**Eagle Mine**
4547 County Road 601
Champion, MI 49814, USA
Phone: (906) 339-7000
Fax: (906) 339-7005
www.eaglemine.com

Monday, March 14, 2022

Ms. Melanie Humphrey
Michigan Department of Environment, Great Lakes, and Energy
1504 W. Washington St.
Marquette, MI 49855

**Subject: Annual Mining and Reclamation Report, Eagle Mine, LLC**
**Nonferrous Metallic Mineral Mining Permit (MP 01 2010), Humboldt Mill**

Dear Ms. Humphrey:

Eagle Mine, LLC has an approved Mining Permit (MP 01 2010) dated February 9, 2010. General Permit Condition F-2 states, "The permittee shall file with the MMU supervisor a Mining and Reclamation Report on or before March 15 of each year, both during milling operations and post closure monitoring as required by Section 324.63213 and R 425.501. The report shall include a description of the status of mining and reclamation operations, an update of the contingency plan, monitoring results from the preceding calendar year, tonnage totals of material mined, and amount of metallic product by weight."

Please find enclosed, the 2021 Annual Mining and Reclamation Report for the Humboldt Mill.

Should you have any questions about this report, please do not hesitate to contact me at 906-203-0301.

Sincerely,

*Lauren Cavalieri*

Lauren Cavalieri
Environmental Advisor

Cc: Humboldt Township

enclosure

# 2021 Annual Mining and Reclamation Report
# Humboldt Mill
# Mine Permit MP 01 2010

March 15, 2022

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## Acronyms and Abbreviations

| | |
|---|---|
| AEM | Advanced Ecological Management |
| AMP | adaptive management plan |
| BMPs | best management practices |
| COSA | Coarse Ore Storage Area |
| CLO | Concentrate Load-Out Facility |
| CN | Canadian National |
| COI | Constituents of Interest |
| DO | dissolved oxygen |
| Eagle | Eagle Mine LLC |
| EGLE | Michigan Department of the Environment, Great Lakes & Energy |
| EMT | Emergency Medical Technician |
| gpm | gallons per minute |
| HDPE | high-density polyethylene |
| HTDF | Humboldt Tailings Disposal Facility |
| HWMB | Humboldt Wetland Mitigation Bank |
| MER | Middle Branch Escanaba River |
| MDNR | Michigan Department of Natural Resources |
| MG | million gallons |
| MRR | Mining and Reclamation Report |
| µg/L | micrograms per liter |
| mg/L | milligrams per liter |
| MNFI | Michigan Natural Features Inventory |
| MSL | mean sea level |
| NPDES | National Pollution Discharge Elimination System |
| NREPA | Natural Resources & Environmental Protection Act |
| NTU | Nephelometric Turbidity Units |
| ORP | Oxidation Reduction Potential |
| Q1 | Quarter 1 |
| QAL | quaternary unconsolidated formation |
| SESC | Soil Erosion and Sedimentation Control |
| SU | standard units |
| SWPPP | Storm water Pollution Prevention Plan |
| t | metric ton (tonne) |
| TDS | total dissolved solids |
| TSS | total suspended solids |
| TIE | Toxicity Identification Evaluation |
| UFB | upper fractured bedrock |
| WBR | Black River |
| WTP | Water Treatment Plant |
| WRD | Water Resources Division |

# 1. Document Preparers and Qualifications

This Mining and Reclamation Report (MRR) was prepared by the Eagle Mine-Humboldt Mill Environmental Department and incorporates information prepared by other qualified professionals. Table 1 provides a listing of the individuals and organizations who were responsible for the preparation of this MRR as well as those who contributed information for inclusion in the report.

**Table 1. Document Preparation – List of Contributors**

| Organization | Name | Title |
|---|---|---|
| **Individuals responsible for the preparation of the report** | | |
| Eagle Mine LLC | Amanda Zeidler | HSE & Permitting Manager |
| Eagle Mine LLC | Jennifer Nutini, PE | Environmental Superintendent |
| Eagle Mine LLC | David Bertucci | Environmental Compliance Supervisor |
| Eagle Mine LLC | Lauren Cavalieri | Environmental Advisor |
| **Report contributors** | | |
| Advanced Ecological Management LLC | Doug Workman, PhD | Aquatic Scientist |
| Barr Engineering | Chris Miron, PE | Senior Chemical Engineer |
| Barr Engineering | Denise Levitan, PhD, PG | Geochemist |
| Barr Engineering | Katy Lindstrom, PE | Groundwater hydrogeologist |
| Barr Engineering | Matt MacGregor | Wetland Scientist/Biologist |
| Barr Engineering | Mehgan Blair, PG | Geochemist |
| Eagle Mine LLC | Brooke Routhier, PE | Water Services Superintendent |
| Eagle Mine LLC | Carlye Hares | HSE Data Specialist |
| Eagle Mine LLC | Christine Bekkala | Finance Controller |
| Eagle Mine LLC | Hugo Staton | Mill Operations Supervisor |
| Eagle Mine LLC | Karen Carlson | HSE Administrative |
| Eagle Mine LLC | Miguel Valenzuela | Metallurgist |
| Eagle Mine LLC | Steve Daavettila | Metallurgist |
| Golder Associates | Devin Castendyk, PhD | Geochemist |
| TriMedia Environmental & Engineering | Ryan Whaley | Senior Scientist |

## 2. Introduction

Eagle Mine officially began the remediation and reconstruction of the Humboldt Mill located in Humboldt Township in October 2008. Processing of ore from the Eagle Mine commenced in September 2014. Due to the commencement of milling operations, Eagle Mine is required per Part 632 to submit an annual Mining and Reclamation Report (MMR) as detailed in R 425.501.

The MRR is required to provide a description of mining and reclamation activities, updated contingency plan, monitoring results, tonnage of material processed, and a list of incident reports that created, or may create a threat to the environment, natural resources, or public health and safety at the Eagle Mine Site. In addition, this MRR will also memorialize the decisions and/or modifications that have been approved throughout the process.

## 3. Site Modifications and Amendments

Two notifications were submitted in 2021, one of which was in relation to a well installation project; the other was a notification of the removal of the HTDF weather station.

Proper notifications were submitted and approved by the Michigan Department of Environment, Great Lakes & Energy (EGLE).

- In August of 2021, a notification was submitted describing a well installation project along the south side of the HTDF. Four (4) wells were installed to characterize groundwater inflows on the southern end of the HTDF. This groundwater data will assist with water quality modelling of the HTDF in closure planning.
- In October of 2021, a notification was submitted for the removal of the floating weather station which was installed under Special Permit Conditions Section F.3.H. The nearby Clarksburg weather station is used to monitor atmospheric data and an YSI EXO auto-profiler purchased and installed in 2018 is now used to monitor changes to the water column structure of the HTDF to meet the monitoring criteria stated in Section F.3.H. The sonde has continuous communication abilities and high-quality sensors which makes it more effective and accurate then the floating weather station in closely monitoring changes in the chemical and physical characteristics of the water column.


**Left:** Development of one of the newly installed wells, September 2021. **Right:** Auto-Profiler purchased and installed in 2018.

**Table 3. Submittals and Approvals Required Under Part 632**

| Date | Description | Approval |
|---|---|---|
| 3/15/21 | 2020 Annual Mining and Reclamation Report | N/A |
| 6/14/21 | Q1 groundwater and surface water monitoring data | N/A |
| 8/12/21 | Notification of well installation | 8/12/2021 |
| 9/27/21 | Q2 groundwater and surface water monitoring data | N/A |
| 10/11/21 | Notification of weather station removal | 10/15/2021 |
| 11/30/21 | Q3 groundwater and surface water monitoring data | N/A |
| 2/11/2022 | Q4 groundwater and surface water monitoring data | N/A |

**Table 4. Non-Routine Submittals and Approvals Required Under Other Permits**

| Date | Description | Approval |
|---|---|---|
| 1/07/21 | Submitted the revised Storm Water Pollution Prevention Plan (SWPPP) | N/A |
| 3/1/21 | SARA Title III Tier II Report | N/A |
| 3/5/21 | Notification of WTP deep water influent discharge | N/A |
| 3/15/21 | Submitted Michigan Air Emissions Reporting System (MARES) Report | N/A |
| 3/15/21 | Notification of change in facility operations – Remineralization system | N/A |
| 3/19/21 | Notification of unintended discharges | N/A |
| 4/6/21 | Notification of amenable cyanide detection | N/A |
| 6/07/21 | Notification of amenable cyanide detection | N/A |
| 7/28/21 | Notification of reverse osmosis permeate discharge | N/A |
| 8/24/21 | Notification of unintended discharges | N/A |
| 9/28/21 | United States EPA DMR-QA 41 Study | N/A |
| 12/14/21 | Humboldt Township zoning permit for zero liquid discharge (ZLD) treatment plant | 2/28/22 |

## 4. Processing Activities and Data Report

As of September 23, 2014, the mill was officially operating and producing concentrate. The commencement of milling activities initiated all monitoring programs per the Part 632 Mining Permit. A description of the 2021 monitoring activities can be found in Section 7 of this report.

### 4.1. Processing Report

In 2021, 705,279 wet metric tonnes of ore were transported from the Eagle Mine to the Humboldt Mill by over the road haul trucks. Table 4.1 below summarizes the dry tonnes of ore crushed and milled and the total volume of nickel and copper concentrate produced in 2021.

In 2021, approximately 49,834 dry tonnes of copper and 136,768 dry tonnes of nickel were shipped offsite via rail. Mineral Range manages rail shipments from the Humboldt Mill to the Ishpeming Rail Yard. From that point Canadian National (CN), and to a lesser extent, Canadian Pacific Rail and Ontario Northland Rail transports the material to its final destination.

**Table 4.1 Volume of Ore Crushed, Milled, and Concentrate Produced in 2021**

| Month | Ore Crushed (dry tonnes) | Ore Milled (dry tonnes) | Copper Concentrate Produced (dry tonnes) | Nickel Concentrate Produced (dry tonnes) |
|---|---|---|---|---|
| January | 64,062 | 64,602 | 5,476 | 15,453 |
| February | 58,845 | 59,181 | 4,033 | 10,916 |
| March | 63,320 | 62,675 | 4,836 | 12,757 |
| April | 61,322 | 62,276 | 4,166 | 13,152 |
| May | 65,339 | 64,322 | 6,466 | 12,072 |
| June | 53,363 | 53,081 | 3,781 | 9,768 |
| July | 49,325 | 49,832 | 4,018 | 12,011 |
| August | 59,044 | 59,280 | 4,335 | 10,848 |
| September | 56,827 | 57,008 | 2,922 | 9,038 |
| October | 57,991 | 58,129 | 3,476 | 10,587 |
| November | 58,721 | 58,364 | 3,369 | 10,606 |
| December | 49,970 | 50,383 | 2,956 | 9,560 |
| **2021 Annual Total** | 698,129 | 699,133 | 49,834 | 136,768 |

Source: Mill Operations Year End Reconciled

### 4.1.1. Tailings

Tailings are the waste material that is generated when processing ore. At the Humboldt Mill, tailings are sub-aqueously disposed in the Humboldt Tailings Disposal Facility (HTDF) which is an industry best practice to minimize the risk of oxidation of sulfide bearing material. The tailings slurry is comprised of finely ground waste rock, water, and process effluents and is deposited in the HTDF via a double-walled high-density polyethylene (HDPE) pipeline. At the shoreline of the HTDF, the pipeline splits and the tailings can be routed to one of the subaqueous outfalls located within the HTDF. The use of multiple outfalls allows for better control of the depth of tailings in an area and optimizes the storage volume that is available.

In 2021 approximately 223 million gallons (MG) of tailings slurry was sub-aqueously disposed of in the HTDF.

Tailings were deposited at pit floor locations in the winter months and in the summer months, tailings were deposited using a barge system at elevated positions between 70 feet and 100 feet deep. The elevated deposition points strategically formed a ridge across the pit effectively dividing the HTDF into north and south basins. This was a part of the tailings deposition plan and allows for the intentional isolation of water on either side of the ridge for water treatment purposes. In December 2021, tailings deposition returned to a pit floor deposition point in the northern portion of the HTDF where it will remain until Spring 2022.

In accordance with permit condition, F-7, an annual bathymetry survey is required to be conducted in order to accurately monitor tailings placement and calculate changes in HTDF water storage. However, to better understand the settling characteristics of the tailings, two surveys were completed in 2021. The surveys were conducted in June and October and focused on the entire HTDF as tailings were dispersed to multiple areas in 2021. Copies of the bathymetry surveys are available in Appendix B. Based on October 2021 bathymetry survey results, the maximum tailings peak measured at 1,463 MSL with the majority of the tailings stored below elevation 1,445 MSL.

Photo of the HTDF, June 2021

The Metallic Minerals Lease (No. M-00602) requires the lessee to furnish a mill waste reject report on an annual basis. In 2021, 515 dry metric tonnes of copper and 2,934 dry metric tonnes of nickel were deposited in the HTDF as tailings.

## 5. Site Water Usage, Treatment and Discharge

Three separate sources supply water to the mill site to support various operational activities and the site water balance is comprised of well water, process water, precipitation, groundwater infiltration, and storm water runoff. With the exception of potable water, which is discharged to the onsite septic system, all of the other water sources are captured in the HTDF and are treated by the WTP before being discharged.

### 5.1. Supply Water Sources and Use

Three separate sources supply water to the mill site to support various operational activities. These sources include the potable well, industrial well, and reclaim water from the HTDF. Utilizing the detailed water use logs maintained on site, the following summary of average water use from each source has been compiled.

The domestic well is mainly used to supply potable water to the facility. In 2021, approximately 0.75 MG of water was drawn from the domestic water well which is an increase from the 2020 total of 0.60 MG. The decrease in domestic water usage onsite in 2020 can likely be linked to telecommuting due to COVID-19.

The industrial well is only used to keep the fire water tank full, limiting consumption from this source. In 2021, approximately 0.28 MG of water was utilized from the industrial well. This is a slight increase from the 0.20 MG withdrawn in 2020.

The third source of water at the mill site is the reclaim water which is pumped from the HTDF. This water is used throughout the process with the volume that is not consumed being recycled back to the HTDF via tailings. Where possible, reclaim water usage in the mill has been replaced with internally recycled process water and the volume of water sent to the HTDF has been reduced to match the reduction in reclaim water brought into the mill. In 2021, approximately 183 MG of reclaim water was pumped from the HTDF for use in processing ore. Apart from approximately 5.6 MG of water that was contained in the concentrate and shipped offsite, the remainder of the water was recycled back to the HTDF for eventual reuse or treatment by the WTP.

### 5.2. Storm Water Control

A site grading plan was developed with the purpose of keeping all storm water onsite and directing run-off to one of two locations: the HTDF or storm water retention basin. The majority of site grading, paving, and curbing was previously completed to direct water to the series of catch basins that were installed along the length of the main facility from the rail spur to the security building. These catch basins direct storm water from the main mill facility to the HTDF. Water which falls south of the main site access road, is directed to the storm water retention basin via a drainage ditch or series of catch basins in the administrative building parking lot. A copy of the Humboldt Mill Storm Water Drainage map is included in Appendix C.

Storm water control at the Humboldt Mill is managed under NPDES permit (MI00058649) and in accordance with Part I.B of the permit a storm water pollution prevention plan (SWPPP) has been developed. The SWPPP describes the Humboldt Mill site and its operations, identifies potential sources of storm water pollution at the facility, recommends appropriate best management practices (BMPs) or pollution control measures to reduce the discharge of pollutants in storm water runoff, and provides for periodic inspections of pollution control measures. The plan must be reviewed, and updated, if necessary, on an annual basis and a written report of the review must be maintained and submitted to EGLE on or before January 10th of each year. The 2021 SWPPP annual review was completed and submitted to the Department on January 4th, 2022. A copy of the plan is available upon request.

### 5.3. Water Treatment Plant Operations and Discharge

Effluent discharges are regulated under the NPDES permit MI0058649 with analytical results and discharge volume reported to EGLE monthly through the MiWaters electronic reporting system. Throughout 2021, Eagle continued discharging treated effluent water to Outfall 004, located at the Escanaba River, which was permitted and constructed in late 2018. Eagle also continued using the Escanaba River intake system to supply water and maintain optimal hydrologic conditions in wetlands adjacent to the Humboldt WTP and within the wetlands north of U.S. Hwy 41 via Outfall 003. Outfalls 001 and 003 were not used to discharge treated effluent during 2021.

In April 2021, a remineralization system was constructed giving Eagle the ability to add hardness ions to the reverse osmosis (RO) permeate in form of calcium carbonate. This gives more control over the hardness in our effluent discharge. The remineralization system has not yet been used in our water treatment process.

In addition to the remineralization system, the existing brine concentrator RO was converted into a two stage, primary RO, and concentrator RO, designed to treat higher total dissolved solids (TDS) feed water. This system was commissioned at the end of April 2021.

**Left:** Remineralization System, May 2021. **Right:** Concentrator RO, May 2021

In 2021, approximately 289.9 MG of water was treated and discharged from the water treatment plant. Table 5.3 below summarizes the monthly flow rate from each WTP outfall in 2021.

**Table 5.3 Volume of Water Discharged in 2021**

| Month | Outfall 001 Volume of WTP Effluent Water Discharged (MG) | Outfall 003 Volume of WTP Effluent Water Discharged (MG) | Volume of Escanaba River Water Recirculated through Outfall 003 (MG) | Outfall 004 Volume of WTP Effluent Water Discharged (MG) |
|---|---|---|---|---|
| January | 0 | 0 | 18.8 | 36.7 |
| February | 0 | 0 | 15.3 | 32.7 |
| March | 0 | 0 | 16.9 | 36.4 |
| April | 0 | 0 | 16.2 | 30.3 |
| May | 0 | 0 | 16.5 | 32.7 |
| June | 0 | 0 | 16.6 | 23.4 |
| July | 0 | 0 | 15.1 | 19.0 |
| August | 0 | 0 | 10.0 | 7.1 |
| September | 0 | 0 | 7.4 | 11.5 |
| October | 0 | 0 | 9.5 | 11.4 |
| November | 0 | 0 | 15.7 | 26.0 |
| December | 0 | 0 | 18.3 | 22.7 |
| **2021 Total** | **0** | **0** | **176.3** | **289.9** |

Source = WTP Operators log

To accomplish near term and longer-term operating objectives Eagle continues to evaluate the equipment capacities in the WTP. The agency will be notified appropriately in advance of process changes under the NPDES program permit requirements.

