Spring 5-27-2022

Draft Final Annual Operations and Maintenance (O&M) Report, Butte Treatment Lagoon (BTL) System – 2021

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May 27, 2022

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RE: Butte Priority Soils Operable Unit (BPSOU) Draft Final Annual Operations and Maintenance (O&M) Report Butte Treatment Lagoon System – 2021

Agency Representatives:

I am writing you on behalf of Atlantic Richfield Company to submit the BPSOU Draft Final Annual Operations and Maintenance (O&M) Report Butte Treatment Lagoon (BTL) System – 2021 for your review and approval.

A link to the annual report files is below.

https://pioneertechnicalservices.sharepoint.com/:f:/s/submitted/EggbwxoGYA9Honmn0j7QQxcB5EMvHAu4NtAfYcN6JMTWxQ.

If you have questions or concerns, please do not hesitate to call me at (406) 723-1820.

Sincerely,

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SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT

Draft Final

Annual Operations and Maintenance (O&M) Report, Butte Treatment Lagoon (BTL) System – 2021

Atlantic Richfield Company

May 27, 2022

SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT

Draft Final

Annual Operations and Maintenance (O&M) Report, Butte Treatment Lagoon (BTL) System – 2021

Prepared for:

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May 27, 2022

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DOCUMENT MODIFICATION SUMMARY

Revision No.	Author	Version	Description	Date
Rev 0	Brad Hollamon	Draft	Issued for Internal Review	5/10/2022
Rev 1	Brad Hollamon	Draft Final	Issued for Agency Review	5/27/2022

1.0 INTRODUCTION

This Operations and Maintenance (O&M) Report summarizes the operation, maintenance, and monitoring (OM&M) tasks completed at the Butte Treatment Lagoons (BTL) from January 1 to December 31, 2021. All work described in this document was performed as described in the *Revised Draft Final BTL Groundwater Treatment System Routine OM&M Plan* (Atlantic Richfield Company, 2021a) (referred to herein as Routine OM&M Plan). All reporting was provided as required by the U.S. Environmental Protection Agency (EPA) 2011 *Unilateral Administrative Order for the Partial Remedial Design/Remedial Action Implementation and Certain Operation and Maintenance at the Butte Priority Soils Operable Unit* [BPSOU]*/Butte Site; EPA Docket No. CERCLA-08-2011-0011* (EPA, 2011) and the BPSOU Consent Decree (CD) (EPA, 2020) and EPA Record of Decision Amendment (RODA) for the BPSOU (Appendix A to the BPSOU CD; EPA, 2020).

Ancillary information provided with this annual report includes the following:

- Appendix A: Reports and Analytical Summary Results.
  - Appendix A.1: Discharge Monitoring Reports (DMRs).
  - Appendix A.2: Analytical Laboratory Results Graphs.
  - Appendix A.3: Lime Usage, System Flows, and System Levels.
- Appendix B: Subdrain Video Inspection Report.
- Appendix C: Data Summary Report (DSR).

Additional details related to sampling and monitoring tasks are provided in the Routine OM&M Plan. All required samples were collected at the sample station locations shown on Figure 1 and sent to Pace Analytical Laboratory, LLC (Pace) in Minneapolis, Minnesota, for analyses. The laboratory completed data verification and provided Level 4 validation packages according to the laboratory quality assurance procedures for all data.

All final validated data are provided in the previously submitted quarterly reports listed below. Quarterly reports also include system flow data and water quality monitoring data.

- First Quarter 2021 BTL O&M Report submitted June 30, 2021.
- Second Quarter 2021 BTL O&M Report submitted September 21, 2021.
- Third Quarter 2021 BTL O&M Report submitted December 10, 2021.
- Fourth Quarter 2021 BTL O&M Report submitted March 30, 2022.

1.1 Data Usability Summary

This section provides a summary of data usability for data associated with the BTL system.

In 2021, 168 natural samples were collected during 104 sampling events, and 2,523 natural data points were generated by Pace. A summary by sample type is shown below in Table 1.

Table 1. Summary of Enforcement and Screening Quality Data Points from each Sample Location

Type	No. of Samples	No. of Data Points	No. of Enforcement Data Points (% of total)	No. of Screening Data Points (% of total)	No. of Rejected Data Points (% of total)
LAO-SS-1* (EFS-07)	104	1,497	1,209 (81%)	288 (19%)	0 (0%)
LAO-SS-2 (INF-04)	52	773	740 (96%)	33 (4%)	0 (0%)
LAO-SS-3 (MSD-HCC)	12	253	238 (94%)	15 (6%)	0 (0%)
Total for Original Samples	168	2,523	2,187 (87%)	336 (13%)	0 (0%)

LAO: Lower Area One. SS: sampling station.
* Denotes compliance sampling location.

1.1.1 Data Flags and Qualifiers

Data flags and qualifiers are presented in the previously submitted quarterly DVRs in Tables A1, A2 and A3. No data points were rejected. Data were also evaluated using the Level A/B Checklist (included in previously submitted quarterly DVR's).

All samples met both the Level A and Level B criteria defined in the *Clark Fork River Superfund Site Investigations* (CFRSSI) *Data Management/Data Validation* (DM/DV) *Plan* (ARCO, 1992a) and *CFRSSI DM/DV Plan Addendum* (AERL, 2000).

1.1.2 Data Quality

A summary of BTL precision, accuracy, repeatability, and completeness statement criteria is provided below, and additional detailed information is provided in the BTL data validation reports submitted as Appendix A of the DSR in Appendix C of the quarterly operation reports. Of the data points generated by Pace, 87% were considered enforcement quality and 13% were classified as screening quality. In the DSR provided as Appendix C in this document, Table A1 shows the analytical results with laboratory qualifiers; data validation qualifiers; enforcement, screening, and rejected classifications; and data validation reason codes for each data point. Tables A1, A2, A3, and A4 list the data for the field duplicate pair, equipment rinsate blank samples, and sample identification, respectively. Table A5 shows the laboratory flags and data validation qualifiers for each of the data points.

All the natural data points are usable because no sample results were rejected, 100% of the planned samples were collected, and 99.7% of the planned analyses were performed. An email from Pace included in SDG 10571741 stated, "*LAO-SS-1-072621 (10571741-002): the unpreserved container arrived without the lid on the container and almost empty. There was not enough volume to complete any unpreserved analyses.*" There were 7 analytes (total alkalinity, bicarbonate alkalinity, carbonate alkalinity, hydroxide alkalinity, total dissolved solids, total suspended solids, and sulfate) that were not analyzed for LAO-SS-1-072621. This meets the 95%

quality assurance and quality control completeness Data Quality Objective (DQO) listed in the *CFRSSI Quality Assurance Project Plan* (QAPP) (ARCO, 1992b).

The DQOs for the data associated with the BTL system were met. Both the enforcement and screening quality data are considered usable for monitoring the BTL system. No data points were rejected; therefore, all data are considered usable.

2.0 SYSTEM DESCRIPTION

The BTL receives impacted water from the West Camp Pump System (WCP-1), Missoula Gulch base flow, BPSOU subdrain (subdrain), Butte Reduction Works (BRW) groundwater capture, Hydraulic Control Channel (HCC) groundwater capture, and BTL system D Cells. These waters are conveyed to the BTL collection cell (Cell D4). Collected waters are then pumped from Cell D4 to the Chemical Addition System (CAS) building as influent flow, where pre-treatment water quality is monitored at the influent station (INF-04) or sample station 2 (SS-2).

The treatment technology blends active and passive treatment techniques. Active treatment uses calcium hydroxide, commonly referred to as hydrated lime, in slurry form introduced into the influent water supply. The technique creates a chemical precipitate suspended solid that is subject to settling out of the effluent water. Additional treatment details are provided below.

The influent flow, described previously, is mixed with lime slurry to reach a target pH, which allows dissolved heavy metals to precipitate and separate from the collected groundwater as treated water flows through a series of lagoon cells in the remainder of the BTL system. The lime slurry is created by adding dry calcium hydroxide in milligrams (mg) to a portion of the influent water that is split off into mixing tanks located in the CAS building. The calcium hydroxide addition to the influent water is delivered by an automated measurement system as milligrams per Liter (mg/L), measured by milligrams of lime (calcium hydroxide) per liter of influent flow. The slurry is then added back to the remainder of the influent, and pH-adjusted influent flow is directed to the distribution tank which then diverts treated water to three parallel lagoon cell systems. The lagoon system consists of multiple cells operating in parallel (A, B, and C), where the A system is to the north and C system to the south. Each system consists of three unlined, open water cells. The primary purpose of the first cell is to allow the chemical reaction to occur, introduce additional carbon dioxide (CO_2) to the system, and to capture sediment and chemical precipitates.

A fourth series of smaller non-treatment cells (the D Cells) are located south of Lagoons A2 and A3. The D Cells act as hydraulic barriers between the treatment cells and Silver Bow Creek. The A Cells are separated by earthen berms with outlet structures containing manually adjustable stop log weir overflow structures (identified as OS-1, OS-5, and OS-7), while the cells within the B and C systems are separated by cobble berms. Control structures are installed in positions to allow diversion of flows from B3 (OS-2) and C3 (OS-3) Cells to the A Cells, the effluent pipeline, or to the D Cells, which allows for recirculation of the treated water. Typically, approximately one third of the influent flow is directed into the lagoon system (A, B, and C). Waters exiting at Cells B3 and C3 are combined, routed to the effluent pipeline to combine with

treated water coming out of Cell A3 or to Cell A2 for additional passive treatment and then discharged to Silver Bow Creek at the effluent station (EFS-07) or SS-1.

3.0 MONITORING

Influent and effluent water quality samples are typically collected using automated Teledyne ISCO samplers programmed to collect composite samples over a 24-hour period. Sample station locations referenced in this section are shown on Figure 1. Effluent water samples are collected twice weekly at the BTL effluent sampling station EFS-07 (SS-1). Influent waters are sampled weekly at the Influent Pump Station (IPS) INF-04 (SS-2). Field grab samples are collected monthly at station MSD-HCC (SS-3), where the collected subdrain flow discharges to the upper HCC. Samples are analyzed for total recoverable metals (aluminum, arsenic, cadmium, calcium, copper, iron, lead, magnesium, mercury, silver, uranium, zinc) and hardness. Also, alkalinity, total dissolved solids, total suspended solids, and nitrates/nitrites are measured monthly at the influent station INF-04 (SS-2), effluent station EFS-07 (SS-1), and MSD-HCC station (SS-3). One field blank sample (SS-4), one rinsate blank sample (SS-10), and one field duplicate sample (T) are collected monthly for quality control as described in the sampling and monitoring QAPP for the BTL Groundwater Treatment System (Atlantic Richfield Company, 2018)[1].

All required samples were collected and sent to Pace for analysis.

NOTE: Aluminum is the sole analyte in routine BTL monitoring, which is based off the dissolved fraction. Previous discussions with Agency representatives indicated that reporting the total recoverable aluminum data in quarterly and annual monitoring tasks was acceptable. As described in Section 5.0, System Performance, the aluminum standard is based on dissolved fraction, and reported values are provided as total recoverable. Values in appendices are compared to the aluminum chronic standard (87 microgram per liter [µg/L]) listed in the 2006 Record of Decision (ROD), Table 8-2, and the BPSOU CD Appendix D, Attachment A, Table 8-1 (EPA, 2020).

Field parameters are collected daily at many points within the system, and real-time data are collected by an automated monitoring system. Influent water pumped through the treatment system and effluent water discharged from the BTL are measured using electromagnetic flow meters located at INF-04 and EFS-07, respectively, and reported both as instantaneous (gallons per minute [gpm]) and totalized flow (gallons).

Analytical results are compared to "end of pipe" discharge standards listed in Table 8-1 in Appendix D Attachment A of the BPSOU CD (EPA, 2020). The DEQ-7 aquatic life standards for cadmium, copper, lead, silver, and zinc are dependent on effluent hardness with an upper limit of 400 mg/L calcium carbonate ($CaCO_3$). Hardness of BTL effluent is most commonly greater than 400 mg/L $CaCO_3$, resulting in a consistent maximum standard from sample to sample.

4.0 SYSTEM OPERATION

[1] A Quality Assurance Project Plan (QAPP) is being finalized at the time of this document submittal.

This section provides a summary of influent, lime addition, and effluent conditions from January 1 through December 31, 2021. The system was routinely operated in auto mode, which provided reliable system control and performance. Graphical representations of lime usage and system flows levels are provided in Appendix A.3.

4.1 Influent Conditions

Approximately 571 million gallons of water were pumped into the BTL facility via the IPS and measured at INF-04, compared to approximately 626 million gallons of influent pumped in 2020. Based on total flow volumes measured at inflow points during 2021, the average influent flow rate pumped to the BTL system was 1,067 gpm. The average daily flow ranged between 840 gpm and 1,371 gpm.

Dewatering associated with the Butte Reduction Works (BRW) step/drawdown test was routed to the BTL system for treatment on September 20 and 21, 2021.

4.2 Lime Addition

Lime usage, calculated on total lime dispensed via the gravimetric system, ranged between 42 and 138 mg/L with an average of 122 mg/L. The lime dose set point minimum was 115 mg/L, maximum was 130 mg/L, and most common was 125 mg/L. It should be noted that lime addition ceased for brief periods to accommodate general maintenance. Total lime use was approximately 285 tons compared to approximately 313 tons in 2020. Post-treatment pH is measured immediately after mixing at station INDC to confirm lime addition to the influent water meets the routine range for pH adjustment. This post-treatment pH ranged from 9.79 standard units (SU) to 10.77 SU with an average of 10.10 SU.

Inconsistent lime addition occurred during the weekend of February 13 and 14, 2021, when the lime feed system was inadvertently operated in “volumetric” mode for approximately 10 to 12 hours due to the WIN 911 dialer not functioning as intended to notify operators of a change in operational status. Appropriate notifications were made to the Atlantic Richfield PM and Agencies.
Information was also provided in the BTL Weekly Operations report on February 19, 2021, along with additional follow up e-mail correspondence in early March 2021.

Corrective actions taken following this event included the following:

- The WIN 911 Dialer was reconfigured to provide automated call out to site operations personnel for all priority 1 and 2 conditions.
- Functional testing and verification was completed to confirm that this change results in a call out to operators.
- Increased monitoring of the lagoons was performed immediately following the event.
- The RACO dialer was reactivated as a redundant call out system.

- An annual functional test of the WIN 911 dialer call out for "lime feeder off" will be performed to verify configuration and proper function of alarm priority call out.

4.3 Effluent Conditions

Effluent water from the BTL was monitored using the electromagnetic flow meter installed in the effluent discharge line. In 2021, approximately 474 million gallons of treated effluent water were discharged to Silver Bow Creek via the effluent discharge at EFS-07, compared to approximately 515 million gallons in 2020. Effluent flow, based on totalizer data, averaged 887 gpm during the monitoring period. Comparison of total influent and effluent flow, based on totalizer data at each location, indicates an average loss of 185 gpm during this period. Effluent loss is attributed to evaporative losses of the treatment cells and effective groundwater capture within Lower Area One (LAO) as well as recirculation from the drying beds during dredging operations, which recirculates to Cell D4 and ultimately back through the system. The CAS building main 14-inch influent flowmeter was replaced on December 1, 2021. Both of the IPS main 14-inch flowmeters were replaced on December 8 and December 15, 2021. These flowmeters are used to track the totalized influent flows, since the flowmeters have been replaced, it appears that the influent-effluent difference has decreased. These will continue to be tracked over the coming months and compared in the quarterly reports.

The maximum target pH for effluent discharge is 9.50 SU, as described in the BPSOU ROD (EPA, 2020). Effluent pH monitoring showed a range in pH from 9.08 SU to 9.49 SU, and an average of 9.30 SU. The maximum pH (9.50 SU) was not exceeded in 365 total measurements obtained in 2021, consistent with 0 exceedances in 2020. High pH is primarily a cold weather phenomenon due to the lagoons freezing over and limiting oxygenation and CO_2 gas exchange with the atmosphere. A permanent CO_2 addition system was installed to limit this increase in pH at the effluent station (EFS-07). The CO_2 addition system allows CO_2 to be added immediately downstream of the Cell A3 outlet structure (OS-7) and upstream of the effluent monitoring station (EFS-07). The CO_2 addition system consists of one 1,000-pound CO_2 storage tank complete with pressure gauge, regulator, internal vaporizing/pressure-building unit, and intra-connecting tubing; a CO_2 unloading station and fill box located near the Automatic Sampling Building; and a CO_2 discharge hosing and gas diffuser. CO2 addition ceased at EFS-07on April 1, 2021. Addition of CO_2 at this location resumed on December 14, 2021, with the initial addition rate set at 5 cubic feet per hour (cfh).

4.4 Subdrain Pump Station Conditions

Approximately 232 million gallons of water were pumped into the BTL facility via the subdrain Pump Station. Based on total flow volumes measured at the discharge point, the average flow rate pumped to the BTL system was 435 gpm.

The average water level at this station was 45.27 inches above the bottom of the main chamber in the wet vault (5,432.20 feet above mean sea level [amsl] National Geodetic Vertical Datum of 1929 [NGVD29]). This is equal to a water elevation of 5,435.97 feet (amsl-NGVD29). The minimum and maximum water levels at this station were 5,435.79 feet and 5,437.83 feet (amsl-

NGVD29), respectively. The invert of the perforated subdrain pipe at the vault inlet is at an elevation of 5,436.68 feet (amsl-NGVD29).

The subdrain pumps were operated in "auto" mode to maintain a constant vault level during most of the year. The diesel-engine powered Godwin pump was used during jetting/pigging activities and routine maintenance activities for short periods to maintain the level in the wet vault below the invert of the subdrain. The flow readings for all pumping activities were recorded from the Rosemont flow meters located near the discharge into the HCC in the BRW area.

Dewatering associated with the Northside Tailings (NST) pumping test was routed through the subdrain vault to the BTL system for treatment from March 8 to March 10, 2021.

4.5 West Camp Pump Station Conditions

Approximately 90 million gallons of water were pumped into the BTL facility via the WCP-1. Based on total flow volumes measured at the WCP-1 flow meter, the average flow rate pumped to the BTL system was 169 gpm.

The WCP-1 station was intentionally shut down on four isolated occasions during 2021.

One planned shutdown was performed to manage increased influent flow to Cell D4 due to precipitation events that occurred on August 1, 2021.

The WCP-1 station was intentionally shut down on three occasions in December (December 1, 7 and 15) to decrease influent flows while replacing the CAS and IPS flowmeters.

The WCP-1 station experienced a unintentional pumping outage due to a power spike that occurred on August 8, 2021, resulting in pump fault and shutdown. The on-call operator restored pump operations within 30 minutes of notification of the occurrence.

The average water elevation at this station was 5,421.47 feet (amsl -NAVD29). The minimum and maximum water levels at this station were 5,420.80 feet and 5,422.49 feet (amsl-NAVD29), respectively.

5.0 SYSTEM PERFORMANCE

The Compliance Comparison Report, provided as Appendix A, presents a summary DMR and water quality graphics for the contaminants of concern (COCs) total recoverable (arsenic, cadmium, copper, iron, lead, mercury, and silver) concentrations.

Of the BTL effluent samples collected, none exhibited exceedances of DEQ-7 water quality standards (DEQ, 2006; described in Section 5.0) for aluminum, copper, iron, lead, mercury, silver, or zinc during this reporting period. Aluminum is the sole analyte in routine BTL monitoring which is based off the dissolved fraction. As previously described, prior discussions

with Agency representatives indicated reporting total recoverable aluminum in quarterly and annual monitoring data is acceptable. As a result, aluminum values provided in routine reporting are shown as total recoverable aluminum and compared to the dissolved aluminum standard. All reported total recoverable aluminum values are below the dissolved standard. In the event the total recoverable value exceeds the dissolved standard, additional analysis would be performed on the dissolved sample to provide dissolved fraction present in the sample. The results of the dissolved fraction analysis would then be reported and compared to the dissolved standard.

One sample result (LAO-SS-1-021521) was reported above the standard of 0.00076 mg/L for cadmium. Ten results for arsenic were reported above the Human Heath standard of 0.010 mg/L throughout 2021. Two samples in April (LAO-SS-1-041221 and LAO-SS-1-041921), both with reported results of 0.011 mg/L. Eight additional samples were reported throughout the year in September, October, and November. Sample IDs for these occurrences are provided as LAO-SS-1-093021, LAO-SS-1-100421, LAO-SS-1-100721, LAO-SS-1-101121, LAO-SS-1-101421, LAO-SS-1-101821, LAO-SS-1-102121, LAO-SS-1-110121), all with a reported value of 0.011 mg/L.

Email notification was sent to the Atlantic Richfield Project Manager (PM) and the Agencies on April 27, 2021, in response to the reported elevated arsenic results on April 12 and 19, 2021. A brief summary of operational activities prior to the reported arsenic results above standard (Table 8-1) was also provided.

Email notification was sent to the Atlantic Richfield PM and the Agencies on October19, 2021, in response to the reported elevated arsenic results during October. A summary of operational activities prior to the reported arsenic results above standard (Table 8-1) and corrective actions taken were also provided.

The following steps were taken in response to the above arsenic reported above standard (Table 8-1).

- The operations team reviewed the available operating data for the periods that the recent reported arsenic values were above standard (Table 8-1) (spring and fall of 2021), including the spring/fall dredging events. The 2022 spring dredging activities will also be pushed back to the first or second week in May if lagoon conditions/capacity will allow. This is intended to determine if dredging activities contributed to the elevated arsenic levels at EFS-07.
- During this period, fewer maintenance activities will be performed in parallel, and the timing of the dredging activities will be distinctly separated from other maintenance such as subdrain jetting.
- Additional longer-term operating trends and performance records are currently being reviewed and compared to operating changes and other factors that may have occurred over the last five years.
- Additional samples were collected from within the lagoons, HCC, BRW-01W and WCP, and field arsenic tests and additional parameters were monitored during the September to November 2021 timeframe.

The preventative steps bulleted above were implemented in 2021 and continued into 2022. Effluent samples will continue to be routinely monitored through the Spring 2022 as described in the BTL QAPP. If effluent samples continue to trend above discharge standard values, a field sampling plan will be developed and provided for Agency review to describe additional sampling and monitoring parameters. If effluent sample results do not exceed discharge standards, routine sampling and monitoring will continue to be performed as described in the BTL QAPP.

As recommended in the Agency comments to the Q4 BTL OM&M report, a forthcoming technical memo summarizing any findings related to the reported elevated arsenic values during the spring/fall of 2021 will be provided for Agency review. This document is anticipated to be available in late 2022.

