
Teck Alaska, Inc. - Red Dog Mine
4th Quarter & Annual Report 2019
Waste Management Permit No. 2016DB0002
Reclamation Plan Approval F20169958
February 10th, 2020

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Introduction

This report has been prepared to fulfill the 4th quarter and annual reporting requirements of Teck Alaska Incorporated's (TAK) obligations under the State of Alaska Waste Management Permit No. 2016DB0002 and the Red Dog Mine Reclamation Plan Approval F20169958.

This report addresses mine water management, biomonitoring, waste rock management, tailings management, permafrost and groundwater monitoring, water load balance, Class III waste landfill, mining and milling activities, reclamation activities, land disturbance and wildlife interactions for the reporting period.

Biomonitoring Program

Annual Biomonitoring Report

The annual biomonitoring report is still being prepared will be submitted with the 2020 2nd quarter report. The report when completed will be listed as Appendix A within this report.

Annual Summary of Biomonitoring Water Quality Sampling

Analytical results of samples collected for biomonitoring water quality for the last five years are attached with the electronic file, *Red Dog Analytical Data 2019.xlsx*.

Permafrost and Sub-permafrost Groundwater Monitoring

Permafrost and Subsurface Temperature Monitoring

Piezometer and thermistor measurements were completed for the 4th quarter, no issues noted.

The 4th quarter and the 2019 annual Long-Term Permafrost and Groundwater Monitoring Report will be submitted as soon as it is completed and listed as Appendix B to this report.

Significant activities in Permafrost and Sub-permafrost Groundwater Monitoring

A new piezometer and digital thermistor well was scheduled to be completed during the fall of 2019, due to complications related to the drilling contractor well construction was postponed. The EPA Region 10 was notified of the delay, it is anticipated the new well will be completed by this summer. No changes to the previously approved work plan are anticipated at this time.

The new well will be constructed in the same vicinity as piezometer well P-96-013 (located on the Kivalina Overburden stockpile). P-96-013 will remain active and continue to be monitored and results compared to the new well once it is completed. The new well will include both a shallow and deep piezometers along with a digital thermistor string which will be used to correlate any temperature differences with thermistor T-96-013 (next to P96-013) which utilizes an older type analog thermistor string.

Mine Water Management

Mine water flows

Table 1 lists mine water volumes transferred from mine areas during the reporting period. The table also includes a summation of volumes transferred for the report year. All flow monitoring stations operated normally with no problems noted for the period.

Table 1 - Water Management Volumes

| | Volume in Gallons | | | |
|---|-------------------|-------------|-------------|---------------|
| Mine Water Monitoring Stations | October | November | December | 2019 Total |
| Bon's Creek Total Flow | 8,240,383 | 7,027,046 | 6,623,322 | 118,610,304 |
| Mine Water Sump Total Flow ¹ | 136,777,542 | 62,859,590 | 312,762 | 848,091,158 |
| Main Dam Seepage Pumpback | 31,890,031 | 33,345,665 | 13,782,843 | 299,919,481 |
| Reclaim Flow to Mill | 255,090,754 | 214,061,447 | 288,609,992 | 3,220,652,602 |
| WTP #1 Influent from Reclaim | 0 | 0 | 0 | 195,813,590 |
| WTP #1 Influent from Mine Sump | 0 | 0 | 5,588,481 | 5,588,481 |
| WTP #1 Clarifier Sludge To Tails | 0 | 0 | 0 | 0 |
| WTP #2 Influent from Reclaim | 0 | 0 | 0 | 1,954,036,141 |
| WTP #2 Sludge To Tails | 0 | 0 | 0 | 65,505,026 |
| Discharge to Red Dog Creek | 0 | 0 | 0 | 1,396,242,113 |
| WTP #3 Influent from MWD | 13,806,014 | 6,766,732 | 8,250,231 | 103,914,825 |
| WTP #3 Influent from Mine Sump | 0 | 0 | 0 | 0 |
| WTP #3 Total Effluent | 2,574,000 | 2,335,000 | 0 | 103,914,825 |
| East Overburden Sump | 900,600 | 299,400 | 566,700 | 15,553,800 |
| West Overburden Sump | 4,636,800 | 2,765,400 | 415,400 | 24,885,400 |
| Main Waste ARD to Main Pit | 0 | 1,288,128 | 142,242 | 6,800,801 |
| Treated Water to Main Pit | 0 | 0 | 0 | 0 |
| Tailings Water Supernatant (calc.) | 219,356,000 | 228,570,000 | 227,664,000 | 2,865,485,000 |
| Mill Pad Runoff | 40,543 | 19,527 | 597 | 4,740,000 |

Notes: ¹ Includes Main Pit water pumped back to Tailings Storage Facility, does not include any volumes pumped from the Main pit or the TSF to the Aqqaluk Pit beginning Dec 14th, 2019.

Mine water quality

A Mine water spreadsheet *Red Dog Analytical Data 2019.xlsx* is attached with this report which includes data for the last five years. The spreadsheet includes all data used to generate the charts data for Appendixes C, D, E and F within this report.

Mine Water Quality Trend Charts

Mine water quality trend charts are provided in Appendixes C, D, E, and F of this report. Water quality Profile I and II ("*Monitoring Plan, Jan 2018*") constituents for the Mine Water, Mine Drainage, Bons Creek and APDES stations are illustrated for a five year period ending with the 4th quarter. Only the Mine Water Quality charts (Profile II) were sampled during the 4th quarter since the discharge season ended early on September 11th, 2019 due to higher than normal background TDS concentrations noticed in the Ikalurok River (outside of the mine area). No significant trends were noted for the Mine Water 4th quarter monitoring results.

Visual Monitoring of Mine Water Management Systems

Red Dog diversion ditches, seepage collection and treated water discharge lines were monitored during the quarter. All mine water management systems operated without incident during the reporting period.

Fish weir inspections

The fish weir was inspected on October 4th, 2019, no major issues were identified. The system is operating as designed. A written report was submitted to US EPA Region 10 on October 6th, 2019.

Figure 1 - Photo of Fish Weir



Fish weir: Looking west across east abutment and weir notch

Water and Load Balance

A mine water balance computer simulation program is maintained using GoldSim software. Minor updates were made to the model during the 2019 year, updates included additional weather inputs, pumping to main pit and ice accumulation at the south end of the MWD. A dataset for the model is provided as an excel attachment labeled as *RedDog_GoldSimModel_Input_Database.xlsx*.

A Total Dissolved Solids (TDS) load balance spreadsheet was not generated for the 2019 reporting year due to the reverse pumping occurring between the Tailings Storage Facility, the Main and Aqqaluk pits to maintain freeboard limits in the Tailings Storage Facility.

Significant reagents consumed for wastewater treatment during 2019:

- Total quantity of flocculant used in Water Treatment Plant 2 (WTP2) and WTP1 was 96.5 metric tonnes, the majority being used in WTP2.
- Total quantity of lime used in WTP2 is not tracked individually, though the total lime used in WTP1, WTP2 and WTP3 was 13,271 metric dry tonnes.
- Total quantity of sodium sulfide used in WTP1 and WTP2 was 492.8 metric tonnes, utilized to precipitate cadmium.
- Total quantity of flocculants used in WTP3; - None
- Quantity of any other chemicals used in significant quantities in WTP2; - Gypsum 2619.1 metric tonnes

Significant activities in mine water management

The Tailings Storage Facility contained an estimated 4.215 billion gallons of free water (end of 2019) compared to 3.446 billion gallons for the previous year. The increase was mostly attributable to unusually high precipitation during the year. Reverse pumping from the Tailings Storage Facility to the Aqqaluk pit was initiated in December in order to maintain freeboard limits.

The Acid Rock Drainage (ARD) water collection system treated approximately 103 million gallons for 2019, almost double compared to the previous year. As mentioned in the 2018 annual report the decommissioned collection sump was scheduled to be replaced during 2019. A new temporary sump was completed and became operational during the summer of 2019.

An estimated 17,900 tonnes of TDS was removed from ARD water treated during the 2019 year a 35% increase compared to 2018.

Waste Rock Management

Quantities, placement locations and analysis of waste rock

Results of waste rock geochemical monitoring

Other than blast hole analyses, no additional geochemical monitoring was conducted on waste rock during the reporting period. Geochemical blast hole monitoring results are included within the Waste Rock Production Summary report listed in Appendix G of this report.

Visual monitoring of waste rock facilities

Weekly waste dump inspections were conducted on both inactive and active waste rock dumps with no adverse findings noted. Dig face inspections were carried out on waste shots to confirm waste characteristics and suitability for designated stockpile locations. All waste material was placed in suitable waste storage stockpiles. The primary waste storage sites have been the Main Pit Dump (MPD3, MPD4, and MPD5), Oxide Main Waste Dump (Cover Dump, Oxide Ore Stockpile, Copper Waste Dump and the landfill), and project construction areas (Incinerator Pad, Crusher Pad, MS15, and Portable Crusher Pad).

A total of 1,507,170 tonnes of waste rock were hauled from the Aqqaluk pit and a total of 520,914 tonnes of waste rock were hauled from Qanaiyaq pit.

Main Pit Dump Area

For the fourth quarter of 2019 a total of 1,824,865 tonnes of waste were hauled to the Main Pit dump area.

- 173 tonnes of Ikalukrok Most Reactive Waste were hauled to MPD3
- 860,743 tonnes of Ikalukrok, Siksikpuk, Okpikruak, Kivalina and Mixed Other Waste were hauled to MPD4
- 499,139 tonnes of Ikalukrok, Siksikpuk and Okpikruak Most Reactive Waste were hauled to MPD4
- 192,231 tonnes of Ikalukrok, Siksikpuk and Mixed Other Waste were hauled to MPD5
272,579 tonnes of Ikalukrok Most Reactive Waste were hauled to MPD5

Main Waste Dump Area

For the fourth quarter of 2019 a total of 192,459 tonnes were hauled to the Main Waste Dump Area.

- 54,365 tonnes of Ikalukrok Most Reactive Waste were hauled to the Oxide Stockpile (OXO).
- 20,023 tonnes of Ikalukrok Most Reactive Waste were hauled to the Copper Waste Dump (CWD).
- 1,000 tonnes of Ikalukrok Most Reactive Waste were hauled to the landfill (LAN).

Project Construction Areas: A-PAD, MS15, and Crusher Pad

For the fourth quarter of 2019 a total of 10,760 tonnes were hauled to project construction areas.

- 9,411 tonnes of Siksikpuk Construction Waste were hauled to the Incinerator Pad (INC).
- 880 tonnes of Siksikpuk Construction Waste were hauled to the Crusher Pad (CPAD).
- 395 tonnes of Ikalukrok Construction Waste were hauled to the Portable Crusher Pad (PCP).
- 74 tonnes of Ikalukrok Most Reactive Waste were hauled to MS15.

Cover Material at Main Waste Dump

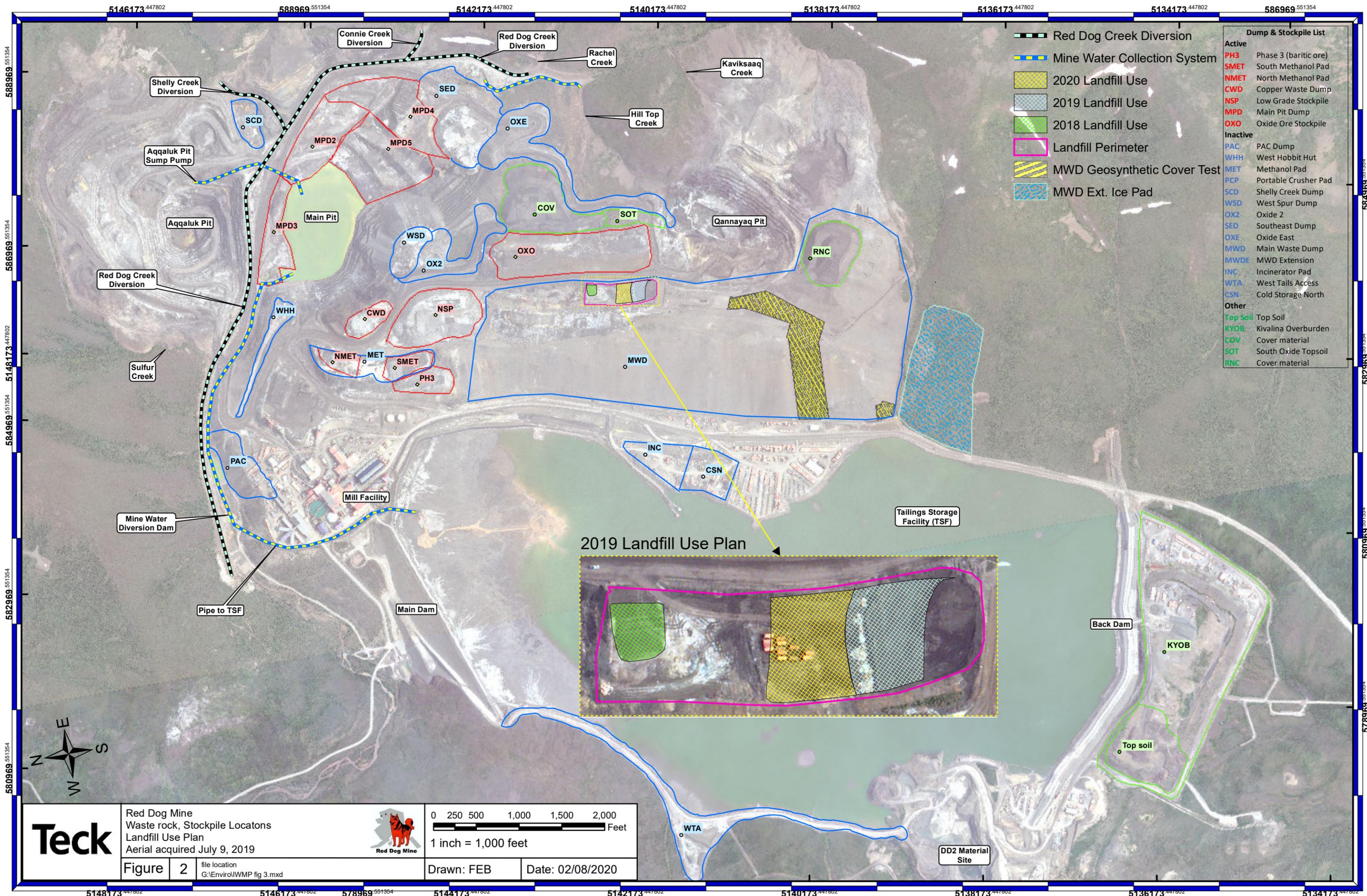
- 117,071 tonnes of Cover Material were hauled to the Cover Dump (COV). Appendix H includes a more detailed report for the 4th quarter reporting period. Table 2 lists amount of cover material stockpiled onsite.

Table 2 - Cover Material Amount

| Cover Stockpile Location | Tonnes Hauled per Month | | | Total Tonnes Report Period | Tonnes Collected |
|------------------------------|-------------------------|--------|-----|----------------------------|------------------|
| | Oct | Nov | Dec | | |
| Ramp to Nowhere (RNC) | 0 | 0 | 0 | 0 | 1,271,891 |
| North Oxide (COV) | 55,248 | 61,823 | 0 | 117,071 | 974,417 |
| South Oxide Top Soil (SOT) | 0 | 0 | 0 | 0 | 81,094 |
| Kivalina Overburden Top Soil | 0 | 0 | 0 | 0 | 70,913 |
| | | | | Total | 2,398,315 |
| | | | | Cover used | 48,400 |
| | | | | Total stockpiled | 2,349,915 |

Significant activities in waste rock management

A temporary Ice pad was constructed within the Main Waste Dump extension area during November. A preliminary waste rock dump design for the south MWD extension was submitted to RDO from Golder, this is currently being reviewed by RDO, once the review is completed the final design will be submitted to appropriate agencies for review.



- Red Dog Creek Diversion**
- Mine Water Collection System**
- 2020 Landfill Use**
- 2019 Landfill Use**
- 2018 Landfill Use**
- Landfill Perimeter**
- MWD Geosynthetic Cover Test**
- MWD Ext. Ice Pad**

| Dump & Stockpile List | |
|-----------------------|-----------------------|
| Active | |
| PH3 | Phase 3 (baritic ore) |
| SMET | South Methanol Pad |
| NMET | North Methanol Pad |
| CWD | Copper Waste Dump |
| NSP | Low Grade Stockpile |
| MPD | Main Pit Dump |
| OXO | Oxide Ore Stockpile |
| Inactive | |
| PAC | PAC Dump |
| WHH | West Hobbit Hut |
| MET | Methanol Pad |
| PCP | Portable Crusher Pad |
| SCD | Shelly Creek Dump |
| WSD | West Spur Dump |
| OX2 | Oxide 2 |
| SED | Southeast Dump |
| OXE | Oxide East |
| MWD | Main Waste Dump |
| MWDE | MWD Extension |
| INC | Incinerator Pad |
| WTA | West Tails Access |
| CSN | Cold Storage North |
| Other | |
| Top Soil | Top Soil |
| KYOB | Kivalina Overburden |
| COV | Cover material |
| SOT | South Oxide Topsoil |
| RNC | Cover material |



Red Dog Mine
Waste rock, Stockpile Locations
Landfill Use Plan
Aerial acquired July 9, 2019

0 250 500 1,000 1,500 2,000
Feet

1 inch = 1,000 feet

Figure 2

file location
G:\Envirol\WMP fig 3.mxd

Drawn: FEB

Date: 02/08/2020

5148173 5146173 578969 5144173 5142173 5140173 5138173 5136173 5134173

Quantities and analysis of tailings

Table 3 depicts the dry tonnes of tailings generated and the average lead, zinc and iron concentrations in the tailings solids for the 4th quarter and summation and average concentrations for the 2019 report year.

Table 3 - Tailings Generated

| Month | Dry Tonnes Tailings | Analysis | | |
|------------------------|---------------------|------------|------------|------------|
| | | % Pb | % Zn | % Fe |
| Oct | 229,947 | 1.7 | 2.6 | 7.0 |
| Nov | 247,592 | 1.2 | 2.9 | 5.9 |
| Dec | 238,644 | 2.5 | 2.8 | 6.4 |
| Annual sum/avg. | 3,058,193 | 1.7 | 2.6 | 6.8 |

Tailings Storage Facility and Main Pit Dump water elevation

Table 4 depicts the surveyed Tailings Storage Facility and Main Pit water levels during the reporting period. The current dam permits allow for a crest elevation of 986 feet amsl or 981 amsl freeboard. The Tailings Storage Facility water level for the 4th quarter was maintained below the freeboard limit. The Main Pit Dump was maintained below an elevation of 850 feet amsl.

Table 4 - Tailings Storage Facility and Main Pit Water Elevations

| Tailings Storage Facility Elevation | | | Main Pit Dump | | |
|-------------------------------------|-----------|-------------------------|---------------|-----------|--|
| Date | Elevation | Comment | Date | Elevation | Comment |
| 10/3/2019 | 978.49 | Weekly water | 10/3/2019 | 838.83 | Weekly water |
| 10/8/2019 | 978.78 | Weekly water | 10/8/2019 | 839.09 | Weekly water |
| 10/16/2019 | 978.90 | Weekly water | 10/16/2019 | 838.21 | Weekly water |
| 10/23/2019 | 979.19 | Weekly water | 10/23/2019 | 838.54 | Weekly Water |
| 10/30/2019 | 979.74 | 27* snow and wind 15-20 | 10/30/2019 | 839.46 | 27* snow windy 15-20 |
| 11/5/2019 | 979.90 | 10* sunny lt wind | 11/5/2019 | 838.80 | 10* sunny, lt wind |
| 11/12/2019 | 980.06 | Weekly | 11/12/2019 | 837.90 | Weekly |
| 11/20/2019 | 980.19 | Weekly | 11/20/2019 | 837.56 | Weekly. Top of ice. May not be representative. |
| 11/29/2019 | 980.54 | weekly h2o | 11/29/2019 | 838.49 | weekly h2o |
| 11/30/2019 | 980.39 | requested check | 11/30/2019 | 836.67 | requested check |
| 12/1/2019 | 980.42 | Requested observation | 12/1/2019 | 838.83 | Requested observation |
| 12/2/2019 | 980.39 | requested check | 12/3/2019 | 838.91 | weekly h2o |
| 12/3/2019 | 980.41 | weekly h2o | 12/2/2019 | 838.97 | requested check |
| 12/5/2019 | 980.44 | requested observation | 12/5/2019 | 839.11 | requested observation |

| | | | | | |
|------------|--------|-------------------------|------------|--------|-------------------------|
| 12/6/2019 | 980.45 | requested observation | 12/6/2019 | 839.08 | requested observation |
| 12/10/2019 | 980.51 | weekly h2o | 12/10/2019 | 839.25 | weekly h2o |
| 12/11/2019 | 980.56 | Daily Monitor | 12/11/2019 | 839.29 | Daily Monitor |
| 12/12/2019 | 980.57 | Daily Monitor | 12/12/2019 | 839.35 | Daily Monitor |
| 12/13/2019 | 980.54 | Daily Monitor | 12/13/2019 | 839.41 | Daily Monitor |
| 12/14/2019 | 980.60 | H2O @ 1:30 PM | 12/14/2019 | 839.45 | H2O @ 2:20 PM |
| 12/15/2019 | 980.58 | H2O @ 10:50 AM | 12/15/2019 | 839.47 | H2O @ 11:30 AM |
| 12/16/2019 | 980.59 | H2O @ 3:20 PM | 12/16/2019 | 839.51 | H2O @ 2:50 PM |
| 12/17/2019 | 980.59 | H2O @ 12:00PM | 12/17/2019 | 839.58 | H2O @ 4:15 PM |
| 12/18/2019 | 980.60 | H2O @ 11:45 PM | 12/18/2019 | 839.59 | H2O @ 3:45 PM |
| 12/19/2019 | 980.58 | H2O @ 8:45 AM | 12/19/2019 | 839.62 | H2O @ 9:20 am |
| 12/20/2019 | 980.60 | 11* It East wind 3:00pm | 12/20/2019 | 839.73 | 11* It East wind 2:00pm |
| 12/21/2019 | 980.60 | 3* It wind It snow | 12/21/2019 | 839.78 | 3* It wind It snow |
| 12/22/2019 | 980.61 | Daily | 12/22/2019 | 839.84 | Daily |
| 12/23/2019 | 980.61 | Daily | 12/23/2019 | 839.82 | Daily |
| 12/24/2019 | 980.62 | -10* 10mph NE wind | 12/24/2019 | 839.75 | -10* 10mph NE wind |
| 12/25/2019 | 980.61 | -17* 10mph NE wind | 12/25/2019 | 839.81 | -17* 10mph NE wind |
| 12/27/2019 | 980.60 | | 12/27/2019 | 839.64 | |
| 12/28/2019 | 980.63 | | 12/28/2019 | 839.71 | |
| 12/29/2019 | 980.60 | | 12/29/2019 | 839.55 | |
| 12/31/2019 | 980.37 | | | | |

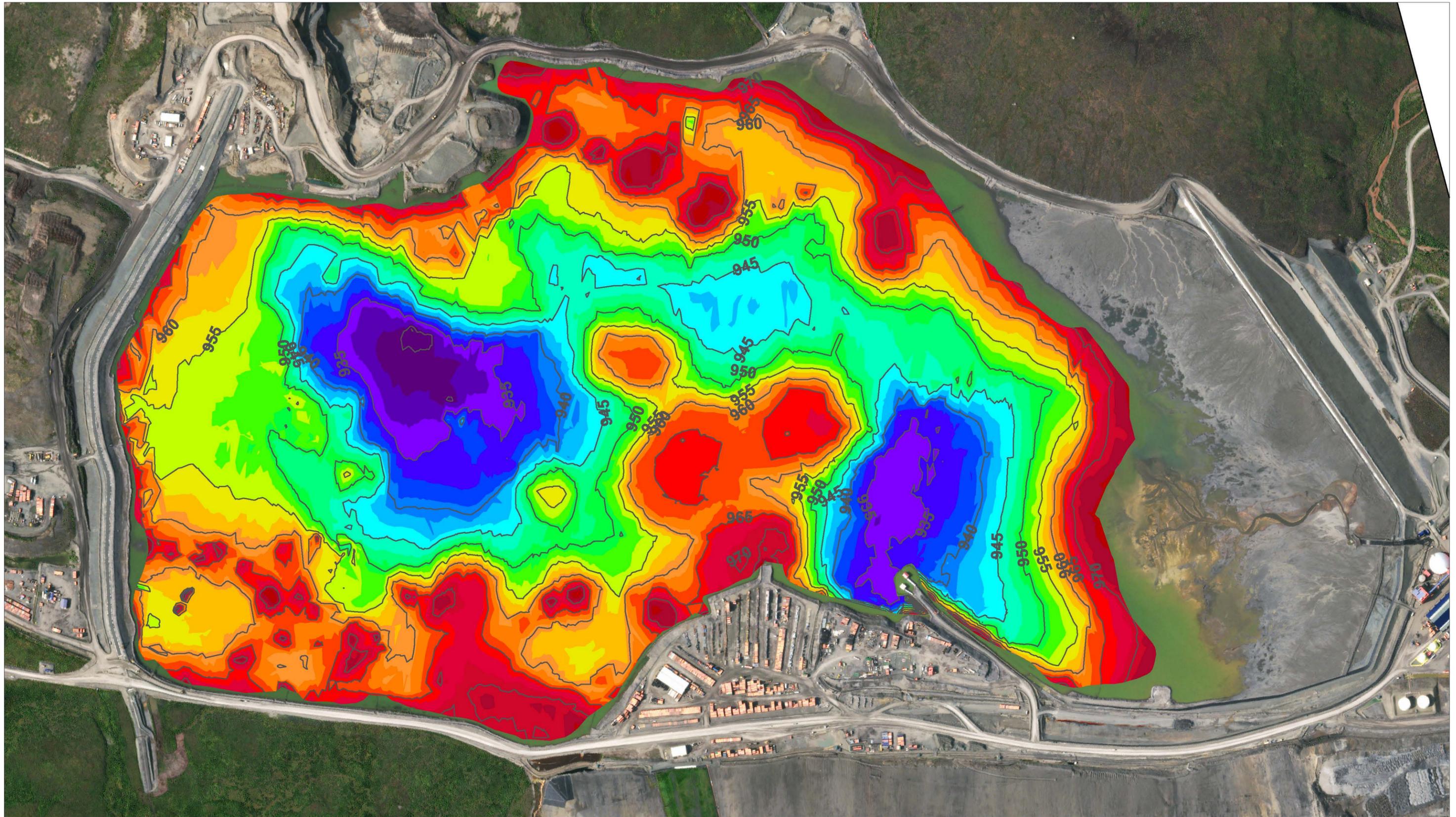
Visual monitoring of tailings facilities

Visual monitoring inspections of the Tailings Storage Facility were completed as required. All systems operated as designed with no findings noted for the quarter. Monitoring of the dams per the requirements specified in each dams Operation and Maintenance Manuals was completed with no significant findings noted for the quarter.

Significant activities in tailings management

Tailings were deposited several areas of the Tailings Storage Facility during the 4th quarter, mainly along the northwest portions of the Tailings Storage Facility.

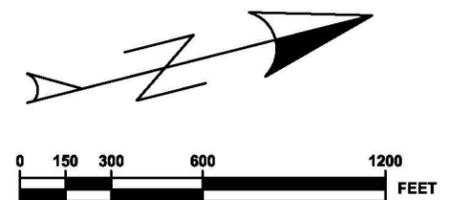
Bathymetry surveys were completed on August 21st and 23rd, 2019 for the Tailings Storage Facility and the Main Pit. A bathymetry map for each area was generated and depicted in Figures 3 and 4.

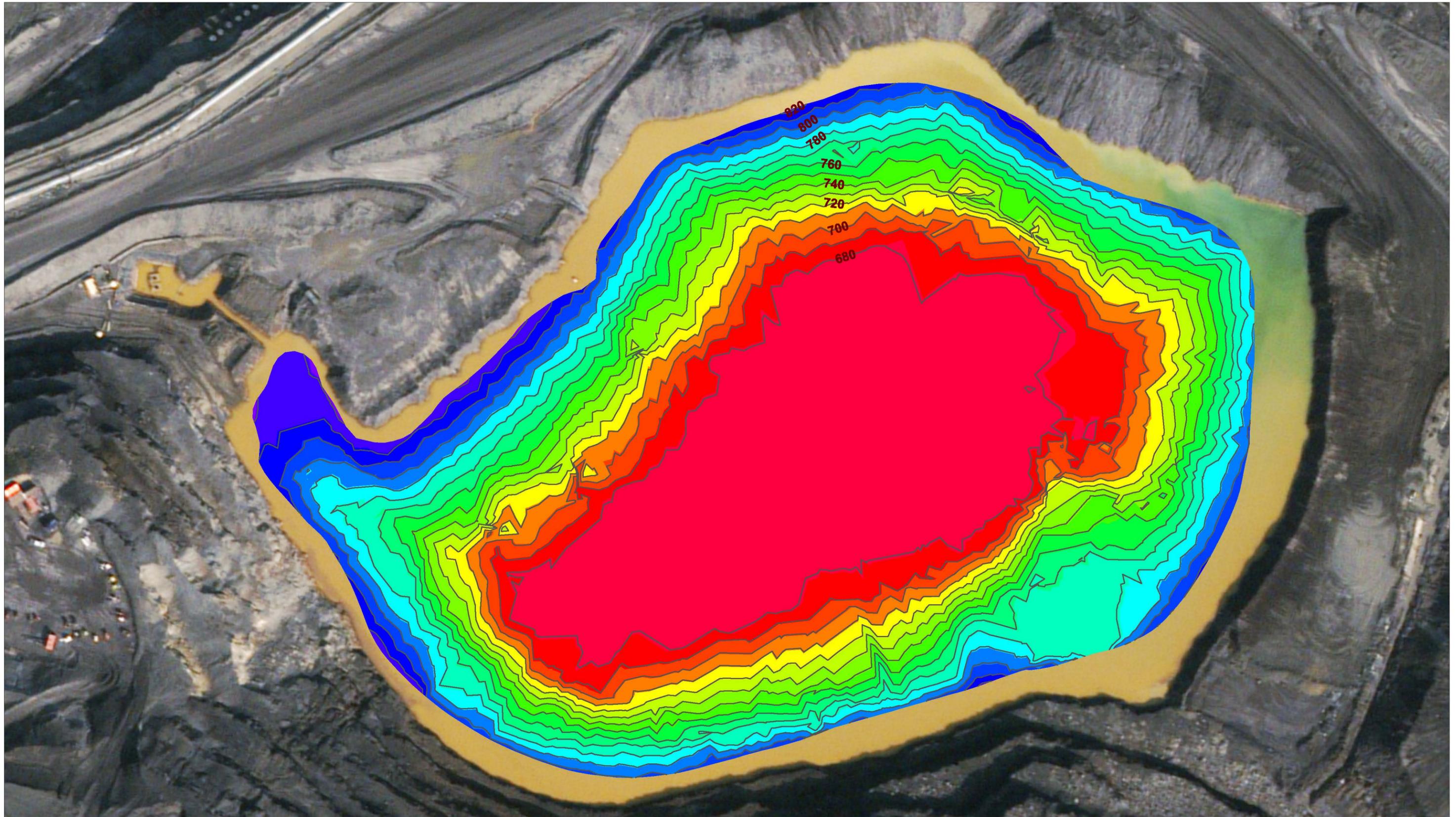


Red Dog / **Teck**

2019 Tailings Storage Facility Bathymetry Map

Bathymetry Date: 8/21/2019
Imagery Date: 8/17/2019
TSF Water Elevation: 976.17 ft
Free Water Volume: 3,380 MGal

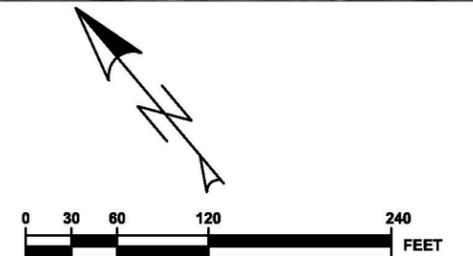




Red Dog / **Teck**

2019 Main Pit Water Reservoir Bathymetry Map

Bathymetry Date: 8/23/2019
Imagery Date: 8/17/2019
MPWR Water Elevation: 838.31 ft
Free Water Volume: 687 MGal



Class III Municipal Solid Waste Landfill

Visual inspections were conducted at the landfill and random inspections conducted on bins of refuse waste prior to being hauled to the landfill. No incidents were reported during the 4th quarter.

The annual mine incinerator composite (3-week) ash sample was collected on September 9th and analyzed for metals using EPA 1311 Toxicity Characteristics Leaching Procedure (TCLP), 6010C, 7470A and ASTM D2974 methods. The results were all below RCRA levels. A copy of the analytical lab report was submitted to Neil Lehner with ADEC.

Quantities of inert solid waste for the reporting year

The Red Dog survey department performed a LiDAR scan of the landfill on October 10th, 2019 and calculated a total volume of 28,412 cubic yards (13,164 cubic yards of waste rock used as cover) placed for the period from September 2018 through to October 2019. Approximately 13,164 cubic yards of refuse was placed in the landfill during the 2019 year.

Figure 5 – 2019 Landfill LiDAR image depicts the difference between the operating years 2019 and 2018. The 2019 surface is colored brown. The difference in volumes was taken as a volumetric calculation between surfaces utilizing MineSight.

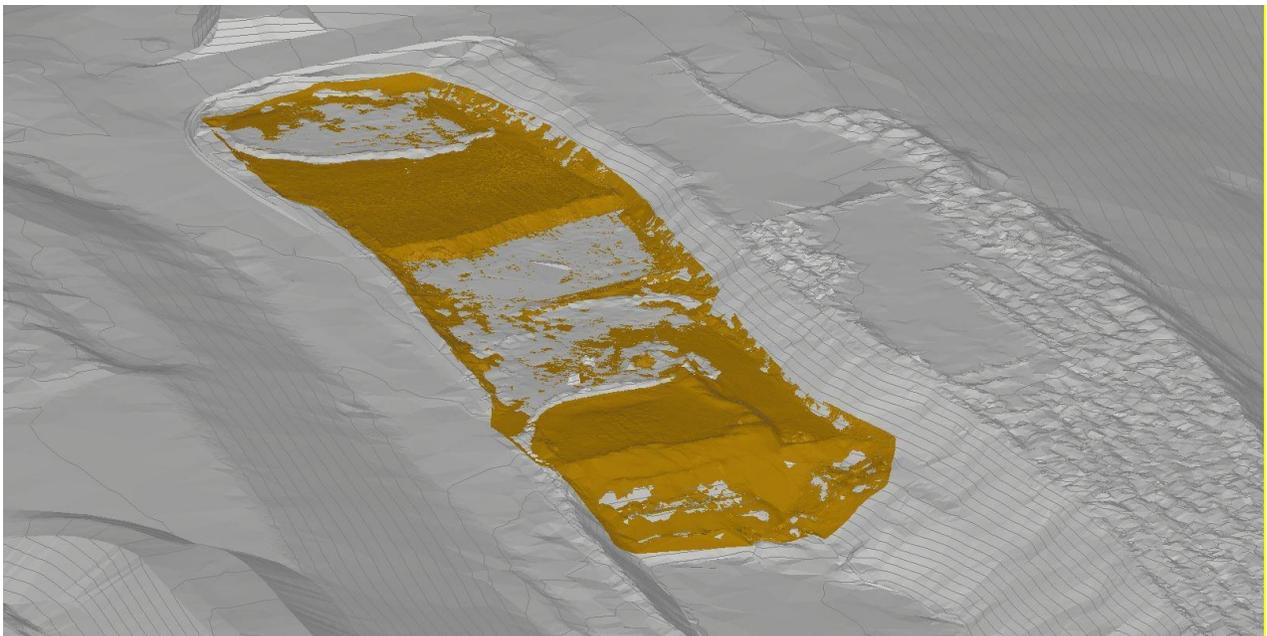


Figure 5 - 2019 Landfill LiDAR image

Significant activities in solid waste landfill and waste management

Red Dog Operations continued with many improvements to the recycling program for the 2019 year. Opportunities to enhance recyclables will continue into 2020. For the 2019 reporting year the following solid waste amounts were sent offsite for recycling:

- Recycled 354,000 lbs. of cardboard, plastic and paper
- Recycled 838,000 lbs. of scrap steel and copper
- Recycled 194,000 lbs. of used tires
- Recycled 10,000 lbs. of electronic waste
- Recycled 792,000 lbs. of used mantles and Sag liners

Landfill Use Plan

For the 2020 year, refuse will continue to be placed within the existing cell with placement progressing to the north. Figure 2 provides a Landfill Use Plan Map which depicts the areas of use for 2018, 2019 and plans for 2020.

Mining and Milling Activities aerial

Mining quantities

Table 5 lists the tonnes of ore hauled to the mill stockpile each month during the reporting period and also provides a total amount produced for the 2019 year. This does not include marginal ore which was placed within the Marginal Ore Stockpile.

Table 5 - Ore Mined

| Date | Ore Mined, tonnes |
|---------------|-------------------|
| Oct | 289,215 |
| Nov | 282,619 |
| Dec | 346,484 |
| Annual | 3,871,111 |

Milling Quantities

Table 6 lists the tonnes of ore processed through the mill facilities each month during the reporting period and summation for the reporting year.

Table 6 - Ore Processed through Mill

| Date | Ore Milled, tonnes |
|---------------|--------------------|
| Oct | 325,629 |
| Nov | 348,262 |
| Dec | 329,681 |
| Annual | 4,256,208 |

Significant activities in mining and milling

There were no significant activities in mining and milling during the quarter.

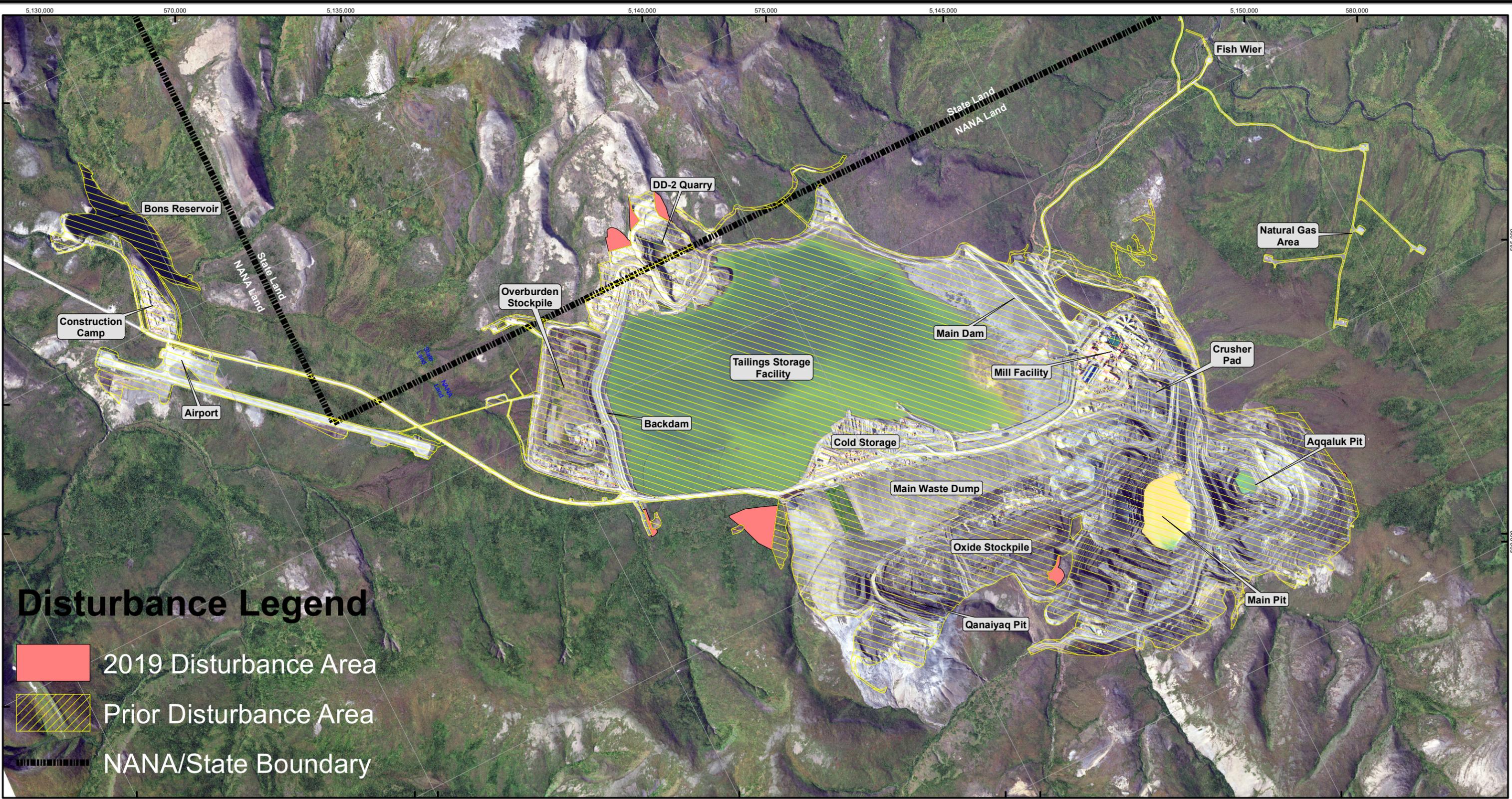
Reclamation

Reclamation Activities

A map of the new land disturbance occurring for the mine site during the 2019 reporting year is shown in Figure 6 – Red Dog Operations 2019 Land Disturbance Map. Table 7 depicts new disturbed acreage for 2019. No areas were reclaimed during the reporting period. Top soil recovered from newly disturbed areas was stockpiled for future use.

Table 7 - Area Disturbed in 2019

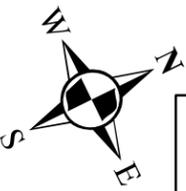
| 2019 New Disturbance Area | Acres |
|---------------------------|-------|
| Ice Buildup south of MWD | 9.7 |
| Back dam clearing | 0.8 |
| Cover dump expansion | 1.8 |
| DD2 and Pad expansion | 6.1 |
| Total | 18.4 |



Disturbance Legend

- 2019 Disturbance Area
- Prior Disturbance Area
- NANA/State Boundary

| ITEM | 2019 ACRES | CHANGE | COMMENTS |
|------------------------------------|----------------|-------------|--|
| 2018 Total | 2048.0 | 0.0 | Total from 2018 |
| 2019 Glacier Making MWD Ext | 9.7 | 9.7 | Glacier making disturbance for water balance |
| 2019 Backdam Clearing | 0.8 | 0.8 | Expanding backdam east ramp |
| Cover dump expansion | 1.8 | 1.8 | Expanded cover dump |
| DD2 and Pad Expansion (State Land) | 6.1 | 6.1 | Expanded pad for crusher and DD2 pit limits |
| TOTAL | 2,066.4 | 18.4 | |



Red Dog Operations
2019 Land Disturbance Map
 Aerial acquired August 2019

file location
Y:\Minetech\Inter\MAPS\Land_Use\Drawings\disturbance\2019 Disturbance.mxd

Drawn: AMK

Date: 12/21/19

Reclamation Research

No research was conducted for the reporting year.

Reclamation Monitoring

No monitoring was completed for the reporting year.

Significant reclamation activities

No reclamation activities took place during the 2019 reporting year.

Dust**Dust monitoring activities**

Dust monitoring activities for the 2019 year will be presented in the 2019 Risk Management Plan (RMP) Annual Report which is expected to be submitted by the 3rd quarter of 2020. The annual RMP Report will be submitted as Appendix I in this report.

Wildlife**Wildlife interactions**

On Dec 9th 2019, incident 11571 - A Caribou darted out in front of truck near airport, PRC truck hit Caribou. Caribou was deceased. The Caribou was pulled off of the road and meat harvested and sent to the village of Noorvik.

Financial Assurance

TAK increased the reclamation bond for Reclamation Plan Approval (F20169958) by \$18,786,543 to account for inflation based on the Anchorage Consumer price Index (CPI). The total bond amount is \$588,075,736. The adequacy of the bond is sufficient for current operations and conditions.

2021 Renewal of the Waste Management Permit (WMP) and the Reclamation and Closure Plan (RCP)

Red Dog Mine expects to submit complete renewal applications for both the WMP and RCP by September 2020.

2020 Mine Plan

A 2020 Mine Plan is currently being updated to account for water flow changes within the mine site, the plan is expected to be finalized by the end of the 1st quarter. The mine plan will be submitted as Appendix J once it has been completed.

Closing

Please accept this report as required under the State of Alaska Waste Management Permit No. 2016DB0002 and Reclamation Plan Approval F20169958. If there are any questions, please contact Frank Bendrick at (907) 754-5138 or myself at (907) 754-5127.

Based on information and belief formed after reasonable inquiry, I certify that the statements and information in and attached to this document are true, accurate and complete.

Sincerely,
Teck Alaska Incorporated



Les Yesnik
General Manager

cc: Tim Pilon, ADEC, Fairbanks;
Emily Hart, ADNR, Juneau
Brent Martellaro, ADNR, Fairbanks
DNR.Water.Reports
Jim Vohden, ADNR
Audra Brase, ADF&G, Fairbanks
Neil Lehner, ADEC, Fairbanks
Lance Miller, NANA
Mike Gonzales, Red Dog Mine
Robert Napier, Red Dog Mine

Appendix A: Biomonitoring Report (pending 2nd quarter)

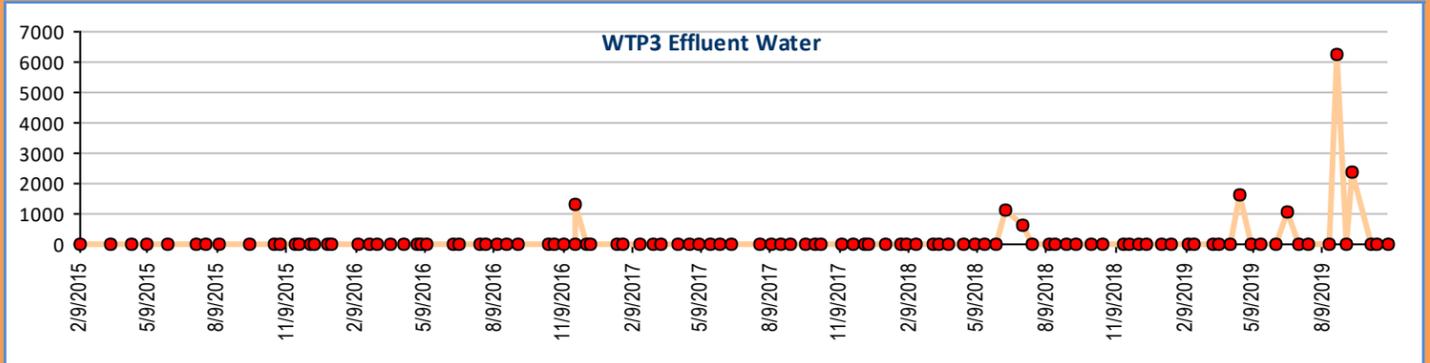
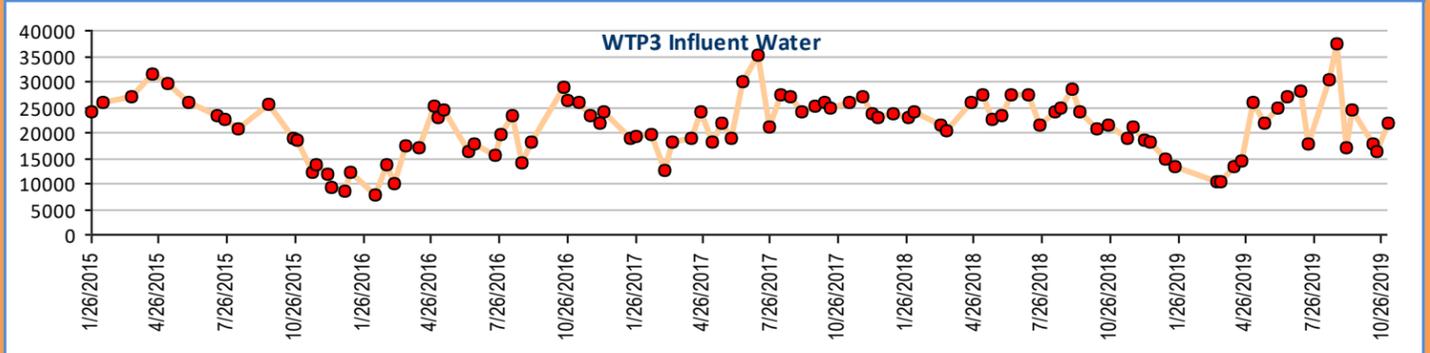
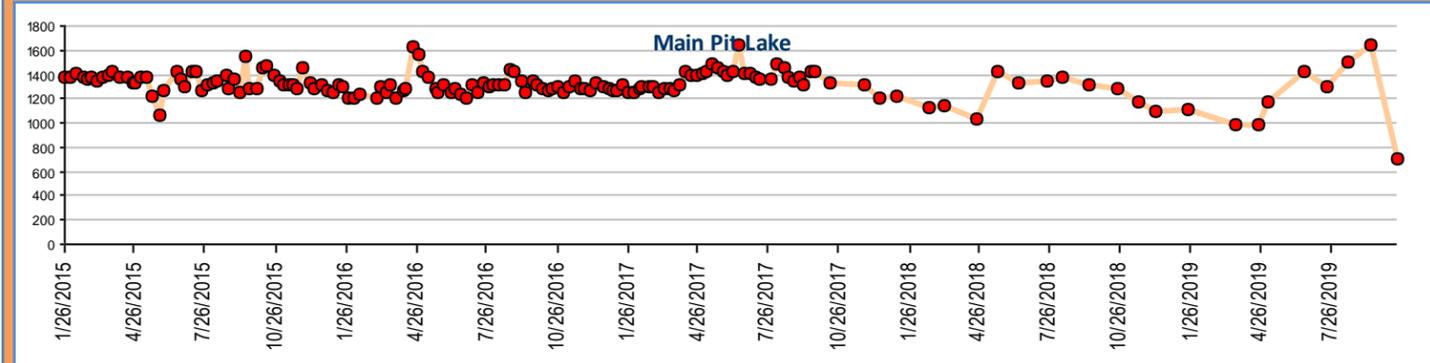
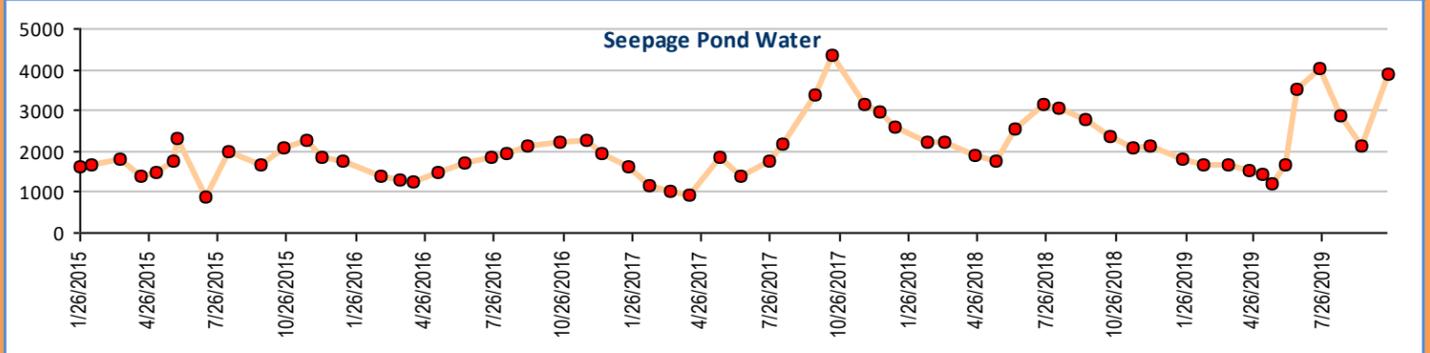
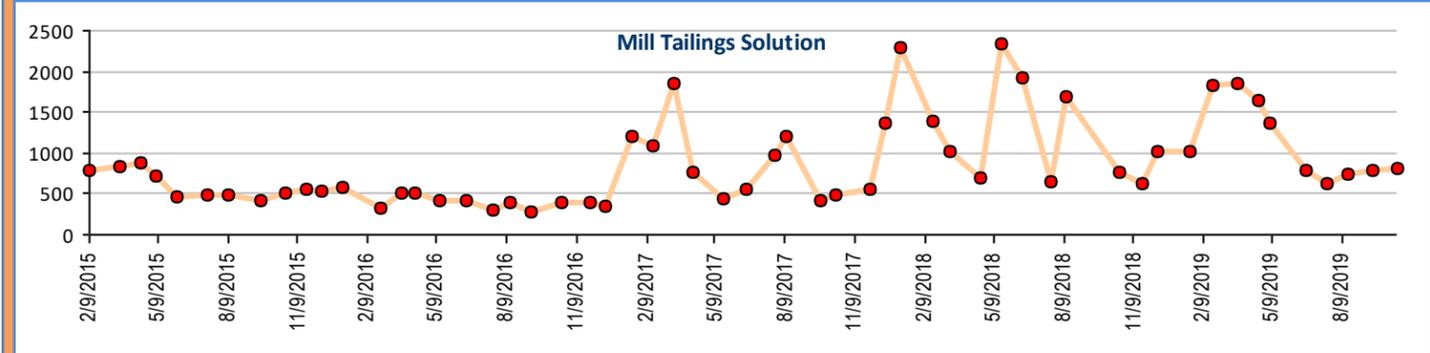
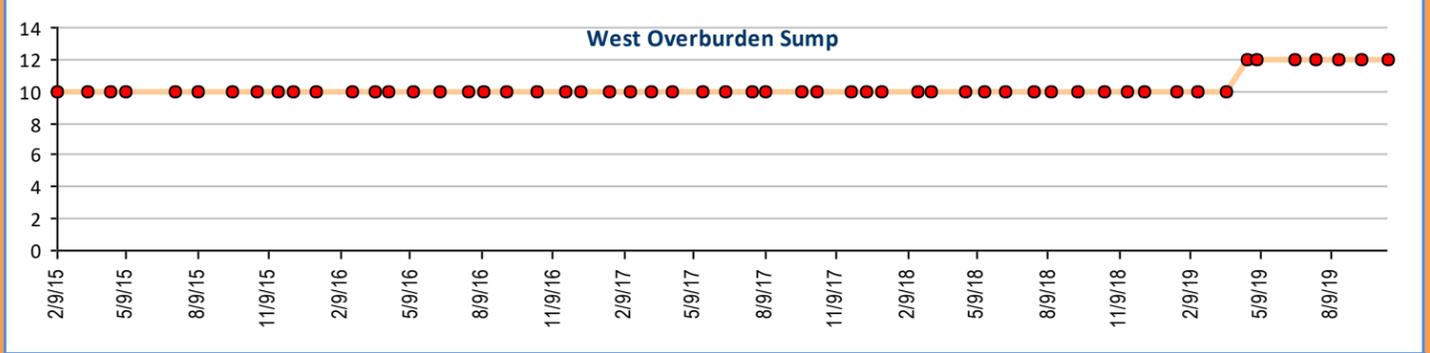
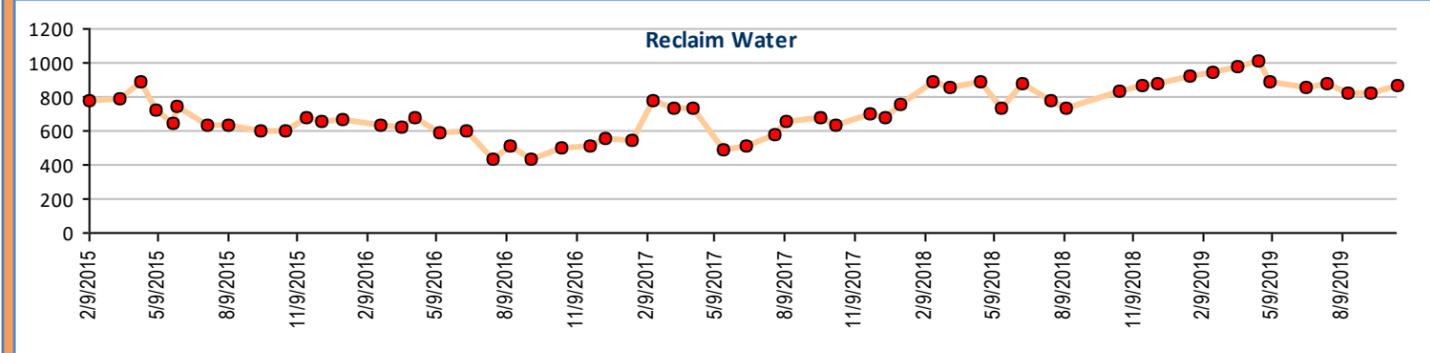
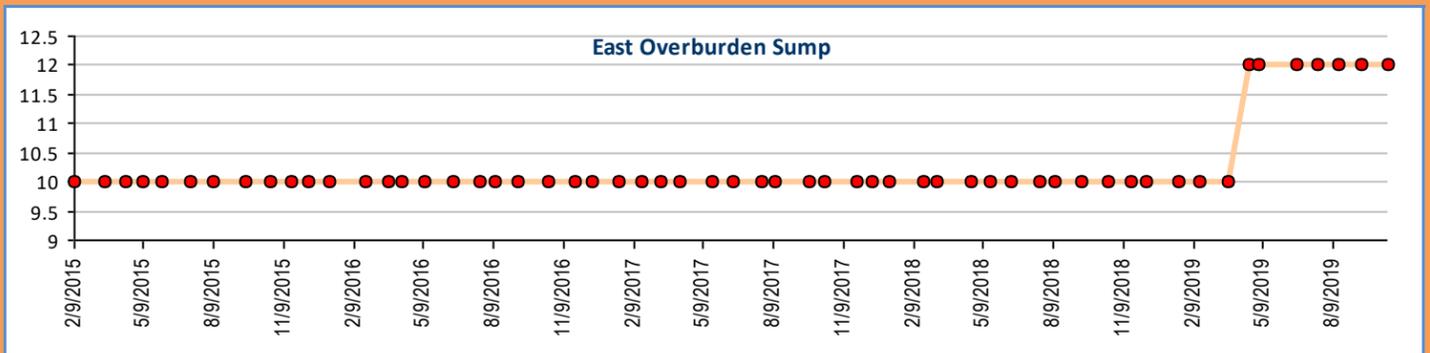
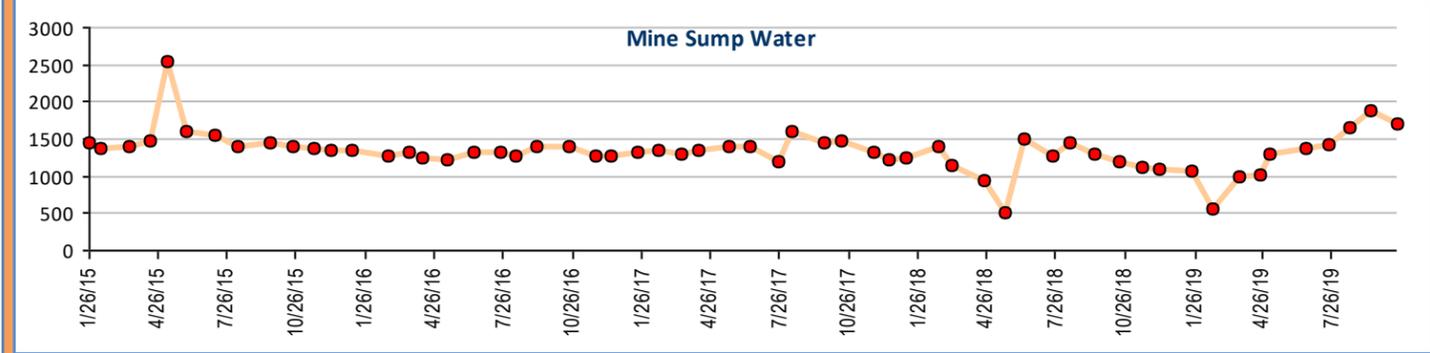
Appendix B: Long-Term Permafrost and Groundwater Monitoring (pending 1st or 2nd quarter)

Appendix C: Water Quality Profile II Charts – Mine Water Monitoring Stations



Mine Water Monitoring - Water Quality Profile II, Trend Charts

Acidity as CaCO₃, units mg/L

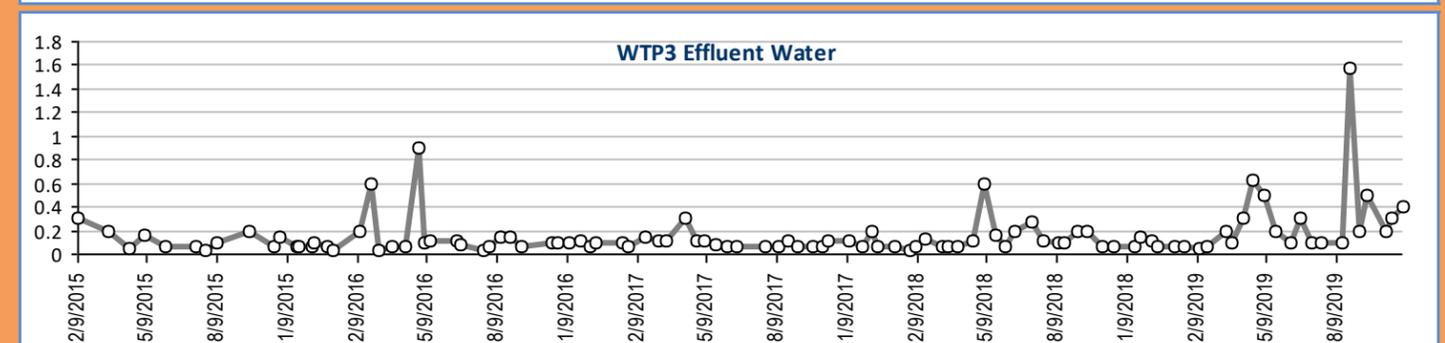
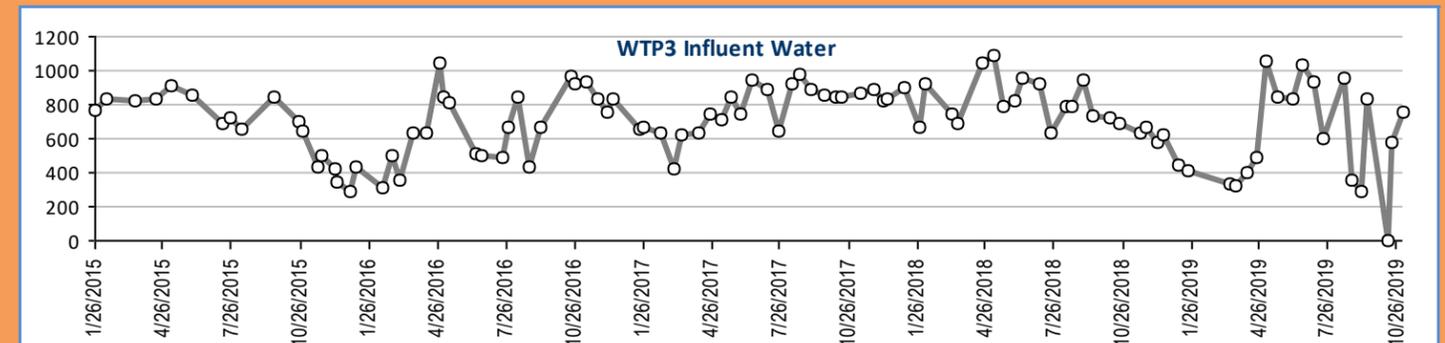
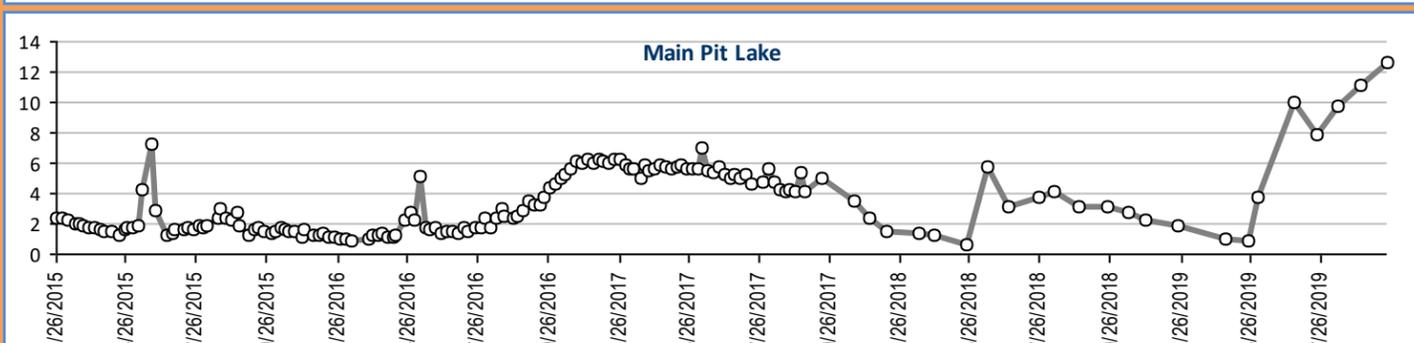
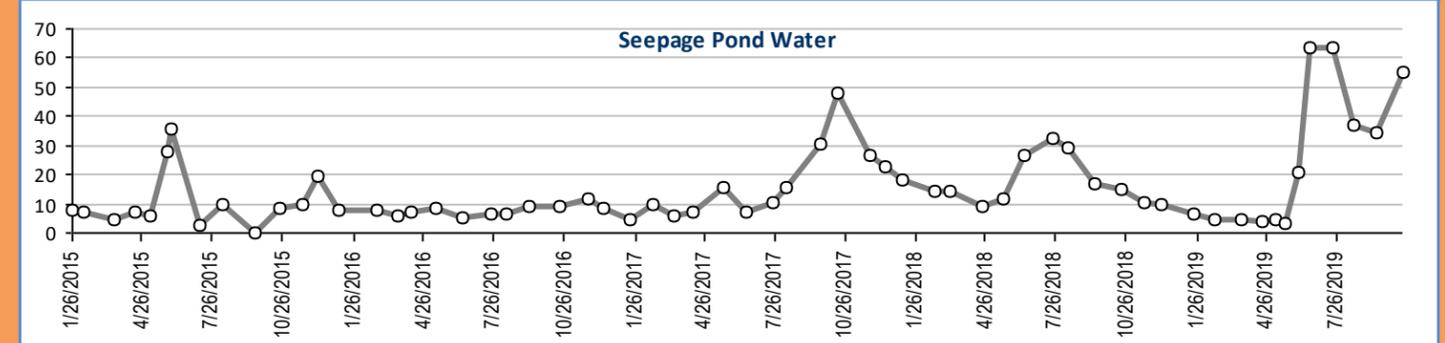
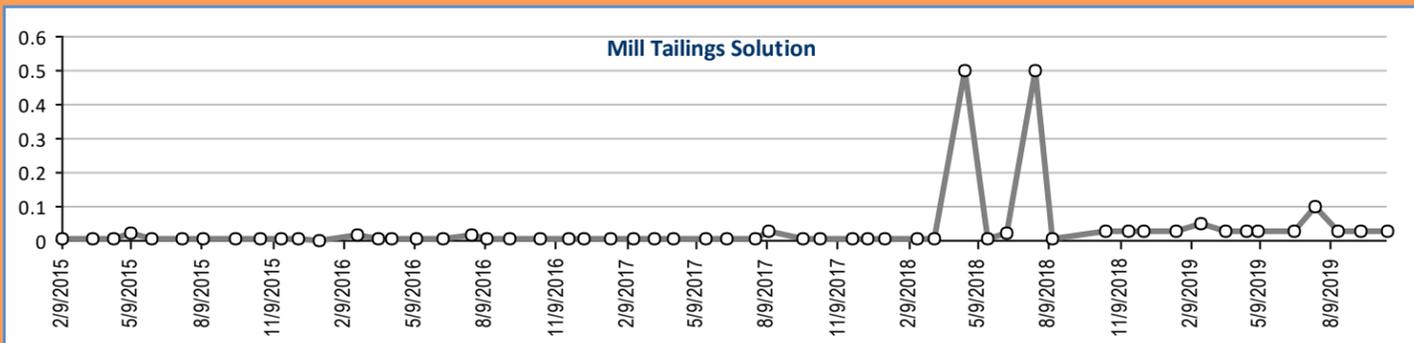
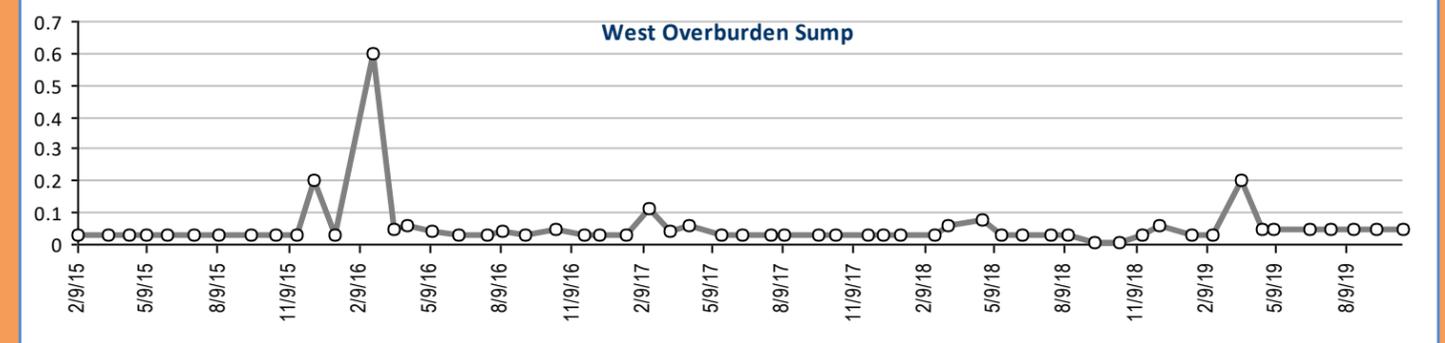
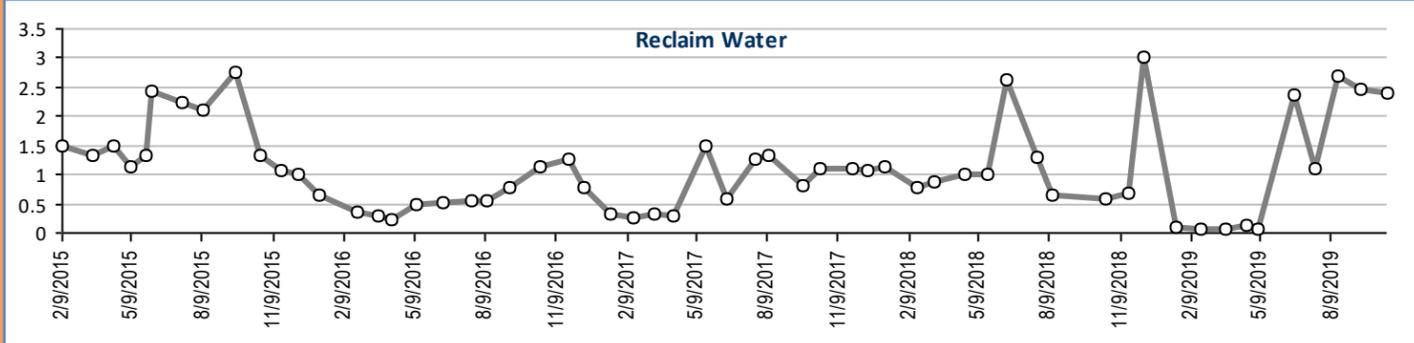
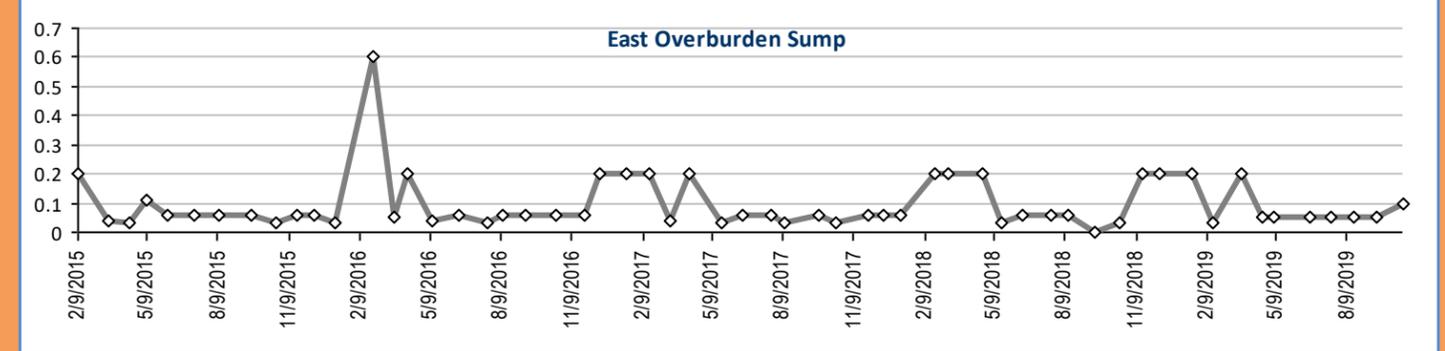
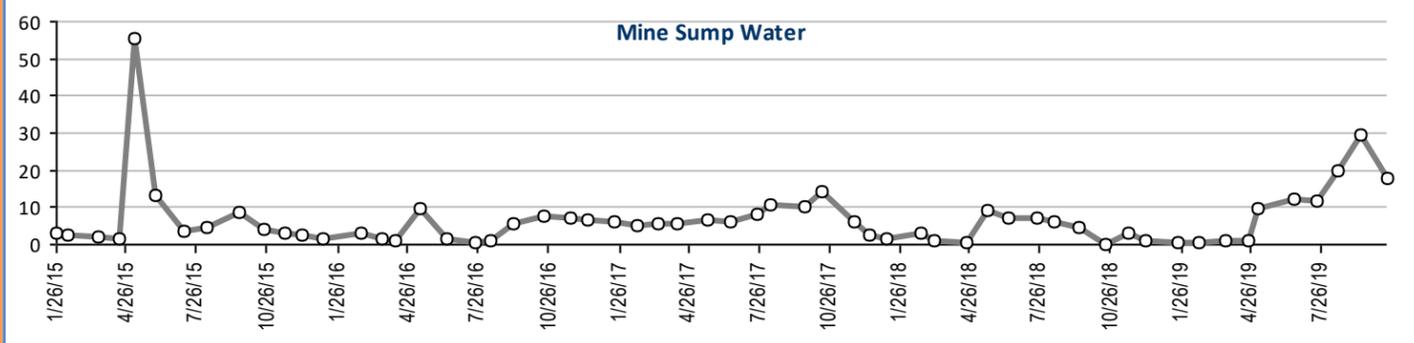




Mine Water Monitoring - Water Quality Profile II, Trend Charts

RED DOG MINE

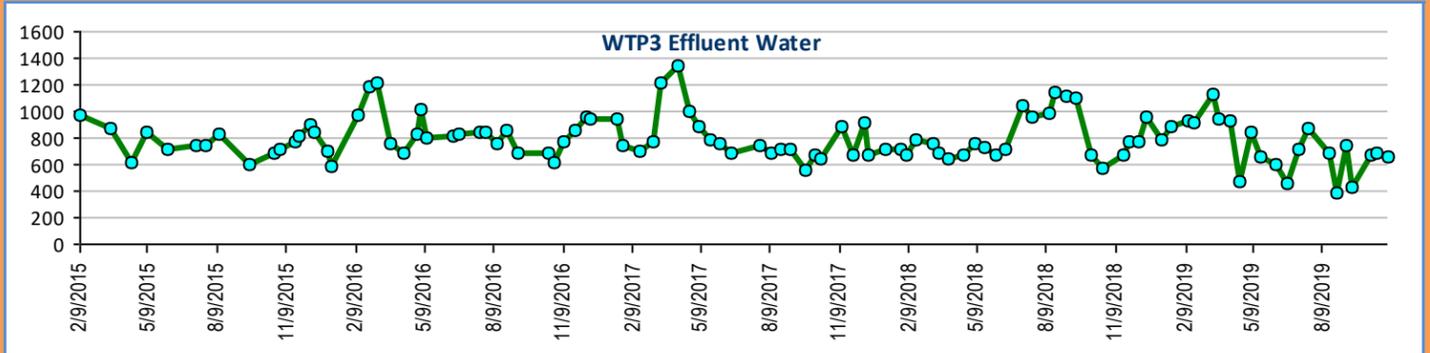
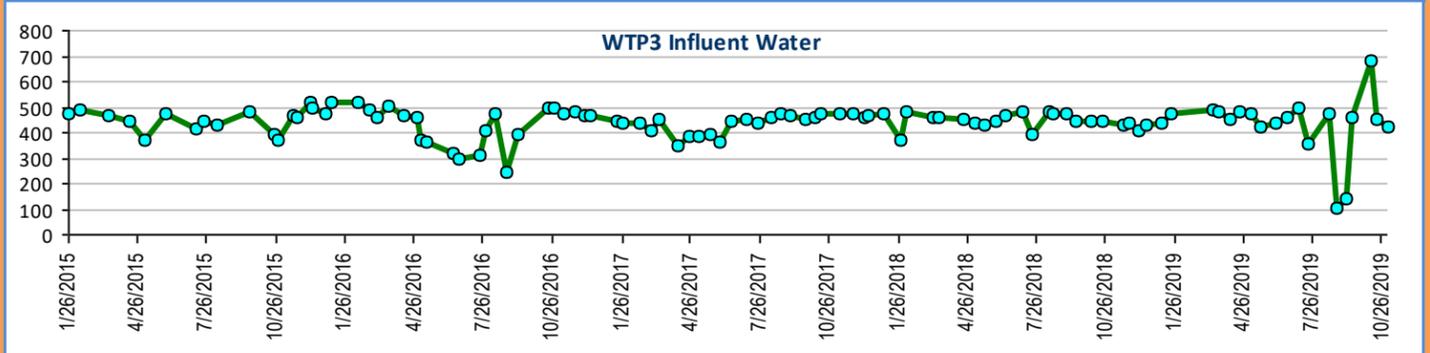
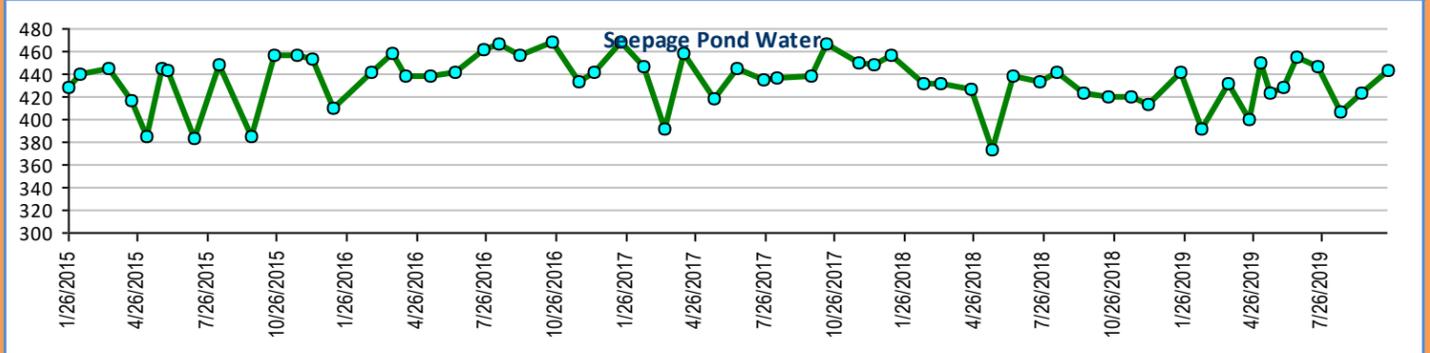
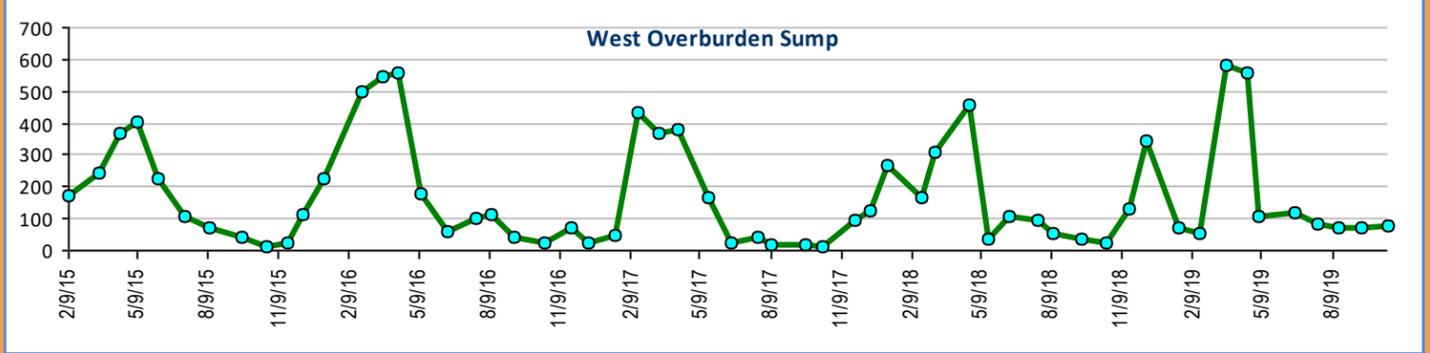
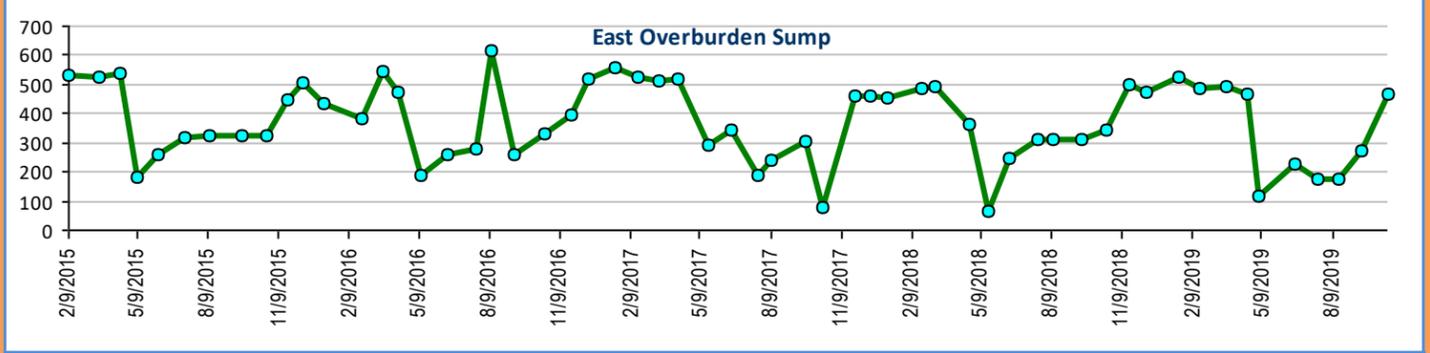
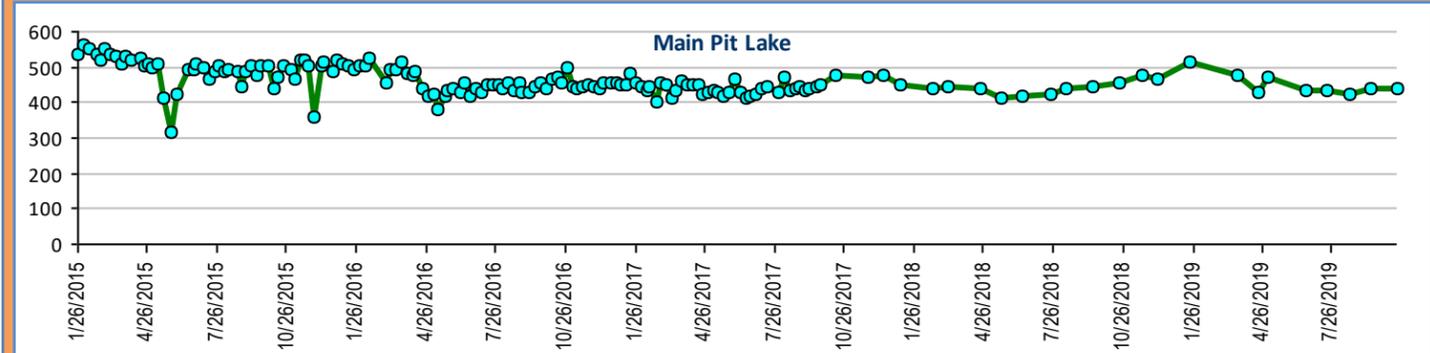
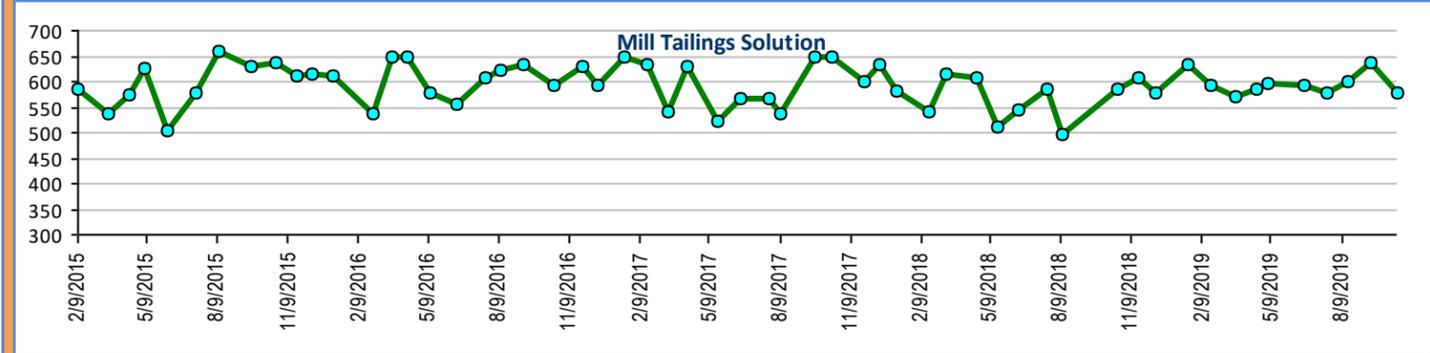
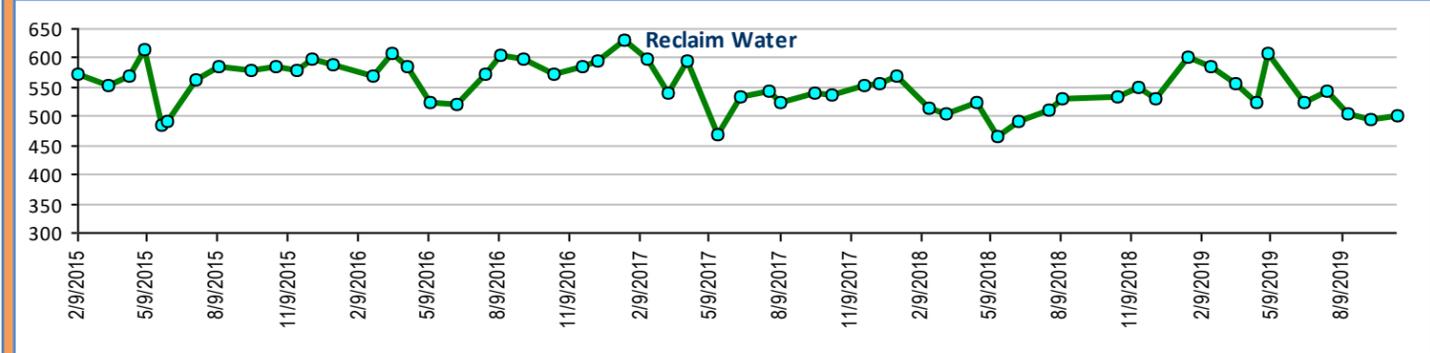
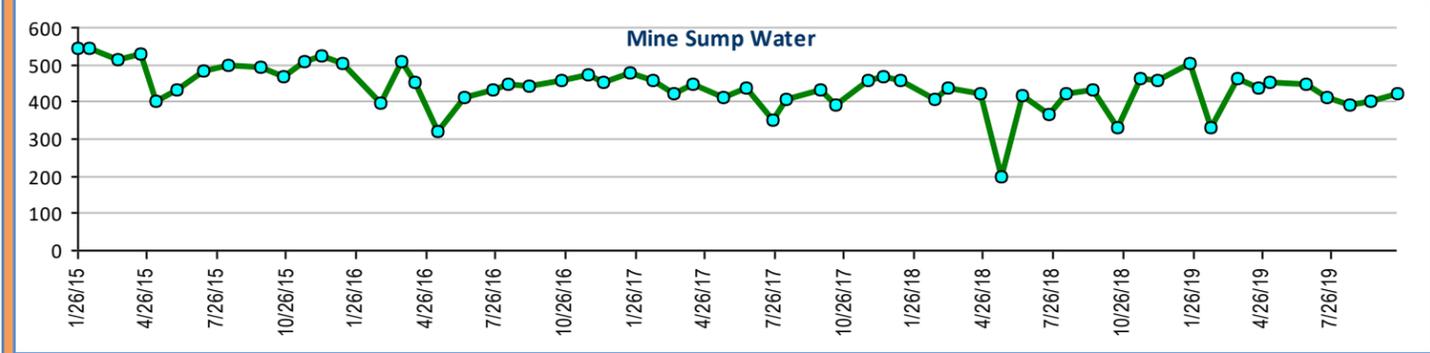
Aluminum, dissolved, units mg/L





Mine Water Monitoring - Water Quality Profile II, Trend Charts

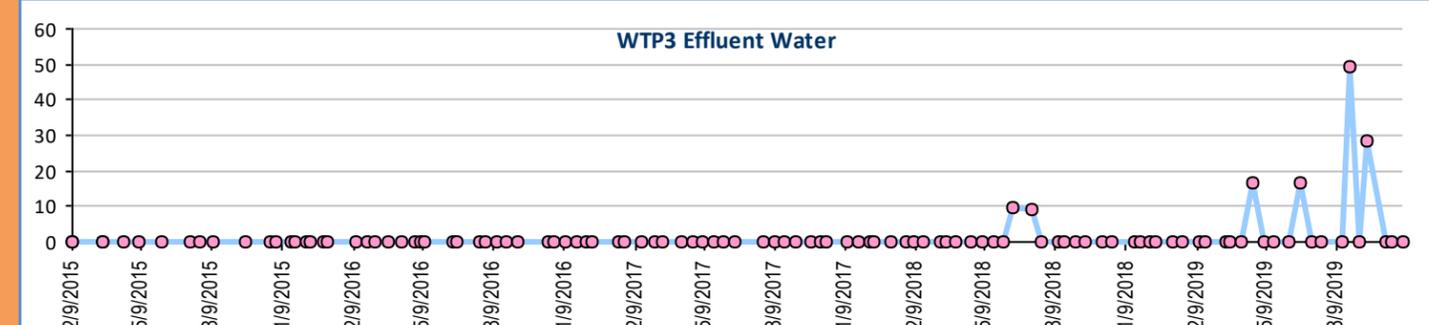
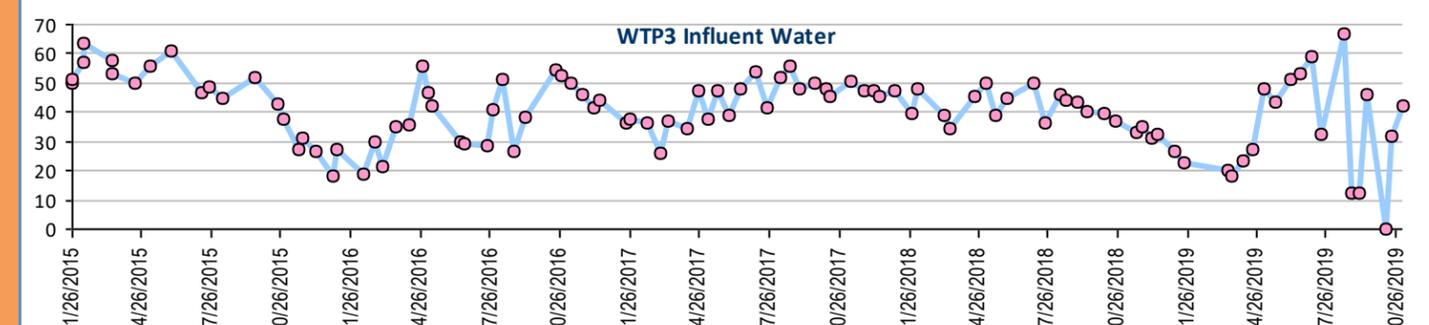
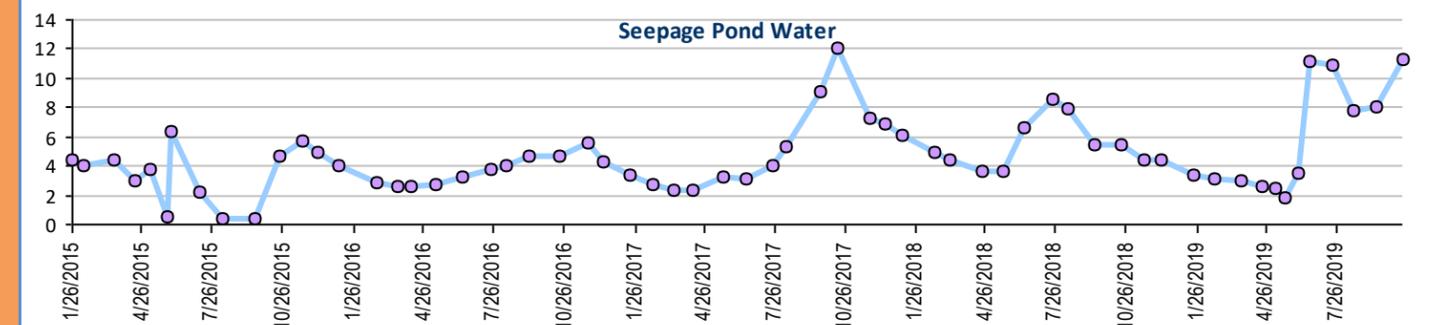
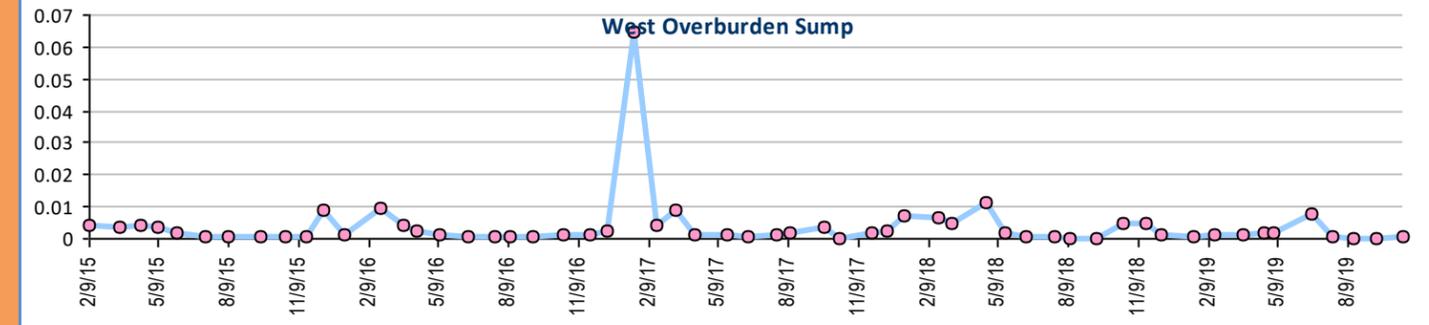
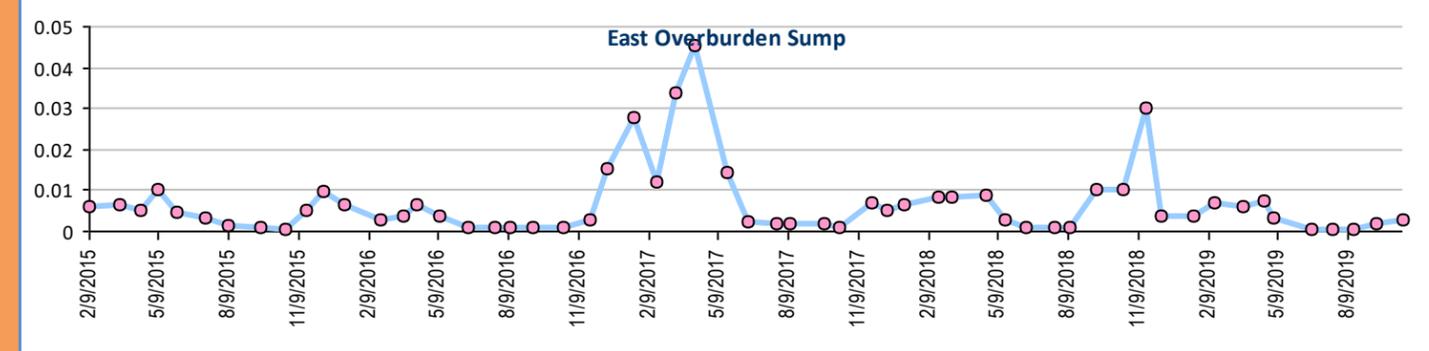
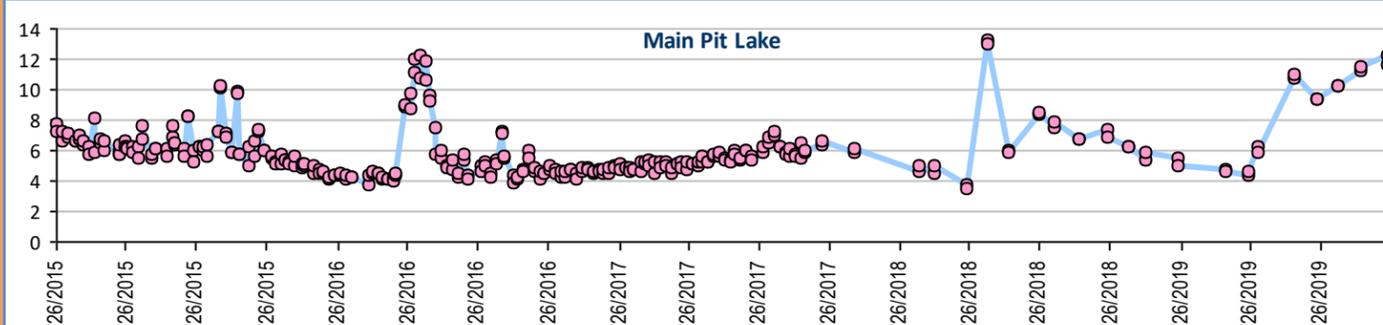
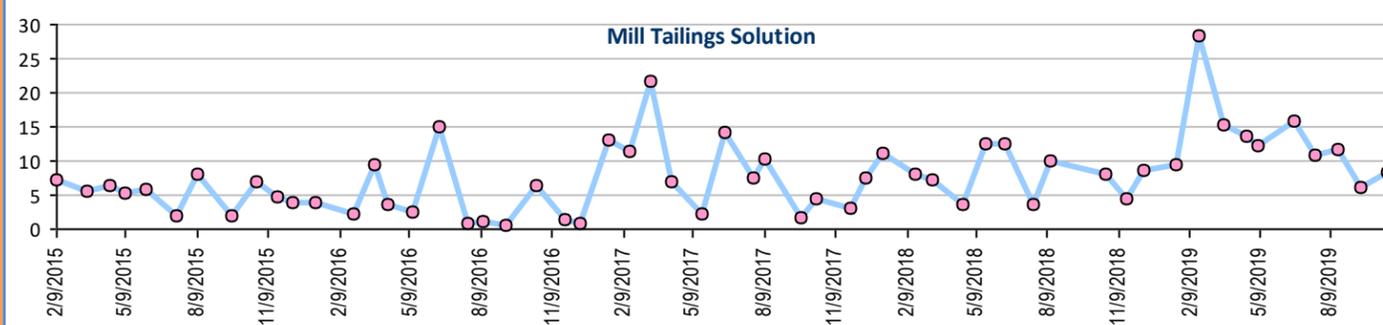
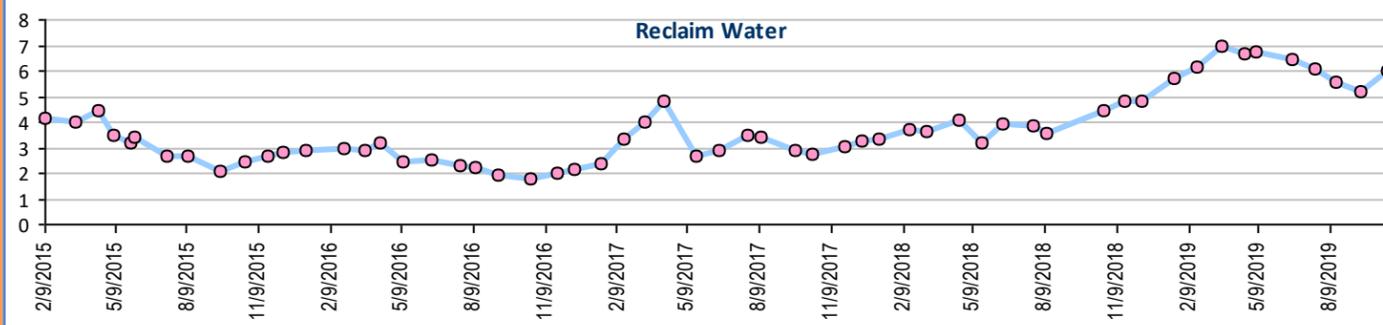
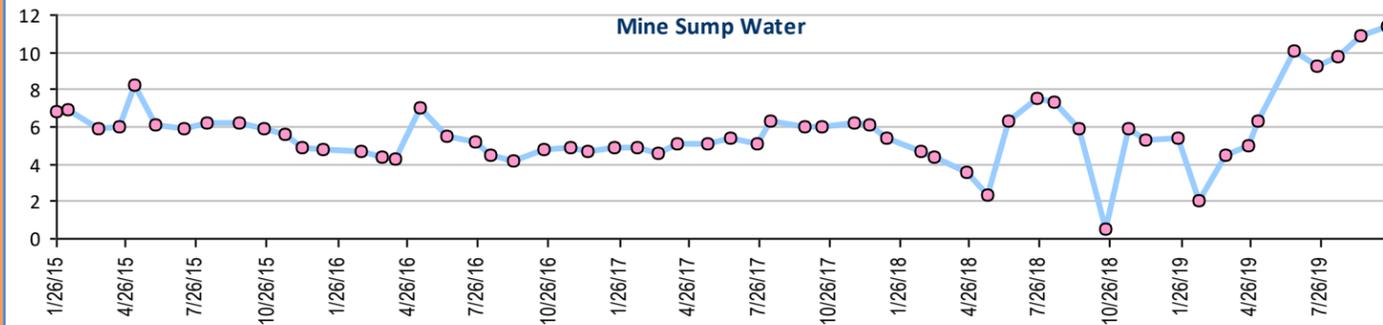
Calcium, dissolved, units mg/L





Mine Water Monitoring - Water Quality Profile II, Trend Charts

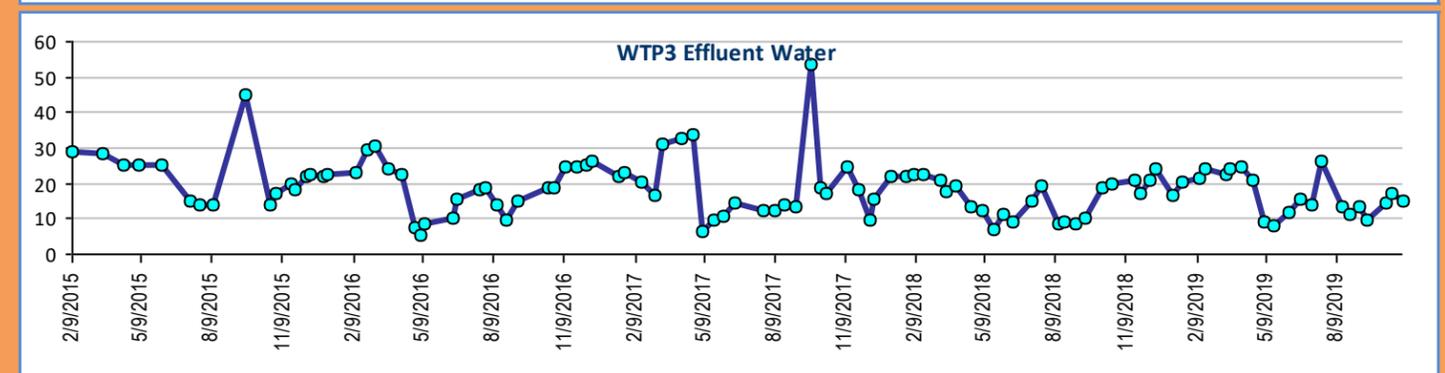
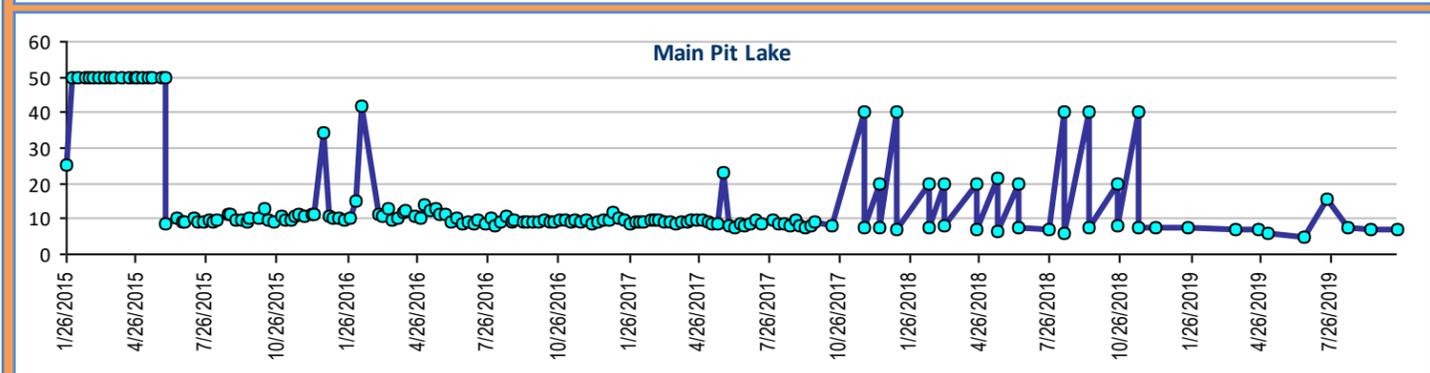
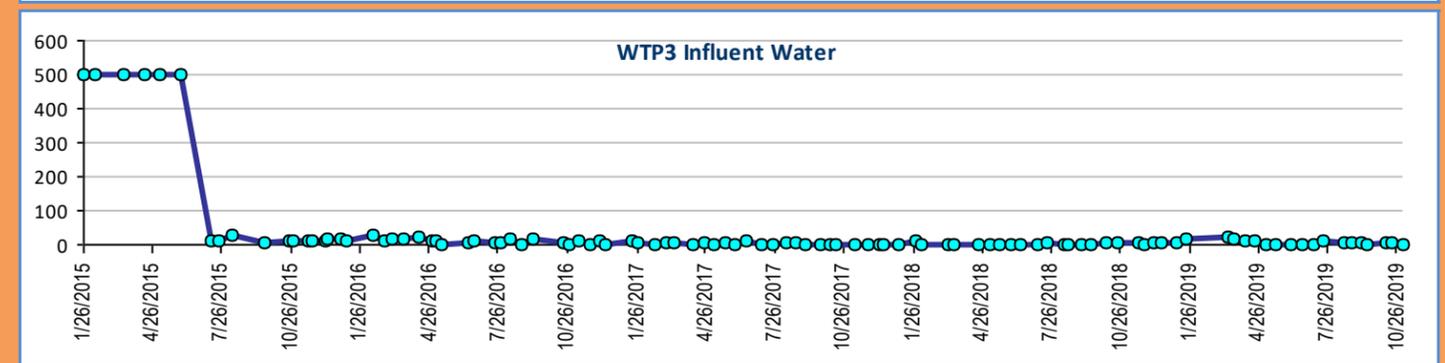
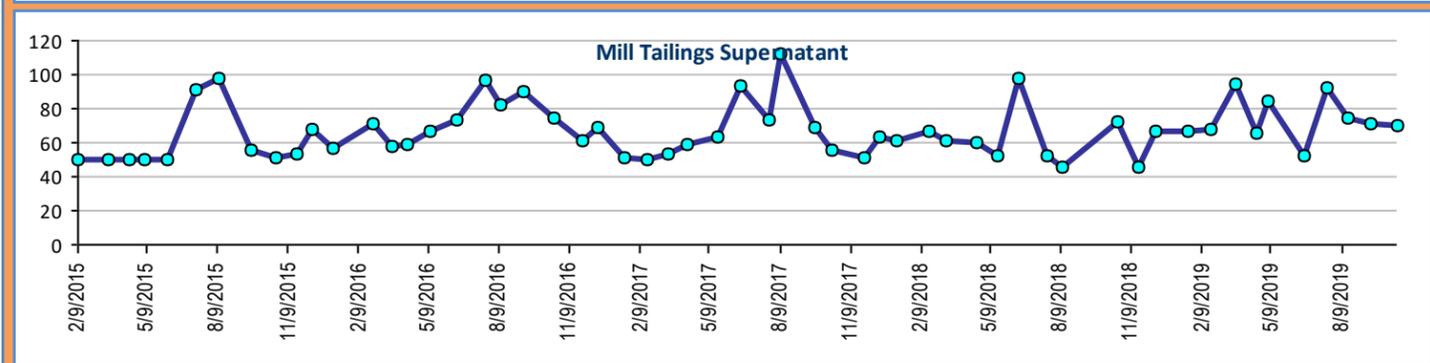
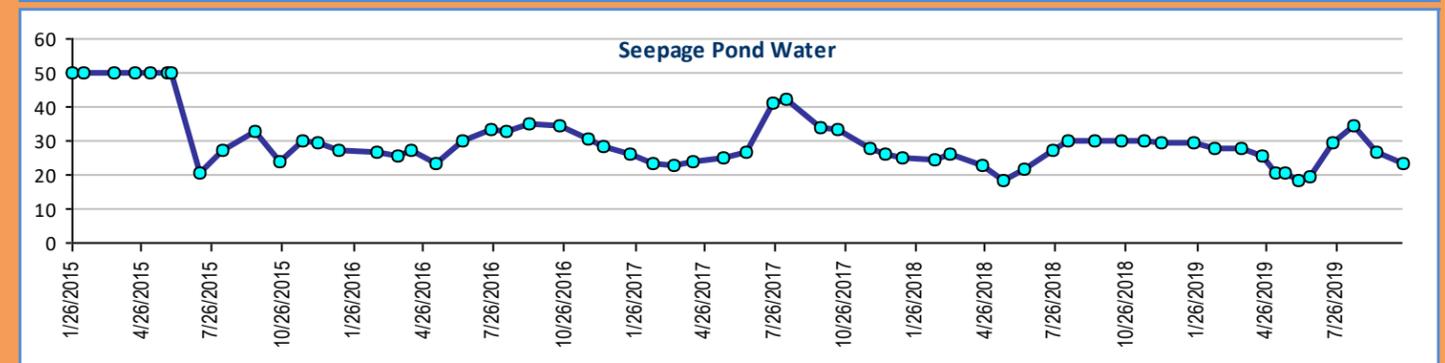
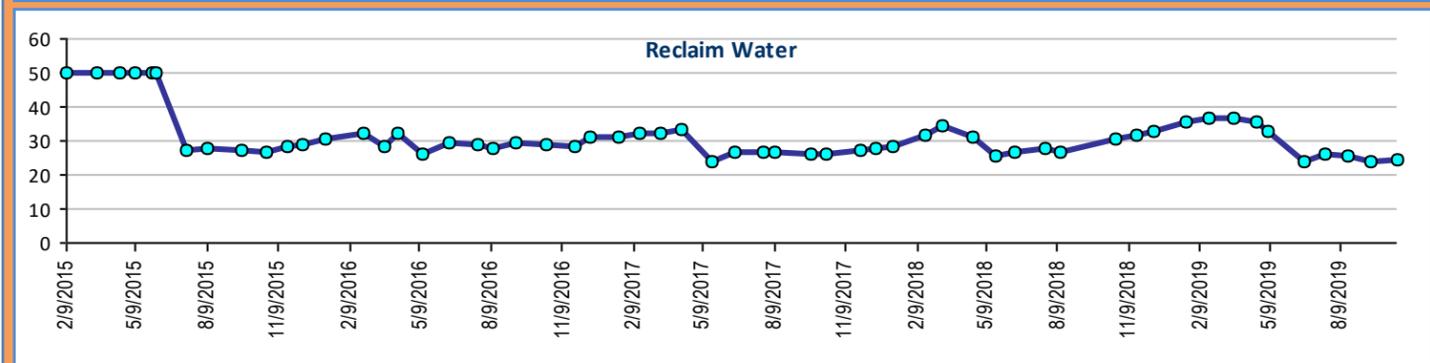
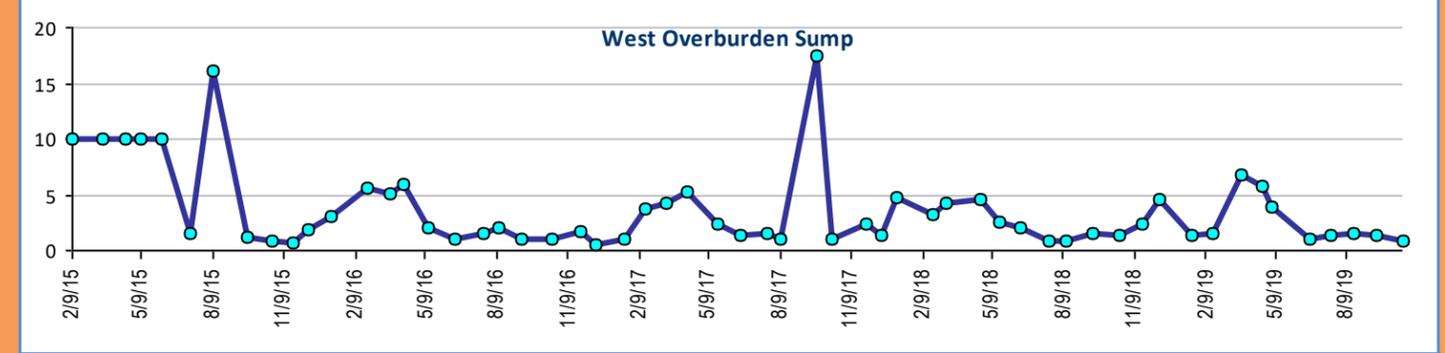
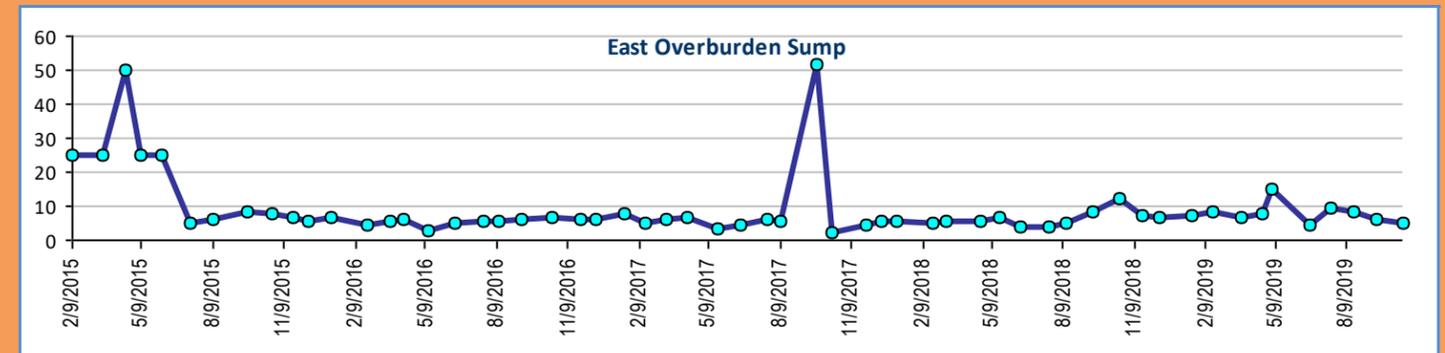
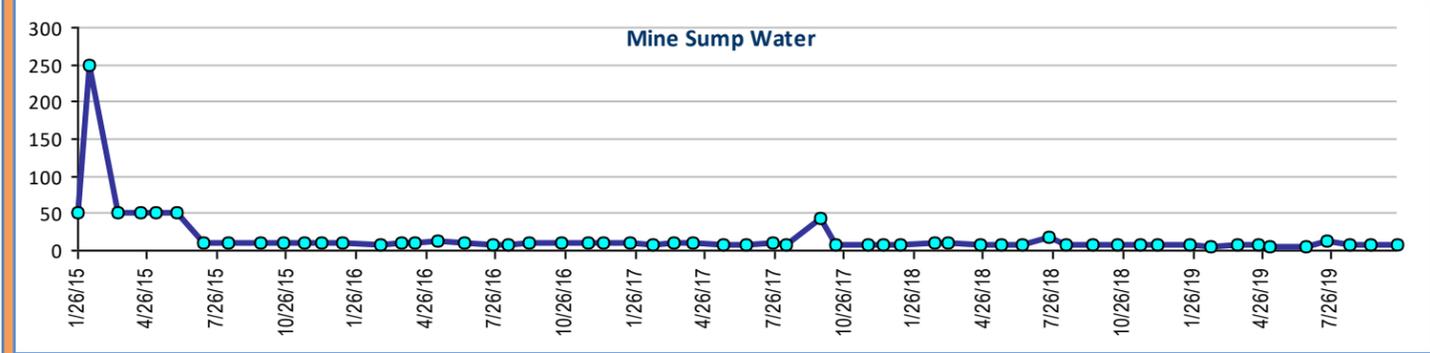
Cadmium, dissolved, units mg/L





