Red Dog Operations

4th Quarter & Annual Report
Waste Management Permit 2021DB0001
Reclamation Plan Approval F20219958

February 25th, 2025

Teck

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Appendix B: Annual Long-Term Permafrost & Groundwater Monitoring for TSF
Appendix C: Water Quality Profile II Charts – Mine Water Monitoring Stations
Appendix D: Water Quality Profile I Charts – Mine Drainage Monitoring Stations
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Appendix F: APDES Monitoring Stations
Appendix G: TMD Seepage Monitoring Well
Appendix H: Kaviqsaaq Diversion Profile I Trend Charts
Appendix I: Hill top Diversion Profile II Trend Charts
Appendix J: Waste Rock and Cover Rock Summary Reports
Appendix K: Risk Management Plan Annual Report

Introduction

This report has been prepared to fulfill the 4th quarter and annual reporting requirements for Teck Alaska Incorporated obligations under the State of Alaska Waste Management Permit No. 2021DB0001 and the Red Dog Mine Reclamation Plan Approval F20219958.

This report addresses Biomonitoring, Permafrost and Sub-permafrost Groundwater Monitoring around the Tailings Storage Facility, Mine Water Management, Waste Rock Management, Tailings Management, Class III Municipal Solid Waste Landfill, Mining and Milling Activities, Reclamation, Risk Management Plan, Financial Assurance, Amendments and Wildlife Interactions which addresses both 4th quarter and annual reporting as specified in the *Integrated Waste Management Plan – Monitoring Plan, (November 2021).*

Biomonitoring Program

Annual biomonitoring report

The 2024 annual *Biomonitoring Report* is being prepared by the Alaska Department of Fish & Game (ADF&G) this report is normally submitted by the 2nd quarter. The 2024 biomonitoring report when received will be submitted as Appendix A within this report.

Annual summary of biomonitoring water quality sampling

Analytical results of samples collected for all biomonitoring water quality data are included as electronic file *Red Dog Analytical Data 2024.xls* and will be attached with the report submission.

Permafrost and Sub-permafrost Groundwater Monitoring

SEP permafrost and subsurface temperature monitoring (TSF)

Supplemental Environmental Project (SEP) piezometer and thermistor monitoring well measurements were completed quarterly for the 2024 year. The data collected in 2024 was consistent with the data from prior years with no significant changes noted with subpermafrost. The *2024 Annual Report - Long-Term Permafrost and Groundwater Monitoring Program* for the Tailings Storage Facility is included within Appendix B in this report.

As indicated in the 2023 annual report all SEP thermistors were to be inspected and cleaned in 2024, the was completed last summer. The cleaning involved separating the pin connectors housing, washing pin connectors in a mild nitric acid solution, applying a deionized water rinse, alcohol rinse and then re-sealing the connector wire harness with silicone. The report in Appendix B provides further information on the effectiveness of the cleaning and re-splicing of some with new connectors which were missing pins.

Significant activities in permafrost and sub-permafrost groundwater monitoring

No significant changes associated with the SEP permafrost monitoring program.

Mine Water Management

Mine water flows

Table 1 below provides a summary of mine water flows for mine water monitoring stations during the reporting period. Influent process water flows to Water Treatment Plant (WTP) #3 increased by 15% compared to the 2023 year. Water collection from the MWD sumps is expected to increase and will continue to be monitored for flows and chemistry to gauge effects from the MWD liner cover project.

Table 1 - Water Monitoring Volumes

	Volume in Gallons			
Mine Water Monitoring Stations	Oct	Nov	Dec	2024 Total
Bon's Creek Total Flow	9,032,000	10,360,000	12,420,000	124,831,000
Mine Water Sump Total Flow	54,400,000	56,150,000	29,520,000	786,260,000
Main Dam Seepage Pump back	33,450,000	28,110,000	28,650,000	420,120,000
Reclaim Flow to Mill	110,400,000	251,600,000	145,400,000	2,411,720,000
WTP #1 Influent from Reclaim	47,630,000	64,250,000	50,960,000	352,263,000
WTP #1 Influent from Mine Sump	0	0	0	93,920,000
WTP #1 Clarifier Sludge to Tails	0	0	0	0
WTP #2 Influent from Reclaim	0	0	0	2,315,235,660
WTP #2 Sludge to Tails	6,066	5,005	5,742	76,429,744
Discharge to Red Dog Creek	0	0	0	1,744,977,356
WTP #3 Influent from MWD	5,967,000	9,260,000	11,090,000	78,049,000
WTP #3 Influent from Mine Sump	0	0	0	16,754
WTP #3 Total Effluent	5,967,000	9,260,0000	11,090,000	78,065,754
East Overburden Sump	752,700	391,600	365,800	11,186,000
West Overburden Sump	4,058,800	1,437,500	201,500	28,263,800
Main Waste ARD to Main Pit	0	0	0	0
Treated Water to Main Pit	0	0	0	0
Tailings Water Supernatant (calc.) to TSF	311,860,000	160,320,000	209,684,000	2,907,500,900
Mill Pad Collection	24,947	12,986	0	1,740,641
Sand filter Effluent - Mine Road Dust Control	0	0	0	1,725,900
Kaviqsaaq Diversion	0	0	0	4,149,152

Mine water quality

An electronic spreadsheet titled *Red Dog Analytical Data 2024.xlsx* is included with this report. The spreadsheet incorporates all analytical data used to generate the trend charts depicted in the Appendices of this report.

Mine water quality trend charts

Mine water quality trend charts are provided in Appendices C, D, E, F, G, H, and I of this report. Water quality Profile I and II (*"Monitoring Plan, November 2021")* constituents for the Mine Water, Mine Drainage, Bons Creek, APDES stations, Mill Pad, Hilltop and the Kaviqsaaq Diversion are illustrated for a five-year period ending with the 4th quarter. No unusual trends were noted for the any of the monitored areas during 4th quarter period.

Visual monitoring of mine water management systems

Mine water collection systems were visually inspected during the quarter as required per the *Integrated Waste Management Plan – Monitoring Plan, (November 2021).* All systems operated as designed during the 4th quarter. The Kaviqsaaq diversion was winterized in late September, the system operated normally during the summer months with no reported issues.

Fish weir inspection

The fish weir fall inspection was completed on October 11th, 2024, no major issues were identified and the system was operating as designed. A written report was submitted to the ADEC, ADF&G and the Environmental Protection Agency (EPA) Region 10.

As mentioned in the Spring report the liner was to be repaired once the water flow had decreased to safe levels, unfortunately the repair did not occur due to a record amount of precipitation occurring during the summer and early fall which did not allow for safe access near the weir notch.

During the fall visual inspection, frozen ice conditions allowed for a closer inspection of the separated liner, while not able to "unravel it" due to it being frozen in place the liner appeared to be fully intact, pliable and just torn from anchor points. Figure 1 depicts the liner separated from the gabion basket weir notch. Basically, the liner tore from the grommet anchor points.

The existing weir notch liner will be replaced with a reinforced geomembrane (XR-5) liner, the replacement liner was ordered and onsite, work is scheduled for the summer of 2025 once freshet flows have ended ensuring a safe work area. Figure 1 shows the fish weir "notch" and is structurally intact and functioning.



Figure 1 - Fish Wier

Water balance

A mine water balance computer simulation program is maintained using GoldSim software. The GoldSim simulation generates a water elevation projection for Life of Mine (LOM) through multiple data sets entered into the model. Figure 2 depicts forecasted Tailings Storage Facility elevation based on current and expected operations. A free water inventory chart is provided in Figure 3 which represents historic trends through 2024 and includes water volumes for the Tailings Storage Facility, Main Pit Water Reservoir and Aqqaluk Pit.

Waste water treatment reagent consumption

Significant reagents consumed for wastewater treatment during 2024 are listed below:

- Total quantity of flocculant used in Water Treatment Plant 2 (WTP2) and WTP1 was 116.9 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 14,384 metric dry tonnes.
- Total quantity of sodium sulfide used in WPT1 and WTP2 was 497.7 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 20,437 metric tonnes

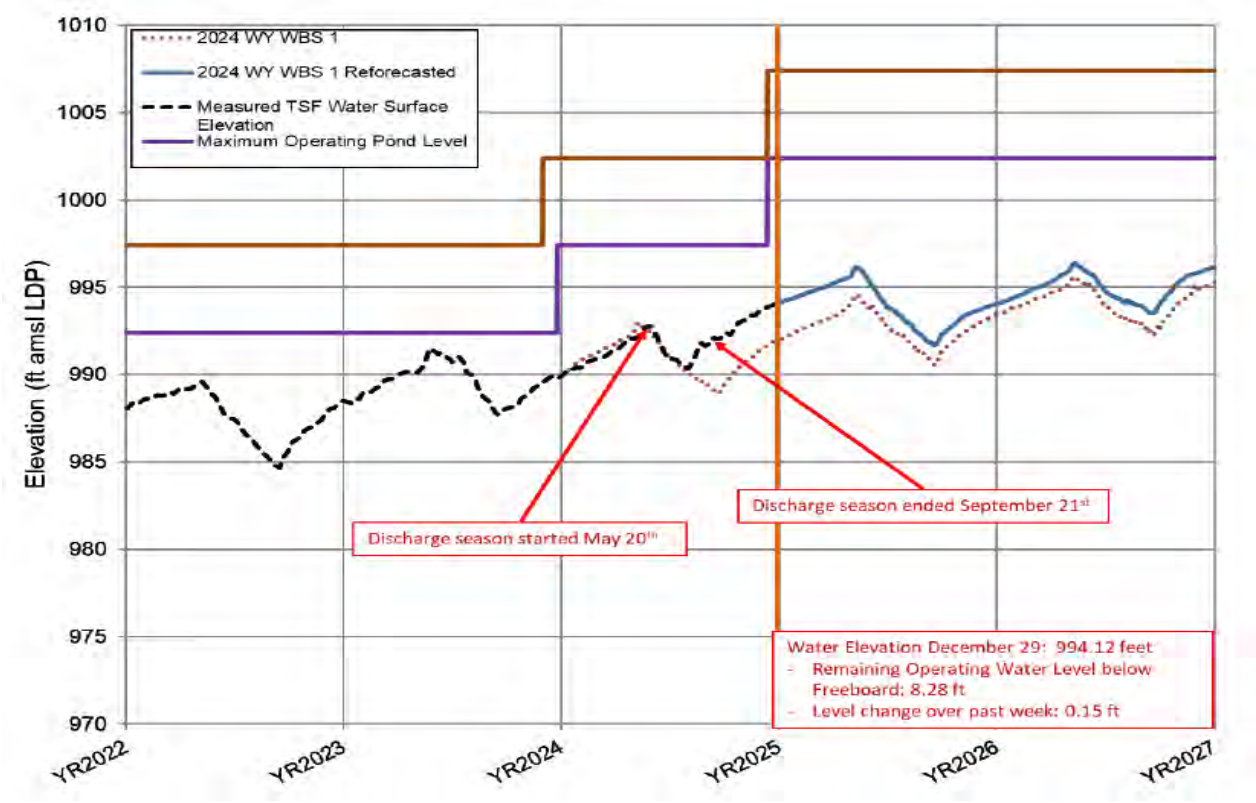


Figure 2 – Water Balance Forecast & TSF Surface Elevation

WATER INVENTORY

Site water volume increased ~185 mgal from end of 2023 discharge season to end of 2024.Discharge season ended Sept. 21st with 1.74 Bgal and 21,645 tonnes of TDS or 98% allowed under permit.



Year	Discharge Volume (mgal)
2012	311
2013	1,308
2014	1,352
2015	1,143
2016	1,257
2017	1,891
2018	1,405
2019	1,367
2020	869
2021	1,716
2022	1,724
2023	1,778
2024	1,739

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Figure 3 – Tailings Storage Facility Surface Elevation Forecast

Significant activities in mine water management

The Tailings Storage Facility (TSF) contained a calculated 4.284 billion gallons of free water for December 2024 compared to 4.212 billion gallons during December 2023. The slight increase in TSF water volume was attributable to a successful discharge season though total precipitation for the 2024 year was recorded at 27.34" of precipitation, well above the normal average for the region.

The Main Pit The contained an estimated 33 million gallons of free water as of December 2024, a significant reduction compared to 133 million gallons measured the same time for the previous year.

A total of 1.74 billion gallons of water was discharged from outfall 001 during 2024 compared to 1.78 million gallons discharged in 2023. Red Dog commenced water discharge from Outfall 001 on May 20th and ceased discharging on September 21st, 2024.

New Certificate of Authorizations (COA) were issued for the Mine Water Diversion Dam (MWDD), Tailings Back Dam (TBD) and the Tailings Main Dam (TMD) in December 2024. The current permitted dam elevation for the TBD and the TMD dam is 1007.4 ft. which allows for a maximum surface water elevation of 1002.4 ft. in the Tailings Storage Facility.

Waste Rock Management

Quantities, placement locations and analysis of waste rock

Dig face inspections of waste shots and weekly waste dump inspections were completed to confirm waste characteristics and suitability for stockpile locations. There were no exceptions to the Waste Rock Management Plan (Oct 2023), all waste was managed in accordance with the plan.

During Q4 2024, a total of 1,164,963 tonnes of Aqqaluk and 362,369 tonnes of Qanaiyaq waste rock were hauled to the waste stockpile areas. During this quarter, two new waste dump locations were established (APD1 and CSE). APD1 (Aqqaluk Pit Dump 1) was established in the Southeast Shelly area of Aqqaluk pit and the CSE (Cold Storage East), Figure 5 depicts the dump locations.

The purpose of APD1 to construct a final ramp on the Shelly area of Aqqaluk pit. CSE (Cold Storage East) was established on the southern toe of the MWD and with sole purpose to store connexs laden with various materials and supplies.

The primary waste storage sites were:

- Main Pit Dump (APD1, MPD3, MPD4 and MPD5)
- Oxide / Main Waste Dumps (CWD, LAN [Landfill], OXO, and QPD1)
- Projects & Construction Areas (CPAD, CSB, CSE [Cold Storage East], CSN [Cold Storage North], INC, and ROADS)

Table 2 below provides a summation of waste rock lithology and placement, Appendix J - *Waste Rock Management Summary Reports* provide additional information for waste rock and cover material stockpiled. The *Waste Rock Production Report* provides geochemistry data and the *Cover Material Report* lists physical and chemical characteristics associated with the cover rock.

Table 2 - Summary of Waste Haulage, placement area and lithology

Tonnes			Type		
Dump Area	**Location**	**Lithology**	**Construction**	**Most Reactive**	**Other**
Main Pit Dump	APD1	Ikalukrok			55,094
		Siksikpuk			32,608
	APD1 Total				**87,702**
	MPD3	Siksikpuk			666
	MPD3 Total				**666**
	MPD4	Ikalukrok		124,661	188,240
		Siksikpuk			220,582
	MPD4 Total			**124,661**	**408,822**
	MPD5	Ikalukrok		377,985	17,260
		Siksikpuk			67,175
	MPD5 Total			**377,985**	**84,435**
Main Pit Dump Total				**502,646**	**581,625**
Oxide/Main Waste Dump	CWD	Ikalukrok		28,406	
	CWD Total			**28,406**	
	LAN	Siksikpuk			5,477
	LAN Total				**5,477**
	OXO	Ikalukrok			1,979
	OXO Total				**1,979**
	QPD1	Ikalukrok			323,168
		Siksikpuk			9,525
	QPD1 Total				**332,693**
Oxide/Main Waste Dump Total				**28,406**	**340,149**
Projects & Construction	CPAD	Siksikpuk	601		
	CPAD Total		**601**		
	CSB	Ikalukrok	386		
	CSB Total		**386**		
	CSE	Siksikpuk	40,249		
	CSE Total		**40,249**		
	CSN	Siksikpuk	31,791		
	CSN Total		**31,791**		

	INC	Siksikpuk	703		
	INC Total		**703**		
	ROADS	Siksikpuk	776		
	ROADS Total		**776**		
Projects & Construction Total			**74,506**		

Table 3 lists the volume of cover rock used to date for reclamation as well as the total cover material stockpiled and available for future closure requirements.

Table 3 - Cover Material Stockpiled

Cover Stockpile Location	Total Tonnes
Road to Nowhere (RNC) - depleted	901,217
North Oxide (COV)	3,234,717
South Oxide Top Soil (SOT)	81,094
Kivalina Overburden Top Soil (KOB)	70,913
North Oxide (COV2)	3,430,563
Main Staged Cover (MSC) depleted	2,934
Oxide (COV3)	256,570
Total collected to date	7,978,008
Cover used to date	997,844
Available	6,980,164

Results of waste rock geochemical monitoring

Other than blasthole analyses, no additional geochemical testing was conducted on waste rock during the reporting period. Geochemical waste rock test results are included in the *Waste Rock and Cover Rock Summary Report* listed in Appendix J of this report. The report addresses quantity, location placement and geochemical analysis for waste rock managed during this reporting period. All waste rock was managed in accordance with the *Integrated Waste Management Plan - Waste Rock Management (Oct 2023)*.

Visual monitoring of waste rock dumps

Weekly visual inspections of active waste rock dumps were conducted by the Senior Geotechnical Engineer or their designee if offsite. No significant waste rock dump incidents were observed during the inspections though Geotechnical Engineers were alerted when mine operators visually observed another ground hazard crack in the pit wall in November. This incident is further discussed in the next section.

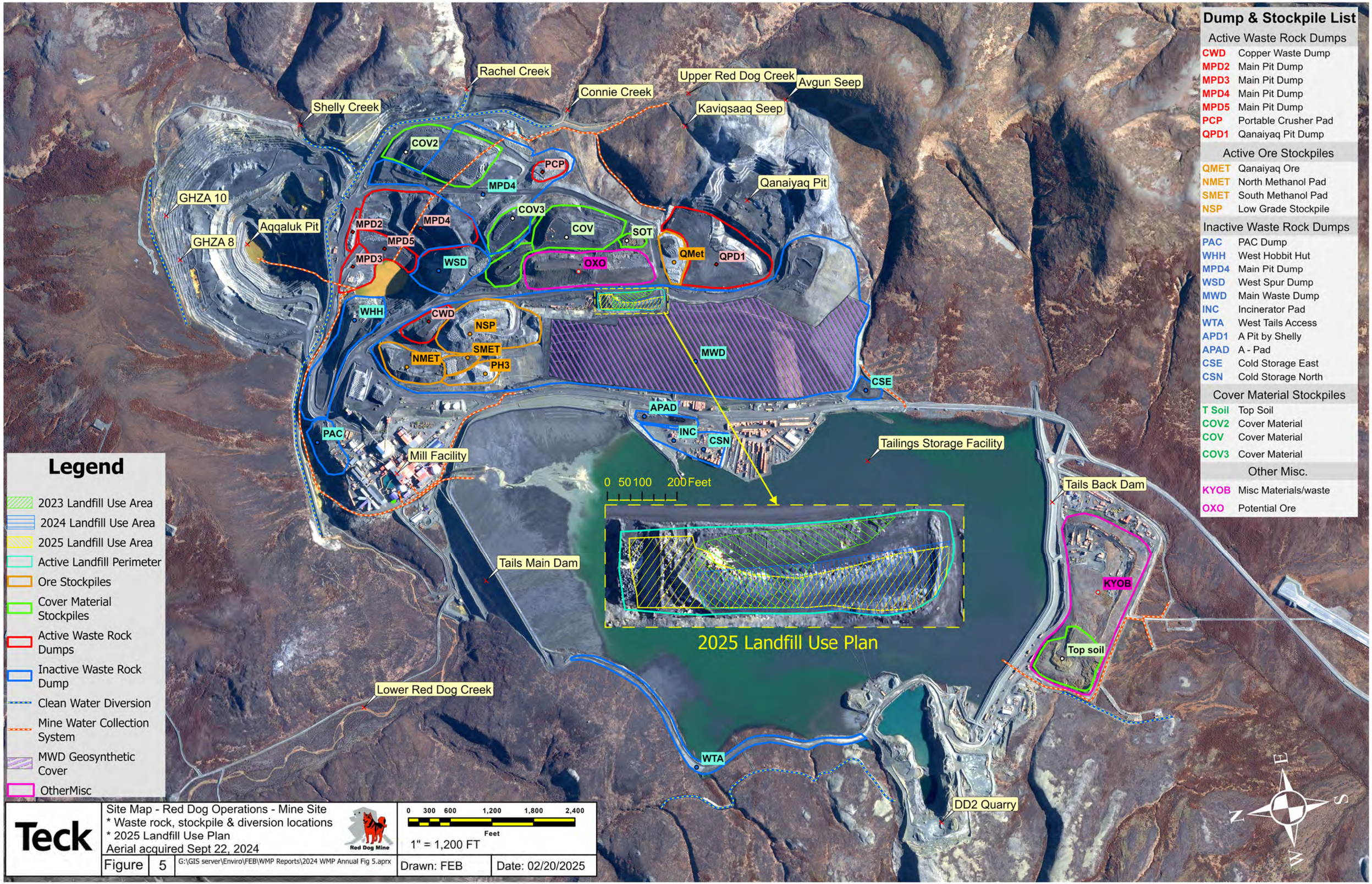
Significant activities in waste rock management

As reported in the 2023 annual report a geotechnical incident was observed on November 25, 2023 which occurred during night shift of Nov 25-26, 2023, the northwest highwall of Aqqaluk Pit started cracking open. The area was evacuated and barricaded. By morning, approximately 5 benches were impacted. This area was called (Ground Hazard))GHZA 8. The area experienced creep for a brief period prior to reaching steady state. Occasionally, the area creeps during heavy rainstorms, but aside from this brief movement, the area is generally stable. The area remains barricaded to all personnel.

During night shift on September 14, 2024, a large portion of the northern highwall of Aqqaluk Pit started moving. Multiple cracks were formed, with benches settling and some material raveling. At the pit crest, a 15-20' vertical scarp formed as a large crack opened up. A monitoring hut connex and parts of the Sulfur Creek Diversion channel were brought down into the crack. This area is referred to as GHZA 10. The area below was evacuated and barricaded. The area has steadily been decelerating since the initial event and recently achieved steady state. The area remains barricaded to all personnel. Figure 5 depicts both incident areas within the Aqqaluk Pit. For now, mining operations are working around these two hazard arounds.



Figure 4 - Geotechnical Incident GHZA 10



Dump & Stockpile List

Active Waste Rock Dumps

CWD	Copper Waste Dump
MPD2	Main Pit Dump
MPD3	Main Pit Dump
MPD4	Main Pit Dump
MPD5	Main Pit Dump
PCP	Portable Crusher Pad
QPD1	Qanaiyaq Pit Dump

Active Ore Stockpiles

QMET	Qanaiyaq Ore
NMET	North Methanol Pad
SMET	South Methanol Pad
NSP	Low Grade Stockpile

Inactive Waste Rock Dumps

PAC	PAC Dump
WHH	West Hobbit Hut
MPD4	Main Pit Dump
WSD	West Spur Dump
MWD	Main Waste Dump
INC	Incinerator Pad
WTA	West Tails Access
APD1	A Pit by Shelly
APAD	A - Pad
CSE	Cold Storage East
CSN	Cold Storage North

Cover Material Stockpiles

T Soil	Top Soil
COV2	Cover Material
COV	Cover Material
COV3	Cover Material

Other Misc.

KYOB	Misc Materials/waste
OXO	Potential Ore

Legend

- 2023 Landfill Use Area
- 2024 Landfill Use Area
- 2025 Landfill Use Area
- Active Landfill Perimeter
- Ore Stockpiles
- Cover Material Stockpiles
- Active Waste Rock Dumps
- Inactive Waste Rock Dump
- Clean Water Diversion
- Mine Water Collection System
- MWD Geosynthetic Cover
- OtherMisc

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Site Map - Red Dog Operations - Mine Site
* Waste rock, stockpile & diversion locations
* 2025 Landfill Use Plan
Aerial acquired Sept 22, 2024

Red Dog Mine

0 300 600 1,200 1,800 2,400
Feet
1" = 1,200 FT

Figure	5	G:\GIS server\Enviro\FEB\WMP Reports\2024 WMP Annual Fig 5.aprx	Drawn: FEB	Date: 02/20/2025

Tailings Management

Quantities and analysis of tailings

Table 4 depicts the dry tonnes of tailings generated and the average lead, zinc and iron concentration in the tailing's solids discharged to the Tailings Storage Facility for the quarter. No tailings were placed into the former DD2 pit this quarter.

Table 4 - Tailings Produced

		Analysis		
Month	Dry Tonnes Tailings	% Pb	% Zn	% Fe
Oct	317,285	3.3	2.8	7.9
Nov	171,150	2.7	3.5	11.9
Dec	233,853	1.6	2.9	11.1

Tailings Storage Facility and Main Pit water elevations

Table 5 lists the surveyed Tailings Storage Facility water elevation levels recorded during the reporting period. The Tailings Storage Facility was maintained within the permitted level. The Main Pit was maintained below a water elevation of 850 feet amsl.

Table 5 - Tailings Storage Facility, Elevations

Survey Date	TSF
10/04/2024	992.420
10/18/2024	992.656
10/25/2024	992.984
11/02/2024	993.080
11/08/2024	993.190
11/30/2024	993.662
12/07/2024	992.350

Visual monitoring of tailings facilities

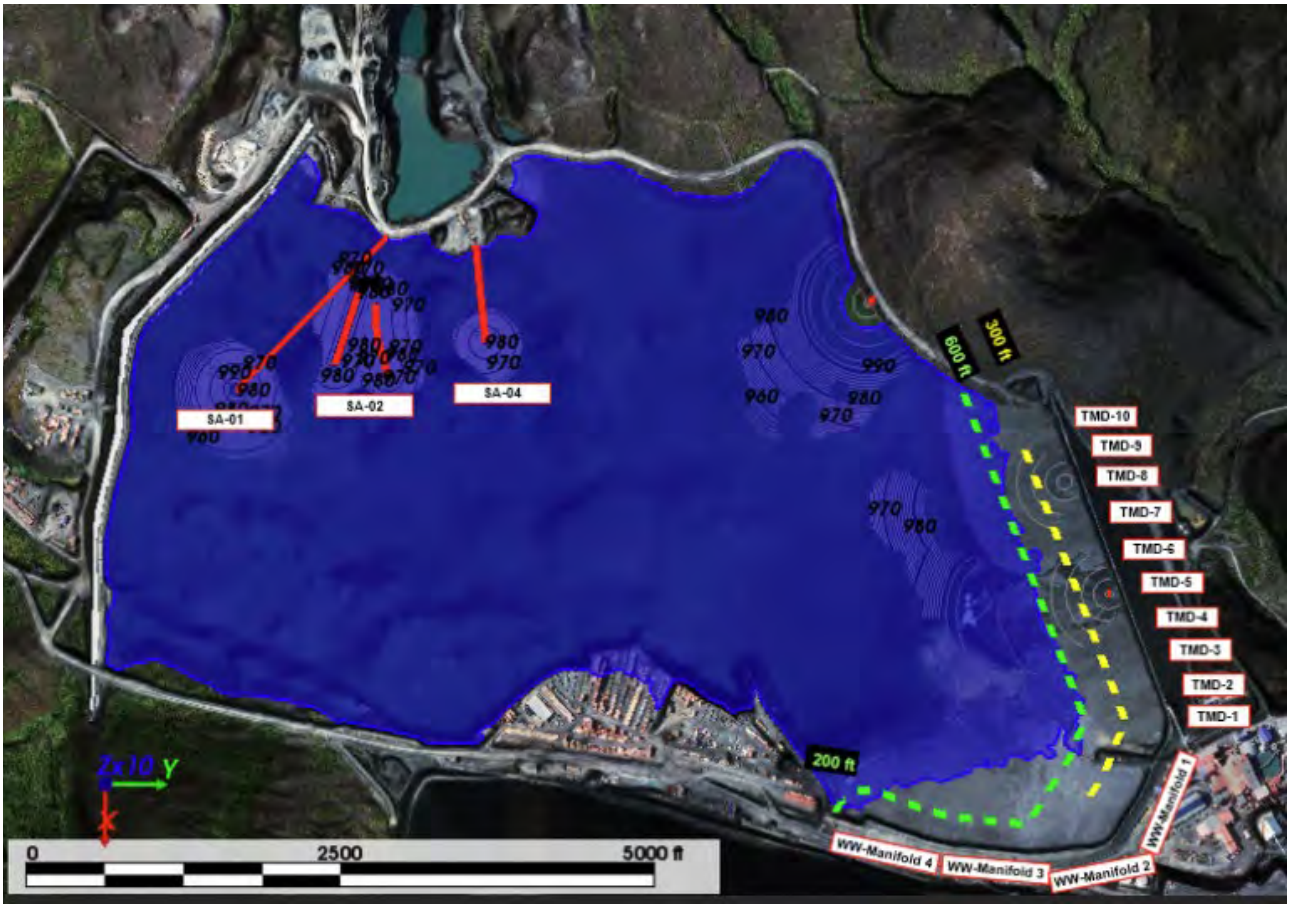
Visual monitoring inspections of the Tailings Storage Facility were completed as required. All systems operated as designed with no findings noted for the quarter. Monitoring of the dams per the requirements specified by each dams Operation and Maintenance Manual was completed for the period.

Significant activities in tailings management

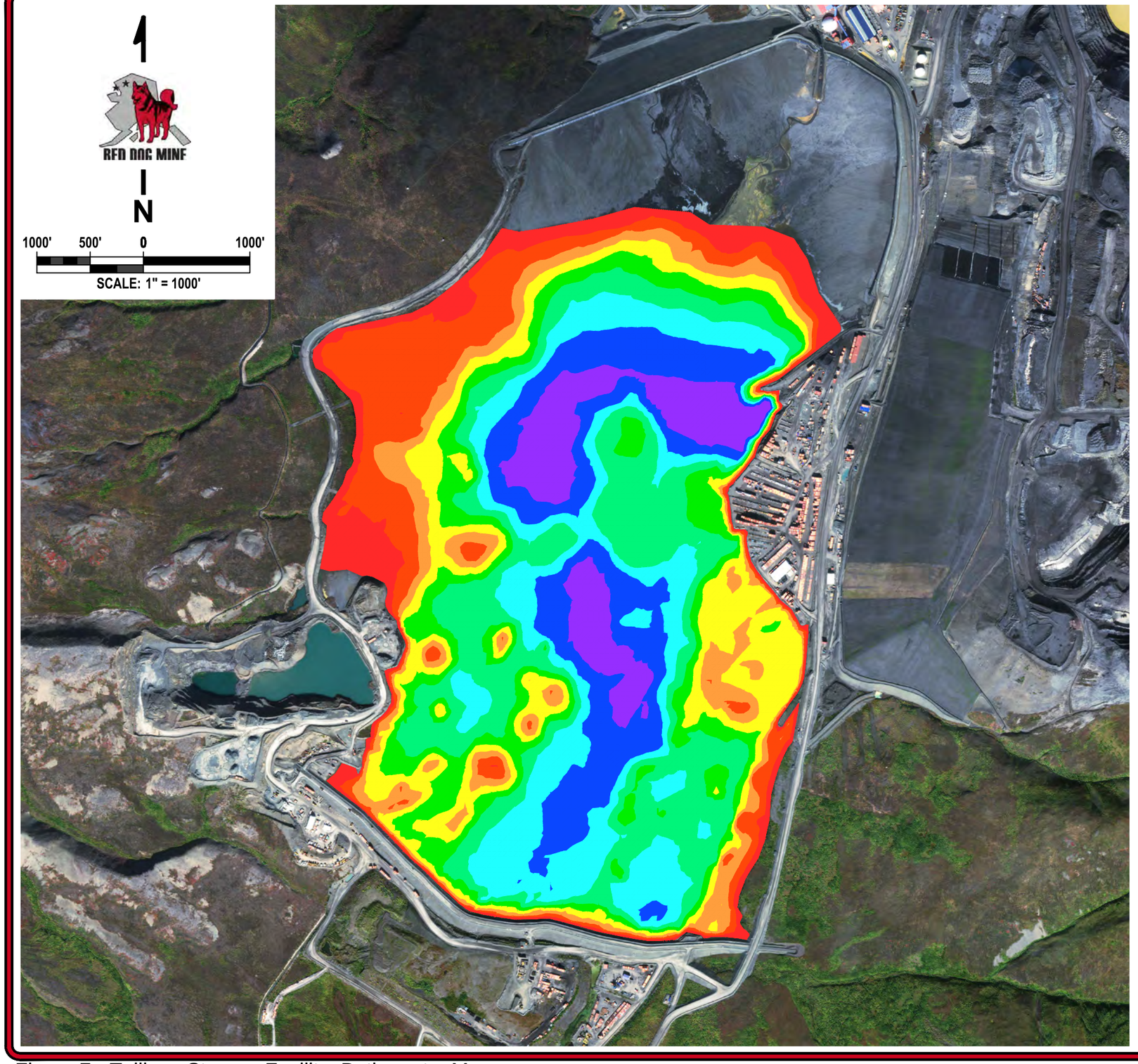
A Tailings Storage Facility and the Main Pit bathymetry surveys were completed for the 2024-year, bathymetry maps are provided in figures 7 and 8 of this report.

Tailings continued to be deposited sub aqueously for the 4th quarter. Figure 6 denotes tailings deposition areas for the quarter.

Figure 6 - Tailing Deposition in TSF for 4th quarter



2024 Actual Tailings Deposition Locations, Durations, and Tailings Tonnages				
Location	**Start Date**	**End Date**	**Durations (days)**	**Tailings Placed (Dry Tonnes)**
SA-02	9/21/2024	11/10/2024	50	441,646
SA-01	11/10/2024	12/21/2024	41	305,783
SA-04	12/21/2024	12/31/2024	10	79,755



Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	948	953	
2	953	958	
3	958	963	
4	963	968	
5	968	973	
6	973	978	
7	978	983	
8	983	988	
9	988	993	

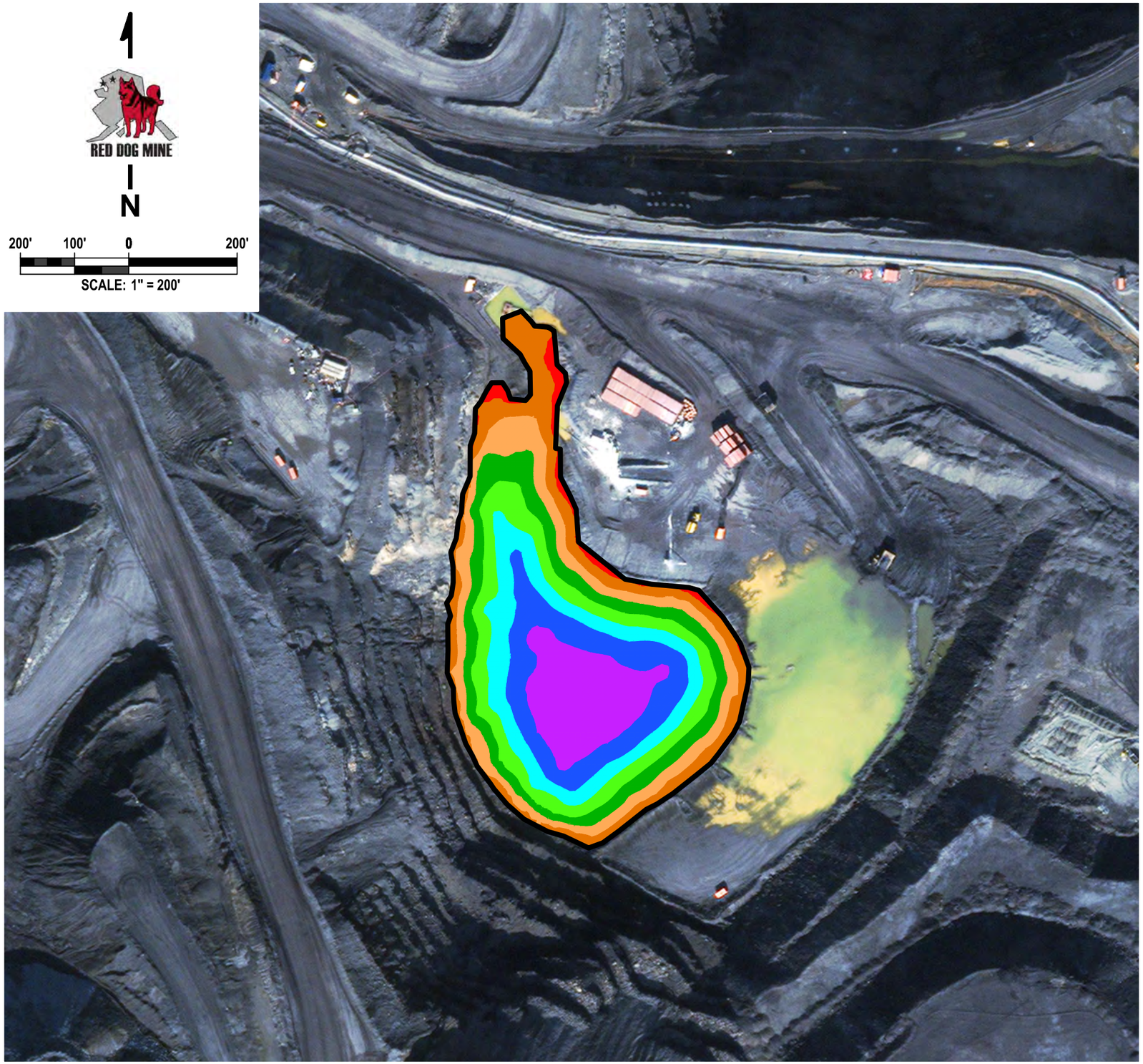
BATHYMETRY DATE: AUGUST 15-25, 2024
IMAGERY DATE: AUGUST 25 2024
TSF WATER ELEVATION: 991.4'
TSF AREA: 24,658,135.75 Sq. Ft. 566.073 Acres
FREE WATER VOLUME: 4109.6399 M Gal
COORDINATE SYSTEM: RED DOG MINE LDP

2024 TSF BATHYMETRIC MAP

PROJECT # E7750
DRAWN BY: JM
CHECKED BY: BE
DATE: 09/16/24
SCALE: 1"=1000'
SHEET: 1 OF 1

RED DOG MINE
Red Dog Operations
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Figure 7 - Tailings Storage Facility Bathymetry Map



Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	744	752	
2	752	775	
3	775	793	
4	793	809	
5	809	824	
6	824	837	
7	837	847	
8	847	848	

BATHYMETRY DATE: AUGUST 20, 2024
IMAGERY DATE: AUGUST 25, 2024
MPWR WATER ELEVATION: 848.1'
MPWR AREA: 289,559 Sq. Ft. 6.647 Acres
FREE WATER VOLUME: 103.9805 M Gal
COORDINATE SYSTEM: RED DOG MINE LDP

2024 MPWR BATHYMETRIC MAP

PROJECT # E7750
DRAWN BY: JM
CHECKED BY: BE
DATE: 10/01/2024
SCALE: 1"=200'
SHEET: 1 OF 1

RED DOG MINE

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Figure 8 - Main Pit Bathymetry Map

Class III Municipal Solid Waste Landfill

Monthly visual landfill inspections were completed as required with no noted concerns. The annual mine incinerator composite (3-week) ash sample was collected during September and analyzed for metals using EPA method 1311 - Toxicity Characteristics Leaching Procedure (TCLP). TCLP results indicated the ash is non-hazardous waste under the EPA Resource Conservation Recovery Act (RCRA). A copy of the analytical lab report was previously submitted on December 5, 2024 to Neil Lehner with ADEC.

Quantities of inert solid waste

Figure 9 – *Class III Landfill LiDAR image looking southwest* depicts the areas of use for the 2024. The gray shading indicates usage area for the 2024 year. The LiDAR survey was completed on Sept 30, 2024. Materials placed in the landfill are now being tracked daily and presented with quarterly reporting. Tables 6 and 7 list the monthly volumes of items placed in cubic yards

Figure 9 - Landfill LiDAR Survey

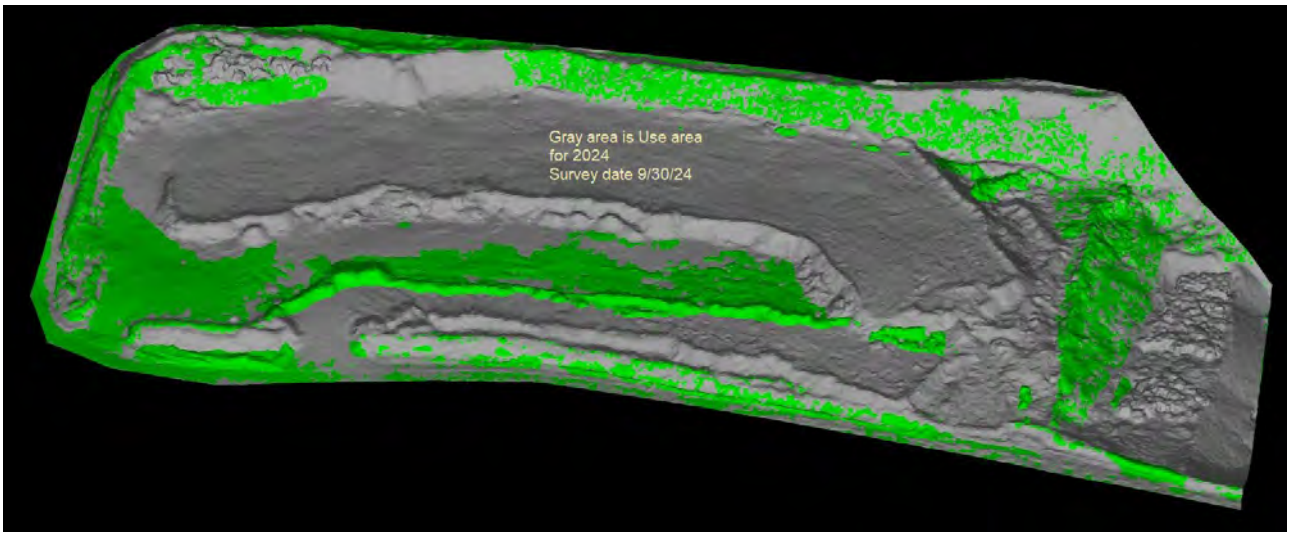


Table 6 - Red Dog Surface Crew Landfill Dumpster Log

Month	Ash	Misc. Packing Waste	Construction & Demo debris	Other	Total (cy)
Oct	10	435	740	0	1185
Nov	10	730	470	295	1505
Dec	10	0	1225	790	2025
				Total	4,715

Table 7 – Contractors Landfill Dumpster Log

Month	Ash	Misc. Packing Waste	Construction & Demo debris	Other	Total (cy)
Oct	0	0	62	0	62
Nov	0	0	264	0	264
Dec	0	0	54	0	54
				Total	380

Significant activities in solid waste landfill and waste management

Red Dog Operations continued with recycling various items which could be sent offsite for reuse or recycling. Enhancements to the recycling program are ongoing with the goal of decreasing the amount of waste placed in the Class III landfill. Waste reduction programs are constantly being reviewed to further eliminate waste though better management of how packaged materials are received at the facility, reviewing new recycling options both onsite and off and through better management and segregation of wastes generated onsite.

The bullet list below represents the amount of waste which was sent off site for recycling from all of Red Dog Operations (mine and port) for the 2024 reporting year.

- Recycled 355,596 lbs of cardboard
- Recycled 5,660 lbs. of plastic
- Recycled 5,180 lbs. paper
- Recycled 442,910 lbs. of scrap steel
- Recycled 294,400 lbs. of used tires
- Recycled 9,590 lbs. of electronic waste
- Recycled 795,640 lbs. of sag mill liners
- Recycled 699,450 wooden pallets
- Recycled 1,050,550 lbs of used oil for reprocessing offsite

Landfill Use Plan

For the 2025-year, non-municipal refuse will continue to be placed within the existing cell with refuse placement progressing to the west and north. *Figure 5 – Site Map* depicts the landfill use area planned for 2025.

Significant activities in Class III municipal solid waste landfill

Approximately ten 20 cy boxes of various metals (copper, stainless, iron) were collected and sent offsite in addition to the amounts reported in the bullet list above.

A 2nd boneyard cleanup is potentially planned for 2025 in which economically salvageable materials will continue to be diverted from landfill disposal and sent off site for recycling.

Mining and Milling Activities

Mining quantities

Table 6 lists the total tonnes of ore hauled to the mill stockpile each month during the reporting period. The total includes both Aqqaluk and Qanaiyaq ore and does not include any marginal ore placed within the Marginal Ore Stockpile.

Table 8 - Ore Mined and Stockpiled

Month	Ore Mined, tonnes
Oct	279,883
Nov	299,178
Dec	398,804

Milling Quantities

Table 7 lists the total tonnes of ore processed through the mill facilities each month during the reporting period.

Table 9 - Ore Processed through Mill

Month	Ore Milled, tonnes
Oct	415,777
Nov	239,699
Dec	243,892

Significant activities in mining and milling

Qanaiyaq ore continued to be mixed with Aqqaluk ore at a mill feed blend of approximately 20% to 30% for the 4th quarter.

Reclamation

Significant activities associated with reclamation

As mentioned in the 3rd quester report reclamation activities for the Main Waste Dump (MWD) cover project were completed for the year in October. The work focused on completing the remaining Phase III area which involved placing cover material over the goecomposite, repairing rill erosion on the slope which occurred during the 2nd quarter and reseeding the repaired areas in September.

Phase III was mostly completed with the exception of approximately 2.2 acres which were deferred due to slope instabilities which were noticed on the northern most edge, Figure 2 depicts this area in red shading. This area will be deferred to Phase V which will leaving approximately 12 acres left for Phase V to be completed in 2030-31 or once the low-grade ore stockpiled in the Phase V area is processed.

Rill erosion on the slope of the MWD was repaired and the area reseeded in October. Some minor culvert work at the Phase III toe is planned for 2025. Visual monitoring of vegetation and erosion will continue throughout the snow free months and repairs made as necessary.

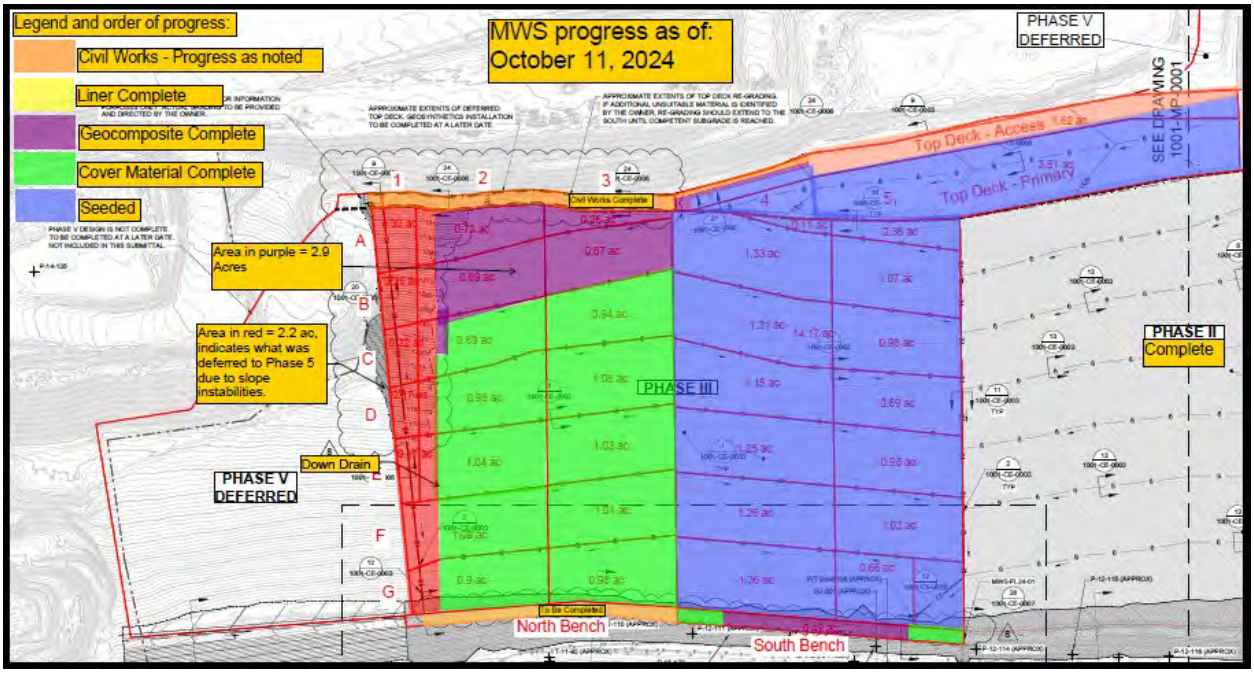


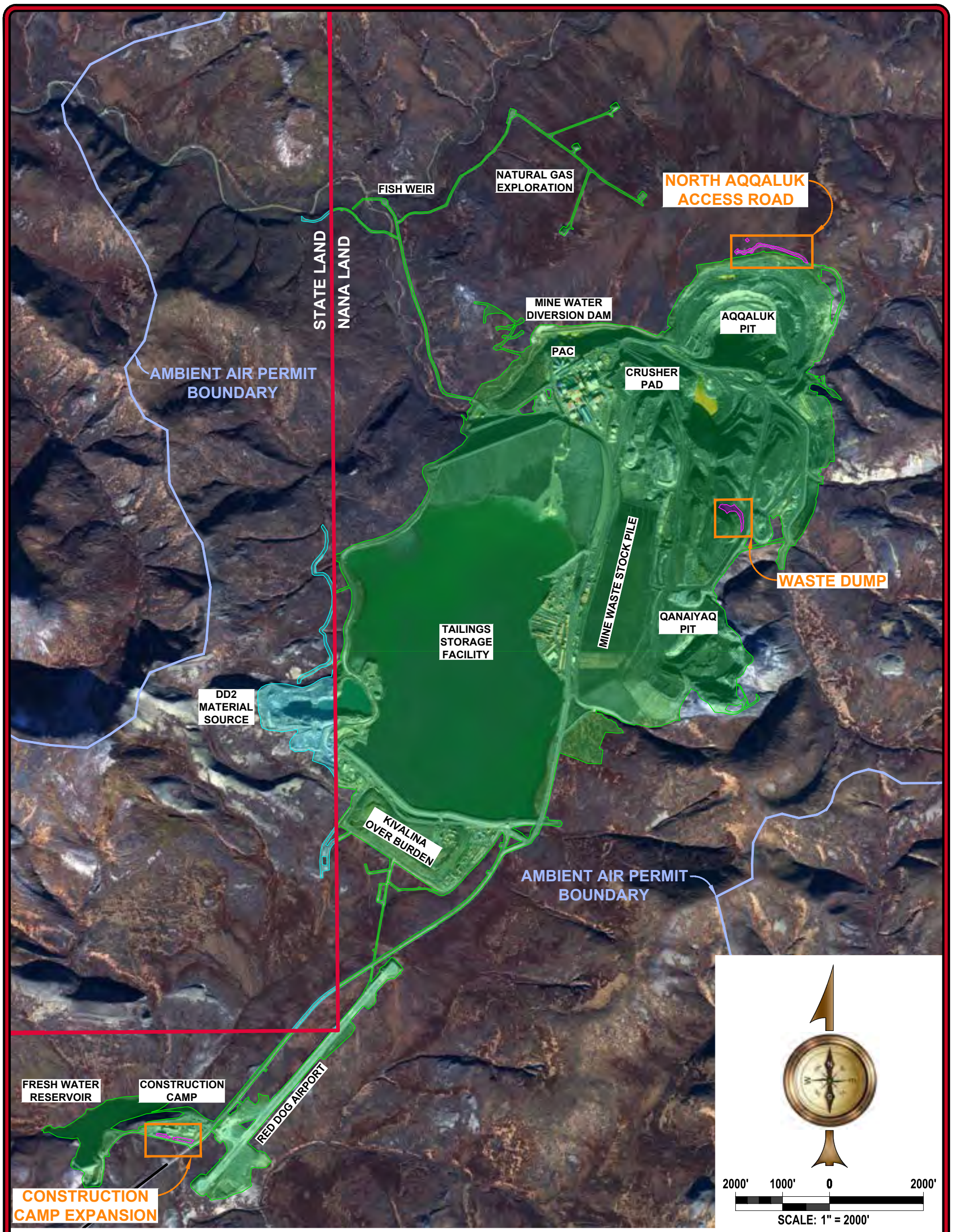
Figure 10 - MWD Cover Progress

Disturbance

A map of the new land disturbance for the mine site for the year is shown in Figure 8 – *Red Dog Operations 2024 Land Disturbance Map*. Table 8 lists the areas or projects contributing to the disturbance for 2024.

Table 10 - Area Disturbed in 2024

2024 New Disturbance Area	Acres
CC Camp Expansion	0.890
Drill access road north of Aqqaluk Pit	2.296
Expanded Cover stockpile	1.679
Total 2024 Disturbance	4.865



LAND DISTURBANCE AREA

NANA DISTURBANCE AREA = 4.865 ACRES

STATE DISTURBANCE AREA = 0.000 ACRES

TOTAL LAND DISTURBANCE AREA = 2195.275 ACRES

LEGEND

- LAND NEWLY DISTURBED
- NANA LAND PREVIOUSLY DISTURBED
- STATE LAND PREVIOUSLY DISTURBED

2024 LAND DISTURBANCE MAP

IMAGERY - SEPTEMBER 2024

PROJECT #	
DRAWN BY:	JM
CHECKED BY:	CC
DATE:	01/04/25
SCALE:	1"=2000'
FIGURE	1

RED DOG MINE

Red Dog Operations

Teck

Y:\Minetech\Intra\Diversions\Tailings\T&W GIS_PROJECTS\NANA LAND DISTURBANCE\RDM LAND DISTURBANCE.dwg

Reclamation research

No reclamation research was completed for the reporting year.

Reclamation monitoring

No formal reclamation monitoring was completed for the reporting year, established vegetation and recently seeded areas on the MWD will continue to be monitored each year.

Amendments and Authorizations to the WMP and RPA

Red Dog Operations requested an amendment to the Reclamation Plan Approval (RPA) # F20219958RPA for a net reduction in the Financial Assurance (FA) bond for construction and reclamation work completed on the Main Waste Dump (MWD). For simplicity, the amendment requests incorporated both the 2024 (Consumer Price Index) annual CPI adjustment and the completed reclamation work as one amendment. The amendment was approved on September 17th,2024 reducing the FA from $660,451,050 to $653,960,200

On May 8, 2024, the Division of Mining, Land, and Water, Mining Section (DMLW) received correspondence from Red Dog Operations requesting approval to amend the Reclamation Plan Approval # F20219958RPA for construction of exploration roads and drill pads north of the existing Aqqaluk pit, extending the existing Sulfur Creek diversion and construction of a Sulfur Creek bypass west of the Aqqaluk pit. The requested amendment to the RPA was approved by DMLW as Red Dog Amendment Approval F20219958RPA.2.

ADEC reviewed two new trial dust suppressants proposed for use within the TSF and issued approval for their use. One of the products has shown promising results and will be utilized in a larger scale in 2025.

Another dust trial product received ADEC approval for use to be injected directly into the TSF slurry freestream piping, while initial test results were positive there are some geotechnical issues still being reviewed with this product before being considered for continuous use.

ADEC approved the use of a tracer dye to visually inspect the Red Dog clean water diversion for leakage from the culvert pipe, the dye usage was approved on September 23rd, 2024. The dye was applied though turned out to be only visually detectable by UV light and no UV light was available during the test, another test may be planned for 2025.

Risk Management Plan

The 2023 Risk Management Plan (RMP) Annual report was submitted to applicable state agencies during December 2024, the report is included in Appendix K - *2023 Risk Management Plan Annual Report*.

Dust monitoring activities

Dust monitoring activities for the reporting year will be presented in the 2024 Risk Management Plan Annual Report which is anticipated to be submitted in December 2025.

Financial Assurance

As mentioned earlier an amendment to reduce the closure Financial Assurance (FA) costs per the Reclamation Plan Approval (RPA) # F20219958RPA was approved on September 17 by the Alaska Department of Natural Resources (ADNR), this was resulted in a net FA reduction of US $6,490,850, reducing the existing FA from US $660,451,050 to US $653,960,200. The FA is adequate for current operations at Red Dog, a more thorough review will be made within the next year prior to the renewal package being submitted for the Reclamation Plan Approval.

Wildlife

Wildlife interactions and casualties

There were nine recorded wildlife interactions recorded for this reporting period. Table 9 provides details for each recorded event.

Table 11 - Wildlife Interactions

SIR ID	Date	Incident Comments
13851	23-Oct-24	Enviro Tech heard a report over the radio about a bear on the road at the Y. The tech informed the reporting party that we would respond. Two Enviro Techs grabbed a shotgun and cracker shells and drove to the Y. The bear was spotted south of the intersection. The techs honked the horn, but the bear was unfazed. One tech got out of the truck and fired a cracker shell at the bear. The bear began running, and another cracker shell was fired. The bear started looking for a path to get off the road after the second cracker shell went off. The tech got back in the truck and drove to the area where the bear got off the road and fired two more cracker shells. The bear attempted to climb the north end of the runway but was unable to make it over the cornice. It descended the runway and began walking east, away from the road. One more cracker shell was fired to encourage it to keep walking away. The techs drove to the airport tower to get permission to drive on the runway. From the runway, the bear was spotted about a quarter mile away, walking southeast.

13853	24-Oct-24	The Environmental Technical Supervisor (ETS) was at the airport, leaving for R&R, when a bear was spotted on the south end of the airstrip. The ETS contacted the Enviro Shop to notify the crew of the hazard. A helicopter flew to the airstrip with two technicians. The bear was then spotted on the east side of the airstrip. The helicopter began hazing the bear southeast, away from the airstrip. Once the bear was away, the "all clear" was given.
13854	25-Oct-24	The Environmental Technician heard the tower report ptarmigan at the north end of the airstrip. The technician radioed the tower that they would respond. Technician drove a snowmobile to the north end and hazed approximately 100 ptarmigan across the street and away from the runway. The technician then gave the "all clear" to the tower, allowing Northern Air Cargo to take off.
13875	7-Nov-24	Airport tower contacted environmental shortly before 11am about some ptarmigan on the Northwest side of the runway. Environmental responded shortly after 11am and found the birds just north of the runway. A call out was made to inform the mine road area of the hazing operation and that a shotgun would be used. Two cracker shells were deployed just south of the birds and away from the road and any potential people/property. The birds flew about 50 yards and two more shots were deployed in a safe direction to haze them further from the runway. A call out was made to inform mine road traffic and airport tower that the hazing was complete.
13870	12-Nov-24	This morning, Environmental received a call about a fox that was approaching people in the smoking area in front of the PAC (Personnel Accommodation Complex). Environmental technicians walked to the PAC and spotted the fox approximately 200 yards from the smoking area. The technicians returned to the office to suit up and drive to the last known location. While getting ready, Environmental was informed that the fox had chased Red Dog personnel in front of the Heavy Equipment Shop in the North Bay Doors area. Once we understood the fox to be a threat to personnel safety, we retrieved a .22 rifle from our safe. The environmental technicians continued to receive radio calls about the fox's whereabouts, finally locating it on the west side of the service complex. Once the fox stopped in a safe, clear area for firearm discharge, one of the environmental technicians dispatched the animal with a heart shot, resulting in an instant fatality. The fox was then bagged, refrigerated and will be shipped to ADF&G at Fairbanks, AK.
13902	4-Dec-24	On December 4, 2024, warehouse personnel reported to the Environmental Department the presence of a deceased fox in the Cold Storage area. Environmental Technicians responded to the report by conducting a thorough search of the Cold Storage area. Following standard procedures, the animal was securely double-bagged to ensure safe and proper disposal in compliance with environmental and safety guidelines.
13910	12-Dec-24	A NMS employee was bringing garbage from the kitchen into the garbage hallway by the Maintenance shop. There he discovered a red fox had entered the building. At first it did not want to leave then the employee had to yell at it before it moved back outside. Either the surface crew or the maintenance personnel had left the door way opened, allowing entry into the building.

13914	16-Dec-24	At approximately 1430 this afternoon an NCC electrician was performing work in the Power Distribution Connex. During the work activities a red fox approached the worker. The fox got within two to three feet of the worker. Employee raised his voice and was able to get the fox to back off and not continue approaching. The fox was not acting in an overly aggressive manner but it also was not shy or bashful.
13915	17-Dec-24	During Enviro's lunch break, warehouse personnel left a Team message at 12:30 about a fox near the McDonald's building and requested us to haze the animal out of the area. We responded shortly after 13:00 and investigated the area. The fox was no longer in the area so we contacted someone from the warehouse who told us it was near the Y intersection. There we saw it laying on the road and thought the behavior seemed odd. Upon a closer look, we saw that the fox had found a dead ptarmigan which it was eating. We were able to haze the fox away and it did not show any aggressive behavior during hazing. We concluded that it was not a threat as it was timid our presence.

Closing

Please accept this report as required under the State of Alaska Waste Management Permit No. 2021DB0001 and Reclamation Plan Approval F20219958. If there are any questions, please contact Frank Bendrick at (907) 754-5138 or myself at (907) 754-5700.

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,

Yesnik Leslie RDOG

Digitally signed by Yesnik Leslie RDOG
Date: 2025.02.25 14:37:32 -09'00'

Les Yesnik
General Manager
Red Dog Operations

cc: Tim Pilon, ADEC, Fairbanks
Neil Lehner, ADEC, Fairbanks
William Groom, ADNR, Fairbanks
Adam Daniels, ADNR, Fairbanks
DNR.Water.Reports
Audra Brase, ADF&G, Fairbanks
Lance Miller , NANA
Mike Gonzales, Red Dog Operations
Richard Hudson, Red Dog Operations

Appendix A: 2024 Biomonitoring Report (pending 2nd quarter)

Appendix B: 2024 Annual Long-Term Permafrost & Groundwater Monitoring for TSF

2024 ANNUAL REPORT

Long-Term Permafrost and Groundwater Monitoring Program

Red Dog Mine Tailings Storage Facility

February 2025

Prepared for:

Teck Alaska, Inc.
2525 C St., Suite 310
Anchorage, AK 99503
Teck PO #1461094-SVC

Prepared by:

4300 B Street, Suite 605
Anchorage, AK 99503

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Appendix B – Figures/Maps
Appendix C – 2024 Thermistor Measurements
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Appendix F – Quality Assurance/Quality Control Data, Field Measurement Forms, and Maintenance Photos
Appendix G – Comparison Graphs, P/T-96-13 and P/T-21-13

Acronyms and Abbreviations

EPA	(US) Environmental Protection Agency
ft amsl	feet above mean sea level
ft bgs	feet below ground surface
Kohms	kilo-ohms
Kuna	Kuna Engineering, LLC
QA/QC	Quality Assurance and Quality Control
SEP	Supplemental Environmental Program
TAK	Teck Alaska, Inc.
WMCI	Water Management Consultants, Inc.
WRWP	Well Replacement Work Plan

1 Introduction

The Long-Term Permafrost and Groundwater Monitoring Program (the Monitoring Program) was established as an outcome of the Supplemental Environmental Project (SEP) and the Consent Decree between Cominco Alaska, Inc. (now Teck Alaska Incorporated) and the United States Environmental Protection Agency (EPA), entered into on November 25, 1997 (US v. Cominco Alaska Incorporated, Civil Action A97-267CV). The Monitoring Program was developed to monitor the potential effects of the Tailings Impoundment Facility (now called the Tailings Storage Facility, TSF) on permafrost and groundwater in the areas of the TSF Main Dam, the Overburden Stockpile, and background locations downgradient of the TSF within the Red Dog Creek and Bons Creek drainages. The Consent Decree requires the submission of an annual report to provide a data collection summary, a quality assurance and quality control (QA/QC) summary, and a description of the status of the monitoring program. This report follows a similar format and content as previously submitted reports, including the most recent annual report submitted in December 2023 for calendar year 2023 (Kuna 2023). This report also builds on the most recent 5-year report submitted in April 2022 for calendar years 2017 – 2021 (Kuna 2022a).

2 Background

The Red Dog Mine is a lead-zinc mine located in northwestern Alaska approximately 50 miles northeast of Kotzebue, Alaska and 107 miles north of the Arctic Circle within the DeLong Mountains. The mine is owned by NANA Regional Corporation and operated by Teck Alaska (TAK). Figure 1 illustrates the regional setting and layout of the mine and its support facilities. The mine consists primarily of several open pits (ore bodies) and associated support facilities. Support facilities include an ore milling and concentration facility, an employee housing area, a construction camp, an asphalt paved runway, and a power generation facility. The site also includes approximately 300 acres of waste rock piles and a tailings storage facility (impoundment) behind two earthen dams (the main and back dams). The TSF is used for the storage of tailings (underwater) and receives drainage from the open pit areas, natural surface run-off, and process waters from the milling operation. Following treatment, water is discharged during summer months. The original Red Dog ore body (i.e., Main Pit) is no longer being actively mined and is instead receiving waste rock from the mining of the Aqqaluk and Qanaiyaq ore bodies. Waste rock will continue to be placed in the Main Pit until the pit has been completely backfilled; this is anticipated to occur during late 2025.

The TSF has the potential to affect both permafrost and groundwater in one or more adjacent watersheds/drainages. To document these potential effects, a ground temperature and groundwater level monitoring program began in the mid-1990s as part of the Groundwater Monitoring Supplemental Environmental Project (SEP). Results from this project are documented in the project's report (Water Management Consultants, Inc. 2001b) and form the basis for the Long-Term Permafrost and Groundwater Monitoring Plan (WMCI 2001a). Long-term monitoring is intended to demonstrate the continuity of the permafrost and the minimal flow of groundwater beneath and from (outside of) the TSF. The continuity of subsurface frozen conditions is critical to ensuring that any impacts from dissolved metals or other compounds in the TSF do not affect the adjacent watersheds.

The key elements of the SEP monitoring program are:

- The quarterly monitoring of sixteen thermistors at background sites, the overburden stockpile, and within and downgradient from main dam area;
- The quarterly monitoring of nine piezometers at background sites and the main dam area;
- Data reduction, presentation, and management;
- Annual data reporting; and,
- Assessment of pertinent data trends on a five-year basis. The last five-year report was submitted in April 2022 for the period of 2017 – 2021.

3 2024 Data Collection

TAK personnel collect the data from the project thermistors and piezometers (see listing in Appendix A). These data are then submitted to Kuna Engineering (Kuna). Appendix B contains a table of the raw data. Kuna is then responsible for the data reduction, presentation, and management.

The RDM thermistor and piezometer monitoring locations are illustrated on Figure 3 (northern portion), Figure 4 (central portion), and Figure 5 (southern portion).

Table 1 provides a summary of the quarterly data collection dates for the active thermistor strings, and Table 2 provides a summary of the quarterly data collection dates for the active piezometers.

Table 1. Summary of the 2024 Quarterly Thermistor Data Collection

Thermistors	Associated Figure	General Location	Monitoring Dates			
			1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
T-96-015	Figure 2	Red Dog Creek	3/25/24	6/23/24	9/26/24*	10/27/24
T-95-005	Figure 2	Dam Area	-	6/23/24	9/26/24	10/27/24
T-96-010	Figure 2	Dam Area	-	-	-	-
T-97-028	Figure 2	Dam Area	-	6/23/24	9/26/24*	10/27/24
T-97-029	Figure 2	Dam Area	3/25/24	6/23/24	9/26/24	10/27/24
T-97-030	Figure 2	Dam Area	3/25/24	6/23/24	9/26/24*	10/27/24
T-14-110	Figure 2	Tailing Impoundment	3/23/24	6/23/24	9/26/24	10/26/24
T-95-004	Figure 2	Dam area	-	-	9/26/24	-
T-05-061	Figure 2	Dam area	-	6/23/24	9/26/24*	10/27/24
T-95-008 #2	Figure 3	Overburden Stockpile	3/24/24	6/23/24	9/26/24*	10/27/24
T-96-013	Figure 3	Overburden Stockpile	3/24/24	6/23/24	9/26/24	10/27/24
T-96-021	Figure 3	Overburden Stockpile	3/24/24	6/23/24	9/26/24*	10/27/24
T-96-022	Figure 3	Overburden Stockpile	3/24/24	6/23/24	9/26/24	10/27/24
T-96-023	Figure 3	Overburden Stockpile	-	6/23/24	9/26/24	10/27/24
T-96-012	Figure 3	Bons Creek	3/24/24	6/23/24	9/26/24	10/27/24
T-96-012s	Figure 3	Bons Creek	3/24/24	6/23/24	9/26/24	10/27/24
T-21-013	Figure 3	Overburden Stockpile	3/26/24	6/23/24	-	-

Note: Hyphens (-) indicate that data was not collected. * Indicates inaccurate readings.

Table 2. Summary of the 2024 Quarterly Piezometer Data Collection

Piezometer	Associated Figure	General Location	Monitoring Dates			
			1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
P-96-015	Figure 2	Red Dog Creek	3/25/24	6/23/24	9/26/24	10/27/24
P-96-010	Figure 2	Dam Area	3/26/24	6/23/24	9/30/24	10/27/24
P-97-028	Figure 2	Dam Area	3/24/24	6/23/24	9/30/24	10/27/24
SPP-97-002	Figure 2	Dam Area	3/26/24	6/23/24	9/30/24	10/27/24
P-08A	Figure 2	Dam Area	3/24/24	6/23/24	9/30/24	10/27/24
P-08B	Figure 2	Dam Area	3/24/24	6/23/24	9/30/24	10/27/24
P-97-020	Figure 2	Dam Area	3/24/24	6/23/24	9/30/24	10/27/24
P-96-013	Figure 3	Overburden Stockpile	3/24/24	6/23/24	9/26/24	10/27/24
P-97-012	Figure 3	Bons Creek	3/24/24	6/23/24	9/26/24	10/27/24
P-21-013	Figure 3	Overburden Stockpile	-	-	-	10/27/24

Note: Hyphens (-) indicate that data was not collected.

Wells T-96-010 and T-95-004 have missing data throughout 2023 and 2024 due to the inadvertent burial of the extension cables during the 2021 Main Dam raise and the development of a new seepage pond below the Main Dam. During September 2024, the buried cable of T-95-004 was cut and spliced with 200 additional feet of cable and a 6’ pigtail Amphenol connector at the roadside for improved access. Other thermistors have no readings during winter months where snow either buried the wells or impeded access. While periodic data quality and collection issues continue to exist, these do not impact the overall long-term monitoring objective for the program.

4 Data Management and Reporting

As previously described, the reading and collection of the data from the thermistors and piezometers was performed by TAK personnel in 2024. These data were periodically provided to Kuna to upload to the Red Dog Mine groundwater monitoring database. Microsoft Access™ and Excel™ software are used to generate the tables and graphical plots of the data.

4.1 Thermistor Data Collection

Data collected from the thermistor cables is measured as a resistance value, in kilo-ohms (kohms) using a Dryden Instrumentation T5KMUK Automated Thermistor String Reader. The measured resistance values are subsequently converted to temperatures using calibration coefficients for each thermistor sensor. A calibrated digital temperature acquisition cable was used to measure ground temperature at replacement site T-14-110; similar to the T-21-013 thermistor string. The temperature data is logged and available for download on a periodic basis as necessary. Measured values are reviewed for completeness and the data is subsequently uploaded to the database. Where possible and if time permits, erroneous readings (such as negative values or those marked as “9999”) are re-read during the quarter.

Some thermistor measurements are not representative of true/valid measurements (i.e., where the measurements are less than zero (0) kohms or greater than 300 kohms). These measurements may also represent issues with the sensors or cable breaks/shorts. Statistical methods that have been used to

identify and remove outliers from thermistor data include both the interquartile range (IQR) method and the standard deviation method. For the 2024 data, values greater than 2 standard deviations from the mean are excluded from the analysis dataset and the graphs included in Appendix D. Outlier values are shaded red in the raw data table presented in Appendix C.

4.2 Piezometer Data Collection

As with the thermistor readings, TAK personnel are responsible for providing the measurements from the vibrating wire piezometers (VWPs) and the associated barometric pressure readings from the mine meteorological station. The VWP measurements (via pressure transducers) are then converted by Kuna to groundwater elevations using the individual transducer calibration coefficients, site elevations, and the barometric pressure readings. The calibration coefficients for each of the VWPs was determined during installation. Following conversion and a quality control review, the 2024 data were uploaded to the database.

Some piezometer measurements are not representative of true/valid measurements and in some cases may represent issues with the sensors or cable breaks/shorts. For piezometer data, the interquartile range (IQR) method is utilized to identify and exclude outliers (Penn State 2022). Measurement values that are >1Q + 3*IQ or < 1Q – 3*IQ are considered outliers and are excluded from the analysis data set and the graphs included in Appendix E.

4.3 Data Analyses

The ground temperature measurements collected from the sixteen thermistor monitoring locations are plotted using three types of graphs/plots as presented in Appendix D (separate plots for each thermistor string):

- Temperature trumpet plots of data for all years (different color for each year/quarter)
- Temperature vs depth plots of 2024 data (different color for each quarter)
- Average temperature vs depth plots of 2024 data

The piezometer data are presented in Appendix D as time series graphs of groundwater elevation and depth.

Graphs are scaled to optimize resolution of the plots and include validated measurements only (i.e., those not excluded as statistical outliers). Note that values excluded as outliers represent measurements from individual nodes that are likely caused by intermittent connections and are therefore unlikely to represent true changes in temperature or water elevation.

5 Summary of Data QA/QC and Data Considerations

Copies of the quarterly report data checklists are provided in Appendix E, with the quarterly data field reporting forms. The checklists are completed by Kuna following the receipt of the quarterly data and sent back to TAK personnel to enable the recollection of data as necessary. Standard operating procedures developed for the monitoring program included taking duplicate measurements to ensure different operators and or equipment would not impact representativeness of the data.

According to the 1997 consent decree, a full analysis and interpretation of the data will be provided in the next 5-year monitoring report to be submitted in 2026. A 5-year report covering the years 2017 – 2021 was submitted in Spring 2022 (Kuna 2022b).

5.1 Thermistor QA/QC

Duplicate measurements were collected for 11 thermistor strings from the Dryden Instruments T5KMUK data logger and the Dryden Switchbox Fluke multimeter system during 2024. Variations in the thermistor measurements were also compared to previously collected data and trends. The thermistor QA/QC data is presented in Table 3.

Table 3. Summary of 2024 Thermistor QA/QC Data

Quarter	Date	Thermistor	Multi-meter Start Time	Comments
1st Quarter	3/26/24	T-96-13	11:26	Nodes 4 and 24 “jumpy”
2nd Quarter	6/23/24	T-96-12	10:36	Nodes 12, 13, and 21 have errors
2nd Quarter	6/23/24	T-96-22	11:09	Nodes 3, 8 and 15 have errors
2nd Quarter	6/23/24	T-96-13	11:37	Nodes 4 and 24 have errors
2nd Quarter	6/23/24	T-96-29	16:18	Error on node 3; several “jumpy” nodes
2nd Quarter	6/23/24	T-96-28	16:23	Several “jumpy” nodes
2nd Quarter	6/23/24	T-96-15	17:54	Error on node 12
3rd Quarter	-	-	-	Not completed
4th Quarter	10/27/24	T-97-28	16:27	Error on node 13; several “jumpy” nodes
4th Quarter	10/27/24	T-97-29	16:38	Several “jumpy” nodes
4th Quarter	10/27/24	T-95-05	15:41	

5.2 Piezometer QA/QC

Piezometer QA/QC consists of a duplicate reading within five minutes of the first piezometer reading each quarter. Table 4 presents a summary of the QA/QC data for 2024.

Table 4. Summary of 2024 Piezometer QA/QC Data

Quarter	Date	Piezometer	Comments
1st Quarter	3/24/24	P-96-13	6556.5 m/m at 0.4°C
2nd Quarter	6/23/24	P-97-12	6231.7 m/m at 0.2°C
3rd Quarter	-	-	Not completed
4th Quarter	10/27/24	P-96-15	7534.4 m/m at 0.3°C

5.3 Thermistor Maintenance

Thermistor measurements collected during 2023 indicated that several were malfunctioning (i.e., out of range readings, Appendix F) and required maintenance. Out-of-range readings may be indicative of shorts or discontinuities in the cabling/wiring of a thermistor at the connectors or exposed ends. An investigation into sporadic thermistor readings led to the discovery of resistance errors, possibly from buildup of dirt inside of the sealed connectors. During July 2024, an inspection and cleaning of thermistors, associated cables and connections was performed. Connections were cleaned with acid

(20% HNO_3), rinsed with DI water and then resealed with silicone to prevent future corrosion and build-up. Connections were inspected and any broken, bent or missing pins or damaged wires were noted for future repair. Field notes and additional photos from this effort are included in Appendix F.



Figure 1. Thermistor connector with debris build up (left) and after cleaning (right).

Additional efforts are planned for Summer 2025 to improve data collection including continued inspection, maintenance and cleaning of thermistors and repair of damaged wires, cables and connector pins as needed.

5.4 Piezometer System Maintenance

Most of the VWPs are functioning, with limited erroneous measurements in 2024. Measurements from piezometer P-08B from Q3 and Q4 were identified as outliers and removed from the analysis dataset. Data collected from this instrument during Q1 of 2025 will be scrutinized to determine if the instrument requires maintenance or repair.

5.5 New Thermistor/Piezometer Comparisons

The 2018 SEP Well Replacement Work Plan (2018 SEP WRWP, Golder 2018) describes the replacement details for the P/T 96-013 thermistor and piezometer, located just south of the back dam, within the Kivalina Overburden Stockpile (Figure 3). The original piezometer and thermistor wells were installed in 1996 as part of the SEP Phase I project. This site is replaced by the P/T-21-13 well, completed late in 2021. The piezometer is installed to a total depth of 610 feet bgs with dual VWPs located at this depth. The thermistor string is installed to a total depth of 490 feet bgs and has 24 sensors, identical to T-96-013. A memo was previously submitted to the USEPA providing documentation on these installations and the comparison of the P/T 21-13 and P/T 96-013 (Kuna 2022a).

A graph showing all piezometer data collected from this location to-date is provided in Appendix G. As shown in this graph, the water levels measured by P-21-013-1 are on average 6 – 8 feet higher than those measured by P-21-013-2. The reason for this difference is uncertain, however, the measurements remain consistent. Measurements from P-96-13 are included on the graph as point data, which show a strong correlation with data from P-21-13-2. A second graph compares water levels measured by P-21-13-2 with water level measurements from P-96-13. The difference in feet at points of simultaneous measurement collection are shown on the graph.

A trumpet plot showing all data to-date from T-21-13, in addition to temperature vs depth plots of T-21-13 and T-96-13 are provided in Appendix G. The temperature vs depth plots show good correlation between datasets from the two instruments, with exception of a few nodes on T-96-13 that are likely not functioning properly.

These comparisons are used to recommend the future data collection and management activities as outlined in Section 7.

6 Summary and Conclusions

The data collected in 2024 for the permafrost and groundwater monitoring program is generally consistent with the data from prior quarters and years. The Red Dog Mine area is characterized by a "warm" permafrost that exhibits temperatures of just a few degrees below freezing. Permafrost near the TSF area is continuous from roughly 40 – 80 feet bgs to 150 – 200 ft bgs, with unfrozen material below these depths. Permafrost is no longer present south of the dam for approximately a half of mile (Golder, 2020). Groundwater elevations are generally consistent with past years, with flows typically towards Red Dog Creek, except in the back dam area where a flow divide exists, around the south side of the overburden stockpile, separating the Bons Creek drainage from the Red Dog Creek drainage.

7 Future Data Monitoring and Management Recommendations

The comparisons of the water elevation and temperature data for the new and old piezometers and thermistors is described in Section 5.5 and through the graphs included in Appendix G. The following recommendations for future data management activities are recommended as a result of these comparisons:

- Teck recommends the cessation of data collection for piezometer P-96-013. These data are considered comparable and nearly duplicative of the data measured through P21-013-2. Going forward, the readings from P-96-13 would be collected on a periodic basis to provide a general confirmation of the P21-13-2 data.
- Teck recommends periodic data collection for piezometer P-21-13-1. These data will be collected on an irregular, but periodic basis to provide a general confirmation of the P21-13-2 data.
- Teck recommends the cessation of data collection for thermistor T-96-013. Going forward these data would be collected on a periodic basis to provide a general confirmation of the T-21-13 data.

Teck will not move forward on these recommendations until an official approval is received from the USEPA.

8 References

Golder, 2018. Technical Memorandum – Work Plan for Proposed 2018 SEP Well Replacement, Red Dog Mine, Alaska.

Golder, 2020. Technical Report – Site Wide Permafrost Delineation, Red Dog Mine, Alaska

Kuna Engineering, 2021. 2020 Annual Report, Long-Term Permafrost and Groundwater Monitoring Program for the Tailings Impoundment Facility, February 2021.

Kuna Engineering, 2022a. Technical Memorandum, Comparison of PT96-13 and PT21-113.

Kuna Engineering, 2022b. Data Analysis Report, 2017 – 2021, Long-Term Permafrost and Groundwater Monitoring Program, April 2022.

Kuna Engineering, 2023. 2022 Annual Report, Long-Term Permafrost and Groundwater Monitoring Program for the Tailings Impoundment Facility, February 2023.

Kuna Engineering, 2023. 2023 Annual Report, Long-Term Permafrost and Groundwater Monitoring Program for the Tailings Impoundment Facility, December 2023.

Penn State, 2022. Identifying Outliers: IQR Method. Accessed at https://online.stat.psu.edu/stat200/book/export/html/63.

Water Management Consultants, Inc. (WMCI), 2001a, *Red Dog Mine – Long-Term Permafrost and Groundwater Monitoring Plan for the Tailing Impoundment*, March 2001.

Water Management Consultants, Inc. (WMCI), 2001b, *Red Dog Mine – Phase III Hydrologic Characterization of the Tailings Impoundment*, March 2001.

Appendix A
Listing of SEP Thermistors and Piezometers

SEP GW Instrument Information

Station ID	Type	No. Nodes (thermistors only)	Location	Status	Instrument Depth	Notes
P-08A	piezometer		Dam Area	Active	153	
P-08B	piezometer		Dam Area	Active	178	
P-21-013	piezometer (1)		Overburden Stockpile	Active	610	Will replace P-96-013; 2 VWPs, both at 610 ft bgs
P-96-010	piezometer		Dam Area	Active	197.2	
P-96-013	piezometer		Overburden Stockpile	Active	544.4	
P-96-015	piezometer		Bons Creek	Active	300	
P-97-012	piezometer		Bons Creek	Active	460.52	
P-97-020	piezometer		Dam Area	Active	410	
P-97-028	piezometer		Dam Area	Active	48.5	
P-99-007R	piezometer		Tailing Impoundment	Inactive	-	Flooded
SPP-97-002	piezometer		Dam Area	Active	unknown	
T-05-061	thermistor	6	Dam Area	Active	58	
T-14-110	thermistor (1)	44	Tailing Impoundment	Active	unknown	Replaced T-95-007
T-21-013	thermistor (1)	44	Overburden Stockpile	Active	490	Will replace T-96-013
T-95-004	thermistor	24	Dam Area	Active	400	Cable repaired 9/15/2024
T-95-005	thermistor	24	Dam Area	Active	400	Inspected/cleaned July 2024
T-95-007	thermistor	--	Tailing Impoundment	Inactive	400	
T-95-008	thermistor	--	Overburden Stockpile	Inactive	260	
T-95-008#2	thermistor	24	Overburden Stockpile	Active	260	Replaced T-95-008; Inspected/cleaned July 2024
T-96-010	thermistor	24	Dam Area	Active	360	Cable severed, needs repair.
T-96-012	thermistor	24	Bons Creek	Active	490	Inspected/cleaned July 2024
T-96-012S	thermistor	24	Bons Creek	Active	490	
T-96-013	thermistor	24	Overburden Stockpile	Active	490	Inspected/cleaned July 2024
T-96-015	thermistor	14	Red Dog Creek	Active	210	
T-96-020	thermistor	--	Dam Area	Inactive	470	
T-96-021	thermistor	24	Overburden Stockpile	Active	122	Inspected/cleaned July 2024
T-96-022	thermistor	24	Overburden Stockpile	Active	122	Inspected/cleaned July 2024
T-96-023	thermistor	24	Overburden Stockpile	Active	112	Inspected/cleaned July 2024
T-97-028	thermistor	24	Dam Area	Active	235	Inspected/cleaned July 2024
T-97-029	thermistor	24	Dam Area	Active	235	Inspected/cleaned July 2024
T-97-030	thermistor	24	Dam Area	Active	275	Inspected/cleaned July 2024

Notes:

(1) Digital type instruments. T-21-13 is connected to a continuous data logger.

Appendix B
Figures/Maps

- Figure 1 – Mine Layout
- Figure 2 – Main Dam Area
- Figure 3 – Overburden Stockpile/Back Dam Area



Legend

- Contour Line (50 Foot)
- Streams

0 0.38 0.75 1.5 Miles

N

Notes:
1. Coordinate system is NAD83 Zone 7N, units are US feet.
2. Background imagery is from 2024 contour lines are from 2024 topography.

The information in this map is for planning purposes only and is not to be used as a legal document.

KUNA ENGINEERING

Red Dog Mine Supplemental Environmental Program Long Term Permafrost and Groundwater Monitoring Program

MINE LAYOUT

File Name: RDM_Map	Date: 2/17/2025	Job No. 165.030386	Approved: JCR/MLN	Figure: 1



Overview Map

MILL AND CAMP FACILITIES

T-95-005

MAIN DAM

T-97-030

T-97-029

P-97-020

P-97-011

P-08A

T-97-028

MAIN DAM BEACH

P-96-010

T-96-010

SPP-97-002

T-95-004

T-05-061

SEEPAGE COLLECTION SYSTEM DAM

P-99-007R

Red Dog Creek

P-96-015

T-96-015

1050 1000 950 900 850 800 750

Legend

- Inactive Groundwater (Piezometer)
- Groundwater (Piezometer)
- Ground Temperature (Thermistor)
- Contour Line (50 Foot)
- Streams

N

0 0.1 0.2 0.4 Miles

Notes:
1. Coordinate system is NAD83 Zone 7N, units are US feet.
2. Background imagery is from 2024, contour lines are from 2024 topography.

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KUNA ENGINEERING

Red Dog Long Term Permafrost and Groundwater Monitoring Program

MAIN DAM AREA

File Name: RDM_Map	Date: 2/17/2025	Job No. 165.030386	Approved: JCR/MLN	Figure: 2



Overview Map

BACK DAM

BACK DAM BEACH

T-96-013

P-21-013

P-21-013
P-96-013

OVERBURDEN STOCKPILE

T-96-021

T-95-008 #2

T-96-023

T-96-022

T-96-012S

T-96-012

P-97-012

Bon's Creek

Legend

- Contour Line (50 Foot)
- Streams
- Groundwater (Piezometer)
- Ground Temperature (Thermistor)
- Inactive Groundwater (Piezometer)

N

0 0.1 0.2 0.4 Miles

Notes:
1. Coordinate system is NAD83 Zone 7N, units are US feet.
2. Background imagery is from 2024, contour lines are from 2024 topography.

The information in this map is for planning purposes only and is not to be used as a legal document.

KUNA ENGINEERING

Red Dog Long Term Permafrost and Groundwater Monitoring Program

OVERBURDEN STOCKPILE/ BACK DAM AREA

File Name: RDM_Map	Date: 2/17/2025	Job No. 165.030386	Approved: JCR/MLN	Figure: 3

Appendix C
Raw Thermistor Data

Appendix B - THERMISTOR DATA READINGS 2024 (SORTED BY INSTRUMENT)

Site ID	Num Therm	Date/Time	pt-01	pt-02	pt-03	pt-04	pt-05	pt-06	pt-07	pt-08	pt-09	pt-10	pt-11	pt-12	pt-13	pt-14	pt-15	pt-16	pt-17	pt-18	pt-19	pt-20	pt-21	pt-22	pt-23	pt-24
T95-8 #2	24	3/24/20 9:56	20.718	16.735	16.783	16.914	16.919	16.936	16.921	8.4772	8.4772	16.996	17.003	16.966	16.98	17.041	16.989	17.006	17.019	16.996	17.01	17.036	17.04	17.038	17.096	17.137
T95-8 #2	24	6/23/20 11:29	16.703		17.12	16.792	16.933	16.943	16.959	16.942	16.922	16.987	17.005	17.007	16.969	16.985	17.047	16.991	17.024	17.029	17.013	17.037	17.06	17.05	17.042	17.098
T95-8 #2	24	9/26/24 11:31	15.99	16.896	16.889	16.935	16.952	16.959	16.942	15.29	14.89	17.004	17.007	17.004	16.984	17.064	16.992	-72.23	17.028	17.013	17.035	17.058	17.048	17.066	-27.68	-9999
T95-8 #2	24	10/27/24 15:06	16.339	16.844	16.811	16.934	16.942	16.956	16.94	8.4813	8.4813	16.997	17.009	16.965	-281.8	17.085	16.988	17.025	17.024	17.004	17.03	17.047	17.04	16.998	17.09	-518.7
T96-13	24	3/24/24 9:31	16.249	15.59	13.759	-9999	16.695	16.801	17.402	8.4707	8.4707	17.028	17.095	17.131	19.282	20.233	18.325	17.123	17.171	16.988	19.728	16.824	16.741	16.627	16.55	-21.38
T96-13	24	6/23/24 11:38	12.198	17.794	14.473	9999.9	16.694	16.803	17.434	16.89	16.985	4758		17.094	17.134	19.326	20.301	18.348	17.232	17.17	16.985	21.025	16.827	16.743	16.627	16.552
T96-13	24	9/26/24 11:37	12.173	15.413	14.231	9999.9	16.693	16.813	17.469	16.888	16.983	9999.9	17.089	17.138	19.376	20.361	18.366	17.129	17.168	16.984	19.839	16.825	16.741	16.626	16.55	16.37
T96-21	24	3/24/24 14:56	20.935	17.352	15.232	-18.53	13.533	13.557	13.162	13.22	13.387	13.712	-1640	-6099	-6616	15.439	-2148	16.07	16.483	16.583	-645	16.722	16.767	16.81	16.834	16.884
T96-21	24	6/23/24 11:01	7.0055	8.9402	13.29	14.354	14.21	14.113	13.511	13.43	13.553	13.91	14.272	14.627	14.957	15.37	15.759	16.066	16.491	16.592	16.611	16.735	16.781	16.819	16.837	16.898
T96-21	24	9/26/24 16:30	15.117	9999.9	9999.9	12.133	14.426	13.476	-33.7	6.8456	6.8456	14.082	14.238	9999.9	-39.52	9999.9	-3783	-21.4	16.52	9999.9	9999.9	-25.58	-24.55	9999.9	16.816	-67.6
T96-21	24	10/27/24 14:34	24.263	34.154	-1276	36.59	-21.79	13.327	13.324	13.246	13.385	14.006	16.654	-2718	15.009	7112	-255.6	16.128	16.475	16.569	16.607	16.592	16.774	21.78	16.827	16.877
T96-22	24	3/24/24 14:45	-21.24	18.51	-2078	15.19	14.679	14.577	14.82	-5851	15.537	15.835	-21.63	-42.47	-54.49	16.724	-2005	16.786	16.958	16.9	16.991	17.004	17.02	15.823	10.398	-15.72
T96-22	24	6/23/24 11:08	6.5722	9.3852	9999.9	15.545	15.188	15.082	15.167	18.28		15.723	16.031	16.237	16.544	16.712	16.771	9999.9	16.881	17.002	16.935	17.014	17.034	17.045	15.095	10.35
T96-22	24	9/26/24 16:22	-97.89	14.836	-9999	12.587	13.4	14.202	14.74	15.8	15.799	16.152	16.288	16.534	16.708	16.663	-1552	16.705	17.28	16.883	16.918	16.829	16.997	14.457	10.252	15.027
T96-22	24	10/27/24 14:41	-9999	19.649	9999.9	13.098	13.383	13.939	14.557	15.639	15.639	16.05	16.275	16.532	16.706	16.764	9999.9	16.857	16.985	16.918	16.941	16.489	16.93	14.387	10.28	14.882
T96-23	24	6/23/24 11:17	9999.9	9999.9	10.154	12.422	12.958	14.63	14.552	15.171	15.375	15.674	15.943	16.785	16.629	16.562	16.662	16.804	16.775	16.845	16.952	16.973	16.836	16.41		17.079
T96-23	24	9/26/24 16:17	-9999	9999.9	13.396	11.568	11.908	12.829	13.796	7.7505	7.7505	16.346	16.379	8.4426	16.701	16.824	16.764	9999.9	16.97	16.959	17.013	17.105	16.553	16.716	17.064	8.4426
T96-23	24	10/27/24 14:45	9999.9	9999.9	15.743	13.282	12.769	13.273	14.031	14.45	15	16.357	16.641	8.4868	16.803	16.836	16.822	16.959	16.926	16.95	17.023	17.069	16.651	16.718	17.121	8.4868
T96-12s	24	3/24/24 10:20	29.343	30.01	22.349	20.423	20.057	18.649	17.064	11.405	11.411	16.507	16.574	16.587	16.615	16.605	16.654	16.677	-9999	16.754	16.76	16.794	16.85	16.853	16.876	16.825
T96-12s	24	6/23/24 10:43	8.7539	7.7247	7.8335	8.8683	11.52	15.457	16.565	16.476	16.453	16.533	16.579	16.633	16.61	16.596	16.644	16.667	-9999	16.746	16.75	16.769	16.779	16.845	16.867	16.699
T96-12s	24	9/26/24 11:14	16.063	16.723	17.009	16.264	15.453	14.989	15.676	8.9707	8.999	16.536	16.575	16.574	16.611	16.598	16.646	16.665	9999.9	16.727	16.725	16.725	16.797	16.829	16.854	16.799
T96-12s	24	10/27/24 14:22	27.452	28.716	28.528	22.039	17.804	16.729	16.446	8.2146	8.2146	16.528	16.572	16.592	16.651	16.599	16.647	16.664	9999.9	16.731	16.741	16.775	16.833	16.833	16.855	16.804
T96-12	24	3/24/20 10:19	17.793	16.608	16.816	16.895	16.993	17.031	17.076	17.127	17.132	17.115	17.175	0.0003	9999.9	17.017	16.885	16.823	16.763	16.64	16.512	16.354	-9999	16.132	16.011	15.901
T96-12	24	6/23/20 10:32	16.308	16.56	16.805	16.875	16.976	16.977	17.062	17.128	17.127	16.706	17.177	0.004		9999.9	16.968	16.57		16.39		16.42		16.295	16.178	16.047
T96-12	24	9/26/24 11:04	15.237	16.589	16.799	16.871	16.98	17.025	17.065	17.132	17.12	17.121	17.179	-2454	-9999	17.017	16.994	16.849	16.745	16.657	16.527	16.374	9999.9	16.163	16.014	15.906
T96-12	24	10/27/24 14:20	15.823	15.992	15.963	16.461	16.628	16.884	17.006	8.5586	8.5586	17.077	17.155	9999.9	-5884	16.145	16.378	16.127	16.238	16.316	16.281	16.247	-3728	16.046	15.951	15.885
T95-4	24	9/27/24 9:46	13.718	13.679	14.372	15.864	16.577	16.723	16.724	8.5835	8.5835	17.92	16.998	17.491	9999.9	9999.9	9999.9	9999.9	9999.9	9999.9	9999.9	9999.9	9999.9	9999.9	9999.9	9999.9
T95-5	24	6/23/24 14:47		15.214	15.712	15.74	16.165	16.441	16.589	16.666	16.714	16.743	16.786	16.793	16.748	28.07		16.725	16.667	16.621	16.595	9999.9	16.337	16.167	16.048	15.873
T95-5	24	9/26/24 15:28	12.832	14.876	15.824	16.19	16.428	16.58	16.658	16.392	16.24	16.759	16.787	16.742	18.182	16.72	16.661	16.616	16.592	9999.9	16.335	16.164	16.046	15.871	15.722	15.552
T95-5	24	10/27/24 15:42	14.029	14.692	15.749	16.193	16.425	16.576	16.655	14.27	14.233	16.758	16.785	16.74	16.73	16.717	16.661	16.614	16.592	9999.9	16.334	16.162	16.045	15.869	15.721	15.546
T97-28	24	6/23/24 16:17	13.06		13.44		14.04		14.02		14.27		13.6		13.83		7.115		7.141		12.68		13.84		13.59	
T97-28	24	9/26/24 14:56	10.96	13.32	13.17	13.402	14.171	13.31	13.635	13.937	13.919	12.59	13.71	13.54	-114.1	9508.8	14.36	-87.61	-176	14.946	14.802	0.0373	14.725	-283.6	-216.8	19.27
T97-28	24	10/27/24 16:27	11.58	13.34	13.27	13.459	14.136	13.295	13.528	13.11	12.95	11.81	12.73	12.47	84.7	-5579	14.49	95.94	193.6	14.956	14.83	0.031	14.761	-299.9	-222.6	19.27
T97-29	24	3/25/24 10:41	14.133	14.049	9999.9	-4078	14.083	-1652	14.483	14.498	14.524	-13.91	-14.61	-4838	-13.91	15.16	15.432	15.495	-15.24	-15.11	-14.98	-12.18	-13.9	-15.1	-14.86	-13.46
T97-29	24	6/23/24 16:16	13.901	13.819	9999.9	6358		14.04		1961		20.23		14.512	14.479	13.81		14.59		432.4		13.91		15.29	15.453	15.511
T97-29	24	9/26/24 14:49	14.014	13.73	9999.9	-5416	14.051	-1654	20.32	14.486	14.453	13.874	14.47	-263.7	13.75	15.222	15.37	15.413	-97.45	15.079	14.797	11.58	13.84	14.71	14.832	12.75
T97-29	24	10/27/24 16:38	14.029	13.822	9999.9	-6628	14.06	-1726	19.38	7.2445	7.2511	13.831	14.478	-310.3	13.69	15.152	15.324	15.235	3579.1	23.536	-1947	23.78	13.81	14.75	14.827	12.79
T97-30	24	3/25/24 10:44	13.979	13.672	13.647	13.702	13.644	13.44	13.718	13.891	13.775	13.805	13.887	14.076	14.408	14.677	14.682	14.419	15.116	14.886	15.072	15.098	15.19	-391.4	-466.3	14.632
T97-30	24	6/23/24 16:13	14	13.967	13.975	14.047	13.895	13.88	13.957	14.033	14.053	14.156	14.26	14.452	14.679	14.728	14.875	14.999	15.181	15.141	15.241	15.259	15.352	2437		1250
T97-30	24	9/26/24 14:47	13.941	13.979	13.947	14.032	13.845	13.865	13.953	7.0453	7.0453	14.145	14.256	14.453	14.677	14.659	14.774	14.898	15.078	15.11	15.2	15.163	15.3	-1886	-3427	15.26
T97-30	24	10/27/24 16:49	13.995	13.903	13.862	18.732	13.714	13.759	13.921	7.0306	7.0306	14.145	14.253	14.451	14.675	14.72	14.866	14.98	15.164	15.117	15.212	15.237	15.321	-2722	-4709	15.257
T96-15	14	3/25/24 10:24	16.65	16.853	16.84	16.841	16.753	16.679	16.646	16.562	16.512	16.497	16.391	9999.9	16.267	16.213										
T96-15	14	6/23/24 17:54	16.98	16.848	16.838	16.841	16.752	16.68	16.647	8.2659	8.2659	16.498	16.391	9999.9	16.267	16.213										
T96-15	14	9/26/24 14:09	16.821	16.859	16.832	16.836	16.749	16.676	16.645	16.54	16.12	16.495	16.389	9999.9	16.265	16.211										
T96-15	14	10/27/24 16:11	16.774	16.861	16.83	16.833	16.747	16.673	16.643	16.558	16.508	16.493	16.387	-9999	16.263	16.208										
T05-61	6	6/23/24 14:23	15.375	14.92		15.363	15.493	134.3																		
T05-61	6	9/26/24 15:55	-120.8	15.152	-64.31	75.207	-135.6	-23.17																		
T05-61	6	10/27/24 15:32	6.774	6.199	5.176	6.728	4060.4	6.69																		
T-14-110	24	3/22/2024 23:58	0.76	0.7	0.32	0.06	-0.13	-0.06	-0.13	-0.13	0	0	0.06	0.13	0.13	0.25	0.32	0.38	0.51	0.63	0.7	0.82	1.01	1.2	1.33	1.45
T-14-110	24	6/23/2024 23:57	0.31	0.51	0.32	0.06	-0.13	-0.06	-0.06	-0.06	0	0.06	0.06	0.13	0.13	0.25	0.25	0.32	0.44	0.57	0.7	0.82	1.01	1.14	1.33	1.52
T-14-110	24	9/26/2024 23:57	2.09	0.51	0.25	0.06	-0.06	-0.06	-0.06	-0.13	0	0.06	0.06	0.13	0.13	0.25	0.25	0.38	0.51	0.63	0.7	0.82	0.95	1.14	1.33	1.45
T-14-110	24	10/26/2024 23:57	1.96	0.63	0.25	0.13	-0.13	-0.06	-0.13	-0.13	0	0.06	0.06	0.13	0.13	0.25	0.32	0.38	0.44	0.63	0.7	0.82	1.01	1.14	1.33	1.52
T-21-013	44	3/26/2024 11:33	0.95	-6.33	-5.38	-3.99	-1.9	-0.44	0.5	1.33	1.64	1.96	1.96	2.02	2.09	1.96	2.02	1.9	1.39	1.2	0.63	0.25	0.06	-0.19	-0.13	-0.13
T-21-013	44	6/23/2024 0:01	27.53	28.97	5.12	2.46	2.9	-0.5	-0.12																	

Site ID	Num Therm	Date/Time	pt-25	pt-26	pt-27	pt-28	pt-29	pt-30	pt-31	pt-32	pt-33	pt-34	pt-35	pt-36	pt-37	pt-38	pt-39	pt-40	pt-41	pt-42	pt-43	pt-44				
T-21-013		3/26/2024 11:33	-0.51	-0.63	-0.82	-0.89	-0.95	-0.95	-1.01	-1.08	-1.01	-1.08	-1.01	-1.01	-0.89	-0.82	-0.7	-0.63	-0.51	-0.38	-0.32	-0.06				

Notes:

Num of Therms = total number of thermistor sensors at each site (string)

Date/Time = mm/dd/yy hh:mm

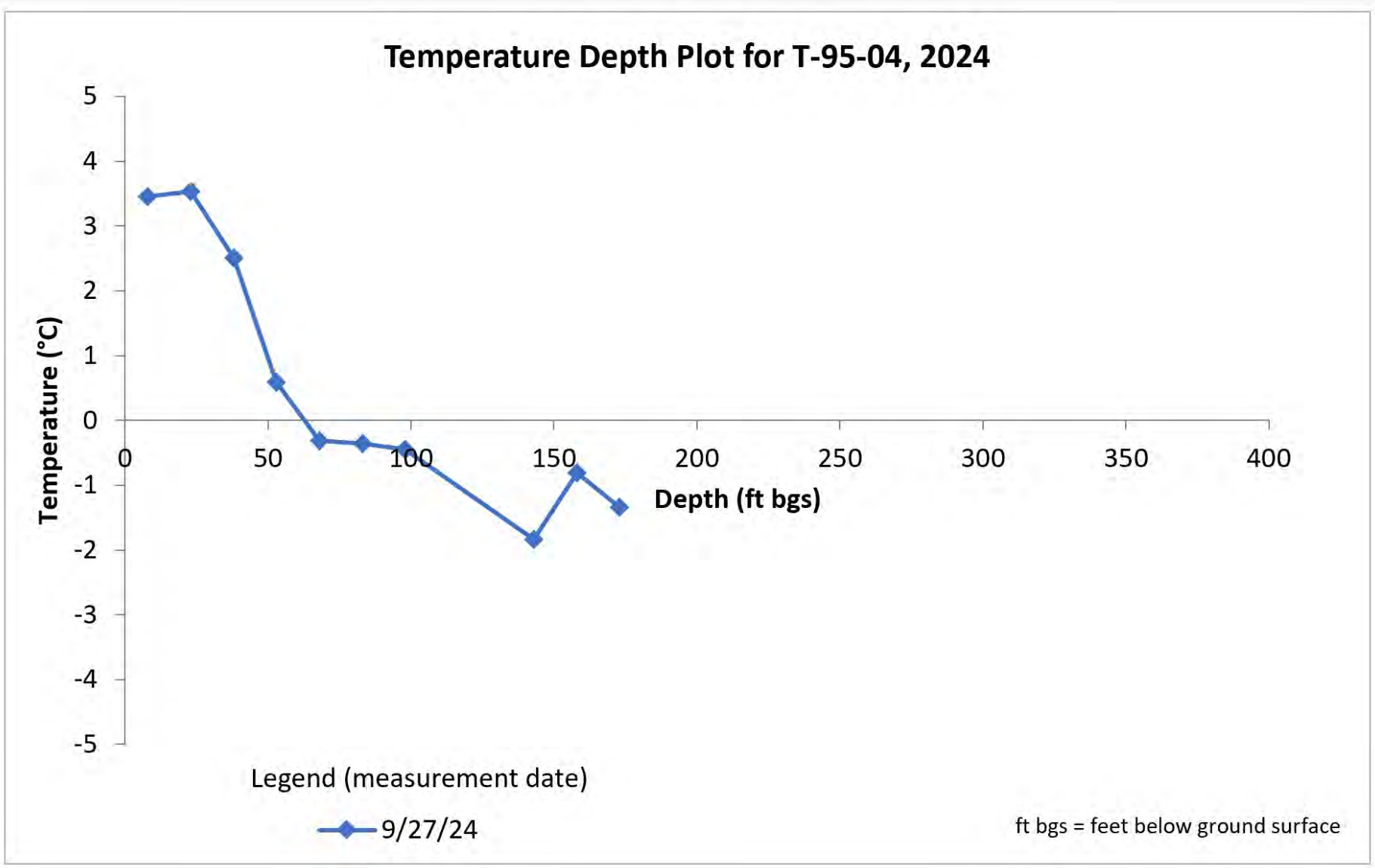
Measurements are shown in kohms. *T14-110 and T21-013 measurements are in Celsius

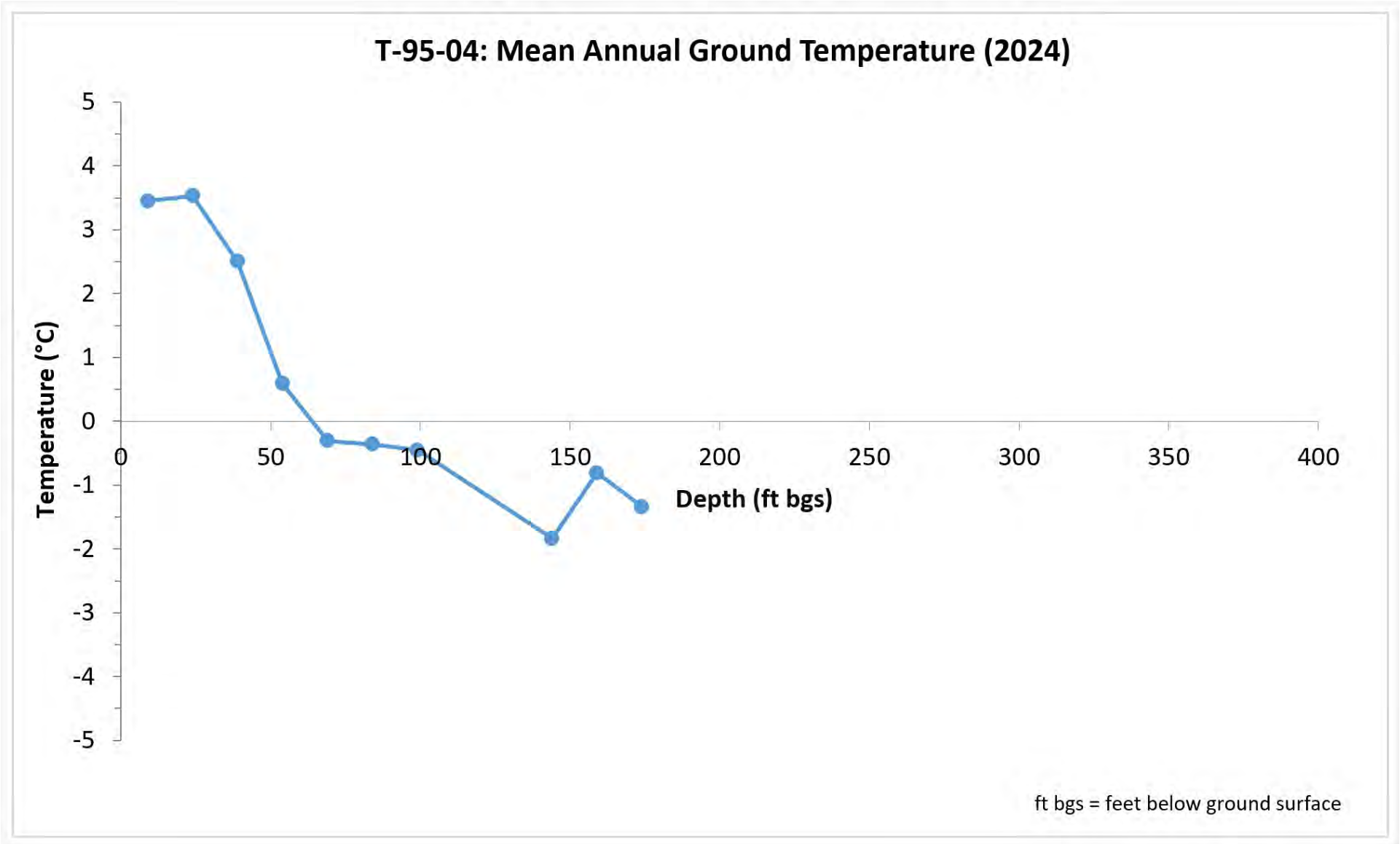
Red highlighted data represent measurements that are outside of database criteria and omitted from the database.

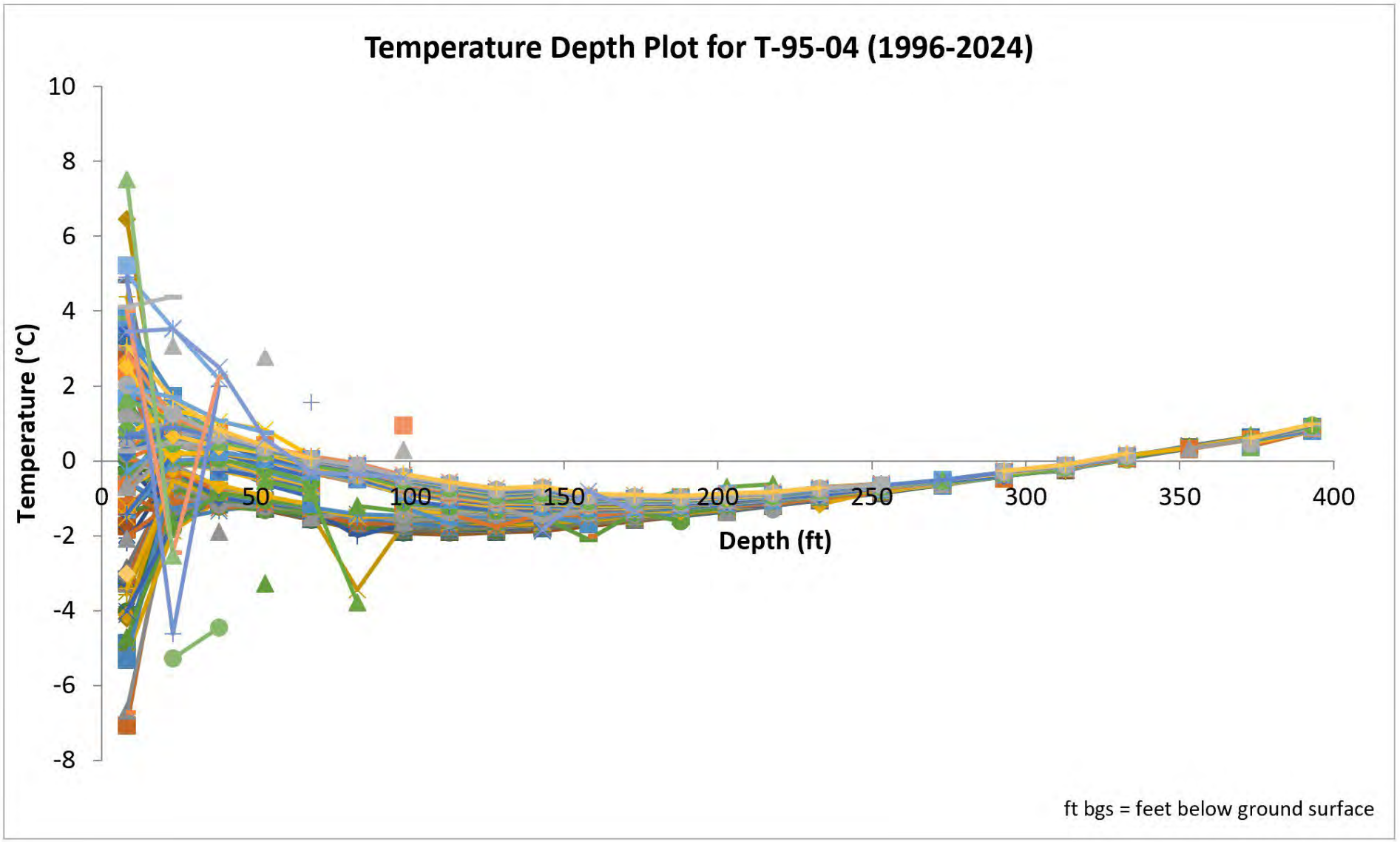
Appendix D
Thermistor Plots

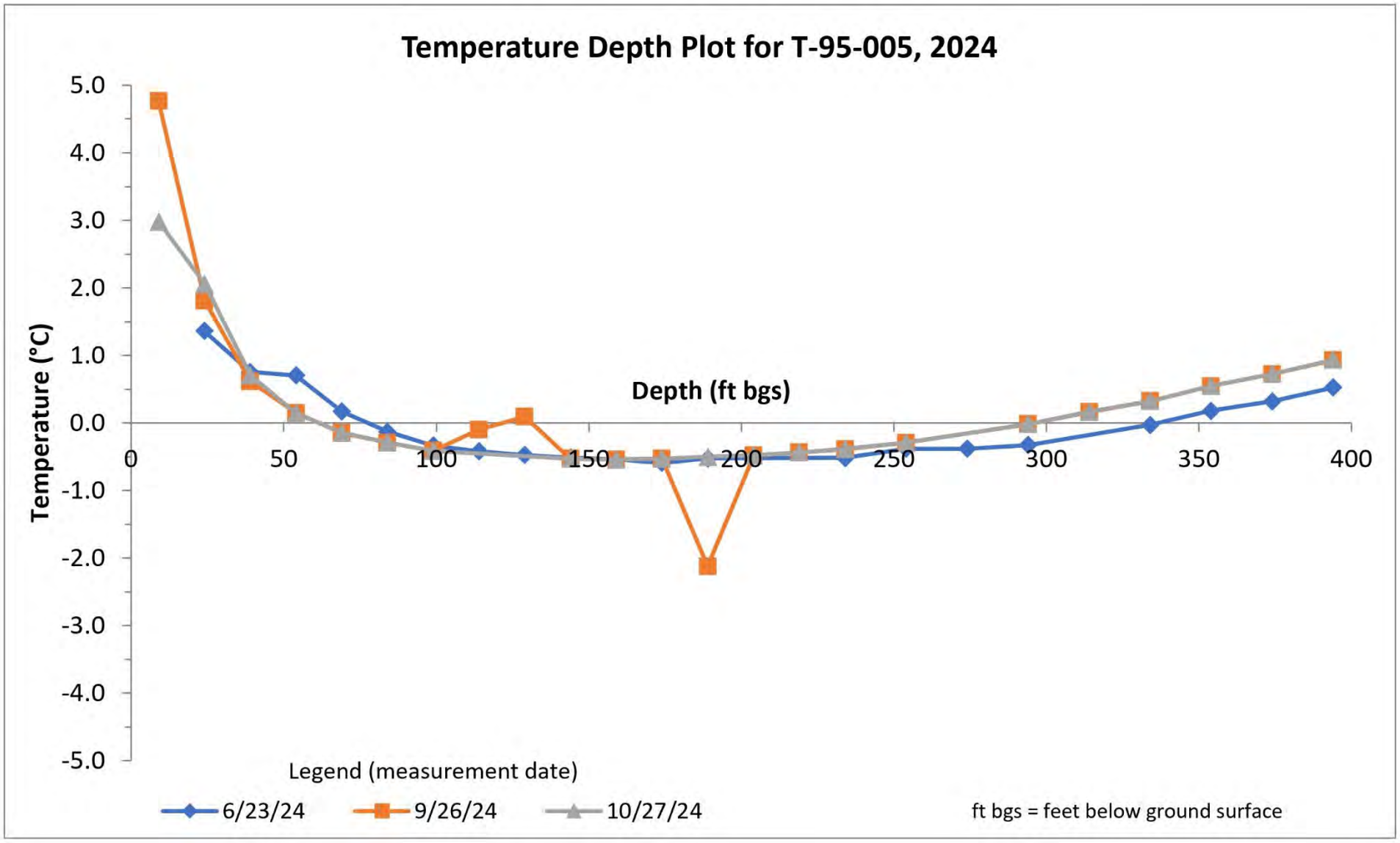
3 plots per thermistor:

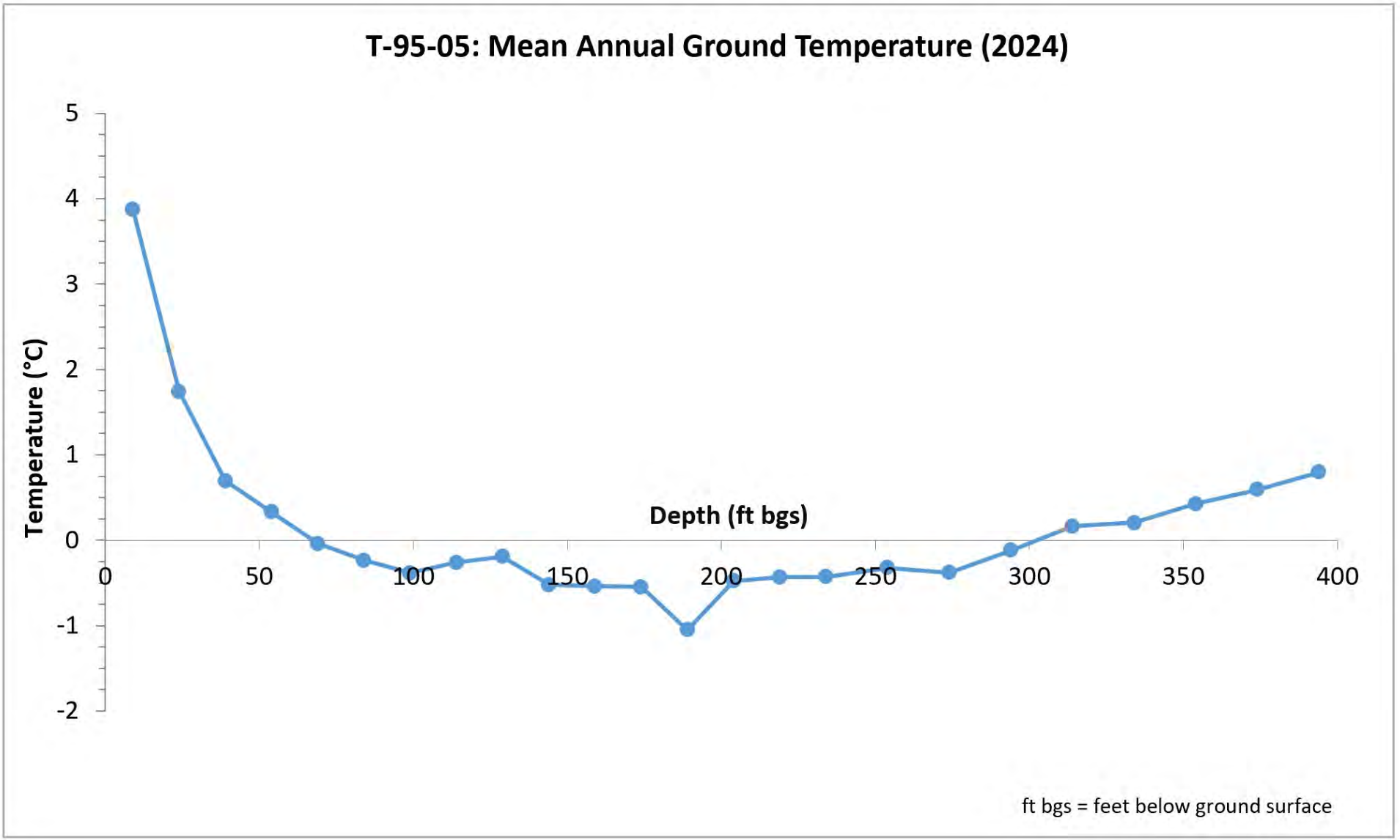
- 2024 quarterly temperatures vs. depth
- 2024 average temperature vs. depth
- Cumulative temperature vs. depth (by quarter)

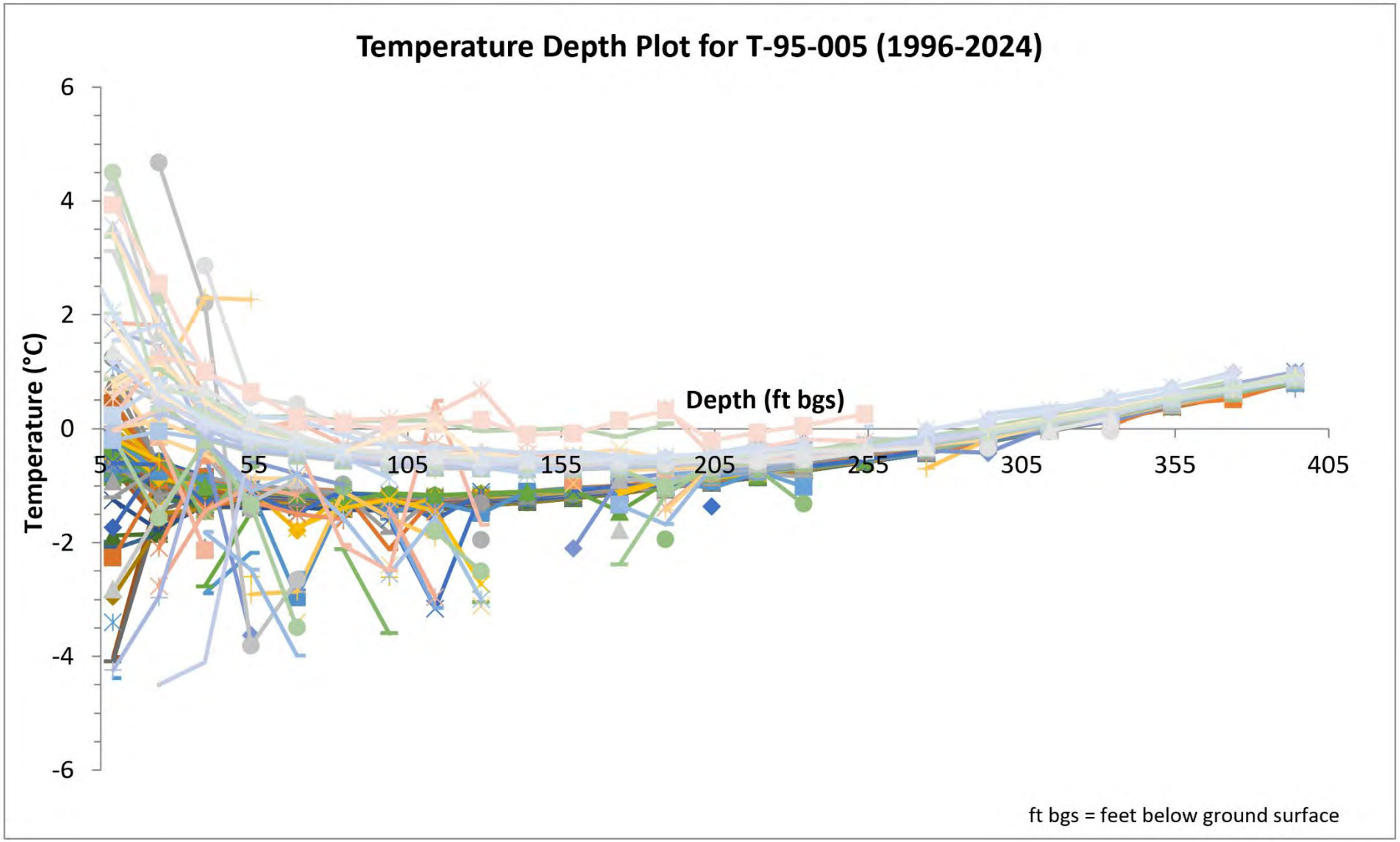

Temperature Depth Plot for T-95-04, 2024
Temperature (°C)
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
50
100
150
200
250
300
350
400
Depth (ft bgs)
Legend (measurement date)
9/27/24
ft bgs = feet below ground surface

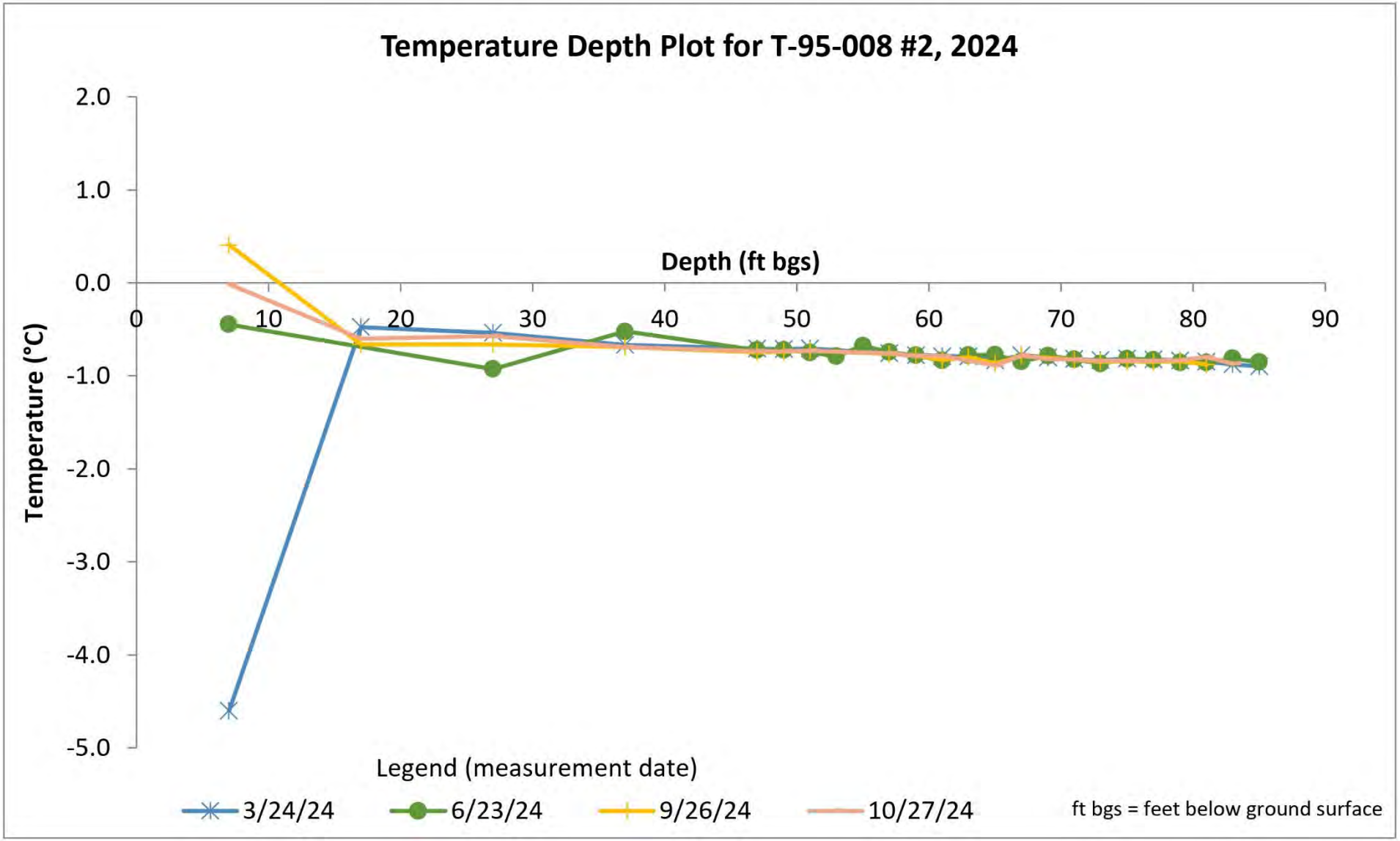

T-95-04: Mean Annual Ground Temperature (2024)
Temperature (°C)
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
50
100
150
200
250
300
350
400
Depth (ft bgs)
ft bgs = feet below ground surface

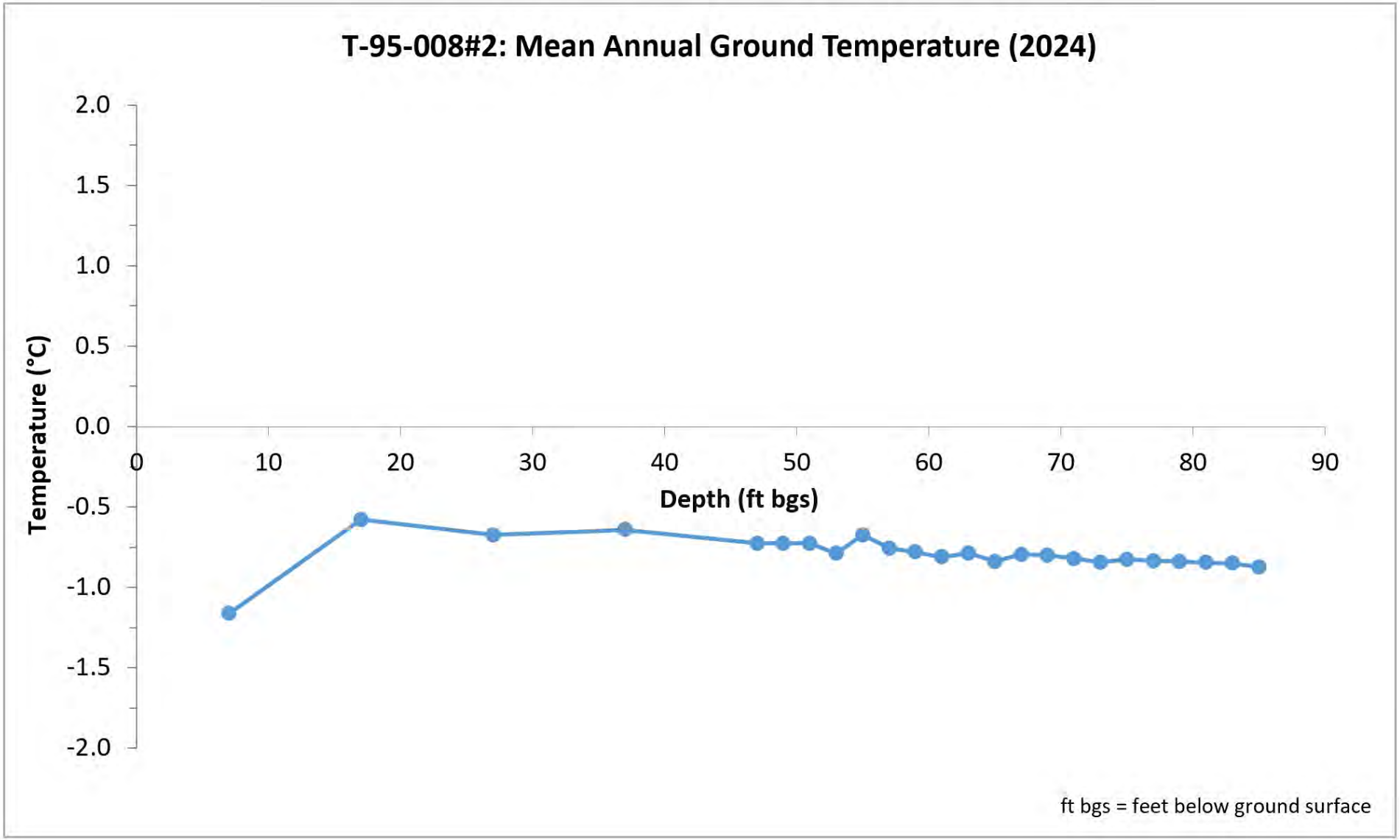

Temperature Depth Plot for T-95-04 (1996-2024)
Temperature (°C)
10
8
6
4
2
0
-2
-4
-6
-8
0
50
100
150
200
250
300
350
400
Depth (ft)
ft bgs = feet below ground surface

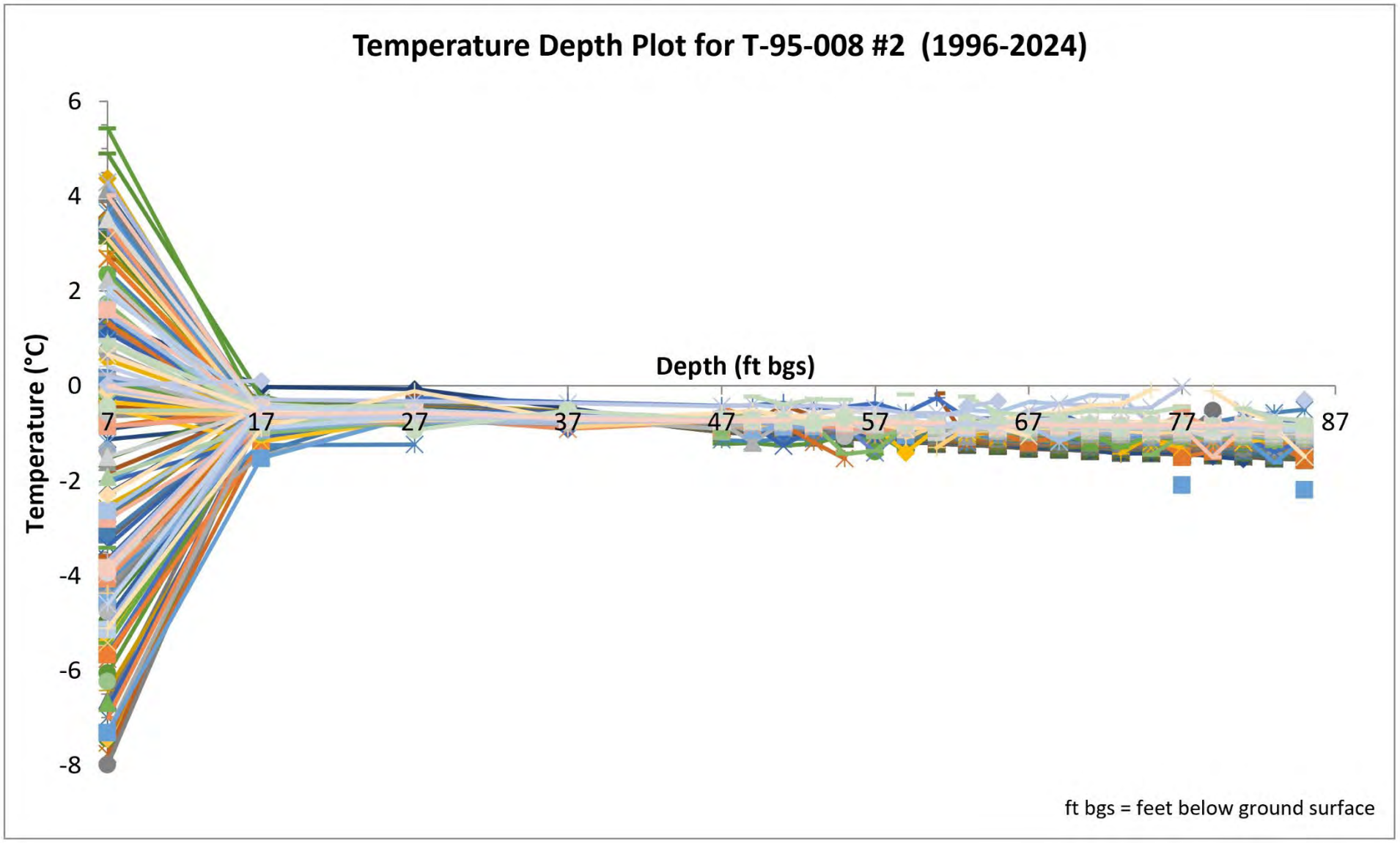

Temperature Depth Plot for T-95-005, 2024
Temperature (°C)
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
Depth (ft bgs)
0
50
100
150
200
250
300
350
400
Legend (measurement date)
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

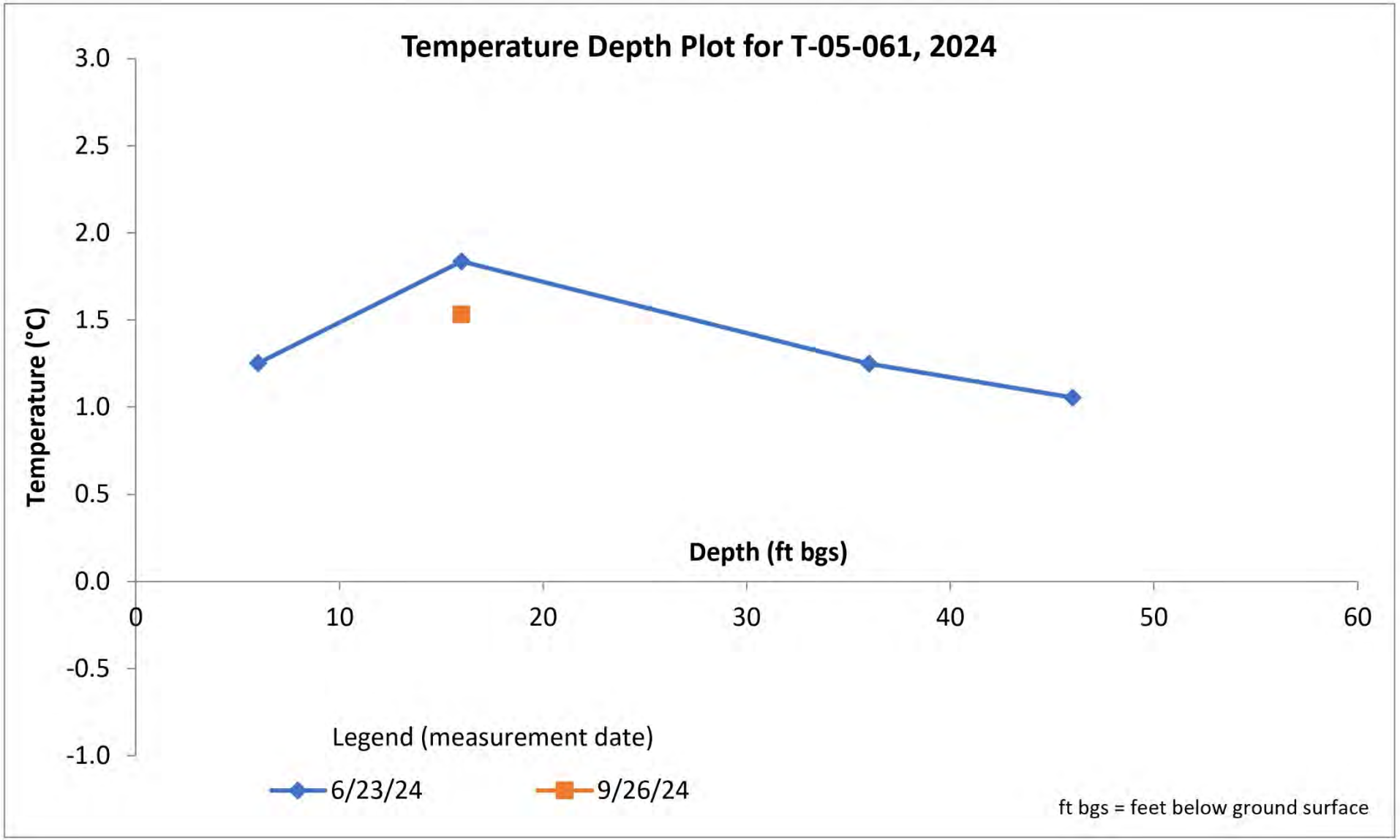

T-95-05: Mean Annual Ground Temperature (2024)
Temperature (°C)
5
4
3
2
1
0
-1
-2
0
50
100
150
200
250
300
350
400
Depth (ft bgs)
ft bgs = feet below ground surface

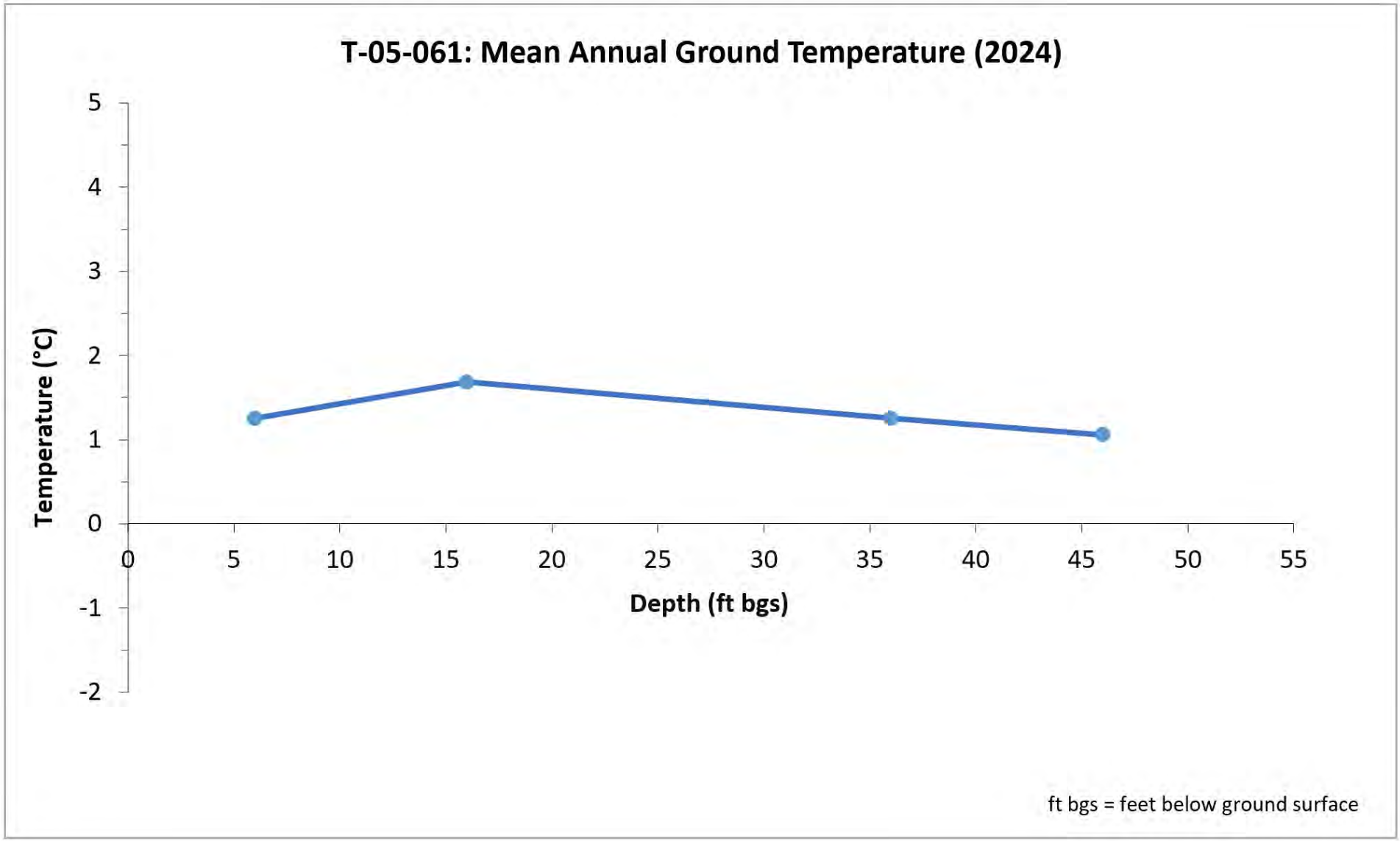

Temperature Depth Plot for T-95-005 (1996-2024)
Temperature (°C)
6
4
2
0
-2
-4
-6
Depth (ft bgs)
5
55
105
155
205
255
305
355
405
ft bgs = feet below ground surface

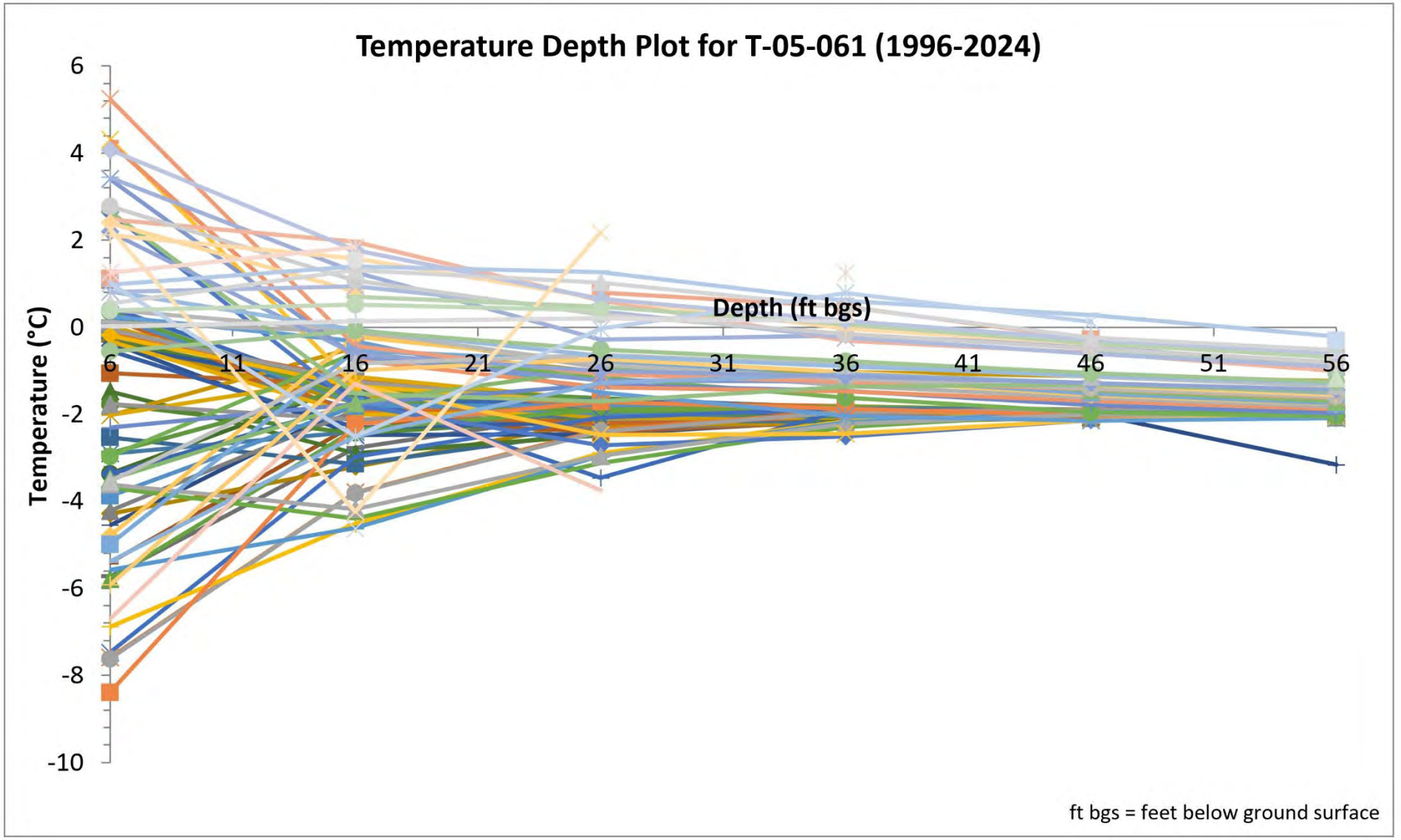

Temperature Depth Plot for T-95-008 #2, 2024
Temperature (°C)
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
Depth (ft bgs)
0
10
20
30
40
50
60
70
80
90
Legend (measurement date)
3/24/24
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

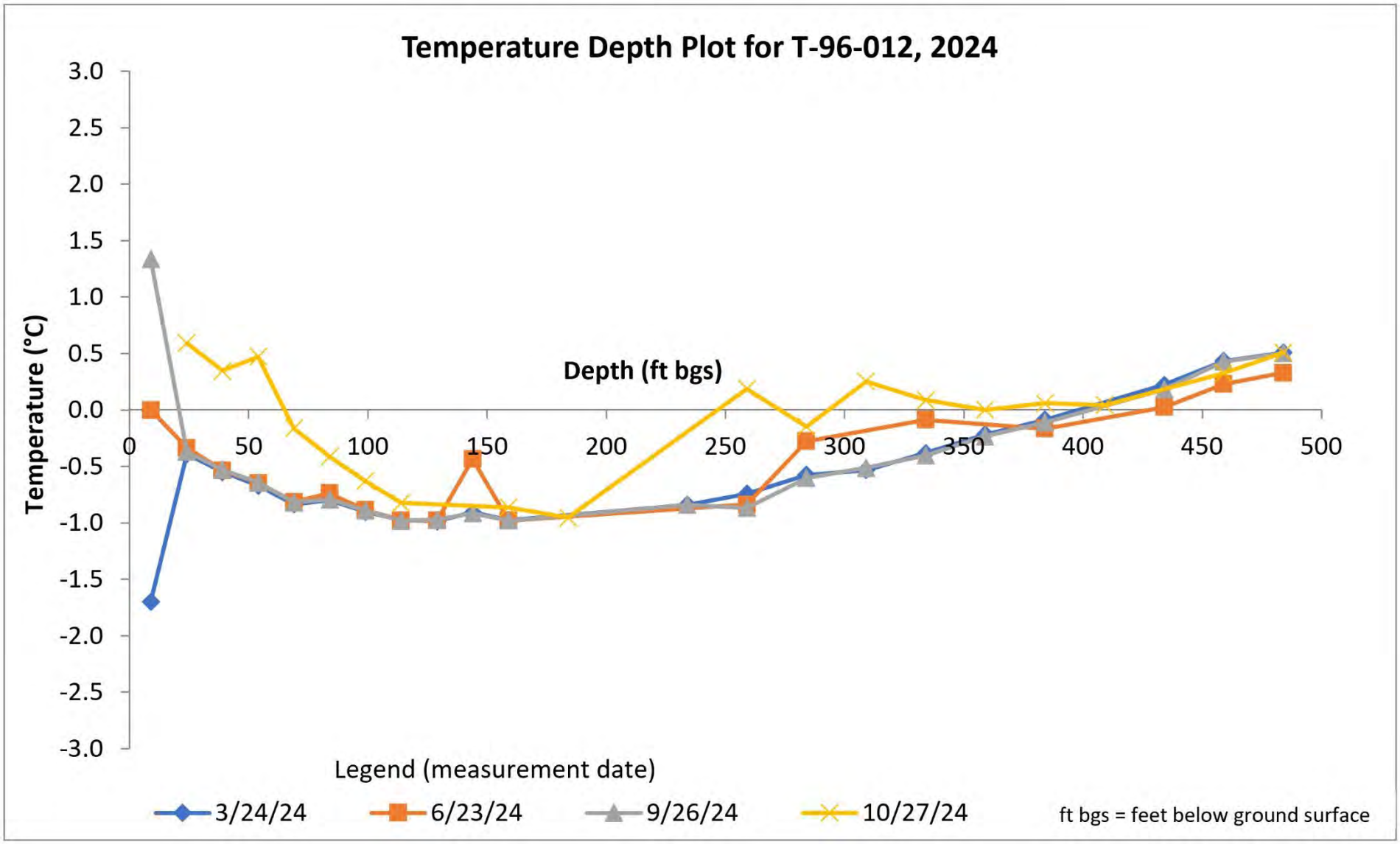

T-95-008#2: Mean Annual Ground Temperature (2024)
Temperature (°C)
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
0
10
20
30
40
50
60
70
80
90
Depth (ft bgs)
ft bgs = feet below ground surface

