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MINING DONE RIGHT

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February 22, 2018
COR-18-015
Via Electronic

Kyle Moselle, Large Mine Project Manager
Office of Project Management and Permitting
Alaska Department of Natural Resources
400 Willoughby Street
Juneau, Alaska 99801-0101

Re: **Sumitomo Metal Mining Pogo LLC 2017 Annual Activity and Monitoring Report**

Dear Kyle:

Enclosed is Sumitomo Metal Mining Pogo LLC (Pogo's) 2017 Annual Activity and Monitoring Report. This report is prepared to fulfill the requirements of the *Alaska Department of Natural Resources (ADNR) Pogo Mine Millsite Lease ADL416949*, *Alaska Department of Environmental Conservation (ADEC) APDES Permit AK0053341,* and *ADEC Waste Management Permit 2011DB0012*. This report covers the period from January 1, 2017 through December 31, 2017.

If you have any questions, please contact Stacy Staley, Sr. Environmental Coordinator at (907) 895-2761 or by at stacy.staley@smmpogo.com. Or you may contact me at 907-895-2879 or jillian.ladegard@smmpogo.com.

Sincerely,

Jillian Ladegard, P.E.
Environmental Manager

Enclosure: 2017 Activity and Monitoring Report Sumitomo metal Mining Pogo LLC (via ZENDTO)

cc: Tim Pilon, ADEC (via ZENDTO)
dec-wqreporting@alaska.gov (via ZENDTO)
Brent Martellaro, ADNR (via ZENDTO)

2017 ANNUAL ACTIVITY AND MONITORING REPORT

SUMITOMO METAL MINING POGO LLC

Submitted To:

Alaska Department of Conservation
Division of Water, Compliance Program
555 Cordova Street
Anchorage, Alaska 99501

Alaska Department of Natural Resources
Division of Mining, Land, and Water
550 West 7th Avenue, Suite 900D
Anchorage, AK 99501-3577

Prepared by:

Sumitomo Metal Mining Pogo LLC
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February 22, 2018

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List of Acronyms

ADEC: *Alaska Department of Environmental Conservation*

ADNR: *Alaska Department of Natural Resources*

ADF&G: *Alaska Department Fish & Game*

APDES: *Alaska Pollutant Discharge Elimination System*

BOD: *Biological Oxygen Demand*

CIP: *Carbon in Pulp*

COE: *Corp of Engineers*

DMR: *Discharge Monitoring Report*

DSTF: *Dry Stack Tailing Facility*

EPA: *Environmental Protection Agency*

GPM: *Gallons per Minute*

MDL: *Method Detection Limit*

MWTP: *Mine Water Treatment plant*

ORTW: *Off River Treatment Works*

QAP: *Quality Assurance Plan*

RTP: *Recycle Tailing Pond*

SRCE: *Standardized Reclamation Cost Model*

STP: *Sewage Treatment Plant*

TDS: *Total Dissolved Solids*

TKN: *Total Kjehldahl Nitrogen (ammonia)*

TSS: *Total Suspended Solids*

TWUP: *Temporary Water Use Permits*

WAD: *Weak-Acid Dissociable (cyanide)*

WET: *Whole Effluent Toxicity*

1. INTRODUCTION

Sumitomo Metal Mining Pogo LLC (Pogo) prepared this report to fulfill the requirements of the *Alaska Department of Environmental Conservation (ADEC) APDES Permit AK0053341 (8/1/2017), Alaska Department of Environmental Conservation (ADEC) Waste Management Permit 2011DB0012 (2/7/2012), Alaska Department of Natural Resources (ADNR) Pogo Mine Millsite Lease ADL416949 (3/9/04)*, *and ADNR Plan of Operations Approval F20129500 (2/7/2012)*. This report covers the period from January 1, 2017 through December 31, 2017. A General Location Map can be found in **Figure 1, Appendix A**.

2. 2017 MONITORING

A prescriptive environmental monitoring program as required by Pogo's operating permits is conducted in accordance with Pogo's approved *Pogo Mine Monitoring Plan* and *Quality Assurance Plan (QAP)*.

The objectives of Pogo's monitoring programs are to:

- Monitor the water quality of the effluent discharged from the facility,
- Monitor water quality changes in the Goodpaster River and in the groundwater below the facility that may occur as a result of mining activities or discharges from the facility,
- Monitor the CIP Tailings Processes associated with the underground paste backfill, and
- Monitor the Flotation Tailings and the materials placed in the Dry Stack Tailings Facility (DSTF).

Samples collected from Mine Water Treatment Plant (MWTP) #3 (located near the 1525 portal), groundwater stations, surface water stations, the Sewage Treatment Plant (STP); and the Off River Treatment Works (ORTW) effluent were submitted to Energy Laboratories, Inc. Pollen Environmental Laboratories, Inc. also analyzes STP samples. Samples collected from PC002 to monitor mineralized waste rock and PC003 floatation tailings were analyzed by ALS Chemex. Annual Whole Effluent Toxicity (WET) Test samples were submitted to TRE Environmental Laboratory and CH2MHill Laboratory. Annual fish tissue samples were analyzed by Test America Laboratory, Tacoma.

2.1 ANNUAL VERIFICATION OF LABORATORY SPECIFIC METHOD DETECTION LIMIT (MDL) STUDY

ADEC Waste Management Permit 2011DB0012 (2/7/12), Section I.3.1.4, 1.7.3

Laboratories perform lab quality assurance and quality control procedures at regular intervals to verify the accuracy of the established MDLs. EPA-accredited laboratories' routinely spike and run replicate samples once or twice a year to either confirm or re-establish laboratory MDLs. A copy of the most recent MDL studies from Energy Laboratories and Pollen Environmental are provided in **Appendix D**.

2.2 SUMMARY

A summary of the 2017 monitoring results show:

APDES Permit:

- **Outfall 011:** Pogo reported several minor pH excursions during 2017. Refer to **Section 2.3.1** for more detail.
- **Outfall 001:** Pogo reported one potential cadmium exceedance in January, a turbidity exceedance in February (due to instrument error), and two potential Weak Acid Dissociable (WAD) cyanide exceedances in April due to flooding conditions. Refer to **Section 2.3.2** for more detail.
- **Outfall 002:** Pogo reported no exceedances during 2017. Refer to **Section 2.3.3** for more detail.
- **Surface Water:** No adverse trends were observed in the surface water samples collected during 2017. Refer to **Section 2.4.1** for more detail.
- **Whole Effluent Toxicity:** WET testing took place in June. Chronic bioassays were conducted by two laboratories concurrently. All final test results were within the permit limits. Refer to **Section 2.4.2** for more detail.
- **Fish Tissue:** Annual fish tissue sampling was completed during September. No adverse trends were observed. Refer to **Section 2.4.3** for more detail.

Groundwater:

- **2011 Series Wells:** Two wells are located below the Dry Stack Tailings Facility, MW11-001A and MW11-001B. The wells monitor groundwater downstream of the DSTF and upstream of the Recycled Tailings Pond (RTP). No adverse trends were observed. Refer to **Section 2.5.1** for more detail.

- **500 Series Wells:** Three wells are located below the Recycled Tailings Pond Dam (MW12-500, MW12-501, and MW12-502). The wells monitor groundwater downstream of the RTP seepage collection system. Chloride, sodium, nitrate were detected above the trigger limits in some of the wells. Refer to **Section 2.5.3** for more detail.

- **200 Series Wells:** Two wells, MW04-213 and MW11-216, are located downgradient of the ore body to monitor groundwater quality. MW04-213 is showing an upward trend in arsenic. Refer to **Section 2.5.4** for more detail.

- **LL Series Wells:** LL04-031 and LL04-032 are located downgradient of the ORTW to monitor groundwater between the ORTW and Goodpaster River. Samples were collected during the third quarter. No adverse trends were observed. Refer to **Section 2.5.5** for more detail.

- **2012 Series Wells:** Two wells are located adjacent to the Pogo Airstrip, MW12-001A and MW12-001B. No adverse trends were observed. Refer to **Section 2.5.6** for more detail.

Process Control:

- **PC001:** PC001 monitors CIP tails prior to use in paste backfill. All samples are within limits and conditions set forth within the permit. Refer to **Section 2.6.3** for more detail.

- **PC002, PC003 Solids:** PC002 samples monitor mineralized waste rock that is placed within the Dry Stack Tailings Facility. PC003 Solids samples monitor floatation tailings that are placed within the DSTF. No adverse trends were observed. Refer to **Sections 2.6.4 and 2.6.5** for more detail.

- **PC003 Interstitial Water:** PC003 liquid samples monitor interstitial water pressed from the flotation tailings prior to placement within the DSTF. Mercury and copper concentrations

remain above target operating ranges. Refer to **Section 2.6.6** for more detail.

A discussion of the results for each sampling program is provided below. Time series graphs are provided in **Appendix C**.

2.3 TREATED EFFLUENT MONITORING

ADEC APDES AK0053341 (8/1/2017), Appendix A, 3.0

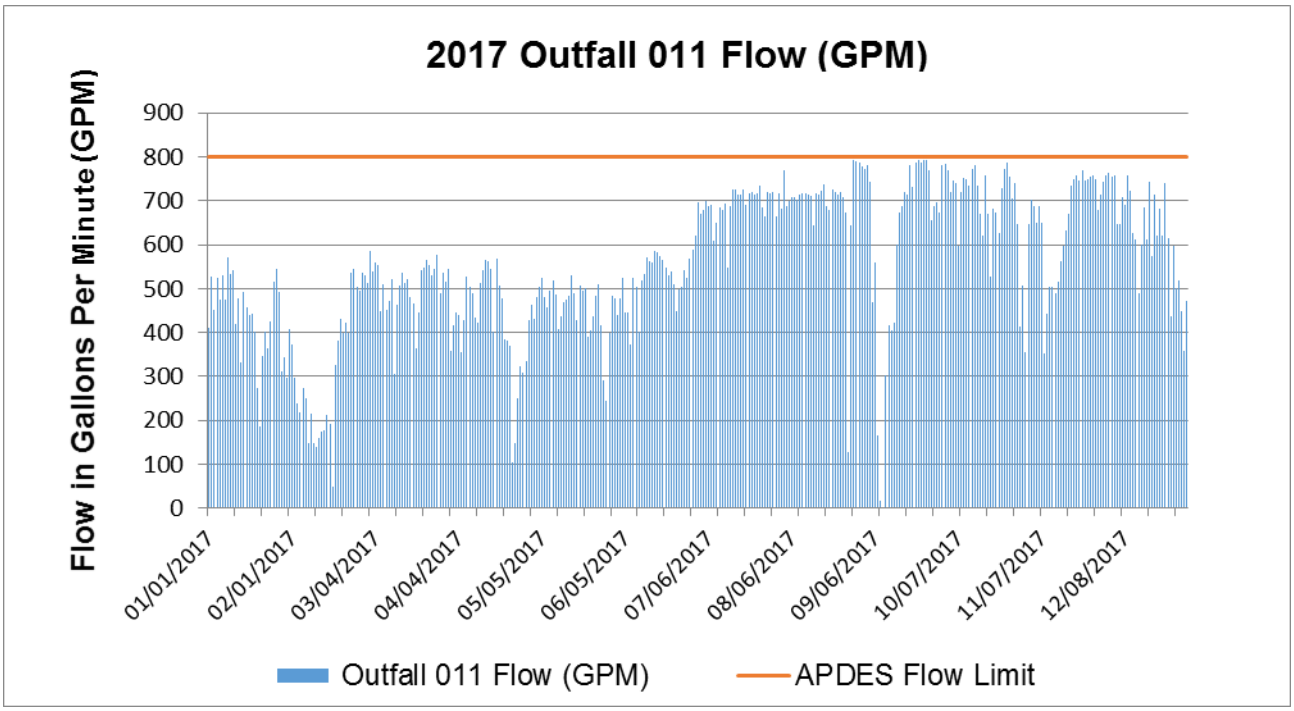
Treated effluent data were previously submitted to ADEC via copies of the Discharge Monitoring Reports (DMRs) under the APDES Permit. The monitoring locations for treated effluent are shown on **Figure 2 in Appendix A**.

2.3.1 Outfall 011- Treated Effluent from Mine Water Treatment Plant

ADEC APDES AK0053341 (8/1/17), 1.4

Groundwater and drill water collected from the underground workings, surface runoff and groundwater collected in the RTP and mine seepage water are sent to the MWTP#3, treated and then discharged to the Off River Treatment Works or directed to the mill for use as process water. Discharge to the ORTW occurred throughout the year. The volume of water discharged from Outfall 011 in 2017 is shown below in **Chart 1.**

Chart 1: 2017 Water Treatment Plant #2 & #3 Outfall 011 Discharge to ORTW



Continuous pH data is collected at Outfall 011 along with weekly and quarterly laboratory samples for metals, total suspended solids (TSS), hardness, Weak-Acid Dissociable (WAD) cyanide, anions, cations, and total dissolved solids (TDS).

- In March two pH excursions were reported at Outfall 011. The excursions fall under the continuous pH monitoring exemption under 40 CFR 401.17 allowing single incidences less than 60 minutes, and the monthly cumulative total less than 7 hours and 26 minutes.
- On March 4, the continuous monitor, Meter A, recorded a pH level above 9.0 su for 4 minutes; the maximum pH was reported at 9.20 su.
- On March 4, the continuous monitor, Meter B, recorded a pH level above 9.0 su for 3 minutes; the maximum pH was reported at 9.12 su.

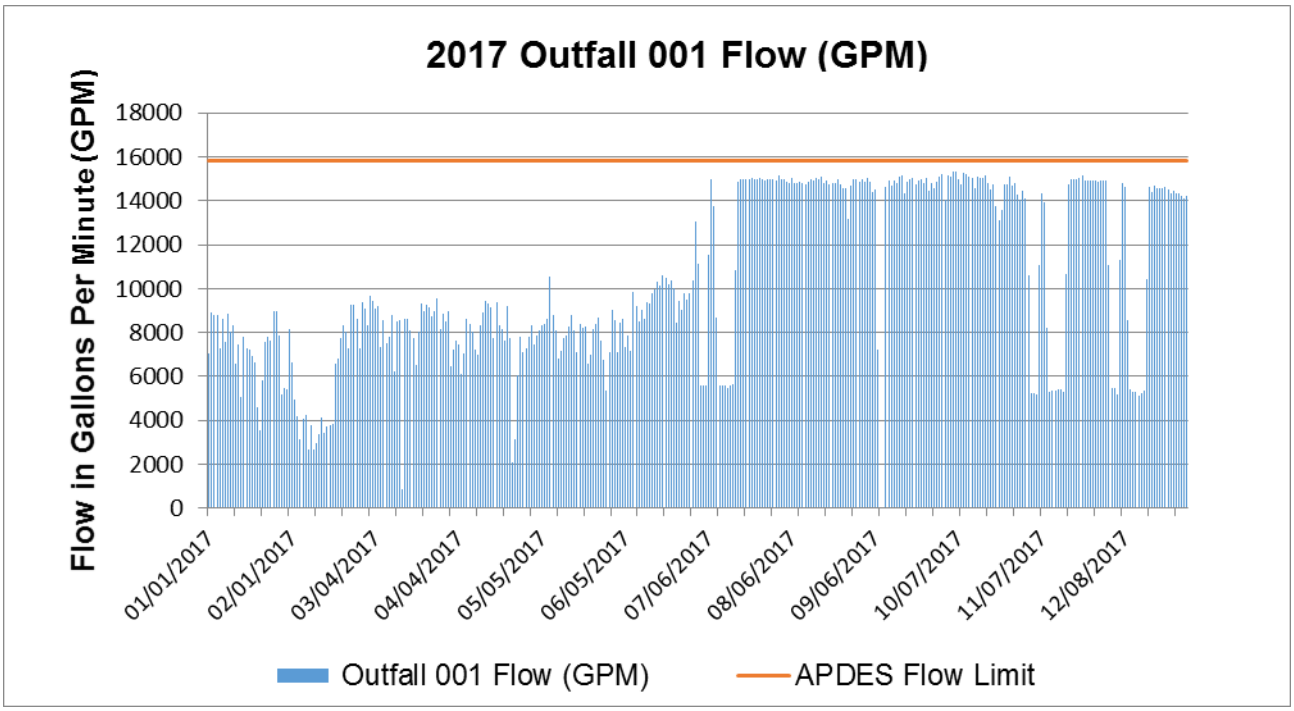
Except as noted above, all results are within the limits and conditions set forth within the permit. Time series graphs are provided in **Appendix C**. Monitoring and historic data are provided in **Appendix G**.

2.3.2 Outfall 001 – Discharge from Off River Treatment Works

ADEC APDES AK0053341 (8/1/17), 1.3

Treated effluent from MWTP#3 is sent to the ORTW. After mixing in the ORTW, water flows over the weir of Pond 2 (Outfall 001) and into the Goodpaster River. The sampling location is at the weir. **Chart 2** presents the gallons per minute flow from Outfall001 for 2017.

Chart 2: 2017 Outfall 001 Discharge from ORTW



Continuous turbidity data and twice-daily pH readings are collected along with weekly laboratory samples for metals, WAD cyanide, TDS, turbidity, sulfate, and hardness at Outfall 001. In addition, daily field parameters and weekly samples required by the permit, (turbidity) and other parameters, were collected upstream from the discharge point (NPDES001B) to determine background water quality of the Goodpaster River.

On the January DMR, Pogo reported a potential exceedance of the maximum daily effluent limit and the monthly average effluent limit for cadmium. After investigation no direct cause was found, and subsequent samples have not detected cadmium above the permit limit.

On the February DMR, Pogo reported a potential exceedance for turbidity. Values were elevated

several hours after a power outage, upon the turbidity meter being reset, the meter readings returned to levels observed prior to the power outage. After investigation no other instrumentation showed any evidence or cause for elevated turbidity over this period. As a result, Pogo believes the turbidity readings are not representative of actual discharge.

Pogo reported two potential WAD cyanide exceedances at Outfall 001. The sample collected on April 12, 2017 reported WAD cyanide at 20 ug/L. The sample collected on April 19, 2017 reported WAD cyanide at 22 ug/L. Pogo believes the reported WAD cyanide concentrations may not be representative of river conditions. The Goodpaster River's turbid and tannic water– characteristic of spring runoff– potentially caused inference with the WAD cyanide analytical method resulting in positive results. Samples collected at Outfall 011 on the same days reported WAD cyanide concentrations of 6 ug/L and 13 ug/L. The monthly average for WAD cyanide at Outfall 011 was 9.5 ug/l, less than the site specific limit of <20 ug/l. The ORTW pumps were properly functioning and average dilution was measured at 15.8 on April 12, and 15.7 April 19. The corresponding concentration of WAD cyanide at Outfall 001 should have been below Pogo's site specific method detection and reporting limits for WAD cyanide.

WAD cyanide analysis of samples collected at Outfall 001 during the second quarter also included two samples where the results fell between the site specific limits of <10 (MDL) and <20 (MRL). The WAD cyanide levels bracketing the potential exceedance discussed above, showed 11 ug/l on April 5 and 16 ug/L on April 26.

Due to an oversight, the July monthly Outfall 001 samples for metals analysis including hardness, cadmium, zinc, and mercury were not collected. A review of compliance sampling procedures, profiles, and schedules with Environmental Department personnel was conducted. A consultant, with Environmental Standards, Inc. provided training and reviewed sampling methods and procedures with staff August 14 - 16, 2017.

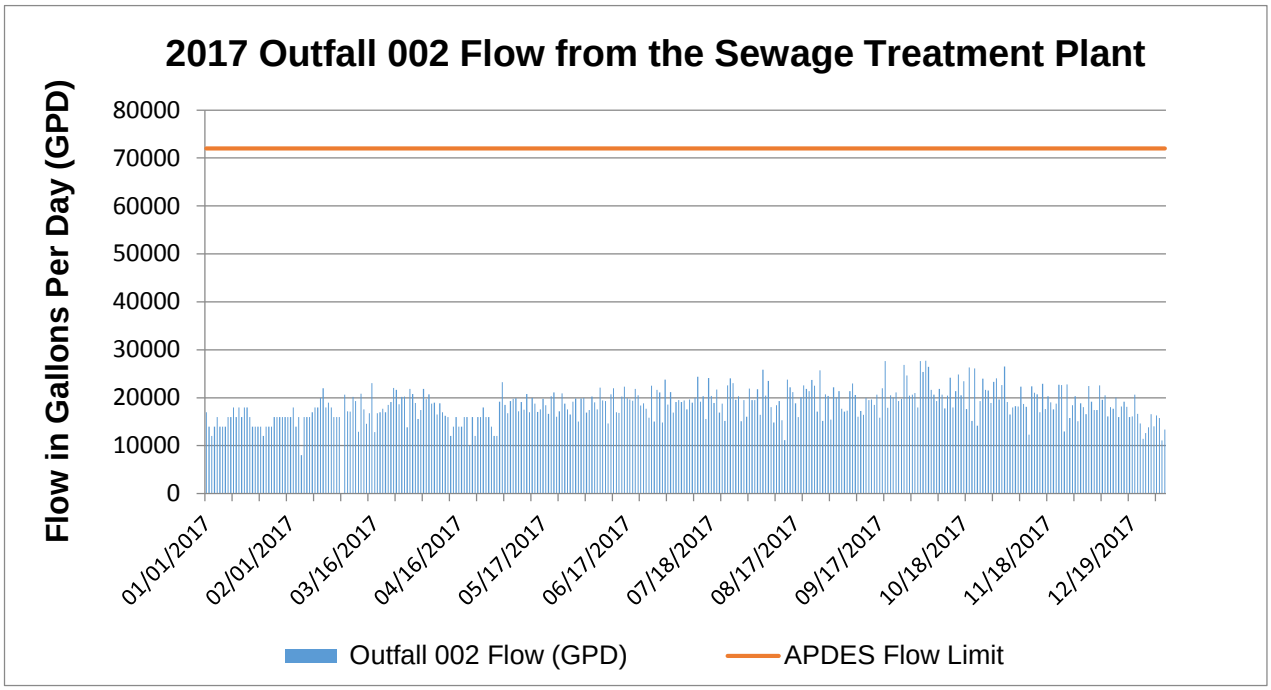
Except as noted above, all results were within the limes and conditions set forth within the permit. Time series graphs are provided in **Appendix C**. Monitoring and historic data are provided in **Appendix G**.

2.3.3 Outfall 002 – Treated Effluent from Sewage Treatment Plant

ADEC APDES AK0053341 (8/1/17), 1.5

The STP operated throughout 2017 with discharge flows ranging between 8,000 and 27,700 gallons per day. Daily field parameters were collected to assess quality of treated effluent prior to discharge in the mixing zone in the Goodpaster River. Weekly samples were also collected for Biological Oxygen Demand (BOD5), TSS, fecal coliform, nitrates, and chlorine. Influent data from STP002 were collected for BOD5 and TSS on a monthly basis to determine quarterly percent removal.

Chart 3: 2017 Outfall 002 Flow



All results were within the limits and conditions set forth within the permit. Time series graphs are provided in **Appendix C.** Monitoring and historic data are provided in **Appendix G**.

2.4 SURFACE WATER MONITORING

2.4.1 Goodpaster River

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.6.2.2 & 1.6.4; ADEC APDES AK0053341 (8/1/17), 1.8; Pogo Mine Monitoring Plan (6/13) 5.0

Five surface water stations are monitored to evaluate water quality along the Goodpaster River. An additional sampling site upstream of the ORTW, SW49, was added in 2016 to monitor background water quality. Previously established sampling locations are: SW01 located upstream of the Pogo Mine, SW41 located downstream of Outfall 001, SW42 downstream of Outfall 002, and SW15 located downstream from all Pogo facilities.

Surface water samples are analyzed for WAD cyanide, ionic balance, major cations and anions, and total and dissolved metals. Physical and aggregate properties of ammonia, conductivity, hardness, nitrates, pH, TDS, TSS, turbidity, TKN, and temperature are also measured.

Surface water samples were collected on March 9, May 15, June 22, August 15, September 26, and December 11, 2017. Fish Tissue samples were collected in conjunction with the September 26, sampling event. Results of the fish tissue sampling are provided in the **Section 2.4.3**.

All surface water sampling results were within the limits and conditions set forth within the permit. The locations of the surface water monitoring stations are shown in **Appendix A, Figure 2.** Time series graphs are provided in **Appendix C**. Monitoring and historic data are provided in **Appendix G**.

2.4.2 Whole Effluent Toxicity

ADEC APDES Permit AK0053341 (8/1/17), 1.7

The annual Whole Effluent Toxicity test was conducted June 20 through June 27, 2017 by CH2M Hill's Aquatic Toxicology Laboratory in Corvallis, Oregon. A split of the same sample was also sent to TRE Environmental Strategies in Fort Collins, CO. Results from both laboratories are presented in **Table 1**. All results were within the limits and conditions set forth within the permit. Laboratory reports are provided in **Appendix E**.

Table 1: Pogo Mine Whole Effluent Toxicity (WET) Testing 2017

Laboratory	Species	No Observed Effect Concentration (%)	Low Observed Effect Concentration (%)	Inhibition Concentration 25 % (IC25)	Toxicity Units Chronic (TUc)
CH2MHILL	*Ceriodaphnia dubia*	100	>100	>100	<1
	Pimephales promelas	100	>100	>100	<1
TRE	*Ceriodaphnia dubia*	100	>100	>100	<1
	Pimephales promelas	100	>100	>100	<1

2.4.3 Fish Tissue

ADEC APDES Permit AK0053341 (8/1/17), 1.8.8

In order to assess long term trends in Goodpaster River quality, annual whole body analysis of juvenile Chinook salmon are required at monitoring sites both upstream (SW01) and downstream (SW12) from the project facilities. Juvenile Chinook salmon were collected from these stations on September 26, 2017.

The juvenile Chinook were collected at both locations, SW01 and SW12. Metals analysis was conducted on individual Chinook and a composite sample of fish for each location was also analyzed. As required by **Fish Resource Permit SF2017-207** a report of collecting activities and data submission form was submitted to ADF&G on October 8, 2017.

All results are consistent with historical data. Time series graphs are provided in **Appendix C**. Monitoring and historic data are provided in **Appendix G**.

2.5 GROUNDWATER QUALITY MONITORING

Groundwater samples are analyzed for WAD cyanide, ionic balance, major cations and anions, and total and dissolved metals. Physical and aggregate properties of ammonia, conductivity, hardness, nitrates, pH, TDS, TSS, turbidity, TKN, and temperature are also measured.

The locations of the groundwater monitoring stations are shown in **Appendix A**, **Figure 2.**

2.5.1 Downgradient of DSTF

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.1.4, 1.2.7, 1.6.4; Pogo Mine Monitoring Plan (6/13), 6.0

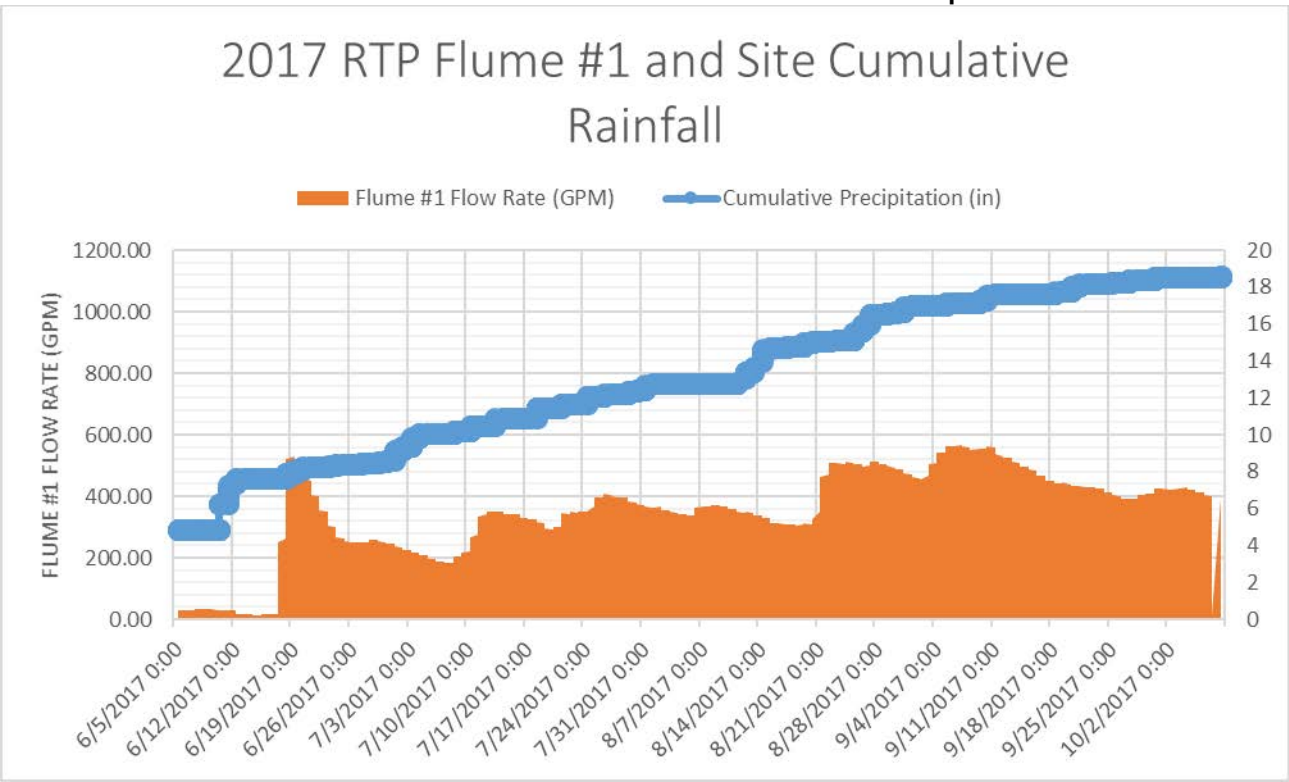
MW11-001A and MW11-001B provide information on water quality trends down-gradient from the DSTF and up-gradient of the RTP. MW11-001A is an alluvial well and MW11-001B is a bedrock well. MW11-001A and MW11-001B both had water present during the sampling events that occurred September 11 and October 10. MW11-001B was also sampled earlier on March 14, April 25, and May 23.

Cadmium, copper and TDS concentrations in MW11-001A are decreasing. TDS concentrations in MW11-001B are also decreasing. Nitrate concentrations in MW11-001A and MW11-001B continued to fluctuate with no apparent trend. Piezometer well LT99-099 below the drystack is monitored for water elevation on a quarterly basis. Time series graphs are provided in **Appendix C**. Monitoring and historic data are provided in **Appendix G**.

2.5.2 Liese Creek Flumes

Four flumes were installed in Liese Creek in 2012. **Chart 4** provides flow data for Flume #1 (near the toe of the DSTF) versus precipitation rate in 2017.

Chart 4: 2017 Liese Creek Flume #1 Flow Rate vs. Precipitation



*Adjusted values in this chart were estimated by comparing piezometer readings against manual readings taken by staff during routine inspections.

2.5.3 Downgradient of RTP Dam

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.1.4, 1.2.6, 1.6.4, Pogo Mine Monitoring Plan (6/13), 6.0

Three wells located below the RTP Dam, MW12-500, MW12-501, and MW12-502 monitor groundwater downstream of the RTP seepage collection system. Samples for these wells were collected quarterly throughout 2017 (provided sufficient water was available). Trigger limits for groundwater monitoring at these locations are set forth in Pogo's ADEC Waste Management Permit 2011DB0012 and the Pogo Mine Quality Assurance Plan.

Six sampling events occurred in 2017 for MW12-500. Chloride and nitrate were detected above the trigger limits on all sampling events.

Three sampling events occurred in 2017 for MW12-501 and MW12-502. Chloride, sodium, and

nitrate were detected above the trigger limits in all three sampling events for both wells.

Except as noted above, all results are within the limits and conditions set forth within the permit. Time series graphs are provided in **Appendix C**. Monitoring and historic data are provided in **Appendix G**.

2.5.4 Downgradient of Ore Zone

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.1.4, 1.2.7, 1.6; Pogo Mine Monitoring Plan (6/13), 6.0

Monitoring wells MW04-213 and MW11-216 provide information on water quality trends down-gradient from the ore zones. Samples are collected semi-annually at MW04-213 and MW11-216. Samples were collected from MW04-213 on March 27, and September 12, 2017 and show an upward trend in arsenic. An investigation to explain the origin of the elevated arsenic concentration is planned for 2018. Samples were collected from MW11-216 on March 13, and August 28, 2017. Except as noted, no other adverse trends were observed.

Piezometer well MW99-216 is monitored quarterly for water elevation. Time series graphs are provided in **Appendix C**. Monitoring and historic data are provided in **Appendix G**.

2.5.5 Downgradient of ORTW

Not required by permit.

Monitoring stations LL04-031 and LL04-032 are sampled annually and provide information on ground water quality trends between the ORTW and the Goodpaster River. Samples were collected June 20, 2017. No adverse trends were observed. Time series graphs are provided in **Appendix C**. Monitoring and historic data are provided in **Appendix G**.

2.5.6 Goodpaster River Area

Not required by permit.

MW12-001A and MW12-001B were established in support of the hydrogeologic study that was initiated during 2012. Dedicated pumps were installed in 2013 and samples were collected monthly during the entire year to establish background water quality data and continued through 2017, quarterly. Time series graphs are provided in **Appendix C**. Monitoring and historic data are

provided in **Appendix G**.

2.6 PROCESS CONTROL MONITORING

Process facilities are monitored as follows.

2.6.1 Water Balance

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.6.2.4; Pogo Plan of Operations (11/1/2011), 8.0; Water Rights LAS 24611 – LAS 24617

At the beginning of the 2017 the RTP reservoir volume was observed at 12.2 million gallons. At the end of 2017 the RTP volume was recorded at 11.7 million gallons. Water balance details are summarized below:

Added to RTP

- 139 million gallons of runoff and seepage water was collected in the RTP; and
- 14.9 million gallons of treated water was recycled to the RTP distribution system.

Removed from RTP distribution system

- 16 million gallons were pumped from the RTP for underground drill water;
- 86 million gallons were pumped from the RTP to the mill process; and
- 56.8 million gallons were pumped from the RTP to the Mine Water Treatment Plant.

Recycled treated water

- 96 million gallons were recycled at the Mill from the Mine Water Treatment Plant; and
- 15 million gallons were recycled to the RTP distribution system from the Mine Water Treatment Plant.

Discharge to ORTW

- 290 million gallons were treated and discharged via the Off RiverTreatment Works.

2.6.2 Permits to Appropriate Water and Temporary Water Use Permit Summary

ADNR Permits to Appropriate Water, LAS 24616, 24613, 24611, 24612 Condition 6; ADNR Temporary Water Use Authorization TWUP F2011-131, F2011-76, F2011-130, F2013-023, F2013-143, Condition 14. A summary of water usage for Permits to Appropriate Water and Temporary Water Use Permits is provided in **Table 2** and **Table 3.**

Table 2: Permits to Appropriate Water 2017 Monthly Total Flows

Month	LAS 24616 Surface Water Collected in Recycle Tailings Pond (RTP)	LAS 24613 Goodpaster River ORTW Influent	LAS 24611 Drinking Water Wells DW02 & DW03	LAS 24612 Gravel Pit Pond*
	(gallons)	(gallons)	(gallons)	(gallons)
January	2,787,028	322,727,514	692,665	0
February	1,679,672	229,443,082	618,421	0
March	2,304,392	379,827,798	628,249	0
April	6,898,795	325,404,918	702,189	9,000
May	17,189,211	353,113,645	703,218	355,500
June	13,967,446	400,481,499	699,760	589,500
July	20,328,875	634,227,928	788,416	247,500
August	22,081,686	616,032,000	766,129	198,000
September	19,417,427	538,920,000	746,949	49,500
October	13,947,035	582,207,991	845,300	0
November	6,445,298	607,292,183	783,967	0
December	12,035,905	622,155,865	692,809	0
Total (gallons)	**139,082,770**	**5,611,834,425**	**8,668,071**	**1,449,000**
Total in Acre-ft	**427**	**17,222**	**27**	**4.5**
Permit Limit Acre-ft	**387.12**	**24,195.11**	**81.77**	**241.95**

* includes water used for Mill make-up and for road dust control

Pogo is applying for water rights in 2018 for LAS 24616 Surface Water Collection in the Recycle Tailing Pond. An increase in water use, up to 600 acre-feet a year, has been requested to accommodate more intensive use of the impoundment.

Table 3: Temporary Water Use Permits 2017 Monthly Total Flows

Month	TWUP F2011-131 RTP Seepage Collection System Wells	TWUP F2011-76 Rosa Creek, Caribou Creek, Gilles Creek, Shaw Creek	TWUP F2011-130 Diversion Ditches	TWUP F2013-023 (includes LAS 24617 water use) Underground Water Recycle
	(gallons)	(gallons)	(acre-feet)	(gallons)
January	3,689,667	0	Annual Calculated Amount	25,063,993
February	2,664,181	0		21,279,325
March	2,450,923	0		32,514,892
April	1,974,245	0		26,540,371
May	2,093,010	222,200		24,659,755
June	2,116,462	381,800		22,227,198
July	3,174,993	614,970		25,646,514
August	3,267,648	499,500		26,048,766
September	4,039,200	459,000		23,389,440
October	3,816,426	0		28,178,515
November	4,421,573	0		28,657,780
December	3,751,775	0		27,498,266
Total Gallons	**37,460,105**	**2,177,470**	**278,716,000**	**311,704,814**
Total Acre-feet	**115**	**6.7**	**855**	**957**
Permit Limit	**1,945,000,000 gals**	**14,400,000 gals**	**1460 acre-ft.**	**1613.3 acre-ft.**

2.6.3 Carbon-in-Pulp (CIP) Tailings Cyanide Destruction

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.2.3, 1.6.2.3; Pogo Mine Monitoring Plan (6/13), 4.2

After cyanide destruction, the CIP tailings are stored in the CIP tank prior to being mixed with cement and used as backfill in the mine. Pogo's Mine Monitoring Plan requires grab samples at station PC001 (CIP Stock Tank), which is located directly after the cyanide destruction circuit. Pogo collects a daily sample during a paste pour. The Waste Management Permit 2011DB0012 requires that samples contain less than 10 mg/kg of WAD cyanide as a monthly average with no samples can contain more than 20 mg/kg of WAD cyanide. During 2017, 100% of the monthly averages of the PC001 samples measured less than 10 mg/kg WAD Cyanide and no samples were greater than 20 mg/kg WAD cyanide. Time series graphs are provided in **Appendix C**. Monitoring and historic data are provided in **Appendix G**.

2.6.4 Mineralized Development Rock Geochemistry

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.2.1, 1.6.2.6; Pogo Mine Monitoring Plan (6/13) 4.1.1, Appendix A

Samples of mineralized waste rock placed in the DSTF (PC002) are collected monthly and composited to form a quarterly sample which is then analyzed. Quarterly samples were analyzed and showed no adverse trends for 2017.

Appendix B, **Table 2**, shows selected parameters for the PC002 mineralized waste rock samples. Monitoring and historic data are provided in **Appendix G**.

2.6.5 Flotation Tailings Geochemistry

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.6.4; Pogo Mine Monitoring Plan (6/13) 4.0

Flotation tailings geochemistry solid samples were collected on April 1, June 20, September 25, and December 12, 2017 at PC003, the underflow of the filter-feed tank at the end of the mill circuit, prior to disposal on the DSTF. No adverse trends were observed. **Appendix B**, **Table 3**, shows selected parameters for the PC003 Solid flotation tailings samples. Monitoring and historic data are provided in **Appendix G**.

2.6.6 Flotation Tailings Interstitial Water Chemistry

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.6.4; Pogo Mine Monitoring Plan (6/13) 4.0

The interstitial water from the tailings samples was collected at PC003 on April 1, June 20, September 25, and December 12, 2017. Mercury and copper concentrations remain above target operating ranges. Pogo believes the fluctuations may due to variation in ore chemistry, however an investigation into other possible sources of mercury is underway. Time series graphs are provided in **Appendix C**. Monitoring and historic data are provided in **Appendix G**.

2.7 VISUAL MONITORING

2.7.1 Facility Inspection

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.6.2.1, 1.6.9.3, 1.6.9.4; Pogo Mine Monitoring Plan (6/13) 2.0, 3.1; Pogo RTP Operating and Maintenance Manual (12/16), 4.0.

Visual inspections of the DSTF, RTP Dam, and monitoring wells were completed throughout 2017. No cracks, bulging, settlement, geotechnical concerns, erosion or damage were observed.

2.7.2 Biological Survey

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.6.2.5; Pogo Mine Monitoring Plan (6/13) 2.4

The objective of the visual biological survey program is to monitor wildlife interaction with the surface waste disposal facilities at the DSTF.

No wildlife issues with the surface waste disposal facilities occurred during 2017.

2.8 DEVELOPMENT ROCK SEGREGATION AND STORAGE

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.2.1, 1.6.2.6; Pogo Mine Monitoring Plan (6/13), 4.1.1, Appendix A

During 2017, 1,105 rounds were blasted underground and sampled in accordance with the *Rock Segregation Procedure*. Three hundred and seventy-eight rounds (34%) exceeded either the arsenic threshold of 600 mg/l or the sulfide threshold of 0.5% and these were encapsulated in the DSTF. Ninety-two were not sampled due to operational challenges and these rounds were also placed internally in the DSTF.

2.9 WASTE DISPOSAL

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.2.1, 1.5.4

During 2017, 633,900 dry tons of flotation tailing, 237,450 tons of mineralized rock, and 108,725 tons of non-mineralized rock were placed in the DSTF. Also during 2017, 186,412 dry tons of CIP Tailing and145,258 tons of filtered flotation tailings were placed underground as paste backfill.

The approximate quantities of miscellaneous waste materials placed either into the DSTF or underground during the year are shown in **Table 4**.

Table 4: Miscellaneous Waste Disposal in DSTF and Underground in 2017

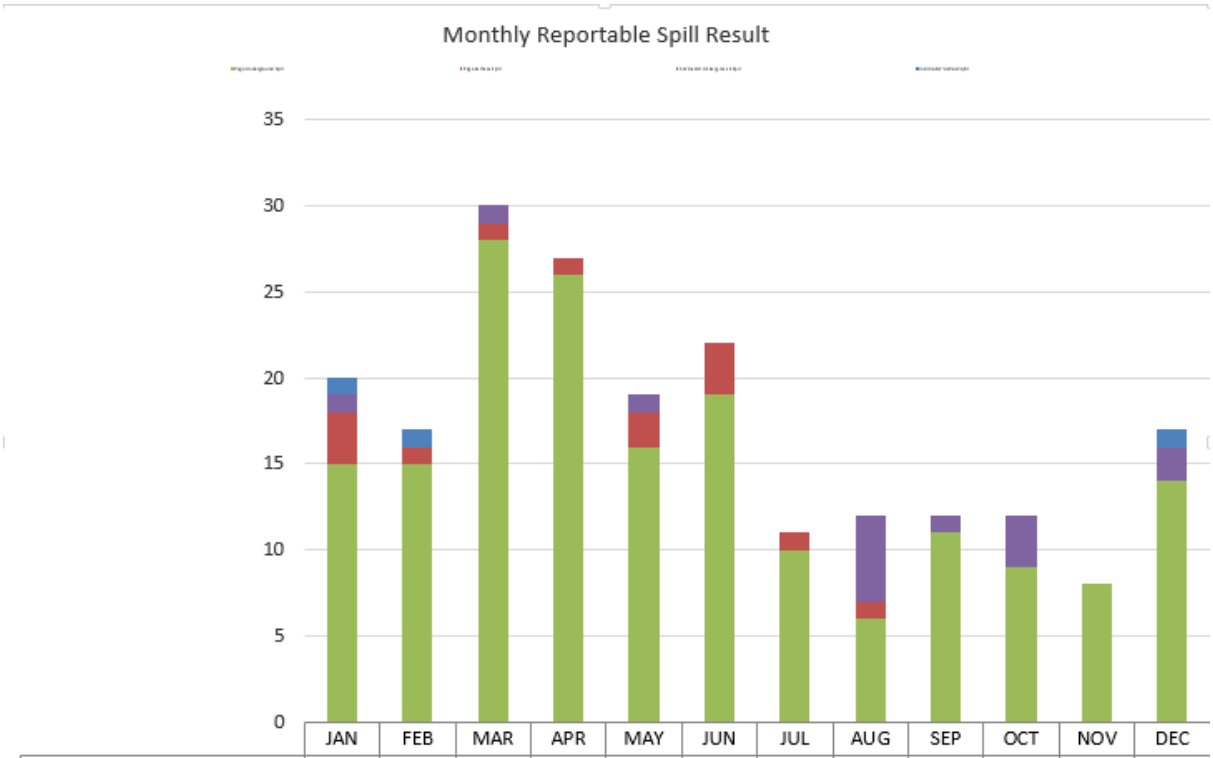
Material	Disposal Location	Approximate Quantity	Unit
Assay Lab Ore Samples (XRF Wafers)	DSTF	90	lbs
Cyanide Contacted/Reagent Bay Residue	Paste Stope	50	tons
Grinding/Flotation Debris Screen Residue	DSTF	110	tons
LAROK Filter Clothes	DSTF	7	each
Water Treatment Plant Filter Press Waste	Paste Stope	500	yds

2.10 SPILL REPORTING

ADEC APDES AK0053341 (8/1/17), Appendix A, 1.14; ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.5.10

During 2017, there were a total of 207 spills reported, refer to **Chart 5**, 2017 Pogo Spill Reporting.

Chart 5: 2017 Pogo Spill Reporting



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Contractor Surface Spill	1	1	0	0	0	0	0	0	0	0	0	1
Contractor Underground Spill	1	0	1	0	1	0	0	5	1	3	0	2
Pogo Surface Spill	3	1	1	1	2	3	1	1	0	0	0	0
Pogo Underground Spill	15	15	28	26	16	19	10	6	11	9	8	14

2.11 GEOTECHNICAL MONITORING

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.5.3, 1.5.3.4; Pogo Mine Plan of Operations F20129500 (11/3/11) Appendix F: Pogo DSTF Construction and Maintenance Plan

No shell construction took place at the DSTF during 2017; therefore, no geotechnical monitoring took place. Currently there are no plans to continue shell construction in 2018.

3. 2016 AS-BUILT REPORTS AND MAPS

Pogo Mine Site 2016 as-built maps are located in **Appendix A. Figure 3** provides an overview of all facilities within the Pogo Millsite lease boundary at the end of 2016. **Figures 3a** through **3d Appendix A** provide additional detail for the major areas of the mine. On September 20, 2017 as-built drawings of the new, 10,000 gallon potable water storage tank were submitted to ADEC. Final Approval to Operate was received September 22, 2017. As-Built drawings in **Appendix F**.

4. RECLAMATION AND FINANCIAL RESPONSIBILITY

ADEC Waste Management Permit 2011DB0012 (2/7/12), 1.11, 3. ADNR Plan of Operations Approval F20129500 (2/7/12), pg. 3, 9; ADNR Pogo Mine Millsite Lease ADL416949 (3/9/04), Section 8

The Pogo Mine reclamation and closure bond is currently $52.29 million (refer to Table 7). The road/transmission line reclamation and closure cost estimate is currently at $4.8 million. Neither Bond changed during 2017 (refer to Table 8).

In 2016, SRK consulting was contracted to convert the current bond to a Standardized Reclamation Cost Estimator (SRCE) model for the renewal of the *ADEC Waste Management Permit 2011DB0012 (2/7/12)* and *ADNR Plan of Operations Approval F20129500 (2/7/12)*. The SRCE model was submitted with the renewal applications in 2017.

Table 5: Summary of Mine Reclamation and Closure Cost Estimates as of December 2012

SUMMARY OF ESTIMATED RECLAMATION AND CLOSURE COSTS-POGO MINE SITE									
Item Description		**1 year holding cost**	**Phase I**	**Phase II**	**Phase III**	**Phase IV Water Treatment**	**Phase IV Reclamation**	**Phase V**	**Total**
Direct Cost		$ 812,700	$ -	$ 952,400	$ 10,819,000	$ 6,298,300	$ 3,686,000	$ 109,500	$ 22,677,900
Site Management Cost		$ 1,221,900	$ -	$ 27,800	$ 2,953,800	$ 5,374,833	$ 2,001,700	$ -	$ 11,580,033
Subtotal Direct Cost		**$ 2,034,600**	**$ -**	**$ 980,200**	**$ 13,772,800**	**$ 11,673,133**	**$ 5,687,700**	**$ 109,500**	**$ 34,257,933**
Indirect Costs	**% of Subtotal**								
Mobilization/Demobilization	**5.0%**	$ -	$ -	$ 49,010	$ 688,640	$ -	$ 284,385	$ 5,475	$ 1,027,510
Subtotal		**$ 2,034,600**	**$ -**	**$ 1,029,210**	**$ 14,461,440**	**$ 11,673,133**	**$ 5,972,085**	**$ 114,975**	**$ 35,285,443**
Contractor Overhead and Profit	**15.0%**	$ 305,190	$ -	$ 154,382	$ 2,169,216	$ 1,750,970	$ 895,813	$ 17,246	$ 5,292,816
Subtotal		**$ 2,339,790**	**$ -**	**$ 1,183,592**	**$ 16,630,656**	**$ 13,424,103**	**$ 6,867,898**	**$ 132,221**	**$ 40,578,259**
Performance Bond	**3.0%**	$ 70,194	$ -	$ 35,508	$ 498,920	$ 402,723	$ 206,037	$ 3,967	$ 1,217,348
Insurance	**1.5%**	$ 35,097	$ -	$ 17,754	$ 249,460	$ 201,362	$ 103,018	$ 1,983	$ 608,674
Subtotal		**$ 2,445,081**	**$ -**	**$ 1,236,853**	**$ 17,379,036**	**$ 14,028,187**	**$ 7,176,953**	**$ 138,171**	**$ 42,404,281**
Contract Administration	**4.0%**	$ 97,803	$ -	$ 49,474	$ 695,161	$ 561,127	$ 287,078	$ 5,527	$ 1,696,171
Engineering Re-Design	**3.0%**	$ -	$ -	$ 37,106	$ 521,371	$ -	$ 215,309	$ 4,145	$ 777,930
Contingency	**15.0%**	$ 366,762	$ -	$ 185,528	$ 2,606,855	$ 2,104,228	$ 1,076,543	$ 20,726	$ 6,360,642
Total Indirects		**$ 875,046**	**$ -**	**$ 528,761**	**$ 7,429,623**	**$ 5,020,410**	**$ 3,068,183**	**$ 59,069**	**$ 16,981,092**
Total Direct + Indirect		$ 2,909,646	$ -	$ 1,508,961	$ 21,202,423	$ 16,693,543	$ 8,755,883	$ 168,569	$ 51,239,025
Inflation Proofing	**2.06%**	$ 59,926	$ -	$ 31,078	$ 436,676	$ 343,813	$ 180,332	$ 3,472	$ 1,055,297
Total Closure Cost		**$ 2,969,572**	**$ -**	**$ 1,540,039**	**$ 21,639,099**	**$ 17,037,356**	**$ 8,936,215**	**$ 172,041**	**$ 52,294,322**
								Rounded	$ 52,294,000

Table 6: Summary of Pogo Access Road/Transmission Line Reclamation and Closure Cost Estimates as of December 2012

Pogo Access Road and Transmission Line - Estimated Closure Cost							
		Phase I	Phase II	Phase III	Phase IV	Phase V	Total
Direct Cost		$ -	$ 13,666	$ -	$ 2,478,500	$ -	$ 2,492,167
Site Management Cost		$ -	$ 128	$ -	$ 582,645		$ 582,773
Subtotal Direct Cost		**$ -**	**$ 13,794**	**$ -**	**$ 3,061,145**	**$ -**	**$ 3,074,940**
Indirect Costs	**% of Subtotal**						
Mobilization/Demobilization	**6.5%**	$ -	$ 897	$ -	$ 198,974	$ -	$ 199,871
Subtotal		$ -	$ 14,691	$ -	$ 3,260,119	$ -	$ 3,274,811
Contractor Overhead and Profit	**15.0%**	$ -	$ 2,204	$ -	$ 489,018	$ -	$ 491,222
Subtotal		$ -	$ 16,895	$ -	$ 3,749,137	$ -	$ 3,766,032
Performance Bond	**3.0%**	$ -	$ 507	$ -	$ 112,474	$ -	$ 112,981
Insurance	**1.5%**	$ -	$ 253	$ -	$ 56,237	$ -	$ 56,490
Subtotal		$ -	$ 17,655	$ -	$ 3,917,849	$ -	$ 3,935,504
Contract Administration	**4.0%**	$ -	$ 706	$ -	$ 156,714	$ -	$ 157,420
Engineering Re-Design	**4.0%**	$ -	$ 706	$ -	$ 156,714	$ -	$ 157,420
Contingency	**10.0%**	$ -	$ 1,766	$ -	$ 391,785	$ -	$ 393,550
1 year holding cost			$ 41,000				$ 41,000
Total Indirects		**$ -**	**$ 48,038**	**$ -**	**$ 1,561,916**	**$ -**	**$ 1,609,955**
Total directs and indirects		$ -	$ 61,833	$ -	$ 4,623,061	$ -	$ 4,684,894
Inflation Proofing	2.66%	$ -	$ 1,645	$ -	$ 122,973	$ -	$ 124,618
Total Closure Cost		**$ -**	**$ 63,478**	**$ -**	**$ 4,746,035**	**$ -**	**$ 4,809,513**
						Rounded	**$ 4,810,000**

4.1 REVEGETATION TEST TRIAL PROGRAM AT THE POGO MINE

Based on the *Revegetation Test Trial Program for Reclamation at Pogo Mine* submitted May 1, 2012, native seed collection, and purchase of grass seed, for the revegetation trials began in the summer and fall of 2013. The fourth and last test plot was developed during 2015 for mesic and xeric alpine meadow establishment on Shell 2 of the DSTF, against the south diversion ditch wall. Cover Data was collected in 2017, with three years of data for wetlands, alluvial shrub, and broadleaf forest trial plots, and two years of cover data collection for the alpine meadow trial plots.

Photo 1 through **Photo 4** shows trial plot growth in 2017.

Photo 1: Wetland plots 2017, three years after seeding.

Photo 2: Alluvial Shrub plots 2017, three years after seeding.

Photo 3: Broadleaf Forest plots 2017, three years after seeding.

Photo 4: Alpine Meadow plots of the DSTF Shell 2, in 2017, two years after seeding.

5. PERMIT ACTIVITIES

5.1 2017 PERMIT ACTIVITIES

Permitting activities conducted during 2017 includes:

Plan of Operations Renewal: Pogo submitted its renewal application on January 6, 2017 and supplemented the application on February 15, 2017. On January 3, 2017, ADNR administratively extended Pogo's Plan of Operations Approval to June 1, 2017 and on November 22, 2017, following delivery of draft comments, ADNR administratively extended the Plan of Operations Approval (F20129500) through June 1, 2018.

Waste Management Permit Renewal: Pogo submitted the renewal application on January 6, 2017 and supplemented the application on February 15, 2017. On January 10, 2017, ADEC administratively extended Pogo's Waste Management Permit until a replacement permit is issued.

Alaska Pollutant Discharge Elimination (APDES) Permit Renewal: Pogo Mine's new APDES Permit No AK0053341 became effective July 1, 2017. The permit expires June 30, 2022. Since August, all monthly Discharge Monitoring Report (DMR) data is electronic submitted via netDMR.

Hazardous Material Certificate of Registration: The registration certificate was renewed in July for Years 2017-2020.

Air Quality Control Operating Permit No. AQ0406TVP02: The new permit was issued by ADEC June 6, 2017 and remains effective until June 6, 2022. The Refinery Report and CISWI Report were submitted to ADEC and EPA on September 25. A Notification of Compliance was submitted with 40CFR 63.11645(c) to ADEC for existing carbon processes without mercury retorts on September 25. Performance testing for the refinery emission units and the small remote incinerator covered under Pogo's Title V Air Quality Operating Permit was completed in July. Performance Test results were submitted to EPA and ADEC with the Annual Report on January 22, 2018, as required by Pogo's Title V Air Quality Operating Permit.

Toxic Release Inventory (TRI) Report was submitted under the Emergency Planning and Community Right to Know Act on June 29, 2017.

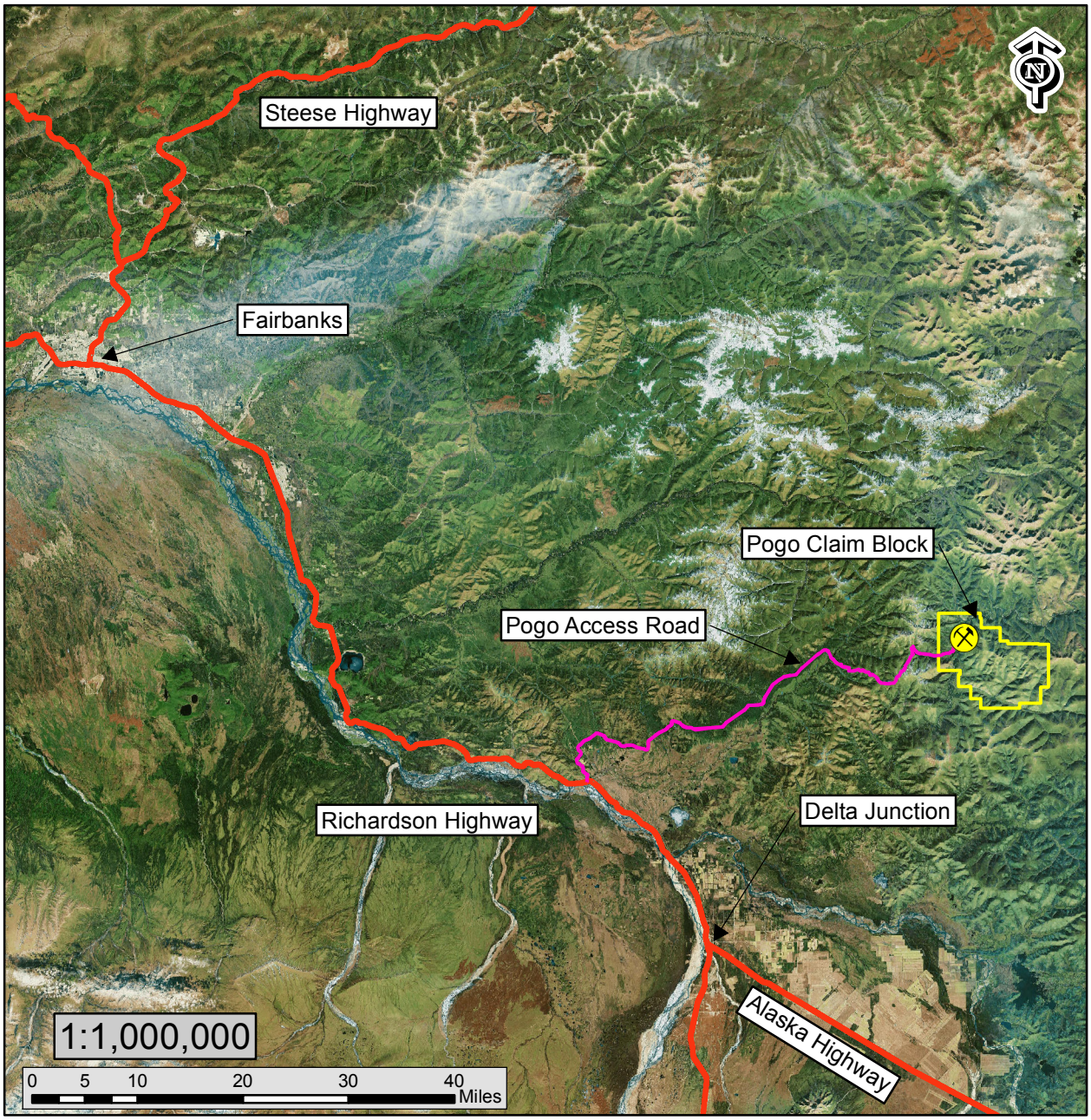
5.2 FUTURE PERMIT ACTIVITIES

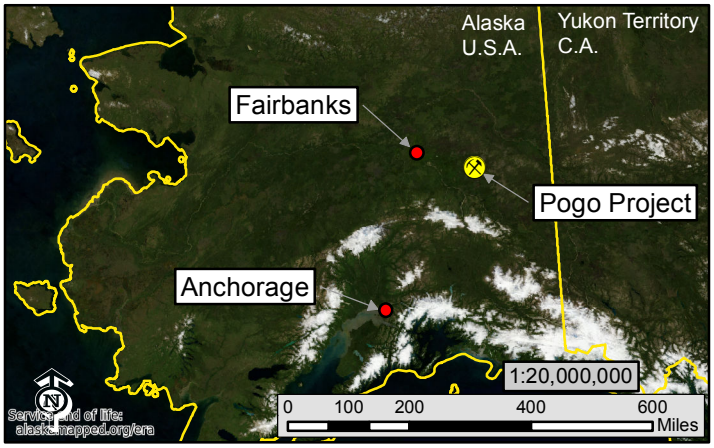
Plan of Operations Renewal: Pogo is waiting on final comments from ADNR on the SRCE cost model presented as part of the Reclamation and Closure documents with the Plan of Operations. On January 3, 2017, and again on November 22, ADNR administratively extended Pogo's Plan of Operations Approval to June 1, 2018.

Waste Management Permit Renewal: Pogo anticipates the renewal of the Waste Management Permit by ADNR in 2018. On January 10, 2017 and again on November 22, ADRN administratively extended Pogo's Waste Management Permit until a replacement permit is issued.

APPENDIX A –

MAPS





Pogo Project
Figure 1
General Location Map

POGO MINE
MINING DONE RIGHT

Basemap: GINA BDL WMS
Coordinate System: NAD 1983 StatePlane Alaska 3 FIPS 5003 Feet
Projection: Transverse Mercator
False Easting: 1,640,416.67
Central Meridian: -146.00
Latitude of Origin: 54.00

Author: Pogo Environmental
File Location: P:\Geology\Environmental\Maps

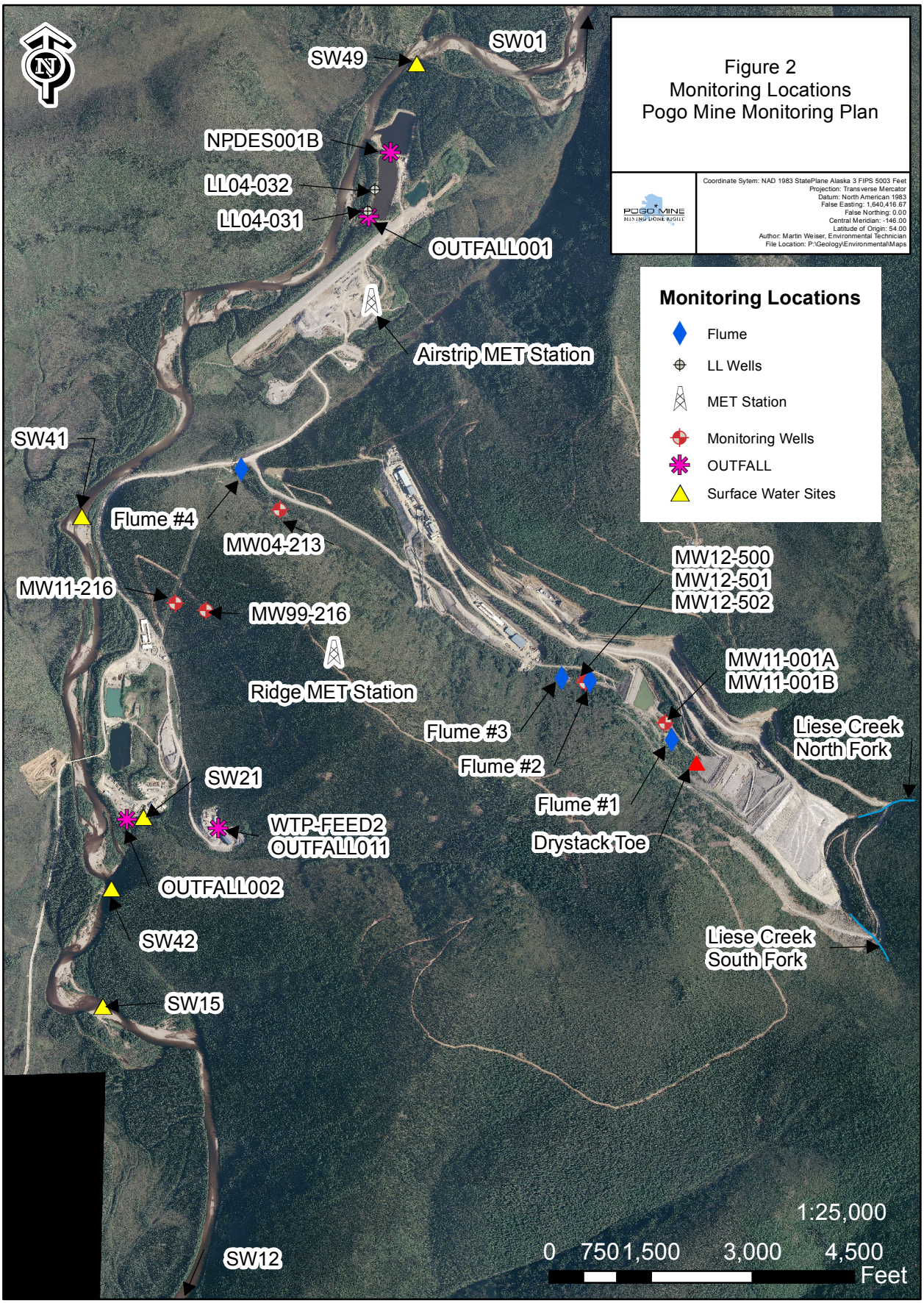


Figure 2
Monitoring Locations
Pogo Mine Monitoring Plan
Coordinate Sytem: NAD 1983 StatePlane Alaska 3 FIPS 5003 Feet
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 1,640,416.67
False Northing: 0.00
Central Meridian: -146.00
Latitude of Origin: 54.00
Author: Martin Weiser, Environmental Technician
File Location: P:\Geology\Environmental\Maps
Monitoring Locations
Flume
LL Wells
MET Station
Monitoring Wells
OUTFALL
Surface Water Sites
SW01
SW49
NPDES001B
LL04-032
LL04-031
OUTFALL001
Airstrip MET Station
SW41
Flume #4
MW04-213
MW11-216
MW99-216
Ridge MET Station
MW12-500
MW12-501
MW12-502
MW11-001A
MW11-001B
Liese Creek
North Fork
Flume #3
Flume #2
Flume #1
Drystack Toe
SW21
WTP-FEED2
OUTFALL011
OUTFALL002
SW42
SW15
Liese Creek
South Fork
SW12
1:25,000
0 750 1,500 3,000 4,500
Feet

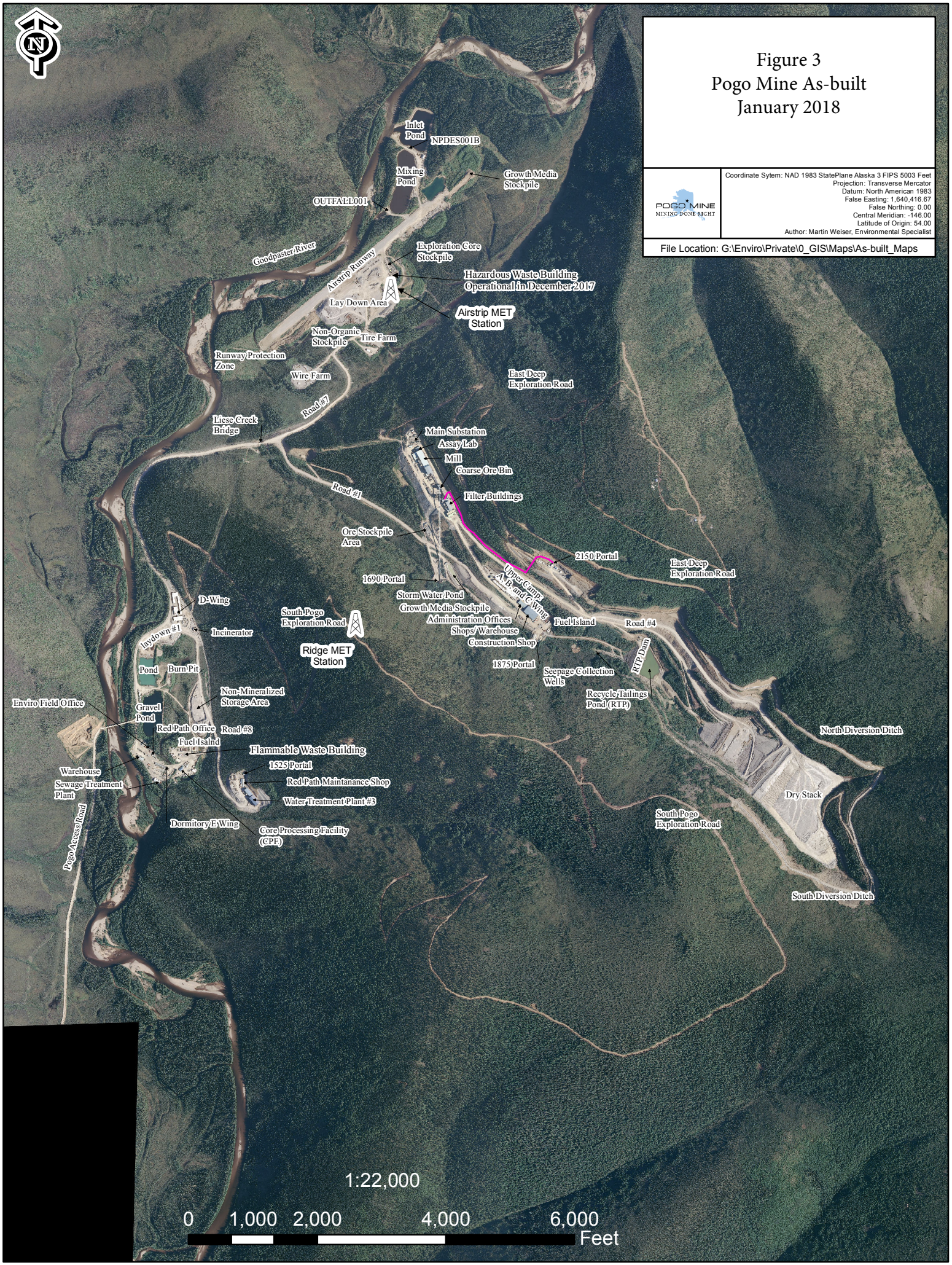


Figure 3
Pogo Mine As-built
January 2018
POGO MINE
MINING DONE RIGHT
Coordinate Sytem: NAD 1983 StatePlane Alaska 3 FIPS 5003 Feet
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 1,640,416.67
False Northing: 0.00
Central Meridian: -146.00
Latitude of Origin: 54.00
Author: Martin Weiser, Environmental Specialist
File Location: G:\Enviro\Private\0_GIS\Maps\As-built_Maps
Inlet Pond
NPDES001B
Mixing Pond
Growth Media Stockpile
OUTFALL001
Goodpaster River
Airstrip Runway
Exploration Core Stockpile
Hazardous Waste Building Operational in December 2017
Lay Down Area
Airstrip MET Station
Non-Organic Stockpile
Tire Farm
Runway Protection Zone
Wire Farm
East Deep Exploration Road
Road #7
Liese Creek Bridge
Main Substation
Assay Lab
Mill
Coarse Ore Bin
Road #1
Filter Buildings
Ore Stockpile Area
2150 Portal
East Deep Exploration Road
1690 Portal
Upper Camp A, B, and C Wing
Storm Water Pond
Growth Media Stockpile
Administration Offices
Shops / Warehouse
Construction Shop
Fuel Island
Road #4
D-Wing
South Pogo Exploration Road
Incinerator
laydown #1
Ridge MET Station
Pond
Burn Pit
1875 Portal
Seepage Collection Wells
RTP Dam
Recycle Tailings Pond (RTP)
Non-Mineralized Storage Area
Enviro Field Office
Gravel Pond
Red Path Office
Road #3
Fuel Isalnd
Flammable Waste Building
North Diversion Ditch
1525 Portal
Warehouse
Sewage Treatment Plant
Red Path Maintanance Shop
Water Treatment Plant #3
Dry Stack
South Pogo Exploration Road
Dormitory E Wing
Core Processing Facility (CPF)
Pogo Access Road
South Diversion Ditch
1:22,000
0
1,000
2,000
4,000
6,000
Feet

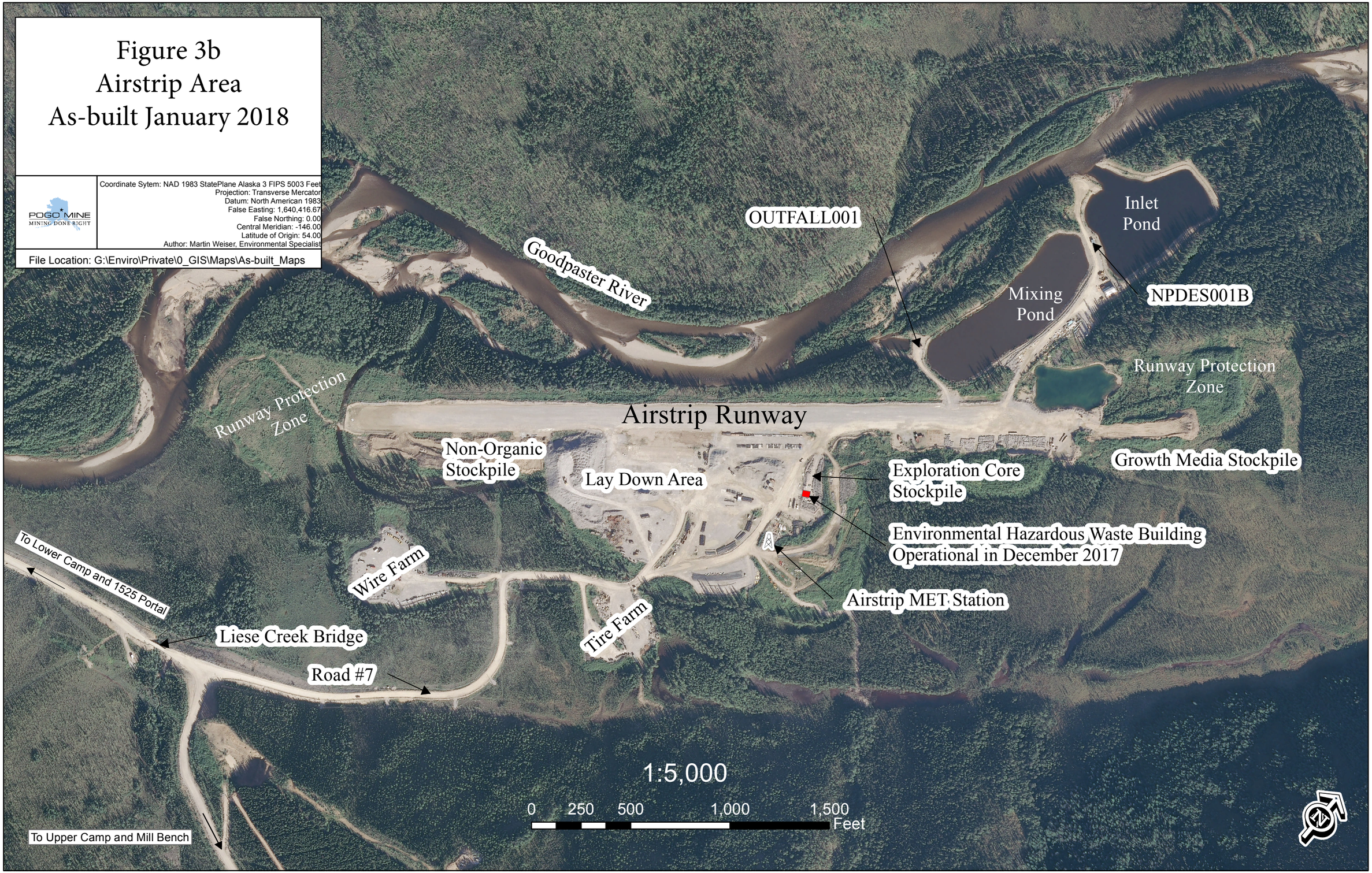
Figure 3a
1525 Portal Area and
Lower Camp As-built
January 2018
POGO MINE
MINING DONE RIGHT
Coordinate Sytem: NAD 1983 StatePlane Alaska 3 FIPS 5003 Feet
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 1,640,416.67
False Northing: 0.00
Central Meridian: -146.00
Latitude of Origin: 54.00
Author: Martin Weiser, Environmental Specialist
File Location: G:\Enviro\Private\0_GIS\Maps\As-built_Maps
0 250 500 1,000 1,500 Feet
1:5,000
South Pogo Exploration Road
Powerline
Water Treatment Plant #3
Redpath Warehouse and Maintenance Shop
1525 Portal
Vaporizer Shack & Propane Tank
Road #8
Incinerator
Dormitory D-Wing
Mineralized Storage Area
Burn Pit
Laydown #1
Pond
Gravel Pond
Helipad
Fuel Island
Red Path Office
Flammable Waste Building
Ruen Drilling Office
Core Processing Facility
Dormitory E-Wing
Sewage Treatment Plant (STP)
Enviro Field Office
Warehouse
Potable Water Treatment Plant
Goodpaster River
Material Site #23
Pogo Access Road to Richardson Highway
To Airstrip and Upper Camp

Figure 3b
Airstrip Area
As-built January 2018

POGO MINE
MINING DONE RIGHT

Coordinate Sytem: NAD 1983 StatePlane Alaska 3 FIPS 5003 Feet
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 1,640,416.67
False Northing: 0.00
Central Meridian: -146.00
Latitude of Origin: 54.00
Author: Martin Weiser, Environmental Specialist

File Location: G:\Enviro\Private\0_GIS\Maps\As-built_Maps



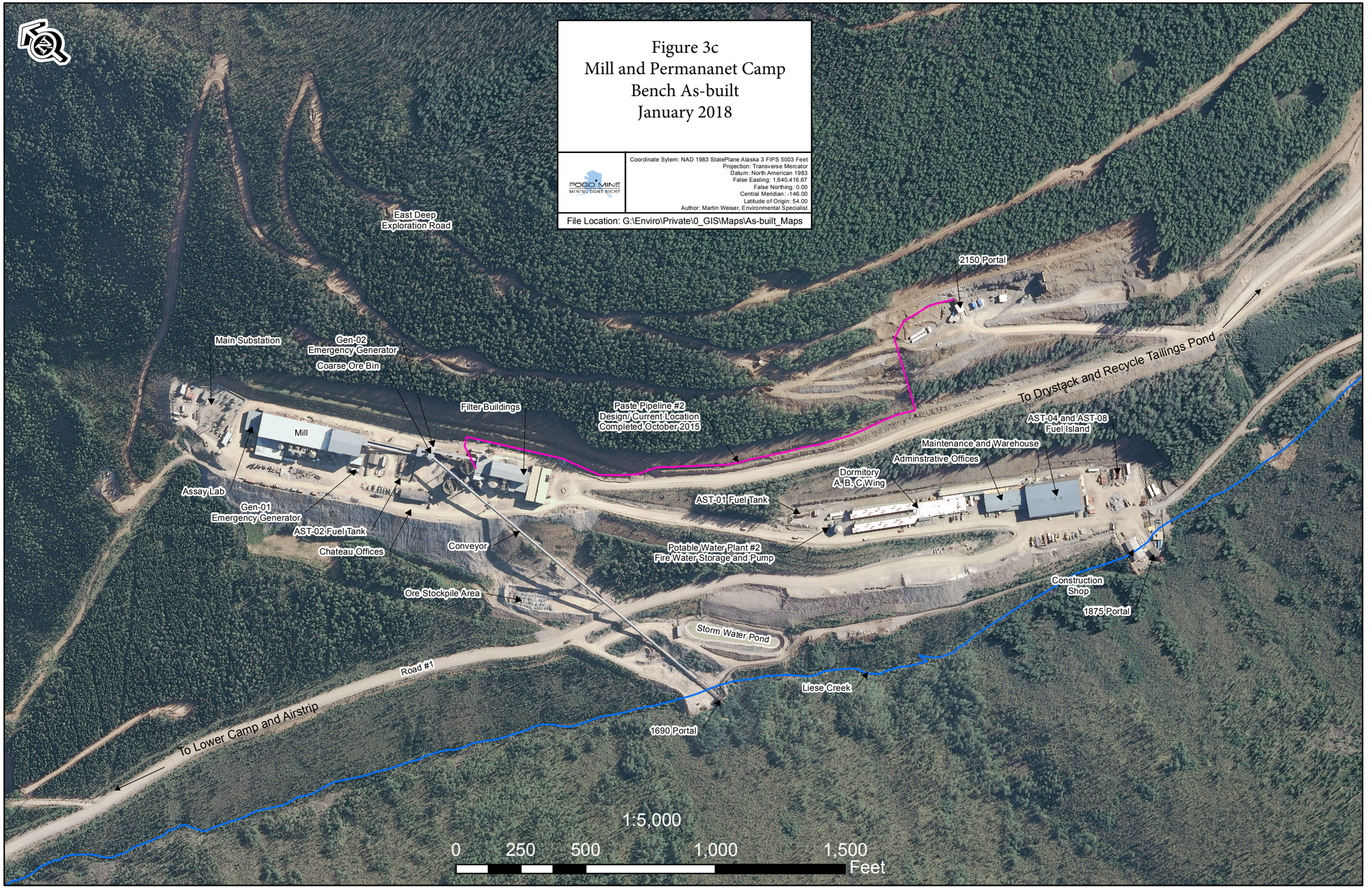
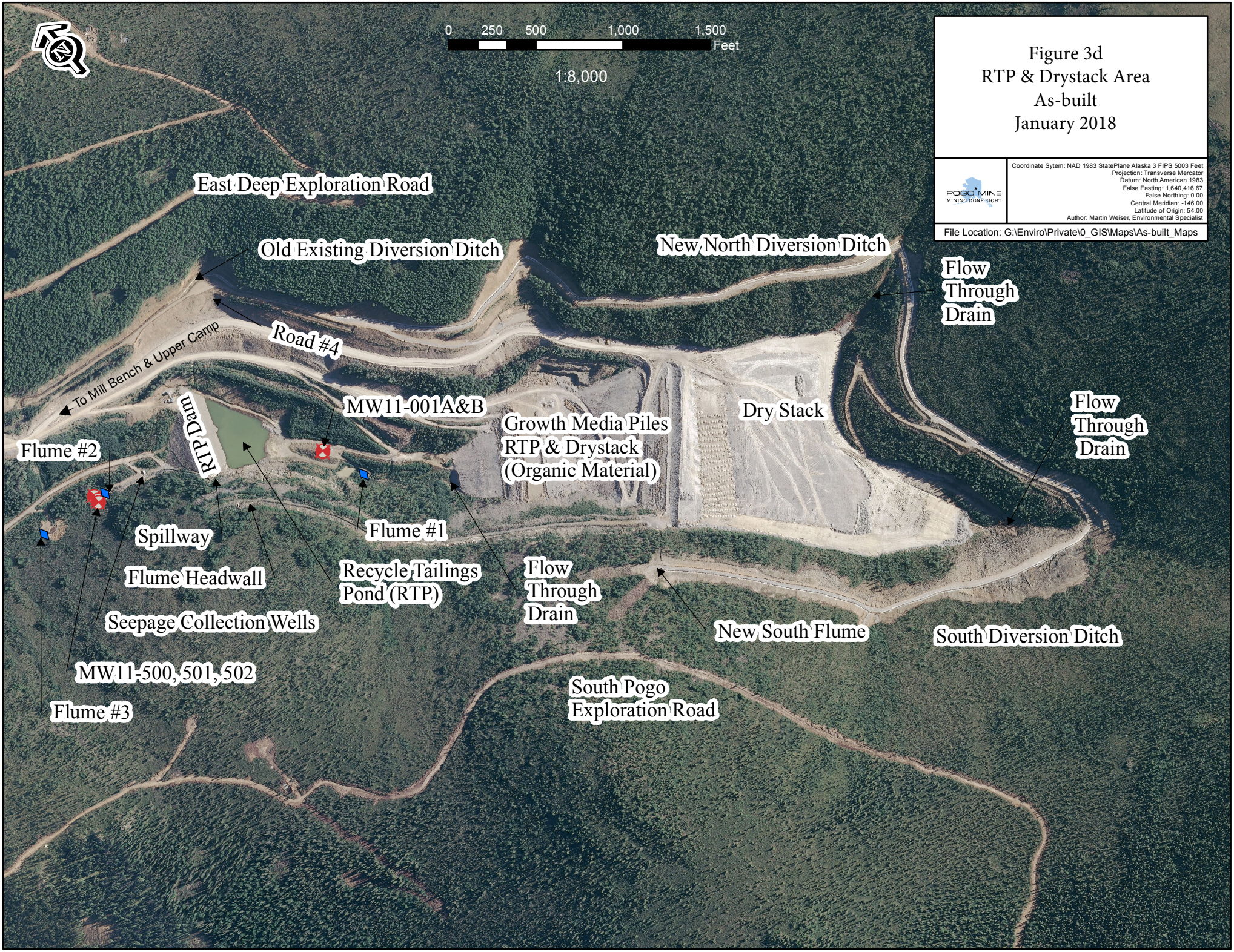


Figure 3c
Mill and Permananet Camp
Bench As-built
January 2018
POGO MINE
MINING DONE RIGHT
Coordinate Sytem: NAD 1983 StatePlane Alaska 3 FIPS 5003 Feet
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 1,640,416.67
False Northing: 0.00
Central Meridian: -146.00
Latitude of Origin: 54.00
Author: Martin Weiser, Environmental Specialist
File Location: G:\Enviro\Private\0_GIS\Maps\As-built_Maps
East Deep
Exploration Road
2150 Portal
Main Substation
Gen-02
Emergency Generator
Coarse Ore Bin
Filter Buildings
Paste Pipeline #2
Design/Current Location
Completed October 2015
To Drystack and Recycle Tailings Pond
AST-04 and AST-08
Fuel Island
Maintenance and Warehouse
Adminstrative Offices
Dormitory
A, B, C Wing
Mill
Assay Lab
Gen-01
Emergency Generator
AST-02 Fuel Tank
Chateau Offices
Conveyor
AST-01 Fuel Tank
Potable Water Plant #2
Fire Water Storage and Pump
Ore Stockpile Area
Construction
Shop
1875 Portal
Storm Water Pond
Road #1
Liese Creek
To Lower Camp and Airstrip
1690 Portal
1:5,000
0
250
500
1,000
1,500
Feet


0 250 500 1,000 1,500
Feet
1:8,000
Figure 3d
RTP & Drystack Area
As-built
January 2018
POGO MINE
MINING DONE RIGHT
Coordinate Sytem: NAD 1983 StatePlane Alaska 3 FIPS 5003 Feet
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 1,640,416.67
False Northing: 0.00
Central Meridian: -146.00
Latitude of Origin: 54.00
Author: Martin Weiser, Environmental Specialist
File Location: G:\Enviro\Private\0_GIS\Maps\As-built_Maps
East Deep Exploration Road
Old Existing Diversion Ditch
New North Diversion Ditch
Flow Through Drain
Road #4
To Mill Bench & Upper Camp
RTP Dam
MW11-001A&B
Growth Media Piles
RTP & Drystack
(Organic Material)
Dry Stack
Flow Through Drain
Flume #2
Spillway
Flume #1
Flume Headwall
Recycle Tailings Pond (RTP)
Flow Through Drain
Seepage Collection Wells
New South Flume
South Diversion Ditch
MW11-500, 501, 502
Flume #3
South Pogo Exploration Road

APPENDIX B –

WASTE ROCK GEOCHEMISTRY AND FLOTATION TAILINGS SOLIDS CHEMISTRY DATA

Appendix B. Table 1. Whole Rock Geochemistry for Mineralized Waste Rock placed into the Dry Stack Tailings Facility 2017

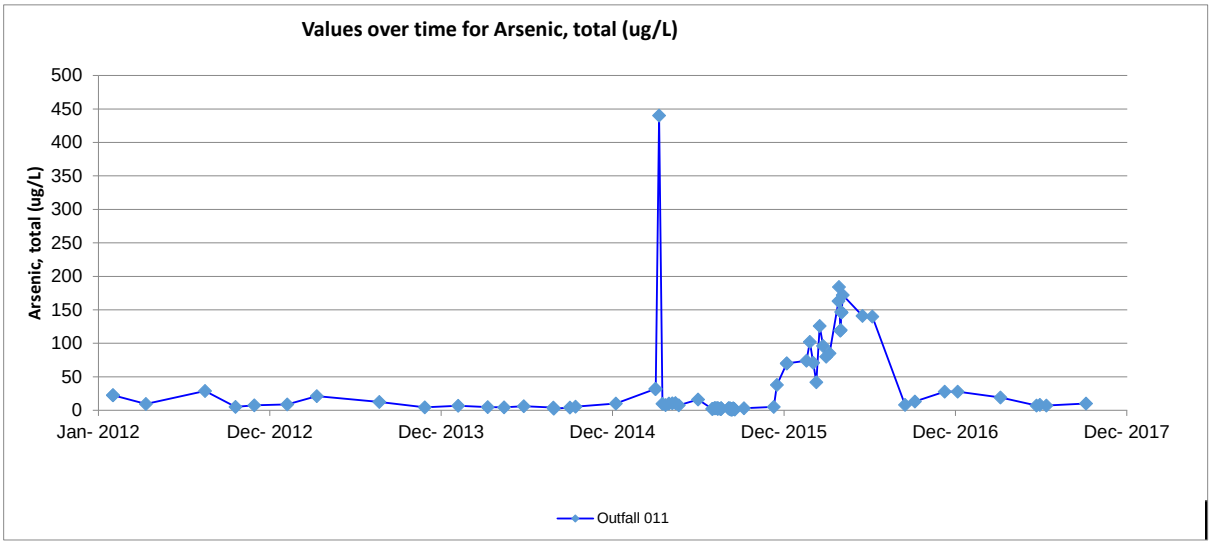
PC002	units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Antimony, Total	mg/kg	5.37	1.42	0.85	2.14
Arsenic, Total	mg/kg	619	389	379	3020
Carbon	%	0.66	0.28	0.27	0.38
Copper, Total	mg/kg	24.4	33.8	25.6	26.7
Inorganic Carbon	%	2.4	1.00	1	1.40
Iron, Total	mg/kg	35,800	41,900	38,300	40,600
Lead, Total	mg/kg	17.5	17.4	23.7	17
Maximum Potential Acidity	tCaCO3/1000t	16.6	23.4	14.4	13.1
Net Neutralization Potential	tCaCO3/1000t	29	12	26	27
pH, Paste	pH units	8.1	8.2	8.6	8.5
Potassium, Total	mg/kg	28,100	25,500	26,900	23,500
Ratio (NP/MPA)	su	2.78	1.49	2.79	3.05
Selenium, Total	mg/kg	1	2	<1	2
Sodium, Total	mg/kg	5,700	7,300	14,500	15,400
Sulfate Sulfur (CO_3 Leach)	%	<0.01	0.01	<0.01	0.01
Sulfate Sulfur (HCL Leach)	%	<0.01	<0.01	<0.01	<0.01
Sulfide Sulfur (Calculated)	%	0.53	0.74	0.46	0.41
Sulfur, Total (LECO)	%	0.53	0.75	0.46	0.42
Zinc, Total	mg/kg	58	79	63	53

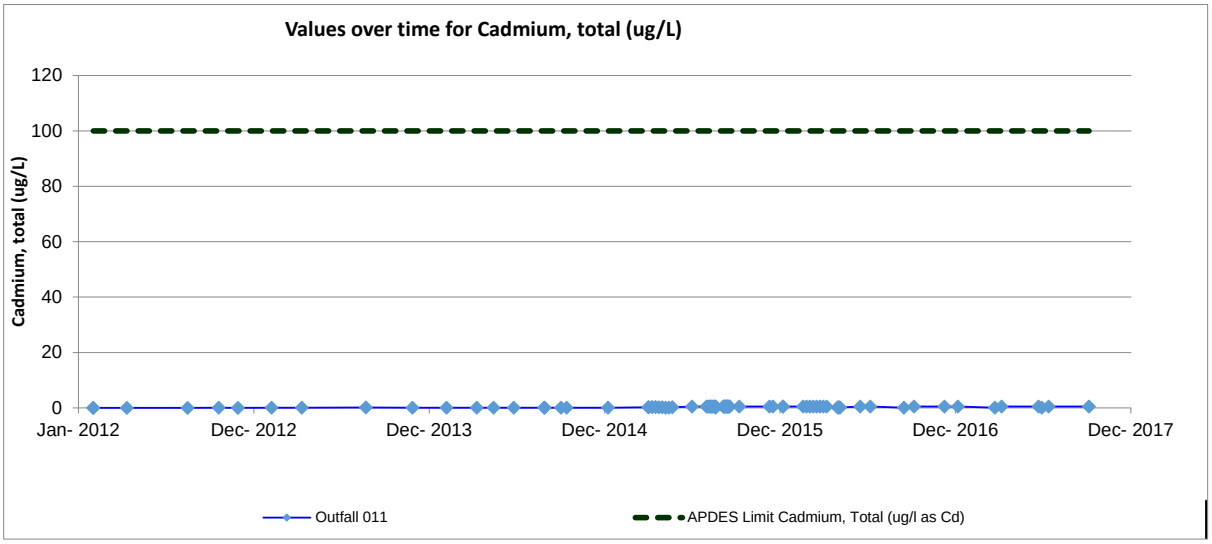
Appendix B. Table 2. Geochemistry of Flotation Tailings Solids placed into Dry Stack Tailings Facility 2017

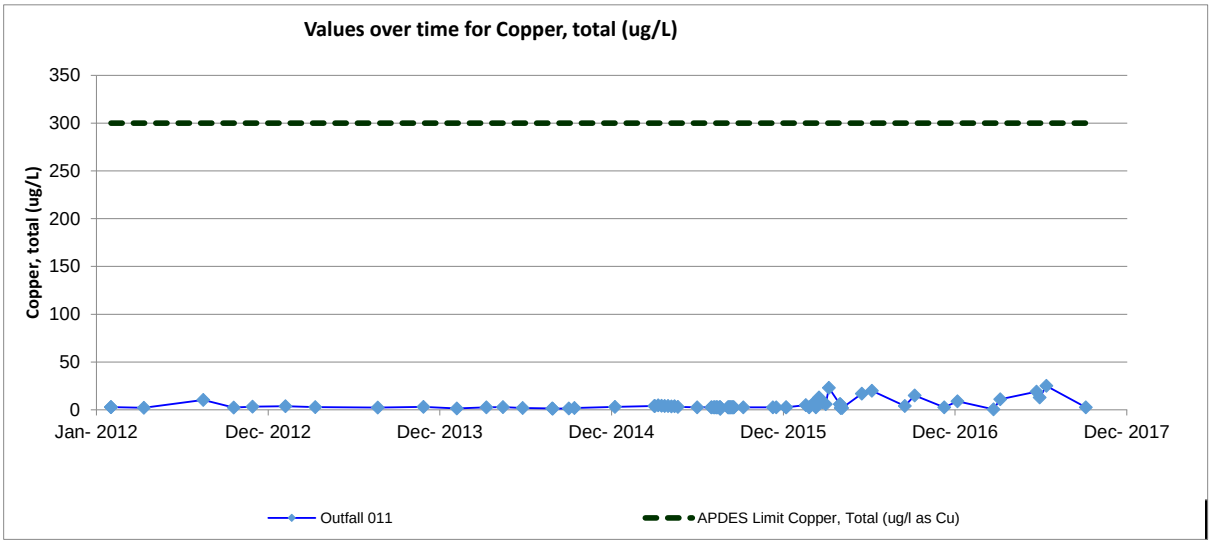
PC003 Solid	units	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Antimony, Total	mg/kg	2.46	1.72	1.84	1.91
Arsenic, Total	mg/kg	996	445	673	446
Carbon	%	0.43	0.39	0.34	0.46
Copper, Total	mg/kg	60.4	51.7	65.6	39.1
Inorganic Carbon	%	1.6	1.40	1.2	1.7
Iron, Total	mg/kg	20,100	24,300	21,800	22,100
Lead, Total	mg/kg	11.7	11.4	13.9	11.8
Maximum Potential Acidity	tCaCO3/1000t	3.8	3.4	4.7	3.1
Net Neutralization Potential	tCaCO3/1000t	35	39	27	33
pH, Paste	pH units	8.2	8.3	8.1	8.1
Potassium, Total	mg/kg	17,900	22,000	21,000	18,300
Ratio (NP/MPA)	su	10.4	12.22	6.83	11.52
Selenium, Total	mg/kg	1	1	<1	<1
Sodium, Total	mg/kg	3,800	5,000	5,400	4,600
Sulfate Sulfur (CO_3 Leach)	%	0.02	0.01	0.03	0.02
Sulfate Sulfur (HCL Leach)	%	0.02	<0.01	0.03	0.01
Sulfide Sulfur (Calculated)	%	0.1	0.1	0.12	0.08
Sulfur, Total (LECO)	%	0.12	0.11	0.15	0.1
Zinc, Total	mg/kg	23	23	20	23

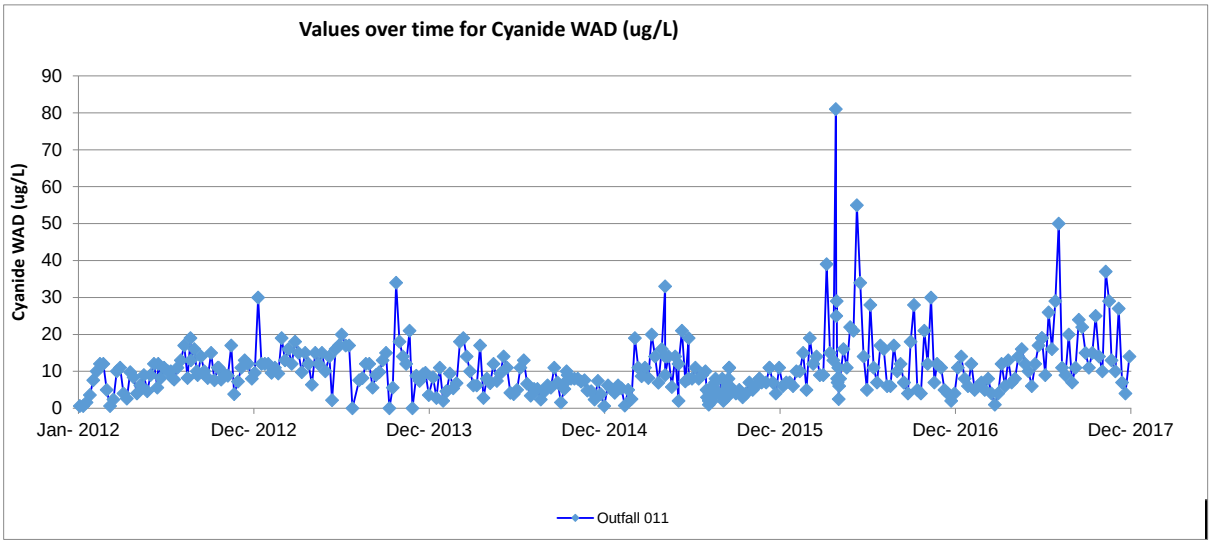
APPENDIX C –

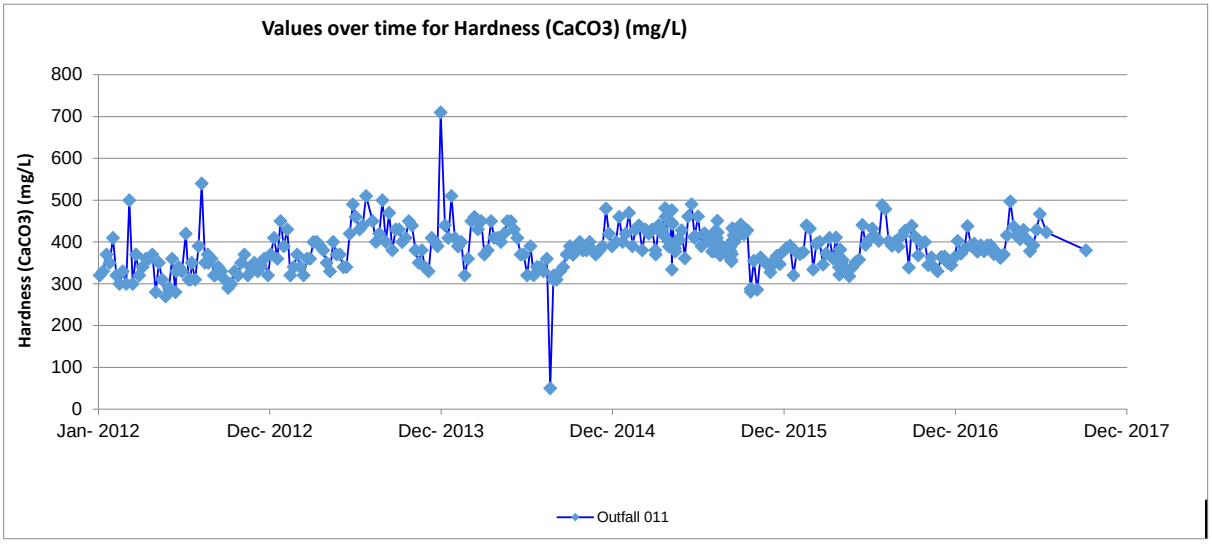
TIME SERIES GRAPHS OF MONITORING DATA

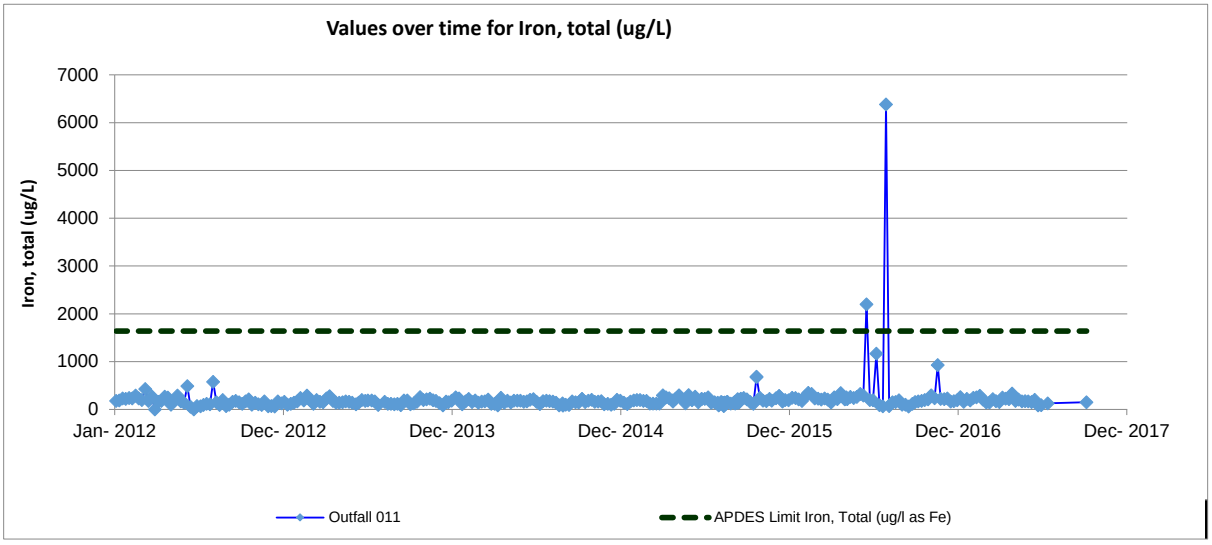

Values over time for Arsenic, total (ug/L)
Arsenic, total (ug/L)
500
450
400
350
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011

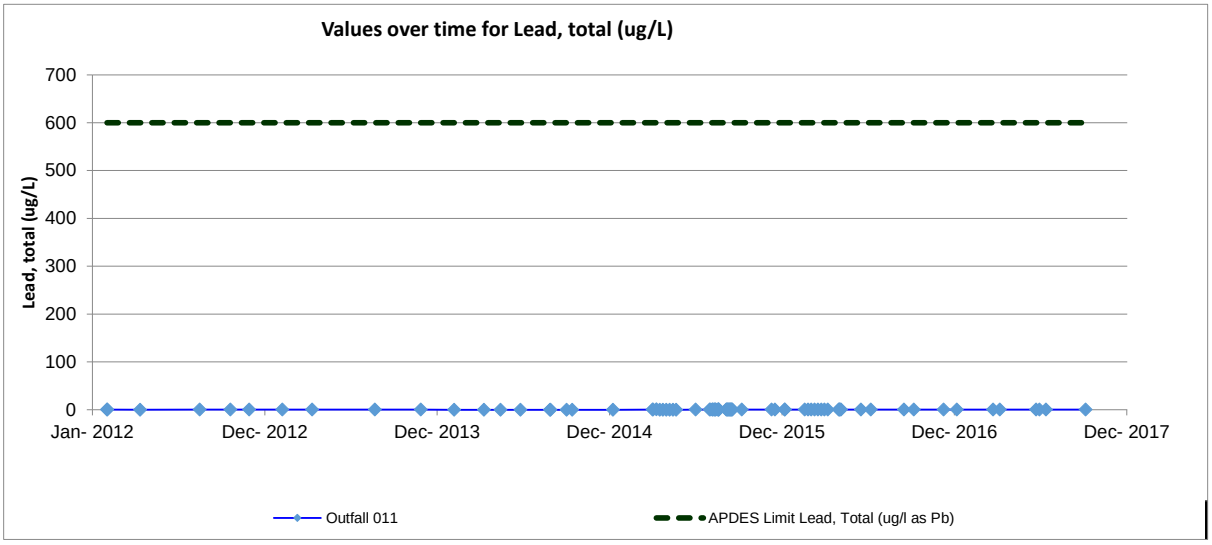

Values over time for Cadmium, total (ug/L)
Cadmium, total (ug/L)
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011
APDES Limit Cadmium, Total (ug/l as Cd)

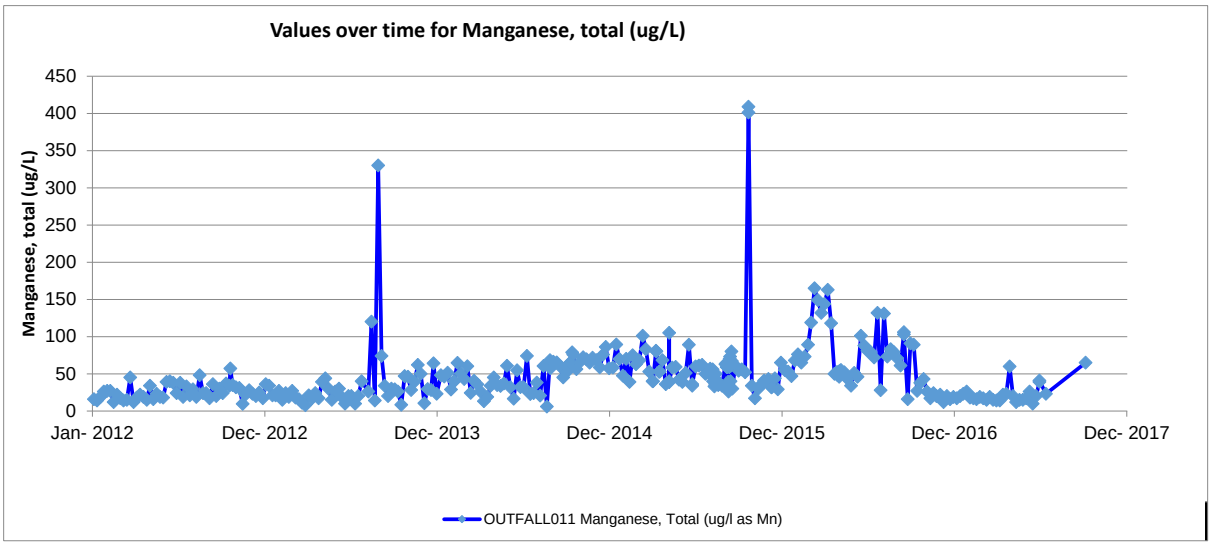

Values over time for Copper, total (ug/L)
Copper, total (ug/L)
350
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011
APDES Limit Copper, Total (ug/l as Cu)

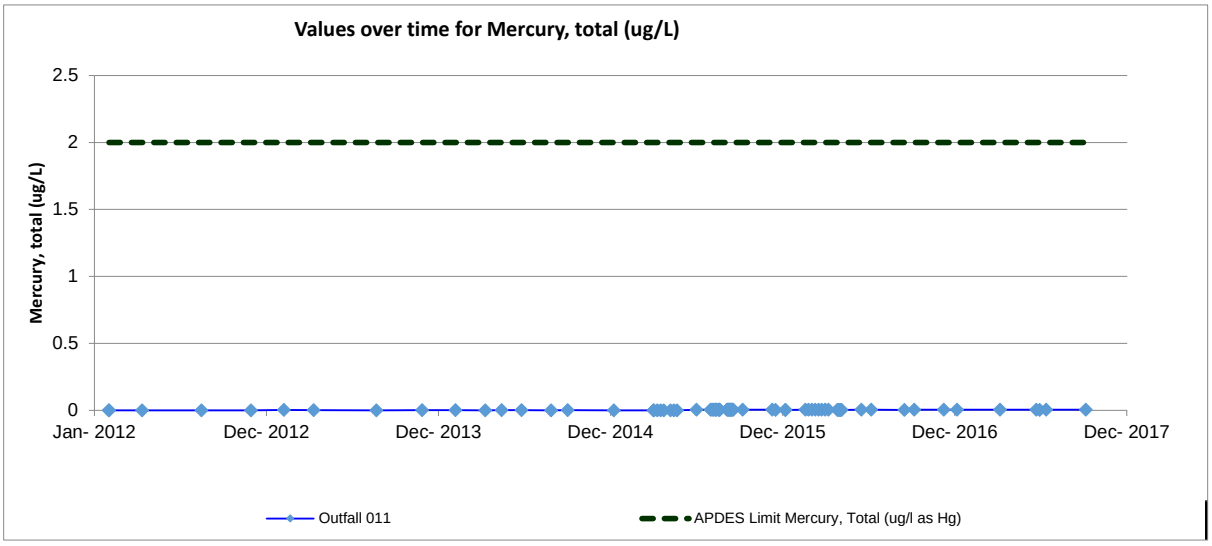

Values over time for Cyanide WAD (ug/L)
Cyanide WAD (ug/L)
90
80
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011

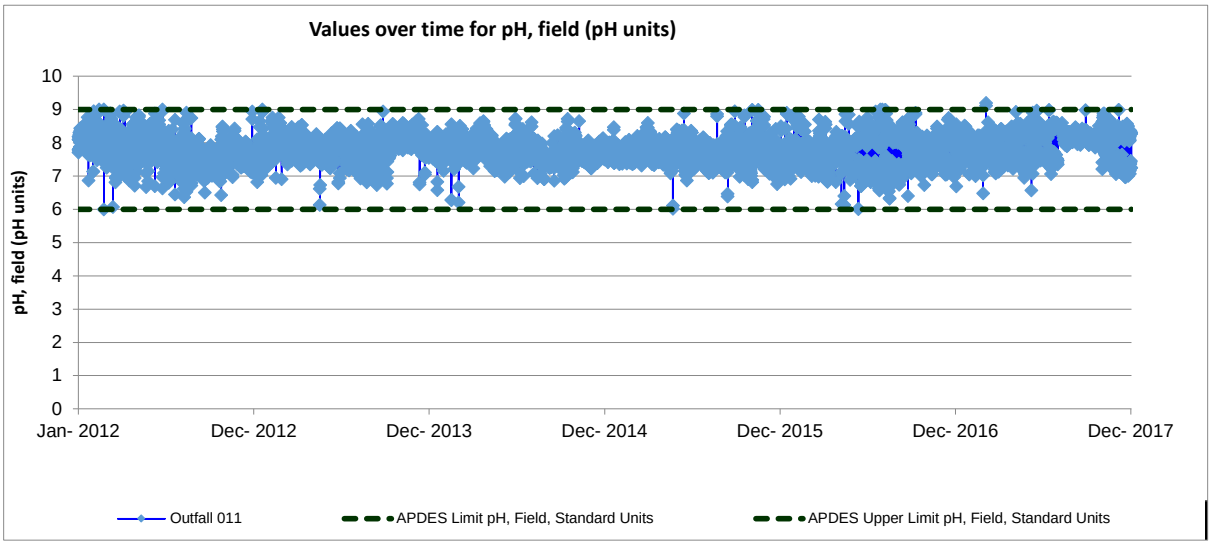

Values over time for Hardness (CaCO3) (mg/L)
Hardness (CaCO3) (mg/L)
800
700
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011

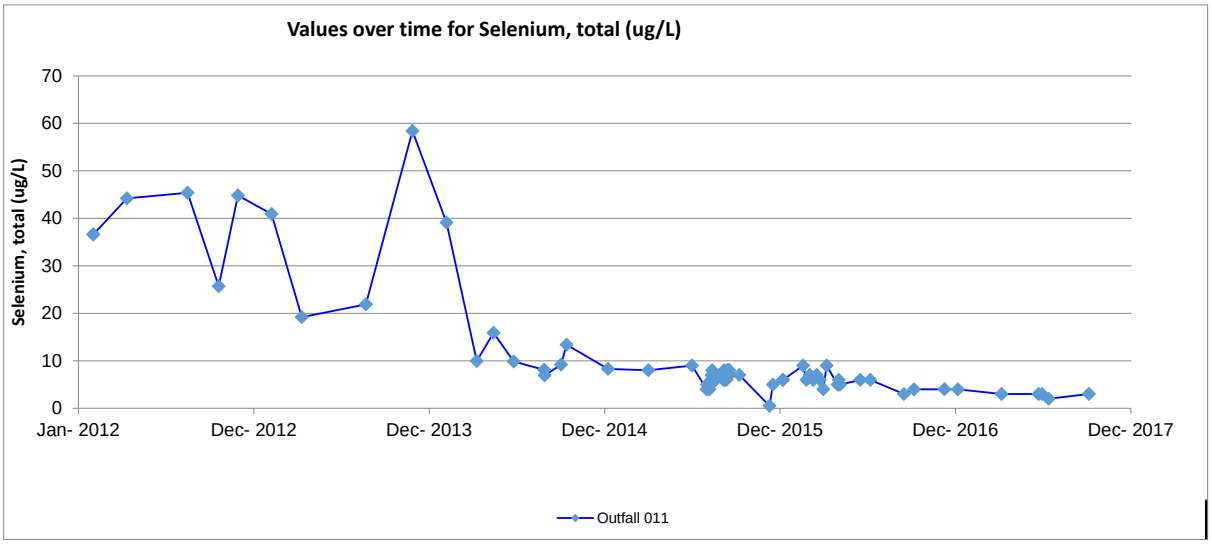

Values over time for Iron, total (ug/L)
Iron, total (ug/L)
7000
6000
5000
4000
3000
2000
1000
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011
APDES Limit Iron, Total (ug/l as Fe)

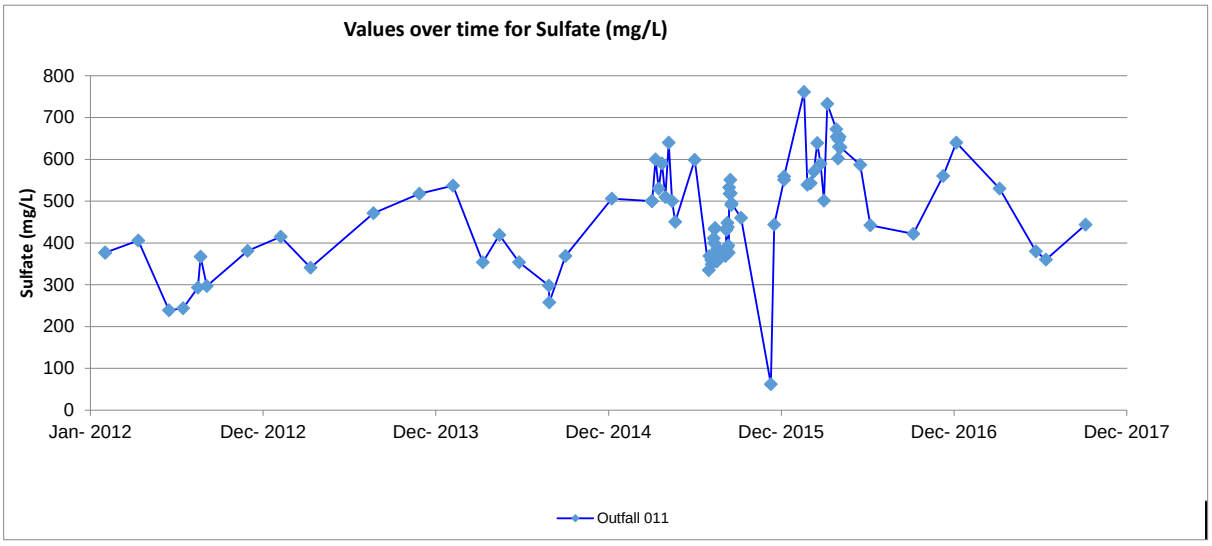

Values over time for Lead, total (ug/L)
Lead, total (ug/L)
700
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011
APDES Limit Lead, Total (ug/l as Pb)