Mine Water Monitoring - Water Quality Profile II, Trend Charts

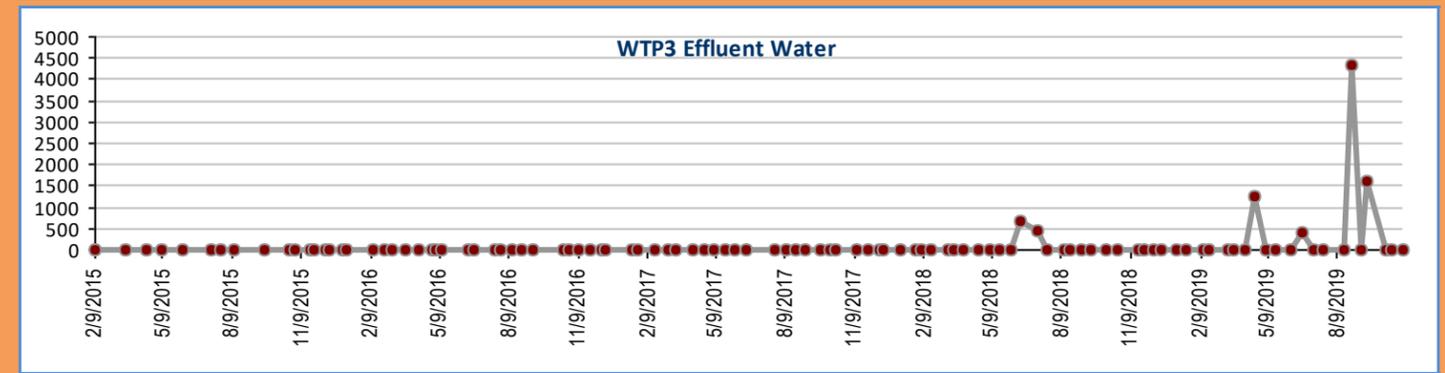
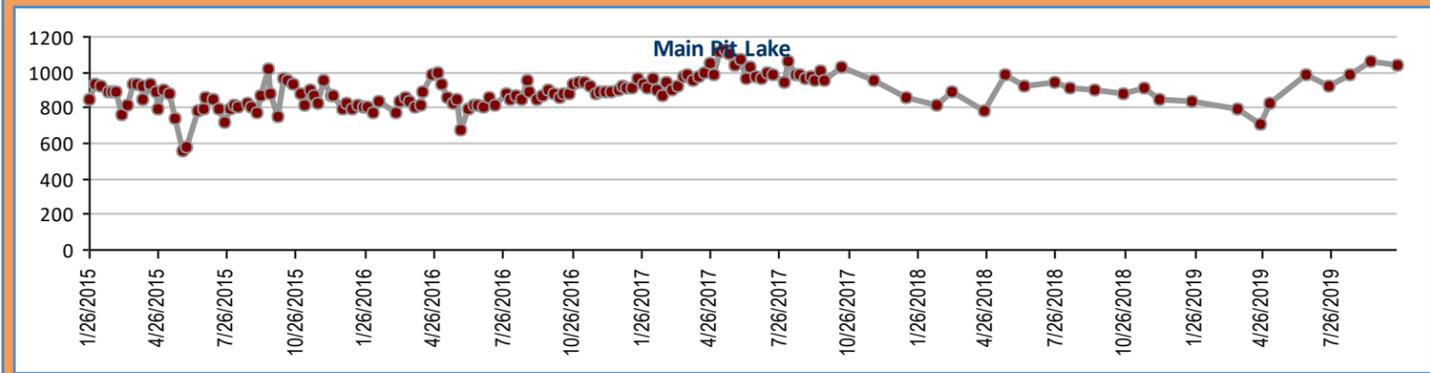
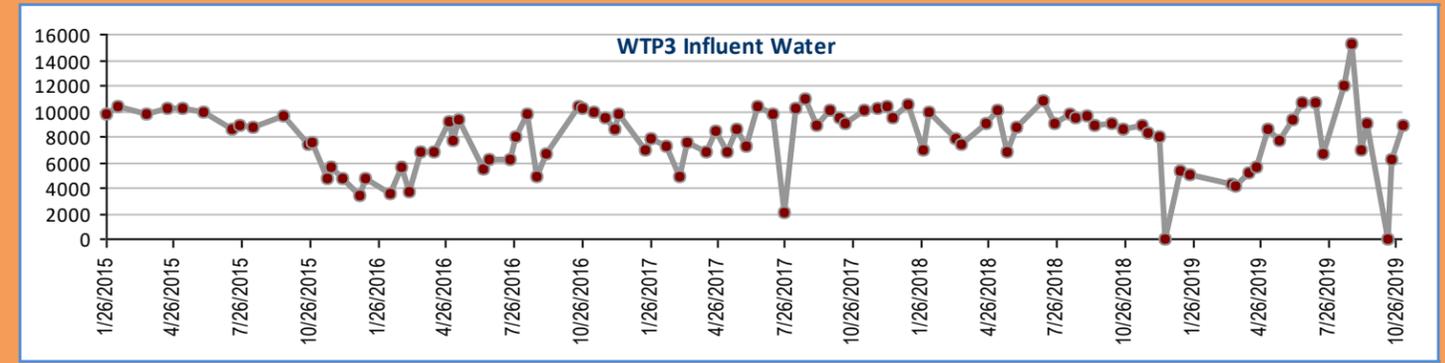
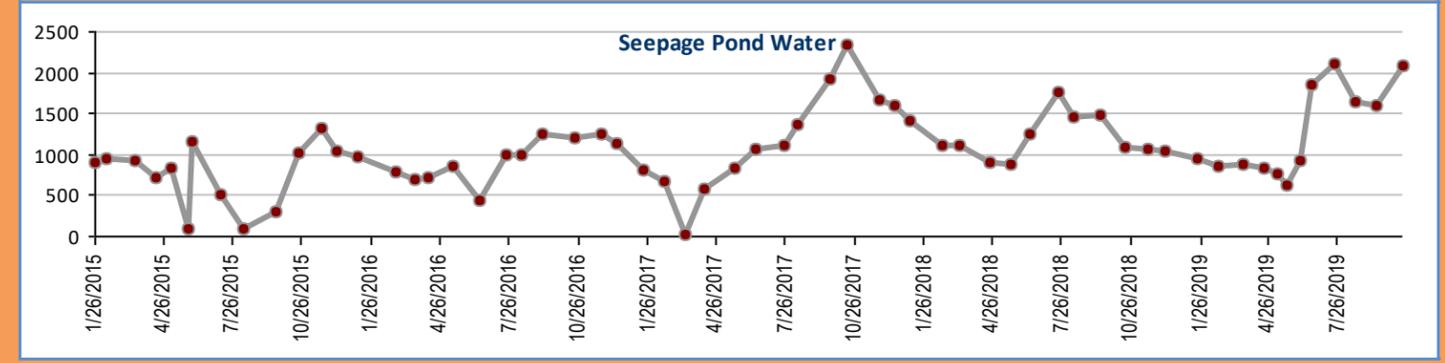
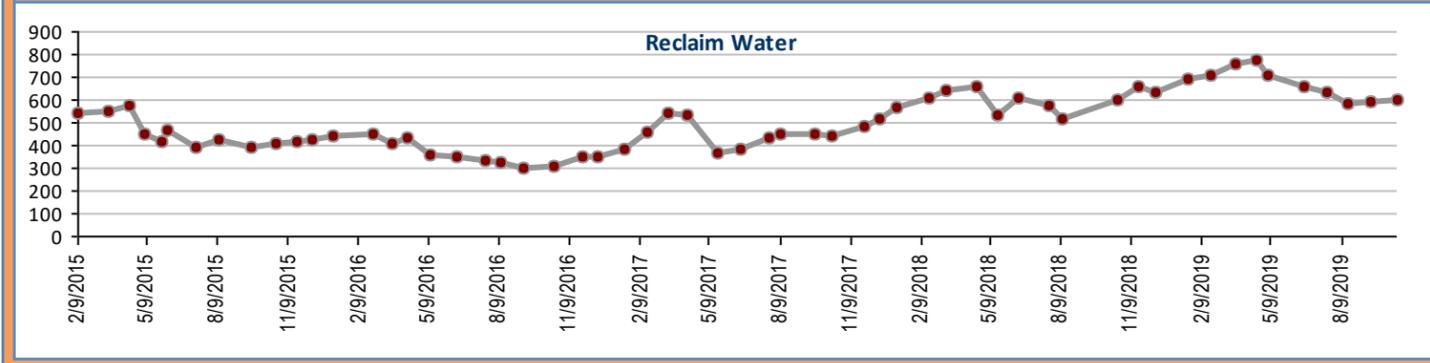
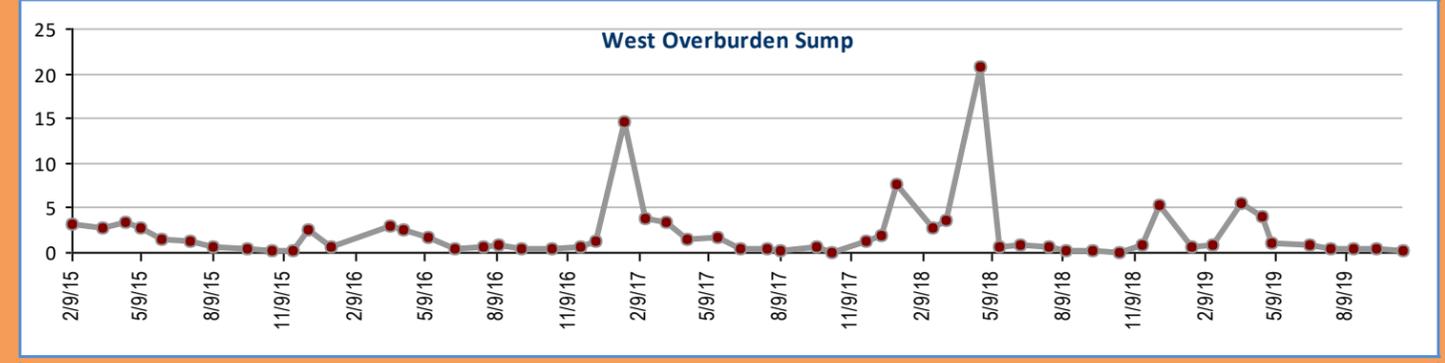
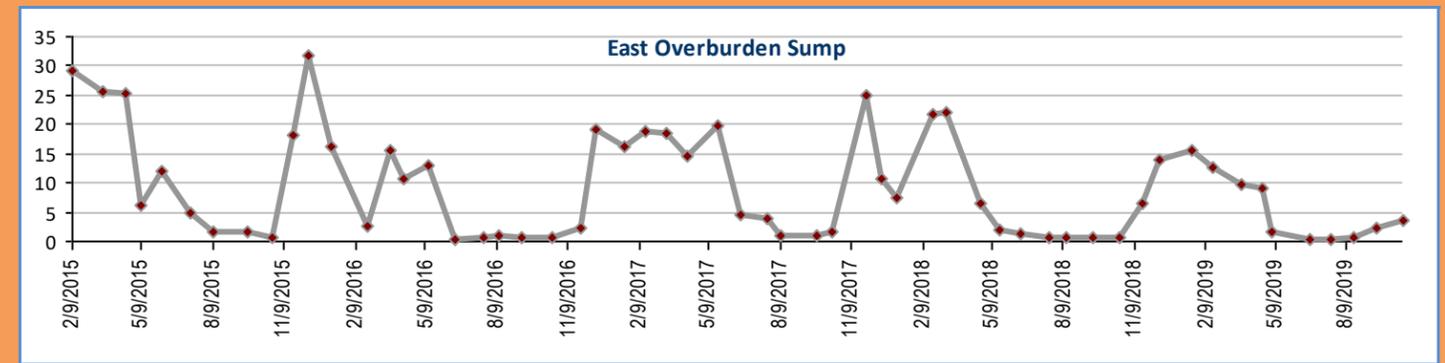
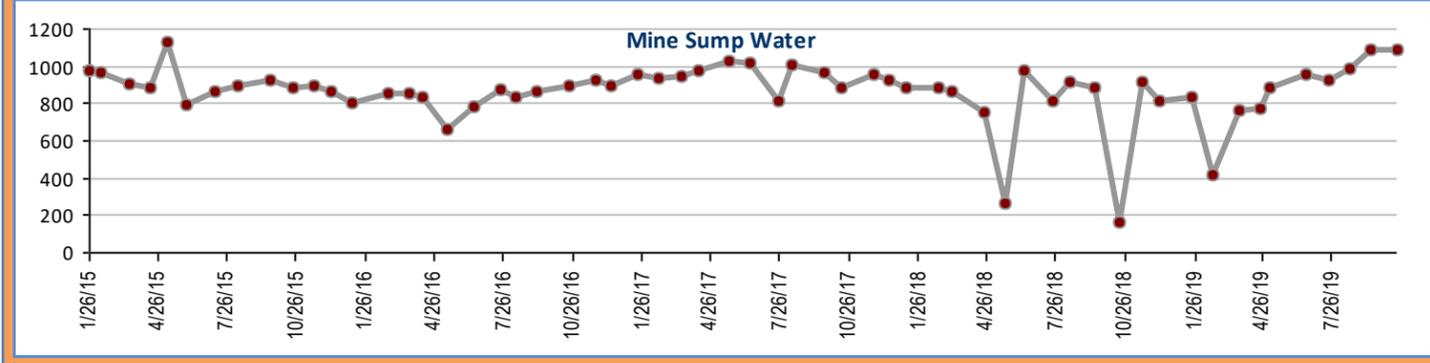
Chloride, dissolved, units mg/L





Mine Water Monitoring - Water Quality Profile II, Trend Charts

Zinc, dissolved, units, mg/L

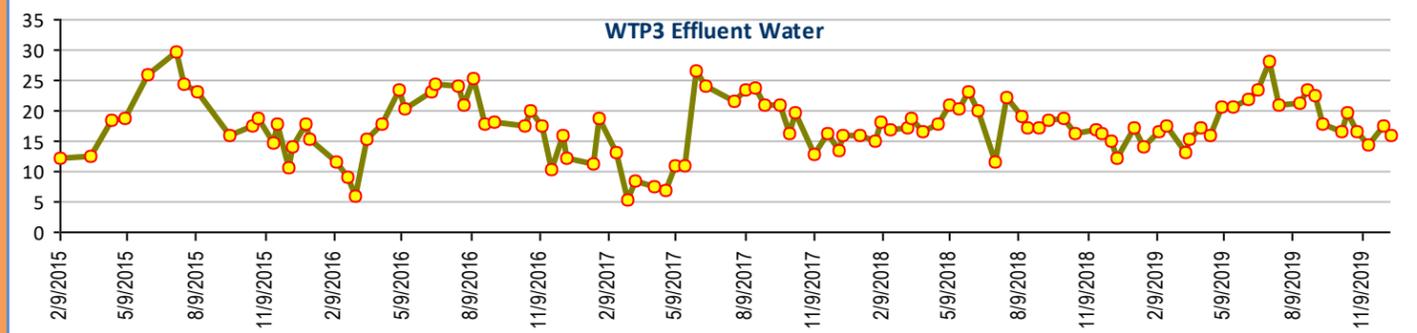
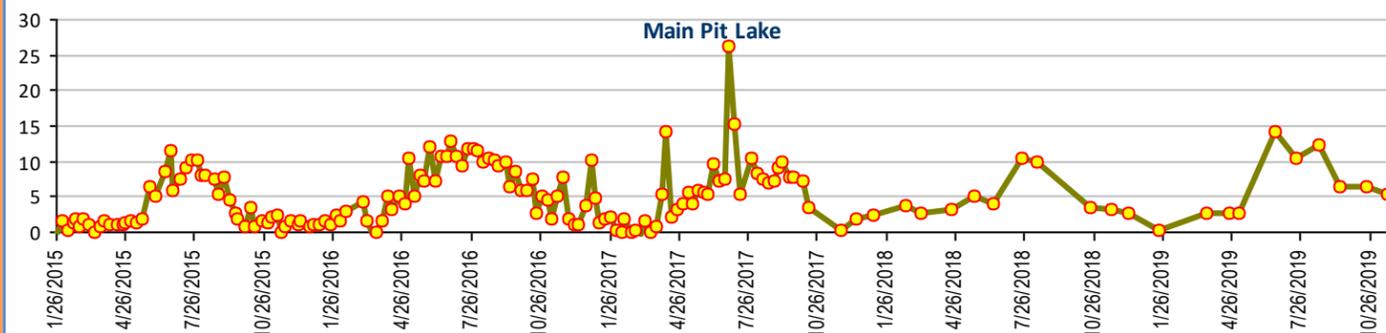
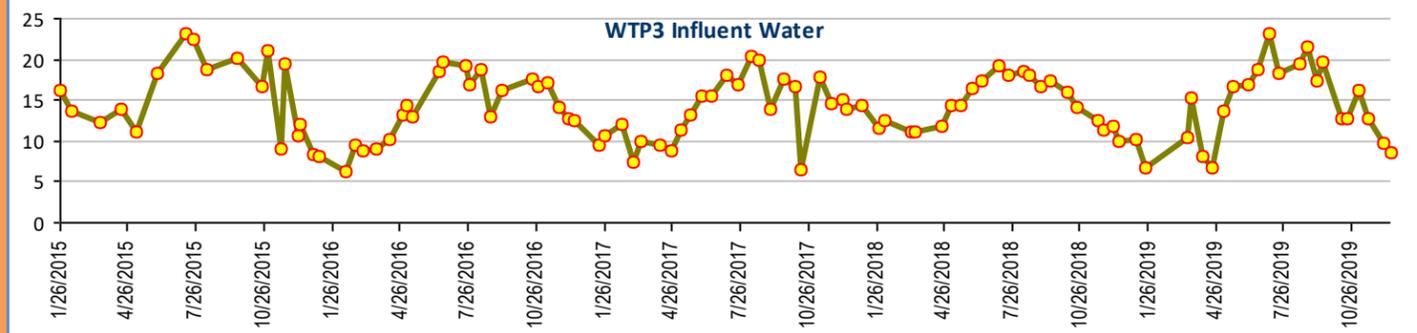
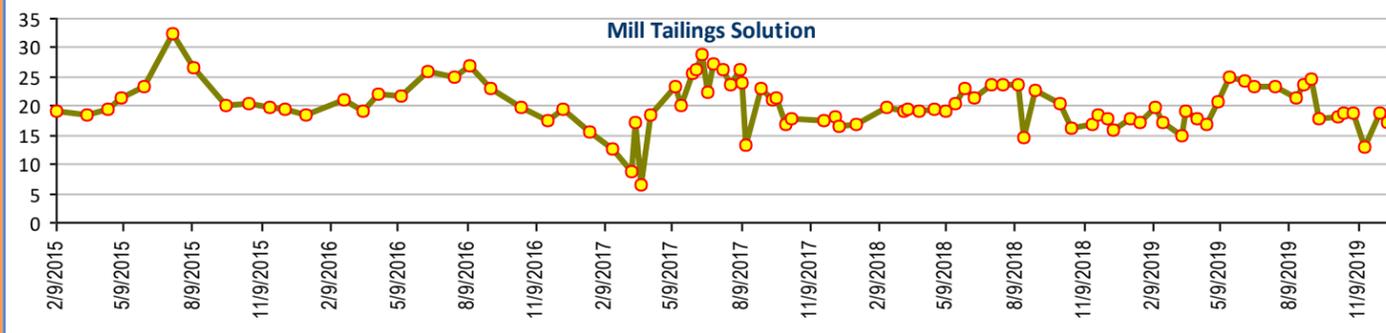
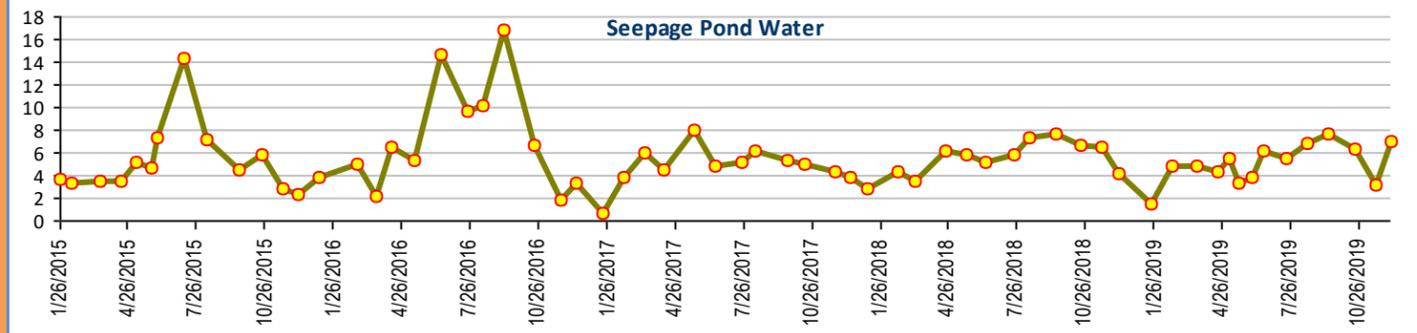
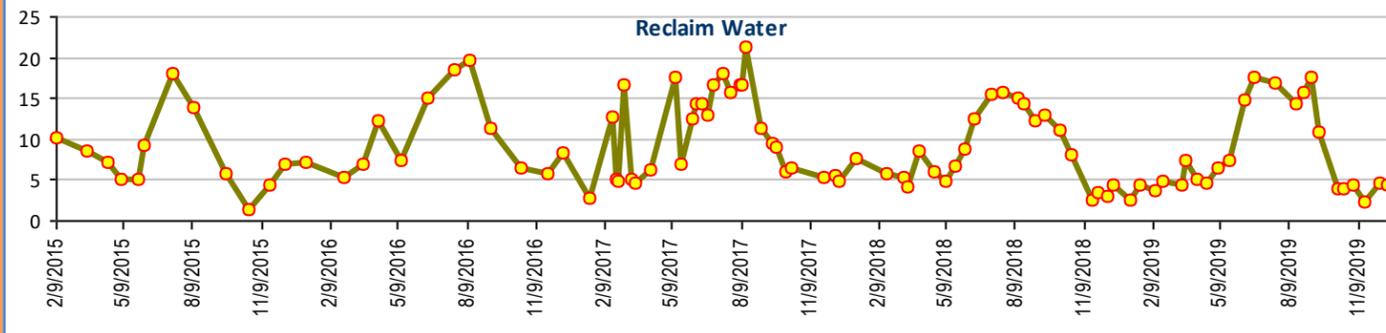
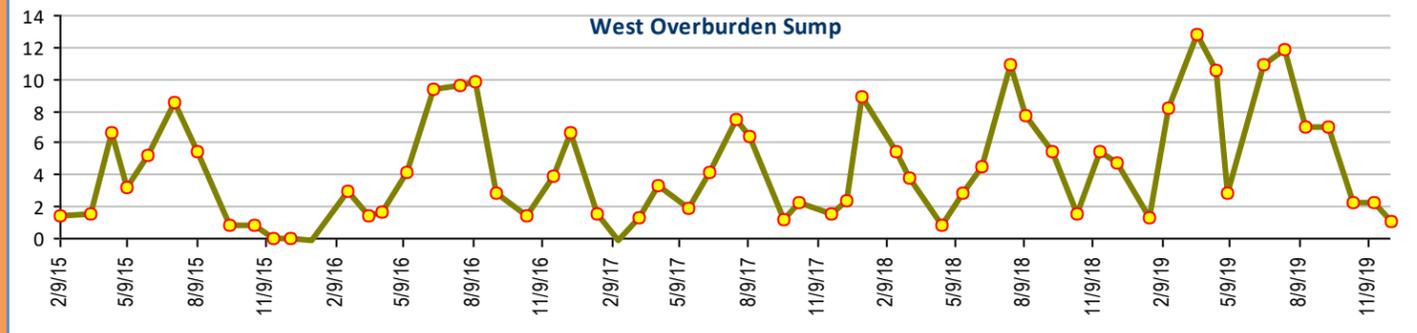
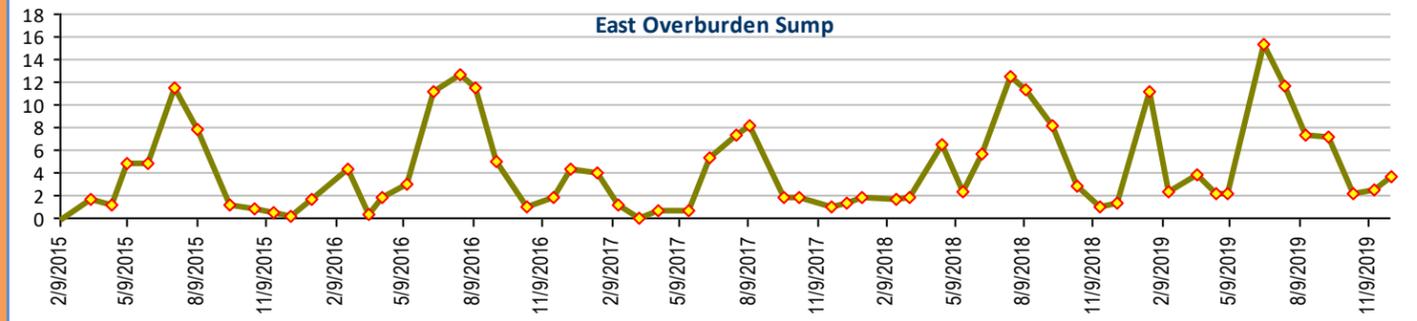
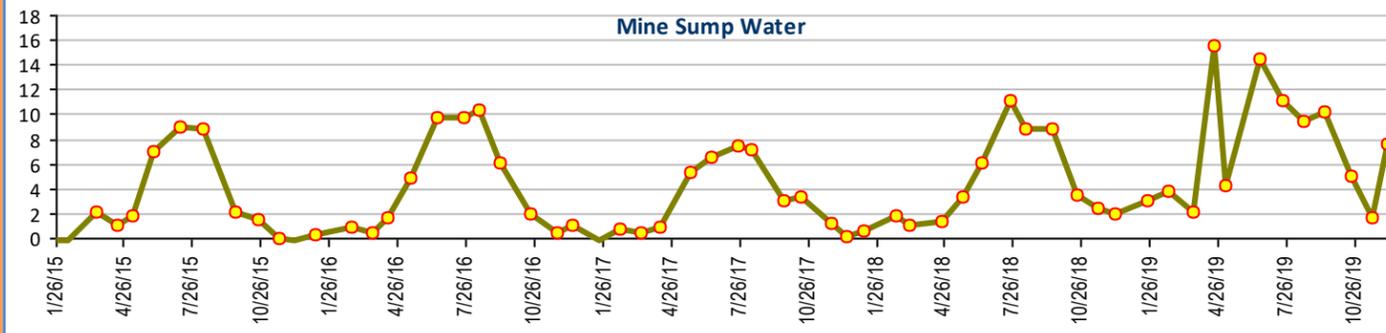




Mine Water Monitoring - Water Quality Profile II, Trend Charts

RED DOG MINE

Temperature, Celsius

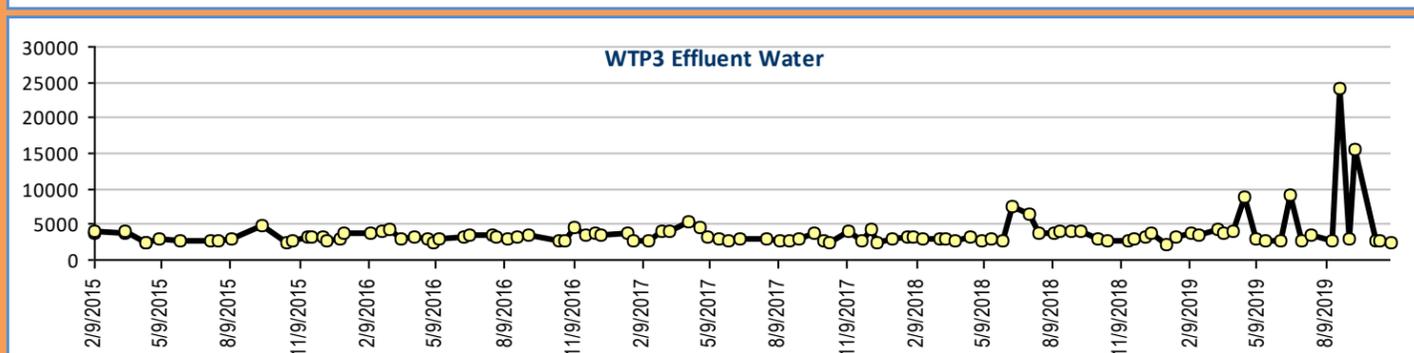
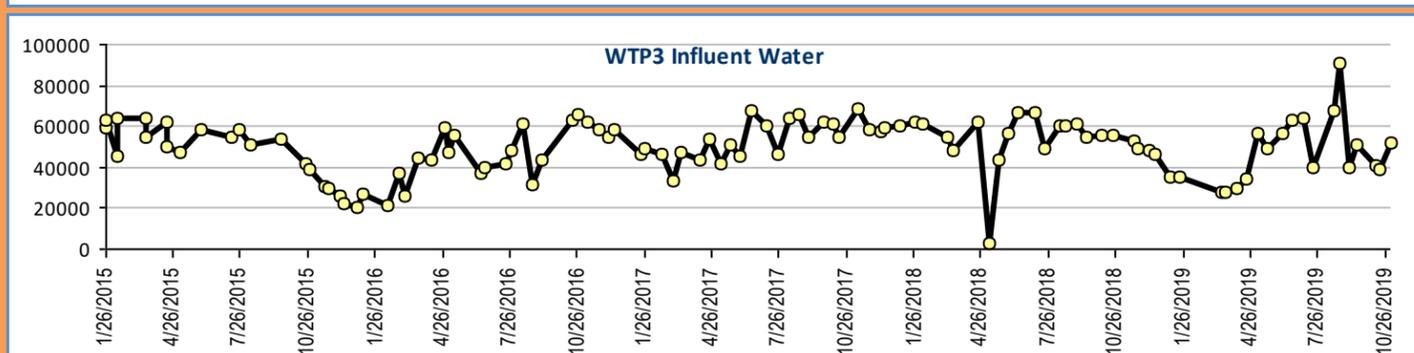
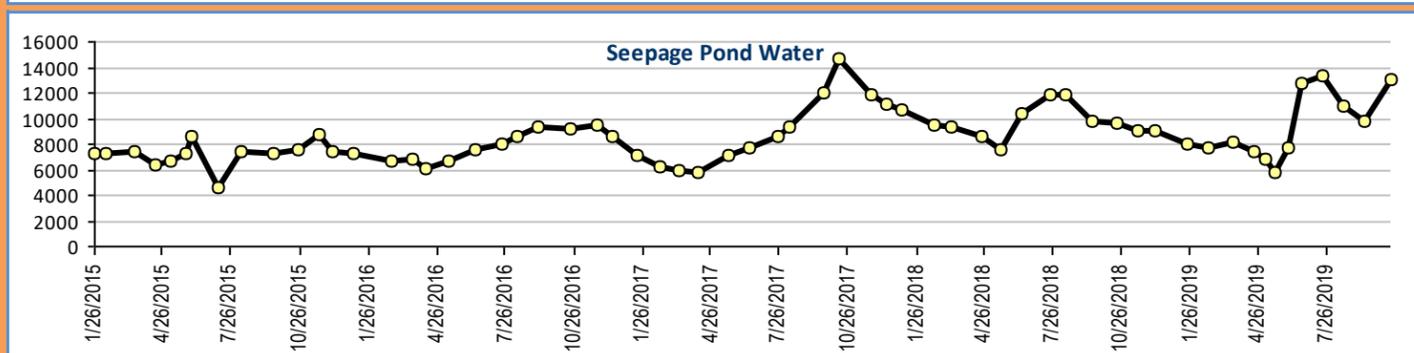
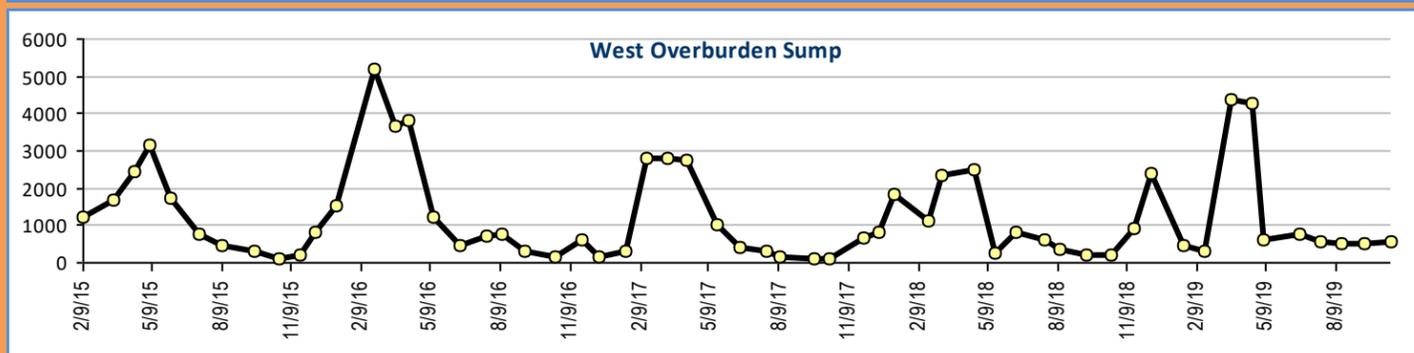
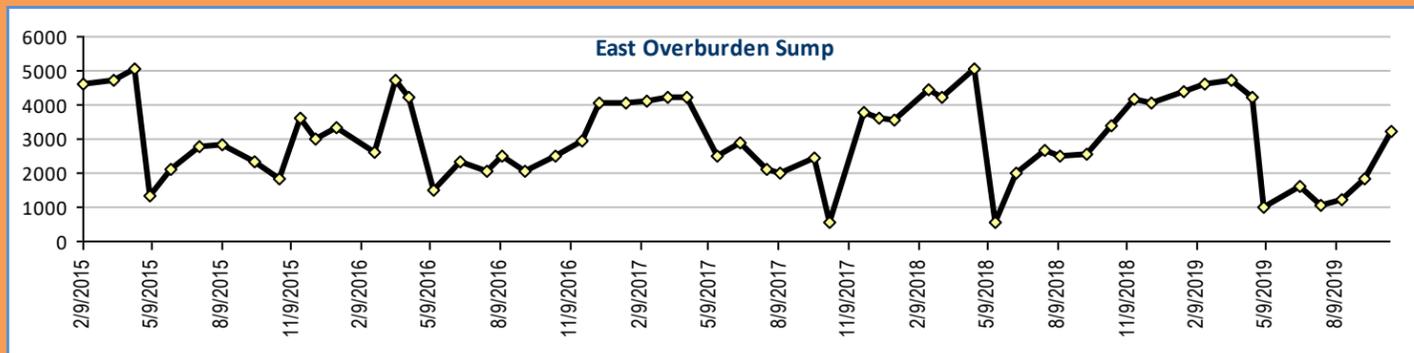
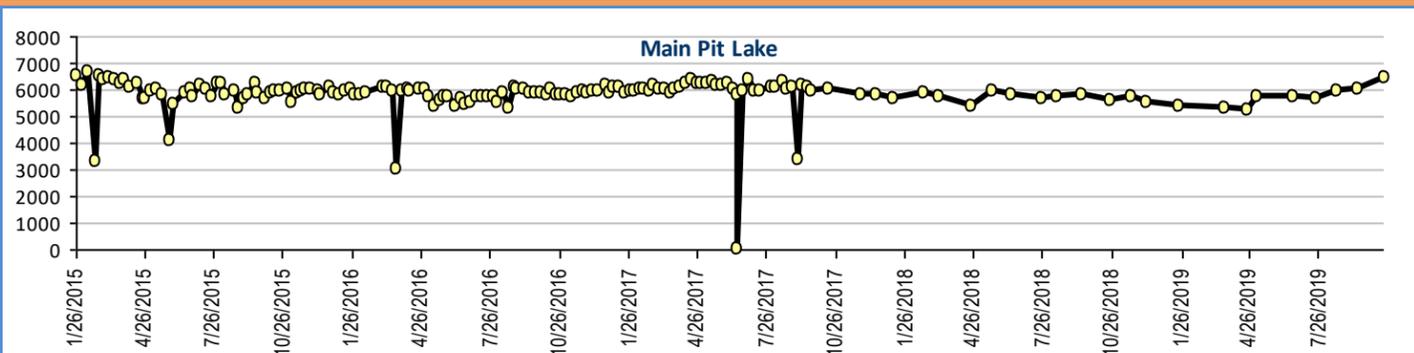
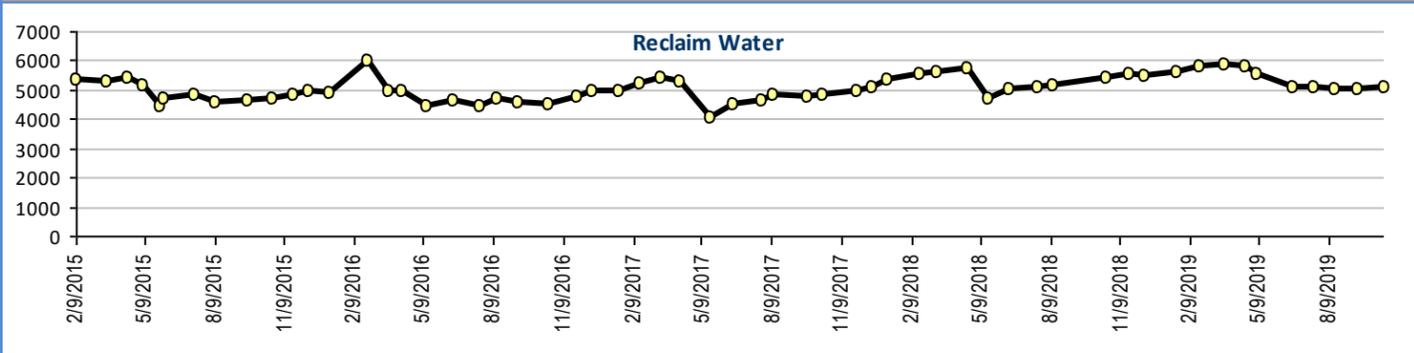
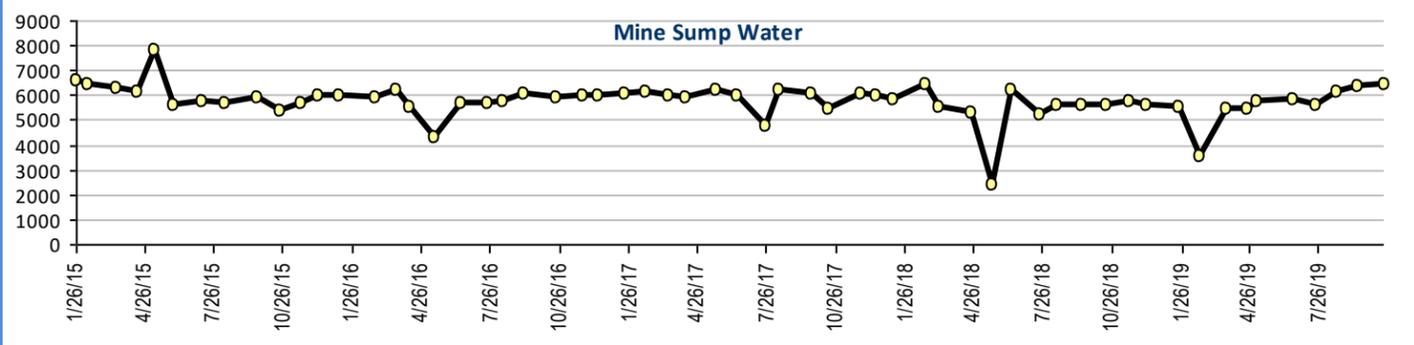




RED DOG MINE

Mine Water Monitoring - Water Quality Profile II, Trend Charts

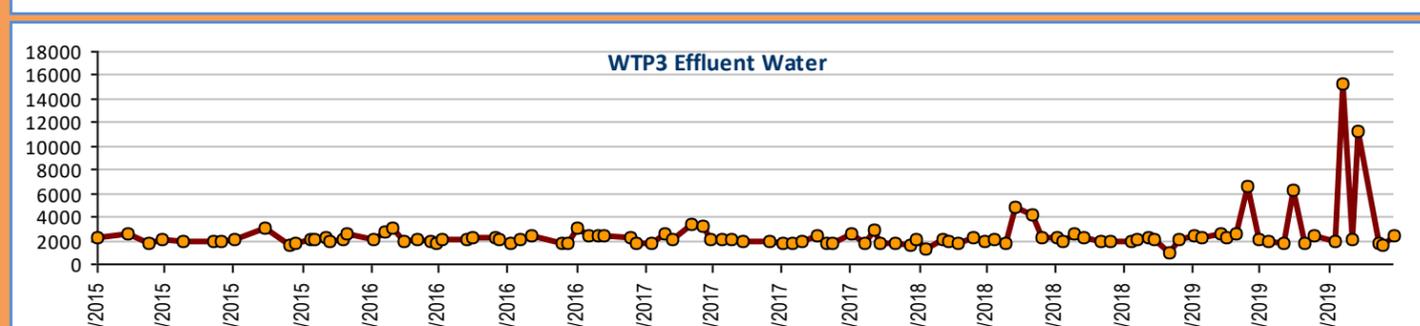
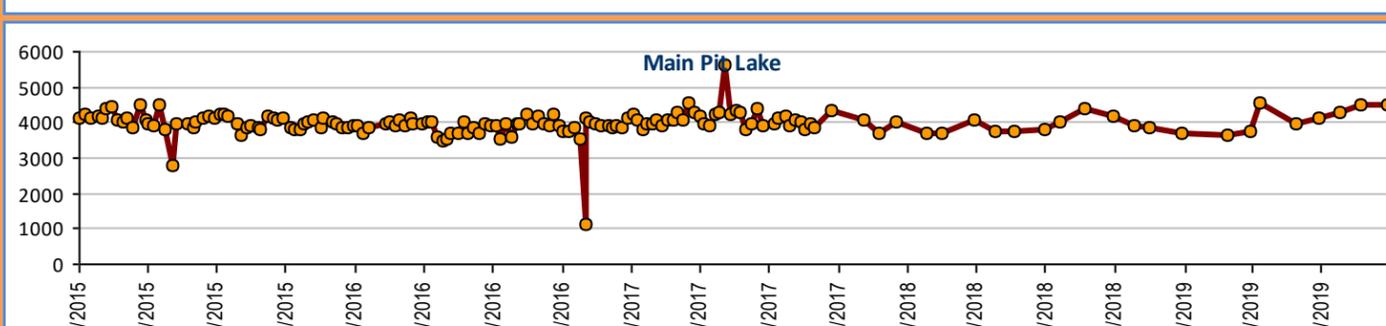
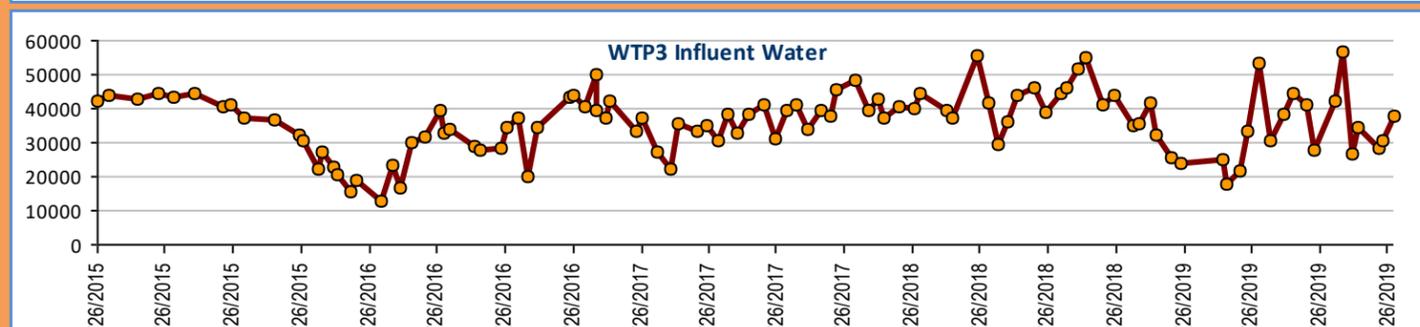
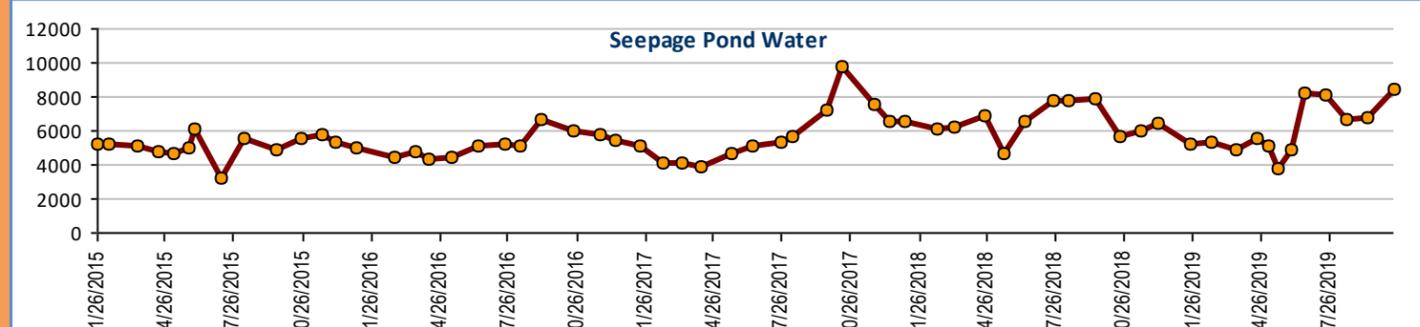
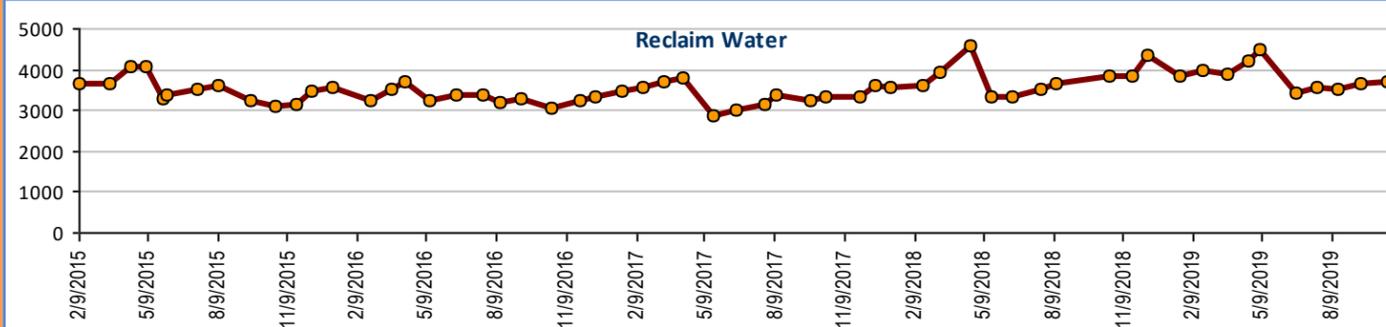
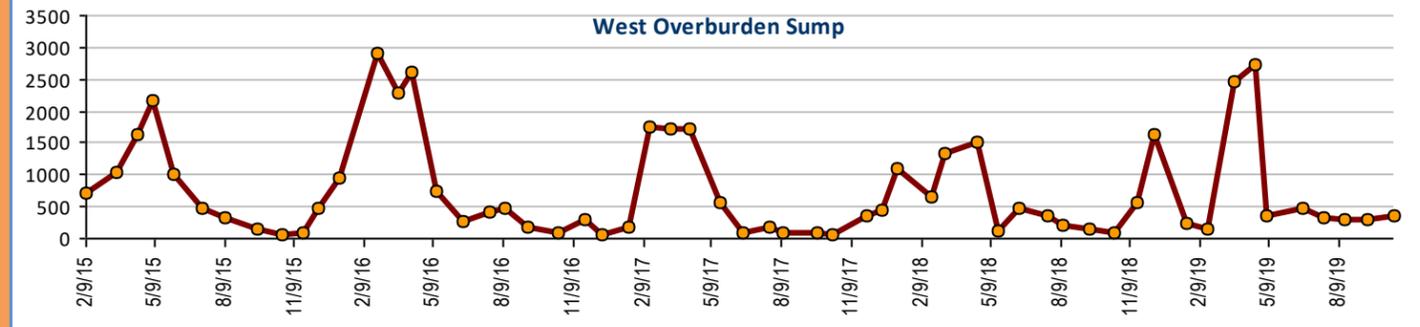
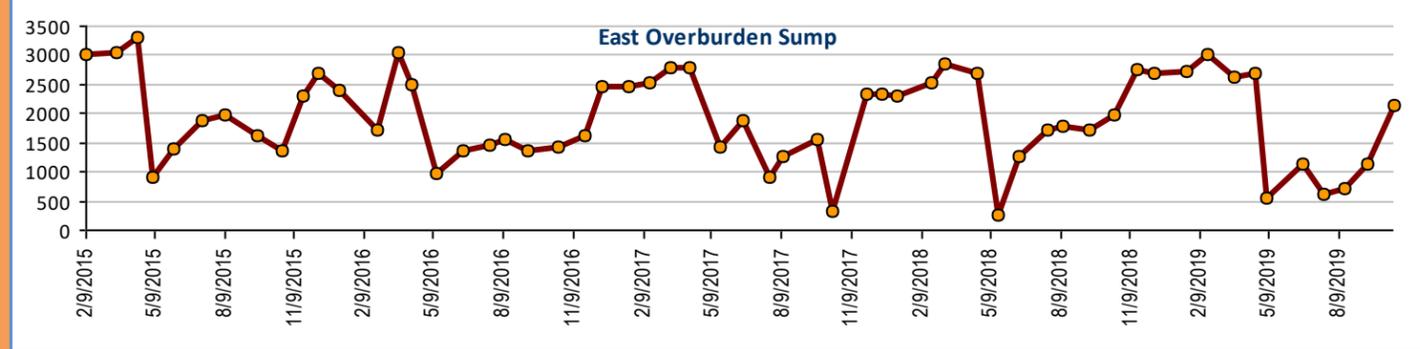
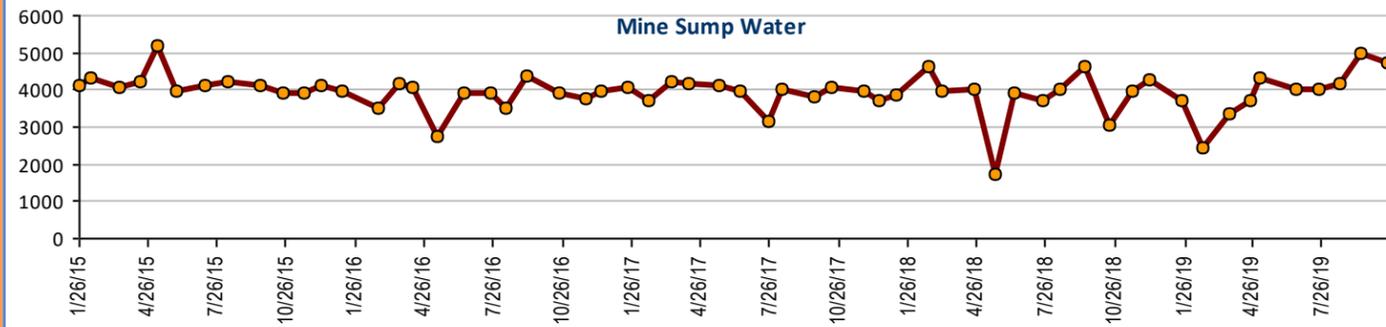
Total Dissolved Solids, units, mg/L





Mine Water Monitoring - Water Quality Profile II, Trend Charts

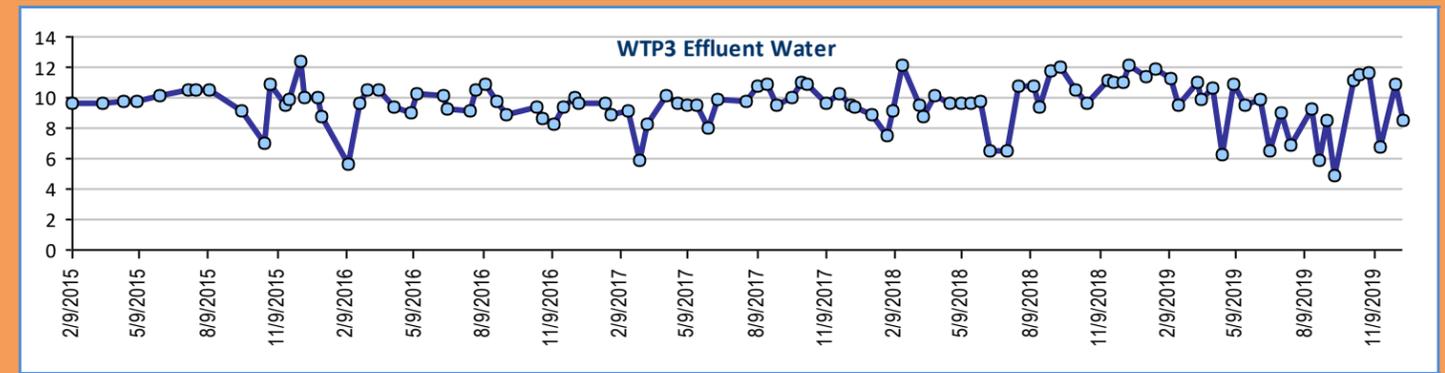
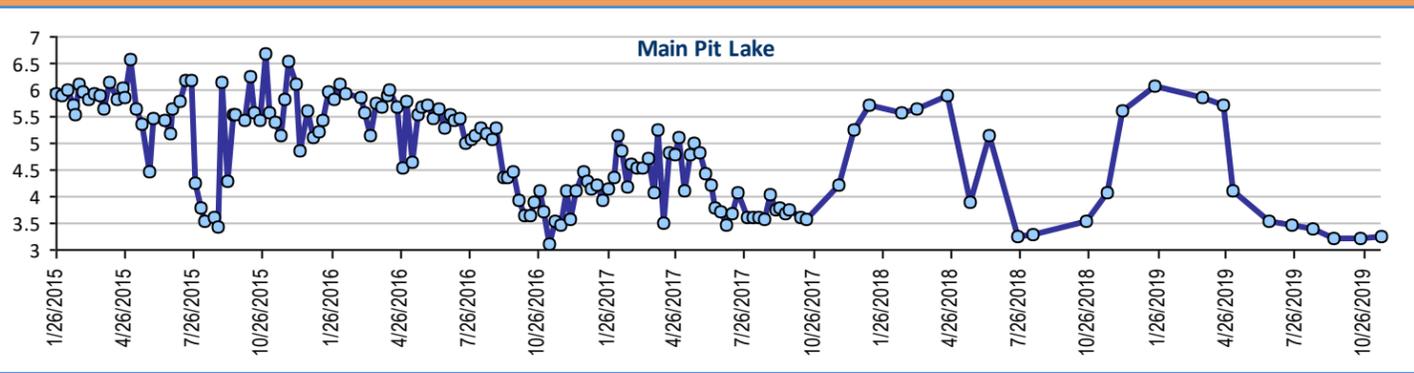
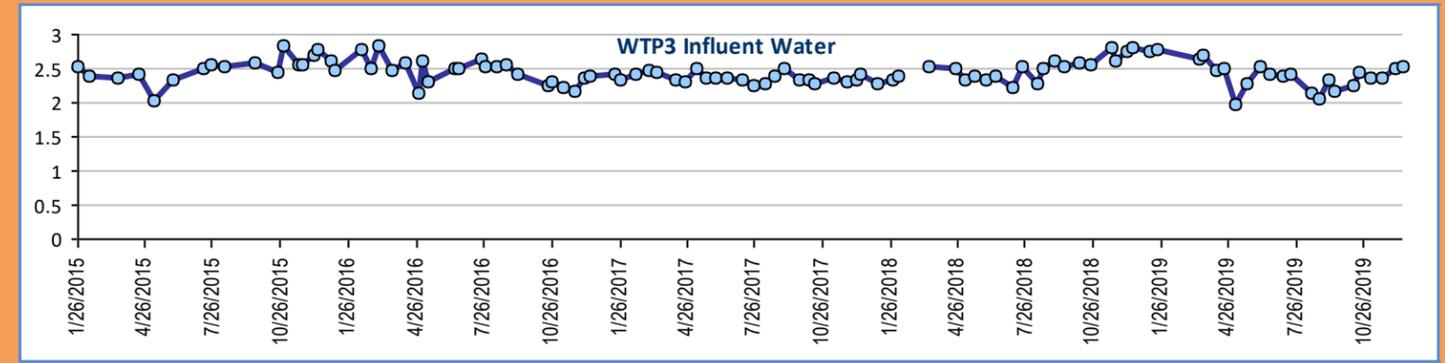
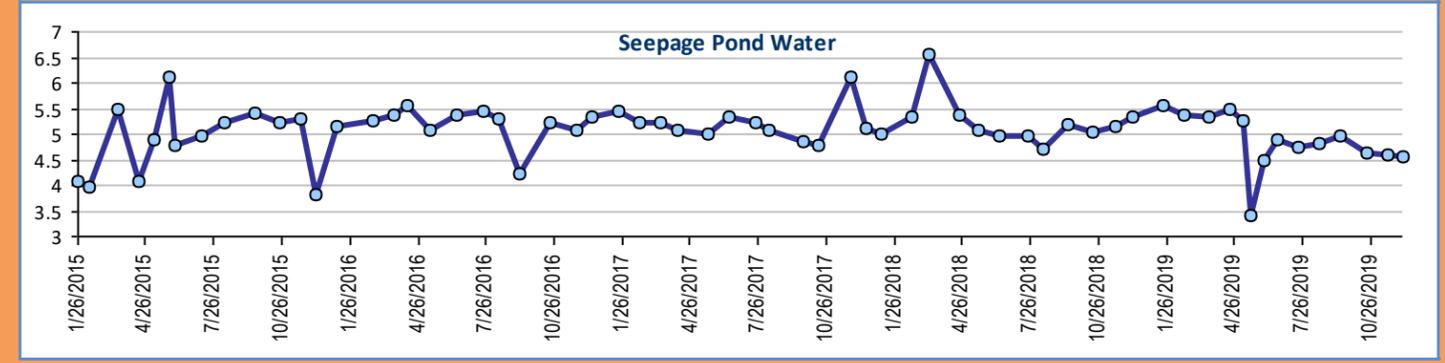
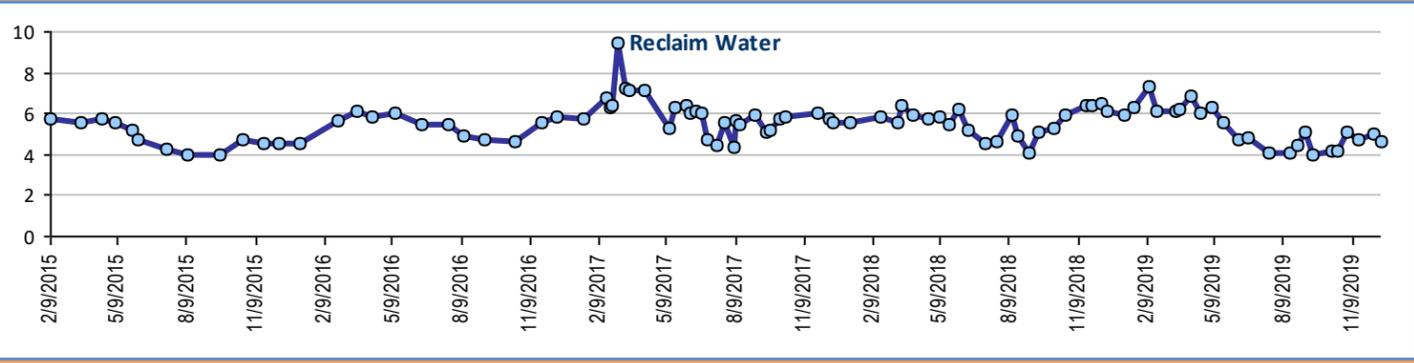
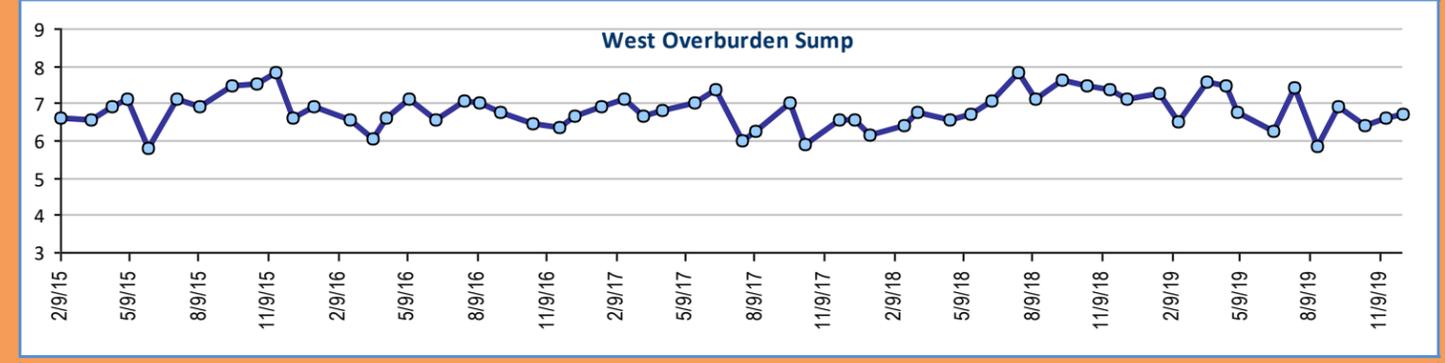
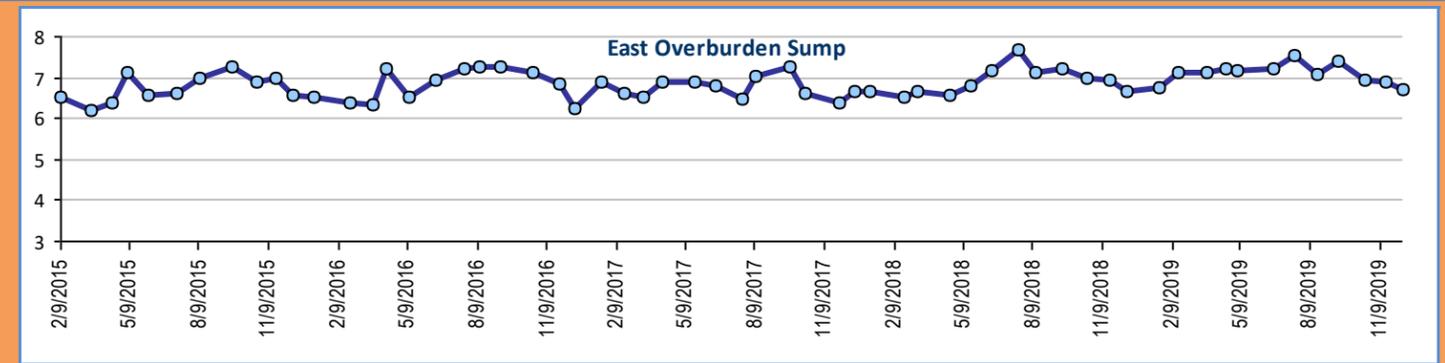
Sulfate, units mg/L





Mine Water Monitoring - Water Quality Profile II, Trend Charts

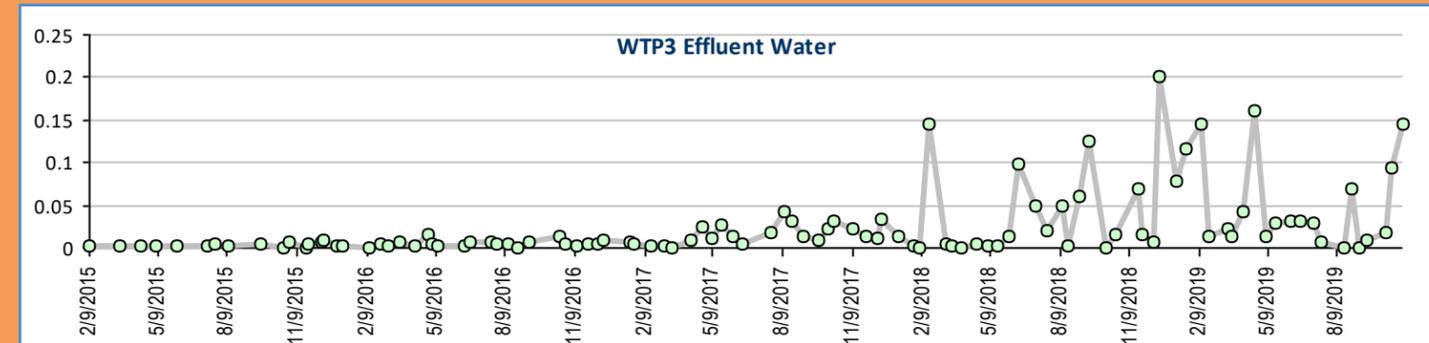
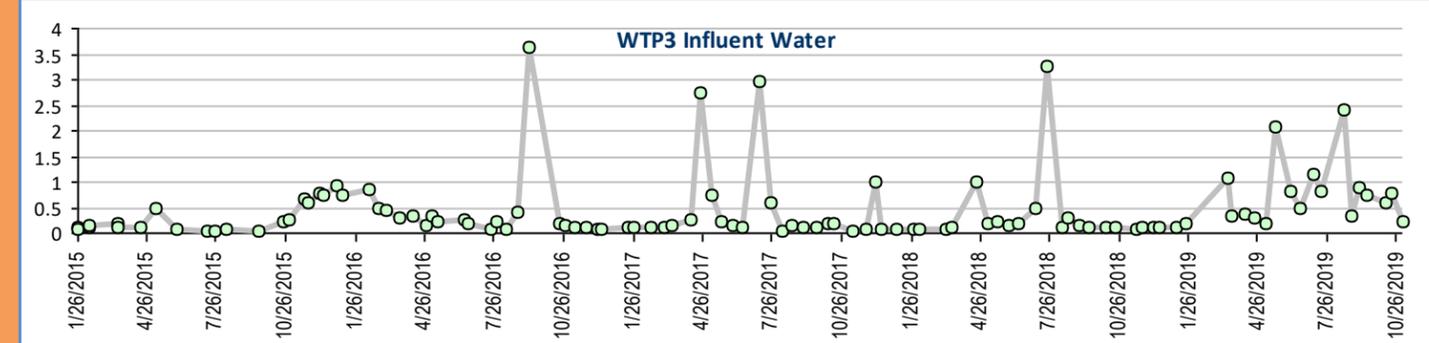
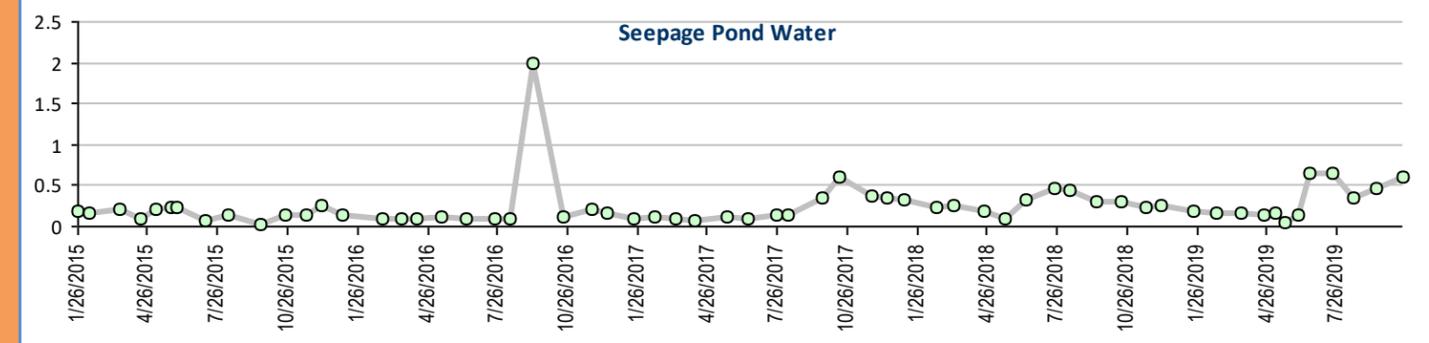
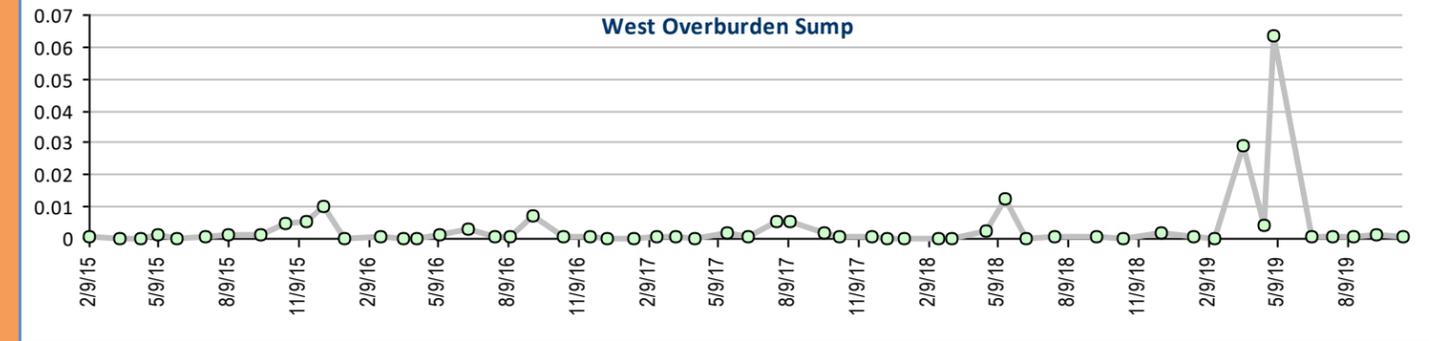
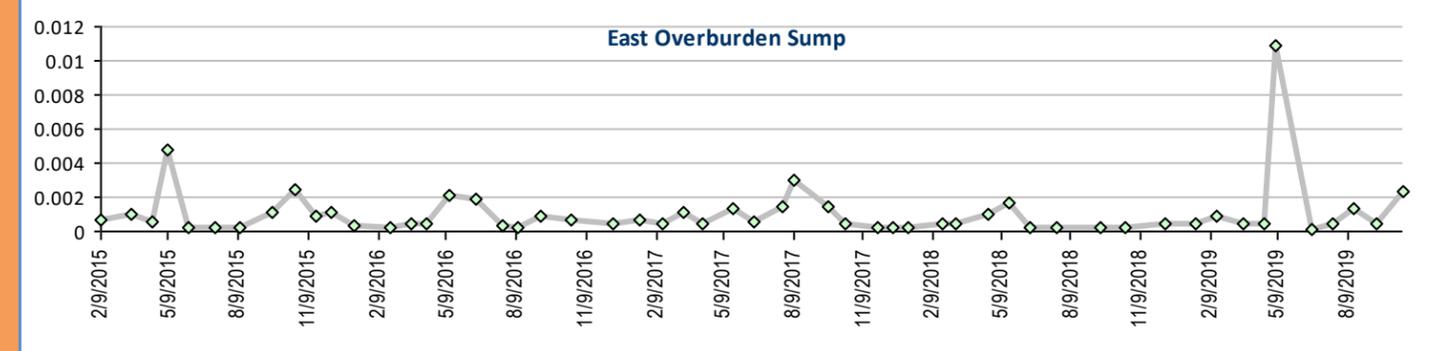
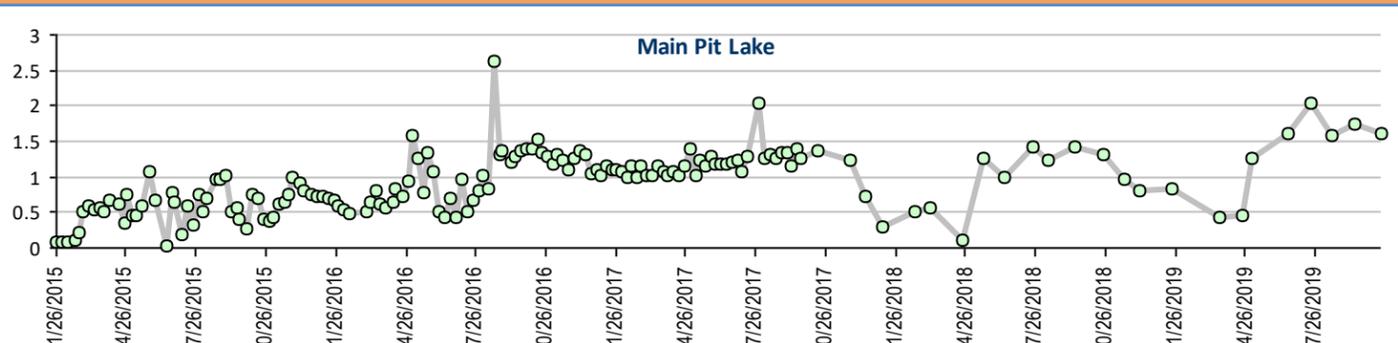
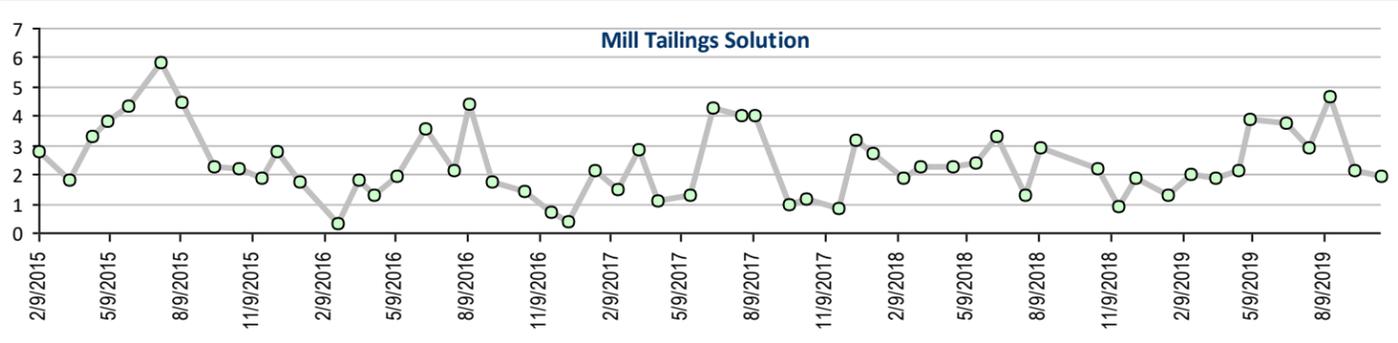
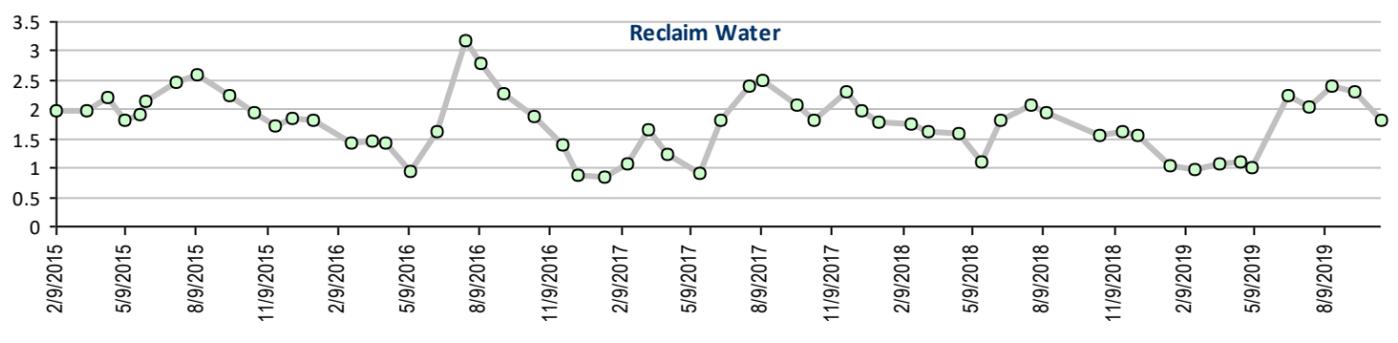
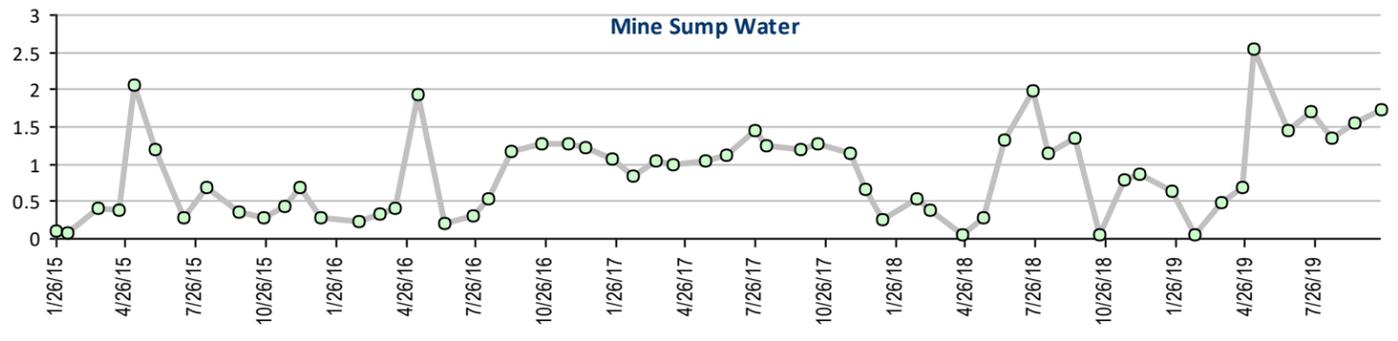
pH, units





Mine Water Monitoring - Water Quality Profile II, Trend Charts

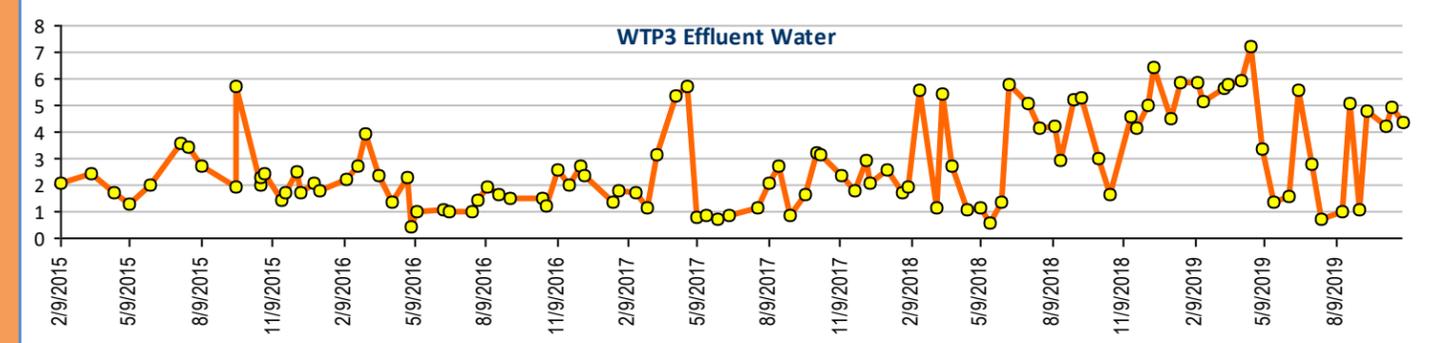
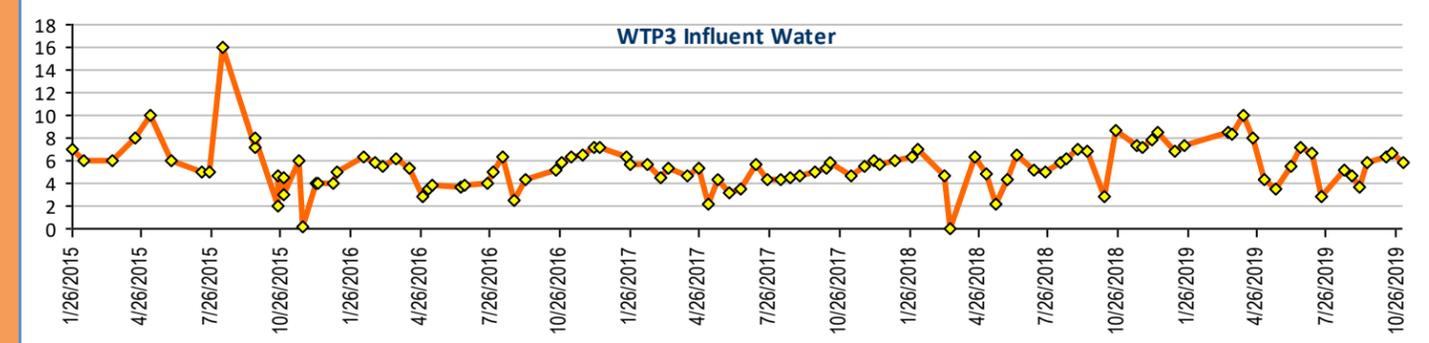
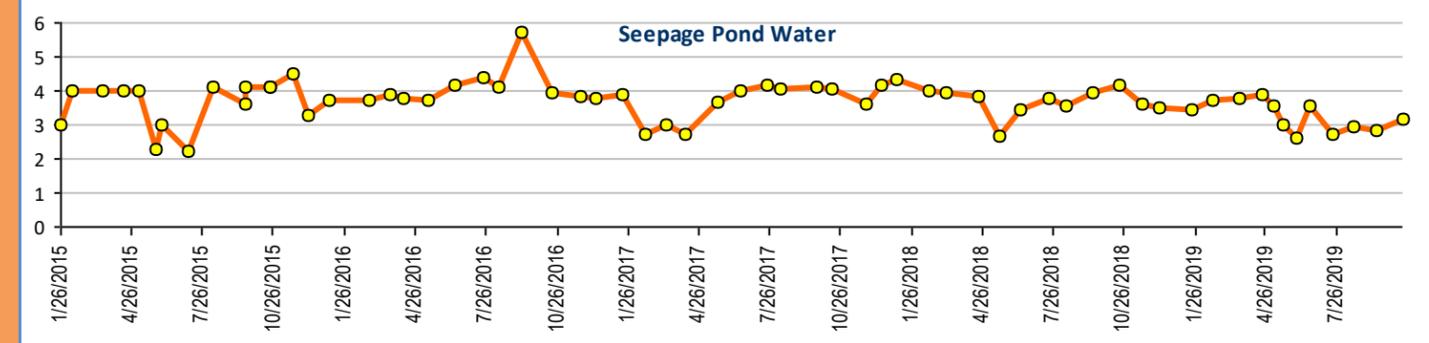
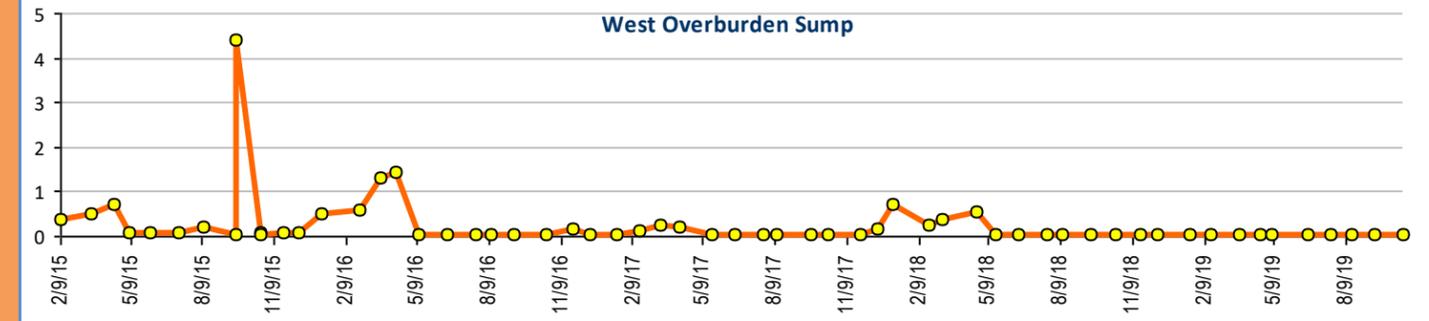
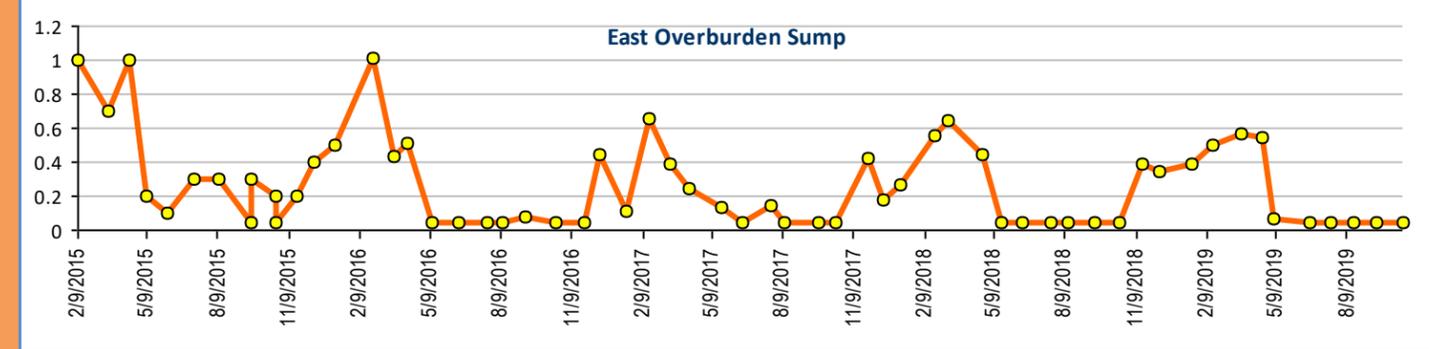
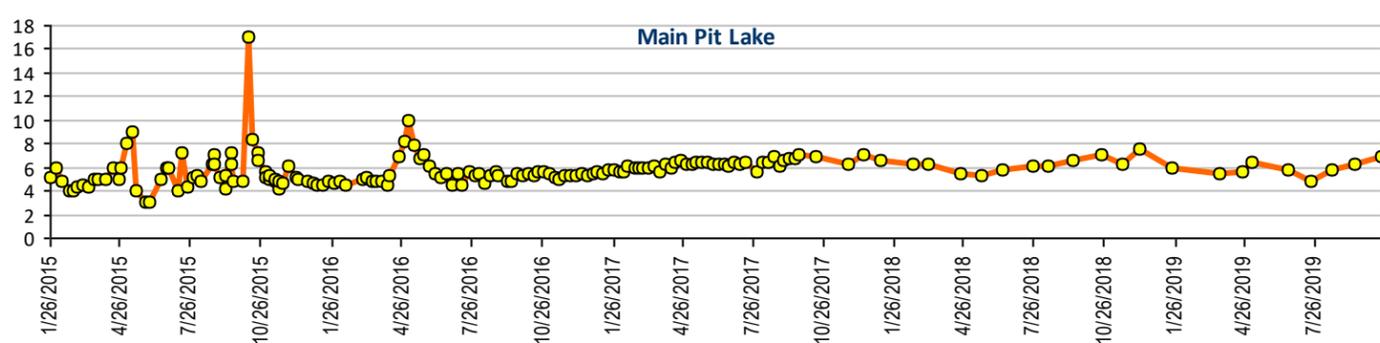
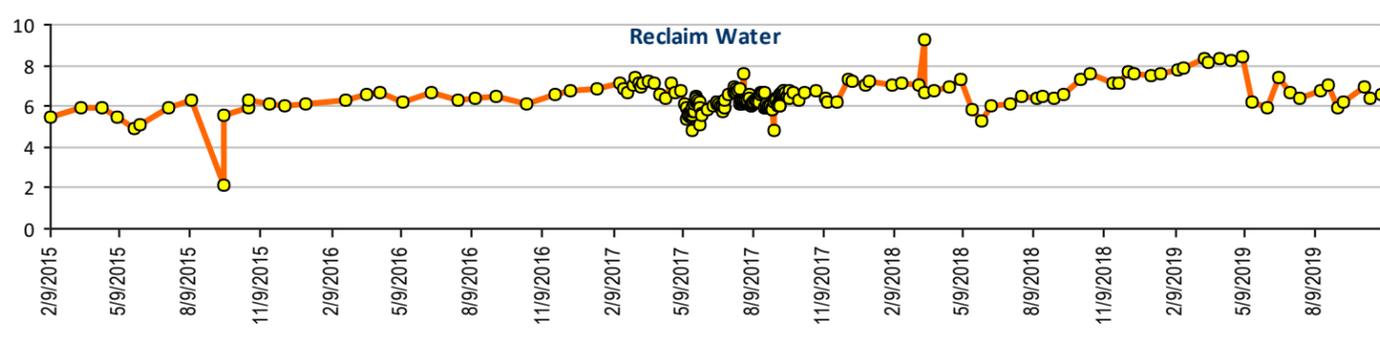
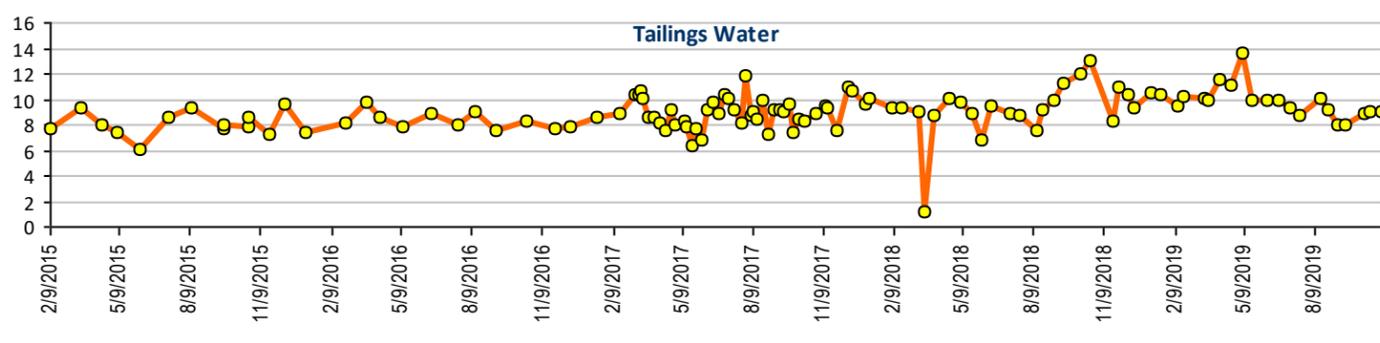
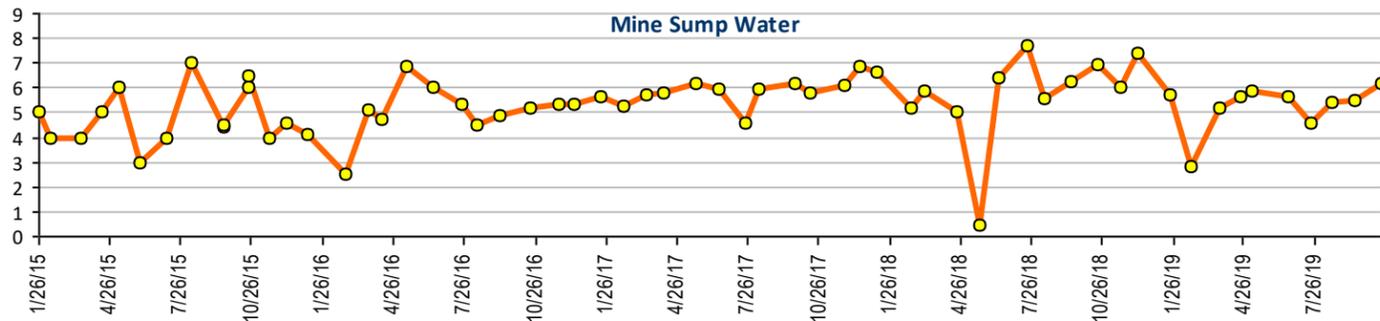
Lead, dissolved, units mg/L





Mine Water Monitoring - Water Quality Profile II, Trend Charts

Ammonia as N, units mg/L

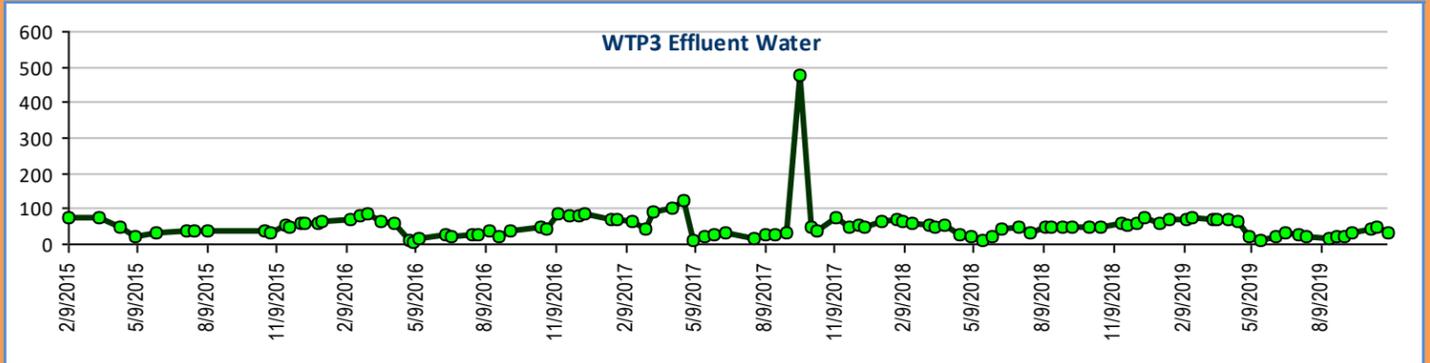
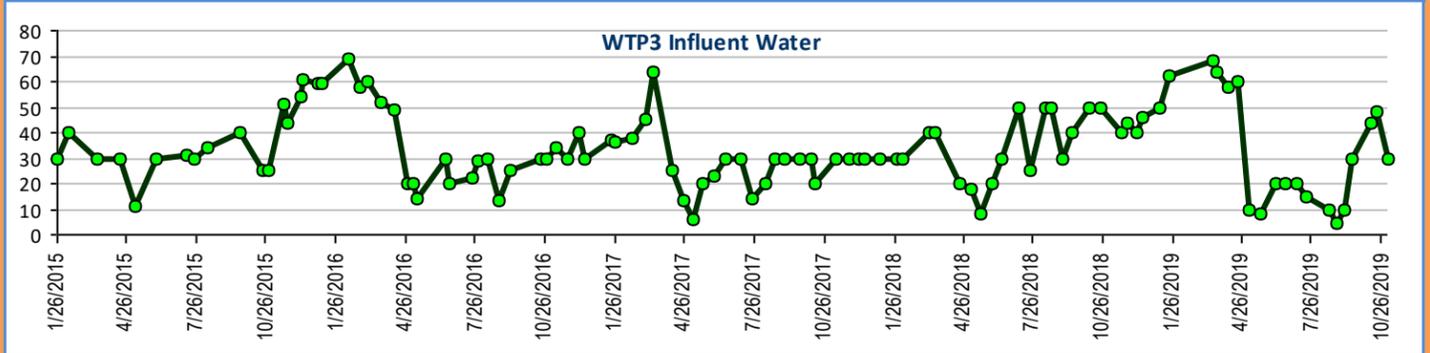
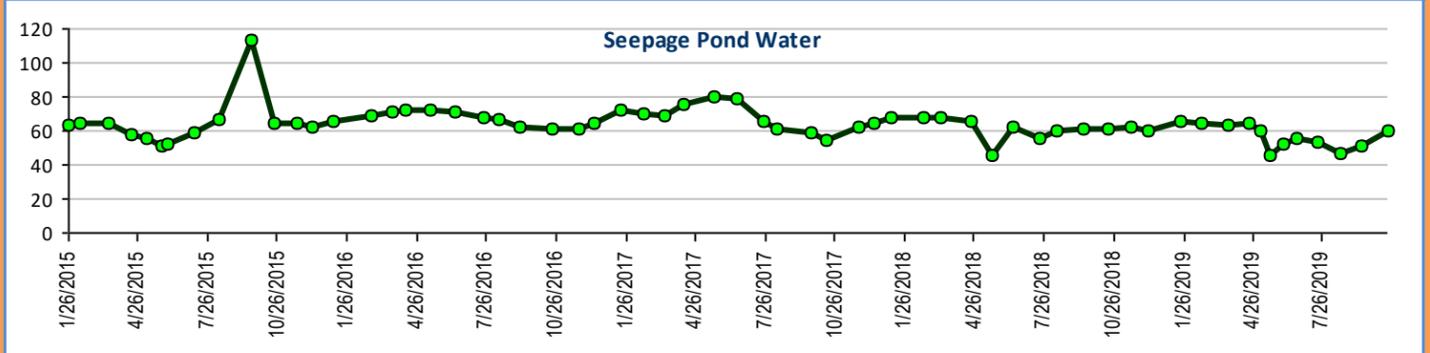
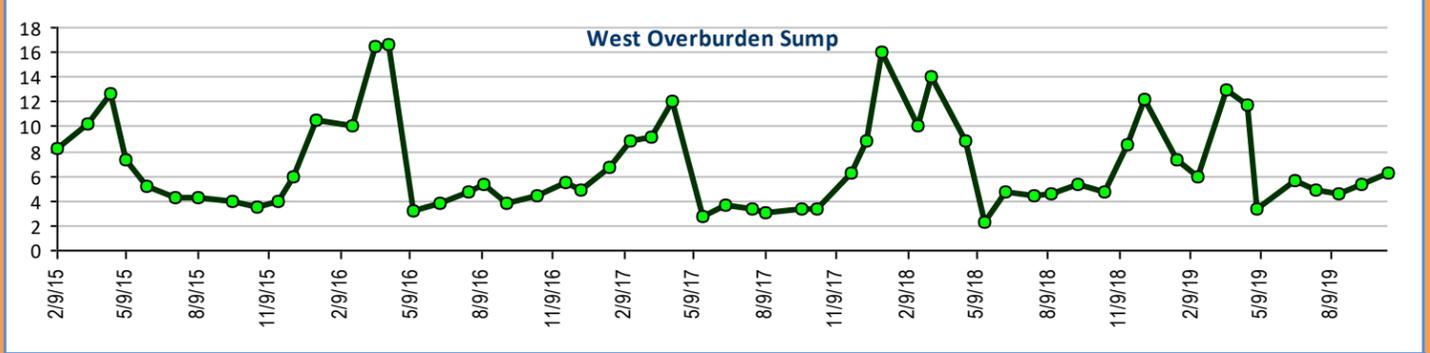
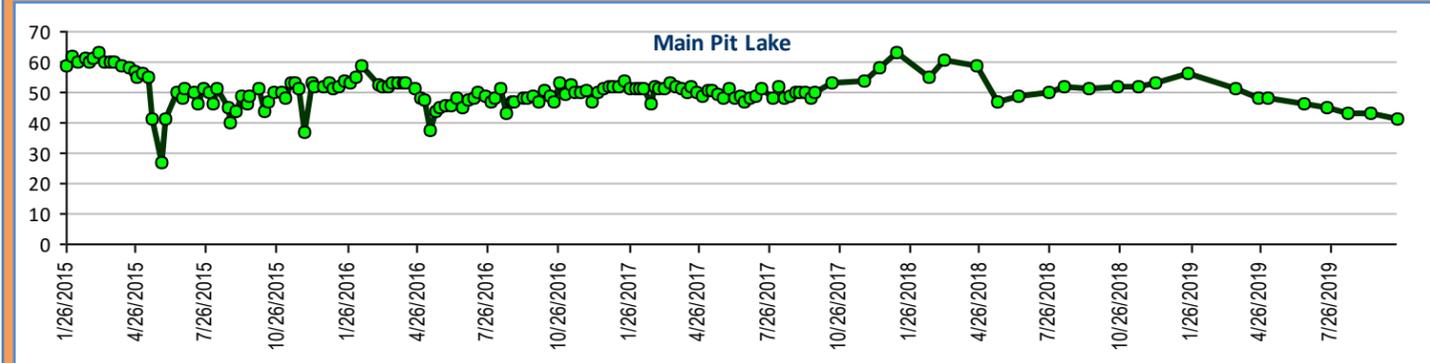
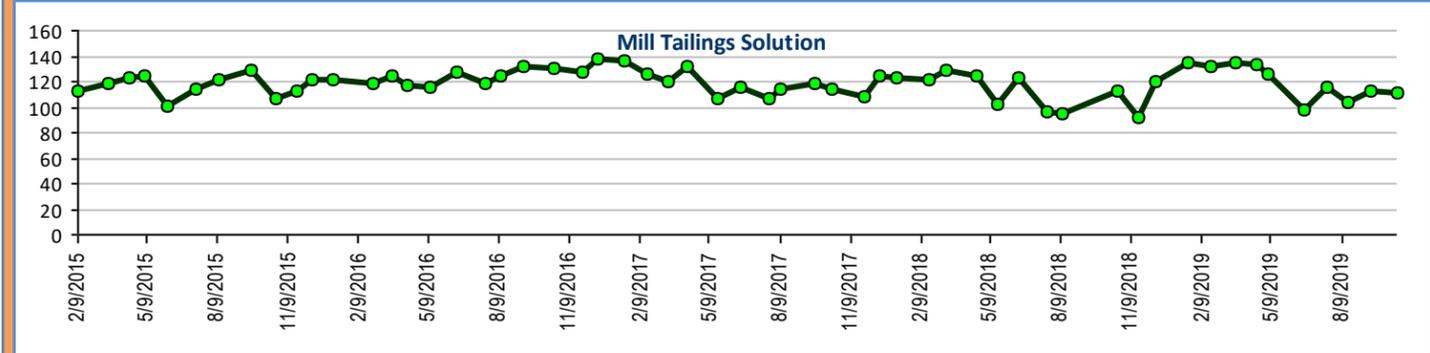
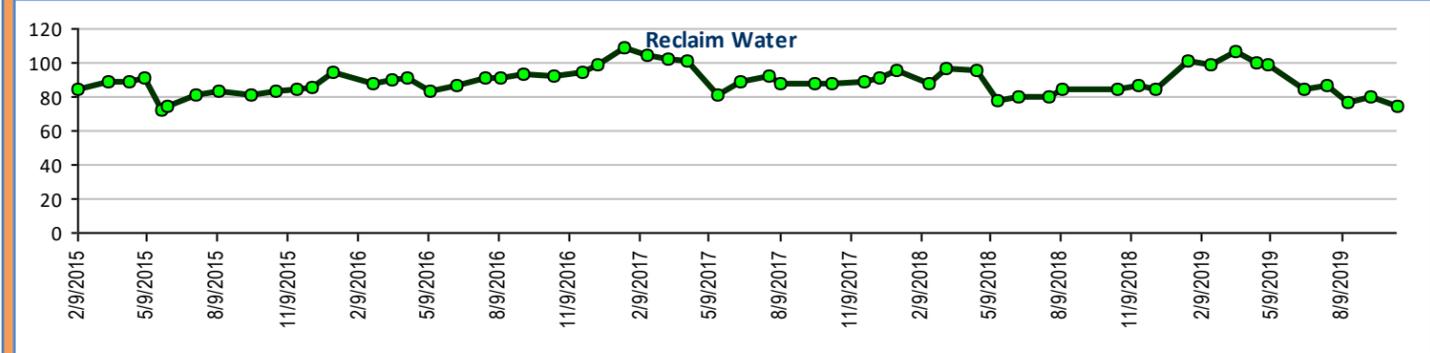
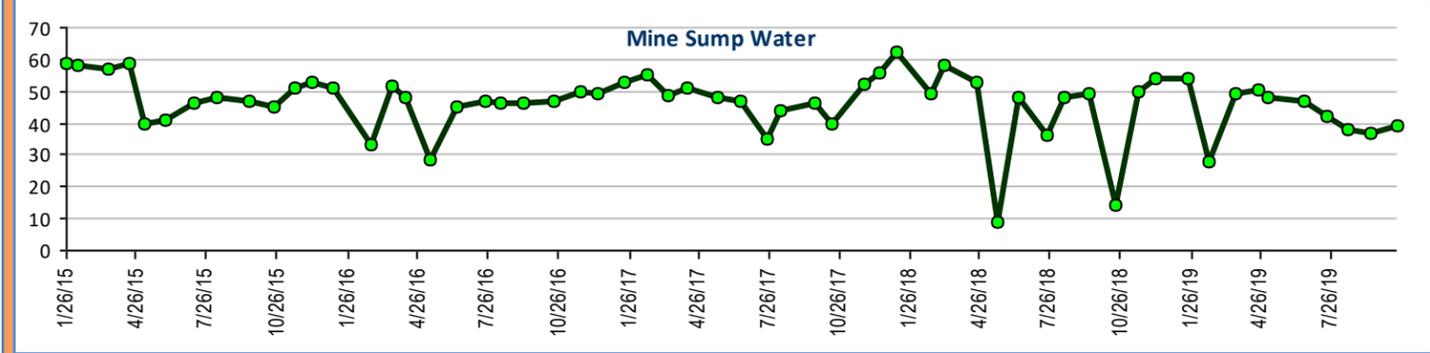




Mine Water Monitoring - Water Quality Profile II, Trend Charts

RED DOG MINE

Sodium, dissolved, units mg/L

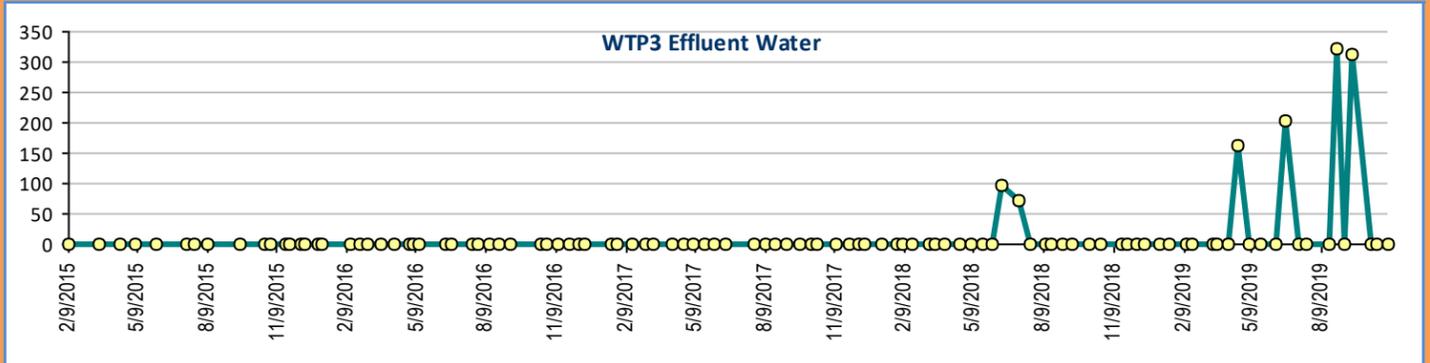
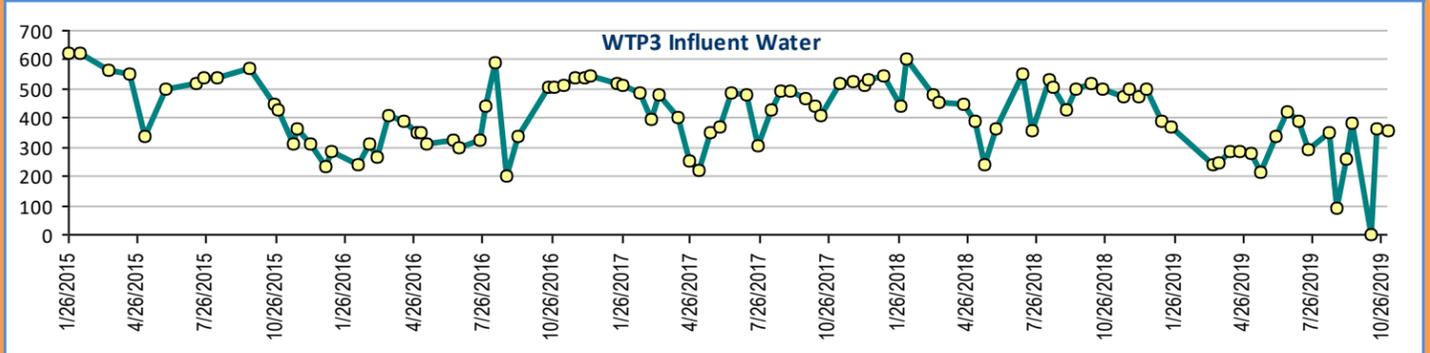
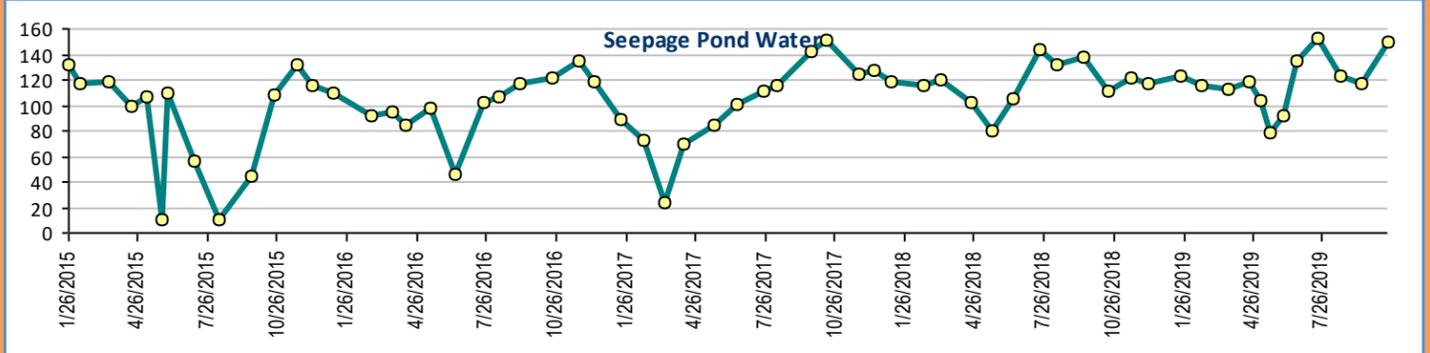
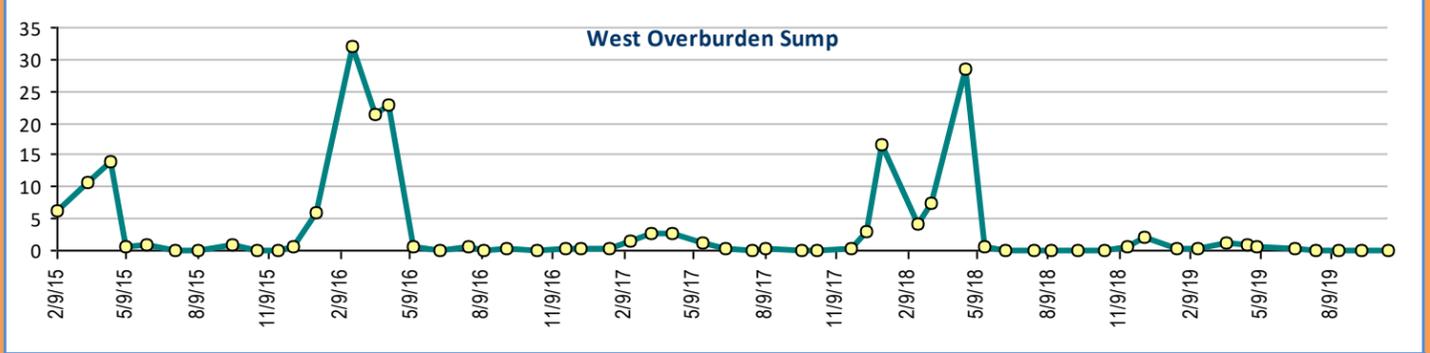
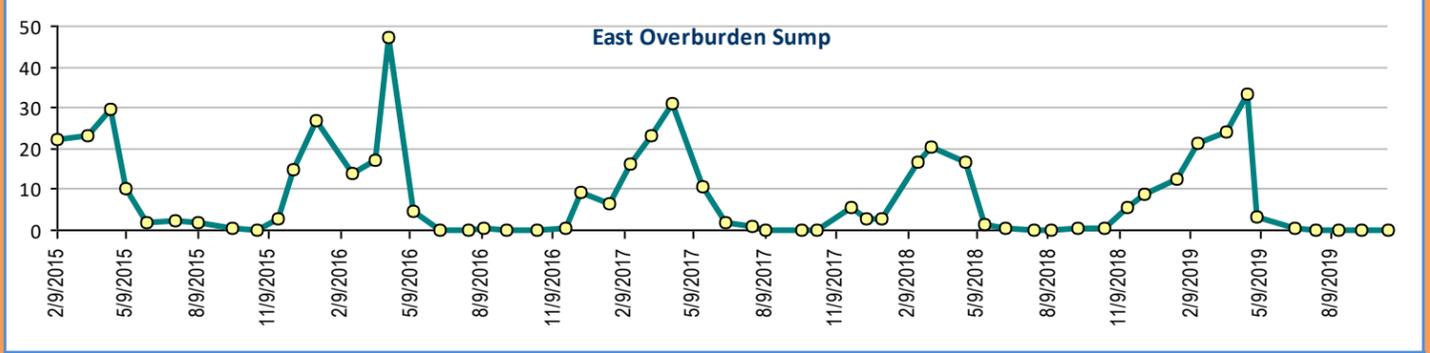
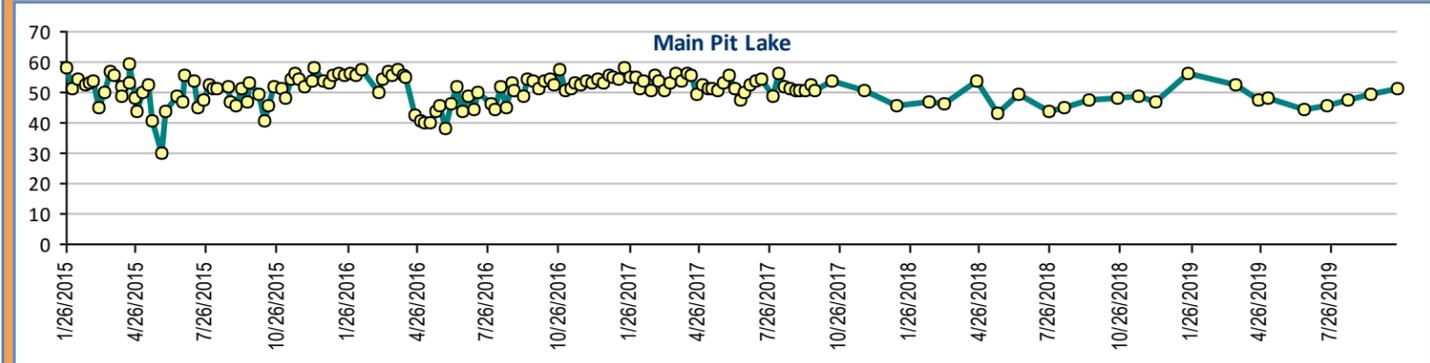
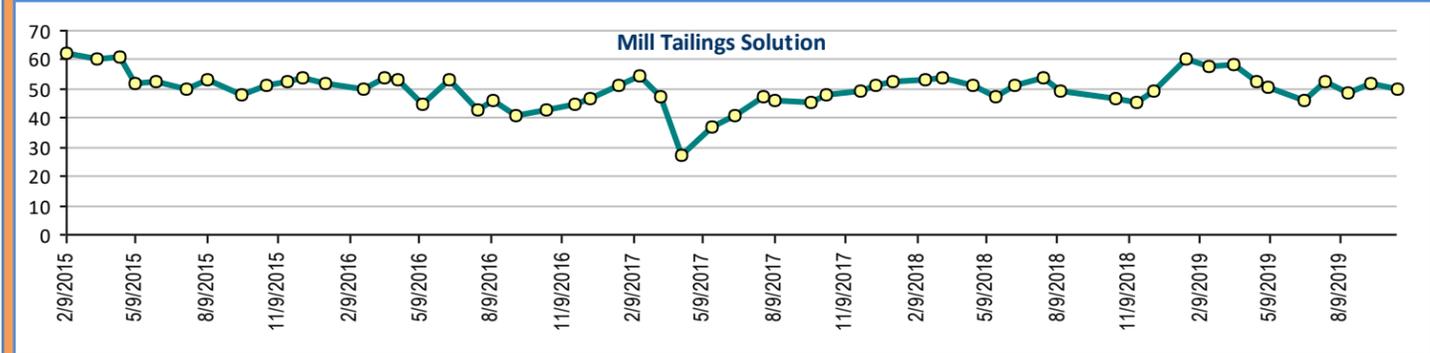
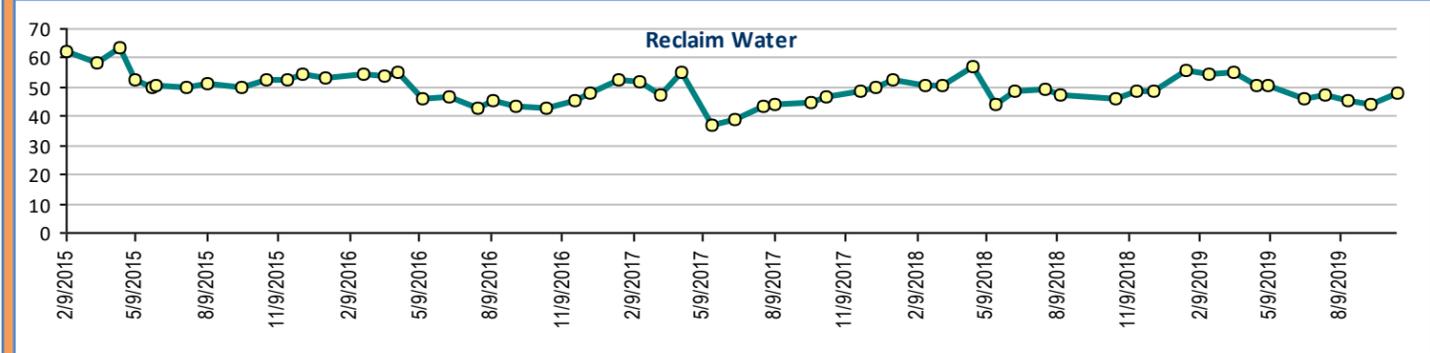
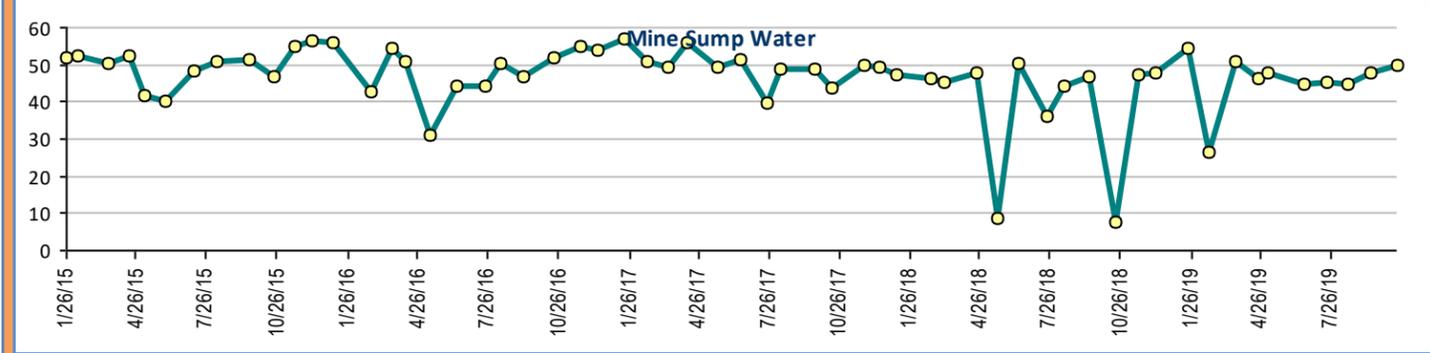