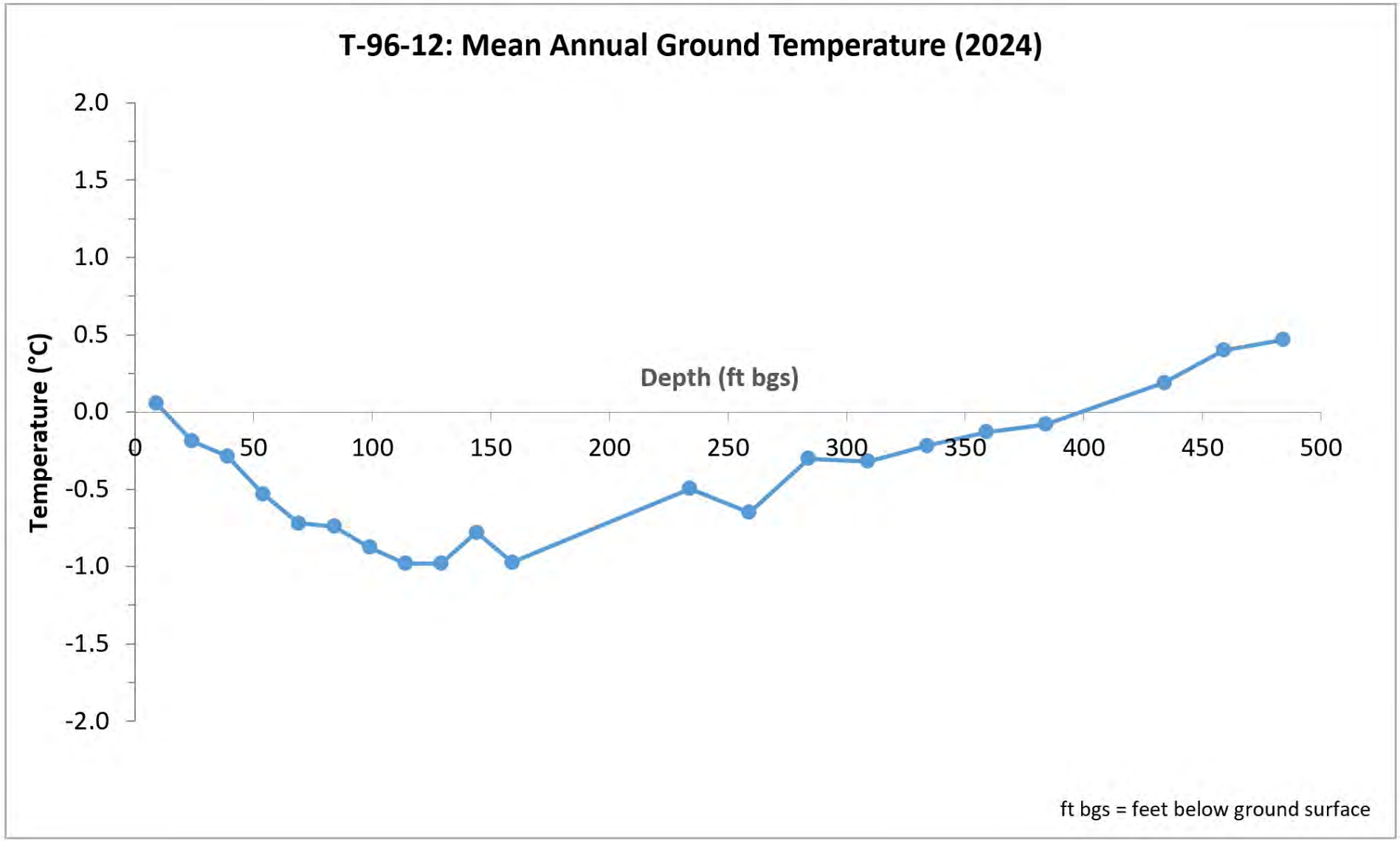

Temperature Depth Plot for T-95-008 #2 (1996-2024)
Temperature (°C)
6
4
2
0
-2
-4
-6
-8
Depth (ft bgs)
7
17
27
37
47
57
67
77
87
ft bgs = feet below ground surface

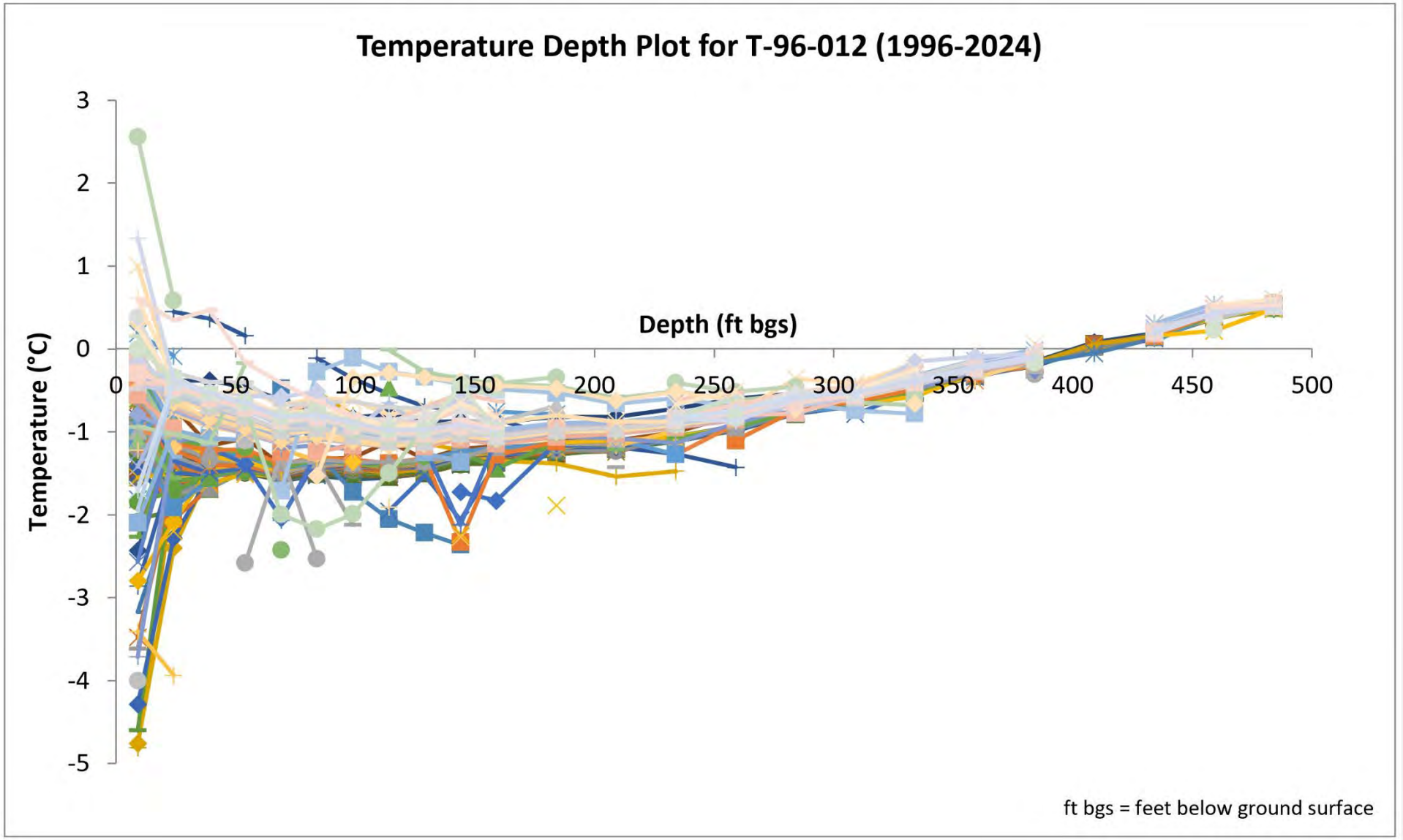

Temperature Depth Plot for T-05-061, 2024
Temperature (°C)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
Depth (ft bgs)
0
10
20
30
40
50
60
Legend (measurement date)
6/23/24
9/26/24
ft bgs = feet below ground surface

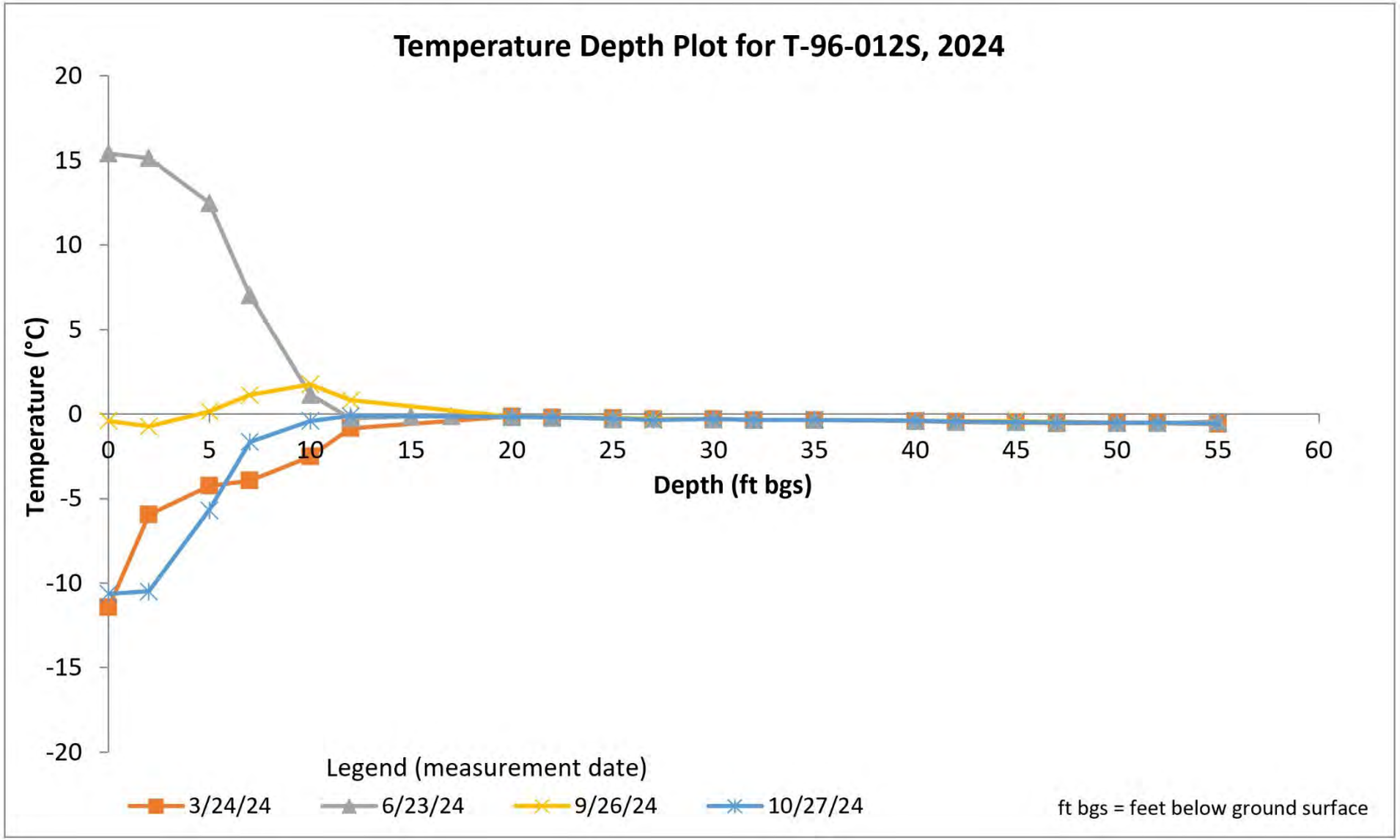

T-05-061: Mean Annual Ground Temperature (2024)
Temperature (°C)
5
4
3
2
1
0
-1
-2
0
5
10
15
20
25
30
35
40
45
50
55
Depth (ft bgs)
ft bgs = feet below ground surface

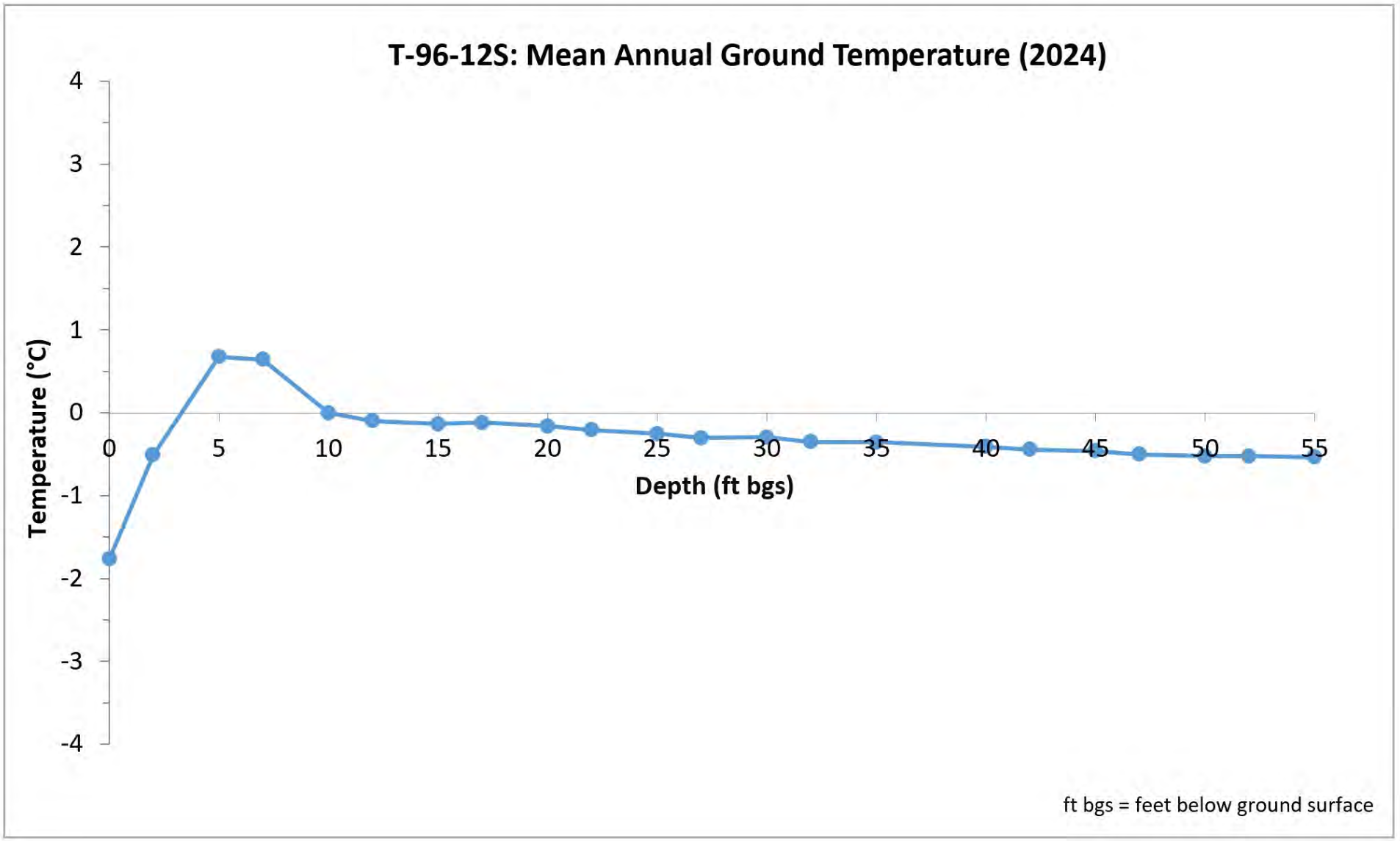

Temperature Depth Plot for T-05-061 (1996-2024)
Temperature (°C)
6
4
2
0
-2
-4
-6
-8
-10
Depth (ft bgs)
6
11
16
21
26
31
36
41
46
51
56
ft bgs = feet below ground surface

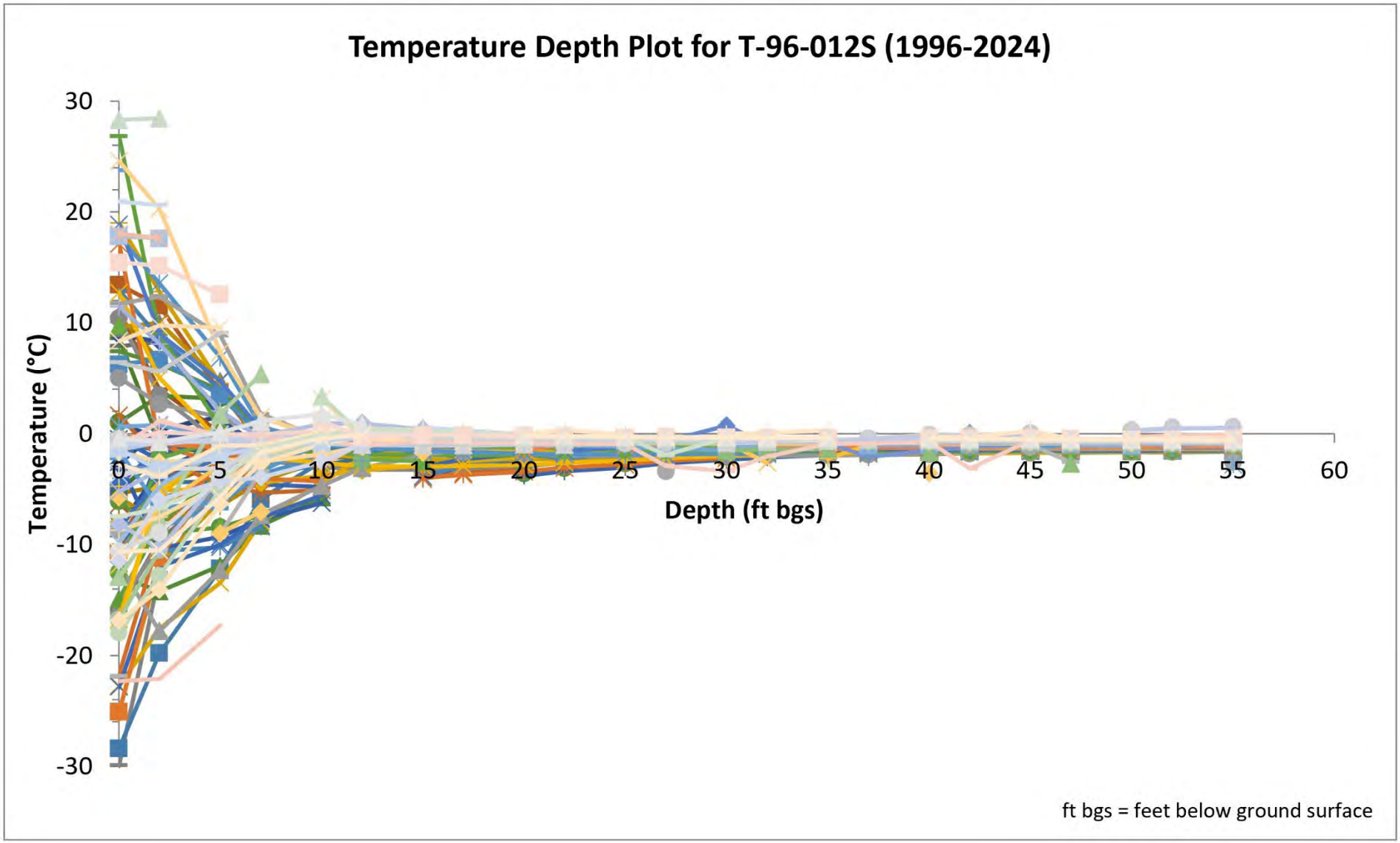

Temperature Depth Plot for T-96-012, 2024
Temperature (°C)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
Depth (ft bgs)
0
50
100
150
200
250
300
350
400
450
500
Legend (measurement date)
3/24/24
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

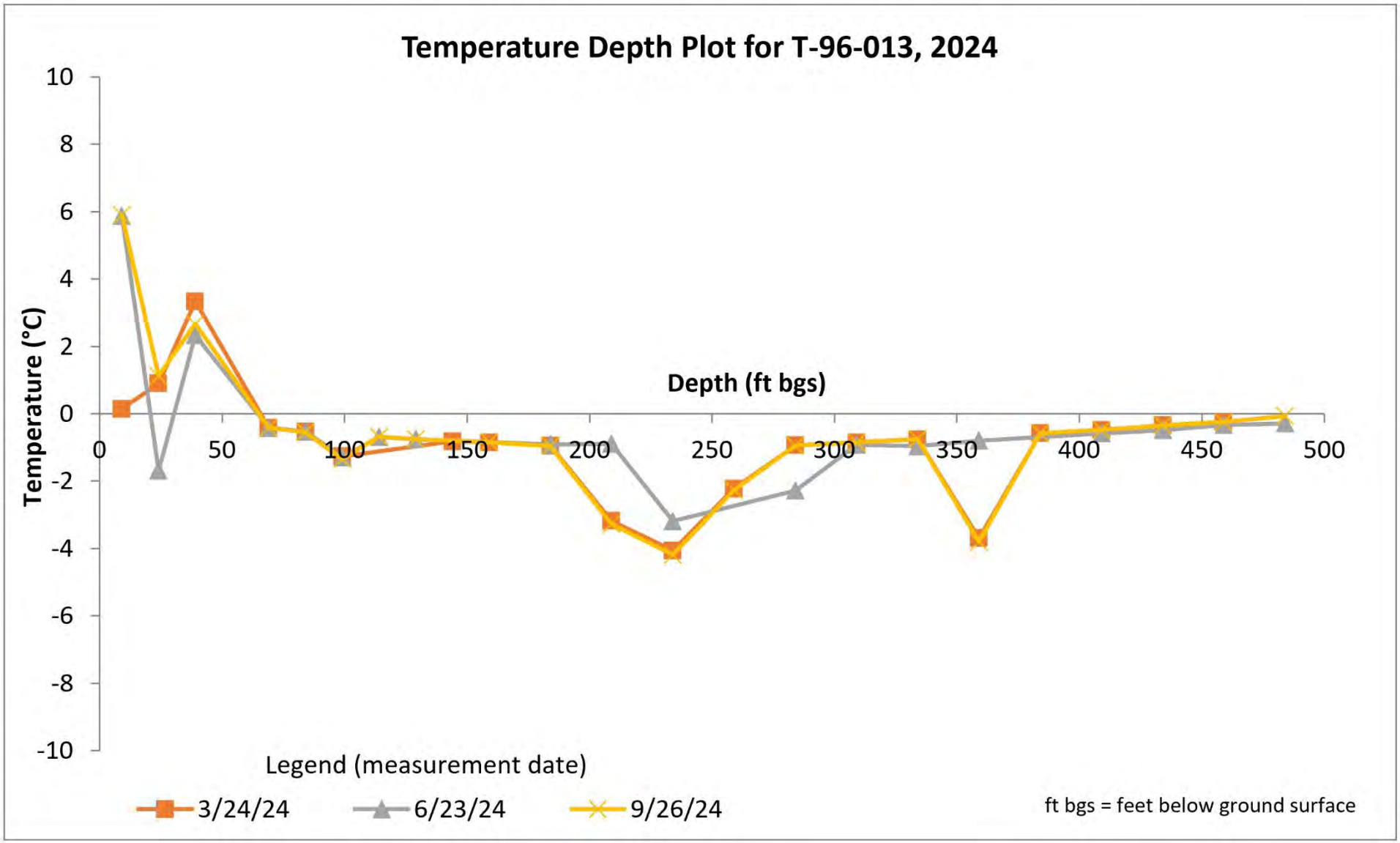

T-96-12: Mean Annual Ground Temperature (2024)
Temperature (°C)
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
Depth (ft bgs)
0
50
100
150
200
250
300
350
400
450
500
ft bgs = feet below ground surface

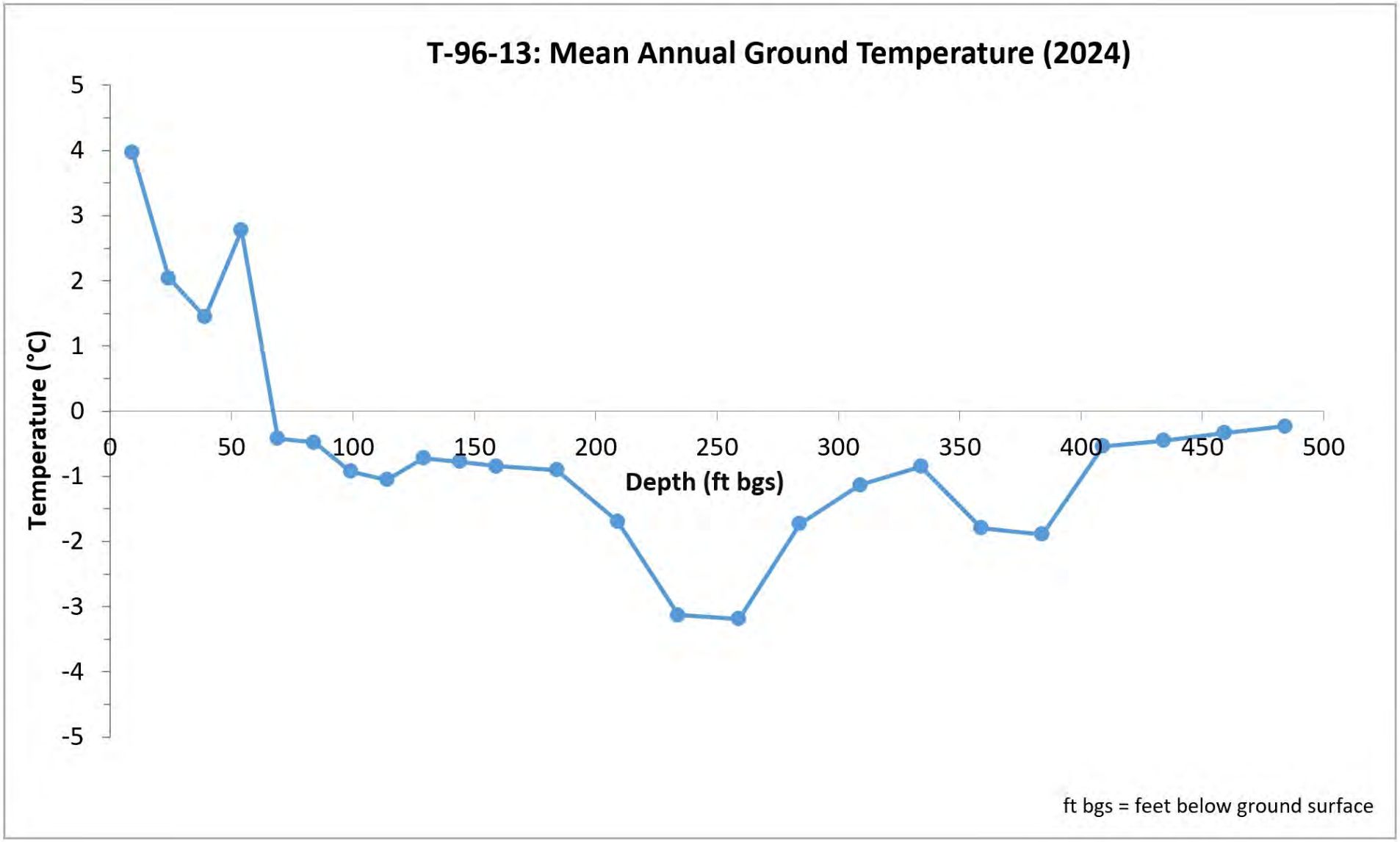

Temperature Depth Plot for T-96-012 (1996-2024)
Temperature (°C)
3
2
1
0
-1
-2
-3
-4
-5
Depth (ft bgs)
0
50
100
150
200
250
300
350
400
450
500
ft bgs = feet below ground surface

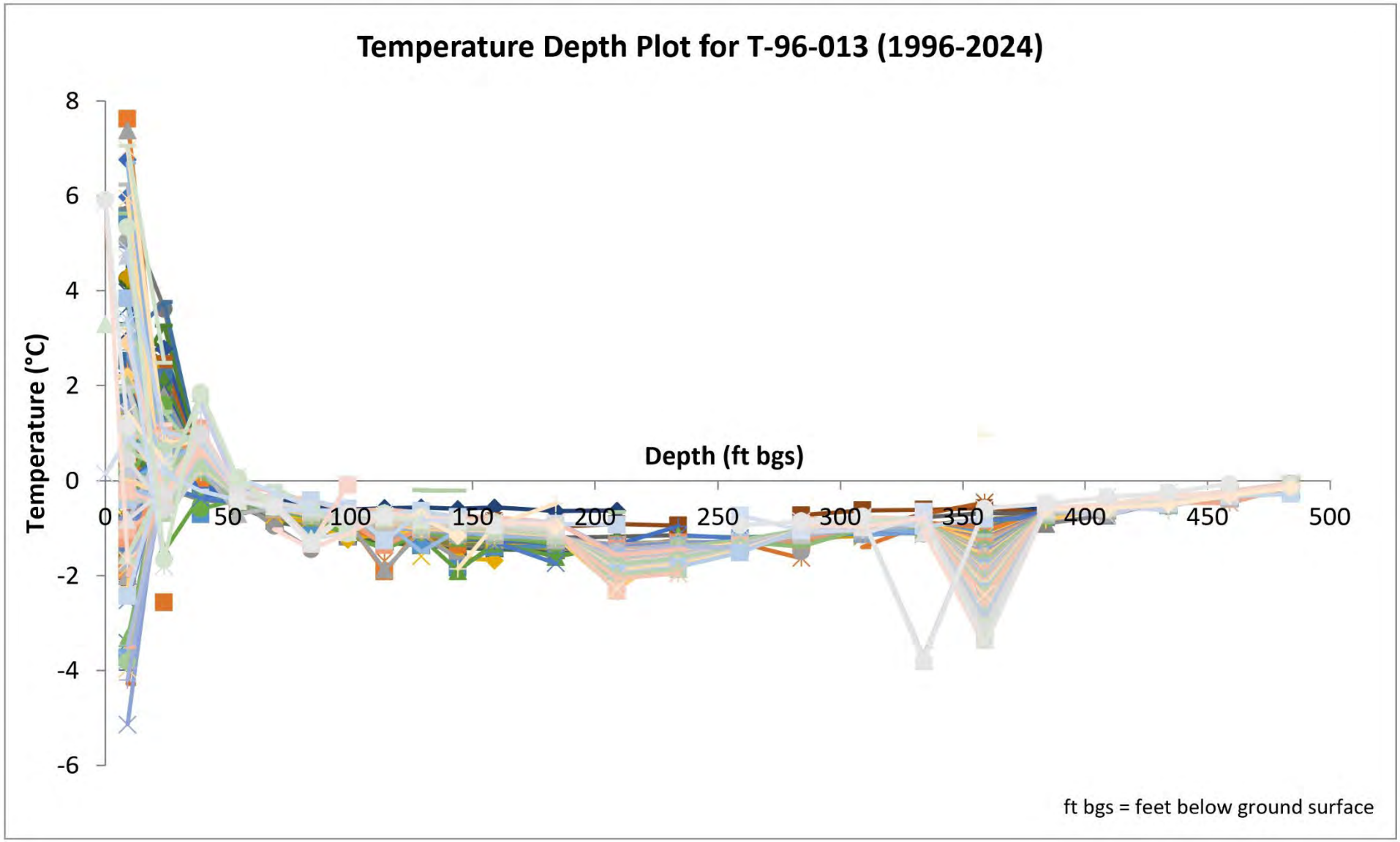

Temperature Depth Plot for T-96-012S, 2024
Temperature (°C)
20
15
10
5
0
-5
-10
-15
-20
0
5
10
15
20
25
30
35
40
45
50
55
60
Depth (ft bgs)
Legend (measurement date)
3/24/24
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

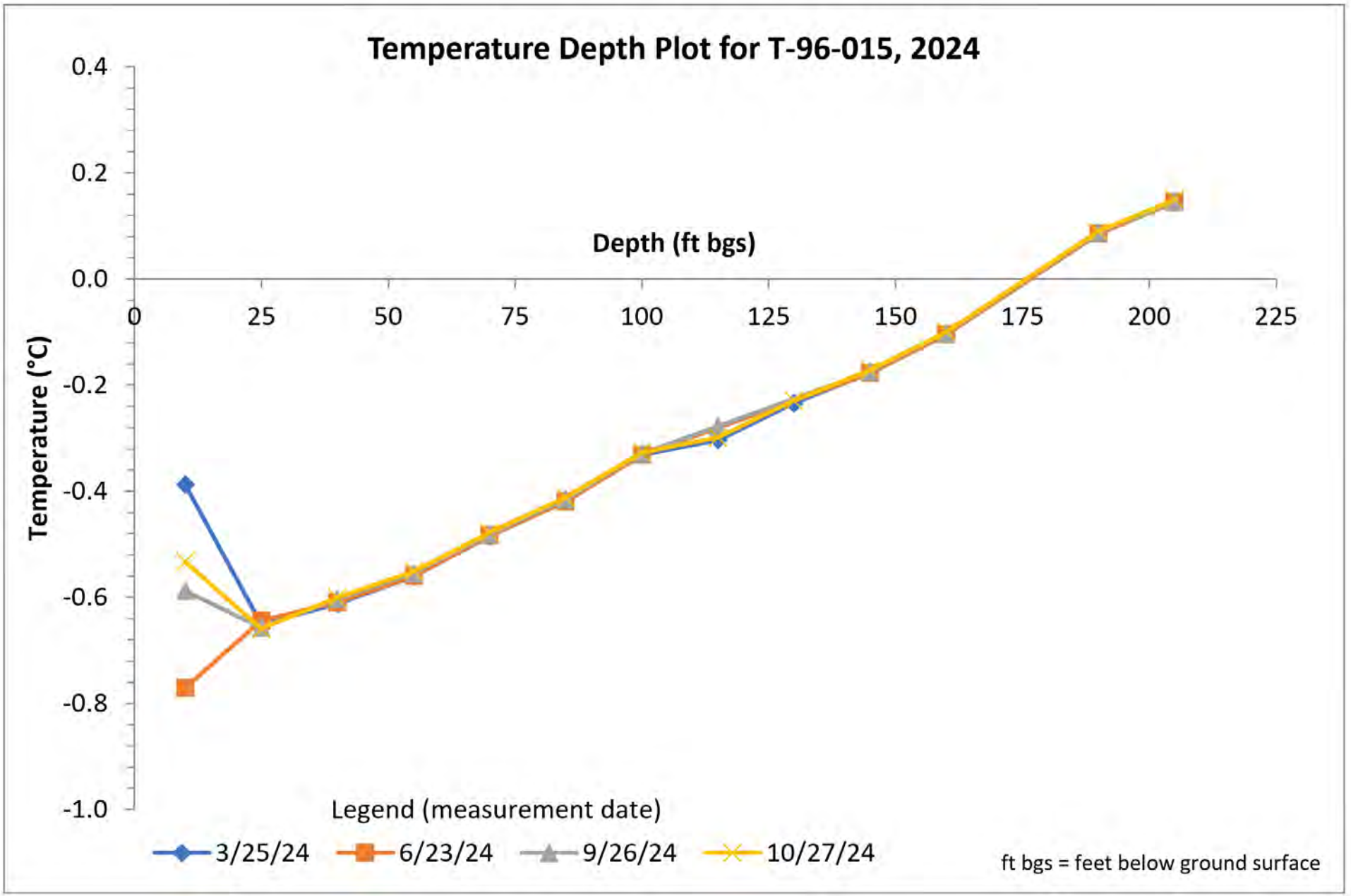

T-96-12S: Mean Annual Ground Temperature (2024)
Temperature (°C)
4
3
2
1
0
-1
-2
-3
-4
0
5
10
15
20
25
30
35
40
45
50
55
Depth (ft bgs)
ft bgs = feet below ground surface

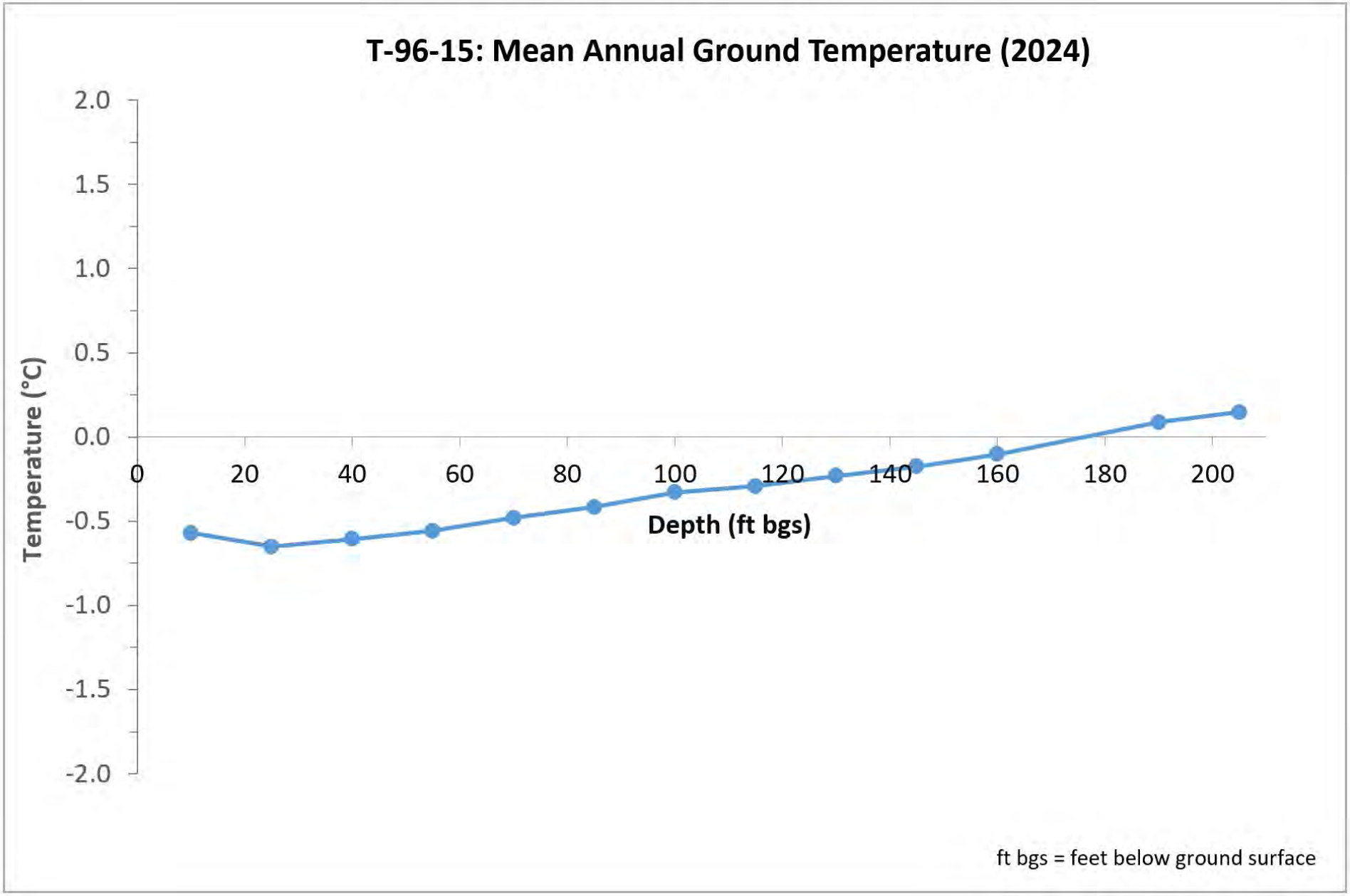

Temperature Depth Plot for T-96-012S (1996-2024)
Temperature (°C)
30
20
10
0
-10
-20
-30
0
5
10
15
20
25
30
35
40
45
50
55
60
Depth (ft bgs)
ft bgs = feet below ground surface

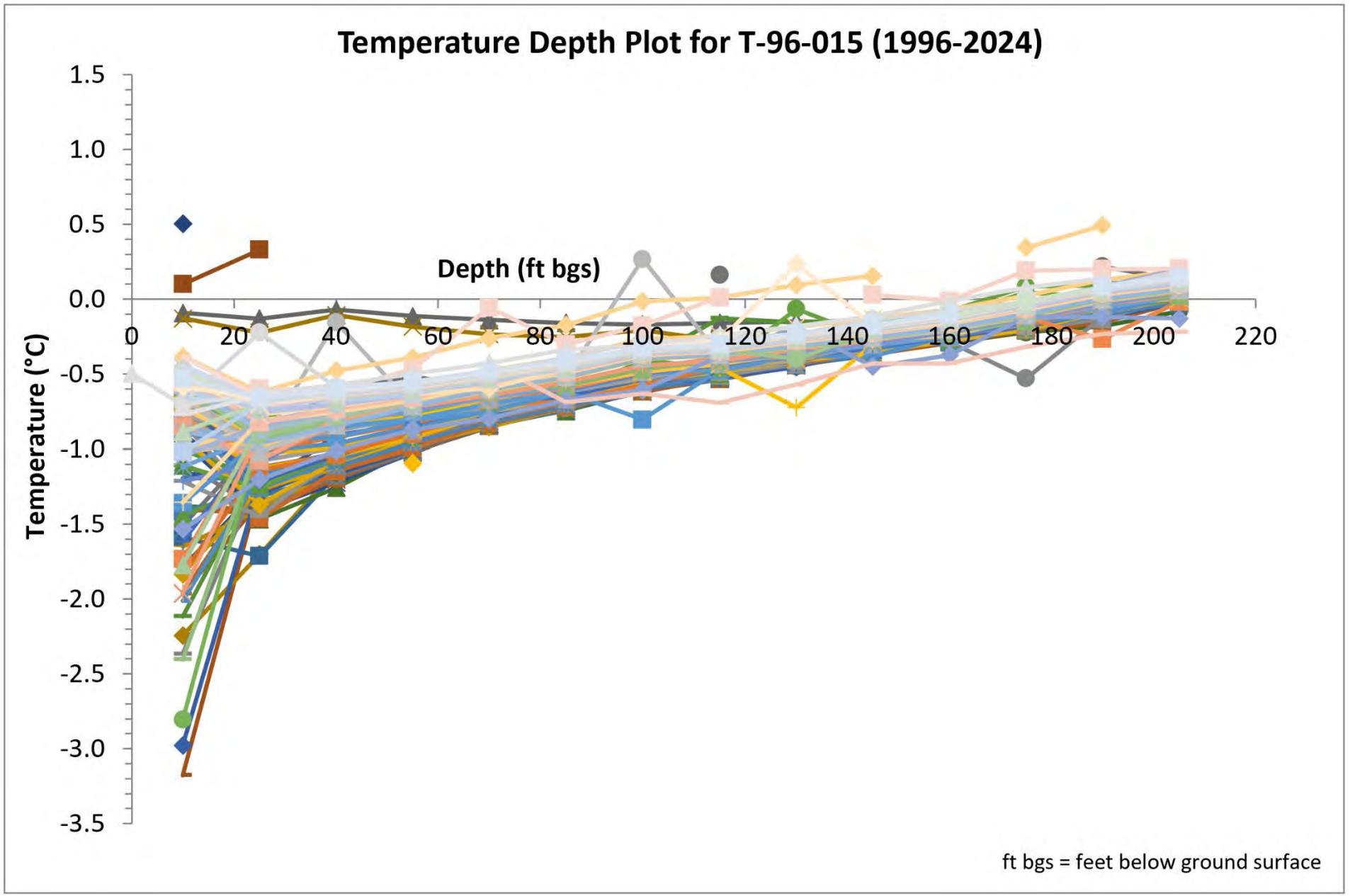

Temperature Depth Plot for T-96-013, 2024
Temperature (°C)
10
8
6
4
2
0
-2
-4
-6
-8
-10
Depth (ft bgs)
0
50
100
150
200
250
300
350
400
450
500
Legend (measurement date)
3/24/24
6/23/24
9/26/24
ft bgs = feet below ground surface

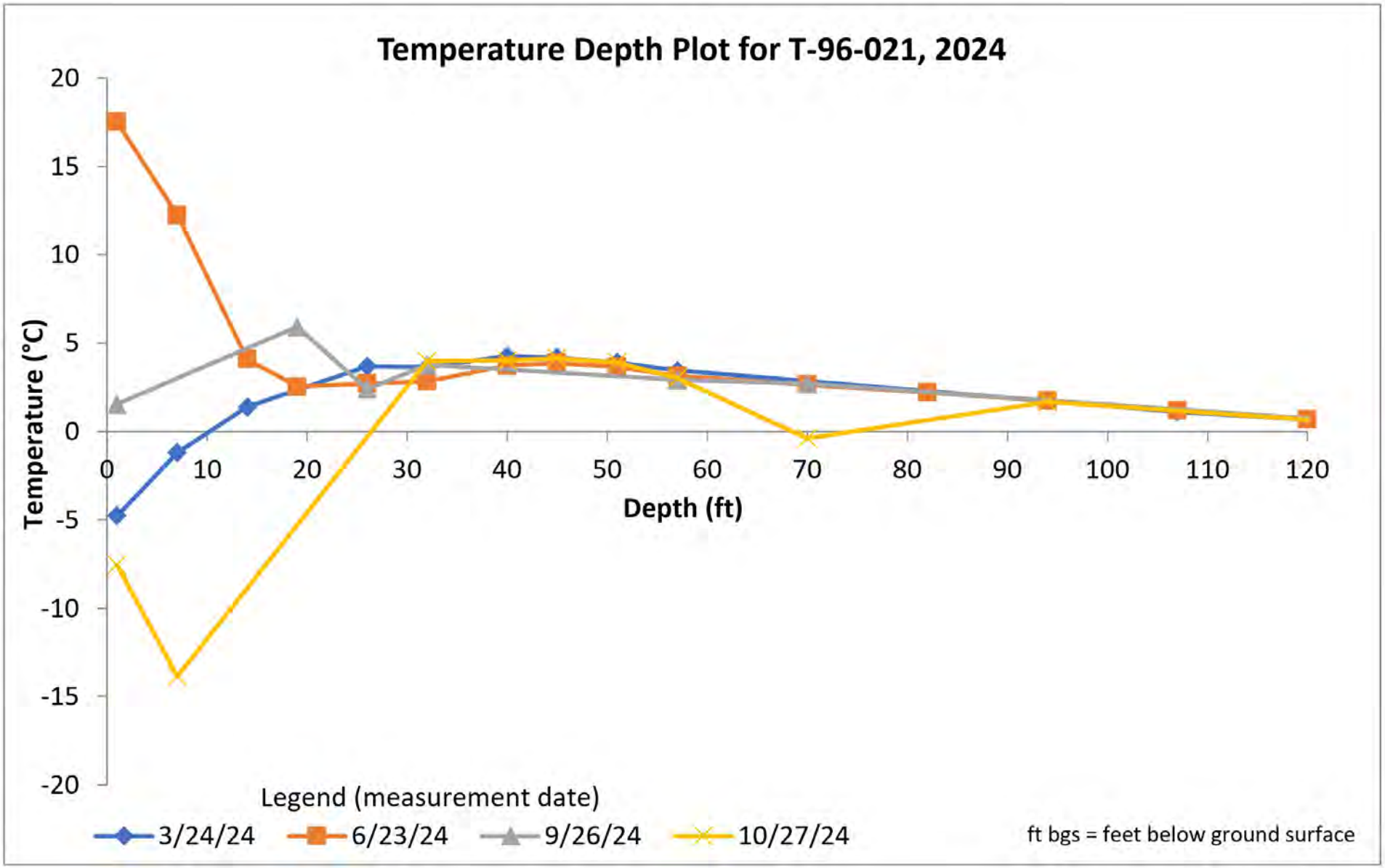

T-96-13: Mean Annual Ground Temperature (2024)
Temperature (°C)
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
50
100
150
200
250
300
350
400
450
500
Depth (ft bgs)
ft bgs = feet below ground surface

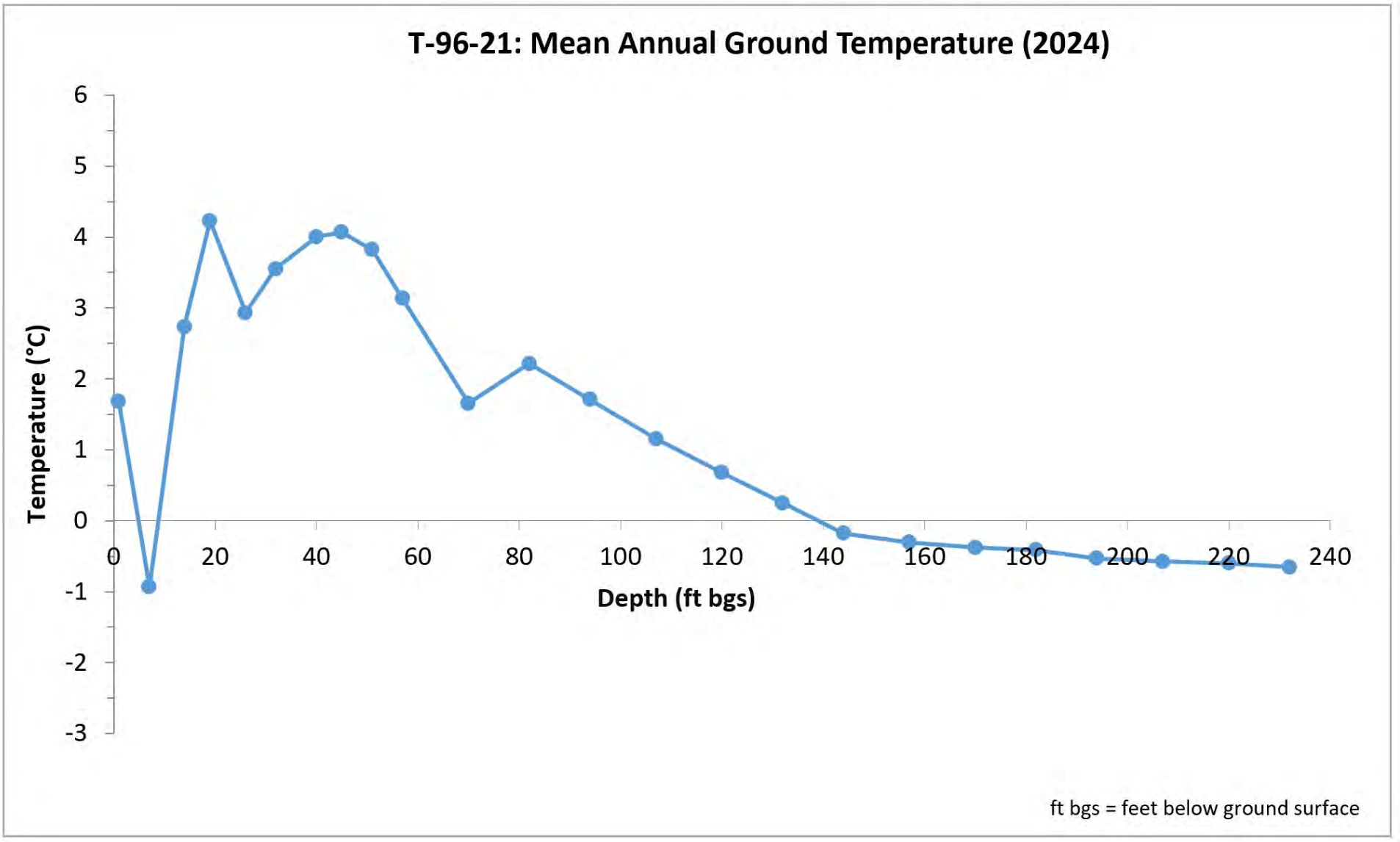

Temperature Depth Plot for T-96-013 (1996-2024)
Temperature (°C)
8
6
4
2
0
-2
-4
-6
Depth (ft bgs)
0
50
100
150
200
250
300
350
400
450
500
ft bgs = feet below ground surface

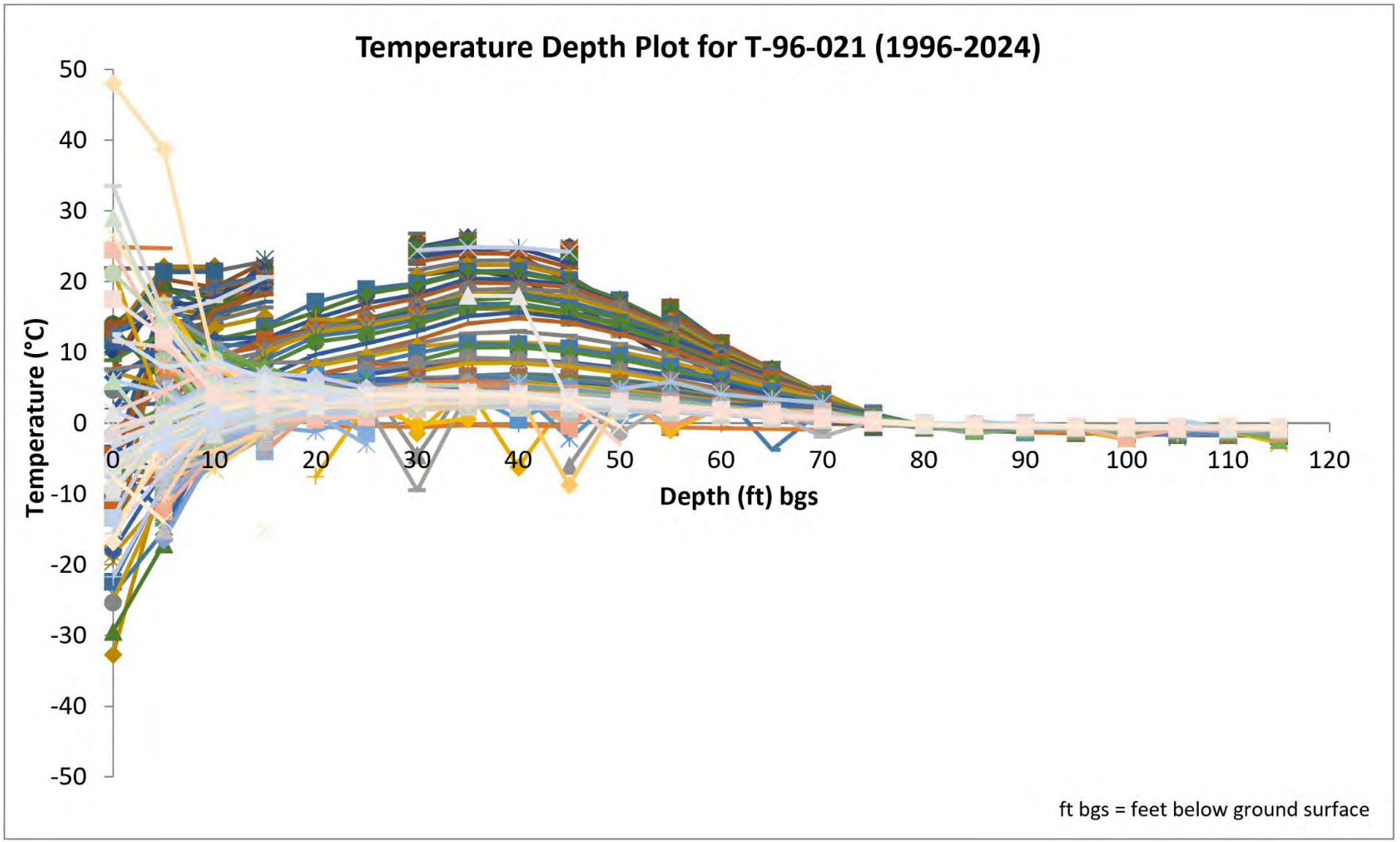

Temperature Depth Plot for T-96-015, 2024
Depth (ft bgs)
Temperature (°C)
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
0
25
50
75
100
125
150
175
200
225
Legend (measurement date)
3/25/24
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

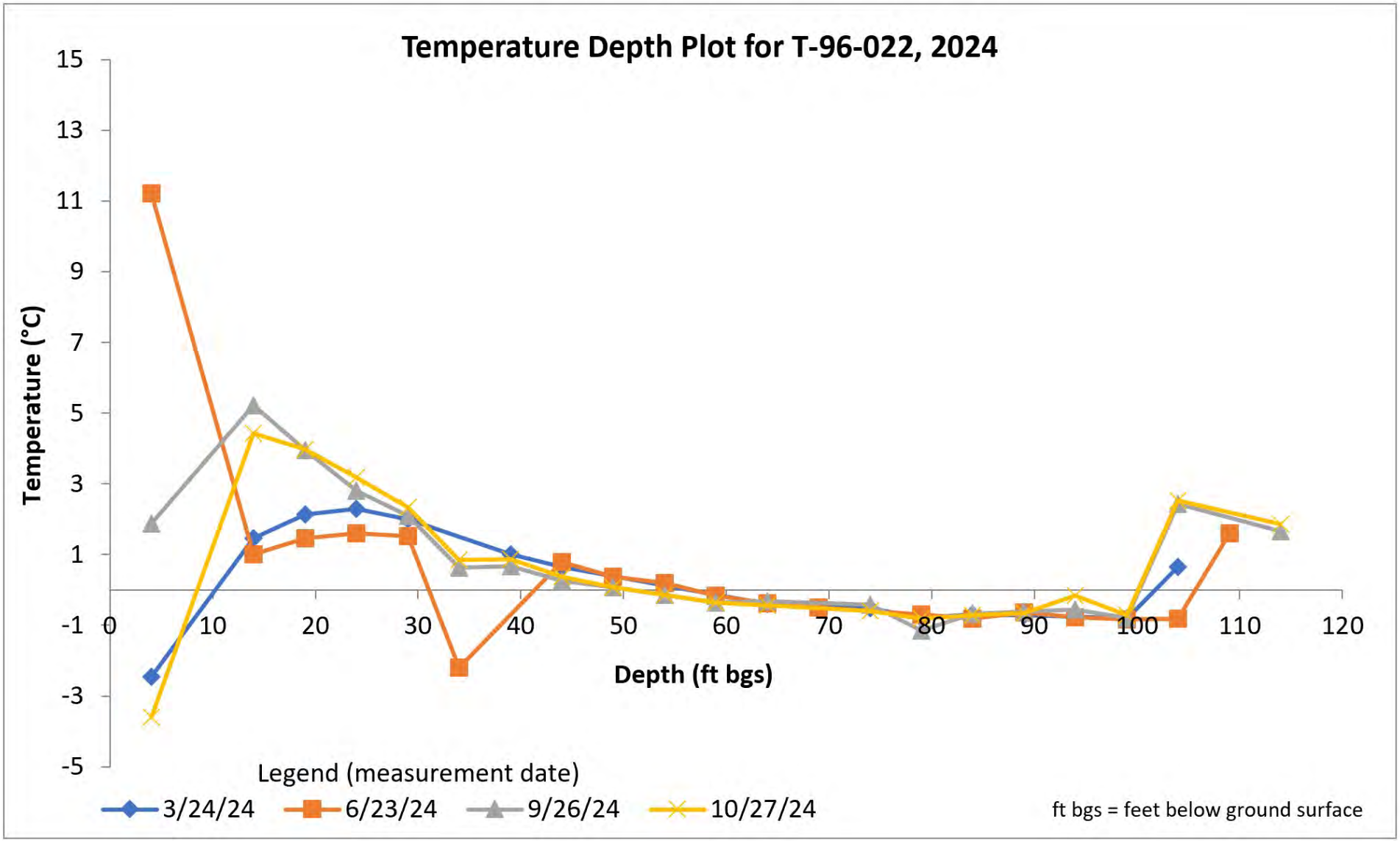

T-96-15: Mean Annual Ground Temperature (2024)
Temperature (°C)
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
0
20
40
60
80
100
120
140
160
180
200
Depth (ft bgs)
ft bgs = feet below ground surface

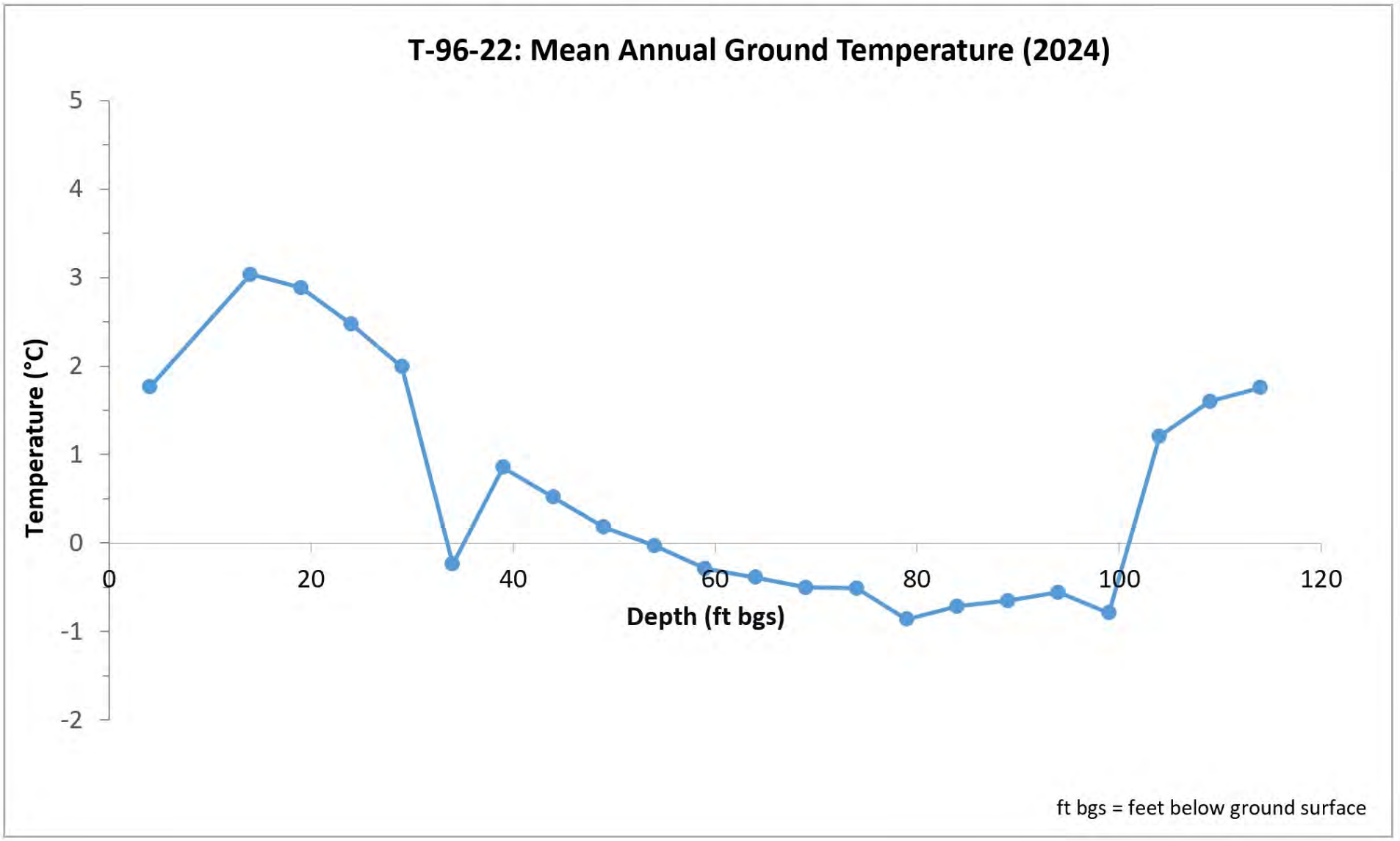

Temperature Depth Plot for T-96-015 (1996-2024)
Temperature (°C)
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
Depth (ft bgs)
0
20
40
60
80
100
120
140
160
180
200
220
ft bgs = feet below ground surface

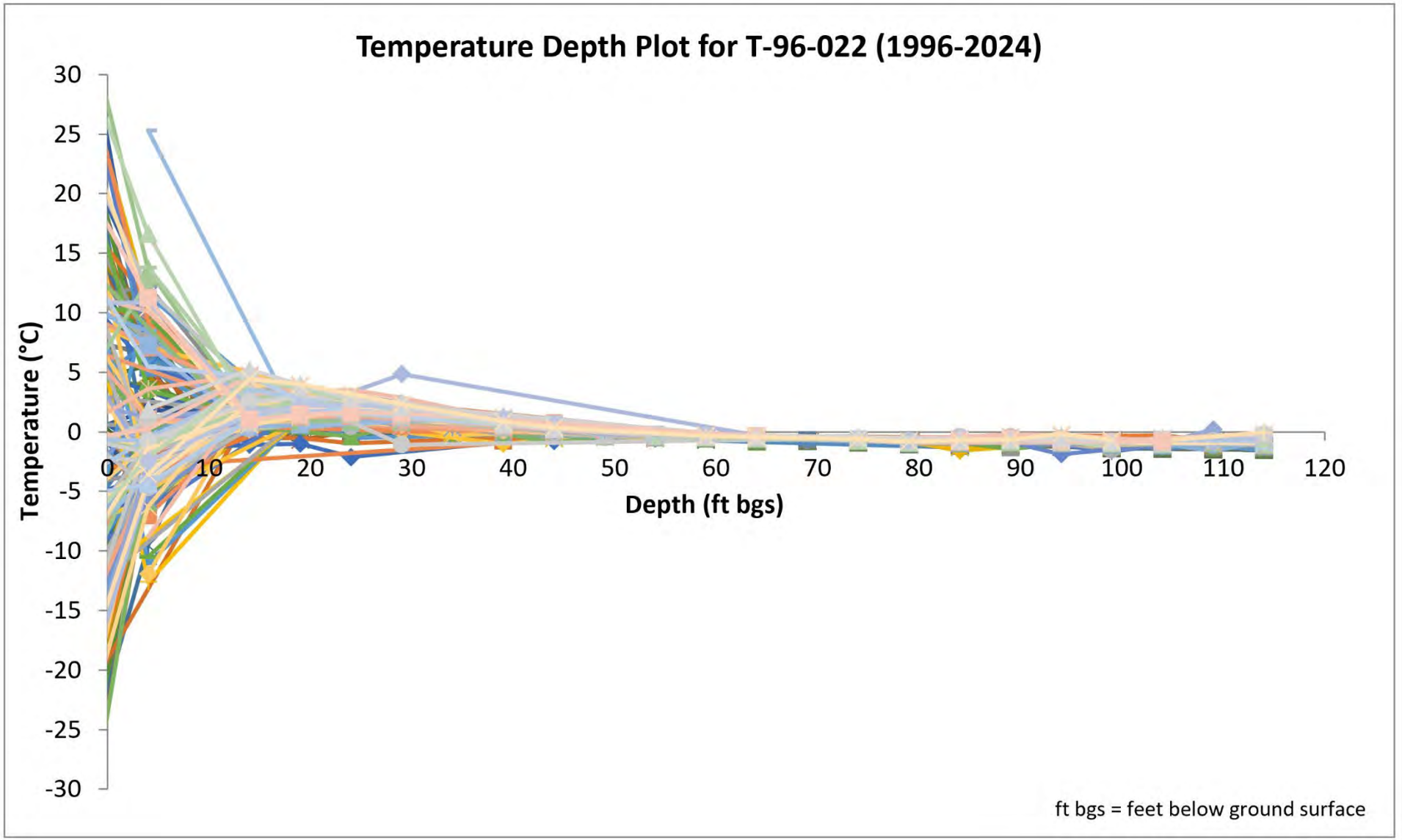

Temperature Depth Plot for T-96-021, 2024
Temperature (°C)
20
15
10
5
0
-5
-10
-15
-20
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (ft)
Legend (measurement date)
3/24/24
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

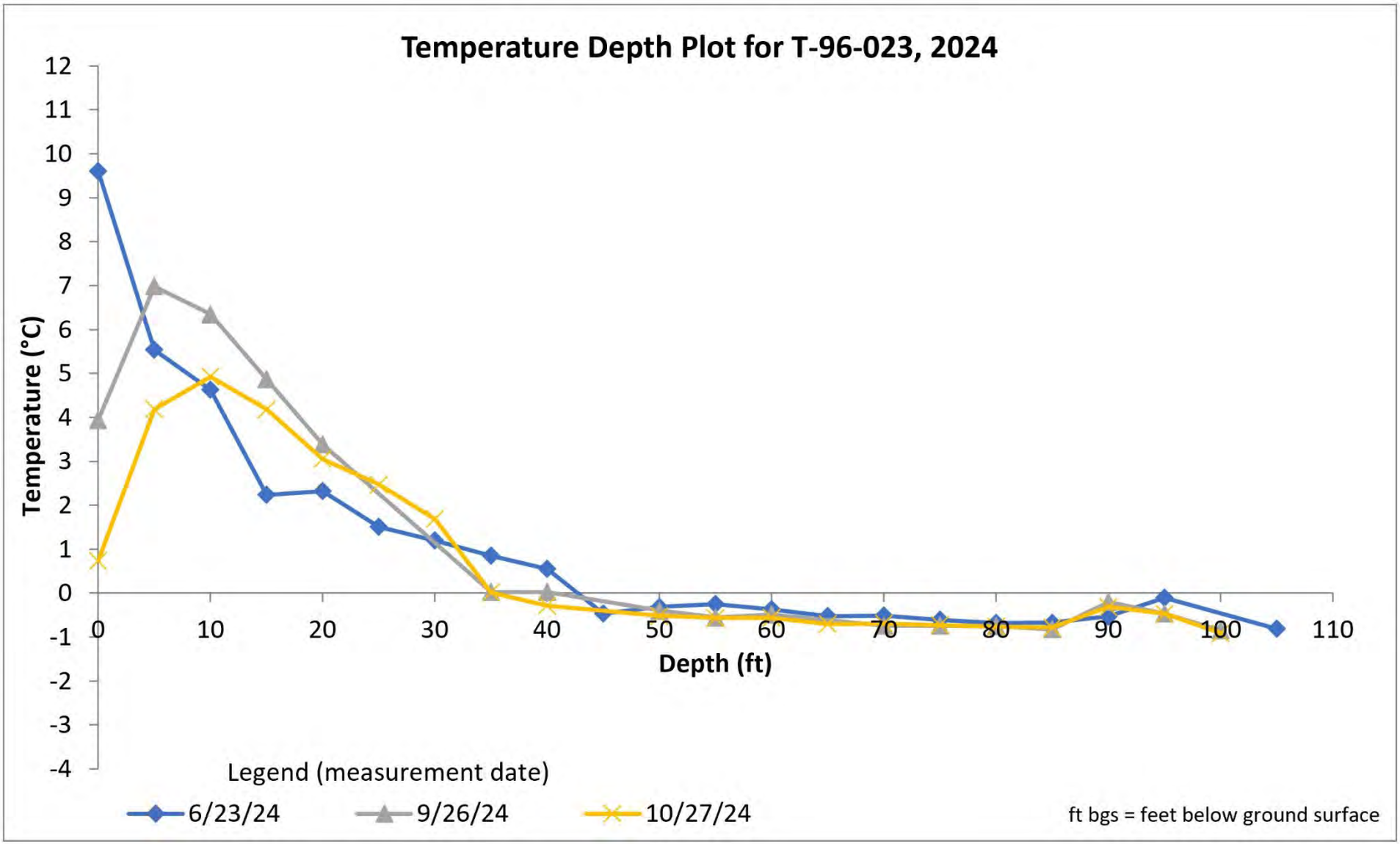

T-96-21: Mean Annual Ground Temperature (2024)
Temperature (°C)
6
5
4
3
2
1
0
-1
-2
-3
0
20
40
60
80
100
120
140
160
180
200
220
240
Depth (ft bgs)
ft bgs = feet below ground surface

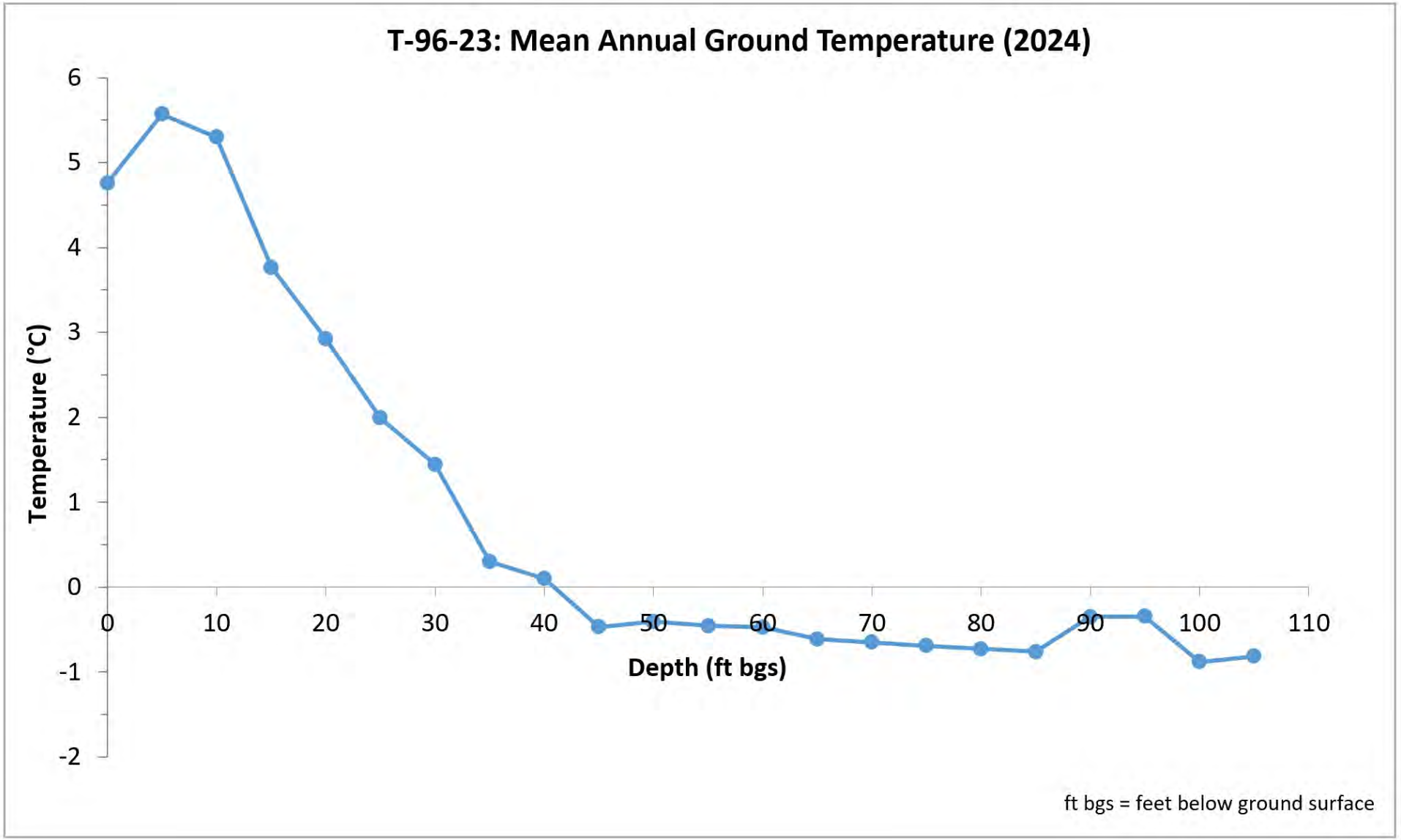

Temperature Depth Plot for T-96-021 (1996-2024)
Temperature (°C)
50
40
30
20
10
0
-10
-20
-30
-40
-50
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (ft) bgs
ft bgs = feet below ground surface

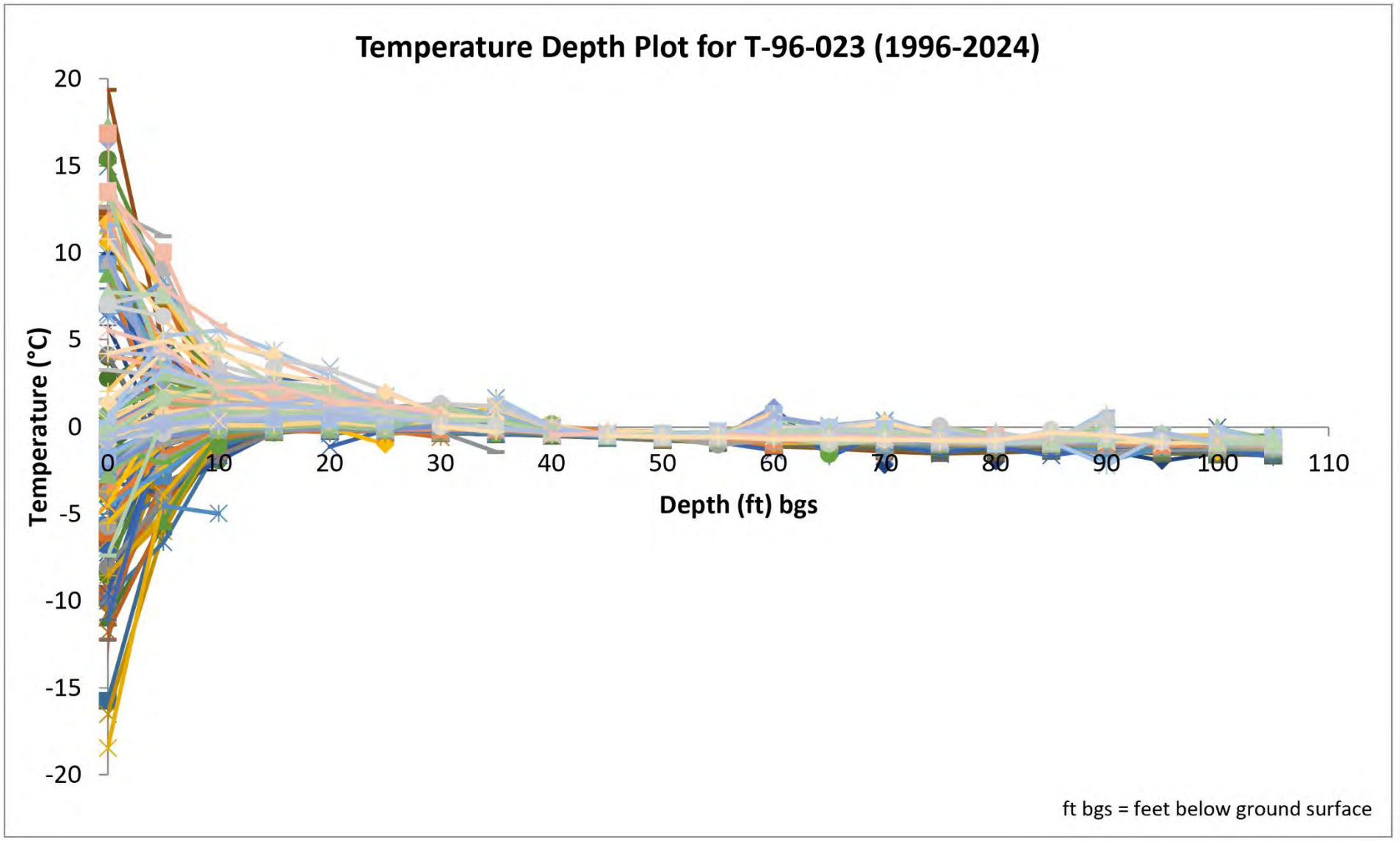

Temperature Depth Plot for T-96-022, 2024
Temperature (°C)
15
13
11
9
7
5
3
1
-1
-3
-5
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (ft bgs)
Legend (measurement date)
3/24/24
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

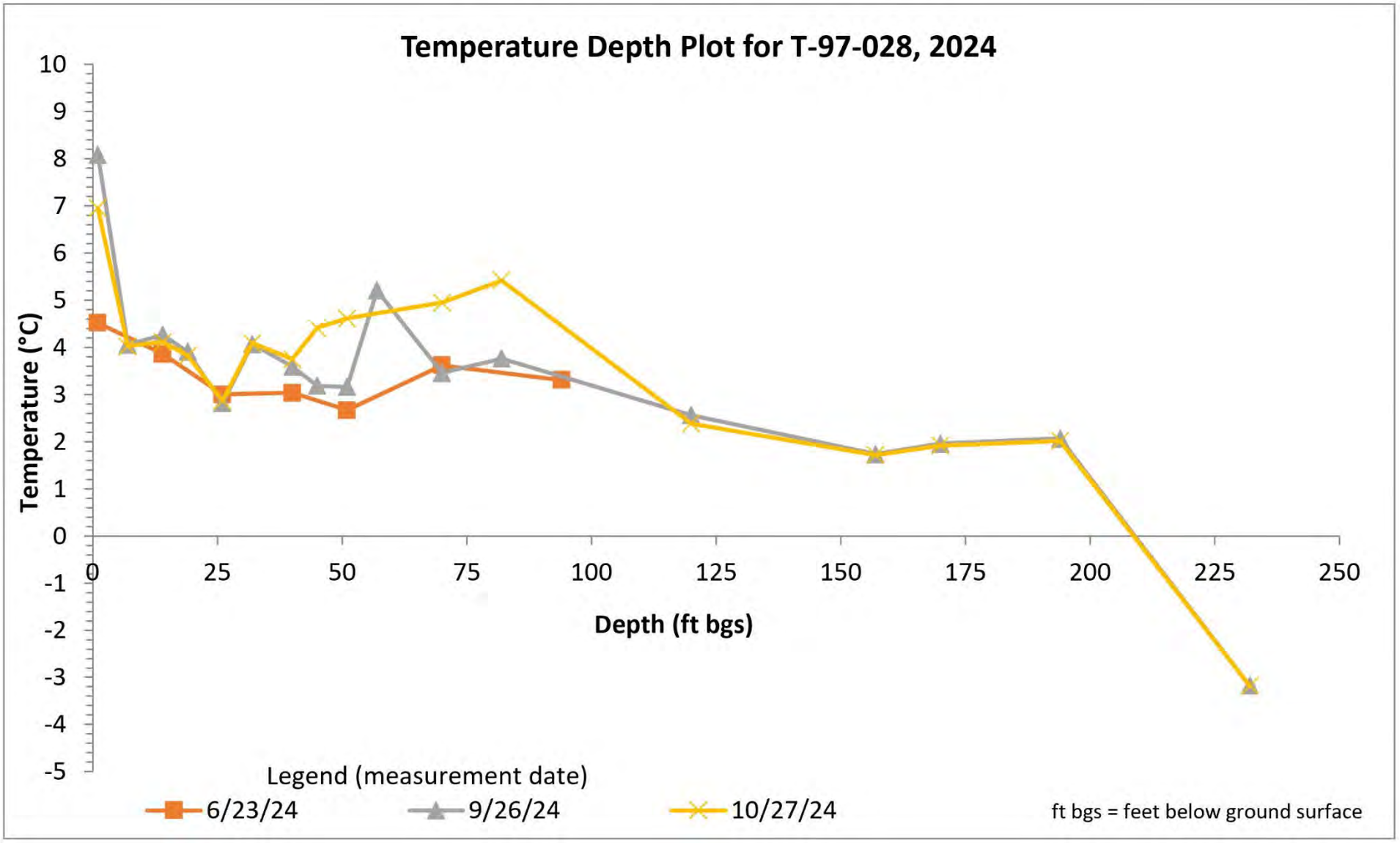

T-96-22: Mean Annual Ground Temperature (2024)
Temperature (°C)
5
4
3
2
1
0
-1
-2
0
20
40
60
80
100
120
Depth (ft bgs)
ft bgs = feet below ground surface

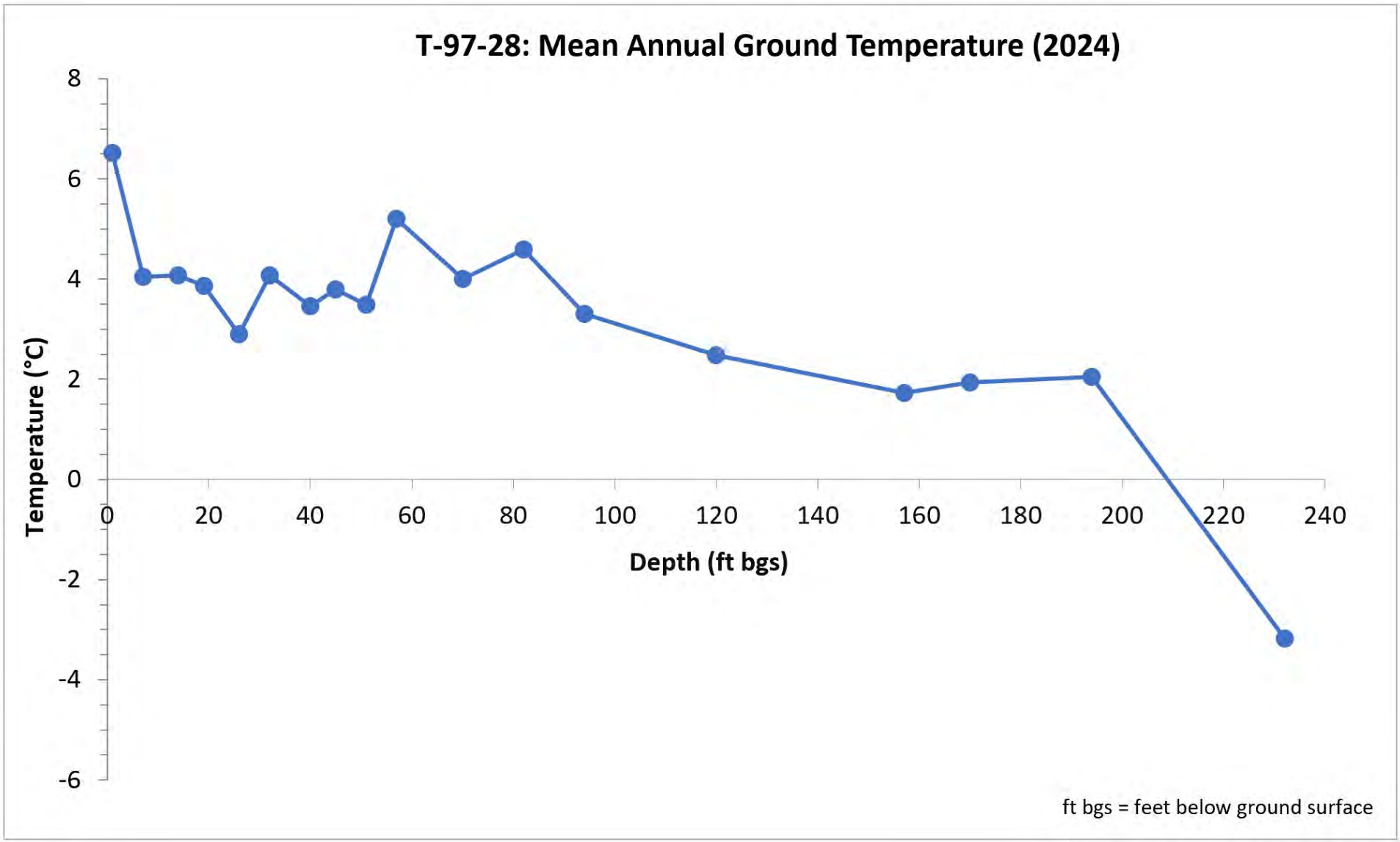

Temperature Depth Plot for T-96-022 (1996-2024)
Temperature (°C)
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0
10
20
30
40
50
60
70
80
90
100
110
120
Depth (ft bgs)
ft bgs = feet below ground surface

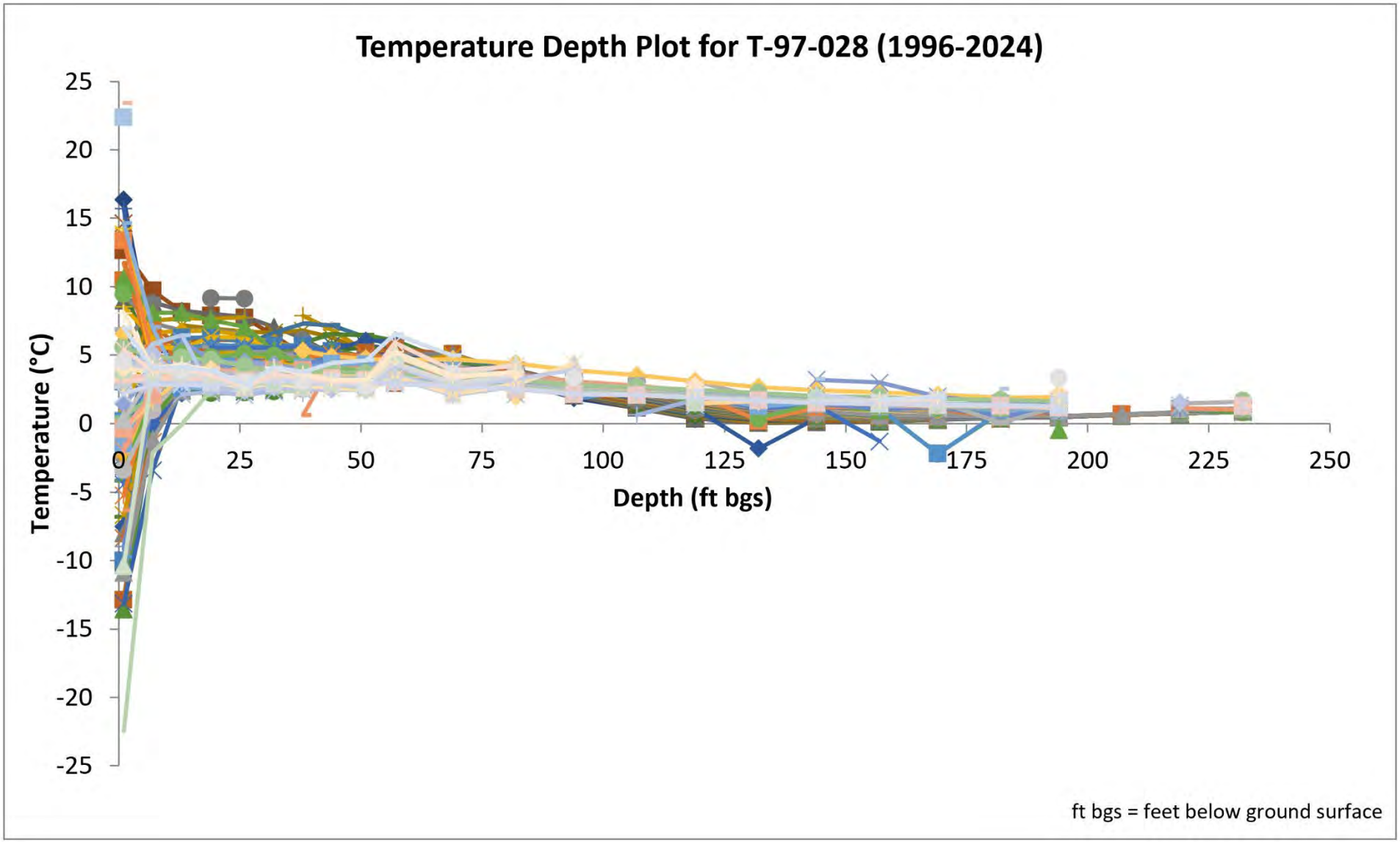

Temperature Depth Plot for T-96-023, 2024
Temperature (°C)
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
0
10
20
30
40
50
60
70
80
90
100
110
Depth (ft)
Legend (measurement date)
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

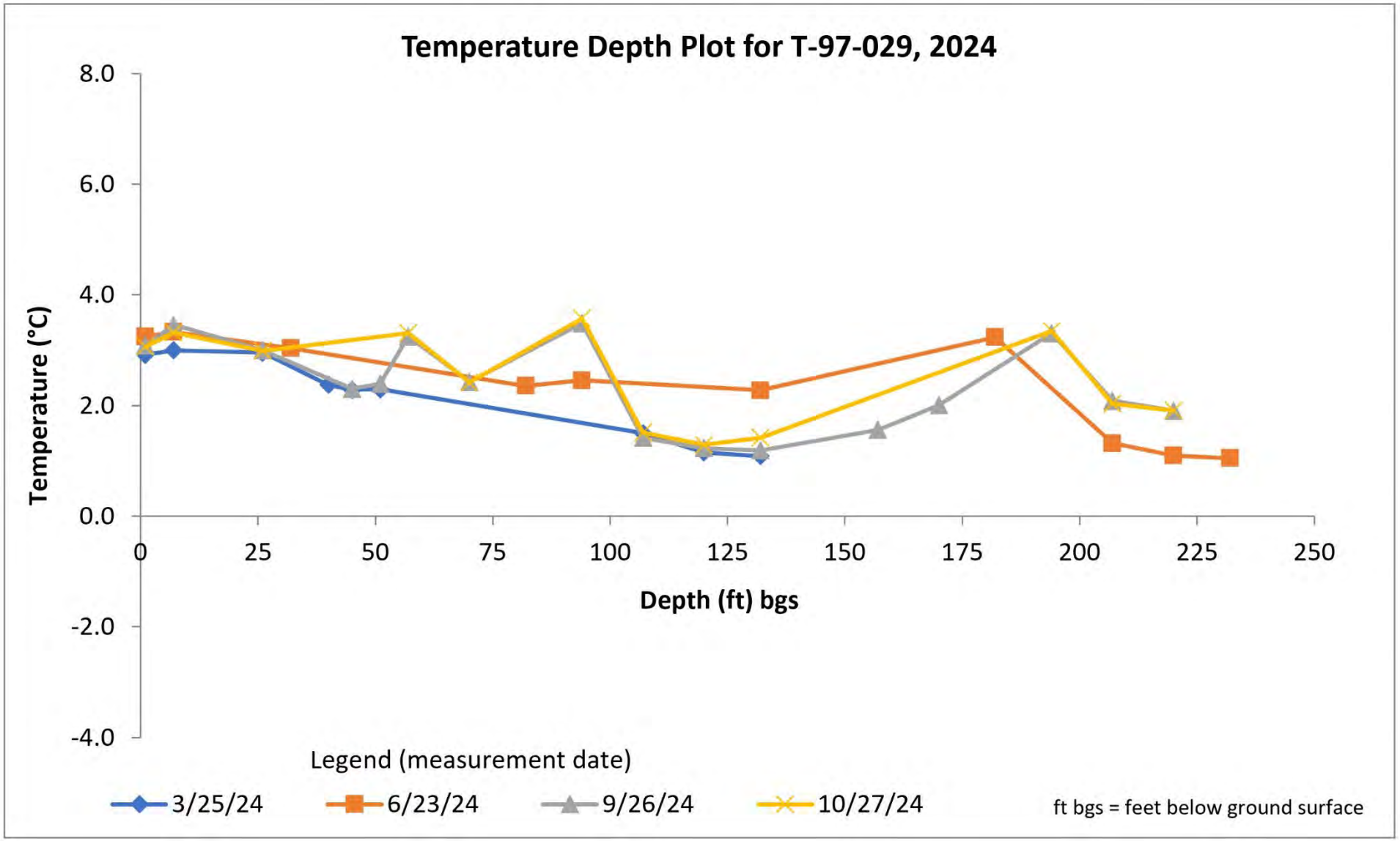

T-96-23: Mean Annual Ground Temperature (2024)
Temperature (°C)
6
5
4
3
2
1
0
-1
-2
0
10
20
30
40
50
60
70
80
90
100
110
Depth (ft bgs)
ft bgs = feet below ground surface

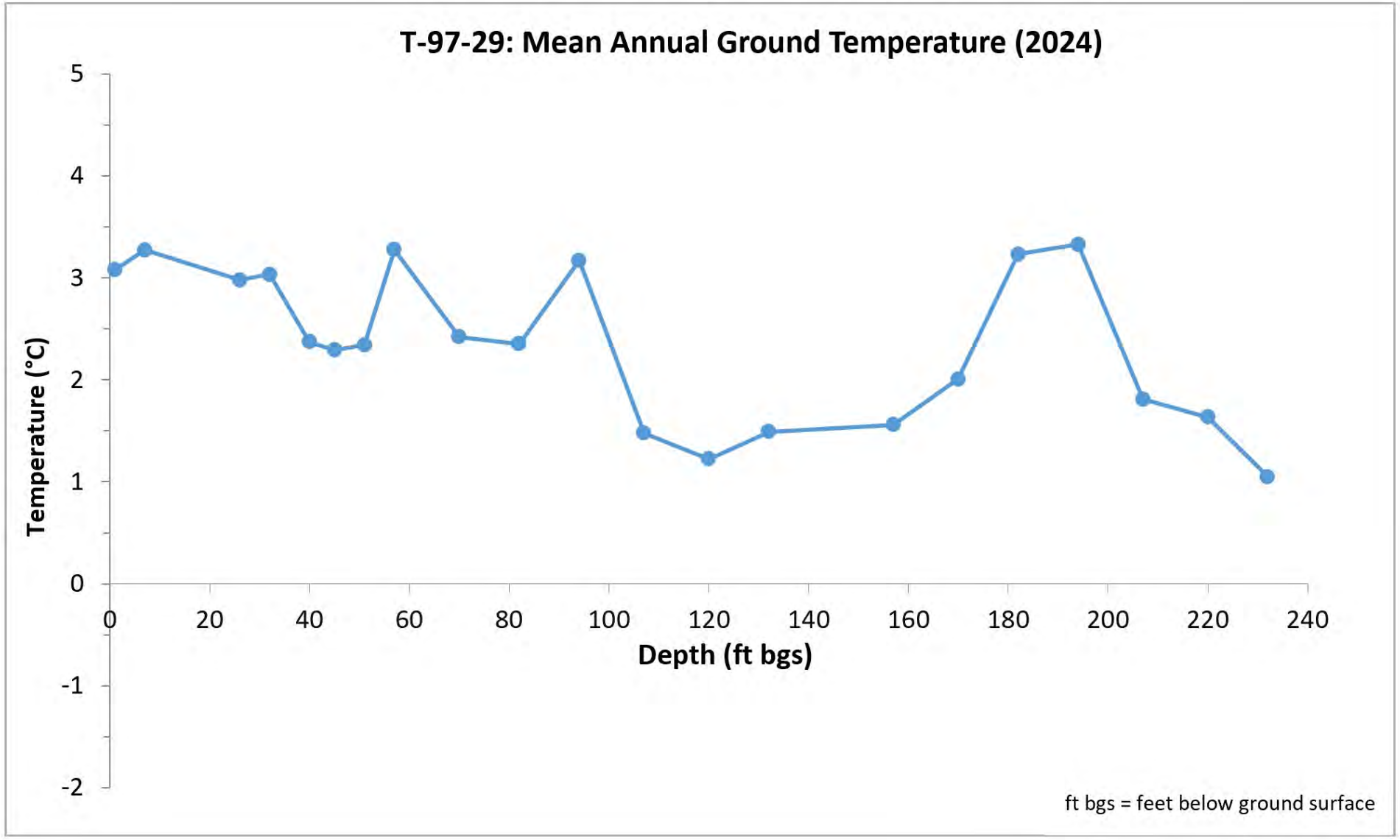

Temperature Depth Plot for T-96-023 (1996-2024)
Temperature (°C)
20
15
10
5
0
-5
-10
-15
-20
0
10
20
30
40
50
60
70
80
90
100
110
Depth (ft) bgs
ft bgs = feet below ground surface

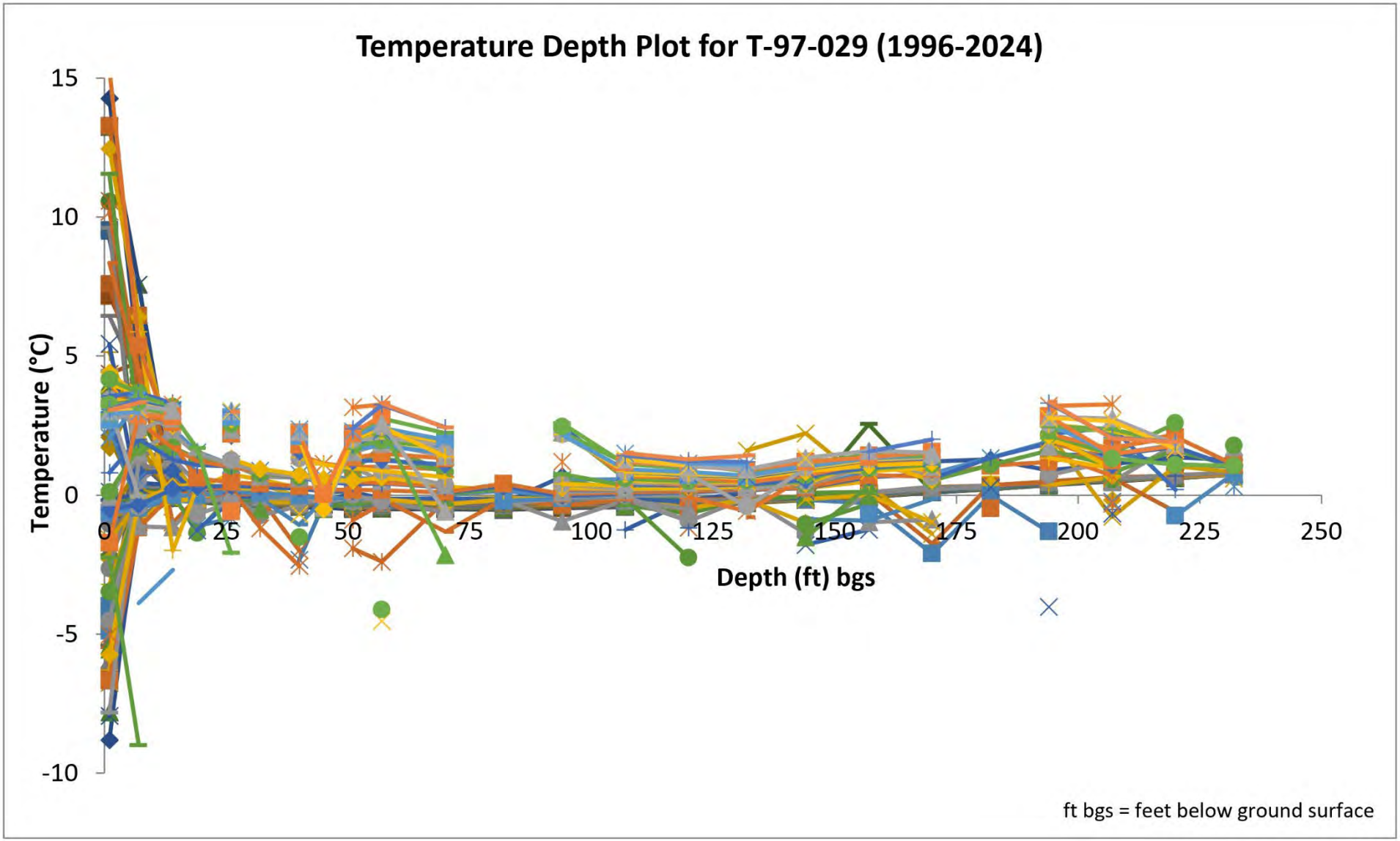

Temperature Depth Plot for T-97-028, 2024
Temperature (°C)
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
0
25
50
75
100
125
150
175
200
225
250
Depth (ft bgs)
Legend (measurement date)
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

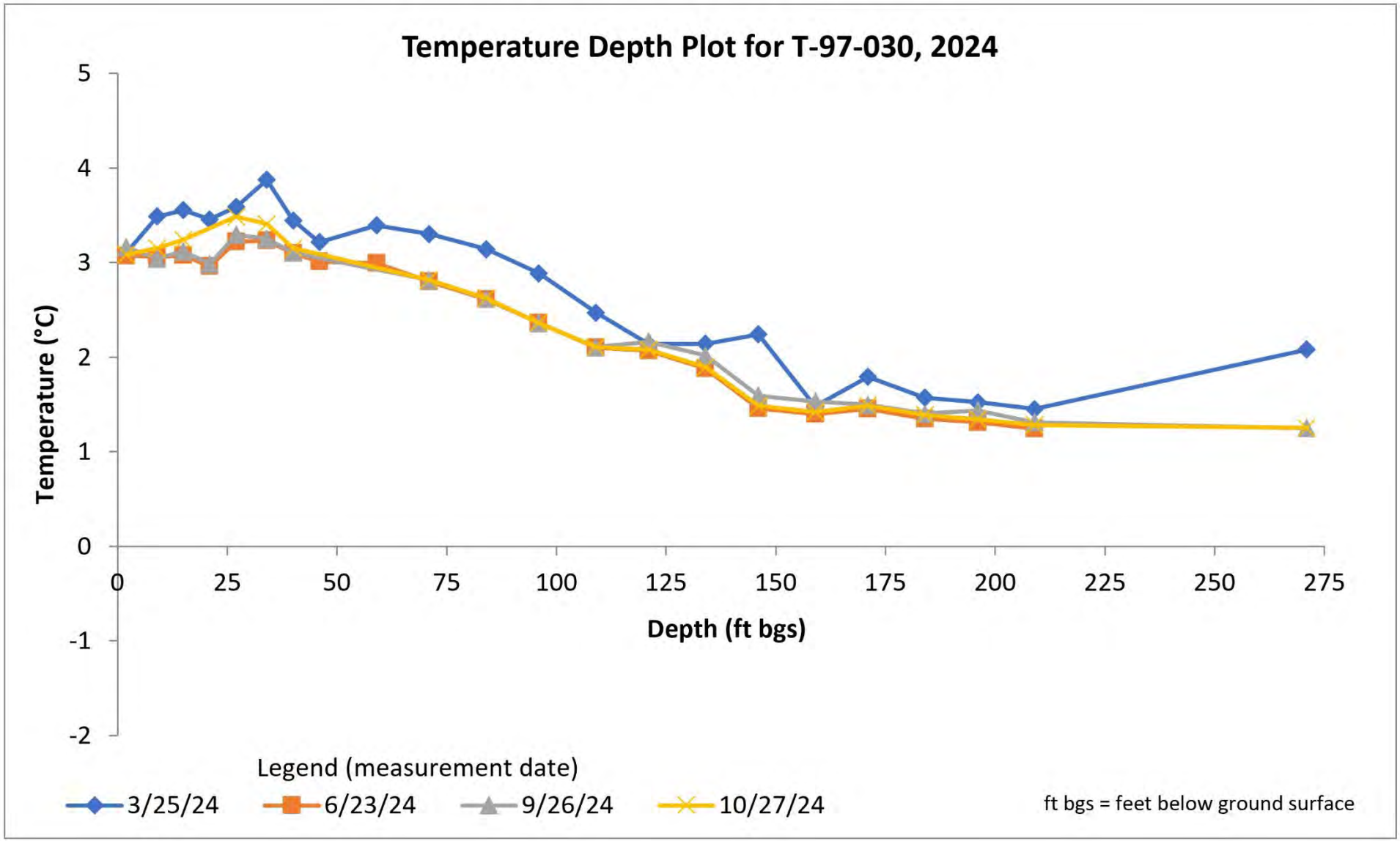

T-97-28: Mean Annual Ground Temperature (2024)
Temperature (°C)
8
6
4
2
0
-2
-4
-6
0
20
40
60
80
100
120
140
160
180
200
220
240
Depth (ft bgs)
ft bgs = feet below ground surface

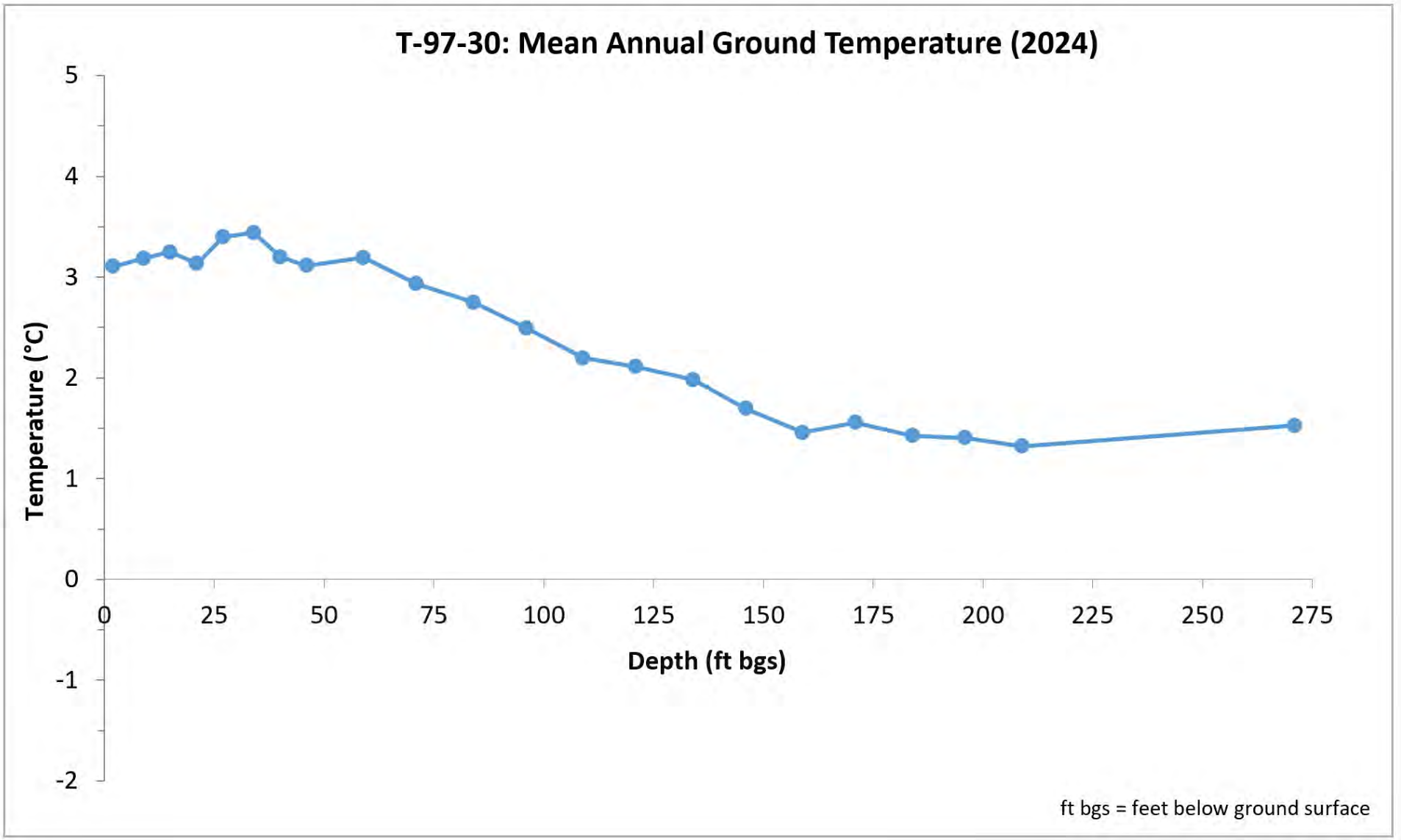

Temperature Depth Plot for T-97-028 (1996-2024)
Temperature (°C)
25
20
15
10
5
0
-5
-10
-15
-20
-25
0
25
50
75
100
125
150
175
200
225
250
Depth (ft bgs)
ft bgs = feet below ground surface

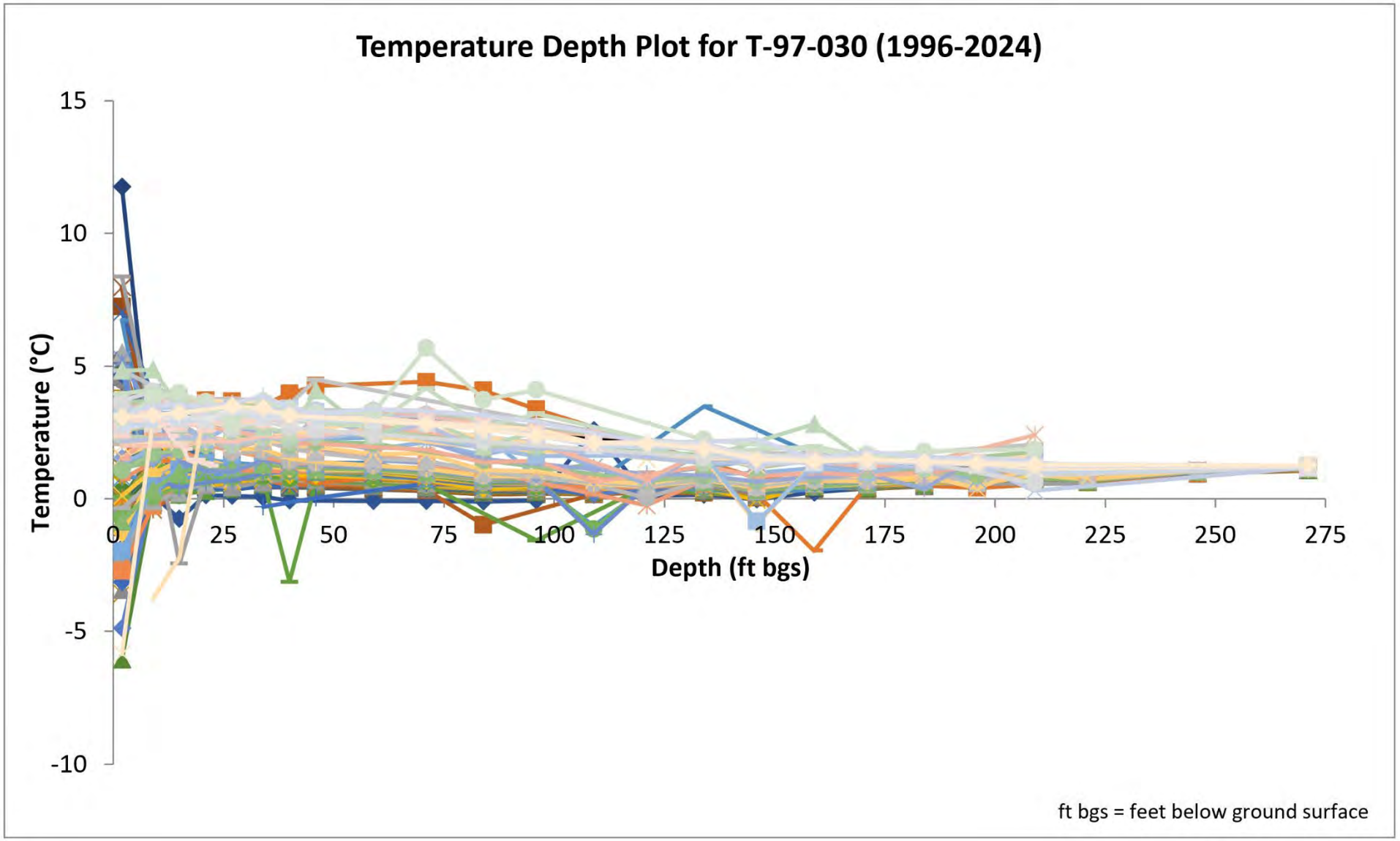

Temperature Depth Plot for T-97-029, 2024
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
Temperature (°C)
0
25
50
75
100
125
150
175
200
225
250
Depth (ft) bgs
Legend (measurement date)
3/25/24
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

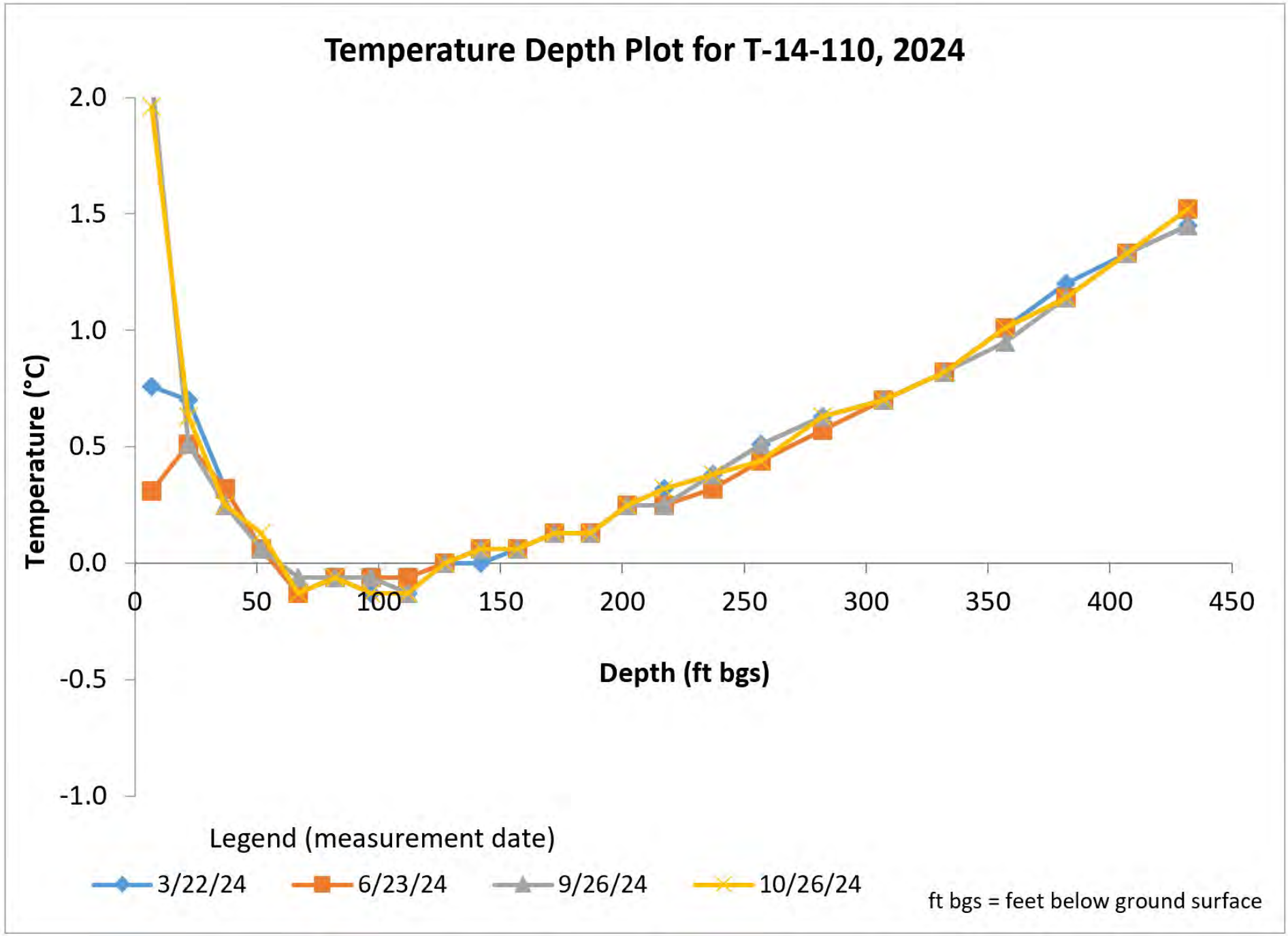

T-97-29: Mean Annual Ground Temperature (2024)
Temperature (°C)
5
4
3
2
1
0
-1
-2
0
20
40
60
80
100
120
140
160
180
200
220
240
Depth (ft bgs)
ft bgs = feet below ground surface

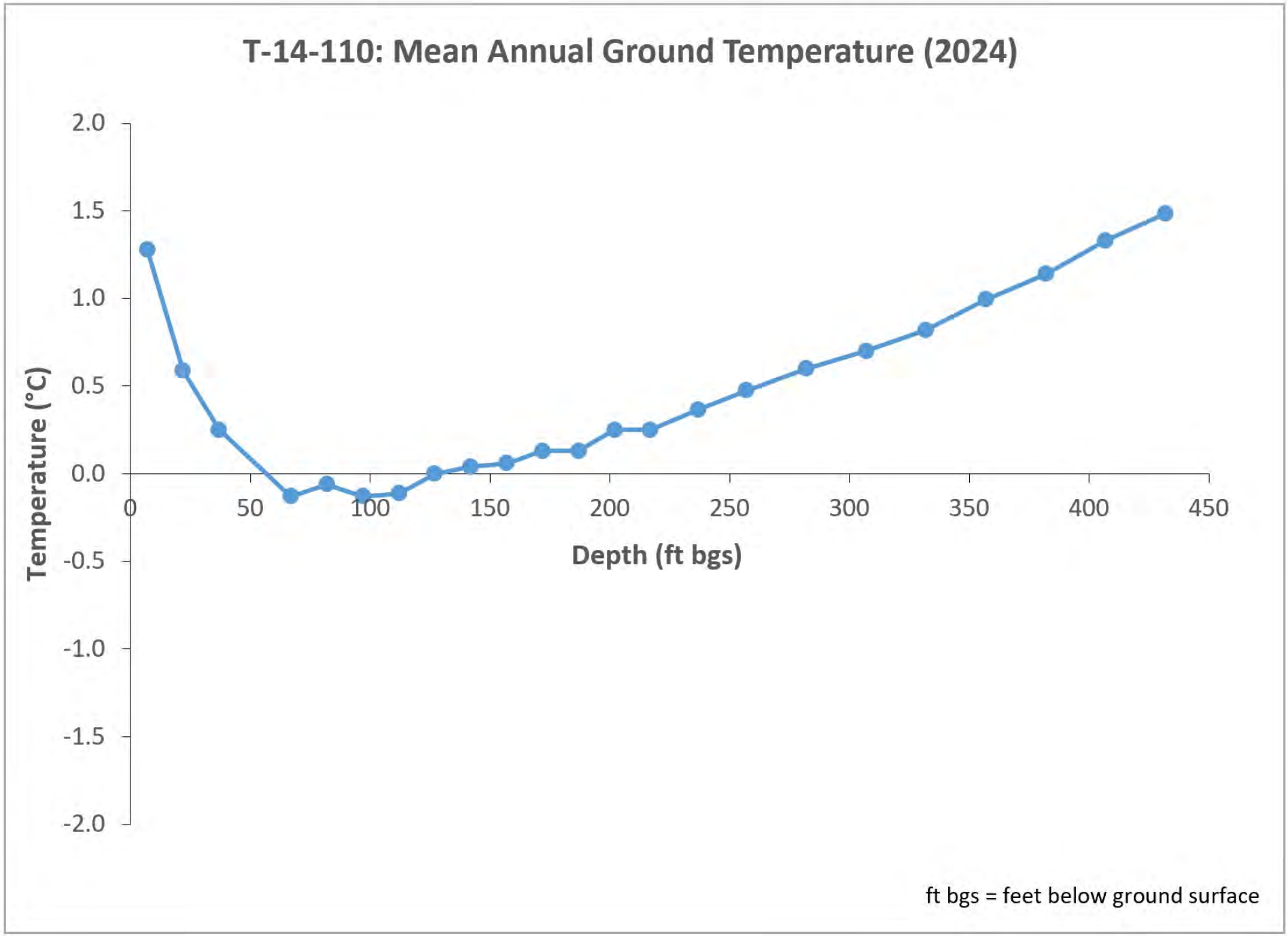

Temperature Depth Plot for T-97-029 (1996-2024)
15
10
5
0
-5
-10
Temperature (°C)
0
25
50
75
100
125
150
175
200
225
250
Depth (ft) bgs
ft bgs = feet below ground surface


Temperature Depth Plot for T-97-030, 2024
Temperature (°C)
5
4
3
2
1
0
-1
-2
0
25
50
75
100
125
150
175
200
225
250
275
Depth (ft bgs)
Legend (measurement date)
3/25/24
6/23/24
9/26/24
10/27/24
ft bgs = feet below ground surface

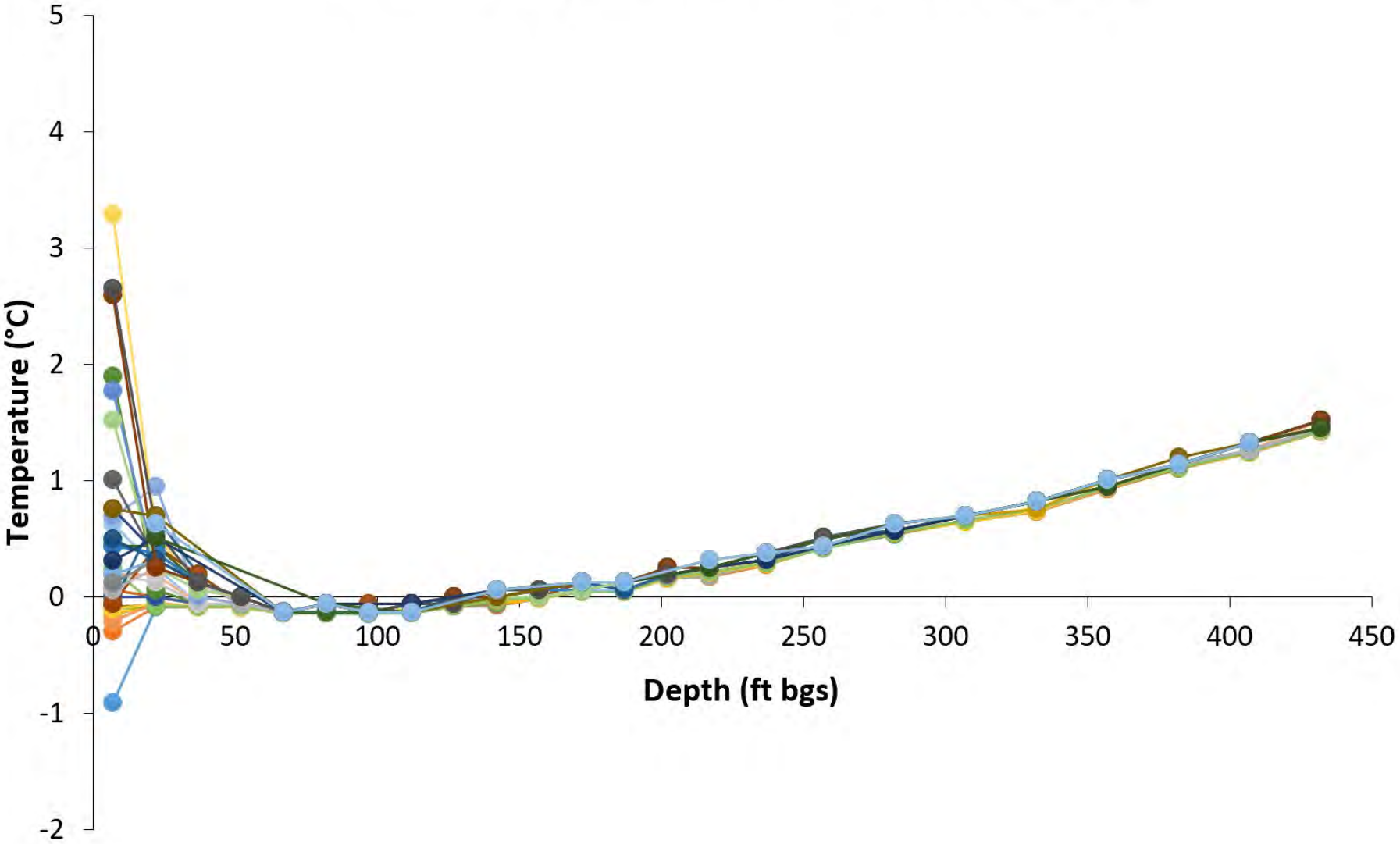

T-97-30: Mean Annual Ground Temperature (2024)
Temperature (°C)
5
4
3
2
1
0
-1
-2
0
25
50
75
100
125
150
175
200
225
250
275
Depth (ft bgs)
ft bgs = feet below ground surface


Temperature Depth Plot for T-97-030 (1996-2024)
Temperature (°C)
15
10
5
0
-5
-10
0
25
50
75
100
125
150
175
200
225
250
275
Depth (ft bgs)
ft bgs = feet below ground surface


Temperature Depth Plot for T-14-110, 2024
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
Temperature (°C)
0
50
100
150
200
250
300
350
400
450
Depth (ft bgs)
Legend (measurement date)
3/22/24
6/23/24
9/26/24
10/26/24
ft bgs = feet below ground surface


T-14-110: Mean Annual Ground Temperature (2024)
Temperature (°C)
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
0
50
100
150
200
250
300
350
400
450
Depth (ft bgs)
ft bgs = feet below ground surface

Temperature Depth Plot for T-14-110 (2015-2024)

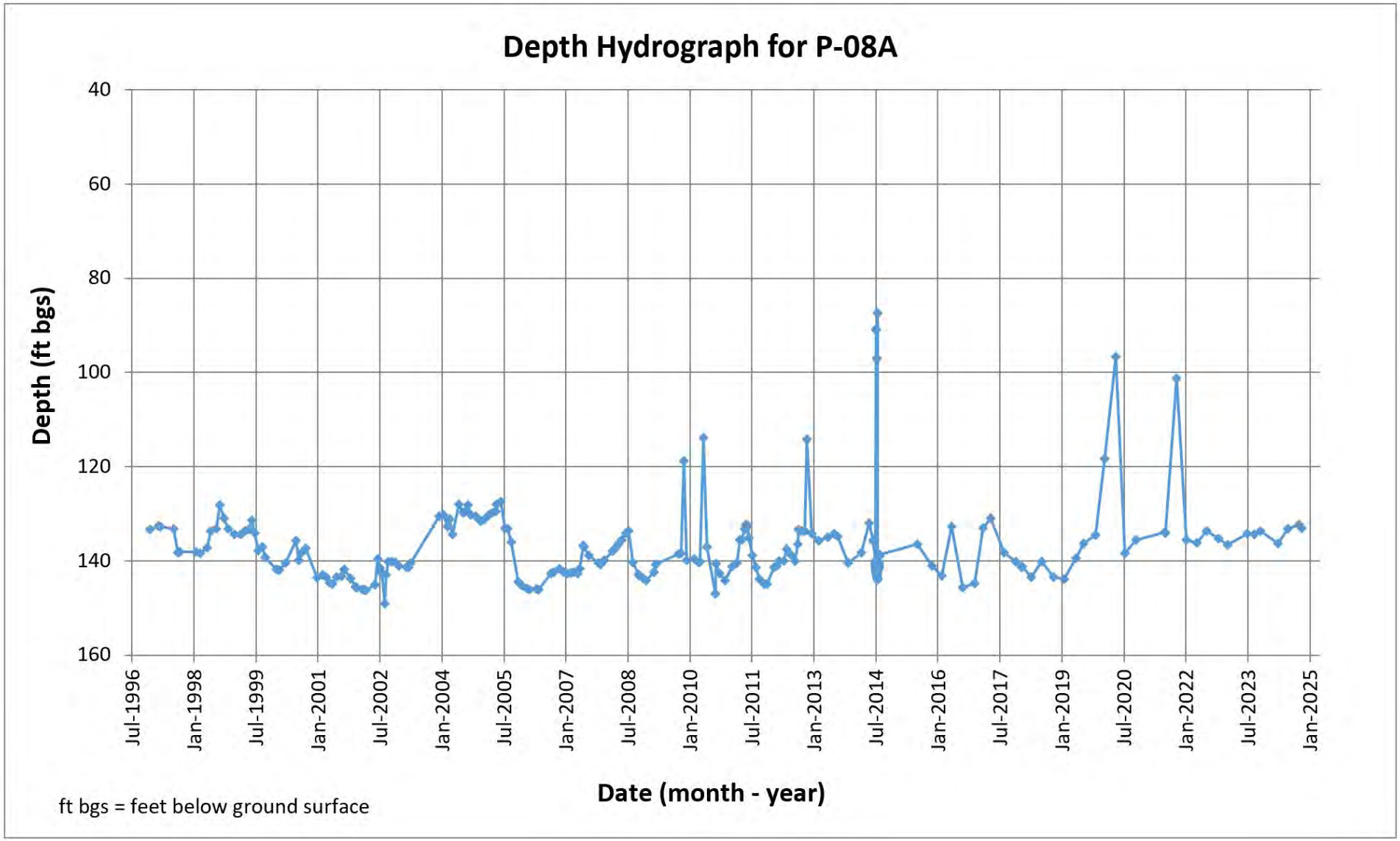


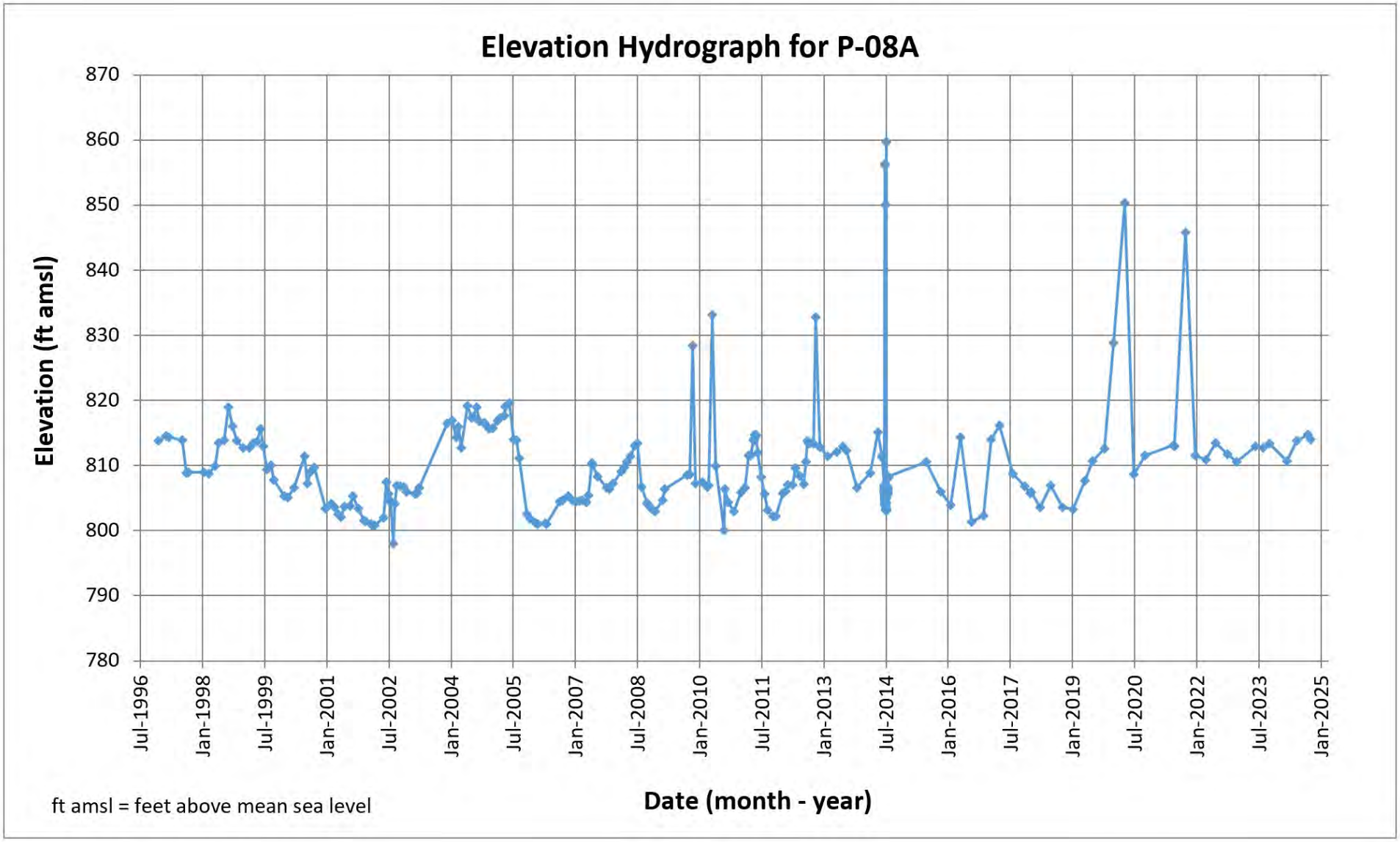
ft bgs = feet below ground surface

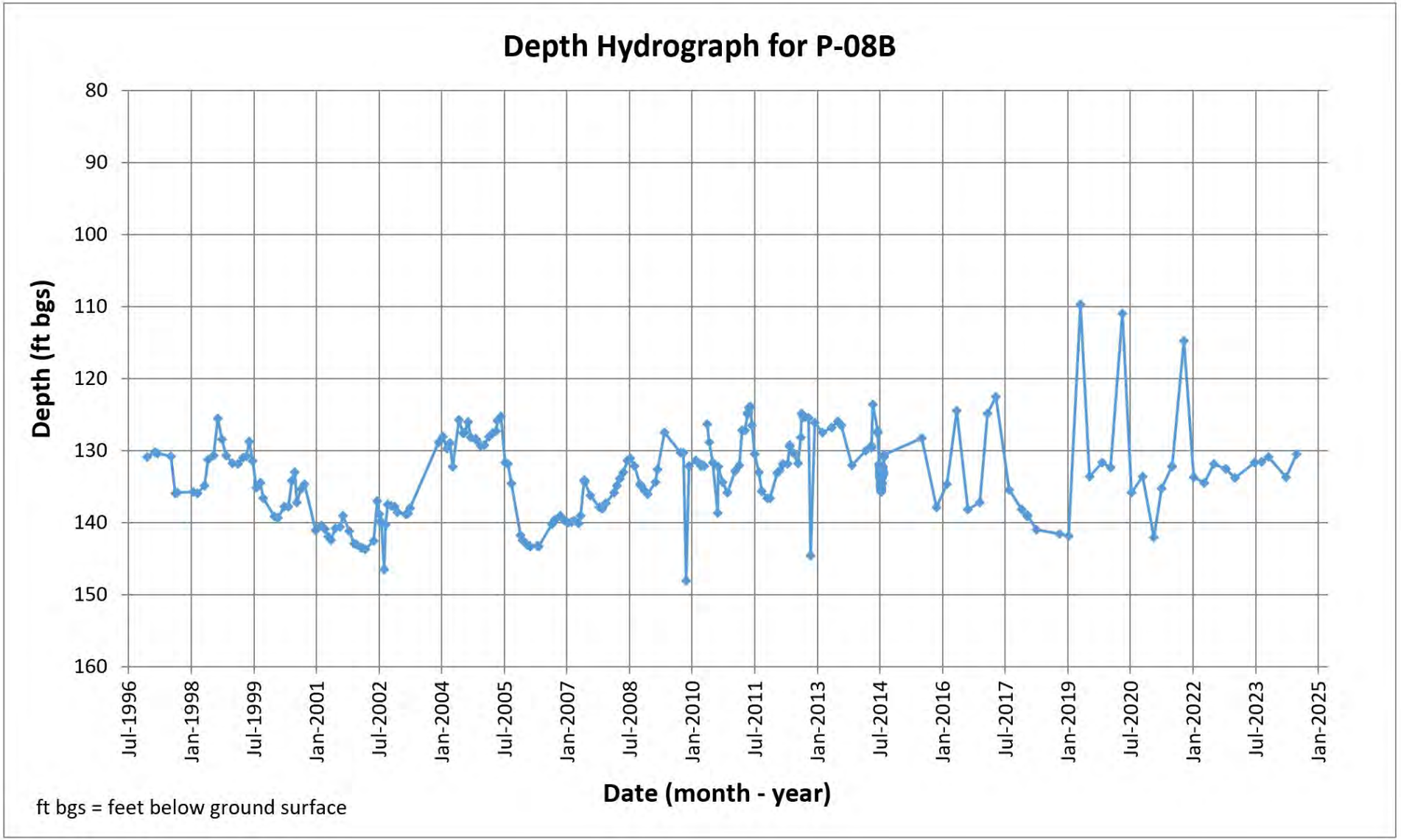
Appendix E
Piezometer Plots

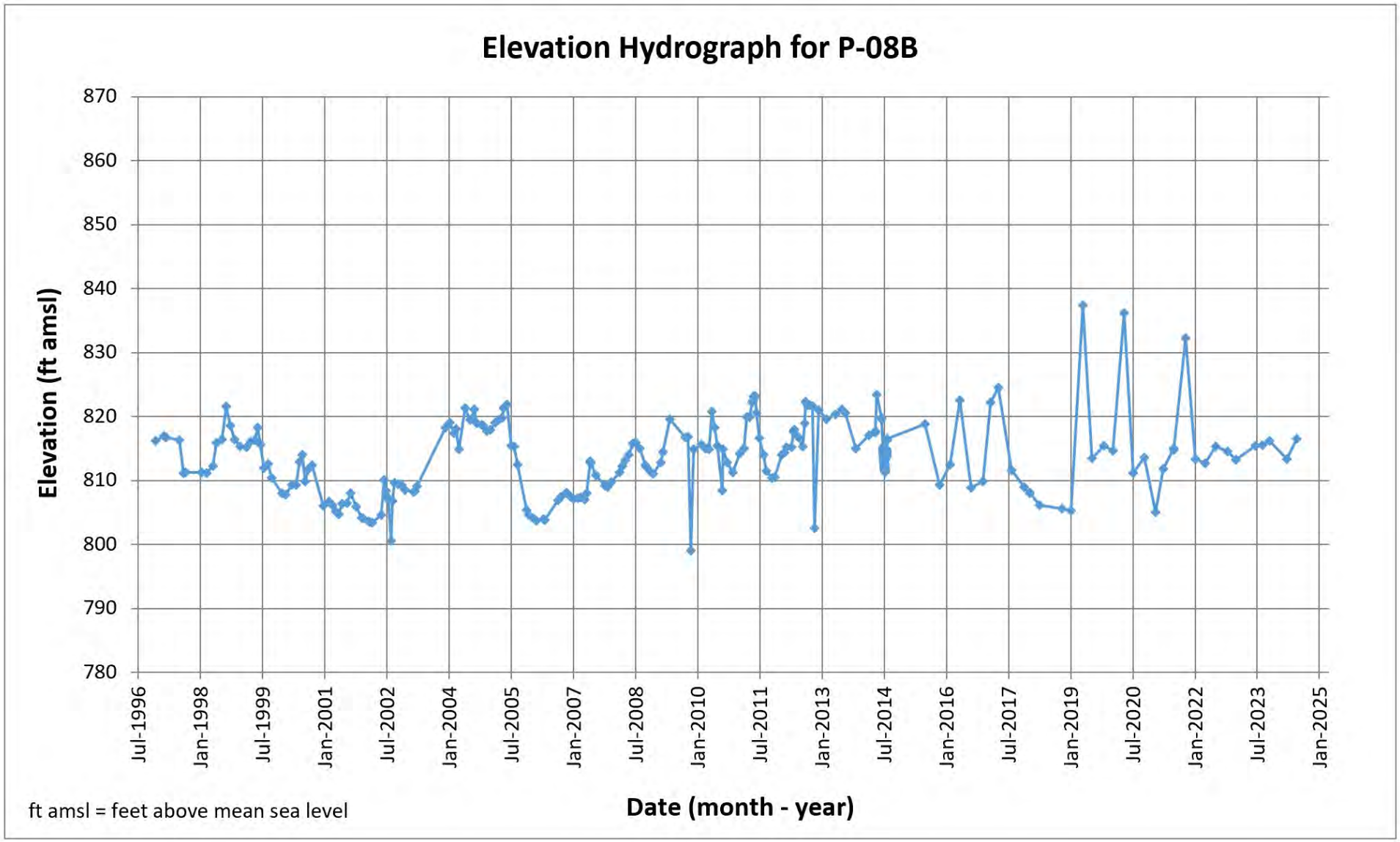
2 plots per thermistor:

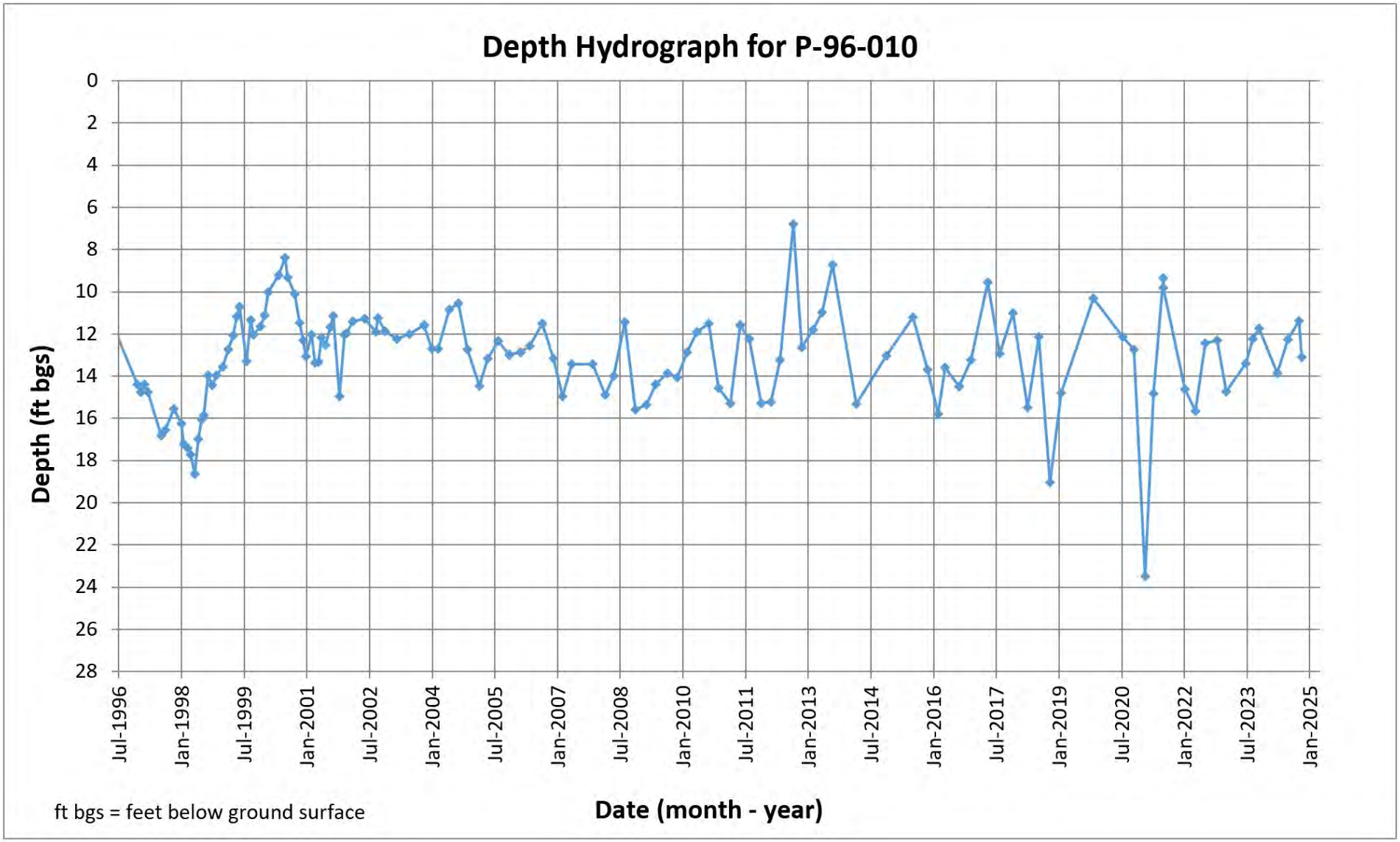
- 2024 Depth Hydrograph
- 2024 Elevation Hydrograph

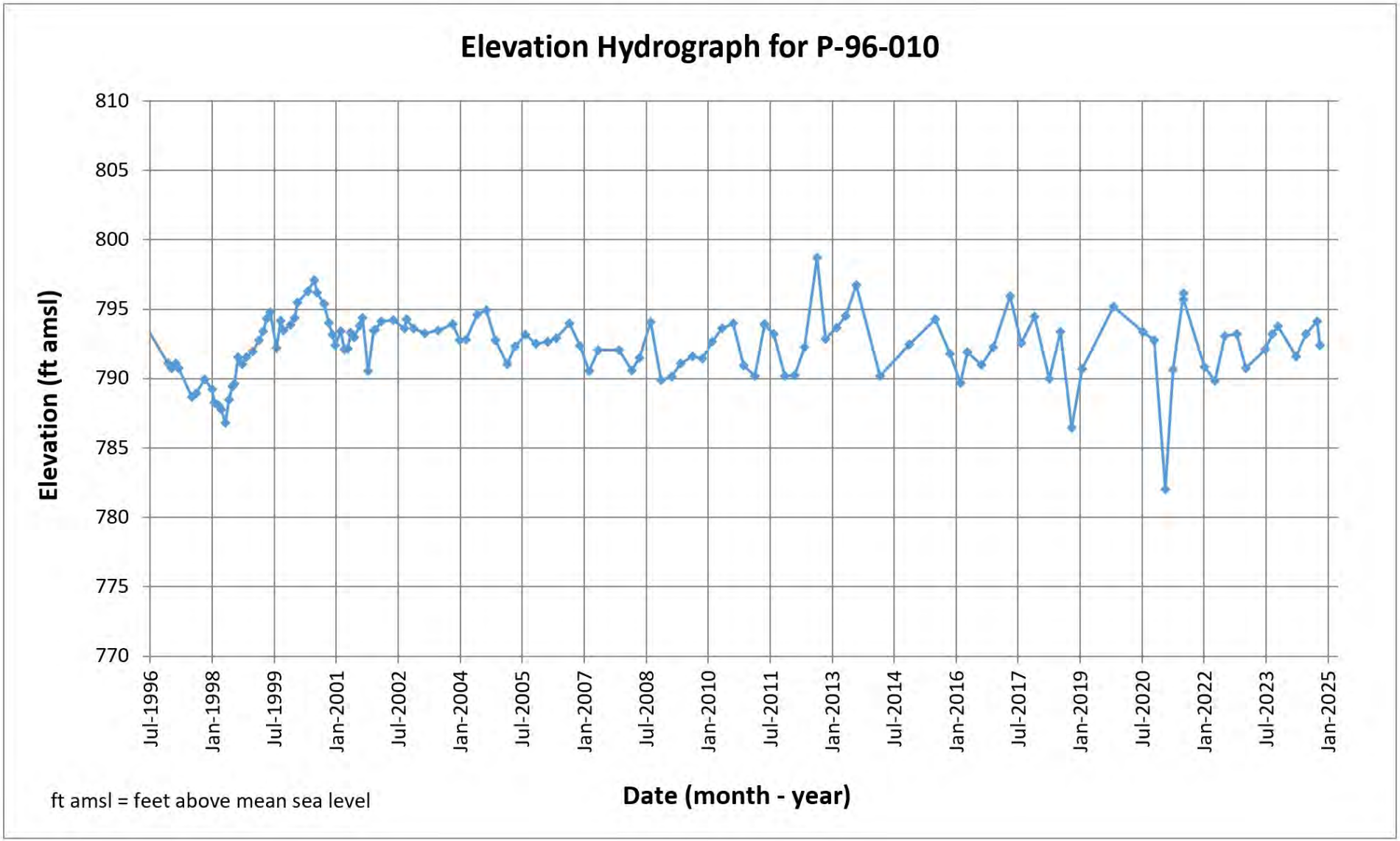

Depth Hydrograph for P-08A
Depth (ft bgs)
40
60
80
100
120
140
160
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft bgs = feet below ground surface