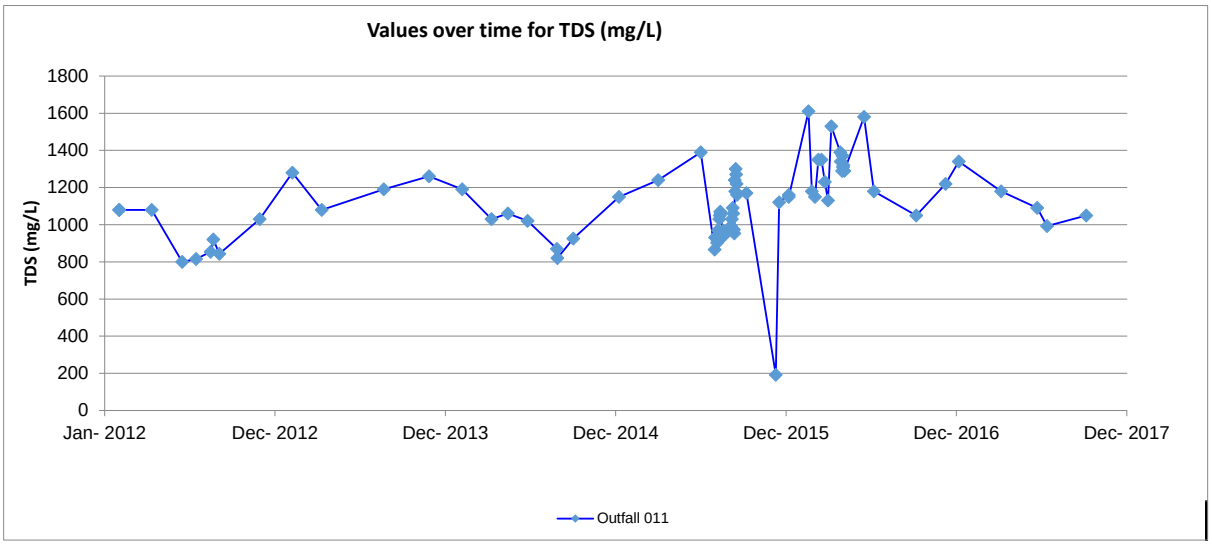

Values over time for Manganese, total (ug/L)
Manganese, total (ug/L)
450
400
350
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
OUTFALL011 Manganese, Total (ug/l as Mn)

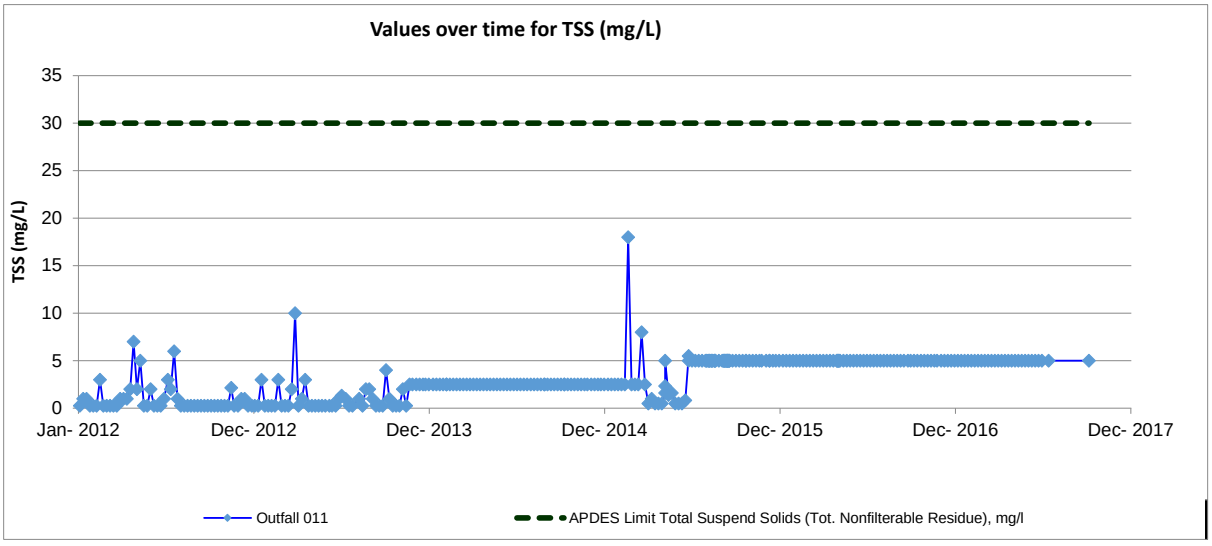

Values over time for Mercury, total (ug/L)
Mercury, total (ug/L)
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011
APDES Limit Mercury, Total (ug/l as Hg)

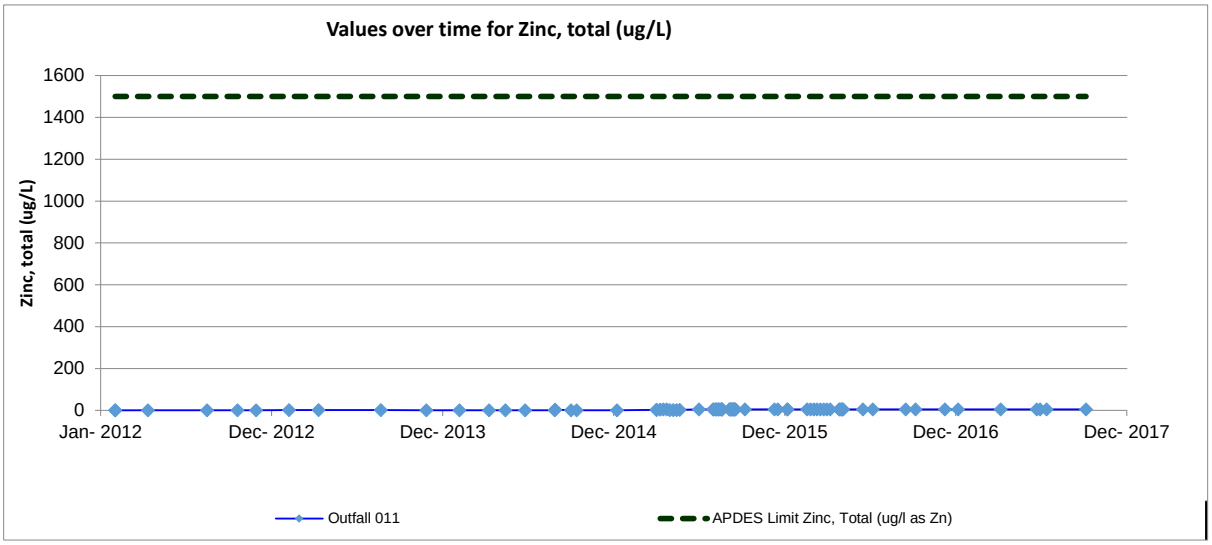

Values over time for pH, field (pH units)
pH, field (pH units)
10
9
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011
APDES Limit pH, Field, Standard Units
APDES Upper Limit pH, Field, Standard Units

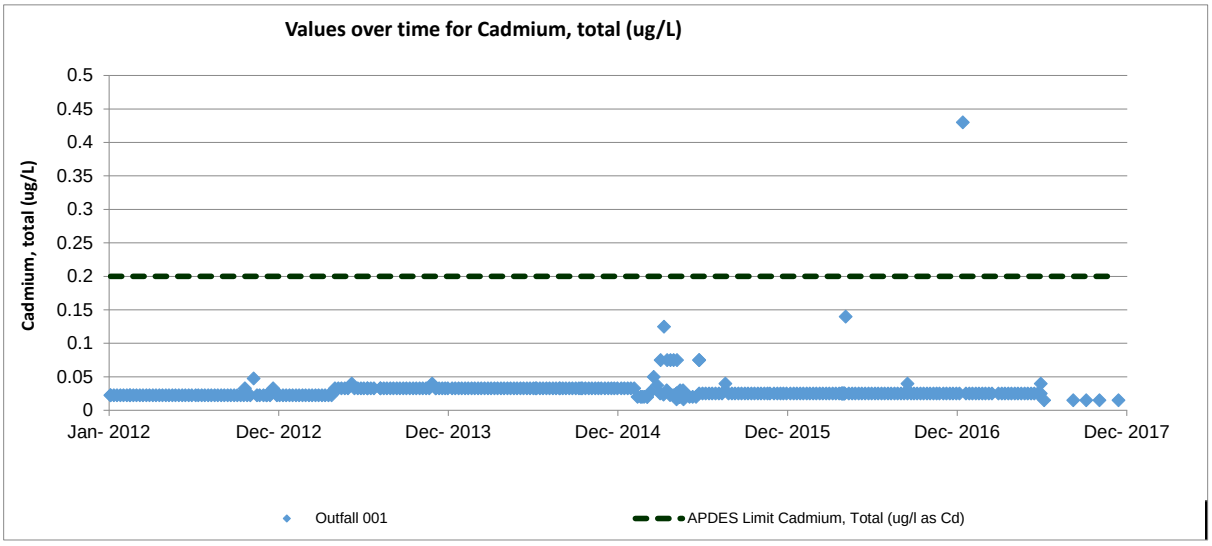

Values over time for Selenium, total (ug/L)
Selenium, total (ug/L)
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011

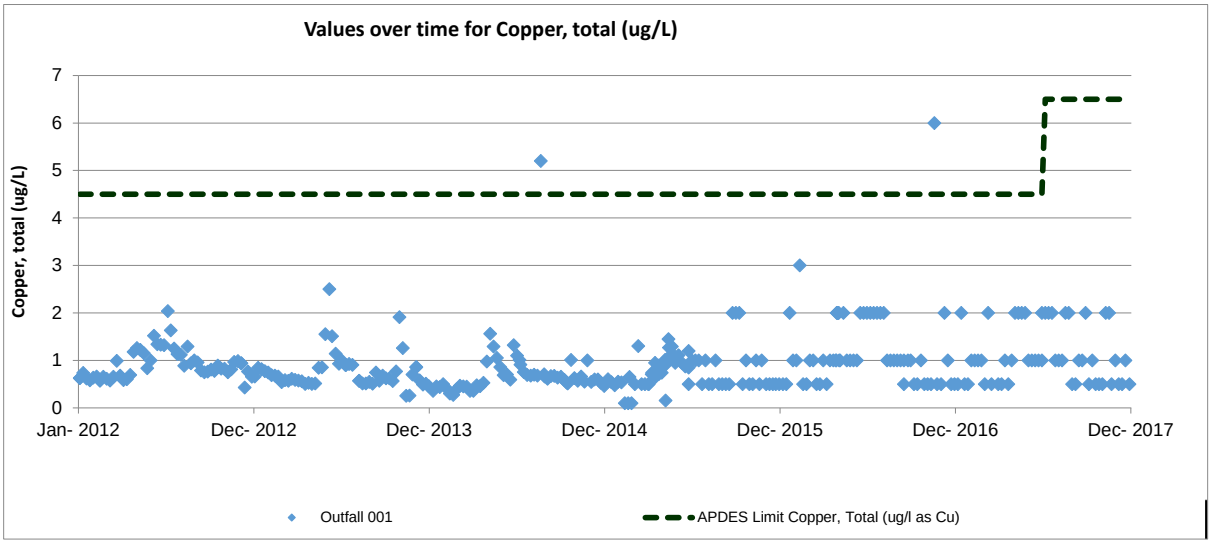

Values over time for Sulfate (mg/L)
Sulfate (mg/L)
800
700
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011

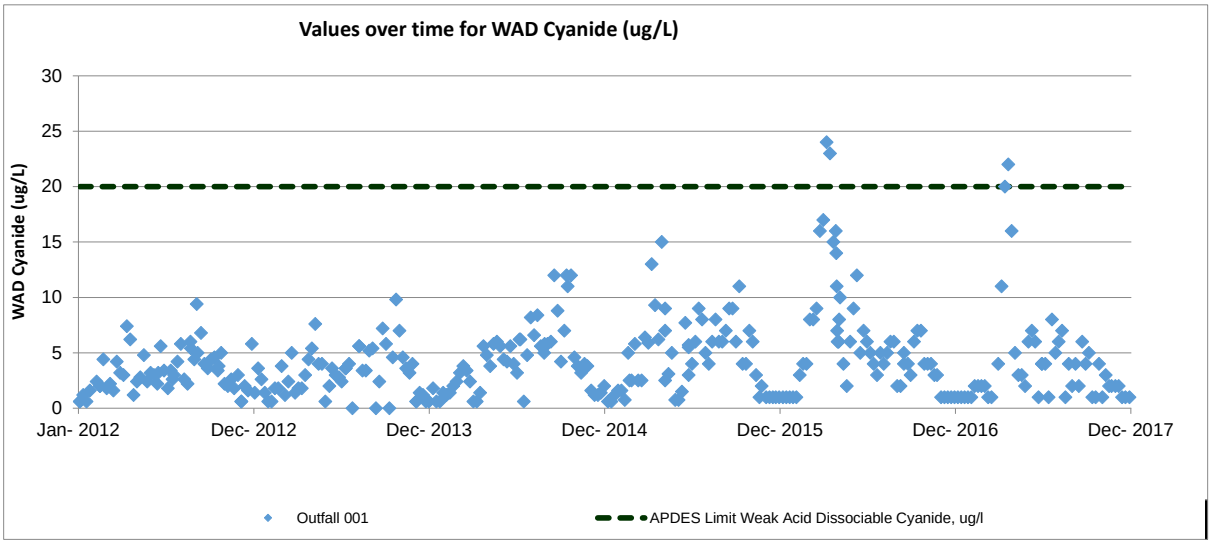

Values over time for TDS (mg/L)
TDS (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011

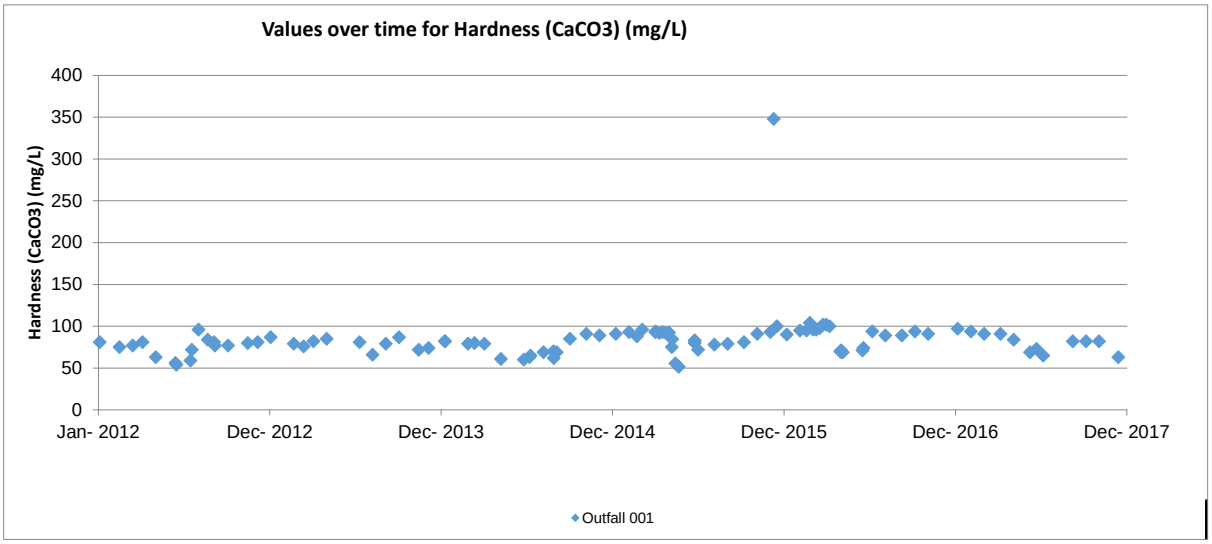

Values over time for TSS (mg/L)
TSS (mg/L)
35
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011
APDES Limit Total Suspend Solids (Tot. Nonfilterable Residue), mg/l

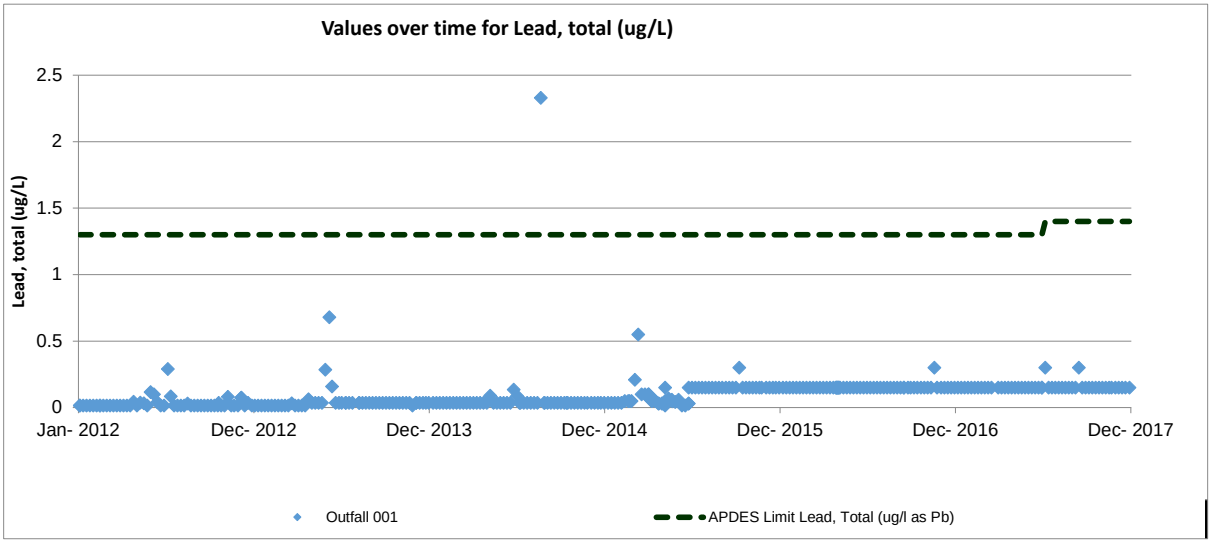

Values over time for Zinc, total (ug/L)
Zinc, total (ug/L)
1600
1400
1200
1000
800
600
400
200
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 011
APDES Limit Zinc, Total (ug/l as Zn)

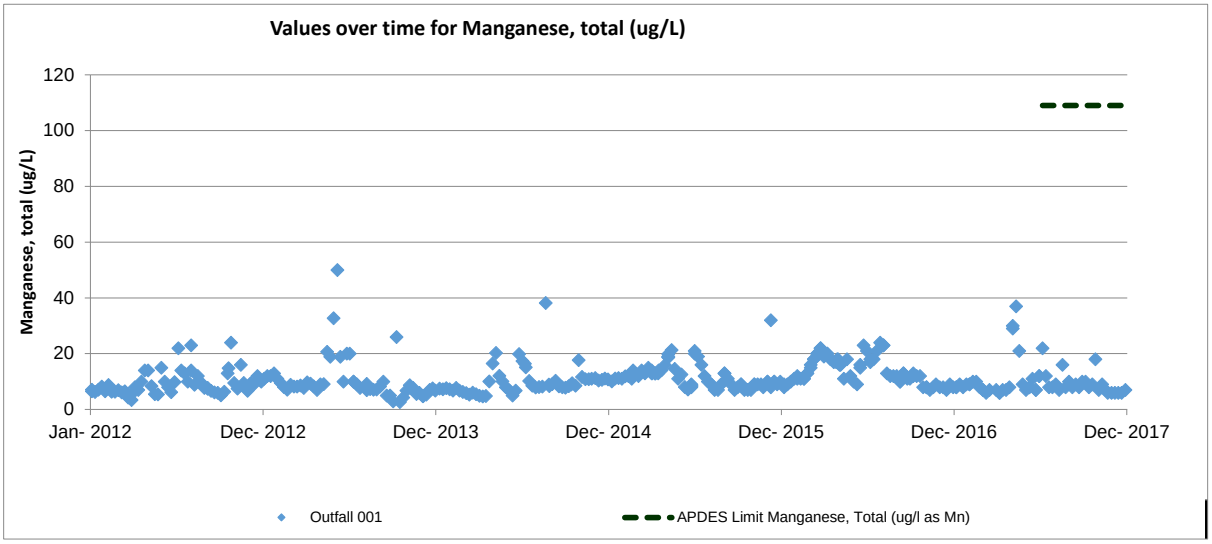

Values over time for Cadmium, total (ug/L)
Cadmium, total (ug/L)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 001
APDES Limit Cadmium, Total (ug/l as Cd)

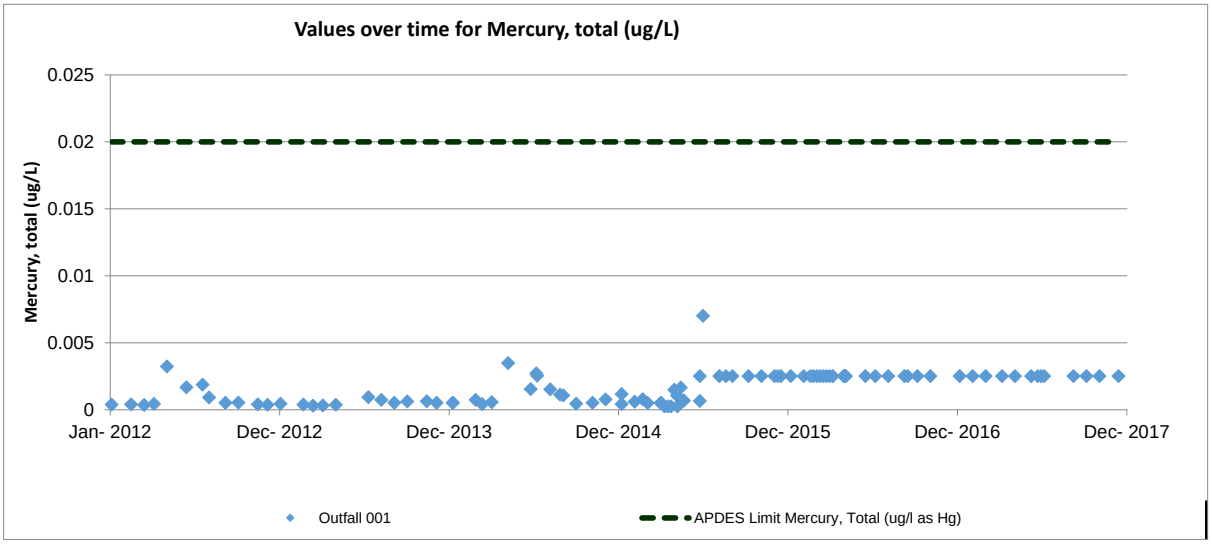

Values over time for Copper, total (ug/L)
Copper, total (ug/L)
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 001
APDES Limit Copper, Total (ug/l as Cu)

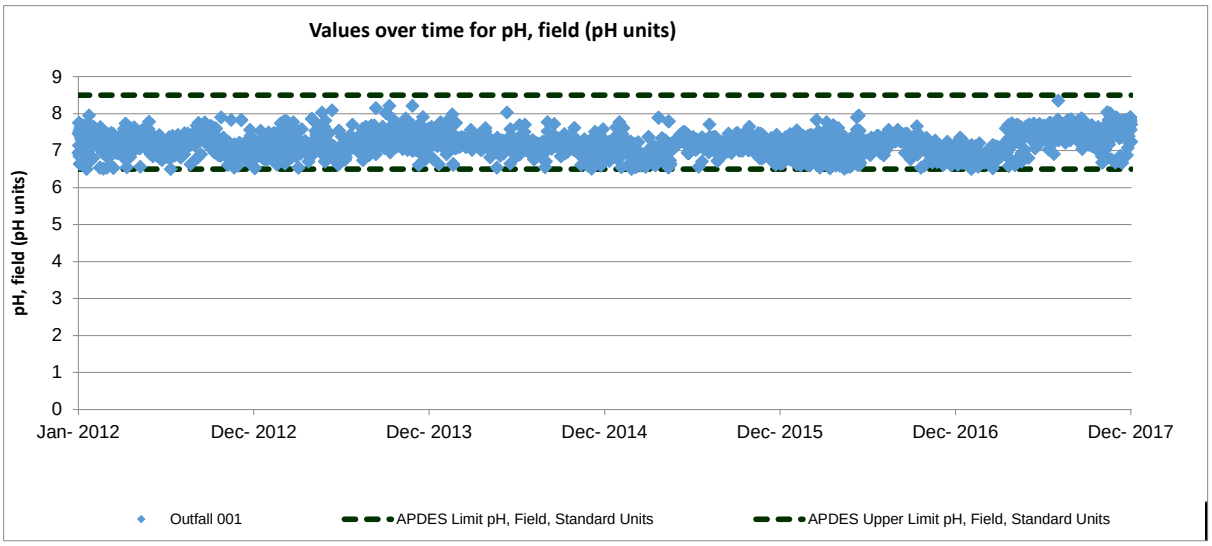

Values over time for WAD Cyanide (ug/L)
WAD Cyanide (ug/L)
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 001
APDES Limit Weak Acid Dissociable Cyanide, ug/l

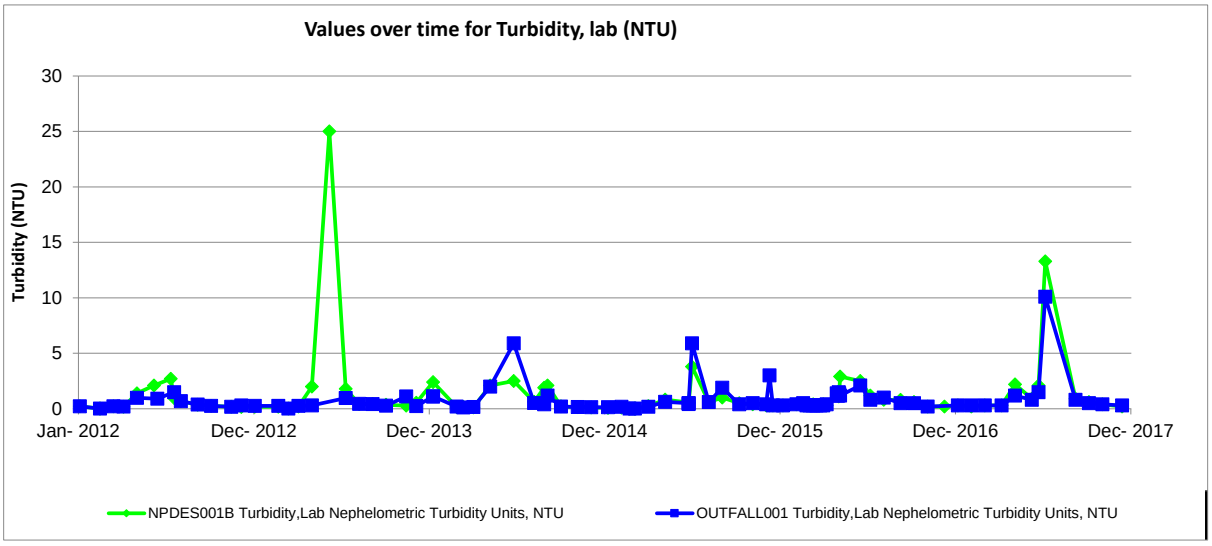

Values over time for Hardness (CaCO3) (mg/L)
Hardness (CaCO3) (mg/L)
400
350
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 001

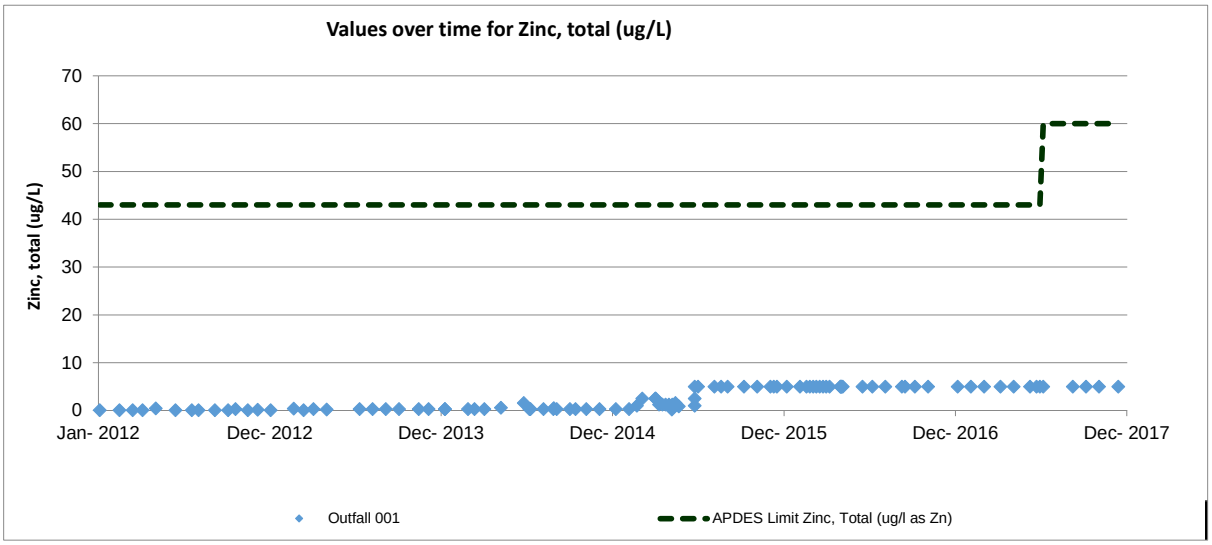

Values over time for Lead, total (ug/L)
Lead, total (ug/L)
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 001
APDES Limit Lead, Total (ug/l as Pb)

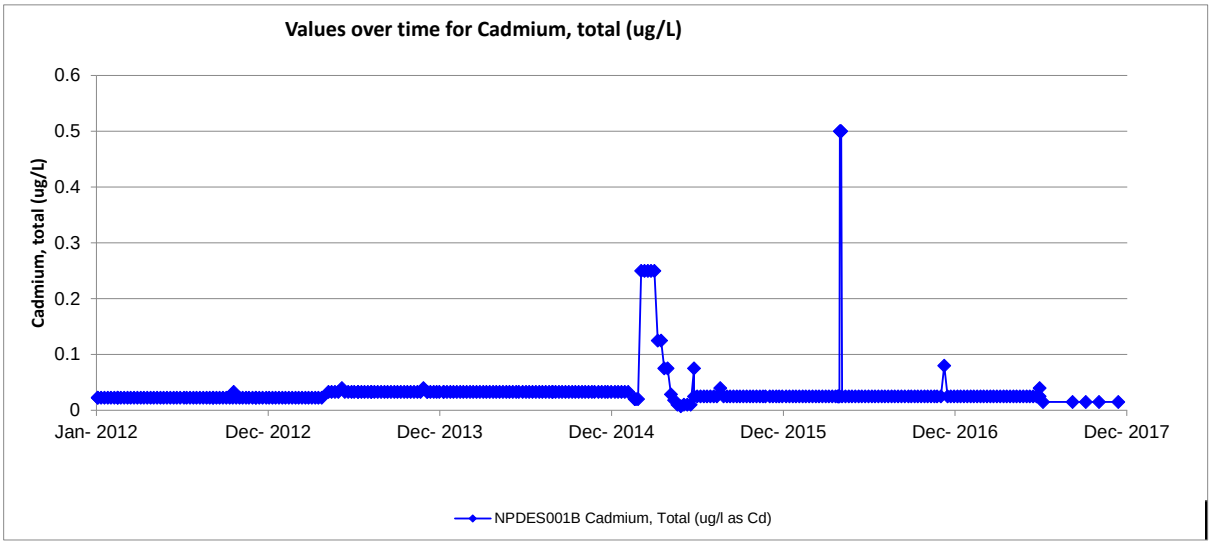

Values over time for Manganese, total (ug/L)
Manganese, total (ug/L)
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 001
APDES Limit Manganese, Total (ug/l as Mn)

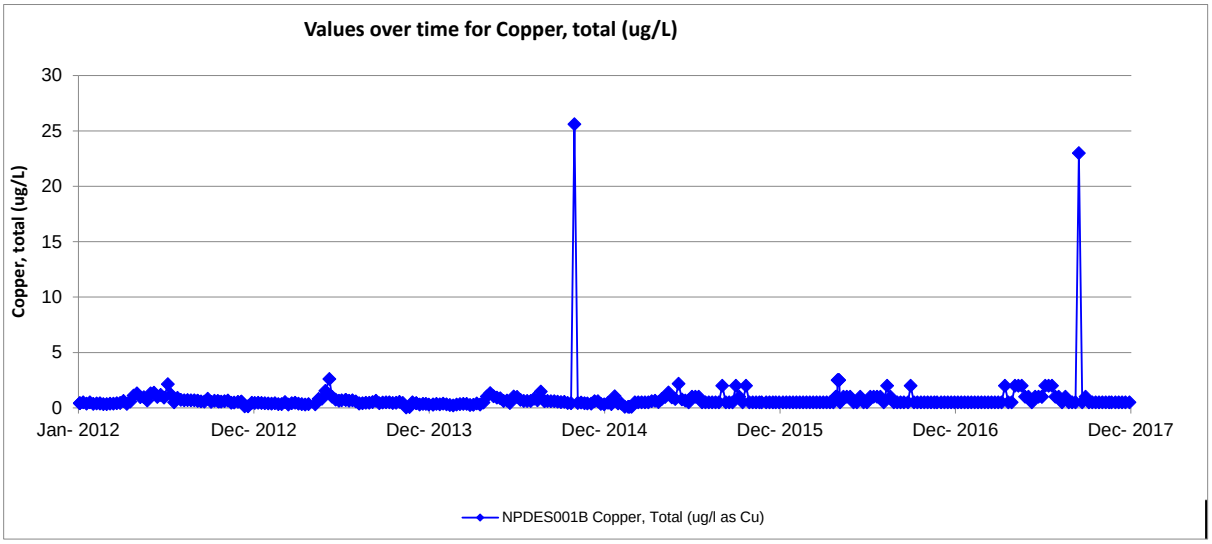

Values over time for Mercury, total (ug/L)
Mercury, total (ug/L)
0.025
0.02
0.015
0.01
0.005
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 001
APDES Limit Mercury, Total (ug/l as Hg)

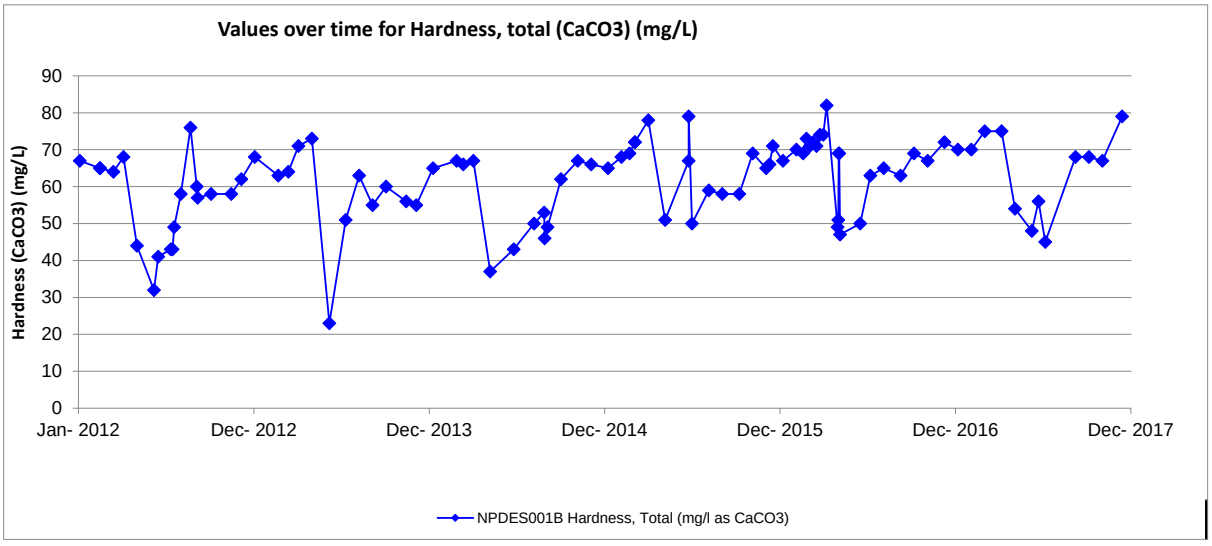

Values over time for pH, field (pH units)
pH, field (pH units)
9
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 001
APDES Limit pH, Field, Standard Units
APDES Upper Limit pH, Field, Standard Units

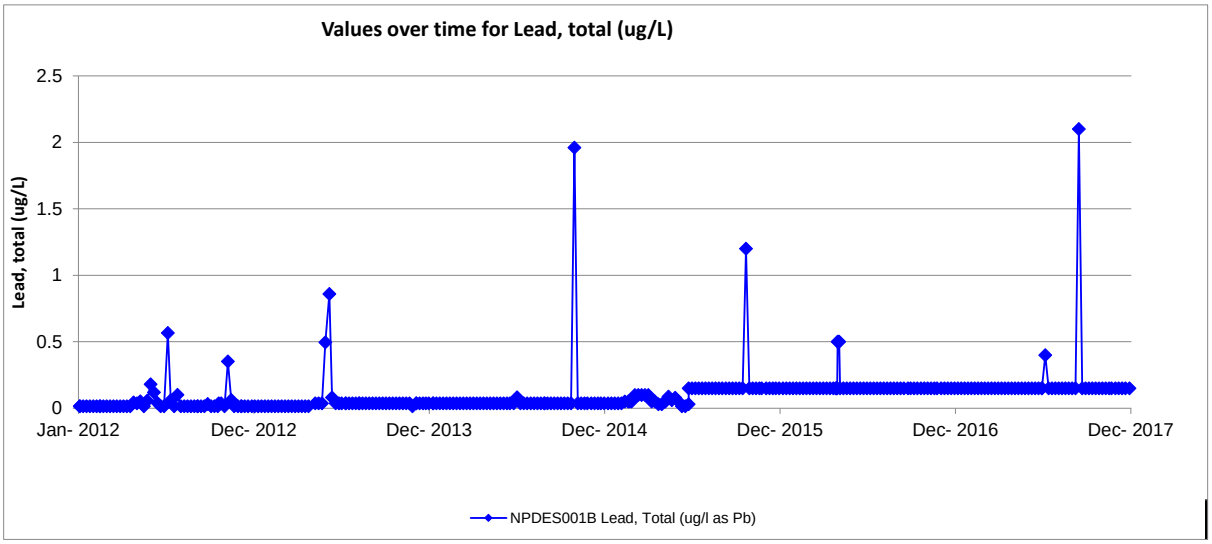

Values over time for Turbidity, lab (NTU)
Turbidity (NTU)
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
NPDES001B Turbidity,Lab Nephelometric Turbidity Units, NTU
OUTFALL001 Turbidity,Lab Nephelometric Turbidity Units, NTU

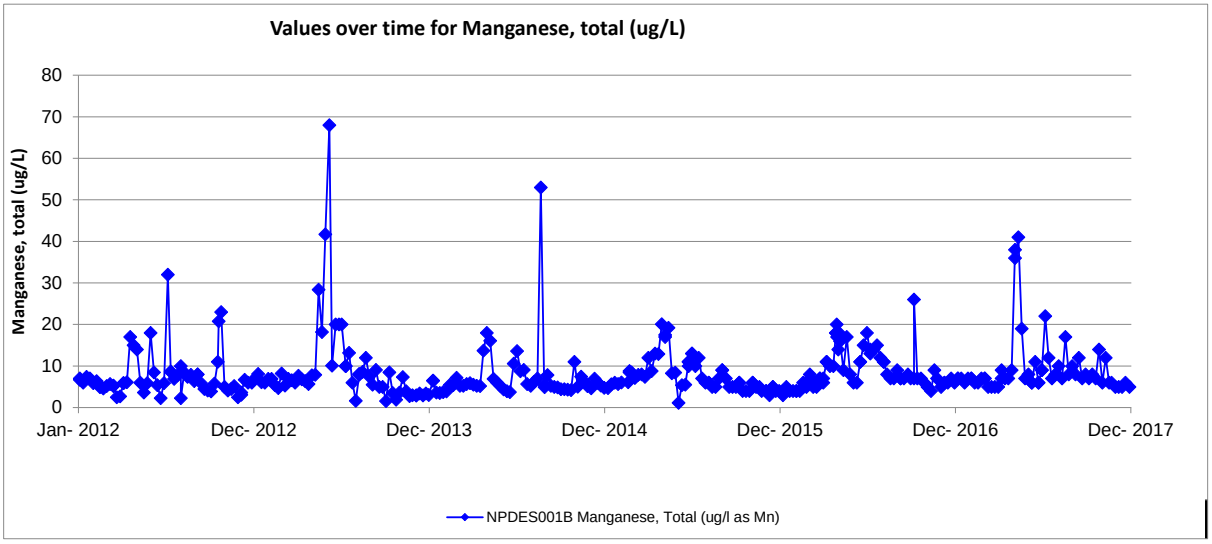

Values over time for Zinc, total (ug/L)
Zinc, total (ug/L)
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 001
APDES Limit Zinc, Total (ug/l as Zn)

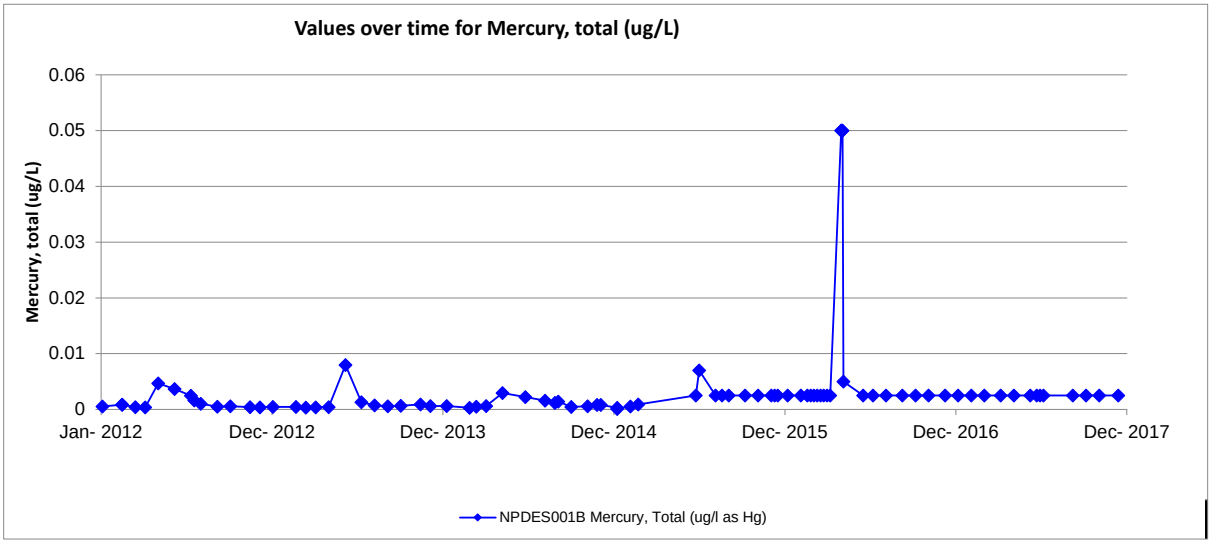

Values over time for Cadmium, total (ug/L)
Cadmium, total (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
NPDES001B Cadmium, Total (ug/l as Cd)

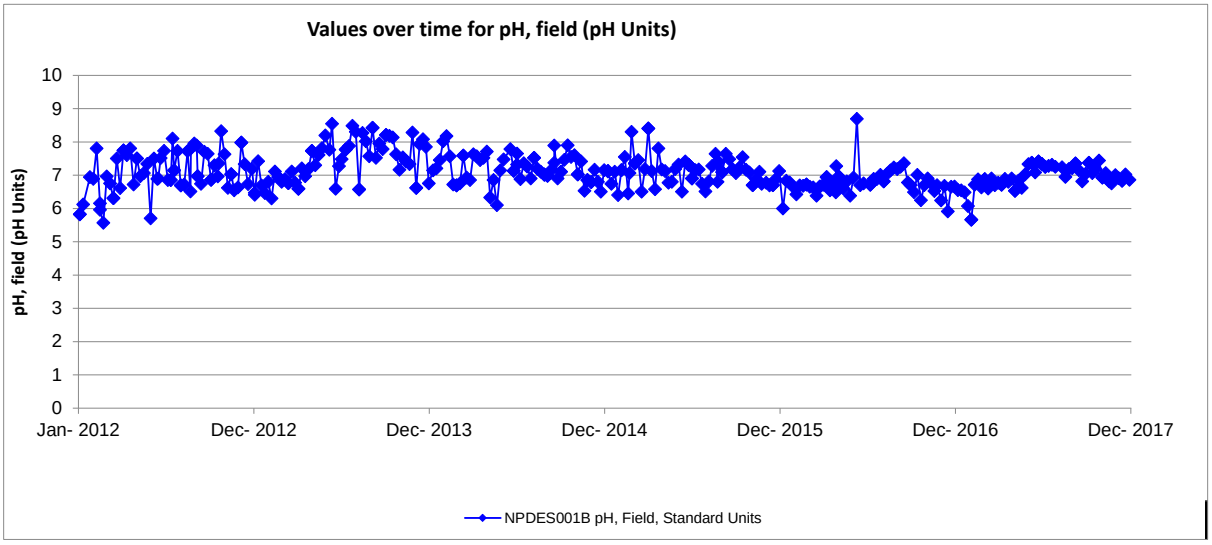

Values over time for Copper, total (ug/L)
Copper, total (ug/L)
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
NPDES001B Copper, Total (ug/l as Cu)

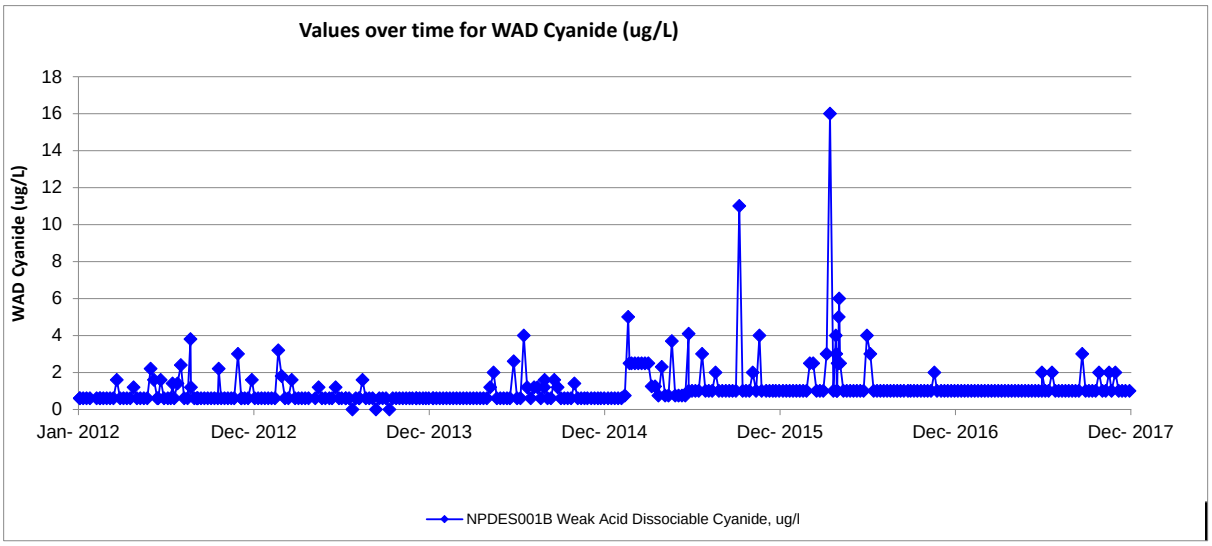

Values over time for Hardness, total (CaCO3) (mg/L)
Hardness (CaCO3) (mg/L)
90
80
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
NPDES001B Hardness, Total (mg/l as CaCO3)

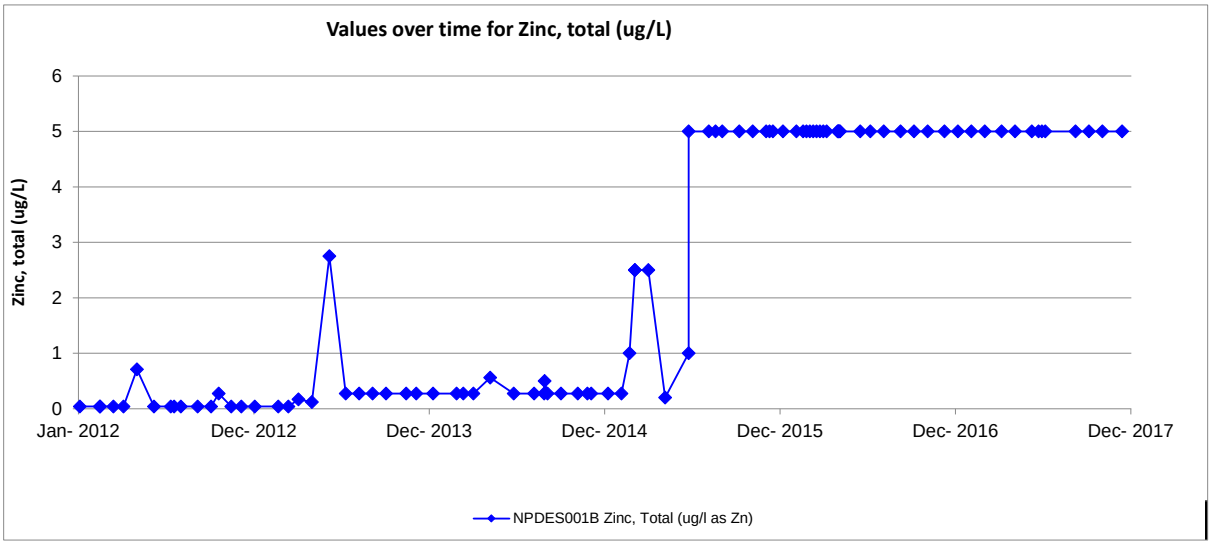

Values over time for Lead, total (ug/L)
Lead, total (ug/L)
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
NPDES001B Lead, Total (ug/l as Pb)

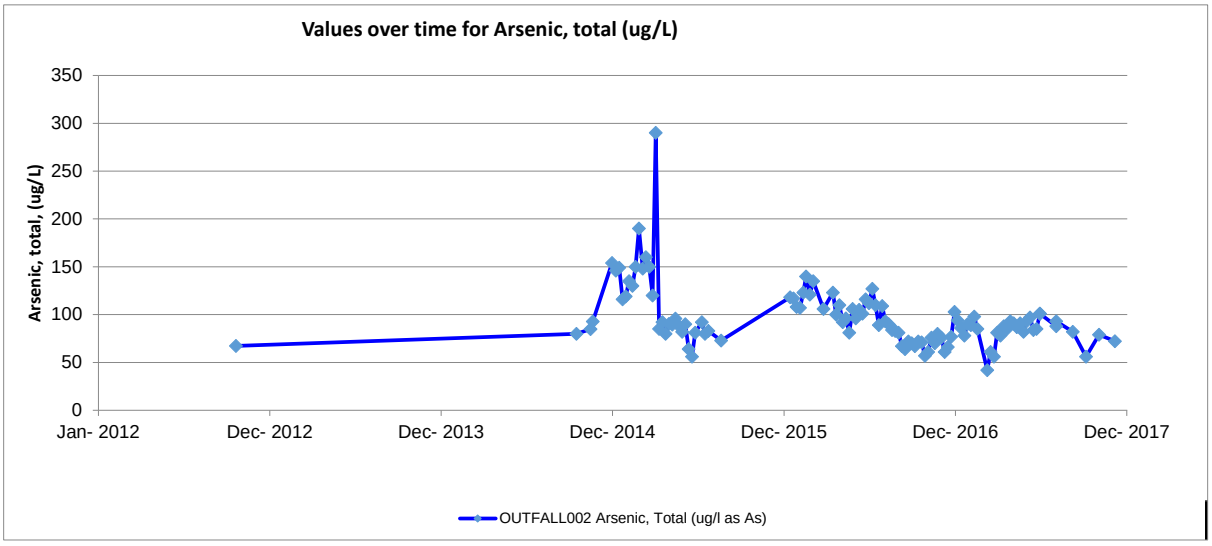

Values over time for Manganese, total (ug/L)
Manganese, total (ug/L)
80
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
NPDES001B Manganese, Total (ug/l as Mn)

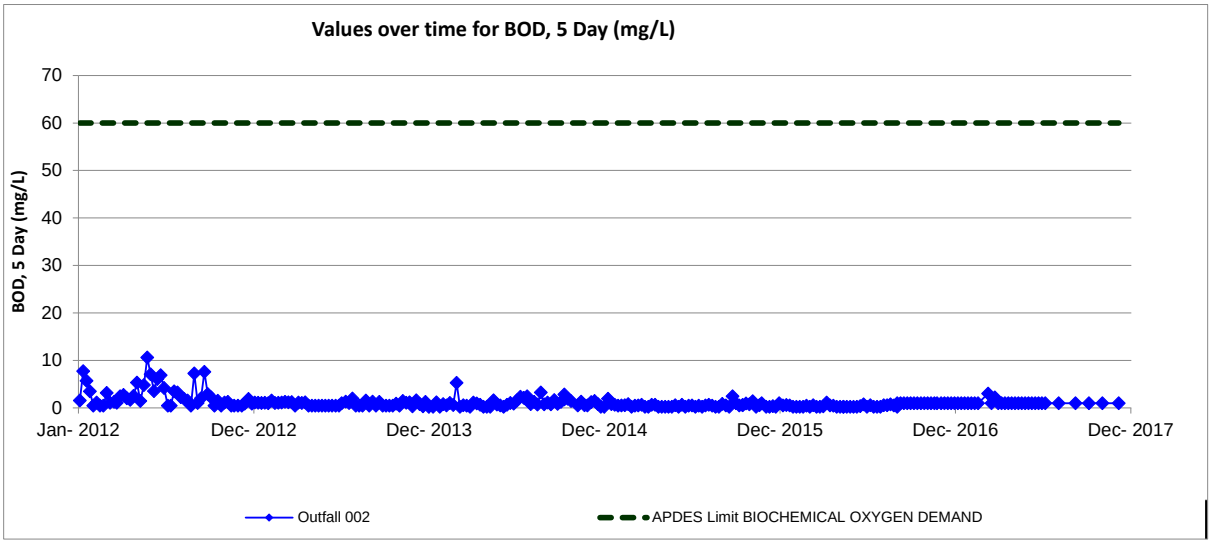

Values over time for Mercury, total (ug/L)
Mercury, total (ug/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
NPDES001B Mercury, Total (ug/l as Hg)

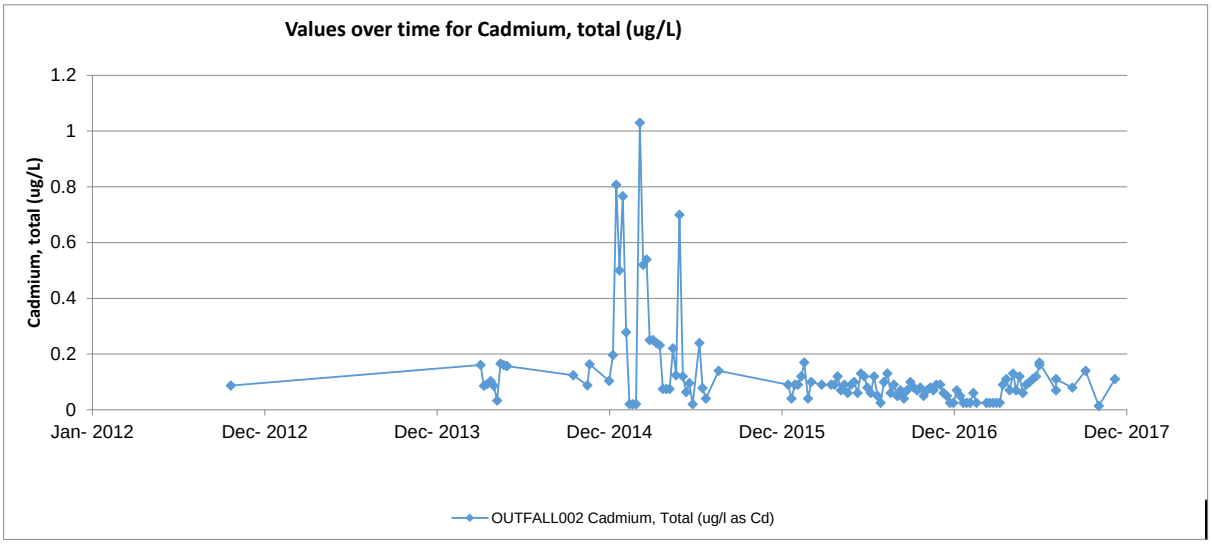

Values over time for pH, field (pH Units)
pH, field (pH Units)
10
9
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
NPDES001B pH, Field, Standard Units

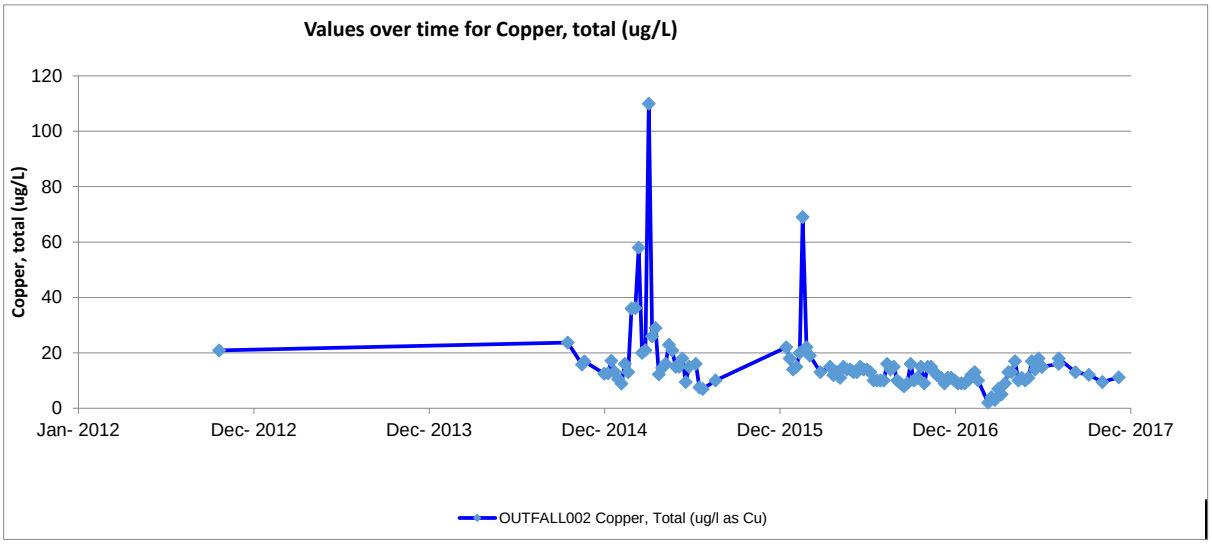

Values over time for WAD Cyanide (ug/L)
WAD Cyanide (ug/L)
18
16
14
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
NPDES001B Weak Acid Dissociable Cyanide, ug/l

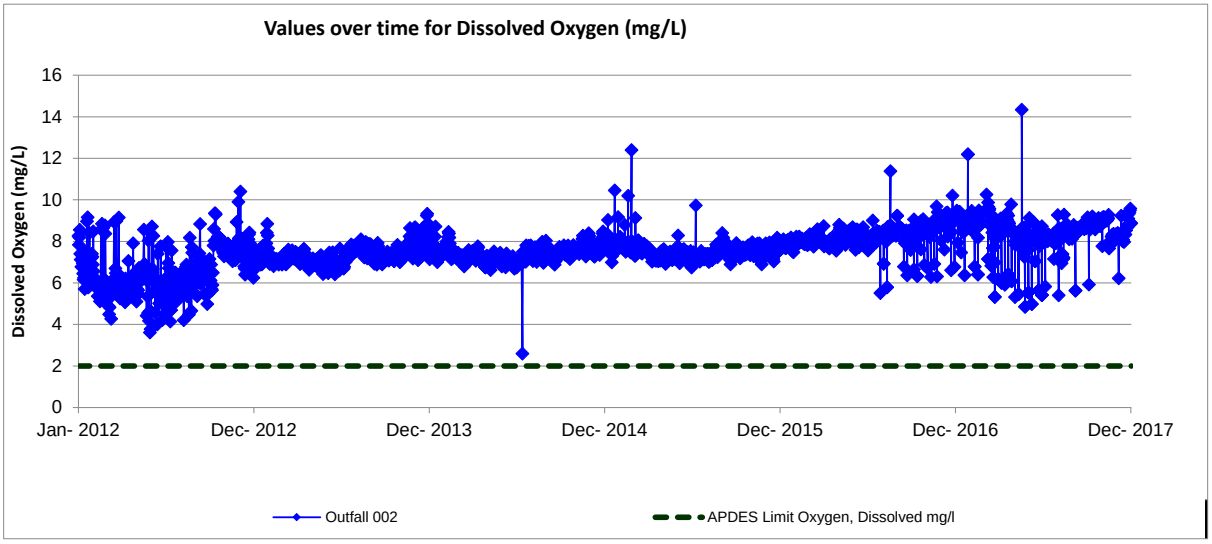

Values over time for Zinc, total (ug/L)
Zinc, total (ug/L)
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
NPDES001B Zinc, Total (ug/l as Zn)

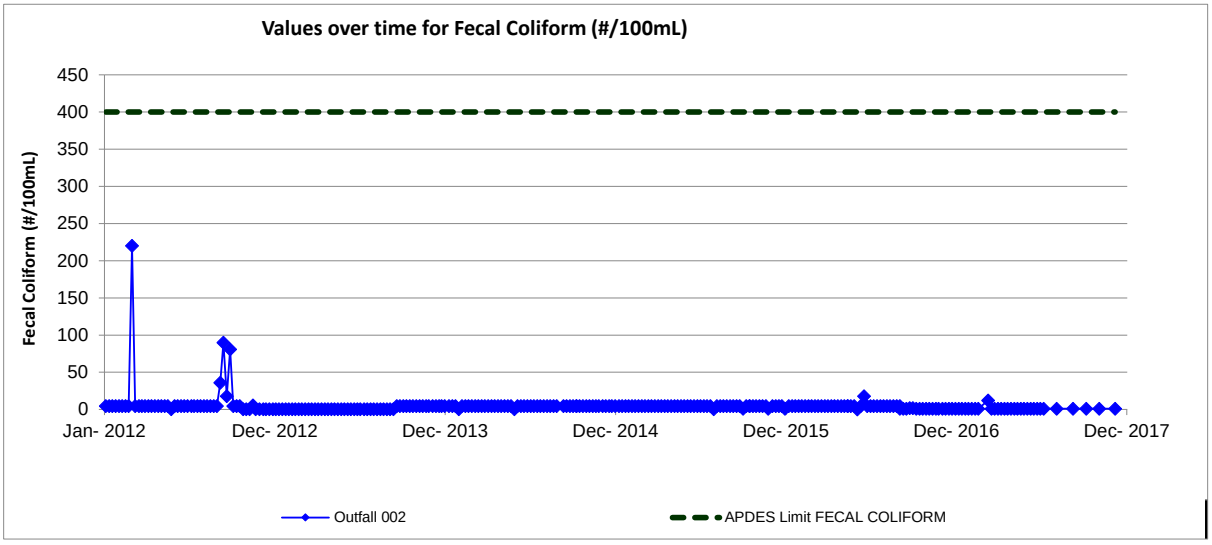

Values over time for Arsenic, total (ug/L)
Arsenic, total, (ug/L)
350
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
OUTFALL002 Arsenic, Total (ug/l as As)

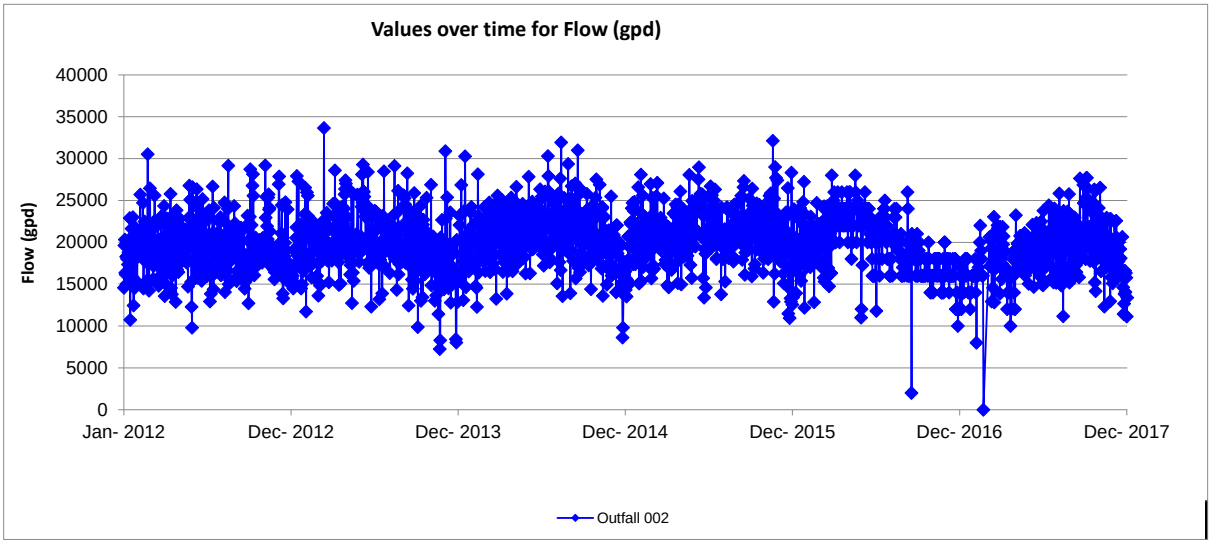

Values over time for BOD, 5 Day (mg/L)
BOD, 5 Day (mg/L)
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 002
APDES Limit BIOCHEMICAL OXYGEN DEMAND

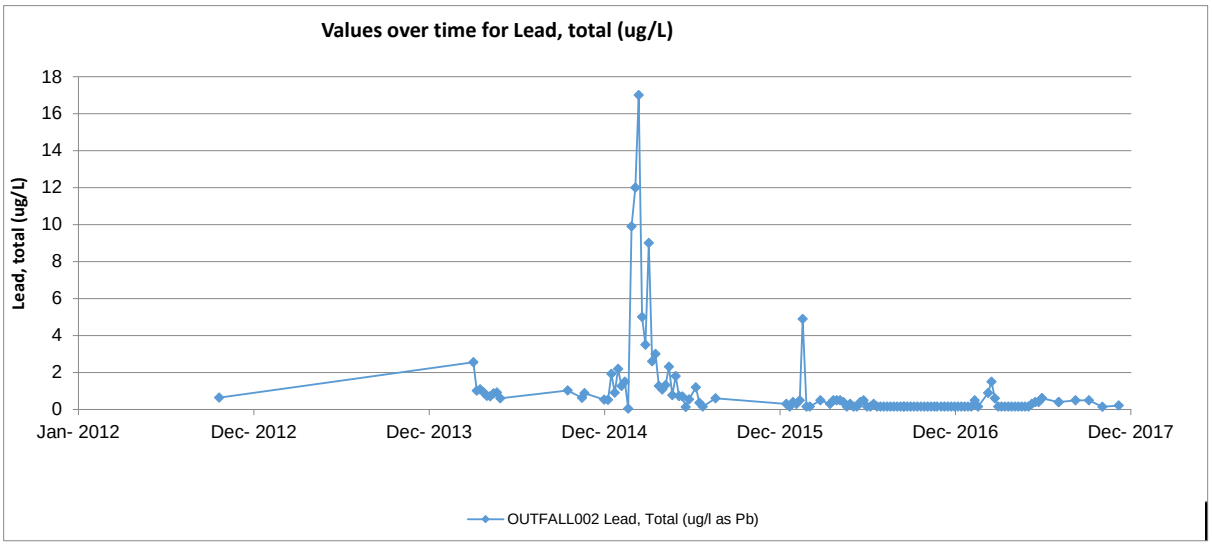

Values over time for Cadmium, total (ug/L)
Cadmium, total (ug/L)
1.2
1
0.8
0.6
0.4
0.2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
OUTFALL002 Cadmium, Total (ug/l as Cd)

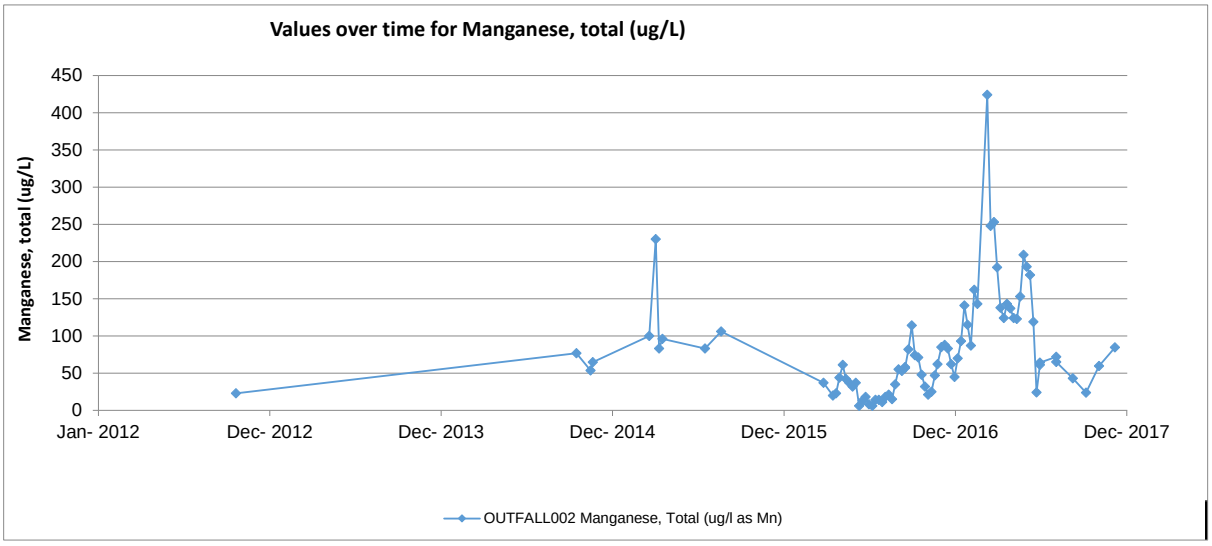

Values over time for Copper, total (ug/L)
Copper, total (ug/L)
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
OUTFALL002 Copper, Total (ug/l as Cu)

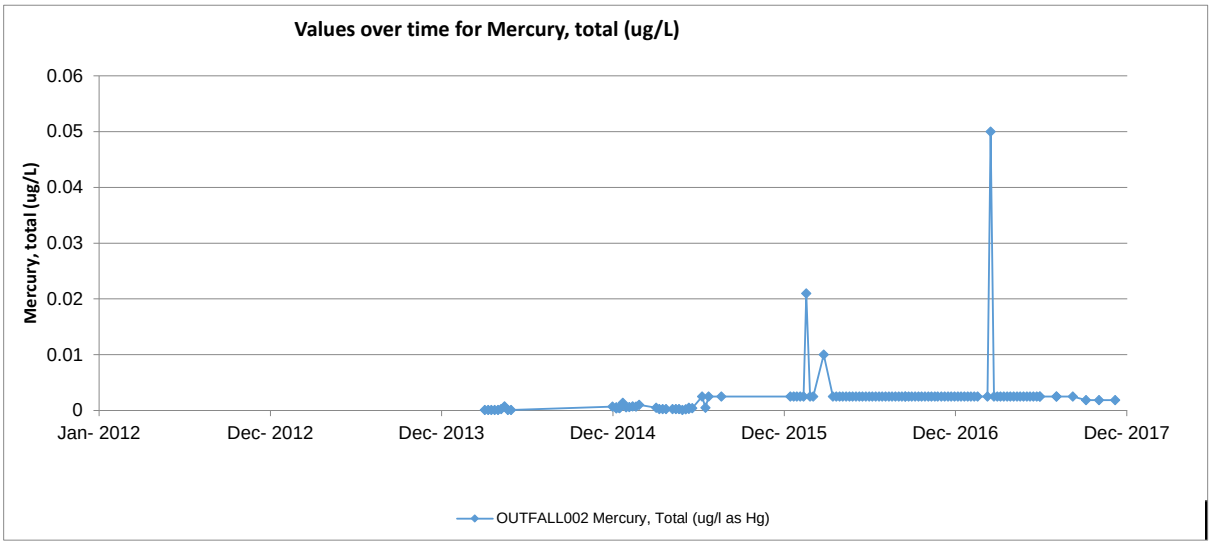

Values over time for Dissolved Oxygen (mg/L)
Dissolved Oxygen (mg/L)
16
14
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 002
APDES Limit Oxygen, Dissolved mg/l

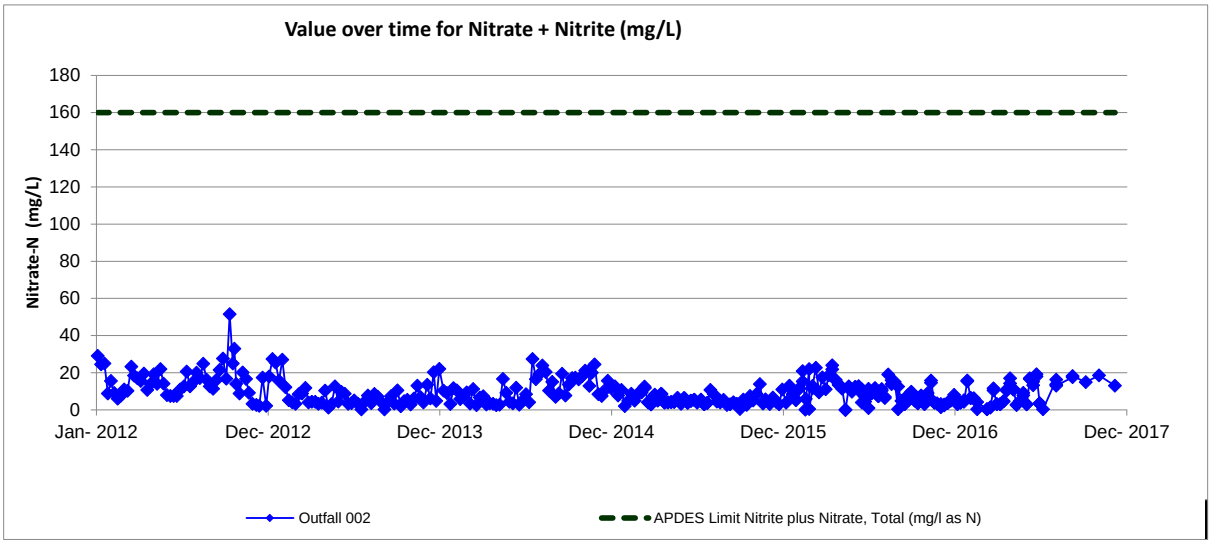

Values over time for Fecal Coliform (#/100mL)
Fecal Coliform (#/100mL)
450
400
350
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 002
APDES Limit FECAL COLIFORM

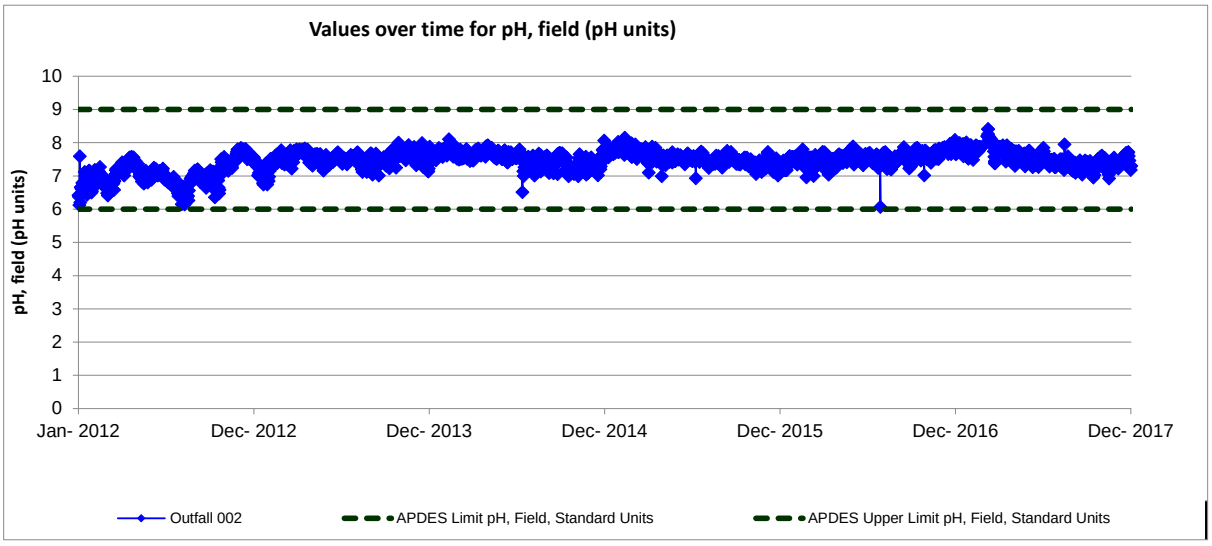

Values over time for Flow (gpd)
Flow (gpd)
40000
35000
30000
25000
20000
15000
10000
5000
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 002

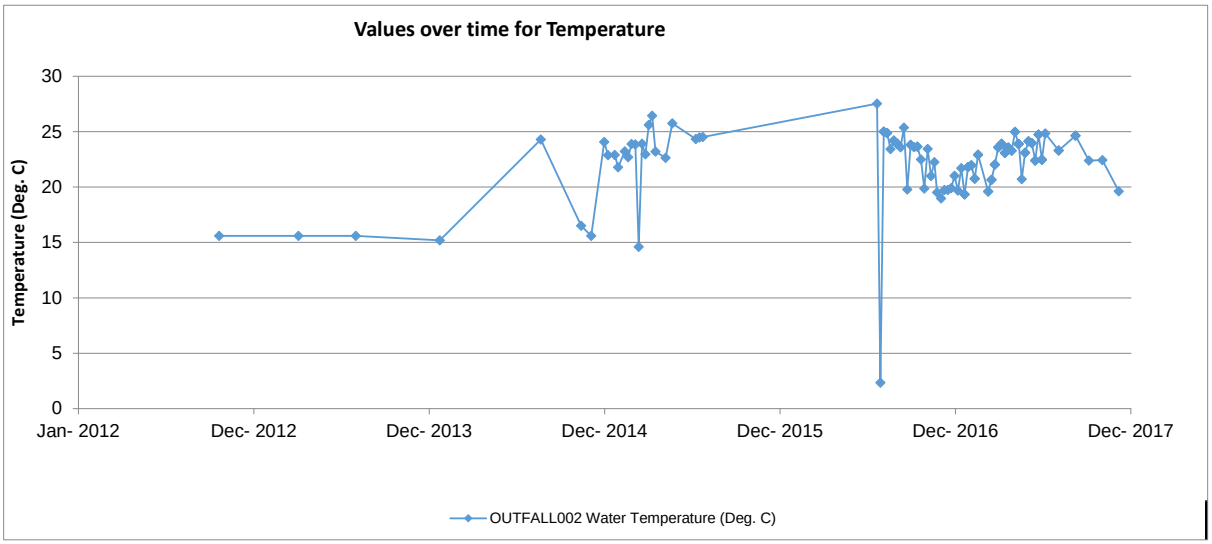

Values over time for Lead, total (ug/L)
Lead, total (ug/L)
18
16
14
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
OUTFALL002 Lead, Total (ug/l as Pb)

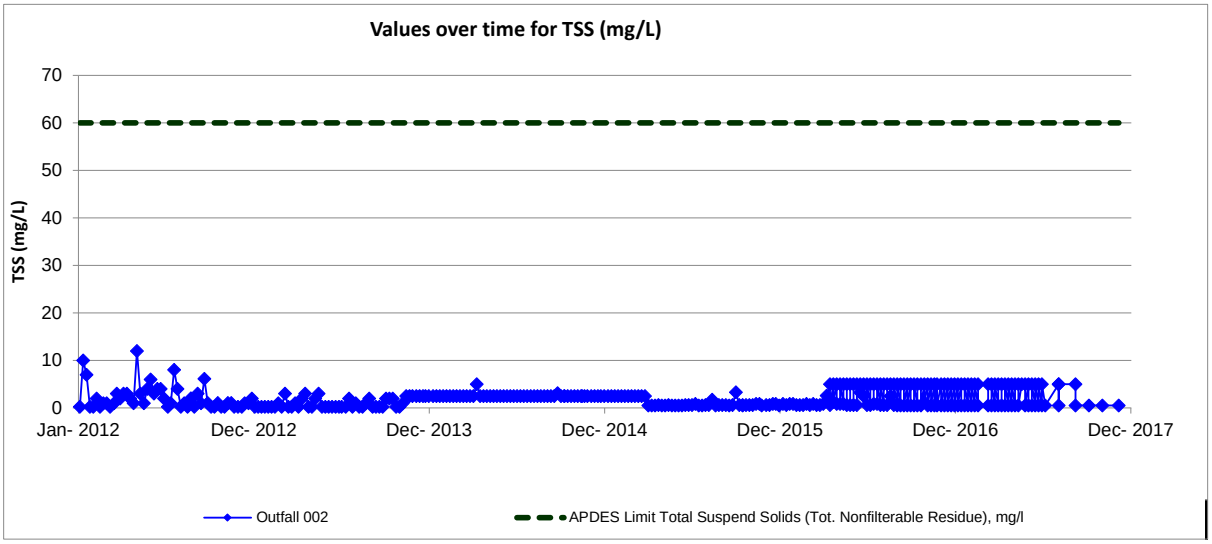

Values over time for Manganese, total (ug/L)
Manganese, total (ug/L)
450
400
350
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
OUTFALL002 Manganese, Total (ug/l as Mn)

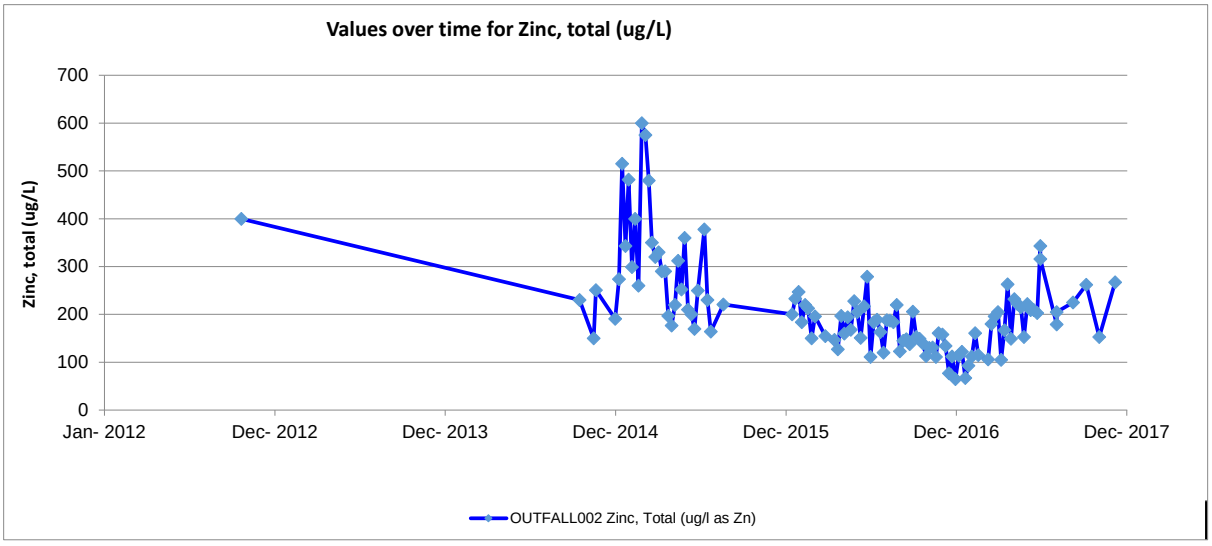

Values over time for Mercury, total (ug/L)
Mercury, total (ug/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
OUTFALL002 Mercury, Total (ug/l as Hg)

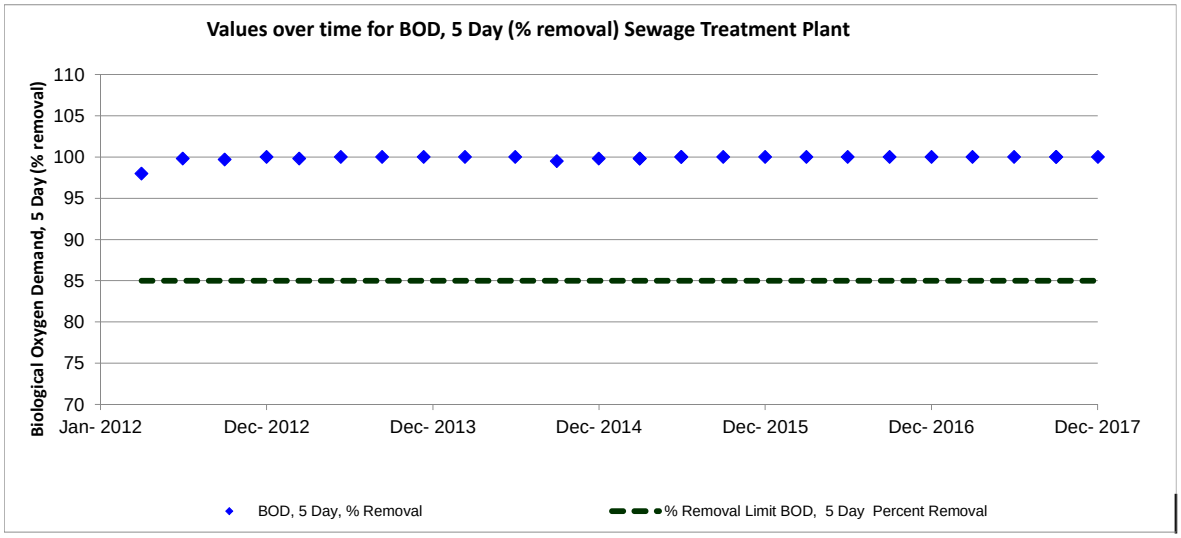

Value over time for Nitrate + Nitrite (mg/L)
Nitrate-N (mg/L)
180
160
140
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 002
APDES Limit Nitrite plus Nitrate, Total (mg/l as N)

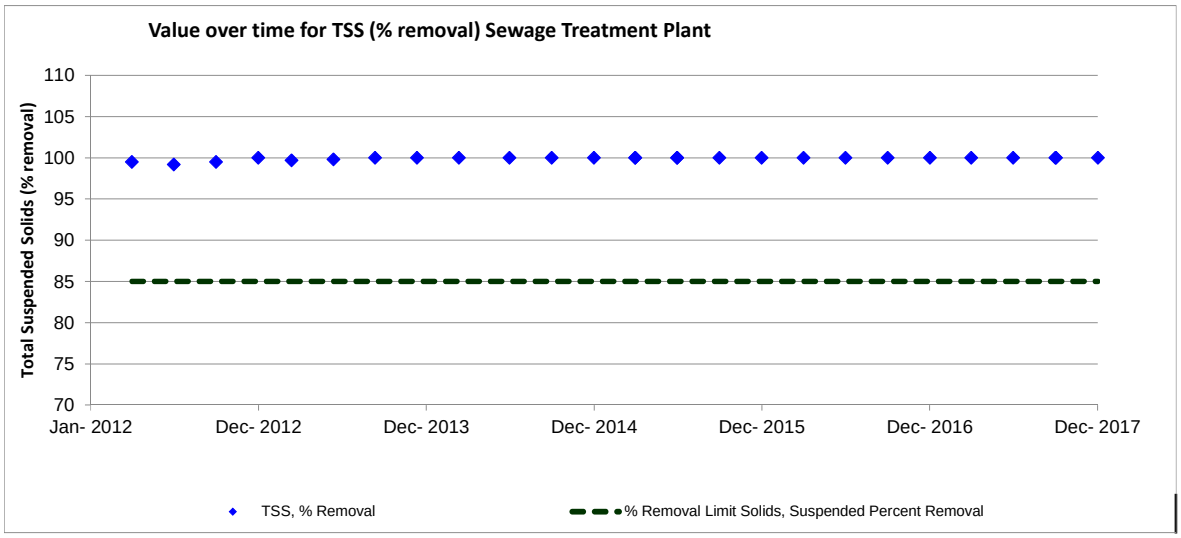

Values over time for pH, field (pH units)
pH, field (pH units)
10
9
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 002
APDES Limit pH, Field, Standard Units
APDES Upper Limit pH, Field, Standard Units

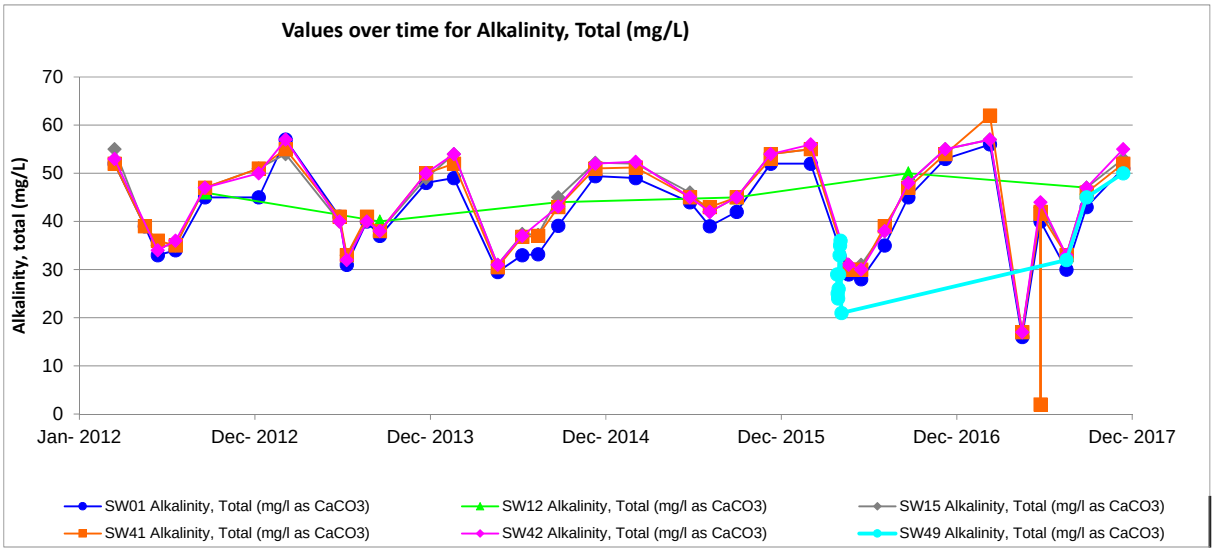

Values over time for Temperature
Temperature (Deg. C)
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
OUTFALL002 Water Temperature (Deg. C)

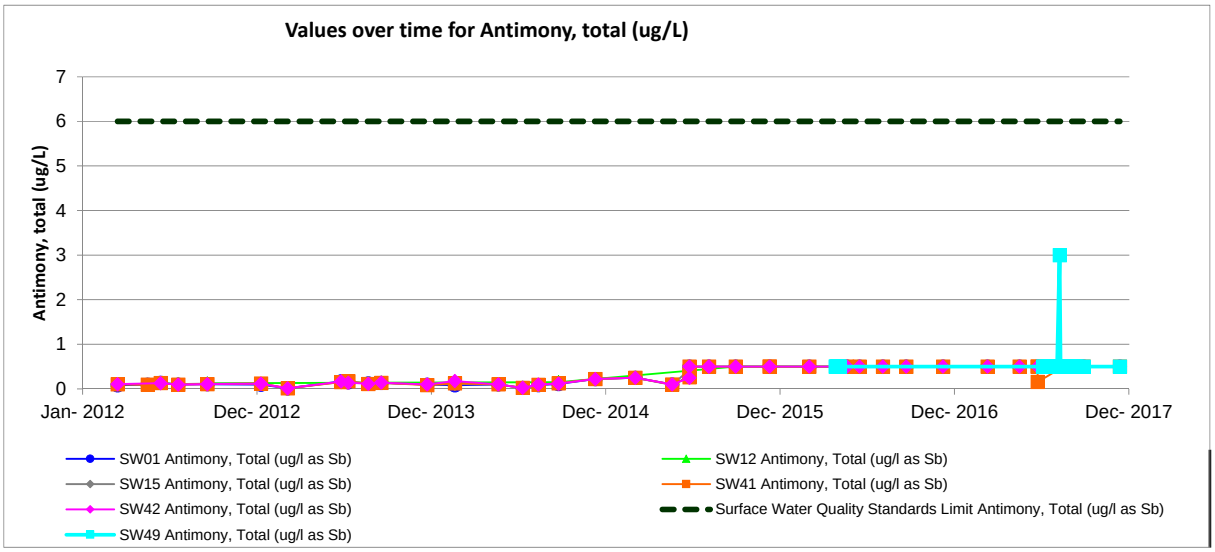

Values over time for TSS (mg/L)
TSS (mg/L)
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
Outfall 002
APDES Limit Total Suspend Solids (Tot. Nonfilterable Residue), mg/l

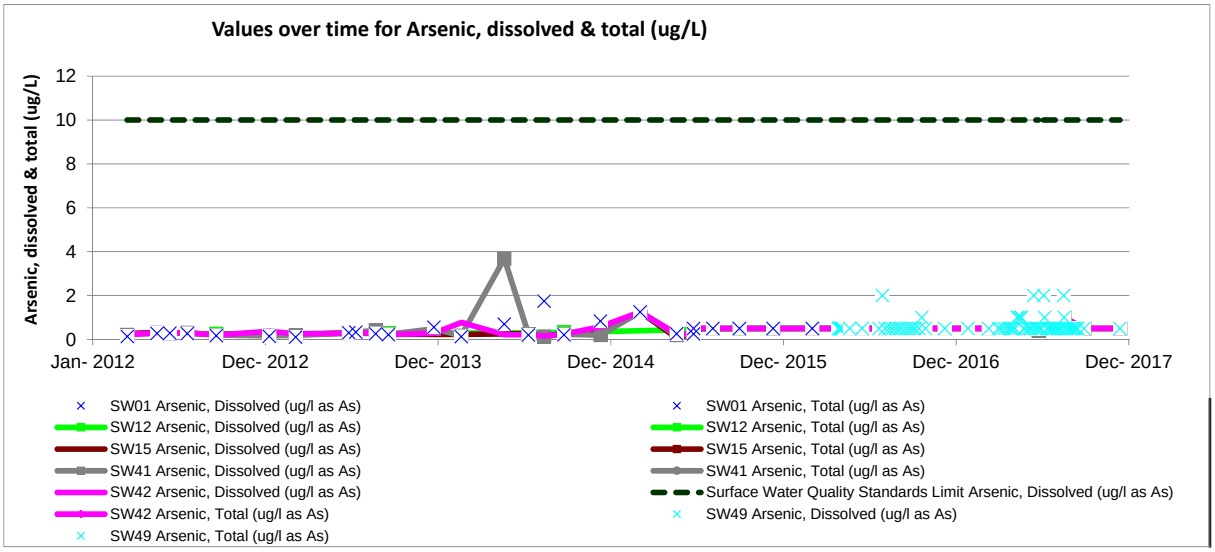

Values over time for Zinc, total (ug/L)
Zinc, total (ug/L)
700
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
OUTFALL002 Zinc, Total (ug/l as Zn)

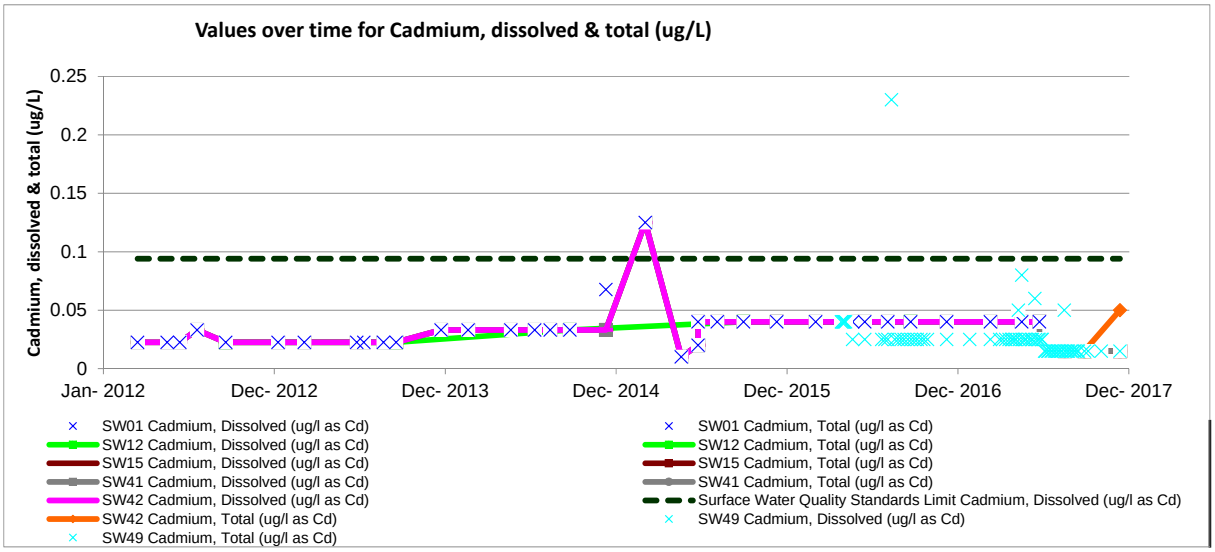

Values over time for BOD, 5 Day (% removal) Sewage Treatment Plant
Biological Oxygen Demand, 5 Day (% removal)
110
105
100
95
90
85
80
75
70
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
BOD, 5 Day, % Removal
% Removal Limit BOD, 5 Day Percent Removal

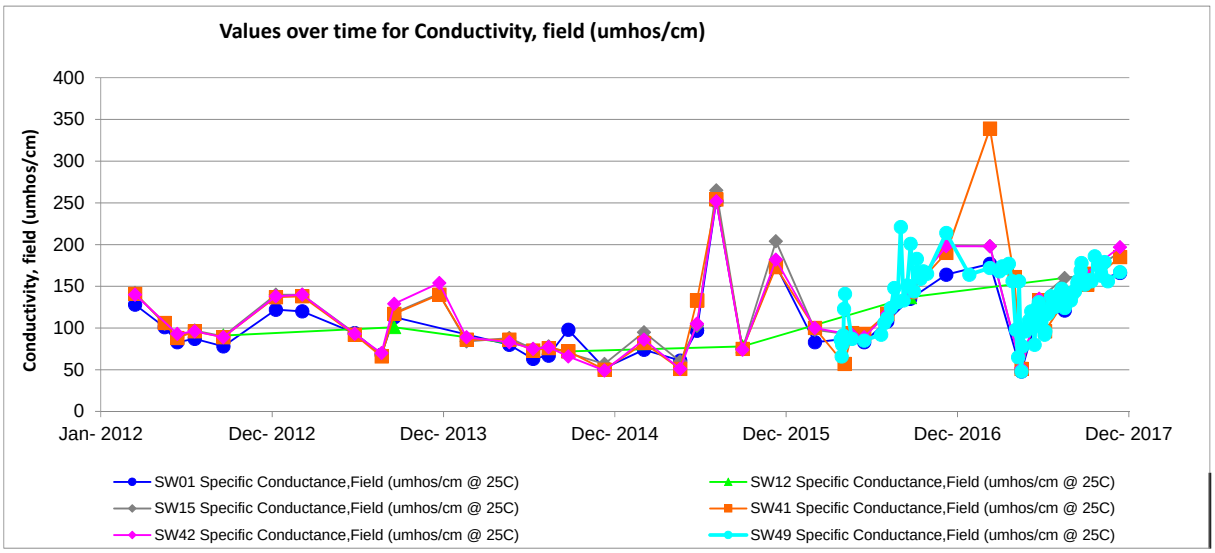

Value over time for TSS (% removal) Sewage Treatment Plant
Total Suspended Solids (% removal)
110
105
100
95
90
85
80
75
70
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
TSS, % Removal
% Removal Limit Solids, Suspended Percent Removal

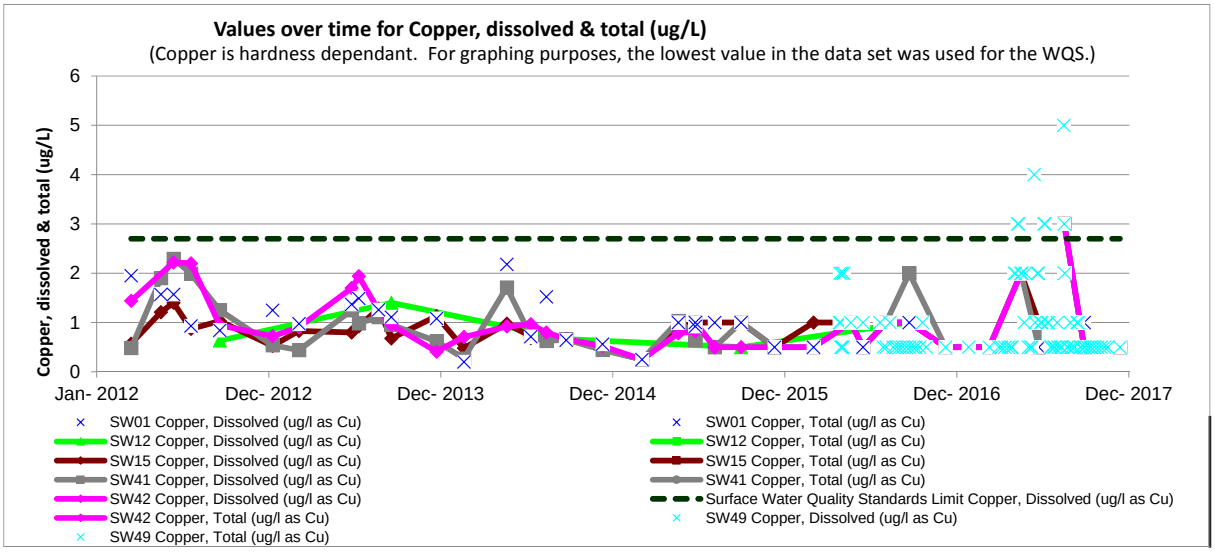

Values over time for Alkalinity, Total (mg/L)
Alkalinity, total (mg/L)
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Alkalinity, Total (mg/l as CaCO3)
SW12 Alkalinity, Total (mg/l as CaCO3)
SW15 Alkalinity, Total (mg/l as CaCO3)
SW41 Alkalinity, Total (mg/l as CaCO3)
SW42 Alkalinity, Total (mg/l as CaCO3)
SW49 Alkalinity, Total (mg/l as CaCO3)

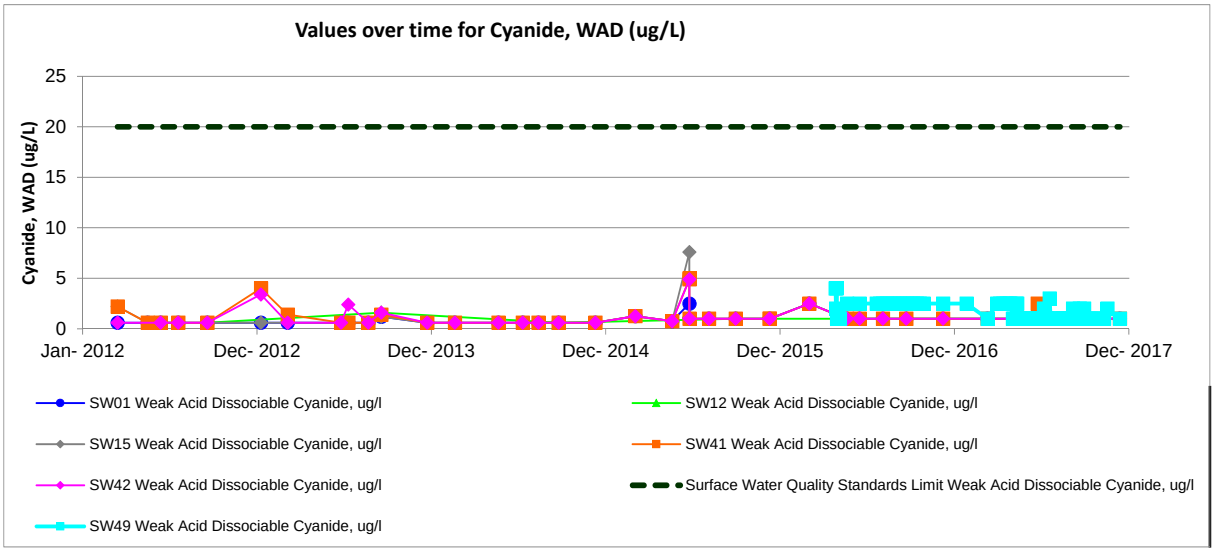

Values over time for Antimony, total (ug/L)
Antimony, total (ug/L)
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Antimony, Total (ug/l as Sb)
SW12 Antimony, Total (ug/l as Sb)
SW15 Antimony, Total (ug/l as Sb)
SW41 Antimony, Total (ug/l as Sb)
SW42 Antimony, Total (ug/l as Sb)
Surface Water Quality Standards Limit Antimony, Total (ug/l as Sb)
SW49 Antimony, Total (ug/l as Sb)

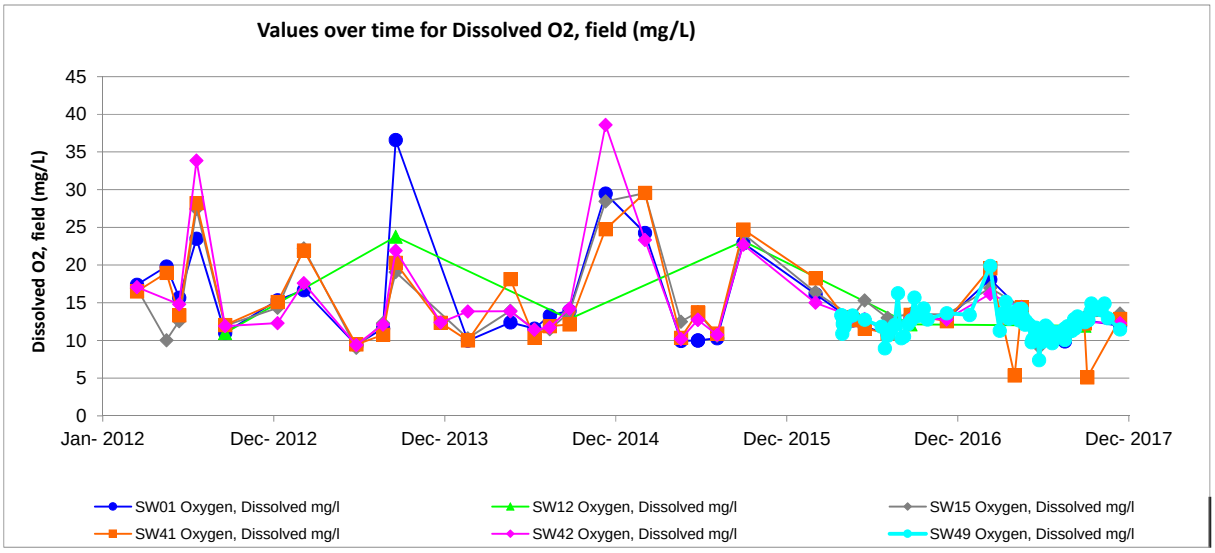

Values over time for Arsenic, dissolved & total (ug/L)
Arsenic, dissolved & total (ug/L)
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Arsenic, Dissolved (ug/l as As)
SW01 Arsenic, Total (ug/l as As)
SW12 Arsenic, Dissolved (ug/l as As)
SW12 Arsenic, Total (ug/l as As)
SW15 Arsenic, Dissolved (ug/l as As)
SW15 Arsenic, Total (ug/l as As)
SW41 Arsenic, Dissolved (ug/l as As)
SW41 Arsenic, Total (ug/l as As)
SW42 Arsenic, Dissolved (ug/l as As)
Surface Water Quality Standards Limit Arsenic, Dissolved (ug/l as As)
SW42 Arsenic, Total (ug/l as As)
SW49 Arsenic, Dissolved (ug/l as As)
SW49 Arsenic, Total (ug/l as As)

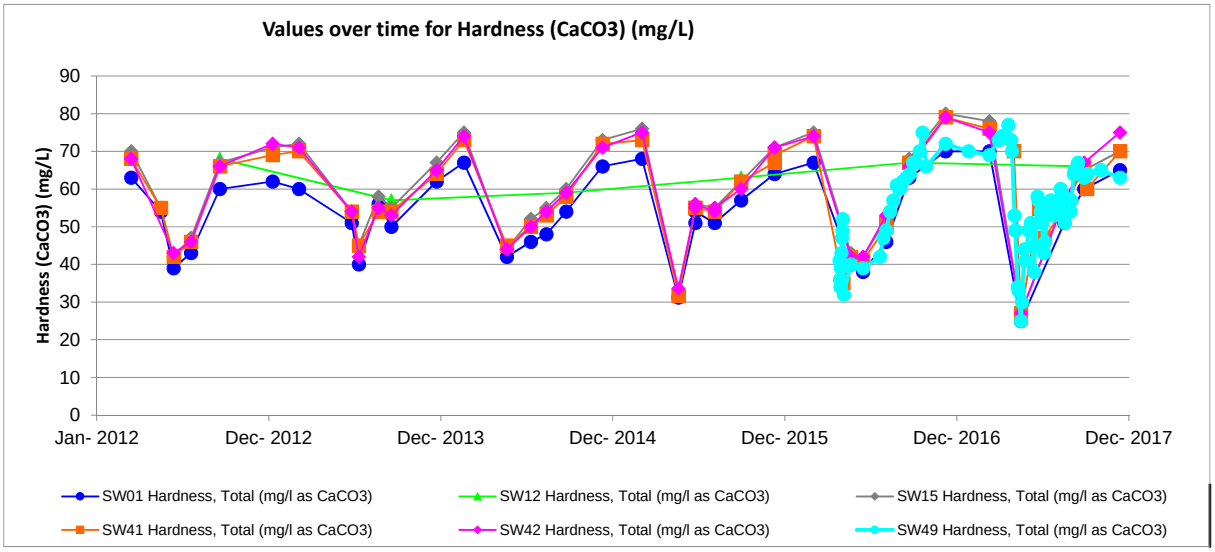

Values over time for Cadmium, dissolved & total (ug/L)
Cadmium, dissolved & total (ug/L)
0.25
0.2
0.15
0.1
0.05
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Cadmium, Dissolved (ug/l as Cd)
SW12 Cadmium, Dissolved (ug/l as Cd)
SW15 Cadmium, Dissolved (ug/l as Cd)
SW41 Cadmium, Dissolved (ug/l as Cd)
SW42 Cadmium, Dissolved (ug/l as Cd)
SW42 Cadmium, Total (ug/l as Cd)
SW49 Cadmium, Total (ug/l as Cd)
SW01 Cadmium, Total (ug/l as Cd)
SW12 Cadmium, Total (ug/l as Cd)
SW15 Cadmium, Total (ug/l as Cd)
SW41 Cadmium, Total (ug/l as Cd)
Surface Water Quality Standards Limit Cadmium, Dissolved (ug/l as Cd)
SW49 Cadmium, Dissolved (ug/l as Cd)

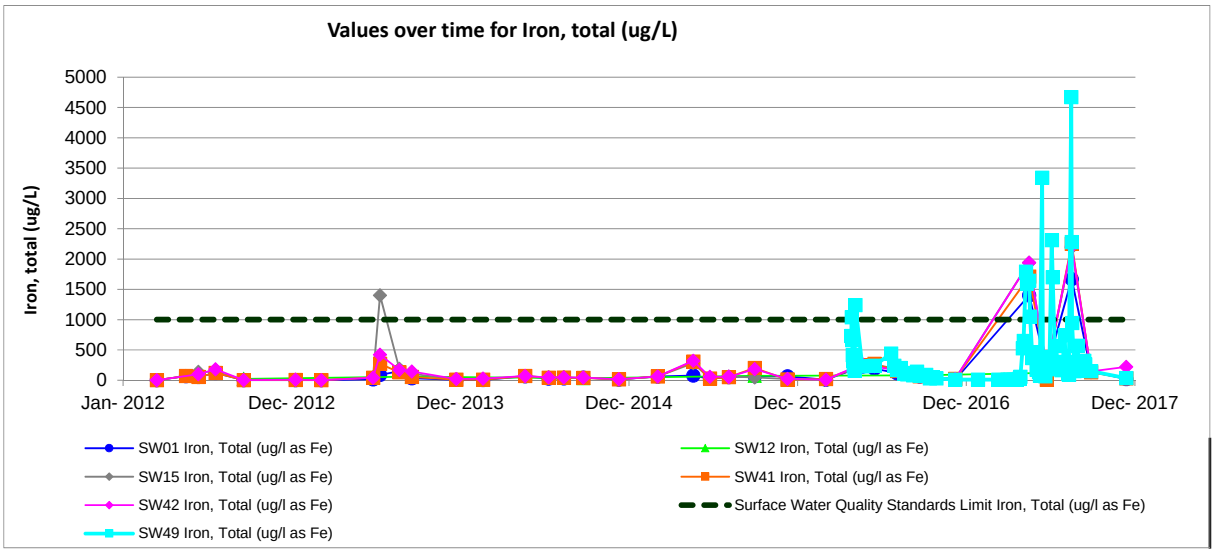

Values over time for Conductivity, field (umhos/cm)
Conductivity, field (umhos/cm)
400
350
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Specific Conductance,Field (umhos/cm @ 25C)
SW12 Specific Conductance,Field (umhos/cm @ 25C)
SW15 Specific Conductance,Field (umhos/cm @ 25C)
SW41 Specific Conductance,Field (umhos/cm @ 25C)
SW42 Specific Conductance,Field (umhos/cm @ 25C)
SW49 Specific Conductance,Field (umhos/cm @ 25C)

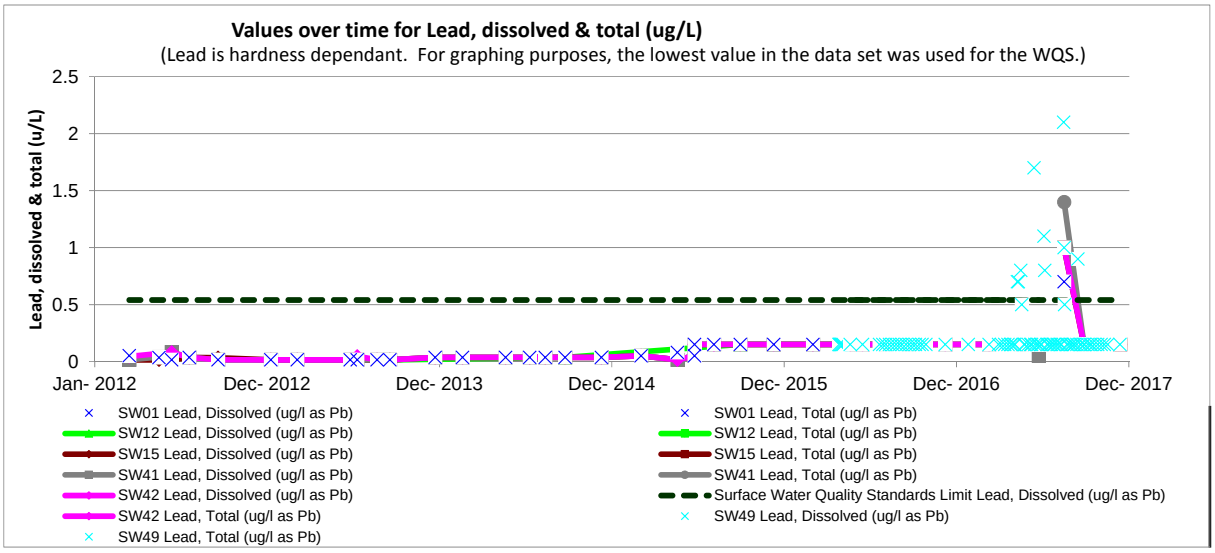

Values over time for Copper, dissolved & total (ug/L)
(Copper is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Copper, dissolved & total (ug/L)
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Copper, Dissolved (ug/l as Cu)
SW12 Copper, Dissolved (ug/l as Cu)
SW15 Copper, Dissolved (ug/l as Cu)
SW41 Copper, Dissolved (ug/l as Cu)
SW42 Copper, Dissolved (ug/l as Cu)
SW42 Copper, Total (ug/l as Cu)
SW49 Copper, Total (ug/l as Cu)
SW01 Copper, Total (ug/l as Cu)
SW12 Copper, Total (ug/l as Cu)
SW15 Copper, Total (ug/l as Cu)
SW41 Copper, Total (ug/l as Cu)
Surface Water Quality Standards Limit Copper, Dissolved (ug/l as Cu)
SW49 Copper, Dissolved (ug/l as Cu)

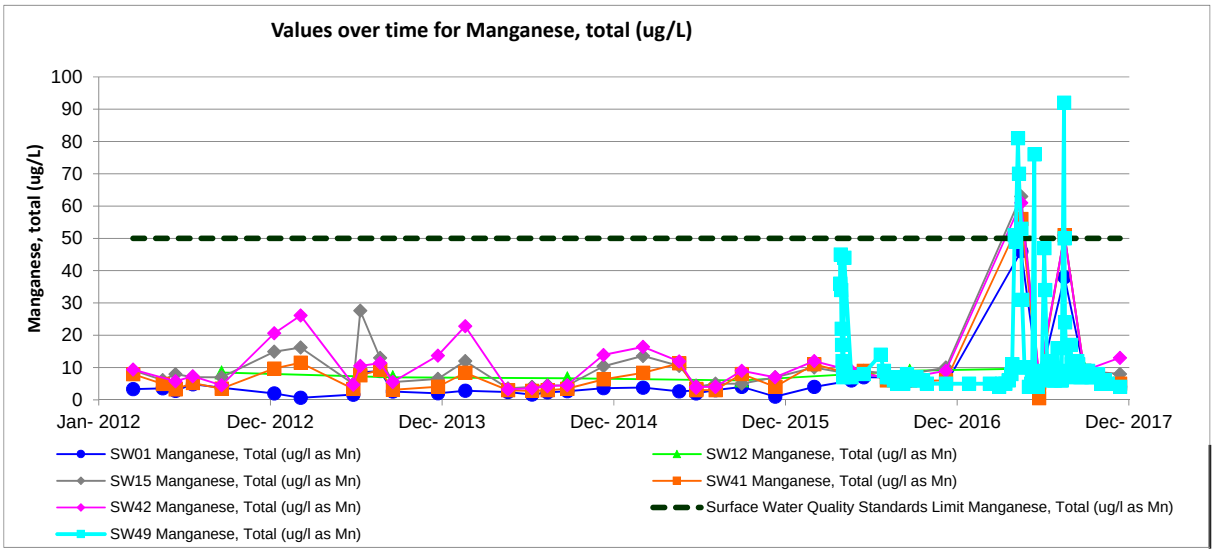

Values over time for Cyanide, WAD (ug/L)
Cyanide, WAD (ug/L)
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Weak Acid Dissociable Cyanide, ug/l
SW12 Weak Acid Dissociable Cyanide, ug/l
SW15 Weak Acid Dissociable Cyanide, ug/l
SW41 Weak Acid Dissociable Cyanide, ug/l
SW42 Weak Acid Dissociable Cyanide, ug/l
Surface Water Quality Standards Limit Weak Acid Dissociable Cyanide, ug/l
SW49 Weak Acid Dissociable Cyanide, ug/l