Of the 365 pH measurements collected at the effluent station (EFS-07), none exceeded the maximum discharge pH value of 9.50 SU, which indicates the target pH value was achieved consistently through system operation. The target pH was achieved in 100% of the samples in 2021. Additional statistics regarding water quality samples are provided in Appendix A.

All mercury concentrations were detected below the human health standard of 0.00005 mg/L. Out of 104 mercury values, 68 were flagged as non-detect (U), meaning compounds were analyzed for but not detected.
All silver concentrations were detected below the hardness-corrected acute aquatic standard. Out of 104 silver values 101 were flagged as non-detect (U), meaning compounds were analyzed for but not detected. Out of 104 aluminum total recoverable results 44 were flagged as non-detect (U), meaning compounds were analyzed for but not detected. These results were recorded as the sample detection limit or "*the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte*." Exceedance information and COC statistics are shown in the DMR form provided in Appendix A.1. Validated final data were provided in the 2021 quarterly reports.

All BTL O&M data (event logs and field data summary) were provided electronically with each of the 2021 quarterly reports (listed previously in Section 1.0). The data include chemistry, flow rates, and other manually collected field parameters. Note that an "event" can be described as any situation or occurrence that is out of routine system operating conditions or causes increased operator awareness. Events are logged to provide additional information that contributes to a change of site operating conditions. Events are logged at the discretion of operations personnel.

6.0 MAINTENANCE SUMMARY

This section summarizes major maintenance activities completed. Daily maintenance activities described under routine operations are recorded on daily checklists and are available upon request.

6.1 Dredging and Sludge Removal

Dredging operations to remove sludge accumulations from the primary cells (A1, B1, and C1) at BTL were completed once in the spring and once in the fall. The first dredging operation began on April 7, 2021, in Lagoon Cell A1, continued in Lagoon Cell B1, and finished in Lagoon Cell C1 on May 5, 2021. The second dredging operation began on September 16 in Lagoon Cell A1, continued in Lagoon Cell B1, and finished in Lagoon Cell C1 on October 27, 2021. Additional time and effort were expended in each lagoon cell to clean accumulated sludge from around the silt curtains in cells A1, B1, and C1. Approximately 1,800 cubic yards of dried sludge were hauled from the drying bed located in the BRW area to the Mine Waste Repository.

Additional sludge removal was completed in cell D4 from May 17, through June 2, 2021.

6.2 Subdrain Jetting

Following the procedures outlined in BTL-SOP-20, jetting of the subdrain was completed using the new Warthog jet nozzle on two specific occasions. The first event, performed on June15 and 16, 2021, consisted of jetting the subdrain from MSD-MH116 to MSD-MH106. The second event, performed on October 12 and 13, 2021, consisted of jetting the subdrain from manhole MH-MSD-116 to MH-MSD106 (manhole locations are shown on Figure 1).

Operators observed an increase in water level in MH-MSD-110 during monthly sampling of the subdrain on January 19, 2021. A subdrain jetting event was completed on Thursday January 28, 2021, on the lower section from MH-MSD-110 down to MH-MSD-106 near the vault in response to this observation.

6.3 Subdrain Video Inspection

A video camera inspection of the subdrain was completed following the fall jetting event completed in October 2021. The post-jetting video inspection was completed from MSD-MH106 to MSD-MH116 on October 21 and 22, 2021.

Manholes MH-MSD106, 108, 110, 113, and 116 were inspected on October 21 and October 22, 2021, after jetting. At each manhole, Hunter Brothers, Inc. used a pipe inspection camera to inspect the subdrain and provide a video record of the inside of the 10-inch polyvinyl chloride (PVC) slotted pipe. During the inspection, operators stopped advancing the camera approximately every 50 feet and panned the camera 360 degrees around the pipe following each section of the perforation from directly in front of the camera to approximately 10 feet forward. This process was repeated throughout the inspection process. Still photographs and inspection notes are provided in Appendix B. Note that the video files are not included with this document but can be made available upon request.

Based on the results of this video inspection, the following recommendations are provided:

> Continue biannual jetting activities using the updated jetting procedures that specify additional passes, higher jetting pressures, and slower retrieval rate during jetting as

recommended in the 2018 report (Atlantic Richfield Company, 2018). This would ensure multiple passes along identified problem areas above MH-MSD108 from 480 feet to 580 feet and from approximately 470 feet above MH-MSD110. The jetting SOP has been updated to include that additional hose will be added during the jetting process to ensure adequate overlap during jetting between manholes with distances greater than 1,000 feet between them.

Continue to use the Warthog jet nozzle for future jetting events. The new Warthog nozzle appears to clean the perforations much better than the previous nozzles used.

6.4 Subdrain Pump System Pipe Pigging

Site operators completed pipe pigging activities on both pump system discharge pipe systems twice in 2021 per BTL-SOP-21. Pigging was coincident with jetting operations previously described. The first event was performed on June17 and the second was performed on October 14, 2021. Pigging successfully reduced pump discharge pressure from 45 pounds per square inch (psi) to approximately 9 to 12 psi. This reduction was similar for each pigging event.

6.5 Carbon Dioxide Addition

Carbon dioxide is added to effluent during winter months and freezing conditions per BTL-SOP-45-CO2. It is added to limit an increase in pH at the effluent station (EFS-07) due to reduced gas exchange of lagoon cells under ice-forming conditions.

In 2021, the CO_2 was added at a variable flow rate of approximately 5 cfh minimum to 15 cfh maximum from January 1 through April 1, 2021. The CO_2 addition was discontinued on April 1, 2021, due to warming atmospheric conditions and melting of ice coverage on the lagoon cells. The CO_2 addition began again December 14, 2021, at a rate of approximately 5 cfh and continued through the remainder of 2021.

6.6 Inspection and Maintenance Activities

Visual inspections for general component integrity occurred quarterly. The intent of the inspections was to deliberately look for signs and indicators of damage, malfunction, degradation, serious corrosion, and other conditions that could threaten the integrity of the equipment, system housing, and system appurtenances. Site operators completed daily, weekly, and monthly system inspection checklists to document the assessments and findings for each system.

Operators completed site overview inspections each quarter. These inspections typically included visually inspecting system components and comparing them to originally installed equipment to detect deterioration or other issues that must be corrected soon. Key system devices and alarm set points were also verified during quarterly inspections to confirm alarm functionality at the appropriate value. Field set points were verified with set points provided on system documents such as piping and instrumentation diagrams and cause and effect tables.

Valves equipped with a carseal device were inspected during routine inspections to ensure carseals remained in place and valves were aligned appropriately. Inspecting carseal valves requires the operator to verify that the carseal number in the field matches the number recorded on the carseal register and ensuring the device is in good condition.

Each quarterly inspection also included valve cycling to ensure that all site valves were operable. Valve cycling requires the operator to fully open and fully close all manually actuated valves and verify valve function. Also, level transducer elevations are verified (BTL-SOP-39 Transducer Maintenance and Verification) to a known elevation and readjusted as needed.

During 2021, the following additional maintenance tasks were completed:

- Annual maintenance and load bank testing was completed for the on-site backup generators located at the IPS, WCP, subdrain vault, and the CAS by TW Enterprises, Inc. technicians.
- Operators completed annual maintenance for the compressed air system air compressors located in the operations building as well as completing maintenance and inspections of the on-site crane/hoists.
- Operators downloaded data monthly from the subdrain area-velocity (AV) flow meters and completed semi-annual maintenance on the meters.
- Colbert Electric installed security cameras at the IPS, WCP, CAS building, BRW area and BPSOU vault pumping stations.
- Colbert Electric also completed upgrades to both interior and exterior lighting to improve nighttime visibility and energy usage at all locations within BTL/LAO.
- The subdrain vault north Ampco pump was replaced with the spare pump and the in-use north pump was refurbished and placed in spare inventory.
- The subdrain vault south Ampco pump was replaced with the spare pump on November 1, 2021, and the in-use south pump was refurbished.
- Xylem technicians completed annual inspections and maintenance for both IPS pumps (model CD225 electric centrifugal pumps). Both IPS pumps wet ends and bearing assemblies were rebuilt and reinstalled.
- Water associated with the NST pumping test was routed through the BTL system for treatment from March 8 through 10, 2021. Water was also routed for treatment from the BRW step drawdown test from September 20 through the 21, 2021.
- Hunter Bros. Inc completed jetting of the BTL lagoon effluent lines on September 16, 2021.
- JCI replaced both 14-inch flowmeters at the IPS and the 14-inch flowmeter located in the CAS.
- JCI cleaned the upper section of the HCC from approximately HCC-02 to the discharge of the BPSOU subdrain using an excavator in the fall of 2021.

6.7 Vegetation Maintenance Activities

Minor vegetative maintenance occurred due to minor erosion and construction activities on the BTL/LAO site. Weed spraying occurred at LAO and WCP-1 from July 26 through August 5, 2021, along the flood control dike (FCD) from the BRW area south of BRW-00 and continued west to the end of the FCD at the southwest corner of Cell D4. Additional weed spraying was completed from the LAO west entrance to the area near Silver Bow Creek at approximately SS-

07. Weed spraying at WCP-1 was limited to areas north of the pump station control building and south along Centennial Avenue (Figure 2).

Cattails and willows were cut and removed from the Upper Silver Bow Creek channel near the subdrain vault to allow unrestricted flow in the channel during stormflow.

Willows that had been previously sprayed and killed were removed from the BTL interior dike slopes and hauled to the landfill.

7.0 CONCLUSION

The BTL system performed effectively through the reporting period, and operators continued to optimize treatment.

7.1 System Operation

Influent flow decreased by approximately 55 million gallons compared to 2020 (from 626 million gallons in 2020 to 571 million gallons in 2021), and lime used for treatment decreased by approximately 28 tons (313 tons in 2020 to 285 tons in 2021). In 2020, the gross annual dosage of lime was approximately 120 mg/L, calculated using total annual influent flow and total annual lime usage; in 2021, the gross annual dosage of lime was approximately 122 mg/L.

All required OM&M tasks were completed on schedule and entered into the MMS tracking system as complete. Quarterly site inspections which include both visual and functional evaluation of critical components were completed during each quarter of 2021. Valve cycling and transducer verifications were also completed during the quarterly inspections.

Critical components of the treatment system continue to be evaluated and replaced per manufacturer “end of life” recommendations. These include flowmeters, SCADA components, software, valves, and other wear items.

8.0 REFERENCES

AERL, 2000. Clark Fork River Superfund Site Investigations (CFRSSI) Data Management/Data Validation (DM/DV) Plan Addendum. Prepared for ARCO by Exponent, Lake Oswego, Oregon. June 2000.

ARCO, 1992a. Clark Fork River Superfund Site Investigation (CFRSSI) Data Management/Data Validation Plan, PTI Environmental Services, Contract C 117-06-64. April 1992.

ARCO, 1992b. Clark Fork River Superfund Site Investigations (CFRSSI) Quality Assurance Project Plan (QAPP). Prepared for ARCO by PTI Environmental Services, Bellevue, Washington. May 1992.

Atlantic Richfield Company, 2021a. Revised Draft Final Butte Treatment Lagoons (BTL) Groundwater Treatment System Routine Operations, Maintenance, and Monitoring (OM&M) Plan. Atlantic Richfield Company. May 27, 2016.

Atlantic Richfield Company, 2018. Revised Draft Final Butte Treatment Lagoons Groundwater Treatment System and MSD Sub-Drain Sampling and Monitoring Quality Assurance Project Plan (QAPP). October 31, 2018.

DEQ, 2006 Circular DEQ-7 Montana Numeric Water Quality Standards. Montana Department of Environmental Quality. February 2006.

EPA, 2020. Consent Decree for the Butte Priority Soils Operable Unit. Partial Remedial Design/Remedial Action and Operation and Maintenance. U.S. Environmental Protection Agency. February 13, 2020. Available at https://www.co.silverbow.mt.us/2161/ButtePriority-Soils-Operable-Unit-Conse. Includes the Butte Priority Soils Operable Unit Silver Bow Creek/Butte NPL Site 2006 Record of Decision, 2011 Explanation of Significant Differences to the 2006 Record of Decision, and 2020 Record of Decision Amendment as Appendix A.

EPA, 2011. Unilateral Administrative Order for the Partial Remedial Design/Remedial Action Implementation and Certain Operation and Maintenance at the Butte Priority Soils Operable Unit/Butte Site; EPA Docket No. CERCLA-08-2011-0011. U. S. Environmental Protection Agency, 2011.

Figures

Point Table			Point Table		
Description	Northing	Easting	Description	Northing	Easting
MH-MSD106	651209.02	1197905.47	HCC-01	651325.00	1193749.26
MH-MSD108	651265.29	1198781.03	HCC-01A	651326.53	1193021.75
MH-MSD110	651503.81	1199850.85	HCC-01B	651331.65	1192933.79
MH-MSD113	652414.06	1200906.31	HCC-02A	651364.64	1192780.84
MH-MSD116	653236.82	1201858.01	HCC-03	651895.05	1192245.96
MSD-HCC	651600.21	1194949.19	HCC-03A	651940.66	1192156.74
MSD-OUT	651324.20	1197083.50	HCC-04	652072.94	1191792.43
A1	651838.45	1192164.94	HCC-04A	652097.11	1191743.43
A2	651931.22	1191690.21	HCC-05	652280.66	1191254.87
A3	652055.47	1191180.80	HCC-05A	652303.23	1191210.43
B1	651484.14	1192551.84	HCC-06	652343.18	1191051.80
B2	651657.02	1192233.20	HCC-06A	652355.78	1191012.56
B3	651702.08	1192096.79	HCC-07	652188.07	1190724.00
C1	651464.96	1192558.36	INDC	651511.64	1192604.67
C3	651541.57	1192046.18	INF04	651457.40	1192637.70
			EFS-07	651925.98	1191093.47

LEGEND:

- BTL ANALYTICAL SAMPLE COLLECTION
- SUBDRAIN LOADING - FLOW WATER LEVEL, FIELD PARAMETERS. ANALYTICAL SAMPLES
- BTL FIELD DATA - LEVEL
- HCC STAFF GAUGE LOCATIONS
- BTL FIELD DATA- pH, TEMP, CONDUCTIVITY
- INDC

DISPLAYED AS:
COORD SYS/ZONE: MSP
DATUM: NAD 83
UNITS: FEET
SOURCE: PIONEER

SCALE IN FEET
0 100 200

FIGURE 1

BTL AND BPSOU SUBDRAIN ROUTINE SAMPLE AND MONITORING LOCATIONS

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

DATE: 2/2019

LEGEND:

KNAPWEED

N

DISPLAYED AS:
COORD SYS/ZONE: MONTANA STATE PLANE
DATUM: NAD 83
UNITS: FEET
SOURCE: PIONEER

SCALE IN FEET
0 NTS NTS

FIGURE 2

BUTTE TREATMENT LAGOONS WEED SPRAYING

PIONEER TECHNICAL SERVICES, INC.
307 E. PARK AVE., SUITE 421
ANACONDA, MONTANA 59711
(406) 563-9371

DATE:3/2/2016

3/14/2017 2:42:01 PM P:\ARCO\BPSOU\BTL-LAO\WEED SPRAYING 2015.DWG

Appendix A
Compliance Comparison

Appendix A.1
Discharge Monitoring Reports

SUMMARY OF ANALYTICAL RESULTS FOR EFS-07. Annual 2021				
COC	**LOW**	**AVG**	**HIGH**	**EXCURSIONS**
ARSENIC (mg/l)	0.0042	0.0065	0.0110	10 out of 104
CADMIUM (mg/l)	0.00009	0.00025	0.00080	1 out of 104
COPPER (mg/l)	0.0060	0.0136	0.0290	0 out of 104
IRON (mg/l)	0.012	0.030	0.130	0 out of 104
LEAD (mg/l)	0.00003	0.00032	0.00130	0 out of 104
MERCURY (mg/l)	0.000005	0.000006	0.000045	0 out of 104
SILVER (mg/l)	0.00008	0.00012	0.00018	0 out of 104
ALUMINUM (mg/l)	0.007	0.012	0.051	0 out of 104
ZINC (mg/l)	0.021	0.071	0.180	0 out of 104
pH (SU)	9.18	9.34	9.48	0 out of 365
HARDNESS (mg/l)	339	386	400	n/a

DISCHARGE MONITORING REPORT FORM

Name:	Atlantic Richfield Company
Address:	317 Anaconda Road
	Butte, MT 59701
Facility:	Butte Treatment Lagoons
Location:	Butte, Montana

Discharge Number
EFS-07
Comparison to ROD Standards

MONITORING PERIOD						
YEAR	MO	DAY		YEAR	MO	DAY
2021	**1**	**1**	to	**2021**	**12**	**31**

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	QUANTITY OR LOADING UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	QUALITY OR CONCENTRATION UNITS	NO. EX	FREQUENCY OF ANALYSES	SAMPLE TYPE
ARSENIC (Total)	SAMPLE MEASUREMENT	NA	NA		**0.0042**	**0.0065**	**0.0110**		**10/104**	**2/7**	**COMP**
	DISCHARGE STANDARD	NA	NA	NA	0.010 Daily Min		0.010 Daily Max	mg/l		Twice/Week	ISCO
CADMIUM *	SAMPLE MEASUREMENT	NA	NA	NA	**0.00009**	**0.00025**	**0.00080**		**1/104**	**2/7**	**COMP**
	DISCHARGE * STANDARD	NA	NA	NA	0.00067 Daily Min		0.00076 Daily Max	mg/l		Twice/Week	ISCO
COPPER *	SAMPLE MEASUREMENT	NA	NA	NA	**0.0060**	**0.0136**	**0.0290**		**0/104**	**2/7**	**COMP**
	DISCHARGE STANDARD	NA	NA	NA	0.0265 Daily Min		0.0305 Daily Max	mg/l		Twice/Week	ISCO
IRON	SAMPLE MEASUREMENT	NA	NA	NA	**0.012**	**0.030**	**0.130**		**0/104**	**2/7**	**COMP**
	DISCHARGE STANDARD	NA	NA	NA	1.0 Daily Min		1.0 Daily Max	mg/l		Twice/Week	ISCO
LEAD *	SAMPLE MEASUREMENT	NA	NA	NA	**0.00003**	**0.00032**	**0.00130**		**0/104**	**2/7**	**COMP**
	DISCHARGE * STANDARD	NA	NA	NA	0.015 Daily Min	0.015 HH	0.015 Daily Max	mg/l		Twice/Week	ISCO
MERCURY	SAMPLE MEASUREMENT	NA	NA	NA	**0.000005**	**0.000006**	**0.000045**		**0/104**	**2/7**	**COMP**
	DISCHARGE STANDARD	NA	NA	NA	Daily Min	0.00005 HH	Daily Max	mg/l		Twice/Week	ISCO
SILVER*	SAMPLE MEASUREMENT	NA	NA	NA	**0.00008**	**0.00012**	**0.00018**		**0/104**	**2/7**	**COMP**
	DISCHARGE STANDARD	NA	NA	NA	0.033 Daily Min		0.044 Daily Max	mg/l		Twice/week	ISCO

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachements here)

* Values are hardness corrected.

Reported total recoverable values for aluminum are compared to the chronic dissolved standard of 0.087 mg/L.
Mercury Reporting limit is 0.00005 mg/L, the detection limit is 0.0000047 mg/L.

DISCHARGE MONITORING REPORT FORM

Name: Atlantic Richfield Company								Discharge Number		
Address: 317 Anaconda Road								**EFS-07**		
Butte, MT 59701								Comparison to ROD Standards		
			MONITORING PERIOD							
Facility: Butte Treatment Lagoons			YEAR	MO	DAY		YEAR	MO	DAY	
Location: Butte, Montana		from	**2021**	**1**	**1**	to	**2021**	**12**	**31**	

PARAMETER		QUANTITY OR LOADING AVERAGE	QUANTITY OR LOADING MAXIMUM	QUANTITY OR LOADING UNITS	QUALITY OR CONCENTRATION MINIMUM	QUALITY OR CONCENTRATION AVERAGE	QUALITY OR CONCENTRATION MAXIMUM	QUALITY OR CONCENTRATION UNITS	NO. EX	FREQUENCY OF ANALYSES	SAMPLE TYPE
ALUMINUM	SAMPLE MEASUREMENT	NA	NA		**0.007**	**0.012**	**0.051**		**0/104**	**2/7**	**COMP**
	DISCHARGE STANDARD	NA	NA	NA	0.087 Daily Min		0.087 Daily Max	mg/l		Twice/Week	ISCO
ZINC *	SAMPLE MEASUREMENT	NA	NA	NA	**0.021**	**0.071**	**0.180**		**0/104**	**2/7**	**COMP**
	DISCHARGE * STANDARD	NA	NA	NA	0.337 Daily Min		0.388 Daily Max	mg/l		Twice/Week	ISCO
pH	SAMPLE MEASUREMENT	NA	NA	NA	**9.18**	**9.34**	**9.48**		**0/365**	**7/7**	**INST**
	DISCHARGE STANDARD	NA	NA	NA	6.5 Daily Min		9.5 Daily Max	NA		Daily	Instan.
HARDNESS	SAMPLE MEASUREMENT	NA	NA	NA	**339**	**386**	**400**		**N/A**	**2/7**	**COMP**
	DISCHARGE STANDARD	NA	NA	NA	Daily Min		Daily Max	mg/l		Twice/Week	ISCO

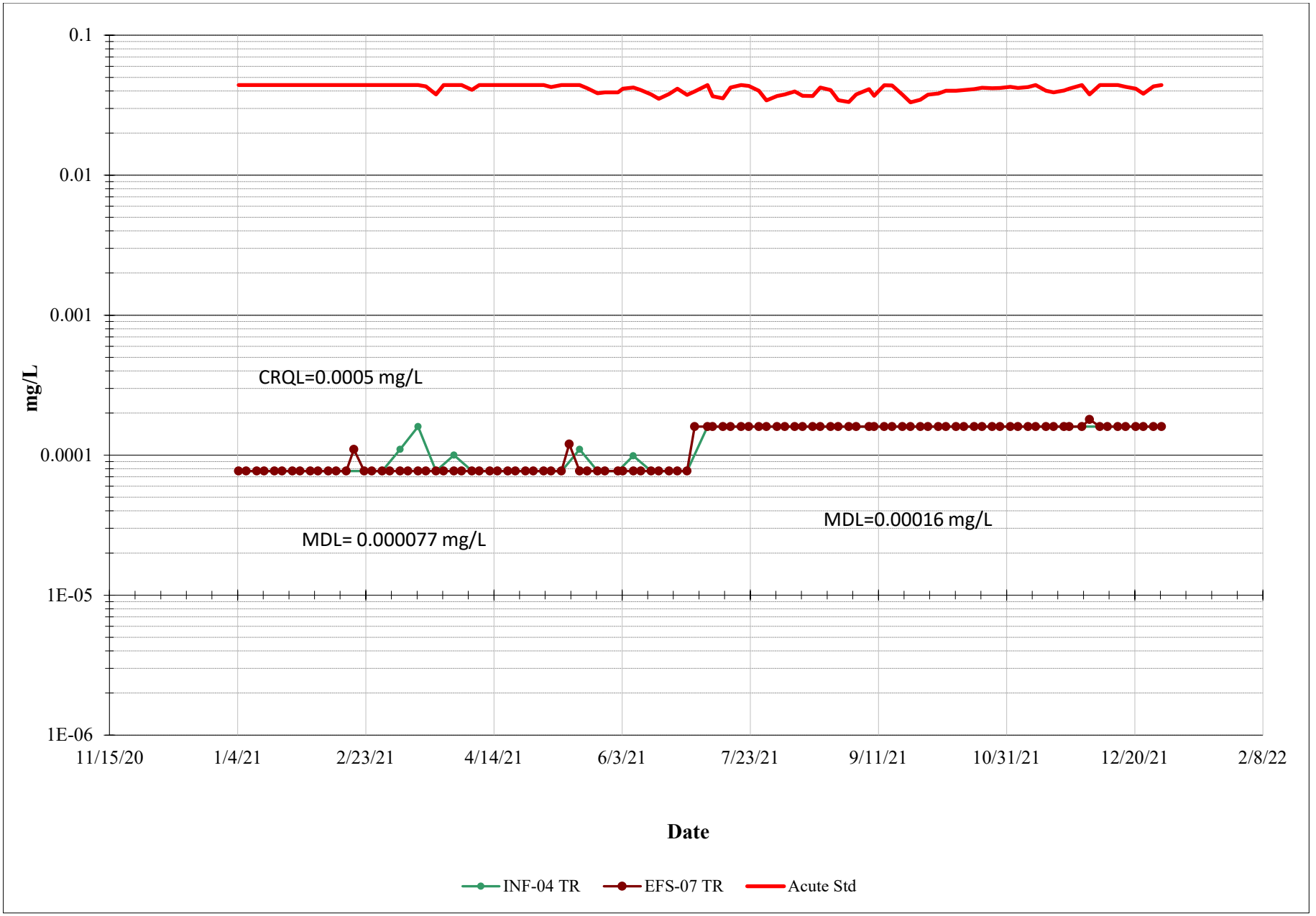
COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachements here)

* Values are hardness corrected.