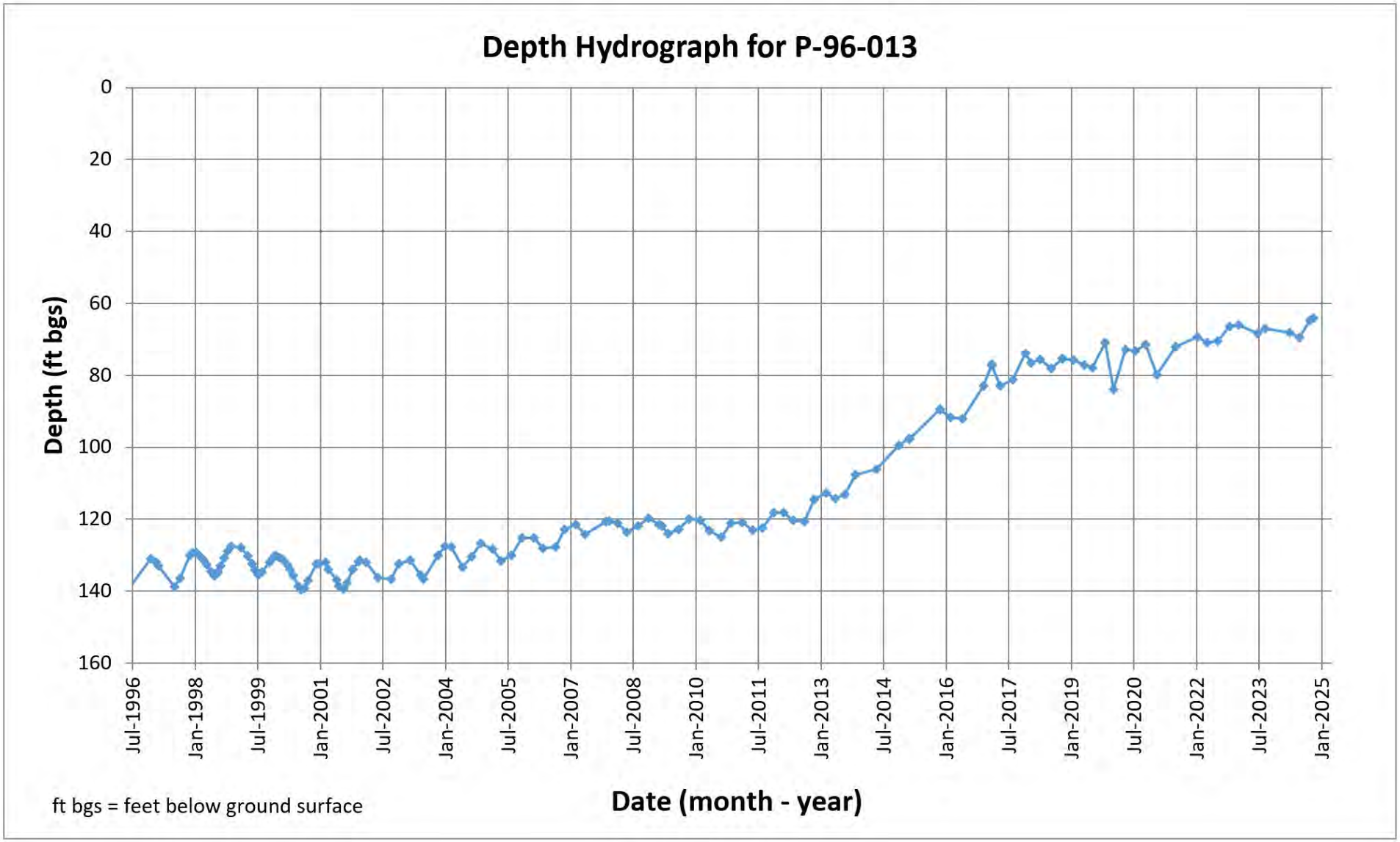

Elevation Hydrograph for P-08A
Elevation (ft amsl)
870
860
850
840
830
820
810
800
790
780
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft amsl = feet above mean sea level

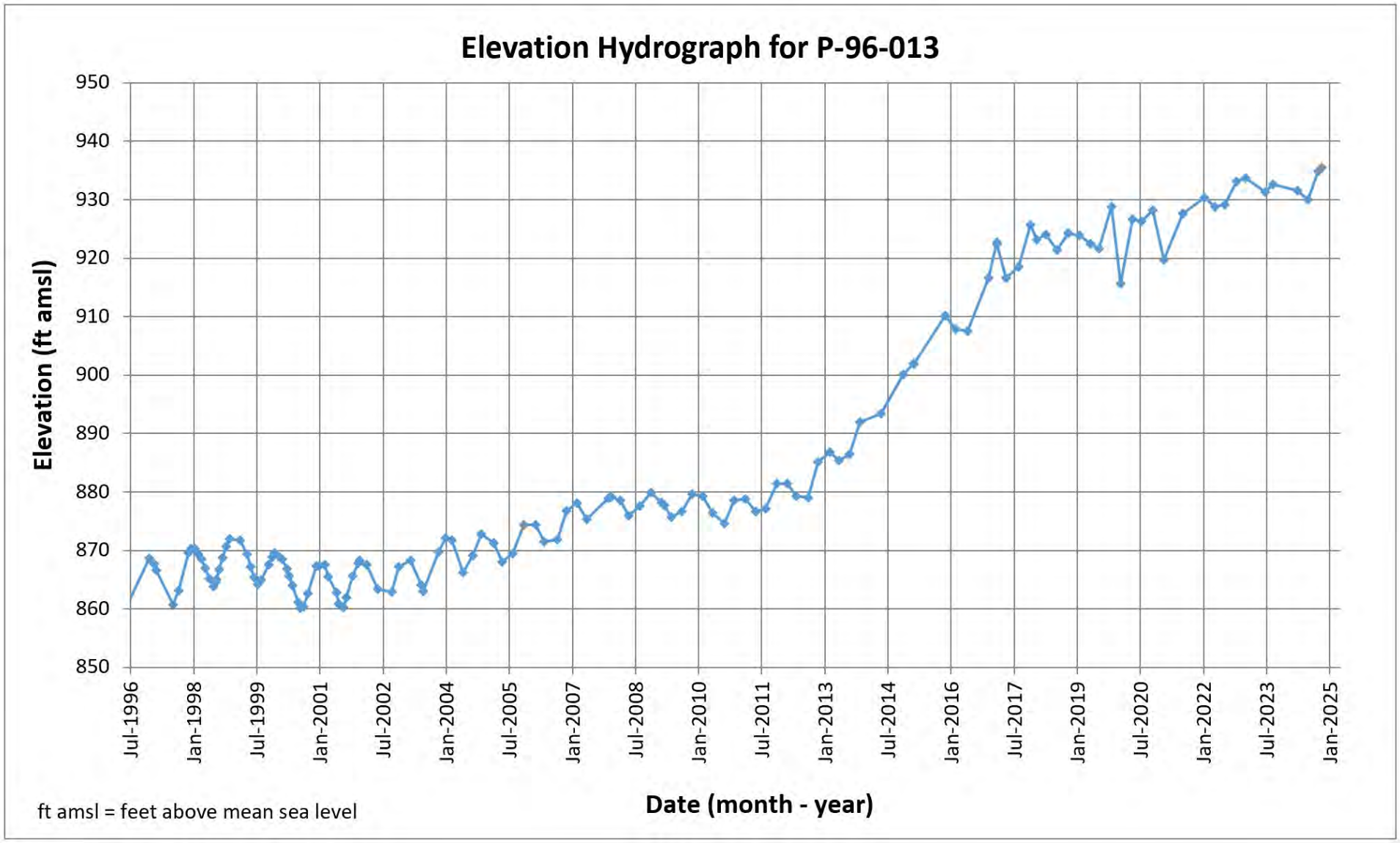

Depth Hydrograph for P-08B
Depth (ft bgs)
80
90
100
110
120
130
140
150
160
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft bgs = feet below ground surface

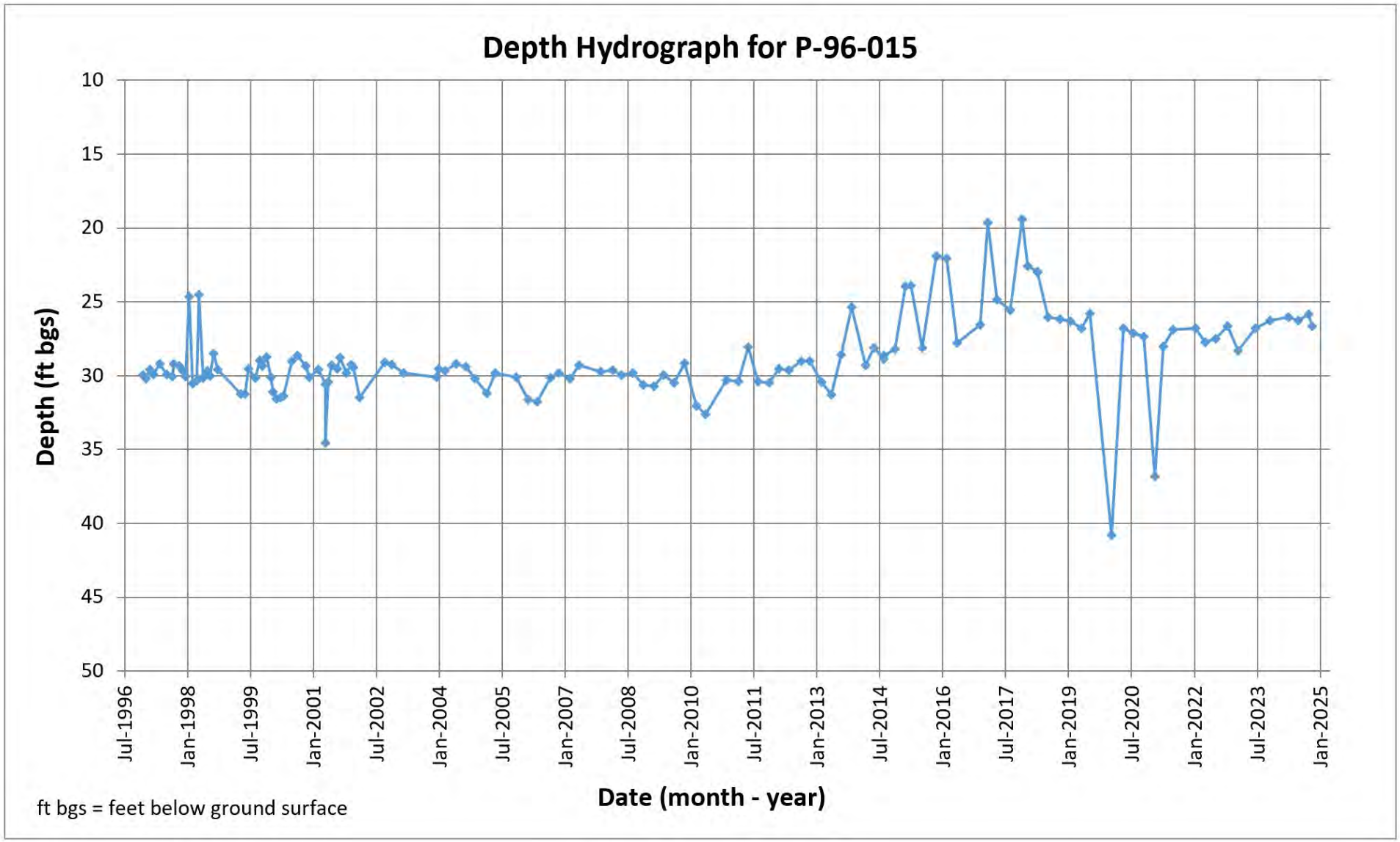

Elevation Hydrograph for P-08B
Elevation (ft amsl)
870
860
850
840
830
820
810
800
790
780
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft amsl = feet above mean sea level

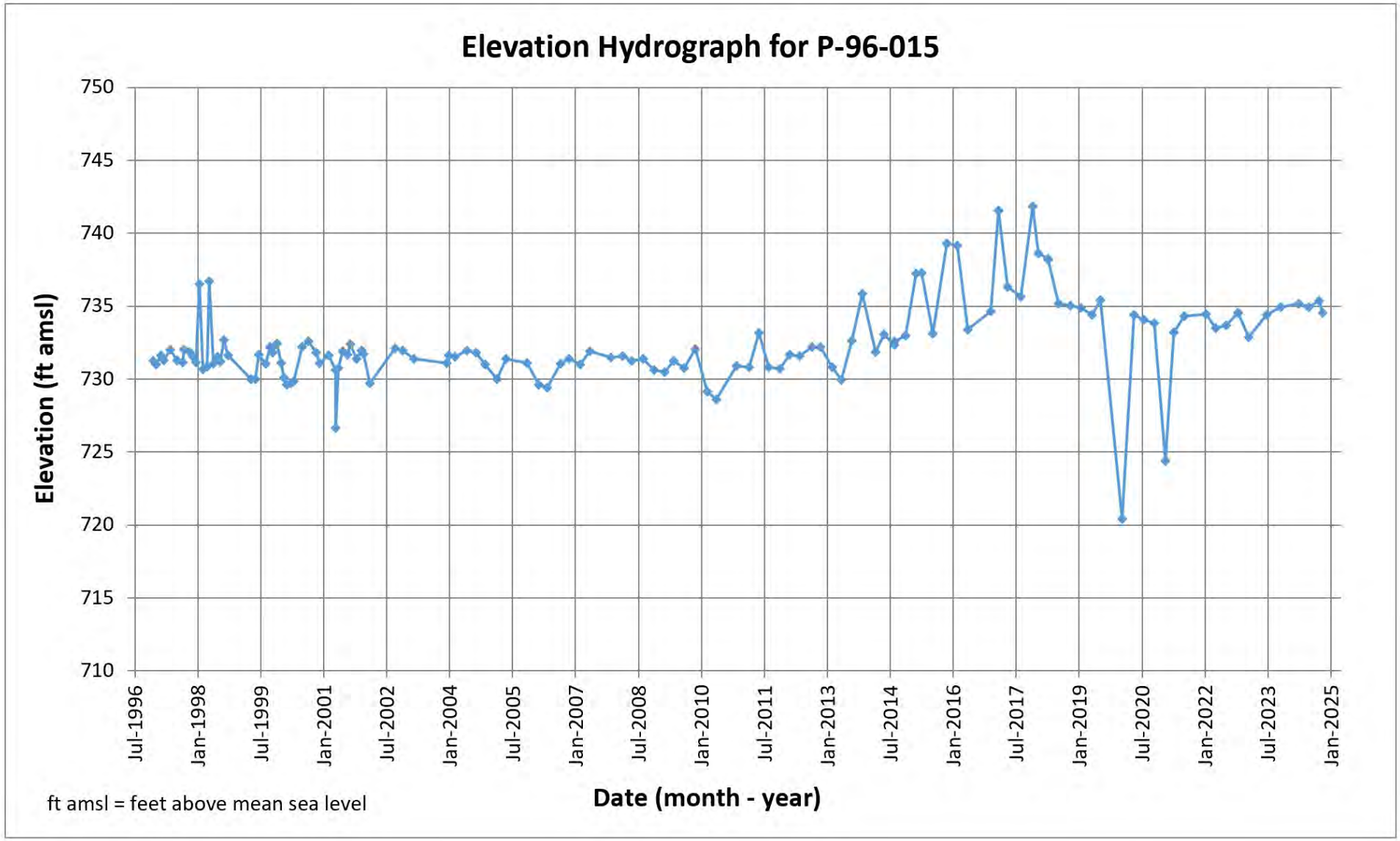

Depth Hydrograph for P-96-010
Depth (ft bgs)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft bgs = feet below ground surface

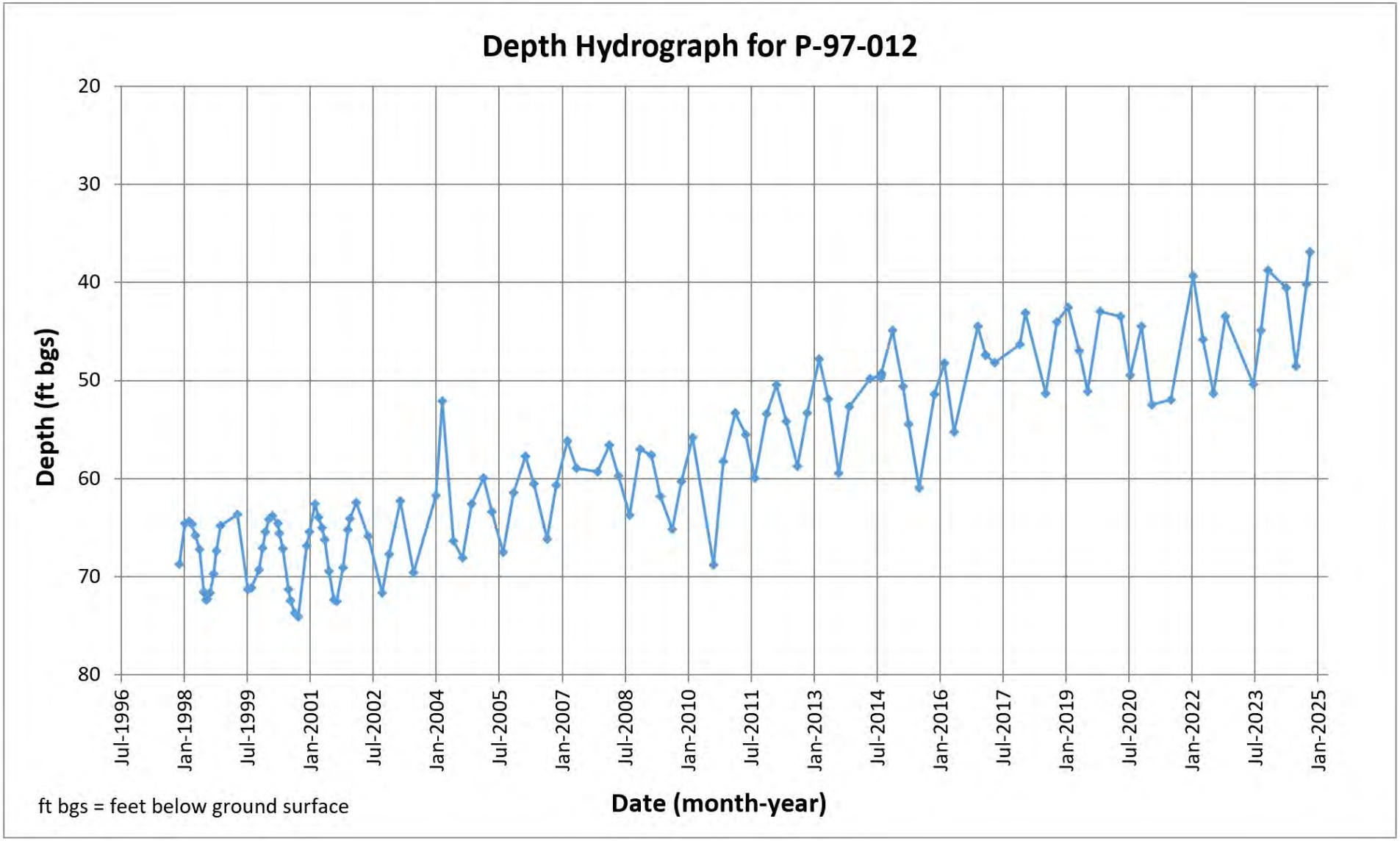

Elevation Hydrograph for P-96-010
Elevation (ft amsl)
810
805
800
795
790
785
780
775
770
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft amsl = feet above mean sea level

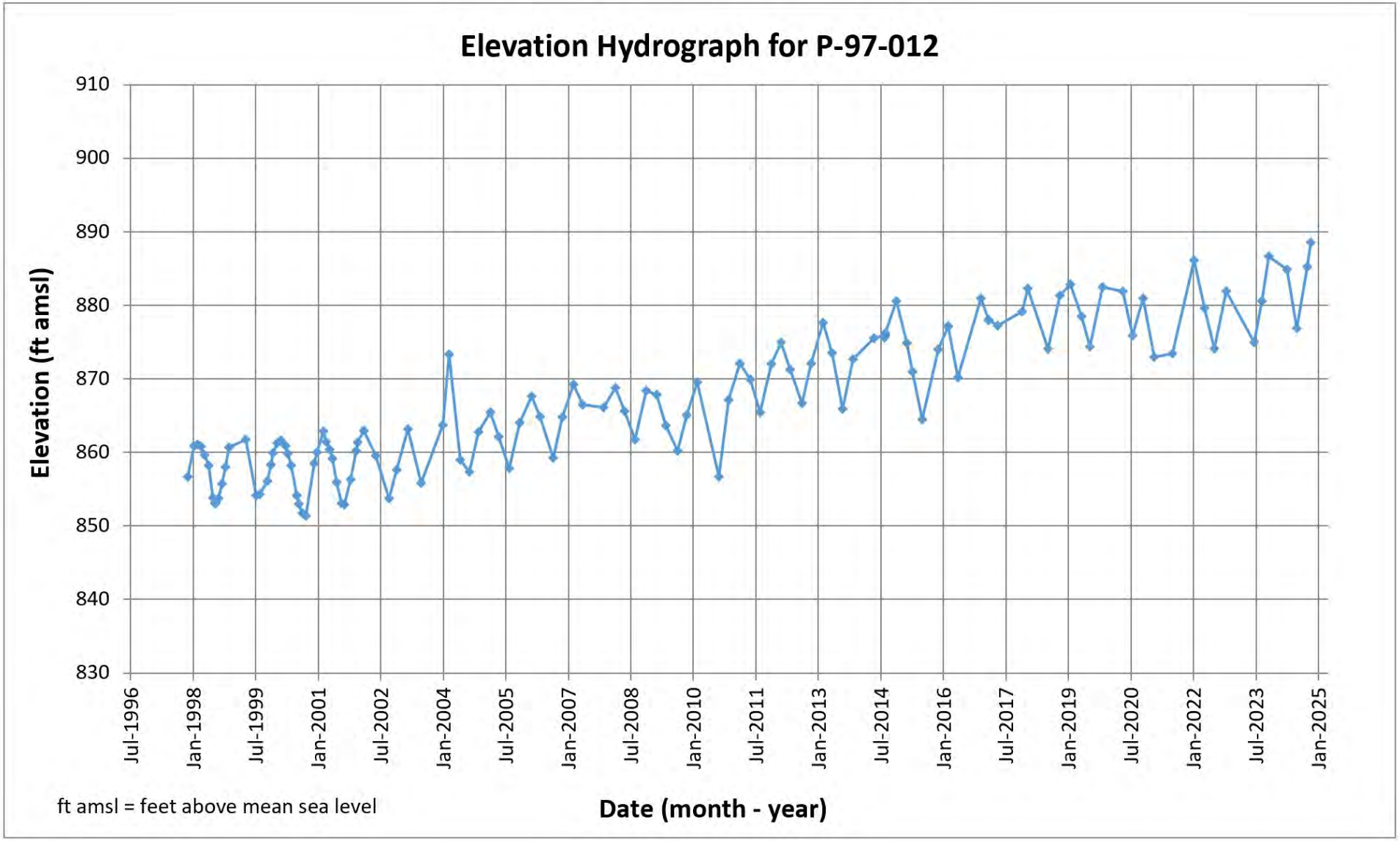

Depth Hydrograph for P-96-013
Depth (ft bgs)
0
20
40
60
80
100
120
140
160
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft bgs = feet below ground surface

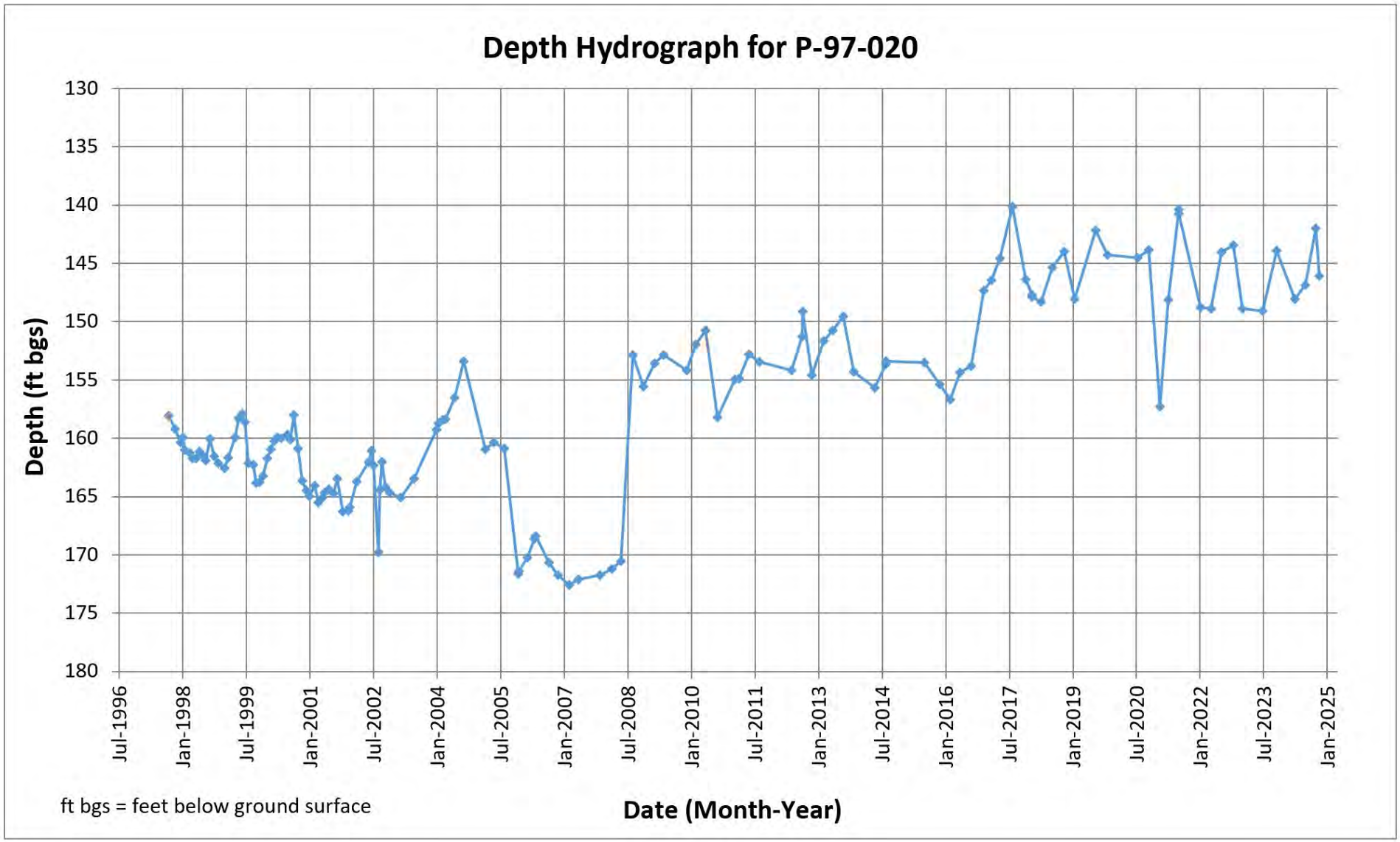

Elevation Hydrograph for P-96-013
Elevation (ft amsl)
950
940
930
920
910
900
890
880
870
860
850
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft amsl = feet above mean sea level

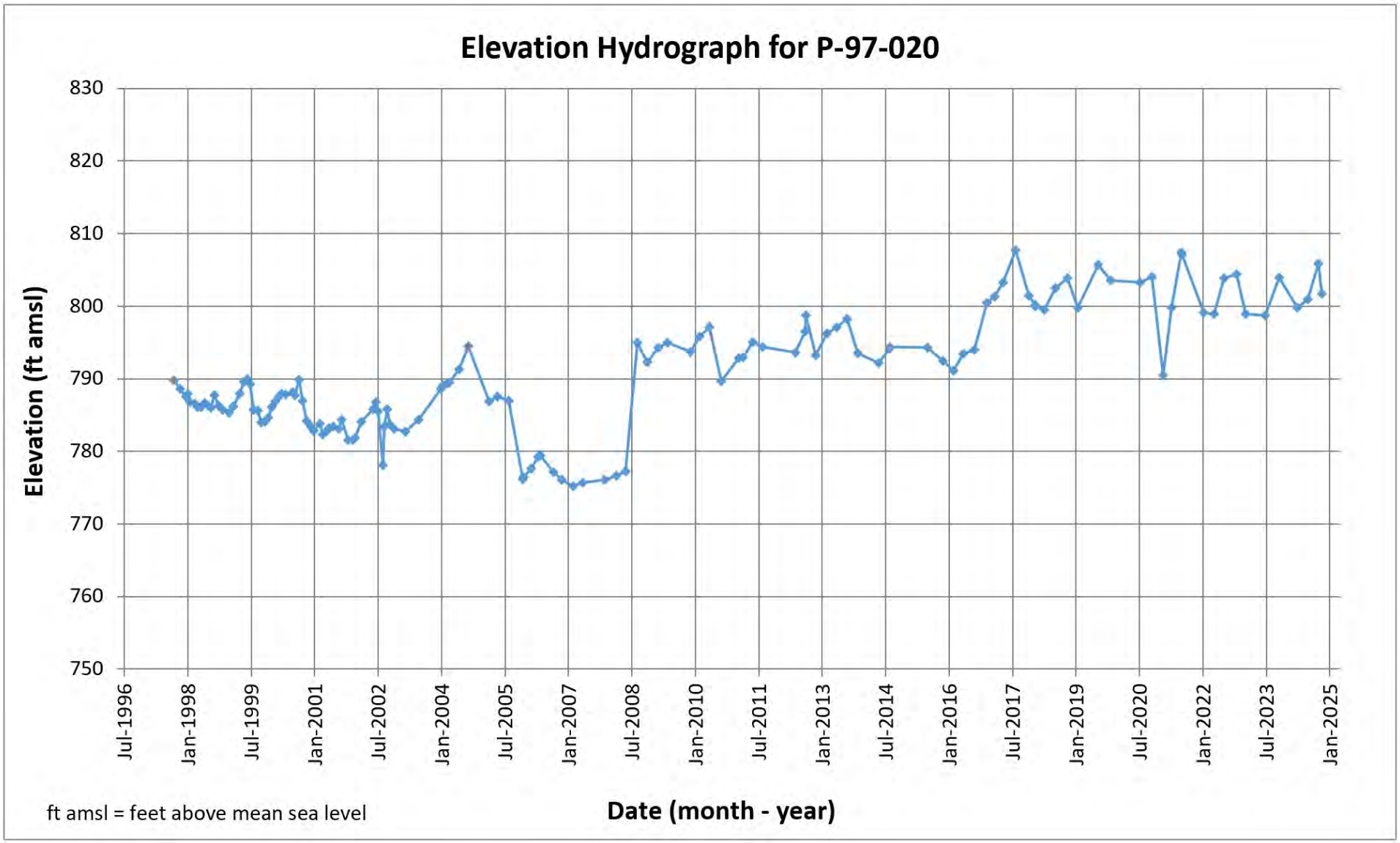

Depth Hydrograph for P-96-015
Depth (ft bgs)
10
15
20
25
30
35
40
45
50
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft bgs = feet below ground surface

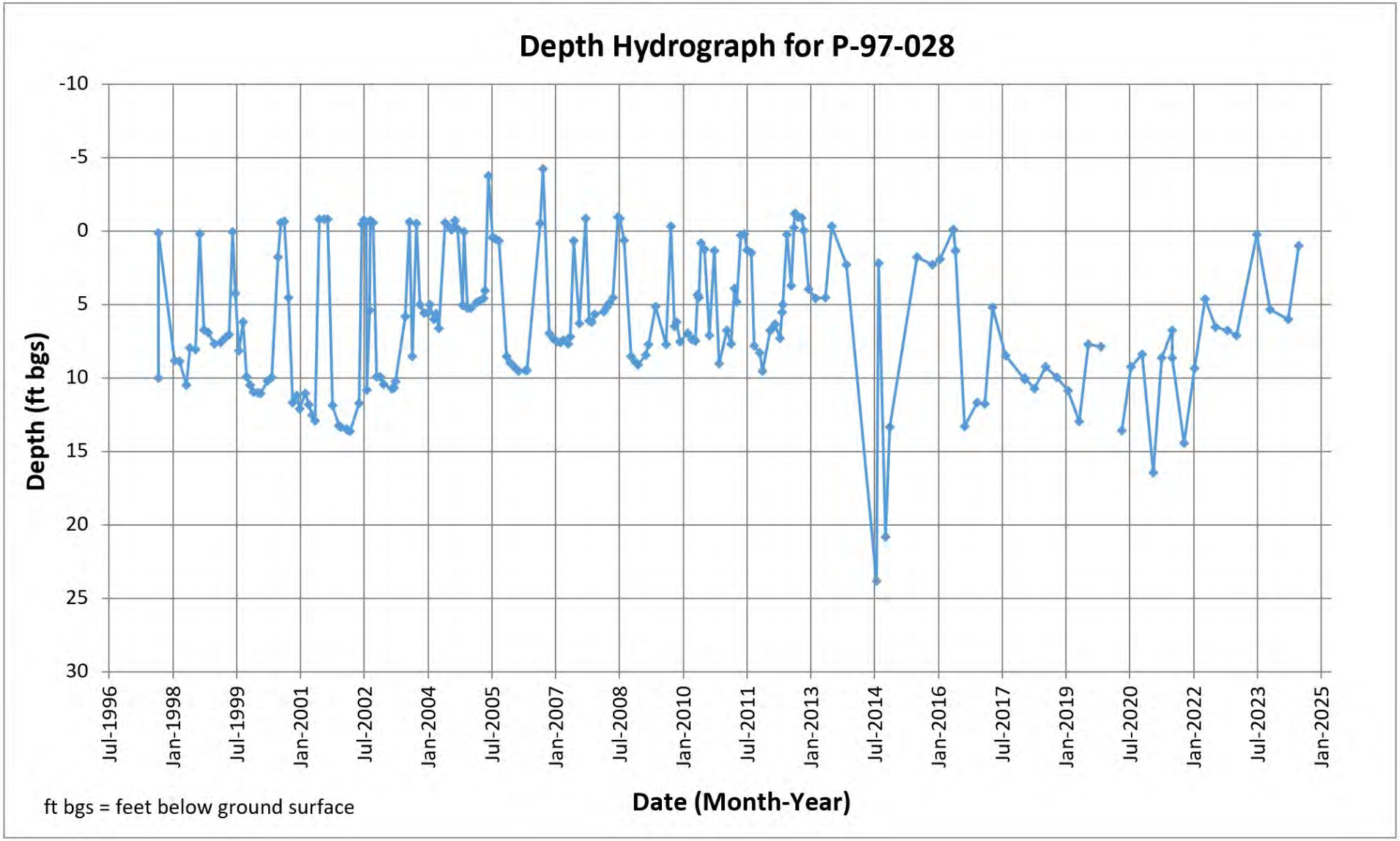

Elevation Hydrograph for P-96-015
750
745
740
735
730
725
720
715
710
Elevation (ft amsl)
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft amsl = feet above mean sea level

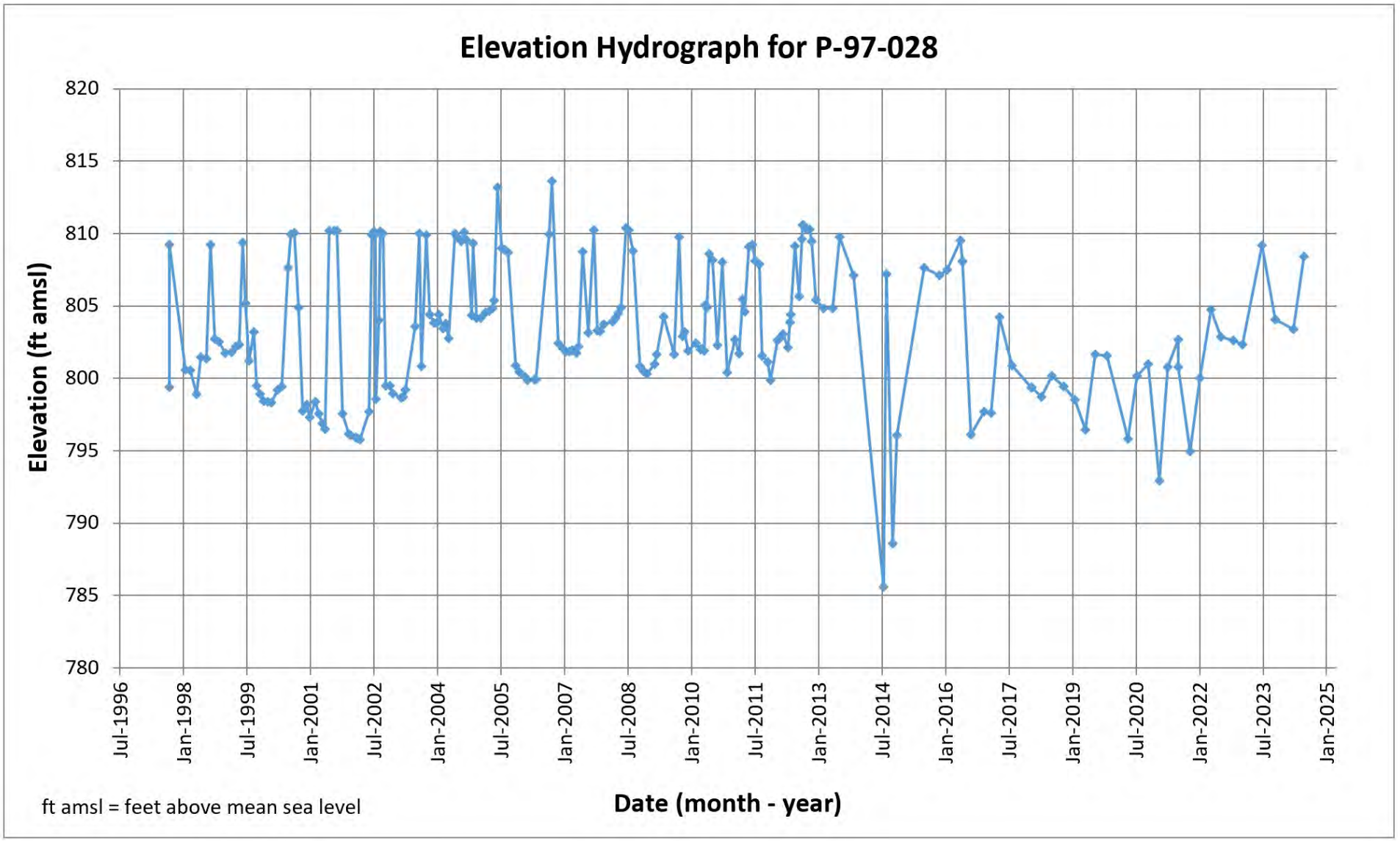

Depth Hydrograph for P-97-012
Depth (ft bgs)
20
30
40
50
60
70
80
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month-year)
ft bgs = feet below ground surface

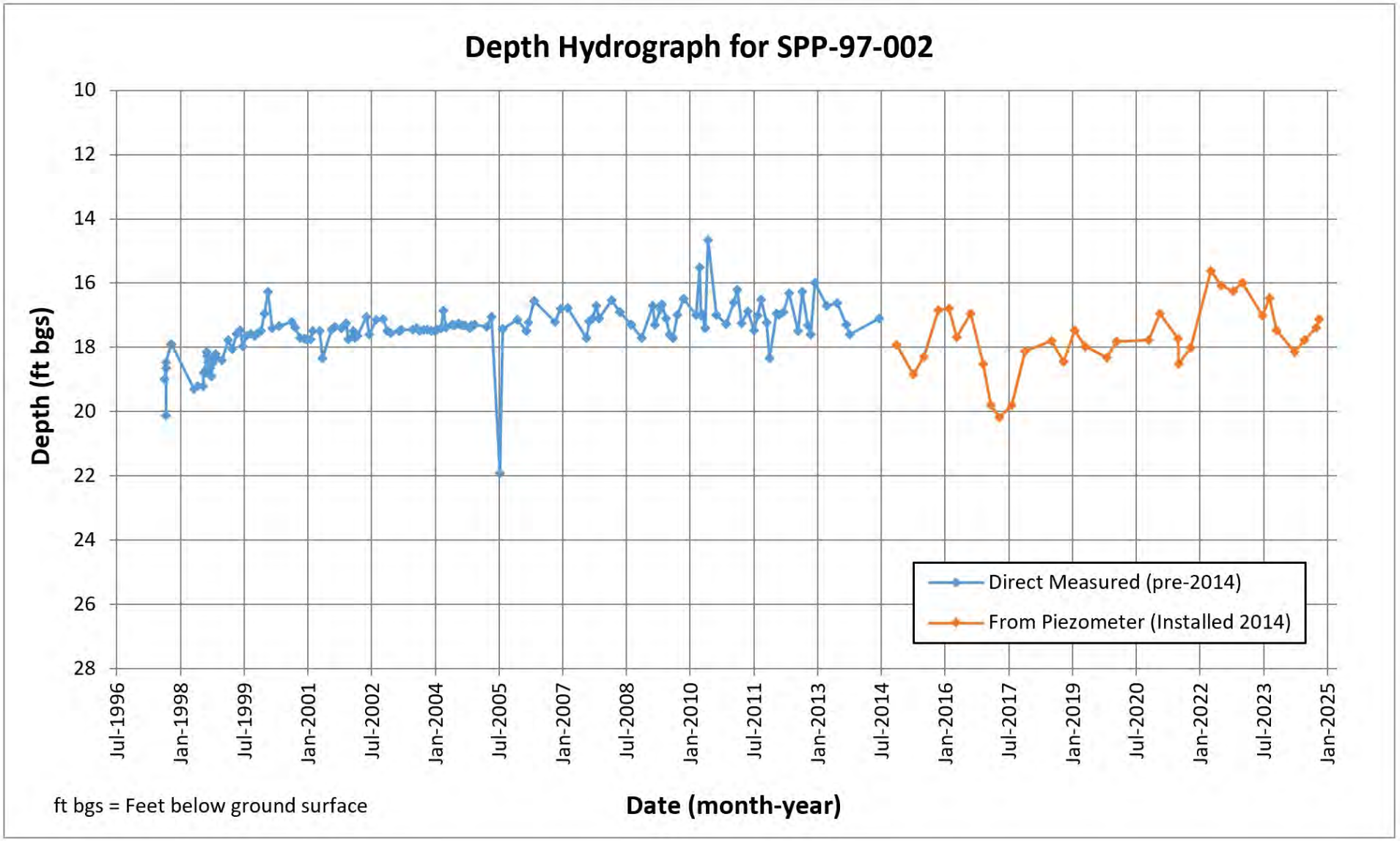

Elevation Hydrograph for P-97-012
910
900
890
880
870
860
850
840
830
Elevation (ft amsl)
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft amsl = feet above mean sea level

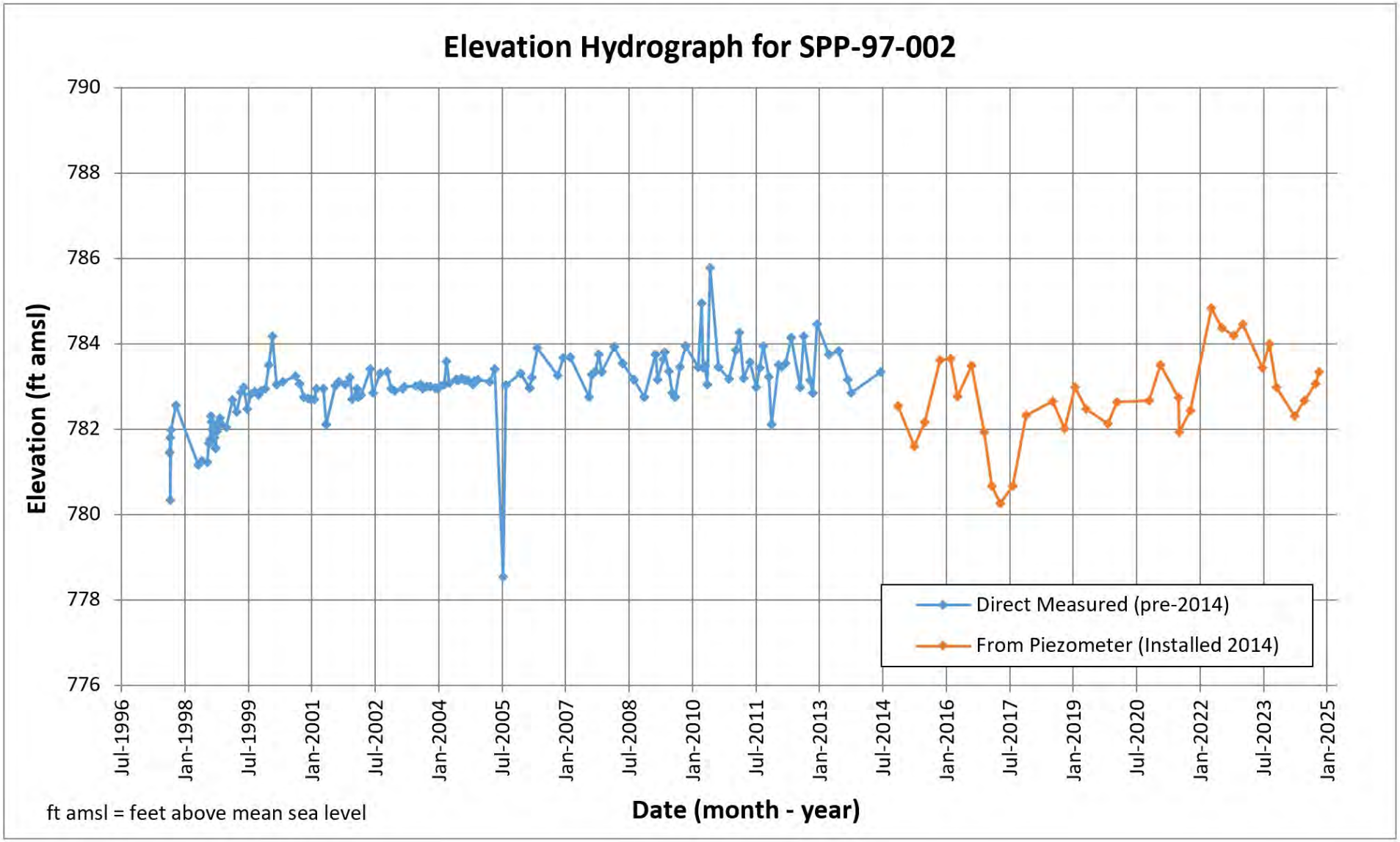

Depth Hydrograph for P-97-020
Depth (ft bgs)
130
135
140
145
150
155
160
165
170
175
180
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
ft bgs = feet below ground surface
Date (Month-Year)


Elevation Hydrograph for P-97-020
Elevation (ft amsl)
830
820
810
800
790
780
770
760
750
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft amsl = feet above mean sea level


Depth Hydrograph for P-97-028
-10
-5
0
5
10
15
20
25
30
Depth (ft bgs)
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (Month-Year)
ft bgs = feet below ground surface


Elevation Hydrograph for P-97-028
820
815
810
805
800
795
790
785
780
Elevation (ft amsl)
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
ft amsl = feet above mean sea level


Depth Hydrograph for SPP-97-002
Depth (ft bgs)
10
12
14
16
18
20
22
24
26
28
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Direct Measured (pre-2014)
From Piezometer (Installed 2014)
ft bgs = Feet below ground surface
Date (month-year)


Elevation Hydrograph for SPP-97-002
790
788
786
784
782
780
778
776
Elevation (ft amsl)
Jul-1996
Jan-1998
Jul-1999
Jan-2001
Jul-2002
Jan-2004
Jul-2005
Jan-2007
Jul-2008
Jan-2010
Jul-2011
Jan-2013
Jul-2014
Jan-2016
Jul-2017
Jan-2019
Jul-2020
Jan-2022
Jul-2023
Jan-2025
Date (month - year)
Direct Measured (pre-2014)
From Piezometer (Installed 2014)
ft amsl = feet above mean sea level

Appendix F
QA/QC Data and Field Forms

1st Quarter 2024

KUNA QUARTERLY REPORT DATA CHECKLIST **Quarter** Q1 2024 **Date** 3/29/2024

Checklist Items

☐ **YES / NO** Quarterly data received from Teck. Date received: 3/29/2024

☐ **YES / NO** Data received for 16 Thermistors: 4 missing (see below)

☐ **YES / NO** Data received for 9 Piezometers:

☐ **YES / NO** QA/QC Forms received for both Thermistors and Piezos

☐ **YES / NO** Is data complete for all Thermistors? If "No" make note of data gaps: see below

☐ **YES / NO** Is data complete for all Piezometers? If "No" make note of data gaps:

See notes in table on specific data values/readings.

☐ **YES / NO** Field Notes for the Quarter. Are data gaps/irregularities addressed?

Data irregularities are not identified/addressed

Thermistor Data

Thermistor	Data Received? Y / N	Comments
T-95-008 #2	Y	
T-96-013	Y	
T-95-04	**N**	
T-96-021	Y	
T-96-022	Y	
T-96-023	**N**	Buried by snow and ice *Picture taken
T-96-012	Y	
T-96-012s	Y	
T-14-110	Y	
T-95-005	**N**	Buried by snow and ice *Picture taken
T-05-061	Y	Buried by snow and ice *Picture taken
T-97-028	Y	Buried by snow and ice *Picture taken
T-97-029	Y	
T-97-030	Y	
T-96-010	**N**	Therm Connection severed
T-96-015	Y	

Piezometer Data

Piezometer	Data Received? Y / N	Comments
P-96-015	Y	
P-08A	Y	Temp is 25.9 C (78 F)
P-08B	Y	Temp is 25.9 C (78 F)
P-96-010	Y	
P-97-020	Y	
P-97-028	Y	
SPP-97-002	Y	
P-96-013	Y	
P-97-012	Y	
Barometer	Y	

Quarterly Thermistor/Piezometer Fieldsheet

Technician(s): KMP	Geokon ID #:	Thermrdr ID #: 2 19977	Date: 3/23/24	General Weather: 3°F, Wind N 16mph, light snow

Col. # Row	Well	Location	Collection Method Instrument	Nodes	Piezo PSI or Therm Error Code	Date	Comments
26	*T-95-008	Overburden	Yellow box Thermistor	24	3	3/24/24	23.7
25	*P-96-013	Overburden	Geokon Piezometer		PSI Reading: 240	3/24/24	0.4°C 6556.5
29	*T-96-013	Overburden	Yellow box Thermistor	24	3	3/24/24	32.2
30	T-96-013S	Overburden	Yellow box Thermistor	24	—	3/24/24	Connection severed. No pigtail *picture taken
31	*T-96-021	Overburden	Yellow box Thermistor	24	3	3/24/24	23.4
32	*T-96-022	Overburden	Yellow box Thermistor	24	3	3/24/24	22.9
33	*T-96-023	Overburden	Yellow box Thermistor	24	—	3/24/24	Buried by snow and ice. Unable to locate *Picture taken
24	*P-97-012	Blast Road	Geokon Piezometer		PSI Reading: —	3/24/24	0.2°C 6188.0 NO PSI gauge
27	*T-96-012	Blast Road	Yellow box Thermistor	24	3	3/24/24	29.0
28	*T-96-012S	Blast Road	Yellow box Thermistor	24	3	3/24/24	12.1
1	*T-14-110	W. Tails Pond	Beaded Stream Datalogger	24	Collect Data via Internet	3/23	Timestamp: 3/22/24 23:58
70	*T-95-005	By sandfilter	Yellow box Thermistor	24	—	3/25/24	Buried under ice/snow. Unable to locate *pic taken
127	*T-05-061	TDAM (end)	Yellow box Thermistor	6	—	3/25/24	Buried under ice & snow. Unable to locate *
75	*T-97-028	Buttress	Yellow box Thermistor	24	—	3/25/24	Buried under ice & snow. Unable to locate *
76	*T-97-029	Buttress	Yellow box Thermistor	24	3	3/25/24	37.1
77	*T-97-030	Buttress	Yellow box Thermistor	24	3	3/25/24	37.5
71	*T-96-010	Seepage Dam	Yellow box Thermistor	24	—	3/24/24	Therm connection severed.
	*P-96-010	Seepage Dam	Read PSI Only		PSI Reading:		Gone
23	*P-96-015	Lower RDC	Geokon Piezometer		PSI Reading: 0	3/25/24	0.6°C 7532.9 PSI reading zero
44	*T-96-015	Lower RDC	Yellow box Thermistor	14	3	3/25/24	31.3
	T21-13	Overburden	Yellow box Thermistor	44	0	3/26/24	Get reading from Tailing & Water Dam Safety Logger D6050419
	P21-13	Overburden	Geokon Piezometer		PSI Reading: —		Get reading from Tailing & Water Dam Safety
		Write-in QAQC Piezometer #	Geokon Piezometer		Duplicate reading within 5 minutes of first Piezo reading for QAQC		

Additional Comments:

Request Piezo data from T&W for Piezometer's P-97-028, P-96-010, SPP 97-002, P-08A, P-08B, P-97-020, Barometer (Baro needed for each day of data collectior

Quarterly Thermistor QAQC Schedule: **2021** Q1=T97-28, Q2=T96-21, Q3=T96-22, Q4=T96-23; **2022** Q1=T96-12, Q2=T95-15, Q3=T96-05, Q4=T96-10;

Quarterly Thermistor QAQC Schedule: **2023** Q1=T97-28, Q2=T97-29, Q3=97-30, Q4=T95-08; **2024** Q1=T96-13, Q2=T96-21, Q3=T96-22, Q4=T96-05

*SEP Thermistor. QAQC: Datalogger & Manual Switchbox w/Ohmmeter readings to be taken within 5 min. of each other

3/24/2023				Time
Piezo	B Reading	Temp (Celsius)	Water Elevation	
P-97-28	2743.78	—	—	13:31 pm
P-96-10	2914.75	0.84	785.85	3/26/24 12:26pm
SPP 97-2	2949.617	1.73°	783.85	3/26/24 10:50 am
P-08A	2979.11	25.05°	816.95	11:24/4 am
P-08B	2935.165	25.05°	819.198	11:40 am
P-97-20	2724.299	2.84°	798.3145	10:25 am
Baro	28.18 in Hg			11:00 am
P-96-013 / P2021-13-1 – Deep	2636.303	0.47°	939.58	11:25 am
P-96-013 / P2021-13-2 – Shallow	2642.298	0.58°	929.1518	11:25 am

Quarterly Thermistor QA / QC

Location: T 96-13 Date: 3/26/24

Technician: DLS Start Time: 11:26 Stop Time: 11:30

Node	Ohms	Comments	Node	Temperature
Test	16.33		Test	
1	16.25		1	
2	15.66		2	
3	13.76		3	
4	28.88	Jumpy	4	
5	16.73		5	
6	16.84		6	
7	17.45		7	
8	16.93		8	
9	17.02		9	
10	17.02		10	
11	17.13		11	
12	~~19.32~~ 17.	17	12	
13	19.32		13	
14	19.89		14	
15	18.05		15	
16	16.92		16	
17	16.99		17	
18	16.88		18	
19	16.78		19	
20	16.84		20	
21	16.77		21	
22	16.67		22	
23	16.58		23	
24	100.8	Jumpy	24	
Test	16.33		Test	

Read these locations on noted quarter.

Month	Location
Q1-2021	T 97-28
Q2-2021	T 96-21
Q3-2021	T96-22
Q4-2021	T 96-23
Q1-2022	T 96-12
Q2-2022	T 95-15
Q3-2022	T 96-05
Q4-2022	T 96-10
Q1-2023	T 97-28
Q2-2023	T 97-29
Q3-2023	T 97-30
Q4-2023	T 95-8
Q1-2024	T 96-13
Q2-2024	T 96-21
Q3-2024	T 96-22
Q4-2024	T 95-04

Make a comment if reading jumps around and takes a long time to stabilize.

QA / QC readings to be done on 5% of SEP required thermistors - see above schedule.

Record test readings before and after other readings.

CR850 & multimeter readings are to be taken within 5 minutes of each other.

Teck

2nd Quarter 2024

KUNA QUARTERLY REPORT DATA CHECKLIST **Quarter** Q2 2024 **Date** 8/2/2024

Checklist Items

☐ **YES / NO** Quarterly data received from Teck. Date received: 6/28/2024

☐ **YES / NO** Data received for 16 Thermistors: 2 missing (see below)

☐ **YES / NO** Data received for 9 Piezometers:

☐ **YES / NO** QA/QC Forms received for both Thermistors and Piezos

☐ **YES / NO** Is data complete for all Thermistors? If "No" make note of data gaps: see below

☐ **YES / NO** Is data complete for all Piezometers? If "No" make note of data gaps:

See notes in table on specific data values/readings.

☐ **YES / NO** Field Notes for the Quarter. Are data gaps/irregularities addressed?

Data irregularities are not identified/addressed

Thermistor Data

Thermistor	Data Received? Y / N	Comments
T-95-008 #2	Y	
T-96-013	Y	
T-95-04	**N**	Buried in slurry cable
T-96-021	Y	
T-96-022	Y	
T-96-023	Y	
T-96-012	Y	
T-96-012s	Y	
T-14-110	Y	
T-95-005	Y	
T-05-061	Y	
T-97-028	Y	
T-97-029	Y	
T-97-030	Y	
T-96-010	**N**	Therm Connection severed
T-96-015	Y	

Piezometer Data

Piezometer	Data Received? Y / N	Comments
P-96-015	Y	
P-08A	Y	Temp is 25.9 C (78 F)
P-08B	Y	Temp is 25.9 C (78 F)
P-96-010	Y	
P-97-020	Y	
P-97-028	Y	
SPP-97-002	Y	
P-96-013	Y	
P-97-012	Y	
Barometer	N	

Quarterly Thermistor/Piezometer Fieldsheet

Technician(s):	Geokon ID #:	Thermrdr ID #:	Date:	General Weather:
DJS / MVL	392	19977	6/23/24	Partly Cloudy, 52°F Light winds

Col. # Row	Well	Location	Collection Method Instrument	Nodes	Piezo PSI or Therm Error Code	Date	Comments
1 26	*T-95-008	Overburden	Yellow box Thermistor	24		6/23/24	good
25	*P-96-013	Overburden	Geokon Piezometer		PSI Reading:	6/23/24	6563.0 @ 0.3°
4 29	*T-96-013	Overburden	Yellow box Thermistor	24		6/23/24	manual reading
30	T-96-013S	Overburden	Yellow box Thermistor	24		6/23/24	cable broken at drill steel end - top of pipe
5 31	*T-96-021	Overburden	Yellow box Thermistor	24		6/23/24	good
6 32	*T-96-022	Overburden	Yellow box Thermistor	24		6/23/24	manual reading
7 33	*T-96-023	Overburden	Yellow box Thermistor	24		6/23/24	good
24	*P-97-012	Blast Road	Geokon Piezometer		PSI Reading: no gauge	6/23/24	6231.0 @ 0.1°C
2 27	*T-96-012	Blast Road	Yellow box Thermistor	24		6/23/24	manual reading
3 28	*T-96-012S	Blast Road	Yellow box Thermistor	24		6/23/24	good
1	*T-14-110	W. Tails Pond	Beaded Stream Datalogger	24	Collect Data via Internet		✓
70	*T-95-005	By sandfilter	Yellow box Thermistor	24		6/23/24	good
	T-95-004	TDAM (Beach)	Yellow box Thermistor	24		6/23/24	buried in slurry, cable
127	*T-05-061	TDAM (end)	Yellow box Thermistor	6		6/23/24	good
75	*T-97-028	Buttress	Yellow box Thermistor	24		6/23/24	manual reading
76	*T-97-029	Buttress	Yellow box Thermistor	24		6/23/24	manual reading
14 77	*T-97-030	Buttress	Yellow box Thermistor	24		6/23/24	good
71	*T-96-010	Seepage Dam	Yellow box Thermistor	24		6/23/24	damaged
	*P-96-010	Seepage Dam	Read PSI Only		PSI Reading:	~~6/23/24~~ DO3	~~damaged~~ Request from T+W
23	*P-96-015	Lower RDC	Geokon Piezometer		PSI Reading:	6/23/24	45 7534.3 @ 0.5°C
44	*T-96-015	Lower RDC	Yellow box Thermistor	14		6/23/24	Manual Reading
	T21-13	Overburden	Yellow box Thermistor	44			Get reading from Tailing & Water Dam Safety
	P21-13	Overburden	Geokon Piezometer		PSI Reading:		Get reading from Tailing & Water Dam Safety
	P97-12	Write-in QAQC Piezometer #	Geokon Piezometer		Duplicate reading within 5 minutes of first Piezo reading for QAQC		6731.7 @ 0.2°C

Additional Comments: Fluke Multimeter 77

Request Piezo data from T&W for Piezometer's P-97-028, P-96-010, SPP 97-002, P-08A, P-08B, P-97-020, Barometer (Baro needed for each day of data collection

Quarterly Thermistor QAQC Schedule: **2021** Q1=T97-28, Q2=T96-21, Q3=T96-22, Q4=T96-23; **2022** Q1=T96-12, Q2=T95-15, Q3=T96-05, Q4=T96-10;

Quarterly Thermistor QAQC Schedule: **2023** Q1=T97-28, Q2=T97-29, Q3=97-30, Q4=T95-08; **2024** Q1=T96-13, Q2=T96-21, Q3=T96-22, Q4=T96-05

3rd Quarter 2024

KUNA QUARTERLY REPORT DATA CHECKLIST **Quarter** Q3 2024 **Date** 10/10/2024

Checklist Items

☒ **YES** ☐ **NO** Quarterly data received from Teck. Date received: 10/1/2024

☒ **YES** ☐ **NO** Data received for 16 Thermistors: 1 missing (see below)

☒ **YES** ☐ **NO** Data received for 9 Piezometers:

☒ **YES** ☐ **NO** QA/QC Forms received for both Thermistors and Piezos

☐ **YES** ☒ **NO** Is data complete for all Thermistors? If "No," see data gaps below

☒ **YES** ☐ **NO** Is data complete for all Piezometers? If "No," see notes in table below

☒ **YES** ☐ **NO** Field Notes for the Quarter. Are data gaps/irregularities addressed?

Data irregularities are not identified/addressed

Thermistor Data

Thermistor	Data Received? Y / N	Comments
T-95-008 #2	Y	
T-96-013	Y	
T-95-04	Y	
T-96-021	Y	
T-96-022	Y	
T-96-023	Y	
T-96-012	Y	
T-96-012s	Y	
T-14-110	Y	
T-95-005	Y	
T-05-061	Y	
T-97-028	Y	Transducer temp not recorded
T-97-029	Y	
T-97-030	Y	
T-96-010	**N**	Therm Connection severed
T-96-015	Y	

Piezometer Data

Piezometer	Data Received? Y / N	Comments
P-96-015	Y	
P-08A	Y	Temp is 17.02 C (78 F)
P-08B	Y	Temp is 17.02 C (78 F)
P-96-010	Y	
P-97-020	Y	
P-97-028	Y	
SPP-97-002	Y	
P-96-013	Y	
P-97-012	Y	
Barometer	N	

Quarterly Thermistor/Piezometer Fieldsheet

Technician(s):	Geokon ID #:	Thermrdr ID #:	Date:	General Weather:
SJT - ATB - JWM	1973		9-26-24	32°F Snowing Light Winds

Col. # Row	Well	Location	Collection Method Instrument	Nodes	Piezo PSI or Therm Error Code	Date	Comments
26	*T-95-008	Overburden	Yellow box Thermistor	24		9-26-24	ERR3, ~~Will do manual reading~~, 11:30
25	*P-96-013	Overburden	Geokon Piezometer		PSI Reading: N/A	9-26-24	Good
29	*T-96-013	Overburden	Yellow box Thermistor	24		9-26-24	11:34, ERR 3, will do manual reading
30	T-96-013S	Overburden	Yellow box Thermistor	24		9-26-24	Broken cable
31	*T-96-021	Overburden	Yellow box Thermistor	24		9-26-24	ERR 3, manual Reading
32	*T-96-022	Overburden	Yellow box Thermistor	24		9.26.24	ERR 3, good
33	*T-96-023	Overburden	Yellow box Thermistor	24		9-26-24	ERR 3, good
24	*P-97-012	Blast Road	Geokon Piezometer		PSI Reading:	9-26-24	11:19
27	*T-96-012	Blast Road	Yellow box Thermistor	24		9-26-24	ERR 3, will do manual reading
28	*T-96-012S	Blast Road	Yellow box Thermistor	24		9-26-24	ERR 3, will do manual reading
1	*T-14-110	W. Tails Pond	Beaded Stream Datalogger	24	Collect Data via Internet	9.26.24	
70	*T-95-005	By sandfilter	Yellow box Thermistor	24		9.26.24	good
	T-95-004	TDAM (Beach)	Yellow box Thermistor	24		9-26-24	~~Buried~~ ERR3, Manual Reading
127	*T-05-061	TDAM (end)	Yellow box Thermistor	6		9.26.24	~~Good~~ ERR3 Unsuccesful repair
75	*T-97-028	Buttress	Yellow box Thermistor	24		9-26-24	ERR 3, 1454, Manual Reading
76	*T-97-029	Buttress	Yellow box Thermistor	24		9-26-24	ERR 3, 1447, Will do manual reading
77	*T-97-030	Buttress	Yellow box Thermistor	24		9-26-24	ERR 3, 1446
71	*T-96-010	Seepage Dam	Yellow box Thermistor	24		9.26.24	Damaged
	*P-96-010	Seepage Dam	Read PSI Only		PSI Reading:	9.26.24	Damaged
23	*P-96-015	Lower RDC	Geokon Piezometer		PSI Reading: 0	9-26-24	14:14
44	*T-96-015	Lower RDC	Yellow box Thermistor	14		9-26-24	ERR 3, 1408
	T21-13	Overburden	Yellow box Thermistor	44			Get reading from Tailing & Water Dam Safety
	P21-13	Overburden	Geokon Piezometer		PSI Reading:		Get reading from Tailing & Water Dam Safety
		Write-in QAQC Piezometer #	Geokon Piezometer		Duplicate reading within 5 minutes of first Piezo reading for QAQC		

Additional Comments:

Request Piezo data from T&W for Piezometer's P-97-028, P-96-010, SPP 97-002, P-08A, P-08B, P-97-020, Barometer (Baro needed for each day of data collectior

Quarterly Thermistor QAQC Schedule: **2021** Q1=T97-28, Q2=T96-21, Q3=T96-22, Q4=T96-23; **2022** Q1=T96-12, Q2=T95-15, Q3=T96-05, Q4=T96-10;

Quarterly Thermistor QAQC Schedule: **2023** Q1=T97-28, Q2=T97-29, Q3=97-30, Q4=T95-08; **2024** Q1=T96-13, Q2=T96-21, Q3=T96-22, Q4=T96-05

Quarterly Thermistor QA / QC

Technician(s): DJS/mVL Date: 6/23/24

Location: T96 12 Start Time: 10:36 Stop Time: 10:39

Node Test	Ohms	Comments
1	16.33	
2	16.45	
3	16.62	
4	16.85	
5	16.93	
6	17.02	
7	17.04	
8	17.10	
9	17.16	
10	17.17	
11	17.12	
12	17.21	
13	0.2	bad
14		open
15	17.05	
16	16.78	
17	16.76	
18	16.66	
19	16.50	
20	16.33	
21	16.25	
22	1.3M	bad
23	15.97	
24	16.04	
Test	15.93	
	16.33	

Node Test	Temperature
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
Test	

Make a comment if reading jumps around and takes a long time to stabilize.
QA / QC readings to be done on 5% of SEP required thermistors - see above schedule.
Record test readings before and after other readings.
CR850 & multimeter readings are to be taken within 5 minutes of each other.

Quarterly Thermistor QA / QC

Technician(s): MVL/DJS Date: 6/23/24

Location: T-96-22 Start Time: 1109 Stop Time: 1111

Node Test	Ohms	Comments
1	16.33	
2	6.48	
3	9.4	
4		open
5	15.58	
6	15.22	
7	15.11	
8	15.19	
9		open
10	15.76	
11	16.08	
12	16.27	
13	16.59	
14	16.75	
15	16.81	
16		open
17	16.91	
18	17.07	
19	16.97	
20	17.04	
21	17.07	
22	17.09	
23	15.14	
24	10.41	
Test	15.58	
	16.63	

Node Test	Temperature
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
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16	
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22	
23	
24	
Test	

Make a comment if reading jumps around and takes a long time to stabilize.
QA / QC readings to be done on 5% of SEP required thermistors - see above schedule.
Record test readings before and after other readings.
CR850 & multimeter readings are to be taken within 5 minutes of each other.

Quarterly Thermistor QA / QC

Technician(s): MVL / DJS

Date: 6/23/24

Location: T-96-13

Start Time: 1137

Stop Time: 1140

Node Test	Ohms	Comments	Node Test	Temperature
1	16.33		1	
2	12.22		2	
3	17.84		3	
4	17.32	20 secs to stabilize	4	
5		open	5	
6	16.73		6	
7	16.83		7	
8	17.48		8	
9	16.92		9	
10	17.02		10	
11	17.06		11	
12	~~mvl 17.10~~ 17.13		12	
13	17.16		13	
14	19.37		14	
15	20.34		15	
16	18.39		16	
17	17.17		17	
18	17.20		18	
19	17.02		19	
20	19.84		20	
21	16.86		21	
22	16.77		22	
23	16.67		23	
24	16.59		24	
Test	~~28 mvl~~	will not stabilize ~30K	Test	
	16.33			

Make a comment if reading jumps around and takes a long time to stabilize.
QA / QC readings to be done on 5% of SEP required thermistors - see above schedule.
Record test readings before and after other readings.
CR850 & multimeter readings are to be taken within 5 minutes of each other.

Quarterly Thermistor QA / QC

Technician(s): MV4/DSS Date: 6/23/24

Location: T-96-29 Start Time: 16:18 Stop Time: 16:23

Node Test	Ohms	Comments
1	16.33	
2	13.94	
3	13.91	
4	tmx	open
5	9.3m	unstable
6	14.27	
7	5.2m	unstable
8	0.3m	unstable
9	14.58	
10	14.57	
11	14.63	
12	14.84	
13	19.5m	unstable
14	15.02	
15	15.35	
16	15.51	
17	15.56	
18	15.37	
19	15.54	
20	15.61	
21	15.58	
22	15.34	
23	15.36	
24	15.25	
Test	15.37	
	16.33	

Node Test	Temperature
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
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18	
19	
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21	
22	
23	
24	
Test	

Make a comment if reading jumps around and takes a long time to stabilize.
QA / QC readings to be done on 5% of SEP required thermistors - see above schedule.
Record test readings before and after other readings.
CR850 & multimeter readings are to be taken within 5 minutes of each other.

Quarterly Thermistor QA / QC

Technician(s): MVL/DJS Date: 6/23/24

Location: T-96-28 Start Time: 16:23 Stop Time: 16:31

Node Test	Ohms	Comments
1	16.33	
2	13.97	
3	14.06	
4	14.10	
5	14.16	
6	14.62	
7	14.27	
8	14.32	
9	14.48	
10	14.56	
11	14.67	
12	14.96	
13	14.93	
14	1.8m	unstable
15	18.1m	unstable
16	15.17	
17	0.83m	unstable
18	1.5m	unstable
19	15.34	
20	15.31	
21	31.0	31.0 ohms - not K
22	15.33	
23	2.1m	unstable
24	42.5K	
Test	64.0K	
	16.33	

Node Test	Temperature
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
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18	
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21	
22	
23	
24	
Test	

Make a comment if reading jumps around and takes a long time to stabilize.
QA / QC readings to be done on 5% of SEP required thermistors - see above schedule.
Record test readings before and after other readings.
CR850 & multimeter readings are to be taken within 5 minutes of each other.

Quarterly Thermistor QA / QC

Technician(s): MVL/DJS Date: 6/23/24

Location: T-96-15 Start Time: 14:54 Stop Time: 17:56

Node Test	Ohms	Comments
1	16.33	
2	17.01	
3	16.87	
4	16.86	
5	16.87	
6	16.78	
7	16.70	
8	16.71	
9	16.59	
10	16.54	
11	16.52	
12	16.42	
13		open
14	16.29	
15	16.24	
16		
17		
18		
19		
20		
21		
22		
23		
24		
Test	16.33	

Node Test	Temperature
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
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12	
13	
14	
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16	
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21	
22	
23	
24	
Test	

Make a comment if reading jumps around and takes a long time to stabilize.
QA / QC readings to be done on 5% of SEP required thermistors - see above schedule.
Record test readings before and after other readings.
CR850 & multimeter readings are to be taken within 5 minutes of each other.

4th Quarter 2024

KUNA QUARTERLY REPORT DATA CHECKLIST **Quarter** Q4 2024 **Date** 11/8/2024

Checklist Items

☒ **YES** ☐ **NO** Quarterly data received from Teck. Date received: 11/8/2024

☐ **YES** ☒ **NO** Data received for 13 Thermistors: 3 missing (see below)

☒ **YES** ☐ **NO** Data received for 9 Piezometers:

☒ **YES** ☐ **NO** QA/QC Forms received for both Thermistors and Piezos

☐ **YES** ☒ **NO** Is data complete for all Thermistors? If "No," see data gaps below

☐ **YES** ☒ **NO** Is data complete for all Piezometers? If "No," see notes in table below

☒ **YES** ☐ **NO** Field Notes for the Quarter. Are data gaps/irregularities addressed?

Data irregularities are not identified/addressed

Thermistor Data

Thermistor	Data Received? Y / N	Comments
T-95-008 #2	Y	
T-96-013	**N**	Severed pigtail – needs repair
T-95-04	**N**	Cable was buried in slurry - Spliced/repaired on 9/15
T-96-021	Y	
T-96-022	Y	
T-96-023	Y	
T-96-012	Y	
T-96-012s	Y	
T-14-110	***Y***	Found blown down - missing Oct 27-29 data
T-95-005	Y	
T-05-061	Y	
T-97-028	***Y***	Transducer temp not recorded
T-97-029	Y	
T-97-030	Y	
T-96-010	**N**	Severed pigtail – needs repair
T-96-015	Y	

Piezometer Data

Piezometer	Data Received? Y / N	Comments
P-96-015	Y	
P-08A	Y	Temp is 15.9° C (60.6° F)
P-08B	Y	Temp is 15.9° C (60.6° F)
P-96-010	Y	
P-97-020	Y	
P-97-028	***Y***	Temp stopped recording on 9/27
SPP-97-002	Y	
P-96-013	Y	
P-97-012	Y	
Barometer	Y	Bons Baro Met station reading reported

Quarterly Thermistor/Piezometer Fieldsheet

Technician(s):	Geokon ID #:	Thermrdr ID #:	Date:	General Weather:
JWM TLA	1973 392	19977	15 of	Low-Winds, Clear Skys

Col. # Row	Well	Location	Collection Method Instrument	Nodes	Piezo PSI or Therm Error Code	Date	Comments
26	*T-95-008	Overburden	Yellow box Thermistor	24	3	10/27	
25	*P-96-013	Overburden	Geokon Piezometer		PSI Reading:	10/27	
29	*T-96-013	Overburden	Yellow box Thermistor	24			Cable is broken
30	T-96-013S	Overburden	Yellow box Thermistor	24	3	10/27/24	add "S" in file
31	*T-96-021	Overburden	Yellow box Thermistor	24	3	10/27	
32	*T-96-022	Overburden	Yellow box Thermistor	24	3	10/27	
33	*T-96-023	Overburden	Yellow box Thermistor	24	3	10/27	
24	*P-97-012	Blast Road	Geokon Piezometer		PSI Reading:	10/27	
27	*T-96-012	Blast Road	Yellow box Thermistor	24	3	10/27	
28	*T-96-012S	Blast Road	Yellow box Thermistor	24	3	10/27	
1	*T-14-110	W. Tails Pond	Beaded Stream Datalogger	24	Collect Data via Internet		
70	*T-95-005	By sandfilter	Yellow box Thermistor	24	3	10/27	QAQC
127	*T-05-061	TDAM (end)	Yellow box Thermistor	6	3	10/27	
75	*T-97-028	Buttress	Yellow box Thermistor	24	3	10/27	Manual Reading
76	*T-97-029	Buttress	Yellow box Thermistor	24	3	10/27	Manual Reading
77	*T-97-030	Buttress	Yellow box Thermistor	24	3	10/27	
71	*T-96-010	Seepage Dam	Yellow box Thermistor	24			Severed wire. Needs Repair
	*P-96-010	Seepage Dam	Read PSI Only		PSI Reading: —	10/27	
23	*P-96-015	Lower RDC	Geokon Piezometer		PSI Reading: —	10/27	
44	*T-96-015	Lower RDC	Yellow box Thermistor	14	3	10/27	
	T21-13	Overburden	Yellow box Thermistor	44			Get reading from Tailing & Water Dam Safety Not collected
	P21-13	Overburden	Geokon Piezometer		PSI Reading:	10/27	Get reading from Tailing & Water Dam Safety
		Write-in QAQC Piezometer #	Geokon Piezometer		Duplicate reading within 5 minutes of first Piezo reading for QAQC		

Additional Comments:

equest Piezo data from T&W for Piezometer's P-97-028, P-96-010, SPP 97-002, P-08A, P-08B, P-97-020, Barometer (Baro needed for each day of data collectior

arterly Thermistor QAQC Schedule: **2021** Q1=T97-28, Q2=T96-21, Q3=T96-22, Q4=T96-23; **2022** Q1=T96-12, Q2=T95-15, Q3=T96-05, Q4=T96-10;

Quarterly Thermistor QAQC Schedule: **2023** Q1=T97-28, Q2=T97-29, Q3=97-30, Q4=T95-08; **2024** Q1=T96-13, Q2=T96-21, Q3=T96-22, Q4=T96-05

Datalogger & Manual Switchbox w/Ohmmeter readings to be taken within 5 min. of each other

Quarterly Thermistor QA / QC

Technician(s):

Date: 10/27/24

Location: T97-28 Start Time: 16:27 Stop Time: 16:33

Node Test	Ohms	Comments
1	16.34	
2	13.56	
3	14.04	
4	14.05	
5	14.10	
6	14.52	
7	14.1	
8	14.12	
9	13.6	
10	13.61	
11	13.74	
12	14.10	
13	14.05	
14		Unstable
15	5.84	
16	15.14	
17	1.44	Jumpy
18	1.9	Jumpy
19	19.31	
20	15.29	
21	288	
22	15.33	
23	2.9	Jumpy
24	1.92	" Jumpy "
Test	1.2	" Jumpy "
	16.34	

Node Test	Temperature
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
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19	
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21	
22	
23	
24	
Test	

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Month
Q1-2021
Q2-2021
Q3-2021
Q4-2021
Q1-2022
Q2-2022
Q3-2022
Q4-2022
Q1-2023
Q2-2023
Q3-2023
Q4-2023
Q1-2024
Q2-2024
Q3-2024
Q4-2024

Make a comment if reading jumps around and takes a long time to stabilize.
QA / QC readings to be done on 5% of SEP required thermistors - see above schedule.
Record test readings before and after other readings.
CR850 & multimeter readings are to be taken within 5 minutes of each other.

Quarterly Thermistor QA / QC

Technician(s):

Date: 10/27/24

Location: T97-29 Start Time: 1638 Stop Time: 1643

Node Test	Ohms	Comments
1	16.34	
2	14.07	
3	13.94	
4	OL	
5	20.8	
6	OL	
7	4.4	
8	0.78	Jumpy
9	14.56	
10	14.55	
11	14.6	
12	40.2	
13	~~OL~~ 12.9	
14	14.7	
15	15.25	
16	16.03	
17	14.19	Jumpy
18	14.35	Jumpy
19	1.34	Jumpy
20	15.1	
21	460.4	Jumpy
22	15.2	
23	15.27	
24	15.2	
Test	15.25	
Test	16.34	

Node Test	Temperature
1	
2	
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4	
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7	
8	
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10	
11	
12	
13	
14	
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16	
17	
18	
19	
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21	
22	
23	
24	
Test	

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Month
Q1-2021
Q2-2021
Q3-2021
Q4-2021
Q1-2022
Q2-2022
Q3-2022
Q4-2022
Q1-2023
Q2-2023
Q3-2023
Q4-2023
Q1-2024
Q2-2024
Q3-2024
Q4-2024

Make a comment if reading jumps around and takes a long time to stabilize.
QA / QC readings to be done on 5% of SEP required thermistors - see above schedule.
Record test readings before and after other readings.
CR850 & multimeter readings are to be taken within 5 minutes of each other.

Quarterly Thermistor QA / QC

Technician(s): TH RJWM / TLA Date: 10/27/24

Location: T95-C5 Start Time: 15:41 Stop Time: 15:44

Node Test	Ohms	Comments	Node Test	Temperature
1	16.34		1	
2	14.07		2	
3	14.73		3	
4	15.3		4	
5	16.23		5	
6	16.46		6	
7	16.62		7	
8	16.69		8	
9	16.75		9	
10	16.17		10	
11	16.8		11	
12	16.82		12	
13	16.78		13	
14	16.77		14	
15	16.76		15	
16	16.71		16	
17	16.65		17	
18	16.63		18	
19	OL		19	
20	16.37		20	
21	16.2		21	
22	16.08		22	
23	15.9		23	
24	15.75		24	
Test	15.58		Test	
	16.34			

Read these l
noted q

Month
Q1-2021
Q2-2021
Q3-2021
Q4-2021
Q1-2022
Q2-2022
Q3-2022
Q4-2022
Q1-2023
Q2-2023
Q3-2023
Q4-2023
Q1-2024
Q2-2024
Q3-2024
Q4-2024

Make a comment if reading jumps around and takes a long time to stabilize.
QA / QC readings to be done on 5% of SEP required thermistors - see above schedule.
Record test readings before and after other readings.
CR850 & multimeter readings are to be taken within 5 minutes of each other.

July 2024 Thermistor Maintenance

Quarterly Thermistor/Piezometer Fieldsheet

Technician(s):	Geokon ID #:	Thermrdr ID #:	Date:	General Weather:

Col. # Row	Well	Location	Collection Method Instrument	Nodes	Piezo PSI or Therm Error Code	Date	Comments
26	*T-95-008	Overburden	Yellow box Thermistor	24		8/2/24	6th two pics. 1549. One bent prong - can possibly rebend back. need silicone.
25	*P-96-013	Overburden	Geokon Piezometer		PSI Reading:	8/2/24	5th ~~two~~ three pics. 1541. Cleaned & Siliconed. Good.
29	*T-96-013	Overburden	Yellow box Thermistor	24			
30	T-96-013S	Overburden	Yellow box Thermistor	24			
31	*T-96-021	Overburden	Yellow box Thermistor	24		8/2/24	2nd two pictures. 1440. Cleaned & Siliconed. Good.
32	*T-96-022	Overburden	Yellow box Thermistor	24		8/2/24	3rd two pictures. Cleaned & Siliconed. Good. 1451.
33	*T-96-023	Overburden	Yellow box Thermistor	24	8/2/24 ~~8/2/24~~ SEW		4th three pictures. Cleaned & Siliconed. Good. 1500
24	*P-97-012	Blast Road	Geokon Piezometer		PSI Reading:		
27	*T-96-012	Blast Road	Yellow box Thermistor	24		8/2/24	couple wires broke. First 3 pictures..
28	*T-96-012S	Blast Road	Yellow box Thermistor	24			and needs resplice. 1425
1	*T-14-110	W. Tails Pond	Beaded Stream Datalogger	24	Collect Data via Internet		
70	*T-95-005	By sandfilter	Yellow box Thermistor	24		8/2/24	Missing 2 pins. 7th two pics. 1405. Replace.
	*T-95-004	TDAM	Yellow box Thermistor	24			
127	*T-05-061	TDAM (end)	Yellow box Thermistor	6			
75	*T-97-028	Buttress	Yellow box Thermistor	24	01	8/2/24	Cleaned + siliconed. SEW ~~1618~~. 1624. Good
76	*T-97-029	Buttress	Yellow box Thermistor	24	02	8/2/24	has a broken pin, needs silicone. 1620. Last pic. 1%
77	*T-97-030	Buttress	Yellow box Thermistor	24	03	8/2/24	Cleaned + siliconed. 1618. Good.
71	*T-96-010	Seepage Dam	Yellow box Thermistor	24			
	*P-96-010	Seepage Dam	Read PSI Only		PSI Reading:		
23	*P-96-015	Lower RDC	Geokon Piezometer		PSI Reading:		
44	*T-96-015	Lower RDC	Yellow box Thermistor	14			
	T21-13	Overburden	Yellow box Thermistor	44			Get reading from Tailing & Water Dam Safety
	P21-13	Overburden	Geokon Piezometer		PSI Reading:		Get reading from Tailing & Water Dam Safety
		Write-in QAQC Piezometer #	Geokon Piezometer		Duplicate reading within 5 minutes of first Piezo reading for QAQC		

Additional Comments:

Request Piezo data from T&W for Piezometer's P-97-028, P-96-010, SPP 97-002, P-08A, P-08B, P-97-020, Barometer (Baro needed for each day of data collectior

Quarterly Thermistor QAQC Schedule: **2021** Q1=T97-28, Q2=T96-21, Q3=T96-22, Q4=T96-23; **2022** Q1=T96-12, Q2=T95-15, Q3=T96-05, Q4=T96-10;

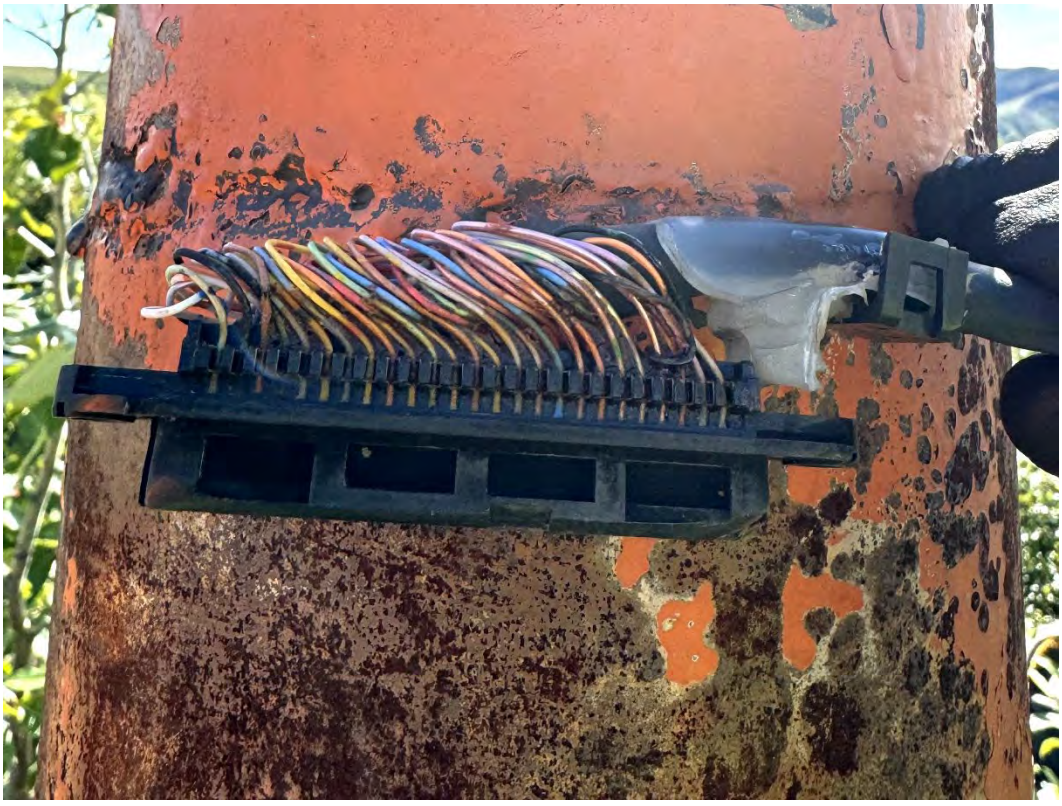
Quarterly Thermistor QAQC Schedule: **2023** Q1=T97-28, Q2=T97-29, Q3=97-30, Q4=T95-08; **2024** Q1=T96-13, Q2=T96-21, Q3=T96-22, Q4=T96-05

*SEP Thermistor. QAQC: Datalogger & Manual Switchbox w/Ohmmeter readings to be taken within 5 min. of each other

Remember to print QAQC form for Thermistor



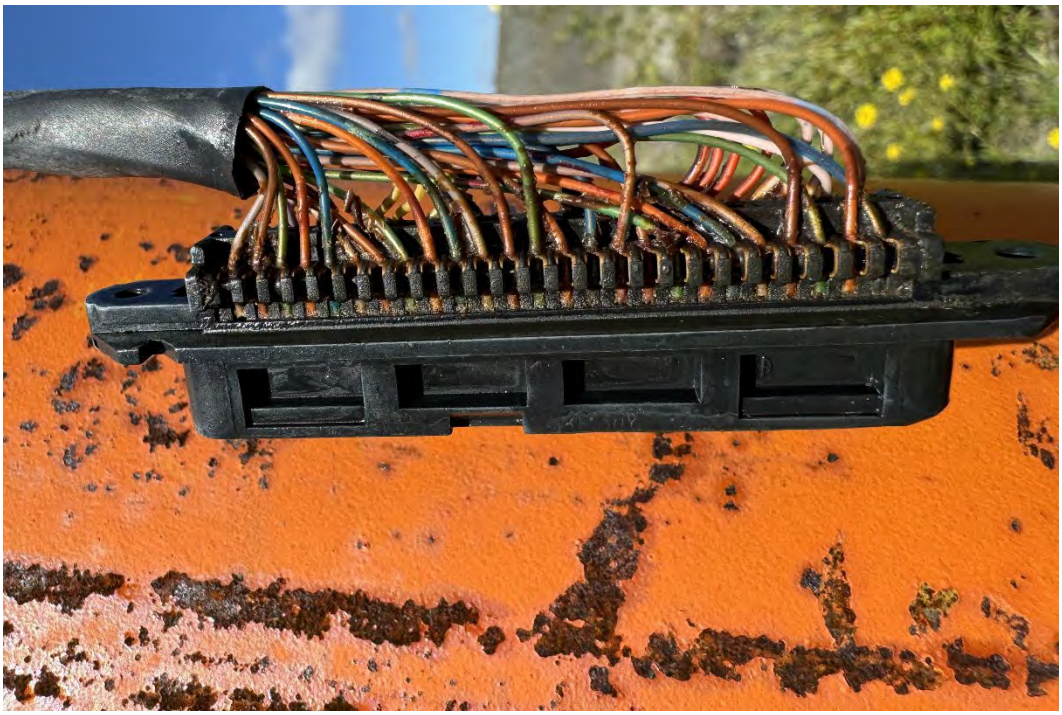
Thermistor T-96-23 before cleaning (top) and after cleaning (bottom).





Thermistor T-96-21 after cleaning (top) and with wires pulled, showing intact pins (bottom).





Thermistor T-96-12 before cleaning (top). Thermistor T-96-13 after cleaning (bottom).
**Note: photo of T-96-012 after cleaning not taken.*





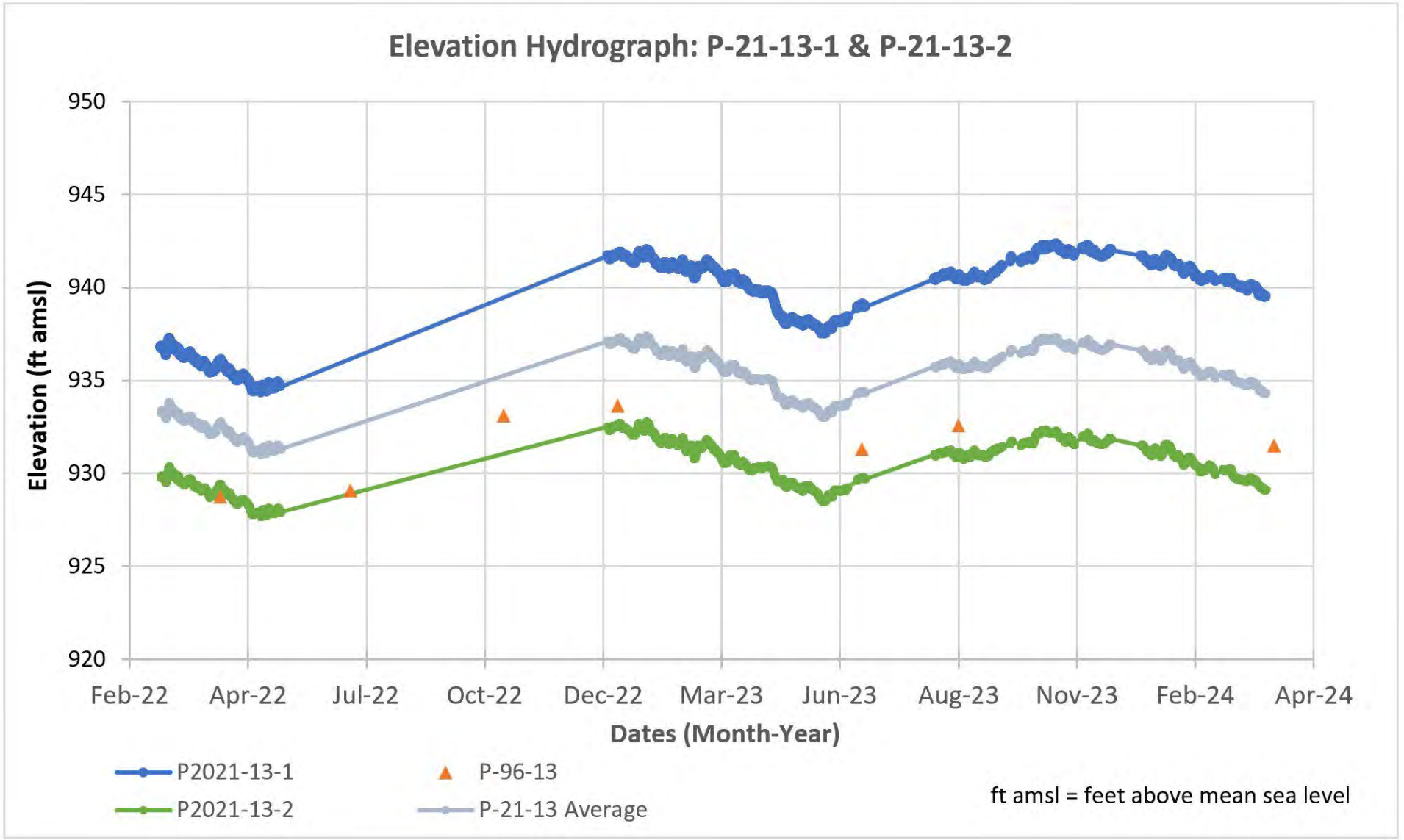
Thermistor T-95-008#2 after cleaning, with wires plugged in (top) and with wires pulled out (bottom). Note one bent pin second from right.

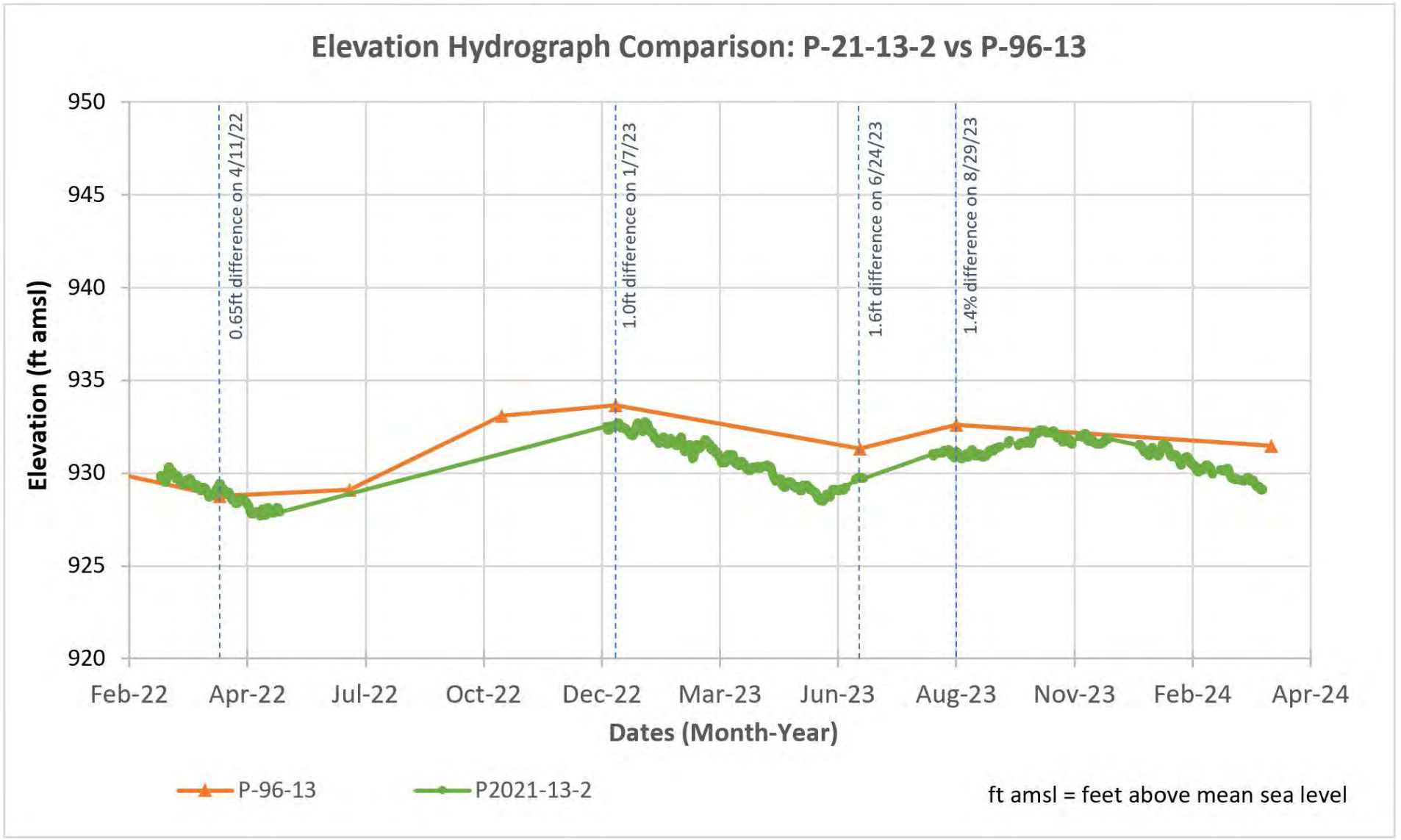


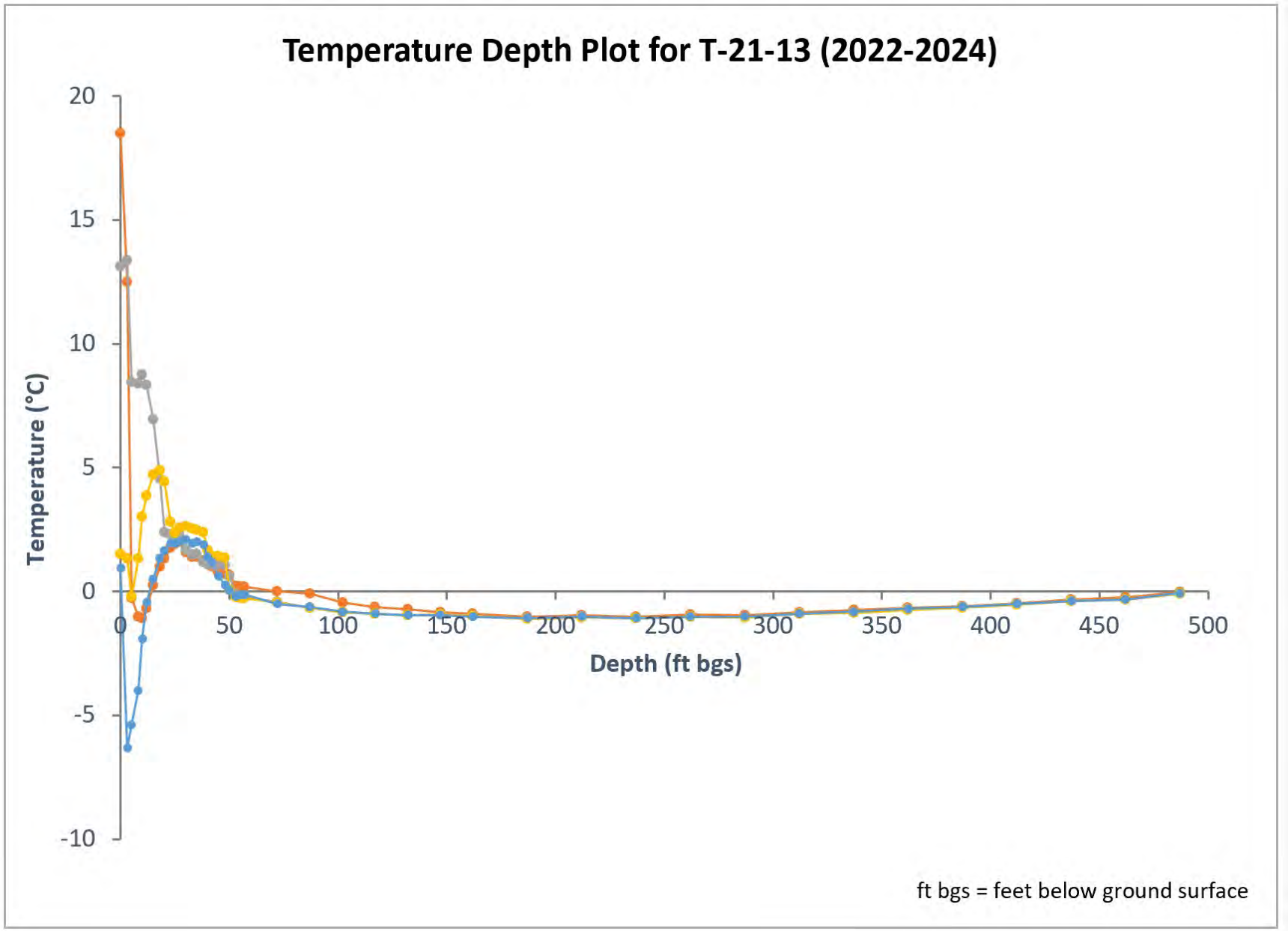


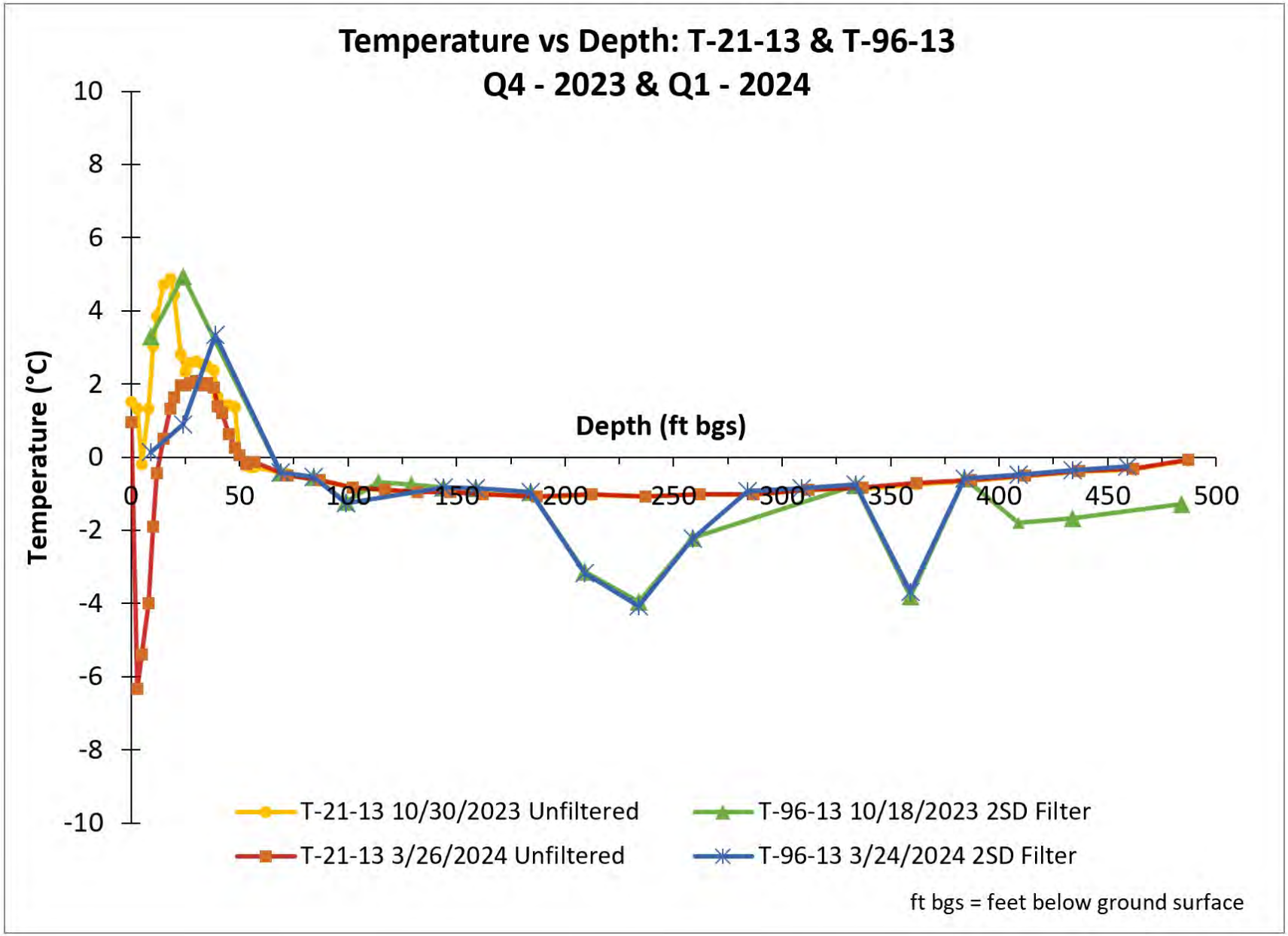
Thermistor T-95-005 with wires pulled and showing 2 missing pins (top). Thermistor T-97-29 with wires pulled and showing one bent pin (bottom).

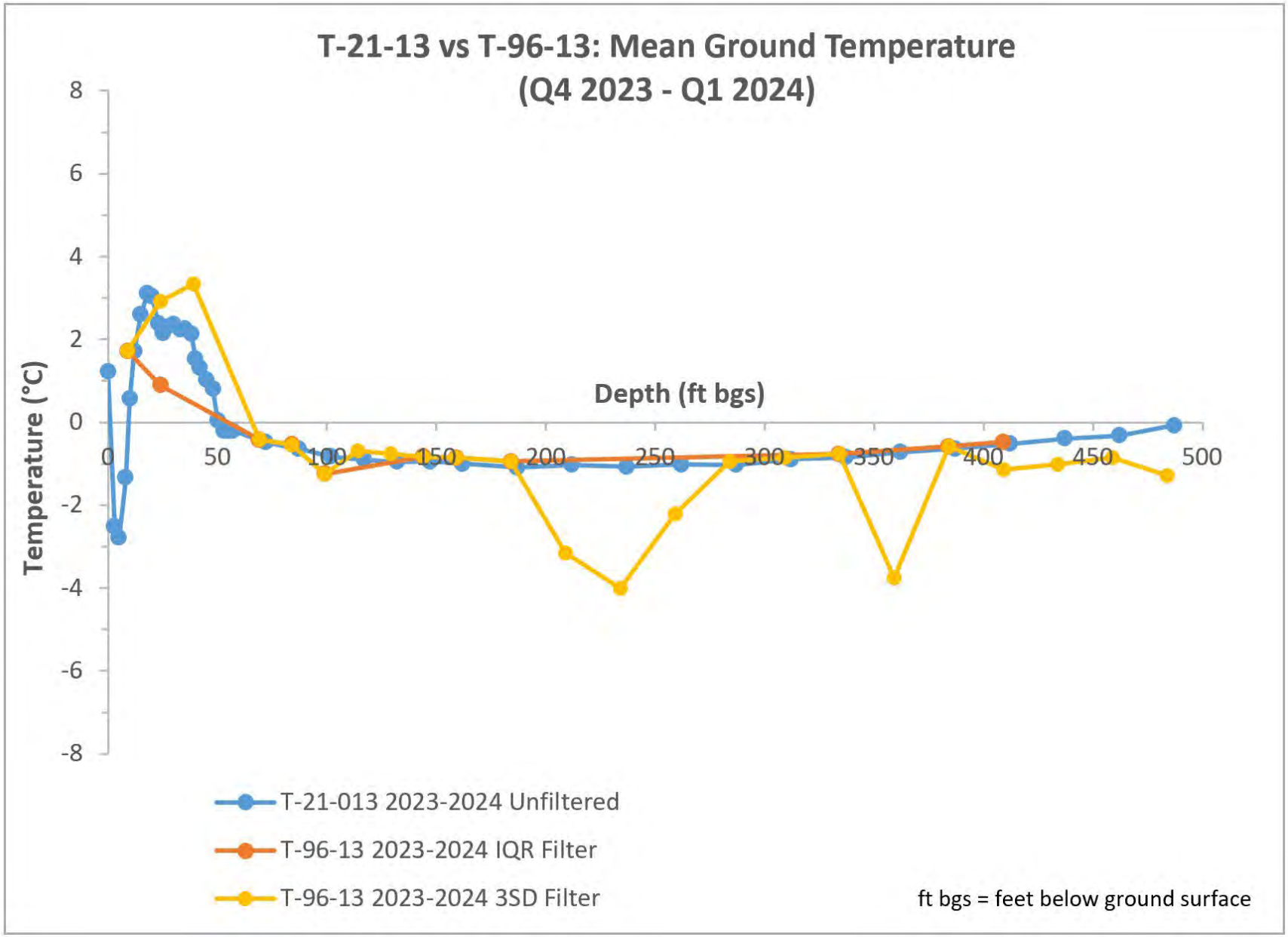
Appendix G
P/T-96-13 and P/T-21-13 Comparison Graphs


Elevation Hydrograph: P-21-13-1 & P-21-13-2
950
945
940
935
930
925
920
Elevation (ft amsl)
Feb-22
Apr-22
Jul-22
Oct-22
Dec-22
Mar-23
Jun-23
Aug-23
Nov-23
Feb-24
Apr-24
Dates (Month-Year)
P2021-13-1
P-96-13
P2021-13-2
P-21-13 Average
ft amsl = feet above mean sea level


Elevation Hydrograph Comparison: P-21-13-2 vs P-96-13
Elevation (ft amsl)
950
945
940
935
930
925
920
0.65ft difference on 4/11/22
1.0ft difference on 1/7/23
1.6ft difference on 6/24/23
1.4% difference on 8/29/23
Feb-22
Apr-22
Jul-22
Oct-22
Dec-22
Mar-23
Jun-23
Aug-23
Nov-23
Feb-24
Apr-24
Dates (Month-Year)
P-96-13
P2021-13-2
ft amsl = feet above mean sea level


Temperature Depth Plot for T-21-13 (2022-2024)
Temperature (°C)
20
15
10
5
0
-5
-10
0
50
100
150
200
250
300
350
400
450
500
Depth (ft bgs)
ft bgs = feet below ground surface


Temperature vs Depth: T-21-13 & T-96-13
Q4 - 2023 & Q1 - 2024
Temperature (°C)
Depth (ft bgs)
10
8
6
4
2
0
-2
-4
-6
-8
-10
0
50
100
150
200
250
300
350
400
450
500
T-21-13 10/30/2023 Unfiltered
T-96-13 10/18/2023 2SD Filter
T-21-13 3/26/2024 Unfiltered
T-96-13 3/24/2024 2SD Filter
ft bgs = feet below ground surface

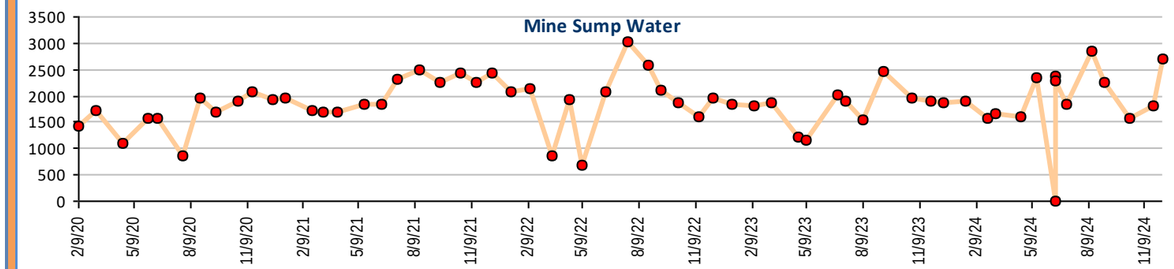

T-21-13 vs T-96-13: Mean Ground Temperature
(Q4 2023 - Q1 2024)
Temperature (°C)
8
6
4
2
0
-2
-4
-6
-8
Depth (ft bgs)
0
50
100
150
200
250
300
350
400
450
500
T-21-013 2023-2024 Unfiltered
T-96-13 2023-2024 IQR Filter
T-96-13 2023-2024 3SD Filter
ft bgs = feet below ground surface

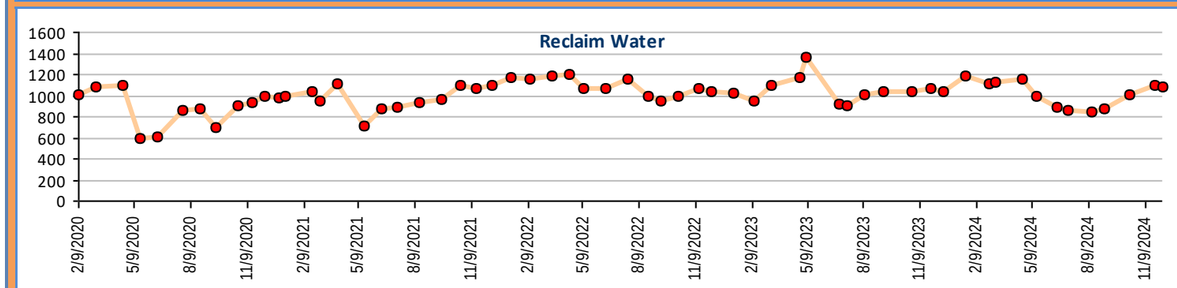
Appendix C: Water Quality Profile II Charts – Mine Water Monitoring Stations

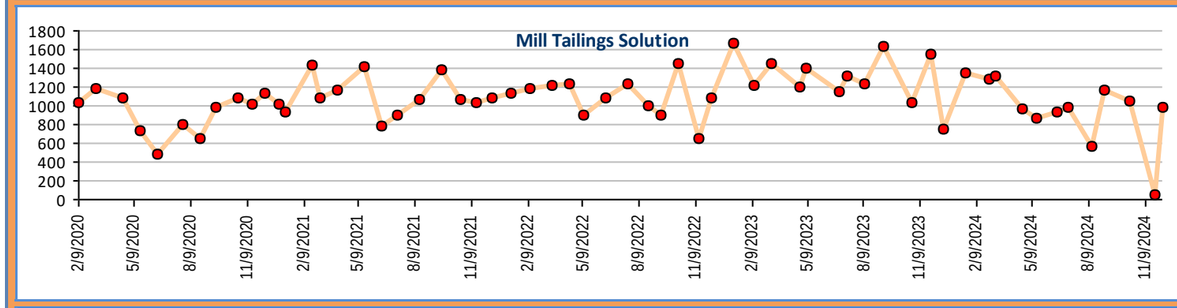
RED DOG MINE

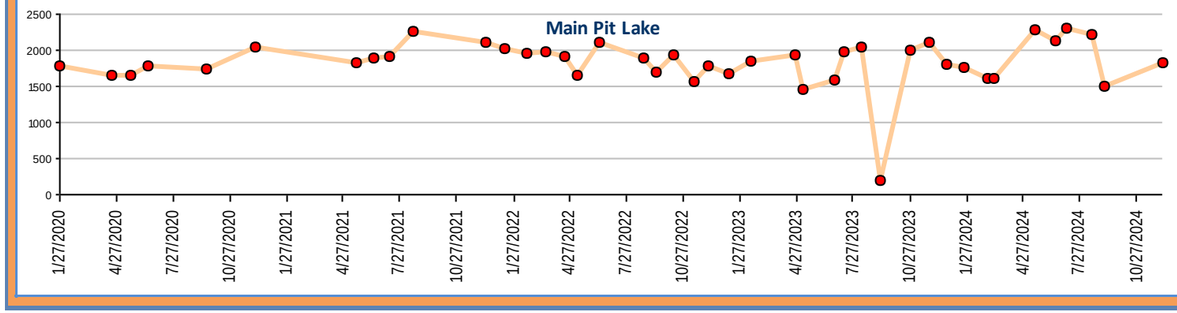
Mine Water Monitoring - Water Quality Profile II, Trend Charts

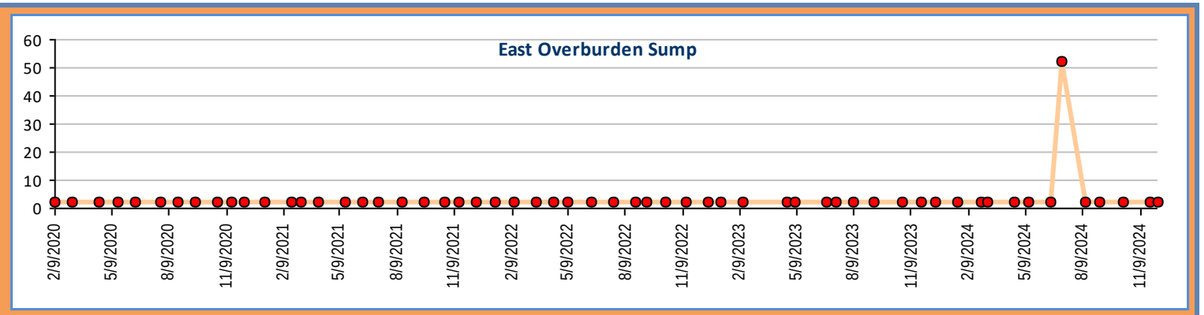
Acidity as CaCO3, units mg/L

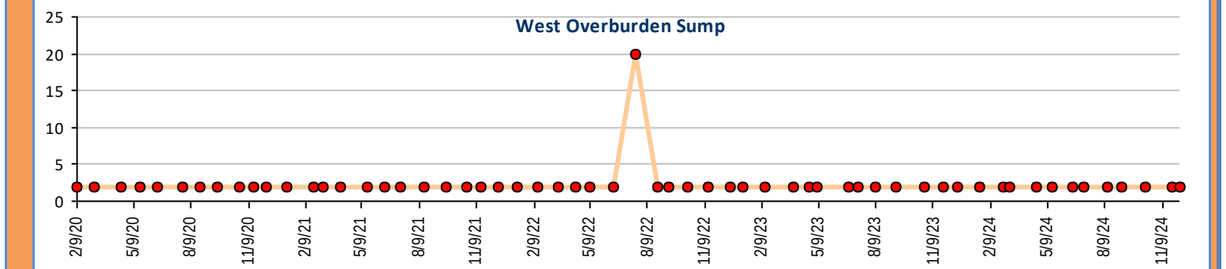


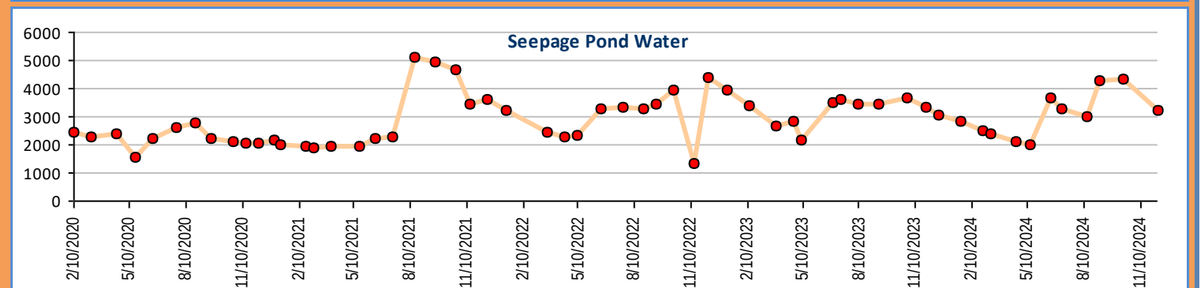


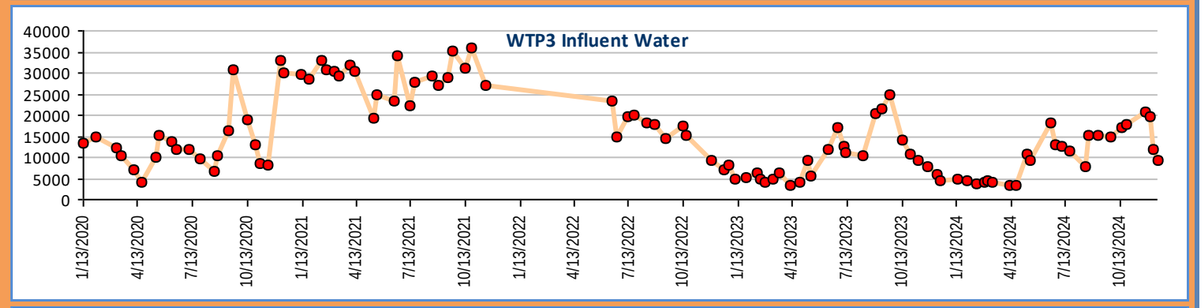


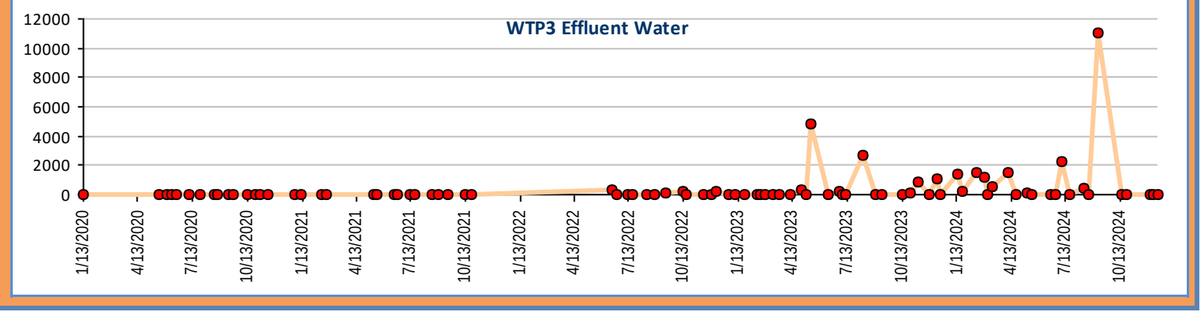








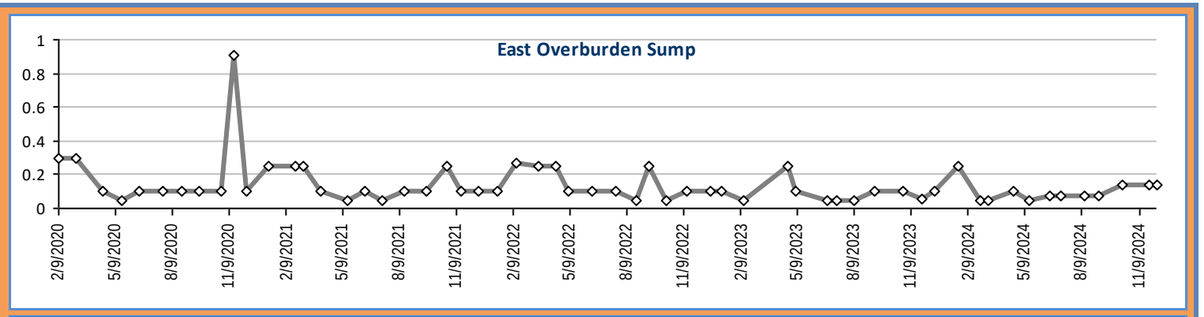


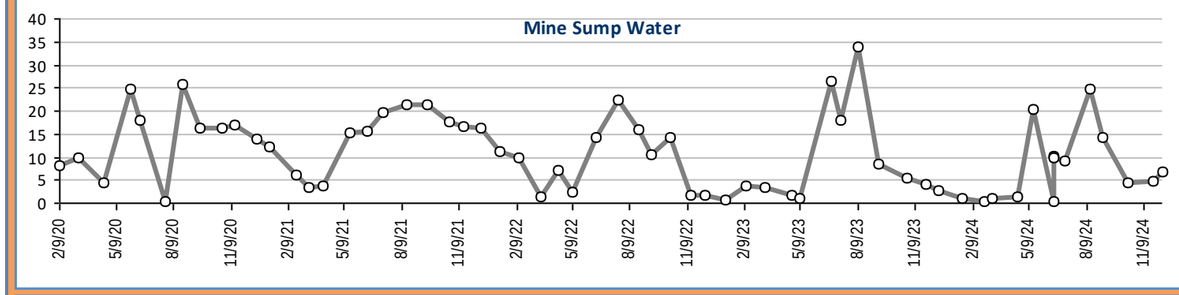


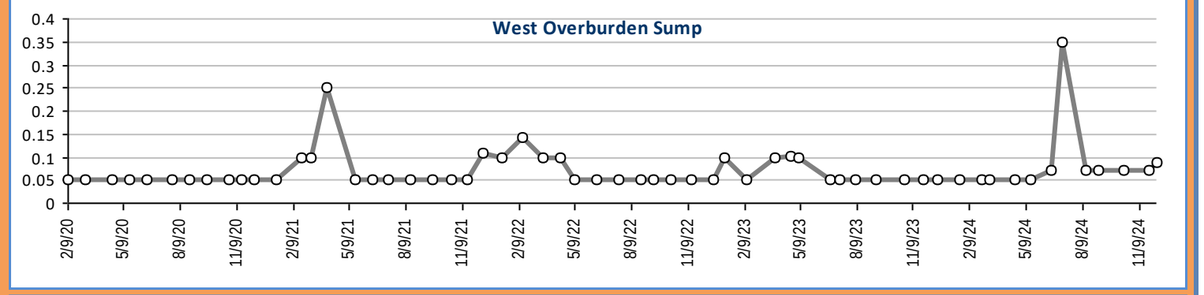
RED DOG MINE

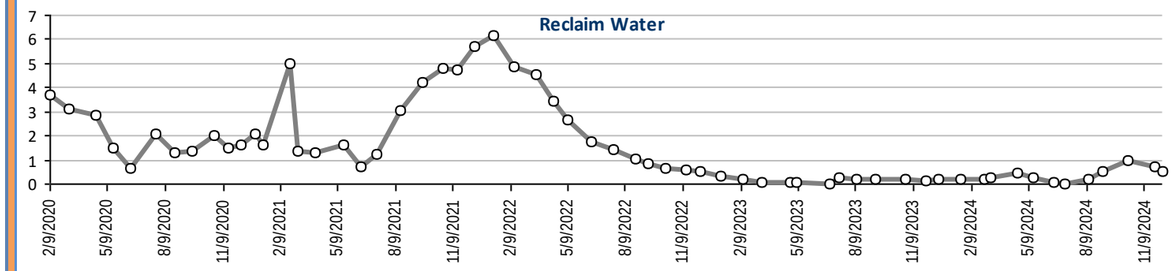
Mine Water Monitoring - Water Quality Profile II, Trend Charts

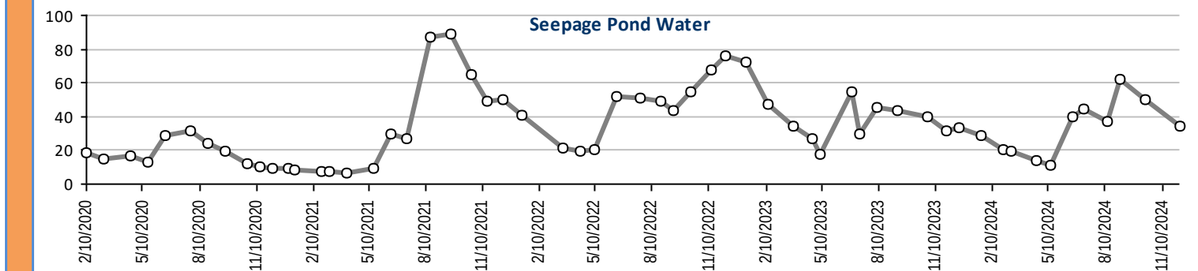
Aluminum, dissolved, units mg/L

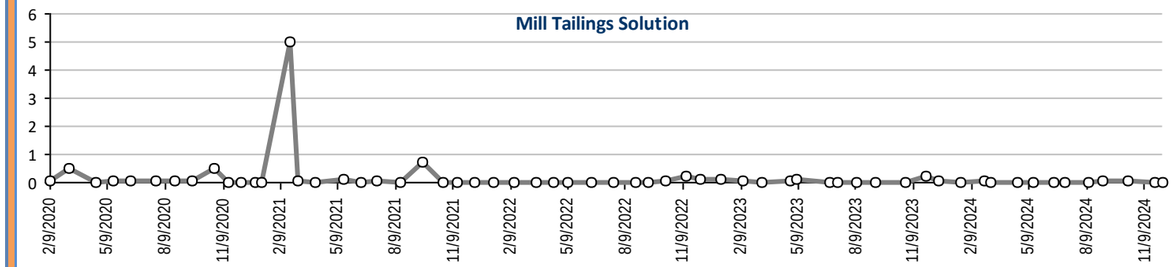


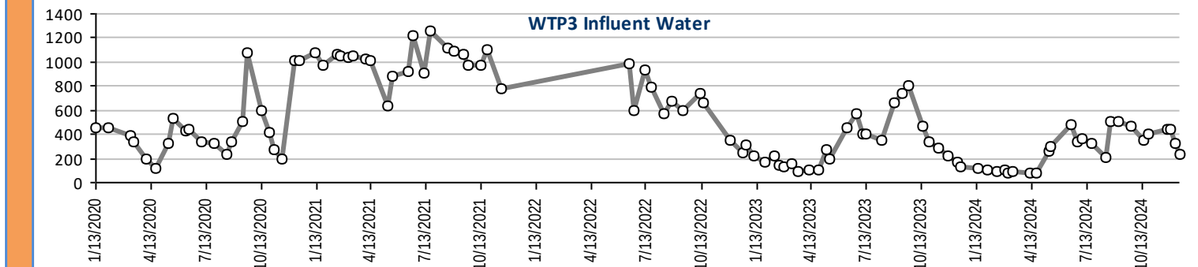


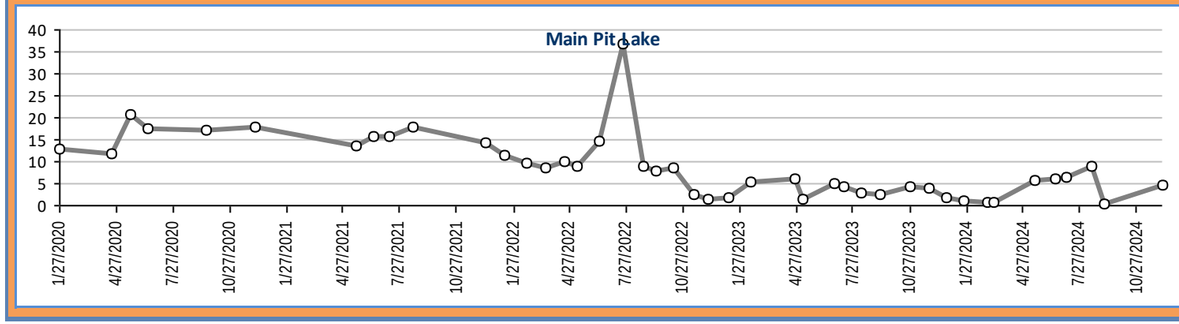


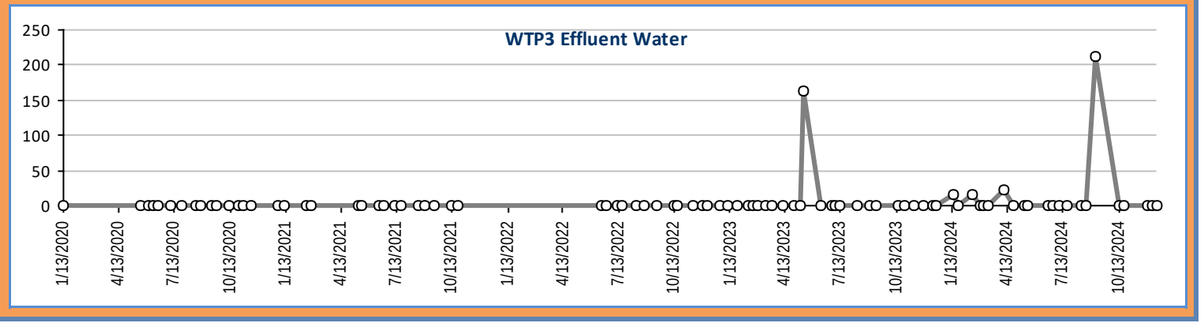








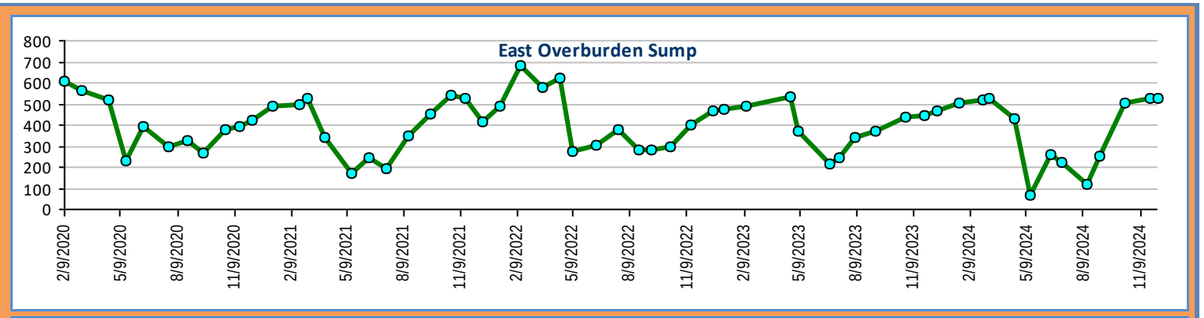


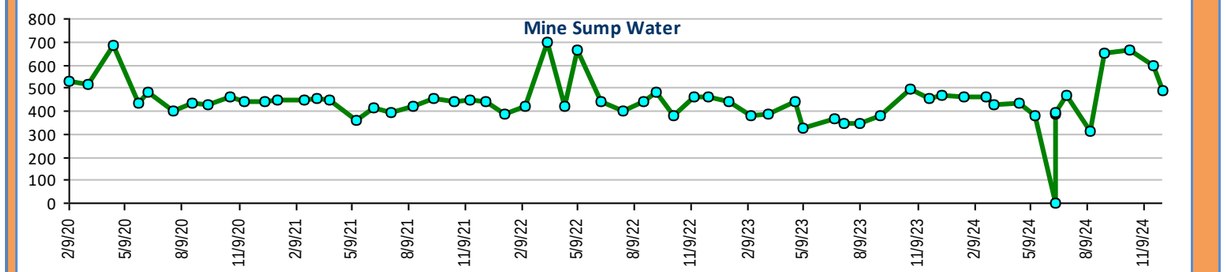


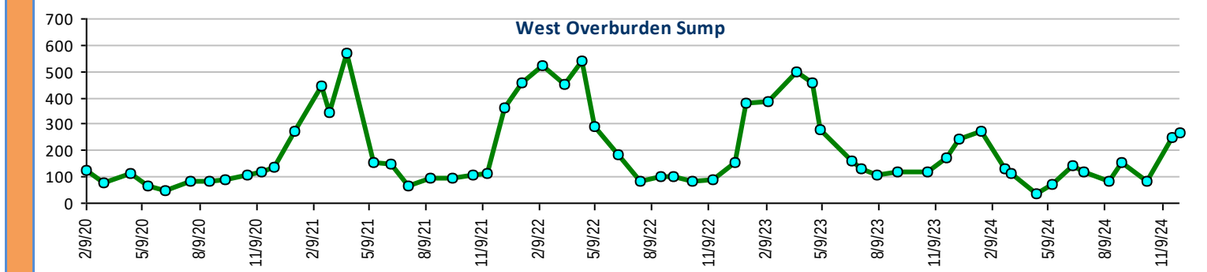
RED DOG MINE

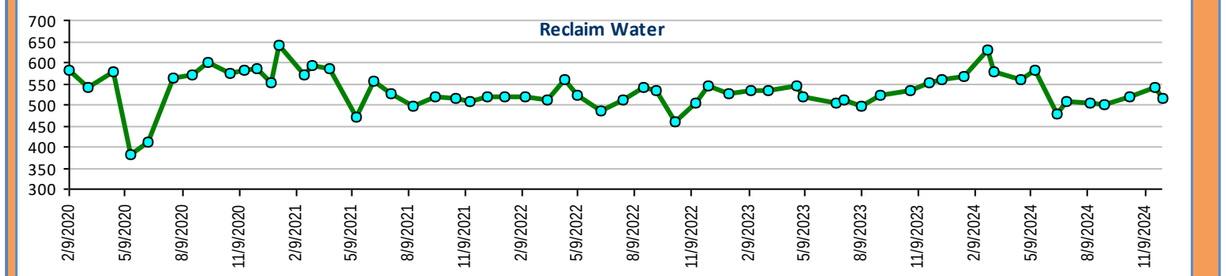
Mine Water Monitoring - Water Quality Profile II, Trend Charts

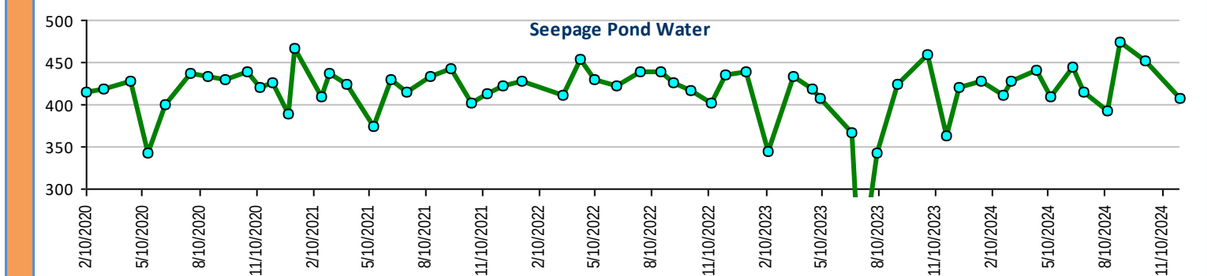
Calcium, dissolved, units mg/L

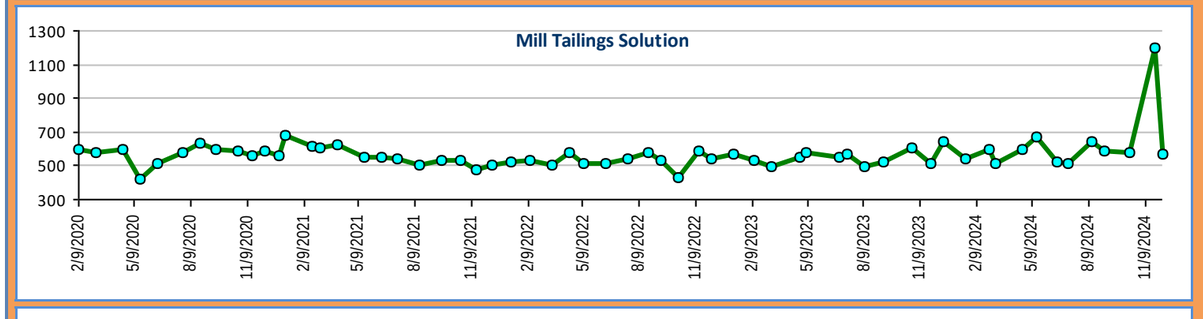


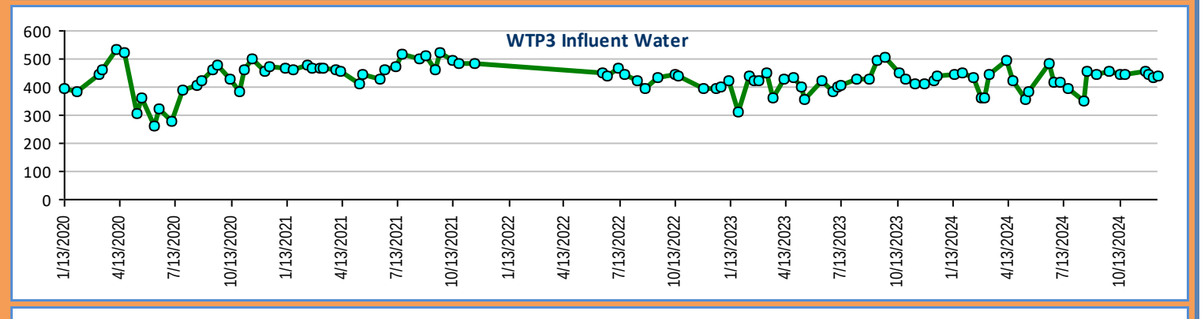


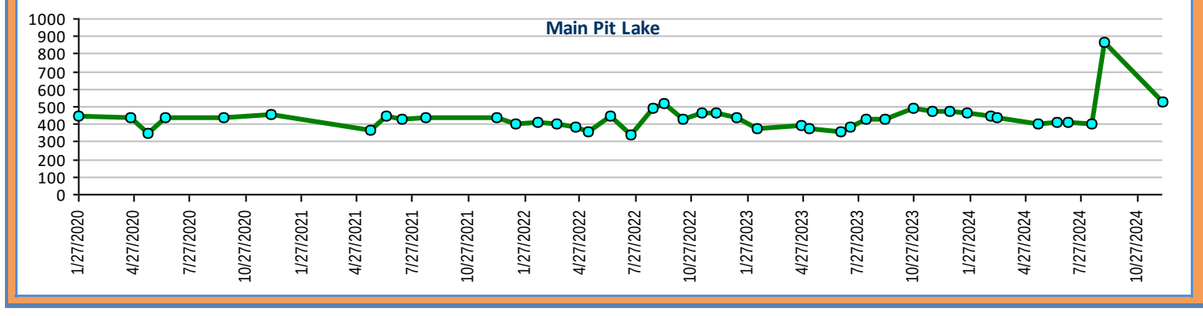


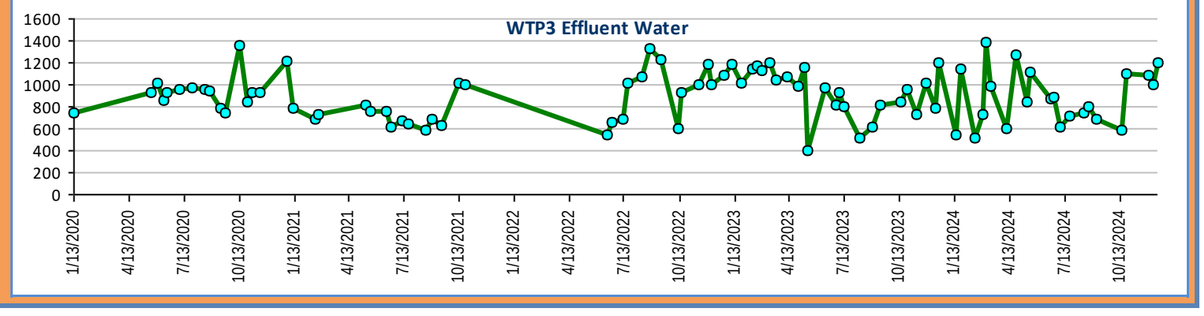








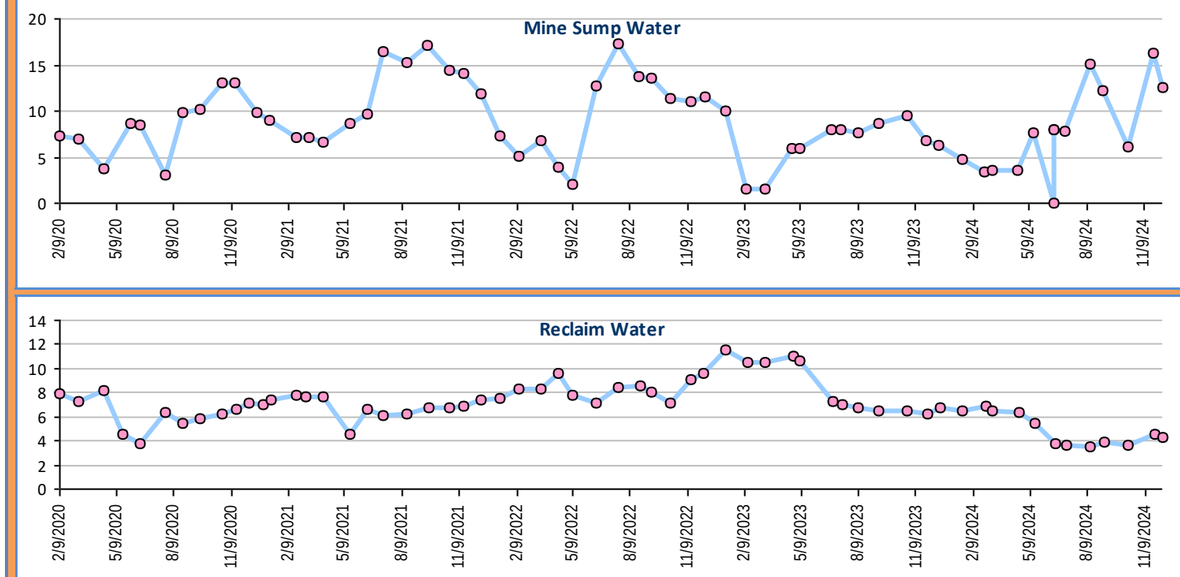


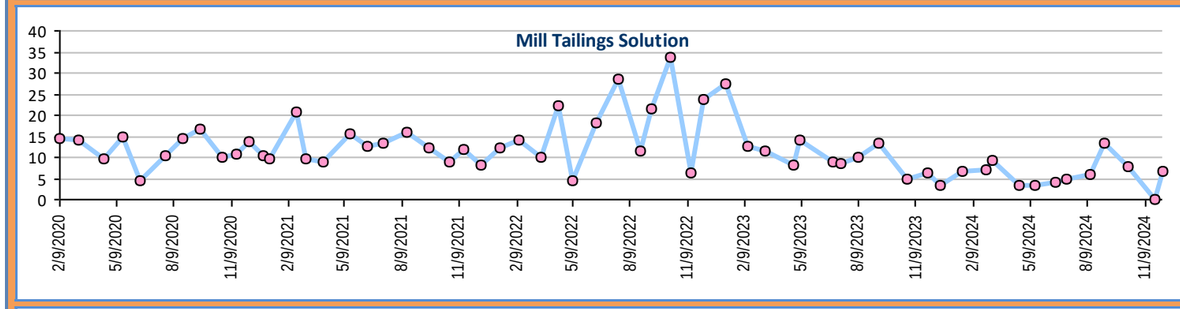


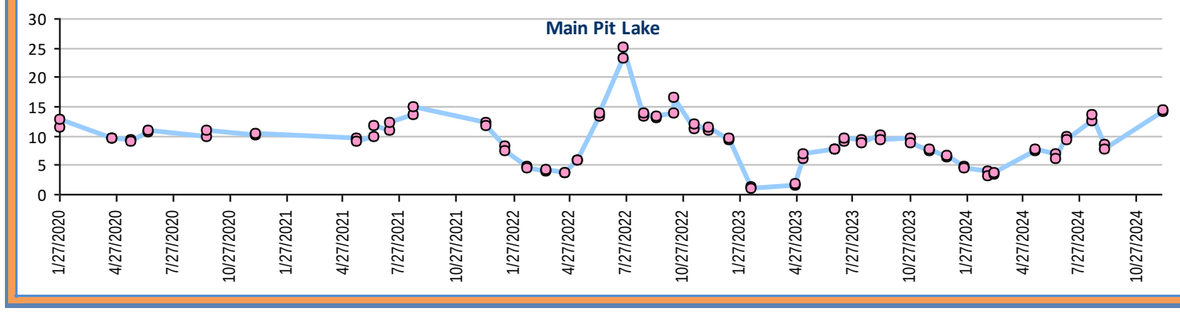
RED DOG MINE

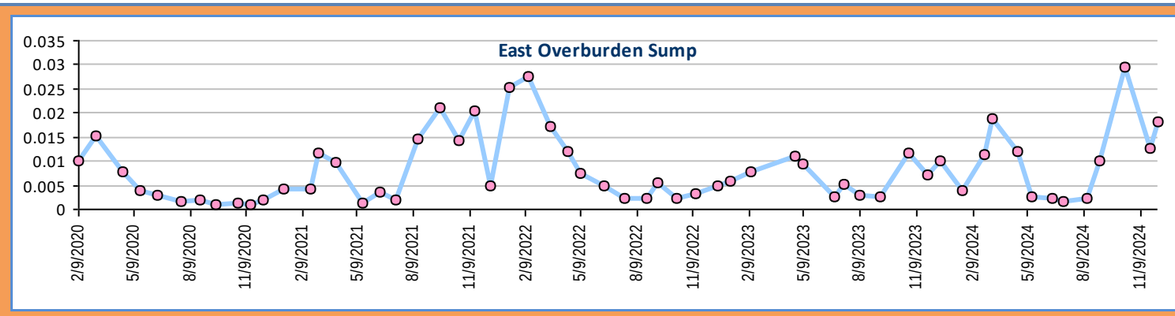
Mine Water Monitoring - Water Quality Profile II, Trend Charts