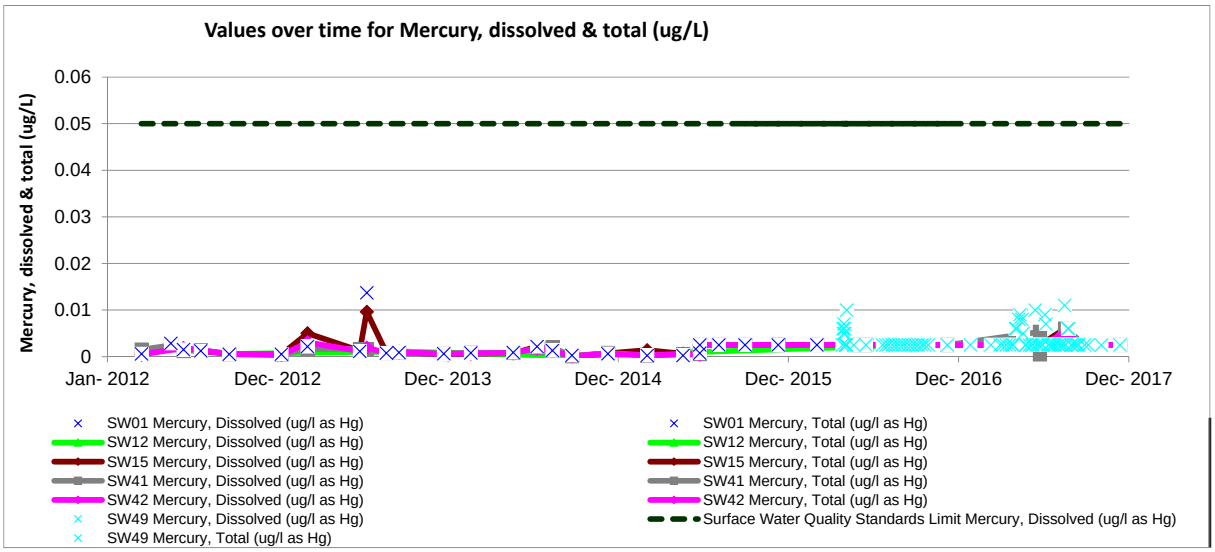

Values over time for Dissolved O2, field (mg/L)
Dissolved O2, field (mg/L)
45
40
35
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Oxygen, Dissolved mg/l
SW12 Oxygen, Dissolved mg/l
SW15 Oxygen, Dissolved mg/l
SW41 Oxygen, Dissolved mg/l
SW42 Oxygen, Dissolved mg/l
SW49 Oxygen, Dissolved mg/l

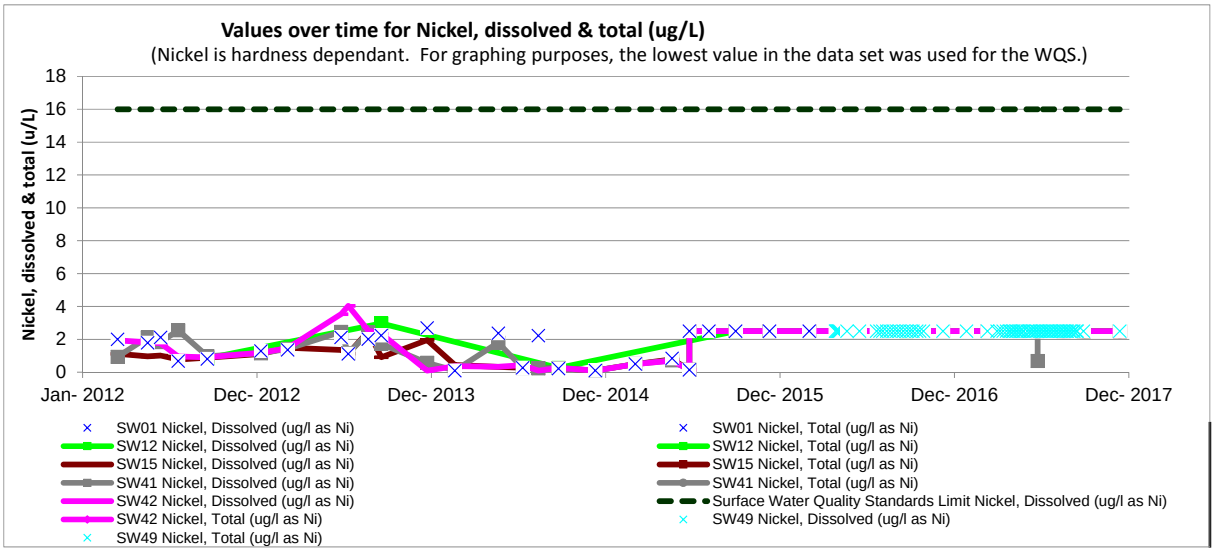

Values over time for Hardness (CaCO3) (mg/L)
Hardness (CaCO3) (mg/L)
90
80
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Hardness, Total (mg/l as CaCO3)
SW12 Hardness, Total (mg/l as CaCO3)
SW15 Hardness, Total (mg/l as CaCO3)
SW41 Hardness, Total (mg/l as CaCO3)
SW42 Hardness, Total (mg/l as CaCO3)
SW49 Hardness, Total (mg/l as CaCO3)

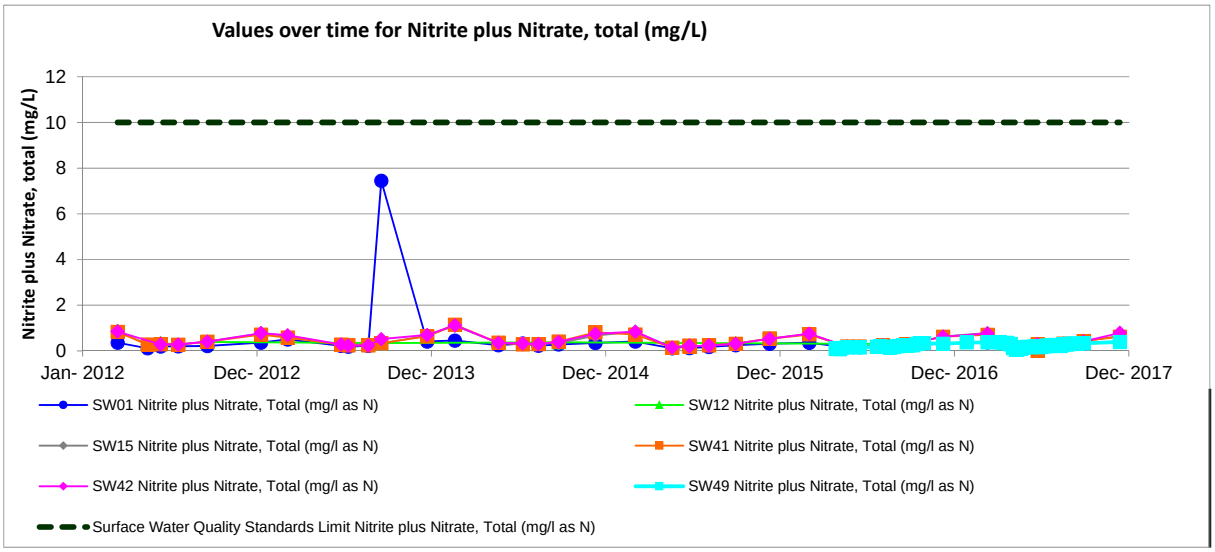

Values over time for Iron, total (ug/L)
Iron, total (ug/L)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Iron, Total (ug/l as Fe)
SW12 Iron, Total (ug/l as Fe)
SW15 Iron, Total (ug/l as Fe)
SW41 Iron, Total (ug/l as Fe)
SW42 Iron, Total (ug/l as Fe)
Surface Water Quality Standards Limit Iron, Total (ug/l as Fe)
SW49 Iron, Total (ug/l as Fe)

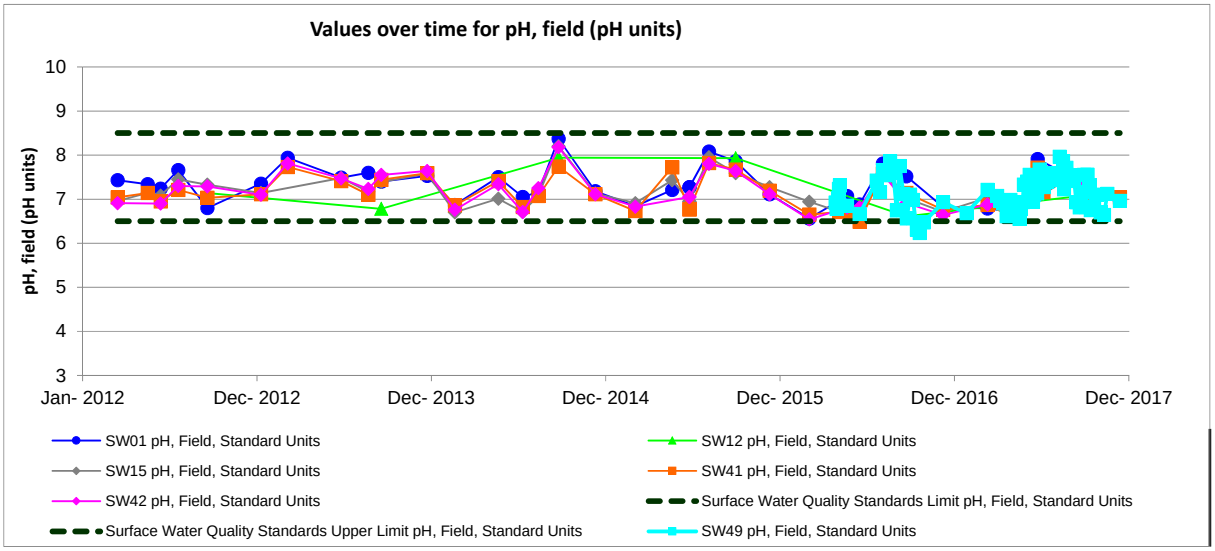

Values over time for Lead, dissolved & total (ug/L)
(Lead is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Lead, dissolved & total (u/L)
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Lead, Dissolved (ug/l as Pb)
SW01 Lead, Total (ug/l as Pb)
SW12 Lead, Dissolved (ug/l as Pb)
SW12 Lead, Total (ug/l as Pb)
SW15 Lead, Dissolved (ug/l as Pb)
SW15 Lead, Total (ug/l as Pb)
SW41 Lead, Dissolved (ug/l as Pb)
SW41 Lead, Total (ug/l as Pb)
SW42 Lead, Dissolved (ug/l as Pb)
Surface Water Quality Standards Limit Lead, Dissolved (ug/l as Pb)
SW42 Lead, Total (ug/l as Pb)
SW49 Lead, Dissolved (ug/l as Pb)
SW49 Lead, Total (ug/l as Pb)

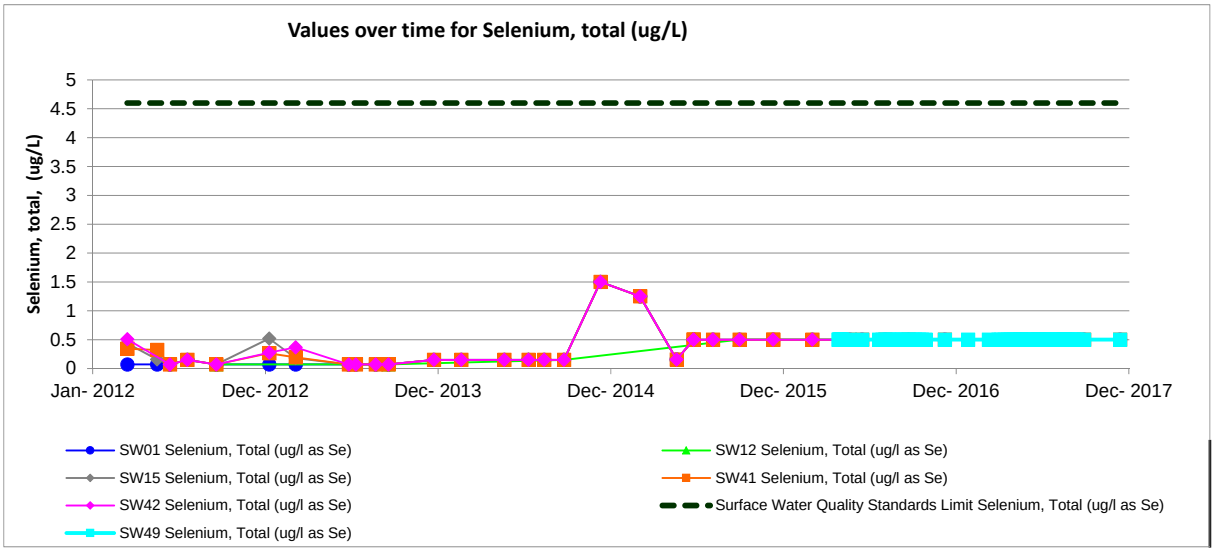

Values over time for Manganese, total (ug/L)
Manganese, total (ug/L)
100
90
80
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Manganese, Total (ug/l as Mn)
SW12 Manganese, Total (ug/l as Mn)
SW15 Manganese, Total (ug/l as Mn)
SW41 Manganese, Total (ug/l as Mn)
SW42 Manganese, Total (ug/l as Mn)
Surface Water Quality Standards Limit Manganese, Total (ug/l as Mn)
SW49 Manganese, Total (ug/l as Mn)

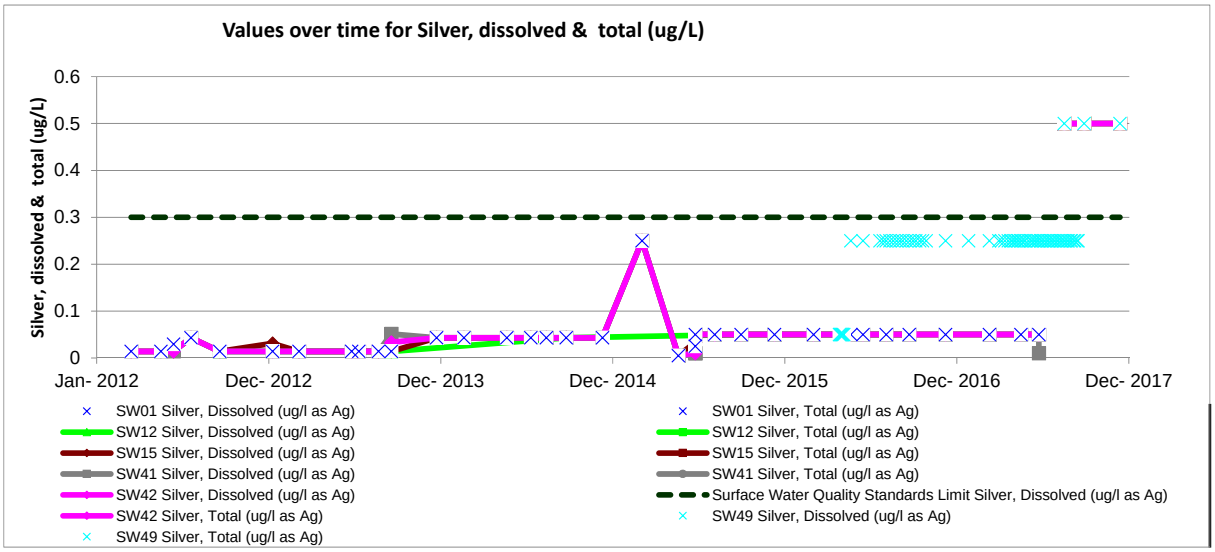

Values over time for Mercury, dissolved & total (ug/L)
Mercury, dissolved & total (ug/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Mercury, Dissolved (ug/l as Hg)
SW12 Mercury, Dissolved (ug/l as Hg)
SW15 Mercury, Dissolved (ug/l as Hg)
SW41 Mercury, Dissolved (ug/l as Hg)
SW42 Mercury, Dissolved (ug/l as Hg)
SW49 Mercury, Dissolved (ug/l as Hg)
SW49 Mercury, Total (ug/l as Hg)
SW01 Mercury, Total (ug/l as Hg)
SW12 Mercury, Total (ug/l as Hg)
SW15 Mercury, Total (ug/l as Hg)
SW41 Mercury, Total (ug/l as Hg)
SW42 Mercury, Total (ug/l as Hg)
Surface Water Quality Standards Limit Mercury, Dissolved (ug/l as Hg)

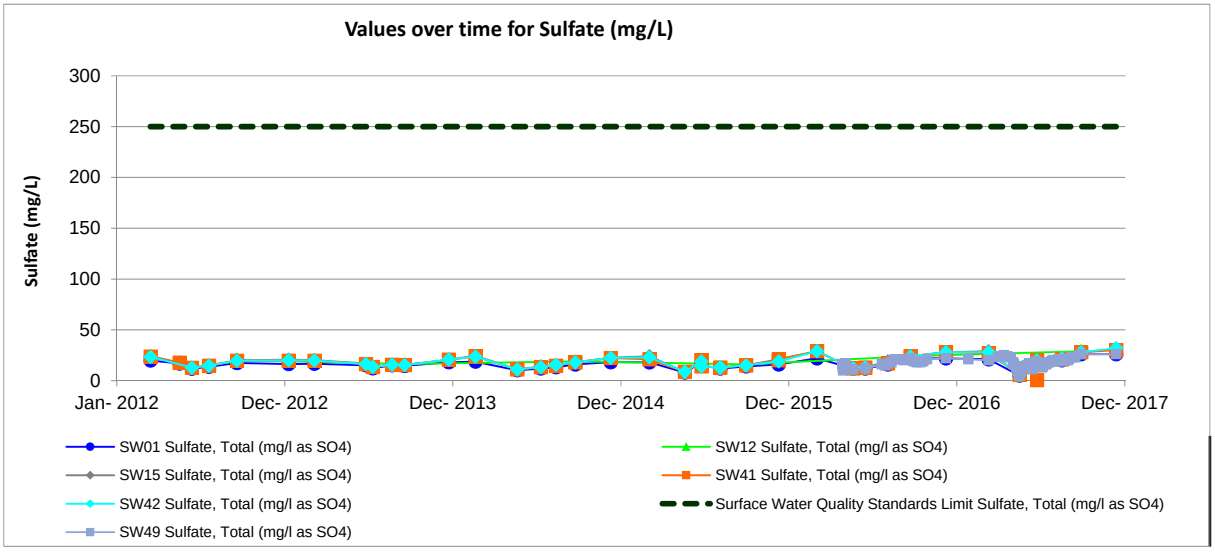

Values over time for Nickel, dissolved & total (ug/L)
(Nickel is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Nickel, dissolved & total (u/L)
18
16
14
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Nickel, Dissolved (ug/l as Ni)
SW12 Nickel, Dissolved (ug/l as Ni)
SW15 Nickel, Dissolved (ug/l as Ni)
SW41 Nickel, Dissolved (ug/l as Ni)
SW42 Nickel, Dissolved (ug/l as Ni)
SW42 Nickel, Total (ug/l as Ni)
SW49 Nickel, Total (ug/l as Ni)
SW01 Nickel, Total (ug/l as Ni)
SW12 Nickel, Total (ug/l as Ni)
SW15 Nickel, Total (ug/l as Ni)
SW41 Nickel, Total (ug/l as Ni)
Surface Water Quality Standards Limit Nickel, Dissolved (ug/l as Ni)
SW49 Nickel, Dissolved (ug/l as Ni)

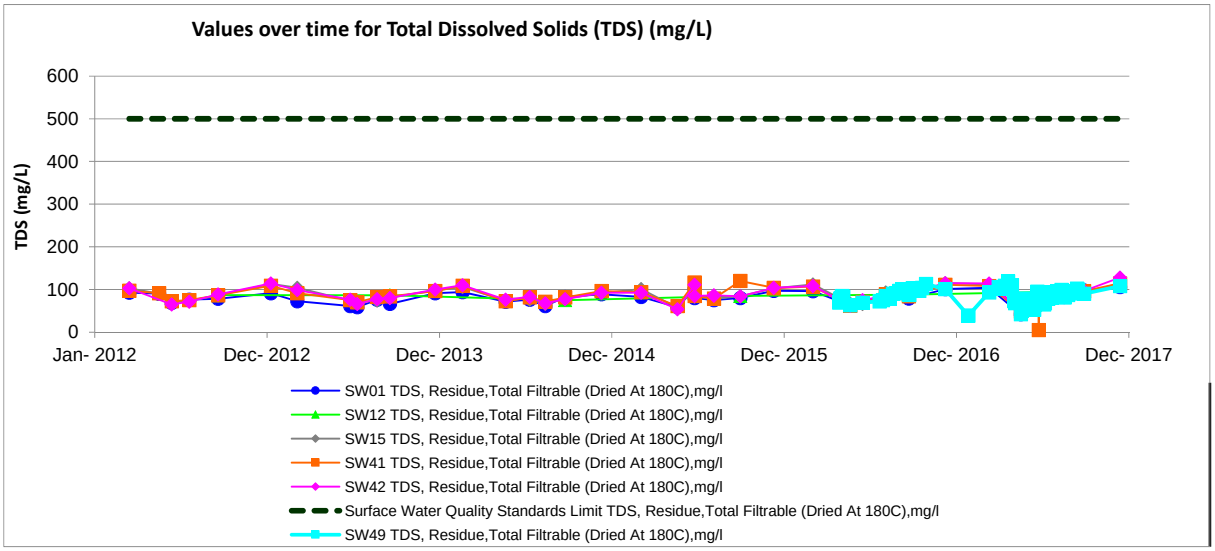

Values over time for Nitrite plus Nitrate, total (mg/L)
Nitrite plus Nitrate, total (mg/L)
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Nitrite plus Nitrate, Total (mg/l as N)
SW12 Nitrite plus Nitrate, Total (mg/l as N)
SW15 Nitrite plus Nitrate, Total (mg/l as N)
SW41 Nitrite plus Nitrate, Total (mg/l as N)
SW42 Nitrite plus Nitrate, Total (mg/l as N)
SW49 Nitrite plus Nitrate, Total (mg/l as N)
Surface Water Quality Standards Limit Nitrite plus Nitrate, Total (mg/l as N)

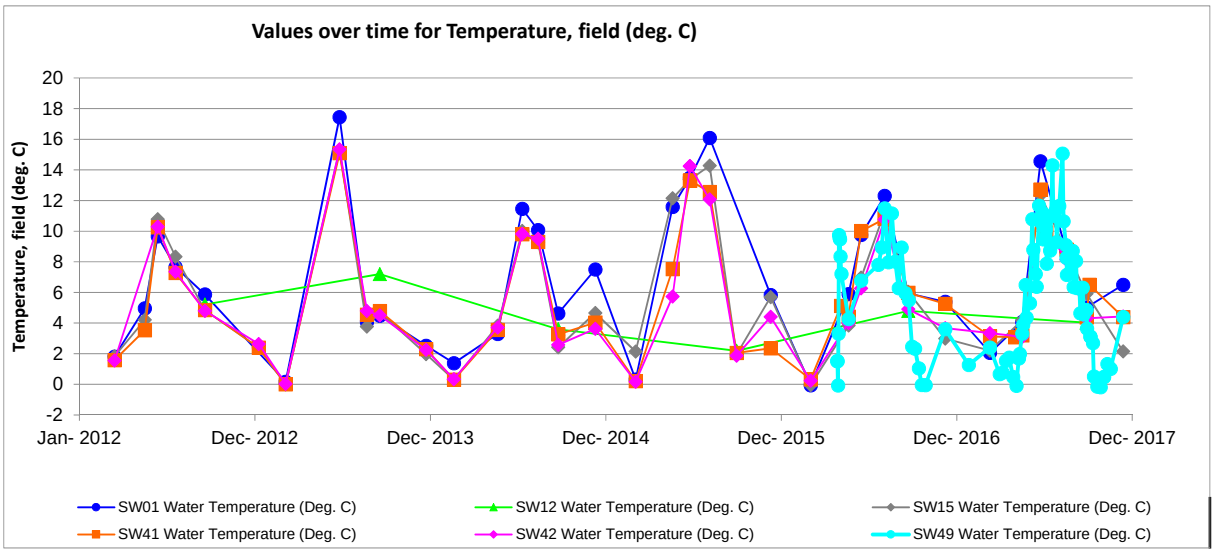

Values over time for pH, field (pH units)
pH, field (pH units)
10
9
8
7
6
5
4
3
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 pH, Field, Standard Units
SW12 pH, Field, Standard Units
SW15 pH, Field, Standard Units
SW41 pH, Field, Standard Units
SW42 pH, Field, Standard Units
Surface Water Quality Standards Limit pH, Field, Standard Units
Surface Water Quality Standards Upper Limit pH, Field, Standard Units
SW49 pH, Field, Standard Units

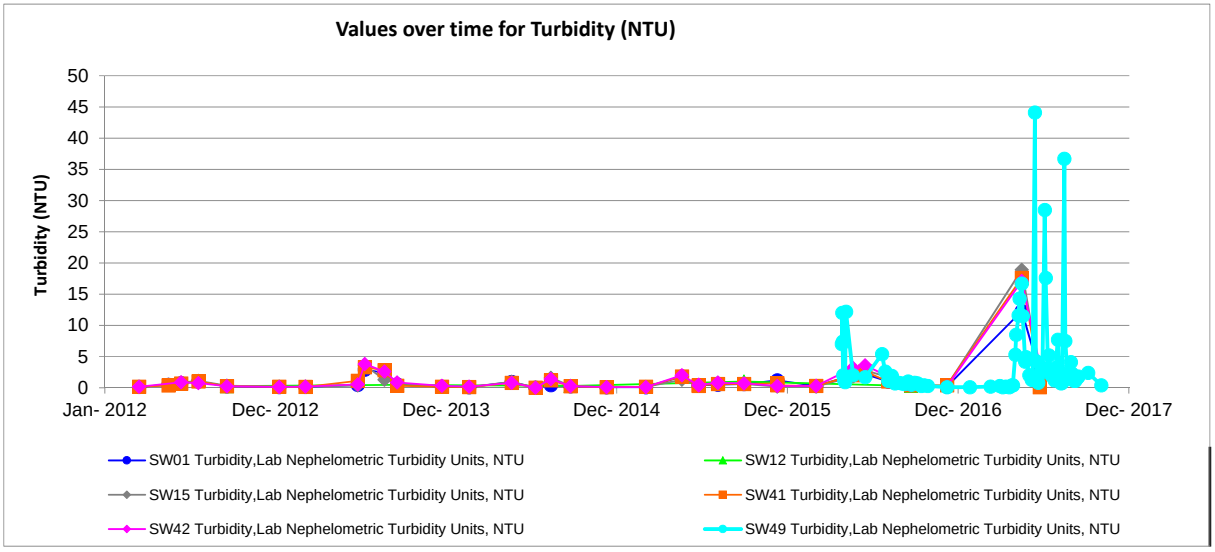

Values over time for Selenium, total (ug/L)
Selenium, total, (ug/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Selenium, Total (ug/l as Se)
SW12 Selenium, Total (ug/l as Se)
SW15 Selenium, Total (ug/l as Se)
SW41 Selenium, Total (ug/l as Se)
SW42 Selenium, Total (ug/l as Se)
Surface Water Quality Standards Limit Selenium, Total (ug/l as Se)
SW49 Selenium, Total (ug/l as Se)

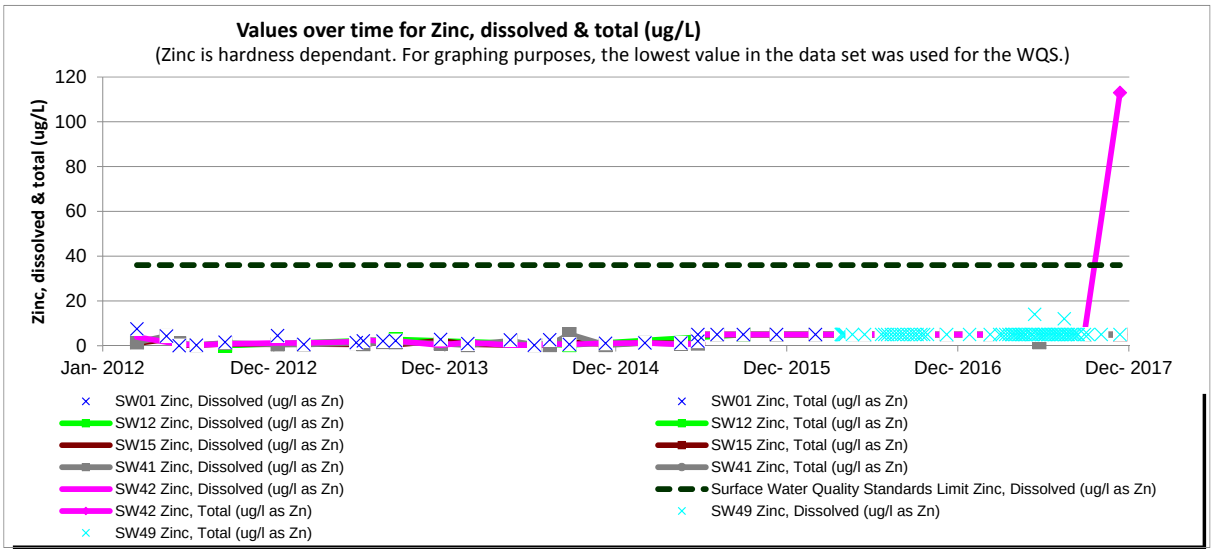

Values over time for Silver, dissolved & total (ug/L)
Silver, dissolved & total (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Silver, Dissolved (ug/l as Ag)
SW01 Silver, Total (ug/l as Ag)
SW12 Silver, Dissolved (ug/l as Ag)
SW12 Silver, Total (ug/l as Ag)
SW15 Silver, Dissolved (ug/l as Ag)
SW15 Silver, Total (ug/l as Ag)
SW41 Silver, Dissolved (ug/l as Ag)
SW41 Silver, Total (ug/l as Ag)
SW42 Silver, Dissolved (ug/l as Ag)
Surface Water Quality Standards Limit Silver, Dissolved (ug/l as Ag)
SW42 Silver, Total (ug/l as Ag)
SW49 Silver, Dissolved (ug/l as Ag)
SW49 Silver, Total (ug/l as Ag)

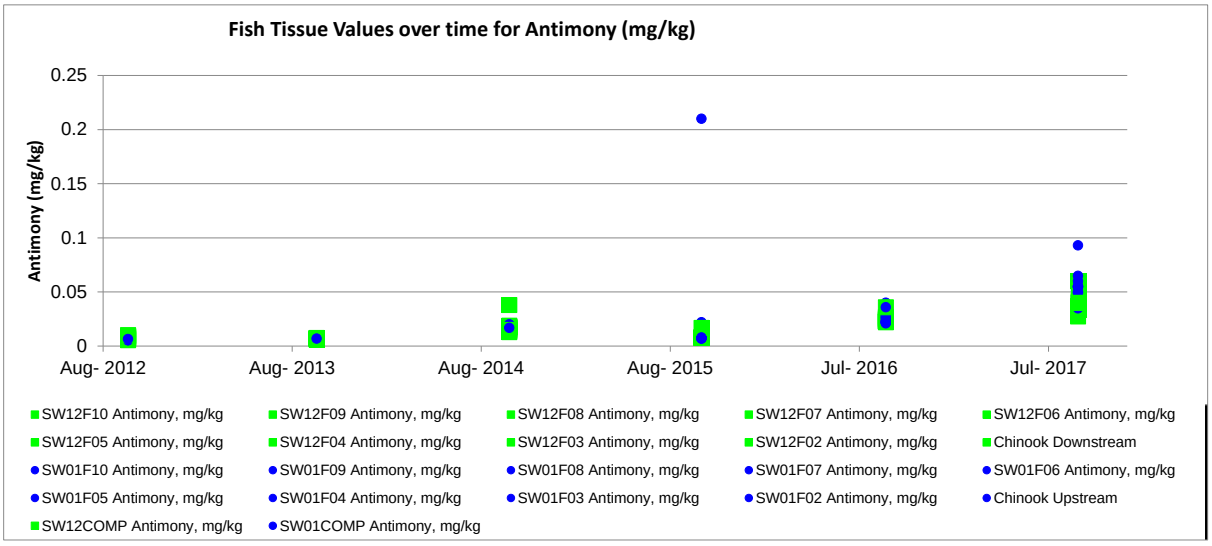

Values over time for Sulfate (mg/L)
Sulfate (mg/L)
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Sulfate, Total (mg/l as SO4)
SW12 Sulfate, Total (mg/l as SO4)
SW15 Sulfate, Total (mg/l as SO4)
SW41 Sulfate, Total (mg/l as SO4)
SW42 Sulfate, Total (mg/l as SO4)
Surface Water Quality Standards Limit Sulfate, Total (mg/l as SO4)
SW49 Sulfate, Total (mg/l as SO4)

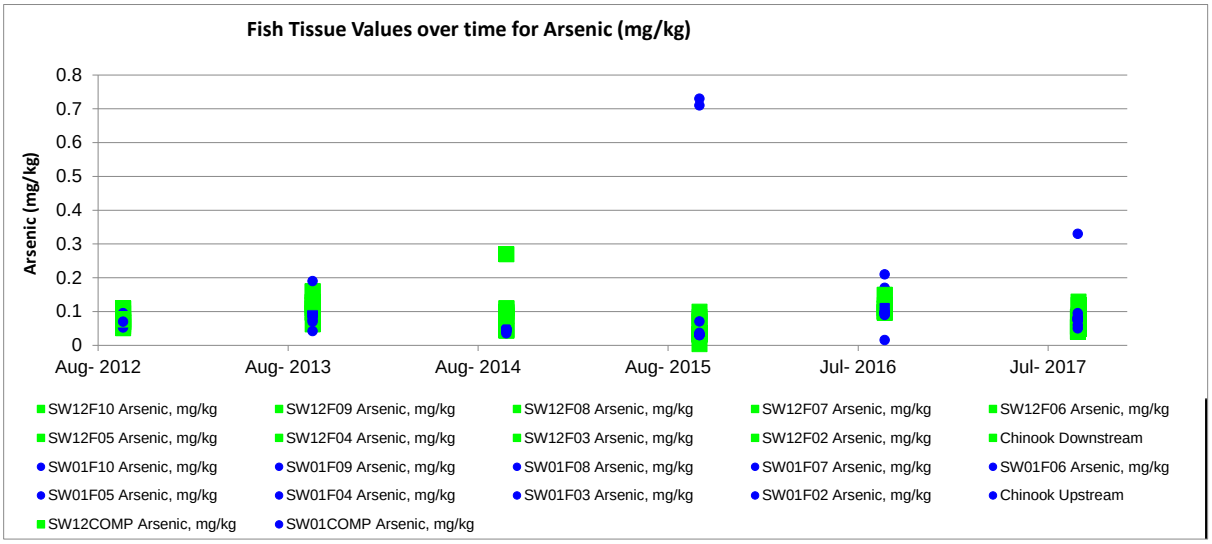

Values over time for Total Dissolved Solids (TDS) (mg/L)
TDS (mg/L)
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
SW12 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
SW15 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
SW41 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
SW42 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
Surface Water Quality Standards Limit TDS, Residue,Total Filtrable (Dried At 180C),mg/l
SW49 TDS, Residue,Total Filtrable (Dried At 180C),mg/l

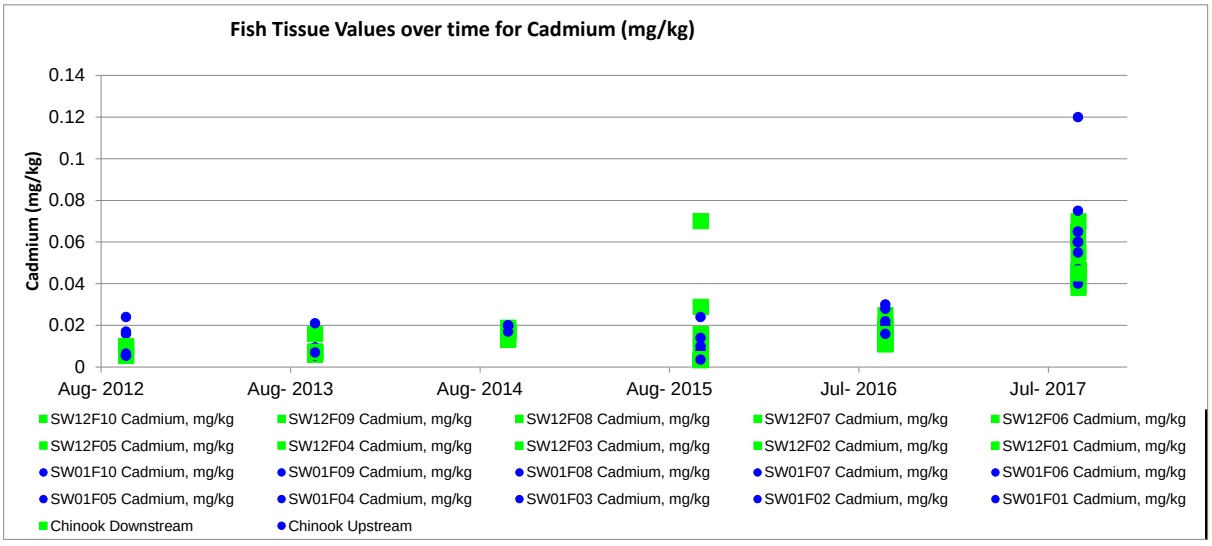

Values over time for Temperature, field (deg. C)
Temperature, field (deg. C)
20
18
16
14
12
10
8
6
4
2
0
-2
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Water Temperature (Deg. C)
SW12 Water Temperature (Deg. C)
SW15 Water Temperature (Deg. C)
SW41 Water Temperature (Deg. C)
SW42 Water Temperature (Deg. C)
SW49 Water Temperature (Deg. C)

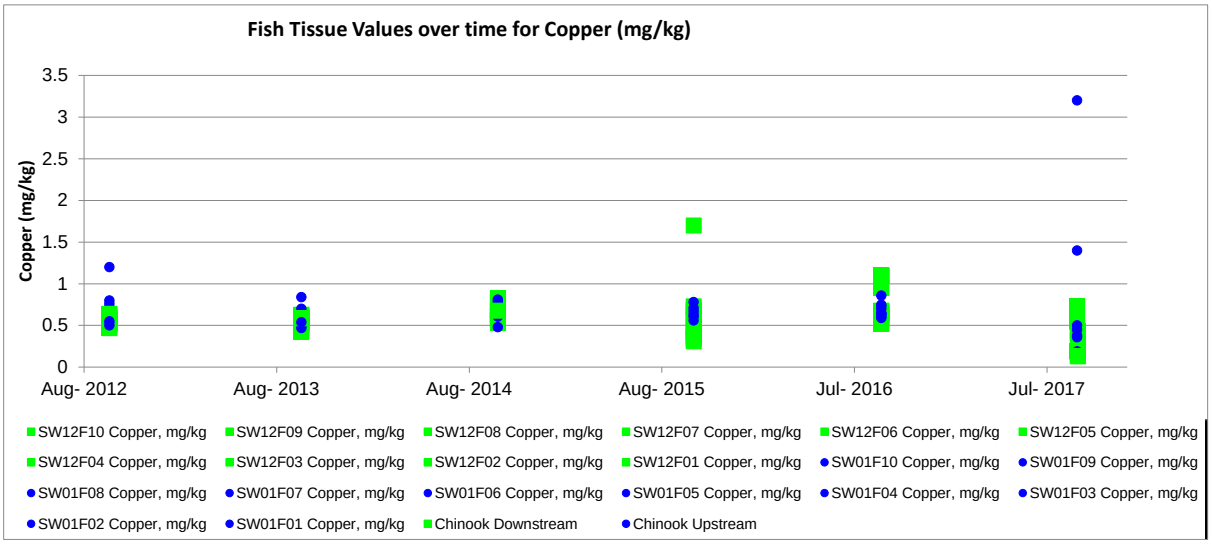

Values over time for Turbidity (NTU)
Turbidity (NTU)
50
45
40
35
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Turbidity,Lab Nephelometric Turbidity Units, NTU
SW12 Turbidity,Lab Nephelometric Turbidity Units, NTU
SW15 Turbidity,Lab Nephelometric Turbidity Units, NTU
SW41 Turbidity,Lab Nephelometric Turbidity Units, NTU
SW42 Turbidity,Lab Nephelometric Turbidity Units, NTU
SW49 Turbidity,Lab Nephelometric Turbidity Units, NTU

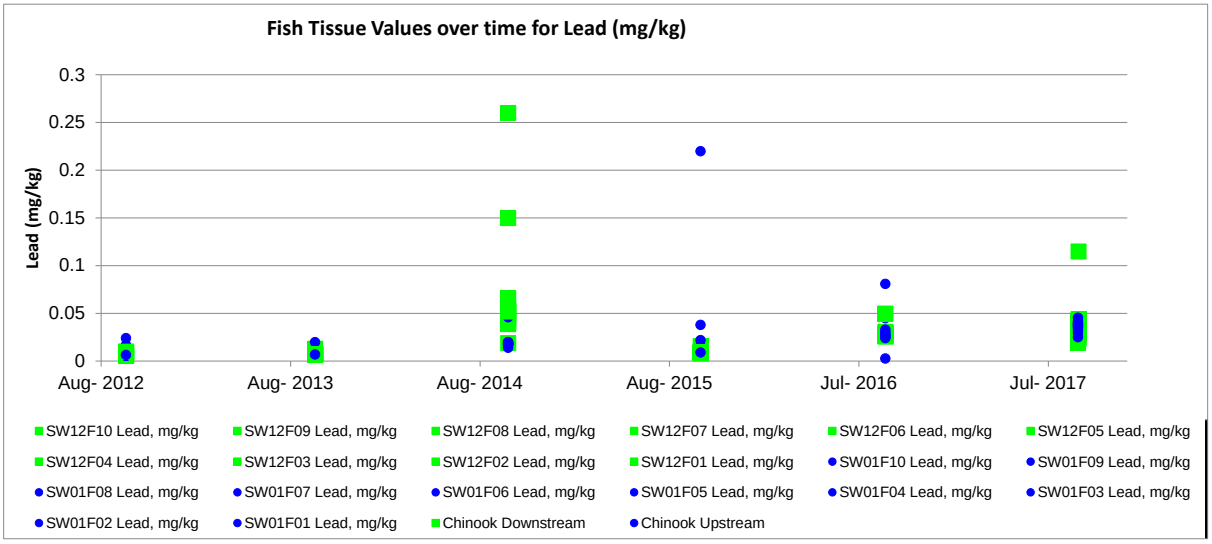

Values over time for Zinc, dissolved & total (ug/L)
(Zinc is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Zinc, dissolved & total (ug/L)
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
SW01 Zinc, Dissolved (ug/l as Zn)
SW01 Zinc, Total (ug/l as Zn)
SW12 Zinc, Dissolved (ug/l as Zn)
SW12 Zinc, Total (ug/l as Zn)
SW15 Zinc, Dissolved (ug/l as Zn)
SW15 Zinc, Total (ug/l as Zn)
SW41 Zinc, Dissolved (ug/l as Zn)
SW41 Zinc, Total (ug/l as Zn)
SW42 Zinc, Dissolved (ug/l as Zn)
Surface Water Quality Standards Limit Zinc, Dissolved (ug/l as Zn)
SW42 Zinc, Total (ug/l as Zn)
SW49 Zinc, Dissolved (ug/l as Zn)
SW49 Zinc, Total (ug/l as Zn)

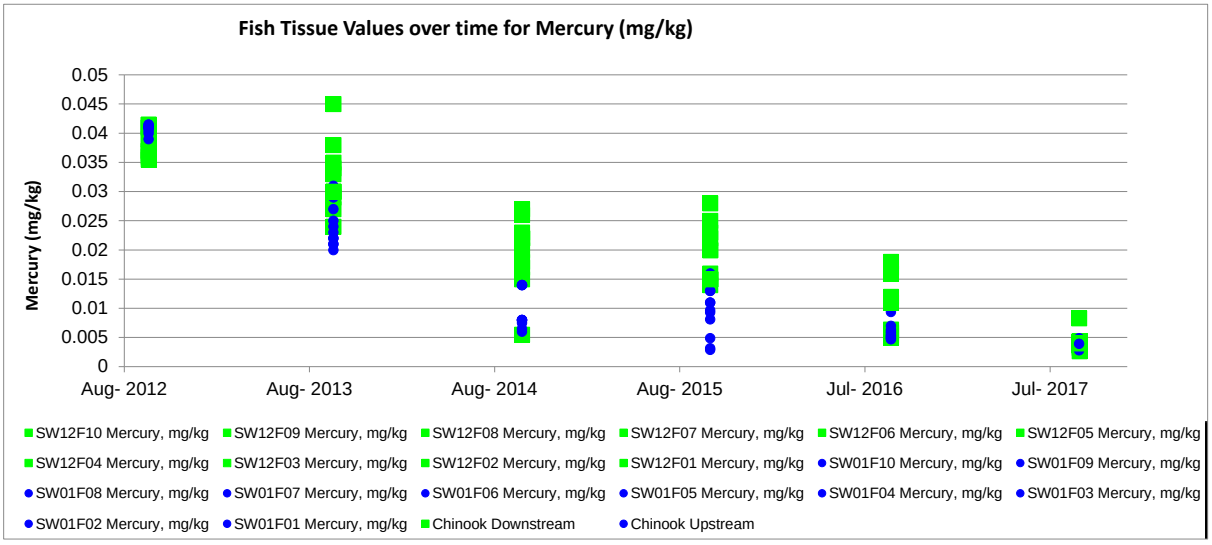

Fish Tissue Values over time for Antimony (mg/kg)
Antimony (mg/kg)
0.25
0.2
0.15
0.1
0.05
0
Aug- 2012
Aug- 2013
Aug- 2014
Aug- 2015
Jul- 2016
Jul- 2017
SW12F10 Antimony, mg/kg
SW12F09 Antimony, mg/kg
SW12F08 Antimony, mg/kg
SW12F07 Antimony, mg/kg
SW12F06 Antimony, mg/kg
SW12F05 Antimony, mg/kg
SW12F04 Antimony, mg/kg
SW12F03 Antimony, mg/kg
SW12F02 Antimony, mg/kg
Chinook Downstream
SW01F10 Antimony, mg/kg
SW01F09 Antimony, mg/kg
SW01F08 Antimony, mg/kg
SW01F07 Antimony, mg/kg
SW01F06 Antimony, mg/kg
SW01F05 Antimony, mg/kg
SW01F04 Antimony, mg/kg
SW01F03 Antimony, mg/kg
SW01F02 Antimony, mg/kg
Chinook Upstream
SW12COMP Antimony, mg/kg
SW01COMP Antimony, mg/kg

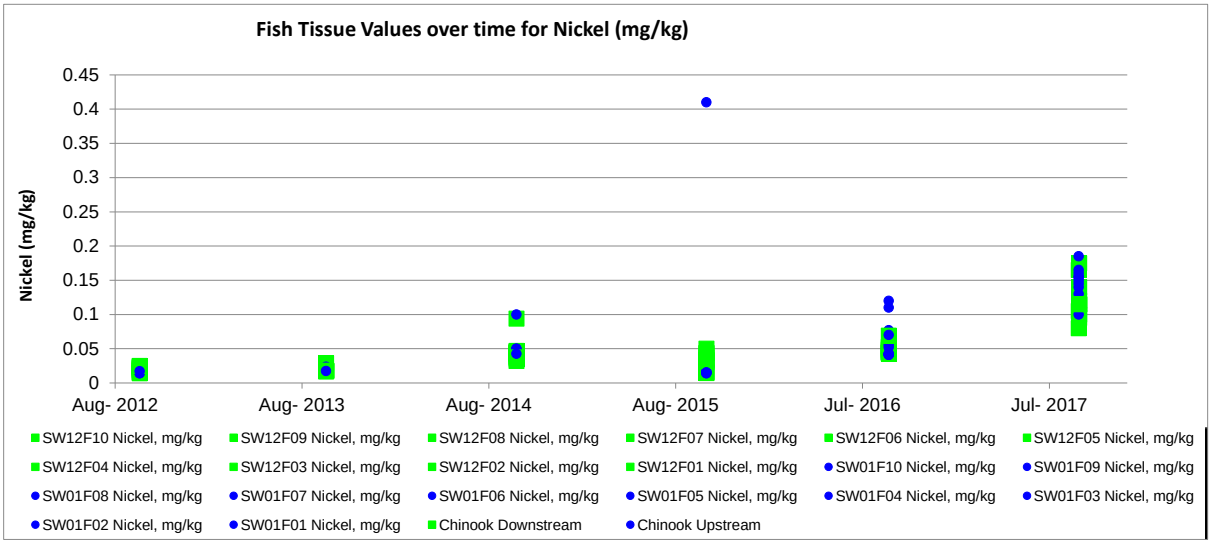

Fish Tissue Values over time for Arsenic (mg/kg)
Arsenic (mg/kg)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Aug- 2012
Aug- 2013
Aug- 2014
Aug- 2015
Jul- 2016
Jul- 2017
SW12F10 Arsenic, mg/kg
SW12F09 Arsenic, mg/kg
SW12F08 Arsenic, mg/kg
SW12F07 Arsenic, mg/kg
SW12F06 Arsenic, mg/kg
SW12F05 Arsenic, mg/kg
SW12F04 Arsenic, mg/kg
SW12F03 Arsenic, mg/kg
SW12F02 Arsenic, mg/kg
Chinook Downstream
SW01F10 Arsenic, mg/kg
SW01F09 Arsenic, mg/kg
SW01F08 Arsenic, mg/kg
SW01F07 Arsenic, mg/kg
SW01F06 Arsenic, mg/kg
SW01F05 Arsenic, mg/kg
SW01F04 Arsenic, mg/kg
SW01F03 Arsenic, mg/kg
SW01F02 Arsenic, mg/kg
Chinook Upstream
SW12COMP Arsenic, mg/kg
SW01COMP Arsenic, mg/kg

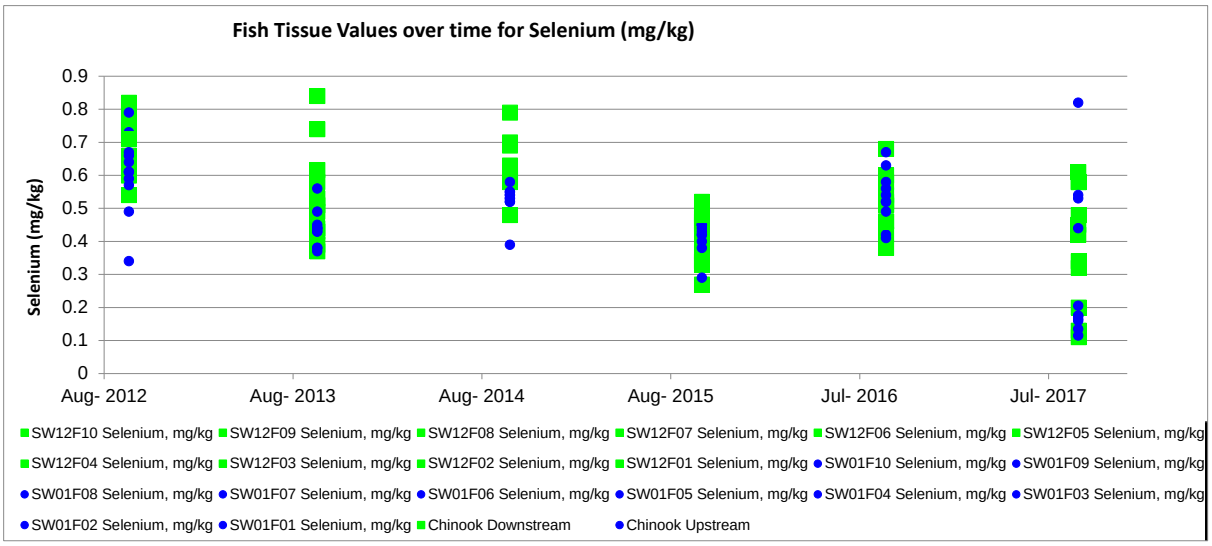

Fish Tissue Values over time for Cadmium (mg/kg)
Cadmium (mg/kg)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Aug- 2012
Aug- 2013
Aug- 2014
Aug- 2015
Jul- 2016
Jul- 2017
SW12F10 Cadmium, mg/kg
SW12F09 Cadmium, mg/kg
SW12F08 Cadmium, mg/kg
SW12F07 Cadmium, mg/kg
SW12F06 Cadmium, mg/kg
SW12F05 Cadmium, mg/kg
SW12F04 Cadmium, mg/kg
SW12F03 Cadmium, mg/kg
SW12F02 Cadmium, mg/kg
SW12F01 Cadmium, mg/kg
SW01F10 Cadmium, mg/kg
SW01F09 Cadmium, mg/kg
SW01F08 Cadmium, mg/kg
SW01F07 Cadmium, mg/kg
SW01F06 Cadmium, mg/kg
SW01F05 Cadmium, mg/kg
SW01F04 Cadmium, mg/kg
SW01F03 Cadmium, mg/kg
SW01F02 Cadmium, mg/kg
SW01F01 Cadmium, mg/kg
Chinook Downstream
Chinook Upstream

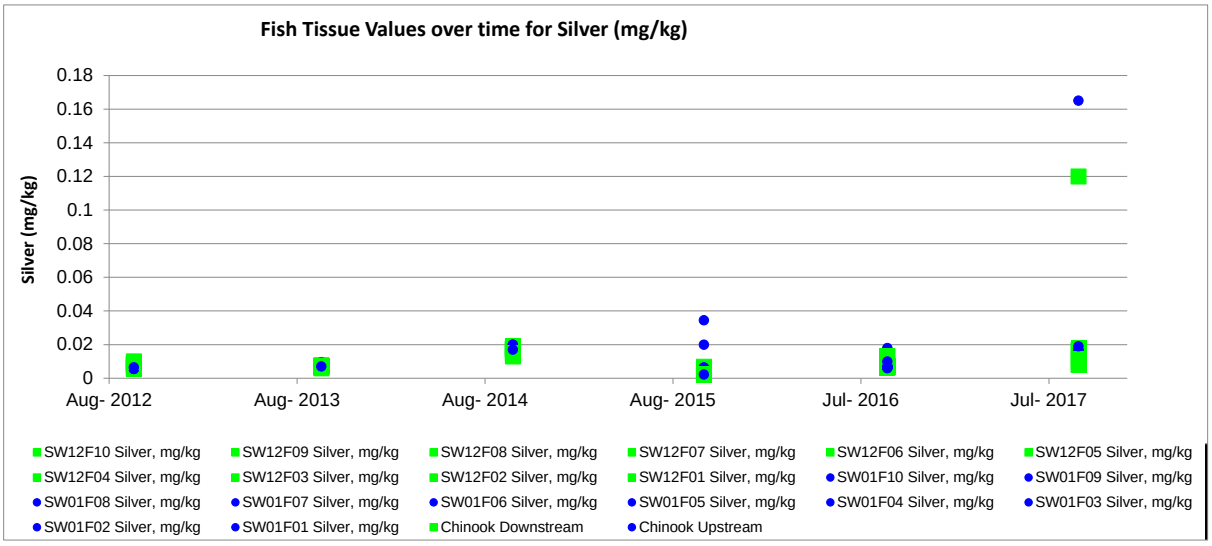

Fish Tissue Values over time for Copper (mg/kg)
Copper (mg/kg)
3.5
3
2.5
2
1.5
1
0.5
0
Aug- 2012
Aug- 2013
Aug- 2014
Aug- 2015
Jul- 2016
Jul- 2017
SW12F10 Copper, mg/kg
SW12F09 Copper, mg/kg
SW12F08 Copper, mg/kg
SW12F07 Copper, mg/kg
SW12F06 Copper, mg/kg
SW12F05 Copper, mg/kg
SW12F04 Copper, mg/kg
SW12F03 Copper, mg/kg
SW12F02 Copper, mg/kg
SW12F01 Copper, mg/kg
SW01F10 Copper, mg/kg
SW01F09 Copper, mg/kg
SW01F08 Copper, mg/kg
SW01F07 Copper, mg/kg
SW01F06 Copper, mg/kg
SW01F05 Copper, mg/kg
SW01F04 Copper, mg/kg
SW01F03 Copper, mg/kg
SW01F02 Copper, mg/kg
SW01F01 Copper, mg/kg
Chinook Downstream
Chinook Upstream

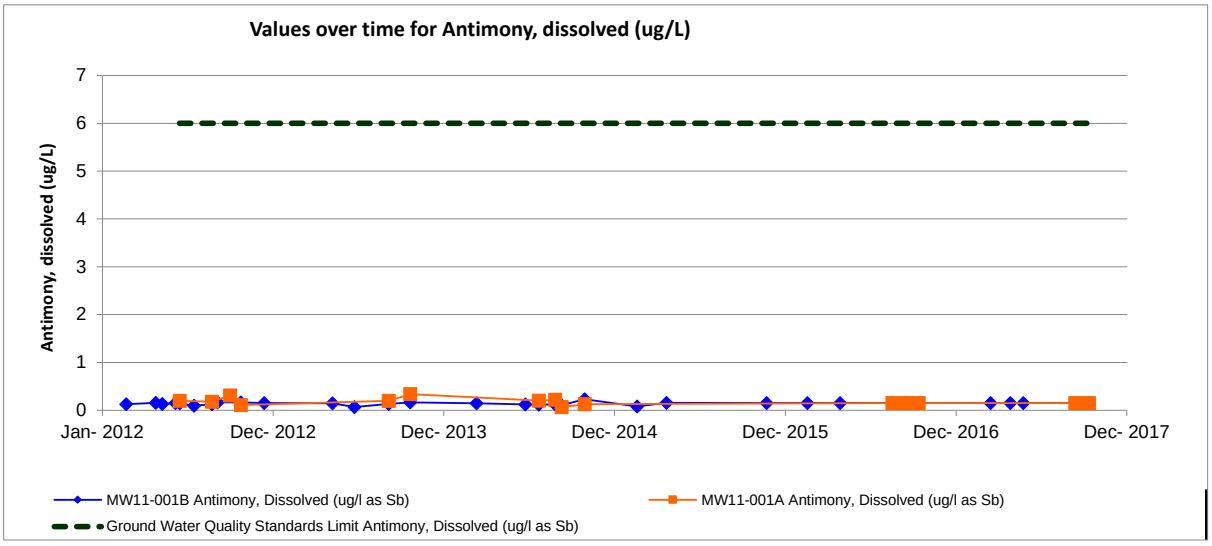

Fish Tissue Values over time for Lead (mg/kg)
Lead (mg/kg)
0.3
0.25
0.2
0.15
0.1
0.05
0
Aug- 2012
Aug- 2013
Aug- 2014
Aug- 2015
Jul- 2016
Jul- 2017
SW12F10 Lead, mg/kg
SW12F09 Lead, mg/kg
SW12F08 Lead, mg/kg
SW12F07 Lead, mg/kg
SW12F06 Lead, mg/kg
SW12F05 Lead, mg/kg
SW12F04 Lead, mg/kg
SW12F03 Lead, mg/kg
SW12F02 Lead, mg/kg
SW12F01 Lead, mg/kg
SW01F10 Lead, mg/kg
SW01F09 Lead, mg/kg
SW01F08 Lead, mg/kg
SW01F07 Lead, mg/kg
SW01F06 Lead, mg/kg
SW01F05 Lead, mg/kg
SW01F04 Lead, mg/kg
SW01F03 Lead, mg/kg
SW01F02 Lead, mg/kg
SW01F01 Lead, mg/kg
Chinook Downstream
Chinook Upstream

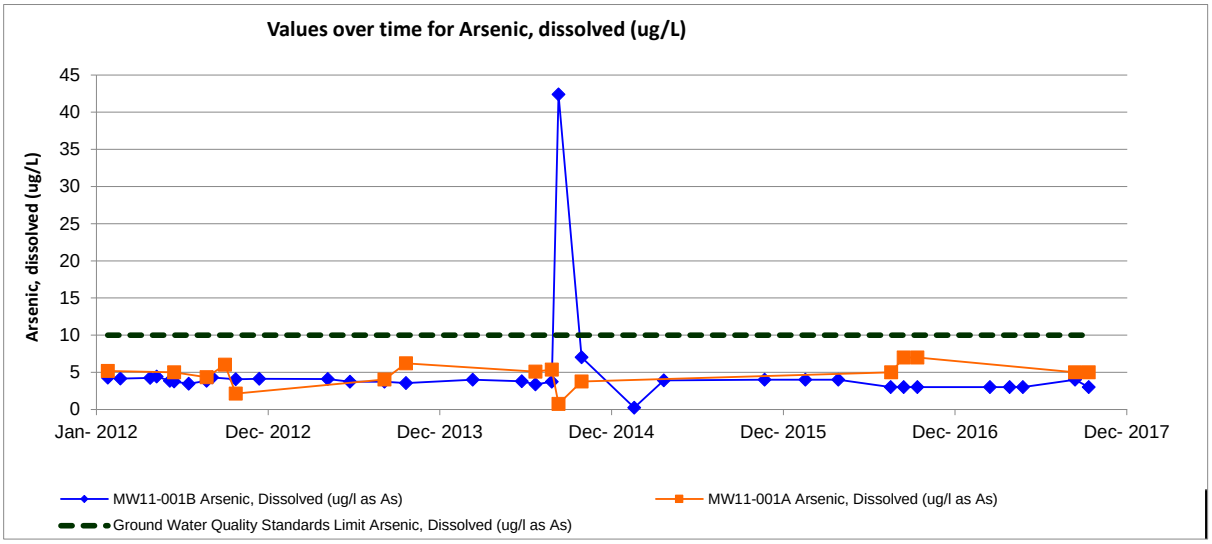

Fish Tissue Values over time for Mercury (mg/kg)
Mercury (mg/kg)
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Aug- 2012
Aug- 2013
Aug- 2014
Aug- 2015
Jul- 2016
Jul- 2017
SW12F10 Mercury, mg/kg
SW12F09 Mercury, mg/kg
SW12F08 Mercury, mg/kg
SW12F07 Mercury, mg/kg
SW12F06 Mercury, mg/kg
SW12F05 Mercury, mg/kg
SW12F04 Mercury, mg/kg
SW12F03 Mercury, mg/kg
SW12F02 Mercury, mg/kg
SW12F01 Mercury, mg/kg
SW01F10 Mercury, mg/kg
SW01F09 Mercury, mg/kg
SW01F08 Mercury, mg/kg
SW01F07 Mercury, mg/kg
SW01F06 Mercury, mg/kg
SW01F05 Mercury, mg/kg
SW01F04 Mercury, mg/kg
SW01F03 Mercury, mg/kg
SW01F02 Mercury, mg/kg
SW01F01 Mercury, mg/kg
Chinook Downstream
Chinook Upstream

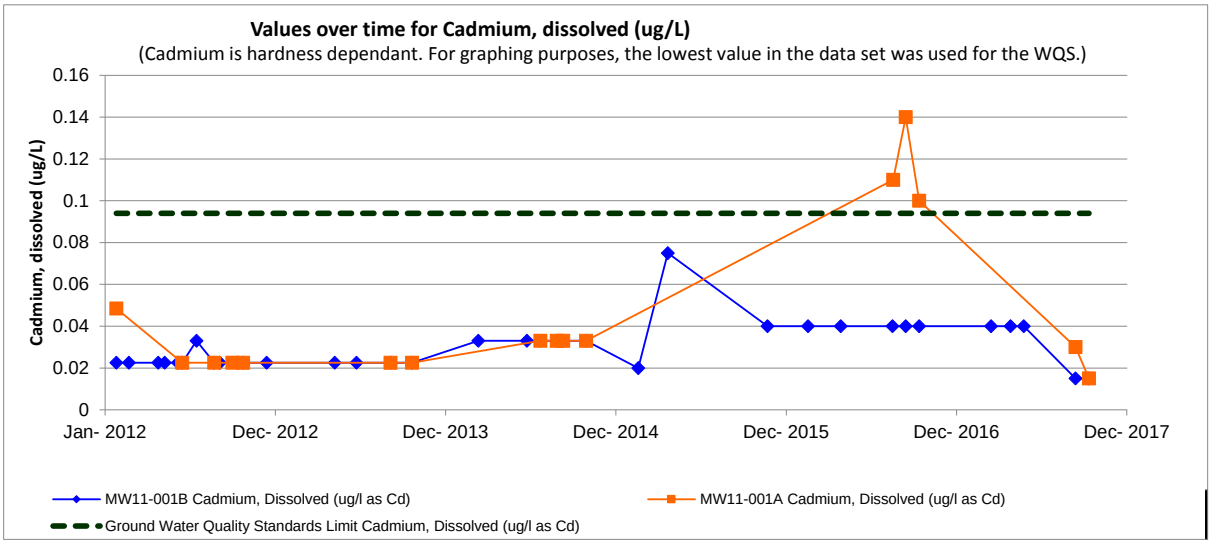

Fish Tissue Values over time for Nickel (mg/kg)
Nickel (mg/kg)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Aug- 2012
Aug- 2013
Aug- 2014
Aug- 2015
Jul- 2016
Jul- 2017
SW12F10 Nickel, mg/kg
SW12F09 Nickel, mg/kg
SW12F08 Nickel, mg/kg
SW12F07 Nickel, mg/kg
SW12F06 Nickel, mg/kg
SW12F05 Nickel, mg/kg
SW12F04 Nickel, mg/kg
SW12F03 Nickel, mg/kg
SW12F02 Nickel, mg/kg
SW12F01 Nickel, mg/kg
SW01F10 Nickel, mg/kg
SW01F09 Nickel, mg/kg
SW01F08 Nickel, mg/kg
SW01F07 Nickel, mg/kg
SW01F06 Nickel, mg/kg
SW01F05 Nickel, mg/kg
SW01F04 Nickel, mg/kg
SW01F03 Nickel, mg/kg
SW01F02 Nickel, mg/kg
SW01F01 Nickel, mg/kg
Chinook Downstream
Chinook Upstream

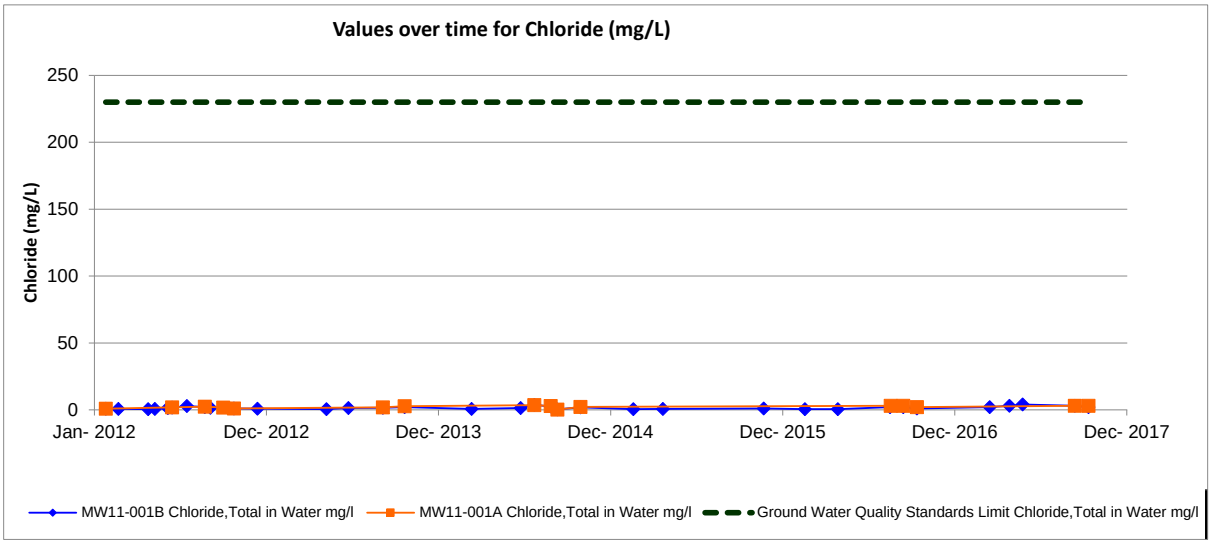

Fish Tissue Values over time for Selenium (mg/kg)
Selenium (mg/kg)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Aug- 2012
Aug- 2013
Aug- 2014
Aug- 2015
Jul- 2016
Jul- 2017
SW12F10 Selenium, mg/kg
SW12F09 Selenium, mg/kg
SW12F08 Selenium, mg/kg
SW12F07 Selenium, mg/kg
SW12F06 Selenium, mg/kg
SW12F05 Selenium, mg/kg
SW12F04 Selenium, mg/kg
SW12F03 Selenium, mg/kg
SW12F02 Selenium, mg/kg
SW12F01 Selenium, mg/kg
SW01F10 Selenium, mg/kg
SW01F09 Selenium, mg/kg
SW01F08 Selenium, mg/kg
SW01F07 Selenium, mg/kg
SW01F06 Selenium, mg/kg
SW01F05 Selenium, mg/kg
SW01F04 Selenium, mg/kg
SW01F03 Selenium, mg/kg
SW01F02 Selenium, mg/kg
SW01F01 Selenium, mg/kg
Chinook Downstream
Chinook Upstream

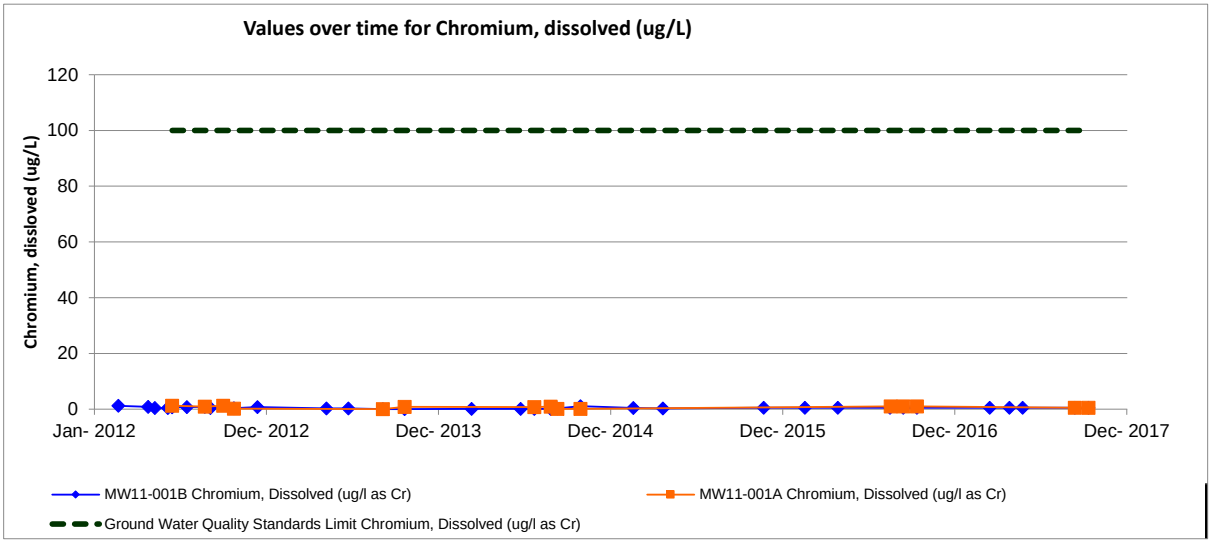

Fish Tissue Values over time for Silver (mg/kg)
Silver (mg/kg)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Aug- 2012
Aug- 2013
Aug- 2014
Aug- 2015
Jul- 2016
Jul- 2017
SW12F10 Silver, mg/kg
SW12F09 Silver, mg/kg
SW12F08 Silver, mg/kg
SW12F07 Silver, mg/kg
SW12F06 Silver, mg/kg
SW12F05 Silver, mg/kg
SW12F04 Silver, mg/kg
SW12F03 Silver, mg/kg
SW12F02 Silver, mg/kg
SW12F01 Silver, mg/kg
SW01F10 Silver, mg/kg
SW01F09 Silver, mg/kg
SW01F08 Silver, mg/kg
SW01F07 Silver, mg/kg
SW01F06 Silver, mg/kg
SW01F05 Silver, mg/kg
SW01F04 Silver, mg/kg
SW01F03 Silver, mg/kg
SW01F02 Silver, mg/kg
SW01F01 Silver, mg/kg
Chinook Downstream
Chinook Upstream

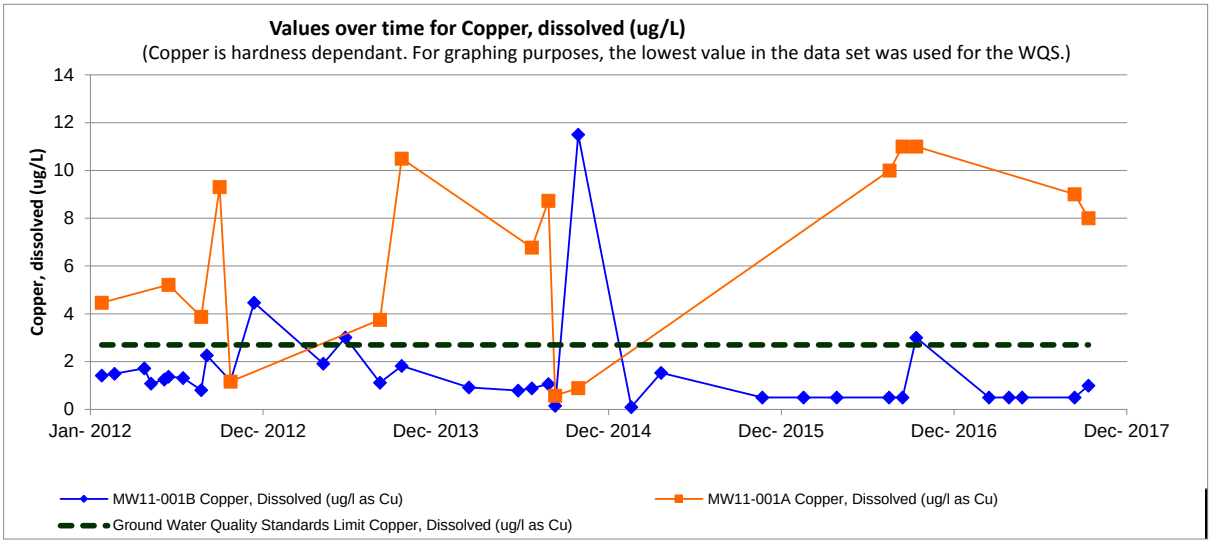

Values over time for Antimony, dissolved (ug/L)
Antimony, dissolved (ug/L)
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Antimony, Dissolved (ug/l as Sb)
MW11-001A Antimony, Dissolved (ug/l as Sb)
Ground Water Quality Standards Limit Antimony, Dissolved (ug/l as Sb)

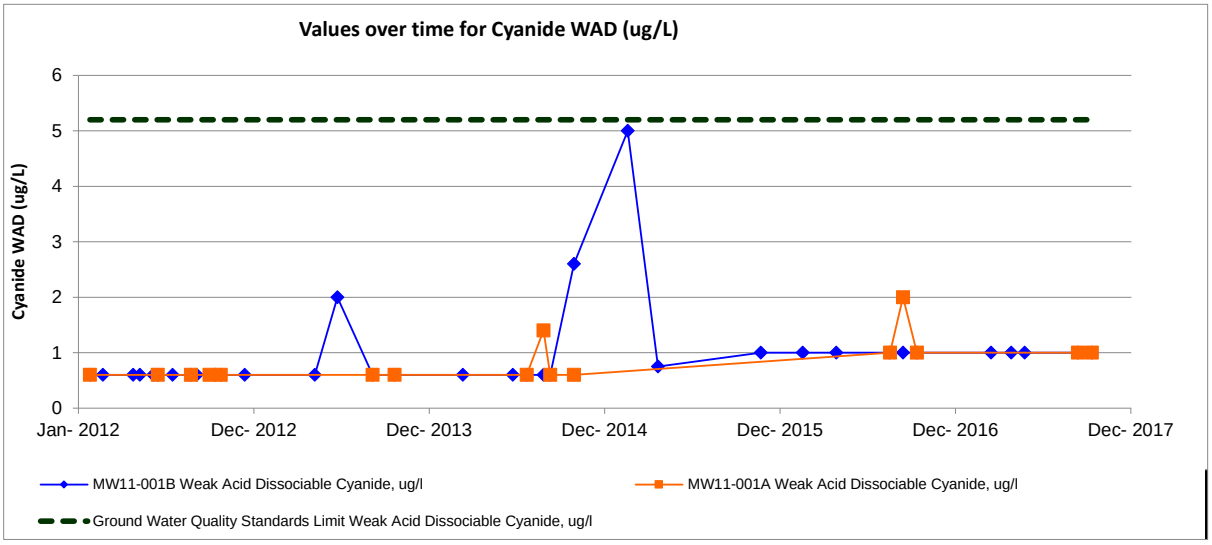

Values over time for Arsenic, dissolved (ug/L)
Arsenic, dissolved (ug/L)
45
40
35
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Arsenic, Dissolved (ug/l as As)
MW11-001A Arsenic, Dissolved (ug/l as As)
Ground Water Quality Standards Limit Arsenic, Dissolved (ug/l as As)

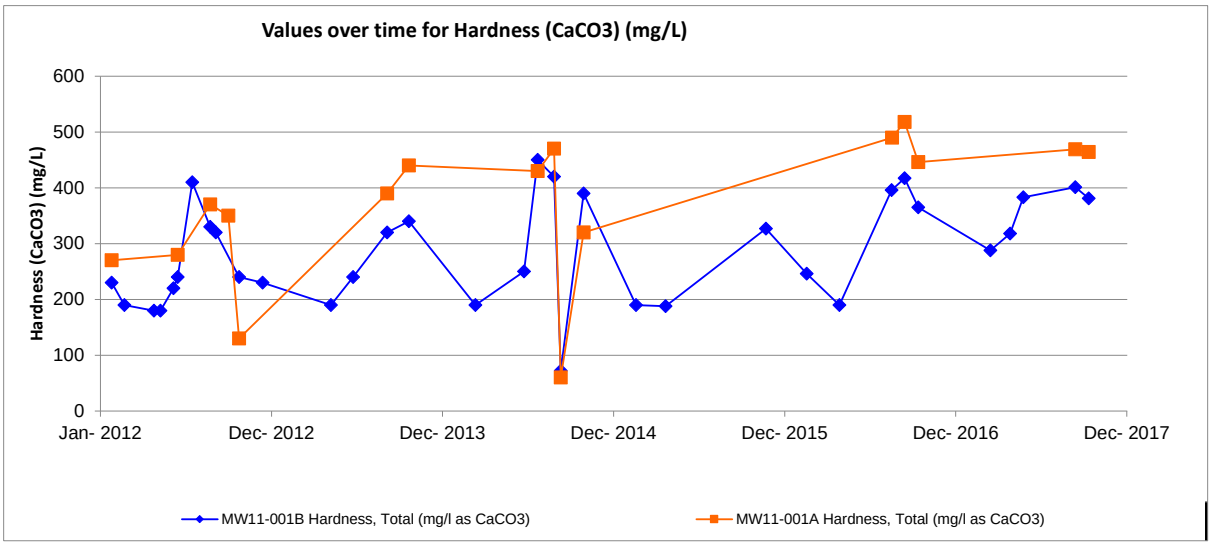

Values over time for Cadmium, dissolved (ug/L)
(Cadmium is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Cadmium, dissolved (ug/L)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Cadmium, Dissolved (ug/l as Cd)
MW11-001A Cadmium, Dissolved (ug/l as Cd)
Ground Water Quality Standards Limit Cadmium, Dissolved (ug/l as Cd)

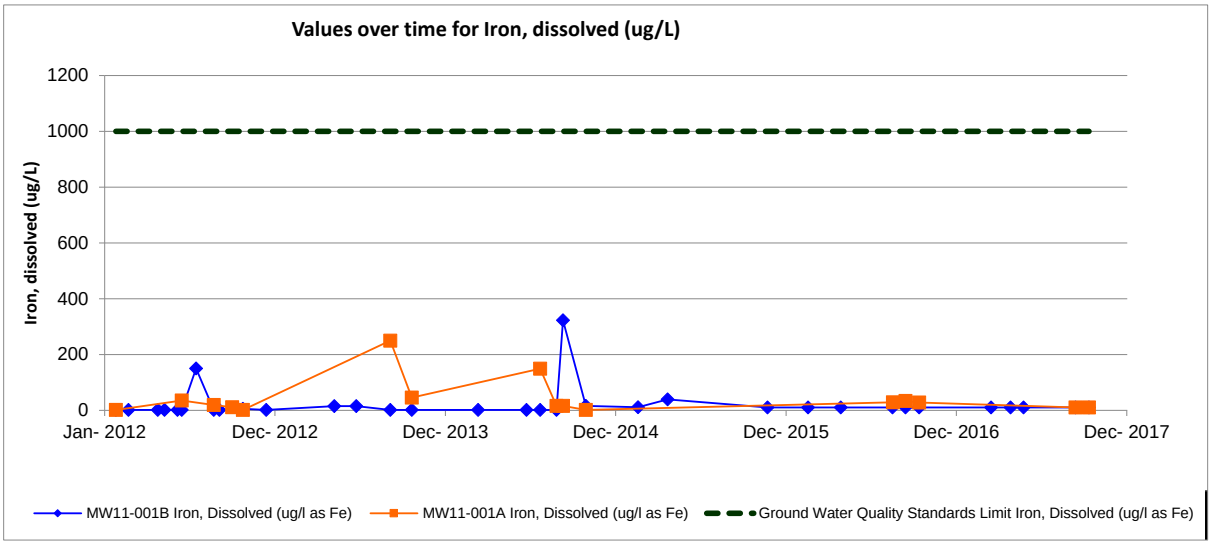

Values over time for Chloride (mg/L)
Chloride (mg/L)
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Chloride,Total in Water mg/l
MW11-001A Chloride,Total in Water mg/l
Ground Water Quality Standards Limit Chloride,Total in Water mg/l

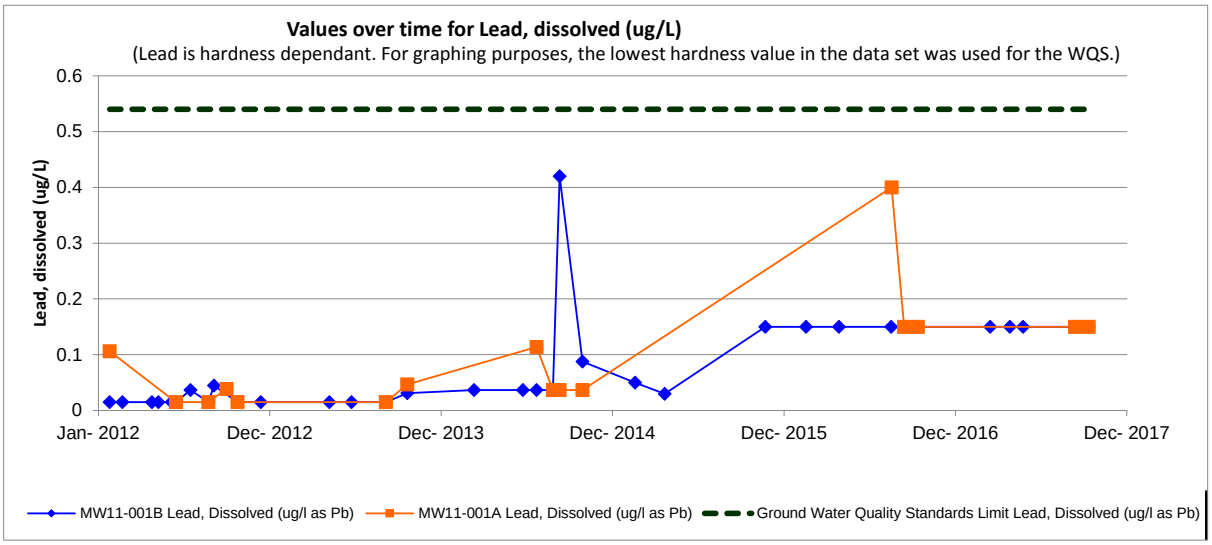

Values over time for Chromium, dissolved (ug/L)
Chromium, dissloved (ug/L)
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Chromium, Dissolved (ug/l as Cr)
MW11-001A Chromium, Dissolved (ug/l as Cr)
Ground Water Quality Standards Limit Chromium, Dissolved (ug/l as Cr)

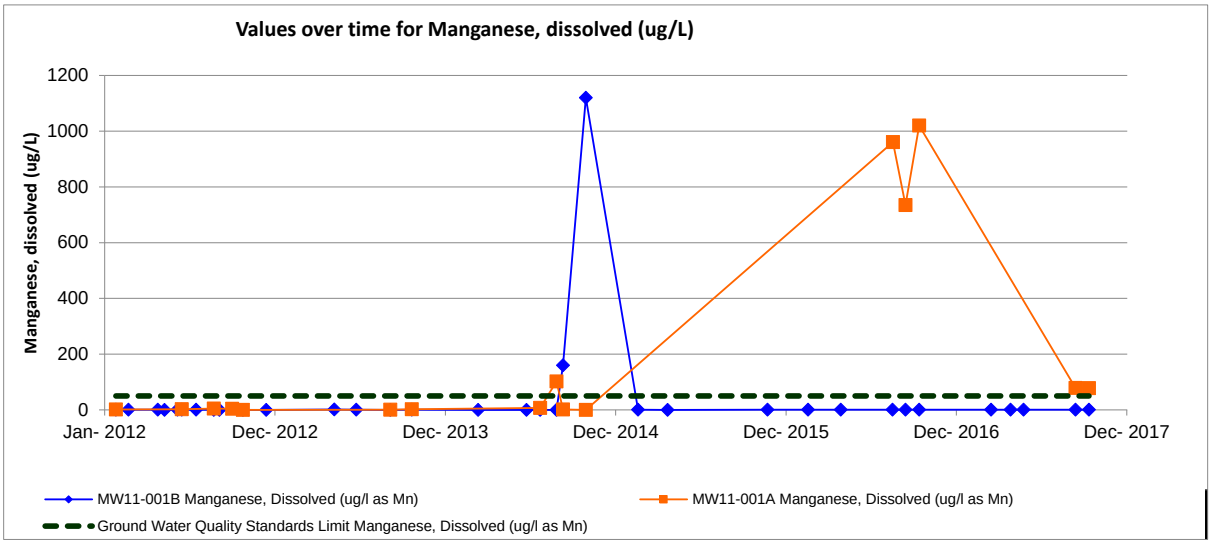

Values over time for Copper, dissolved (ug/L)
(Copper is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Copper, dissolved (ug/L)
14
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Copper, Dissolved (ug/l as Cu)
MW11-001A Copper, Dissolved (ug/l as Cu)
Ground Water Quality Standards Limit Copper, Dissolved (ug/l as Cu)

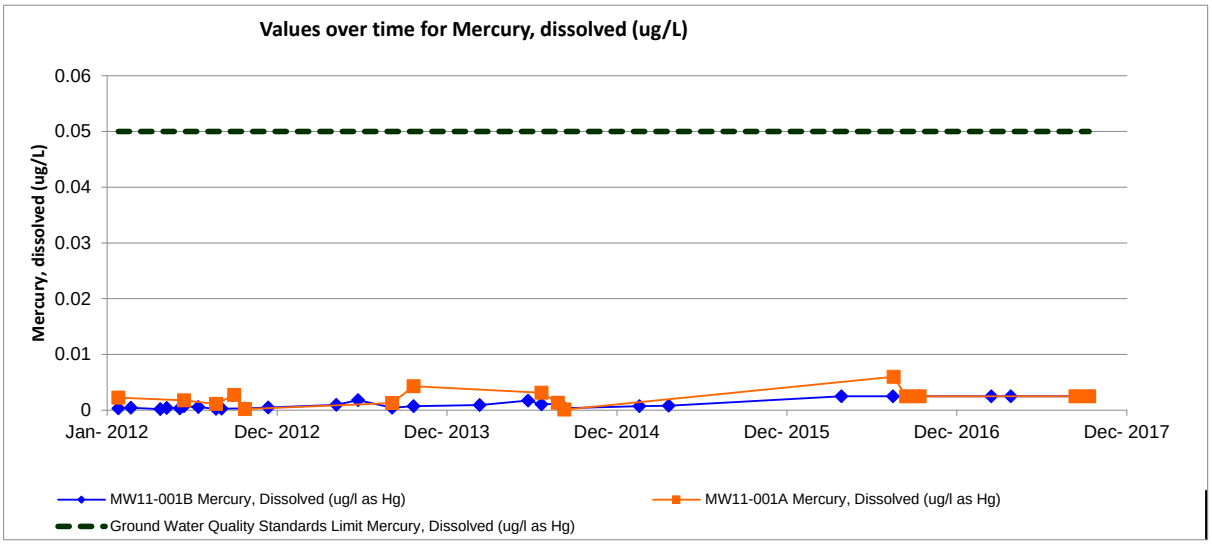

Values over time for Cyanide WAD (ug/L)
Cyanide WAD (ug/L)
0
1
2
3
4
5
6
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Weak Acid Dissociable Cyanide, ug/l
MW11-001A Weak Acid Dissociable Cyanide, ug/l
Ground Water Quality Standards Limit Weak Acid Dissociable Cyanide, ug/l

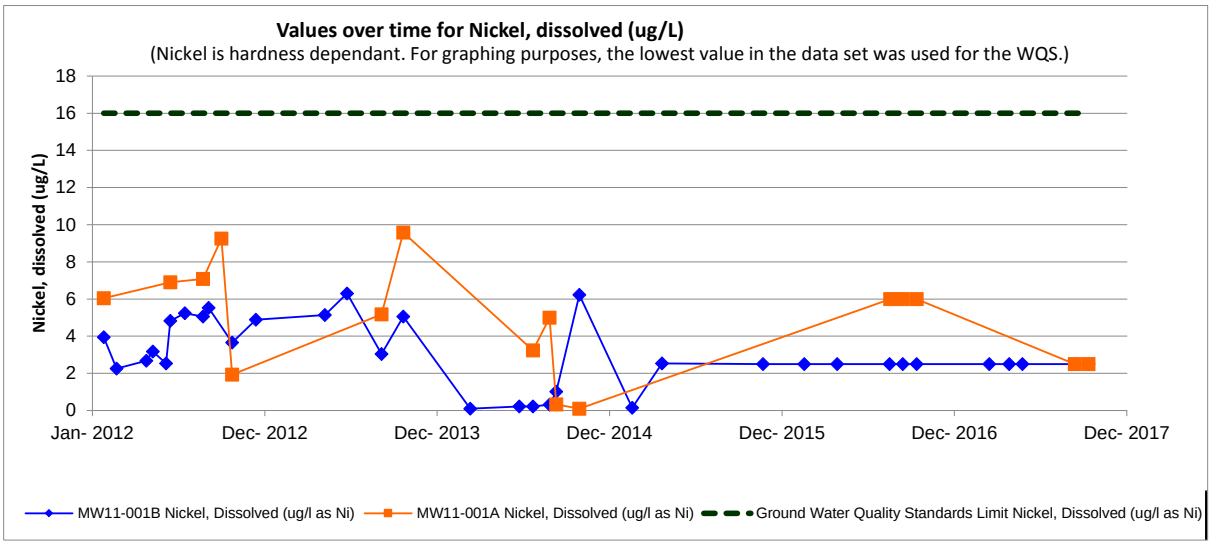

Values over time for Hardness (CaCO3) (mg/L)
Hardness (CaCO3) (mg/L)
0
100
200
300
400
500
600
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Hardness, Total (mg/l as CaCO3)
MW11-001A Hardness, Total (mg/l as CaCO3)

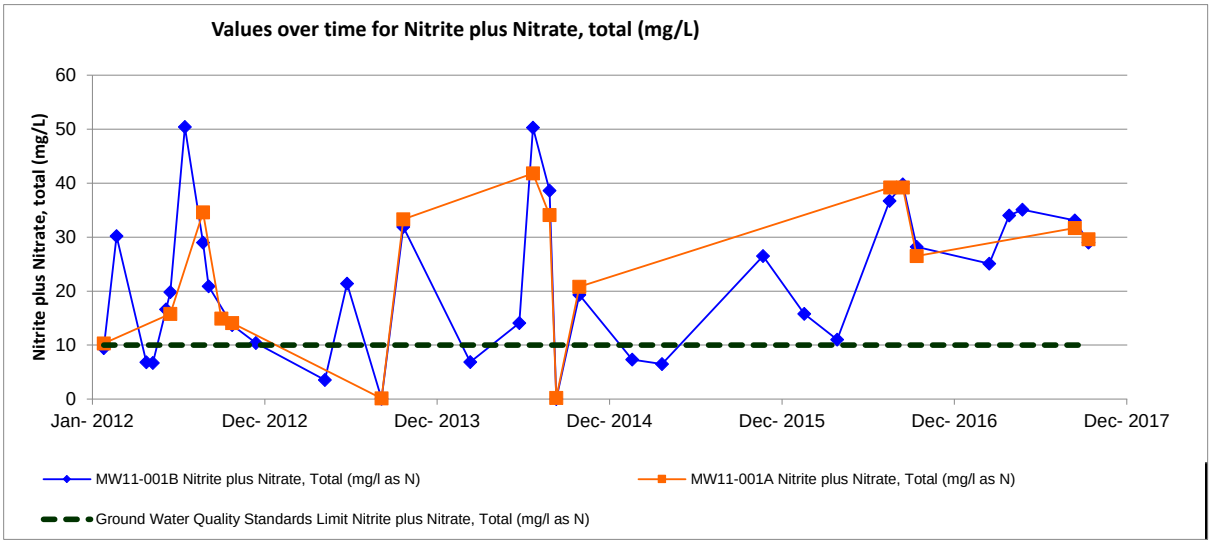

Values over time for Iron, dissolved (ug/L)
Iron, dissolved (ug/L)
0
200
400
600
800
1000
1200
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Iron, Dissolved (ug/l as Fe)
MW11-001A Iron, Dissolved (ug/l as Fe)
Ground Water Quality Standards Limit Iron, Dissolved (ug/l as Fe)

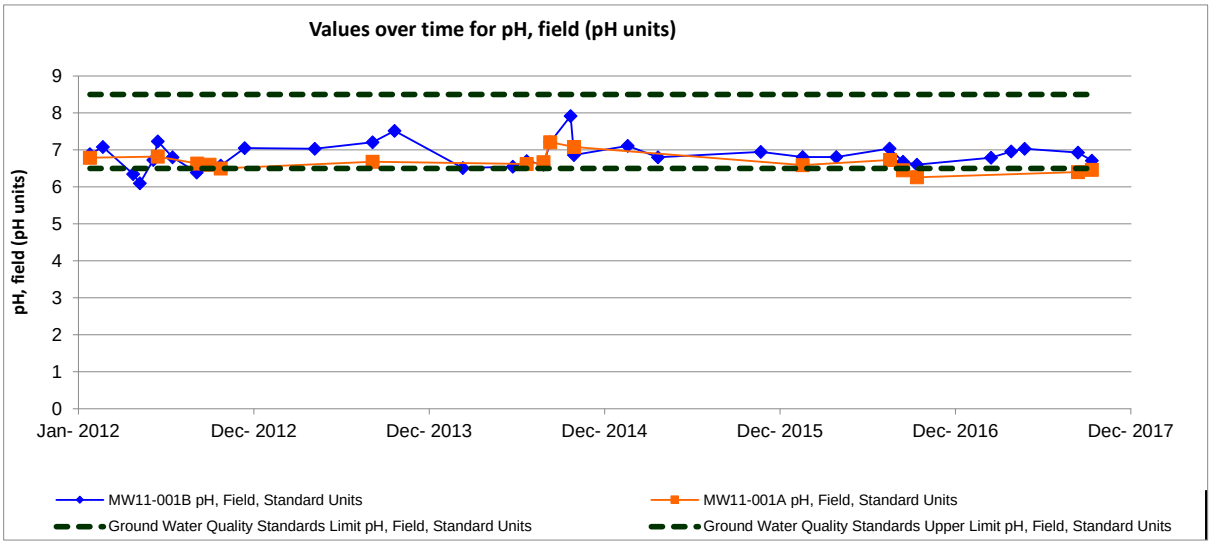

Values over time for Lead, dissolved (ug/L)
(Lead is hardness dependant. For graphing purposes, the lowest hardness value in the data set was used for the WQS.)
Lead, dissolved (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Lead, Dissolved (ug/l as Pb)
MW11-001A Lead, Dissolved (ug/l as Pb)
Ground Water Quality Standards Limit Lead, Dissolved (ug/l as Pb)

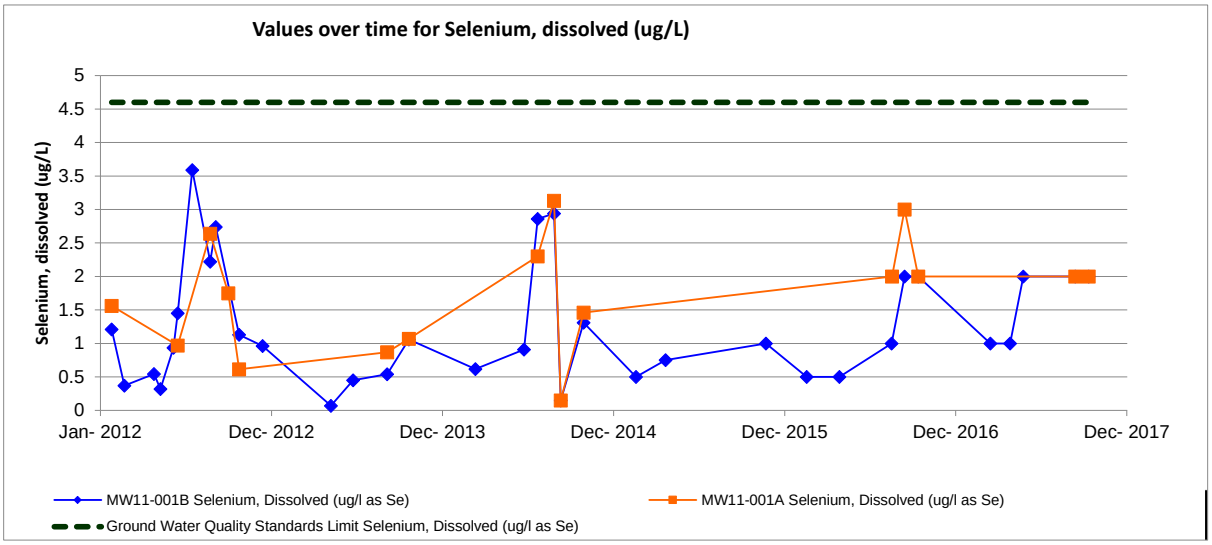

Values over time for Manganese, dissolved (ug/L)
Manganese, dissolved (ug/L)
1200
1000
800
600
400
200
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Manganese, Dissolved (ug/l as Mn)
MW11-001A Manganese, Dissolved (ug/l as Mn)
Ground Water Quality Standards Limit Manganese, Dissolved (ug/l as Mn)

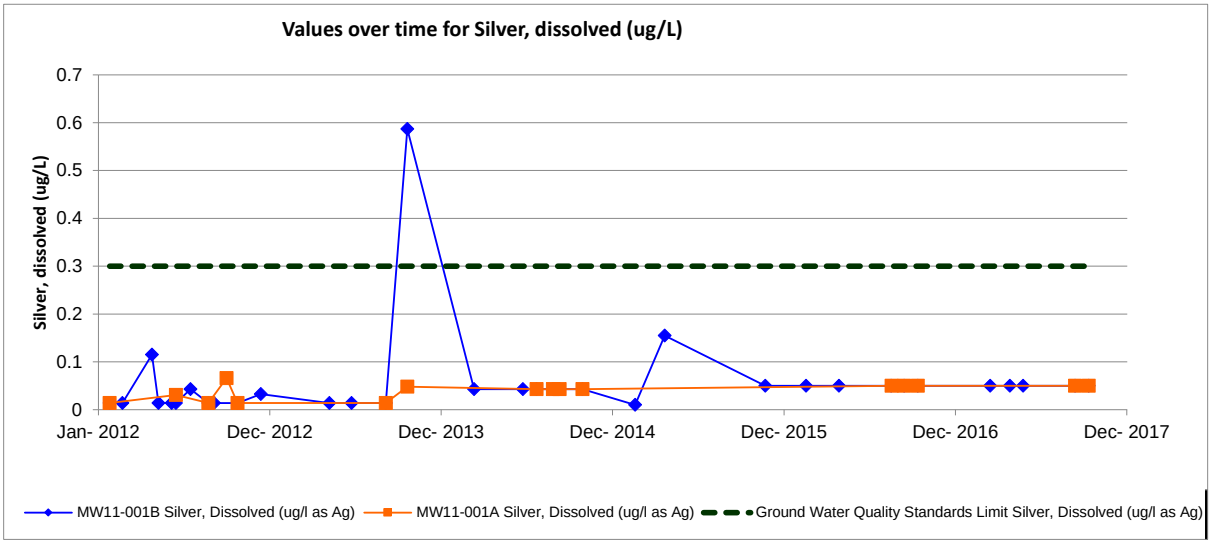

Values over time for Mercury, dissolved (ug/L)
Mercury, dissolved (ug/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Mercury, Dissolved (ug/l as Hg)
MW11-001A Mercury, Dissolved (ug/l as Hg)
Ground Water Quality Standards Limit Mercury, Dissolved (ug/l as Hg)

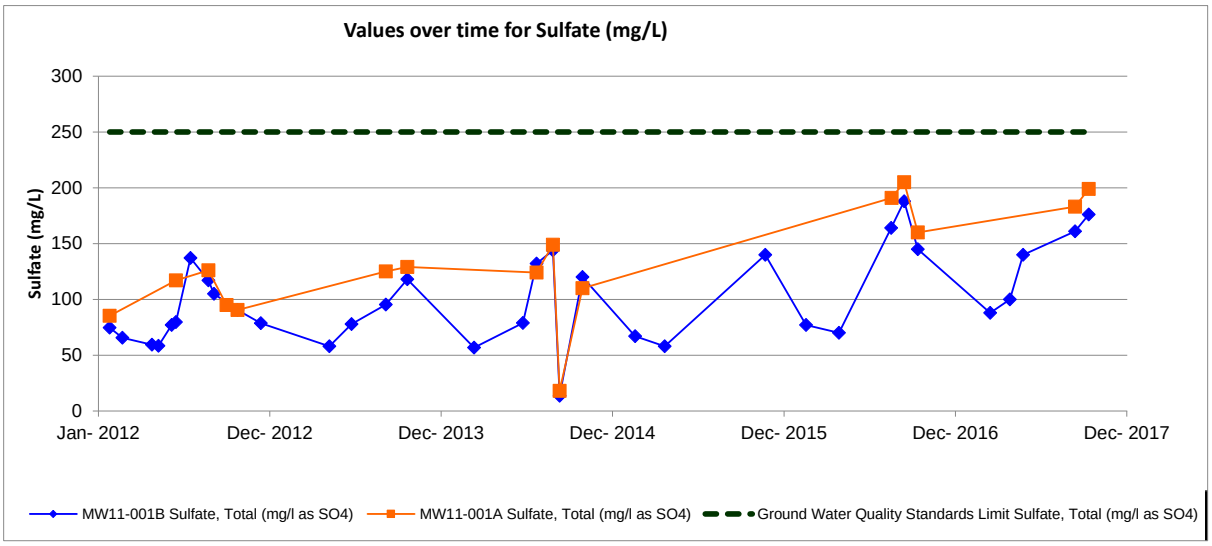

Values over time for Nickel, dissolved (ug/L)
(Nickel is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Nickel, dissolved (ug/L)
18
16
14
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Nickel, Dissolved (ug/l as Ni)
MW11-001A Nickel, Dissolved (ug/l as Ni)
Ground Water Quality Standards Limit Nickel, Dissolved (ug/l as Ni)

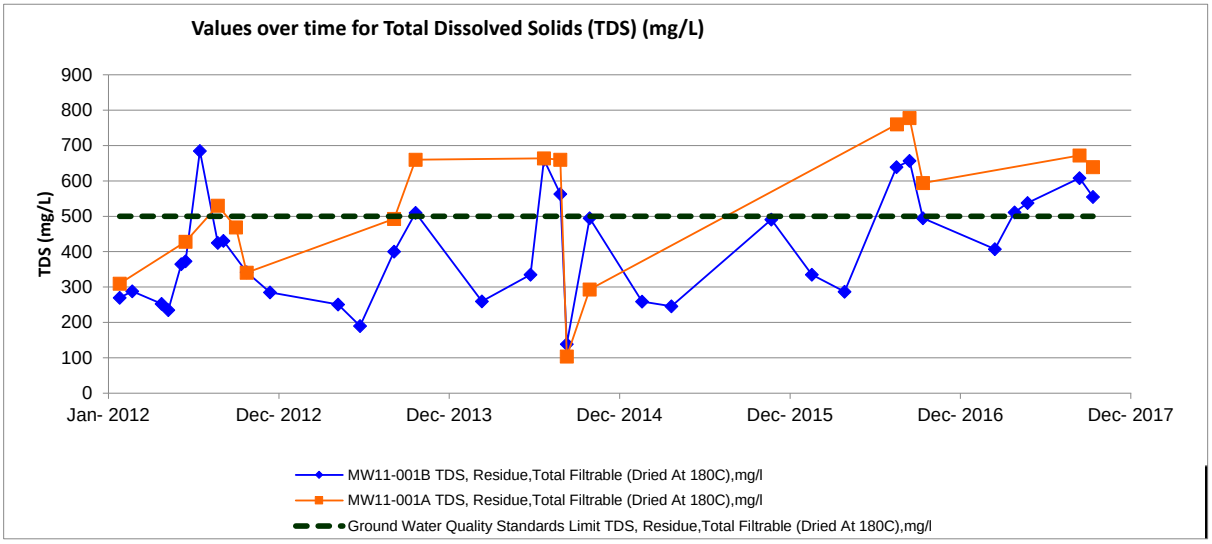

Values over time for Nitrite plus Nitrate, total (mg/L)
Nitrite plus Nitrate, total (mg/L)
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Nitrite plus Nitrate, Total (mg/l as N)
MW11-001A Nitrite plus Nitrate, Total (mg/l as N)
Ground Water Quality Standards Limit Nitrite plus Nitrate, Total (mg/l as N)

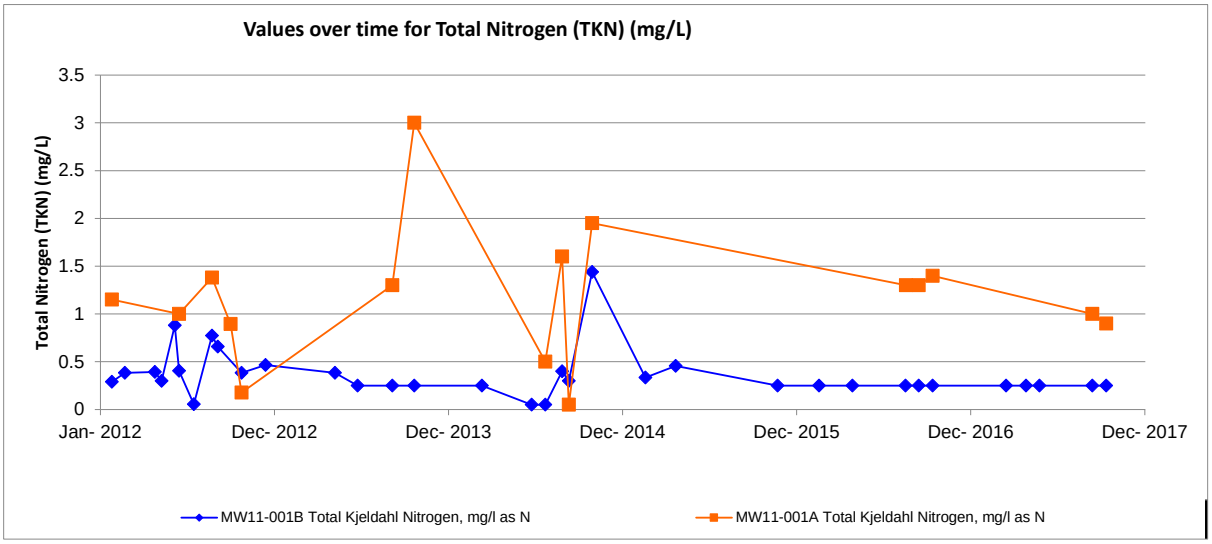

Values over time for pH, field (pH units)
pH, field (pH units)
9
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B pH, Field, Standard Units
MW11-001A pH, Field, Standard Units
Ground Water Quality Standards Limit pH, Field, Standard Units
Ground Water Quality Standards Upper Limit pH, Field, Standard Units

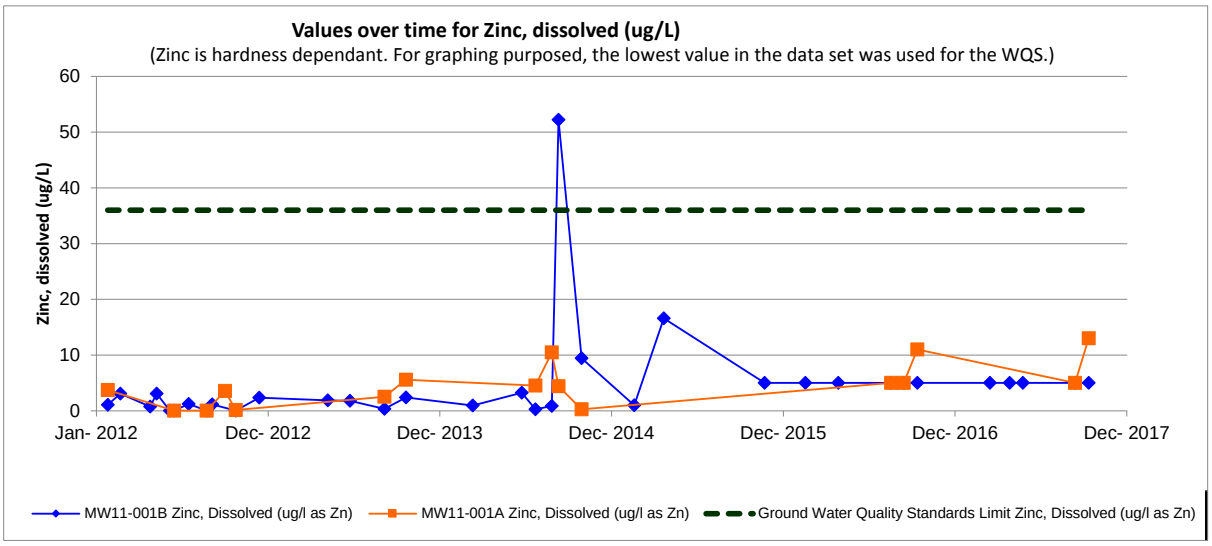

Values over time for Selenium, dissolved (ug/L)
Selenium, dissolved (ug/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Selenium, Dissolved (ug/l as Se)
MW11-001A Selenium, Dissolved (ug/l as Se)
Ground Water Quality Standards Limit Selenium, Dissolved (ug/l as Se)

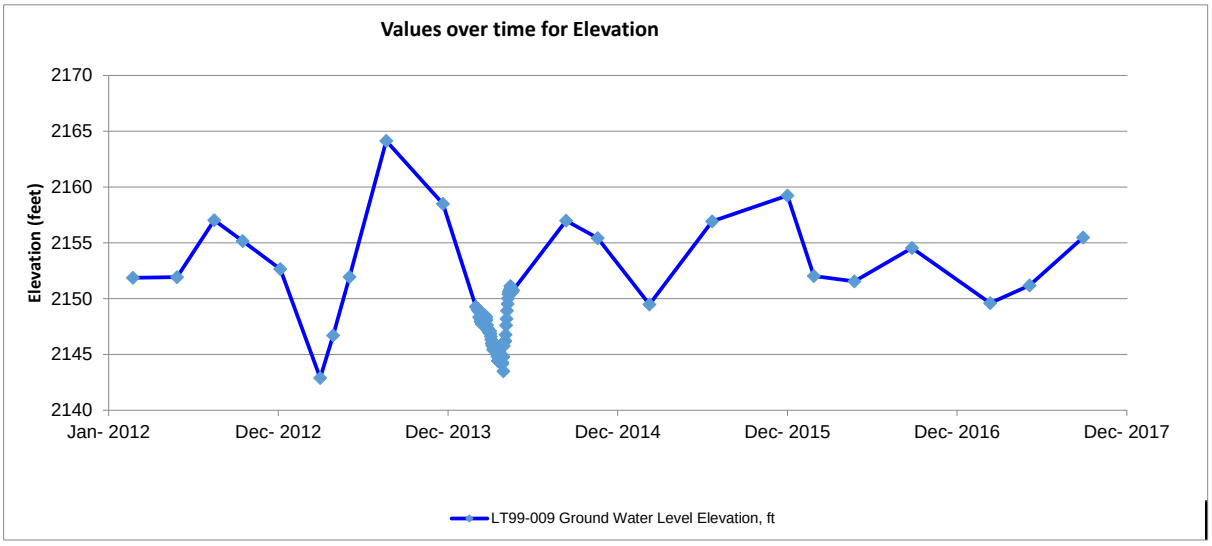

Values over time for Silver, dissolved (ug/L)
Silver, dissolved (ug/L)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Silver, Dissolved (ug/l as Ag)
MW11-001A Silver, Dissolved (ug/l as Ag)
Ground Water Quality Standards Limit Silver, Dissolved (ug/l as Ag)

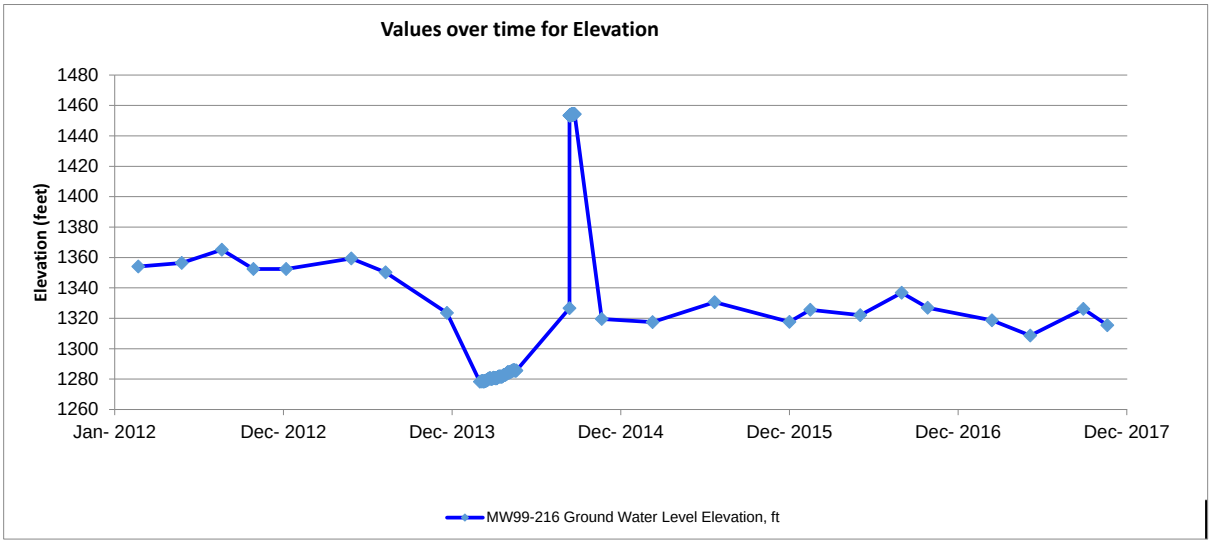

Values over time for Sulfate (mg/L)
Sulfate (mg/L)
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Sulfate, Total (mg/l as SO4)
MW11-001A Sulfate, Total (mg/l as SO4)
Ground Water Quality Standards Limit Sulfate, Total (mg/l as SO4)

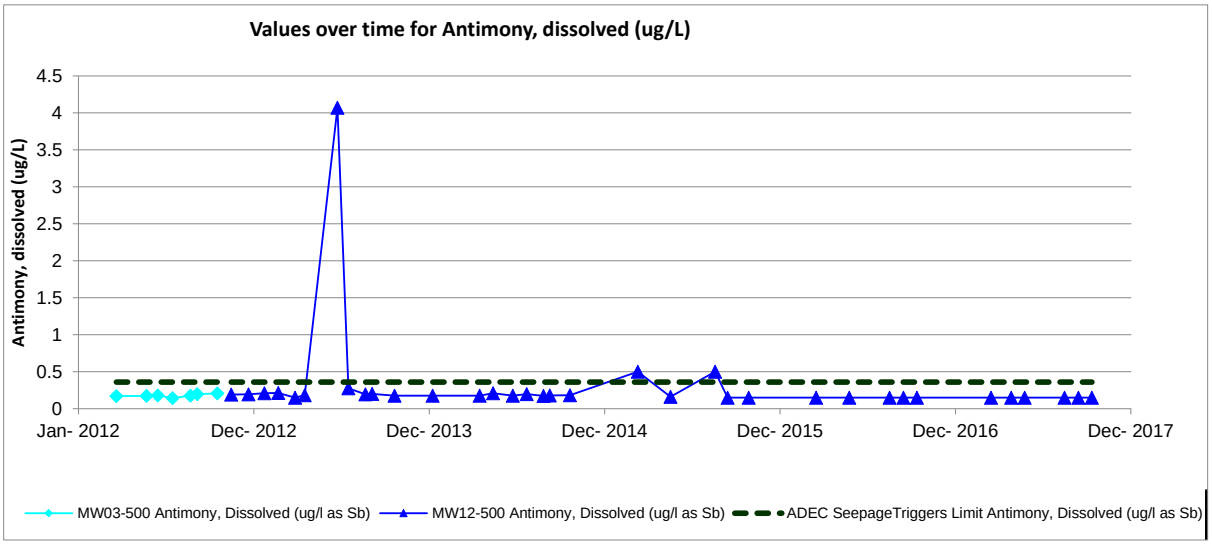

Values over time for Total Dissolved Solids (TDS) (mg/L)
TDS (mg/L)
900
800
700
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B TDS, Residue,Total Filtrable (Dried At 180C),mg/l
MW11-001A TDS, Residue,Total Filtrable (Dried At 180C),mg/l
Ground Water Quality Standards Limit TDS, Residue,Total Filtrable (Dried At 180C),mg/l