Reported total recoverable values for aluminum are compared to the chronic dissolved standard of 0.087 mg/L.
Mercury Reporting limit is 0.00005 mg/L, the detection limit is 0.0000047 mg/L.

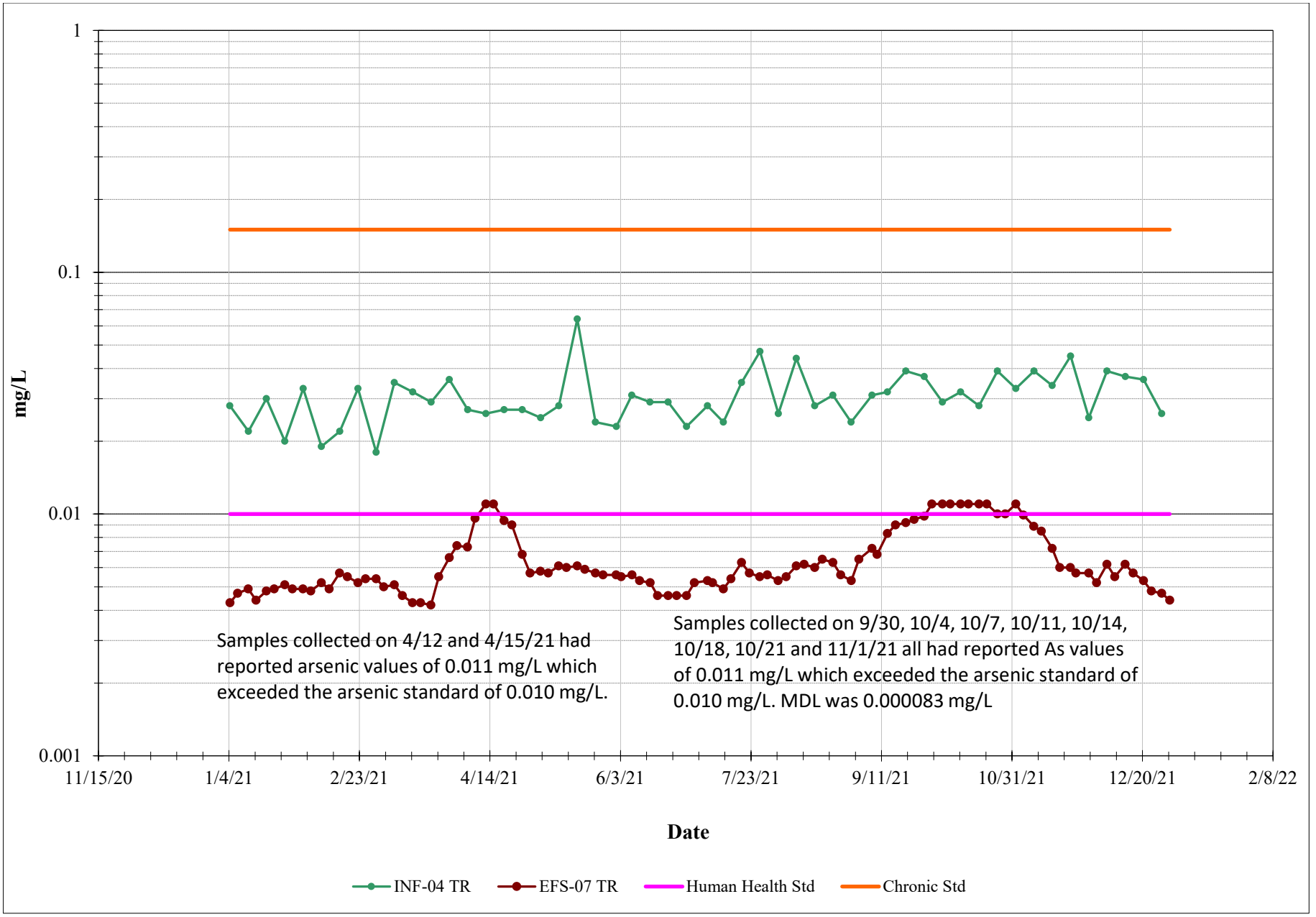
Appendix A.2
Analytical Laboratory Results Graphs

Butte Treatment Lagoon System
Silver Concentration- Final



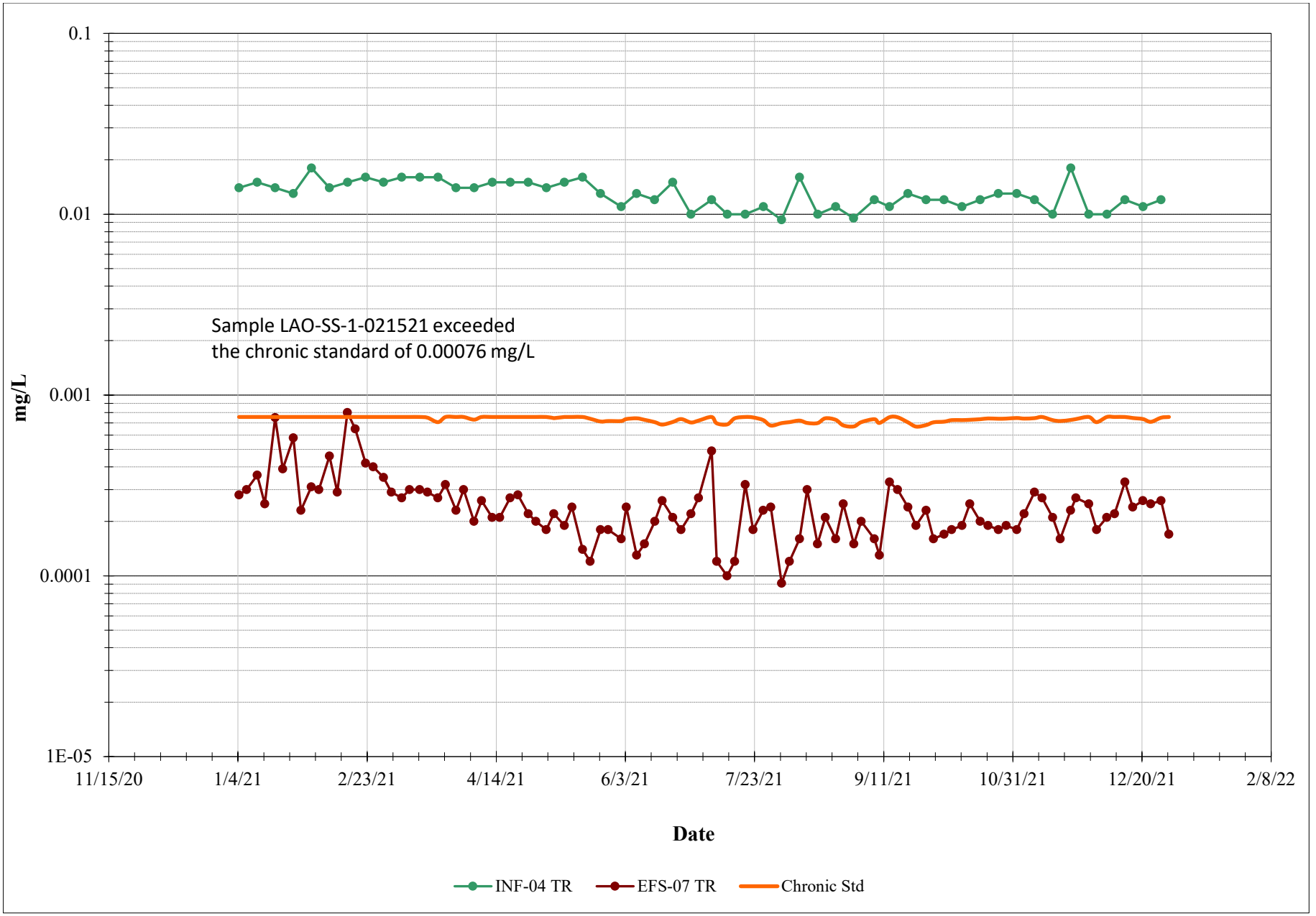
Silver maximum standard is DEQ-7 Acute Aquatic standard calculated based on effluent (EFS-07) hardness.

Butte Treatment Lagoon System
Arsenic Concentration- Final



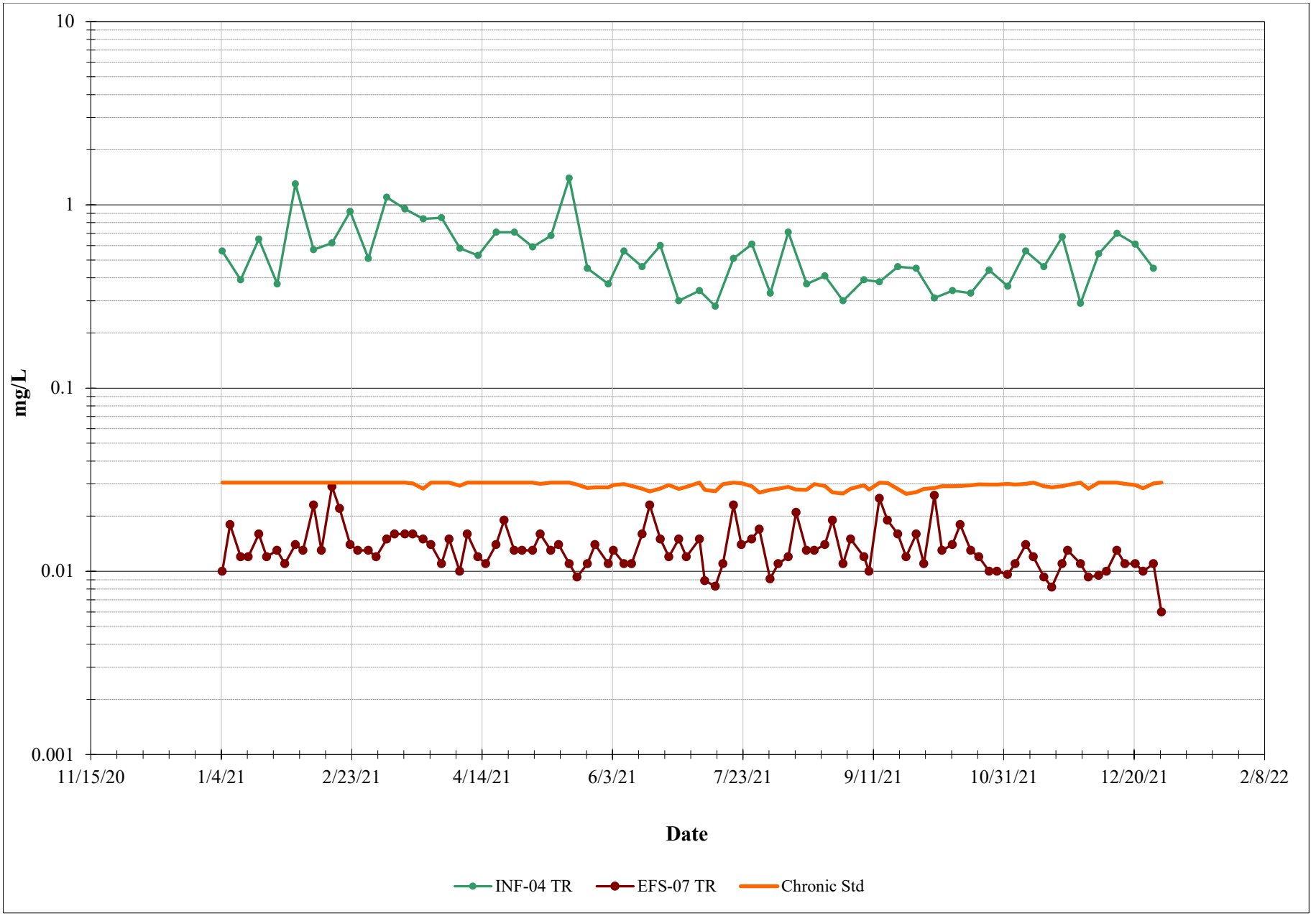
Arsenic maximum standard is DEQ-7 Human Heath standard.

Butte Treatment Lagoon System
Cadmium Concentration- Final



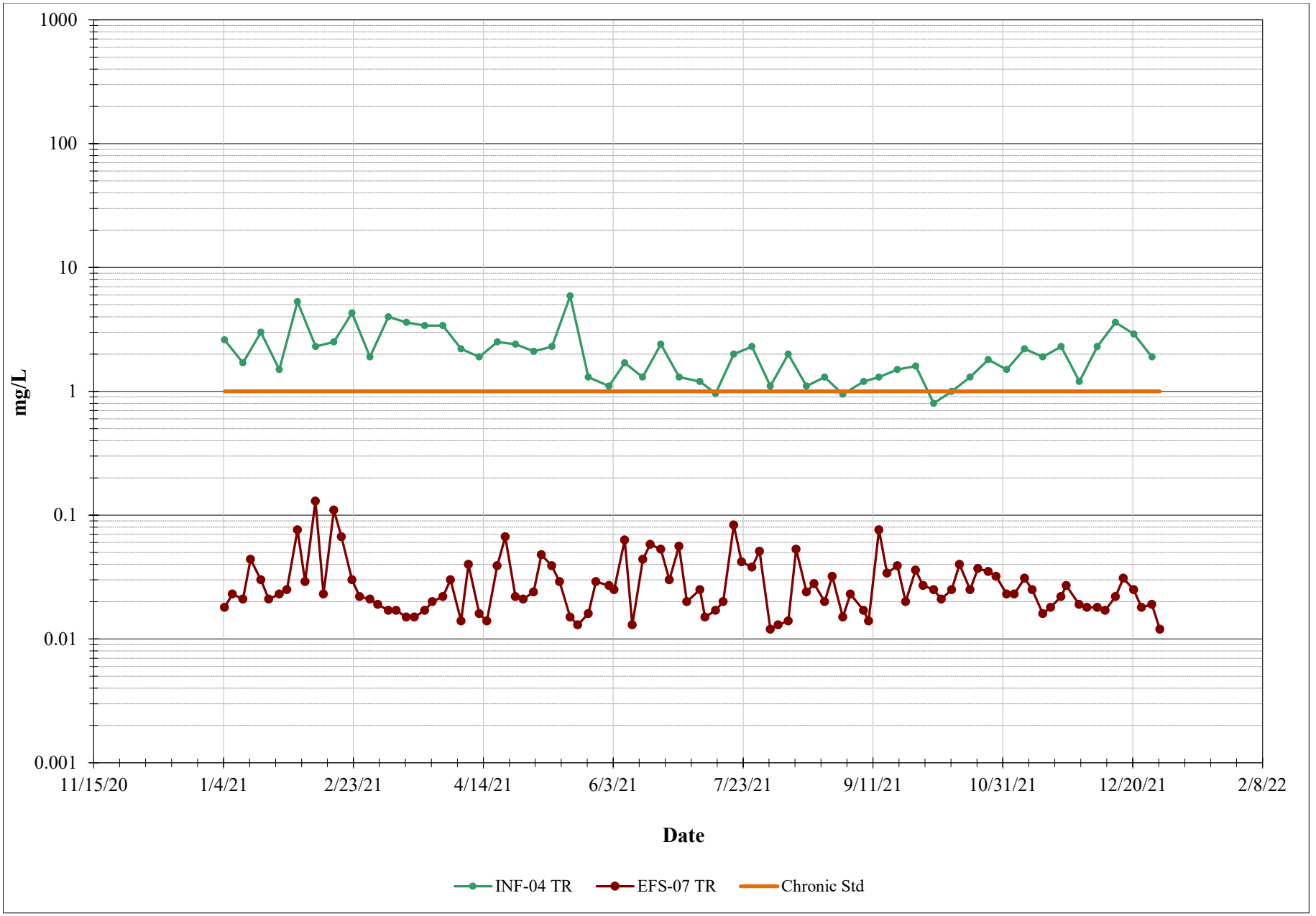
Cadmium maximum standard is DEQ-7 Chronic Aquatic standard calculated based on effluent (EFS-07) hardness.

Butte Treatment Lagoon System
Copper Concentration- Final



Copper maximum standard is DEQ-7 Chronic Aquatic standard calculated based on effluent (EFS-07) hardness.

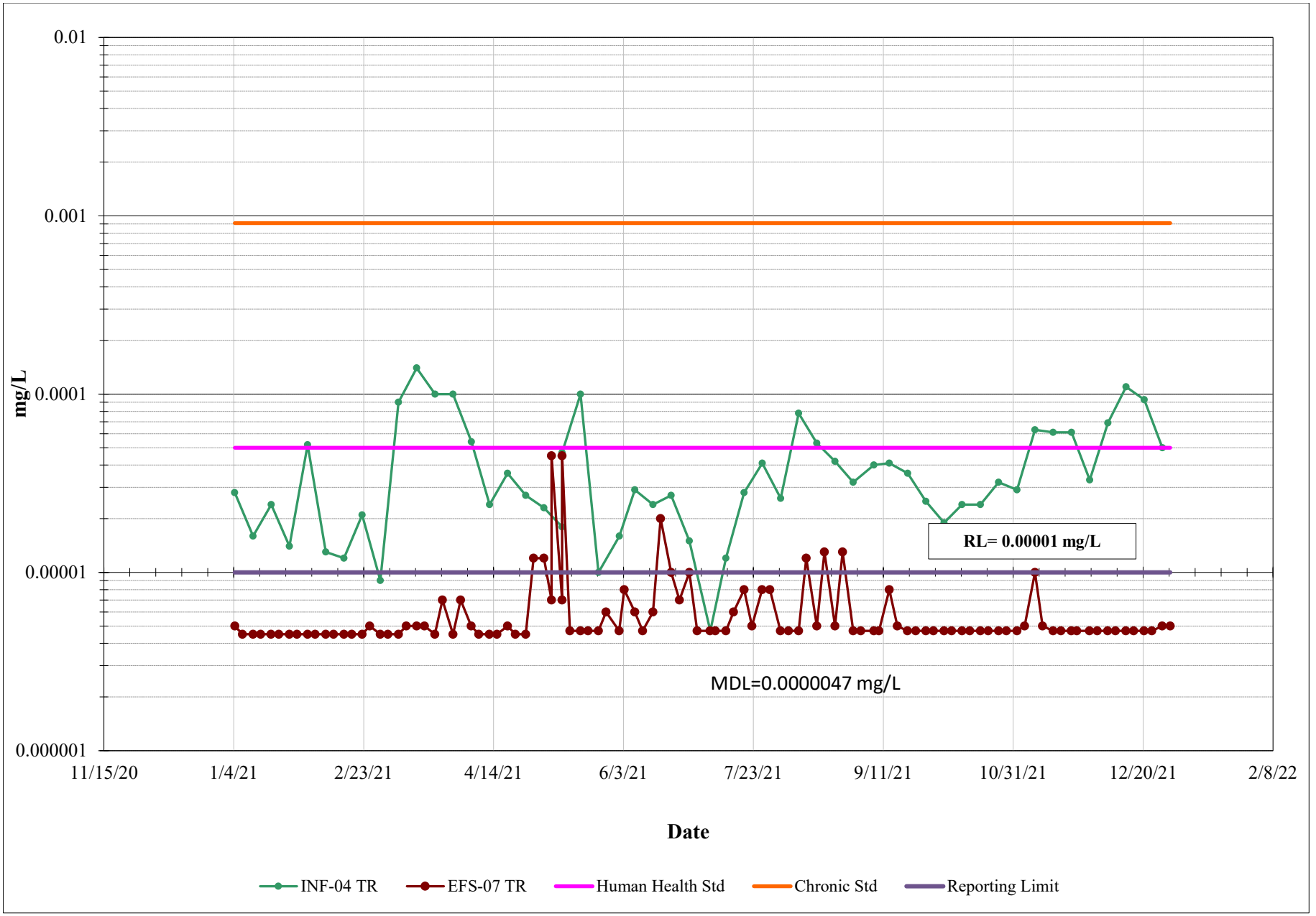
Butte Treatment Lagoon System
Iron Concentration- Final



Iron maximum standard is DEQ-7 Chronic Aquatic standard, Non-priority Pollutant value, 1.0 mg/L.