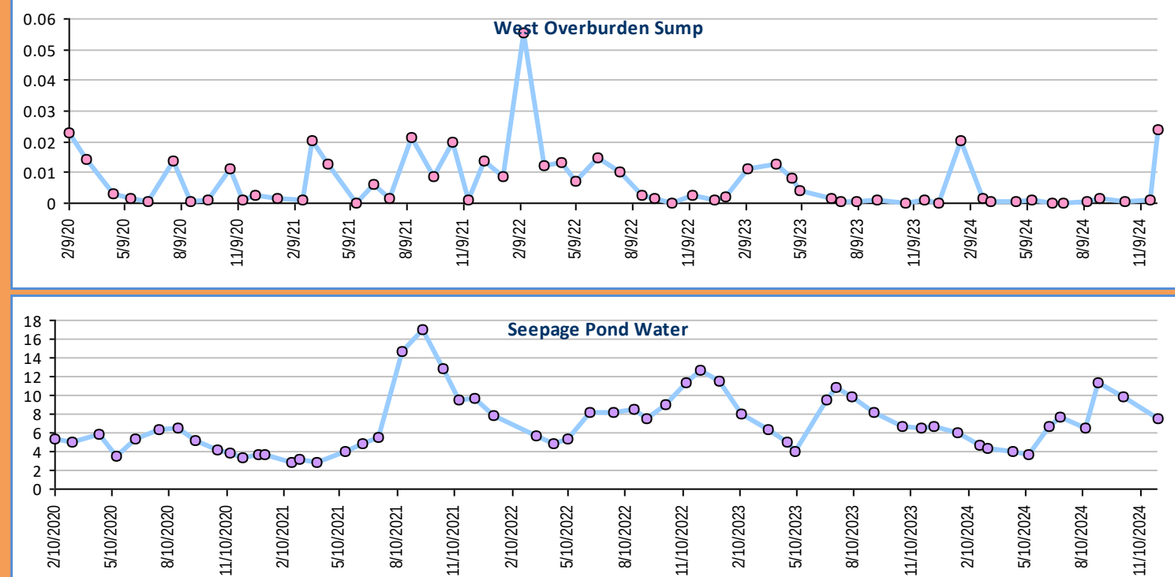
Cadmium, dissolved, units mg/L

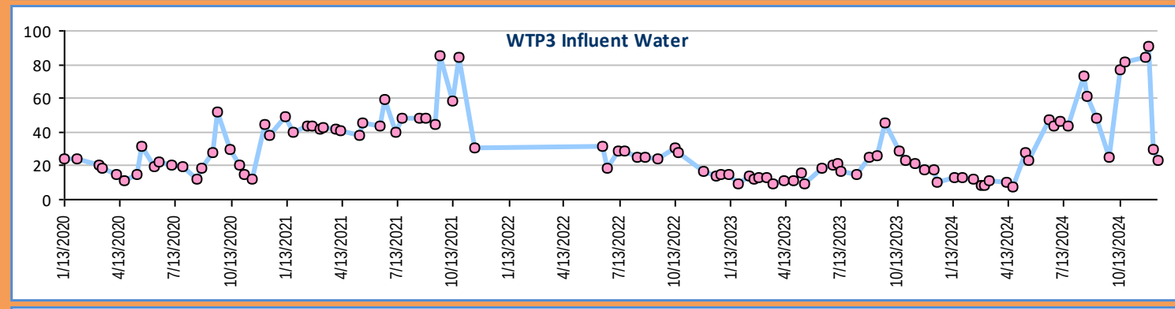


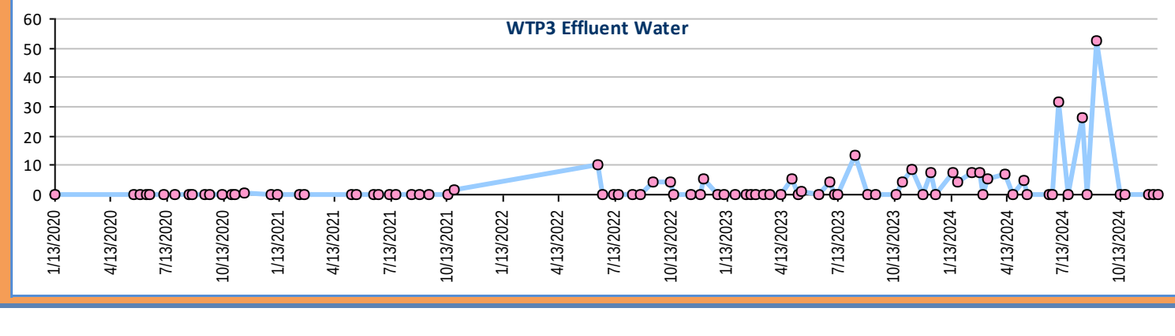








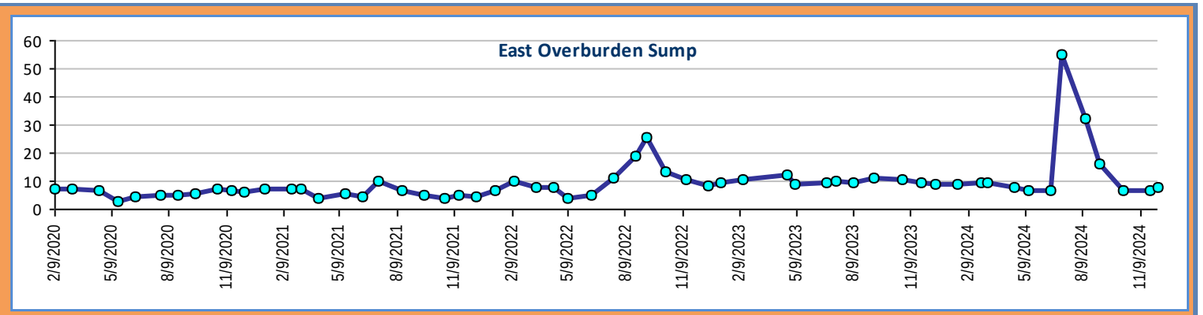


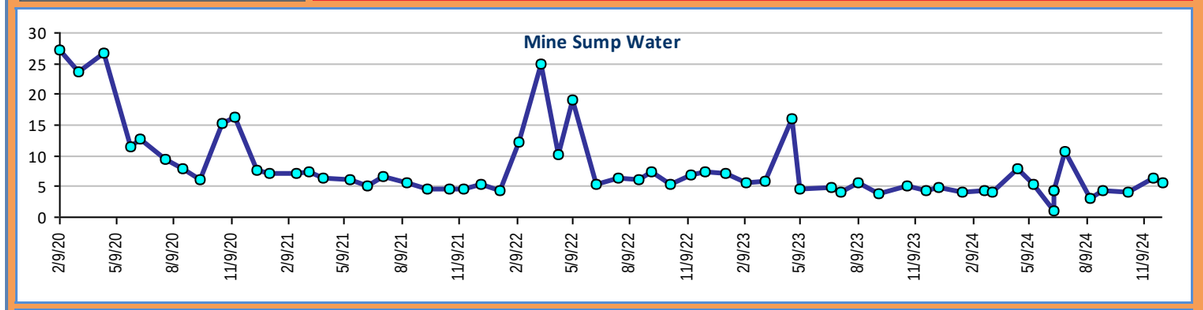


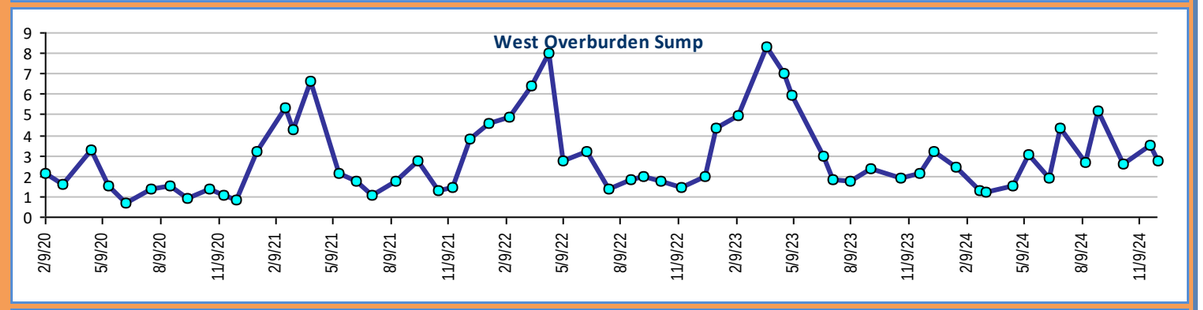
RED DOG MINE

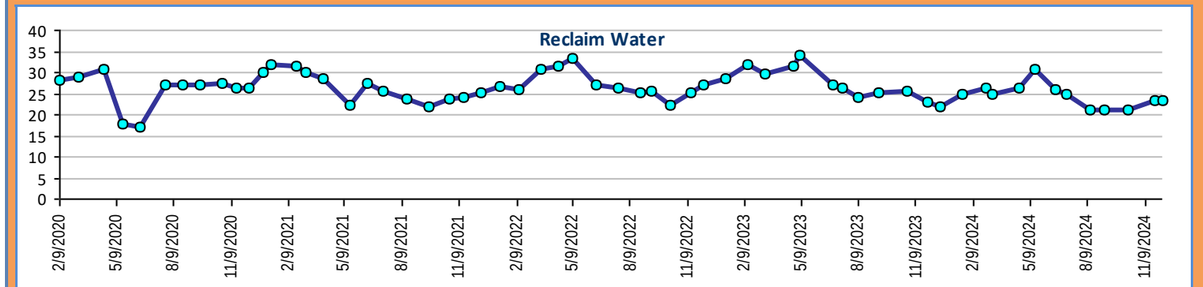
Mine Water Monitoring - Water Quality Profile II, Trend Charts

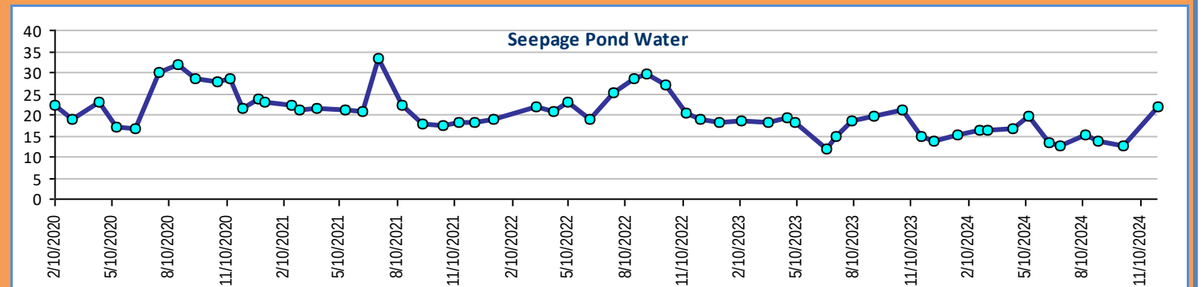
Chloride, dissolved, units mg/L

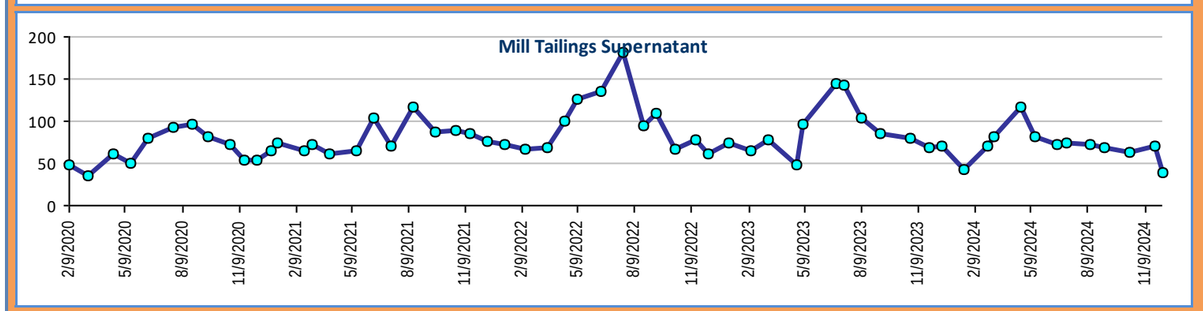


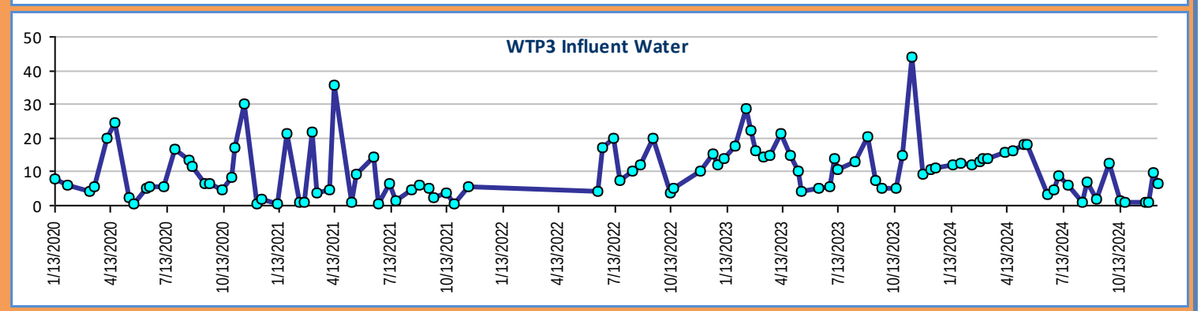


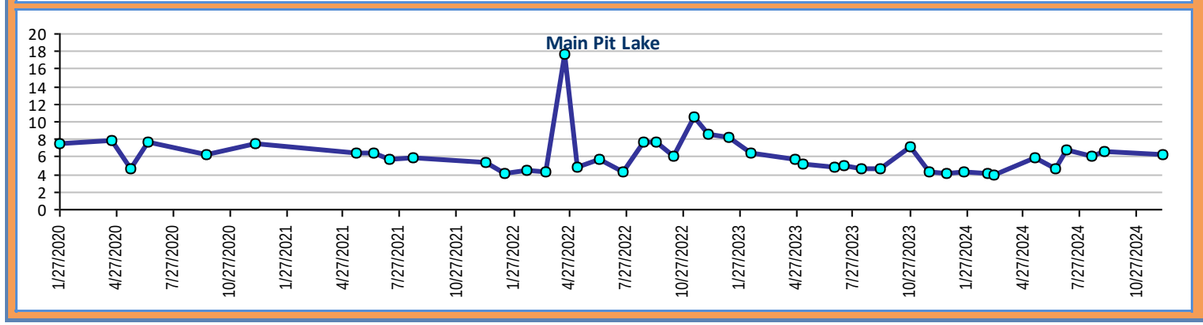


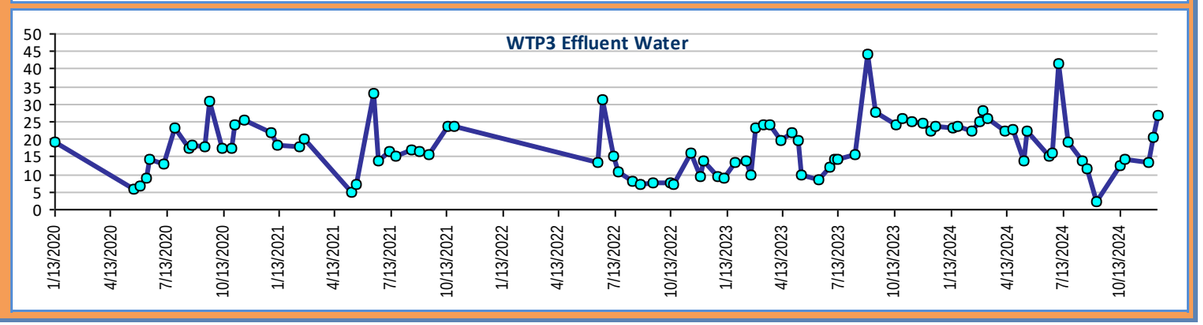








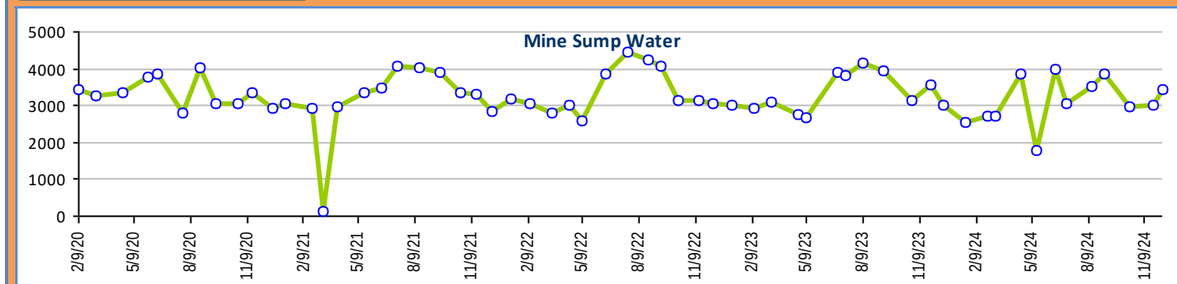


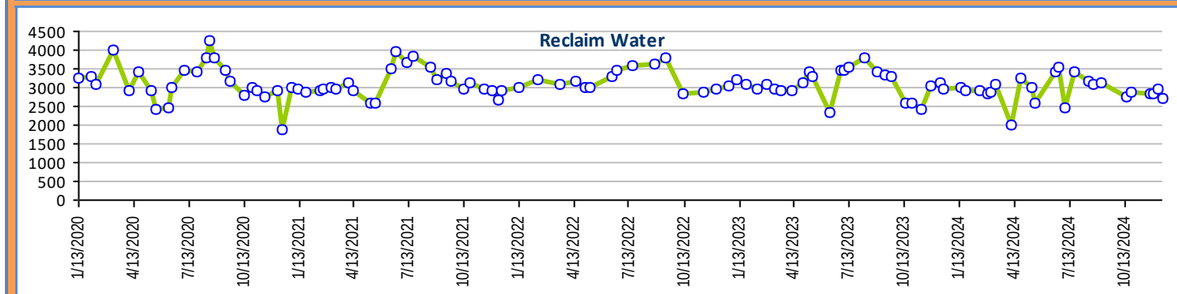


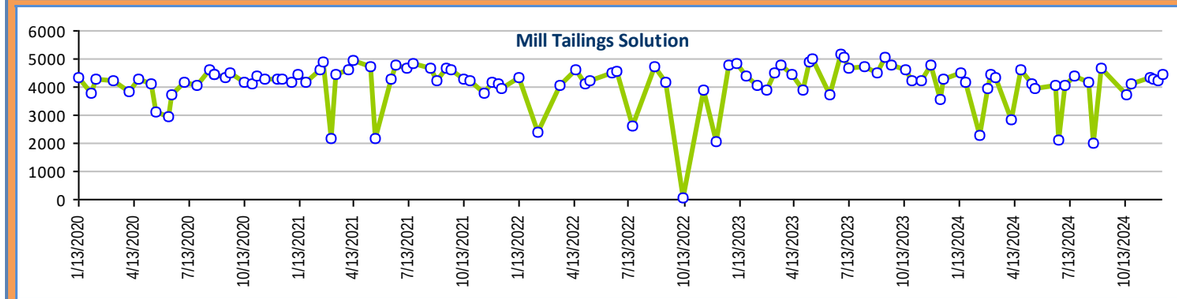
RED DOG MINE

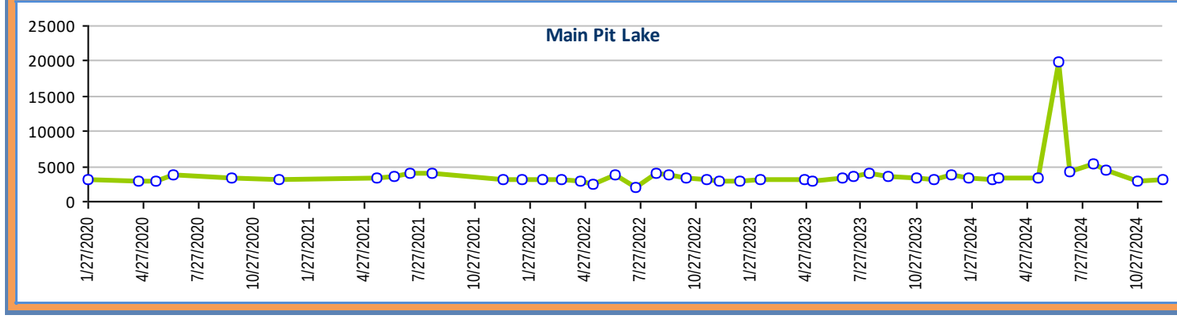
Mine Water Monitoring - Water Quality Profile II, Trend Charts

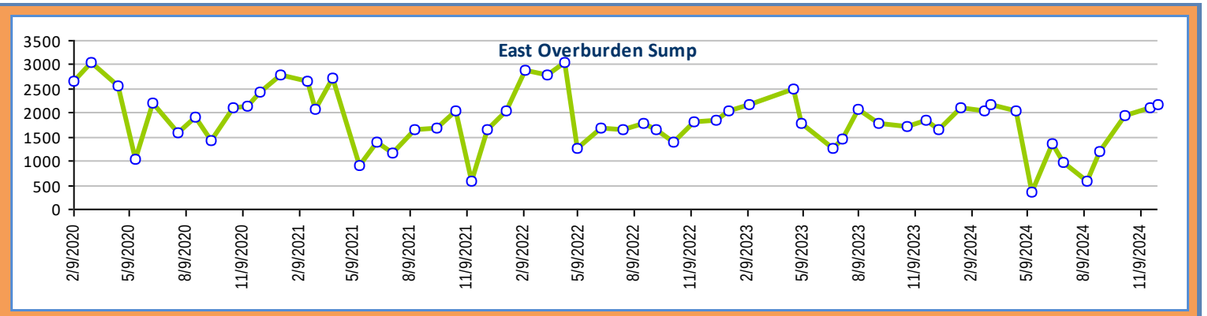
Conductivity, units uS/cm

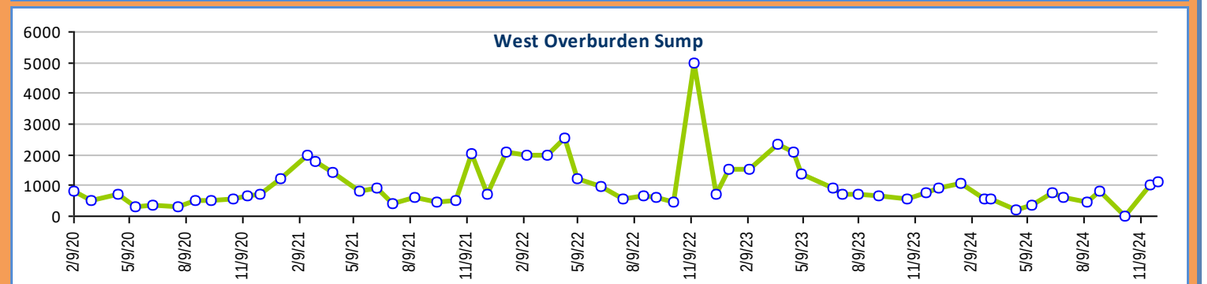


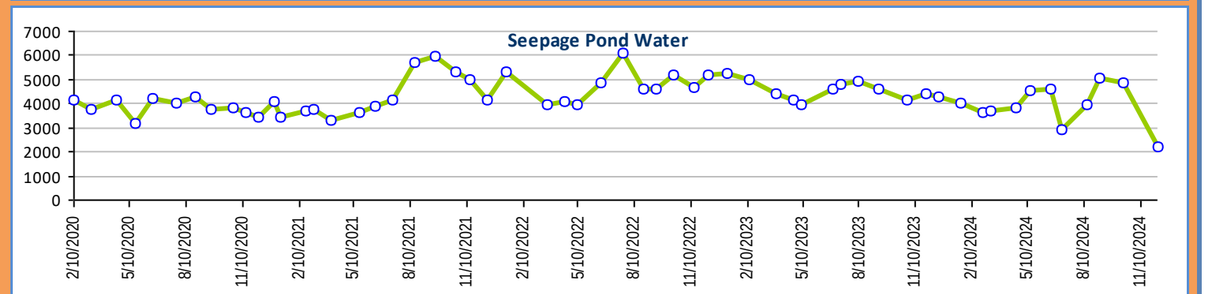


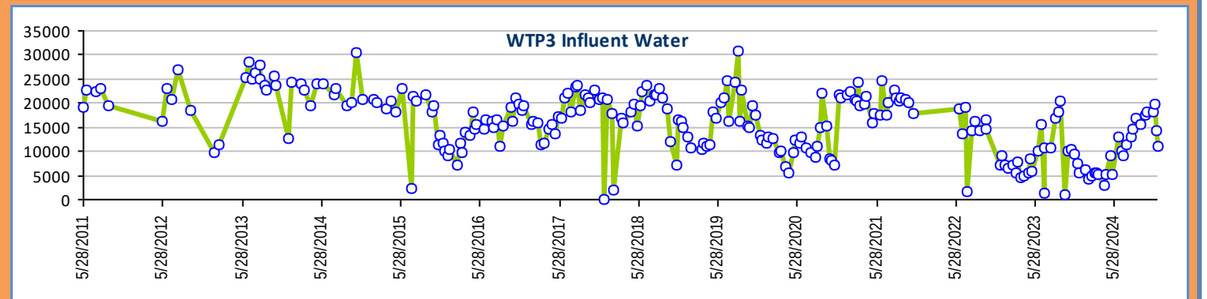


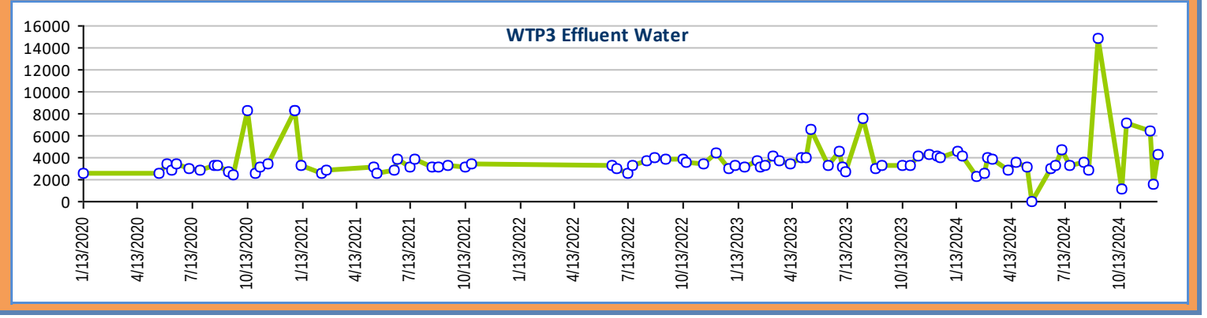








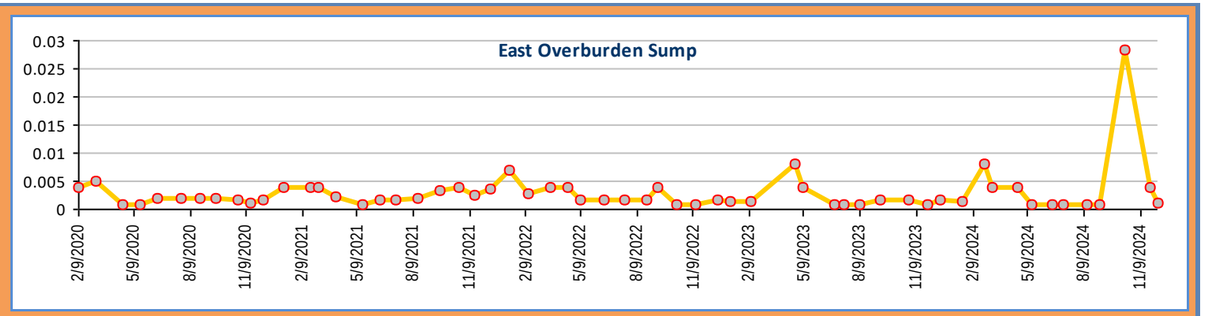


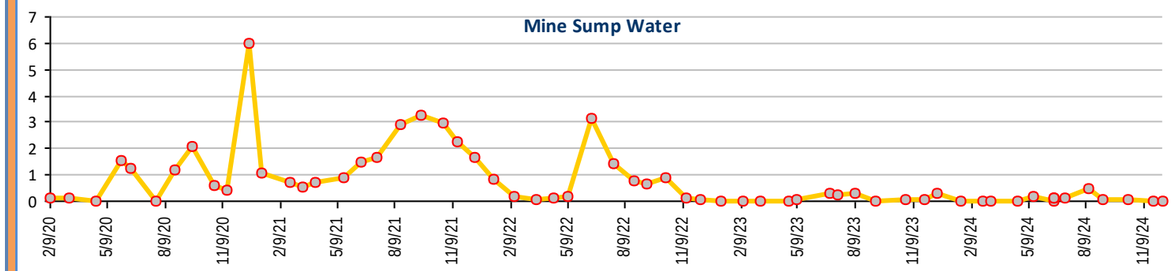


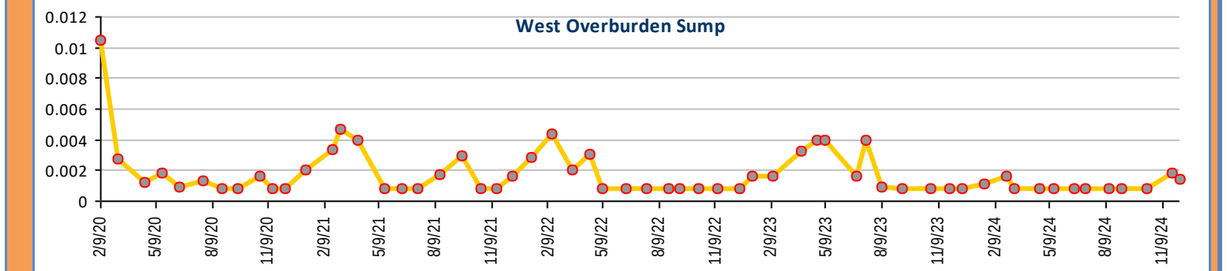
RED DOG MINE

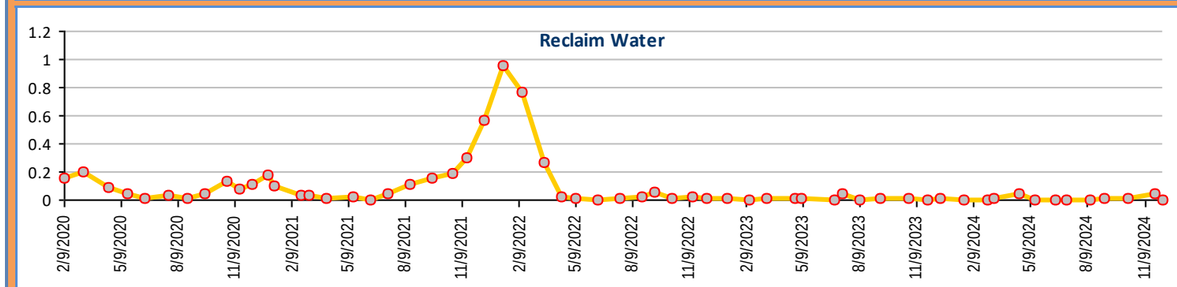
Mine Water Monitoring - Water Quality Profile II, Trend Charts

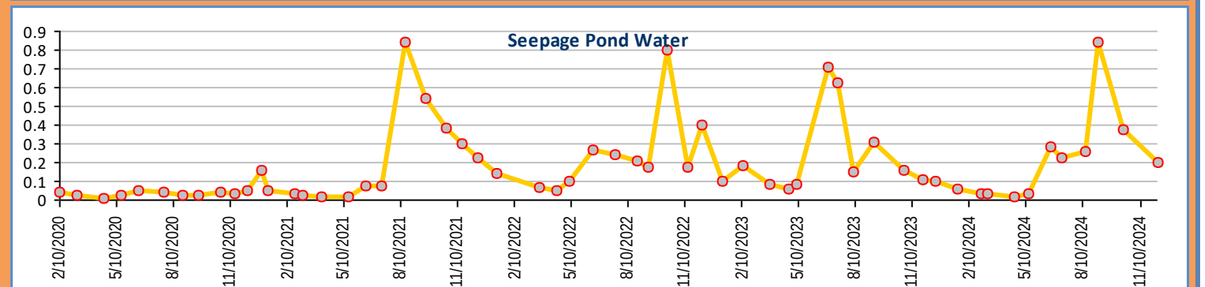
Copper, dissolved, units mg/L

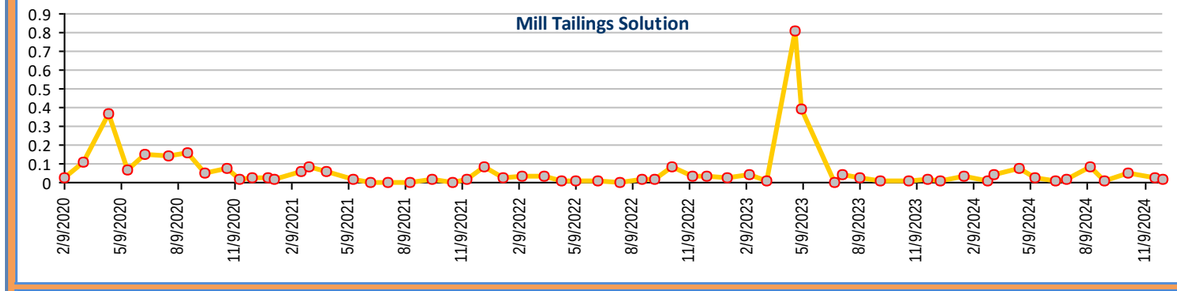


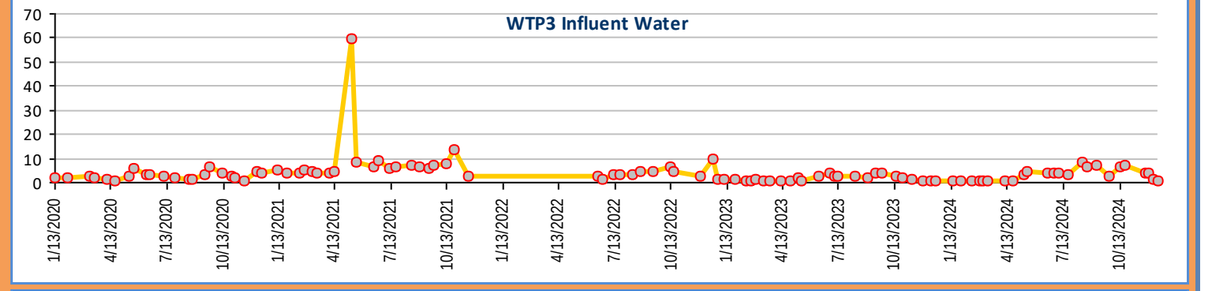


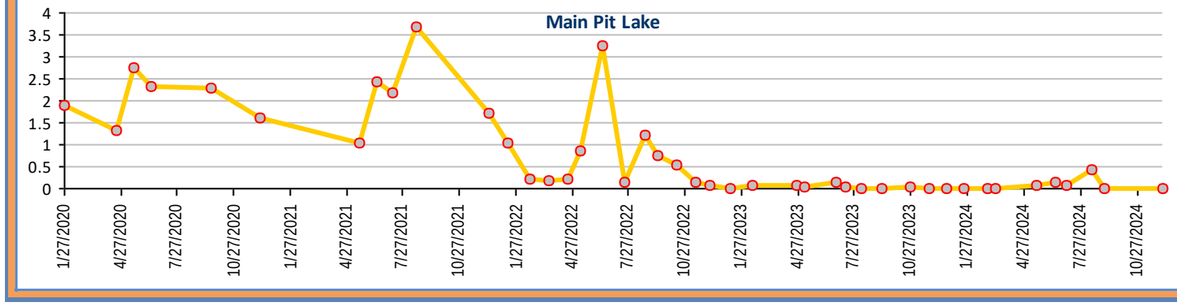


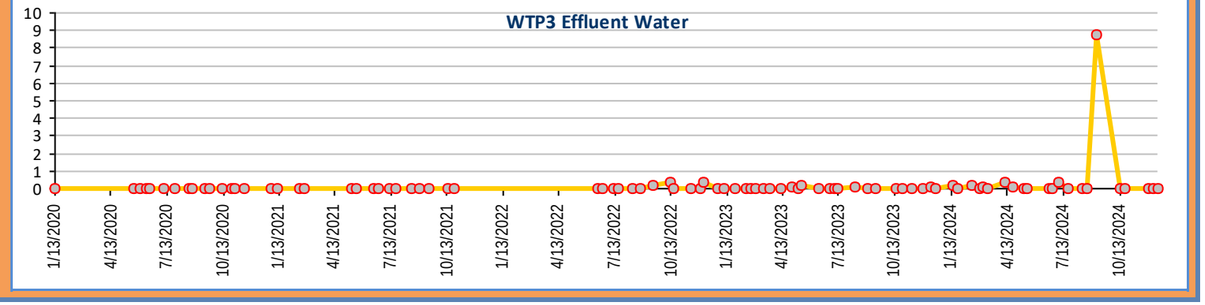








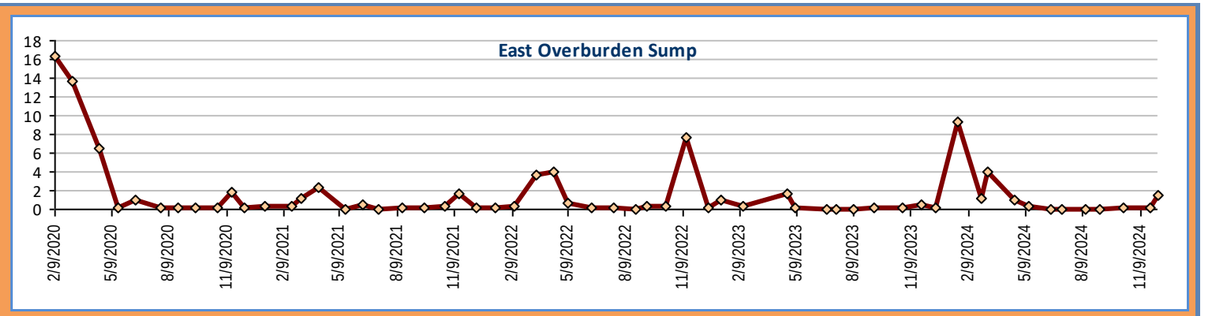


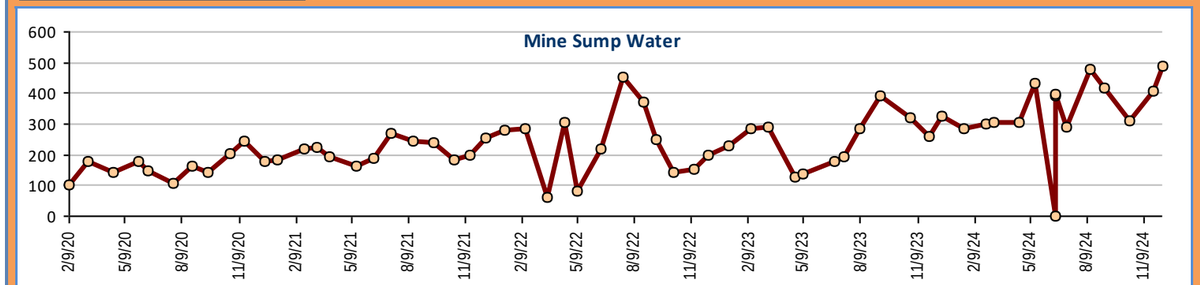


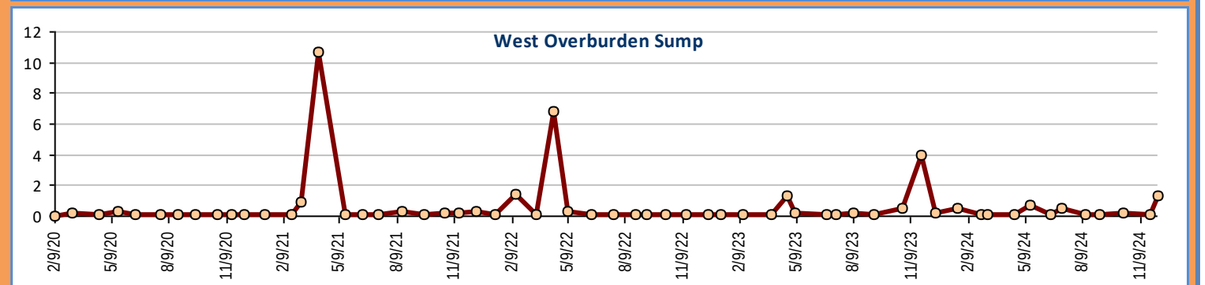
RED DOG MINE

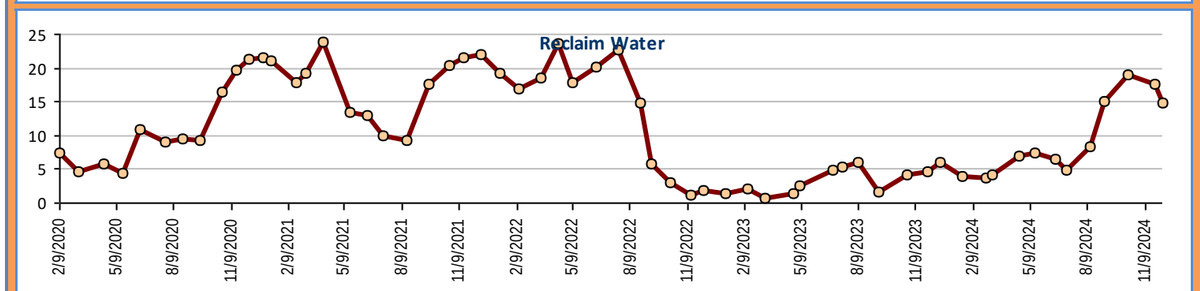
Mine Water Monitoring - Water Quality Profile II, Trend Charts

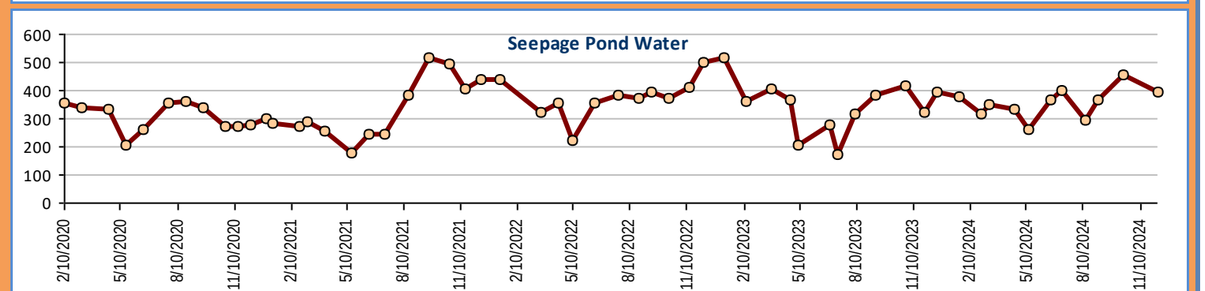
Iron, dissolved, units mg/L

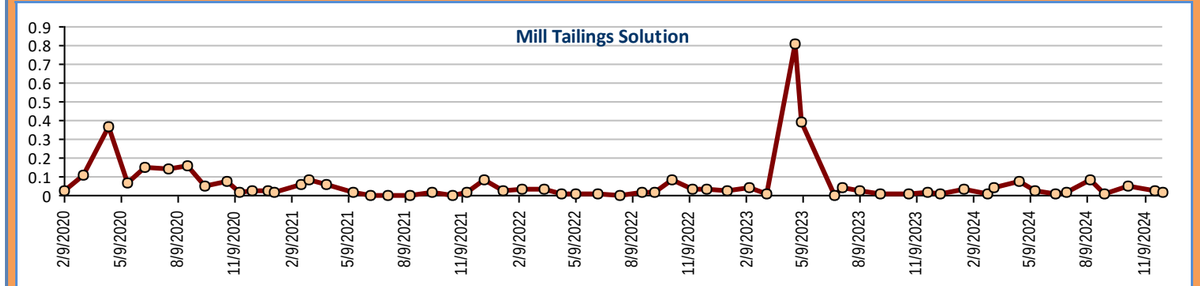


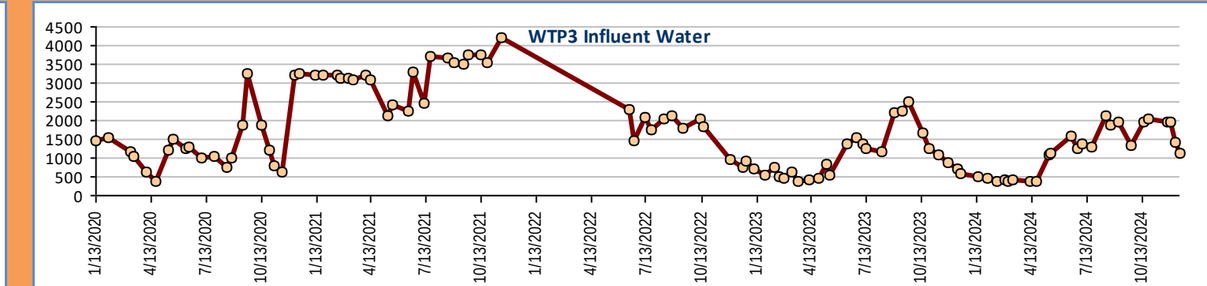


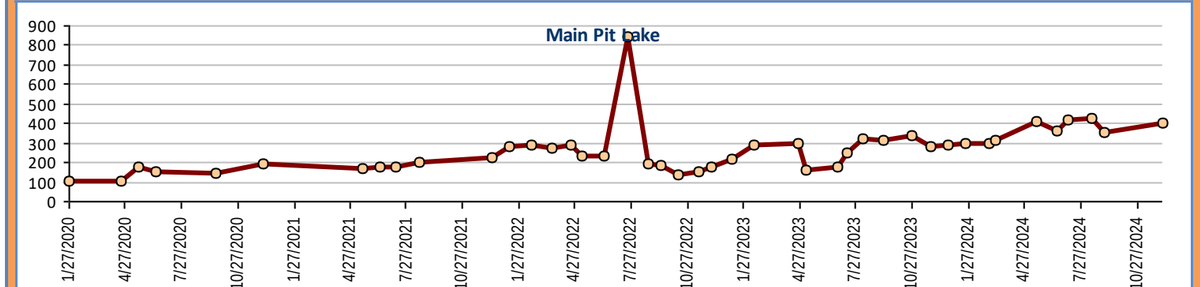


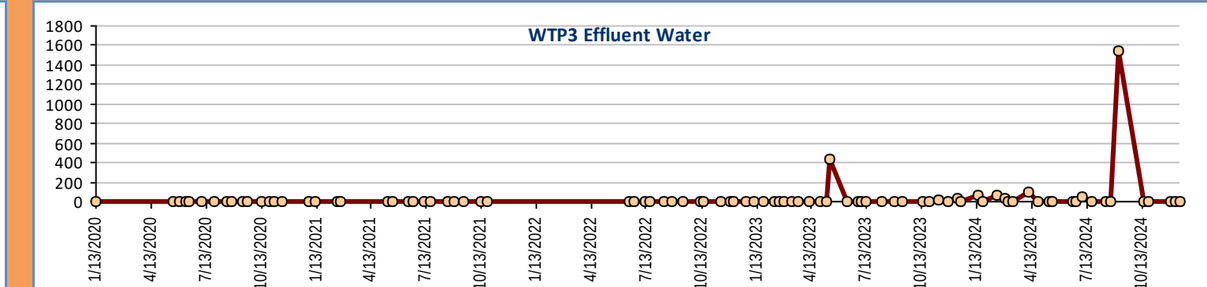








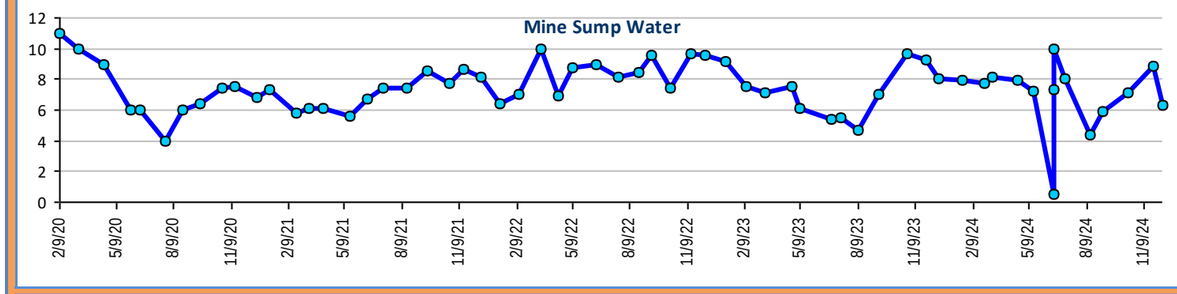


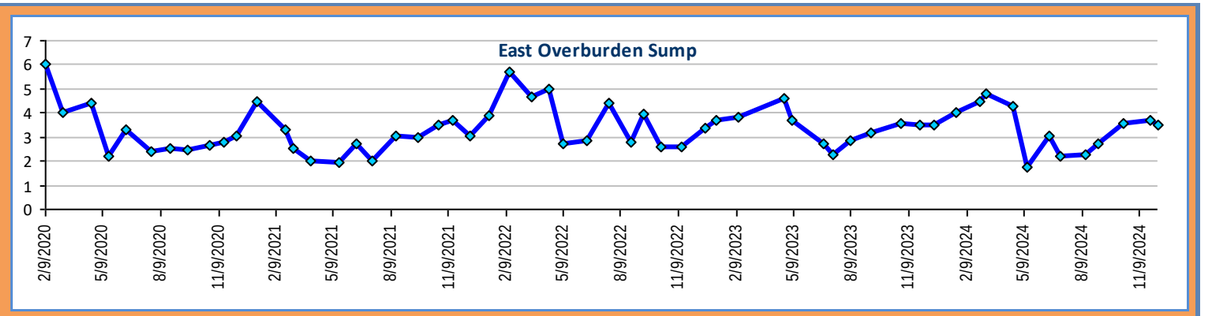


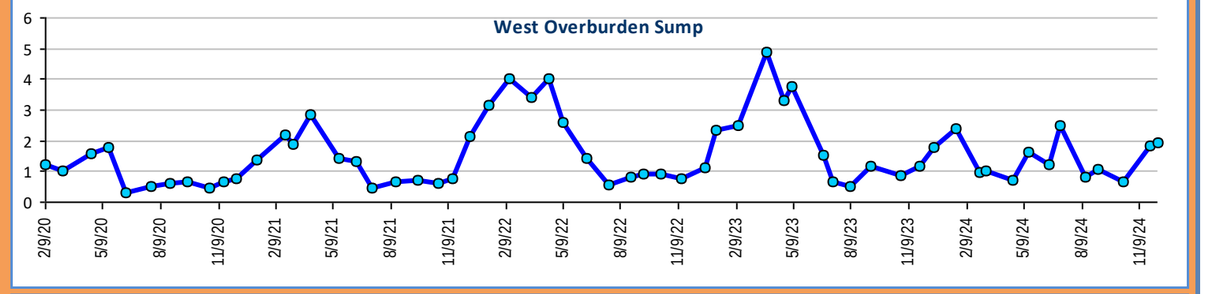
RED DOG MINE

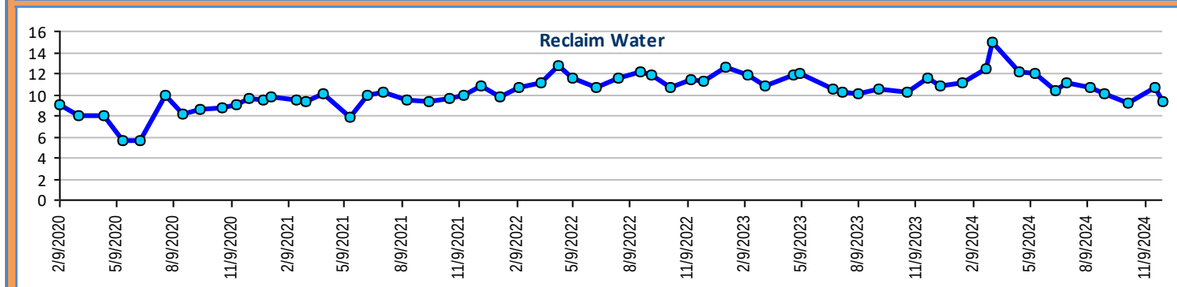
Mine Water Monitoring - Water Quality Profile II, Trend Charts

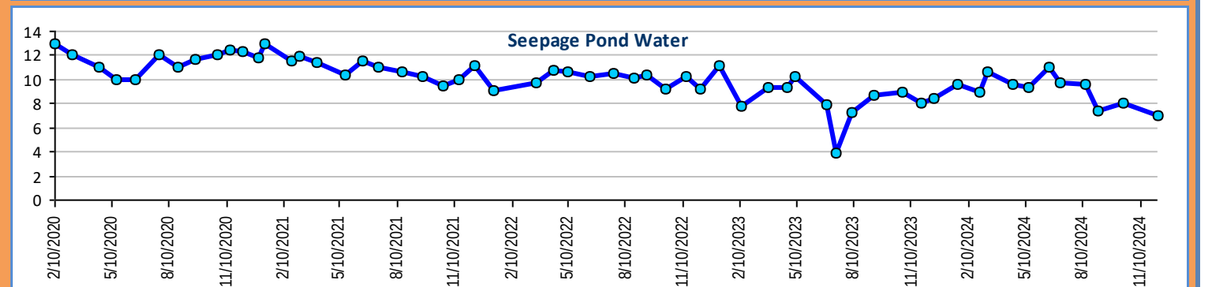
Potassium, dissolved, units mg/L

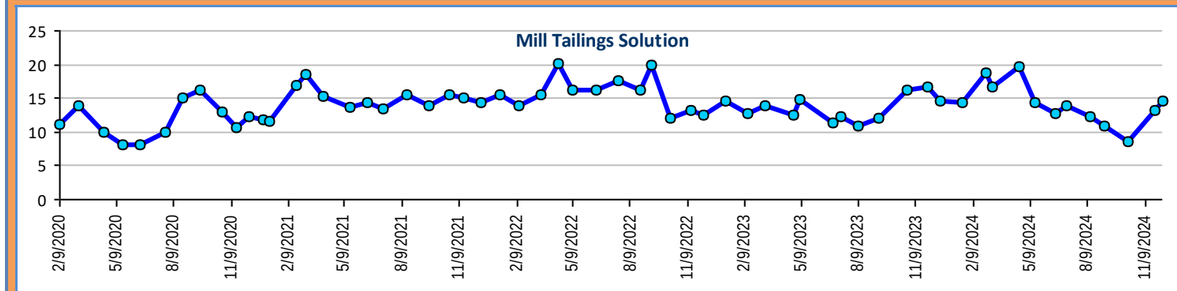


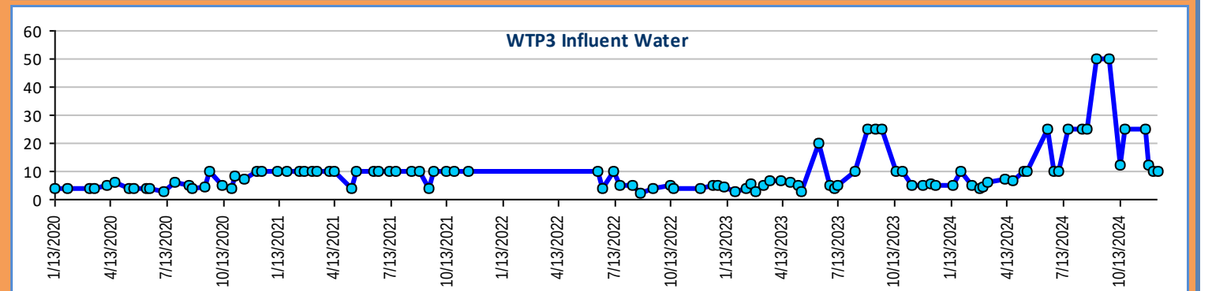


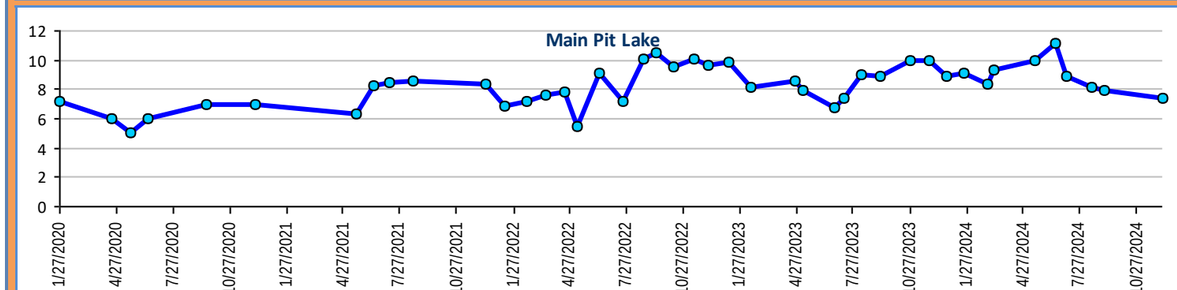


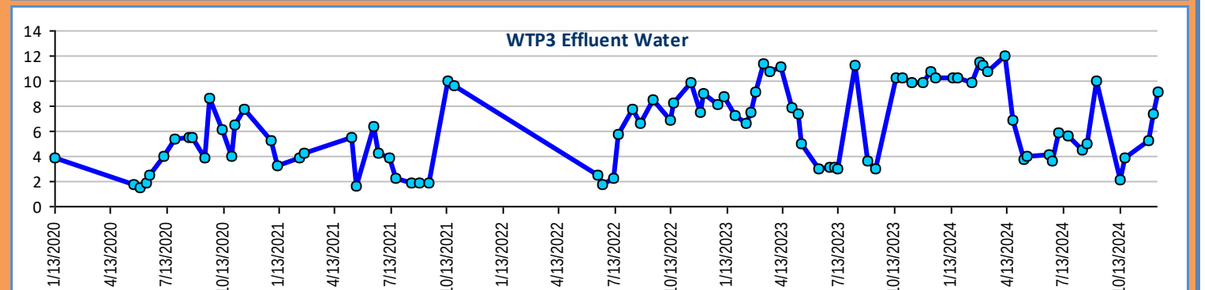








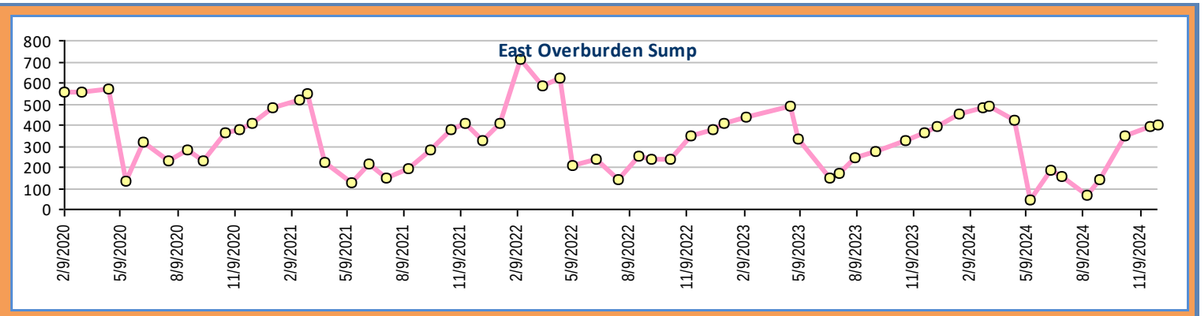


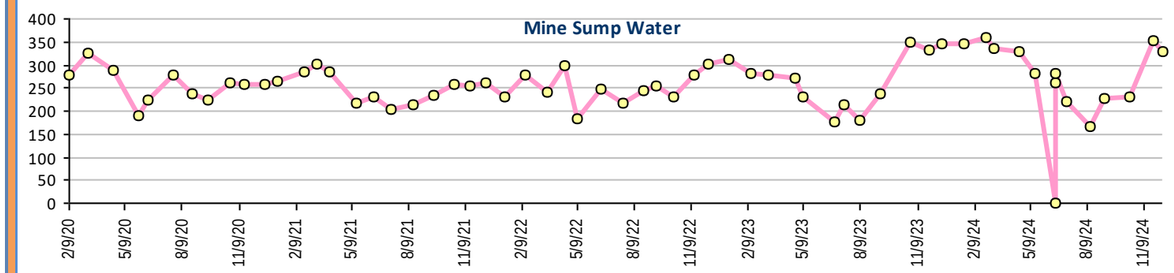


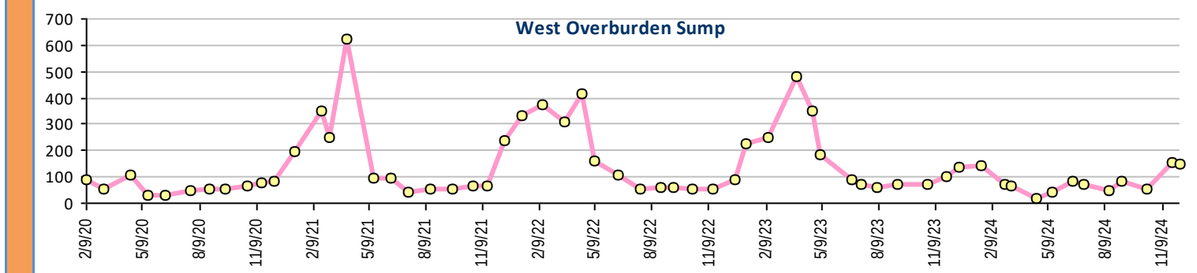
RED DOG MINE

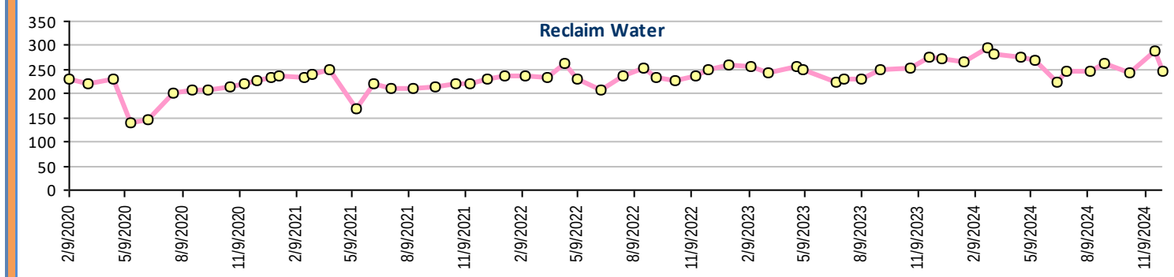
Mine Water Monitoring - Water Quality Profile II, Trend Charts

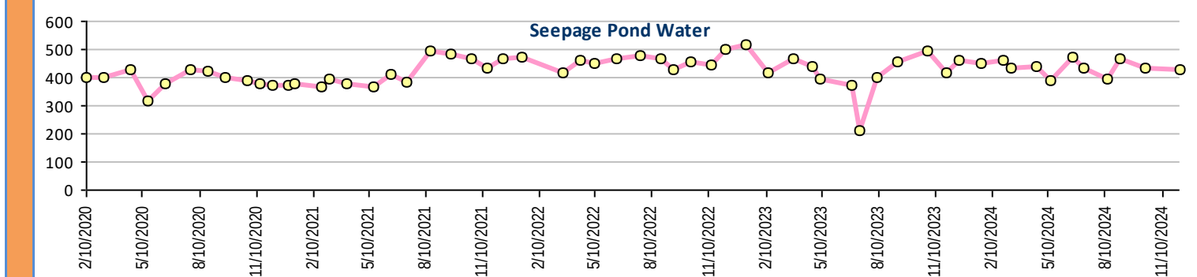
Magnesium, dissolved, units mg/L

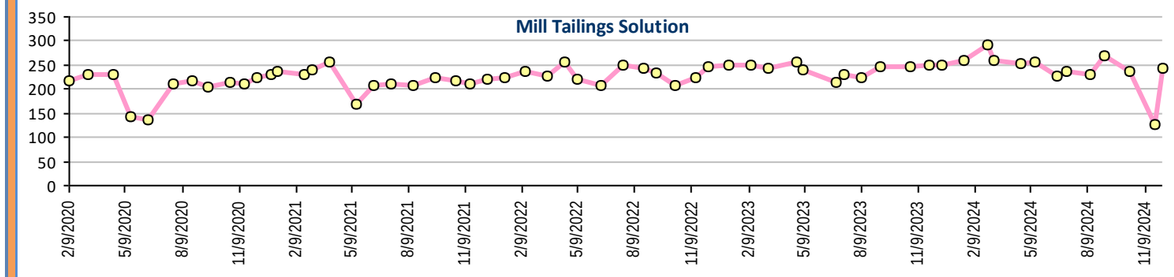


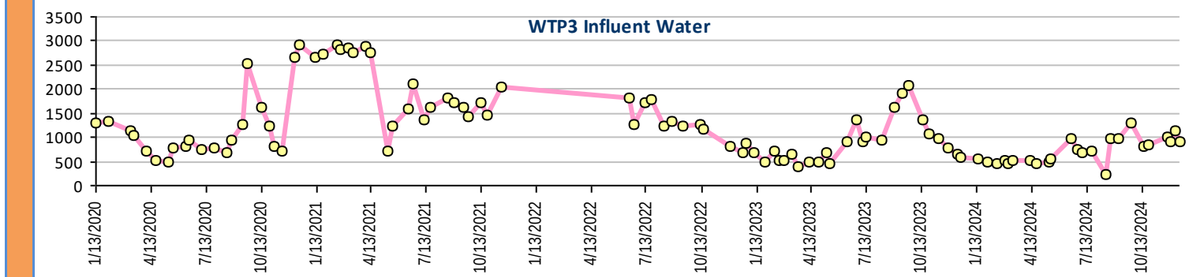


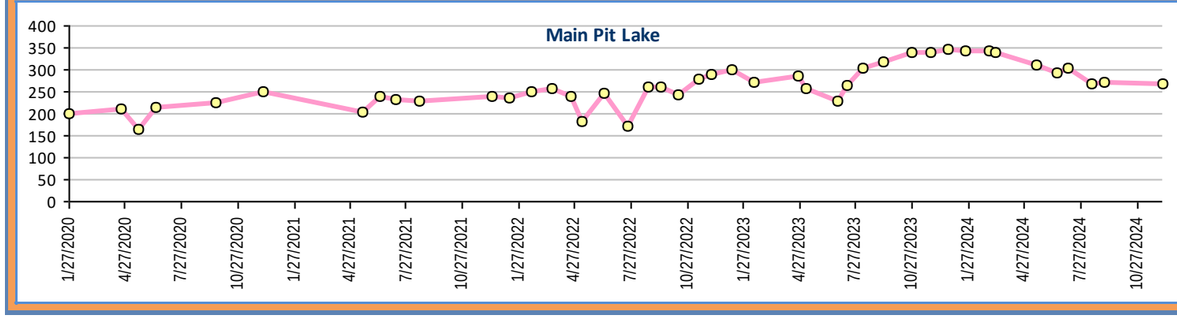


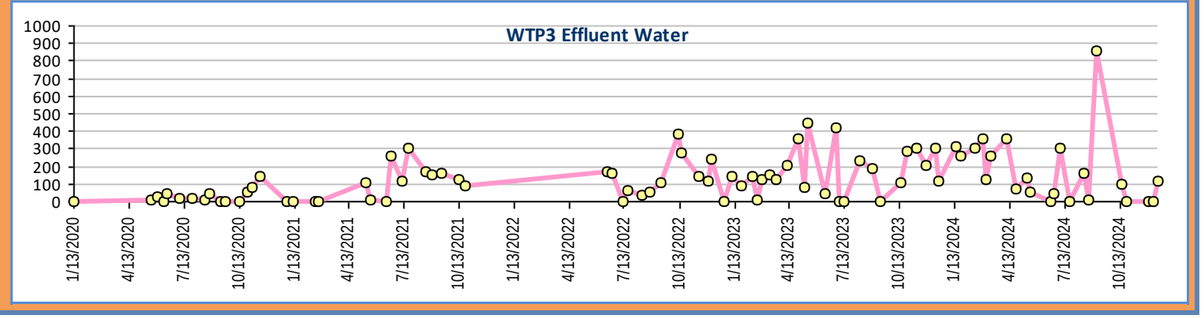








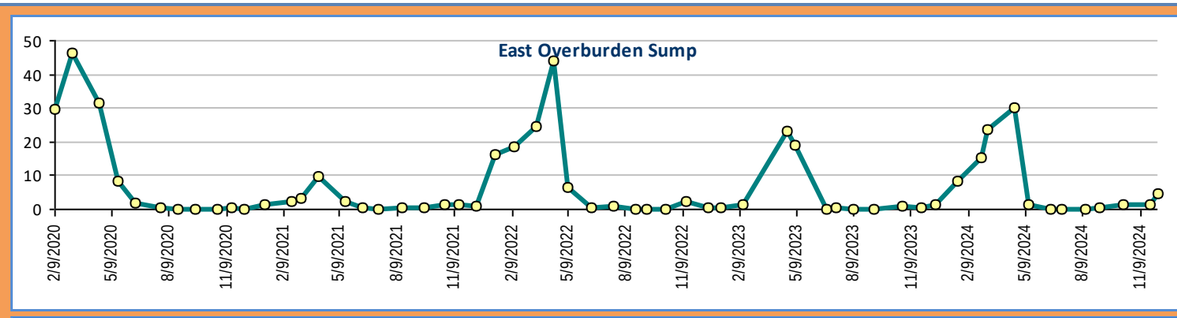


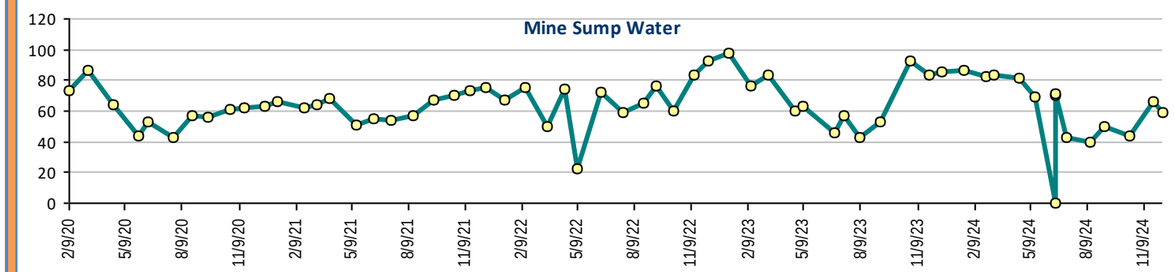


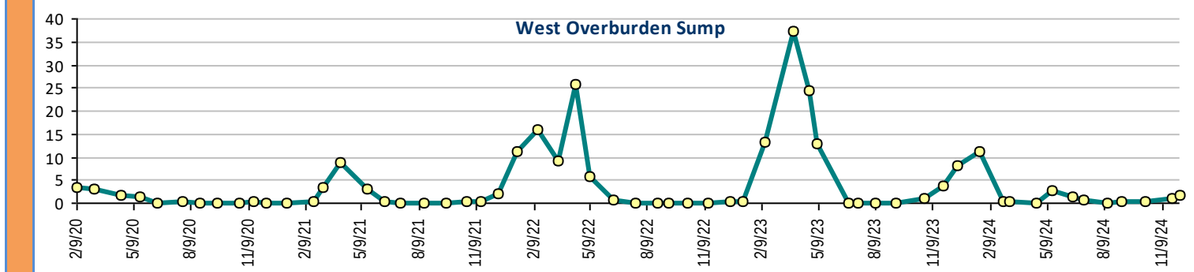
RED DOG MINE

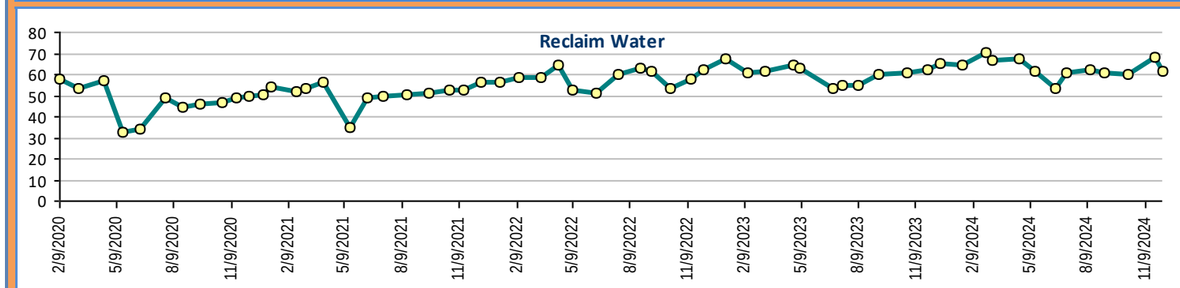
Mine Water Monitoring - Water Quality Profile II, Trend Charts

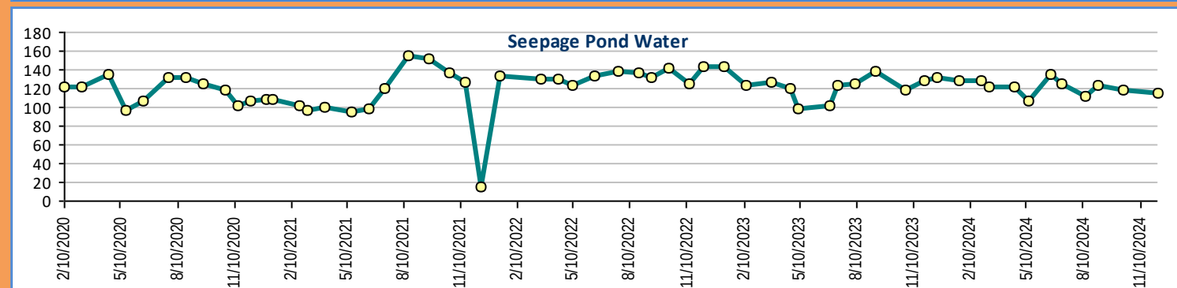
Manganese, dissolved, units mg/L

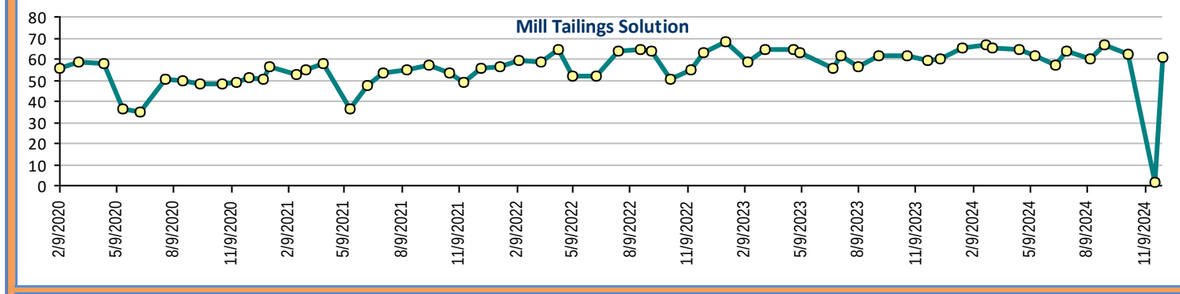


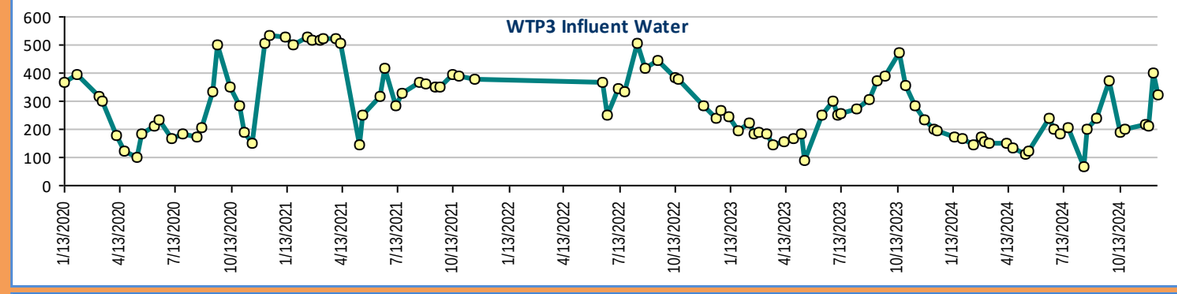


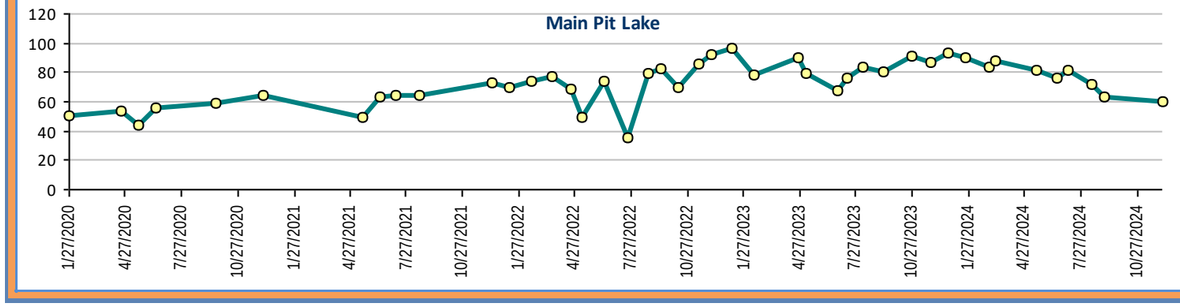


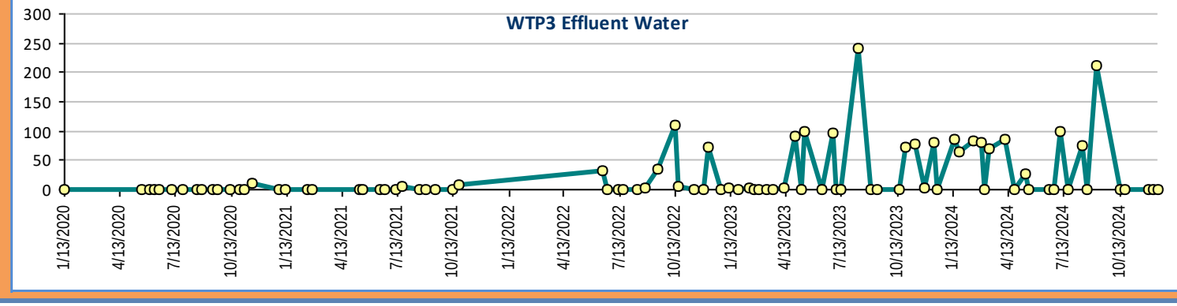








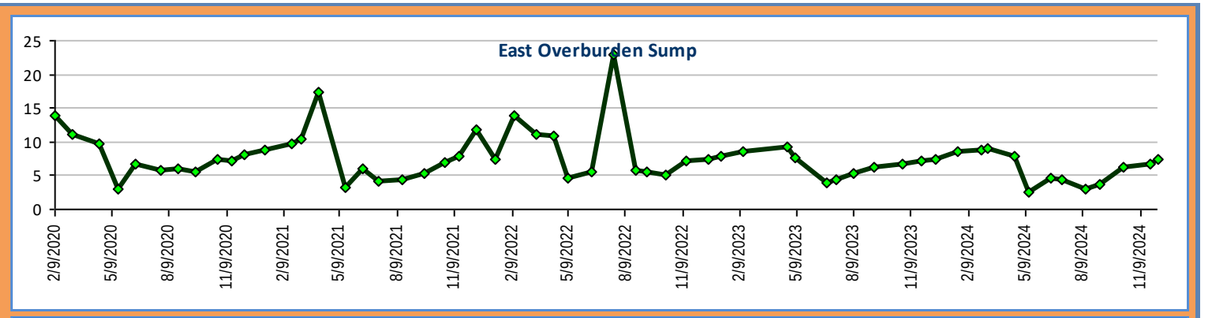


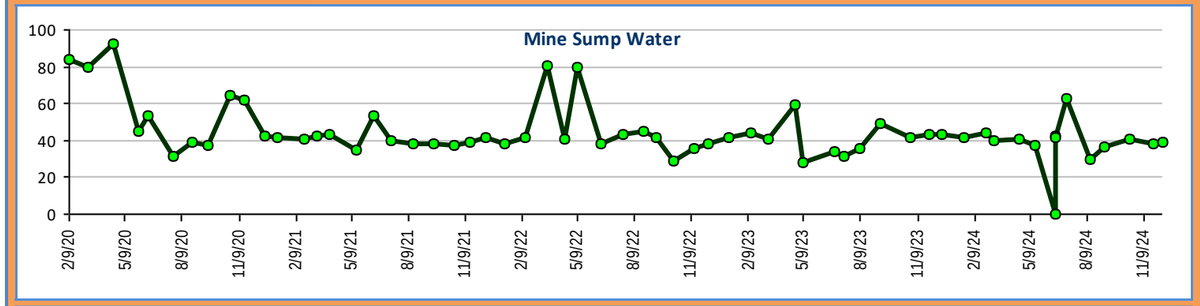


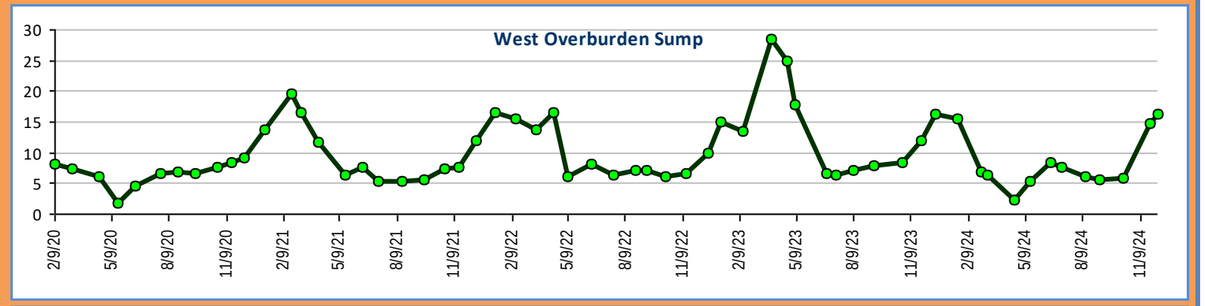
RED DOG MINE

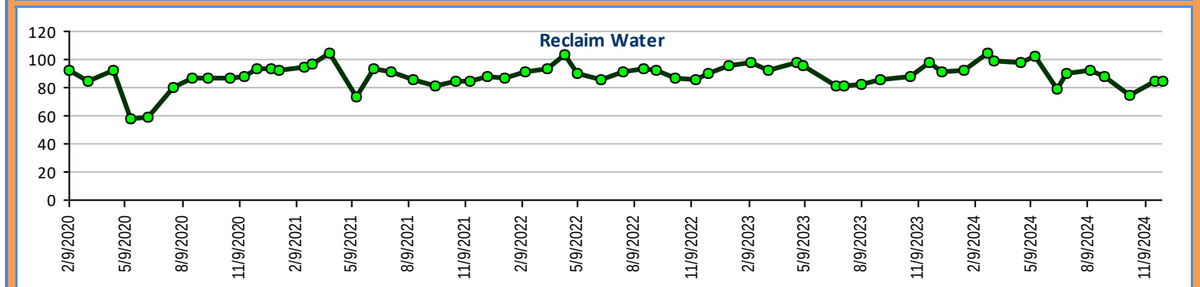
Mine Water Monitoring - Water Quality Profile II, Trend Charts

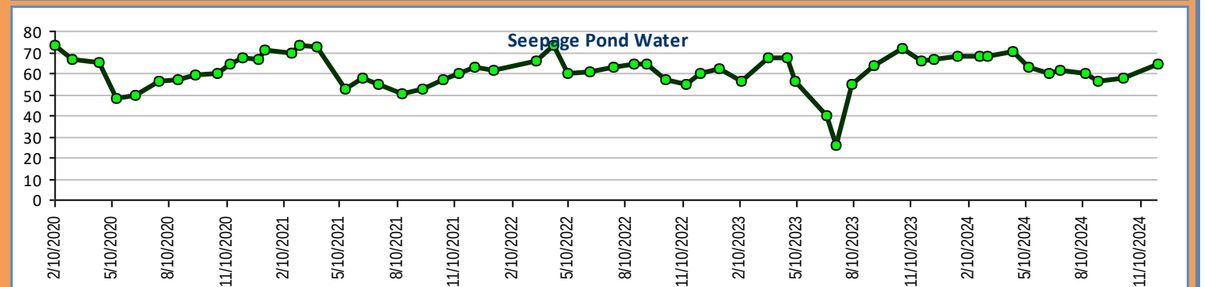
Sodium, dissolved, units mg/L



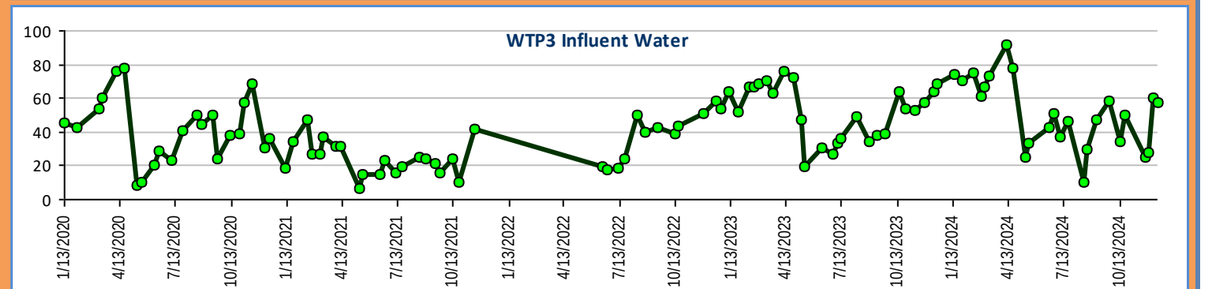


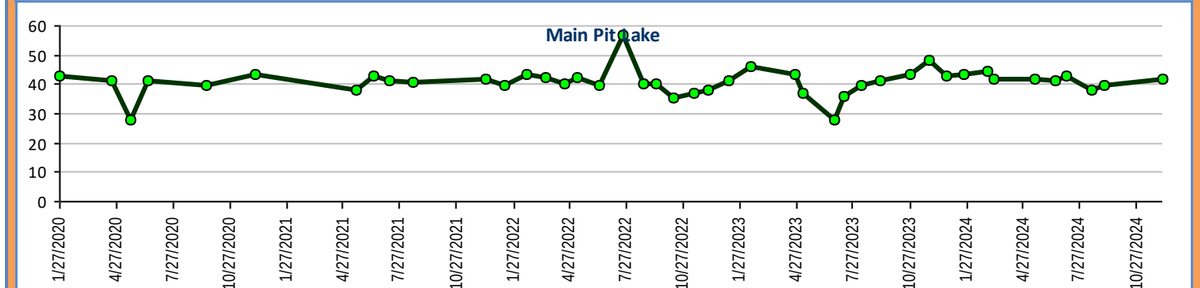


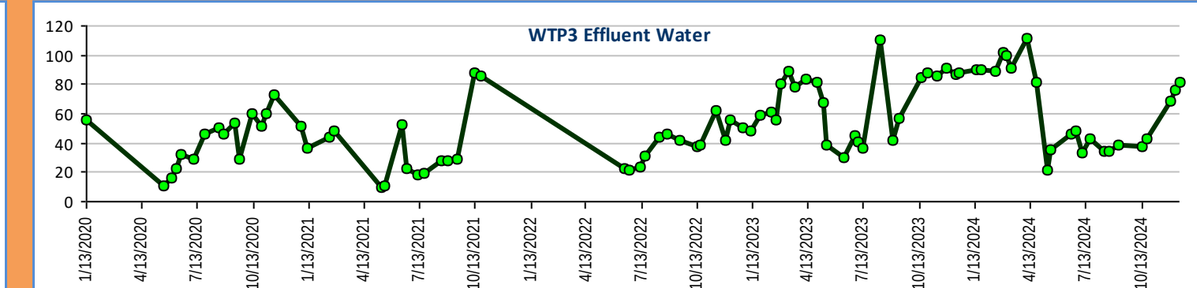








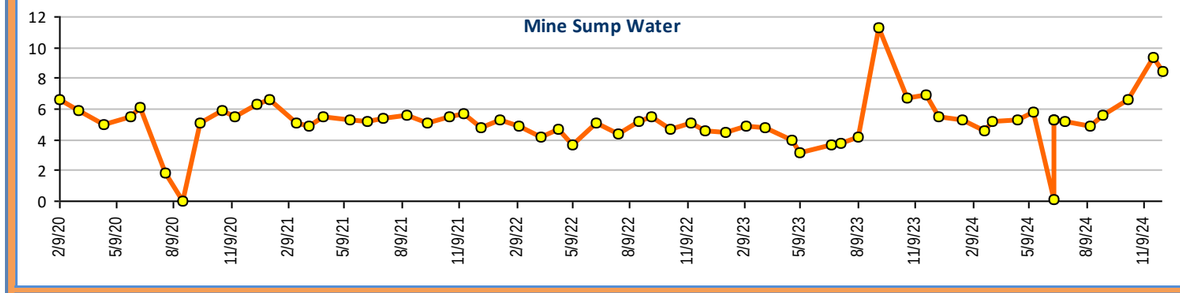


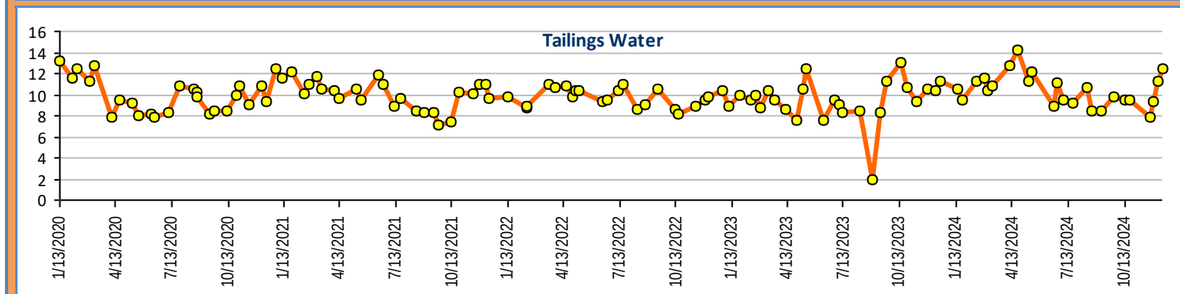


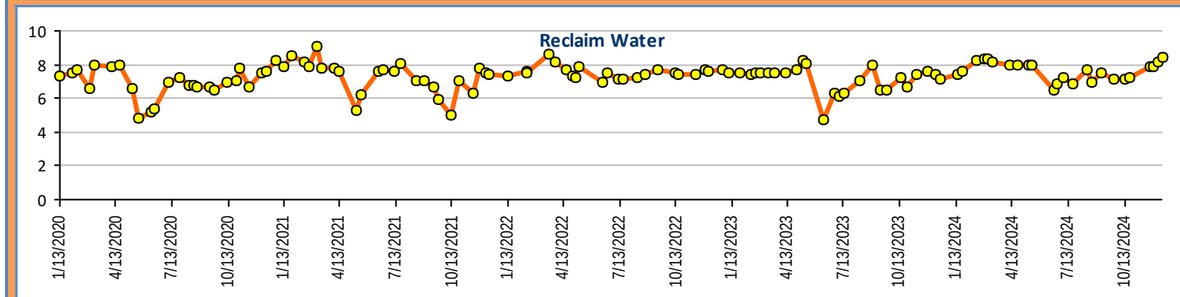
RED DOG MINE

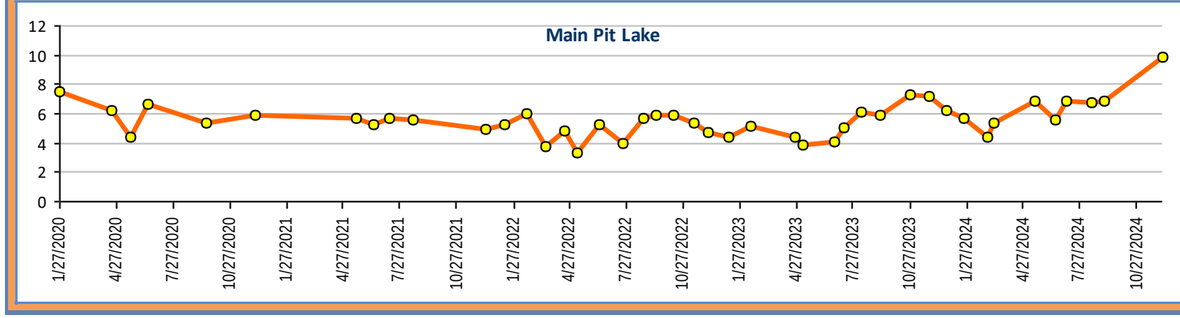
Mine Water Monitoring - Water Quality Profile II, Trend Charts

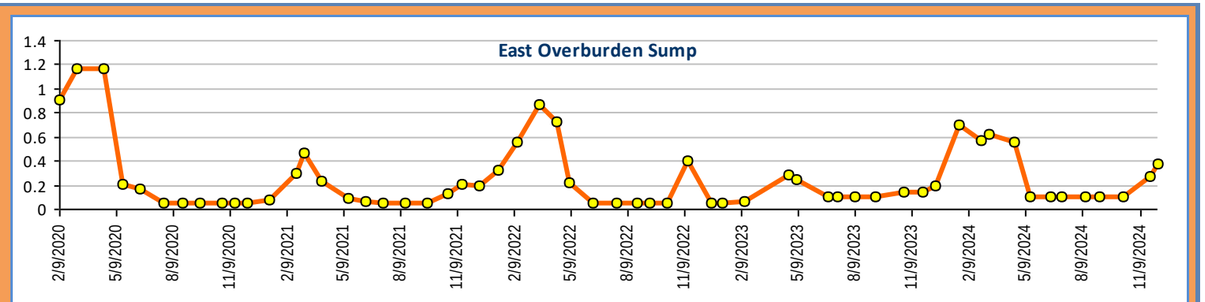
Ammonia as N, units mg/L

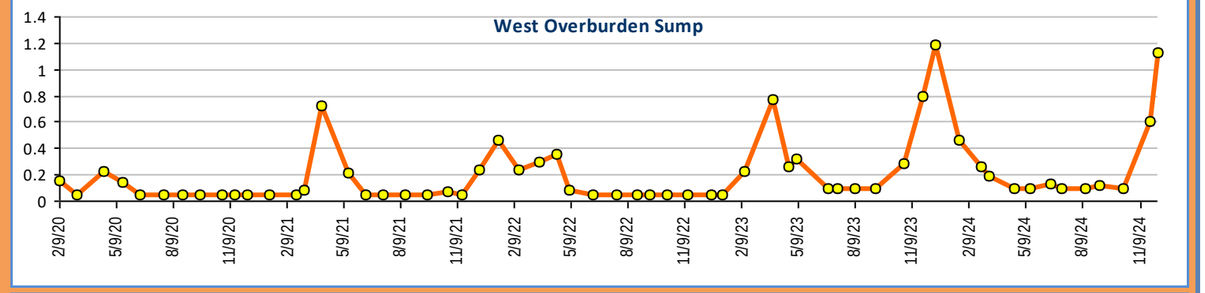


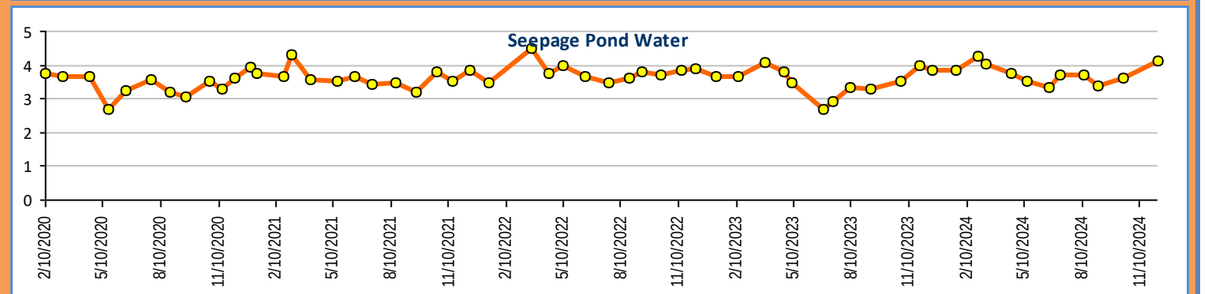


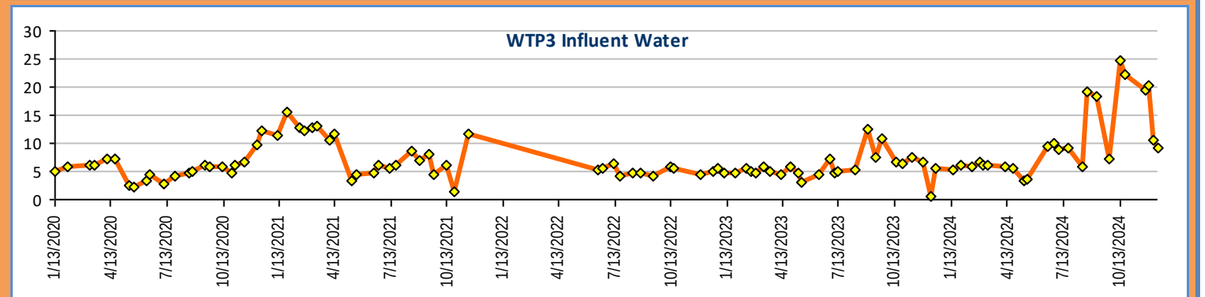


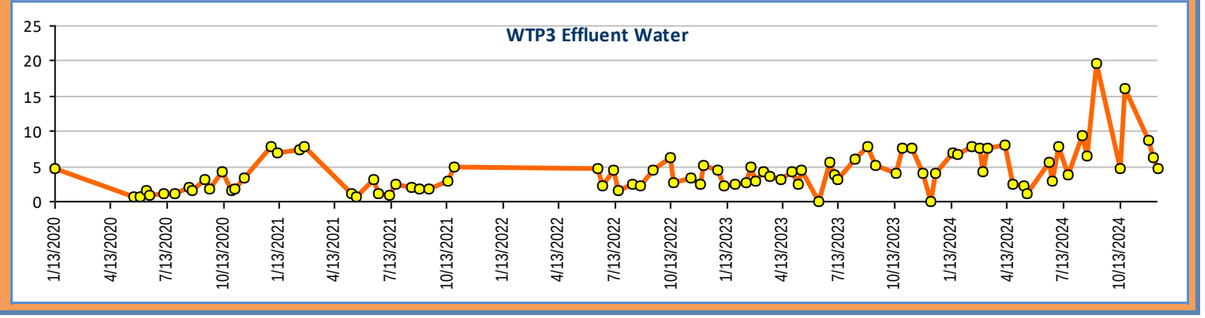








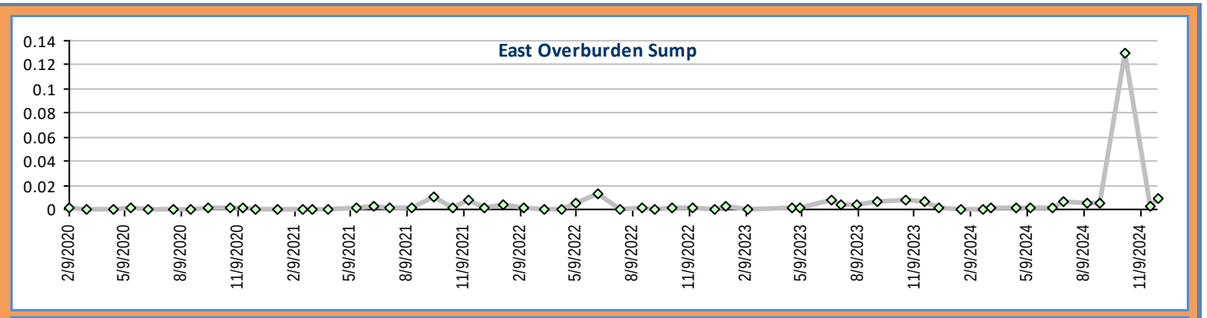


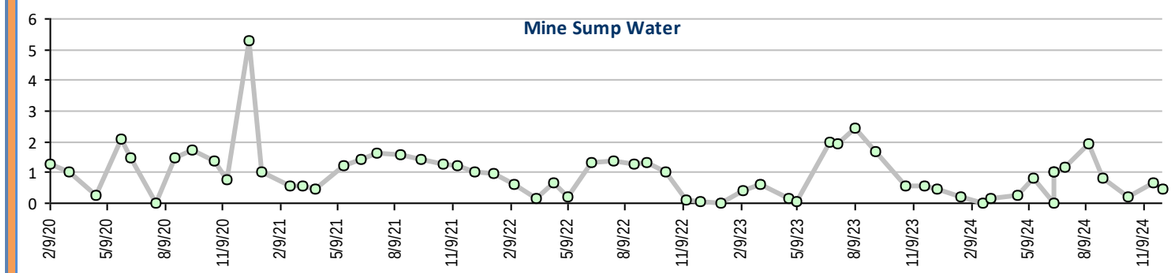


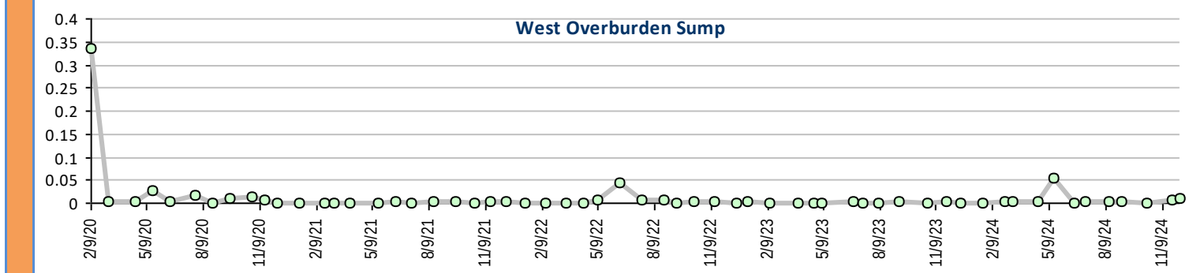
RED DOG MINE

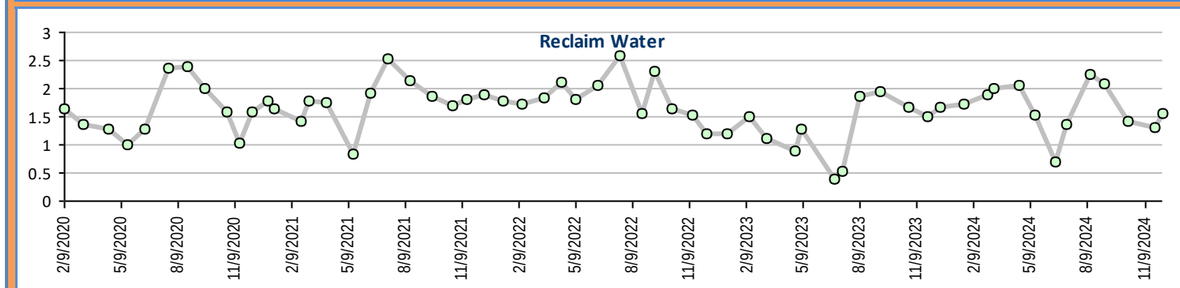
Mine Water Monitoring - Water Quality Profile II, Trend Charts

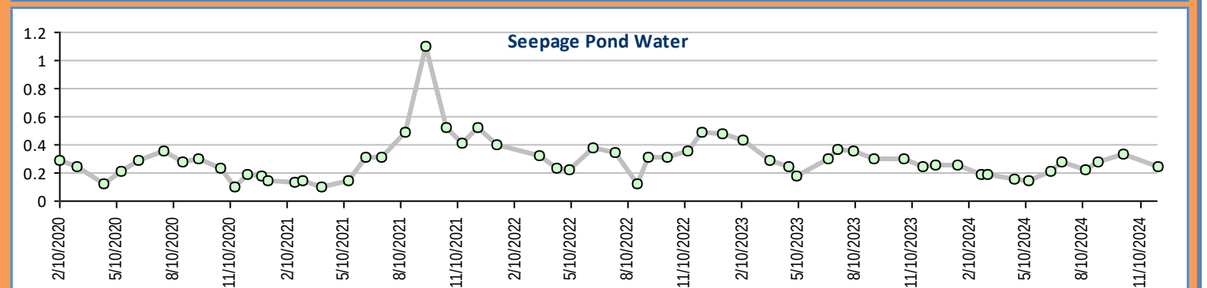
Lead, dissolved, units mg/L

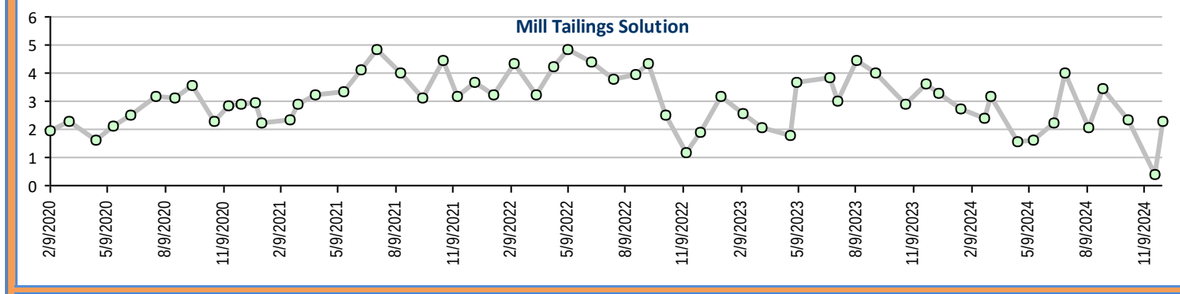


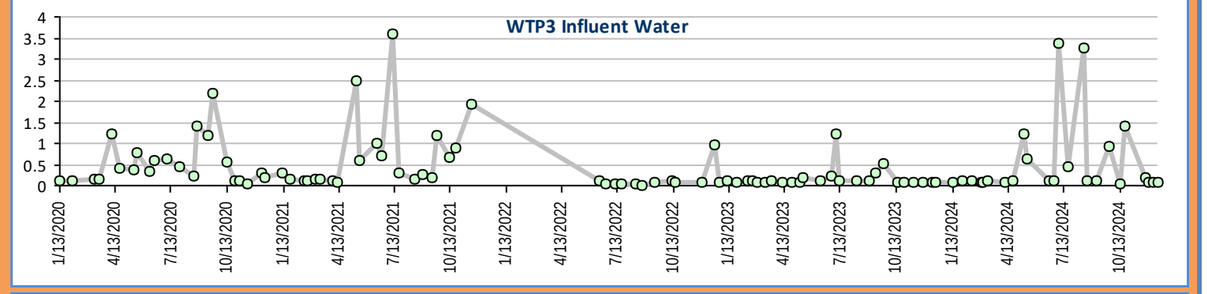


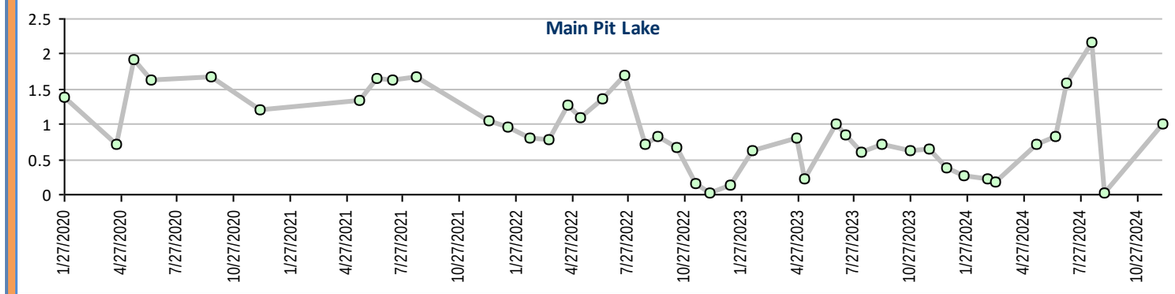


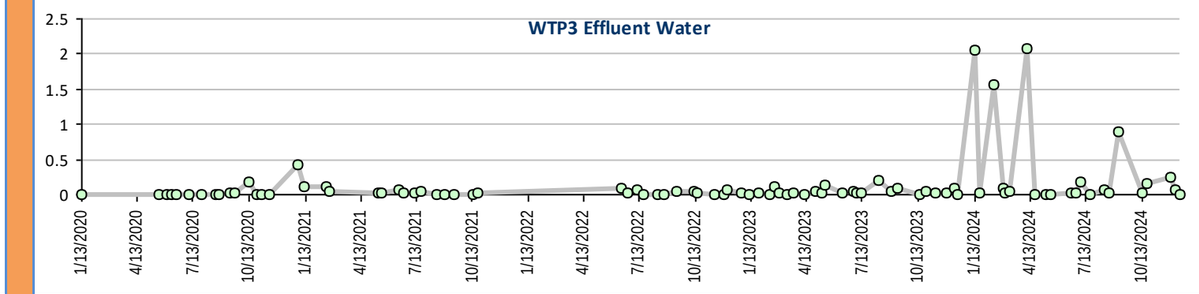








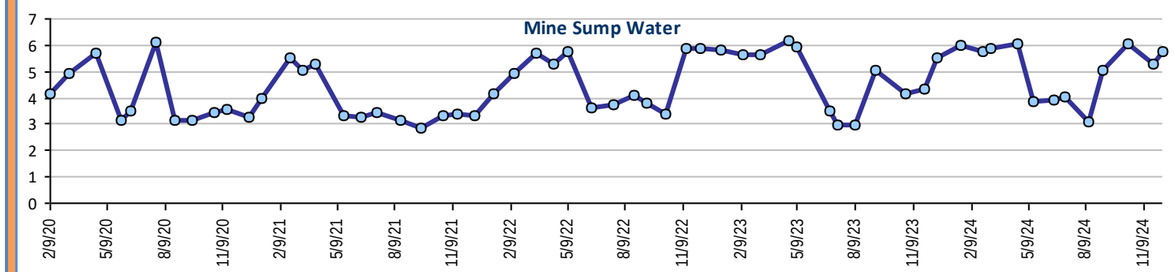


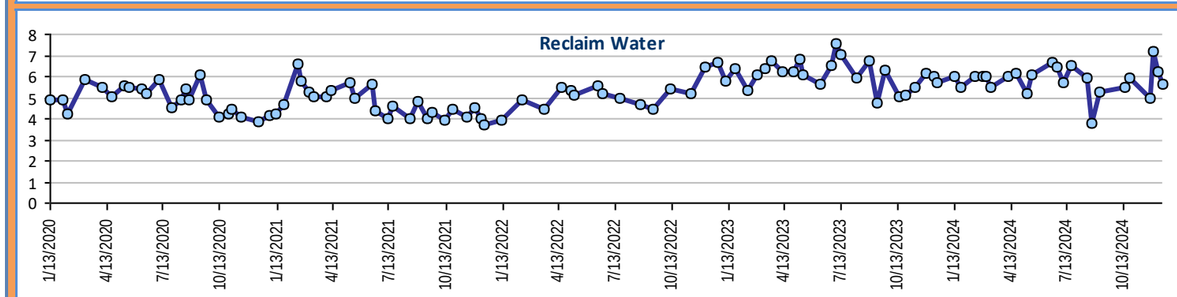


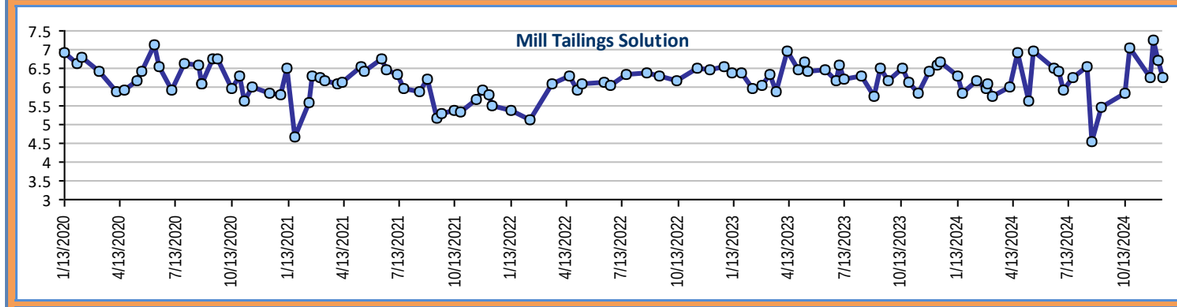
RED DOG MINE

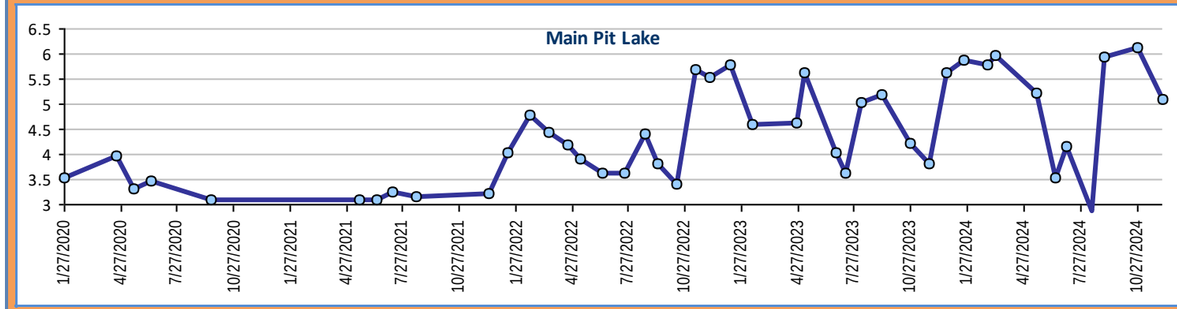
Mine Water Monitoring - Water Quality Profile II, Trend Charts

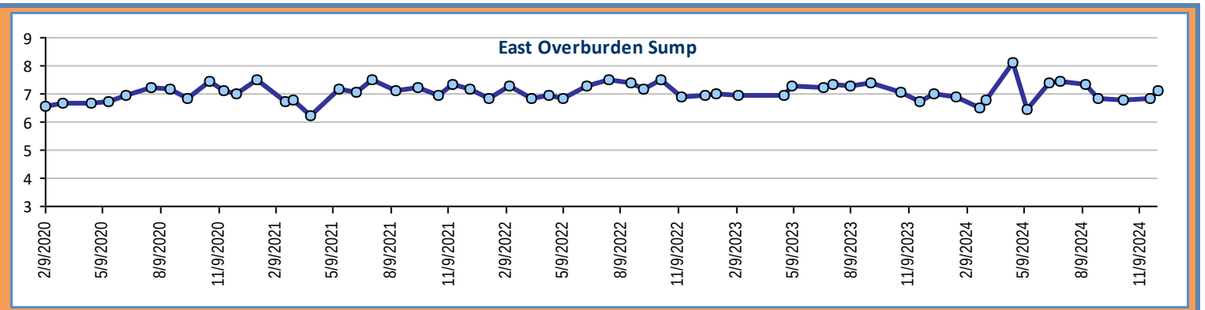
pH, units

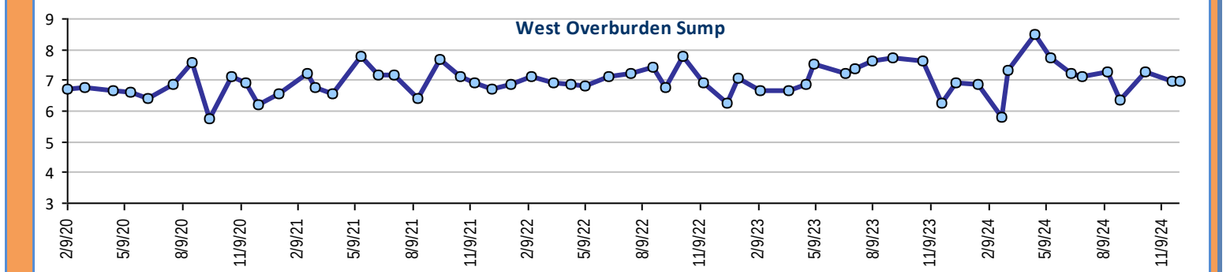


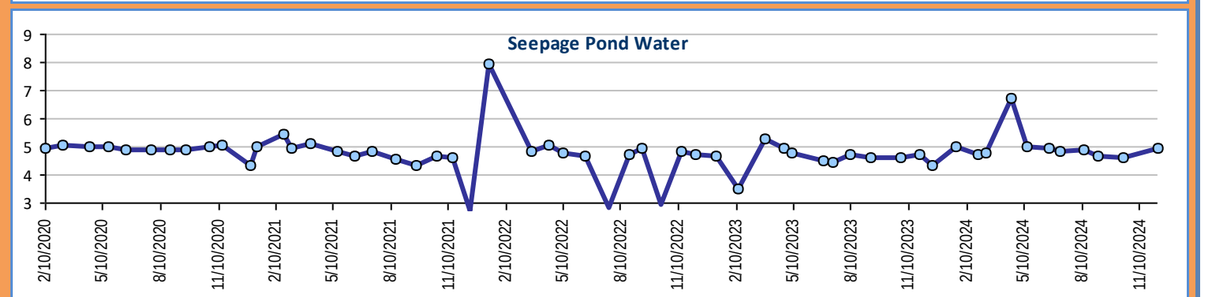


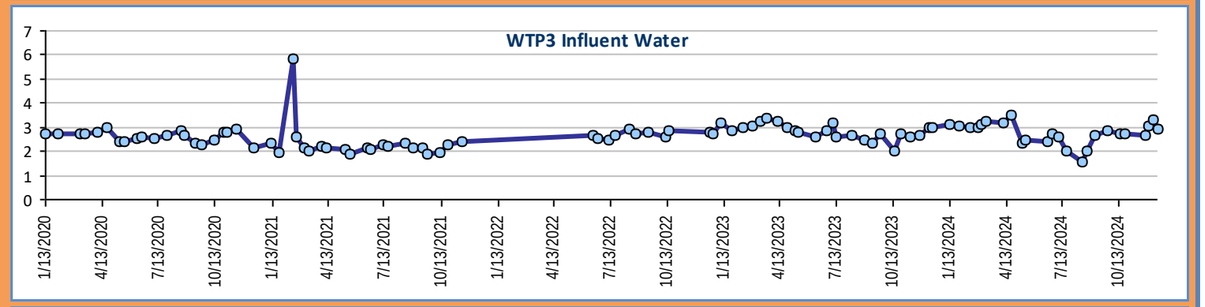


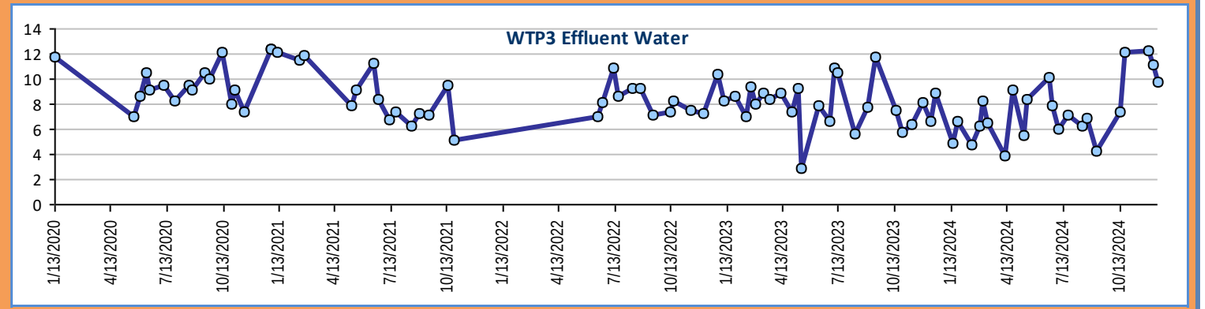








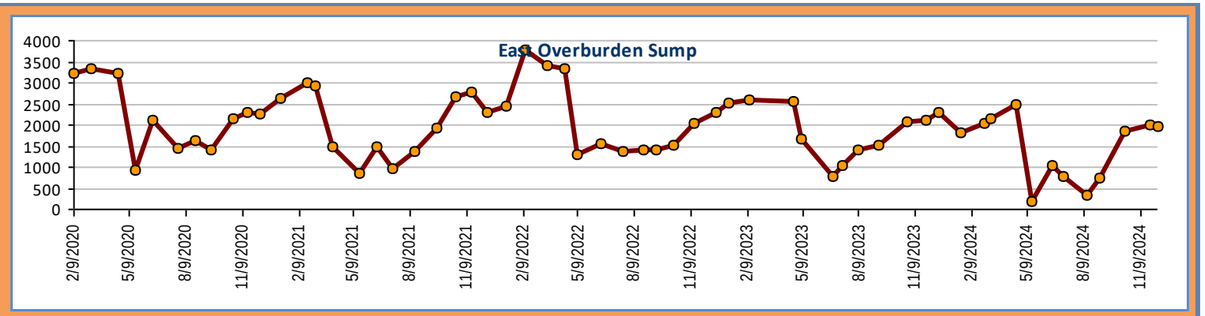


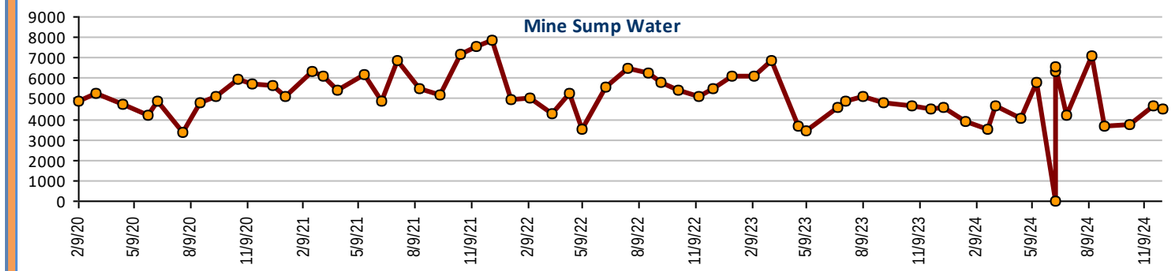


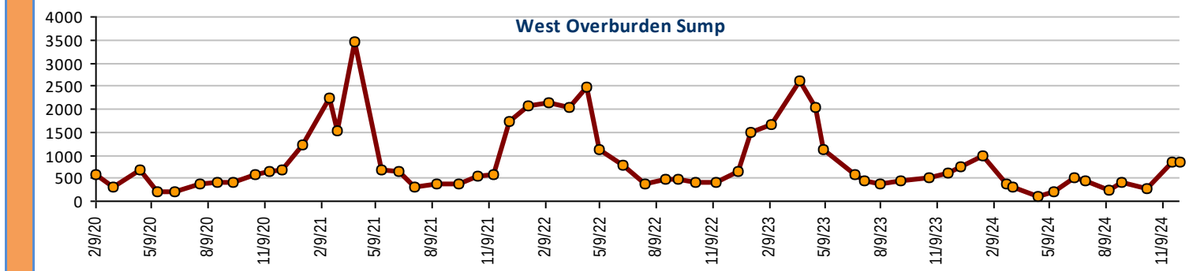
RED DOG MINE

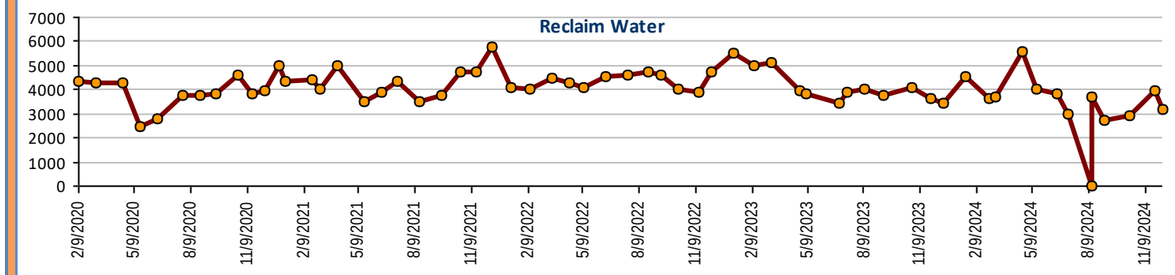
Mine Water Monitoring - Water Quality Profile II, Trend Charts

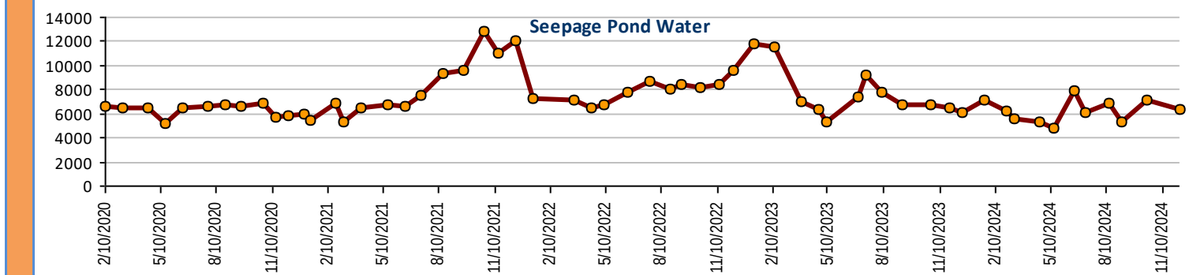
Sulfate, units mg/L

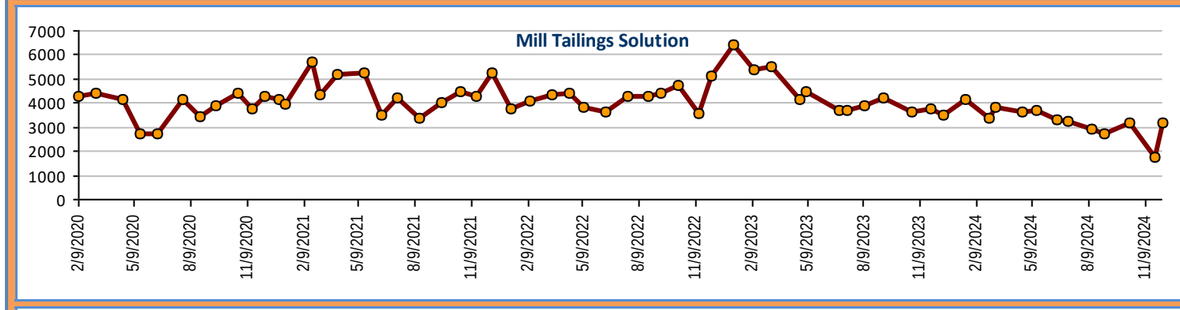


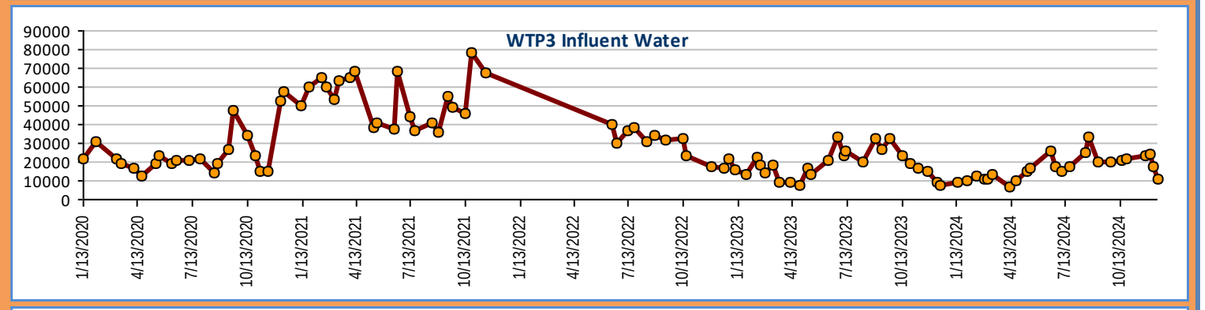


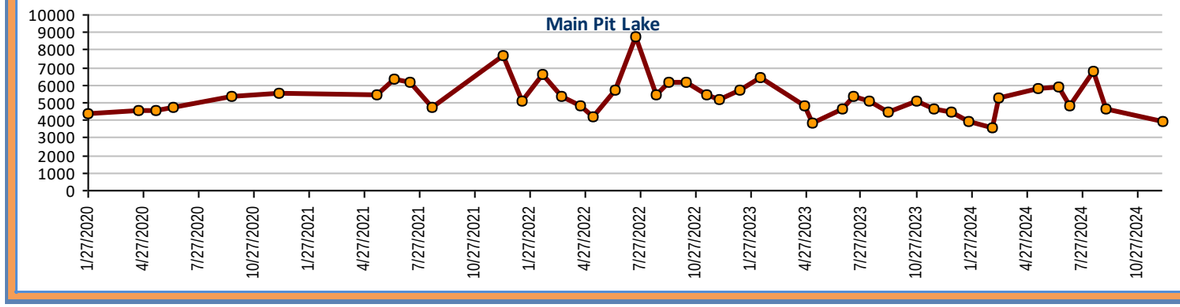


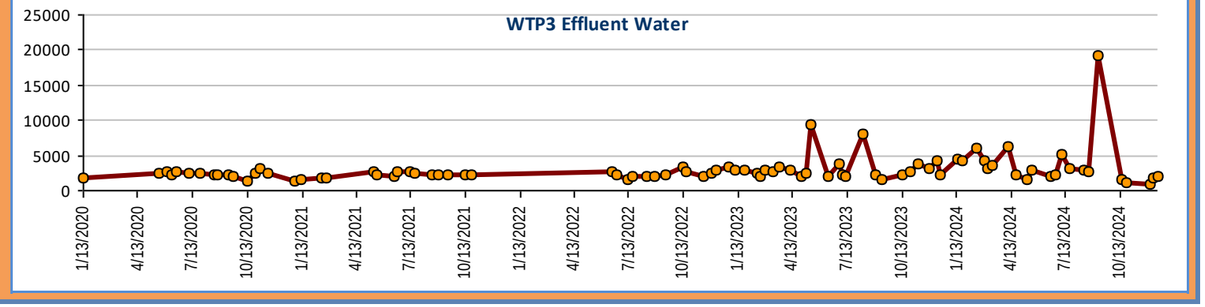








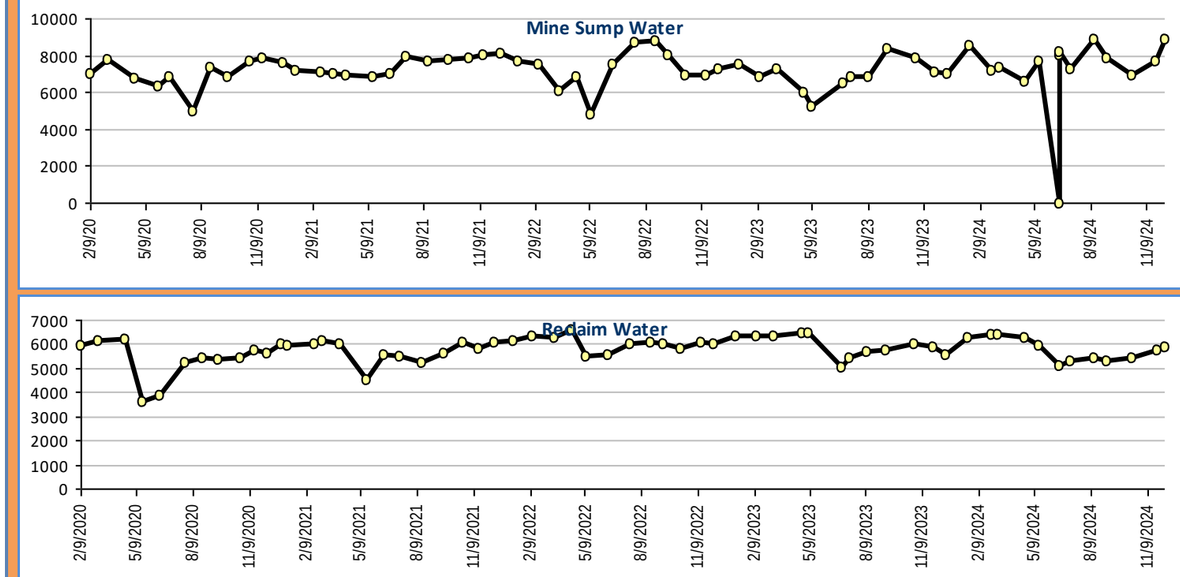


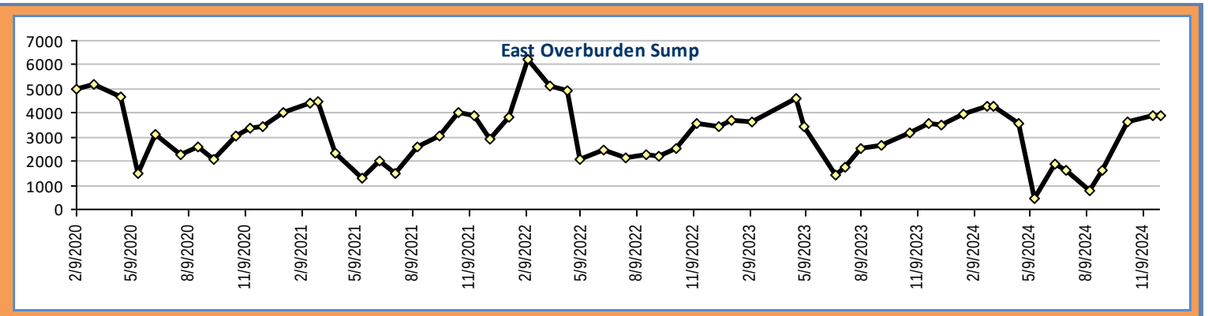


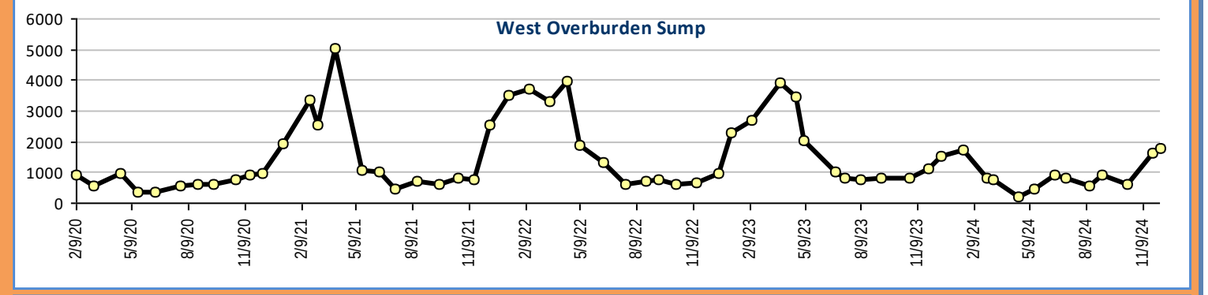
RED DOG MINE

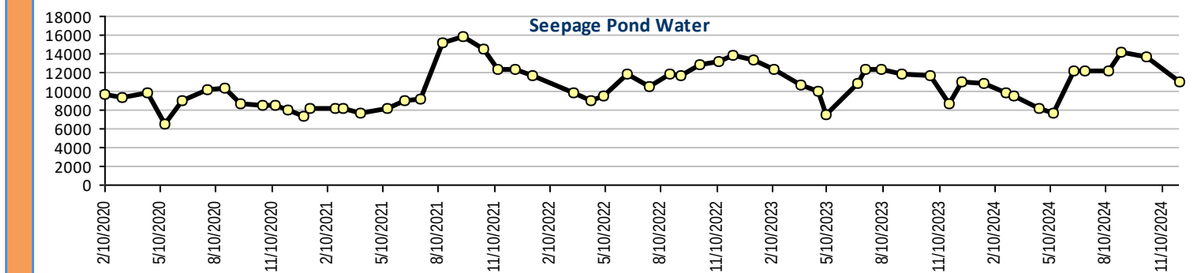
Mine Water Monitoring - Water Quality Profile II, Trend Charts

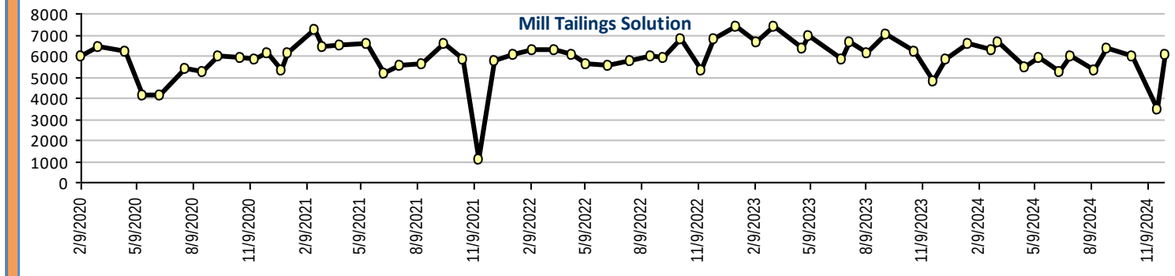
Total Dissolved Solids, units, mg/L

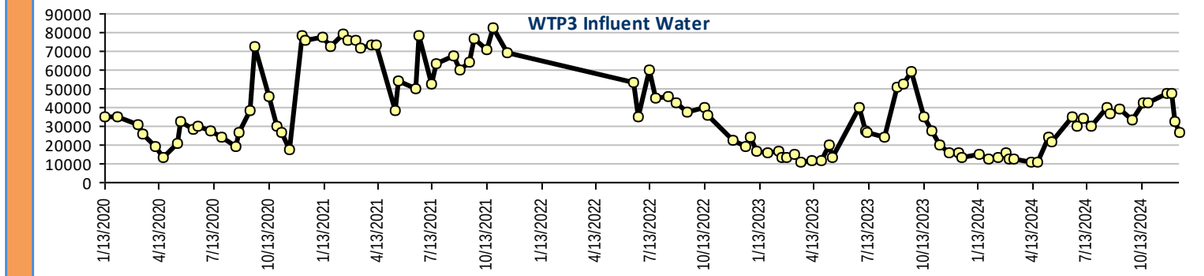


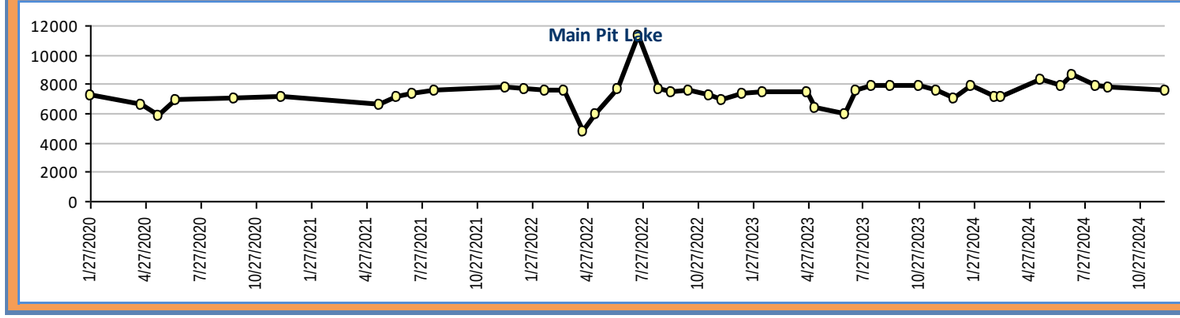


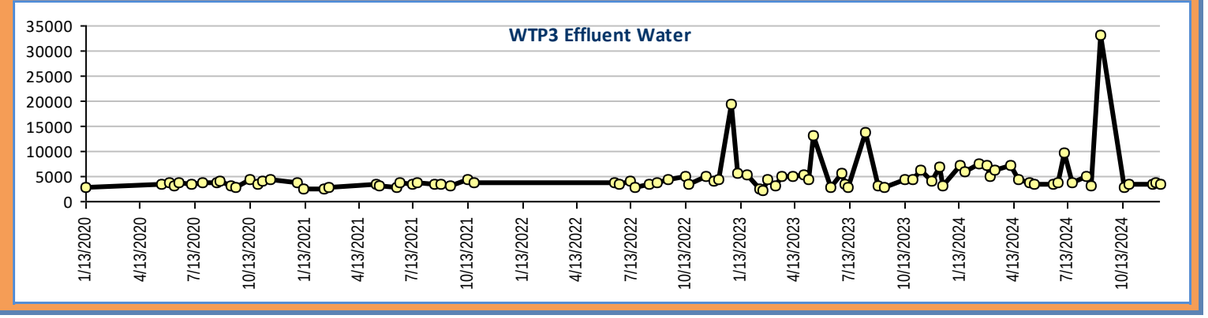








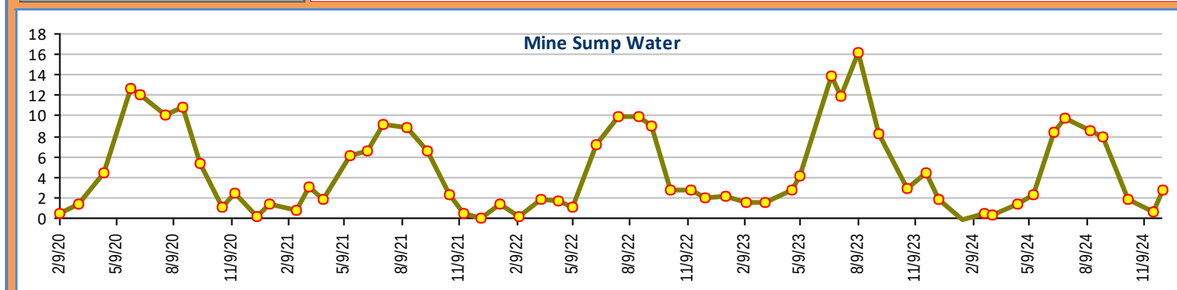


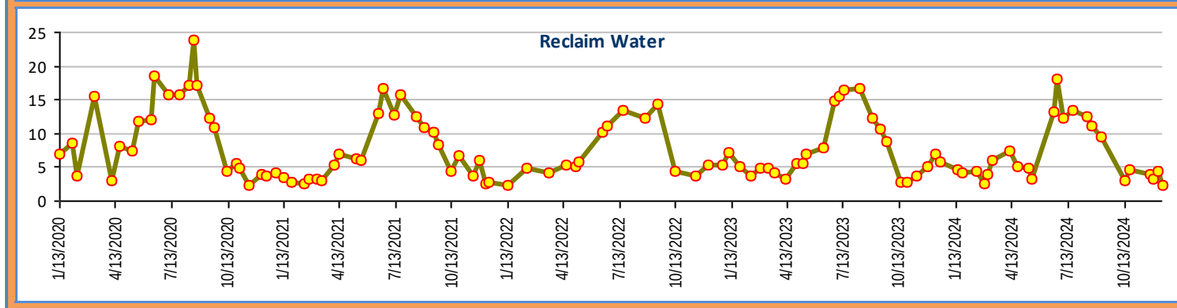


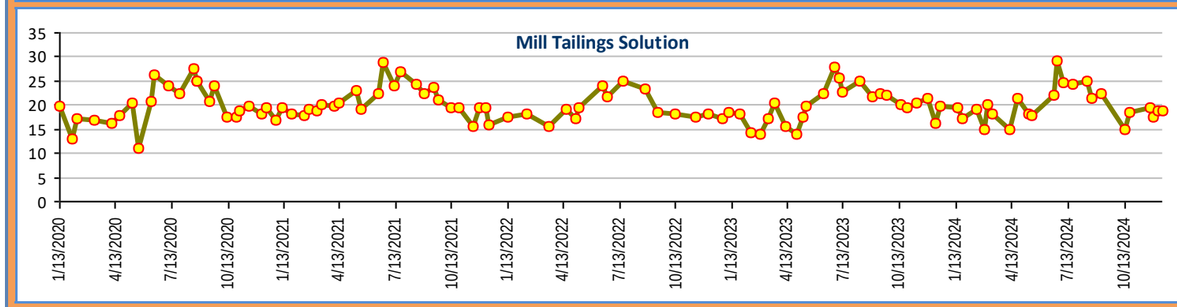
RED DOG MINE

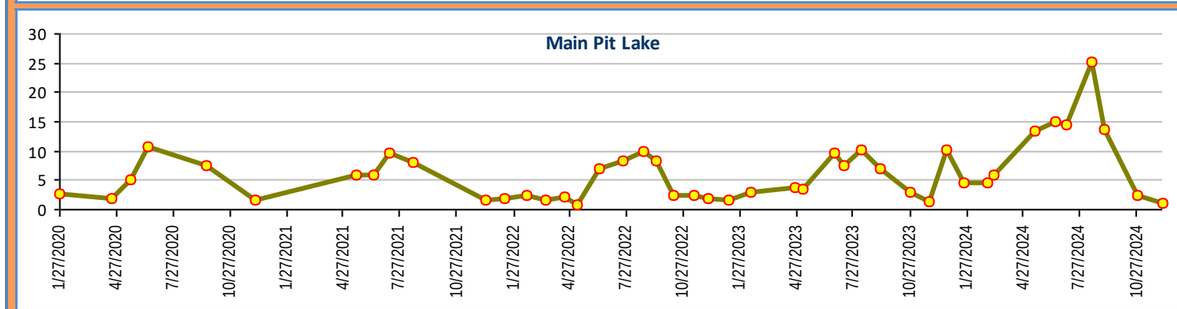
Mine Water Monitoring - Water Quality Profile II, Trend Charts

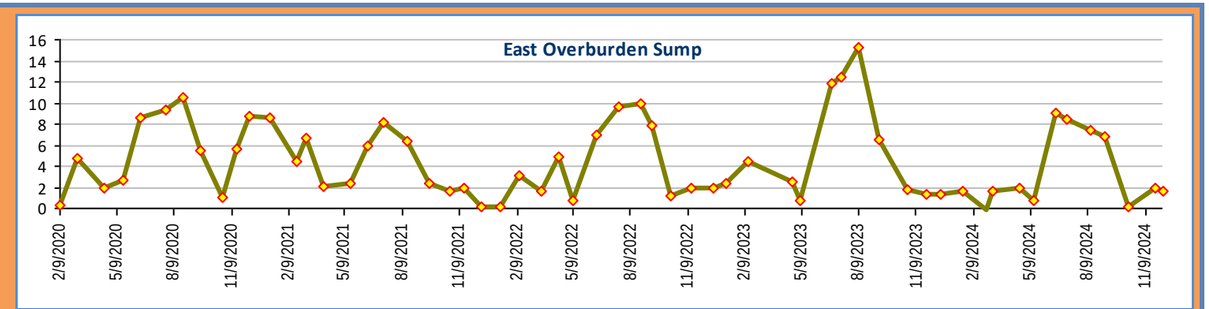
Temperature, Celsius

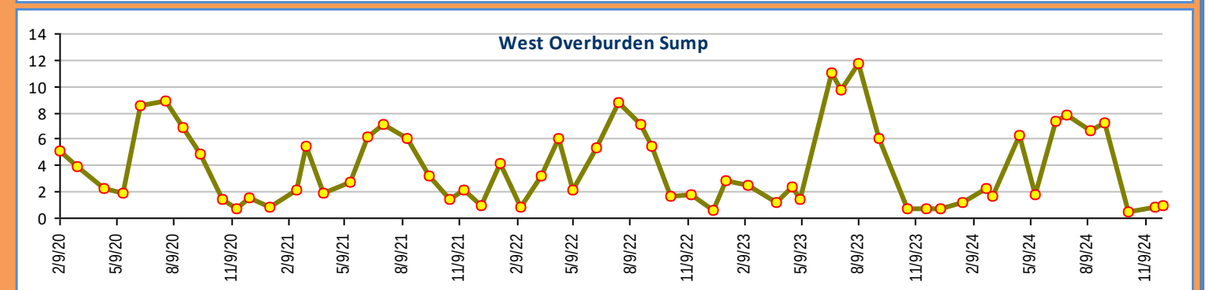


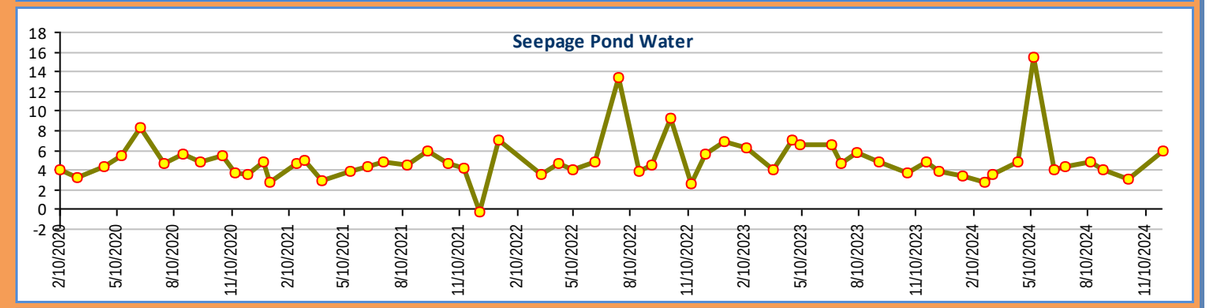


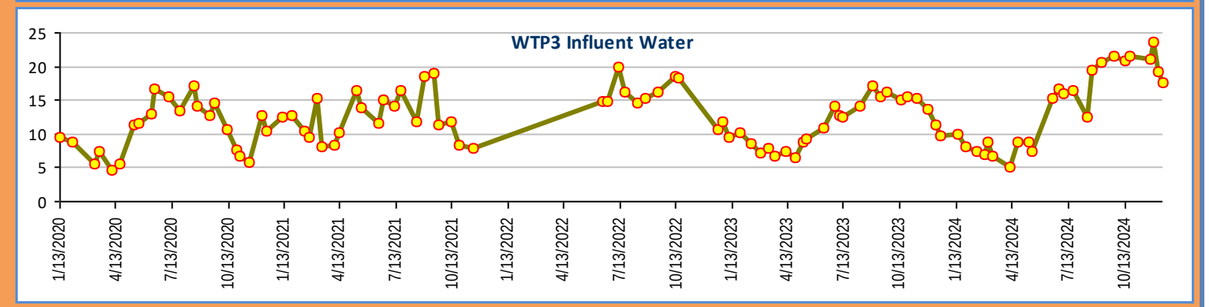


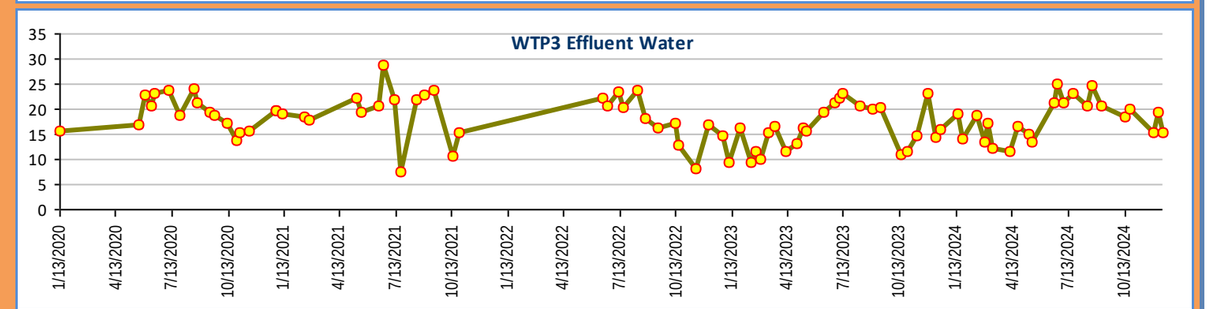












Appendix D: Water Quality Profile I Charts – Mine Drainage Monitoring Stations

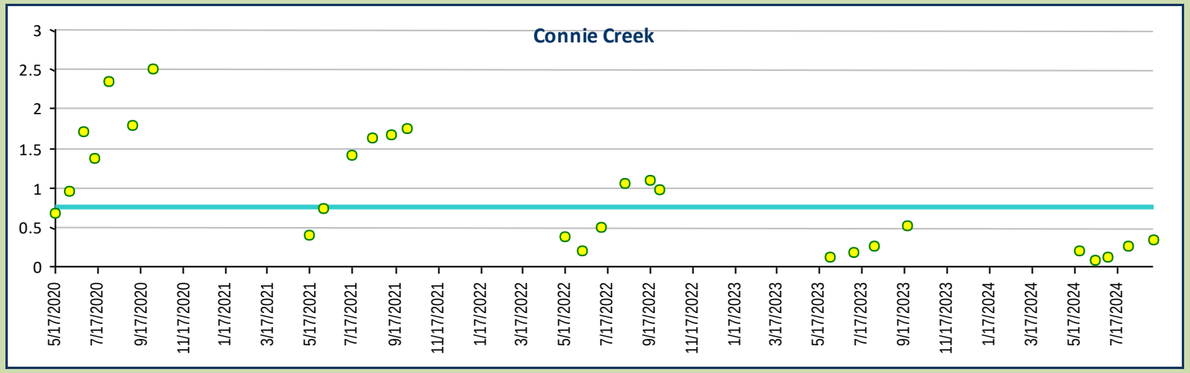
RED DOG MINE

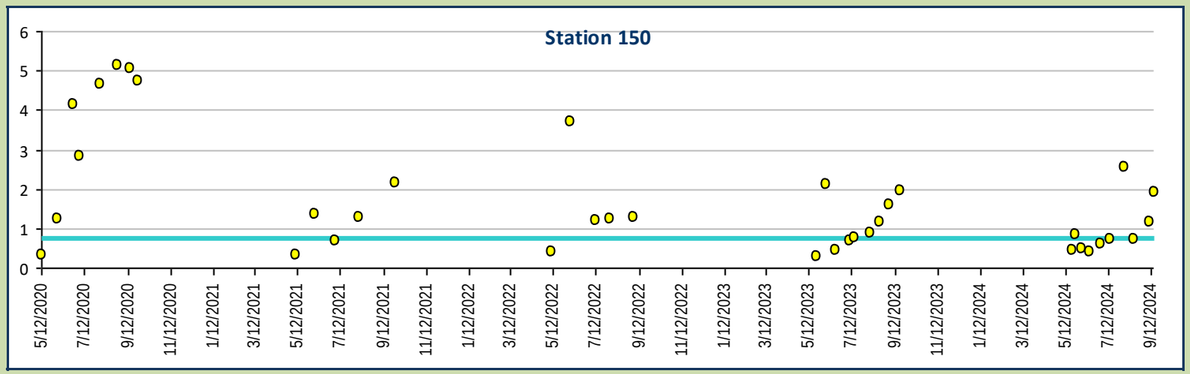
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