The water treatment process generates one solid waste stream derived from solids in the clarifier, which is primarily comprised of aluminum, iron, calcium, sodium, magnesium, and nickel. Waste characterization samples are required by the landfill prior to acceptance of the material. Samples from the filter press waste stream were collected in January 2021 and sent to ALS Laboratory for analysis. Laboratory results confirmed the waste stream is non-hazardous. In 2021, approximately 158 tons of filter press waste was disposed of at the Marquette County Landfill.

## 5.4. Water Balance

The main components of the water balance are reclaim water/WTP intake, off-spec WTP water, process water, well water, precipitation, groundwater infiltration, and storm water runoff all of which are captured or otherwise managed in the HTDF and treated by the WTP before discharging to the Middle Branch of the Escanaba River (Outfall 004). Permit condition F-2 requires that the site water balance be updated on a quarterly basis to ensure the water level of the HTDF is managed in a manner that minimizes risk to the environment. The 2021 target operating water elevation of the HTDF was between 1530.5 and 1531.0 ft MSL which is significantly lower than originally planned during the permitting process. The lower operating level mitigates risks associated with overflow situations and provides excess capacity to manage various operational situations.

Eagle returns off-specification water from the WTP plant in a single line depositing the water in the same area as tailings are being discharged. The off-specification water includes backwash from the UF and RO systems, filter press filtrate and excess RO permeate. This water exhibits a moderate concentration of dissolved solids similar to that of tailings. Brine is discharged below the elevation of tailings disposal in an area of the HTDF that has been reserved for brine storage.

Throughout 2021 the area received average to light precipitation in the form of rainfall and snowfall. After high HTDF water levels of 1537.64 MSL in October of 2019, the HTDF elevation decreased in 2020. That remained stable in 2021 with an average HTDF elevation of 1531.33 ft MSL. In 2022, Eagle will again focus on maintaining the water level with a continued target operating level of 1530.5 to 1531.0 ft MSL.

Eagle continues to use an integrated groundwater, surface water, and water balance model to estimate the water balance based on several years of operational data. The model estimates the water balance for the HTDF and surrounding watershed for both current watershed conditions and those consistent with pre-existing conditions prior to redevelopment of the Humboldt Mill.

Eagle continued to maintain the water balance to Wetland EE and the downstream wetland systems by discharging water from the Middle Branch of the Escanaba River to Outfall 003. The last few years, the pump system was unable to reach the design flows despite improvement efforts. Although the system was still unable to meet high design flows in 2021, improvements made in 2021 included:

- Flow meter testing to confirm readings are accurate.
- Inspection of the intake line with a wheeled camera to determine if restrictions were present (a layer of biofilm and fine sediment has accumulated in a portion of the system).

- Occasional cleaning of valves to remove material that would plug them and reduce flow through the system
- Replace valves, vents, and joints with a different style to minimize flow restrictions.
- In the spring of 2022, Eagle plans to try Ice Pigging™, which is an in-line inspection and cleaning technique where an ice slurry is moved through the piping network to remove unwanted material, sediment, or product.

Outfall 003 is supplied with water year-round.

Despite periodic deviations from the flow model, the wetland hydrology was maintained year-round with no major flooding or drought conditions experienced in the downstream areas. This may indicate that the downgradient wetland mitigation bank and other wetland culvert systems are robust and mature enough to handle a variety of water conditions, which will be useful information to consider for closure planning and design. The wetland response information is continually tracked for the purpose of a closure design for a passively controlled discharge structure on the HTDF.

Copies of the 2021 quarterly water balance diagrams and HTDF water elevation data are included in Appendix D.

# 6. Materials Handling

## 6.1. Fuel Handling

A 3,000-gallon double-walled stationary bulk diesel tank with leak detection located on the east side of the COSA is the only bulk fuel storage on site. The bulk tank is refueled as necessary by an offsite fuel provider.

## 6.2. Bulk Chemical Handling and Storage

It is the goal of Eagle Mine to create a culture of environmental awareness throughout the workforce. Therefore, all employees and subcontractors are trained to immediately respond and report any spills that occur. In 2021, the Humboldt Mill had zero reportable spills under the Part 5 Rules of Part 31, Water Resources Protection of NREPA, 1994 PA 451 as amended (Spillage of Oil and Polluting Materials).

The Michigan SARA Title III Program requires reporting of onsite chemicals being stored above certain threshold quantities. Due to the volume of chemicals stored/used at the site for processing and water treatment, a Tier II Report was submitted in February 2021 via the online Tier II Reporting System to the State Emergency Response Commission (SERC). Copies of the report were also mailed to the Marquette County Local Emergency Planning Committee (LEPC) and Humboldt Township Fire Department.

# 7. Monitoring Activities

## 7.1. Water Quality Monitoring

A significant amount of surface water and groundwater quality monitoring is required on the mill site and surrounding areas. The following is a summary of the water quality monitoring activities.

### 7.1.1. Quarterly Groundwater Quality Monitoring

Groundwater quality is monitored through a network of monitoring wells located inside the perimeter fence line of the mill site. The monitoring wells are classified as either compliance, leachate, facility, or monitoring. Compliance wells are located on the north-side of the cut-off wall, outside of the influence of the HTDF; leachate wells are located on south-side of the cut-off wall and generally represent HTDF water quality; facility monitoring wells are located downgradient of each operating facility; the remaining monitoring wells are located north of the cut-off wall but are not used to confirm effectiveness of the cut-off wall as the compliance and leachate wells are. A map of the well locations can be found in Appendix E. Four rounds of quarterly sampling were completed in March (Q1), June (Q2), August (Q3), and November (Q4), 2021. The Eagle Mine Permit prescribes both a long parameter list for annual monitoring events (conducted in Q3 2021) and a short list to be used quarterly (Q1, Q2, Q4 2020). Samples were collected in accordance with the Eagle Project Quality Assurance Project Plan and Standard Operating Procedures (North Jackson, 2004a and 2004b) and the results are summarized and compared to benchmarks in the tables found in Appendix F.

Monitoring Locations MW-704 QAL, and MW-707 QAL June 2021

***Monitoring Results***

Twenty-four monitoring well samples were collected by TriMedia Environmental & Engineering (TriMedia) during each of the four quarterly sampling events. Samples were collected using low-flow sampling techniques, and field parameters (dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, specific conductivity, temperature, turbidity) are collected and analyzed using a flow-through cell and YSI probe. All samples are shipped overnight to Pace Analytical Services in Grand Rapids, Michigan, for analysis.

In accordance with Part 632, R426.406 (6) when a result is greater than a benchmark for two consecutive sampling events at a compliance monitoring location, the permittee is required to notify EGLE and determine the potential source or cause resulting in the deviation from the benchmark. Fluctuations in groundwater elevation, the potential impact by road salt/sand applications, and/or shifts in the redox conditions of groundwater are the likely drivers of the conditions that occurred throughout the year. The following is a summary of the events that occurred in 2021:

- Seventeen of the 24 monitoring locations required field filtering for at least one quarter in 2021 due to turbidity levels that exceeded 3 NTU, and therefore the values are reported as dissolved concentrations. The remaining locations/quarters reported turbidity below 3 NTU and are reported as total concentrations. The sample summary denotes whether the sample values are total or dissolved.
- Four of the monitoring locations (i.e., MW-702 UFB, MW-703 UFB, HW-1L, and HW-1U) are very slow to recharge and are pumped down in advance of sampling in order to ensure that the samples collected are representative of the groundwater at the monitoring location. Locations MW-702, MW-703, and HW-1L take approximately one month to recover while HW-1U takes approximately four months to fully recover due to the tight formation in which it is located. The presence of bentonite has also been observed in proximity to the screened interval of the monitoring well and may also contribute to the slow recharge rate at HW-1U. Samples from these locations follow low-flow sampling procedures (with the exception of HW-1U) after the recharge period. The results from these wells may not accurately characterize the true water quality of the location and are also likely to be pulling the same water from the well every quarter (i.e., causing dependent sample measurements). Early in 2022, Eagle evaluated the sampling frequency for several locations in accordance with EPA procedures and proposed changes were submitted to the Department for consideration.
- The major cation parameters analyzed (calcium, magnesium, potassium, and sodium) were detected at all locations with most of the detections below the calculated benchmarks. Among major anion parameters analyzed, bicarbonate alkalinity, sulfate and chloride were detected in many of the samples. Concentrations were frequently but not always below the calculated benchmarks. Nitrogen species (ammonia, nitrate, and nitrite) were detected more irregularly. Carbonate alkalinity, fluoride, and sulfide were rarely detected. A summary of wells that have had one or more parameters exceed a benchmark value can be found in Appendix F.
- The majority of the metals were listed as non-detect because the value was below the instrument detection limit.

- For several years, Eagle employees have used a gravel roadway from the mill property to the WTP that traverses the cut off wall and passes by the Fenton's reactor area. This was commonly used by warehouse, maintenance and WTP employees for activities such as delivering supplies or moving mobile equipment that cannot be driven over the road (such as a man lift). However, in order to keep that road surface safe for use year-round, the road periodically was treated with sand/salt mixtures. The typical salt used is sodium chloride, containing readily soluble calcium and sulfate, along with trace amounts of soluble magnesium. As an example, one salt product used contains 98% NaCl with 0.81% SO4 and 0.31% Ca. The road salt minerals are designed to dissolve in water, so represent a potentially significant source of these elements to shallow groundwater and soils in the vicinity of the cut-off wall; in addition to these direct changes, road salts have the potential to affect general nutrient cycling (such as for nitrogen/ammonia) and cation exchange reactions within the affected soil profiles. Changes in these parameters in groundwater measurements are characteristic of the sand/salt application activities taking place nearby causing ion exchange processes to occur in the clays and other minerals in contact with shallow groundwater. As this is a potential confounding factor to interpreting the results in the monitoring water quality in these wells, the road was closed to vehicle traffic from December 2020 – March 2021 to limit the application of sand/salt. Access to the Fenton's reactor area is still maintained for chemical deliveries and personnel, so some well sets will continue to be influenced by vehicle traffic and sand/salt application, though at a lesser rate than seen in the past due to the shutdown of the reactor in October 2021, after extensive water quality testing. The reactor remains capable of being switched back into operation if needed in the future. These influences have been discussed in Q1-Q4 benchmark reports and are summarized below. The majority of these parameters are not characteristically related to milling operations. Trend monitoring will continue in 2022.
    - Throughout 2021, salt related parameters trended downwards at nearly all affected wells. This began in Q1 2021, and by Q2, there were significant decreases in almost all sand/salt related parameters in wells along the closed section of road (H1-1L LLA, MW-701 QAL, MW-701 UFB, MW-702 UFB), with the exception of an increase in sodium at MW-701 QAL (located near the Fenton's reactor). Many wells (HW-1L, MW-702 QAL, MW-703 UFB, MW-703 DBA) had all parameters drop back below benchmark values in Q2 2021. In Q3 and Q4 2021, the majority of sand/salt related parameters in wells along the closed section of road (H1-1L LLA, MW-701 QAL, MW-701 UFB) decreased.
    - At HW-1U UFB all the parameters that were previously above benchmark decreased in Q1 including chloride, calcium, magnesium, sodium, and hardness. pH was below the benchmark at this location in Q3 and Q4 2021.
    - Potassium increased above benchmark values at HW-8U and MW-704 UFB. Potassium, sodium, and chloride remain above benchmark values at HW-8U Potassium is highly soluble in water and is common in nature and is easily exchanged for sodium via ion exchange processes that take place in soils influenced by road salts.
    - Nitrogen as ammonia and nitrate were elevated at HYG-1 and MW-703 QAL. Road salts have the potential to affect general nutrient cycling.

- Iron, calcium, sodium, and hardness dropped back below benchmark values at MW-704 UFB. This location is also near the excavation site for the new zero liquid discharge (ZLD) water treatment plant that will be constructed over the next 18 months. In the fall of 2021, over 11,000 cubic yards of unsuitable soil (including cut off wall bentonite mixed soil and other residual fill from the Cliffs-era mining) was removed and replaced with clean imported fill. We expect this well set to continue be influenced by construction and future operations activities.

- HW-2, a well outside of the cut-off wall, was a well impacted by past precipitation events, affecting the redox conditions in the aquifer at the well site. Subsequently, manganese was mobilized due to reductive dissolution of pervasive manganese oxides within soils below the water table. In Q1 2021, all parameters at HW-2 started trending downwards. Though DO increased slightly in Q1 and Q3 2021, and the water remained in an anaerobic state, the ORP shifted to an oxidizing environment resulting in lowering of manganese as the precipitate manganese oxide. As a result, manganese dropped back below benchmark for the first time since Q1 2019. Iron followed a similar downward trend in Q1 2021 which is indicative of an oxidizing environment and remained below benchmark throughout 2021. By Q2 2021, all parameters were back below benchmark values which maintained throughout the rest of 2021.

- In Q1-Q4 2021, sodium concentrations at KMW-5R, which is located near the COSA, were above established benchmarks but stable. This trend has been consistent since 2018 when benchmark values were established. Aluminum was also higher than the benchmarks at KMW-5R during the annual sampling event in Q3. Aluminum is commonly found in wells with high turbidity levels because colloidal aluminum can bypass sample filters. Turbidity in KMW-5R has typically been higher than in other wells. KMW-5R is a low recharge well that is pumped down a day in advance of sampling to help ensure the sample is accurately representing the water quality of the location, and a bailer is used to sample which can increase sediment disturbance during sample collection.

- Manganese was observed outside of the benchmark value at several locations throughout 2021 (HYG-1, MW-701 UFB, MW-703 UFB, MW-704 UFB, MW-704 LLA, and MW-704 DBA, MW-705 UFB). Manganese is found ubiquitously in the environment and is expected to vary in groundwater throughout the region, often as a function of redox environment. Manganese is monitored in shallow water within the HTDF on a regular basis and has been found at a concentration ranging from 281-1640 ppb throughout 2021. Most of the wells outside of the cut off wall do not have matching manganese signatures, and more importantly, they are not accompanied by HTDF signatures such as sulfate and sodium at magnitudes found in the HTDF.

- Parameters are trending back toward the benchmark levels at MW-701 UFB, a well that was impacted by the 2019 sulfuric acid spill that mobilized most major cations and anions.

- pH at MW-703 QAL has been greater than 0.5 SU below the recommended benchmark since Q3 2020. The pH values have been below the benchmark range since 2018.

- Bicarbonate alkalinity at MW-704 LLA has remained above benchmark but stable since Q3 2019.

- MW-705 QAL appears to have slowly increasing concentrations of chloride, ammonia, and sodium. MW-705 UFB also has gradually increasing chloride concentrations. These wells are located near the water treatment plant area and appear to be influenced from road construction/maintenance activities such as road salt application.

- After four quarters of being outside of established benchmarks, in Q3 2021 pH was back within benchmark range at MW-706 QAL.

- MW-701 QAL was installed for the purpose of monitoring shallow groundwater inside the cut off wall. Water in this well is generally expected to be indicative of either HTDF water quality, or, when water levels are low in the HTDF, the water in this well may be derived from the infiltration of precipitation that falls within the cut off wall. The well was acutely affected by the 2019 acid spill, but the effects of that are diminishing over time. During 2021 water level decreased slightly in MW-701 QAL while the HTDF was lower in Q2 2021 and maintained water levels in Q1, Q3, and Q4. Water quality in MW-701 QAL since the 2019 acid spill has been dissimilar to the HTDF water quality while remaining under the influence of quarterly seasonal trends. In general, the effects of the acid spill are expected to diminish with time.

- Water quality at MW-702 QAL was installed for the purpose of monitoring shallow groundwater inside the cut off wall, or when HTDF water levels are particularly low, the well water quality would be generally reflective of the precipitation that infiltrates within the cut-off wall. Mercury was marginally above benchmark in Q4 2021. The pH varied quarterly throughout 2021; in Q1 and Q4, pH was below the benchmark range, whereas it was above the benchmark range in Q3. After review of the Q3 well purge record, it seems likely that Q3 results were anomalous due to inadequate purge volume prior to sampling. Elevated concentrations above benchmarks for carbonate alkalinity and nitrate and nitrite nitrogen were also observed in the Q3 sample.

In 2021, trend testing was conducted using the Mann-Kendall test with Sen's slope estimator. The Mann-Kendall test is a non-parametric evaluation for increasing or decreasing trend, and Sen's slope estimator provides an indication of the magnitude of the trend. Although the Mann-Kendall test can be computed in most cases, guidance suggests that it is not appropriate to use for evaluating trend when there are fewer than eight (8) to twelve (12) detected measurements and/or the highest reporting limit is greater than the majority of observations (USEPA, 2009). The trend testing was conducted only on parameters for which most of the wells had eight or more samples above detection limits. Well-parameter pairs with fewer than 50% of samples above reporting limits and/or fewer than six (6) detected samples were excluded. Based on these criteria, the parameters that were considered were bicarbonate alkalinity, calcium, chloride, hardness, iron, magnesium, manganese, pH, potassium, sodium, and sulfate. Visual outliers and outlier detection limits were removed from the data. Non-detect values were set to the reporting limit, which may introduce some error into the analysis due to variation in detection limits among samples.

Tabulated results of the GW trend analyses are shown in Appendix G The p-value determines whether a monotonic trend exists at 95% confidence. For this test, "no trend" is indicated when the p-value is >0.05. When the p-value is ≤0.05, there is either a "POSITIVE" (increasing with time) or "NEGATIVE" (decreasing with time) trend indicated. For compliance monitoring locations in which results are outside of established benchmarks for at least two consecutive sampling quarters and a potential trend is identified, the trend charts are provided in Appendix G.

### 7.1.2. Quarterly Surface Water Quality Monitoring

Surface water sampling was conducted on a quarterly basis in 2021 at eight surface water locations by TriMedia. Four locations are associated with surface water resources in the subwatershed containing the HTDF and four are associated with the subwatershed of the milling facility. The samples collected represent winter base flow, spring snowmelt/runoff, summer base flow, and the fall rain season. Samples were collected in March (Q1), June (Q2), August (Q3), and November (Q4) in 2021. A map of the surface water sampling locations is found in Appendix H. Samples are collected in accordance with the Eagle Project Quality Assurance Project Plan and Standard Operating Procedures (North Jackson, 2004a and 2004b) and the results are summarized and compared to benchmarks (i.e. upper prediction limit) and are located in the tables found in Appendix I. Measured water levels in HMP-009 (Wetland EE) are also included in Appendix I.

