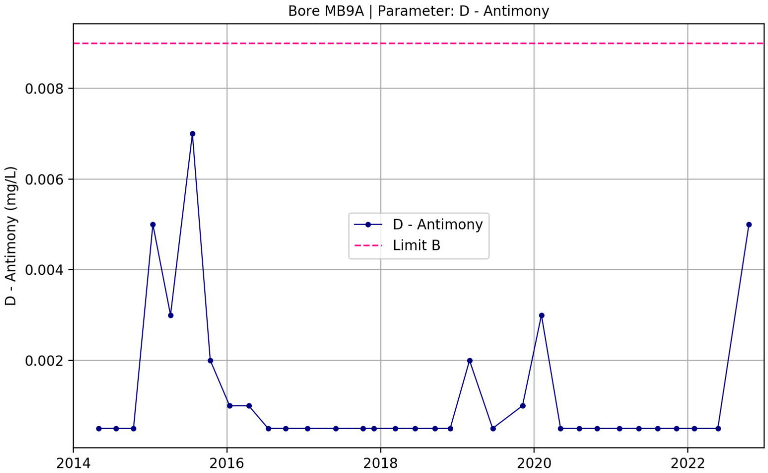

Bore MB8B | Parameter: Sulfate as SO4
Sulfate as SO4 (mg/L)
250
300
350
400
450
500
2014
2016
2018
2020
2022
Sulfate as SO4
Limit B

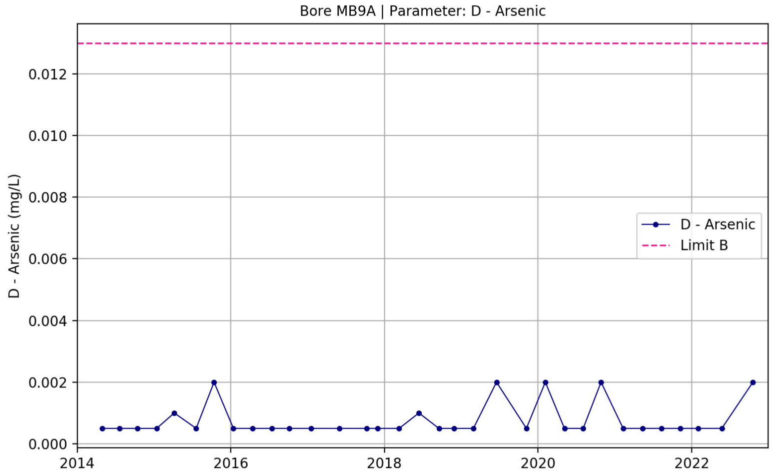

Bore MB9A | Parameter: C6 - C10 Fraction
C6 - C10 Fraction
Limit B
C6 - C10 Fraction (µg/L)
0
100
200
300
400
2014
2016
2018
2020
2022

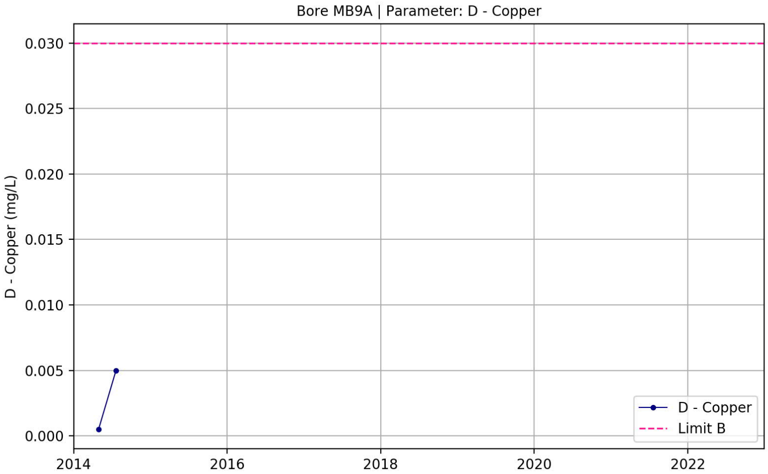

Bore MB9A | Parameter: C10 - C40 Fraction
C10 - C40 Fraction
Limit B
C10 - C40 Fraction (µg/L)
50
100
150
200
250
2014
2016
2018
2020
2022

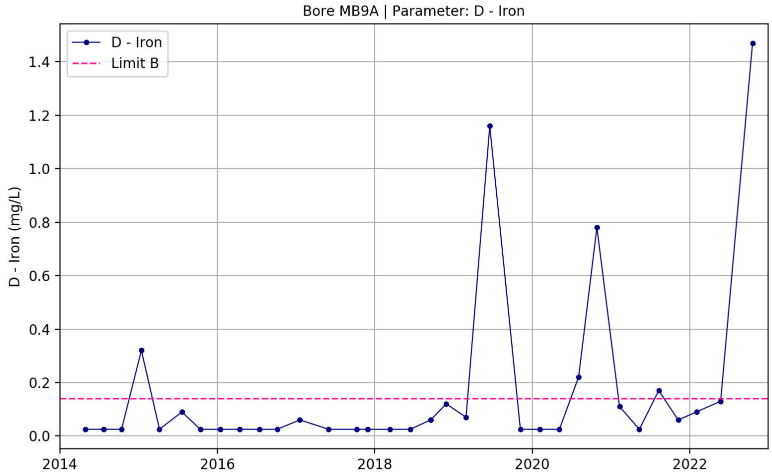

Bore MB9A | Parameter: Chloride
Chloride
Limit B
Chloride (mg/L)
5600
5800
6000
6200
6400
6600
6800
2014
2016
2018
2020
2022

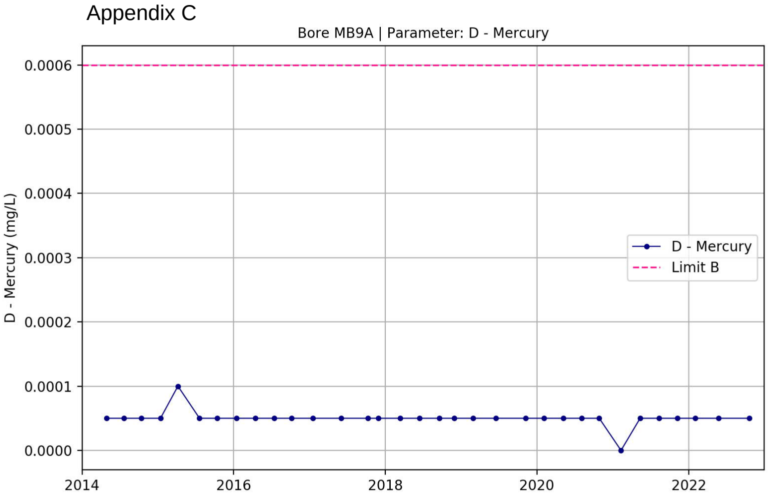

Bore MB9A | Parameter: D - Aluminium
D - Aluminium
Limit B
D - Aluminium (mg/L)
0.0
0.2
0.4
0.6
0.8
2014
2016
2018
2020
2022

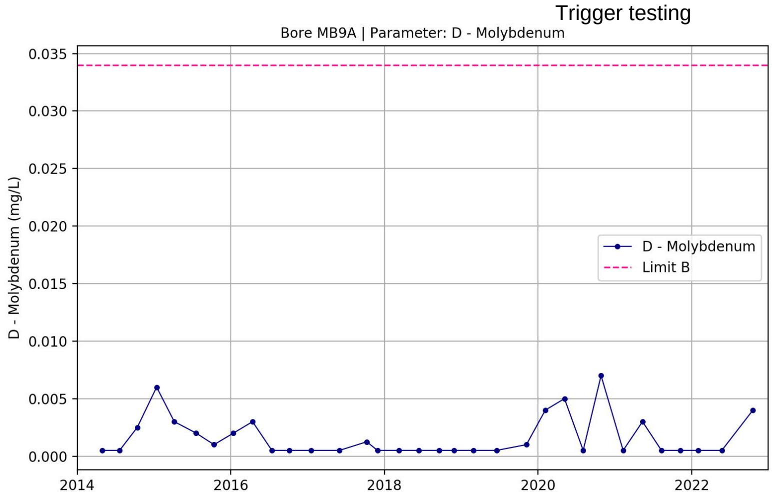

Bore MB9A | Parameter: D - Antimony
D - Antimony
Limit B
D - Antimony (mg/L)
0.002
0.004
0.006
0.008
2014
2016
2018
2020
2022

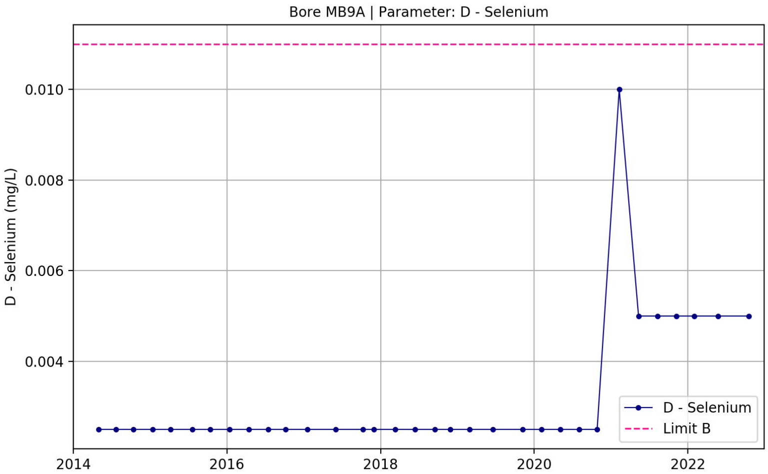

Bore MB9A | Parameter: D - Arsenic
D - Arsenic
Limit B
D - Arsenic (mg/L)
0.000
0.002
0.004
0.006
0.008
0.010
0.012
2014
2016
2018
2020
2022