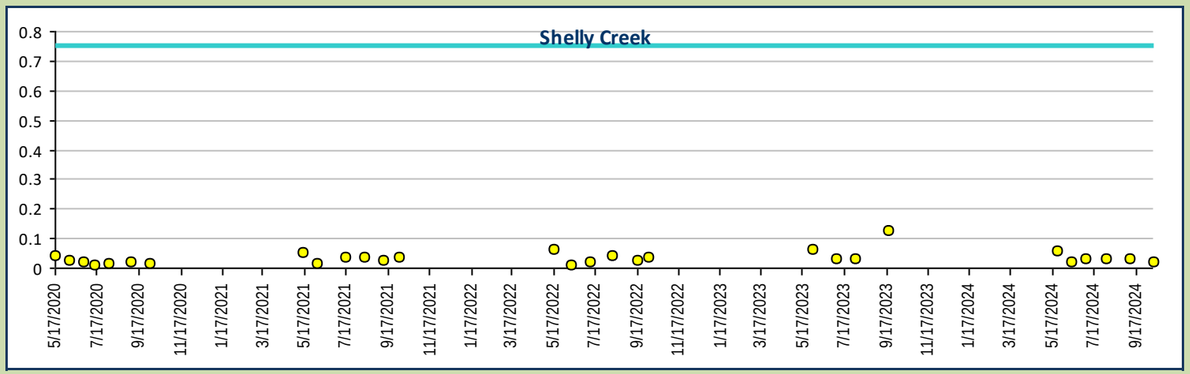
Aluminum, Total recoverable, units mg/L

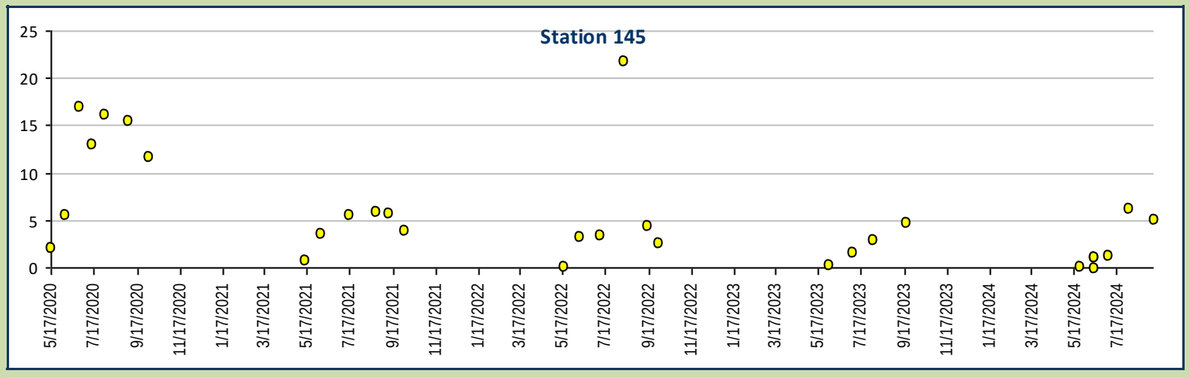
Aquatic Life - Fresh Water Chronic WQS mg/L

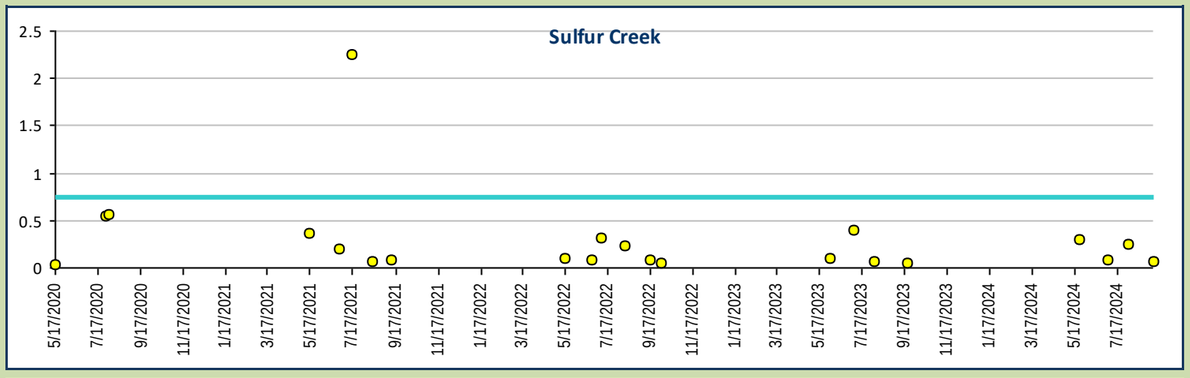
If pH > 7 and hardness > 50. then WQS = 0.75mg/l

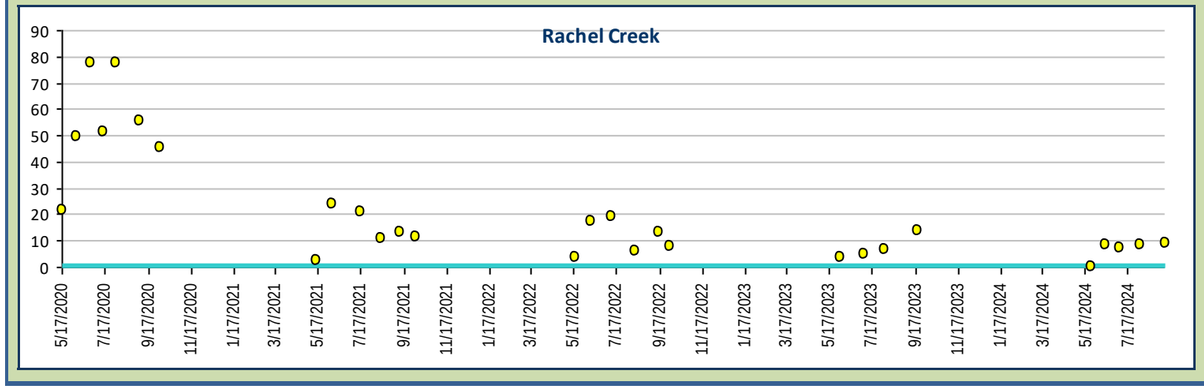


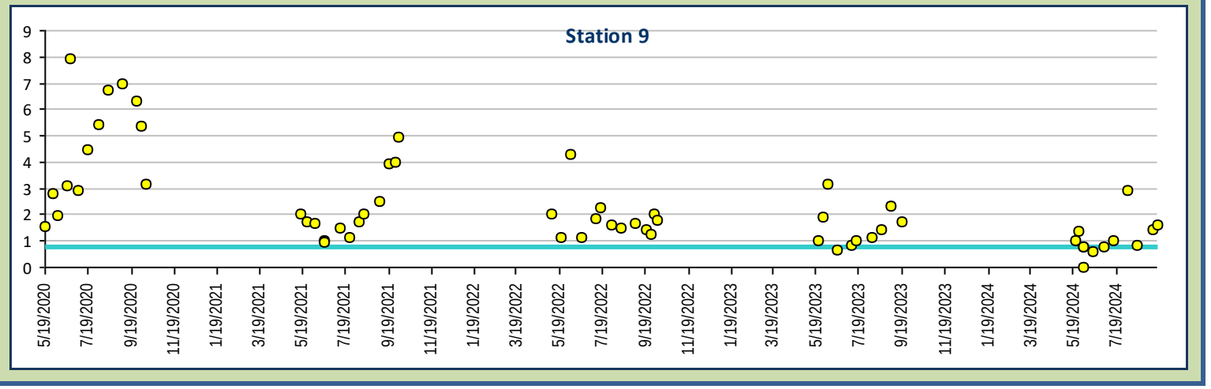












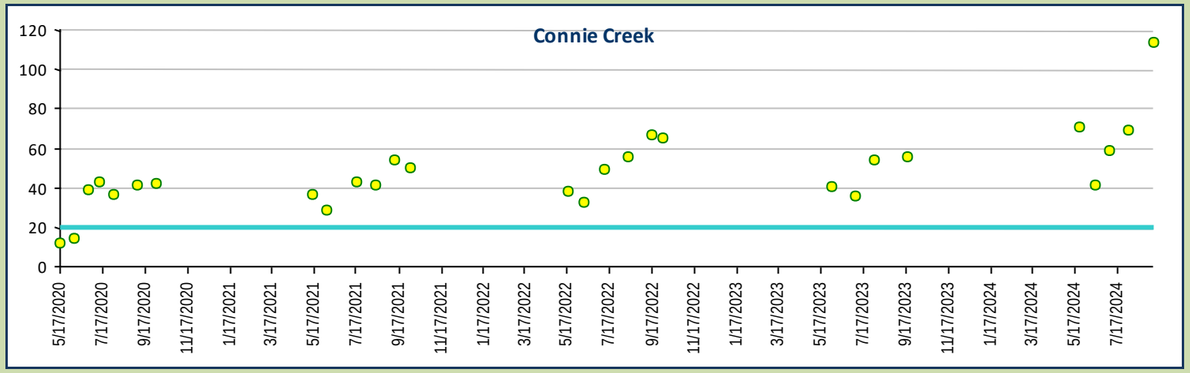
RED DOG MINE

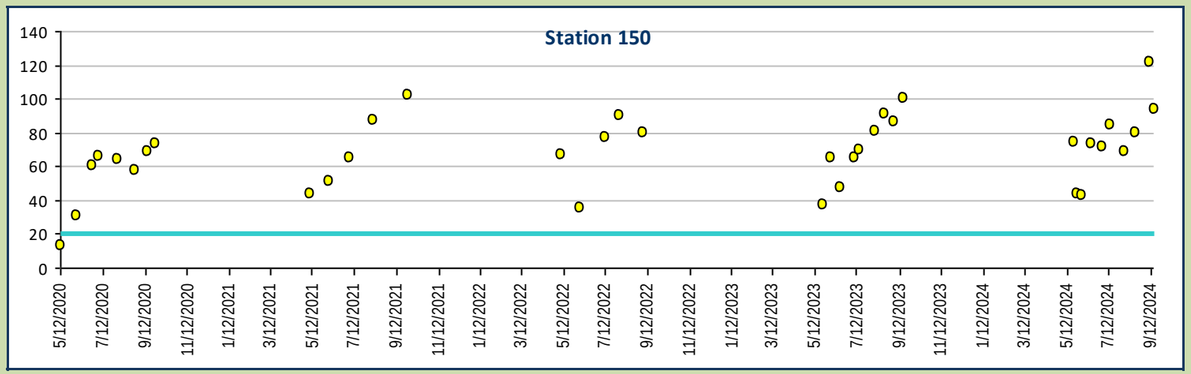
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

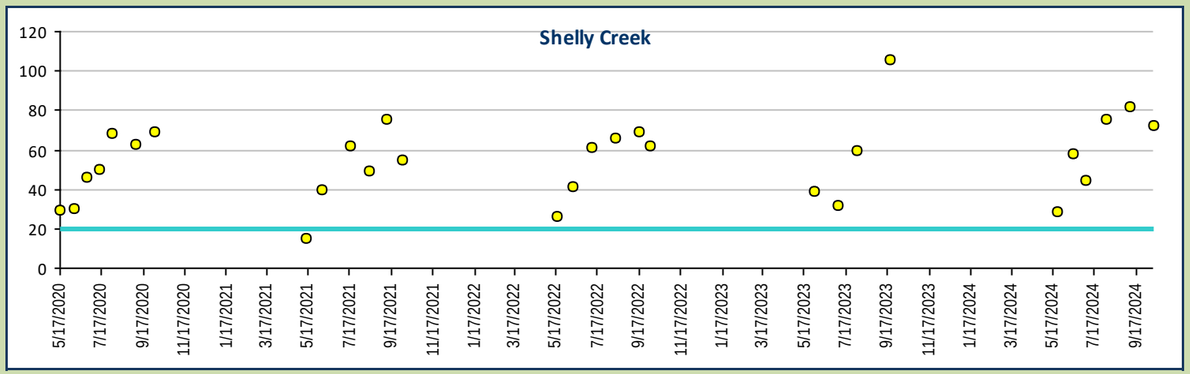
Alkalinity as CaCO3, units mg/L

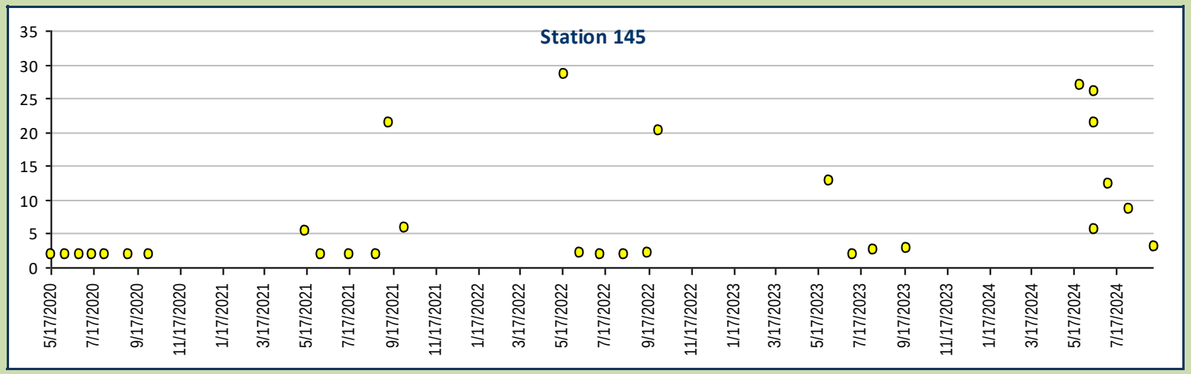
Aquatic Life - Fresh Water Chronic WQS mg/L

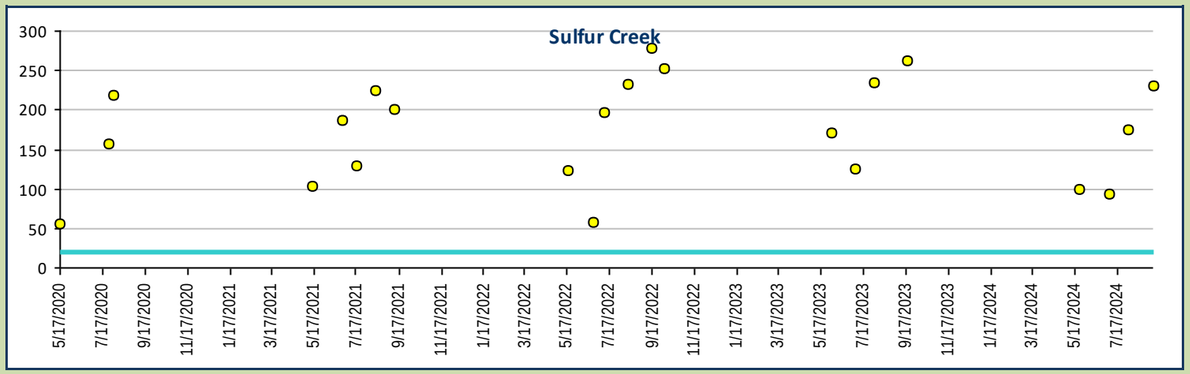
20 mg/L minimum

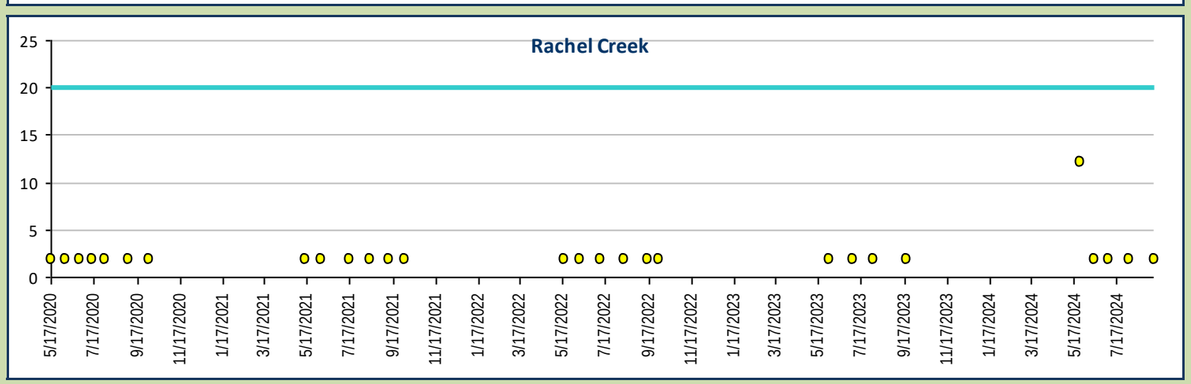


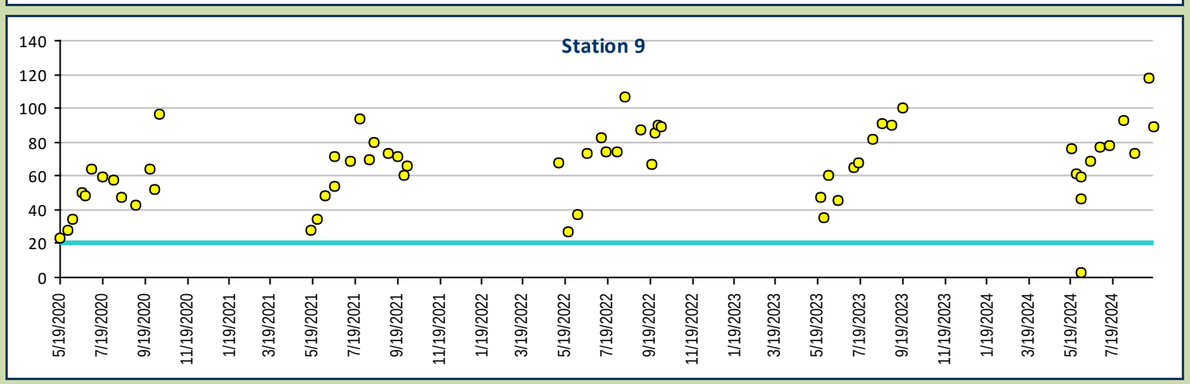








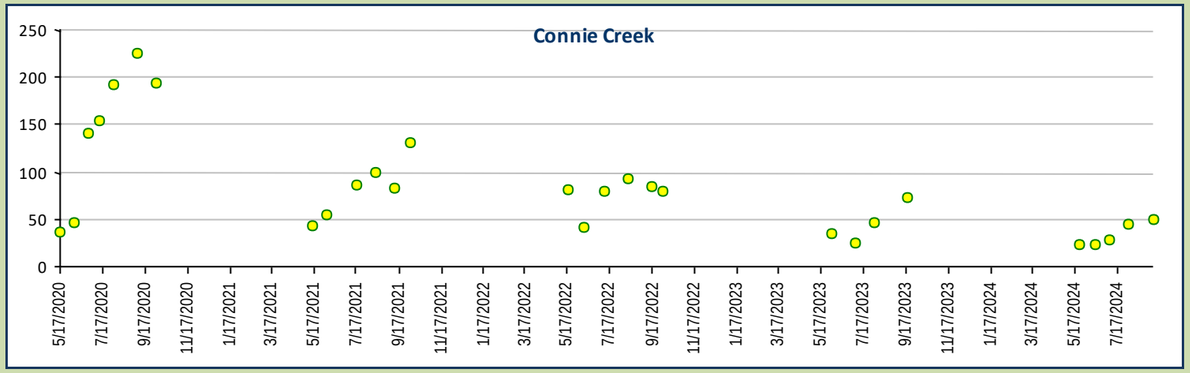


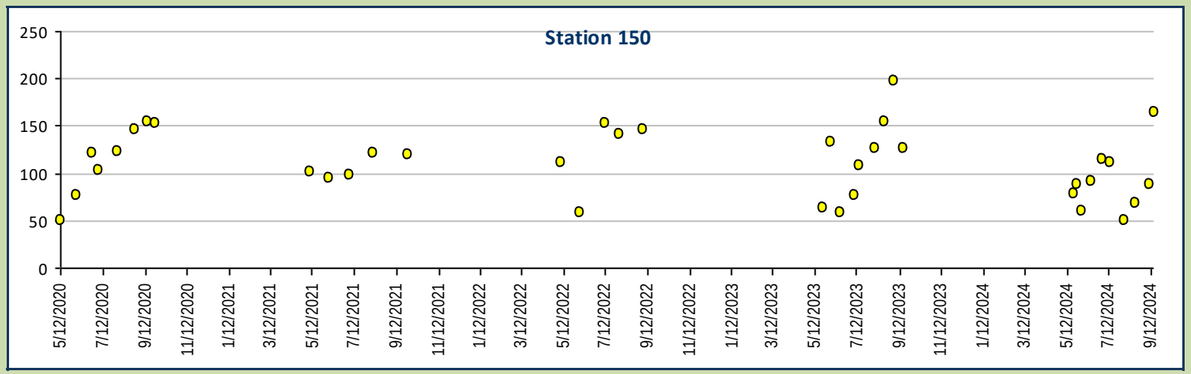


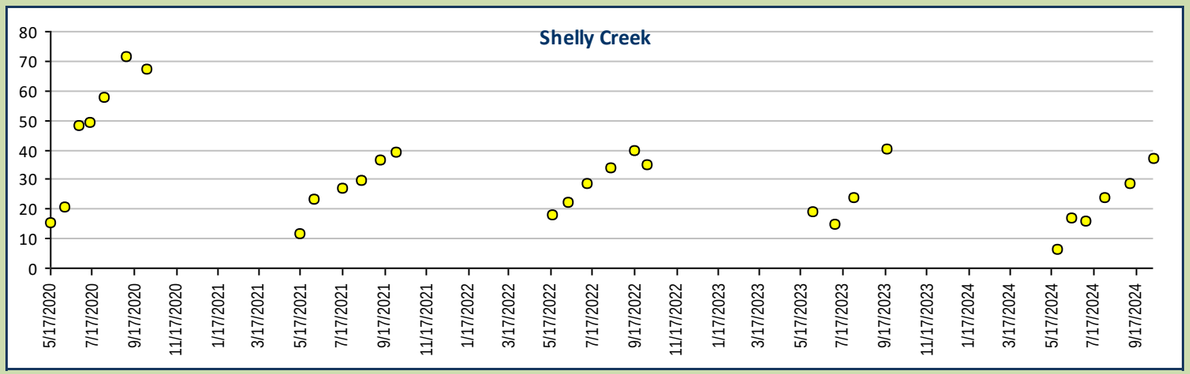
RED DOG MINE

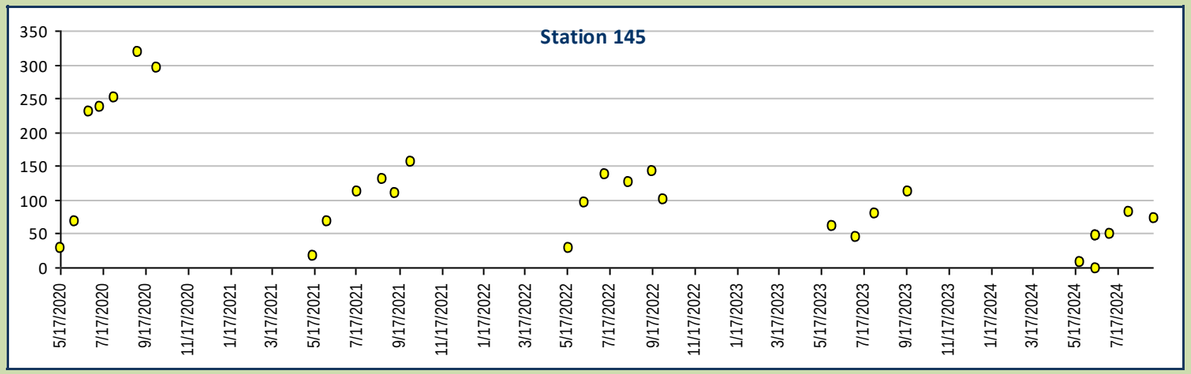
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

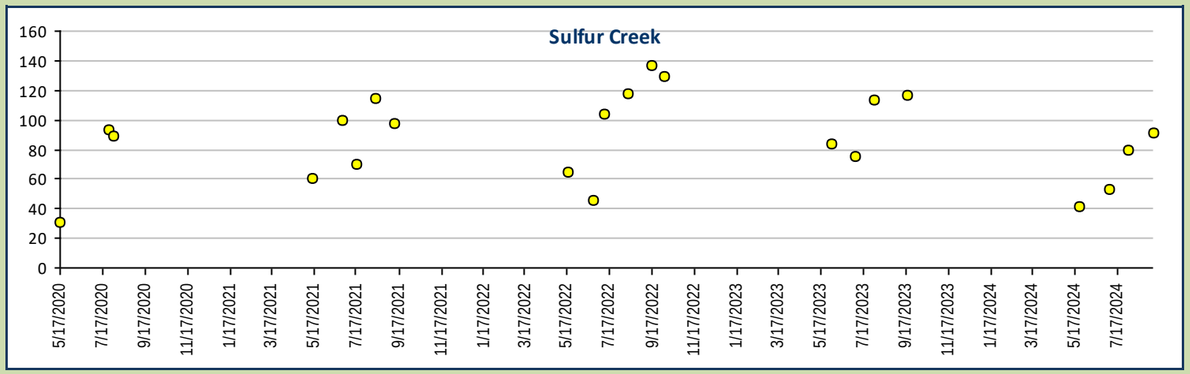
Calcium, Total recoverable, units mg/L

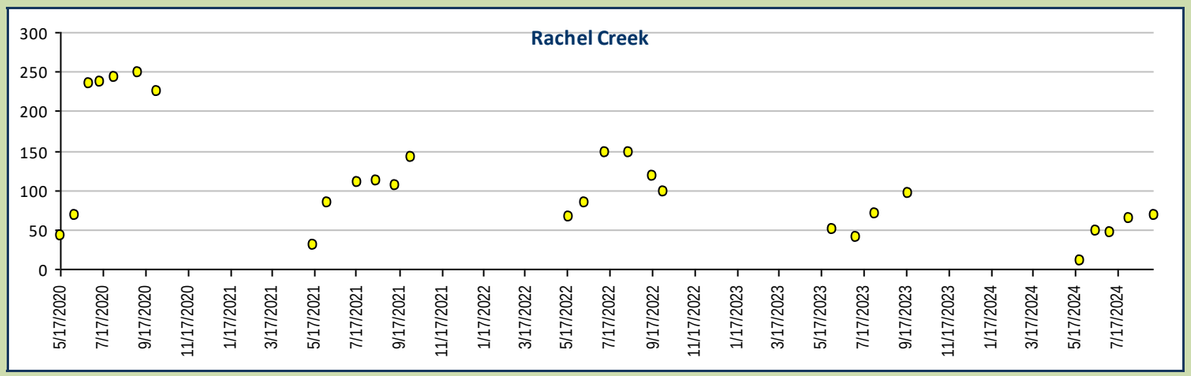


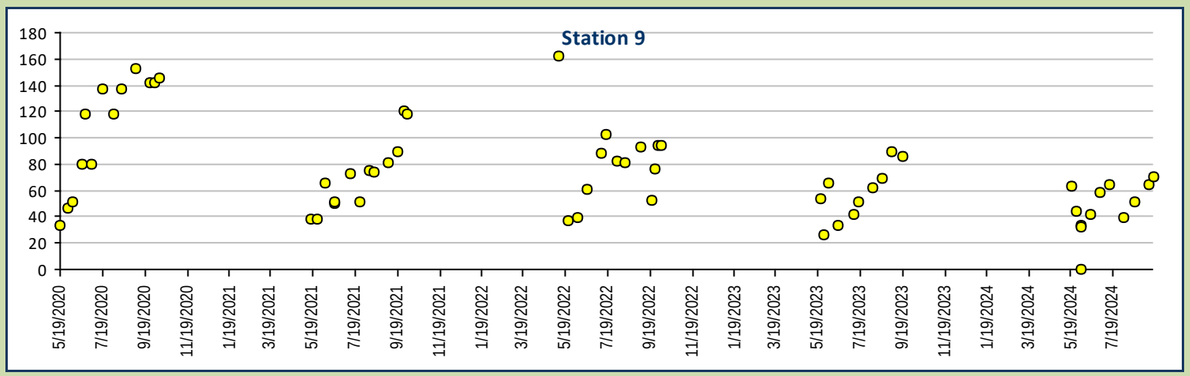












RED DOG MINE

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

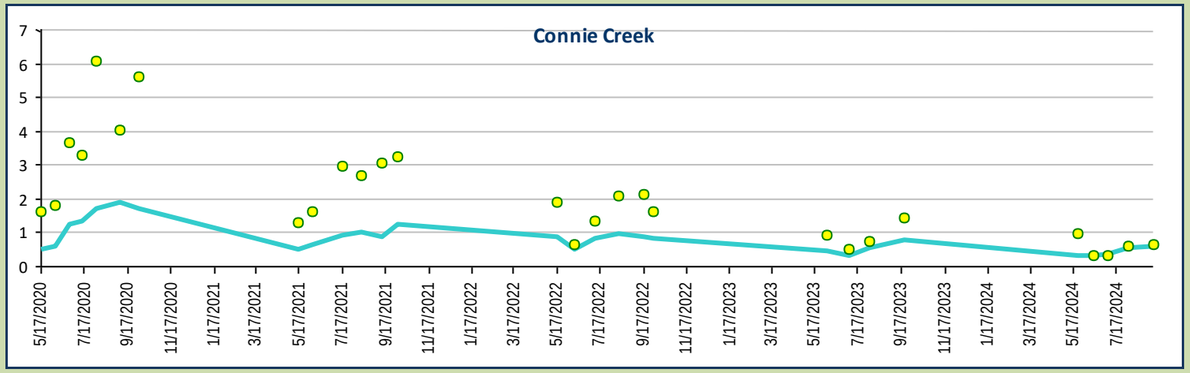
Cadmium, Total Recoverable, units ug/L

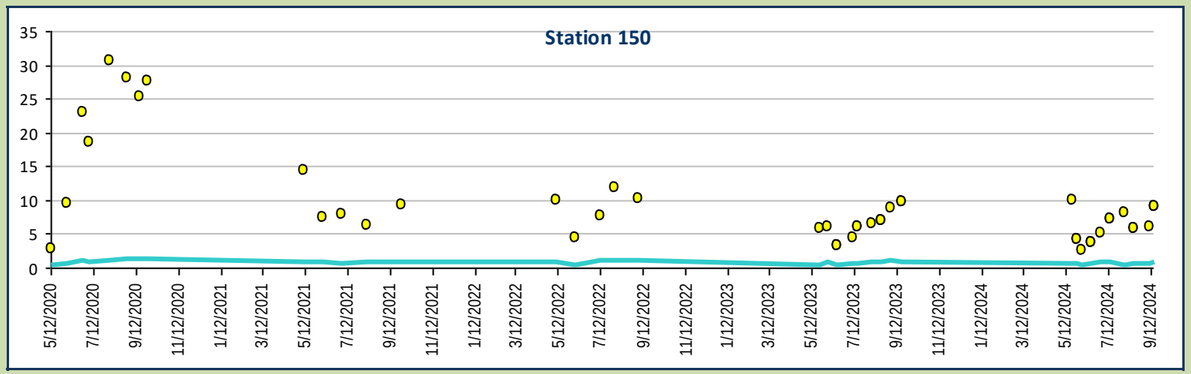
Aquatic Life - Fresh Water Chronic WQS ug/L

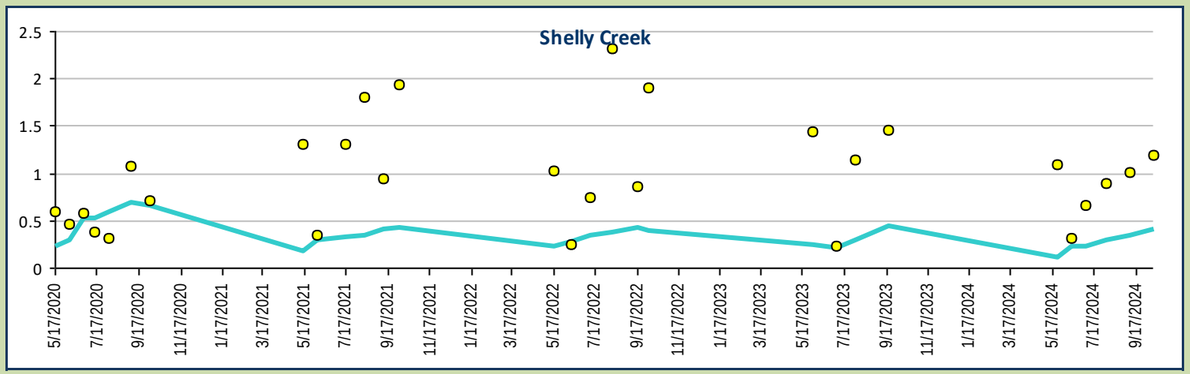
Hardness Dependent Calculation

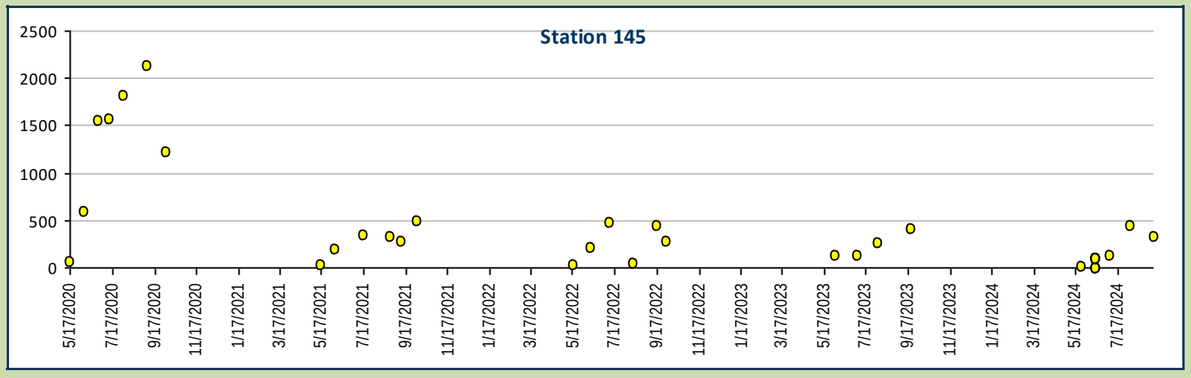
=EXP(0.7409*(LN(calc *hardness))-4.719)

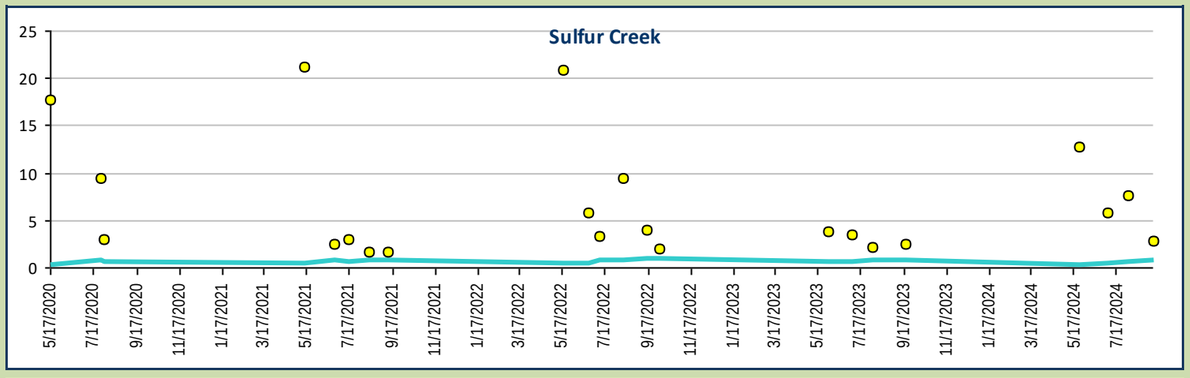
* Calculated using Standard Methods 2340B

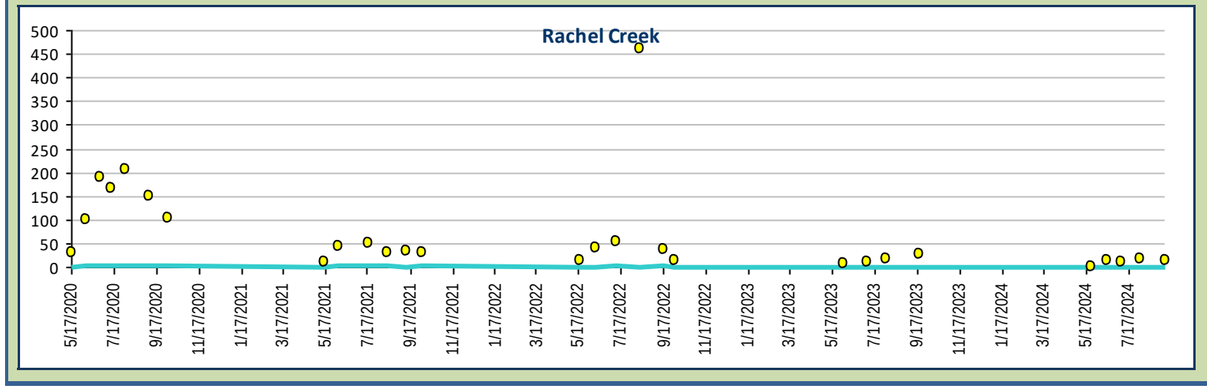


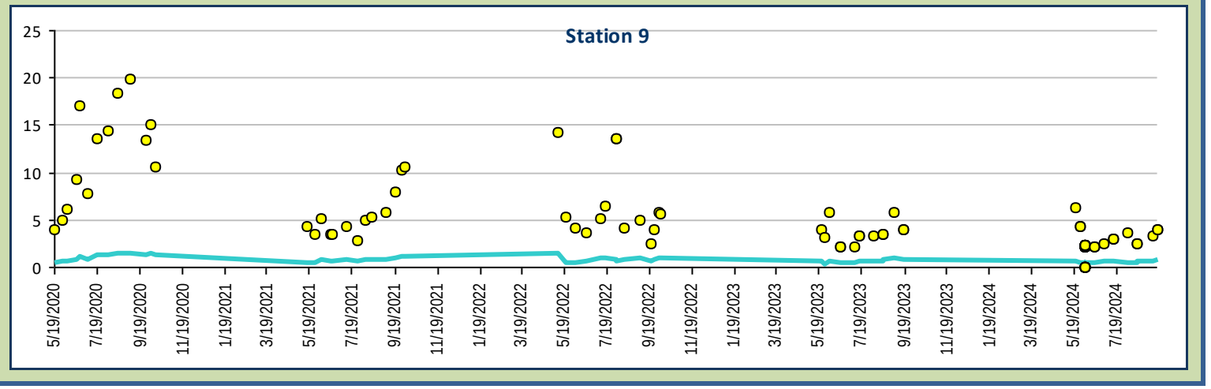












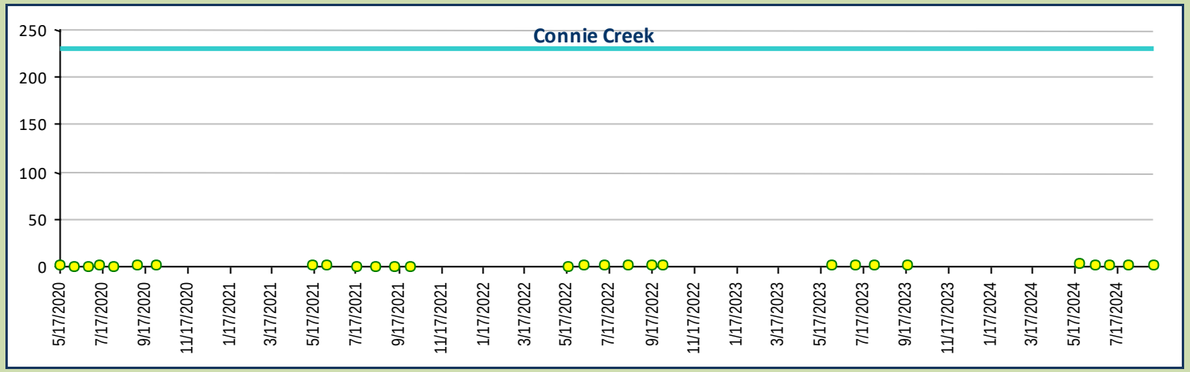
RED DOG MINE

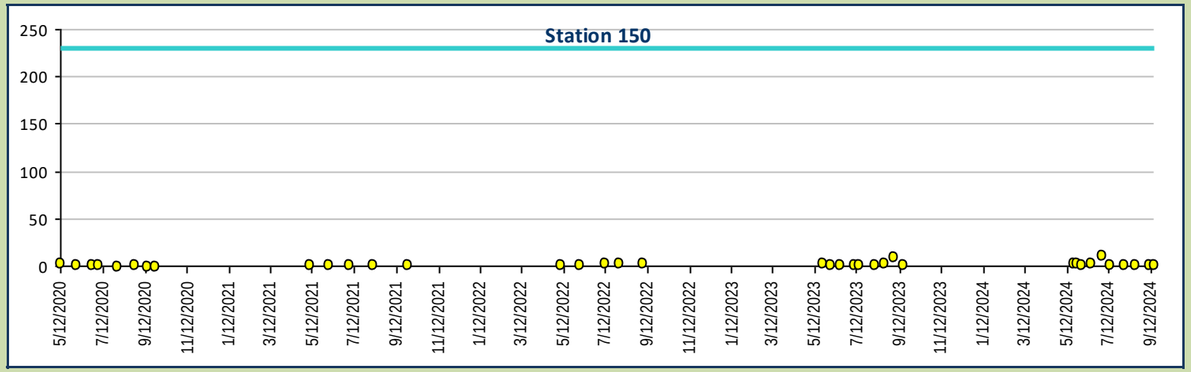
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

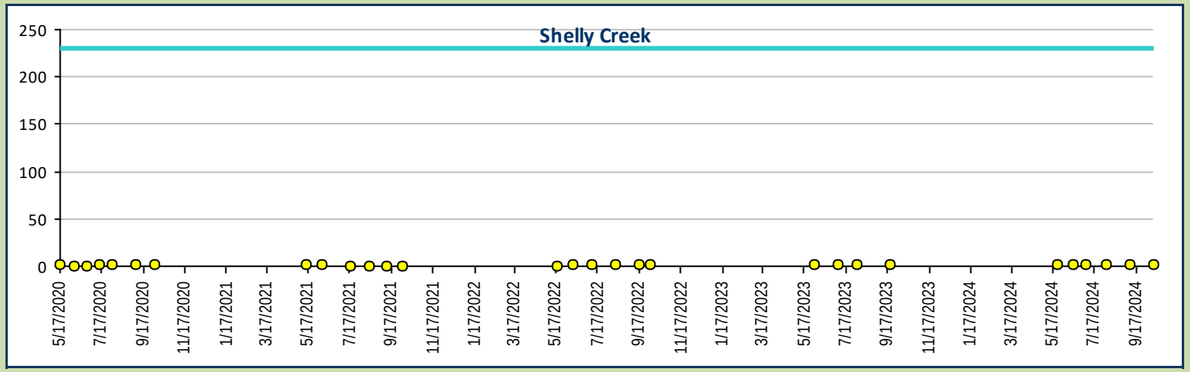
Chloride, Total Recoverable, units mg/L

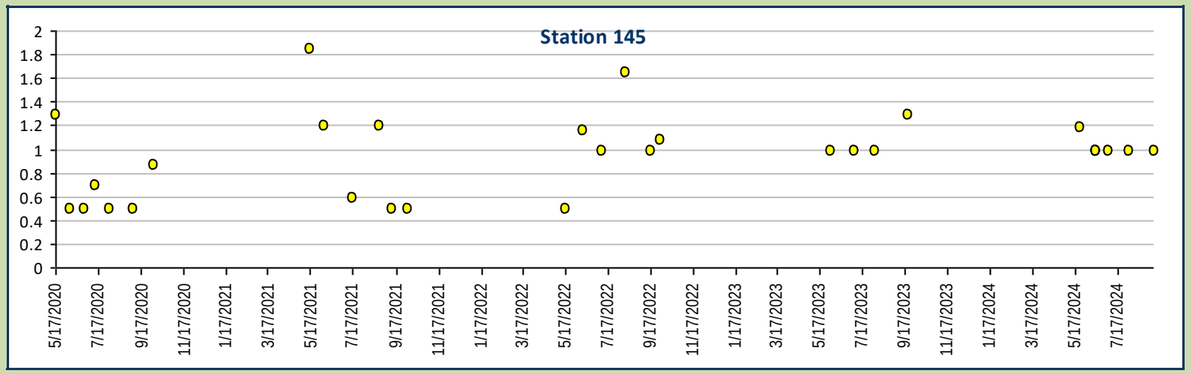
Aquatic Life - Fresh Water Chronic WQS mg/L

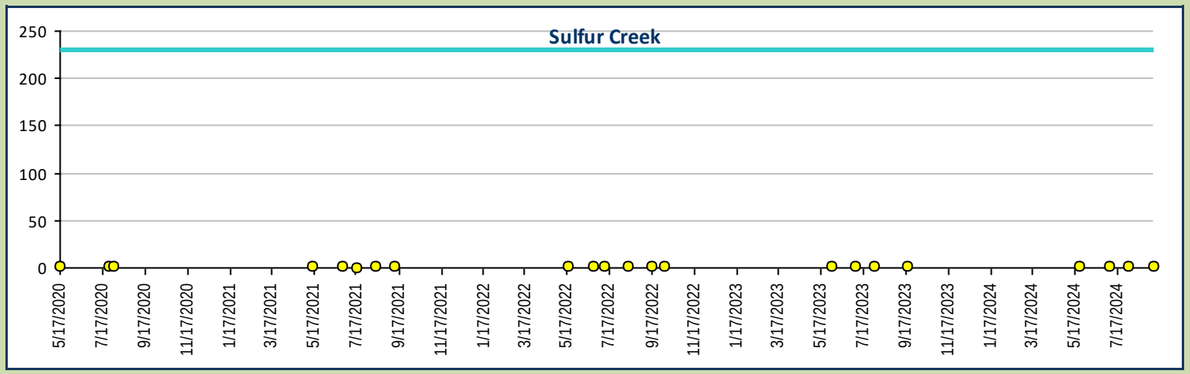
230 mg/L

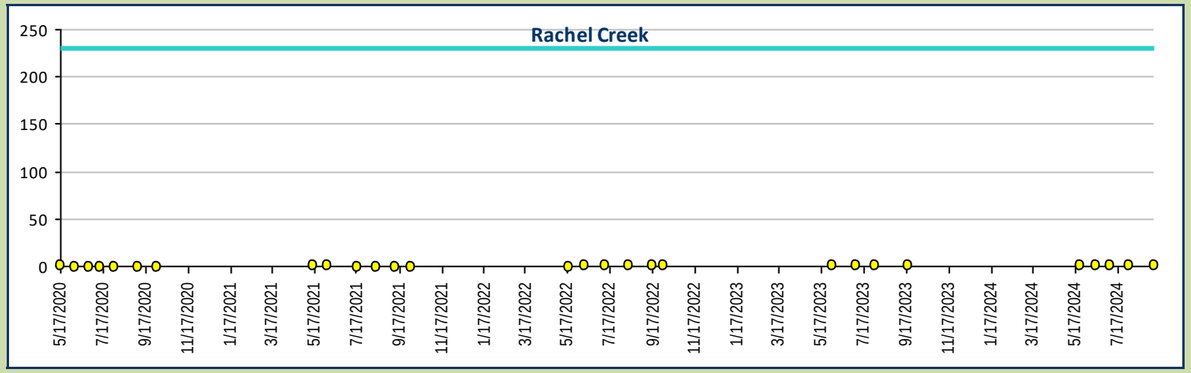


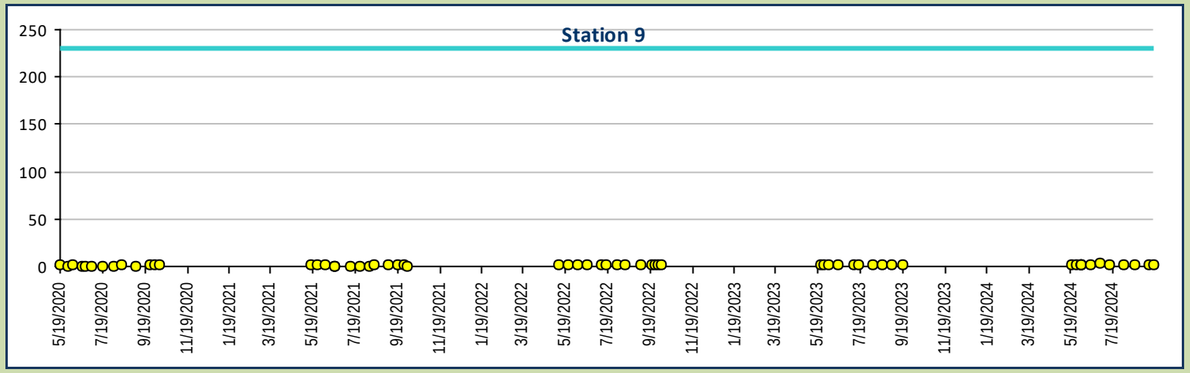








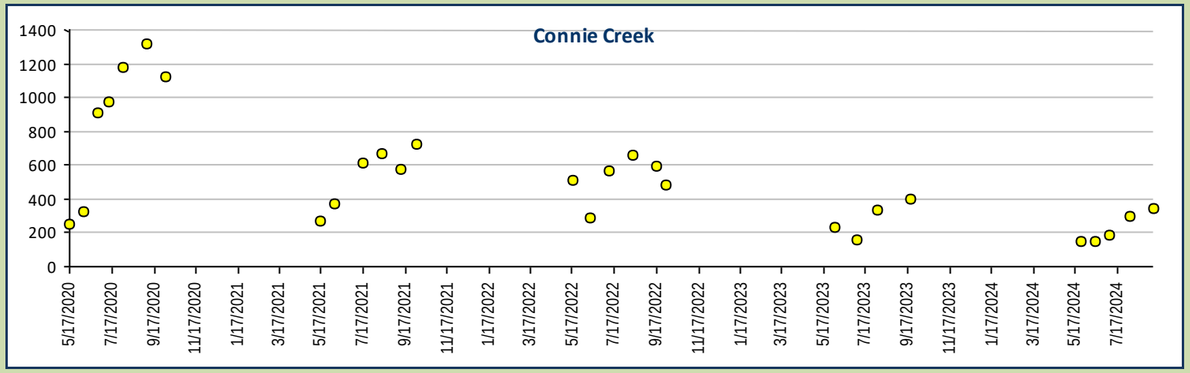


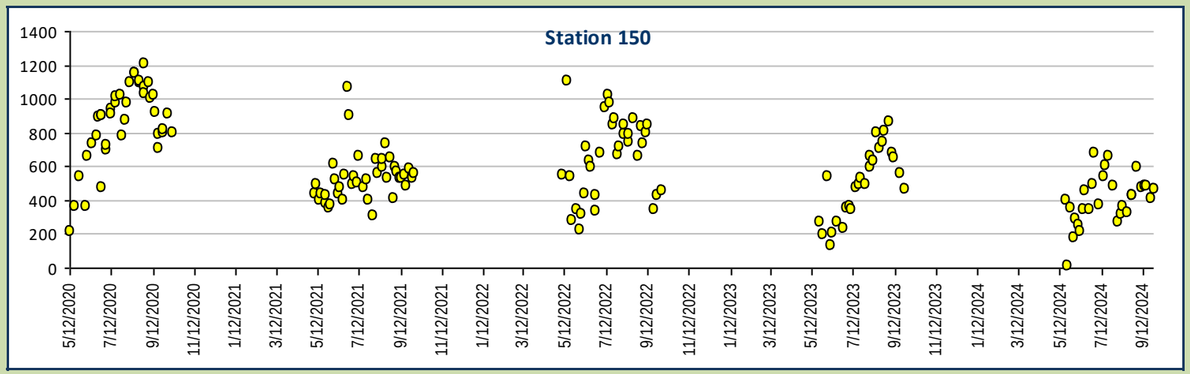


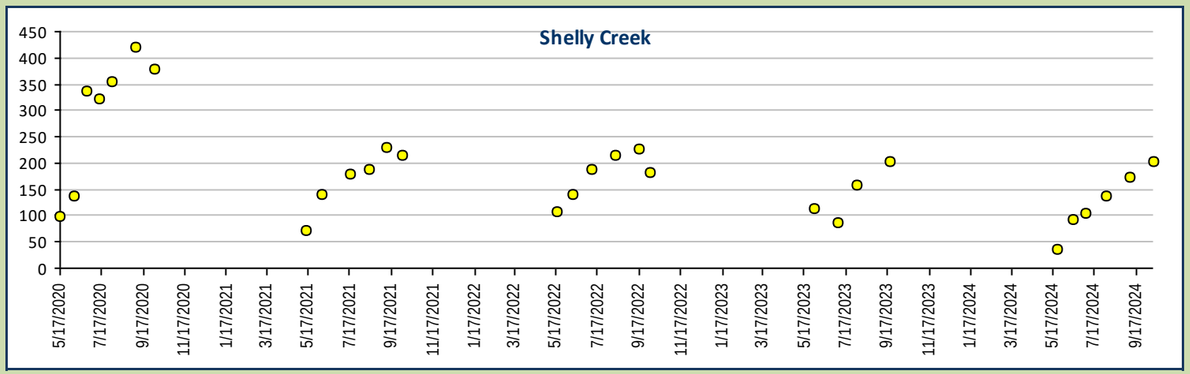
RED DOG MINE

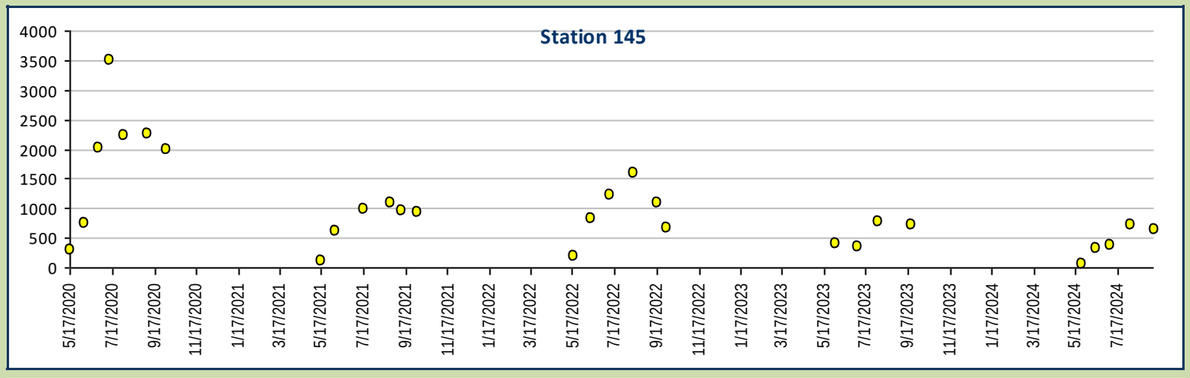
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

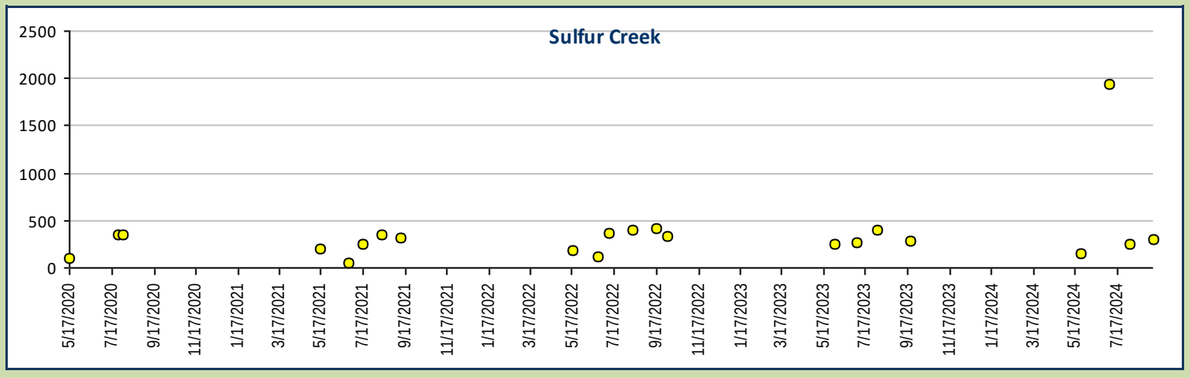
Conductivity, units uS/cm

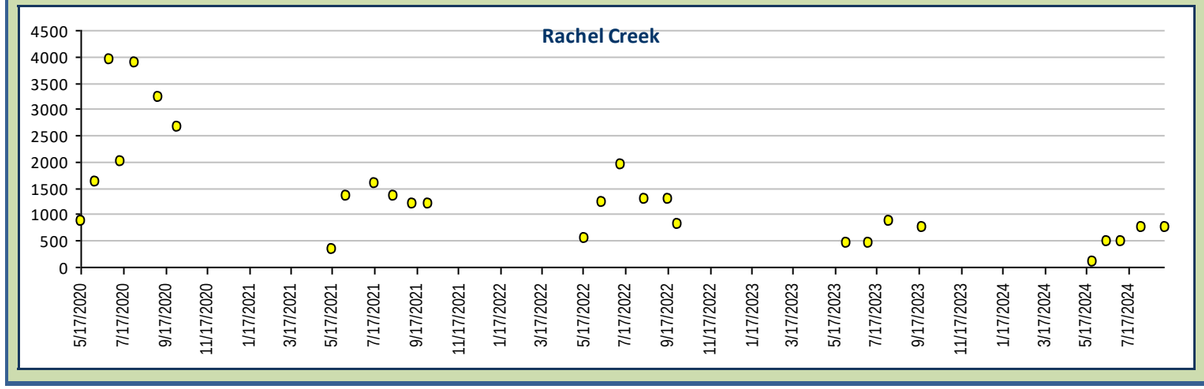


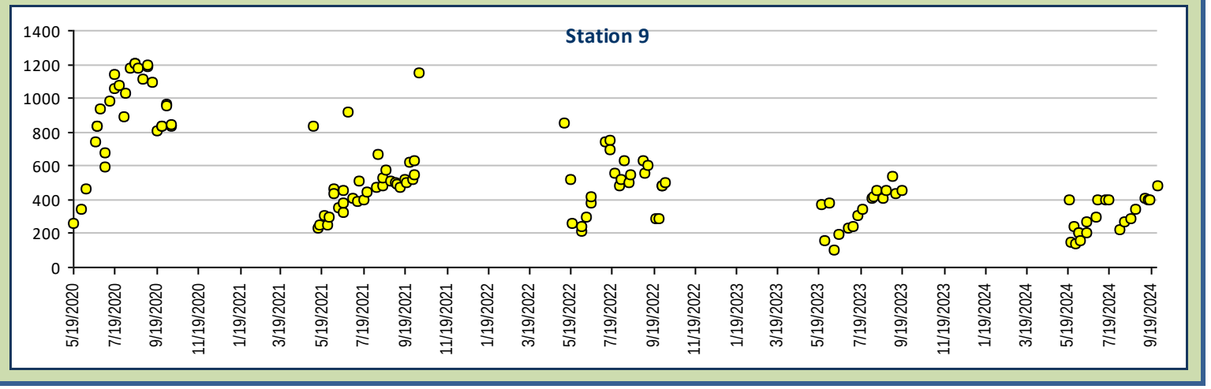












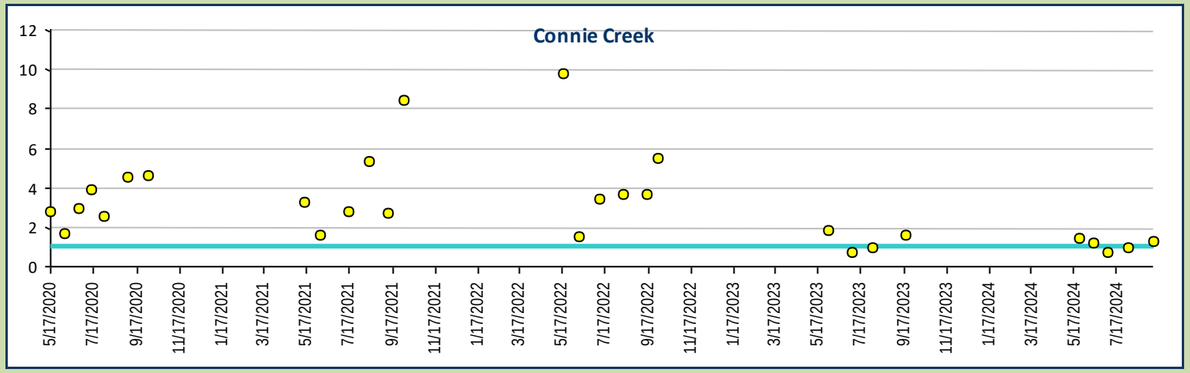
RED DOG MINE

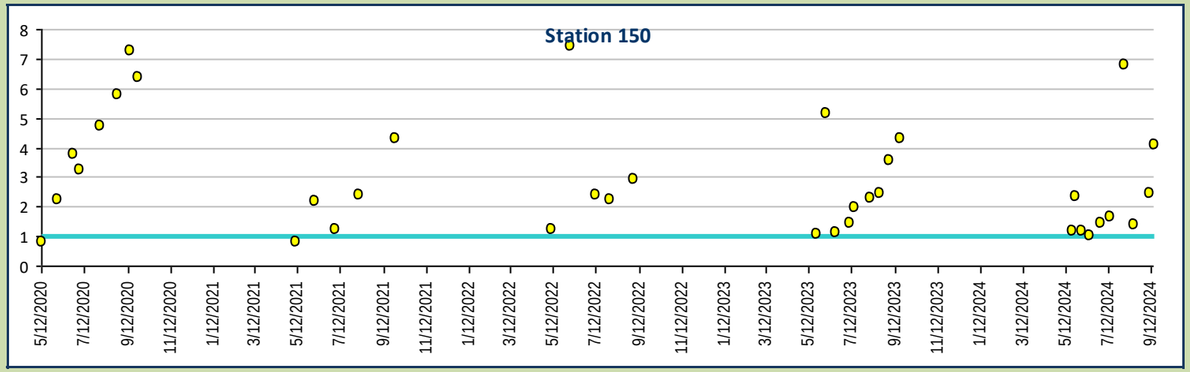
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

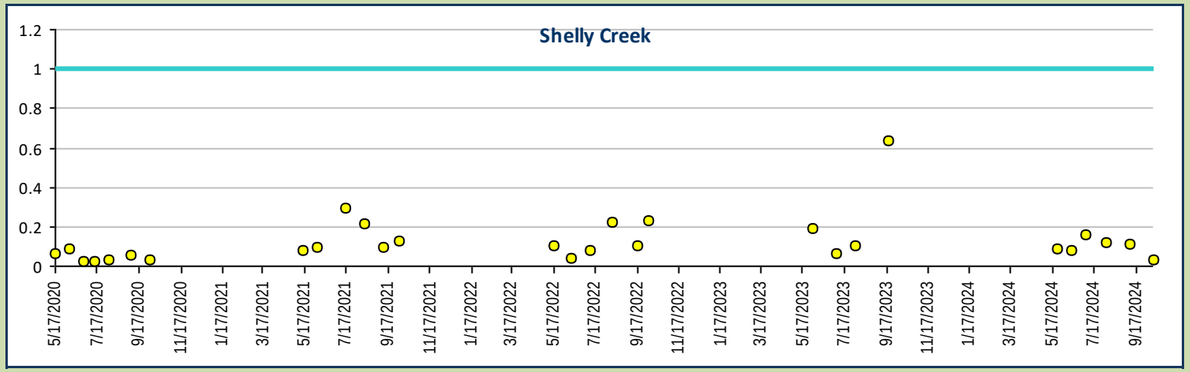
Iron, Total Recoverable, units mg/L

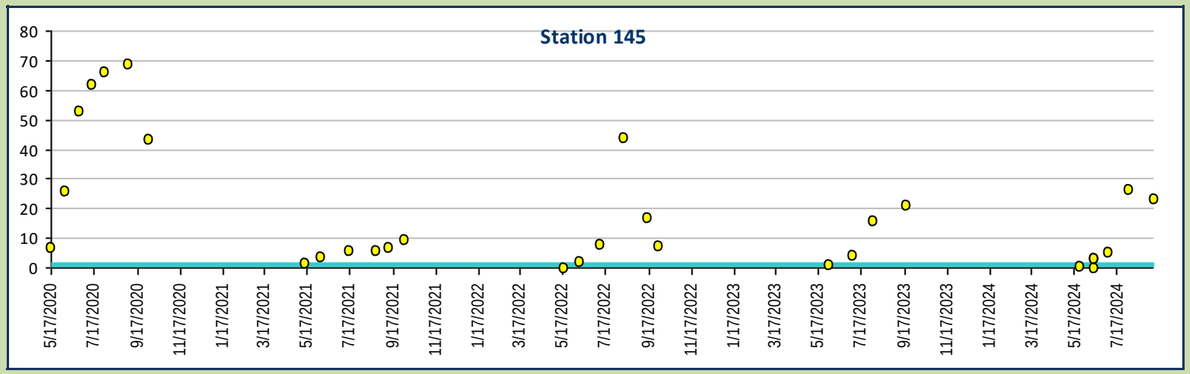
Aquatic Life - Fresh Water Chronic WQS mg/L

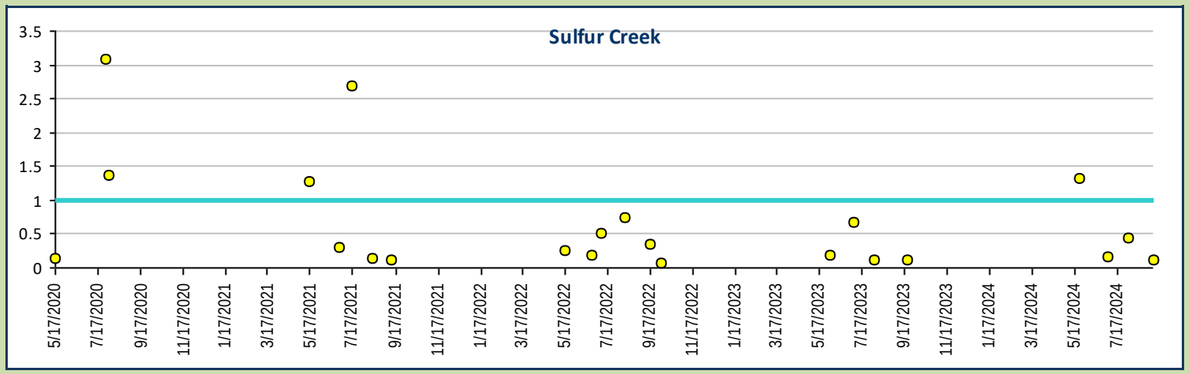
1.0 mg/L

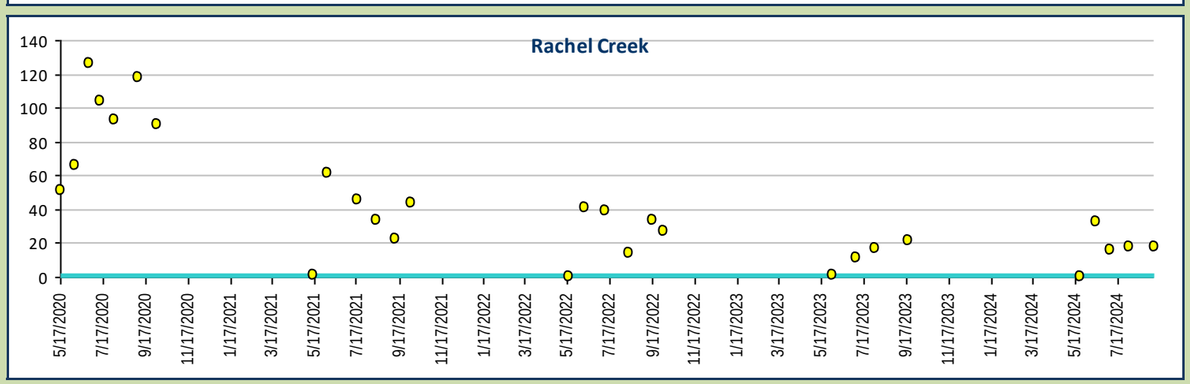


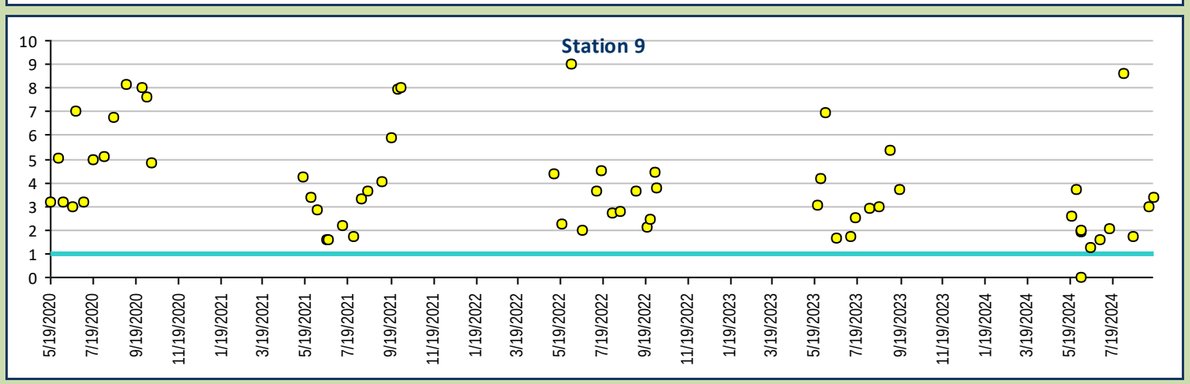








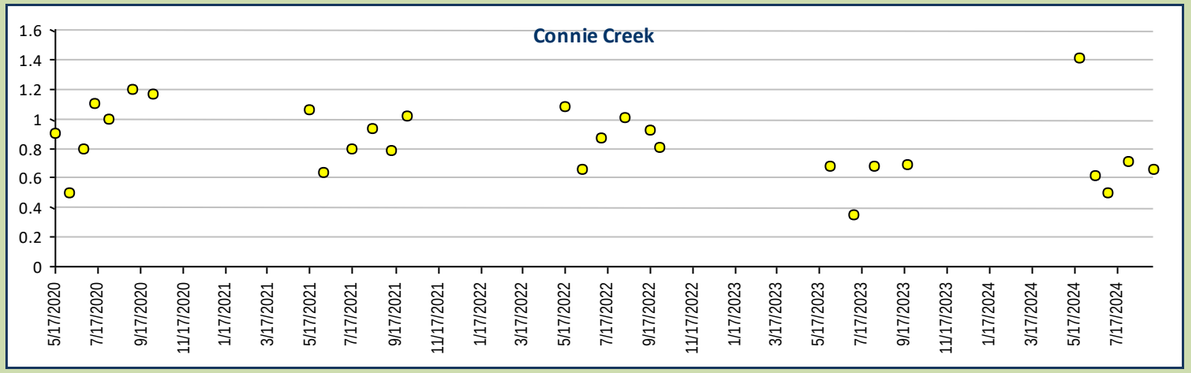


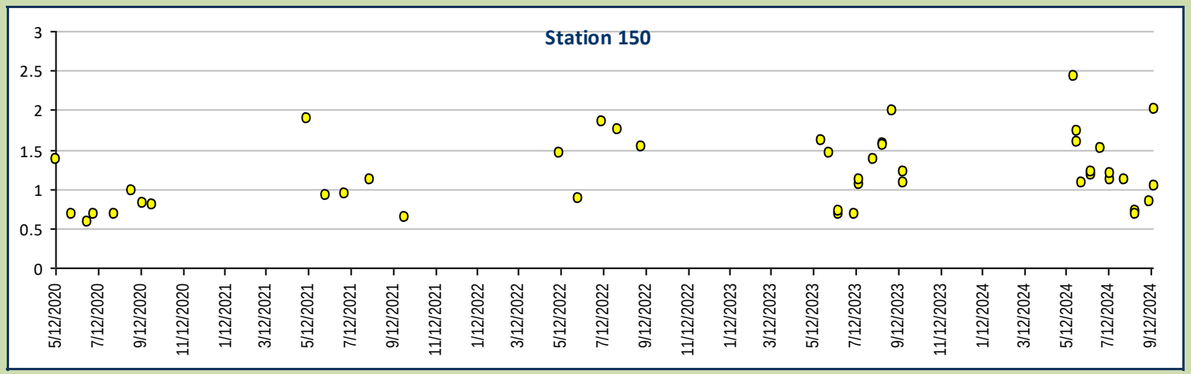


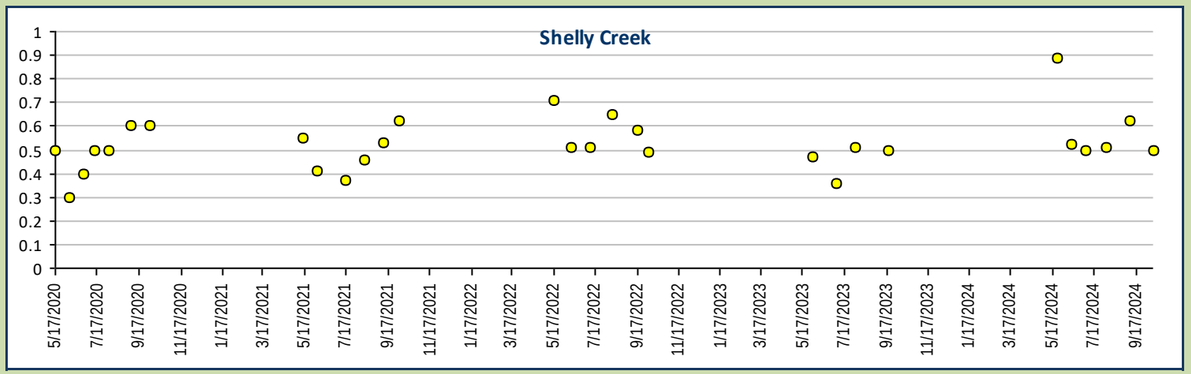
RED DOG MINE

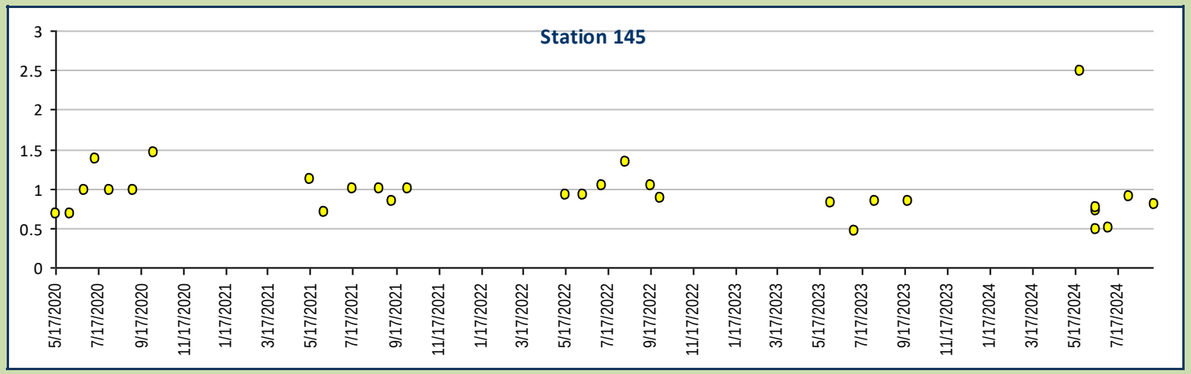
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

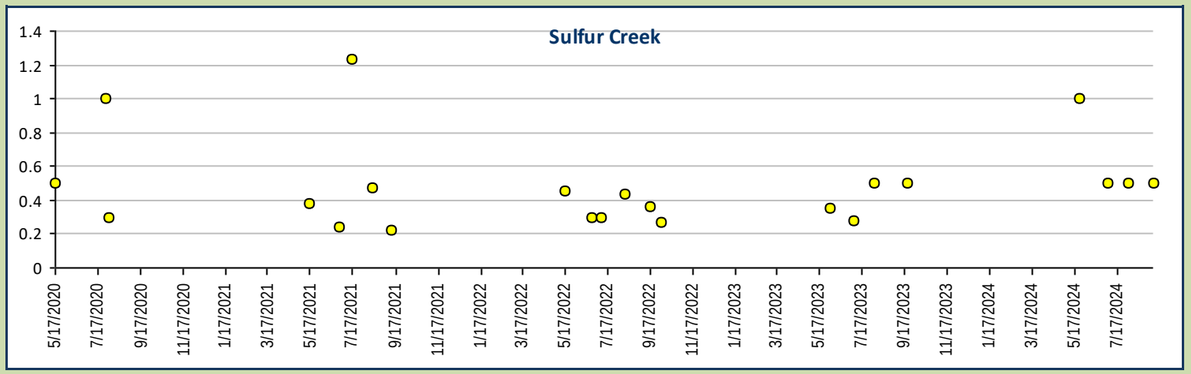
Potassium, Total Recoverable, units mg/L

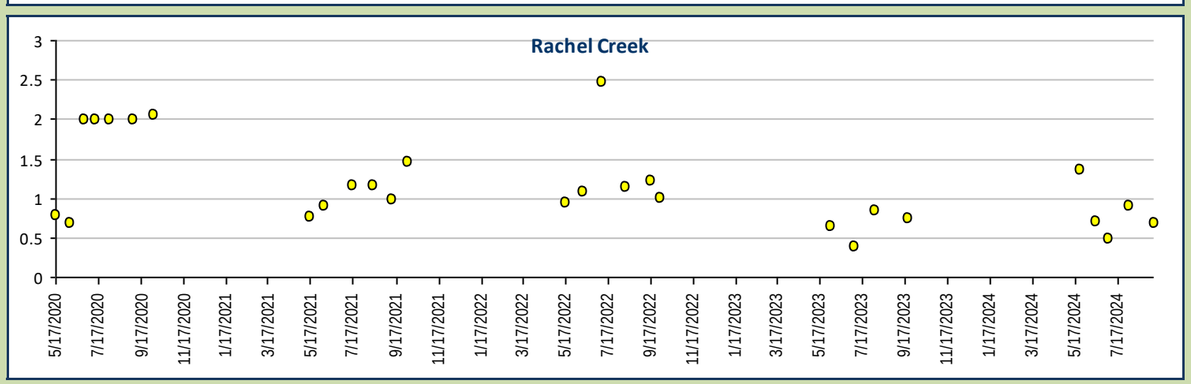


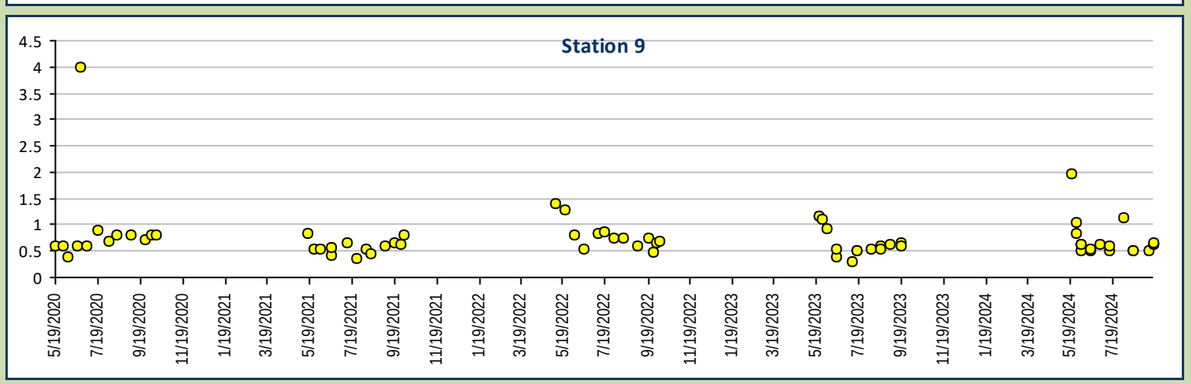








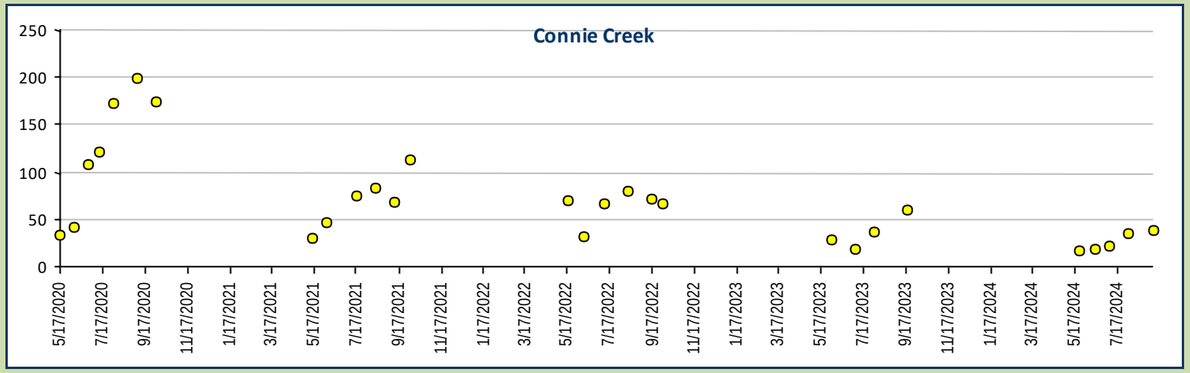


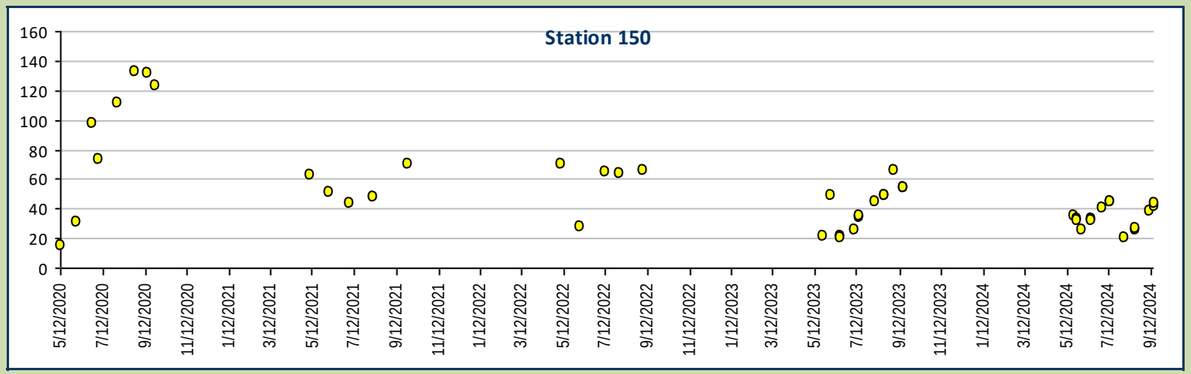


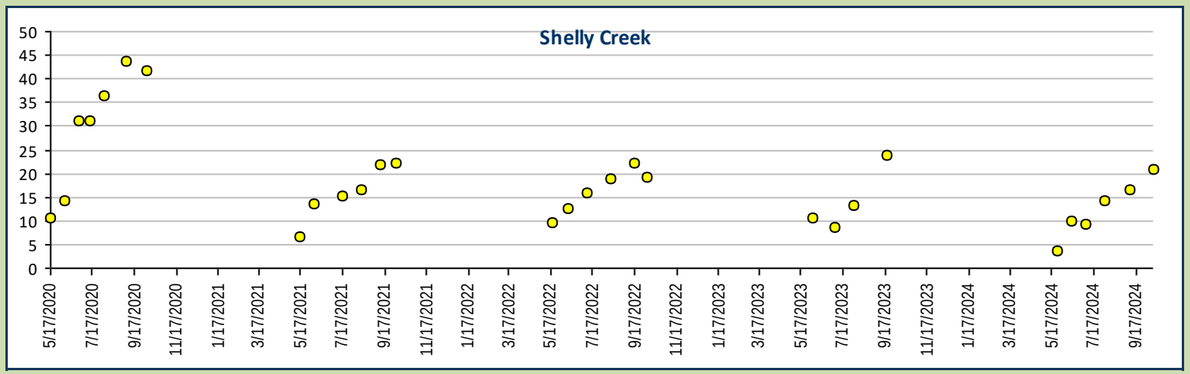
RED DOG MINE

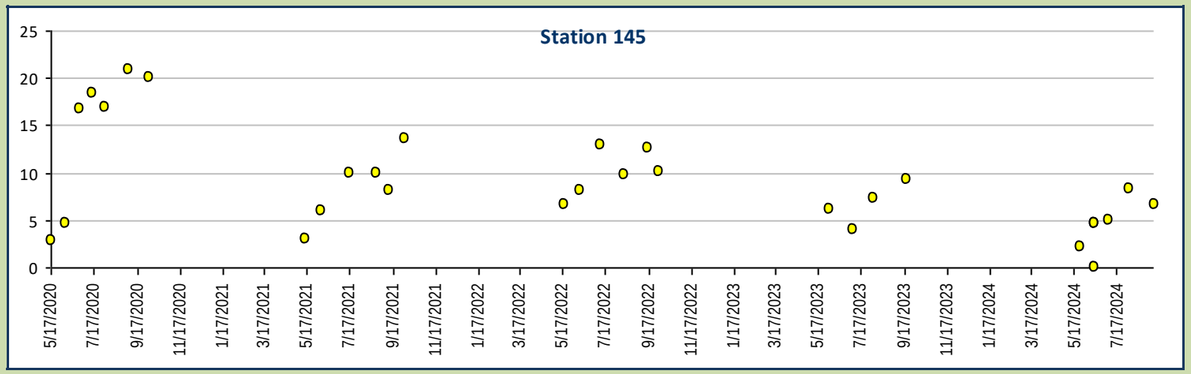
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

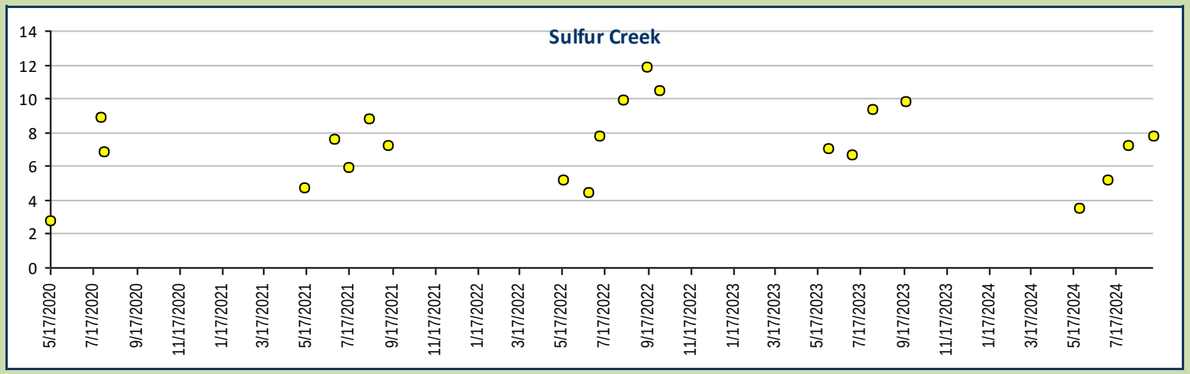
Magnesium, Total Recoverable, units mg/L

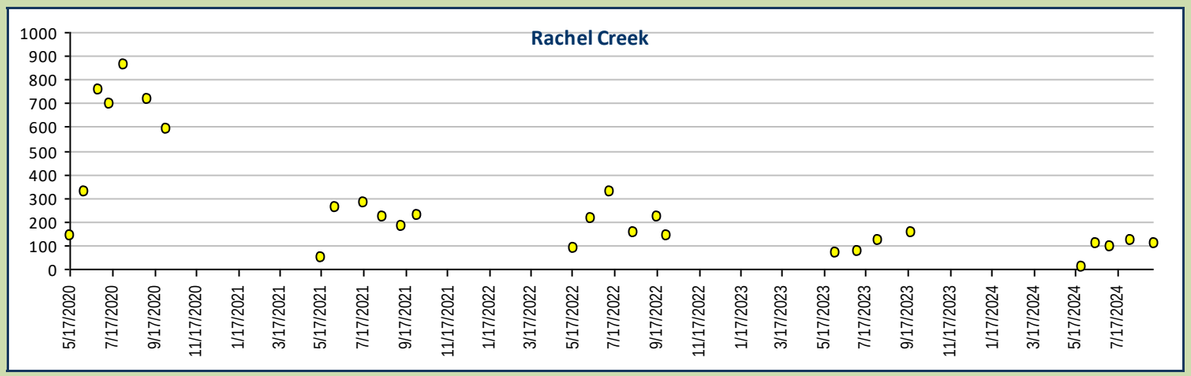


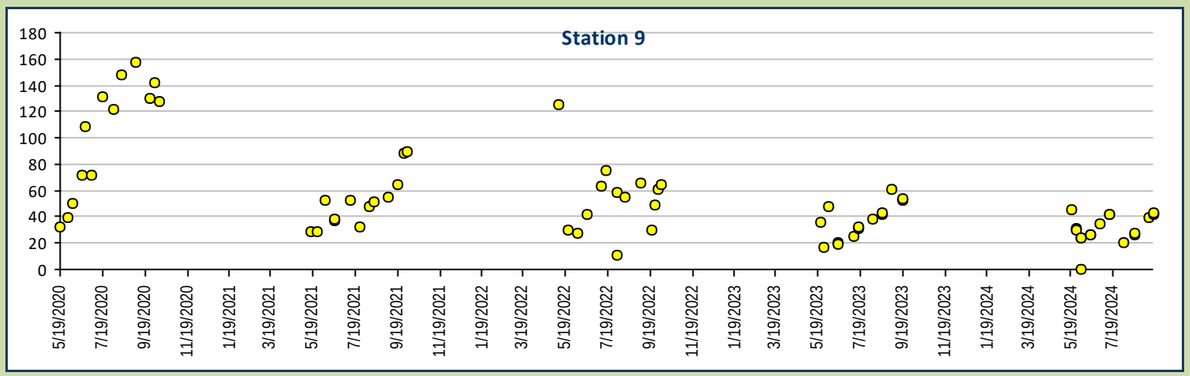








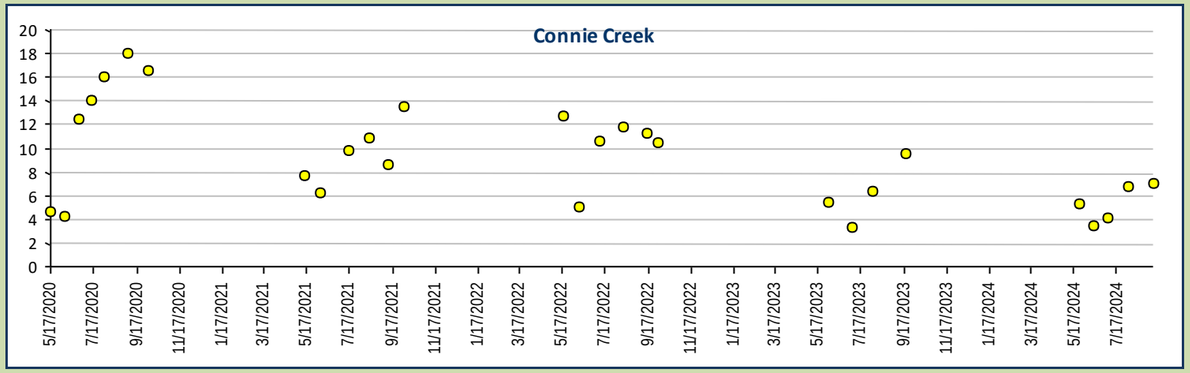


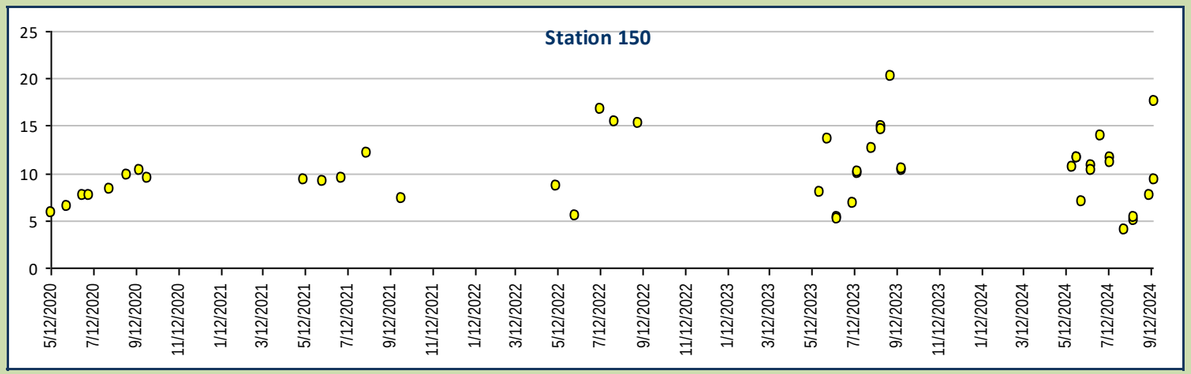


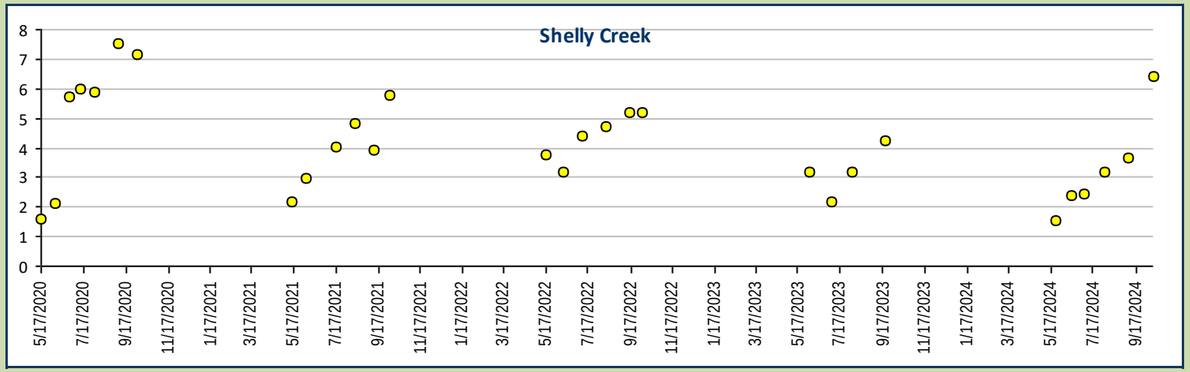
RED DOG MINE

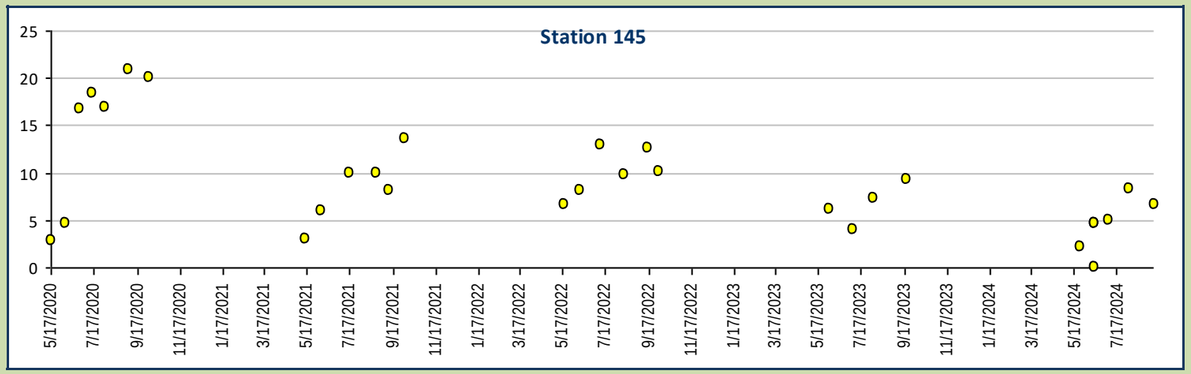
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

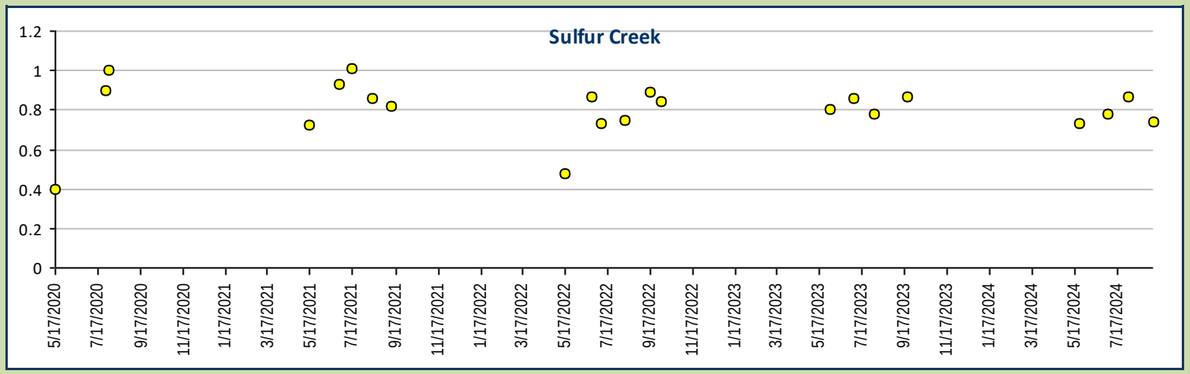
Sodium, Total Recoverable, units mg/L

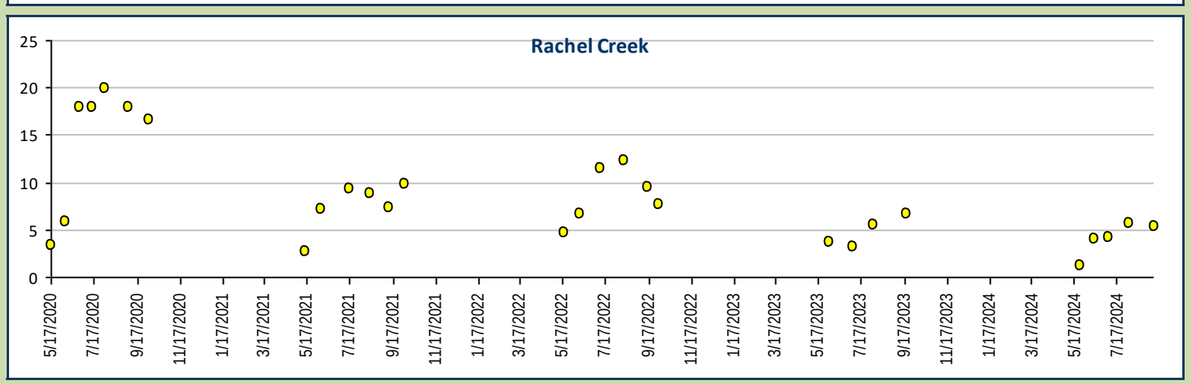


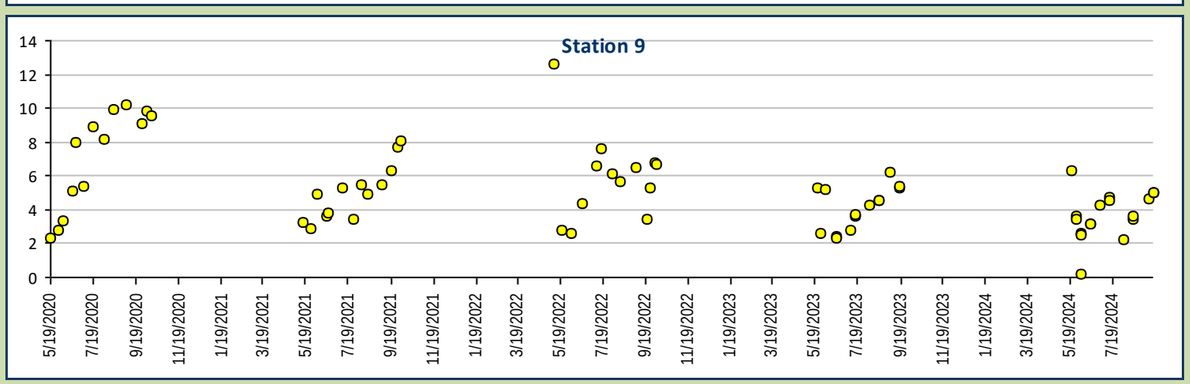












RED DOG MINE

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

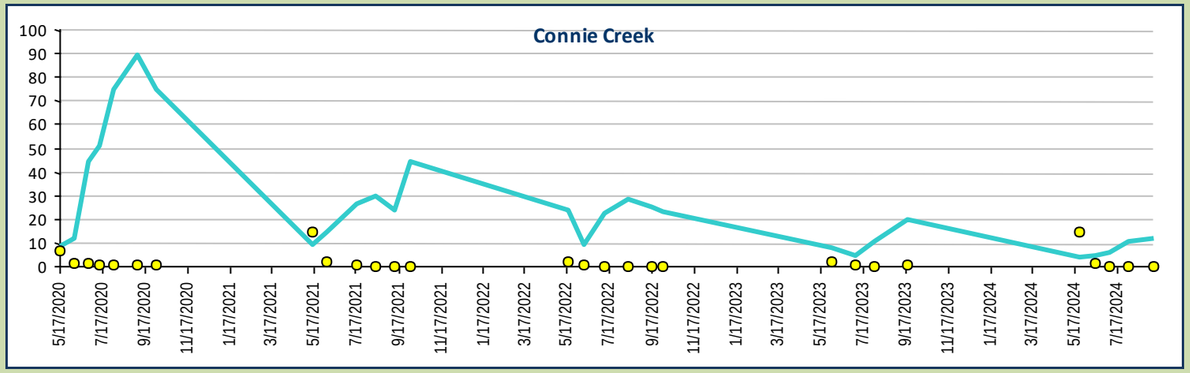
Lead, Total Recoverable, units ug/L

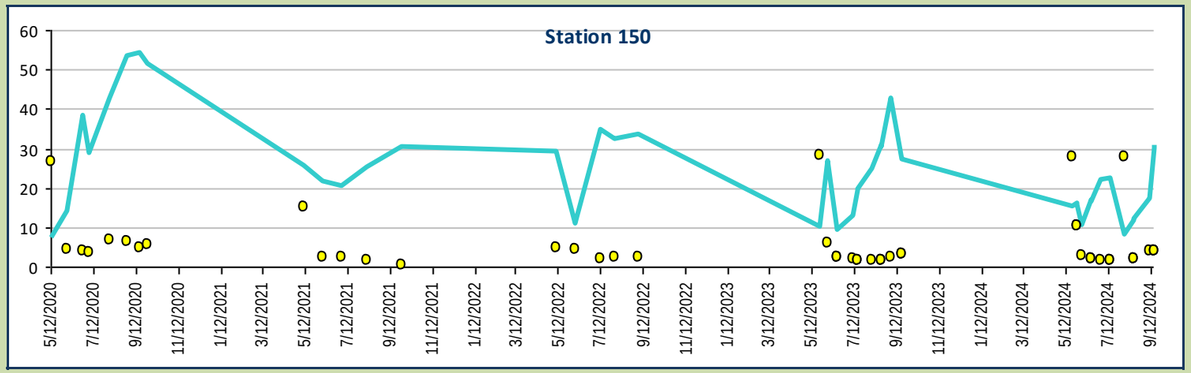
Aquatic Life - Fresh Water Chronic WQS ug/L

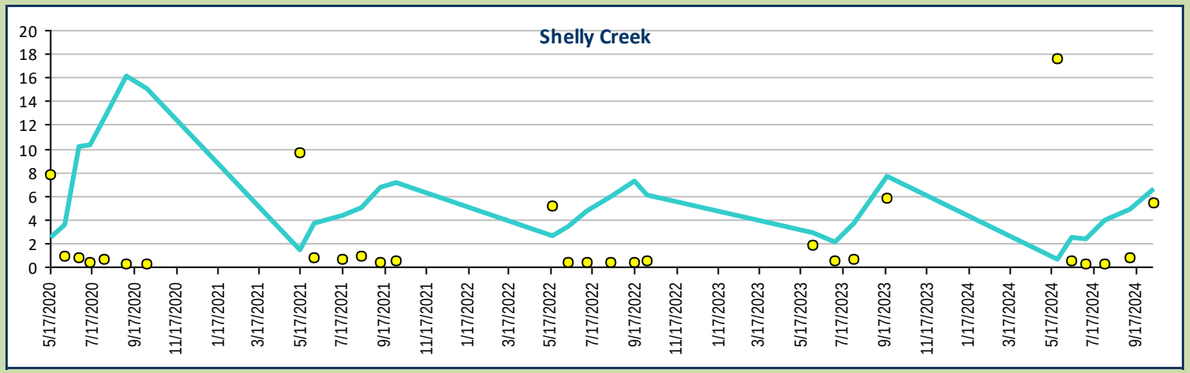
Hardness Dependent Calculation

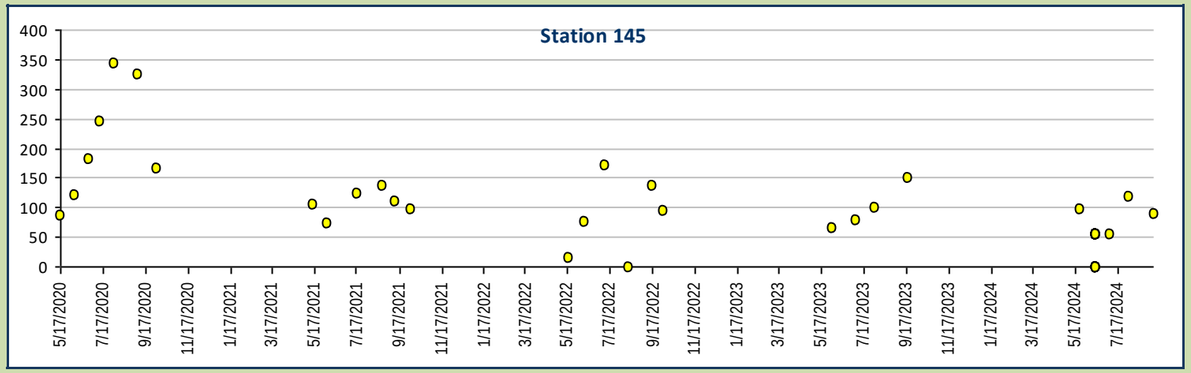
=EXP(1.273*(LN(calc *hardness))-4.705)

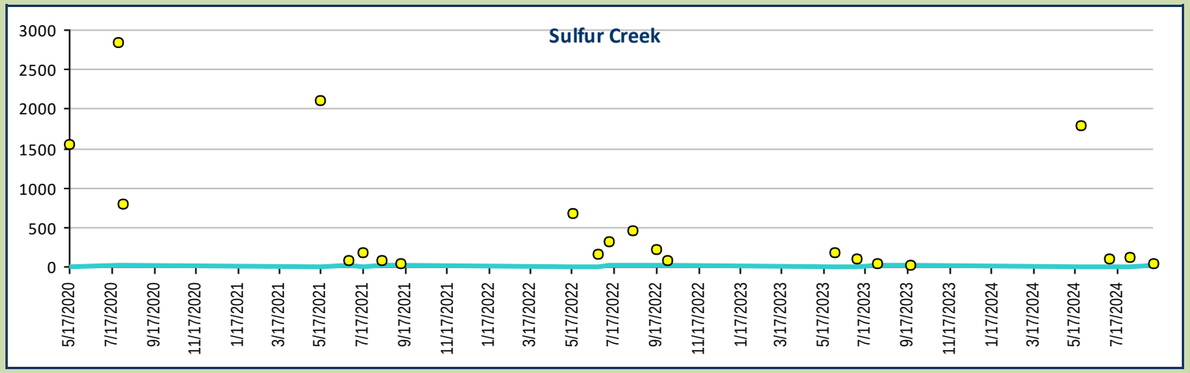
* Calculated using Standard Methods 2340B

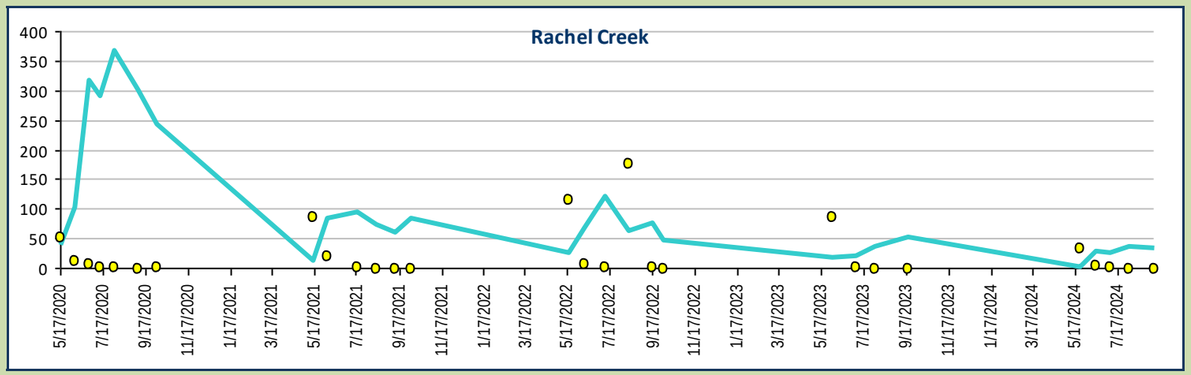


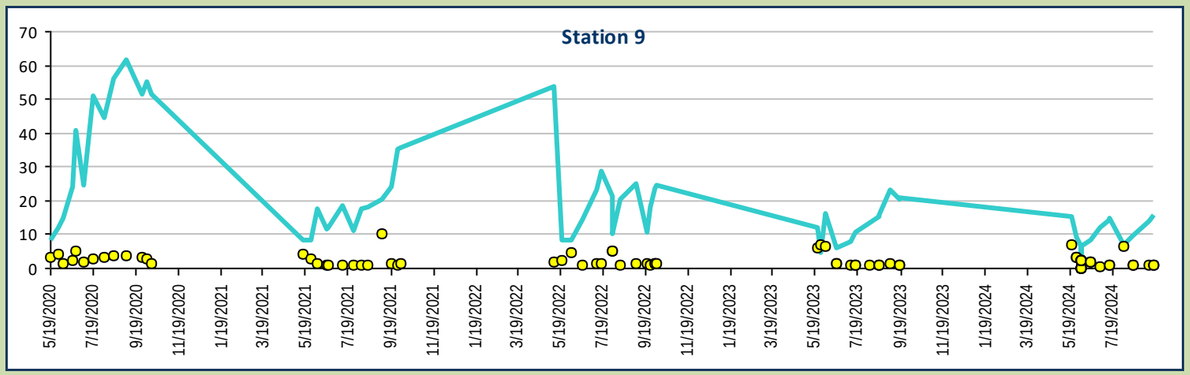










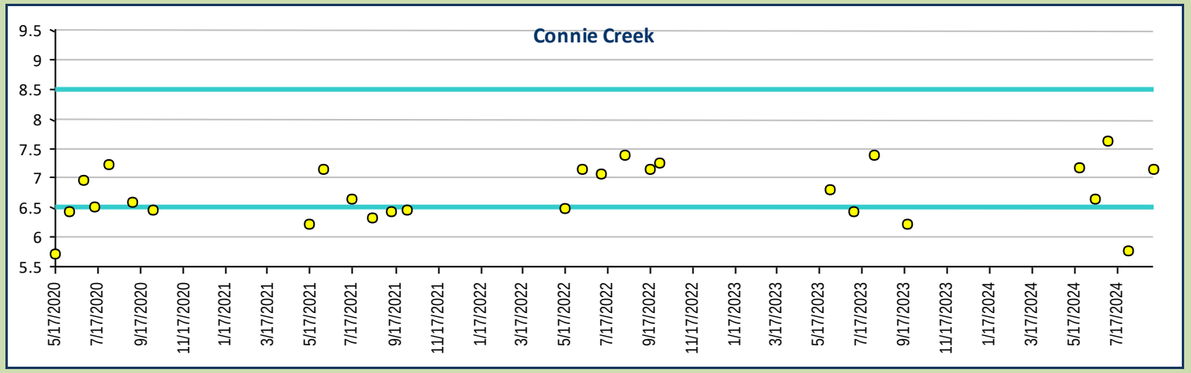


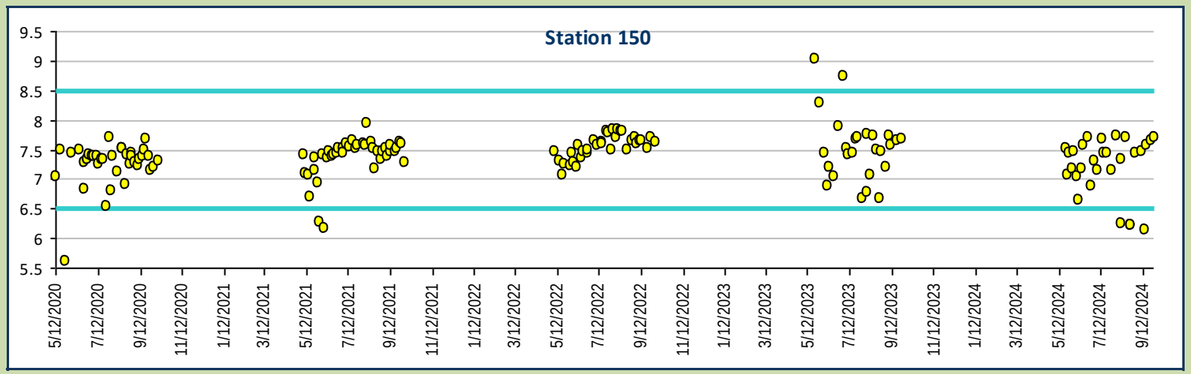
RED DOG MINE

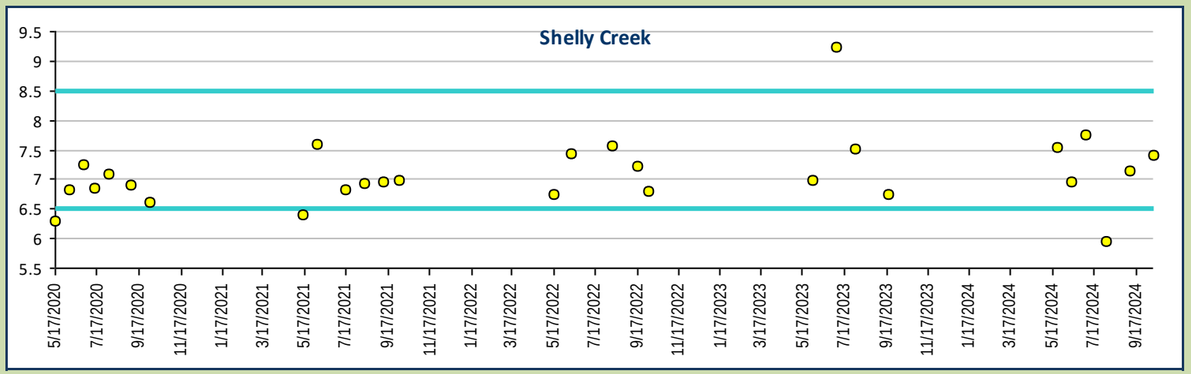
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

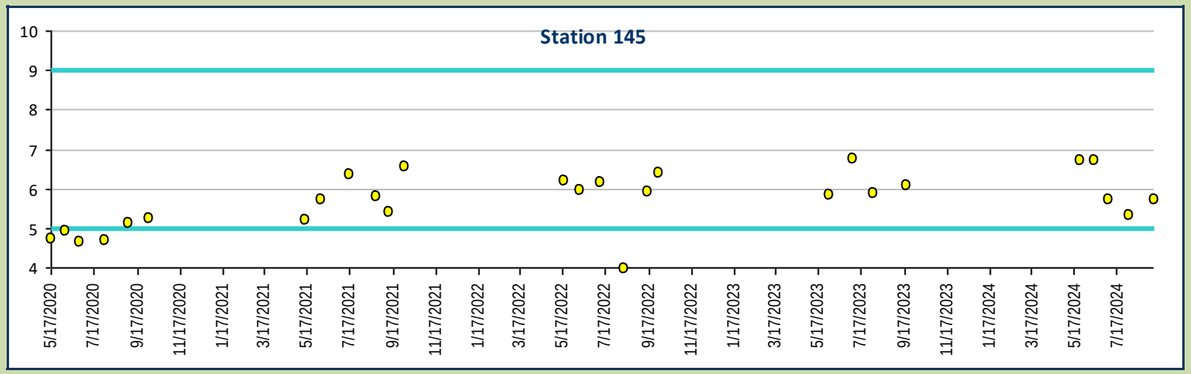
pH

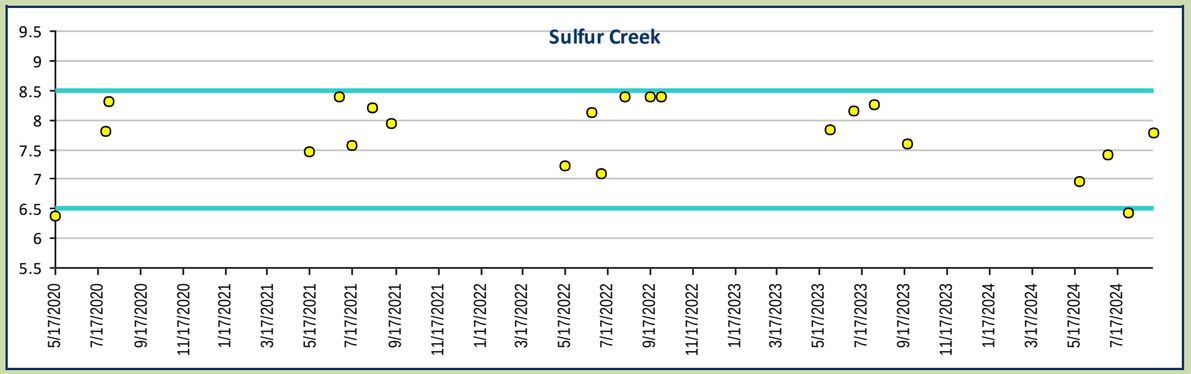
Site Specific WQS pH units

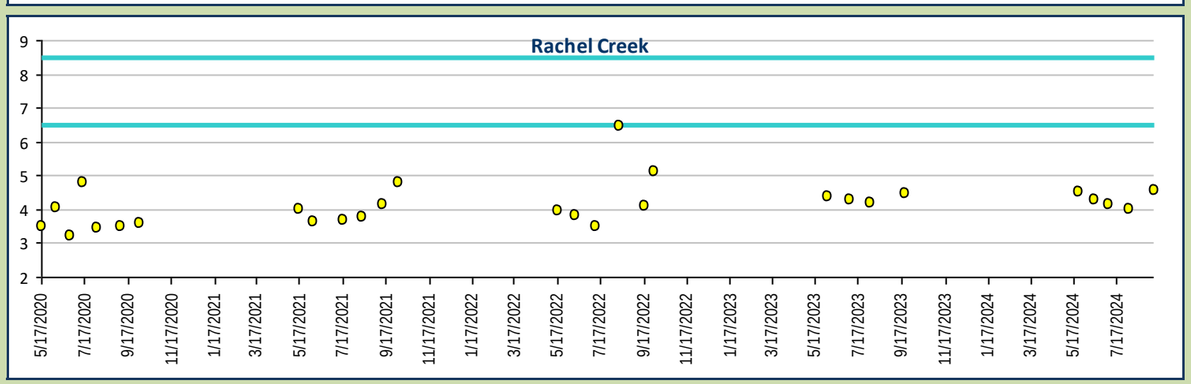


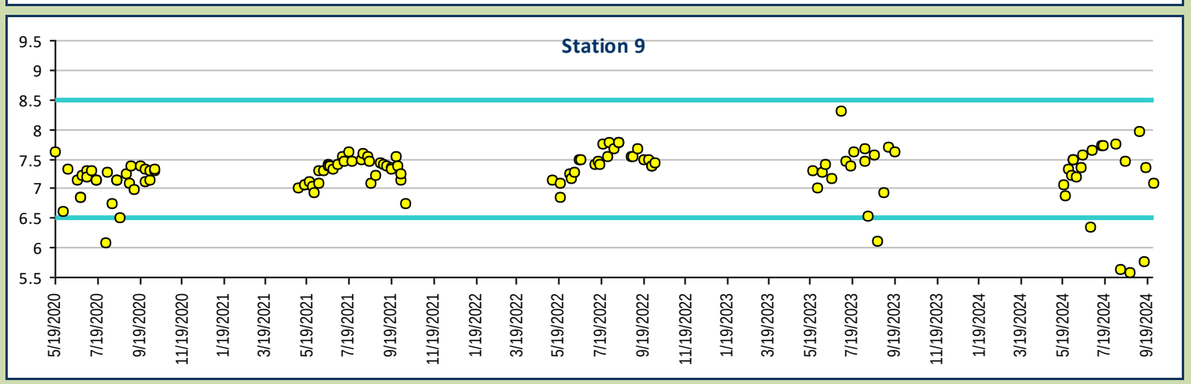












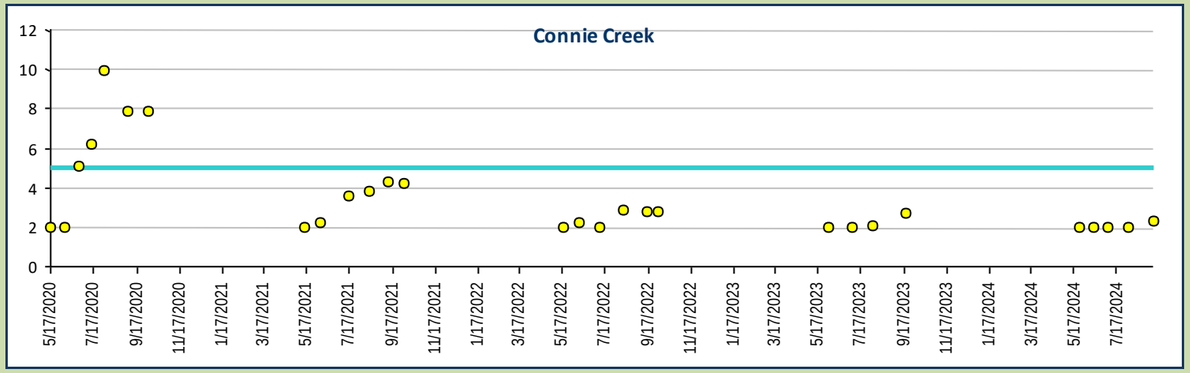
RED DOG MINE

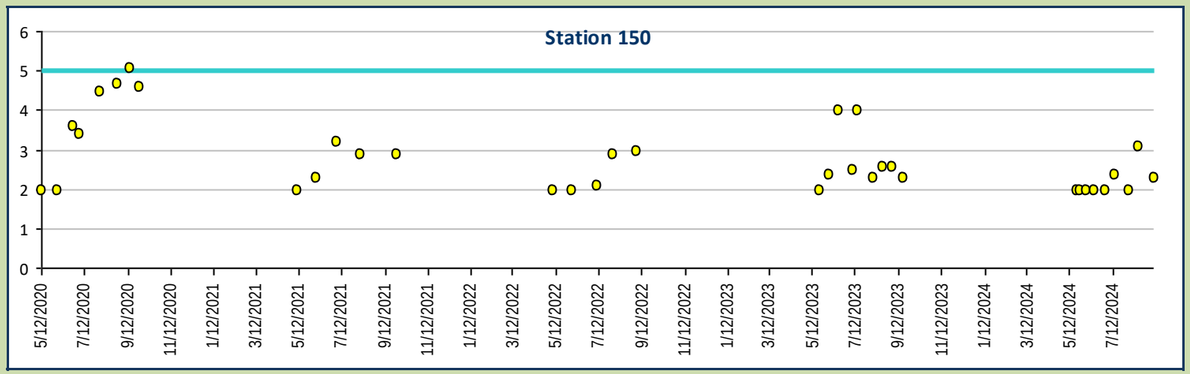
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

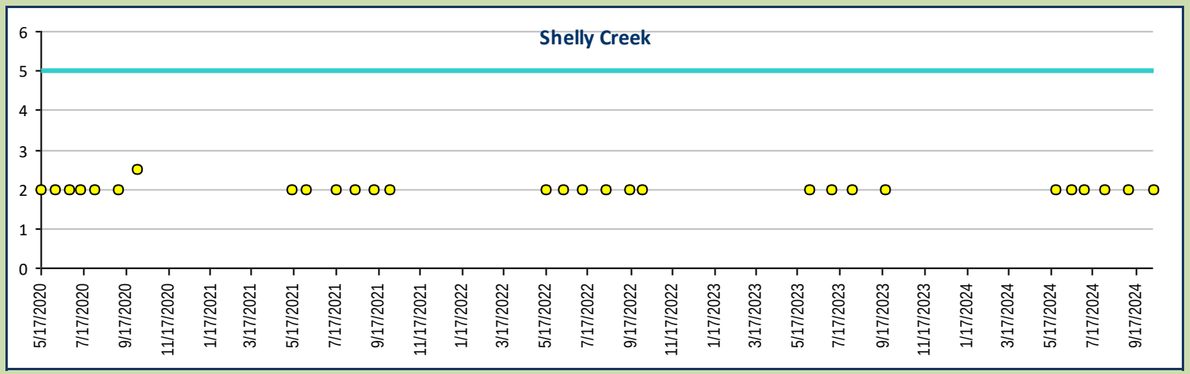
Selenium, Total Recoverable, units ug/L

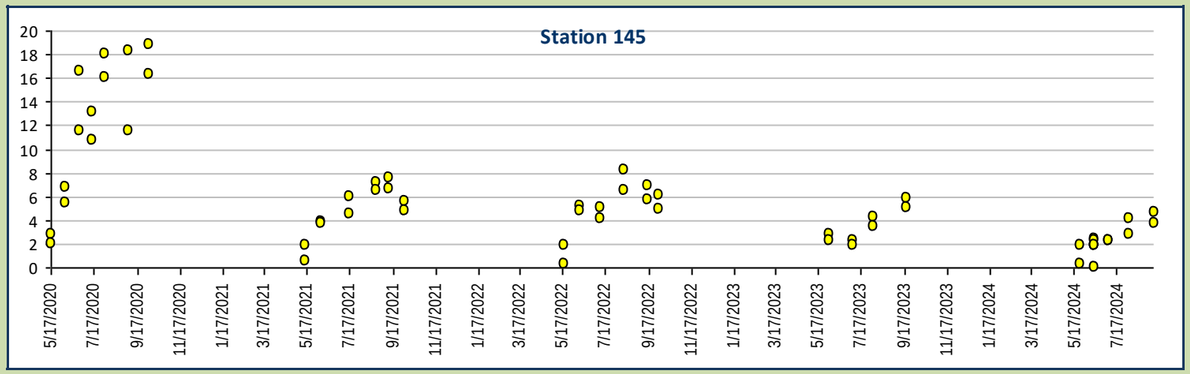
Aquatic Life - Fresh Water Chronic WQS ug/L

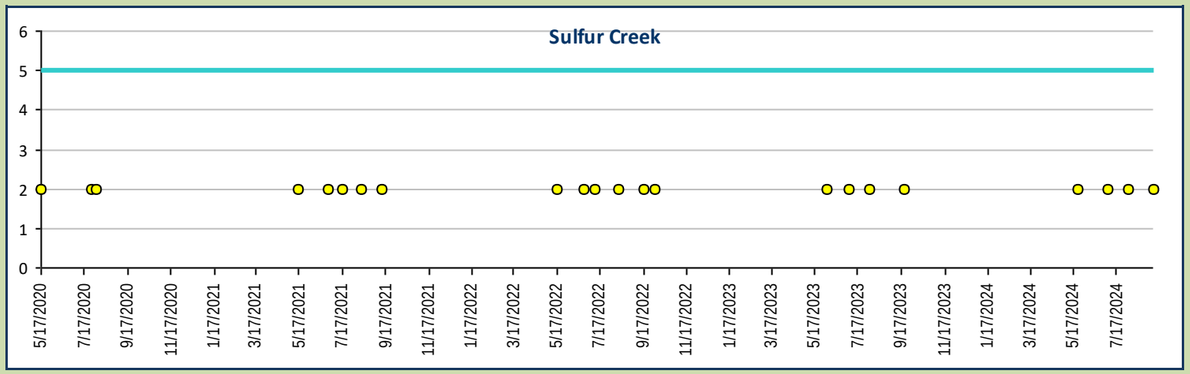
5 ug/L

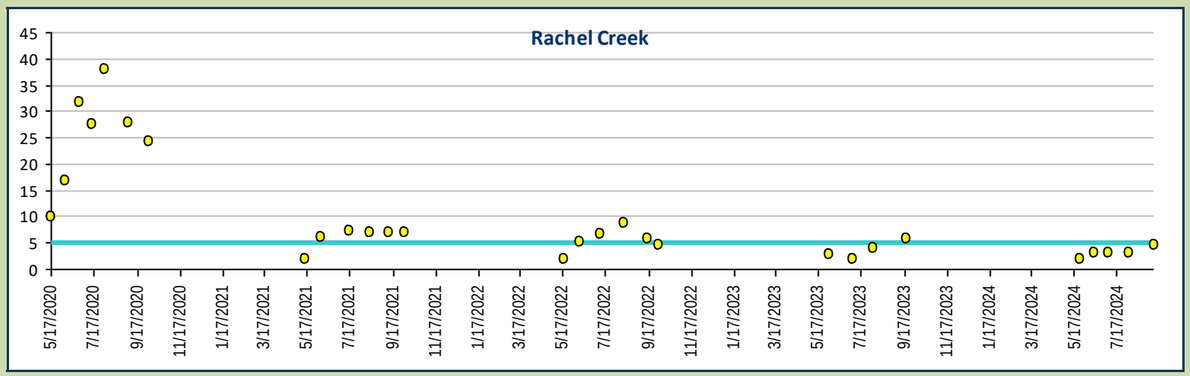


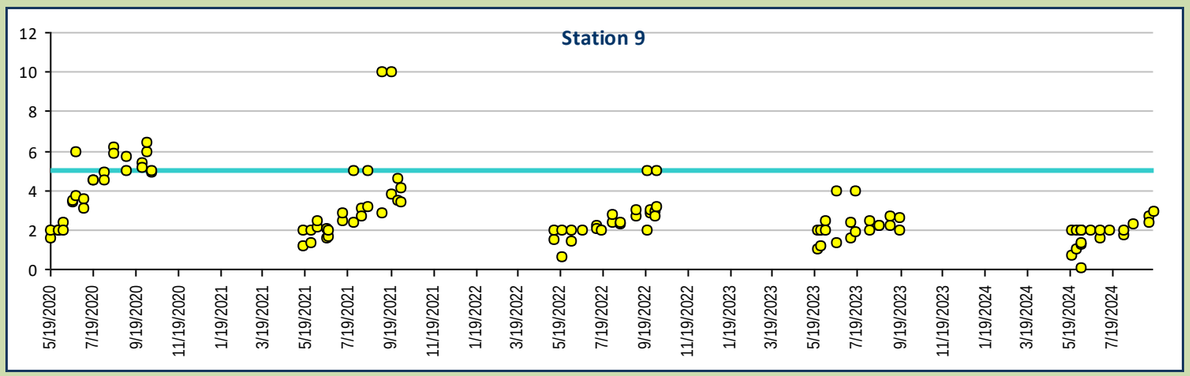








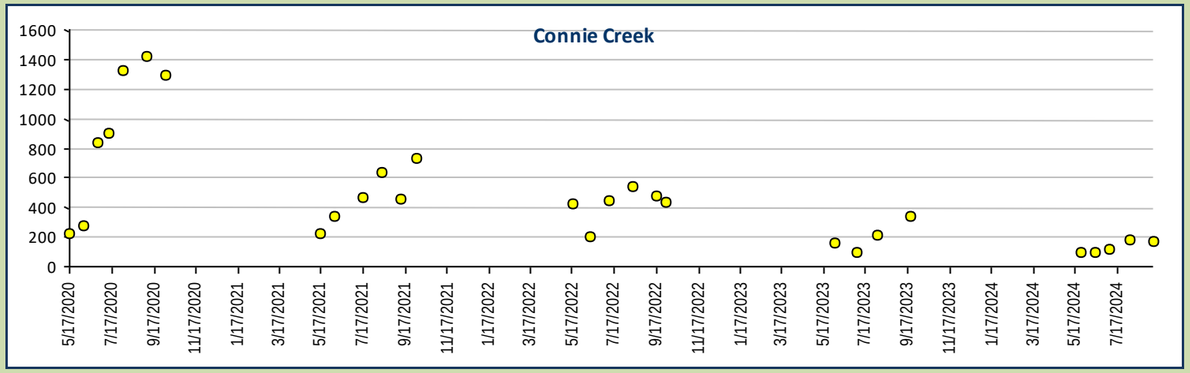


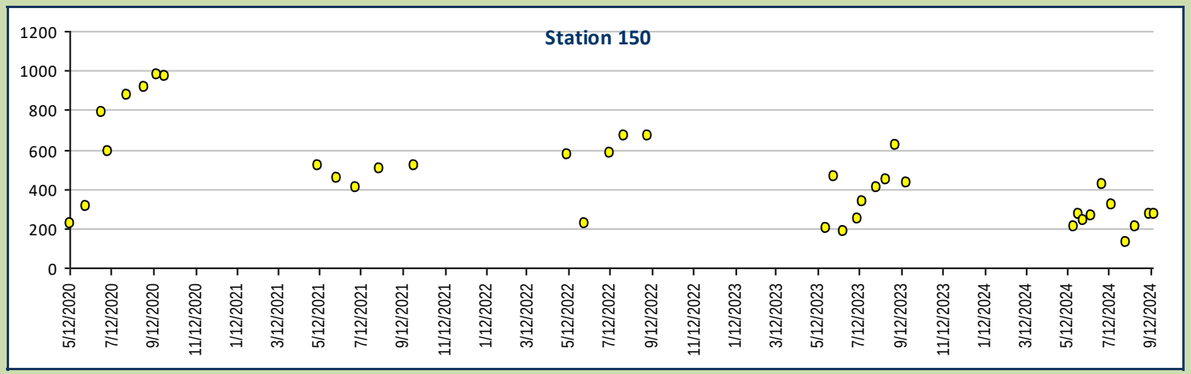


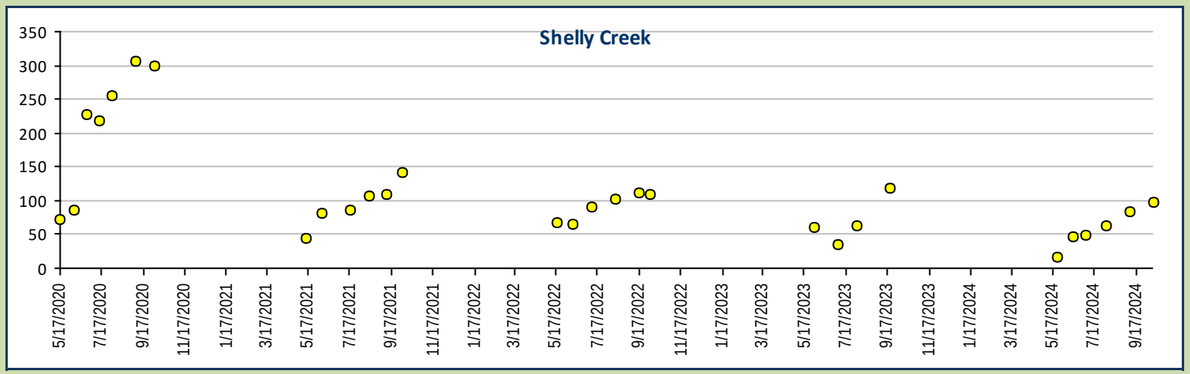
RED DOG MINE

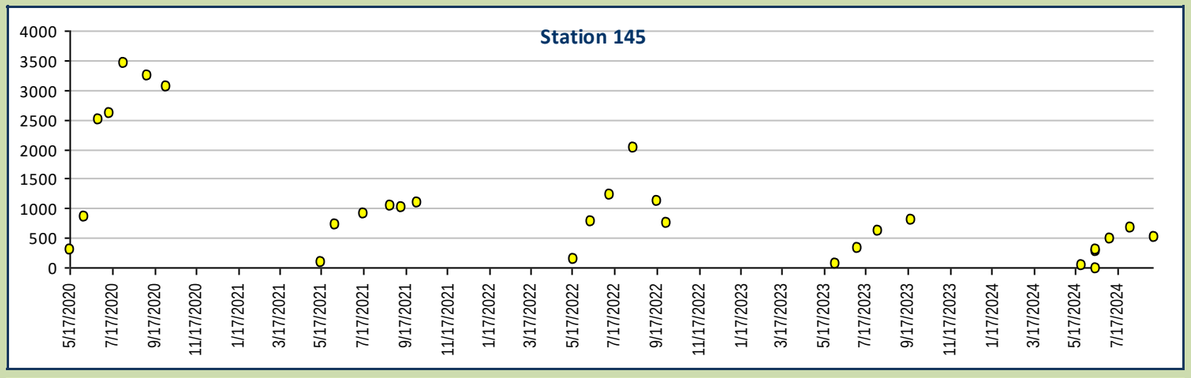
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

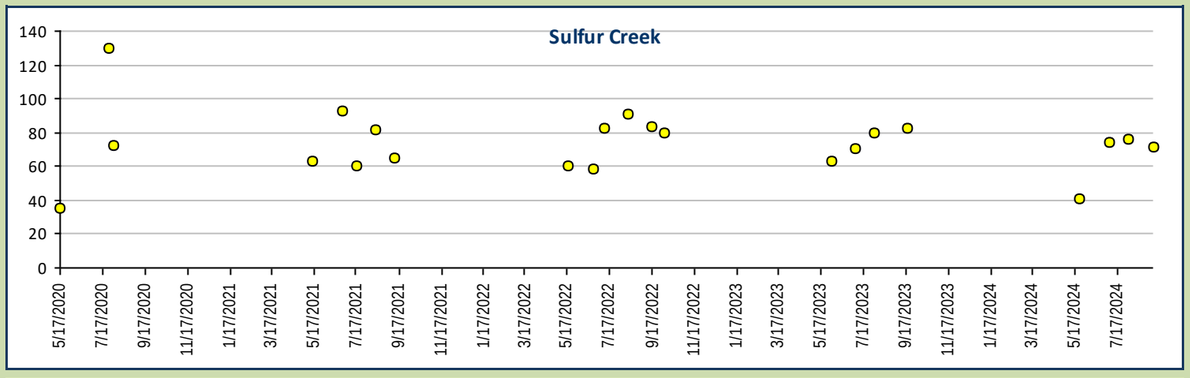
Sulfate, units mg/L

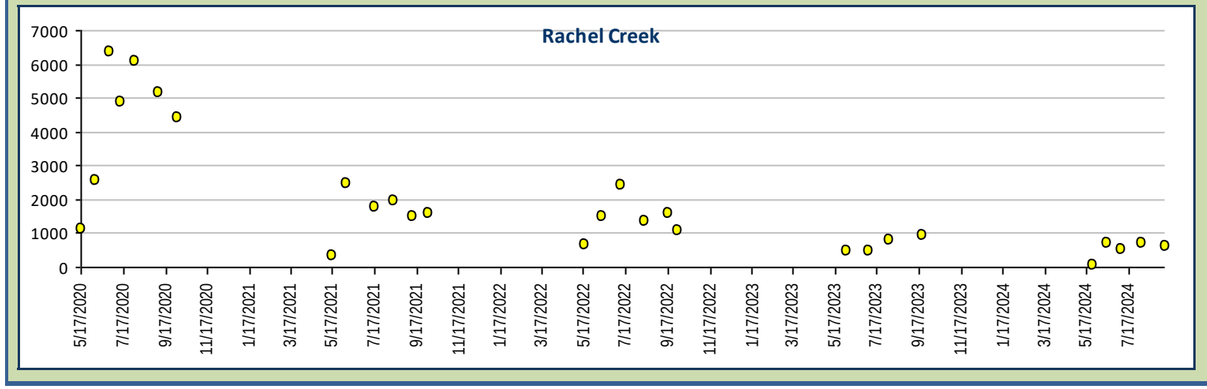


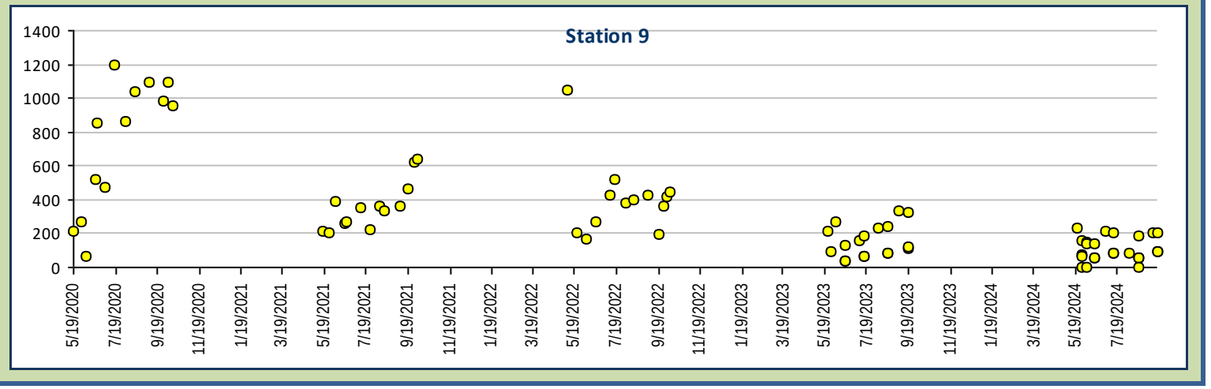












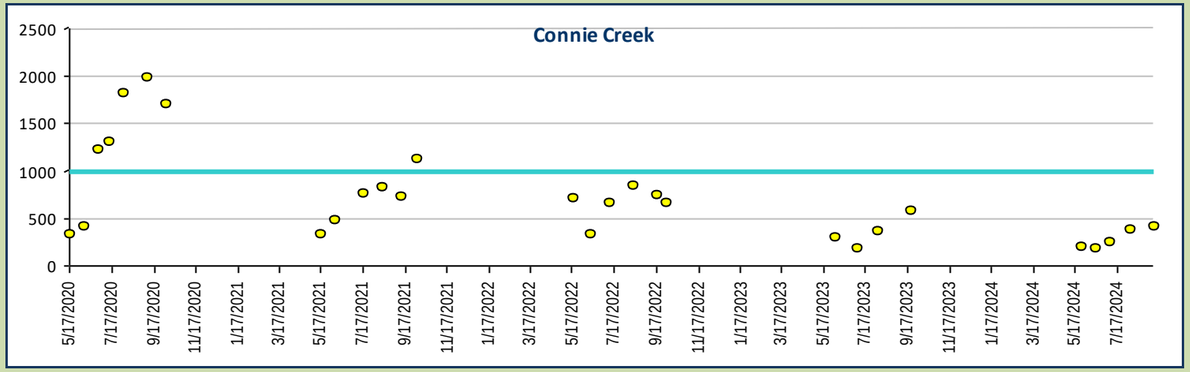
RED DOG MINE

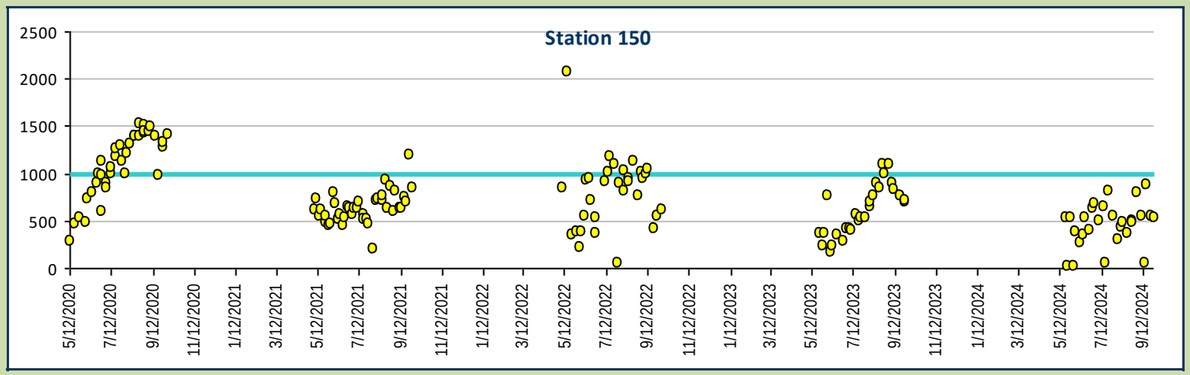
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