Mine Water Monitoring - Water Quality Profile II, Trend Charts

RED DOG MINE

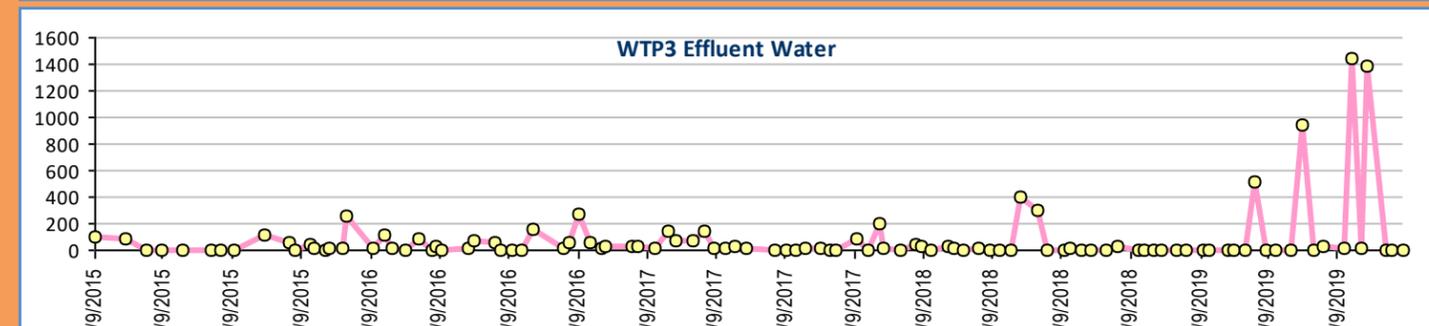
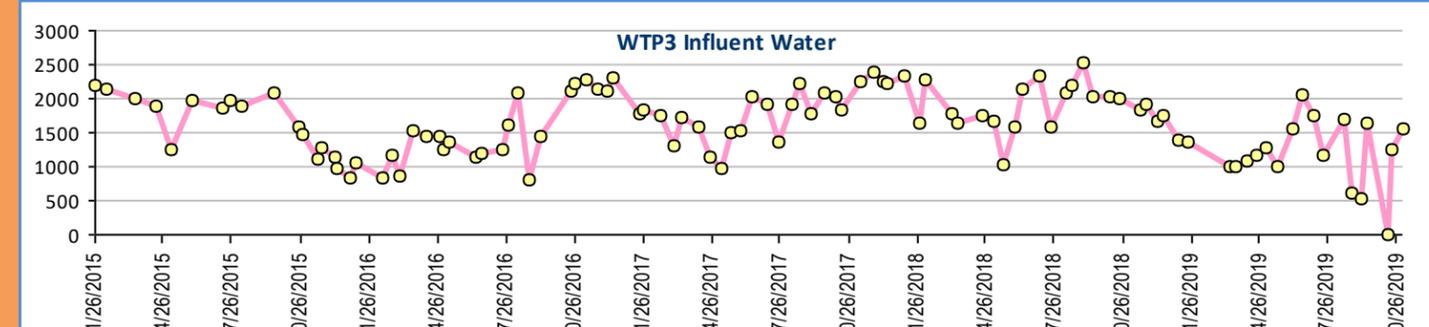
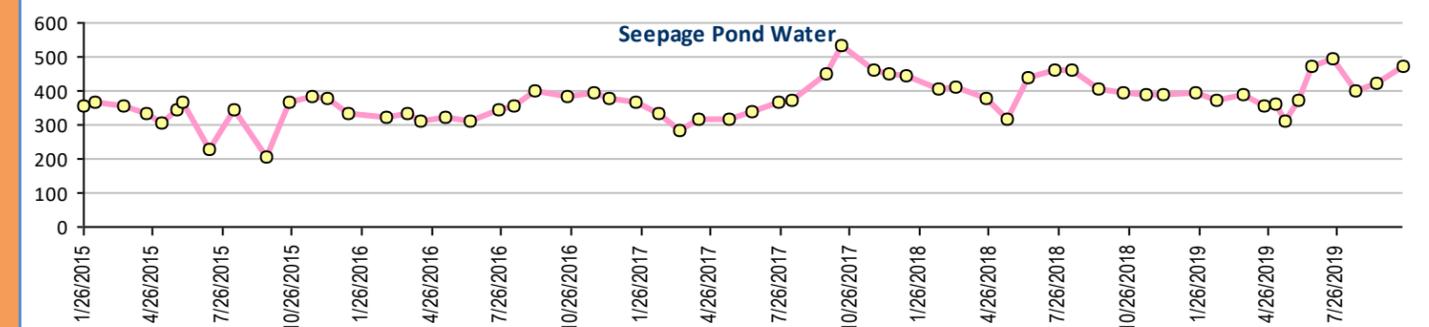
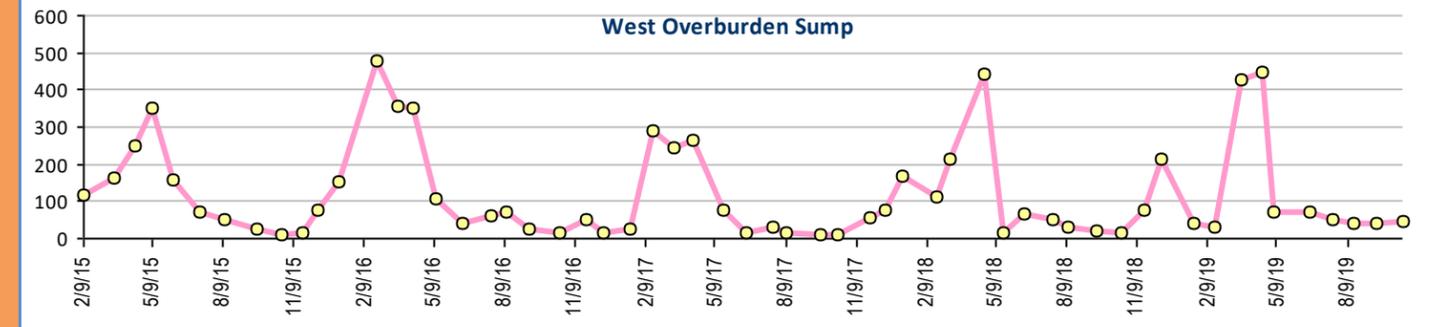
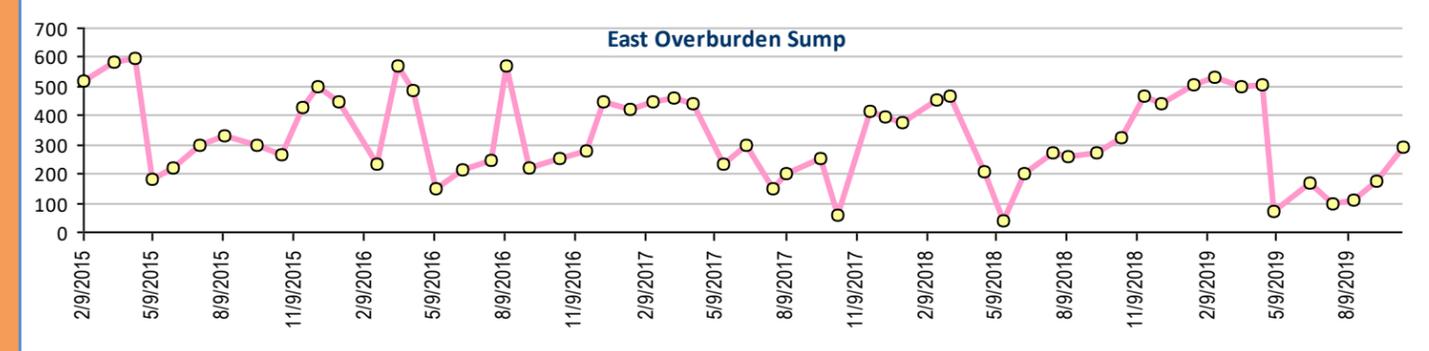
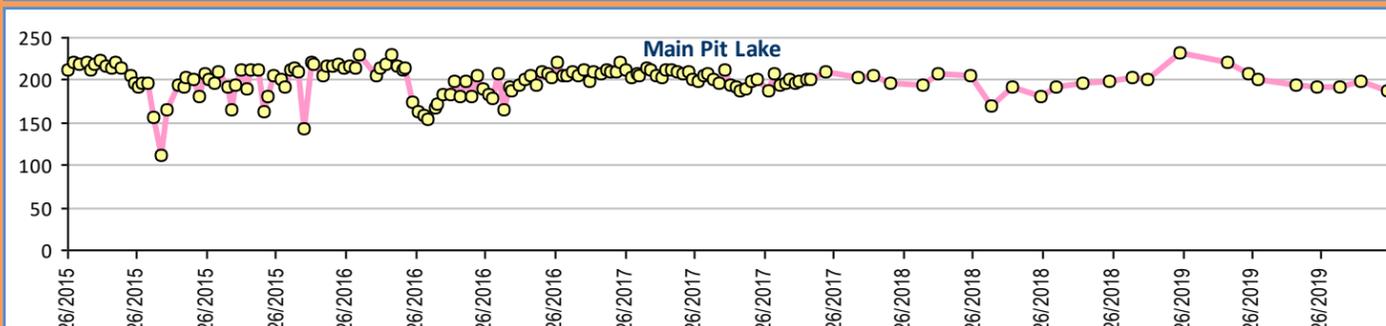
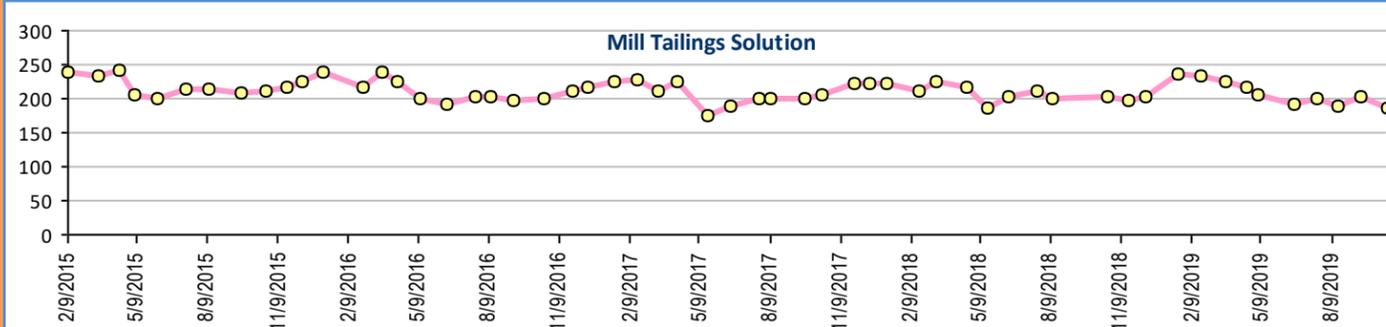
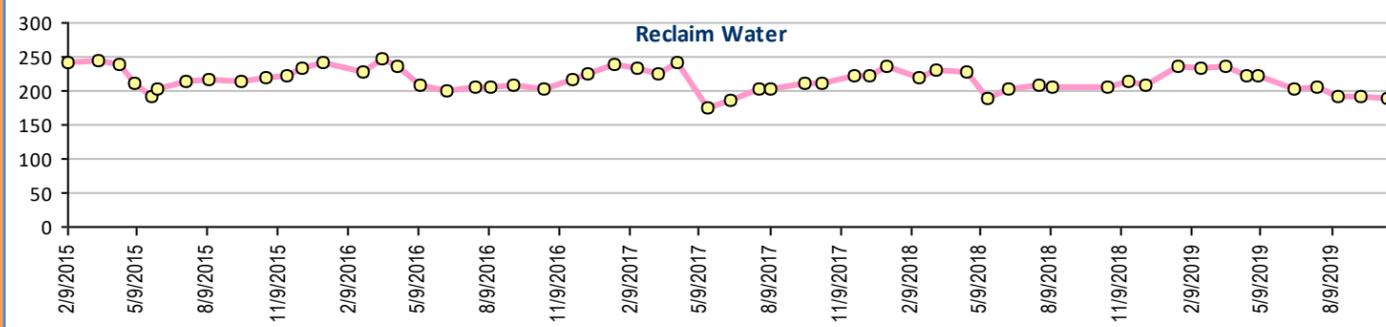
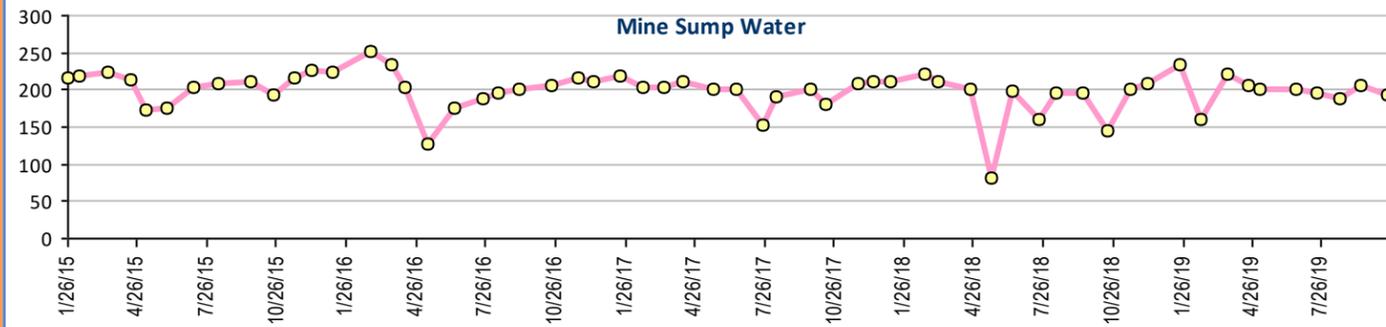
Manganese, dissolved, units mg/L





Mine Water Monitoring - Water Quality Profile II, Trend Charts

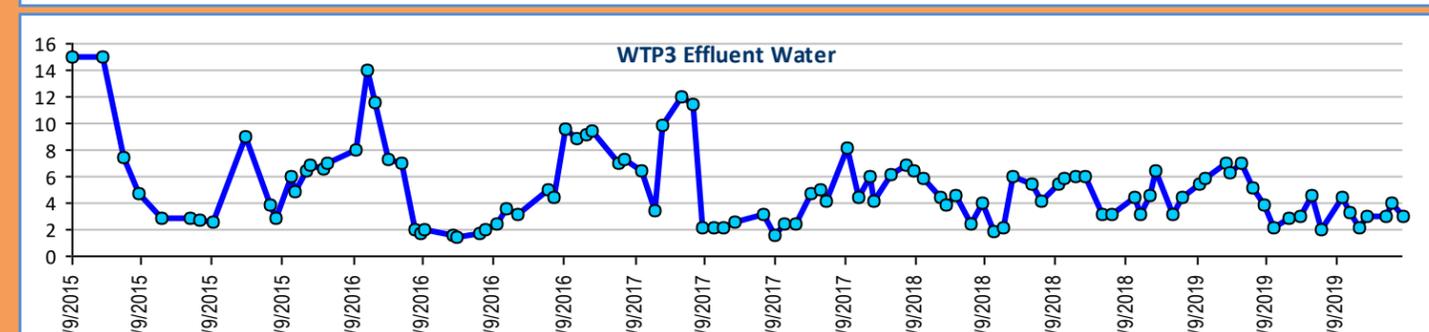
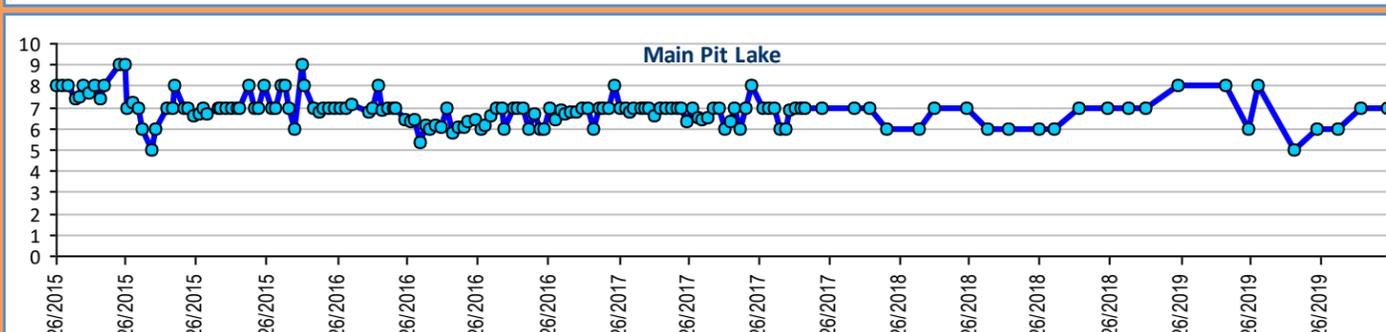
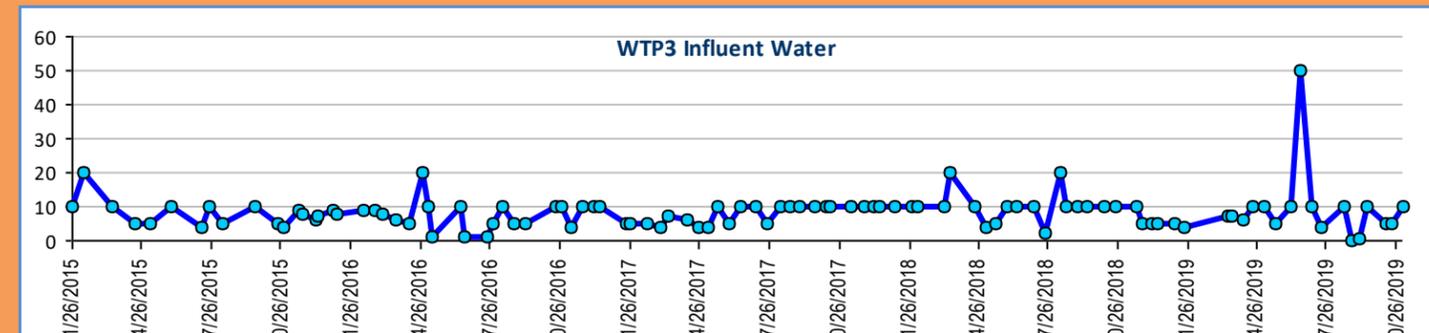
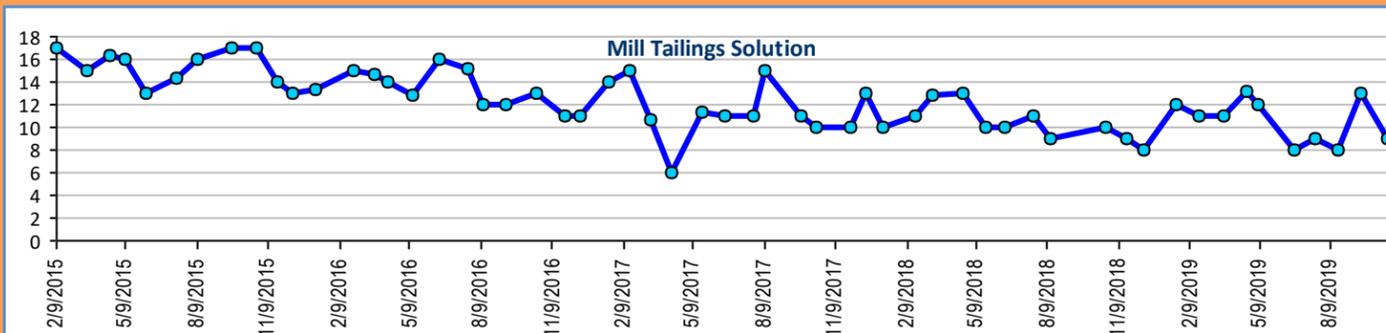
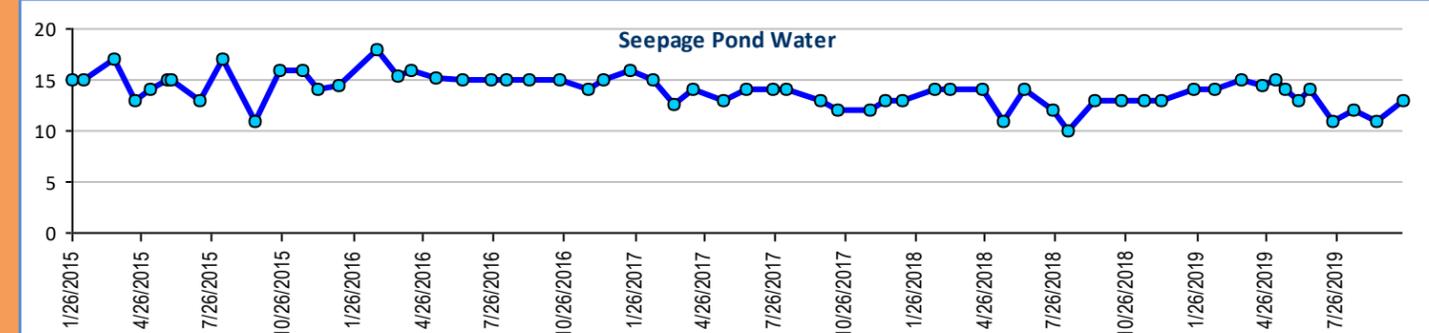
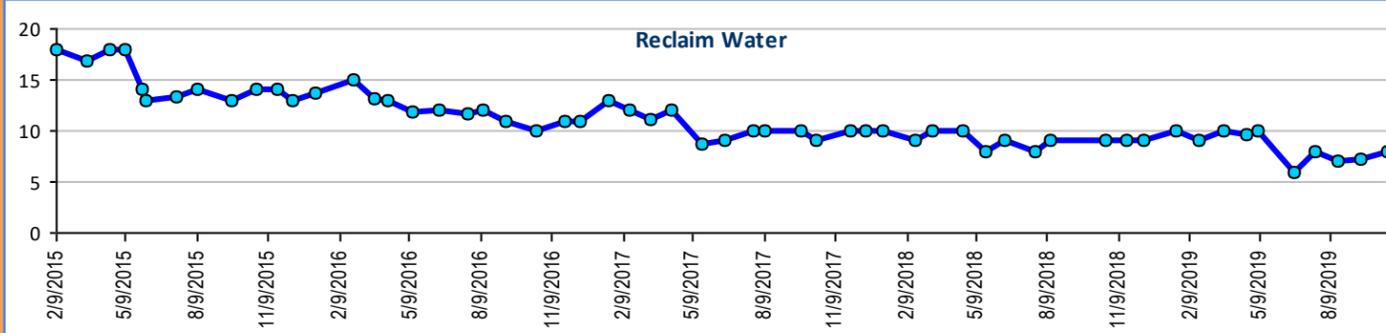
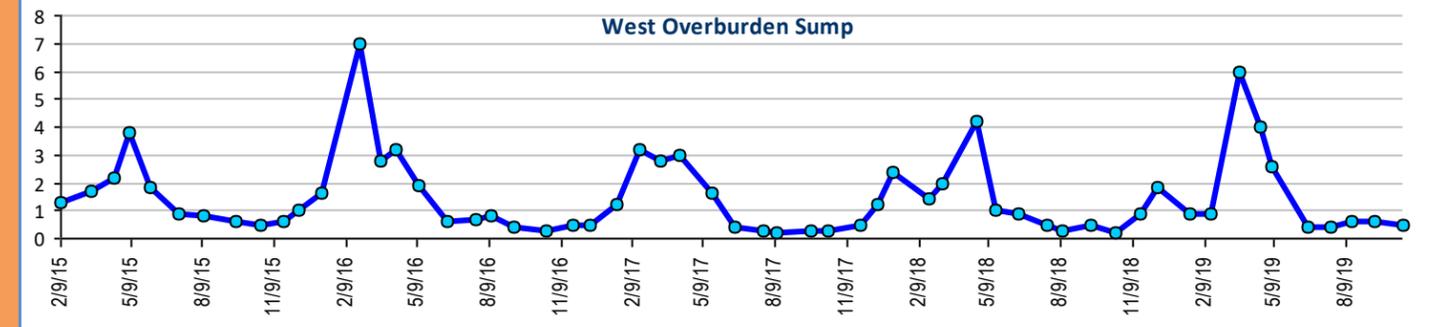
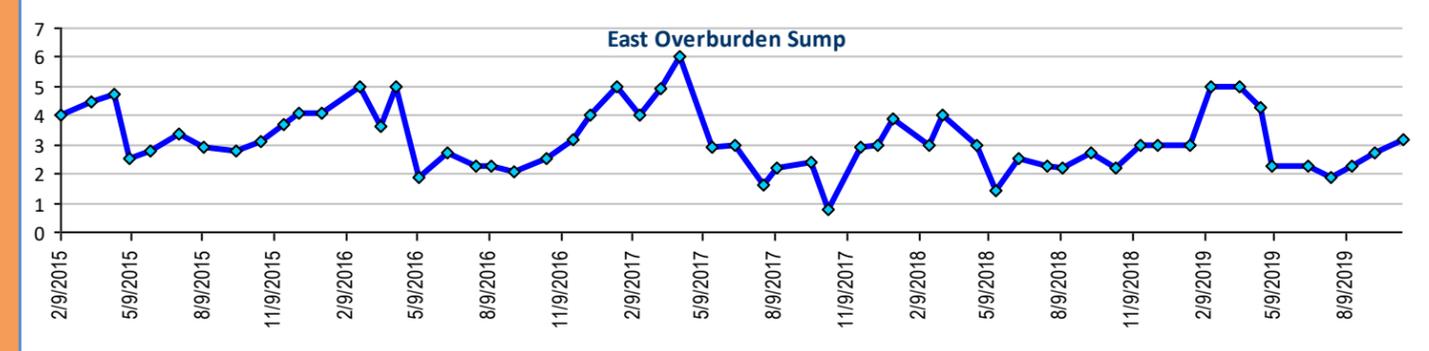
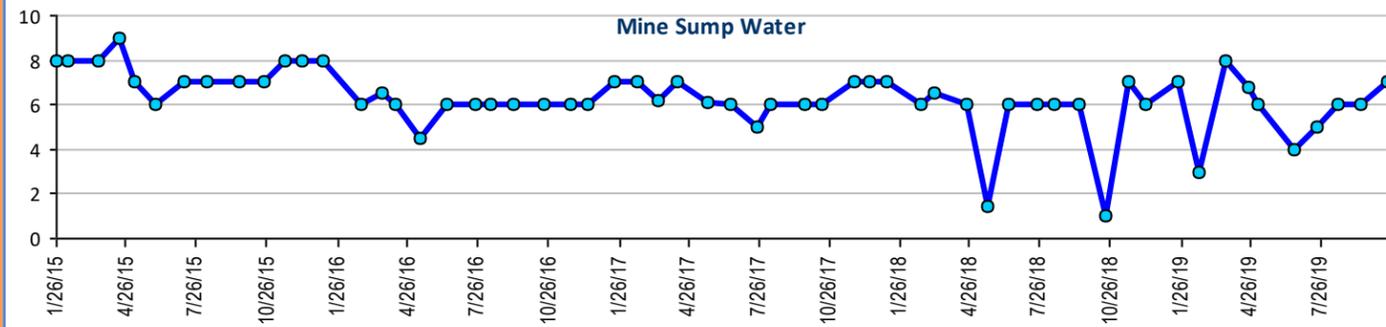
Magnesium, dissolved, units mg/L





Mine Water Monitoring - Water Quality Profile II, Trend Charts

Potassium, dissolved, units mg/L

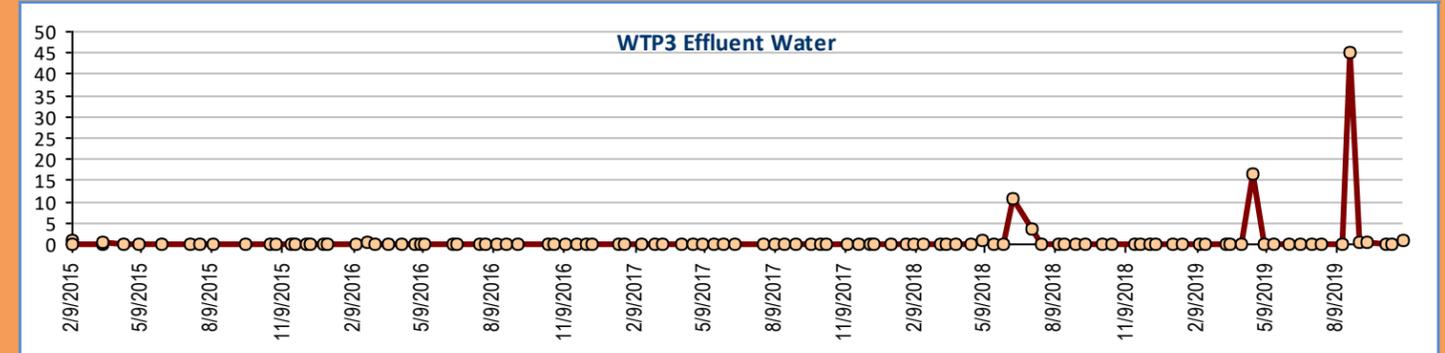
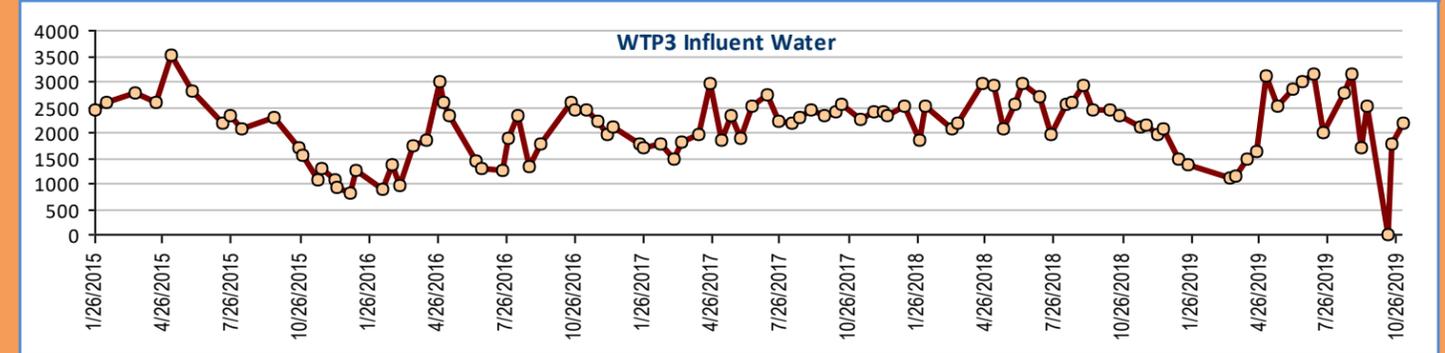
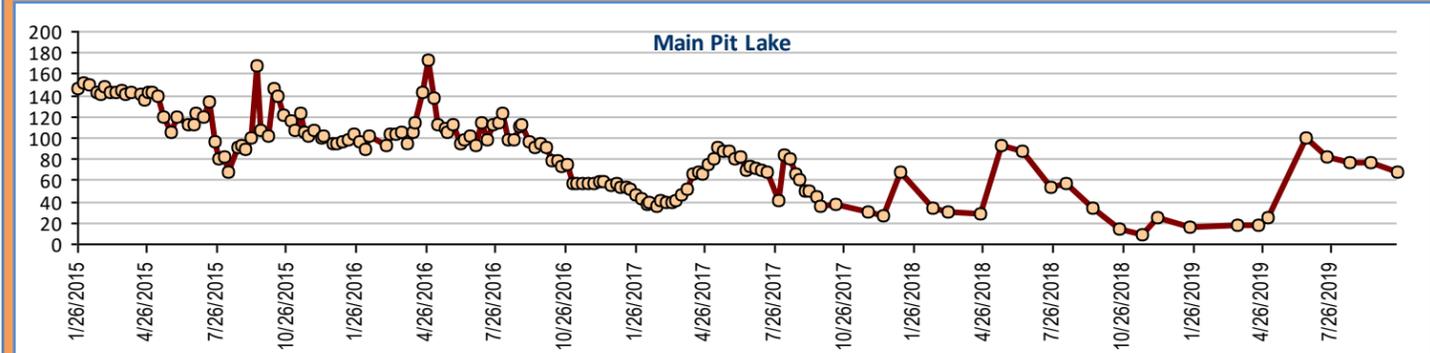
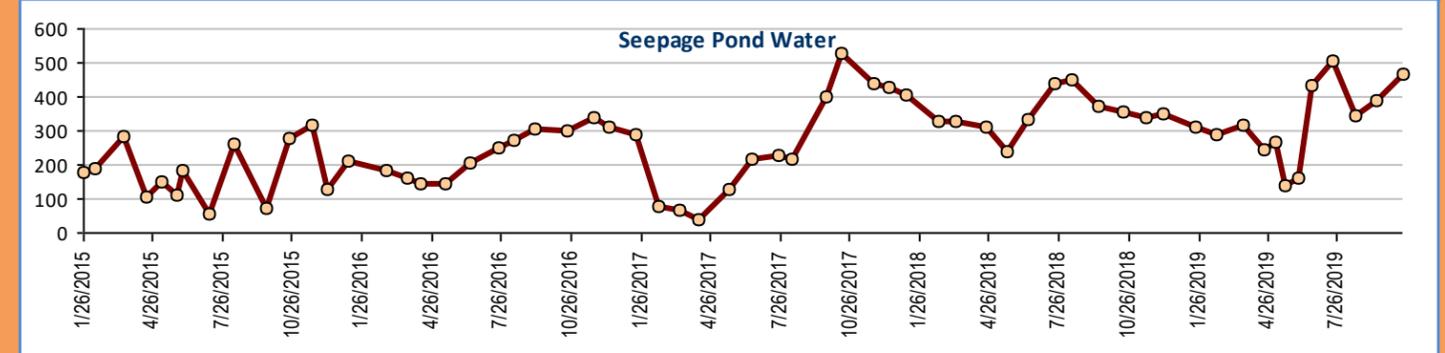
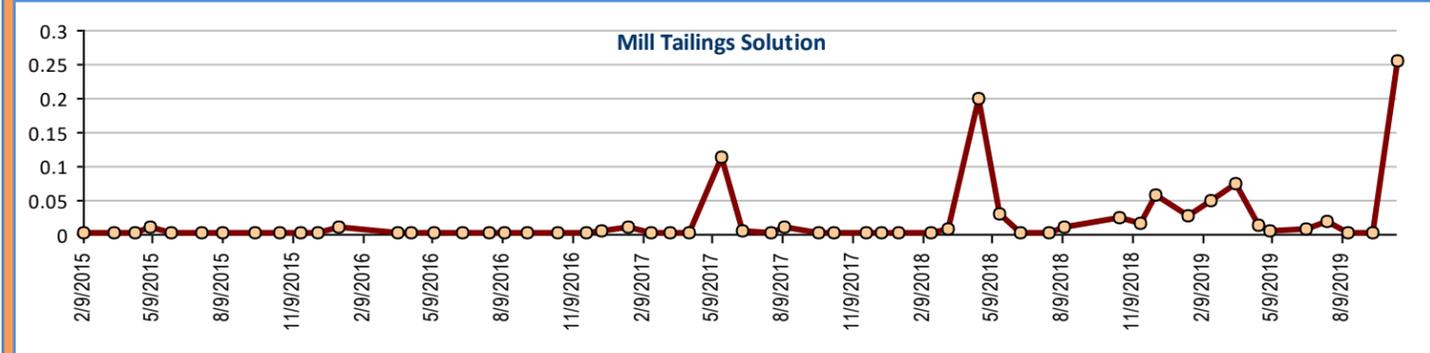
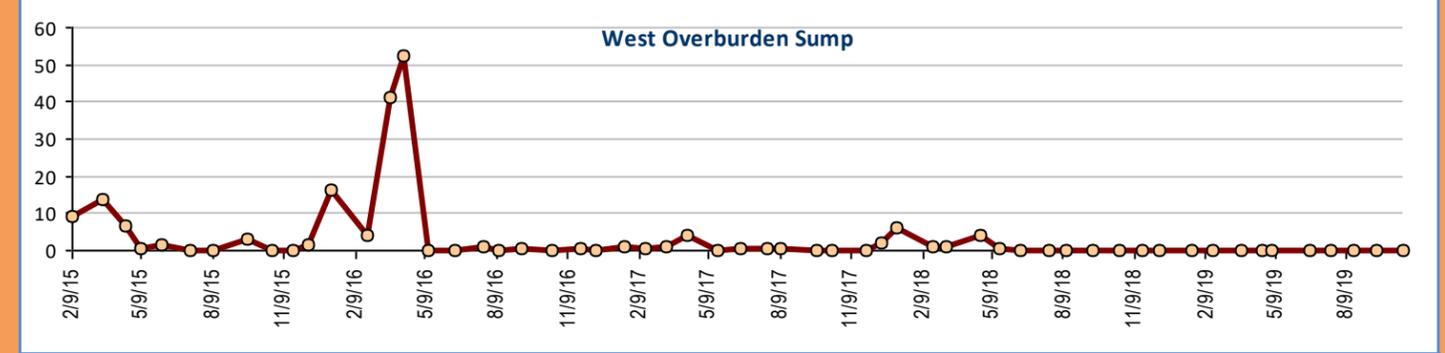
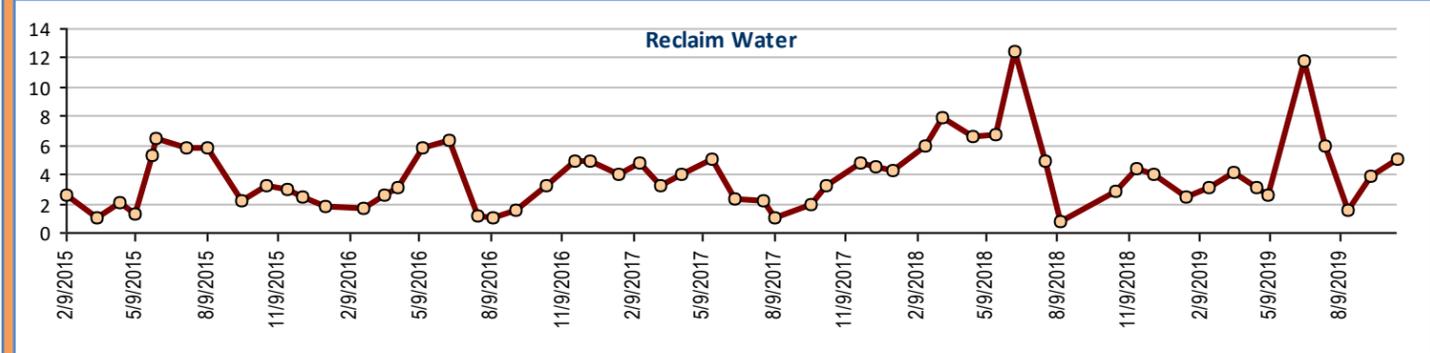
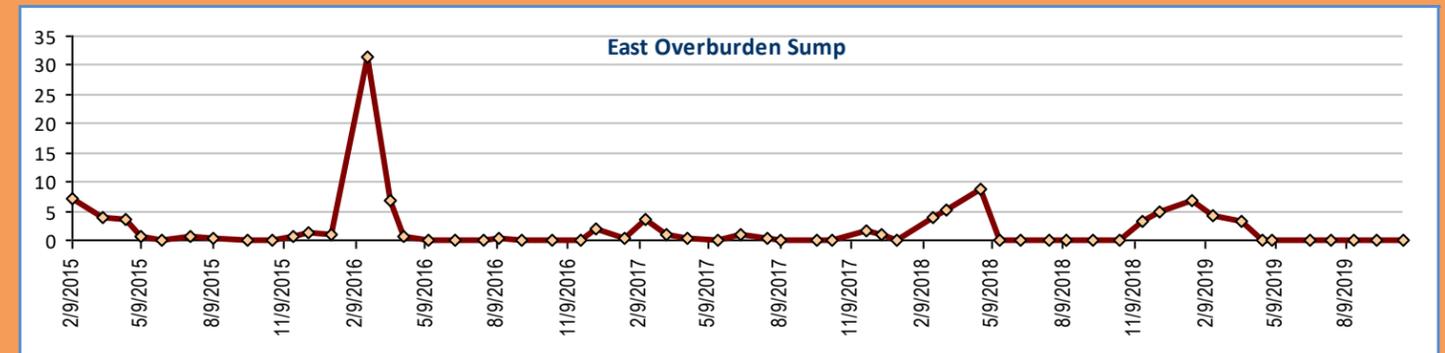
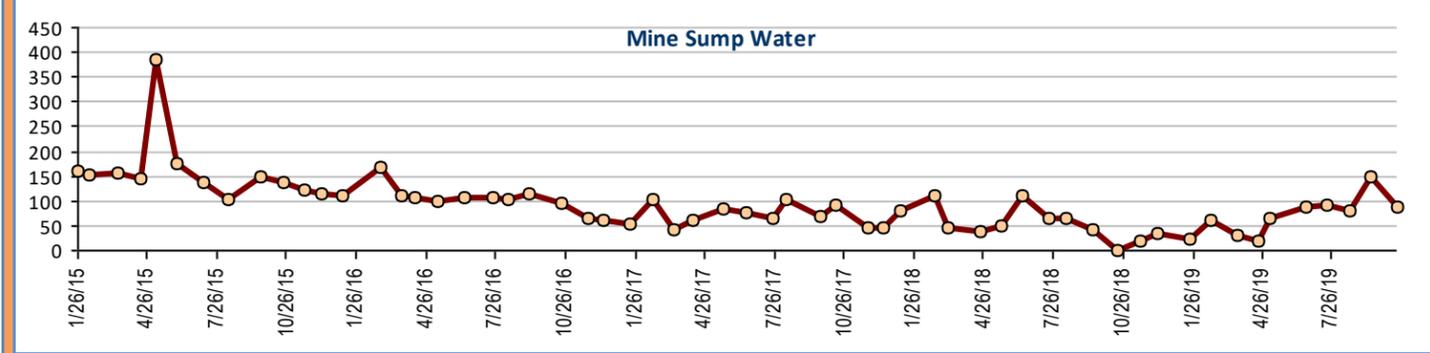




Mine Water Monitoring - Water Quality Profile II, Trend Charts

RED DOG MINE

Iron, dissolved, units mg/L

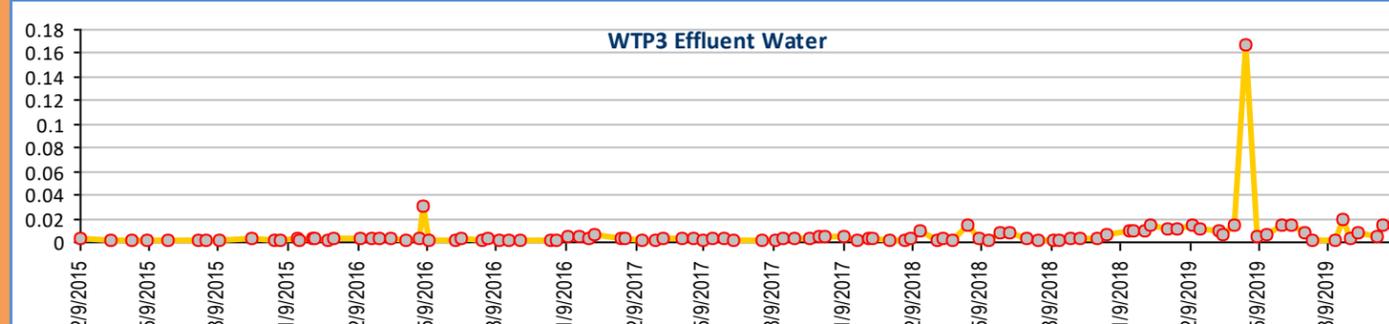
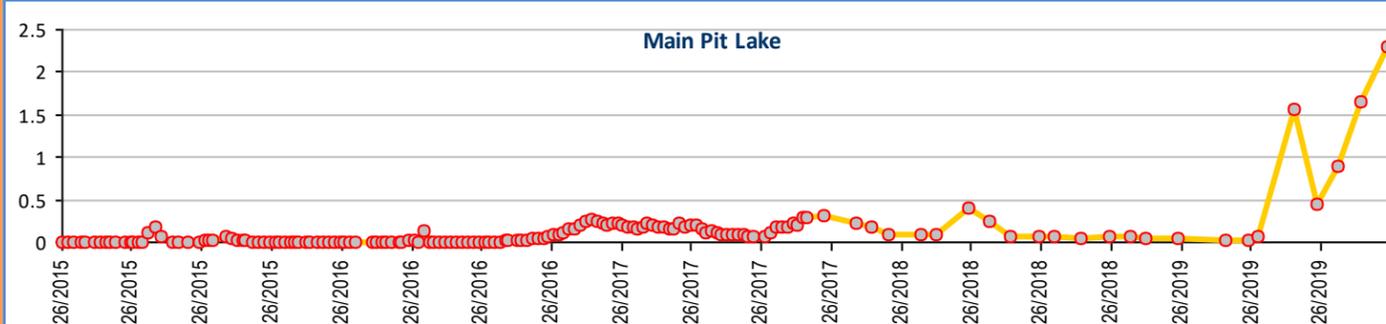
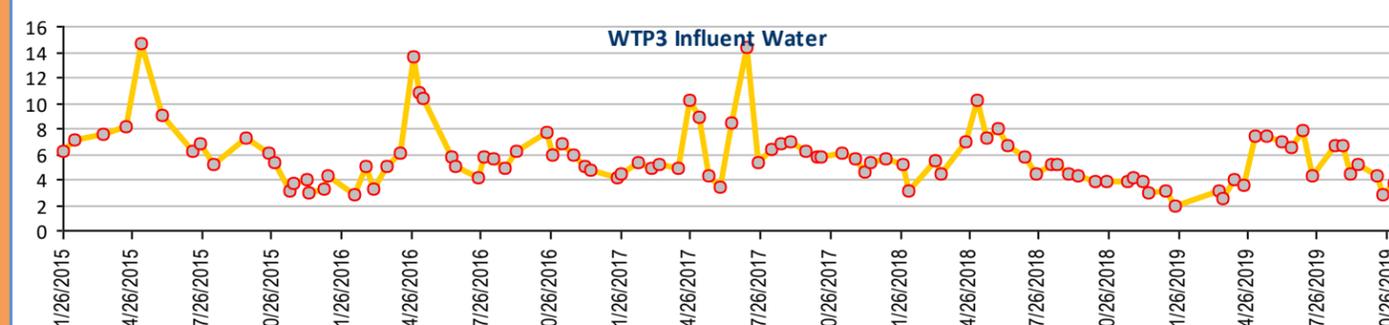
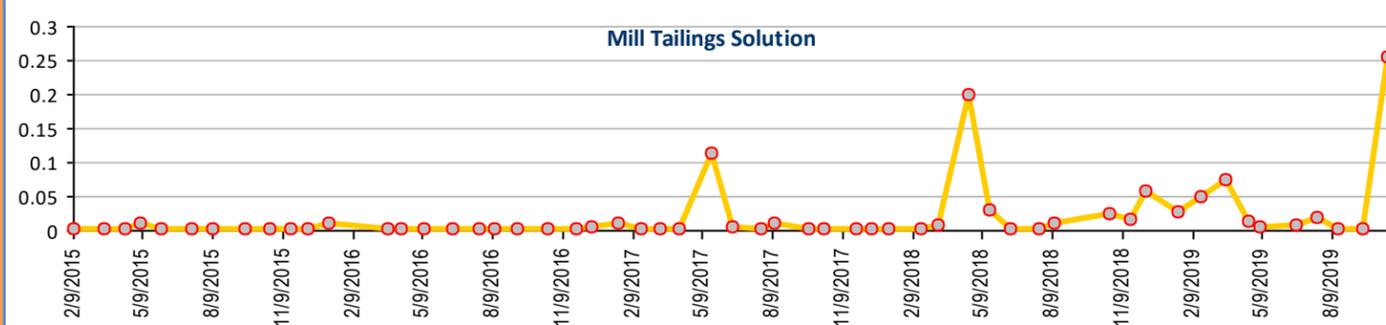
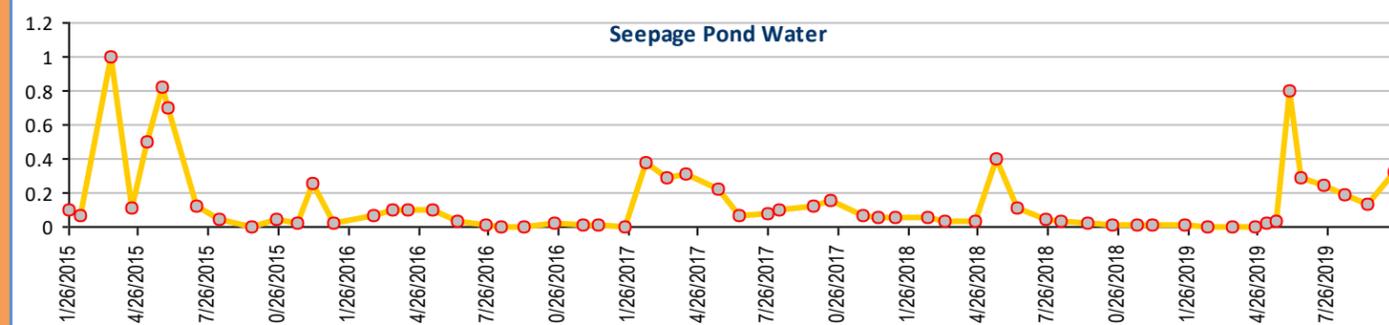
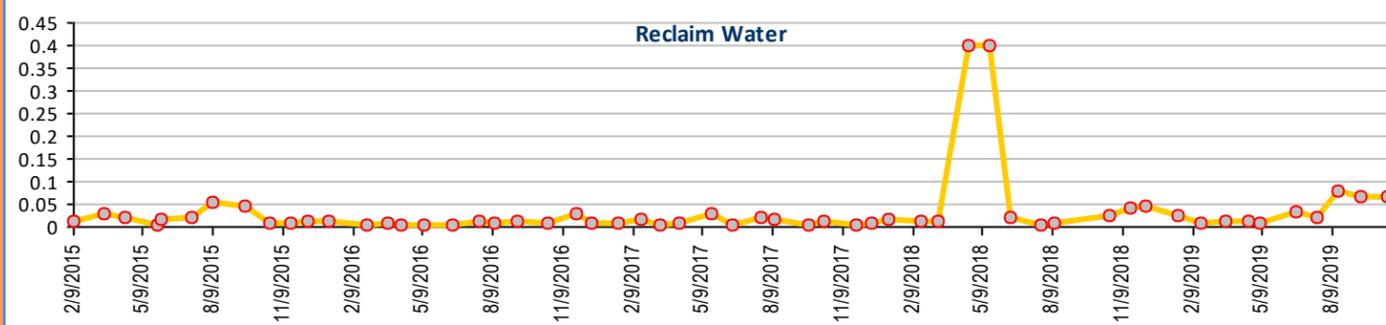
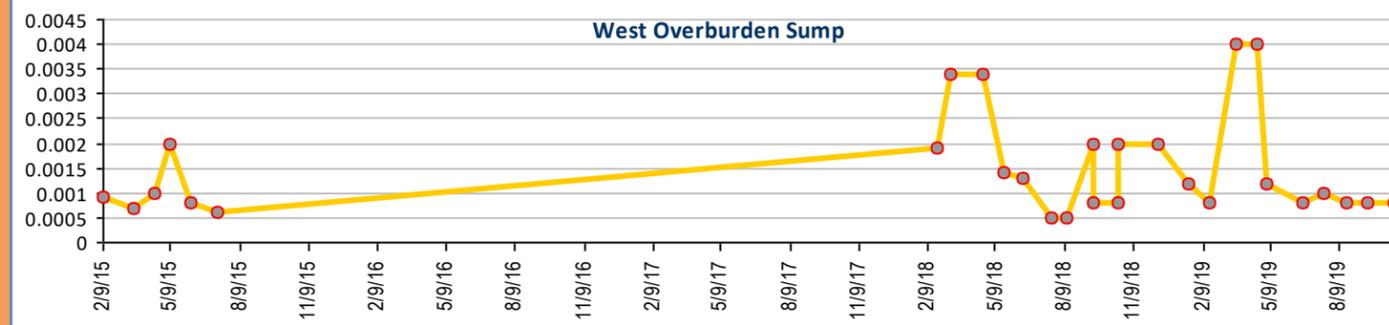
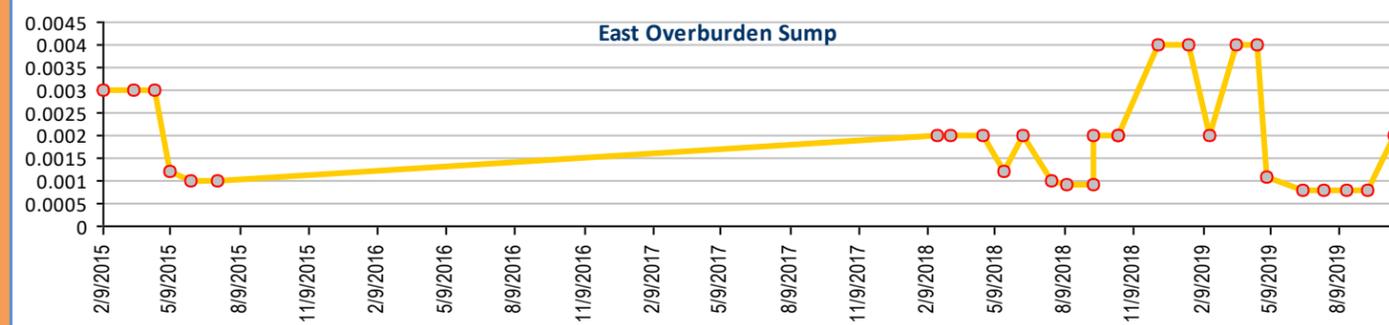
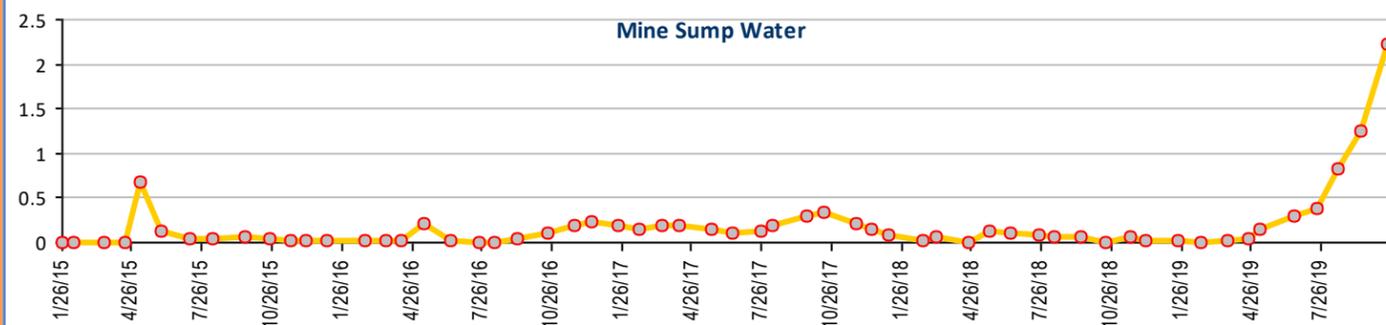




RED DOG MINE

Mine Water Monitoring - Water Quality Profile II, Trend Charts

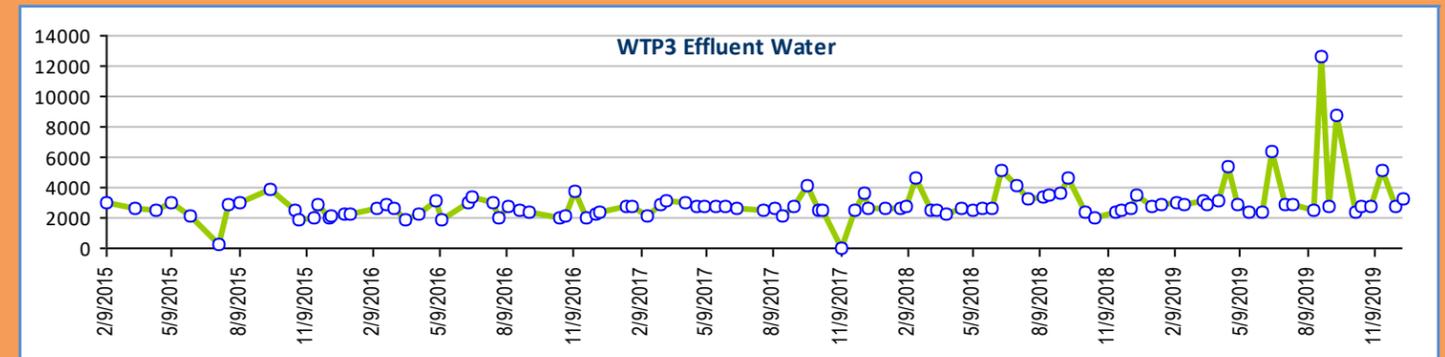
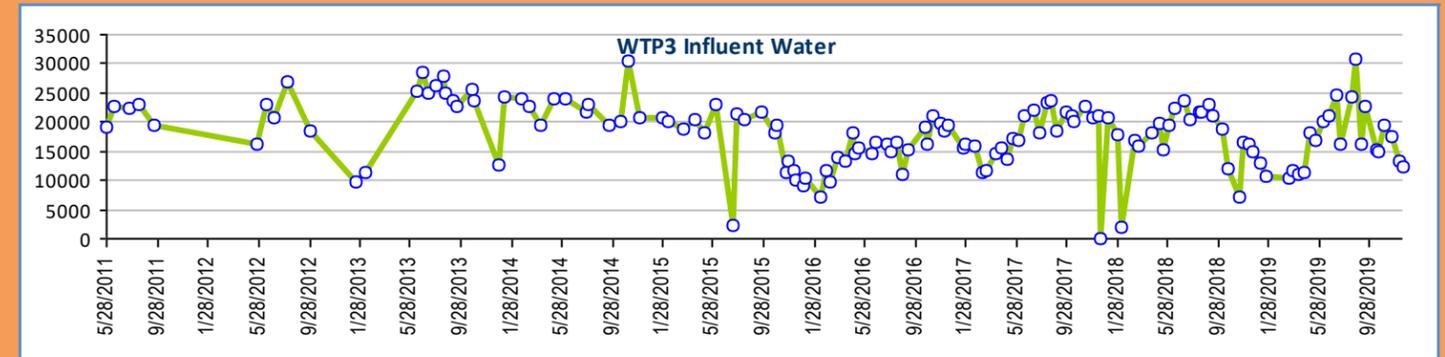
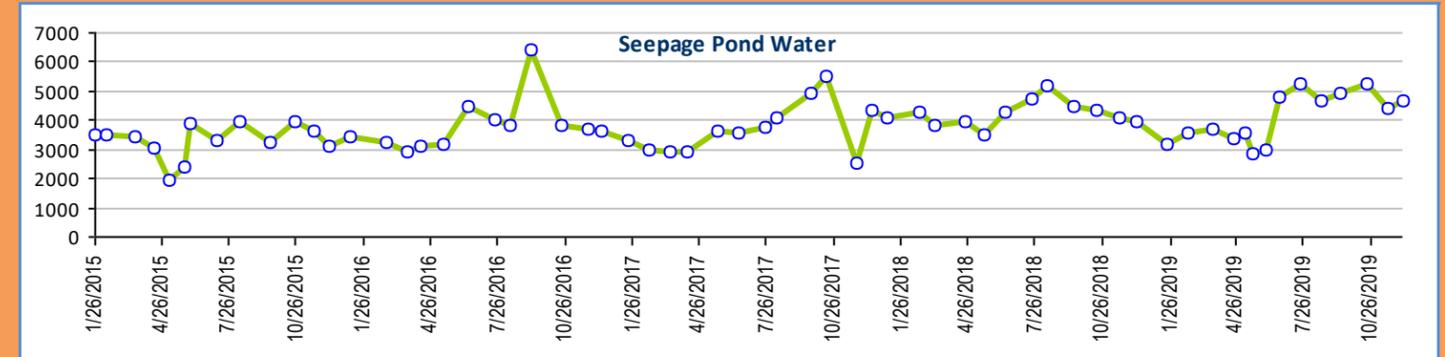
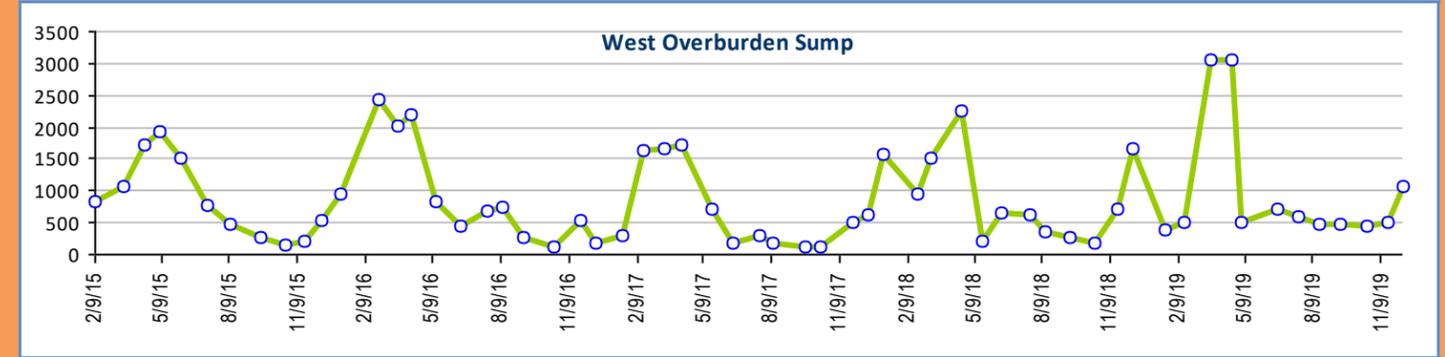
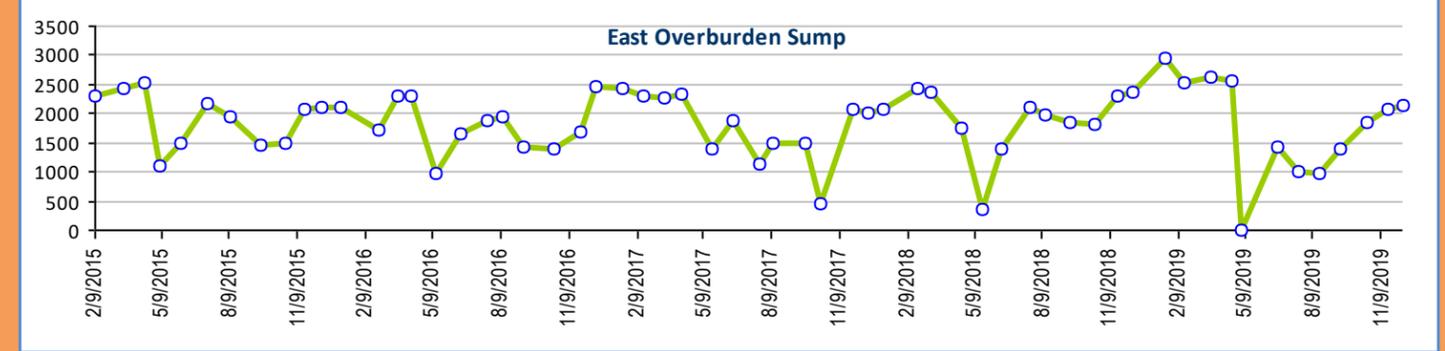
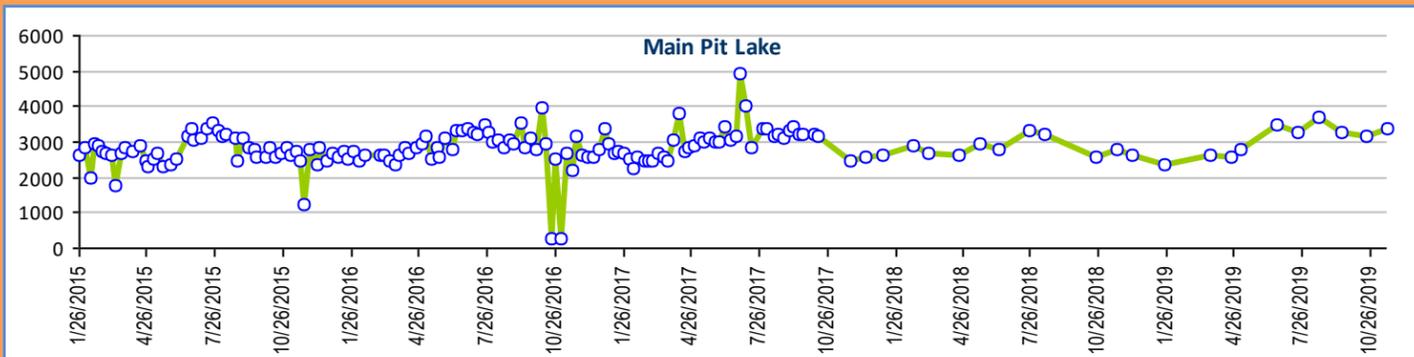
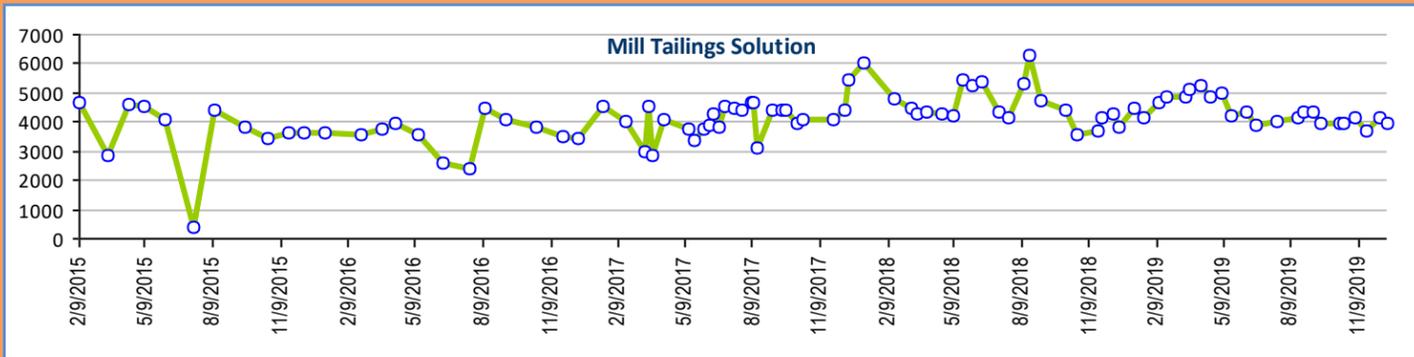
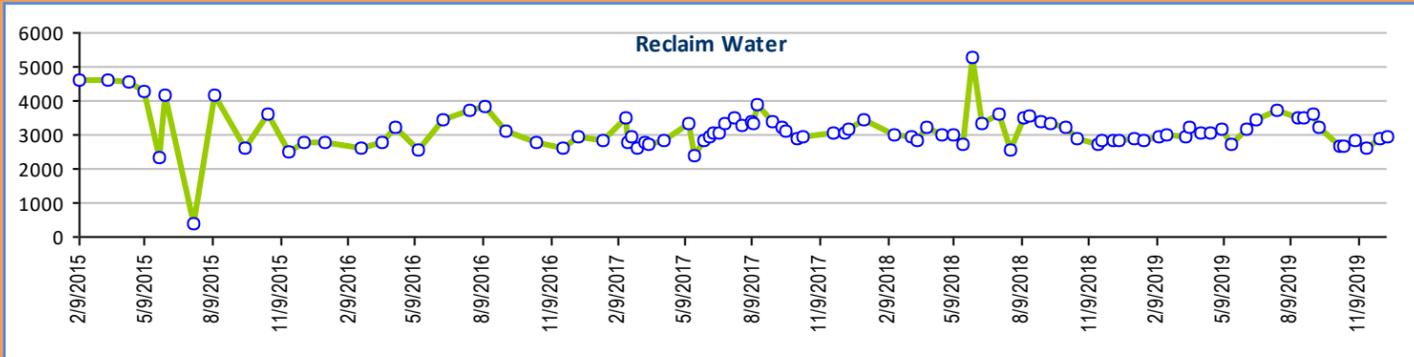
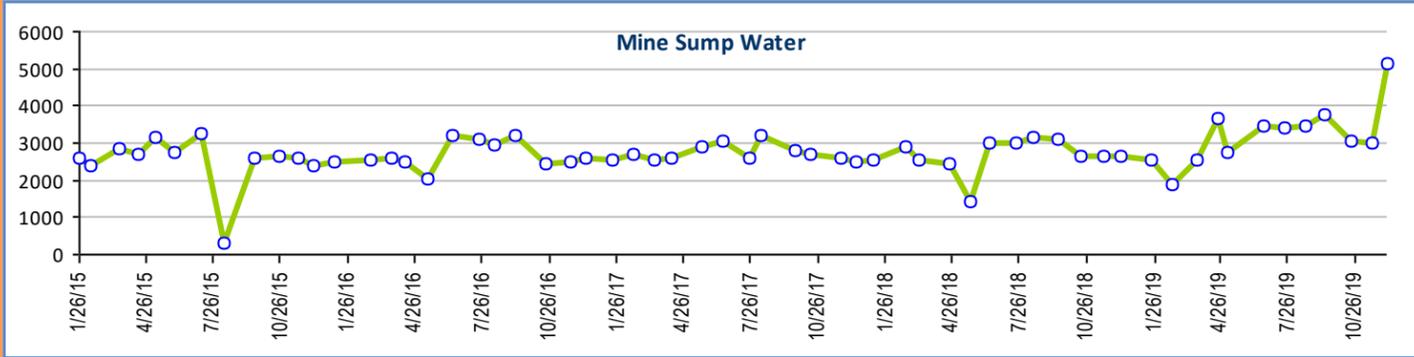
Copper, dissolved, units mg/L





Mine Water Monitoring - Water Quality Profile II, Trend Charts

Conductivity, units uS/cm



Appendix D: Water Quality Profile I Charts – Mine Drainage Monitoring Stations



Water Monitoring Drainage Water Quality Profile I, 5-Year Trend Charts

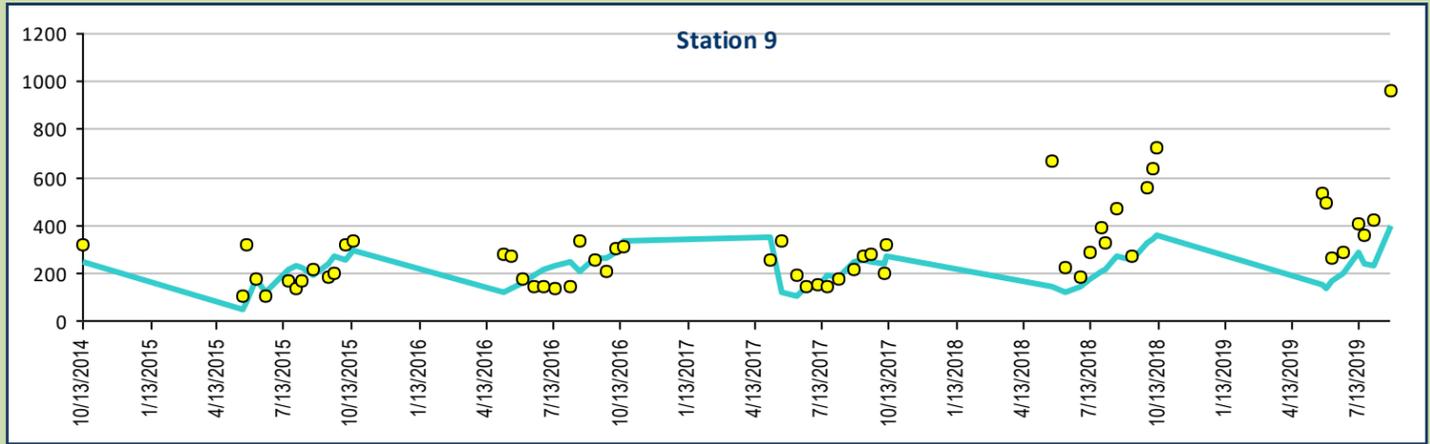
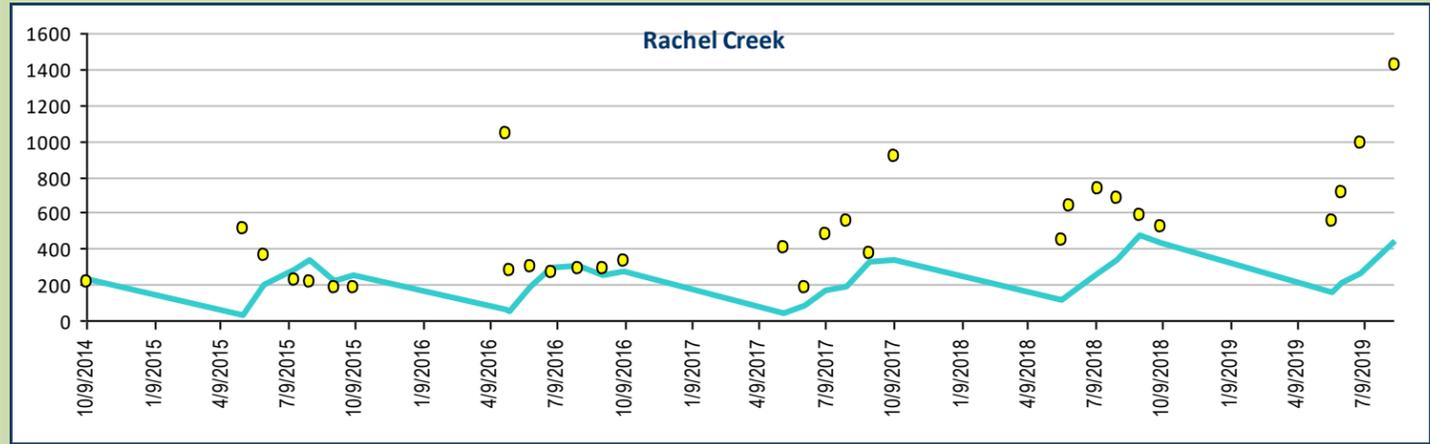
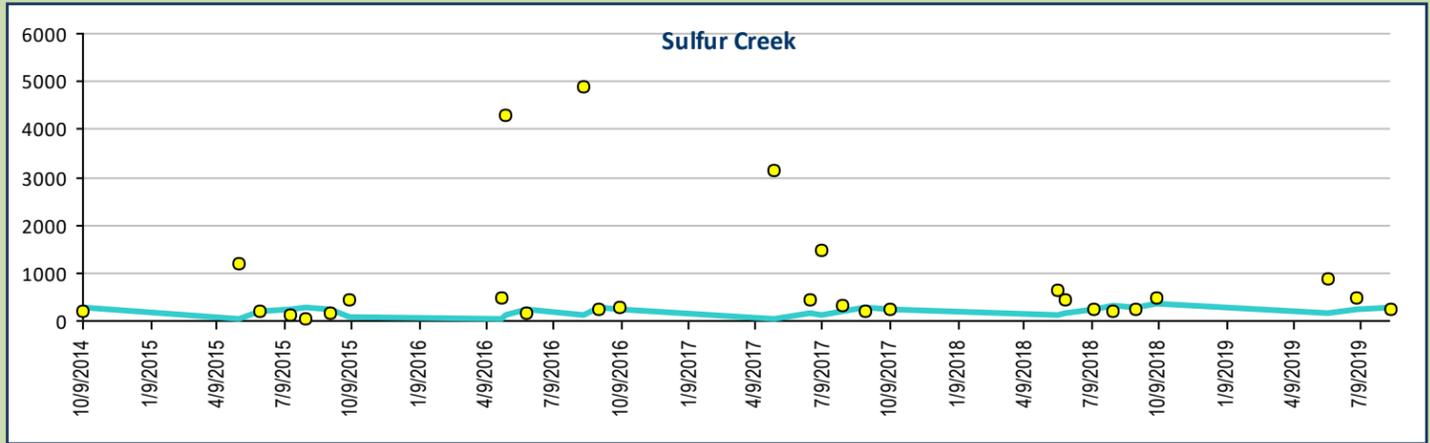
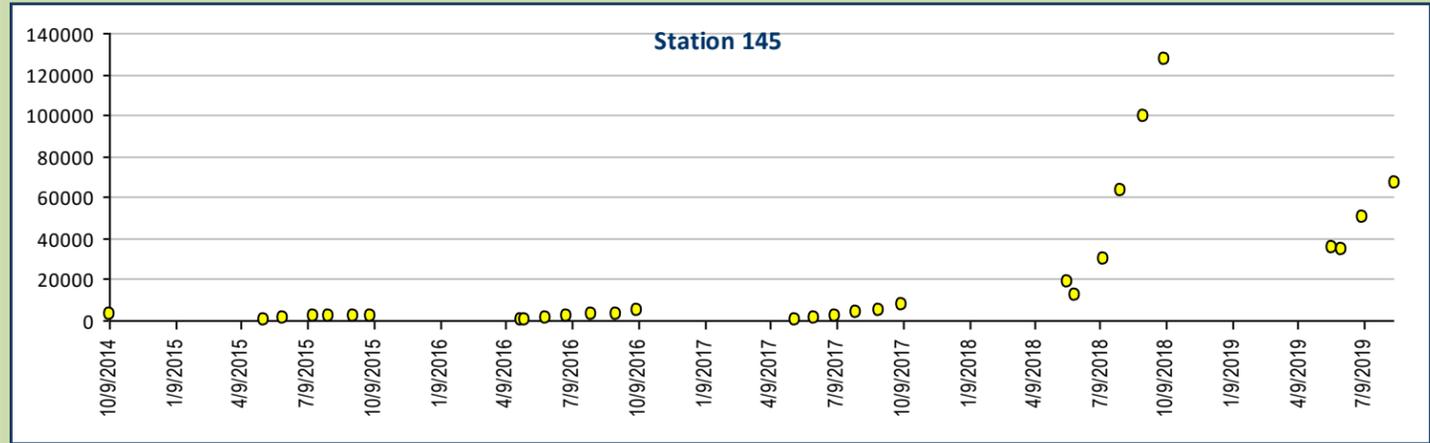
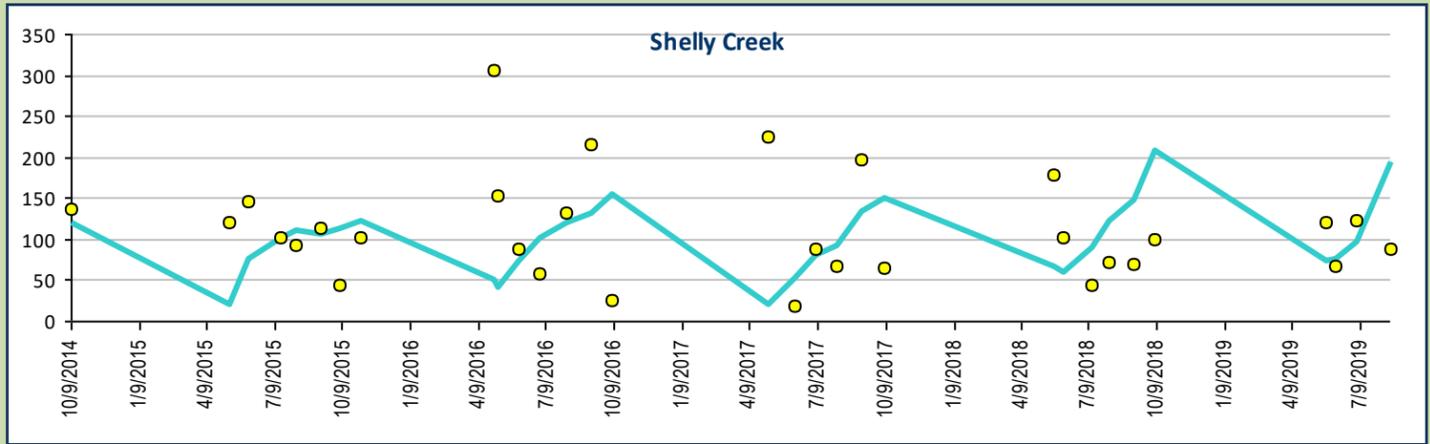
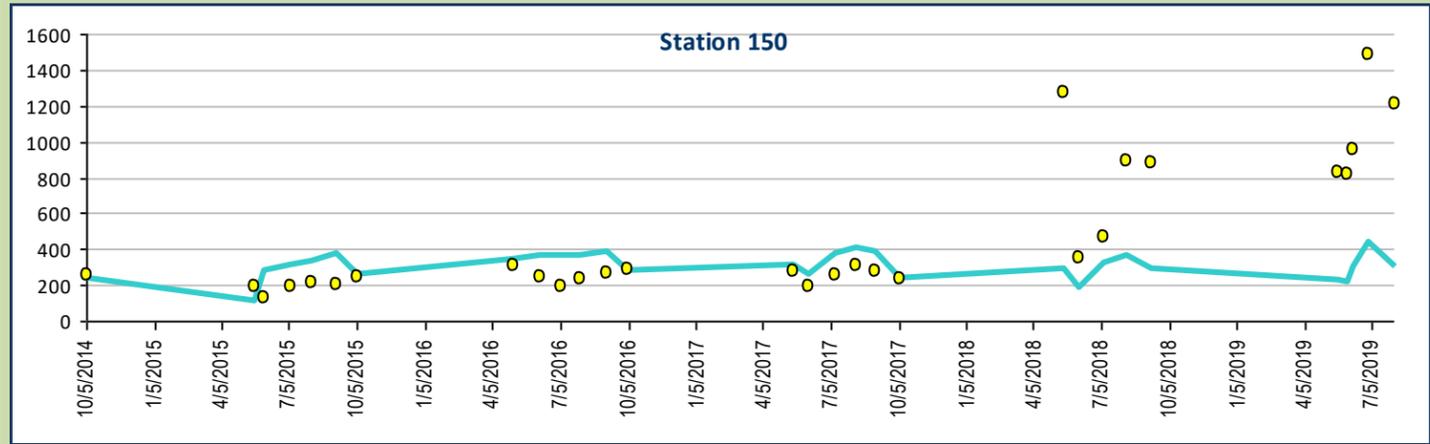
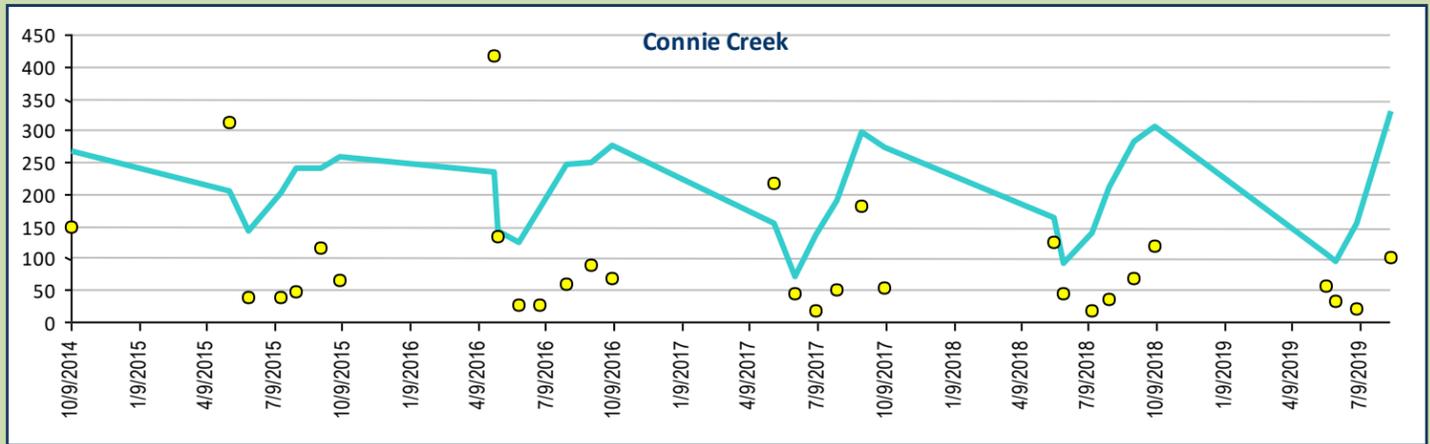
Zinc, Total Recoverable, units ug/L

Aquatic Life - Fresh Water Acute WQS ug/L

Hardness Dependent Calculation

$$=EXP(0.8473*(LN(*hardness))+0.884)$$

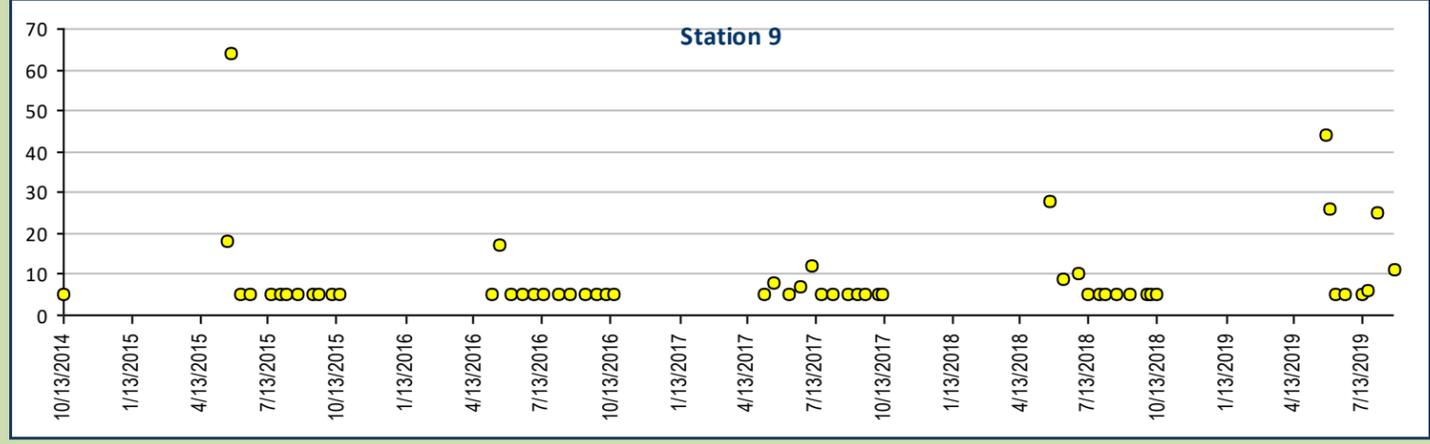
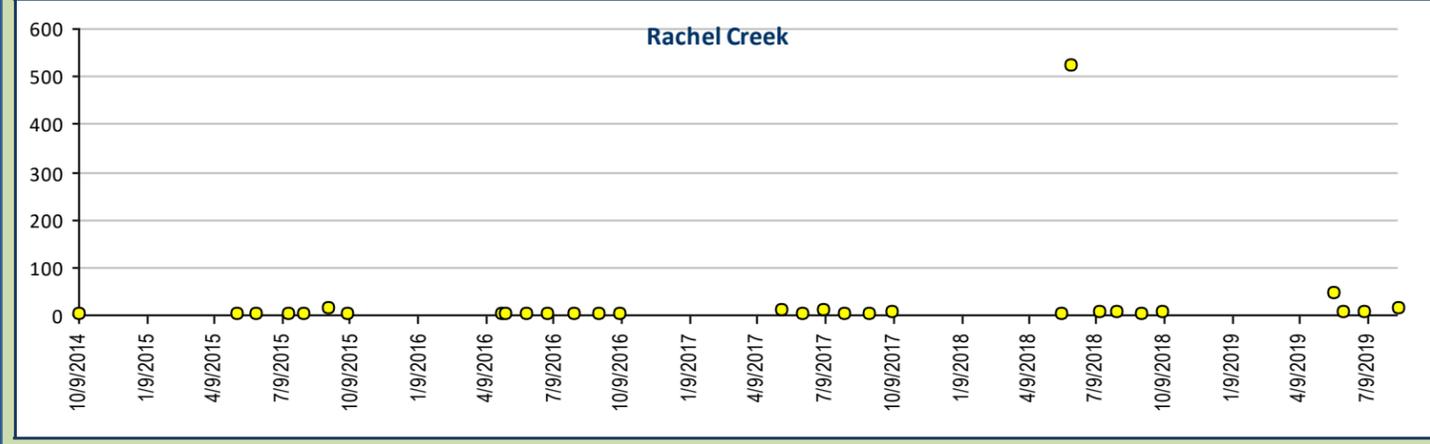
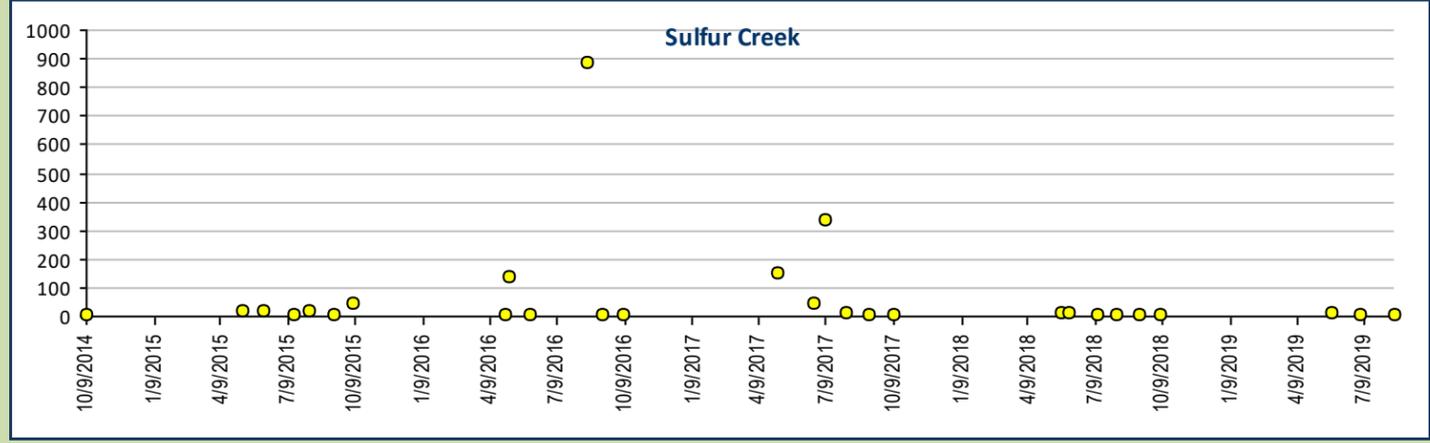
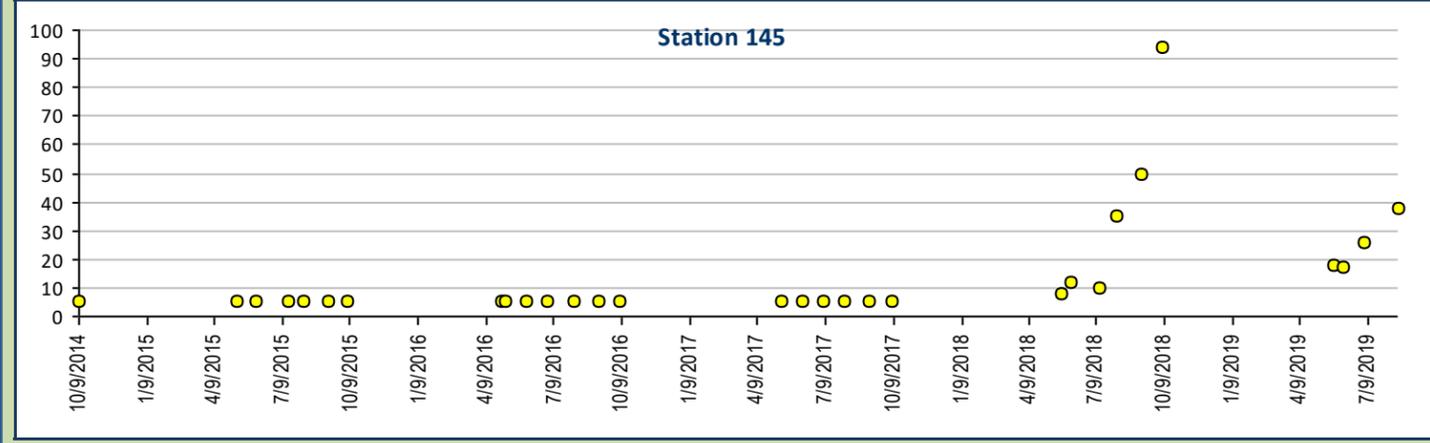
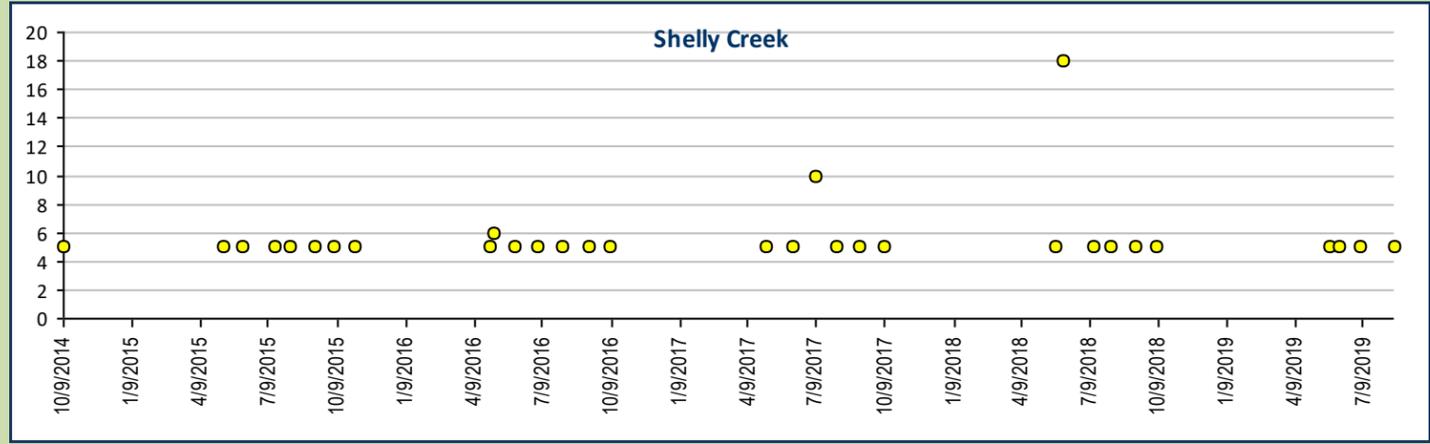
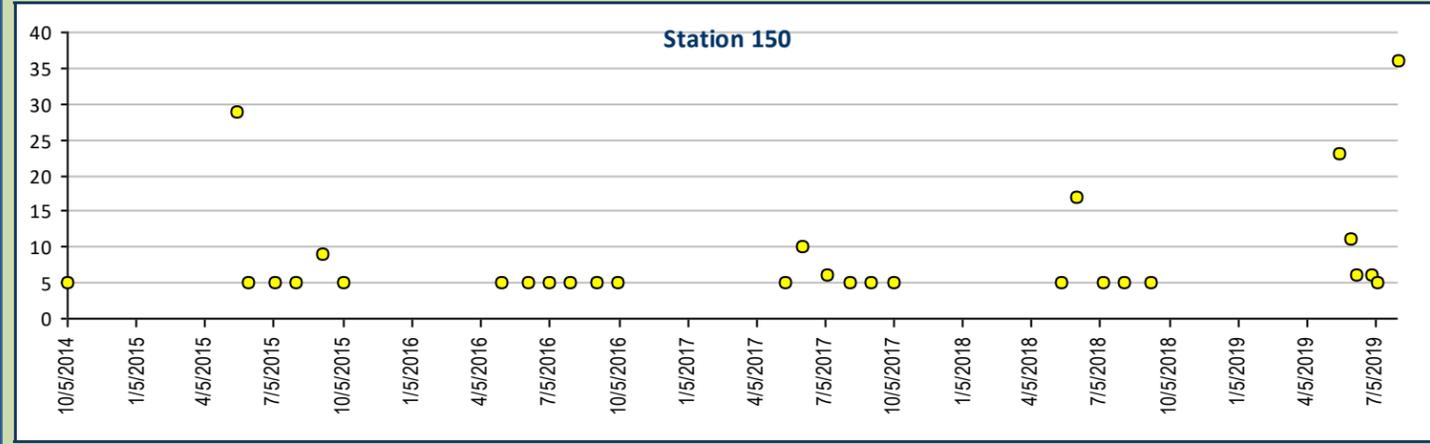
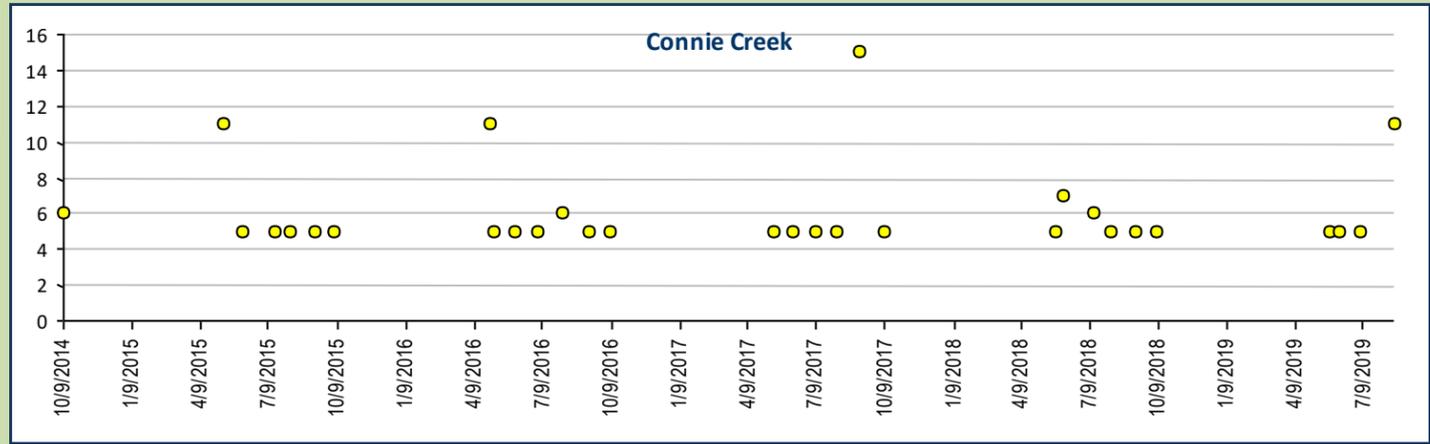
* Calculated using Standard Methods 2340B





Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

Total Suspended Solids, units mg/L



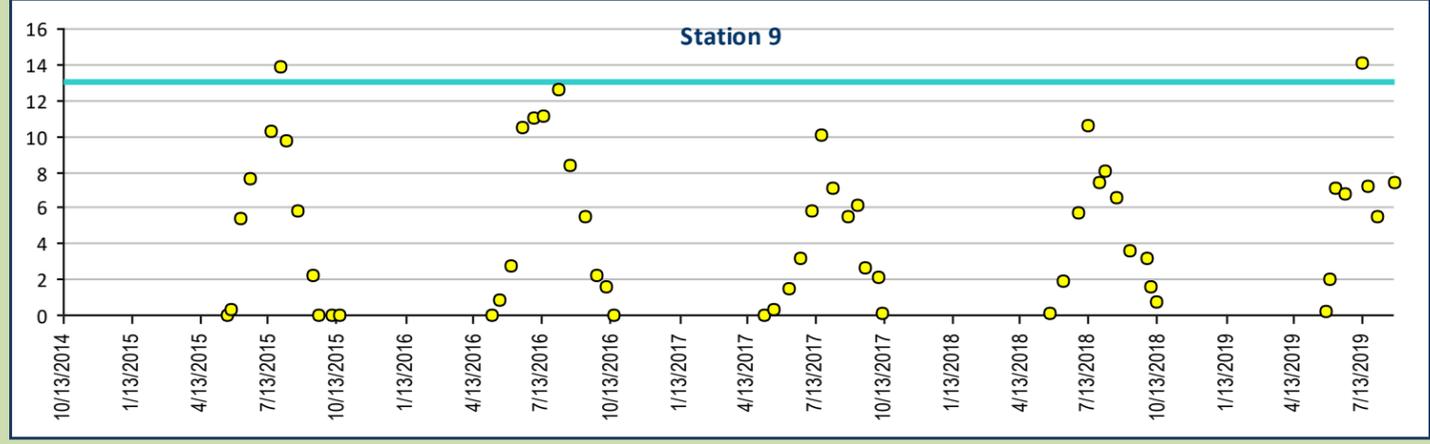
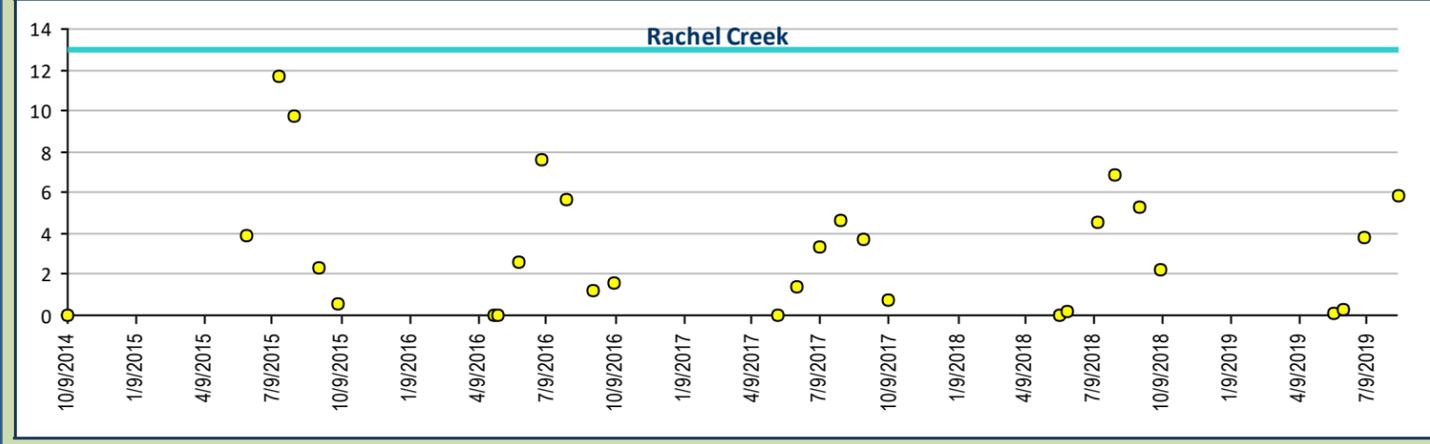
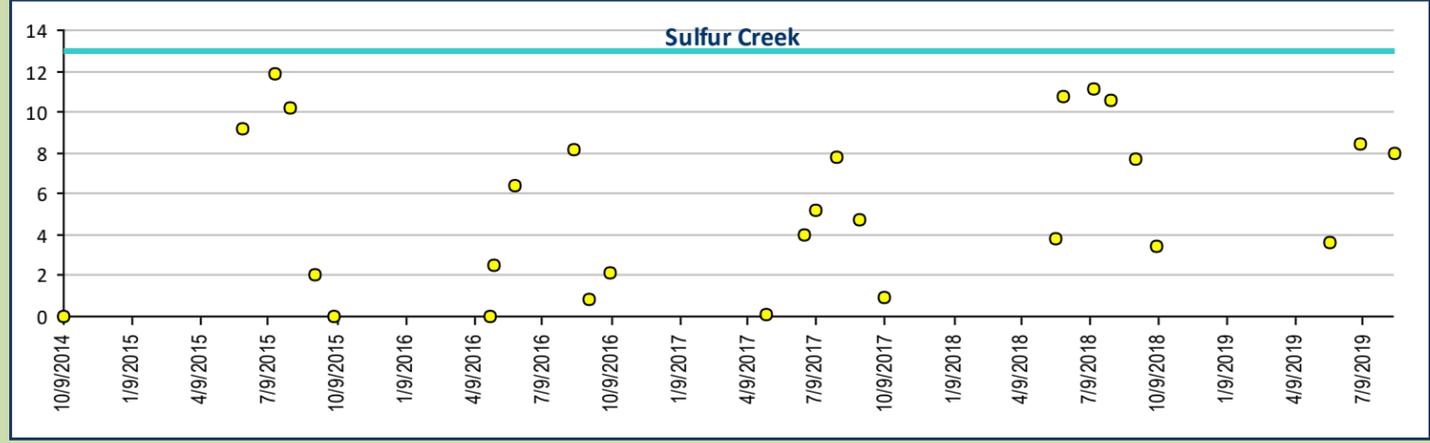
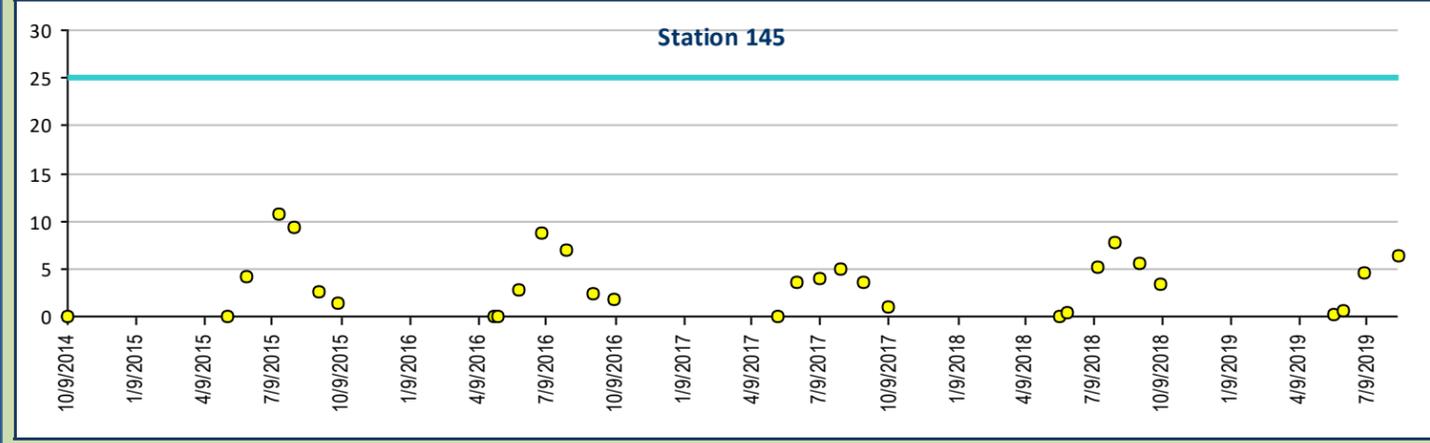
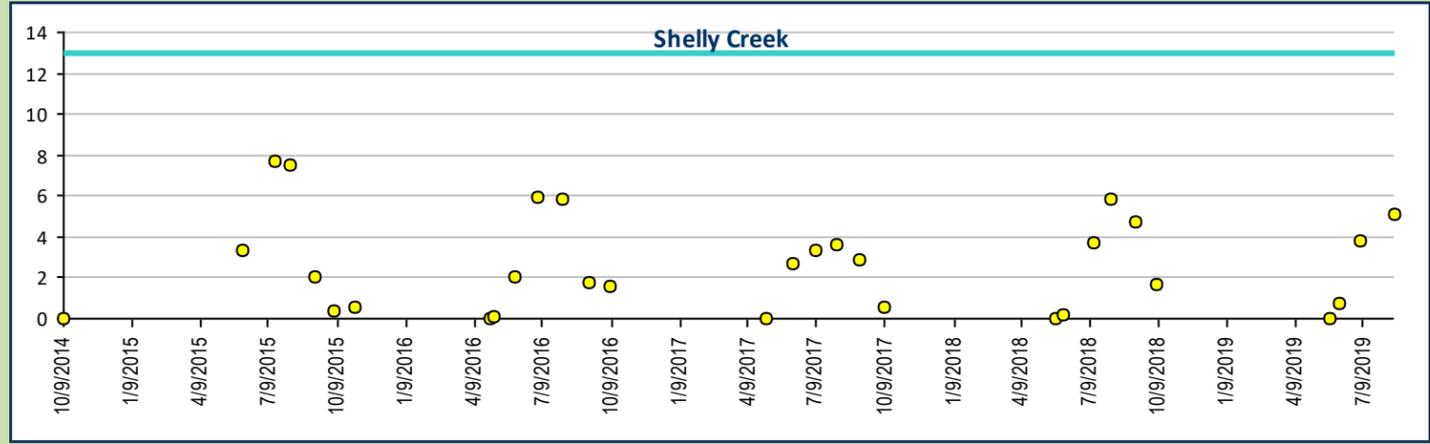
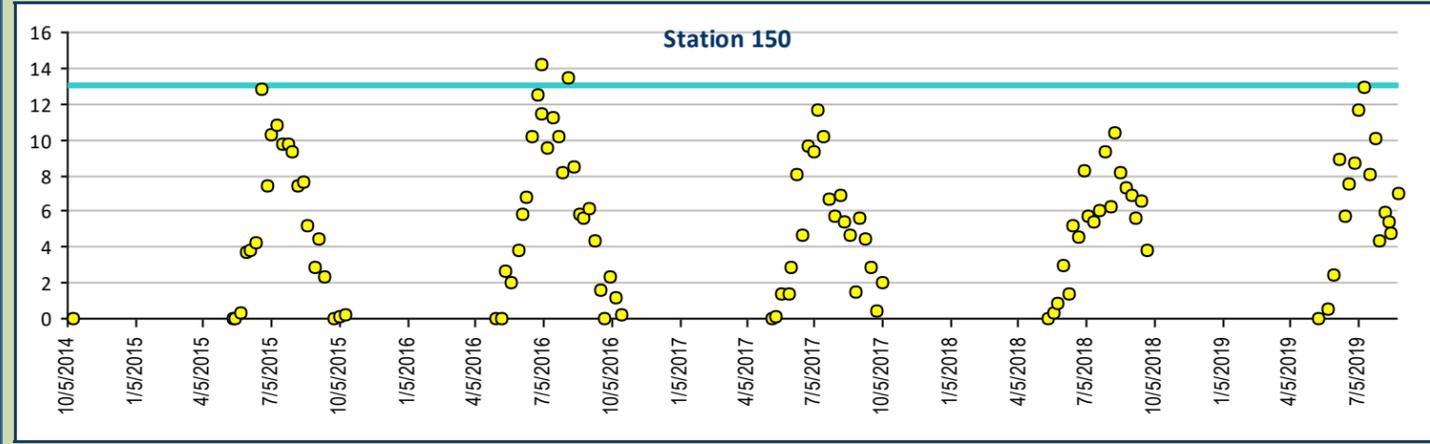
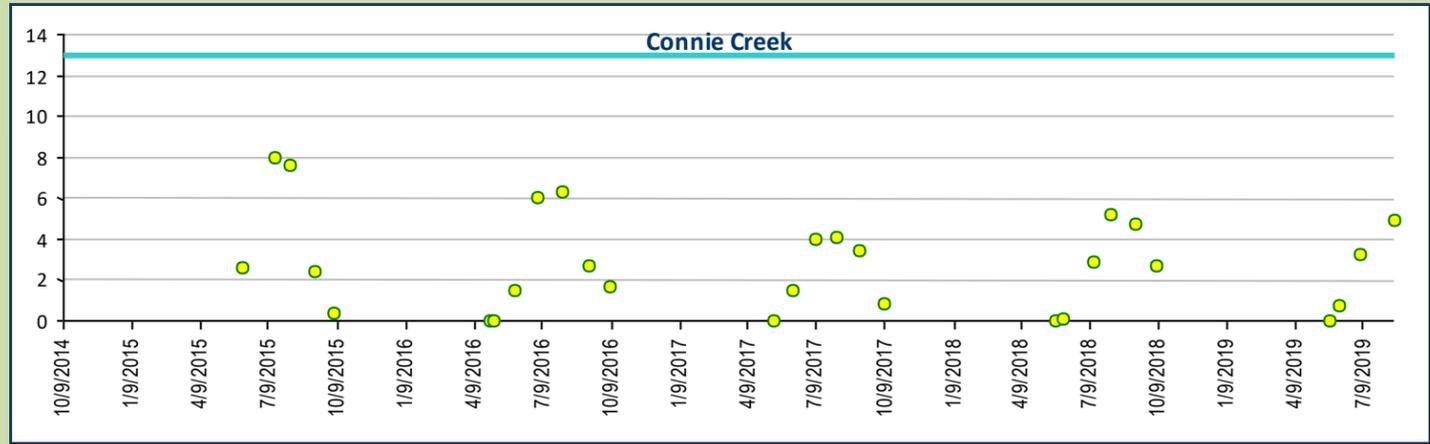


Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

Temperature Field, Celsius

Site Specific WQS mg/L

13 Celsius



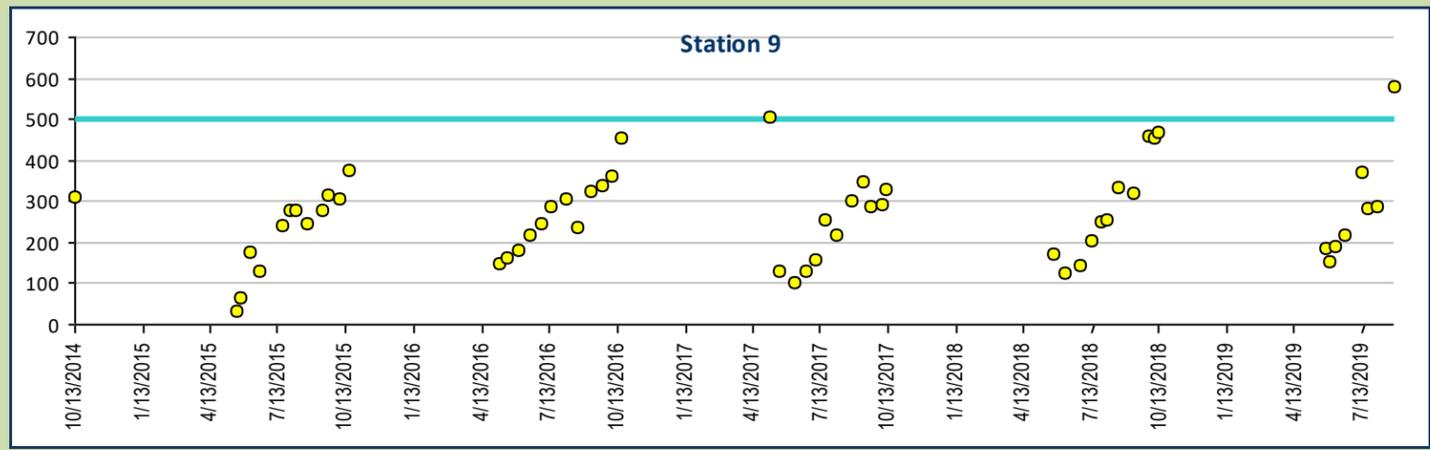
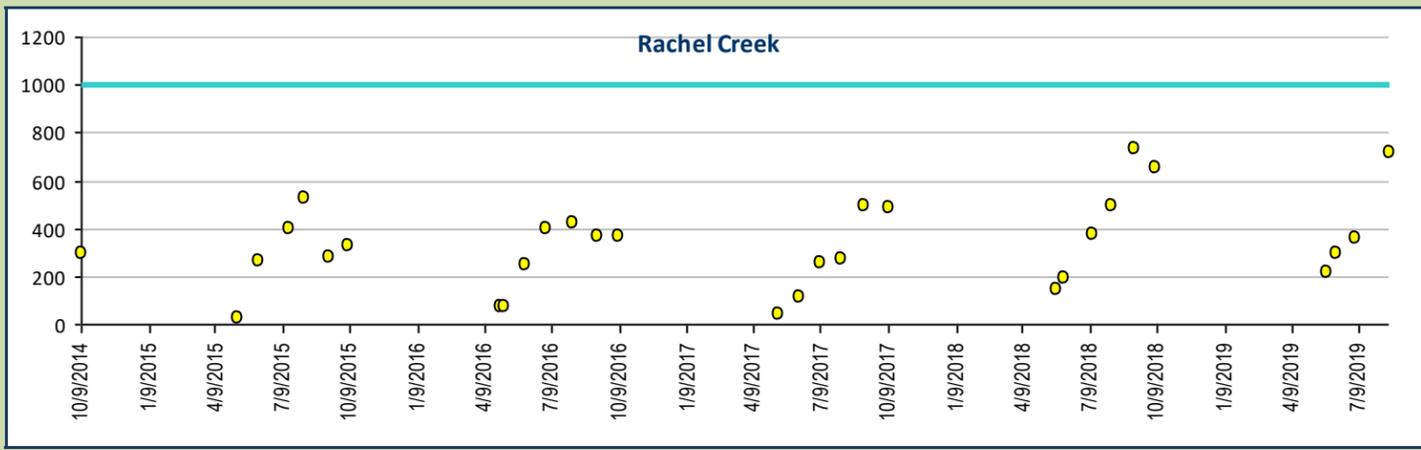
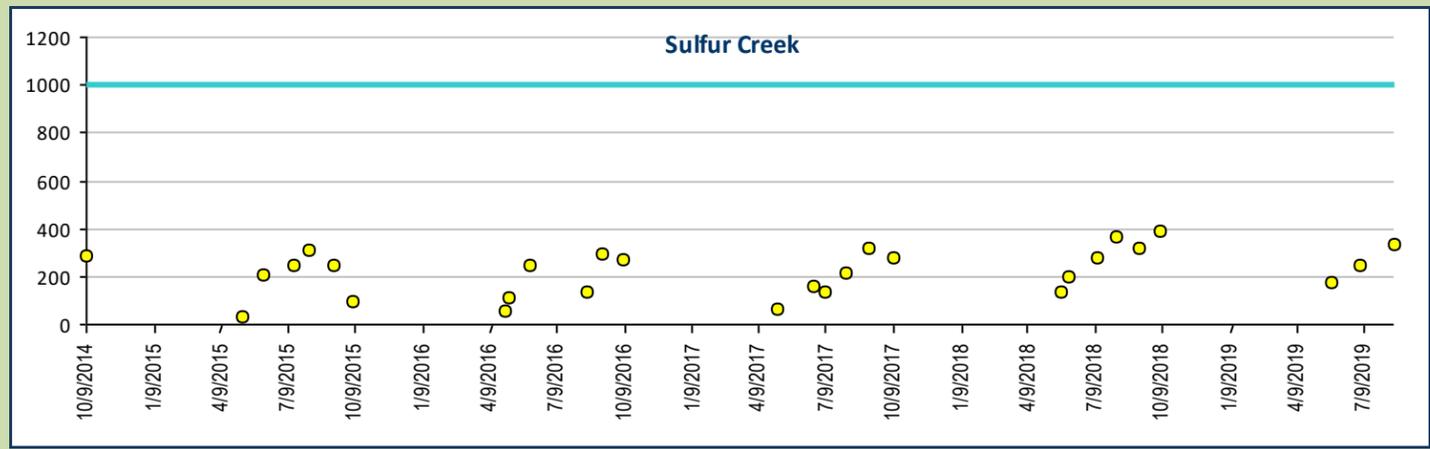
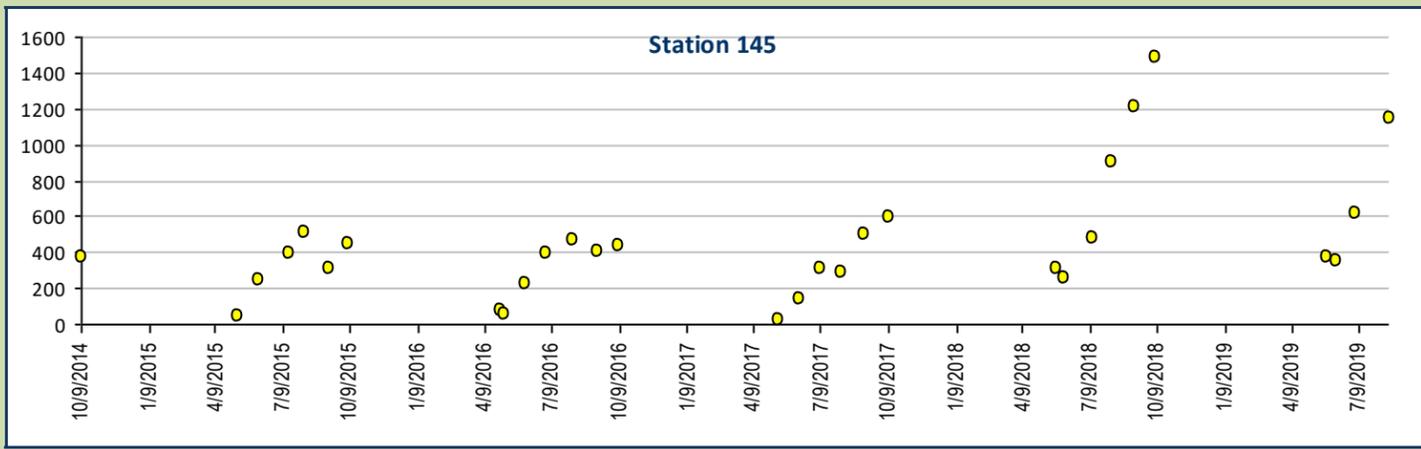
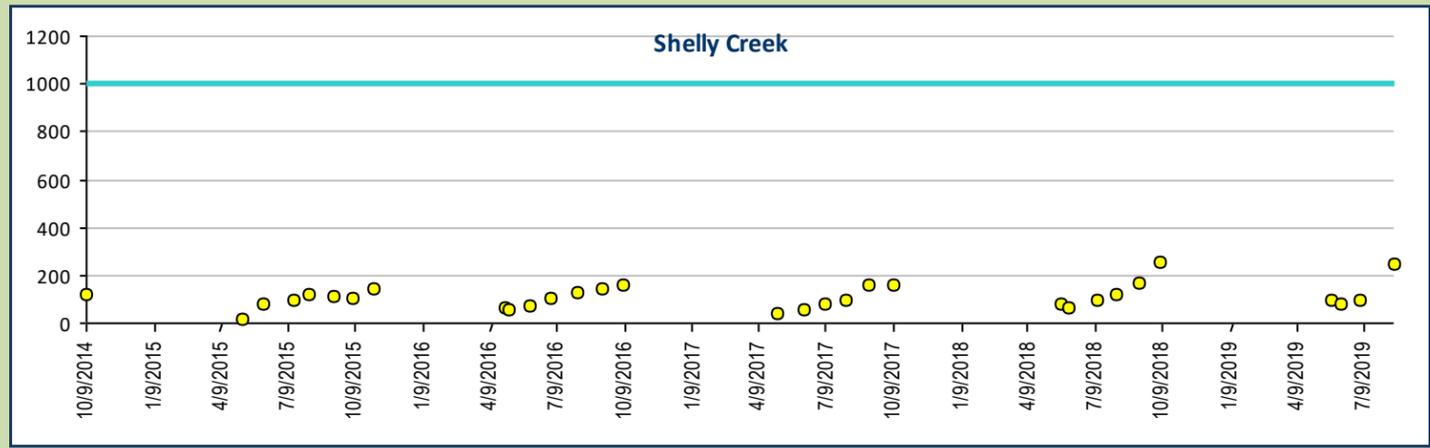
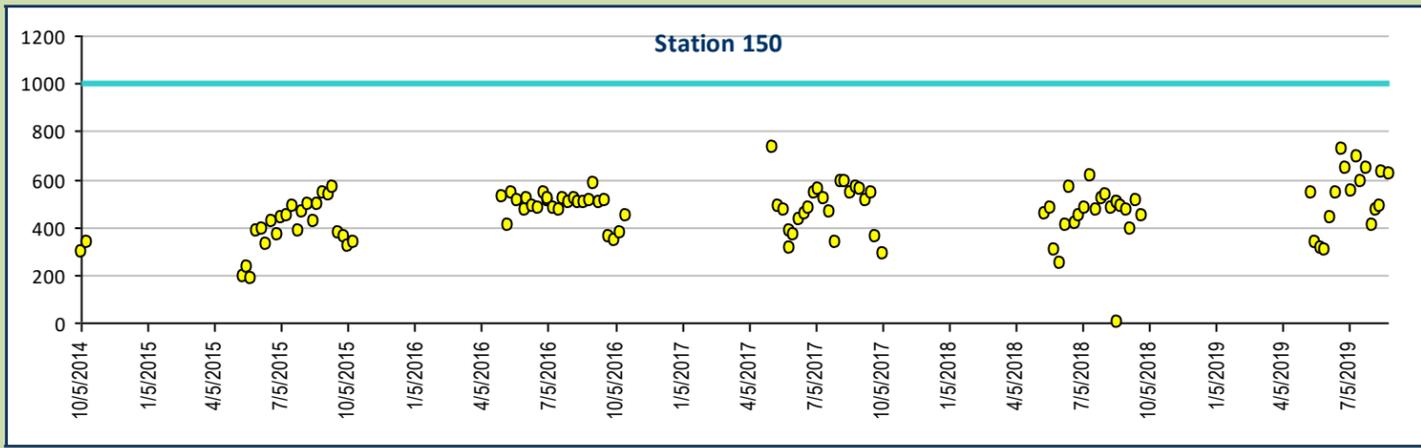
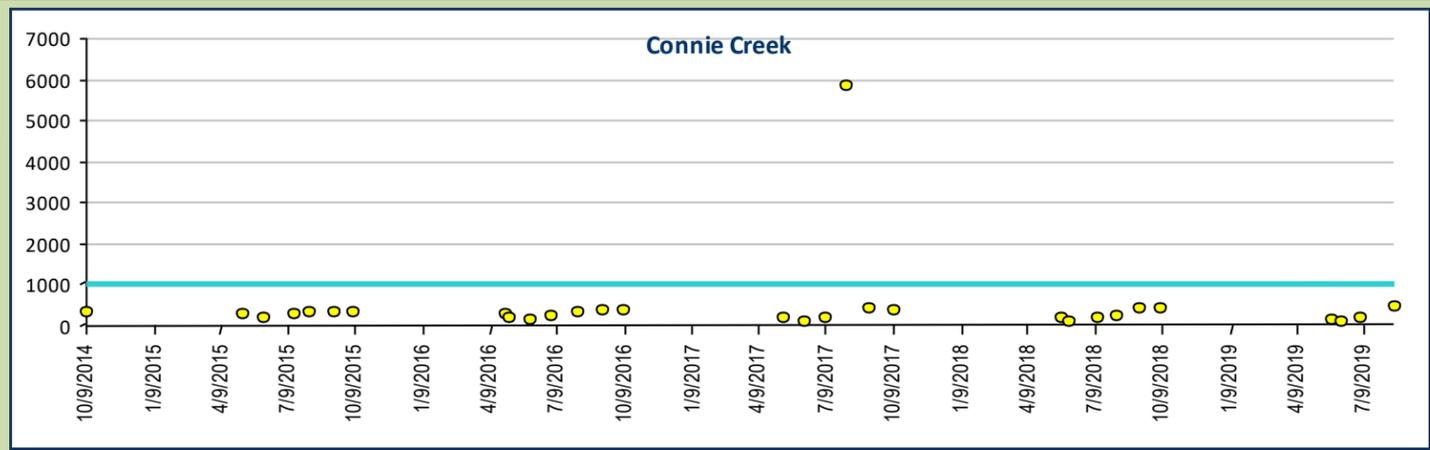


Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

Total Dissolved Solids, units mg/L

Site Specific WQS mg/L

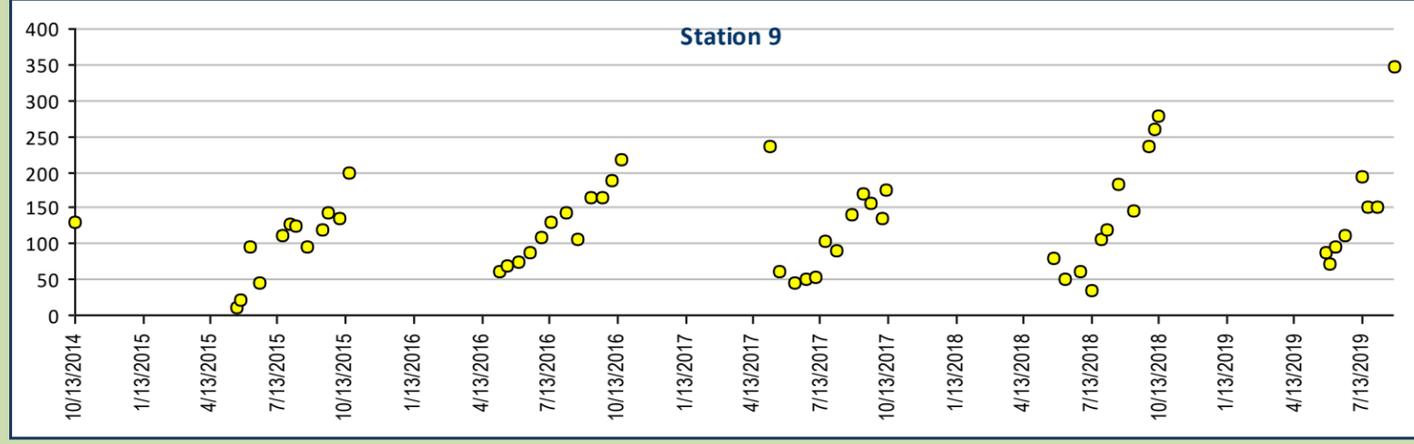
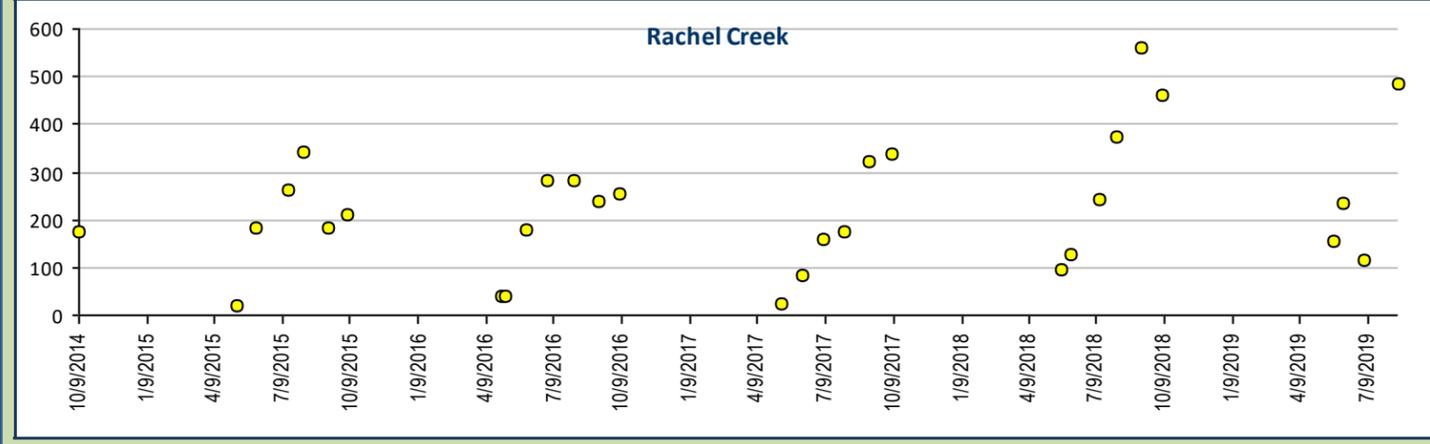
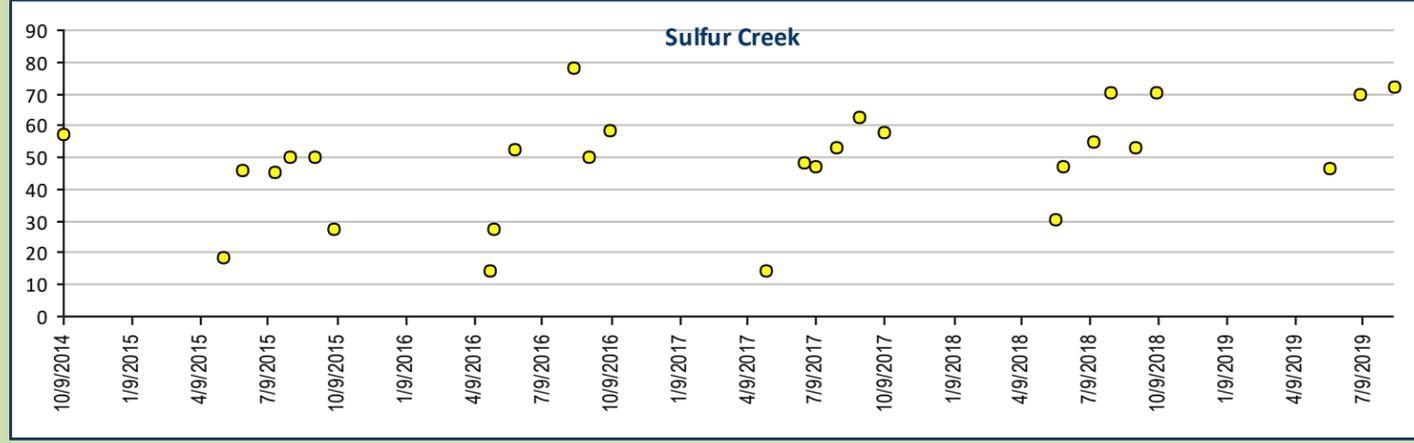
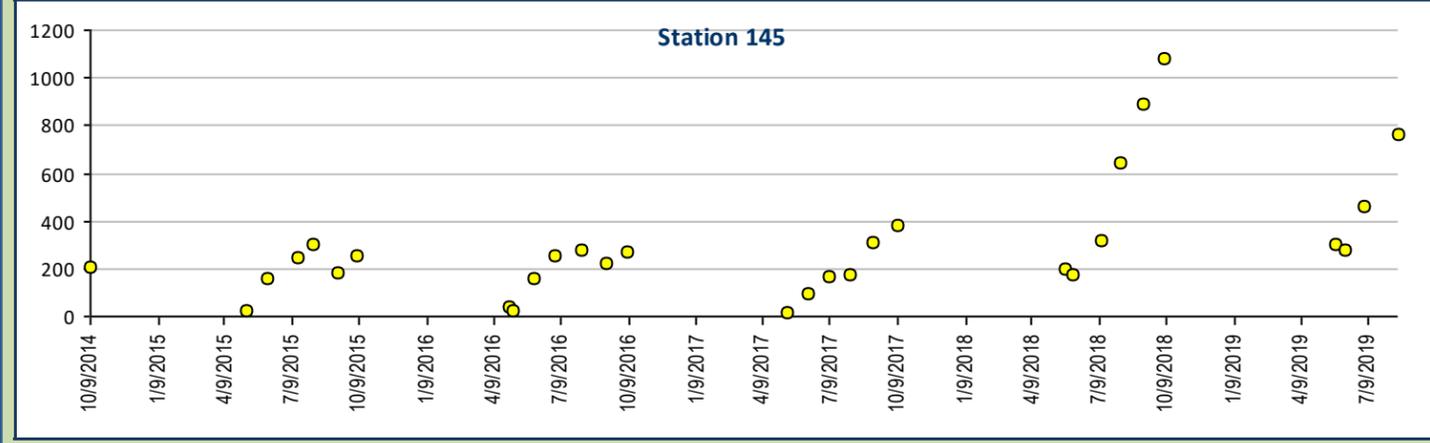
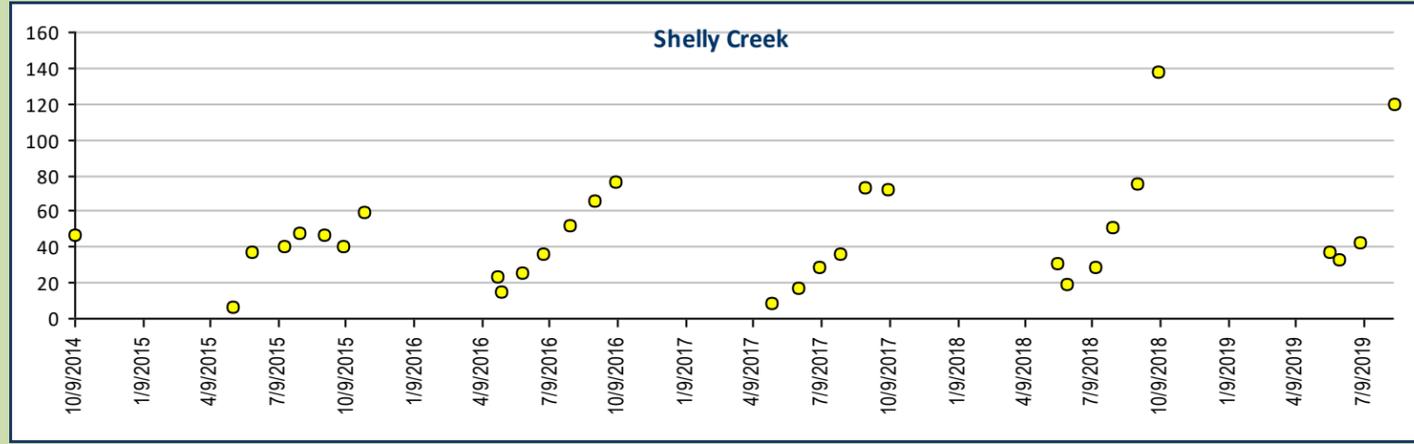
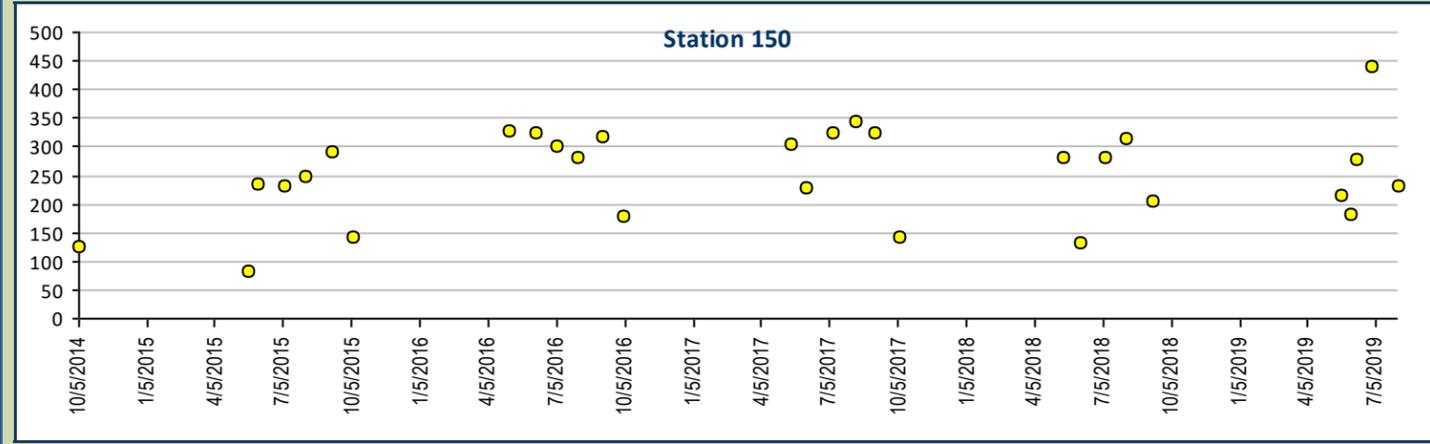
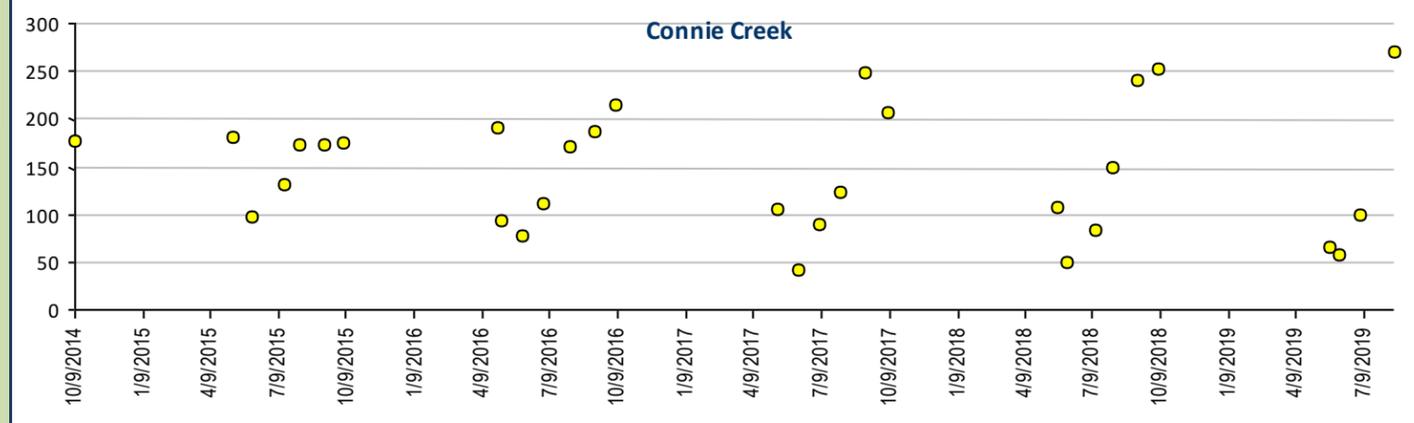
1000 mg/L





Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

Sulfate, units mg/L

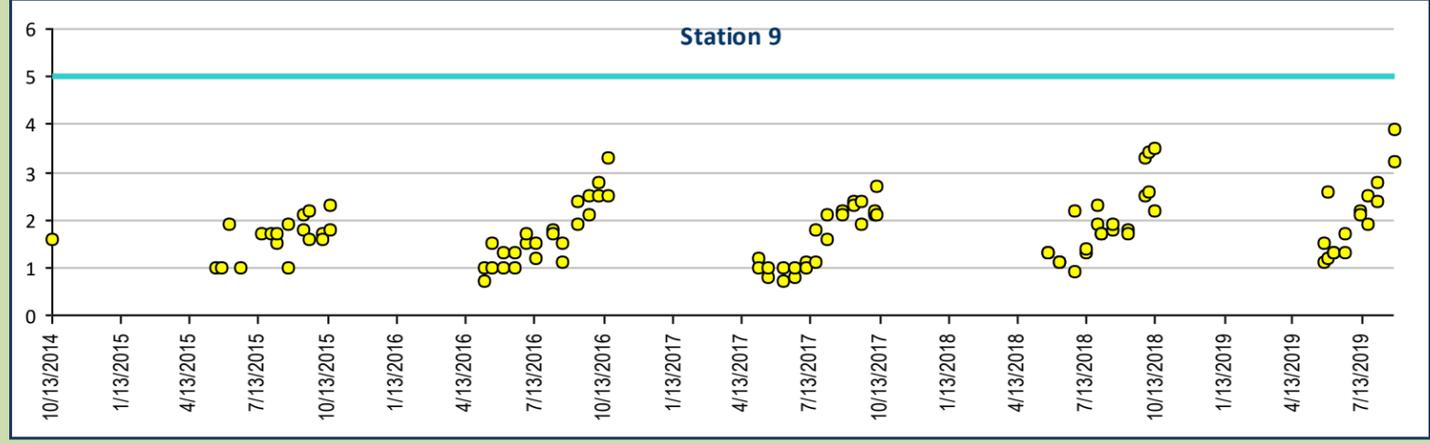
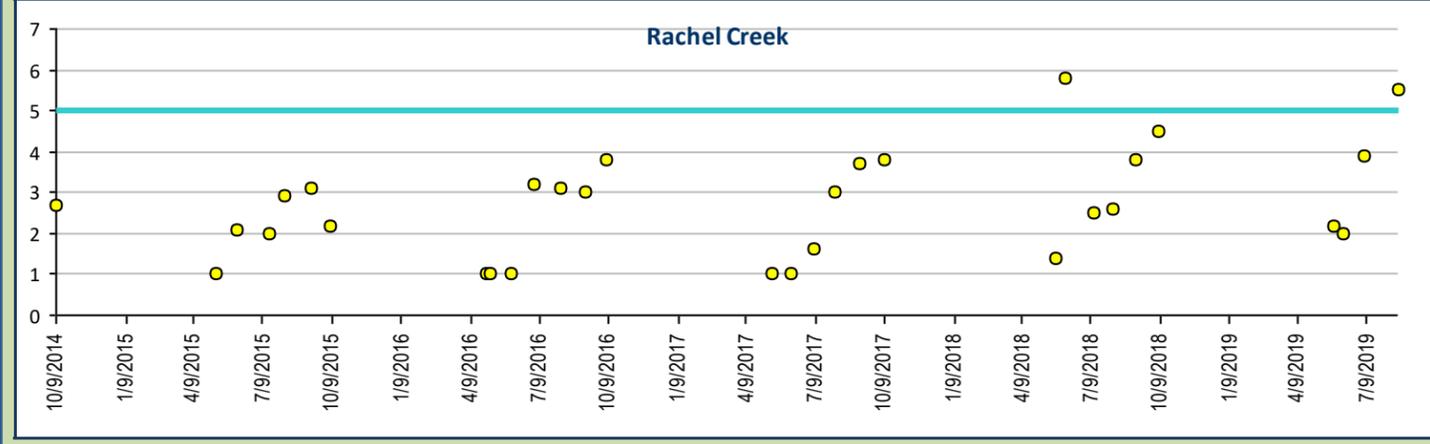
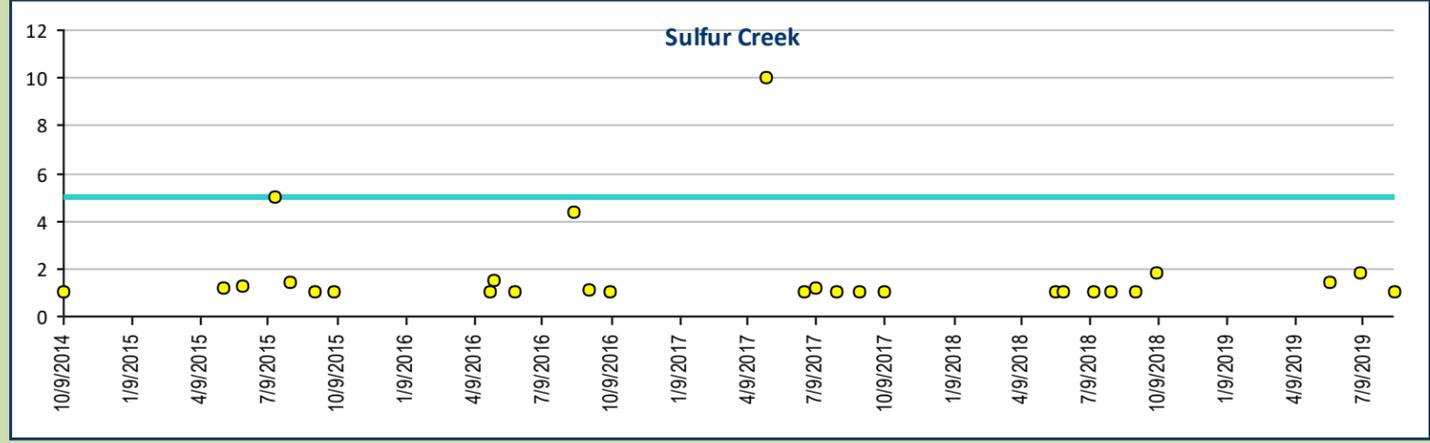
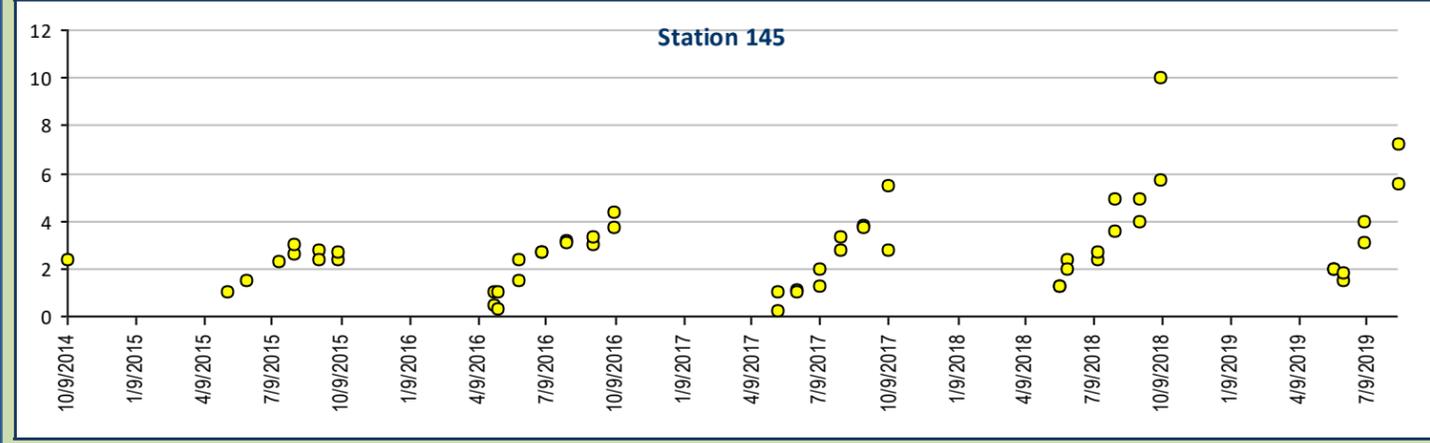
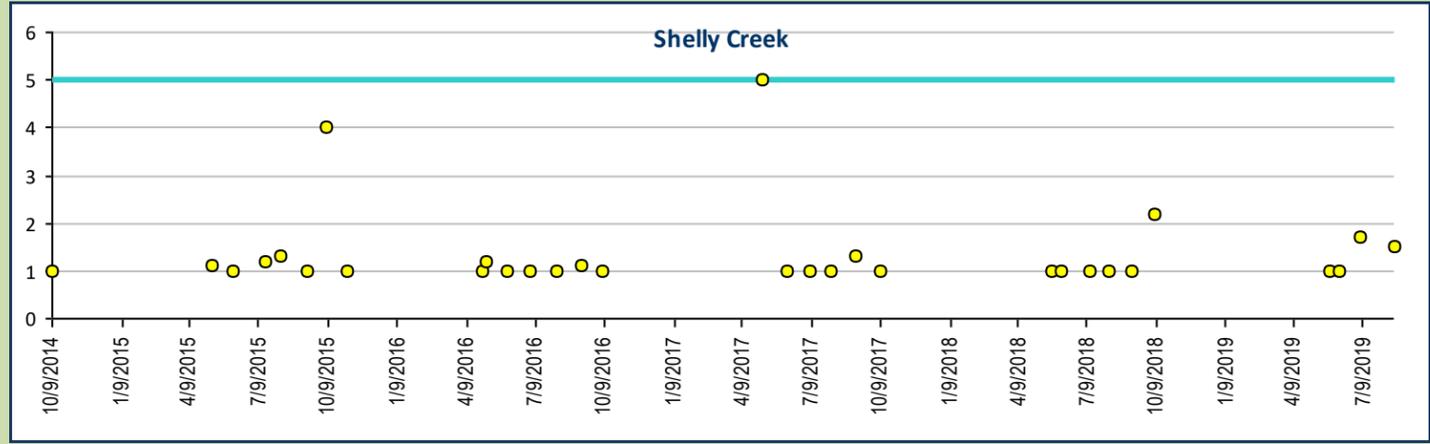
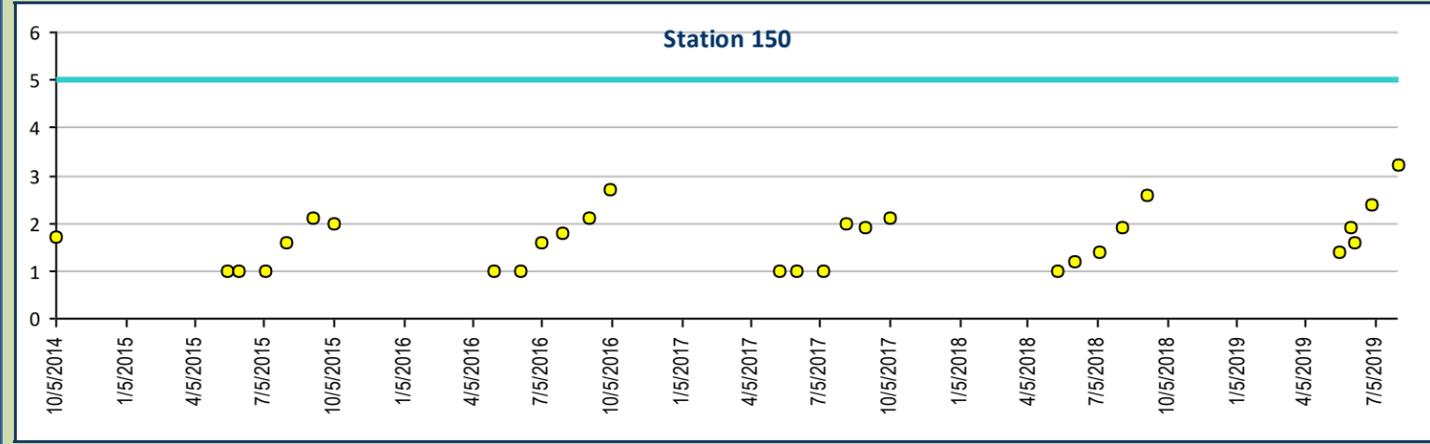
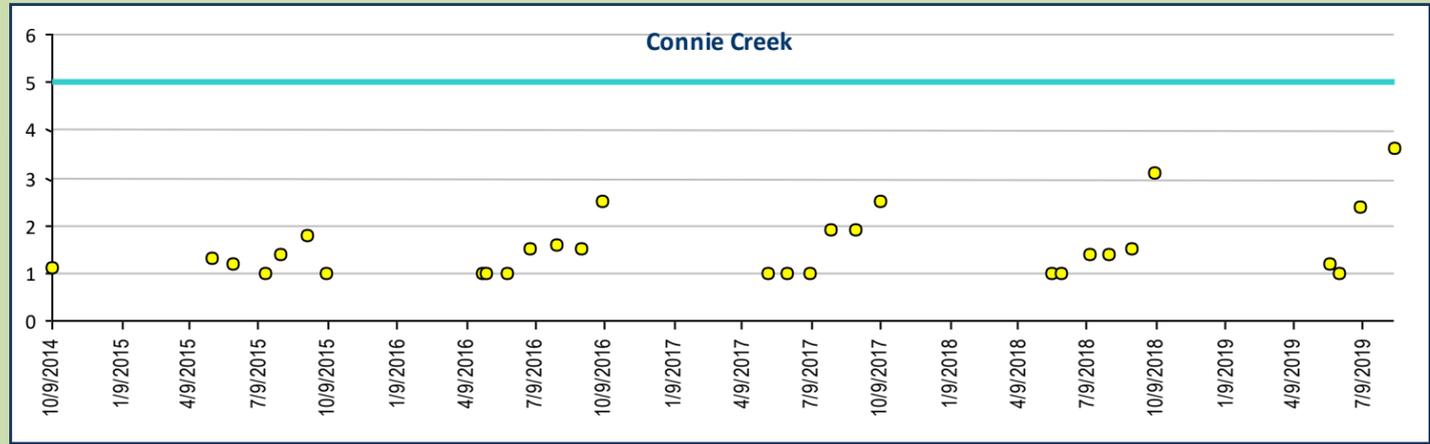




Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

Selenium, Total Recoverable, units ug/L

Aquatic Life - Fresh Water Chronic WQS ug/L ———
5 ug/L

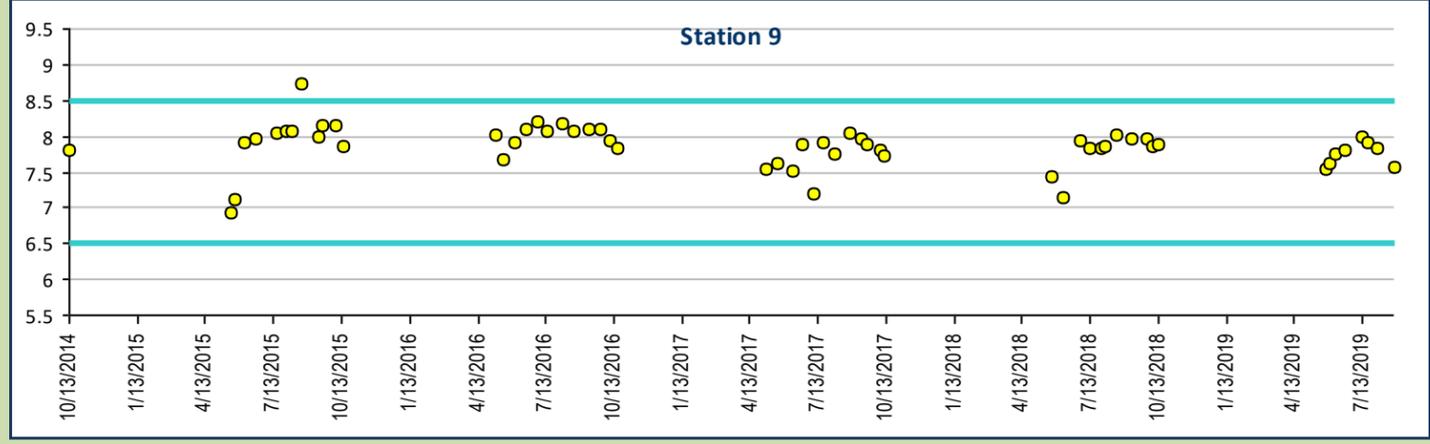
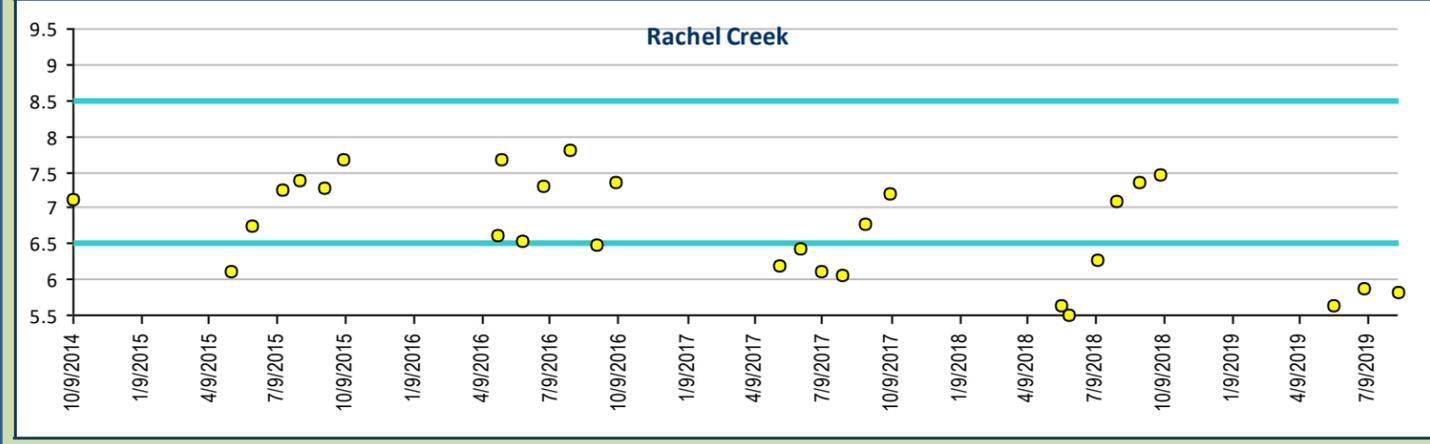
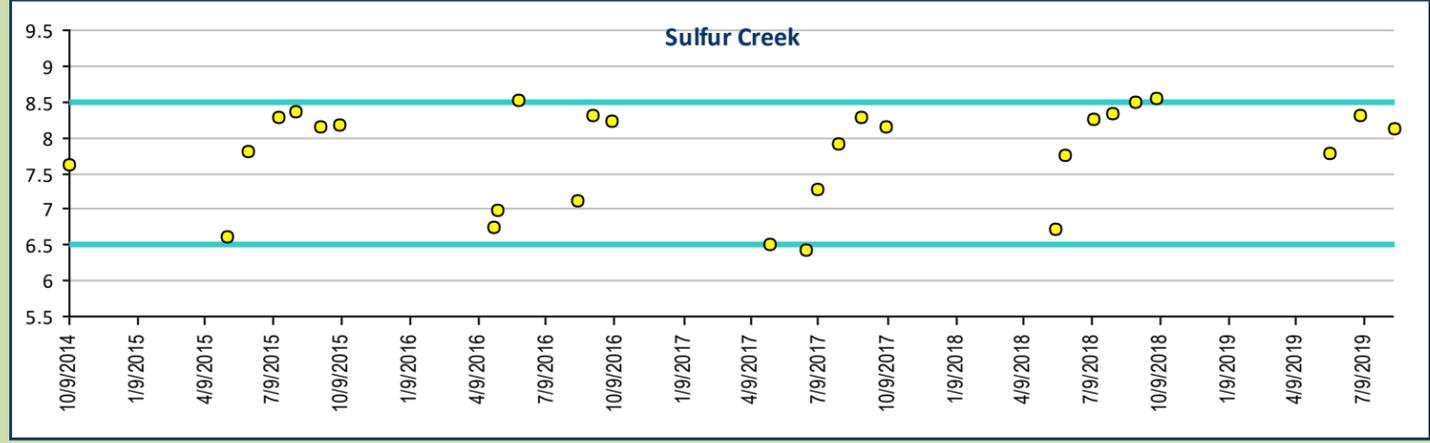
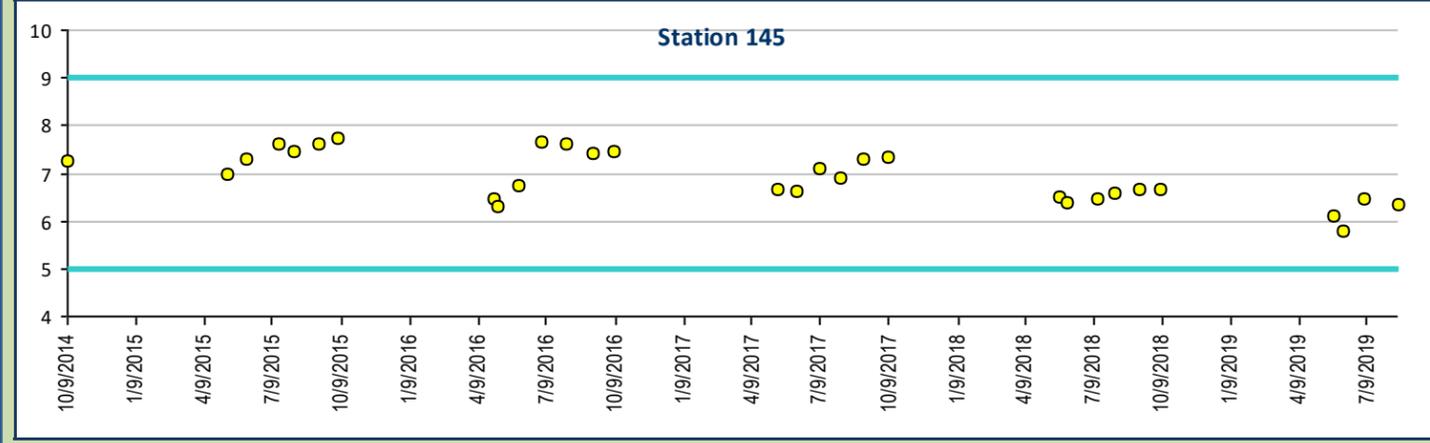
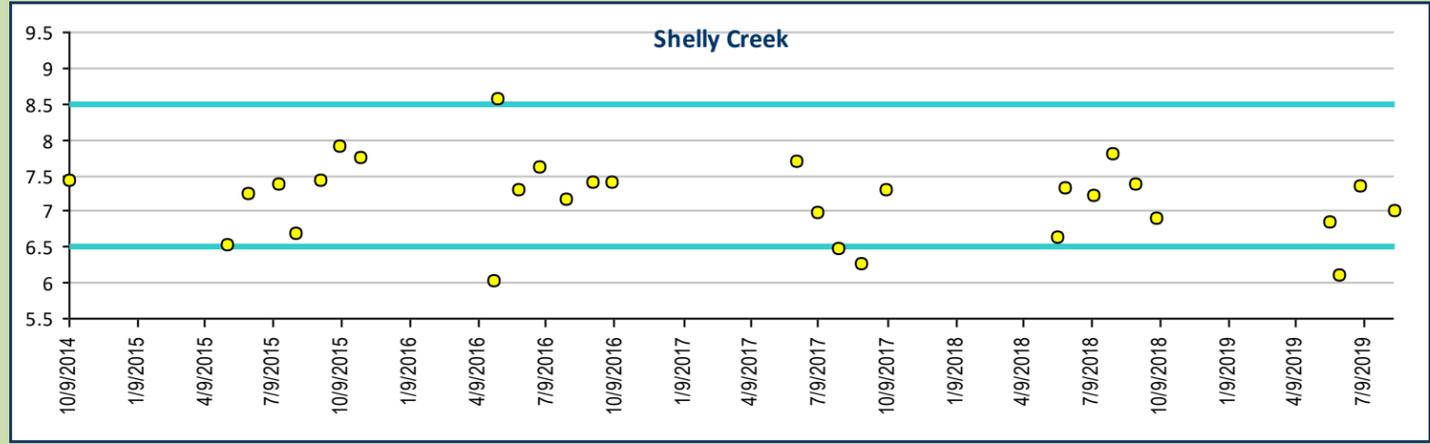
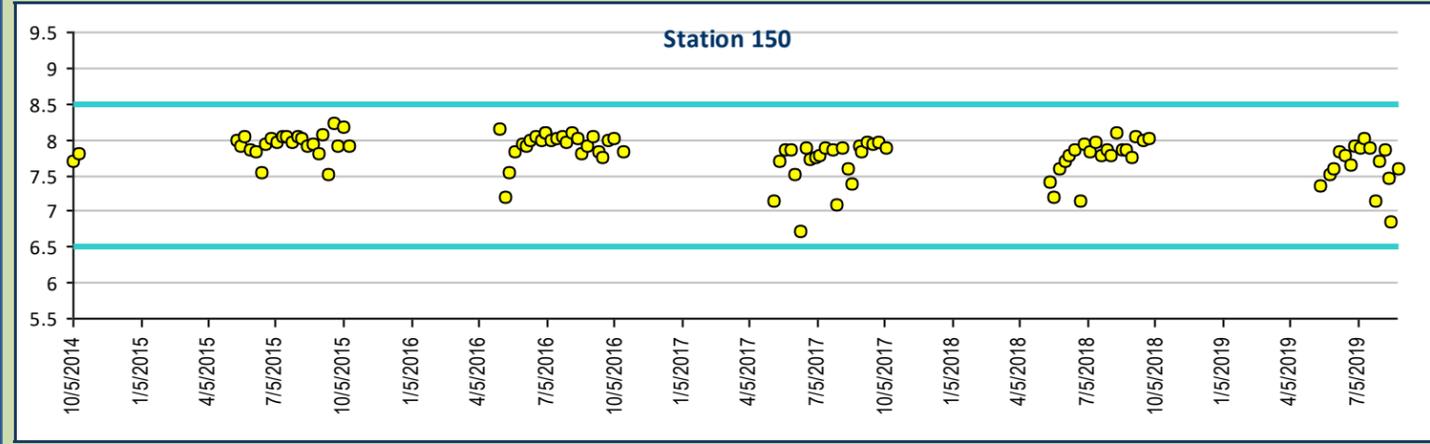
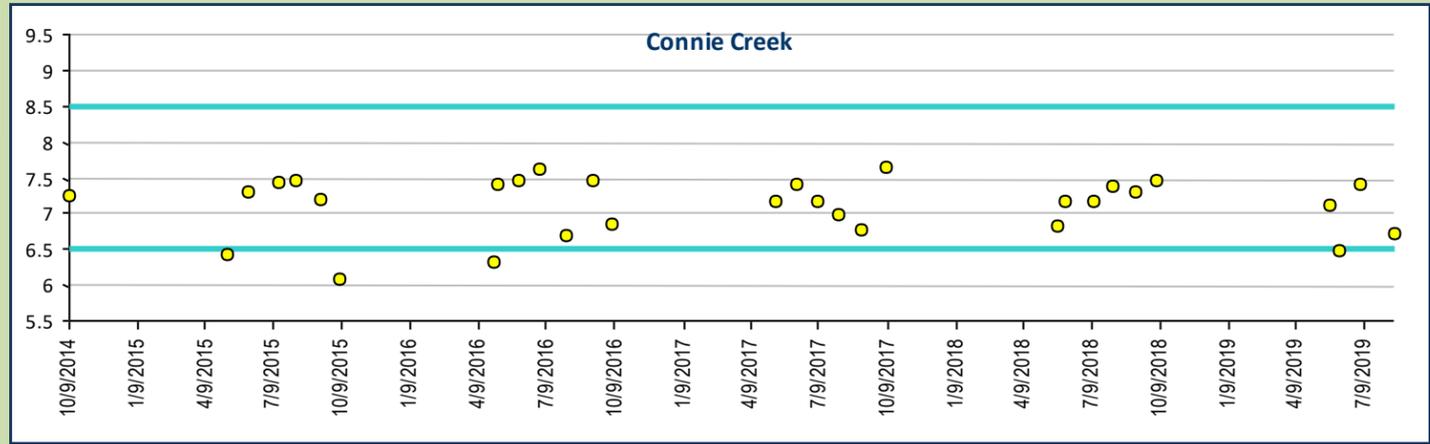




Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

pH

Site Specific WQS pH units





Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

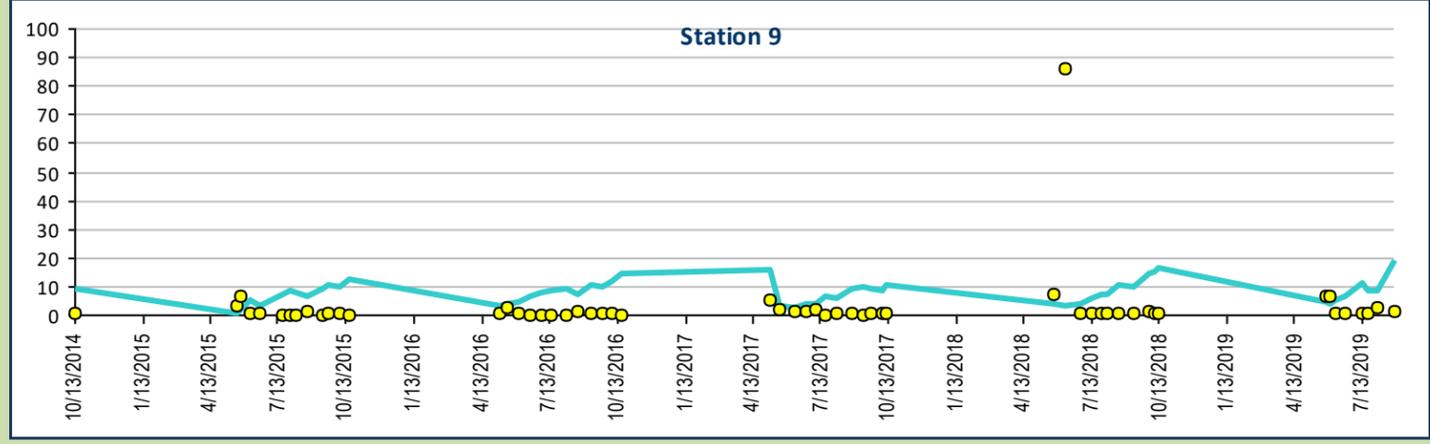
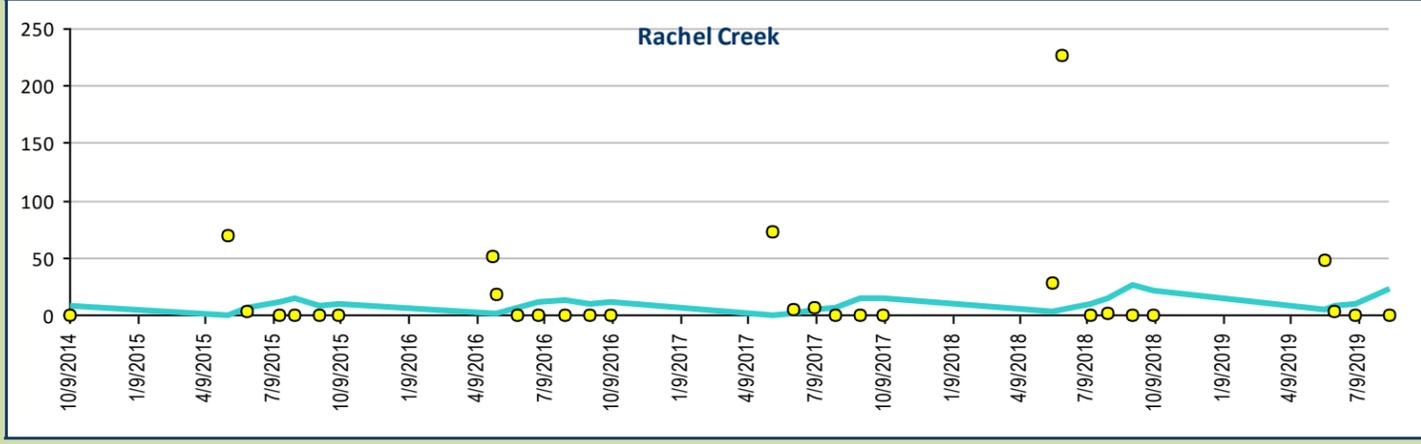
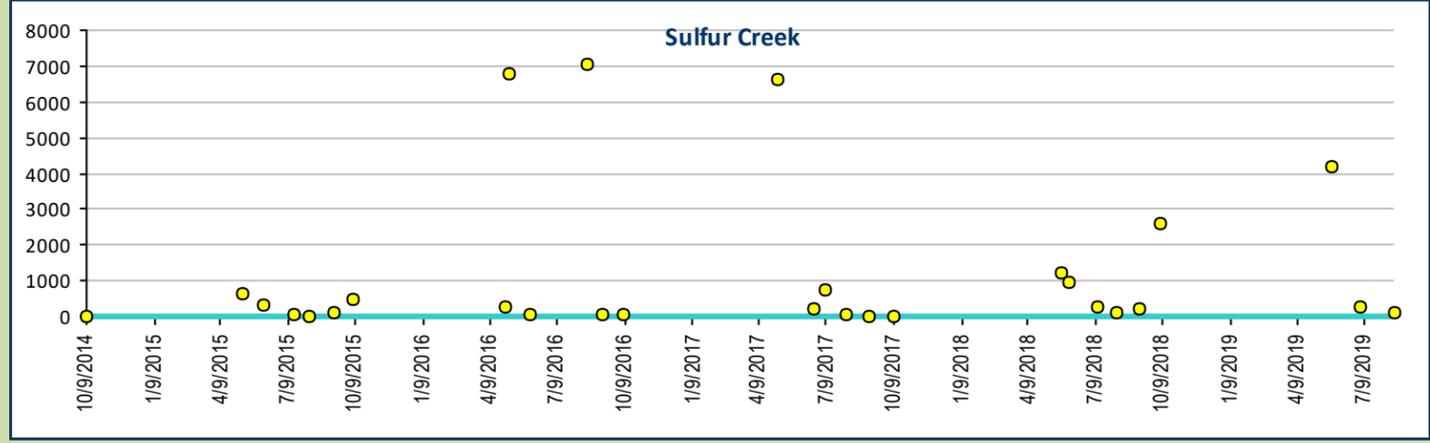
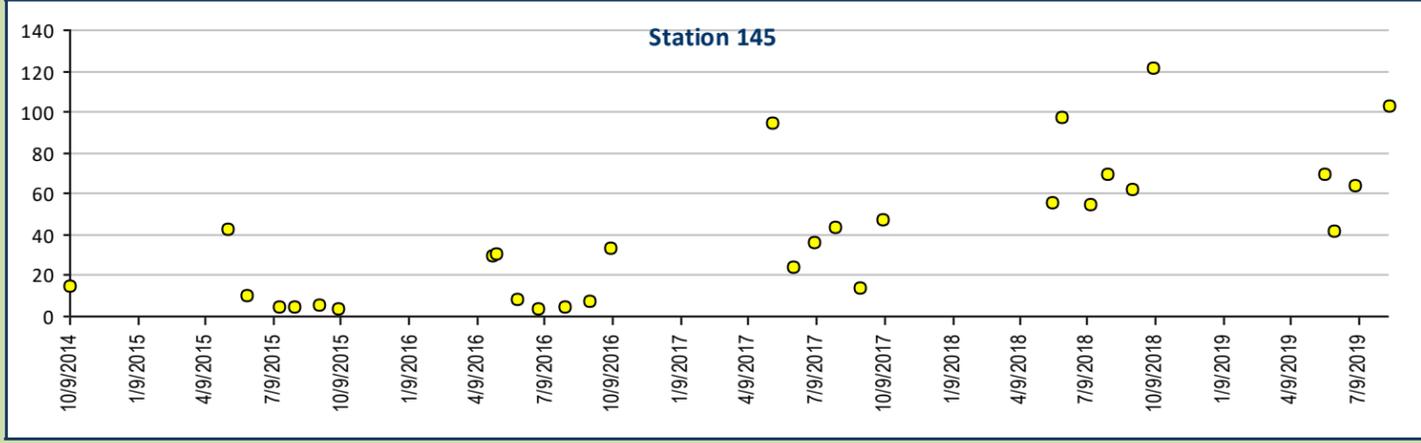
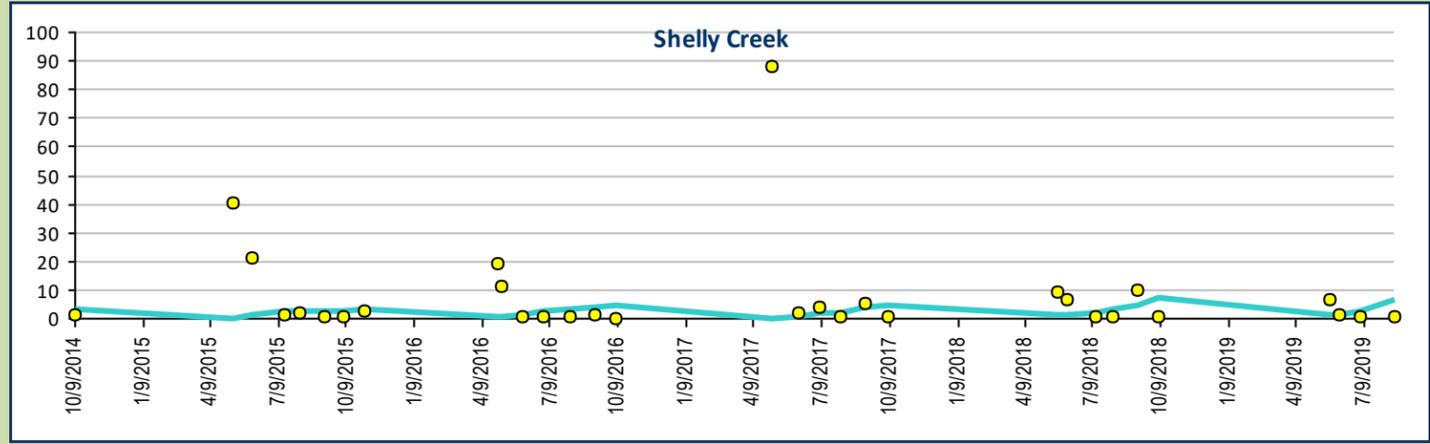
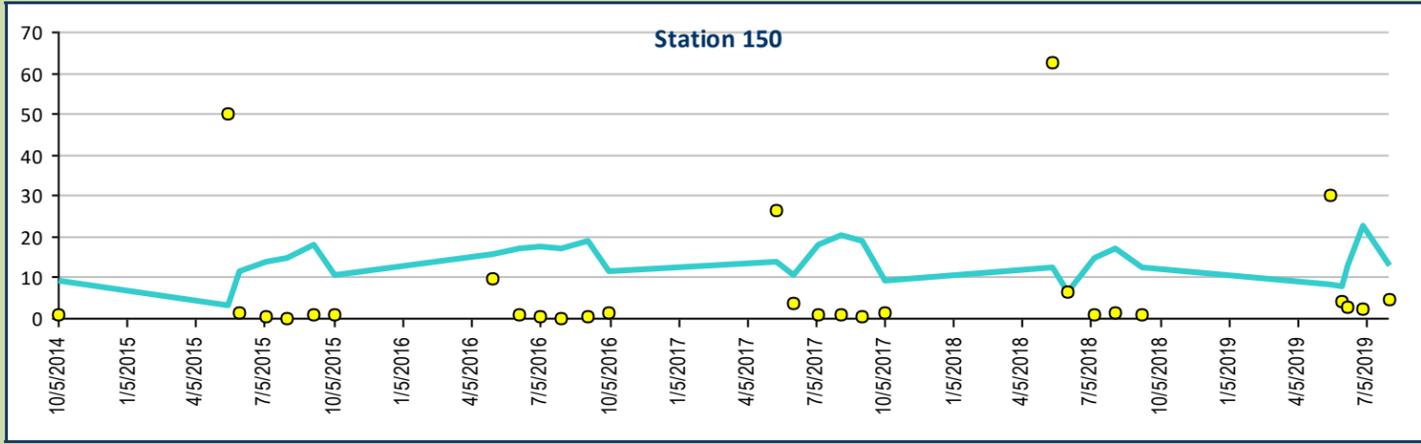
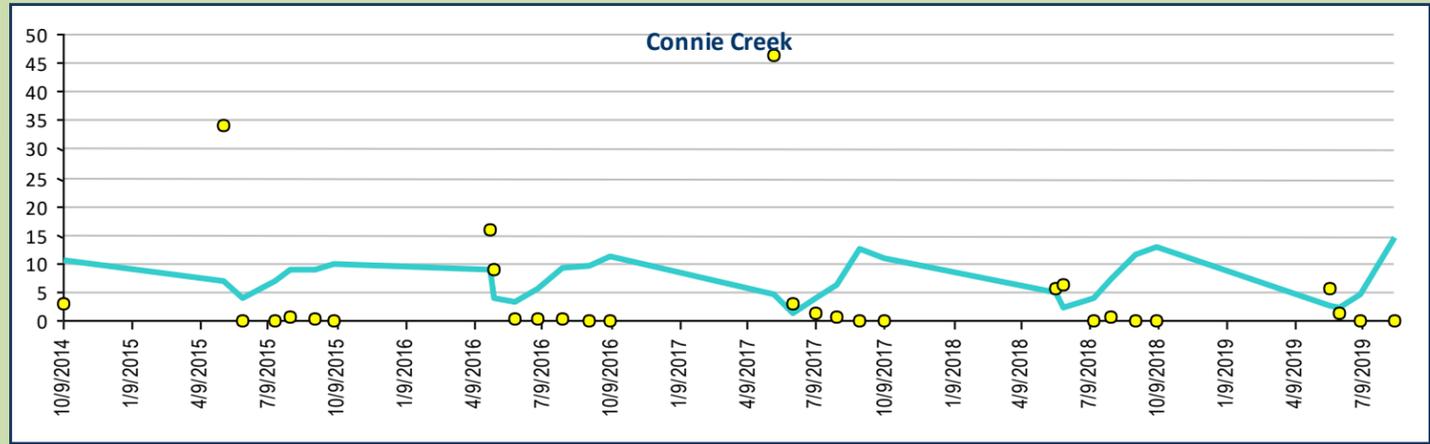
Lead, Total Recoverable, units ug/L

Aquatic Life - Fresh Water Chronic WQS ug/L

Hardness Dependent Calculation

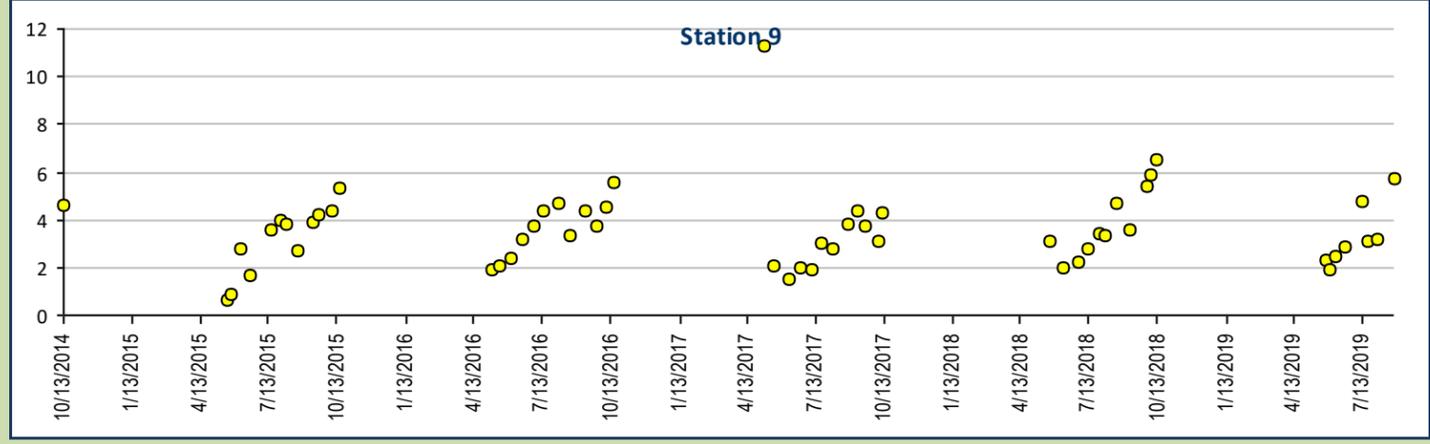
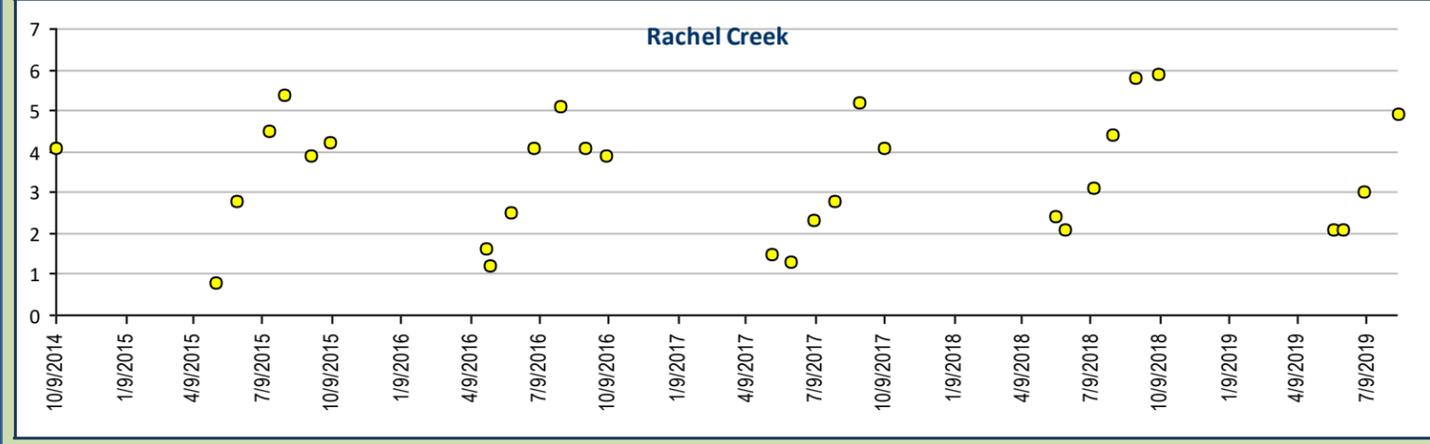
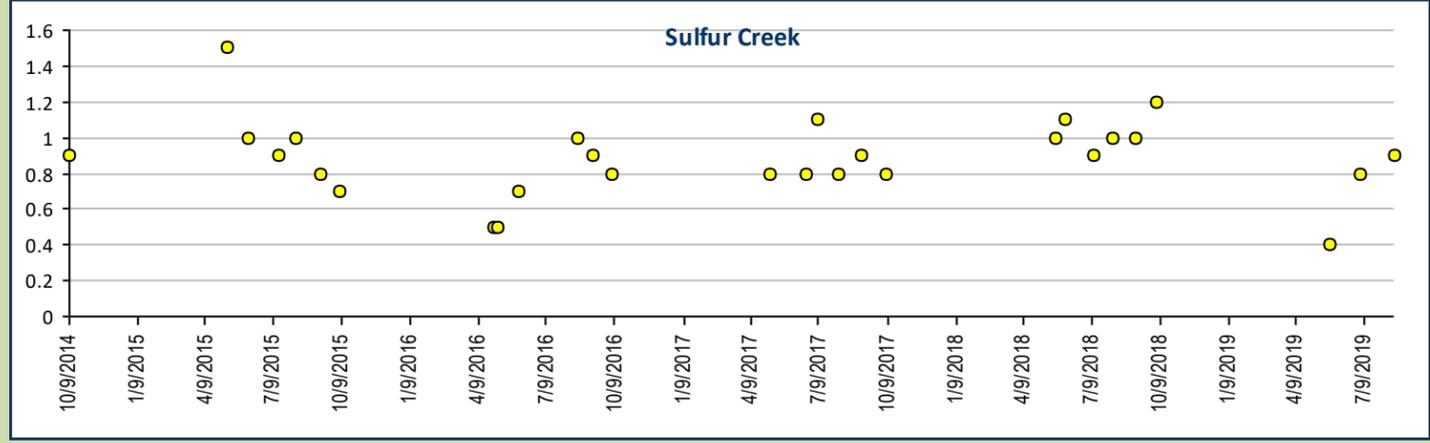
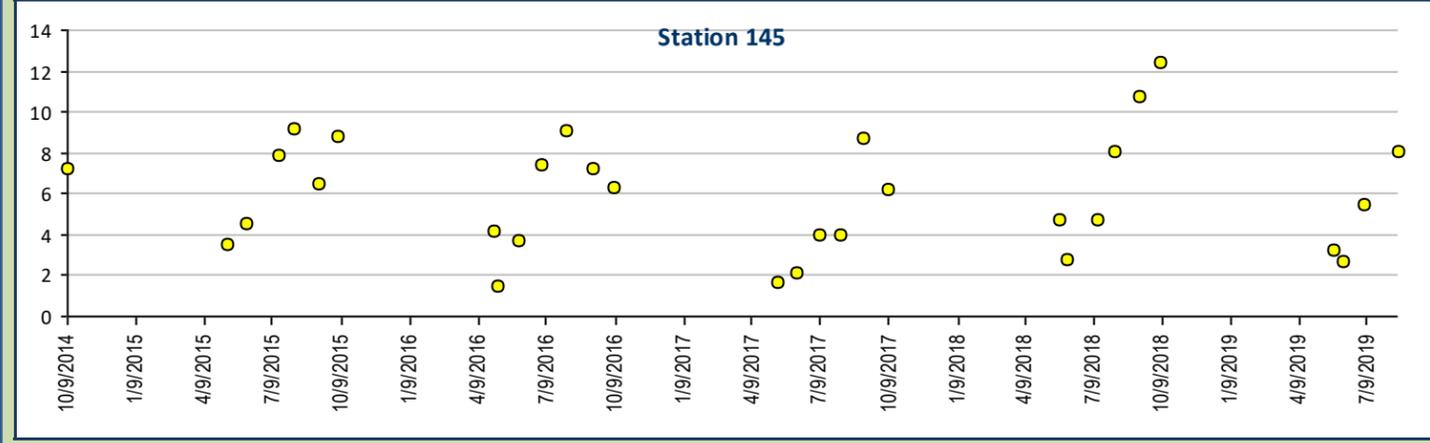
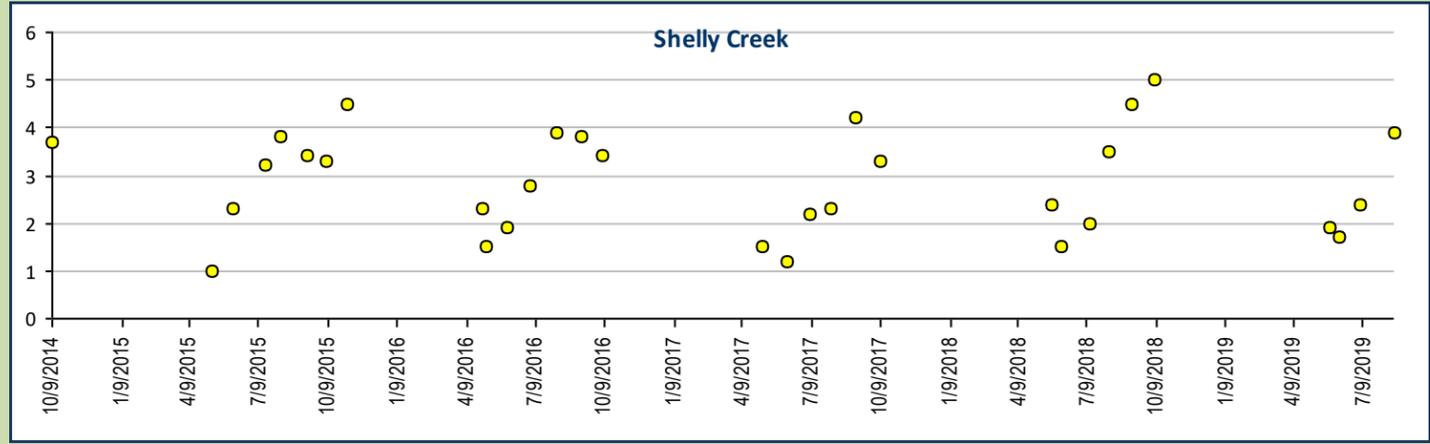
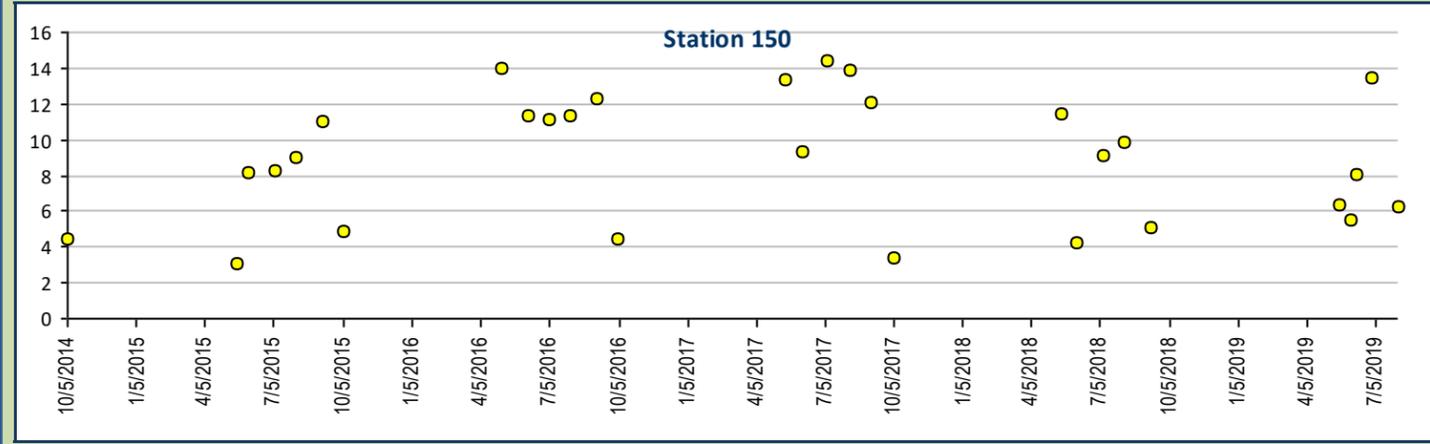
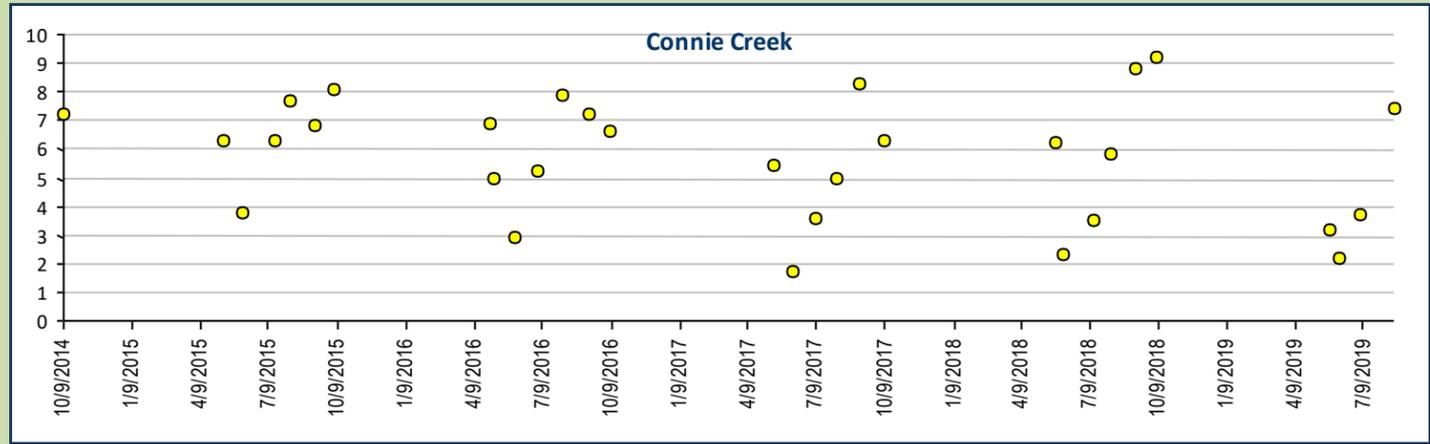
$$=EXP(1.273*(LN(calc *hardness))-4.705)$$

* Calculated using Standard Methods 2340B



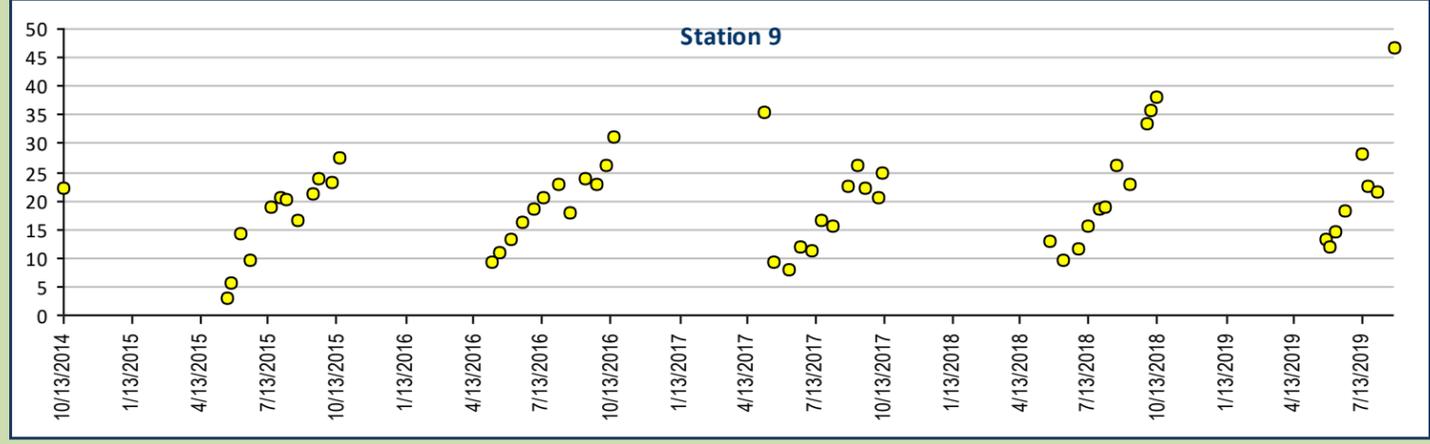
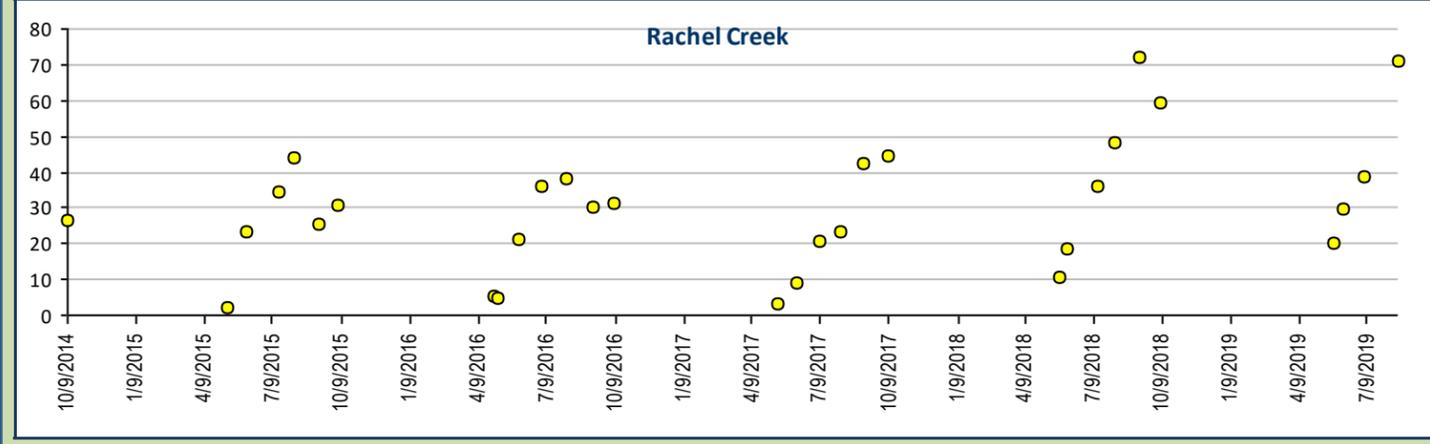
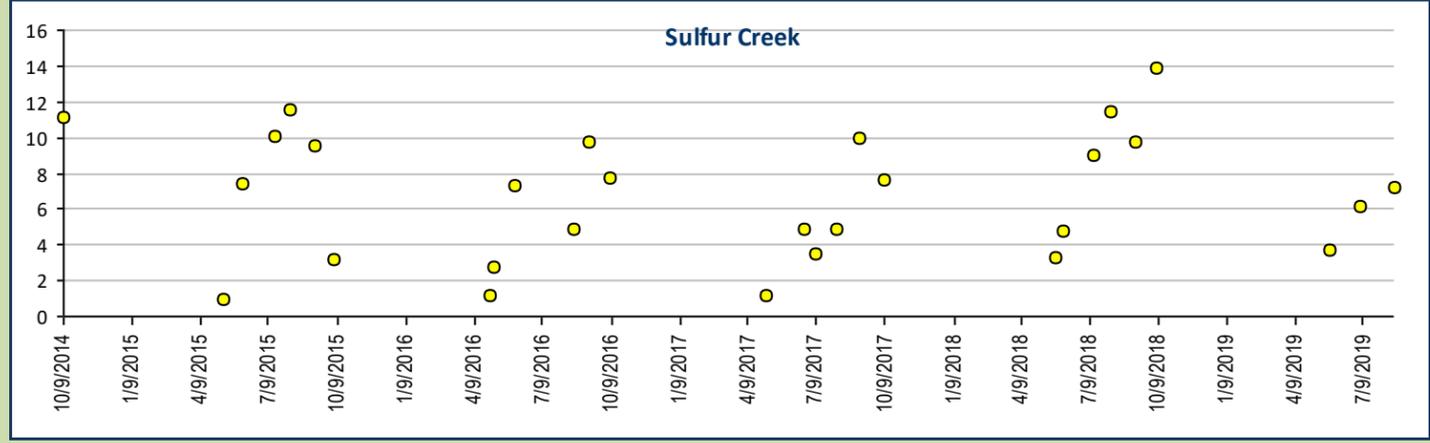
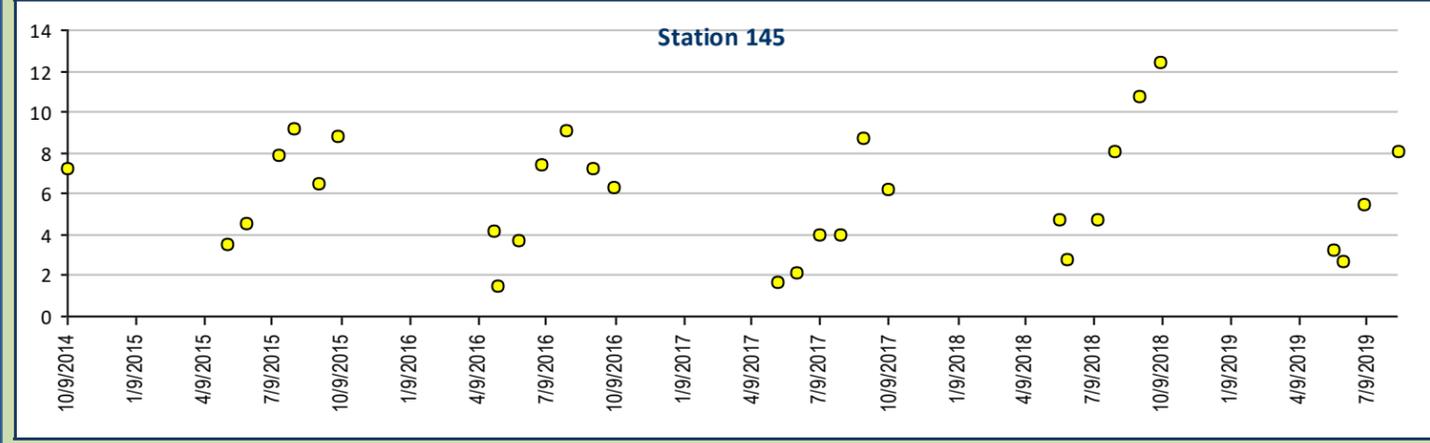
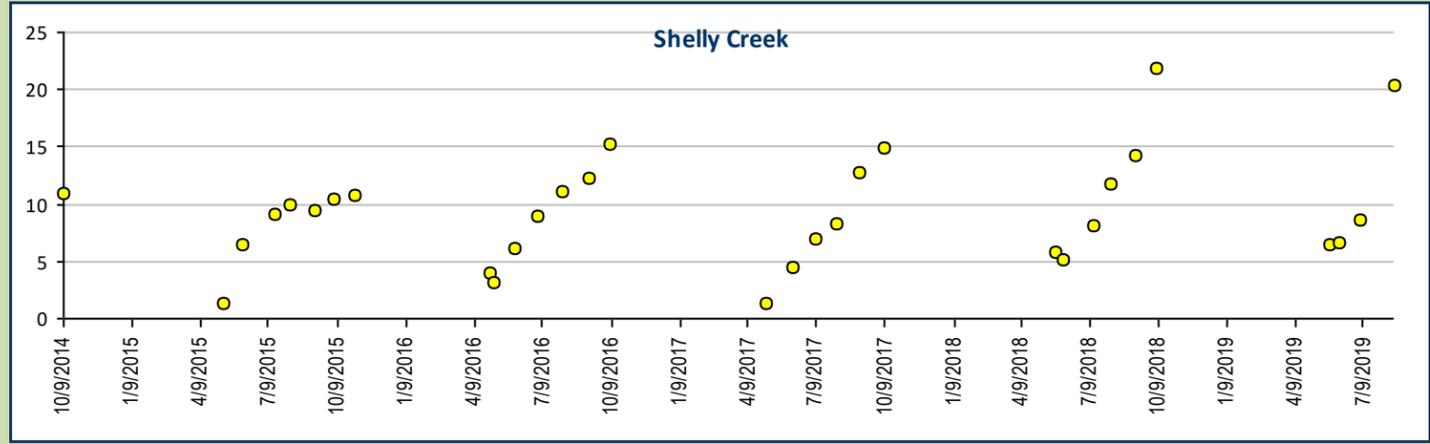
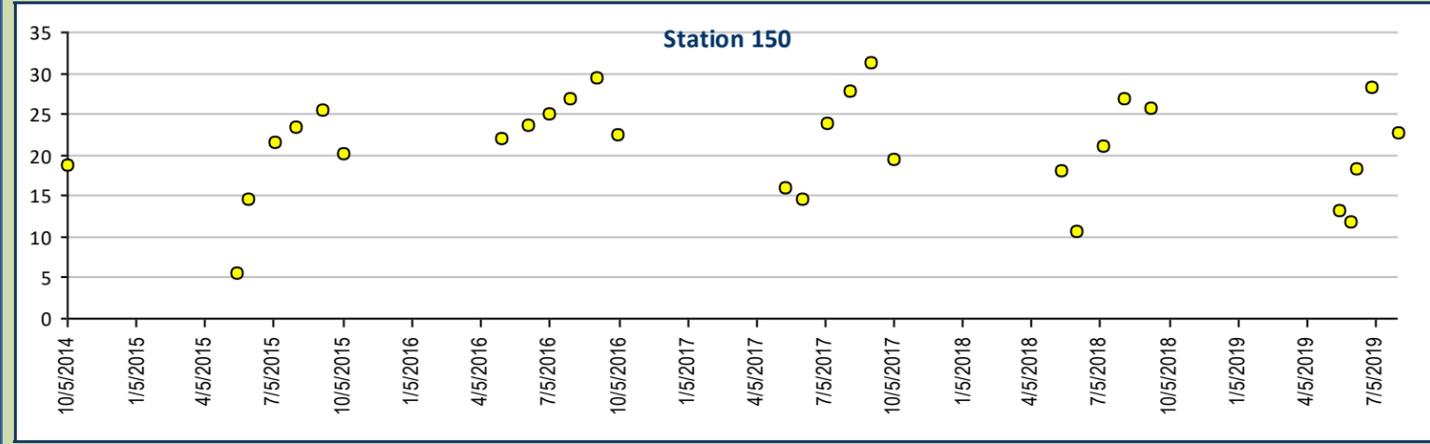
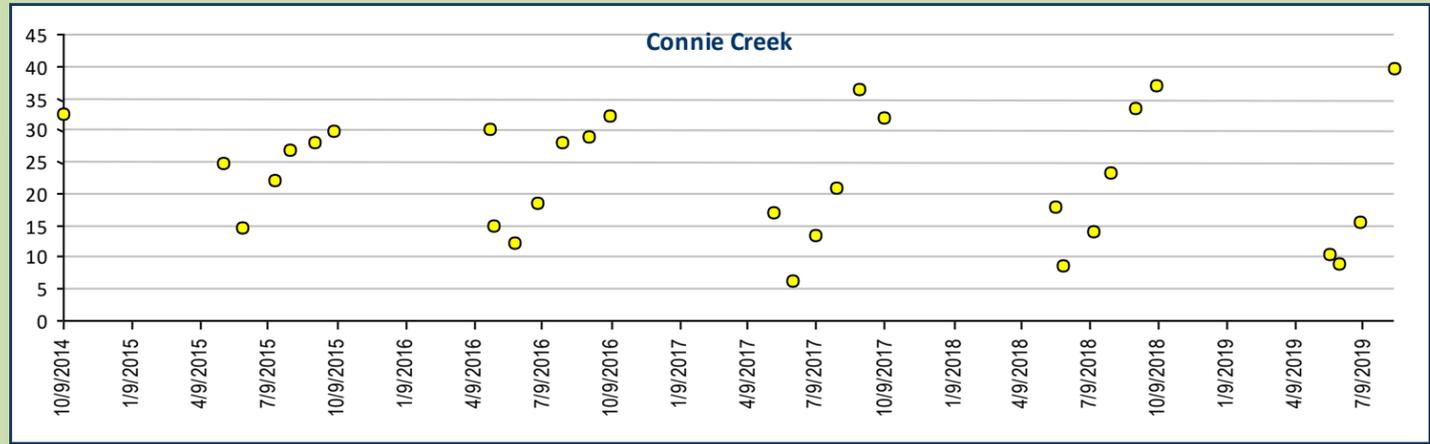


Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts Sodium, Total Recoverable, units mg/L



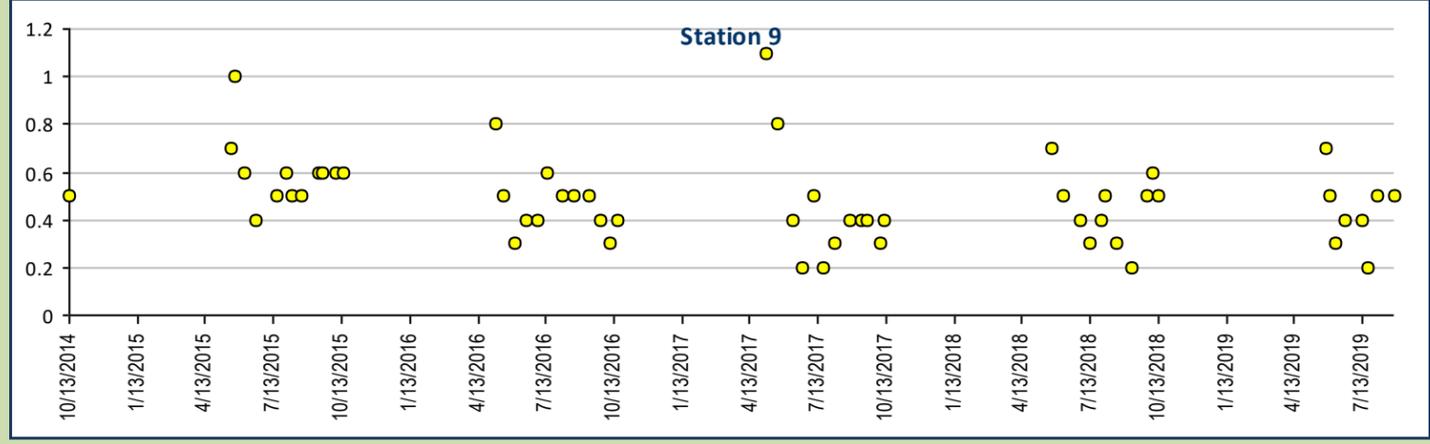
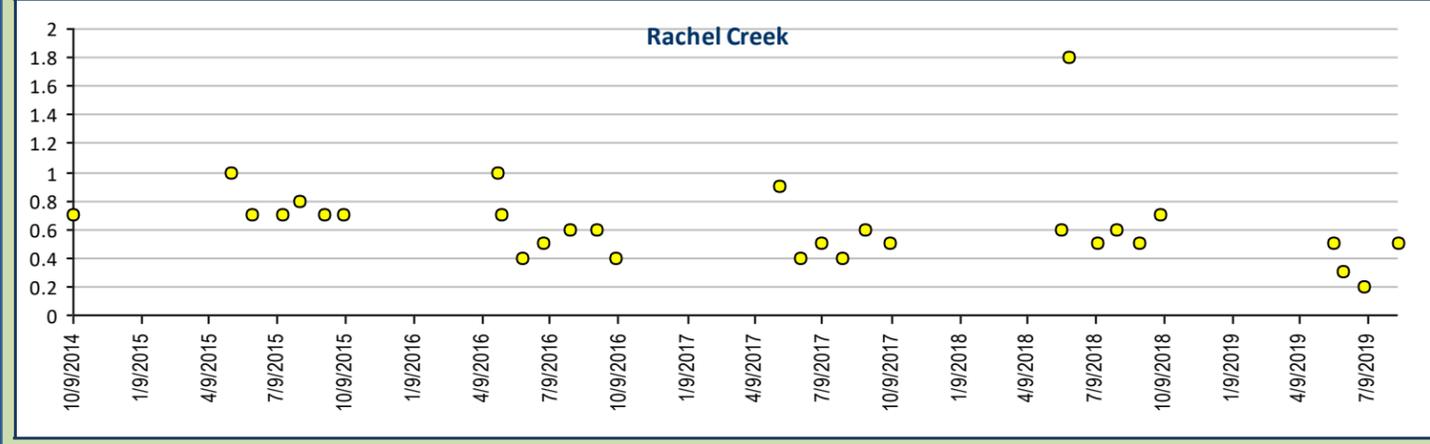
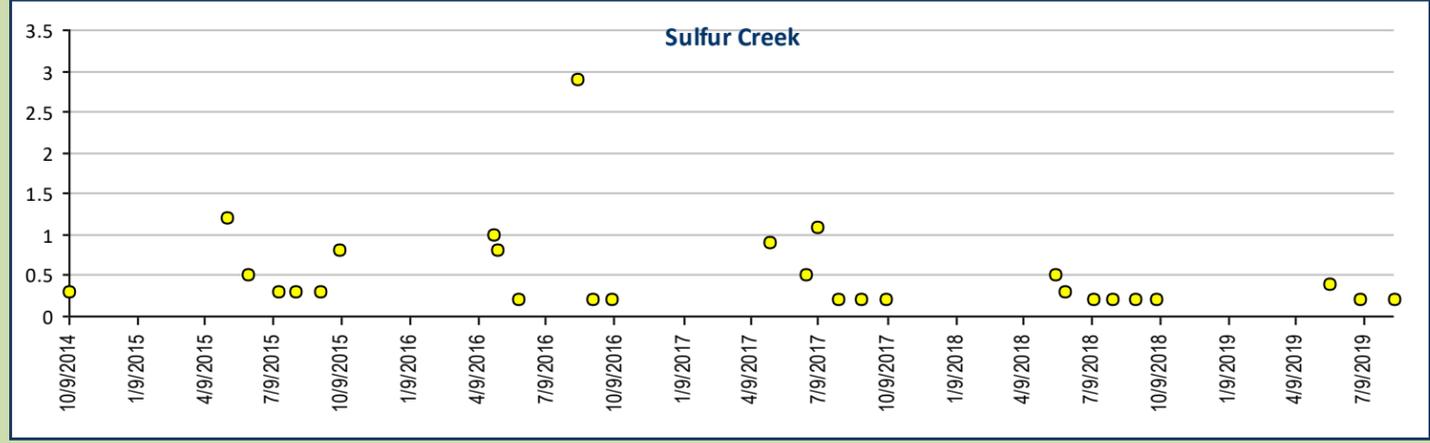
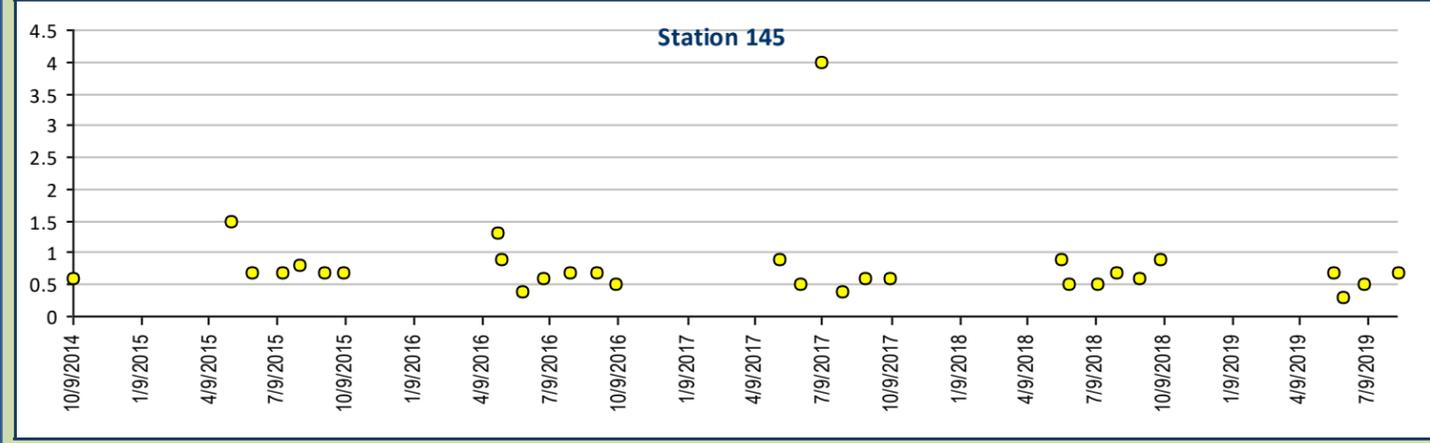
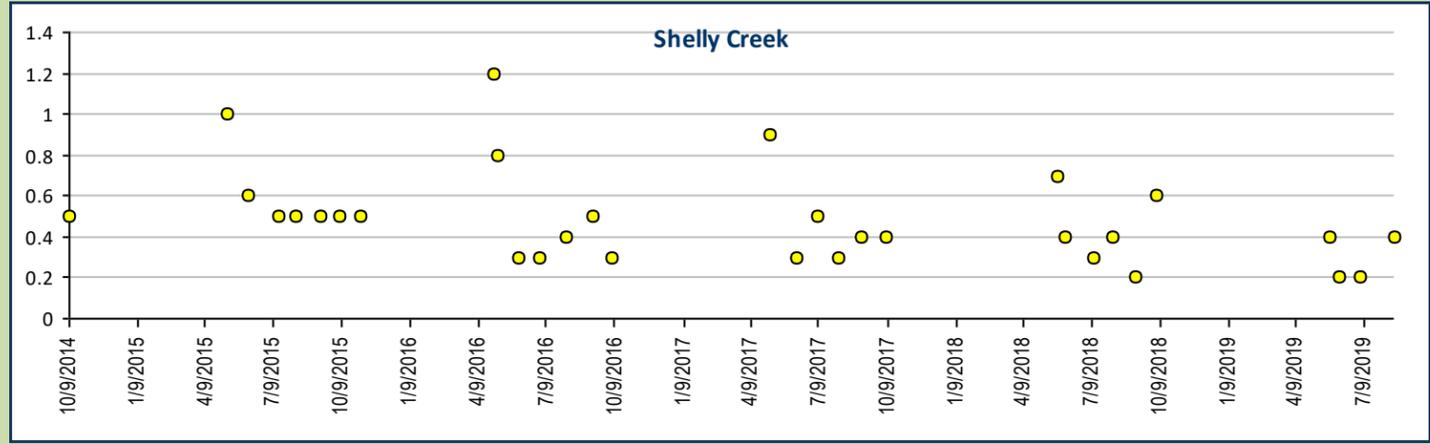
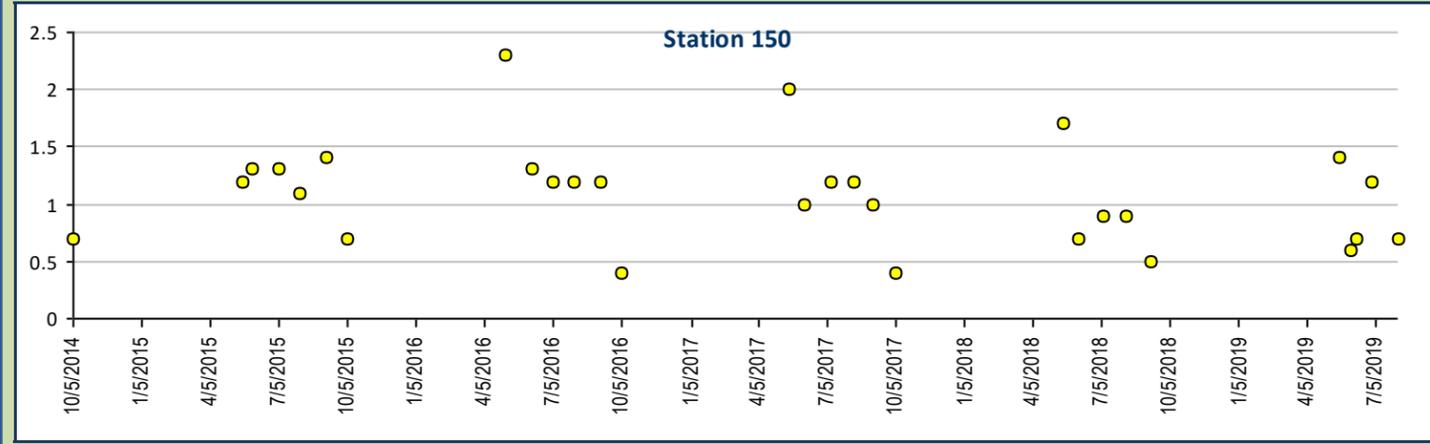
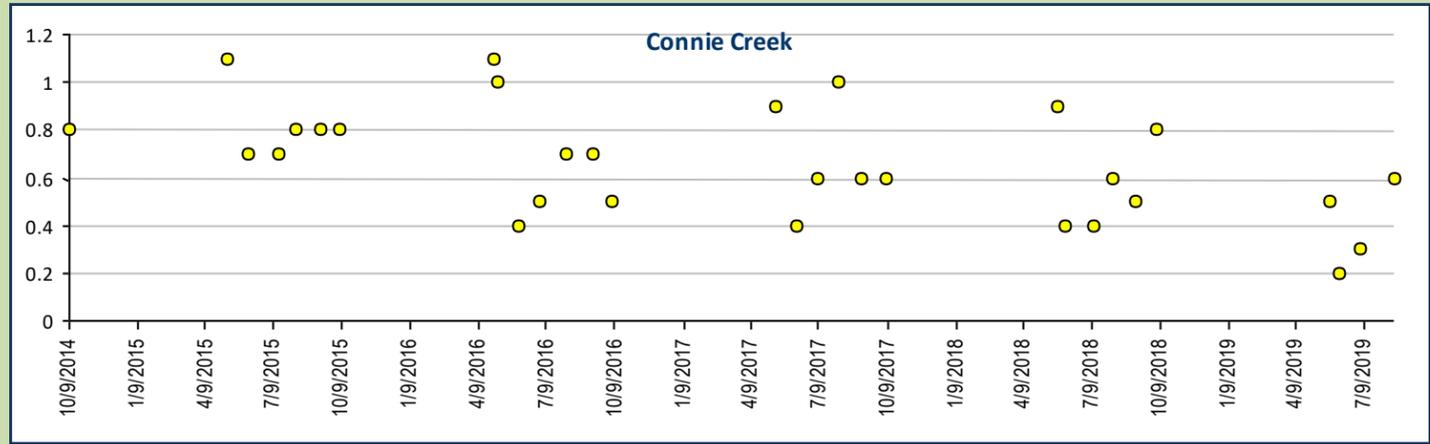


Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts Magnesium, Total Recoverable, units mg/L





Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts Potassium, Total Recoverable, units mg/L

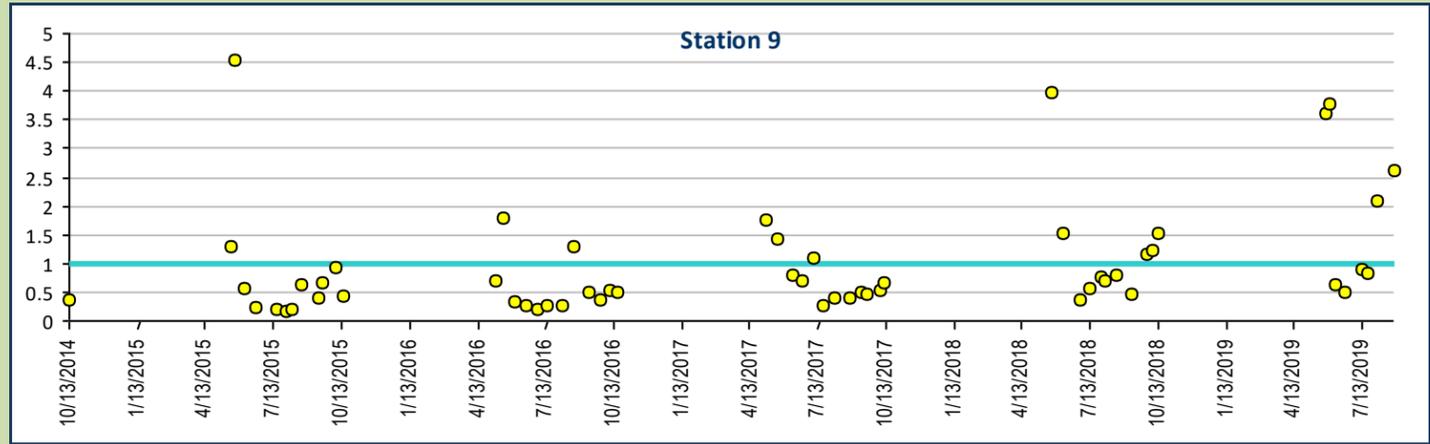
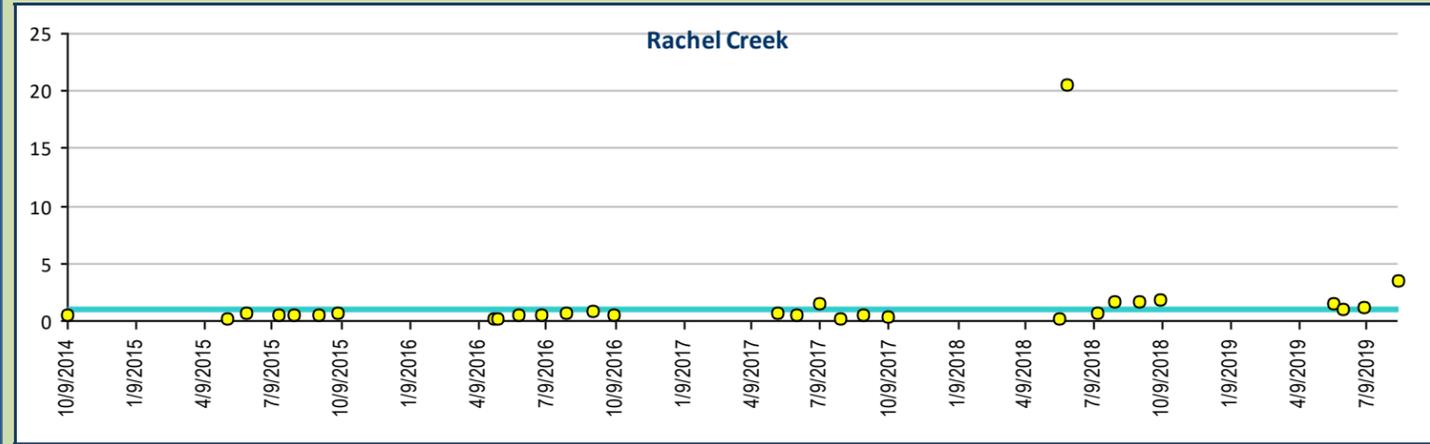
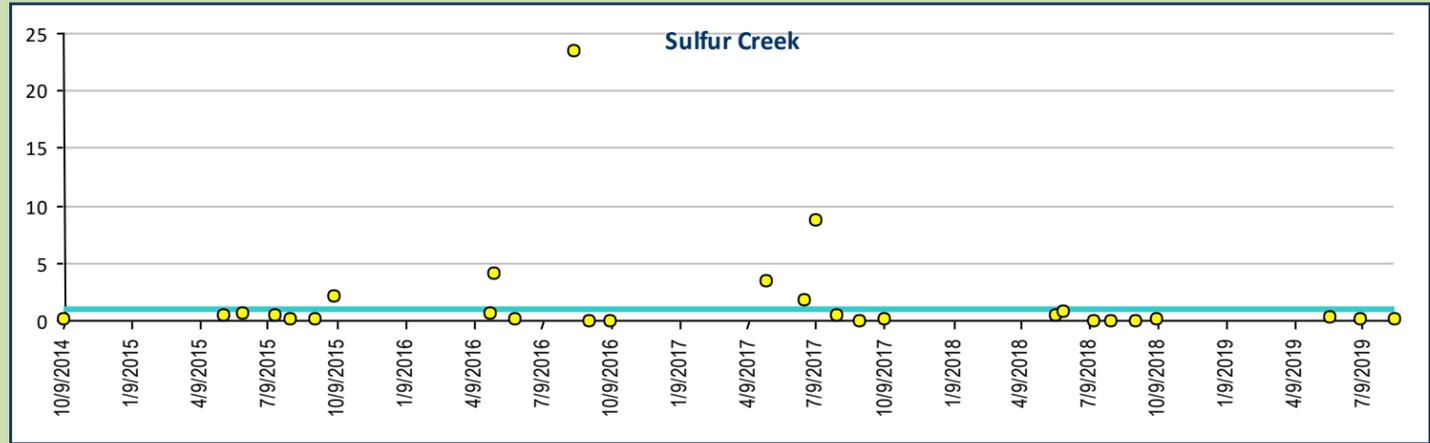
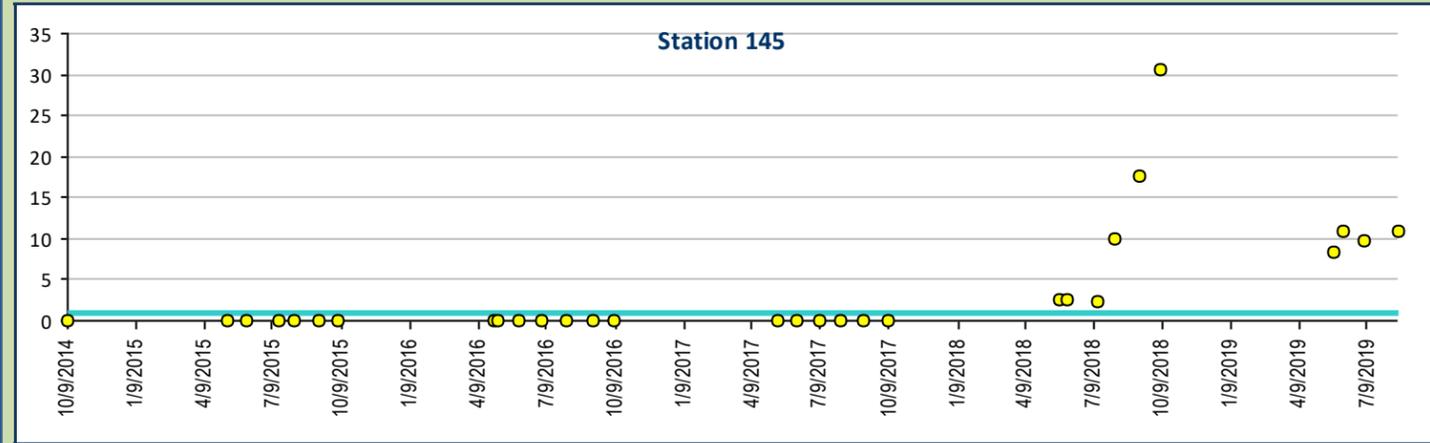
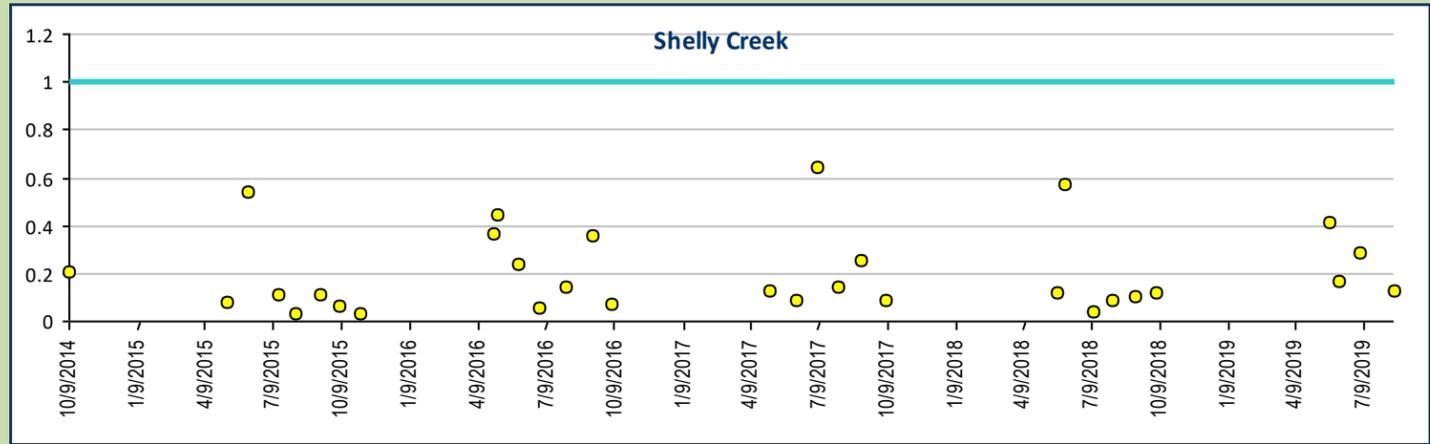
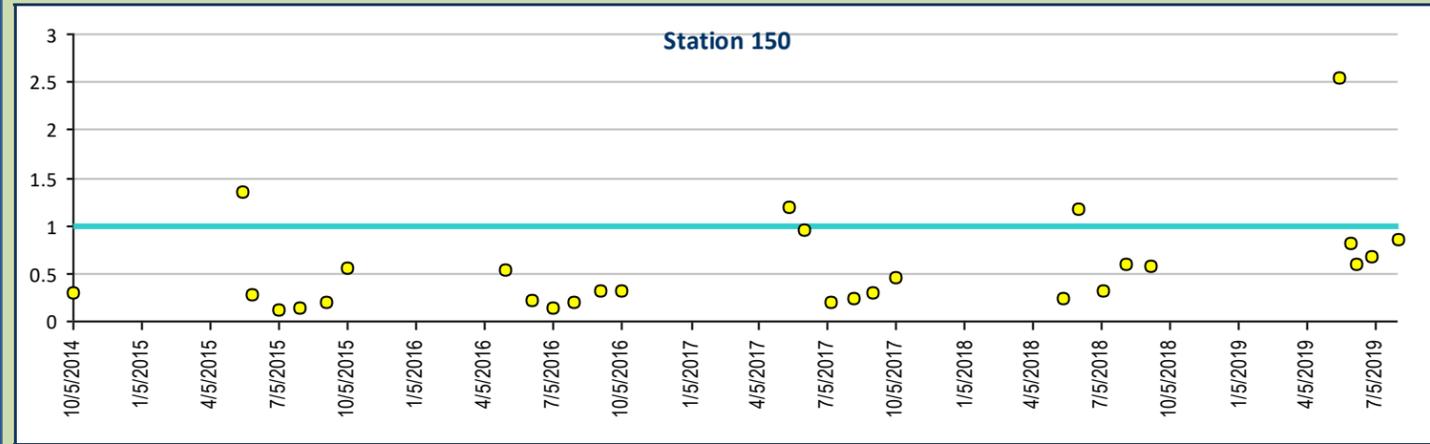
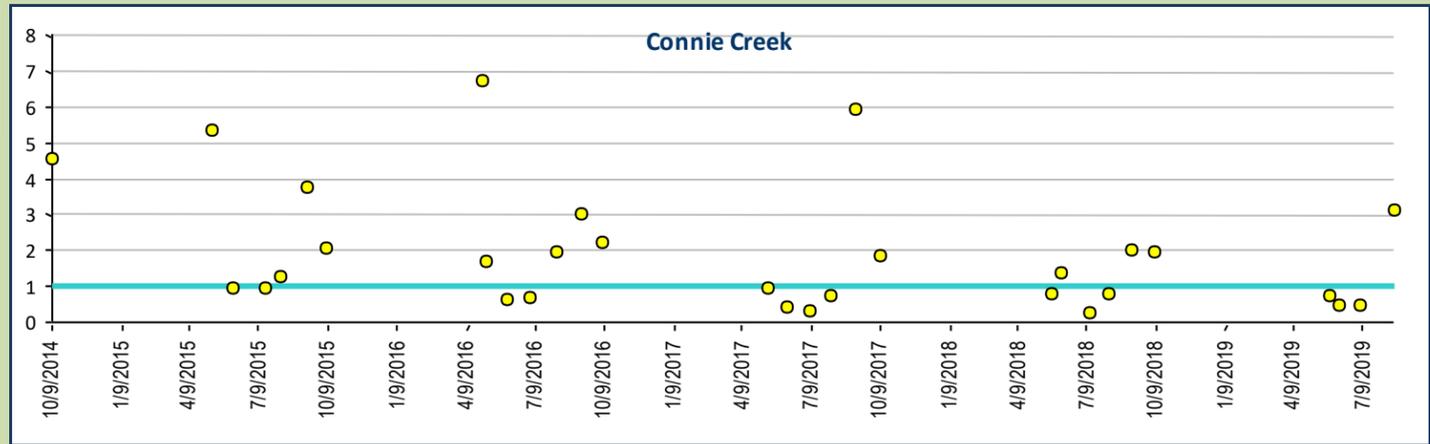




Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

Iron, Total Recoverable, units mg/L

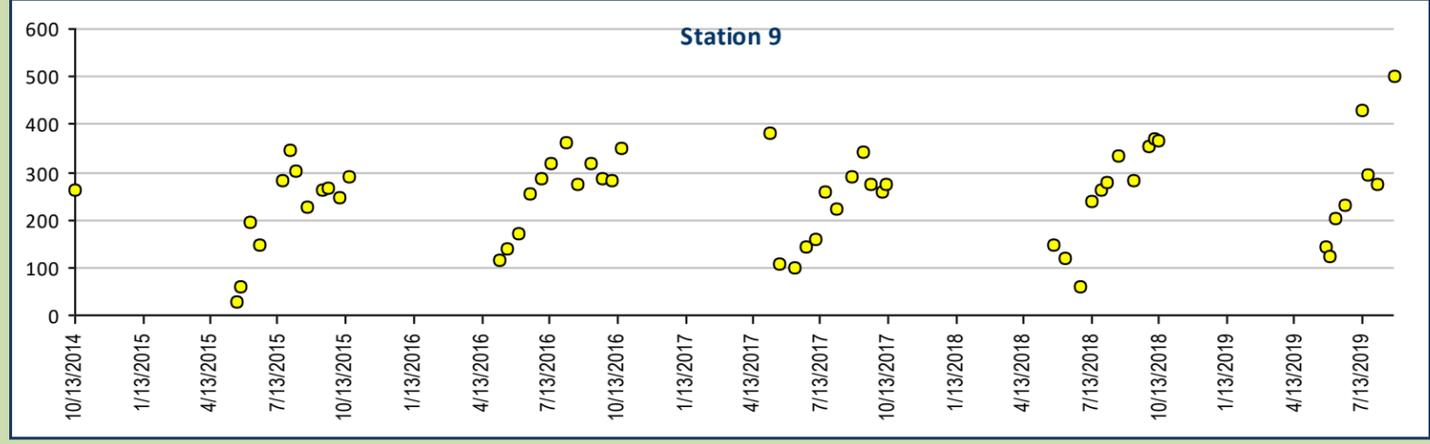
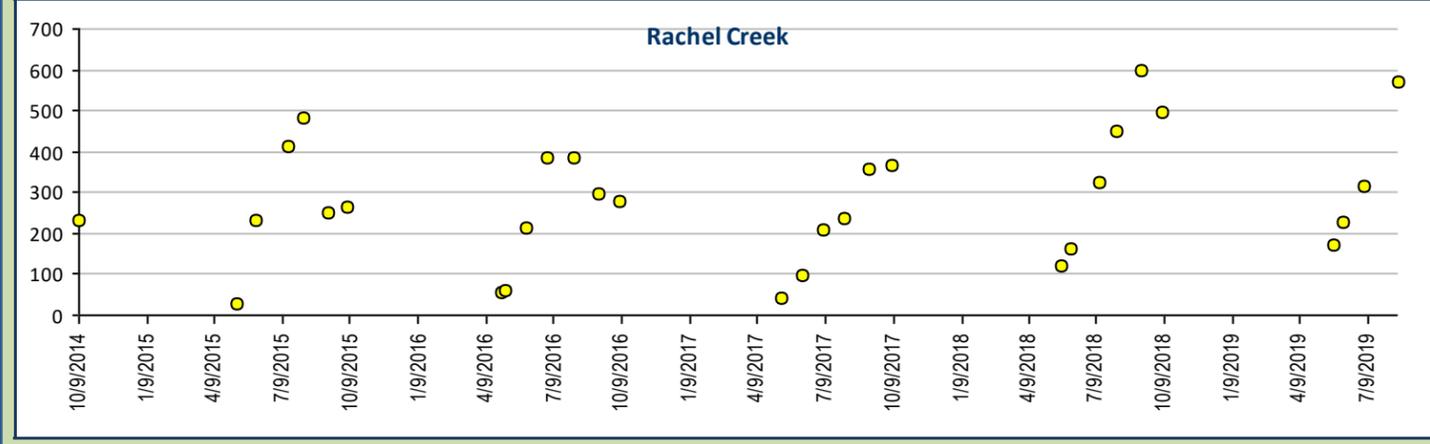
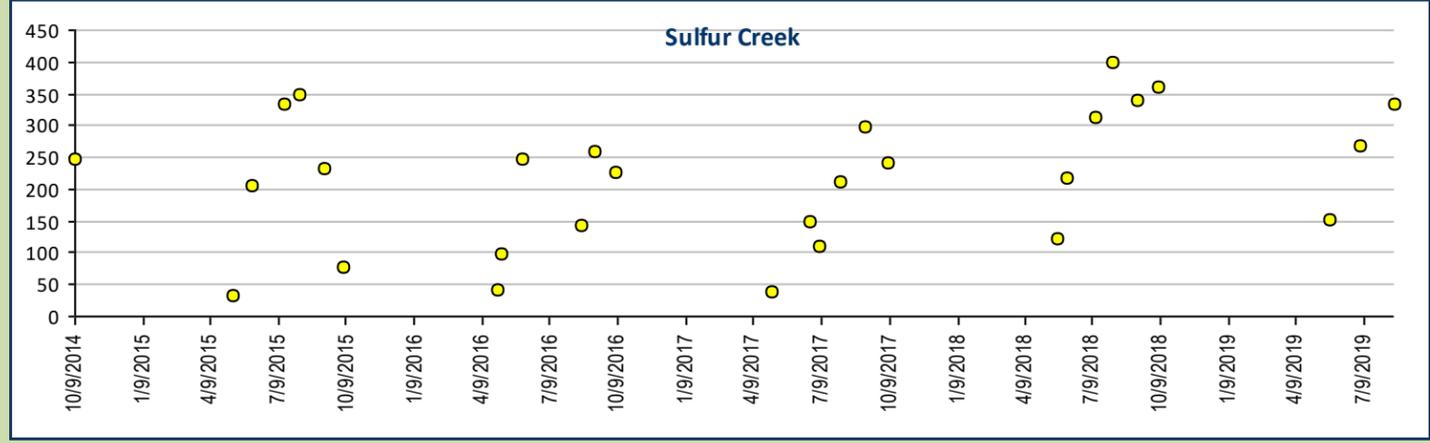
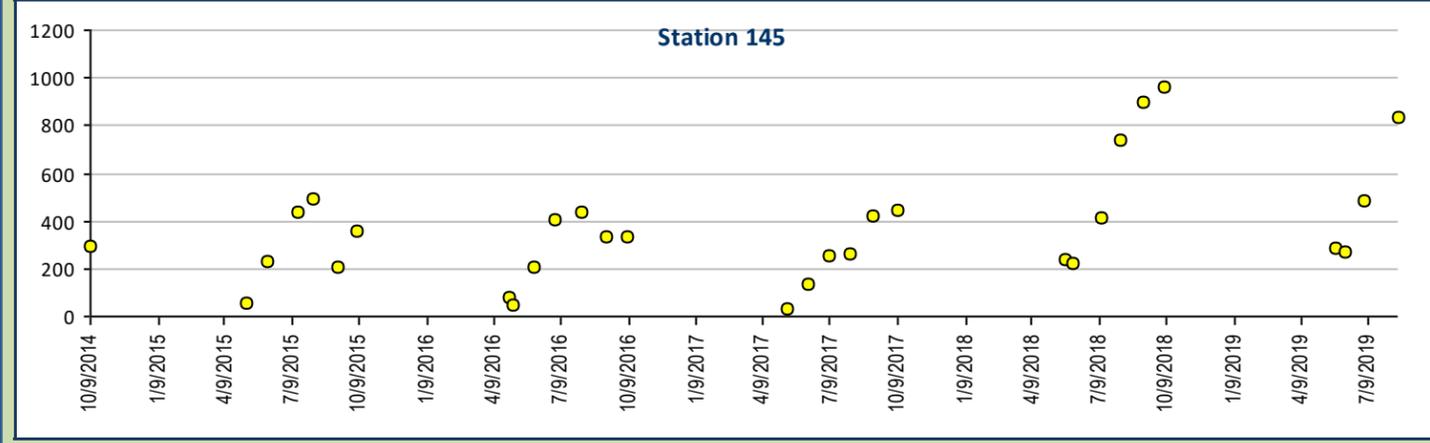
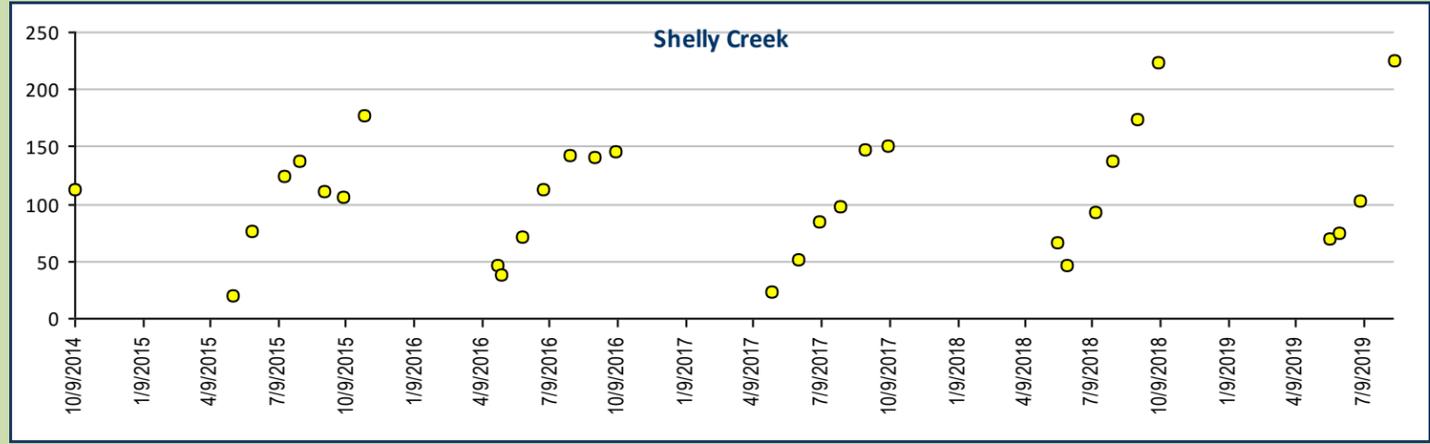
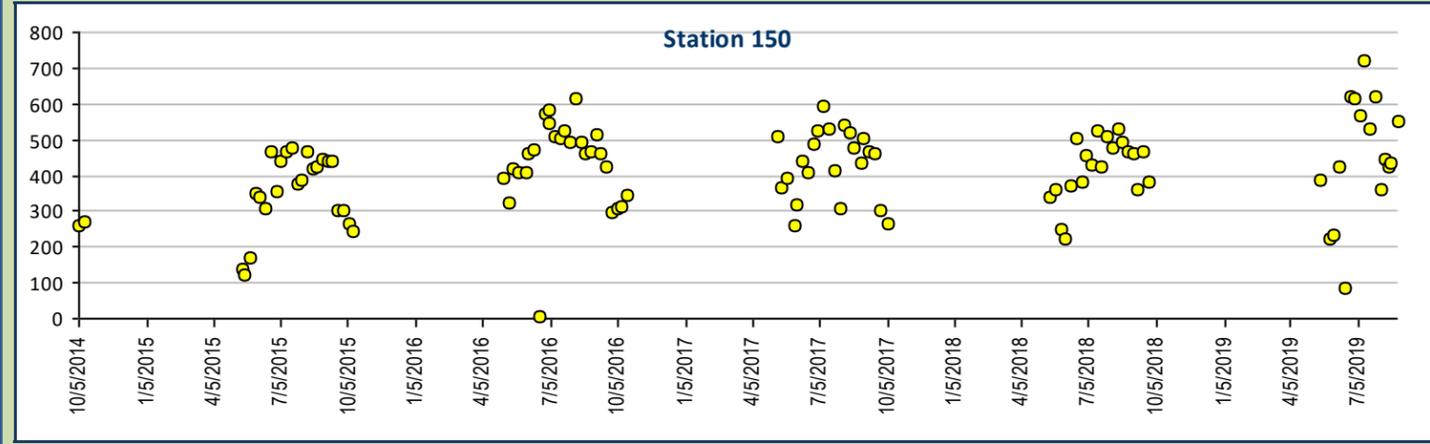
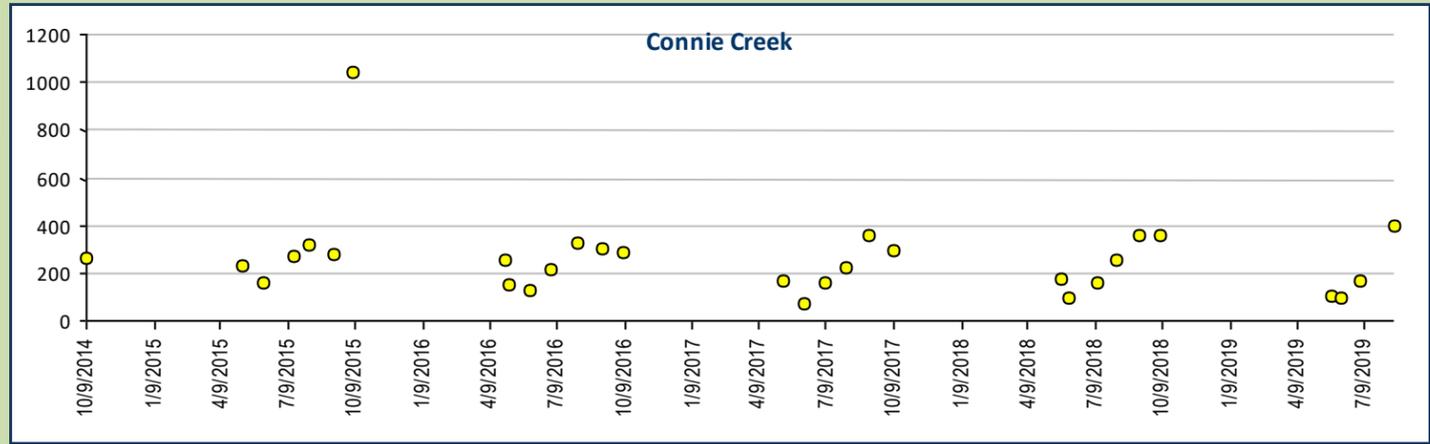
Aquatic Life - Fresh Water Chronic WQS mg/L
1.0 mg/L





Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

Conductivity, units uS/cm



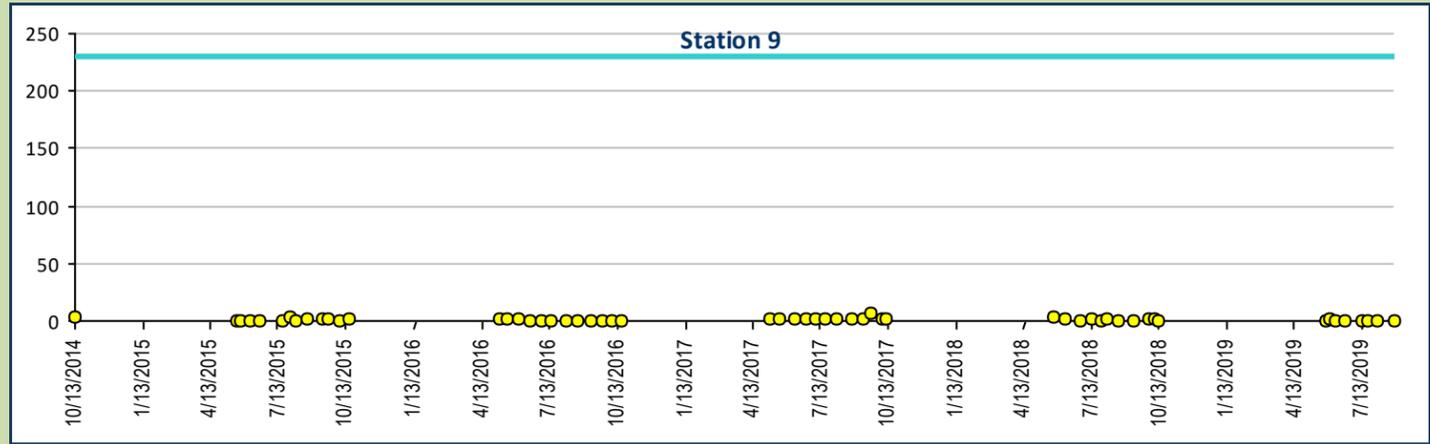
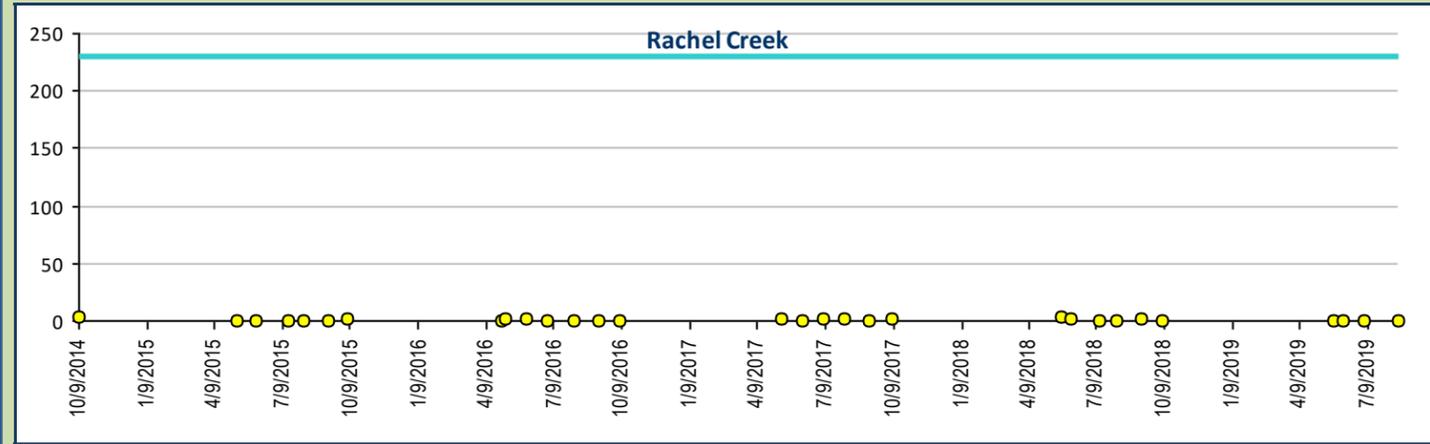
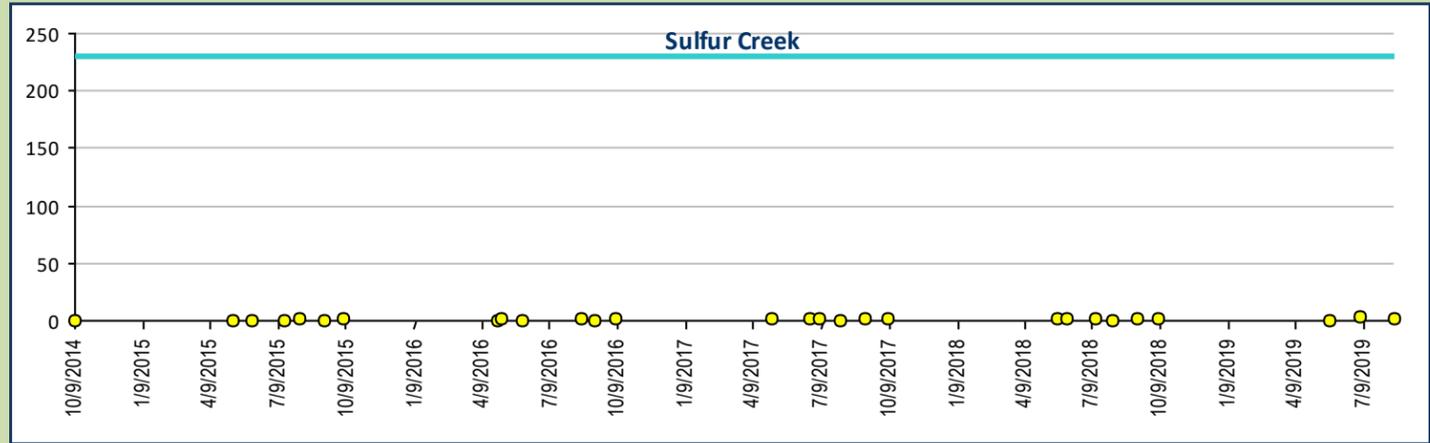
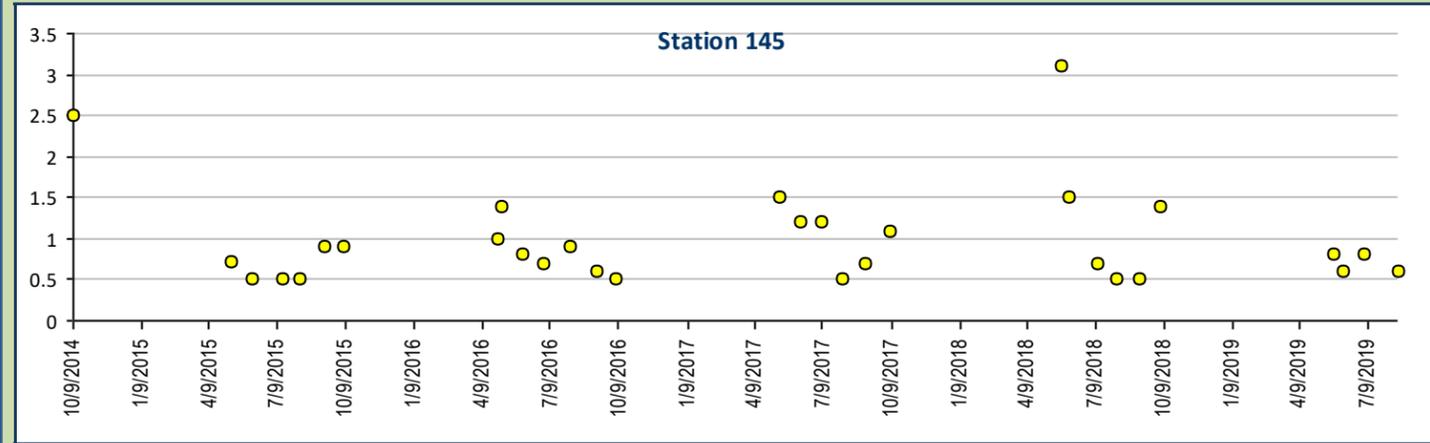
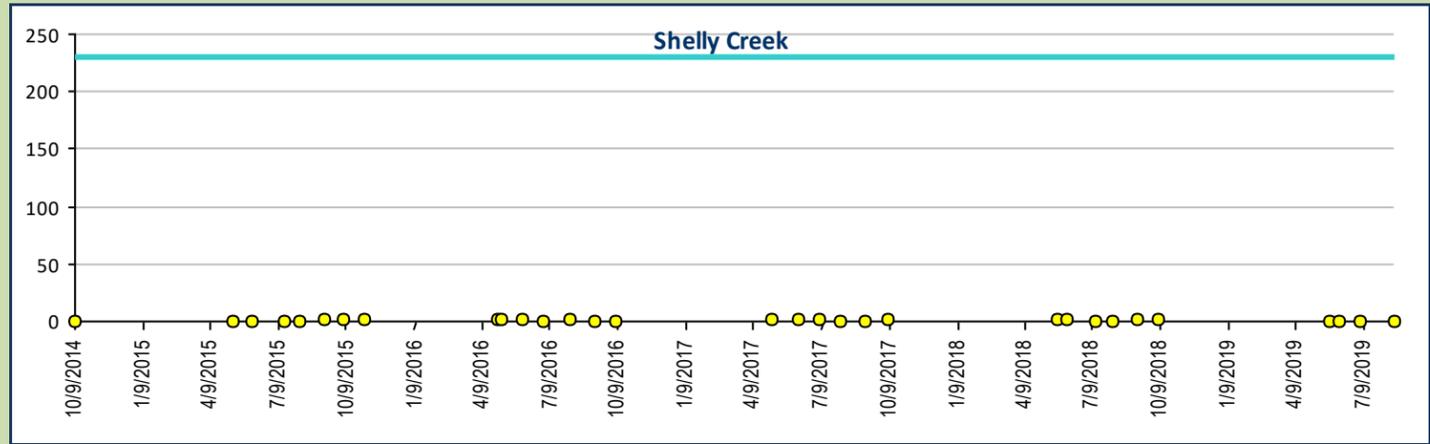
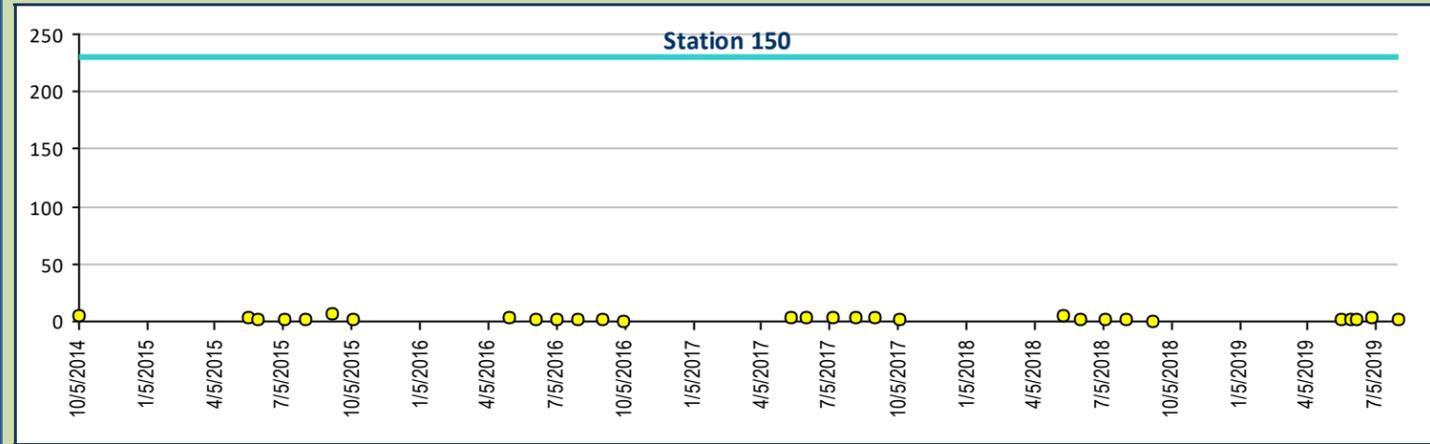
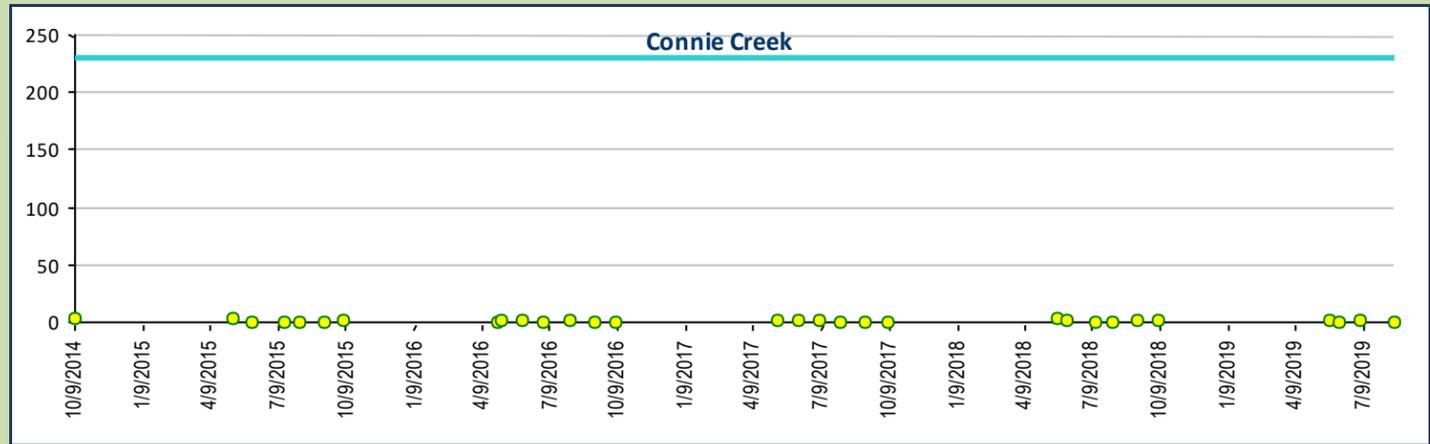


Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

Chloride, Total Recoverable, units mg/L

Aquatic Life - Fresh Water Chronic WQS mg/L

230 mg/L





Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

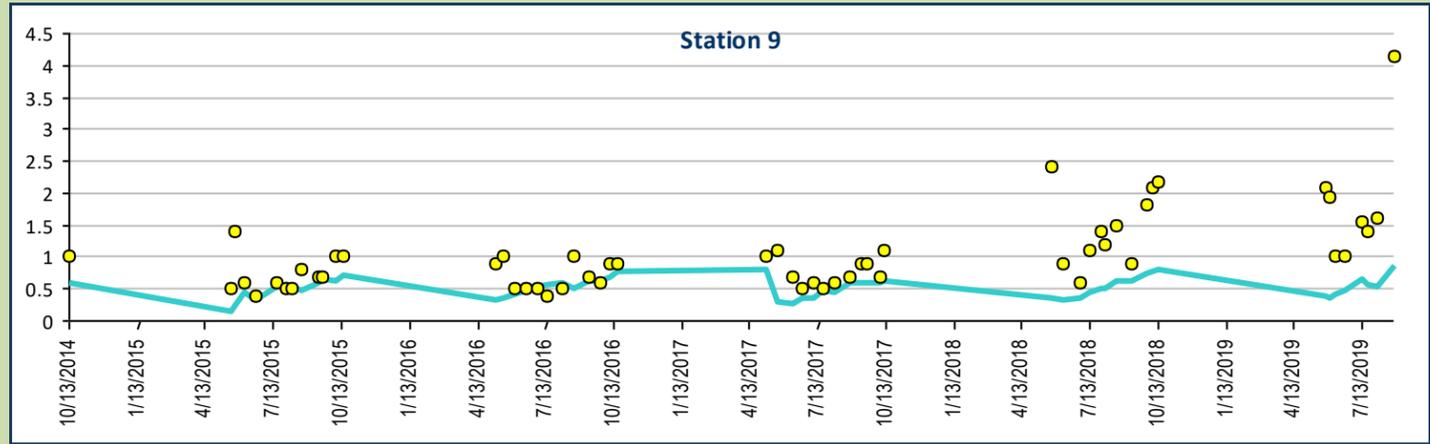
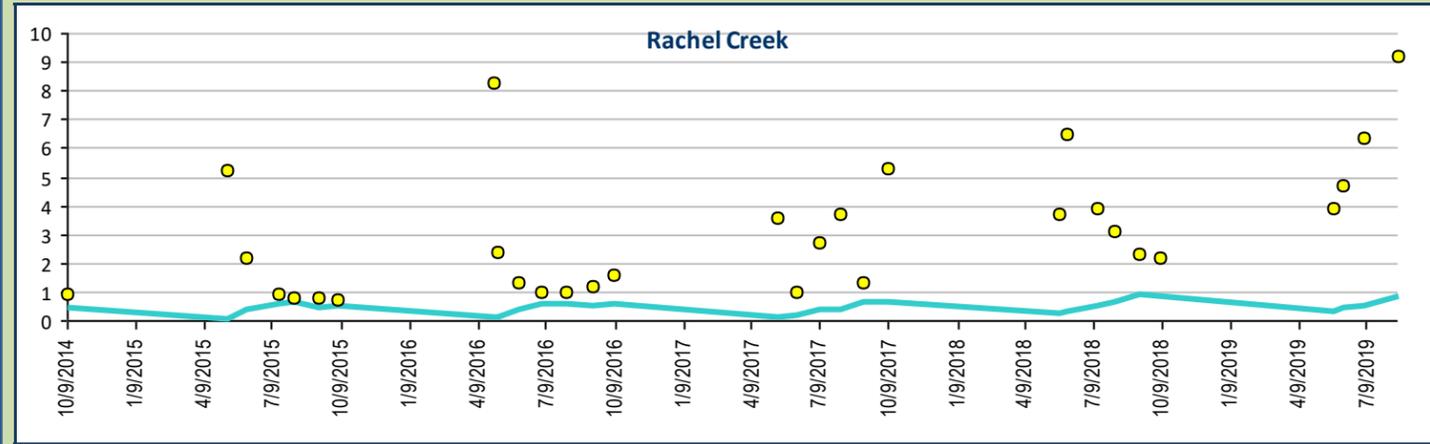
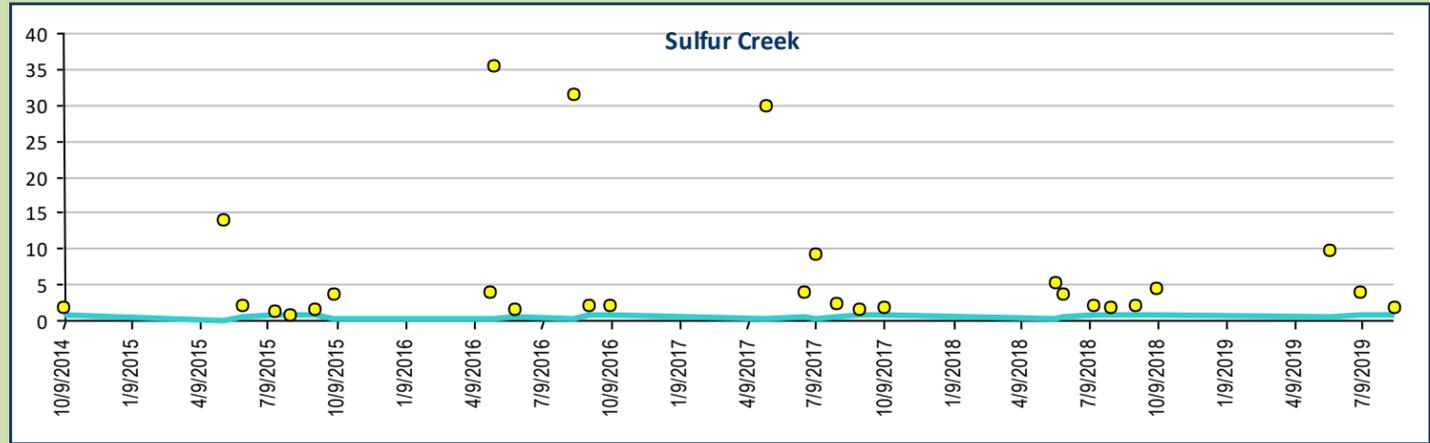
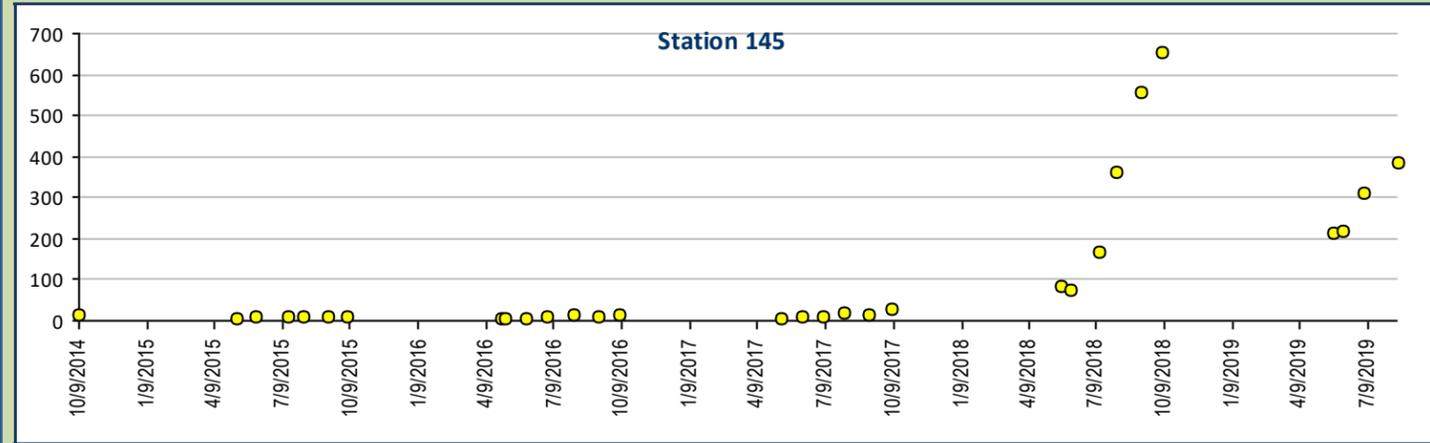
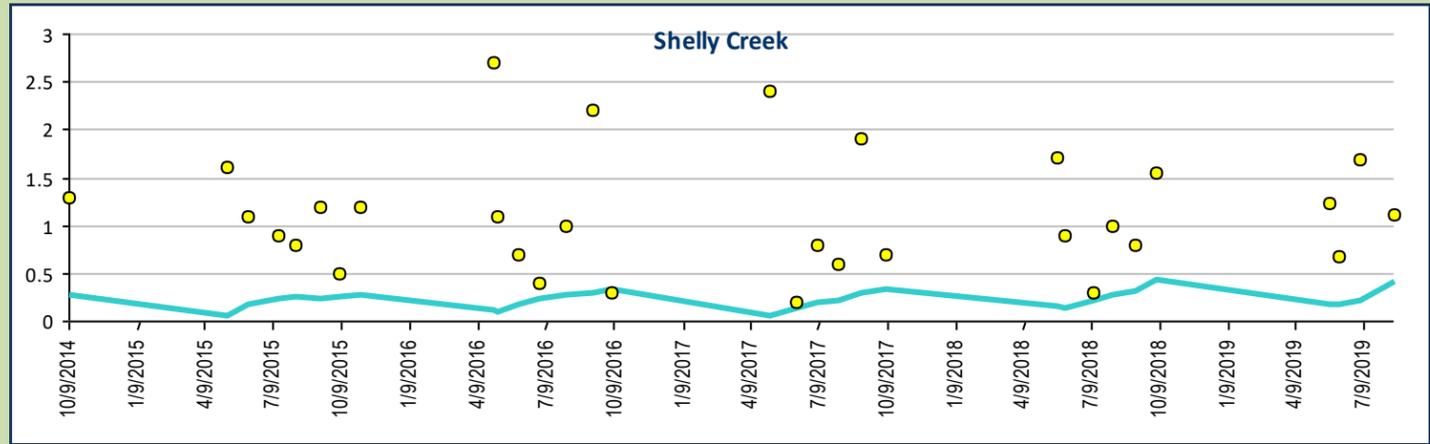
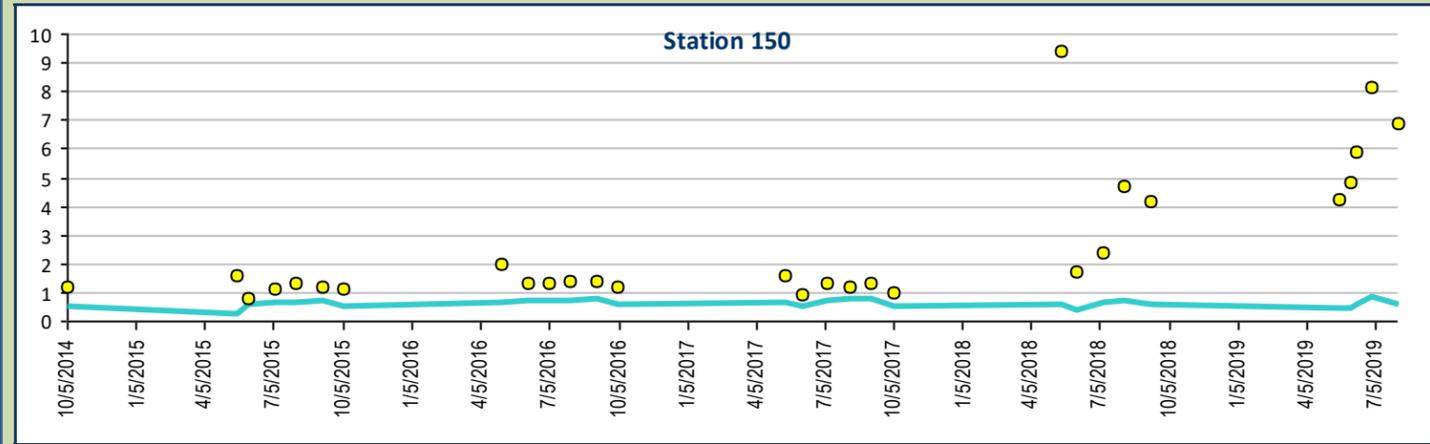
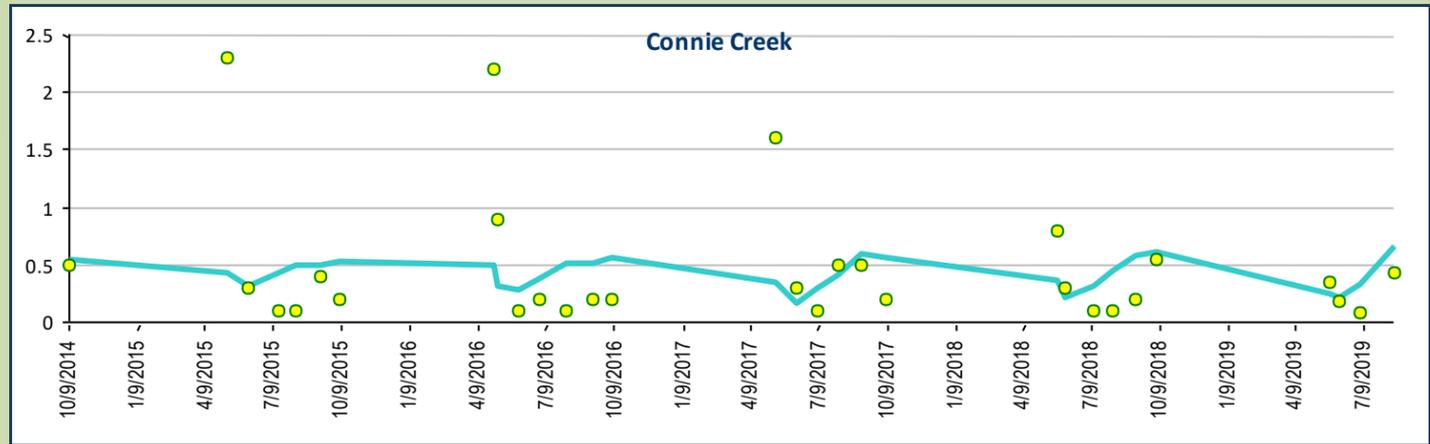
Cadmium, Total Recoverable, units ug/L

Aquatic Life - Fresh Water Chronic WQS ug/L

Hardness Dependent Calculation

$$=EXP(0.7409*(LN(calc *hardness)))-4.719$$

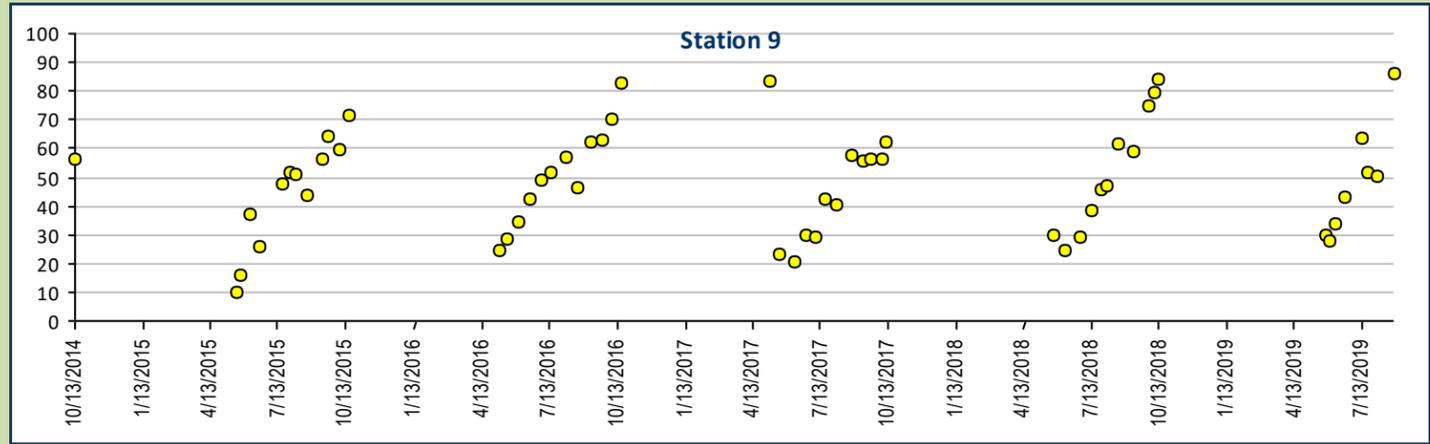
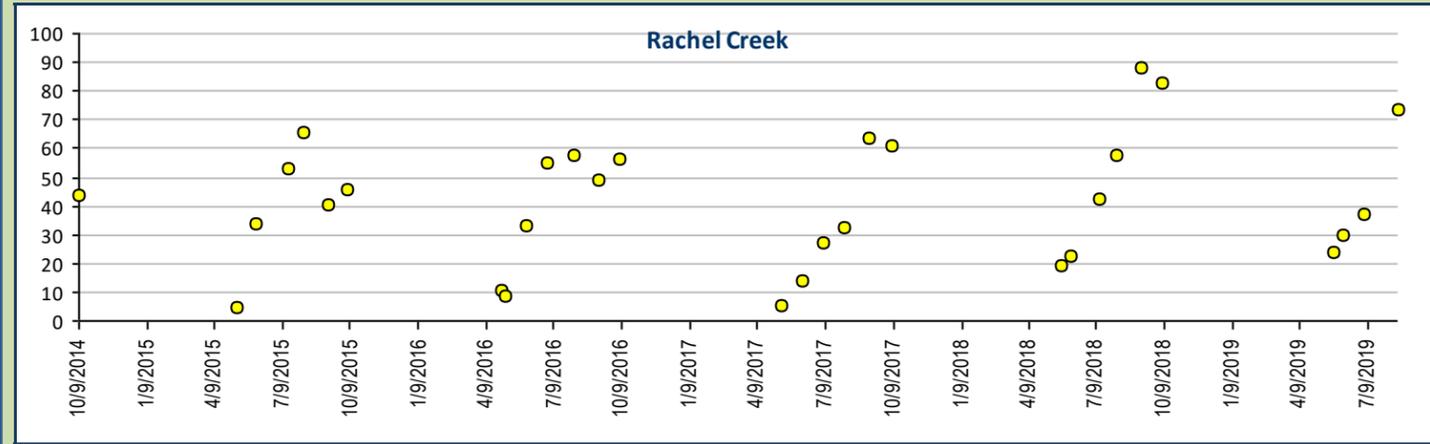
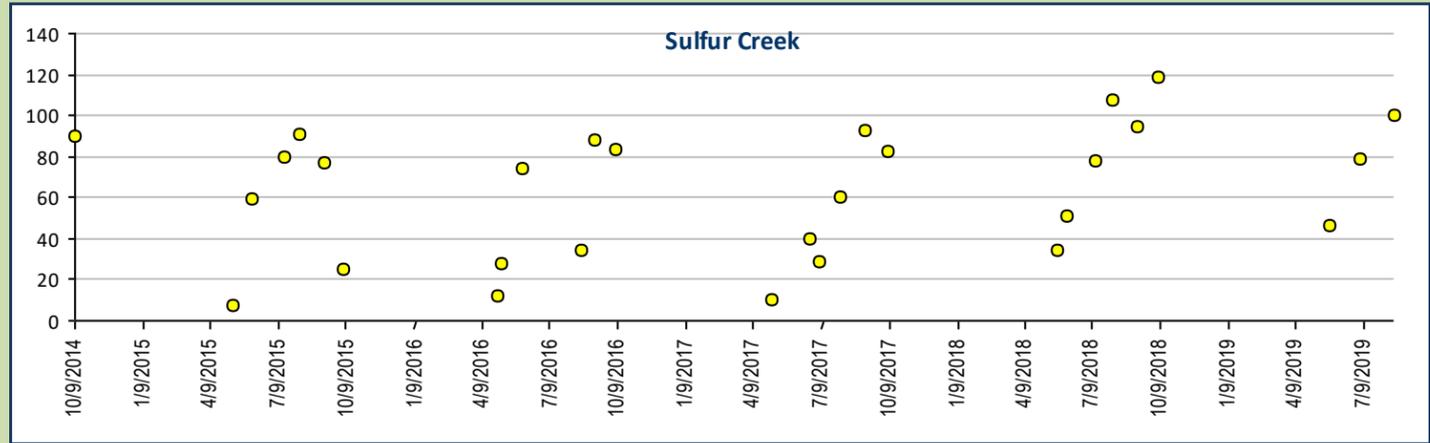
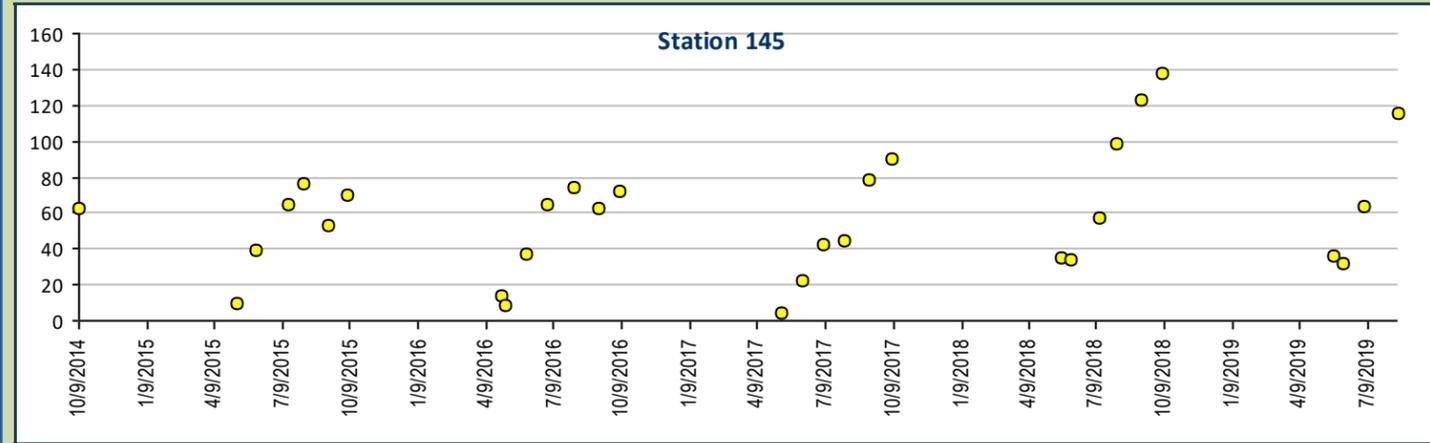
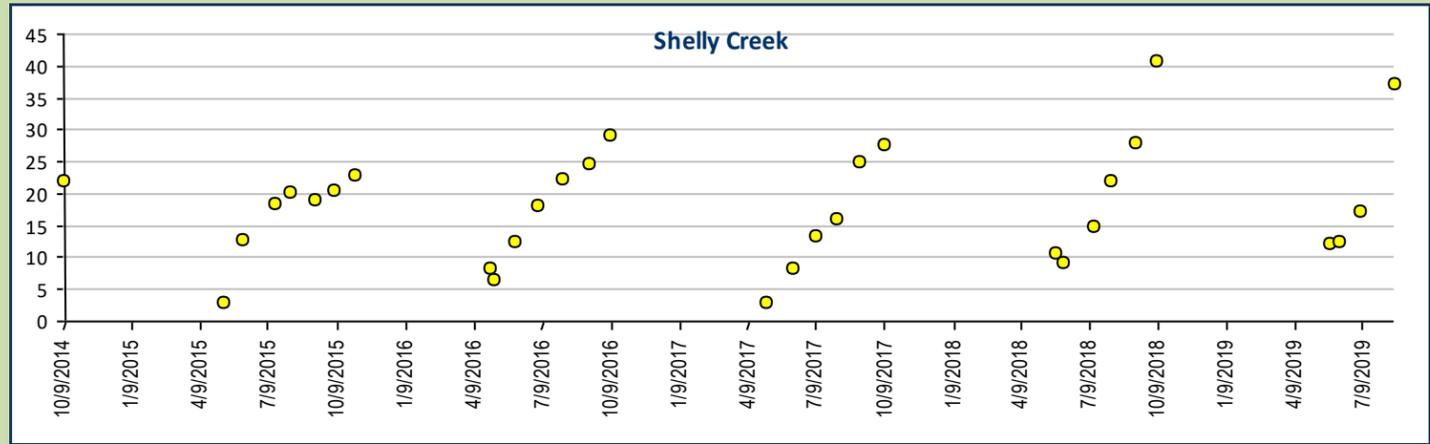
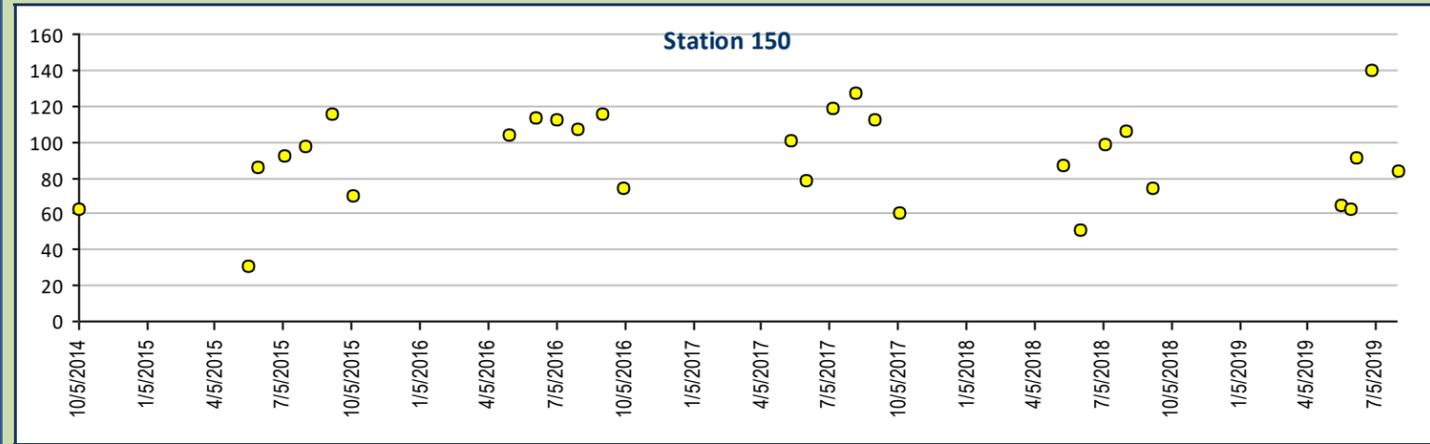
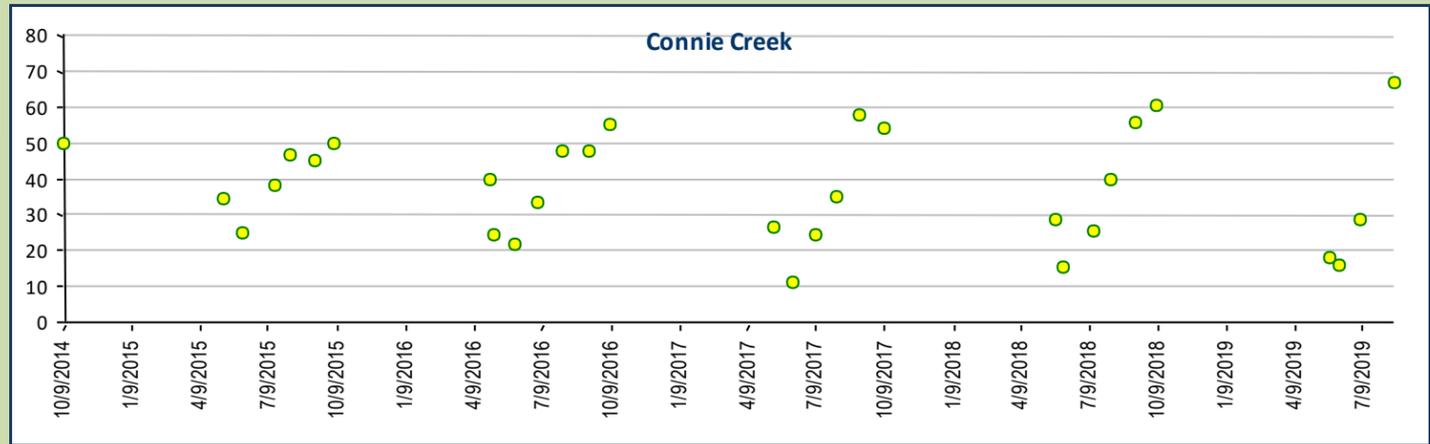
* Calculated using Standard Methods 2340B





Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

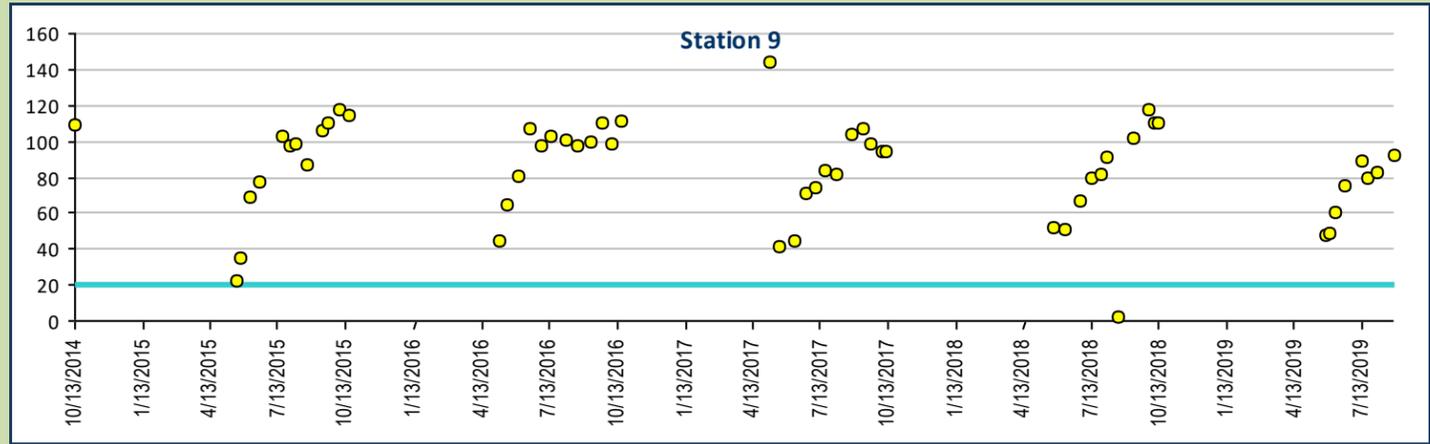
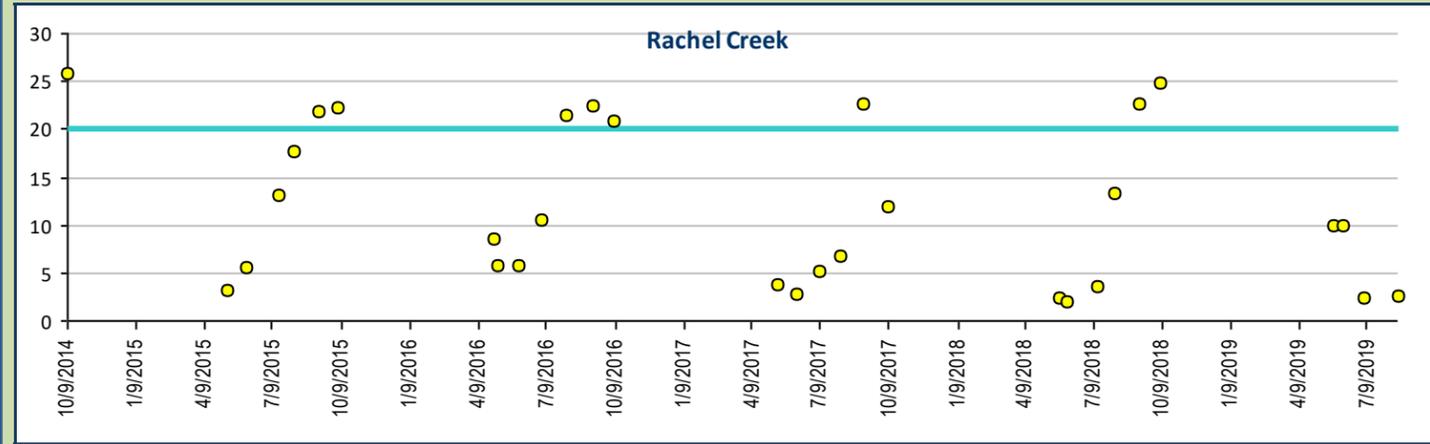
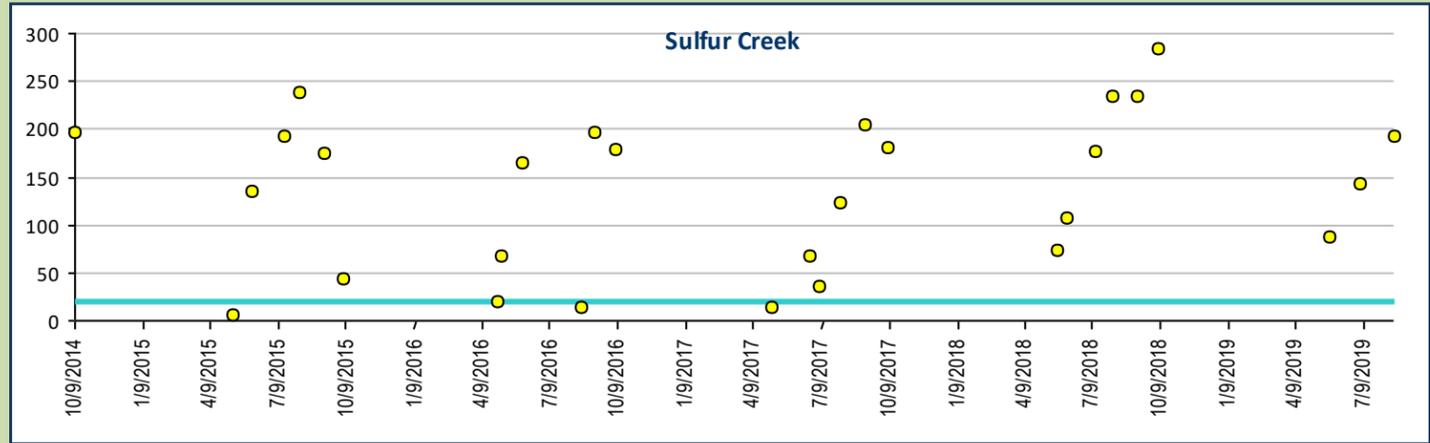
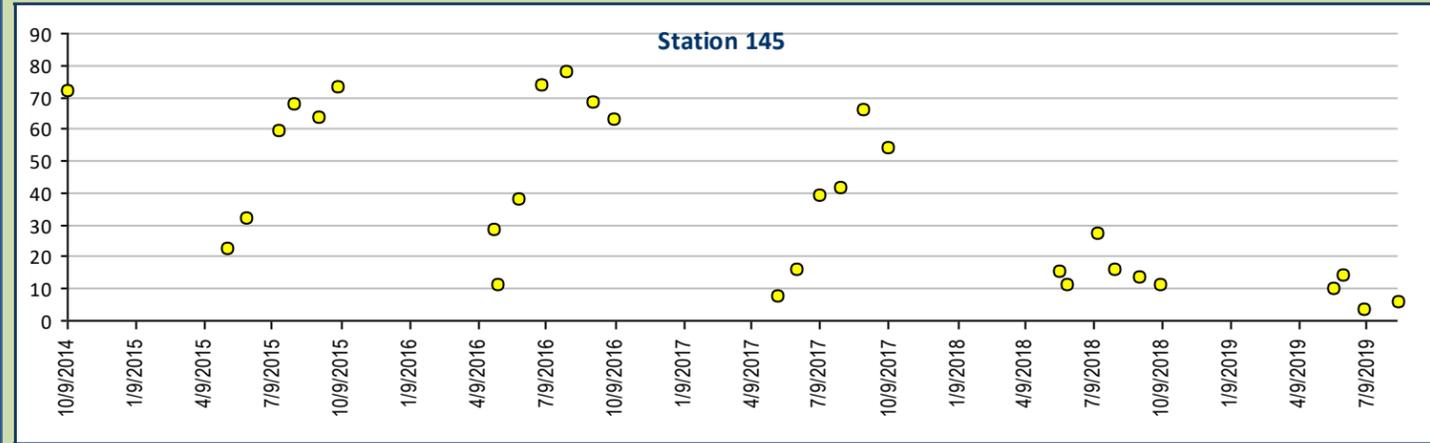
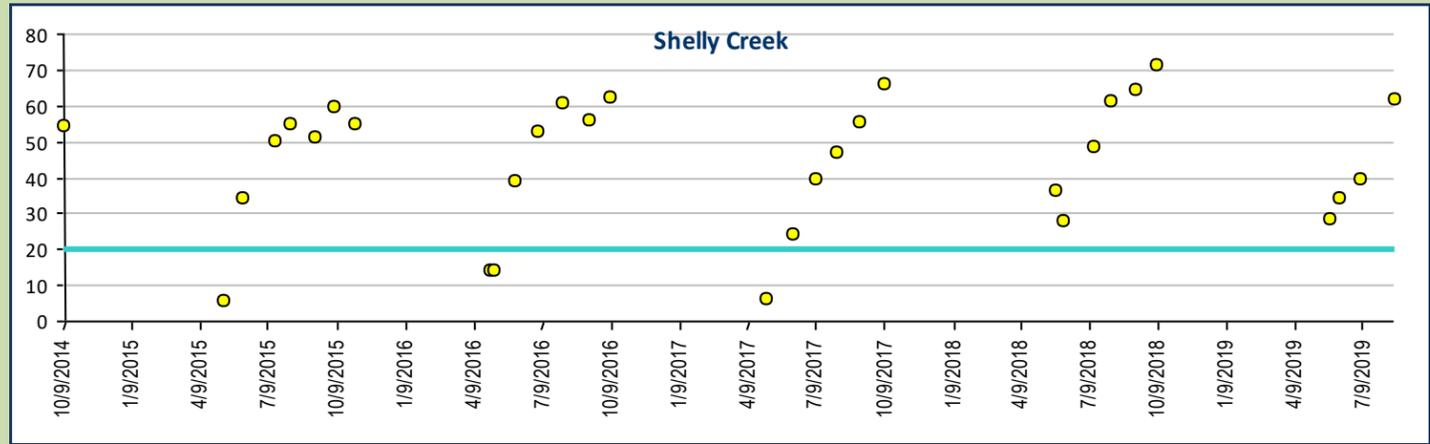
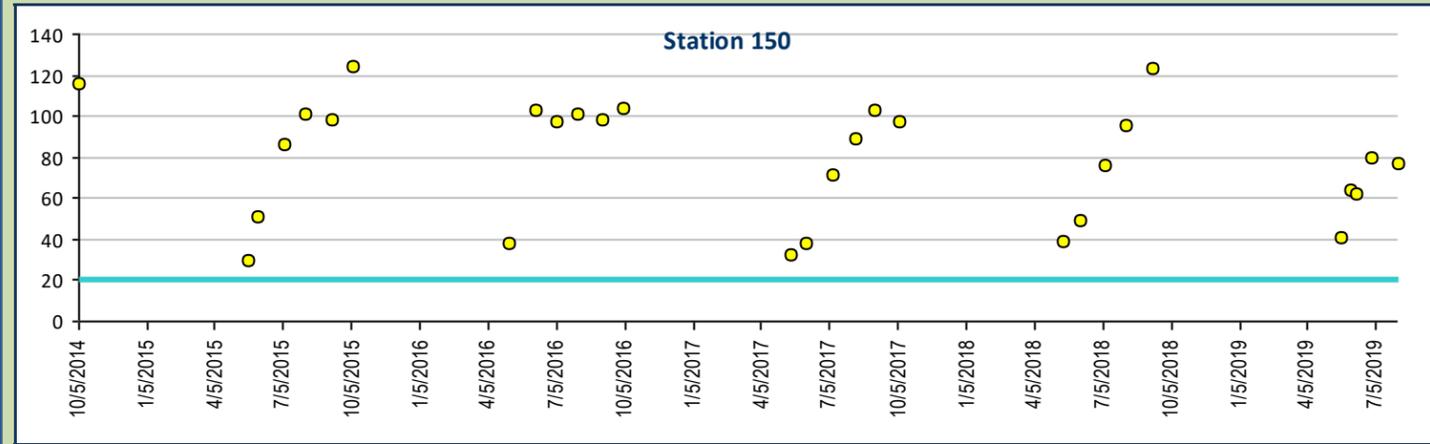
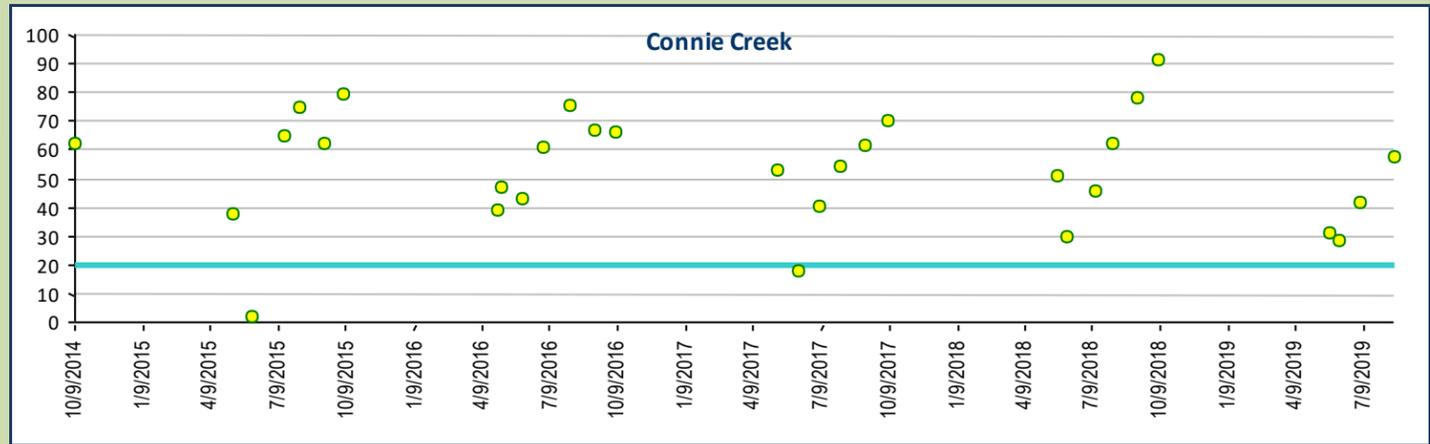
Calcium, Total recoverable, units mg/L





Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

Alkalinity as CaCO₃, units mg/L
Aquatic Life - Fresh Water Chronic WQS mg/L
20 mg/L minimum



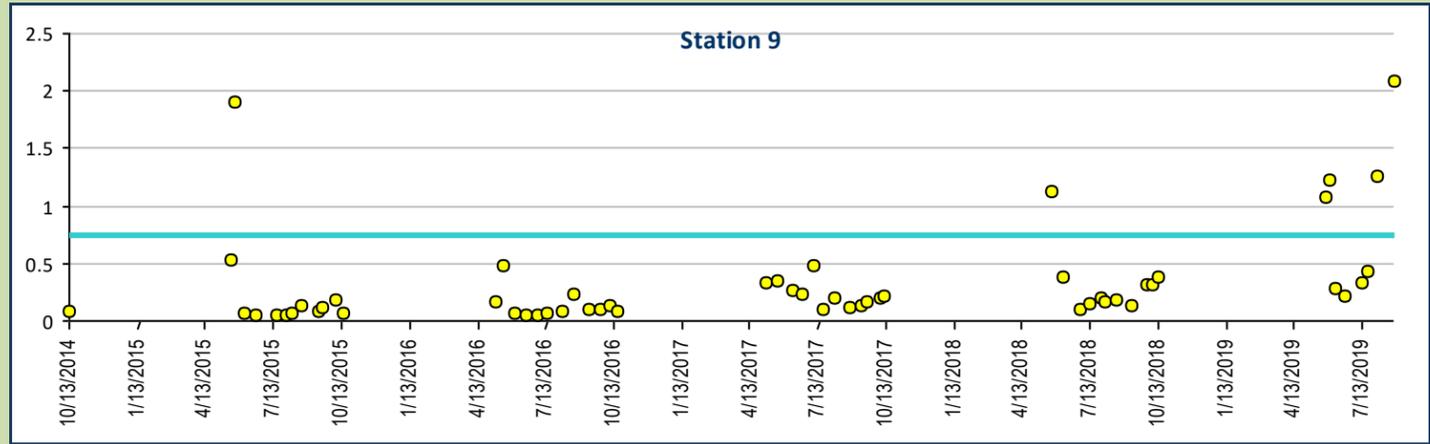
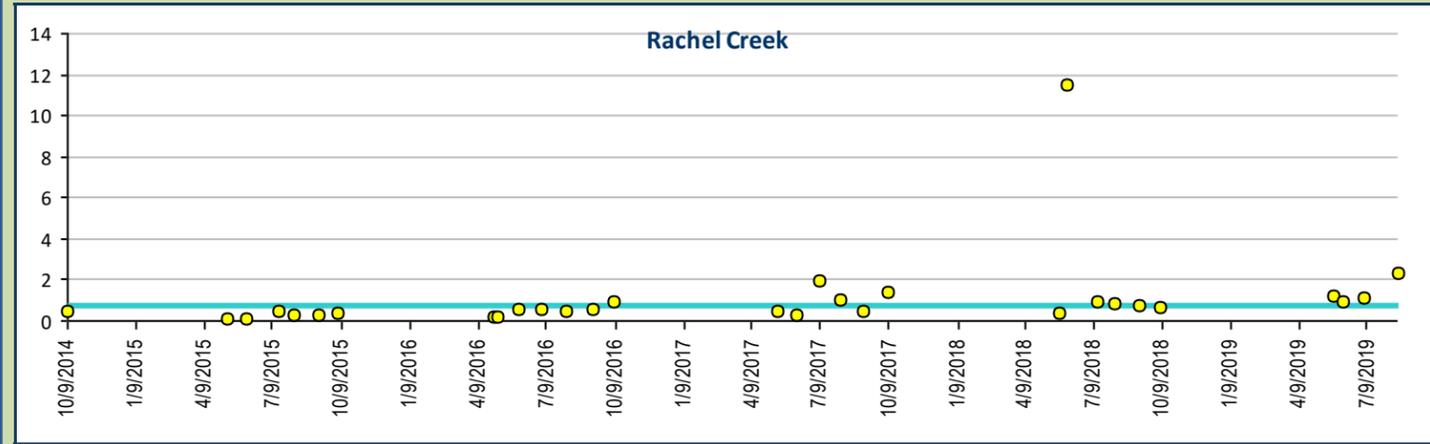
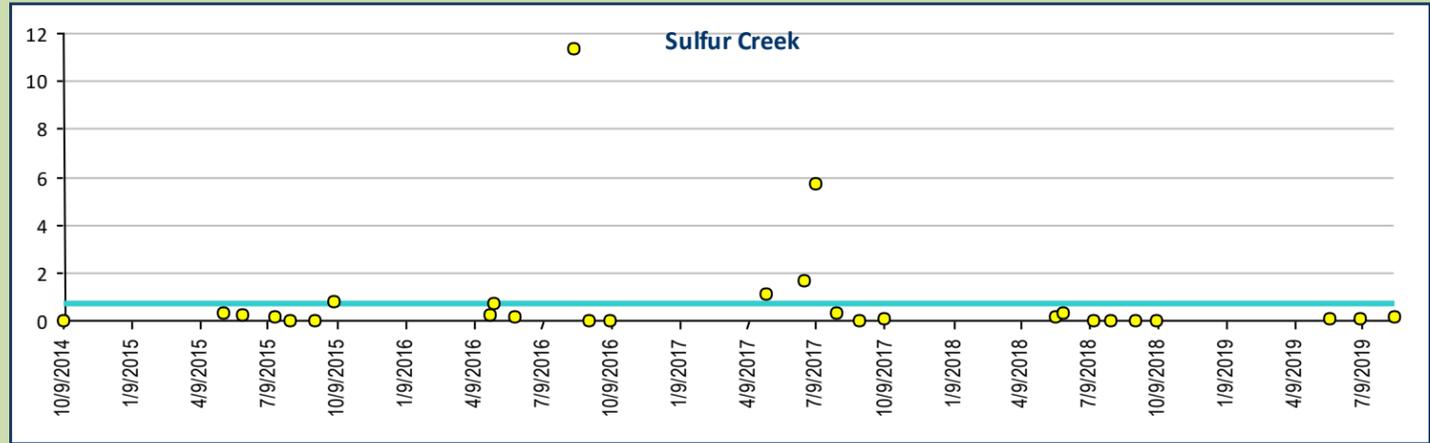
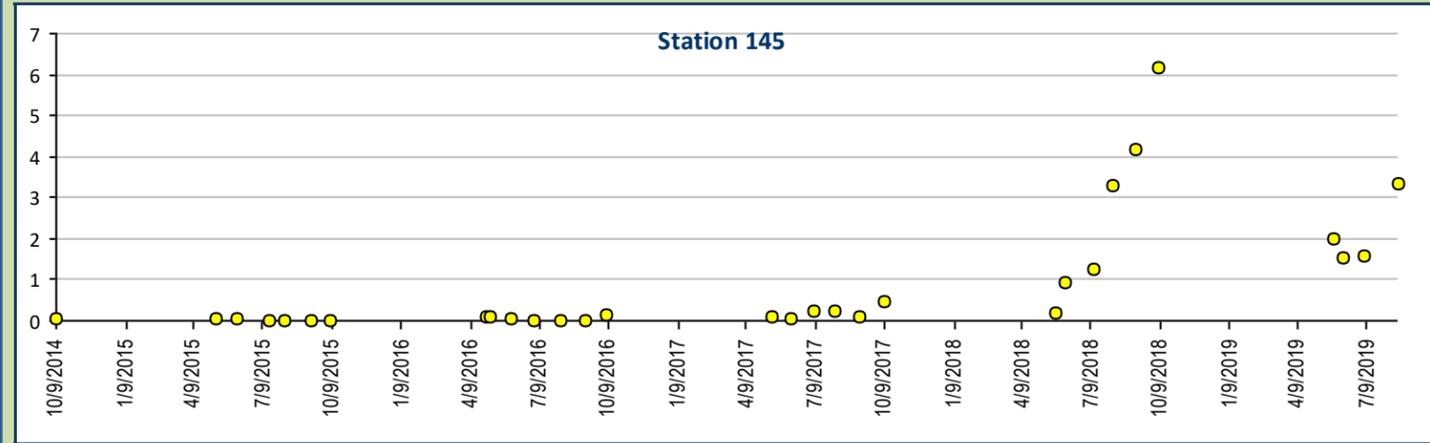
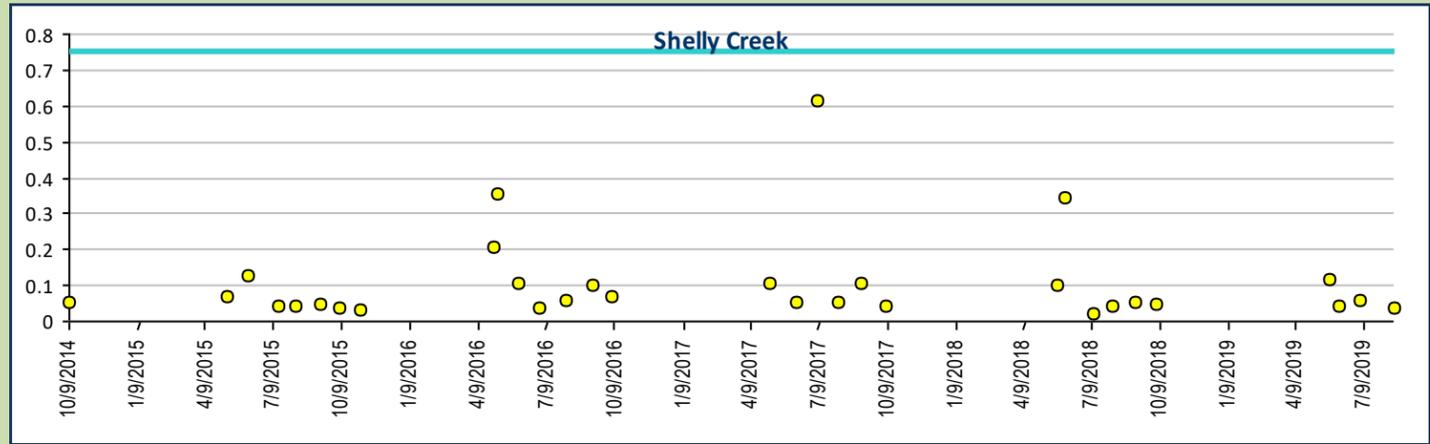
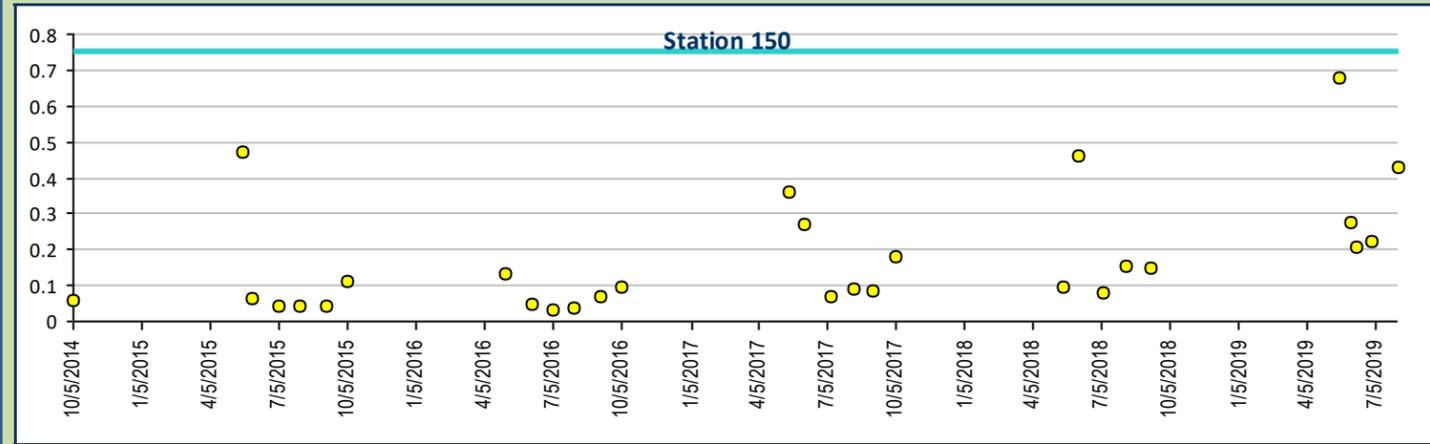
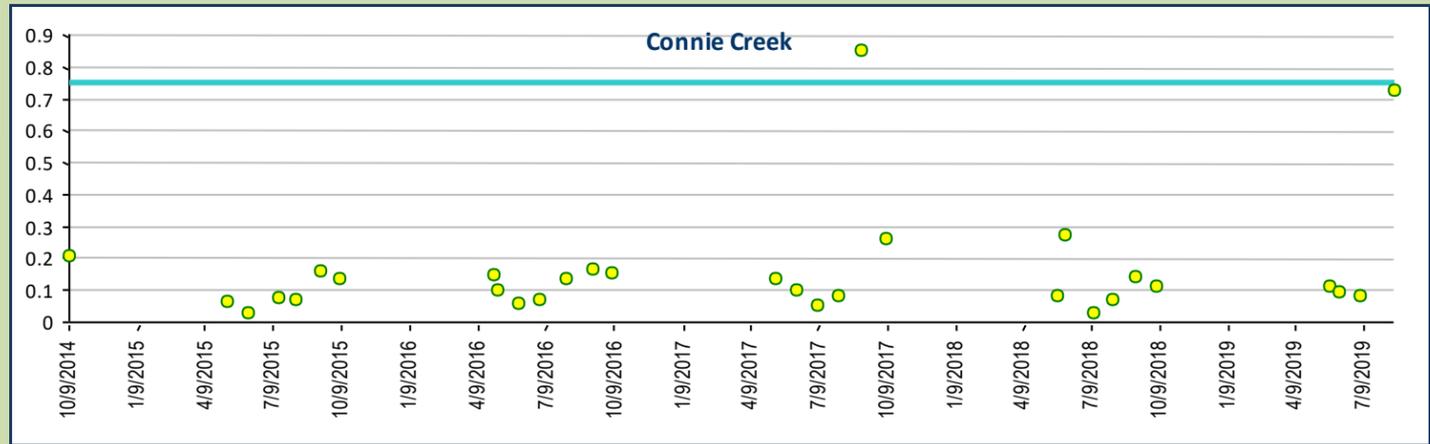


Water Monitoring Mine Drainage Water Quality Profile I, 5-Year Trend Charts

Aluminum, Total recoverable, units mg/L

Aquatic Life - Fresh Water Chronic WQS mg/L

If pH > 7 and hardness > 50. then WQS = 0.75mg/l



Appendix E: Water Quality Profile I Charts – Bons Creek Monitoring Stations



Water Monitoring Bons Creek Drainage Water Quality Profile I , 5-Year Trend Charts

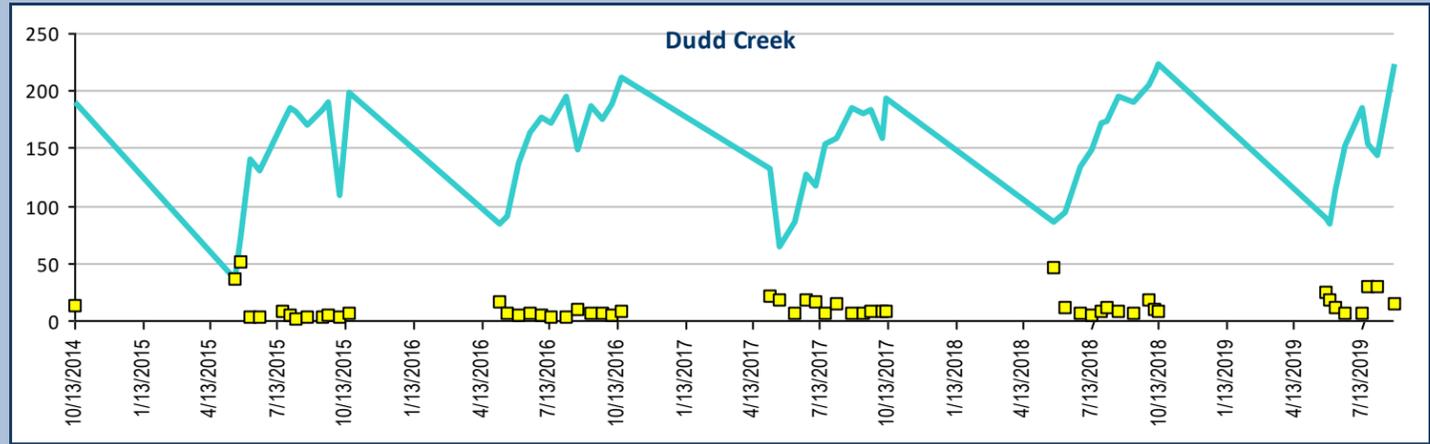
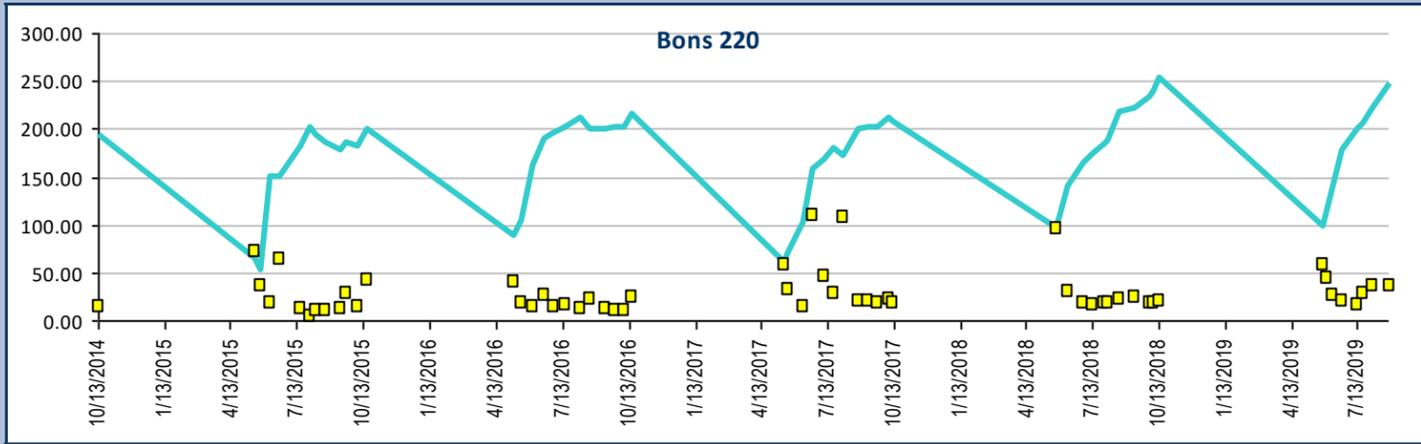
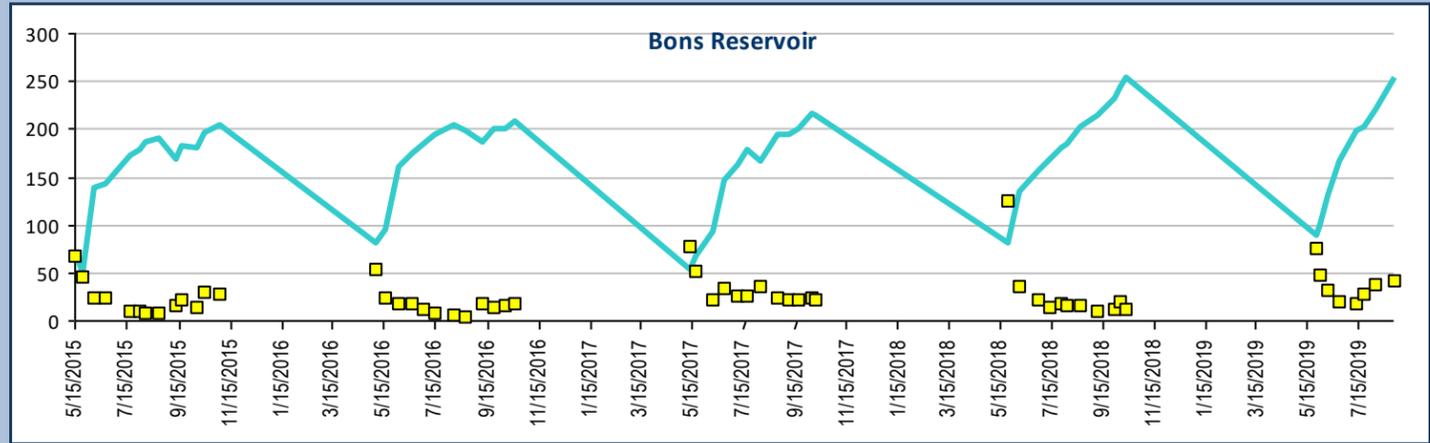
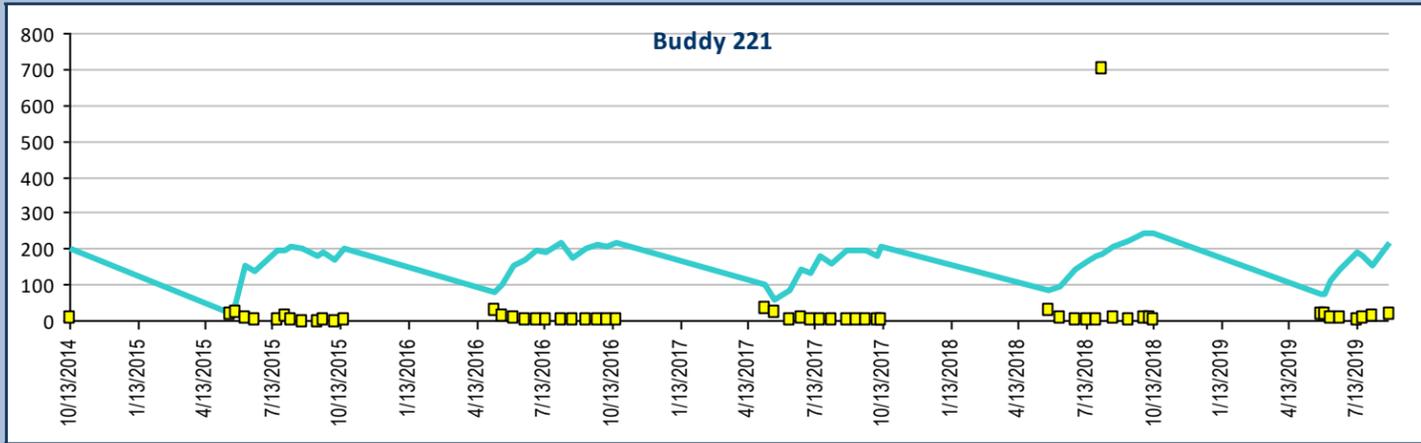
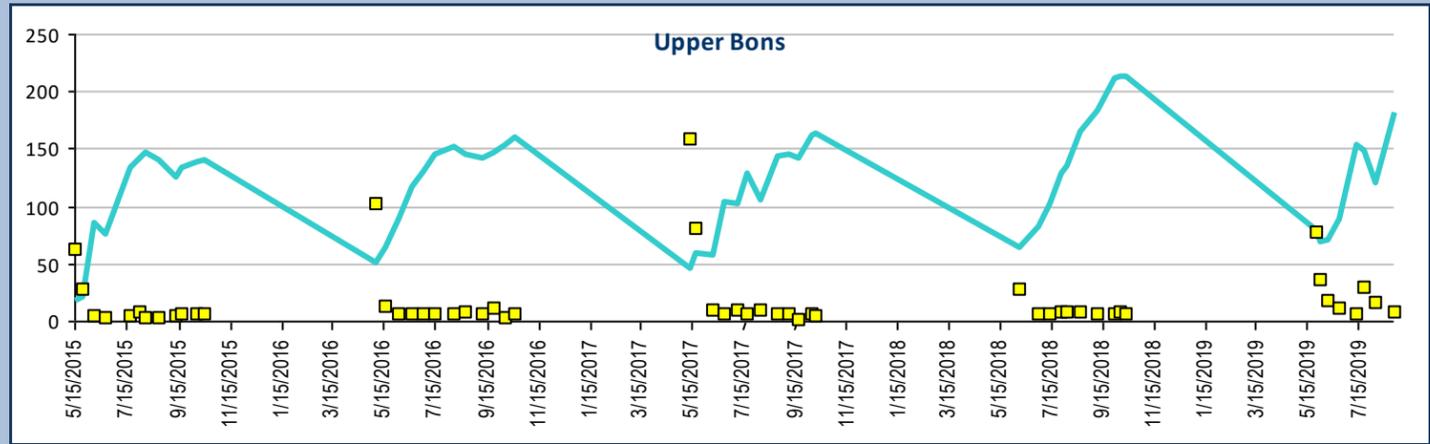
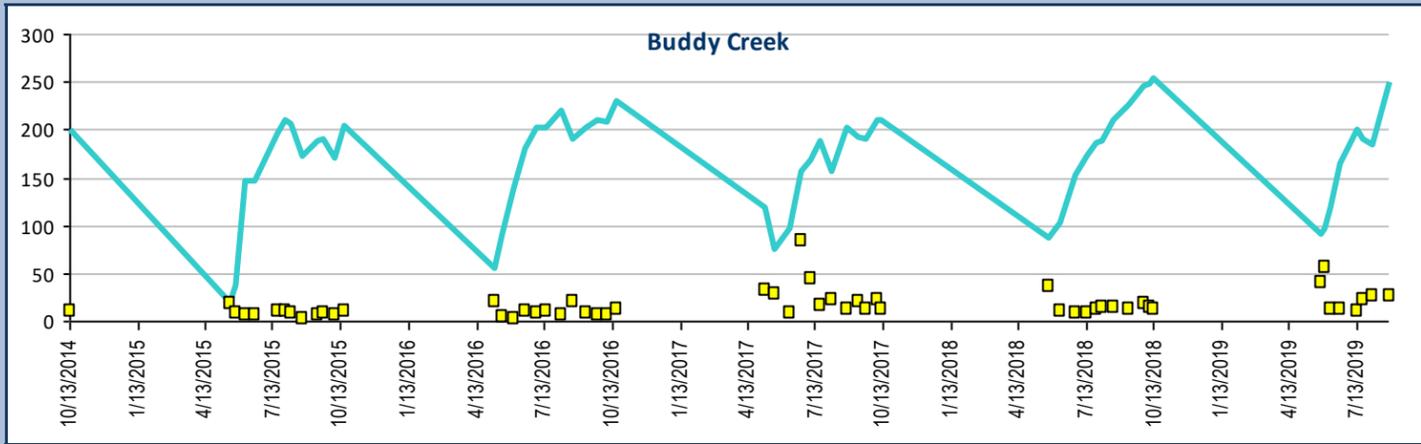
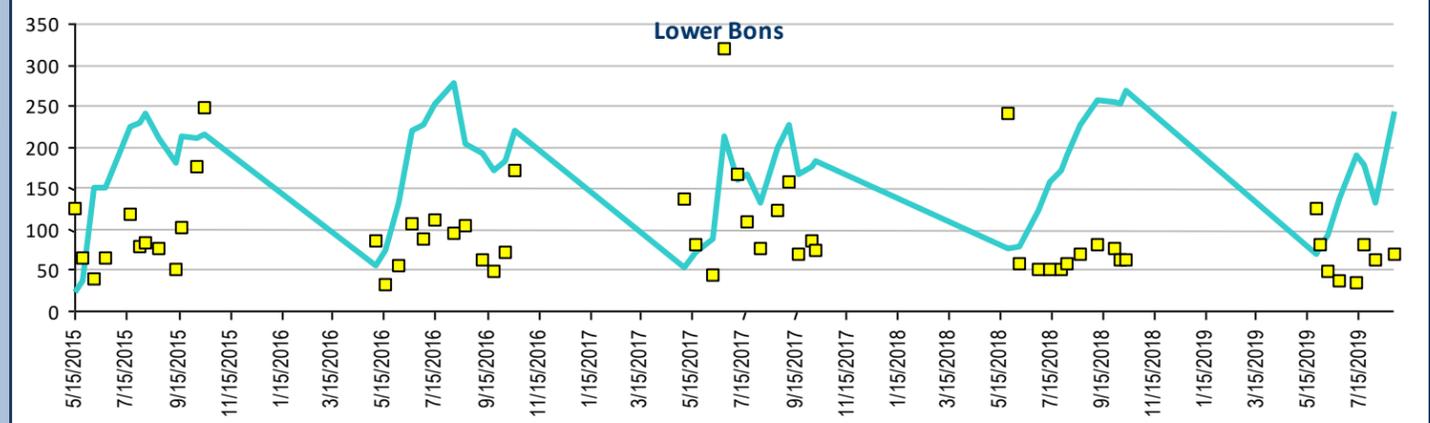
Zinc, Total Recoverable, units ug/L

Aquatic Life - Fresh Water Acute WQS ug/L

Hardness Dependent Calculation

$$=EXP(0.8473*(LN(*hardness))+0.884)$$

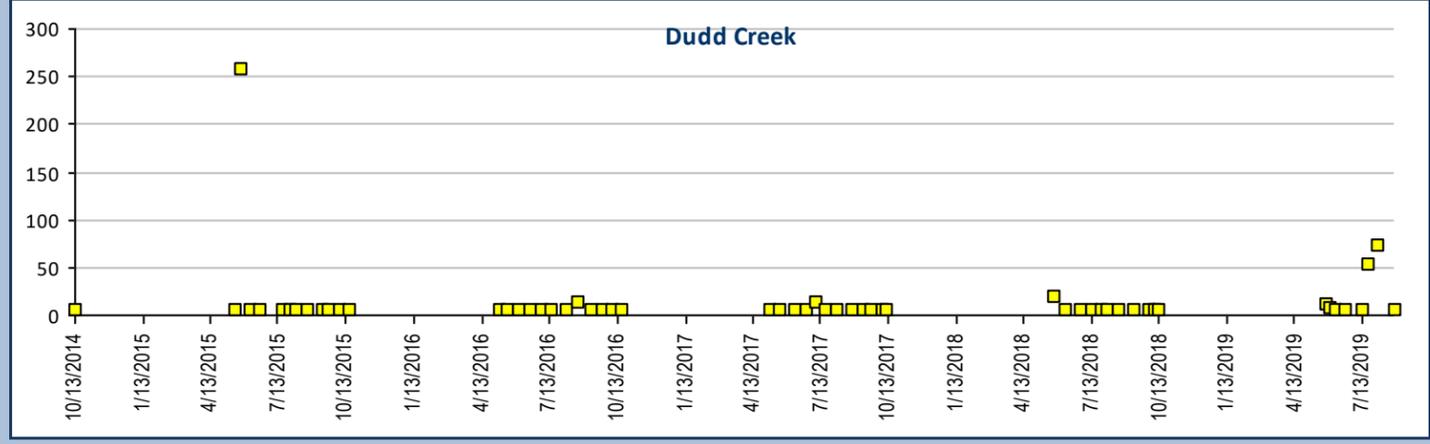
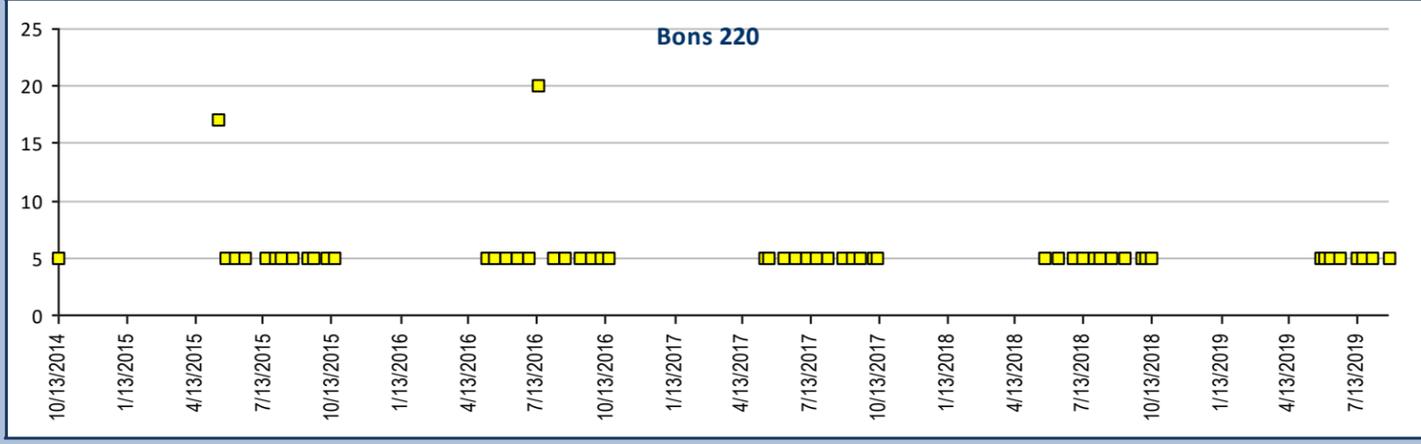
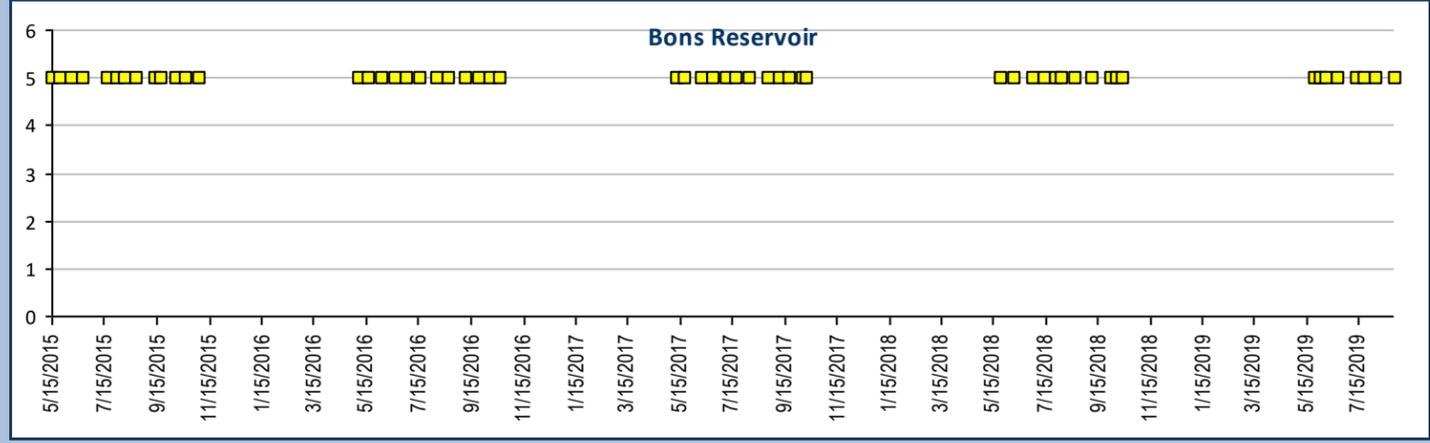
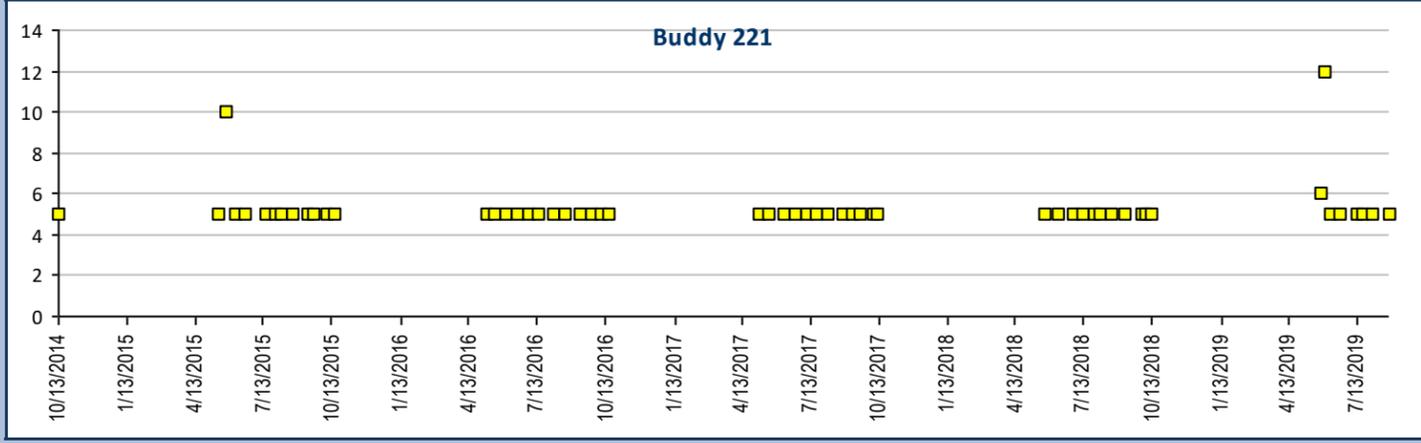
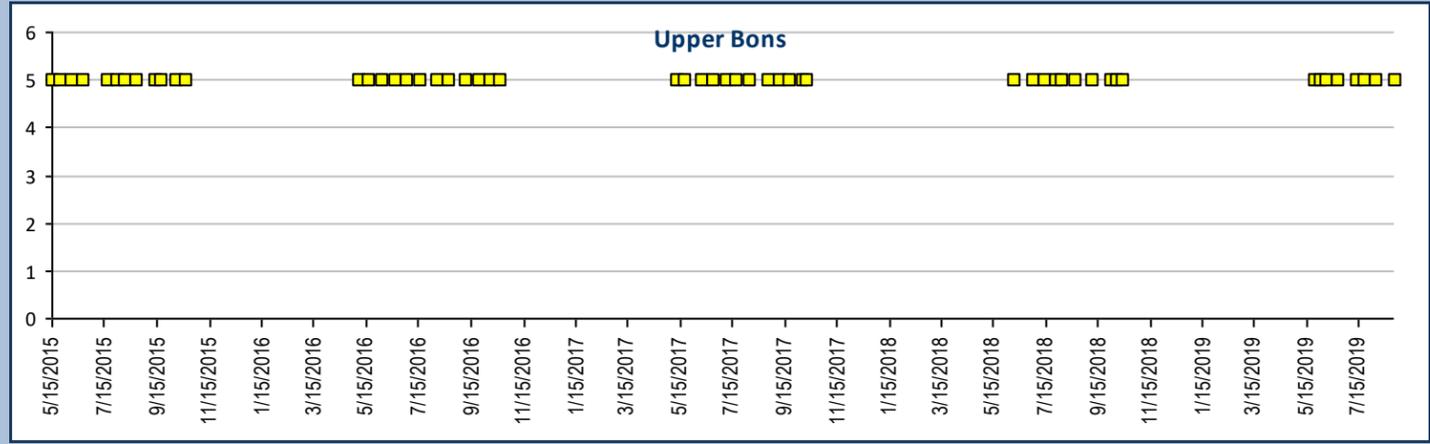
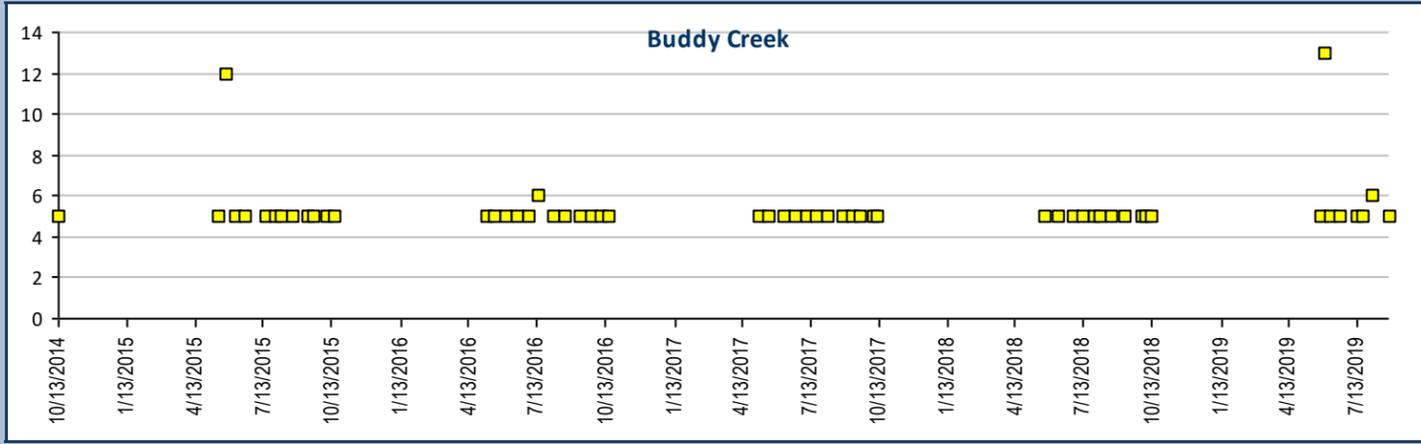
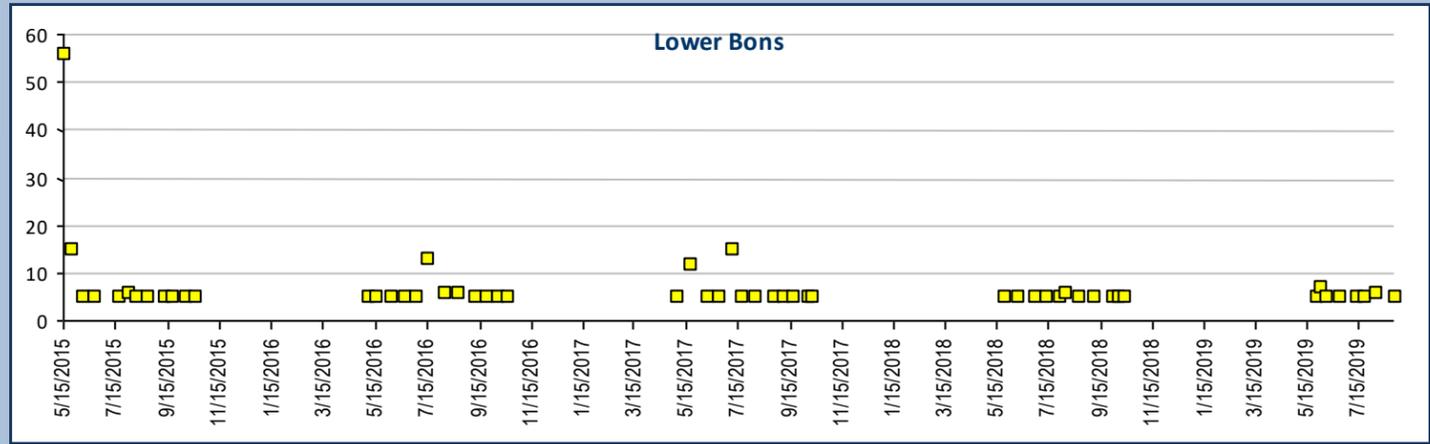
* Calculated using Standard Methods 2340B





Water Monitoring Bons Creek Drainage Water Quality Profile I , 5-Year Trend Charts