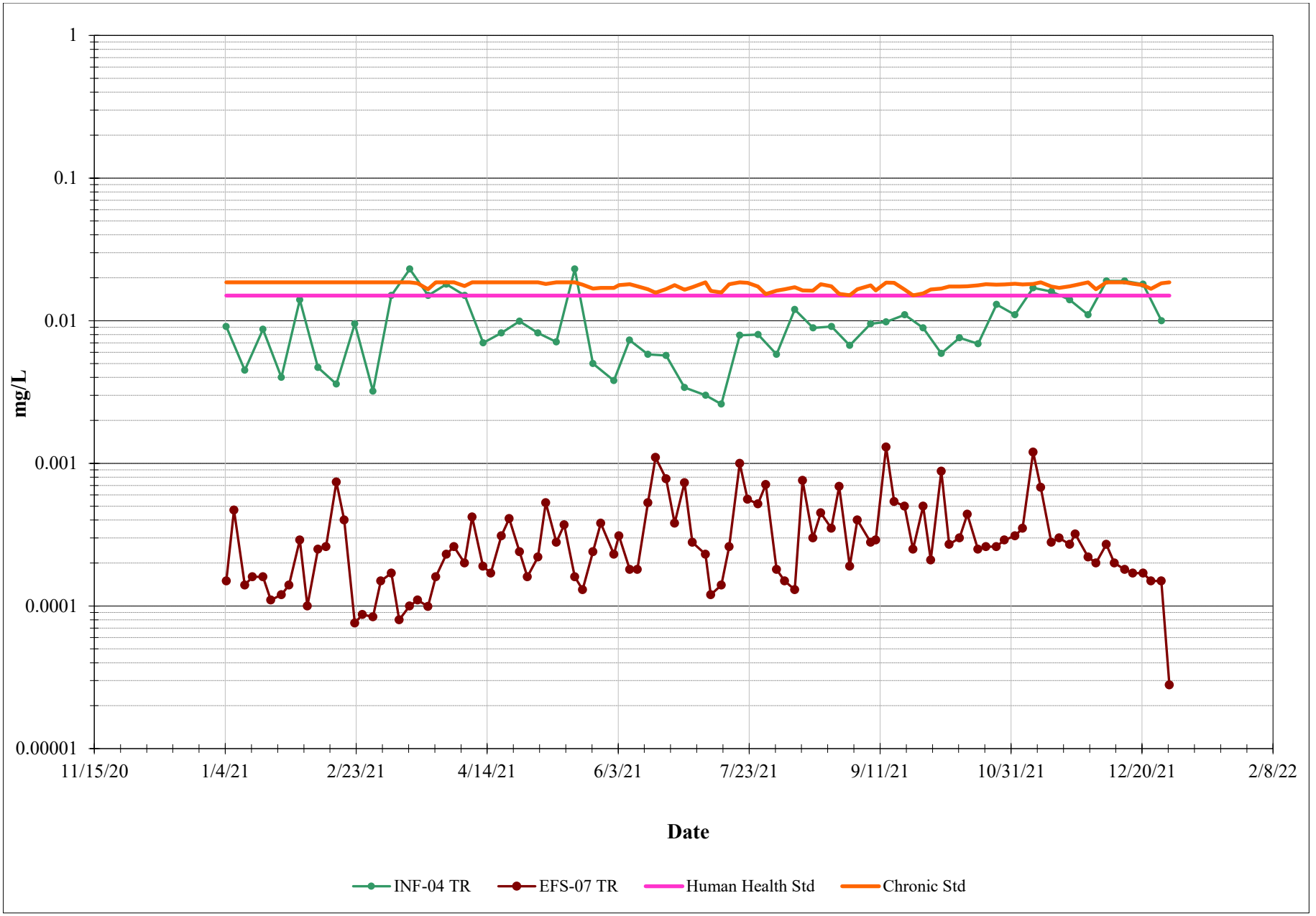
2021 Annual_BTLChemDump
4/19/2022

Butte Treatment Lagoon System
Mercury Concentration- Final



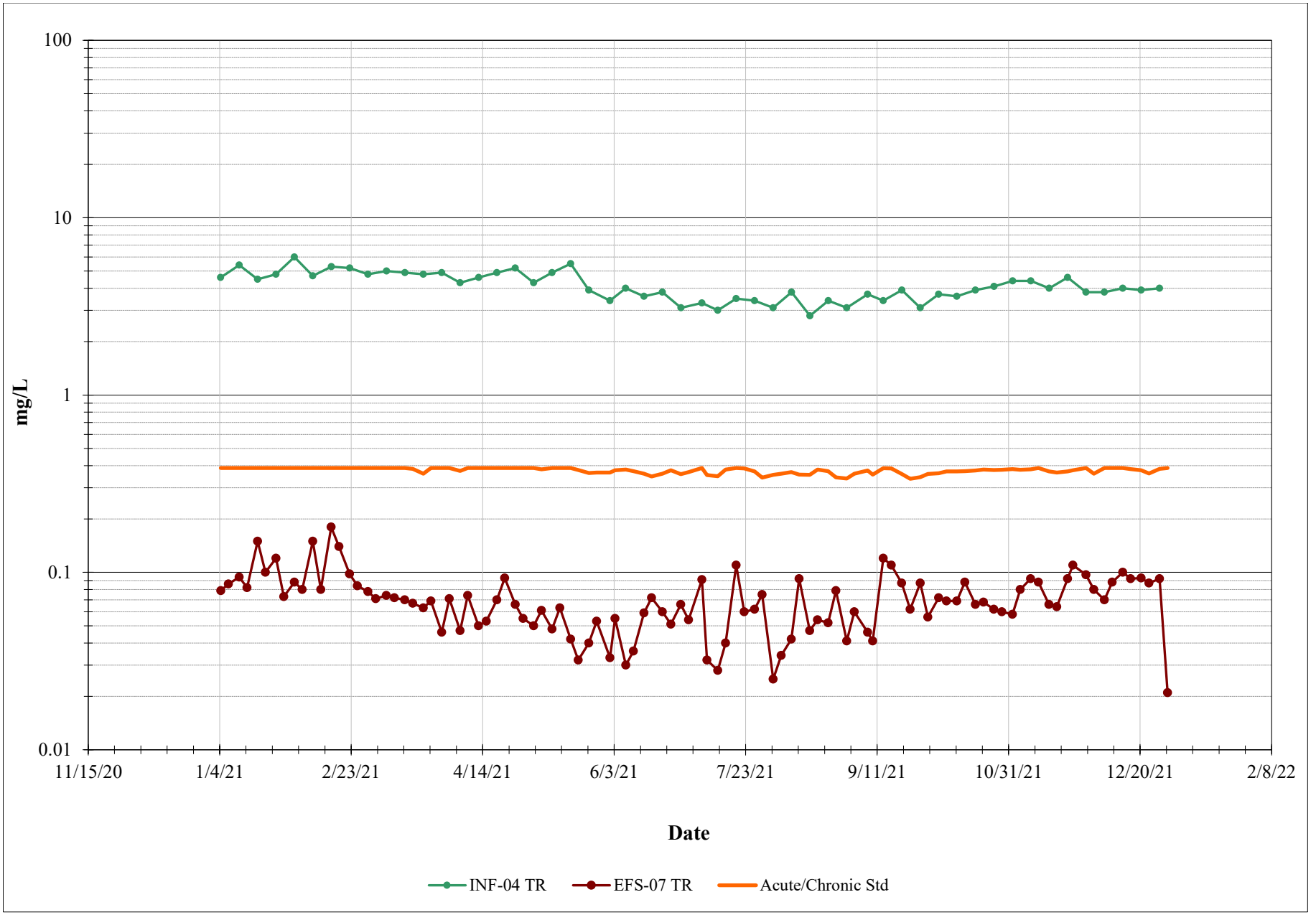
Mercury maximum standard is DEQ-7 Human Health standard.

Butte Treatment Lagoon System
Lead Concentration- Final



Lead maximum standard is DEQ-7 Human Health standard. Chronic Aquatic Life standard calculated based on effluent (EFS-07) hardness.

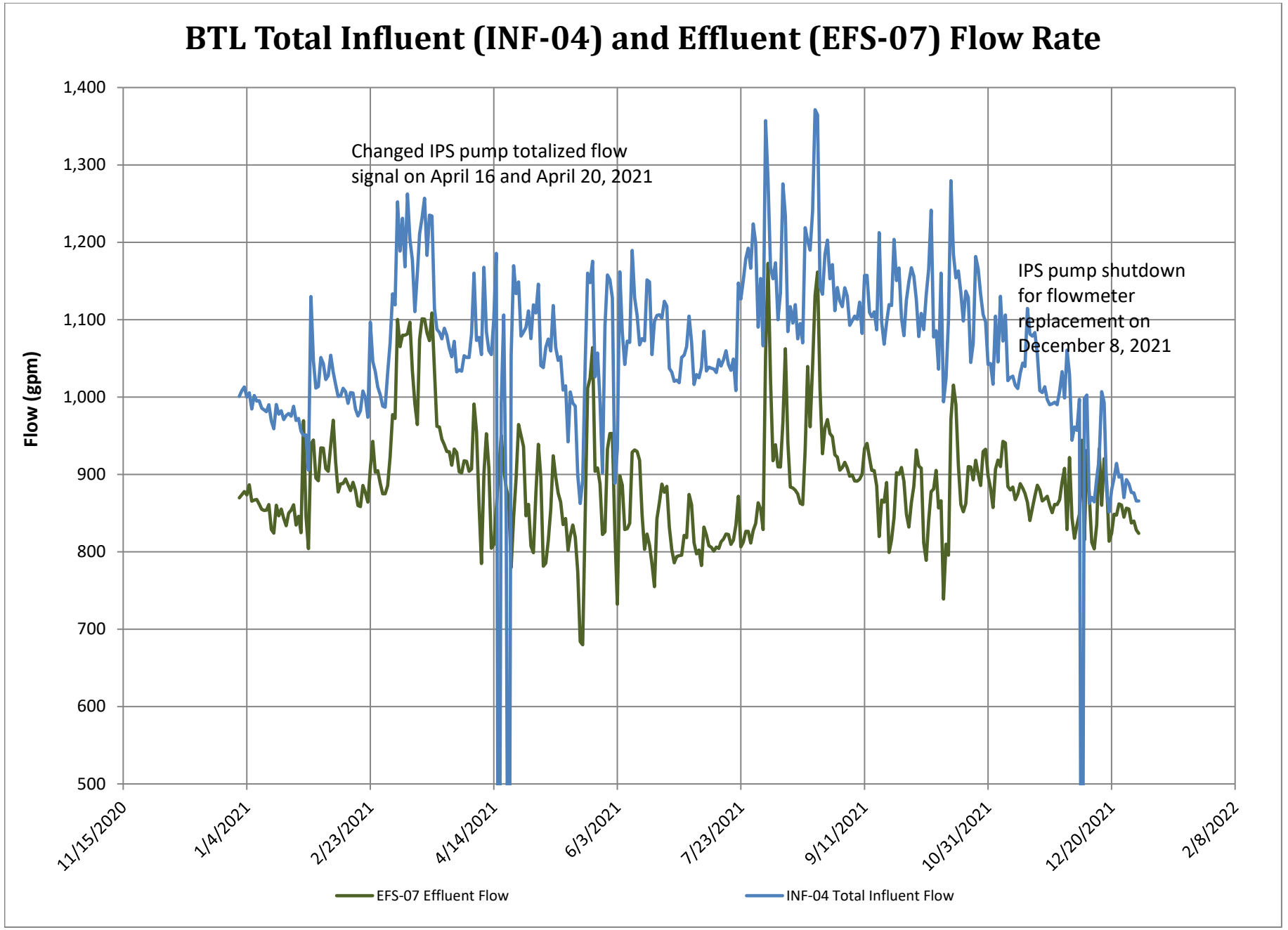
Butte Treatment Lagoon System
Zinc Concentration- Final

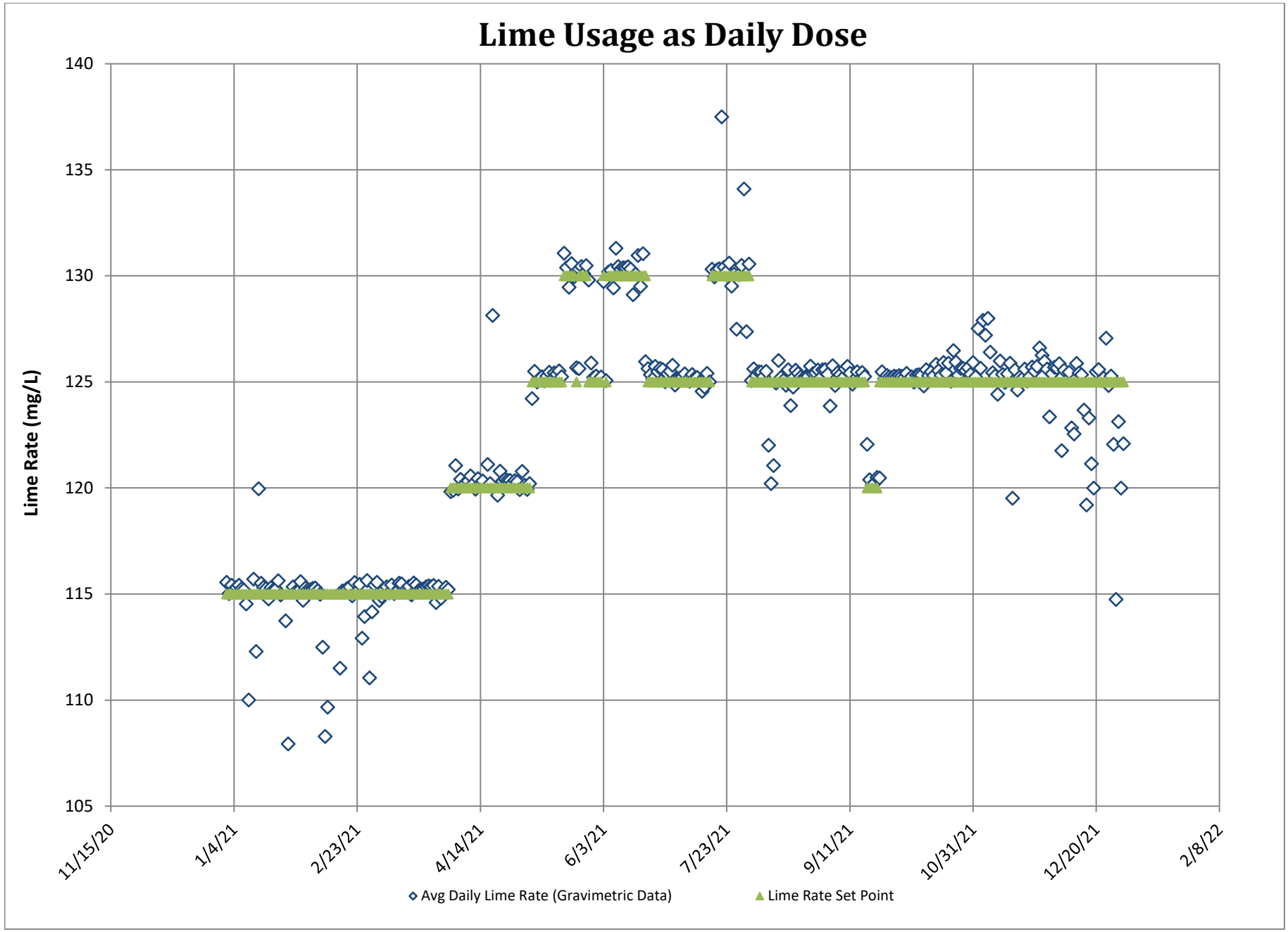


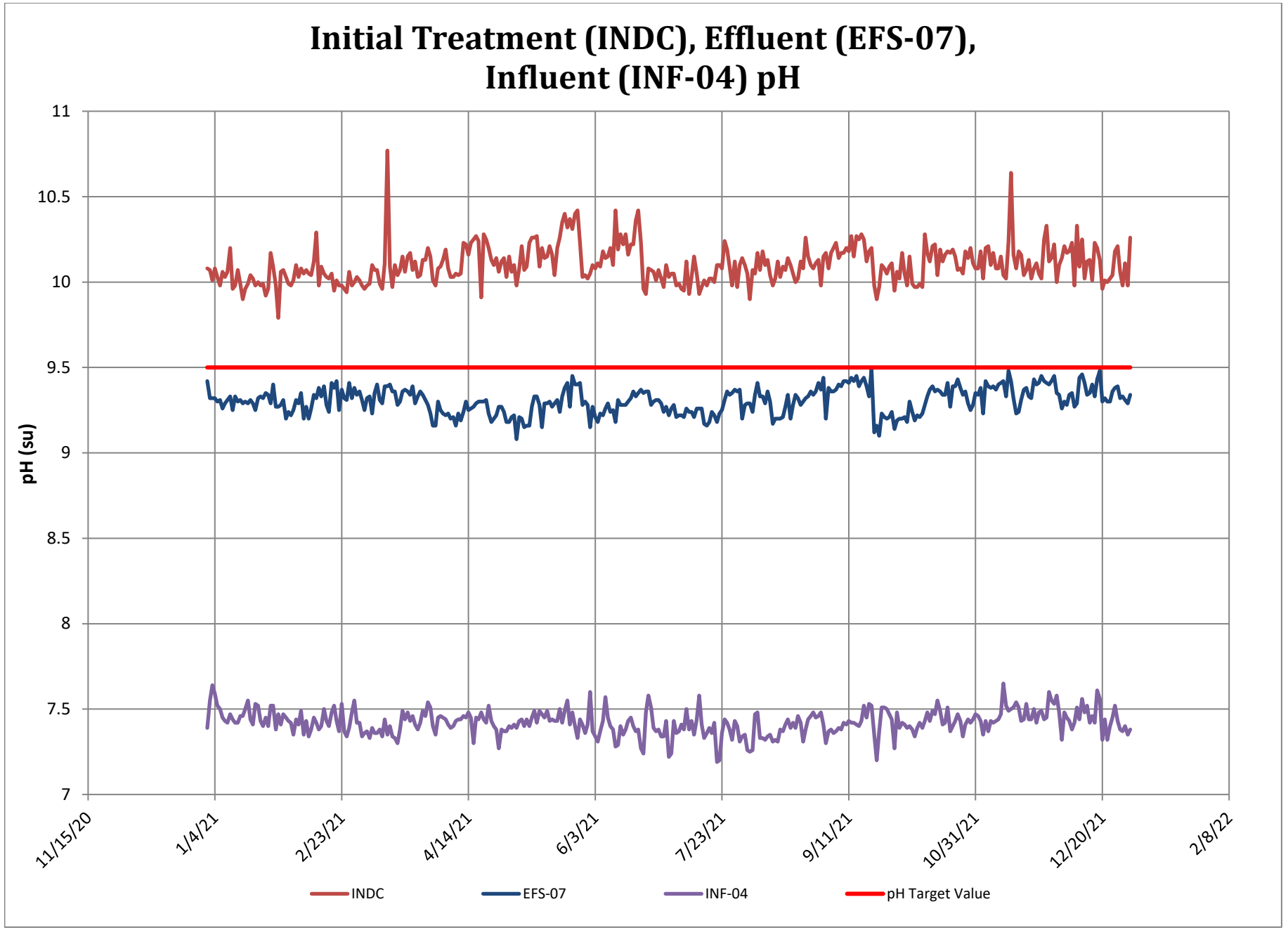
Zinc maximum standard is DEQ-7 Acute/Chronic standard calculated based on effluent (EFS-07) hardness.