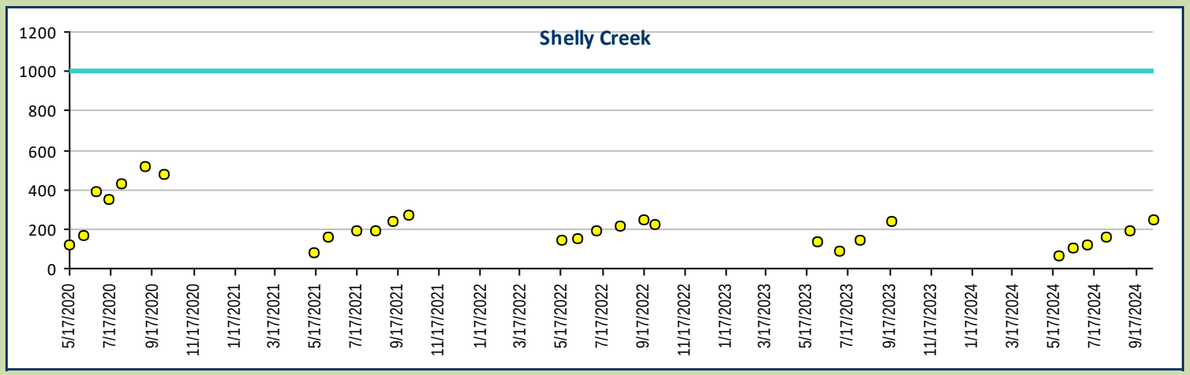
Total Dissolved Solids, units mg/L

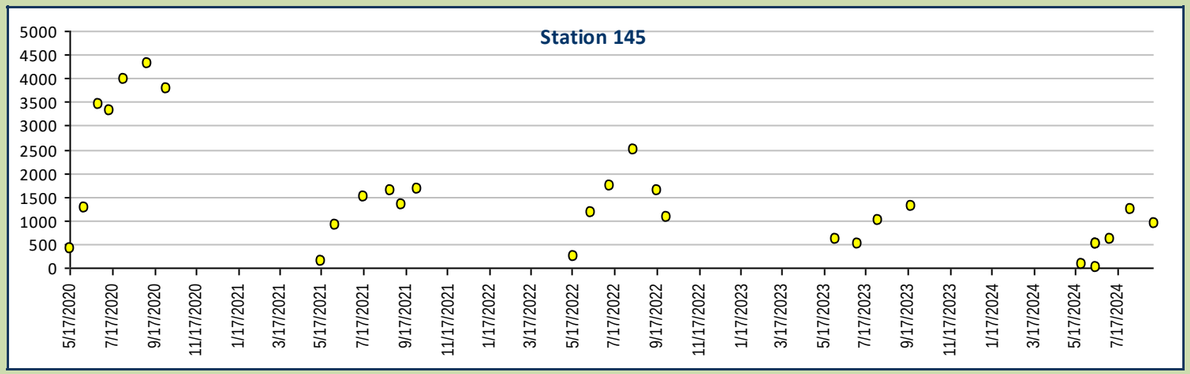
Site Specific WQS mg/L

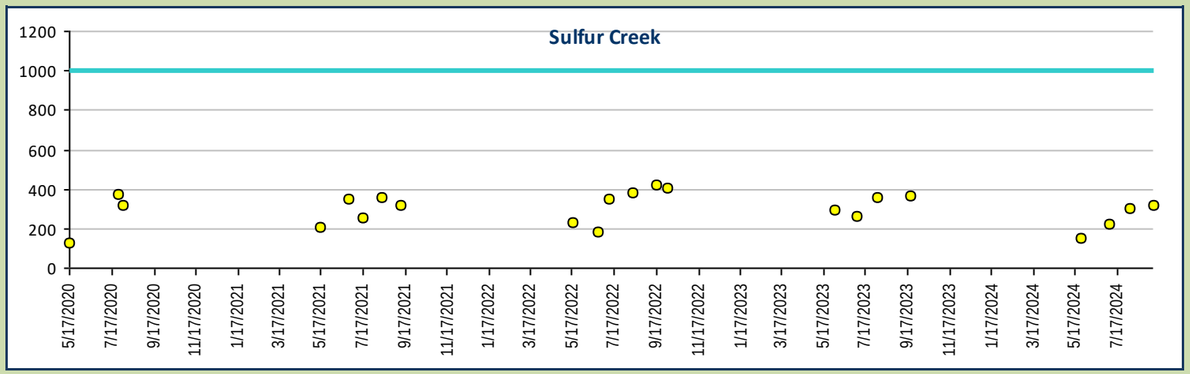
1000 mg/L

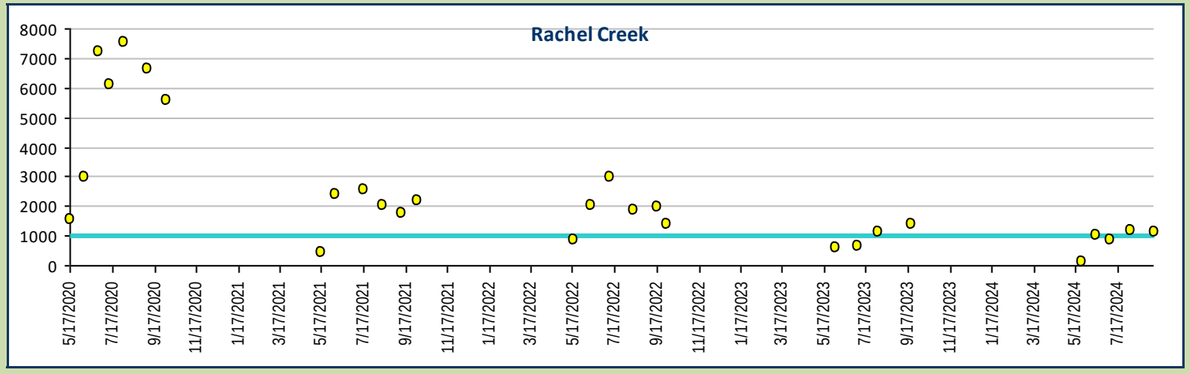


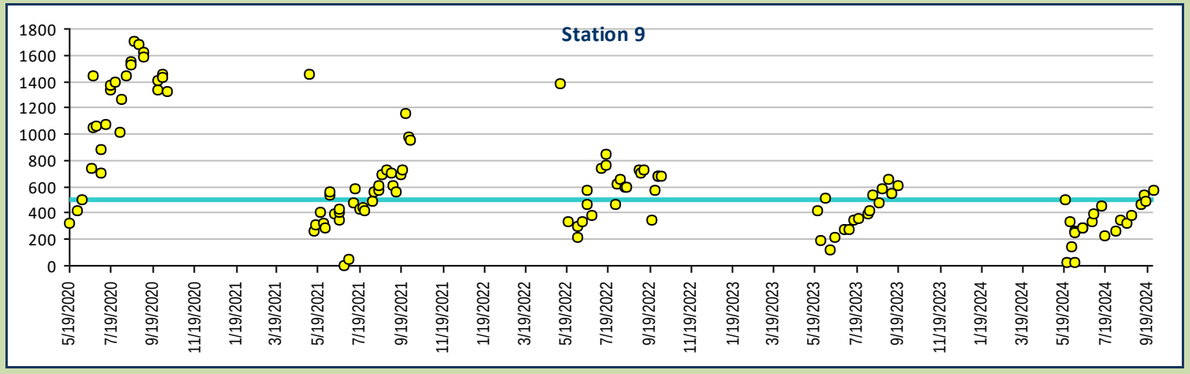












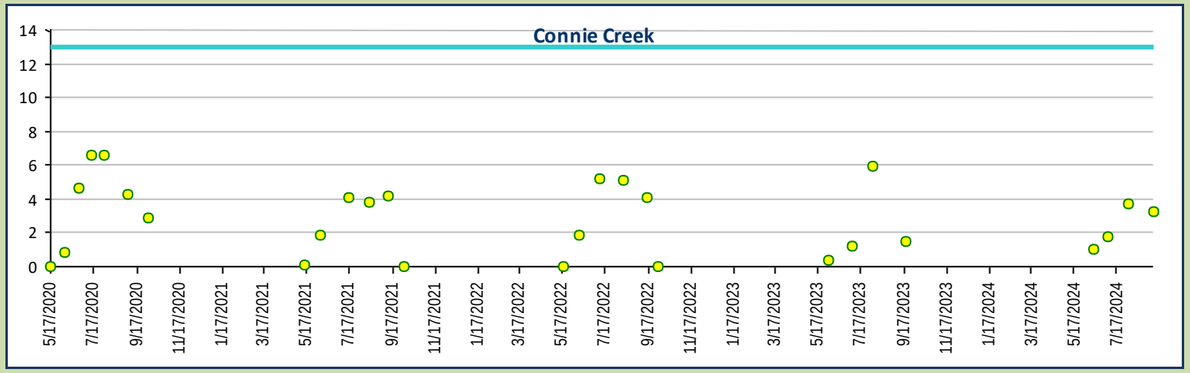
RED DOG MINE

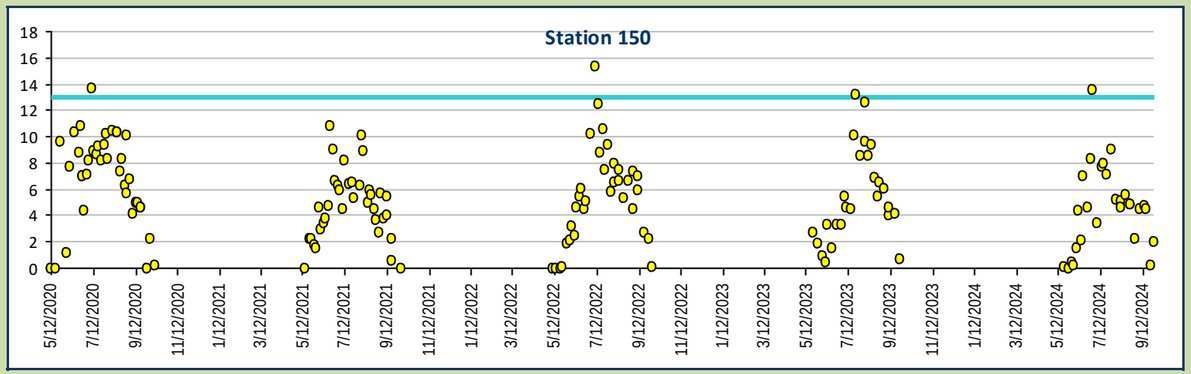
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

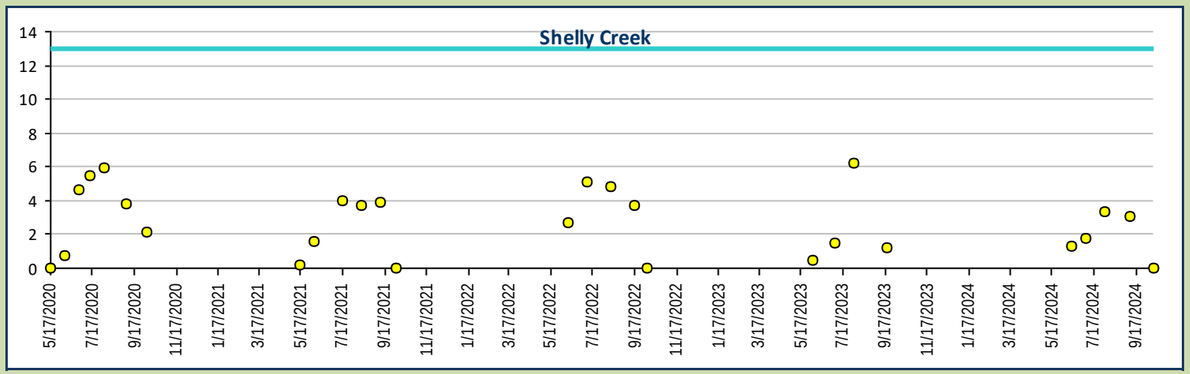
Temperature Field, Celsius

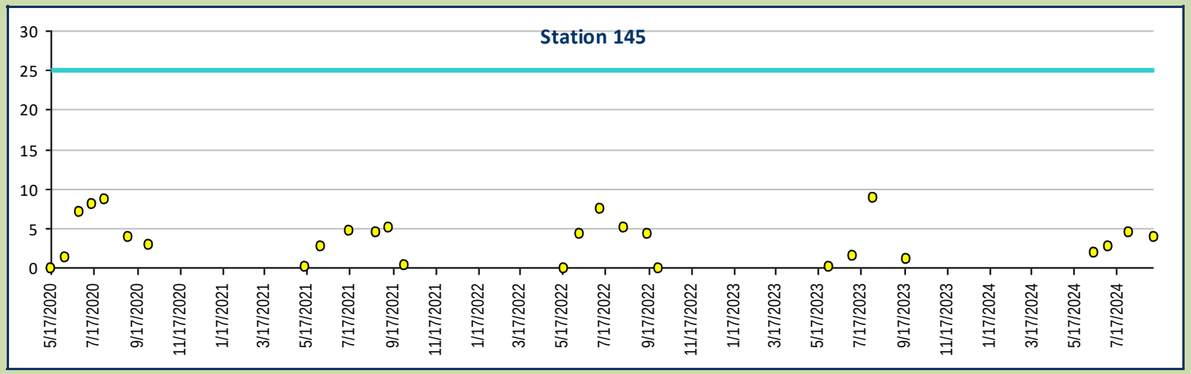
Site Specific WQS mg/L

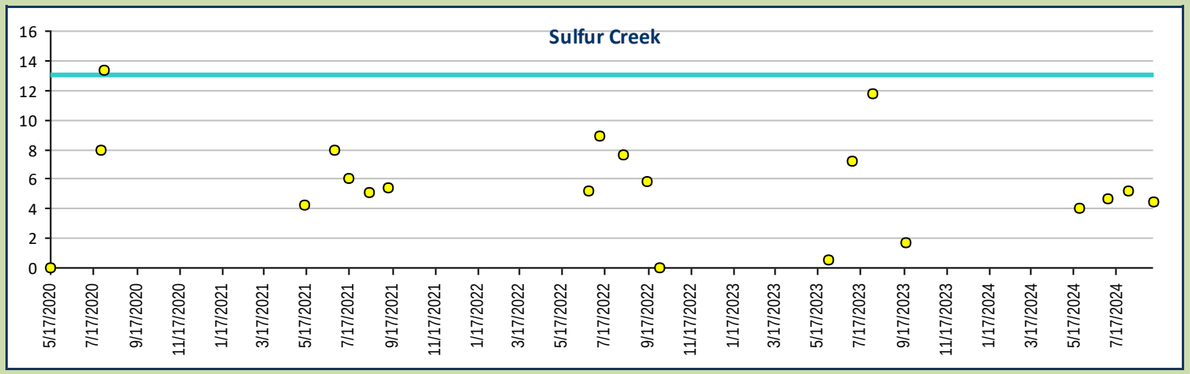
13 Celsius

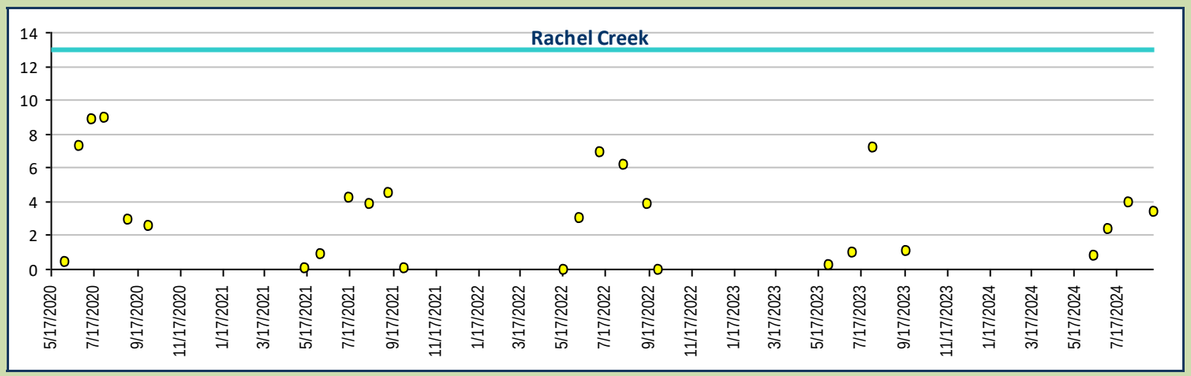


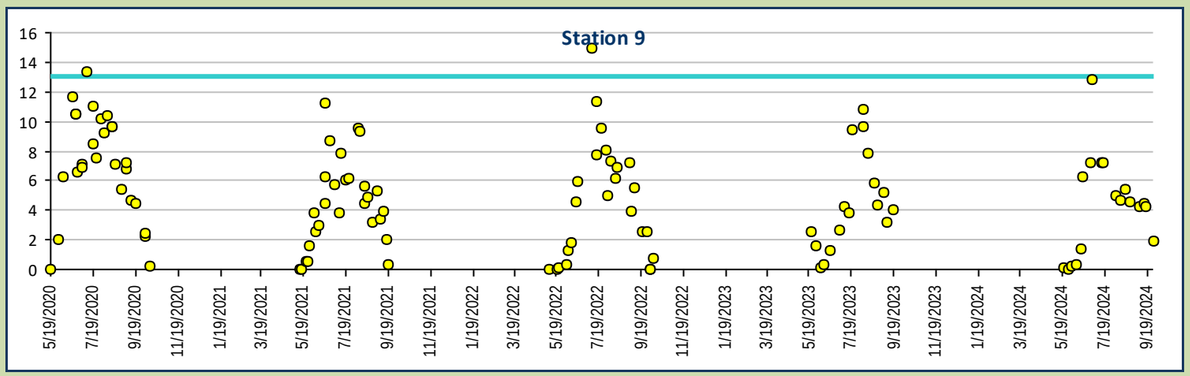








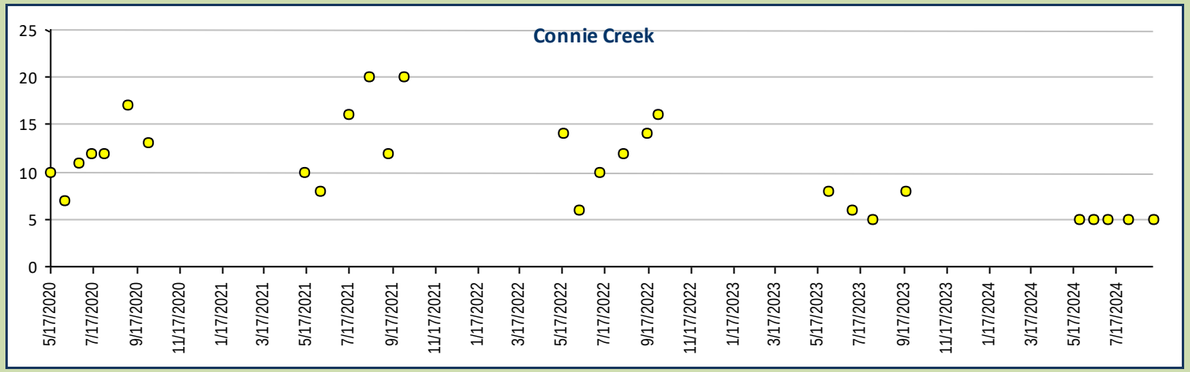


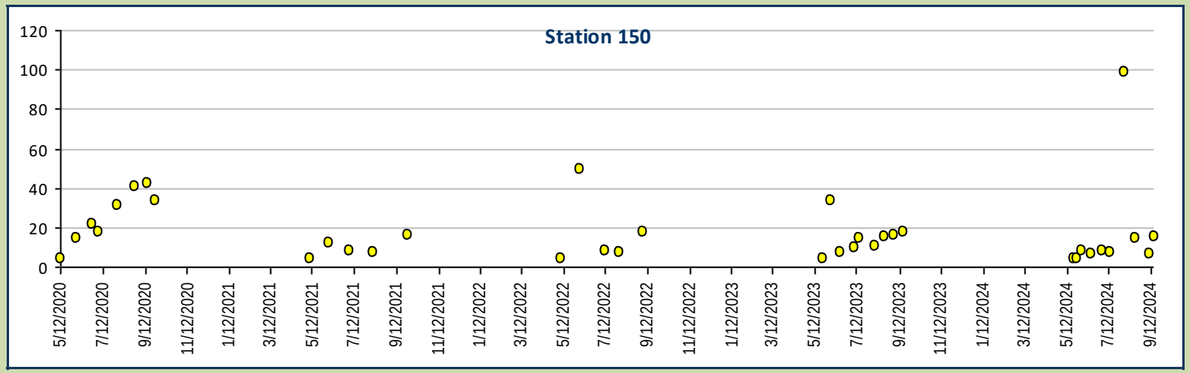


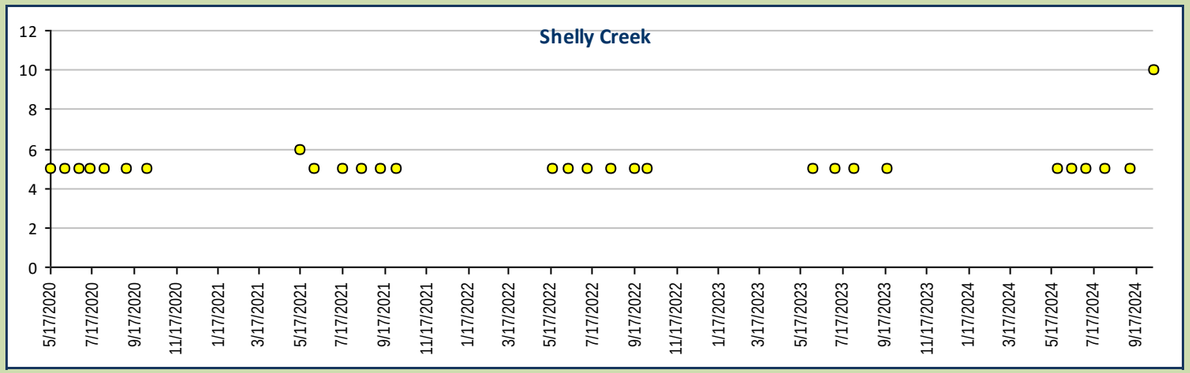
RED DOG MINE

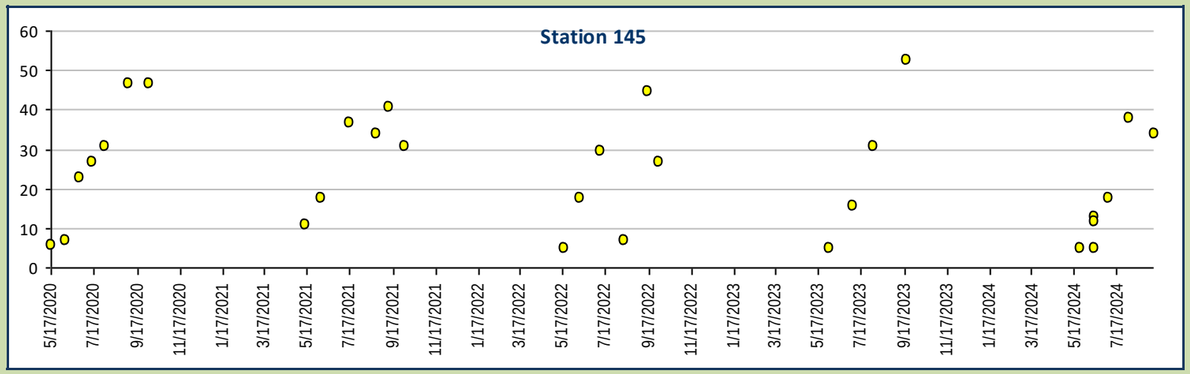
Water Monitoring Mine Drainage
Water Quality Profile I , 5-Year Trend Charts

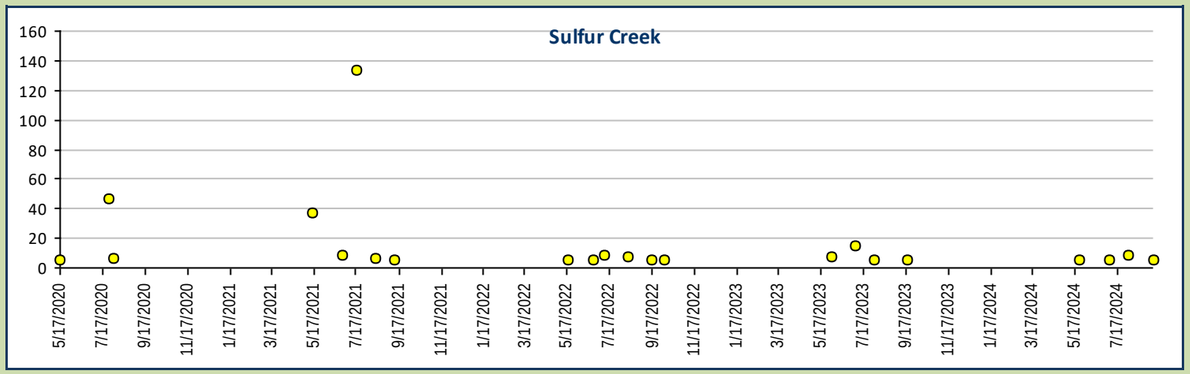
Total Suspended Solids, units mg/L

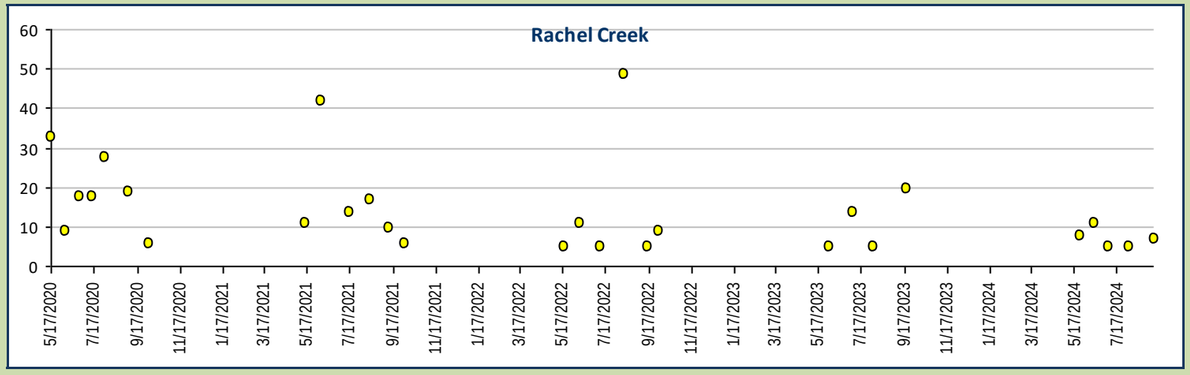


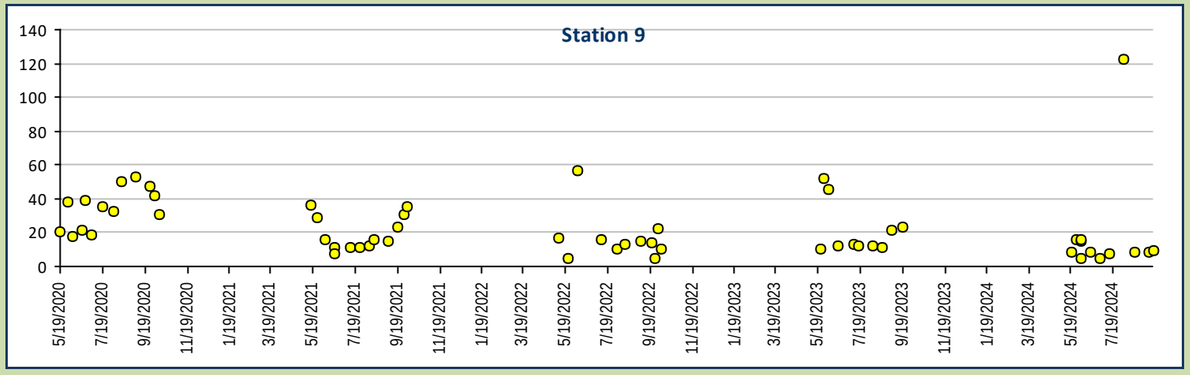












RED DOG MINE

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

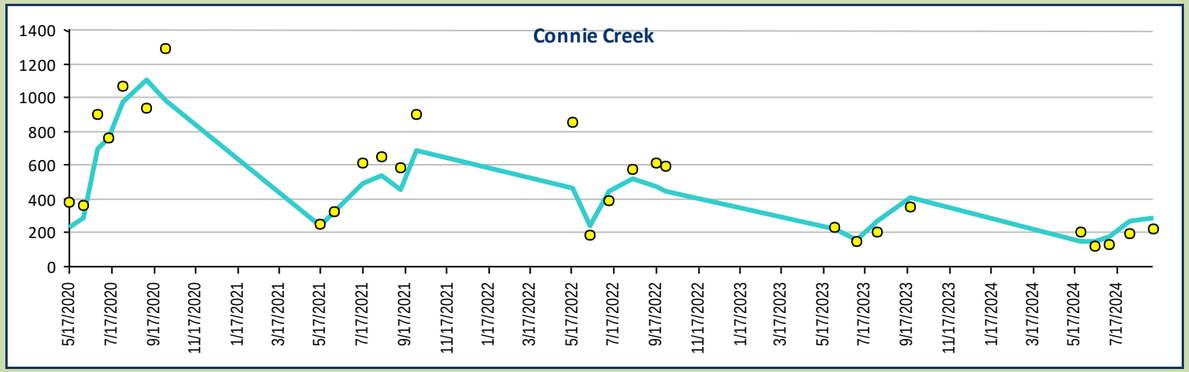
Zinc, Total Recoverable, units ug/L

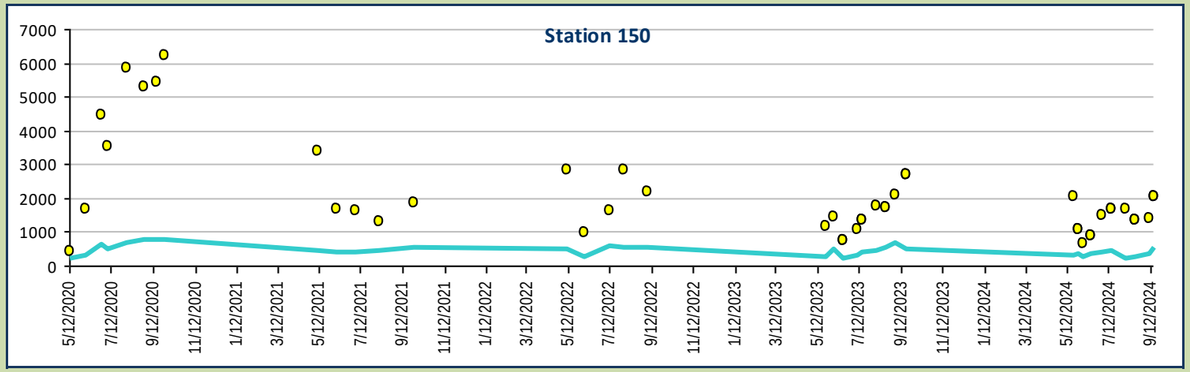
Aquatic Life - Fresh Water Acute WQS ug/L

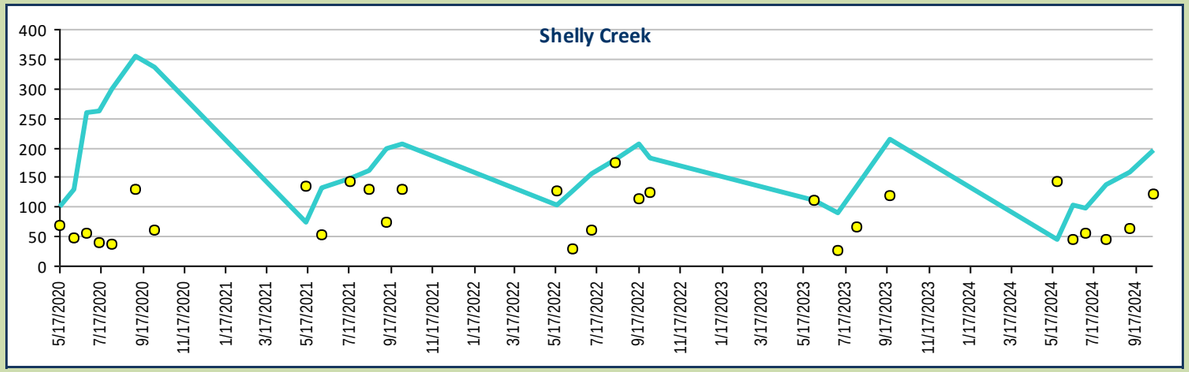
Hardness Dependent Calculation

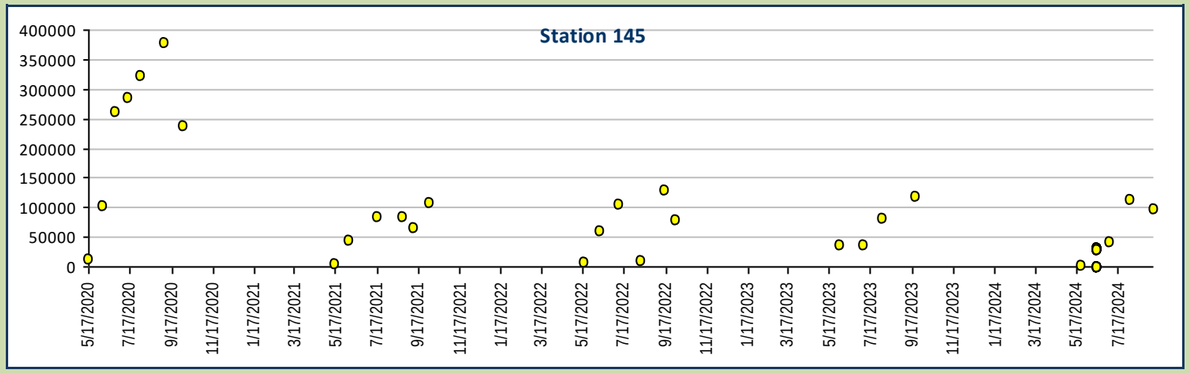
=EXP(0.8473*(LN(*hardness))+0.884)

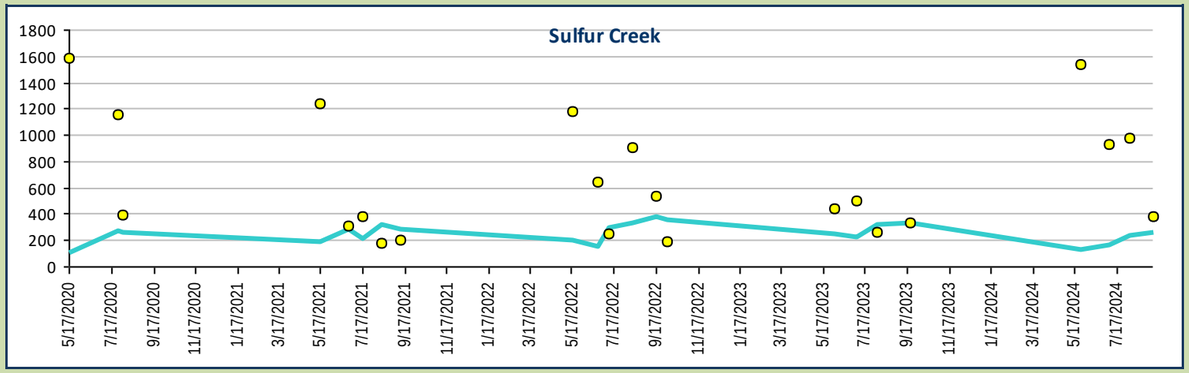
* Calculated using Standard Methods 2340B

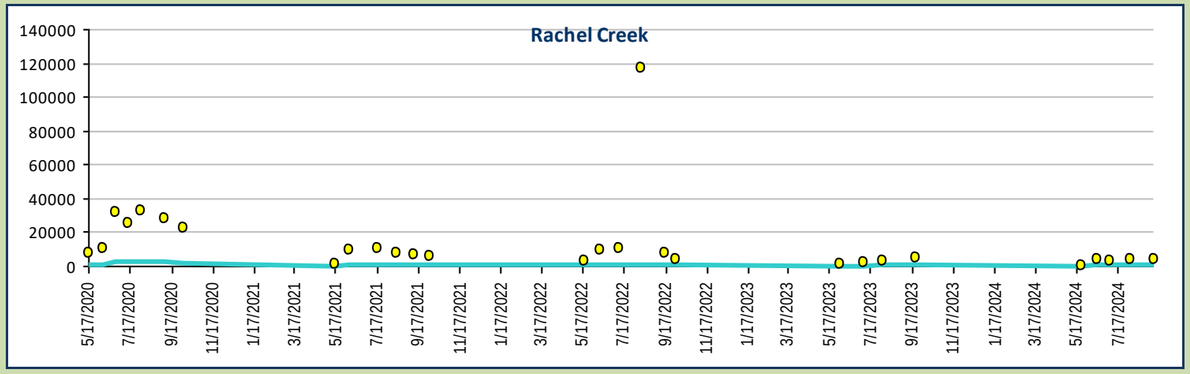


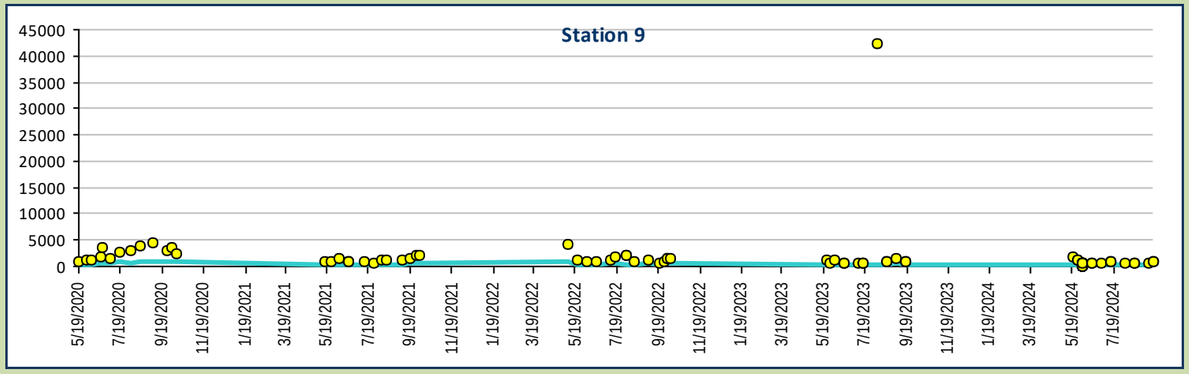












Appendix E: Water Quality Profile I Charts – Bons Creek Monitoring Stations

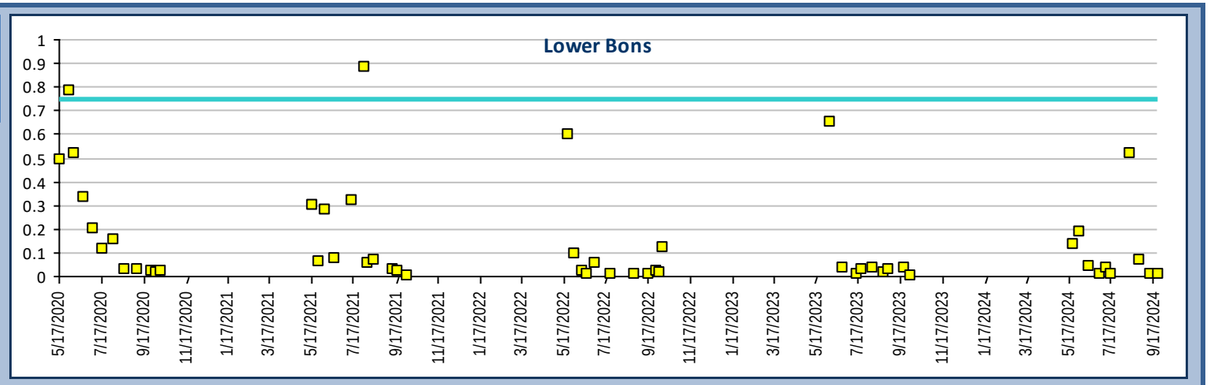
RED DOG MINE

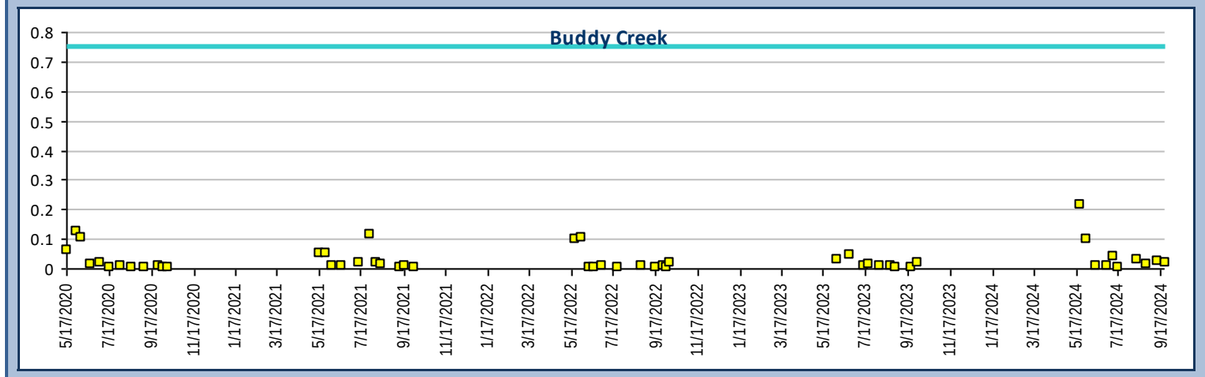
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

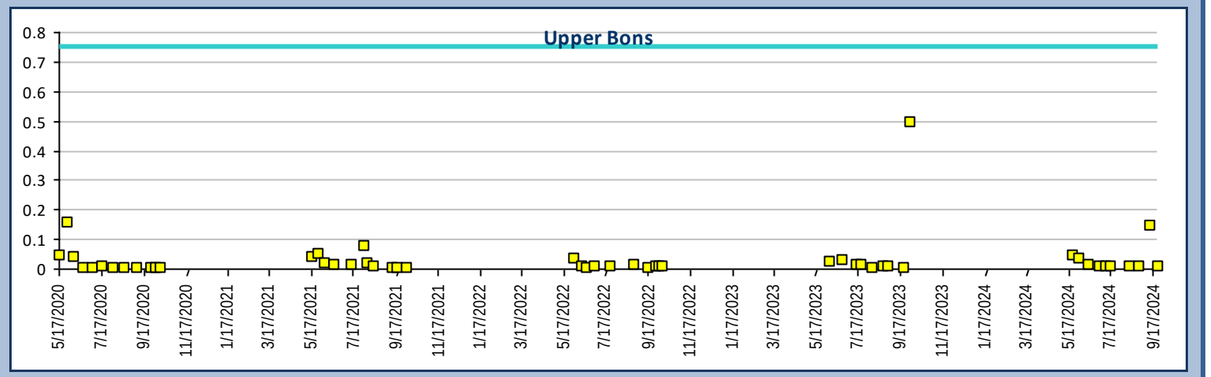
Aluminum, Total Recoverable, units mg/L

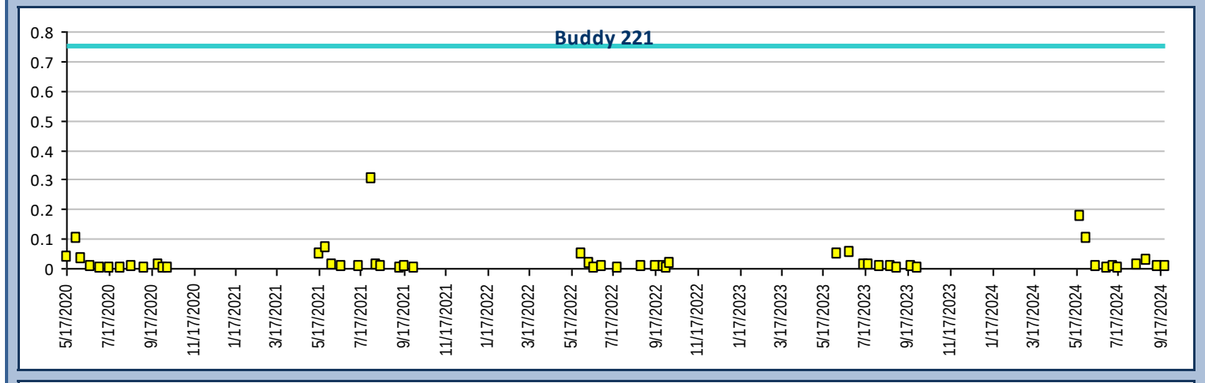
Aquatic Life - Fresh Water Chronic WQS mg/L

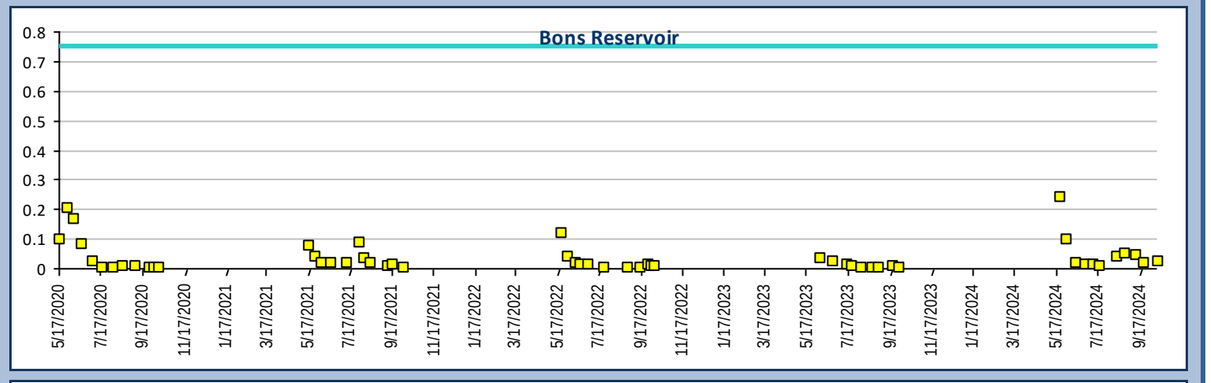
If pH > 7 and hardness > 50. then WQS = 0.75mg/l

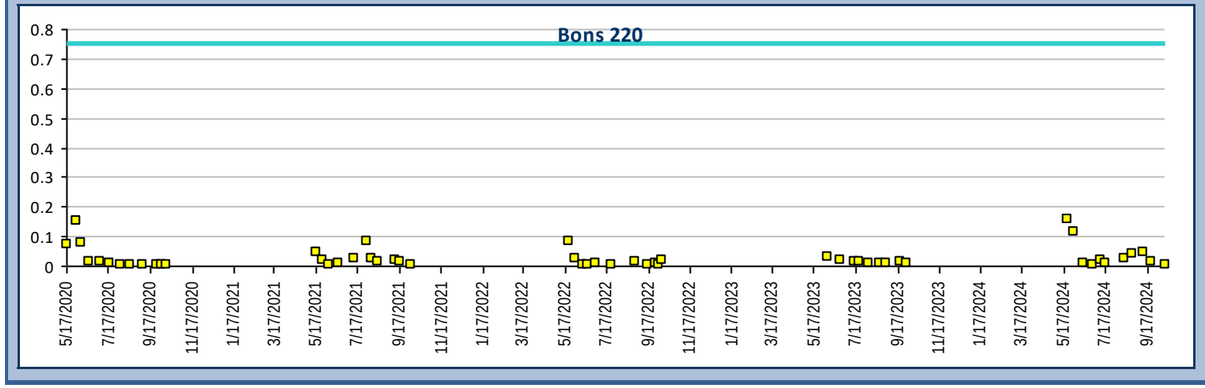


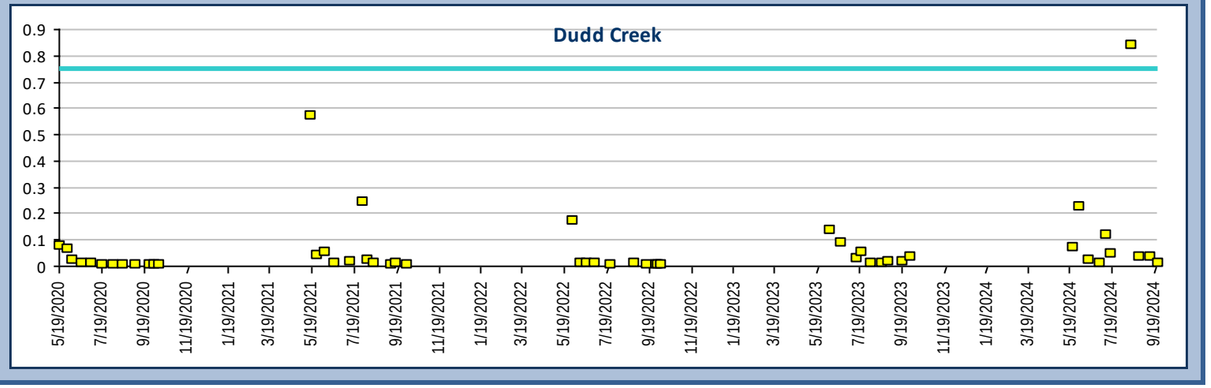












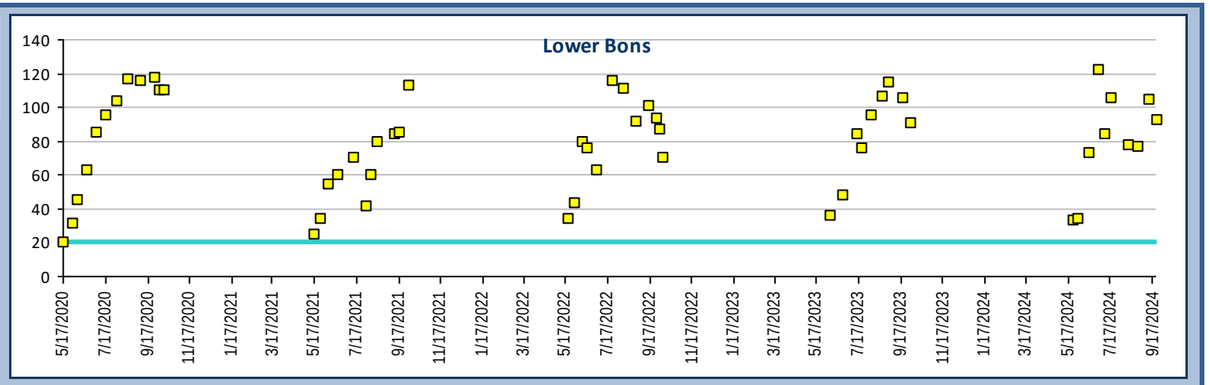
RED DOG MINE

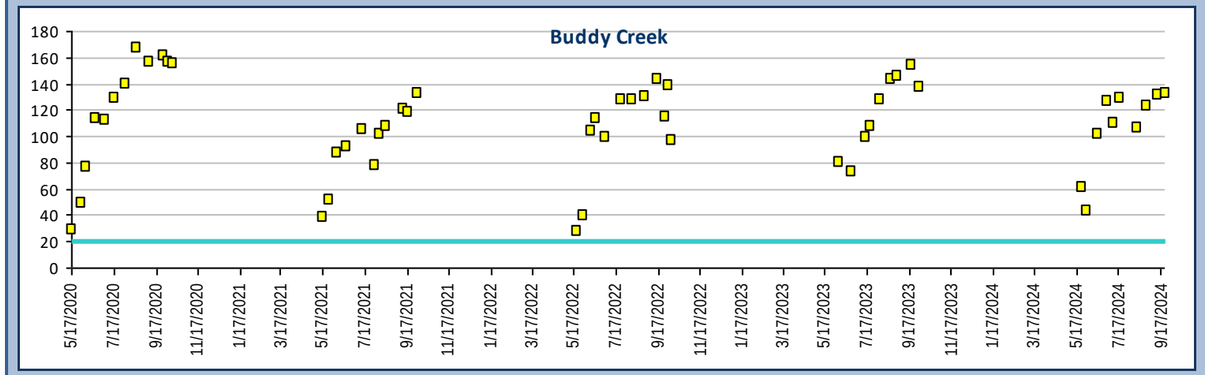
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

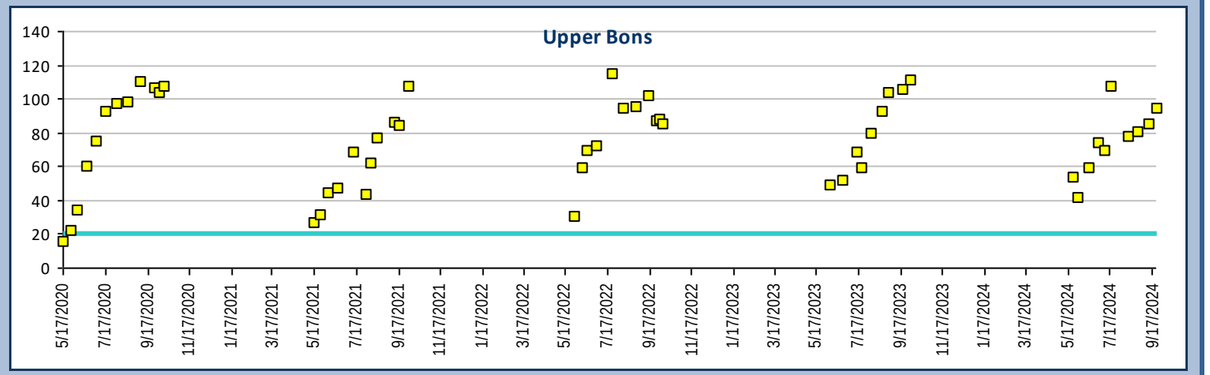
Alkalinity (as CaCO3), units mg/L

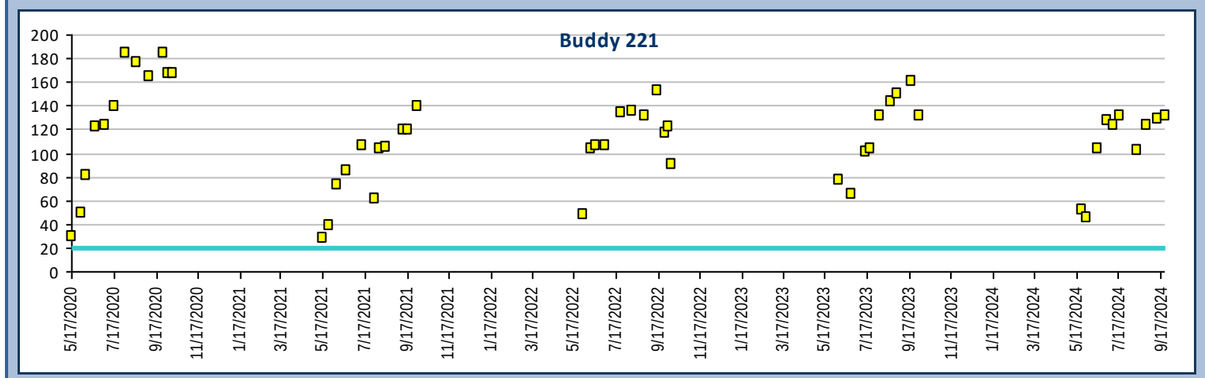
Aquatic Life - Fresh Water Chronic WQS mg/L

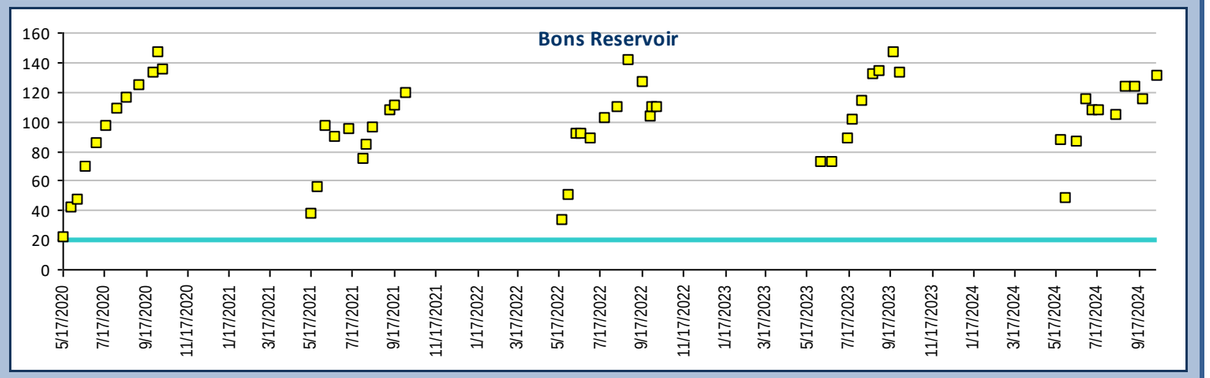
20 mg/L minimum

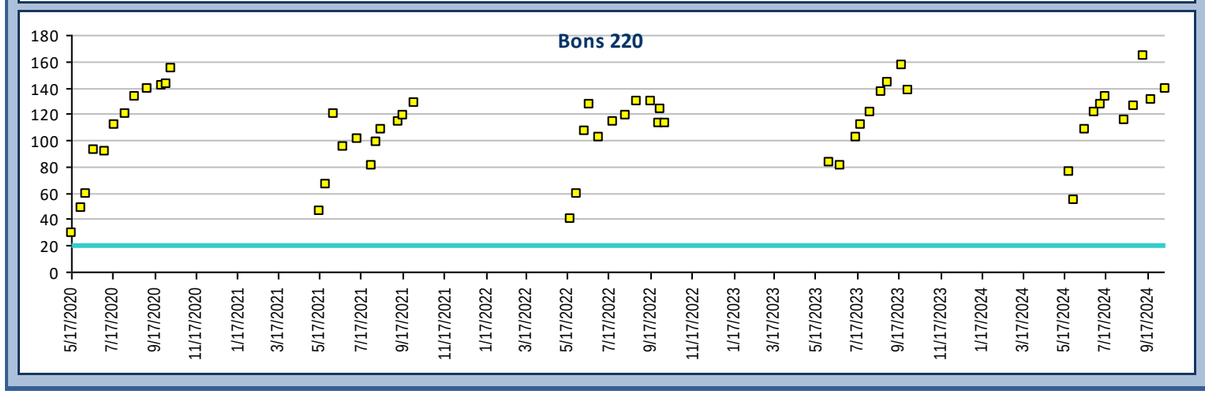


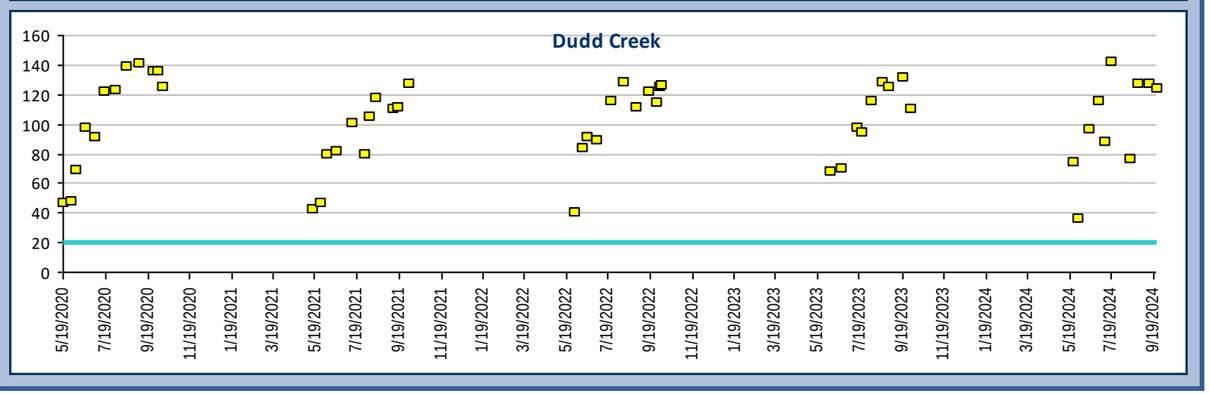








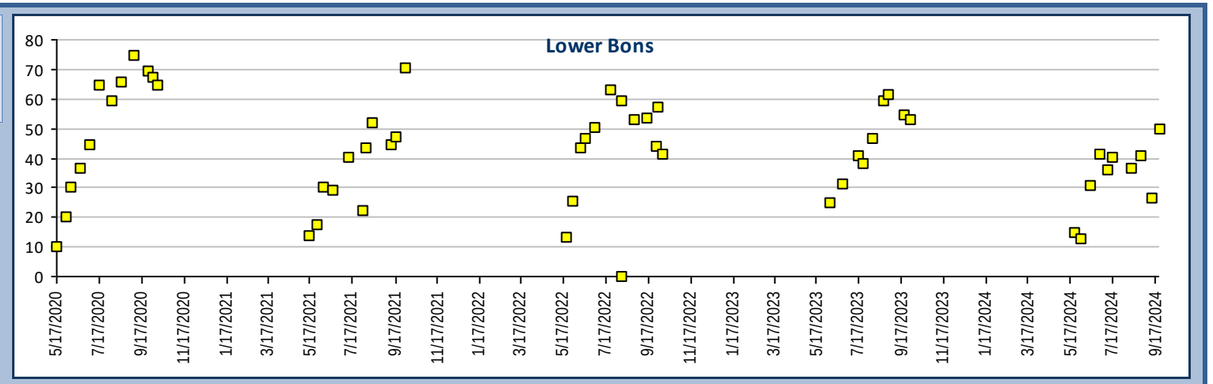


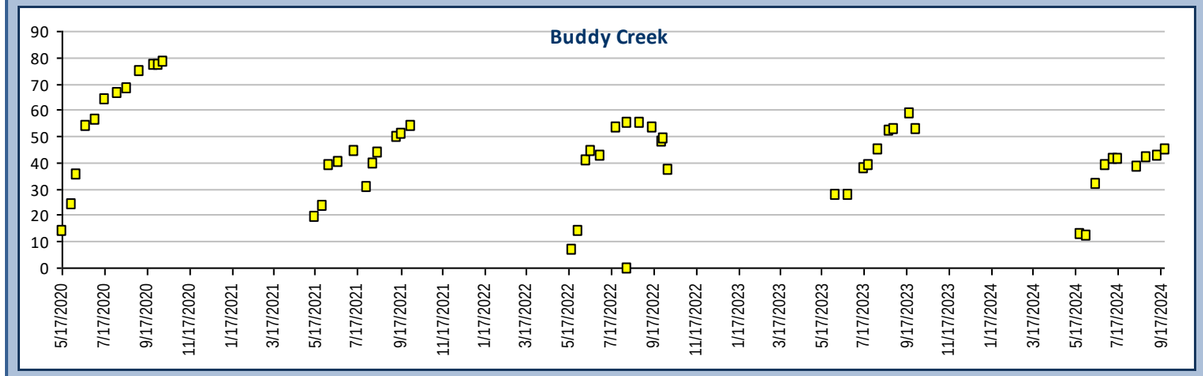


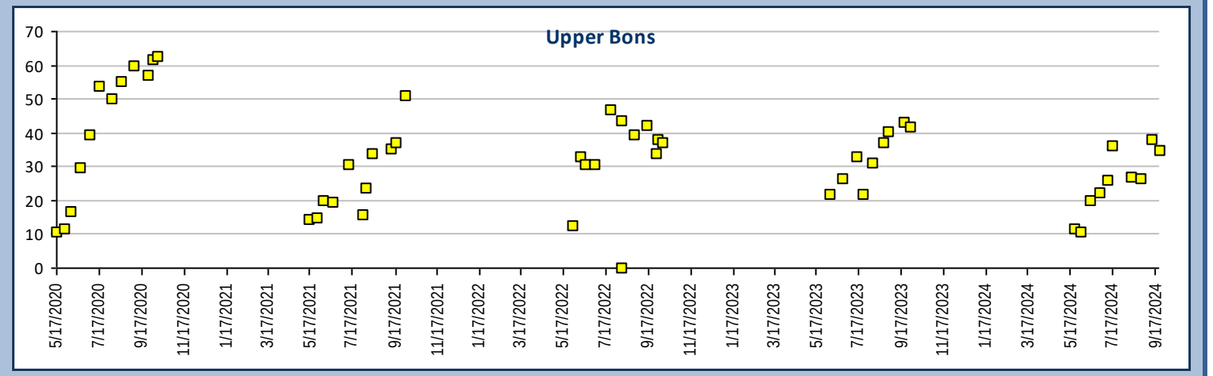
RED DOG MINE

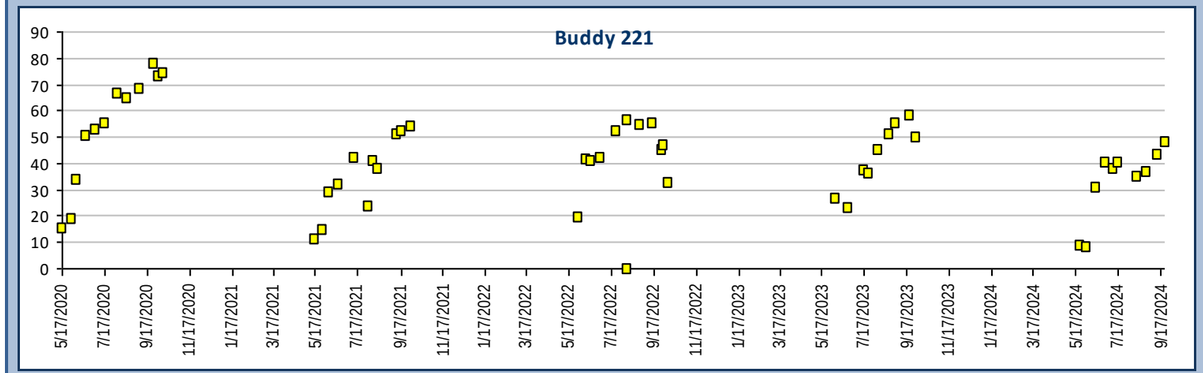
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

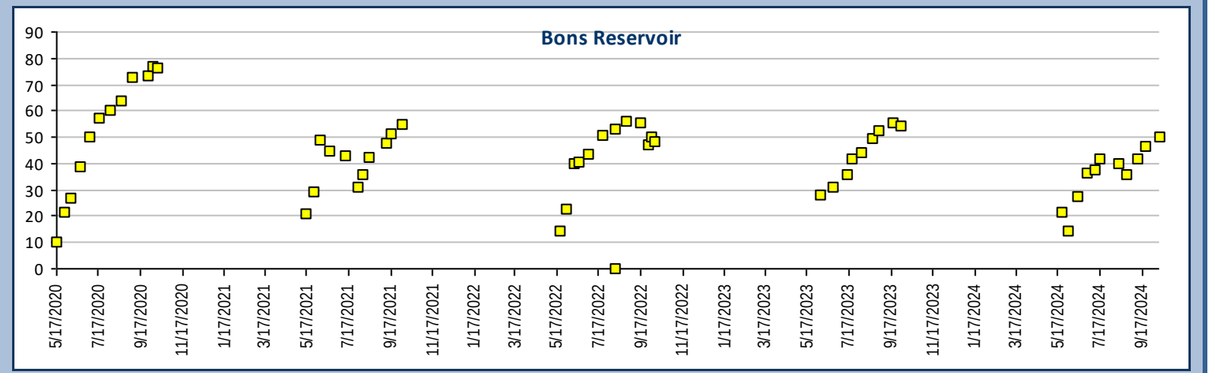
Calcium, Total Recoverable, units mg/L

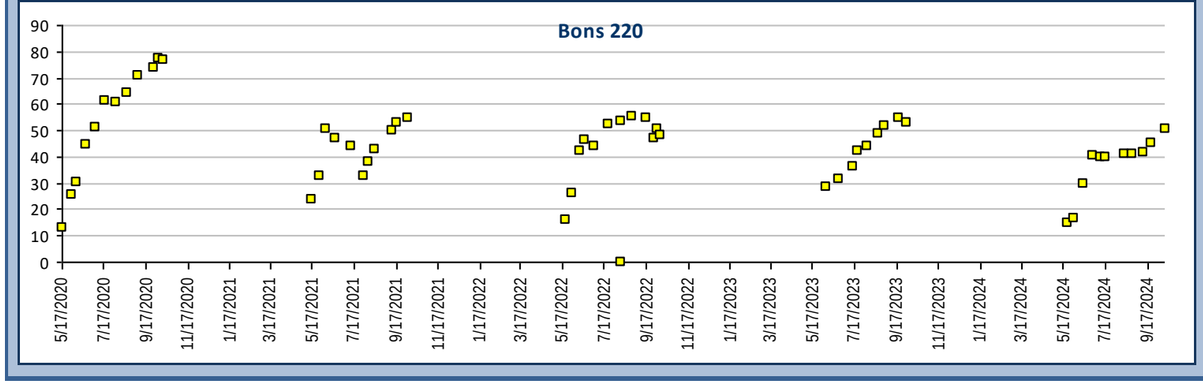


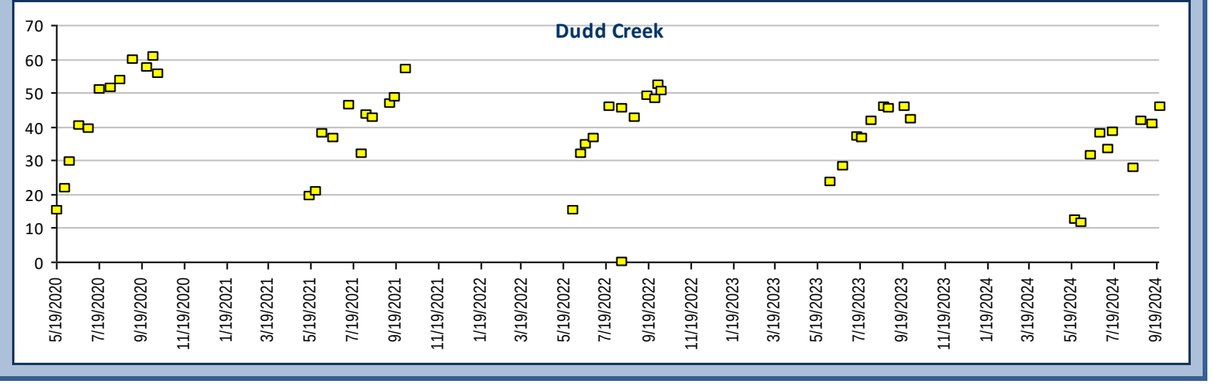












Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

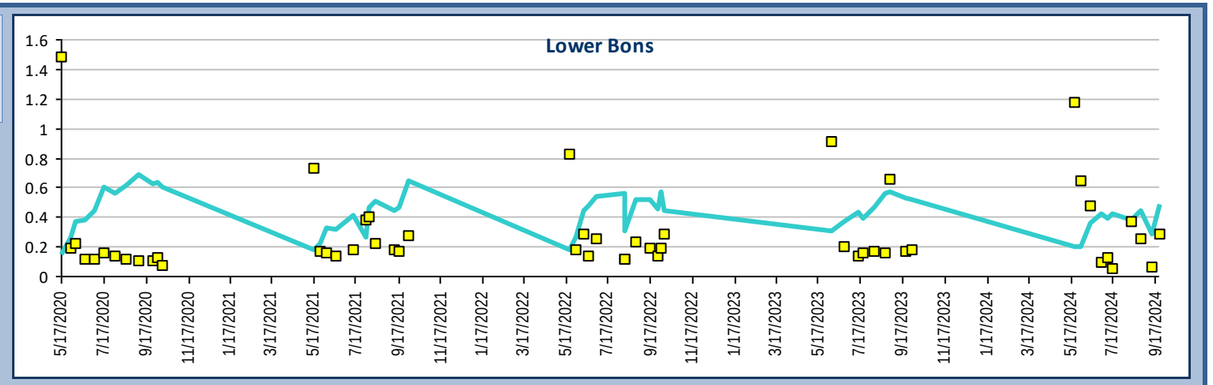
Cadmium, Total Recoverable, units ug/L

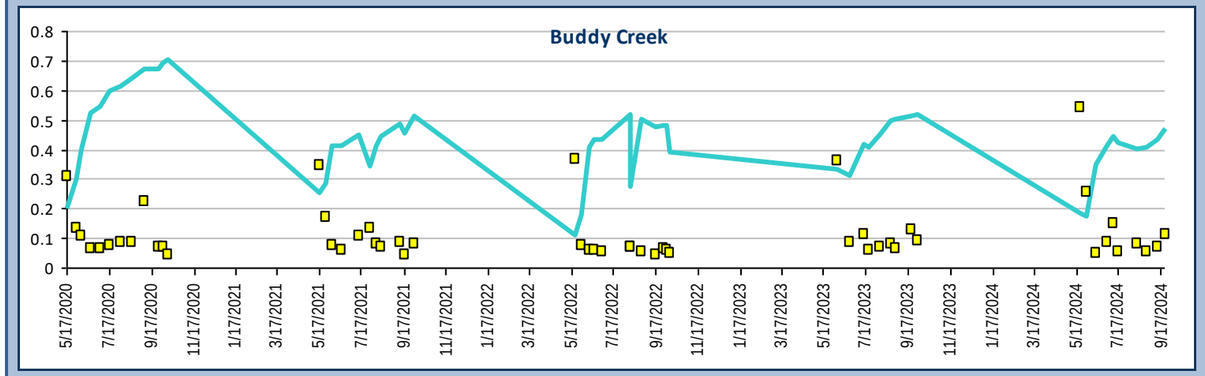
Aquatic Life - Fresh Water Chronic WQS ug/L

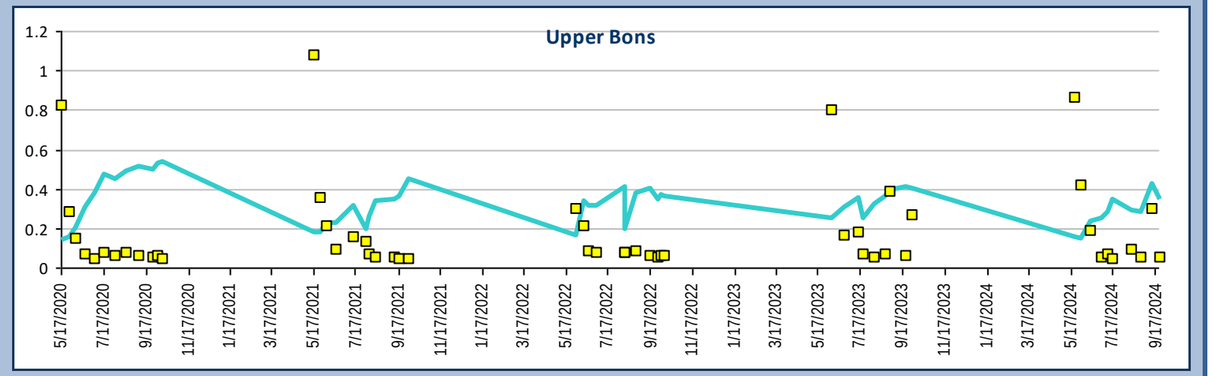
Hardness Dependent Calculation

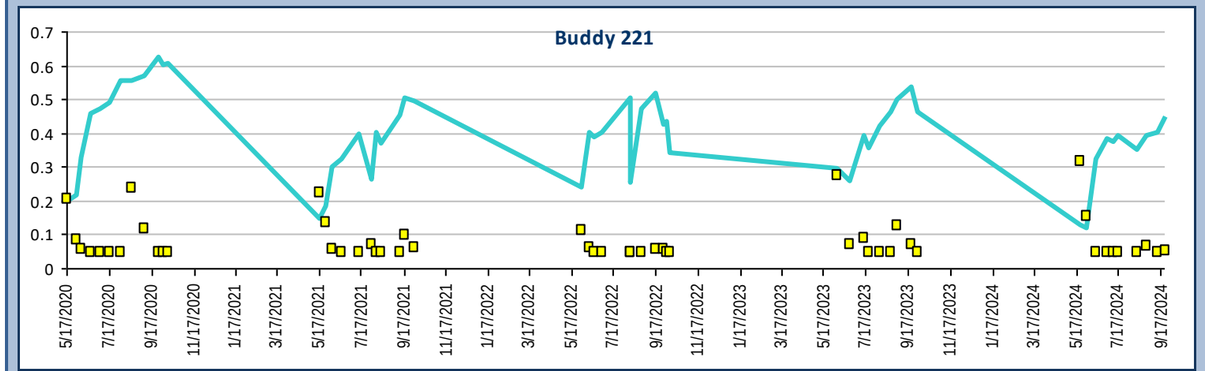
=EXP(0.7409*(LN(calc *hardness))-4.719)

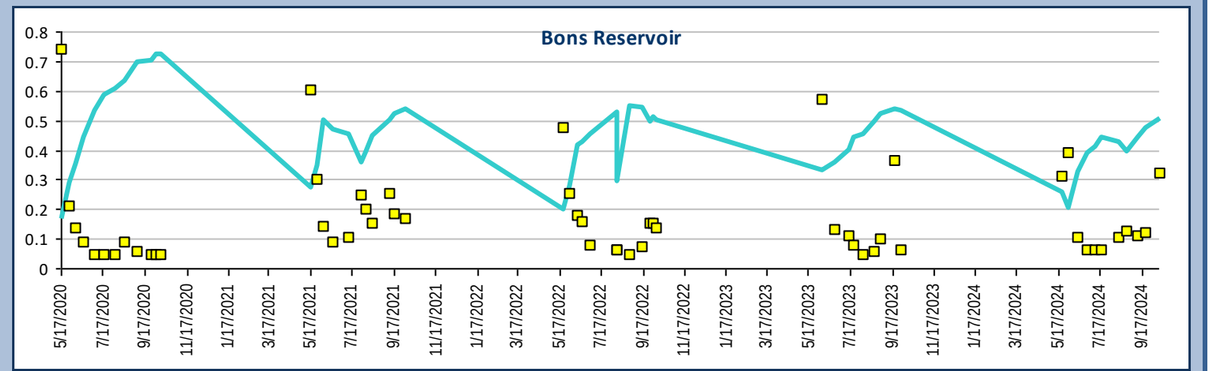
* Calculated using Standard Methods 2340B

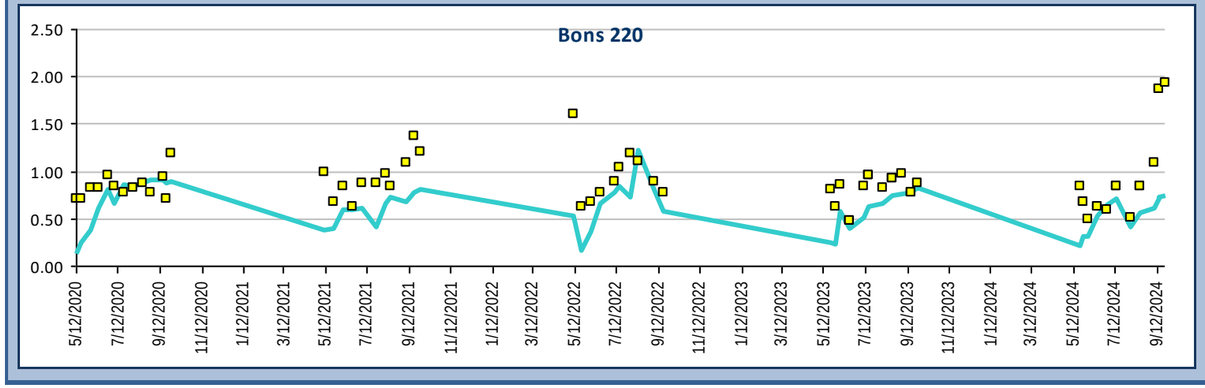


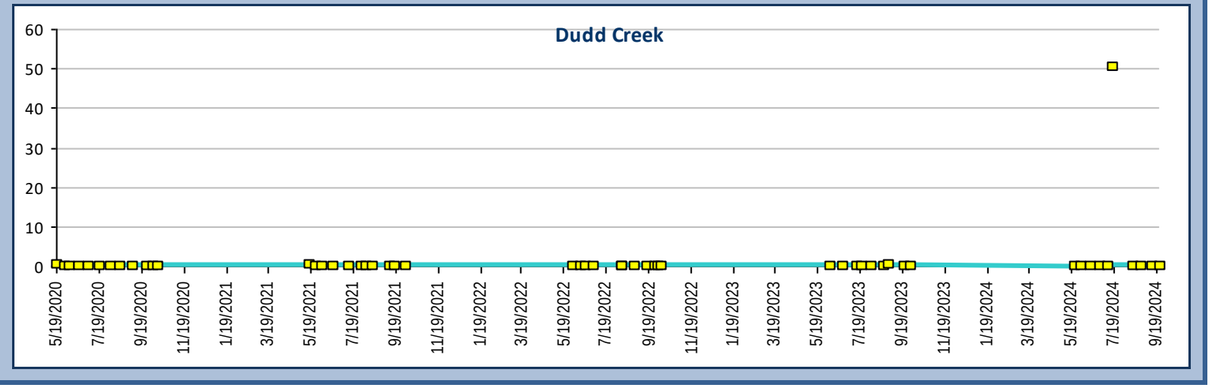








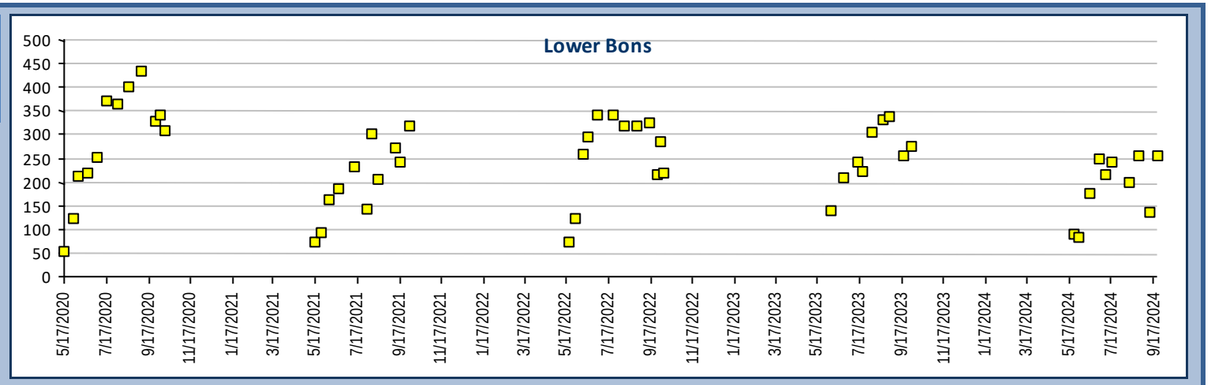


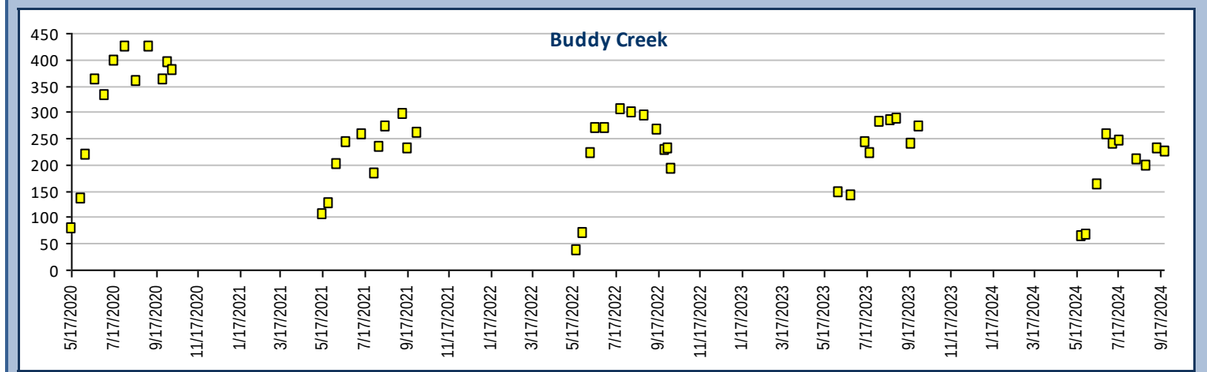


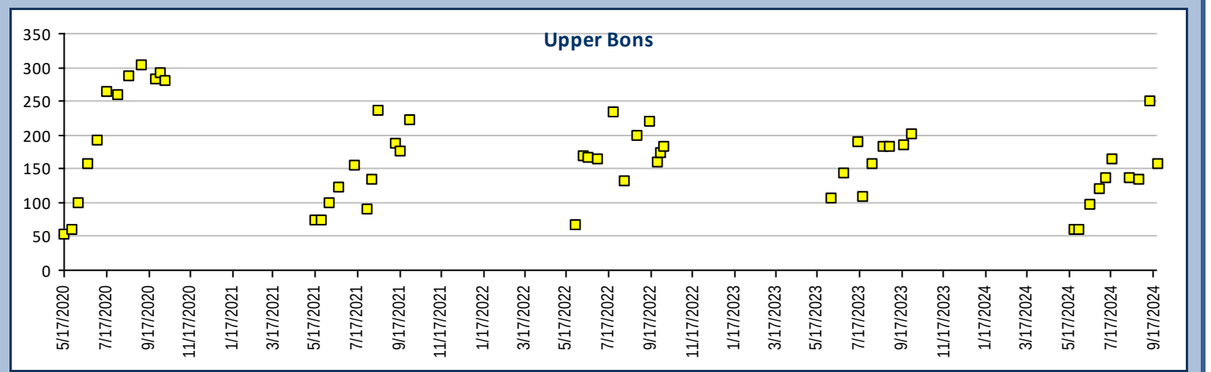
RED DOG MINE

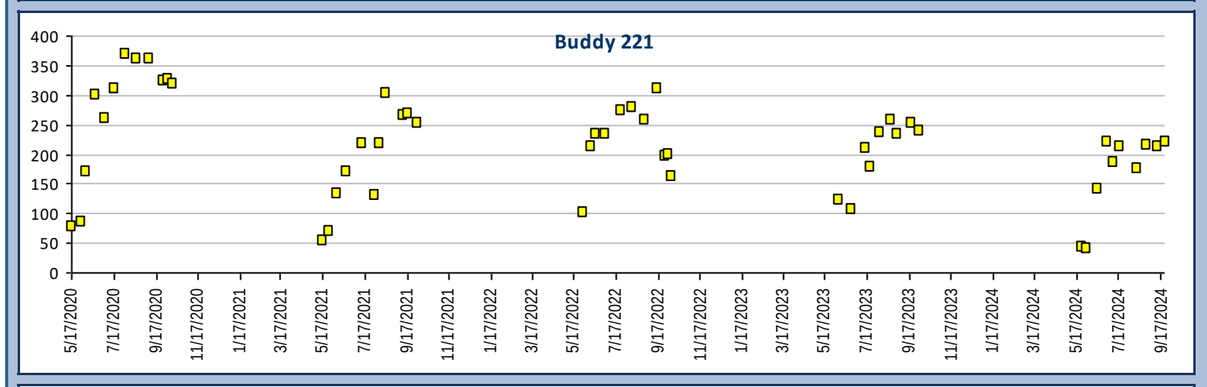
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

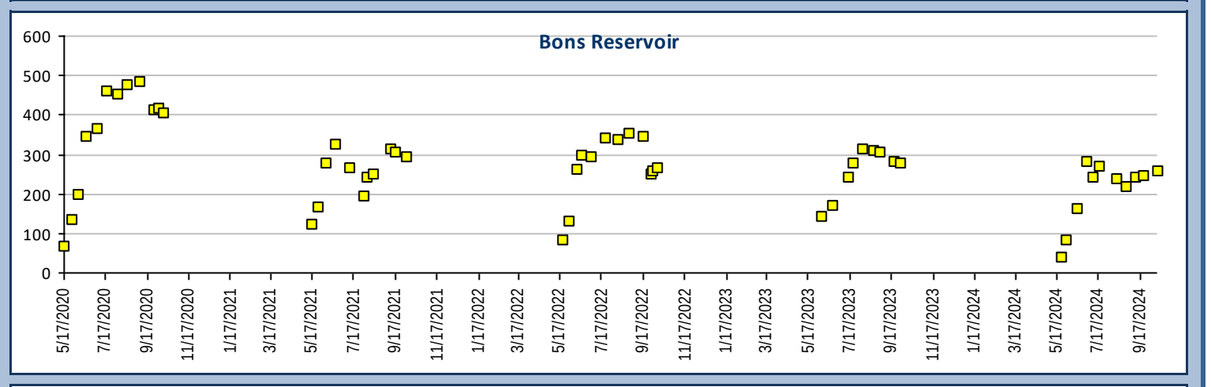
Conductivity, units uS/cm

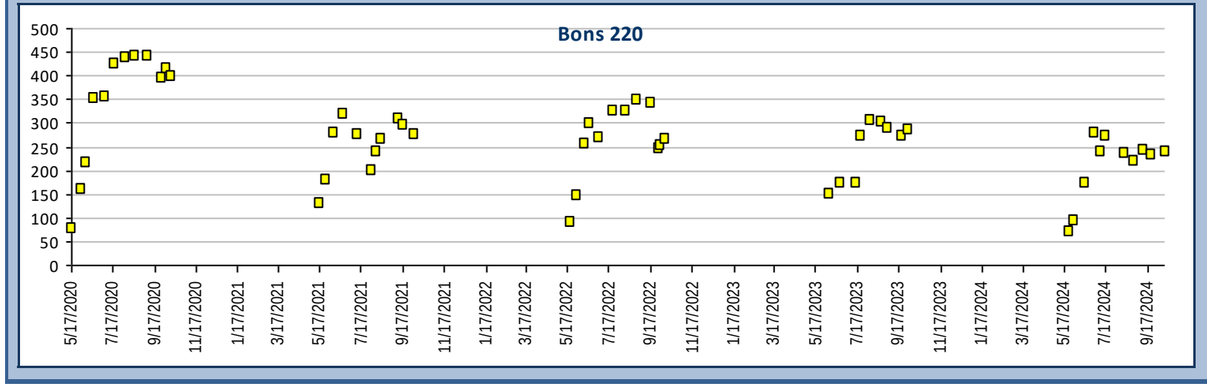


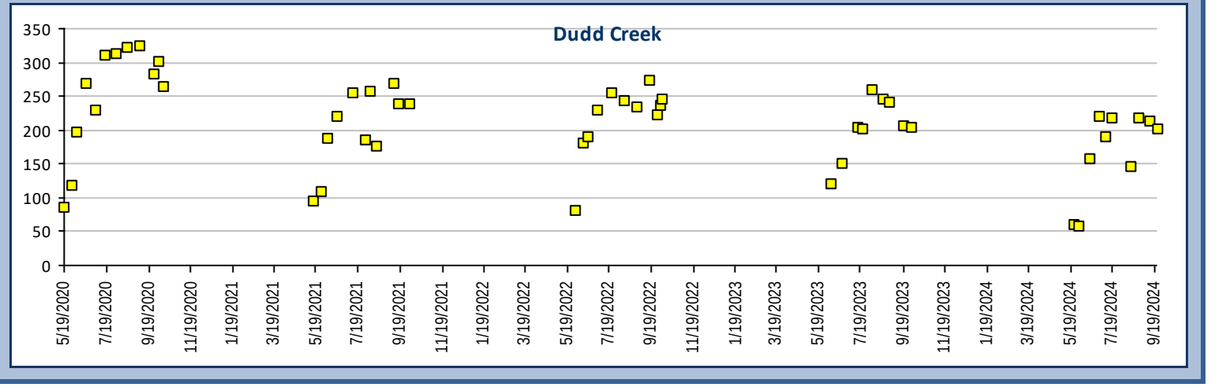








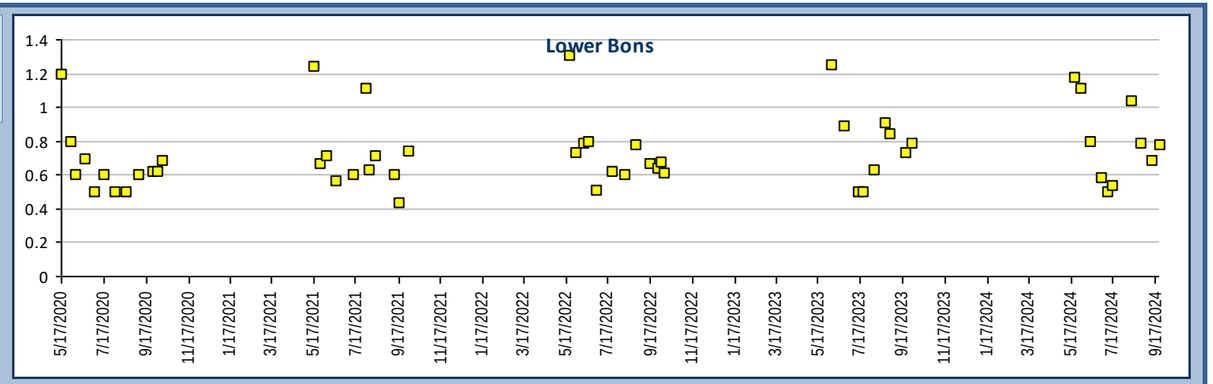


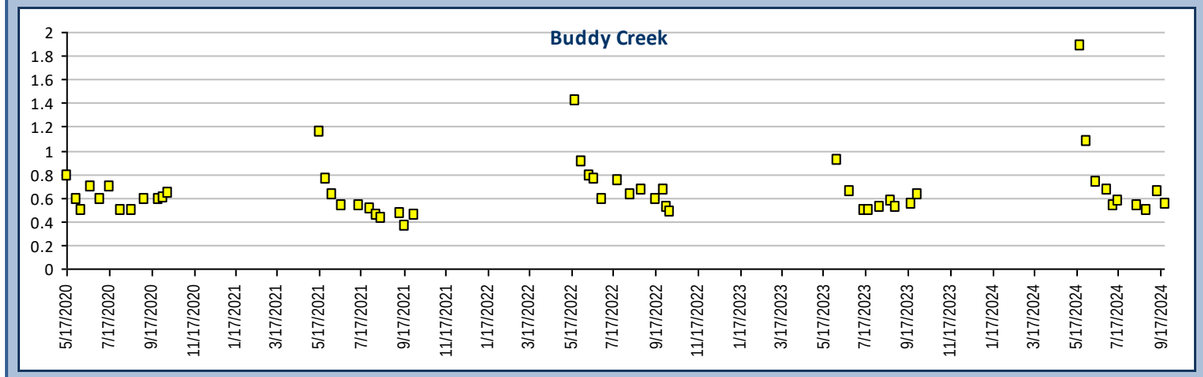


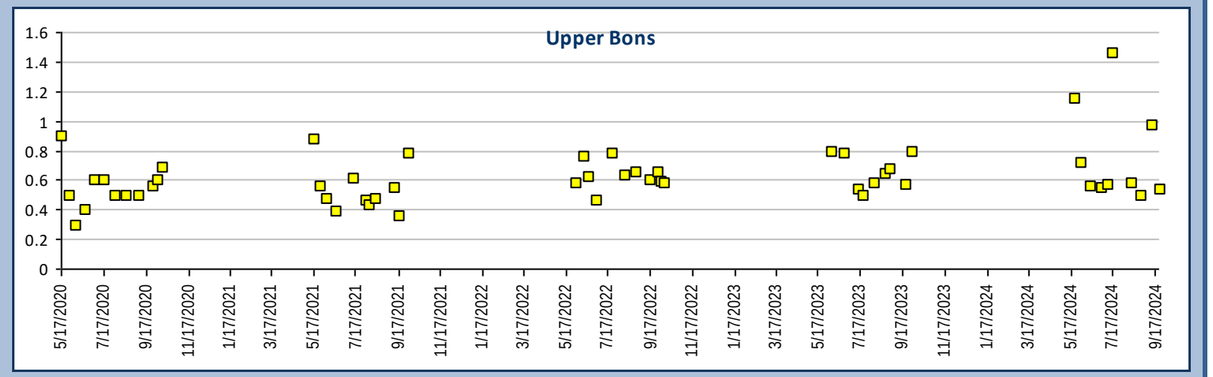
RED DOG MINE

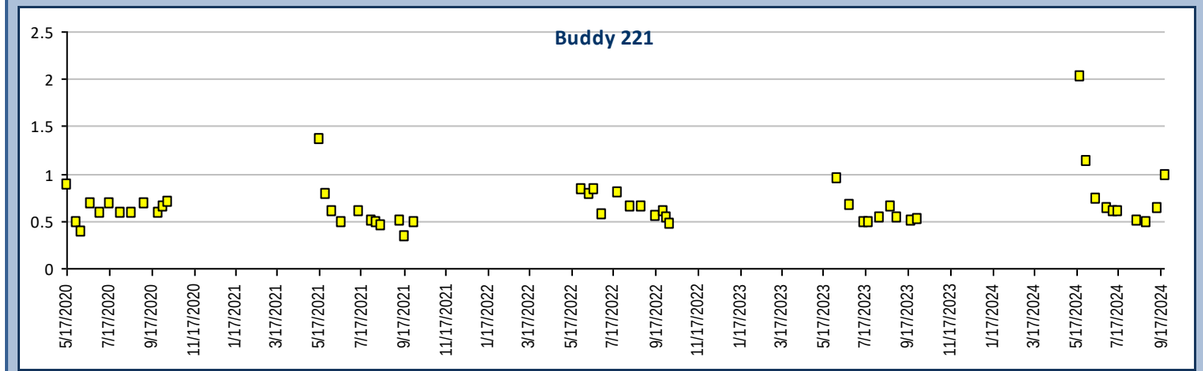
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

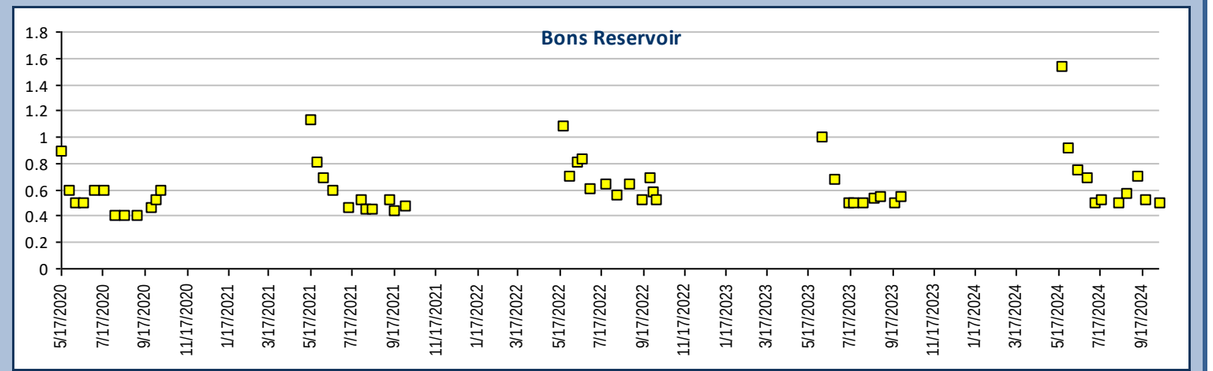
Potassium, Total Recoverable, units mg/L

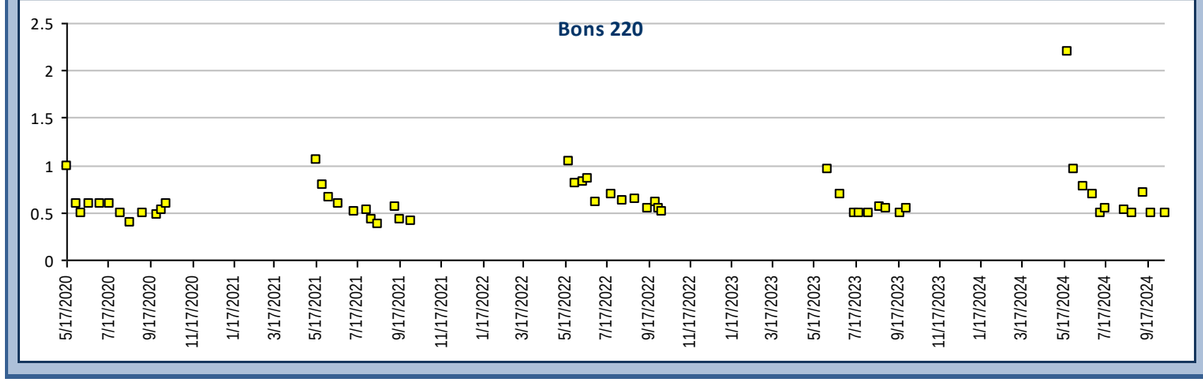


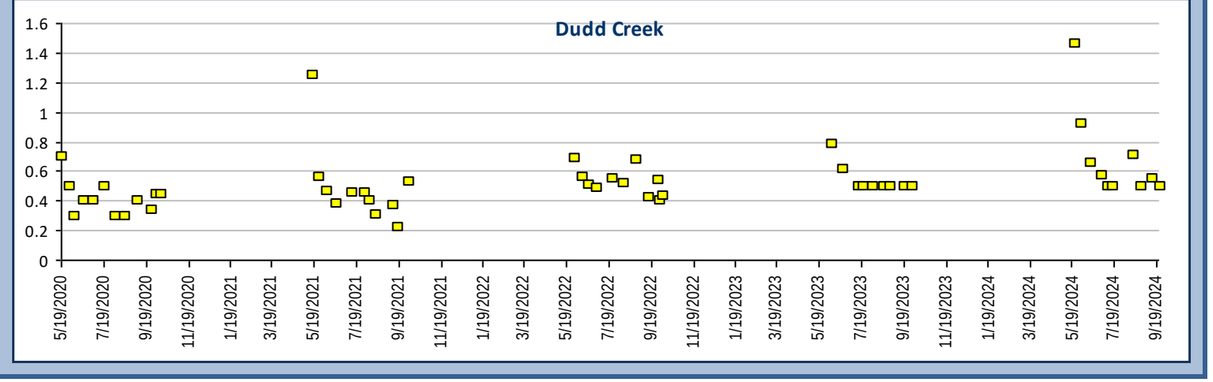






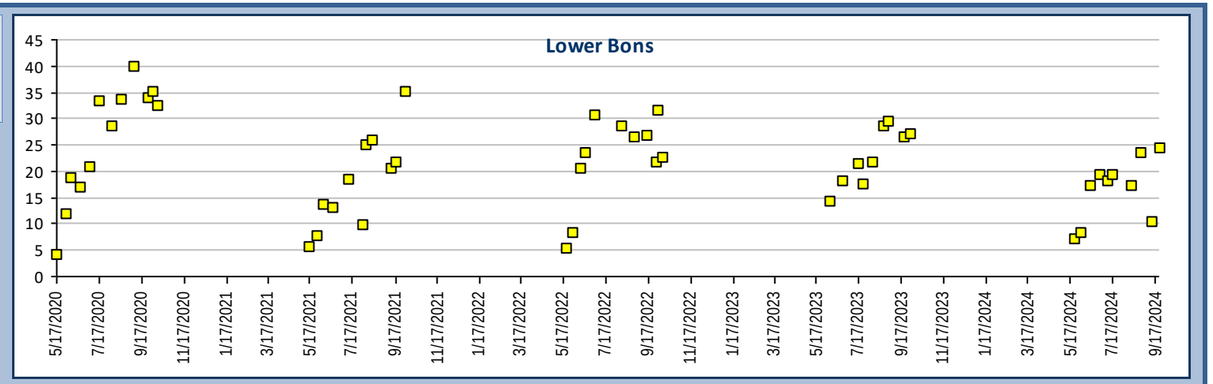


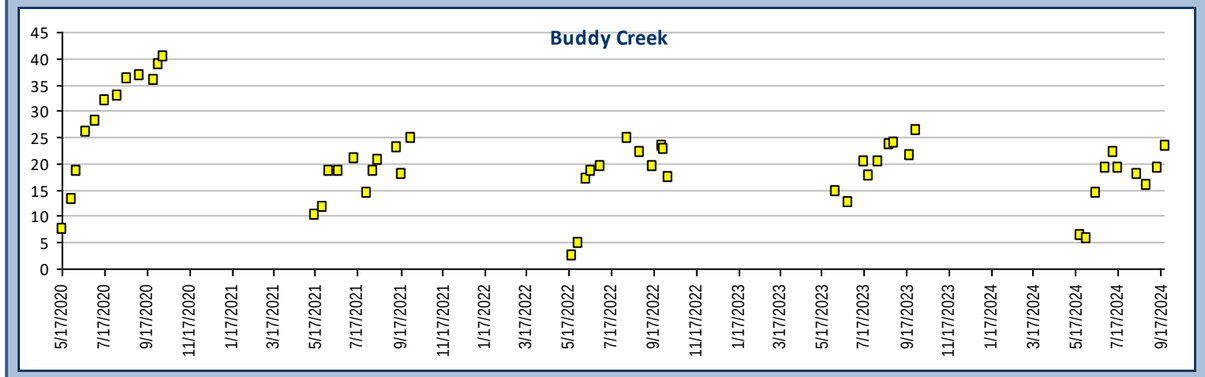


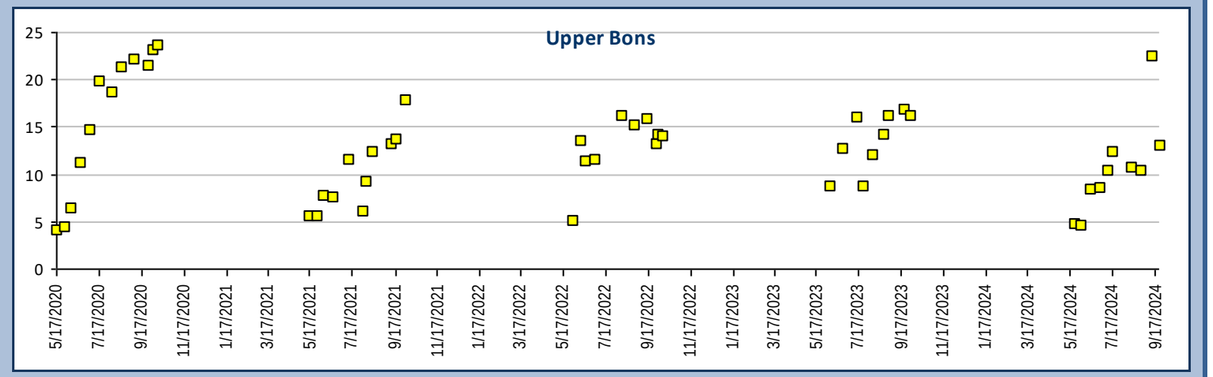


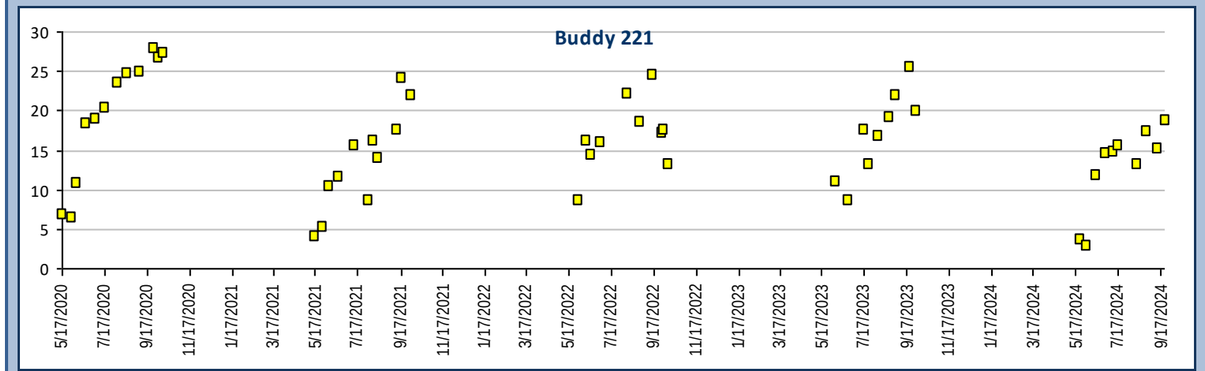
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

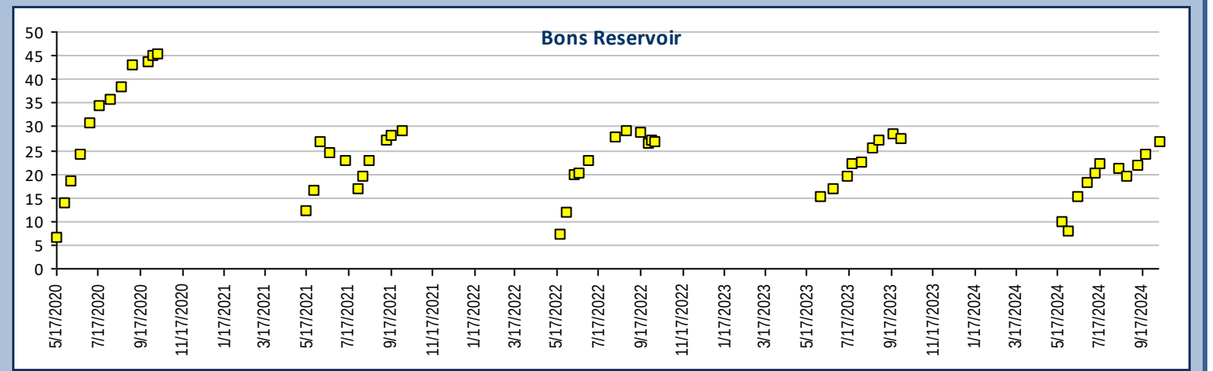
Magnesium, Total Recoverable, units mg/L

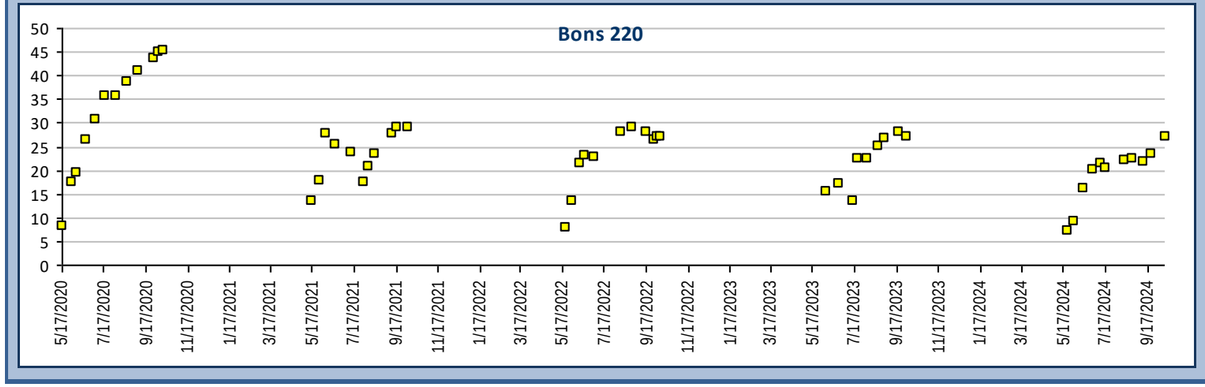


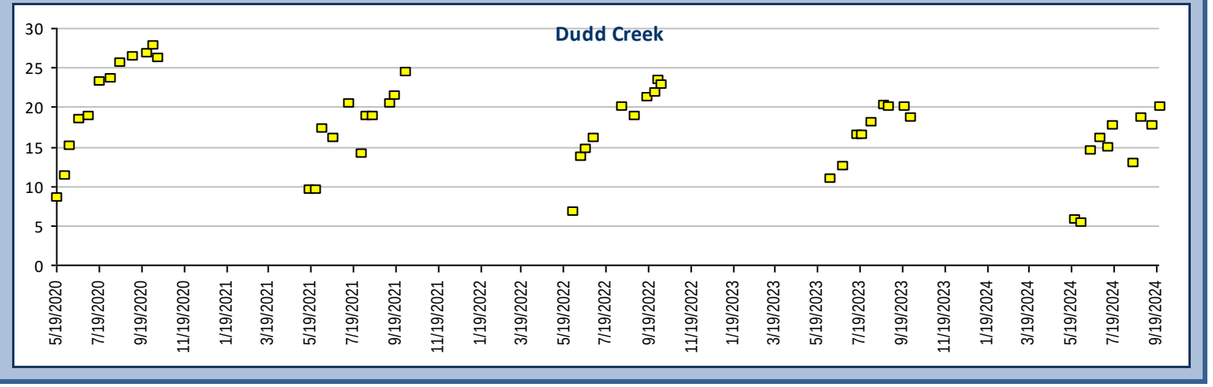








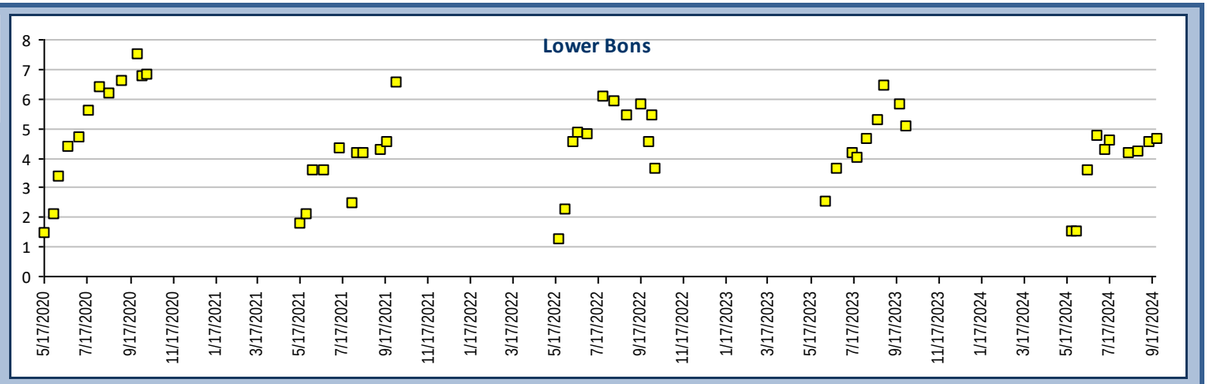


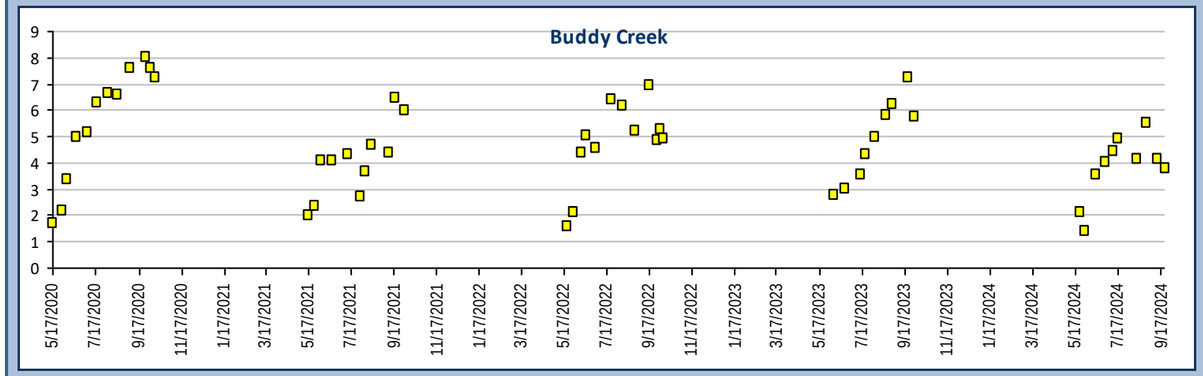


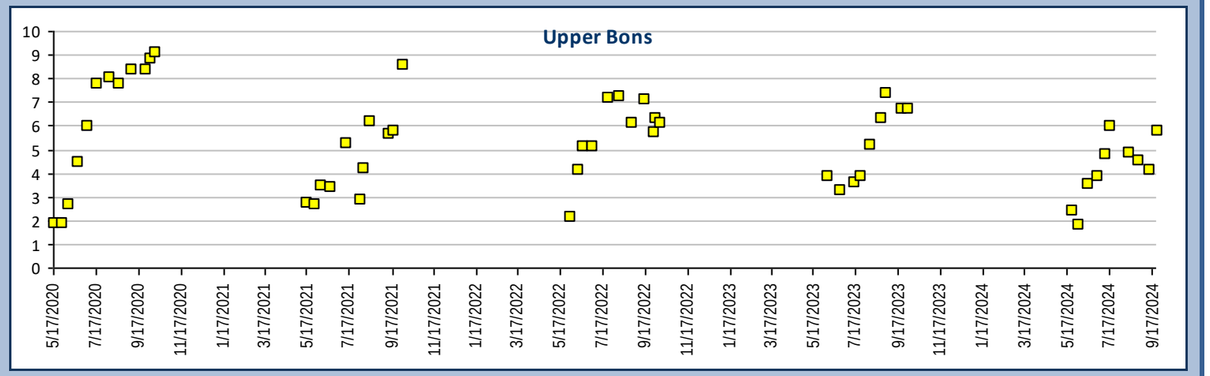
RED DOG MINE

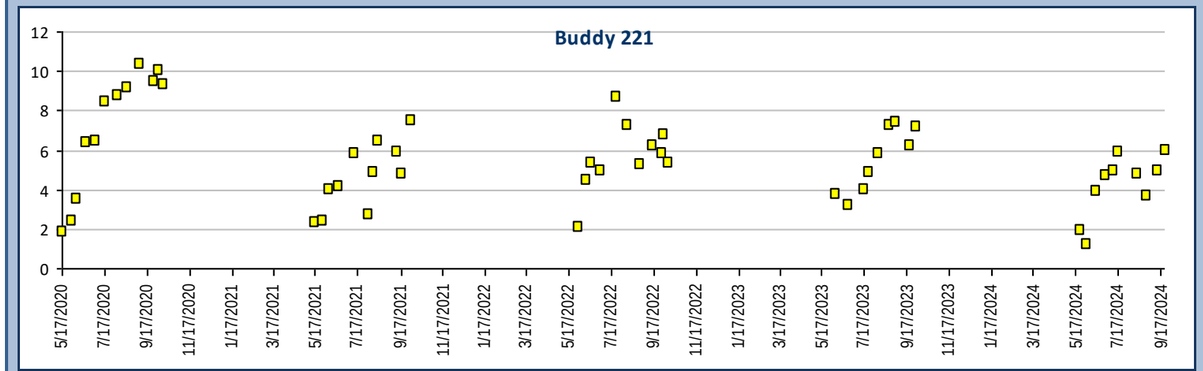
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

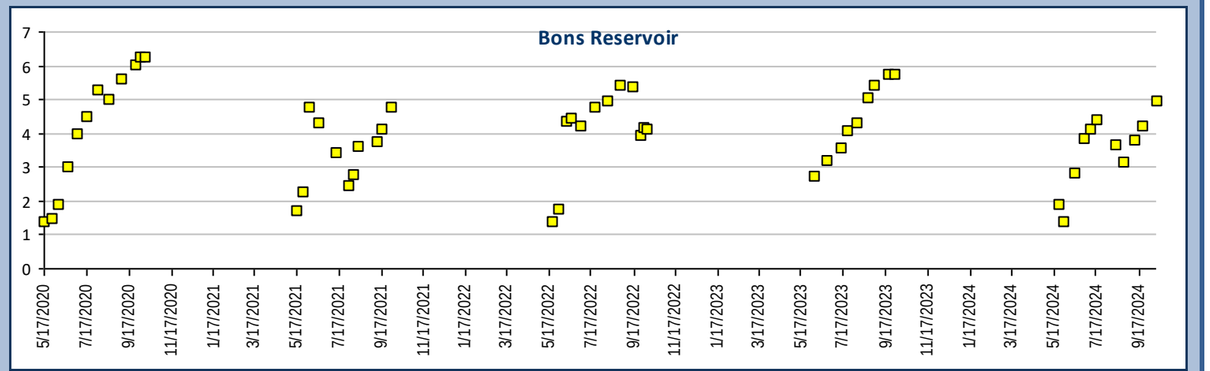
Sodium, Total Recoverable, units mg/L

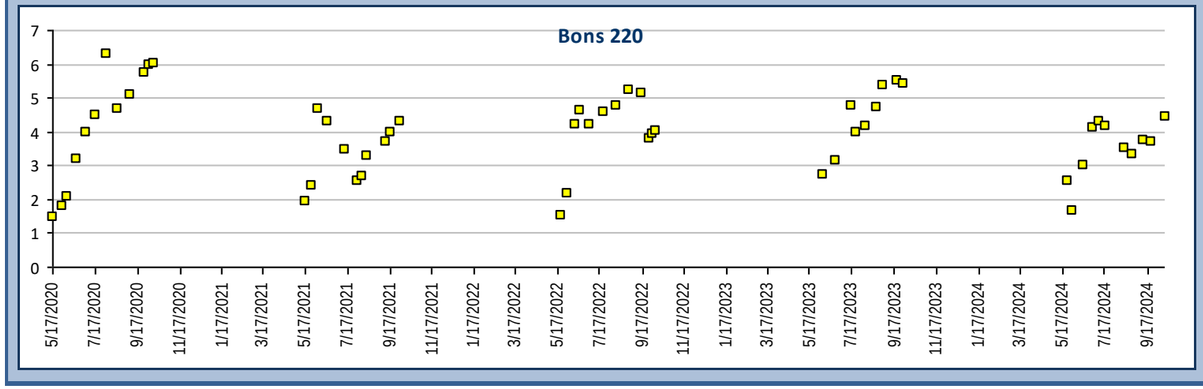


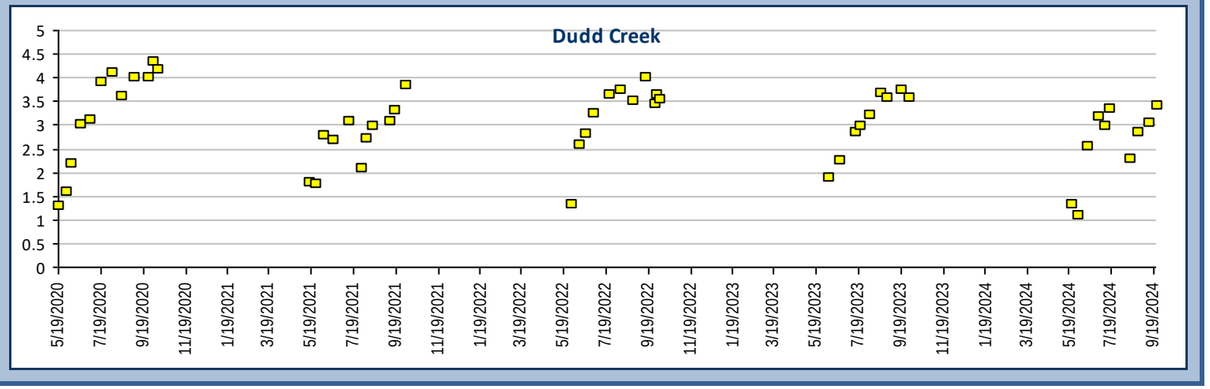










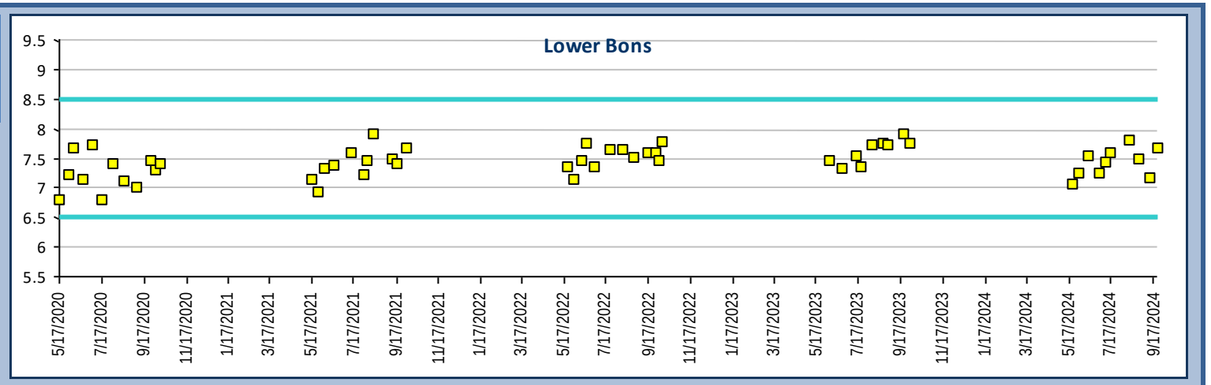


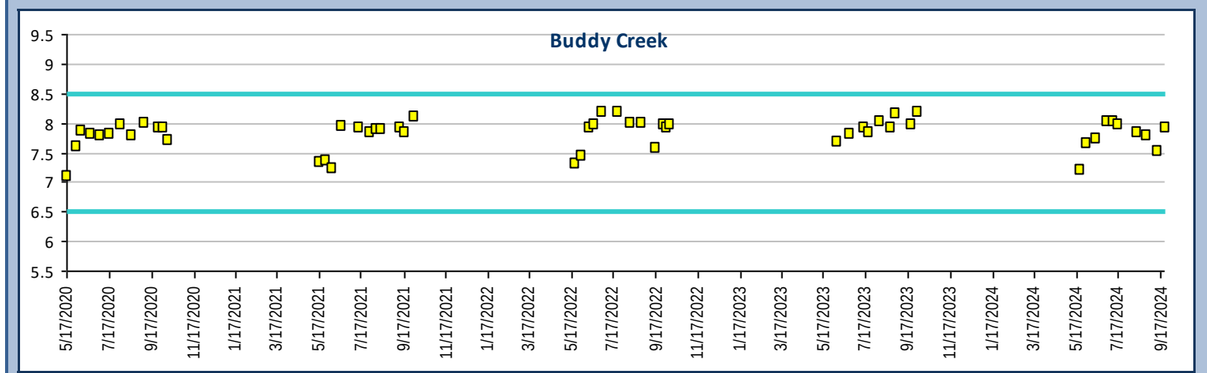
RED DOG MINE

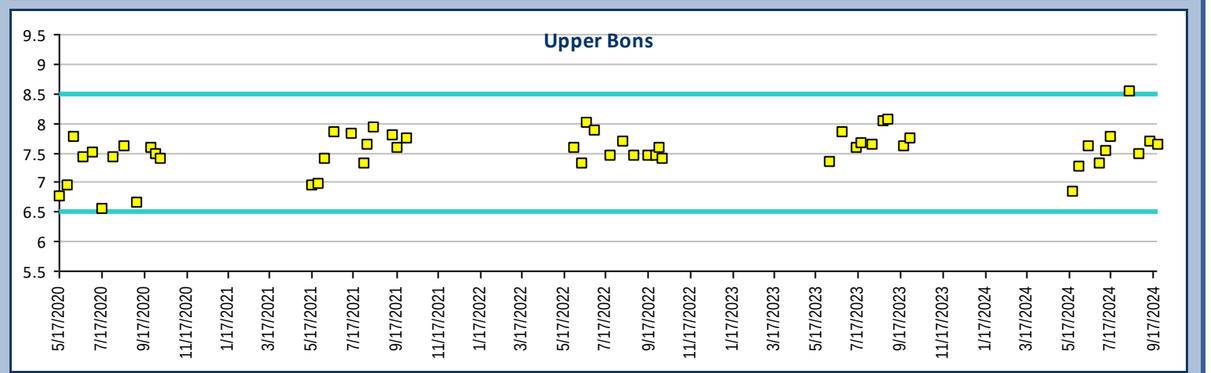
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

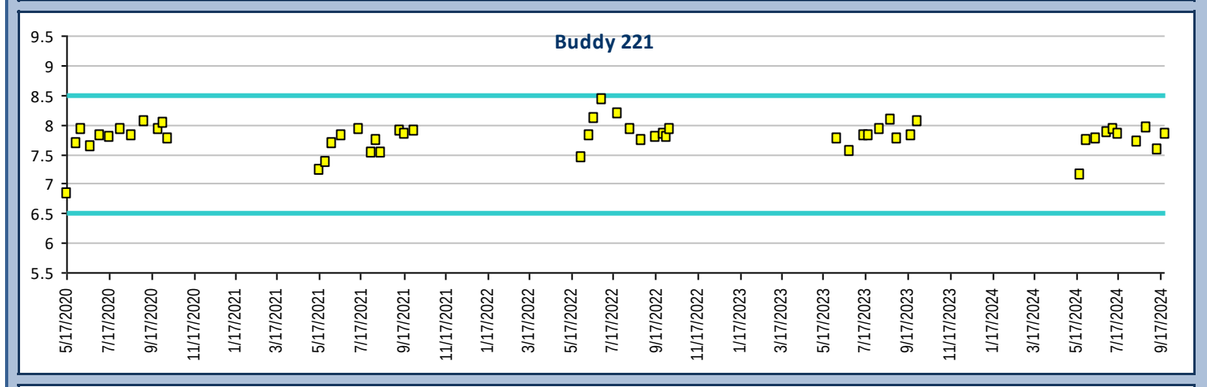
pH

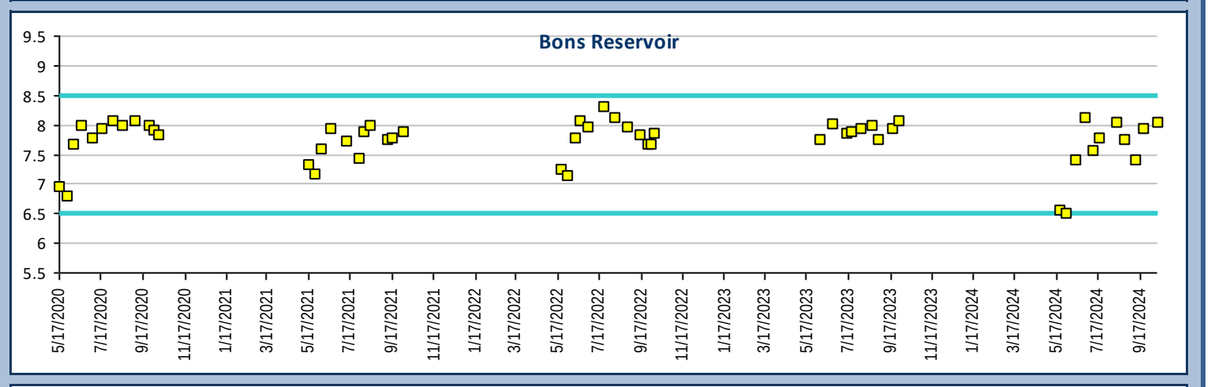
Site Specific WQS between 6.5 and 8.5

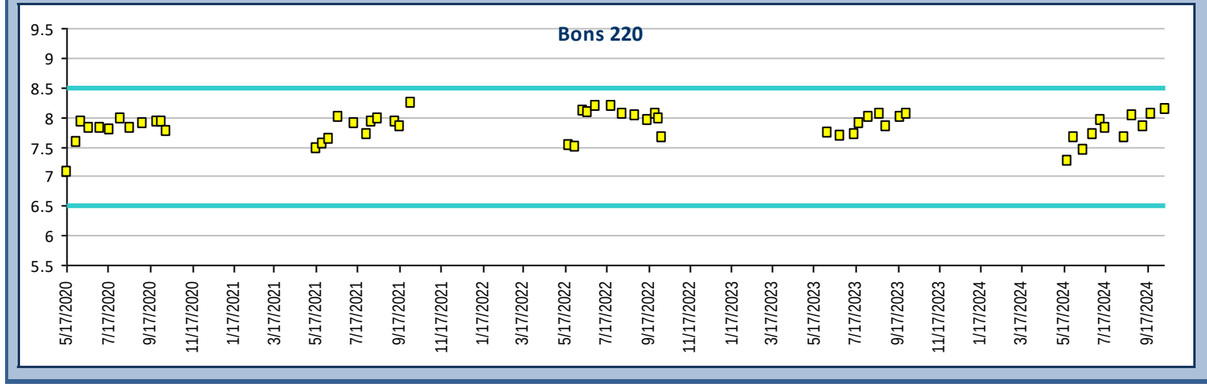


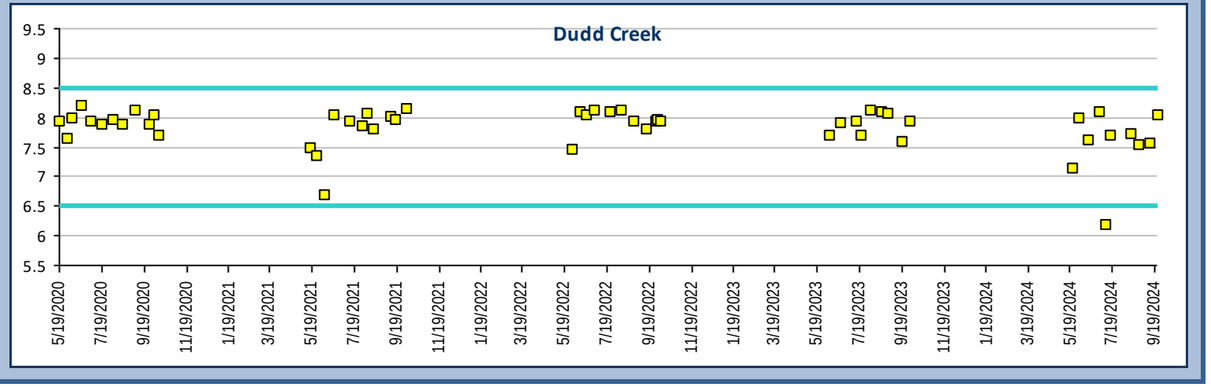












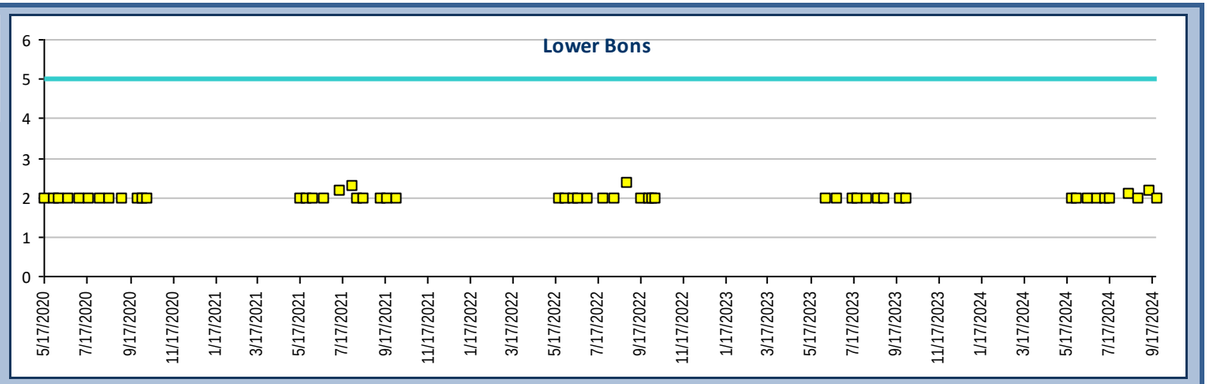
RED DOG MINE

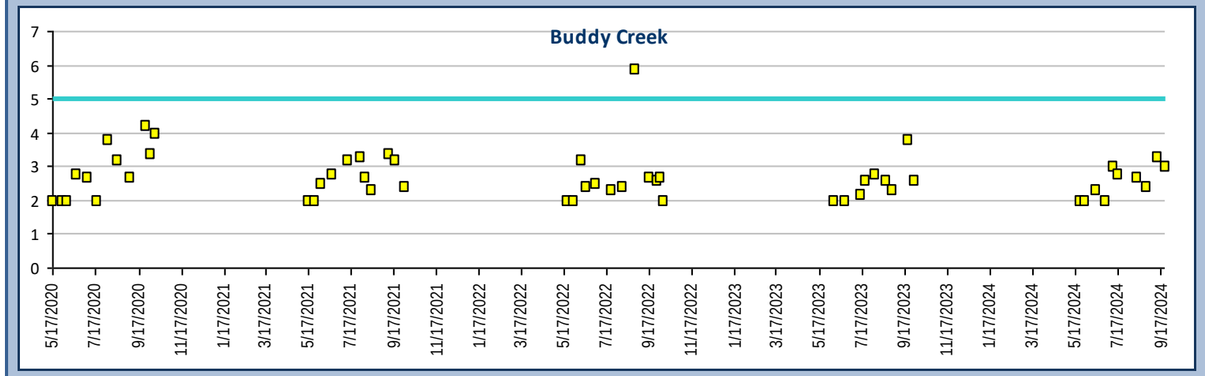
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

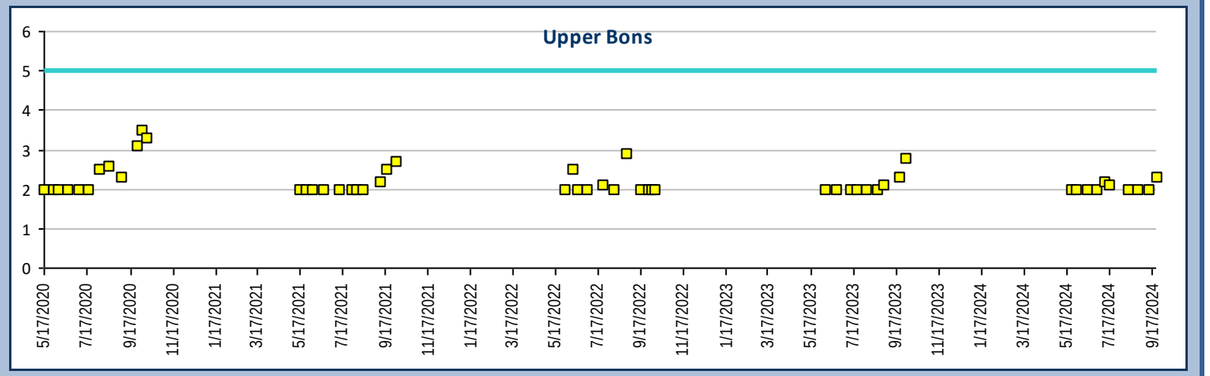
Selenium, Total Recoverable, units ug/L

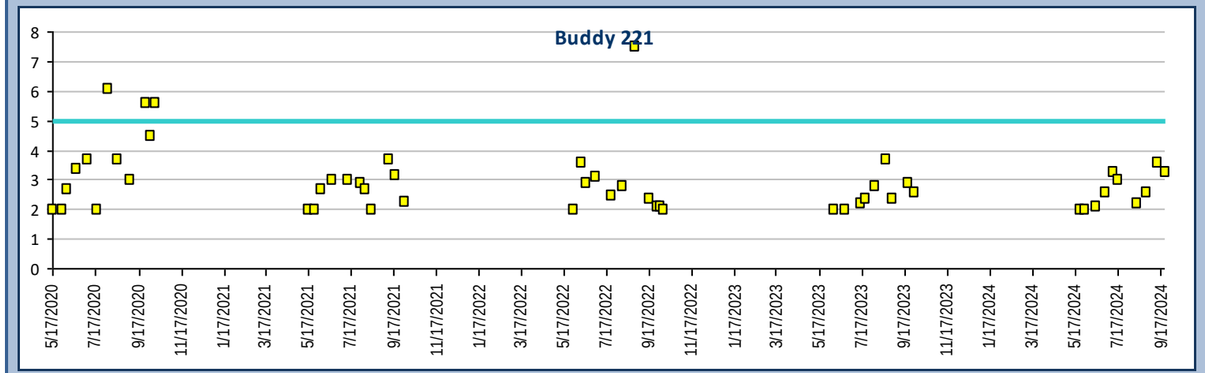
Aquatic Life - Fresh Water Chronic WQS ug/L

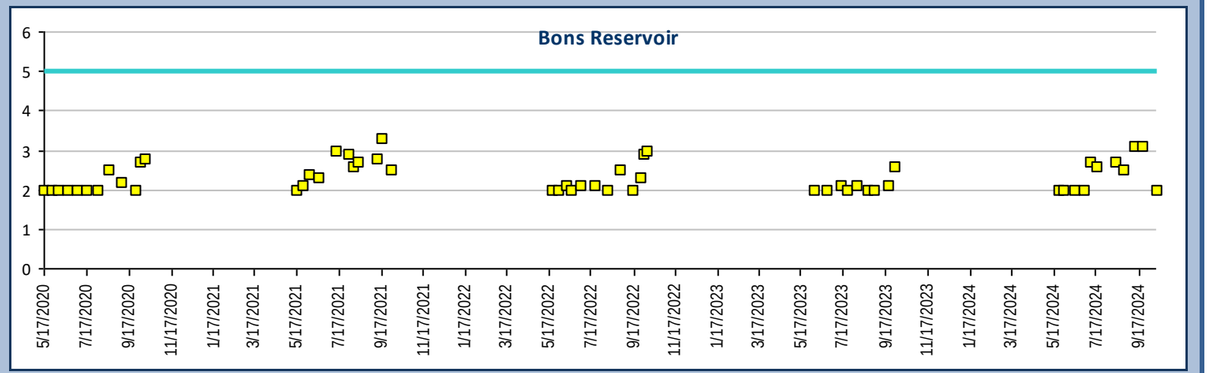
5 ug/L

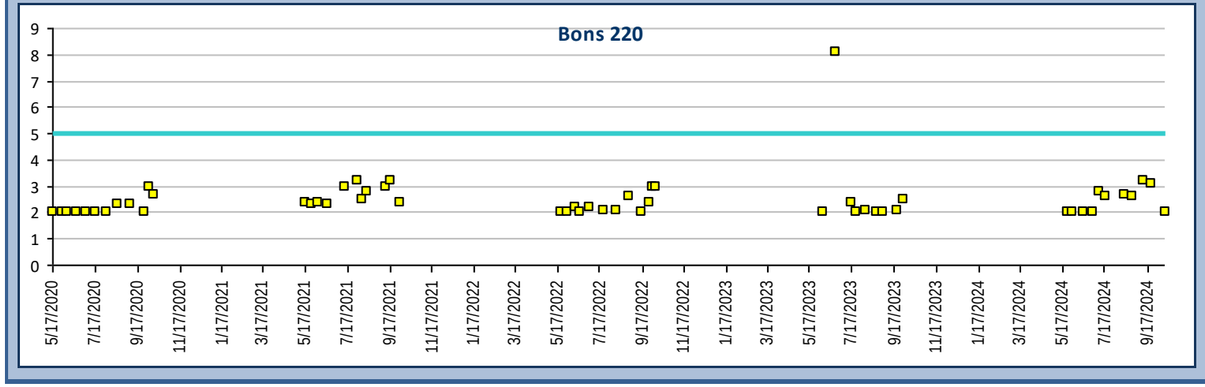


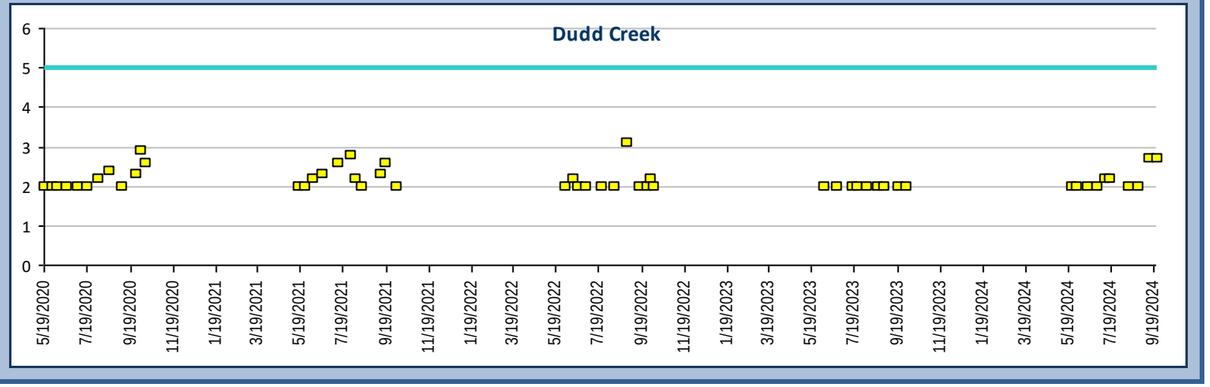








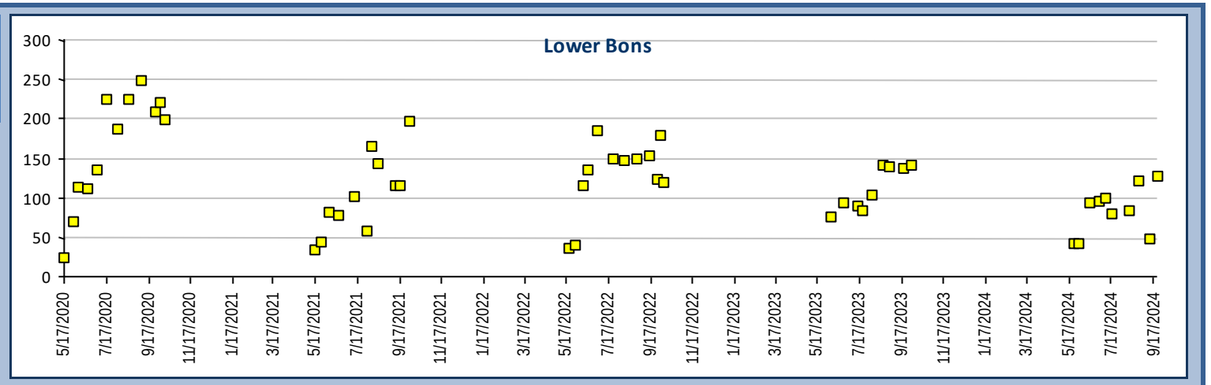


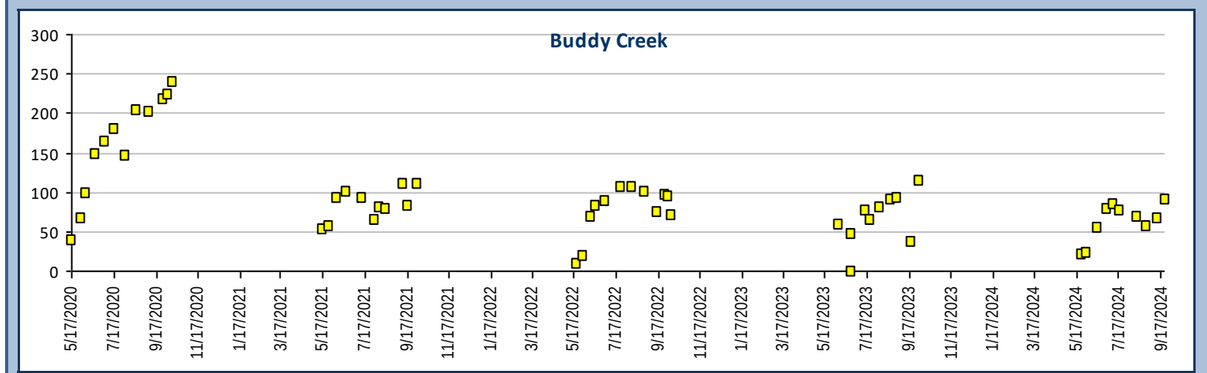


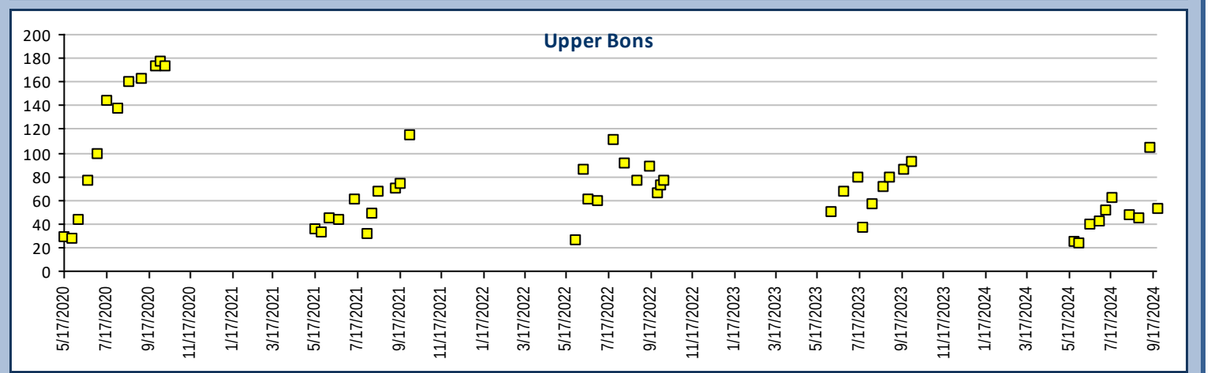
RED DOG MINE

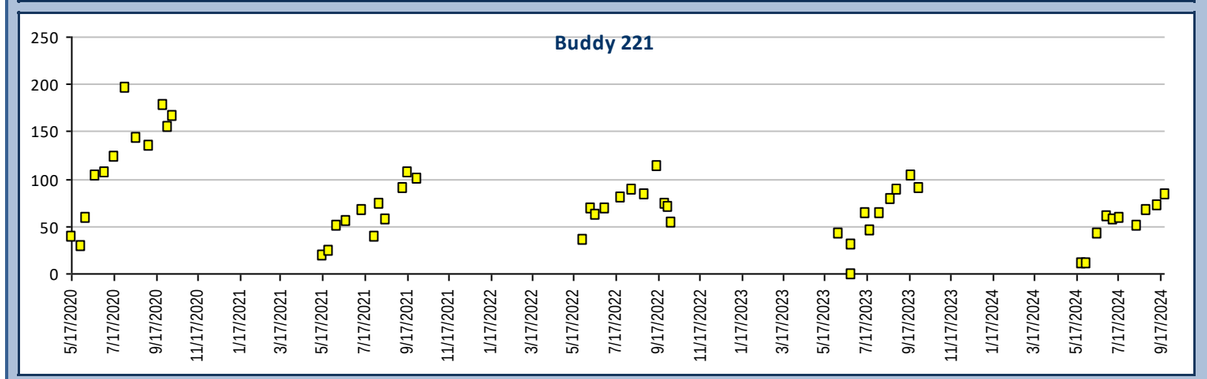
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