As stated in the groundwater quality monitoring section above (7.1.1), the surface water benchmark values were also recalculated in 2018 using results that were not determined to be trending based on statistical analysis. A sufficient data set was also available which allowed the establishment of benchmarks for each season which will help to account for seasonal variability. Benchmarks were not updated at locations HMP-009 and HMWQ-004 as they did not have enough data points to revise the benchmarks at that time. Results for HMP-009 will continue to be compared to the initial benchmark values established in 2014. HMWQ-004 was a new surface water reference location that was added in 2020. For the remaining locations, results will now be compared based on seasonal variation (i.e., Q1 2017 compared to Q1 2018) per Special Permit Condition L2 of the Humboldt Mill Part 632 Mining Permit (MP 01 2010).

Black River Monitoring Location WBR-003, and Middle Branch Escanaba River Monitoring Location MER-004, June 2021

***Monitoring Results***

The Humboldt Mill Surface Water and Sediment Monitoring Plan prescribes a long parameter list for surface water samples that are collected annually (Q3 2021) and a shorter list to be used during the remaining quarterly monitoring events (Q1, Q2, Q4 2021). In addition to grab samples, field measurements (DO, pH, ORP, specific conductivity, temperature, and turbidity) were collected and determined using a YSI multiparameter water quality meter. Flow measurements were obtained, where conditions allowed, using a wading rod and current meter. Flow rates for location MER-002 were recorded from the USGS website for the station located adjacent to the monitoring location (i.e., 04057800 Middle Branch Escanaba River Humboldt Mill location). Water quality samples were shipped overnight to Pace Analytical Services in Grand Rapids, Michigan, for analysis. Parameters requiring low-level analysis were sent to Eurofins Frontier Global Sciences in Bothell, WA by subcontract of White Water Associates Laboratory in Amasa, MI.

The following is a summary of field observations that occurred at compliance monitoring locations in 2021:

- HMWQ-004 is located in an area in which the only contributions are related to precipitation and storm water run-off from the adjacent roadway, therefore sampling from this location is dependent upon precipitation. Similar to previous years, there was insufficient water to collect samples from this location in 2021.
- MER-002 is located near the bridge crossing on Wolf Lake Road upstream of Outfall 004 and just downstream from the pump house used to recirculate river water within Wetland EE. Results for pH, manganese, hardness, chloride, and alkalinity bicarbonate were greater than seasonal benchmarks for two consecutive Q2 sampling events. pH and sulfate were also greater than benchmarks during the last two Q4 sampling events. The Escanaba River reference location MER-001, located outside of Eagle's influence, also had detections that were also outside of benchmarks for the majority of these parameters indicating that the results are likely related to regional influences and not mining activities.
- MER-003 is located downstream of Outfall 004 and would be expected to be somewhat influenced by the discharge water quality. The discharge water quality meets all requirements of Eagle's NPDES permit but is not identical to water quality that was used when calculating initial benchmarks. TDS and hardness were elevated for the last two Q2 sampling events, pH for the last two Q3 sampling events, and pH, nickel, sodium, and sulfate for the last two Q4 sampling events. Reference stream MER-001 also had elevated results for hardness in Q2 and pH is Q4 indicating that in addition to the influence of the outfall water quality that there are also regional influences unrelated to mining that are also occurring.
- HMP-009 is located north of the HTDF in Wetland EE and is strongly influenced by the recirculating Escanaba River water. Iron was detected above benchmarks for two consecutive Q3 sampling events. Iron was within a similar range at MER-002 which is located near the river pumphouse and therefore would be indicative of the water quality being distributed to the wetland.
- WBR-002 is located in the Black River watershed, south of the mill site and near an old legacy iron tailings basin. Alkalinity bicarbonate was greater than established benchmarks for two consecutive Q2 sampling events, calcium was elevated for two consecutive Q3 sampling events, and manganese and alkalinity bicarbonate for two consecutive Q4 sampling events. Turbidity in Q3 2021 at WBR-002 was much higher than during other sampling events, which could result in higher concentrations of some parameters. The Black River reference monitoring location WBR-001, located outside the influence of mining operations also had elevated levels of alkalinity bicarbonate in Q2 and manganese in Q4 indicating that the results are likely related to regional influences.

- WBR-003 is located further downstream of WBR-002 and the mill site. Arsenic, iron, manganese, alkalinity bicarbonate, and hardness were greater than established benchmarks for two consecutive Q2 sampling events, arsenic, boron, and total suspended solids (TSS) were elevated for two consecutive Q3 sampling events, and alkalinity bicarbonate and hardness for two consecutive Q4 sampling events. Turbidity in Q3 2021 WBR-003 was much higher than during other sampling events, which could result in higher concentrations of some parameters. Reference monitoring location WBR-001 also had elevated levels of arsenic, iron manganese and alkalinity bicarbonate in Q2, and arsenic and TSS in Q4 indicating that the results are likely related to regional influences. It is possible that the elevated iron and arsenic values are associated with the legacy iron tailings basin located upstream of WBR-003.

In 2021, trend testing was conducted using the Mann-Kendall test with Sen's slope estimator. The Mann-Kendall test is a non-parametric evaluation for increasing or decreasing trend, and Sen's slope estimator provides an indication of the magnitude of the trend. Although the Mann-Kendall test can be computed in most cases, guidance suggests that it is not appropriate to use for evaluating trend when there are fewer than eight (8) to twelve (12) detected measurements and/or the highest reporting limit is greater than the majority of observations (USEPA, 2009). The trend testing was conducted only on parameters for which most of the wells had eight or more samples above detection limits. Well-parameter pairs with fewer than 50% of samples above reporting limits and/or fewer than six (6) detected samples were excluded. Based on these criteria, the parameters that were considered were bicarbonate alkalinity, calcium, chloride, hardness, iron, magnesium, manganese, pH, potassium, sodium, and sulfate. Visual outliers and outlier detection limits were removed from the data. Non-detect values were set to the reporting limit, which may introduce some error into the analysis due to variation in detection limits among samples.

Tabulated results of the SW trend analyses are shown in Appendix J The p-value determines whether a monotonic trend exists at 95% confidence. For this test, "no trend" is indicated when the p-value is >0.05. When the p-value is ≤0.05, there is either a "POSITIVE" (increasing with time) or "NEGATIVE" (decreasing with time) trend indicated. For compliance monitoring locations in which results are outside of established benchmarks for at least two consecutive sampling quarters and a potential trend is identified, the trend charts are provided in Appendix J.

## 7.2. Sediment Sampling

Sediment sampling is conducted on a biennial basis and therefore was not required to be conducted in 2021. The next sediment sampling event will occur in 2022.

## 7.3. Regional Hydrologic Monitoring

### 7.3.1. Continuous Groundwater Elevations

Monitoring wells MW-701, MW-702, MW-703, MW-704, MW-705, HYG-1, HW-2, HW-1U, HW-1L, HW-8U are instrumented with continuous water level meters and downloaded quarterly by TriMedia field technicians. Permit condition F-9 requires that water levels are continuously monitored in Wetland EE and the HTDF. HTDF water level readings were recorded using a stilling well containing a pressure transducer which was installed in the HTDF to collect continuous water level measurements.

To ensure accurate readings in the winter, an "ice eater" was installed to prevent the water surrounding the stilling well from freezing. A map of monitoring locations can be found in Appendix E.

Special Condition F-9a requires continuous monitoring of water levels on each side of the cutoff wall and a comparison of the gradient changes actually measured versus earlier predictions. In 2021, there was a continued effort to maintain the HTDF water level at an operational level between 1530.5 – 1531.0 MSL. This has resulted in the current HTDF water level being approximately 3 feet lower than the wetland water level and therefore there is an inward gradient toward the HTDF.

Continuous groundwater elevation results are reported by water year (October 1 – September 30). Water year is the preferred approach for reporting water levels because the hydrographs demonstrate the effect of late fall and winter precipitation, which melts and drains in spring, in one 12-month hydrologic cycle. Copies of groundwater hydrographs are located in Appendix K. A review of the hydrographs found the following:

- The hydrographs clearly illustrate when the wells are pumped down in advance of, or during, sampling and the rate at which they recharge.
- Equipment malfunctions which resulted in data gaps of continuous water level data occurred at two locations over the course of the year. All water level meters were replaced as soon as possible after discovery of the malfunction. Table 7.3.1 summarizes the locations, duration, and potential cause of equipment malfunctions:

**Table 7.3.1 Summary of Continuous Monitoring Equipment Malfunctions**

| Locations | Date Equipment Malfunction Occurred | Reason for Malfunction |
|---|---|---|
| HW-1U UFB | 3/16/2021 - 6/9/2021 | Battery Failure |
| MW-704 UFB | 6/20/2021 - 9/27/2021 | Battery Failure |

- HW-1L, HW-1U LLA, MW-702 UFB, and MW-703 UFB are located in a tight formation and are very slow to recharge. MW-702 UFB, MW-703 UFB, and HW-1L takes approximately one month to recharge and HW-1U LLA take almost four months to fully recharge.
- Similar to previous years, most of the shallower, quaternary aquifer wells displayed signs of seasonal influence as groundwater elevations decreased during the winter months and increased again in during the onset of spring melt.

### 7.3.2. Continuous Surface Water Monitoring

In accordance with permit condition F-9, Wetland EE is required to be instrumented with a meter to continuously monitor water levels. However, due to the presence of the cut-off wall, recharge is now primarily based on precipitation (i.e., rain and snow melt) and the recirculation of Escanaba River water as managed by Eagle Mine. The purpose of the continuous water level measurements is to monitor the effectiveness of the cut-off wall and record seasonal variations. However, in accordance with NPDES permit MI0058649, Eagle is required to maintain the hydrology of the wetland and deliver water flows that represent post-closure flows. This is currently accomplished through the use of a river water intake/recirculation system and due to this requirement, the monitoring objective can no longer be met and therefore continuous readings are not being collected. However, surface water grab samples and field parameters will be collected quarterly when possible although results will be strongly influenced by Escanaba River water quality.

## 7.4. Cut-Off Wall Effectiveness Review

In accordance with permit condition F-9, Eagle is required to monitor the effectiveness of the cut-off wall in terms of hydraulic containment. This condition includes the requirement for collecting and analyzing water levels in wells, Wetland EE, and in the HTDF in comparison to predicted water levels; comparisons of groundwater quality between upgradient and downgradient wells, and analysis of the water balance of the facility to aid in evaluation of the data.

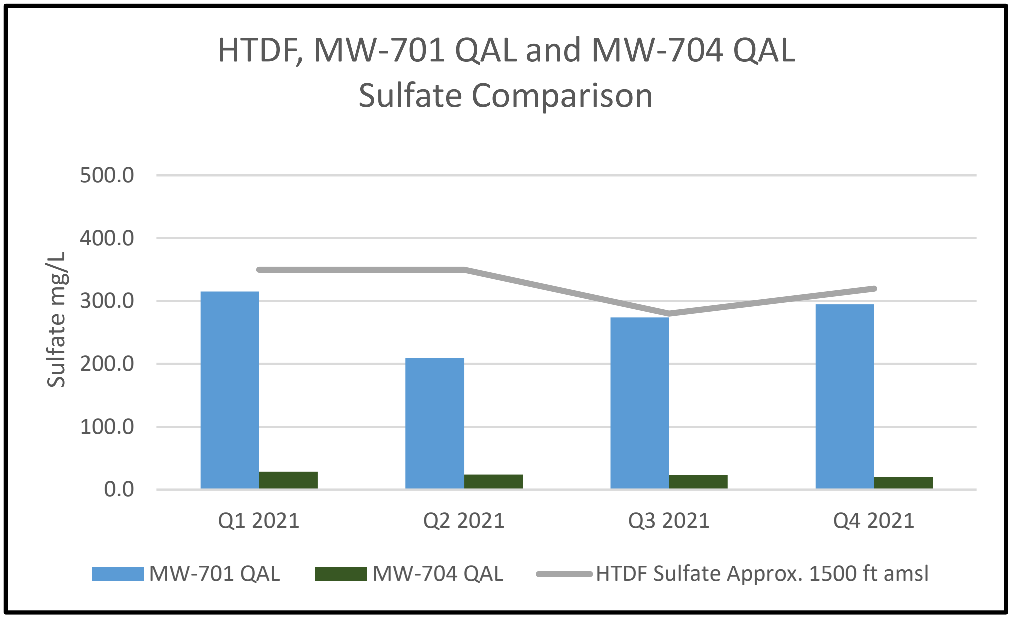
Prior to operations, Eagle's consultants prepared predictions of water gradients that would exist in the facility over a 10-year period of operation. The expectation was that water levels in the HTDF would rise to approximately 1540 ft amsl, and a gradient of up to 9 feet of hydraulic head would develop in paired wells over many years of operation. However, the water balance of the facility has not followed the trajectory that was used in that prediction. Initially, Eagle purposely lowered the water level of the HTDF by approximately 10 feet below that which was used to develop the gradient prediction, and over the past three years the facility water level has fluctuated by several feet (up and down) due to extreme weather and subsequent drawdown periods. As such, it is challenging to complete a direct comparison of the prediction to the actual gradients. Fortunately, the water quality, static water elevations, and other water balance observations are useful to demonstrate that the cut off wall continues to perform well to hydraulically contain the tailings disposal facility despite nuances related to seasonal water balance.

The tabular summary provided in Appendix L provides commentary on various observations that the cut off wall continues to meet hydraulic containment performance standards. Based on this data there is sufficient information to show that the cut-off wall is functioning as expected.

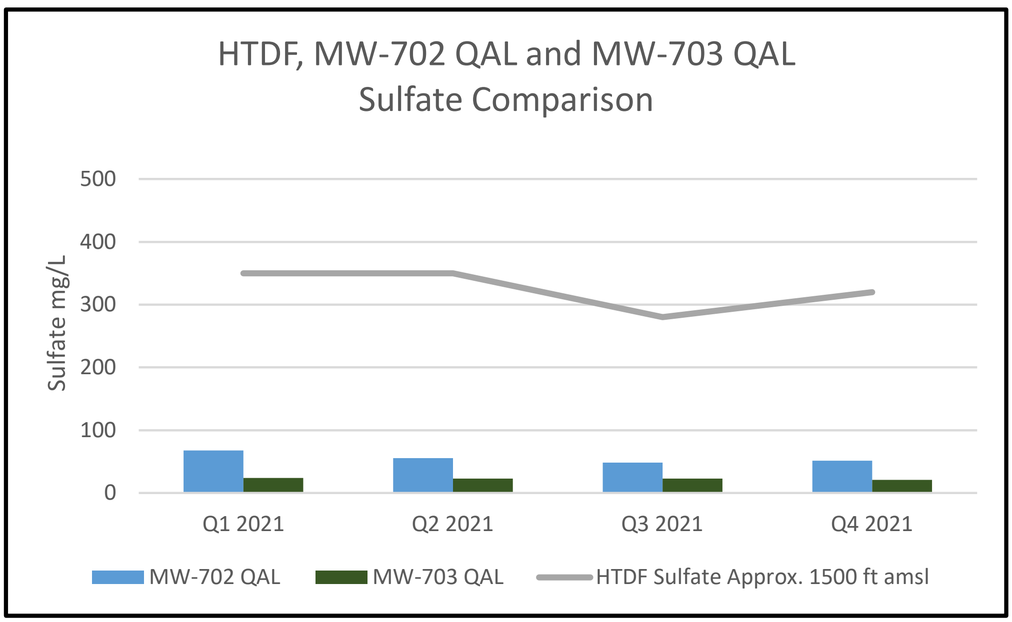
### 7.4.1. Water Quality

The effectiveness of the cut-off wall was also evaluated by comparing sulfate levels. Sulfate was chosen due to it's substantial presence in the HTDF, it is a good identifier of groundwater influence. As shown in the graphs below, the water quality at the leachate monitoring well pairs is distinct and shows that the cut-off wall is functioning as expected.

Sulfate levels at MW-701 QAL, a well inside the cut-off wall, continue to increase, indicating the influence of water from the HTDF, as expected. Sulfate levels at MW-704 QAL, the well outside of the cut-off wall, do not correlate with levels found in its leachate monitoring pair or the HTDF. This suggests overall water quality of the HTDF is not communicating with this well.



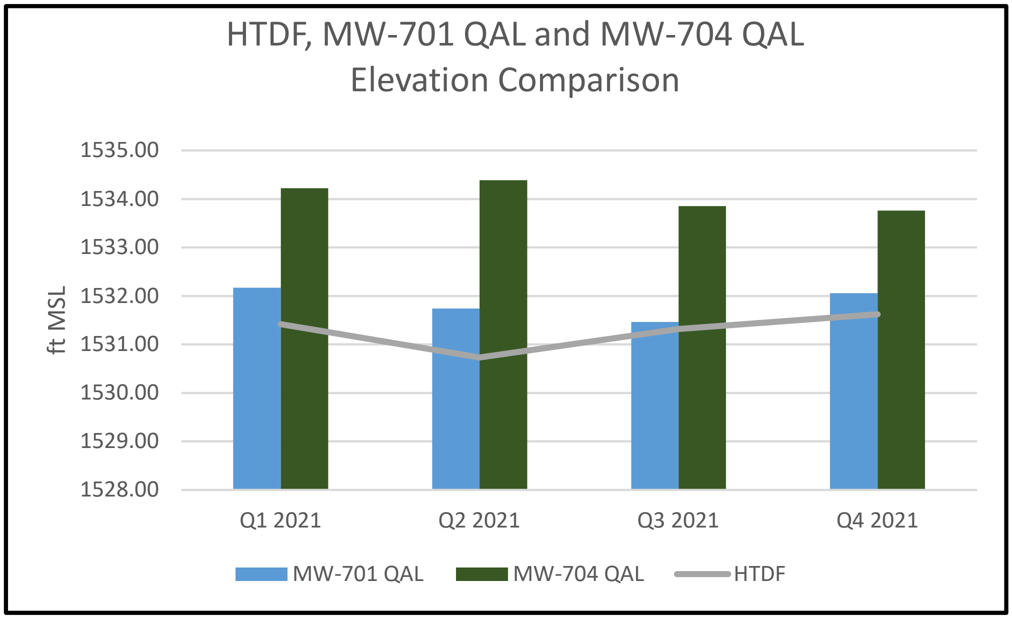

Though sulfate levels in MW-702 QAL, a well located within the cut-off wall, are lower than sulfate levels seen in the HTDF, they are still higher than what is seen in MW-703 QAL, the well located outside of the cut-off wall. This further suggests that the cut-off wall is functioning as expected.