Total Suspended Solids, units mg/L



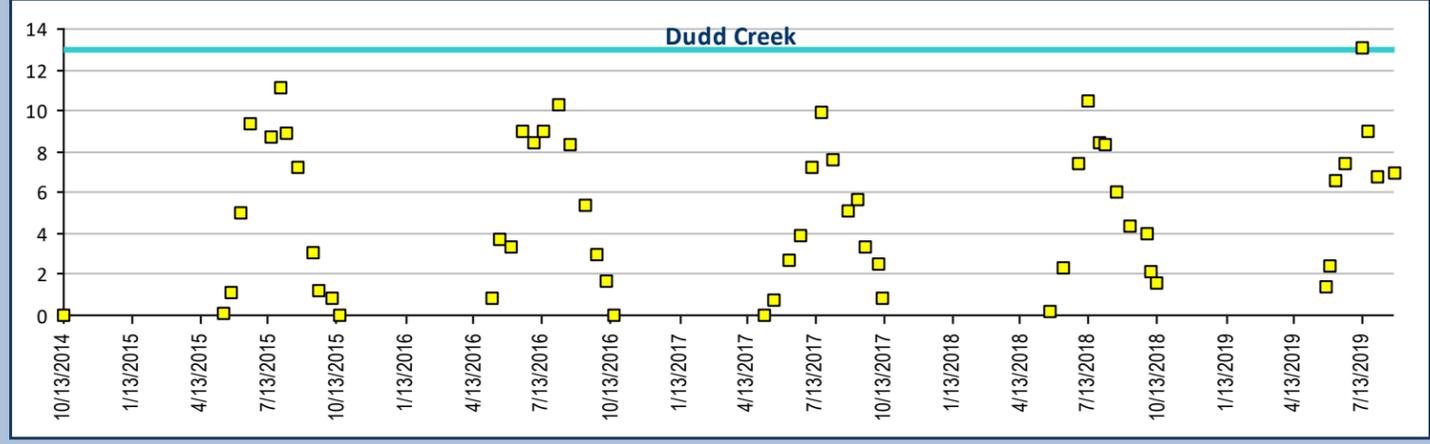
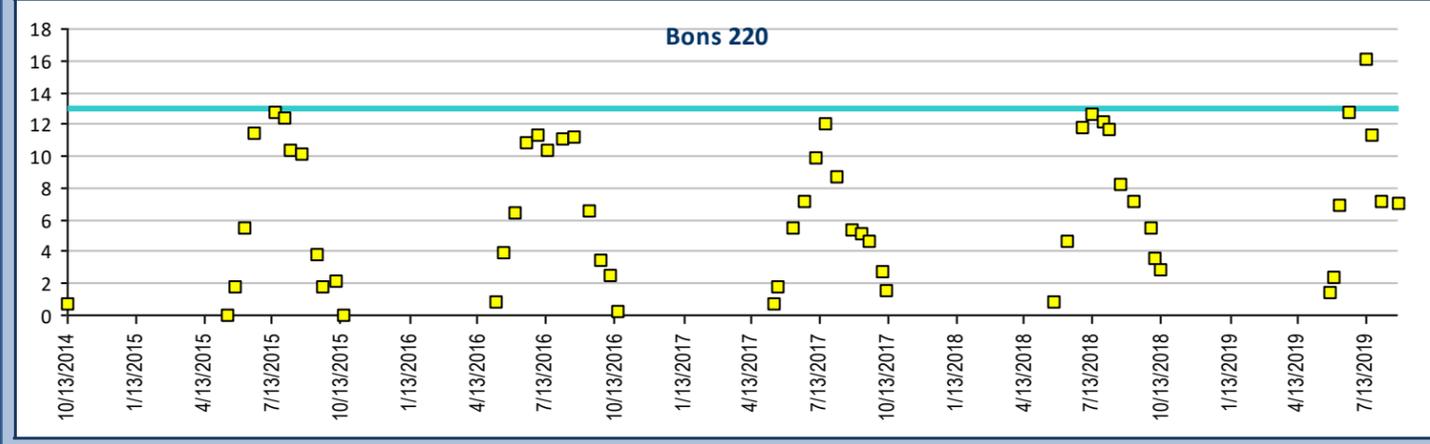
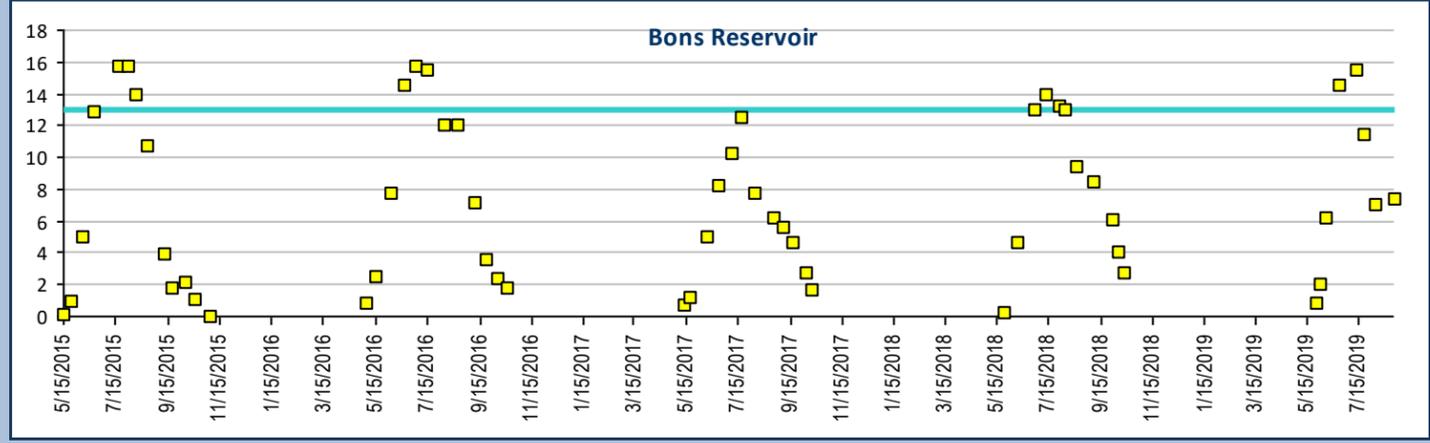
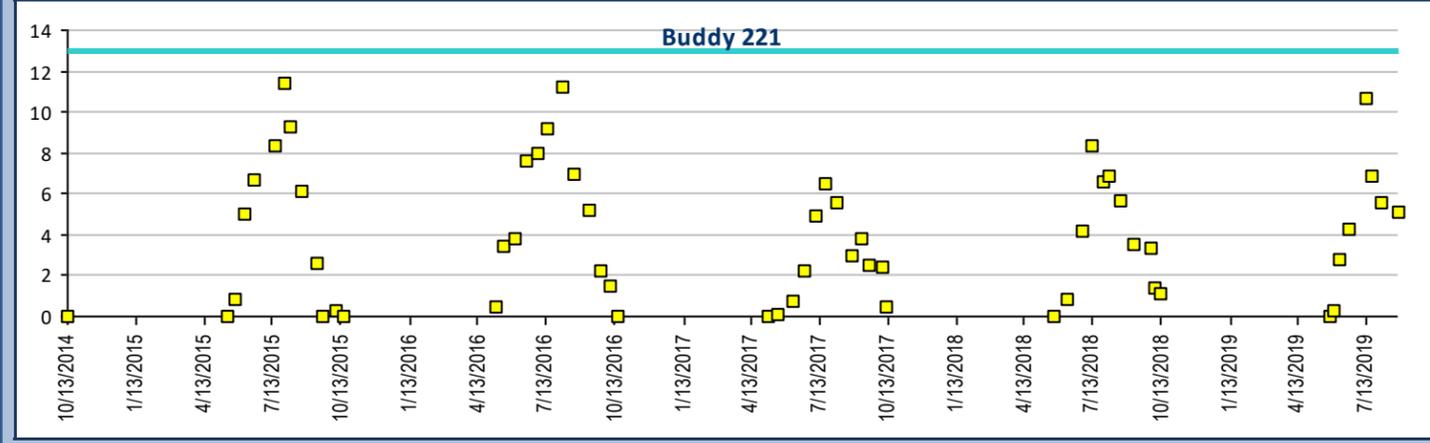
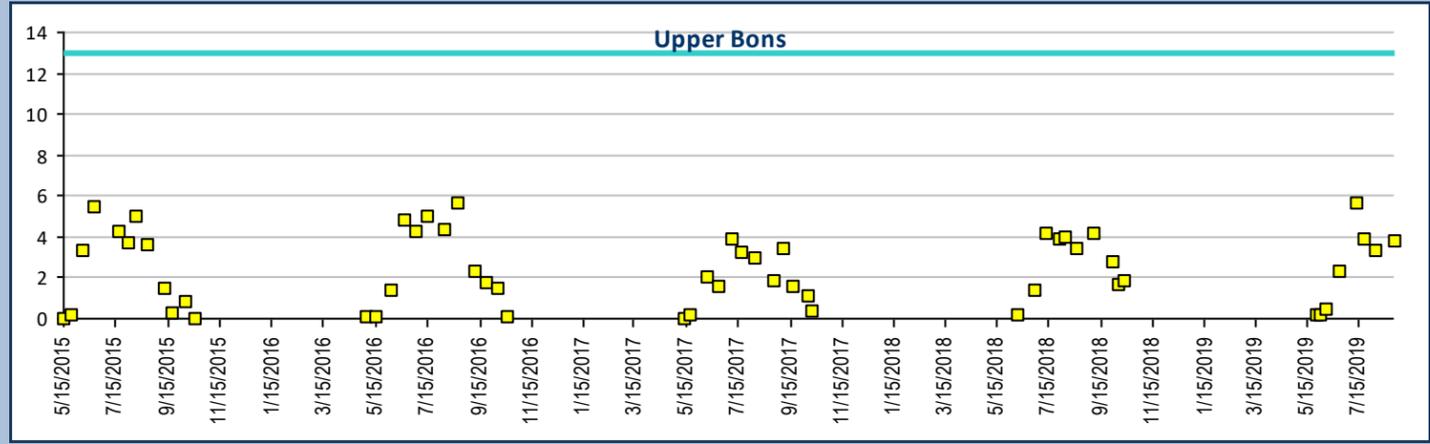
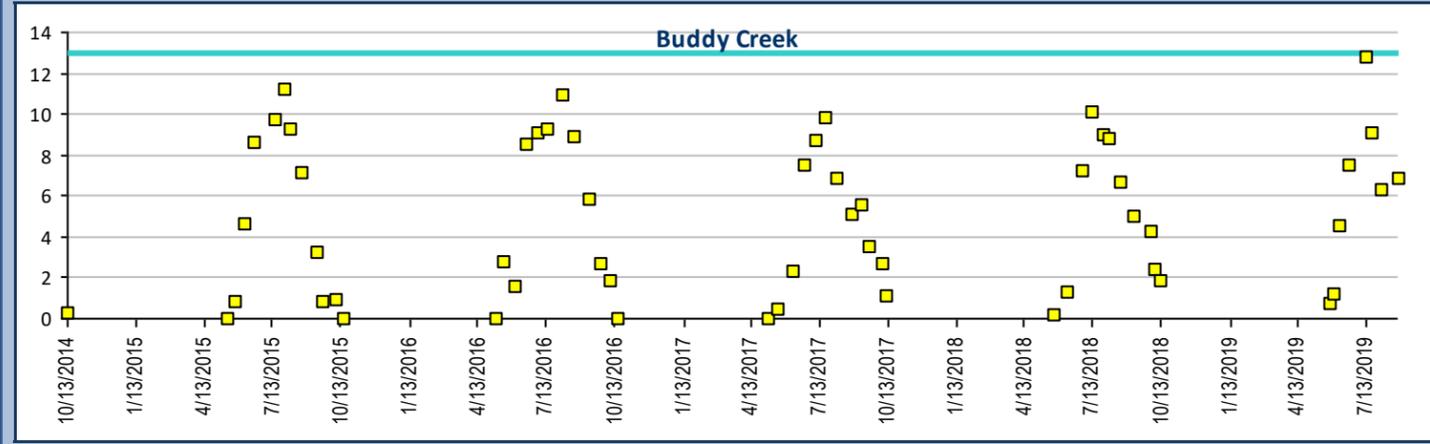
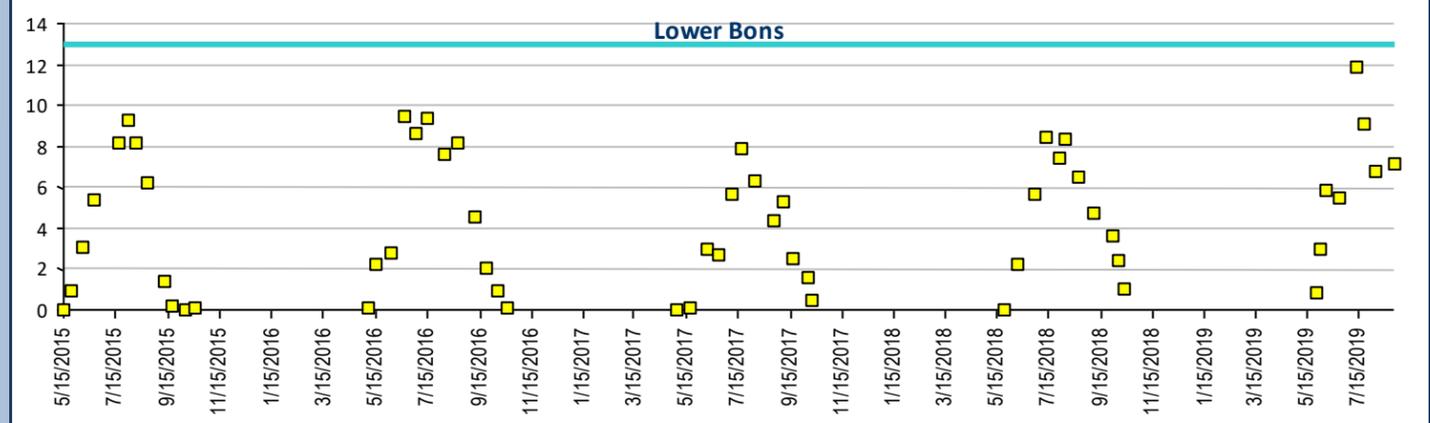


Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts

Temperature Field, units Celsius

Site Specific WQS mg/L

13 Celsius



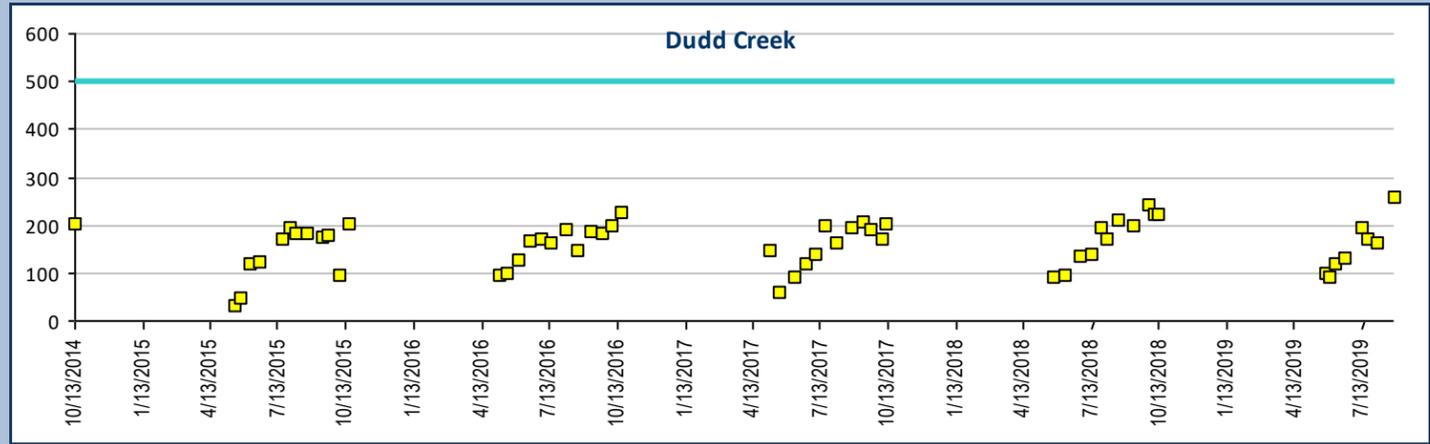
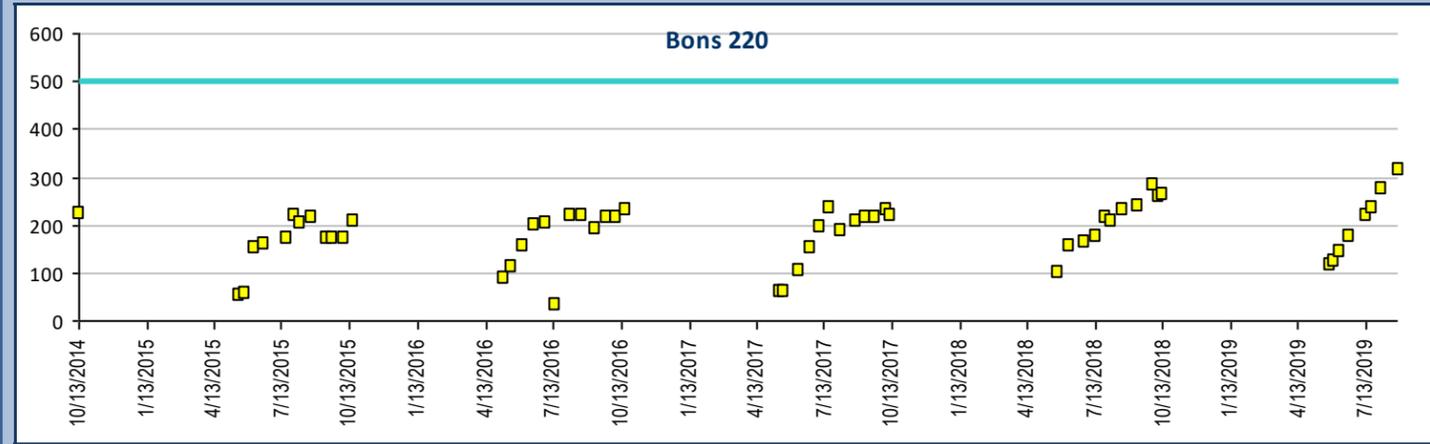
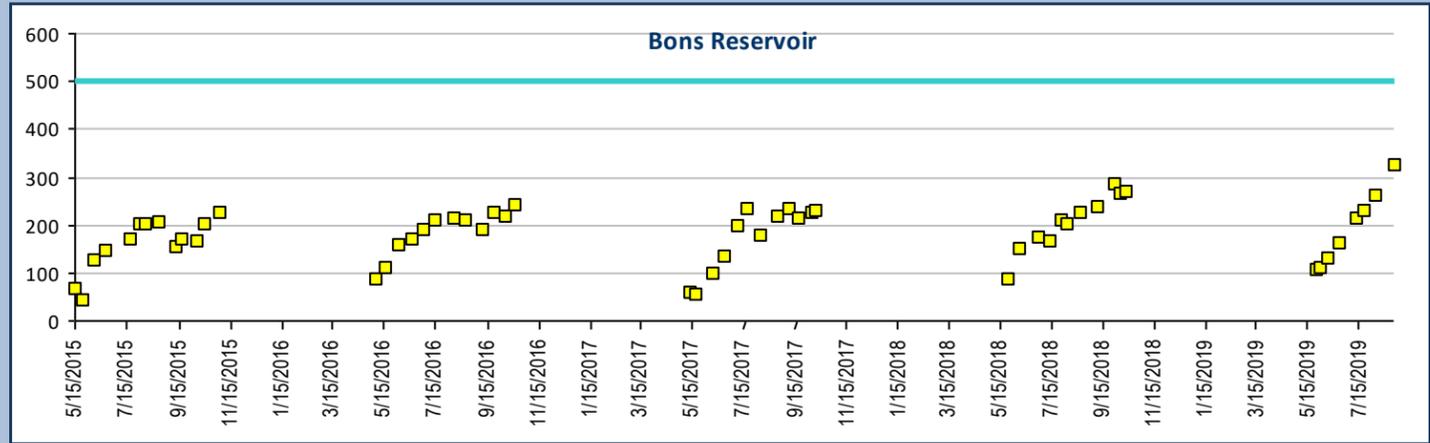
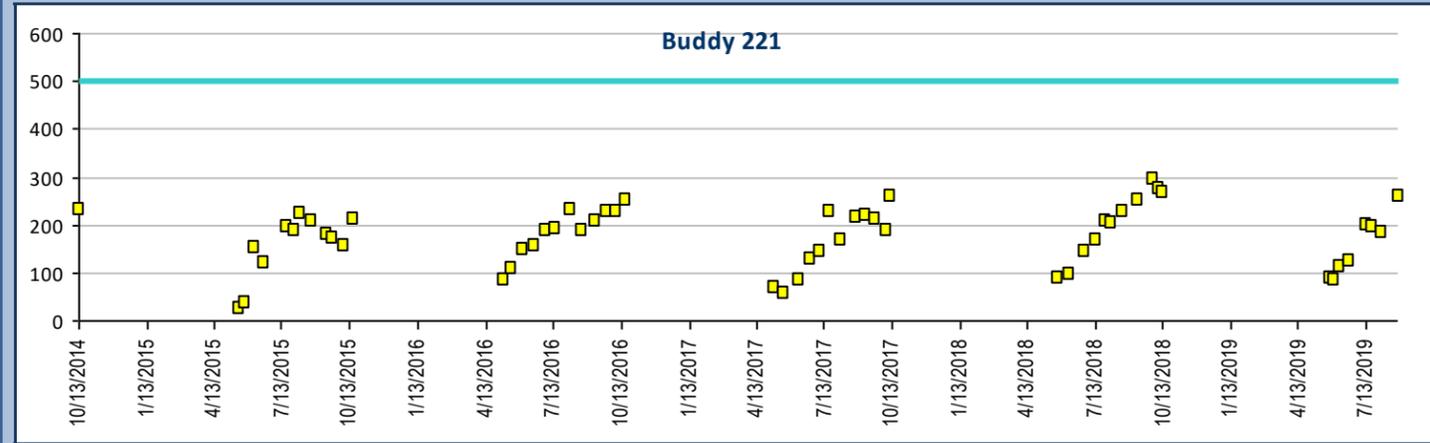
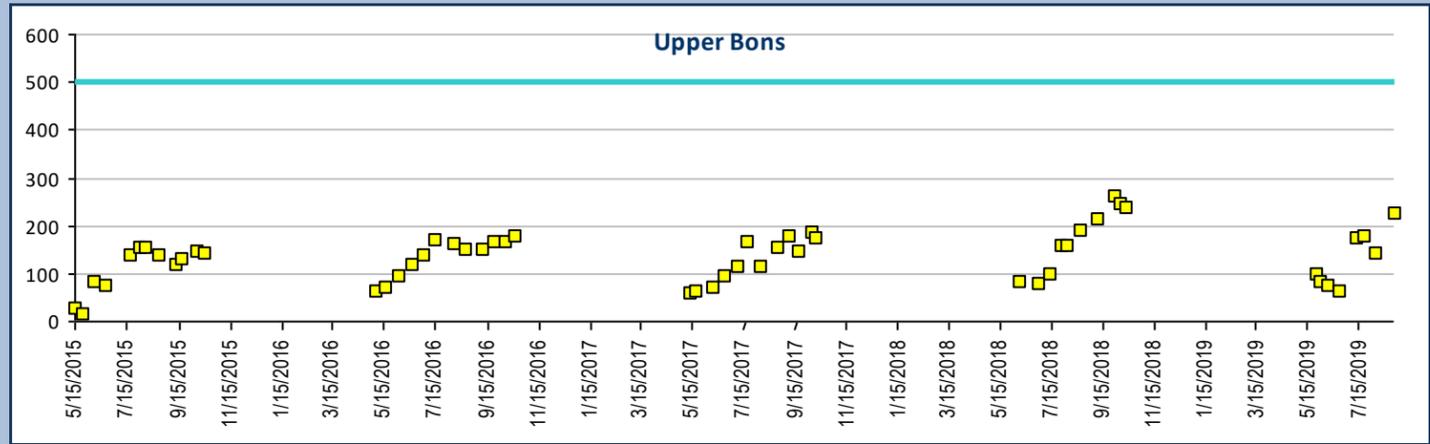
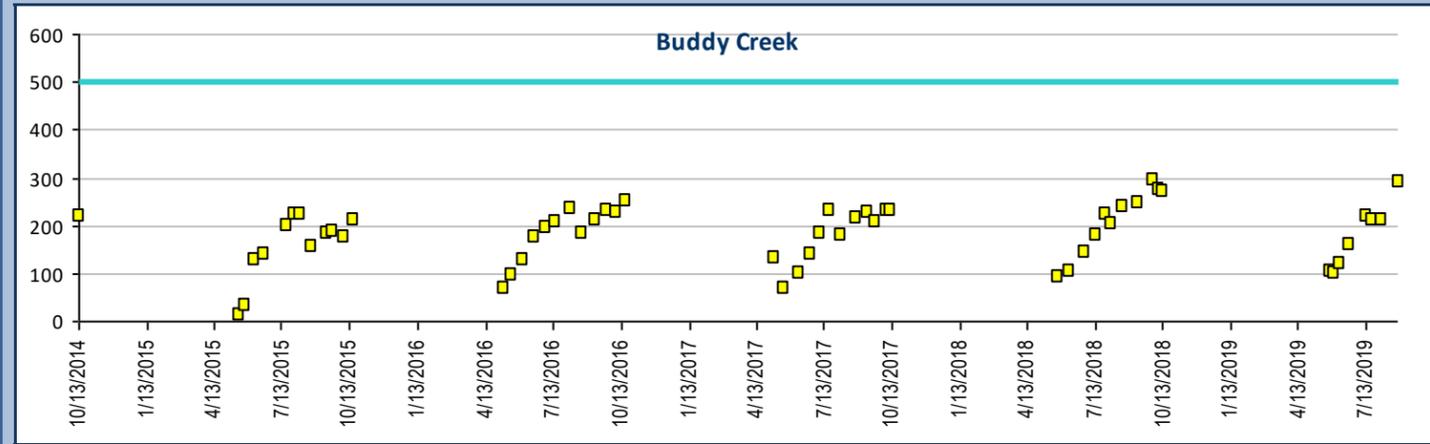
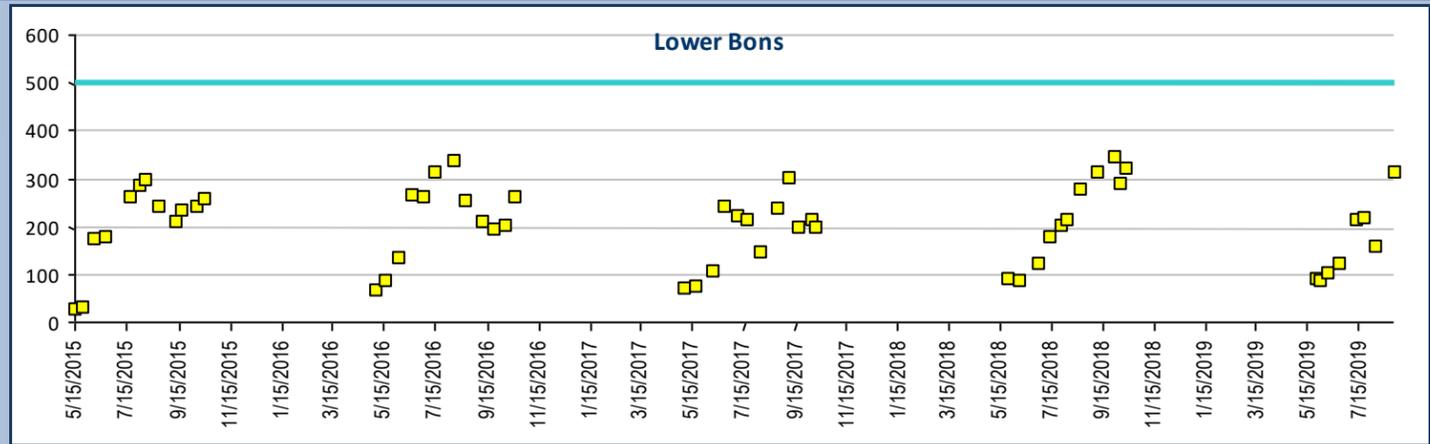


Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts

Total Dissolved Solids, units mg/L

Site Specific WQS mg/L

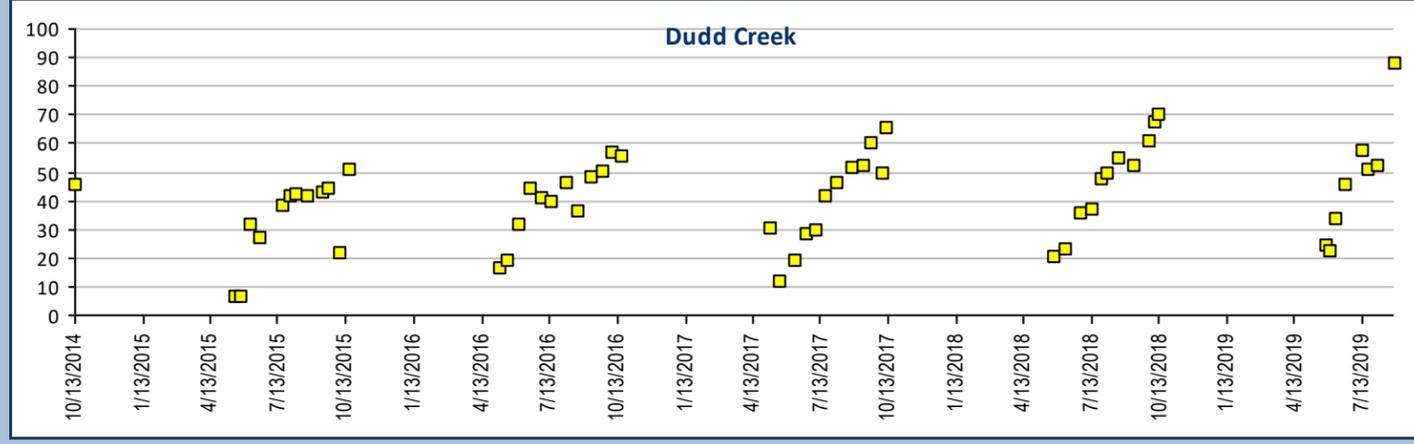
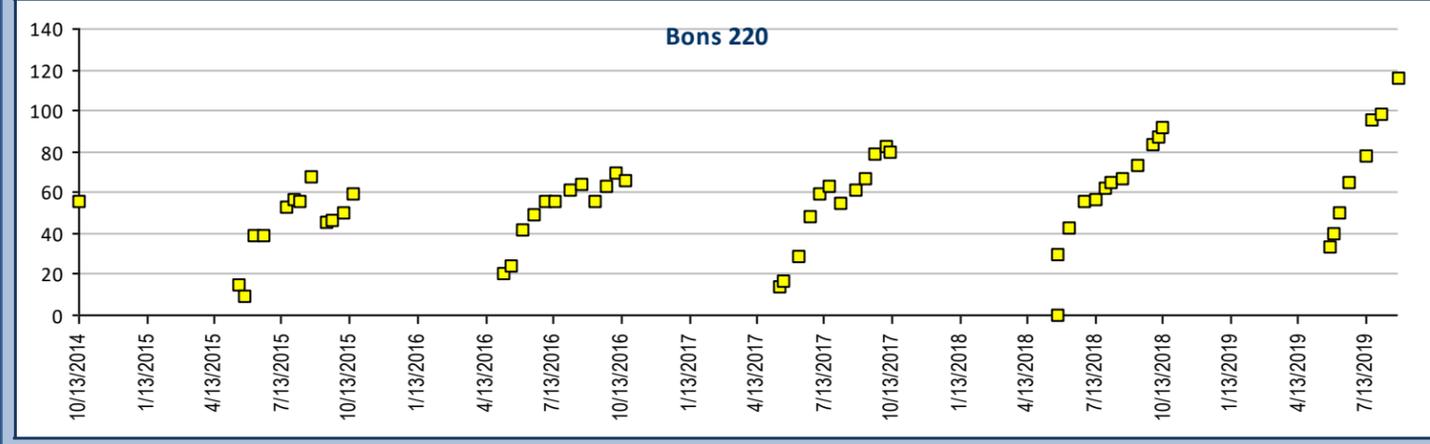
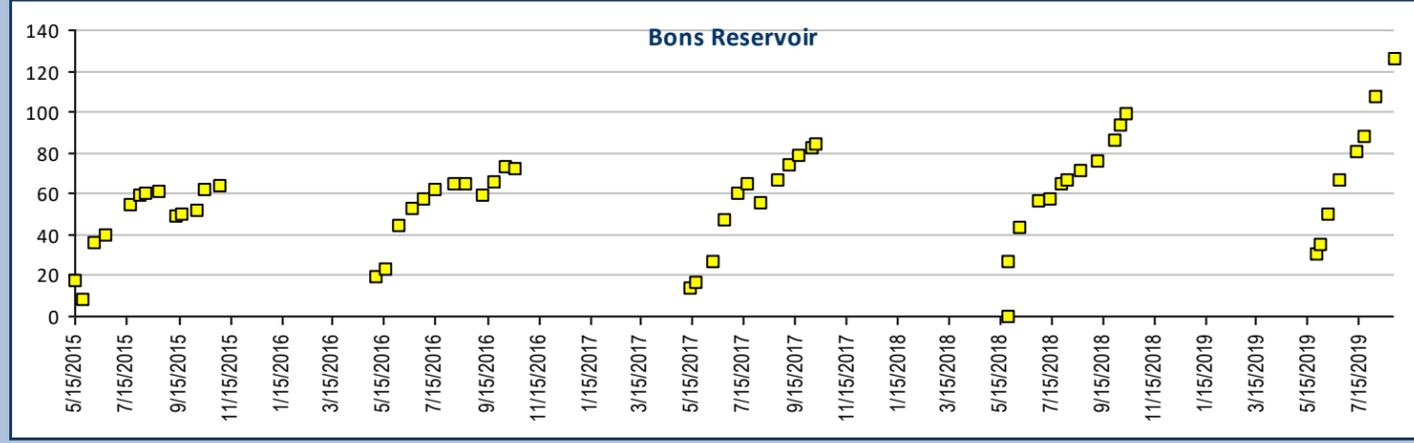
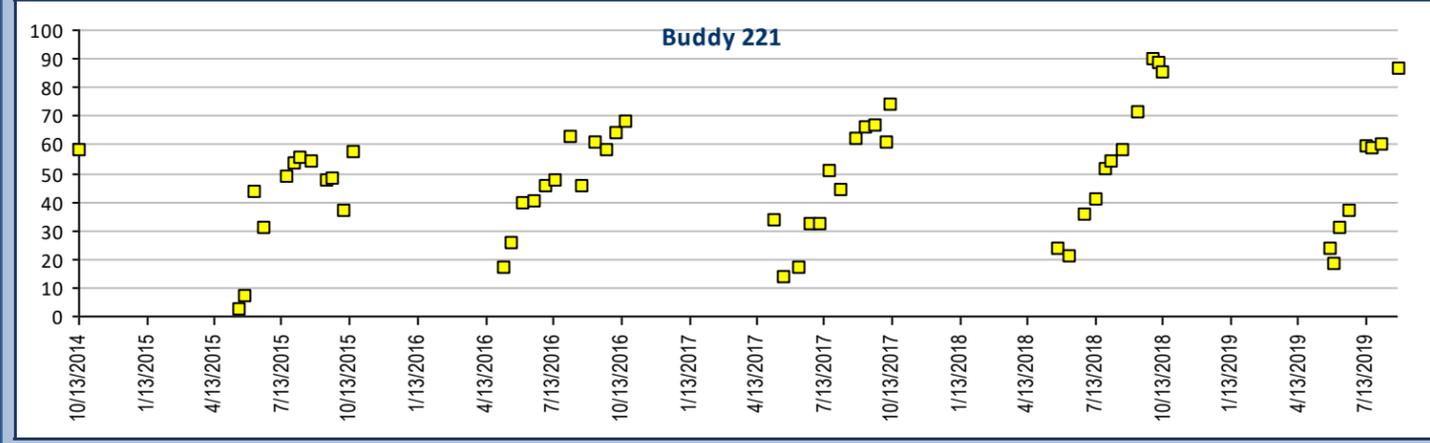
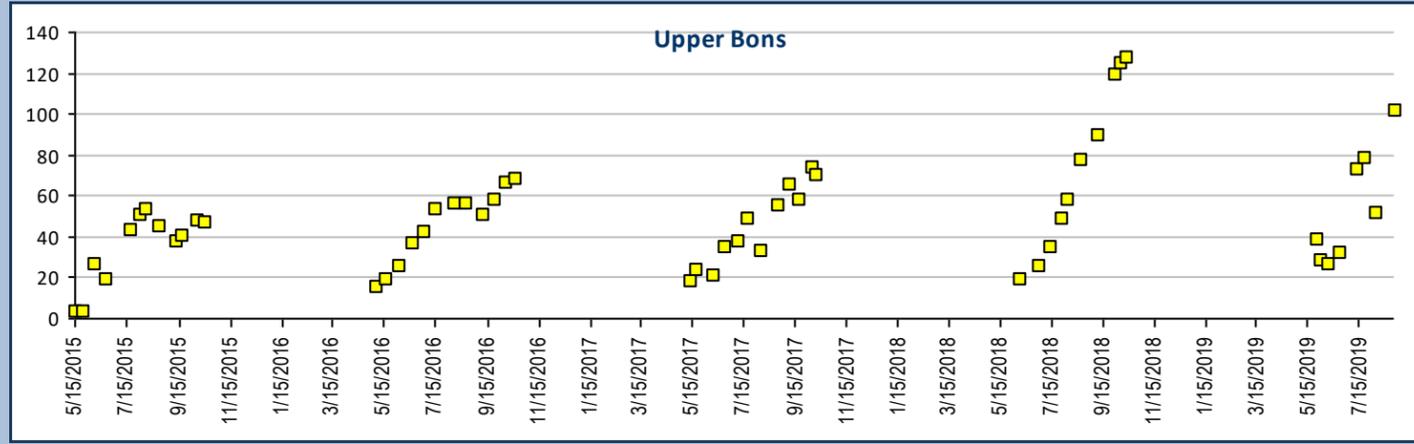
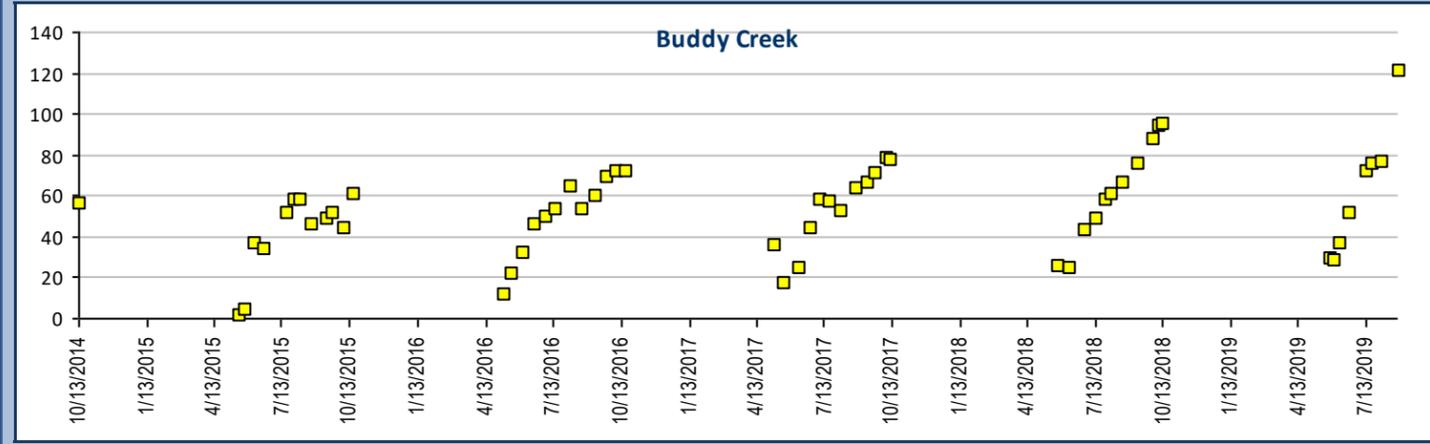
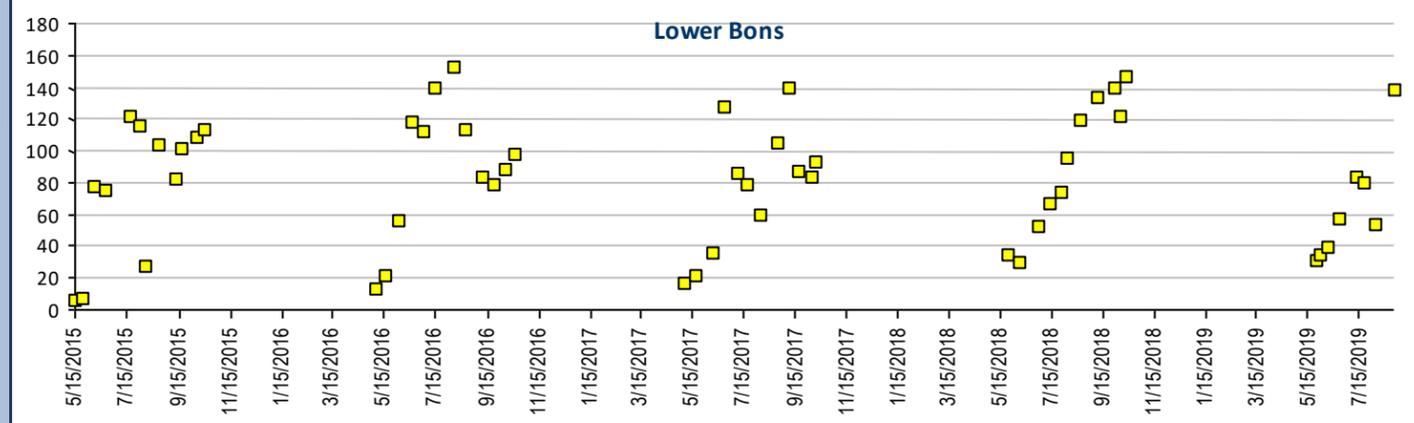
500 mg/L





Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts

Sulfate, Total recoverable, units mg/L



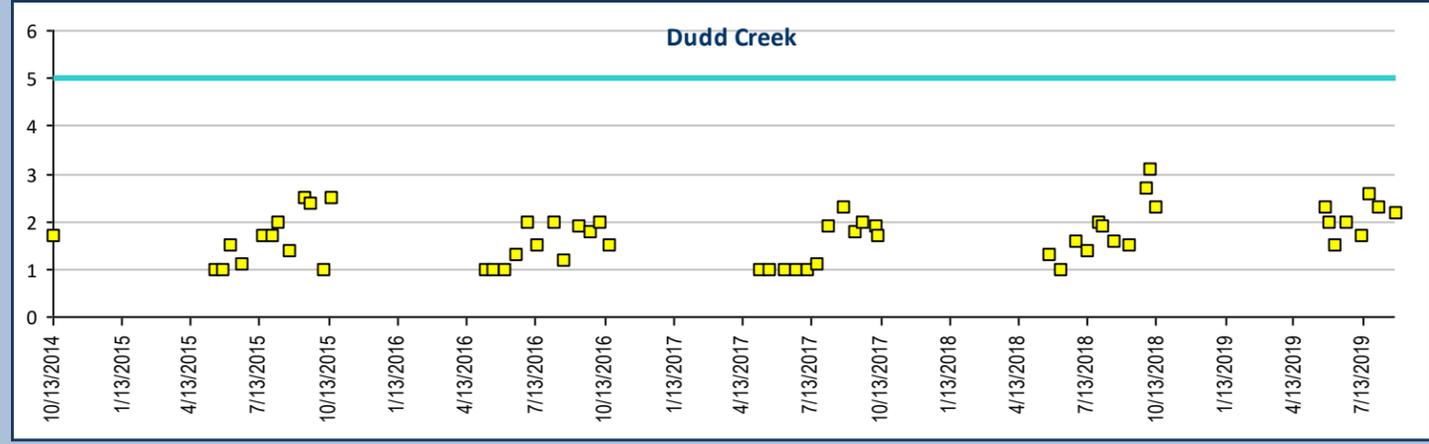
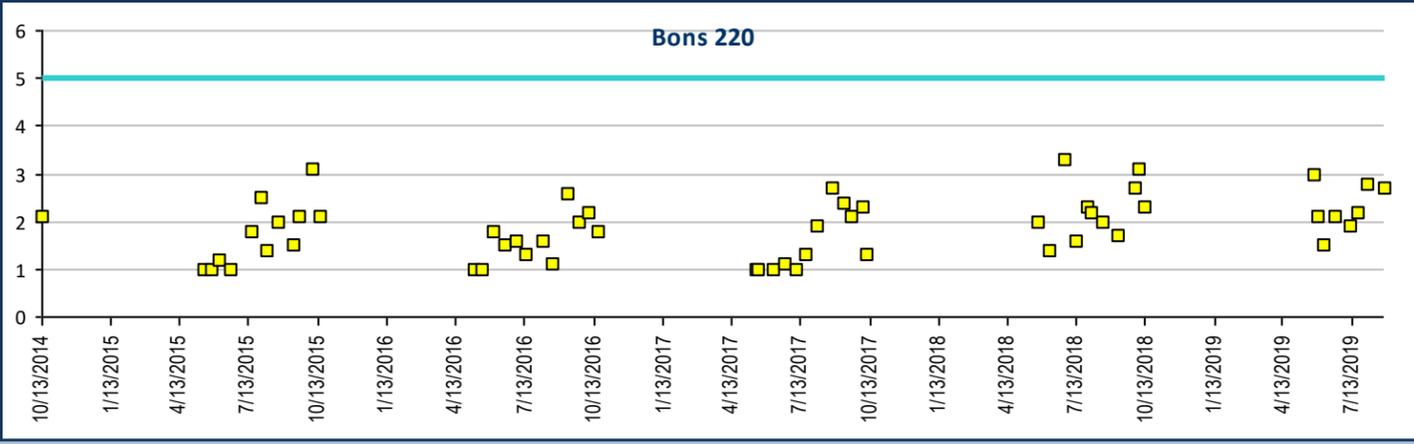
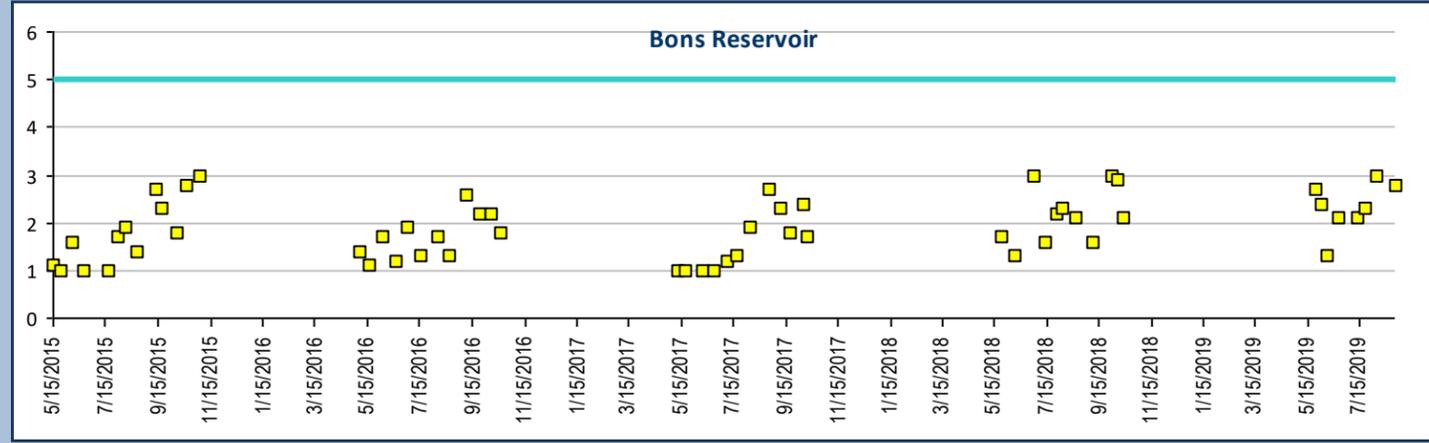
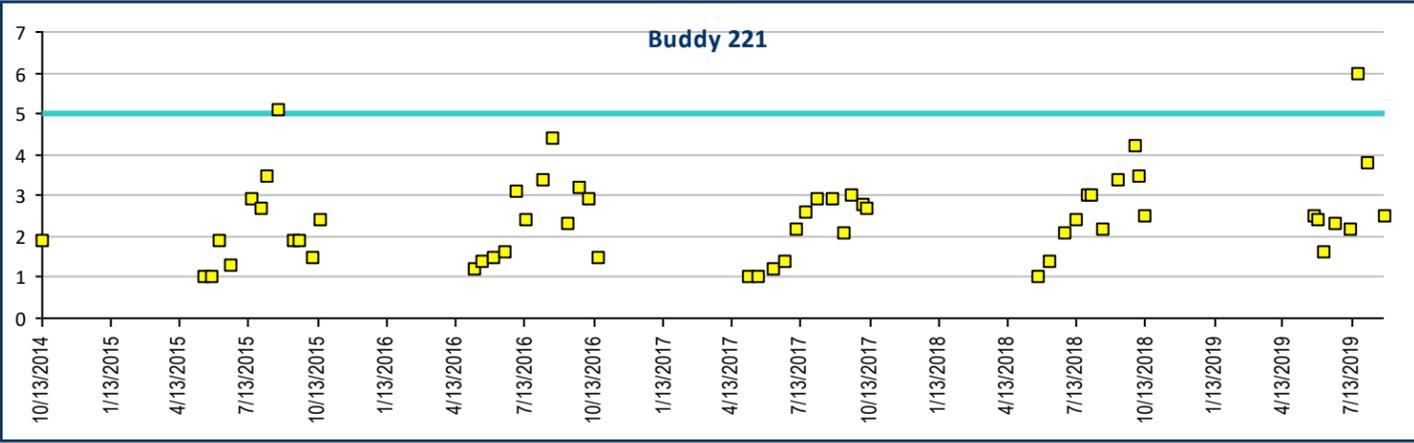
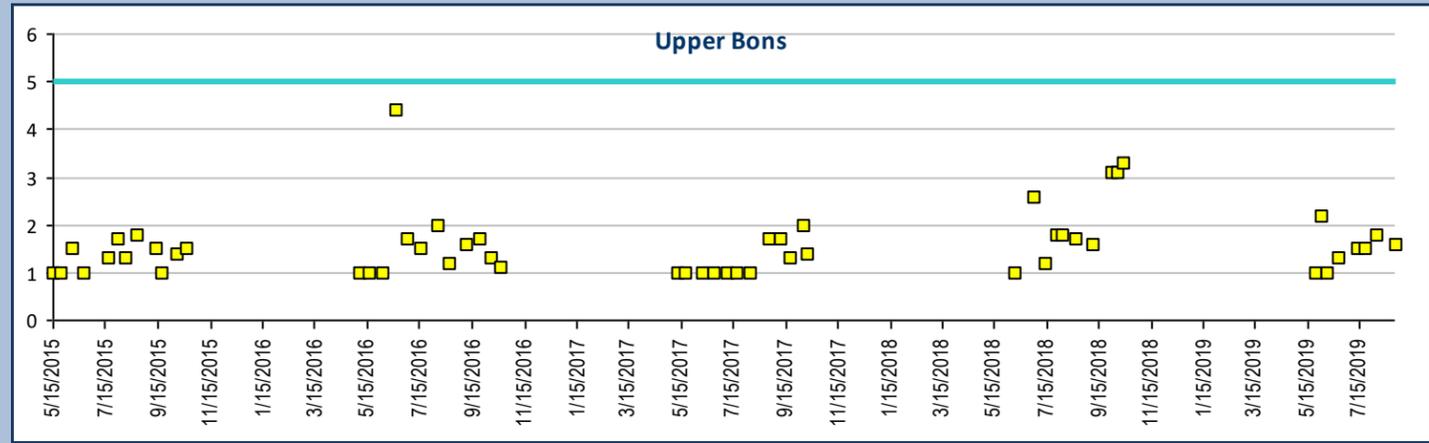
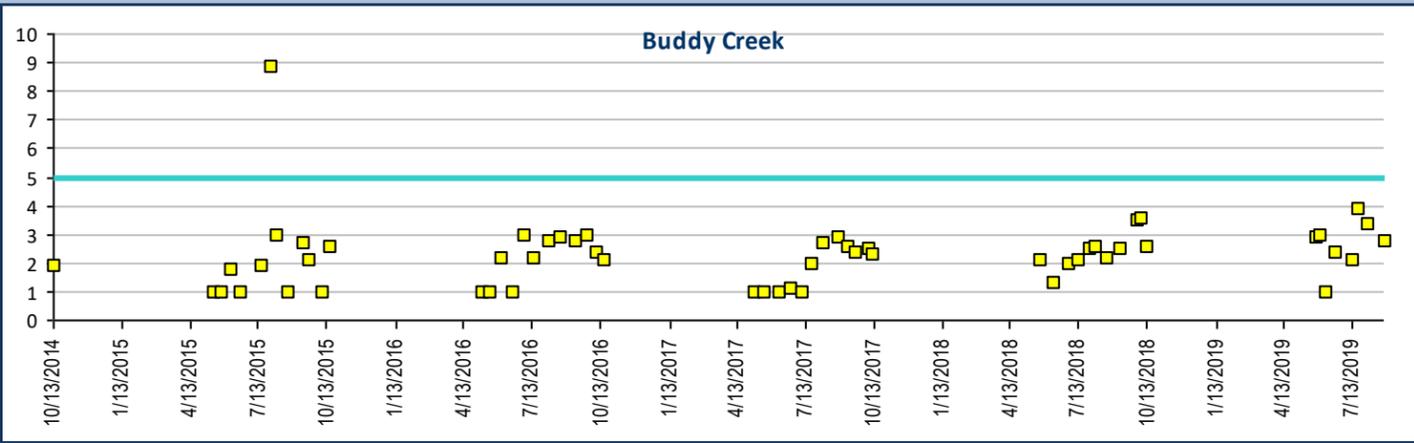
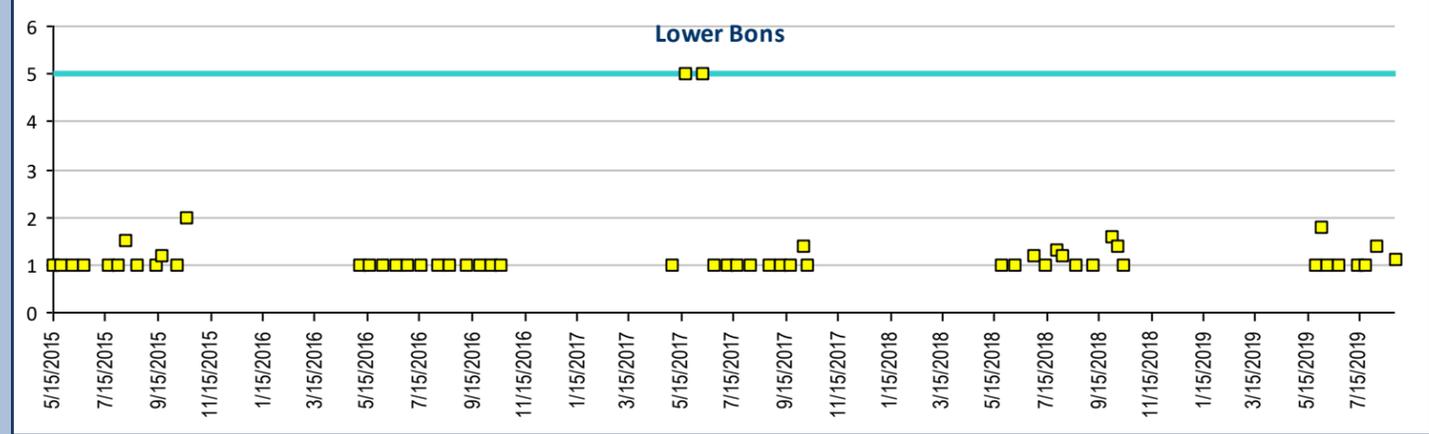


Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts

Selenium, Total Recoverable, units ug/L

Aquatic Life - Fresh Water Chronic WQS ug/L

5 ug/L

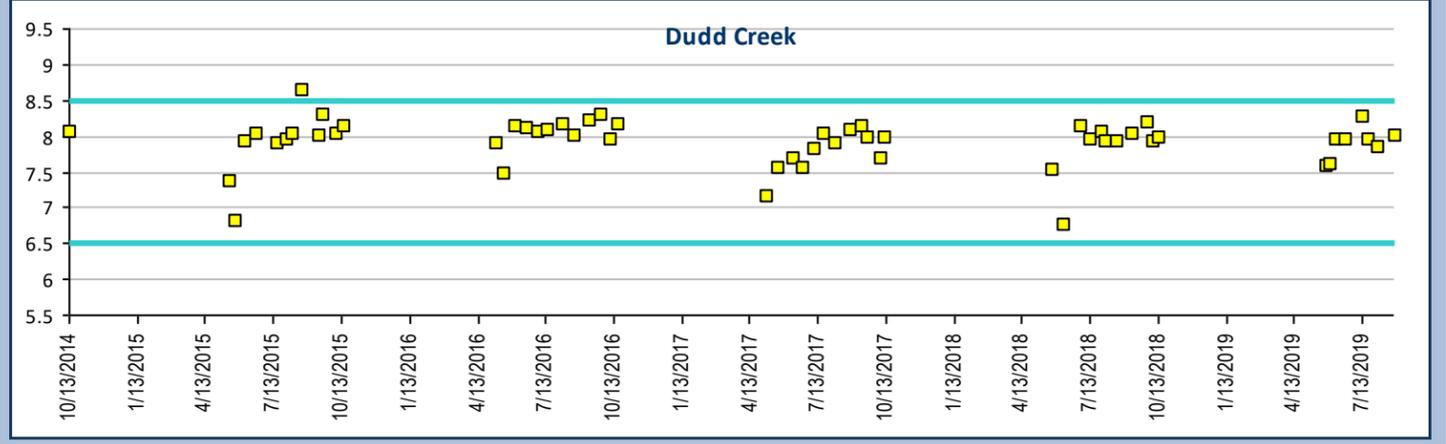
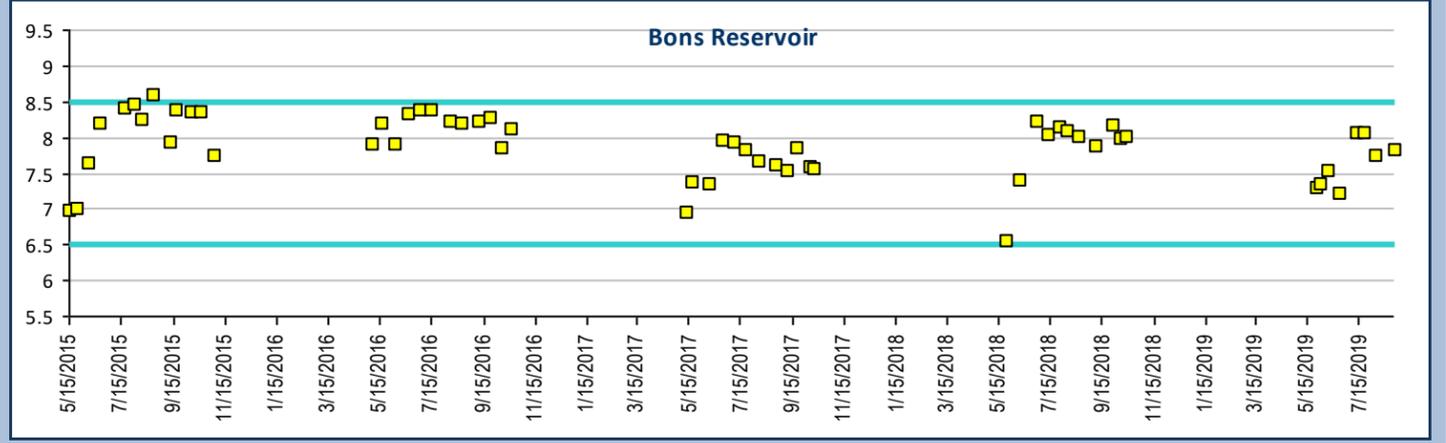
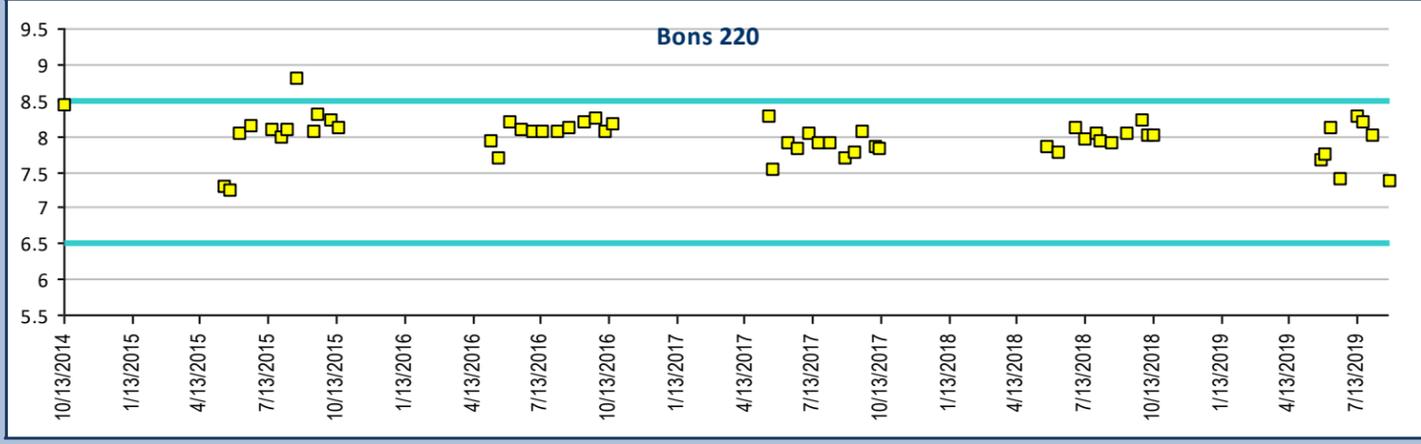
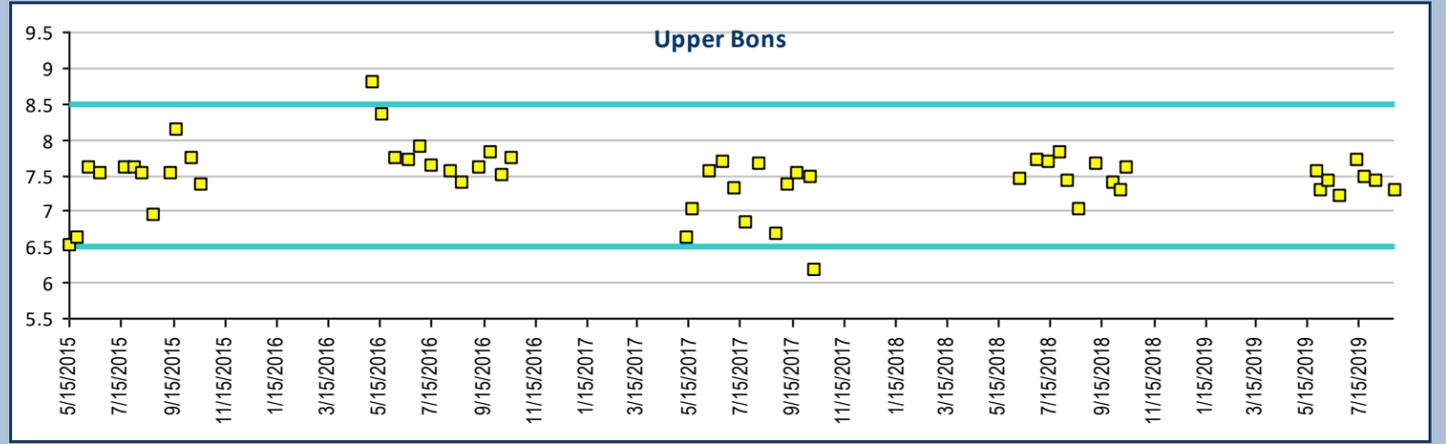
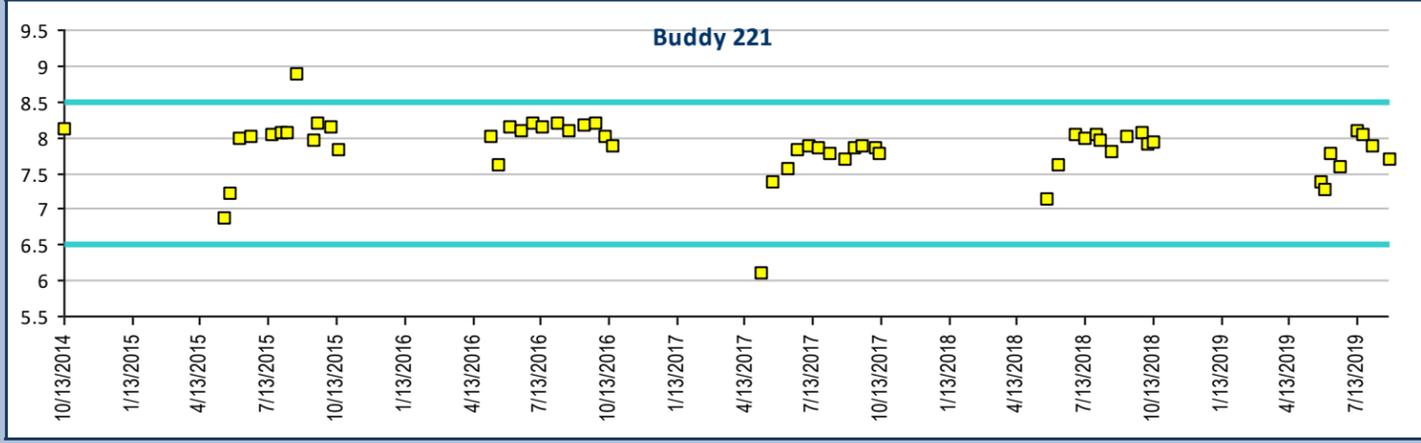
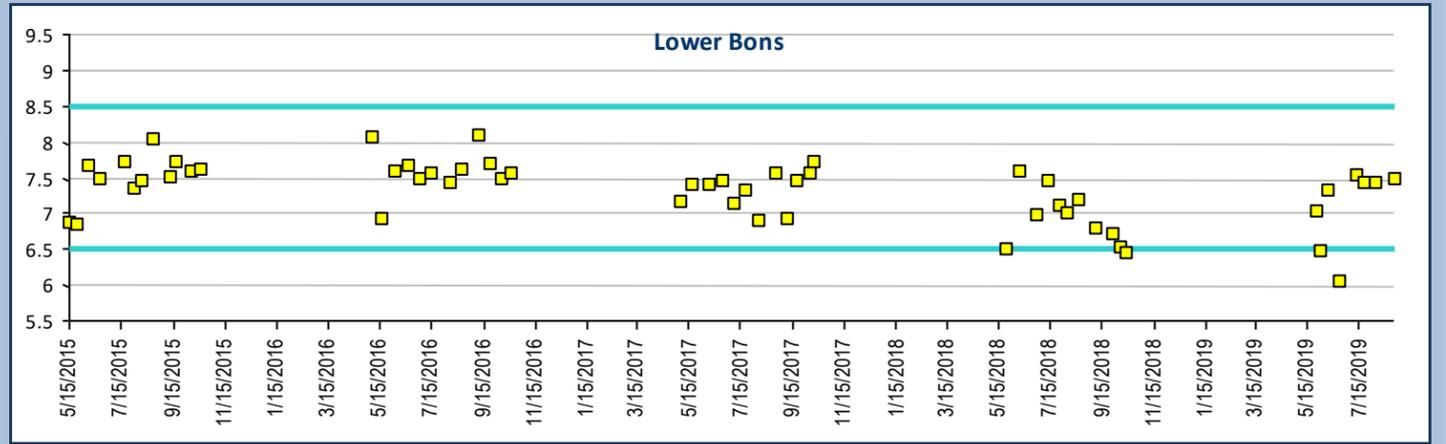
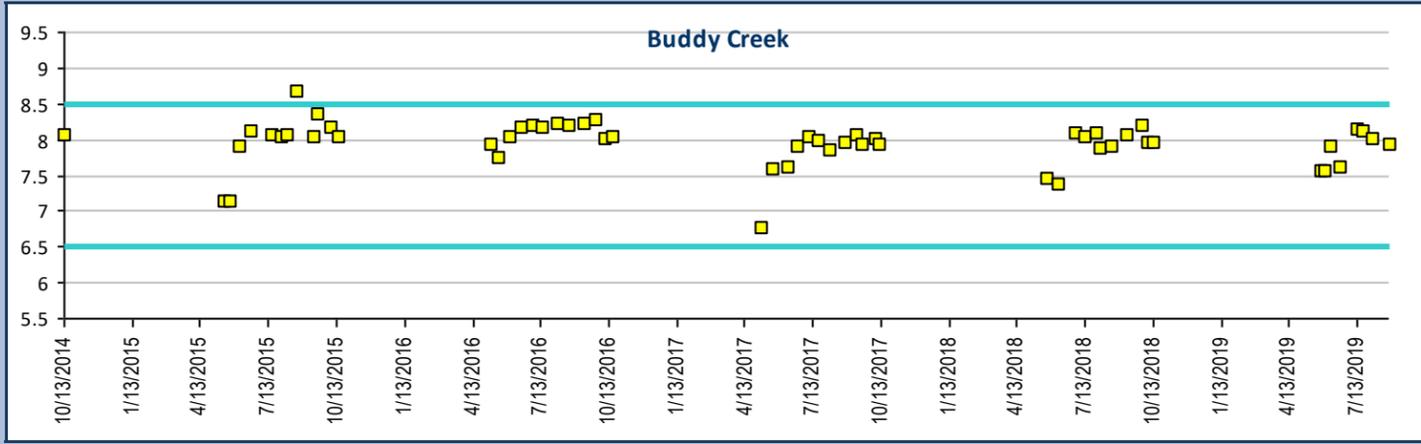




Water Monitoring Bons Creek Drainage Water Quality Profile I , 5-Year Trend Charts

pH

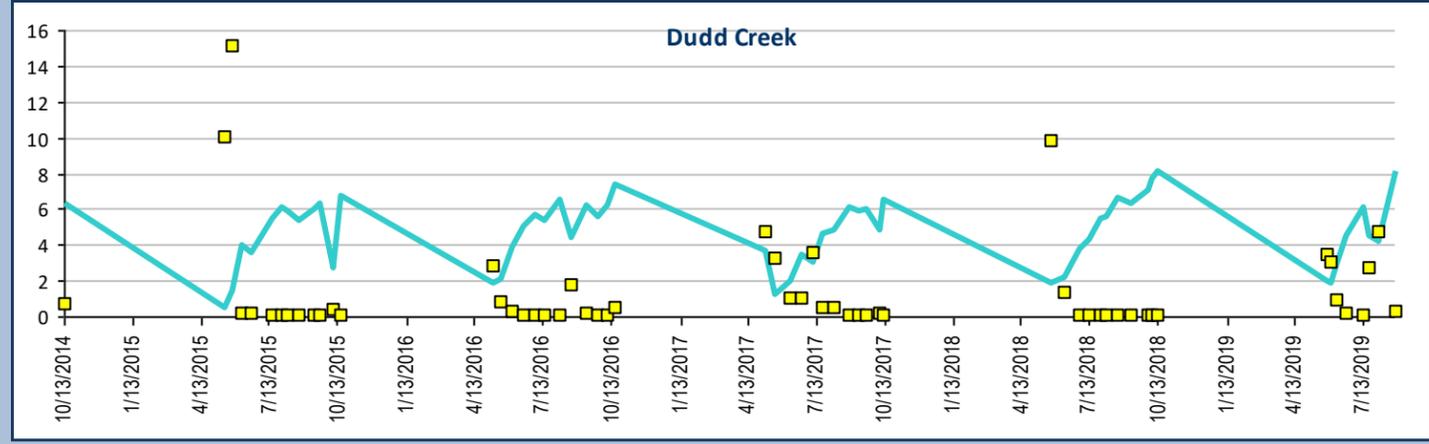
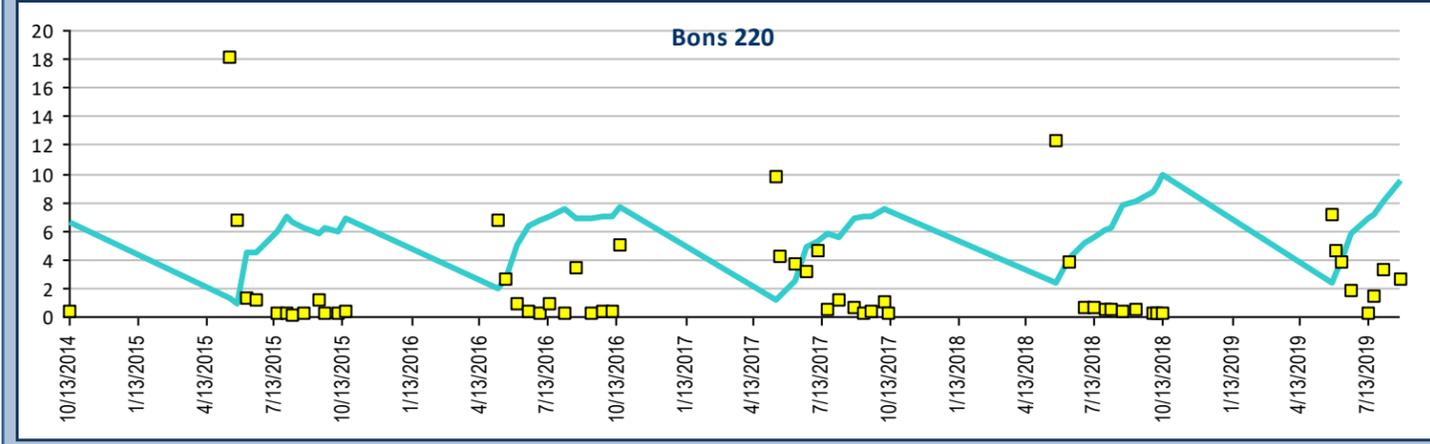
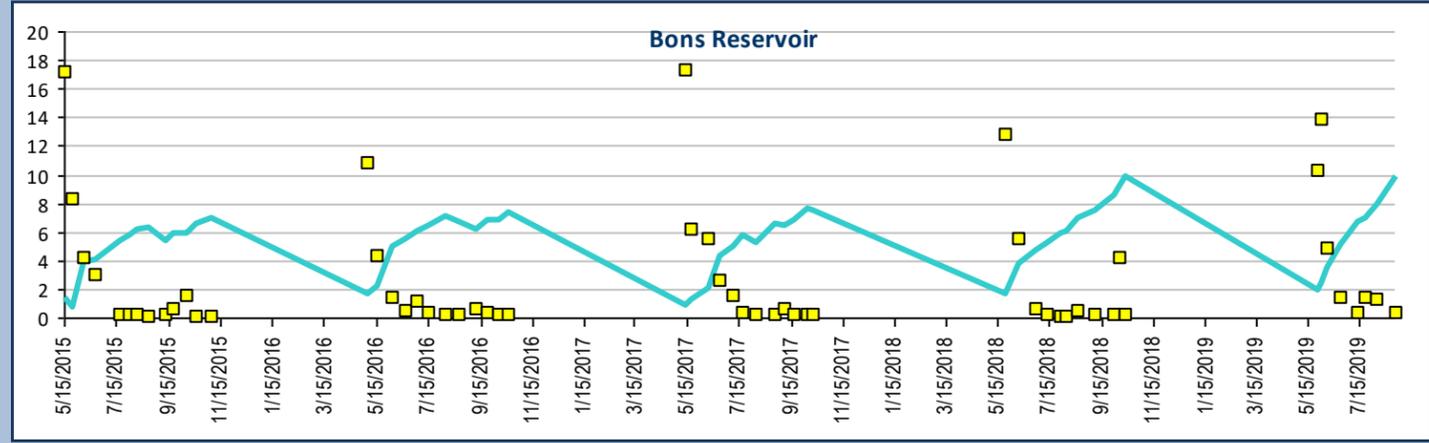
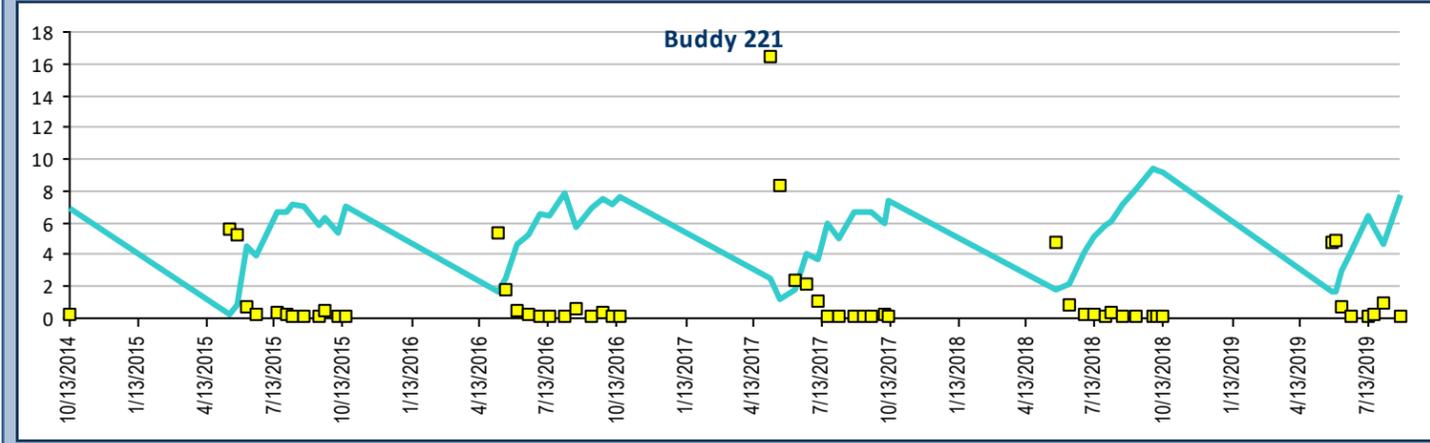
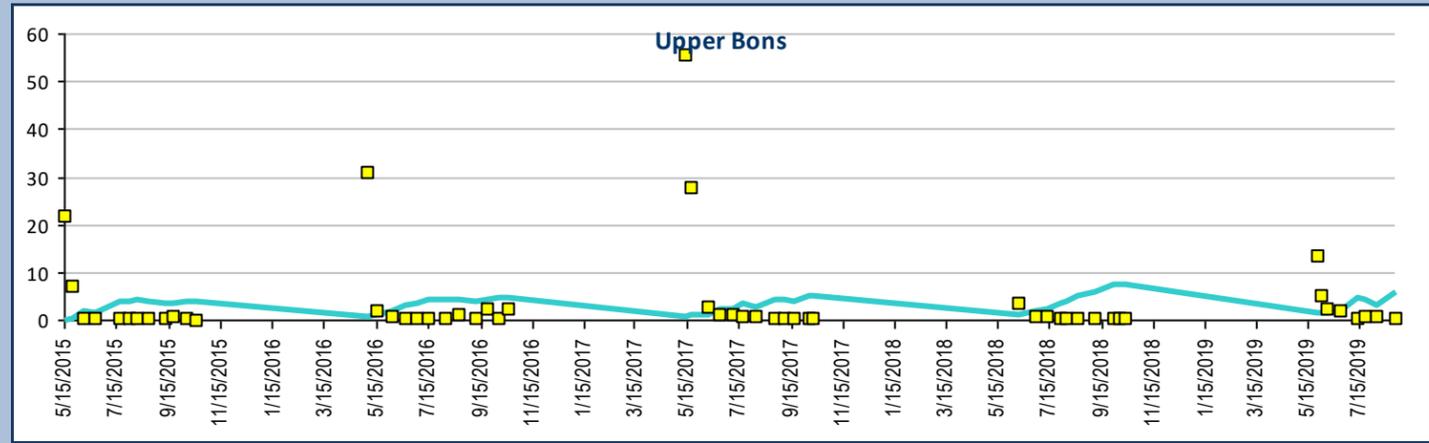
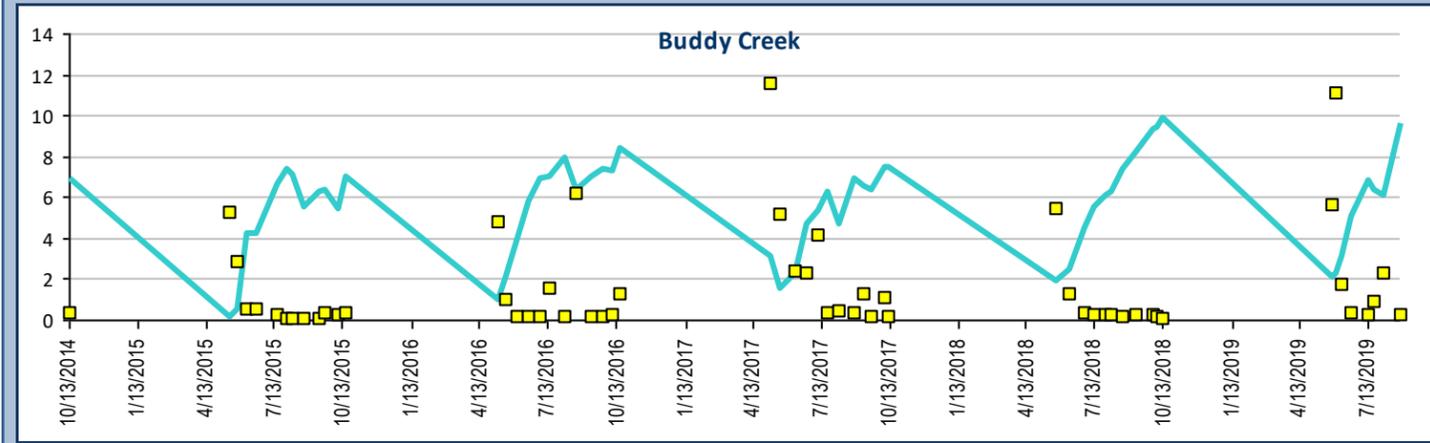
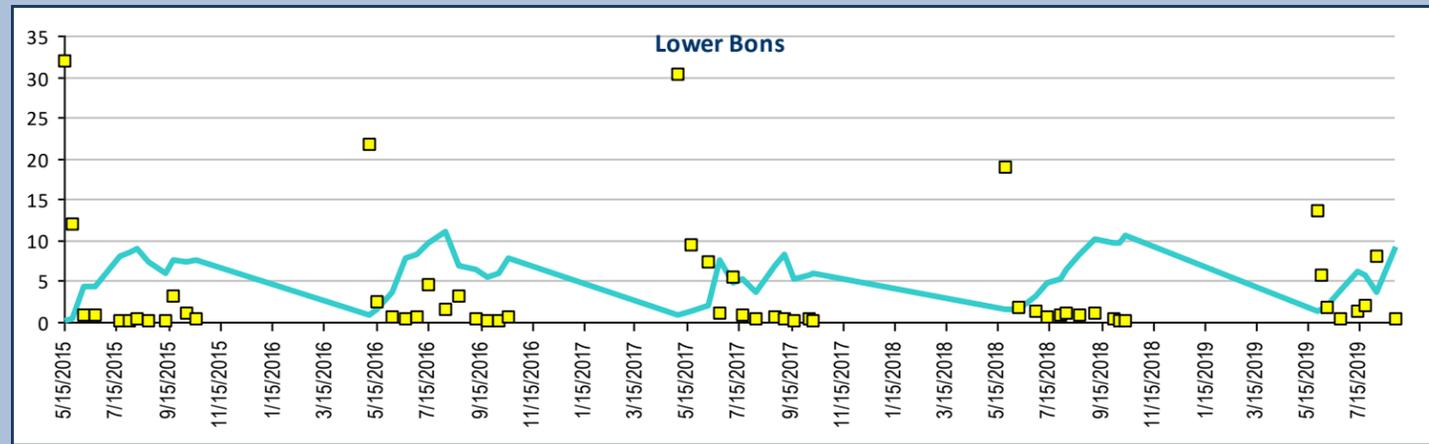
Site Specific WQS between 6.5 and 8.5





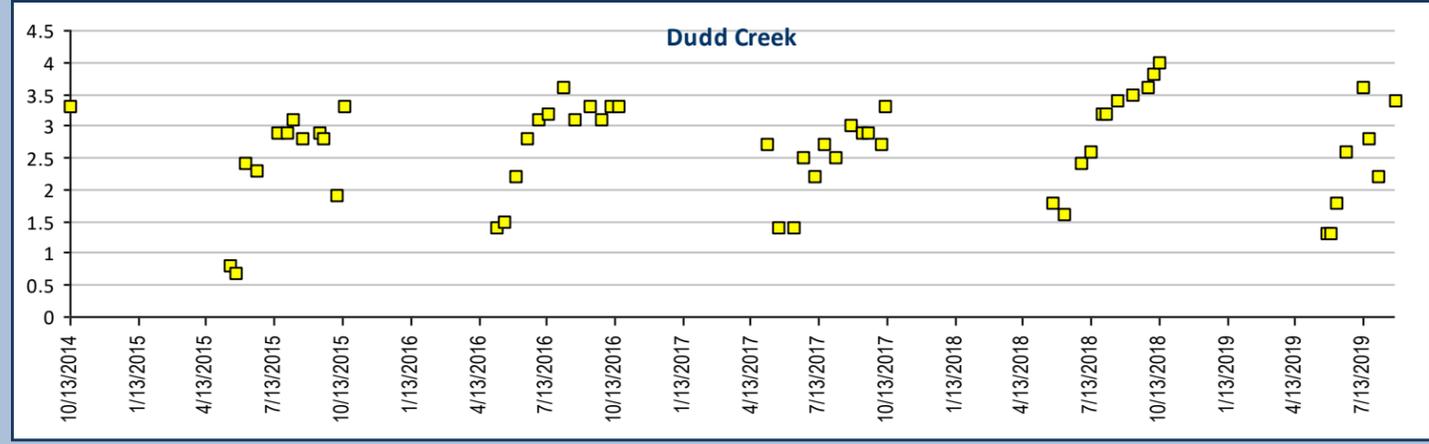
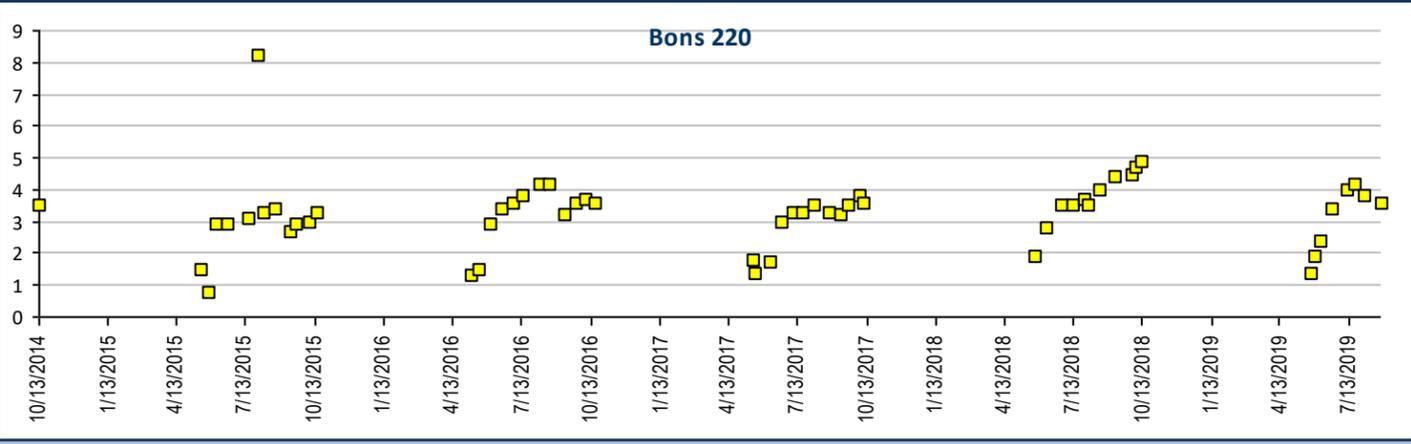
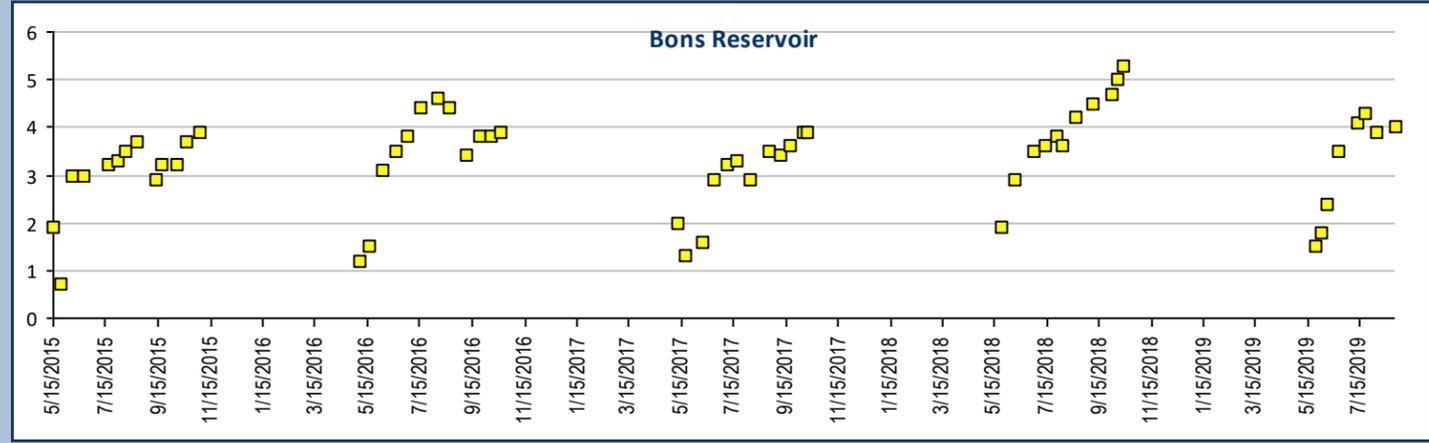
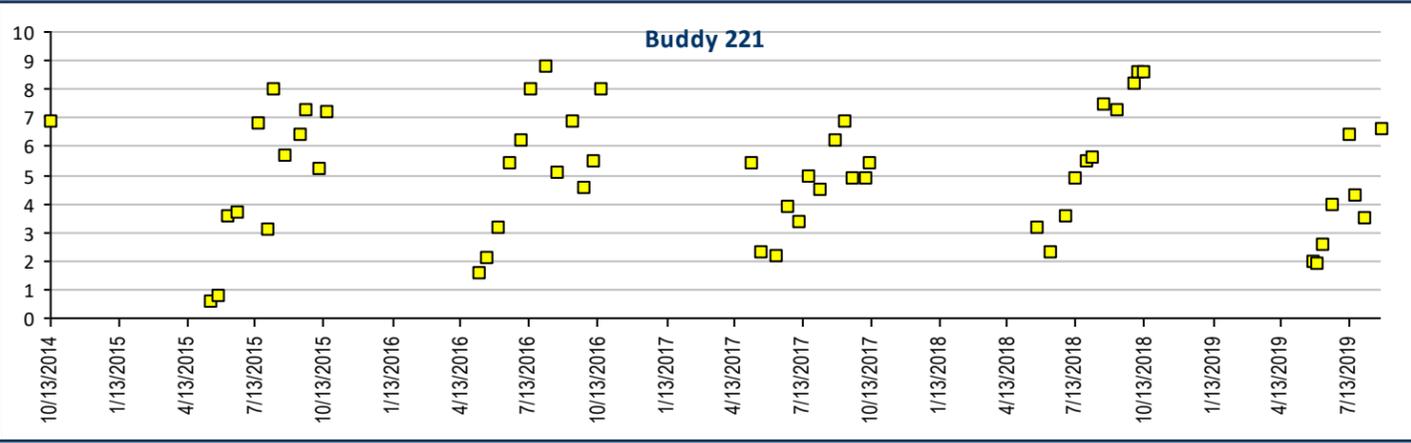
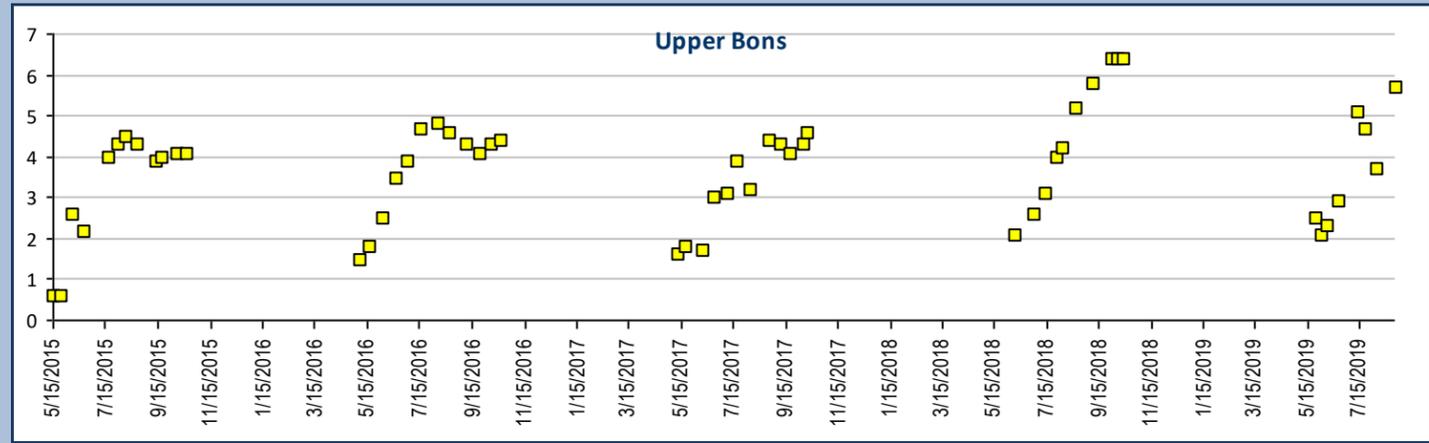
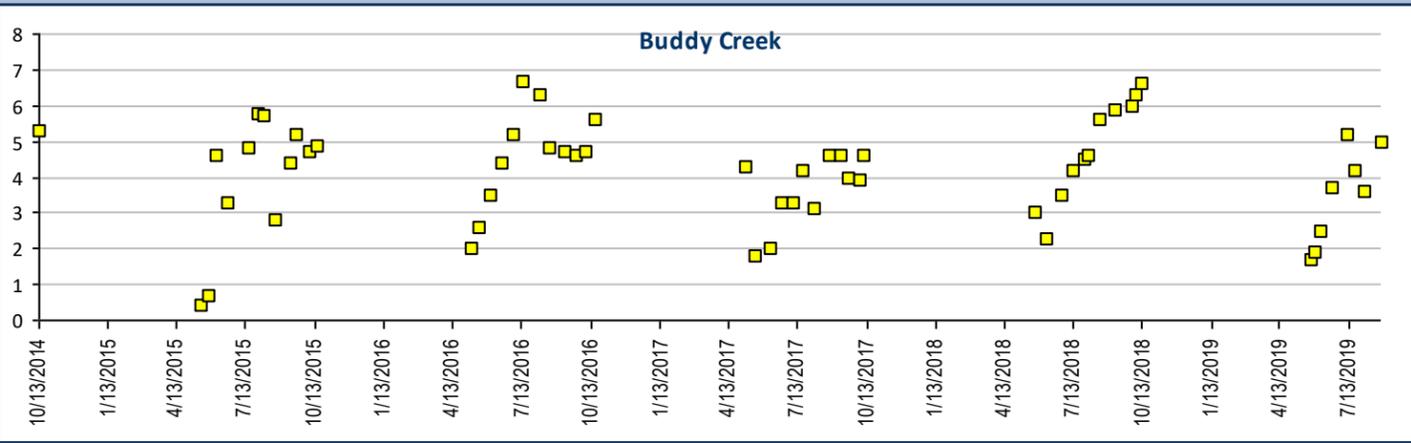
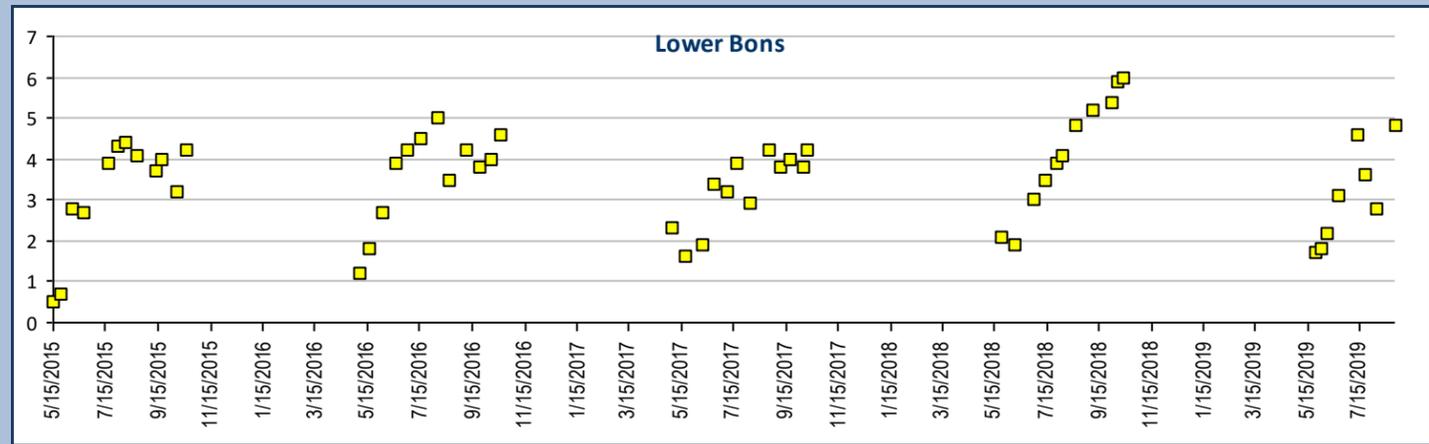
Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts

Lead, Total recoverable, units ug/L
 Aquatic Life - Fresh Water Chronic WQS ug/L
 Hardness Dependent Calculation
 $=EXP(1.273*(LN(calc *hardness))-4.705)$
 * Calculated using Standard Methods 2340B





Water Monitoring Bons Creek Drainage
 Water Quality Profile I, 5-Year Trend Charts
 Sodium, Total Recoverable, units mg/L

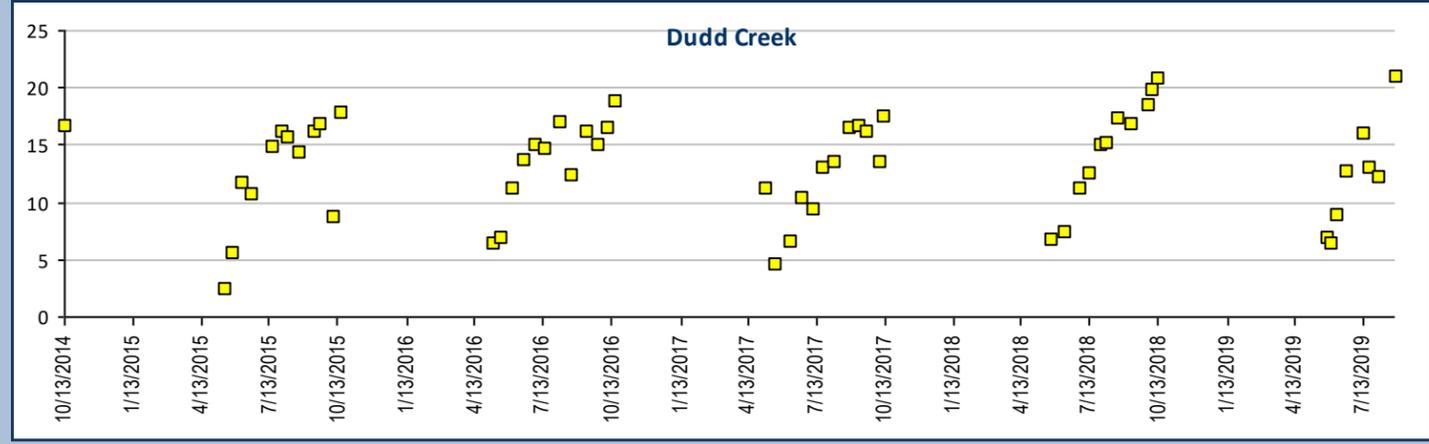
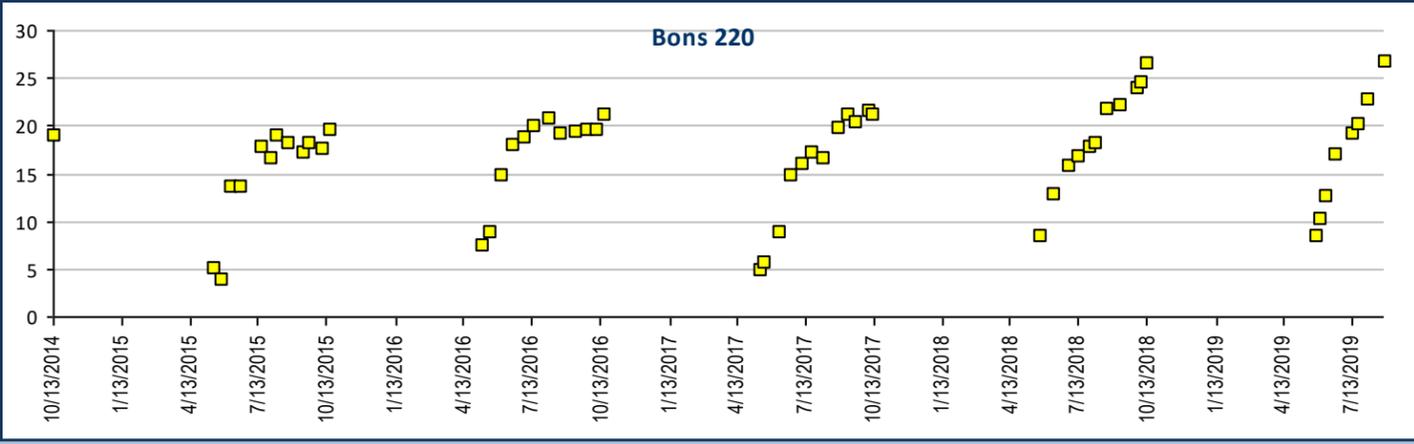
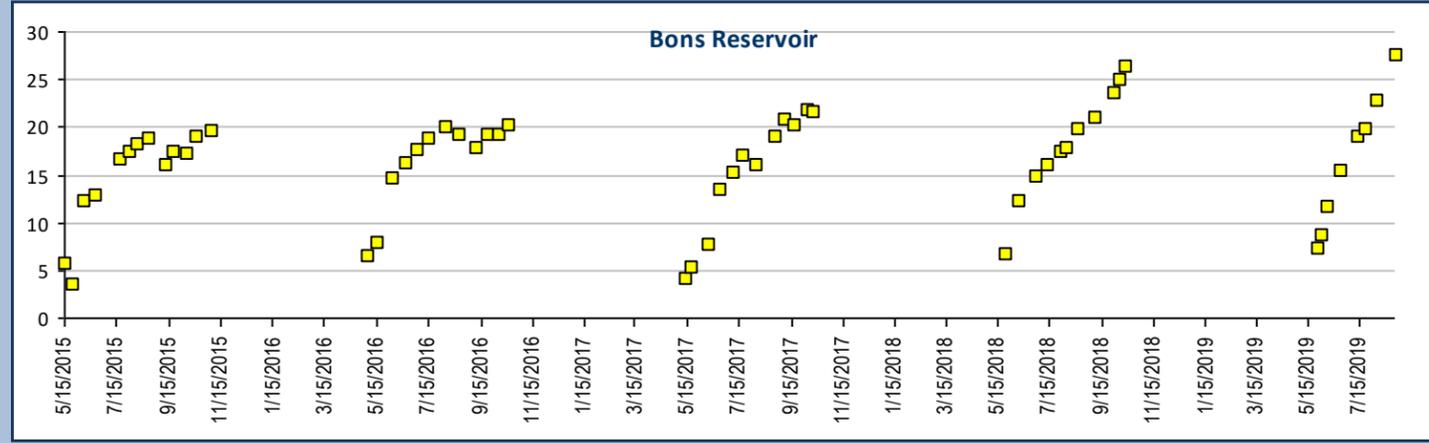
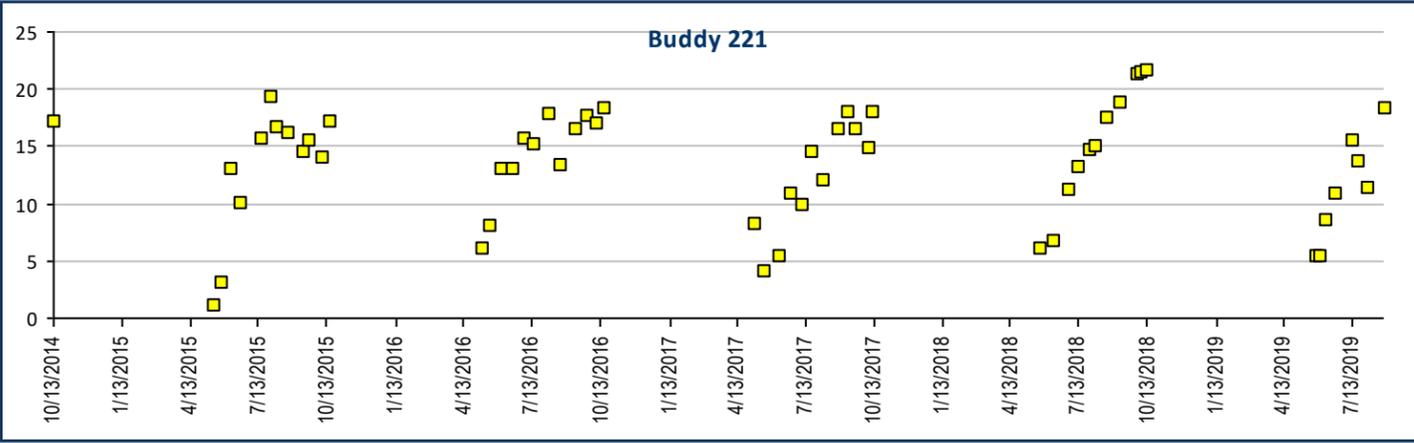
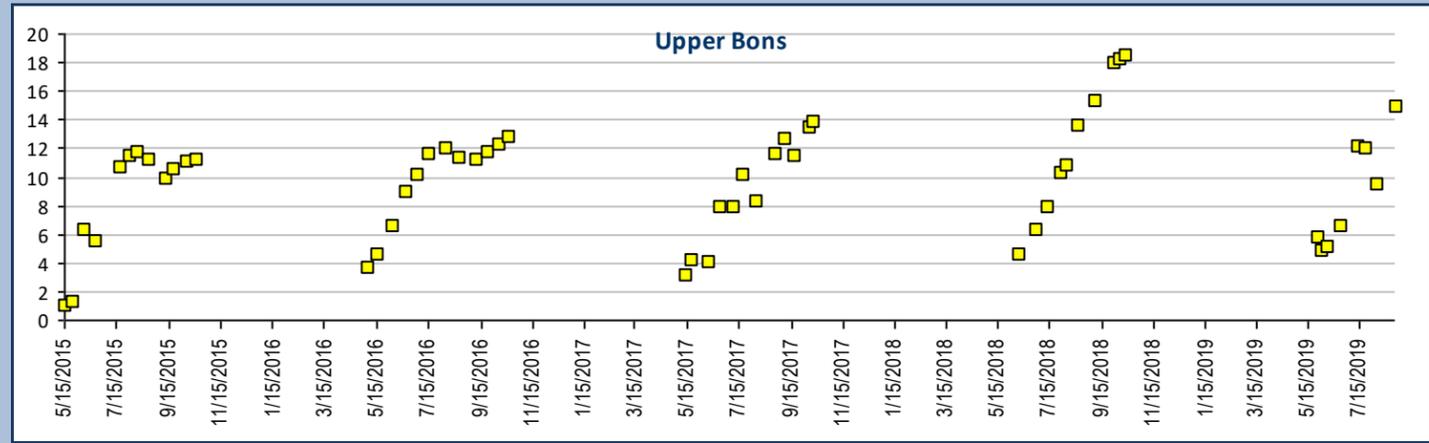
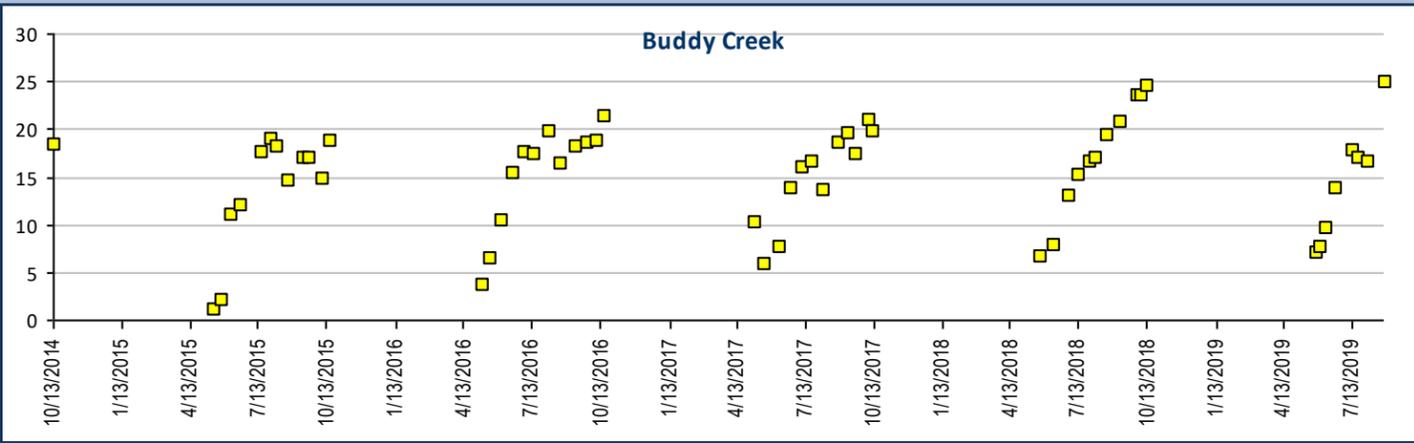
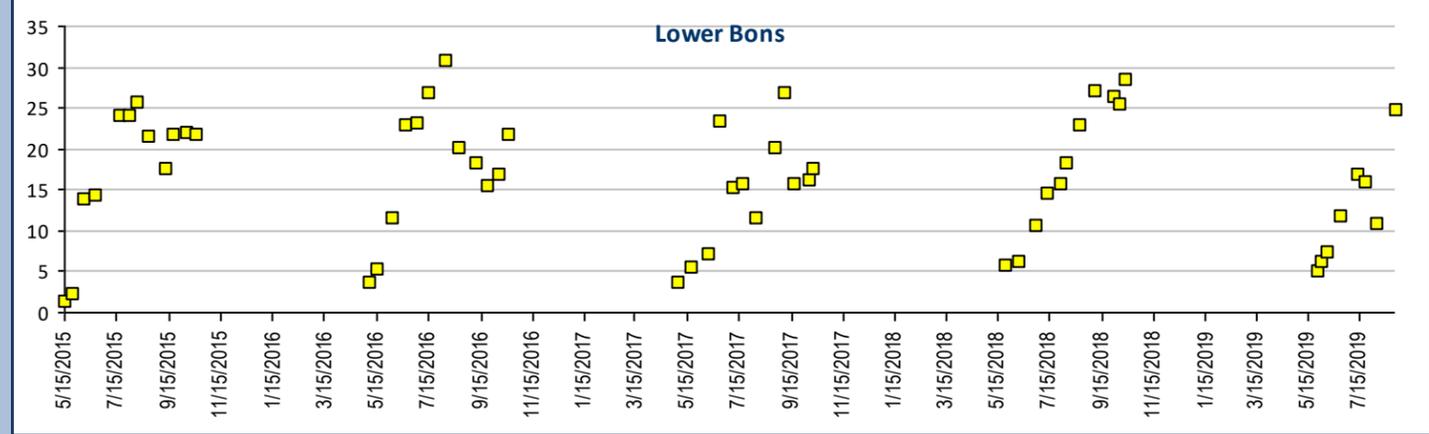