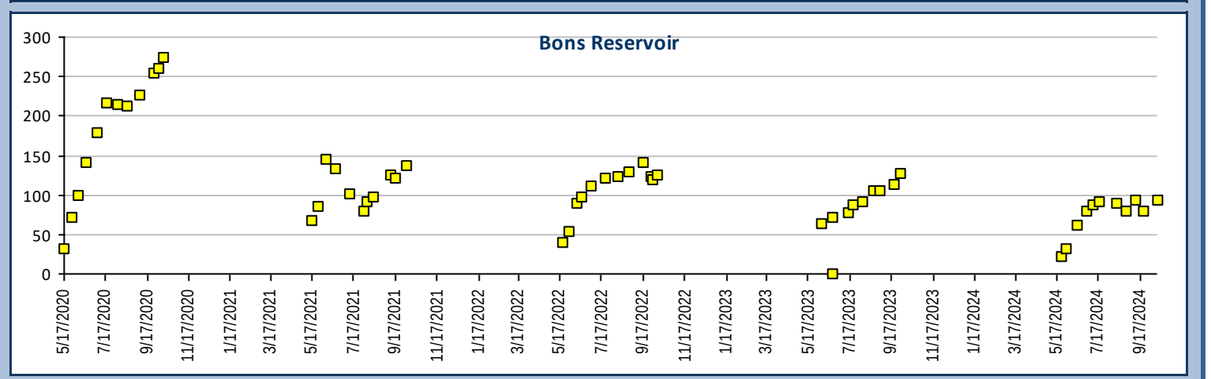
Sulfate, Total recoverable, units mg/L

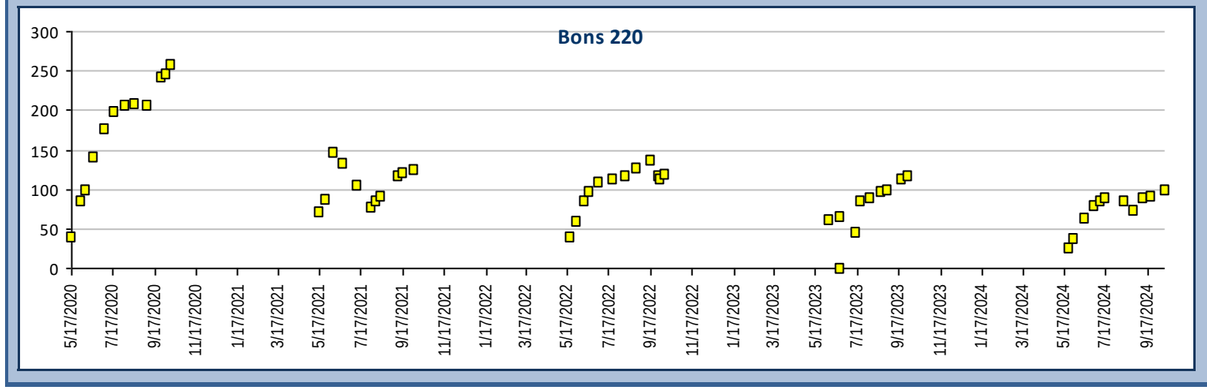


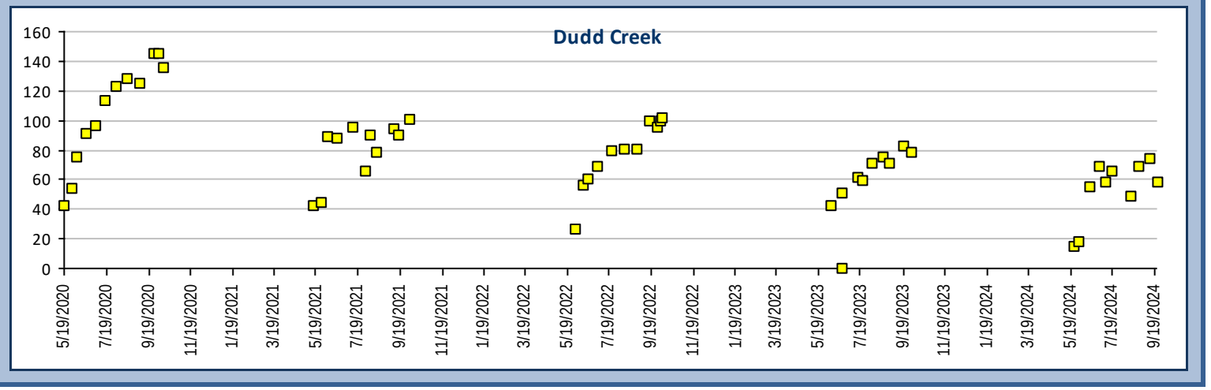












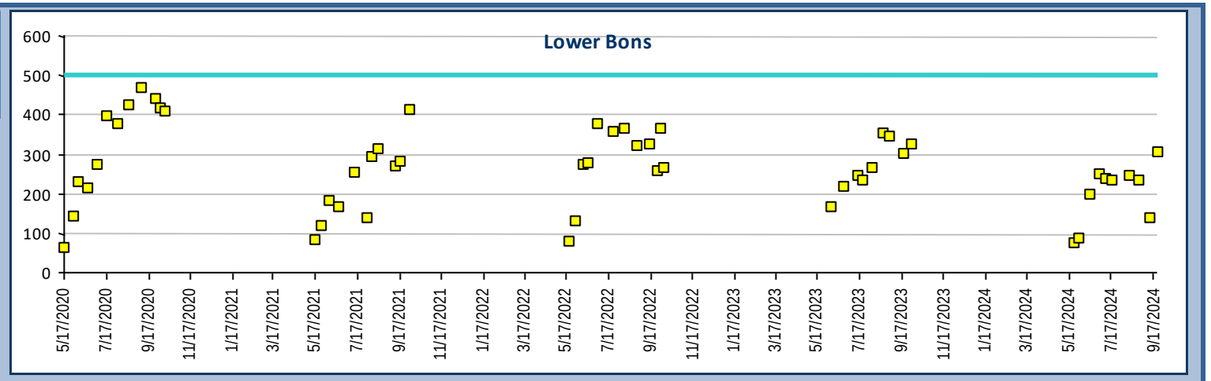
RED DOG MINE

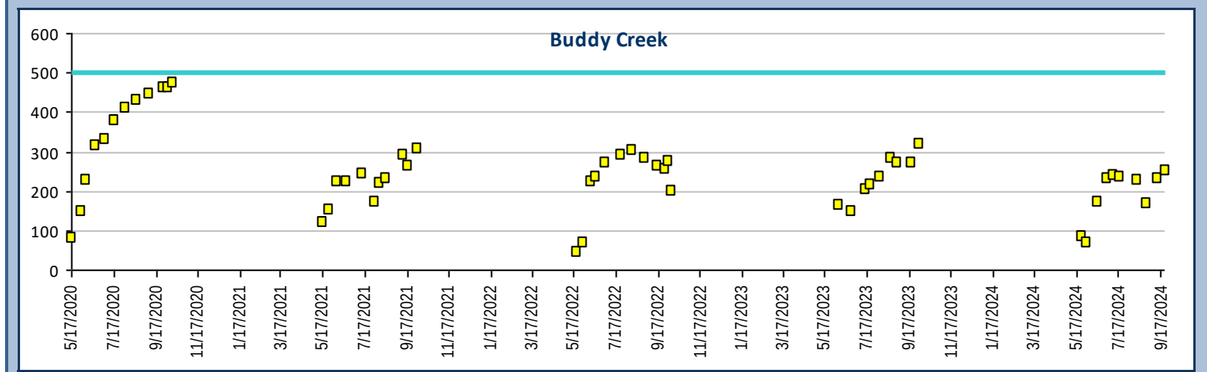
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

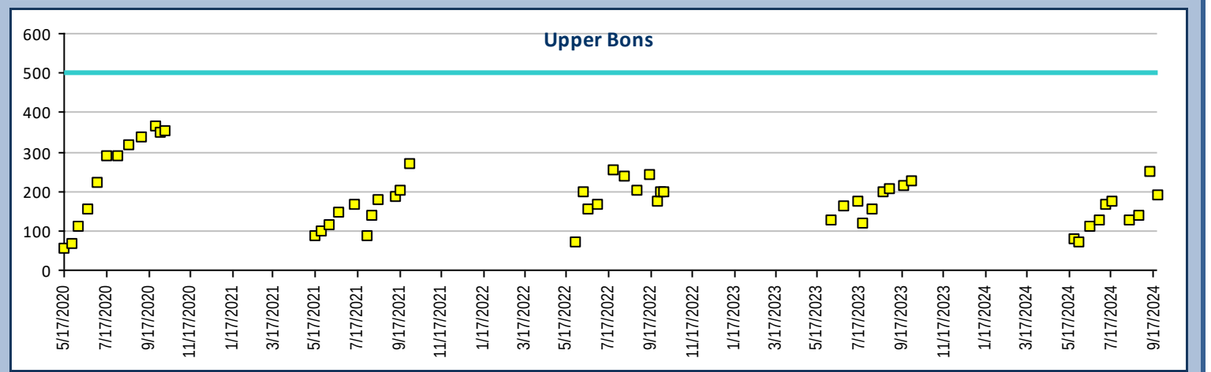
Total Dissolved Solids, units mg/L

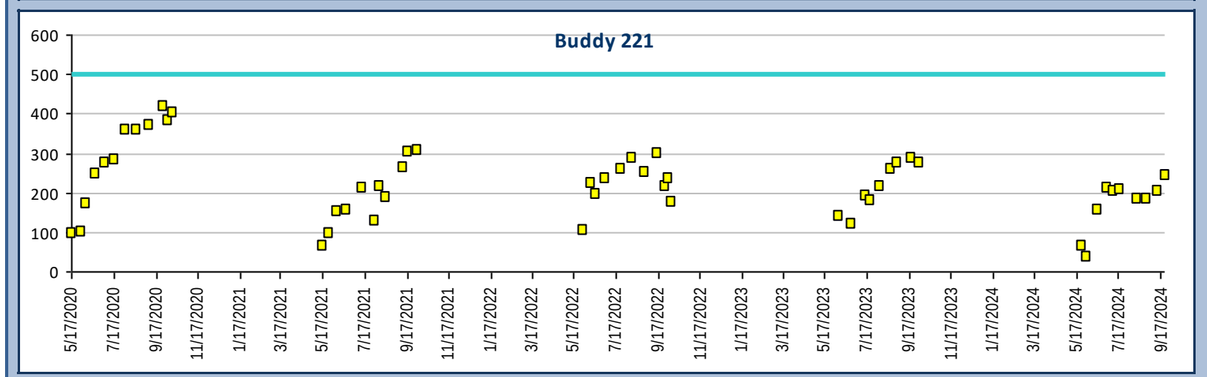
Site Specific WQS mg/L

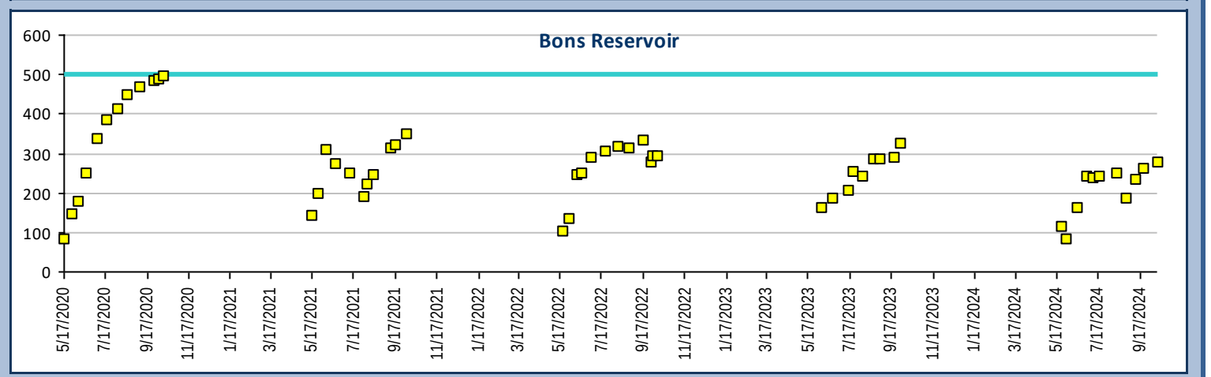
500 mg/L

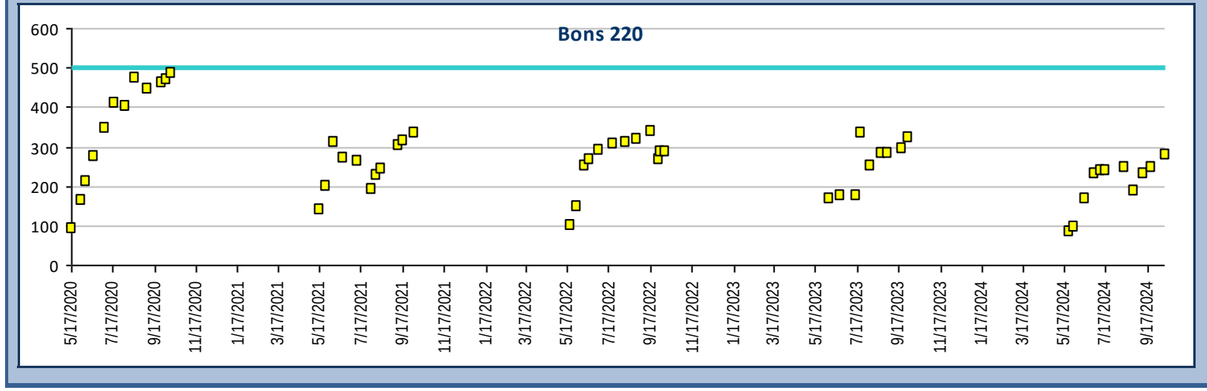


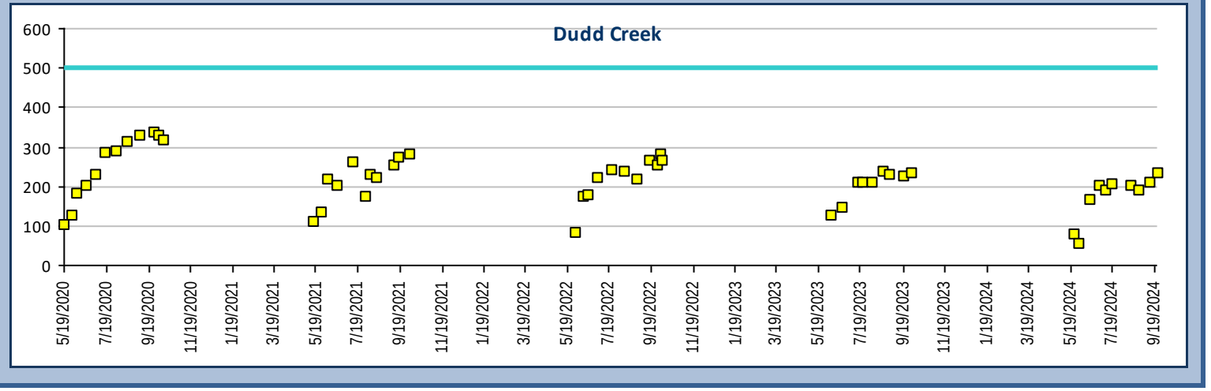










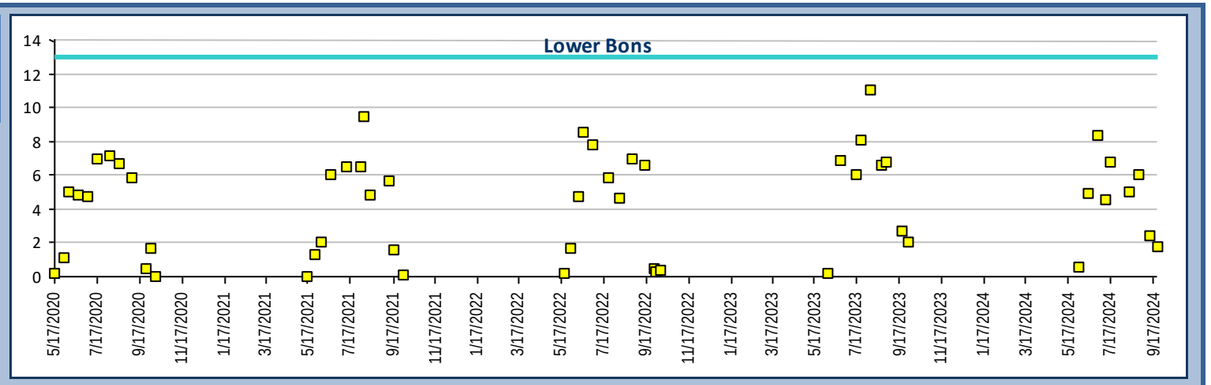


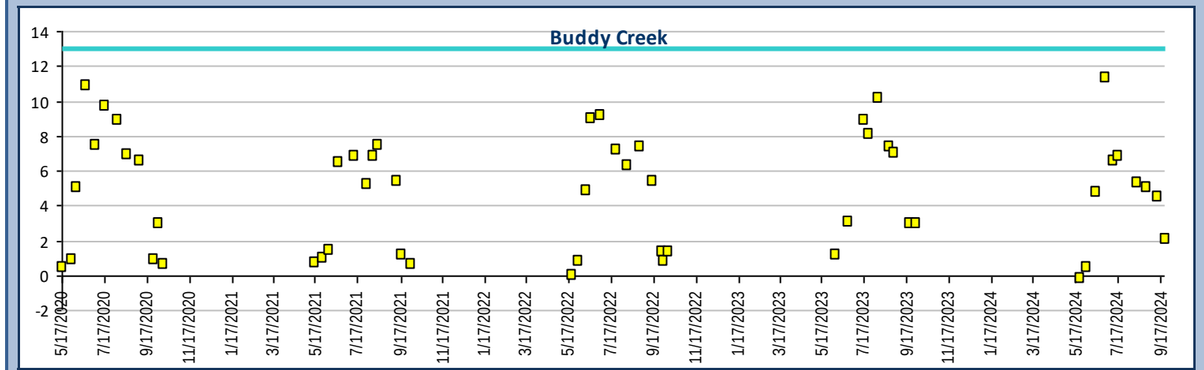
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

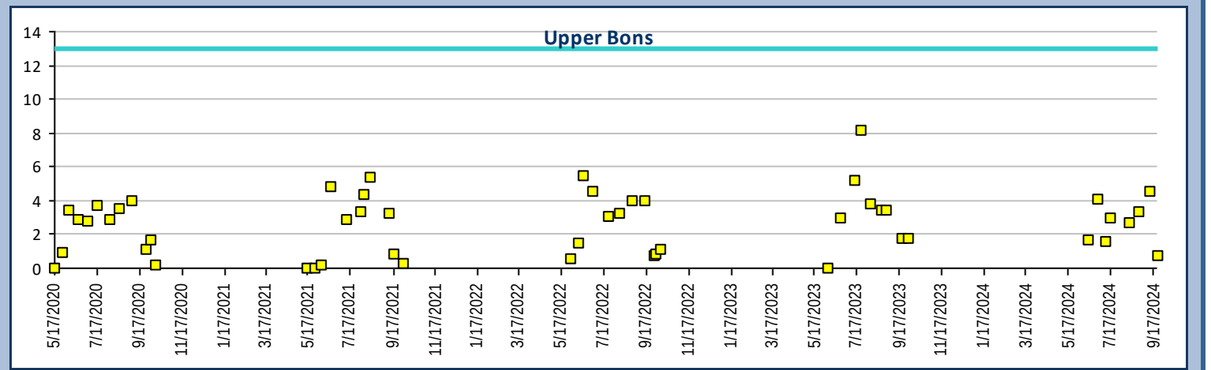
Temperature Field, units Celsius

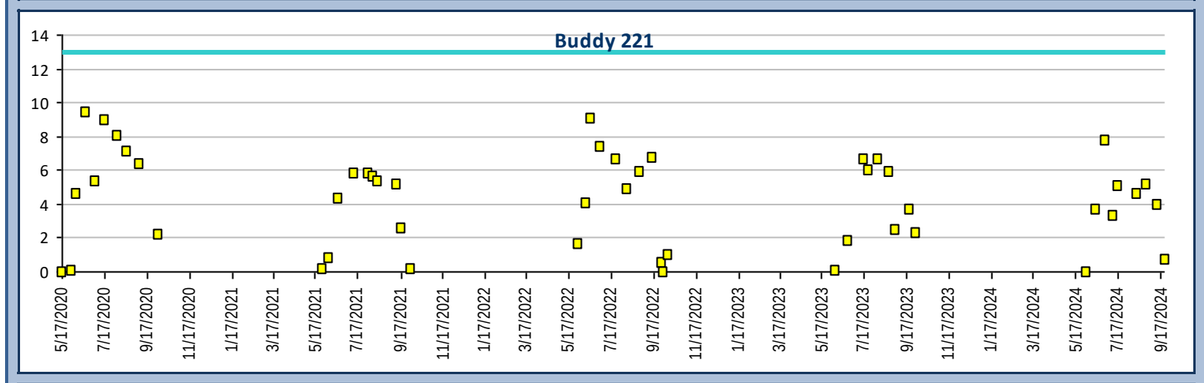
Site Specific WQS mg/L

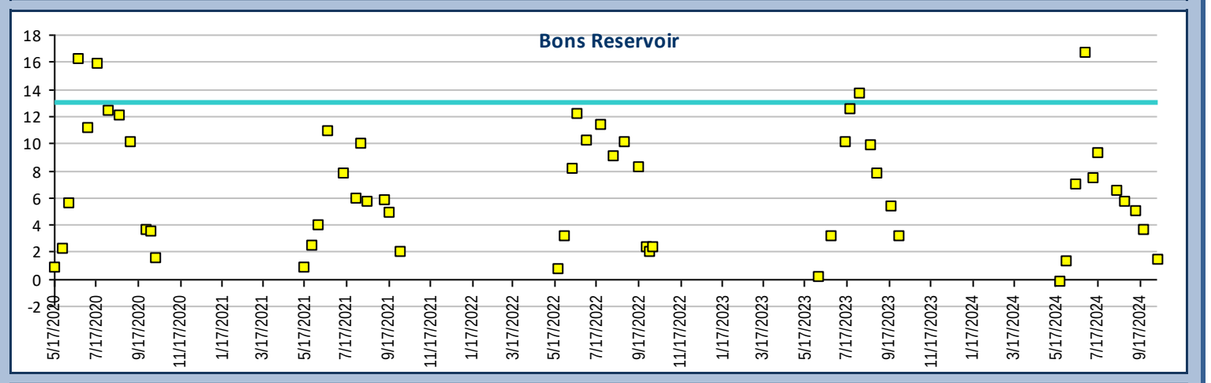
13 Celsius

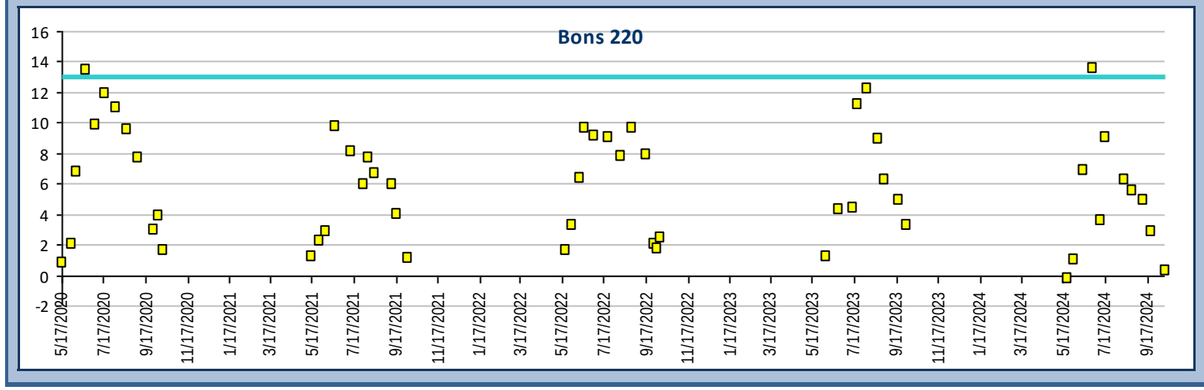


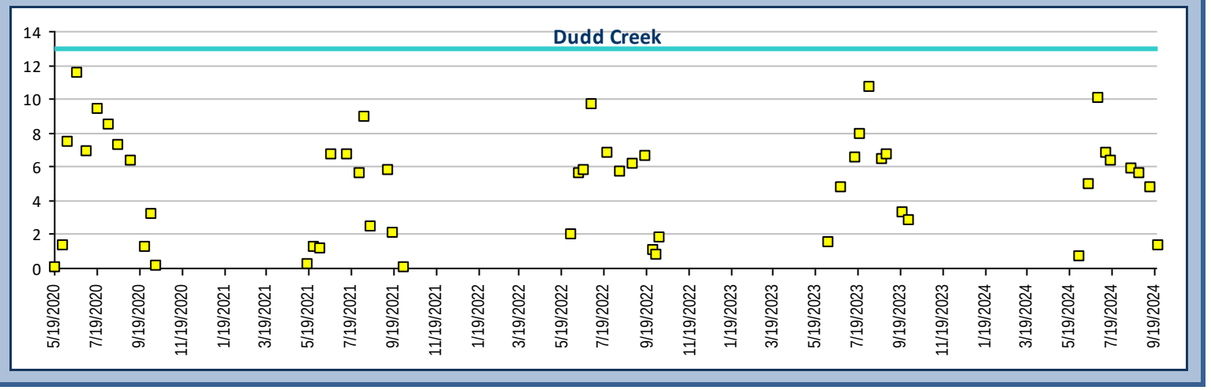






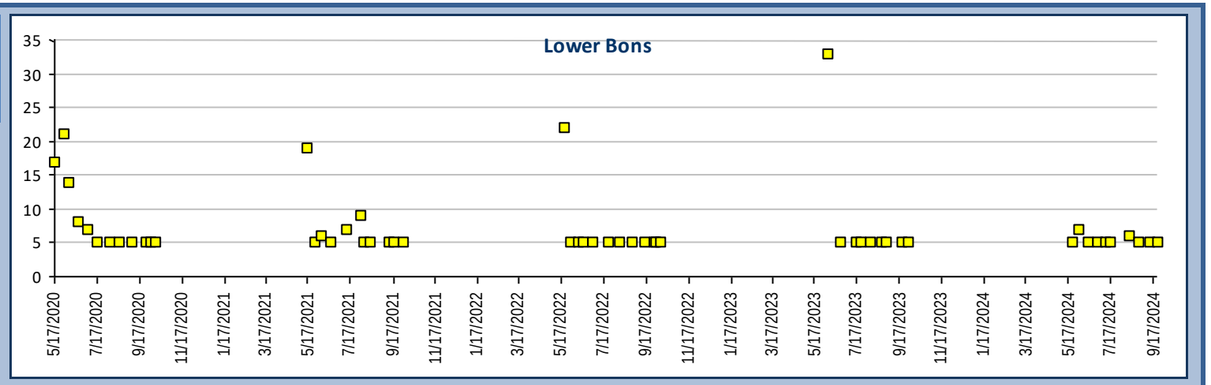


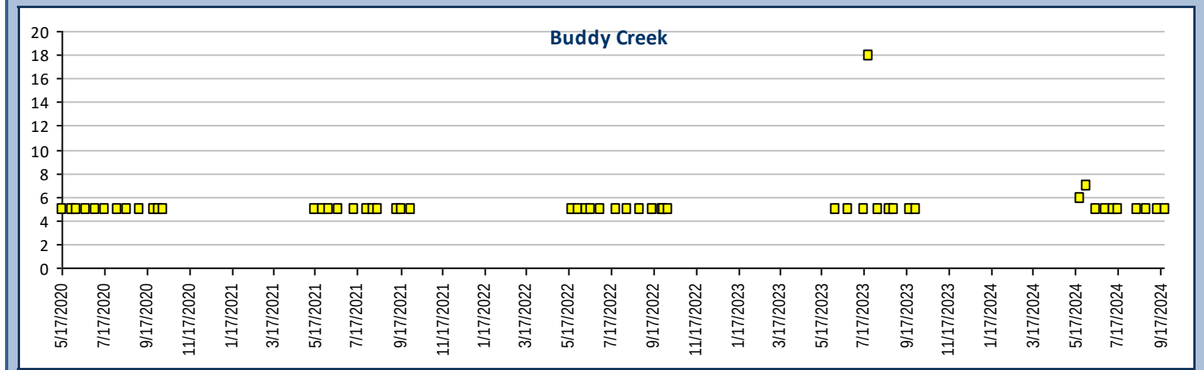


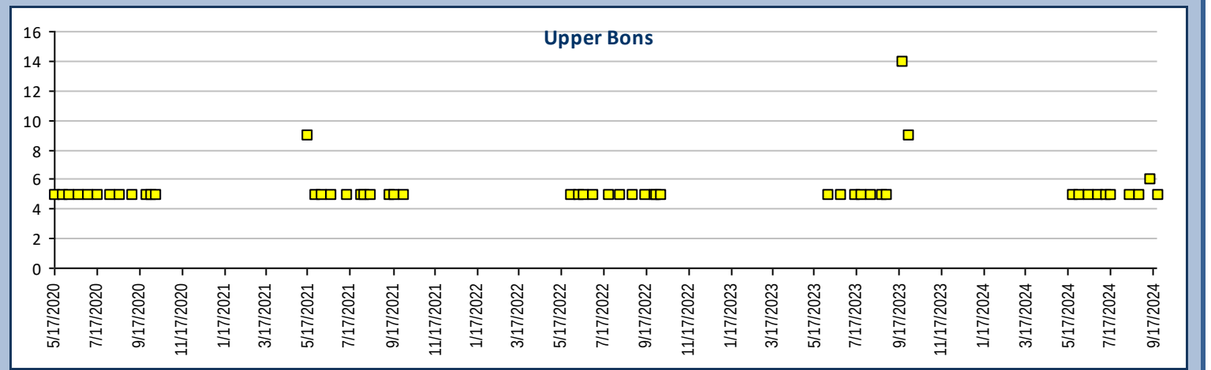


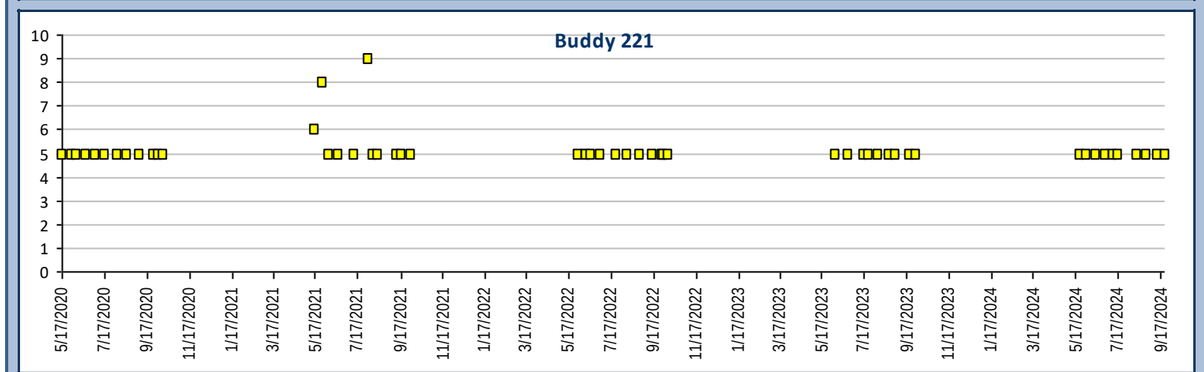
Water Monitoring Bons Creek Drainage
Water Quality Profile I , 5-Year Trend Charts

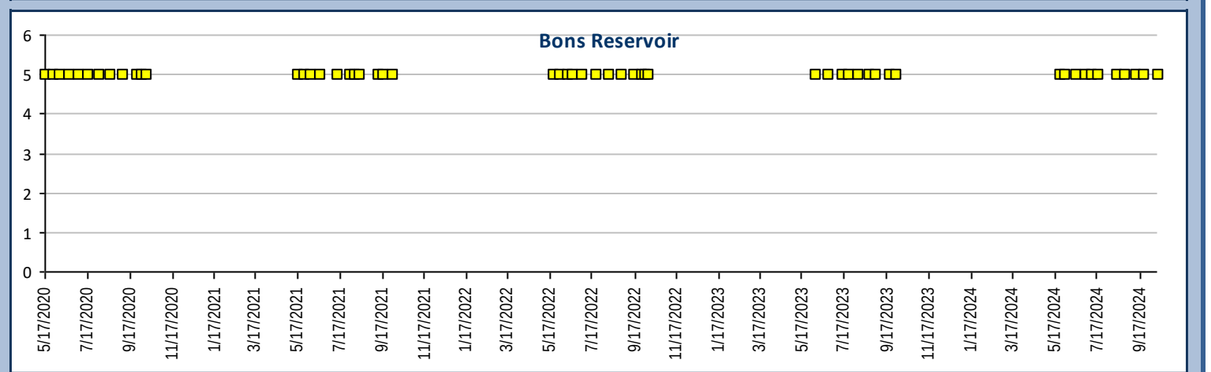
Total Suspended Solids, units mg/L

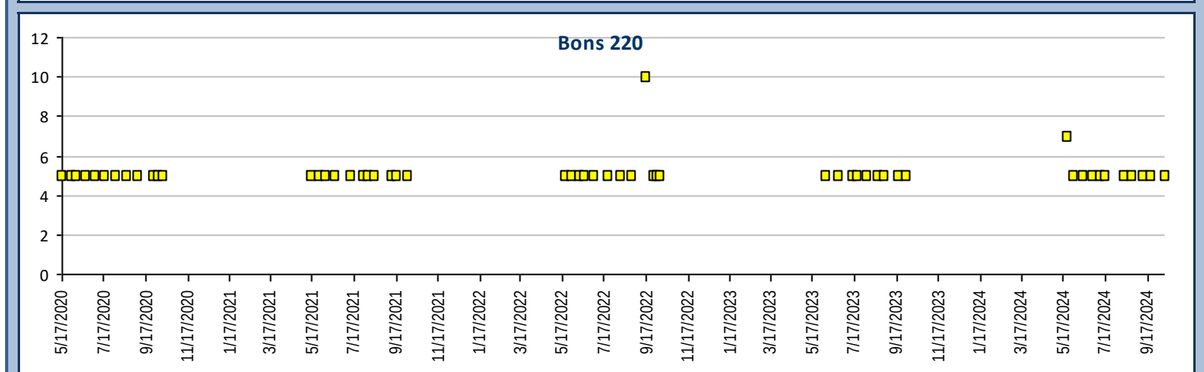


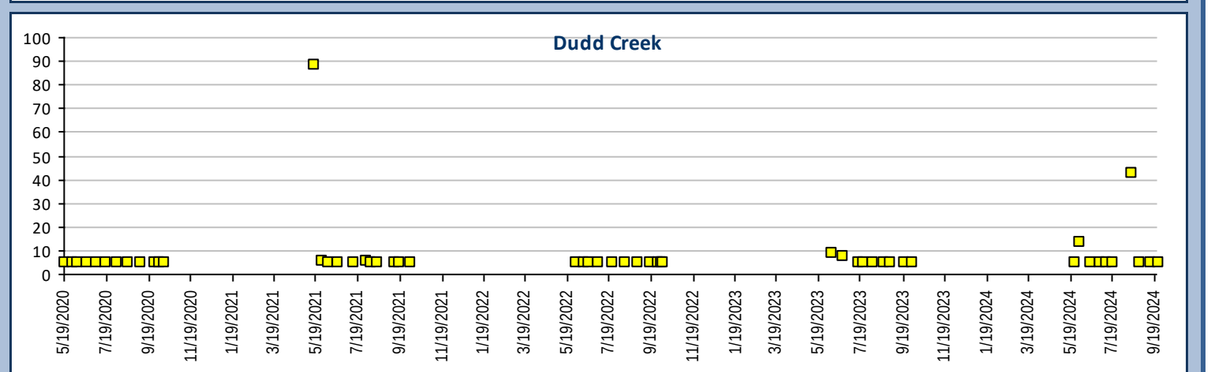












RED DOG MINE

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

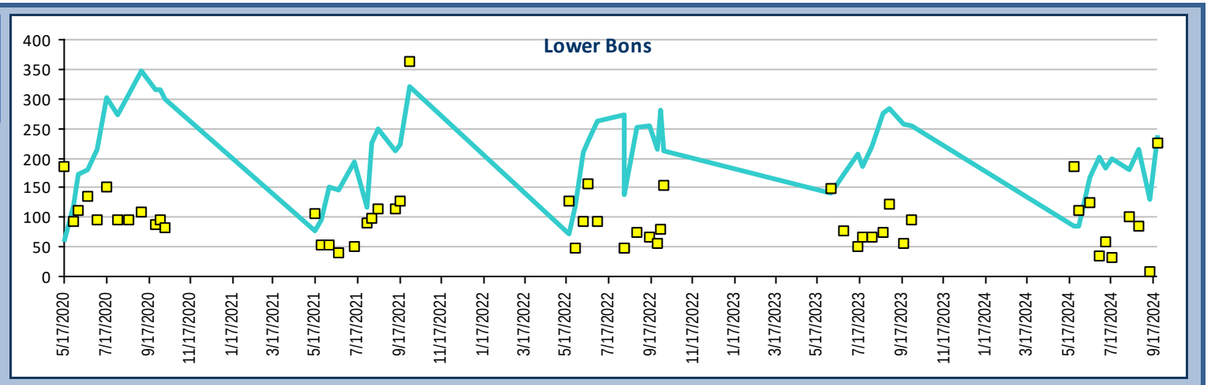
Zinc, Total Recoverable, units ug/L

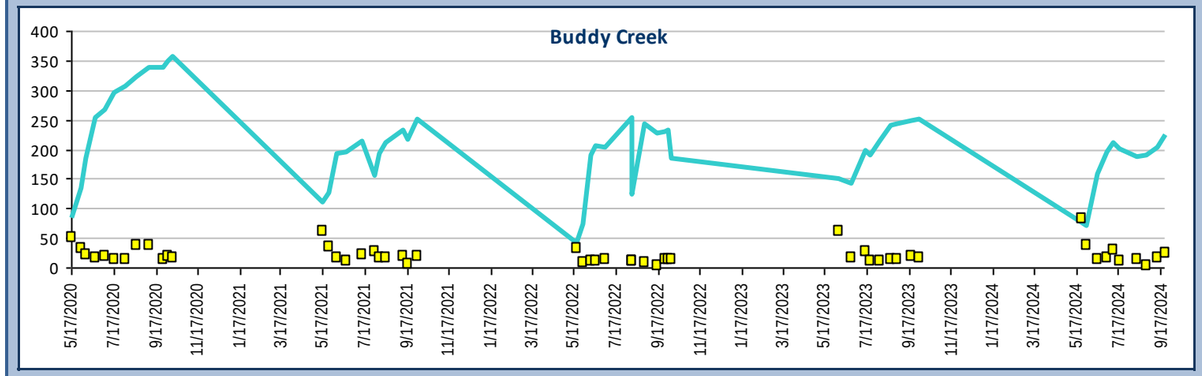
Aquatic Life - Fresh Water Acute WQS ug/L

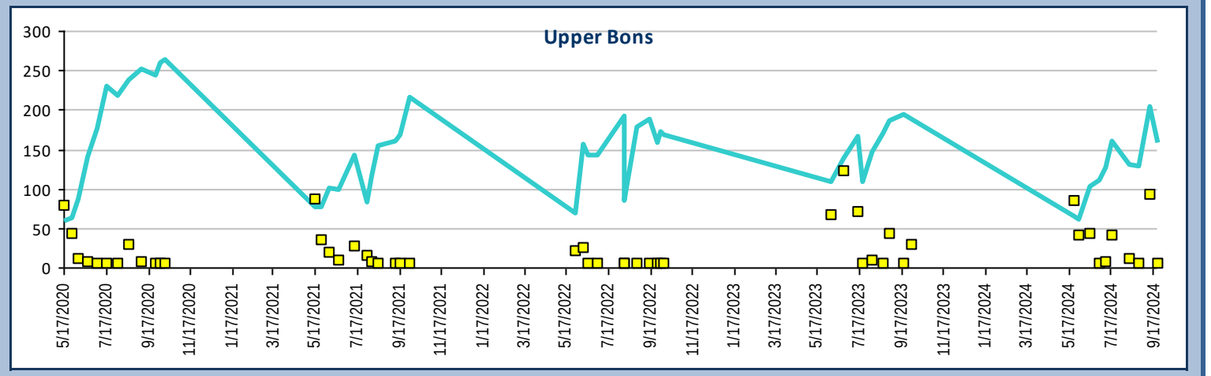
Hardness Dependent Calculation

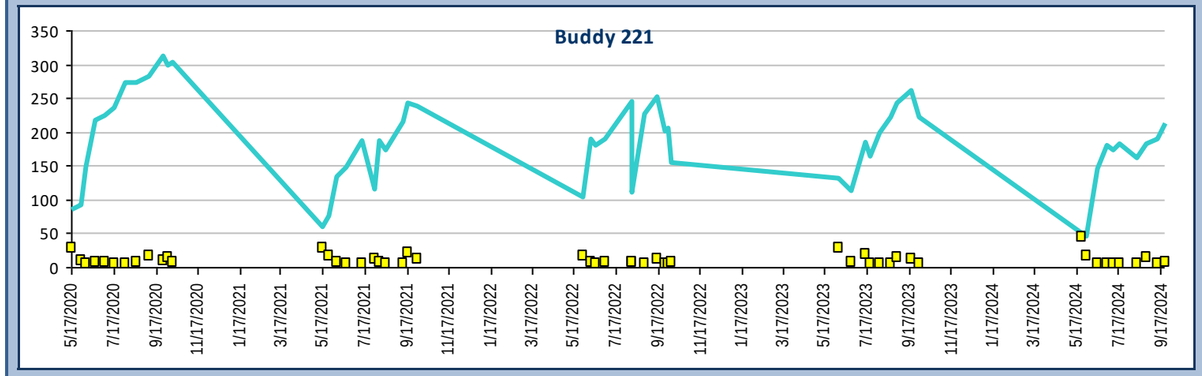
=EXP(0.8473*(LN(*hardness))+0.884)

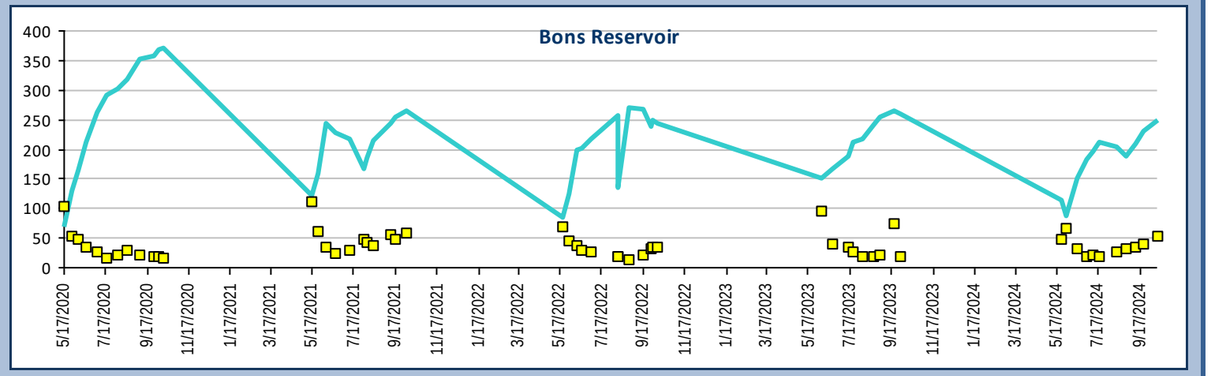
* Calculated using Standard Methods 2340B

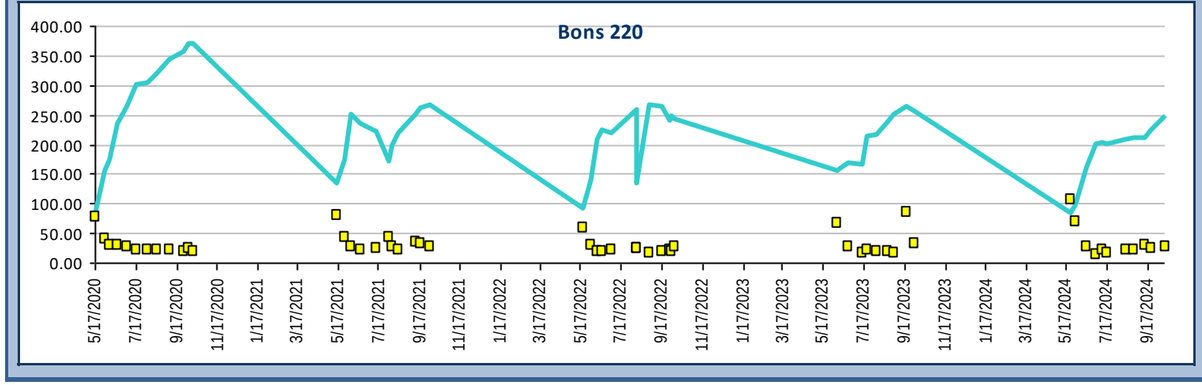


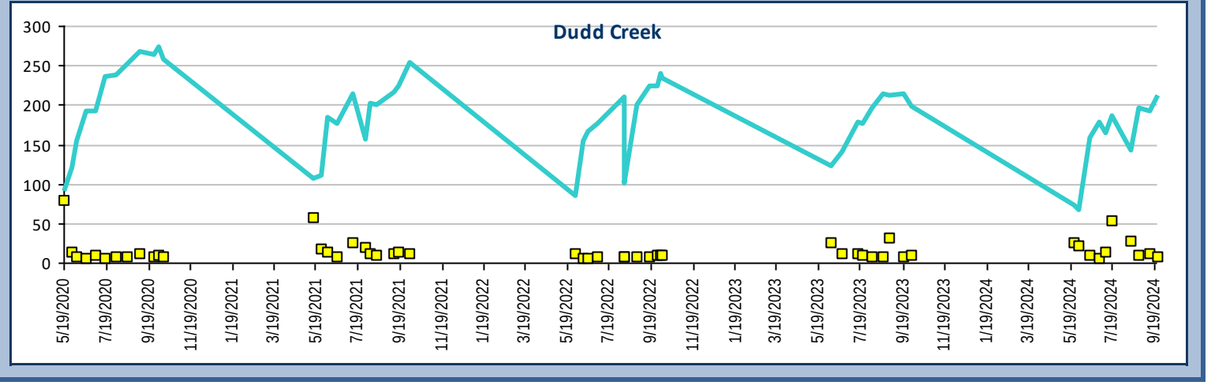






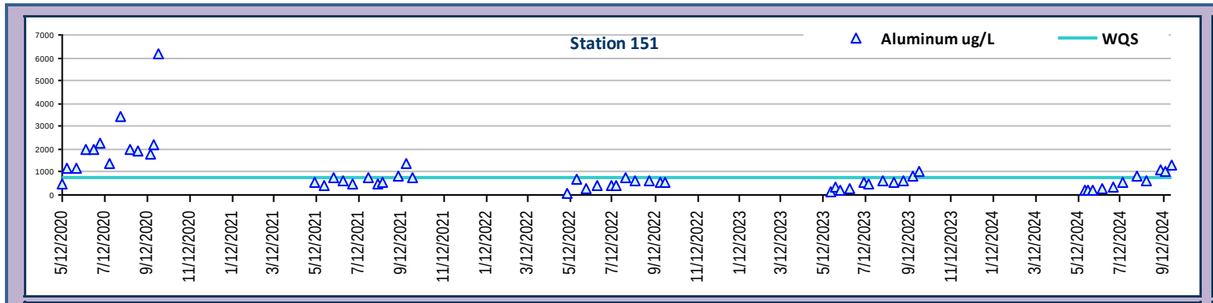


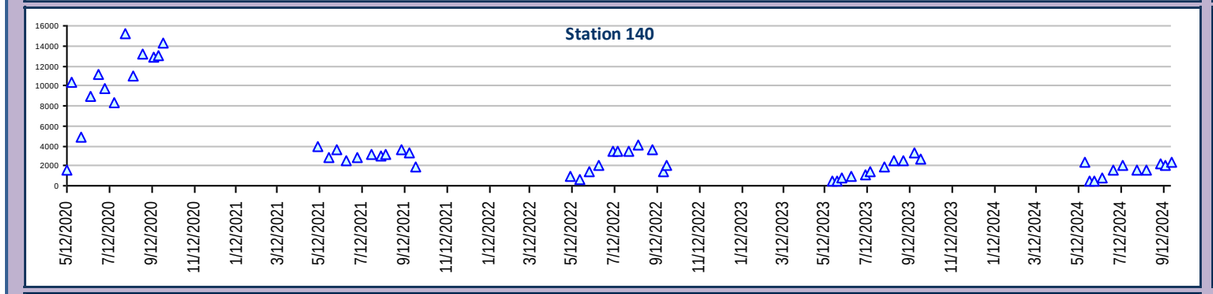


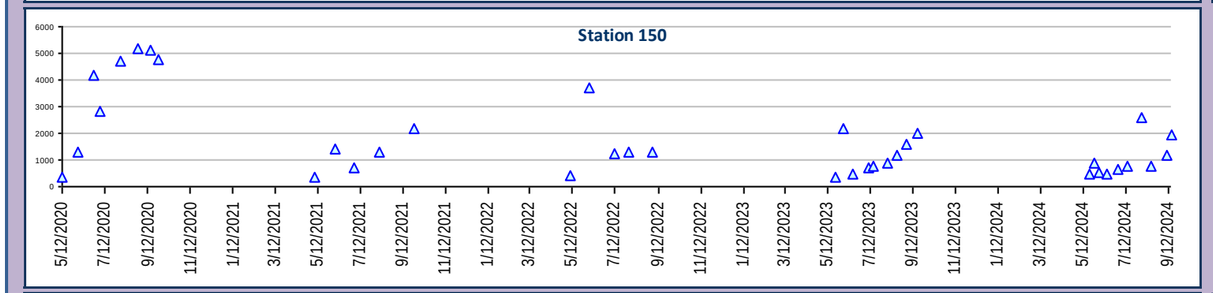


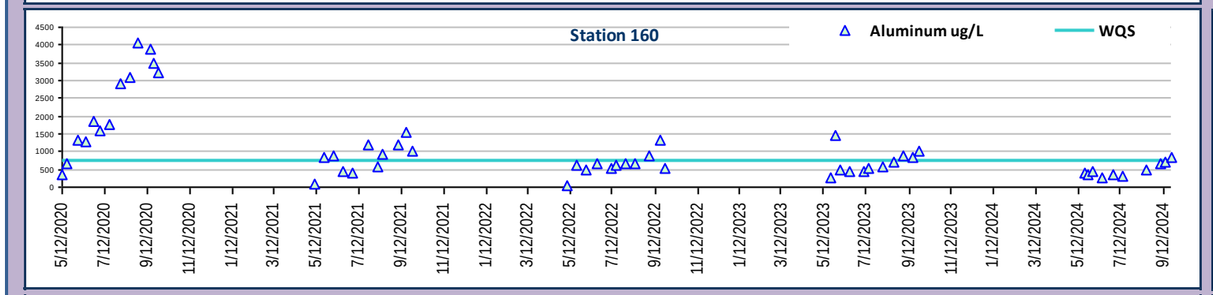
Appendix F: APDES Monitoring Station Trend Charts

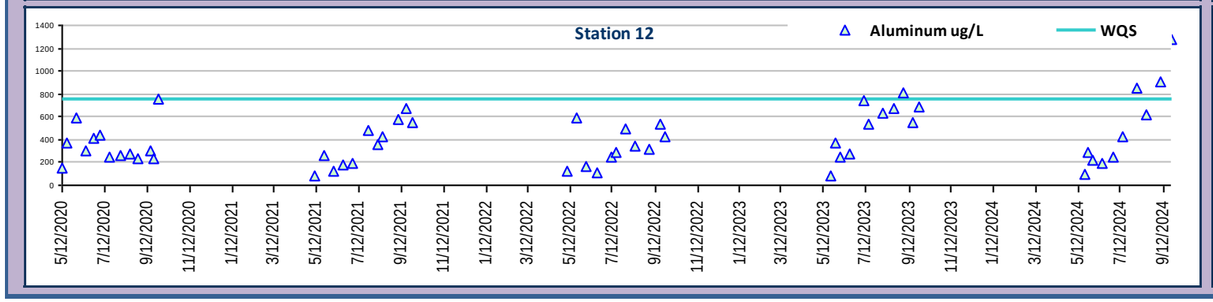
APDES Stations : Aluminum, Total, units ug/L - 5 Year Trend



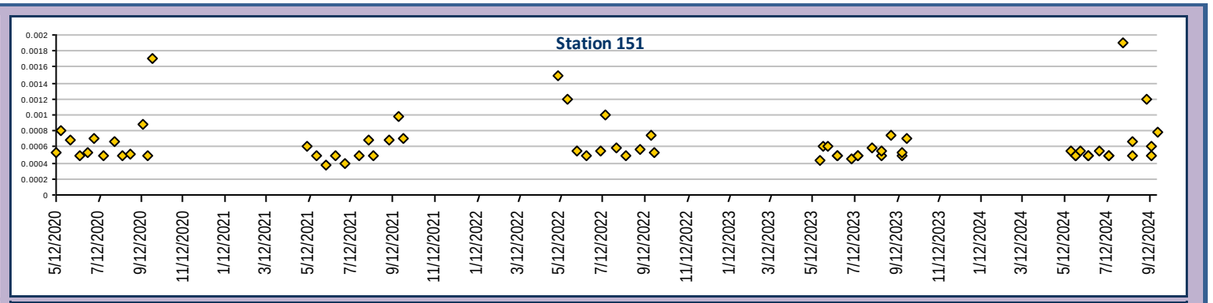


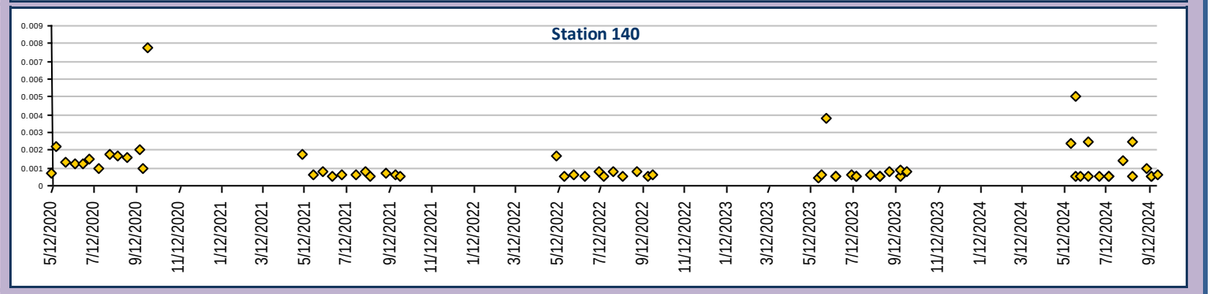


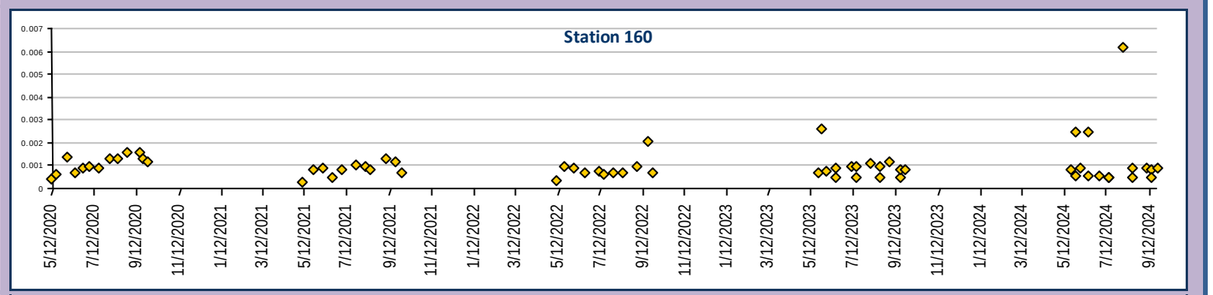


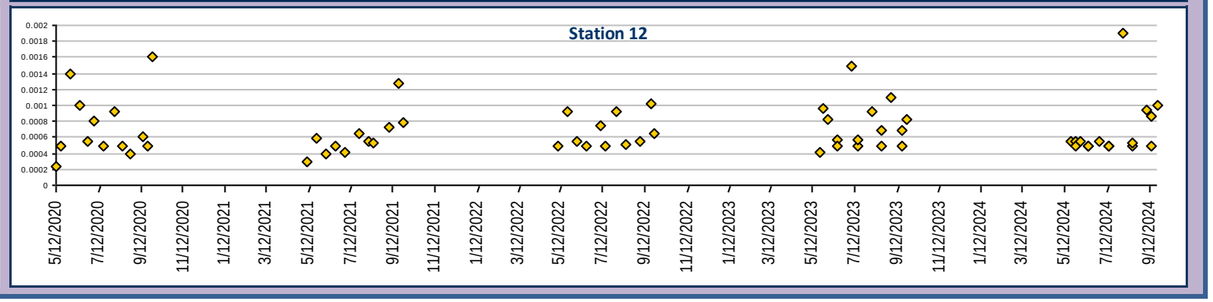


APDES Stations : Chromium, Total, units mg/L - 5 Year Trend

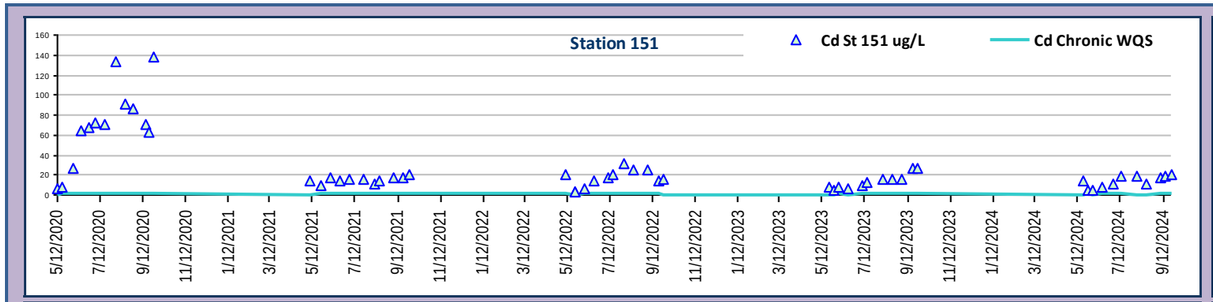


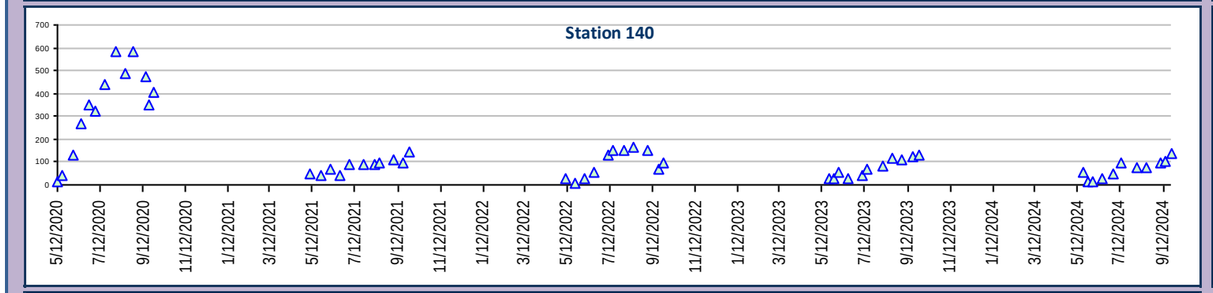


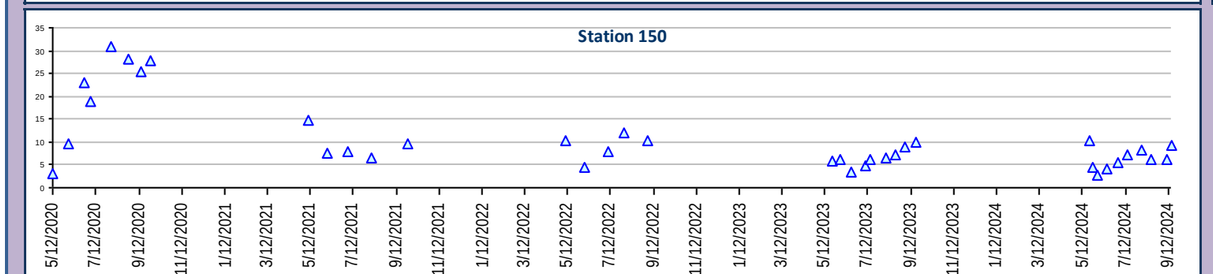


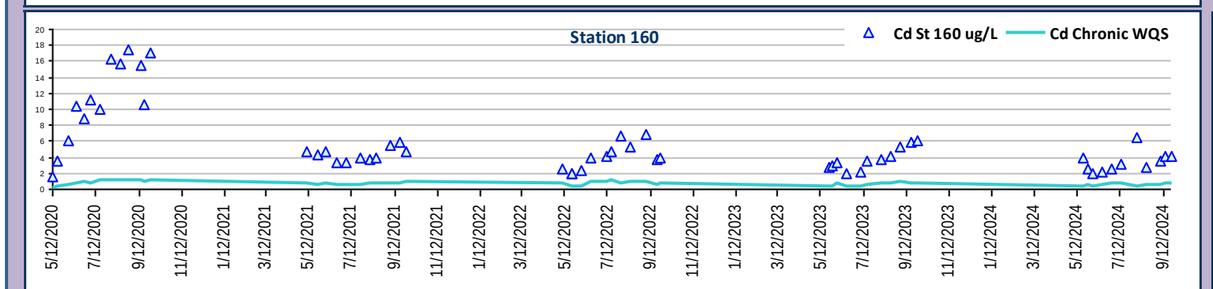


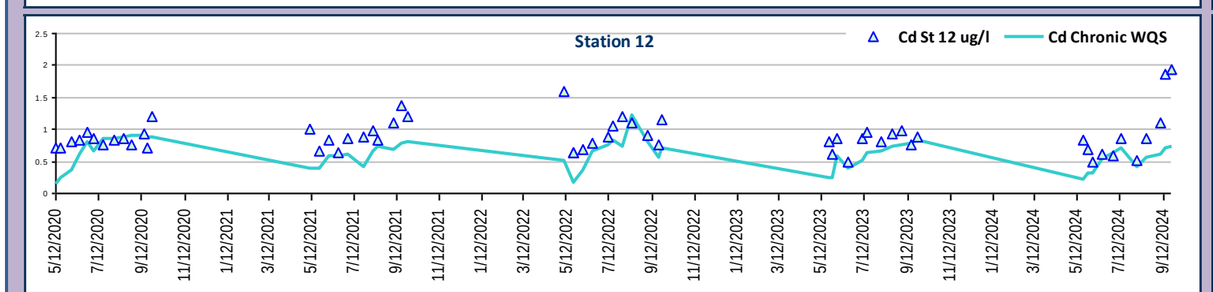
APDES Stations : Cadmium, Total, units ug/L - 5 Year Trend



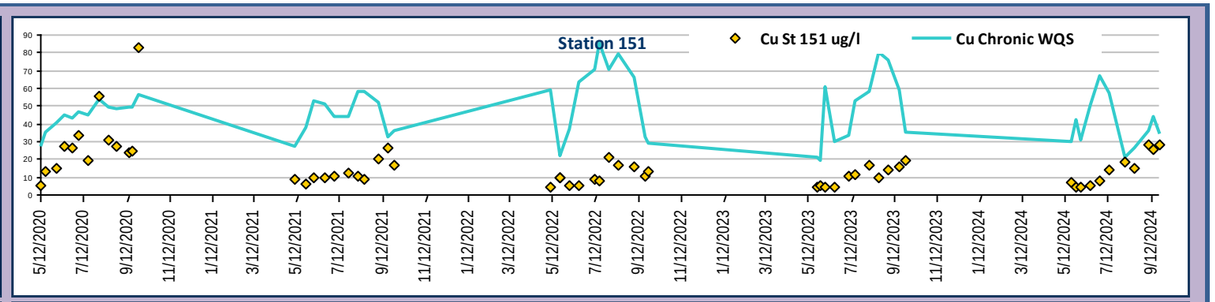


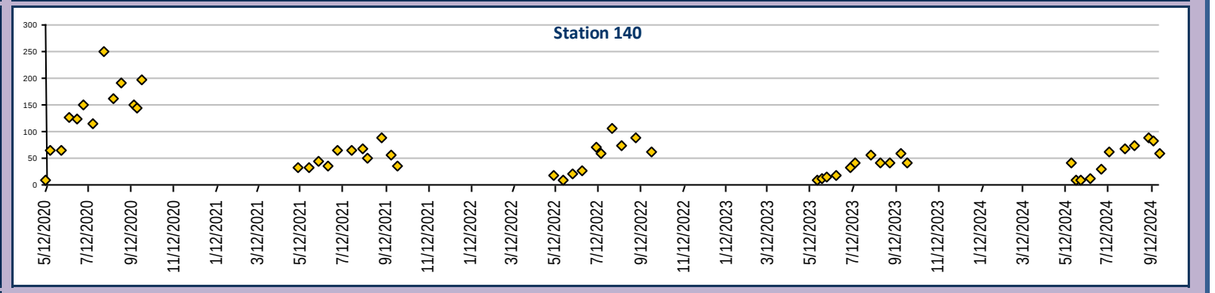


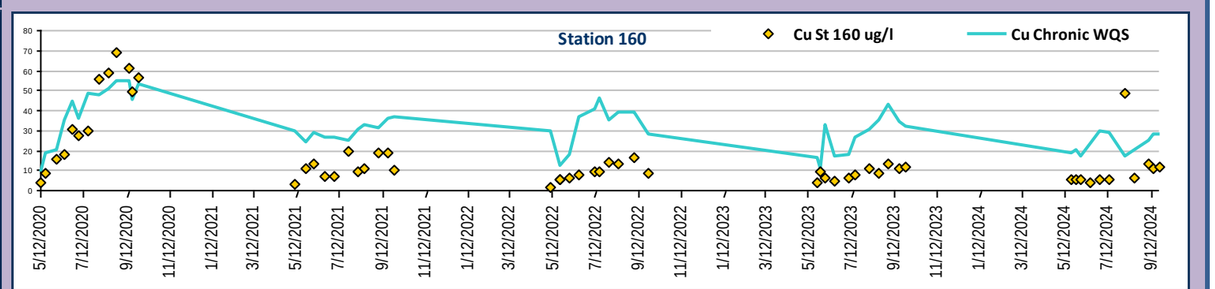


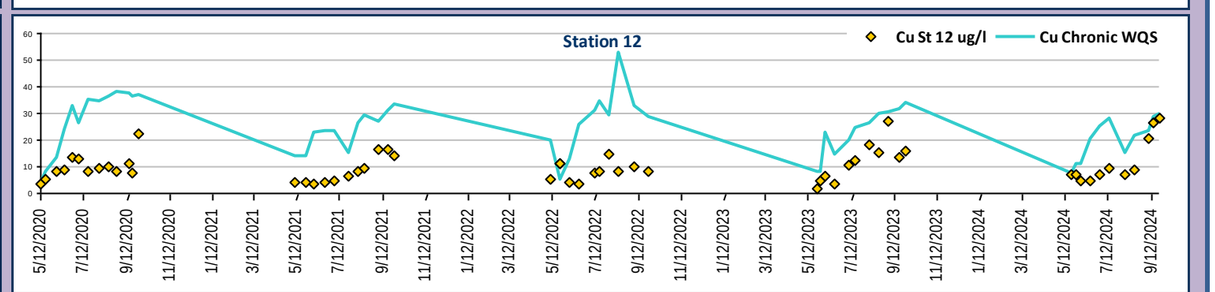


APDES Stations : Copper, Total, units, ug/L - 5 Year Trend

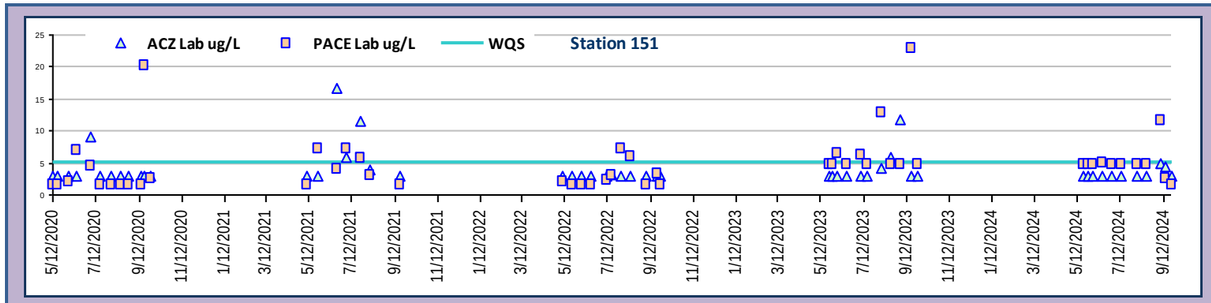




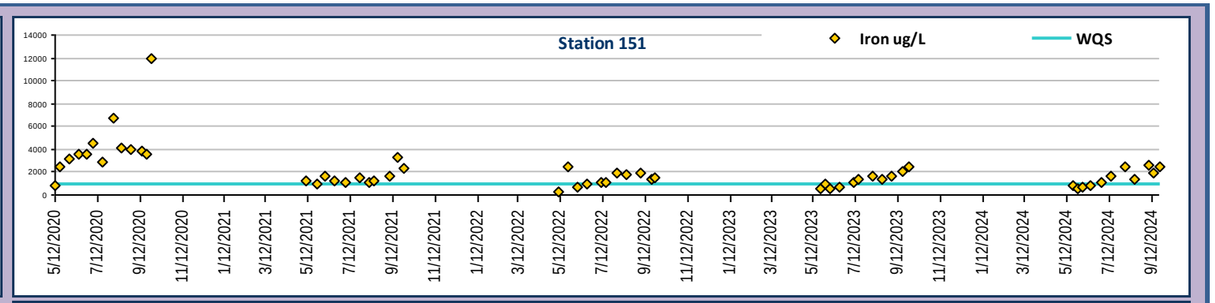


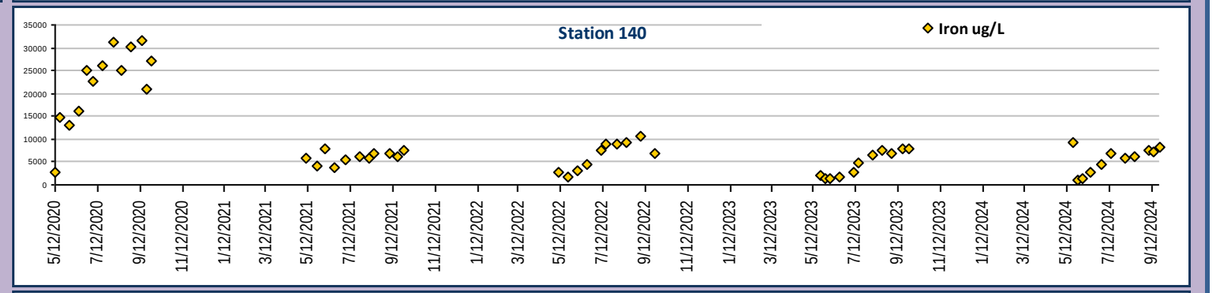


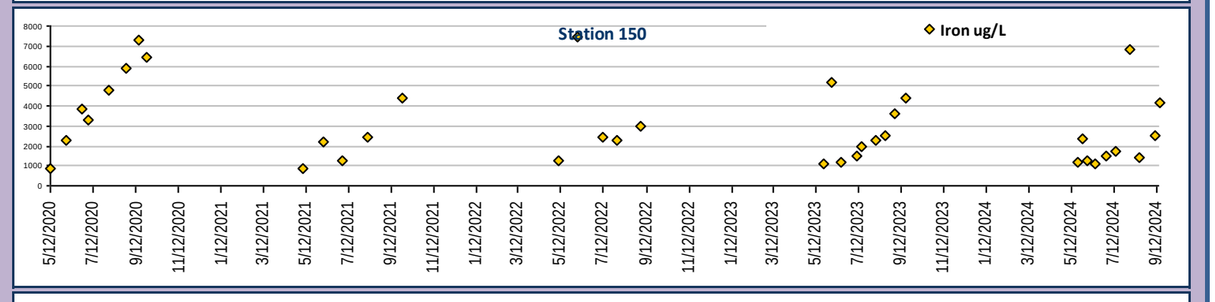
APDES Stations : Cyanide, WAD, units ug/L - 5 Year Trend

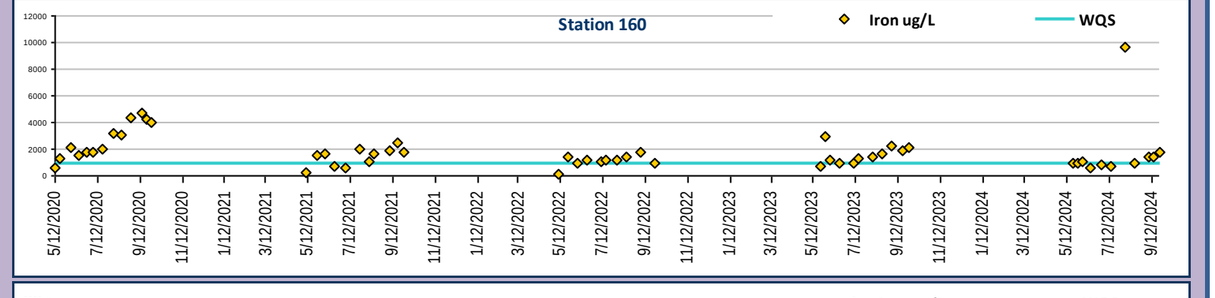


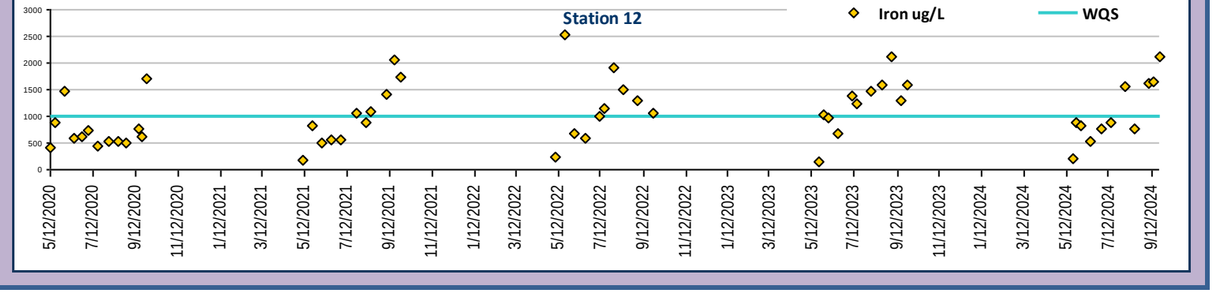
APDES Stations : Iron, Total, units, ug/L - 5 Year Trend



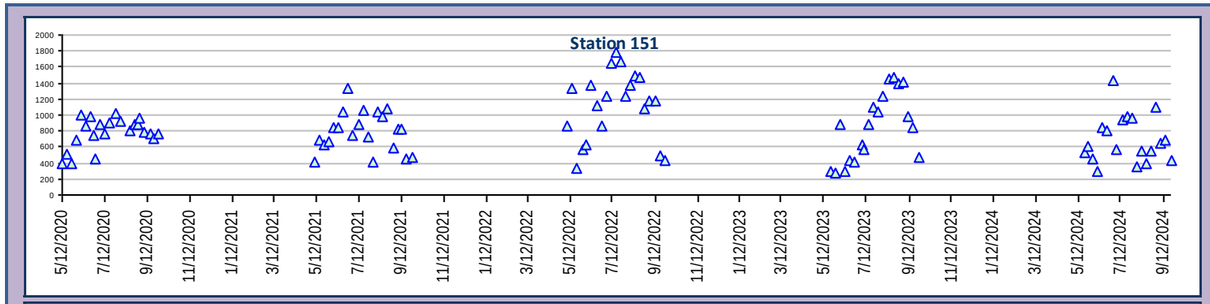


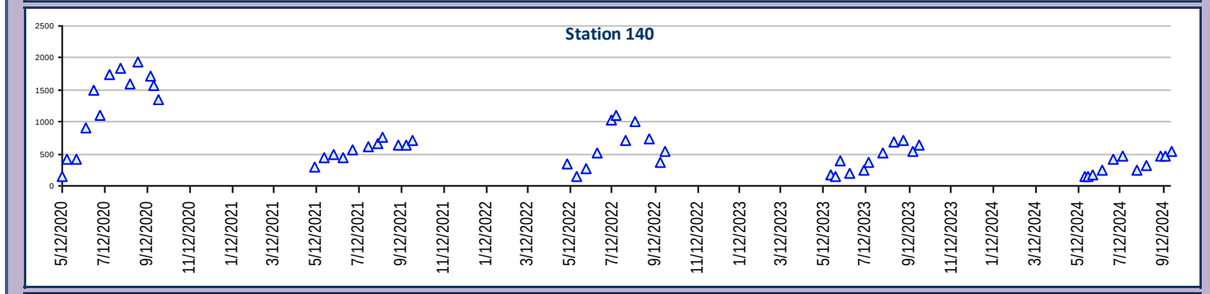


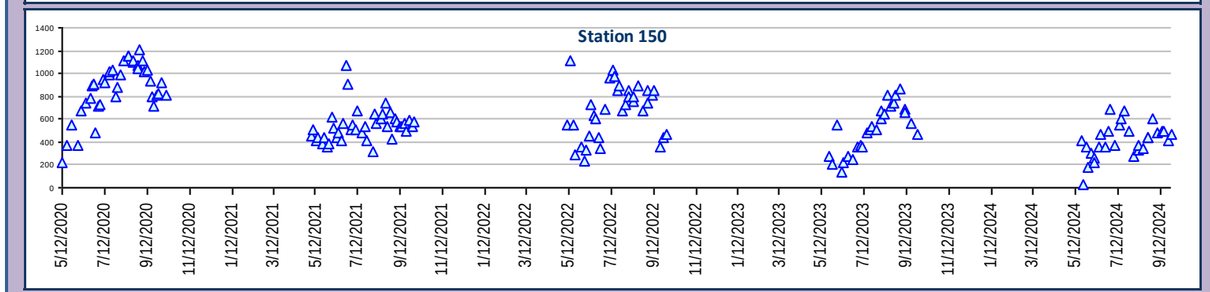


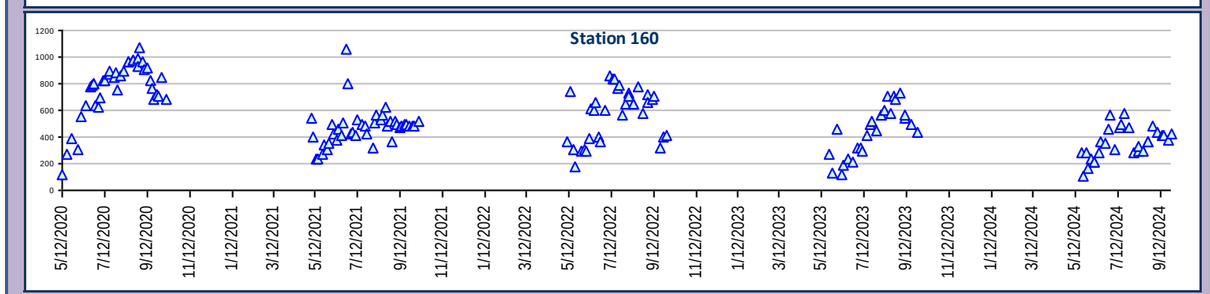


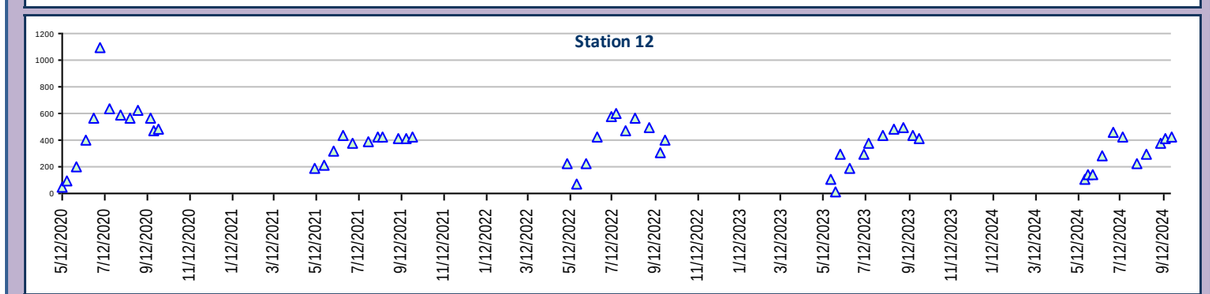
APDES Stations : Conductivity, Total, units uS/cm - 5 Year Trend



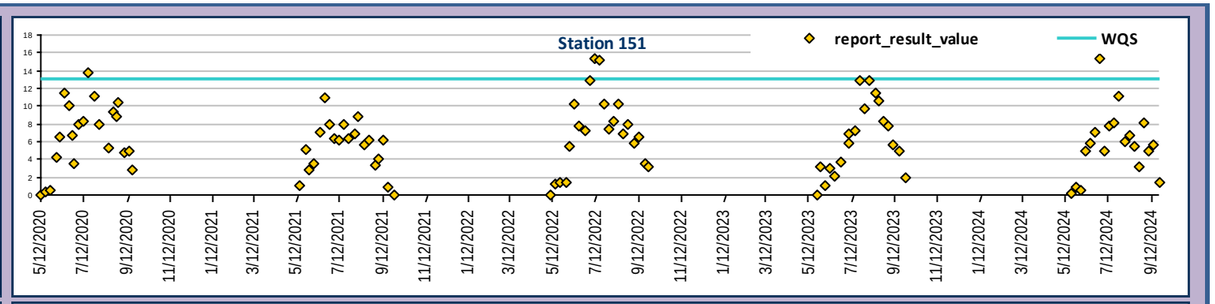


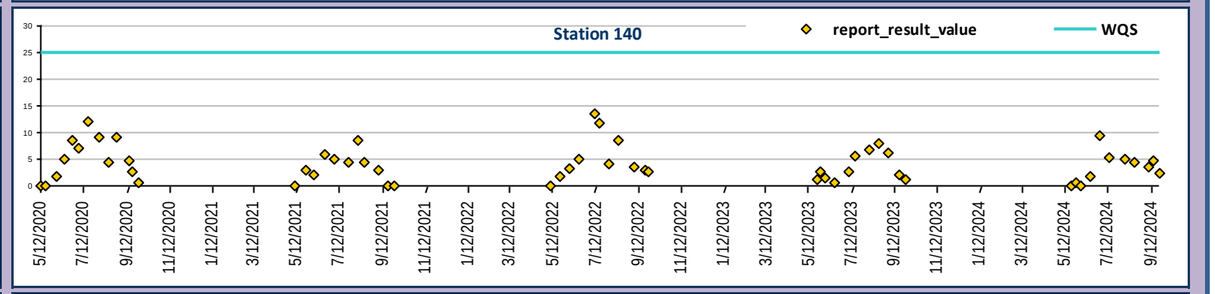


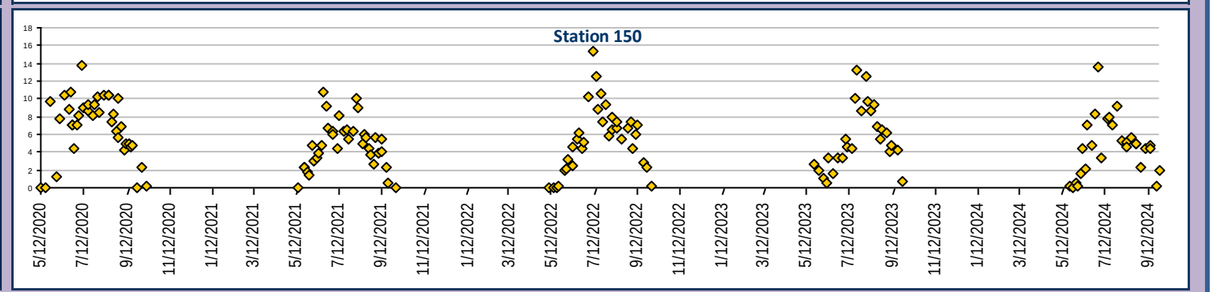


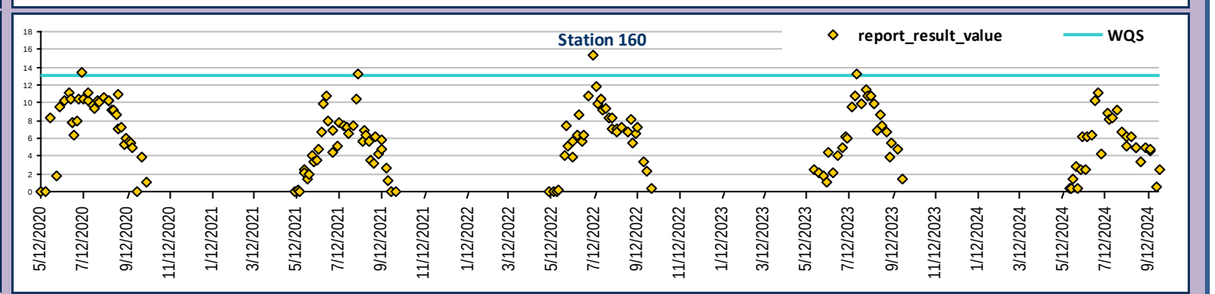


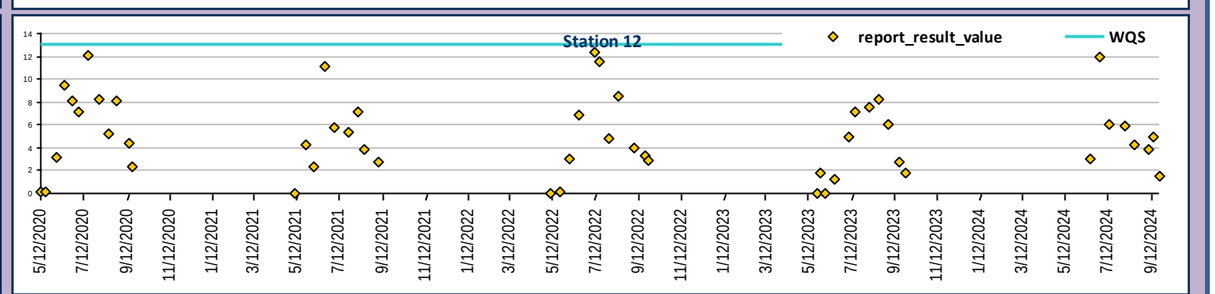
APDES Stations : Temperature, units Celsius - 5 Year Trend



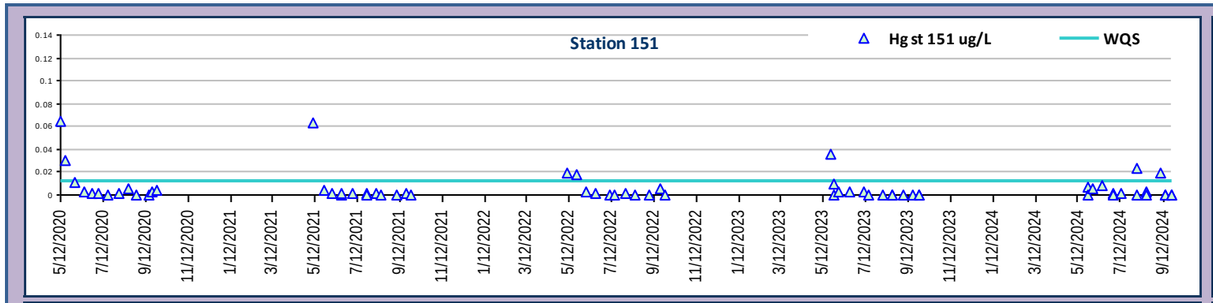


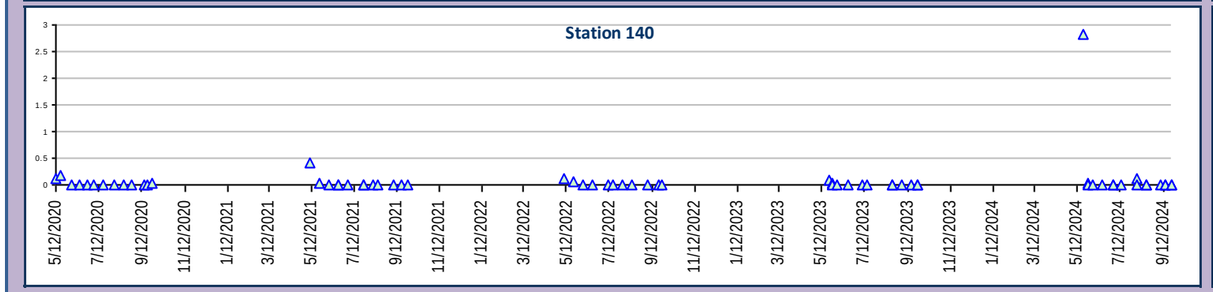




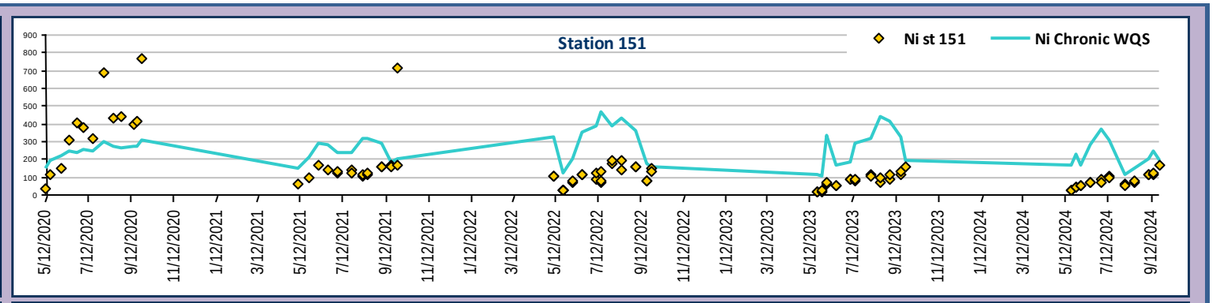


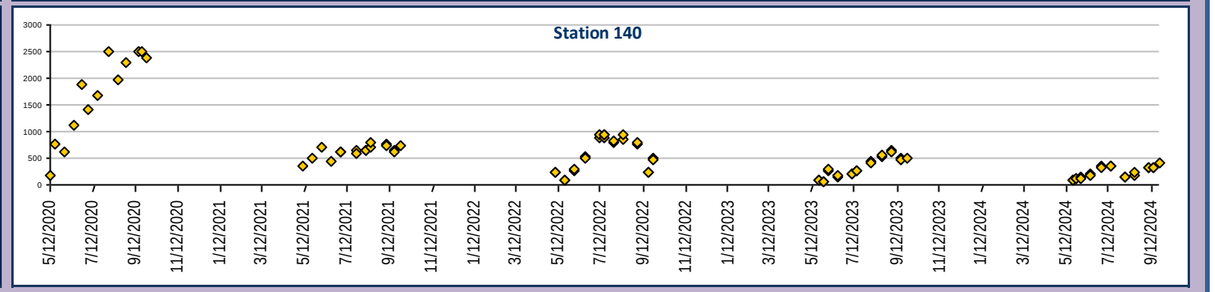
APDES Stations : Mercury, Total, units ug/L - 5 Year Trend

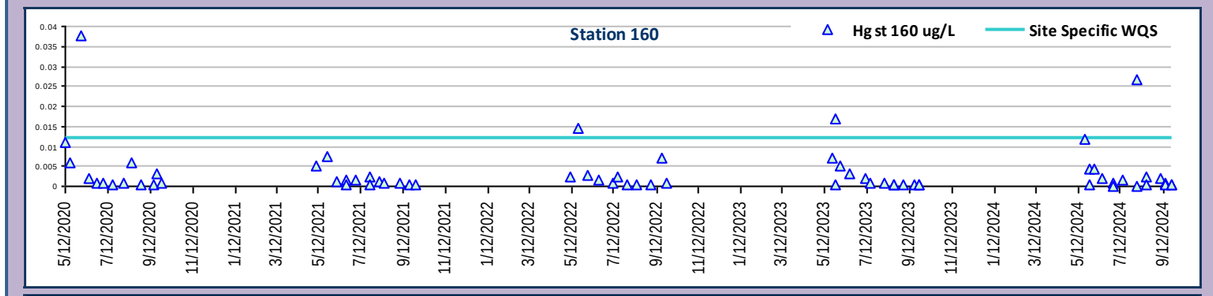


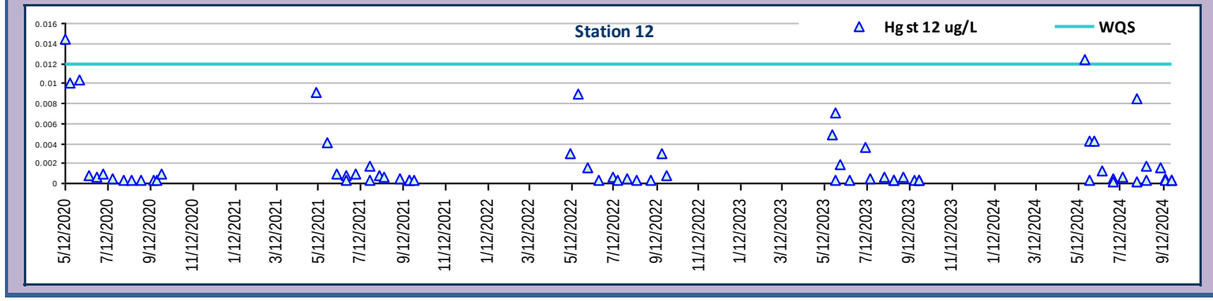


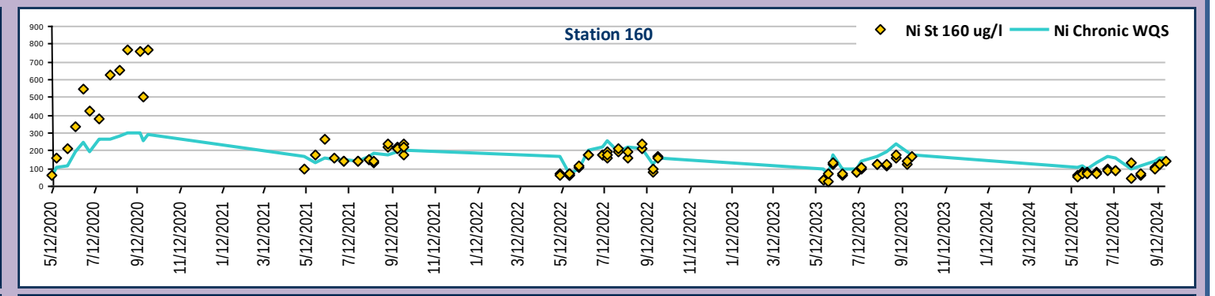
APDES Stations : Nickel, Total, units, ug/L - 5 Year Trend

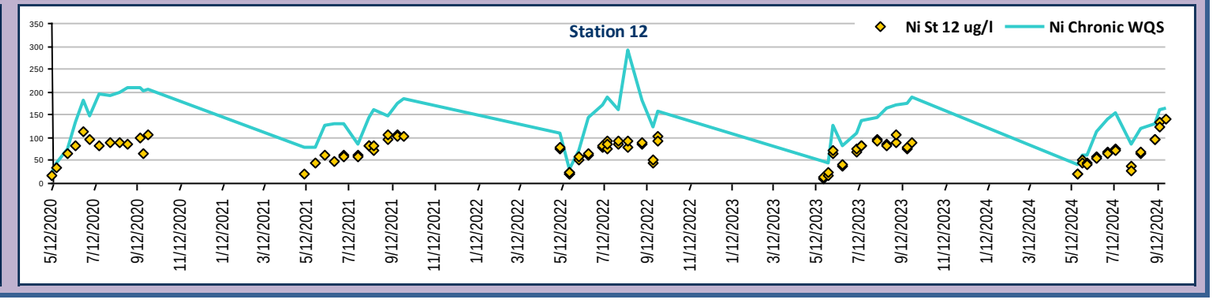




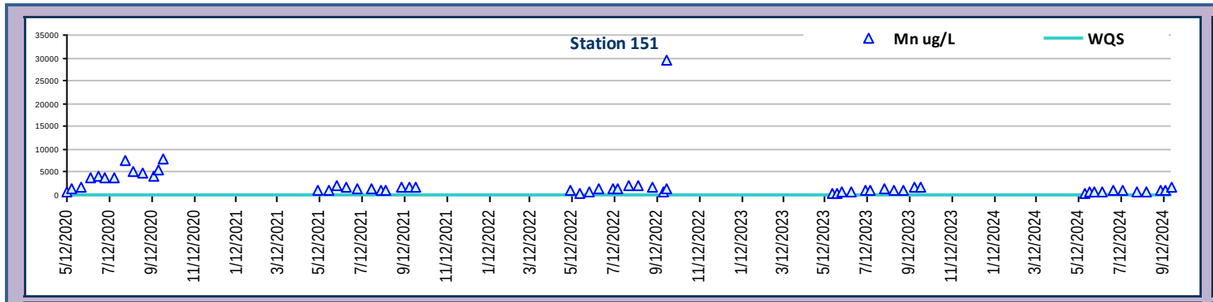


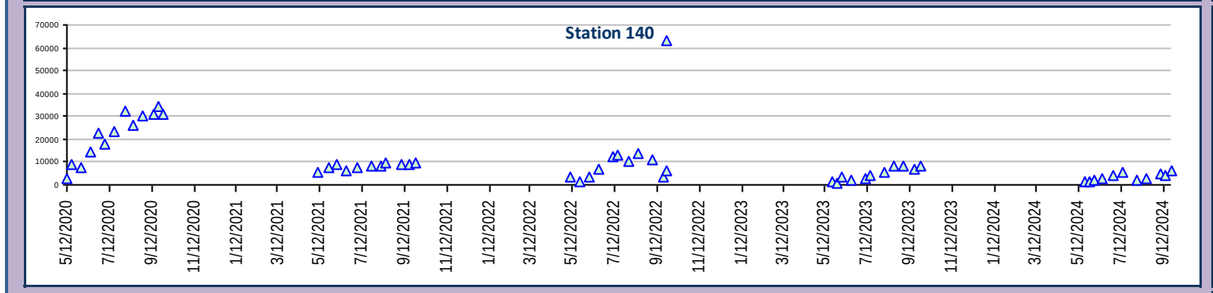


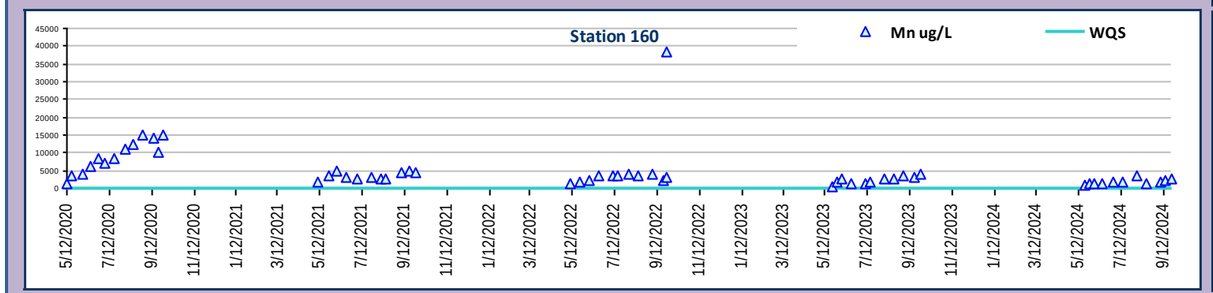


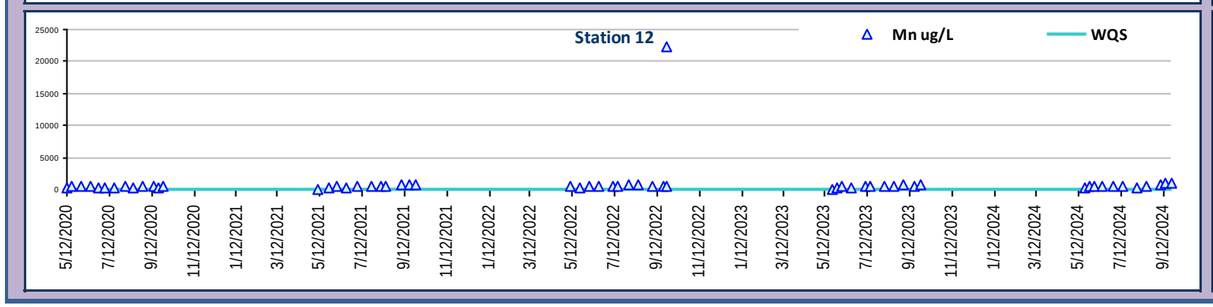


APDES Stations : Manganese, Total, units ug/L - 5 Year Trend



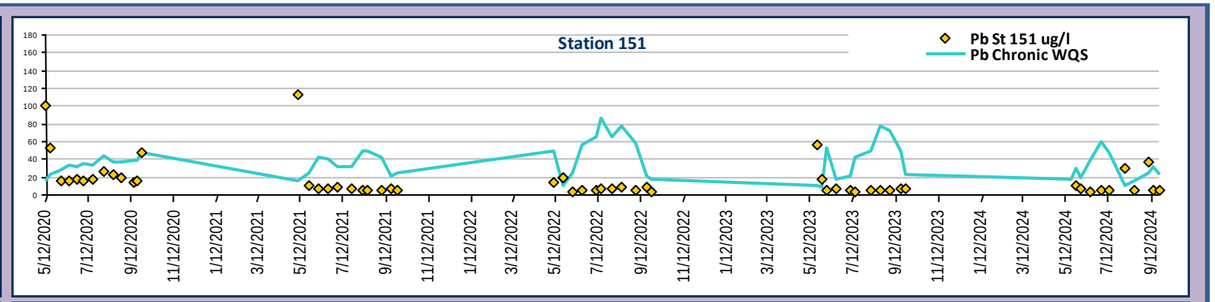


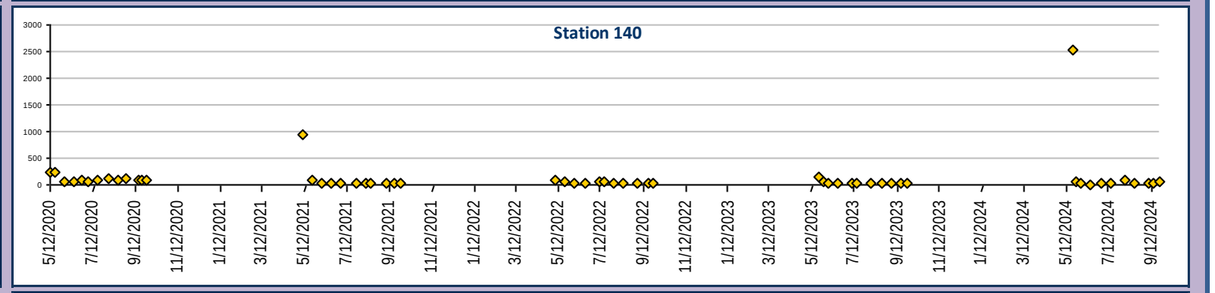


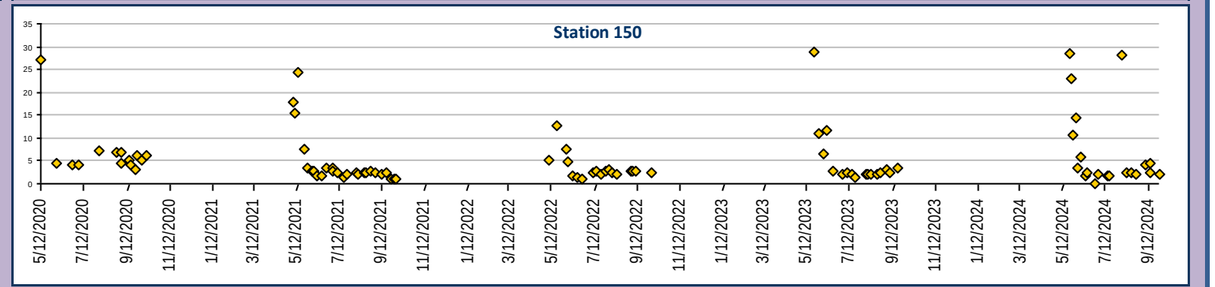


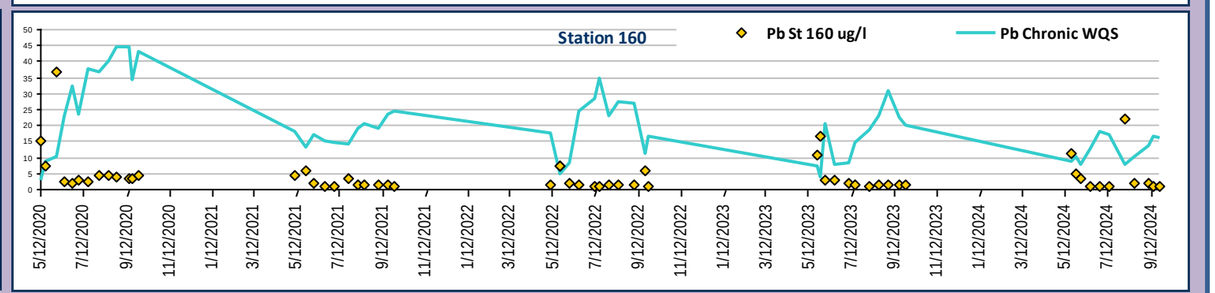
APDES Stations : Lead, Total, units, ug/L - 5 Year Trend

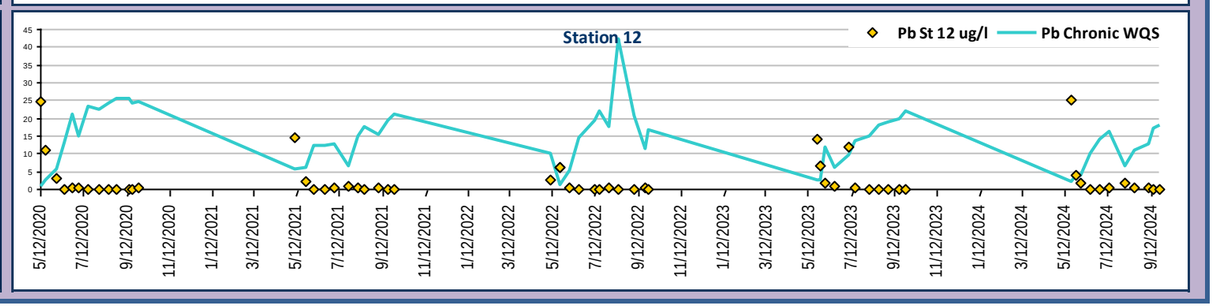
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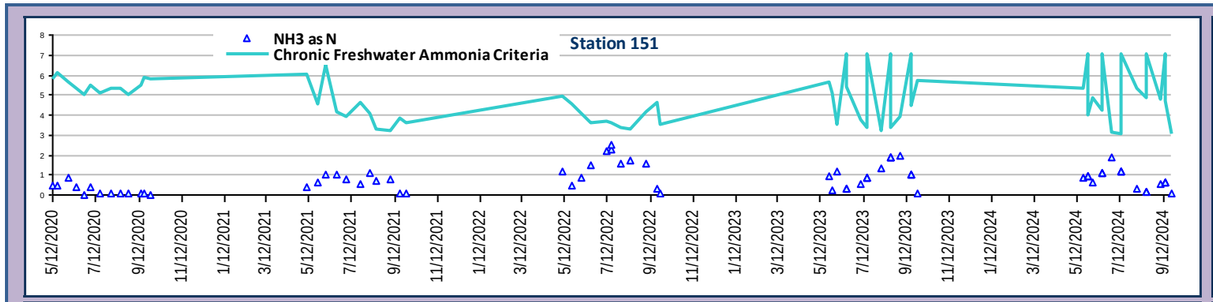


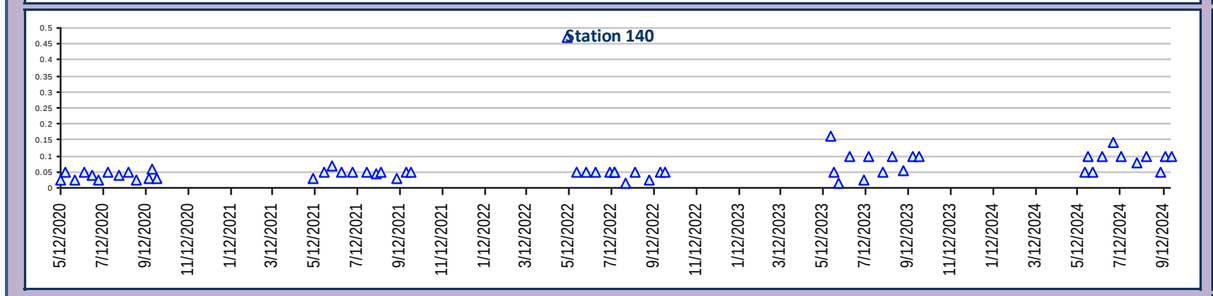


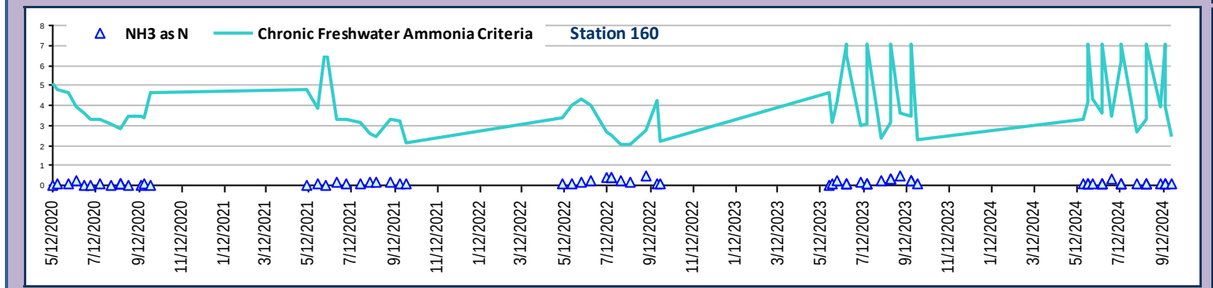


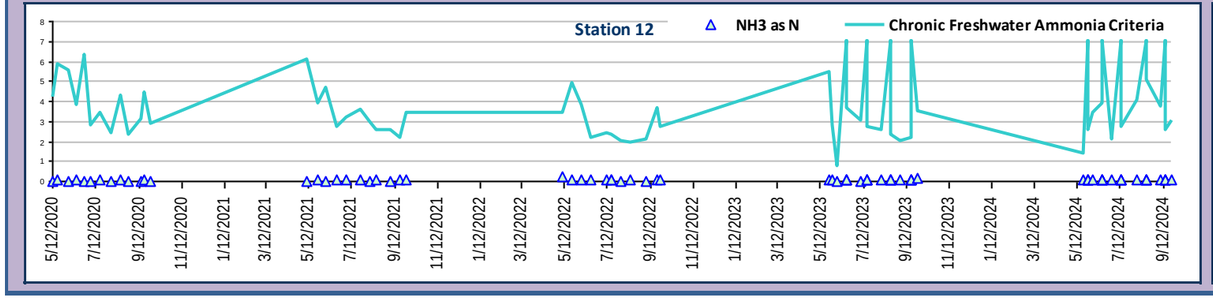


APDES Stations : NH3-N, Total, units mg/l - 5 Year Trend

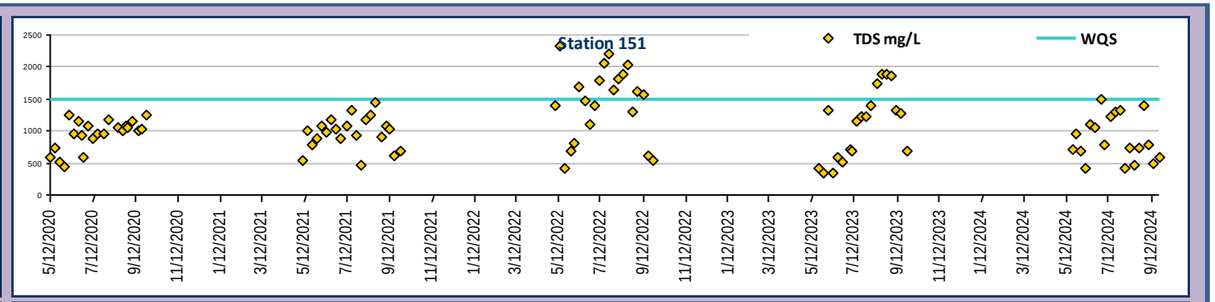


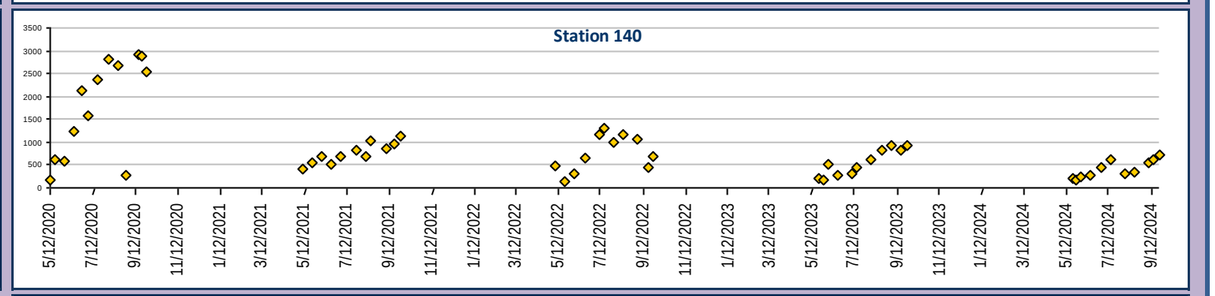


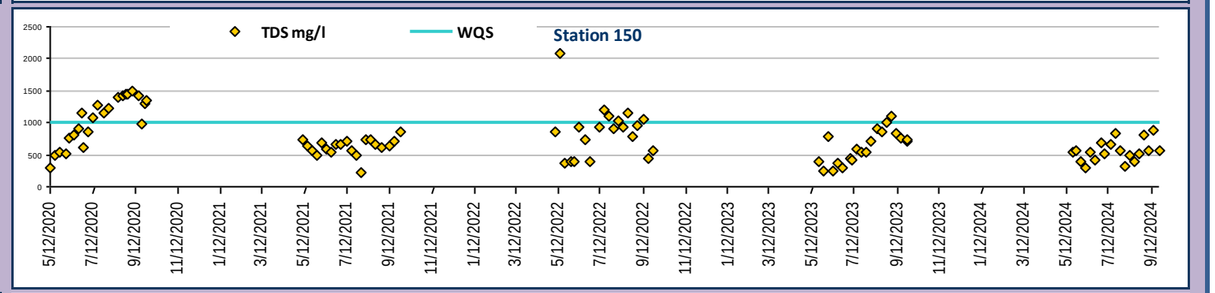


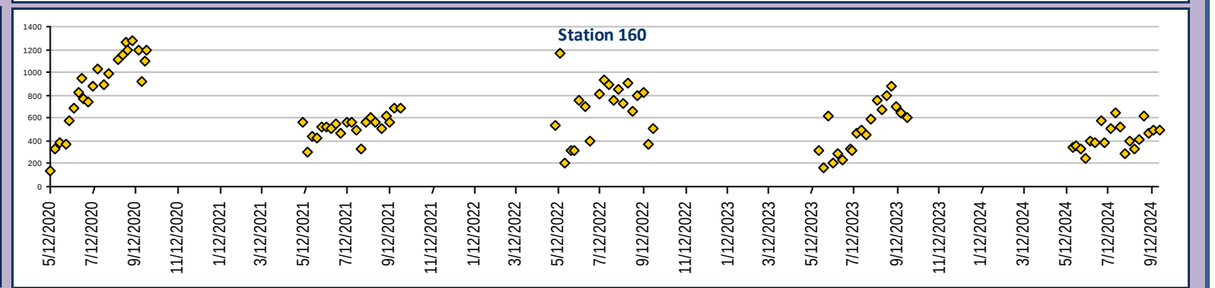


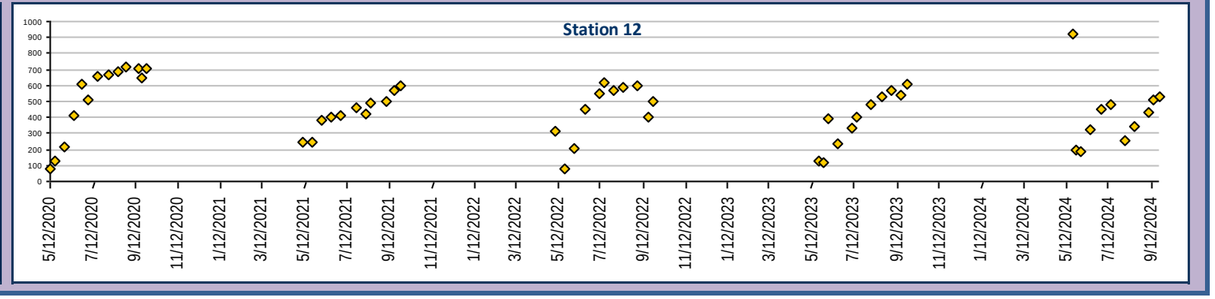
APDES Stations : TDS, units mg/l - 5 Year Trend



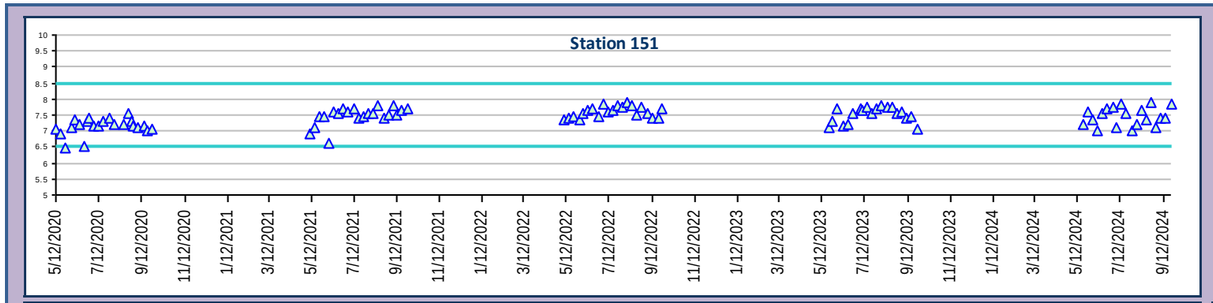


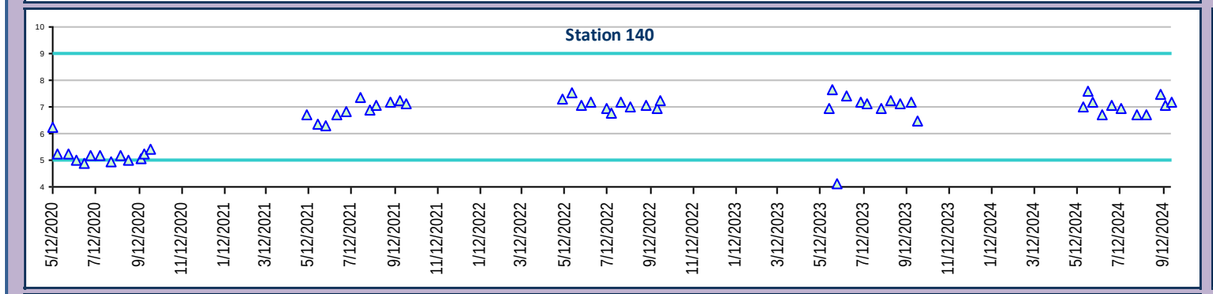


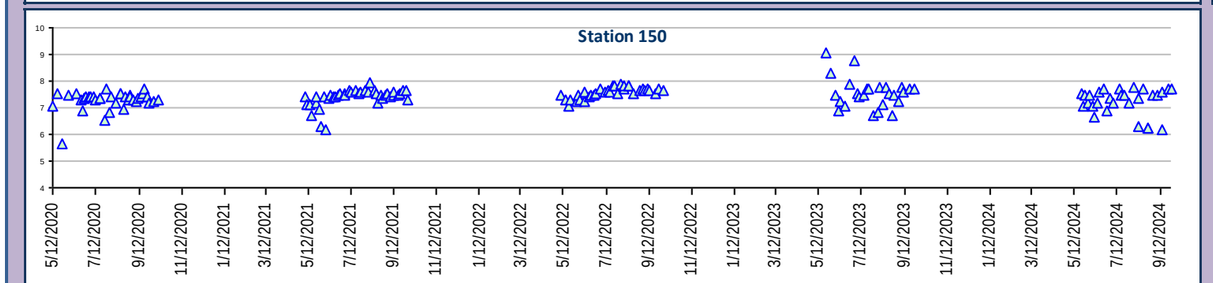


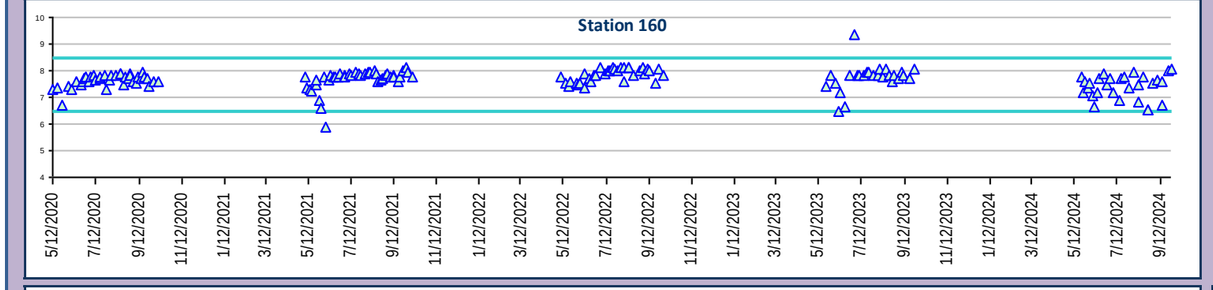


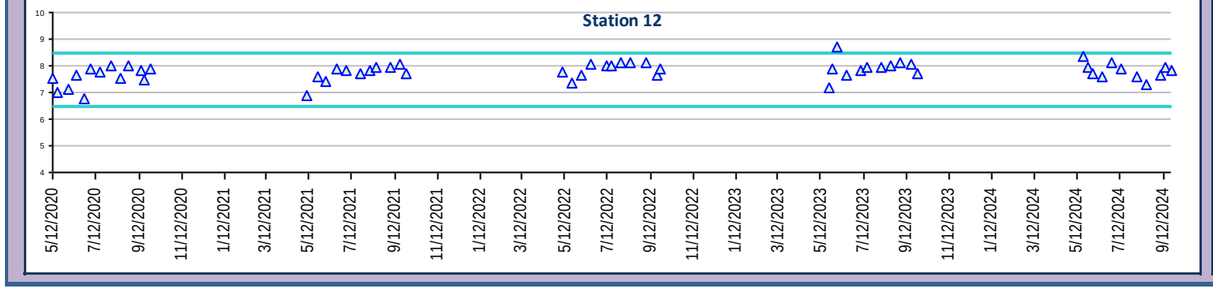
APDES Stations : pH, units - 5 Year Trend



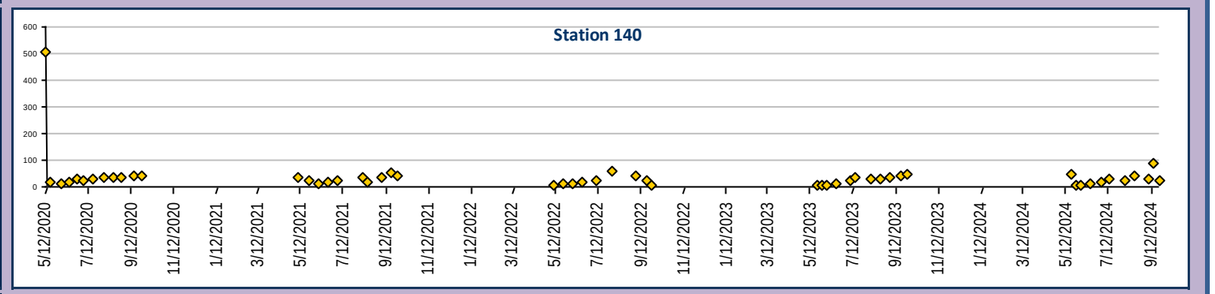


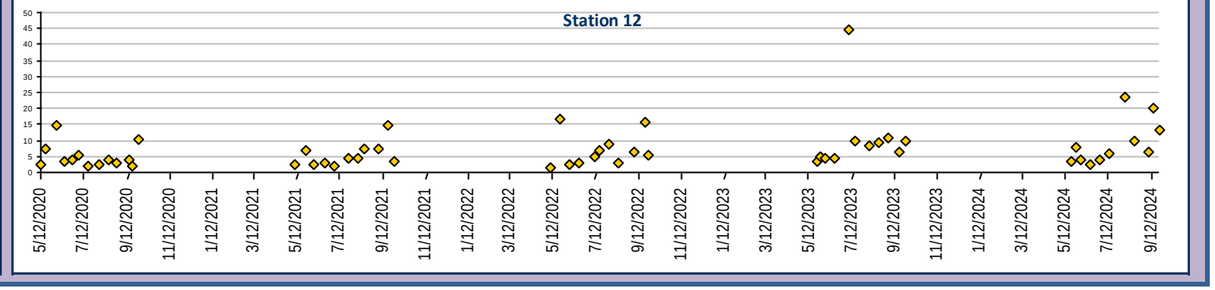




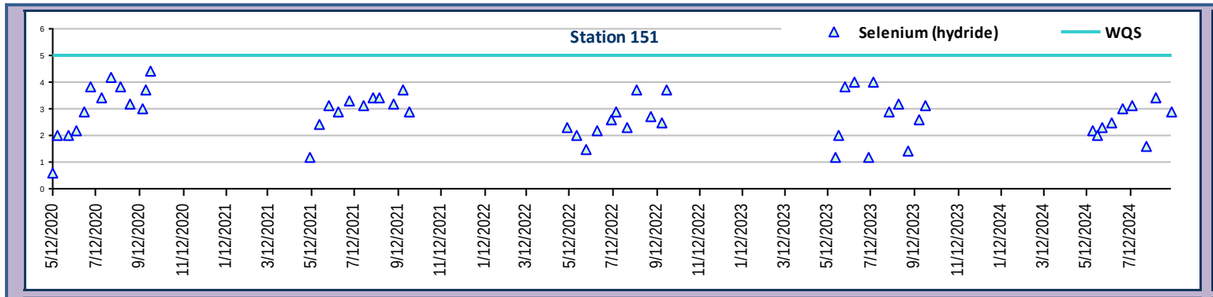


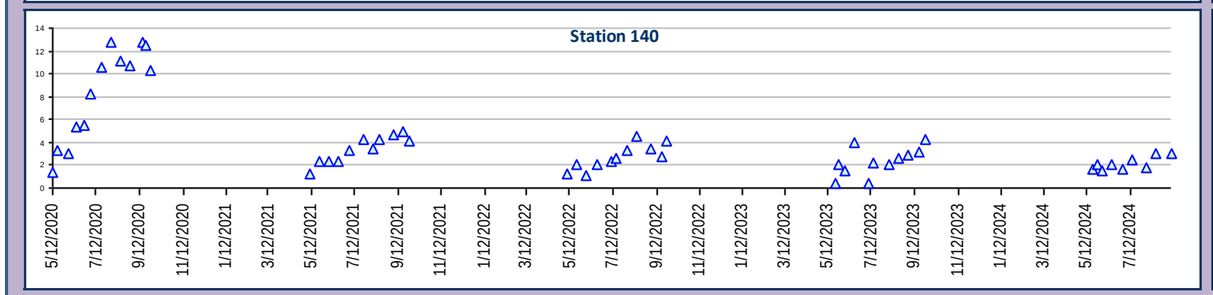
APDES Stations : Turbidity, Total, units NTU - 5 Year Trend

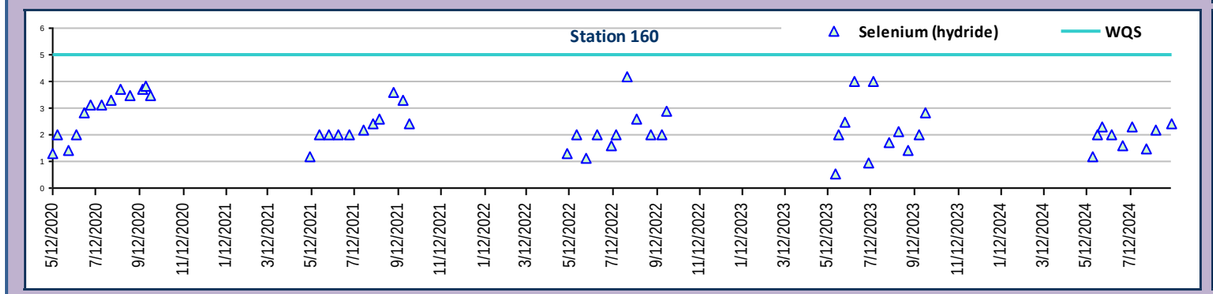


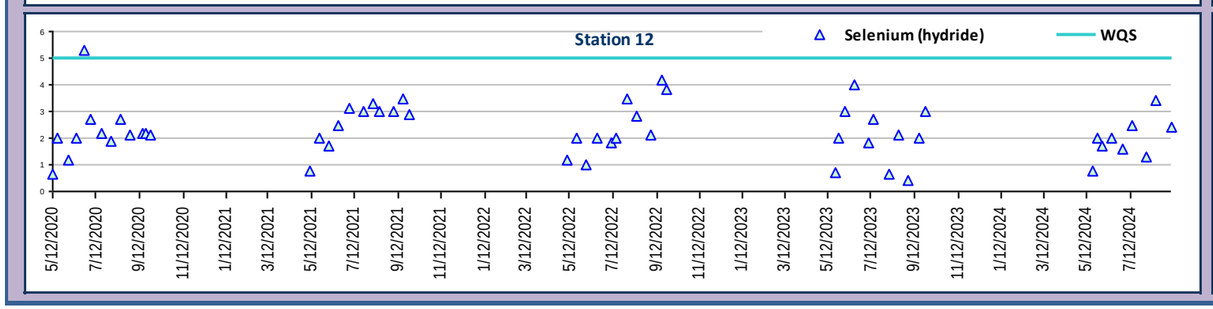


APDES Stations : Selenium, units, ug/l - 5 Year Trend

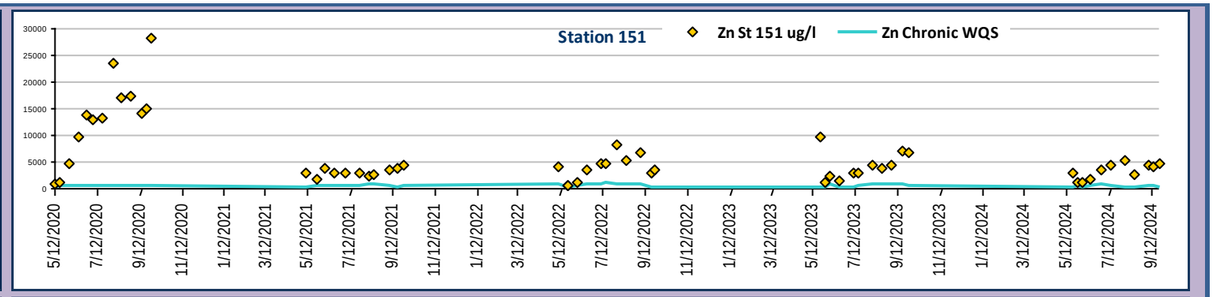


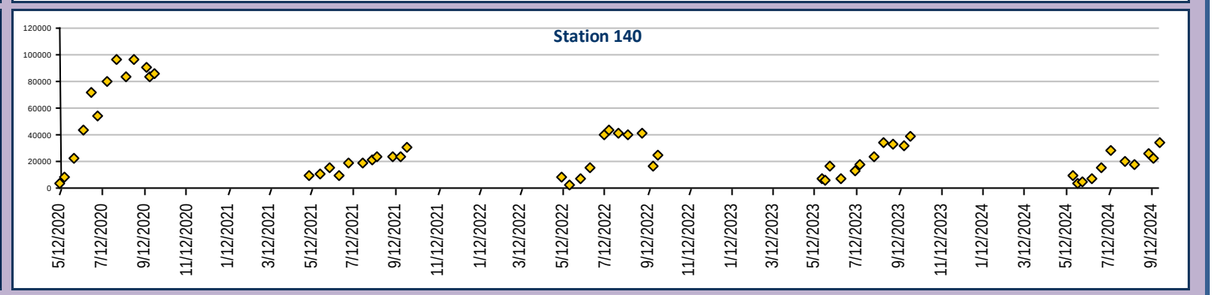


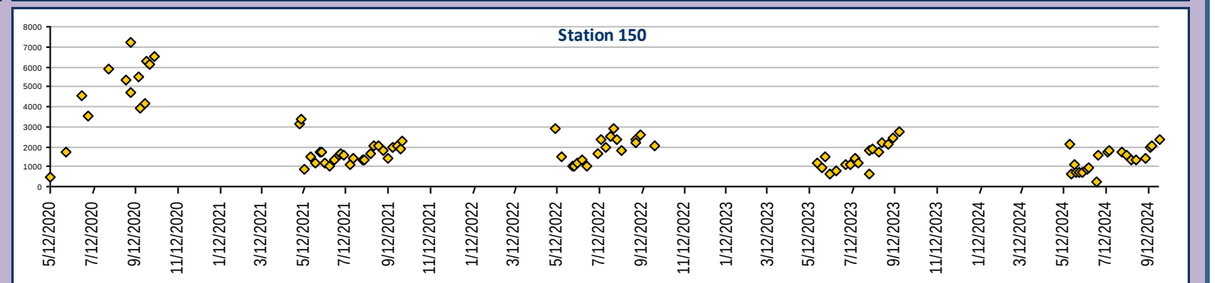


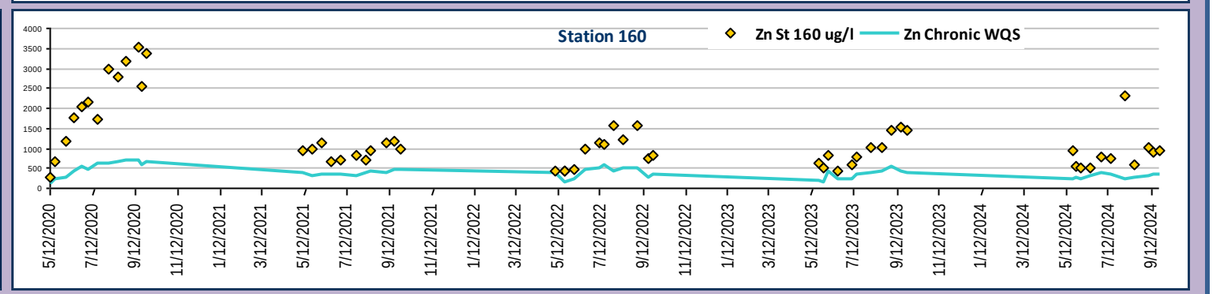


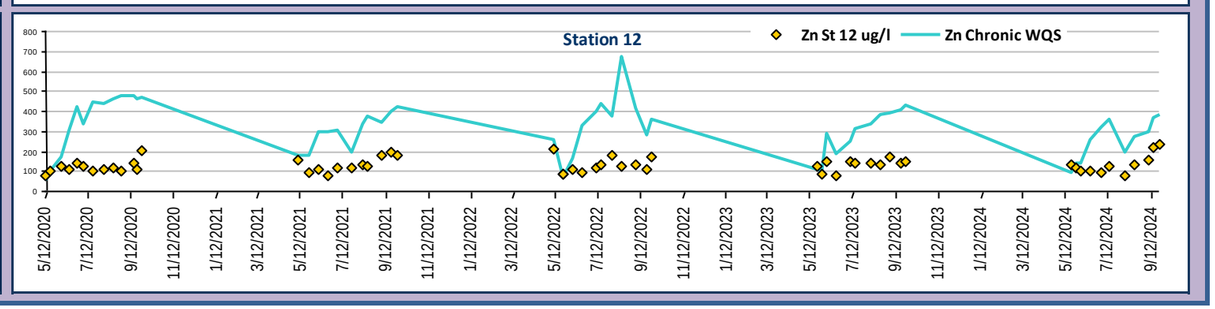
APDES Stations : Zinc, Total, units ug/l - 5 Year Trend





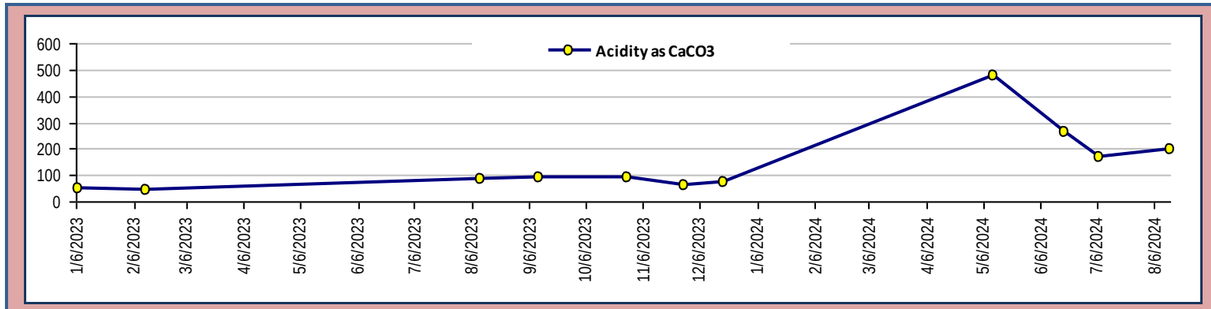


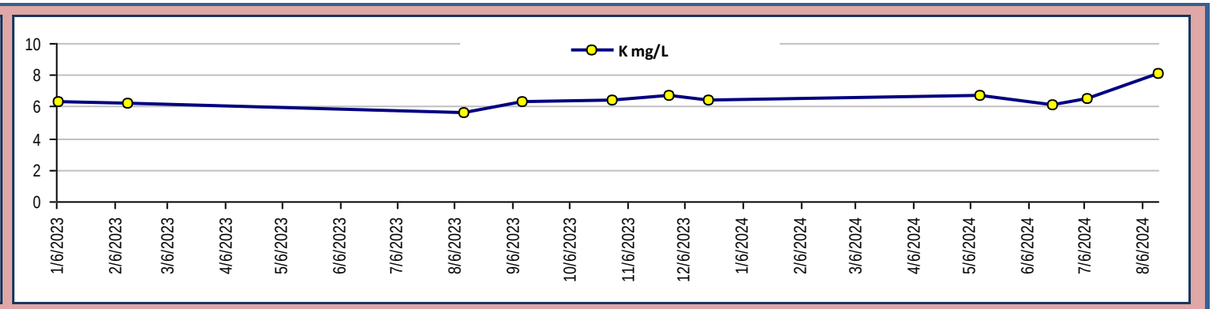


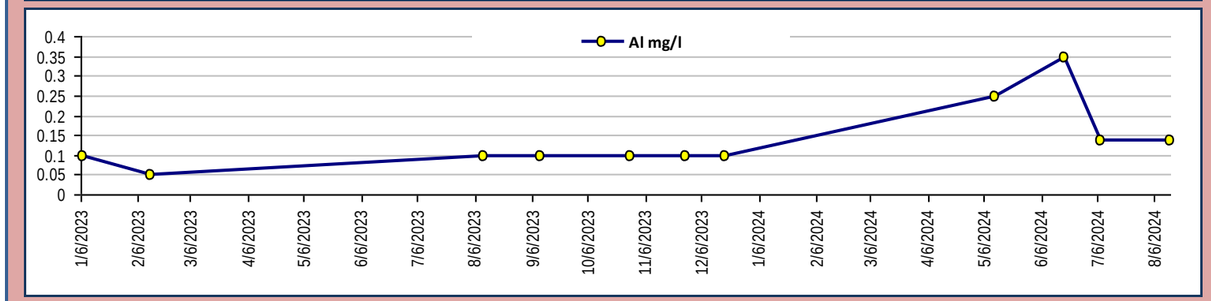


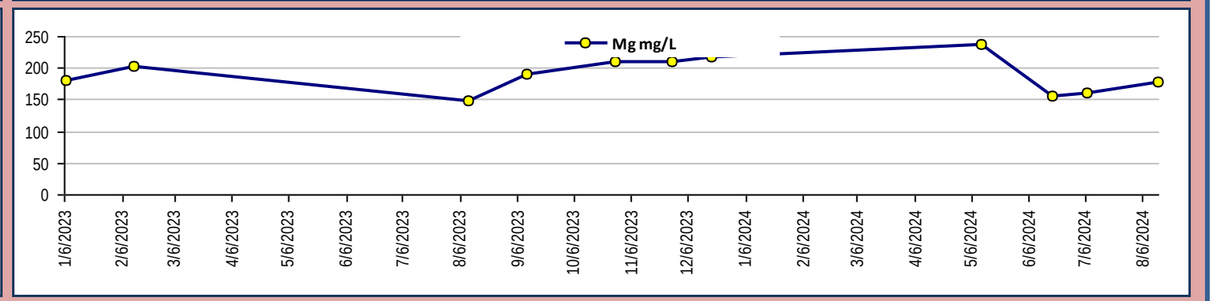
Appendix G: TMD Seepage Monitoring Well Trend Charts

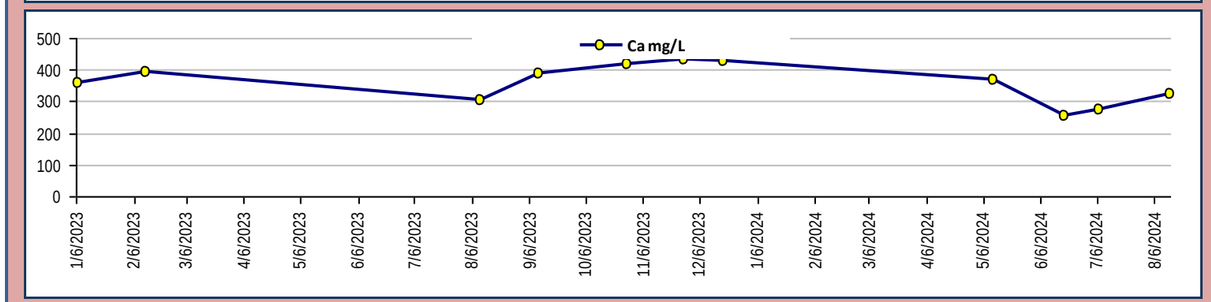
TMD Seepage Monitoring Well - Profile II: Dissolved

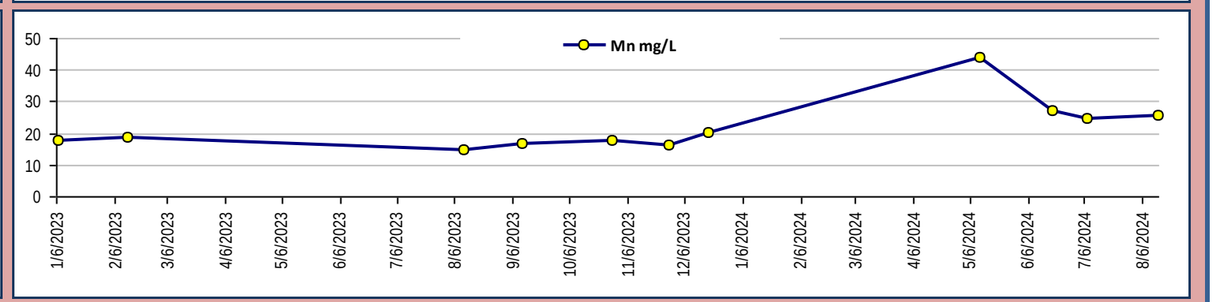


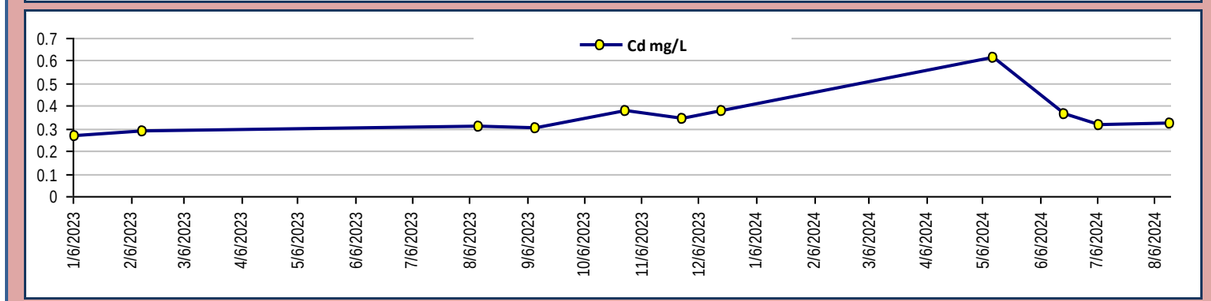


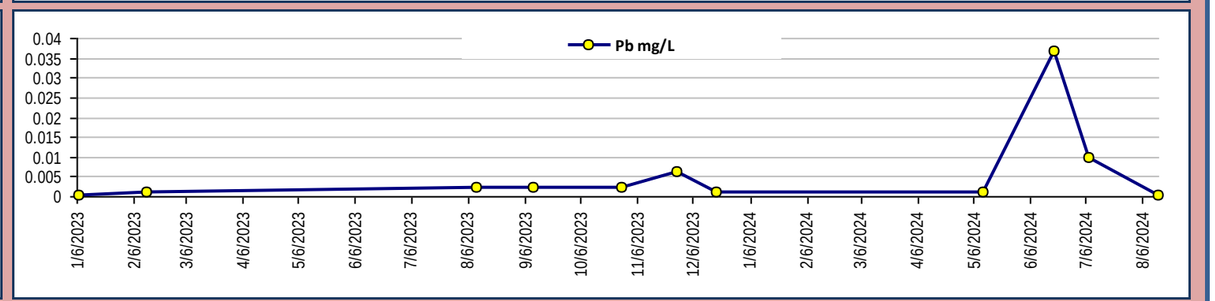


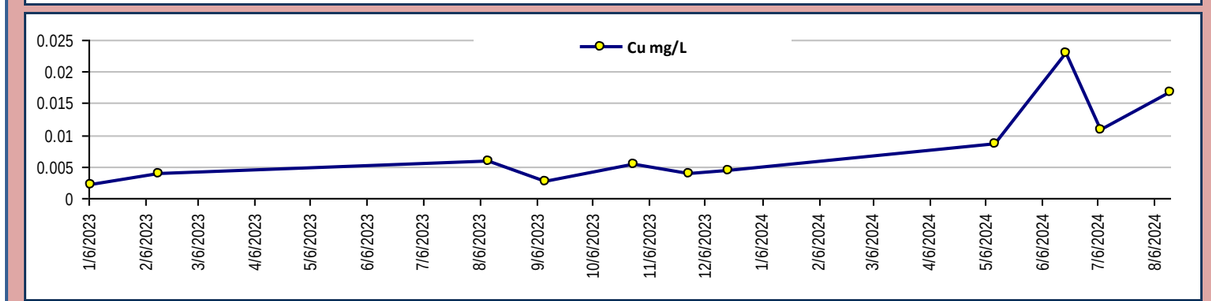


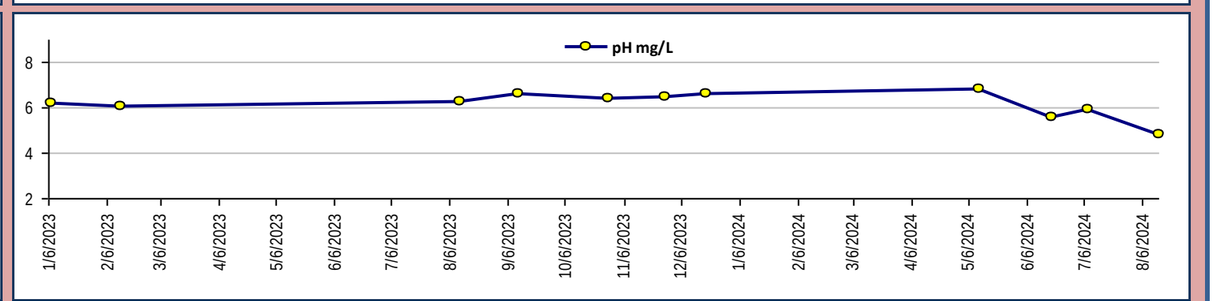




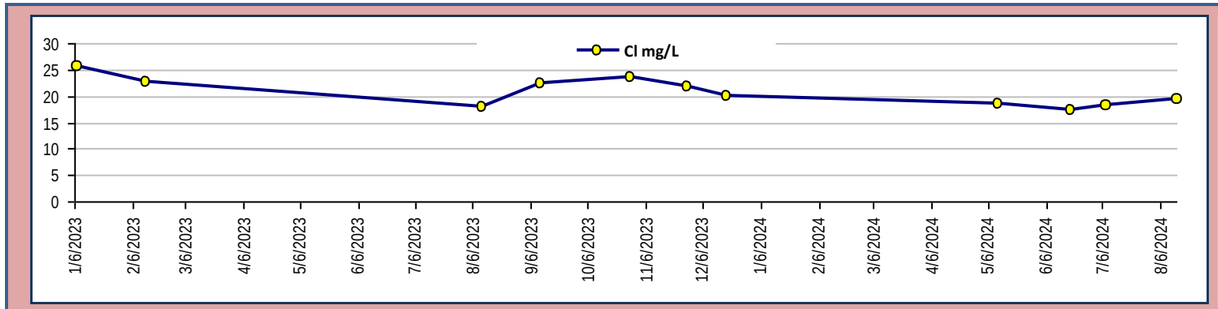


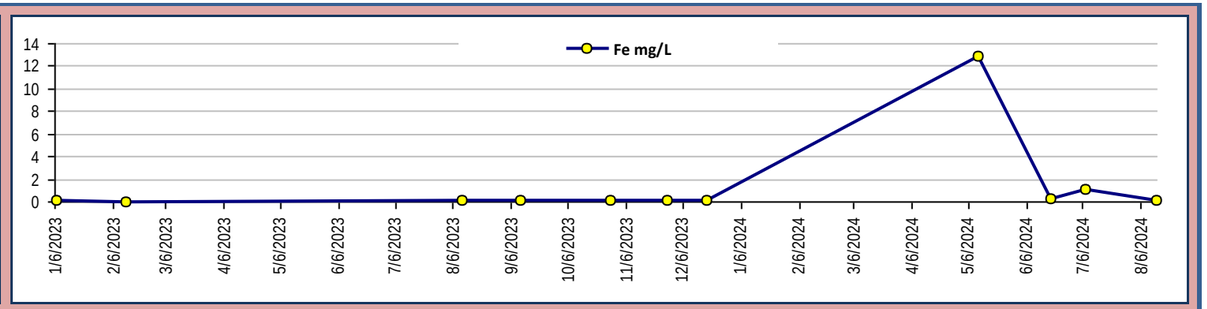


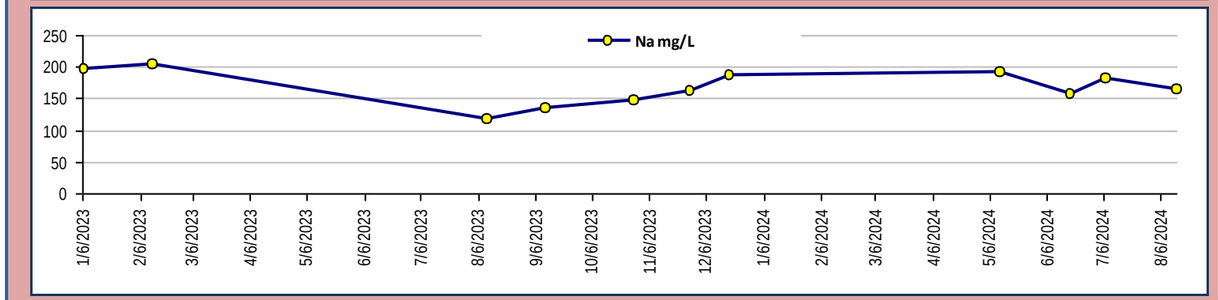


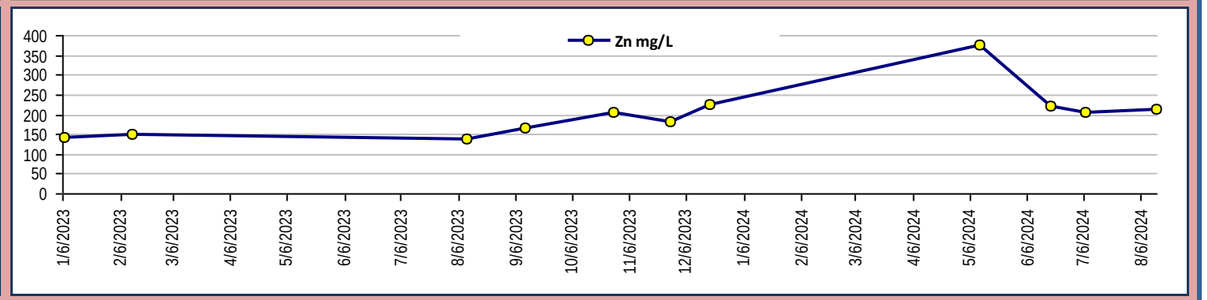


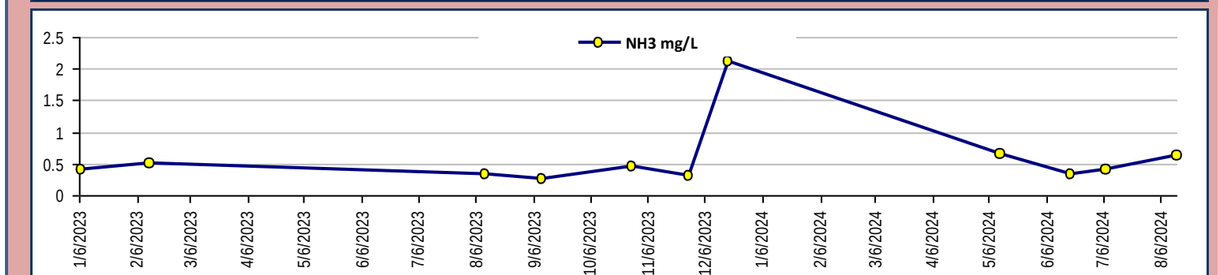
TMD Seepage Monitoring Well - Prifile II: Dissolved