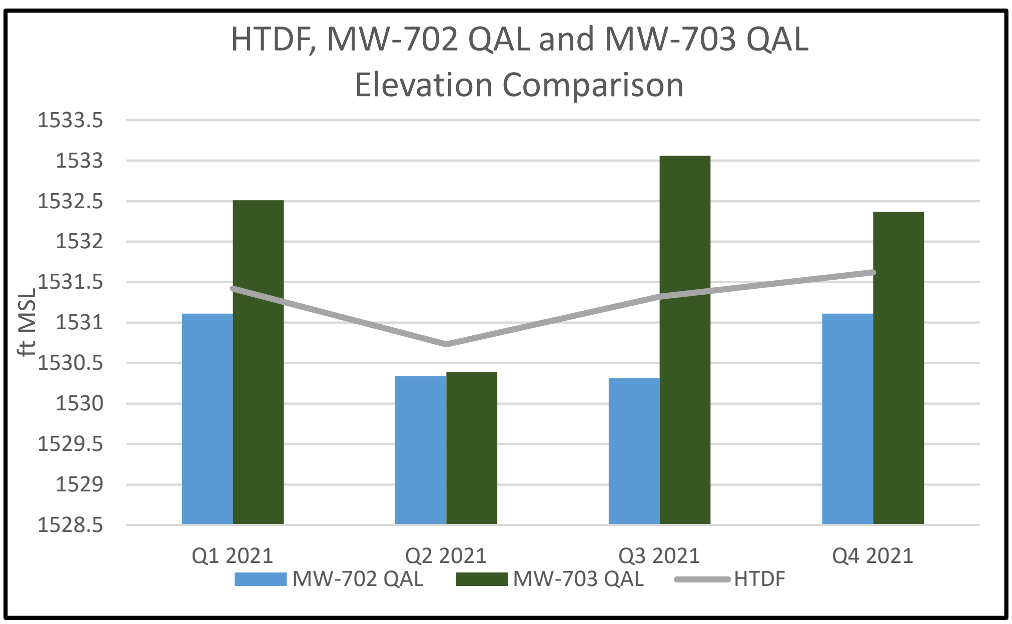

### 7.4.2. Water Levels

Monitoring groundwater elevations compared to HTDF elevations demonstrate that the cut-off wall is functioning as expected.

Decreases in groundwater elevation in MW-701 QAL were similar to what was seen in the HTDF, as expected, whereas groundwater elevations in MW-704 QAL stayed more consistent and appeared to act independently from the HTDF water level fluctuations. Due to its location outside of the cut-off wall, MW-704 QAL may also be under local influence of discharges made to Outfall 003 at Wetland EE and due to proximity and depth relative to the wetland.




Throughout most of 2021, MW-702 QAL followed HTDF levels as expected. Though MW-703 QAL also decreased in Q2, it remained at a higher elevation throughout the year, indicating that it was not influenced by HTDF fluctuations.




## 7.5. Biological Monitoring

Biological monitoring events conducted in 2021 included surveys of birds, large and small mammals, frogs, toads, fish, and macro invertebrates. Results from each survey have been compiled into annual reports which are available upon request. A brief summary of each survey is provided below.

### 7.5.1. Flora and Fauna Report

The 2021 flora, fauna, and wetland vegetation surveys were conducted by Barr Engineering (formerly King & MacGregor Environmental, Inc. (KME)). Table 7.5.1 below outlines the type and duration of the surveys that were conducted in 2021. A map of the survey locations can be found in Appendix M.

**Table 7.5.1 Type and Duration of 2019 Ecological Investigation**

| Survey Type | Survey Date |
|---|---|
| Birds | June 14, 15; October 13,14 |
| Small Mammals | September 21-23 |
| Large Mammals | May - October |
| Toads/Frogs | May 5; June 1; July 6 |
| Threatened and Endangered Species | May - October |

The wildlife and plant species identified during the 2021 surveys within the Study Area are similar to those identified during previous KME surveys. Following is a summary of the survey results:

- A combined total of 583 birds representing 62 species were identified during 2021 bird surveys. American Robin (*Turdus miratorius*), Nashville warbler (*Vermivora ruficapilla*), and song sparrow (*Melospiza melodia*) were the most abundant birds observed during the June 2021 survey, while mallard (*Anas platyrhynchos*), American crow (*Corvus brachyrhynchos*), and dark-eyed junco (*Junco hyemalis*) were the most abundant during the October 2021 survey. The bird species identified in 2021 are similar to those bird species identified in previous surveys conducted within the Study Area and are consistent with the bird species expected to be found in the habitats present.
- Sixty-seven small mammals representing seven species were collected during the September survey period. The most common small mammal identified during the survey was the American pygmy shrew (*Sorex hoyi*). The total number of individuals captured, and species richness recorded in 2021 is consistent with those in previous years, with a small increase in number of individuals and number of species. No threatened, endangered, or special concern small mammals were observed during any of the surveys. The small mammals encountered within the Study Areas during the 2021 survey period is typical of those expected in the habitats present and are consistent with previous survey results.
- During the 2021 surveys, no large mammals were directly observed, however, tracks and scat of Whitetail deer (*Odocoileus virginianus*) were present. There was also evidence of a canid predator such as a gray wolf (Canis lupus), or coyote (Canis latrans), at small mammal survey point 7, where traps were raided and torn open. The traps contained tooth punctures and canid tracks and scat were observed nearby. Previously observed or other regionally common species possibly present within the Study Area, but not observed during the 2021 surveys include the American black bear (*Ursus americanus*), bobcat (*Lynx rufus*), coyote, the federally endangered gray wolf, and red fox (*Vulpes vulpes*). The large mammal species detected during the 2021 surveys are regionally common large mammal species and are expected to utilize the habitats present.

- Five frog species were observed during the 2021 surveys: American toad (*Bufo Americanus*), gray treefrog (*Hyla versicolor*), green frog (*Rana clamitans*), northern spring peeper (*Pseudacris crucifer*), and western chorus frog (*Pseudacris triseriata*). Calling activity included Call Index Values of 1, 2, and 3. As in most years, the spring peeper was the most frequently recorded species in 2021. The 2021 observations are consistent with previous surveys.

### 7.5.2. Threatened and Endangered Species

The Michigan Natural Features Inventory (MNFI) maintains a database of rare plants and animals in Michigan. Barr requested a Rare Species Review to determine if any protected species had been found within 1.5 miles of the Study Area. Table 7.5.2 lists the species identified during the MNFI review process.

**Table 7.5.2 MNFI Review Results of Study Area**

| Species | Classification |
|---|---|
| Canada rice grass | State threatened species |
| American bittern | State special concern species |
| Bald eagle | State special concern species |
| pickerel frog | State special concern species |
| Great blue heron rookery | Rare natural feature |

In accordance with Michigan Department of Natural Resources (MDNR) guidelines (MDNR 2001), Barr surveyed for any MNFI listed species and their habitats during the appropriate season. The exception is Canada grass which is no longer surveyed on an annual basis as there is no suitable habitat within the study area. Following are the results of the threatened and endangered species survey:

- Pickerel frogs have not been observed at any times since the surveys began in 2014, however suitable habitat may exist within the study area.
- American bittern was not observed in June 2021.
- The bald eagle nest on the north shore of Lake Lory was observed to be in good conditions, with no occupation of the nest observed in May, June, or July. However, there was a bald eagle fly-over observed in June 2021 nearby the nest.
- In May, June, and July 2021, two unoccupied nests were identified in the heron rookery. This number of nests is significantly lower than previous years, however the usage of the rookery has varied considerably since observations began. This rookery has been abandoned and reoccupied before.

A copy of the 2021 Humboldt Mill flora and fauna report is available upon request.

### 7.5.3. Fisheries and Macro Invertebrate Report

The 2021 Fisheries and Macro-Invertebrate annual surveys were conducted by Advanced Ecological Management (AEM). A total of six stations were surveyed in June 2021, including two stations on the Middle Branch of the Escanaba River (MBER), one station on a tributary of the Middle Branch of the Escanaba, one station on an unnamed tributary of the Black River (WBR), one station in Wetland Complex EE located northeast of the HTDF, and Lake Lory. A map of the survey locations can be found in Appendix N.

*Stream Stations*

A total of 320 fish representing 17 species were collected in 2021 from all stream stations, which is 151 more fish than were observed in 2020. The central mudminnow (*Umbra limi*) was the most frequently collected species (140) followed by the Pearl dace (*Margariscus margarita*) (75). No threatened, endangered, or special concern fish species were observed at any of the stream stations in 2021. The following is a summary of the findings:

- The community composition of fish species was generally consistent over the past six years.
- Beaver impoundments have been observed at Station 1 since 2014 and continue to influence the hydrology and potentially the number of fish collected during the surveys at that location. In 2021, a new station location was selected downstream of the road crossing to minimize the influence of beaver impoundments that are located upstream of the road crossing.
- A total of 94 fish representing five taxa were collected from Station 1 in 2021, which is a significant increase than the 36 fish collected in 2020.
- The number and species of fish observed at Station 5 decreased again in 2021, from 13 in 2020 to 7 in 2021. This is on trend with 2018, where 15 fish were observed. In 2019, there was a significant increase in fish due to an unexpected large number of central mudminnows found.
- There was a significant increase in number and slight increase in species at MBER1 in 2021. In 2021, 161 fish were collected representing 11 species, and in 2020, 80 fish were collected representing 10 species. The increase observed in both 2020 and 2021 is primarily associated with the large number of central mudminnows found.
- A total of 58 fish representing 10 taxa were observed at MBER2 in 2021, and a total of 40 fish representing seven taxa were observed in 2020.


Station MBER2 – Downstream Extent, June 2021

Using the P-51 protocol, a total of 985 macro-invertebrates were collected from all four stream stations investigated in 2021. The total number of macro-invertebrates collected in 2021 increased by 51 specimens compared to 2020. MBER2 experienced the greatest change with 88 more specimens collected in 2021 compared to 2020, the difference primarily being an increase in the number of scuds and true flies observed. Station 1 followed the increase shown in MBER2 with 58 more specimens collected in 2021 compared to 2020. MBER1 remained consistent with 343 collected in 2021 compared to the 354 collected in 2020. Station 2 was the only sampling point below 2020 levels, with 84 less macroinvertebrates collected during the 2021 study, these were mostly made up of sowbugs. Considering the increase in macroinvertebrates collected, the numbers and taxa observed remain consistent with previous surveys. No threatened, endangered, or special concern macroinvertebrate species were observed at any of the stream stations in 2021.

A summary of the fish, macroinvertebrate, and habitat ratings for the four stream stations are displayed in Table 7.5.3 below. Stream habitat was considered “excellent” in stations MBER1 and MBER2 and “good” at Station 1 and 5 which mimics 2020 ratings. Similar to 2020, Station 5 was rated as a “poor” fish community. The macroinvertebrate community ratings at Station 5, MBER1, and MBER2 remained consistent with 2020 results with all Stations classified as “acceptable.” In 2021, Station 1 was classified as “poor”. The macroinvertebrate community at Station 1 was rated as “acceptable” in 2016, 2018, and 2019, and “poor” in 2017 and 2020. Station 1 is a low gradient system that is frequently affected by beaver activity, which has impounded the water. The low gradient coupled with the beaver activity impounding water has likely contributed to the fluctuation between “poor” and “acceptable” macroinvertebrate community ratings.

**Table 7.5.3 2021 Habitat Ratings**

| | **Station 1** | **Station 5** | **Station MBER1** | **Station MBER2** |
|---|---|---|---|---|
| Fish Community | N/A | Poor | N/A | N/A |
| Macroinvertebrate Community | Poor | Acceptable | Acceptable | Acceptable |
| Stream Habitat | Good | Good | Excellent | Excellent |

*Lake Lory*

A total of 167 fish were collected from Lake Lory in 2021 representing seven different taxa. A total of 193 fish were collected from Lake Lory in 2020, a total of 294 fish were collected from Lake Lory in 2019, and a total of 165 fish were collected from Lake Lory in 2018. However, the community composition was generally consistent among years surveyed by AEM. Yellow perch, bluegills (*Lepomis macrochirus*), and largemouth bass (*Micropterus salmoides*) were the most frequently collected species among all sample gear in 2021 and 2020. Many of the fish observed in Lake Lory appear to be in good condition, but similar to previous years, it was found that black spot, which is caused by a natural parasite (larval trematode) that burrows into the skin of the fish, was observed in several species. Review of the MDNR website found that black spot is a common disease in earthen bottom ponds and lakes.

Aquatic macroinvertebrate sampling was conducted on June 12, 2021, within Lake Lory where a total of 265 macroinvertebrates were collected, which is 82 more than the 183 that were collected in 2020. Snails and true flies were the most abundant macroinvertebrates collected from Lake Lory in 2021 and the community composition was generally consistent with the 2015 through 2020 macroinvertebrate communities. No threatened, endangered, or special concern macroinvertebrate species were observed in Lake Lory.

Lake Lory – North facing view, June 2021

*Wetland EE*

One brook stickleback (*Culaea inconstans*) was collected from Wetland EE during the 2021 study. One brook stickleback and one central mudminnow were collected during the 2020 study. Two brook sticklebacks were collected here in the 2018 and 2019 studies. No fish were collected during the 2015 or 2017 studies and one juvenile brook stickleback was collected from this location in 2016.

Aquatic macroinvertebrate sampling was conducted on June 12, 2020, where a total of 48 macroinvertebrates were collected, which is 41 less than was found in 2020 (89 total). True flies, mayflies, and true bugs were the most frequently collected species in 2021. These species observed have been consistent between survey years. No threatened, endangered, or special concern macroinvertebrate species were observed in Wetland Complex EE. The 2021 aquatic vegetation density appeared to be consistent with conditions observed in the previous four aquatic surveys (2017-2020). Cattails have grown in most of the areas of Wetland Complex EE that were previously open water. A copy of the 2021 Humboldt Mill Aquatic Survey Report is available upon request.


Wetland EE – North of the HTDF, June 2021

### 7.5.4. Fish Tissue Survey

No fish tissue survey was required to be completed in 2021. The next survey will be conducted in 2023.

### Miscellaneous Monitoring

### 7.6.1 Soil Erosion Control Measures

Soil erosion and sedimentation control (SESC) measures related to the construction of mining facilities now falls under the purview of Part 632. Silt fence and riprap was maintained near the east side of the WTP expansion area where the risk of soil erosion and sedimentation was present, primarily near the adjacent wetland boundary areas in 2021.

Earthwork took place near the WTP in November of 2021. This is in preparation for the ZLD treatment plant that will be constructed in 2022. A mix of SESC measures is in place for this project and will remain in place throughout construction. An existing vegetated berm is in place between the excavation site and the delineated wetland. Straw waddles were placed along the base of this berm and around monitoring wells as a secondary control. Silt fence was placed where the berm was nonexistent.

Silt fence remains along the HTDF where additional work on the cut-off wall may occur in the future. The Department will be notified in the event that any construction activities occur in which soil erosion measures are necessary and all inspections will be completed as required.

### 7.6.2. Impermeable Surface Inspections

The Impermeable Surface Inspection and Surface Repair Plan outlines the requirements of integrity monitoring of surfaces exposed to site storm water and areas of ore, concentrate and chemical handling/storage. Areas inspected in 2021 included sumps and floors of the coarse ore storage area (COSA), concentrator building, concentrate load out facility, and WTP. Monitoring was conducted monthly as required by the plan.

Floors are inspected for cracks and overall general condition and the sumps are evaluated for any areas of cracking, pitting, or other surface deficiencies, and accumulation of material. All inspection results are recorded on the impermeable surface inspection form by Environmental Department staff and stored in the compliance binder at the Mill Administration Building. Any issues identified during the inspections are immediately reported and fixed by onsite staff. Follow-up inspections are completed to ensure the repairs were made. Soil was excavated in an area without pavement by the COSA and pavement was laid on November 1$^{st}$, 2021, to provide improved management of front-end loader parking.

### 7.6.3. Tailings Line Inspection

In accordance with Mining Permit Condition E-12, the double-walled HDPE pipeline is monitored by Mill operators and Environmental Department staff. Any concerns identified during the inspections would be immediately reported to the Mill operations and maintenance departments who would complete any necessary repairs. No new concerns were identified in 2021.

### 7.6.4. Geochemistry Program

In accordance with Permit Condition F-1, Eagle continued implementation of the comprehensive HTDF geochemistry monitoring program which was prepared by Hatch Associates in 2015 and subsequent revisions by Golder Associates. In 2021, the monitoring program included collecting high resolution physiochemical profiles, limnological modeling, water quality monitoring, characterization of watershed input chemistry, and interpretation of the effects of changes in water management, water treatment, and tailings deposition on the chemistry and layer dynamics within the facility.

***Physiochemical Monitoring***

Eagle continued to conduct physiochemical monitoring of the HTDF using various multiparameter reading instruments either lowered over the side of the boat (or through the ice) to multiple depths, or via the YSI EXO auto-profiler that was installed in 2018. In 2021, profiles were manually collected on March 8th, April 21st, June 17th, June 22nd, July 13th, July 14th, and October 13th using multiparameter probes. The profiling device was re-installed on the HTDF in 2021 and was operational during ice off conditions from May 5th through November 17th. The YSI auto-profiler collected four profiles per day and data was regularly analyzed by geochemists to assess layer characteristics and physics.

Photo of the HTDF and YSI EXO auto-profiler, June 2021

The HTDF continued to be stratified in 2021 owning to the water management activities designed to treat deep water from the HTDF. In 2021, Eagle continued to improve isolation of waste streams from the WTP and discharged them to specific depths of the HTDF to minimize unnecessary dilution of dense fluids and create distinct layers that could be managed according to their chemistry in the future. Geochemists continued studying vertical profiles and at present, the HTDF exhibits six distinct layers:

1) A Mixolimnion seasonally divided into an Epilimnion and a Hypolimnion from elevation 1,496 ft AMSL to surface. Between May and November, this layer was separated into a 10-foot, shallow

Epilimnion Layer and a 26-foot, deeper Hypolimnion Layer. Fall turnover between the Epilimnion and Hypolimnion layers began in late October 2021 as indicated by a gradual homogenization of temperature.