2021 Annual_BTLChemDump
4/19/2022

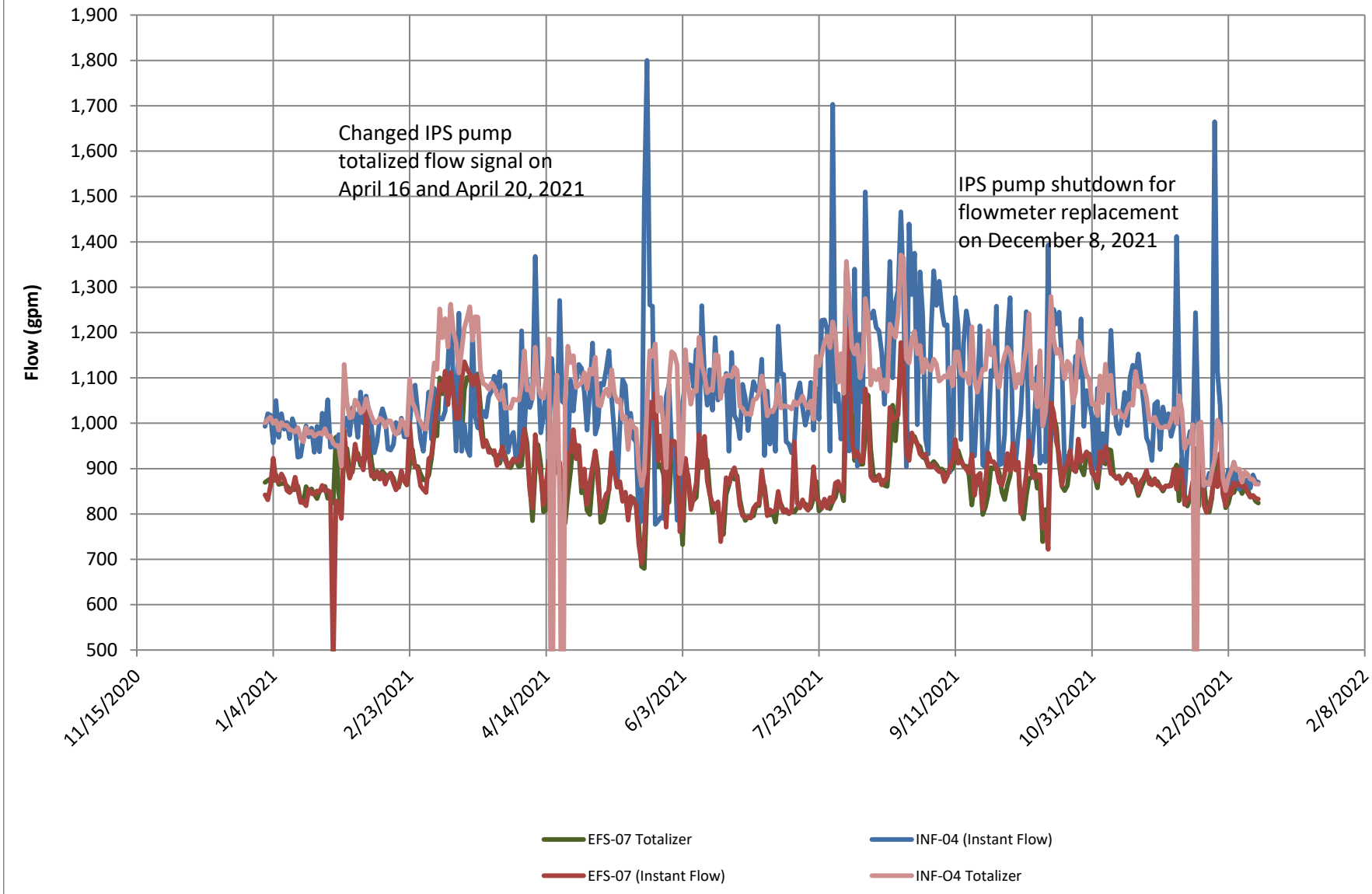
Appendix A.3
Lime Usage, System Flows, and System Levels

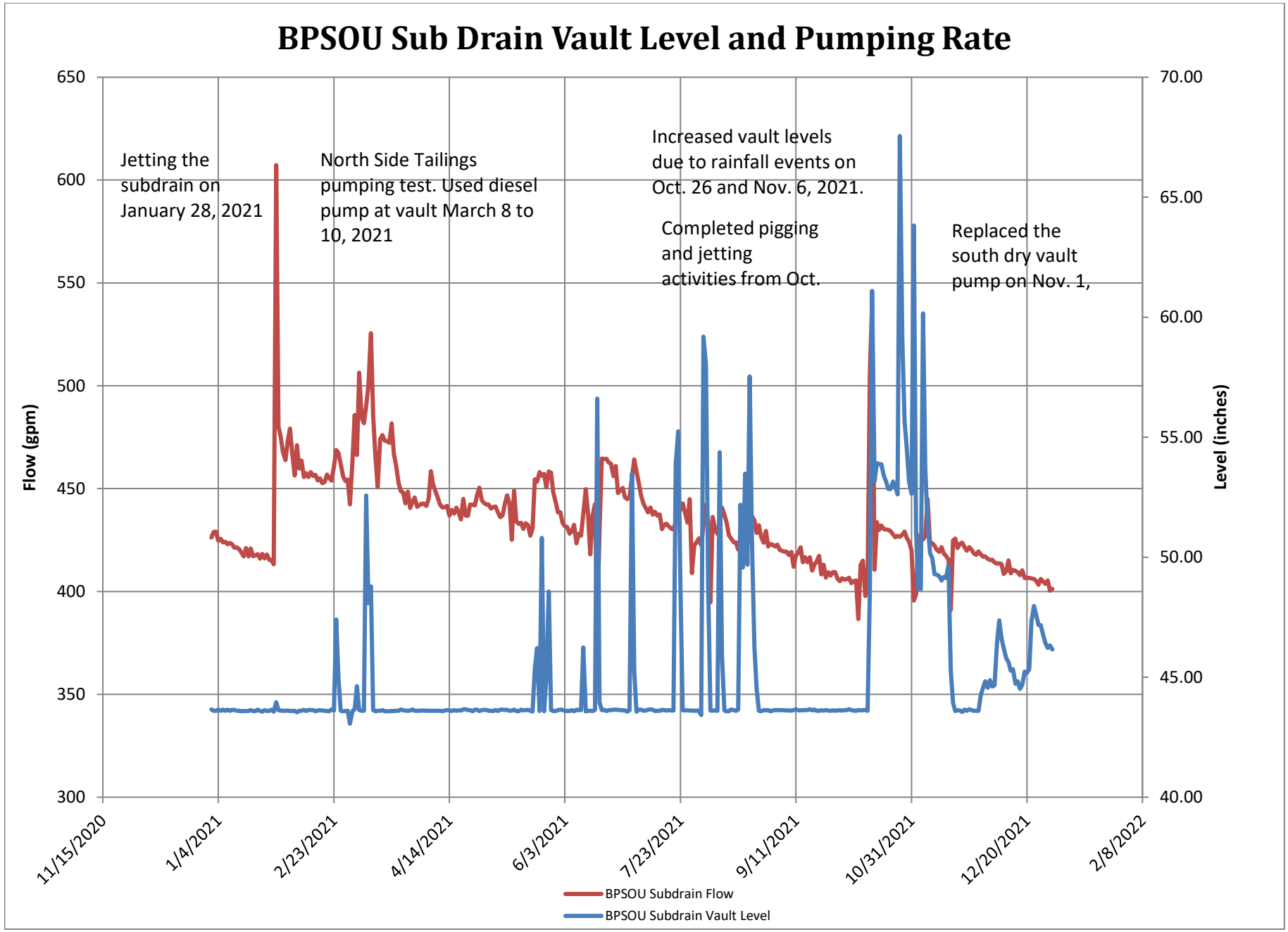

BTL Total Influent (INF-04) and Effluent (EFS-07) Flow Rate
Flow (gpm)
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
Changed IPS pump totalized flow signal on April 16 and April 20, 2021
IPS pump shutdown for flowmeter replacement on December 8, 2021
11/15/2020
1/4/2021
2/23/2021
4/14/2021
6/3/2021
7/23/2021
9/11/2021
10/31/2021
12/20/2021
2/8/2022
EFS-07 Effluent Flow
INF-04 Total Influent Flow

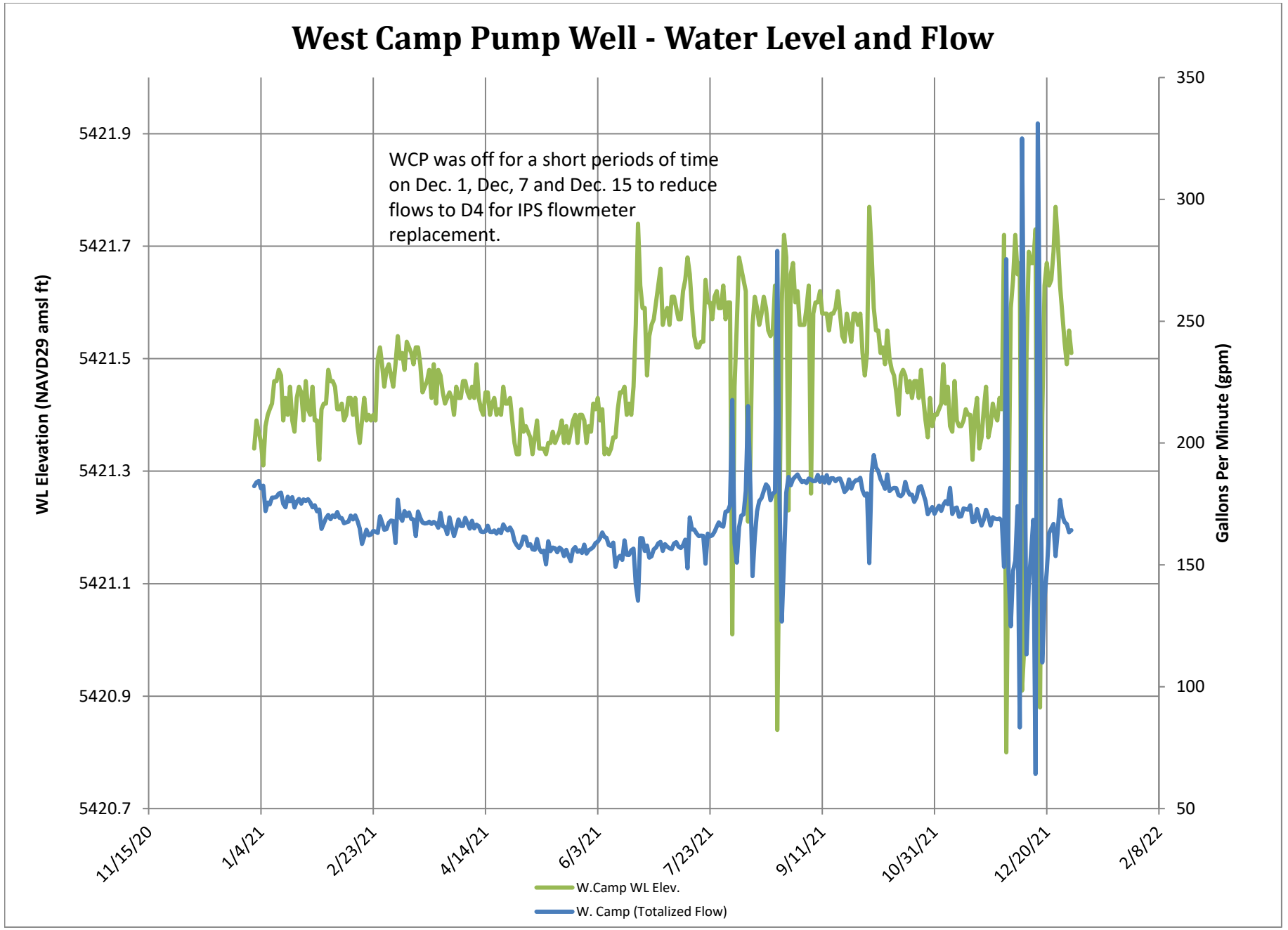

Lime Usage as Daily Dose
Lime Rate (mg/L)
140
135
130
125
120
115
110
105
11/15/20
1/4/21
2/23/21
4/14/21
6/3/21
7/23/21
9/11/21
10/31/21
12/20/21
2/8/22
Avg Daily Lime Rate (Gravimetric Data)
Lime Rate Set Point


Initial Treatment (INDC), Effluent (EFS-07), Influent (INF-04) pH
pH (su)
11
10.5
10
9.5
9
8.5
8
7.5
7
11/15/20
1/4/21
2/23/21
4/14/21
6/3/21
7/23/21
9/11/21
10/31/21
12/20/21
2/8/22
INDC
EFS-07
INF-04
pH Target Value

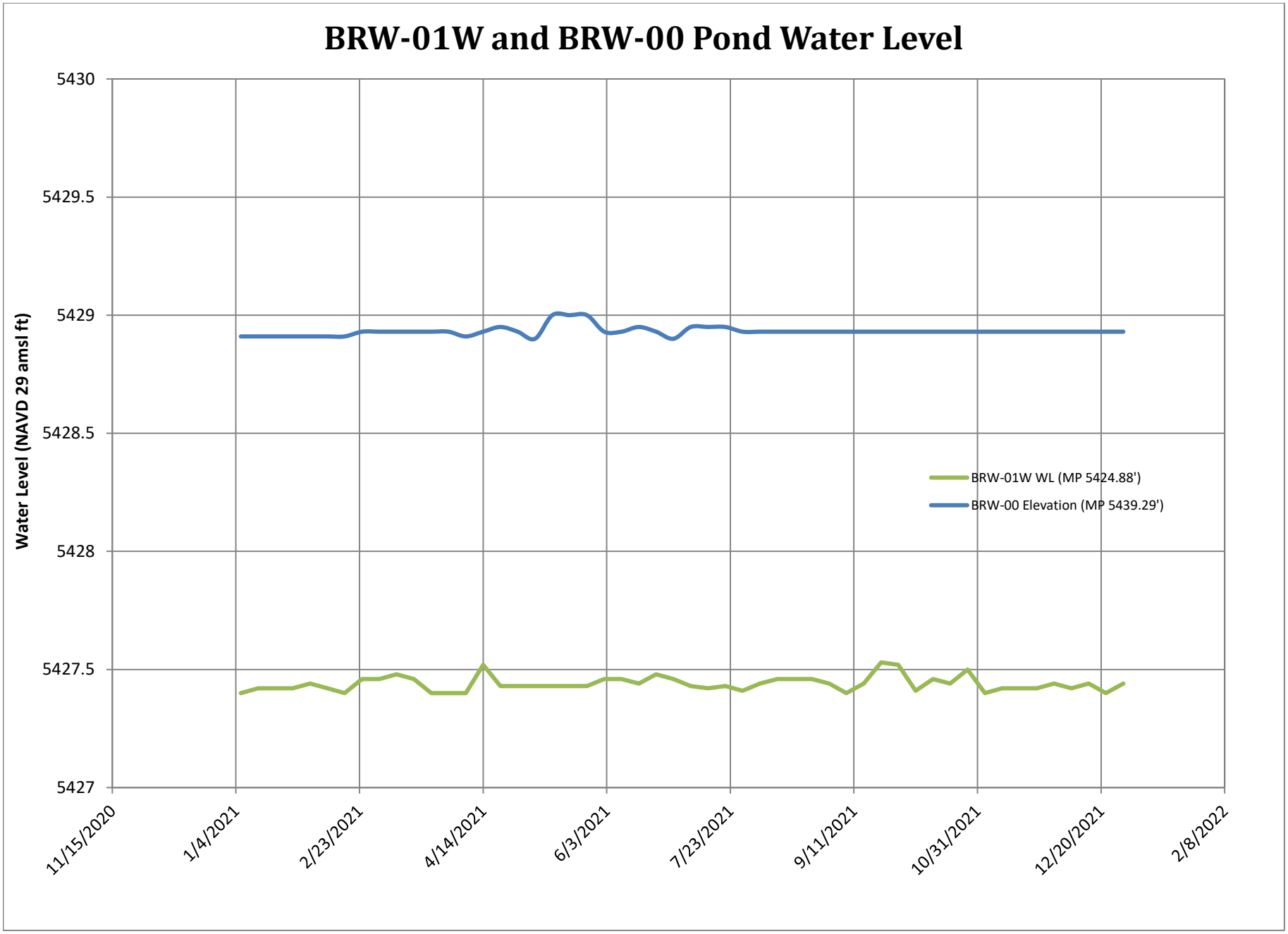
BTL Influent (INF-04) and Effluent (EFS-07) Flow Rate




BPSOU Sub Drain Vault Level and Pumping Rate
Jetting the subdrain on January 28, 2021
North Side Tailings pumping test. Used diesel pump at vault March 8 to 10, 2021
Increased vault levels due to rainfall events on Oct. 26 and Nov. 6, 2021.
Completed pigging and jetting activities from Oct.
Replaced the south dry vault pump on Nov. 1,
Flow (gpm)
Level (inches)
650
600
550
500
450
400
350
300
70.00
65.00
60.00
55.00
50.00
45.00
40.00
11/15/2020
1/4/2021
2/23/2021
4/14/2021
6/3/2021
7/23/2021
9/11/2021
10/31/2021
12/20/2021
2/8/2022
BPSOU Subdrain Flow
BPSOU Subdrain Vault Level


West Camp Pump Well - Water Level and Flow
WCP was off for a short periods of time on Dec. 1, Dec, 7 and Dec. 15 to reduce flows to D4 for IPS flowmeter replacement.
WL Elevation (NAVD29 amsl ft)
Gallons Per Minute (gpm)
5421.9
5421.7
5421.5
5421.3
5421.1
5420.9
5420.7
350
300
250
200
150
100
50
11/15/20
1/4/21
2/23/21
4/14/21
6/3/21
7/23/21
9/11/21
10/31/21
12/20/21
2/8/22
W.Camp WL Elev.
W. Camp (Totalized Flow)

BRW-01W and BRW-00 Pond Water Level



Appendix B
Subdrain Video Inspection Report

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

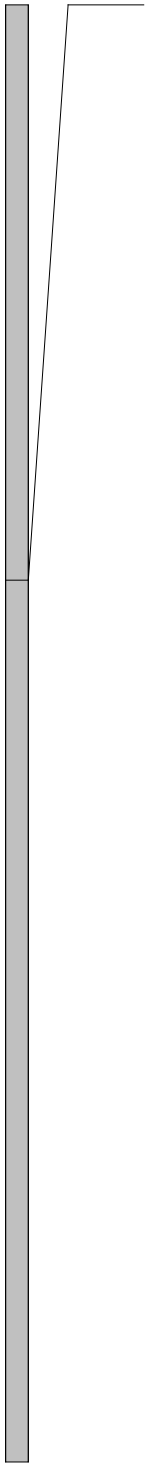
Pipe Segment Reference	City	Street
MH-MSD106 to MH-MSD108	**butte**	**walking trail**
Date	Operator	Pre-Cleaning
21/10/2021	**pat Hunter**	**Jetting**
Upstream MH	Downstream MH	Height
MH-MSD108	**MH-MSD-106**	**8 inch**
Total Length	Length Surveyed	Width
887.6 ft	**812.2 ft**	
~~	Direction	Material
MH-MSD108->MH-MSD-106	**MH-MSD-106->MH-MSD108**	**Polyvinyl Chloride**
Shape	Sewer Use	Video name
Circular		**MH-MSD106 to MH-MSD108_00[...]**

POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
7.20		AMH	Manhole, MH-MSD106	01:13:364	MH-MSD106 to MH-
75.46		MGO	General Observation, Slot inspection	00:02:22	MH-MSD106 to MH-
75.46		MGO	General Observation, Slot inspection	00:02:39	MH-MSD106 to MH-
155.69		MGO	General Observation, Slot inspection	00:05:17	MH-MSD106 to MH-
225.70		MGO	General Observation, Slot inspection	00:08:41	MH-MSD106 to MH-
290.82		MGO	General Observation, Slot inspection	00:11:36	MH-MSD106 to MH-
365.32		MGO	General Observation, Slot inspection	00:15:17	MH-MSD106 to MH-
440.71		MGO	General Observation, Slot inspection	00:19:02	MH-MSD106 to MH-
515.79		MGO	General Observation, Slot inspection	00:22:05	MH-MSD106 to MH-
590.64		MGO	General Observation, Slot inspection	00:26:11	MH-MSD106 to MH-
665.44		MGO	General Observation, Slot inspection	00:31:37	MH-MSD106 to MH-

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

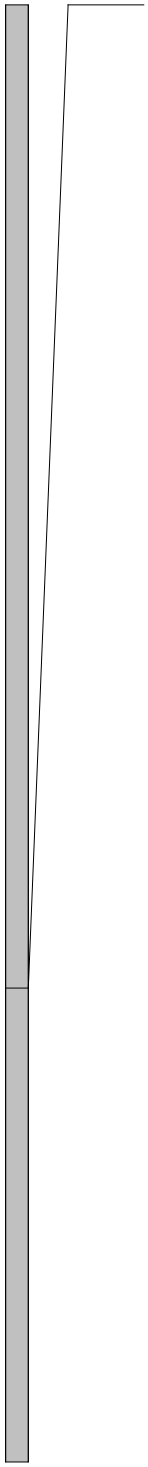
POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
743.83		MGO	General Observation, Slot inspection	00:36:32	MH-MSD106 to MH-



Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

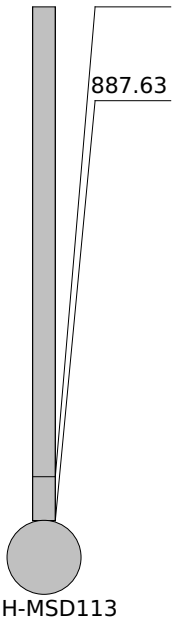
POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
805.39		MGO	General Observation, Slot inspection	00:41:39	MH-MSD106 to MH-



Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
881.82		MGO	General Observation, Slot inspection	00:48:28	MH-MSD106 to MH-
887.63		AMH	Manhole, MH-MSD-108	00:49:50	MH-MSD106 to MH-



MH-MSD113

Scale 1:100

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD106 to MH-MSD108	**butte**	**walking trail**

File name: **MH-MSD106 to MH-MSD108_0015.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **7.20 ft**
Code: **AMH**
Manhole, MH-MSD106

File name: **MH-MSD106 to MH-MSD108_0001.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **75.46 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD106 to MH-MSD108_0002.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **75.46 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD106 to MH-MSD108	**butte**	**walking trail**

File name: **MH-MSD106 to MH-MSD108_0003.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **155.69 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD106 to MH-MSD108_0004.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **225.70 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD106 to MH-MSD108_0005.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **290.82 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD106 to MH-MSD108	**butte**	**walking trail**

File name: **MH-MSD106 to MH-MSD108_0006.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **365.32 ft**
Code: **MGO**
General Observation, Slot inspection

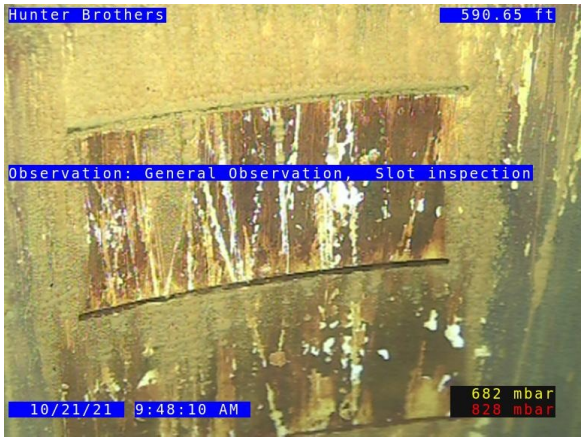
File name: **MH-MSD106 to MH-MSD108_0007.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **440.71 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD106 to MH-MSD108_0008.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **515.79 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD106 to MH-MSD108	**butte**	**walking trail**



File name: **MH-MSD106 to MH-MSD108_0009.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **590.64 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD106 to MH-MSD108_0010.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **665.44 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD106 to MH-MSD108_0011.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **743.83 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD106 to MH-MSD108	**butte**	**walking trail**

File name: **MH-MSD106 to MH-MSD108_0012.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **805.39 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD106 to MH-MSD108_0013.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **881.82 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD106 to MH-MSD108_0014.jpeg**
Inspection date and time: **21/10/2021 08:54**
Position: **887.63 ft**
Code: **AMH**
Manhole, MH-MSD-108