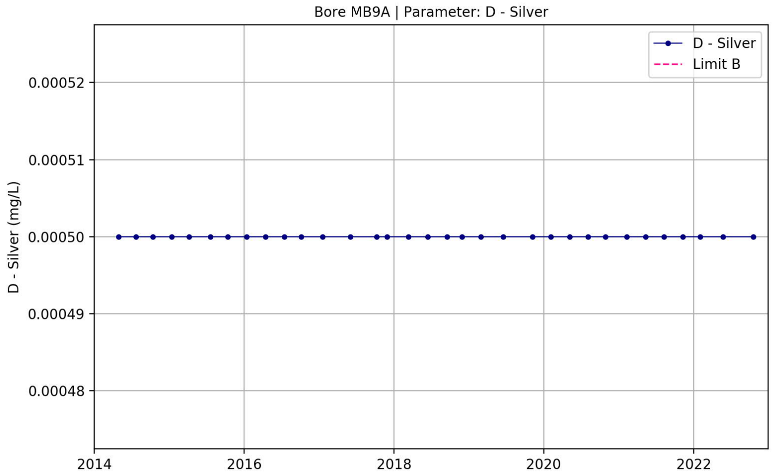

Bore MB9A | Parameter: D - Copper
D - Copper
Limit B
D - Copper (mg/L)
0.000
0.005
0.010
0.015
0.020
0.025
0.030
2014
2016
2018
2020
2022

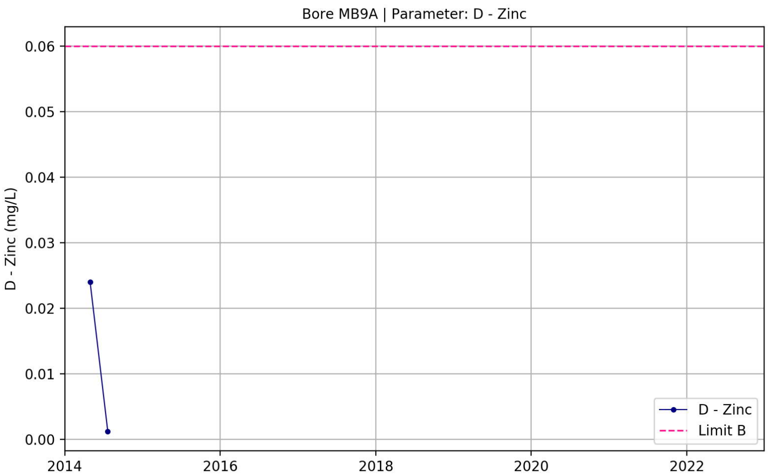

Bore MB9A | Parameter: D - Iron
D - Iron
Limit B
D - Iron (mg/L)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
2014
2016
2018
2020
2022

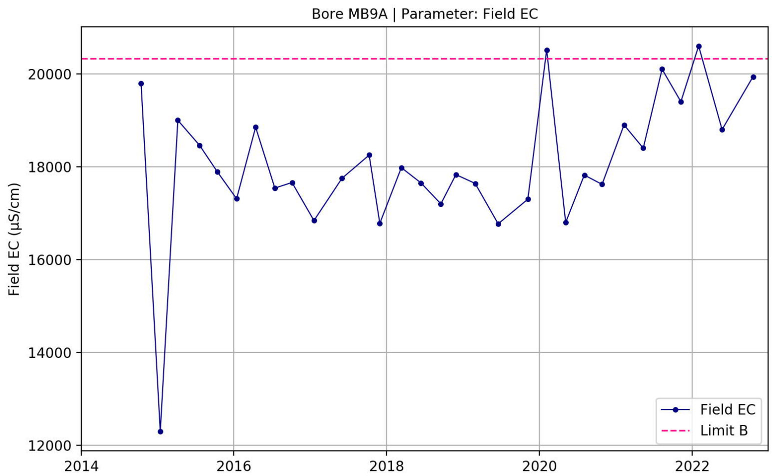

Bore MB9A | Parameter: D - Mercury
D - Mercury (mg/L)
D - Mercury
Limit B

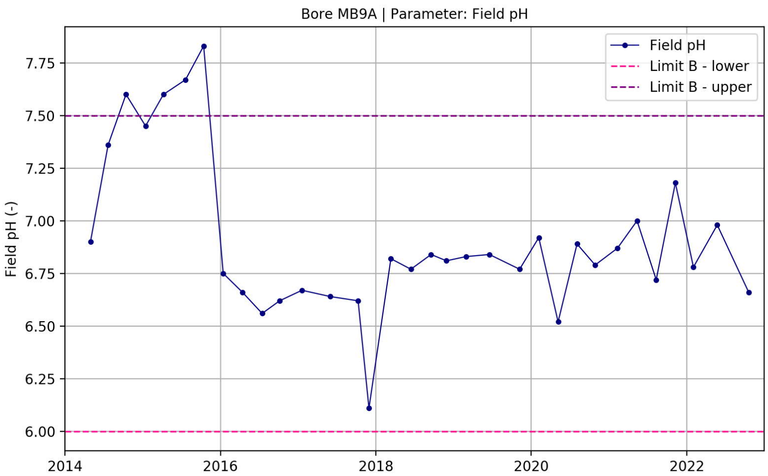

Bore MB9A | Parameter: D - Molybdenum
D - Molybdenum (mg/L)
D - Molybdenum
Limit B

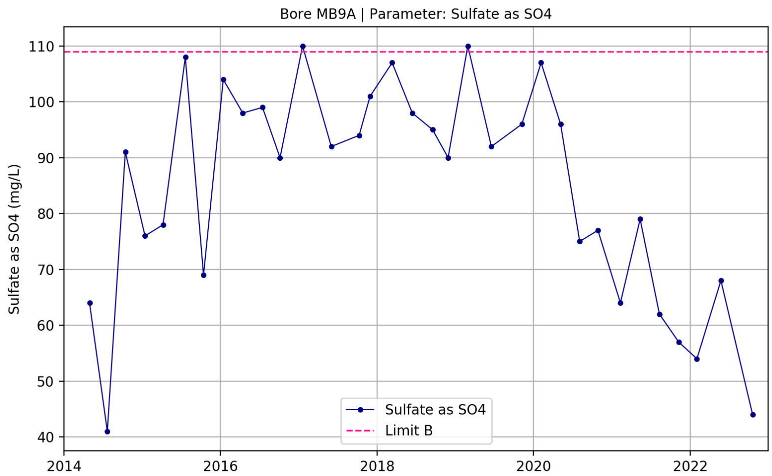

Bore MB9A | Parameter: D - Selenium
D - Selenium (mg/L)
D - Selenium
Limit B

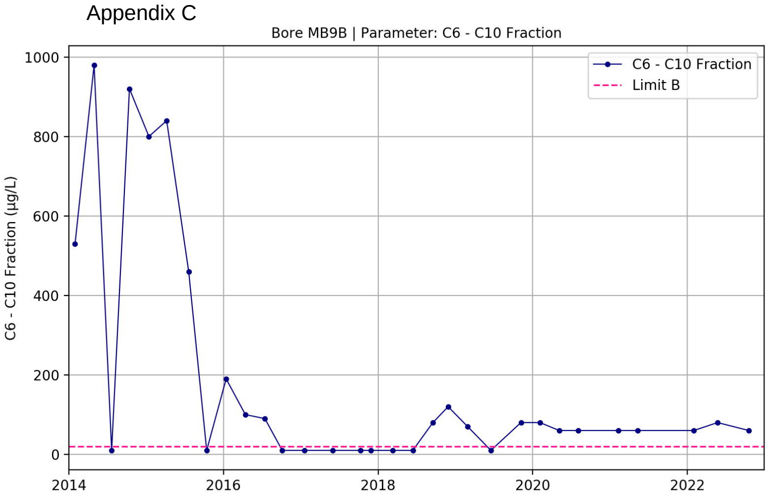

Bore MB9A | Parameter: D - Silver
D - Silver (mg/L)
D - Silver
Limit B

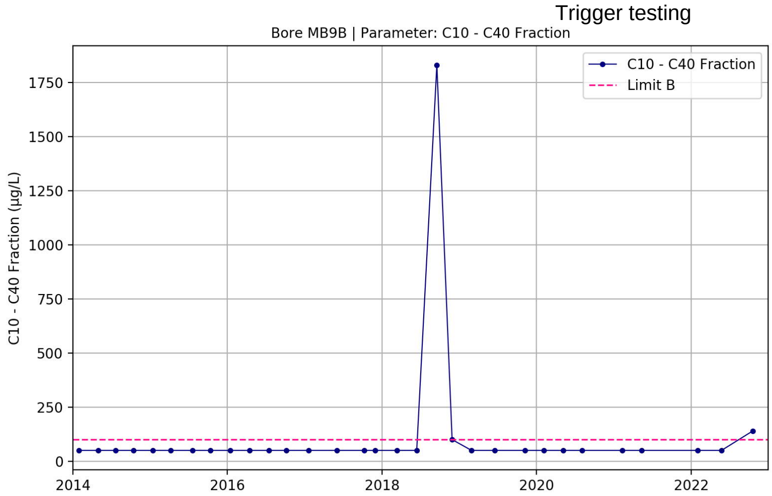

Bore MB9A | Parameter: D - Zinc
D - Zinc (mg/L)
D - Zinc
Limit B

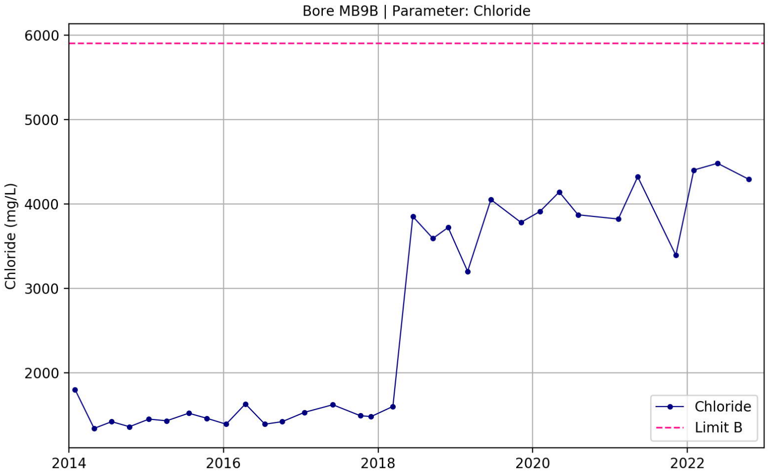

Bore MB9A | Parameter: Field EC
Field EC (µS/cm)
Field EC
Limit B

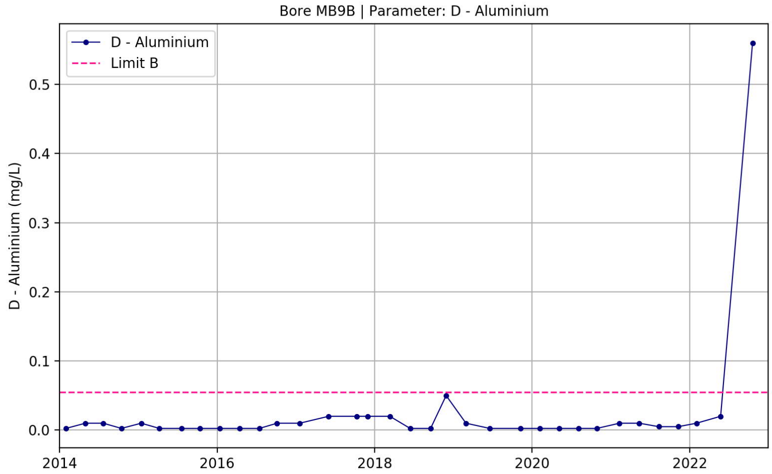

Bore MB9A | Parameter: Field pH
Field pH (-)
Field pH
Limit B - lower
Limit B - upper