2) A Middle Layer from approximately 1,496 ft AMSL to 1,479 ft AMSL is marked by increased water temperature, low dissolved oxygen, low oxygen reduction potential, and notable specific conductance. Since the start of operations in 2014, Eagle has not observed complete mixing between the Middle Layer and the Surface Layer during fall or spring turnover periods. This has resulted in anoxic, strongly reducing conditions occurring below the top of the Middle Layer. The absence of complete vertical mixing of the water column defines the HTDF as a meromictic pit lake, one of the few known meromictic water bodies in the United States.

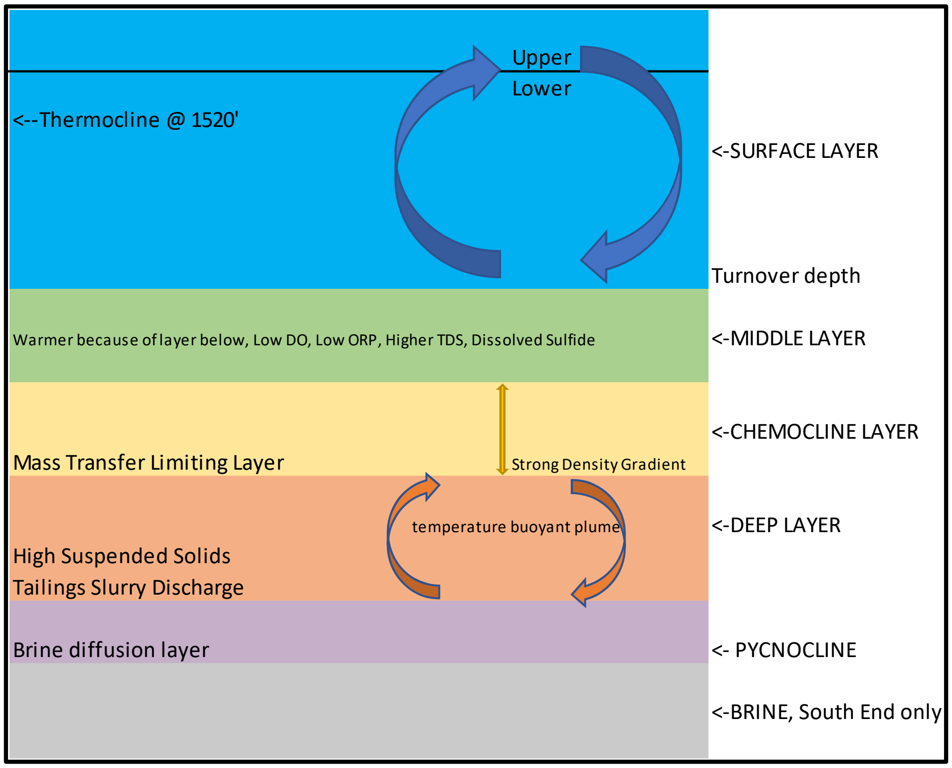
3) A layer characterized as a “Chemocline” extending from elevation 1,479 ft AMSL to 1,466 ft AMSL. This layer presents a strong density gradient and receives some mass transfer from the layer below it.

4) A ‘Deep Layer’ exists from approximately 1,466 ft AMSL to 1,448 ft AMSL or, in places, the floor of the HTDF (varies in depth based on tailings deposition areas) consists of tailings slurry water, process water, and off-specification water (Fenton’s reaction recirculation water, filter, and membrane cleaning solutions) from the WTP. The injection of warmer slurry water into a slightly cooler Deep Layer results in a buoyant plume of process water that rises to the bottom of the Chemocline. After cooling, the plume sinks to the base of the Deep Layer. The entire process results in a convection cell that perpetually mixes and homogenizes water across this 18-ft depth interval.

5) Within the South Basin, a second transitional boundary exists from the base of the Deep Layer to the top of the Brine Layer, called the ‘Pycnocline.’ This layer is between 1,448 and 1,433 ft amsl (15 ft). The Pycnocline results from the strong chemical gradient between the deep layer and brine that is being deposited in the south basin; and also results from the upward diffusion of mass along this gradient. The Pycnocline was first observed in 2021.

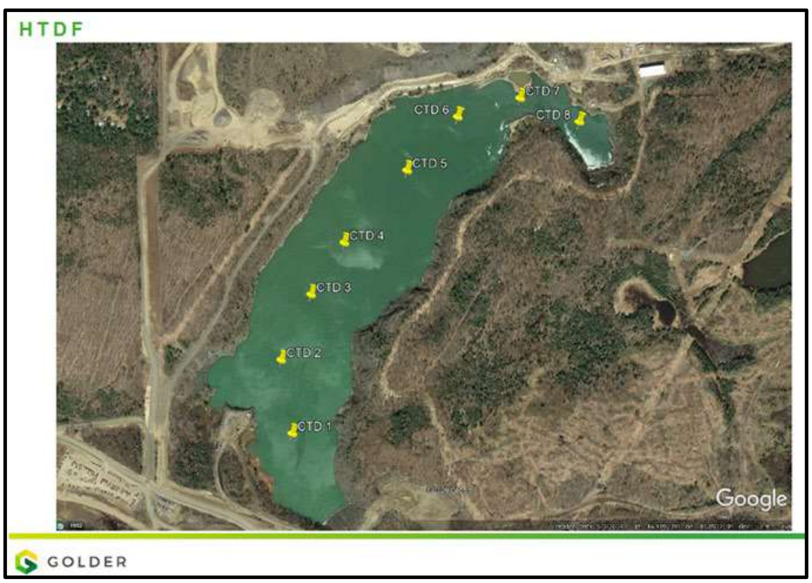
6)A Brine Layer approximately 10 feet thick formed in the deepest area of the southern section of the HTDF from 1,433 ft ASML to 1,423 ft AMSL. Due to strong density, temperature, and specific conductance differences between the brine and tailings water, brine has successfully formed its own distinct layer.

As previously experienced, in the spring and fall there were thermodynamically driven shallow turnover events within the mixolimnion with some partial erosion of the upper layer of the chemocline, but complete mixing of the entire water body did not occur. Modelling suggests that the HTDF will remain stratified in 2022.




Simplified layer diagram of the HTDF, 2021.

Eagle collected a transect of eight profiles along the North-South axis of the HTDF to confirm the assumption that the HTDF is homogenous in the lateral (x and y) direction and only varies in the vertical (z) direction, and this confirmation was important so that modelers could continue using two-dimensional hydrodynamic models to simulate the HTDF. With the exception of data collected in the brine storage area, each profile indicates consistently similar trends in key parameters.




HTDF Transect, July 2021.

As is done annually, several modeling efforts were conducted to understand HTDF limnology for both short-term and long-term stability. Short term modeling focused on spring and fall turnover predictions of the surface water layer quality, since this water is an integral part of the WTP operations strategy. As was described in the 2019 annual report, Eagle and its consultant have demonstrated ample confidence in the density-driven physical stability of the HTDF. The vertical position of inputs and outputs influenced the layering of the HTDF as predicted, and model calibration exercised continued to reproduce changes in the HTDF that were measured in-situ, so in 2021, the majority of modeling focused on longer-term water quality predictions and incremental improvements in those future water quality predictions.

The main modeling activity completed in 2021 was the initial stages of a transient limnology model which is intended to be used to predict conditions in the HTDF at the beginning of reclamation. Reclamation of the facility will begin concurrent with operations by using a ZLD water treatment system (until the close of operations) through the closure of the facility after operations cease. This type of model is useful for several purposes: 1) to understand how to optimize water treatment and tailings placement operations; 2) to confirm the time and cost associated with reclamation of the HTDF; and 3) to confirm closure conditions will meet regulatory obligations in perpetuity.

Previously developed CE-QUAL-W2 limnology and water quality models were well-calibrated to observed conditions, therefore the hydrodynamics of the system would be expected to be predictable when modeled forward. During late 2021, modelers updated modeling framework to accept transient changes in tailings placement in the model sequences through the end of 2025 and revised code to include turbidity currents present at the deposition point. Eagle's engineers then provided model inputs in 6-month increments beginning in 2021 to iterate the transient modeling (i.e., changing) conditions in water treatment and tailings placement over time. Presently the model is being actively worked on, but model runs are complete through closure of operations in 2025. Operational scenarios were selected which prevented significant deterioration of the surface water quality in the HTDF, removed brine by the end of 2025, and maintained the stability of the density stratification in the HTDF for the duration of operations. In 2022 the model will be completed for remaining years of closure and post-closure and will be subject to sensitivity testing and other revisions based on mine plan adjustments.

Other modeling efforts in 2021 included two-dimensional groundwater fate and transport modeling of the proposed reclaimed facility. The groundwater model indicated that groundwater quality downgradient of the system will receive contributions from tailings pore water migrating through bedrock at closure. Modelers conducted multi-parameter uncertainty analyses to study the flow path and concentration of TDS in water downgradient of the facility for 100 years after closure. Approximately 600 model iterations between two separate cross sections parallel with groundwater flow was completed. A high degree of conservatism was included in the water quality inputs, therefore in 2022, additional studies will be done to improve the model inputs to limit unnecessary conservatism, to test additional hypotheses surrounding tailings placement designs, to incorporate the final water column structure predicted in the transient model, and other potential model refinements.

***Tailings Pore Water Chemistry***

The tailings pore water chemistry sampling program that began in 2019 was not carried out in 2021 but there are plans to consider a larger sampling program involving a barge mounted drill rig in 2022. If the sampling program is determined to be safe and technically feasible, then a barge mounted drilling rig will be used to collect tailings cores from various ages and depths of tailings throughout the basin. This information will be used to update and/or verify modeling efforts.

***Sulfur Gas Analyses***

In response to sulfur gas odors detected in previous years, Eagle continued to take measures needed to monitor for sulfur gasses when on the HTDF, including the use of gas monitors which is a common health and safety standard, detections of both odor and $H_2S$ were rarely encountered. During spring and fall 2022 Eagle will continue monitoring for $H_2S$ gasses during the turnover timeframe and continue to track the relationship between concentration of dissolved sulfide present in the layer and sulfur odors and ensure that any changes are detected and addressed promptly if needed.

In the spring of 2022, Eagle will be installing an in-situ $H_2S$ measurement sensor to work in tandem with the YSI EXO sonde for HTDF monitoring. Which will provide more information on levels of $H_2S$ found in the HTDF.

***<u>Water Chemistry</u>***

Similar to previous years, water chemistry profile samples were collected on July 13th, 2021, from a vertical profile at multiple depths in the HTDF to monitor changes in total and dissolved concentrations and COI over time. Most COI concentrations increase with depth through the water column. All water samples collected were sent to a certified lab for analysis.

Key observations regarding water quality are divided between each layer of the HTDF:

General observations (entire basin)

- The pH at all layers is above 6.6, so there is no evidence of acidification due to acid rock drainage.
- Concentrations of total thiosalts have diminished over time in the HTDF and were below detection limits in 2021. This indicates that use of the Fenton's reaction water treatment process may be unnecessary. October samples collected in the Deep and Brine layers were not analyzed for total thiosalts.
- Concentrations of xanthate breakdown products are lower than previous years.

Surface Layer

- The turbidity of the Surface Layer has decreased since 2018.
- Concentrations of TDS in the Surface Layer were lower between 1,526 and 1,501 ft amsl compared to 2020 values. This is as continuation of a declining trend in Surface Layer TDS values first observed in 2020.
- Concentrations of iron, magnesium, sulfate, and barium have decreased over time.
- Between 94% to 98% of total nickel in the Surface Layer occurred as dissolved nickel, suggesting that it is not adsorbed onto the surface of colloidal iron particulates. The primary source of nickel to the Surface Layer remains unknown.

Middle Layer

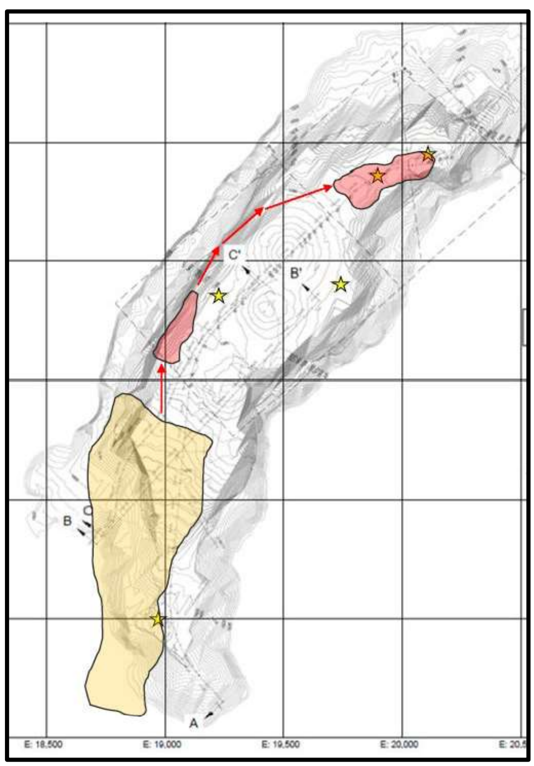
- Mn is elevated and dissolved oxygen is low.
- The concentration of total sulfide in the Middle Layer, a proxy for dissolved hydrogen sulfide gas (H2S), decreased by roughly 20 mg/L from 2020 values to between 9 and 13 mg/L in 2021.

Chemocline and Deep Layers

- Concentrations of the following constituents have decreased in the Deep Layer over time: iron, manganese, copper, nickel, selenium, arsenic, and cadmium (note, elevated concentrations reported in the Deep Layer in 2020 may have resulted from the 2020 sampling method).
- In 2021, the Deep Layer contained the highest concentrations of TDS and several major ions (sodium, potassium, calcium, chloride, ammonium, and sulfate) observed since the record began in 2010. Several trace constituents (barium, boron, and strontium) also exhibited the highest concentrations on record. These increases are likely to be associated with changes in ore composition and corresponding changes in tailings slurry composition observed in 2021.
- 70% to 90% of total nickel in the Deep Layer was present as a solid. As the Eagle and Eagle East Deposits are nickel ore bodies, the tailings and off-specification water are considered to be the primary source of nickel to the Deep Layer.

***Tailings Deposition and Brine Storage***

The tailings deposition model completed in late 2019 was followed in 2021 to continue to store brine in the southern end of the HTDF. If brine was to move from the southern storage area it would not be considered problematic, but the preference is for it to be contained to just one area of the HTDF for ease of future removal. Eagle completed a brine survey to monitor the extent and volume of brine present in the HTDF. During the initial 2021 survey (June), there was evidence that a tailings deposition area was slightly low and did not effectively prevent brine from moving from the southern area of the HTDF into other adjacent low-lying areas of the HTDF. The tailings deposition plan was adjusted in June to prevent this migration from continuing.




Approximate location of brine (including pycnocline) in yellow; minor brine migration (red), Summer 2021

In the second half of 2021, Eagle began efforts to design and procure a ZLD system which is scheduled to go online near the end of 2023. The ZLD system is designed to reduce the volume of the Brine/Pycnocline layers prior to the end of operations and to facilitate rapid reclamation of the facility after operations cease. The process will involve pumping brine to the ZLD which will concentrate and evaporate the liquid into a solid. The solid product will be either beneficially reused in another industrial market or disposed at a landfill.

## 8. Reclamation Activities

No reclamation activities occurred in 2021 and there are currently no plans to conduct any reclamation activities in 2022. The Department will be notified, in advance, if any activities do commence in 2022.

*Closure Planning*

Closure planning continued in 2021 and included detailed planning, closure team workshops, and continued technical studies needed to support closure planning for the facility. This process was initiated in 2017 due of the Lundin corporate requirement to have a written closure plan in place five years in advance of anticipated closure. The closure planning team completed a draft of the closure implementation plan in 2021, and in 2022 additional level of detail will be refined. The closure plan is a living document that will be continually refined and supplemented with detail until it becomes the scope of work for the closure project.

Closure related studies that occurred in 2021 included:

- Scoping for brine water concentrating, removal and/or treatment system upgrades began. Eagle's water services team began design and procurement of a brine treatment facility. This included the engineer's design of the building that the equipment will be housed in and earthwork for the building foundation (previously discussed). Eagle submitted a zoning permit application to Humboldt Township on December 14, 2021.
- Eagle continued waste characterization studies and solicitation of vendors for beneficial re-use opportunities for brine solids generated through the future brine treatment system.
- A consultant completed draft civil restoration plans for the mill site – including re-grading, stabilization of exposed rock faces and steep roadways, revegetation plans, and reclamation and demolition schedules. Though Eagle has not identified a party interested in re-purposing the mill, one civil restoration plan will be made for the property to be sold to another industrial user, and a separate restoration plan will be developed for complete demolition of the facility. Financial assurance will remain allocated for the complete demolition scenario until a viable re-use has been identified and modifications to the reclamation plan have been formally approved.
- A consultant completed a draft conceptual design for the spillway that will be used for passive discharge at closure of the HTDF. Eagle's primary stakeholder in the design, the Humboldt Wetland Mitigation Bank (HWMB), was engaged in review of the preliminary design. In 2022 an adaptive management plan (AMP) informing the near and future

management of hydrology in Wetland EE and downgradient areas will be written. The objective of the AMP will be to adjust the flows provided to Wetland EE to gradually transition the hydrology to the expected post-closure conditions prior to when the spillway is constructed. The HWMB will continue to be engaged in the development and execution of the AMP.

## 9. Contingency Plan Update

One element of the contingency plan is to test its effectiveness on an annual basis. Testing is generally comprised of two components. The first component is participation in adequate training programs for individuals involved in responding to emergencies and the second component is a mock field test.

The Humboldt Mill Emergency Response Team (ERT) continued to be active in 2021. This team is not required by the Mine Safety Health Administration (MSHA) but was established to assist first responders in the event of an emergency. The focus of the team is to act as the liaison with first responders as well as the Eagle Crisis Management Team (CMT), providing assistance where needed as they are considered the site experts. ERT training occurs on a monthly basis and in 2021 focused on fire system familiarization and mapping, practicing patient care, packaging, and extraction of patient from elevated platforms/tanks. The ERT also conducted training scenarios with site security simulating a cardiac arrest in a remote location only accessible by stairs. Five employee evacuation drills occurred in which the ERT team conducted building sweeps to ensure complete evacuations to the muster point.