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

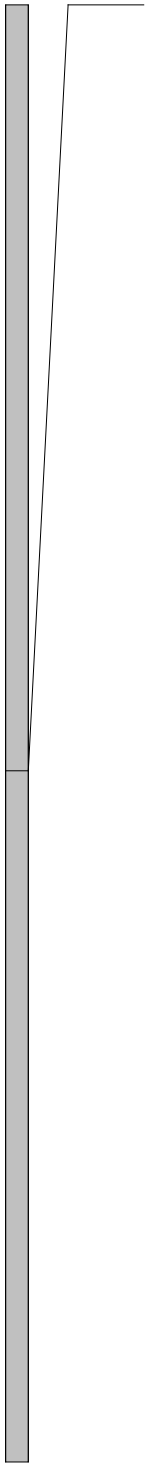
Pipe Segment Reference	City	Street
MH-MSD108 to MH-MSD110	**butte**	**walking trail**
Date	Operator	Pre-Cleaning
21/10/2021	**pat Hunter**	**Jetting**
Upstream MH	Downstream MH	Height
MH-MSD110	**MH-MSD108**	**8 inch**
Total Length	Length Surveyed	Width
950.0 ft	**873.4 ft**	
~~	Direction	Material
MH-MSD110->MH-MSD108	**MH-MSD108->MH-MSD110**	**Polyvinyl Chloride**
Shape	Sewer Use	Video name
Circular		**MH-MSD108 to MH-MSD110_00[...]**

POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
3.01		AMH	Manhole, MH-MSD108	01:07:364	MH-MSD108 to MH-
76.58		MGO	General Observation, Slot inspection	00:01:36	MH-MSD108 to MH-
150.79		MGO	General Observation, Slot inspection	00:04:42	MH-MSD108 to MH-
225.77		MGO	General Observation, Slot inspection	00:07:50	MH-MSD108 to MH-
301.50		MGO	General Observation, Slot inspetion	00:11:08	MH-MSD108 to MH-
375.71		MGO	General Observation, Slot inspection	00:14:19	MH-MSD108 to MH-
452.43		MGO	General Observation, Slot inspection	00:18:08	MH-MSD108 to MH-
525.49		MGO	General Observation, Slot inspectoin	00:22:04	MH-MSD108 to MH-
600.52		MGO	General Observation, Slot inspection	00:25:40	MH-MSD108 to MH-
675.40		MGO	General Observation, Slot inspection	00:29:42	MH-MSD108 to MH-
750.86		MGO	General Observation, Slot inspection	00:33:53	MH-MSD108 to MH-
825.31		MGO	General Observation, Slot inspection	00:38:36	MH-MSD108 to MH-

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

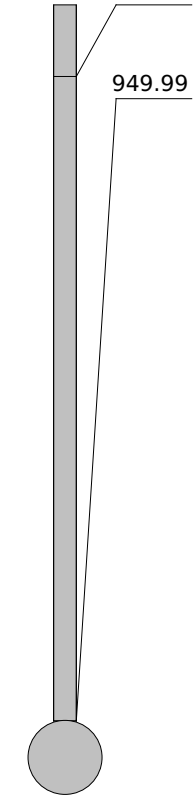
POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
900.36		MGO	General Observation, Slot inspection	00:42:49	MH-MSD108 to MH-



Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
949.99		MGO	General Observation, Slot inspection	00:46:37	MH-MSD108 to MH-
949.99		MGO	General Observation, Out of cable	00:47:18	MH-MSD108 to MH-

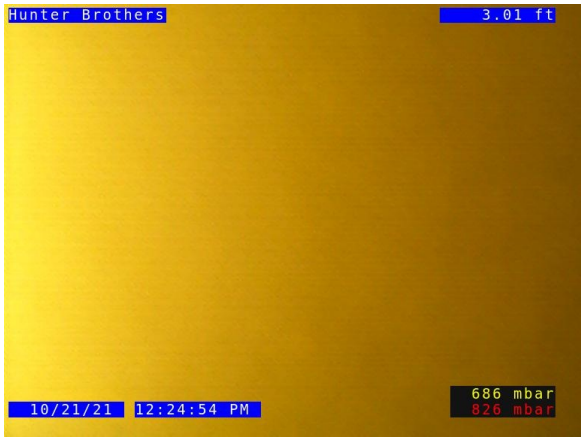


MH-MSD110
Scale 1:100

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD108 to MH-MSD110	**butte**	**walking trail**



File name: **MH-MSD108 to MH-MSD110_0015.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **3.01 ft**
Code: **AMH**
Manhole, MH-MSD108

File name: **MH-MSD108 to MH-MSD110_0001.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **76.58 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD108 to MH-MSD110_0002.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **150.79 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD108 to MH-MSD110	**butte**	**walking trail**

File name: **MH-MSD108 to MH-MSD110_0003.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **225.77 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD108 to MH-MSD110_0004.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **301.50 ft**
Code: **MGO**
General Observation, Slot inspetion

File name: **MH-MSD108 to MH-MSD110_0005.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **375.71 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD108 to MH-MSD110	**butte**	**walking trail**

File name: **MH-MSD108 to MH-MSD110_0006.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **452.43 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD108 to MH-MSD110_0007.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **525.49 ft**
Code: **MGO**
General Observation, Slot inspectoin

File name: **MH-MSD108 to MH-MSD110_0008.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **600.52 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD108 to MH-MSD110	**butte**	**walking trail**

File name: **MH-MSD108 to MH-MSD110_0009.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **675.40 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD108 to MH-MSD110_0010.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **750.86 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD108 to MH-MSD110_0011.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **825.31 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD108 to MH-MSD110	**butte**	**walking trail**

File name: **MH-MSD108 to MH-MSD110_0012.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **900.36 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD108 to MH-MSD110_0013.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **949.99 ft**
Code: **MGO**
General Observation, Slot inspection

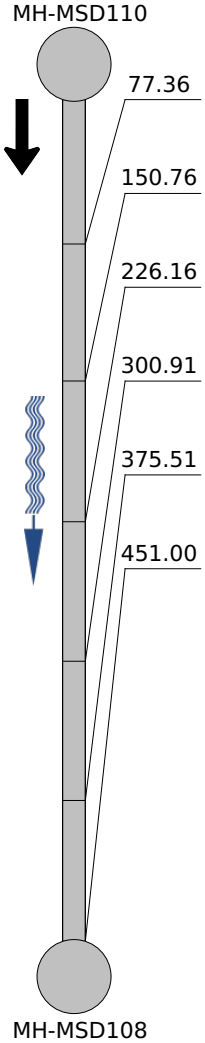
File name: **MH-MSD108 to MH-MSD110_0014.jpeg**
Inspection date and time: **21/10/2021 11:02**
Position: **949.99 ft**
Code: **MGO**
General Observation, Out of cable

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD110 to MH-MSD108	**butte**	**walking trail**
Date	Operator	Pre-Cleaning
21/10/2021	**pat Hunter**	**Jetting**
Upstream MH	Downstream MH	Height
MH-MSD110	**MH-MSD108**	**8 inch**
Total Length	Length Surveyed	Width
451.0 ft	**451.0 ft**	
~~	Direction	Material
MH-MSD110->MH-MSD108	**MH-MSD110->MH-MSD108**	**Polyvinyl Chloride**
Shape	Sewer Use	Video name
Circular		**MH-MSD110 to MH-MSD108_00[...]**

POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
MH-MSD110					
77.36		MGO	General Observation, Slot inspection	00:01:50	MH-MSD110 to MH-
150.76		MGO	General Observation, Slot inspection	00:05:28	MH-MSD110 to MH-
226.16		MGO	General Observation, Slot inspection	00:08:44	MH-MSD110 to MH-
300.91		MGO	General Observation, Slot inspection	00:12:28	MH-MSD110 to MH-
375.51		MGO	General Observation, Slot inspection	00:15:55	MH-MSD110 to MH-
451.00		MGO	General Observation, Slot inspection	00:19:24	MH-MSD110 to MH-



Scale 1:4051

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD110 to MH-MSD108	**butte**	**walking trail**

File name: **MH-MSD110 to MH-MSD108_0001.jpeg**
Inspection date and time: **21/10/2021 12:44**
Position: **77.36 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD110 to MH-MSD108_0002.jpeg**
Inspection date and time: **21/10/2021 12:44**
Position: **150.76 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD110 to MH-MSD108_0003.jpeg**
Inspection date and time: **21/10/2021 12:44**
Position: **226.16 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD110 to MH-MSD108	**butte**	**walking trail**

File name: **MH-MSD110 to MH-MSD108_0004.jpeg**
Inspection date and time: **21/10/2021 12:44**
Position: **300.91 ft**
Code: **MGO**
General Observation, Slot inspection

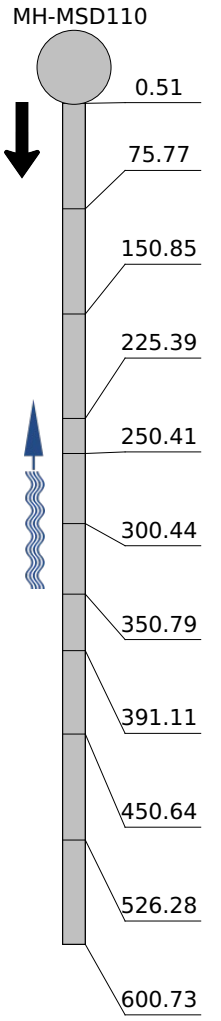
File name: **MH-MSD110 to MH-MSD108_0005.jpeg**
Inspection date and time: **21/10/2021 12:44**
Position: **375.51 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD110 to MH-MSD108_0006.jpeg**
Inspection date and time: **21/10/2021 12:44**
Position: **451.00 ft**
Code: **MGO**
General Observation, Slot inspection

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD110 to MH-MSD113	**butte**	**walking trail**
Date	Operator	Pre-Cleaning
21/10/2021	**pat Hunter**	**Jetting**
Upstream MH	Downstream MH	Height
MH-MSD113	**MH-MSD110**	**8 inch**
Total Length	Length Surveyed	Width
900.6 ft	**824.8 ft**	
~~	Direction	Material
MH-MSD113->MH-MSD110	**MH-MSD110->MH-MSD113**	**Polyvinyl Chloride**
Shape	Sewer Use	Video name
Circular		**MH-MSD110 to MH-MSD113_00[...]**

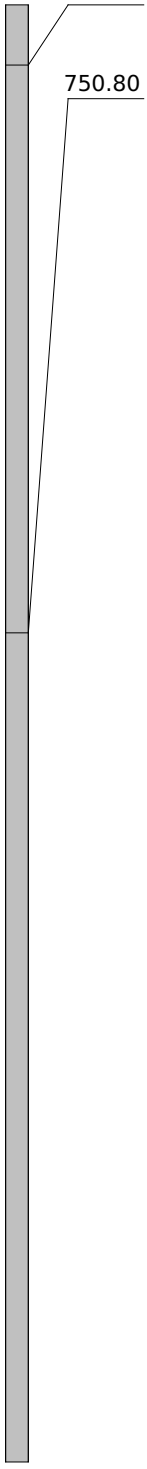


POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
0.51		AMH	Manhole, MH-MSD110	01:02:361	MH-MSD110 to MH-
75.77		MGO	General Observation, Slot inspection	00:02:23	MH-MSD110 to MH-
150.85		MGO	General Observation, Slot inspection	00:06:34	MH-MSD110 to MH-
225.39		MGO	General Observation, Slot inspection	00:11:05	MH-MSD110 to MH-
250.41		MGO	General Observation, Slot inspection	00:12:43	MH-MSD110 to MH-
300.44		MGO	General Observation, Slot inspection	00:16:20	MH-MSD110 to MH-
350.79		MGO	General Observation, Slot inspection	00:20:19	MH-MSD110 to MH-
391.11		MGO	General Observation, Slot inspection	00:23:34	MH-MSD110 to MH-
450.64		MGO	General Observation, Slot inspection	00:27:26	MH-MSD110 to MH-
526.28		MGO	General Observation, Slot inspection	00:30:35	MH-MSD110 to MH-
600.73		MGO	General Observation, Slot inspection	00:33:00	MH-MSD110 to MH-

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

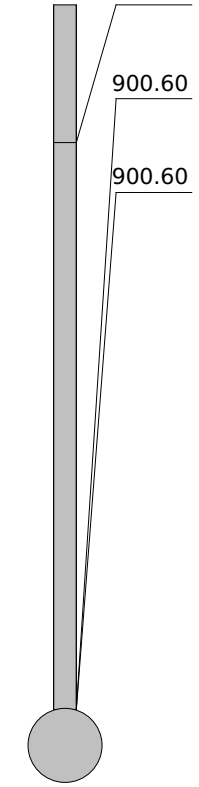
POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
675.71		MGO	General Observation, Slot inspection	00:35:11	MH-MSD110 to MH-
750.80		MGO	General Observation, Slot inspection	00:37:55	MH-MSD110 to MH-



Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
825.59		MGO	General Observation, Slot inspection	00:40:45	MH-MSD110 to MH-
900.60		MGO	General Observation, Slot inspection	00:44:02	MH-MSD110 to MH-
900.60		ACOM	Cleanout Mainline, No slots due to clean	00:44:43	MH-MSD110 to MH-



MH-MSD113
Scale 1:100

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD110 to MH-MSD113	**butte**	**walking trail**

File name: **MH-MSD110 to MH-MSD113_0016.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **0.51 ft**
Code: **AMH**
Manhole, MH-MSD110

File name: **MH-MSD110 to MH-MSD113_0001.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **75.77 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD110 to MH-MSD113_0002.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **150.85 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD110 to MH-MSD113	**butte**	**walking trail**

File name: **MH-MSD110 to MH-MSD113_0003.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **225.39 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD110 to MH-MSD113_0004.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **250.41 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD110 to MH-MSD113_0005.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **300.44 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD110 to MH-MSD113	**butte**	**walking trail**

File name: **MH-MSD110 to MH-MSD113_0006.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **350.79 ft**
Code: **MGO**
General Observation, Slot inspection

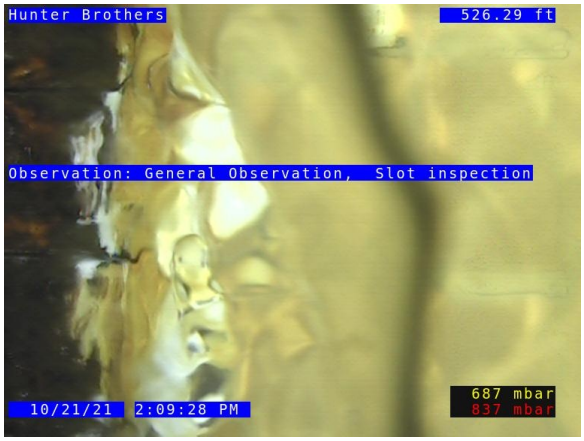
File name: **MH-MSD110 to MH-MSD113_0007.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **391.11 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD110 to MH-MSD113_0008.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **450.64 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD110 to MH-MSD113	**butte**	**walking trail**



File name: **MH-MSD110 to MH-MSD113_0009.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **526.28 ft**
Code: **MGO**
General Observation, Slot inspection

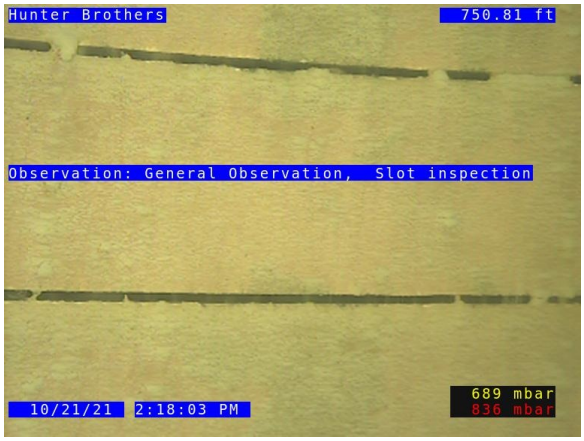
File name: **MH-MSD110 to MH-MSD113_0010.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **600.73 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD110 to MH-MSD113_0011.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **675.71 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD110 to MH-MSD113	**butte**	**walking trail**



File name: **MH-MSD110 to MH-MSD113_0012.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **750.80 ft**
Code: **MGO**
General Observation, Slot inspection

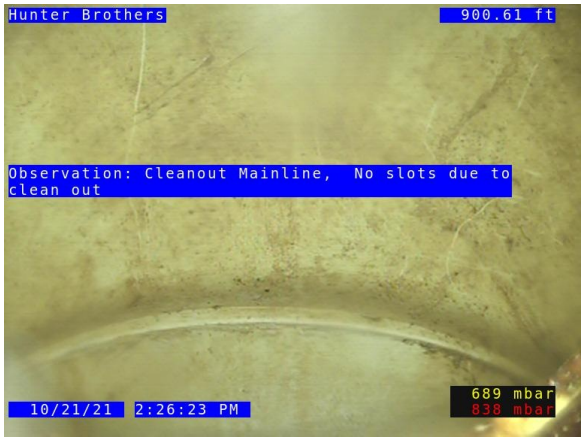
File name: **MH-MSD110 to MH-MSD113_0013.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **825.59 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD110 to MH-MSD113_0014.jpeg**
Inspection date and time: **21/10/2021 13:32**
Position: **900.60 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD110 to MH-MSD113	**butte**	**walking trail**



File name: **MH-MSD110 to MH-MSD113_0015.jpeg**

Inspection date and time: **21/10/2021 13:32**

Position: **900.60 ft**

Code: **ACOM**

Cleanout Mainline, No slots due to clean out

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

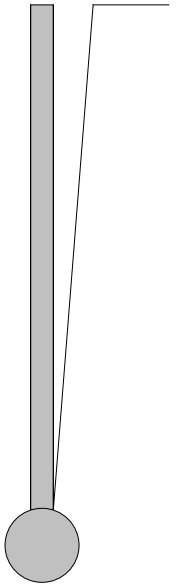
Pipe Segment Reference	City	Street
MH-MSD113 to MH-MSD116	**butte**	**walking trail**
Date	Operator	Pre-Cleaning
21/10/2021	**pat Hunter**	**Jetting**
Upstream MH	Downstream MH	Height
MH-MSD-116	**MH-MSD113**	**8 inch**
Total Length	Length Surveyed	Width
865.9 ft	**790.3 ft**	
~~	Direction	Material
MH-MSD-116->MH-MSD113	**MH-MSD113->MH-MSD-116**	**Polyvinyl Chloride**
Shape	Sewer Use	Video name
Circular		**2021-10-21_15-54_0001.mp4**

POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
MH-MSD113					
-3.12		AMH	Manhole, MH-MSD113	00:43:40	MH-MSD113 to MH-
75.57		MGO	General Observation, Slot inspection	00:01:43	MH-MSD113 to MH-
151.00		MGO	General Observation, Slot inspection	00:04:06	MH-MSD113 to MH-
226.39		MGO	General Observation, Slot inspection	00:06:25	MH-MSD113 to MH-
301.26		MGO	General Observation, Slot inspection	00:08:49	MH-MSD113 to MH-
376.38		MGO	General Observation, Slot inspection	00:11:22	MH-MSD113 to MH-
451.25		MGO	General Observation, Slot inspection	00:14:01	MH-MSD113 to MH-
526.08		MGO	General Observation, Slot inspection	00:16:32	MH-MSD113 to MH-
600.85		MGO	General Observation, Slot inspection	00:19:02	MH-MSD113 to MH-
676.09		MGO	General Observation, Slot inspectio	00:22:04	MH-MSD113 to MH-
751.00		MGO	General Observation, Slot inspection	00:25:02	MH-MSD113 to MH-
826.55		MGO	General Observation, Slot inspection	00:27:18	MH-MSD113 to MH-

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
865.89		MGO	General Observation, Size reduction to	00:29:14	MH-MSD113 to MH-



MH-MSD-116
Scale 1:100

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD113 to MH-MSD116	**butte**	**walking trail**

File name: **MH-MSD113 to MH-MSD116_0013.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **-3.12 ft**
Code: **AMH**
Manhole, MH-MSD113

File name: **MH-MSD113 to MH-MSD116_0001.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **75.57 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD113 to MH-MSD116_0002.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **151.00 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD113 to MH-MSD116	**butte**	**walking trail**

File name: **MH-MSD113 to MH-MSD116_0003.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **226.39 ft**
Code: **MGO**
General Observation, Slot inspection

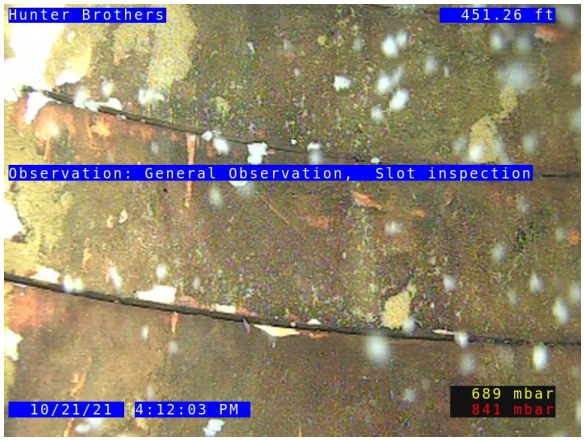
File name: **MH-MSD113 to MH-MSD116_0004.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **301.26 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD113 to MH-MSD116_0005.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **376.38 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD113 to MH-MSD116	**butte**	**walking trail**



File name: **MH-MSD113 to MH-MSD116_0006.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **451.25 ft**
Code: **MGO**
General Observation, Slot inspection

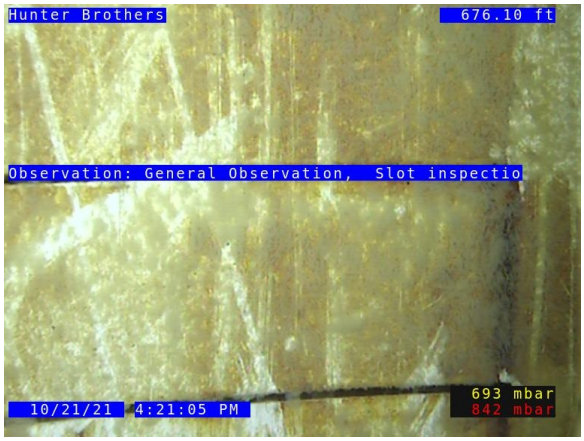
File name: **MH-MSD113 to MH-MSD116_0007.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **526.08 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD113 to MH-MSD116_0008.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **600.85 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

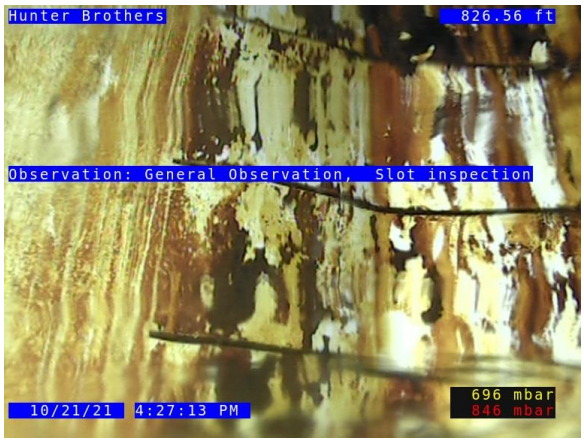
Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD113 to MH-MSD116	**butte**	**walking trail**