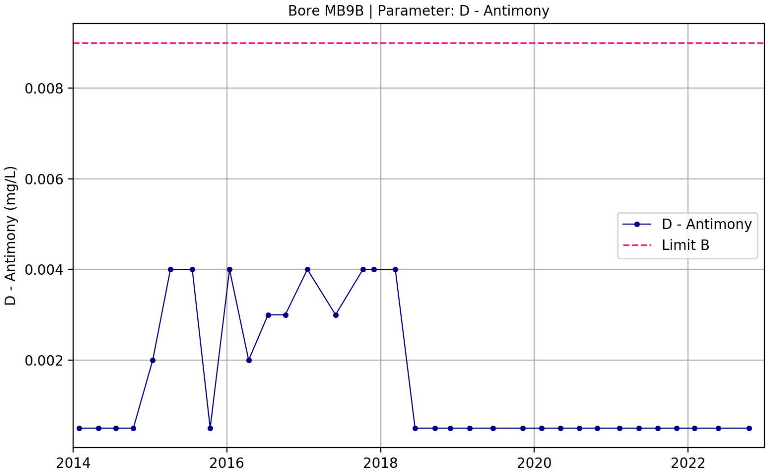

Bore MB9A | Parameter: Sulfate as SO4
Sulfate as SO4 (mg/L)
Sulfate as SO4
Limit B

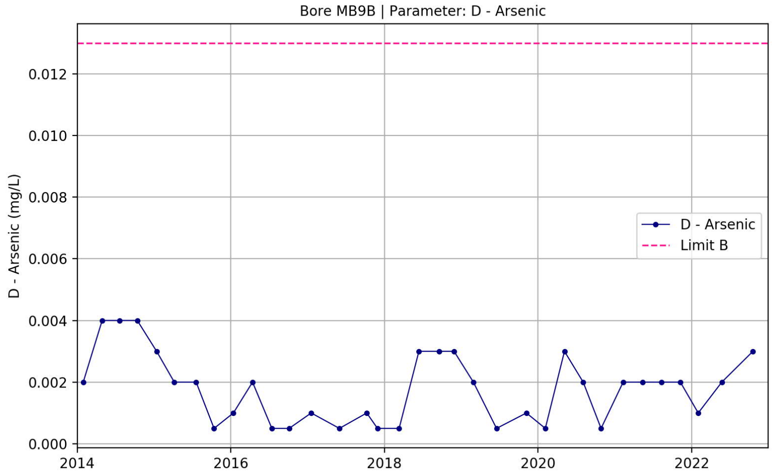

Bore MB9B | Parameter: C6 - C10 Fraction
C6 - C10 Fraction (µg/L)
C6 - C10 Fraction
Limit B

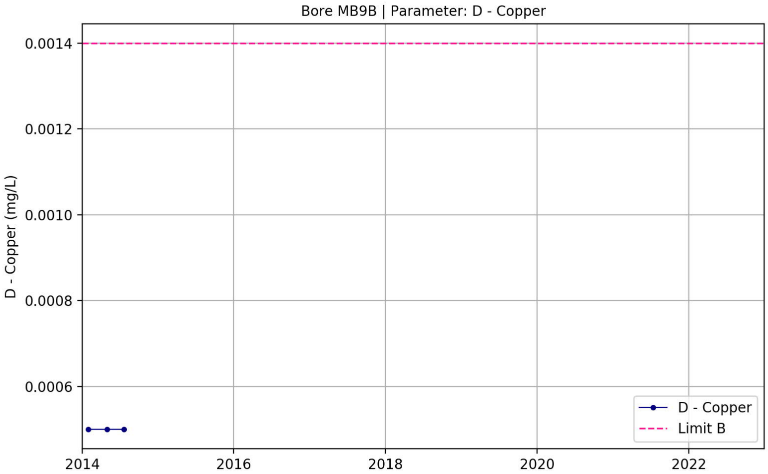

Bore MB9B | Parameter: C10 - C40 Fraction
C10 - C40 Fraction (µg/L)
C10 - C40 Fraction
Limit B