In addition to the ERT, security personnel are EMTs and paramedics who are trained in accordance with state and federal regulations. This allows for immediate response to medical emergency situations.

A mock field test in the form of a desktop exercise was conducted in May 2021. The exercise tested the emergency response measures of the contingency plan and crisis management plan in place at Eagle Mine. With the assistance of Eagle Mine employees, a third-party consultant developed an emergency scenario. The scenario generally involves a situation in which both safety and environmental risks are considered and in 2021 the emergency involved a fall of ground in Eagle East. In the scenario, material fell onto a haul truck trapping an operator inside the cab. The crisis management team was aware that a test would occur but were unaware of the nature of the emergency. During the crisis management exercise, the team worked through the incident identifying the strategic objectives, key priorities, critical decisions and triggers, and communications that would need to be made to stakeholders. The third-party consultant observed the activity to identify strengths, weaknesses, and opportunities for improvement. Once the exercise was complete, the consultant and crisis management team held a debrief session to capture feedback. The results were captured in a summary report with actions for improvement. As a result of this session, the site risk register was updated, including additional mitigation measures.

Eagle's CMT also continued to meet regularly in 2021 to manage the COVID-19 pandemic. At the onset of the pandemic, the CMT established three strategic objectives: employee health and safety, site safety, and business continuity. These objectives continued to be the basis of the actions and decisions that were taken by the CMT in 2021 with a focus on risk mitigation.

An updated contingency plan can be found in Appendix O. This plan will also be submitted to the Local Emergency Management Coordinator.

## 10. Financial Assurance Update

Updated reclamation costs were submitted to the Department for review on January 31, 2022. Eagle Mine understands that EGLE will notify Eagle Mine if these updated costs require re-negotiation of the current bond for financial assurance

## 11. Organizational Information

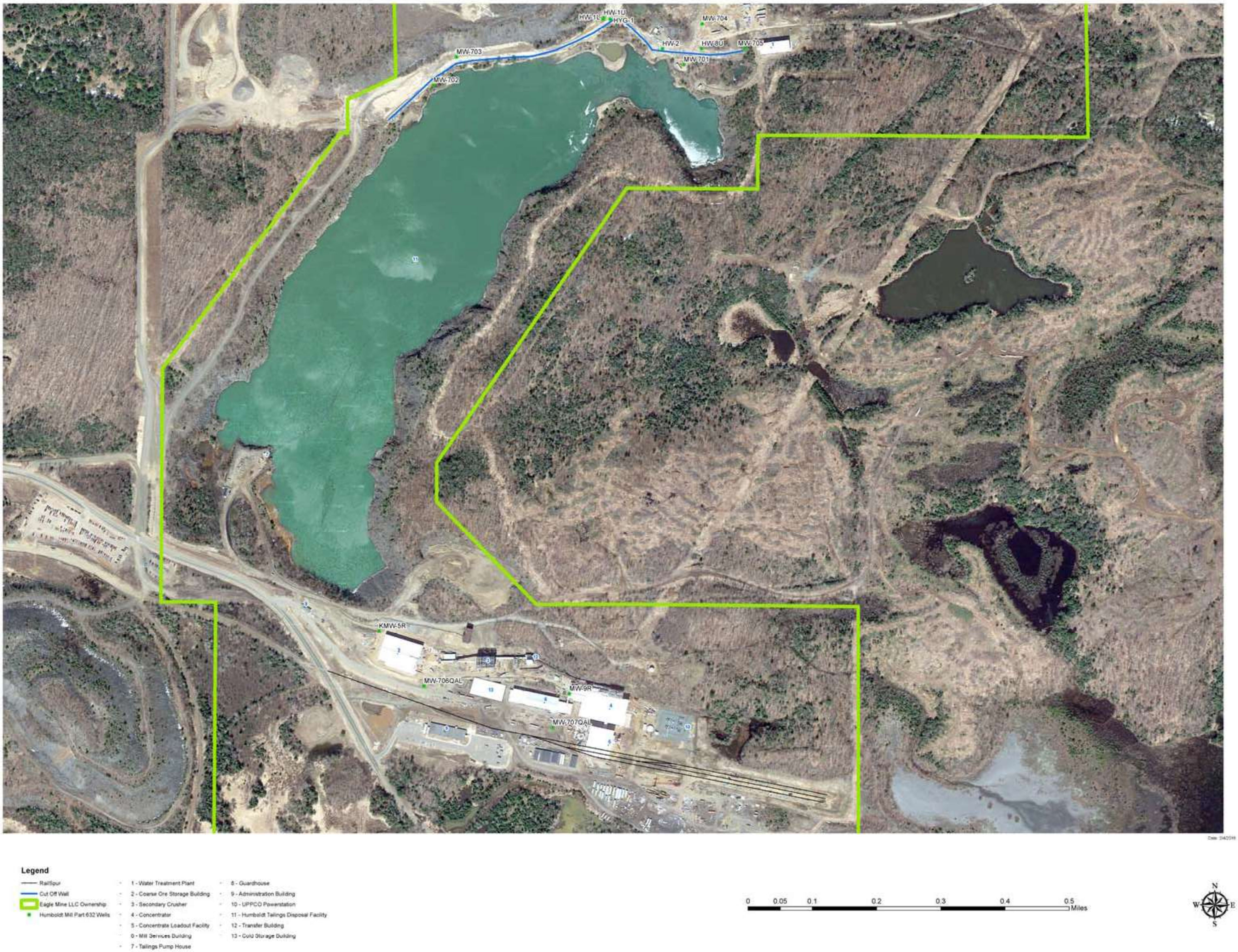
An updated organization report can be found in Appendix P.

# Appendix A

# Humboldt Mill

# Site Map

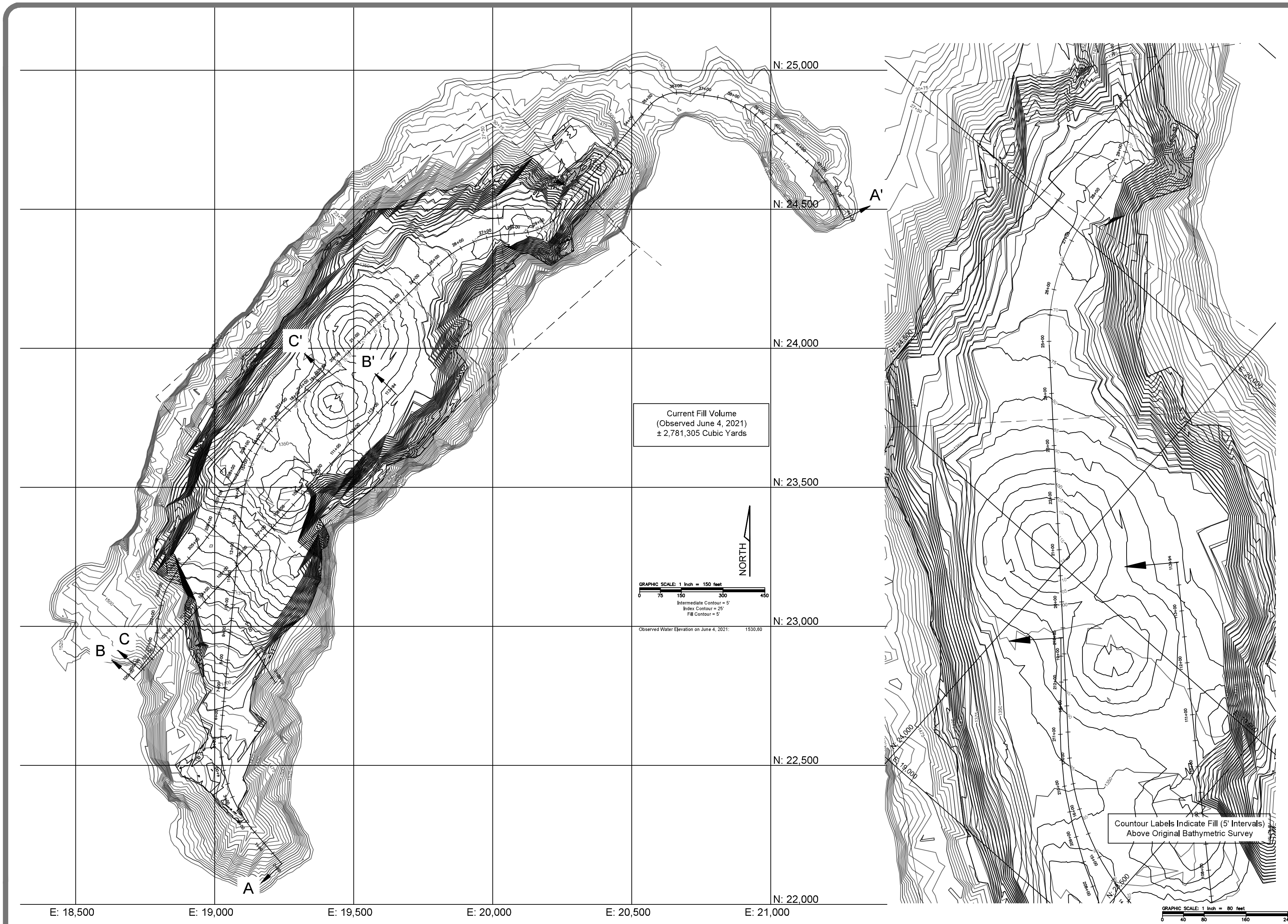
# Eagle Mine LLC Humboldt Mill Monitoring Map



# Appendix B

# Humboldt Mill

# Bathymetry Maps




TRIMEDIA
ENVIRONMENTAL & ENGINEERING

Eagle Mine - Humboldt Mill
June 4, 2021 Bathymetric Survey
Champion, MI

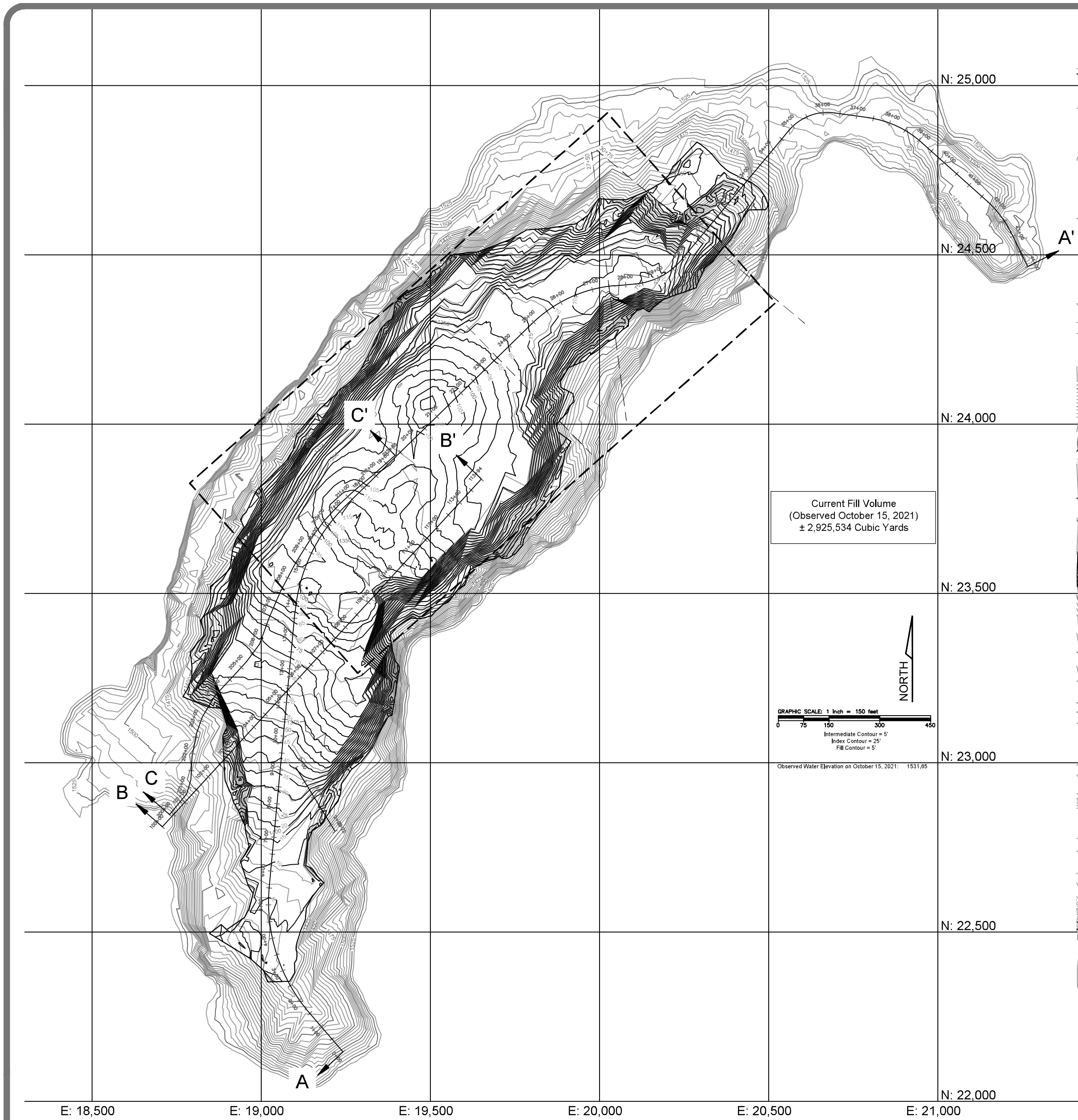
| DATE | DESCRIPTION | ISSUED |
|---|---|---|
| 06/08/2021 | Client Review | |

DESIGNED:
DRAWN: JWM
CHECKED: GWM
APPROVED: GWM

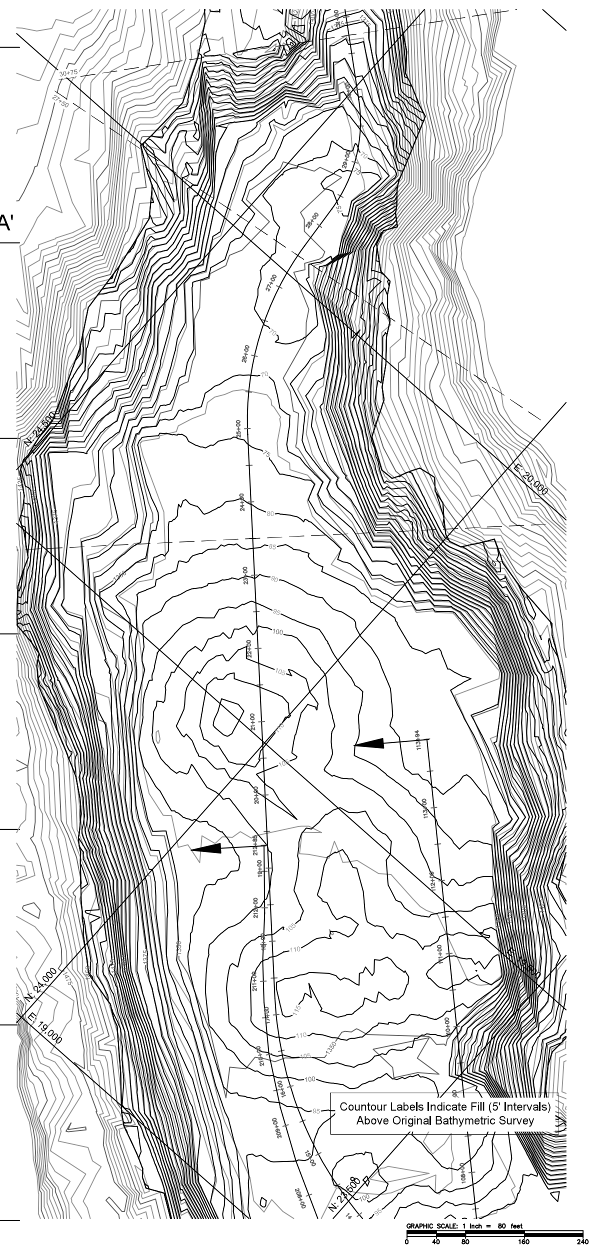
TRIMEDIA
JOB NUMBER:
2014-100

SHEET TITLE:
Tailings Basin
Product Fill Map

SHEET NUMBER:
1.0




Current Fill Volume
(Observed October 15, 2021)
± 2,925,534 Cubic Yards




Countour Labels Indicate Fill (5' Intervals)
Above Original Bathymetric Survey

TRIMEDIA
ENVIRONMENTAL & ENGINEERING

Eagle Mine - Humboldt Mill
October 15, 2021 Bathymetric Survey
Champion, MI

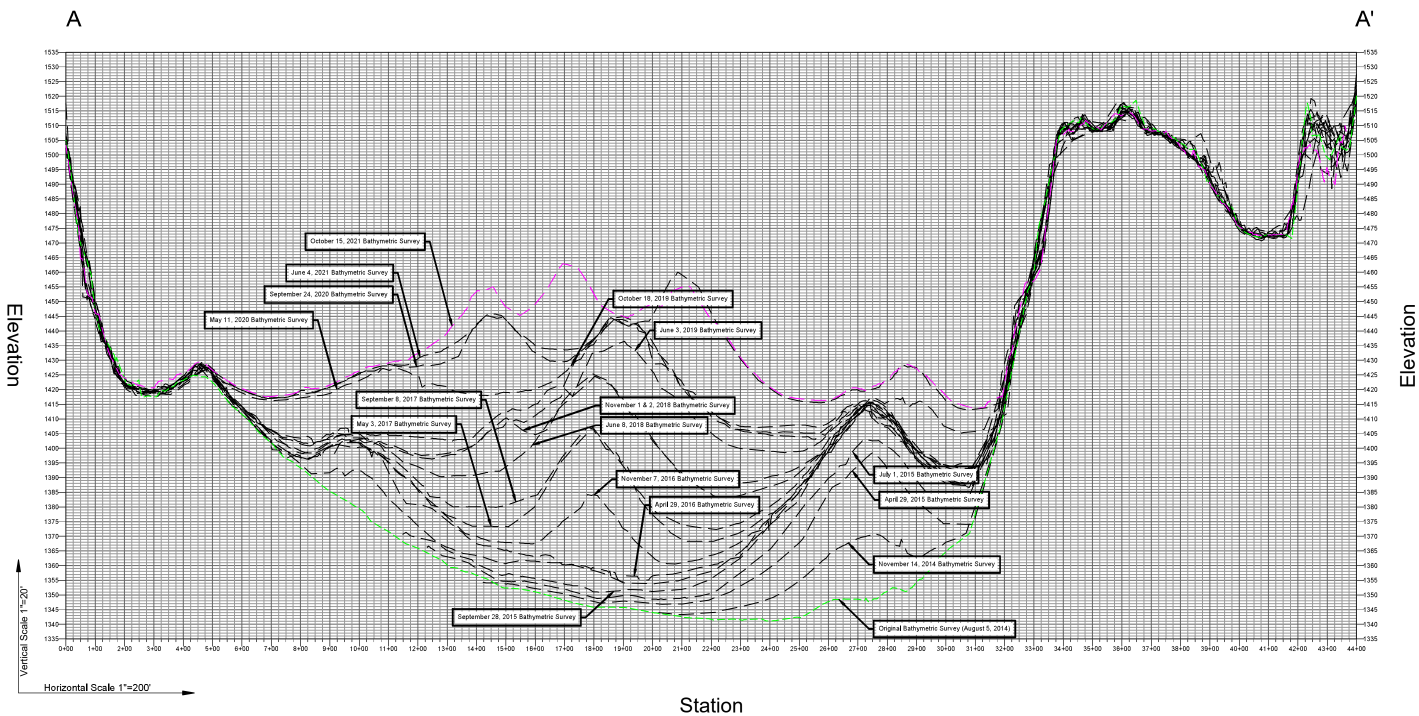
| DATE | DESCRIPTION | ISSUED |
|---|---|---|
| 10/26/2021 | Client Review | |