File name: **MH-MSD113 to MH-MSD116_0009.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **676.09 ft**
Code: **MGO**
General Observation, Slot inspectio

File name: **MH-MSD113 to MH-MSD116_0010.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **751.00 ft**
Code: **MGO**
General Observation, Slot inspection

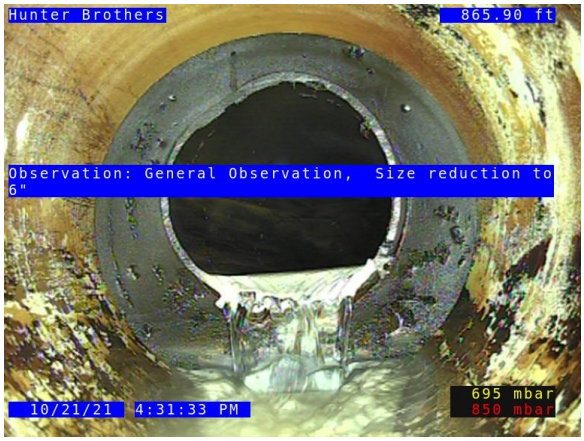


File name: **MH-MSD113 to MH-MSD116_0011.jpeg**
Inspection date and time: **21/10/2021 15:44**
Position: **826.55 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD113 to MH-MSD116	**butte**	**walking trail**



File name: **MH-MSD113 to MH-MSD116_0012.jpeg**

Inspection date and time: **21/10/2021 15:44**

Position: **865.89 ft**

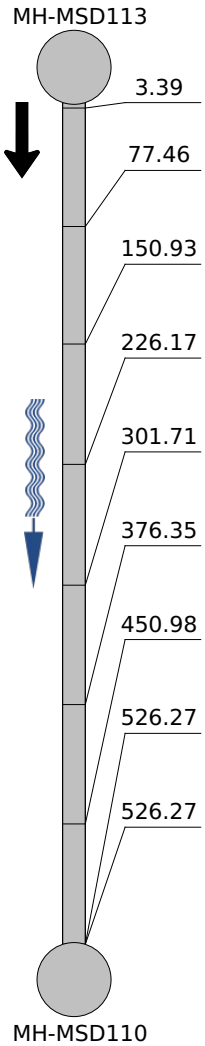
Code: **MGO**

General Observation, Size reduction to 6\"

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD113 to MH-MSD110	**butte**	**walking trail**
Date	Operator	Pre-Cleaning
21/10/2021	**pat Hunter**	**Jetting**
Upstream MH	Downstream MH	Height
MH-MSD113	**MH-MSD110**	**8 inch**
Total Length	Length Surveyed	Width
526.3 ft	**448.8 ft**	
~~	Direction	Material
MH-MSD113->MH-MSD110	**MH-MSD113->MH-MSD110**	**Polyvinyl Chloride**
Shape	Sewer Use	Video name
Circular		**MH-MSD113 to MH-MSD110_00[...]**



POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
3.39		MGO	General Observation, MH-MSD113	00:29:02	MH-MSD113 to MH-
77.46		MGO	General Observation, Slot inspection	00:02:23	MH-MSD113 to MH-
150.93		MGO	General Observation, Slot inspection	00:05:16	MH-MSD113 to MH-
226.17		MGO	General Observation, Slot inspection	00:07:37	MH-MSD113 to MH-
301.71		MGO	General Observation, Slot inspection	00:10:01	MH-MSD113 to MH-
376.35		MGO	General Observation, Slot inspection	00:12:18	MH-MSD113 to MH-
450.98		MGO	General Observation, Slot inspection	00:14:32	MH-MSD113 to MH-
526.27		MGO	General Observation, Slot inspection	00:18:02	MH-MSD113 to MH-
526.27		MGO	General Observation, End of run	00:18:45	MH-MSD113 to MH-

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD113 to MH-MSD110	**butte**	**walking trail**

File name: **MH-MSD113 to MH-MSD110_0009.jpeg**
Inspection date and time: **21/10/2021 15:06**
Position: **3.39 ft**
Code: **MGO**
General Observation, MH-MSD113

File name: **MH-MSD113 to MH-MSD110_0001.jpeg**
Inspection date and time: **21/10/2021 15:06**
Position: **77.46 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD113 to MH-MSD110_0002.jpeg**
Inspection date and time: **21/10/2021 15:06**
Position: **150.93 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD113 to MH-MSD110	**butte**	**walking trail**

File name: **MH-MSD113 to MH-MSD110_0003.jpeg**
Inspection date and time: **21/10/2021 15:06**
Position: **226.17 ft**
Code: **MGO**
General Observation, Slot inspection

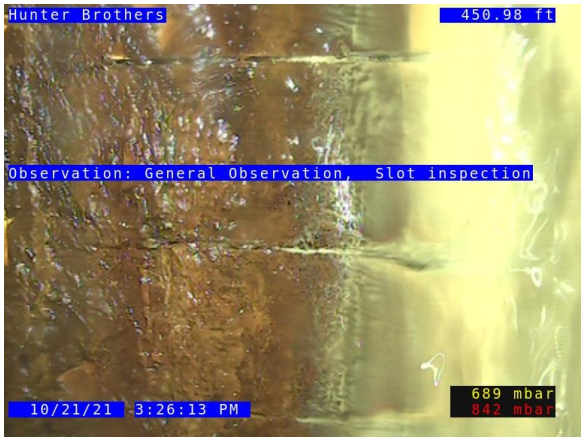
File name: **MH-MSD113 to MH-MSD110_0004.jpeg**
Inspection date and time: **21/10/2021 15:06**
Position: **301.71 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD113 to MH-MSD110_0005.jpeg**
Inspection date and time: **21/10/2021 15:06**
Position: **376.35 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD113 to MH-MSD110	**butte**	**walking trail**



File name: **MH-MSD113 to MH-MSD110_0006.jpeg**
Inspection date and time: **21/10/2021 15:06**
Position: **450.98 ft**
Code: **MGO**
General Observation, Slot inspection

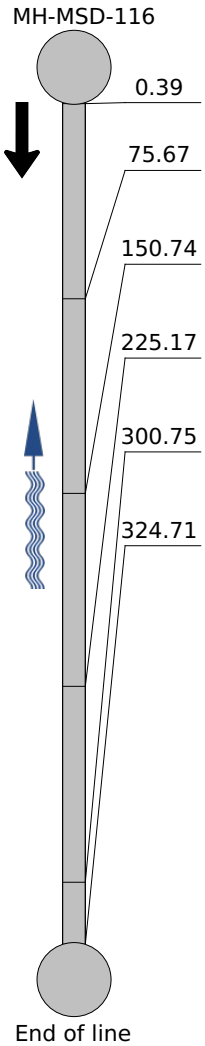
File name: **MH-MSD113 to MH-MSD110_0007.jpeg**
Inspection date and time: **21/10/2021 15:06**
Position: **526.27 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD113 to MH-MSD110_0008.jpeg**
Inspection date and time: **21/10/2021 15:06**
Position: **526.27 ft**
Code: **MGO**
General Observation, End of run

Section Inspection Report

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD116 to East end	**butte**	**walking trail**
Date	Operator	Pre-Cleaning
22/10/2021	**pat Hunter**	**Jetting**
Upstream MH	Downstream MH	Height
End of line	**MH-MSD-116**	**8 inch**
Total Length	Length Surveyed	Width
324.7 ft	**249.0 ft**	
~~	Direction	Material
End of line->MH-MSD-116	**MH-MSD-116->End of line**	**Polyvinyl Chloride**
Shape	Sewer Use	Video name
Circular		**MH-MSD116 to East end_0001.mp4**



POSITION [ft]	DC	CODE	OBSERVATION	VIDEO	FOTO
0.39		AMH	Manhole, MH-MSD116	00:18:49	MH-MSD116 to East
75.67		MGO	General Observation, Slot inspection	00:02:24	MH-MSD116 to East
150.74		MGO	General Observation, Slot inspection	00:04:31	MH-MSD116 to East
225.17		MGO	General Observation, Slot inspection	00:08:09	MH-MSD116 to East
300.75		MGO	General Observation, Slot inspection	00:10:31	MH-MSD116 to East
324.71		AEP	End of Pipe	00:11:55	MH-MSD116 to East

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD116 to East end	**butte**	**walking trail**

File name: **MH-MSD116 to East end_0006.jpeg**
Inspection date and time: **22/10/2021 07:51**
Position: **0.39 ft**
Code: **AMH**
Manhole, MH-MSD116

File name: **MH-MSD116 to East end_0001.jpeg**
Inspection date and time: **22/10/2021 07:51**
Position: **75.67 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD116 to East end_0002.jpeg**
Inspection date and time: **22/10/2021 07:51**
Position: **150.74 ft**
Code: **MGO**
General Observation, Slot inspection

Pictures

Project	Printed on	
BPSOU 10-21-2021 post jet film	**1/29/2022**	**NASSCO~PACP-6**

Pipe Segment Reference	City	Street
MH-MSD116 to East end	**butte**	**walking trail**

File name: **MH-MSD116 to East end_0003.jpeg**
Inspection date and time: **22/10/2021 07:51**
Position: **225.17 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD116 to East end_0004.jpeg**
Inspection date and time: **22/10/2021 07:51**
Position: **300.75 ft**
Code: **MGO**
General Observation, Slot inspection

File name: **MH-MSD116 to East end_0005.jpeg**
Inspection date and time: **22/10/2021 07:51**
Position: **324.71 ft**
Code: **AEP**
End of Pipe

Appendix C
Data Summary Report

SILVER BOW CREEK/BUTTE AREA NPL SITE
BUTTE PRIORITY SOILS OPERABLE UNIT

Draft Final

Butte Treatment Lagoon System
Data Summary Report
Annual 2021

Atlantic Richfield Company

May 27, 2022

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BUTTE PRIORITY SOILS OPERABLE UNIT

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Butte Treatment Lagoon System
Data Summary Report
Annual 2021

Prepared for:

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May 27, 2022

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ABBREVIATIONS AND ACRONYMS

Acronym	Definition	Acronym	Definition
%D	Percent Difference	**LMS**	Laboratory Matrix Spike (sample)
%R	Percent Recovery	**MDL**	Method Detection Limit
BPSOU	Butte Priority Soils Operable Unit	**mg/L**	Milligrams per Liter
BRW	Butte Reduction Works	**mL**	milliliter
BTL	Butte Treatment Lagoons	**NFG**	National Functional Guidelines
CCV	Continuing Calibration Verification	**NPL**	National Priorities List
CD	Consent Decree	**Pace**	Pace Analytical Services, Inc.
CFRSSI	Clark Fork River Superfund Site Investigation	**Pioneer**	Pioneer Technical Services, Inc.
CLP	Contract Laboratory Program	**QA**	Quality Assurance
CRDL	Contract-Required Detection Limit	**QAPP**	Quality Assurance Project Plan
CRQL	Contract-Required Quantitation Limit	**QC**	Quality Control
DEQ	Department of Environmental Quality (Montana)	**RL**	Reporting Limit
DM/DV	Data Management/Data Validation	**ROD**	Record of Decision
DQA	Data Quality Assessment	**RPD**	Relative Percent Difference
DQO	Data Quality Objective	**RRL**	Required Reporting Limits
DSR	Data Summary Report	**SOP**	Standard Operating Procedure
EPA	U.S. Environmental Protection Agency	**SOW**	Statement of Work
HCC	Hydraulic Control Channel	**SS**	Sampling Station
ICS	Interference Check Sample	**Stage 4**	Stage 4 Data Verification and Validation
ICV	Initial Calibration Verification	**TDS**	Total Dissolved Solids
ID	Identification (sample)	**TSS**	Total Suspended Solids
LAO	Lower Area One	**WCP-1**	West Camp Pump Station
LCS	Laboratory Control Sample		

ABSTRACT

This annual 2021 Data Summary Report (DSR) summarizes the analytical results from compliance sampling at the Butte Priority Soil Operable Unit (BPSOU) Butte Treatment Lagoons (BTL) Lower Area One (LAO) from January 1 to December 31, 2021. All data have undergone a Stage 4 data verification and validation in accordance with U.S. Environmental Protection Agency (EPA) *National Functional Guidelines* [NFG] *for Inorganic Superfund Data Review* (EPA, 2017) and EPA *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA, 2009). For the year, a total of 168 natural samples were collected during 104 sampling events: 104 sampling events included sampling station (SS) LAO-SS-1, 52 sampling events included LAO-SS-2, and 12 sampling events included LAO-SS-3. This resulted in a total of 2,523 natural data points generated by Pace Analytical Services, LLC (Pace). Of the 2,523 natural data points collected, 2,187 points (87.0%) were designated as enforcement quality, 336 points (13%) were designated as screening quality, and no data points were rejected based on laboratory and field quality control (QC) sample results.

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The information presented in this DSR includes laboratory analytical results from water samples related to monitoring activities performed during 2021.

STATEMENT OF AUTHENTICITY

Consistent with the provisions described in the 2020 U.S. EPA BPSOU Consent Decree (CD), which includes the 2006 BPSOU Record of Decision (ROD), the 2011 Explanation of Significant Differences to the 2006 ROD, and 2020 ROD Amendment as Appendix A (EPA, 2020), the data sets in this document are considered to be final data generated or evaluated. Consistent with the aforementioned orders, the signatories below hereby stipulate to the authenticity and accuracy of the data and hereby waive any evidentiary or other objection as to the authenticity and accuracy of reference in endangerment assessments, public health evaluations, feasibility studies, and remedial design/remedial action documents.

Approved by: _____ _____

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EXECUTIVE SUMMARY

This DSR summarizes data collected for the BPSOU BTL during 2021 in accordance with the project work documents and long-term monitoring objectives for the BTL.

All sampling activities followed required protocols. Site-specific Standard Operating Procedures (SOPs) developed by Pioneer followed the Clark Fork River Superfund Site Investigation (CFRSSI) procedures. The SOPs were followed for sample and data collection along with field and office protocols.

Samples collected were sent to Pace in Minneapolis, Minnesota, for analysis. Pioneer completed Stage 4 data verification and validation. All data included in this annual report are provided as final.

Data generated from the samples collected for the year sampling events were examined to ensure that project objectives were met. In total, 2,523 data points were generated from 168 natural samples collected in 104 sampling events: 336 data points were designated screening quality (13.0%), and 2,187 data points (87.0%) were designated enforcement quality based on laboratory and field QC sample results. There were no data points rejected.

All data presented herein have undergone required Stage 4 data verification and validation.

1.0 INTRODUCTION

This DSR summarizes data collected for the BTL during 2021. Specifically, this report summarizes sampling events that occurred from January 1 through December 31, 2021 (referred to as year), and provides the following:

- Data collected from weekly, twice weekly, and monthly sampling events throughout the year.

Information referenced throughout this DSR is included in the previously submitted quarterly reports below:

- First Quarter Draft Final 2021 BTL O&M Report submitted June 30, 2021.
- Second Quarter Draft Final 2021 BTL O&M Report submitted September 21, 2021.
- Third Quarter Draft Final 2021 BTL O&M Report submitted December 10, 2021.
- Fourth Quarter Draft Final 2021 BTL O&M Report submitted March 30, 2022.

All work described in this document was performed as detailed in the *BTL Groundwater Treatment System Routine Operation, Maintenance, and Monitoring (OM&M) Plan* (Atlantic Richfield Company 2021) (referred to herein as the Routine OM&M Plan*)*. Refer to the Routine OM&M Plan for additional details related to sampling and monitoring tasks. The sampling events were conducted as specified in the BTL groundwater treatment system and subdrain sampling and monitoring Quality Assurance Project Plan (QAPP) (an appendix to the Routine OM&M Plan) (referred to as QAPP herein).

The Pioneer sampling team conducted the sampling and fieldwork during the year. Water chemistry samples were collected from sample station locations shown on Figure 1 and identified below by location name, station field identification, and sample identification. Sample locations include:

Sample Station Name	Station Field Identification	Sample Identification
Effluent sample station	EFS-07	SS-1
Influent sample station	INF-04	SS-2
MSD-HCC station	MSD-HCC	SS-3

Samples collected were sent to Pace in Minneapolis, Minnesota, for analysis. The laboratory completed data verification and validation according to the laboratory quality procedures. All data included in this annual report are provided as final.

Data generated from the samples collected for the year were examined to ensure that project objectives were met. In total, 2,523 data points were generated from 168 natural samples collected in 104 sampling events: 336 data points were designated screening quality (13.0%), and 2,187 data points (87.0%) were designated enforcement quality based on laboratory and field QC sample results. There were no rejected data points during the year.

Personnel from Pioneer completed the water chemistry sampling activities. The water chemistry data collected had to undergo rigorous sampling and analysis procedures and meet quality assurance (QA)/QC protocols and documentation requirements to be designated as enforcement quality. All data underwent a Stage 4 verification and validation in accordance with EPA NFG (EPA, 2017) and EPA *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA, 2009). All data presented herein have undergone data validation in accordance with the *CFRSSI Data Management/Data Validation* (DM/DV) *Plan Addendum* (CFRSSI DM/DV Plan Addendum) (AERL, 2000a). Information pertaining to water chemistry, data quality, and data validation is provided in Section 3.0 and the previously submitted quarterly DVRs.

This DSR contains the following information:

- Investigation objectives (Section 1.1).
- Site description and background (Sections 1.2 and 1.3).
- Sampling and analysis summary (Section 2.0).
- Water quality sample collection (Section 2.1).
- Data quality assessment (Section 3.0).
- Project objectives and sampling design review (Section 3.1).
- Preliminary data review (Section 3.2).
- Data verification and validation (Section 3.3).
- Conclusions on the quality of the data (Section 4.0).

Site-specific SOPs were developed by Pioneer in accordance with the *CFRSSI SOPs* (ARCO, 1992a) and are included in the QAPP. The SOPs were followed for sample and data collection along with field and office protocols.

1.1 Objectives

The information compiled in this DSR verifies the data collected under BTL LAO operations. The QAPP identifies the primary monitoring objectives as the following:

- The surface water discharge monitoring activity objective of the BTL groundwater treatment system is to define the frequency, location, and analysis of discharge water quality.
- Document approved methods to sample and analyze water to provide data that are complete, precise, accurate, and defensible.

1.2 Investigation Site Description

The purpose of the BTL is to intercept impacted water from the West Camp Pump Station (WCP-1), Missoula Gulch baseflow, BPSOU subdrain (subdrain), Butte Reduction Works (BRW) groundwater capture, Hydraulic Control Channel (HCC) groundwater capture, and BTL system D cells, and convey it to the BTL collection cell (Cell D4). The water is then pumped from Cell D4

to the Chemical Addition System building as influent flow, where pre-treatment water quality is monitored at SS-2. The influent flow is mixed with lime slurry to reach a target pH, which allows dissolved heavy metals to precipitate and separate from the collected groundwater as treated water flows through a series of lagoon cells in the remainder of the BTL system. The lime slurry is created by adding dry calcium hydroxide, delivered by an accurate measurement system, measured by milligrams of lime (calcium hydroxide) per liter (mg/L) of influent water, to a portion of the influent water. The slurry is then added back to the remainder of the influent, and pH-adjusted influent flow is directed to three parallel lagoon cell systems. Each system consists of three, unlined, open water cells operating in parallel: A, B, and C, where the A system is to the north and C to the south. The primary purpose of the first cell is to allow the chemical reaction to occur, introduce additional carbon dioxide to the system, and to capture sediment and chemical precipitates. A fourth series of smaller, non-treatment cells, the D cells, is to the south of lagoons A2 and A3. The D cells act as hydraulic barriers between the treatment cells and Silver Bow Creek. Treated effluent water is then discharged to Silver Bow Creek at the effluent station, SS-1.

Construction details for the above-described treatment system are documented in the *Final Butte Treatment Lagoons and West Camp Pump Station Upgrades Construction Completion Report* (Atlantic Richfield Company, 2014)

1.3 Background

The LAO is located within the BPSOU immediately west of the Butte-Silver Bow municipal water treatment facility on the western edge of the city of Butte in Silver Bow County, Montana. The entire LAO site is approximately 80 acres wide and 1 mile long. Currently, the full-scale water treatment system (BTL system) is operating within the northwest one-quarter of the LAO site as a portion of the final BPSOU remedy. Figure 1 shows the area. Remedial action activities completed in the LAO area in the late 1990s included removing approximately 1.2 million cubic yards of tailings and impacted soils and reconstructing the stream and floodplain. During remedial action activities in 1996, two demonstration wetlands projects were constructed within LAO. One demonstration was discontinued in 2005. The remaining demonstration system has undergone a series of improvements and modifications from 1999 through 2010. The Agency-approved, full-scale, permanent BTL system was constructed between 2011 and 2014. The BTL system can effectively treat Missoula Gulch baseflow and WCP-1 groundwater entering the HCC, groundwater collected from the subdrain, groundwater collected from the BRW western areas (BRW-00 and BRW-01W), and groundwater collected within the BTL system at LAO.

2.0 DATA COLLECTION, EQUIPMENT MAINTENANCE, SAMPLING, AND LABORATORY ANALYSES SUMMARY

This section summarizes completed tasks that addressed the monitoring objectives described in the QAPP including sampling methods, field analysis methods, and analytical results for the year water chemistry sampling.

2.1 Water Quality Sample Collection

For the sampling events completed during the year, field technicians collected samples from the 3 surface water locations. Water chemistry samples were collected and sent to Pace for analysis. Dissolved samples were filtered through a 0.45-micron environmental filter. All sample containers were appropriately labeled with the site identification (ID), sampler, date, time, sample type, and preservation and filtration methods.

Samples were collected twice weekly at EFS-07 (LAO-SS-1) and once weekly at INF-04 (LAO-SS-2) throughout the year. Samples were collected at 1 additional surface water site at MSD-HCC (LAO-SS-3) once a month. All the required samples were collected. Pace analyzed all the samples for the required analytes as listed in Table 2 of the QAPP. In addition to the required analytes listed in the QAPP, 6 samples were analyzed for dissolved arsenic and 4 samples were analyzed for dissolved aluminum, dissolved arsenic, dissolved cadmium, dissolved calcium, dissolved copper, dissolved iron, dissolved lead, dissolved magnesium, dissolved silver, dissolved total hardness, dissolved uranium, and dissolved zinc.