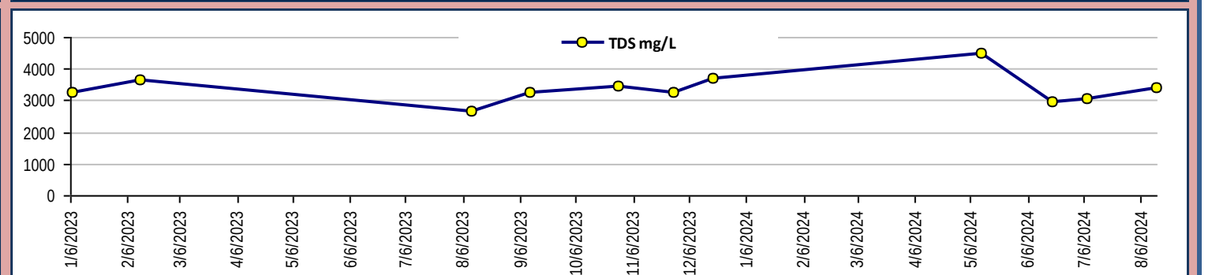


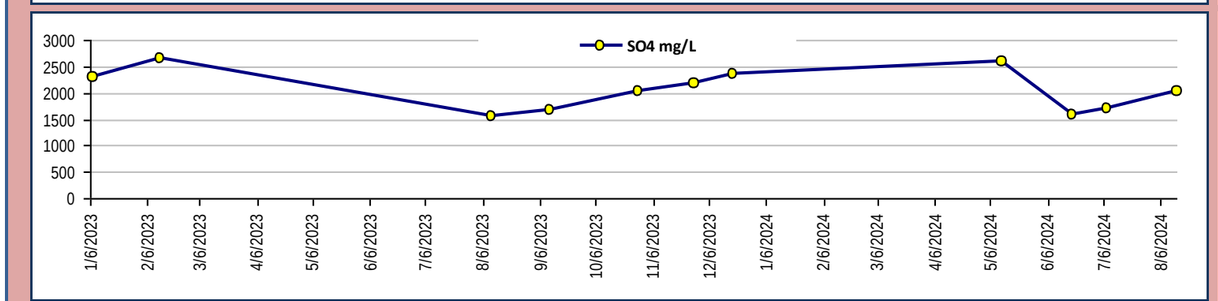


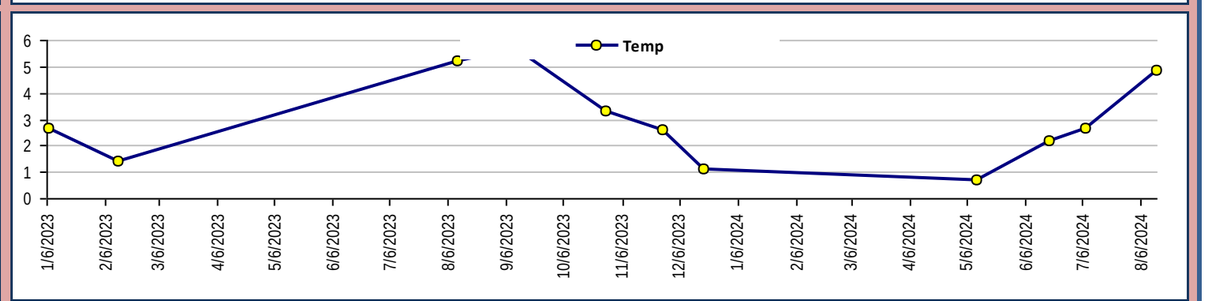


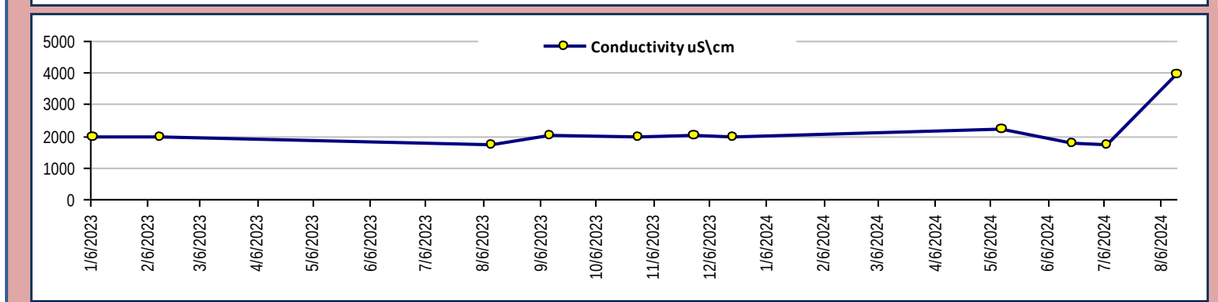








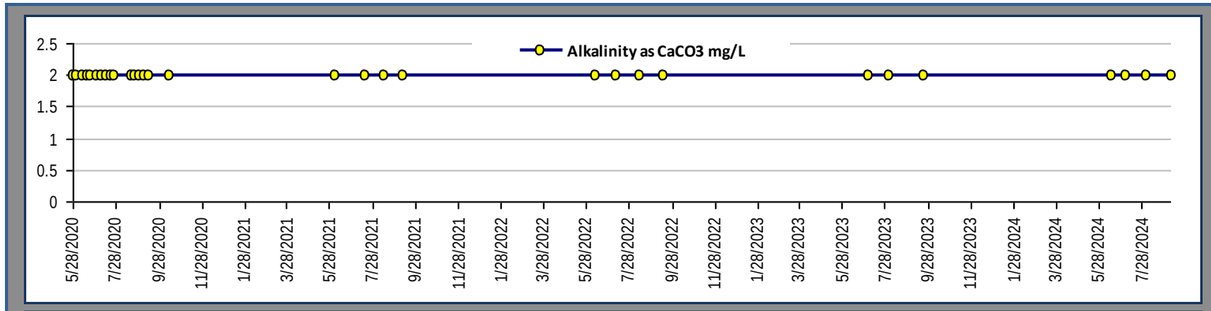


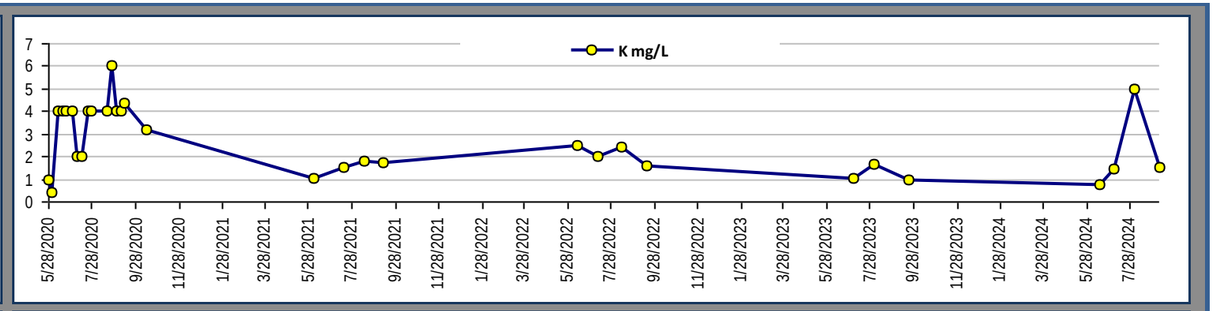


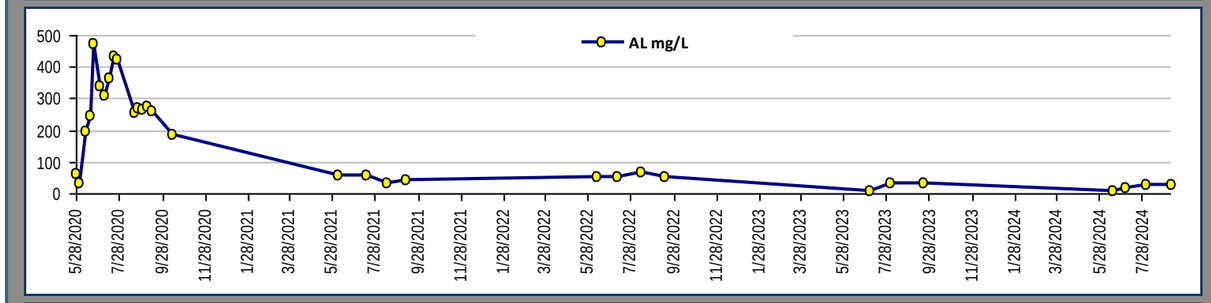
Appendix H: Kaviqsaaq Diversion – Profile I Trend Charts

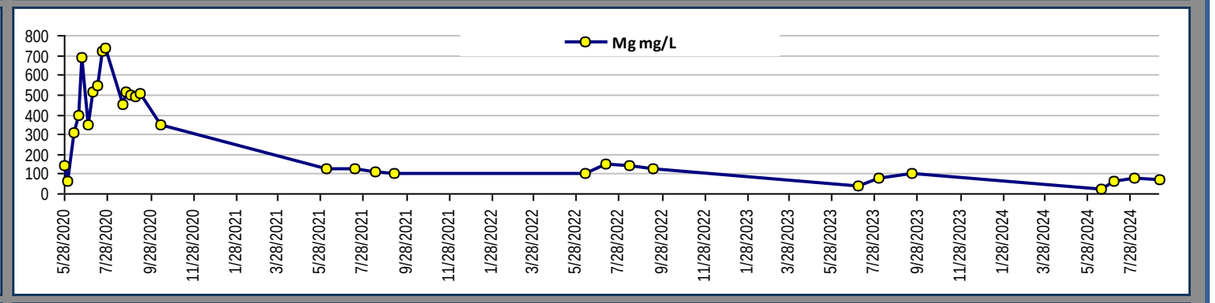
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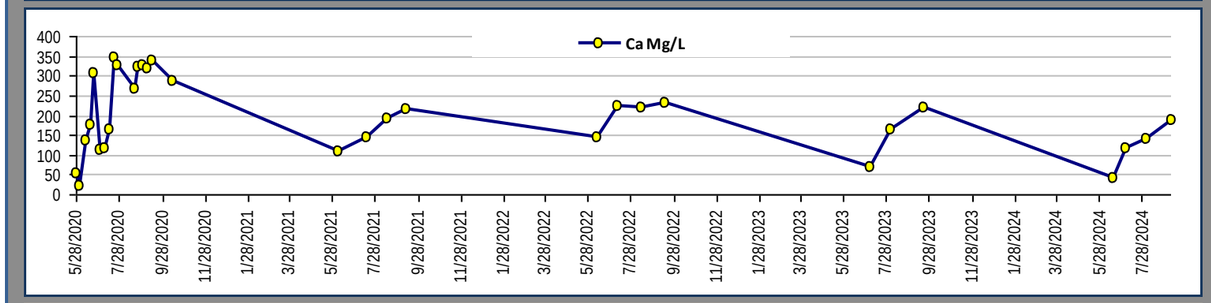
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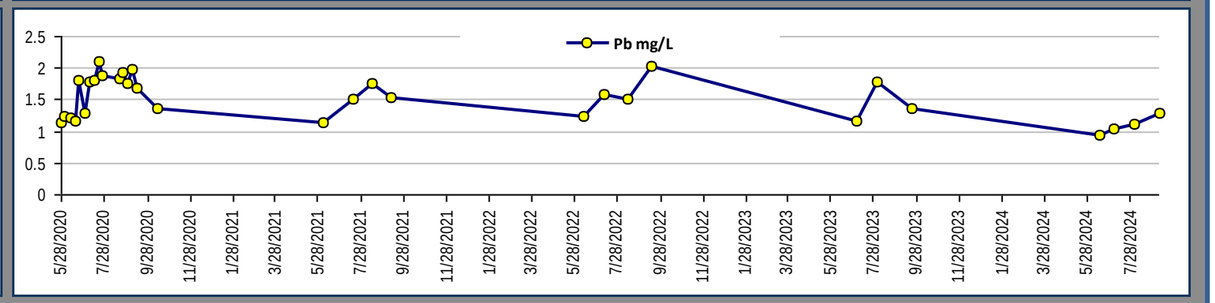


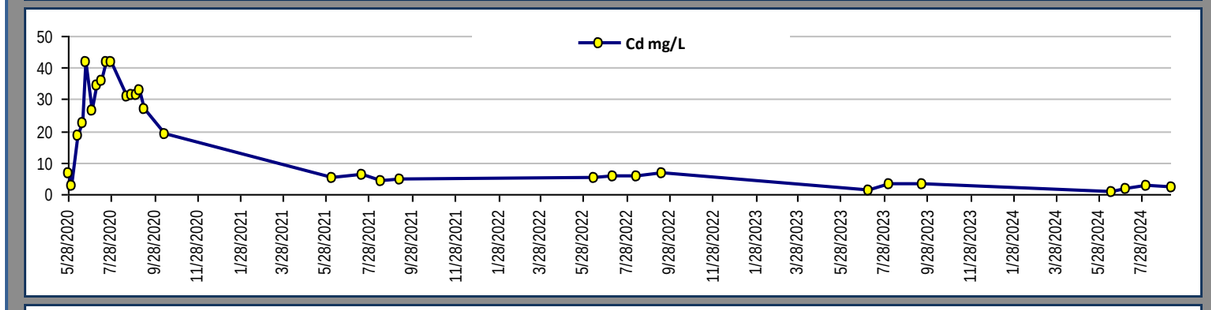


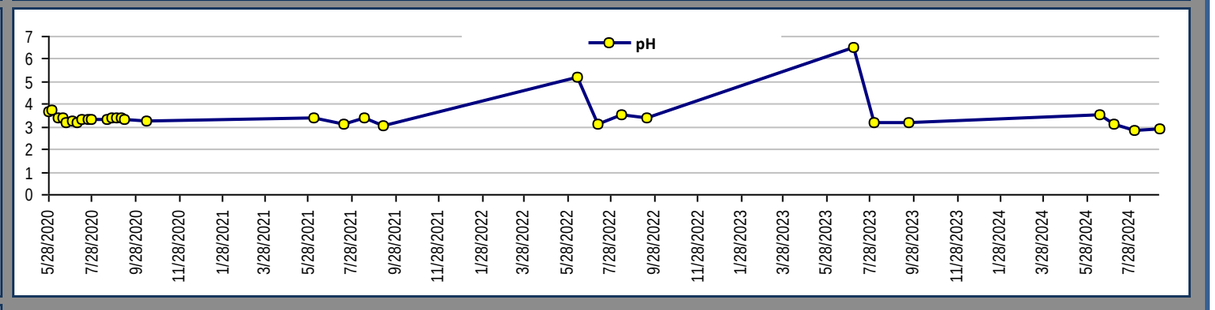


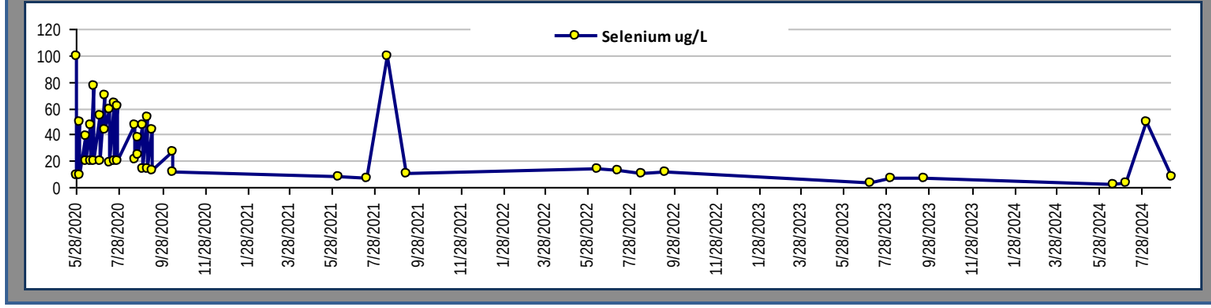




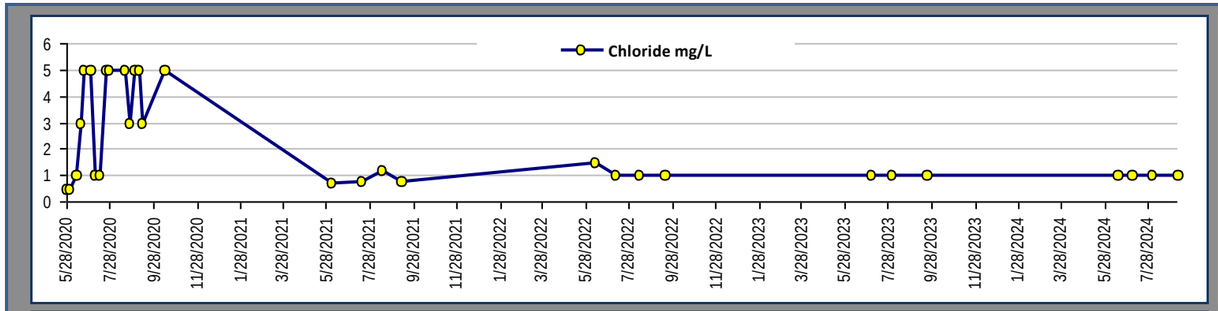


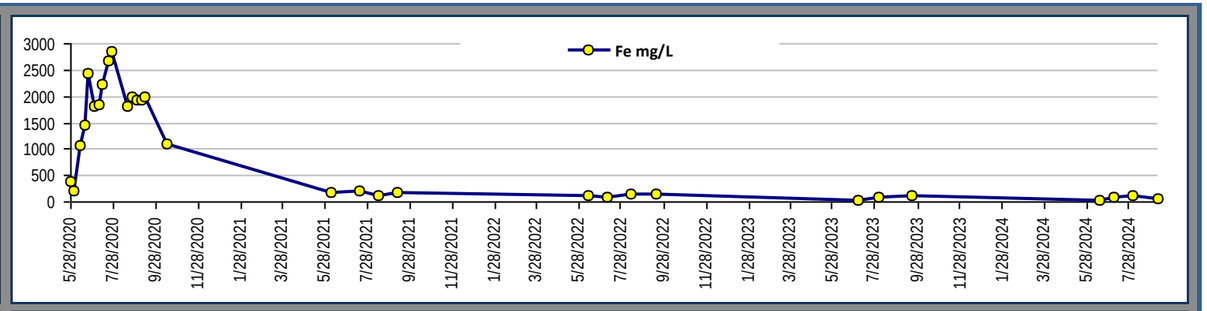


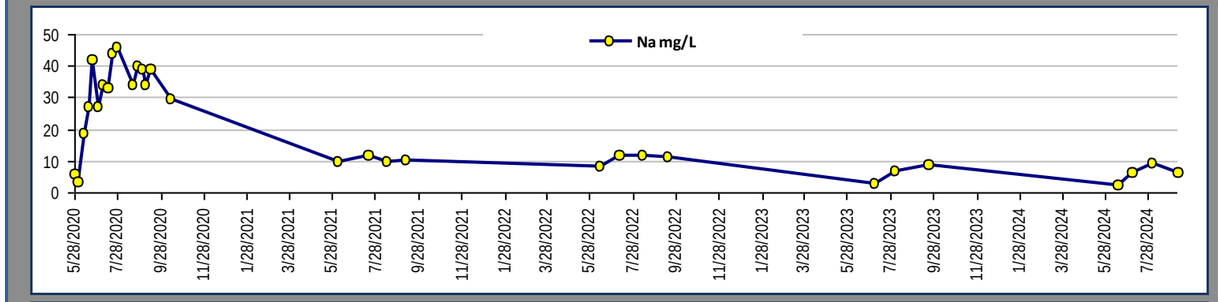


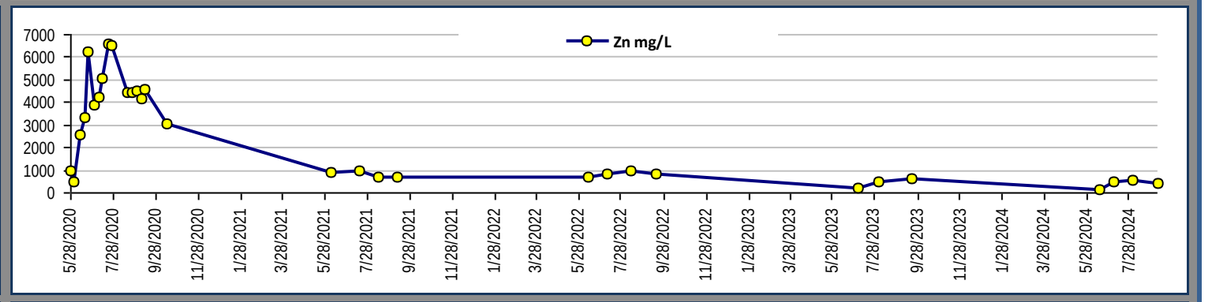


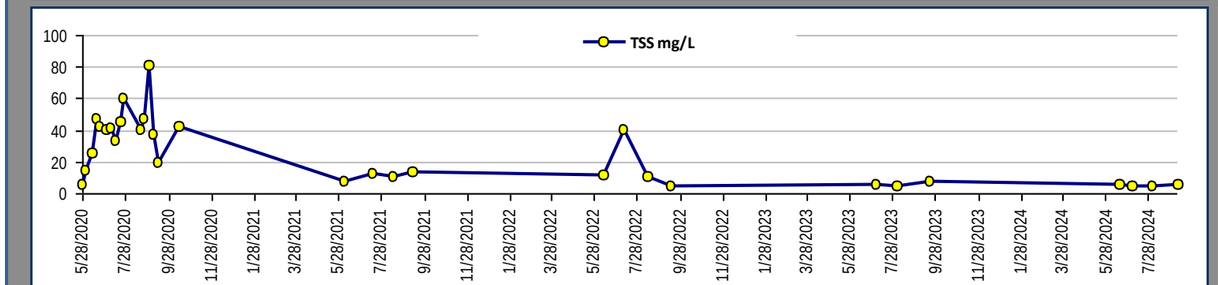
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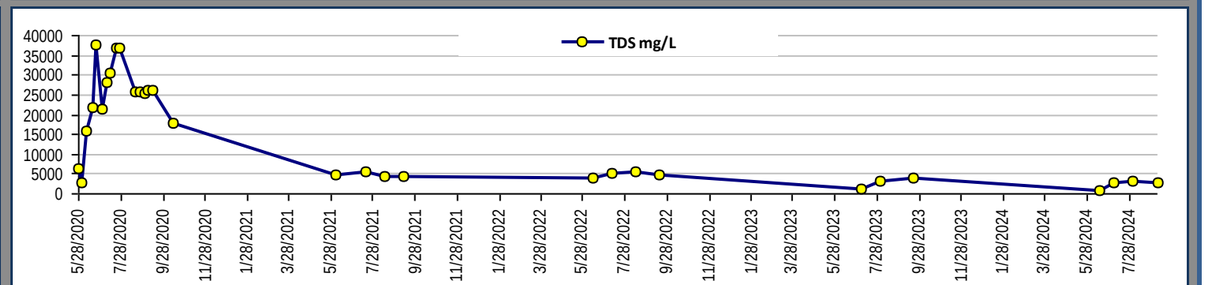


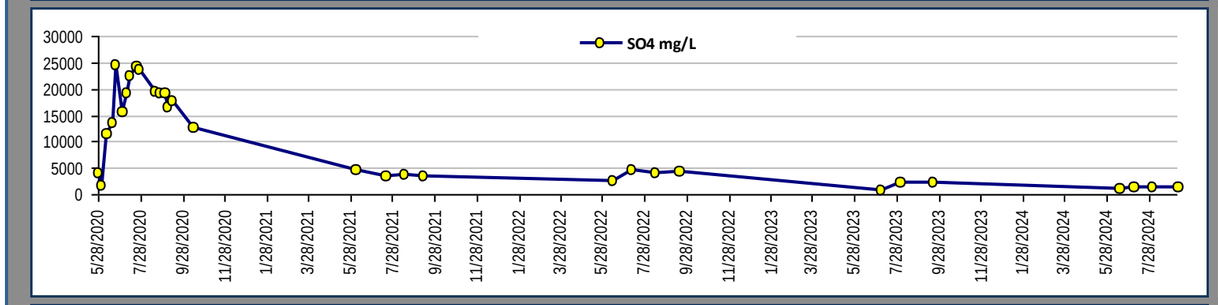


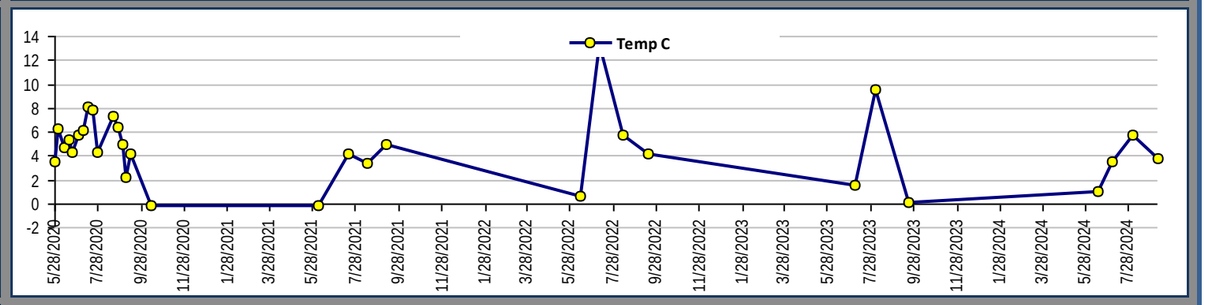


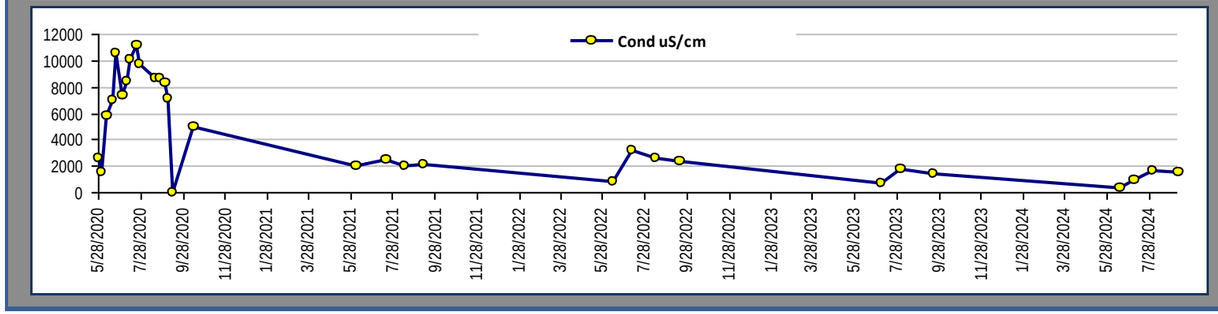






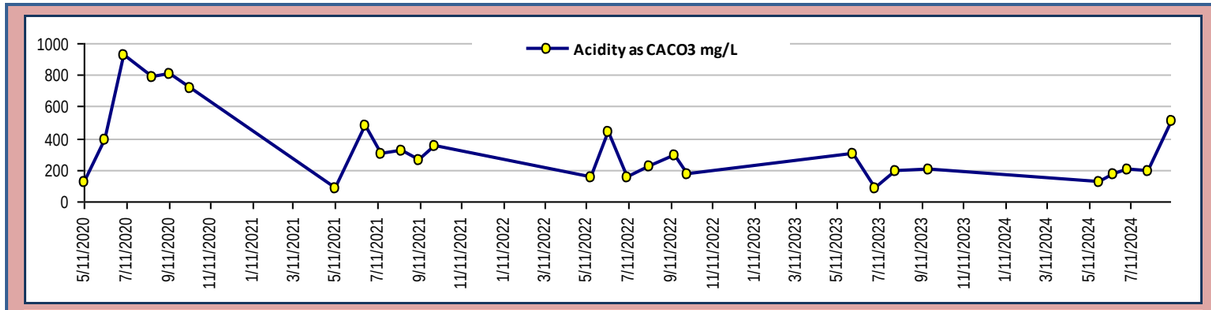


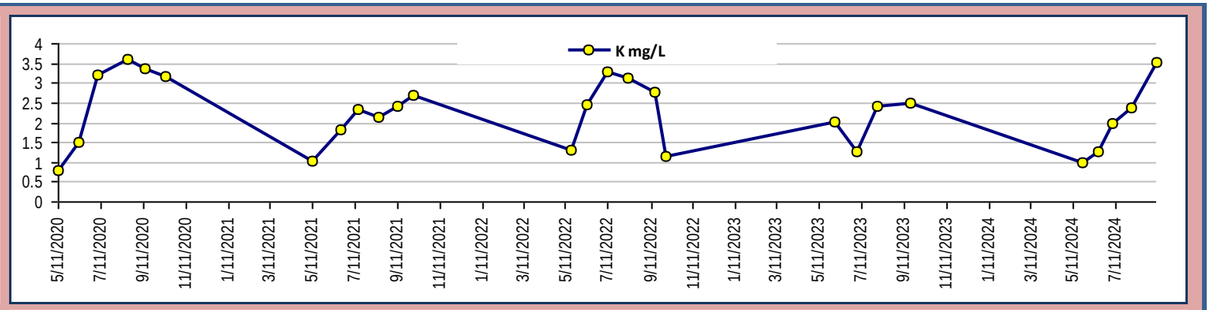


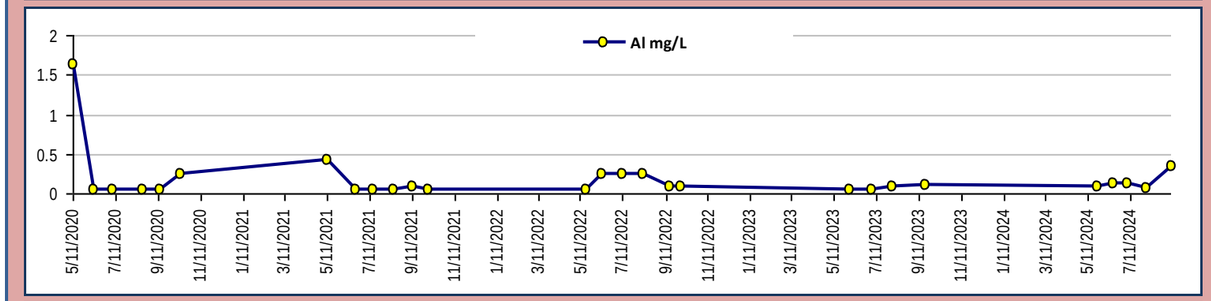


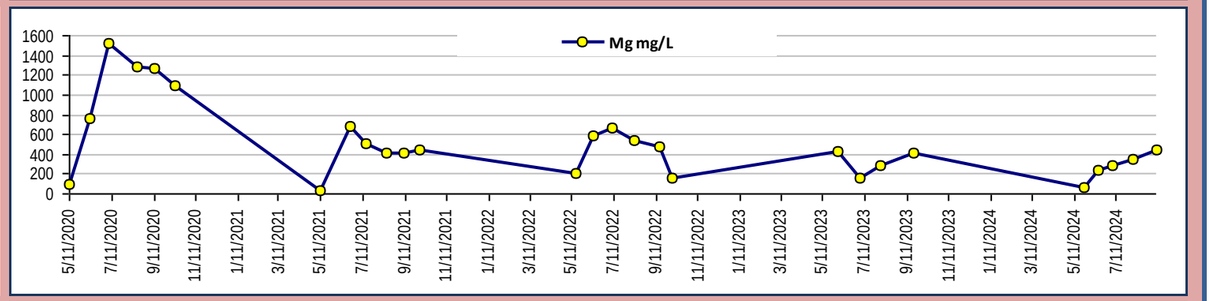
Appendix I: Hill top Diversion Profile II Trend Charts

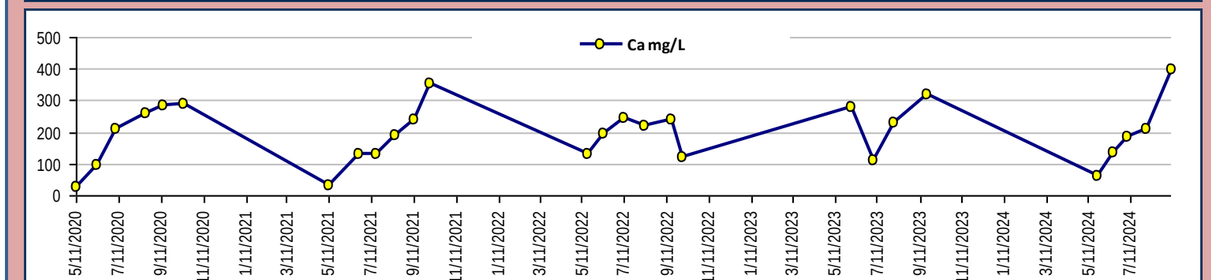
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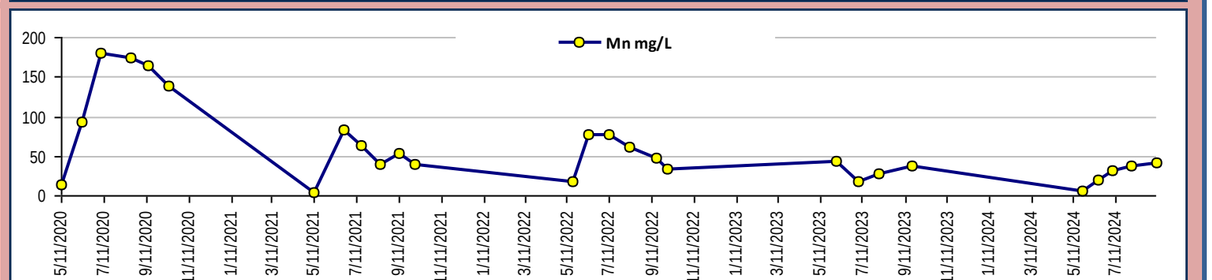


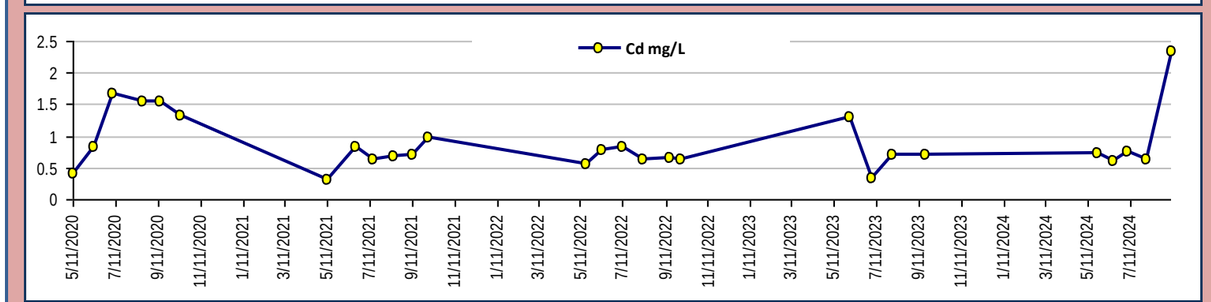


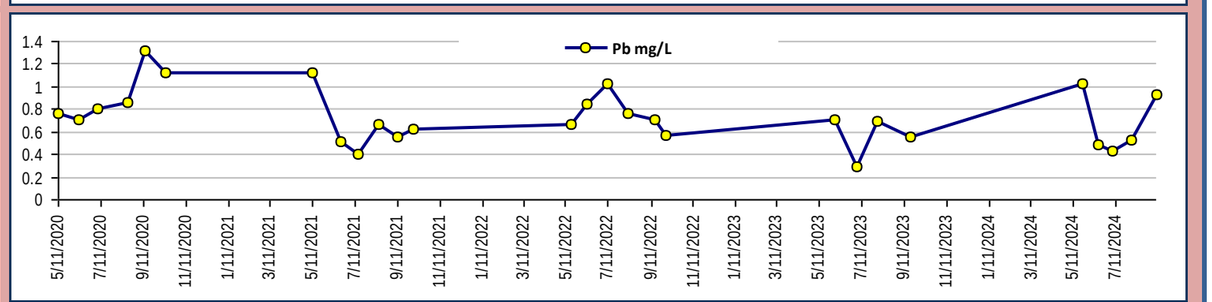


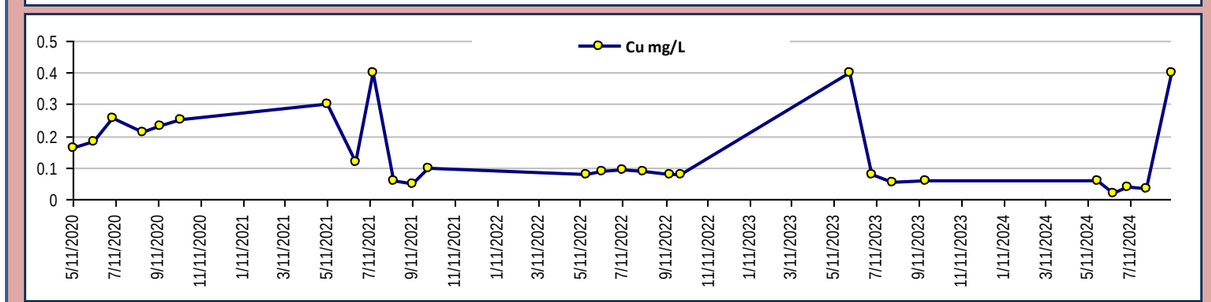


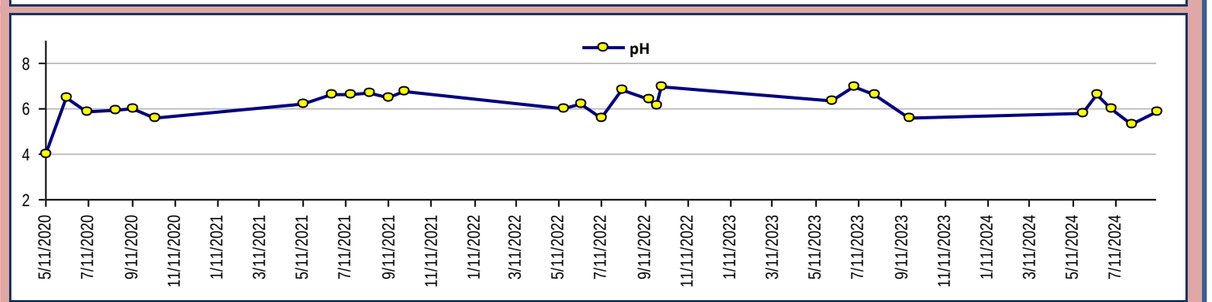






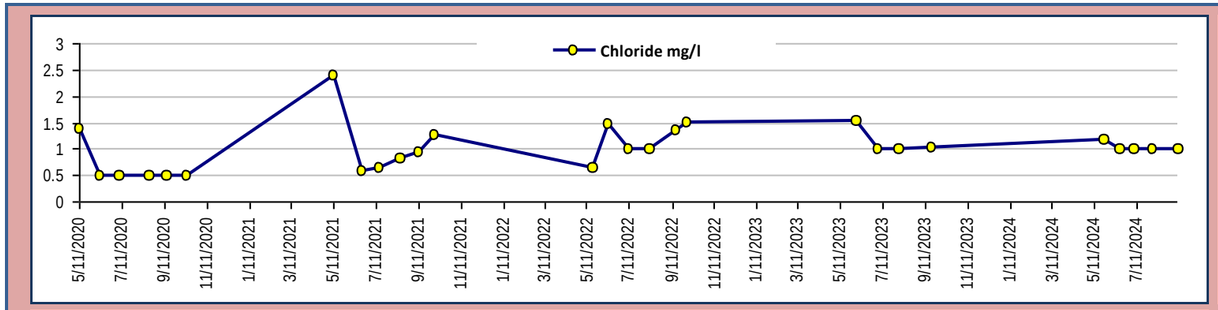


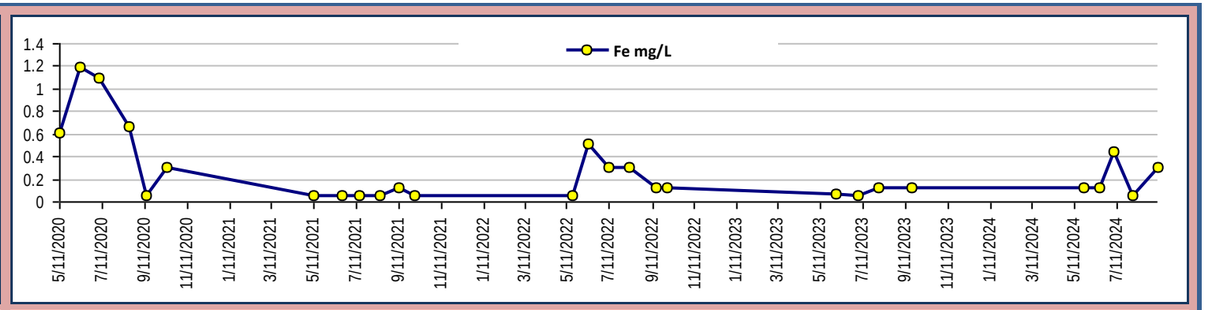


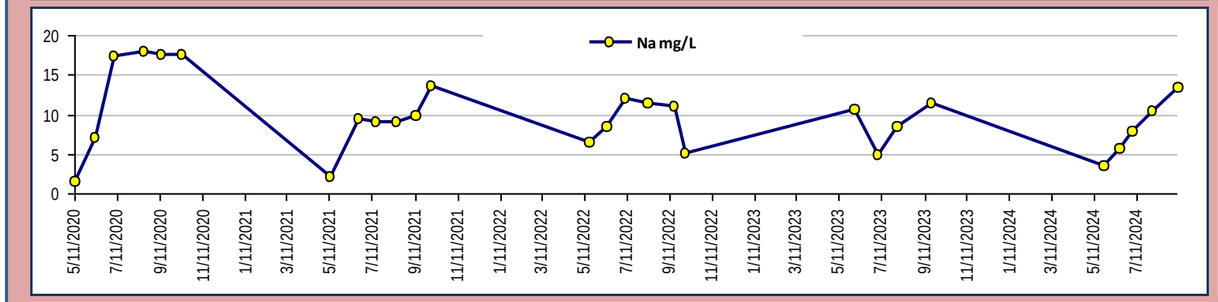


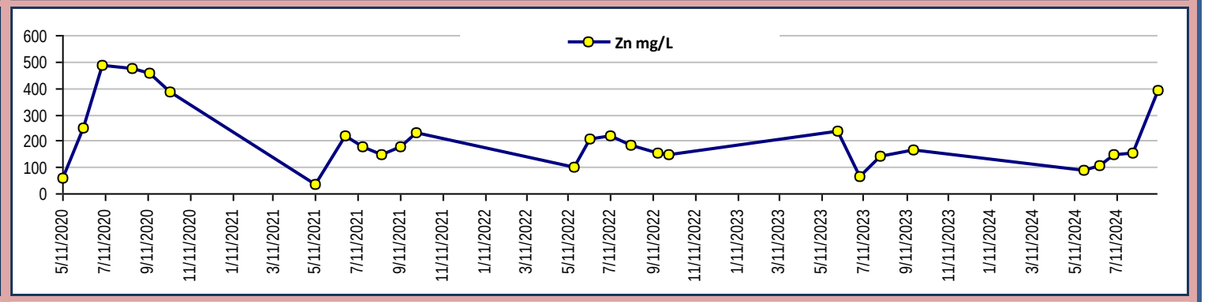
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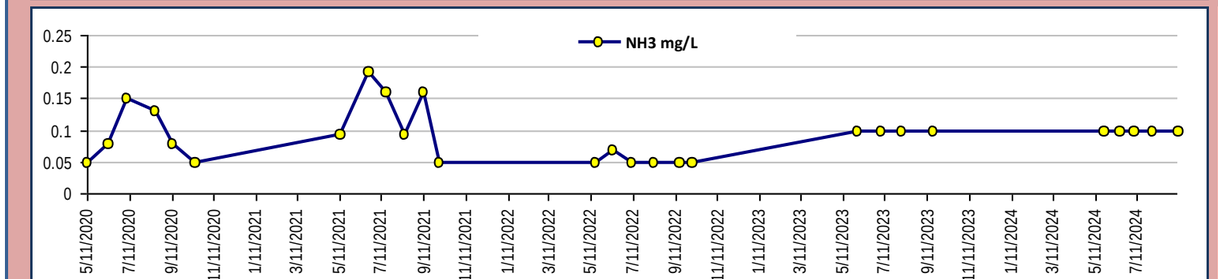
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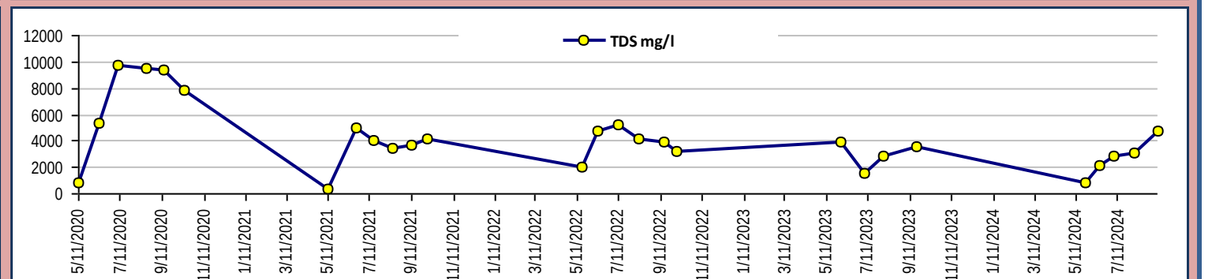


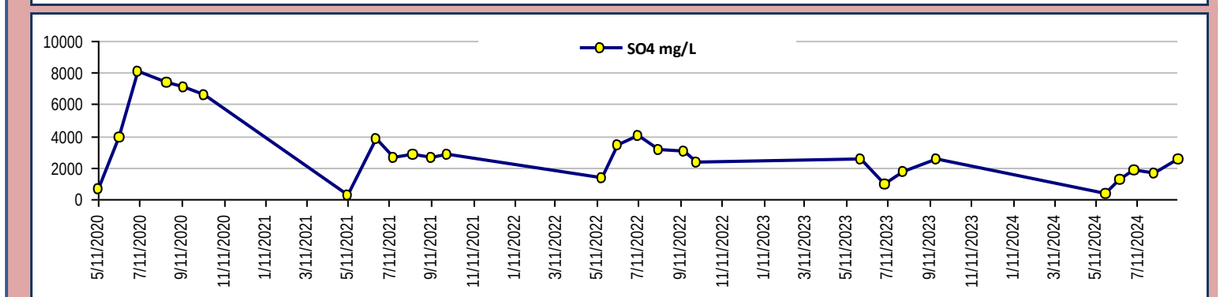


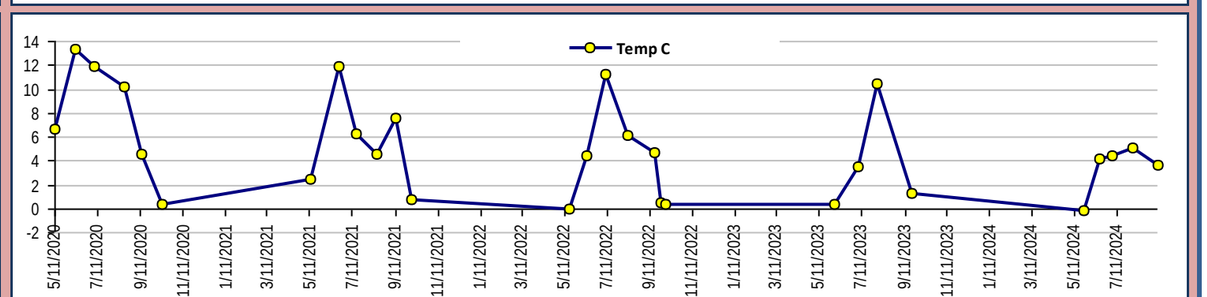


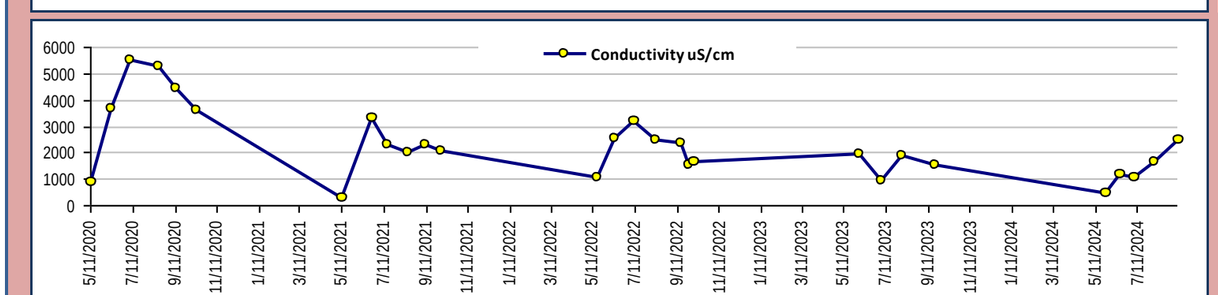












Appendix J: Waste Rock Management Summary Reports

Quarterly Waste Rock Production Report

Teck

Production Month **October 2024**

Waste Type: Construction Waste	**Tonnes**	**Avg Zn%**	**Avg Fe%**	**Avg Pb%**
Formation: Siksikpuk				
Placed Location				
Cold Storage North	8,654	0.11%	3.59%	0.11%
Placed Location				
Crusher Pad	601	0.11%	3.63%	0.11%
Placed Location				
Haul Road Maintenance	776	0.11%	3.66%	0.11%
Placed Location				
Cold Storage East	23,848	0.12%	3.87%	0.09%
Waste Type Subtotal	**33,879**			

Waste Type: Most Reactive Waste	**Tonnes**	**Avg Zn%**	**Avg Fe%**	**Avg Pb%**
Formation: Ikalukrok				
Placed Location				
CWD	12,721	15.16%	7.44%	8.14%
Placed Location				
Main pit dump 4	12,440	2.91%	17.58%	1.68%
Placed Location				
Main Pit Dump 5	185,745	4.72%	25.28%	1.81%
Waste Type Subtotal	**210,906**			

Waste Type: Other Waste	**Tonnes**	**Avg Zn%**	**Avg Fe%**	**Avg Pb%**
Formation: Ikalukrok				
Placed Location				
Main Pit Dump 5	17,260	0.34%	3.09%	0.16%
Placed Location				
Oxide Ore Stockpile	763	1.62%	1.74%	13.94%
Placed Location				
Main pit dump 4	68,196	1.25%	5.79%	1.79%
Placed Location				
Qanaiyaq Pit Dump 1	34,996	1.38%	1.60%	5.63%
Formation: Siksikpuk				
Placed Location				
Landfill @MWD	1,514	0.11%	3.89%	0.09%
Placed Location				
Main Pit Dump 3	666	0.11%	3.63%	0.11%
Placed Location				
Main pit dump 4	174,353	0.14%	3.75%	0.10%
Placed Location				
Main Pit Dump 5	57,996	0.14%	3.72%	0.11%
Placed Location				
Qanaiyaq Pit Dump 1	9,525	2.40%	2.92%	1.57%
Waste Type Subtotal	**365,269**			
Total tonnes for month	**610,054**			

Production Month **November 2024**

Waste Type: Construction Waste	**Tonnes**	**Avg Zn%**	**Avg Fe%**	**Avg Pb%**
Formation: Ikalukrok				
Placed Location				
Concentrate storage	386	0.09%	5.31%	0.08%
Formation: Siksikpuk				
Placed Location				
Incinerator Pad	703	0.09%	5.31%	0.08%
Placed Location				
Cold Storage North	23,137	0.09%	2.83%	0.08%
Placed Location				
Cold Storage East	16,401	0.11%	3.89%	0.09%
Waste Type Subtotal	**40,627**			

Waste Type: Most Reactive Waste	**Tonnes**	**Avg Zn%**	**Avg Fe%**	**Avg Pb%**
Formation: Ikalukrok				
Placed Location				
CWD	9,844	14.62%	7.69%	8.10%
Placed Location				
Main pit dump 4	21,468	5.38%	23.49%	1.64%
Placed Location				
Main Pit Dump 5	192,240	5.14%	23.79%	1.80%
Waste Type Subtotal	**223,552**			

Waste Type: Other Waste	**Tonnes**	**Avg Zn%**	**Avg Fe%**	**Avg Pb%**
Formation: Ikalukrok				
Placed Location				
Main pit dump 4	920	3.47%	10.22%	1.38%
Placed Location				
Qanaiyaq Pit Dump 1	161,963	1.41%	1.84%	3.73%
Formation: Siksikpuk				
Placed Location				
Main Pit Dump 5	8,955	0.09%	2.91%	0.08%
Placed Location				
Landfill @MWD	581	0.11%	14.18%	0.13%
Placed Location				
Main pit dump 4	17,582	0.09%	5.13%	0.08%
Waste Type Subtotal	**190,001**			
Total tonnes for month	**454,180**			

Production Month **December 2024**

Waste Type: Most Reactive Waste	**Tonnes**	**Avg Zn%**	**Avg Fe%**	**Avg Pb%**
Formation: Ikalukrok				
Placed Location				
CWD	5,841	14.45%	6.73%	6.08%
Placed Location				
Main pit dump 4	90,753	6.34%	26.42%	2.04%
Waste Type Subtotal	**96,594**			
Waste Type: Other Waste	**Tonnes**	**Avg Zn%**	**Avg Fe%**	**Avg Pb%**
Formation: Ikalukrok				
Placed Location				
Main pit dump 4	119,124	1.71%	5.43%	0.72%
Placed Location				
Oxide Ore Stockpile	1,216	0.20%	1.38%	11.64%
Placed Location				
Qanaiyaq Pit Dump 1	126,209	1.56%	4.15%	2.97%
Placed Location				
Shelly side Aqqaluk Dump	55,094	1.69%	5.36%	0.47%
Formation: Siksikpuk				
Placed Location				
Shelly side Aqqaluk Dump	32,608	0.09%	4.15%	0.08%
Placed Location				
Landfill @MWD	3,382	0.10%	8.33%	0.10%
Placed Location				
Main pit dump 4	28,647	0.25%	12.47%	0.12%
Placed Location				
Main Pit Dump 5	224	0.09%	2.83%	0.08%
Waste Type Subtotal	**366,504**			
Total tonnes for month	**463,098**			

Total Waste Rock tonnes for period **1,527,332**

Appendix K: 2023 Risk Management Plan Annual Report

Teck



Fugitive Dust Risk Management Plan

2023 Annual Report

Red Dog Operations
Teck Alaska Incorporated

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Acronyms and Abbreviations

CAKR	Cape Krusenstern National Monument
CSB	Concentrate Storage Building
DEC	Alaska Department of Environmental Conservation
DMTS	DeLong Mountain Transportation System
DNR	Alaska Department of Natural Resources
NANA	NANA Regional Corporation
NPS	National Park Service
PAC	Personnel Accommodations Complex
RDO	Red Dog Operations
RDTWG	Red Dog Tundra Working Group
RMP	Fugitive Dust Risk Management Plan
T-Dam	Main Tailings Dam
Teck	Teck Alaska, Inc.
Terramac	Terramac 9T Crawler
TSP	total suspended particulates
TUB	Truck Unloading Building
VEE	visible emissions evaluation

Summary

This document presents the 2023 Fugitive Dust Risk Management Plan (RMP) Annual Report for Red Dog Operations (RDO), including the mine, and road and port areas that make up the DeLong Mountain Transportation System (DMTS). The goal of the RDO Fugitive Dust Risk Management Program [overarching goal: *Minimize risk to human health and the environment surrounding the DMTS and outside the Red Dog Mine boundary over the life of the mine*] is to ensure that dust levels remain low using the practices discussed in this 2023 report. This report presents results from efforts related to each of the risk management implementation plans, including the Communication Plan, Dust Emissions Reduction Plan, Remediation and Reclamation Plan, Worker Dust Protection Plan, Uncertainty Reduction Plan, and Monitoring Plan. Activities are summarized below in relation to each of these plans.

The Communication Plan centers around maintaining clear communication with local communities and other interested parties about fugitive dust risk management efforts at the mine. Communication Plan activities during 2023 included community meetings, Subsistence Committee meetings, and communications with other stakeholders and organizations who expressed an interest in mine operations. Details are presented in the section titled "Communication Actions," below.

The Dust Emissions Reduction Plan in 2023 included application of calcium chloride and water on roads to reduce dust, use of the "waterless" air truck wash at the port site, a truck wash located at the mine site in summer months, tailings beach dust suppression, and installation of a new water source for the mine water truck. Details are presented in the section titled "Dust Emission Reduction Actions," below.

Activities related to the Remediation and Reclamation Plan in 2023 involved revisiting previously remediated sites to determine if ecological recovery was progressing in accordance with Alaska Department of Environmental Conservation (DEC) Spill Prevention and Response goals. A zinc concentrate spill occurred on the Port Road in October 2023, and once remediated, will start the reclamation process with engagement of the Red Dog Tundra Working Group. Details are presented in the section titled "Remediation Actions," below.

Activities related to the Worker Dust Protection Plan include ongoing programs designed to monitor and minimize workers' exposure to dust while at Red Dog, and to facilitate comprehensive communication about these programs, policies, and practices. In 2023, worker health monitoring continued through regular blood lead level testing and by environmental monitoring performed by the on-site Safety & Health department. Strictly enforced policies remain in place to ensure that worker health is protected and that all work environments are safe. Teck Alaska, Inc. (Teck) takes employee health extremely seriously, and noncompliance with health and safety policies is not tolerated. Details are presented in the section titled "Worker Dust Protection Actions," below.

Activities related to the Uncertainty Reduction Plan include research or studies to reduce uncertainties related to the assessment and management of risk to humans and the environment. The major project for uncertainty reduction in 2023 was related to previously remediated and reclaimed spill site areas. Rehabilitation study plots were previously prepared and treatments were applied in 2022. The research project design was shared with communities, the Red Dog Subsistence Committee, and agencies, all as part of the RDTWG in 2022. Monitoring continued in 2023 to improve our understanding of what works when rehabilitating Arctic sites.

Activities related to the Monitoring Plan are intended to provide the necessary operational and environmental monitoring data to facilitate continued reduction of fugitive metals and dust emissions, verify the continued safety of caribou and other subsistence foods and water, as well as the health of ecological environments and habitats in the vicinity of the mine, road, and port. In 2023, monitoring activities proceeded on schedule, and statistical analyses were performed on multi-year data sets to identify and evaluate trends and patterns. In 2023, the following monitoring programs were implemented:

- Visual emissions evaluations
- Source monitoring at the mine and port with real-time air samplers
- Real-time alarm system monitoring for dust at the mine
- Road surface monitoring to assess tracking of metals
- Dustfall jar monitoring at the mine, road, and port
- Soil monitoring

- Vegetation community monitoring

In 2023, soil monitoring occurred, the results of that report will be included in the 2024 Annual Report. The additional monitoring conducted under the RMP for the past four years, (2020-2023) shows significant decreases in lead and zinc metals concentrations along the road, port and mine, indicating that dust control methods along the roads have been effective. Also over the same period, there have been no significant changes in dustfall rates at the mine, port and road. However at the mine site, lead and zinc concentrations have shown significant increases, based on the short-term high frequency data collected by partisols and dustfall jars. This indicates that review of current dust control methods and best management practices will be focused on in 2024 at the mine operational areas.

Introduction

In accordance with the Fugitive Dust RMP (Exponent 2008), the purpose of this report is to provide a summary of risk management activities conducted at the Red Dog operation in the prior calendar year.

Background

The Red Dog Mine is approximately 50 miles inland of the Chukchi Sea, in the western end of the Brooks Range of Northern Alaska. The mine is located on land owned by the NANA Regional Corporation (NANA) and operated by Teck. Base metal mineralization occurs naturally throughout much of the western Brooks Range, and elevated zinc, lead, and silver concentrations have been identified in many areas (Exponent 2007). The Red Dog Mine has been in operation since December 1989.

At the mine, ore containing lead and zinc sulfides is mined and milled to produce lead and zinc concentrates in a powder form. These concentrates are hauled year-round from the mine via the DMTS road to Concentrate Storage Buildings (CSBs) at the port, where they are stored until being loaded onto ships during the summer months when the port is ice-free. The storage capacity allows mine operations to continue year-round. During the shipping season, the concentrates from the storage buildings are loaded into an enclosed conveyor system and transferred to the shiploader, and then into barges. The barges have built-in and enclosed conveyors that are used to transfer the concentrates to the holds of deepwater ships. The DMTS road passes through the Cape Krusenstern National Monument (CAKR), which is managed by the National Park Service (NPS). A study conducted by NPS in 2000 found elevated levels of metals in moss near the DMTS road, declining with distance from the road (Ford and Hasselbach 2001).

In response to the results from the NPS study, Teck conducted studies to characterize the dust issue throughout the mine, road, and port areas, and subsequently conducted a human health and ecological risk assessment (Exponent 2007) to estimate possible risks to humans and ecological receptors[1] posed by exposure to metals in soil, water, sediments, and plants and

[1] Plants and animals

animals in areas surrounding the DMTS, and in areas surrounding the Red Dog Mine ambient air/solid waste permit boundary and port site. The human health risk assessment evaluated potential exposure to DMTS-related metals through incidental soil ingestion, water ingestion, and subsistence food consumption under three scenarios: 1) child subsistence use, 2) adult subsistence use, and 3) combined worker/subsistence use.

The human health risk assessment, including the subsistence foods evaluations, found that it was safe to continue harvesting subsistence foods from all areas surrounding the DMTS and mine, including in unrestricted areas near the DMTS, without restrictions. Although harvesting remains off limits within the DMTS, human health risks were not elevated even when data from restricted areas were included in the risk estimates.

The ecological risk assessment evaluated potential risks to ecological receptors inhabiting terrestrial, freshwater stream and pond, coastal lagoon, and marine environments from exposure to DMTS-related metals. The ecological risk assessment found that:

- In the tundra environment, changes in plant community composition (e.g., decreased lichen cover) were observed near the road, port, and mine, although it was not clear to what extent those effects may have resulted from metals in fugitive dust, or from other chemical and physical effects typical of dust from gravel roads in Alaska.
- The likelihood of risk to populations of animals was considered low, with the exception of possible risks related to lead exposure for ptarmigan living closest to the port and mine.
- No harmful effects were observed or predicted in the marine, coastal lagoon, freshwater stream, and tundra pond environments, although the potential for effects to invertebrates and plants could not be ruled out for some small, shallow ponds found close to facilities within the port site. However, no evidence of adverse effects was observed in these port site ponds during field sampling conducted as part of the risk assessment.

Subsequent to completion of the risk assessment, Teck prepared an RMP designed to minimize the potential for effects on human health and the environment over the remaining mine life and beyond (Exponent 2008).

Risk Management Plan Overview

Based on the results of the risk assessment and stakeholder input on risk management objectives, the RMP was developed to combine and build upon prior and ongoing efforts by Teck to reduce dust emissions and minimize potential effects to human health and the environment over the life of the mine. Specifically, the overarching risk management goal is to: *Minimize risk to human health and the environment surrounding the DMTS and outside the Red Dog Mine boundary over the life of the mine*.[2]

Although human health risks were not found to be elevated, and potential ecological risks were found to be limited, conditions may change over time, and this possibility was also considered in the design of the RMP. Future changes in conditions and in potential human and ecological exposures over the life of the operation can be addressed through implementation of risk management, dust emissions control, and monitoring activities. More specifically, the RMP established a set of seven risk management objectives (Exponent 2008), which formed the basis for preparation of six implementation plans. Each of the six implementation plans addresses one or several of the overall objectives of the RMP (Figure 1) and includes the planned scope of work to achieve the objectives.

This annual report assumes that the reader has some familiarity with the Fugitive Dust Risk Management Program and is therefore not intended to be a thorough discussion of that program, nor is it intended to provide complete background on either the risk management program or risk assessment that led to the development of the RMP. To develop a more thorough understanding of the risk management programs, interested parties are encouraged to review the human health and ecological risk assessment documents (Exponent 2007), as well as the RMP (Exponent 2008) and its component implementation plans:

- Communication Plan (Exponent 2010)
- Dust Emissions Reduction Plan (Exponent 2011a)
- Remediation Plan (Exponent 2011b)

[2] The mine closure and reclamation plan addresses risk management within the mine solid waste permit boundary (collocated with the ambient air boundary, see Figure 4).

- Worker Dust Protection Plan (Exponent 2011c)
- Monitoring Plan (Exponent 2014)
- Uncertainty Reduction Plan (Exponent 2012)

These plans are available for review under “News and Related Documents” at http://www.teck.com/operations/united-states/operations/red-dog/.

Data Collection and Reporting Objectives

The risk management program includes collection of large amounts of data for the various implementation plans (discussed below) that are intended for either operational or regulatory purposes. Data collected for operational purposes are intended to provide Teck with information on the effectiveness of dust emissions control and reduction efforts. Data collected for regulatory purposes are intended to provide DEC with the necessary information to verify that conditions are protective of human health and the environment.

The soil monitoring and marine sediment monitoring programs (described in the section below regarding the summary of monitoring results) are intended to satisfy a number of requirements, including the regulatory requirements under the DEC Contaminated Sites Program, pursuant to 18 AAC 75.360. These two monitoring programs are intended to provide DEC with a means to continue oversight and implement enforcement actions as needed. As such, the results of these programs are formally documented in separate reports to DEC after each monitoring event. Sediment monitoring occurs once every 2 years, and soil monitoring occurs once every 3 years. Soil sampling occurred in Summer 2023, and the next sediment sampling event is scheduled for Fall 2024.

Report Organization

The annual report summarizes work that was conducted during the 2023 calendar year related to each of the implementation plans that are part of the overall RMP. Sections that follow document the communication, dust emissions reduction, remediation, worker dust protection, uncertainty reduction, and monitoring actions taken in 2023.

Risk Management Actions Taken in 2023

The following sections of this annual report summarize each implementation plan, the corresponding risk management objectives, and the actions taken during the 2023 calendar year toward achieving these objectives.

Communication Actions

The Communication Plan follows from RMP Objective #6: *Improve collaboration and communication among all stakeholders to increase the level of awareness and understanding of fugitive dust issues*. To achieve this objective, the Communication Plan was developed with the goal: "To establish consistent methods for communication and collaboration among stakeholders regarding efforts related to dust emission issues." The plan identified multiple types of communication actions, within three categories: communication, collaboration, and education and outreach. A number of methods from these three categories have been implemented as part of the various risk management programs within the RMP.

The following sections outline actions that were taken in 2023 by the Red Dog Environmental and Communication Relations Department to increase communication and participation between RDO and the communities, and to ensure that information is being communicated to all stakeholders and interested parties in an effective manner:

Community Meetings

Community meetings provide the opportunity for Red Dog to engage with communities, discuss updated information on operations, learn from attendees, discuss concerns, and discover what questions community members have about Red Dog. Below are examples of meetings and events that occurred in 2023:

- Exploration engagement meetings with the Kivalina IRA, Noatak IRA, and Red Dog Subsistence Committee
- Joint Leadership meetings with the Kivalina IRA, Kivalina City Council, and Noatak IRA Council
- Water discharge management engagement meetings with Kivalina IRA, Kivalina City Council, and Noatak IRA Council

- Annual village meetings with the Ambler, Buckland, Deering, Kiana, Kivalina, Kobuk, Kotzebue, Noatak, and Shungnak communities
- Siñġagmiut Working Group subcommittee meetings, virtual community celebration/open house (The Working Group was formed to address environmental concerns, human health issues, traditional land use, and other topics decided on by the Kivalina representatives. To date, topics have focused on water quality testing in the community, tailings dam information sharing, human health studies and employment.)
- Helicopter overflights to monitor pre- and post-discharge conditions for Kivalina residents
- Village Fuel Program fuel transfers with the community of Noatak
- 2023 Kivalina Whaling Captains Gas Donation
- 2023 Marine Mammal Hunter Gas Donation
- Northwest Arctic Borough and Assembly Meetings
- Contributions for a total of $1,420,093 in 2023:
    - $250,000 Northwest Arctic Borough (NWAB) School District Youth Leaders
    - $65,000 NWAB School District - Alaska Native Science and Engineering - University of Alaska Anchorage Program
    - $78,500 for the NWAB Piuqutuq Entrepreneurial Program
    - $30,000 Kobuk 440 Dog Racing Events
    - $49,000 Kivalina School Road Access
    - $737,000 Kivalina Projects (drinking water study and support, relocation, playground)
    - Smaller contributions for community and holiday events, spring cleanup, community wellness taskforce, funeral support, Toys for Tots, and emergency drinking water needs.

Subsistence Committee Meetings

The Red Dog/NANA Subsistence Committee is an advisory committee made up of hunters and Elders from Noatak and Kivalina. The committee shares traditional knowledge with Red Dog

Mine operators and discusses possible effects of mine operations on subsistence activities. Red Dog holds quarterly meetings with the Subsistence Committee. This provides a key opportunity to discuss environmental monitoring trends from traditional ecological knowledge holders and Elders, to discuss upcoming work, and for the Committee to provide guidance and feedback on land use planning.

In 2023, discussions were centered around the following:

- Reclamation & Restoration Activities at material sites and historical spill sites and the main waste stockpile
- Beluga activity
- Caribou Protection along the DMTS Port Road
- Wildlife interactions at Red Dog
- Exploration activities
- 2031 Closure Planning
- Discharge updates
- Port summer schedule
- Fugitive Metals Dust trends and mitigations
- Port CSB Building Roof Maintenance & Replacement Project
- Marine Mammal Harvest & Pre-Shipping Meetings—RDO voluntarily delays all shipping season activities and delays vessels from approaching the port in early spring, until the Subsistence Committee meets with RDO and gives permission to bring in vessels for the summer port activities. The goal is to minimize potential impacts to the local community's subsistence hunting activities for marine mammals, including beluga, walrus, and ugruk (bearded seal). Multiple meetings were conducted leading up to the start of the shipping season to ensure that all parties were communicating about the location and status of beluga, walrus, and ugruk hunting activities. In 2023, marine observers from Noatak and Kivalina were hired to monitor port activities and seal behavior from the shiploader observation deck. Information provided by the observers is used by the Subsistence Committee to inform when shipping can begin.

Dust Emissions Reduction Actions

The Dust Emissions Reduction Plan is intended to achieve RMP Objective #1: *Continue reducing fugitive metals emissions and dust emissions*. In order to achieve this objective, the Dust Emissions Reduction Plan was developed with the goal: "To reduce the amount of fugitive dust released into the environment near the DMTS and Red Dog Mine to protect human health and the environment."

Road Dust Emissions Reduction Actions

During the warmer months when snow and ice are no longer present, calcium chloride is applied to the gravel roads as a dust suppressant because it retains moisture for prolonged periods. In addition, water trucks spread water on the port and mine site roads. Using calcium chloride with water applications holds down dust and stabilizes unpaved road surfaces.

Tailings Beach Dust Suppression

NANA Construction, LLC utilized the Terramac 9T Crawler (Terramac) to complete dust suppression application of a product called FutureChem Lockdown to the tailings surfaces from August 24 to September 1, 2023 (Figure 2, below). The dust suppression application areas are shown below in Figure 2.



Figure 2. Tailings beach dust suppression activities in 2023: Top-left shows Terramac applying FutureChem Lockdown on Tailings Main Dam Beach; Top-right shows hand spraying in areas that can be reached, Bottom-left shows dust suppression application area when completed on Tailings Main Dam Beach; Bottom-right shows dust suppression application area at DD2 Cove.

Year-Round Air Wash

In 2023, the “waterless” truck wash at the port Truck Unloading Building (TUB) was used. The air wash uses high-powered blowers to remove residual dust from the trucks following loading and before exiting the TUB. The system designed for the TUB consists of six high-powered air blowers that are typically used to dry cars in automatic car washes.

Mine Concentrate Storage Building

The Mine CSB provides temporary storage for zinc and lead concentrates produced at the RDO Mill. The Mine CSB was built in 1989, with two modifications/additions completed in 1997 and

1999. Haul trucks are loaded in the CSB, and the concentrate is then transported to the Red Dog Port Facility. The Mine CSB is a steel structure wrapped by fiberglass panel cladding and a fiberglass panel roof. In 2023, a formal review of the structure was conducted of the roofing and cladding, truck bay, and general building envelope, to identify maintenance related activities for the building and to extend the life of the building.

Remediation Actions

The Remediation Plan is intended to facilitate the achievement of RMP Objective #2: *Continue remediation or reclamation of selected areas to reduce human and ecological exposure.* To achieve this objective, the remediation plan was developed with the goal: "To define a consistent method for identifying and selecting affected areas and implementing remediation and/or reclamation." Specific requirements for remediation are set forth in various permits and approved documents such as the Red Dog Reclamation and Closure Plan.

Concentrate Spills in 2023

On October 18, 2023, a loaded DML concentrate haul truck was heading southbound during a minor snow event. The warm temperatures created slick conditions at Milepost 14.5, and the driver lost traction. The unit slid backwards and the rear trailer broke loose, slid to the bottom of the road slope, and laid over onto its side. Approximately 1200 pounds of zinc spilled. As designed, the lid of the trailer mostly stayed in place and retained a vast majority of product inside the trailer. There were no injuries; a plastic cover was applied immediately to contain the spilled contents, and to protect the zinc concentrate from being disbursed by wind or covered by snow. When wind conditions were calm, the vacuum truck was used to remove concentrate from inside the trailer and then taken to the Port Concentrate Storage Building. A qualified environmental professional from Restoration Sciences was mobilitze to site to observe and document the initital cleanup efforts. Arrangements were made with the Alaska Department of Environmental Conservation and National Park Service representatives for permitting and cultural resource consultations.

Once the site remediated, reclamation will be started, which will include engagement with the Red Dog Tundra Working Group. The Red Dog Tundra Working Group was established in 2019 to invite agencies and communities to discuss best management practices related to coordinating cleanup activities and rehabilitating spill sites along the DMTS. Representatives

from the following are involved in the RDTWG: NPS, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, Alaska Department of Natural Resources (DNR), U.S. Coast Guard, Northern Alaska Environmental Center, Kivalina City Council, Kivalina IRA, NANA, NANA/Lynden, and Alaska Industrial Development and Export Authority.

Worker Dust Protection Actions

The Worker Dust Protection Plan was prepared in response to RMP Objective #7: *Protect worker health*. To achieve this objective, the Worker Dust Protection Plan was developed with the goal: "To minimize worker exposure to fugitive dust, provide ongoing monitoring of exposure, and ensure a comprehensive communication system."

Safety is a core value for Teck, and the company is committed to providing leadership and resources for managing safety and health. Accordingly, the company has developed Environment, Health, Safety and Community Management Standards applicable to its operations worldwide. In addition, Teck has a comprehensive Occupational Safety and Health Program tailored specifically to RDO to protect worker health. The program complements the corporate standards and is designed to manage all aspects of workplace safety and health, including worker dust protection. The Worker Dust Protection Plan ties in closely with the existing health and safety programs at the mine that are overseen by the Red Dog medics.

The Blood Lead Biological Monitoring Program is for personnel who work in areas that meet or exceed Occupational Safety and Health Administration action levels for lead exposure. The frequency of monitoring for an individual worker is dependent on previous blood lead level history. The higher an individual's blood lead levels, the more frequent that worker will be monitored. The overall goal is to keep worker lead exposure as low as possible through engineering controls, administrative controls, and use of personal protective equipment and proper hygiene practices.

Worksite blood lead monitoring was conducted in 2023 by the Red Dog Human Resources Medical Department. Blood lead level testing is performed for all employees on a regular basis**.**

The Red Dog blood lead standards are as follows:

- 0–20 mcg/dL: continue testing employee every 6 months
- 20.1–25 mcg/dL: test employee every 3 months and review protocol for use and cleaning of respirator
- 25.1–40 mcg/dL: continue testing employee every month and provide employee counseling by supervisors on the importance of proper respirator usage and the need for best practices regarding personal hygiene
- >40 mcg/dL: relocate employee from normal work area to an area with lower lead exposure until blood lead levels are 25 mcg/dL or less.

In 2023, the average blood lead result for females was 2.75 mcg/dL, and for males was 5.8 mcg/dL. In 2023, all female employees had blood lead levels below 20 mcg/dL. In 2023, six males had blood lead levels in the 20–24 mcg/dL range. For these individual cases, the supervisor discussed elevated lead levels and reviewed work habits with the employee, including cleaning of filter mask, appropriate filter change protocols, and personal hygiene habits. No Teck Red Dog workers were removed from the job due to elevated blood lead levels.

Uncertainty Reduction Actions

The Uncertainty Reduction Plan follows from RMP Objective #5: *Conduct research or studies to reduce uncertainties in the assessment of effects to humans and the environment*. To achieve this objective, the Uncertainty Reduction Plan was developed with the goal: "To identify and prioritize prospective research or studies to reduce uncertainties in the assessment of effects of fugitive dust to humans and the environment."

The Red Dog Tundra Working Group was established in 2019 to invite agencies and communities to discuss best management practices related to coordinating cleanup activities and rehabilitating spill sites along the DMTS. Representatives from the following are involved in the RDTWG: NPS, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, Alaska Department of Natural Resources (DNR), U.S. Coast Guard, Northern Alaska Environmental Center, Kivalina City Council, Kivalina IRA, NANA, NANA/Lynden, and Alaska Industrial Development and Export Authority.

The rehabilitation study was proposed to learn more about tundra rehabilitation following land disturbance in the northwest Arctic. The goal of the study is to identify the most effective and

efficient rehabilitation techniques for concentrate spill sites along the DMTS road. With the exception of one diesel spill site, the sites selected for the rehabilitation study included locations where historical concentrate spills had occurred; all spills were cleaned up using excavation and met cleanup standards. The rehabilitation study was designed with input from all members of the RDTWG present at the July 2021 meeting.

The study will examine revegetation success following treatments at three types of sites (not all sites were previously remediated and cleanup levels had been achieved): 1) excavated and unvegetated spill sites treated with seed and fertilizer treatments; 2) minimally excavated spill sites with the surrounding tundra treated with fertilizer to encourage seed rain from established tundra plants; and 3) previously remediated spill sites planted with tundra sod. In summer 2023, the rehabilitation study plots were monitored as scheduled to improve best management practices for rehabilitation of Arctic spill sites.

Monitoring Actions

The Monitoring Plan (Exponent 2014) is intended to achieve the following RMP objectives:

- Objective 1: Continue reducing fugitive metals and dust emissions. (This objective is indirectly addressed through monitoring, to verify effectiveness of operational dust control measures.)
- Objective 3: Verify continued safety of caribou, other representative subsistence foods, and water.
- Objective 4: Monitor conditions in various ecological environments and habitats and implement corrective measures when action levels are triggered.
- Objective 6: Improve collaboration and communication among all stakeholders to increase the level of awareness and understanding of fugitive dust issues.

To achieve these objectives, the Monitoring Plan was developed with the goal: “To monitor changes in dust emissions and deposition over time and space, using that information to: 1) assess the effectiveness of operational dust control actions, 2) evaluate the effects of the dust emissions on the environment and on human and ecological exposure, and 3) trigger additional actions where necessary.”

Actions included in the Monitoring Plan were developed from priorities identified during development of the RMP, with input from local stakeholders, technical experts, and state and federal regulatory agencies. This section presents the results of the Monitoring Plan actions implemented during 2023. An overview of the components of the monitoring program along with the frequency of monitoring is shown in Figure 3. A map-based illustration of the risk management monitoring program components and monitoring stations and sites is shown in Figure 4.

Monitoring Programs for DEC Oversight

The marine sediment and soil monitoring programs are ongoing and require DEC oversight, and the monitoring results are also used for trend analysis at RDO. Sediment monitoring is conducted every 2 years, and soil monitoring occurs once every 3 years. The last sediment monitoring event occurred in 2022, the next sediment monitoring event is scheduled for 2024. In 2023, soil monitoring occurred, results will be included in the 2024 Annual Report.

Operational Monitoring

U.S. Environmental Protection Agency Method 22—Visible Emissions Evaluation

Visible emissions evaluations (VEEs) were conducted as required for the Title V of the Clean Air Act operating permit at the mine. VEE monitoring occurs at multiple locations within the mine boundary and at the port. Along all unpaved roads, including the DMTS haul road, calcium chloride and/or water is used to control fugitive dust emissions when the road surfaces are not frozen or when the road surfaces do not exhibit visible surface moisture. To verify the effectiveness of these control measures, VEE observations are conducted daily when road surfaces are dry and not frozen. If dust is visibly present for more than 2 minutes on the unpaved road surfaces, additional calcium chloride or water is applied as soon as practicable and VEE monitoring is repeated to verify fugitive emissions are no longer present. All VEE readings that are required under the Title V permit are submitted twice a year to DEC within the Title V Facility Operating Report.

Partisol Source Monitoring

Partisol instruments produce real-time measurements of dust in air and collect discrete samples, which are then analyzed to provide airborne metals concentrations. Measurements

are reported as total suspended particulates (TSP), and zinc and lead concentrations are reported as TSP-Zn and TSP-Pb, respectively. Partisol instruments are operated continuously[3] to measure real-time TSP. Filters are used to collect TSP over 24-hour periods every third day at the mine and every sixth day at the port, and are then analyzed for TSP-Zn and TSP-Pb. The Mine Partisol samplers are located downwind of the pit and crusher at the Personnel Accommodations Complex (PAC), and at the main tailings dam (T-Dam) downwind of the tailings beach, mill, and other facilities (Figure 5a). The port Partisol samplers are located downwind of the CSBs and in the lagoon area downwind of the concentrate conveyor (Figure 5b).

Statistical testing methods were used to evaluate whether the Partisol data sets exhibit statistically significant temporal trends in metals concentrations. The Seasonal Mann-Kendall trend test is a nonparametric method to investigate temporal trends in time series containing substantial seasonal variability. For this analysis, the real-time data were summarized on a monthly basis. Seasonal trend tests were conducted using monthly means and monthly upper limit 95th percentile concentrations to evaluate both average conditions and measures of the upper limits over the past four years (beginning of 2020 to end of 2023). Results of the statistical trend tests for real-time data (lead and zinc concentrations) in four locations (Mine PAC, Mine T-Dam, Port CSB, and Port Lagoon) are summarized in Table 1.

The calculated monthly averages for TSP-Pb and TSP-Zn concentrations are shown on Figures 6 and 7, respectively, for all four mine and port Partisol locations. The concentrations of lead and zinc at the mine area are typically higher than those at the port area (Figures 6 and 7, respectively). At the mine and port, lead and zinc concentrations were typically lowest in summer months (the months with higher humidity and more road watering for dust control), and highest in winter months (the coldest, driest, and lowest humidity months, when road watering is not possible because of freezing conditions).

[3] Occasional system upsets do occur as a result of weather or equipment failure. Partisol readings are monitored frequently so that system upsets are noted and corrected as soon as possible. Missing or unusable data are noted in the raw data files and are not used in statistical trend evaluations.

- **Mine PAC Results.** The Mine PAC results show significant increasing trends in mean and upper limit 95th percentile concentrations for lead and zinc (Figures 6 and 7, Table 1).
- **Mine T-Dam Results.** The Mine T-Dam results show significant decreasing trends for lead, but significant increasing trends for zinc in both mean and upper limit 95th percentile lead and zinc concentrations over the past four years at the Mine T-Dam Partisol (Figures 6 and 7, Table 1).
- **Port CSB Results.** There was a significant decreasing trend in both mean and upper limit 95th percentile lead and zinc concentrations at the Port CSB over the past four years (Figure 6, Table 1). In contrast, there was a significant increasing trend in the upper limit 95th percentile zinc concentrations over the past four years (Figure 7, Table 1).
- **Port Lagoon Results.** The Port Lagoon Partisol results show significant increasing trends in mean and upper limits 95th percentile concentrations for lead and zinc over the past four years (Figures 6 and 7, Table 1).

Real Time Alarm System Monitoring

Real-time SHARP (synchronized hybrid ambient real-time particulate) monitor (ThermoScientific 5030i SHARP) data are used to monitor for high dust events so that mine activities can be modified (where possible) to reduce dust levels. There are two SHARPs units operating at the Mine PAC and Mine T-Dam partisol locations. When air quality measurements exceed a warning level or an alarm level, the alarm status is displayed on the Red Dog weather intranet web page to notify personnel within the Mine Operations and Environmental departments to take corrective action. Examples of these corrective actions include applying water on the roads or stockpiles, or shutting down loading operations during windy conditions.

Road Surface Monitoring

Loose fine materials that may be subject to airborne transport are sampled from the road surface at eight locations every 2 months. From the mine site to the port, the eight-road surface monitoring station locations are:

- Mine CSB (near exit from truck loading portion of CSB)
- The Y (near the back dam, between the CSB and the Airport)
- Airport
- MS-13 (former material site where road crosses the mine boundary)
- MS-9 (material site between the mine and CAKR)
- R-Boundary (northern boundary of CAKR)
- MS-2 (material site just inside the northern boundary of the port)
- Port CSB Track (road near exit from truck unloading building at the port CSBs).

Samples are collected and sent to ACZ Laboratories for analysis using Method 3050 (ICP-MS) to determine lead, zinc, and cadmium concentrations within road surface materials. The "Mine CSB" and "The Y" stations (located inside the operational mine boundary) generally exhibit higher metals concentrations and are managed so as to reduce tracking of metals toward the port, using a traffic plan and truck wash that is operational during warmer months.

During most recent 4-year period (2020 to 2023), statistical analyses indicate lead, cadmium and zinc in road fugitive dust samples have either significantly decreased or show no significant trend (Figures 8, 9, and 10, respectively; Table 2). When each location is examined separately, the same is true, no statistically significant increases noted, except directly outside the Mine CSB, where zinc (but not lead or cadmium) concentrations had significantly increased over the past 4 years (Table 2).

If measured road surface concentrations at stations outside the mine boundary exceed Arctic Zone Industrial Cleanup Levels for lead (800 mg/kg[4]), or exceed the Arctic Zone Residential

[4] Cleanup levels according to 18 AAC 75.341, were revised in 2019 and have an effective date of October 18, 2023, and appear in the official pulished form in the January 2024 Supplement to the Alaska Administrative Code. Available on the internet at https://dec.alaska.gov/media/533hr3p0/18-aac-75.pdf).

Human Health Cleanup Levels for cadmium (110 mg/kg[5]) or zinc (41,100 mg/kg[6]), for more than two consecutive sampling periods, that road section is to be remediated and resurfaced as described in the Remediation Plan (Exponent 2011). No additional road remediation was required during 2023 because results for stations outside the mine and port boundaries did not exceed the Arctic Zone Industrial Cleanup Levels.

Dustfall Jar Monitoring

Dustfall jars are passive continuous collectors used for measuring dust deposition; samples are collected every 2 months at all locations. Approximately 86 dustfall stations are located around the mine, port, and DMTS road (Figure 4), as follows:

- At the mine, approximately 34 jars are placed in locations around the facilities.
- Along the DMTS road, 12 dustfall jars are located at three stations, each with four dustfall jars, two on either side of the road. The DMTS road stations are collocated with road surface sampling stations near the port boundary, the CAKR northern boundary, and midway between CAKR and the mine. The dustfall jars are located approximately 100 m from the shoulder of the DMTS, with 100 m between them, oriented parallel to the road.
- At the port, 38 jars are placed roughly in a rectangular grid throughout the area.
- An additional two jars are considered reference stations, one upwind of the road near Evaingiknuk Creek, and another near the Wulik River, to the north of the mine operation.

Temporal trends in deposition rates as well as metals concentrations in dustfall jar data were evaluated using seasonal trend tests conducted with bimonthly mean and 95th percentiles.

- **Lead.** Lead concentrations at the mine and dustfall stations showed statistically significantly increases over the past 4 years (Table 3). There were no statistically

[5] Cleanup levels according to 18 AAC 75.341, were revised in 2019 and have an effective date of October 18, 2023, and appear in the official pulished form in the January 2024 Supplement to the Alaska Administrative Code. Available on the internet at https://dec.alaska.gov/media/533hr3p0/18-aac-75.pdf).

[6] Cleanup levels according to 18 AAC 75.341, were revised in 2019 and have an effective date of October 18, 2023, and appear in the official pulished form in the January 2024 Supplement to the Alaska Administrative Code. Available on the internet at https://dec.alaska.gov/media/533hr3p0/18-aac-75.pdf).

significant trends were noted along the road. There were no significant trends identified in rate of lead deposition noted. Time series plots of lead concentrations and dustfall deposition rates are presented in Figures 11 and 12, respectively.

- **Zinc.** Zinc concentrations at the mine and port dustfall stations significantly increased over the past 4 years (Table 3). There were no statistically significant trends were noted along the road. There were no significant trends identified in rate of zinc deposition noted. Time series plots of zinc concentrations and dustfall deposition rates are presented in Figures 13 and 14, respectively.
- **Total Solids.** No statistically significant trends were identified in total solids deposition rates during the most recent 4-year monitoring period at the mine, along the DMTS road, or port (Table 3). Time series plots of total solids dustfall rates are presented in Figure 15.

Caribou Tissue Monitoring

Red Dog Mine is located within the normal annual range of the Western Arctic Herd of caribou. Surveys of caribou tissue metals concentrations have been conducted periodically since 1984 by the Alaska Department of Fish and Game, and these data provide baseline information against which more current studies may be compared. Previous caribou tissue monitoring events near Red Dog were completed in 2002 and 2009. The next caribou tissue monitoring (meat, kidney, liver) event is currently scheduled for 2025, pending approval and permits; therefore, there are no results to present for 2023.

Summary of Monitoring Results

Dust monitoring data from the Partisol air samplers, road surface samples, and the dustfall jars were statistically evaluated to assess the current trends over the most recent 4-year period. A summary of statistical trend analysis results for Partisols, road surface, and dustfall jar monitoring programs is presented in Table 4. Table 4 provides an at-a-glance overview of results of dust monitoring programs.

Over the past four years, (2020-2023), fugitive dust concentrations along the road, port and mine have shown significant decreases in lead and zinc concentrations indicating that dust control methods along the roads have been effective. Also over the same period, there have been no significant changes in dustfall rates at the mine, port and road. However at the mine

site, lead and zinc concentrations have shown significant increases, based on partisol data and dustfall jar data. A summary of all results is shown in Table 4. Additional attention to dust events will need to be considered in 2024 at the mine operations areas.

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Exponent, 2014. Fugitive Dust Risk Management Monitoring Plan. Prepared for Teck Alaska Incorporated. May 2014.

Ford, S., and L. Hasselbach, 2001. Heavy metals in mosses and soils on six transects along the Red Dog Mine haul road, Alaska. NPS/AR/NRTR-2001/38. National Park Service, Western Arctic National Parklands.

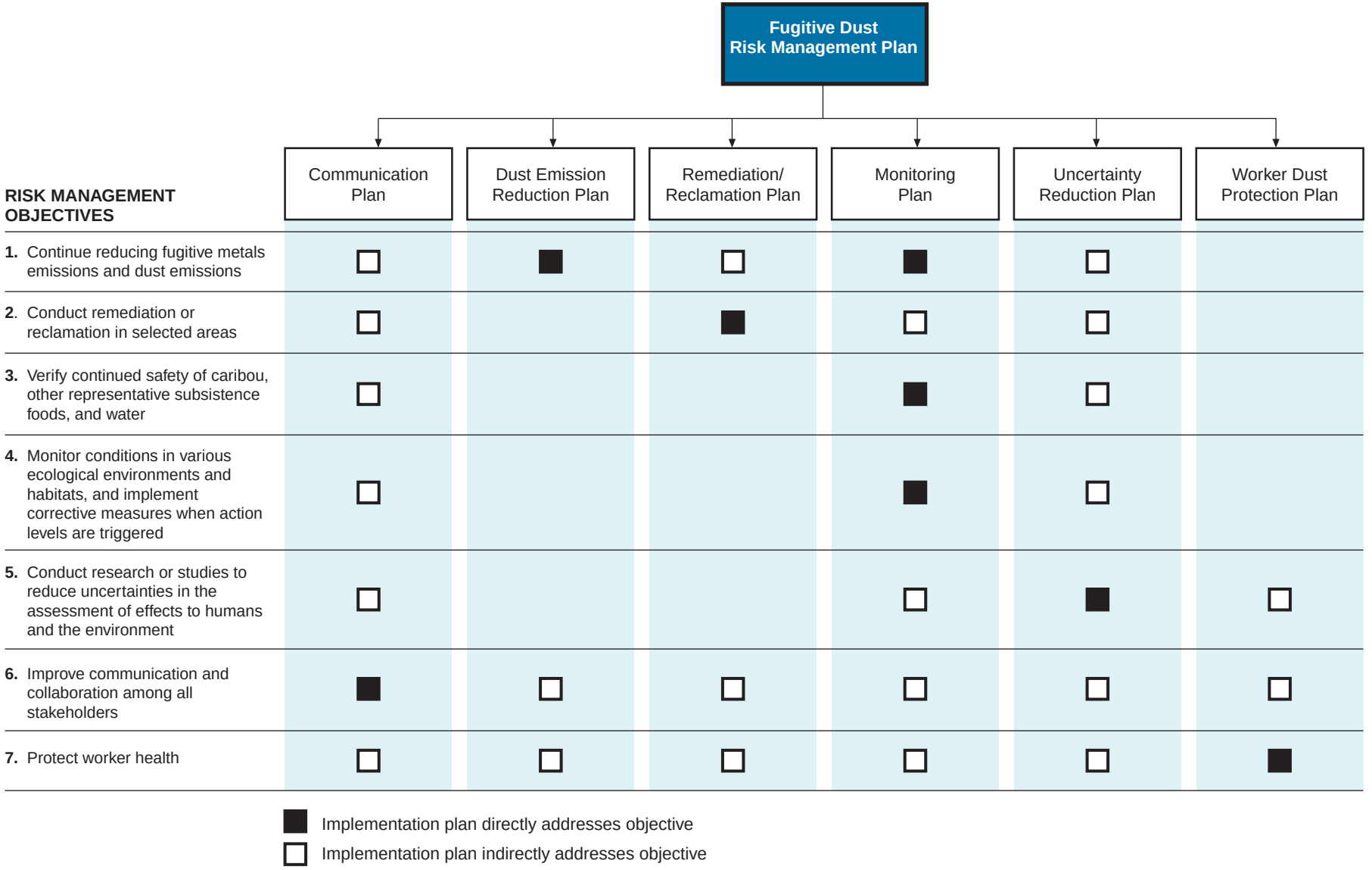


Figure 1. Risk management objectives and associated implementation plans

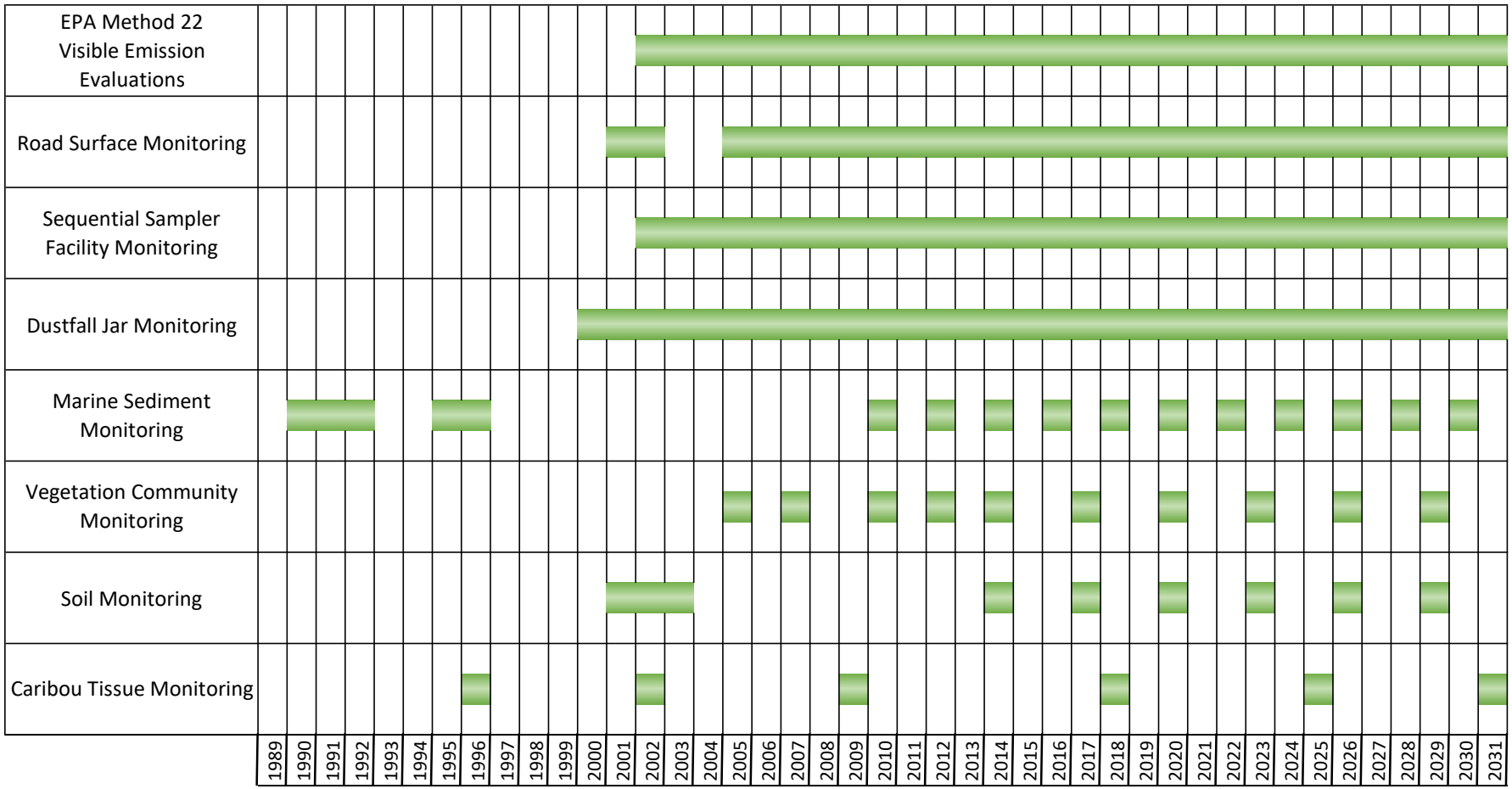


Figure 3. Monitoring Program Frequency

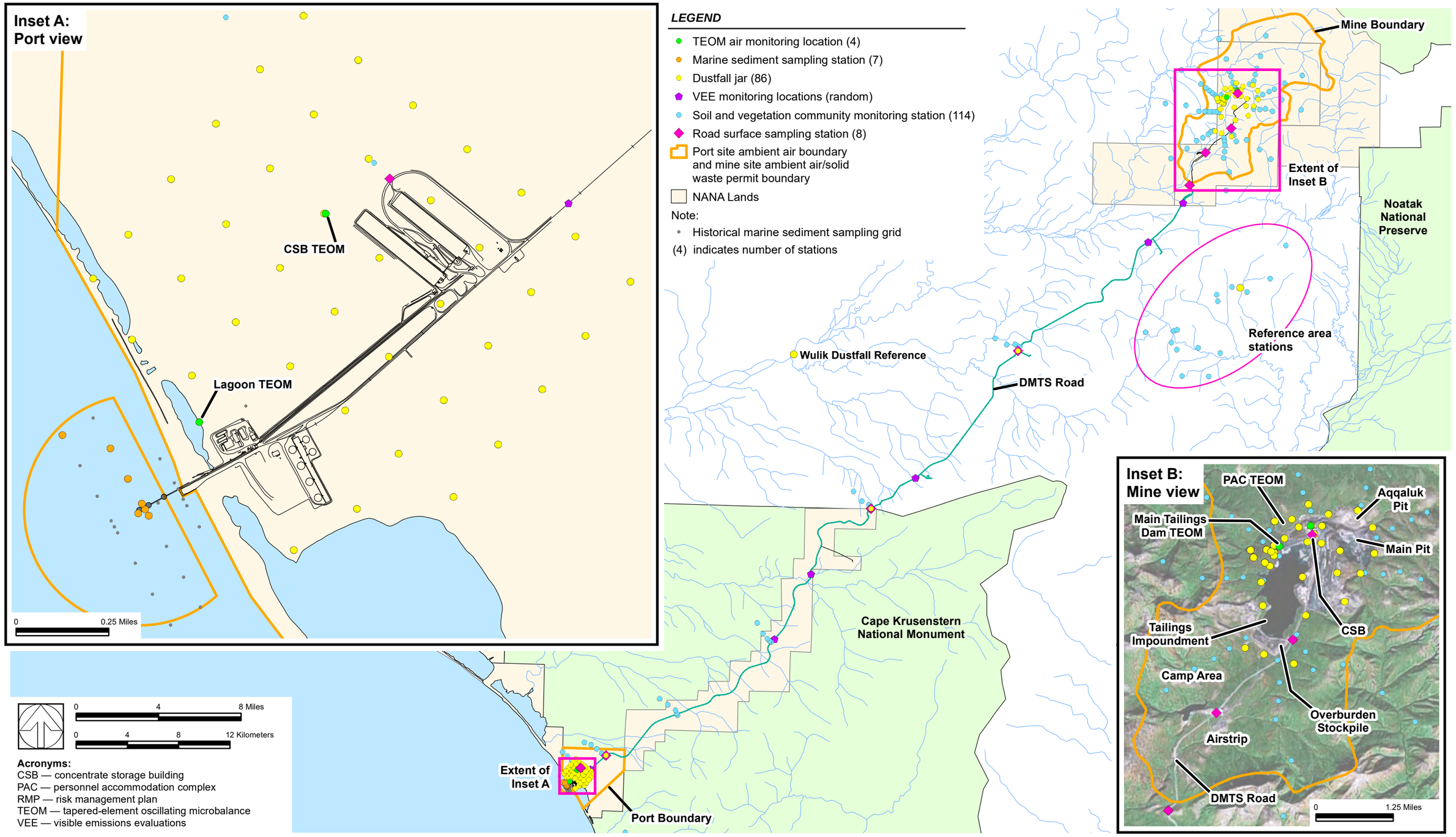


Figure 4. Overview of risk management monitoring programs



Figure 5a. Mine TEOM locations



Figure 5b. Port TEOM locations

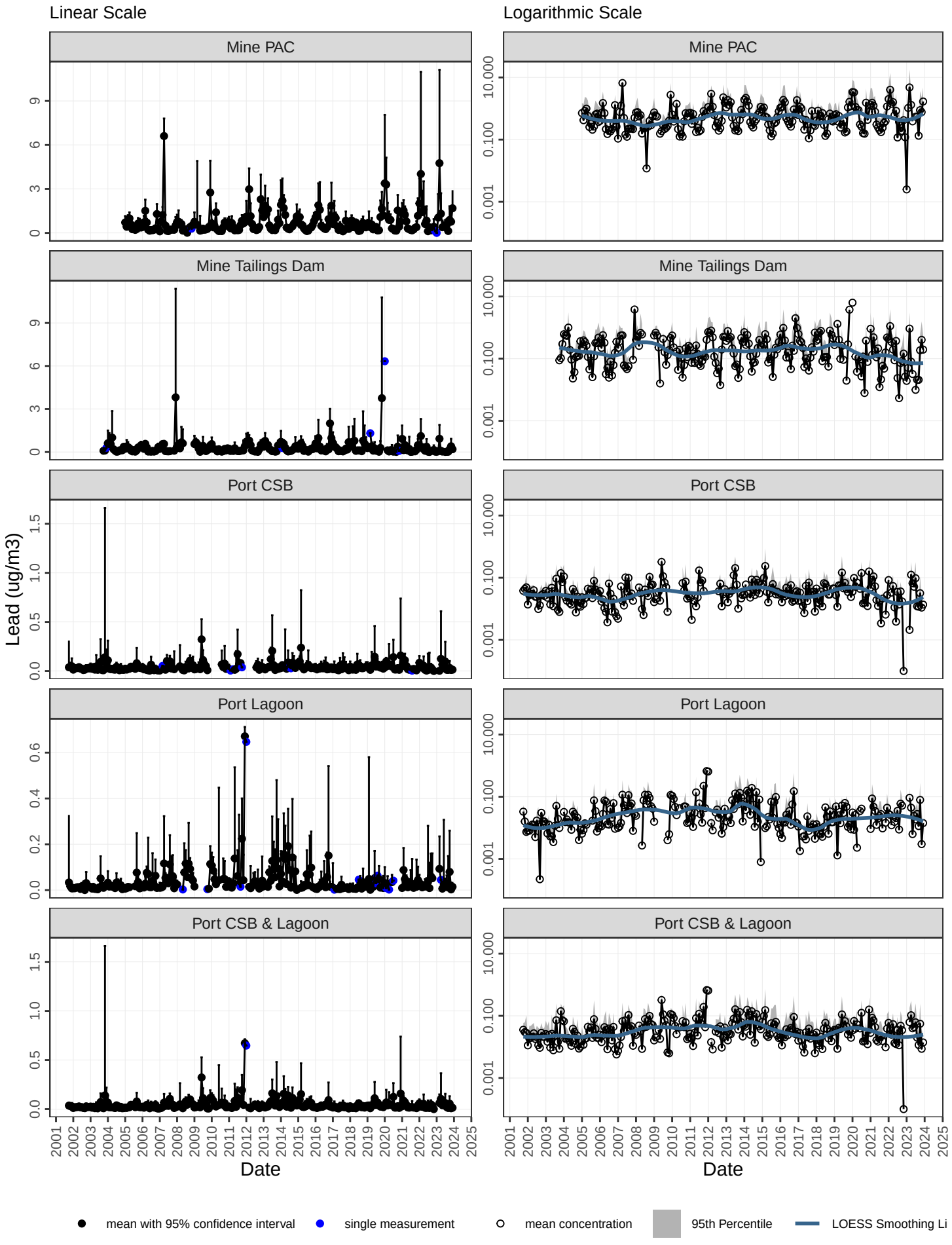


Figure 6. Particulate Lead Concentration plots (all years).

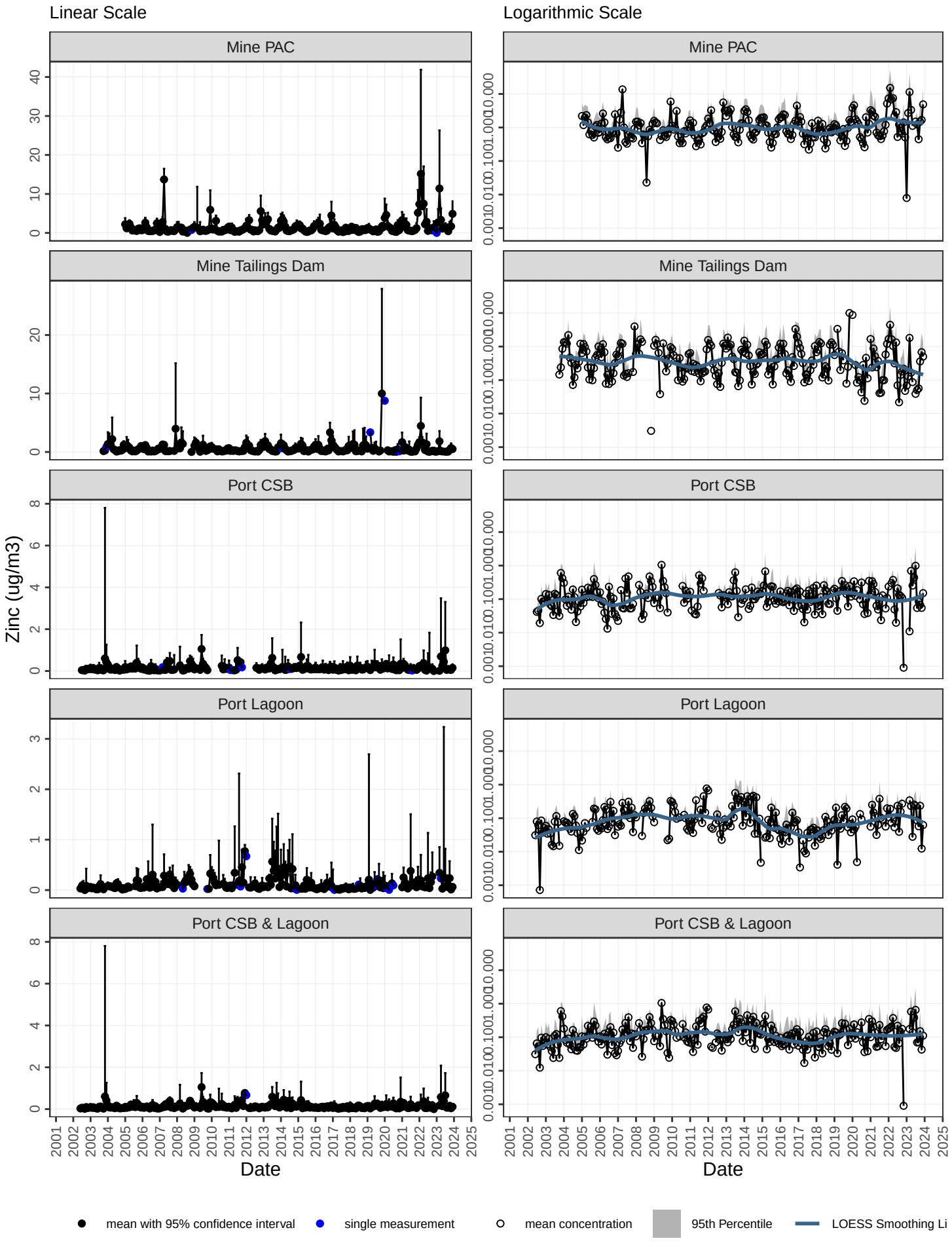


Figure 7. Particulate Zinc Concentration plots (all years).

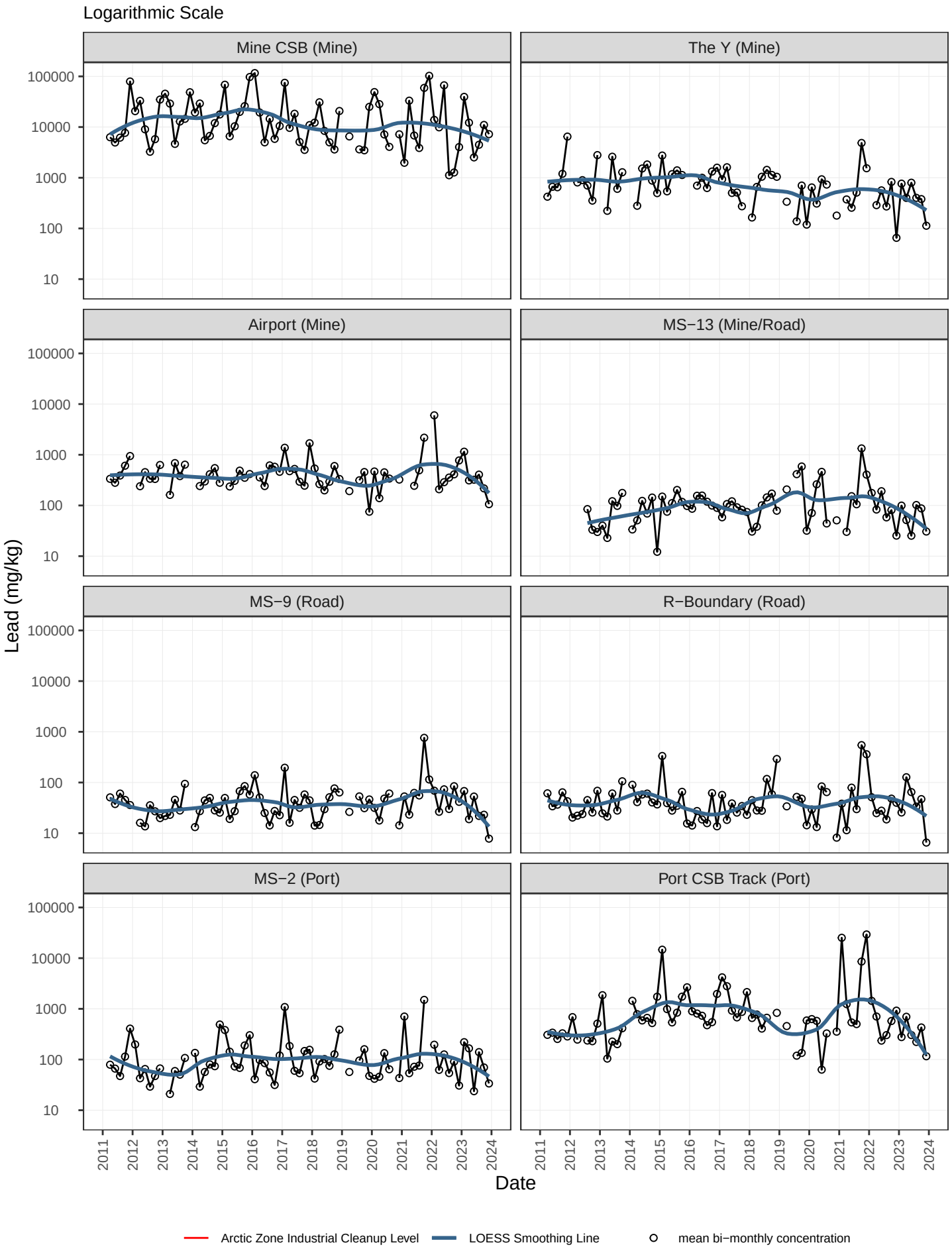


Figure 8. Road Surface Lead Concentrations (all years)

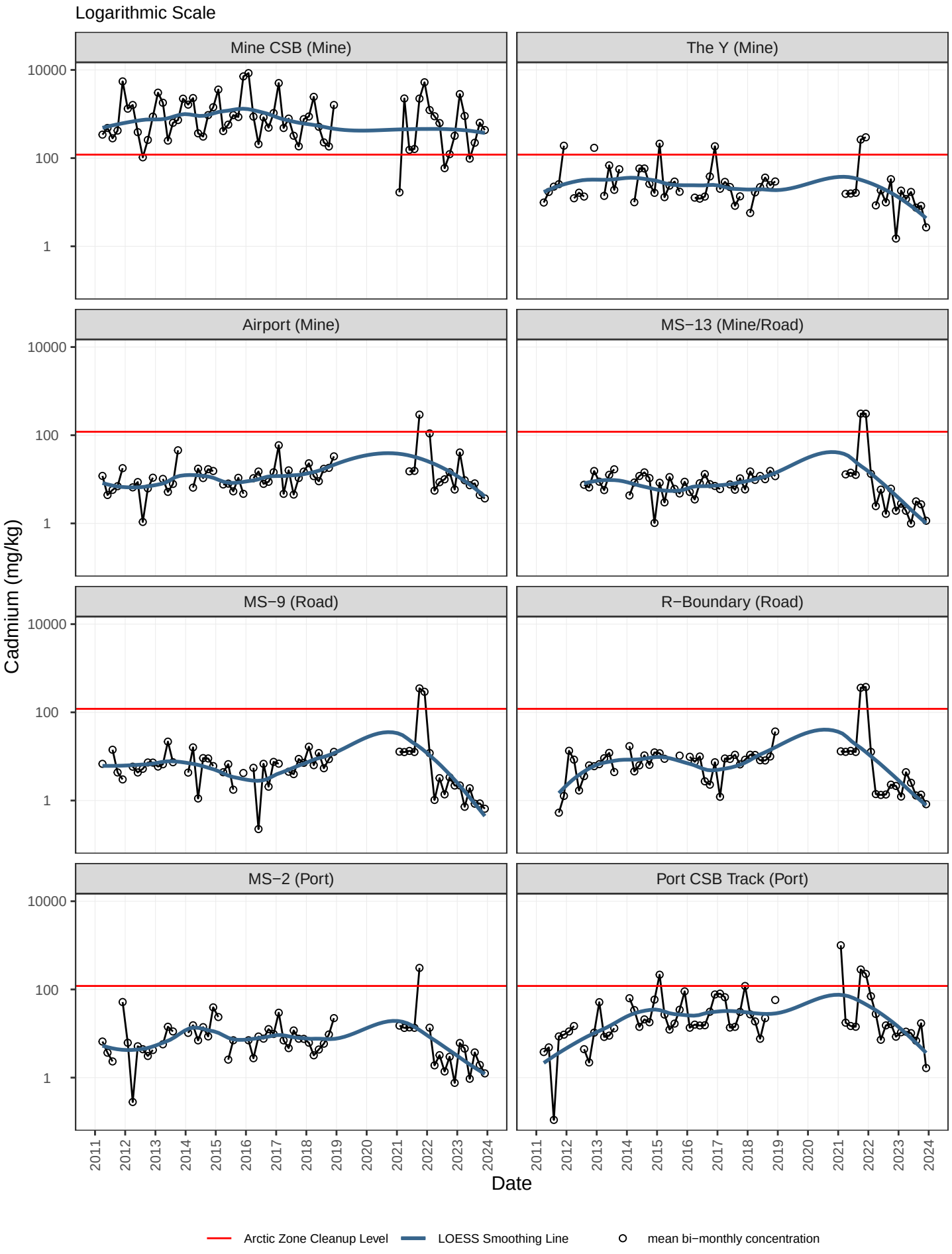


Figure 9. Road Surface Cadmium Concentrations (all years)

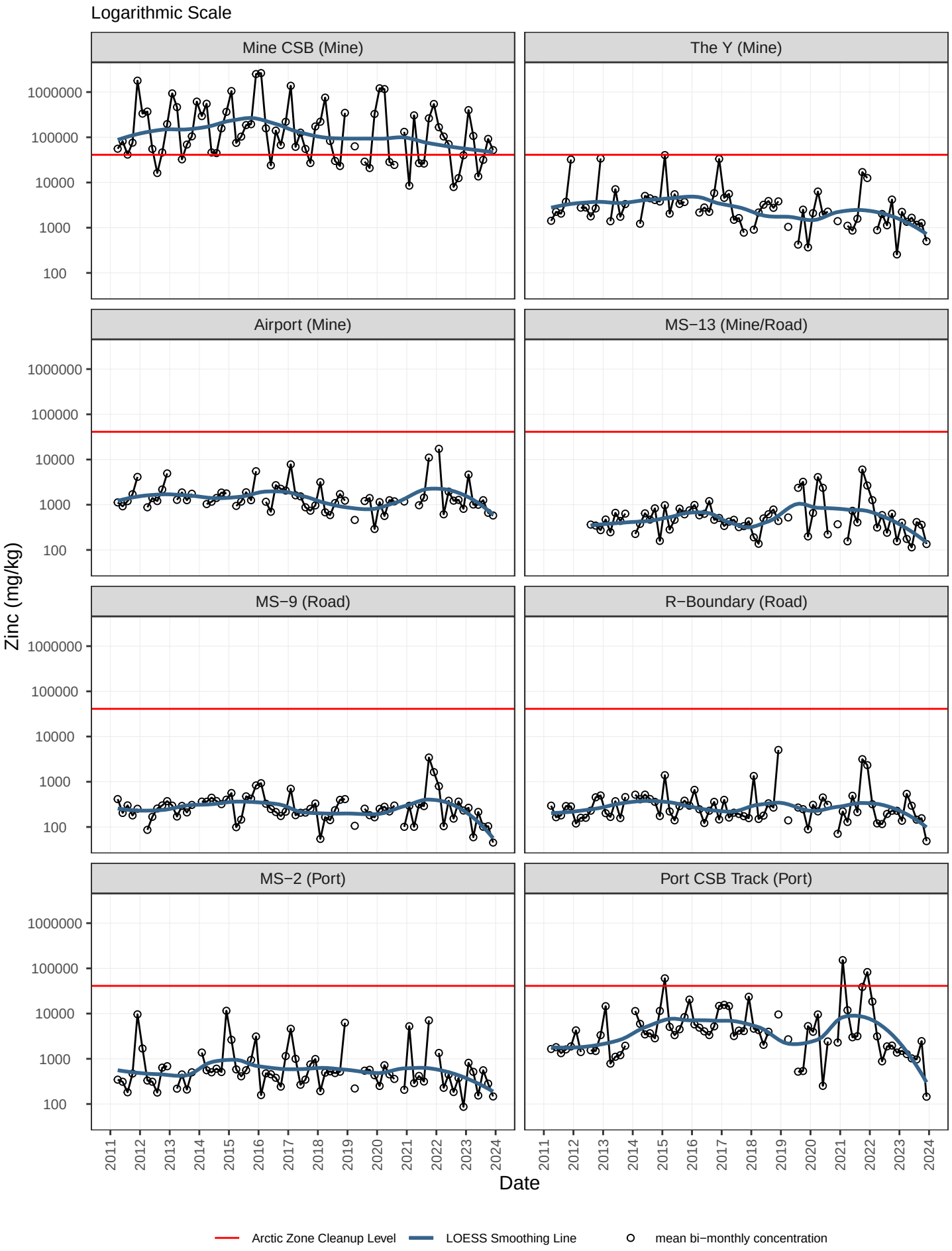


Figure 10. Road Surface Zinc Concentrations (all years)

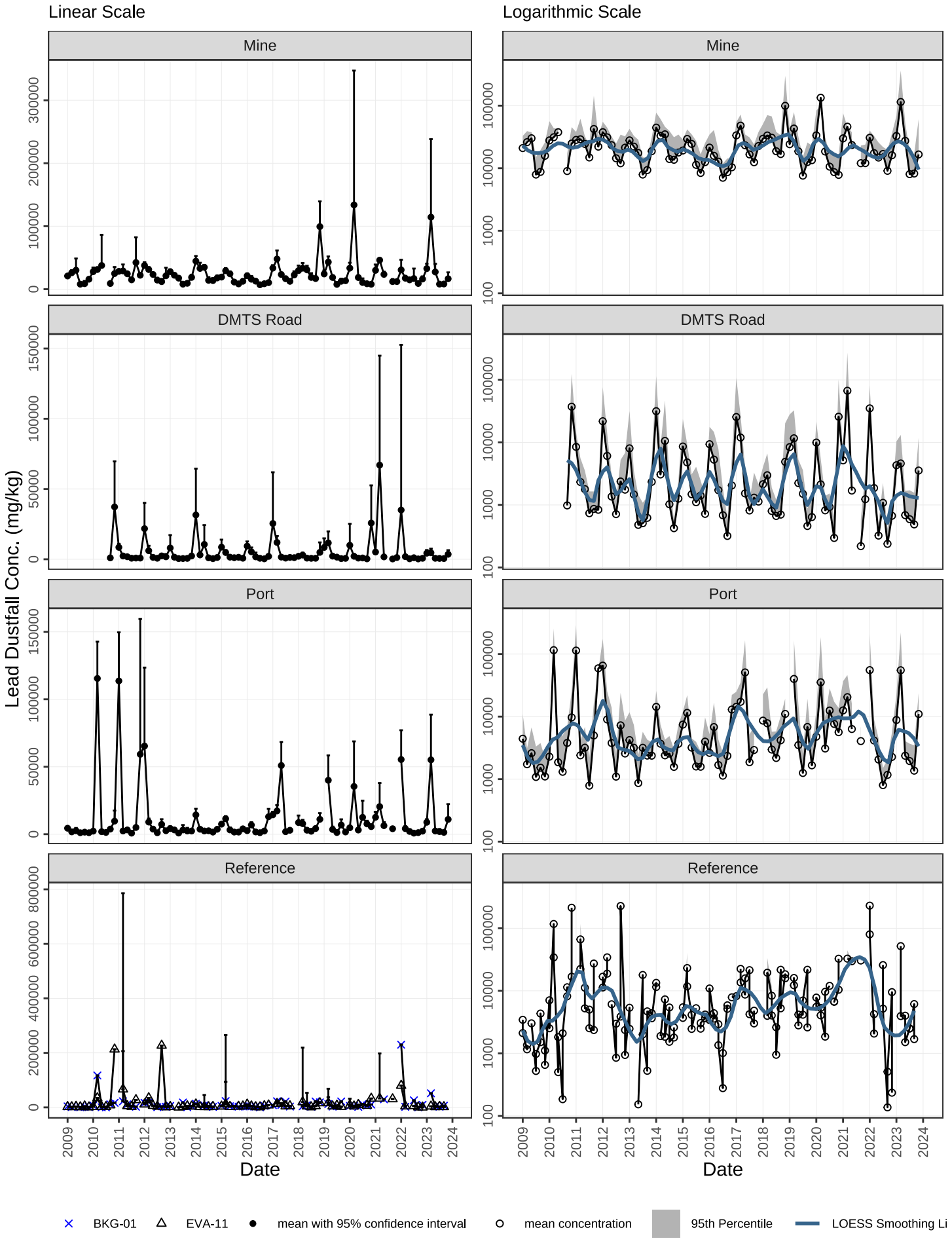


Figure 11. Dustfall Jars Lead Conc. plots (all years)

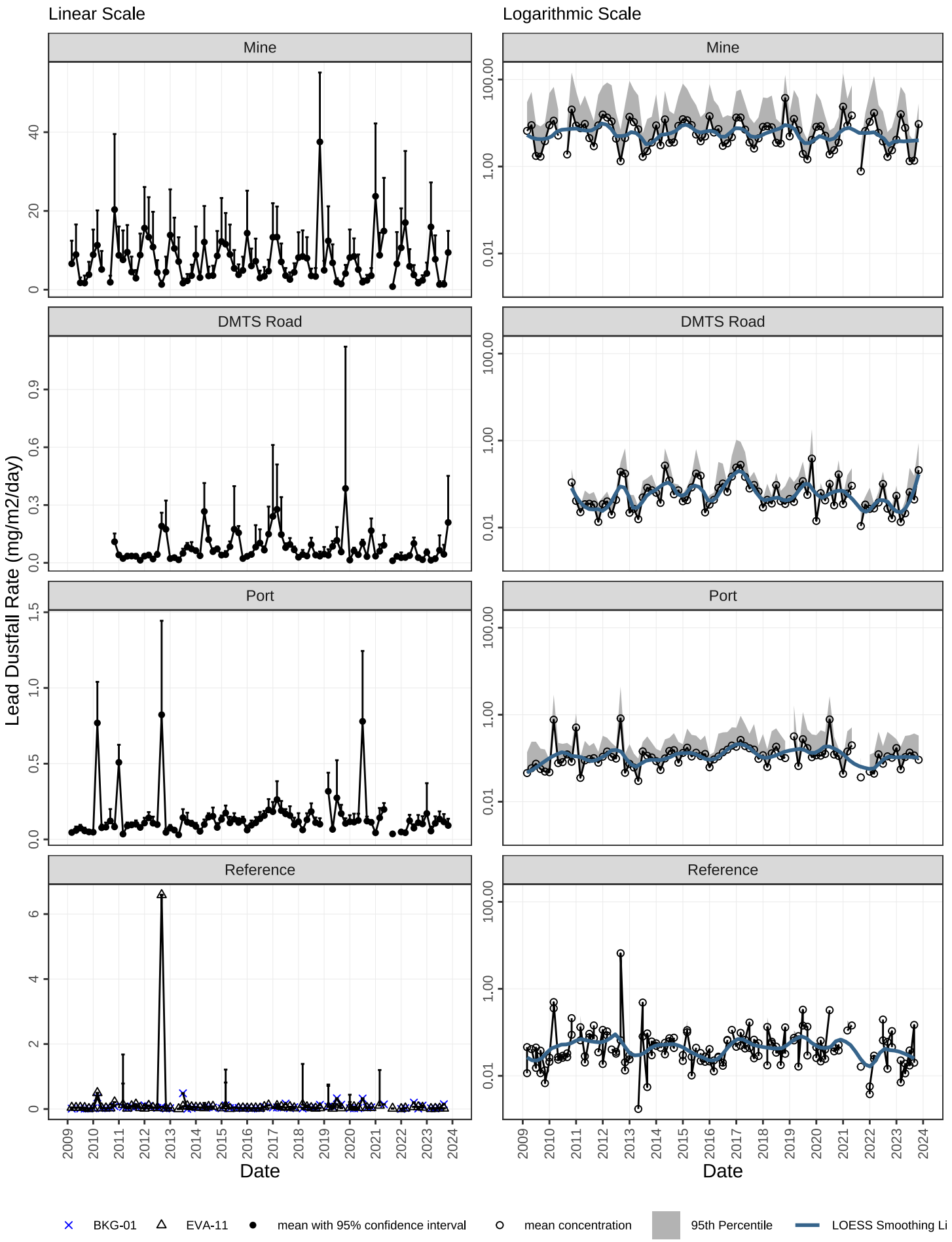


Figure 12. Dustfall Jars Lead Rate plots (all years)

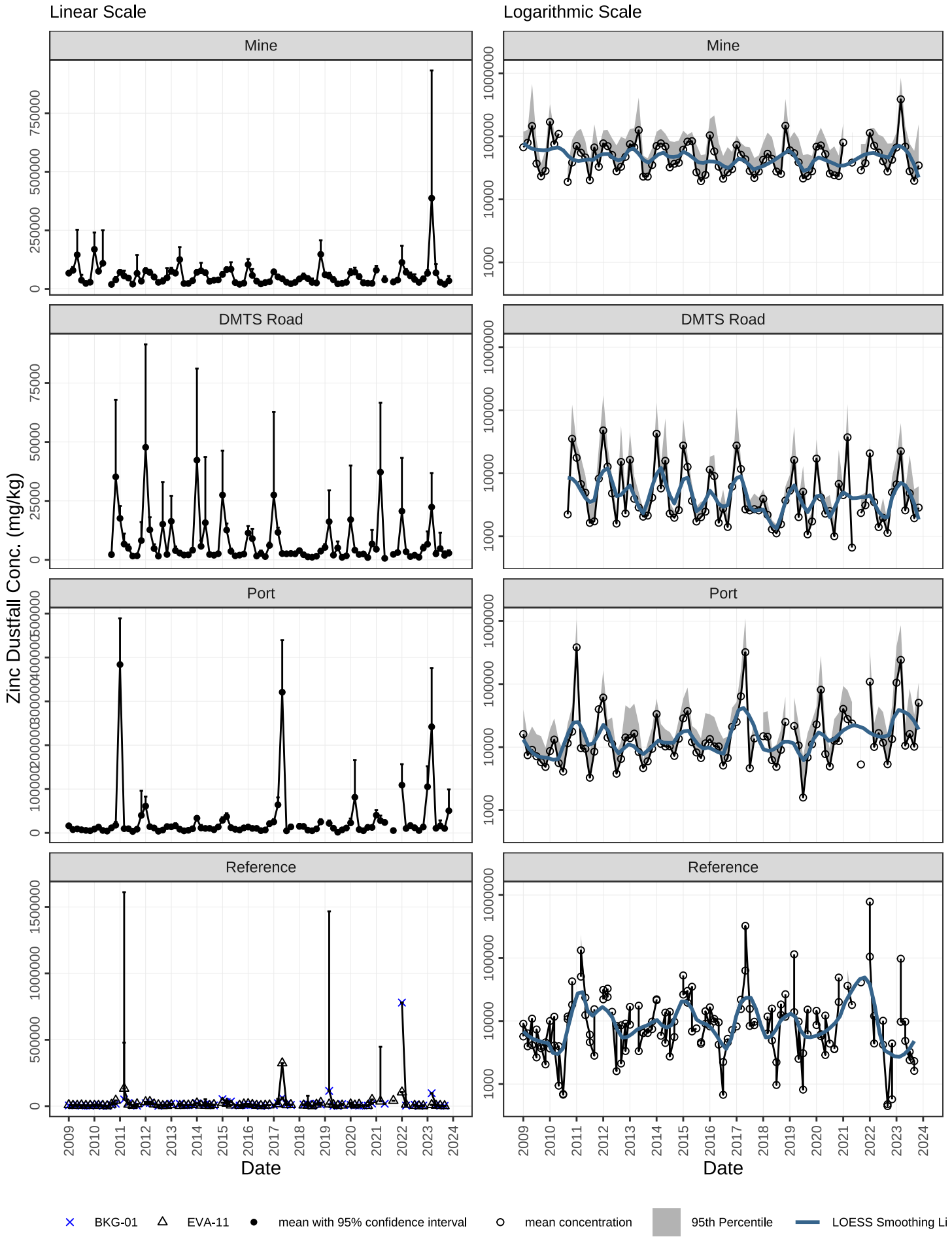


Figure 13. Dustfall Jars Zinc Conc. plots (all years)

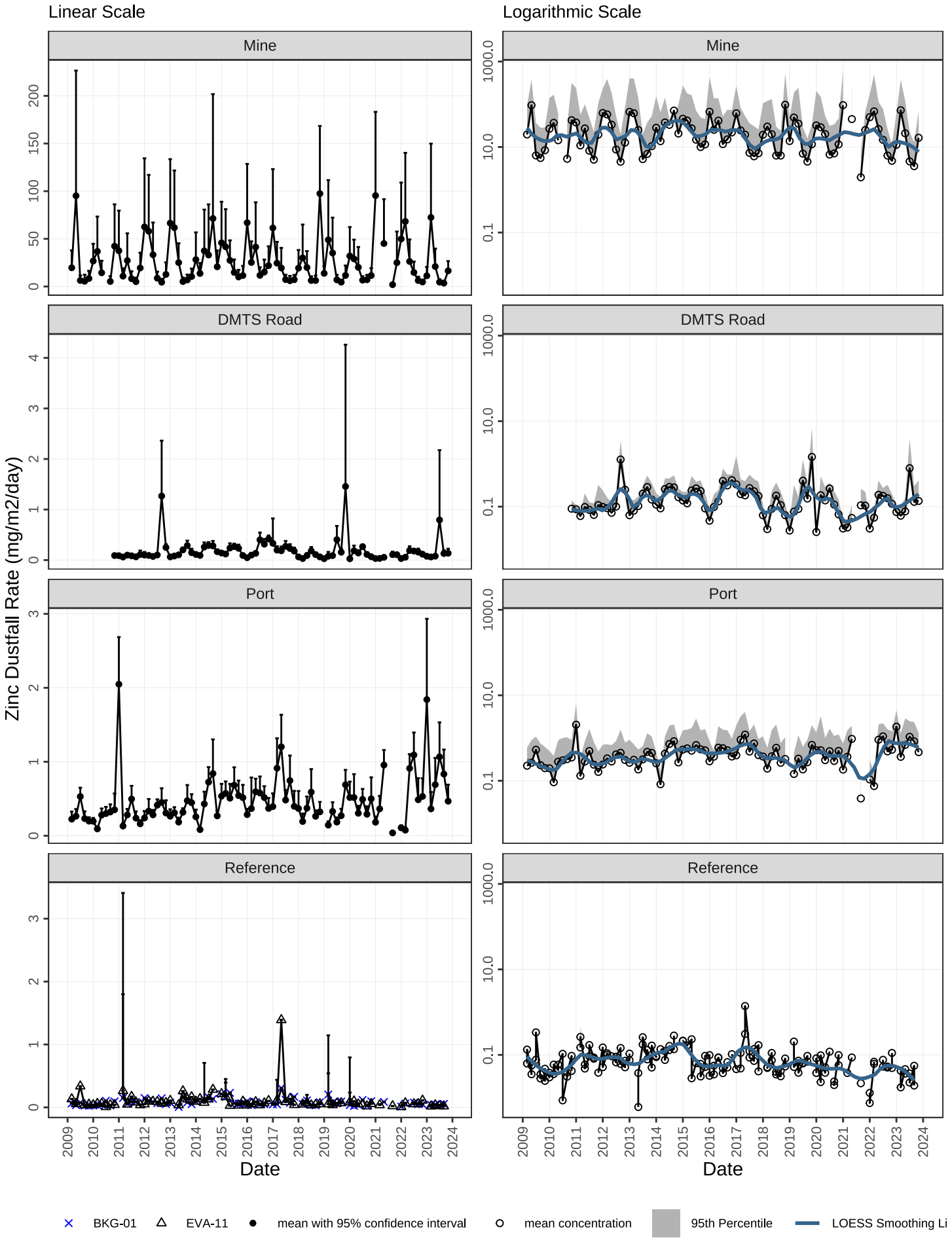


Figure 14. Dustfall Jars Zinc Rate plots (all years)

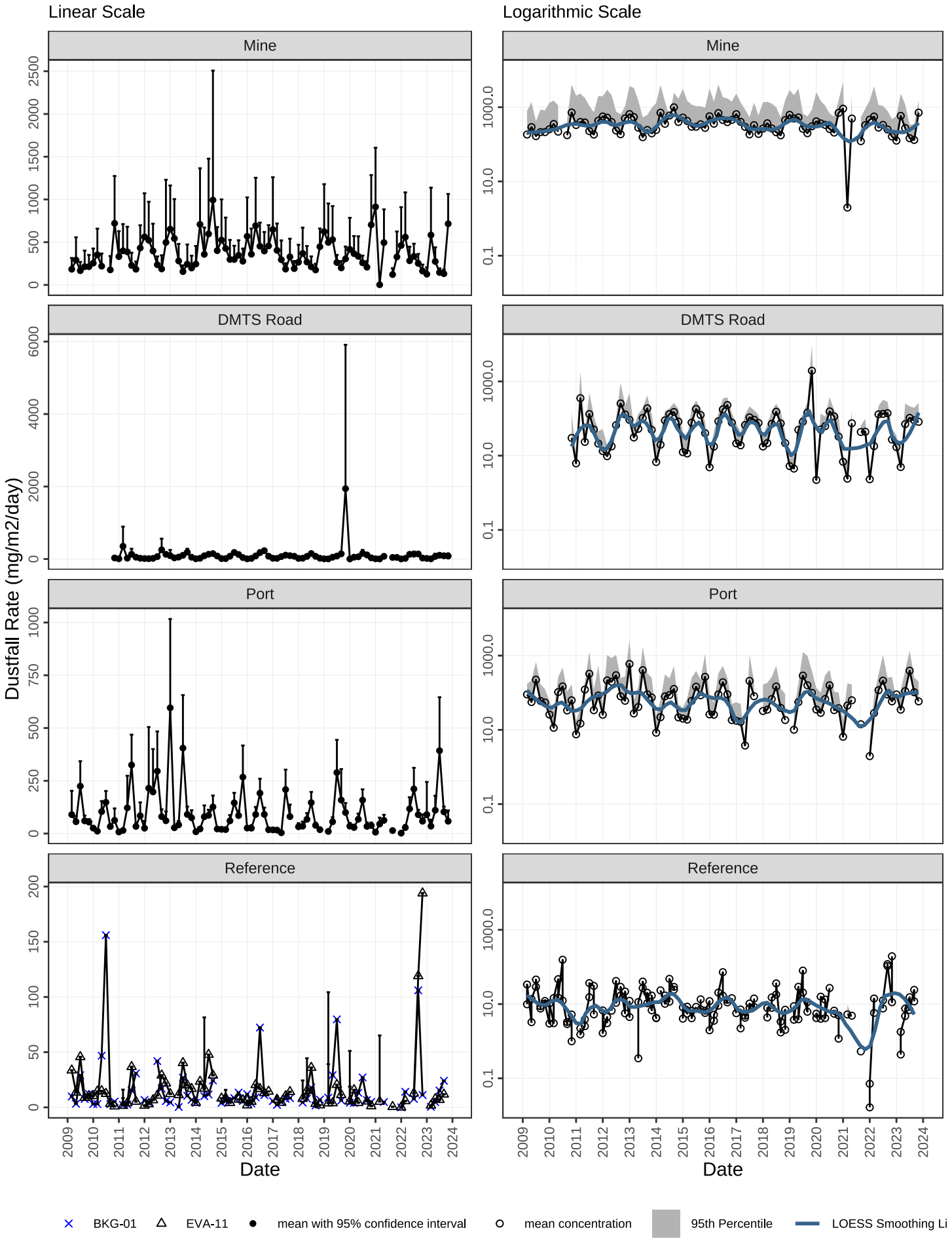


Figure 15. Dustfall Jars Solids Rate plots (all years)

Table 1. Partisol & TEOM concentration statistical trend analysis (Seasonal Mann-Kendall Trend Test)

For 1/2020 - 12/2023; Mean Concentration

LEAD	Concentration (µg/m^3)		
	tau statistic	p value	significant trend?[a]
Mine PAC	-0.331	0.0000794	Yes; Increasing
Mine T-Dam	-0.359	0.0000257	Yes; Decreasing
Port CSB	-0.342	0.0000876	Yes; Decreasing
Port Lagoon	-0.278	0.0024	Yes; Increasing
Port CSB & Lagoon	-0.336	0.000106	Yes; Decreasing

ZINC	Concentration (µg/m^3)		
	tau statistic	p value	significant trend?[a]
Mine PAC	-0.277	0.000986	Yes; Increasing
Mine T-Dam	-0.327	0.000125	Yes; Increasing
Port CSB	-0.295	0.000728	Yes; Decreasing
Port Lagoon	-0.255	0.00545	Yes; Increasing
Port CSB & Lagoon	-0.316	0.000267	Yes; Decreasing

[a] Significant at p<0.05/2 (i.e., p<0.025 with Bonferroni adjustment because multiple [2] related hypotheses are tested).

For 1/2020 - 12/2023; Top 95% Concentration

LEAD	Concentration (µg/m^3)		
	tau statistic	p value	significant trend?[a]
Mine PAC	-0.307	0.000256	Yes; Increasing
Mine T-Dam	-0.34	0.0000675	Yes; Decreasing
Port CSB	-0.329	0.000165	Yes; Decreasing
Port Lagoon	-0.294	0.00134	Yes; Increasing
Port CSB & Lagoon	-0.296	0.000637	Yes; Increasing

ZINC	Concentration (µg/m^3)		
	tau statistic	p value	significant trend?[a]
Mine PAC	-0.277	0.000986	Yes; Increasing
Mine T-Dam	-0.314	0.000227	Yes; Increasing
Port CSB	-0.275	0.00166	Yes; Increasing
Port Lagoon	-0.247	0.00707	Yes; Increasing
Port CSB & Lagoon	-0.269	0.00188	Yes; Increasing

[a] Significant at p<0.05/2 (i.e., p<0.025 with Bonferroni adjustment because multiple [2] related hypotheses are tested).

Table 2. Road surface concentration statistical trend analysis (Seasonal Mann-Kendall Trend Test)

For 1/2020 - 12/2023; Mean Concentration:

LEAD		Concentration (ppm)		
		tau statistic	p value	significant trend?[a]
Mine[b]	2020 - 2023	-0.304	0.011	Yes; Decreasing
Port		-0.329	0.00593	Yes; Decreasing
Road		-0.354	0.00308	Yes; Decreasing
Mine CSB (Mine)		-0.0311	0.795	No
The Y (Mine)		-0.365	0.00313	Yes; Decreasing
Airport (Mine)		-0.3	0.0167	No
MS-13 (Mine/Road)		-0.377	0.00193	Yes; Decreasing
MS-9 (Road)		-0.366	0.00219	Yes; Decreasing
R-Boundary (Road)		-0.391	0.00107	Yes; Decreasing
MS-2 (Port)		-0.325	0.00753	Yes; Decreasing
Port CSB Track (Port)		-0.304	0.011	Yes; Decreasing

ZINC		Concentration (ppm)		
		tau statistic	p value	significant trend?[a]
Mine[b]	2020 - 2023	0.155	0.194	No
Port		-0.304	0.011	Yes; Decreasing
Road		-0.441	0.000228	Yes; Decreasing
Mine CSB (Mine)		0.553	0.00000383	Yes; Increasing
The Y (Mine)		-0.392	0.00151	Yes; Decreasing
Airport (Mine)		-0.314	0.0122	Yes; Decreasing
MS-13 (Mine/Road)		-0.416	0.000624	Yes; Decreasing
MS-9 (Road)		-0.429	0.000341	Yes; Decreasing
R-Boundary (Road)		-0.441	0.000228	Yes; Decreasing
MS-2 (Port)		-0.403	0.00092	Yes; Decreasing
Port CSB Track (Port)		-0.267	0.0256	No

CADMIUM		Concentration (ppm)		
		tau statistic	p value	significant trend?[a]
Mine[b]	2020 - 2023	-0.286	0.0273	No
Port		-0.413	0.00143	Yes; Decreasing
Road		-0.413	0.00143	Yes; Decreasing
Mine CSB (Mine)		-0.286	0.0273	No
The Y (Mine)		-0.304	0.0234	No
Airport (Mine)		-0.315	0.0213	No
MS-13 (Mine/Road)		-0.383	0.00362	Yes; Decreasing
MS-9 (Road)		-0.429	0.00093	Yes; Decreasing
R-Boundary (Road)		-0.397	0.00217	Yes; Decreasing
MS-2 (Port)		-0.35	0.0079	Yes; Decreasing
Port CSB Track (Port)		-0.365	0.0048	Yes; Decreasing

[a]Significant at $p<0.05/3$ (i.e., $p<0.017$ with Bonferroni adjustment because multiple [3] related hypotheses are tested)

[b]MS-13 included in Mine

Table 3. Dustfall rate and concentrations statistical trend analysis (Seasonal Mann-Kendall Trend Test)

For 1/2020 - 12/2023; Mean Deposition Rate and Concentration:

LEAD	Dustfall Desposition Rate (mg/m^2/day)			Concentration (mg/kg-total solid)		
	tau statistic	p value	significant trend?[a]	tau statistic	p value	significant trend?[a]
Mine	-0.0443	0.634	No	0.291	0.00173	Yes; Increasing
DMTS Road	-0.0629	0.498	No	0.0443	0.634	No
Port	-0.0483	0.606	No	0.111	0.236	No
Reference	0.0444	0.648	No	0.306	0.00169	Yes; Increasing

ZINC	Dustfall Desposition Rate (mg/m^2/day)			Concentration (mg/kg-total solid)		
	tau statistic	p value	significant trend?[a]	tau statistic	p value	significant trend?[a]
Mine	-0.0531	0.571	No	0.826	0	Yes; Increasing
DMTS Road	-0.0117	0.9	No	0.0723	0.437	No
Port	0.00483	0.959	No	0.343	0.000253	Yes; Increasing
Reference	0.0556	0.568	No	0.267	0.00613	Yes; Decreasing

TOTAL SOLIDS	Dustfall Desposition Rate (mg/m^2/day)		
	tau statistic	p value	significant trend?[a]
Mine	-0.0676	0.467	No
DMTS Road	-0.0117	0.9	No
Port	0.0242	0.797	No
Reference	0.0889	0.361	No

[a] Significant at p<0.05/3 (i.e., p<0.017 with Bonferroni adjustment because multiple [3] related hypotheses are tested).

For 1/2020 - 12/2023; Top 95% Deposition Rate and Concentration:

LEAD	Dustfall Deposition Rate (mg/m^2/day)			Concentration (mg/kg-total solid)		
	tau statistic	p value	significant trend?[a]	tau statistic	p value	significant trend?[a]
Mine	-0.049	0.599	No	0.641	5.41E-12	Yes; Increasing
DMTS Road	-0.0303	0.744	No	0.0909	0.328	No
Port	-0.0435	0.643	No	0.256	0.00631	Yes; Increasing
Reference	0.0556	0.568	No	0.361	0.000206	Yes; Increasing

ZINC	Dustfall Deposition Rate (mg/m^2/day)			Concentration (mg/kg-total solid)		
	tau statistic	p value	significant trend?[a]	tau statistic	p value	significant trend?[a]
Mine	-0.0435	0.643	No	0.86	0	Yes; Increasing
DMTS Road	0.00233	0.98	No	0.198	0.0331	No
Port	0.029	0.757	No	0.725	1.07E-14	Yes; Increasing
Reference	0.0556	0.568	No	0.261	0.00728	Yes; Decreasing

TOTAL SOLIDS	Dustfall Deposition Rate (mg/m^2/day)		
	tau statistic	p value	significant trend?[a]
Mine	-0.0629	0.498	No
DMTS Road	0.00233	0.98	No
Port	0.0338	0.718	No
Reference	0.0889	0.361	No

[a] Significant at p<0.05/3 (i.e., p<0.017 with Bonferroni adjustment because multiple [3] related hypotheses are tested).

Table 4. Summary of dust monitoring trends

For most recent 4 years (2020-2023)																	
Location and Measure	Road Surface (Concentration)			Location and Measure	Paritsol & TEOM (Air Concentration)				Location and Measure	Dustfall Jars (Concentration and Deposition Rate)							
	Mean				Mean		95th Percentile			Mean			95th Percentile				
	Pb	Zn	Cd[c]		Pb	Zn	Pb	Zn		Pb	Zn	Solids	Pb	Zn	Solids		
Mine[b] (Conc.)	↘	—	—	Mine PAC (Conc.)	↗	↗	↗	↗	Mine (Conc.)	↗	↗	a	↗	↗	a		
				Mine TDam (Conc.)	↘	↗	↘	↗	Mine (Rate)	—	—	—	—	—	—		
Road (Conc.)	↘	↘	↘						Road (Conc.)	—	—	a	—	—	a		
									Road (Rate)	—	—	—	—	—	—		
Port (Conc.)	↘	↘	↘	Port CSB (Conc.)	↘	↘	↘	↗	Port (Conc.)	—	↗	a	↗	↗	a		
				Port Lagoon (Conc.)	↗	↗	↗	↗	Port (Rate)	—	—	—	—	—	—		
				Port CSB & Lagoon (Conc.)	↘	↘	↗	↗									
									Reference (Conc.)	↗	↘	a	↗	↘	a		
									Reference (Rate)	—	—	—	—	—	—		

[a] Concentration is not evaluated for solids, because total solids is the entire sample mass.

[b] MS-13 included in Mine

[c] No Cadmium data since 2018 so trends have not changed

1. Results are presented for statistical testing using data from the past four years.

Notes:

— Indicates no statistically significant change over time period tested (trend is FLAT).

↗ Indicates a statistically significant increase over time period tested (trend is UP).

↘ Indicates a statistically significant decrease over time period tested (trend is DOWN).

TEOM = tapered element oscillating microbalance (air sampling device)
Conc = air concentration (TEOM air sampling) or concentration in dustfall (dustfall jars)
Rate = dustfall deposition rate based on dustfall jar measurements

TDam = mine tailings dam
PAC = personnel accommodations complex
CSB = concentrate storage building