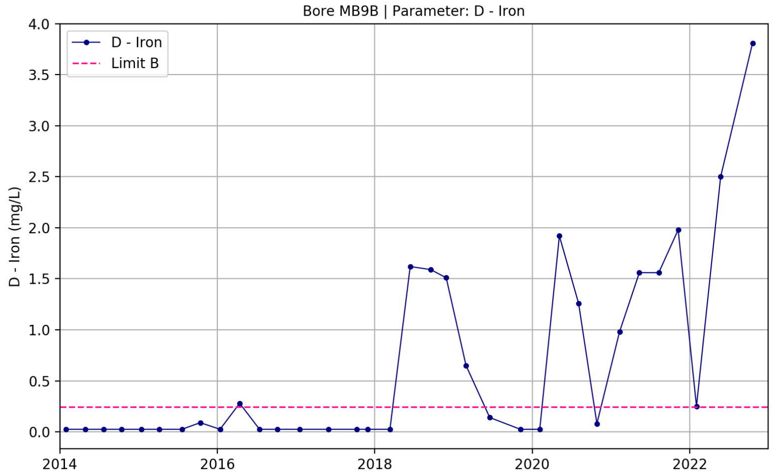

Bore MB9B | Parameter: Chloride
Chloride (mg/L)
Chloride
Limit B

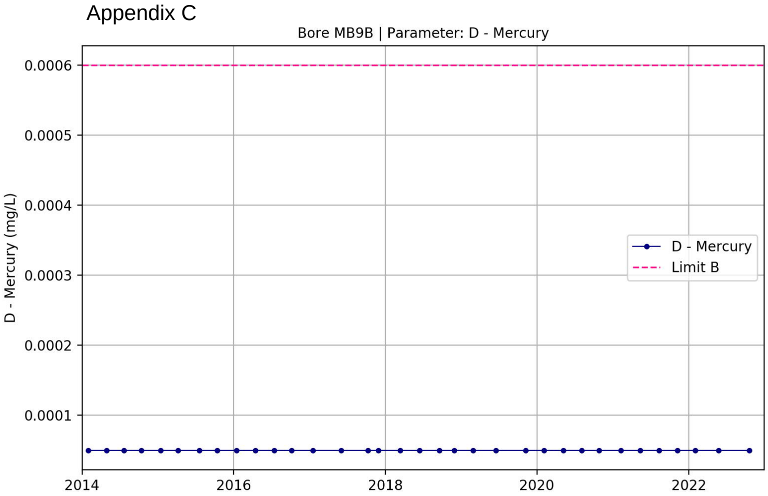

Bore MB9B | Parameter: D - Aluminium
D - Aluminium (mg/L)
D - Aluminium
Limit B

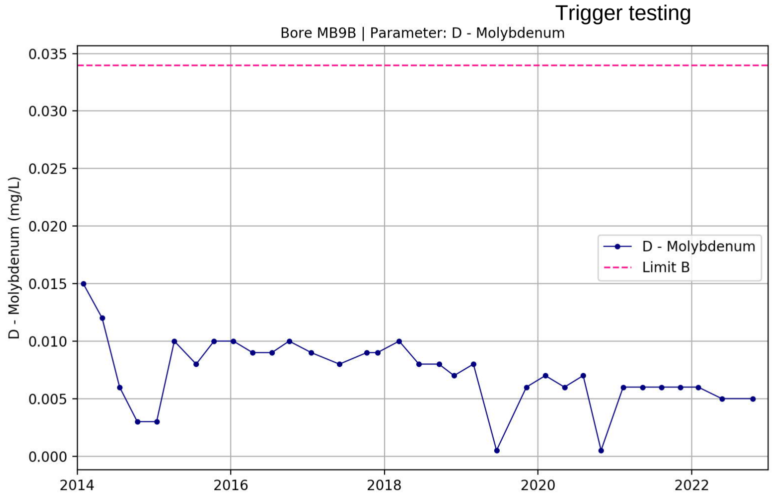

Bore MB9B | Parameter: D - Antimony
D - Antimony (mg/L)
D - Antimony
Limit B

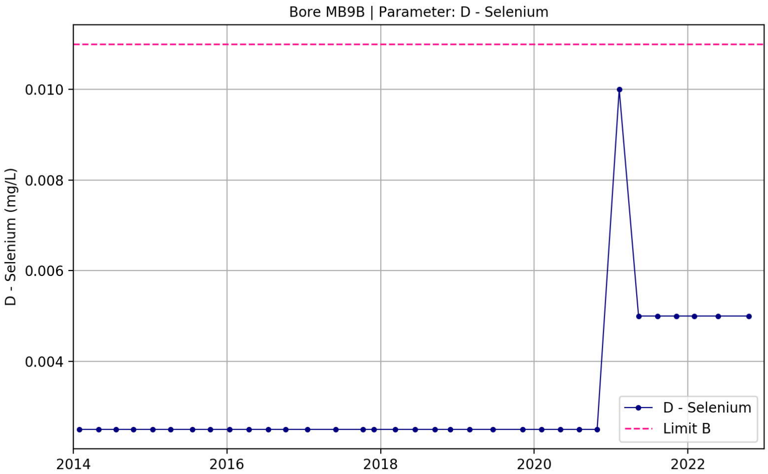

Bore MB9B | Parameter: D - Arsenic
D - Arsenic (mg/L)
D - Arsenic
Limit B

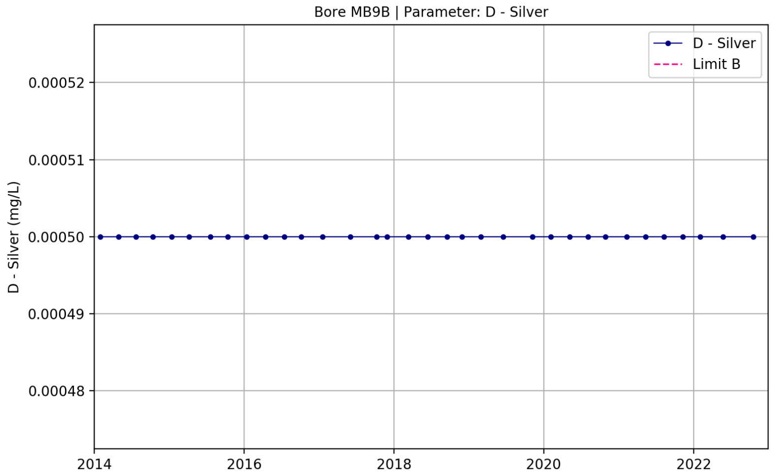

Bore MB9B | Parameter: D - Copper
D - Copper (mg/L)
D - Copper
Limit B

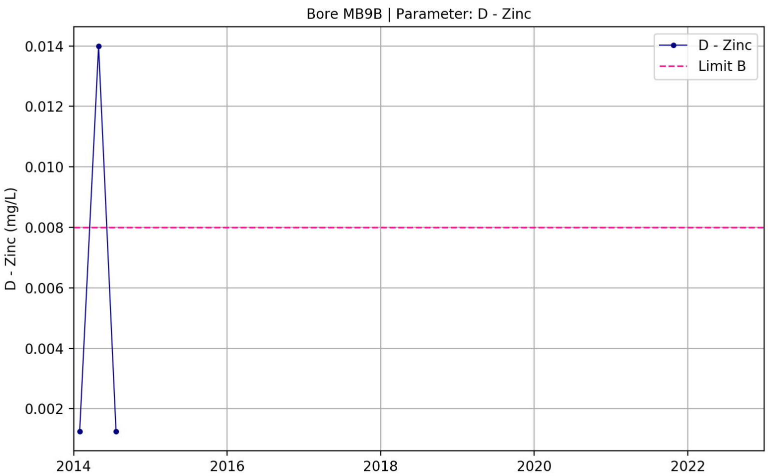

Bore MB9B | Parameter: D - Iron
D - Iron (mg/L)
D - Iron
Limit B

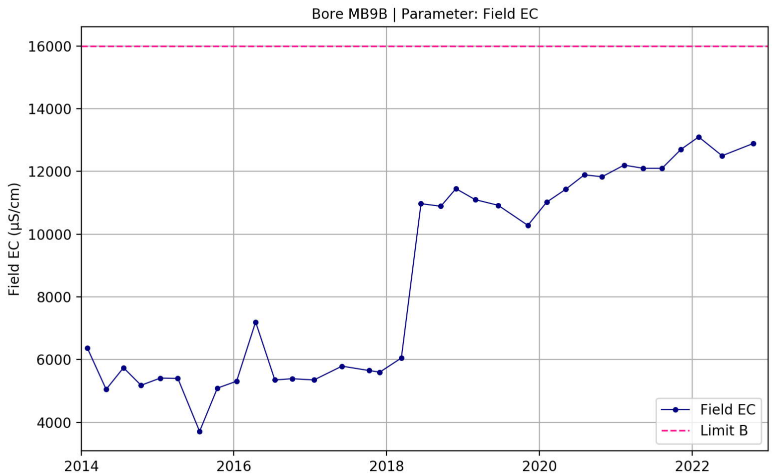

Bore MB9B | Parameter: D - Mercury
D - Mercury (mg/L)
D - Mercury
Limit B

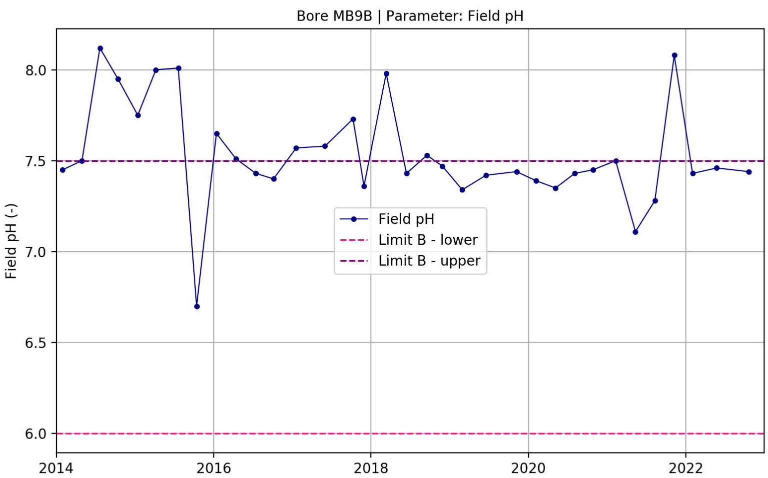

Bore MB9B | Parameter: D - Molybdenum
D - Molybdenum (mg/L)
D - Molybdenum
Limit B