DESIGNED:
DRAWN: MLC
CHECKED: GWM
APPROVED: GWM

TRIMEDIA
JOB NUMBER:
2014-100

SHEET TITLE:
Tailings Basin
Product Fill Map

SHEET NUMBER:
1.0




TRIMEDIA
ENVIRONMENTAL & ENGINEERING

Eagle Mine - Humboldt Mill
October 15, 2021 Bathymetric Survey
Champion, MI

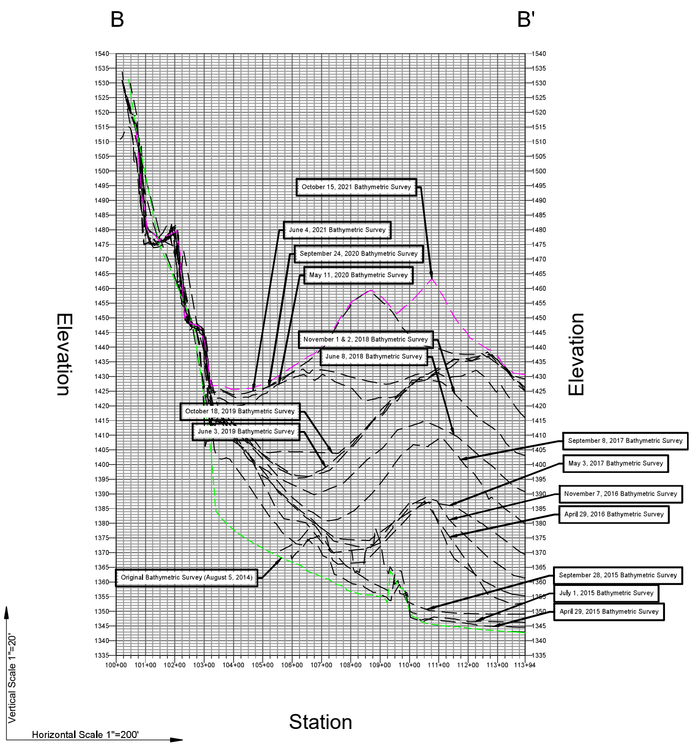
| DATE | DESCRIPTION | ISSUED |
|---|---|---|
| | | |

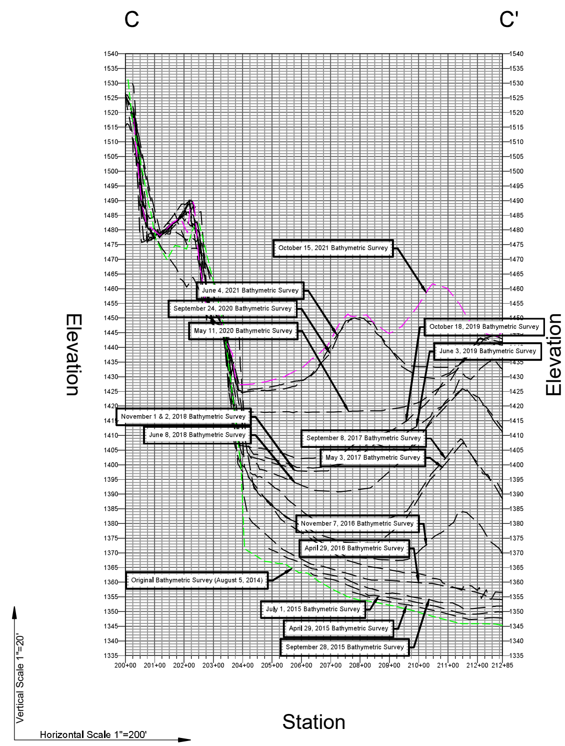
DESIGNED:
DRAWN: MLC
CHECKED: GWM
APPROVED: GWM

TRIMEDIA
JOB NUMBER:
2014-100

SHEET TITLE:
Tailings Basin 2021
Profile
(Cross Section A)

SHEET NUMBER:
2.0




TRIMEDIA
ENVIRONMENTAL & ENGINEERING

Eagle Mine - Humboldt Mill
October 15, 2021 Bathymetric Survey
Champion, MI

| DATE | DESCRIPTION | ISSUED |
|---|---|---|

DESIGNED:
DRAWN: MLC
CHECKED: GWM
APPROVED: GWM

TRIMEDIA
JOB NUMBER:
2014-100

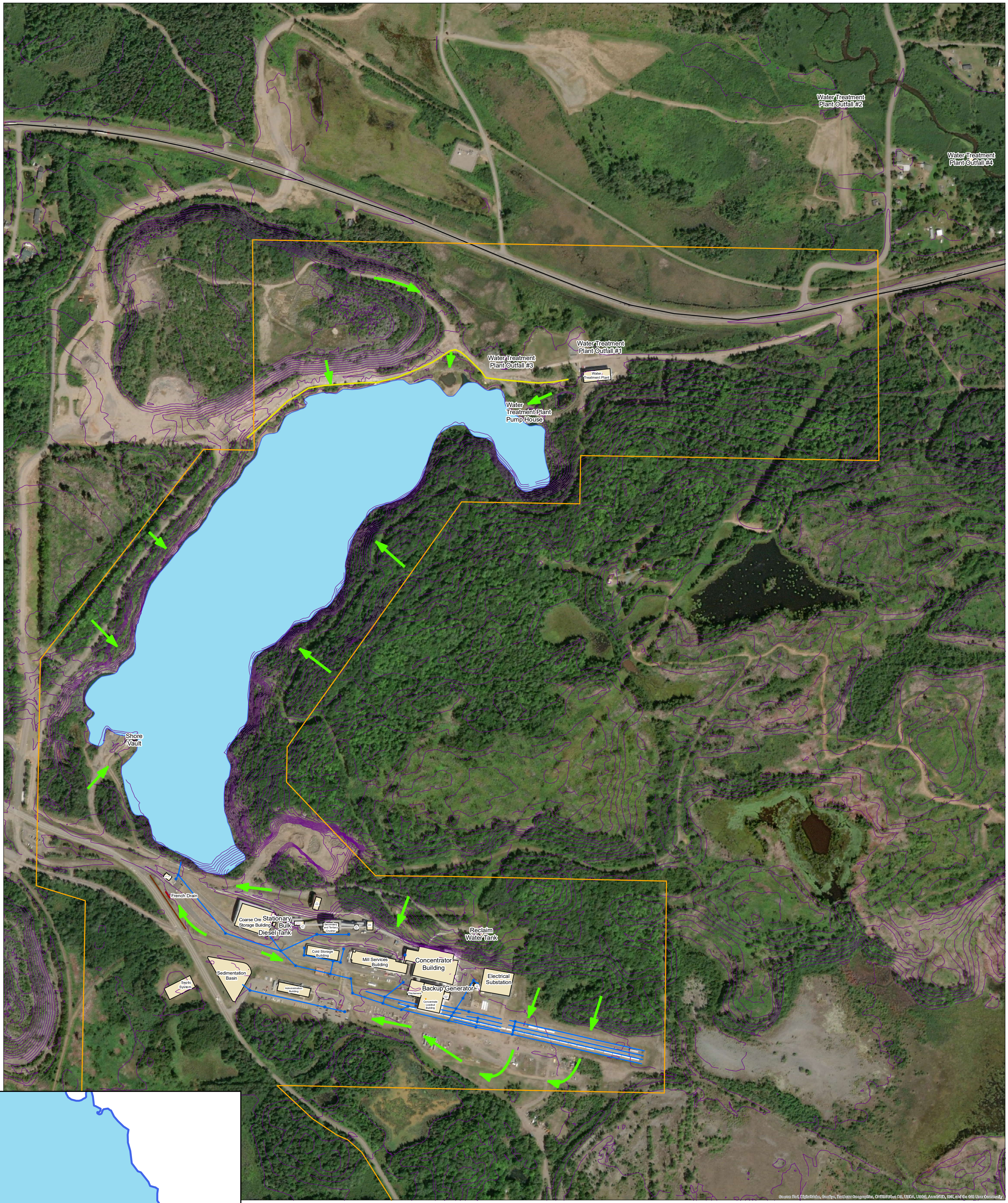
SHEET TITLE:
Tailings Basin 2021 Profiles (Cross Section B & C)

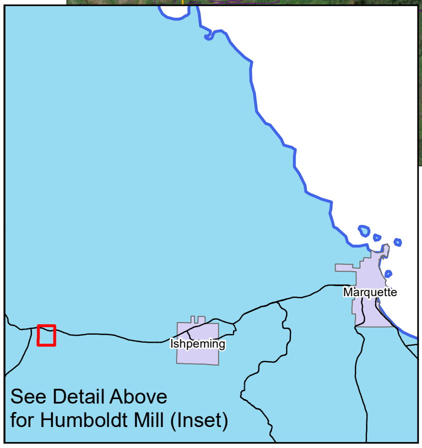
SHEET NUMBER:
3.0

# Appendix C

# Humboldt Mill

# Storm Water Drainage Map




0 0.05 0.1 0.2 0.3 0.4 Miles

## Legend

- Cut Off Wall
- Eagle Mine Property Boundary
- Catch Basins
- Berm
- Stormwater Conduit
- Surface Water Flow
- Contours 10ft
- Humboldt Facilities
- Humboldt Tailings Disposal Facility
- Main Roads

# Humboldt Mill Site Map

Figure 1

| | |
|---|---|
| Edited on November 2, 2018<br>Created on October 9, 2015 | Locations and Coordinates based on UTM Zone 16N NAD83 |

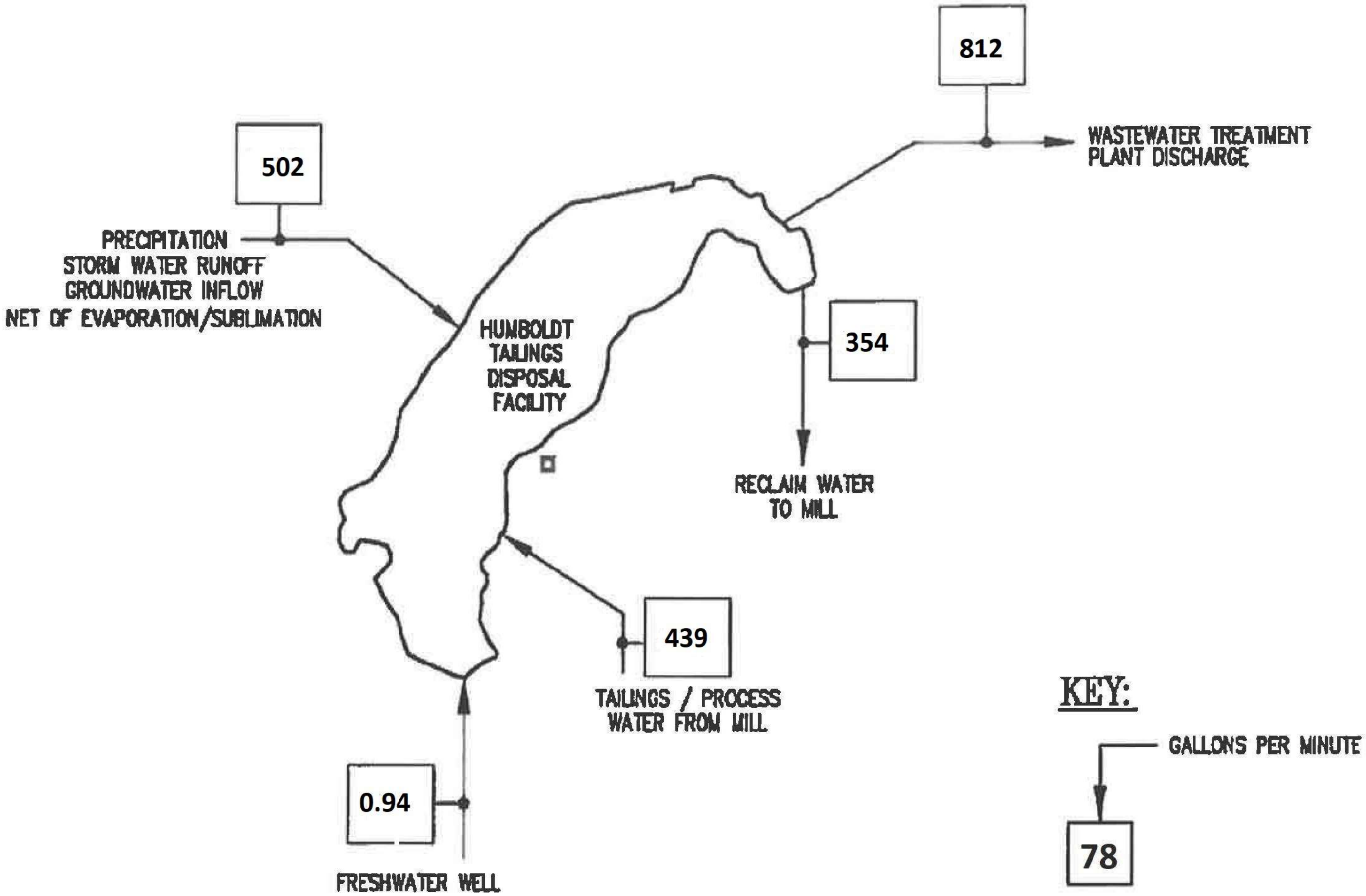
Eagle Mine
a subsidiary of lundin mining

Author: JRE

# Appendix D

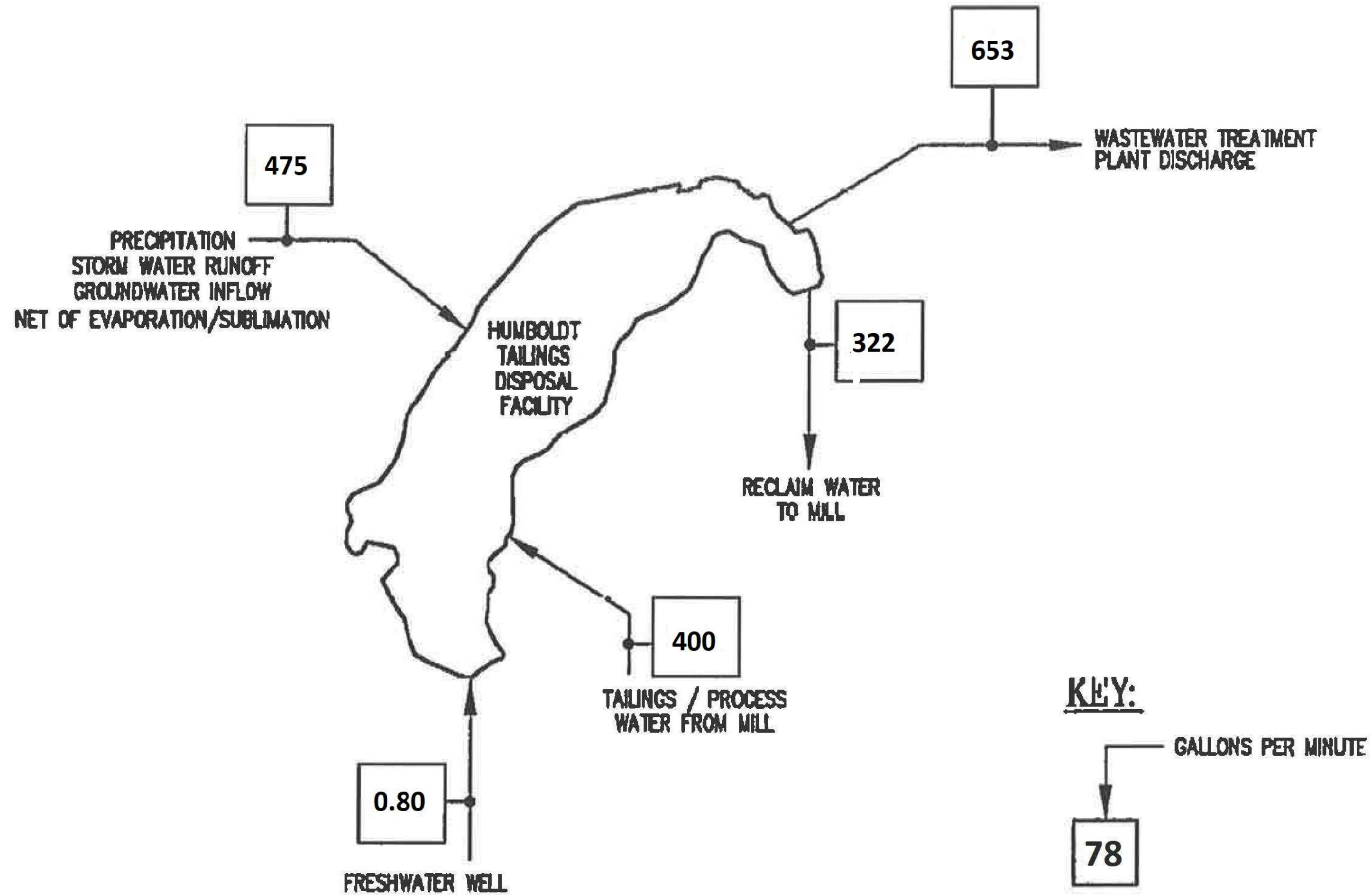
# Humboldt Mill

# Water Balance Diagrams




Tailings total includes the dry tailings volume. As such, this diagram illustrates a volume balance rather than a pure water balance.