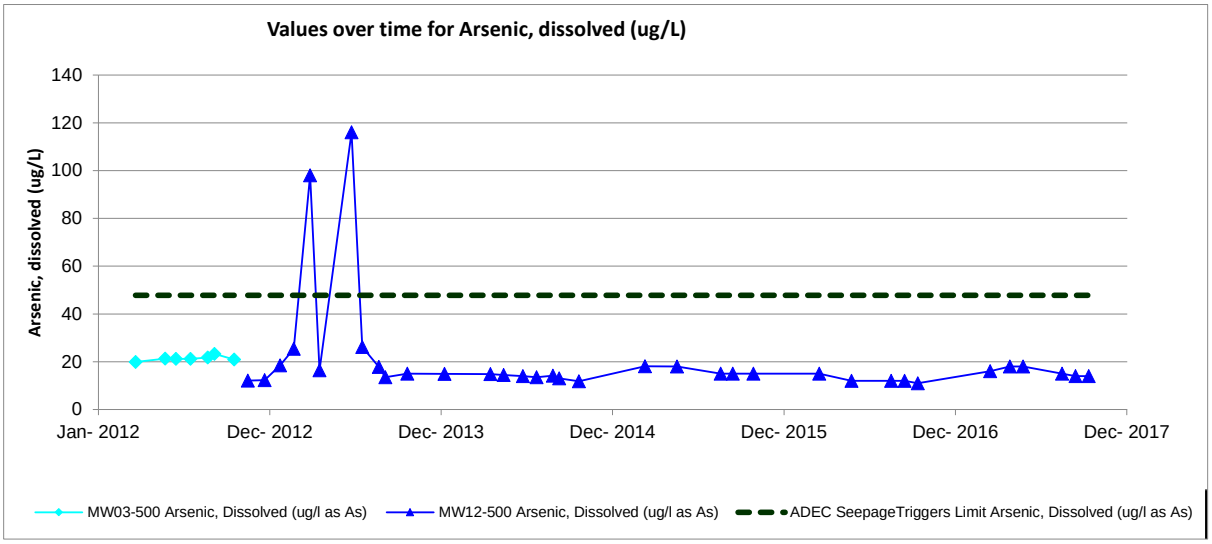

Values over time for Total Nitrogen (TKN) (mg/L)
Total Nitrogen (TKN) (mg/L)
3.5
3
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Total Kjeldahl Nitrogen, mg/l as N
MW11-001A Total Kjeldahl Nitrogen, mg/l as N

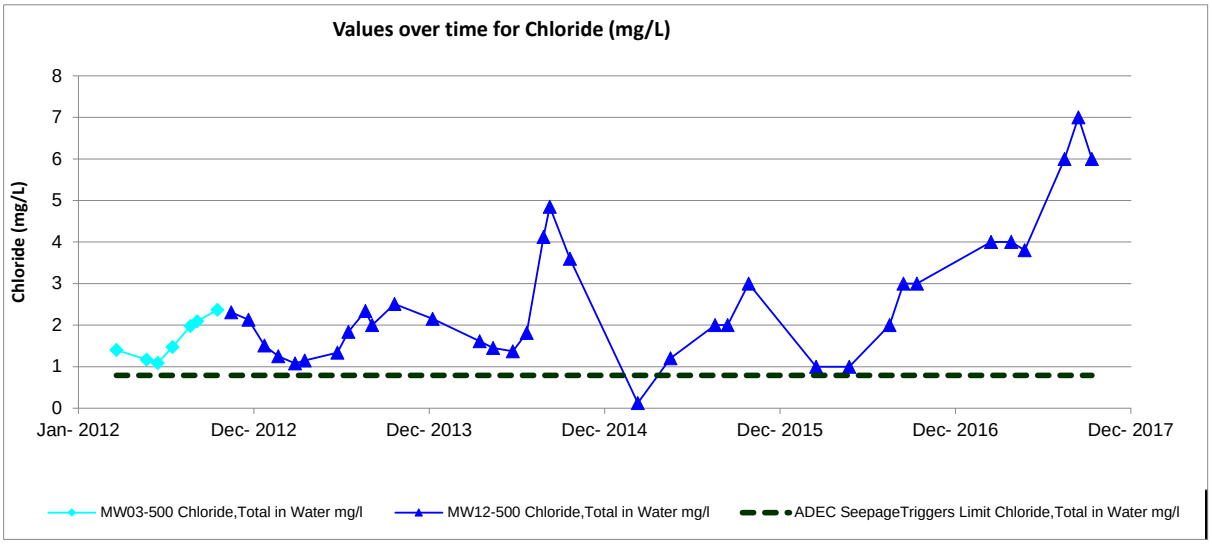

Values over time for Zinc, dissolved (ug/L)
(Zinc is hardness dependant. For graphing purposed, the lowest value in the data set was used for the WQS.)
Zinc, dissolved (ug/L)
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW11-001B Zinc, Dissolved (ug/l as Zn)
MW11-001A Zinc, Dissolved (ug/l as Zn)
Ground Water Quality Standards Limit Zinc, Dissolved (ug/l as Zn)

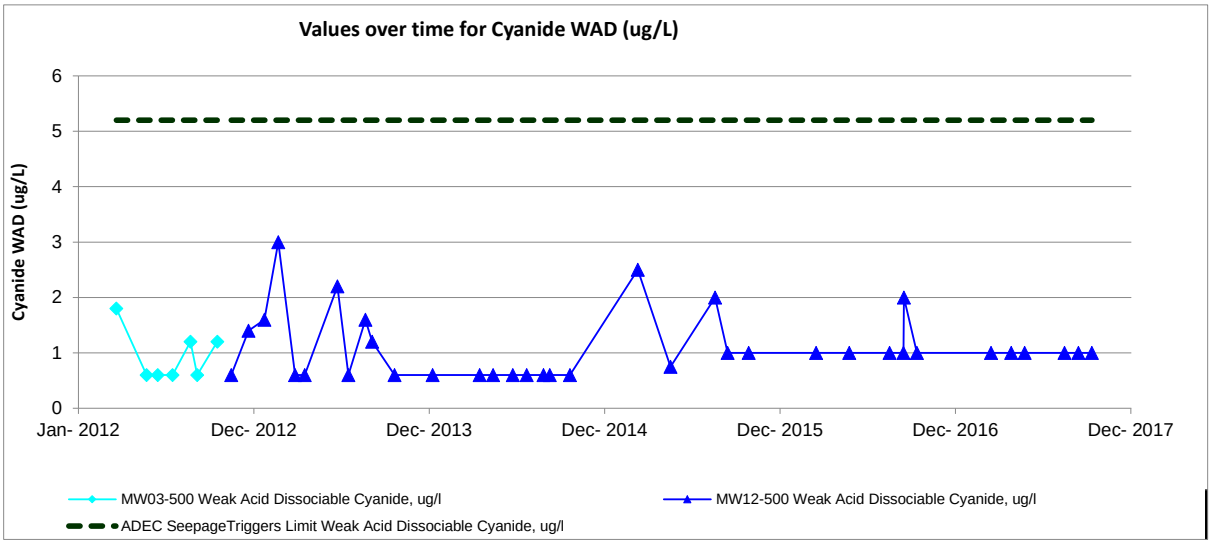

Values over time for Elevation
Elevation (feet)
2170
2165
2160
2155
2150
2145
2140
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LT99-009 Ground Water Level Elevation, ft

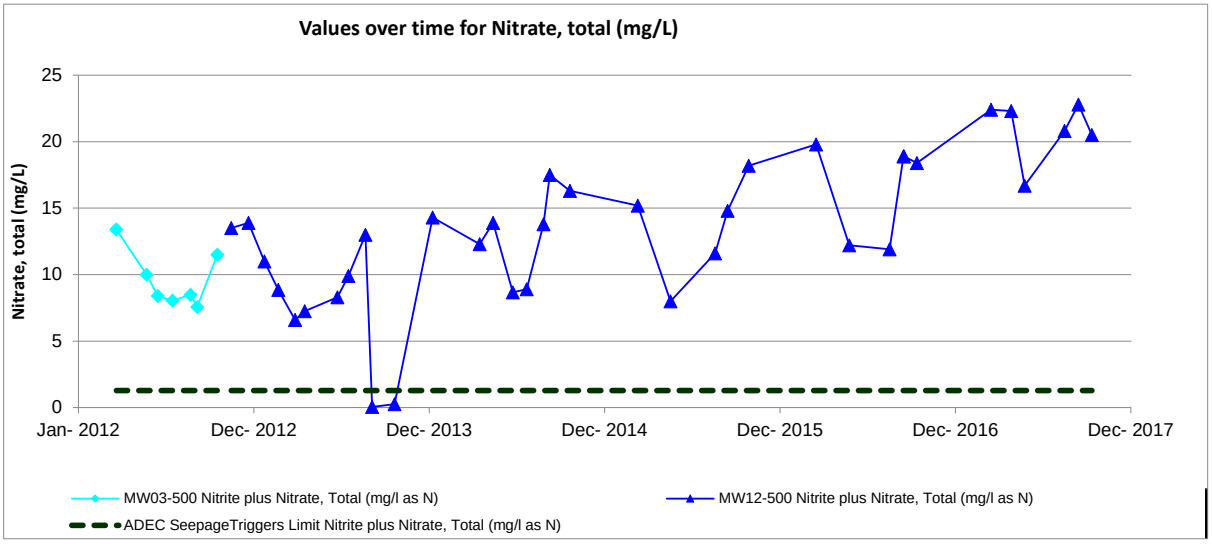

Values over time for Elevation
Elevation (feet)
1480
1460
1440
1420
1400
1380
1360
1340
1320
1300
1280
1260
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW99-216 Ground Water Level Elevation, ft

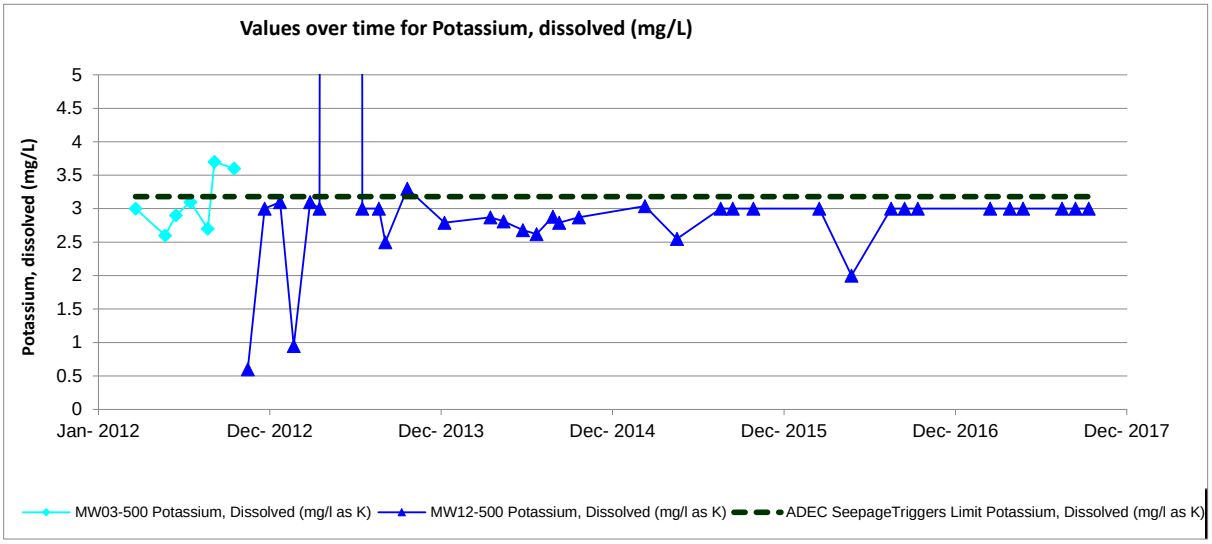

Values over time for Antimony, dissolved (ug/L)
Antimony, dissolved (ug/L)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-500 Antimony, Dissolved (ug/l as Sb)
MW12-500 Antimony, Dissolved (ug/l as Sb)
ADEC SeepageTriggers Limit Antimony, Dissolved (ug/l as Sb)

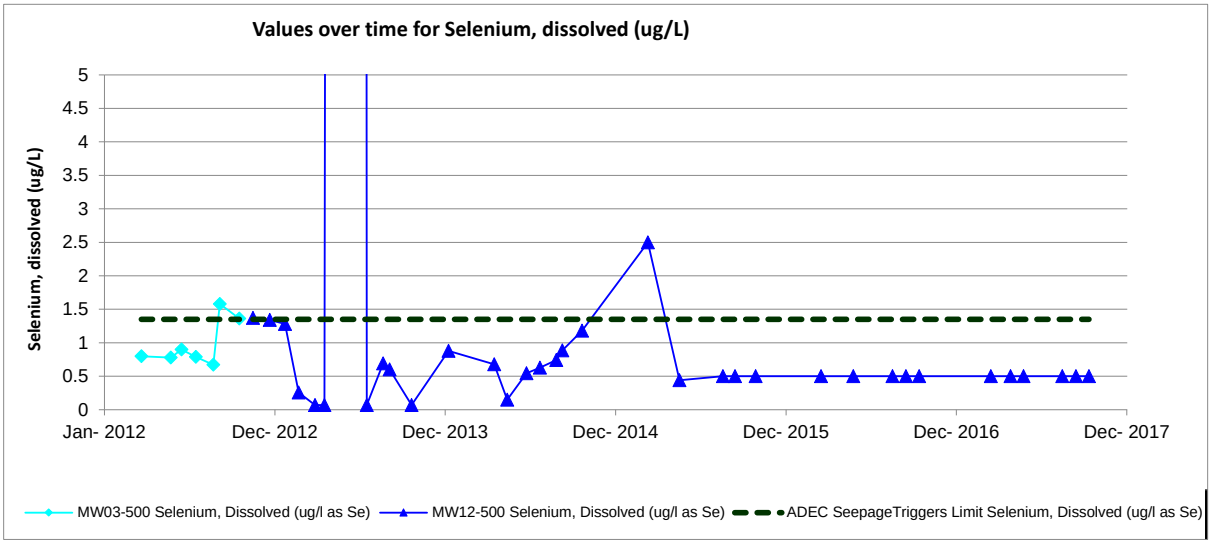

Values over time for Arsenic, dissolved (ug/L)
Arsenic, dissolved (ug/L)
140
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-500 Arsenic, Dissolved (ug/l as As)
MW12-500 Arsenic, Dissolved (ug/l as As)
ADEC SeepageTriggers Limit Arsenic, Dissolved (ug/l as As)

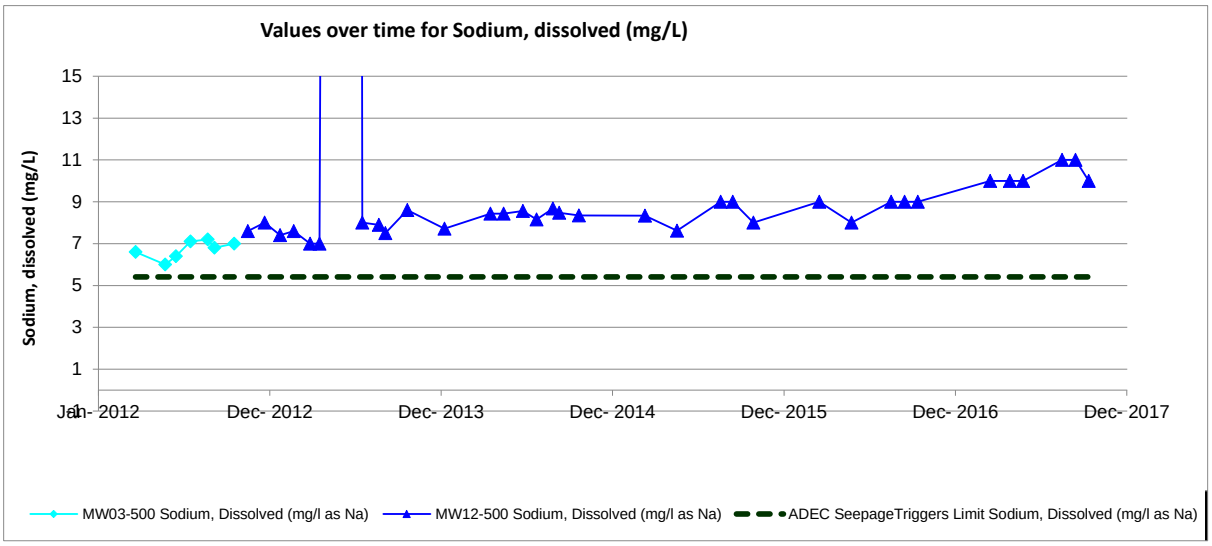

Values over time for Chloride (mg/L)
Chloride (mg/L)
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-500 Chloride,Total in Water mg/l
MW12-500 Chloride,Total in Water mg/l
ADEC SeepageTriggers Limit Chloride,Total in Water mg/l

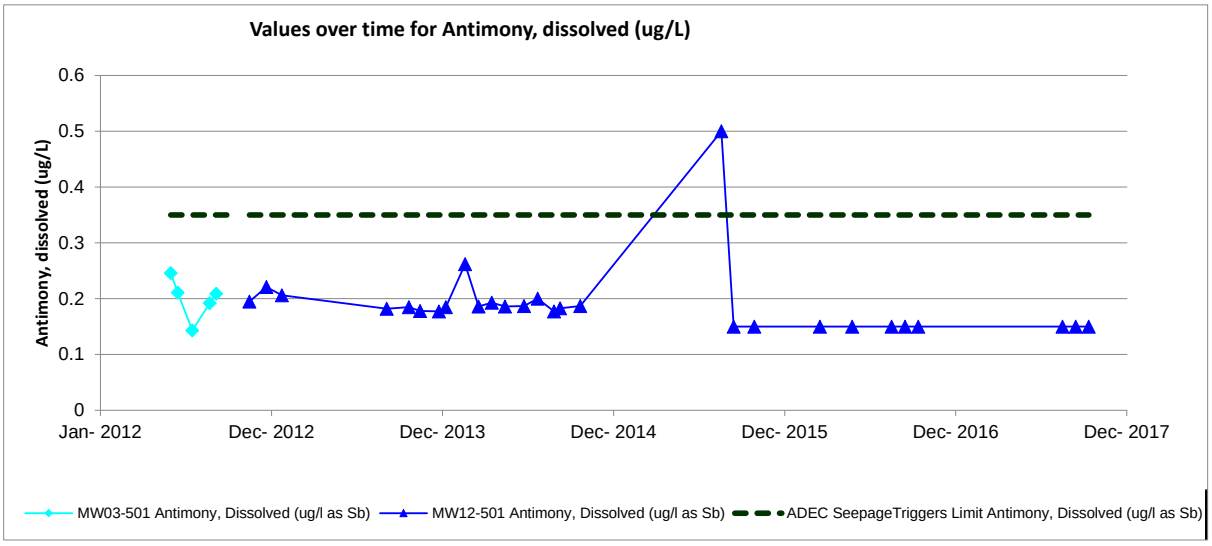

Values over time for Cyanide WAD (ug/L)
Cyanide WAD (ug/L)
0
1
2
3
4
5
6
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-500 Weak Acid Dissociable Cyanide, ug/l
MW12-500 Weak Acid Dissociable Cyanide, ug/l
ADEC SeepageTriggers Limit Weak Acid Dissociable Cyanide, ug/l

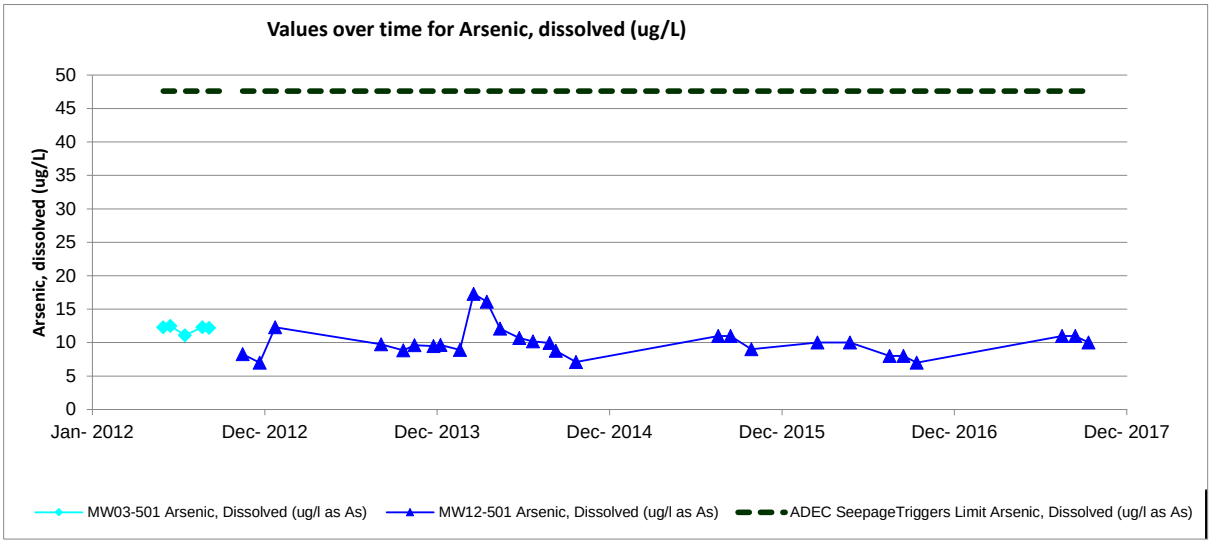

Values over time for Nitrate, total (mg/L)
Nitrate, total (mg/L)
0
5
10
15
20
25
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-500 Nitrite plus Nitrate, Total (mg/l as N)
MW12-500 Nitrite plus Nitrate, Total (mg/l as N)
ADEC SeepageTriggers Limit Nitrite plus Nitrate, Total (mg/l as N)

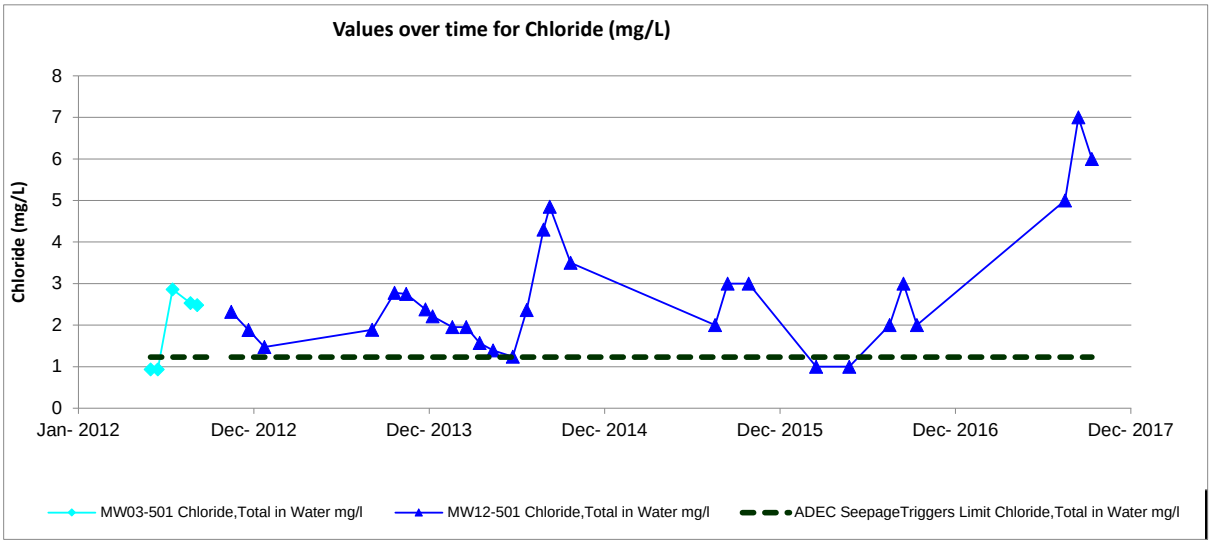

Values over time for Potassium, dissolved (mg/L)
Potassium, dissolved (mg/L)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-500 Potassium, Dissolved (mg/l as K)
MW12-500 Potassium, Dissolved (mg/l as K)
ADEC SeepageTriggers Limit Potassium, Dissolved (mg/l as K)

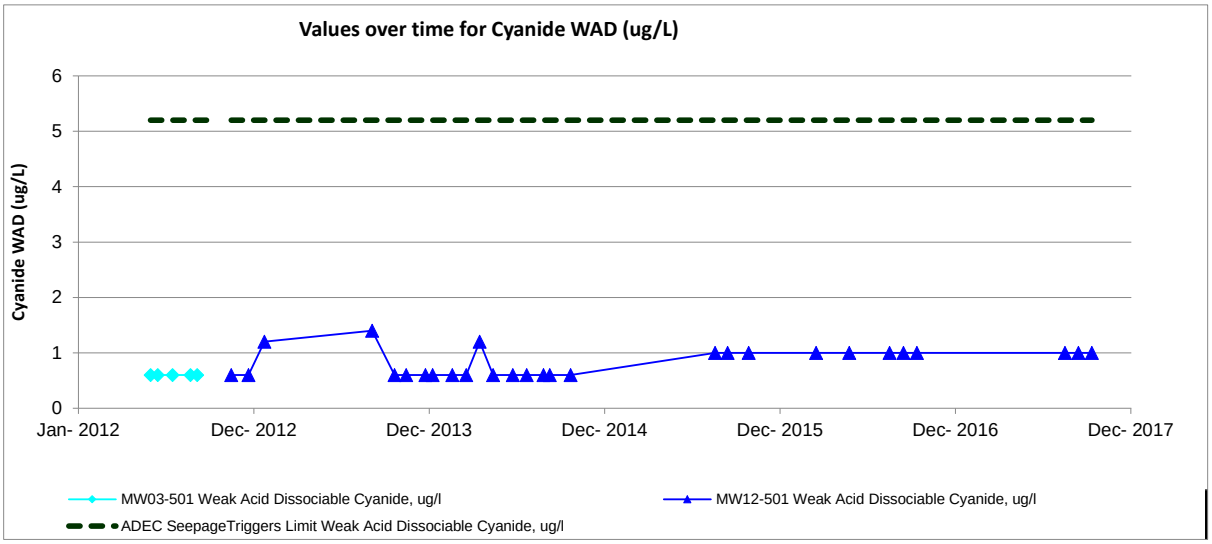

Values over time for Selenium, dissolved (ug/L)
Selenium, dissolved (ug/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-500 Selenium, Dissolved (ug/l as Se)
MW12-500 Selenium, Dissolved (ug/l as Se)
ADEC SeepageTriggers Limit Selenium, Dissolved (ug/l as Se)

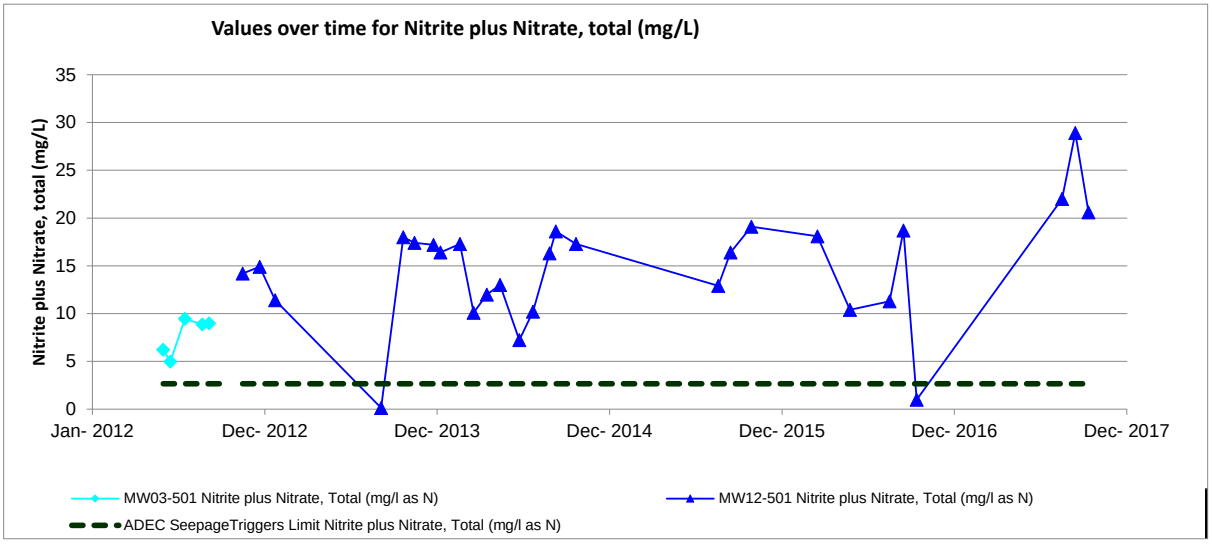

Values over time for Sodium, dissolved (mg/L)
Sodium, dissolved (mg/L)
15
13
11
9
7
5
3
1
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-500 Sodium, Dissolved (mg/l as Na)
MW12-500 Sodium, Dissolved (mg/l as Na)
ADEC SeepageTriggers Limit Sodium, Dissolved (mg/l as Na)

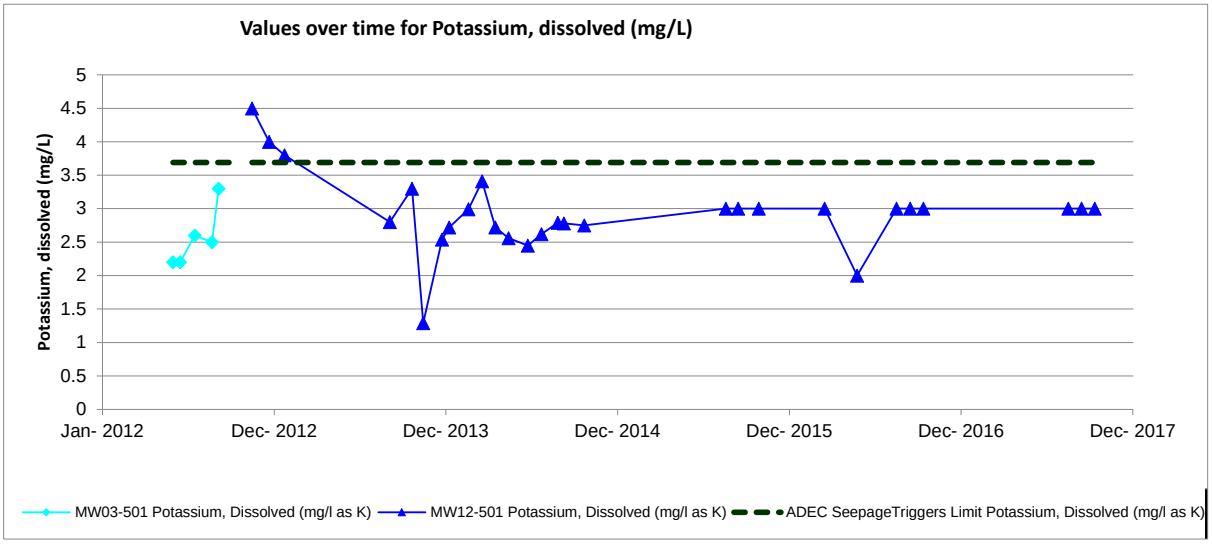

Values over time for Antimony, dissolved (ug/L)
Antimony, dissolved (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Antimony, Dissolved (ug/l as Sb)
MW12-501 Antimony, Dissolved (ug/l as Sb)
ADEC SeepageTriggers Limit Antimony, Dissolved (ug/l as Sb)

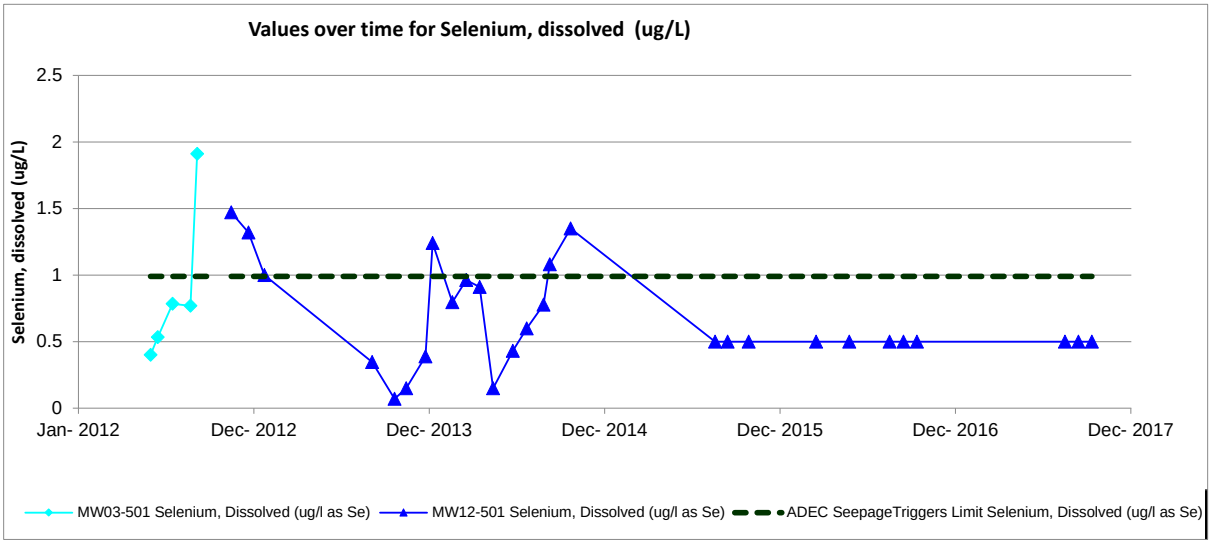

Values over time for Arsenic, dissolved (ug/L)
Arsenic, dissolved (ug/L)
50
45
40
35
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Arsenic, Dissolved (ug/l as As)
MW12-501 Arsenic, Dissolved (ug/l as As)
ADEC SeepageTriggers Limit Arsenic, Dissolved (ug/l as As)

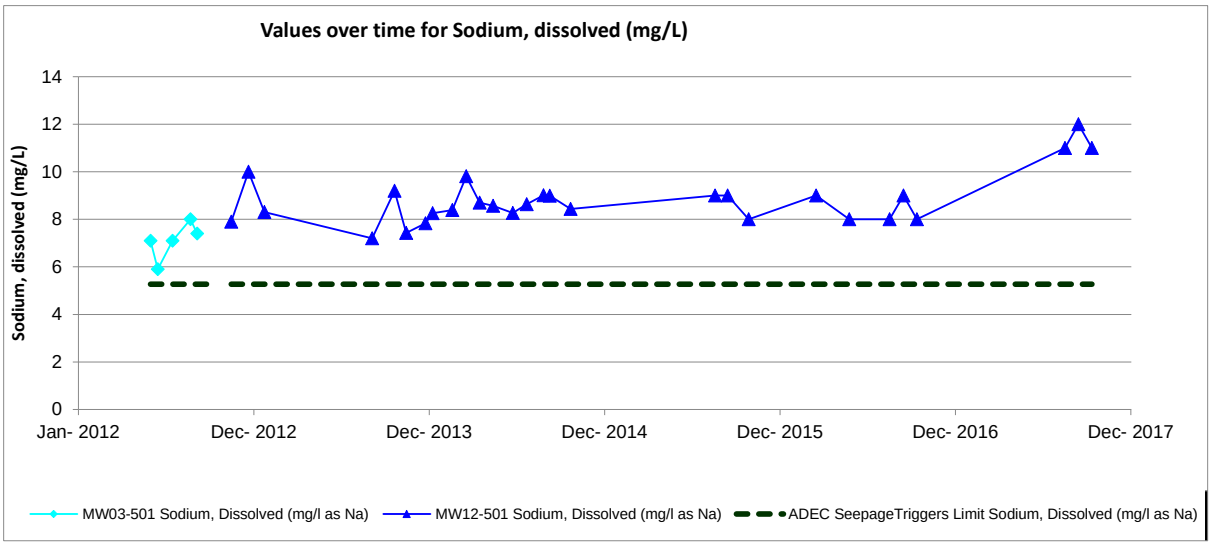

Values over time for Chloride (mg/L)
Chloride (mg/L)
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Chloride,Total in Water mg/l
MW12-501 Chloride,Total in Water mg/l
ADEC SeepageTriggers Limit Chloride,Total in Water mg/l

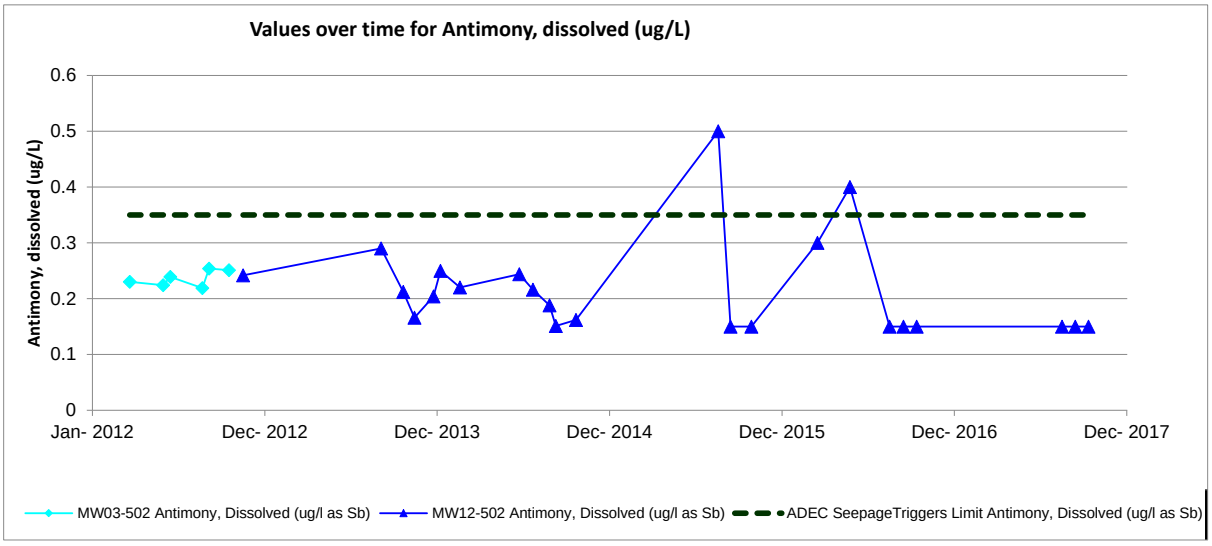

Values over time for Cyanide WAD (ug/L)
Cyanide WAD (ug/L)
0
1
2
3
4
5
6
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Weak Acid Dissociable Cyanide, ug/l
MW12-501 Weak Acid Dissociable Cyanide, ug/l
ADEC SeepageTriggers Limit Weak Acid Dissociable Cyanide, ug/l

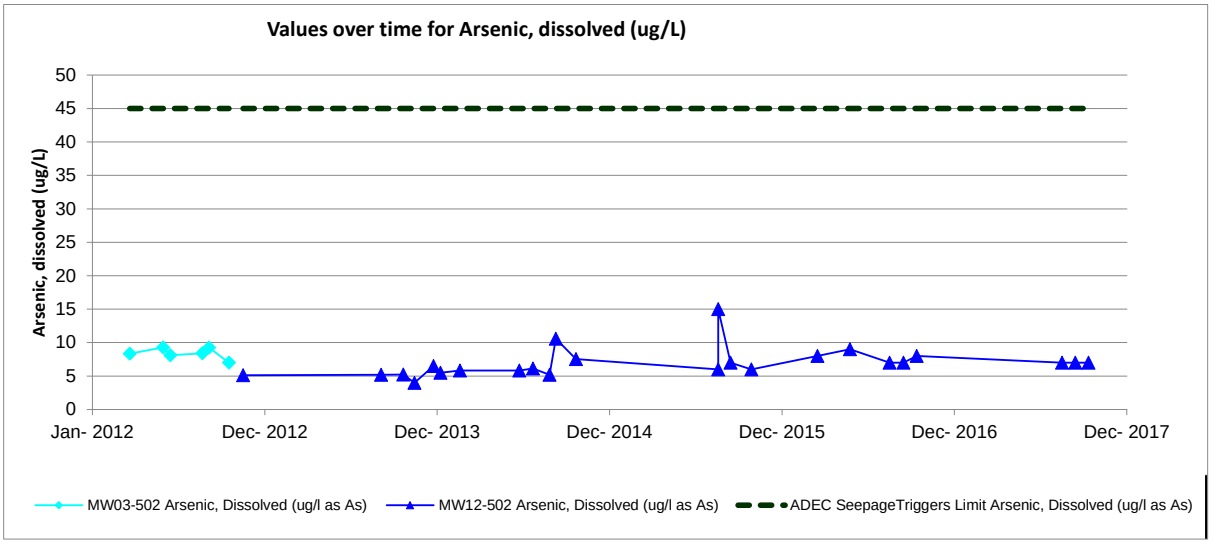

Values over time for Nitrite plus Nitrate, total (mg/L)
Nitrite plus Nitrate, total (mg/L)
0
5
10
15
20
25
30
35
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Nitrite plus Nitrate, Total (mg/l as N)
MW12-501 Nitrite plus Nitrate, Total (mg/l as N)
ADEC SeepageTriggers Limit Nitrite plus Nitrate, Total (mg/l as N)

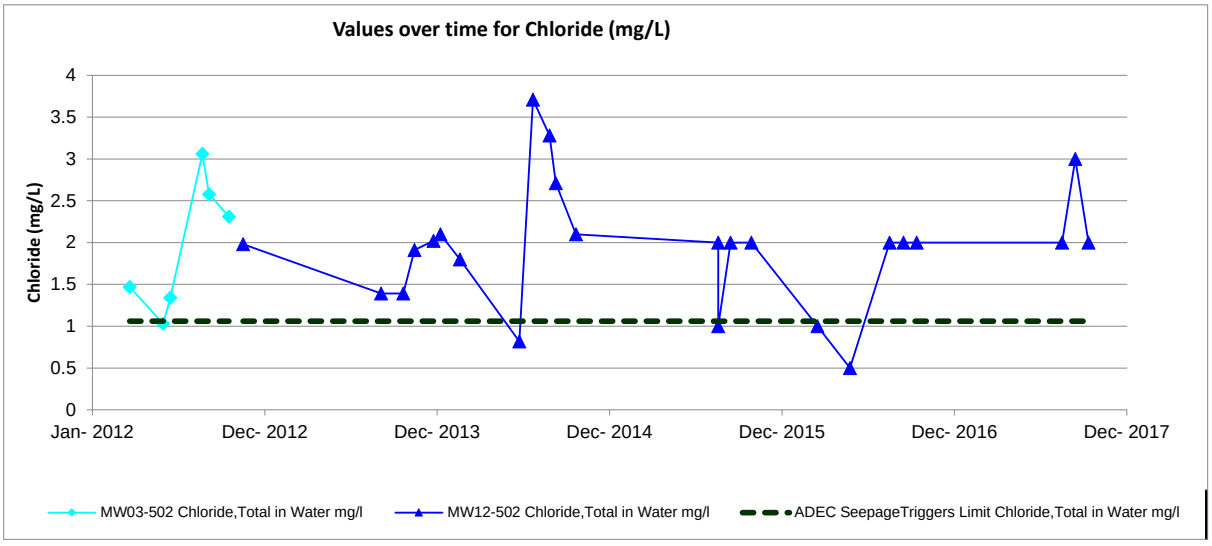

Values over time for Potassium, dissolved (mg/L)
Potassium, dissolved (mg/L)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Potassium, Dissolved (mg/l as K)
MW12-501 Potassium, Dissolved (mg/l as K)
ADEC SeepageTriggers Limit Potassium, Dissolved (mg/l as K)

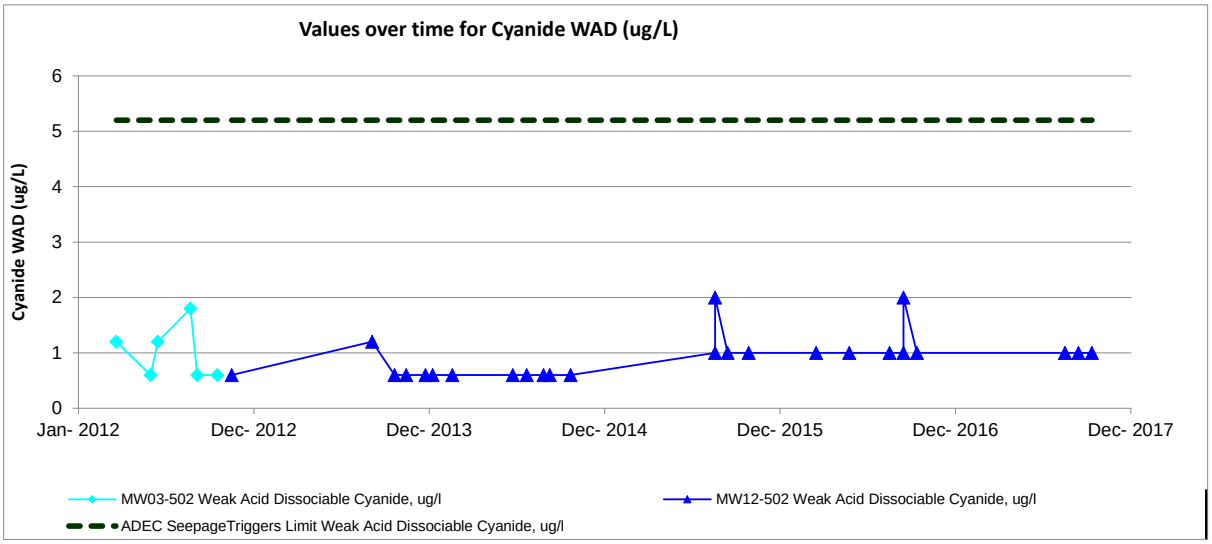

Values over time for Selenium, dissolved (ug/L)
Selenium, dissolved (ug/L)
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Selenium, Dissolved (ug/l as Se)
MW12-501 Selenium, Dissolved (ug/l as Se)
ADEC SeepageTriggers Limit Selenium, Dissolved (ug/l as Se)

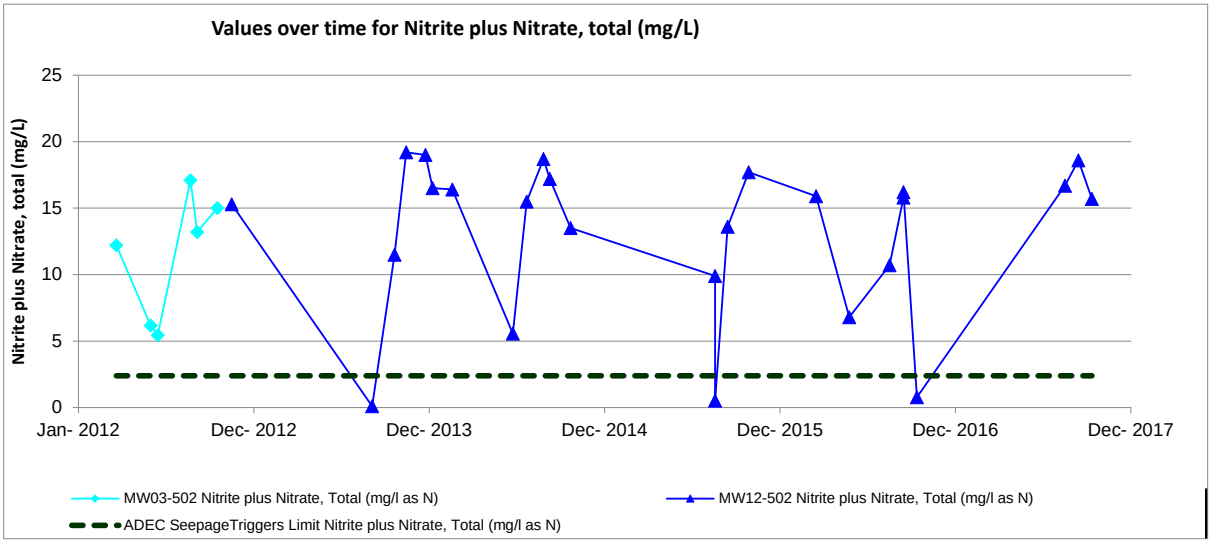

Values over time for Sodium, dissolved (mg/L)
Sodium, dissolved (mg/L)
14
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Sodium, Dissolved (mg/l as Na)
MW12-501 Sodium, Dissolved (mg/l as Na)
ADEC SeepageTriggers Limit Sodium, Dissolved (mg/l as Na)

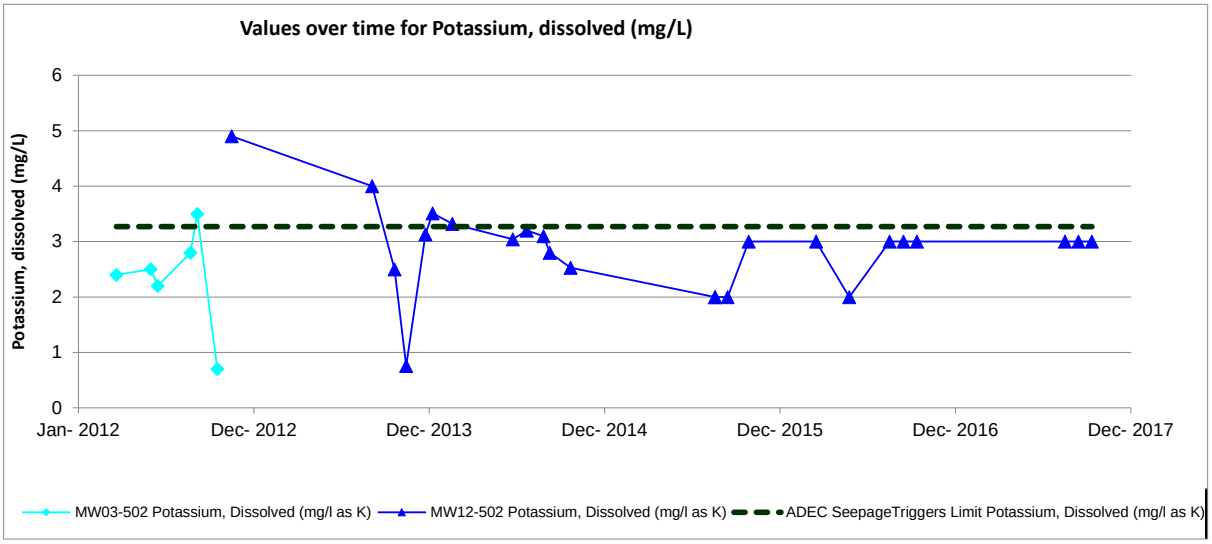

Values over time for Antimony, dissolved (ug/L)
Antimony, dissolved (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-502 Antimony, Dissolved (ug/l as Sb)
MW12-502 Antimony, Dissolved (ug/l as Sb)
ADEC SeepageTriggers Limit Antimony, Dissolved (ug/l as Sb)

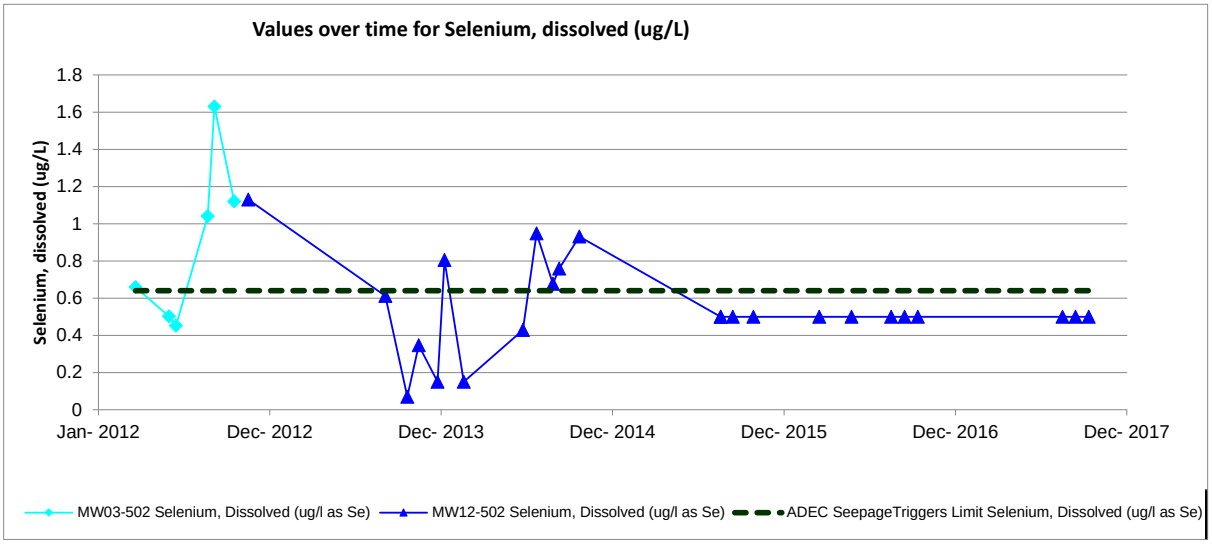

Values over time for Arsenic, dissolved (ug/L)
Arsenic, dissolved (ug/L)
50
45
40
35
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-502 Arsenic, Dissolved (ug/l as As)
MW12-502 Arsenic, Dissolved (ug/l as As)
ADEC SeepageTriggers Limit Arsenic, Dissolved (ug/l as As)

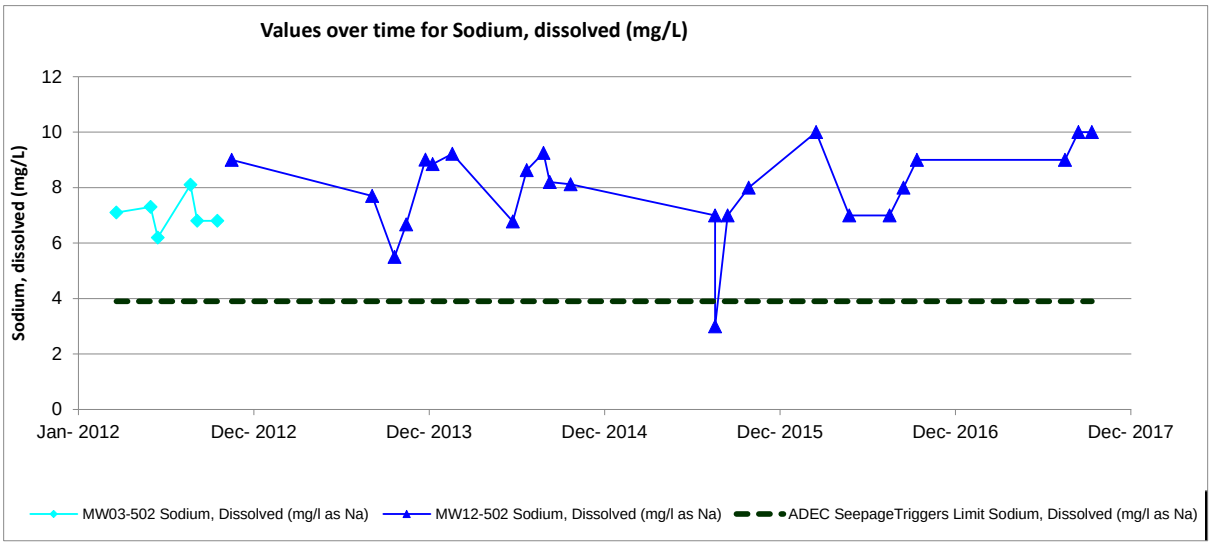

Values over time for Chloride (mg/L)
Chloride (mg/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-502 Chloride,Total in Water mg/l
MW12-502 Chloride,Total in Water mg/l
ADEC SeepageTriggers Limit Chloride,Total in Water mg/l

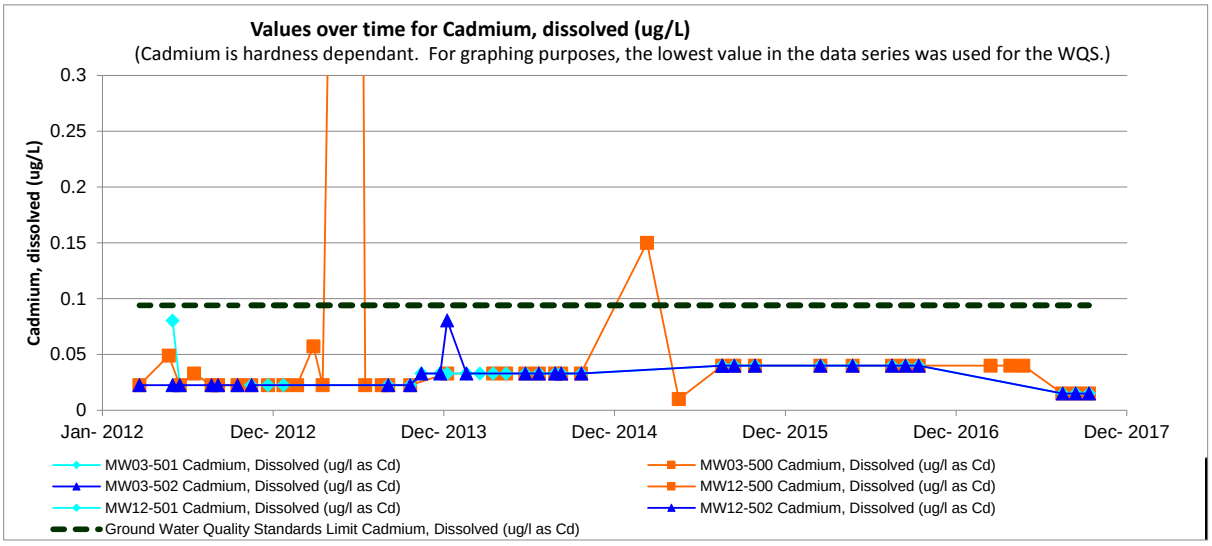

Values over time for Cyanide WAD (ug/L)
Cyanide WAD (ug/L)
0
1
2
3
4
5
6
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-502 Weak Acid Dissociable Cyanide, ug/l
MW12-502 Weak Acid Dissociable Cyanide, ug/l
ADEC SeepageTriggers Limit Weak Acid Dissociable Cyanide, ug/l

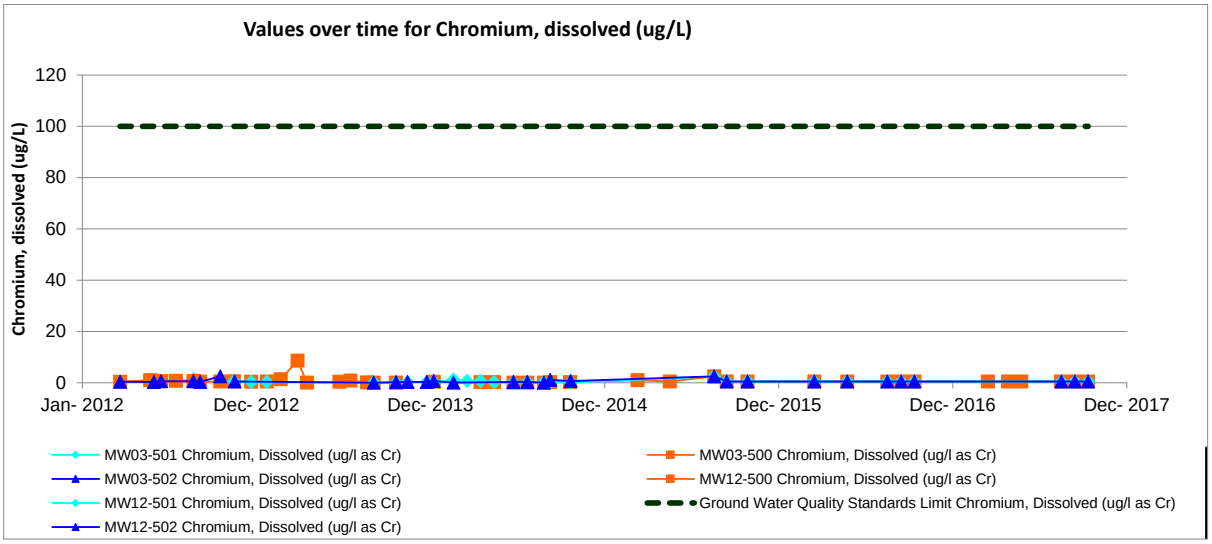

Values over time for Nitrite plus Nitrate, total (mg/L)
Nitrite plus Nitrate, total (mg/L)
0
5
10
15
20
25
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-502 Nitrite plus Nitrate, Total (mg/l as N)
MW12-502 Nitrite plus Nitrate, Total (mg/l as N)
ADEC SeepageTriggers Limit Nitrite plus Nitrate, Total (mg/l as N)

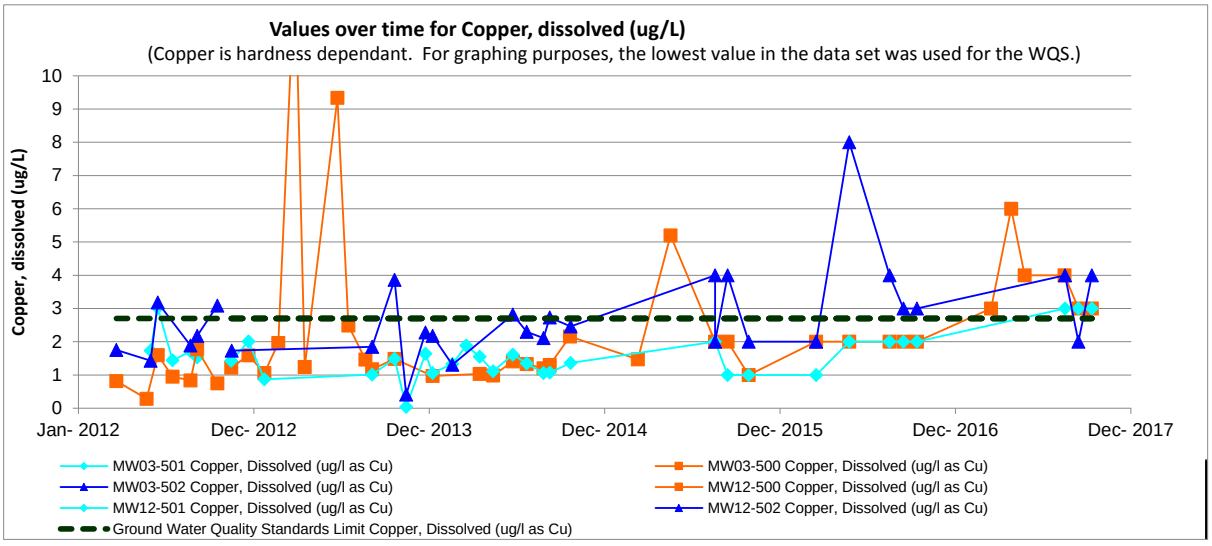

Values over time for Potassium, dissolved (mg/L)
Potassium, dissolved (mg/L)
0
1
2
3
4
5
6
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-502 Potassium, Dissolved (mg/l as K)
MW12-502 Potassium, Dissolved (mg/l as K)
ADEC SeepageTriggers Limit Potassium, Dissolved (mg/l as K)

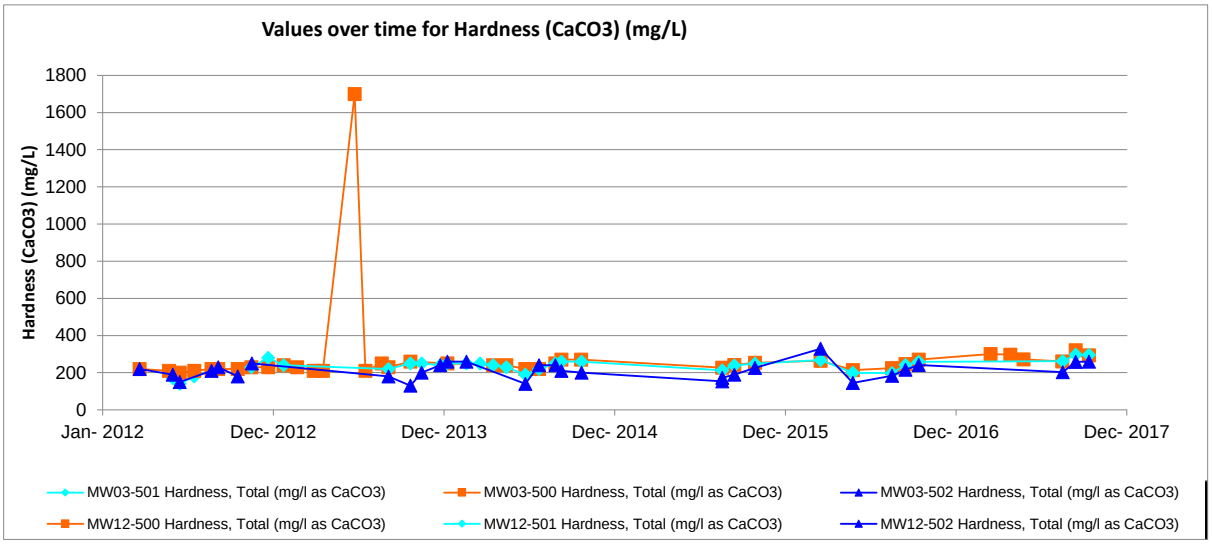

Values over time for Selenium, dissolved (ug/L)
Selenium, dissolved (ug/L)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-502 Selenium, Dissolved (ug/l as Se)
MW12-502 Selenium, Dissolved (ug/l as Se)
ADEC SeepageTriggers Limit Selenium, Dissolved (ug/l as Se)

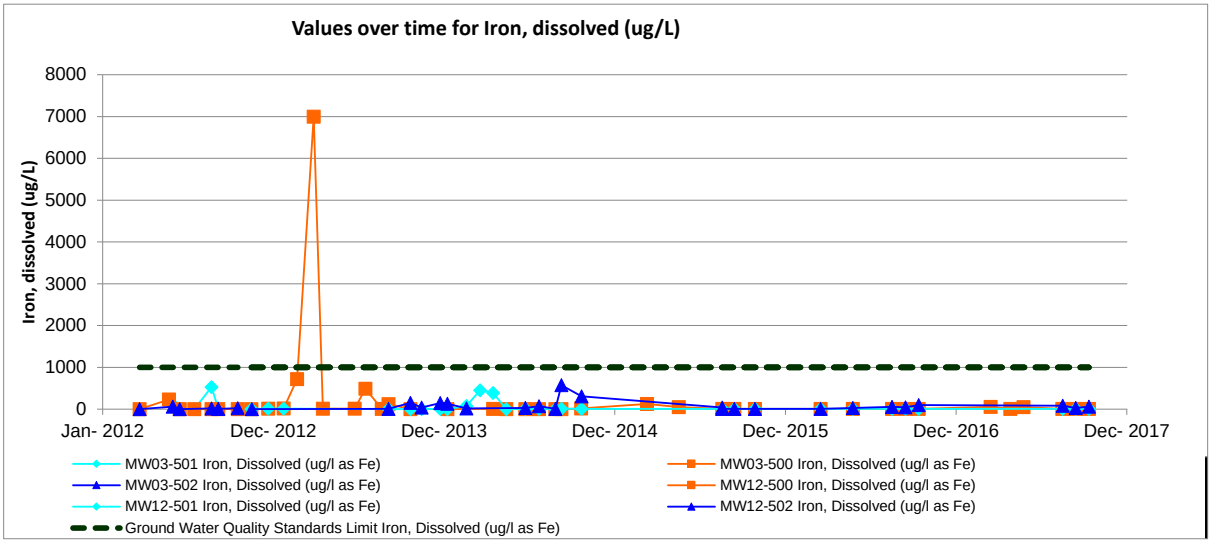

Values over time for Sodium, dissolved (mg/L)
Sodium, dissolved (mg/L)
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-502 Sodium, Dissolved (mg/l as Na)
MW12-502 Sodium, Dissolved (mg/l as Na)
ADEC SeepageTriggers Limit Sodium, Dissolved (mg/l as Na)

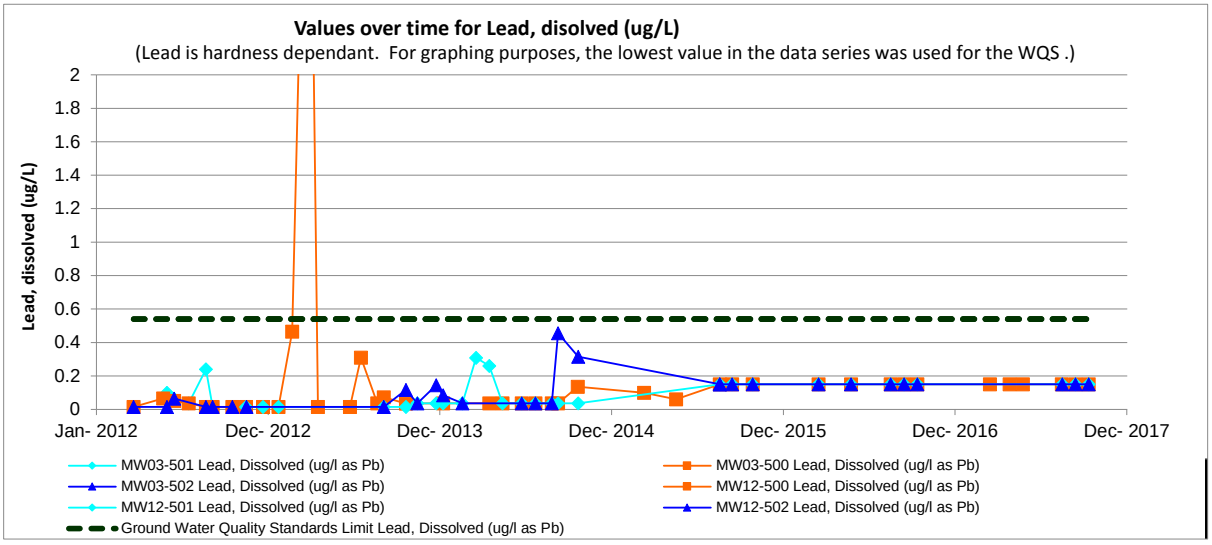

Values over time for Cadmium, dissolved (ug/L)
(Cadmium is hardness dependant. For graphing purposes, the lowest value in the data series was used for the WQS.)
Cadmium, dissolved (ug/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Cadmium, Dissolved (ug/l as Cd)
MW03-500 Cadmium, Dissolved (ug/l as Cd)
MW03-502 Cadmium, Dissolved (ug/l as Cd)
MW12-500 Cadmium, Dissolved (ug/l as Cd)
MW12-501 Cadmium, Dissolved (ug/l as Cd)
MW12-502 Cadmium, Dissolved (ug/l as Cd)
Ground Water Quality Standards Limit Cadmium, Dissolved (ug/l as Cd)

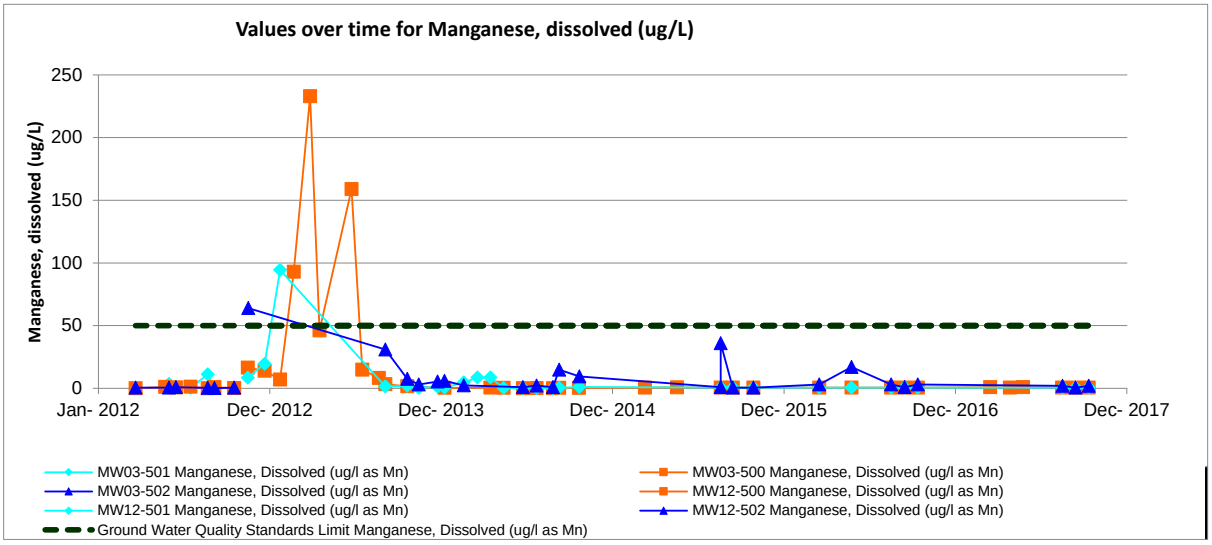

Values over time for Chromium, dissolved (ug/L)
Chromium, dissolved (ug/L)
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Chromium, Dissolved (ug/l as Cr)
MW03-500 Chromium, Dissolved (ug/l as Cr)
MW03-502 Chromium, Dissolved (ug/l as Cr)
MW12-500 Chromium, Dissolved (ug/l as Cr)
MW12-501 Chromium, Dissolved (ug/l as Cr)
Ground Water Quality Standards Limit Chromium, Dissolved (ug/l as Cr)
MW12-502 Chromium, Dissolved (ug/l as Cr)

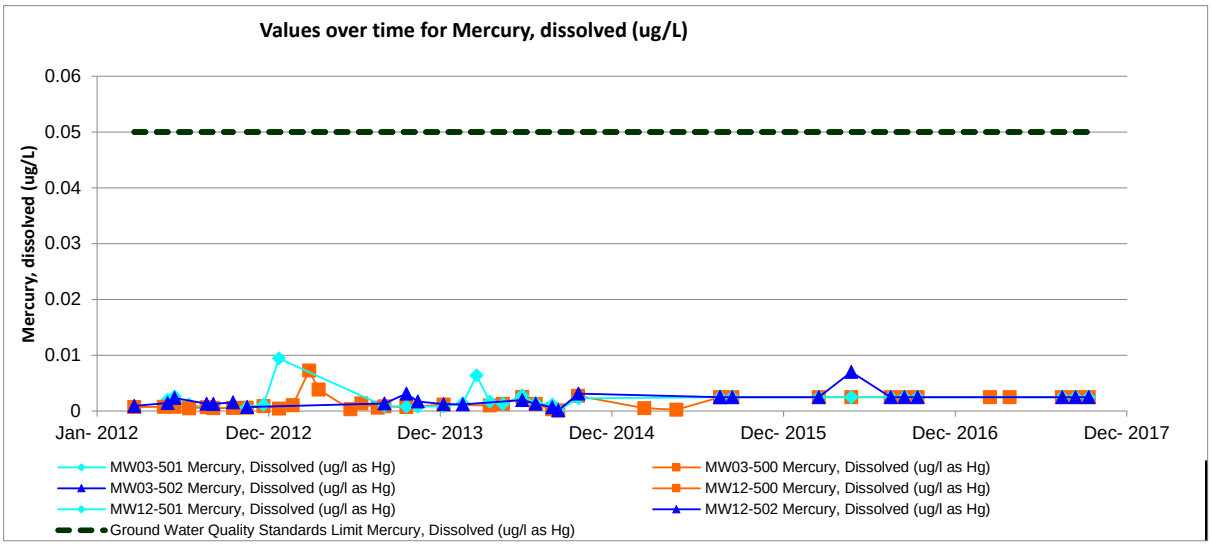

Values over time for Copper, dissolved (ug/L)
(Copper is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Copper, dissolved (ug/L)
10
9
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Copper, Dissolved (ug/l as Cu)
MW03-500 Copper, Dissolved (ug/l as Cu)
MW03-502 Copper, Dissolved (ug/l as Cu)
MW12-500 Copper, Dissolved (ug/l as Cu)
MW12-501 Copper, Dissolved (ug/l as Cu)
MW12-502 Copper, Dissolved (ug/l as Cu)
Ground Water Quality Standards Limit Copper, Dissolved (ug/l as Cu)

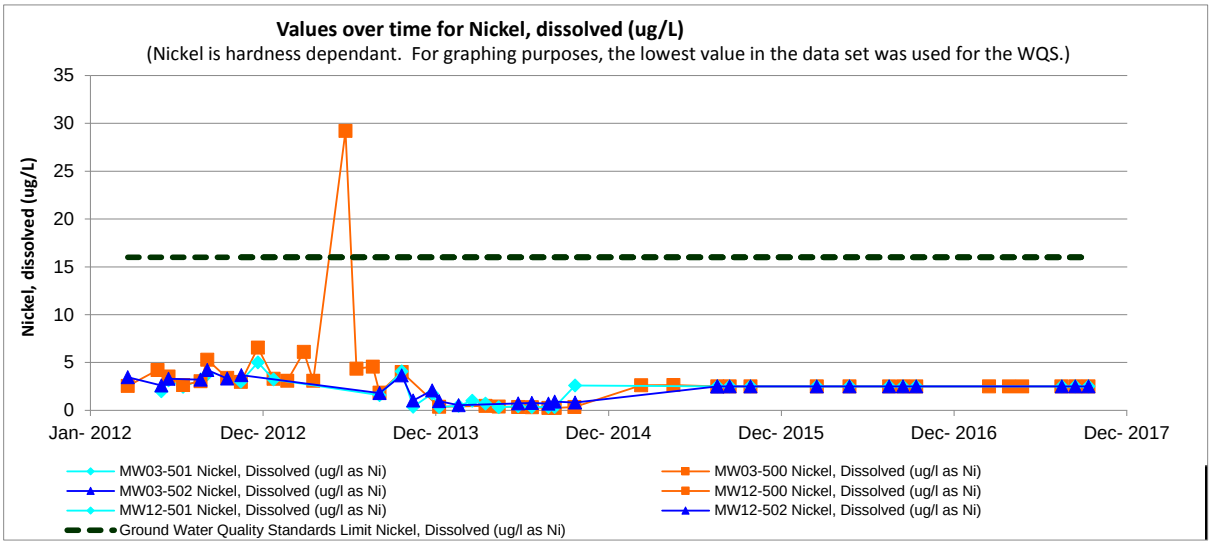

Values over time for Hardness (CaCO3) (mg/L)
Hardness (CaCO3) (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Hardness, Total (mg/l as CaCO3)
MW03-500 Hardness, Total (mg/l as CaCO3)
MW03-502 Hardness, Total (mg/l as CaCO3)
MW12-500 Hardness, Total (mg/l as CaCO3)
MW12-501 Hardness, Total (mg/l as CaCO3)
MW12-502 Hardness, Total (mg/l as CaCO3)

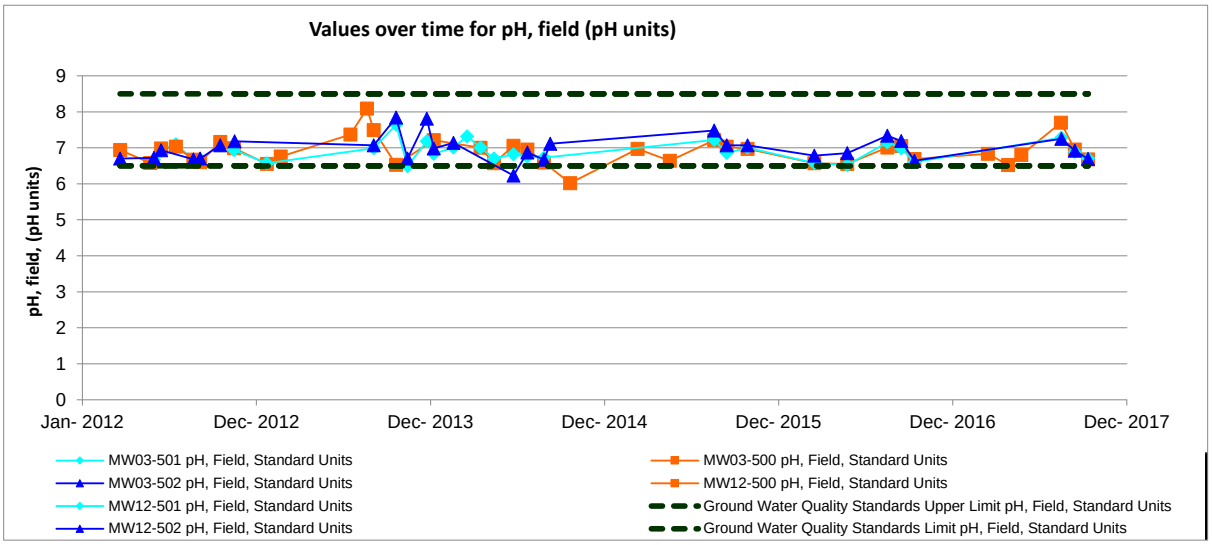

Values over time for Iron, dissolved (ug/L)
Iron, dissolved (ug/L)
8000
7000
6000
5000
4000
3000
2000
1000
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Iron, Dissolved (ug/l as Fe)
MW03-500 Iron, Dissolved (ug/l as Fe)
MW03-502 Iron, Dissolved (ug/l as Fe)
MW12-500 Iron, Dissolved (ug/l as Fe)
MW12-501 Iron, Dissolved (ug/l as Fe)
MW12-502 Iron, Dissolved (ug/l as Fe)
Ground Water Quality Standards Limit Iron, Dissolved (ug/l as Fe)

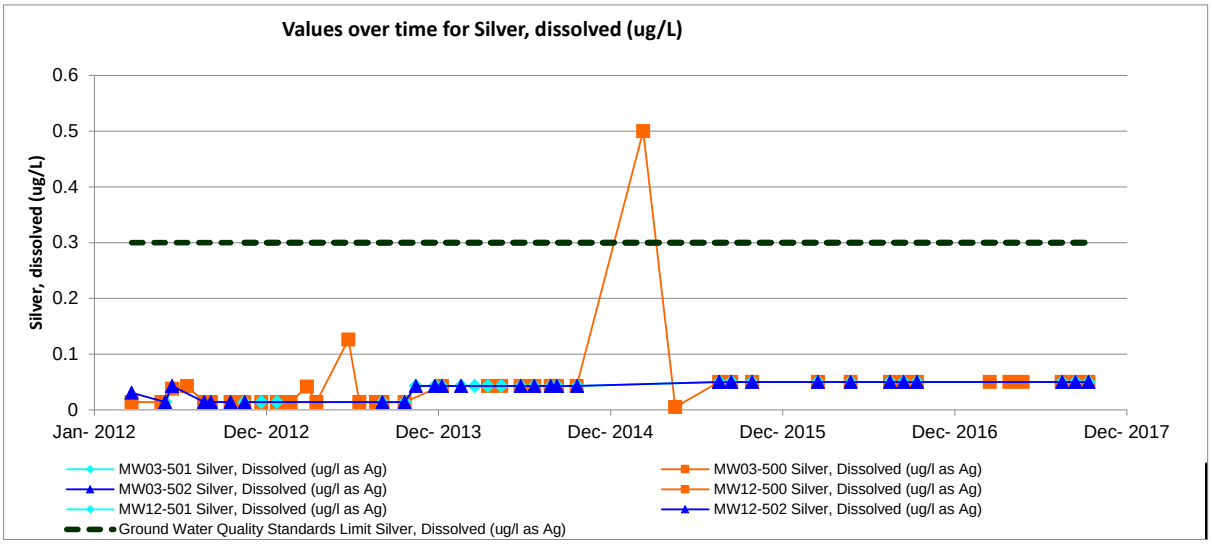

Values over time for Lead, disolved (ug/L)
(Lead is hardness dependant. For graphing purposes, the lowest value in the data series was used for the WQS .)
Lead, dissolved (ug/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Lead, Dissolved (ug/l as Pb)
MW03-500 Lead, Dissolved (ug/l as Pb)
MW03-502 Lead, Dissolved (ug/l as Pb)
MW12-500 Lead, Dissolved (ug/l as Pb)
MW12-501 Lead, Dissolved (ug/l as Pb)
MW12-502 Lead, Dissolved (ug/l as Pb)
Ground Water Quality Standards Limit Lead, Dissolved (ug/l as Pb)

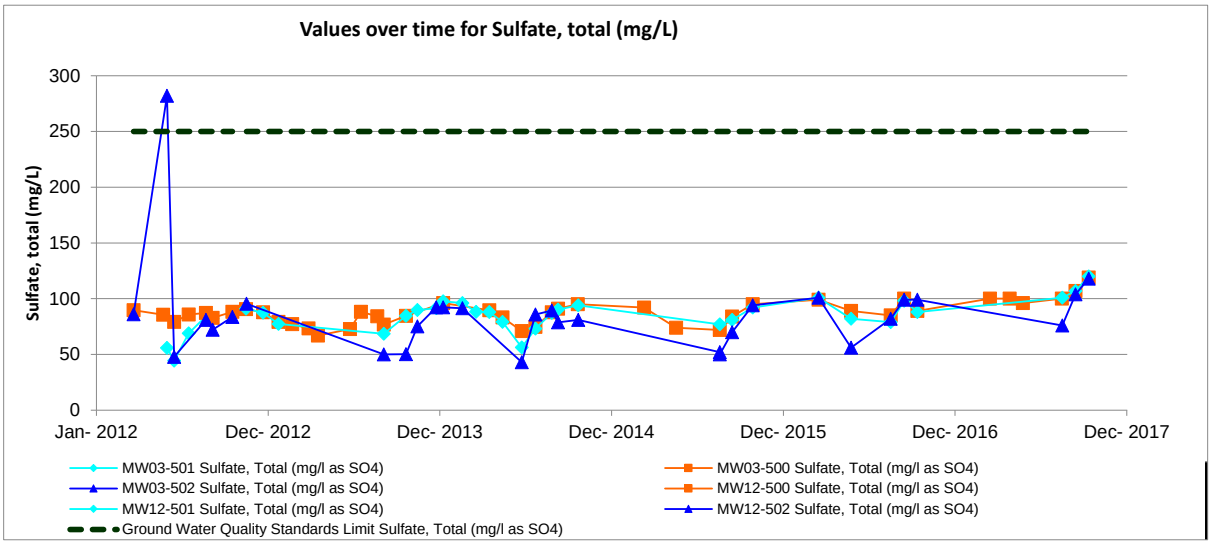

Values over time for Manganese, dissolved (ug/L)
Manganese, dissolved (ug/L)
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Manganese, Dissolved (ug/l as Mn)
MW03-500 Manganese, Dissolved (ug/l as Mn)
MW03-502 Manganese, Dissolved (ug/l as Mn)
MW12-500 Manganese, Dissolved (ug/l as Mn)
MW12-501 Manganese, Dissolved (ug/l as Mn)
MW12-502 Manganese, Dissolved (ug/l as Mn)
Ground Water Quality Standards Limit Manganese, Dissolved (ug/l as Mn)

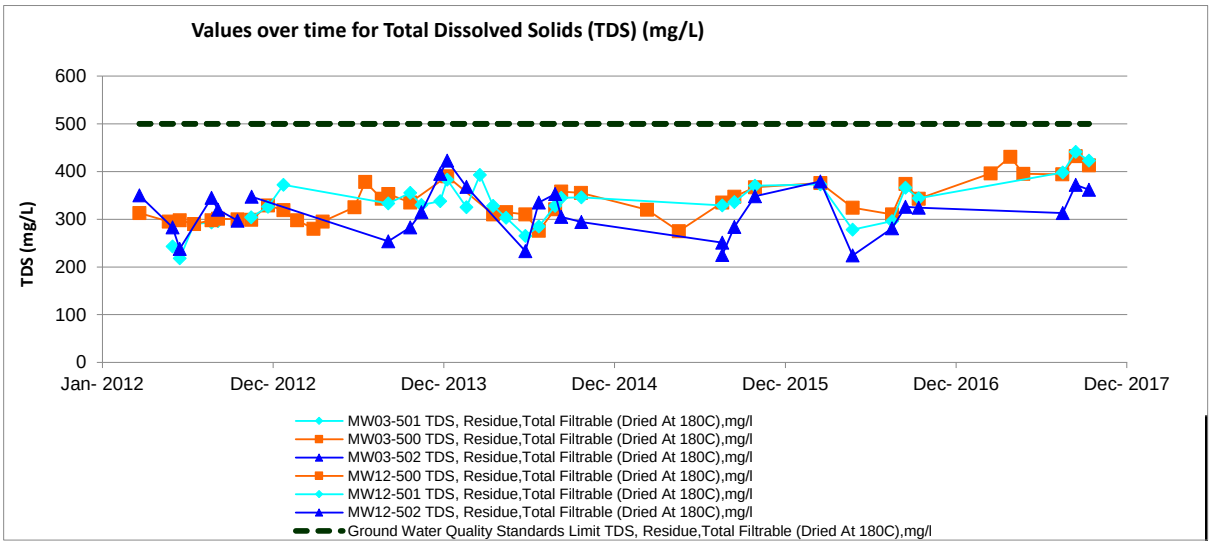

Values over time for Mercury, dissolved (ug/L)
Mercury, dissolved (ug/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Mercury, Dissolved (ug/l as Hg)
MW03-500 Mercury, Dissolved (ug/l as Hg)
MW03-502 Mercury, Dissolved (ug/l as Hg)
MW12-500 Mercury, Dissolved (ug/l as Hg)
MW12-501 Mercury, Dissolved (ug/l as Hg)
MW12-502 Mercury, Dissolved (ug/l as Hg)
Ground Water Quality Standards Limit Mercury, Dissolved (ug/l as Hg)

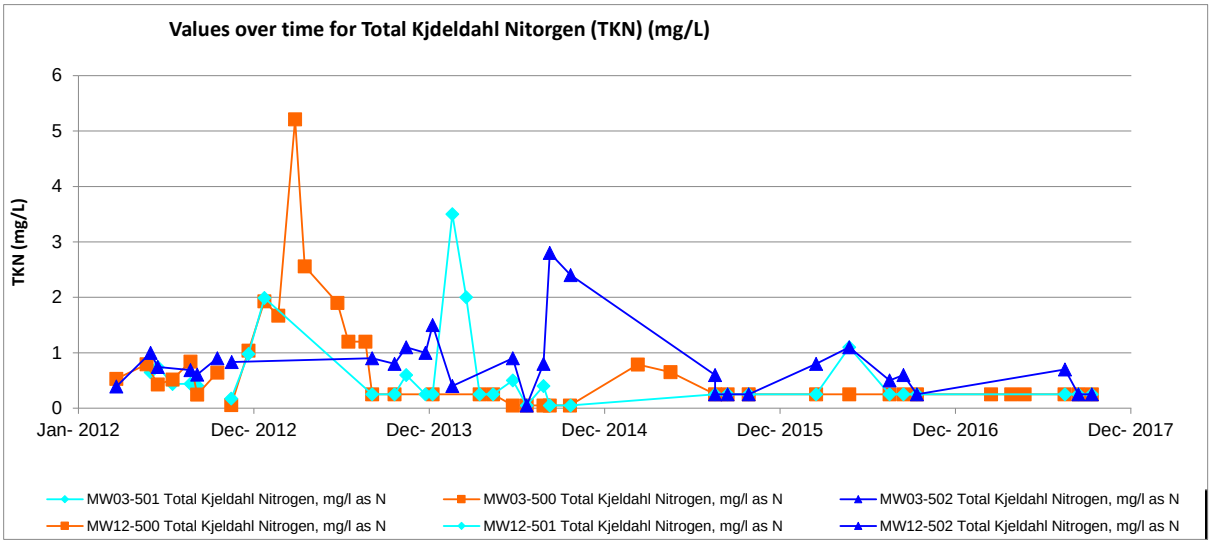

Values over time for Nickel, dissolved (ug/L)
(Nickel is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Nickel, dissolved (ug/L)
35
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Nickel, Dissolved (ug/l as Ni)
MW03-500 Nickel, Dissolved (ug/l as Ni)
MW03-502 Nickel, Dissolved (ug/l as Ni)
MW12-500 Nickel, Dissolved (ug/l as Ni)
MW12-501 Nickel, Dissolved (ug/l as Ni)
MW12-502 Nickel, Dissolved (ug/l as Ni)
Ground Water Quality Standards Limit Nickel, Dissolved (ug/l as Ni)

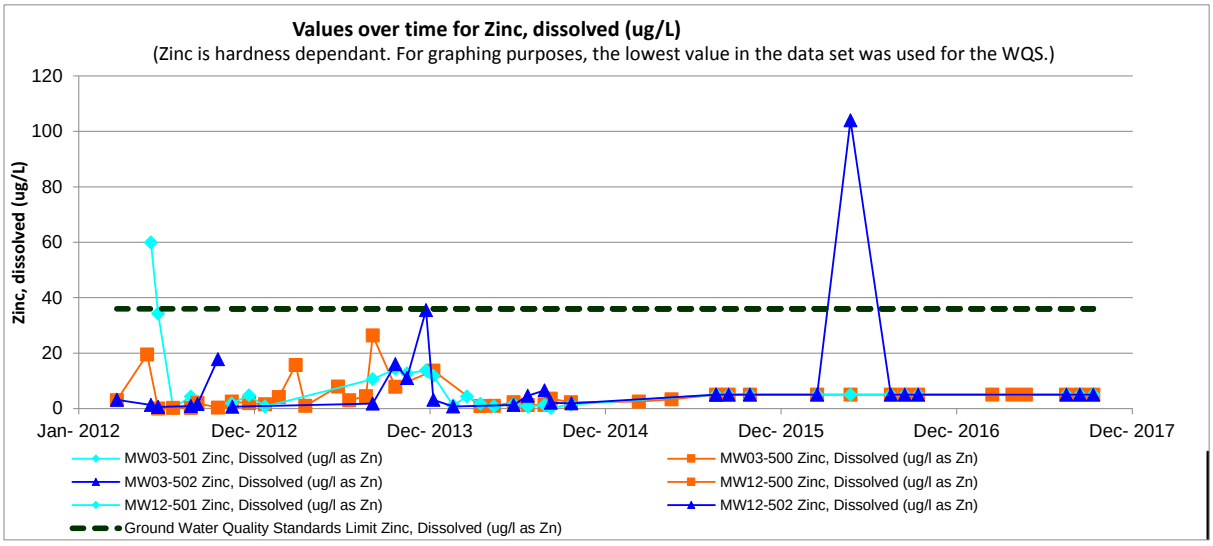

Values over time for pH, field (pH units)
pH, field, (pH units)
9
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 pH, Field, Standard Units
MW03-500 pH, Field, Standard Units
MW03-502 pH, Field, Standard Units
MW12-500 pH, Field, Standard Units
MW12-501 pH, Field, Standard Units
Ground Water Quality Standards Upper Limit pH, Field, Standard Units
MW12-502 pH, Field, Standard Units
Ground Water Quality Standards Limit pH, Field, Standard Units

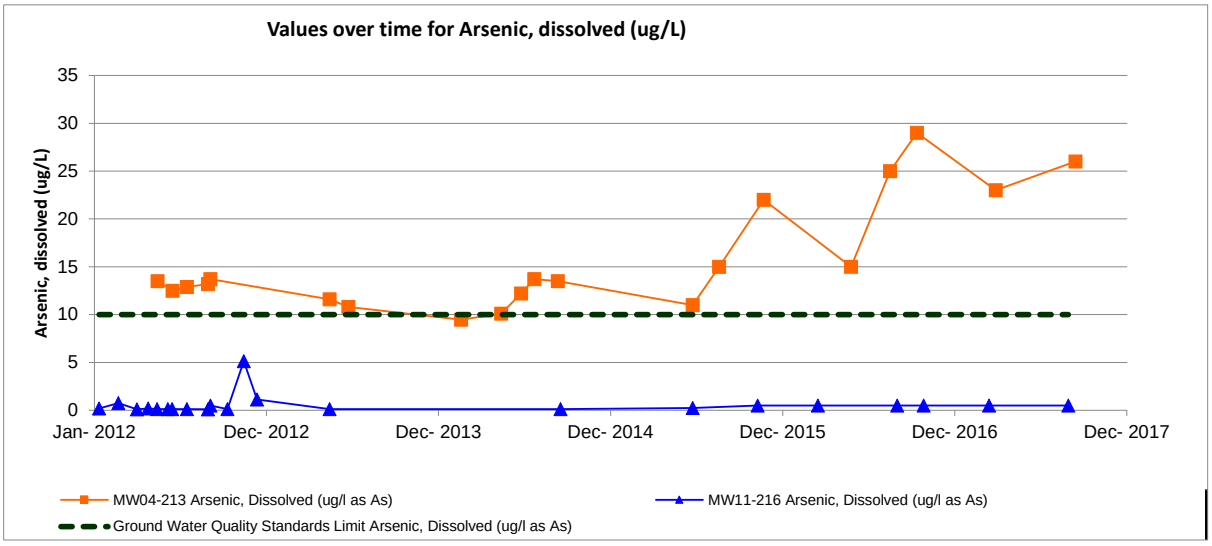

Values over time for Silver, dissolved (ug/L)
Silver, dissolved (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Silver, Dissolved (ug/l as Ag)
MW03-500 Silver, Dissolved (ug/l as Ag)
MW03-502 Silver, Dissolved (ug/l as Ag)
MW12-500 Silver, Dissolved (ug/l as Ag)
MW12-501 Silver, Dissolved (ug/l as Ag)
MW12-502 Silver, Dissolved (ug/l as Ag)
Ground Water Quality Standards Limit Silver, Dissolved (ug/l as Ag)

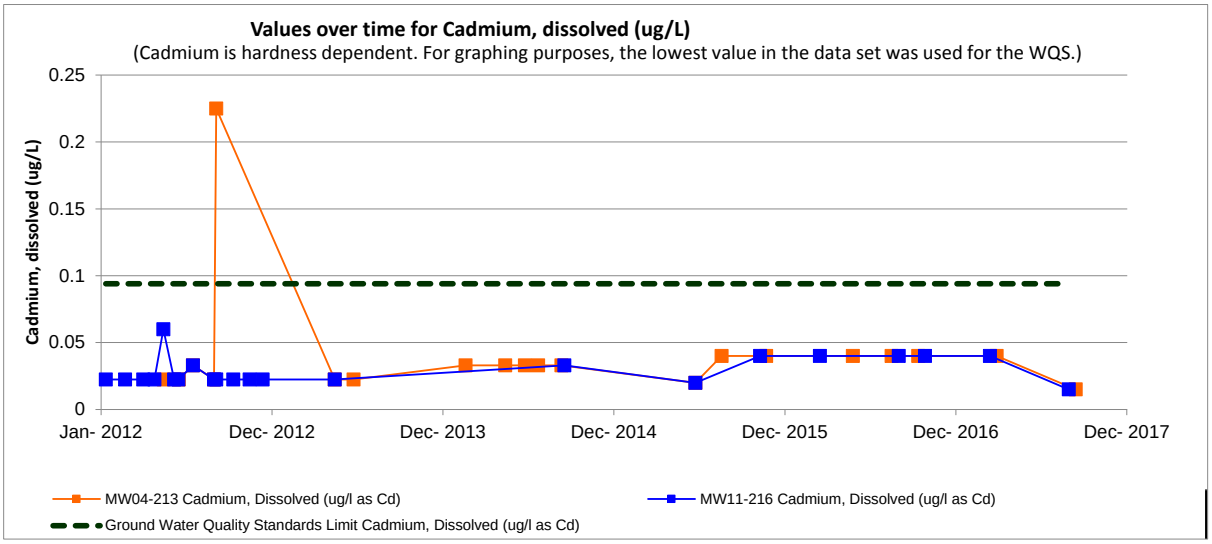

Values over time for Sulfate, total (mg/L)
Sulfate, total (mg/L)
300
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Sulfate, Total (mg/l as SO4)
MW03-500 Sulfate, Total (mg/l as SO4)
MW03-502 Sulfate, Total (mg/l as SO4)
MW12-500 Sulfate, Total (mg/l as SO4)
MW12-501 Sulfate, Total (mg/l as SO4)
MW12-502 Sulfate, Total (mg/l as SO4)
Ground Water Quality Standards Limit Sulfate, Total (mg/l as SO4)

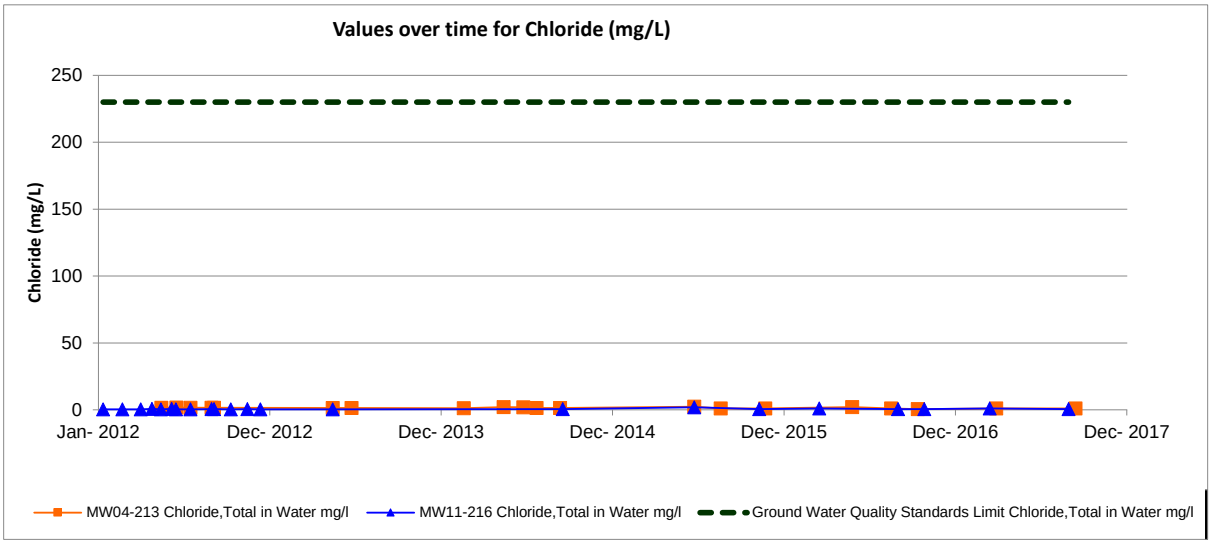

Values over time for Total Dissolved Solids (TDS) (mg/L)
TDS (mg/L)
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
MW03-500 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
MW03-502 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
MW12-500 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
MW12-501 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
MW12-502 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
Ground Water Quality Standards Limit TDS, Residue,Total Filtrable (Dried At 180C),mg/l

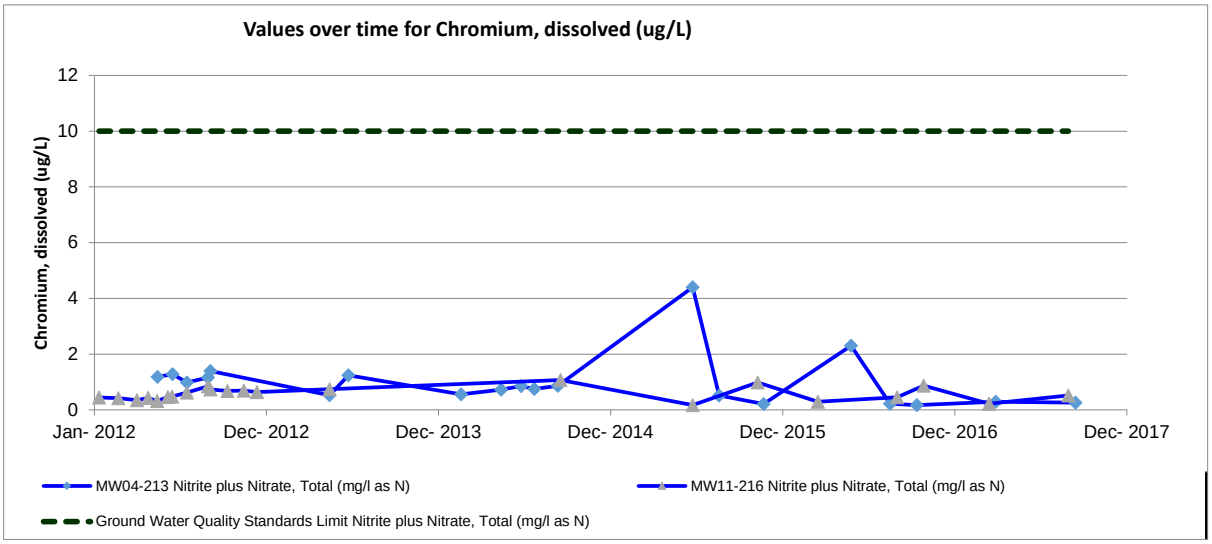

Values over time for Total Kjdeldahl Nitorgen (TKN) (mg/L)
TKN (mg/L)
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Total Kjeldahl Nitrogen, mg/l as N
MW03-500 Total Kjeldahl Nitrogen, mg/l as N
MW03-502 Total Kjeldahl Nitrogen, mg/l as N
MW12-500 Total Kjeldahl Nitrogen, mg/l as N
MW12-501 Total Kjeldahl Nitrogen, mg/l as N
MW12-502 Total Kjeldahl Nitrogen, mg/l as N

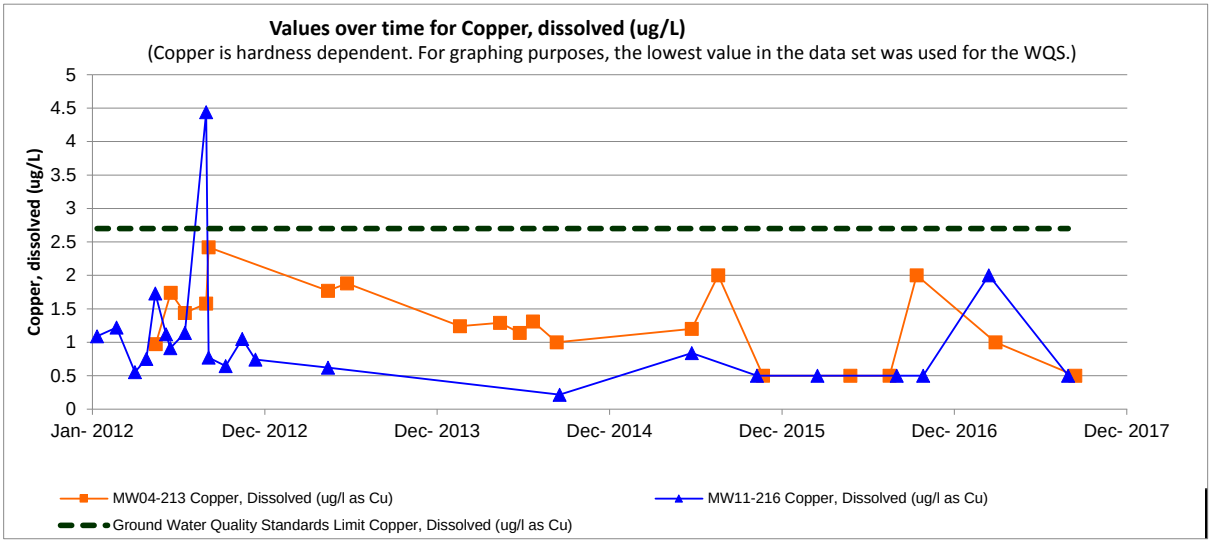

Values over time for Zinc, dissolved (ug/L)
(Zinc is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Zinc, dissolved (ug/L)
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW03-501 Zinc, Dissolved (ug/l as Zn)
MW03-500 Zinc, Dissolved (ug/l as Zn)
MW03-502 Zinc, Dissolved (ug/l as Zn)
MW12-500 Zinc, Dissolved (ug/l as Zn)
MW12-501 Zinc, Dissolved (ug/l as Zn)
MW12-502 Zinc, Dissolved (ug/l as Zn)
Ground Water Quality Standards Limit Zinc, Dissolved (ug/l as Zn)

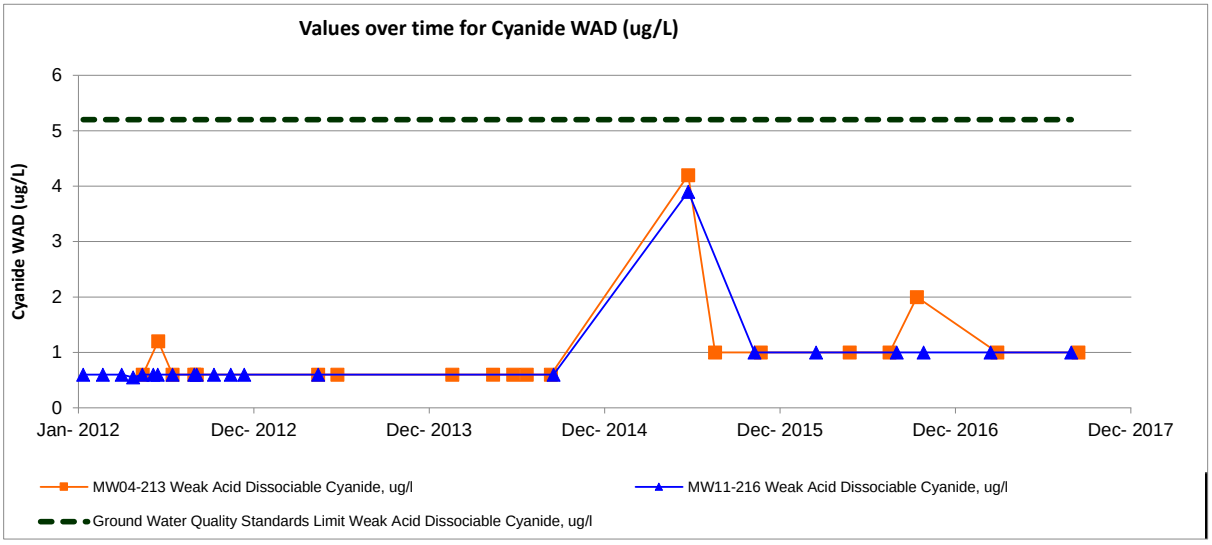

Values over time for Arsenic, dissolved (ug/L)
Arsenic, dissolved (ug/L)
35
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Arsenic, Dissolved (ug/l as As)
MW11-216 Arsenic, Dissolved (ug/l as As)
Ground Water Quality Standards Limit Arsenic, Dissolved (ug/l as As)

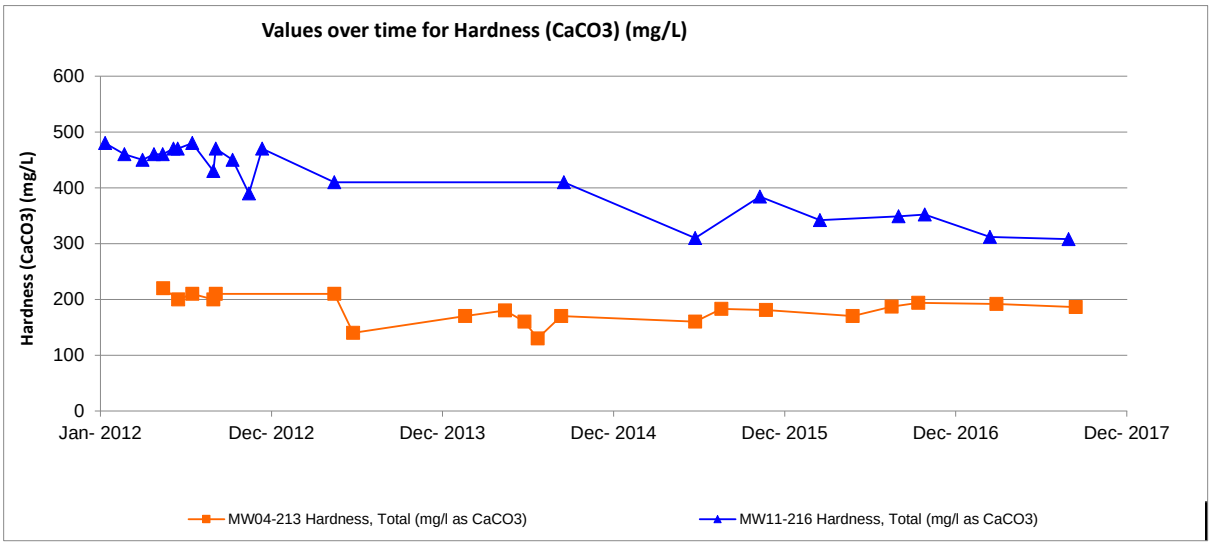

Values over time for Cadmium, dissolved (ug/L)
(Cadmium is hardness dependent. For graphing purposes, the lowest value in the data set was used for the WQS.)
Cadmium, dissolved (ug/L)
0.25
0.2
0.15
0.1
0.05
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Cadmium, Dissolved (ug/l as Cd)
MW11-216 Cadmium, Dissolved (ug/l as Cd)
Ground Water Quality Standards Limit Cadmium, Dissolved (ug/l as Cd)

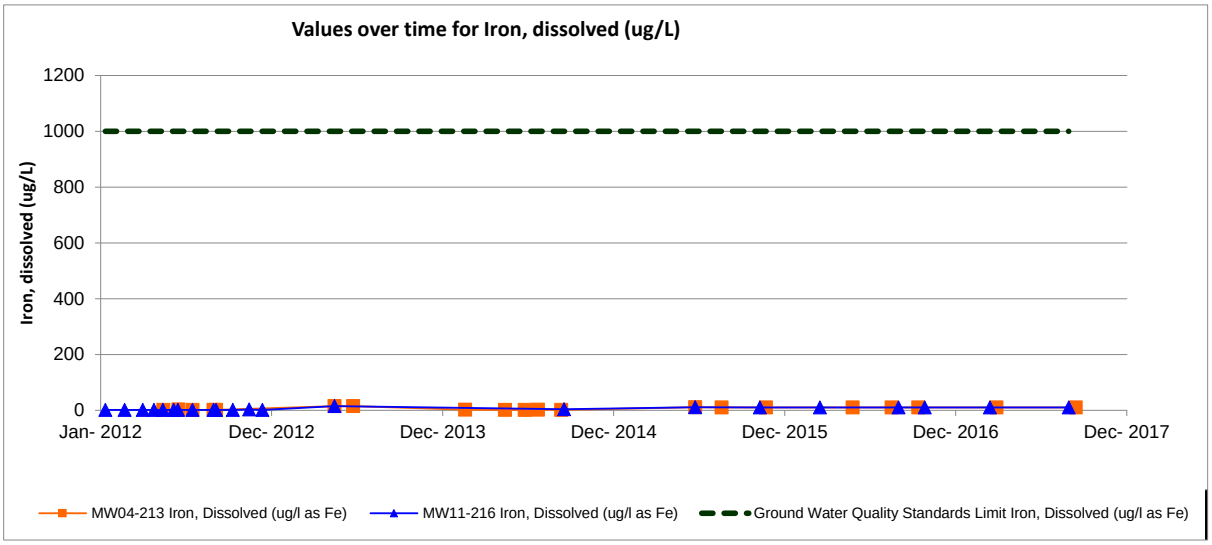

Values over time for Chloride (mg/L)
Chloride (mg/L)
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Chloride,Total in Water mg/l
MW11-216 Chloride,Total in Water mg/l
Ground Water Quality Standards Limit Chloride,Total in Water mg/l

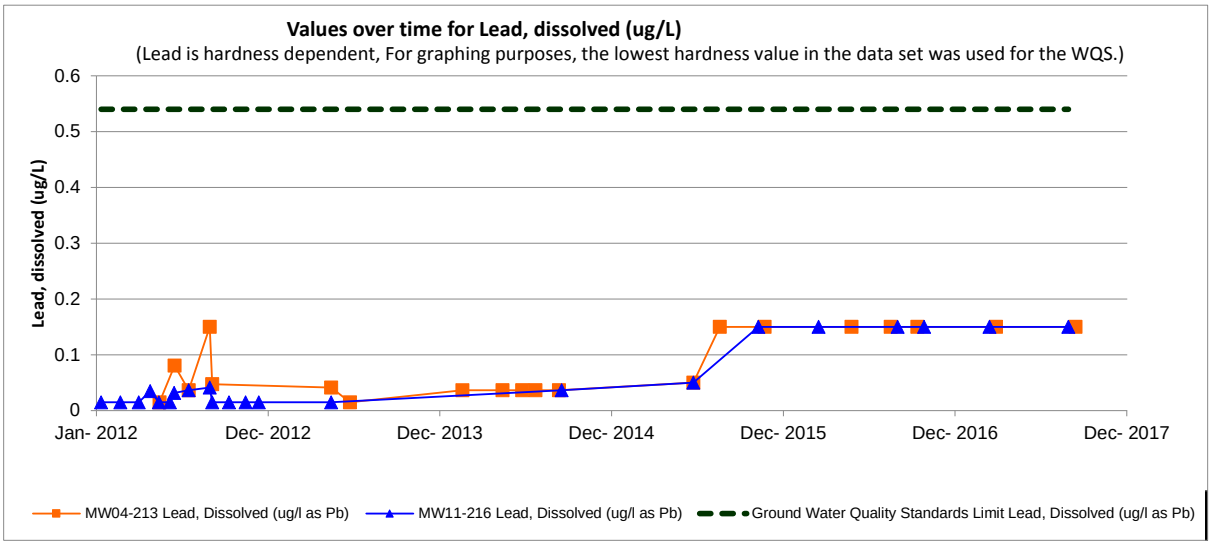

Values over time for Chromium, dissolved (ug/L)
Chromium, dissolved (ug/L)
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Nitrite plus Nitrate, Total (mg/l as N)
MW11-216 Nitrite plus Nitrate, Total (mg/l as N)
Ground Water Quality Standards Limit Nitrite plus Nitrate, Total (mg/l as N)