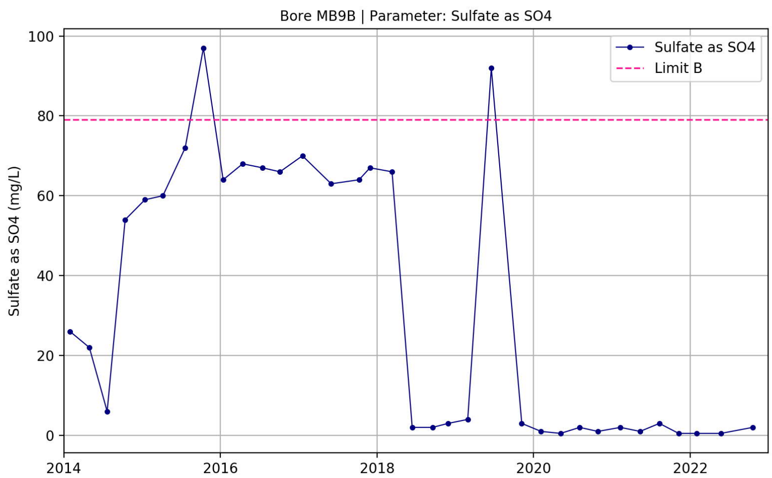

Bore MB9B | Parameter: D - Selenium
D - Selenium (mg/L)
D - Selenium
Limit B

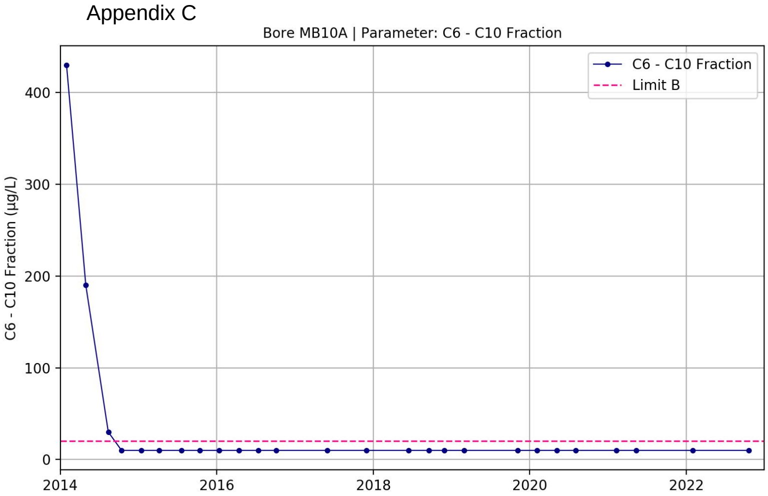

Bore MB9B | Parameter: D - Silver
D - Silver (mg/L)
D - Silver
Limit B

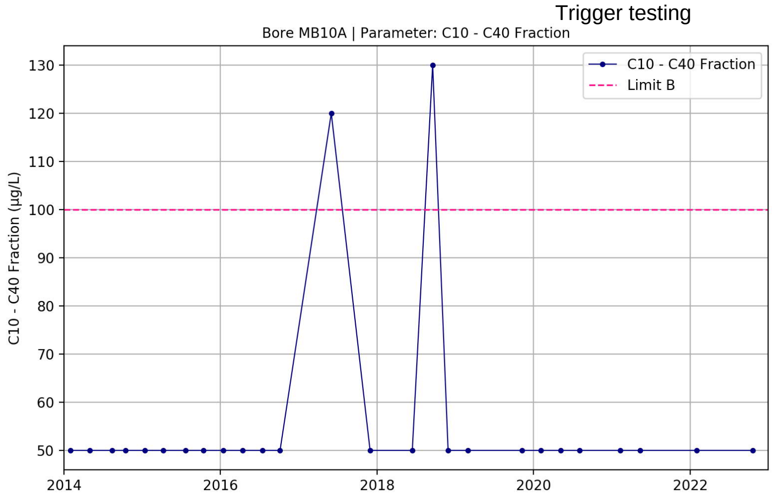

Bore MB9B | Parameter: D - Zinc
D - Zinc (mg/L)
D - Zinc
Limit B

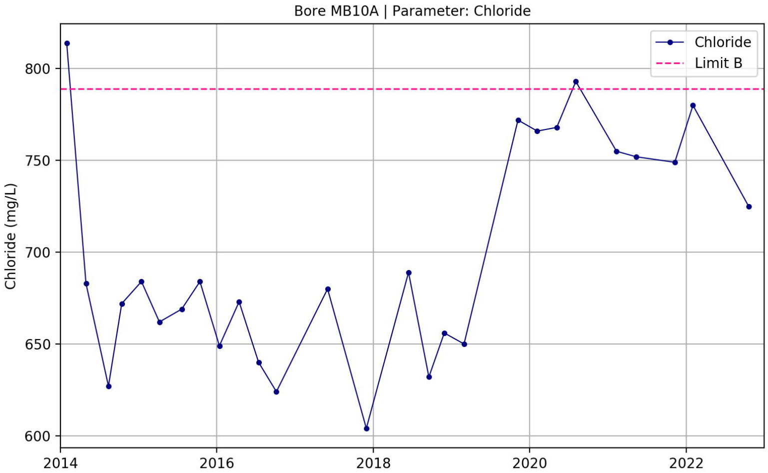

Bore MB9B | Parameter: Field EC
Field EC (µS/cm)
Field EC
Limit B

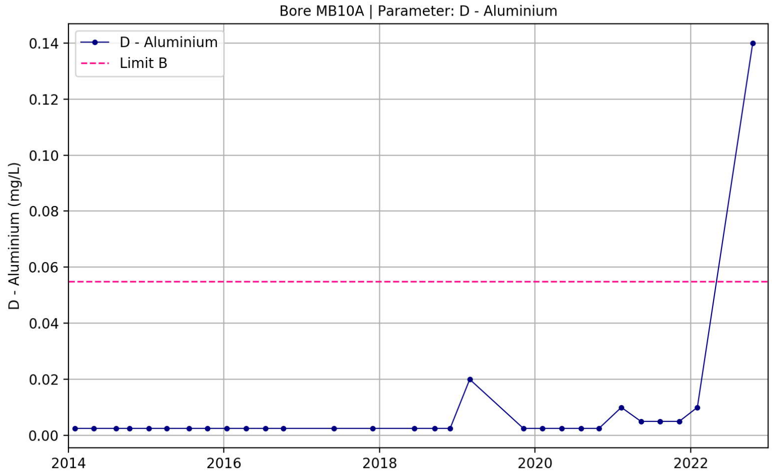

Bore MB9B | Parameter: Field pH
Field pH (-)
Field pH
Limit B - lower
Limit B - upper

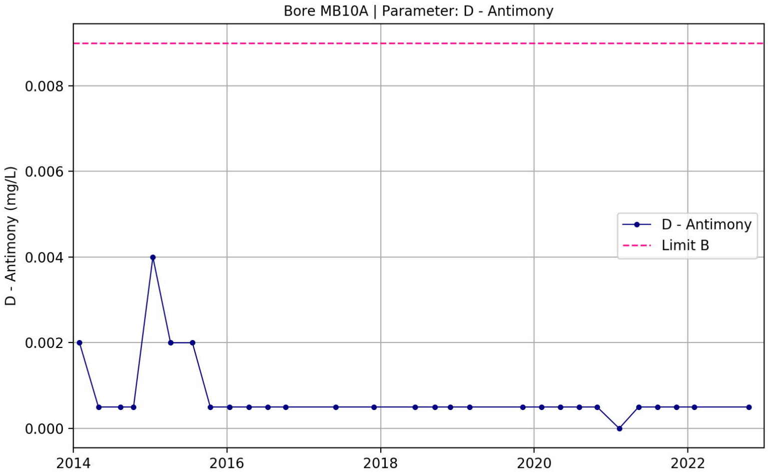

Bore MB9B | Parameter: Sulfate as SO4
Sulfate as SO4 (mg/L)
Sulfate as SO4
Limit B

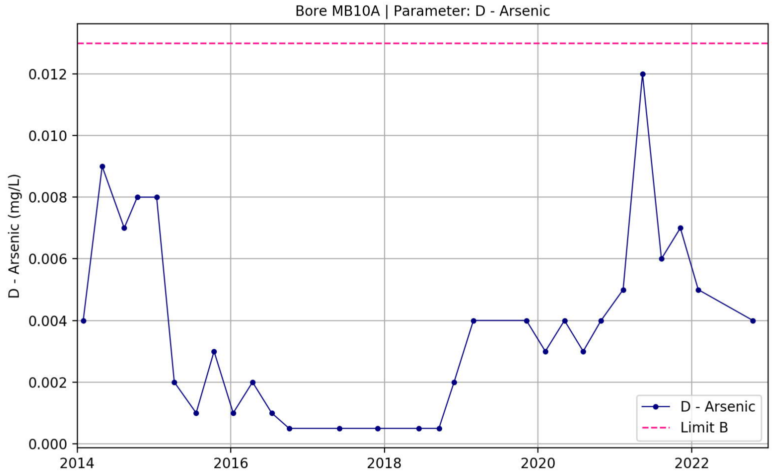

Bore MB10A | Parameter: C6 - C10 Fraction
C6 - C10 Fraction (µg/L)
C6 - C10 Fraction
Limit B
0
100
200
300
400
2014
2016
2018
2020
2022

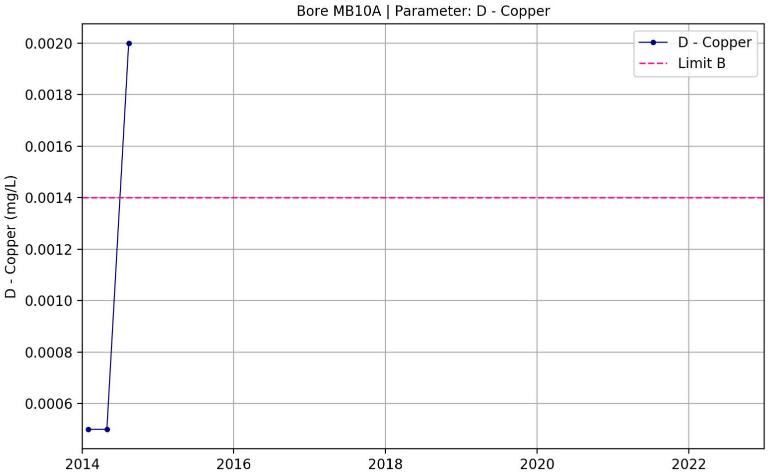

Bore MB10A | Parameter: C10 - C40 Fraction
C10 - C40 Fraction (µg/L)
C10 - C40 Fraction
Limit B
50
60
70
80
90
100
110
120
130
2014
2016
2018
2020
2022

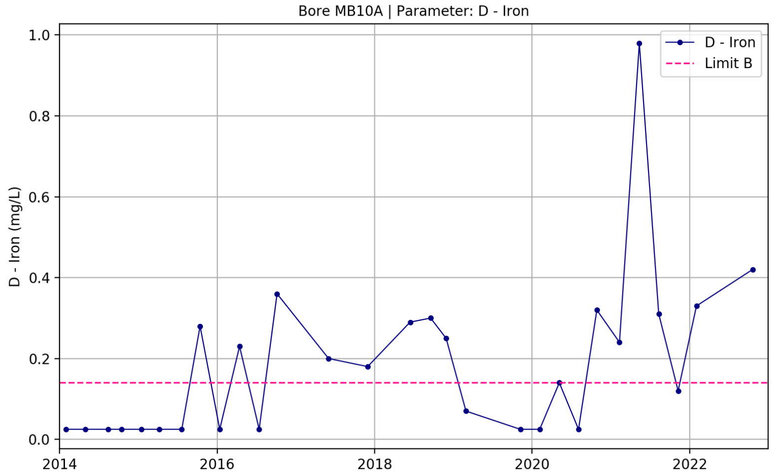

Bore MB10A | Parameter: Chloride
Chloride (mg/L)
Chloride
Limit B
600
650
700
750
800
2014
2016
2018
2020
2022

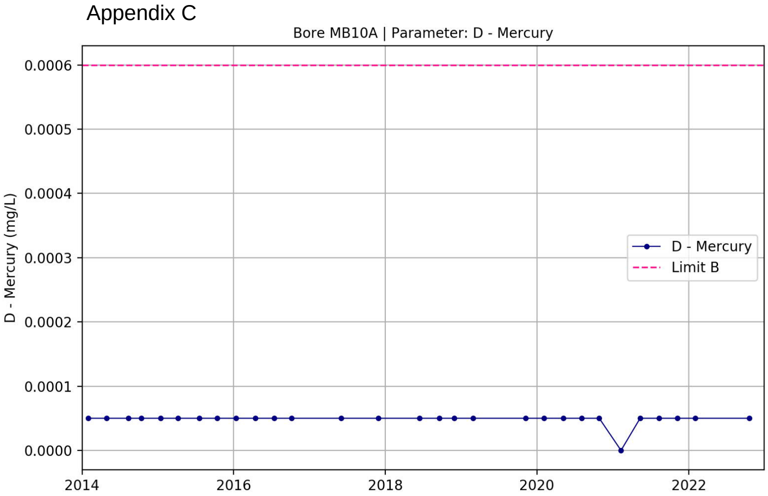

Bore MB10A | Parameter: D - Aluminium
D - Aluminium (mg/L)
D - Aluminium
Limit B
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
2014
2016
2018
2020
2022

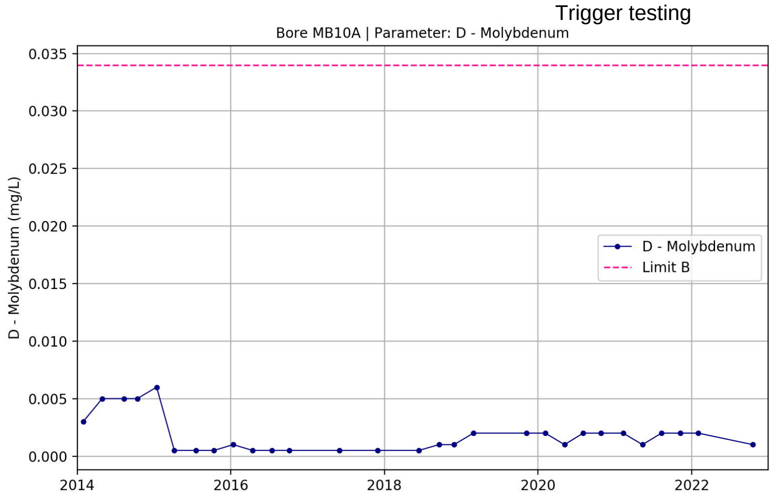

Bore MB10A | Parameter: D - Antimony
D - Antimony (mg/L)
D - Antimony
Limit B
0.000
0.002
0.004
0.006
0.008
2014
2016
2018
2020
2022