Water Monitoring Bons Creek Drainage

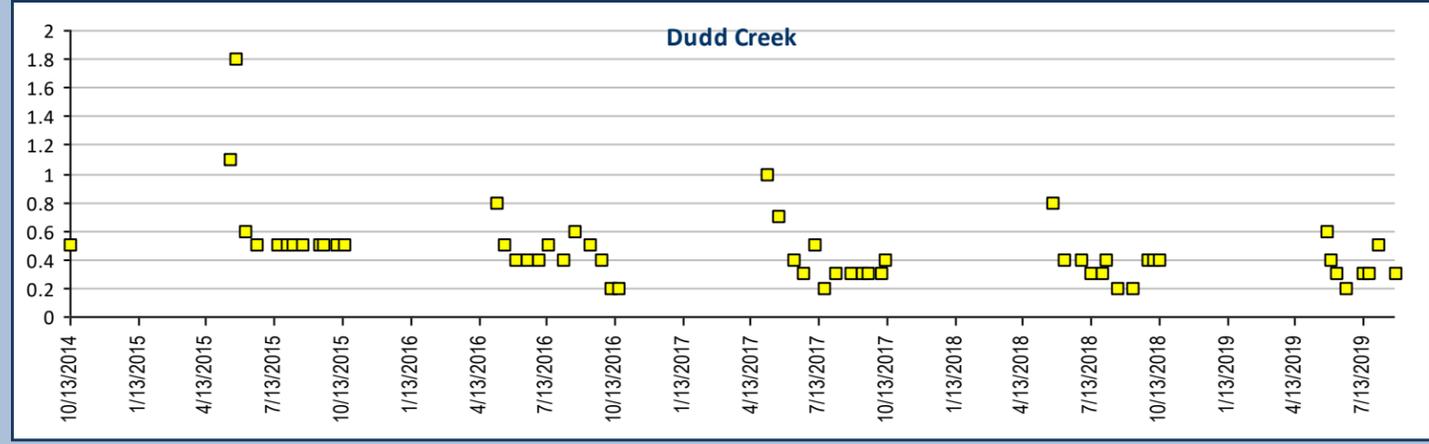
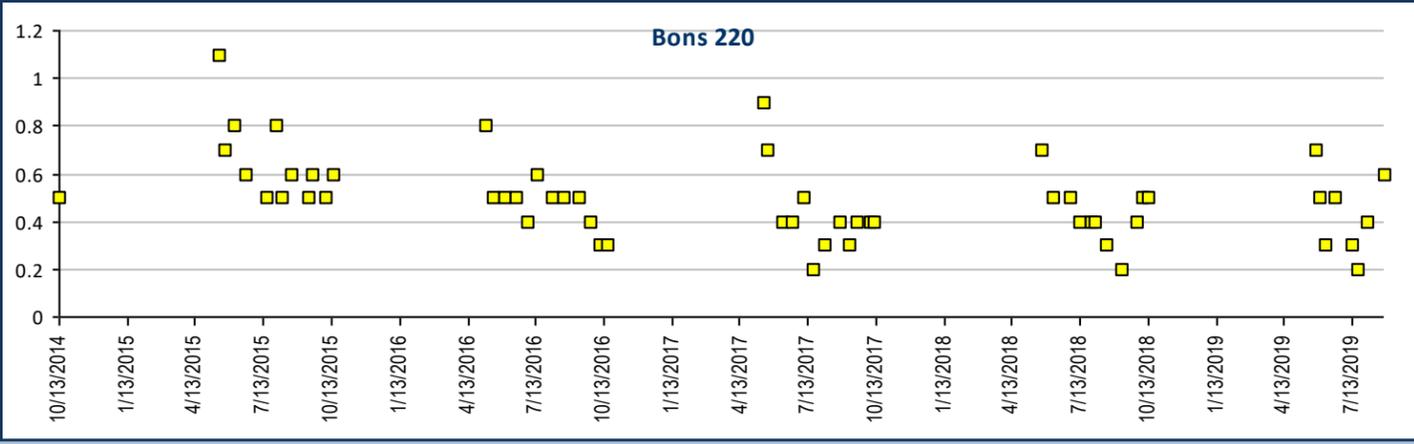
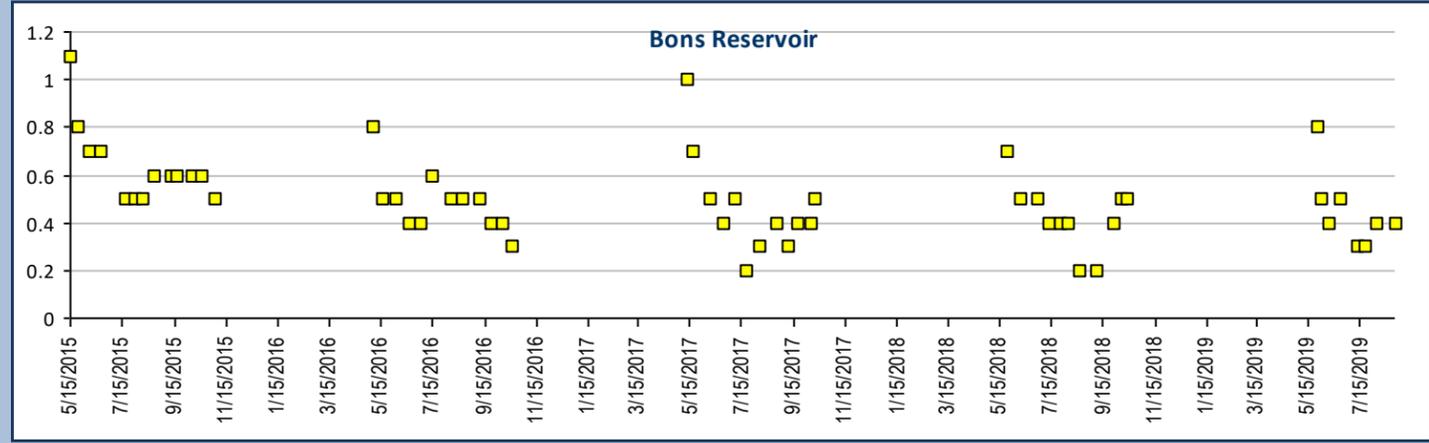
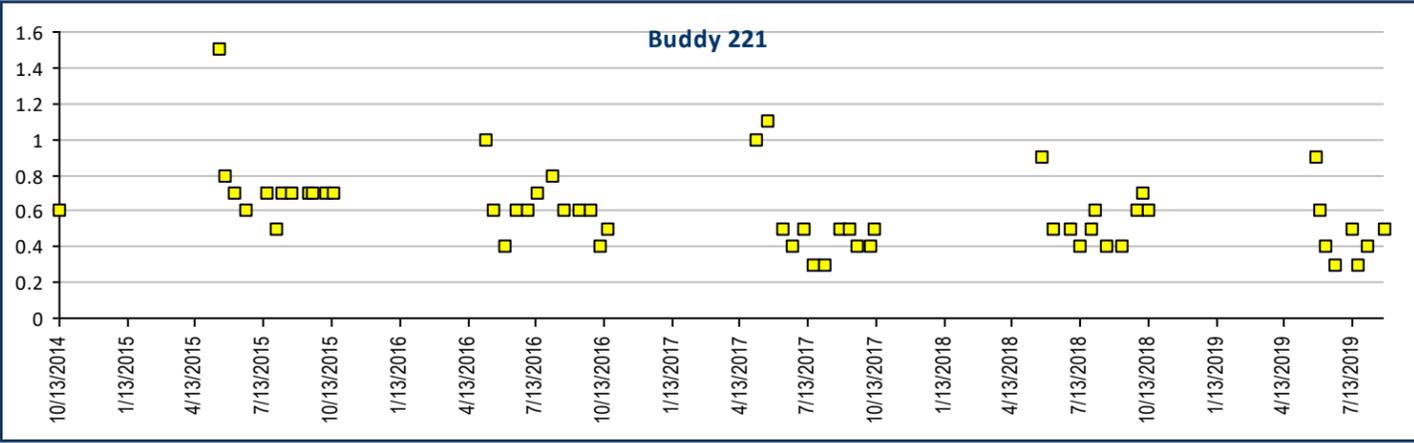
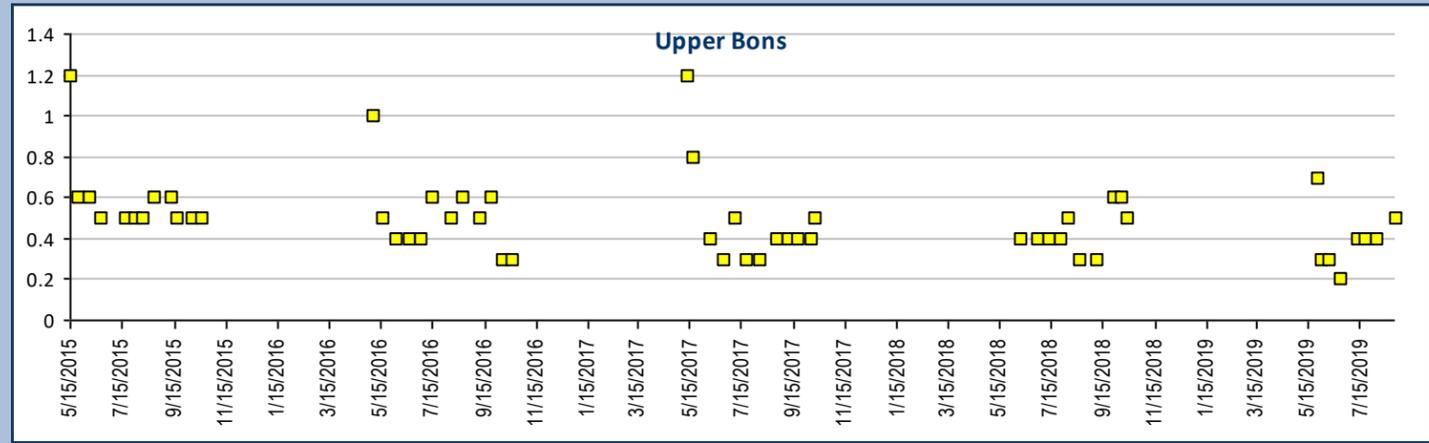
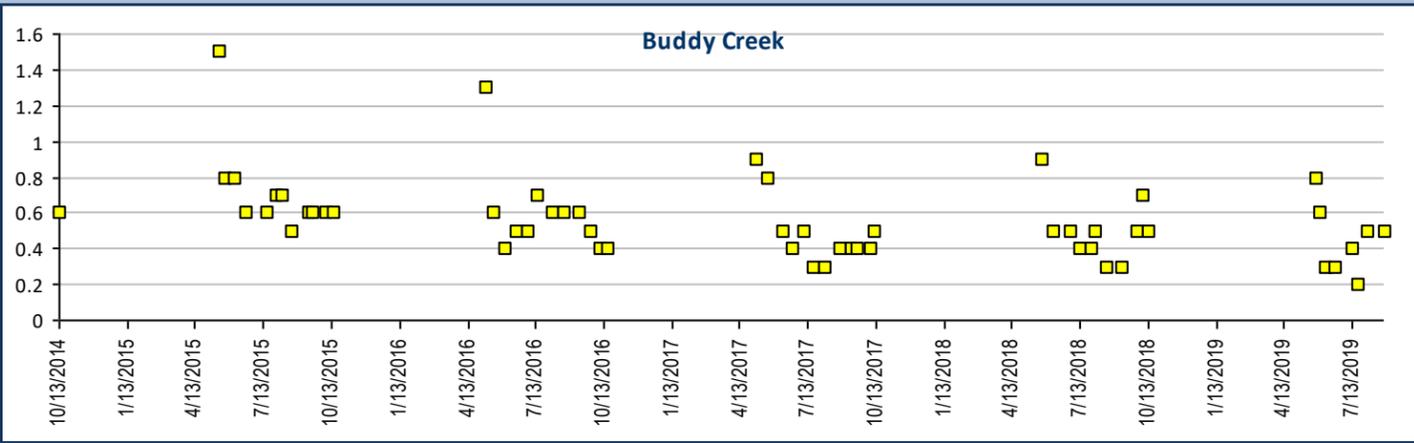
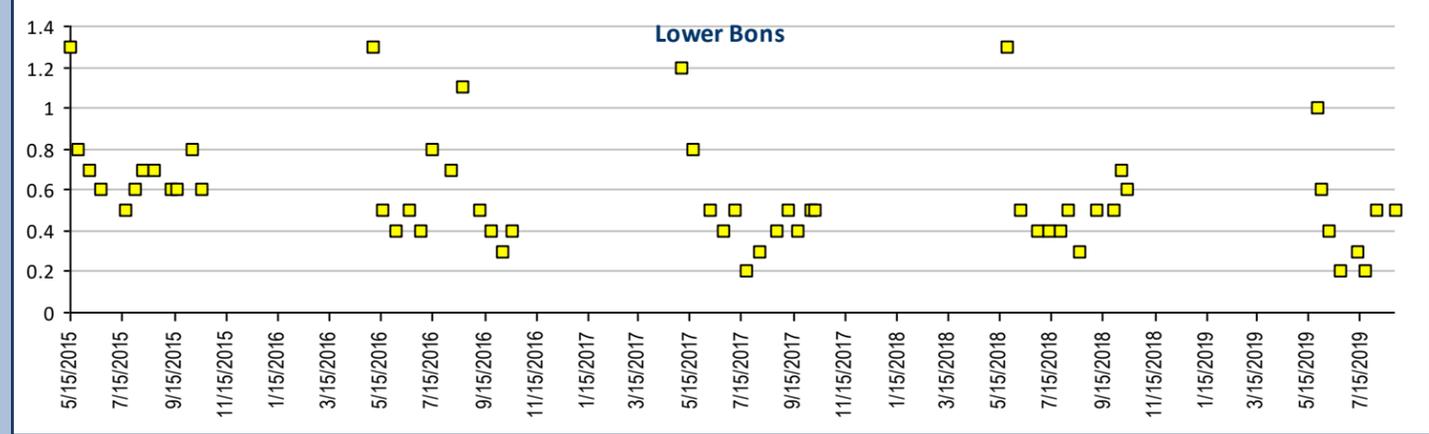
Water Quality Profile I, 5-Year Trend Charts

Magnesium, Total Recoverable, units mg/L





Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts Potassium, Total Recoverable, units mg/L



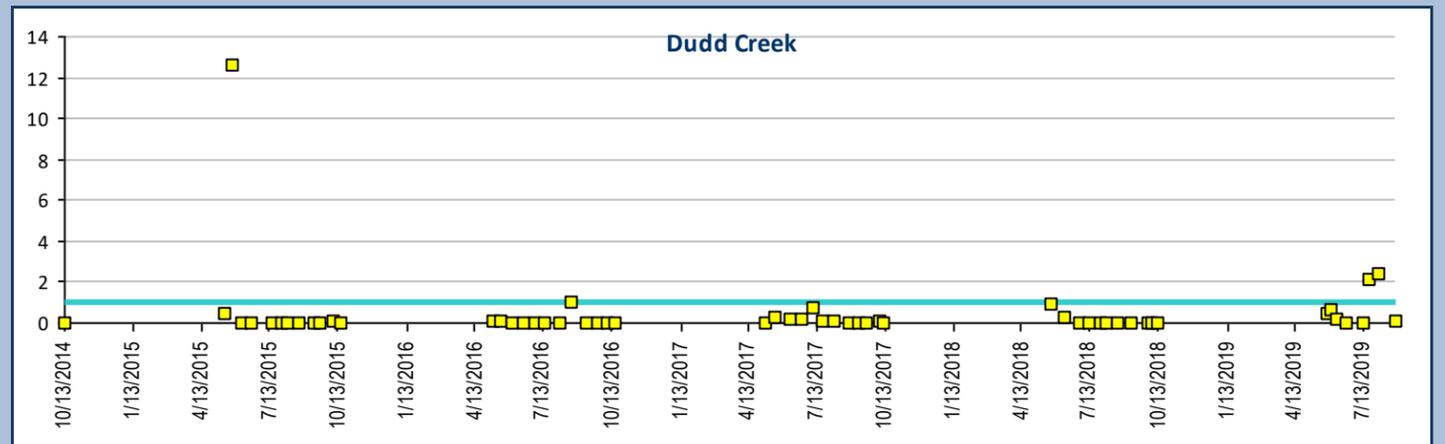
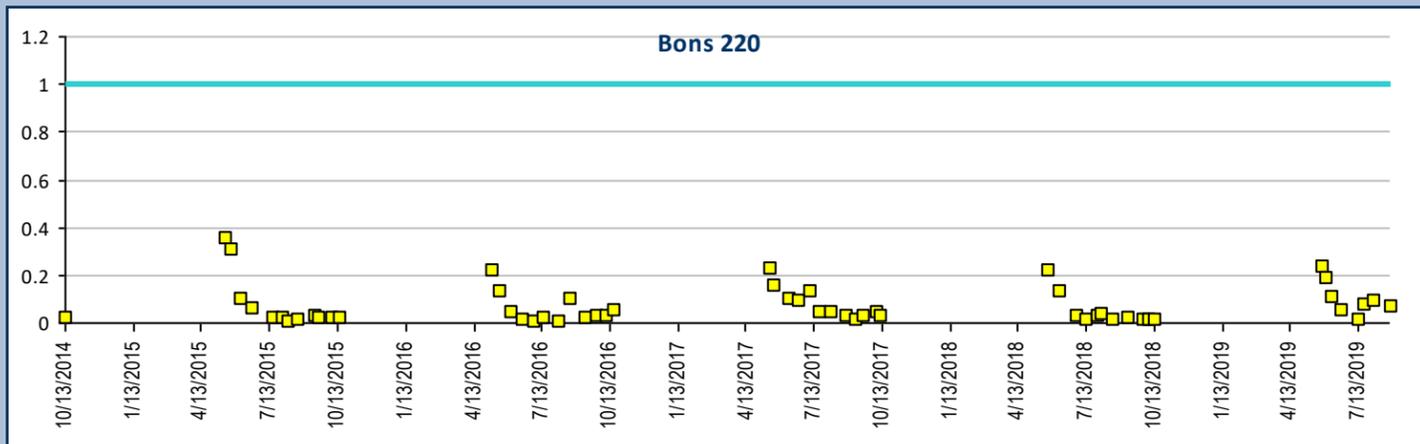
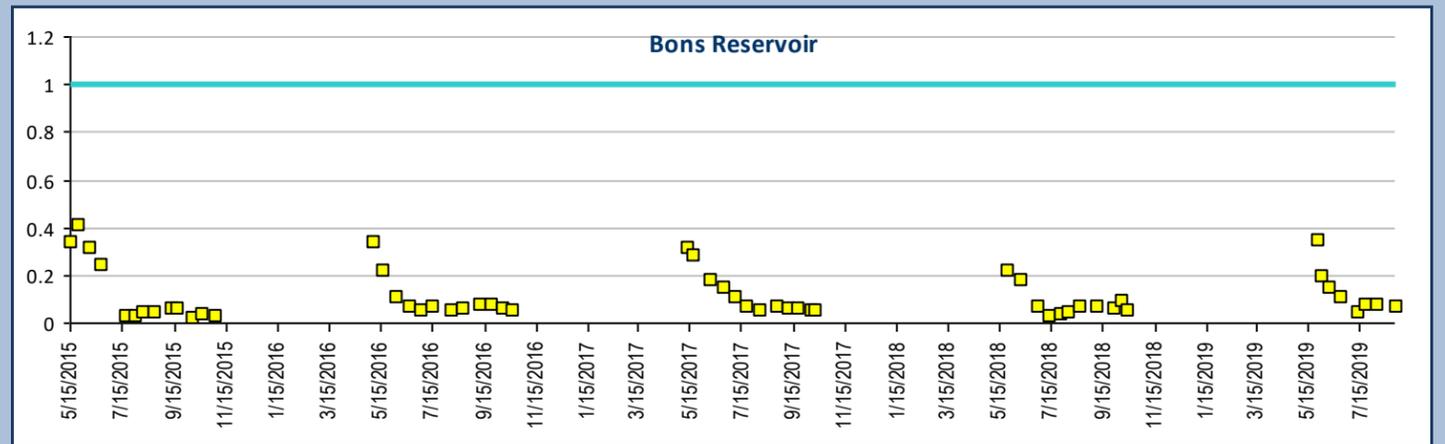
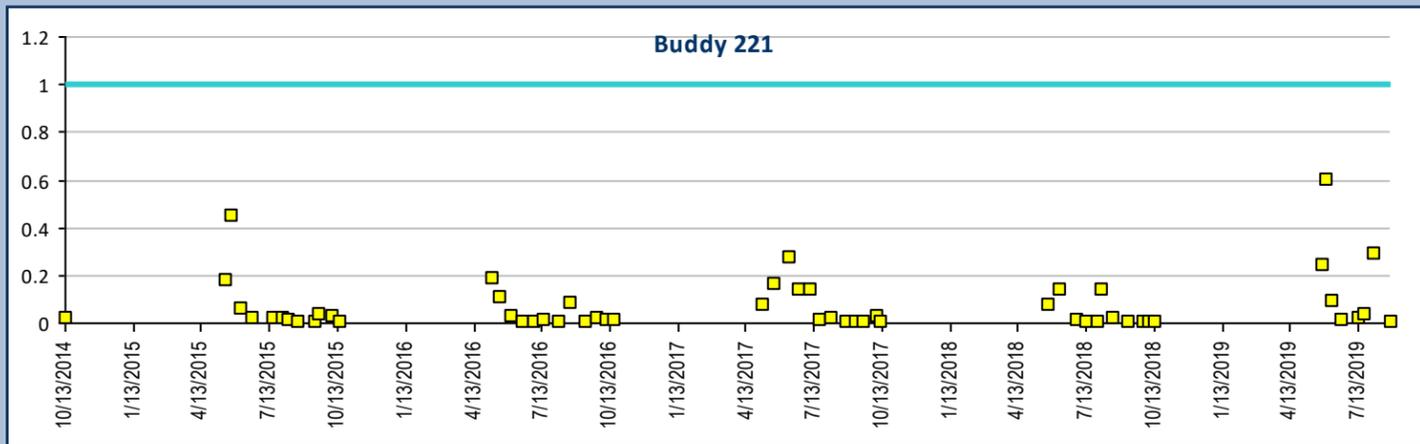
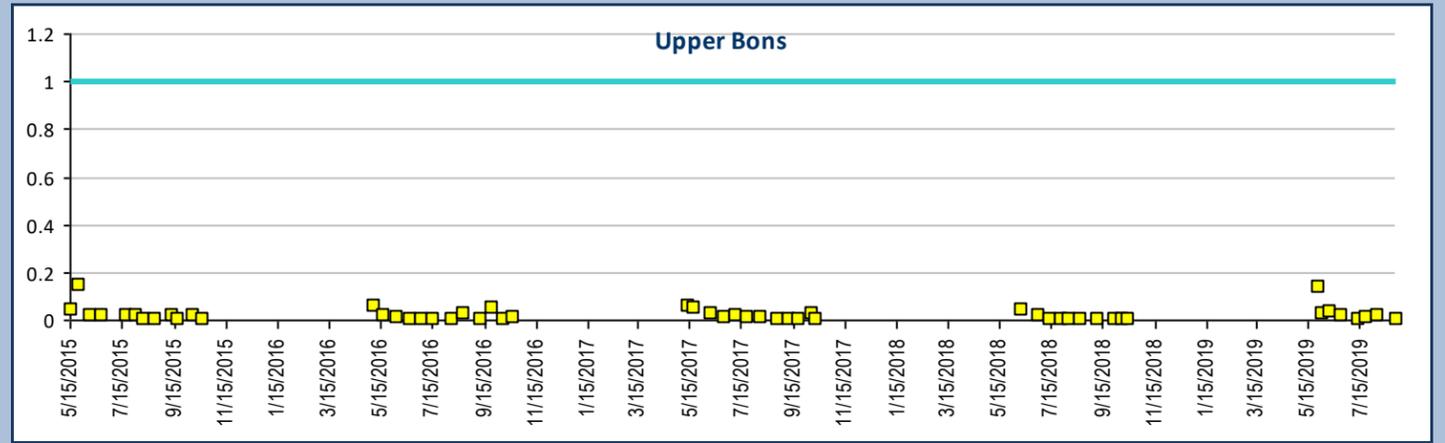
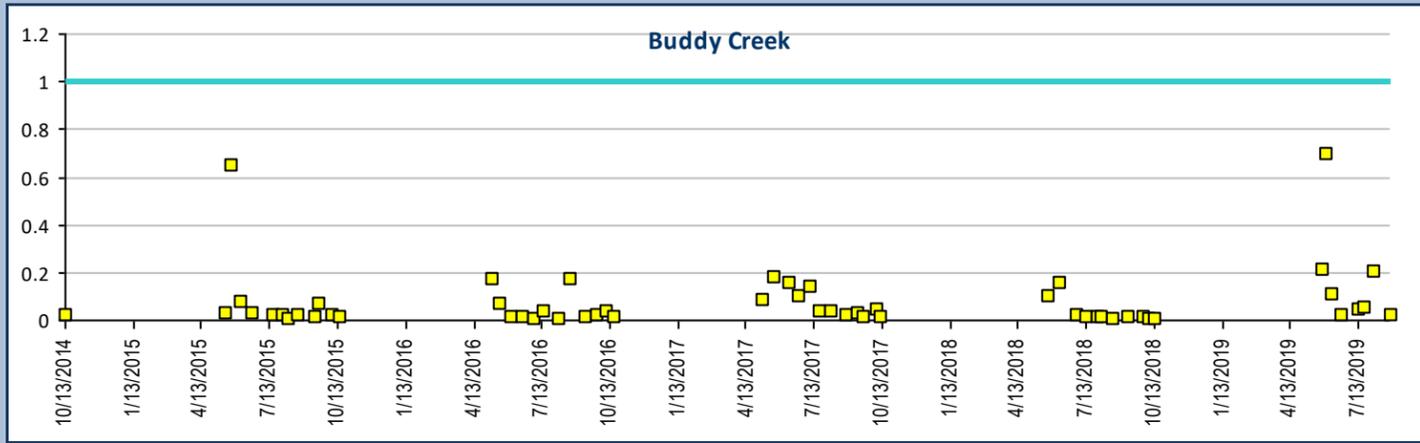
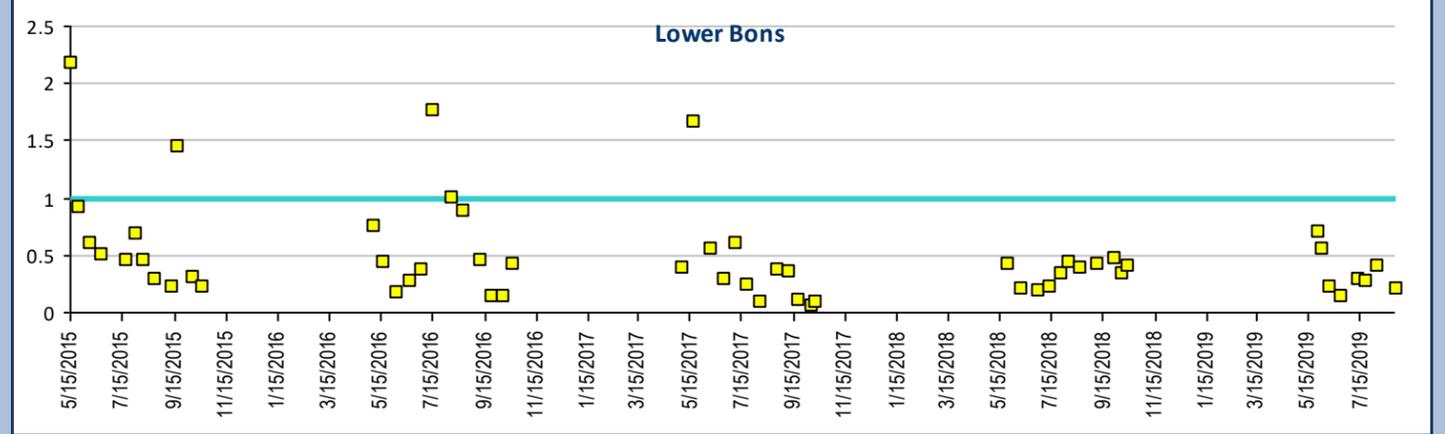


Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts

Iron, Total Recoverable, units mg/L

Aquatic Life - Fresh Water Chronic WQS mg/L

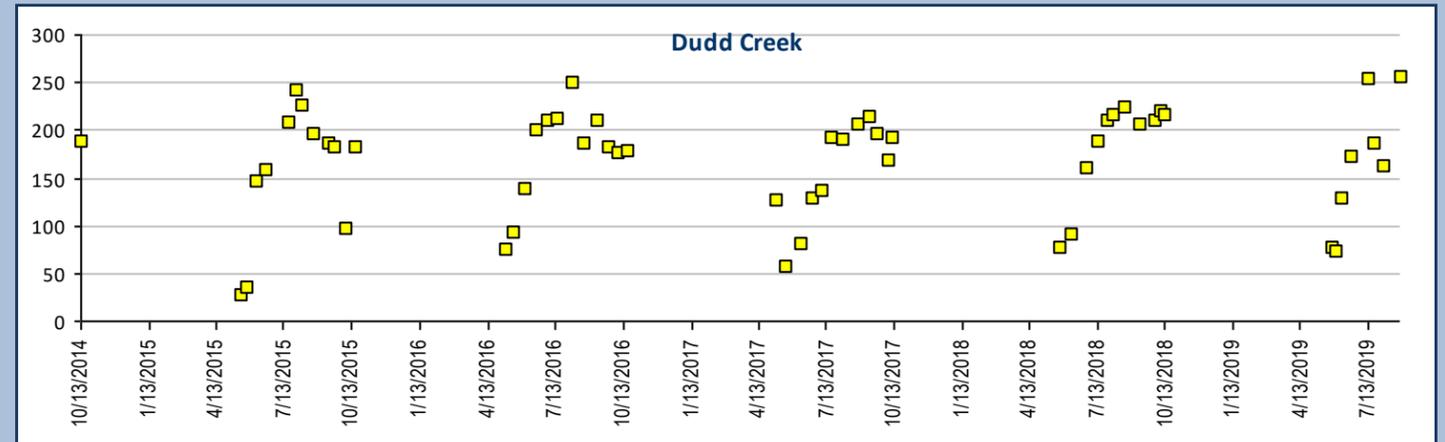
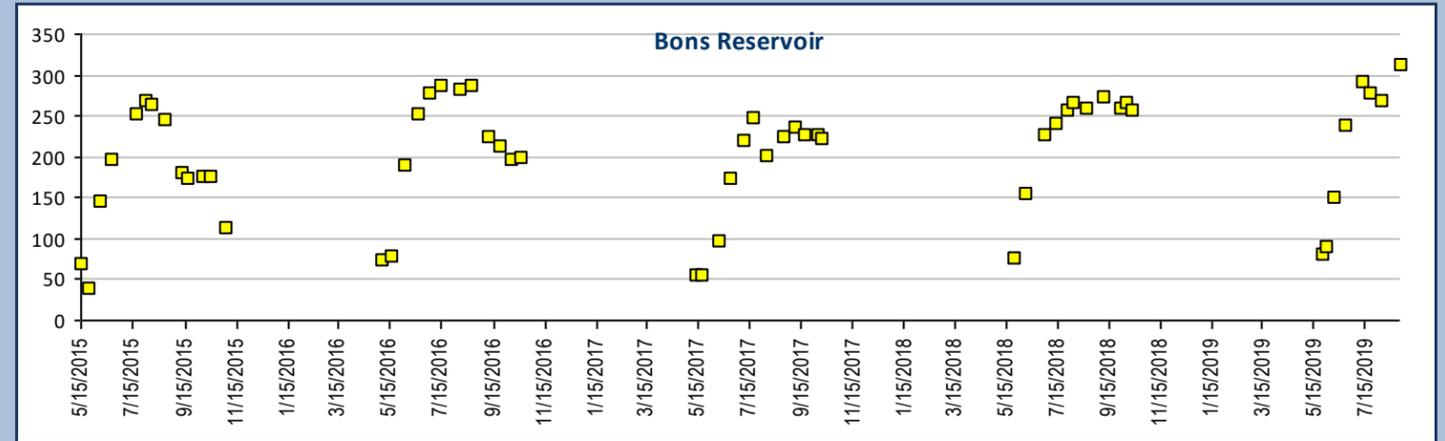
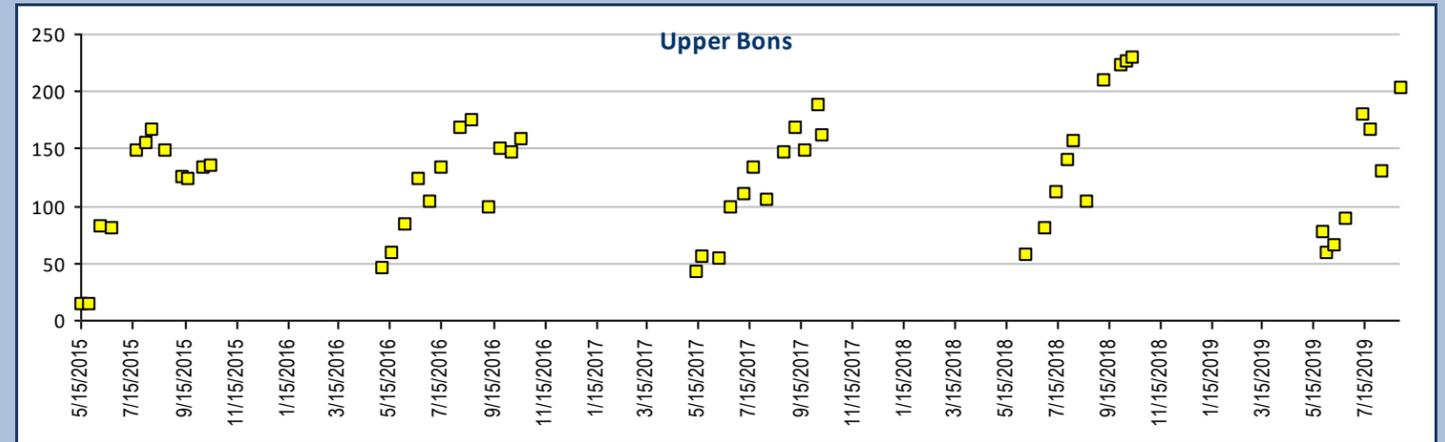
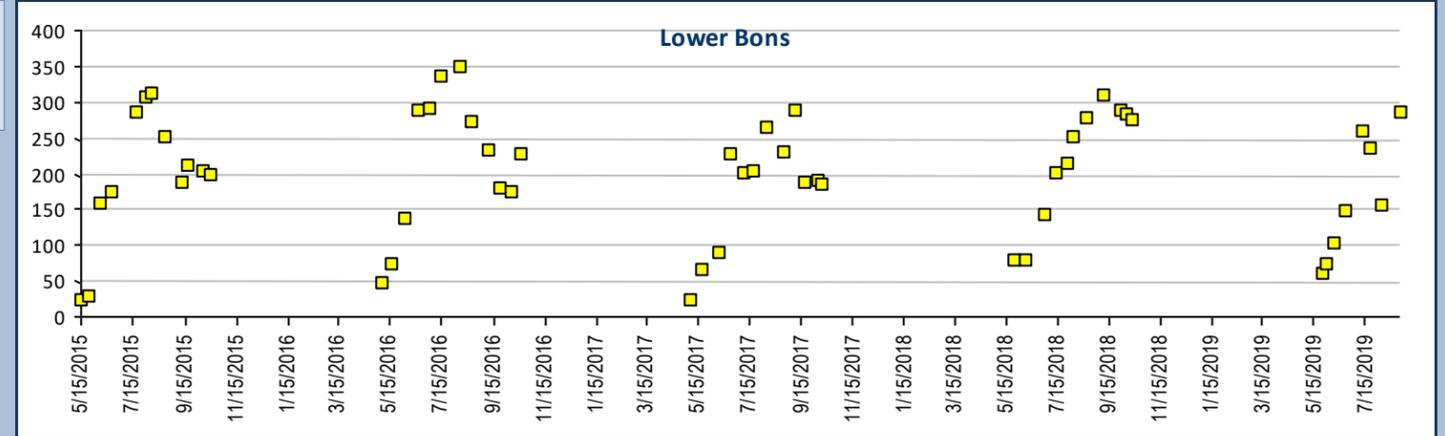
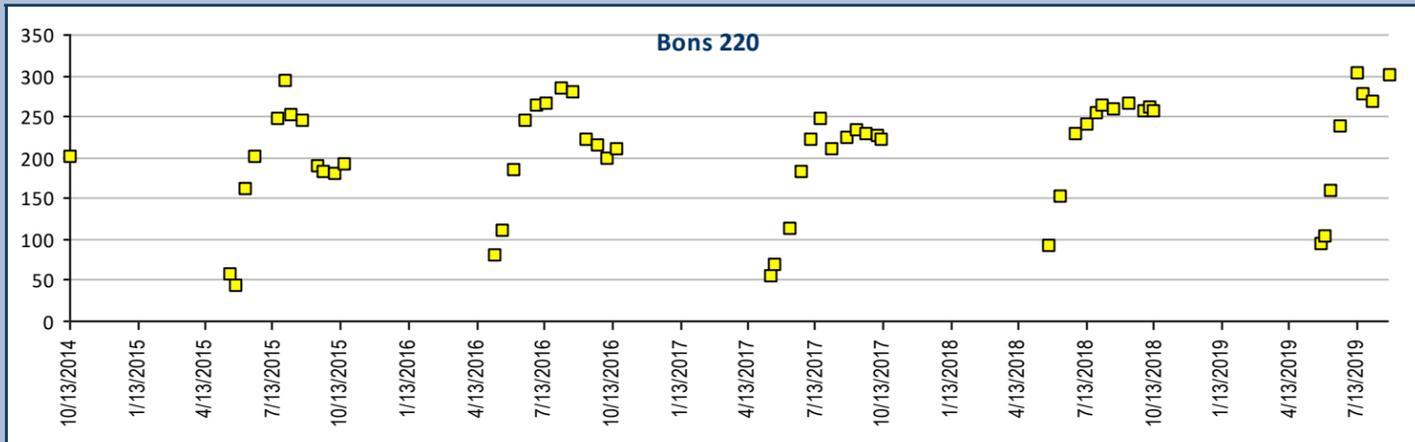
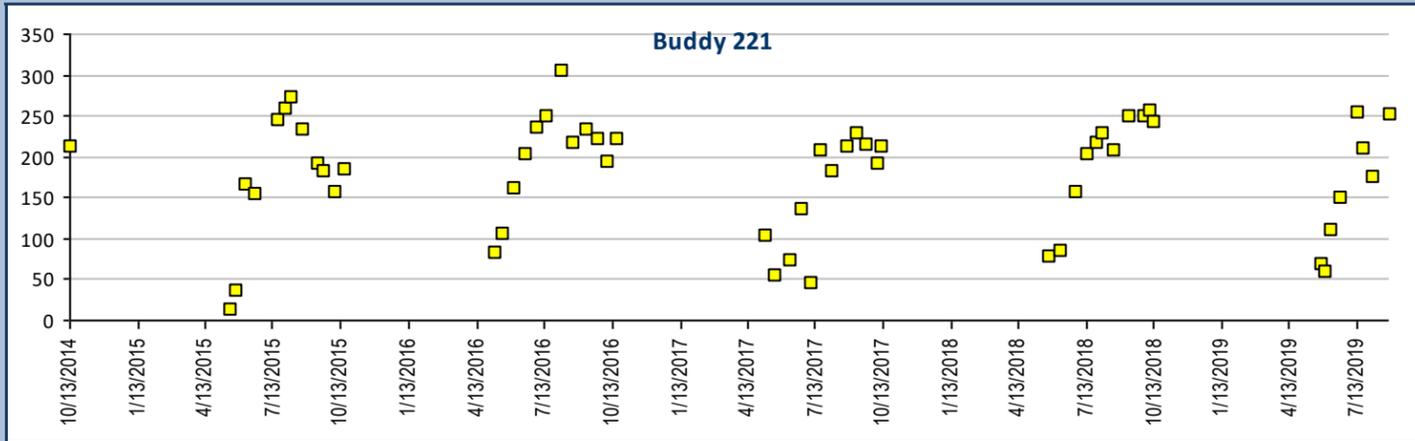
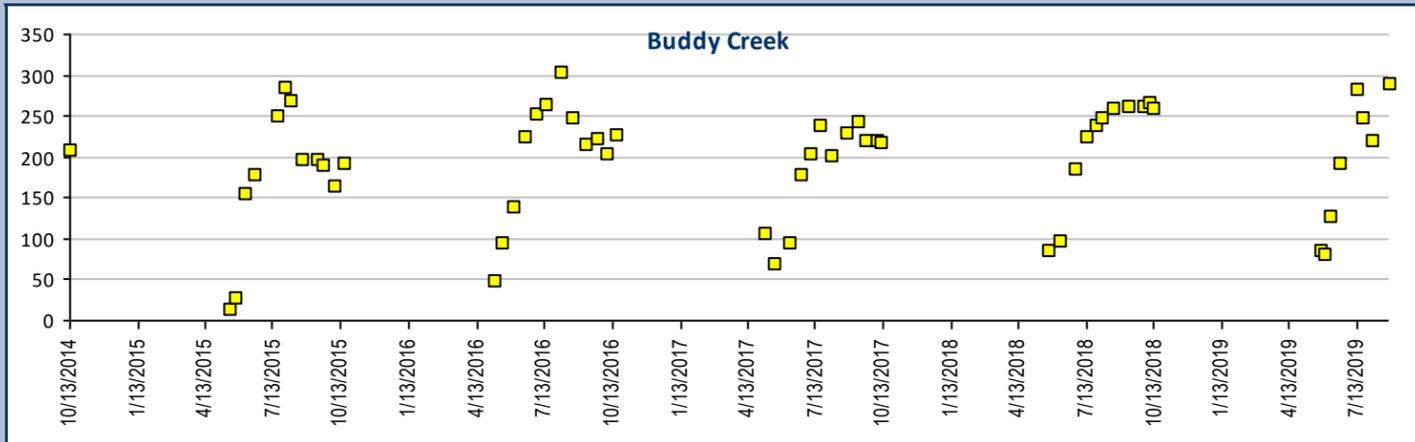
1.0 mg/L





Water Monitoring Bons Creek Drainage Water Quality Profile I , 5-Year Trend Charts

Conductivity, units uS/cm



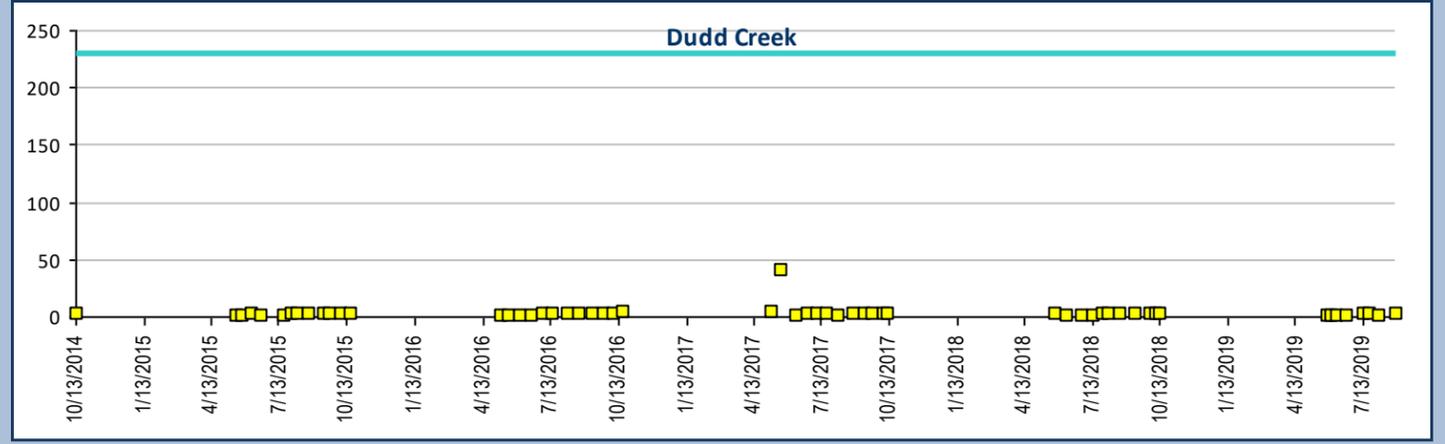
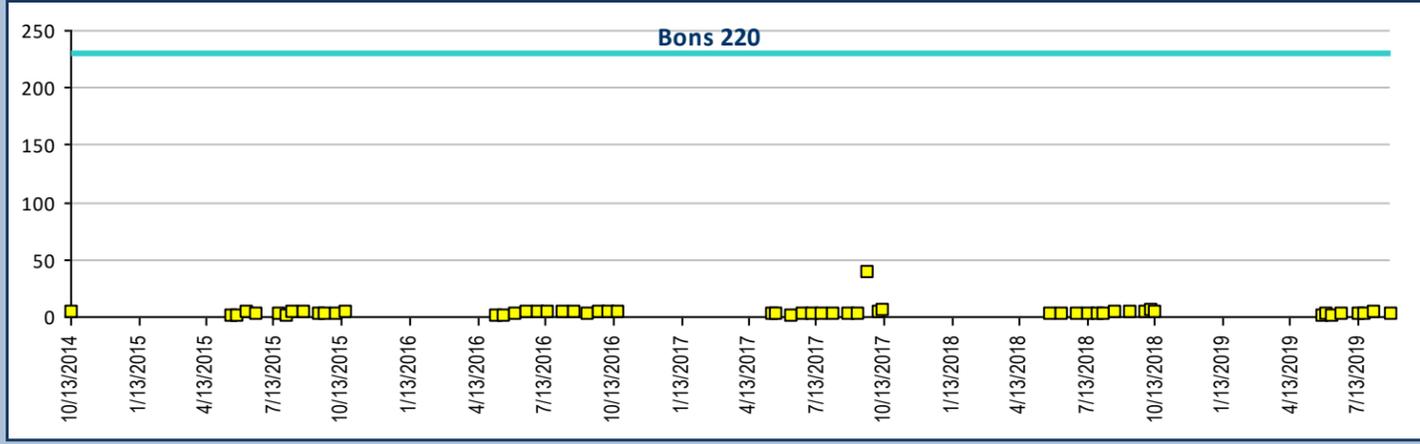
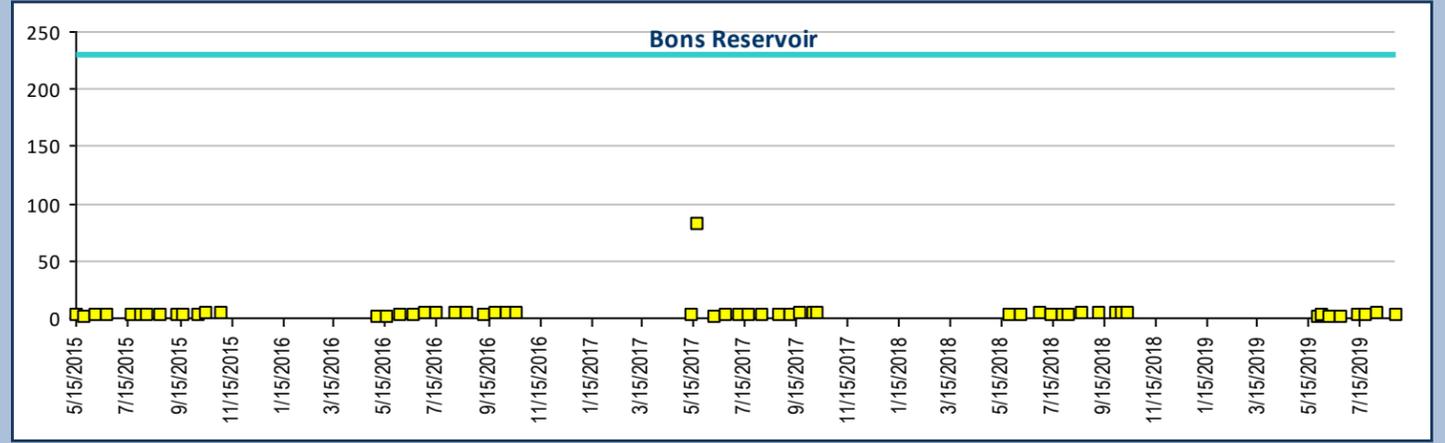
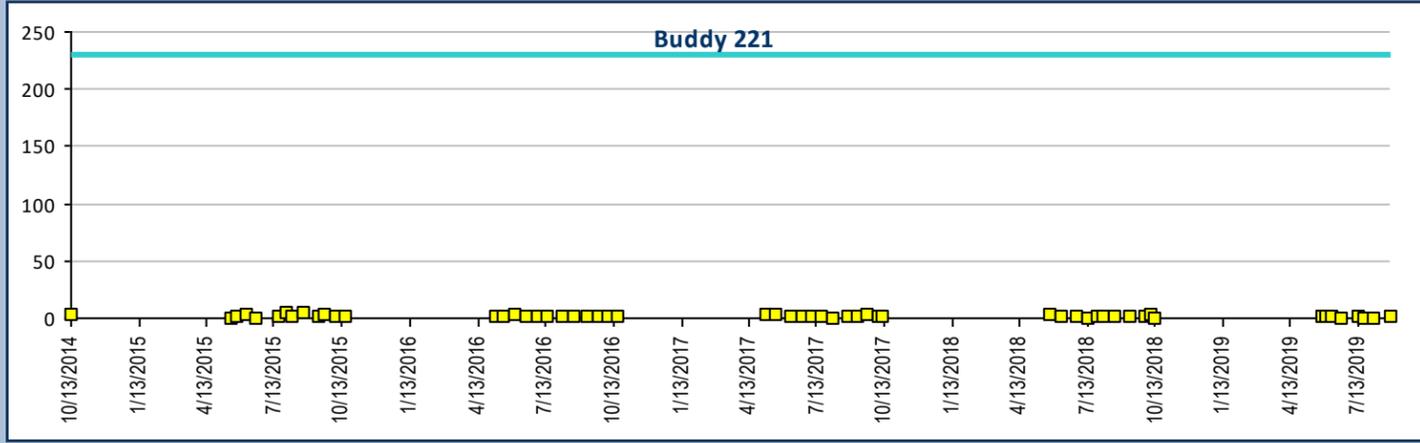
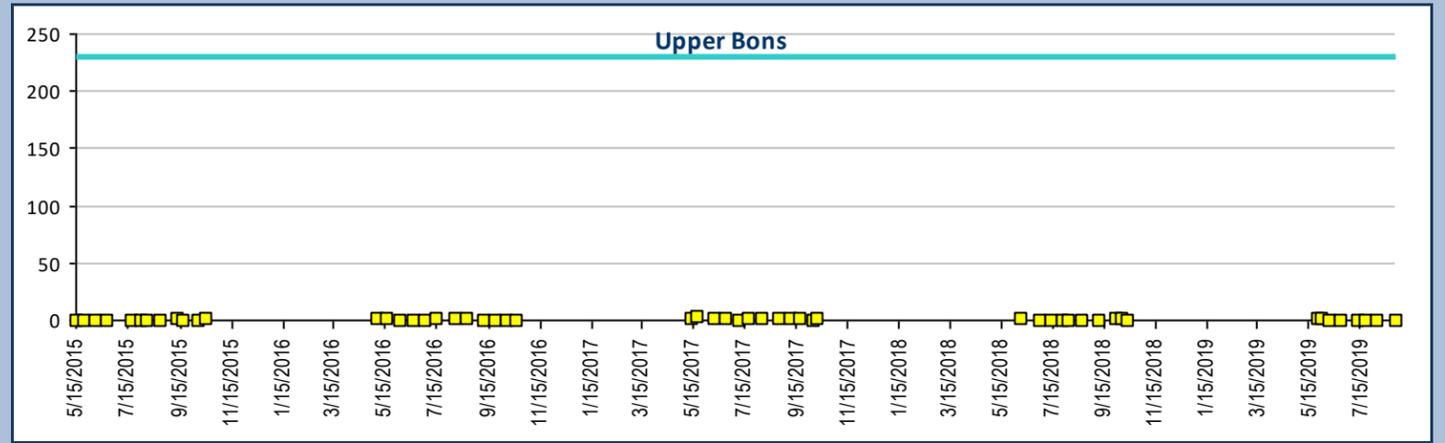
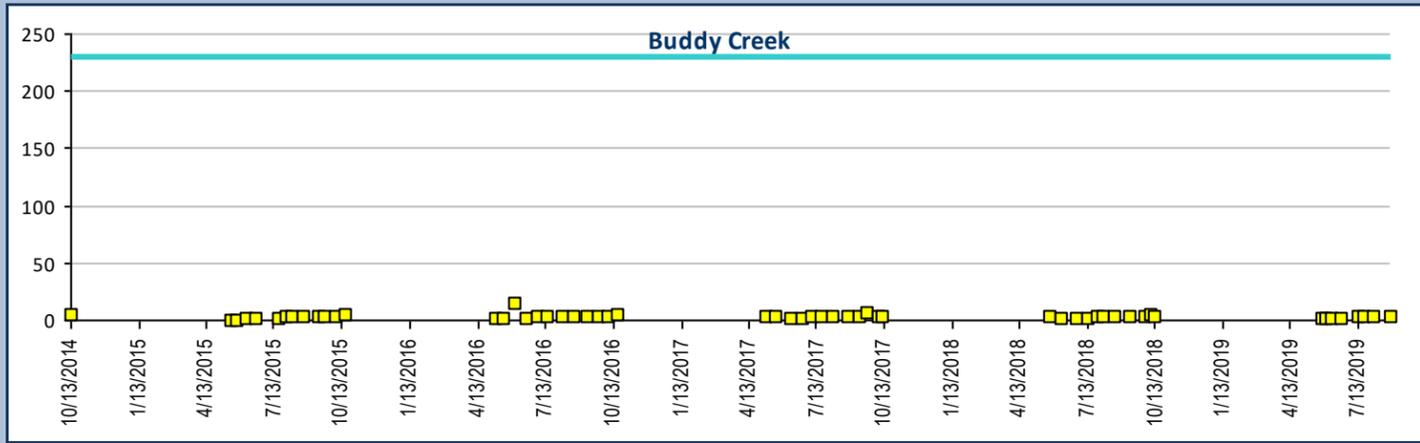
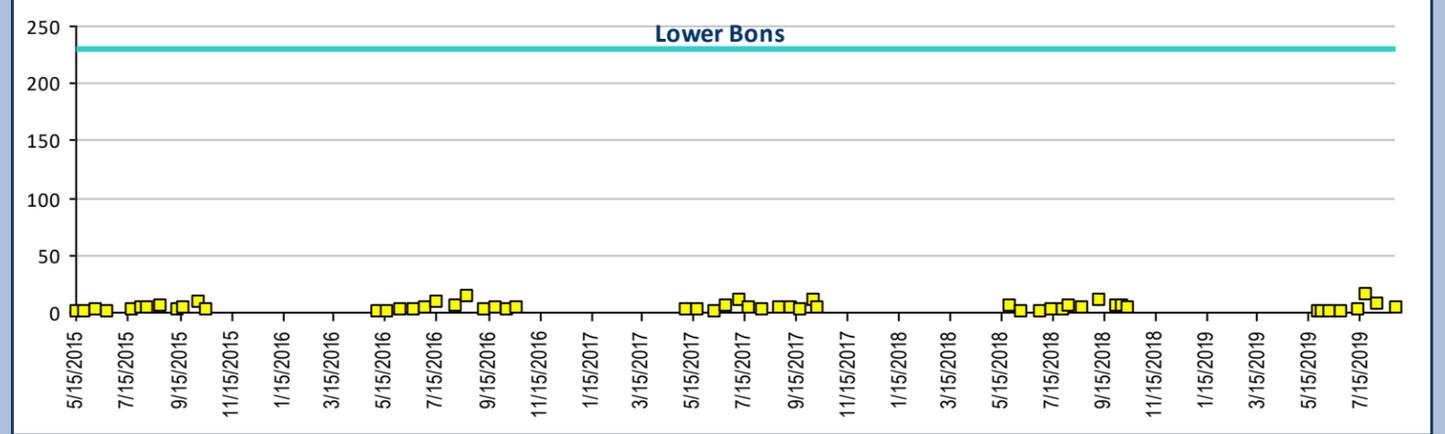


Water Monitoring Bons Creek Drainage
Water Quality Profile I, 5-Year Trend Charts

Chloride, Total recoverable, units mg/L

Aquatic Life - Fresh Water Chronic WQS mg/L

230 mg/L





Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts

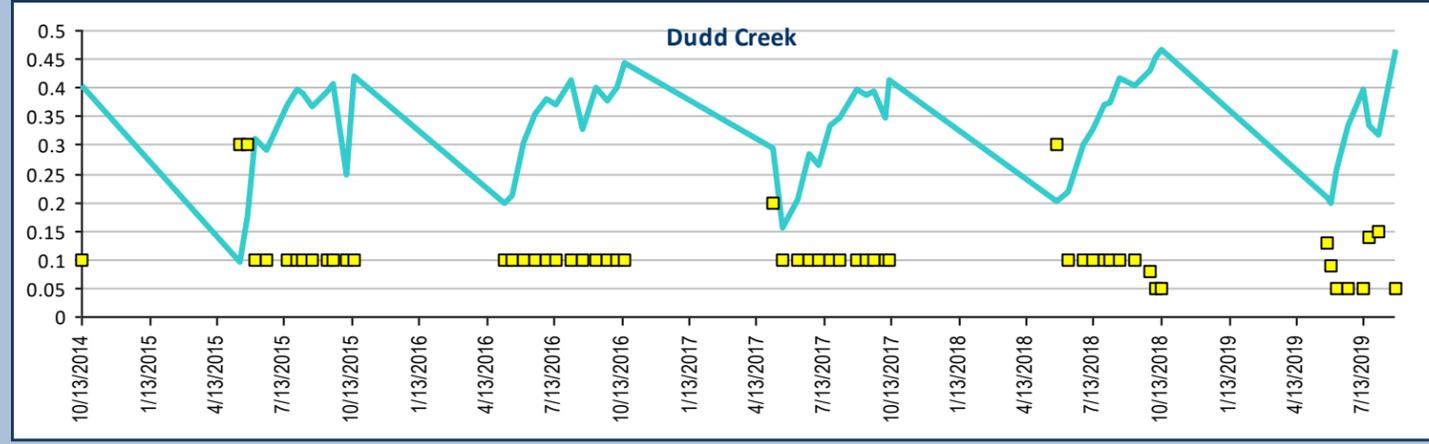
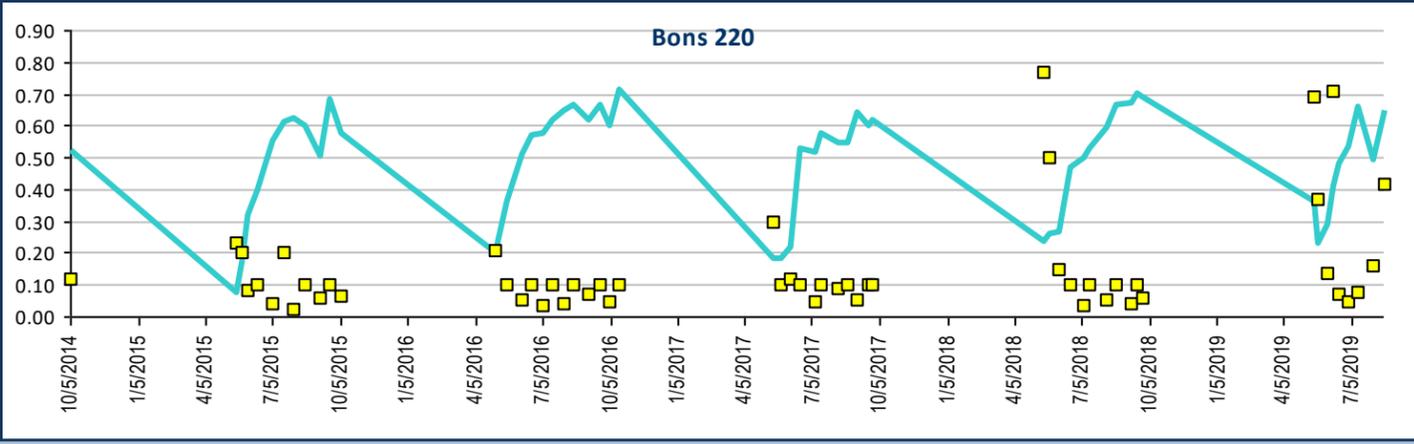
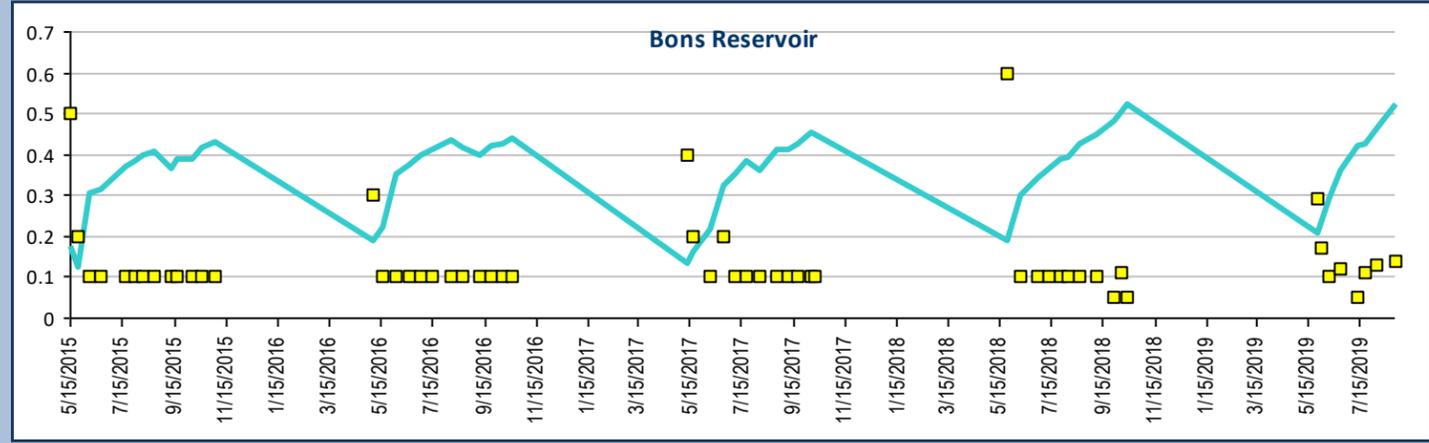
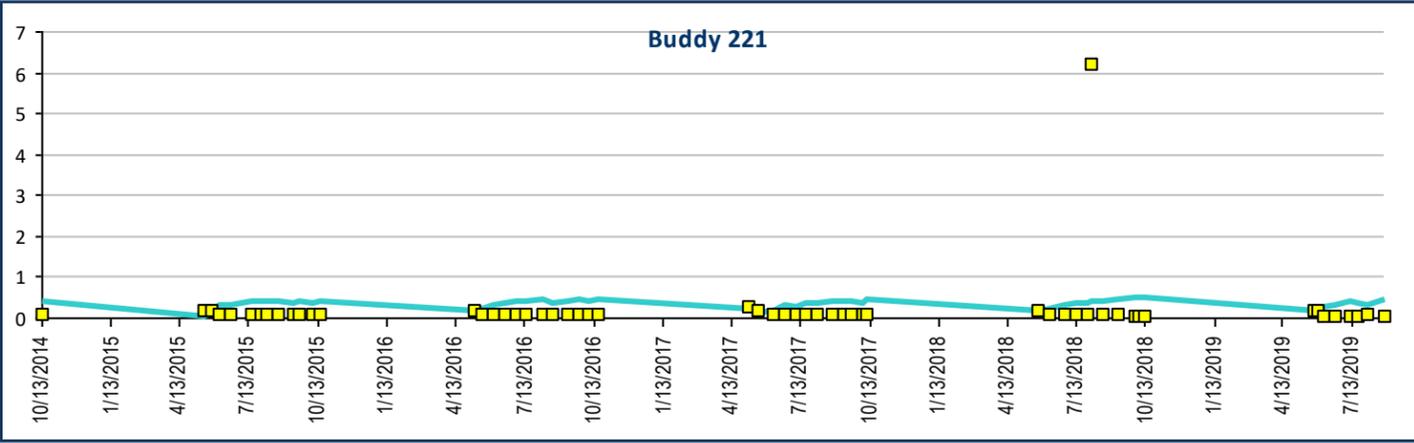
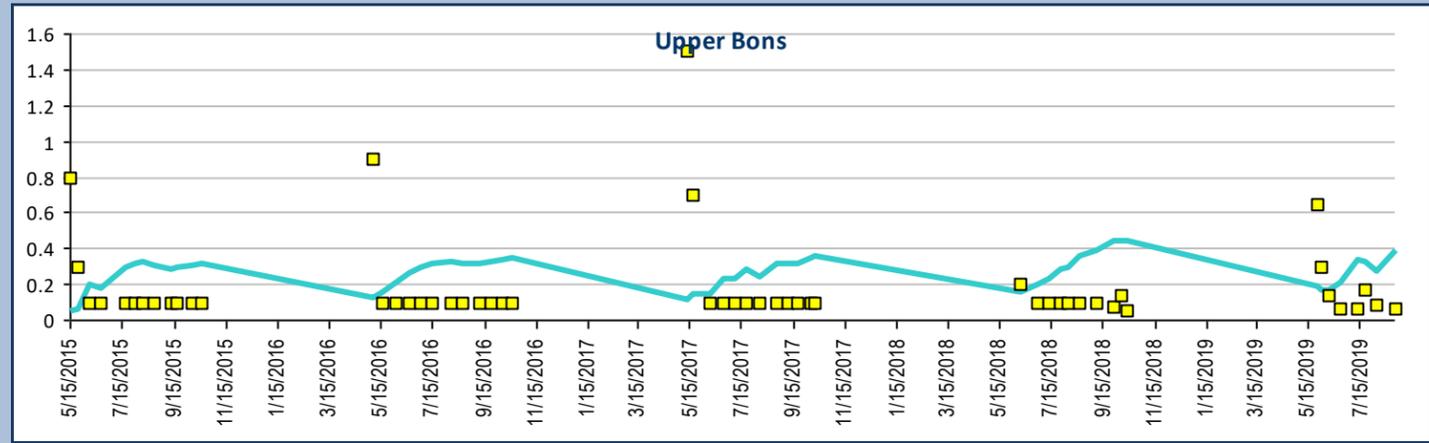
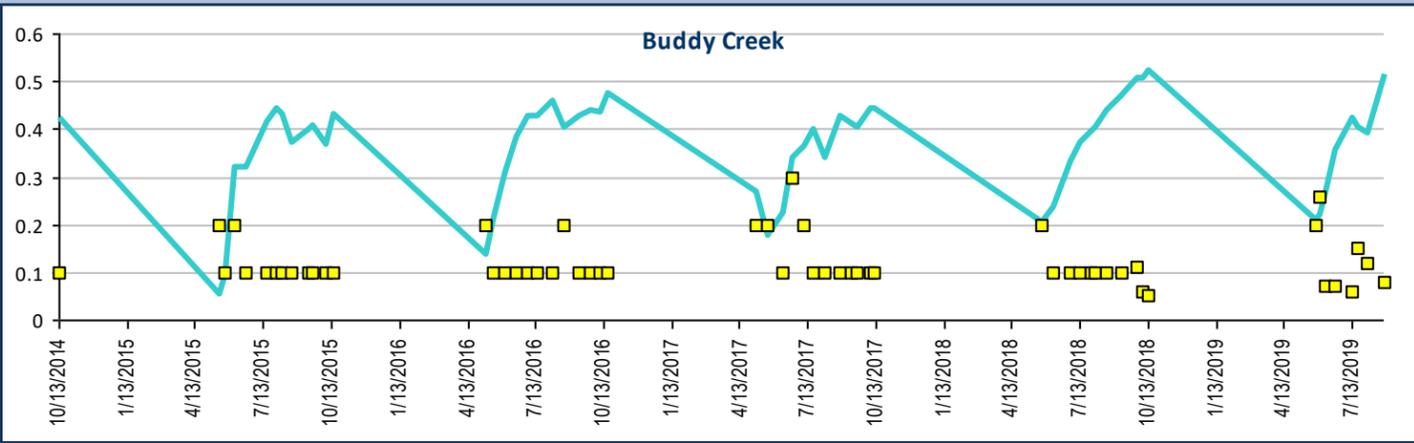
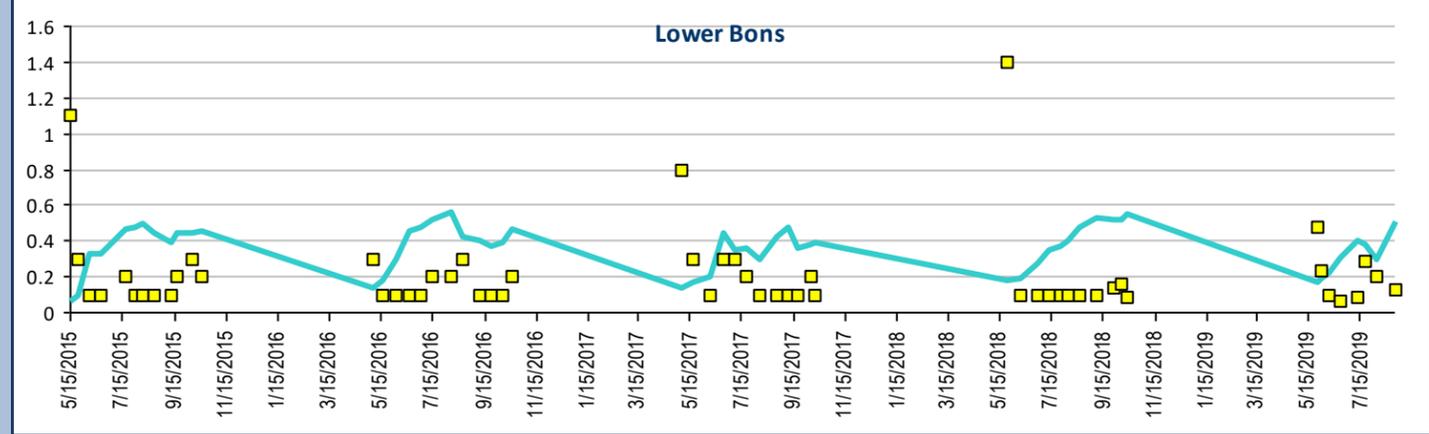
Cadmium, Total Recoverable, units ug/L

Aquatic Life - Fresh Water Chronic WQS ug/L

Hardness Dependent Calculation

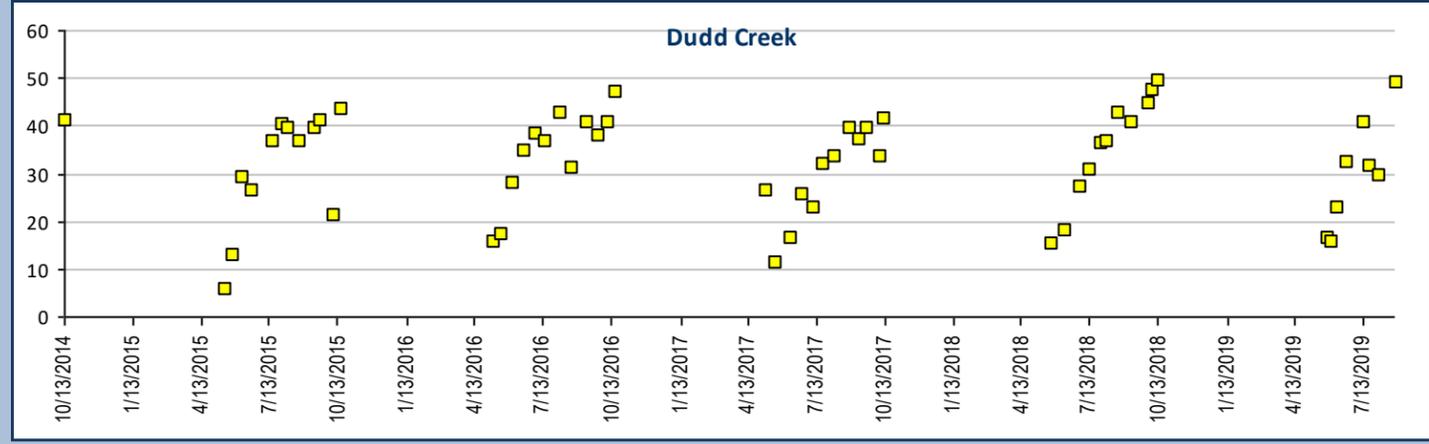
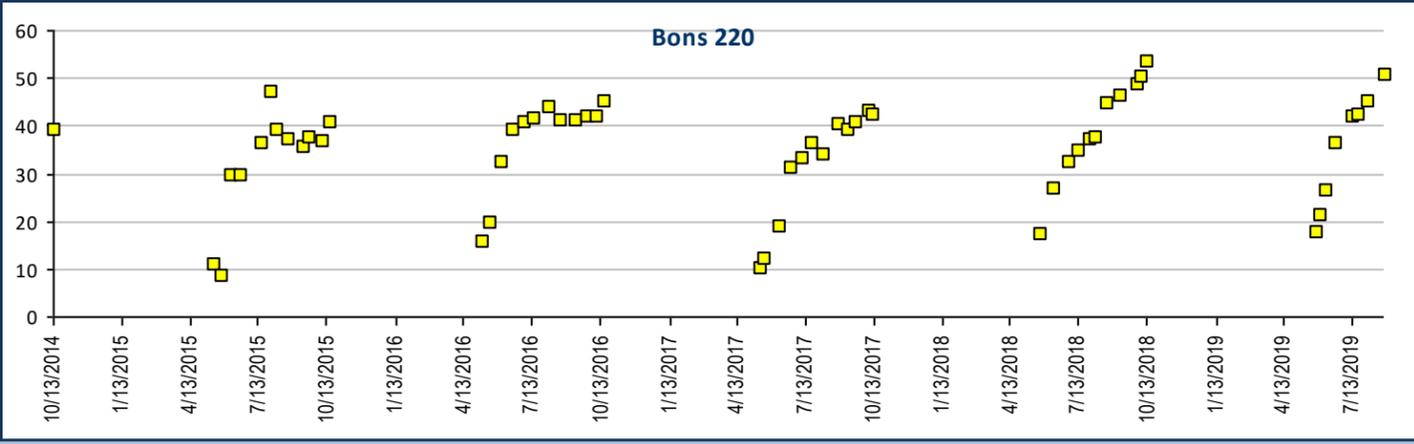
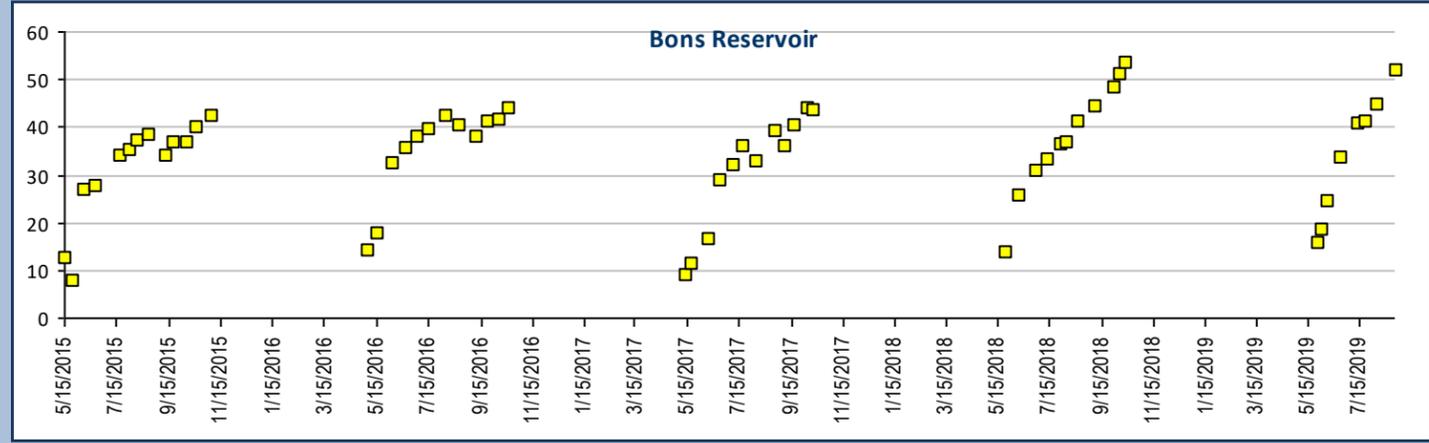
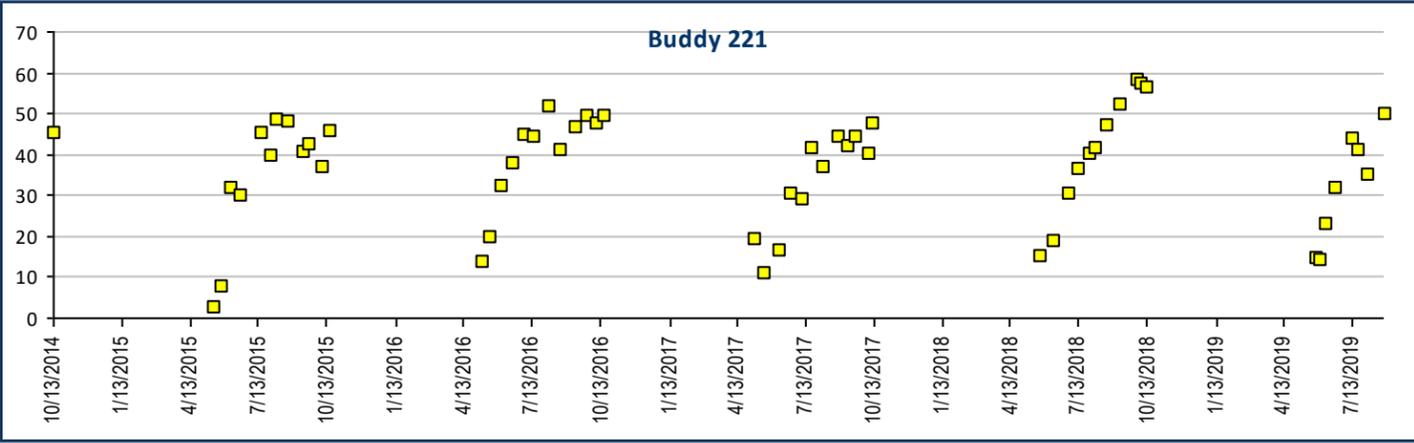
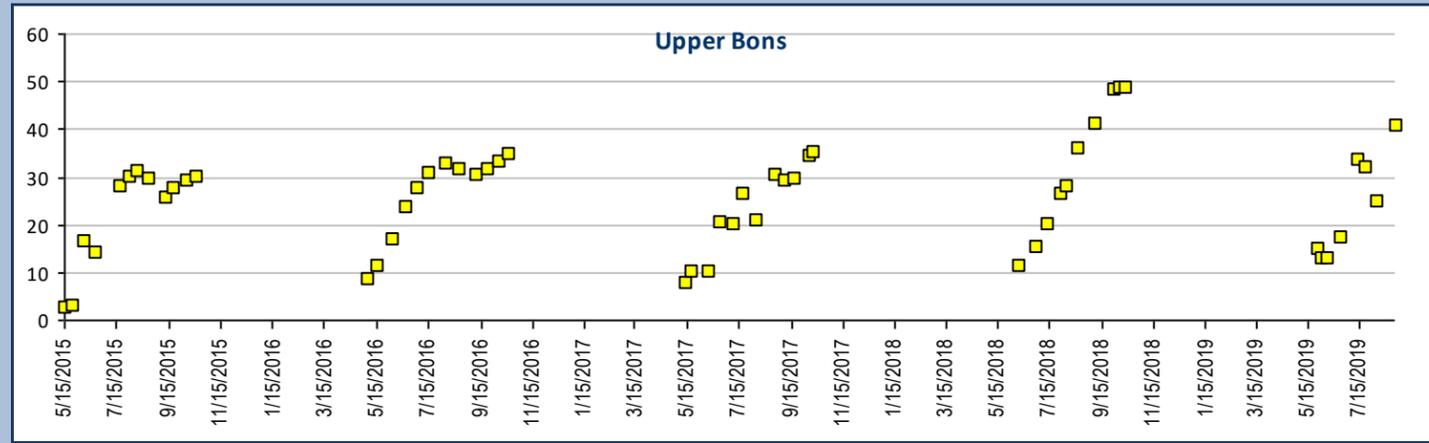
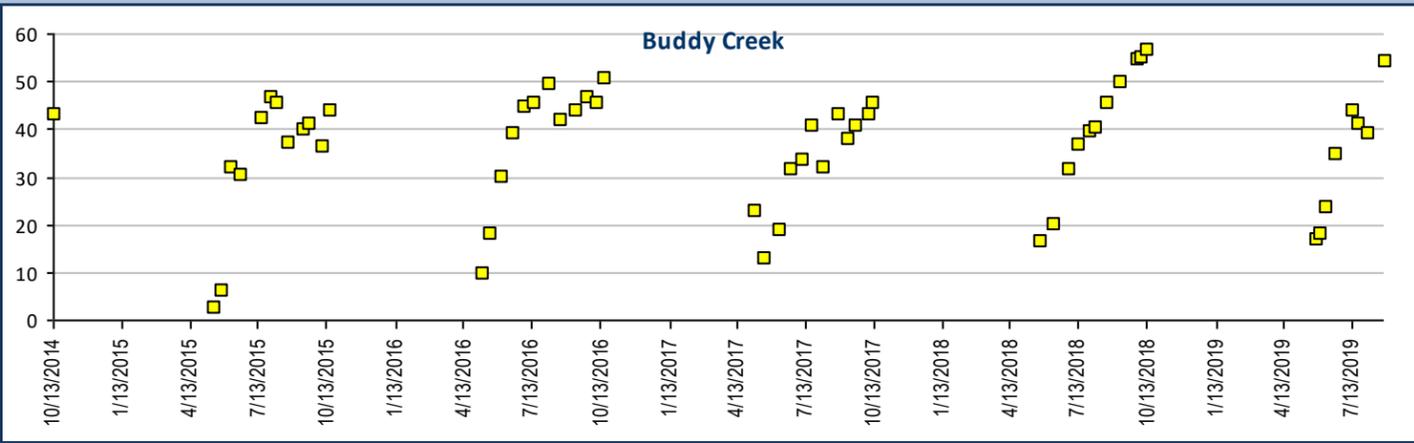
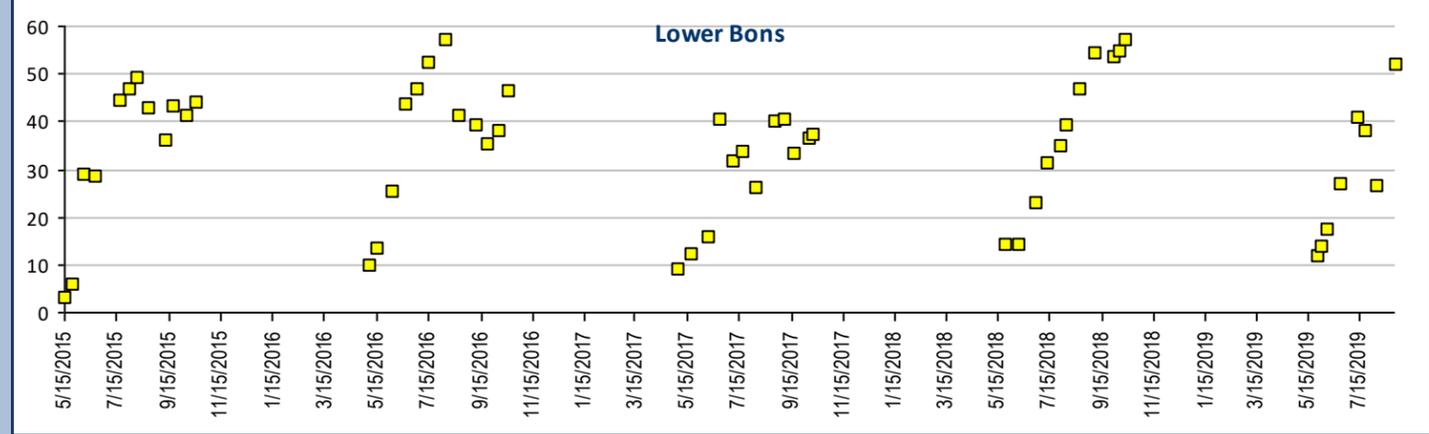
$$=EXP(0.7409*(LN(calc *hardness)))-4.719$$

* Calculated using Standard Methods 2340B





Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts Calcium, Total Recoverable, units mg/L



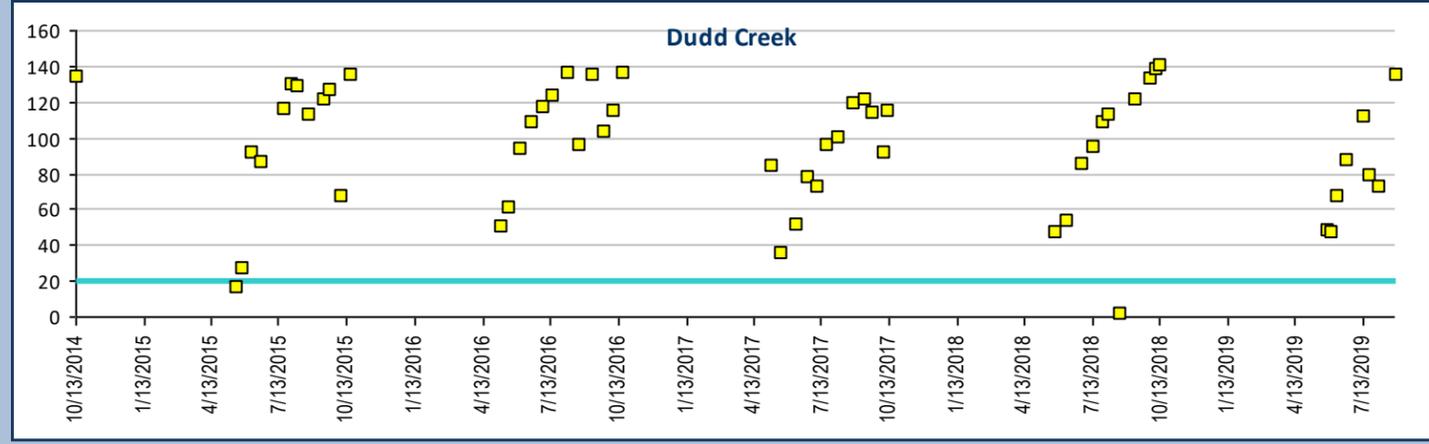
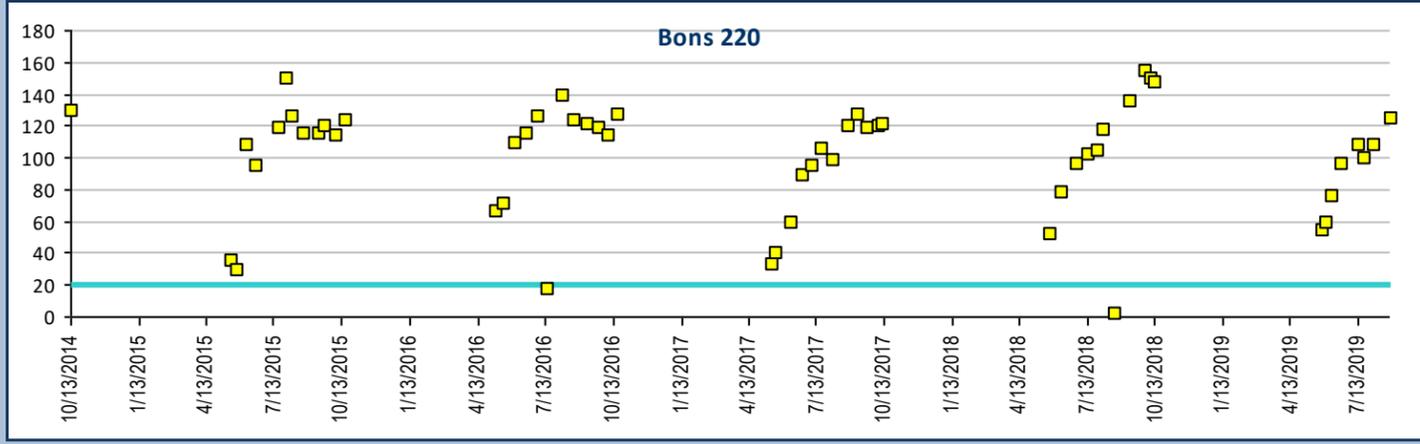
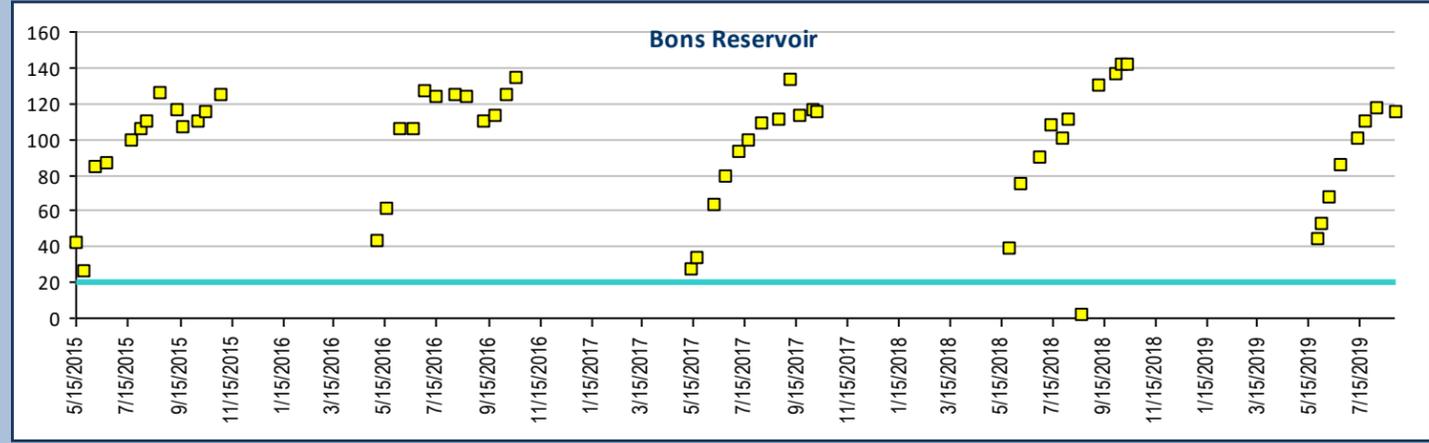
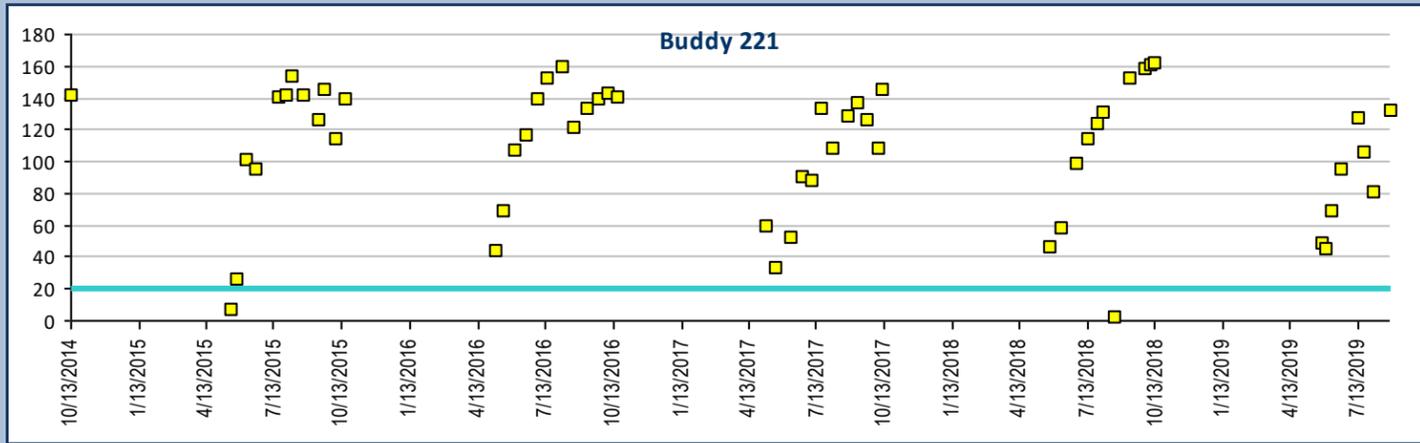
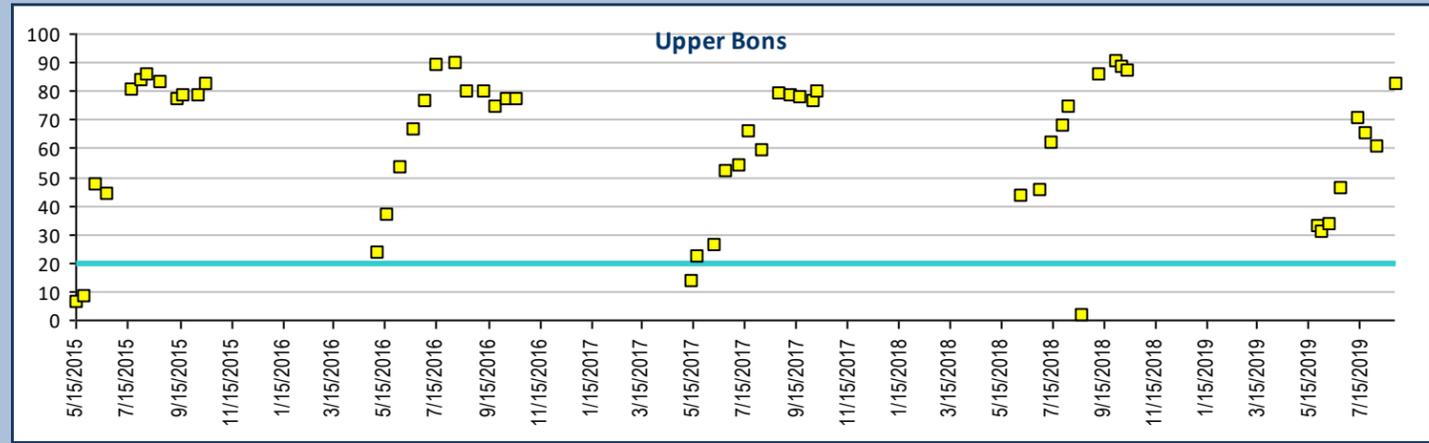
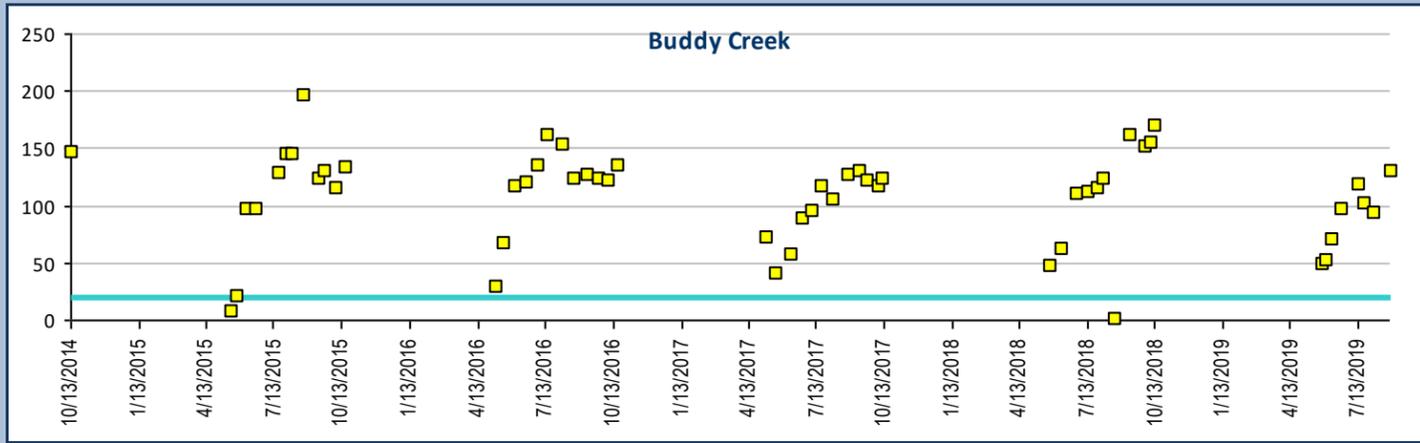
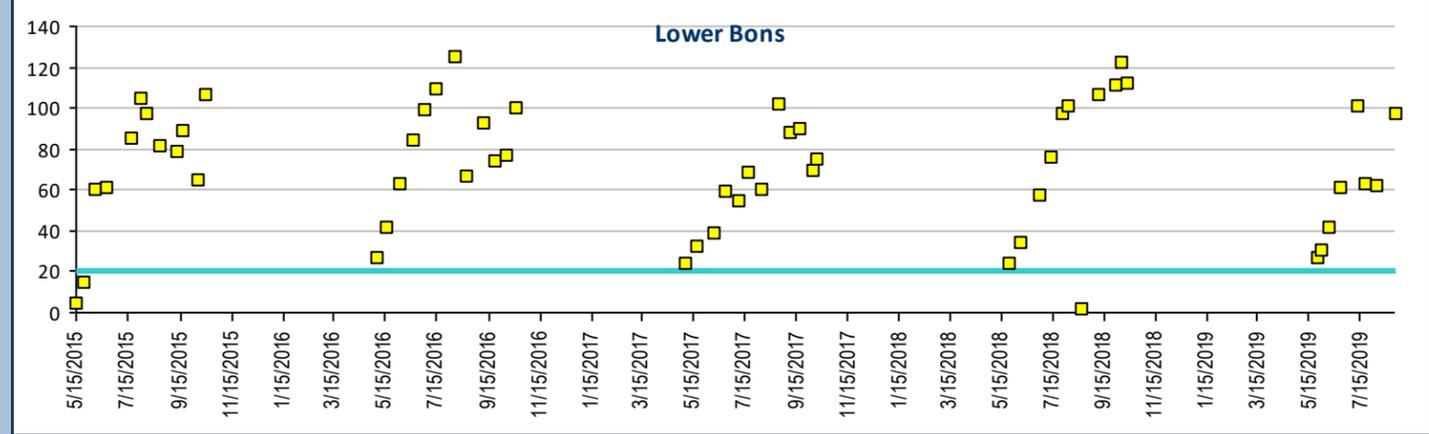


Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts

Alkalinity (as CaCO₃), units mg/L

Aquatic Life - Fresh Water Chronic WQS mg/L

20 mg/L minimum



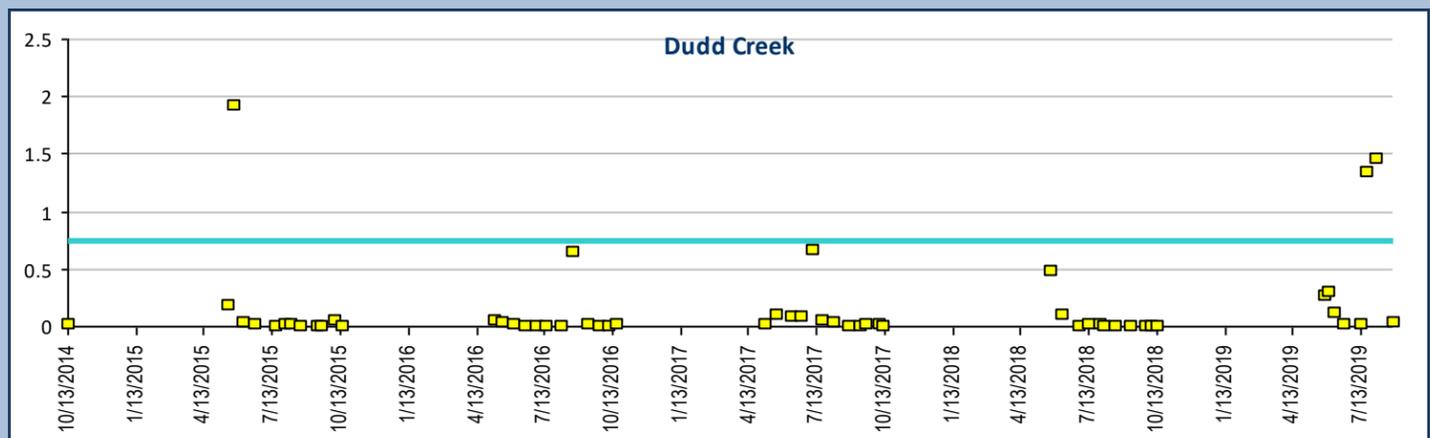
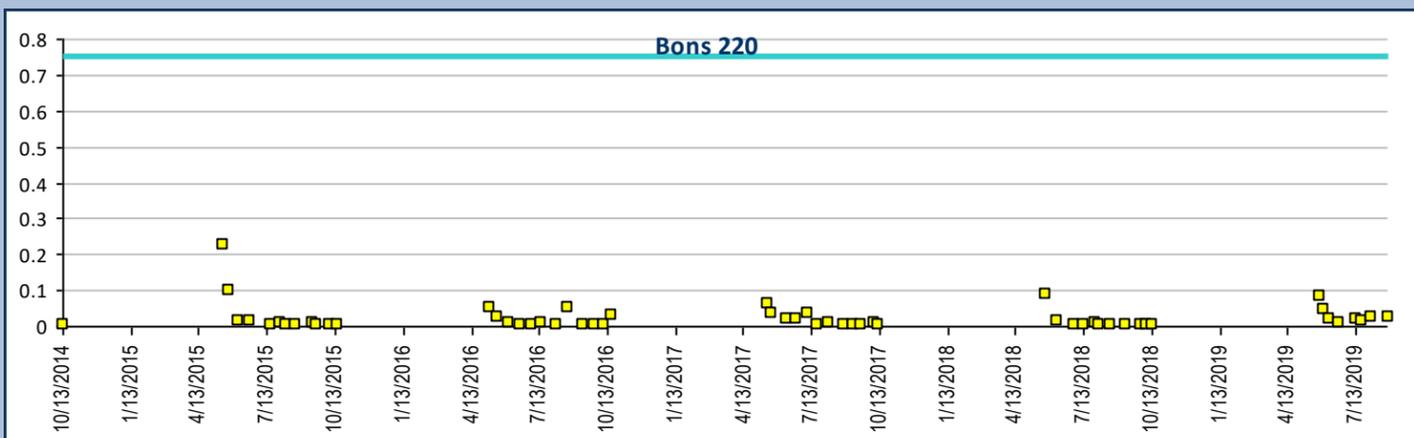
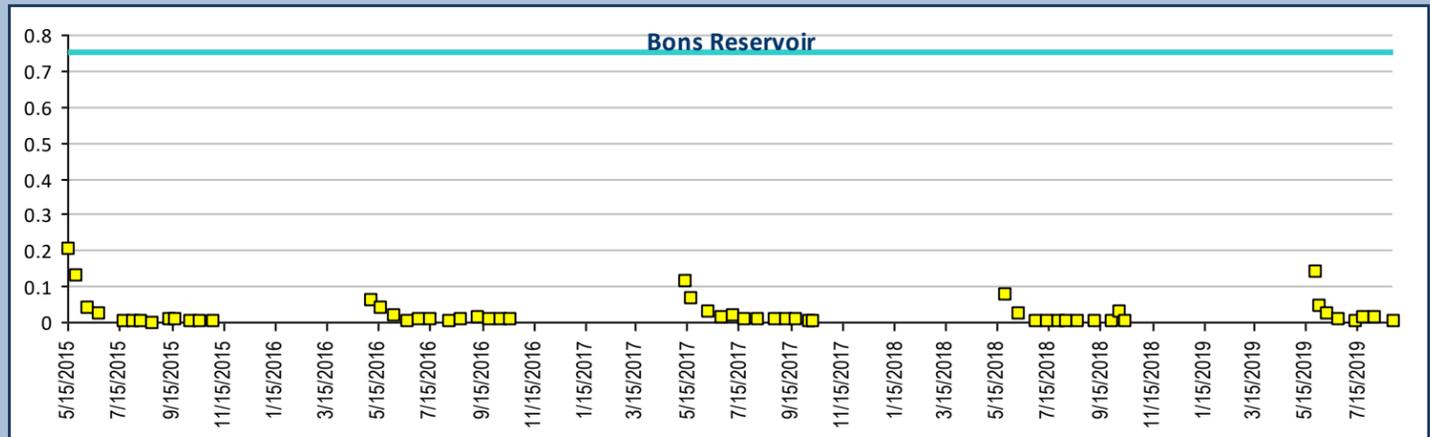
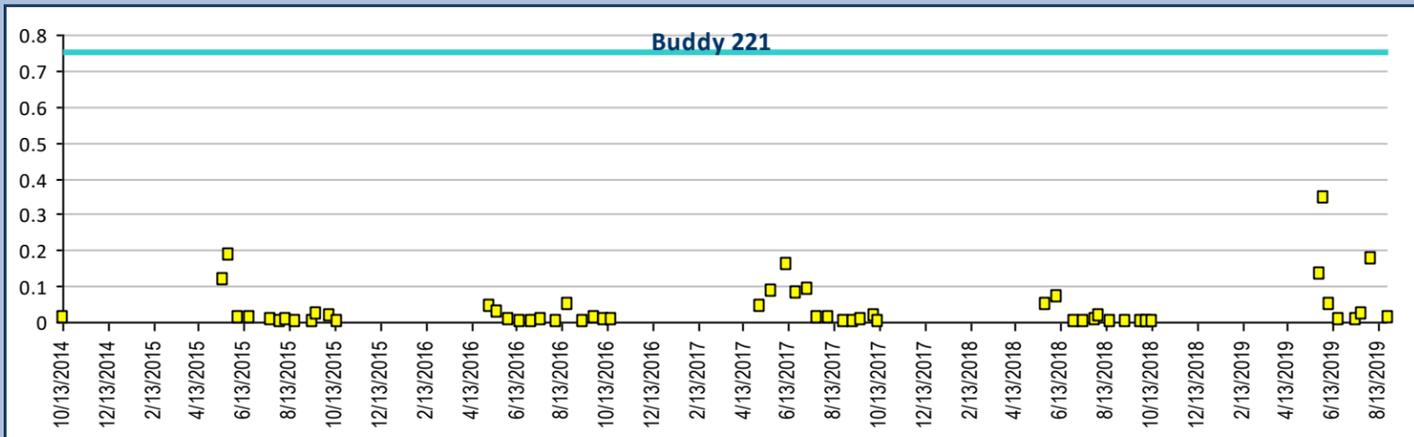
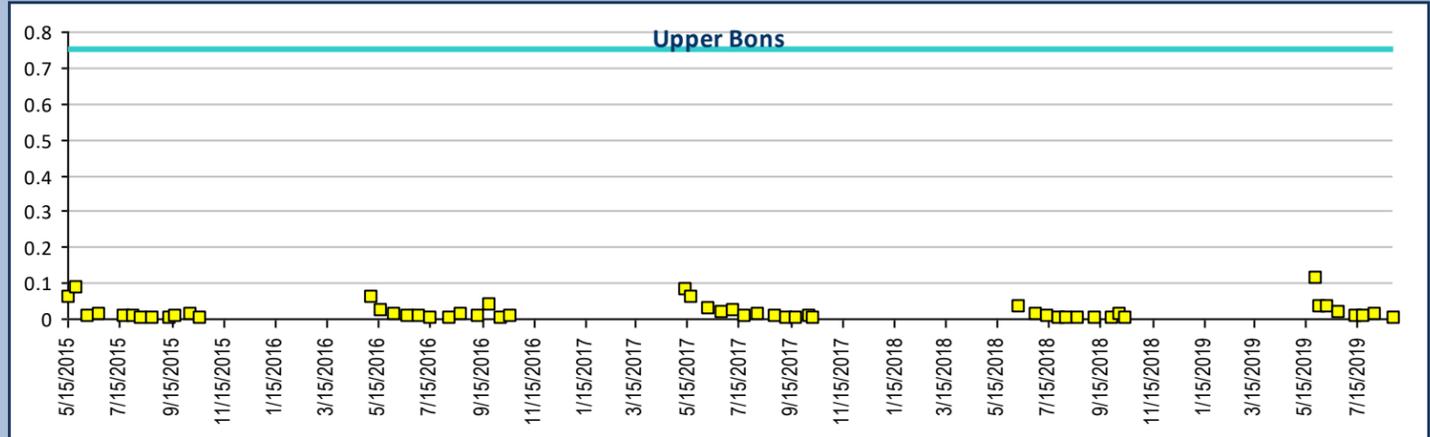
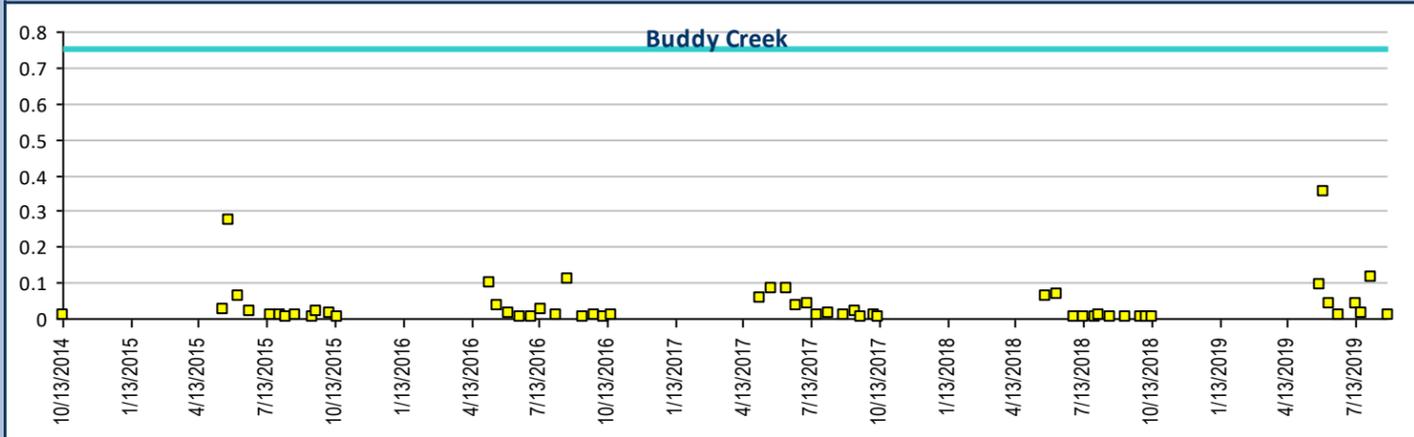
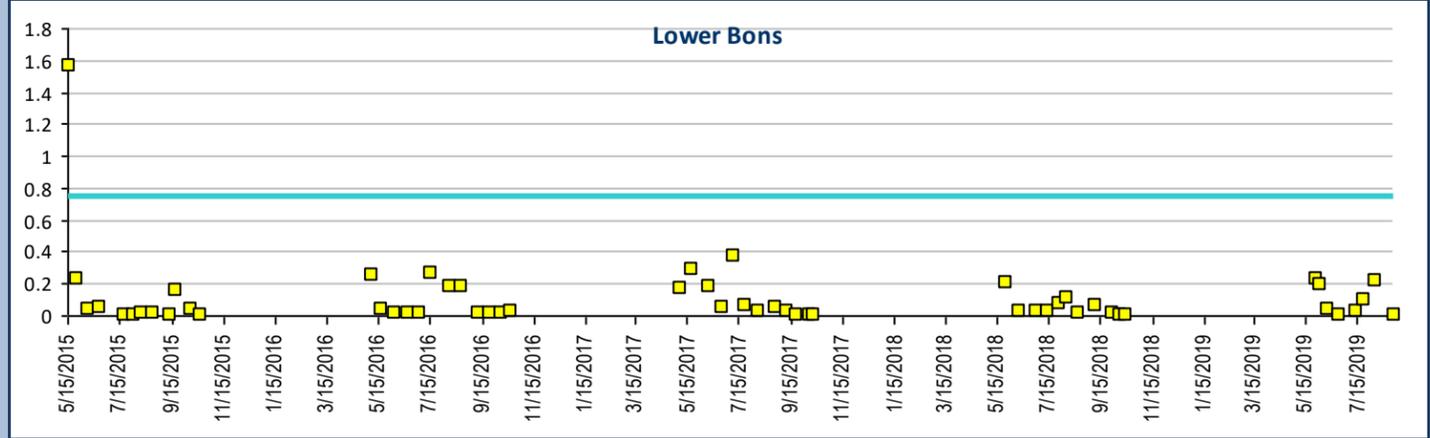


Water Monitoring Bons Creek Drainage Water Quality Profile I, 5-Year Trend Charts

Aluminum, Total Recoverable, units mg/L

Aquatic Life - Fresh Water Chronic WQS mg/L

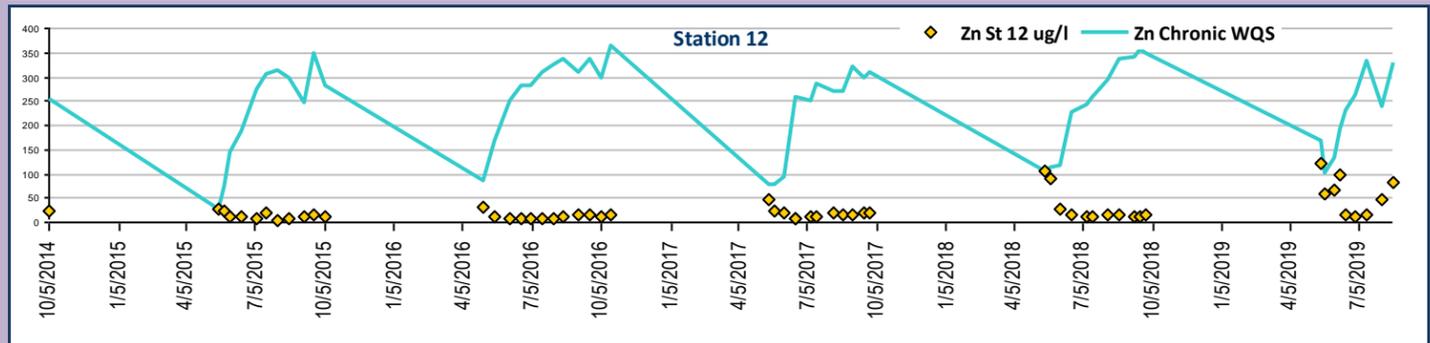
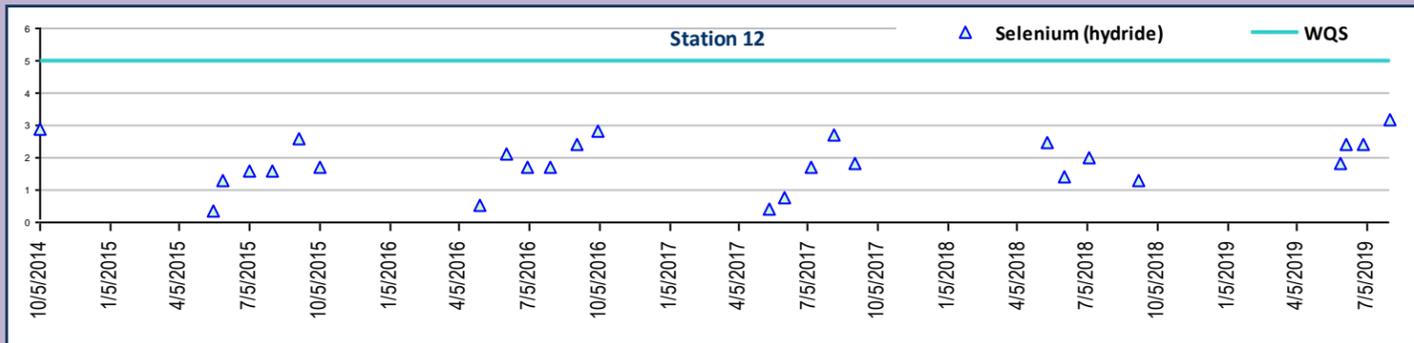
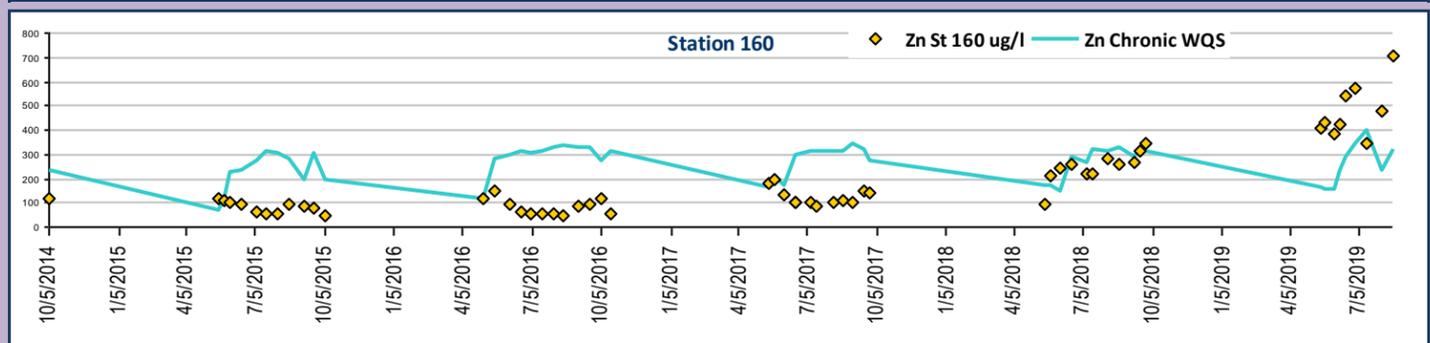
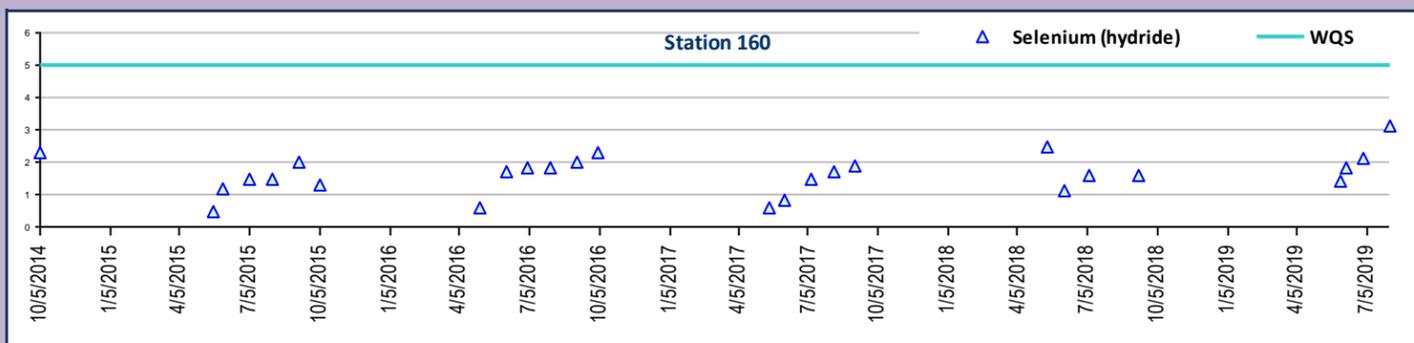
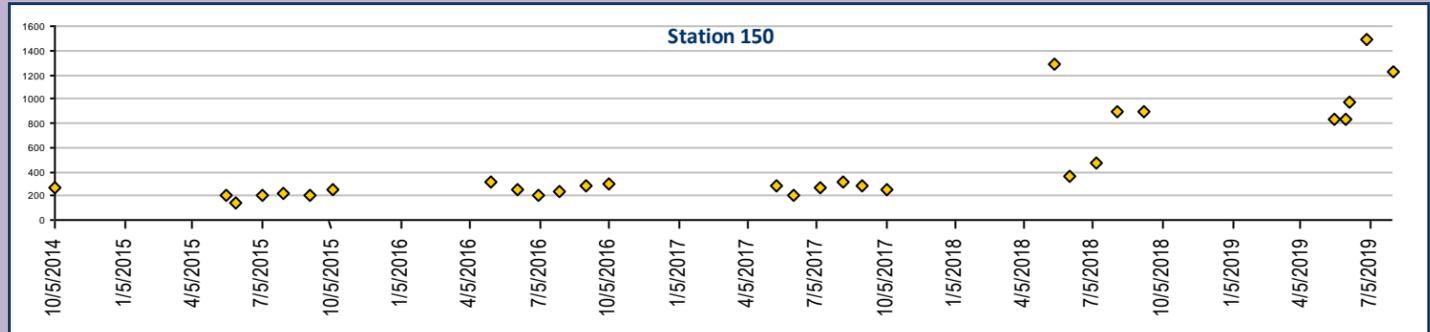
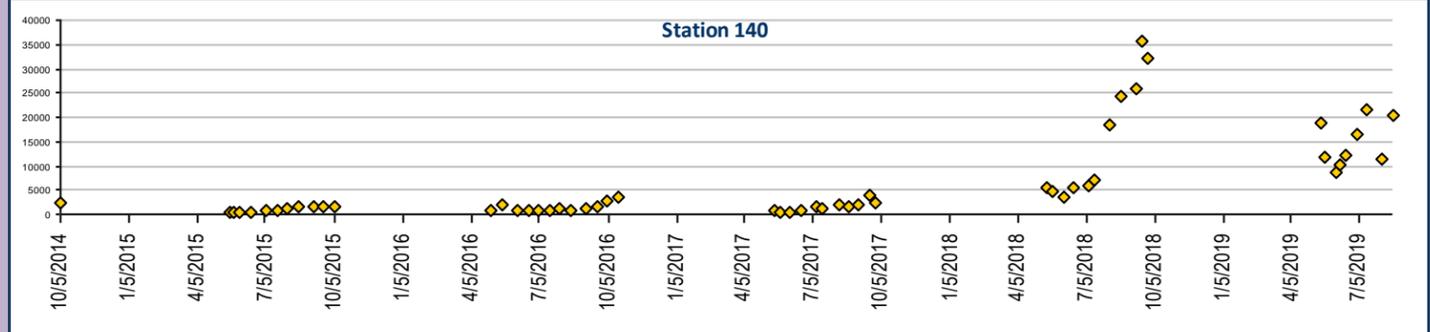
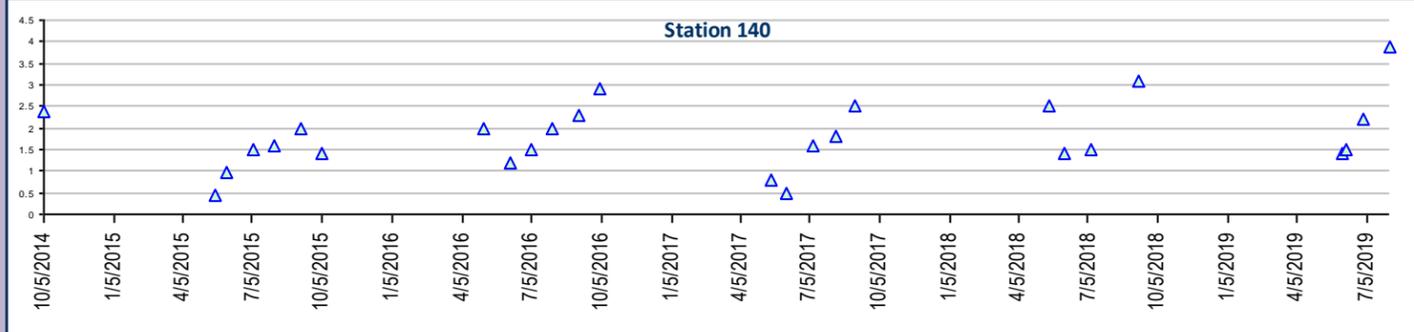
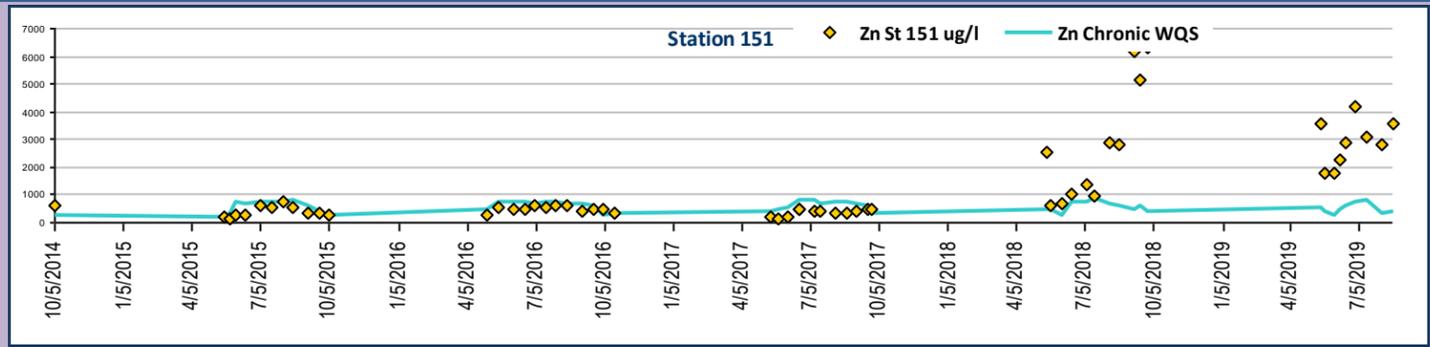
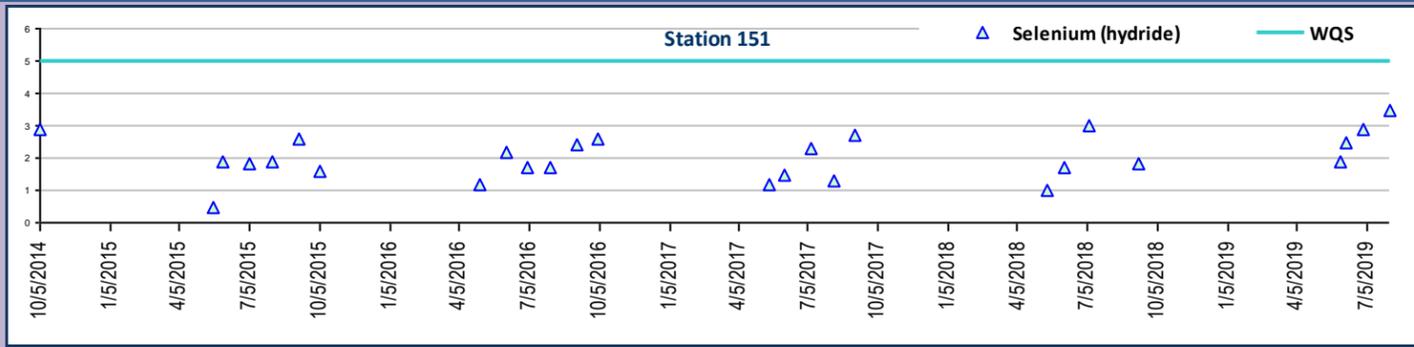
If pH > 7 and hardness > 50. then WQS = 0.75mg/l