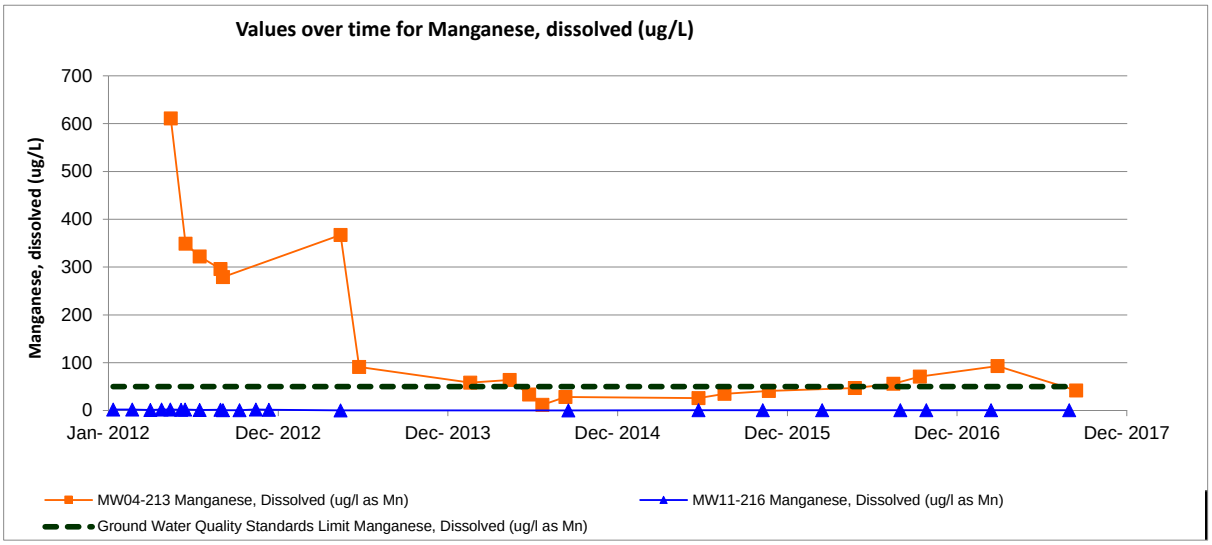

Values over time for Copper, dissolved (ug/L)
(Copper is hardness dependent. For graphing purposes, the lowest value in the data set was used for the WQS.)
Copper, dissolved (ug/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Copper, Dissolved (ug/l as Cu)
MW11-216 Copper, Dissolved (ug/l as Cu)
Ground Water Quality Standards Limit Copper, Dissolved (ug/l as Cu)

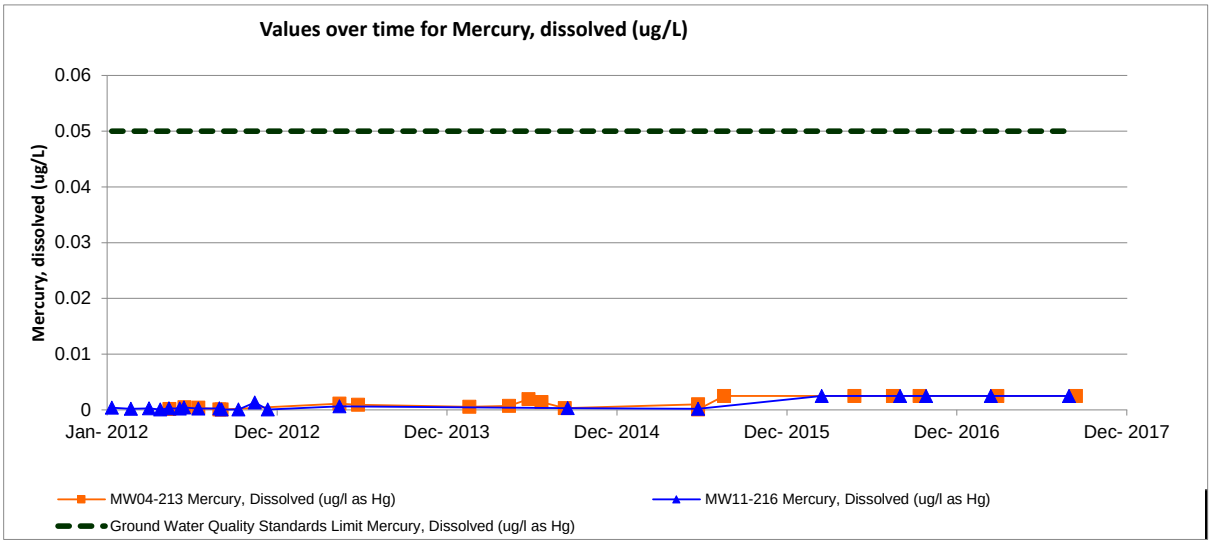

Values over time for Cyanide WAD (ug/L)
Cyanide WAD (ug/L)
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Weak Acid Dissociable Cyanide, ug/l
MW11-216 Weak Acid Dissociable Cyanide, ug/l
Ground Water Quality Standards Limit Weak Acid Dissociable Cyanide, ug/l

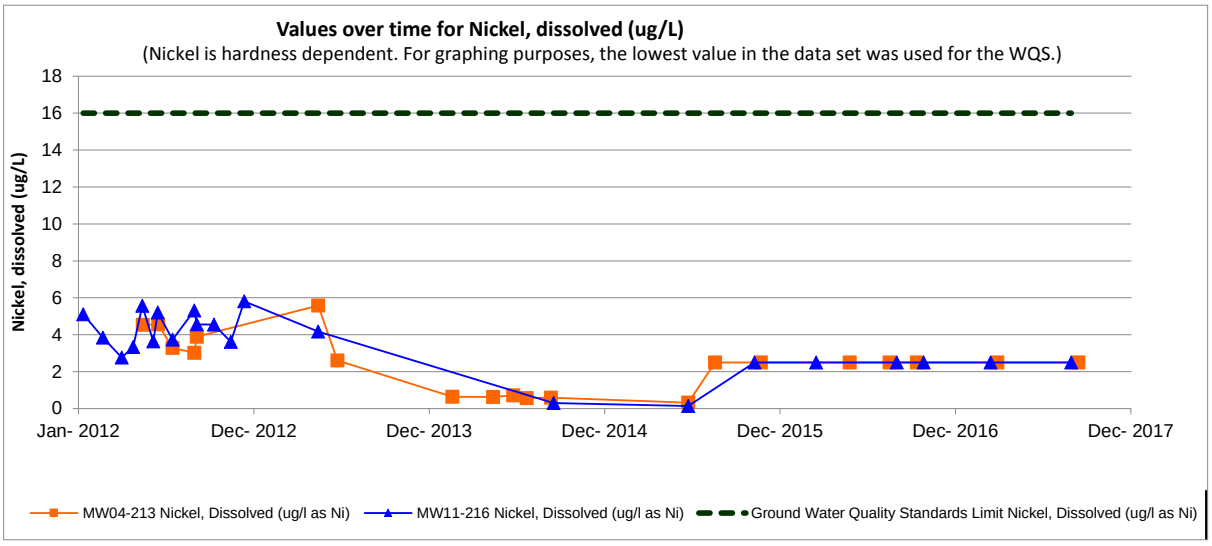

Values over time for Hardness (CaCO3) (mg/L)
Hardness (CaCO3) (mg/L)
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Hardness, Total (mg/l as CaCO3)
MW11-216 Hardness, Total (mg/l as CaCO3)

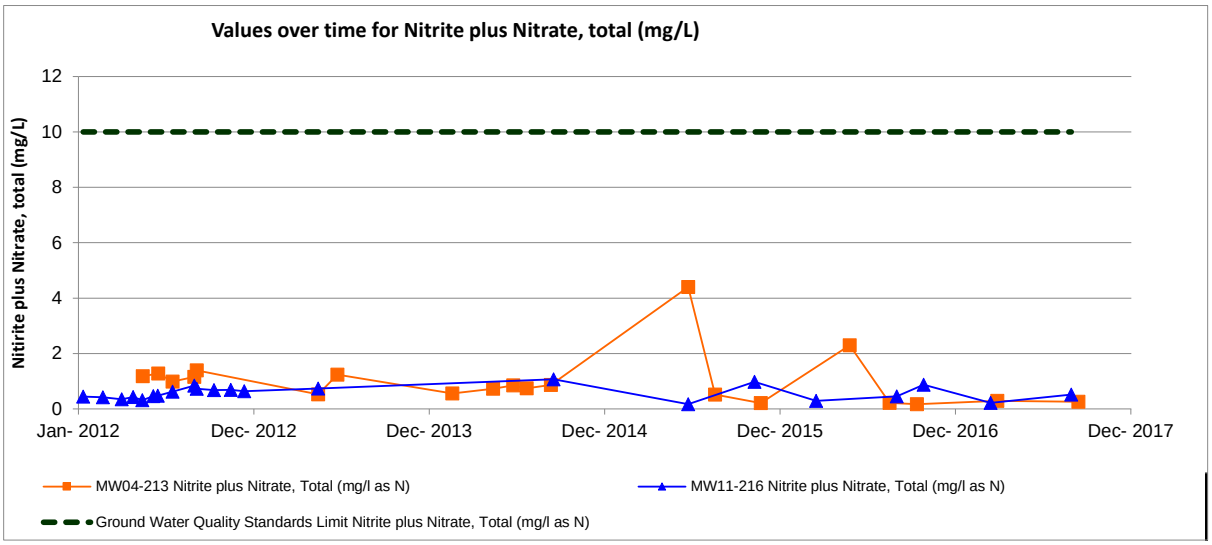

Values over time for Iron, dissolved (ug/L)
Iron, dissolved (ug/L)
1200
1000
800
600
400
200
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Iron, Dissolved (ug/l as Fe)
MW11-216 Iron, Dissolved (ug/l as Fe)
Ground Water Quality Standards Limit Iron, Dissolved (ug/l as Fe)

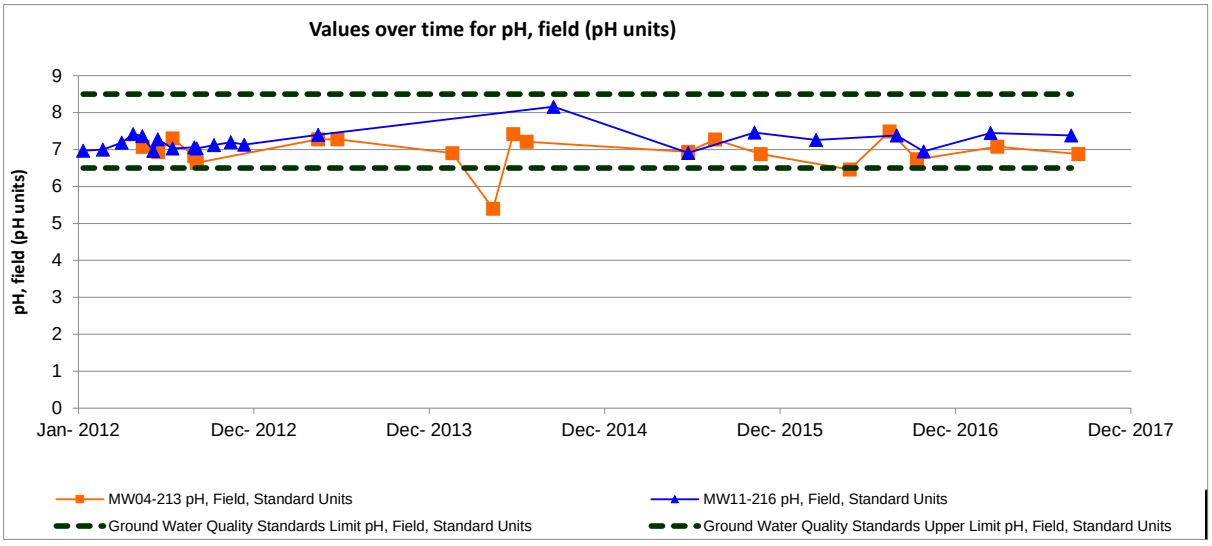

Values over time for Lead, dissolved (ug/L)
(Lead is hardness dependent, For graphing purposes, the lowest hardness value in the data set was used for the WQS.)
Lead, dissolved (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Lead, Dissolved (ug/l as Pb)
MW11-216 Lead, Dissolved (ug/l as Pb)
Ground Water Quality Standards Limit Lead, Dissolved (ug/l as Pb)

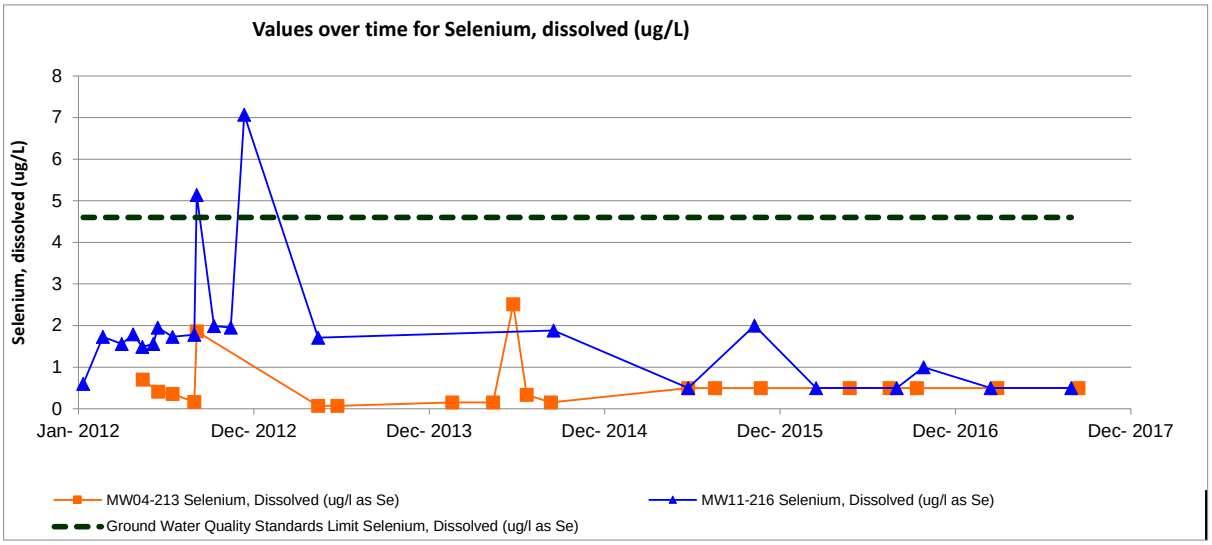

Values over time for Manganese, dissolved (ug/L)
Manganese, dissolved (ug/L)
700
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Manganese, Dissolved (ug/l as Mn)
MW11-216 Manganese, Dissolved (ug/l as Mn)
Ground Water Quality Standards Limit Manganese, Dissolved (ug/l as Mn)

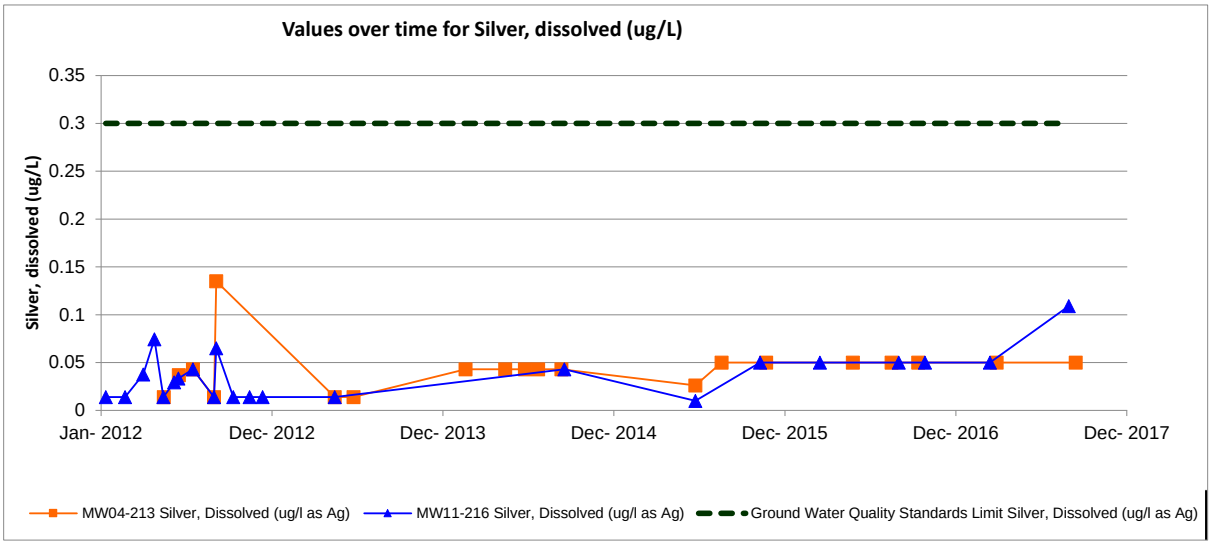

Values over time for Mercury, dissolved (ug/L)
Mercury, dissolved (ug/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Mercury, Dissolved (ug/l as Hg)
MW11-216 Mercury, Dissolved (ug/l as Hg)
Ground Water Quality Standards Limit Mercury, Dissolved (ug/l as Hg)

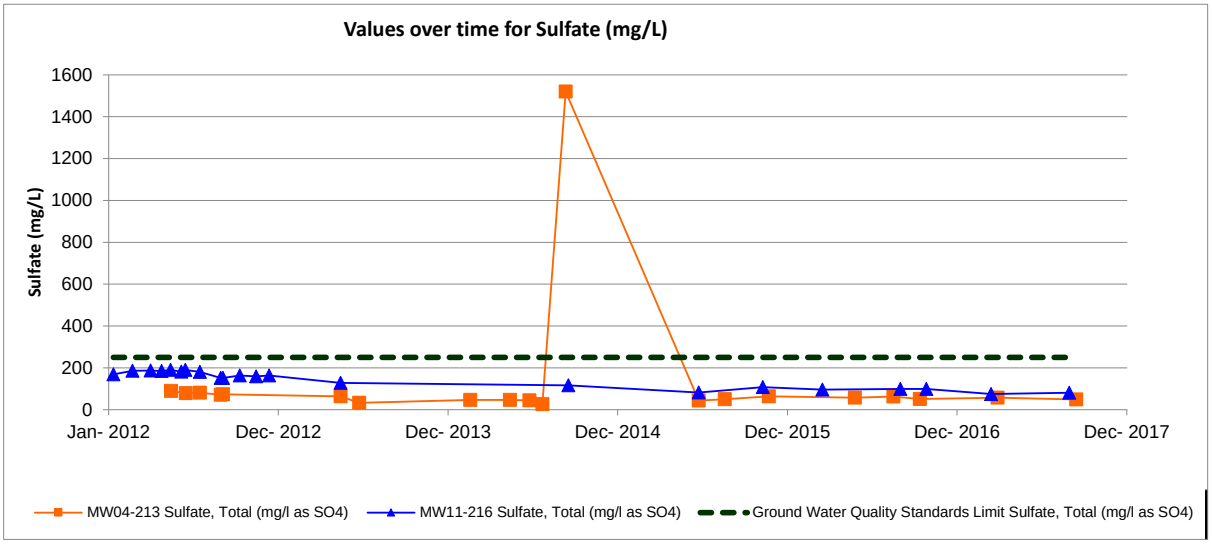

Values over time for Nickel, dissolved (ug/L)
(Nickel is hardness dependent. For graphing purposes, the lowest value in the data set was used for the WQS.)
Nickel, dissolved (ug/L)
18
16
14
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Nickel, Dissolved (ug/l as Ni)
MW11-216 Nickel, Dissolved (ug/l as Ni)
Ground Water Quality Standards Limit Nickel, Dissolved (ug/l as Ni)

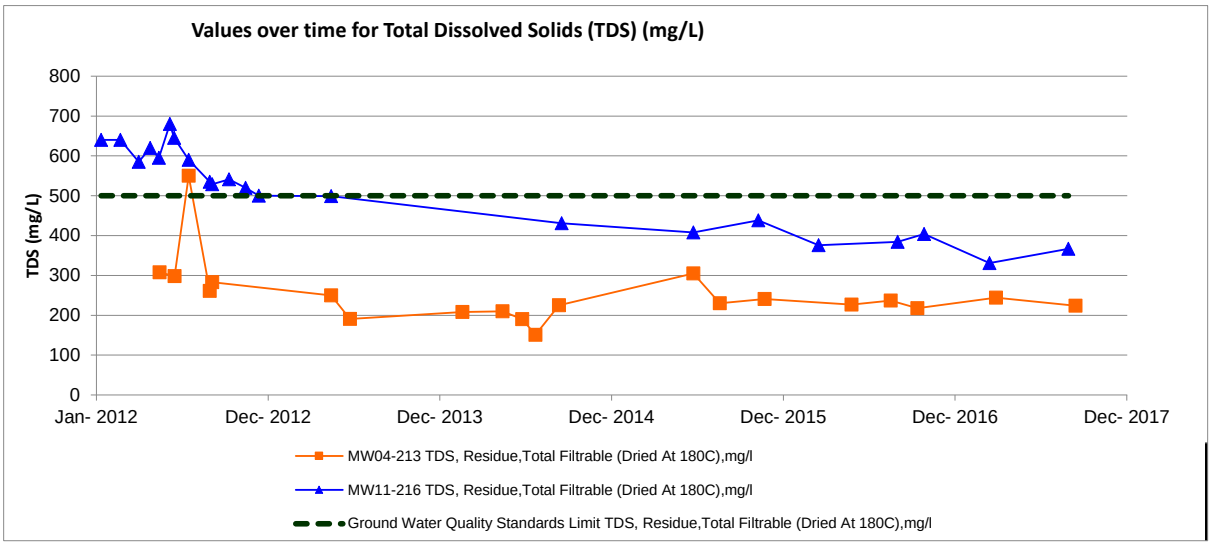

Values over time for Nitrite plus Nitrate, total (mg/L)
Nitirite plus Nitrate, total (mg/L)
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Nitrite plus Nitrate, Total (mg/l as N)
MW11-216 Nitrite plus Nitrate, Total (mg/l as N)
Ground Water Quality Standards Limit Nitrite plus Nitrate, Total (mg/l as N)

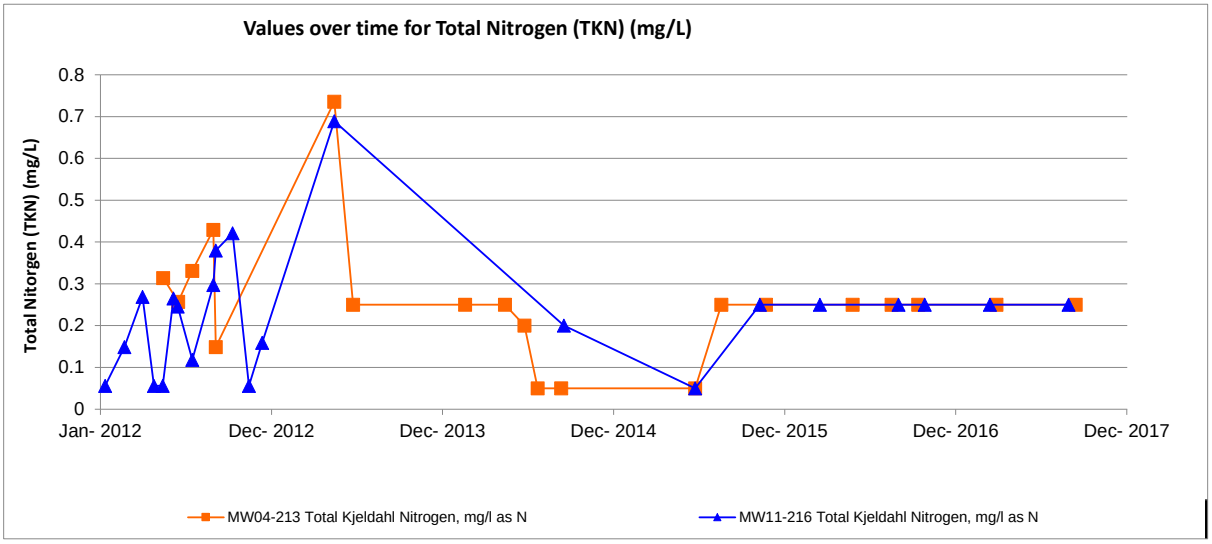

Values over time for pH, field (pH units)
pH, field (pH units)
9
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 pH, Field, Standard Units
MW11-216 pH, Field, Standard Units
Ground Water Quality Standards Limit pH, Field, Standard Units
Ground Water Quality Standards Upper Limit pH, Field, Standard Units

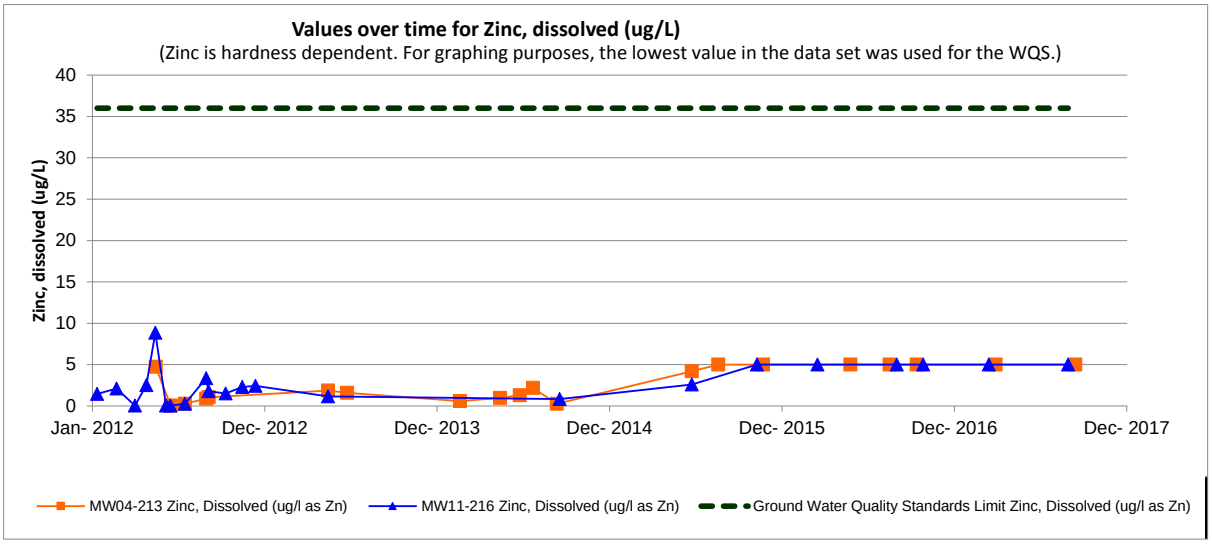

Values over time for Selenium, dissolved (ug/L)
Selenium, dissolved (ug/L)
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Selenium, Dissolved (ug/l as Se)
MW11-216 Selenium, Dissolved (ug/l as Se)
Ground Water Quality Standards Limit Selenium, Dissolved (ug/l as Se)

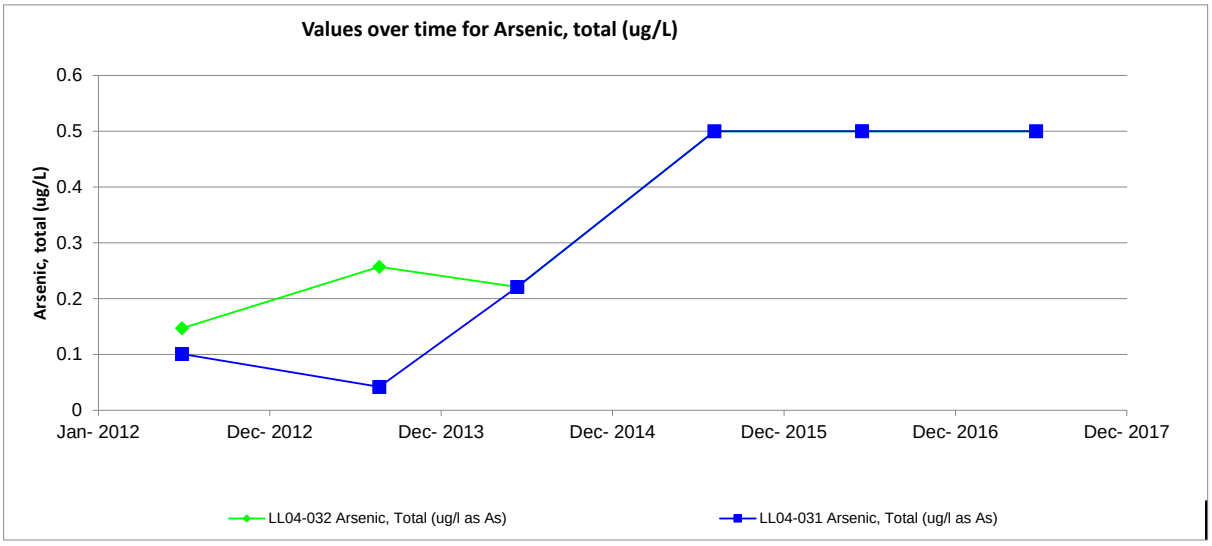

Values over time for Silver, dissolved (ug/L)
Silver, dissolved (ug/L)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Silver, Dissolved (ug/l as Ag)
MW11-216 Silver, Dissolved (ug/l as Ag)
Ground Water Quality Standards Limit Silver, Dissolved (ug/l as Ag)

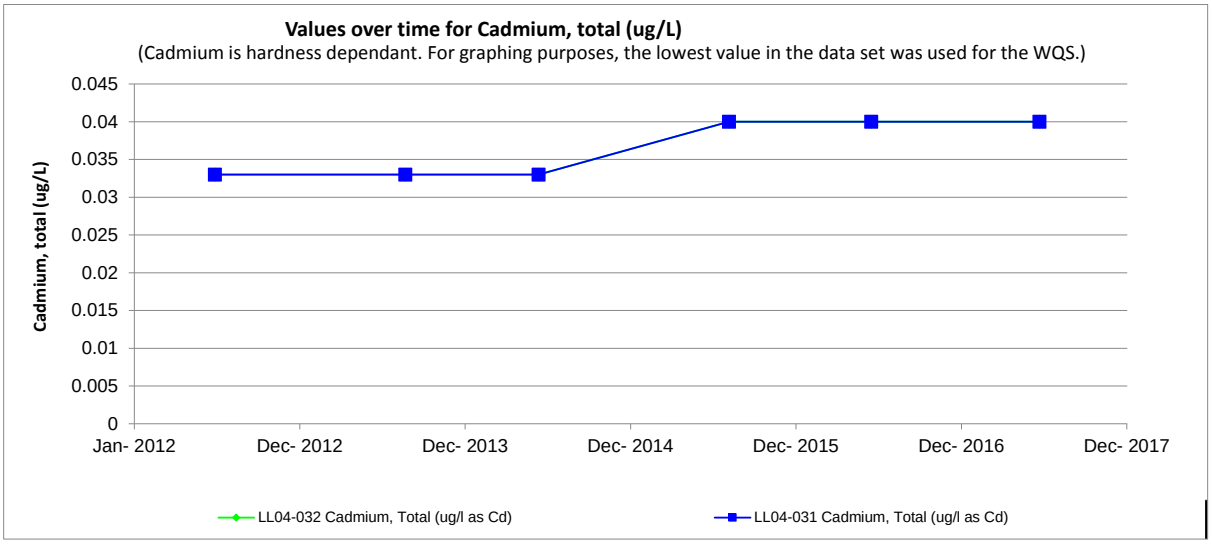

Values over time for Sulfate (mg/L)
Sulfate (mg/L)
1600
1400
1200
1000
800
600
400
200
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Sulfate, Total (mg/l as SO4)
MW11-216 Sulfate, Total (mg/l as SO4)
Ground Water Quality Standards Limit Sulfate, Total (mg/l as SO4)

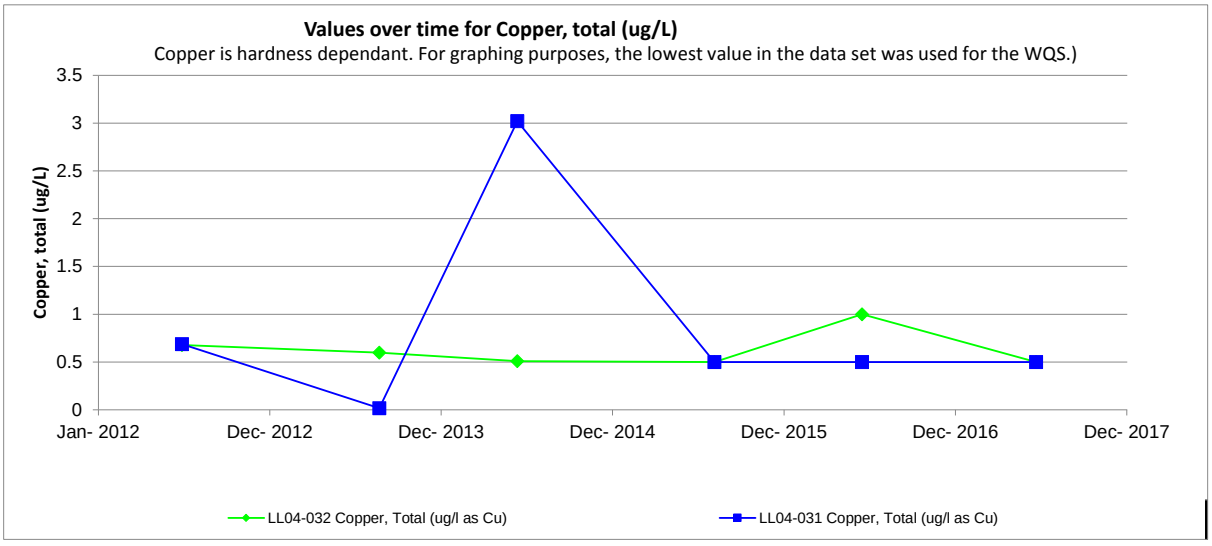

Values over time for Total Dissolved Solids (TDS) (mg/L)
TDS (mg/L)
800
700
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
MW11-216 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
Ground Water Quality Standards Limit TDS, Residue,Total Filtrable (Dried At 180C),mg/l

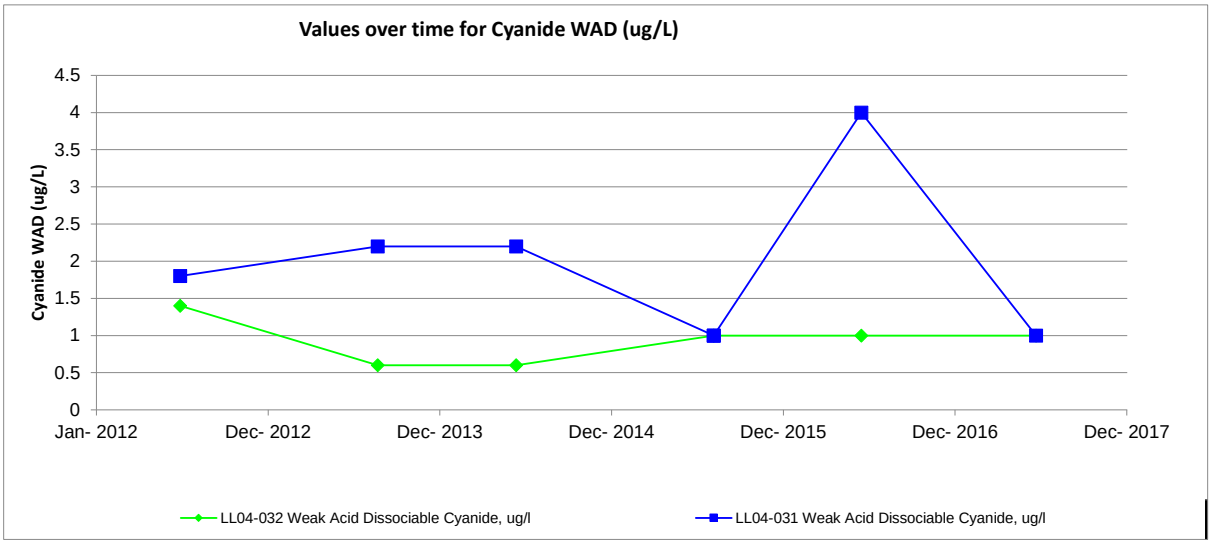

Values over time for Total Nitrogen (TKN) (mg/L)
Total Nitorgen (TKN) (mg/L)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Total Kjeldahl Nitrogen, mg/l as N
MW11-216 Total Kjeldahl Nitrogen, mg/l as N

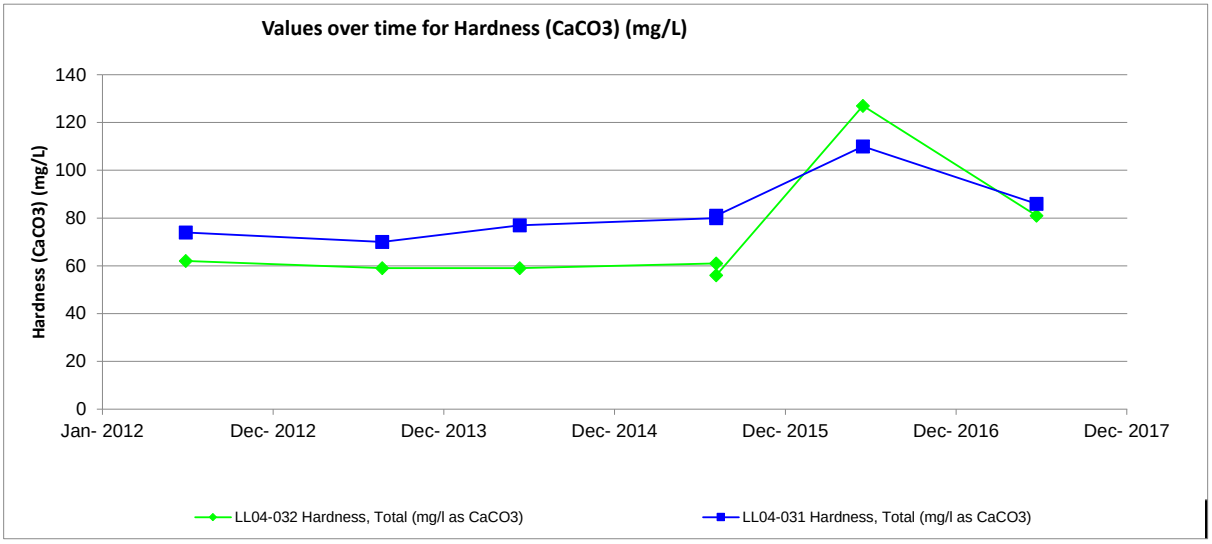

Values over time for Zinc, dissolved (ug/L)
(Zinc is hardness dependent. For graphing purposes, the lowest value in the data set was used for the WQS.)
Zinc, dissolved (ug/L)
40
35
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
MW04-213 Zinc, Dissolved (ug/l as Zn)
MW11-216 Zinc, Dissolved (ug/l as Zn)
Ground Water Quality Standards Limit Zinc, Dissolved (ug/l as Zn)

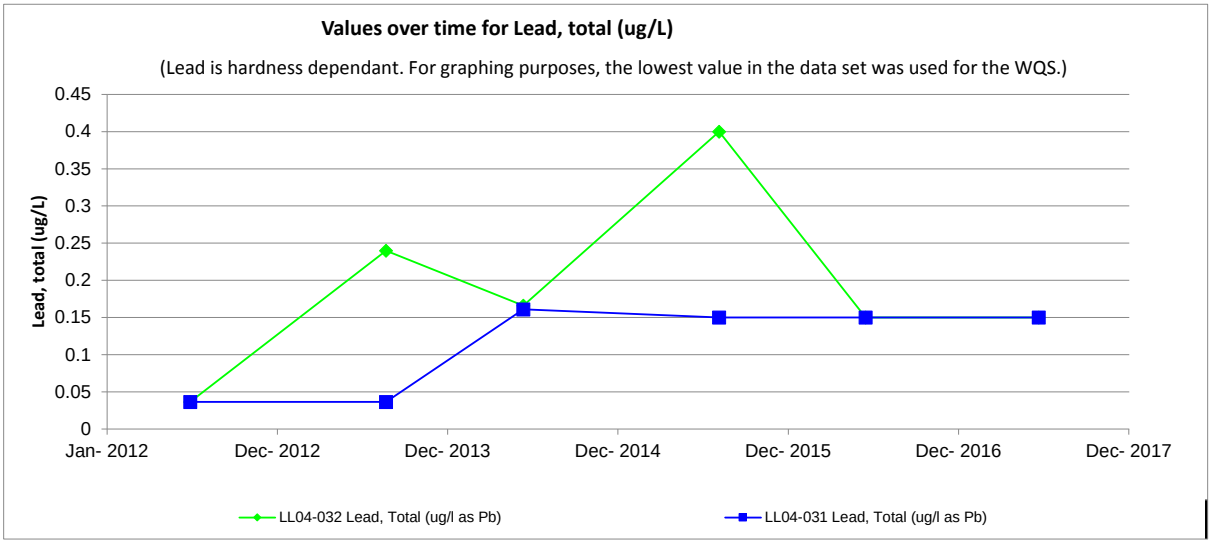

Values over time for Arsenic, total (ug/L)
Arsenic, total (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 Arsenic, Total (ug/l as As)
LL04-031 Arsenic, Total (ug/l as As)

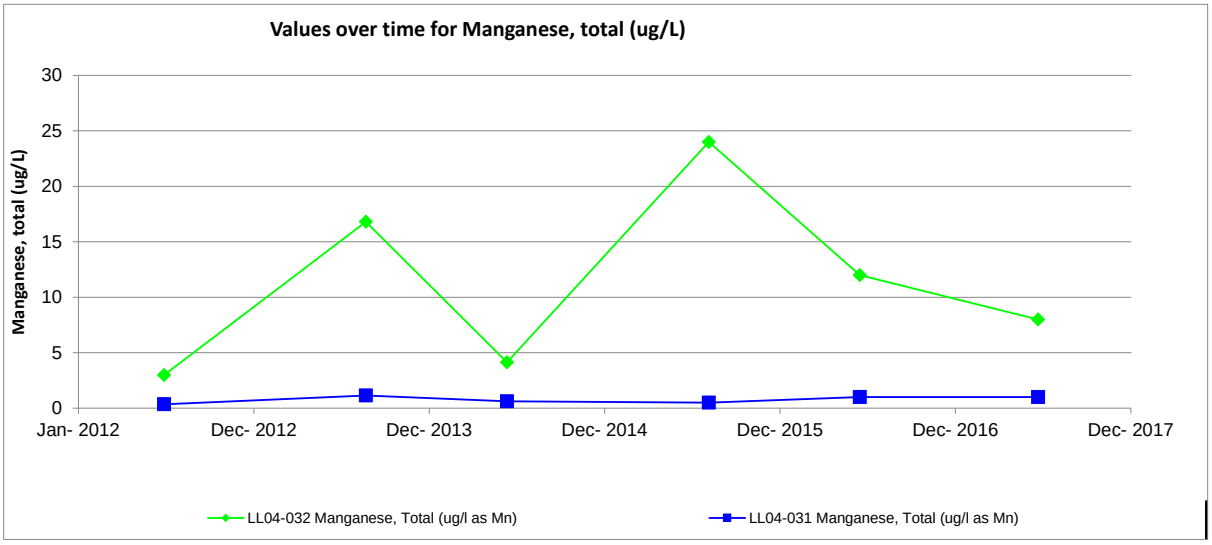

Values over time for Cadmium, total (ug/L)
(Cadmium is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Cadmium, total (ug/L)
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 Cadmium, Total (ug/l as Cd)
LL04-031 Cadmium, Total (ug/l as Cd)

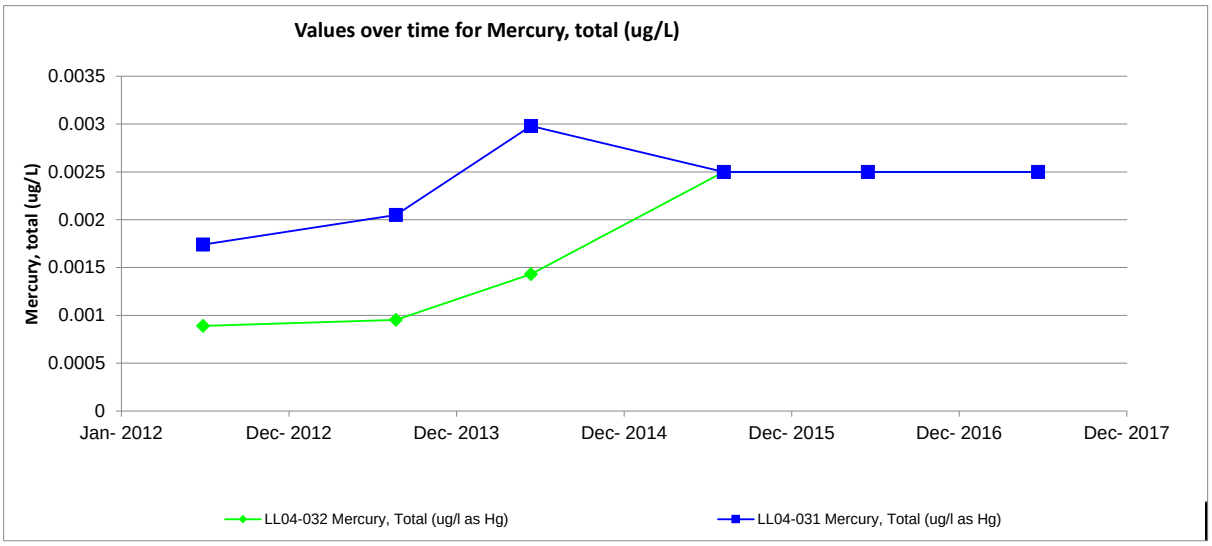

Values over time for Copper, total (ug/L)
Copper is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Copper, total (ug/L)
3.5
3
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 Copper, Total (ug/l as Cu)
LL04-031 Copper, Total (ug/l as Cu)

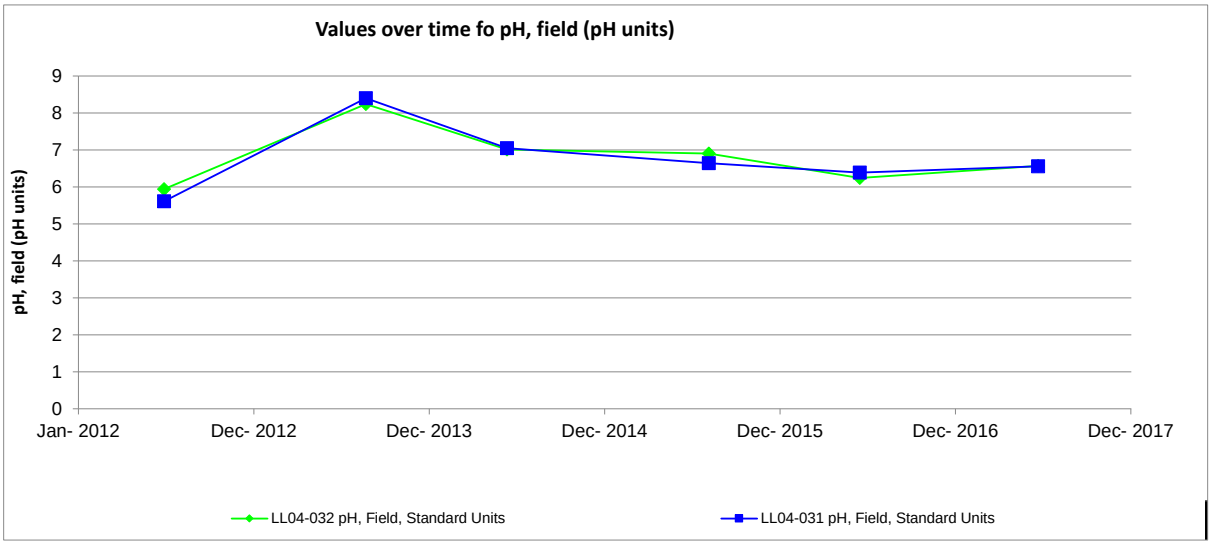

Values over time for Cyanide WAD (ug/L)
Cyanide WAD (ug/L)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 Weak Acid Dissociable Cyanide, ug/l
LL04-031 Weak Acid Dissociable Cyanide, ug/l

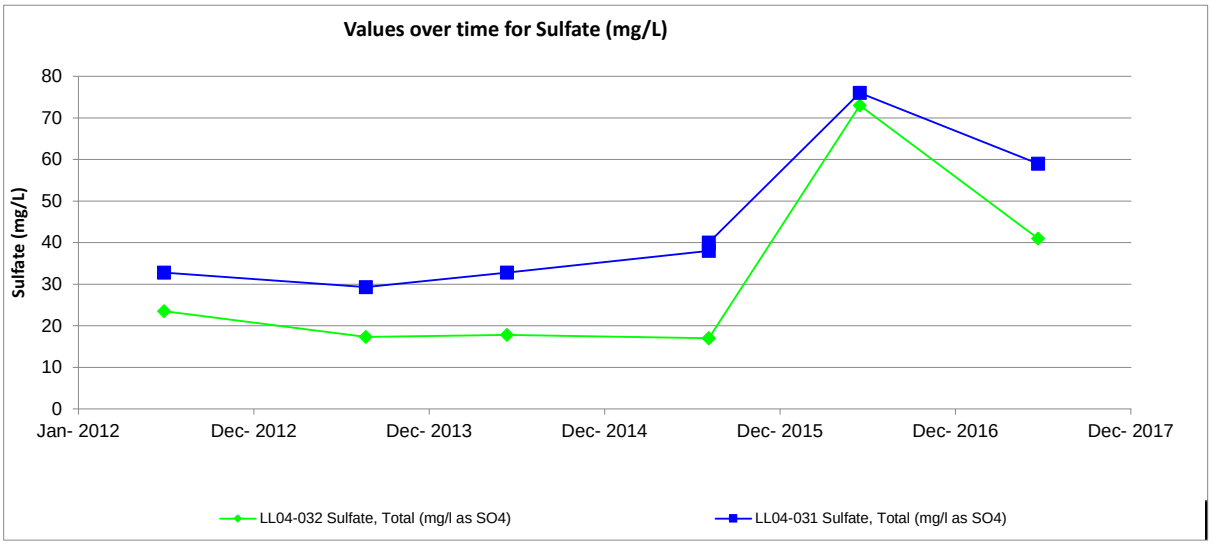

Values over time for Hardness (CaCO3) (mg/L)
Hardness (CaCO3) (mg/L)
140
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 Hardness, Total (mg/l as CaCO3)
LL04-031 Hardness, Total (mg/l as CaCO3)

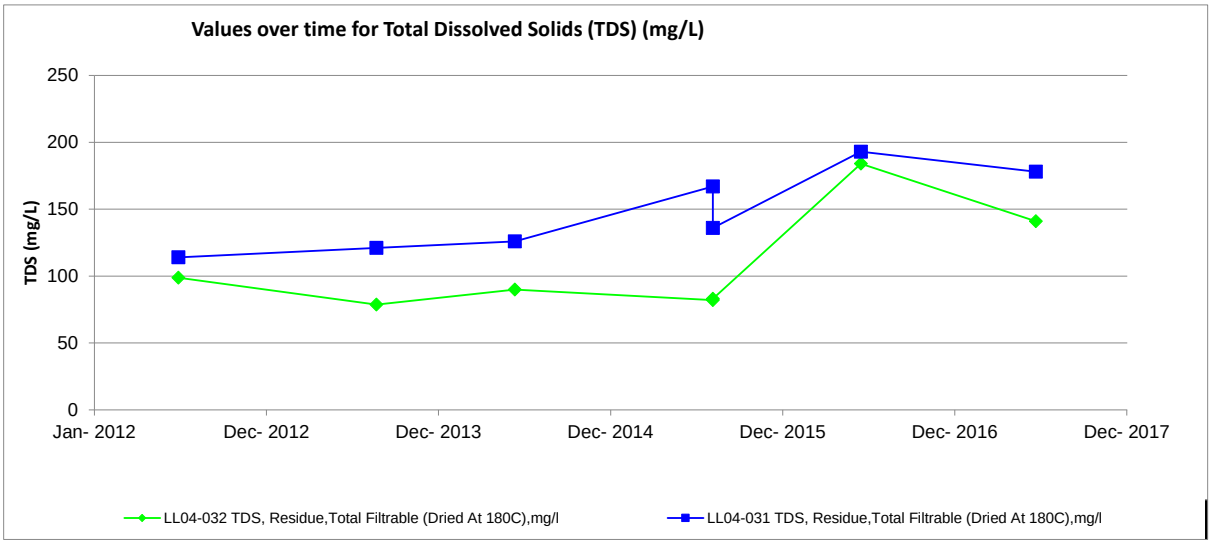

Values over time for Lead, total (ug/L)
(Lead is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Lead, total (ug/L)
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 Lead, Total (ug/l as Pb)
LL04-031 Lead, Total (ug/l as Pb)

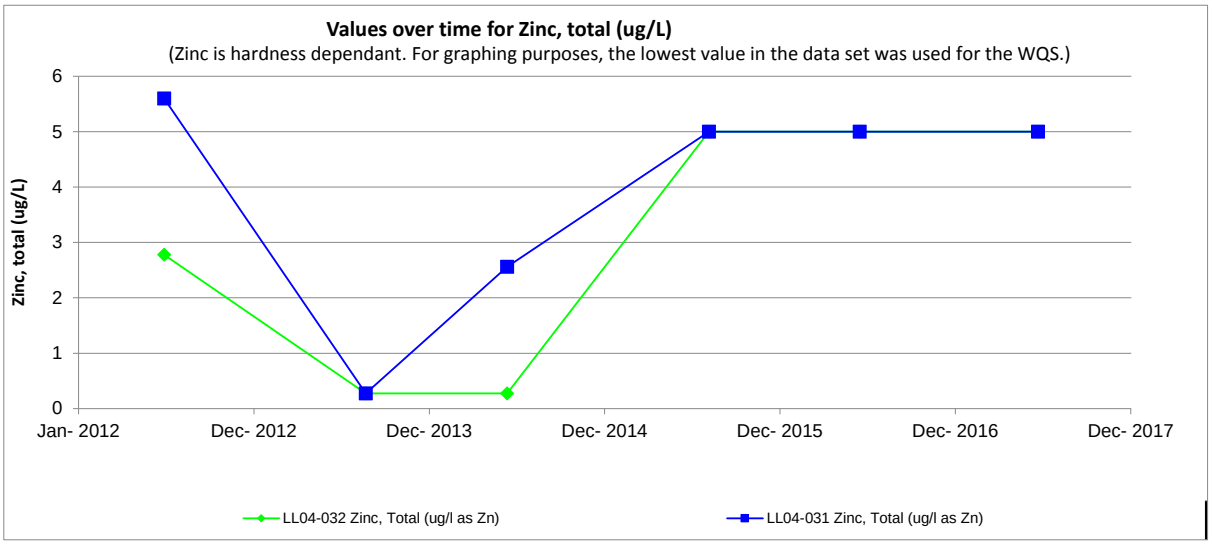

Values over time for Manganese, total (ug/L)
Manganese, total (ug/L)
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 Manganese, Total (ug/l as Mn)
LL04-031 Manganese, Total (ug/l as Mn)

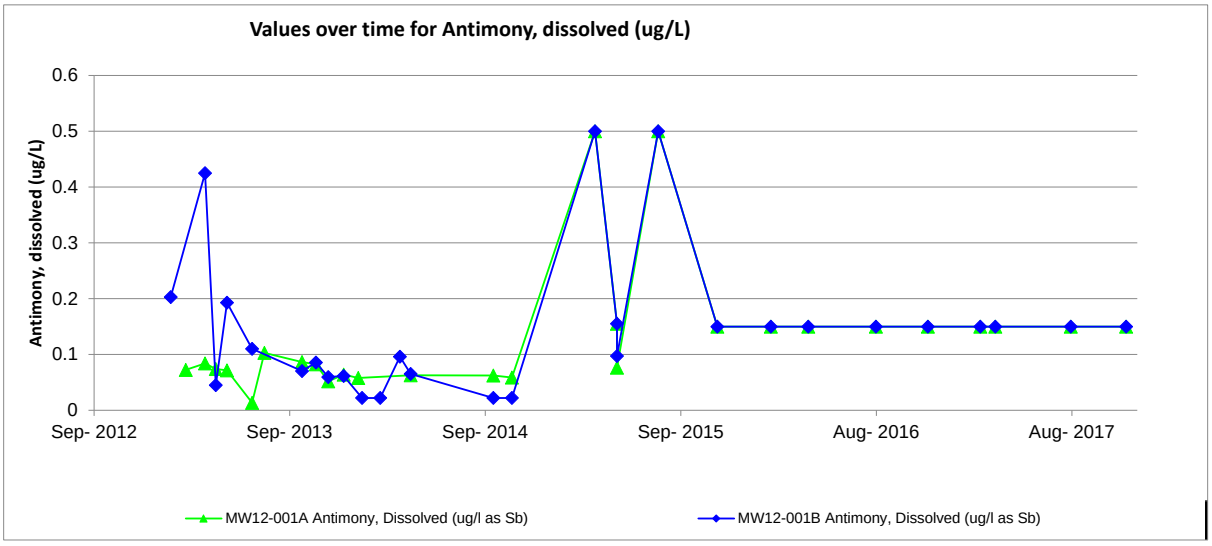

Values over time for Mercury, total (ug/L)
Mercury, total (ug/L)
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 Mercury, Total (ug/l as Hg)
LL04-031 Mercury, Total (ug/l as Hg)

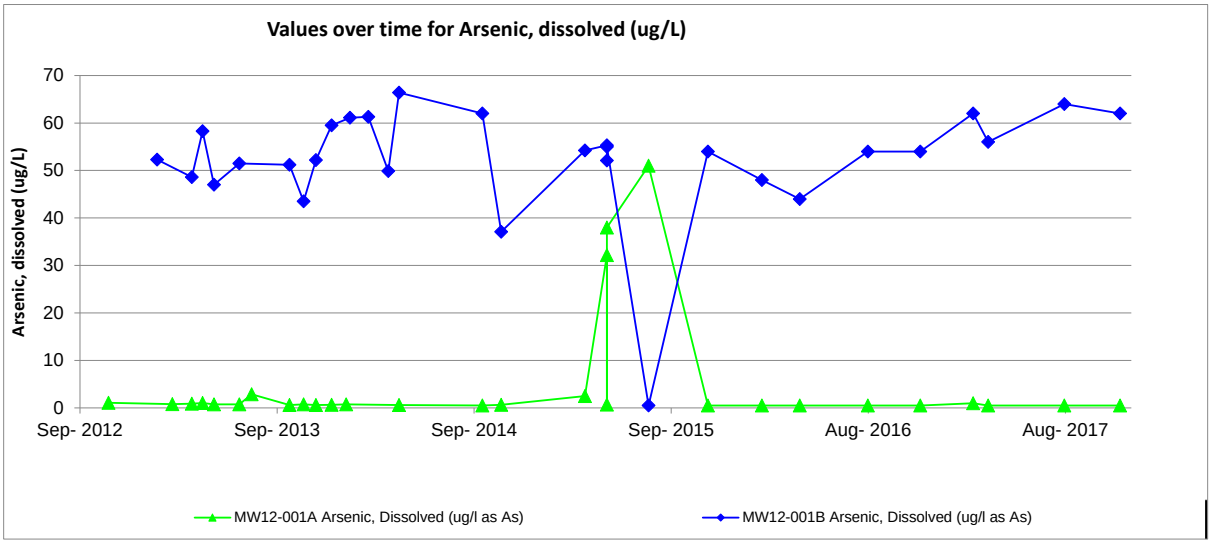

Values over time fo pH, field (pH units)
pH, field (pH units)
9
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 pH, Field, Standard Units
LL04-031 pH, Field, Standard Units

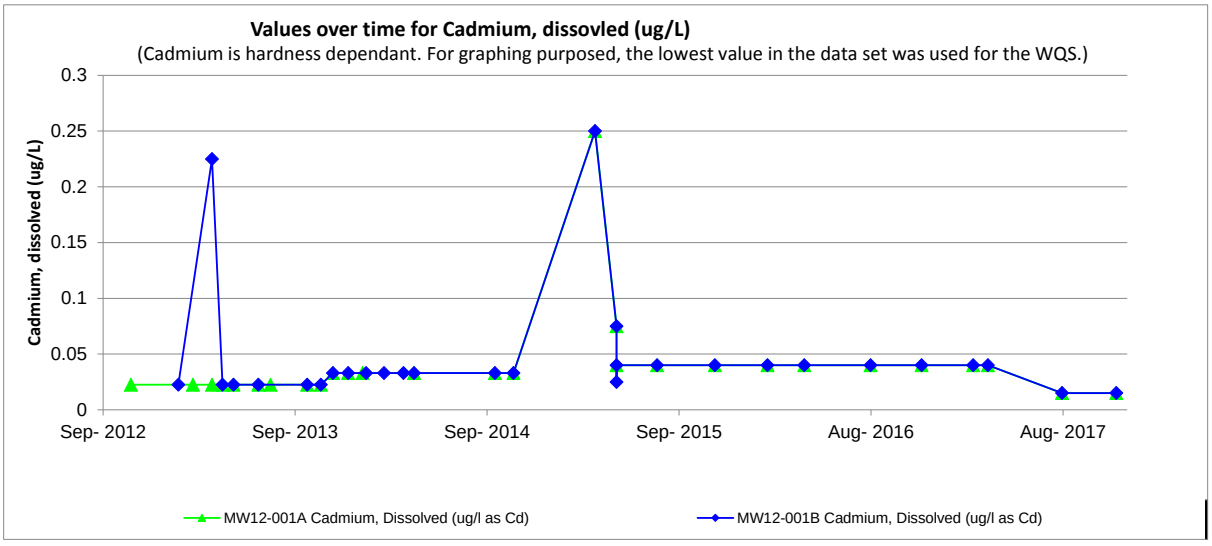

Values over time for Sulfate (mg/L)
Sulfate (mg/L)
80
70
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 Sulfate, Total (mg/l as SO4)
LL04-031 Sulfate, Total (mg/l as SO4)

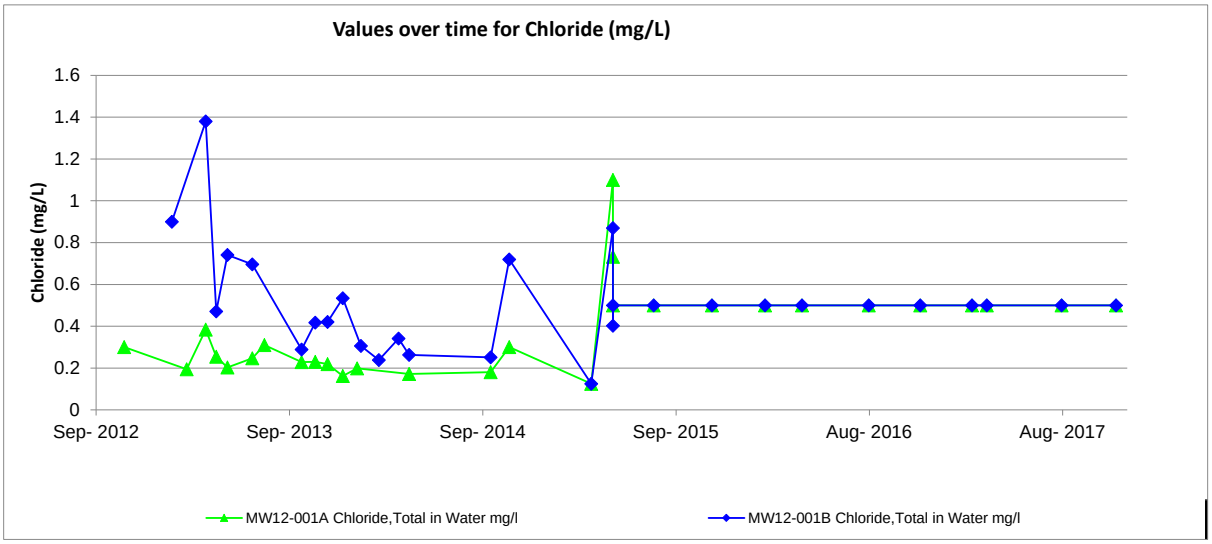

Values over time for Total Dissolved Solids (TDS) (mg/L)
TDS (mg/L)
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
LL04-031 TDS, Residue,Total Filtrable (Dried At 180C),mg/l

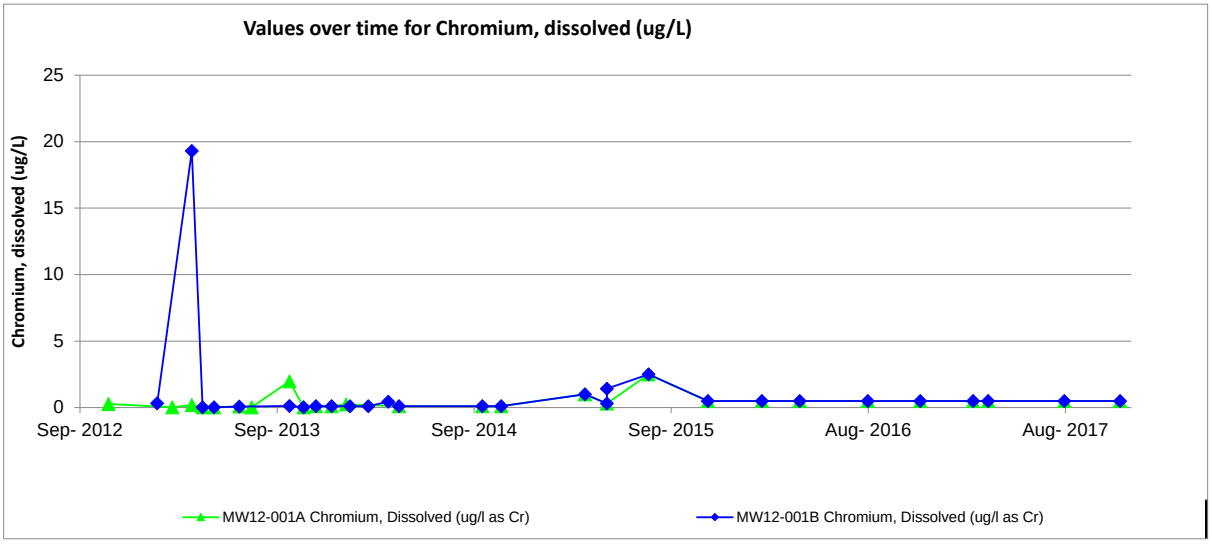

Values over time for Zinc, total (ug/L)
(Zinc is hardness dependant. For graphing purposes, the lowest value in the data set was used for the WQS.)
Zinc, total (ug/L)
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
LL04-032 Zinc, Total (ug/l as Zn)
LL04-031 Zinc, Total (ug/l as Zn)

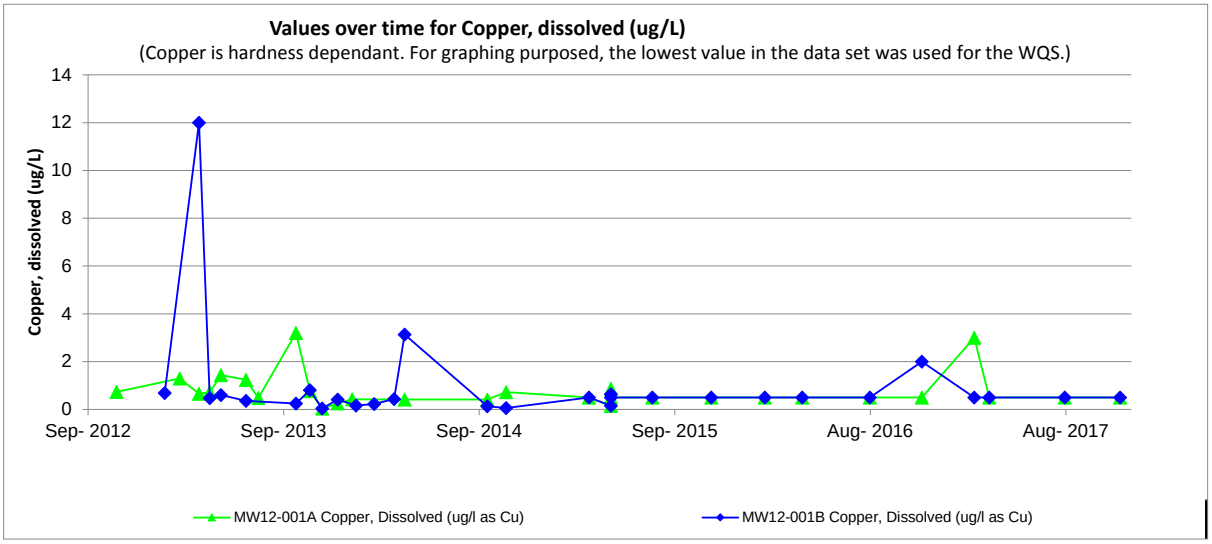

Values over time for Antimony, dissolved (ug/L)
Antimony, dissolved (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Antimony, Dissolved (ug/l as Sb)
MW12-001B Antimony, Dissolved (ug/l as Sb)

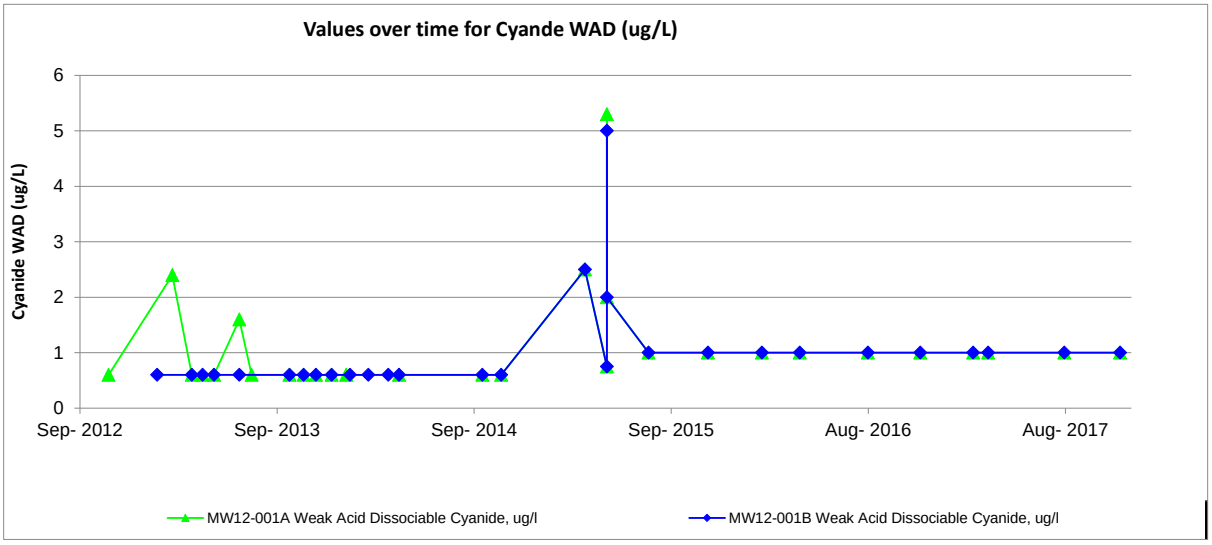

Values over time for Arsenic, dissolved (ug/L)
Arsenic, dissolved (ug/L)
70
60
50
40
30
20
10
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Arsenic, Dissolved (ug/l as As)
MW12-001B Arsenic, Dissolved (ug/l as As)

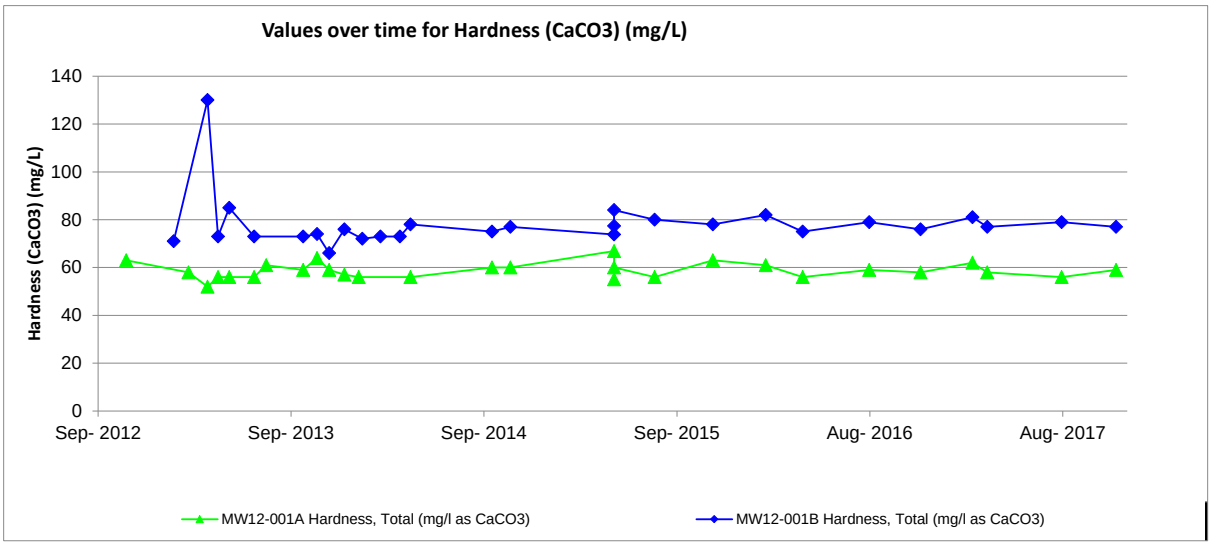

Values over time for Cadmium, dissovled (ug/L)
(Cadmium is hardness dependant. For graphing purposed, the lowest value in the data set was used for the WQS.)
Cadmium, dissolved (ug/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Cadmium, Dissolved (ug/l as Cd)
MW12-001B Cadmium, Dissolved (ug/l as Cd)

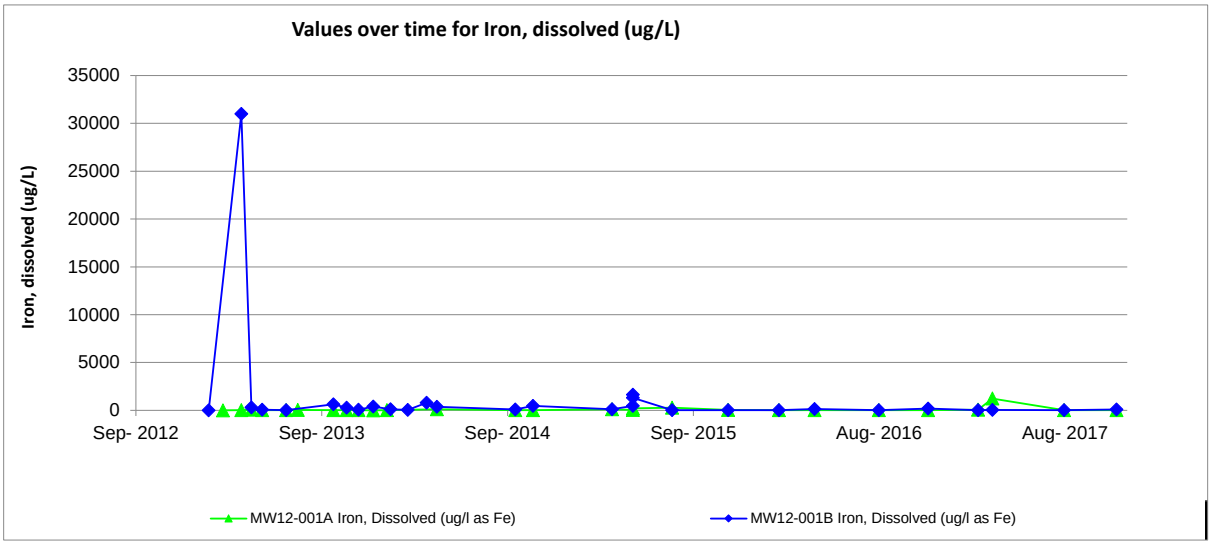

Values over time for Chloride (mg/L)
Chloride (mg/L)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Chloride,Total in Water mg/l
MW12-001B Chloride,Total in Water mg/l

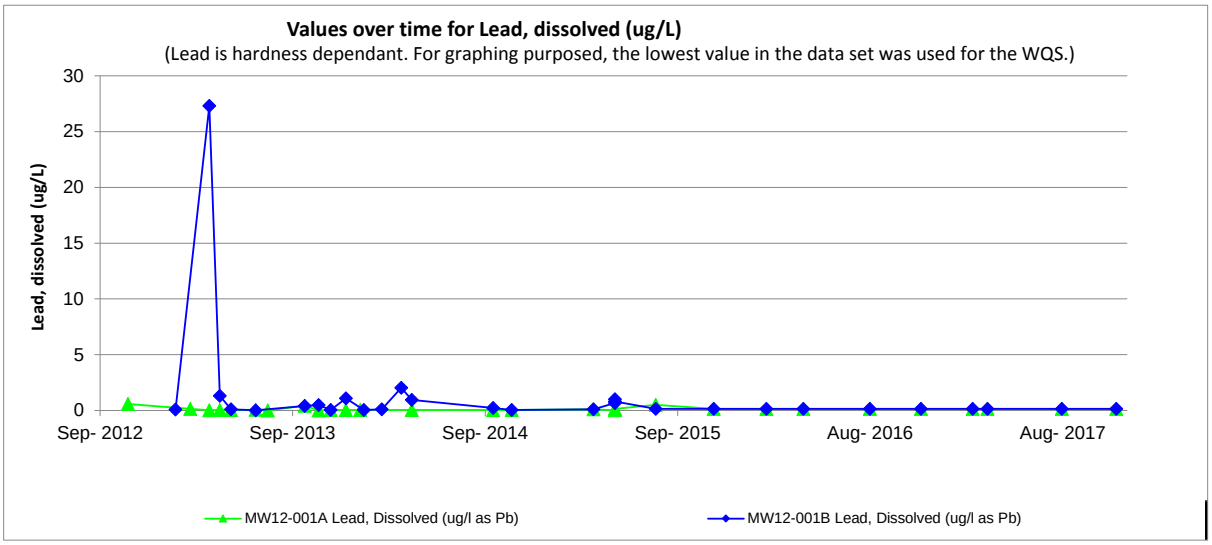

Values over time for Chromium, dissolved (ug/L)
Chromium, dissolved (ug/L)
25
20
15
10
5
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Chromium, Dissolved (ug/l as Cr)
MW12-001B Chromium, Dissolved (ug/l as Cr)

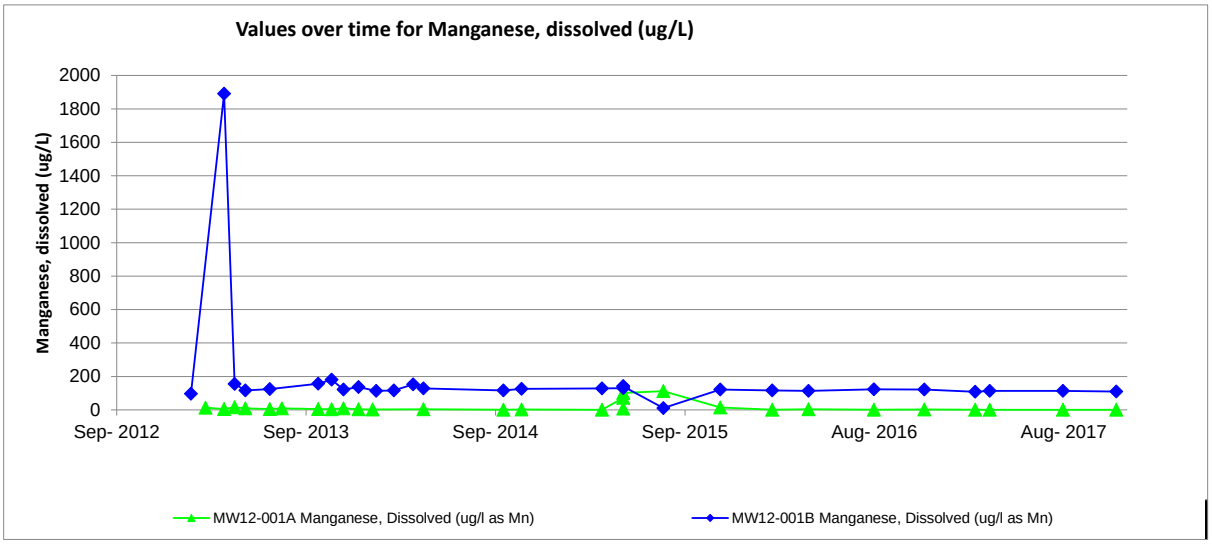

Values over time for Copper, dissolved (ug/L)
(Copper is hardness dependant. For graphing purposed, the lowest value in the data set was used for the WQS.)
Copper, dissolved (ug/L)
14
12
10
8
6
4
2
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Copper, Dissolved (ug/l as Cu)
MW12-001B Copper, Dissolved (ug/l as Cu)

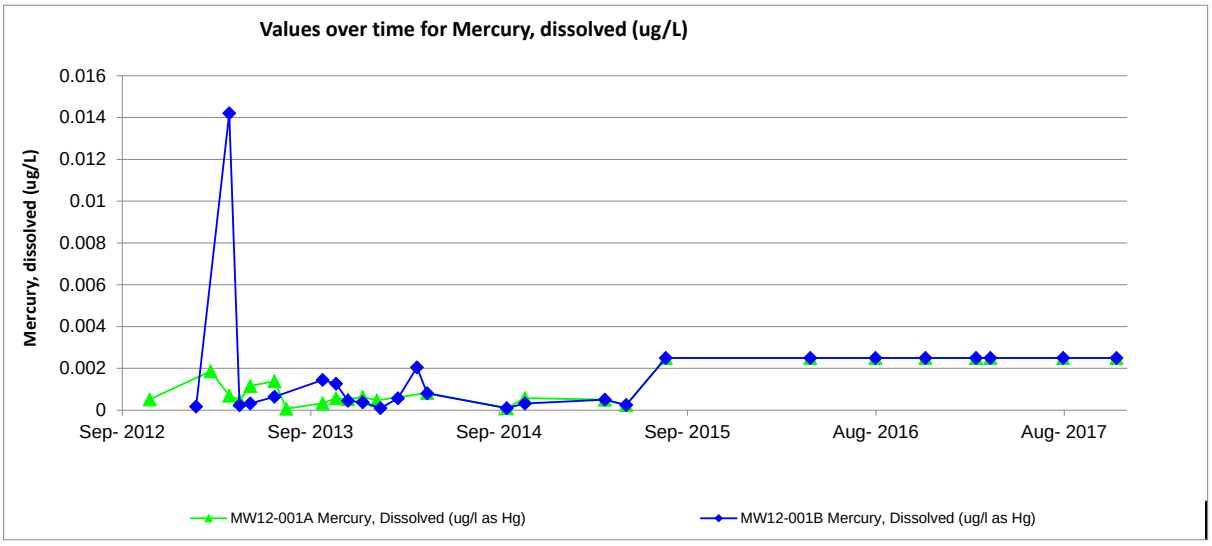

Values over time for Cyande WAD (ug/L)
Cyanide WAD (ug/L)
6
5
4
3
2
1
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Weak Acid Dissociable Cyanide, ug/l
MW12-001B Weak Acid Dissociable Cyanide, ug/l

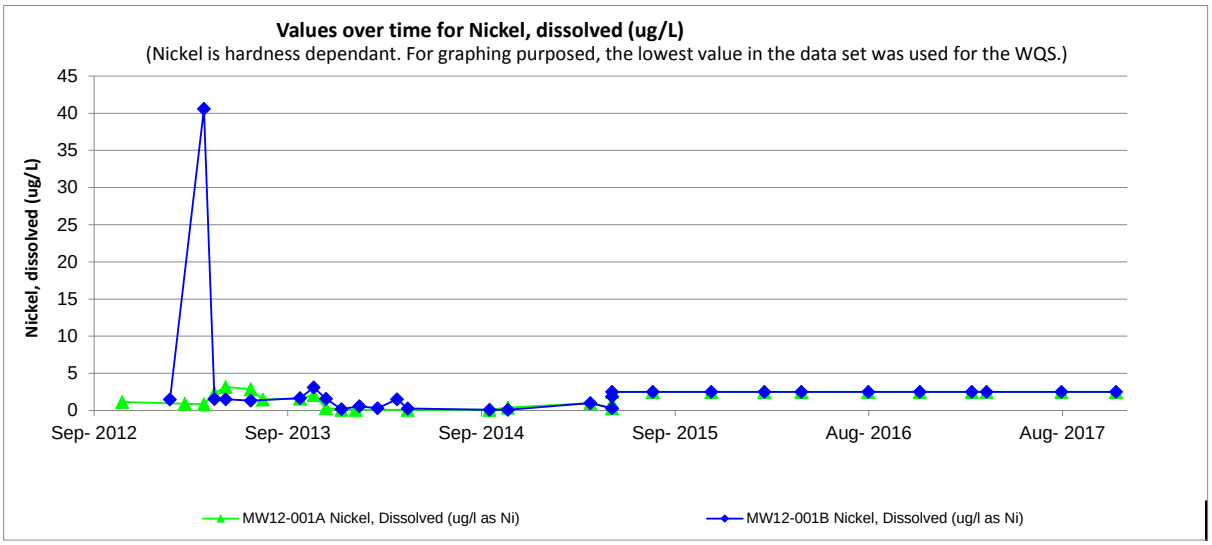

Values over time for Hardness (CaCO3) (mg/L)
Hardness (CaCO3) (mg/L)
140
120
100
80
60
40
20
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Hardness, Total (mg/l as CaCO3)
MW12-001B Hardness, Total (mg/l as CaCO3)

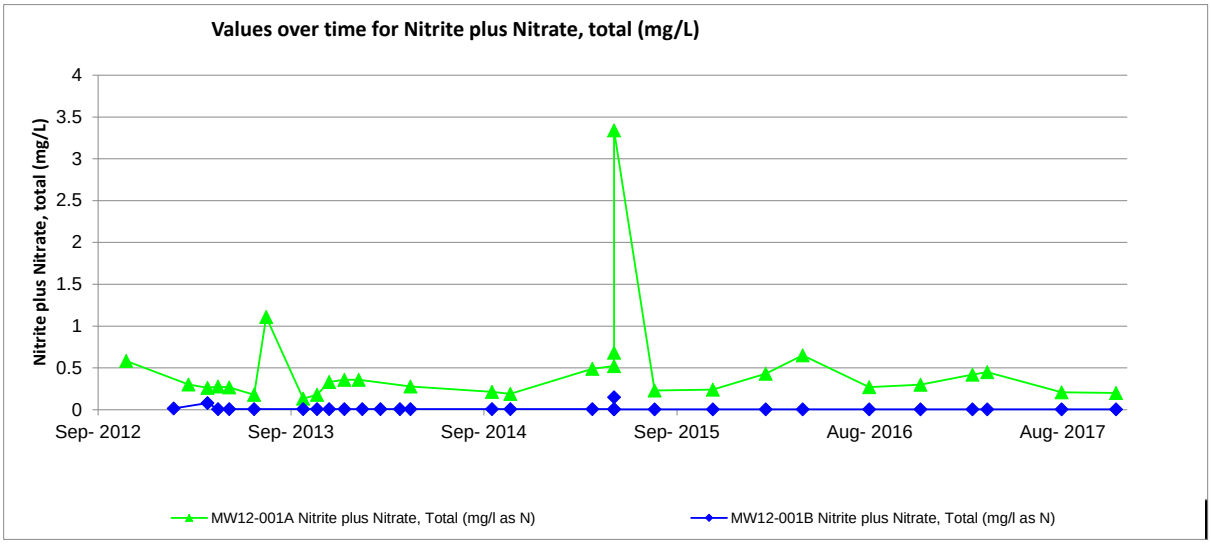

Values over time for Iron, dissolved (ug/L)
Iron, dissolved (ug/L)
35000
30000
25000
20000
15000
10000
5000
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Iron, Dissolved (ug/l as Fe)
MW12-001B Iron, Dissolved (ug/l as Fe)

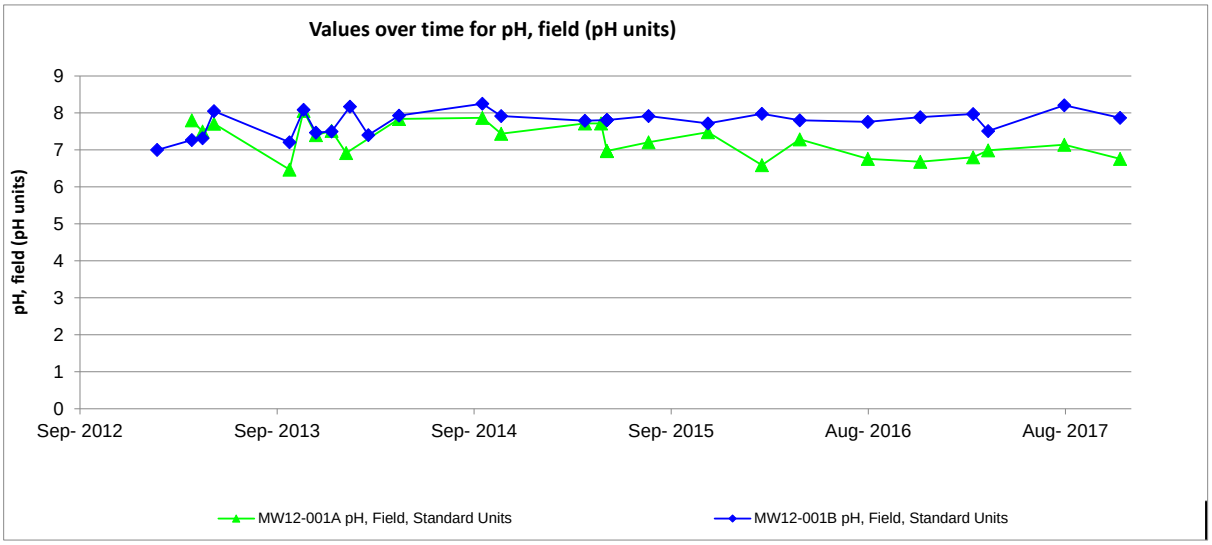

Values over time for Lead, dissolved (ug/L)
(Lead is hardness dependant. For graphing purposed, the lowest value in the data set was used for the WQS.)
Lead, dissolved (ug/L)
30
25
20
15
10
5
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Lead, Dissolved (ug/l as Pb)
MW12-001B Lead, Dissolved (ug/l as Pb)

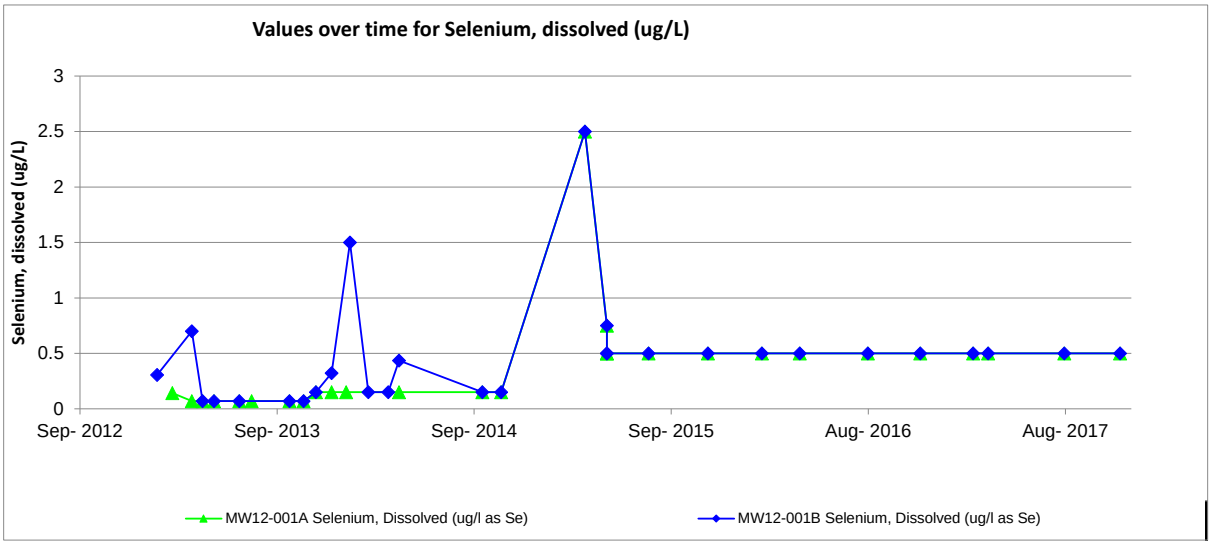

Values over time for Manganese, dissolved (ug/L)
Manganese, dissolved (ug/L)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Manganese, Dissolved (ug/l as Mn)
MW12-001B Manganese, Dissolved (ug/l as Mn)

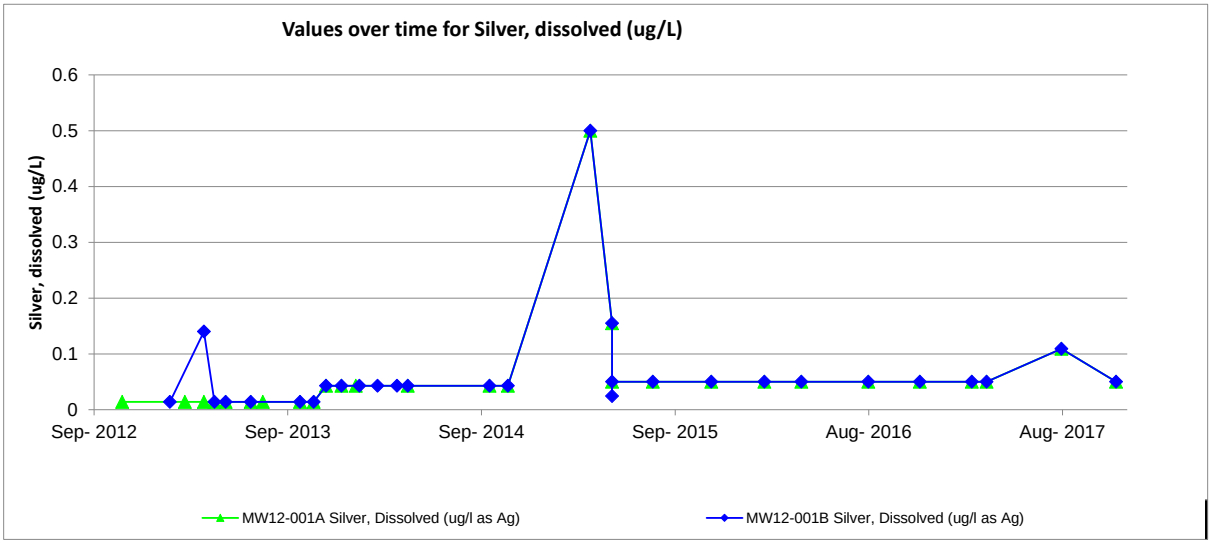

Values over time for Mercury, dissolved (ug/L)
Mercury, dissolved (ug/L)
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Mercury, Dissolved (ug/l as Hg)
MW12-001B Mercury, Dissolved (ug/l as Hg)

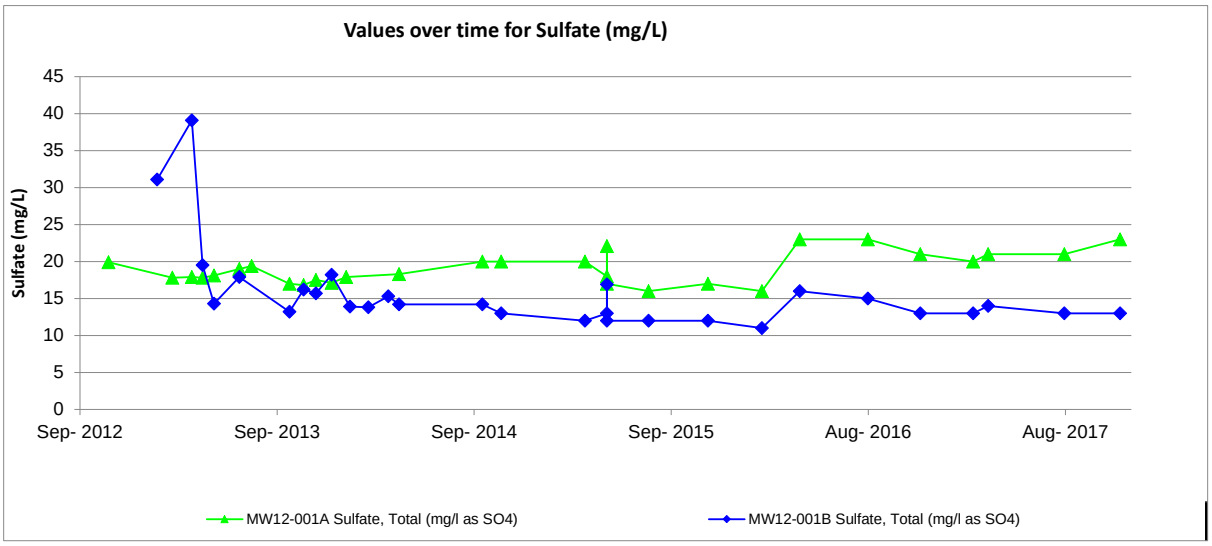

Values over time for Nickel, dissolved (ug/L)
(Nickel is hardness dependant. For graphing purposed, the lowest value in the data set was used for the WQS.)
Nickel, dissolved (ug/L)
45
40
35
30
25
20
15
10
5
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Nickel, Dissolved (ug/l as Ni)
MW12-001B Nickel, Dissolved (ug/l as Ni)

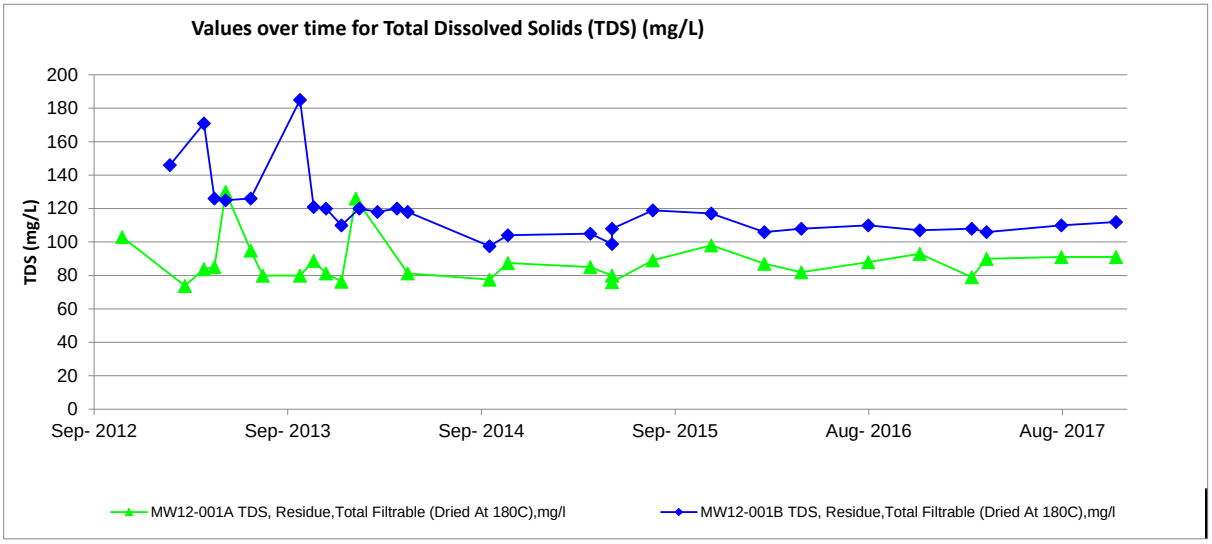

Values over time for Nitrite plus Nitrate, total (mg/L)
Nitrite plus Nitrate, total (mg/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Nitrite plus Nitrate, Total (mg/l as N)
MW12-001B Nitrite plus Nitrate, Total (mg/l as N)

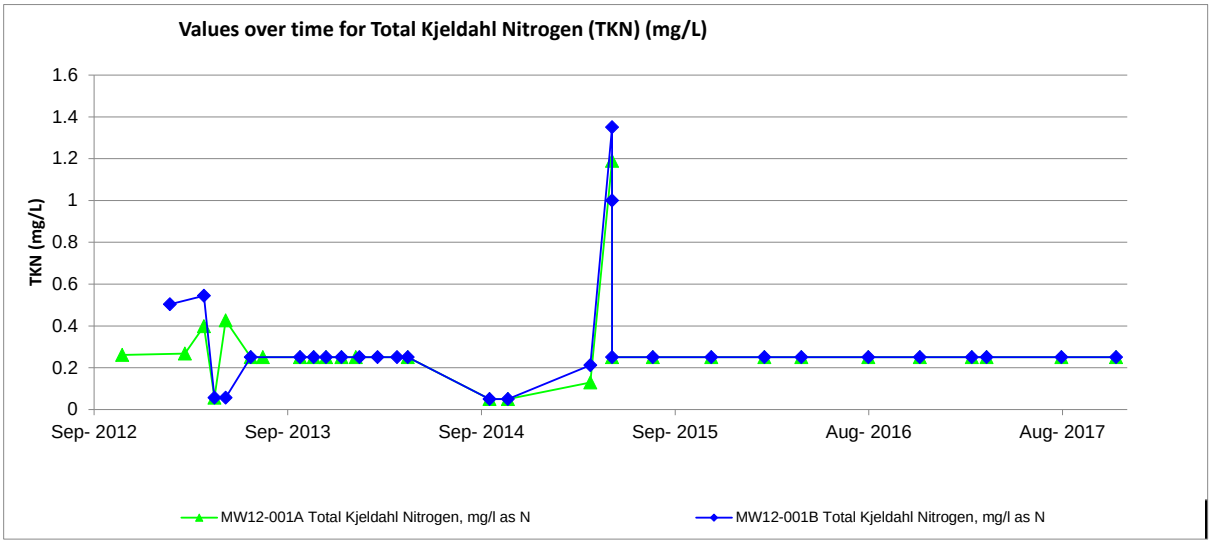

Values over time for pH, field (pH units)
pH, field (pH units)
9
8
7
6
5
4
3
2
1
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A pH, Field, Standard Units
MW12-001B pH, Field, Standard Units

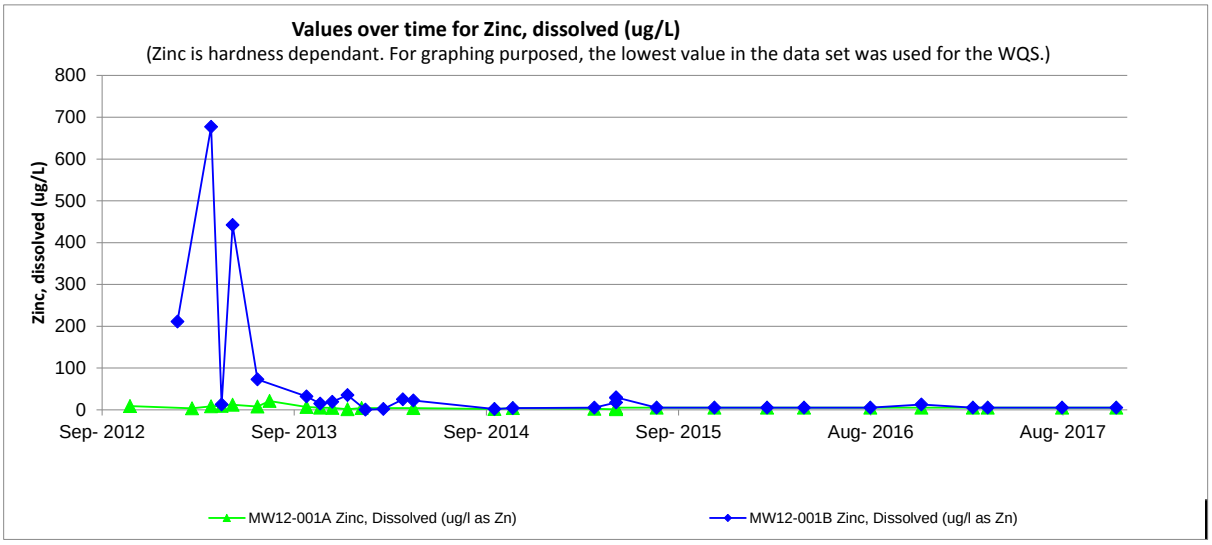

Values over time for Selenium, dissolved (ug/L)
Selenium, dissolved (ug/L)
3
2.5
2
1.5
1
0.5
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Selenium, Dissolved (ug/l as Se)
MW12-001B Selenium, Dissolved (ug/l as Se)

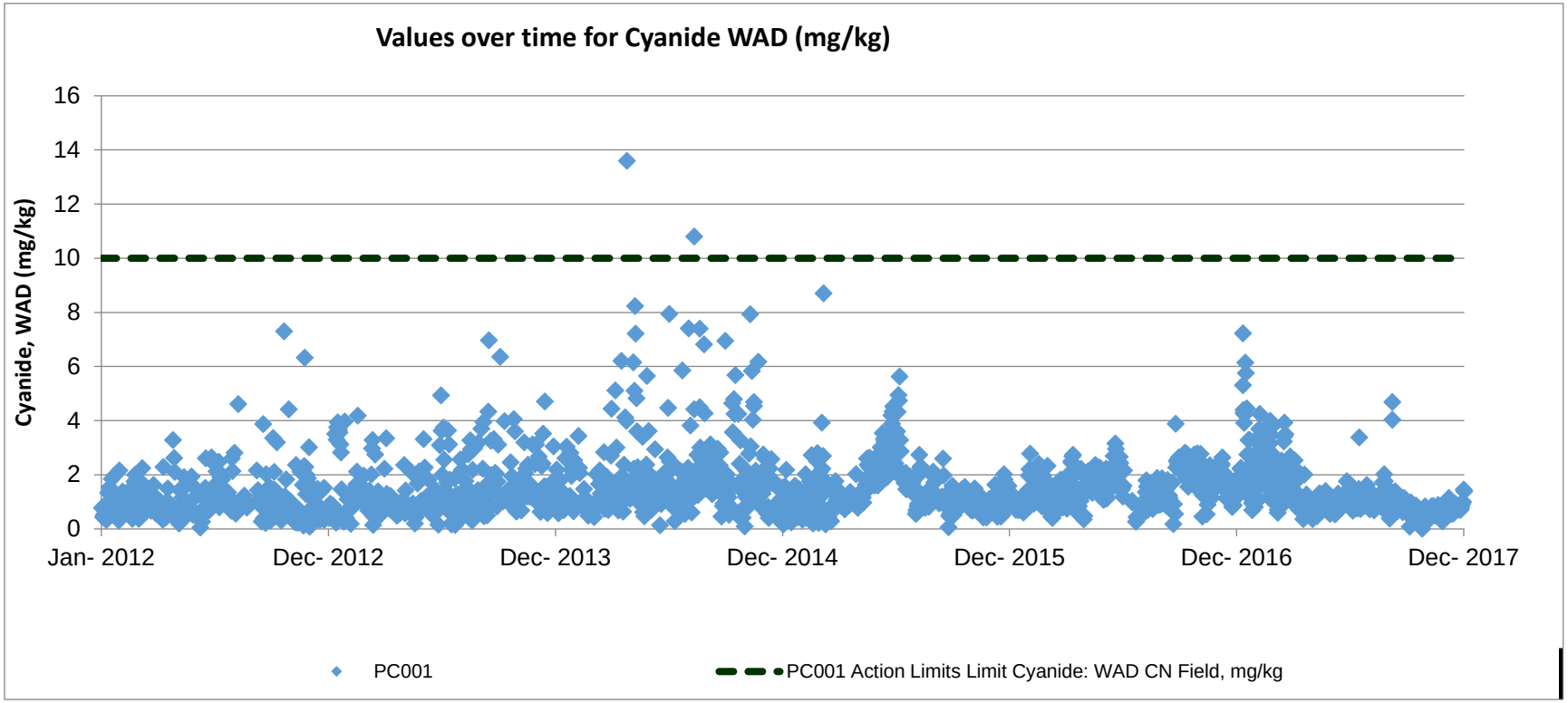

Values over time for Silver, dissolved (ug/L)
Silver, dissolved (ug/L)
0.6
0.5
0.4
0.3
0.2
0.1
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Silver, Dissolved (ug/l as Ag)
MW12-001B Silver, Dissolved (ug/l as Ag)

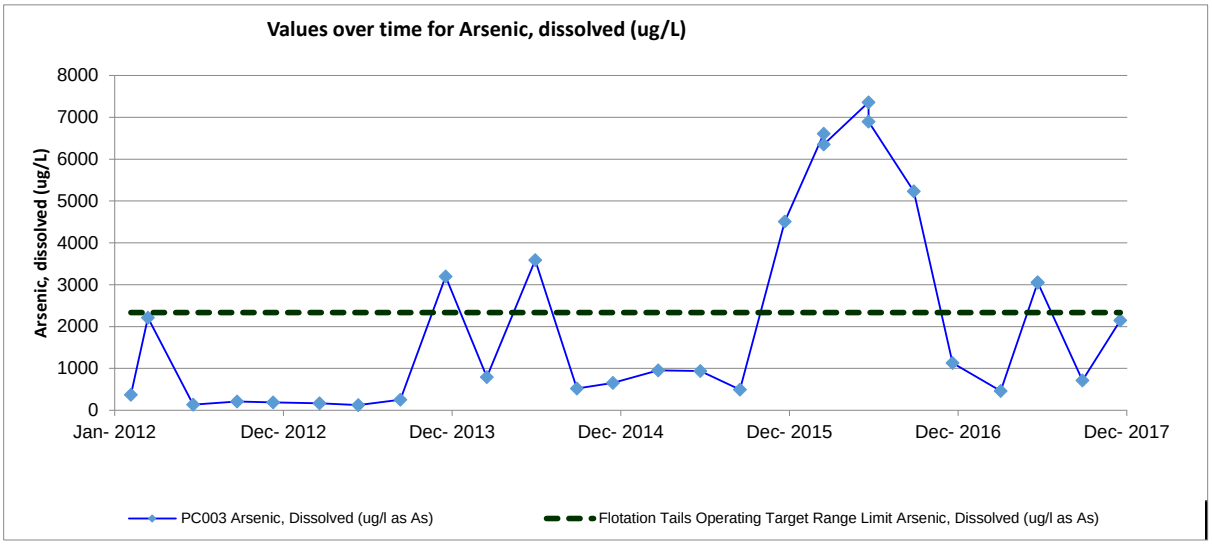

Values over time for Sulfate (mg/L)
Sulfate (mg/L)
45
40
35
30
25
20
15
10
5
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Sulfate, Total (mg/l as SO4)
MW12-001B Sulfate, Total (mg/l as SO4)

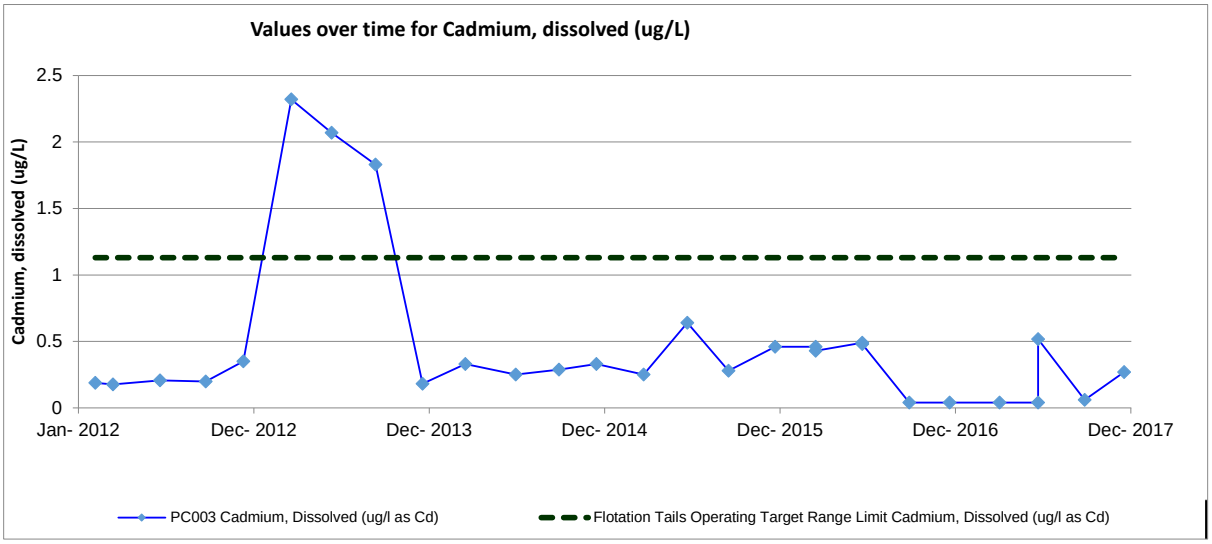

Values over time for Total Dissolved Solids (TDS) (mg/L)
TDS (mg/L)
200
180
160
140
120
100
80
60
40
20
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A TDS, Residue,Total Filtrable (Dried At 180C),mg/l
MW12-001B TDS, Residue,Total Filtrable (Dried At 180C),mg/l

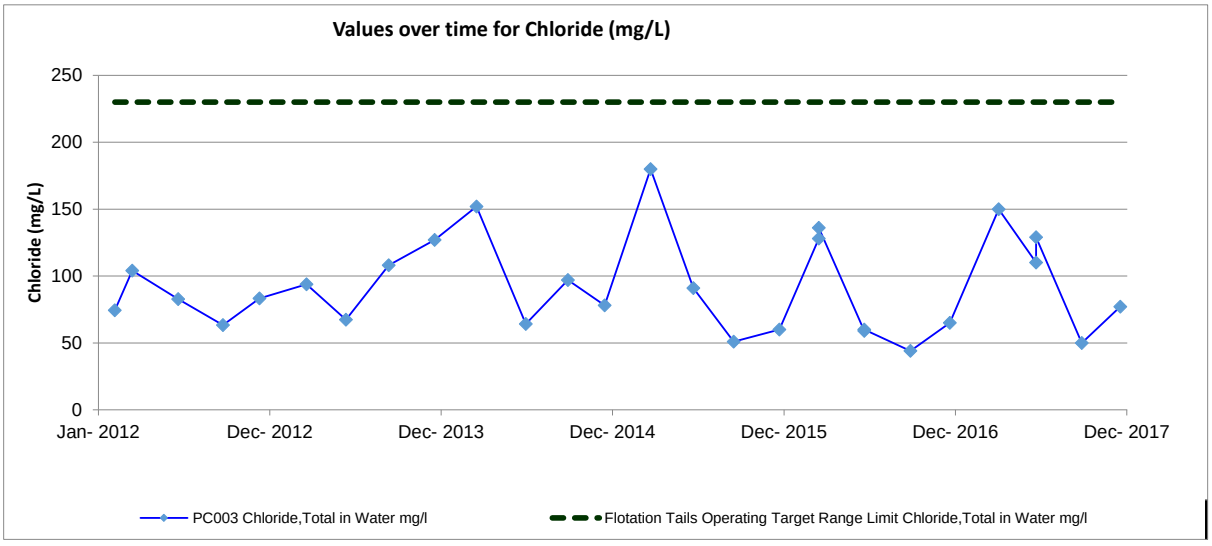

Values over time for Total Kjeldahl Nitrogen (TKN) (mg/L)
TKN (mg/L)
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Total Kjeldahl Nitrogen, mg/l as N
MW12-001B Total Kjeldahl Nitrogen, mg/l as N

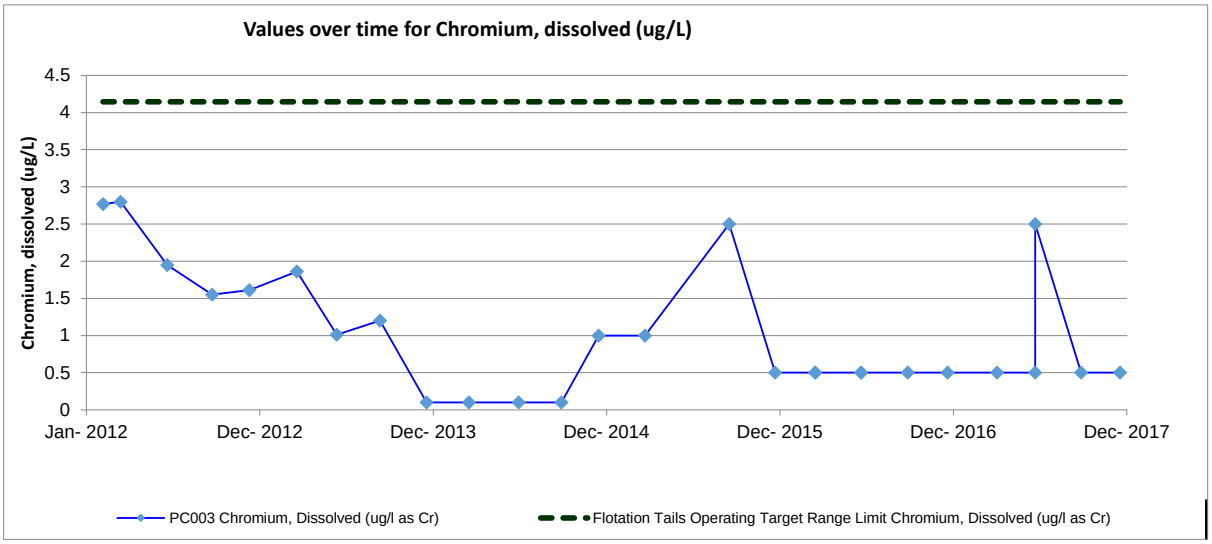

Values over time for Zinc, dissolved (ug/L)
(Zinc is hardness dependant. For graphing purposed, the lowest value in the data set was used for the WQS.)
Zinc, dissolved (ug/L)
800
700
600
500
400
300
200
100
0
Sep- 2012
Sep- 2013
Sep- 2014
Sep- 2015
Aug- 2016
Aug- 2017
MW12-001A Zinc, Dissolved (ug/l as Zn)
MW12-001B Zinc, Dissolved (ug/l as Zn)