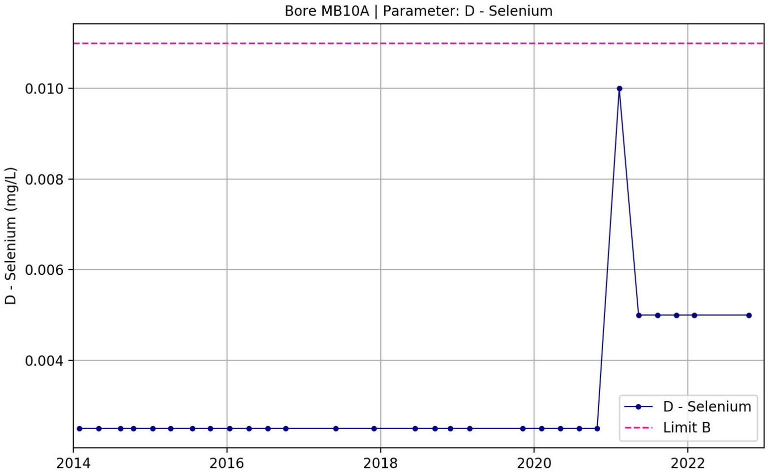

Bore MB10A | Parameter: D - Arsenic
D - Arsenic (mg/L)
D - Arsenic
Limit B
0.000
0.002
0.004
0.006
0.008
0.010
0.012
2014
2016
2018
2020
2022

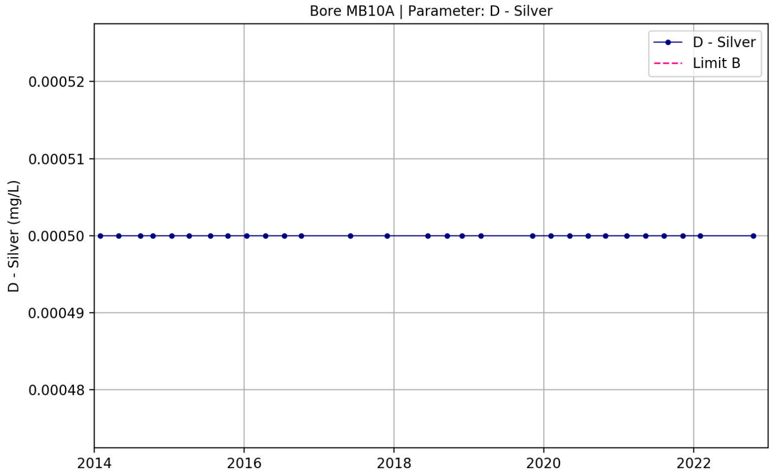

Bore MB10A | Parameter: D - Copper
D - Copper (mg/L)
D - Copper
Limit B
0.0006
0.0008
0.0010
0.0012
0.0014
0.0016
0.0018
0.0020
2014
2016
2018
2020
2022

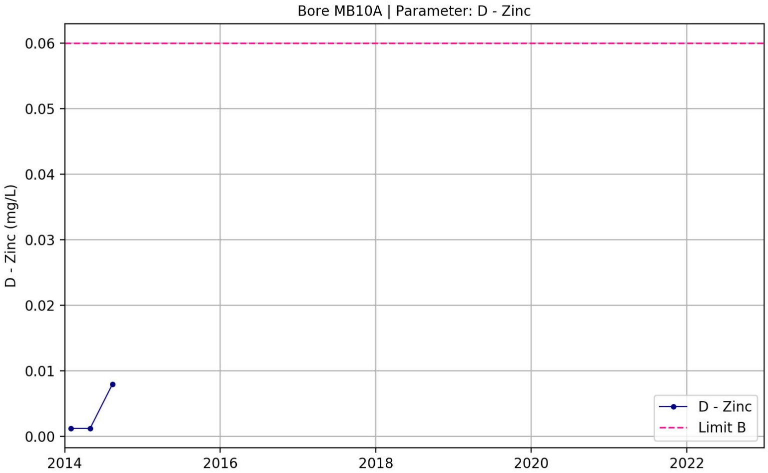

Bore MB10A | Parameter: D - Iron
D - Iron (mg/L)
D - Iron
Limit B
0.0
0.2
0.4
0.6
0.8
1.0
2014
2016
2018
2020
2022

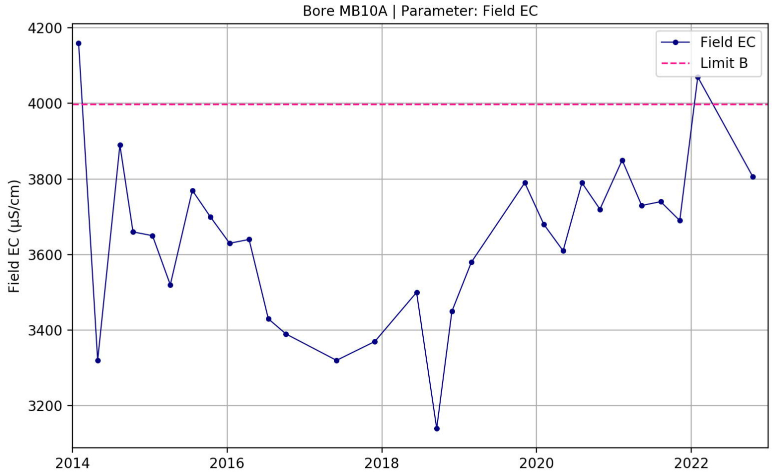

Bore MB10A | Parameter: D - Mercury
D - Mercury (mg/L)
D - Mercury
Limit B

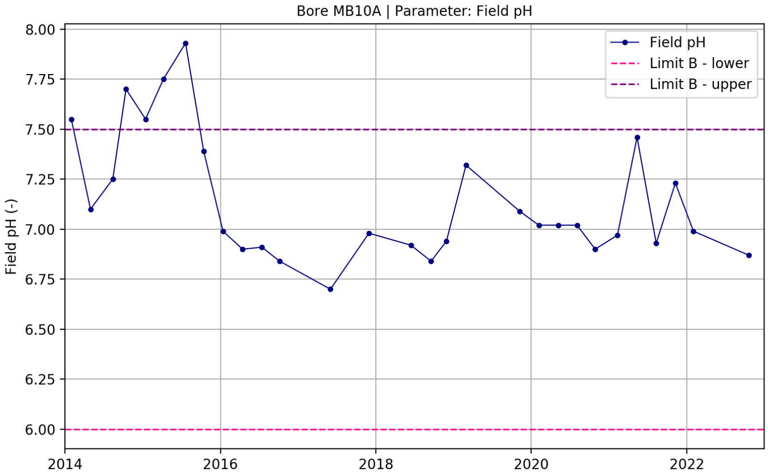

Bore MB10A | Parameter: D - Molybdenum
D - Molybdenum (mg/L)
D - Molybdenum
Limit B