Appendix F: Water Quality Profile I Charts – APDES Monitoring Stations

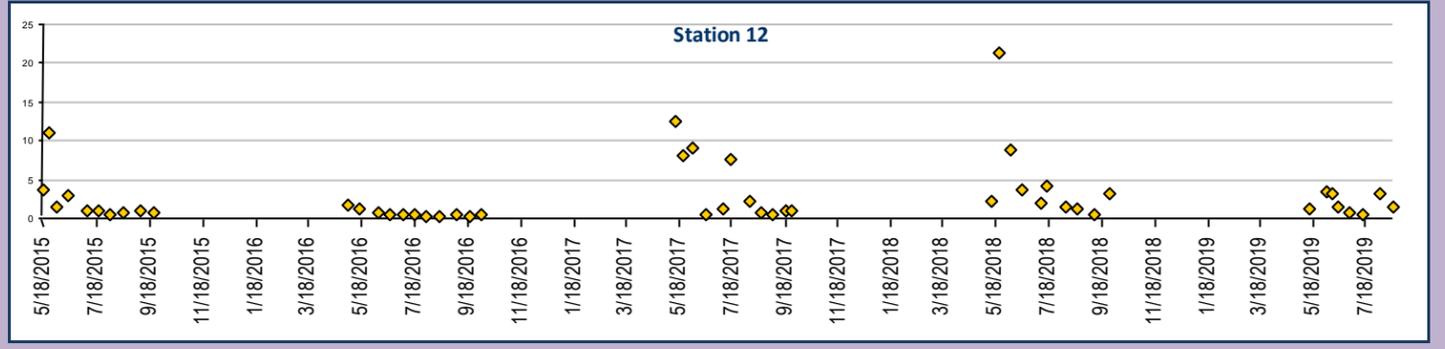
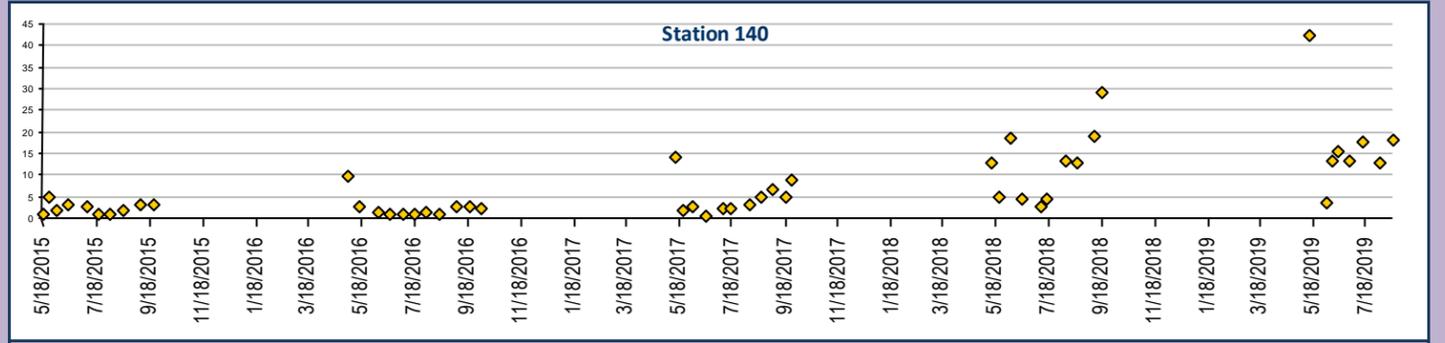
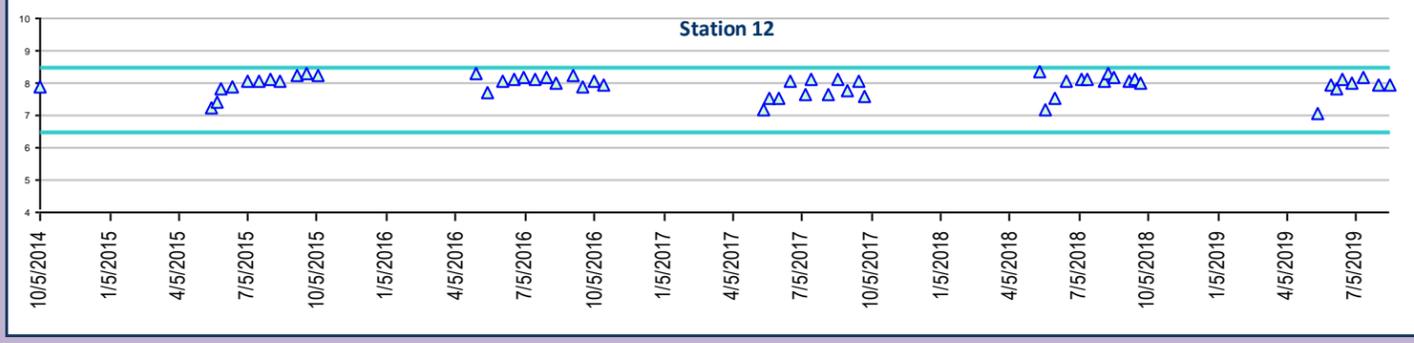
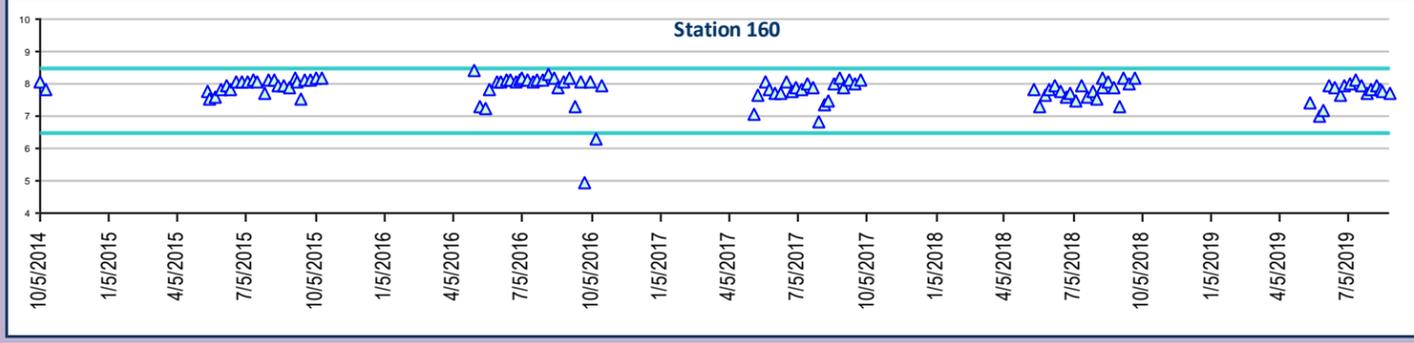
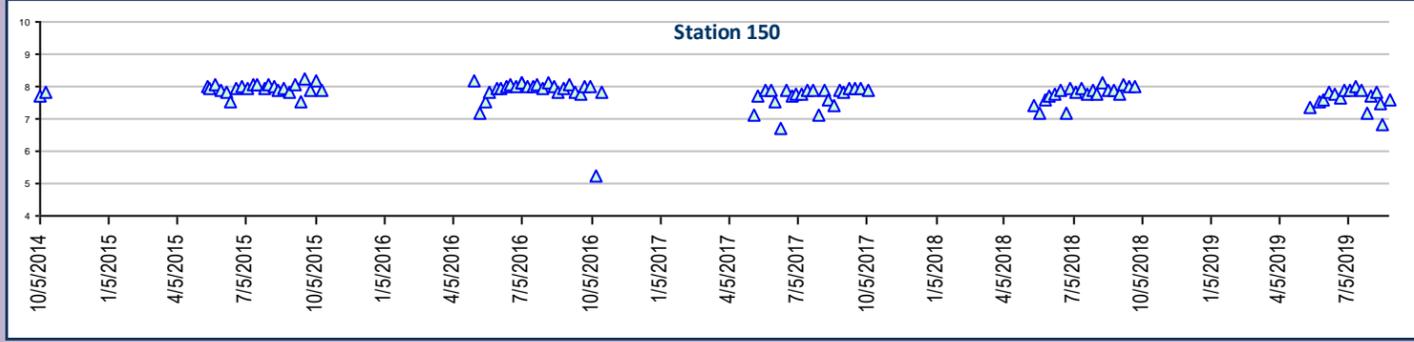
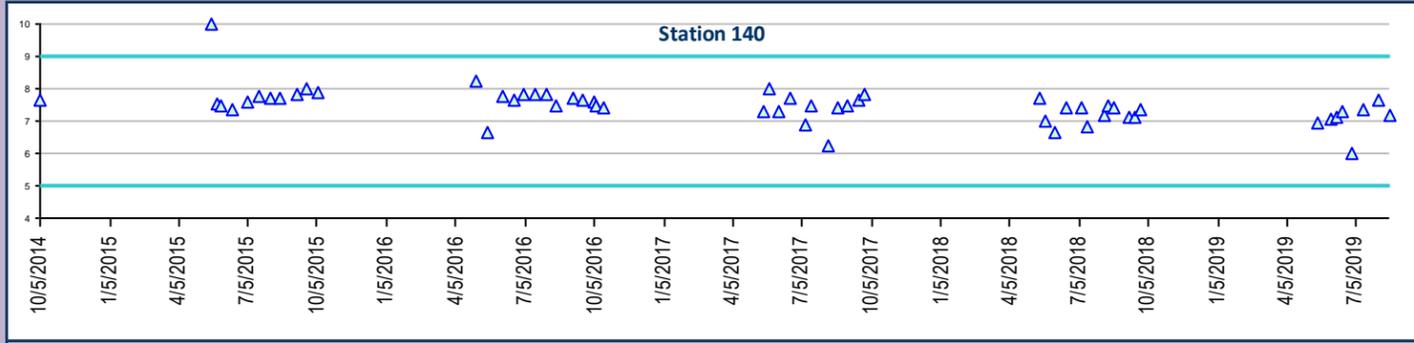
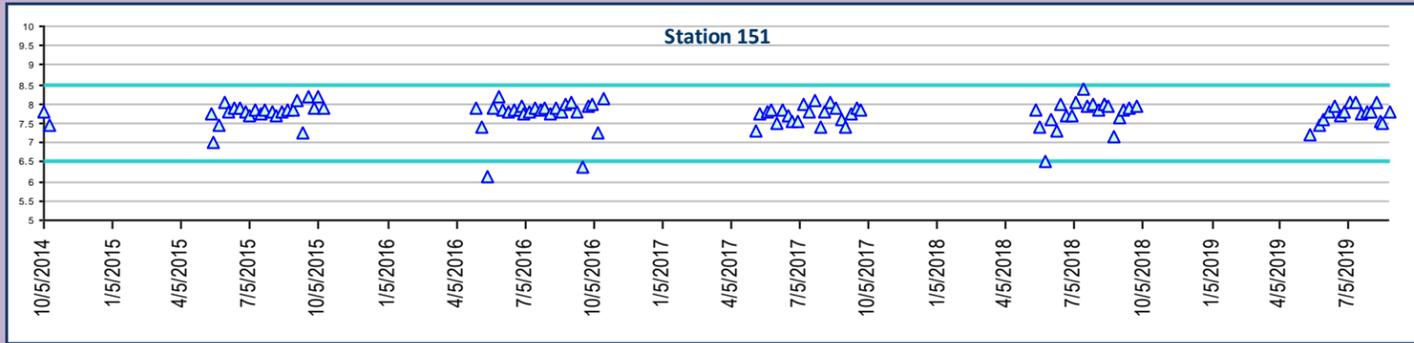
APDES Stations : Selenium, units, ug/l - 5 Year Trend

APDES Stations : Zinc, Total, units ug/l - 5 Year Trend



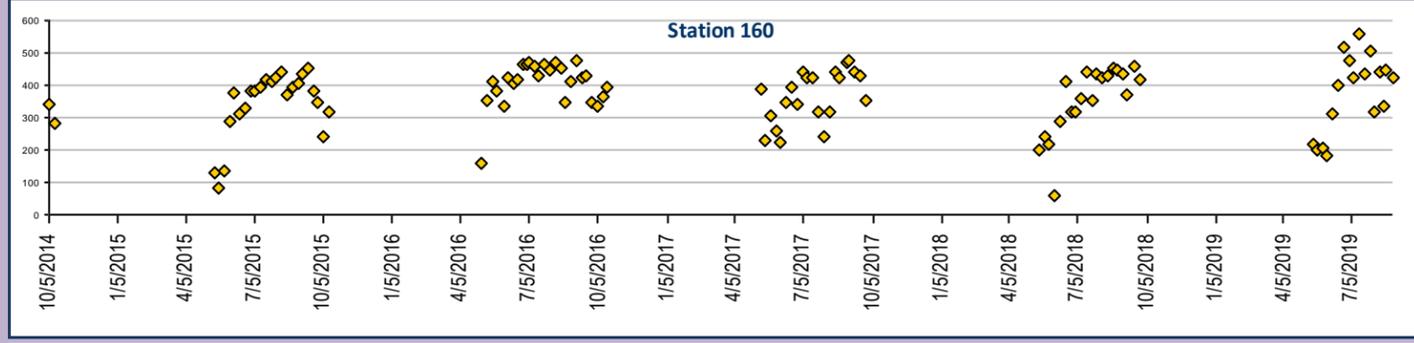
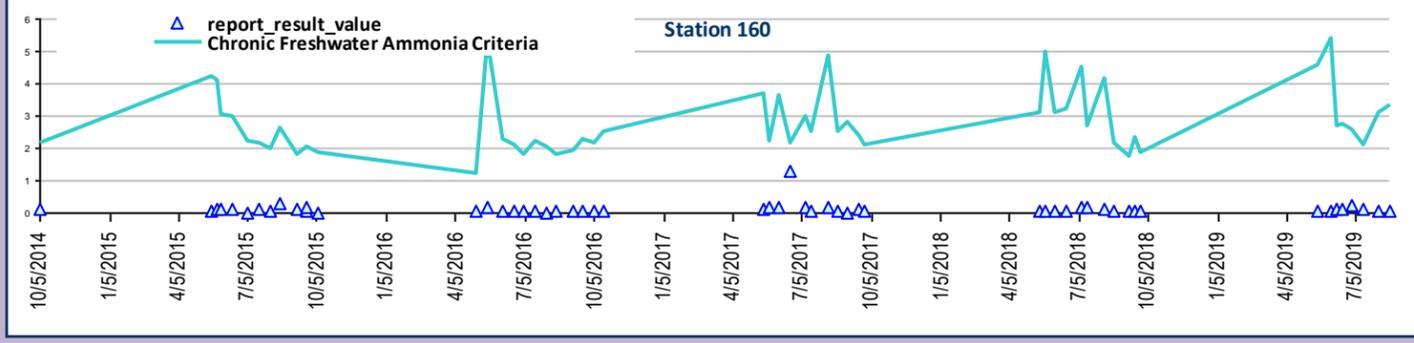
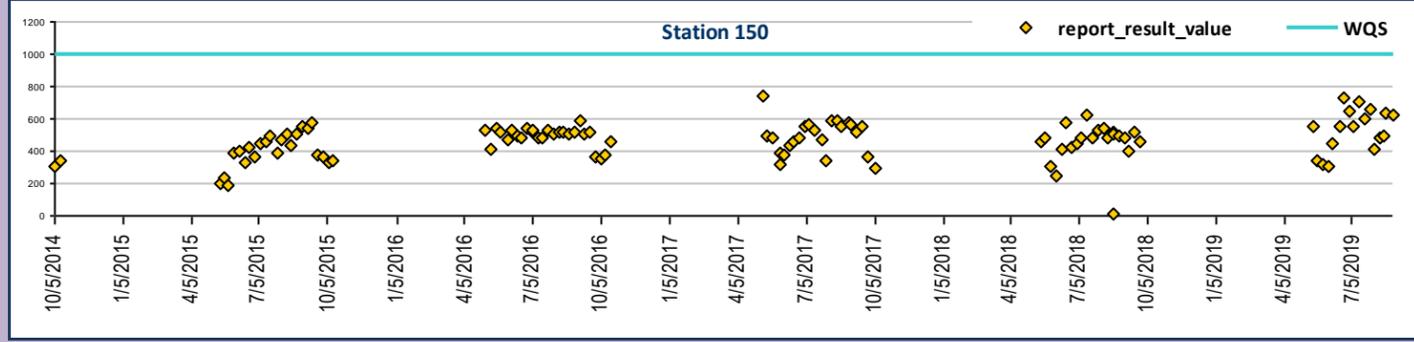
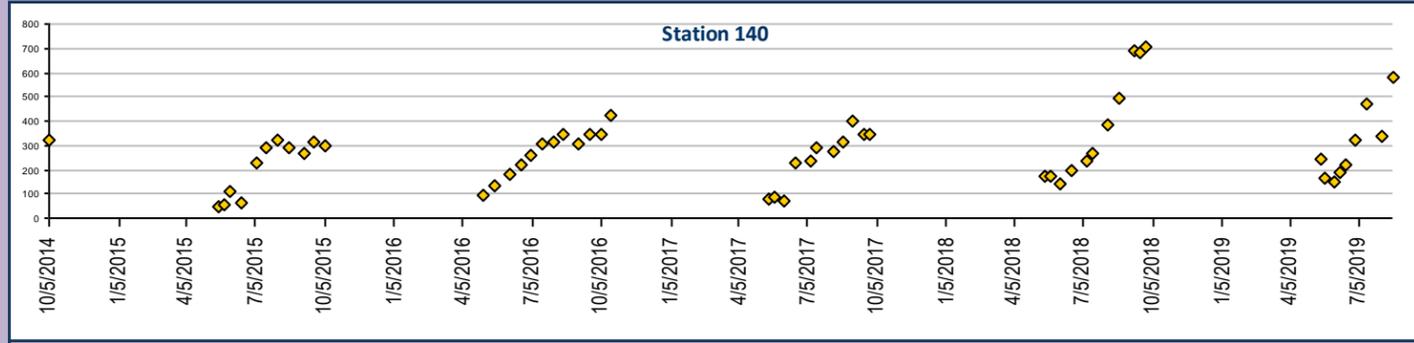
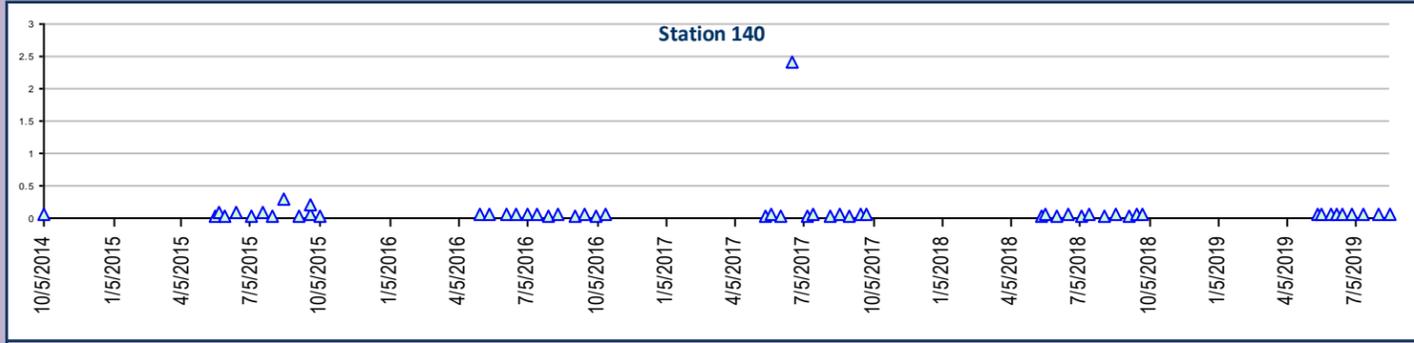
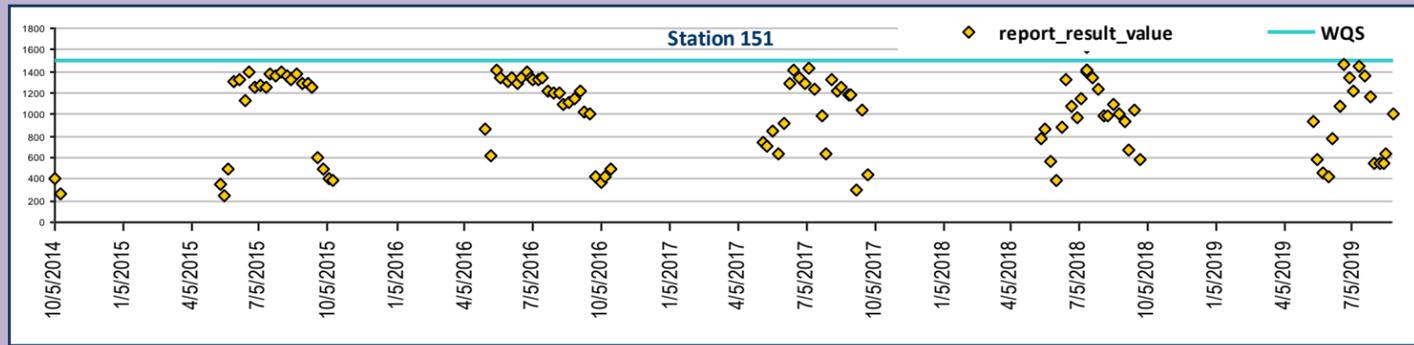
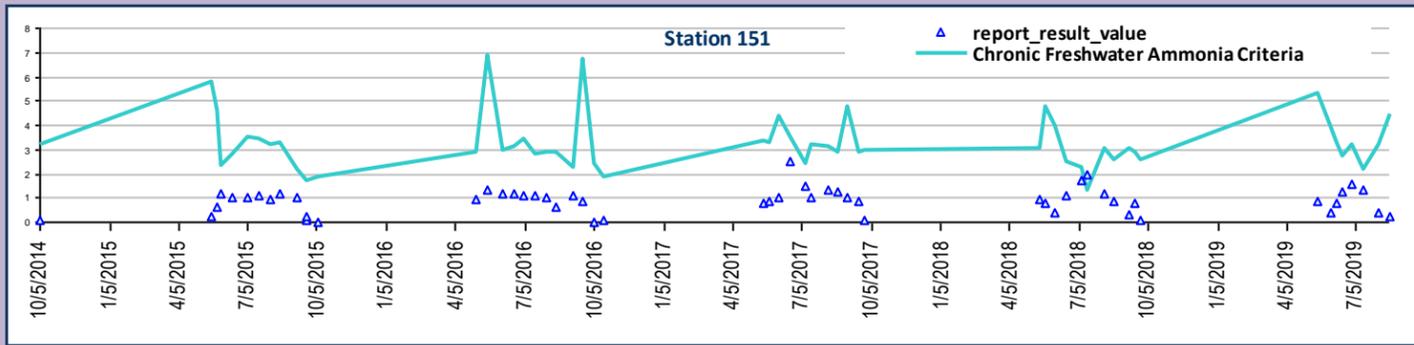
APDES Stations : pH, units - 5 Year Trend

APDES Stations : Turbidity, Total, units NTU - 5 Year Trend **Teck**



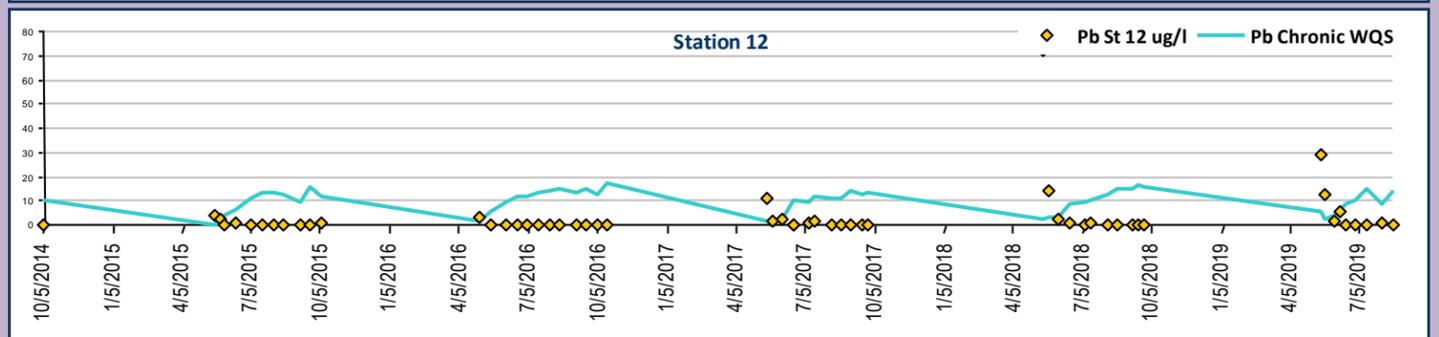
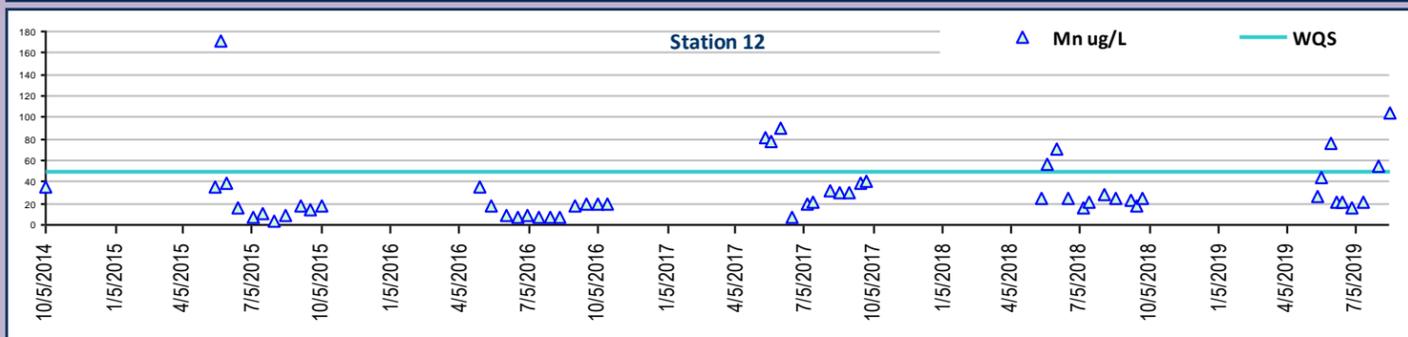
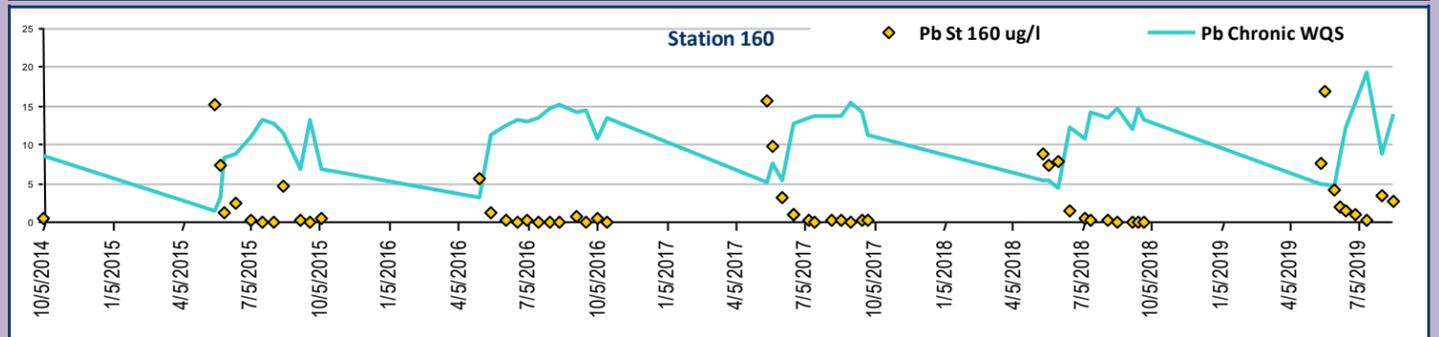
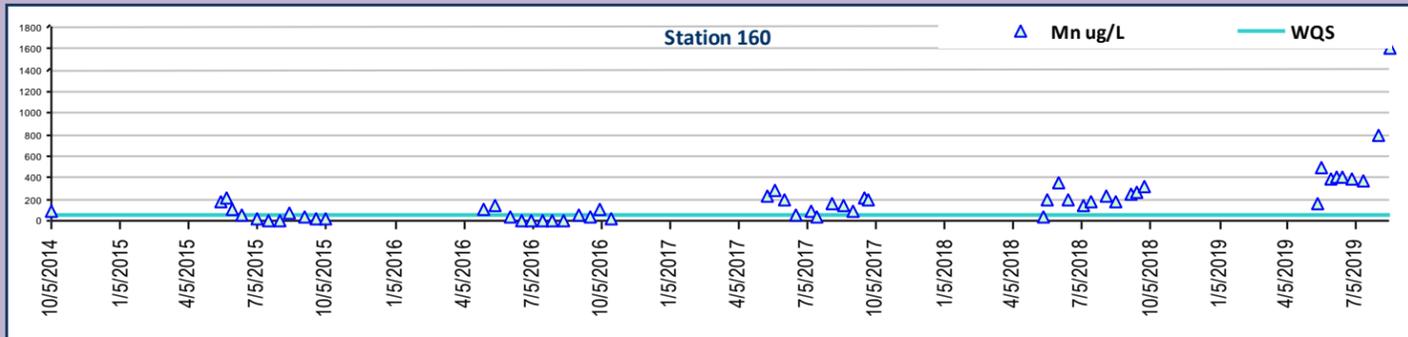
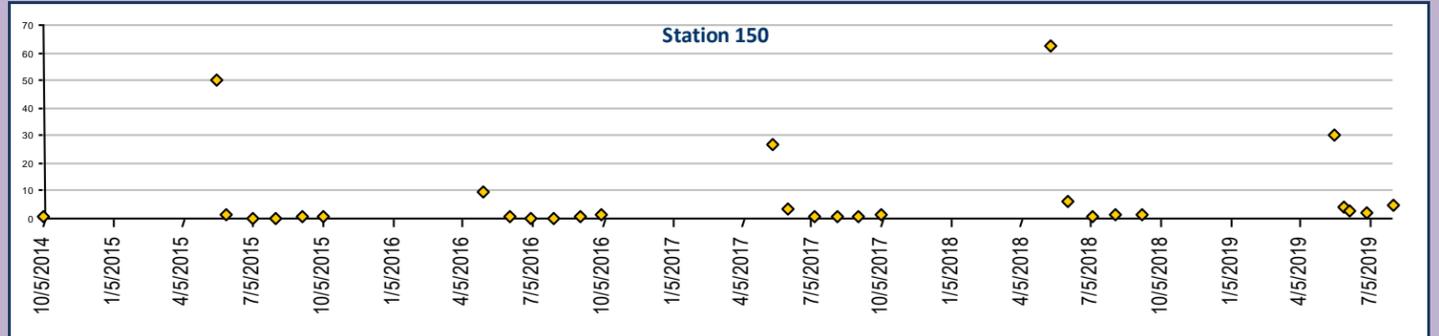
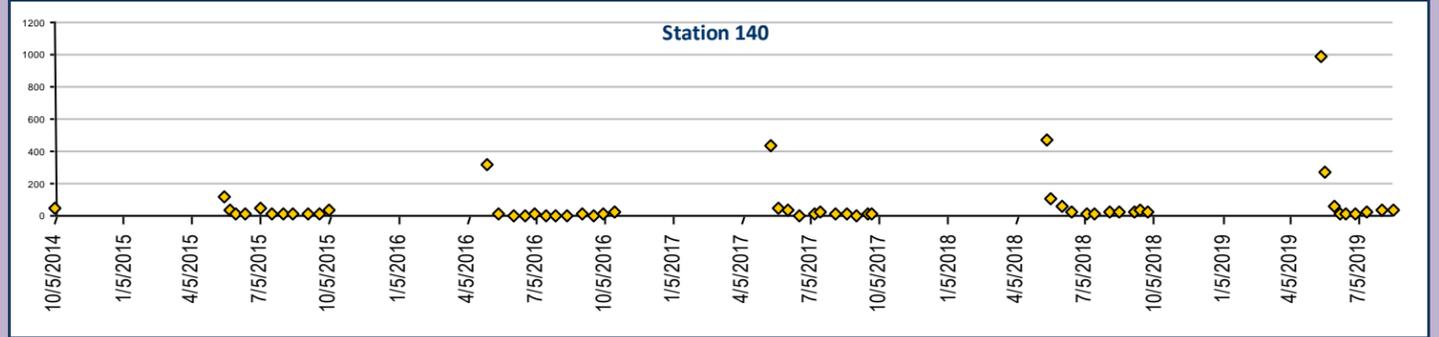
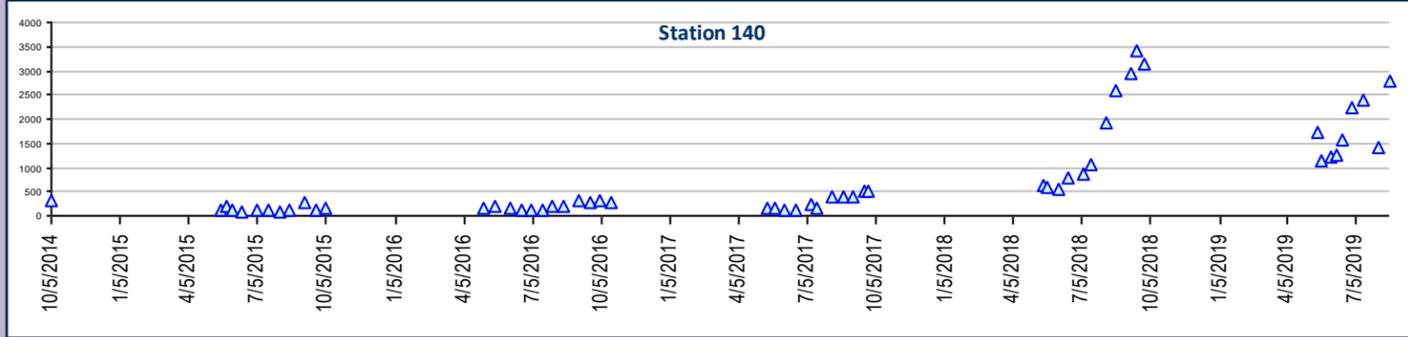
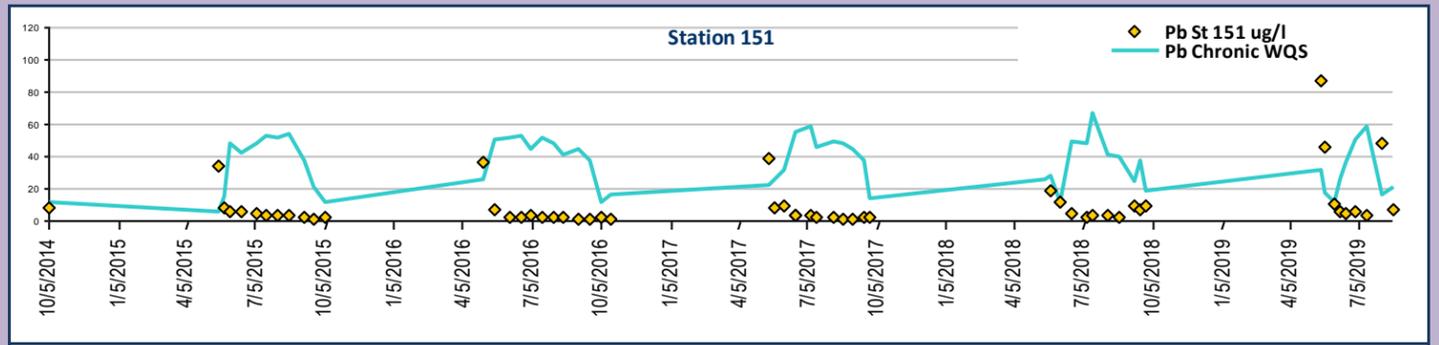
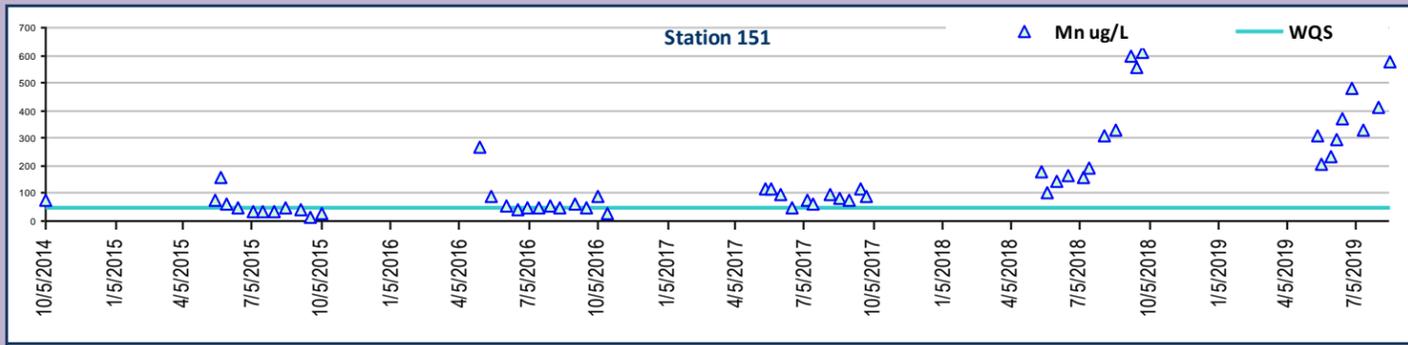
APDES Stations : NH3-N, Total, units mg/l - 5 Year Trend

APDES Stations : TDS, units mg/l - 5 Year Trend



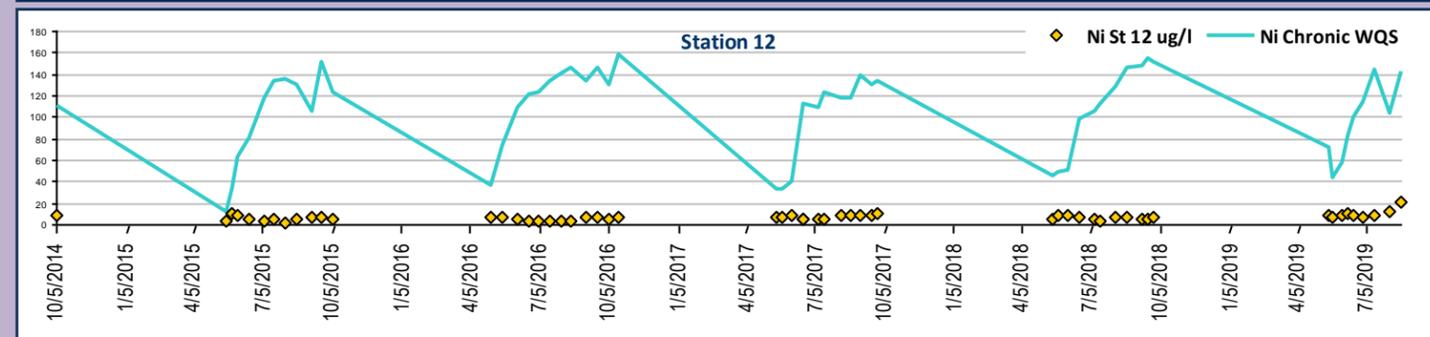
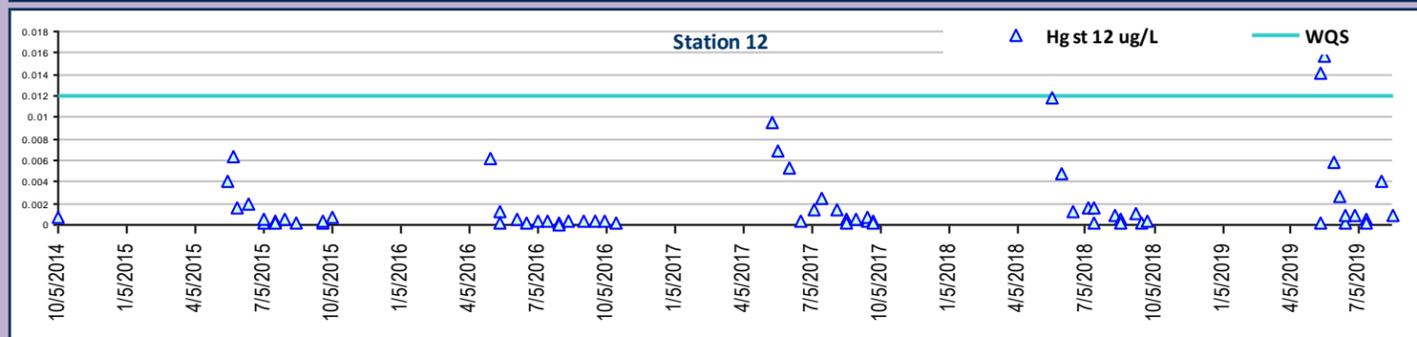
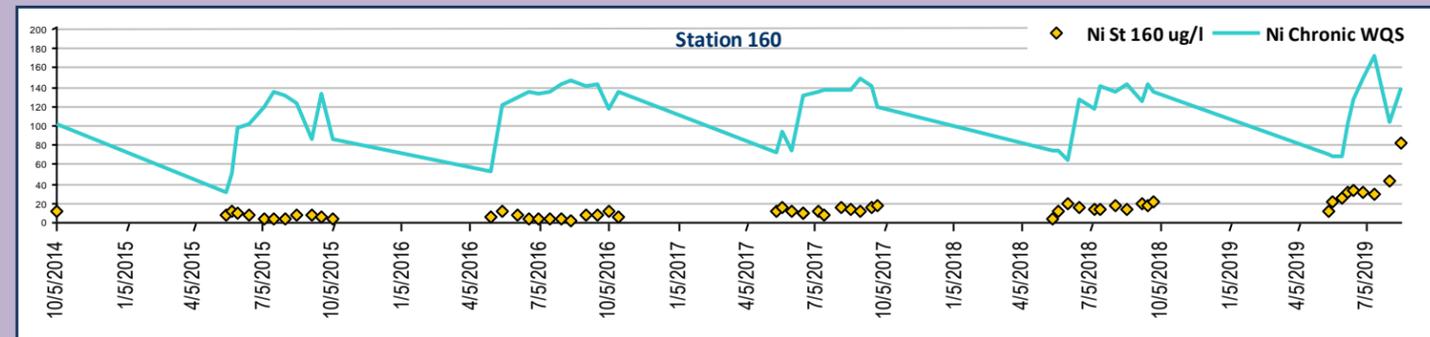
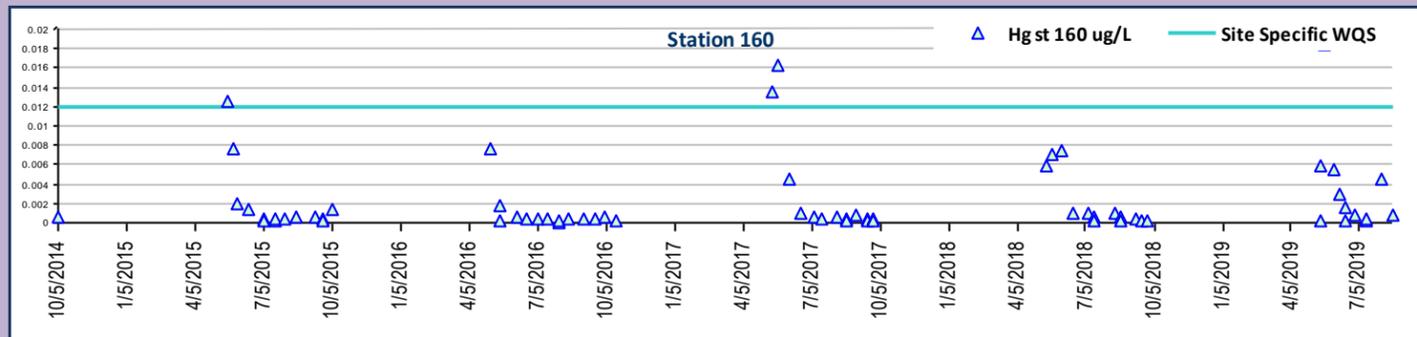
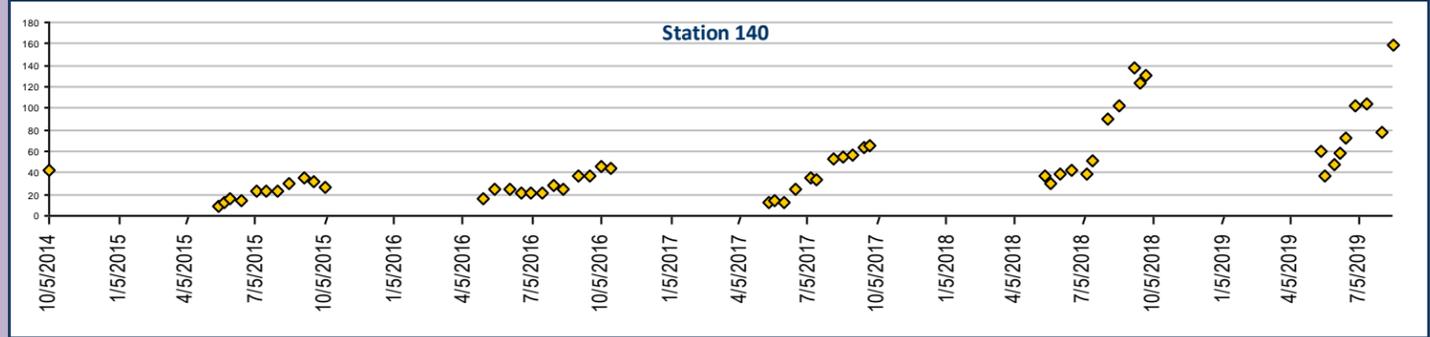
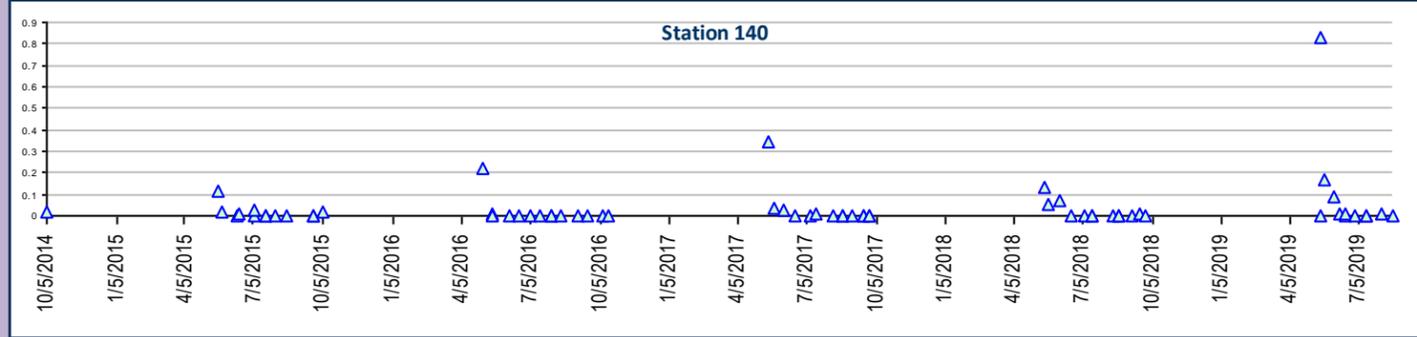
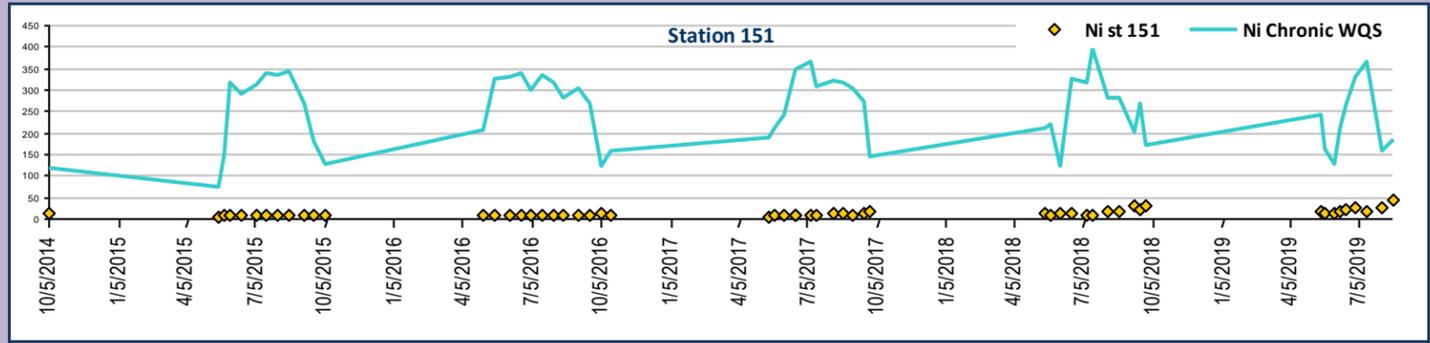
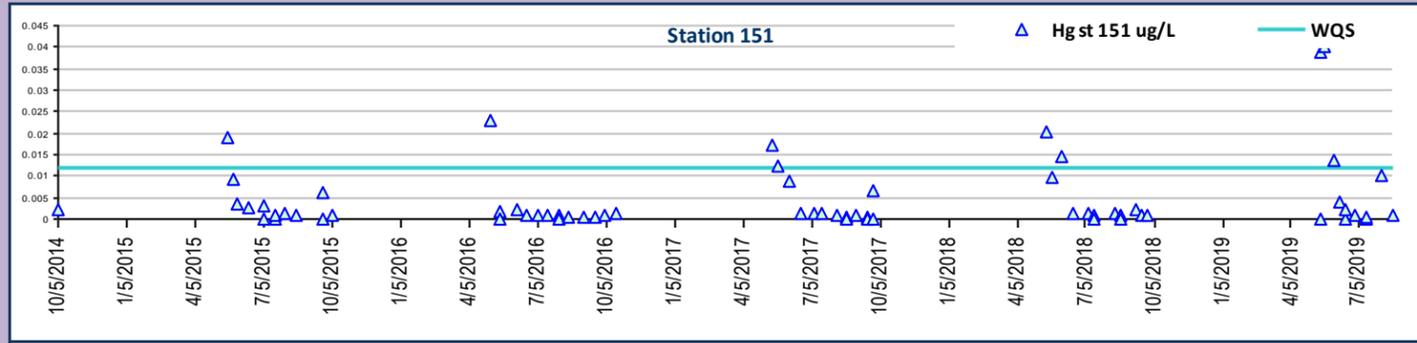
APDES Stations : Manganese, Total, units ug/L - 5 Year Trend

APDES Stations : Lead, Total, units, ug/L - 5 Year Trend



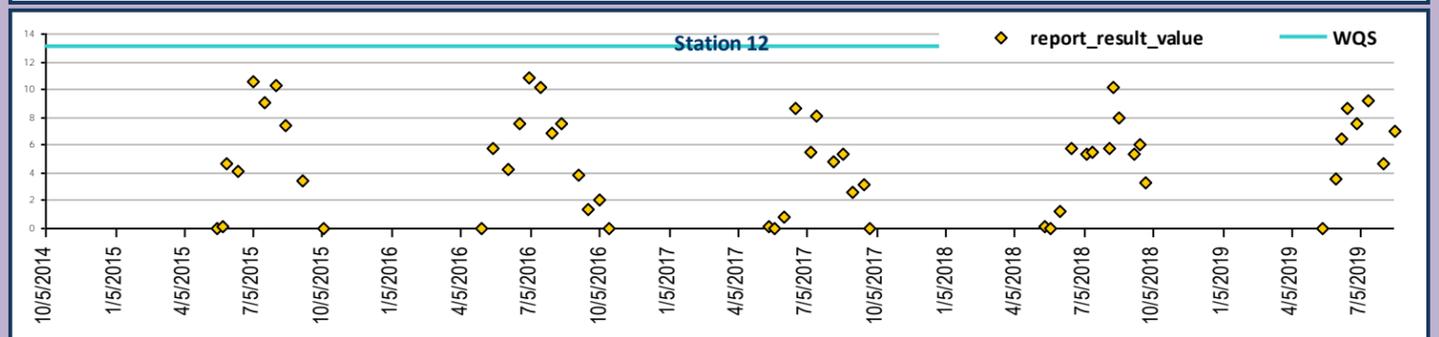
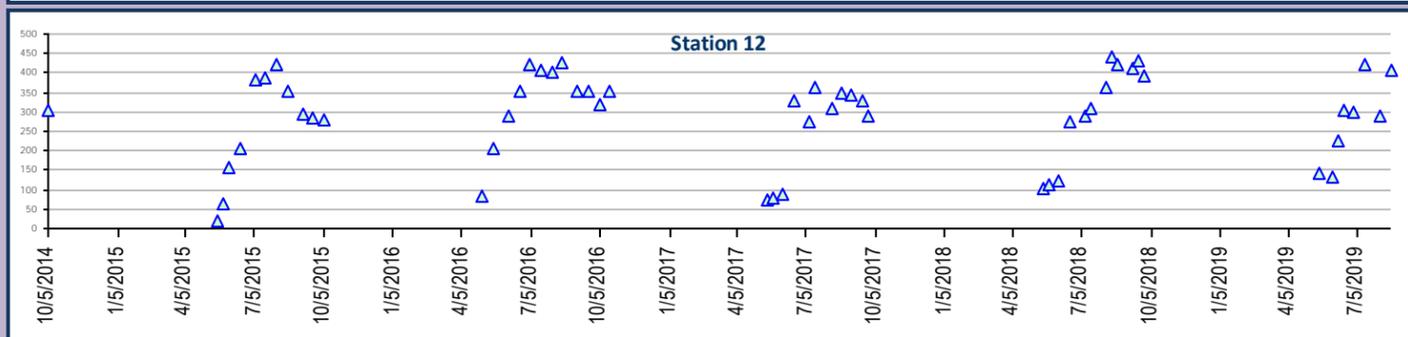
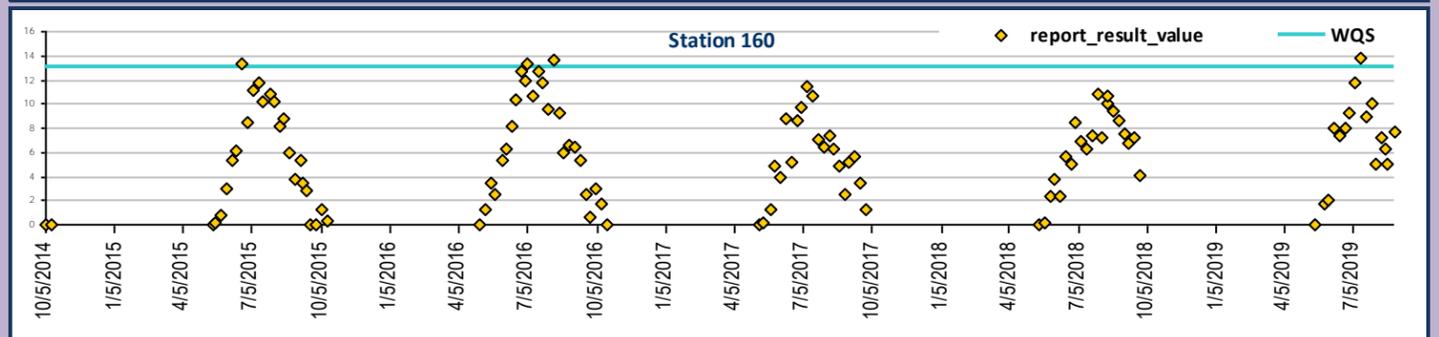
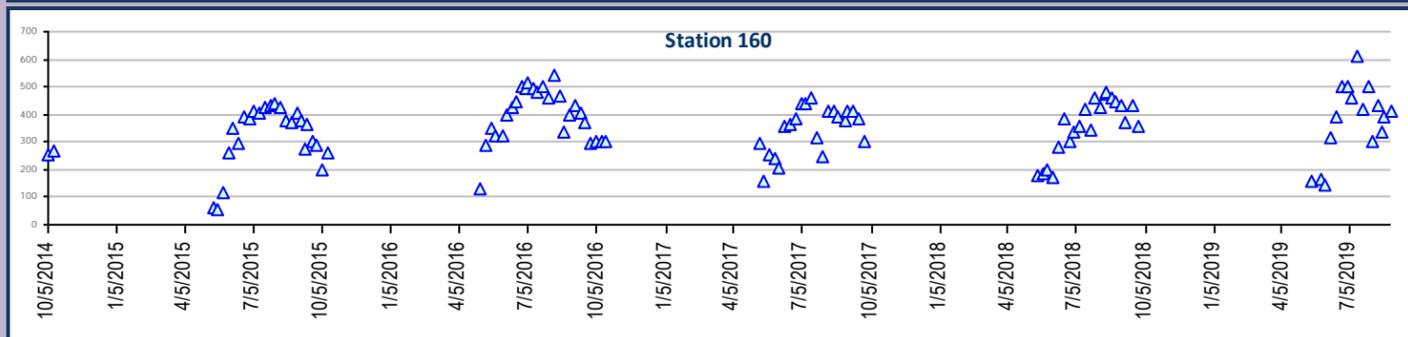
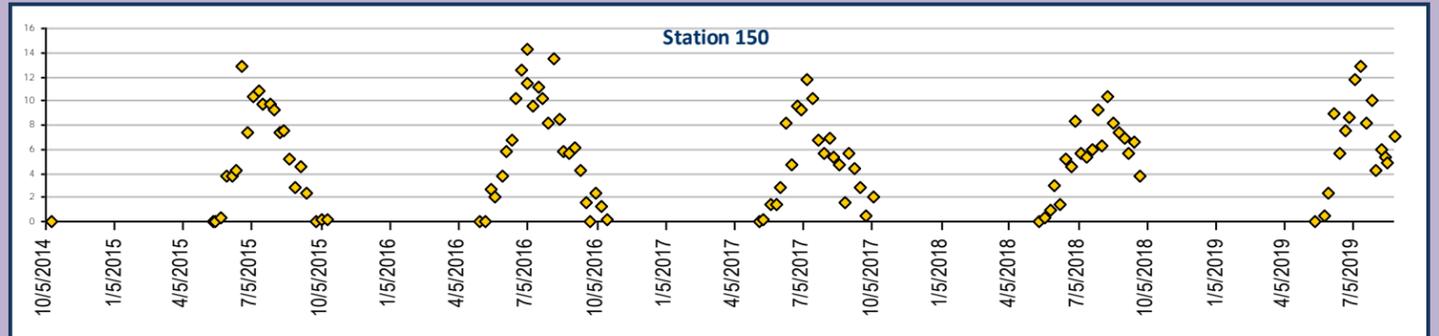
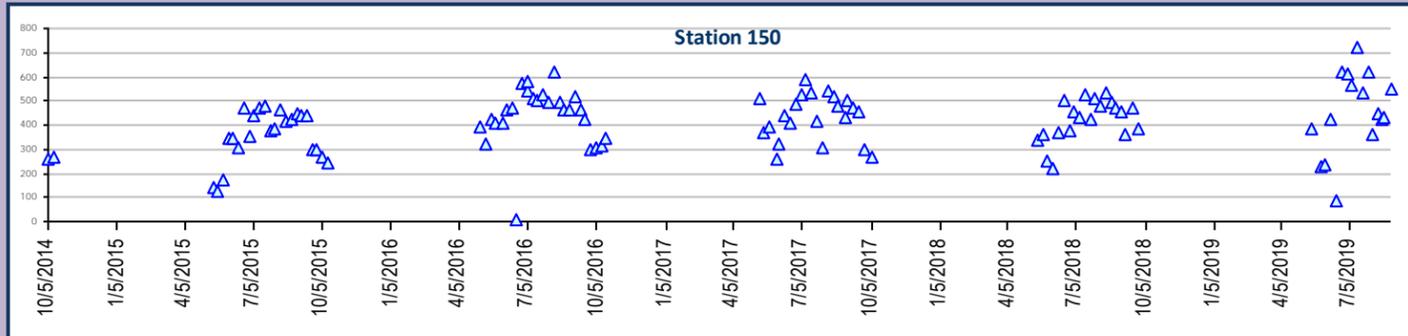
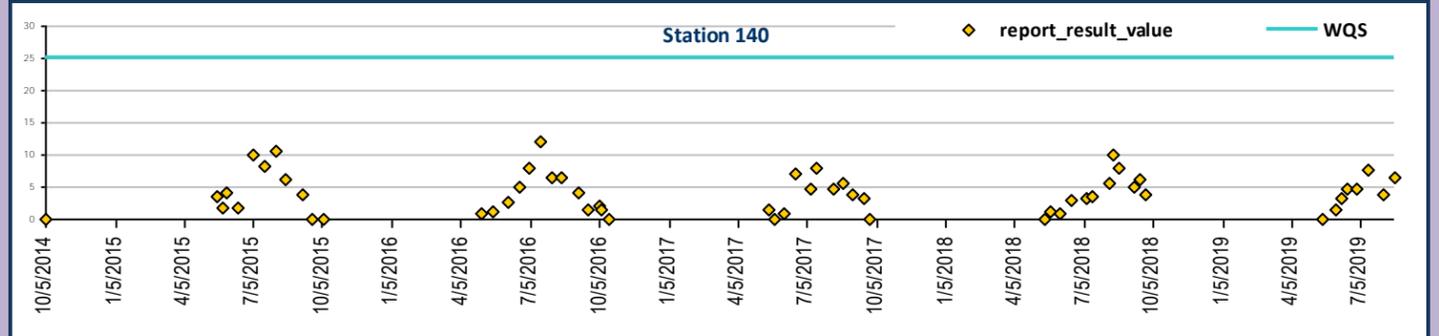
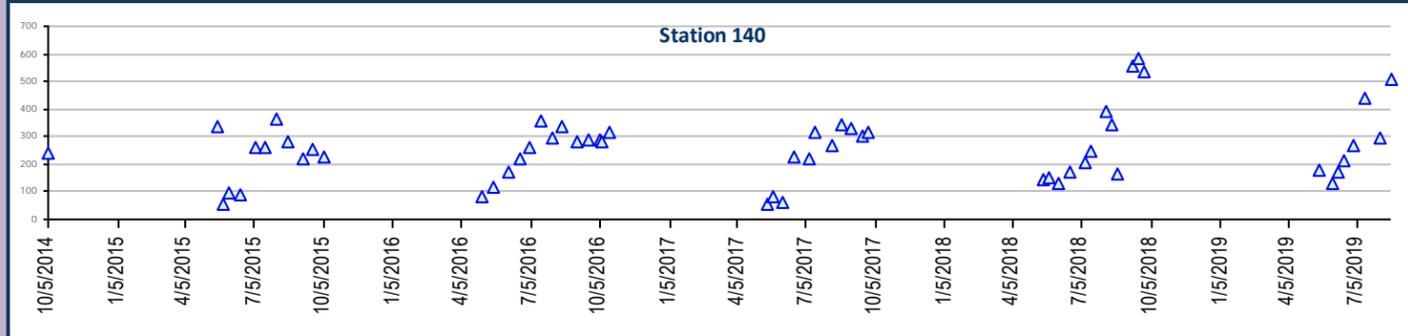
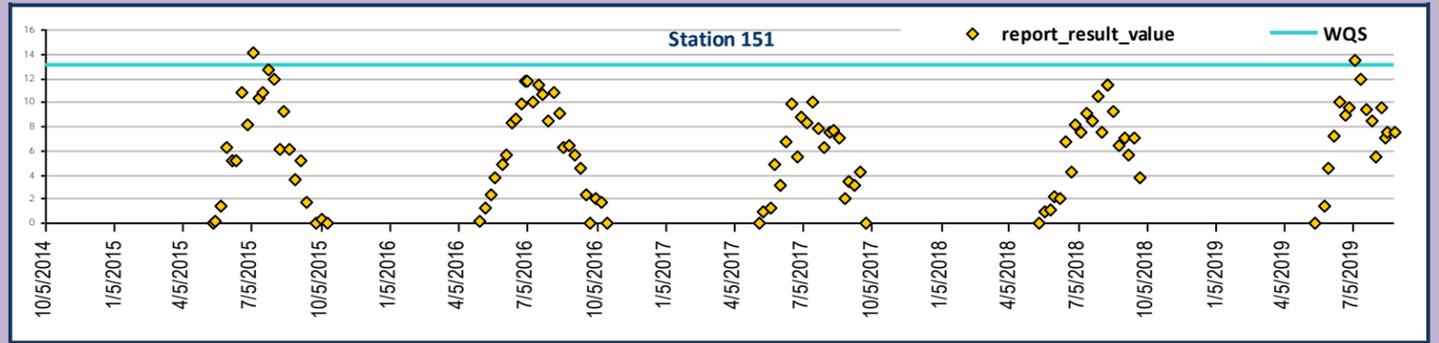
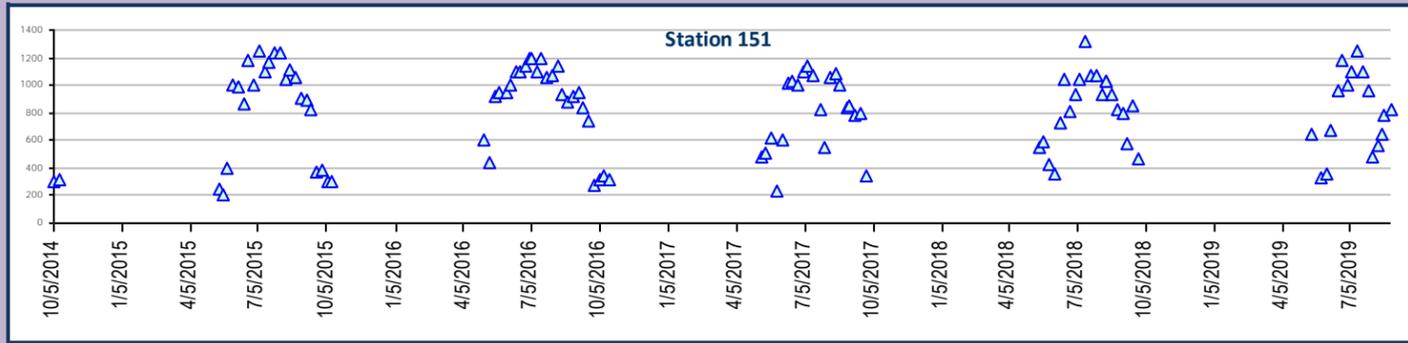
APDES Stations : Mercury, Total, units ug/L - 5 Year Trend

APDES Stations : Nickel, Total, units, ug/L - 5 Year Trend



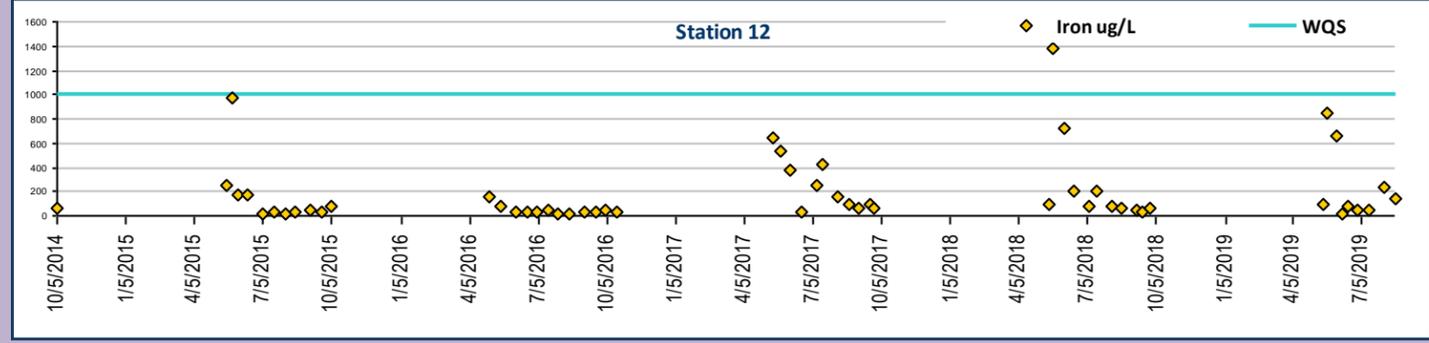
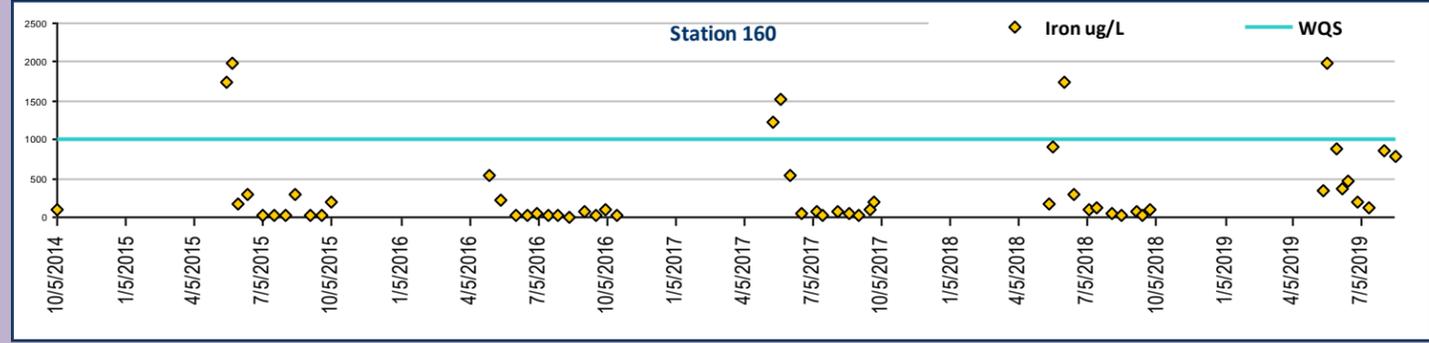
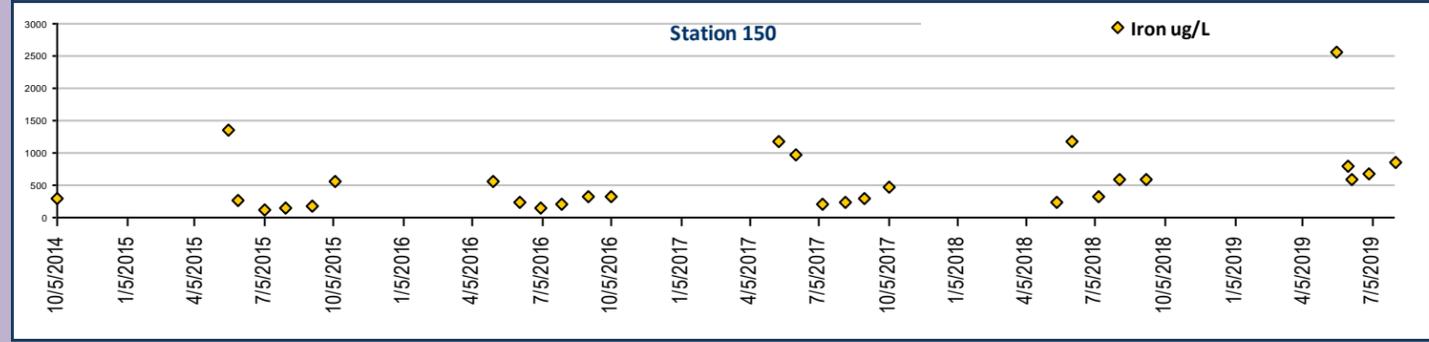
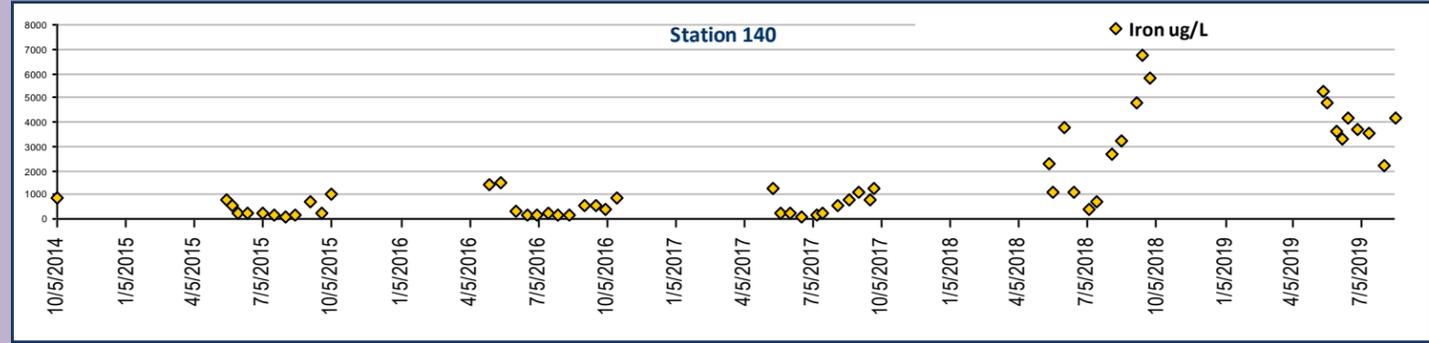
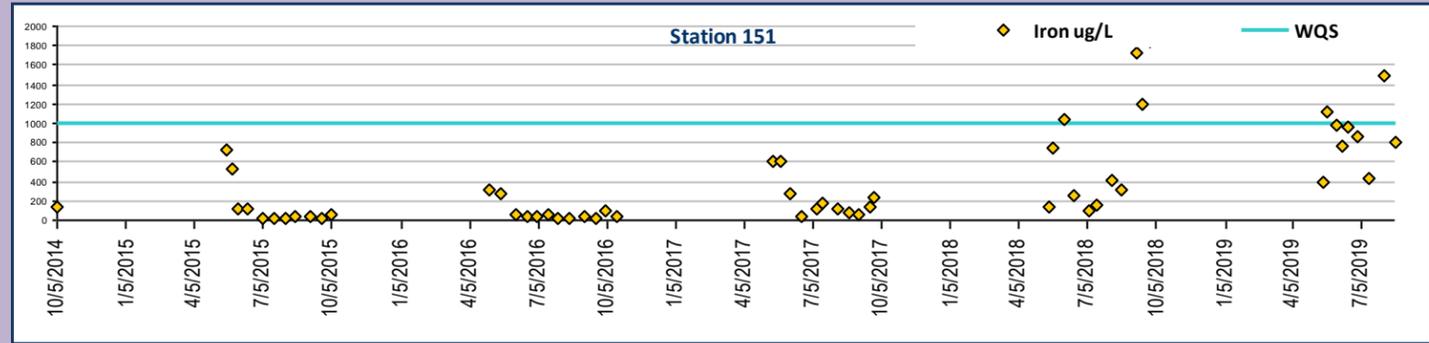
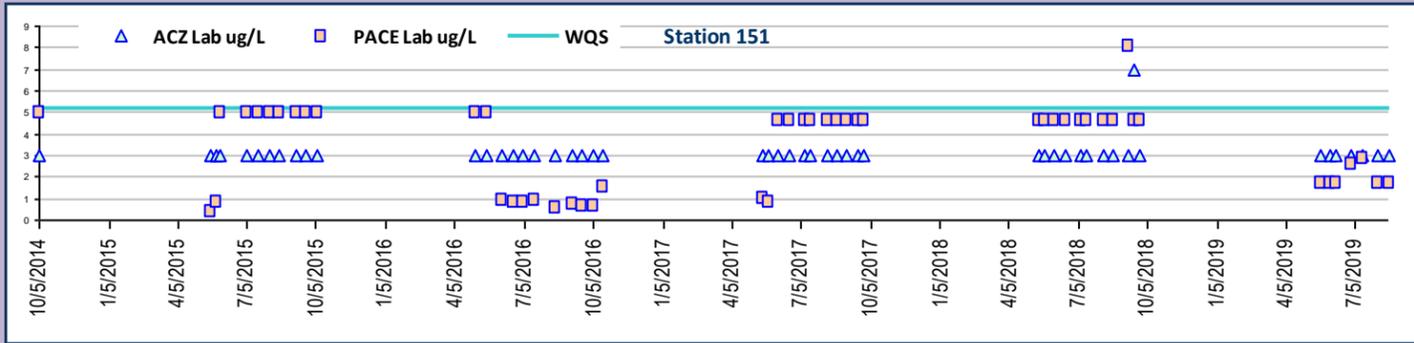
APDES Stations : Conductivity, Total, units uS/cm - 5 Year Trend

APDES Stations : Temperature, units Celsius - 5 Year Trend **Teck**



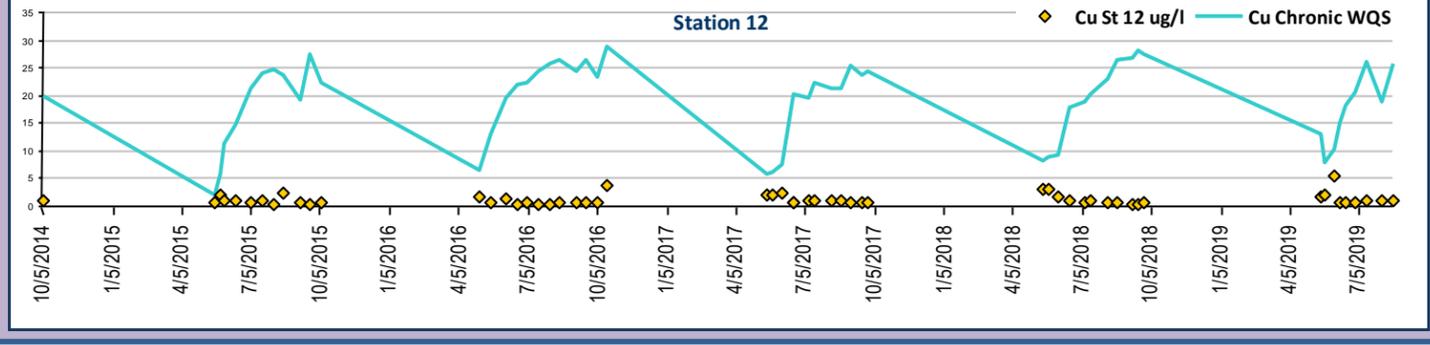
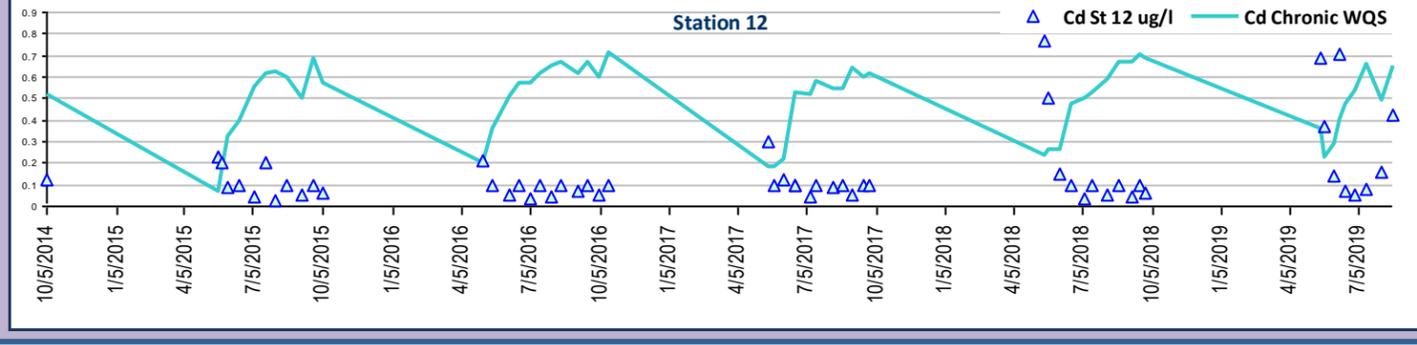
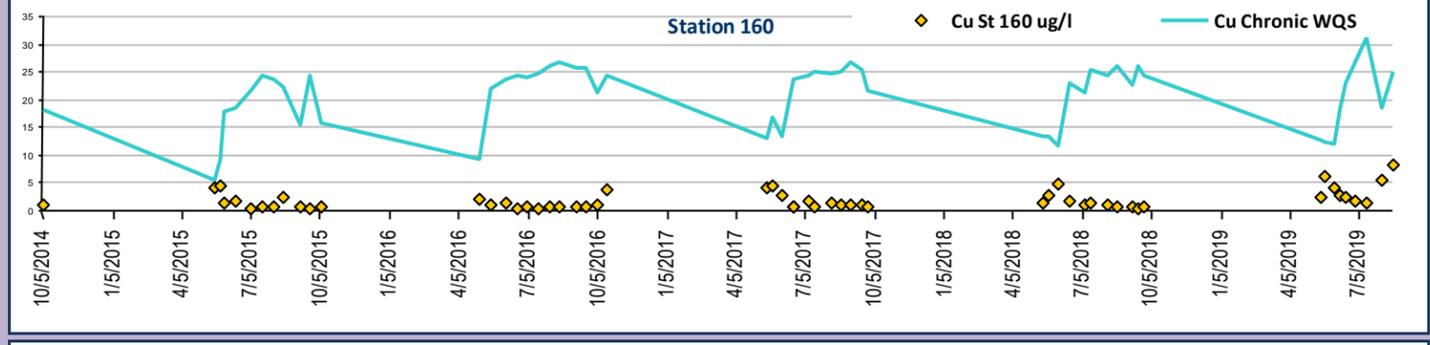
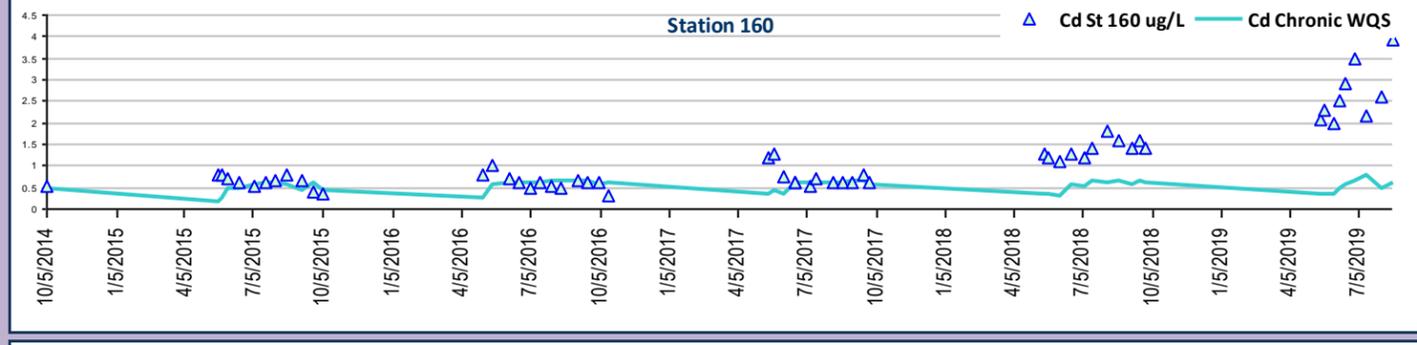
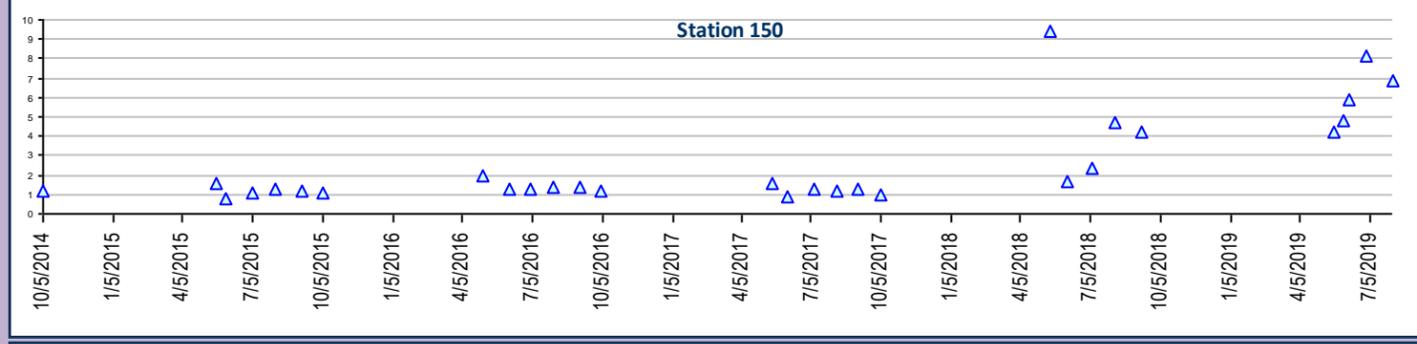
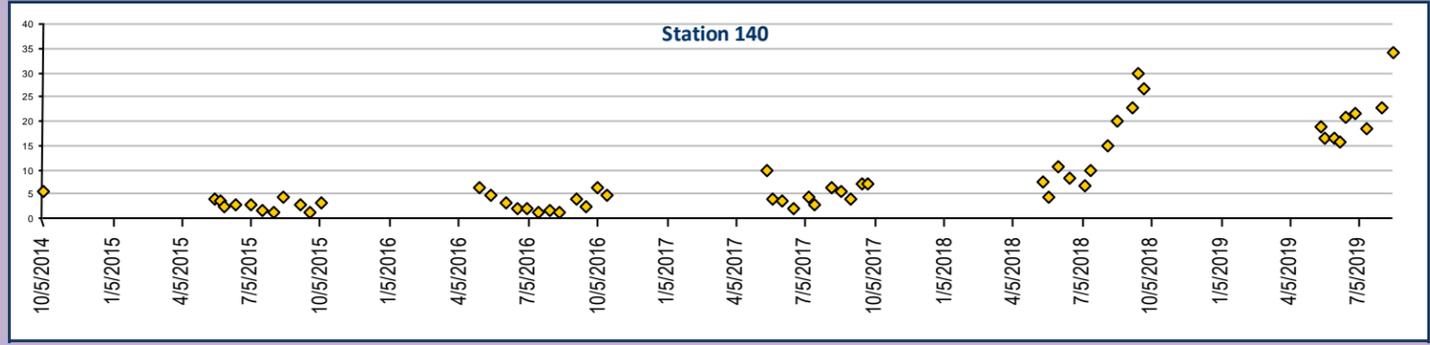
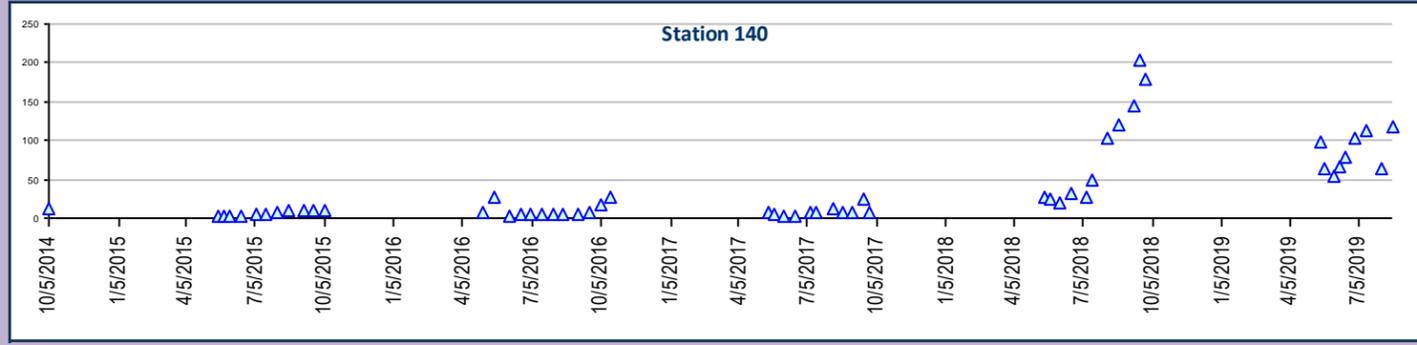
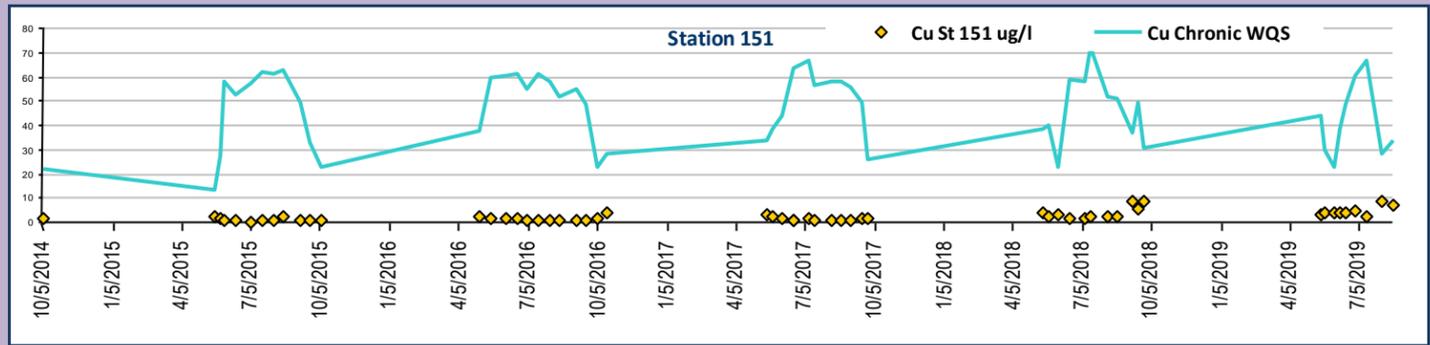
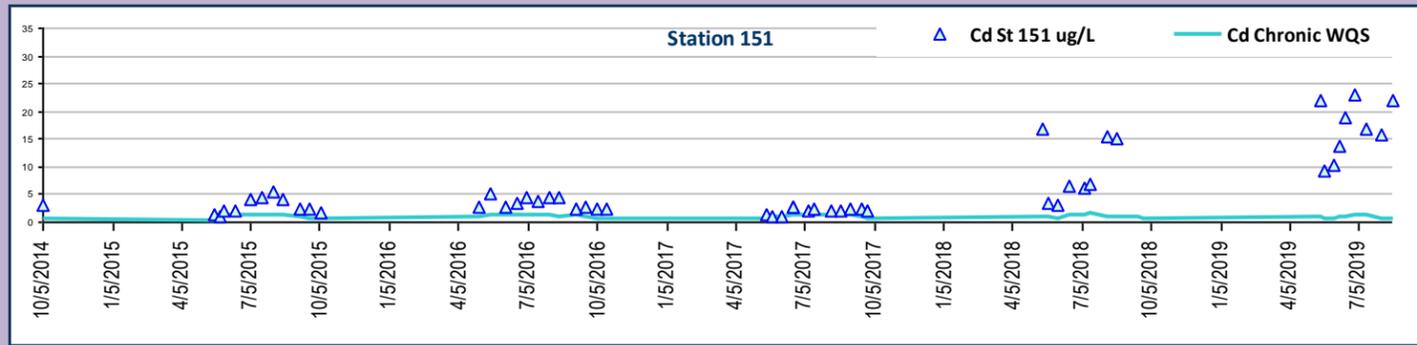
APDES Stations : Cyanide, WAD, units ug/L - 5 Year Trend

APDES Stations : Iron, Total, units, ug/L - 5 Year Trend



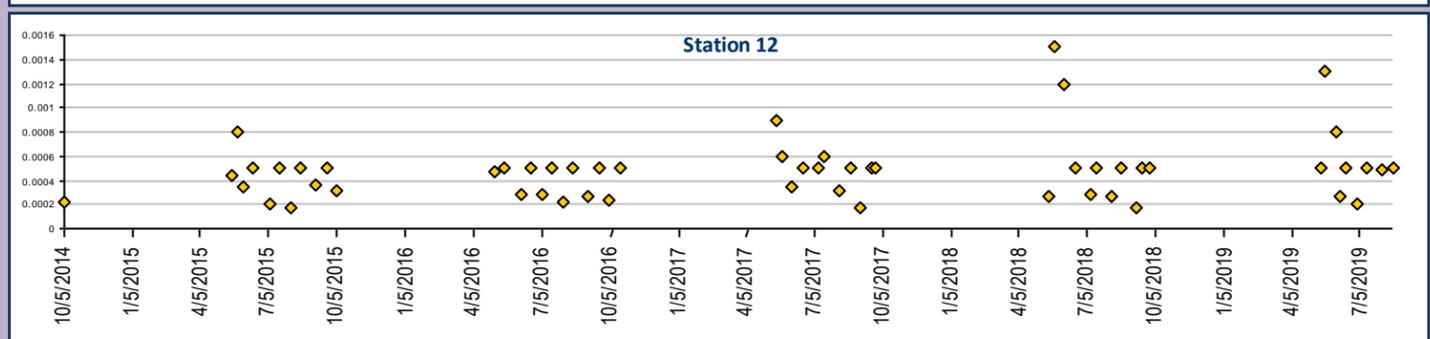
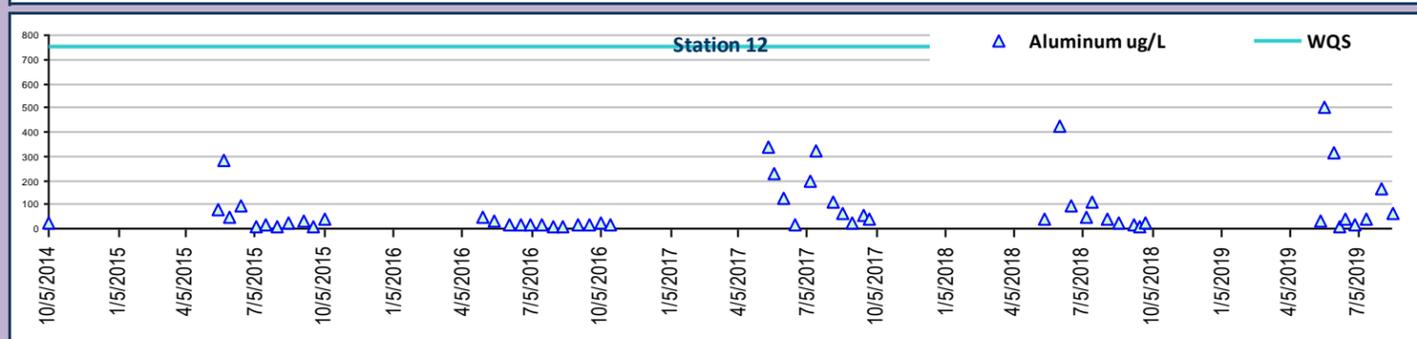
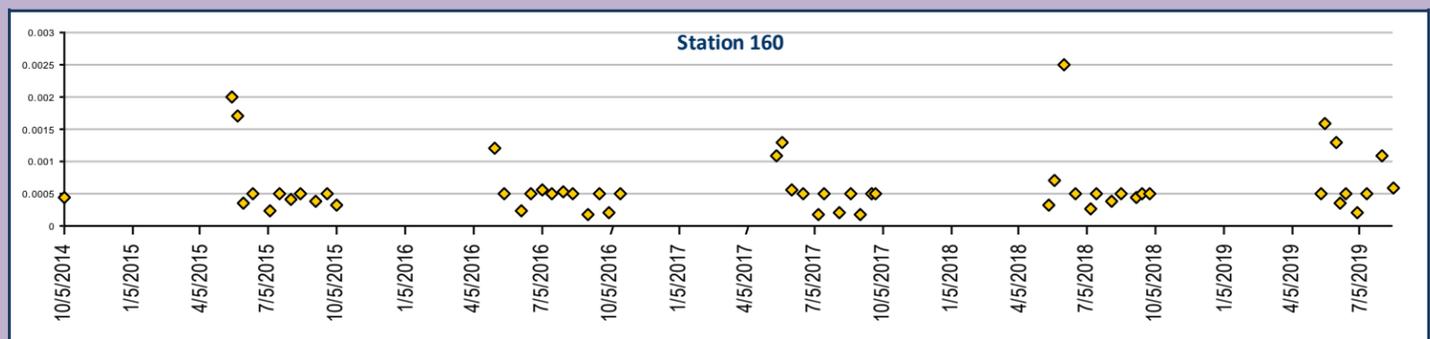
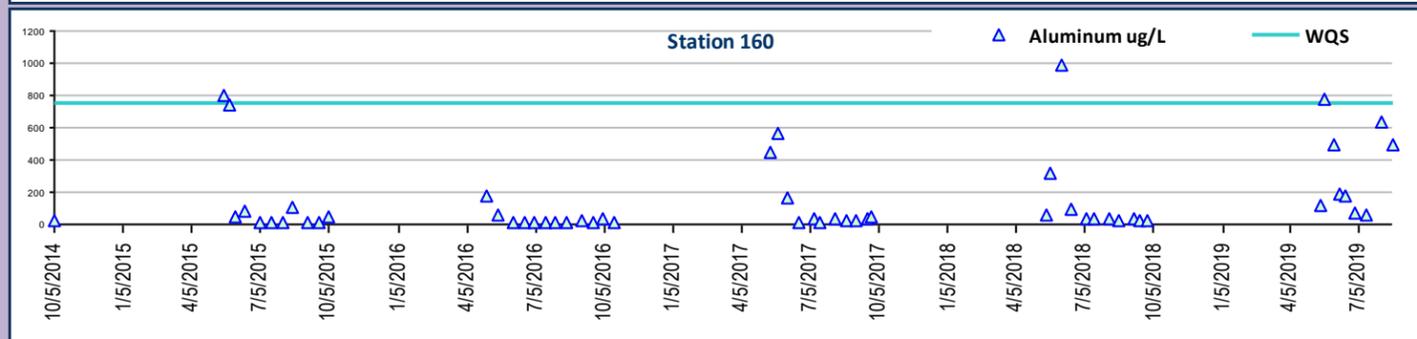
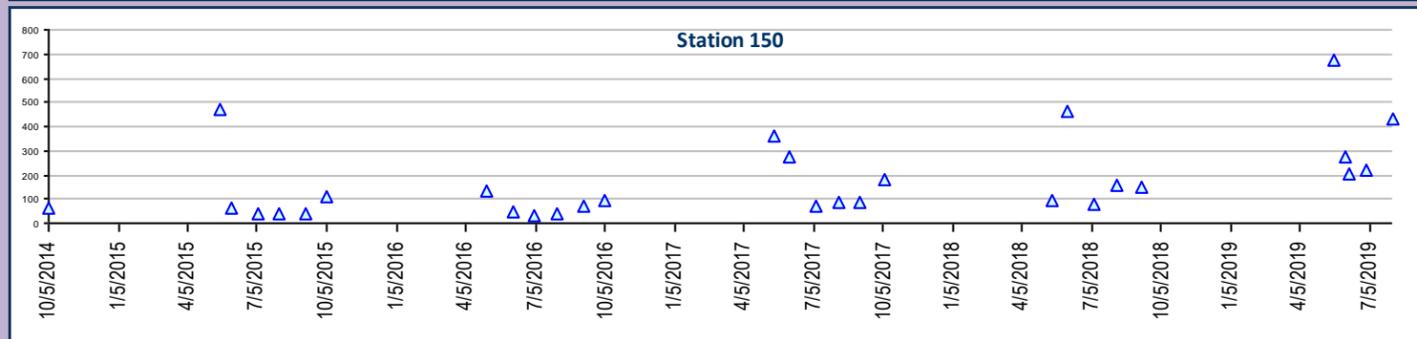
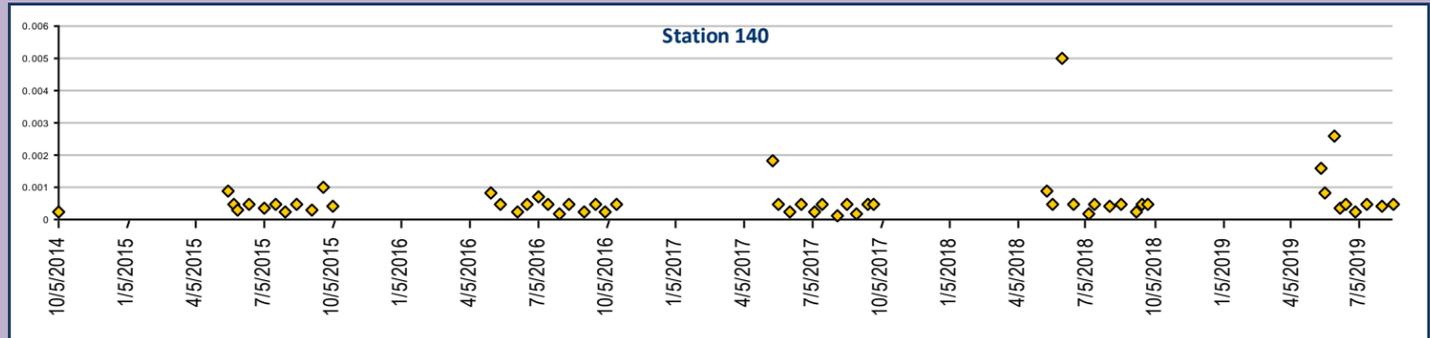
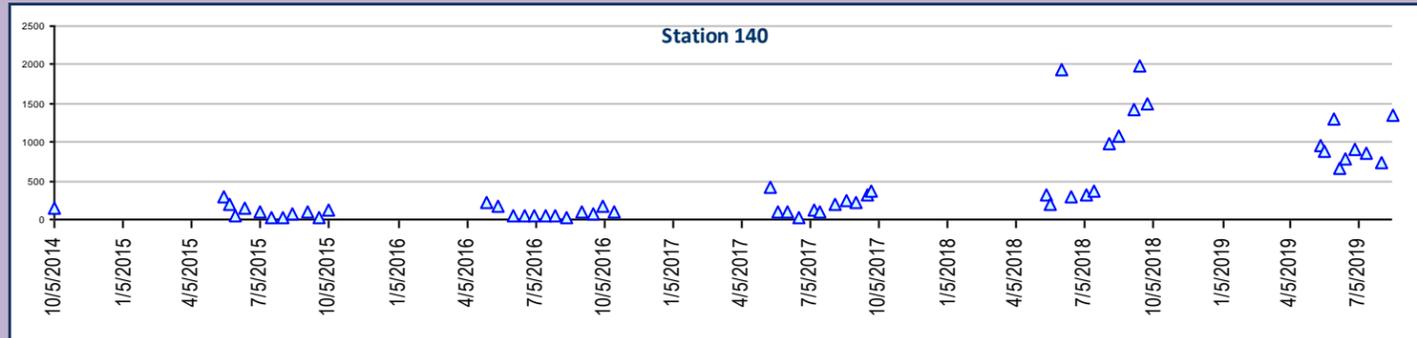
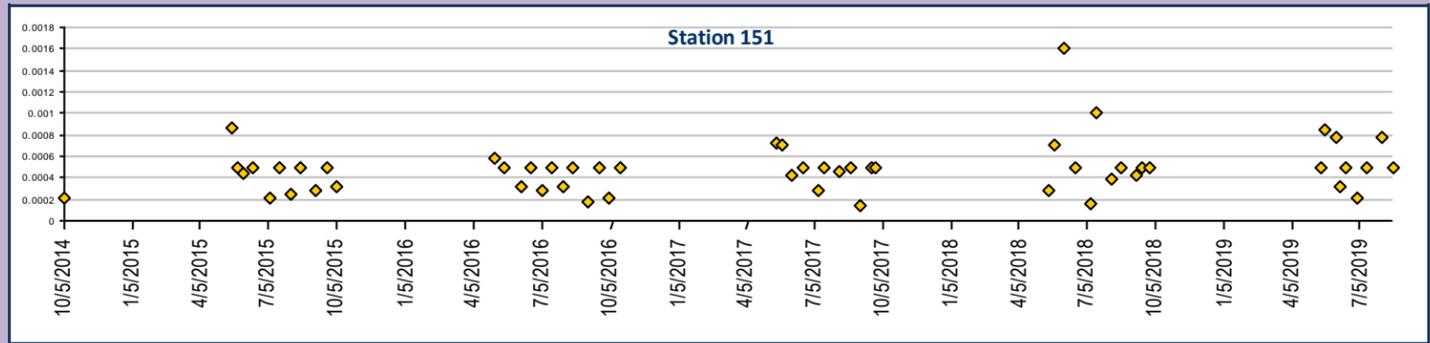
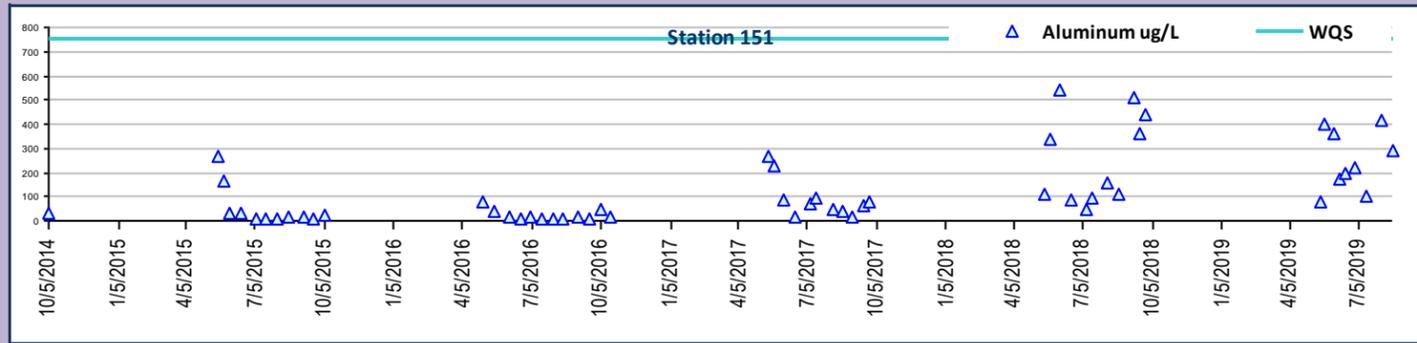
APDES Stations : Cadmium, Total, units ug/L - 5 Year Trend

APDES Stations : Copper, Total, units, ug/L - 5 Year Trend



APDES Stations : Aluminum, Total, units ug/L - 5 Year Trend

APDES Stations : Chromium, Total, units mg/L - 5 Year Trend



Appendix G: Waste Rock Production Summary

Quarterly Waste Rock Production Report



Production Month **October 2019**

| <u>Waste Type:</u> | <u>Construction Waste</u> | <u>Tonnes</u> | <u>Avg Zn%</u> | <u>Avg Fe%</u> | <u>Avg Pb%</u> |
|----------------------------|----------------------------|----------------|----------------|----------------|----------------|
| Formation: | Ikalukrok | | | | |
| Placed Location | Portable crusher Pad | 395 | 2.10% | 2.80% | 2.80% |
| Formation: | Siksikpuk | | | | |
| Placed Location | Crusher Pad | 880 | 1.35% | 4.41% | 0.59% |
| Waste Type Subtotal | | 1,275 | | | |
| <u>Waste Type:</u> | <u>Cover Material</u> | <u>Tonnes</u> | <u>Avg Zn%</u> | <u>Avg Fe%</u> | <u>Avg Pb%</u> |
| Formation: | Kivalina | | | | |
| Placed Location | Cover Dump | 55,248 | 0.29% | 0.51% | 0.01% |
| Waste Type Subtotal | | 55,248 | | | |
| <u>Waste Type:</u> | <u>Most Reactive Waste</u> | <u>Tonnes</u> | <u>Avg Zn%</u> | <u>Avg Fe%</u> | <u>Avg Pb%</u> |
| Formation: | Ikalukrok | | | | |
| Placed Location | CWD | 20,023 | 12.54% | 7.37% | 4.95% |
| Placed Location | Landfill @MWD | 1,000 | 0.60% | 7.73% | 4.61% |
| Placed Location | Main pit dump 4 | 65,984 | 2.99% | 5.60% | 2.85% |
| Placed Location | Main Pit Dump 5 | 219,184 | 2.89% | 8.70% | 2.89% |
| Formation: | Okpikruak | | | | |
| Placed Location | Main pit dump 4 | 2,775 | 0.50% | 6.30% | 0.60% |
| Formation: | Siksikpuk | | | | |
| Placed Location | Main pit dump 4 | 4,656 | 2.90% | 4.00% | 3.30% |
| Waste Type Subtotal | | 313,622 | | | |
| <u>Waste Type:</u> | <u>Other Waste</u> | <u>Tonnes</u> | <u>Avg Zn%</u> | <u>Avg Fe%</u> | <u>Avg Pb%</u> |
| Formation: | Ikalukrok | | | | |
| Placed Location | Main Pit Dump 5 | 48,708 | 1.16% | 3.86% | 1.92% |
| Placed Location | Main pit dump 4 | 57,096 | 1.11% | 3.36% | 1.14% |
| Formation: | Kivalina | | | | |
| Placed Location | Main pit dump 4 | 240 | 0.30% | 0.40% | 0.00% |
| Formation: | Mixed | | | | |
| Placed Location | Main pit dump 4 | 12,460 | 0.00% | 0.00% | 0.00% |
| Placed Location | Main Pit Dump 5 | 2,022 | 0.00% | 0.00% | 0.00% |
| Formation: | Siksikpuk | | | | |
| Placed Location | Main pit dump 4 | 26,809 | 1.44% | 3.63% | 0.42% |

| | | | | |
|-------------------------------|----------------|-------|-------|-------|
| Placed Location | | | | |
| Main Pit Dump 5 | 121,109 | 0.89% | 3.44% | 1.01% |
| Waste Type Subtotal | 268,444 | | | |
| Total tonnes for month | 638,589 | | | |

Production Month November 2019

| | | | | |
|--|---------------|----------------|----------------|----------------|
| Waste Type: <u>Construction Waste</u> | Tonnes | Avg Zn% | Avg Fe% | Avg Pb% |
| Formation: Siksikpuk | | | | |
| Placed Location | | | | |
| incinerator | 7,231 | 0.10% | 3.60% | 0.10% |
| Waste Type Subtotal | 7,231 | | | |

| | | | | |
|--|---------------|----------------|----------------|----------------|
| Waste Type: <u>Cover Material</u> | Tonnes | Avg Zn% | Avg Fe% | Avg Pb% |
| Formation: Kivalina | | | | |
| Placed Location | | | | |
| Cover Dump | 61,823 | 0.16% | 1.11% | 0.08% |
| Waste Type Subtotal | 61,823 | | | |

| | | | | |
|---|----------------|----------------|----------------|----------------|
| Waste Type: <u>Most Reactive Waste</u> | Tonnes | Avg Zn% | Avg Fe% | Avg Pb% |
| Formation: Ikalukrok | | | | |
| Placed Location | | | | |
| Main pit dump 4 | 212,504 | 2.97% | 9.86% | 2.35% |
| Placed Location | | | | |
| Main Pit Dump 5 | 53,395 | 6.25% | 28.72% | 2.81% |
| Placed Location | | | | |
| Oxide Ore Stockpile | 44,548 | 1.26% | 3.62% | 17.77% |
| Waste Type Subtotal | 310,447 | | | |

| | | | | |
|---------------------------------------|----------------|----------------|----------------|----------------|
| Waste Type: <u>Other Waste</u> | Tonnes | Avg Zn% | Avg Fe% | Avg Pb% |
| Formation: Ikalukrok | | | | |
| Placed Location | | | | |
| Main pit dump 4 | 188,098 | 0.63% | 2.94% | 1.87% |
| Formation: Kivalina | | | | |
| Placed Location | | | | |
| Main pit dump 4 | 5,396 | 0.40% | 3.80% | 1.60% |
| Formation: Siksikpuk | | | | |
| Placed Location | | | | |
| Main Pit Dump 5 | 20,392 | 0.30% | 1.93% | 2.63% |
| Placed Location | | | | |
| Main pit dump 4 | 138,448 | 0.29% | 3.14% | 0.35% |
| Waste Type Subtotal | 352,334 | | | |
| Total tonnes for month | 731,835 | | | |

Production Month December 2019

| <u>Waste Type:</u> | | <u>Tonnes</u> | <u>Avg Zn%</u> | <u>Avg Fe%</u> | <u>Avg Pb%</u> |
|-------------------------------|----------------------------|----------------|----------------|----------------|----------------|
| Formation: Siksikpuk | | | | | |
| Placed Location | | | | | |
| incinerator | | 2,180 | 0.10% | 3.60% | 0.10% |
| Waste Type Subtotal | | 2,180 | | | |
| <u>Waste Type:</u> | <u>Most Reactive Waste</u> | <u>Tonnes</u> | <u>Avg Zn%</u> | <u>Avg Fe%</u> | <u>Avg Pb%</u> |
| Formation: Ikalukrok | | | | | |
| Placed Location | | | | | |
| Main pit dump 4 | | 62,693 | 3.86% | 20.27% | 2.11% |
| Placed Location | | | | | |
| MS-15 | | 74 | 3.75% | 27.68% | 2.10% |
| Placed Location | | | | | |
| Oxide Ore Stockpile | | 9,817 | 1.11% | 3.07% | 16.75% |
| Placed Location | | | | | |
| Main Pit Dump 3 | | 173 | 2.32% | 9.47% | 1.67% |
| Formation: Siksikpuk | | | | | |
| Placed Location | | | | | |
| Main pit dump 4 | | 150,527 | 1.75% | 6.32% | 1.49% |
| Waste Type Subtotal | | 223,284 | | | |
| <u>Waste Type:</u> | <u>Other Waste</u> | <u>Tonnes</u> | <u>Avg Zn%</u> | <u>Avg Fe%</u> | <u>Avg Pb%</u> |
| Formation: Ikalukrok | | | | | |
| Placed Location | | | | | |
| Main pit dump 4 | | 174,406 | 0.85% | 2.62% | 3.15% |
| Formation: Okpikruak | | | | | |
| Placed Location | | | | | |
| Main pit dump 4 | | 37,213 | 1.36% | 3.98% | 1.16% |
| Formation: Siksikpuk | | | | | |
| Placed Location | | | | | |
| Main pit dump 4 | | 220,577 | 0.72% | 2.34% | 1.17% |
| Waste Type Subtotal | | 432,196 | | | |
| Total tonnes for month | | 657,660 | | | |

Total Waste Rock tonnes for period 2,028,084

Appendix H: Cover Material Stockpile Summary

Waste Rock Cover Material Monitoring Report



| Date Stockpiled | Waste Rock Type | Tonnes | Formation | Zinc_% | Stockpile Code |
|-----------------------|-----------------|----------------|-----------|--------|----------------|
| September 2019 | | | | | |
| 9/30/2019 | Cover Material | 1,697 | Kivalina | 0.08 | COV |
| October 2019 | | | | | |
| 10/1/2019 | Cover Material | 11,297 | Kivalina | 0.08 | COV |
| 10/2/2019 | Cover Material | 9,987 | Kivalina | 0.08 | COV |
| 10/3/2019 | Cover Material | 4,035 | Kivalina | 0.08 | COV |
| 10/4/2019 | Cover Material | 8,019 | Kivalina | 0.08 | COV |
| 10/5/2019 | Cover Material | 1,122 | Kivalina | 0.08 | COV |
| 10/6/2019 | Cover Material | 6,669 | Kivalina | 0.08 | COV |
| 10/7/2019 | Cover Material | 7,329 | Kivalina | 0.08 | COV |
| 10/8/2019 | Cover Material | 1,647 | Kivalina | 0.08 | COV |
| 10/9/2019 | Cover Material | 2,100 | Kivalina | 0.08 | COV |
| 10/10/2019 | Cover Material | 366 | Kivalina | 0.08 | COV |
| 10/26/2019 | Cover Material | 2,182 | Kivalina | 0.10 | COV |
| 10/26/2019 | Cover Material | 495 | Kivalina | 0.20 | COV |
| November 2019 | | | | | |
| 11/2/2019 | Cover Material | 13,284 | Kivalina | 0.10 | COV |
| 11/3/2019 | Cover Material | 1,557 | Kivalina | 0.10 | COV |
| 11/4/2019 | Cover Material | 13,643 | Kivalina | 0.18 | COV |
| 11/5/2019 | Cover Material | 14,928 | Kivalina | 0.18 | COV |
| 11/6/2019 | Cover Material | 18,411 | Kivalina | 0.18 | COV |
| Total | | 118,768 | | | |

Appendix I: Risk Management Plan (RMP) Fugitive Dust (pending, 3rd quarter)

Appendix J: Red Dog One Year Mine Plan 2020