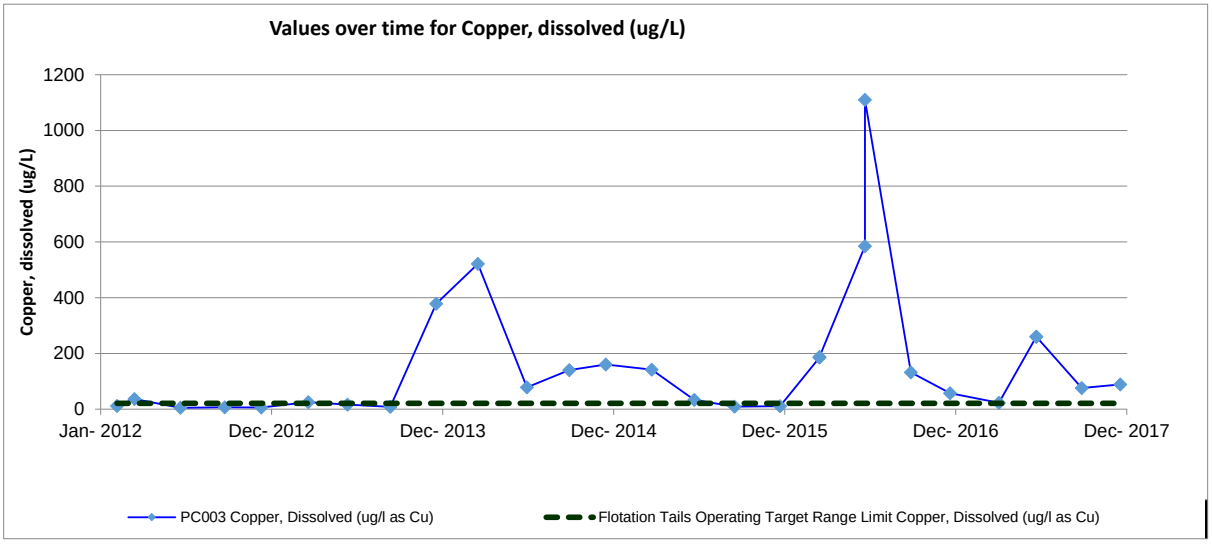

Values over time for Cyanide WAD (mg/kg)
Cyanide, WAD (mg/kg)
16
14
12
10
8
6
4
2
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC001
PC001 Action Limits Limit Cyanide: WAD CN Field, mg/kg

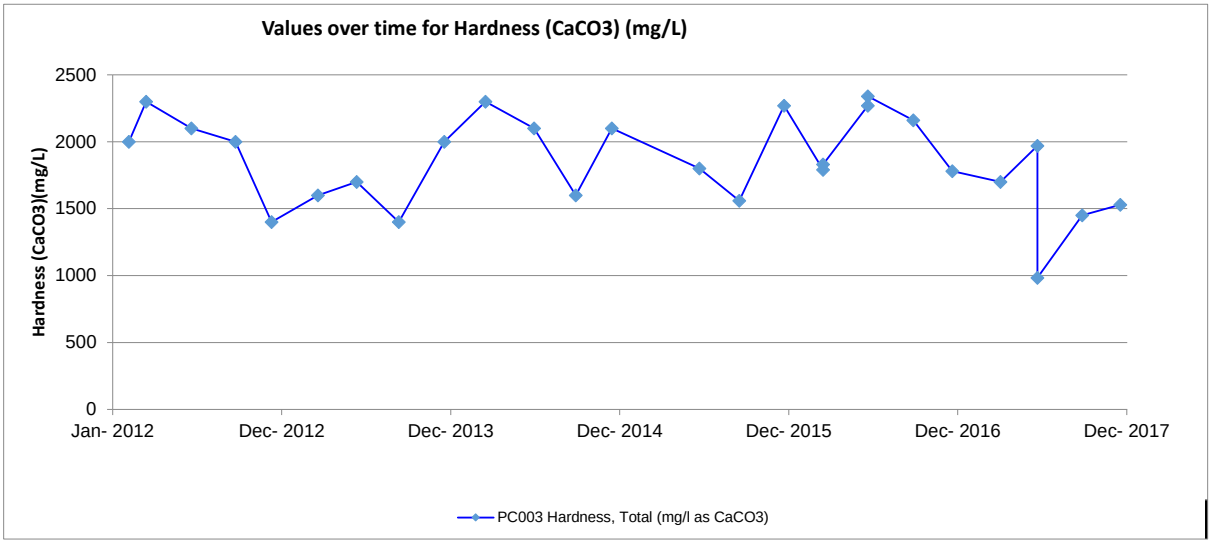

Values over time for Arsenic, dissolved (ug/L)
Arsenic, dissolved (ug/L)
8000
7000
6000
5000
4000
3000
2000
1000
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Arsenic, Dissolved (ug/l as As)
Flotation Tails Operating Target Range Limit Arsenic, Dissolved (ug/l as As)

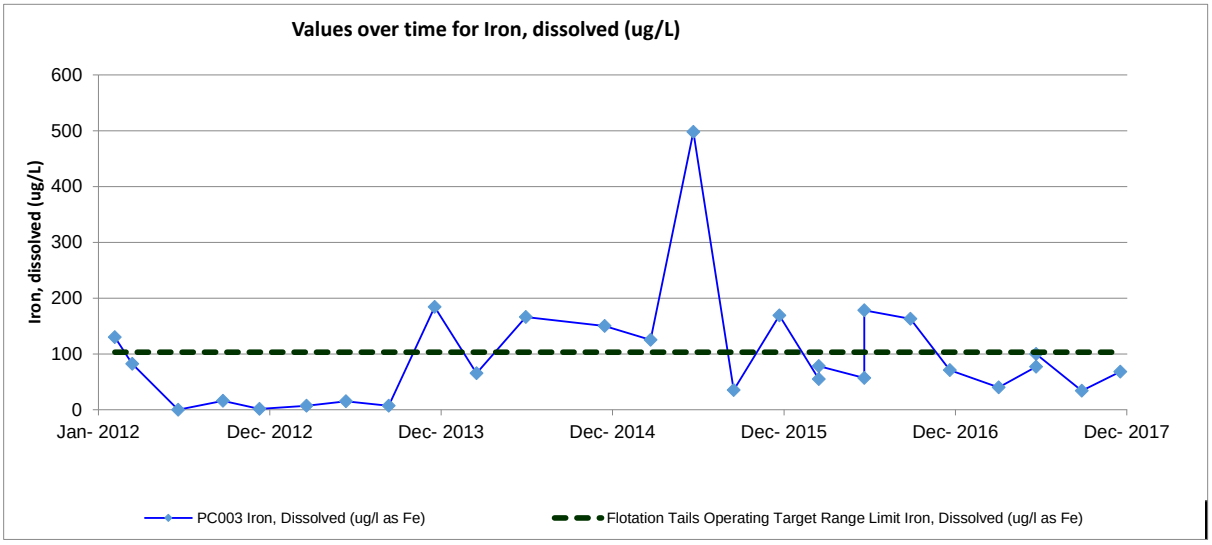

Values over time for Cadmium, dissolved (ug/L)
Cadmium, dissolved (ug/L)
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Cadmium, Dissolved (ug/l as Cd)
Flotation Tails Operating Target Range Limit Cadmium, Dissolved (ug/l as Cd)

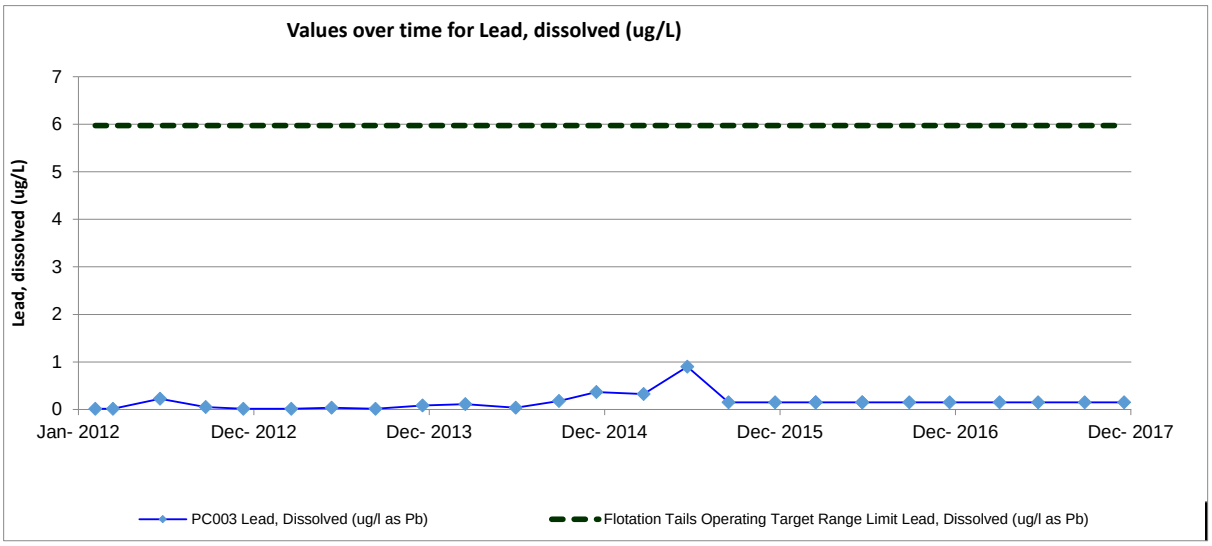

Values over time for Chloride (mg/L)
Chloride (mg/L)
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Chloride,Total in Water mg/l
Flotation Tails Operating Target Range Limit Chloride,Total in Water mg/l

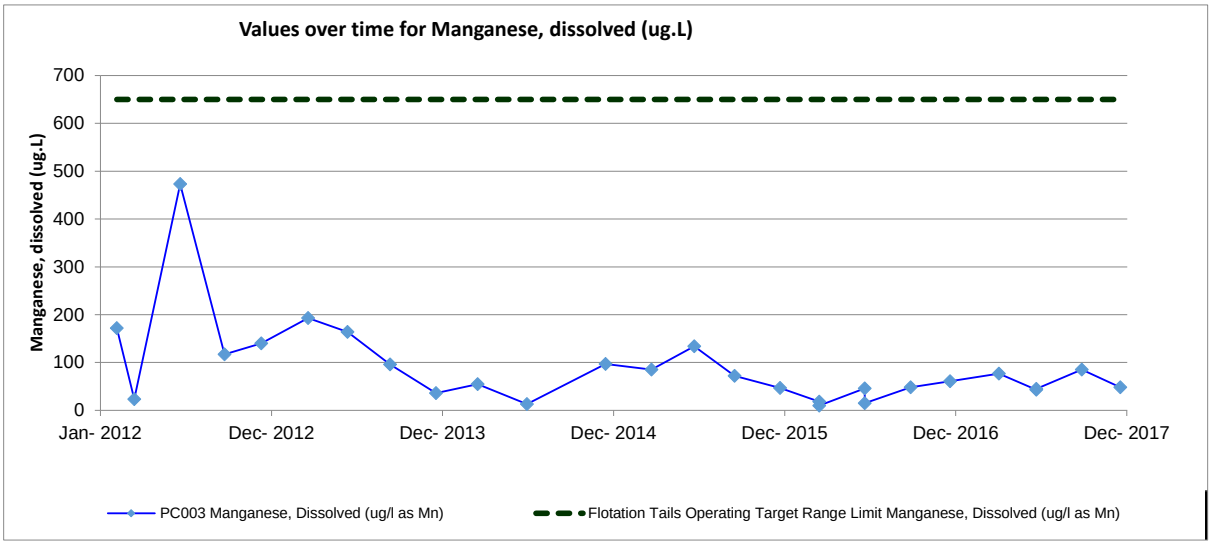

Values over time for Chromium, dissolved (ug/L)
Chromium, dissolved (ug/L)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Chromium, Dissolved (ug/l as Cr)
Flotation Tails Operating Target Range Limit Chromium, Dissolved (ug/l as Cr)

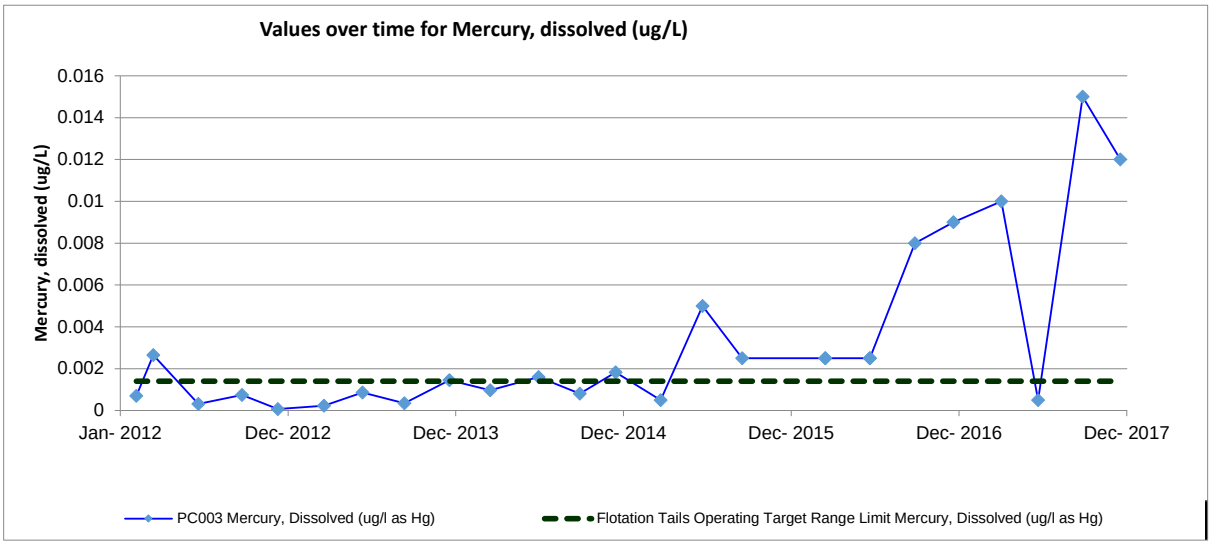

Values over time for Copper, dissolved (ug/L)
Copper, dissolved (ug/L)
1200
1000
800
600
400
200
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Copper, Dissolved (ug/l as Cu)
Flotation Tails Operating Target Range Limit Copper, Dissolved (ug/l as Cu)

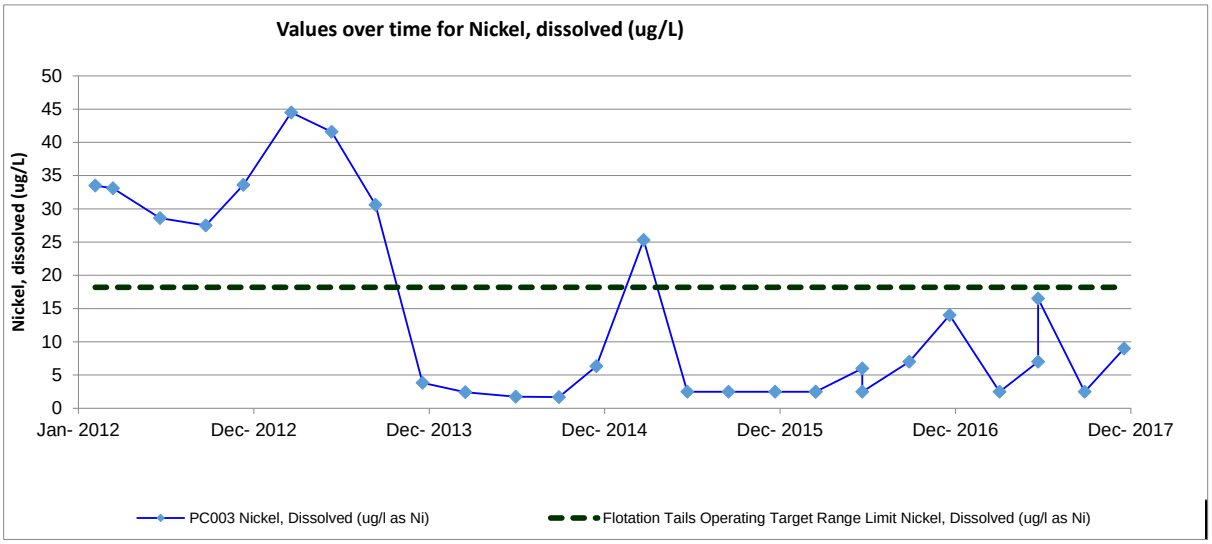

Values over time for Hardness (CaCO3) (mg/L)
Hardness (CaCO3)(mg/L)
2500
2000
1500
1000
500
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Hardness, Total (mg/l as CaCO3)

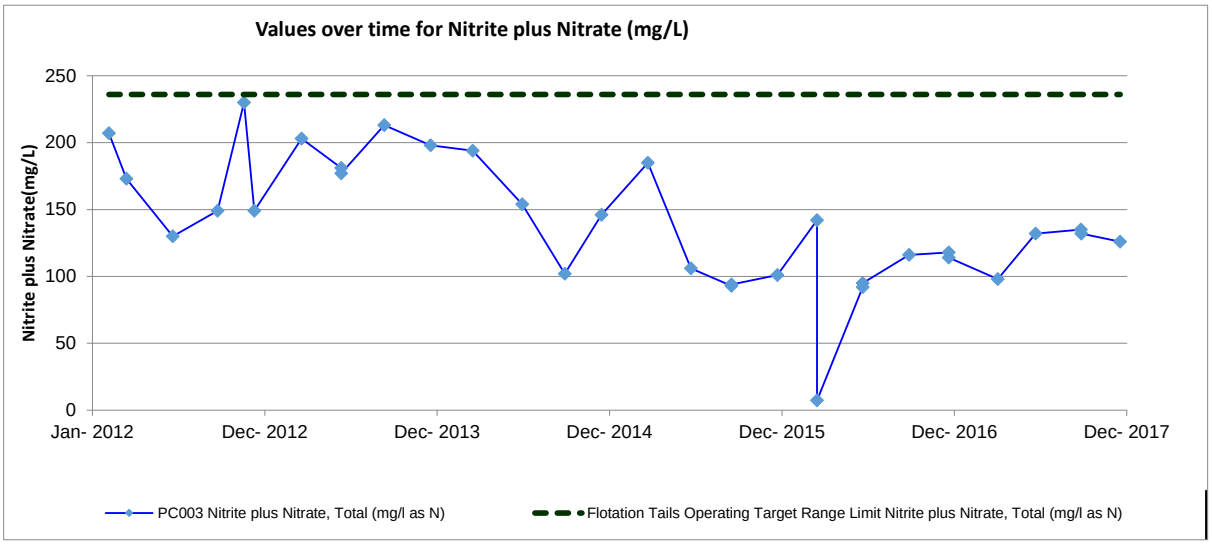

Values over time for Iron, dissolved (ug/L)
Iron, dissolved (ug/L)
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Iron, Dissolved (ug/l as Fe)
Flotation Tails Operating Target Range Limit Iron, Dissolved (ug/l as Fe)

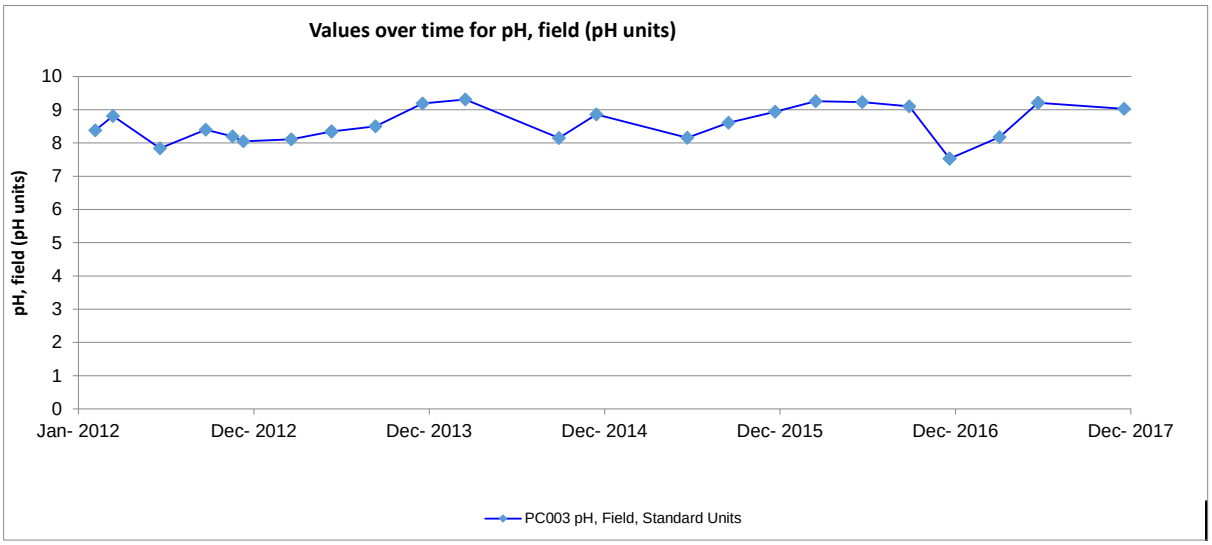

Values over time for Lead, dissolved (ug/L)
Lead, dissolved (ug/L)
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Lead, Dissolved (ug/l as Pb)
Flotation Tails Operating Target Range Limit Lead, Dissolved (ug/l as Pb)

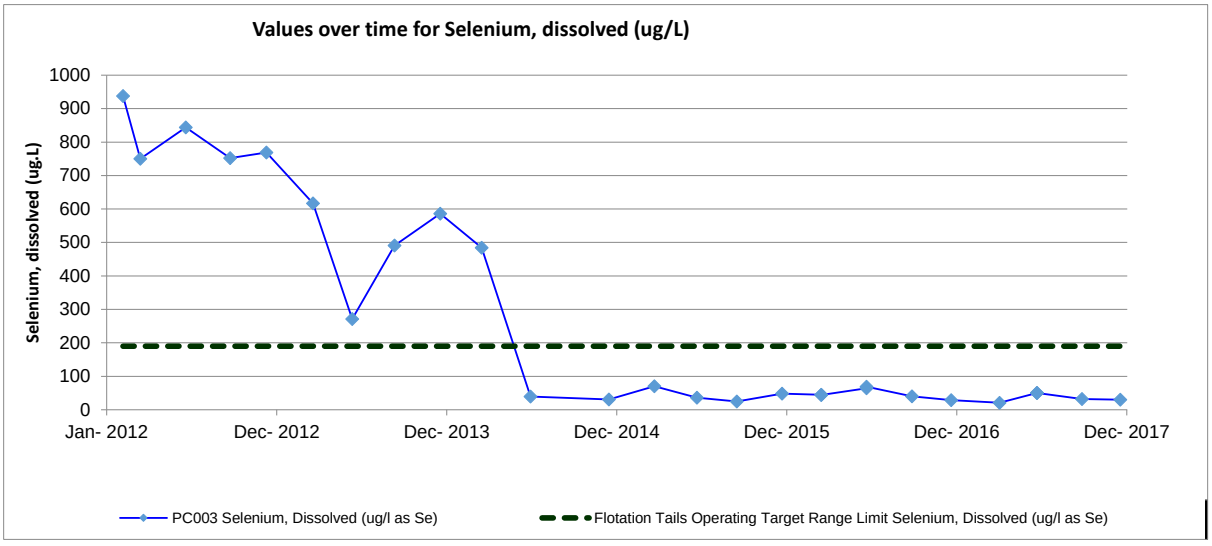

Values over time for Manganese, dissolved (ug.L)
Manganese, dissolved (ug.L)
700
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Manganese, Dissolved (ug/l as Mn)
Flotation Tails Operating Target Range Limit Manganese, Dissolved (ug/l as Mn)

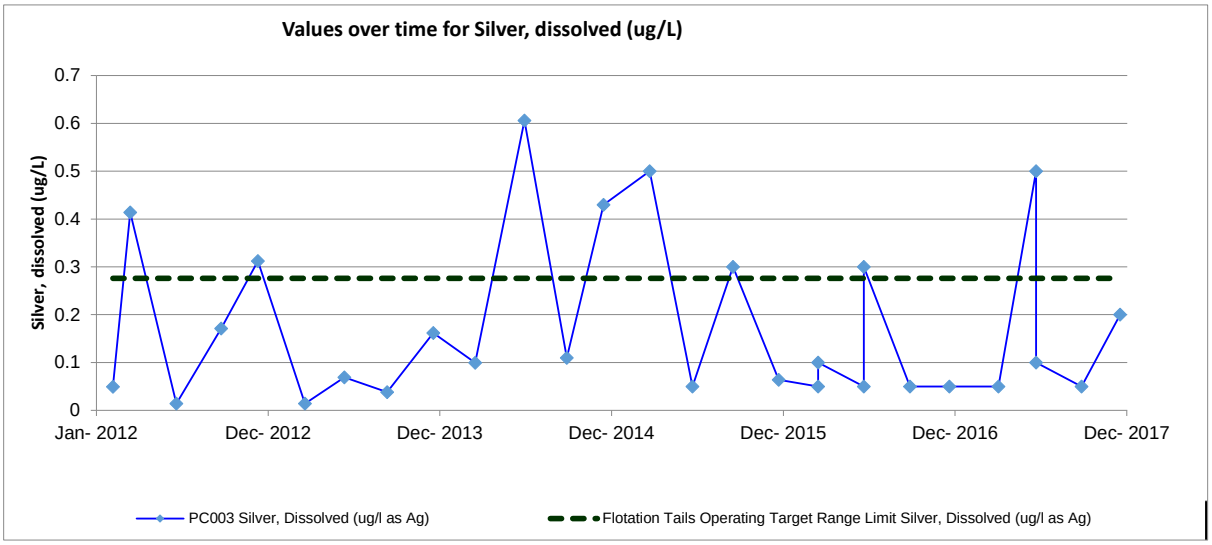

Values over time for Mercury, dissolved (ug/L)
Mercury, dissolved (ug/L)
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Mercury, Dissolved (ug/l as Hg)
Flotation Tails Operating Target Range Limit Mercury, Dissolved (ug/l as Hg)

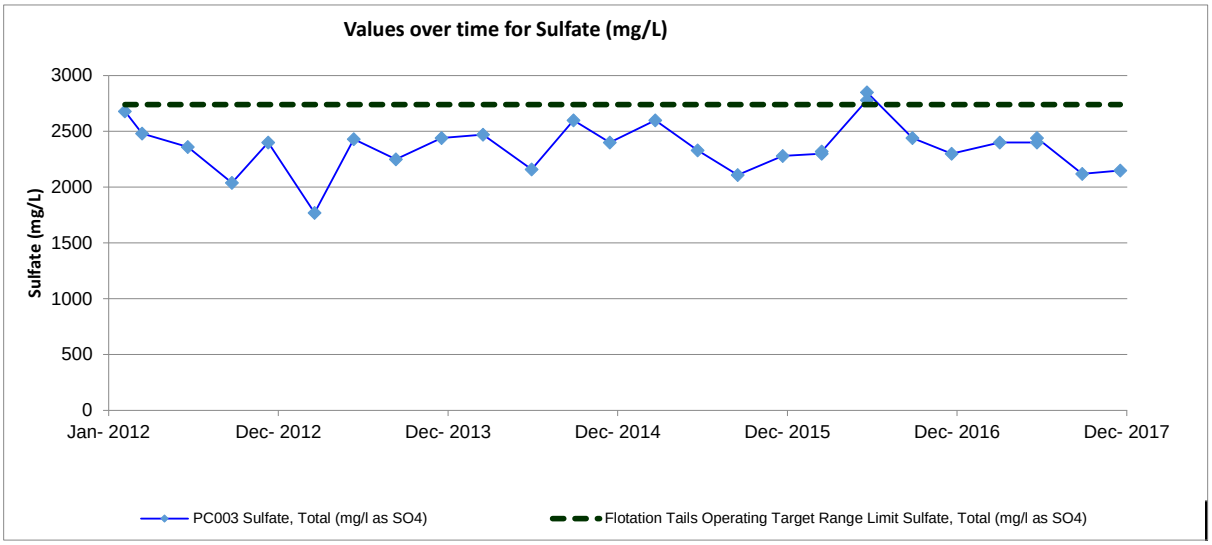

Values over time for Nickel, dissolved (ug/L)
Nickel, dissolved (ug/L)
50
45
40
35
30
25
20
15
10
5
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Nickel, Dissolved (ug/l as Ni)
Flotation Tails Operating Target Range Limit Nickel, Dissolved (ug/l as Ni)

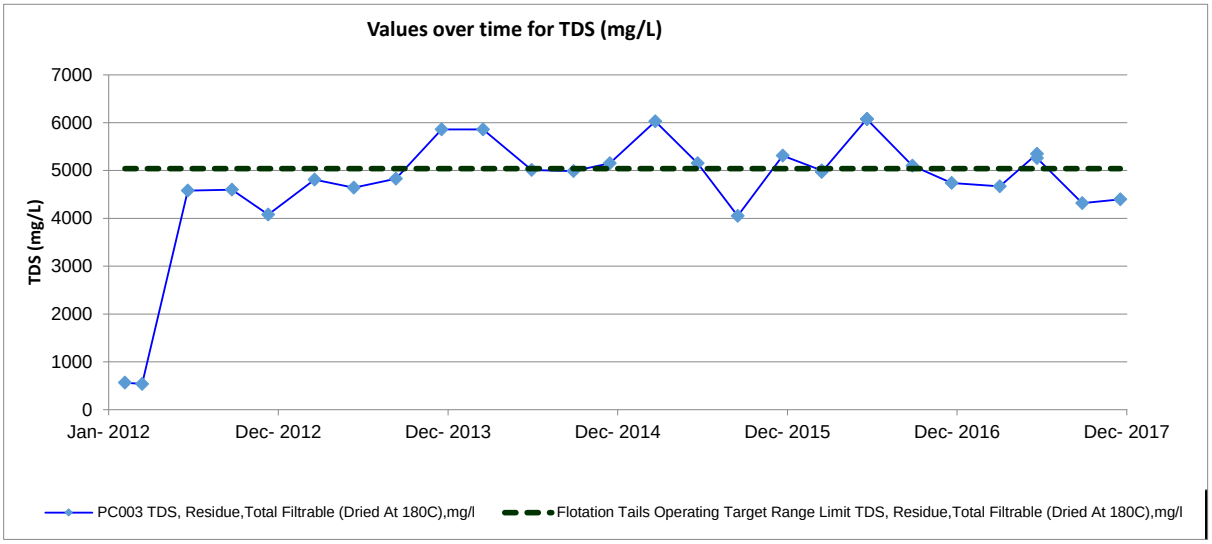

Values over time for Nitrite plus Nitrate (mg/L)
Nitrite plus Nitrate(mg/L)
250
200
150
100
50
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Nitrite plus Nitrate, Total (mg/l as N)
Flotation Tails Operating Target Range Limit Nitrite plus Nitrate, Total (mg/l as N)

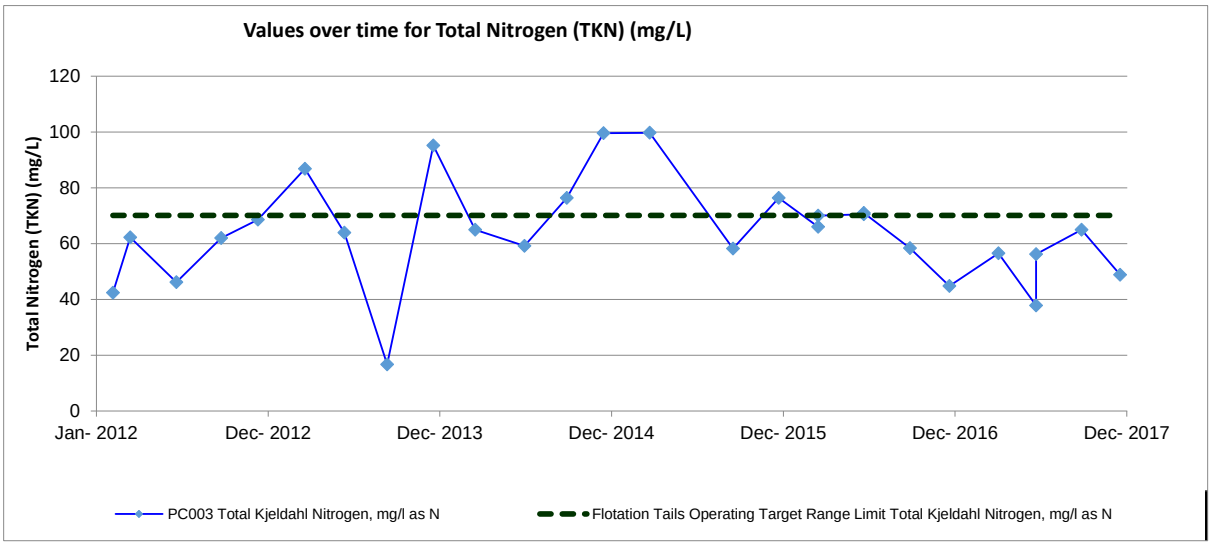

Values over time for pH, field (pH units)
pH, field (pH units)
10
9
8
7
6
5
4
3
2
1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 pH, Field, Standard Units

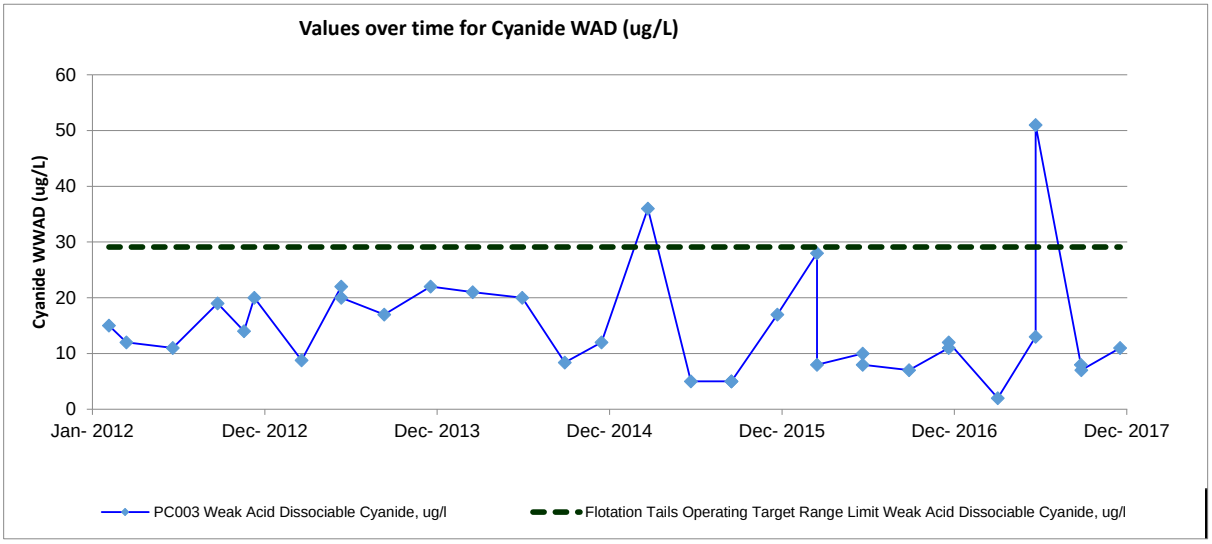

Values over time for Selenium, dissolved (ug/L)
Selenium, dissolved (ug.L)
1000
900
800
700
600
500
400
300
200
100
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Selenium, Dissolved (ug/l as Se)
Flotation Tails Operating Target Range Limit Selenium, Dissolved (ug/l as Se)

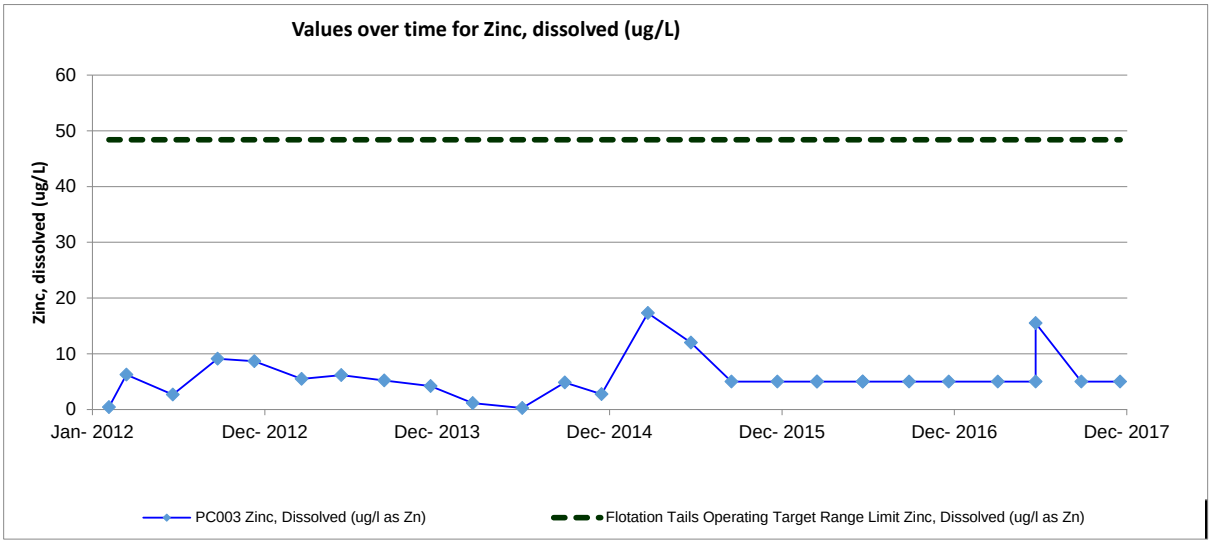

Values over time for Silver, dissolved (ug/L)
Silver, dissolved (ug/L)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Silver, Dissolved (ug/l as Ag)
Flotation Tails Operating Target Range Limit Silver, Dissolved (ug/l as Ag)


Values over time for Sulfate (mg/L)
Sulfate (mg/L)
3000
2500
2000
1500
1000
500
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Sulfate, Total (mg/l as SO4)
Flotation Tails Operating Target Range Limit Sulfate, Total (mg/l as SO4)


Values over time for TDS (mg/L)
TDS (mg/L)
7000
6000
5000
4000
3000
2000
1000
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 TDS, Residue,Total Filtrable (Dried At 180C),mg/l
Flotation Tails Operating Target Range Limit TDS, Residue,Total Filtrable (Dried At 180C),mg/l


Values over time for Total Nitrogen (TKN) (mg/L)
Total Nitrogen (TKN) (mg/L)
120
100
80
60
40
20
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Total Kjeldahl Nitrogen, mg/l as N
Flotation Tails Operating Target Range Limit Total Kjeldahl Nitrogen, mg/l as N


Values over time for Cyanide WAD (ug/L)
Cyanide WWAD (ug/L)
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Weak Acid Dissociable Cyanide, ug/l
Flotation Tails Operating Target Range Limit Weak Acid Dissociable Cyanide, ug/l


Values over time for Zinc, dissolved (ug/L)
Zinc, dissolved (ug/L)
60
50
40
30
20
10
0
Jan- 2012
Dec- 2012
Dec- 2013
Dec- 2014
Dec- 2015
Dec- 2016
Dec- 2017
PC003 Zinc, Dissolved (ug/l as Zn)
Flotation Tails Operating Target Range Limit Zinc, Dissolved (ug/l as Zn)

APPENDIX D –

LABORATORY MDL STUDIES

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Tellurium									
	Te2142								
		01/23/2017 10:30	0.83876	0.8	0.885	111%	0.056	**0.167**	mg/L
		01/23/2017 10:34	0.8163						
		01/23/2017 10:38	0.8337						
		01/25/2017 10:06	0.96038						
		01/25/2017 10:17	0.96478						
		01/27/2017 11:07	0.90046						
		01/27/2017 11:11	0.88386						
		01/27/2017 11:15	0.88162						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Aluminum									
	Al3961								
		01/23/2017 9:25	0.02802	0.025	0.028	110%	0.0076	**0.023**	mg/L
		01/23/2017 9:29	0.04285						
		01/23/2017 9:33	0.03379						
		01/25/2017 9:20	0.02344						
		01/25/2017 9:32	0.01831						
		01/27/2017 10:02	0.02443						
		01/27/2017 10:06	0.02268						
		01/27/2017 10:10	0.0273						
Barium									
	Ba4554								
		01/23/2017 9:25	0.00491	0.005	0.0049	97%	0.00019	**0.00056**	mg/L
		01/23/2017 9:29	0.00503						
		01/23/2017 9:33	0.00494						
		01/25/2017 9:20	0.00446						
		01/25/2017 9:32	0.00475						
		01/27/2017 10:02	0.00482						
		01/27/2017 10:06	0.00503						
		01/27/2017 10:10	0.00489						
Boron									
	B_2089								
		01/23/2017 9:25	0.02513	0.025	0.025	101%	0.00097	**0.0029**	mg/L
		01/23/2017 9:29	0.02661						
		01/23/2017 9:33	0.02578						
		01/25/2017 9:20	0.02507						
		01/25/2017 9:32	0.02637						
		01/27/2017 10:02	0.02574						
		01/27/2017 10:06	0.02377						
		01/27/2017 10:10	0.02438						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Chromium									
	Cr2055								
		01/23/2017 9:25	0.00505	0.01	0.0082	82%	0.0032	**0.0097**	mg/L
		01/23/2017 9:29	0.00629						
		01/23/2017 9:33	0.00444						
		01/25/2017 9:20	0.00759						
		01/25/2017 9:32	0.00631						
		01/27/2017 10:02	0.01178						
		01/27/2017 10:06	0.01204						
		01/27/2017 10:10	0.01185						
Cobalt									
	Co2388								
		01/23/2017 9:25	0.01251	0.01	0.01	102%	0.0021	**0.0063**	mg/L
		01/23/2017 9:29	0.00926						
		01/23/2017 9:33	0.01288						
		01/25/2017 9:20	0.01091						
		01/25/2017 9:32	0.01011						
		01/27/2017 10:02	0.01022						
		01/27/2017 10:06	0.00622						
		01/27/2017 10:10	0.00913						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Copper									
	Cu2199								
		01/23/2017 9:25	0.01557	0.015	0.0084	56%	0.0039	**0.012**	mg/L
		01/23/2017 9:29	0.00491						
		01/23/2017 9:33	0.00559						
		01/25/2017 9:20	0.00822						
		01/25/2017 9:32	0.01129						
		01/27/2017 10:02	0.00648						
		01/27/2017 10:06	0.00419						
		01/27/2017 10:10	0.01115						
	Cu3273								
		01/23/2017 9:25	0.00493	0.015	0.013	87%	0.0043	**0.013**	mg/L
		01/23/2017 9:29	0.018						
		01/23/2017 9:33	0.01278						
		01/25/2017 9:20	0.01583						
		01/25/2017 9:32	0.01182						
		01/27/2017 10:02	0.01089						
		01/27/2017 10:06	0.01772						
		01/27/2017 10:10	0.0123						
Gold									
	Au2427								
		01/23/2017 9:25	0.04817	0.05	0.048	96%	0.0071	**0.021**	mg/L
		01/23/2017 9:29	0.04405						
		01/23/2017 9:33	0.04666						
		01/25/2017 9:20	0.05814						
		01/25/2017 9:32	0.05892						
		01/27/2017 10:02	0.04397						
		01/27/2017 10:06	0.04452						
		01/27/2017 10:10	0.0386						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Silicon									
	Si2516								
		01/23/2017 9:25	0.0987	0.1	0.098	98%	0.0067	**0.02**	mg/L
		01/23/2017 9:29	0.09026						
		01/23/2017 9:33	0.08979						
		01/25/2017 9:20	0.10844						
		01/25/2017 9:32	0.106						
		01/27/2017 10:02	0.09494						
		01/27/2017 10:06	0.10089						
		01/27/2017 10:10	0.09718						
	Si2881								
		01/23/2017 9:25	0.10089	0.1	0.101	101%	0.015	**0.045**	mg/L
		01/23/2017 9:29	0.07608						
		01/23/2017 9:33	0.09015						
		01/25/2017 9:20	0.10771						
		01/25/2017 9:32	0.12763						
		01/27/2017 10:02	0.10038						
		01/27/2017 10:06	0.10823						
		01/27/2017 10:10	0.0946						
Silver									
	Ag3280								
		01/23/2017 9:25	0.01021	0.01	0.012	117%	0.0025	**0.0076**	mg/L
		01/23/2017 9:29	0.00924						
		01/23/2017 9:33	0.01062						
		01/25/2017 9:20	0.01563						
		01/25/2017 9:32	0.01515						
		01/27/2017 10:02	0.00901						
		01/27/2017 10:06	0.01099						
		01/27/2017 10:10	0.01252						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Titanium									
	Ti3361								
		01/23/2017 9:25	0.00508	0.005	0.0049	99%	0.00085	**0.0025**	mg/L
		01/23/2017 9:29	0.00429						
		01/23/2017 9:33	0.00366						
		01/25/2017 9:20	0.00619						
		01/25/2017 9:32	0.00583						
		01/27/2017 10:02	0.0046						
		01/27/2017 10:06	0.00442						
		01/27/2017 10:10	0.00538						
Uranium									
	U_3670								
		01/23/2017 9:25	0.2709	0.2	0.283	141%	0.058	**0.173**	mg/L
		01/23/2017 9:29	0.29393						
		01/23/2017 9:33	0.26282						
		01/25/2017 9:20	0.23947						
		01/25/2017 9:32	0.22633						
		01/27/2017 10:02	0.41053						
		01/27/2017 10:06	0.30357						
		01/27/2017 10:10	0.25575						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Manganese									
	Mn2576								
		01/23/2017 9:25	0.00498	0.005	0.0053	106%	0.00024	**0.00073**	mg/L
		01/23/2017 9:29	0.00518						
		01/23/2017 9:33	0.00568						
		01/25/2017 9:20	0.00495						
		01/25/2017 9:32	0.00528						
		01/26/2017 13:19	0.00542						
		01/26/2017 13:23	0.00531						
		01/26/2017 13:27	0.00545						
Molybdenum									
	Mo2816								
		01/23/2017 9:25	0.02154	0.015	0.02	134%	0.0046	**0.014**	mg/L
		01/23/2017 9:29	0.0154						
		01/23/2017 9:33	0.02619						
		01/25/2017 9:20	0.021						
		01/25/2017 9:32	0.02633						
		01/26/2017 13:19	0.01725						
		01/26/2017 13:23	0.01914						
		01/26/2017 13:27	0.01384						
Phosphorus									
	P_2149								
		01/23/2017 9:25	0.10988	0.1	0.089	89%	0.0092	**0.028**	mg/L
		01/23/2017 9:29	0.08234						
		01/23/2017 9:33	0.08961						
		01/25/2017 9:20	0.08977						
		01/25/2017 9:32	0.08363						
		01/26/2017 13:19	0.08585						
		01/26/2017 13:23	0.08699						
		01/26/2017 13:27	0.08071						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Thallium									
	Tl1908								
		01/23/2017 9:25	0.13011	0.15	0.159	106%	0.027	**0.08**	mg/L
		01/23/2017 9:29	0.12512						
		01/23/2017 9:33	0.12711						
		01/25/2017 9:20	0.17245						
		01/25/2017 9:32	0.17375						
		01/26/2017 13:19	0.17551						
		01/26/2017 13:23	0.18797						
		01/26/2017 13:27	0.18099						
Tin									
	Sn1899								
		01/23/2017 9:25	0.10114	0.1	0.094	94%	0.0073	**0.022**	mg/L
		01/23/2017 9:29	0.09813						
		01/23/2017 9:33	0.09932						
		01/25/2017 9:20	0.08074						
		01/25/2017 9:32	0.08519						
		01/26/2017 13:19	0.09525						
		01/26/2017 13:23	0.09762						
		01/26/2017 13:27	0.09634						
Zinc									
	Zn2062								
		01/23/2017 9:25	0.01145	0.01	0.011	111%	0.00038	**0.0011**	mg/L
		01/23/2017 9:29	0.01086						
		01/23/2017 9:33	0.01154						
		01/25/2017 9:20	0.0111						
		01/25/2017 9:32	0.01118						
		01/26/2017 13:19	0.01045						
		01/26/2017 13:23	0.01144						
		01/26/2017 13:27	0.01083						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Boron									
	B_2497								
		01/23/2017 9:07	0.05229	0.05	0.053	106%	0.0023	**0.007**	mg/L
		01/23/2017 9:10	0.05125						
		01/23/2017 9:14	0.04837						
		01/25/2017 9:13	0.05503						
		01/25/2017 9:17	0.0546						
		01/27/2017 9:43	0.05207						
		01/27/2017 9:47	0.05438						
		01/27/2017 9:51	0.0549						
Calcium									
	Ca3181								
		01/23/2017 9:07	0.68278	0.5	0.572	114%	0.111	**0.332**	mg/L
		01/23/2017 9:10	0.70574						
		01/23/2017 9:14	0.72455						
		01/25/2017 9:13	0.47379						
		01/25/2017 9:17	0.48306						
		01/27/2017 9:43	0.51432						
		01/27/2017 9:47	0.50668						
		01/27/2017 9:51	0.48685						
Gold									
	Au2675								
		01/23/2017 9:07	0.12116	0.1	0.095	95%	0.021	**0.064**	mg/L
		01/23/2017 9:10	0.12158						
		01/23/2017 9:14	0.11273						
		01/25/2017 9:13	0.07724						
		01/25/2017 9:17	0.081						
		01/27/2017 9:43	0.07738						
		01/27/2017 9:47	0.09631						
		01/27/2017 9:51	0.06986						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Iron									
	Fe2332								
		01/23/2017 9:07	0.01715	0.02	0.016	81%	0.0048	**0.014**	mg/L
		01/23/2017 9:10	0.0171						
		01/23/2017 9:14	0.01634						
		01/25/2017 9:13	0.02645						
		01/25/2017 9:17	0.01105						
		01/27/2017 9:43	0.01706						
		01/27/2017 9:47	0.01279						
		01/27/2017 9:51	0.0124						
Lead									
	Pb2169								
		01/23/2017 9:07	0.10193	0.1	0.096	96%	0.014	**0.043**	mg/L
		01/23/2017 9:10	0.10609						
		01/23/2017 9:14	0.11059						
		01/25/2017 9:13	0.08939						
		01/25/2017 9:17	0.08187						
		01/27/2017 9:43	0.11458						
		01/27/2017 9:47	0.08978						
		01/27/2017 9:51	0.07377						
	Pb2203								
		01/23/2017 9:07	0.10904	0.1	0.102	102%	0.006	**0.018**	mg/L
		01/23/2017 9:10	0.10471						
		01/23/2017 9:14	0.10614						
		01/25/2017 9:13	0.10154						
		01/25/2017 9:17	0.10549						
		01/27/2017 9:43	0.09109						
		01/27/2017 9:47	0.10517						
		01/27/2017 9:51	0.09562						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Manganese									
	Mn2593								
		01/23/2017 9:07	0.01033	0.01	0.0083	83%	0.0019	**0.0058**	mg/L
		01/23/2017 9:10	0.01056						
		01/23/2017 9:14	0.01023						
		01/25/2017 9:13	0.00582						
		01/25/2017 9:17	0.00567						
		01/27/2017 9:43	0.00813						
		01/27/2017 9:47	0.00821						
		01/27/2017 9:51	0.00776						
Potassium									
	K_7664								
		01/23/2017 9:07	0.49051	0.5	0.466	93%	0.018	**0.053**	mg/L
		01/23/2017 9:10	0.4663						
		01/23/2017 9:14	0.46847						
		01/25/2017 9:13	0.46638						
		01/25/2017 9:17	0.48073						
		01/27/2017 9:43	0.44819						
		01/27/2017 9:47	0.47384						
		01/27/2017 9:51	0.43469						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Selenium									
	Se1960								
		01/23/2017 9:07	0.20373	0.2	0.195	98%	0.0075	**0.023**	mg/L
		01/23/2017 9:10	0.19345						
		01/23/2017 9:14	0.20184						
		01/25/2017 9:13	0.18655						
		01/25/2017 9:17	0.18269						
		01/27/2017 9:43	0.1945						
		01/27/2017 9:47	0.20164						
		01/27/2017 9:51	0.19638						
	Se2039								
		01/23/2017 9:07	0.2071	0.2	0.205	102%	0.018	**0.054**	mg/L
		01/23/2017 9:10	0.2294						
		01/23/2017 9:14	0.2234						
		01/25/2017 9:13	0.17189						
		01/25/2017 9:17	0.19764						
		01/27/2017 9:43	0.20609						
		01/27/2017 9:47	0.21151						
		01/27/2017 9:51	0.19245						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Magnesium									
	Mg2798								
		01/23/2017 9:07	0.53198	0.5	0.546	109%	0.018	**0.054**	mg/L
		01/23/2017 9:10	0.53041						
		01/23/2017 9:14	0.51607						
		01/25/2017 9:13	0.56424						
		01/25/2017 9:17	0.56766						
		01/26/2017 13:00	0.54923						
		01/26/2017 13:04	0.54947						
		01/26/2017 13:08	0.55842						
Phosphorus									
	P_1774								
		01/23/2017 9:07	0.18731	0.2	0.194	97%	0.014	**0.043**	mg/L
		01/23/2017 9:10	0.18934						
		01/23/2017 9:14	0.18949						
		01/25/2017 9:13	0.21294						
		01/25/2017 9:17	0.22035						
		01/26/2017 13:00	0.18318						
		01/26/2017 13:04	0.18523						
		01/26/2017 13:08	0.18444						
Sodium									
	Na8183								
		01/23/2017 9:07	0.69531	0.5	0.647	129%	0.082	**0.244**	mg/L
		01/23/2017 9:10	0.64061						
		01/23/2017 9:14	0.63595						
		01/25/2017 9:13	0.65117						
		01/25/2017 9:17	0.65008						
		01/26/2017 13:00	0.79936						
		01/26/2017 13:04	0.51707						
		01/26/2017 13:08	0.58447						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Sulfur									
	S_1820								
				0.05	0.041	82%	0.0061	**0.019**	
		01/24/2017 15:47	0.05015						mg/L
		01/24/2017 15:50	0.0452						
		01/24/2017 15:54	0.04368						
		01/26/2017 9:02	0.04179						
		01/26/2017 9:05	0.03957						
		01/30/2017 11:09	0.03706						
		01/30/2017 11:16	0.03105						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Arsenic									
	As1937								
		01/23/2017 10:30	0.40956	0.4	0.439	110%	0.034	**0.103**	mg/L
		01/23/2017 10:34	0.40419						
		01/23/2017 10:38	0.40476						
		01/25/2017 10:06	0.49083						
		01/25/2017 10:17	0.48681						
		01/26/2017 14:24	0.43873						
		01/26/2017 14:28	0.43822						
		01/26/2017 14:32	0.4356						
Cadmium									
	Cd2265								
		01/23/2017 10:30	0.01444	0.02	0.016	81%	0.0022	**0.0067**	mg/L
		01/23/2017 10:34	0.01431						
		01/23/2017 10:38	0.01449						
		01/25/2017 10:06	0.01445						
		01/25/2017 10:17	0.01489						
		01/26/2017 14:24	0.01881						
		01/26/2017 14:28	0.01899						
		01/26/2017 14:32	0.01856						
Chromium									
	Cr2666								
		01/23/2017 10:30	0.08861	0.08	0.09	112%	0.0071	**0.021**	mg/L
		01/23/2017 10:34	0.07688						
		01/23/2017 10:38	0.09451						
		01/25/2017 10:06	0.10171						
		01/25/2017 10:17	0.08548						
		01/26/2017 14:24	0.08947						
		01/26/2017 14:28	0.09054						
		01/26/2017 14:32	0.09221						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Cobalt									
	Co2286								
		01/23/2017 10:30	0.06606	0.08	0.064	79%	0.003	**0.0091**	mg/L
		01/23/2017 10:34	0.06723						
		01/23/2017 10:38	0.06525						
		01/25/2017 10:06	0.05912						
		01/25/2017 10:17	0.05895						
		01/26/2017 14:24	0.06376						
		01/26/2017 14:28	0.06401						
		01/26/2017 14:32	0.06374						
Nickel									
	Ni2303								
		01/23/2017 10:30	0.05643	0.08	0.043	53%	0.012	**0.036**	mg/L
		01/23/2017 10:34	0.0507						
		01/23/2017 10:38	0.05482						
		01/25/2017 10:06	0.04735						
		01/25/2017 10:17	0.04495						
		01/26/2017 14:24	0.03012						
		01/26/2017 14:28	0.02953						
		01/26/2017 14:32	0.02629						
Strontium									
	Sr3464								
		01/23/2017 10:30	0.0414	0.04	0.038	96%	0.0042	**0.013**	mg/L
		01/23/2017 10:34	0.03516						
		01/23/2017 10:38	0.03124						
		01/25/2017 10:06	0.04516						
		01/25/2017 10:17	0.03965						
		01/26/2017 14:24	0.03742						
		01/26/2017 14:28	0.0374						
		01/26/2017 14:32	0.04037						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Uranium									
	U_3859								
		01/23/2017 10:30	1.6105	1.6	1.74	108%	0.08	**0.239**	mg/L
		01/23/2017 10:34	1.7871						
		01/23/2017 10:38	1.7337						
		01/25/2017 10:06	1.8635						
		01/25/2017 10:17	1.7912						
		01/26/2017 14:24	1.6673						
		01/26/2017 14:28	1.689						
		01/26/2017 14:32	1.7383						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Chromium									
	Cr2677								
		01/23/2017 10:19	0.20314	0.2	0.192	96%	0.0071	**0.021**	mg/L
		01/23/2017 10:23	0.19573						
		01/23/2017 10:26	0.19887						
		01/25/2017 9:58	0.19191						
		01/25/2017 10:02	0.18631						
		01/27/2017 10:56	0.18361						
		01/27/2017 10:59	0.18553						
		01/27/2017 11:03	0.18692						
Silver									
	Ag3382								
		01/23/2017 10:19	0.22597	0.2	0.218	109%	0.0068	**0.02**	mg/L
		01/23/2017 10:23	0.22296						
		01/23/2017 10:26	0.21844						
		01/25/2017 9:58	0.22423						
		01/25/2017 10:02	0.2208						
		01/27/2017 10:56	0.20691						
		01/27/2017 10:59	0.21007						
		01/27/2017 11:03	0.21752						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Potassium									
	K_7698								
		01/23/2017 10:19	5.196	5	5.03	101%	0.192	**0.574**	mg/L
		01/23/2017 10:23	5.2486						
		01/23/2017 10:26	5.2937						
		01/25/2017 9:58	4.9659						
		01/25/2017 10:02	4.7667						
		01/26/2017 14:13	4.8823						
		01/26/2017 14:16	4.968						
		01/26/2017 14:20	4.9177						
Zinc									
	Zn3345								
		01/23/2017 10:19	0.11976	0.2	0.149	75%	0.046	**0.138**	mg/L
		01/23/2017 10:23	0.1385						
		01/23/2017 10:26	0.21264						
		01/25/2017 9:58	0.18396						
		01/25/2017 10:02	0.18812						
		01/26/2017 14:13	0.15112						
		01/26/2017 14:16	0.06734						
		01/26/2017 14:20	0.13178						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Beryllium									
	Be3130								
		01/23/2017 10:00	0.00013	0.00015	0.00014	96%	0.000024	**0.000073**	mg/L
		01/23/2017 10:11	0.00018						
		01/23/2017 10:15	0.00016						
		01/25/2017 9:51	0.00014						
		01/25/2017 9:55	0.0001						
		01/26/2017 13:54	0.00013						
		01/26/2017 14:05	0.00015						
		01/26/2017 14:09	0.00016						
Magnesium									
	Mg2852								
		01/23/2017 10:00	0.02373	0.025	0.024	97%	0.0018	**0.0055**	mg/L
		01/23/2017 10:11	0.02695						
		01/23/2017 10:15	0.02639						
		01/25/2017 9:51	0.0243						
		01/25/2017 9:55	0.0249						
		01/26/2017 13:54	0.02175						
		01/26/2017 14:05	0.02355						
		01/26/2017 14:09	0.0222						
Strontium									
	Sr4077								
		01/23/2017 10:00	0.00043	0.0005	0.00049	98%	0.000048	**0.00014**	mg/L
		01/23/2017 10:11	0.00058						
		01/23/2017 10:15	0.00049						
		01/25/2017 9:51	0.00047						
		01/25/2017 9:55	0.00054						
		01/26/2017 13:54	0.00045						
		01/26/2017 14:05	0.00048						
		01/26/2017 14:09	0.00049						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Molybdenum									
	Mo2020								
		01/23/2017 9:48	0.00171	0.003	0.0028	95%	0.00072	**0.0022**	mg/L
		01/23/2017 9:52	0.00304						
		01/23/2017 9:56	0.00278						
		01/25/2017 9:43	0.0023						
		01/25/2017 9:47	0.00243						
		01/27/2017 10:25	0.00412						
		01/27/2017 10:29	0.00326						
		01/27/2017 10:33	0.00308						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Antimony									
	Sb2068								
		01/23/2017 9:48	0.0224	0.02	0.021	107%	0.0059	**0.018**	mg/L
		01/23/2017 9:52	0.01837						
		01/23/2017 9:56	0.02314						
		01/25/2017 9:43	0.02375						
		01/25/2017 9:47	0.03341						
		01/26/2017 13:42	0.01558						
		01/26/2017 13:46	0.01522						
		01/26/2017 13:50	0.01894						
Arsenic									
	As1890								
		01/23/2017 9:48	0.00526	0.01	0.0083	83%	0.002	**0.0059**	mg/L
		01/23/2017 9:52	0.00839						
		01/23/2017 9:56	0.0081						
		01/25/2017 9:43	0.00981						
		01/25/2017 9:47	0.01053						
		01/26/2017 13:42	0.00636						
		01/26/2017 13:46	0.00745						
		01/26/2017 13:50	0.01083						
Cadmium									
	Cd2144								
		01/23/2017 9:48	0.0007	0.0005	0.00063	127%	0.00011	**0.00034**	mg/L
		01/23/2017 9:52	0.00069						
		01/23/2017 9:56	0.00083						
		01/25/2017 9:43	0.00069						
		01/25/2017 9:47	0.0006						
		01/26/2017 13:42	0.00053						
		01/26/2017 13:46	0.0005						
		01/26/2017 13:50	0.00053						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Mercury									
	Hg1849								
		01/23/2017 9:48	0.01852	0.02	0.02	100%	0.00089	**0.0027**	mg/L
		01/23/2017 9:52	0.01968						
		01/23/2017 9:56	0.02022						
		01/25/2017 9:43	0.01942						
		01/25/2017 9:47	0.02019						
		01/26/2017 13:42	0.02011						
		01/26/2017 13:46	0.02129						
		01/26/2017 13:50	0.02107						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Calcium									
	Ca3179								
		01/23/2017 9:37	0.12847	0.1	0.13	131%	0.004	**0.012**	mg/L
		01/23/2017 9:41	0.12619						
		01/23/2017 9:45	0.13156						
		01/25/2017 9:35	0.1375						
		01/25/2017 9:39	0.13233						
		01/27/2017 10:14	0.13307						
		01/27/2017 10:18	0.12912						
		01/27/2017 10:22	0.1255						
Copper									
	Cu3247								
		01/23/2017 9:37	0.0069	0.006	0.0059	98%	0.0012	**0.0035**	mg/L
		01/23/2017 9:41	0.00647						
		01/23/2017 9:45	0.00481						
		01/25/2017 9:35	0.00691						
		01/25/2017 9:39	0.0071						
		01/27/2017 10:14	0.00452						
		01/27/2017 10:18	0.00424						
		01/27/2017 10:22	0.00587						
Nickel									
	Ni2216								
		01/23/2017 9:37	0.0041	0.004	0.0037	94%	0.00048	**0.0014**	mg/L
		01/23/2017 9:41	0.00339						
		01/23/2017 9:45	0.00346						
		01/25/2017 9:35	0.00343						
		01/25/2017 9:39	0.00369						
		01/27/2017 10:14	0.00382						
		01/27/2017 10:18	0.00334						
		01/27/2017 10:22	0.00475						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Titanium									
	Ti3349								
		01/23/2017 9:37	0.00149	0.002	0.002	99%	0.00044	**0.0013**	mg/L
		01/23/2017 9:41	0.00224						
		01/23/2017 9:45	0.00149						
		01/25/2017 9:35	0.00276						
		01/25/2017 9:39	0.0023						
		01/27/2017 10:14	0.00205						
		01/27/2017 10:18	0.00178						
		01/27/2017 10:22	0.00179						
Zinc									
	Zn2138								
		01/23/2017 9:37	0.00492	0.004	0.0052	130%	0.00024	**0.00072**	mg/L
		01/23/2017 9:41	0.00506						
		01/23/2017 9:45	0.00505						
		01/25/2017 9:35	0.00551						
		01/25/2017 9:39	0.00491						
		01/27/2017 10:14	0.00547						
		01/27/2017 10:18	0.00538						
		01/27/2017 10:22	0.00525						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Aluminum									
	Al1670								
		01/23/2017 9:37	0.00912	0.01	0.01	100%	0.00097	**0.0029**	mg/L
		01/23/2017 9:41	0.00819						
		01/23/2017 9:45	0.01081						
		01/25/2017 9:35	0.01052						
		01/25/2017 9:39	0.01122						
		01/26/2017 13:31	0.00979						
		01/26/2017 13:35	0.01015						
		01/26/2017 13:38	0.01005						
Antimony									
	Sb2175								
		01/23/2017 9:37	0.04341	0.04	0.043	108%	0.0076	**0.023**	mg/L
		01/23/2017 9:41	0.02912						
		01/23/2017 9:45	0.03874						
		01/25/2017 9:35	0.04184						
		01/25/2017 9:39	0.05535						
		01/26/2017 13:31	0.04692						
		01/26/2017 13:35	0.04767						
		01/26/2017 13:38	0.04301						
Beryllium									
	Be3131								
		01/23/2017 9:37	0.00041	0.0006	0.00055	92%	0.00011	**0.00034**	mg/L
		01/23/2017 9:41	0.00057						
		01/23/2017 9:45	0.0006						
		01/25/2017 9:35	0.00053						
		01/25/2017 9:39	0.00076						
		01/26/2017 13:31	0.00058						
		01/26/2017 13:35	0.00056						
		01/26/2017 13:38	0.0004						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
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Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Iron									
	Fe2599								
		01/23/2017 9:37	0.00273	0.004	0.0026	65%	0.00077	**0.0023**	mg/L
		01/23/2017 9:41	0.00269						
		01/23/2017 9:45	0.00346						
		01/25/2017 9:35	0.00213						
		01/25/2017 9:39	0.00319						
		01/26/2017 13:31	0.00146						
		01/26/2017 13:35	0.00163						
		01/26/2017 13:38	0.00339						
Lithium									
	Li6707								
		01/23/2017 9:37	0.00351	0.004	0.0026	65%	0.00076	**0.0023**	mg/L
		01/23/2017 9:41	0.0021						
		01/23/2017 9:45	0.00382						
		01/25/2017 9:35	0.00284						
		01/25/2017 9:39	0.00209						
		01/26/2017 13:31	0.00247						
		01/26/2017 13:35	0.00153						
		01/26/2017 13:38	0.0024						
Nickel									
	Ni2316								
		01/23/2017 9:37	0.00488	0.004	0.0046	116%	0.00079	**0.0024**	mg/L
		01/23/2017 9:41	0.00569						
		01/23/2017 9:45	0.00436						
		01/25/2017 9:35	0.00474						
		01/25/2017 9:39	0.00342						
		01/26/2017 13:31	0.00504						
		01/26/2017 13:35	0.00538						
		01/26/2017 13:38	0.00369						

Study Name: 17-ICP2-HE-ICP-200.7-W-D
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/7/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Sodium									
	Na5895								
		01/23/2017 9:37	0.09791	0.1	0.109	109%	0.0055	**0.016**	mg/L
		01/23/2017 9:41	0.11108						
		01/23/2017 9:45	0.11205						
		01/25/2017 9:35	0.10325						
		01/25/2017 9:39	0.11245						
		01/26/2017 13:31	0.11399						
		01/26/2017 13:35	0.11087						
		01/26/2017 13:38	0.11028						
Vanadium									
	V_29240								
		01/23/2017 9:37	0.01199	0.01	0.01	105%	0.003	**0.0089**	mg/L
		01/23/2017 9:41	0.01329						
		01/23/2017 9:45	0.00902						
		01/25/2017 9:35	0.01143						
		01/25/2017 9:39	0.01509						
		01/26/2017 13:31	0.00801						
		01/26/2017 13:35	0.00899						
		01/26/2017 13:38	0.00618						
	V_3102								
		01/23/2017 9:37	0.01178	0.01	0.011	107%	0.0014	**0.0043**	mg/L
		01/23/2017 9:41	0.00902						
		01/23/2017 9:45	0.01198						
		01/25/2017 9:35	0.0108						
		01/25/2017 9:39	0.01299						
		01/26/2017 13:31	0.01002						
		01/26/2017 13:35	0.00944						
		01/26/2017 13:38	0.00948						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Aluminum									
	Al1670								
		02/10/2017 10:46	0.00563	0.005	0.0052	103%	0.0011	**0.0033**	mg/L
		02/10/2017 10:49	0.00541						
		02/10/2017 10:53	0.00603						
		02/14/2017 10:57	0.00499						
		02/14/2017 11:01	0.00316						
		02/16/2017 10:57	0.00415						
		02/16/2017 11:01	0.00509						
		02/16/2017 11:05	0.00677						
Antimony									
	Sb2068								
		02/10/2017 10:46	0.01572	0.02	0.02	98%	0.0045	**0.013**	mg/L
		02/10/2017 10:49	0.0127						
		02/10/2017 10:53	0.02003						
		02/14/2017 10:57	0.02536						
		02/14/2017 11:01	0.0176						
		02/16/2017 10:57	0.01958						
		02/16/2017 11:01	0.02592						
		02/16/2017 11:05	0.02051						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Beryllium									
	Be3130								
		02/10/2017 10:46	0.00026	0.0003	0.00028	95%	0.000044	**0.00013**	mg/L
		02/10/2017 10:49	0.00033						
		02/10/2017 10:53	0.00036						
		02/14/2017 10:57	0.00024						
		02/14/2017 11:01	0.00024						
		02/16/2017 10:57	0.00028						
		02/16/2017 11:01	0.00031						
		02/16/2017 11:05	0.00026						
	Be3131								
		02/10/2017 10:46	0.00029	0.0003	0.00029	96%	0.000069	**0.00021**	mg/L
		02/10/2017 10:49	0.00032						
		02/10/2017 10:53	0.00037						
		02/14/2017 10:57	0.00025						
		02/14/2017 11:01	0.00028						
		02/16/2017 10:57	0.00036						
		02/16/2017 11:01	0.00015						
		02/16/2017 11:05	0.00029						
Gold									
	Au2427								
		02/10/2017 10:46	0.00576	0.01	0.0088	88%	0.0025	**0.0075**	mg/L
		02/10/2017 10:49	0.0082						
		02/10/2017 10:53	0.00984						
		02/14/2017 10:57	0.00677						
		02/14/2017 11:01	0.01234						
		02/16/2017 10:57	0.00626						
		02/16/2017 11:01	0.00897						
		02/16/2017 11:05	0.01205						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Magnesium									
	Mg2852								
		02/10/2017 10:46	0.05628	0.05	0.052	105%	0.0031	**0.0094**	mg/L
		02/10/2017 10:49	0.05461						
		02/10/2017 10:53	0.05612						
		02/14/2017 10:57	0.05271						
		02/14/2017 11:01	0.05143						
		02/16/2017 10:57	0.04881						
		02/16/2017 11:01	0.04859						
		02/16/2017 11:05	0.0497						
Nickel									
	Ni2216								
		02/10/2017 10:46	0.00263	0.002	0.0025	124%	0.00048	**0.0014**	mg/L
		02/10/2017 10:49	0.00224						
		02/10/2017 10:53	0.0031						
		02/14/2017 10:57	0.00148						
		02/14/2017 11:01	0.0028						
		02/16/2017 10:57	0.00245						
		02/16/2017 11:01	0.00256						
		02/16/2017 11:05	0.00257						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Selenium									
	Se1960								
		01/30/2017 14:04	0.10136	0.1	0.103	103%	0.0043	**0.013**	mg/L
		01/30/2017 14:08	0.10602						
		01/30/2017 14:12	0.10715						
		01/31/2017 10:45	0.10598						
		01/31/2017 10:49	0.0986						
		02/02/2017 11:06	0.09706						
		02/02/2017 11:10	0.10911						
		02/02/2017 11:13	0.10132						
Silicon									
	Si2881								
		01/30/2017 14:04	0.11695	0.1	0.128	129%	0.017	**0.05**	mg/L
		01/30/2017 14:08	0.11559						
		01/30/2017 14:12	0.11858						
		01/31/2017 10:45	0.11892						
		01/31/2017 10:49	0.12475						
		02/02/2017 11:06	0.15092						
		02/02/2017 11:10	0.12356						
		02/02/2017 11:13	0.15909						
Titanium									
	Ti3349								
		01/30/2017 14:04	0.00485	0.005	0.0055	110%	0.00057	**0.0017**	mg/L
		01/30/2017 14:08	0.00509						
		01/30/2017 14:12	0.0051						
		01/31/2017 10:45	0.00573						
		01/31/2017 10:49	0.00498						
		02/02/2017 11:06	0.00591						
		02/02/2017 11:10	0.00637						
		02/02/2017 11:13	0.00599						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Aluminum									
	Al3961								
		01/30/2017 13:45	0.0442	0.05	0.051	102%	0.0065	**0.02**	mg/L
		01/30/2017 13:57	0.05241						
		01/30/2017 14:00	0.05695						
		01/31/2017 10:30	0.03922						
		01/31/2017 10:41	0.05708						
		02/02/2017 10:47	0.04995						
		02/02/2017 10:58	0.05727						
		02/02/2017 11:02	0.05119						
Calcium									
	Ca3181								
		01/30/2017 13:45	0.37465	0.5	0.428	86%	0.037	**0.112**	mg/L
		01/30/2017 13:57	0.38139						
		01/30/2017 14:00	0.3975						
		01/31/2017 10:30	0.44678						
		01/31/2017 10:41	0.46585						
		02/02/2017 10:47	0.46302						
		02/02/2017 10:58	0.45063						
		02/02/2017 11:02	0.44493						
Copper									
	Cu2199								
		01/30/2017 13:45	0.02332	0.03	0.022	74%	0.0084	**0.025**	mg/L
		01/30/2017 13:57	0.02046						
		01/30/2017 14:00	0.01834						
		01/31/2017 10:30	0.04057						
		01/31/2017 10:41	0.02552						
		02/02/2017 10:47	0.01262						
		02/02/2017 10:58	0.02057						
		02/02/2017 11:02	0.01632						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Thallium									
	Tl1908								
		01/30/2017 13:45	0.28002	0.3	0.3	100%	0.023	**0.068**	mg/L
		01/30/2017 13:57	0.28262						
		01/30/2017 14:00	0.26869						
		01/31/2017 10:30	0.33371						
		01/31/2017 10:41	0.32748						
		02/02/2017 10:47	0.30408						
		02/02/2017 10:58	0.30002						
		02/02/2017 11:02	0.30282						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Uranium									
	U_3670								
		02/14/2017 10:27	0.34106	0.4	0.383	96%	0.077	**0.231**	mg/L
		02/14/2017 10:30	0.39427						
		02/16/2017 10:15	0.52809						
		02/16/2017 10:19	0.35991						
		02/16/2017 10:30	0.33756						
		03/09/2017 14:41	0.31749						
		03/09/2017 14:45	0.31541						
		03/09/2017 14:56	0.46843						
	U_3859								
		02/14/2017 10:27	0.76079	0.4	0.624	156%	0.095	**0.286**	mg/L
		02/14/2017 10:30	0.74746						
		02/16/2017 10:15	0.52126						
		02/16/2017 10:19	0.526						
		02/16/2017 10:30	0.53319						
		03/09/2017 14:41	0.64932						
		03/09/2017 14:45	0.64165						
		03/09/2017 14:56	0.60905						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Cobalt									
	Co2286								
		02/10/2017 11:16	0.07968	0.08	0.07	88%	0.0094	**0.028**	mg/L
		02/10/2017 11:20	0.07877						
		02/10/2017 11:23	0.07931						
		02/14/2017 11:12	0.05735						
		02/14/2017 11:16	0.05579						
		02/16/2017 11:28	0.07097						
		02/16/2017 11:31	0.07059						
		02/16/2017 11:35	0.06958						
Nickel									
	Ni2303								
		02/10/2017 11:16	0.05443	0.08	0.052	65%	0.0079	**0.024**	mg/L
		02/10/2017 11:20	0.05228						
		02/10/2017 11:23	0.05064						
		02/14/2017 11:12	0.04171						
		02/14/2017 11:16	0.03805						
		02/16/2017 11:28	0.05807						
		02/16/2017 11:31	0.06027						
		02/16/2017 11:35	0.05739						
Silver									
	Ag3382								
		02/10/2017 11:16	0.12098	0.08	0.114	143%	0.0074	**0.022**	mg/L
		02/10/2017 11:20	0.11316						
		02/10/2017 11:23	0.11281						
		02/14/2017 11:12	0.12701						
		02/14/2017 11:16	0.11905						
		02/16/2017 11:28	0.10882						
		02/16/2017 11:31	0.10455						
		02/16/2017 11:35	0.10944						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Tellurium									
	Te2142								
		02/10/2017 11:16	0.85687	0.8	0.896	112%	0.033	**0.098**	mg/L
		02/10/2017 11:20	0.85979						
		02/10/2017 11:23	0.85757						
		02/14/2017 11:12	0.93322						
		02/14/2017 11:16	0.92881						
		02/16/2017 11:28	0.91516						
		02/16/2017 11:31	0.90677						
		02/16/2017 11:35	0.90854						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Arsenic									
	As1890								
		02/10/2017 10:34	0.02228	0.02	0.021	106%	0.0017	**0.0051**	mg/L
		02/10/2017 10:38	0.02172						
		02/10/2017 10:42	0.02176						
		02/14/2017 10:42	0.02223						
		02/14/2017 10:46	0.01793						
		02/16/2017 10:46	0.01903						
		02/16/2017 10:50	0.0212						
		02/16/2017 10:54	0.02267						
Chromium									
	Cr2055								
		02/10/2017 10:34	0.00467	0.004	0.005	125%	0.00039	**0.0012**	mg/L
		02/10/2017 10:38	0.00492						
		02/10/2017 10:42	0.00521						
		02/14/2017 10:42	0.00464						
		02/14/2017 10:46	0.00506						
		02/16/2017 10:46	0.00445						
		02/16/2017 10:50	0.00554						
		02/16/2017 10:54	0.00544						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Antimony									
	Sb2175								
		02/10/2017 10:15	0.09204	0.1	0.092	92%	0.004	**0.012**	mg/L
		02/10/2017 10:26	0.09047						
		02/10/2017 10:30	0.09045						
		02/14/2017 10:34	0.09128						
		02/14/2017 10:38	0.08786						
		02/16/2017 10:34	0.09754						
		02/16/2017 10:38	0.09854						
		02/16/2017 10:42	0.08795						
Boron									
	B_2497								
		02/10/2017 10:15	0.02421	0.025	0.025	99%	0.0014	**0.0041**	mg/L
		02/10/2017 10:26	0.02574						
		02/10/2017 10:30	0.02232						
		02/14/2017 10:34	0.02534						
		02/14/2017 10:38	0.02425						
		02/16/2017 10:34	0.02462						
		02/16/2017 10:38	0.02703						
		02/16/2017 10:42	0.02436						
Cadmium									
	Cd2144								
		02/10/2017 10:15	0.00245	0.0025	0.0025	101%	0.00019	**0.00056**	mg/L
		02/10/2017 10:26	0.00264						
		02/10/2017 10:30	0.00241						
		02/14/2017 10:34	0.00246						
		02/14/2017 10:38	0.00222						
		02/16/2017 10:34	0.00279						
		02/16/2017 10:38	0.00253						
		02/16/2017 10:42	0.00274						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
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Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Copper									
	Cu3273								
		02/10/2017 10:15	0.01072	0.015	0.01	67%	0.0037	**0.011**	mg/L
		02/10/2017 10:26	0.01102						
		02/10/2017 10:30	0.01312						
		02/14/2017 10:34	0.01391						
		02/14/2017 10:38	0.00642						
		02/16/2017 10:34	0.01397						
		02/16/2017 10:38	0.00717						
		02/16/2017 10:42	0.00436						
Lead									
	Pb2203								
		02/10/2017 10:15	0.05872	0.05	0.051	102%	0.0053	**0.016**	mg/L
		02/10/2017 10:26	0.04927						
		02/10/2017 10:30	0.04983						
		02/14/2017 10:34	0.04352						
		02/14/2017 10:38	0.04516						
		02/16/2017 10:34	0.05093						
		02/16/2017 10:38	0.0557						
		02/16/2017 10:42	0.05547						
Manganese									
	Mn2593								
		02/10/2017 10:15	0.00359	0.005	0.0042	84%	0.00074	**0.0022**	mg/L
		02/10/2017 10:26	0.00363						
		02/10/2017 10:30	0.00356						
		02/14/2017 10:34	0.00567						
		02/14/2017 10:38	0.00495						
		02/16/2017 10:34	0.00401						
		02/16/2017 10:38	0.0042						
		02/16/2017 10:42	0.00415						

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Analyst: Stephanie Dull
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Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Molybdenum									
	Mo2020								
		02/10/2017 10:15	0.01647	0.015	0.017	112%	0.0005	**0.0015**	mg/L
		02/10/2017 10:26	0.01667						
		02/10/2017 10:30	0.01654						
		02/14/2017 10:34	0.01663						
		02/14/2017 10:38	0.01598						
		02/16/2017 10:34	0.01716						
		02/16/2017 10:38	0.01689						
		02/16/2017 10:42	0.01767						
	Mo2816								
		02/10/2017 10:15	0.01148	0.015	0.011	72%	0.0041	**0.012**	mg/L
		02/10/2017 10:26	0.00744						
		02/10/2017 10:30	0.00925						
		02/14/2017 10:34	0.00722						
		02/14/2017 10:38	0.00936						
		02/16/2017 10:34	0.00857						
		02/16/2017 10:38	0.01455						
		02/16/2017 10:42	0.01898						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
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Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Phosphorus									
	P_1774								
		02/10/2017 10:15	0.11713	0.1	0.111	111%	0.011	**0.032**	mg/L
		02/10/2017 10:26	0.10693						
		02/10/2017 10:30	0.11175						
		02/14/2017 10:34	0.09471						
		02/14/2017 10:38	0.09526						
		02/16/2017 10:34	0.12137						
		02/16/2017 10:38	0.11942						
		02/16/2017 10:42	0.11962						
	P_2149								
		02/10/2017 10:15	0.11422	0.1	0.105	105%	0.0052	**0.016**	mg/L
		02/10/2017 10:26	0.10744						
		02/10/2017 10:30	0.10258						
		02/14/2017 10:34	0.1064						
		02/14/2017 10:38	0.09768						
		02/16/2017 10:34	0.10562						
		02/16/2017 10:38	0.09909						
		02/16/2017 10:42	0.10511						
Selenium									
	Se2039								
		02/10/2017 10:15	0.08339	0.1	0.086	86%	0.0097	**0.029**	mg/L
		02/10/2017 10:26	0.08492						
		02/10/2017 10:30	0.07113						
		02/14/2017 10:34	0.09719						
		02/14/2017 10:38	0.09851						
		02/16/2017 10:34	0.09338						
		02/16/2017 10:38	0.07849						
		02/16/2017 10:42	0.07961						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Silicon									
	Si2516								
		02/10/2017 10:15	0.10195	0.1	0.1	100%	0.0046	**0.014**	mg/L
		02/10/2017 10:26	0.10361						
		02/10/2017 10:30	0.09871						
		02/14/2017 10:34	0.10506						
		02/14/2017 10:38	0.09801						
		02/16/2017 10:34	0.10379						
		02/16/2017 10:38	0.09082						
		02/16/2017 10:42	0.10018						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Chromium									
	Cr2677								
		02/10/2017 10:04	0.02771	0.02	0.023	116%	0.0041	**0.012**	mg/L
		02/10/2017 10:08	0.02758						
		02/10/2017 10:11	0.0256						
		02/14/2017 10:27	0.02055						
		02/14/2017 10:30	0.01598						
		02/16/2017 10:15	0.0216						
		02/16/2017 10:19	0.02543						
		02/16/2017 10:30	0.02095						
Cobalt									
	Co2388								
		02/10/2017 10:04	0.01638	0.02	0.018	90%	0.0018	**0.0055**	mg/L
		02/10/2017 10:08	0.01478						
		02/10/2017 10:11	0.0173						
		02/14/2017 10:27	0.01836						
		02/14/2017 10:30	0.02036						
		02/16/2017 10:15	0.01919						
		02/16/2017 10:19	0.01954						
		02/16/2017 10:30	0.01877						
Copper									
	Cu3247								
		02/10/2017 10:04	0.03061	0.03	0.03	98%	0.0026	**0.0078**	mg/L
		02/10/2017 10:08	0.02609						
		02/10/2017 10:11	0.03						
		02/14/2017 10:27	0.02963						
		02/14/2017 10:30	0.02682						
		02/16/2017 10:15	0.02769						
		02/16/2017 10:19	0.03098						
		02/16/2017 10:30	0.03415						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Gold									
	Au2675								
		02/10/2017 10:04	0.09452	0.1	0.104	104%	0.015	**0.046**	mg/L
		02/10/2017 10:08	0.09953						
		02/10/2017 10:11	0.11314						
		02/14/2017 10:27	0.08396						
		02/14/2017 10:30	0.08482						
		02/16/2017 10:15	0.114						
		02/16/2017 10:19	0.11206						
		02/16/2017 10:30	0.12641						
Lead									
	Pb2169								
		02/10/2017 10:04	0.11796	0.1	0.103	103%	0.011	**0.034**	mg/L
		02/10/2017 10:08	0.11447						
		02/10/2017 10:11	0.10333						
		02/14/2017 10:27	0.09662						
		02/14/2017 10:30	0.08628						
		02/16/2017 10:15	0.09179						
		02/16/2017 10:19	0.11356						
		02/16/2017 10:30	0.10285						
Magnesium									
	Mg2798								
		02/10/2017 10:04	0.57191	0.5	0.56	112%	0.028	**0.085**	mg/L
		02/10/2017 10:08	0.56308						
		02/10/2017 10:11	0.56073						
		02/14/2017 10:27	0.51535						
		02/14/2017 10:30	0.51819						
		02/16/2017 10:15	0.59071						
		02/16/2017 10:19	0.58287						
		02/16/2017 10:30	0.57779						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Silver									
	Ag3280								
		02/10/2017 10:04	0.02444	0.02	0.023	117%	0.0032	**0.0097**	mg/L
		02/10/2017 10:08	0.02217						
		02/10/2017 10:11	0.01961						
		02/14/2017 10:27	0.02488						
		02/14/2017 10:30	0.03006						
		02/16/2017 10:15	0.02053						
		02/16/2017 10:19	0.02196						
		02/16/2017 10:30	0.02335						
Sodium									
	Na8183								
		02/10/2017 10:04	0.4584	0.5	0.553	111%	0.083	**0.25**	mg/L
		02/10/2017 10:08	0.56037						
		02/10/2017 10:11	0.66207						
		02/14/2017 10:27	0.50996						
		02/14/2017 10:30	0.47317						
		02/16/2017 10:15	0.49917						
		02/16/2017 10:19	0.67849						
		02/16/2017 10:30	0.58329						
Tin									
	Sn1899								
		02/10/2017 10:04	0.16737	0.2	0.184	92%	0.021	**0.062**	mg/L
		02/10/2017 10:08	0.16178						
		02/10/2017 10:11	0.16868						
		02/14/2017 10:27	0.17596						
		02/14/2017 10:30	0.17504						
		02/16/2017 10:15	0.20752						
		02/16/2017 10:19	0.20916						
		02/16/2017 10:30	0.20883						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Arsenic									
	As1937								
		01/30/2017 14:57	0.48939	0.4	0.476	119%	0.021	**0.063**	mg/L
		01/30/2017 15:01	0.48678						
		01/30/2017 15:05	0.48071						
		01/31/2017 11:16	0.44369						
		01/31/2017 11:27	0.44199						
		02/02/2017 11:59	0.49096						
		02/02/2017 12:03	0.4843						
		02/02/2017 12:06	0.49302						
Cadmium									
	Cd2265								
		01/30/2017 14:57	0.01652	0.02	0.016	80%	0.0016	**0.0046**	mg/L
		01/30/2017 15:01	0.01692						
		01/30/2017 15:05	0.01562						
		01/31/2017 11:16	0.014						
		01/31/2017 11:27	0.01356						
		02/02/2017 11:59	0.01718						
		02/02/2017 12:03	0.0172						
		02/02/2017 12:06	0.01768						
Chromium									
	Cr2666								
		01/30/2017 14:57	0.0665	0.08	0.077	96%	0.0073	**0.022**	mg/L
		01/30/2017 15:01	0.08856						
		01/30/2017 15:05	0.07413						
		01/31/2017 11:16	0.07758						
		01/31/2017 11:27	0.08534						
		02/02/2017 11:59	0.07378						
		02/02/2017 12:03	0.07056						
		02/02/2017 12:06	0.07565						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Iron									
	Fe2332								
		01/30/2017 14:57	0.08474	0.08	0.079	99%	0.005	**0.015**	mg/L
		01/30/2017 15:01	0.07884						
		01/30/2017 15:05	0.07705						
		01/31/2017 11:16	0.08184						
		01/31/2017 11:27	0.08452						
		02/02/2017 11:59	0.08173						
		02/02/2017 12:03	0.06978						
		02/02/2017 12:06	0.07607						
Strontium									
	Sr3464								
		01/30/2017 14:57	0.04212	0.04	0.041	102%	0.0019	**0.0056**	mg/L
		01/30/2017 15:01	0.04192						
		01/30/2017 15:05	0.04341						
		01/31/2017 11:16	0.03957						
		01/31/2017 11:27	0.04103						
		02/02/2017 11:59	0.03943						
		02/02/2017 12:03	0.04058						
		02/02/2017 12:06	0.03746						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Manganese									
	Mn2576								
		01/30/2017 14:27	0.00138	0.001	0.0013	133%	0.00021	**0.00063**	mg/L
		01/30/2017 14:31	0.00117						
		01/30/2017 14:42	0.00162						
		01/31/2017 11:00	0.00138						
		01/31/2017 11:04	0.00153						
		02/02/2017 11:29	0.00106						
		02/02/2017 11:32	0.00107						
		02/02/2017 11:44	0.00144						
Strontium									
	Sr4077								
		01/30/2017 14:27	0.00103	0.001	0.0011	107%	0.000076	**0.00023**	mg/L
		01/30/2017 14:31	0.00104						
		01/30/2017 14:42	0.001						
		01/31/2017 11:00	0.00116						
		01/31/2017 11:04	0.00114						
		02/02/2017 11:29	0.00101						
		02/02/2017 11:32	0.00098						
		02/02/2017 11:44	0.00116						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Barium									
	Ba4554								
		01/30/2017 14:16	0.00223	0.002	0.0023	113%	0.0002	**0.00061**	mg/L
		01/30/2017 14:20	0.00246						
		01/30/2017 14:23	0.00219						
		01/31/2017 10:53	0.00253						
		01/31/2017 10:57	0.00222						
		02/02/2017 11:17	0.00198						
		02/02/2017 11:21	0.0024						
		02/02/2017 11:25	0.002						
Boron									
	B_2089								
		01/30/2017 14:16	0.01144	0.01	0.011	108%	0.00072	**0.0022**	mg/L
		01/30/2017 14:20	0.01072						
		01/30/2017 14:23	0.01089						
		01/31/2017 10:53	0.01197						
		01/31/2017 10:57	0.01078						
		02/02/2017 11:17	0.00966						
		02/02/2017 11:21	0.01015						
		02/02/2017 11:25	0.01043						
Calcium									
	Ca3179								
		01/30/2017 14:16	0.12675	0.1	0.131	131%	0.0043	**0.013**	mg/L
		01/30/2017 14:20	0.12446						
		01/30/2017 14:23	0.13246						
		01/31/2017 10:53	0.13458						
		01/31/2017 10:57	0.13393						
		02/02/2017 11:17	0.13056						
		02/02/2017 11:21	0.12766						
		02/02/2017 11:25	0.13704						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Iron									
	Fe2599								
		01/30/2017 14:16	0.00388	0.004	0.0048	120%	0.00097	**0.0029**	mg/L
		01/30/2017 14:20	0.0051						
		01/30/2017 14:23	0.0042						
		01/31/2017 10:53	0.00532						
		01/31/2017 10:57	0.0068						
		02/02/2017 11:17	0.00499						
		02/02/2017 11:21	0.0043						
		02/02/2017 11:25	0.00394						
Lithium									
	Li6707								
		01/30/2017 14:16	0.00211	0.004	0.0022	54%	0.00064	**0.0019**	mg/L
		01/30/2017 14:20	0.00183						
		01/30/2017 14:23	0.00339						
		01/31/2017 10:53	0.00204						
		01/31/2017 10:57	0.00122						
		02/02/2017 11:17	0.00205						
		02/02/2017 11:21	0.00201						
		02/02/2017 11:25	0.00273						
Nickel									
	Ni2316								
		01/30/2017 14:16	0.00533	0.004	0.0042	105%	0.001	**0.0031**	mg/L
		01/30/2017 14:20	0.00604						
		01/30/2017 14:23	0.00458						
		01/31/2017 10:53	0.00361						
		01/31/2017 10:57	0.0033						
		02/02/2017 11:17	0.00364						
		02/02/2017 11:21	0.0042						
		02/02/2017 11:25	0.003						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Potassium									
	K_7664								
		01/30/2017 14:16	0.04079	0.1	0.058	58%	0.018	**0.054**	mg/L
		01/30/2017 14:20	0.03013						
		01/30/2017 14:23	0.05233						
		01/31/2017 10:53	0.08341						
		01/31/2017 10:57	0.06647						
		02/02/2017 11:17	0.0533						
		02/02/2017 11:21	0.0793						
		02/02/2017 11:25	0.06183						
Sodium									
	Na5895								
		01/30/2017 14:16	0.09309	0.1	0.098	98%	0.0068	**0.02**	mg/L
		01/30/2017 14:20	0.10997						
		01/30/2017 14:23	0.10468						
		01/31/2017 10:53	0.09925						
		01/31/2017 10:57	0.09881						
		02/02/2017 11:17	0.09064						
		02/02/2017 11:21	0.09407						
		02/02/2017 11:25	0.09144						
Titanium									
	Ti3361								
		01/30/2017 14:16	0.00395	0.002	0.0028	139%	0.00055	**0.0016**	mg/L
		01/30/2017 14:20	0.00254						
		01/30/2017 14:23	0.00279						
		01/31/2017 10:53	0.00227						
		01/31/2017 10:57	0.00246						
		02/02/2017 11:17	0.00239						
		02/02/2017 11:21	0.0027						
		02/02/2017 11:25	0.00318						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Vanadium									
	V_29240								
		01/30/2017 14:16	0.01184	0.01	0.011	110%	0.0012	**0.0035**	mg/L
		01/30/2017 14:20	0.00956						
		01/30/2017 14:23	0.01295						
		01/31/2017 10:53	0.00989						
		01/31/2017 10:57	0.00993						
		02/02/2017 11:17	0.01106						
		02/02/2017 11:21	0.01132						
		02/02/2017 11:25	0.01163						
	V_3102								
		01/30/2017 14:16	0.01005	0.01	0.01	103%	0.0022	**0.0065**	mg/L
		01/30/2017 14:20	0.00949						
		01/30/2017 14:23	0.01156						
		01/31/2017 10:53	0.01225						
		01/31/2017 10:57	0.01397						
		02/02/2017 11:17	0.00764						
		02/02/2017 11:21	0.00852						
		02/02/2017 11:25	0.00853						

Study Name: 17-ICP2-HE-ICP-200.7-W-T
Analyst: Stephanie Dull
Instrument: ICP2-HE

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 5/5/2017
Matrix: Aqueous

Method Source: E200.7 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units
Zinc									
	Zn2062								
		01/30/2017 14:16	0.0052	0.004	0.0054	135%	0.00032	**0.00096**	mg/L
		01/30/2017 14:20	0.00507						
		01/30/2017 14:23	0.00508						
		01/31/2017 10:53	0.0053						
		01/31/2017 10:57	0.00527						
		02/02/2017 11:17	0.00547						
		02/02/2017 11:21	0.00598						
		02/02/2017 11:25	0.00572						
	Zn2138								
		01/30/2017 14:16	0.00603	0.004	0.0059	148%	0.00048	**0.0014**	mg/L
		01/30/2017 14:20	0.00592						
		01/30/2017 14:23	0.00584						
		01/31/2017 10:53	0.00517						
		01/31/2017 10:57	0.00531						
		02/02/2017 11:17	0.0063						
		02/02/2017 11:21	0.00638						
		02/02/2017 11:25	0.00649						

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Antimony										
	Sb 121									
		02/13/2017 11:38	0.0001	0.0001	0.000097	97%	0.0000051	**0.000015**	mg/L	2
		02/13/2017 11:40	0.000102							
		02/13/2017 11:42	0.000102							
		02/13/2017 11:44	0.000091							
		02/13/2017 11:46	0.000099							
		02/13/2017 11:48	0.000098							
		02/13/2017 11:50	0.000088							
		02/13/2017 11:52	0.000096							
Arsenic										
	As 75									
		02/13/2017 11:38	0.000096	0.0001	0.000086	86%	0.0000073	**0.000022**	mg/L	2
		02/13/2017 11:40	0.000089							
		02/13/2017 11:42	0.00008							
		02/13/2017 11:44	0.000077							
		02/13/2017 11:46	0.000088							
		02/13/2017 11:48	0.000091							
		02/13/2017 11:50	0.000076							
		02/13/2017 11:52	0.00009							
Barium										
	Ba 137									
		02/13/2017 11:38	0.000102	0.0001	0.00011	108%	0.0000081	**0.000024**	mg/L	2
		02/13/2017 11:40	0.000107							
		02/13/2017 11:42	0.000109							
		02/13/2017 11:44	0.000113							
		02/13/2017 11:46	0.00012							
		02/13/2017 11:48	0.000092							
		02/13/2017 11:50	0.000109							
		02/13/2017 11:52	0.000109							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Beryllium										
	Be 9									
		02/13/2017 11:38	0.000069	0.0001	0.000072	73%	0.000026	**0.000077**	mg/L	2
		02/13/2017 11:40	0.000072							
		02/13/2017 11:42	0.000057							
		02/13/2017 11:44	0.000093							
		02/13/2017 11:46	0.000102							
		02/13/2017 11:48	0.000094							
		02/13/2017 11:50	0.000072							
		02/13/2017 11:52	0.000021							
Cadmium										
	Cd 111									
		02/13/2017 11:38	0.000107	0.0001	0.00011	107%	0.0000073	**0.000022**	mg/L	2
		02/13/2017 11:40	0.000114							
		02/13/2017 11:42	0.000113							
		02/13/2017 11:44	0.000103							
		02/13/2017 11:46	0.000095							
		02/13/2017 11:48	0.00011							
		02/13/2017 11:50	0.000113							
		02/13/2017 11:52	0.000098							
Calcium										
	Ca 40									
		02/13/2017 11:38	0.02689	0.025	0.031	125%	0.0068	**0.02**	mg/L	1
		02/13/2017 11:40	0.04705							
		02/13/2017 11:42	0.0301							
		02/13/2017 11:44	0.03046							
		02/13/2017 11:46	0.02669							
		02/13/2017 11:48	0.02733							
		02/13/2017 11:50	0.02808							
		02/13/2017 11:52	0.03316							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Cobalt										
	Co 59									
		02/13/2017 11:38	0.000086	0.0001	0.000083	83%	0.0000058	**0.000017**	mg/L	2
		02/13/2017 11:40	0.000088							
		02/13/2017 11:42	0.000078							
		02/13/2017 11:44	0.000093							
		02/13/2017 11:46	0.000077							
		02/13/2017 11:48	0.00008							
		02/13/2017 11:50	0.000081							
		02/13/2017 11:52	0.000078							
Copper										
	Cu 63									
		02/13/2017 11:38	0.000117	0.0001	0.00012	118%	0.000014	**0.000042**	mg/L	2
		02/13/2017 11:40	0.000124							
		02/13/2017 11:42	0.000119							
		02/13/2017 11:44	0.000148							
		02/13/2017 11:46	0.00011							
		02/13/2017 11:48	0.00011							
		02/13/2017 11:50	0.0001							
		02/13/2017 11:52	0.000118							
	Cu 65									
		02/13/2017 11:38	0.000128	0.0001	0.00013	125%	0.000011	**0.000032**	mg/L	2
		02/13/2017 11:40	0.00014							
		02/13/2017 11:42	0.000113							
		02/13/2017 11:44	0.000138							
		02/13/2017 11:46	0.000118							
		02/13/2017 11:48	0.000112							
		02/13/2017 11:50	0.000124							
		02/13/2017 11:52	0.000128							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Iron										
	Fe 56									
		02/13/2017 11:38	0.001487	0.0026	0.0017	66%	0.00049	**0.0015**	mg/L	1
		02/13/2017 11:40	0.001528							
		02/13/2017 11:42	0.001512							
		02/13/2017 11:44	0.002687							
		02/13/2017 11:46	0.001429							
		02/13/2017 11:48	0.001472							
		02/13/2017 11:50	0.002281							
		02/13/2017 11:52	0.00136							
		02/13/2017 11:38	0.00145	0.0026	0.0017	65%	0.00052	**0.0016**	mg/L	2
		02/13/2017 11:40	0.001452							
		02/13/2017 11:42	0.001606							
		02/13/2017 11:44	0.002909							
		02/13/2017 11:46	0.001422							
		02/13/2017 11:48	0.001535							
		02/13/2017 11:50	0.001914							
		02/13/2017 11:52	0.001293							
Lead										
	Pb 208									
		02/13/2017 11:38	0.000094	0.0001	0.000088	88%	0.0000034	**0.00001**	mg/L	2
		02/13/2017 11:40	0.000084							
		02/13/2017 11:42	0.000088							
		02/13/2017 11:44	0.000091							
		02/13/2017 11:46	0.000086							
		02/13/2017 11:48	0.000088							
		02/13/2017 11:50	0.000084							
		02/13/2017 11:52	0.000087							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Manganese										
	Mn 55									
		02/13/2017 11:38	0.000117	0.0001	0.00012	122%	0.0000088	**0.000027**	mg/L	2
		02/13/2017 11:40	0.00012							
		02/13/2017 11:42	0.000126							
		02/13/2017 11:44	0.000125							
		02/13/2017 11:46	0.000139							
		02/13/2017 11:48	0.000123							
		02/13/2017 11:50	0.000119							
		02/13/2017 11:52	0.000108							
Molybdenum										
	Mo 95									
		02/13/2017 11:38	0.000085	0.0001	0.000092	92%	0.0000065	**0.00002**	mg/L	2
		02/13/2017 11:40	0.000096							
		02/13/2017 11:42	0.000093							
		02/13/2017 11:44	0.000105							
		02/13/2017 11:46	0.000092							
		02/13/2017 11:48	0.000087							
		02/13/2017 11:50	0.000086							
		02/13/2017 11:52	0.000091							
	Mo 98									
		02/13/2017 11:38	0.000088	0.0001	0.000091	91%	0.0000052	**0.000016**	mg/L	2
		02/13/2017 11:40	0.00009							
		02/13/2017 11:42	0.000096							
		02/13/2017 11:44	0.000102							
		02/13/2017 11:46	0.000088							
		02/13/2017 11:48	0.000091							
		02/13/2017 11:50	0.000086							
		02/13/2017 11:52	0.000089							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Nickel										
	Ni 60									
		02/13/2017 11:38	0.000095	0.0001	0.000085	85%	0.000011	**0.000033**	mg/L	2
		02/13/2017 11:40	0.000102							
		02/13/2017 11:42	0.00007							
		02/13/2017 11:44	0.000088							
		02/13/2017 11:46	0.000073							
		02/13/2017 11:48	0.000089							
		02/13/2017 11:50	0.000089							
		02/13/2017 11:52	0.000077							
Selenium										
	Se 78									
		02/13/2017 11:38	0.000096	0.0001	0.000092	92%	0.0000092	**0.000028**	mg/L	1
		02/13/2017 11:40	0.000089							
		02/13/2017 11:42	0.000089							
		02/13/2017 11:44	0.000106							
		02/13/2017 11:46	0.000093							
		02/13/2017 11:48	0.000089							
		02/13/2017 11:50	0.000075							
		02/13/2017 11:52	0.0001							
Sodium										
	Na 23									
		02/13/2017 11:38	0.02492	0.025	0.023	93%	0.0019	**0.0057**	mg/L	2
		02/13/2017 11:40	0.02525							
		02/13/2017 11:42	0.02376							
		02/13/2017 11:44	0.02588							
		02/13/2017 11:46	0.02278							
		02/13/2017 11:48	0.02102							
		02/13/2017 11:50	0.02207							
		02/13/2017 11:52	0.02111							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Strontium										
	Sr 88									
		02/13/2017 11:38	0.000114	0.0001	0.00011	115%	0.0000071	**0.000021**	mg/L	2
		02/13/2017 11:40	0.000109							
		02/13/2017 11:42	0.00011							
		02/13/2017 11:44	0.000127							
		02/13/2017 11:46	0.00012							
		02/13/2017 11:48	0.000104							
		02/13/2017 11:50	0.000116							
		02/13/2017 11:52	0.000116							
Tin										
	Sn 118									
		02/13/2017 11:38	0.000076	0.0001	0.000073	73%	0.0000093	**0.000028**	mg/L	2
		02/13/2017 11:40	0.000083							
		02/13/2017 11:42	0.000067							
		02/13/2017 11:44	0.000089							
		02/13/2017 11:46	0.000063							
		02/13/2017 11:48	0.000069							
		02/13/2017 11:50	0.000075							
		02/13/2017 11:52	0.000064							
Titanium										
	Ti 47									
		02/13/2017 11:38	0.000087	0.0001	0.000091	91%	0.000029	**0.000088**	mg/L	2
		02/13/2017 11:40	0.000057							
		02/13/2017 11:42	0.000128							
		02/13/2017 11:44	0.000088							
		02/13/2017 11:46	0.00013							
		02/13/2017 11:48	0.000058							
		02/13/2017 11:50	0.000068							
		02/13/2017 11:52	0.000109							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Mercury										
	Hg 201									
		02/13/2017 11:16	0.000012	0.00001	0.00001	105%	0.0000018	**0.0000053**	mg/L	2
		02/13/2017 11:18	0.000013							
		02/13/2017 11:20	0.00001							
		02/13/2017 11:22	0.000011							
		02/13/2017 11:24	0.000011							
		02/13/2017 11:26	0.00001							
		02/13/2017 11:28	0.00001							
		02/13/2017 11:30	0.000007							
	Hg 202									
		02/13/2017 11:16	0.000013	0.00001	0.000011	108%	0.0000016	**0.0000047**	mg/L	2
		02/13/2017 11:18	0.000011							
		02/13/2017 11:20	0.000013							
		02/13/2017 11:22	0.00001							
		02/13/2017 11:24	0.000009							
		02/13/2017 11:26	0.000009							
		02/13/2017 11:28	0.000011							
		02/13/2017 11:30	0.00001							
Selenium										
	Se 78									
		02/13/2017 11:16	0.000523	0.0005	0.00054	109%	0.000072	**0.00022**	mg/L	2
		02/13/2017 11:18	0.000407							
		02/13/2017 11:20	0.000535							
		02/13/2017 11:22	0.000508							
		02/13/2017 11:24	0.000552							
		02/13/2017 11:26	0.000633							
		02/13/2017 11:28	0.000576							
		02/13/2017 11:30	0.000624							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Silicon										
	Si 28									
		02/13/2017 11:16	0.000755	0.002	0.0011	53%	0.00034	**0.001**	mg/L	1
		02/13/2017 11:18	0.001195							
		02/13/2017 11:20	0.001223							
		02/13/2017 11:22	0.001314							
		02/13/2017 11:24	0.001648							
		02/13/2017 11:26	0.000788							
		02/13/2017 11:28	0.000933							
		02/13/2017 11:30	0.000661							
Vanadium										
	V 51									
		02/13/2017 11:16	0.000406	0.0005	0.00045	90%	0.000022	**0.000067**	mg/L	2
		02/13/2017 11:18	0.000454							
		02/13/2017 11:20	0.000451							
		02/13/2017 11:22	0.000435							
		02/13/2017 11:24	0.000465							
		02/13/2017 11:26	0.000465							
		02/13/2017 11:28	0.00044							
		02/13/2017 11:30	0.000477							
Zinc										
	Zn 66									
		02/13/2017 11:16	0.000429	0.0005	0.0005	101%	0.000046	**0.00014**	mg/L	2
		02/13/2017 11:18	0.000566							
		02/13/2017 11:20	0.00053							
		02/13/2017 11:22	0.000467							
		02/13/2017 11:24	0.000543							
		02/13/2017 11:26	0.000533							
		02/13/2017 11:28	0.000486							
		02/13/2017 11:30	0.000475							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Cadmium										
	Cd 114									
		02/13/2017 15:31	0.000054	0.00005	0.00005	101%	0.0000019	**0.0000057**	mg/L	2
		02/13/2017 15:33	0.000051							
		02/13/2017 15:35	0.000049							
		02/13/2017 15:36	0.000051							
		02/13/2017 15:38	0.000048							
		02/13/2017 15:40	0.000051							
		02/13/2017 15:42	0.000049							
		02/13/2017 15:44	0.000049							
Thallium										
	Tl 205									
		02/13/2017 15:31	0.000051	0.00005	0.000048	97%	0.0000018	**0.0000053**	mg/L	2
		02/13/2017 15:33	0.000046							
		02/13/2017 15:35	0.000047							
		02/13/2017 15:36	0.000048							
		02/13/2017 15:38	0.000047							
		02/13/2017 15:40	0.000048							
		02/13/2017 15:42	0.00005							
		02/13/2017 15:44	0.00005							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Chromium										
	Cr 52									
		02/13/2017 15:52	0.000066	0.0001	0.000062	62%	0.0000093	**0.000028**	mg/L	2
		02/13/2017 15:54	0.000066							
		02/13/2017 15:56	0.000049							
		02/13/2017 15:58	0.000062							
		02/13/2017 16:00	0.000053							
		02/13/2017 16:02	0.000054							
		02/13/2017 16:04	0.000065							
		02/13/2017 16:06	0.000078							
Potassium										
	K 39									
		02/13/2017 15:52	0.03317	0.025	0.03	120%	0.0029	**0.0087**	mg/L	2
		02/13/2017 15:54	0.03387							
		02/13/2017 15:56	0.03217							
		02/13/2017 15:58	0.03053							
		02/13/2017 16:00	0.02723							
		02/13/2017 16:02	0.02741							
		02/13/2017 16:04	0.02749							
		02/13/2017 16:06	0.02716							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Aluminum										
	Al 27									
		02/13/2017 16:14	0.004905	0.005	0.0052	105%	0.00024	**0.00072**	mg/L	2
		02/13/2017 16:16	0.005379							
		02/13/2017 16:18	0.005065							
		02/13/2017 16:20	0.005364							
		02/13/2017 16:22	0.005011							
		02/13/2017 16:24	0.005254							
		02/13/2017 16:26	0.005344							
		02/13/2017 16:28	0.005644							
Silver										
	Ag 107									
		02/13/2017 16:14	0.001437	0.002	0.0016	79%	0.000073	**0.00022**	mg/L	2
		02/13/2017 16:16	0.001538							
		02/13/2017 16:18	0.001583							
		02/13/2017 16:20	0.001601							
		02/13/2017 16:22	0.001612							
		02/13/2017 16:24	0.001633							
		02/13/2017 16:26	0.001654							
		02/13/2017 16:28	0.001655							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Silver										
	Ag 107									
		09/17/2017 20:33	0.00004	0.00004	0.000042	106%	0.0000028	**0.0000083**	mg/L	2
		09/17/2017 20:35	0.000042							
		09/17/2017 20:37	0.000043							
		09/17/2017 20:39	0.000038							
		09/17/2017 20:41	0.000046							
		09/17/2017 20:43	0.00004							
		09/17/2017 20:45	0.000044							
		09/17/2017 20:47	0.000045							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Magnesium										
	Mg 24									
		09/17/2017 19:51	0.006578	0.00625	0.0064	102%	0.00037	**0.0011**	mg/L	2
		09/17/2017 19:53	0.006549							
		09/17/2017 19:54	0.006438							
		09/17/2017 19:56	0.006321							
		09/17/2017 19:58	0.00612							
		09/17/2017 20:00	0.006005							
		09/17/2017 20:02	0.007135							
		09/17/2017 20:04	0.006052							
Uranium										
	U 238									
		09/17/2017 19:51	0.000024	0.000025	0.000024	96%	0.0000011	**0.0000032**	mg/L	2
		09/17/2017 19:53	0.000026							
		09/17/2017 19:54	0.000024							
		09/17/2017 19:56	0.000023							
		09/17/2017 19:58	0.000024							
		09/17/2017 20:00	0.000023							
		09/17/2017 20:02	0.000025							
		09/17/2017 20:04	0.000023							

Study Name: 17-ICPMS205-H-ICPMS-6020-W-D
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 1/17/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: SW6020 **Prep Method Source:** DIRECT

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Boron										
	B 11									
		02/13/2017 16:14	0.003723	0.005	0.0036	73%	0.000099	**0.0003**	mg/L	1
		02/13/2017 16:16	0.003699							
		02/13/2017 16:18	0.003499							
		02/13/2017 16:20	0.003745							
		02/13/2017 16:22	0.003693							
		02/13/2017 16:24	0.003534							
		02/13/2017 16:26	0.003522							
		02/13/2017 16:28	0.003637							
		02/13/2017 16:14	0.00311	0.005	0.0038	76%	0.00043	**0.0013**	mg/L	2
		02/13/2017 16:16	0.003909							
		02/13/2017 16:18	0.00396							
		02/13/2017 16:20	0.003476							
		02/13/2017 16:22	0.004284							
		02/13/2017 16:24	0.003455							
		02/13/2017 16:26	0.004364							
		02/13/2017 16:28	0.003919							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Antimony										
	Sb 121									
		09/05/2017 14:41	0.000066	0.00005	0.00007	140%	0.0000066	**0.00002**	mg/L	2
		09/05/2017 14:43	0.000067							
		09/05/2017 14:45	0.000061							
		09/06/2017 12:12	0.000069							
		09/06/2017 12:14	0.00007							
		09/06/2017 12:16	0.000068							
		09/07/2017 14:01	0.000077							
		09/07/2017 14:03	0.000082							
Arsenic										
	As 75									
		09/05/2017 14:41	0.000068	0.00005	0.000064	128%	0.0000051	**0.000015**	mg/L	2
		09/05/2017 14:43	0.00006							
		09/05/2017 14:45	0.000063							
		09/06/2017 12:12	0.000064							
		09/06/2017 12:14	0.000064							
		09/06/2017 12:16	0.000058							
		09/07/2017 14:01	0.00006							
		09/07/2017 14:03	0.000074							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Cadmium										
	Cd 111									
		09/05/2017 14:41	0.000078	0.00005	0.000066	131%	0.0000075	**0.000023**	mg/L	2
		09/05/2017 14:43	0.000065							
		09/05/2017 14:45	0.000065							
		09/06/2017 12:12	0.000071							
		09/06/2017 12:14	0.000054							
		09/06/2017 12:16	0.000058							
		09/07/2017 14:01	0.000064							
		09/07/2017 14:03	0.00007							
	Cd 114									
		09/05/2017 14:41	0.000071	0.00005	0.000065	130%	0.0000053	**0.000016**	mg/L	2
		09/05/2017 14:43	0.000061							
		09/05/2017 14:45	0.000061							
		09/06/2017 12:12	0.000065							
		09/06/2017 12:14	0.000061							
		09/06/2017 12:16	0.000059							
		09/07/2017 14:01	0.000072							
		09/07/2017 14:03	0.00007							
Cobalt										
	Co 59									
		09/05/2017 14:41	0.000069	0.00005	0.000066	133%	0.0000065	**0.00002**	mg/L	2
		09/05/2017 14:43	0.000069							
		09/05/2017 14:45	0.000059							
		09/06/2017 12:12	0.000064							
		09/06/2017 12:14	0.000061							
		09/06/2017 12:16	0.00006							
		09/07/2017 14:01	0.000077							
		09/07/2017 14:03	0.000073							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Magnesium										
	Mg 24									
		09/05/2017 14:41	0.01419	0.0125	0.013	107%	0.001	**0.003**	mg/L	2
		09/05/2017 14:43	0.01526							
		09/05/2017 14:45	0.01387							
		09/06/2017 12:12	0.01262							
		09/06/2017 12:14	0.01256							
		09/06/2017 12:16	0.01334							
		09/07/2017 14:01	0.01238							
		09/07/2017 14:03	0.01276							
Molybdenum										
	Mo 95									
		09/05/2017 14:41	0.000098	0.00005	0.000082	164%	0.000011	**0.000032**	mg/L	2
		09/05/2017 14:43	0.000081							
		09/05/2017 14:45	0.000064							
		09/06/2017 12:12	0.000074							
		09/06/2017 12:14	0.000082							
		09/06/2017 12:16	0.000077							
		09/07/2017 14:01	0.000091							
		09/07/2017 14:03	0.000088							
	Mo 98									
		09/05/2017 14:41	0.000085	0.00005	0.000081	162%	0.000009	**0.000027**	mg/L	2
		09/05/2017 14:43	0.00008							
		09/05/2017 14:45	0.000074							
		09/06/2017 12:12	0.000079							
		09/06/2017 12:14	0.000077							
		09/06/2017 12:16	0.000069							
		09/07/2017 14:01	0.000099							
		09/07/2017 14:03	0.000085							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Selenium										
	Se 78									
		09/05/2017 14:41	0.000063	0.00005	0.000068	137%	0.000008	**0.000024**	mg/L	1
		09/05/2017 14:43	0.000082							
		09/05/2017 14:45	0.000071							
		09/06/2017 12:12	0.000068							
		09/06/2017 12:14	0.00006							
		09/06/2017 12:16	0.000064							
		09/07/2017 14:01	0.000078							
		09/07/2017 14:03	0.000062							
Thallium										
	Tl 205									
		09/05/2017 14:41	0.000064	0.00005	0.000062	124%	0.0000062	**0.000019**	mg/L	2
		09/05/2017 14:43	0.000058							
		09/05/2017 14:45	0.000054							
		09/06/2017 12:12	0.000064							
		09/06/2017 12:14	0.000057							
		09/06/2017 12:16	0.000058							
		09/07/2017 14:01	0.00007							
		09/07/2017 14:03	0.000071							
Uranium										
	U 238									
		09/05/2017 14:41	0.000057	0.00005	0.000055	111%	0.0000028	**0.0000083**	mg/L	2
		09/05/2017 14:43	0.000055							
		09/05/2017 14:45	0.000052							
		09/06/2017 12:12	0.000061							
		09/06/2017 12:14	0.000054							
		09/06/2017 12:16	0.000053							
		09/07/2017 14:01	0.000055							
		09/07/2017 14:03	0.000056							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Barium										
	Ba 137									
		09/05/2017 14:47	0.000121	0.0001	0.00014	135%	0.000019	**0.000057**	mg/L	2
		09/05/2017 14:49	0.000113							
		09/05/2017 14:51	0.000126							
		09/06/2017 12:18	0.000166							
		09/06/2017 12:20	0.000142							
		09/06/2017 12:22	0.000135							
		09/07/2017 14:07	0.000121							
		09/07/2017 14:09	0.000159							
Lead										
	Pb 208									
		09/05/2017 14:47	0.000118	0.0001	0.00012	123%	0.0000096	**0.000029**	mg/L	2
		09/05/2017 14:49	0.000108							
		09/05/2017 14:51	0.000123							
		09/06/2017 12:18	0.000122							
		09/06/2017 12:20	0.000124							
		09/06/2017 12:22	0.000142							
		09/07/2017 14:07	0.000125							
		09/07/2017 14:09	0.000118							
Potassium										
	K 39									
		09/05/2017 14:47	0.0204	0.025	0.025	102%	0.0057	**0.017**	mg/L	2
		09/05/2017 14:49	0.02019							
		09/05/2017 14:51	0.01946							
		09/06/2017 12:18	0.02629							
		09/06/2017 12:20	0.02484							
		09/06/2017 12:22	0.02613							
		09/07/2017 14:07	0.03614							
		09/07/2017 14:09	0.02986							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Silver										
	Ag 107									
		09/05/2017 14:47	0.000042	0.00004	0.000043	108%	0.0000027	**0.0000082**	mg/L	2
		09/05/2017 14:49	0.00004							
		09/05/2017 14:51	0.000039							
		09/06/2017 12:18	0.000047							
		09/06/2017 12:20	0.000044							
		09/06/2017 12:22	0.000043							
		09/07/2017 14:07	0.000046							
		09/07/2017 14:09	0.000043							
Strontium										
	Sr 88									
		09/05/2017 14:47	0.000135	0.0001	0.00012	123%	0.000025	**0.000075**	mg/L	2
		09/05/2017 14:49	0.000126							
		09/05/2017 14:51	0.000149							
		09/06/2017 12:18	0.000131							
		09/06/2017 12:20	0.000102							
		09/06/2017 12:22	0.000099							
		09/07/2017 14:07	0.000087							
		09/07/2017 14:09	0.000158							
Vanadium										
	V 51									
		09/05/2017 14:47	0.000094	0.0001	0.000092	93%	0.000011	**0.000034**	mg/L	2
		09/05/2017 14:49	0.00008							
		09/05/2017 14:51	0.000095							
		09/06/2017 12:18	0.000099							
		09/06/2017 12:20	0.000097							
		09/06/2017 12:22	0.000106							
		09/07/2017 14:07	0.000098							
		09/07/2017 14:09	0.000071							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Beryllium										
	Be 9									
		09/05/2017 15:02	0.000713	0.0005	0.0005	99%	0.000097	**0.00029**	mg/L	2
		09/05/2017 15:04	0.00046							
		09/05/2017 15:06	0.00044							
		09/06/2017 12:34	0.000527							
		09/06/2017 12:36	0.000393							
		09/06/2017 12:38	0.000447							
		09/07/2017 14:23	0.0005							
		09/07/2017 14:25	0.000482							
Chromium										
	Cr 52									
		09/05/2017 15:02	0.000543	0.0005	0.00058	116%	0.000064	**0.00019**	mg/L	2
		09/05/2017 15:04	0.000505							
		09/05/2017 15:06	0.000501							
		09/06/2017 12:34	0.000572							
		09/06/2017 12:36	0.000577							
		09/06/2017 12:38	0.000658							
		09/07/2017 14:23	0.000665							
		09/07/2017 14:25	0.00063							
Manganese										
	Mn 55									
		09/05/2017 15:02	0.000812	0.0005	0.00069	138%	0.000061	**0.00018**	mg/L	2
		09/05/2017 15:04	0.000715							
		09/05/2017 15:06	0.000621							
		09/06/2017 12:34	0.000682							
		09/06/2017 12:36	0.000686							
		09/06/2017 12:38	0.0007							
		09/07/2017 14:23	0.000671							
		09/07/2017 14:25	0.000617							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Selenium										
	Se 78									
		09/05/2017 15:02	0.000454	0.0005	0.00056	112%	0.000085	**0.00025**	mg/L	2
		09/05/2017 15:04	0.000498							
		09/05/2017 15:06	0.000528							
		09/06/2017 12:34	0.000607							
		09/06/2017 12:36	0.000504							
		09/06/2017 12:38	0.000686							
		09/07/2017 14:23	0.000531							
		09/07/2017 14:25	0.00067							
Titanium										
	Ti 47									
		09/05/2017 15:02	0.00049	0.0005	0.00056	112%	0.000096	**0.00029**	mg/L	2
		09/05/2017 15:04	0.000582							
		09/05/2017 15:06	0.000582							
		09/06/2017 12:34	0.000554							
		09/06/2017 12:36	0.00058							
		09/06/2017 12:38	0.000414							
		09/07/2017 14:23	0.000748							
		09/07/2017 14:25	0.000513							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Aluminum										
	Al 27									
		09/05/2017 15:08	0.007316	0.005	0.0074	149%	0.00088	**0.0026**	mg/L	2
		09/05/2017 15:10	0.006711							
		09/05/2017 15:12	0.008954							
		09/06/2017 12:40	0.008533							
		09/06/2017 12:42	0.007112							
		09/06/2017 12:44	0.007492							
		09/07/2017 14:29	0.006562							
		09/07/2017 14:31	0.006773							
Boron										
	B 11									
		09/05/2017 15:08	0.006338	0.005	0.0064	127%	0.00052	**0.0016**	mg/L	1
		09/05/2017 15:10	0.006094							
		09/05/2017 15:12	0.006553							
		09/06/2017 12:40	0.007187							
		09/06/2017 12:42	0.006454							
		09/06/2017 12:44	0.006889							
		09/07/2017 14:29	0.005729							
		09/07/2017 14:31	0.005715							
		09/05/2017 15:08	0.005935	0.005	0.0064	128%	0.00098	**0.0029**	mg/L	2
		09/05/2017 15:10	0.006856							
		09/05/2017 15:12	0.00502							
		09/06/2017 12:40	0.007254							
		09/06/2017 12:42	0.006694							
		09/06/2017 12:44	0.007961							
		09/07/2017 14:29	0.005677							
		09/07/2017 14:31	0.005601							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Calcium										
	Ca 40									
		09/05/2017 15:08	1.28	1.25	1.26	101%	0.026	**0.078**	mg/L	1
		09/05/2017 15:10	1.294							
		09/05/2017 15:12	1.276							
		09/06/2017 12:40	1.257							
		09/06/2017 12:42	1.246							
		09/06/2017 12:44	1.214							
		09/07/2017 14:29	1.254							
		09/07/2017 14:31	1.234							
Iron										
	Fe 56									
		09/05/2017 15:08	0.1385	0.13	0.134	103%	0.0041	**0.012**	mg/L	1
		09/05/2017 15:10	0.1289							
		09/05/2017 15:12	0.1317							
		09/06/2017 12:40	0.1339							
		09/06/2017 12:42	0.1311							
		09/06/2017 12:44	0.1299							
		09/07/2017 14:29	0.1406							
		09/07/2017 14:31	0.1336							
		09/05/2017 15:08	0.1451	0.13	0.133	102%	0.0057	**0.017**	mg/L	2
		09/05/2017 15:10	0.1301							
		09/05/2017 15:12	0.1325							
		09/06/2017 12:40	0.1318							
		09/06/2017 12:42	0.1289							
		09/06/2017 12:44	0.1272							
		09/07/2017 14:29	0.1371							
		09/07/2017 14:31	0.1314							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Nickel										
	Ni 60									
		09/05/2017 15:08	0.005394	0.005	0.0047	94%	0.00056	**0.0017**	mg/L	2
		09/05/2017 15:10	0.005138							
		09/05/2017 15:12	0.005131							
		09/06/2017 12:40	0.004214							
		09/06/2017 12:42	0.004095							
		09/06/2017 12:44	0.003909							
		09/07/2017 14:29	0.004909							
		09/07/2017 14:31	0.004867							
Silicon										
	Si 28									
		09/05/2017 15:08	0.02237	0.02	0.023	116%	0.0011	**0.0033**	mg/L	1
		09/05/2017 15:10	0.02368							
		09/05/2017 15:12	0.02182							
		09/06/2017 12:40	0.02423							
		09/06/2017 12:42	0.02482							
		09/06/2017 12:44	0.02371							
		09/07/2017 14:29	0.02326							
		09/07/2017 14:31	0.02181							
Sodium										
	Na 23									
		09/05/2017 15:08	1.234	1.25	1.19	95%	0.023	**0.068**	mg/L	2
		09/05/2017 15:10	1.188							
		09/05/2017 15:12	1.193							
		09/06/2017 12:40	1.199							
		09/06/2017 12:42	1.205							
		09/06/2017 12:44	1.181							
		09/07/2017 14:29	1.176							
		09/07/2017 14:31	1.157							

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T
Analyst: Dustin C. Kono
Instrument: ICPMS205-H

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

Study Date: 8/24/2017
Report Date: 1/15/2018
Matrix: Aqueous

Method Source: E200.8 **Prep Method Source:** E200.2

Analyte	Channel	AnalDate	Result	True Val	Mean	Recovery	StdDev	MDL	Units	Tune
Tin										
	Sn 118									
		09/05/2017 15:08	0.005181	0.005	0.0051	101%	0.000088	**0.00026**	mg/L	2
		09/05/2017 15:10	0.00498							
		09/05/2017 15:12	0.005149							
		09/06/2017 12:40	0.005022							
		09/06/2017 12:42	0.004984							
		09/06/2017 12:44	0.00495							
		09/07/2017 14:29	0.005118							
		09/07/2017 14:31	0.005111							

Energy Laboratories, Inc.