The following samples were collected for analysis at each sampling location during the annual sampling events (Table 2 in the QAPP):

- Filtered water for dissolved metals. Collected in 250-milliliter (mL) Nalgene™ bottles pre-acidified by the laboratory with nitric acid.
- Raw water for total recoverable metals. Collected in 250-mL Nalgene™ bottles pre-acidified by the laboratory with nitric acid.
- Raw water for nitrate/nitrite. Collected in 250-mL Nalgene™ bottles pre-acidified by the laboratory with sulfuric acid.
- Raw water for sulfate, alkalinity, total dissolved solids (TDS) and total suspended solids (TSS). Collected in 1 liter Nalgene™ bottles.

100% of the planned samples were collected, and 100% of the planned analyses were performed. This meets the 95% QA/QC completeness Data Quality Objective (DQO) listed in the *CFRSSI QAPP* (ARCO, 1992b).

2.1.1 Sample Analysis

Water chemistry samples for dissolved metals, total recoverable metals, nitrate/nitrite, sulfate, alkalinity, TDS, TSS, and associated QA/QC samples were packaged and shipped to Pace for analysis. Analytical reports are provided in Appendix C and water chemistry results (including QA/QC samples) and applicable laboratory flags, data validation qualifiers, and reason codes are included in Table A1 through Table A3..

All required analysis (Table 2 in the QAPP) and the appropriate laboratory QC samples were analyzed with each sample group.

3.0 DATA QUALITY ASSESSMENT

The Data Quality Assessment (DQA) process (EPA, 2000) objective is to determine whether the project-specific objectives have been satisfied and if the analytical results are acceptable for project decision making. The DQA process consists of five steps that relate the quality of the results to the intended use of the data:

Step 1: Review sampling design (Section 3.1).
Step 2: Conduct preliminary data review (Section 3.2).
Step 3: Select statistical test(s), as appropriate, to evaluate data quality (not applicable).
Step 4: Verify assumptions (not applicable).
Step 5: Draw conclusions about the quality of the data (Section 4.0).

3.1 Project Objectives and Sampling Design Review

Project-specific objectives were defined to cover the requirements outlined in the BPSOU CD and Appendix A of the BPSOU CD (EPA, 2020) and were used in the sampling design.

3.2 Preliminary Data Review

A preliminary data review was conducted to determine if any problems or anomalies were present in the sample collection and analysis procedures. This was completed by evaluating data quality indicators (Section 3.2.1) followed by data verification and validation (Section 3.3).

3.2.1 Data Quality Indicators

Part of the DQA process is to evaluate the results against data quality indicators of precision, accuracy, representativeness, completeness, comparability, and sensitivity. An evaluation of each data quality indicator follows.

The summary of data points in the following sections includes only the natural samples (the samples collected at EFS-07, INF-04, and MSD-HCC locations) and does not include the field QC samples (the field duplicate and field blank samples). Note that the field QC samples underwent the same data validation procedures as the natural samples and results were included on the data validation checklists (Appendix A) of the previously submitted quarterly reports. The qualifications made to field QC samples are listed in Table A2 and Table A3. however, the qualifications made to these samples are not included in the summary of qualifications made to natural data points, and the field QC samples are not included in Table A1.

3.2.1.1 Precision

Precision is the amount of scatter or variance that occurs in repeated measurements of a particular analyte. Acceptance or rejection of precision measurements is based on the relative percent difference (RPD) of the laboratory and field duplicates. For example, perfect precision would be a 0% RPD between duplicate samples (both samples would have the same analytical result). For total metals and wet chemistry analysis, when both results are greater than 5 times the laboratory

reporting limit (RL) acceptable precision is an RPD of plus or minus 20% in water samples. For samples with 1 or both results less than 5 times the RL (including non-detect), acceptable precision is met if the absolute difference between the 2 sample results is less than the RL. This precision requirement is derived from the Contract Laboratory Program (CLP) Statement of Work (SOW) (EPA, 2016) and the CFRSSI QAPP (ARCO, 1992b). For these sampling events, precision was assessed based on laboratory prepared and field duplicate sample analysis:

$$RPD = \frac{|x - y|}{\frac{(x + y)}{2}} \times 100$$

Where:

x = investigative sample result
y = duplicate sample result

There were 54 (2%) of the natural data points qualified due to poor field and/or laboratory precision, and 2,469 (98%) of the natural data points met the precision requirements for 2021.

3.2.1.2 Accuracy

Accuracy is the ability of the analytical procedure to determine the actual or known quantity of a particular substance in a sample.

The QC criteria used during data validation for each QC sample are listed in Table 5 of the QAPP.

Of the 2,523 natural data points associated with the annual sampling events, 296 (12%) of these data points were qualified for some combination of initial calibration verification (ICV), continuing calibration verification (CCV), and/or laboratory matrix spike (LMS) percent recovery (%R), serial dilution percent difference (%D), a calibration, a detection in the interference check sample (ICS), and/or a detection in an associated blank outside the control limits. The remaining 2,227 (88%) data points met the accuracy requirements

3.2.1.3 Representativeness

Representativeness is a qualitative parameter that is addressed through proper design of the sampling program. The sampling program developed for the QAPP was designed to determine if treated groundwater quality (at LAO-SS-1) meets the end-of-pipe discharge standards and the effectiveness of the BTL treatment system.

The laboratory results were reviewed, and a Stage 4 data verification and validation completed. Based on information provided by Pace, the chain of custody requirements were met for each of the sample events. Preservation requirements were met for all samples, and all samples were analyzed within the appropriate holding times.

The results were determined to be representative of the water quality present at BTL LAO during the year. The results can be used for evaluating compliance of the treated water with the appropriate performance standards.

3.2.1.4 Completeness

Completeness is assessed to determine if enough valid data have been collected to meet the investigation needs. Completeness is assessed by comparing the number of valid sample results to the number of sample results planned for the investigation. The completeness target for this investigation was 95% or greater as designated in the CFRSSI QAPP (ARCO, 1992b). Samples were collected twice weekly at LAO-SS-1 and once weekly at LAO-SS-2 throughout the year. Samples were collected at 1 additional surface water site (LAO-SS-3) once a month. All the required samples were collected. Pace analyzed all the surface water samples for the analytes listed in Table 2 of the QAPP, except for the July monthly sample at EFS-07 (LAO-SS-1-072621). An email from Pace included in SDG 10571741 stated, "*LAO-SS-1-072621 (10571741-002): the unpreserved container arrived without the lid on the container and almost empty. There was not enough volume to complete any unpreserved analyses.*" There were 7 analytes (total alkalinity, bicarbonate alkalinity, carbonate alkalinity, hydroxide alkalinity, total dissolved solids, total suspended solids, and sulfate) that were not analyzed for LAO-SS-1-072621. In addition to the required analytes listed in the QAPP, 6 samples were analyzed for dissolved arsenic and 4 samples were analyzed for dissolved aluminum, dissolved arsenic, dissolved cadmium, dissolved calcium, dissolved copper, dissolved iron, dissolved lead, dissolved magnesium, dissolved silver, dissolved total hardness, dissolved uranium, and dissolved zinc.

Had all requested analytes been analyzed, there would have been a total of 2,530 natural data points. In total, 2,523 natural data points were generated by the sampling events. All the natural data points were usable as no sample results were rejected, 100% of the planned samples were collected, and 99.7% of the planned analyses were performed. This meets the 95% QA/QC completeness DQO listed in the CFRSSI QAPP (ARCO, 1992b)

3.2.1.5 Comparability

Comparability is assessed to determine if one set of data can be compared to another set of data. Comparisons are made by examining and comparing the laboratory and field methods used to acquire sample data for different distinct data sets. The data sets summarized in this report include water samples collected by Pioneer and samples analyzed by Pace.

The water quality samples were collected using standard sampling methods and Pioneer SOPs. The sampling design, SOPs, and laboratory analytical methods are based on EPA and other industry standard practices and were documented in the field logbook.

Sample collection was completed by professionals who were properly trained in the SOPs and equipment use. Proper chain of custody and sample handling were observed during sample collection, delivery to the laboratory, and analysis. The analytical laboratories performed the sample analysis using industry standard methods.

Consequently, data from future surface water sampling events at BTL LAO using comparable sampling and analytical methods may be used in concert with this data set.

3.2.1.6 Sensitivity

Sensitivity is a quantitative measure and is evaluated by comparing the laboratory RL or the laboratory method detection limit (MDL) to the project-required detection limit.

To evaluate sensitivity, the required reporting limits (RRL) listed in the Montana Department of Environmental Quality (DEQ) Circular 7 (DEQ-7) (DEQ, 2019) for aluminum, arsenic, cadmium, copper, iron, lead, mercury, silver, zinc, and nitrogen ($NO_2 + NO_3$) are compared to the laboratory MDL. The remaining analytes (calcium, magnesium, uranium, hardness, total alkalinity, bicarbonate alkalinity, carbonate alkalinity, hydroxide alkalinity, TDS, TSS, and sulfate) have no RRL listed in a Montana Circular DEQ-7 and do not have Applicable or Relevant and Appropriate Requirements for this project.

The laboratory MDL met the RRL for all applicable analytes except nitrate (as $NO_2 + NO_3$). The RRL for nitrate (as $NO_2 + NO_3$) is 0.01 mg/L and the Pace MDL was 0.078 mg/L. All the natural sample results for nitrate (as $NO_2 + NO_3$) were detections above the MDL. The usability of sample results that had detectable levels of analytes is not affected by an MDL that is higher than the RRL. Additionally, the Montana Circular DEQ-7 (DEQ, 2019) human health standard for nitrate/nitrite is 10 mg/L; therefore, this MDL is considered low enough to meet project needs.

For analytes without an RRL, the laboratory MDLs are consistent with anticipated MDLs listed in Table 2 of the QAPP; therefore, this MDL is considered low enough to meet project needs.

3.3 Data Verification and Validation

All data presented herein have undergone a Stage 4 data verification and validation in accordance with EPA NFG (EPA, 2017) except when superseded by the *CFRSSI DM/DV Plan* (ARCO, 1992c) or CFRSSI DM/DV Plan Addendum (AERL, 2000a). Based on the DQA process outlined in the *CFRSSI Pilot Data Report Addendum* (AERL, 2000b), the quality of the data is ranked as enforcement quality, screening quality, or it is rejected.

Enforcement quality data are supported by rigorous sampling and analysis procedures, QA/QC protocols, and documentation requirements. Enforcement quality data, as defined in the CFRSSI DM/DV Plan (ARCO, 1992c), must meet Level A and Level B criteria (Appendix A DVR Section 4.0 of the previously submitted quarterly reports) and remain unqualified during the data validation process (no J, J+, UJ, or R qualifications [U qualifications are still considered enforcement data as these qualifications mean the result is non-detect, not estimated]). Enforcement quality data can be used for all Superfund activities.

Screening quality data, as defined in the CFRSSI DM/DV Plan (ARCO, 1992c), include data that were qualified during the validation process and that met Level A but not Level B criteria. Potential uses of screening quality data, depending on their quality, include site characterization, determining the presence or absence of contaminants, developing or refining sampling and analysis techniques, determining relative concentrations, scoping and planning for future studies, engineering studies and engineering design, monitoring during implementation of the response action, and the ongoing groundwater remedy optimization effort.

Data rejected during data validation cannot be used for any Superfund activities. No results from these sampling events were rejected.

Summaries of the analytical results from samples collected at the BTL site for the year sampling events are included in the following tables.

- Table A1 contains the analytical results with laboratory qualifiers; data validation qualifiers; enforcement, screening, and rejected classifications; and data validation reason codes.
- Table A2 contains the field duplicate pair samples with results, laboratory flags, data validation qualifiers, data validation reason codes, and QC criteria calculations.
- Table A3 contains the field blank samples with results, laboratory flags, data validation qualifiers, data validation reason codes, and QC criteria calculations.
- Table A4 contains sample identification information including the field sample name, sample type, sample location, laboratory sample name, sample date, analytical methods, and analytes.
- Table A5 contains the definitions for the laboratory qualifiers; data validation qualifiers; enforcement, screening, and rejected classification codes; and data validation reason codes.

The data validation checklists for the sampling events for total metals, as well as general chemistry analyses, are included in Appendix A DVR as Attachments A1 and A2, respectively in the previously submitted quarterly reports. The Level A/B assessment checklists for the sampling events were previously included in Appendix A DVR as Attachment B of the quarterly reports. The checklists are from the CFRSSI DM/DV Plan Addendum (AERL, 2000a). The data were validated according to the EPA NFG (EPA, 2017) except when superseded by the CFRSSI DM/DV Plan (ARCO, 1992c) and Addendum.

As shown in the Level A/B checklist in Appendix A DVR (Attachment B) of the quarterly reports, all the samples met both Level A and Level B criteria. No data were designated screening quality or rejected based on the results of Level A/Level B criteria. In Appendix A, Table A1 shows the enforcement, screening, or unusable designators for each natural data point.

Of the 2,523 natural data points generated by Pace for the year samples, 2,187 (87%) of the natural data points were considered enforcement quality and 336 (13%) natural data points were classified as screening quality. In Appendix A, Table A1 show the laboratory flags, data validation qualifiers, enforcement or screening designators, and the reason code for the qualification for each of the data points.

3.3.1 Laboratory Quality Control Samples

Based on information provided by Pace, the chain of custody requirements were met for the sampling events. Receiving temperatures of samples for all events were within control limits, and the samples were analyzed within the appropriate holding times. The appropriate laboratory QC samples were analyzed with each sample group. Any qualifications required based on the laboratory QC sample results are detailed in the data validation checklists in Appendix A of the previously submitted quarterly reports and are listed in Table A1 and Table A2. Also refer to Section 5.1 and 5.2 of the quarterly DVR's..

3.3.2 Field Quality Control Samples

The samples were collected following the requirements in the QAPP: 1 field duplicate and 1 field blank collected each month during a sampling event. During the events, 12 field duplicate and 12 field blanks were collected. The results for field QC samples are listed in Table A2 and Table A3. Qualifications required because of field QC sample results are detailed in quarterly DVR's and listed in Table A1.

3.3.2.1 Field Blank Results

Field blank sample (bottle blanks and rinsate blanks) results are used to provide a measure of the effectiveness of field decontamination and help evaluate the cleanliness of disposable field equipment. Field blank results are listed in Table A3 in Appendix A. The rinsate blanks were collected from the dedicated sampler at EFS-07 (LAO-SS-1). If the rinsate blank results did not meet the control limit, the results for both samples at EFS-07 collected that week were evaluated for qualifications.

Twelve field blanks associated with the samples were submitted for analysis for the year sampling events, this meets the frequency requirement for field blank collection outlined in the QAPP (one field blank collected each month for BTL sampling). In addition to the QAPP requirement, there were 10 rinsate blanks submitted for analysis for the year sampling events. There were 3 natural data points qualified due to an exceedance of a field blanks and 24 natural data points qualified due to an exceedance of a rinsate blank.

3.3.2.2 Field Duplicate Results

Field duplicates are used to assess field and laboratory precisions. The field duplicate and its parent sample results are listed in Table A2 in Appendix A. One field duplicate sample was submitted with the samples from each of the monthly events, this meets the frequency requirement for field duplicate collection outlined in the QAPP. There were 37 instances where the field duplicate pair results did not meet the control limit. This resulted in the qualification of 51 natural data points made to the parent sample and samples considered sufficiently similar due to poor field precision.

4.0 DATA QUALITY CONCLUSIONS

The laboratory samples were collected using standard sampling methods and in accordance with relevant Pioneer SOPs. The sampling design, SOPs, and laboratory analytical methods were based on EPA and other industry standard practices. Sample collection was completed by professionals who were properly trained in following SOPs and using proper equipment. Proper chain of custody and sample handling activities were observed during sample collection, delivery to the laboratory, and analysis. The analytical laboratories performed the sample analyses using industry standard methods. As shown in the checklists (Appendix A), all data met the Level A and Level B criteria.

Data generated from the samples collected for the yearly sampling events were examined to ensure that project objectives were met. The DQOs for the investigation are listed in the QAPP. A data QA/QC review was completed for each of the quarter sampling events.

Sample Location	Total Natural		Level A/B	DV Flag J, J+, J-, or UJ	DV Flag R	DV Flag U or A	Enforcement Quality	Screening Quality	Rejected
	Samples	Data Points	A/B	Data Points	Data Points	Data Points	Data Points (% of total)	Data Points (% of Total)	Data Points (% of Total)
2021 Q1									
LAO-SS-1	25	349	B	59	0	0	290 (83%)	59 (17%)	0 (0%)
LAO-SS-2	13	193	B	5	0	0	188 (97%)	5 (3%)	0 (0%)
LAO-SS-3	3	63	B	1	0	0	62 (98%)	1 (2%)	0 (0%)
2021 Q1 Total	41	605	B	65	0	0	540 (89%)	65 (11%)	0 (0%)
2021 Q2									
LAO-SS-1	26	364	B	55	0	41	309 (85%)	55 (15%)	0 (0%)
LAO-SS-2	13	194	B	8	0	6	186 (96%)	8 (4%)	0 (0%)
LAO-SS-3	3	64	B	7	0	0	57 (89%)	7 (11%)	0 (0%)
2021 Q2 Total	42	622	B	70	0	47	552 (89%)	70 (11%)	0 (0%)
2021 Q3									
LAO-SS-1	27	369	B	102	0	46	267 (72%)	102 (28%)	0 (0%)
LAO-SS-2	13	193	B	5	0	0	188 (97%)	5 (3%)	0 (0%)
LAO-SS-3	3	63	B	2	0	2	61 (97%)	2 (3%)	0 (0%)
2021 Q3 Total	43	625	B	109	0	48	516 (83%)	109 (17%)	0 (0%)
2021 Q4									
LAO-SS-1	26	415	B	72	0	47	343 (83%)	72 (17%)	0 (0%)
LAO-SS-2	13	193	B	15	0	1	178 (92%)	15 (8%)	0 (0%)
LAO-SS-3	3	63	B	5	0	1	58 (92%)	5 (8%)	0 (0%)
2021 Q4 Total	42	671	B	92	0	49	579 (86%)	92 (14%)	0 (0%)
Grand Total	168	2,523	B	336	0	144	2,187 (87%)	336 (13%)	0 (0%)

In total, 2,523 data points were generated by the 104 sampling events: 336 (13%) natural data points were designated screening quality, and 2,187 (87%) natural data points were designated as enforcement quality based on laboratory and field QA/QC sample results.

All the natural data points were usable as no sample results were rejected, 100% of the planned samples were collected, and 100% of the planned analyses were performed. This meets the 95% QA/QC completeness DQO listed in the CFRSSI QAPP (ARCO, 1992b).

4.1 Deviations

The following deviation occurred during 2021.

- Field grab samples were collected during February and March at EFS-07 due to issues with the ISCO sampler and sample pump.
- Field grab samples were collected on April 8, 12, 15, 19, 22, and 26, 2021, at EFS-07 due to issues with the ISCO sampler and sample pump.

"Grab" samples are collected following an approved SOP as a contingency if the ISCO automatic samplers fail to collect the 24-hour composite.

- For the samples in SDG 10559768 collected on May 6 and May 10, 2021, Pace was unable to perform the low-level mercury analysis (MDL = 0.0047 µg/L) within the required hold time (28 days). Pace was instructed to perform the standard mercury analysis (MDL = 0.045 µg/L) within hold time and the low-level mercury analysis when possible. The low-level mercury analyses were performed with hold times of 32 and 29 days.

Due to the relative short amount of time that the method 245.1 low level mercury analysis was completed out of hold, the MDL for the standard method 245.1 was below the Human Health standard,, and both sets of results were reported as non-detects these mercury results still meet the required DQO's for the project.

> The unpreserved container for sample ID LAO-SS-1-072621 arrived at the laboratory without the lid on and the container almost empty. There was insufficient volume to complete analyses for alkalinity, sulfate, TDS and TSS. These analyses are not required for compliance, but are used for operational information.

All validated data were considered enforcement or screening quality data with no data being rejected; therefore, all data are usable for project needs and meet the DQO's listed in the QAPP.

5.0 REFERENCES

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Figures

Figure 1: BTL and BPSOU Subdrain Routine Sampling and Monitoring Locations

Point Table			Point Table		
Description	Northing	Easting	Description	Northing	Easting
MH-MSD106	651209.02	1197905.47	HCC-01	651325.00	1193749.26
MH-MSD108	651265.29	1198781.03	HCC-01A	651326.53	1193021.75
MH-MSD110	651503.81	1199850.85	HCC-01B	651331.65	1192933.79
MH-MSD113	652414.06	1200906.31	HCC-02A	651364.64	1192780.84
MH-MSD116	653236.82	1201858.01	HCC-03	651895.05	1192245.96
MSD-HCC	651600.21	1194949.19	HCC-03A	651940.66	1192156.74
MSD-OUT	651324.20	1197083.50	HCC-04	652072.94	1191792.43
A1	651838.45	1192164.94	HCC-04A	652097.11	1191743.43
A2	651931.22	1191690.21	HCC-05	652280.66	1191254.87
A3	652055.47	1191180.80	HCC-05A	652303.23	1191210.43
B1	651484.14	1192551.84	HCC-06	652343.18	1191051.80
B2	651657.02	1192233.20	HCC-06A	652355.78	1191012.56
B3	651702.08	1192096.79	HCC-07	652188.07	1190724.00
C1	651464.96	1192558.36	INDC	651511.64	1192604.67
C3	651541.57	1192046.18	INF04	651457.40	1192637.70
			EFS-07	651925.98	1191093.47

LEGEND:

- BTL ANALYTICAL SAMPLE COLLECTION
- SUBDRAIN LOADING - FLOW WATER LEVEL, FIELD PARAMETERS. ANALYTICAL SAMPLES
- BTL FIELD DATA - LEVEL
- HCC STAFF GAUGE LOCATIONS
- BTL FIELD DATA- pH, TEMP, CONDUCTIVITY
- INDC

DISPLAYED AS:
COORD SYS/ZONE: MSP
DATUM: NAD 83
UNITS: FEET
SOURCE: PIONEER

SCALE IN FEET
0 100 200

FIGURE 1

BTL AND BPSOU SUBDRAIN ROUTINE SAMPLE AND MONITORING LOCATIONS

PIONEER TECHNICAL SERVICES, INC.
1101 SOUTH MONTANA
BUTTE, MONTANA 59701
(406) 782-5177

DATE: 2/2019

Tables

(Included Separately)