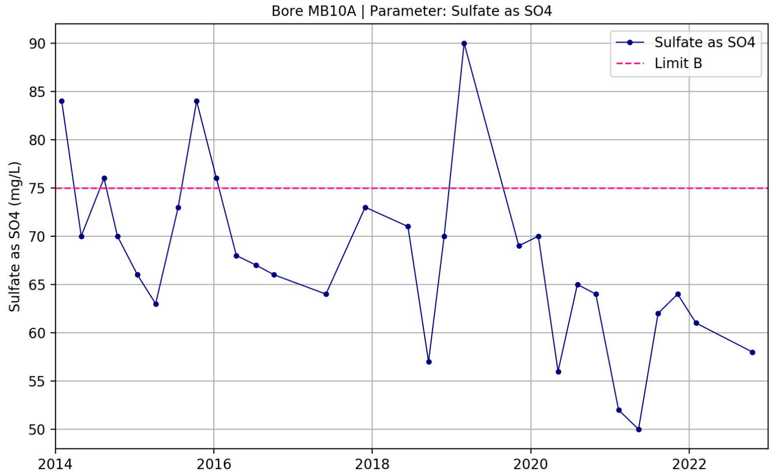

Bore MB10A | Parameter: D - Selenium
D - Selenium (mg/L)
D - Selenium
Limit B

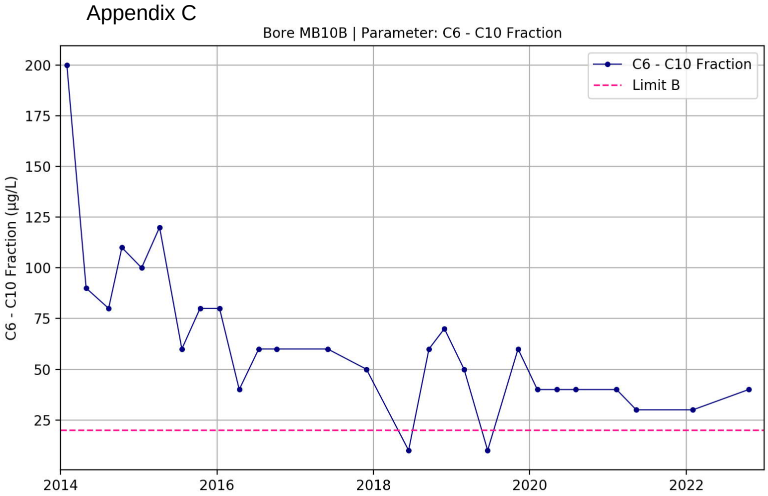

Bore MB10A | Parameter: D - Silver
D - Silver (mg/L)
D - Silver
Limit B

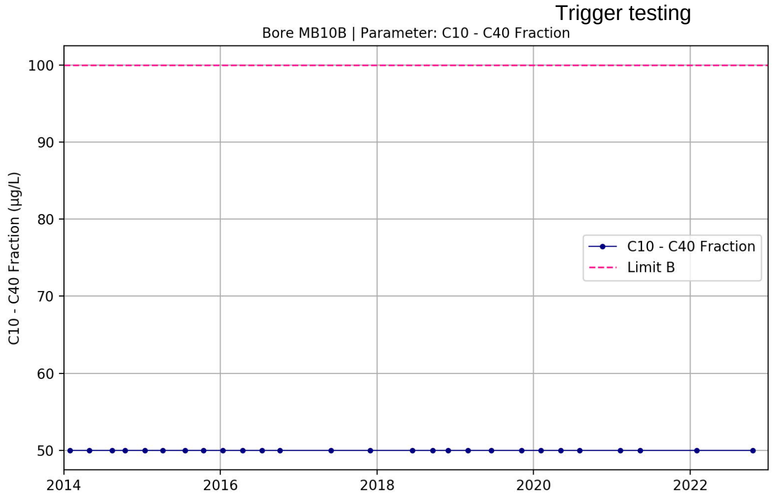

Bore MB10A | Parameter: D - Zinc
D - Zinc (mg/L)
D - Zinc
Limit B

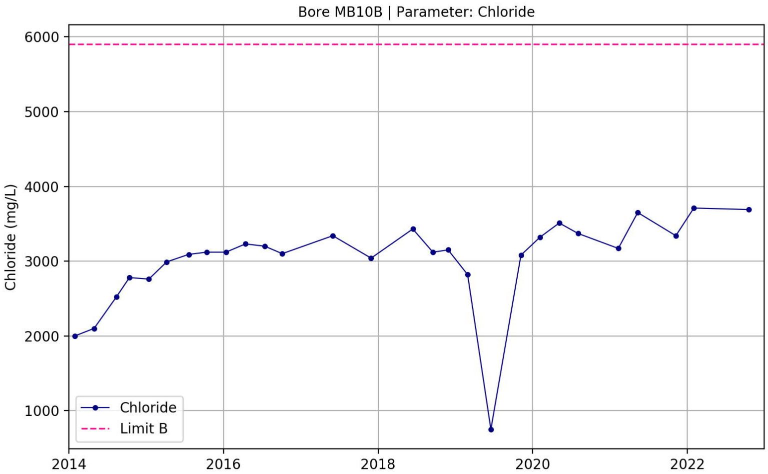

Bore MB10A | Parameter: Field EC
Field EC (µS/cm)
Field EC
Limit B

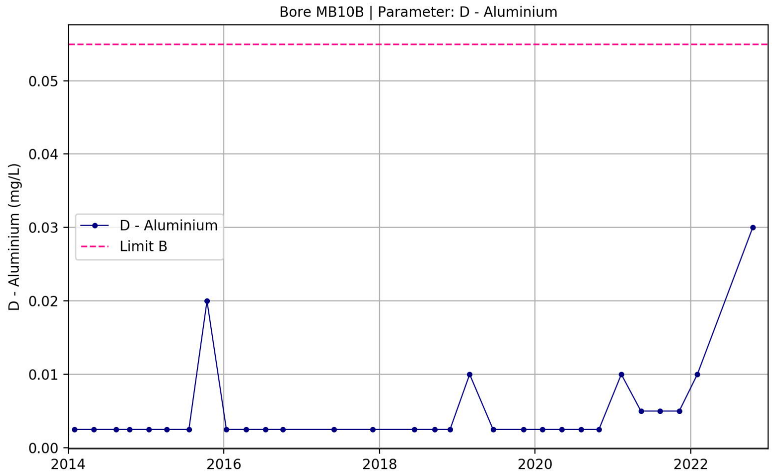

Bore MB10A | Parameter: Field pH
Field pH (-)
Field pH
Limit B - lower
Limit B - upper

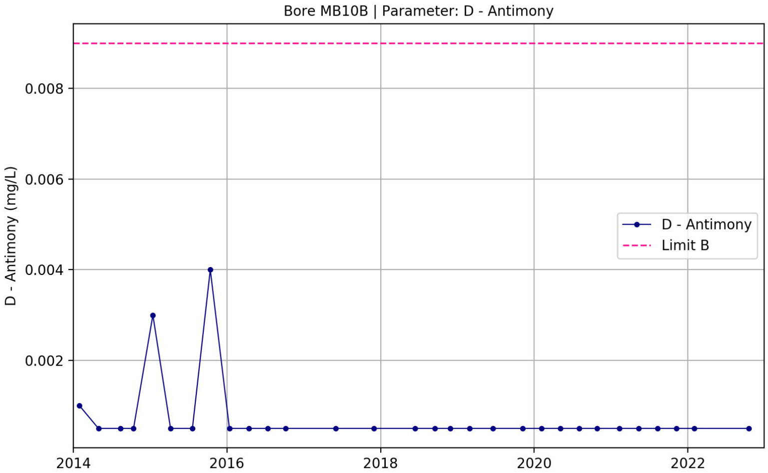

Bore MB10A | Parameter: Sulfate as SO4
Sulfate as SO4 (mg/L)
Sulfate as SO4
Limit B

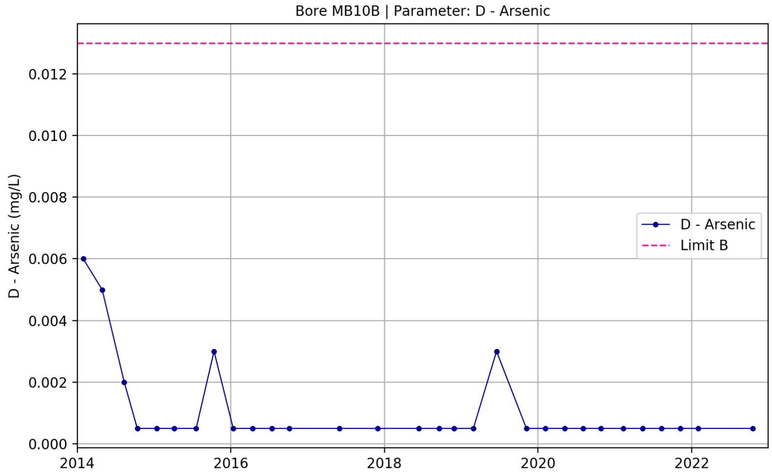

Bore MB10B | Parameter: C6 - C10 Fraction
C6 - C10 Fraction (µg/L)
C6 - C10 Fraction
Limit B

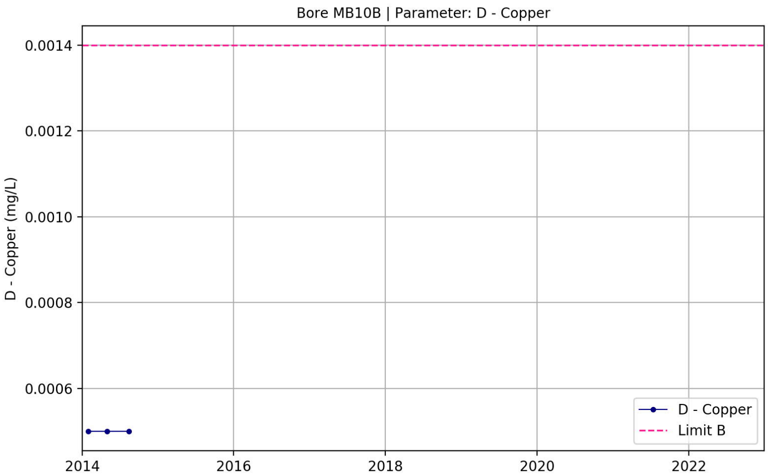

Bore MB10B | Parameter: C10 - C40 Fraction
C10 - C40 Fraction (µg/L)
C10 - C40 Fraction
Limit B