Determination of Method Detection Limits

(40 CFR, Part 136, Appendix B)

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T

Study Information:

Analyst: Dustin C. Kono

Instrument: ICPMS205-H

Method Source: E200.8

Prep Method Source: E200.2

Matrix: Aqueous

Study Date: 8/24/2017

Report Date: 1/15/2018

Study Analytical Data

Analyte	Analyte Channel	Tune Mode	Tested Conc.	09/05/2017 15:08	09/05/2017 15:10	09/05/2017 15:12	09/06/2017 12:40	09/06/2017 12:42	09/06/2017 12:44	09/07/2017 14:29	Calc MDL	Study Units	Mean	Stnd Dev	Recovery
Zinc	Zn 66	2	0.005	0.006424	0.005663	0.006989	0.006026	0.005889	0.005623	0.00698	**0.0018**	mg/L	0.0062	0.00058	124.6%

Energy Laboratories, Inc.

Determination of Method Detection Limits

(40 CFR, Part 136, Appendix B)

Study Name: 17-ICPMS205-H-ICPMS-200.8-W-T

Study Information:

Analyst: Dustin C. Kono

Instrument: ICPMS205-H

Method Source: E200.8

Prep Method Source: E200.2

Matrix: Aqueous

Study Date: 8/24/2017

Report Date: 1/15/2018

Study Analytical Data

Analyte	Analyte Channel	Tune Mode	Tested Conc.	09/05/2017 15:04	09/05/2017 15:06	09/06/2017 12:34	09/06/2017 12:36	09/06/2017 12:38	09/07/2017 14:23	09/07/2017 14:25	Calc MDL	Study Units	Mean	Stnd Dev	Recovery
Copper	Cu 63	2	0.0005	0.000529	0.000583	0.000571	0.000662	0.000656	0.000429	0.000408	**0.00032**	mg/L	0.00055	0.0001	109.7%
Copper	Cu 65	2	0.0005	0.000545	0.000593	0.000587	0.000646	0.000672	0.000444	0.000421	**0.0003**	mg/L	0.00056	9.6E-05	111.7%

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number 4990

Parameter	**Cyanide, Total**	**Matrix**	Aqueous
Date Of Study	7/12/2017	**Prep Method**	E335.4
Analyst	Mark A Spitzer	**Concentration Tested**	0.002
Instrument ID	SFA-201-B	**Lab Reporting Limit**	0.002
Method Source	E335.4	**Units**	mg/L

Replicate Number	FinalVal
1	0.00155
2	0.00180
3	0.00175
4	0.00260
5	0.00135
6	0.00135
7	0.00210
8	0.00205

Average	0.00182 mg/L
Average Recovery %	90.9
Standard Deviation	0.00042
Method Detection Limit	**0.00127 mg/L**
Comment	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number 4991

Parameter	**Cyanide, Weak Acid Dissociable**	**Matrix**	Aqueous
Date Of Study	7/14/2017	**Prep Method**	D2036C
Analyst	Brandy A. Schuster	**Concentration Tested**	0.0025
Instrument ID	SFA-201-B	**Lab Reporting Limit**	0.002
Method Source	D2036C	**Units**	mg/L

Replicate Number	FinalVal
1	0.00120
2	0.00120
3	0.00105
4	0.00145
5	0.00145
6	0.00175
7	0.00165

Average	0.00139 mg/L
Average Recovery %	55.7
Standard Deviation	0.00026
Method Detection Limit	**0.0008 mg/L**
Comment	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number 4993

Parameter	**Cyanide, Total**	**Matrix**	Aqueous
Date Of Study	7/12/2017	**Prep Method**	E335.4
Analyst	Mark A Spitzer	**Concentration Tested**	0.002
Instrument ID	SFA-201-B	**Lab Reporting Limit**	0.002
Method Source	Kelada-01	**Units**	mg/L

Replicate Number	FinalVal
1	0.00190
2	0.00210
3	0.00190
4	0.00300
5	0.00140
6	0.00150
7	0.00195

Average	0.00196 mg/L
Average Recovery %	98.2
Standard Deviation	0.00052
Method Detection Limit	**0.00164 mg/L**
Comment	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number 4995

Parameter	**Cyanide, Weak Acid Dissociable**	**Matrix**	Aqueous
Date Of Study	7/10/2017	**Prep Method**	MWMP
Analyst	Mark A Spitzer	**Concentration Tested**	0.0025
Instrument ID	SFA-201-B	**Lab Reporting Limit**	0.002
Method Source	Kelada-01	**Units**	mg/L

Replicate Number	FinalVal
1	0.00320
2	0.00290
3	0.00270
4	0.00240
5	0.00240
6	0.00205
7	0.00330

Average	0.00271 mg/L
Average Recovery %	108.3
Standard Deviation	0.00046
Method Detection Limit	**0.00144 mg/L**
Comment	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number 4960

Parameter	**Nitrogen, Kjeldahl, Total as N**	**Matrix**	Aqueous
Date Of Study	7/12/2017	**Prep Method**	E351.2
Analyst	Kylee R. Sundsted	**Concentration Tested**	0.1
Instrument ID	FIA202-B	**Lab Reporting Limit**	0.16
Method Source	E351.2	**Units**	mg/L

Replicate Number	FinalVal
1	0.07300
2	0.09900
3	0.10200
4	0.06400
5	0.15800
6	0.10800
7	0.09400

Average	0.09971 mg/L
Average Recovery %	99.7
Standard Deviation	0.03026
Method Detection Limit	**0.0951 mg/L**
Comment	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number 4949

Parameter	**Nitrogen, Kjeldahl, Total as N**	**Matrix**	Aqueous
Date Of Study	7/10/2017	**Prep Method**	E351.2
Analyst	Kylee R. Sundsted	**Concentration Tested**	0.1
Instrument ID	FIA204-B	**Lab Reporting Limit**	0.16
Method Source	E351.2	**Units**	mg/L

Replicate Number	FinalVal
1	0.08520
2	0.09750
3	0.13900
4	0.08440
5	0.09460
6	0.10700
7	0.13300

Average	0.10581 mg/L
Average Recovery %	105.8
Standard Deviation	0.02206
Method Detection Limit	**0.06934 mg/L**
Comment	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number: 1042 **Date Of Study: 1/17/2017**

Analyst	Scott R. Wunderlich	**Matrix**	Aqueous
Instrument ID	PHSC_101-H	**Prep Method**	
Method Source	A2320 B	**Units**	mg/L

Parameter	Average Recovery %	Std Deviation	MDL	Concentration Tested	Reporting Limit	Comment
Alkalinity, Total as CaCO3	129.3	0.22872	0.6857	6	4	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number: 1134 **Date Of Study: 8/4/2017**

Analyst	Cole Mergenthaler	**Matrix**	Aqueous
Instrument ID	FIA203-HE	**Prep Method**	
Method Source	E350.1	**Units**	mg/L

Parameter	Average Recovery %	Std Deviation	MDL	Concentration Tested	Reporting Limit	Comment
Nitrogen, Ammonia as N	57.4	0.00570	0.0171	0.03	0.05	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number: 1131 **Date Of Study: 7/31/2017**

Analyst	Scott R. Wunderlich	**Matrix**	Aqueous
Instrument ID	IC Metrohm	**Prep Method**	
Method Source	E300.0	**Units**	mg/L

Parameter	Average Recovery %	Std Deviation	MDL	Concentration Tested	Reporting Limit	Comment
Bromide	70.0	0.00071	0.0021	0.0125	0.5	
Chloride	37.5	0.00074	0.0022	0.025	1	MDL<0.1*Spike Concentration
Fluoride	63.0	0.00083	0.0025	0.0125	0.1	
Nitrogen, Nitrate as N	3.0	0.00052	0.0016	0.0125	0.125	
Nitrogen, Nitrate+Nitrite as N	242.9	0.00709	0.0213	0.0175	0.05	MDL>Spike Concentration
Phosphorus, Dissolved Orthophos	924.0	0.00093	0.0028	0.0125	0.25	
Sulfate	14.6	0.01667	0.0500	0.1	1	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number: 1043 **Date Of Study: 1/17/2017**

Analyst	Scott R. Wunderlich	**Matrix**	Aqueous
Instrument ID	PHSC_101-H	**Prep Method**	
Method Source	A2510 B	**Units**	umhos/cm

Parameter	Average Recovery %	Std Deviation	MDL	Concentration Tested	Reporting Limit	Comment
Conductivity @ 25 C	0.0	0.29731	0.8913	0	1	MDL>Spike Concentration

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number: 1102 **Date Of Study: 4/13/2017**

Analyst	Scott R. Wunderlich	**Matrix**	Aqueous
Instrument ID	Mantech 2	**Prep Method**	
Method Source	A4500-F C	**Units**	mg/L

Parameter	Average Recovery %	Std Deviation	MDL	Concentration Tested	Reporting Limit	Comment
Fluoride	67.2	0.00362	0.0108	0.1	0.1	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number: 1114 **Date Of Study: 4/27/2017**

Analyst	Dustin C. Kono	**Matrix**	Aqueous
Instrument ID	HGCV202-H	**Prep Method**	E245.1
Method Source	E245.1	**Units**	mg/L

Parameter	Average Recovery %	Std Deviation	MDL	Concentration Tested	Reporting Limit	Comment
Mercury	130.4	0.00000	0.0000	2.5E-06	0.0001	Conc Tested 0.0000025, 0 in MDL due to sig figs

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number: 1122 **Date Of Study: 6/27/2017**

Analyst	Cole Mergenthaler	**Matrix**	Aqueous
Instrument ID	FIA203-HE	**Prep Method**	
Method Source	E353.2	**Units**	mg/L

Parameter	Average Recovery %	Std Deviation	MDL	Concentration Tested	Reporting Limit	Comment
Nitrogen, Nitrate+Nitrite as N	72.8	0.00234	0.0070	0.03	0.01	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number: 1046 **Date Of Study: 1/18/2017**

Analyst	Scott R. Wunderlich	**Matrix**	Aqueous
Instrument ID	Accu-124 (14410200)	**Prep Method**	
Method Source	A2540 C	**Units**	mg/L

Parameter	Average Recovery %	Std Deviation	MDL	Concentration Tested	Reporting Limit	Comment
Solids, Total Dissolved TDS @ 18	100.0	0.75593	2.2663	10	10	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number: 1047 **Date Of Study: 1/18/2017**

Analyst	Scott R. Wunderlich	**Matrix**	Aqueous
Instrument ID	Accu-124 (14410200)	**Prep Method**	A2540 D
Method Source	A2540 D	**Units**	mg/L

Parameter	Average Recovery %	Std Deviation	MDL	Concentration Tested	Reporting Limit	Comment
Solids, Total Suspended TSS @ 10	87.5	0.08864	0.2657	1	10	

Energy Laboratories, Inc.
Determination of Method Detection Limits
(40 CFR, Part 136, Appendix B)

MDL Study Number: 1052 **Date Of Study: 1/19/2017**

Analyst	Scott R. Wunderlich	**Matrix**	Aqueous
Instrument ID	HACH 2100P	**Prep Method**	
Method Source	A2130 B	**Units**	NTU

Parameter	Average Recovery %	Std Deviation	MDL	Concentration Tested	Reporting Limit	Comment
Turbidity	128.8	0.01302	0.0390	0.5	0.2	MDL<0.1*Spike Concentration

Pollen Environmental, LLC
3536 International Street
Fairbanks, AK 99701
907-479-8368

Analyst	Jerry Pollen		
Analyte	Nitrate		
Method	Hach TNT 10206		
Instrument	Hach DR3900		
Spike Con.		0.1	
Units	mg/L		Date
Replicate 1		0.190	5/5/2017
Replicate 2		0.187	5/5/2017
Replicate 3		0.163	5/5/2017
Replicate 4		0.174	5/5/2017
Replicate 5		0.194	5/5/2017
Replicate 6		0.144	5/5/2017
Replicate 7		0.149	5/5/2017
Replicate 8		0.184	5/5/2017
Mean		0.173	
Std. Dev.		0.019	
MDL		0.057	
LOQ		0.191	

High spike Check acceptable	TRUE		
Low spike check acceptable	TRUE		
S/N		9.044	S/N ration should be between 2.5 to 10.

# of rep	t-value
7	3.143
8	2.998

number of reps	8
t-value used	2.998

Xn or Xl	The data point in question	
Xave	The sample mean	0.1731
s	standard deviation	0.0191

Tn = Xn - Xave / s High sided outliner

Tl = Xave - Xl / s Low sided outliner

Table of Critical Values	
# of Observations	Critical Value
7	2.10
8	2.22
9	2.32
10	2.41
11	2.48
12	2.55
13	2.61
14	2.66

Count True result = outlier

8 Outlier test shows XX outliers

0.19	0.8816	FALSE	-0.8816	FALSE
0.187	0.7249	FALSE	-0.7249	FALSE
0.163	-0.5289	FALSE	0.5289	FALSE
0.174	0.0457	FALSE	-0.0457	FALSE
0.194	1.0905	FALSE	-1.0905	FALSE
0.144	-1.5215	FALSE	1.5215	FALSE
0.149	-1.2603	FALSE	1.2603	FALSE
0.184	0.5681	FALSE	-0.5681	FALSE

Do not make changes to this template. Do a Save As…and rename before entered in any data.

	Analyst	LOQ	=	Limit of Quantitation is 10 X Std. Dev
	Analyte	High spike check	=	10 x MDL > spike
Fill out all relvent information	Method	Low spike check	=	MDL< spike
	Instrument	S/N	=	Mean/std dev.
	Spike Con.			
	Units			

Enter the MDLs

All statistical functions are performed automatically

This data is automaically transferred to the Outlier Page following the analyte page.

The Outlier page will determine if any of the data points are
statistical outliers.

If any are they must be dropped and MDLs must be recalculated.

Pollen Environmental, LLC
3536 International Street
Fairbanks, AK 99701
907-479-8368

Analyst	Kristina Organski		
Analyte	Nitrate		
Method	Hach TNT 10206		
Instrument	Hach DR3900		
Spike Con.		0.1	
Units	mg/L		Date
Replicate 1		0.106	5/5/2017
Replicate 2		0.108	5/5/2017
Replicate 3		0.143	5/5/2017
Replicate 4		0.166	5/5/2017
Replicate 5		0.107	5/5/2017
Replicate 6		0.116	5/5/2017
Replicate 7		0.121	5/5/2017
Replicate 8		0.108	5/5/2017
Mean		0.122	
Std. Dev.		0.022	
MDL		0.065	
LOQ		0.217	

High spike Check acceptable	TRUE		
Low spike check acceptable	TRUE		
S/N		5.624	S/N ration should be between 2.5 to 10.

# of rep	t-value
7	3.143
8	2.998

number of reps	8
t-value used	2.998

Xn or Xl	The data point in question	
Xave	The sample mean	0.1219
s	standard deviation	0.0217

Tn = Xn - Xave / s High sided outliner

Tl = Xave - Xl / s Low sided outliner

Table of Critical Values	
# of Observations	Critical Value
7	2.10
8	2.22
9	2.32
10	2.41
11	2.48
12	2.55
13	2.61
14	2.66

Count True result = outlier

8 Outlier test shows XX outliers

0.106	-0.7326	FALSE	0.7326	FALSE
0.108	-0.6403	FALSE	0.6403	FALSE
0.143	0.9749	FALSE	-0.9749	FALSE
0.166	2.0363	FALSE	-2.0363	FALSE
0.107	-0.6865	FALSE	0.6865	FALSE
0.116	-0.2711	FALSE	0.2711	FALSE
0.121	-0.0404	FALSE	0.0404	FALSE
0.108	-0.6403	FALSE	0.6403	FALSE

Do not make changes to this template. Do a Save As…and rename before entered in any data.

	Analyst	LOQ	=	Limit of Quantitation is 10 X Std. Dev
	Analyte	High spike check	=	10 x MDL > spike
Fill out all relvent information	Method	Low spike check	=	MDL< spike
	Instrument	S/N	=	Mean/std dev.
	Spike Con.			
	Units			

Enter the MDLs

All statistical functions are performed automatically

This data is automaically transferred to the Outlier Page following the analyte page.

The Outlier page will determine if any of the data points are
statistical outliers.

If any are they must be dropped and MDLs must be recalculated.

APPENDIX E –

WHOLE EFFLUENT TOXICITY TESTING (WET) LABORATORY REPORTS

TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A Fort Collins, CO 80524
T 970.416.0916 F 970.490.2963

July 5, 2017

Ms. Stacy Staley
Sumitomo Metal Mining Pogo, LLC
Pogo Mine Joint Venture
P.O. Box 145
Delta Junction, Alaska 99737

RE: Results of WET tests – June 2017

Dear Ms. Staley,

Attached are copies of the reports for the *Ceriodaphnia dubia* (water flea) and *Pimephales promelas* (fathead minnow) toxicity tests conducted in June 2017 with effluent from your facility.

TRE Environmental Strategies, LLC greatly appreciates this opportunity to provide our services to Sumitomo Metal Mining Pogo. Please do not hesitate to call if you have any questions.

Sincerely,

Whitney Naddy
Report Author
naddywm.tre@gmail.com

Rami B. Naddy, Ph.D.
Manager / Environmental Toxicologist
naddyrb.tre@gmail.com

Attachments:

14001-412-025
14001-412-026

TRE Environmental Strategies

Report of Short-Term Chronic Toxicity Testing using the Water Flea (Ceriodaphnia dubia)

Project ID: 14001-412-025
June 2017

Sponsor and Laboratory Information

Sponsor	Sumitomo Metal Mining Pogo LLC Pogo Mine Joint Venture P.O. Box 145 Delta Junction, AK 99737
Project Officer	Stacy Staley (907) 895-2761
Testing Facility	TRE Environmental Strategies, LLC 100 Racquette Dr., Unit A Fort Collins, CO 80524 Fax: (970) 490-2963 State of Florida NELAP Laboratory ID: E87972
Study Director	Rami B. Naddy, Ph.D. (970) 416-0916 email: naddyrb.tre@gmail.com
Report Author	Whitney Naddy (970) 416-0916 email: naddywm.tre@gmail.com

Test Information

Test	Short-Term Chronic under Static-Renewal Conditions
Basis	USEPA (2002), method 1002.0
Test Dates and Time	June 20, 2017 @ 1430 to June 27, 2017 @ 1630
Test Length	7 days
Species	*Ceriodaphnia dubia*
Test Material	Effluent
Outfall	Outfall 001
Permit Number	AK-005334-1
Receiving Stream	N/A
Dilution Water	Moderately hard reconstituted water
Concurrent Control Water	None
Test Concentrations	0 (control), 12.5, 25, 50, 75, and 100% effluent
Permit Compliance	_X_ **Pass** ____Fail

- *Results described in this report apply only to the samples submitted to the laboratory and analyzed, as listed in the report*
- *Test results comply with NELAC standards. Reports are intended to be considered in their entirety; TRE is not responsible for consequences arising from use of a partial report*
- *This report contains 5 pages plus 2 appendices*

Effluent Collection and Receipt

Sample No.	Field No.	Collection Date & Time	TRE No.	Date of Receipt	Temp. at Arrival (°C)
1	N/A	06/19/17 @ 0907 to 06/19/17 @ 0911	30631	06/20/17	3.1
2	N/A	06/21/17 @ 0808 to 06/21/17 @ 0812	30639	06/22/17	3.0
3	N/A	06/23/17 @ 0917 to 06/23/17 @ 0921	30642	06/24/17	2.9

Note: See Appendix A for chain of custody records

Effluent Characterization

Sample No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)
1	7.6	74	40	252	<0.02	1.6
2	7.7	80	39	231	<0.02	1.1
3	7.8	74	40	203	<0.02	<1.0

[a] As $CaCO_3$
[b] Total residual chlorine

Initial Dilution/Control Water Characterization

Batch No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)
12888	8.0	90	62	306	<0.02	<1.0

[a] As $CaCO_3$
[b] Total residual chlorine

Test Conditions

Type	Static-Renewal Short-term Chronic			
Test Endpoints	Survival and Reproduction			
Test Chambers	30-ml plastic cups			
Test Solution Volume	15 ml			
Replicates per Treatment	10			
Organisms per Replicate	1			
Test Temperature	25 ± 1°C (≤ 3°C differential)			
Lighting	Fluorescent, 16 hours light:8 hours dark			
Chamber Placement	Random block according to computer-generated chart			
Aeration?	X	No		Yes
Test Solution Renewal	Daily			

Test Organism

Species	*Ceriodaphnia dubia*
Age	<24 hours (all within 8 hours of the same age)
Source	TRE in-house culture, batch 061917
Acclimation	Test temperature
Feeding	0.2 ml YTC/Algae mixed per test chamber daily during the test
Reference Toxicant Testing	Initiated June 2, 2017 using sodium chloride (NaCl)

TEST RESULTS

Biological Data

Treatment (% Effluent)	Percent Survival of *Ceriodaphnia dubia*							Mean Young per Female[a]	Significant Reduction Relative to Control?	
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7		Surv.	Repr.
0 (Control)	100	100	100	100	100	100	100	38.2	N/A	N/A
12.5	100	100	100	100	100	100	100	35.8	No	No
25	100	100	100	100	100	100	100	35.1	No	No
50	100	100	100	100	100	100	100	37.3	No	No
75	100	100	100	100	100	100	100	34.8	No	No
100	100	100	100	100	100	100	100	35.5	No	No
Percent Minimum Significant Difference (Reproduction)								10.1	Low[b]	

[a] Mean young per original female. If any 4th broods or higher were produced, they were excluded from calculation of mean young per female and statistical analysis of reproduction.
[b] PMSD was below the lower bound indicated by USEPA; however, there was no effect on the NOEC
Note: See Appendix B for copies of laboratory data sheets

Data Analysis and Test Endpoints

Biological Endpoint	Statistical Endpoint	Value
Survival	NOEC	100% Effluent
	LOEC	>100% Effluent
	IC_{25}	>100% Effluent
Reproduction	NOEC	100% Effluent
	LOEC	>100% Effluent
	ChV	>100% Effluent
	IC_{25}	>100% Effluent
	TU_c ($100/IC_{25}$)	<1.0

NOEC = No Observed Effect Concentration
LOEC = Lowest Observed Effect Concentration
ChV = Chronic Value
IC_{25} = 25% Inhibition Concentration
TU_c = Chronic Toxic Units
Note: Analyses completed using, where appropriate, CETIS version 1.8.7 (2014).

Physical and Chemical Data

Treatment (% Effluent)	pH		Dissolved Oxygen (mg/L)		Conductivity (µS/cm)		Temperature (°C)	
	Low	High	Low	High	Low	High	Low	High
0 (Control)	8.0	8.2	6.3	7.1	297	341	24	25
100	7.6	8.0	6.4	7.3	203	252	24	25
All Treatments	7.6	8.2	≥6.3		NA		24[a]	25[a]
							24[b]	26[b]

[a] Temperature in test solutions
[b] Continuous wet temperature in the environmental chamber

Reference Toxicant Test Results for *C. dubia*

IC_{25}	TRE Historical 95% Control Limits	
	Low	High
454	229	677

Note: Values are expressed as mg/L of chloride.

References

CETIS. 2014. Comprehensive Environmental Toxicity Information System. User Guide (version 1.8.7). Tidepool Scientific, LLC. McKinleyville, CA.

USEPA. 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. Fourth Edition. EPA-821-R-02-013.

Statement of Quality Assurance

The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol (if applicable) and standard operating procedures, and that the resulting data and report meet the requirements of the NELAC standards. This report is an accurate reflection of the raw data.

Quality Assurance Unit — Date: July 5, 2017

Data Analyst — Date: July 5, 2017

APPENDIX A

Chain of Custody Records

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

023, 024

Client/Project Name: Sumitomo Metal Mining P Project #: 14001-412-

Sampler (Print/Affiliation): Jim Ward, Poop Environmental Signature: [signature]

Chain of Custody Tape #: 46834 Intact?(circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested: CCFC						Sample Temp. Upon Arrival (Therm. # 6-29) °C	Lab Sample ID
Eff #1	6/19/2017	907	6/19/2017	9:09			2.5gal	ICE	L	X						~~3.0~~ 3.1	30631
" "	6/19/2017	910	6/19/2017	9:11			1gal	ICE	L	X						3.1	

Sample Relinquished By: (Print Name/Affiliation)	Date	Received By: (Print Name/Affiliation)	Date	Laboratory (Destination):
Jim Ward - Poop Environmental Signature: [signature]	6/19/2017 Time: 1000	Joel Turner 6-19-17 10:00 Signature:	Time:	TRE Environmental Strategies, LLC 100 Racquette Drive, Unit A Fort Collins, CO 80524 (970) 416-0916 (970) 490-2963 (FAX)
Joel Turner Signature:	6-19-17 Time: 2:25 pm	BBarstow Signature: BBarstow	6-19-17 Time: 2:25 pm	
Sample Relinquished By: (Print Name/Affiliation) Signature:	Date: Time:	Received By: (Print Name/Affiliation) FILET GRASSMETER / TEE Signature: [signature]	6/20/17 Time: 1345	Sample Shipped Via (circle): FedEx Other UPS Courier Temp Blank? Yes No

Comments: RECEIVED ON ICE

© BH 6/20/17 TE

Serial No. 02316

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

023, 024

Client/Project Name: Sumitomo Metal Mining Pogo
Project #: 14001-412-
Sampler (Print/Affiliation): Jim Ward, Pogo Environmental Signature: [signature]
Chain of Custody Tape #: 468416 Intact?(circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested: CN FC						Sample Temp. Upon Arrival (Therm. #C-29) °C	Lab Sample ID
Eff #2	6/21/2017	808	6/21/2017	812	X		2 gal	ICE	L	X						3.0	30059
"	"	"	"	"	"		1 gal	ICE	L	X							

Sample Relinquished By: (Print Name/Affiliation)	Date	Received By: (Print Name/Affiliation)	Date
Jim Ward, Environmental Specialist, Pogo	6/21/2017	Jack Turner	6-21-17
Signature: [signature]	Time:	Signature:	Time: 10:46 AM
Sample Relinquished By: (Print Name/Affiliation)	Date: 6-21-17	Received By: (Print Name/Affiliation)	Date:
Signature:	Time: 2:52 pm	Signature: [signature]	Time:
Sample Relinquished By: (Print Name/Affiliation)	Date:	Received By: (Print Name/Affiliation) Michael Hendricks / TRE	Date: 6/22/17
Signature:	Time:	Signature: [signature]	Time: 1345

Laboratory (Destination):

TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A
Fort Collins, CO 80524
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via (circle): FedEx Other UPS Courier
Temp Blank? Yes No

Comments: Received on ice

Serial No. 02317

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

Client/Project Name: Sumitomo Metal Mining Pogo
Project #: 14001-412-
Sampler (Print/Affiliation): _____ Signature: _____
Chain of Custody Tape #: 46839 Intact?(circle): Yes No

Test Requested: 023, 024

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	CN, FC						Sample Temp. Upon Arrival (Therm. #6-29) °C	Lab Sample ID
Eff #3	6/29/2017	917	6/29/2017	921	X		2 500 ml	ICE	L	X						2.9	30422
" "	"	"	"	"	"		1 500 ml	ICE	L	X							
	06/23/17		06/23/17														

Sample Relinquished By: (Print Name/Affiliation)	Date:	Received By: (Print Name/Affiliation)	Date:	Laboratory (Destination):
Jim Ward, Pogo Environmental Signature:	6/23/2017 Time: 1000	Joel Turner Signature:	6-23-17 Time: 10:45 AM	Received on ice TRE Environmental Strategies, LLC 100 Racquette Drive, Unit A Fort Collins, CO 80524 (970) 416-0916 (970) 490-2963 (FAX)
Sample Relinquished By: (Print Name/Affiliation) Joel Turner Signature:	Date: 6-23-17 Time: 1:38 pm	Received By: (Print Name/Affiliation) Signature:	Date: 6-23-17 Time: 1:38 pm	
Sample Relinquished By: (Print Name/Affiliation) Signature:	Date: Time:	Received By: (Print Name/Affiliation) Mike Wauthier Signature:	Date: 6/24/17 Time: 1510	Sample Shipped Via (circle): FedEx Other UPS Courier Temp Blank? Yes No

Comments:

① on 06/23/17 per client email

Serial No. 02318

APPENDIX B

Test Data

QA Form No. 051
Revision 5
Effective 02/14

QA: AR 7/5/17

TOXICITY DATA PACKAGE COVER SHEET

Test Type: Chronic

Project Number: 14001-412-025

Test Substance: Effluent-(Outfall 001)

Species: *Ceriodaphnia dubia*

Dilution Water Type: Mod Hard

Organism Lot or Batch Number: 060917

Concurrent Control Water Type: NA

Age: 12hr (< 24 hr) Supplier: TRE

Date and Time Test Began: 6/20/17 @ 1430

Date and Time Test Ended: 6/27/17 @ 1630

Protocol Number: USEPA 2002, Method 1002.0

Investigator(s): MH/PR/LMM/MW/AS/ZL

Background Information

pH control?: Yes **No**

Type of Test: Static-Renewal

If yes, give % CO_2: N/A

Test Temperature: 25 ± 1 °C

Env. Chmbr/Bath #: 25 Test Chmbrs: 30-ml cups

Test Solution Vol.: 15 ml

Number of Replicates per Treatment: 10

Length of Test: 3 broods

Number of Organisms per Replicate: 1

Photoperiod: 16 h light : 8 h dark

Light Intensity: 50 to 100 ft.-c.

Type of Food and Quantity per Chamber: 0.2 ml YTC/ALG

Feeding Frequency: 1 x Daily

Test Substance Characterization Parameters and Frequency:

Hardness: Sx Receipt Alkalinity: Sx Receipt NH_3: Sx. Receipt TRC: Sx Receipt

pH: Daily Conductivity: Daily and Test Termination*

Test Concentrations (Volume:Volume): 0 (MH), 12.5, 25, 50, 75, and 100% effluent

Agency Summary Sheet(s)?: _____

Reference Toxicant Data: Test Dates: 06/02/17 to 06/09/17 IC_{25}: 454 mg Cl^-/L

Hist. 95% Control Limits: 229 to 677 Method for Determining Ref. Tox. Value: Linear Interp (ICPIN)

Special Procedures and Considerations:

*Conductivity measured in dilution water and 100% effluent at test termination

D.O. maintained ≥ 4.0 mg/L

Study Director Initials: NZW Date: 6/20/17

TEST SUBSTANCE USAGE LOG

Project Number: 14001-412-025

QA - AR 7/5/17

	Sample 1	Sample 2	Sample 3	
Test Substance Number	30631	30639	30642 ①	
Test Substance Collection Date and Time	From: 6/19/17 @ 0907	From: 6/21/17 @ 0808	From: ~~6/21/17~~ 6/23/17 @ 0917	per client email
	To: 6/19/17 @ ② ~~0910~~ 0911	To: 6/21/17 @ 0812	To: 6/23/17 @ 0921	
Sample Type (Grab or Comp)	Grab	Grab	Grab	
Date Test Substance Received	6/20/17	6/22/17	6/24/17	
Dilution Water Number RW# or TRE#, circle one	12888	12888	12895	
Concurrent Control Water RW#	NA	NA	NA	
Date(s) Used	6/20/17	6/22/17	6/24/17	
	6/21/17	6/23/17	6/25/17	
			6/26/17	

Preparation of Test Solutions

Test Substance % Conc.	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)
0 (MH)	0	1200	1200	0	200	200			
12.5%	150	1050	1200	25	175	200			
25%	300	900	1200	50	150	200			
50%	600	600	1200	100	100	200			
75%	900	300	1200	150	50	200			
100%	1200	0	1200	200	0	200			
Total	3150	4050	7200	525	675	1200			

Initials / Date		MH 6/20/17 Mixed CC	
Initials / Date		MM 6/21/17 " "	
Initials / Date		RR 6/22/17 " "	
Initials / Date		MW 6/23/17 " "	
Initials / Date		AB 6/24/17 " "	
Initials / Date		MH 6/25/17 " "	
Initials / Date		MM 6/26/17 " "	
Initials / Date			

① vm 06/03/17 ② AR for RG 7/5/17 CF

CERIODAPHNIA DUBIA
CHRONIC BIOLOGICAL DATA

QA: AR 7/5/17

Project Number: 14001-412-025

Number of Neonates Produced and Survival of Original Organisms

Conc.	Day	A	B	C	D	E	F	G	H	I	J	Total	Mean	Remarks
0 (MH)	1	0	0	0	0	0	0	0	0	0	0			
	2	0	0	0	0	0	0	0	0	0	0			100%
	3	0	0	0	0	0	0	0	0	0	0			
	4	5/1	6/1	6/1	6/1	6/1	6/1	5/1	6/1	6/1	5/1	57		
	5	1/1▲	16/2	13/2	13/2	15/2	13/2	12/2	11/2	11/2	8/2	113		▲-large neo
	6	16/2	0	16/3	0	0	0	0	0	0	7/2	39		◊large neos
	7	25/3	22/3	0	18/3	18/3	20/3	17/3	17/3	19/3	17/3	173		★UNDEV. NEOS-NC
	8													
Total		47	44	35	37	39	39	34	34	36	37	382	38.2	
12.5%	1	0	0	0	0	0	0	0	0	0	0			
	2	0	0	0	0	0	0	0	0	0	0			
	3	0	0	0	0	0	0	0	0	0	0			100%
	4	6/1	6/1	6/1	5/1	6/1	5/1	6/1	7/1	5/1	6/1	58		
	5	16/2	13/2	14/2	12/2	15/2	11/2	10/2	13/2	13/2	12/2	129		
	6	0	0	0	0	13/3	18/3	0	0	0	0	31		
	7	17/3	18/3	19/3	18/3	5/4	0	16/3★	14/3	19/3	19/3	140		★UNDEV NC-NC
	8													
Total		39	37	39	35	34	34	32	34	37	37	358	35.8	
25%	1	0	0	0	0	0	0	0	0	0	0			
	2	0	0	0	0	0	0	0	0	0	0			100%
	3	0	0	0	0	0	0	0	0	0	0			
	4	7/1	6/1	6/1	5/1	7/1	5/1	5/1	5/1	4/1	6/1	56		
	5	16/2	14/2	13/2	14/2	13/2	12/2	10/2	14/2	16/2	13/2	125		
	6	0	0	0	0	0	0	0	0	3/2◊	0	3		◊large neos
	7	17/3	21/3	16/3	17/3	14/3	15/3	22/3	12/3	14/3	19/3	167		
	8													
Total		40	41	35	36	34	32	37	31	27	38	351	35.1	

Day:	1	2	3	4	5	6	7	8
Date:	6/21/17	6/22/17	6/23/17	6/24/17	6/25/17	6/26/17	6/27/17	
Time:	0940	1525	1105	1545	1040	1445	1630	
Initials:	MM	RR	MW	AO	NA	MM	[illegible]	

Key to symbols: NC = not counted
X = Original organism died.
M = Male
▲ exclude 4th brood

QA Form No. 057
Revision 2
Effective 02/14

CERIODAPHNIA DUBIA
CHRONIC BIOLOGICAL DATA

QA: AR 7/5/17

Project Number: 14001-412-025

Number of Neonates Produced and Survival of Original Organisms

Conc.	Day	A	B	C	D	E	F	G	H	I	J	Total	Mean	Remarks
50%	1	0	0	0	0	0	0	0	0	0	0			
	2	0	0	0	0	0	0	0	0	0	0			100%
	3	0	0	0	0	0	0	0	0	0	0			
	4	5/1	7/1	5/1	5/1	5/1	6/1	6/1	5/1	6/1	6/1	56		
	5	13/2	13/2	12/2	13/2	0	14/2	13/2	15/2	11/2	1/1 △	105		△ large neo
	6	0	0	0	0	14/2	0	0	0	0	14/2	28		
	7	23/3	20/3	20/3	15/3	17/3	14/3	19/3	19/3	17/3 ✱	20/3	184		✱ UNDER NEO - NC
	8													
Total		41	40	37	33	36	34	38	39	34	41	373	37.3	
75%	1	0	0	0	0	0	0	0	0	0	0			
	2	0	0	0	0	0	0	0	0	0	0			100%
	3	0	0	0	0	0	0	0	0	0	0			
	4	6/1	5/1	7/1	5/1	6/1	6/1	5/1	5/1	6/1	6/1	57		
	5	16/2	14/2	10/2	13/2	15/2	14/2	8/2	9/2	13/2	12/2	124		
	6	0	0	0	0	0	0	1/2 △	0	0	0	1		△ large neo
	7	20/3	21/3	12/3 ✱	17/3	17/3	19/3	16/3	14/3	16/3	14/3	166		✱ UNDER NEO - NC
	8													
Total		42	40	29	35	38	39	30	28	35	32	348	34.8	
100%	1	0	0	0	0	0	0	0	0	0	0			
	2	0	0	0	0	0	0	0	0	0	0			100%
	3	0	0	0	0	0	0	0	0	0	0			
	4	7/1	6/1	5/1	4/1	5/1	5/1	5/1	4/1	5/1	5/1	51		
	5	13/2	14/2	16/2	10/2	13/2	12/2	10/2	11/2	14/2	14/2	127		
	6	0	0	0	0	0	0	0	0	0	0	0		
	7	20/3	18/3	17/3	19/3	15/3	16/3	18/3	16/3	19/3	19/3	177		
	8													
Total		40	38	38	33	33	33	33	31	38	38	355	35.5	

Day:	1	2	3	4	5	6	7	8
Date:	6/21/17	6/22/17	6/23/17	6/24/17	6/25/17	6/26/17	6/27/17	
Time:	0940	1525	1105	1545	1040	1445	1630	
Initials:	MAM	RR	MW	AB	MK	MAM	[illegible]	

Key to symbols: NC = not counted
X = Original organism died.
M = Male

CHRONIC CHEMICAL DATA (INITIAL)

QA: AR 7/5/17

Project Number: 14001-412-025

Test Species: ***Ceriodaphnia dubia***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 0 (MH)									All Conc.	
pH	8.0	8.0	8.1	8.1	8.2	8.2	8.2		FM24	
D.O. (mg/L)	6.8	6.7	7.0	7.1	6.9	7.1	6.5		LDO/S	
Temp. (°C)	25	25	25	25	25	25	25		L-3	
Cond. (µS/cm)	306	308	314	297	300	306	303		15	
Hard. (mg/L)	90		96		90				Titr.	
Alk. (mg/L)	62		63		59				Titr.	
TRC (mg/L) (6/8/17)	<0.02				<0.02 (6/14/17)				22	
NH_3 (mg/L)[1] (6/8/17)	<1.0				<1.0 (6/16/17)				HA#1	
Conc.: 12.5%										
pH	8.0	8.0	8.1	8.1	8.2	8.1	8.2			
D.O. (mg/L)	6.9	6.7	7.0	7.1	6.9	7.1	6.5			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	312	302	305	293	297	302	295			
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH_3 (mg/L)										
Conc.: 25%										
pH	7.9	8.0	8.0	8.1	8.1	8.1	8.1			
D.O. (mg/L)	6.9	6.7	7.0	7.2	7.0	7.1	6.5			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	306	294	295	288	288	288	283			
Conc.: 50%										
pH	7.8	7.9	7.9	8.0	8.0	8.0	8.0			
D.O. (mg/L)	6.9	6.7	6.9	7.2	7.0	7.1	6.5			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	288	278	276	268	260	266	257			
Date:	6/20/17	6/21/17	6/22/17	6/23/17	6/24/17	6/25/17	6/26/17			
Time:	1400	0920	1515	1045	1530	1020	1430			
Initials:	MH	MM	RR	MW	AS	MH	MM			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084. QA AR 7/5/17 NA

*Dilution/control water and effluent were brought to 25°C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

QA: AR 7/5/17

CHRONIC CHEMICAL DATA (INITIAL)

Project Number: 14001-412-025

Test Species: ***Ceriodaphnia dubia***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 75%									All Conc.	
pH	7.7	7.8	7.8	8.0	7.9	7.9	8.0			
D.O. (mg/L)	7.0	6.7	7.0	7.4	7.1	7.2	6.5			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	270	259	254	248	232	239	231			
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.: 100%										
pH	7.6	7.7	7.7	7.9	7.8	7.8	7.8			
D.O. (mg/L)	7.0	6.7	6.9	7.3	7.2	7.2	6.5			
Temp. (°C)	25	25	25	25	25	25	25			
Cond. (µS/cm)	252	242	231	229	203	210	204			
Hard. (mg/L)	74		80		74					
Alk. (mg/L)	40		39		40					
TRC (mg/L)	<0.02		<0.02		<0.02					
NH_3 (mg/L)	1.00 △		① ~~1.5~~ 1.1 △		2.0 △				△ HS#2	
Date:	6/20/17	6/21/17	6/22/17	6/23/17	6/24/17	6/25/17	6/26/17			
Time:	1400	0920	1515	1045	1570	1020	1430			
Initials:	MH	MJM	RR	LAW	AO	MH	MJM			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084. ① AR for AMR 7/5/17 E

*Dilution/control water and effluent were brought to 25°C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

QA Form No. 059
Revision 3
Effective 02/14

QA: AR 7/5/17

CHRONIC CHEMICAL DATA (FINAL)

Project Number:	14001-412-025
Test Species:	*Ceriodaphnia dubia*

%	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Meter #	Remarks
Conc.: 0 (MH)							341		All Conc.	* conductivity (15)
pH	8.1	8.1	8.1	8.2	8.1	8.0	8.0		FM24	
D.O. (mg/L)	6.7	6.7	6.8	6.6	6.9	6.3	6.4		5	
Temp (°C)	25	24	24	24	24	24	24		L-10	
Conc.: 12.5%										
pH	8.1	8.1	8.1	8.2	8.0	8.0	7.9			
D.O. (mg/L)	6.6	6.7	6.7	6.7	6.9	6.3	6.4			
Temp (°C)	25	24	24	24	24	24	24			
Conc.: 25%										
pH	8.1	8.0	8.1	8.2	8.1	8.0	7.9			
D.O. (mg/L)	6.6	6.8	6.7	6.7	6.9	6.3	6.4			
Temp (°C)	24	24	24	24	24	24	24			
Conc.: 50%										
pH	8.0	8.0	8.1	8.2	7.9	8.0	7.9			
D.O. (mg/L)	6.5	6.9	6.7	6.7	6.9	6.3	6.5			
Temp (°C)	24	25	24	24	24	24	24			
Conc.: 75%										
pH	8.0	8.0	8.1	8.1	7.9	8.0	7.8			
D.O. (mg/L)	6.6	6.9	6.7	6.8	6.9	6.3	6.5			
Temp (°C)	24	25	24	24	24	24	24			
Conc.: 100%							229			* conductivity (15)
pH	7.9	7.9	8.0	8.0	7.9	7.9	7.7			
D.O. (mg/L)	6.6	6.9	6.7	6.8	6.9	6.4	6.5			
Temp (°C)	25	24	24	24	24	24	24			
Conc.:										
pH										
D.O. (mg/L)										
Temp (°C)										
Date:	6/21/17	6/22/17	6/23/17	6/24/17	6/25/17	6/26/17	6/27/17			
Time:	0945	1520	1110	1545	1050	1455	1630			
Initials:	MMM	RR	MW	AO	MH	MMM	MH			

DAILY TOXICITY TEST LOG

Project Number:	14001-412-025	QA: AR 7/5/17
Test Species:	***Ceriodaphnia dubia***	

General Comments	Neonates obtained from 061317 A-C cerio monoculture board (green marked cups) Random Chart: Nebula Min/Max Therm. #: M14	Feeding 0.2 ml YTC/ALG Daily	Initials/Date
Test Day 0	Test Solution Mixed at: 1400 Test Organisms Added at: 1430	Fed @ 1420	MH/RR 6/20/17
Test Day 1	Real Time Temp= 25 °C Range = 24-26 °C	Fed @ 0925	MM 6/21/17
Test Day 2	Real Time Temp= 25 °C Range = 24-25 °C	Fed @ 1520	RR 6/22/17
Test Day 3	Real Time Temp= 25 °C Range = 25-26 °C	Fed @ 1040	MW 6/23/17
Test Day 4	Real Time Temp= 25 °C Range = 24-26 °C	Fed @ 1535	AB 6/24/17
Test Day 5	Real Time Temp= 24 °C Range = 24-26 °C	Fed @ 1035	MH 6/25/17
Test Day 6	Real Time Temp= 25 °C Range = 24-26 °C	Fed @ 1430	MM 6/26/17
Test Day 7	Real Time Temp= 25 °C Range = 24-26 °C	Fed @ NONE	ZH 6/27/17
Test Day 8	Real Time Temp= °C Range = °C	NONE	

CETIS Analytical Report

Report Date: 29 Jun-17 16:26 (p 1 of 2)
Test Code: 412-025 | 08-5654-1117

Ceriodaphnia 7-d Survival and Reproduction Test — **TRE Environmental Strategies**

Analysis ID:	12-6317-3132	**Endpoint:**	7d Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	29 Jun-17 16:26	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	10-3506-3131	**Test Type:**	Reproduction-Survival (6-8d)	**Analyst:**	Lab Tech
Start Date:	20 Jun-17 14:30	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	27 Jun-17 16:30	**Species:**	Ceriodaphnia dubia	**Brine:**	Not Applicable
Duration:	7d 2h	**Source:**	In-House Culture	**Age:**	<24

Sample ID:	14-7300-4977	**Code:**	57CC45B1	**Client:**	Sumitomo Mining (Pogo)
Sample Date:	19 Jun-17 09:11	**Material:**	Ambient Sample	**Project:**	WET Annual Compliance Test
Receive Date:	20 Jun-17 13:45	**Source:**	Discharge Monitoring Report		
Sample Age:	29h (3.1 °C)	**Station:**	Outfall 001		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	10.1%	100	>100	NA	1

Dunnett Multiple Comparison Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		12.5	1.423	2.29	3.862	18	0.2436	CDF	Non-Significant Effect
		25	1.838	2.29	3.862	18	0.1235	CDF	Non-Significant Effect
		50	0.5335	2.29	3.862	18	0.6311	CDF	Non-Significant Effect
		75	2.016	2.29	3.862	18	0.0883	CDF	Non-Significant Effect
		100	1.601	2.29	3.862	18	0.1855	CDF	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	89.88333	17.97667	5	1.263	0.2931	Non-Significant Effect
Error	768.3	14.22778	54			
Total	858.1833		59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	6.249	15.1	0.2827	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9897	0.946	0.8942	Normal Distribution

7d Reproduction Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	10	38.2	35.13	41.27	37	34	47	1.356	11.2%	0.0%
12.5		10	35.8	34.12	37.48	36	32	39	0.7424	6.56%	6.28%
25		10	35.1	32.04	38.16	35.5	27	41	1.354	12.2%	8.12%
50		10	37.3	35.17	39.43	37.5	33	41	0.9434	8.0%	2.36%
75		10	34.8	31.28	38.32	35	28	42	1.555	14.1%	8.9%
100		10	35.5	33.23	37.77	35.5	31	40	1.003	8.93%	7.07%

7d Reproduction Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	47	44	35	37	39	39	34	34	36	37
12.5		39	37	39	35	34	34	32	34	37	37
25		40	41	35	36	34	32	37	31	27	38
50		41	40	37	33	36	34	38	39	34	41
75		42	40	29	35	38	39	30	28	35	32
100		40	38	38	33	33	33	33	31	38	38

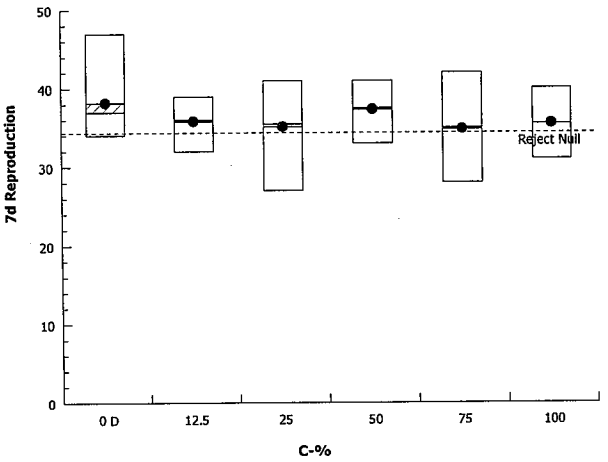
CETIS Analytical Report

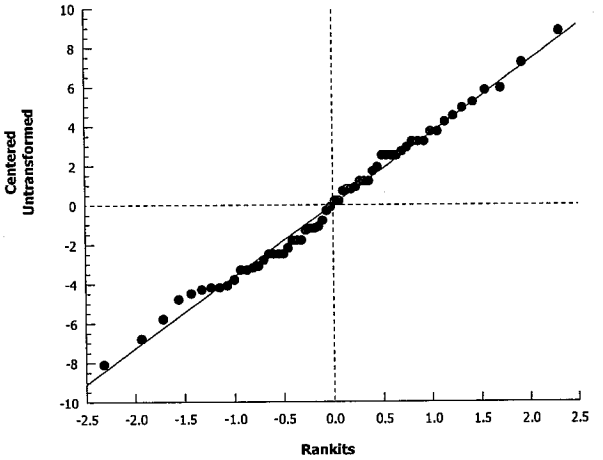
Report Date: 29 Jun-17 16:26 (p 2 of 2)
Test Code: 412-025 | 08-5654-1117

Ceriodaphnia 7-d Survival and Reproduction Test — **TRE Environmental Strategies**

Analysis ID:	12-6317-3132	**Endpoint:**	7d Reproduction	**CETIS Version:**	CETISv1.8.7
Analyzed:	29 Jun-17 16:26	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





TRE Environmental Strategies

Report of Short-Term Chronic Toxicity Testing using the Fathead Minnow (Pimephales promelas)

Project ID: 14001-412-026
June 2017

Sponsor and Laboratory Information

Sponsor	Sumitomo Metal Mining Pogo LLC Pogo Mine Joint Venture P.O. Box 145 Delta Junction, AK 99737
Project Officer	Stacy Staley (907) 895-2761
Testing Facility	TRE Environmental Strategies, LLC Fort Collins Environmental Toxicology Laboratory 100 Racquette Drive, Unit A Fort Collins, CO 80524 Fax: (970) 490-2963 State of Florida NELAP Laboratory ID: E87972
Study Director	Rami B. Naddy, Ph.D. (970) 416-0916 email: naddyrb.tre@gmail.com
Report Author	Whitney Naddy (970) 416-0916 email: naddywm.tre@gmail.com

Test Information

Test	Short-Term Chronic under Static-Renewal Conditions
Basis	USEPA (2002), method 1000.0
Test Dates and Time	June 20, 2017 @ 1525 to June 27, 2017 @ 1500
Test Length	7 days
Species	*Pimephales promelas*
Test Material	Effluent
Outfall	Outfall 001
Permit Number	AK-005334-1
Receiving Stream	N/A
Dilution Water	Moderately hard reconstituted water
Concurrent Control Water	None
Test Concentrations	0 (control), 12.5, 25, 50, 75, and 100% effluent
Permit Compliance	_X_ **Pass** ____Fail

- *Results described in this report apply only to the samples submitted to the laboratory and analyzed, as listed in the report*
- *Test results comply with NELAC standards. Reports are intended to be considered in their entirety; TRE is not responsible for consequences arising from use of a partial report*
- *This report contains 5 pages plus 2 appendices*

Effluent Collection and Receipt

Sample No.	Field No.	Collection Date & Time	TRE No.	Date of Receipt	Temp. at Arrival (°C)
1	N/A	06/19/17 @ 0907 to 06/19/17 @ 0911	30631	06/20/17	3.1
2	N/A	06/21/17 @ 0808 to 06/21/17 @ 0812	30639	06/22/17	3.0
3	N/A	06/23/17 @ 0917 to 06/23/17 @ 0921	30642	06/24/17	2.9

Note: See Appendix A for chain of custody records

Effluent Characterization

Sample No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)
1	7.6	74	40	248	<0.02	1.6
2	7.7	80	39	229	<0.02	1.1
3	7.8	74	40	211	<0.02	<1.0

[a] As $CaCO_3$
[b] Total residual chlorine

Initial Dilution/Control Water Characterization

Batch No.	pH	Hard. (mg/L)[a]	Alk. (mg/L)[a]	Spec. Cond. (µS/cm)	TRC (mg/L)[b]	NH_3-N (mg/L)
12896	8.1	80	57	313	<0.02	<1.0

[a] As $CaCO_3$
[b] Total residual chlorine

Test Conditions

Type	Static-Renewal Short-term Chronic			
Test Endpoints	Survival and Growth			
Test Chambers	500-ml plastic cups			
Test Solution Volume	250 ml			
Replicates per Treatment	4			
Organisms per Replicate	10			
Test Temperature	25 ± 1°C (≤ 3°C differential)			
Lighting	Fluorescent, 16 hours light:8 hours dark			
Chamber Placement	Random according to computer-generated chart			
Aeration?	X	No		Yes
Test Solution Renewal	Daily			

Test Organism

Species	*Pimephales promelas*
Age	<48 hours
Source	TRE in-house culture, batch 061917
Acclimation	Test temperature
Feeding	0.10 ml concentrated suspension of brine shrimp (*Artemia* sp.) nauplii per test chamber three times daily during the test.
Reference Toxicant Testing	Initiated June 2, 2017 using sodium chloride (NaCl)

TEST RESULTS

Biological Data

Treatment (% Effluent)	Percent Survival of *Pimephales promelas*								Significant Reduction Relative to Control?	
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Mean Dry Weight (mg)[a]	Surv.	Growth
0 (Control)	100	92.5	92.5	92.5	90	87.5	87.5	0.551	N/A	N/A
12.5	100	100	100	100	100	100	100	0.736	No	No
25	100	100	97.5	97.5	97.5	95	95	0.689	No	No
50	100	100	100	100	100	100	100	0.651	No	No
75	100	100	100	100	100	100	100	0.668	No	No
100	100	97.5	97.5	97.5	97.5	97.5	97.5	0.586	No	No
Percent Minimum Significant Difference (Growth)								17.6	Acceptable	

[a] Mean dry weight calculated based on the original number of organisms per replicate
Note: See Appendix B for copies of laboratory data sheets

Data Analysis and Test Endpoints

Biological Endpoint	Statistical Endpoint	Value
Survival	NOEC	100% Effluent
	LOEC	>100% Effluent
	IC_{25}	>100% Effluent
Chronic (Growth)	NOEC	100% Effluent
	LOEC	>100% Effluent
	ChV	>100% Effluent
	IC_{25}	>100% Effluent
	TU_c (100/IC_{25})	<1.0

NOEC = No Observed Effect Concentration
LOEC = Lowest Observed Effect Concentration
ChV = Chronic Value
IC_{25} = 25% Inhibition Concentration
TU_c = Chronic Toxic Units
Note: Analyses completed using, where appropriate, CETIS version 1.8.7 (2014).

Physical and Chemical Data

Treatment (% Effluent)	pH		Dissolved Oxygen (mg/L)		Conductivity (µS/cm)		Temperature (°C)	
	Low	High	Low	High	Low	High	Low	High
0 (Control)	7.6	8.2	4.6	7.2	302	329	24	26
100	7.4	7.9	4.3	7.2	204	248	24	25
All Treatments	7.4	8.2	≥4.1		NA		24[a]	26[a]
							24[b]	26[b]

[a] Temperature in test solutions
[b] Continuous wet temperature in the environmental chamber

Reference Toxicant Test Results for *Pimephales promelas*

IC_{25}	TRE Historical 95% Control Limits	
	Low	High
1,287	949	1,372

Note: Values are expressed as mg/L of chloride.

References

CETIS. 2014. Comprehensive Environmental Toxicity Information System. User Guide (version 1.8.7). Tidepool Scientific, LLC. McKinleyville, CA

USEPA. 2002. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. Fourth Edition. EPA-821-R-02-013.

Statement of Quality Assurance

The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol (if applicable) and standard operating procedures, and that the resulting data and report meet the requirements of the NELAC standards. This report is an accurate reflection of the raw data.

Quality Assurance Unit — Date: July 5, 2017

Data Analyst — Date: July 5, 2017

APPENDIX A

Chain of Custody Records

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

023,024

Client/Project Name: Sumitomo Metal Mining P[illegible] Project #: 14001-412-

Sampler (Print/Affiliation): Jim Ward, Poop Environmental Signature: [signature]

Chain of Custody Tape #: 46834 Intact?(circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested: CO, FC						Sample Temp. Upon Arrival (Therm. #L-29) °C	Lab Sample ID
Eff #1	6/19/2017	907	6/19/2017	9:09			2.5gal	ICE	L	X						~~3.0~~	~~30634~~ 30631
" "	6/19/2017	910	6/19/2017	9:11			1gal	ICE	L	X						3.1	

Sample Relinquished By: (Print Name/Affiliation)	Date / Time	Received By: (Print Name/Affiliation)	Date / Time
Jim Ward - Poop Environmental Signature: [signature]	Date: 6/19/2017 Time: 1000	Joel Turner 6-19-17 10:00 Signature:	Date: Time:
Sample Relinquished By: (Print Name/Affiliation) Joel Turner Signature:	Date: 6-19-17 Time: 2:25 pm	Received By: (Print Name/Affiliation) B Barstow Signature: B Barstow	Date: 6-19-17 Time: 2:25 pm
Sample Relinquished By: (Print Name/Affiliation) Signature:	Date: Time:	Received By: (Print Name/Affiliation) Pilot Grassmeier / TEE Signature: [signature]	Date: 6/20/17 Time: 1345

Laboratory (Destination):

TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A
Fort Collins, CO 80524
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via (circle): FedEx Other UPS Courier

Temp Blank? Yes No

Comments:
RECEIVED ON ICE

© DJ 6/20/17 TE

Serial No. 02316

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

023, 024

Client/Project Name: Sumitomo Metal Mining Pogo | Project #: 14001-412-

Sampler (Print/Affiliation): Jim Ward, Pogo Environmental | Signature: [signature]

Chain of Custody Tape #: 468446 | Intact?(circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested						Sample Temp. Upon Arrival (Therm. #C-29) °C	Lab Sample ID
										Cd	FC						
Eff #2	6/21/2017	808	6/21/2017	812	X		2 Gal	ICE	L	X						3.0	30659
" "	"	"	"	"	"		1 gal	ICE	L	X							

Sample Relinquished By: (Print Name/Affiliation)	Date	Received By: (Print Name/Affiliation)	Date
Jim Ward, Environmental Specialist, Pogo	6/21/2017	Jack Turner	6-21-17
Signature: [signature]	Time:	Signature:	Time: 10:46 AM
Sample Relinquished By: (Print Name/Affiliation)	Date: 6-21-17	Received By: (Print Name/Affiliation)	Date:
Signature:	Time: 2:52 pm	Signature: [signature]	Time:
Sample Relinquished By: (Print Name/Affiliation)	Date:	Received By: (Print Name/Affiliation) Michael Hendricks / TRE	Date: 6/22/17
Signature:	Time:	Signature: [signature]	Time: 1345

Laboratory (Destination):

TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A
Fort Collins, CO 80524
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via (circle): FedEx Other UPS Courier

Temp Blank? Yes No

Comments: Received on ice

Serial No. 02317

TRE Environmental Strategies, LLC

100 Racquette Drive, Unit A Fort Collins, CO 80524 Phone: (970) 416-0916 Fax: (970) 490-2963

023, 024

Client/Project Name: Sumitomo Metal Mining Pogo | Project #: 14001-412-

Sampler (Print/Affiliation): _____ Signature: _____

Chain of Custody Tape #: 468339 Intact?(circle): Yes No

Client / Sample ID	Sample Collection Beginning Date	Beginning Time	Ending Date	Ending Time	Sample Type Grab	Comp.	Volume	Preservation (i.e.: 0-6°C)	Matrix (Liq., Soil, Sediment, etc.)	Test Requested: CO, FC						Sample Temp. Upon Arrival (Therm. #6-29) °C	Lab Sample ID
Eff #3	~~6/29/2017~~	917	~~6/29/2017~~	921	X		2 500	ICE	L	X						2.9	30642
" "	"	"	"	"	"		1 500	ICE	L	X							
	06/23/17		06/23/17														

Sample Relinquished By: (Print Name/Affiliation)	Date / Time	Received By: (Print Name/Affiliation)	Date / Time
Jim Ward, Pogo Environmental Signature: [signature]	Date: 6/23/2017 Time: 1000	Joel Turner Signature:	Date: 6-23-17 Time: 10:45 AM
Joel Turner Signature: BBerstow	Date: 6-23-17 Time: 1:38 pm	Received By: (Print Name/Affiliation) Signature:	Date: 6-23-17 Time: 1:38 pm
Sample Relinquished By: (Print Name/Affiliation) Signature:	Date: _____ Time: _____	Received By: (Print Name/Affiliation) Mike Wauthier Signature: [signature]	Date: 6/24/17 Time: 1510

Laboratory (Destination): Received on ice

TRE Environmental Strategies, LLC
100 Racquette Drive, Unit A
Fort Collins, CO 80524
(970) 416-0916
(970) 490-2963 (FAX)

Sample Shipped Via (circle): FedEx Other UPS Courier

Temp Blank? Yes No

Comments:

① vm 06/23/17 per client email

Serial No. 02318

APPENDIX B

Test Data

QA Form No. 051
Revision 5
Effective 02/14

QA: AR 7/5/17

TOXICITY DATA PACKAGE COVER SHEET

Test Type: Chronic

Project Number: 14001-412-026

Test Substance: Effluent-(Outfall 001)

Species: *Pimephales promelas*

Dilution Water Type: Mod Hard

Organism Lot or Batch Number: 060917

Concurrent Control Water Type: NA

Age: ~~1d~~ <48h ① (< 24 hr) Supplier: TRE

Date and Time Test Began: 6/20/17 @ 1525

Date and Time Test Ended: 6/27/17 @ 1500

Protocol Number: USEPA 2002, Method 1000.0

Investigator(s): RR/BS/MMM/MW/TAM

Background Information

pH control?: Yes **No**

If yes, give % CO_2: N/A

Type of Test: Static-Renewal

Test Temperature: 25 ± 1 °C

Env. Chmbr/Bath #: 25

Test Chmbrs: 500-ml cups/beakers

Test Solution Vol.: 250 ml

Number of Replicates per Treatment: 4

Length of Test: 7 days

Number of Organisms per Replicate: 10

Photoperiod: 16 h light : 8 h dark

Light Intensity: 50 to 100 ft.-c.

Type of Food and Quantity per Chamber: 0.1 ml B.S.

Feeding Frequency: 3 x Daily

Test Substance Characterization Parameters and Frequency:

Hardness: Sx Receipt Alkalinity: Sx Receipt NH_3: Sx Receipt TRC: Sx Receipt

pH: Daily Conductivity: Daily

Test Concentrations (Volume:Volume): 0 (MH), 12.5, 25, 50, 75, and 100%

Agency Summary Sheet(s)?: None

Reference Toxicant Data: Test Dates: 06/02/17 to 06/09/17 IC_{25}: 1287 mgCl/L

Hist. 95% Control Limits: 949 to 1372 Method for Determining Ref. Tox. Value: Linear Interp (ICPIN)

Special Procedures and Considerations:

D.O. maintained ≥ 4.0 mg/L

*Conductivity measured in dilution water and 100% effluent at test termination

If survival in any test chamber falls below 50%, reduce feeding in that chamber to 0.05 ml of brine shrimp

Study Director Initials: MJN Date: 6/20/17

① AR for RR 7/5/17 CF

TEST SUBSTANCE USAGE LOG

Project Number: 14001-412-026

QA: NR 7/5/17

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	30631	30639	30642	
Test Substance Collection Date and Time	From: 6/19/17 @ 0907	From: 6/21/17 @ 0808	From: ~~6/19/17~~ 6/23/17 ④ @ 0917	From: @
	To: 6/19/17 @ ③ ~~0910~~ 0911	To: 6/21/17 @ 0812	To: ~~6/19/17~~ 6/23/17 ④ @ 0921	To: @
Sample Type (Grab or Comp)	Grab	Grab	Grab	
Date Test Substance Received	6/20/17	6/22/17	6/24/17	
Dilution Water Number RW# or TRE#, circle one	12896	~~12896~~ 12902 ①	12902/12903	
Concurrent Control Water RW#	NA	NA	NA	
Date(s) Used	6/20/17	6/22/17	6/24/17	
	6/21/17	6/23/17	6/25/17	
			6/26/17*	

Preparation of Test Solutions

Test Substance Conc. (% Effluent)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)	Test Substance Volume (ml)	Dilution Water Volume (ml)	Total Volume (ml)
0 (MH)	0	1200	1200	0	1000	1000			
12.5%	150	1050	1200	125	875	1000			
25%	300	900	1200	250	750	1000			
50%	600	600	1200	500	500	1000			
75%	900	300	1200	750	250	1000			
100%	1200	0	1200	1000	0	1000			
Total	3150	4050	7200	2625	3375	6000			

Initials / Date		RR 6/20/17 mixed FC	
Initials / Date		MJM 6/21/17 " "	
Initials / Date		② ~~RR~~ MW 6/22/17 " "	
Initials / Date		RR 6/23/17 " "	
Initials / Date		MW 6/24/17 " "	
Initials / Date		MJM 6/25/17 " "	
Initials / Date		~~MW~~ MJM 6/26/17 " "	
Initials / Date			

① MW 6/22/17, E ② RR 6/23/17, E ③ NR for RG 7/5/17 CF
④ NR for MW, per client email, 7/5/17 CF, E

FATHEAD MINNOW (*PIMEPHALES PROMELAS*)
CHRONIC BIOLOGICAL DATA

QA: AR 7/5/17

Project Number: 14001-412-026

%Conc.	Test Replicate	Number of Surviving Organisms Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Remarks (%survival)
0 (MH)	A	10	10	9	9	9	9	8*	8	*1 dead org 87.5
	B	10	10	10	10	10	10	10	10	
	C	10	10	9	9	9*	8	8	8	*weak org
	D	10	10	9	9	9	9	9	9	
12.5%	A	10	10	10	10	10	10	10	10	100
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	10	10	10	10	10	
25%	A	10	10	10	10	10	10	10	10	95
	B	10	10	10	10	10	10	9°	9	°1 org NF
	C	10	10	10*	9	9	9	9	9	*weak org.
	D	10	10	10	10	10	10	10	10	
50%	A	10	10	10	10	10	10	10	10	100
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	10	10	10*	10	10	*1 fish bumped w/ siphon
75%	A	10	10	10	10	10	10	10	10	100
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10	10	
	D	10	10	10	10	10	10	10	10	
100%	A	10	10	10	10	10	10	10	10	97.5
	B	10	10	10	10	10	10	10	10	
	C	10	10	10	10	10	10	10*	10	*2 weak orgs
	D	10	10	9	9	9	9	9	9	
	A									
	B									
	C									
	D									
Date:		6/20/17	6/21/17	6/22/17	6/23/17	6/24/17	6/25/17	6/26/17	6/27/17	
Time:		1525	1100	1510	1035	1555	1035	1605	1500	
Initials:		RP	MJM	MW	RP	MW	MJM	NHA	DM	

CHRONIC CHEMICAL DATA (INITIAL)

QA: AR 7/5/17

Project Number: 14001-412-026

Test Species: ***Pimephales promelas***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 0 (MH)									All Conc.	
pH	8.1	8.1	8.1	8.2	8.1	8.2	8.2		FM24	
D.O. (mg/L)	6.8	6.6	6.8	7.2	7.0	6.8	6.4		S	
Temp. (°C)	25	25	25	25	25	25	25		L10	
Cond. (µS/cm)	313	308	305	302	308	308	326		15	
Hard. (mg/L)	80		90	~~88~~ ①	88		100		Titr.	
Alk. (mg/L)	57		58	~~59~~ ①	59		62		Titr.	
TRC (mg/L) (6/21/17)	<0.02		0.03 (6/21/17)				<0.02 (6/24/17)		22	
NH_3 (mg/L) ~~(6/19/17)~~ ②	<1.0		<1.0 (6/21/17)				<1.0 (6/24/17)		HA# 1	
Conc.: 12.5%										
pH	8.0	8.1	8.1	8.2	8.1	8.2	8.1			
D.O. (mg/L)	6.8	6.6	6.9	7.2	7.1	6.8	6.3			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	305	299	300	295	298	295	294			
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH_3 (mg/L)										
Conc.: 25%										
pH	8.0	8.1	8.0	8.1	8.1	8.2	8.1			
D.O. (mg/L)	6.9	6.6	6.9	7.2	7.1	6.8	6.3			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	300	292	290	285	288	283	292			
Conc.: 50%										
pH	7.9	8.0	8.0	8.0	8.1	8.1	8.0			
D.O. (mg/L)	6.9	6.6	7.0	7.2	7.1	6.8	6.5			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	282	274	270	267	261	259	265			
Date:	6/20/17	6/21/17	6/22/17	6/23/17	6/24/17	6/25/17	6/26/17			
Time:	1500	1030	1445	1015	1530	1010	1545			
Initials:	RR	MDM	MW	RR	MW	MDM	MW			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084.

*Dilution/control water and effluent were brought to 25°C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

① MW 6/24/17 E ② AR 7/5/17 NA

QA: AR 7/5/17

CHRONIC CHEMICAL DATA (INITIAL)

Project Number: 14001-412-026

Test Species: ***Pimephales promelas***

%	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Meter #	Remarks
Conc.: 75%									All Conc.	
pH	7.8	7.9	7.8	7.9	8.0	8.0	7.9			
D.O. (mg/L)	7.0	6.7	7.0	7.2	7.1	6.7	6.4			
Temp. (°C)	*	*	*	*	*	*	*			
Cond. (µS/cm)	265	257	250	249	235	232	236			
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.: 100%										
pH	7.6	7.8	7.7	7.8	7.8	7.9	7.7			
D.O. (mg/L)	7.1	6.7	7.2	7.2	7.1	6.7	6.4			
Temp. (°C)	25	25	25	25	25	25	25			
Cond. (µS/cm)	248	240	229	228	217	205	204			
Hard. (mg/L)	74		80		74					
Alk. (mg/L)	40		39		40					
TRC (mg/L)	<0.02		<0.02		<0.02					
NH_3 (mg/L)	1.60		1.1		<1.0					
Date:	6/20/17	6/21/17	6/22/17	6/23/17	6/24/17	6/25/17	6/26/17			
Time:	1500	1030	1425	1015	1530	1010	1545			
Initials:	RR	MM	MW	RR	MW	MM	NH			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084.

*Dilution/control water and effluent were brought to 25°C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25°C.

MW 6/26/17

CHRONIC CHEMICAL DATA (FINAL)

GA. AR 7/5/17

Project Number:	14001-412-026
Test Species:	*Pimephales promelas*

%	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Meter #	Remarks
Conc.: 0 (MH)							329		All Conc.	* conductivity (15)
pH	7.6	7.6	7.7	7.7	7.7	7.2	7.7		FM24	
D.O. (mg/L)	5.4	4.8	5.0	4.7	5.4	4.6	5.4		5	
Temp (°C)	25	25	24	24	24	25	26		L-16	
Conc.: 12.5%										
pH	7.6	7.5	7.6	7.6	7.6	7.6	7.7			
D.O. (mg/L)	5.2	4.2	4.3	4.6	5.2	4.9	5.2			
Temp (°C)	24	24	24	24	24	25	25			
Conc.: 25%										
pH	7.5	7.5	7.6	7.6	7.6	7.6	7.8			
D.O. (mg/L)	5.0	4.1	4.2	4.3	5.0	4.5	4.5			
Temp (°C)	24	24	24	24	24	25	25			
Conc.: 50%										
pH	7.5	7.5	7.5	7.5	7.5	7.5	7.6			
D.O. (mg/L)	4.8	4.2	4.3	4.4	4.9	4.2	5.1			
Temp (°C)	25	25	25	24	24	25	26			
Conc.: 75%										
pH	7.4	7.4	7.5	7.5	7.5	7.5	7.5			
D.O. (mg/L)	4.8	4.1	4.2	4.3	4.8	4.2	5.2			
Temp (°C)	25	24	24	24	24	25	26			
Conc.: 100%							21			* conductivity (15)
pH	7.4	7.4	7.4	7.4	7.5	7.4	7.4			
D.O. (mg/L)	5.0	4.3	4.4	4.3	4.9	4.5	5.0			
Temp (°C)	25	24	24	24	24	25	25			
Conc.:										
pH										
D.O. (mg/L)										
Temp (°C)										
Date:	~~6/20/17~~ 6/21/17	6/22/17	6/23/17	6/24/17	6/25/17	6/26/17	6/27/17			
Time:	~~1500~~ 1530	1230	1020	1525	1010	1525	1505			
Initials:	~~RR~~ MW	MW	RR	MW	MTM	NH	Am			

RR 6/20/17 E
NH 6/26/17 E

DAILY TOXICITY TEST LOG

Project Number:	14001-412-026	QA: MR 7/5/17
Test Species:	***Pimephales promelas***	

General Comments	Random Chart: Epsilon Min/Max Therm. #: M-14	Feeding 0.1 ml B.S. 3 x Daily	Initials/Date
Test Day 0	Test Solution Mixed at: 1455 Test Organisms Added at: 1525	Fed @ 1650 RR	RR 6/20/17
Test Day 1	Real Time Temp= 25 °C Range = 24-26 °C	Fed @ 0825 MTM 1155 MTM 1645 MH	MTM 6/21/17
Test Day 2	Real Time Temp= 25 °C Range = 24-25 °C	Fed @ 0815 RR 1155 NH 1640 RR	MW 6/22/17
Test Day 3	Real Time Temp= 25 °C Range = 24-26 °C	Fed @ 0855 NH 1145 NH 1630 NH	RR 6/23/17
Test Day 4	Real Time Temp= 25 °C Range = 24-26 °C	Fed @ 0820 MM ~~NH~~ ① 1200 MM 1610 MM	MW 6/24/17
Test Day 5	Real Time Temp= 24 °C Range = 24-26 °C	Fed @ 0820 MTM 1145 MH 1555 MTM	MTM 6/25/17
Test Day 6	Real Time Temp= 25 °C Range = 24-26 °C	Fed @ 0820 MTM 1145 MH 1645 MH	Dm/NH 6/26/17
Test Day 7	Real Time Temp= 25 °C Range = 24-26 °C	NONE	Dm 6/27/17
Test Day 8			

①NH 6/23/17 wp

QA Form No.010
Revision 6
Effective 02/14

QA: AR 7/5/17

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 14001-412-026
Species: P. promelas
Date/Time of Tare Wt.: 6/27/17 @ 0905

Test Substance: Effluent (outfall 001)
Analyst Tare: NH Analyst Gross: NH
Date/Time of Gross Wt.: 6/28/17 @ 0910

Comments:
Analytical Balance ID: Sart #1
Dried in Oven # 2 from Date: 6/27/17 Time: 1540
to Date: 6/28/17 Time: 0810

Weight Type (Circle): Wet Blot Dry Dry (>100°C) AFDW (>500°C)
Lot or Batch Number: 061917

Boat No.	Treatment %	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	0	A		1.13286	1.13758	0.00472		10			8		
		B		1.15152	1.15815	0.00663		10			10		
		C		1.15253	1.15755	0.00502		10			8		
		D		1.15127	1.15693	0.00566		10			9		
	12.5	A		1.12574	1.13267	0.00693		10			10		
		B		1.15524	1.16306	0.00782		10			10		
		C		1.13348	1.14076	0.00728		10			10		
		D		1.15535	1.16272	0.00739		10			10		
	25	A		1.13514	1.14199	0.00685		10			10		
		B		1.13121	1.13735	0.00614		10			9		
		C		1.16280	1.17034	0.00754		10			9		
		D		1.11772	1.12476	~~0.00754~~ 0.00704		10			10		
Blank				1.13872	1.13828	+0.00001							
Range													
Mean													

Test Solution Volume:
Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

Perm 06/28/17.E

[redacted]

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

QA: AE 7/5/17

Project Number: 14001-412-026	Test Substance: Effluent (outfall 001)	Comments: Analytical Balance ID: Sart#1
Species: P. promelas	Analyst Tare: NH Analyst Gross: NH	Dried in Oven #2 from Date: 6/27/17 Time: 1540 to Date: 6/28/17 Time: 0810
Date/Time of Tare Wt.: 6/27/17 @ 0905	Date/Time of Gross Wt.: 6/28/17 @ 0910	

Weight Type (Circle): Wet Blot Dry Dry (>100°C) AFDW (>500°C) Lot or Batch Number: 061917

Boat No.	Treatment %	Rep.	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)[1]	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	50	A		1.14071	1.147797	0.00726		10			10		
		B		1.13807	1.144 OR ~~0.00726~~ ①	0.00601		10			10		
		C		1.13465	1.14068 ~~1.14408~~ ①	0.00603		10			10		
		D		1.15525	1.16200	0.00675		10			10		
	75	A		1.14500	1.15191	0.00691		10			10		
		B		1.14418	1.15059	0.00641		10			10		
		C		1.15661	1.16276	0.00615		10			10		
		D		1.14338	1.15061	0.00723		10			10		
	100	A		1.14945	1.15513	0.00568		10			10		
		B		1.15249	1.15892	0.00643		10			10		
		C		1.15349	1.13918	0.00569		10			10		
		D		1.14075	1.146637	0.00562		10			9		
Blank													
Range													
Mean													

Test Solution Volume:	Loading Rate:

[1] Add in weight loss of blank boat, if appropriate.

① NH 6/28/17 WP

QA Form No. 010a
Revision 1
Effective 02/14

TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

WMH 06/28/17
QA: AR 7/5/17

Project Number: 14001-412-026 Species: Fathead minnow

Treatment	Rep	Length Units:	Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No of Orig. Organisms	Mean Wt./ Original Organism (mg)	Mean Wt./ Treatment (mg) (Original)	Number of Surv. Organisms	Mean Wt./ Surviving Organism (mg)	Mean Wt./ Treatment (mg) (Surviving)
MH	A		1.13286	1.13758	0.00472	0.00472	10	0.472	0.5508	8	0.590	0.6273
	B		1.15152	1.15815	0.00663	0.00663	10	0.663		10	0.663	
	C		1.15253	1.15755	0.00502	0.00502	10	0.502		8	0.628	
	D		1.15127	1.15693	0.00566	0.00566	10	0.566		9	0.629	
12.5%	A		1.12574	1.13267	0.00693	0.00693	10	0.693	0.7355	10	0.693	0.7355
	B		1.15524	1.16306	0.00782	0.00782	10	0.782		10	0.782	
	C		1.13348	1.14076	0.00728	0.00728	10	0.728		10	0.728	
	D		1.15533	1.16272	0.00739	0.00739	10	0.739		10	0.739	
25%	A		1.13514	1.14199	0.00685	0.00685	10	0.685	0.6892	10	0.685	0.7272
	B		1.13121	1.13735	0.00614	0.00614	10	0.614		9	0.682	
	C		1.16280	1.17034	0.00754	0.00754	10	0.754		9	0.838	
	D		1.11772	1.12476	0.00704	0.00704	10	0.704		10	0.704	
50%	A		1.14071	1.14797	0.00726	0.00726	10	0.726	0.6512	10	0.726	0.6512
	B		1.13807	1.14408	0.00601	0.00601	10	0.601		10	0.601	
	C		1.13465	1.14068	0.00603	0.00603	10	0.603		10	0.603	
	D		1.15525	1.16200	0.00675	0.00675	10	0.675		10	0.675	
75%	A		1.14500	1.15191	0.00691	0.00691	10	0.691	0.6675	10	0.691	0.6675
	B		1.14418	1.15059	0.00641	0.00641	10	0.641		10	0.641	
	C		1.15661	1.16276	0.00615	0.00615	10	0.615		10	0.615	
	D		1.14338	1.15061	0.00723	0.00723	10	0.723		10	0.723	
100%	A		1.14945	1.15513	0.00568	0.00568	10	0.568	0.5855	10	0.568	0.6011
	B		1.15249	1.15892	0.00643	0.00643	10	0.643		10	0.643	
	C		1.13349	1.13918	0.00569	0.00569	10	0.569		10	0.569	
	D		1.14075	1.14637	0.00562	0.00562	10	0.562		9	0.624	
Blank			1.13827	1.13828	0.00001							

Project Number: 14001-412-026 Species: Fathead minnow

WMM 06/28/17
QA: AR 7/5/17

Summary Statistics for Survival Data

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.8	1.0	0.8750	0.0957	10.942%
12.5%	4	1.0	1.0	1.0000	0.0000	0.000%
25%	4	0.9	1.0	0.9500	0.0577	6.077%
50%	4	1.0	1.0	1.0000	0.0000	0.000%
75%	4	1.0	1.0	1.0000	0.0000	0.000%
100%	4	0.9	1.0	0.9750	0.0500	5.128%

Summary Statistics for Growth Data (dry wt per original)

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.472	0.663	0.5508	0.0845	15.339%
12.5%	4	0.693	0.782	0.7355	0.0367	4.988%
25%	4	0.614	0.754	0.6892	0.0580	8.414%
50%	4	0.601	0.726	0.6512	0.0606	9.300%
75%	4	0.615	0.723	0.6675	0.0486	7.284%
100%	4	0.562	0.643	0.5855	0.0385	6.568%

Summary Statistics for Growth Data (dry wt per surviving organism)

Treatment	N	Min	Max	Mean	SD	C.V.
MH	4	0.590	0.663	0.6273	0.0298	4.754%
12.5%	4	0.693	0.782	0.7355	0.0367	4.988%
25%	4	0.682	0.838	0.7272	0.0743	10.219%
50%	4	0.601	0.726	0.6512	0.0606	9.300%
75%	4	0.615	0.723	0.6675	0.0486	7.284%
100%	4	0.568	0.643	0.6011	0.0384	6.390%

CETIS Analytical Report

Report Date: 29 Jun-17 15:23 (p 1 of 2)
Test Code: 412-026 | 16-2931-3271

Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	12-8305-6382	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	29 Jun-17 15:23	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	20-5975-4698	**Test Type:**	Growth-Survival (7d)	**Analyst:**	Lab Tech
Start Date:	20 Jun-17 15:25	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	27 Jun-17 15:00	**Species:**	Pimephales promelas	**Brine:**	Not Applicable
Duration:	7d	**Source:**	In-House Culture	**Age:**	<48

Sample ID:	20-7684-4846	**Code:**	7BCA232E	**Client:**	Sumitomo Mining (Pogo)
Sample Date:	19 Jun-17 09:11	**Material:**	Ambient Sample	**Project:**	WET Annual Compliance Test
Receive Date:	20 Jun-17 13:45	**Source:**	Discharge Monitoring Report		
Sample Age:	30h (3.1 °C)	**Station:**	Outfall 001		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Untransformed	NA	C > T	NA	NA	17.6%	100	>100	NA	1

Dunnett Multiple Comparison Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		12.5	-4.6	2.41	0.097	6	1.0000	CDF	Non-Significant Effect
		25	-3.448	2.41	0.097	6	1.0000	CDF	Non-Significant Effect
		50	-2.502	2.41	0.097	6	0.9998	CDF	Non-Significant Effect
		75	-2.907	2.41	0.097	6	0.9999	CDF	Non-Significant Effect
		100	-0.8652	2.41	0.097	6	0.9753	CDF	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits	Overlap	Decision
Control Resp	0.5508	0.25 - NL	Yes	Passes Acceptability Criteria
PMSD	0.1755	0.12 - 0.3	Yes	Passes Acceptability Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.09240439	0.01848088	5	5.728	0.0025	Significant Effect
Error	0.05807126	0.003226181	18			
Total	0.1504757		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	2.659	15.1	0.7523	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9687	0.884	0.6348	Normal Distribution

Mean Dry Biomass-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.5507	0.4163	0.6852	0.534	0.472	0.663	0.04224	15.3%	0.0%
12.5		4	0.7355	0.6771	0.7939	0.7335	0.693	0.782	0.01834	4.99%	-33.5%
25		4	0.6892	0.597	0.7815	0.6945	0.614	0.754	0.029	8.41%	-25.1%
50		4	0.6513	0.5549	0.7476	0.639	0.601	0.726	0.03028	9.3%	-18.2%
75		4	0.6675	0.5901	0.7449	0.666	0.615	0.723	0.02431	7.28%	-21.2%
100		4	0.5855	0.5243	0.6467	0.5685	0.562	0.643	0.01923	6.57%	-6.31%

Mean Dry Biomass-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.472	0.663	0.502	0.566
12.5		0.693	0.782	0.728	0.739
25		0.685	0.614	0.754	0.704
50		0.726	0.601	0.603	0.675
75		0.691	0.641	0.615	0.723
100		0.568	0.643	0.569	0.562

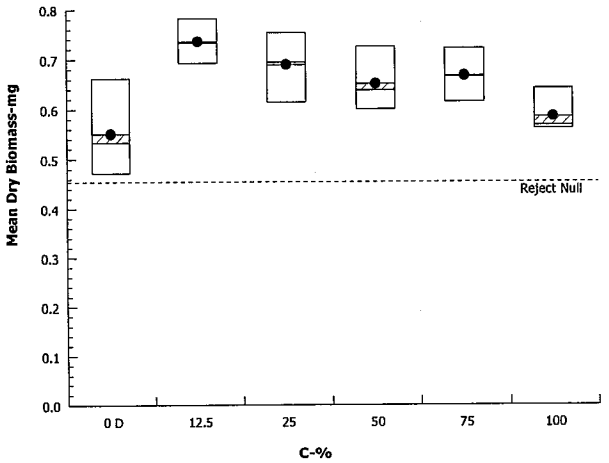
CETIS Analytical Report

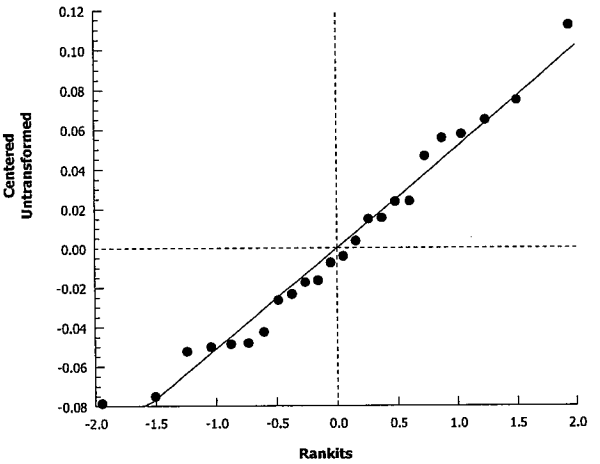
Report Date: 29 Jun-17 15:23 (p 2 of 2)
Test Code: 412-026 | 16-2931-3271

Fathead Minnow 7-d Larval Survival and Growth Test — **TRE Environmental Strategies**

Analysis ID:	12-8305-6382	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.7
Analyzed:	29 Jun-17 15:23	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Graphics





BIOASSAY REPORT

CHRONIC
BIOASSAYS CONDUCTED
June 20 through 27, 2017

Prepared for

SUMITOMO METAL MINING-POGO MINE
DELTA JUNCTION, ALASKA

Prepared by

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

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INTRODUCTION

TestAmerica ASL (TA-ASL) Bioassay Laboratory (formerly CH2M-ASL) conducted chronic bioassay testing from June 20 through 27, 2017 on samples provided by Sumitomo Metal Mining – Pogo Mine, Delta Junction, Alaska. The tests were conducted using the water flea (*Ceriodaphnia dubia*) and the fathead minnow (*Pimephales promelas*).

OVERVIEW OF REGULATORY GUIDANCE

The following provides an overview and excerpts of applicable permit specifics, regulatory guidance, and other relevant information. This is intended only as a helpful guide, from a laboratory perspective, for understanding test outcomes. The final responsibility for interpretation of results remains with the client and/or regulatory agency.

The following guidance is taken from TA-ASL reading of the NPDES permit for Sumitomo - Pogo (permit #AK0053341, effective May 1, 2011, expires April 30, 2016).

Note: At the time of testing, no updated permit has been obtained by TA-ASL.

Whole Effluent Toxicity Testing (WET) Requirements:

- "1.4.1 Toxicity testing must be conducted on grab sample of effluent."
- "1.4.2 Chronic Test Species and Methods"
  - "1.4.2.2 The permittee must conduct short-term tests with the water flea, *Ceriodaphnia dubia* (survival and reproduction test), and the fathead minnow, *Pimephales promelas* (larval survival and growth test) …"
  - "1.4.2.3 The presence of chronic toxicity must be determined as specified in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, EPA/821-R-02-013, October 2002."
  - "1.4.2.4 Results must be reported in TU_c (chronic toxic units), where $TU_c = 100/IC_{25}$."
- "1.4.3 Toxicity Triggers. Since data does not exist to support the development of a WET limit at this time, a target level for chronic toxicity of 2 TUc shall apply …"
- 1.4.4 Quality Assurance
  - 1.4.4.3.1 If organisms are not cultured in-house, concurrent testing with reference toxicants must be conducted. If organisms are cultured in-house, monthly reference toxicant testing is sufficient. Reference toxicant tests must be conducted using the same test conditions as the effluent toxicity tests.

- 1.4.4.3.2 If either of the reference toxicant tests or the effluent tests do not meet all test acceptability criteria as specified in the test methods manual, the permittee must re-sample and re-test within 14 days of receipt of the test results.

SUMMARY OF TEST RESULTS

Exhibit 1 provides a summary of the final test results.

EXHIBIT 1
Summary of Chronic Test Results

Species	NOEC (%)	LOEC (%)	IC_{25} (%)	TUc ($100/IC_{25}$)	Was chronic toxicity demonstrated (a TUc value > 2.0)?
C. dubia	100	> 100	> 100	> 100	No
P. promelas	100	> 100	> 100	> 100	No

Note: acronyms are as defined below.

From the NPDES permit - *Chronic Toxicity Trigger*: "Toxicity Triggers. Since data does not exist to support the development of a WET limit at this time, a target level for chronic toxicity of 2 TUc shall apply …"

More detailed information is provided in the Chronic Results and Data Interpretation sections.

ACRONYM DEFINITIONS (from EPA guidance):

NOEC = No Observed Effect Concentration: The highest test concentration that causes no observable adverse effects on the test organisms (i.e. no statistically significant reduction from the control).
LOEC = Low Observed Effect Concentration: The lowest test concentration that does cause an observable adverse effect on the test organisms (i.e. is statistically significant reduction from the control).
IC_{25} = Inhibition Concentration (25%): A point estimate of the test concentration that would cause a 25 percent reduction of a non-quantal biological measurement (i.e. growth, reproduction, etc.) for the test population.
TUc = Toxic Units (Chronic): Calculated as 100% sample divided by the chronic IC_{25} value.

METHODS AND MATERIALS

TEST METHODS

The chronic test methods were performed according to: *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, (EPA 2002), EPA-821-R-02-013.

DEVIATIONS FROM PROTOCOLS

Deviations from required procedures in the test methods:

- Due to the late delivery of the sample on June 20, the age of the *Ceriodaphnia dubia* in the chronic test conducted for the sample were outside of the EPA required range of less than 24 hours. The *C. dubia* were between 23 ¼ to 26 hours old at test initiation. See further discussion in the Chronic Results section.

Deviations from recommended procedures in the test methods:

- For the *P. promelas* chronic test, some of the instantaneous temperature readings fell outside of the recommended range of 25±1°C. However, the required test condition of a temperature deviation (i.e. maximum minus minimum) of no more than 3 °C was met. This situation is detailed further in the Results and Discussion section of this report.

TEST DESIGN

The following summarizes the conditions used for both overall testing and the specifics for each test (observations and notations can be found on the datasheets in Appendix A):

Overall Test Design:

- Chronic tests: 12.5, 25, 50, 75, and 100 percent sample + dilution water for the control.

Test Organism Conditions:

- All organisms tested were fed and maintained during culturing, acclimation, and testing as prescribed by the EPA (2002).
- The test organisms appeared vigorous and in good condition prior to testing.

C. dubia chronic test:

- Source: TA-ASL in-house cultures
- Age: Less than 24 hours old and within an 8-hour age range, with blocking by known parentage. Age deviation noted in deviations from protocol.
- Design: Ten test vessels per concentration, one organism per vessel
- Test Solution Renewal: Daily

- Monitoring:
    - Daily: Survival and neonate production (with brood determination)
    - Daily: DO and pH in pre and post-renewal solutions, all concentrations
    - Daily: Temperature in pre-renewal solutions, all concentrations
    - With each new sample: Conductivity in post-renewal solutions, control and highest sample concentration
- Termination: When 60%+ of surviving control organisms produce a 3rd brood.
- Endpoints: Survival (at termination) and Reproduction (through first 3 broods)

P. promelas chronic test:

- Source: Aquatox Inc., Hot Springs, Arkansas
- Age: Less than 48 hours old and within an 24 hour age range
- Design: Four test vessels per concentration, ten organisms per vessel
- Test Solution Renewal: Daily
- Monitoring:
    - Daily: Survival
    - Daily: DO and pH in pre and post-renewal solutions, all concentrations
    - Daily: Temperature in pre-renewal solutions, all concentrations
    - With each new sample: Conductivity in post-renewal solutions, control and highest sample concentration
- Termination: 7 days after test initiation.
- Endpoints: Survival and Growth (average dry weight per organism added @ initiation)

DILUTION WATER

The dilution water used was the standard culture water used by TA-ASL:

- Reconstituted, moderately hard water (as per EPA protocol) with a total hardness of 80 to 100 mg/L as $CaCO_3$ and an alkalinity of 60 to 70 mg/L as $CaCO_3$.

SAMPLE COLLECTION AND STORAGE

Samples were collected by Sumitomo-Pogo personnel. The samples were accepted as scheduled by TA-ASL Applied Sciences Laboratory. Chain of Custody and Sample Receipt Records are provided in Appendix C.

- All samples were received within the EPA recommended 0 to 6 °C range.
- All samples were initially used for test initiation or test solution renewal within the EPA recommended maximum holding time of 36 hours of sample collection.
- All subsequent uses of a sample occurred within the EPA recommended maximum holding time of 72 hours past the time of initial use of that sample.
- Following receipt, the samples were stored in the dark at 0 to 6 °C until test solutions were prepared and tested.

SAMPLE PREPARATION

Samples used during these tests were:

- Temperature adjusted prior to test initiation and each daily renewal.
- Filtered through a 60 μm net upon arrival.

DATA ANALYSIS

The statistical analyses performed for the chronic tests were those outlined in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, USEPA Office of Water, Fourth Edition (EPA 2002), EPA-821-R-02-013, using CETIS.

- The specific statistical analysis and CETIS version used for each endpoint evaluation is listed with the statistical outputs included with each test in Appendix A.
- If any additional analysis methods were also used, an explanation of the rationale and reference to the source method is included with the presentation of those results below.

RESULTS AND DISCUSSION

The raw data sheets for all tests are presented in Appendix A.

CHRONIC BIOASSAYS

Table 1 summarizes the survival and reproduction data for the *C. dubia* chronic test.

Table 1
Summary of Chronic Results
C. dubia

Sample Concentration (%)	Percent Survival	Mean Number of Young Per Adult
Control	100	20.1
12.5	100	23.5
25	100	23.1
50	100	24.4
75	100	28.2
100	100	25.9

Statistical analysis in accordance with the EPA protocol results in:

- NOEC = 100 %
- LOEC > 100 %
- IC_{25} > 100 %
- TUc < 1

From the NPDES permit - *Chronic Toxicity Trigger*: "Toxicity Triggers. Since data does not exist to support the development of a WET limit at this time, a target level for chronic toxicity of 2 TUc shall apply …"

- The TUc (calculated as = $100/IC_{25}$) <u>did not</u> exceed 2.0.

Note: The age of the *C. dubia* used in this test were outside of the EPA required range of less than 24 hours at test initiation. The *C. dubia* were between 23¼ to 26 hours old at test initiation. While some of the neonates may have been within the prescribed age range, it is likely that at least some were not. However, it is TA-ASL's professional opinion that missing the required age range by a maximum of 2 hours almost certainly had no significant impact on test results.

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures remained at 25±1°C.

The *C. dubia* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum 15 young produced per surviving control adult. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

Table 2 summarizes the survival and growth data for the *P. promelas* chronic test.

Table 2 Summary of Chronic Results *P. promelas*		
Sample Concentration (%)	**Percent Survival**	**Mean Dry Weight Per Organism Added (mg)**
Control	90.0	0.748
12.5	87.5	0.630
25	95.0	0.772
50	97.5	0.767
75	87.5	0.655
100	92.5	0.779

Statistical analysis in accordance with the EPA protocol results in:

- NOEC = 100 %
- LOEC > 100 %
- IC_{25} > 100 %
- TUc < 1

From the NPDES permit - *Chronic Toxicity Trigger*: "Toxicity Triggers. Since data does not exist to support the development of a WET limit at this time, a target level for chronic toxicity of 2 TUc shall apply …"

- The TUc (calculated as = $100/IC_{25}$) <u>did not</u> exceed 2.0.

The dissolved oxygen levels in the chronic tests remained above 4.0 mg/L. Test temperatures <u>did not</u> remain at 25±1°C.

EPA guidance recommends test temperature to remain at 25±1°C for the *P. promelas* chronic test. On days 5, 6, and 7, the instantaneous temperatures in the test concentrations were slightly outside of this range at 23.5 to 23.8 °C. However, the <u>required</u> test condition of a temperature deviation (i.e. maximum minus minimum) over the entire test period of no more than 3 °C was met (25.0 – 23.5 = 1.5°C). The EPA chronic manual Section 4.9.2 states: "An individual test may be conditionally acceptable if the temperature, DO, and other specified conditions fall outside specifications, depending on the degree of departure and the objectives of the tests. The acceptability of the test would depend on the experience and professional judgment of the laboratory investigator and the reviewing staff of the regulatory authority". It is the laboratory's professional judgment that the minor deviation in the test temperature from the recommended conditions did not appear to affect the test results and the test should be accepted.

The *P. promelas* test meets Test Acceptability Criteria (TAC) for a minimum 80 percent control survival and a minimum weight of 0.250 mg per surviving control organism. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

REFERENCE TOXICANT TESTS

Reference toxicant (reftox) testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the laboratory control, reftox test results also may be used to assess the health and sensitivity of the test organisms. Reftox test results within their respective cumulative summary (Cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity.

As required by the NPDES permit, since the *P. promelas* were not cultured in-house, reference toxicant testing on these organisms was performed concurrently.

The results of the reftox tests indicate that the test organisms were within their respective cusum chart limits based on EPA guidelines. This demonstrates ongoing laboratory proficiency of the test methods and suggests normal test organism sensitivity in the associated client testing.

The *C. dubia* and *P. promelas* reftox tests were conducted using sodium chloride and potassium chloride. The data sheets for the reference toxicant tests are provided in Appendix B.

Table 3 summarizes the reference toxicant test results and Cusum chart limits.

Table 3
Chronic Reference Toxicant Tests (g/L)

Species	IC_{25}	Cusum Chart Limits
C. dubia (survival)	2.27	0.83 to 2.42
C. dubia (reproduction)	1.11	0.24 to 1.27
P. promelas (survival)	0.56	0.55 to 0.65
P. promelas (growth)	0.60	0.44 to 0.65

APPENDIX A

RAW DATA SHEETS

TestAmerica

FRESHWATER TOXICITY TEST: SAMPLE AND DILUTION WATER DATA

Client: Sumitomo Metal Mining - Pogo

Contact: Stacy Staley 1.907.895.2761

SDG # B3790

Test Initiation: Date 6-20-17

Test Termination: Date 6-27-17

Sample ID Number	Field ID	Collected Date (mm/dd/yy)	Collected Time (Pacific Zone)	Received Date (mm/dd/yy)	Received Time (Pacific Zone)	Temp (°C) as Rc'vd	Total Residual Chlorine (mg/l) ☐ Dechlorination allowed: as Rc'vd	/ after Dechlor.	Ammonia NH_3-N mg/l as Rc'vd	Hardness mg/l as $CaCO_3$ as Rc'vd	Alkalinity mg/l as $CaCO_3$ as Rc'vd	DO (mg/L) as Rc'vd	pH as Rc'vd	Cond. (uS) as Rc'vd	60 um filtered prior to use?
B3790 -01	Outfall 001	6/19/17	09:04	6/20/17	14:25	2.8	<0.02	-	1.68	75	-	-	-	-	☑
-02	Outfall 001	6/21/17	08:14	6/22/17	10:10	3.3	<0.02	-	1.21	74	-	-	-	-	☑
-03	Outfall 001	6/23/17	09:09	6/24/17	10:50	4.5	<0.02	-	0.68	77	-	-	-	-	☑
							/								
							/								
							/								
							/								
							/								
							/								
							/								
							/								
							/								
							/								
			Reporting Limits:			na	0.02 mg/L		0.10 mg/L	4 mg/L	4 mg/L	na	na	na	na

Note: "-" Indicates data collection or dechlorination not needed. Any other adjustments to samples prior to use are documented in Comments below or on Dilutions page.

Dilution Water	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$
Recon MH (FHM)	4520	94	67
"	4521	80	61
"	4522	90	66

Comments: ☑ Indicates the action was taken, (☐= action not taken): " - " = sample not dechlorinated, or analyte not collected/needed.

Water Quality Meters Used/ID#: Dissolved Oxygen # 4 pH # 11 Conductivity # 2

TestAmerica

FRESHWATER TOXICITY TEST: TEST ORGANISM INFORMATION

Client: Sumitomo Metal Mining - Pogo

Sample Designation (SDG): B 3790

Test Species Information	Cd # 3317 *Ceriodaphnia dubia* Chronic	FHM # 1929 *Pimephales promelas* Chronic			
Organism Age at Initiation	<24 hrs, all within an 8 hr window	<48 hrs, all within a 24 hour window			
Test Container Size	30 ml	800 ml			
Test Volume	15 ml	500 ml			
Feeding: Type and Amount	0.10 ml Algae and 0.10 ml YCT daily	0.15 ml *Artemia*, 2 x Daily			
Aeration: In Test Chambers via Slow Bubble :	☒ None ☐ Prior to use	☒ None ☐ Prior to use ☐ @ _____ hrs			
Acclimation Period	* <24 hrs	<24 hrs			
Organism Source	In-House	Aquatox			
Size	-	-			
Loading Rate	-	-			

Dissolved Oxygen aeration justifications (in test chambers):

Test(s): ☐ All ☐ _____

Date:

Comments: Cd were not less than 24h at test initiation.

Test Solution Preparation and Dilution Record

Client: Sumitomo Metal Mining - Pogo

Note: ☐ Indicates task not done, ☑ Indicates task was done. Temp adj. = Temperature adjusted to ambient or test temp

Ditto marks (' ') indicate that the same SDG, batch of dilution water, or food as the previous day's entry was used.

Ceriodaphnia dubia - Chronic

Test Concentration (%)	Sample Volume (mls)		Final Volume (mls)
Control	0.00	→	200
12.5	25.0	→	200
25	50.0	→	200
50	100	→	200
75	150	→	200
100	200	→	200

Total Sample volume needed per day = 525 mls

Test Day	Sample ID Used	Daily Sample Preparation (prior to dilution)	Dilution Water Used	YCT ID Used	Algae ID Used	Date	Time	Initials
0 (Initiation)	B 3790 -01	☐ Temp adj, ☐ Aerated	ID # 4520	#1127	#1131	6/20/2017	14:40	BM
1	B -01	☐ Temp adj, ☐ Aerated	ID # 4520	#1127	#1131	6/21/17	08:10	
2	B -02	☐ Temp adj, ☐ Aerated	ID # 4521	#1130	#1131	6/22/17	10:50	
3	B -02	☐ Temp adj, ☐ Aerated	ID # 4521	#1130	#1131	6/23/17	08:35	
4	B -03	☐ Temp adj, ☐ Aerated	ID # 4521	#1127	#1131	6/24/17	11:15	
5	B -03	☐ Temp adj, ☐ Aerated	ID # 4521	#1127	#1131	6/25/"	09:15	BM
6	B -	☐ Temp adj, ☐ Aerated	ID #	#	#	/ / "	:	
7	B -	☐ Temp adj, ☐ Aerated	ID #	#	#	/ / "	:	

Fathead minnow - Chronic

Test Concentration (%)	Sample Volume (mls)		Final Volume (mls)
Control	0.00	→	2000
12.5	250	→	2000
25	500	→	2000
50	1,000	→	2000
75	1,500	→	2000
100	2,000	→	2000

Total Sample volume needed per day = 5250 mls

Test Day	Sample ID Used	Daily Sample Preparation (prior to dilution)	Dilution Water Used	Date	Time	Initials
0 (Initiation)	B 3790 -01	☐ Temp adj, ☐ Aerated	ID # 4520	6/20/2017	14:40	BM
1	B -01	☐ Temp adj, ☐ Aerated	ID # 4520	6/21/17	08:10	
2	B -02	☐ Temp adj, ☐ Aerated	ID # 4521	6/22/17	10:50	
3	B -02	☐ Temp adj, ☐ Aerated	ID # 4521	6/23/17	08:35	
4	B -03	☐ Temp adj, ☐ Aerated	ID # 4521	6/24/17	11:15	
5	B -03	☐ Temp adj, ☐ Aerated	ID # 4521	6/25/"	09:15	BM
6	B -03	☐ Temp adj, ☐ Aerated	ID # 4522	6/26/"	10:35	BM

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Ceriodaphnia dubia Survival and Reproduction Test Data Summary

Client: Sumitomo Metal Mining - Pogo

Test Start Date: 6-20-17

Sample Description: Outfall 001

Initial Sample ID#: B 3790-01

Data summarized by: MJS

Percent or Concentration	Total Live Young Produced in First 3 Broods per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	31	21	14	14	22	25	4	7	29	34	10	201
12.5 %	37	8	24	28	3	35	24	10	29	37	10	235
25 %	17	24	32	24	28	28	23	26	29	0	10	231
50 %	29	28	24	24	28	29	11	8	30	33	10	244
75 %	32	28	29	32	27	~~21~~ 30 MS RoG	~~30~~ 21 RoG MS	~~22~~ 30 MS RoG	22	31	10	282
100 %	13	29	29	26	26	36	22	33	30	15	10	259

MS RoG 6-27-17

Survival data summarized through Day _____. 60%+ of surviving controls with 3+ broods first observed on Day _____.

Test Organism Mortality (Adult dead) = AD? ✓

Test Organism identified as Male = AD? M

Test Organism Injured during test = AD? I

# of Alive Adults = Number of test organism alive at termination

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, *Ceriodaphnia dubia* test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

TestAmerica

CERIODAPHNIA CHRONIC SURVIVAL AND REPRODUCTION DATA

Neo's obtained from	A	B	C	D	E	F	G	H	I	J
Culture Board ID:	E	E	E	E	E	E	E	E	E	E
Slot #:	47	51	53	55	56	8	21	30	31	32

Incubator Used: # 6

Random Template Used: 6 conc # 19

Client: Sumitomo Metal Mining - Pogo

Test Initiation: Date: 6 / 24 20 17 Time: ~~10:30 am~~ 1500 6/26/1

Sample Description: Outfall 001 Initial Sample ID # B3790-01

Termination: Date: 6 / 26 / 20 17 Time: 11:05

Technician: Day 0 Bm Day 1 BAM Day 2 Bm Day 3 [illegible] Day 4 [illegible] Day 5 Bm Day 6 Bm Day 7 ____ Day 8 ____

Time: Day 0 850 Day 1 1135 Day 2 1135 Day 3 1055 Day 4 1220 Day 5 1025 Day 6 1405 Day 7 ____ Day 8 ____

Percent	Day	A	B	C	D	E	F	G	H	I	J	No. Live Adults	Daily Total Live Young
		Daily Number of Live Young for each Replicate											
Control	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	5	3	3	4	4	3	4	4	4	5	10	39
	4	0	0	0	0	4	0	0	2/AY	0	0	10	6
	5	11	7	11	10	0	12	0 AY	1/0	6	11	10	69
	6	15	11	0	0	14	10	0 AY	0 AY	19	18	10	87
	7												
	8												
12.5 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	5	0	5	3	3	4	3	4	4	4	10	35
	4	0	8	6	11	0	12	1/0	0	0	0	10	38
	5	14	0	0	0	0 AY	0	0	6	8	12	10	40
	6	18	0	13	14	0	19	20	0 AY	17	21	10	122
	7												
	8												
25 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	3	5	3	3	5	4	5	4	0	10	32
	4	5	8	10	7	0	0	0	4	0	0	10	34
	5	12	0	0	0	10	7	6	0	6	0 F	10	41
	6	0	13	17	14	15	16	13	17	19	0 AY	10	124
	7												
	8												
50 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	2	3	3	3	3	5	5	4	5	10	37
	4	0	0	6	6	7	7	0	3/AY	0	0	10	29
	5	10	11	0	0	0	0	6	0	4	11	10	42
	6	15	15	15	15	18	19	0	0 AY	22	17	10	136
	7												
	8												
75 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	0	2	4	5	3	4	3	4	2	2	10	29
	4	5	7	8	0	0	10	3	0	1/0	0	10	34
	5	13	0	0	11	11	0	0	5	6	8	10	54
	6	14	19	17	16	13	16	15	21	13	21	10	165
	7												
	8												
100 %	1	0	0	0	0	0	0	0	0	0	0	10	0
	2	0	0	0	0	0	0	0	0	0	0	10	0
	3	4	4	3	6	5	5	2	6	3	0	10	38
	4	0	8	0	6	6	12	0	0	0	7	10	39
	5	9	0	10	14	0	0	0	7	9	0	10	49
	6	0	17	16	0	15	19	20	20	18	8	10	133
	7												
	8												

"AD" = Adult Dead, "AY" = Aborted young, "M" = male organism, "F" = Female, "R" = Adult releasing young, " / " = split brood (carry-over brood / current day brood), "Inj" = Adult Injured during test solution renewal, replicate removed from analysis. "AM" = Adult missing, remove from analysis. A circled neonate count = 4th brood

Footnote: As per EPA, C. dubia tests should be terminated when 60% of the surviving control organisms have produced their third brood, or at eight days, whichever occurs first.

TestAmerica

CERIODAPHNIA WATER QUALITY DATA

Client: Sumitomo Metal Mining - Pogo
Sample Description: Outfall 001

Initiated Date 6/20/2017 Time 15:00 *
Initial Sample ID # B3790-01

Adults Isolated Date 6/19/2017 Time 12:25
Neo's Collected Date 6/19/2017 Time 16:00

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Tech:	Bm	BAM	Bm	[illegible]	[illegible]	Bm	Bm		
Time	16:05	11:35	12:05	13:25	14:40	10:30	14:30	:	:
Therm. #	250	255	255	255	255	255	255	#	#

%	Dissolved Oxygen (mg/l) Day 0	1	2	3	4	5	6	7	8
Control	7.5	7.9 / 7.7	7.5 / 7.6	8.0 / 7.6	7.3 / 7.4	7.5 / 7.6	7.5		
12.5 %	7.5	8.0 / 7.7	7.4 / 7.6	8.0 / 7.7	7.3 / 7.4	7.6 / 7.7	7.3		
25 %	7.6	8.0 / 7.7	7.4 / 7.7	8.0 / 7.7	7.4 / 7.3	7.6 / 7.8	7.6		
50 %	8.0	8.0 / 7.8	7.5 / 7.9	8.0 / 7.6	7.5 / 7.3	7.6 / 8.0	7.5		
75 %	8.1	8.1 / 7.8	7.6 / 8.1	8.0 / 7.7	7.6 / 7.4	7.7 / 8.3	7.4		
100 %	8.1	7.9 / 7.8	7.7 / 8.1	8.1 / 7.7	7.7 / 7.4	7.8 / 8.3	7.5		

%	pH Day 0	1	2	3	4	5	6	7	8
Control	7.4	7.7 / 7.8	8.0 / 7.9	7.6 / 7.5	7.3 / 7.5	7.8 / 7.9	7.4		
12.5 %	7.4	7.7 / 7.7	8.0 / 7.9	7.5 / 7.5	7.3 / 7.5	7.7 / 7.9	7.4		
25 %	7.4	7.7 / 7.7	7.9 / 7.8	7.5 / 7.6	7.3 / 7.5	7.7 / 7.8	7.4		
50 %	7.2	7.6 / 7.5	7.9 / 7.7	7.5 / 7.4	7.3 / 7.5	7.7 / 7.7	7.3		
75 %	7.1	7.6 / 7.4	7.8 / 7.6	7.4 / 7.4	7.3 / 7.4	7.7 / 7.6	7.3		
100 %	7.1	7.5 / 7.4	7.7 / 7.5	7.4 / 7.3	7.2 / 7.3	7.6 / 7.5	7.3		

%	Temperature (°C) / Conductivity (µS) (1st use of each sample only) Day 0	1	2	3	4	5	6	7	8
Control	24.5 / 340	24.8	25.3 / 294	24.6	25.0 / 288	25.7	25.5		
12.5 %	24.4 / -	25.0 / -	24.2 / -	24.3 / -	24.6 / -	25.3 / -	24.3 / -		
25 %	24.3 / -	24.6 / -	25.0 / -	24.5 / -	24.1 / -	24.9 / -	25.5 / -		
50 %	24.5 / -	24.7 / -	25.0 / -	24.7 / -	25.3 / -	25.5 / -	25.5 / -		
75 %	24.3 / -	24.2 / -	25.1 / -	25.0 / -	24.6 / -	25.5 / -	24.5 / -		
100 %	24.6 / 243	25.0 /	25.1 / 232	25.0 /	24.6 / 226	25.4 /	24.3 /		

COMMENTS: Temperatures taken just prior to test solution renewals. DO, pH, and Conductivity taken following organism transfer.

* Cerio were 23.0 to 26.5 hrs old @ initiation Bm 6/20/17

23.8 = Temp out of recom. range

Note: All Day 0 data represents conditions at initiation. All other days: numerator represents pre-renewal conditions, denominator represents post-renewal conditions.

CETIS Summary Report

Ceriodaphnia 7-d Survival and Reproduction Test — **TestAmerica - ASL**

Batch ID:	03-3071-3325	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	20 Jun-17 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	26 Jun-17 14:05	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	5d 23h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	13-8161-5880	**Code:**	B3790-01	**Client:**	
Sample Date:	19 Jun-17 09:04	**Material:**	Unknown	**Project:**	
Receive Date:	20 Jun-17 14:25	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.8 °C)	**Station:**			

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
00-6415-6638	6d Survival Rate	100	>100	N/A	N/A	1	Fisher Exact/Bonferroni-Holm Test
21-4402-7901	Reproduction	100	>100	N/A	45.5%	1	Steel Many-One Rank Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
19-3474-9556	Reproduction	IC25	>100	N/A	N/A	<1	Linear Interpolation (ICPIN)

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
19-3474-9556	Reproduction	Control Resp	20.1	15 - NL	Yes	Passes Acceptability Criteria ✓
21-4402-7901	Reproduction	Control Resp	20.1	15 - NL	Yes	Passes Acceptability Criteria ✓
21-4402-7901	Reproduction	PMSD	0.4548	0.13 - 0.47	Yes	Passes Acceptability Criteria ✓

6d Survival Rate Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	1	1	1	1	1	0	0	0.0%	0.0%
12.5		10	1	1	1	1	1	0	0	0.0%	0.0%
25		10	1	1	1	1	1	0	0	0.0%	0.0%
50		10	1	1	1	1	1	0	0	0.0%	0.0%
75		10	1	1	1	1	1	0	0	0.0%	0.0%
100		10	1	1	1	1	1	0	0	0.0%	0.0%

Reproduction Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	20.1	16.31	23.89	4	34	3.206	10.14	50.43%	0.0%
12.5		10	23.5	18.86	28.14	3	37	3.931	12.43	52.89%	-16.92%
25		10	23.1	19.71	26.49	0	32	2.873	9.085	39.33%	-14.93%
50		10	24.4	21.29	27.51	8	33	2.63	8.316	34.08%	-21.39%
75		10	28.2	26.75	29.65	21	32	1.227	3.882	13.76%	-40.3%
100		10	25.9	23.15	28.65	13	36	2.331	7.37	28.46%	-28.86%

Ceriodaphnia 7-d Survival and Reproduction Test — **TestAmerica - ASL**

6d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1	1	1	1	1	1	1	1	1	1
12.5		1	1	1	1	1	1	1	1	1	1
25		1	1	1	1	1	1	1	1	1	1
50		1	1	1	1	1	1	1	1	1	1
75		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Reproduction Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	31	21	14	14	22	25	4	7	29	34
12.5		37	8	24	28	3	35	24	10	29	37
25		17	24	32	24	28	28	23	26	29	0
50		29	28	24	24	28	29	11	8	30	33
75		32	28	29	32	27	30	21	30	22	31
100		13	29	29	26	26	36	22	33	30	15

CETIS Analytical Report

Report Date:	27 Jun-17 08:07 (p 1 of 1)
Test Code:	B379001cdc | 14-5164-1781

Ceriodaphnia 7-d Survival and Reproduction Test — **TestAmerica - ASL**

Analysis ID:	00-6415-6638	**Endpoint:**	6d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	27 Jun-17 8:06	**Analysis:**	STP 2x2 Contingency Tables	**Official Results:**	Yes

Batch ID:	03-3071-3325	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	20 Jun-17 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	26 Jun-17 14:05	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	5d 23h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	13-8161-5880	**Code:**	B3790-01	**Client:**	
Sample Date:	19 Jun-17 09:04	**Material:**	Unknown	**Project:**	
Receive Date:	20 Jun-17 14:25	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.8 °C)	**Station:**			

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU
Untransformed		C > T	Not Run	100	>100	N/A	1

Fisher Exact/Bonferroni-Holm Test

Control	vs	Conc-%	Test Stat	P-Value	Decision(0.05)
Dilution Water		12.5	1	1.0000	Non-Significant Effect
		25	1	1.0000	Non-Significant Effect
		50	1	1.0000	Non-Significant Effect
		75	1	1.0000	Non-Significant Effect
		100	1	1.0000	Non-Significant Effect

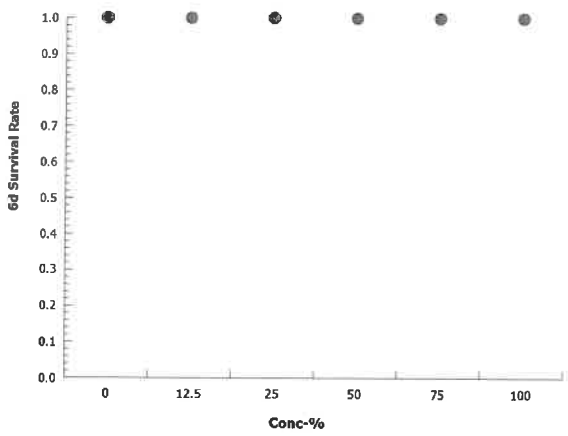
Data Summary

Conc-%	Control Type	No-Resp	Resp	Total
0	Dilution Water	10	0	10
12.5		10	0	10
25		10	0	10
50		10	0	10
75		10	0	10
100		10	0	10

6d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	1	1	1	1	1	1	1	1	1	1
12.5		1	1	1	1	1	1	1	1	1	1
25		1	1	1	1	1	1	1	1	1	1
50		1	1	1	1	1	1	1	1	1	1
75		1	1	1	1	1	1	1	1	1	1
100		1	1	1	1	1	1	1	1	1	1

Graphics



CETIS Analytical Report

Report Date: 27 Jun-17 08:07 (p 1 of 2)
Test Code: B379001cdc | 14-5164-1781

Ceriodaphnia 7-d Survival and Reproduction Test — TestAmerica - ASL

Analysis ID:	21-4402-7901	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	27 Jun-17 8:07	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	03-3071-3325	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	20 Jun-17 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	26 Jun-17 14:05	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	5d 23h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	13-8161-5880	**Code:**	B3790-01	**Client:**	
Sample Date:	19 Jun-17 09:04	**Material:**	Unknown	**Project:**	
Receive Date:	20 Jun-17 14:25	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.8 °C)	**Station:**			

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run	100	>100	N/A	1	45.5%

Steel Many-One Rank Test

Control	vs	Conc-%	Test Stat	Critical	DF	Ties	P-Value	Decision(α:5%)
Dilution Water		12.5	115.5	75	18	1	0.9727	Non-Significant Effect
		25	114.5	75	18	1	0.9664	Non-Significant Effect
		50	117	75	18	1	0.9802	Non-Significant Effect
		75	129	75	18	4	0.9992	Non-Significant Effect
		100	122.5	75	18	2	0.9948	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	0	2.704	3.2	0.3227	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	374.4	74.88	5	0.9392	0.4632	Non-Significant Effect
Error	4305.2	79.72593	54			
Total	4679.6	154.6059	59			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	10.71	15.09	0.0574	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9256	0.9459	0.0013	Non-normal Distribution

Reproduction Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	10	20.1	16.24	23.96	4	34	3.206	10.14	50.43%	0.0%
12.5		10	23.5	18.77	28.23	3	37	3.931	12.43	52.89%	-16.92%
25		10	23.1	19.64	26.56	0	32	2.873	9.085	39.33%	-14.93%
50		10	24.4	21.24	27.56	8	33	2.63	8.316	34.08%	-21.39%
75		10	28.2	26.72	29.68	21	32	1.227	3.882	13.76%	-40.3%
100		10	25.9	23.1	28.7	13	36	2.331	7.37	28.46%	-28.86%

CETIS Analytical Report

Test Code: B379001cdc | 14-5164-1781

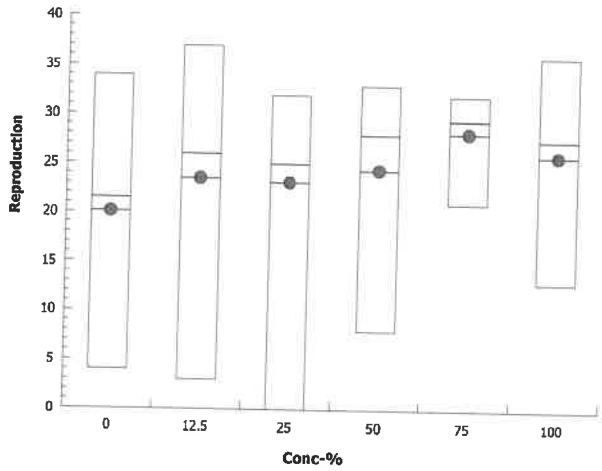
Ceriodaphnia 7-d Survival and Reproduction Test — **TestAmerica - ASL**

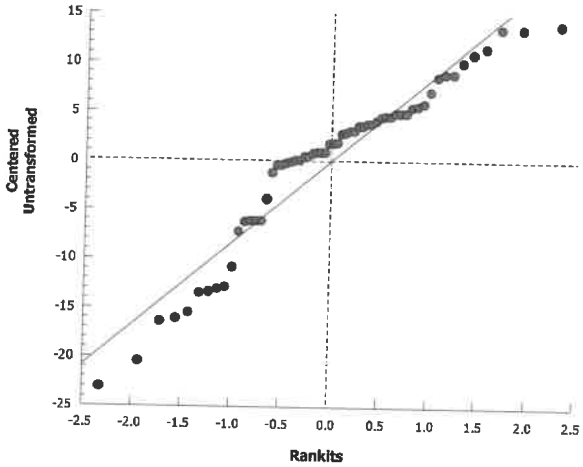
Analysis ID:	21-4402-7901	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	27 Jun-17 8:07	**Analysis:**	Nonparametric-Control vs Treatments	**Official Results:**	Yes

Reproduction Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	31	21	14	14	22	25	4	7	29	34
12.5		37	8	24	28	3	35	24	10	29	37
25		17	24	32	24	28	28	23	26	29	0
50		29	28	24	24	28	29	11	8	30	33
75		32	28	29	32	27	30	21	30	22	31
100		13	29	29	26	26	36	22	33	30	15

Graphics





CETIS Analytical Report

Report Date: 27 Jun-17 08:07 (p 1 of 2)
Test Code: B379001cdc | 14-5164-1781

Ceriodaphnia 7-d Survival and Reproduction Test

TestAmerica - ASL

Analysis ID:	19-3474-9556	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	27 Jun-17 8:07	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	03-3071-3325	**Test Type:**	Reproduction-Survival (7d)	**Analyst:**	
Start Date:	20 Jun-17 15:00	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	26 Jun-17 14:05	**Species:**	Ceriodaphnia dubia	**Brine:**	
Duration:	5d 23h	**Source:**	In-House Culture	**Age:**	<24h

Sample ID:	13-8161-5880	**Code:**	B3790-01	**Client:**	
Sample Date:	19 Jun-17 09:04	**Material:**	Unknown	**Project:**	
Receive Date:	20 Jun-17 14:25	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	30h (2.8 °C)	**Station:**			

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	776235192	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	2.704	3.2	0.3227	No Outliers Detected

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	>100	N/A	N/A	<1	N/A	N/A

Reproduction Summary

			Calculated Variate						
Conc-%	**Control Type**	**Count**	**Mean**	**Min**	**Max**	**Std Err**	**Std Dev**	**CV%**	**%Effect**
0	Dilution Water	10	20.1	4	34	3.206	10.14	50.43%	0.0%
12.5		10	23.5	3	37	3.931	12.43	52.89%	-16.92%
25		10	23.1	0	32	2.873	9.085	39.33%	-14.93%
50		10	24.4	8	33	2.63	8.316	34.08%	-21.39%
75		10	28.2	21	32	1.227	3.882	13.76%	-40.3%
100		10	25.9	13	36	2.331	7.37	28.46%	-28.86%

Reproduction Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Dilution Water	31	21	14	14	22	25	4	7	29	34
12.5		37	8	24	28	3	35	24	10	29	37
25		17	24	32	24	28	28	23	26	29	0
50		29	28	24	24	28	29	11	8	30	33
75		32	28	29	32	27	30	21	30	22	31
100		13	29	29	26	26	36	22	33	30	15

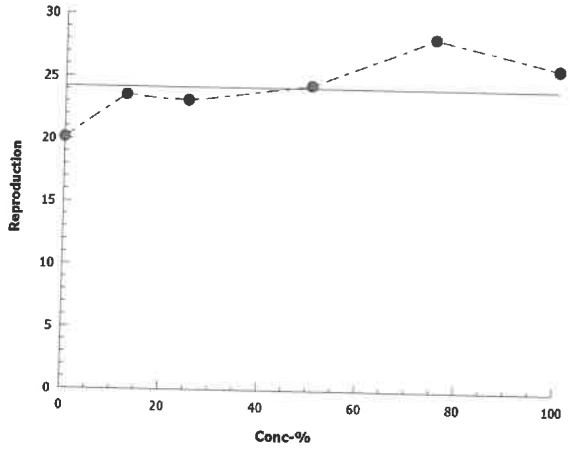
CETIS Analytical Report

Test Code: B379001cdc | 14-5164-1781

Ceriodaphnia 7-d Survival and Reproduction Test — **TestAmerica - ASL**

Analysis ID:	19-3474-9556	**Endpoint:**	Reproduction	**CETIS Version:**	CETISv1.8.1
Analyzed:	27 Jun-17 8:07	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Random Template Used: 6 conc. x 4 reps. # 4 | Waterbath/incubator Used: # 4 | Date Initiated 6/20/2017 Time 16:05

Initial sample ID B3790 -01 | Date Terminated 6/27/2017 Time 09:40

Client: Sumitomo Metal Mining - Pogo | Sample Description: Outfall 001

Tech: Day 0 BW/e Day 1 e Day 2 e Day 3 BW/e Day 4 e Day 5 BW Day 6 BW Day 7 e/DW

Time: Day 0 1605 Day 1 1320 Day 2 1250 Day 3 1530 Day 4 1350 Day 5 1140 Day 6 1805 Day 7 0940

Conc. or Percent	Day	Number of Live Organisms A	B	C	D	Dissolved O_2 (mg/l) Pre	Post	pH Pre	Post	Temp. (°C) Pre	Therm. ID #	Conductivity (µS) Post (1st use)
Control	0	10	10	10	10		7.5		7.4	Post: 24.3	250	322
	1	10	10	10	9	6.8	8.0	7.3	7.9	24.5	250	
	2	10	8	10	9	6.4	7.2	7.8	8.2	24.5	250	294
	3	10	~~7~~ 8	10	8	7.2	8.0	7.1	7.5	24.3	253	
	4	10	8	10	8	6.4	7.3	6.9	7.5	24.4	250	285
	5	10	8	10	8	6.6	7.6	7.5	8.0	24.0	253	
	6	10	8	10	8	6.3	7.4	7.4	8.2	24.2	251	
	7	10	8	10	8	7.0		7.1		24.5	251	
12.5 %	0	10	10	10	10		7.8		7.5	Post: 24.3		
	1	10	10	10	10	6.9	8.0	7.3	7.9	24.5		
	2	9	10	9	10	6.5	7.4	7.8	8.2	24.3		
	3	8	9	9	10	7.2	8.0	7.1	7.6	24.3		
	4	8	9	9	10	6.4	7.4	6.9	7.5	24.2		
	5	8	9	9	10	6.8	7.8	7.5	7.9	24.1		
	6	8	9	8	10	6.5	7.6	7.5	8.1	24.3		
	7	8	9	8	10	7.0		7.1		24.6		
25 %	0	10	10	10	10		7.8		7.4	Post: 24.3		
	1	10	10	9	10	6.8	8.1	7.3	7.8	24.5		
	2	10	9	9	10	6.5	7.6	7.8	8.1	24.5		
	3	10	9	9	10	7.2	8.2	7.1	7.6	24.2		
	4	10	9	9	10	6.4	7.5	6.9	7.5	24.4		
	5	10	9	9	10	6.8	7.9	7.5	7.8	23.8		
	6	10	9	9	10	6.4	7.7	7.4	8.0	24.2		
	7	10	9	9	10	6.9		7.1		24.5		
50 %	0	10	10	10	10		8.0		7.1	Post: 24.3		
	1	10	10	10	10	6.8	8.2	7.3	7.6	24.3		
	2	10	10	10	10	6.5	7.8	7.7	7.9	24.4		
	3	10	10	10	10	7.2	8.3	7.0	7.4	24.0		
	4	10	9	10	10	6.3	7.6	6.8	7.4	24.1		
	5	10	9	10	10	6.7	8.1	7.4	7.6	24.0		
	6					6.3	8.0	7.3	7.8	24.2		
	7	10	9	10	10	6.9		7.0		24.5		
75 %	0	10	10	10	10		8.2		6.9	Post: 24.0		
	1	8	9	10	10	6.9	8.2	7.2	7.3	24.5		
	2	7	9	10	10	6.4	8.1	7.7	7.7	24.4		
	3	7	9	10	10	7.1	8.3	7.0	7.4	24.2		
	4	7	9	9	10	6.3	7.8	6.8	7.1	24.2		
	5	7	9	9	10	6.4	8.2	7.3	7.5	23.8		
	6	7	9	9	10	6.2	8.3	7.3	7.6	24.3		
	7	7	9	9	10	6.5		6.9		24.5		
100 %	0	10	10	10	10		8.3		6.7	Post: 24.1		236
	1	10	10	10	9	7.0	8.1	7.2	7.2	24.5		
	2	10	10	10	9	6.5	8.3	7.6	7.5	24.3		228
	3	10	10	10	9	7.1	8.3	6.9	7.4	24.2		
	4	10	10	10	9	6.3	8.2	6.8	7.0	24.5		203
	5	10	10	10	8 F	6.5	8.3	7.3	7.3	24.0		
	6	10	9	10	8	6.2	8.3	7.2	7.4	24.1		
	7	10	9	10	8	6.7		6.8		24.3		

✓ Indicates one organism inadvertently poured off during solution renewal, replaced into container.
"M" = organism missing, start count reduced. "Inj" = organism injured, remove from stats.
"F" = fungus noted on dead organisms.
☐ Aeration in test chambers begun @ _____ (Note observations on Test Organism Info sheet)

Pre =Pre-renewal solutions. Post =Post-renewal solutions.
Day 0 Temperatures = Post-renewals
Therm ID# = Thermometer ID used for all measurements that day.
(23.8) = Temp. out of recommended range

FATHEAD MINNOW 7-DAY GROWTH DATA

Client: POGO Tins Labeled As: POGO

Lab ID: Start Date:

Sample Description:

Technician:		BAM
Date:		6/2/2017
Balance Serial #:	B328543647	B328543647

Percent	Replicate	Total Weight (mg)	Tare Weight (mg)	No. of Fish
Control	A		1142.82	10
	B		1148.29	8
	C		1132.69	10
	D		1145.07	8
12.5 %	A		1149.59	8
	B		1149.47	9
	C		1151.55	8
	D		1136.14	10
25 %	A		1138.55	10
	B		1144.74	9
	C		1148.62	9
	D		1165.00	10
50 %	A		1140.35	10
	B		1149.71	9
	C		1144.45	10
	D		1148.24	10
75 %	A		1141.05	7
	B		1169.28	9
	C		1133.44	9
	D		1131.39	10
100 %	A		1150.94	10
	B		1145.98	9
	C		1144.92	10
	D		1160.72	8
	A			
	B			
	C			
	D			

weigh to 0.01 mg

FATHEAD MINNOW 7-DAY GROWTH DATA

Client POGO Tins Labeled As: POGO

Lab ID: B3790 Start Date:6/20/2017

Sample Description:

Technician:	DW	BAM
Date:	6/28/2017	6/2/2017
Balance Serial #:	B328543647	B328543647

Percent	Replicate	Total Weight (mg)	Tare Weight (mg)	No. of Fish
Control	A	1151.41	1142.82	10
	B	1154.63	1148.29	8
	C	1141.13	1132.69	10
	D	1151.63	1145.07	8
12.5 %	A	1155.26	1149.59	8
	B	1156.34	1149.47	9
	C	1157.74	1151.55	8
	D	1142.62	1136.14	10
25 %	A	1146.11	1138.55	10
	B	1152.25	1144.74	9
	C	1156.34	1148.62	9
	D	1173.08	1165.00	10
50 %	A	1147.81	1140.35	10
	B	1157.02	1149.71	9
	C	1152.54	1144.45	10
	D	1156.07	1148.24	10
75 %	A	1146.57	1141.05	7
	B	1175.71	1169.28	9
	C	1140.40	1133.44	9
	D	1138.69	1131.39	10
100 %	A	1159.28	1150.94	10
	B	1153.86	1145.98	9
	C	1153.02	1144.92	10
	D	1167.54	1160.72	8
	A			
	B			
	C			
	D			

weigh to 0.01 mg

CETIS Summary Report

Fathead Minnow 7-d Larval Survival and Growth Test — **TestAmerica - ASL**

Batch ID:	02-1116-3178	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	20 Jun-17 16:05	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	27 Jun-17 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 18h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	13-8161-5880	**Code:**	B3790-01	**Client:**	
Sample Date:	19 Jun-17 09:04	**Material:**	Unknown	**Project:**	
Receive Date:	20 Jun-17 14:25	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	31h (2.8 °C)	**Station:**			

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
17-9110-1726	7d Survival Rate	100	>100	N/A	19.4%	1	Dunnett Multiple Comparison Test
03-9015-6328	Mean Dry Biomass-mg	100	>100	N/A	15.9%	1	Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	%	95% LCL	95% UCL	TU	Method
16-3699-5513	Mean Dry Biomass-mg	IC25	>100	N/A	N/A	<1	Linear Interpolation (ICPIN)

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
17-9110-1726	7d Survival Rate	Control Resp	0.9	0.8 - NL	Yes	Passes Acceptability Criteria
03-9015-6328	Mean Dry Biomass-mg	Control Resp	0.7483	0.25 - NL	Yes	Passes Acceptability Criteria
16-3699-5513	Mean Dry Biomass-mg	Control Resp	0.7483	0.25 - NL	Yes	Passes Acceptability Criteria
03-9015-6328	Mean Dry Biomass-mg	PMSD	0.159	0.12 - 0.3	Yes	Passes Acceptability Criteria

7d Survival Rate Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.9	0.8569	0.9431	0.8	1	0.05774	0.1155	12.83%	0.0%
12.5		4	0.875	0.8392	0.9108	0.8	1	0.04787	0.09574	10.94%	2.78%
25		4	0.95	0.9284	0.9716	0.9	1	0.02887	0.05774	6.08%	-5.56%
50		4	0.975	0.9563	0.9937	0.9	1	0.025	0.05	5.13%	-8.33%
75		4	0.875	0.828	0.922	0.7	1	0.06292	0.1258	14.38%	2.78%
100		4	0.925	0.8892	0.9608	0.8	1	0.04787	0.09574	10.35%	-2.78%

Mean Dry Biomass-mg Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.7483	0.7035	0.793	0.634	0.859	0.05986	0.1197	16.0%	0.0%
12.5		4	0.6302	0.6114	0.6491	0.567	0.687	0.02527	0.05054	8.02%	15.77%
25		4	0.7717	0.7621	0.7814	0.751	0.808	0.01289	0.02577	3.34%	-3.14%
50		4	0.7673	0.754	0.7805	0.731	0.809	0.01769	0.03539	4.61%	-2.54%
75		4	0.6552	0.6263	0.6842	0.552	0.73	0.03879	0.07759	11.84%	12.43%
100		4	0.7785	0.7535	0.8035	0.682	0.834	0.03351	0.06702	8.61%	-4.04%

Fathead Minnow 7-d Larval Survival and Growth Test — **TestAmerica - ASL**

7d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	0.8	1	0.8
12.5		0.8	0.9	0.8	1
25		1	0.9	0.9	1
50		1	0.9	1	1
75		0.7	0.9	0.9	1
100		1	0.9	1	0.8

Mean Dry Biomass-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.859	0.634	0.844	0.656
12.5		0.567	0.687	0.619	0.648
25		0.756	0.751	0.772	0.808
50		0.746	0.731	0.809	0.783
75		0.552	0.643	0.696	0.73
100		0.834	0.788	0.81	0.682

Fathead Minnow 7-d Larval Survival and Growth Test — **TestAmerica - ASL**

Analysis ID:	17-9110-1726	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	28 Jun-17 10:09	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	02-1116-3178	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	20 Jun-17 16:05	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	27 Jun-17 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 18h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	13-8161-5880	**Code:**	B3790-01	**Client:**	
Sample Date:	19 Jun-17 09:04	**Material:**	Unknown	**Project:**	
Receive Date:	20 Jun-17 14:25	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	31h (2.8 °C)	**Station:**			

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Angular (Corrected)	0	C > T	Not Run	100	>100	N/A	1	19.4%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	DF	MSD	P-Value	Decision(α:5%)
Dilution Water		12.5	0.4084	2.407	6	0.2401	0.6865	Non-Significant Effect
		25	-0.7113	2.407	6	0.2401	0.9635	Non-Significant Effect
		50	-1.12	2.407	6	0.2401	0.9876	Non-Significant Effect
		75	0.3435	2.407	6	0.2401	0.7130	Non-Significant Effect
		100	-0.3556	2.407	6	0.2401	0.9169	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	0	1.876	2.802	1.0000	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.07275196	0.01455039	5	0.7312	0.6094	Non-Significant Effect
Error	0.3582014	0.01990008	18			
Total	0.4309534	0.03445047	23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	2.409	15.09	0.7901	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.953	0.884	0.3142	Normal Distribution

7d Survival Rate Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.9	0.8561	0.9439	0.8	1	0.05774	0.1155	12.83%	0.0%
12.5		4	0.875	0.8386	0.9114	0.8	1	0.04787	0.09574	10.94%	2.78%
25		4	0.95	0.928	0.972	0.9	1	0.02887	0.05773	6.08%	-5.56%
50		4	0.975	0.956	0.994	0.9	1	0.025	0.05	5.13%	-8.33%
75		4	0.875	0.8271	0.9229	0.7	1	0.06292	0.1258	14.38%	2.78%
100		4	0.925	0.8886	0.9614	0.8	1	0.04787	0.09574	10.35%	-2.78%

Angular (Corrected) Transformed Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	1.26	1.193	1.327	1.107	1.412	0.08801	0.176	13.97%	0.0%
12.5		4	1.219	1.164	1.274	1.107	1.412	0.07256	0.1451	11.91%	3.24%
25		4	1.331	1.295	1.366	1.249	1.412	0.04705	0.09409	7.07%	-5.63%
50		4	1.371	1.34	1.402	1.249	1.412	0.04074	0.08149	5.94%	-8.87%
75		4	1.225	1.159	1.291	0.9912	1.412	0.08699	0.174	14.2%	2.72%
100		4	1.295	1.239	1.351	1.107	1.412	0.07348	0.147	11.35%	-2.82%

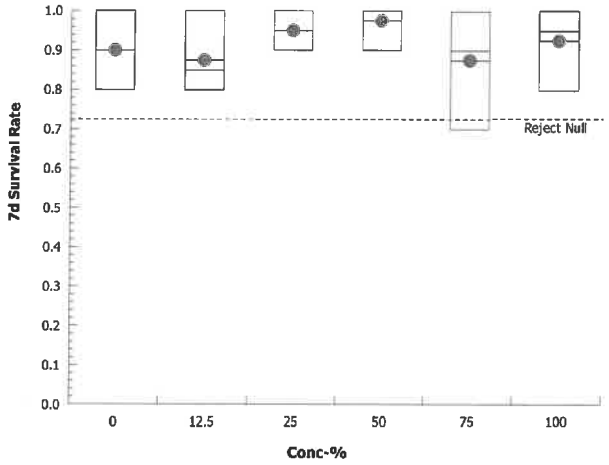
Fathead Minnow 7-d Larval Survival and Growth Test — **TestAmerica - ASL**

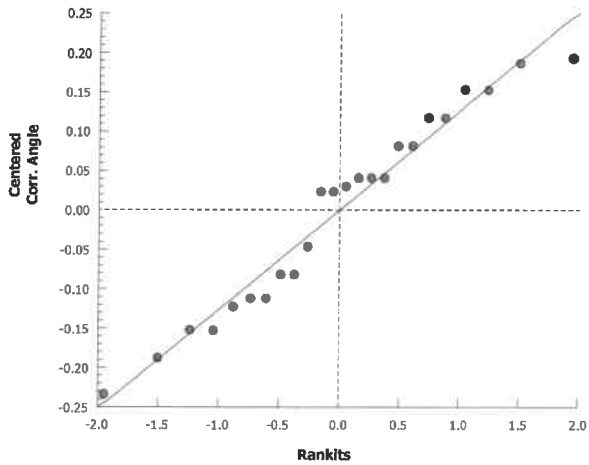
Analysis ID:	17-9110-1726	**Endpoint:**	7d Survival Rate	**CETIS Version:**	CETISv1.8.1
Analyzed:	28 Jun-17 10:09	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

7d Survival Rate Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	0.8	1	0.8
12.5		0.8	0.9	0.8	1
25		1	0.9	0.9	1
50		1	0.9	1	1
75		0.7	0.9	0.9	1
100		1	0.9	1	0.8

Graphics





CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test — **TestAmerica - ASL**

Analysis ID:	03-9015-6328	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	28 Jun-17 10:09	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Batch ID:	02-1116-3178	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	20 Jun-17 16:05	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	27 Jun-17 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 18h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	13-8161-5880	**Code:**	B3790-01	**Client:**	
Sample Date:	19 Jun-17 09:04	**Material:**	Unknown	**Project:**	
Receive Date:	20 Jun-17 14:25	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	31h (2.8 °C)	**Station:**			

Data Transform	Zeta	Alt Hyp	MC Trials	NOEL	LOEL	TOEL	TU	PMSD
Untransformed	0	C > T	Not Run	100	>100	N/A	1	15.9%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	Test Stat	Critical	DF	MSD	P-Value	Decision(α:5%)
Dilution Water		12.5	2.388	2.407	6	0.119	0.0519	Non-Significant Effect
		25	-0.4753	2.407	6	0.119	0.9361	Non-Significant Effect
		50	-0.3844	2.407	6	0.119	0.9219	Non-Significant Effect
		75	1.882	2.407	6	0.119	0.1271	Non-Significant Effect
		100	-0.612	2.407	6	0.119	0.9535	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	0	1.848	2.802	1.0000	No Outliers Detected

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.08486886	0.01697377	5	3.474	0.0226	Significant Effect
Error	0.0879461	0.004885895	18			
Total	0.172815	0.02185967	23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.449	15.09	0.1893	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9657	0.884	0.5624	Normal Distribution

Mean Dry Biomass-mg Summary

Conc-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.7483	0.7027	0.7938	0.634	0.859	0.05986	0.1197	16.0%	0.0%
12.5		4	0.6302	0.611	0.6495	0.567	0.687	0.02527	0.05054	8.02%	15.77%
25		4	0.7717	0.7619	0.7816	0.751	0.808	0.01289	0.02577	3.34%	-3.14%
50		4	0.7673	0.7538	0.7807	0.731	0.809	0.01769	0.03539	4.61%	-2.54%
75		4	0.6552	0.6257	0.6848	0.552	0.73	0.03879	0.07759	11.84%	12.43%
100		4	0.7785	0.753	0.804	0.682	0.834	0.03351	0.06702	8.61%	-4.04%

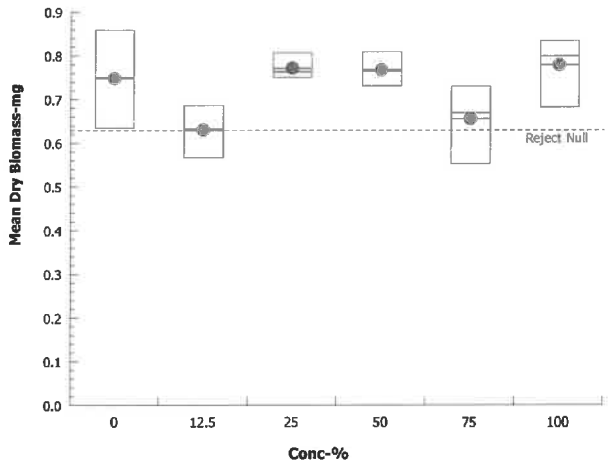
Fathead Minnow 7-d Larval Survival and Growth Test — **TestAmerica - ASL**

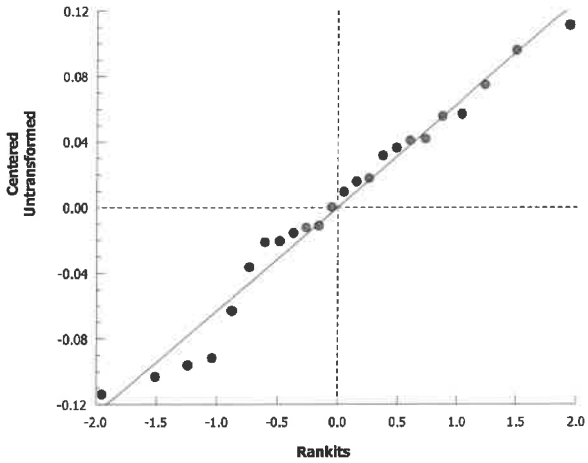
Analysis ID:	03-9015-6328	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	28 Jun-17 10:09	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes

Mean Dry Biomass-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.859	0.634	0.844	0.656
12.5		0.567	0.687	0.619	0.648
25		0.756	0.751	0.772	0.808
50		0.746	0.731	0.809	0.783
75		0.552	0.643	0.696	0.73
100		0.834	0.788	0.81	0.682

Graphics





CETIS Analytical Report

Fathead Minnow 7-d Larval Survival and Growth Test — **TestAmerica - ASL**

Analysis ID:	16-3699-5513	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	28 Jun-17 10:09	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Batch ID:	02-1116-3178	**Test Type:**	Growth-Survival (7d)	**Analyst:**	
Start Date:	20 Jun-17 16:05	**Protocol:**	EPA/821/R-02-013 (2002)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	27 Jun-17 09:40	**Species:**	Pimephales promelas	**Brine:**	
Duration:	6d 18h	**Source:**	Aquatox, AR	**Age:**	<48h

Sample ID:	13-8161-5880	**Code:**	B3790-01	**Client:**	
Sample Date:	19 Jun-17 09:04	**Material:**	Unknown	**Project:**	
Receive Date:	20 Jun-17 14:25	**Source:**	Sumitomo Mining - Pogo (AK0053341)		
Sample Age:	31h (2.8 °C)	**Station:**			

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1.625E+09	200	Yes	Two-Point Interpolation

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Extreme Value	Grubbs Extreme Value	1.848	2.802	1.0000	No Outliers Detected

Point Estimates

Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL
IC25	>100	N/A	N/A	<1	N/A	N/A

Mean Dry Biomass-mg Summary

			Calculated Variate						
Conc-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.7483	0.634	0.859	0.05986	0.1197	16.0%	0.0%
12.5		4	0.6302	0.567	0.687	0.02527	0.05054	8.02%	15.77%
25		4	0.7717	0.751	0.808	0.01289	0.02577	3.34%	-3.14%
50		4	0.7673	0.731	0.809	0.01769	0.03539	4.61%	-2.54%
75		4	0.6552	0.552	0.73	0.03879	0.07759	11.84%	12.43%
100		4	0.7785	0.682	0.834	0.03351	0.06702	8.61%	-4.04%

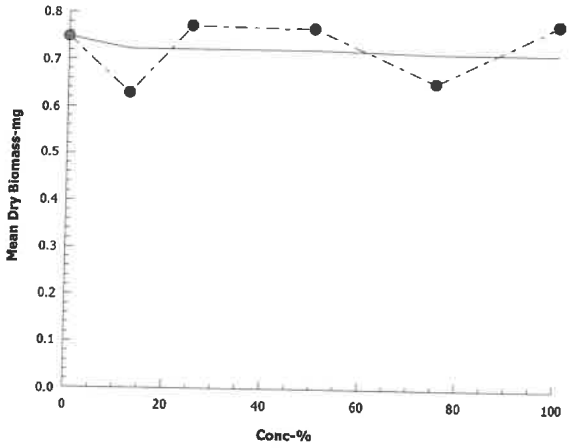
Mean Dry Biomass-mg Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.859	0.634	0.844	0.656
12.5		0.567	0.687	0.619	0.648
25		0.756	0.751	0.772	0.808
50		0.746	0.731	0.809	0.783
75		0.552	0.643	0.696	0.73
100		0.834	0.788	0.81	0.682

Fathead Minnow 7-d Larval Survival and Growth Test — **TestAmerica - ASL**

Analysis ID:	16-3699-5513	**Endpoint:**	Mean Dry Biomass-mg	**CETIS Version:**	CETISv1.8.1
Analyzed:	28 Jun-17 10:09	**Analysis:**	Linear Interpolation (ICPIN)	**Official Results:**	Yes

Graphics



APPENDIX B

REFERENCE TOXICANT DATA SHEETS

CH2M HILL

Ceriodaphnia dubia
Survival and Reproduction
Test Data Summary

Client: QA / QC

Test Start Date: 5-31-2017

Sample Description: NaCl

Initial Sample ID#: 2B063-06

Data summarized by: [illegible]

Percent or Concentration	Total Live Young Produced in First 3 Broods per Replicate										# Alive Adults	Total Live Young
	A	B	C	D	E	F	G	H	I	J		
Control	35	37	32	33	32	30	36	34	37	34	10	340
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
0.25 g/L	34	37	31	30	32	31	31	31	30	33	10	320
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
0.50 g/L	34	34	26	31	29	34	28	33	39	32	10	320
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
1.0 g/L	29	26	30	30	25	30	30	26	32	26	10	284
	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?	AD?		
1.5 g/L	19	14	13	12	15	14	12	16	24	23	9	162
	AD?	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD?	AD?		
2.0 g/L	9	5	7	4	4	0	10	13	9	11	9	72
	AD?	AD?	AD?	AD?	AD?	AD? ✓	AD?	AD?	AD?	AD?		
4.0 g/L	0	0	0	0	0	0	0	0	0	0	0	0
	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓	AD? ✓		

Test Organism Mortality (Adult dead) = AD? ✓

Test Organism identified as Male = AD? M

Test Organism Injured during test = AD? I

# of Alive Adults = Number of test organism alive at termination

Total Live Young = Total neonates produced in first 3 broods

Footnote: As per EPA-600-4-91-002 and EPA-821-R-02-013, *Ceriodaphnia dubia* test should be terminated when 60% of the surviving control organisms have produced their third brood, or at the end of eight days, whichever occurs first.

Also as per EPA-821-R-02-013 (13.10.9.1), "In this three-brood test, offspring from fourth or higher broods should not be counted and should not be included in the total number of neonates produced during the test."

Endpoint	IC25	Cusum Chart Limits
Survival	2.27	0.83 to 2.42
Reproduction	1.11	0.24 to 1.27

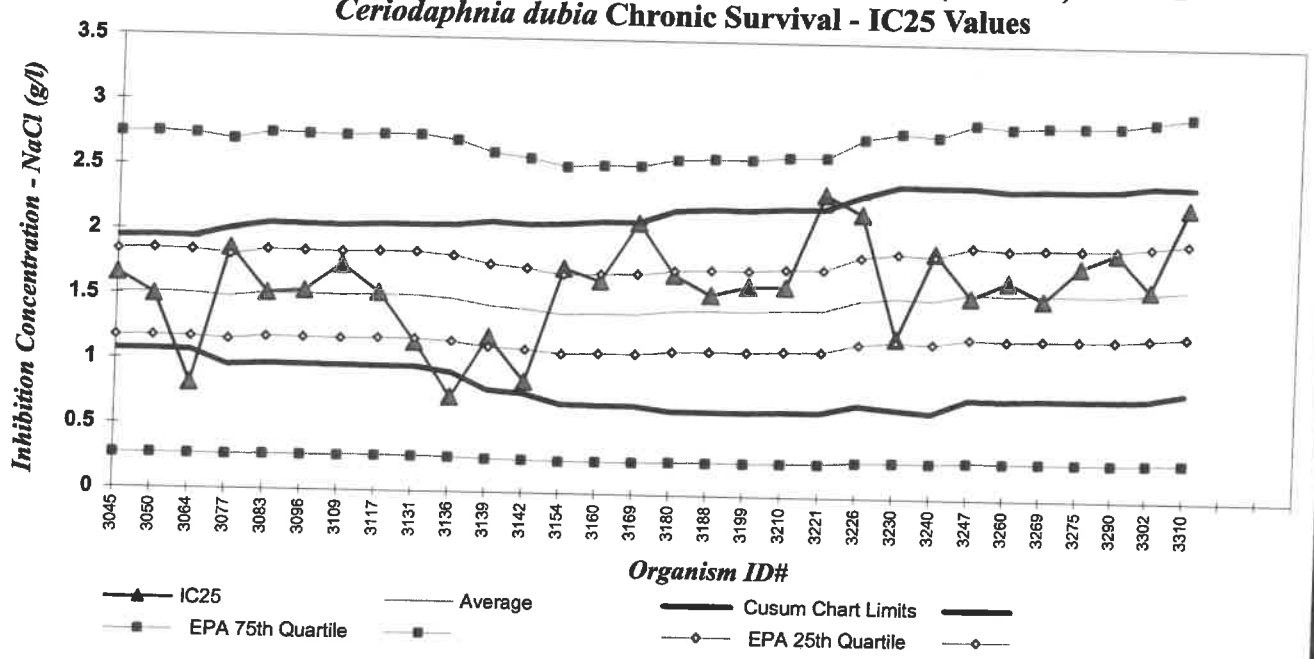
Task Manager: [signature]

Project Manager: [signature]

QA Officer: [signature]

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART

Ceriodaphnia dubia Chronic Survival - IC25 Values



***Ceriodaphnia dubia* - Chronic (EPA Test Method 1002.0)**

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) = 0.07

25th Quartile CV (*warning limit*) = 0.11

75th Quartile CV (warning *limit*) = 0.41

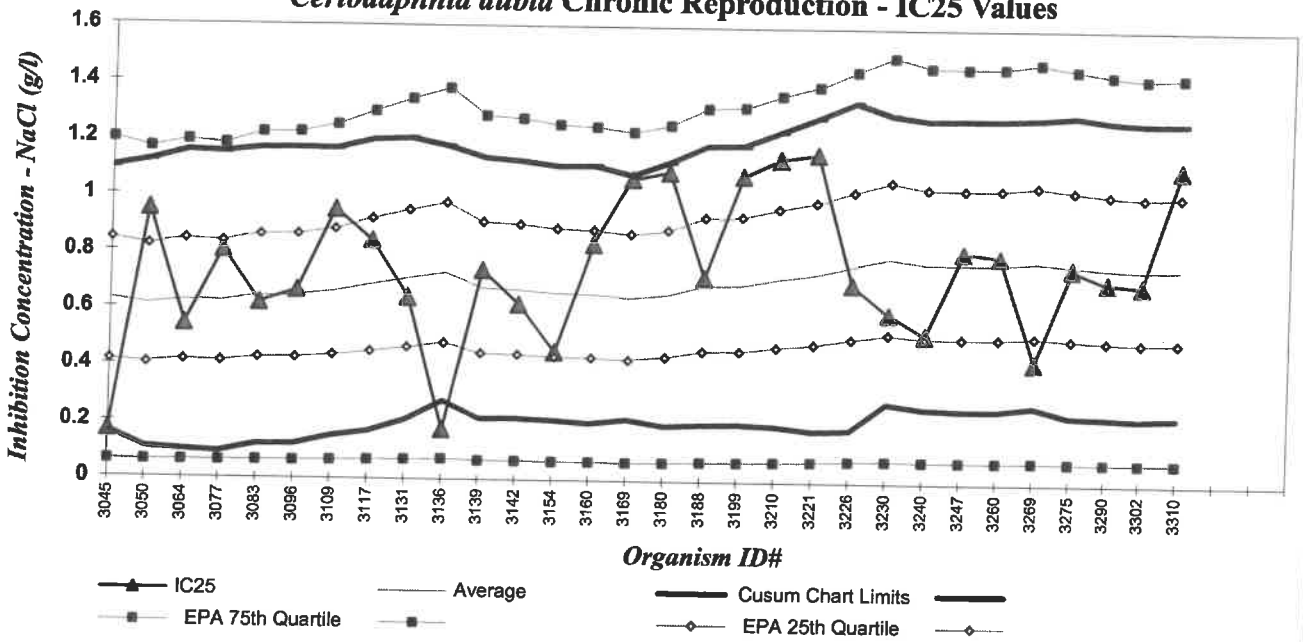
90th Quartile CV (*control limit*) = 0.81

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's),*

If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	Cerio ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	Cusum Chart Limits AVG+2SD	Intralab CV
302	3188	06/02/16	1.55	1.43	0.39	**0.65**	**2.21**	0.27
303	3199	07/06/16	1.62	1.43	0.39	**0.65**	**2.21**	0.27
304	3210	08/02/16	1.62	1.44	0.39	**0.66**	**2.22**	0.27
305	3221	09/07/16	**2.34**	1.44	0.39	**0.66**	**2.23**	0.27
306	3226	09/20/16	2.19	1.52	0.40	**0.71**	**2.33**	0.28
307	3230	10/04/16	1.24	1.55	0.43	**0.69**	**2.41**	0.28
308	3240	11/01/16	1.90	1.53	0.44	**0.66**	**2.41**	0.26
309	3247	11/29/16	1.56	1.59	0.41	**0.77**	**2.40**	0.26
310	3260	01/24/17	1.68	1.57	0.40	**0.77**	**2.38**	0.26
311	3269	02/07/17	1.55	1.58	0.40	**0.77**	**2.39**	0.26
312	3275	02/28/17	1.80	1.58	0.40	**0.77**	**2.39**	0.26
313	3290	04/04/17	1.91	1.58	0.40	**0.77**	**2.39**	0.26
314	3302	05/02/17	1.63	1.60	0.41	**0.78**	**2.43**	0.24
315	3310	05/31/17	2.27	1.63	0.40	**0.83**	**2.42**	0.21
316								
317								

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART
Ceriodaphnia dubia Chronic Reproduction - IC25 Values



***Ceriodaphnia dubia* - Chronic (EPA Test Method 1002.0)**

SODIUM CHLORIDE (g/L)

Endpoint: Chronic Reproduction

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) =	0.08
25th Quartile CV (*warning limit*) =	0.17
75th Quartile CV (warning *limit*) =	0.45
90th Quartile CV (*control limit*) =	0.62

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's),*
If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.

Event #	Cerio ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	Cusum Chart Limits AVG+2SD	Intralab CV
300	3169	4/5/2016	1.06	0.65	0.22	**0.22**	**1.08**	0.35
301	3180	5/3/2016	1.09	0.66	0.23	**0.20**	**1.13**	0.35
302	3188	6/2/2016	0.72	0.69	0.25	**0.20**	**1.18**	0.35
303	3199	7/6/2016	1.08	0.70	0.25	**0.20**	**1.19**	0.36
304	3210	8/2/2016	1.14	0.72	0.26	**0.20**	**1.24**	0.38
305	3221	9/7/2016	1.16	0.73	0.28	**0.18**	**1.29**	0.38
306	3226	9/20/2016	0.70	0.76	0.29	**0.18**	**1.34**	0.32
307	3230	10/4/2016	0.60	0.79	0.25	**0.28**	**1.30**	0.33
308	3240	11/1/2016	0.52	0.77	0.25	**0.26**	**1.28**	0.33
309	3247	11/29/2016	0.81	0.77	0.26	**0.26**	**1.28**	0.33
310	3260	1/24/2017	0.80	0.77	0.26	**0.26**	**1.28**	0.32
311	3269	2/7/2017	0.43	0.78	0.25	**0.27**	**1.29**	0.34
312	3275	2/28/2017	0.76	0.77	0.26	**0.24**	**1.30**	0.34
313	3290	4/4/2017	0.71	0.76	0.26	**0.24**	**1.28**	0.35
314	3302	5/2/2017	0.70	0.75	0.26	**0.23**	**1.27**	0.34
315	3310	5/31/2017	1.11	0.75	0.26	**0.24**	**1.27**	0.29
316								
317								

CH2M HILL

FATHEAD MINNOW 7-DAY SURVIVAL AND WATER QUALITY DATA

Random Template Used: 6 conc. x 4 reps. # 9
Stock Sol. ID 2 B 064 - 01
Organism ID: FHM 1929

Waterbath/incubator Used: # 7

Date Initiated 6/20/2017 Time 15:35
Date Terminated 6/27/2017 Time 09:30

Test Container Size: 800 ml
Solution Volume / rep: 500 ml

QA / QC - RefTox

Sample Description KCl (50 g/L stock)

Tech: Day 0 BAM/[illegible] Day 1 [illegible] Day 2 BAM Day 3 BAM Day 4 [illegible] Day 5 Bm Day 6 Bm Day 7 [illegible]
Time Day 0 1535 Day 1 1215 Day 2 1205 Day 3 1035 Day 4 1025 Day 5 1105 Day 6 1530 Day 7 0920

Conc. or Percent	Day	Number of Live Organisms A	B	C	D	Dissolved O_2 (mg/l) Pre	Post	pH Pre	Post	Temp. (°C) Pre	Therm. ID #	Conductivity (µS) Post (daily)
Control	0	10	10	10	10		7.3		7.8	Post: 25.0	251	338
	1	10	10	10	9	7.4	7.7	7.5	8.1	24.1	251	378
	2	10	10	10	8	6.6	7.7	7.2	7.8	24.3	250	290
	3	9	10	10	8	7.3	7.9	7.1	7.8	24.2	251	292
	4	9	10	10	8	6.9	7.4	6.6	7.4	24.1	251	288
	5	9	10	10	8	6.6	7.3	7.3	7.8	24.4	253	285
	6	9	10	10	8	6.3	7.3	7.5	8.2	24.1	251	305
	7	9	10	10	8	7.1		7.3		24.5	253	
0.25 g/L	0	10	10	10	10		7.3		8.0	Post: 25.1		765
	1	10	10	10	10	7.4	7.8	7.5	8.1	24.1		813
	2	10	9	10	9	6.6	7.7	7.3	7.9	24.2		701
	3	9	9	10	7	7.1	8.0	7.4	8.0	24.1		717
	4	8	9	10	7	7.0	7.4	6.6	7.4	24.2		720
	5	8	9	10	7	6.7	7.6	7.4	7.8	24.3		732
	6	8	9	10	7	6.5	7.4	7.5	8.2	24.1		735
	7	8	9	10	7	7.2		7.5		24.5		
0.50 g/L	0	10	10	10	10		7.4		8.1	Post: 25.1		1180
	1	10	10	10	10	7.3	7.9	7.5	8.1	24.2		1201
	2	9	9	9	10	6.6	7.8	7.3	8.0	24.2		1135
	3	7	9	9	9	7.0	8.0	7.4	8.0	24.3		1195
	4	7	9	9	8	6.9	7.5	6.7	7.4	24.2		1154
	5	6	9	9	8	6.7	7.6	[illegible]	7.8	[illegible]		1174
	6	5	9	9	8	6.5	7.4	7.4	8.2	24.1		1230
	7	5	9	9	8	7.2		7.5		24.4		
1.0 g/L	0	10	10	10	10		7.4		8.1	Post: 25.0		2020
	1	6	9	8	7	7.3	8.0	7.5	8.1	24.1		2040
	2	6	7	8	7	6.6	7.8	7.5	8.1	24.4		2010
	3	5	7	6	5	7.0	8.0	7.5	8.1	24.2		2010
	4	2	3	3	4	6.9	7.6	7.1	7.6	24.1		2010
	5	2	2	3	4	6.7	7.7	7.5	7.9	24.4		2030
	6	1	2	2	4	6.6	7.4	7.6	8.2	24.1		2030
	7	1	2	2	1	7.1		7.5		24.2		
2.0 g/L	0	10	10	10	10		7.4		8.1	Post: 25.0		3650
	1	0	0	0	0	7.3		7.5		24.2		3706
	2											
	3											
	4											
	5											
	6											
	7											
4.0 g/L	0	10	10	10	10		7.5		8.2	Post: 25.0		6780
	1	0	0	0	0	7.3		7.9		24.3		
	2											
	3											
	4											
	5											
	6											
	7											

✓ Indicates one organism inadvertently poured off during solution renewal, replaced into container.
"" organism missing, start count reduced. "Inj" = organism injured, remove from stats.
"" fungus noted on dead organisms.

Pre =Pre-renewal solutions. Post =Post-renewal solutions.

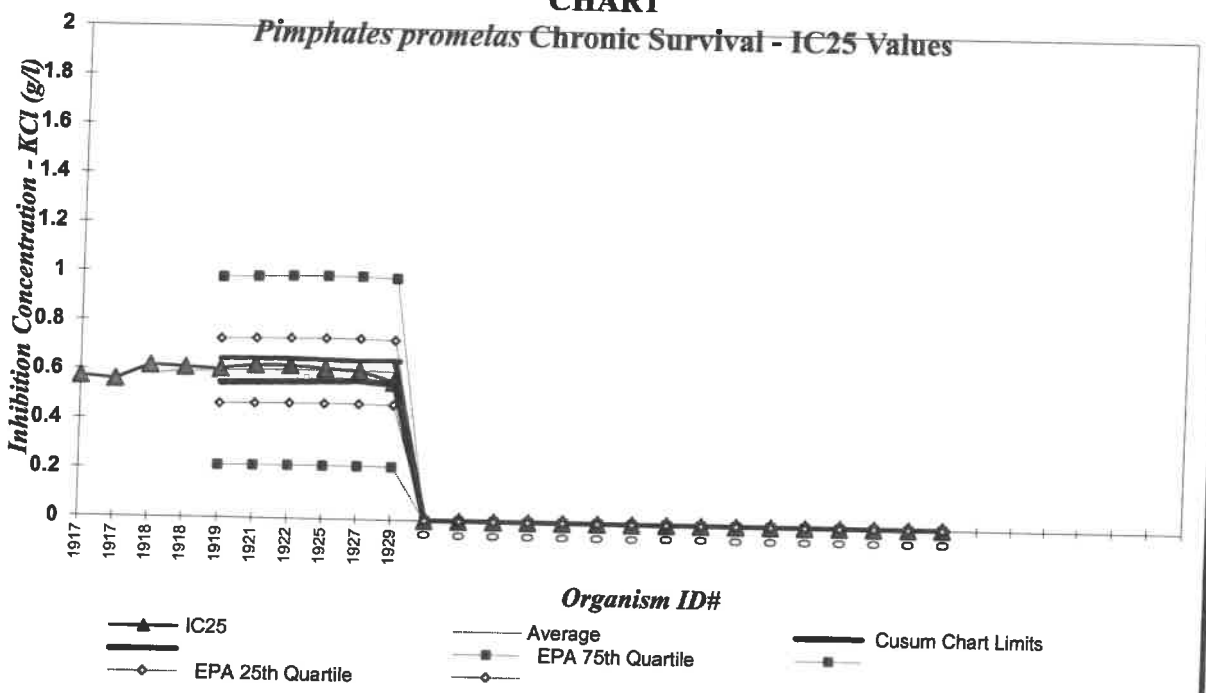
Day 0 Temperatures = Post-renewals
Therm ID# = Thermometer ID used for all measurements that day.
(23.8) = Temp. out of recommended range

Endpoint	IC25	Cusum Chart Limits
Survival	0.56	0.55 to 0.65
Growth	0.60	0.47 to 0.65

Task Manager [signature]
Project Manager [signature]
QA Officer Ginger Collins

NOTE! Zero organism for 2.0 & 4.0 concentrations not added until 7-7-17 [signature]

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART



***Pimephales promelas* - Chronic (EPA Test Method 1000.0)**

POTASSIUM CHLORIDE (g/L)

Endpoint: Chronic Survival

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

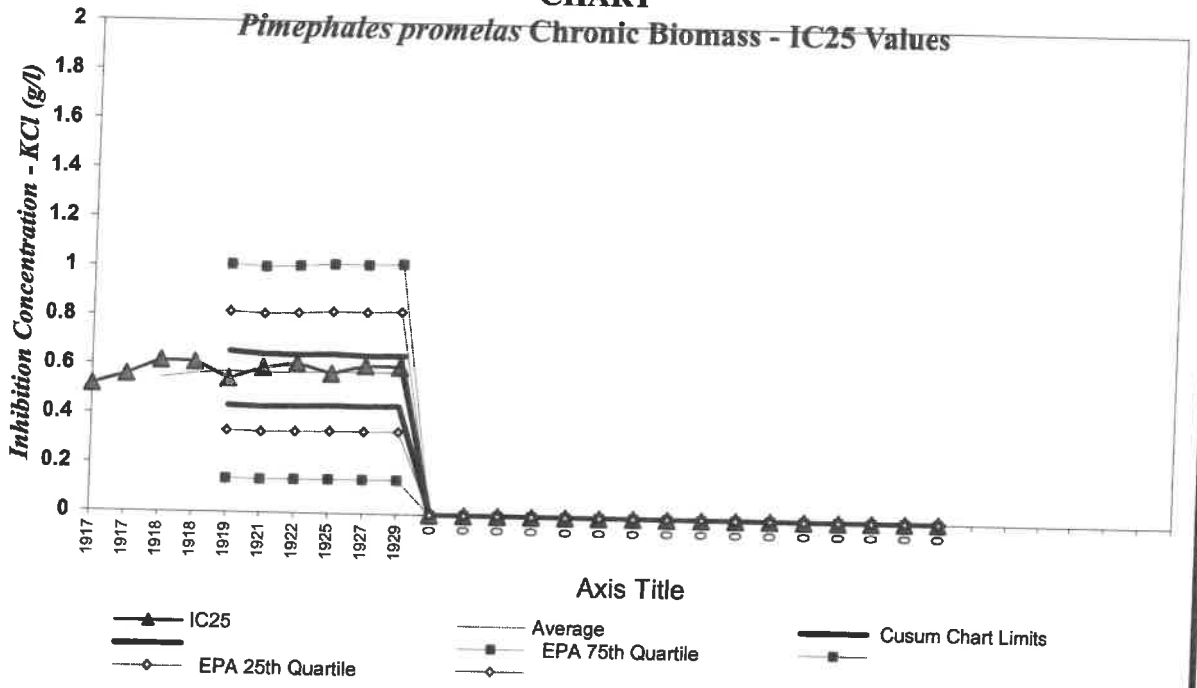
From EPA 833-R-00-003:

10th Quartile CV (*control limit*) =	0.03
25th Quartile CV (*warning limit*) =	0.11
75th Quartile CV (*warning limit*) =	0.32
90th Quartile CV (*control limit*) =	0.52

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's), If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.*

Event #	FHM ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	AVG+2SD	Intralab CV
1	1917	03/24/17	**0.62**	invalid test, did not meet TAC, not included in calcs				
2	1917	03/24/17	**0.57**					
3	1917	03/24/17	**0.56**	0.59	0.03			
4	1918	03/24/17	**0.62**	0.58	0.03			
5	1918	03/24/17	**0.61**	0.60	0.03	**0.54**	**0.65**	0.05
6	1919	03/28/17	**0.60**	0.60	0.02	**0.55**	**0.65**	0.05
7	1921	04/04/17	**0.62**	0.6	0.02	**0.55**	**0.65**	0.04
8	1922	04/11/17	**0.62**	0.6	0.02	**0.56**	**0.65**	0.04
9	1925	05/09/17	**0.61**	0.60	0.02	**0.56**	**0.65**	0.04
10	1927	06/13/17	**0.60**	0.6	0.02	**0.56**	**0.64**	0.04
11	1929	06/20/17	**0.56**	0.6	0.02	**0.55**	**0.65**	0.03
12								
13								

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART



***Pimephales promelas* - Chronic (EPA Test Method 1000.0)**

POTASSIUM CHLORIDE (g/L)

Endpoint: Chronic Growth (Biomass)

Stats Method: Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) =	0.12
25th Quartile CV (*warning limit*) =	0.21
75th Quartile CV (*warning limit*) =	0.38
90th Quartile CV (*control limit*) =	0.45

*Intralab CV is compared to EPA **Warning limits** (25th and 75th CV's) and **Control limits** (10th and 90th CV's), If lab CV is outside EPA Control limits, the EPA Control limits are used to set Cusum chart limits.*

Event #	FHM ID #	Test Start Date	IC25	Running Average	Running SD	Cusum Chart Limits AVG-2SD	Cusum Chart Limits AVG+2SD	Intralab CV
1	1917	03/24/17	**0.56**	invalid test, did not meet TAC, not included in calcs				
2	1917	03/24/17	**0.52**					
3	1917	03/24/17	**0.56**	0.54	0.03			
4	1918	03/24/17	**0.62**	0.55	0.03			
5	1918	03/24/17	**0.61**	0.56	0.04	**0.43**	**0.65**	0.07
6	1919	3/28/2017	**0.54**	0.57	0.04	**0.44**	**0.66**	0.07
7	1921	4/4/2017	**0.59**	0.6	0.04	**0.43**	**0.65**	0.07
8	1922	4/11/2017	**0.61**	0.6	0.04	**0.43**	**0.64**	0.06
9	1925	5/9/2017	**0.57**	0.58	0.04	**0.44**	**0.65**	0.06
10	1927	6/13/2017	**0.60**	0.58	0.03	**0.44**	**0.64**	0.06
11	1929	6/20/2017	**0.60**	0.58	0.03	**0.44**	**0.65**	0.06
12								
13								

APPENDIX C

CHAIN OF CUSTODY

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: B 3790 A

Date Received: 6/20/17

Client/Project: SMM Pogo

Received By: PC

Were custody seals intact?	☒ Yes	☐ No	☐ N/A
Packing Material:	☒ Ice	☐ Blue Ice	☐ Box
Temp OK? (<6C) Therm ID: TH173 Exp. 7/17/17 2-8C	☒ Yes	☐ No	☐ N/A
Was a Chain of Custody (CoC) Provided?	☒ Yes	☐ No	☐ N/A
Was the CoC correctly filled out (If No, document below)	☒ Yes	☐ No	☐ N/A
Were the sample containers in good condition (not broken or leaking)?	☒ Yes	☐ No	☐ N/A
Are all samples within 36 hours of collection?	☒ Yes	☐ No	☐ N/A

Method of Shipment: ☐ Hand Delivered ☐ FedEx ☐ UPS ☐ Greyhound ☒ Other: courier ☐ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on: Client contact:

Resolution to Exception:

CH2MHILL **CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING**

Client: SMM Pogo LLC
Address: 3204 International Street
Fairbanks AK 99701

NPDES#: AK0053341

Contact Person: Jim Ward
Phone: 907-895-2760
E-mail: James.Ward@smmpogo.com

CH2M HILL Project # / Purchase Order #

Composite Sample Information:
Initiated: Date _____ Time _____
Ended: Date _____ Time _____
Chilled During Collection ? Yes ___ No ___
Dechlorinated prior to shipping ? Yes ___ No ___

Ship Samples to:
CH2M HILL - Applied Sciences Laboratory
Attention: Bioasssay Lab
1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
Lab Phone: (541) 768-3160
Customer Service: (541) 768-3120

Analysis Required / Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Green Algae	Trout Acute	Sheepshead Acute	Sheepshead Chronic	Menidia Acute	Menidia Chronic	Mysid Acute	Mysid Chronic	Haz Waste				Concentration and/or Comments
Outfall 001	6/19/2017	904		X	2		X	X															

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Jim Ward, Environmental Specialist J. Ward	6/19/2017 @ 904	Jim Ward, Environmental Specialist J. Ward	6/19/2017 @ 1000
Received By (Please sign and print name) Joel Turner	Date/Time 6-19-17 - 10:00 AM	Relinquished By (Please sign and print name) Joel Turner	Date/Time 6-19-17 - 2:25 pm
Received By (Please sign and print name) BBarstow BBarstow	Date/Time 6-19-17 — 225 pm	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) Rebecca Rebecca Castro	Date/Time 6/20/17 1415	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks B 3790 A		Ice 2-8°C

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: B3790 B

Date Received: 6/22/17

Client/Project: Sumitomo

Received By: PC

Were custody seals intact?	☒ Yes	☐ No	☐ N/A
Packing Material:	☒ Ice	☐ Blue Ice	☐ Box
Temp OK? (<6C) Therm ID: TH173 Exp. 7/17/17 3.3°C	☒ Yes	☐ No	☐ N/A
Was a Chain of Custody (CoC) Provided?	☒ Yes	☐ No	☐ N/A
Was the CoC correctly filled out (If No, document below)	☒ Yes	☐ No	☐ N/A
Were the sample containers in good condition (not broken or leaking)?	☐ Yes	☐ No	☐ N/A
Are all samples within 36 hours of collection?	☐ Yes	☐ No	☐ N/A

Method of Shipment: ☐ Hand Delivered ☐ FedEx ☐ UPS ☐ Greyhound ☒ Other: Courier ☐ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on: Client contact:

Resolution to Exception:

CH2MHILL **CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING**

Client: Sumitomo Metal Mining Pogo LLC
Address: 3204 International Street, Fairbanks, AK 99701
Contact Person: Jim Ward
Phone: (907)895-2760
E-mail: James.Ward@smmpogo.com
CH2M HILL Project # / Purchase Order #

NPDES# AK0053341

Composite Sample Information:
Initiated: Date _____ Time _____
Ended: Date _____ Time _____
Chilled During Collection ? Yes ___ No ___
Dechlorinated prior to shipping ? Yes ___ No ___

Ship Samples to:
CH2M HILL - Applied Sciences Laboratory
Attention: Bioasssay Lab
1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
Lab Phone: (541) 768-3160
Customer Service: (541) 768-3120

Analysis Required / Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Green Algae	Trout Acute	Sheepshead Acute	Sheepshead Chronic	Menidia Acute	Menidia Chronic	Mysid Acute	Mysid Chronic	Haz Waste				Concentration and/or Comments
Outfall001	6/21/2017	814		X	2	B3790-02	X	X	X	X													

Sampled By & Title	(Please sign and print name)	Date/Time	Relinquished By	(Please sign and print name)	Date/Time
Jim Ward, Environmental Specialist	J. Ward	6/21/2017 @ 814	Jim Ward, Env. Specialist	J. Ward	6/21/2017 @
Received By	**(Please sign and print name)**	**Date/Time**	**Relinquished By**	**(Please sign and print name)**	**Date/Time**
Joel Turner	[illegible]	6-21-17 10:45 AM			
Received By	**(Please sign and print name)**	**Date/Time**	**Relinquished By**	**(Please sign and print name)**	**Date/Time**
bbarstow	bbarstow	6-21-17 - 2:52 pm			
Received By	**(Please sign and print name)**	**Date/Time**	**Shipped Via**		**Shipping #**
[illegible]	Pierette Castro	6/21/17 1010	UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___		
Work Authorized By	**(Please sign and print name)**	**Remarks**			
		B3790 B ICE 3.3°C			

027 FAI 3233 9123 027-3233 9123

Shipper's Name and Address
Sumitomo Metal Mining Po
USA
Tel: 9078952841

Shipper's Account Number
27442319143
Customer's ID Number
10659

Not Negotiable
Air Waybill
Issued By
Alaska AIR CARGO
P.O. BOX 68900 SEATTLE, WA 98168
800-225-2752 ALASKACARGO.COM

Consignee's Name and Address
TEST AMERICA ASL
HFPU
CORVALLIS, OR 97330
USA
Tel: 541 768 3112

Consignee's Account Number

Also notify
Tel:

Issuing Carrier's Agent and City

Accounting Information 10659
Sumitomo Metal Mining Pogo LLC
USA

Agent's IATA Code
Account No.

Airport of Departure (Addr. of First Carrier) and Requested Routing
Fairbanks

GoldStreak

To	By First Carrier	To / By		To / By		Currency		WT/VAL		Other		Declared Value For Carriage	Declared Value For Customs
SEA	Alaska Airlines	PDX	AS			USD	PX	X		X		NVD	NCV

Airport of Destination	Flight/Date	Flight/Date	Amount of Insurance
Portland	AS 124/21	AS 2329/22	XXX

Handling Information
PERISHABLE CARGO (NON - FOOD)

SCI

No of Pieces	Gross Weight	kg lb		Commodity Item No.	Chargeable Weight	Rate / Charge	Total	Nature and Quantity of Goods (Incl. Dimensions or Volume)
1	76.0	L	Q		76.0		AS AGREED	WATER SAMPLES KEEP COOL Dims: 13 x 14 x24 x 1 GSX PER
1	76.0						AS AGREED	Volume: 2.528

Prepaid Weight Charge Collect
AS AGREED

Other Charges
XBC 0.00

Valuation Charge

Tax

Total Other Charges Due Agent

Total Other Charges Due Carrier

Shipper certifies that the particulars on the face hereof are correct and that **insofar as any part of the consignment contains dangerous goods, such part is properly described by name and is in proper condition for carriage by air according to the applicable Dangerous Goods Regulations. I consent to the inspection of this cargo.**

For: Sumitomo Metal Mining Pogo LLC

Signature of Shipper or his Agent

[JT] THIS SHIPMENT DOES NOT CONTAIN DANGEROUS GOODS

[ ] THIS SHIPMENT DOES CONTAIN DANGEROUS GOODS

Total Prepaid
AS AGREED

Total Collect

21 Jun 2017 15:03 Executed On (Date)
Fairbanks at (Place)
Alaska Airlines Signature of Issuing Carrier or its Agent

027-3233 9123

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: B3790-03

Date Received: 6-26-17

Client/Project: Semitoxic

Received By: [illegible]

Were custody seals intact?	☒ Yes	☐ No	☐ N/A
Packing Material:	☒ Ice	☐ Blue Ice	☐ Box
Temp OK? (<6C) Therm ID: TH173 Exp. 7-17-17 4.5 °C	☒ Yes	☐ No	☐ N/A
Was a Chain of Custody (CoC) Provided?	☒ Yes	☐ No	☐ N/A
Was the CoC correctly filled out (If No, document below)	☒ Yes	☐ No	☐ N/A
Were the sample containers in good condition (not broken or leaking)?	☒ Yes	☐ No	☐ N/A
Are all samples within 36 hours of collection?	☒ Yes	☐ No	☐ N/A

Method of Shipment: ☐ Hand Delivered ☐ FedEx ☐ UPS ☐ Greyhound ☐ Other: _____ ☐ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on: Client contact:

Resolution to Exception:

CH2MHILL **CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING**

Client: Sumitomo Metal Mining Pogo, LLC
Address: 3204 International St
Fairbanks AK 99701

Contact Person: Jim Ward
Phone: 907-895-2760
E-mail: James.Ward@smmpogo.com

CH2M HILL Project # / Purchase Order #

NPDES# AK0053341

Composite Sample Information:
Initiated: Date _____ Time _____
Ended: Date _____ Time _____
Chilled During Collection ? Yes ___ No ___
Dechlorinated prior to shipping ? Yes ___ No ___

Ship Samples to:
CH2M HILL - Applied Sciences Laboratory
Attention: Bioasssay Lab
1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
Lab Phone: (541) 768-3160
Customer Service: (541) 768-3120

Analysis Required / Comments

Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Green Algae	Trout Acute	Sheepshead Acute	Sheepshead Chronic	Menidia Acute	Menidia Chronic	Mysid Acute	Mysid Chronic	Haz Waste				Concentration and/or Comments
Outfall 001	6/23/2017	909	03790-03	X	2	03790-03	X	X	X	X													

Sampled By & Title (Please sign and print name)	Date/Time	Relinquished By (Please sign and print name)	Date/Time
Jim Ward, Environmental Specialist J Ward	6/23/2017@1000	Jim Ward, Env Spec. J Ward	6/23/2017@
Received By (Please sign and print name) Joe Turner	6-23-17, 10:45 AM	Relinquished By (Please sign and print name) Joel Turner	Date/Time 2-23-17 ~1:38 pm
Received By (Please sign and print name) B Barstow B Barstow	Date/Time 6/23/17 1:38 pm	Relinquished By (Please sign and print name)	Date/Time
Received By (Please sign and print name) L. Otter	Date/Time 6-24-17 1050	Shipped Via UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name)	Remarks		

4.5° C

Shipping Request

_____
Date/Time

TRACKING Numbers: _____ _____
_____ _____
_____ _____

From: ASL Bioassay Laboratory - Ext: x23160

Package must Reach Destination by: ___/___/___ at ___:___

Attn: Stacy Staley

To: Sumitomo Metal Mining - Pogo Total number of coolers sent: _____
Address: c/o Pogo Environmental , Attn: Sherrie Titus
SMM Pogo LLC, 3204 International Street
Fairbanks AK, 99701

Phone: 1.907.895.2761

Declared Value: $0 + commodity listed below

Domestic Shipping: Check one: ☐ Fed Ex ☐ UPS

- ☐ **Ground (5 to 7 days)**
- ☐ 3 Day Express Saver
- ☐ Second Business Day by 5 pm
- ☐ Overnight PM Delivery (by 3:00 PM next business day)
- ☐ Overnight AM Delivery (by 10:30 AM next business day)
- ☐ Saturday Delivery
- ☐ Signature Release

International Shipping: Check one: ☐ Fed Ex ☐ UPS

- ☐ International Priority
- ☐ **International Economy**

Commodity - Merchandise

Cooler #1: _____ x 5 gallon cubetainer
_____ x 2 1/2 gallon cubetainer
_____ x 1 gallon cubetainer

Cooler #2: _____ x 5 gallon cubetainer
_____ x 2 1/2 gallon cubetainer
_____ x 1 gallon cubetainer

Cooler #3: _____ x 5 gallon cubetainer
_____ x 2 1/2 gallon cubetainer
_____ x 1 gallon cubetainer

Cubetainers valued @ $5 each

Cooler #4: _____ x 5 gallon cubetainer
_____ x 2 1/2 gallon cubetainer
_____ x 1 gallon cubetainer

Cooler #5: _____ x 5 gallon cubetainer
_____ x 2 1/2 gallon cubetainer
_____ x 1 gallon cubetainer

Cooler #6: _____ x 5 gallon cubetainer
_____ x 2 1/2 gallon cubetainer
_____ x 1 gallon cubetainer

CLIENT NOTES (NOT to be included in final report)

Client: Sumitomo Metal Mining - Pogo

Notes from the "Front sheet":

MUST run a concurrent FHM chronic reftox (included in price)

TUc = (100% / IC25) note: A TUc > 2 indicates need for repeat/accelerated testing

Aeration Needed ? **No** Dechlorination ? **No** Ships Via: **unknown**

Stats: **Dual-Endpoints needed?** **FHM : No** **@ 96hrs** **ACEC =** **%**
Cerio : No **@ 48hrs** **CCEC =** **%**

Endpoints needed for Acute testing: **NOEC/LOEC** **LC50**
Endpoints needed for Chronic testing: **NOEC/LOEC** **IC25**

-CHOOSE ONE-

- (●) Send CETIS file via email to client only
- ( ) Send CETIS file via email to client and WDOE (Randy Marshall)
- ( ) Send CETIS file via email to client, Randy Marshall and : _____

027 FAI 3233 8036

027-3233 8036

Shipper's Name and Address	Shipper's Account Number	Not Negotiable
Sumitomo Metal Mining Po USA Tel: 9078952841	27442319143 Customer's ID Number 10659	**Air Waybill** Issued By Alaska. AIR CARGO P.O. BOX 68900 SEATTLE, WA 98168 800-225-2752 ALASKACARGO.COM
Consignee's Name and Address	**Consignee's Account Number**	**Also notify**
TESTAMERICA-ASL 1100 NE CIRCLE BLVD STE 310 CORVALLIS, OR 97330 USA Tel: 541 768 3112		Tel:
Issuing Carrier's Agent and City		**Accounting Information** 10659 Sumitomo Metal Mining Pogo LLC USA
Agent's IATA Code	**Account No.**	
Airport of Departure (Addr. of First Carrier) and Requested Routing		GoldStreak
Fairbanks		

To	By First Carrier	To / By		To / By		Currency		WT/VAL		Other		Declared Value For Carriage	Declared Value For Customs
SEA	Alaska Airlines	PDX	AS			USD	PX	X		X		NVD	NCV

Airport of Destination	Flight/Date	Flight/Date	Amount of Insurance
Portland	AS 124/19	AS 2329/20	XXX

Handling Information

PERISHABLE CARGO (NON - FOOD)

SCI

No of Pieces	Gross Weight	kg lb			Commodity Item No.	Chargeable Weight	Rate / Charge	Total	Nature and Quantity of Goods (Incl. Dimensions or Volume)
1	70.0	L		C		70.0		AS AGREED	WATER SAMPLES Dims: 13 x 14 x24 x 1 GSX PER
1	70.0							AS AGREED	Volume: 2.528

Prepaid	Weight Charge	Collect	Other Charges
	AS AGREED		XBC 0.00
	Valuation Charge		
	Tax		
	Total Other Charges Due Agent		
	Total Other Charges Due Carrier		
Total Prepaid		Total Collect	
AS AGREED			

Shipper certifies that the particulars on the face hereof are correct and that **insofar as any part of the consignment contains dangerous goods, such part is properly described by name and is in proper condition for carriage by air according to the applicable Dangerous Goods Regulations. I consent to the inspection of this cargo.**

For: Sumitomo Metal Mining Pogo LLC

Signature of Shipper or his Agent

☒ THIS SHIPMENT DOES NOT CONTAIN DANGEROUS GOODS

☐ THIS SHIPMENT DOES CONTAIN DANGEROUS GOODS

19 Jun 2017 14:33 — Executed On (Date)

Fairbanks — at (Place)

Alaska Airlines — Signature of Issuing Carrier or its Agent

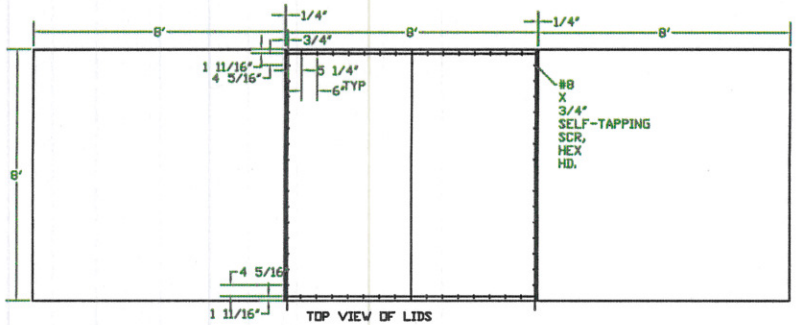
027-3233 8036

APPENDIX F –

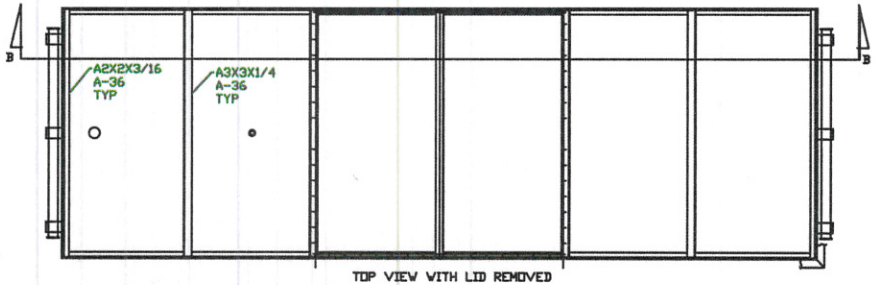
AS-BUILT DRAWING FOR 10,000GALLON POTABLE WATER TANK

NOTES:

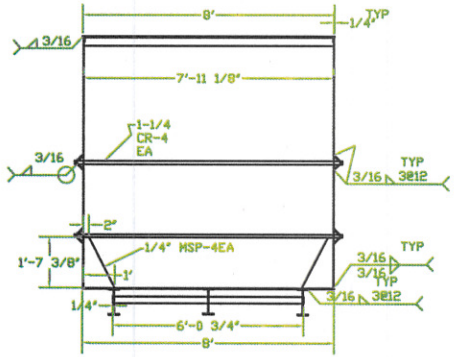
1. INTERIOR FINISH: SANDBLAST PER DEVOE SPECS; COAT 2 COATS DEVOE 233H EPOXY PAINT
2. EXTERIOR: 2.5" MIN SPRAY URETHANE FOAM ALL AROUND. COAT WITH UV PROTECTIVE COATING
3. USE LINCOLN 71M OUTERSHIELD CORED WIRE FOR ALL WELDS SHOWN



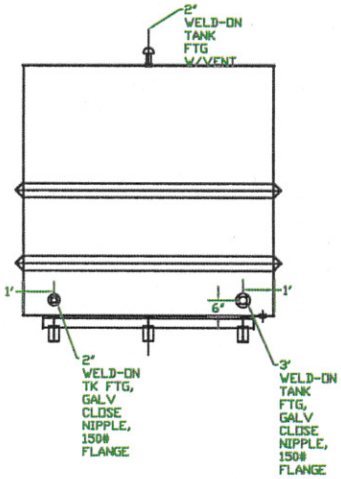
TOP VIEW OF LIDS



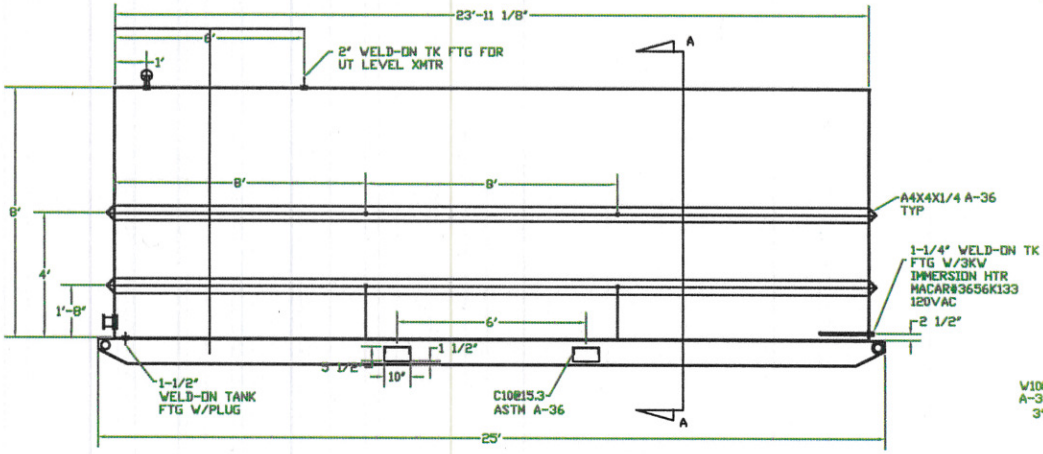
TOP VIEW WITH LID REMOVED

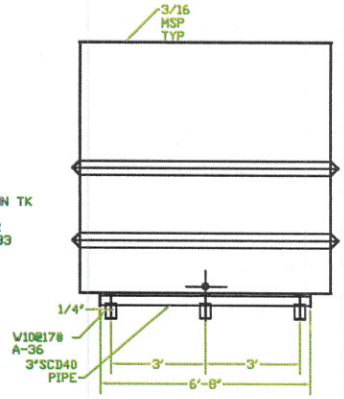


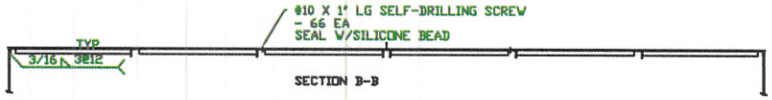
SECTION A-A



ADD DRAIN VALVE 1-½"







SECTION B-B

CampWater Industries LLC BOX 309, DELTA JCT,AK,99737-907-895-4304		
TITLE 10,000 GALLON POTABLE WATER TANK		
DWN JWD	DATE/REV 1-12-2012	JOB NO.
SCALE	CUSTOMER	REF/FILE NO.

DESIGN NOTES:

1. TANK DESIGN IN ACCORDANCE WITH 2009 IBC FOR OUTSIDE LOCATION NEAR DELTA JUNCTION, ALASKA:
   - SNOW LOAD 60 PSF
   - ROOF LL 50 PSF
   - WIND LOAD 90 MPH BASIC WIND SPEED (3 SECOND GUST)
   - SEISMIC:
     Ie=1.0, USE GROUP 1
     Ss=0.501,S1=0.257g,SDS=0.334g,SD1=0.172g
     SITE CLASS B, DESIGN CATEGORY C
   - HYDROSTATIC LOADS – CONTENTS: WATER S.G.=1.0
2. TANK TO BE POSITIONED ONTO LEVEL SUITABLY COMPACTED GRAVEL BASE DESIGNED, EXECUTED, AND APPROVED BY OTHERS. WEIGHT OF FLOODED TANK AND ROOF SNOW LOAD IS APPROX. 125,000 Lbs. TANK DRY WEIGHT IS APPROX. 15,000 Lbs.
3. ALL STEEL PLATE TO BE CSA G40.21 44W WITH MIN. Fy=44Ksi. ALL STRUCTURAL MEMBERS TO BE ASTM A992 or CSA G40.21 50W (MIN Fy=50Ksi)
4. IMMERSION HEATER DESIGN AND SUPPLY BY OTHERS.

INSPECTION & TESTING:

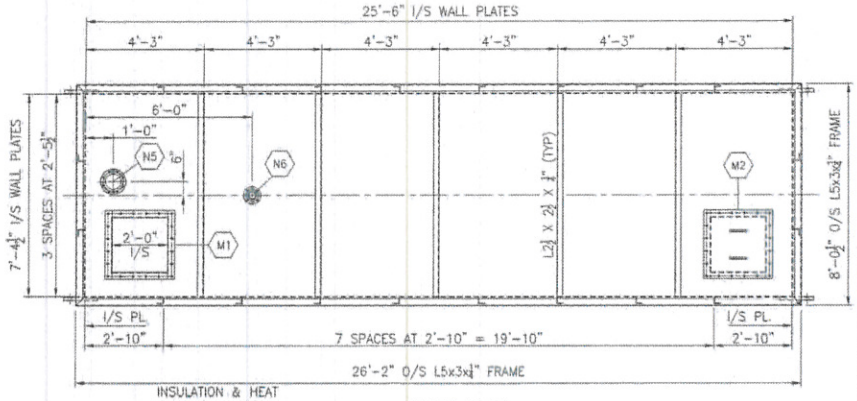
1. PERFORM 100% VISUAL WELD INSPECTION BY REGISTERED CSA W178.2 WELD INSPECTOR
2. PERFORM FULL HYDROSTATIC LEAK TEST WITH WATER – HOLD FOR 24HRS.

COATINGS:

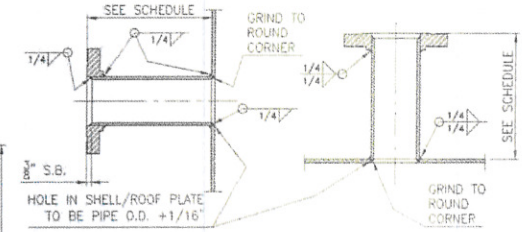
1. INTERNAL
   - PREPARE, GRIND, SAND AND SMOOTH SHARP EDGES, WELDS AND CORNERS IN ACCORDANCE WITH NACE SP-0178-2007 STANDARD PRACTICE FOR IMMERSION SERVICE
   - SANDBLAST SSPC-SP10 (NEAR WHITE)
   - APPLY 2 COATS OF INTERNATIONAL PAINTS "INTERSEAL 670HS",NSF61 APPROVED AT 6-8 MILLS DFT PER COAT, IN ACCORDANCE WITH AWWA D102-14 WATER SERVICE
   - PERFORM INSPECTION AND HOLIDAY TESTING
2. EXTERNAL
   - SANDBLAST SSPC-SP6 (COMMERCIAL)
   - APPLY 1 COAT OF CARBOLINE "CARBOTHANE 8515" AT 3-5 MILS DFT

INSULATION:

1. WALLS
   - APPLY 2" OF 6# MINERAL WOOL INSULATION (R12 MINIMUM)
   - CLAD WITH 1½"x½" CORRUGATED ALUMINUM x .025" THICK
   - FLASH & SEAL ALL JOINTS, CORNERS, NOZZLES AND PROTRUSIONS
2. ROOF
   - APPLY 2½" OF 10# ROCK BOARD INSULATION (CAPABLE OF LIVE LOAD/SNOW LOAD)
   - CLAD WITH SMOOTH STUCCO EMBOSSED ALUMINUM x .025" THICK
   - FLASH AND SEAL ALL JOINTS AND PROTRUSIONS
3. BOTTOM (U/S)
   - APPLY 2" OF 6# MINERAL WOOL INSULATION
   - CLAD WITH SMOOTH STUCCO EMBOSSED ALUMINUM x .025" THICK
   - FLASH AND SEAL ALL JOINTS

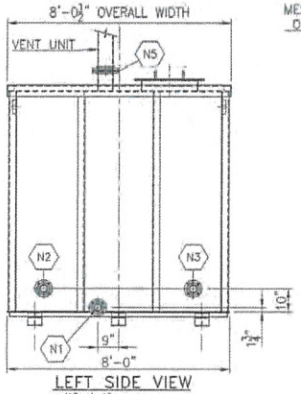


ROOF PLAN
1/2"=1'-0"

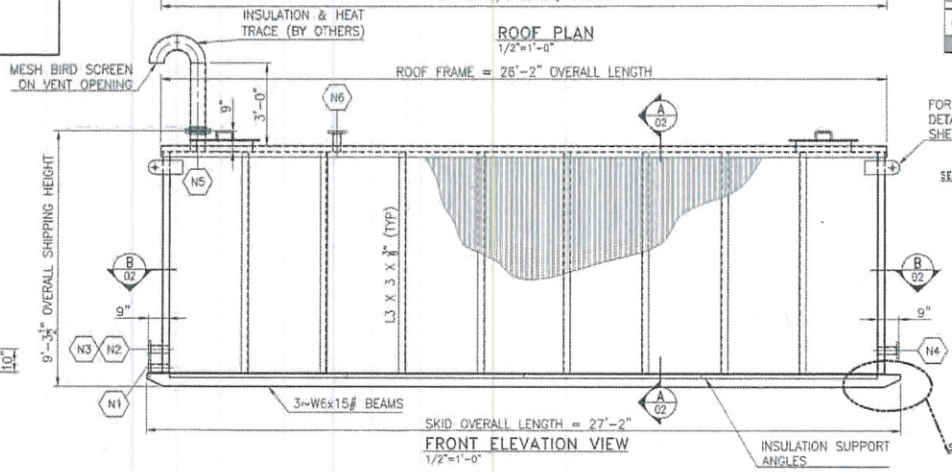


MARK	DIA.	CLASS	FACING	PROJECTION**	C.L. DISTANCE FROM DATUM	REMARKS
N6	3"	150#	RAISED FACE	9"	-	LEVEL TRANSMITTER
N5	6"	150#	RAISED FACE	9"	-	VENT (w. SS. GOOSENECK)
N4	3"	150#	RAISED FACE	9"	10"	IMMERSION HEATER
N3	3"	150#	RAISED FACE	9"	1 3/4"	DISCHARGE
N2	3"	150#	RAISED FACE	9"	10"	INLET
N1	3"	150#	RAISED FACE	9"	1½"	DRAIN
M2	24" SQ.	-		-	-	TANK ACCESS
M1	24" SQ.	-		-	-	TANK ACCESS

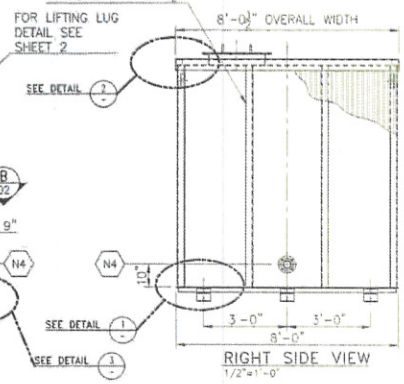
NOZZLE SCHEDULE ** FROM EDGE OF SHELL or ROOF PLATE



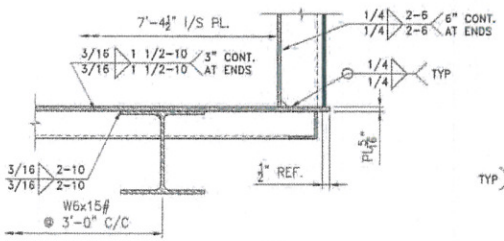
LEFT SIDE VIEW
1/2"=1'-0"



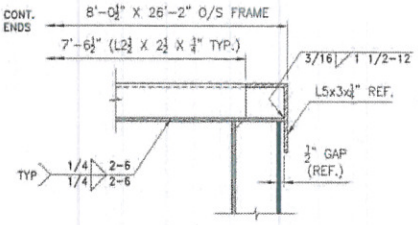
FRONT ELEVATION VIEW
1/2"=1'-0"



RIGHT SIDE VIEW
1/2"=1'-0"



DETAIL 1
3"=1'-0"



DETAIL 2
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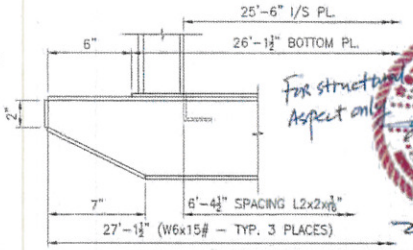

DETAIL 3
3"=1'-0"

For structural Aspect only

STATE OF ALASKA 49TH YUANSANG WU No. CE13287 2017-06-14

WELDING PROCEDURES, SPECIFICATIONS, AND STANDARDS ON THIS DRAWING TO COMPLY WITH CSA W59; ☐ ASME SECTION IX; YES ☐ AWS D1.1; ☐ OTHER;

TOLERANCES U.N.O. : GENERAL DIMENSIONS ±1/8"; HOLE LOCATION ±1/16"

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REV	DESCRIPTION	DATE (MM/DD/YY)	BY
C	CERTIFIED DRAWINGS	06/14/17	TD
B	RE-ISSUED FOR APPROVAL AFTER CLIENTS REVIEW	06/06/17	TD
	PL3/16" WAS PL1/4", MODIFIED TO 3~W6 SUPPORT BEAMS		
	MOVED NOZZLE N1 (8"), ADDED VENTING NOTES		
A	ISSUED FOR APPROVAL	05/19/17	TD

DENNERIK ENGINEERING LTD
20130 STEWART CRESCENT, MAPLE RIDGE, B.C.
CANADA V2X 0T4
Phone: 604-469-8857, Fax: 604-460-8804

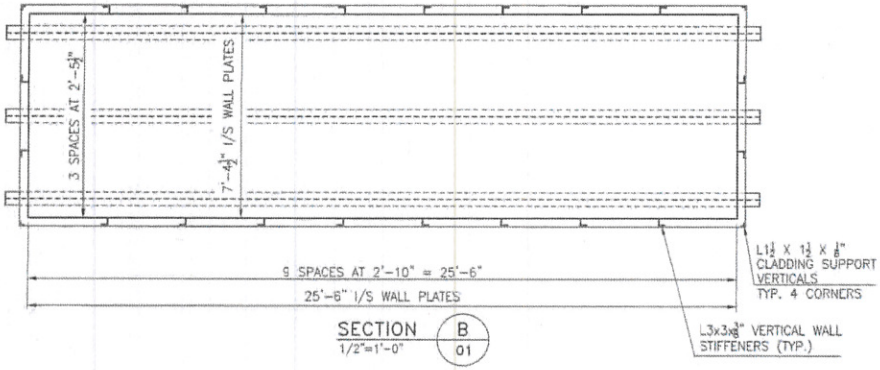
- Custom machinery & equipment manufacturing
- Carbon steel, stainless & aluminum fabricating
- Professional engineering services
- Design & fabricate services

CLIENT: M2C1 CONSTRUCTION AND ENGINEERING
DELTA JUNCTION, ALASKA, U.S.A.

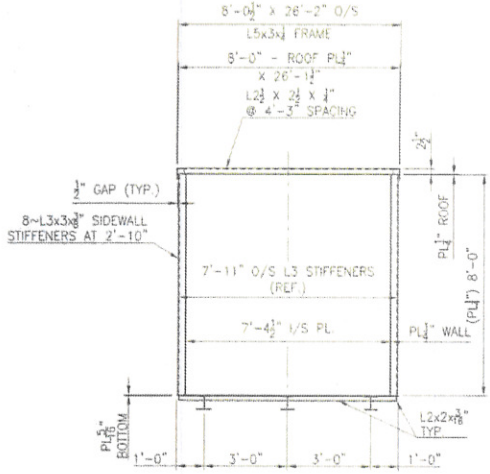
TITLE: POCO METAL MINING LLC
10,000 USG POTABLE WATER TANK
GENERAL ARRANGEMENT

W.O. NUMBER: 4631

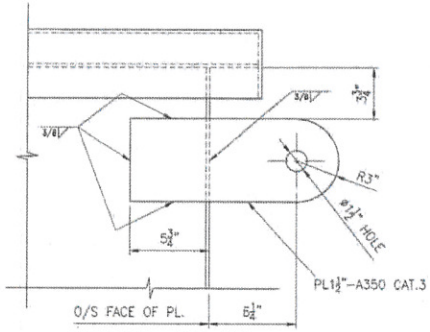
DATE: MAY 2017	APPROVED:	SURFACE FINIS: SEE GENERAL NOTES	
DESIGN: EH	SCALE: NOTED	MAT'L: SEE GENERAL NOTES	
DRAWN: TD	HOLE SIZE:	DWG. NUMBER: 170-4631-01	REV: C
CHECKED: EH	WEIGHT:		SHT. 1 OF 2



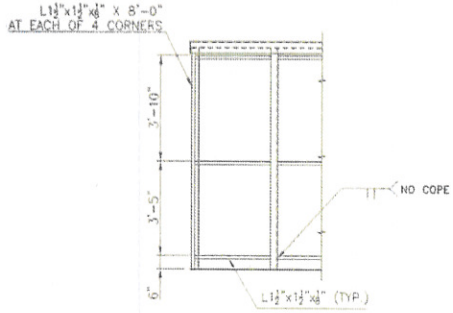
SECTION B 01
1/2"=1'-0"



SECTION A 01
1/2"=1'-0"



LIFTING LUG – ELEV. VIEW
TYPICAL 4 CORNERS
3"=1'-0"



INSULATON SUPPORT DETAIL
1/2"=1'-0"

For structural Aspect only

STATE OF ALASKA 40TH YUANGANG HU No. CE13487 REGISTERED PROFESSIONAL ENGINEER

2017-06-14

REV	DESCRIPTION	DATE (MM/DD/YR)	BY
C	CERTIFIED DRAWING	06/14/17	TD
B	RE-ISSUED FOR APPROVAL AFTER CLIENTS REVIEW	06/05/17	TD
	PL5/16" WAS PL1/4", MODIFIED TO 3-W6 SUPPORT BEAMS		
	MOVED NOZZLE "N1" (6"), ADDED VENTING NOTES		
A	ISSUED FOR APPROVAL	05/19/17	TD

DENNERIK ENGINEERING LTD
20130 STEWART CRESCENT, MAPLE RIDGE, B.C
CANADA V2X 0T4
Phone: 604-460-8857, Fax 604-460-8804

- Custom machinery & equipment manufacturing
- Carbon steel stainless & aluminum fabricating
- Professional engineering services
- Design & fabricate services

CLIENT: M2C1 CONSTRUCTION AND ENGINEERING
DELTA JUNCTION, ALASKA, U.S.A.

TITLE: POGO METAL MINING LLC
10,000 USG POTABLE WATER TANK
GENERAL ARRANGEMENT

W.O. NUMBER: 4631

DATE: MAY 2017	APPROVED	SURFACE PREP: SEE GENERAL NOTES	
DESIGN: EH	SCALE: NOTED	PAINT: SEE GENERAL NOTES	
DRAWN: TD	SHEET SIZE:	DWG. NUMBER: 170-4631-01	REV: C
CHECKED: EH	ANSI/AF		SHT. 2 OF 2

WELDING PROCEDURES, SPECIFICATIONS, AND STANDARDS ON THIS DRAWING TO COMPLY WITH:
CSA W59: ( ) ASME SECTION IX, YES ( ) AWS D1.1; ( ) OTHER:

TOLERANCES U.N.O. ( ) GENERAL DIMENSIONS ±1/8", HOLE LOCATION ±1/16"

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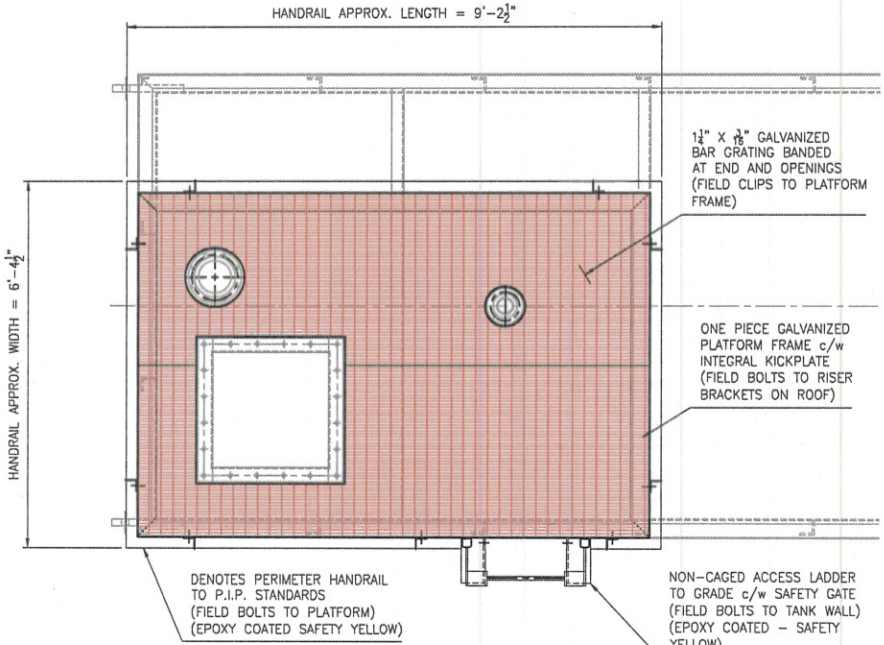
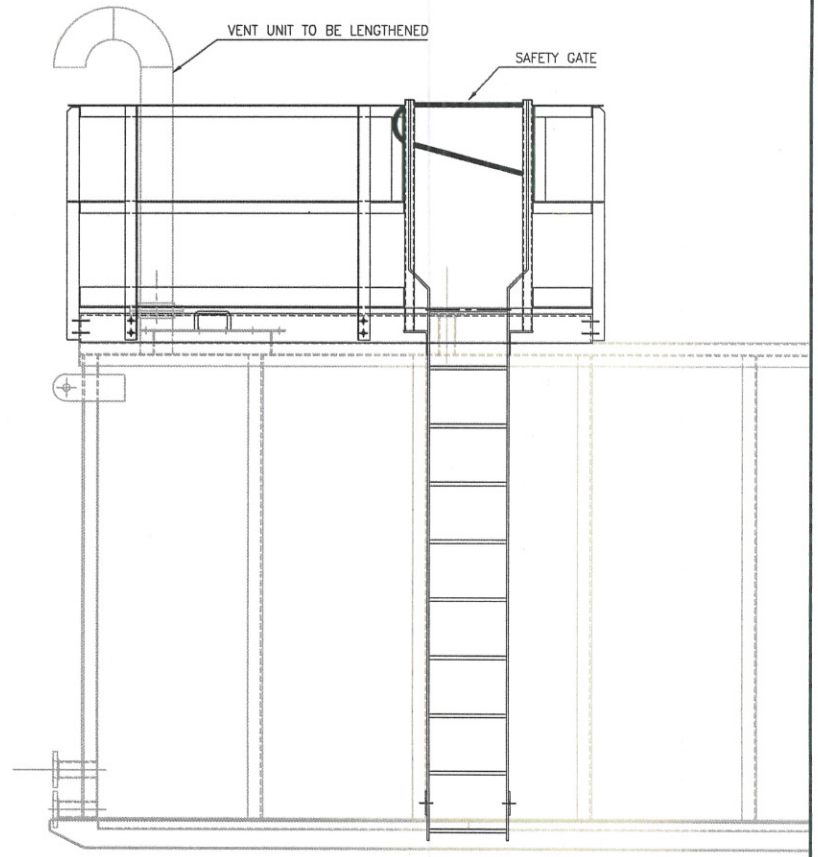
ALL DRAWINGS ARE SUBJECT TO RETURN UPON REQUEST



LADDER & PLATFORM – PLAN
1"=1'-0"



LADDER & PLATFORM – ELEVATION
1"=1'-0"

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ALL DRAWINGS ARE SUBJECT TO RETURN UPON REQUEST.

REV	DESCRIPTION	DATE (MM/DD/YY)	BY
A	ISSUED w QUOTATION DOCUMENT LETTER	06/21/17	EH

DENNERIK ENGINEERING LTD.
20130 STEWART CRESCENT, MAPLE RIDGE, B.C.
CANADA V2X 0T4
Phone: 604-460-8857, Fax: 604-460-8804

- Custom machinery & equipment manufacturing
- Carbon steel, stainless & aluminum fabricating
- Professional engineering services
- Design & fabricate services

CLIENT: M2C1 CONSTRUCTION AND ENGINEERING
DELTA JUNCTION, ALASKA, U.S.A.

TITLE: POGO METAL MINING LLC
10,000 USG POTABLE WATER TANK
ACCESS LADDER & PLATFORM ADDITION

W.O. NUMBER: Q6966A

WELDING PROCEDURES, SPECIFICATIONS, AND STANDARDS ON THIS DRAWING TO COMPLY WITH:
CSA W59: | ASME SECTION IX: YES | AWS D1.1: | OTHER:
TOLERANCES U.N.O. : GENERAL DIMENSIONS ±1/8"; HOLE LOCATION ±1/16"

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ALL DRAWINGS ARE SUBJECT TO RETURN UPON REQUEST.

DATE: JUN 2017	APPROVED	SURFACE PREP: SEE GENERAL NOTES	
DESIGN: EH	SCALE: NOTED	PAINT: SEE GENERAL NOTES	
DRAWN: TD	HOLE SIZE	DWG. NUMBER: Q6966A-01	REV. 1 / SHT. 1 OF 1
CHECKED	WEIGHT		

THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Environmental Conservation
DIVISION OF ENVIRONMENTAL HEALTH
Drinking Water Program
610 University Avenue
Fairbanks, Alaska, 99709-3643
Main: 907.451.2108
Toll Free: 800.770.2137
Fax: 907.451.2188
dec.alaska.gov/eh/dw/

File Number: 121.07.003

September 22, 2017

Chris Kennedy, General Manager
Sumitomo Metal Mining Pogo, LLC.
P.O. Box 145
Delta, AK 99737-0145

Re: **Pogo Lower Camp —10K-Gal WST**
Interim Approval to Operate
PWSID: 372643; Classification: Non-Transient Non-community; Source: GWUDISW

Dear Mr. Kennedy:

On September 21, 2017 the department received a submittal from your engineer, Mr. Stephen Hammond, P.E., requesting interim approval to operate a new 10,000 gallon treated water storage tank that replaces an aging existing tank of the same volume and similar dimensions. The request has been reviewed in accordance to the State of Alaska Drinking Water regulations, 18 AAC 80, and **interim approval to operate is granted until December 22, 2017.** Enclosed is a signed Construction and Operation Certificate with the Interim Approval to Operate section signed.

APPROVED PROJECT

The approved project constructed a welded 10,000 gallon, rectangular, steel tank to replace the old potable water storage tank of similar volume. The tank's internal dimensions are 7.5 feet wide by 25.6 feet long by 8 feet tall. The tank is coated with an International Paint Interseal 670HS epoxy coating (NSF/ANSI-61 certified). The tank is equipped with a combined vent/overflow pipe that is heat-traced and insulated to reduce the chance of the tank collapsing due to vent freeze-up. Inlet and outlet pipes are located adjacent to each other near the bottom of the tank (on one end of the tank's long axis). This tank will not be used for disinfection contact time requirements (CT); CT is achieved by an existing 3,000-gallon plastic tank inside the water plant. The steel tank was manufactured offsite by Dennerik Engineering Ltd. and was placed in the same pad as the old tank.

This project also constructed a temporary water storage system that included four 2,500-gallon, plastic tanks. These tanks will be disconnected once the permanent storage tank is brought into operation. There were no other changes to the water system. Flow and pressure design capacities were not affected by this storage tank replacement project.

OPERATIONAL APPROVAL REQUIREMENTS

In order to obtain final approval to operate the information listed below must be submitted at least 1 month prior to expiration of the interim approval to operate. If additional time is required, you may request an extension of the interim approval to operate prior to its expiration.

1. Letter requesting operational approval.
2. Documentation that sample taps have been installed at the inlet and outlet of the storage tank.
3. Documentation that the temporary plastic tanks have been disconnected from the system and discussion on what their fate will be.
4. Record drawings stamped, signed, and dated by the registered engineer of record responsible for the project in a format no larger than 11 x 17 inches (all construction changes must be clearly shown).

DISCLAIMERS AND ADMINISTRATIVE APPEALS PROCESS

Approval of submitted plans is not approval of omissions or oversights by this office or noncompliance with any applicable regulation. The Department's construction approval does not guarantee correctness of functional design or waive the owner's responsibility for continued compliance with state regulations.

Any person who disagrees with this decision may request an adjudicatory hearing in accordance with 18 AAC 15.195-18 AAC 15.340 or an informal review in accordance with 18 AAC 15.185. Requests for an adjudicatory hearing or informal review may be made by mail, electronic mail, or facsimile. Informal review requests must be delivered to the Division Director, Christina Carpenter, 555 Cordova St., Anchorage, AK 99501, within 15 days of receipt of this decision. Adjudicatory hearing requests must be delivered to the Commissioner of the Department of Environmental Conservation, Larry Hartig, 410 Willoughby Ave., Suite 303, Juneau, AK 99801, within 30 days of this decision. If a hearing is not requested within 30 days, the right to appeal is waived. More information on the Department's administrative appeals process can be found at http://www.dec.state.ak.us/commish/ReviewGuidance.htm.

If you have any questions please contact me at 907-451-5193 or via e-mail at johnny.mendez@alaska.gov.

Sincerely,

Johnny Mendez, P.E.
Engineer I

Enclosure: Construction and Operation Certificates

cc: Stephen Hammond, P.E., M2C1 Construction and Engineering
Joseph Smith, Water System Supervisor, SMM Pogo

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CONSTRUCTION AND OPERATION CERTIFICATE
FOR
PUBLIC WATER SYSTEMS

A. APPROVAL TO CONSTRUCT

Plans for the construction or modification of **10K-Gal Water Storage Tank for the Pogo Lower Camp PWS (PWSID 372643)**, a **NTNC** Public Water System, located in **Pogo Mine, Alaska**, submitted in accordance with 18 AAC 80.205 by **M2C1 Construction and Engineering** have been reviewed and are

☐ **approved as submitted** ☒ **conditionally approved (see approval letter for conditions)**

See Approval Letter Dated: 8/16/2017

Johnny Mendez, P.E.	Engineer I	8/16/2017
(Reviewing Engineer)	(Title)	(Date of Approval)

If applicant fails to construct, alter, install, or modify the system within two years of the date of approval to construct, approval is void, and plans must be resubmitted for Department review and approval.

B. APPROVED CHANGE ORDERS

Change (contract order number or descriptive reference)

(Reviewing Engineer)	(Title)	(Date of Approval)

C. APPROVAL TO OPERATE

The **"Interim Approval to Operate"** section must be completed and signed by the Department before any water is made available for public use.

Interim Approval to Operate:

The construction of the project listed above is hereby granted ***INTERIM APPROVAL TO OPERATE*** until __/ /__. It is illegal to operate a public water system beyond this expiration date without **Final Approval to Operate** from the Department.

	Engineer I	09/22/17
(Reviewing Engineer)	(Title)	(Date of Approval)

Final Approval to Operate:

Record drawings and other documents submitted to the Department, or an inspection by the Department, has confirmed that the public water system was constructed in substantial conformance with the approved plans. The system is hereby granted ***FINAL APPROVAL TO OPERATE***.

(Reviewing Engineer)	(Title)	(Date of Approval)

APPENDIX G – MONITORING DATA

(ATTACHED EXCEL FILES)

2017 MONITORING DATA

2017 QUALIFIED DATA

ALL HISTORIC DATA