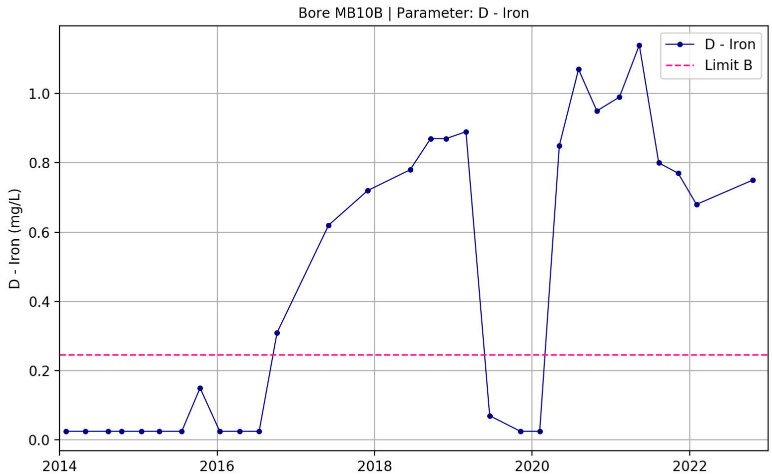

Bore MB10B | Parameter: Chloride
Chloride (mg/L)
Chloride
Limit B

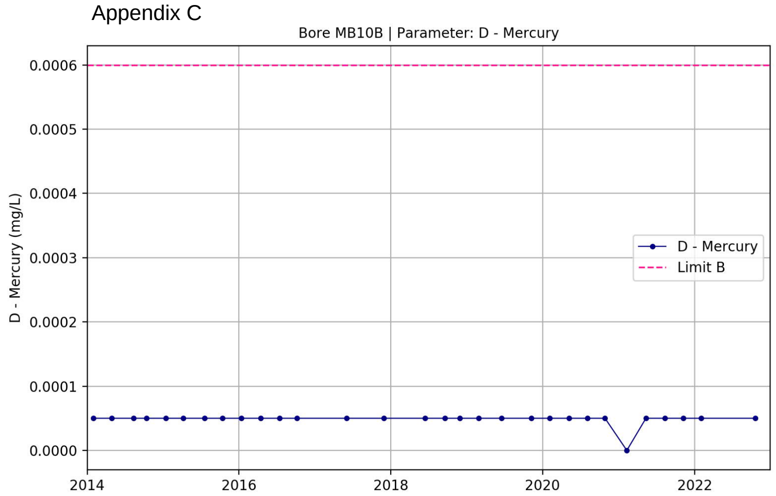

Bore MB10B | Parameter: D - Aluminium
D - Aluminium (mg/L)
D - Aluminium
Limit B

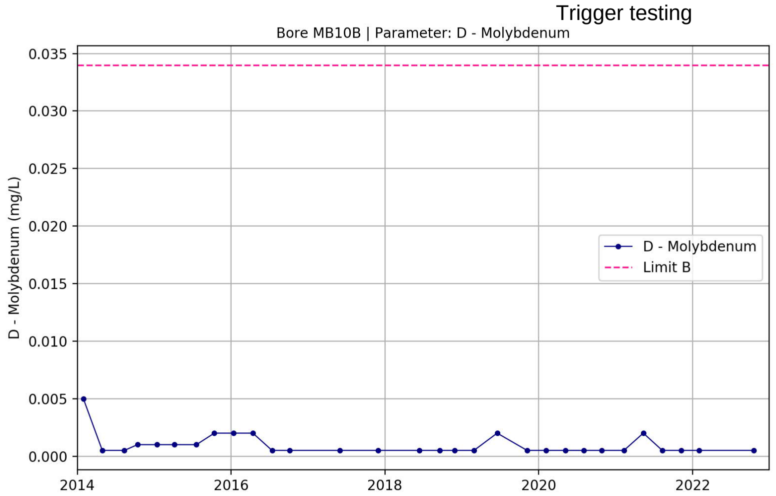

Bore MB10B | Parameter: D - Antimony
D - Antimony (mg/L)
D - Antimony
Limit B

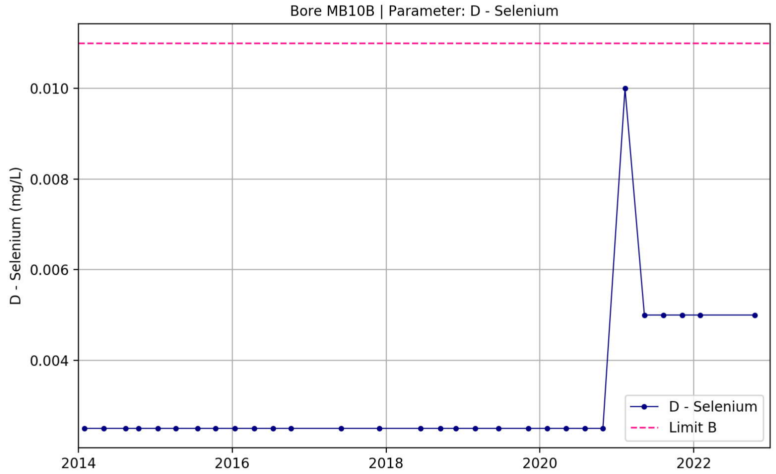

Bore MB10B | Parameter: D - Arsenic
D - Arsenic (mg/L)
D - Arsenic
Limit B

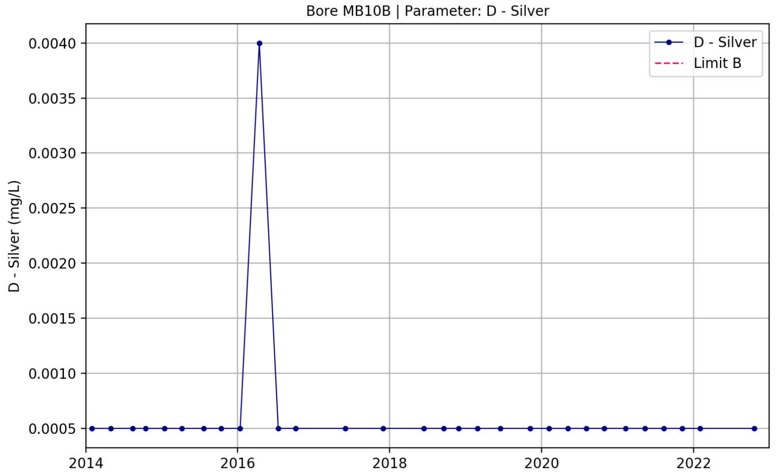

Bore MB10B | Parameter: D - Copper
D - Copper (mg/L)
D - Copper
Limit B

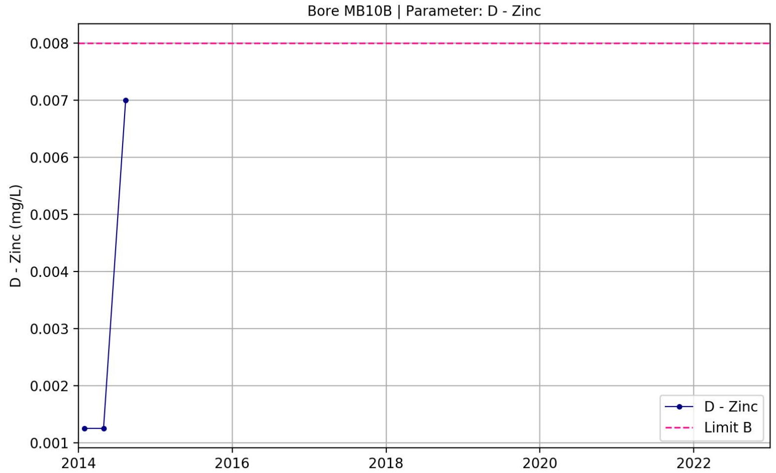

Bore MB10B | Parameter: D - Iron
D - Iron (mg/L)
D - Iron
Limit B

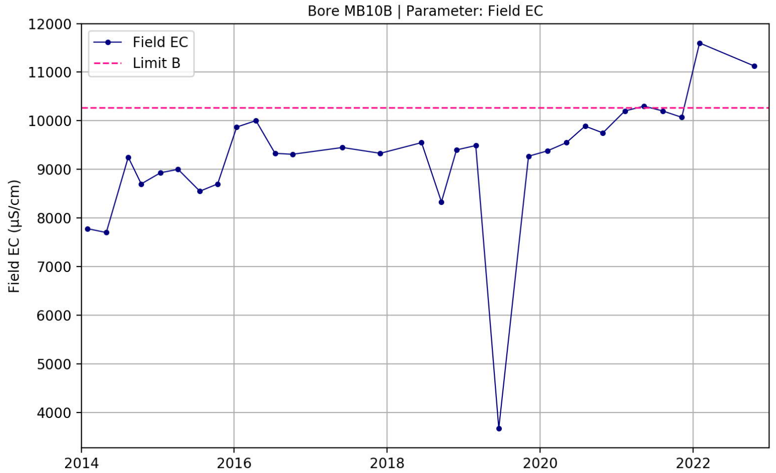

Bore MB10B | Parameter: D - Mercury
D - Mercury (mg/L)
0.0000
0.0001
0.0002
0.0003
0.0004
0.0005
0.0006
2014
2016
2018
2020
2022
D - Mercury
Limit B

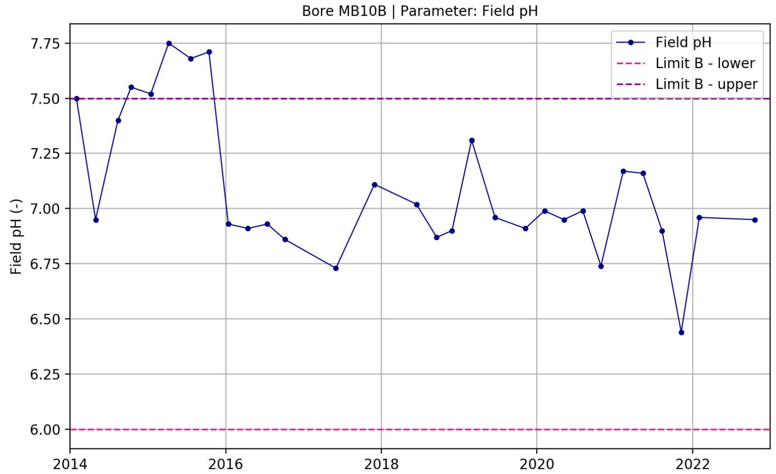

Bore MB10B | Parameter: D - Molybdenum
D - Molybdenum (mg/L)
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
2014
2016
2018
2020
2022
D - Molybdenum
Limit B

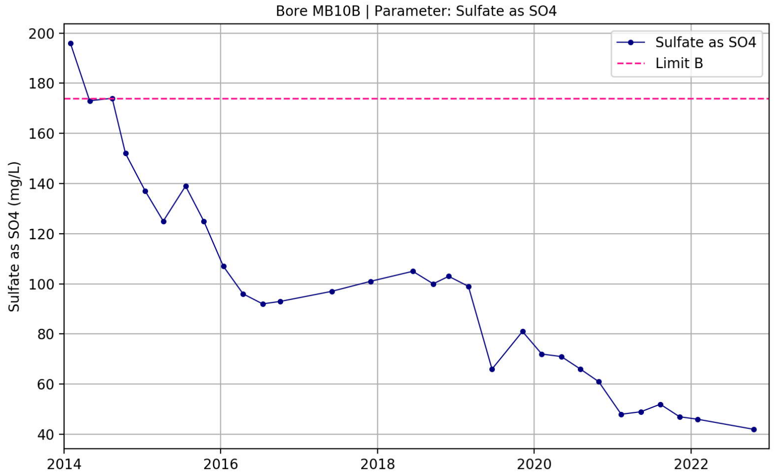

Bore MB10B | Parameter: D - Selenium
D - Selenium (mg/L)
0.004
0.006
0.008
0.010
2014
2016
2018
2020
2022
D - Selenium
Limit B


Bore MB10B | Parameter: D - Silver
D - Silver (mg/L)
0.0005
0.0010
0.0015
0.0020
0.0025
0.0030
0.0035
0.0040
2014
2016
2018
2020
2022
D - Silver
Limit B


Bore MB10B | Parameter: D - Zinc
D - Zinc (mg/L)
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
2014
2016
2018
2020
2022
D - Zinc
Limit B


Bore MB10B | Parameter: Field EC
Field EC (µS/cm)
4000
5000
6000
7000
8000
9000
10000
11000
12000
2014
2016
2018
2020
2022
Field EC
Limit B


Bore MB10B | Parameter: Field pH
Field pH (-)
6.00
6.25
6.50
6.75
7.00
7.25
7.50
7.75
2014
2016
2018
2020
2022
Field pH
Limit B - lower
Limit B - upper


Bore MB10B | Parameter: Sulfate as SO4
Sulfate as SO4 (mg/L)
40
60
80
100
120
140
160
180
200
2014
2016
2018
2020
2022
Sulfate as SO4
Limit B

## ASIA PACIFIC OFFICES


ADELAIDE
60 Halifax Street
Adelaide SA 5000
Australia
T: +61 431 516 449

BRISBANE
Level 16, 175 Eagle Street
Brisbane QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CAIRNS
Level 1 Suite 1.06
Boland's Centre
14 Spence Street
Cairns QLD 4870
Australia
T: +61 7 4722 8090

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE CBD
Suite 2B, 125 Bull Street
Newcastle West NSW 2302
Australia
T: +61 2 4940 0442

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Grd Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND
Level 4, 12 O'Connell Street
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628

WELLINGTON
12A Waterloo Quay
Wellington 6011
New Zealand
T: +64 2181 7186

SINGAPORE
39b Craig Road
Singapore 089677
T: +65 6822 2203