| | |
|---|---|
| **Eagle Mine, LLC - Humboldt Mill Facility**<br>Humboldt Township, Marquette County, Michigan | PROJECT NUMBER: KEX–0102 |
| WATER BALANCE<br>HUMBOLDT TAILINGS DISPOSAL FACILTY<br>(January 1st - March 31, 2021) | *FIGURE:* **1** |



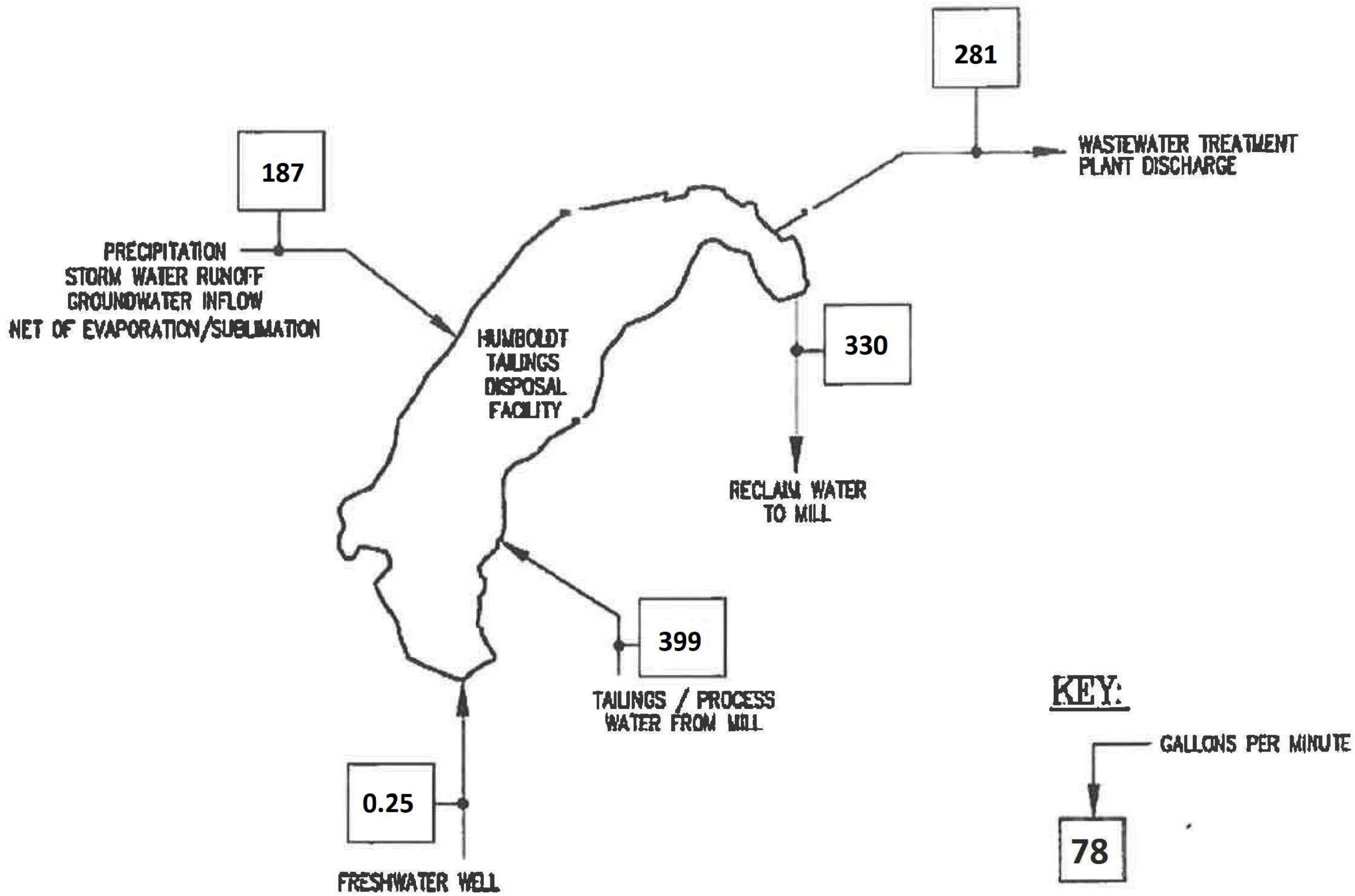

Tailings total includes the dry tailings volume. As such, this diagram illustrates a volume balance rather than a pure water balance.

Eagle Mine, LLC - Humboldt Mill Facility
Humboldt Township, Marquette County, Michigan

WATER BALANCE
HUMBOLDT TAILINGS DISPOSAL FACILTY
(April 1 - June 30, 2021)

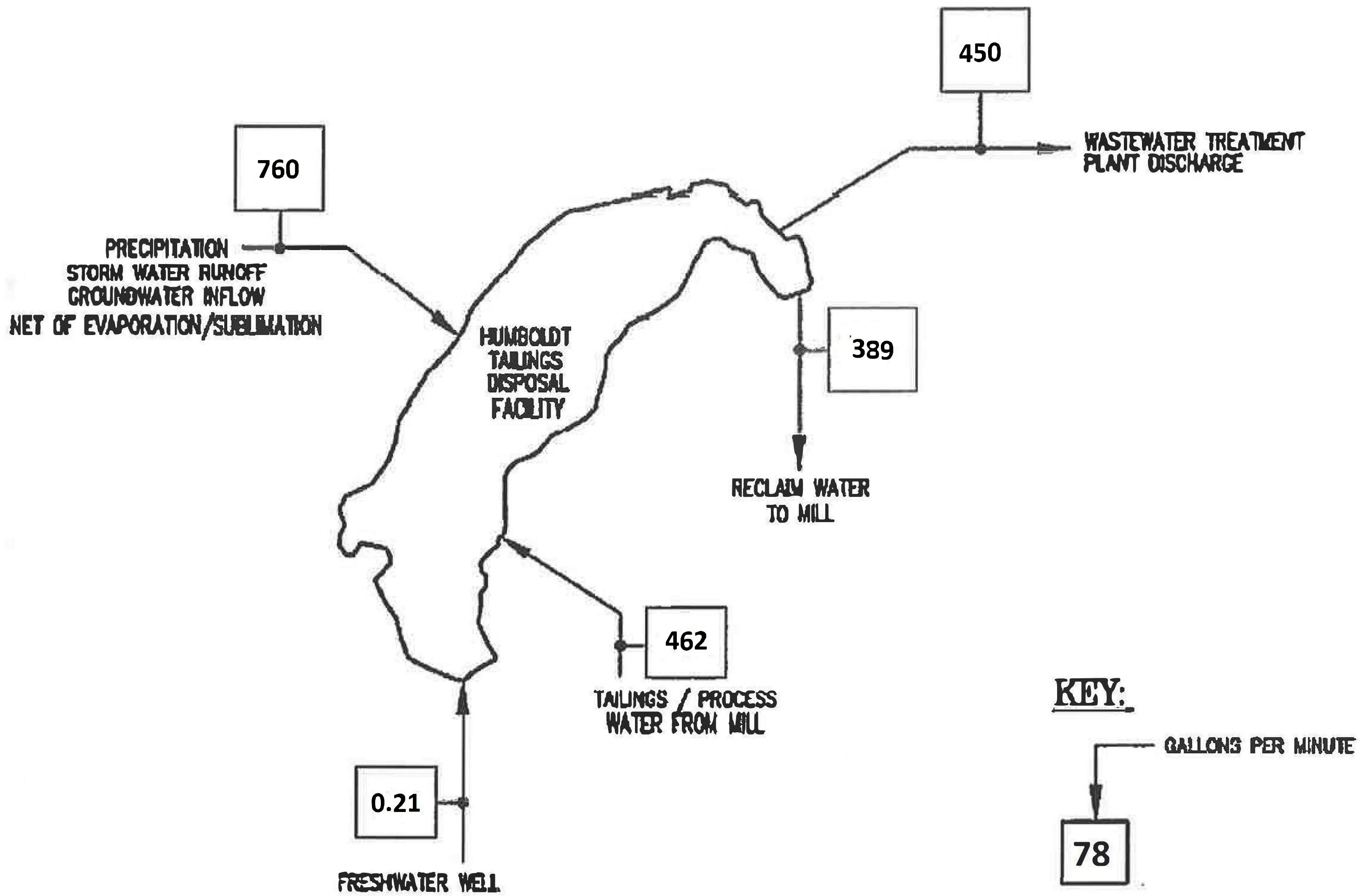
PROJECT NUMBER:
KEX–0102

FIGURE:
1




Tailings total includes the dry tailings volume. As such, this diagram illustrates a volume balance rather than a pure water balance.

| | |
|---|---|
| | PROJECT NUMBER: KEX-0102 |
| Eagle Mine, LLC - Humboldt Mill Facility<br>Humboldt Township, Marquette County, Michigan | FIGURE: |
| WATER BALANCE<br>HUMBOLDT TAILINGS DISPOSAL FACILITY<br>(July 1 - September 30, 2021) | 1 |




PROJECT NUMBER: KEX-0102

Eagle Mine, LLC - Humboldt Mill Facility
Humboldt Township, Marquette County, Michigan

WATER BALANCE
HUMBOLDT TAILINGS DISPOSAL FACILTY
(October 1 - December 31, 2021)

FIGURE: 1

# Appendix E

# Humboldt Mill

# Groundwater Map


## CUT-OFF WALL MONITORING WELL NETWORK LOCATIONS

**Legend**

- Monitoring Well
- Leachate Monitoring Well per R425.406(5)(a)
- Compliance Monitoring Well per R425.406(5)(b)
- Containment Wall
- Estimated Limit of Aquifer
- Flow Divide
- Highway
- Bedrock Outcrop

Reference

Data provided by: Eagle Mine and North Jackson Company
Projection & Datum: UTM NAD 83 Zone 16N
Aerial Photo: 2006

0 200 400 Feet

**1:3,500**

Eagle Mine
a subsidiary of lundin mining

North Jackson Company
ENVIRONMENTAL SCIENCE & ENGINEERING


**LEGEND**

New Compliance Monitoring Wells

**NOTES**

1. SCALE OF AERIAL IMAGERY IS APPROXIMATE.
2. THIS FIGURE HAS BEEN TRANSLATED AND SCALED TO THE HORIZONTAL DATUM NAD83 MICHIGAN STATE PLANE COORDINATE SYSTEM.
3. FOR REFERENCE PURPOSES ONLY. NOT TO BE USED FOR REPORTING.

**REFERENCE**

1. BASE MAP TAKEN FROM GOOGLE EARTH, 2014

CLIENT
EAGLE MINE
HUMBOLDT MILL

PROJECT
GROUNDWATER MONTIORING

TITLE
**EAGLE MINE HUMBOLDT MILL**
**COMPLIANCE MONITORING LOCATIONS**

DRAFT

CONSULTANT

Golder Associates

| | |
|---|---|
| YYYY-MM-DD | 2014-08-14 |
| PREPARED | CJS |
| DESIGN | CJS |
| REVIEW | MAC |
| APPROVED | GJD |

PROJECT 1401484 | Rev. 0 | FIGURE **01**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: 0 1 in

Path: C:\Users\CStacey\Documents\Eagle\1401484 Eagle Mill Monitoring\GIS\Eagle Mill MW Location Map Portrait.mxd

# Appendix F

# Humboldt Mill

# Groundwater Monitoring Well Results

# &

# Benchmark Summary Table

**Humboldt Mill**
**2021 Mine Permit Groundwater Monitoring**
**Benchmark Comparison Summary**

| Location | Location Classification | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|---|
| HW-1L | Monitoring | **chloride, sodium** | | | |
| HW-1U LLA | Monitoring | **chloride, sodium, hardness** | **chloride, sodium, hardness** | **chloride** | **chloride** |
| HW-1U UFB | Monitoring | | | pH | **pH** |
| HW-2 | Monitoring | **sodium** | **sodium** | | |
| HW-8U | Monitoring | **potassium,** sodium | **potassium, sodium** | chloride, ammonia, **potassium, sodium** | **chloride,** calcium, **ammonia, potassium, sodium** |
| HYG-1 | Monitoring | **manganese, ammonia** | pH**, manganese, ammonia,** nitrate | **antimony, manganese, ammonia,** calcium | **manganese, ammonia** |
| KMW-5R | Monitoring | **sodium** | **sodium** | **aluminum, sodium** | **sodium** |
| MW-701 QAL | Monitoring | **pH,** iron, mercury, **chloride, sulfate, calcium, magnesium, sodium, hardness** | **mercury,** alkalinity bicarbonate, **chloride,** nitrate, **sulfate, sodium** | **chloride, sulfate,** calcium, **sodium** | **chloride, sulfate, calcium, sodium,** hardness |
| MW-701 UFB | Monitoring | **iron, manganese, chloride, sulfate, calcium, magnesium, potassium, sodium, hardness** | pH, **iron, manganese,** zinc, **chloride, sulfate, calcium, magnesium, sodium, hardness** | **pH, iron, manganese, sulfate, calcium, magnesium, sodium, hardness** | **iron, sulfate, calcium, magnesium, sodium, hardness** |
| MW-702 QAL | Monitoring | **pH** | | pH, alkalinity carbonate, nitrate, nitrite | **pH,** mercury |
| MW-702 UFB | Monitoring | | | | |
| MW-703 QAL | Monitoring | **pH, nitrate** | **pH, nitrate** | **pH, nitrate** | **pH, nitrate** |
| MW-703 UFB | Monitoring | iron, **manganese** | | | |
| MW-703 LLA | Monitoring | | | | |
| MW-703-DBA | Monitoring | **pH, alkalinity carbonate,** ammonia, potassium, sodium | | | |
| MW-704 QAL | Monitoring | **chloride, calcium, magnesium, sodium, hardness** | pH, **chloride,** ammonia, **calcium, magnesium, sodium, hardness** | **chloride** | **chloride** |
| MW-704 UFB | Monitoring | **iron, manganese, chloride, calcium, magnesium, potassium, sodium, hardness** | pH, iron**, manganese,** mercury, chloride, **calcium, magnesium,** sodium**, hardness** | **pH, iron, chloride, calcium, magnesium, mercury, sodium, hardness** | **chloride, magnesium** |
| MW-704 LLA | Monitoring | **pH, manganese, alkalinity bicarbonate, alkalinity carbonate, calcium, magnesium, hardness** | **pH, manganese, alkalinity bicarbonate, calcium, magnesium, hardness** | **pH, manganese, alkalinity bicarbonate, calcium, magnesium, hardness** | **pH, manganese, alkalinity bicarbonate, calcium,** chloride, **magnesium, hardness** |
| MW-704 DBA | Monitoring | **pH, manganese, alkalinity bicarbonate, calcium, magnesium, hardness** | **manganese** | | |
| MW-705 QAL | Monitoring | **ammonia, sodium** | chloride, **ammonia, sodium** | **chloride, ammonia, sodium** | **chloride, ammonia,** potassium, **sodium** |
| MW-705 UFB | Monitoring | **manganese, chloride, calcium, magnesium, sodium, hardness** | **manganese, chloride, calcium, magnesium,sodium, hardness** | **manganese, chloride, calcium, magnesium, sodium, hardness** | **manganese, chloride, calcium, magnesium,** potassium, **sodium, hardness** |
| MW-706 QAL | Monitoring | **pH** | **pH** | | |
| MW-707 QAL | Monitoring | | | | |
| MW-9R | Monitoring | | | nickel, zinc | NM |

Parameters listed in this table had values reported that were equal to or greater than a site-specific benchmark. Parameters in **BOLD** are instances in which the Department was notified because benchmark deviations were identified at compliance monitoring locations for two consecutive quarters. N/A means there were no parameters outside of benchmark values for that quarter. If the location is classified as background, Department notification is not required for an exceedance.

Blank data cells indicate that no benchmark deviations occurred at the location during the specified sampling quarter.

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**HW-1L (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[D] | Q3 2021[T] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.66** | **1.6** | **0.69** | **0.73** |
| ORP | mV | - | -286 | -273 | -282 | -286 |
| pH | SU | 8.14-9.14 | **8.3** | **8.3** | **8.2** | **8.3** |
| Specific Conductance | uS/cm | - | **437** | **384** | **383** | **357** |
| Temperature | C | - | **8.2** | **9.6** | **10** | **9.4** |
| Turbidity | NTU | - | **3.9** | **5.2** | **3.0** | **2.9** |
| Water Elevation | ft MSL | - | **1445** | **1445** | **1445** | **1445** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 745 | - | - | **587** | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 1187 | **597** | **705** | **942** | **1100** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 23.0 | - | - | <10.0 | - |
| Manganese | ug/L | 200 | <50.0 | <50.0 | <50.0 | **55** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.8 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 109.1 | **78** | **82** | **79** | **84** |
| Alkalinity, Carbonate | mg/L | 7.8 | 3.6 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 57.2 | **58** | **52** | **48** | **46** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.1 | <0.025 | <0.025 | <0.025 | <0.025 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 33 | **28** | **29** | **29** | **31** |
| Sulfide | mg/L | 0.8 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 34 | **28** | **28** | **27** | **29** |
| Magnesium | mg/L | 15 | **11** | **11** | **10** | **12** |
| Potassium | mg/L | 6 | **2.1** | **2.0** | **1.9** | **2.0** |
| Sodium | mg/L | 28 | **30** | **27** | **24** | **26** |
| General | | | | | | |
| Hardness | mg/L | 156 | **115** | **116** | **109** | **120** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**HW-1U LLA (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[T] | Q3 2021[T] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.61** | **1.6** | **0.69** | **0.71** |
| ORP | mV | - | -307 | -283 | -262 | -275 |
| pH | SU | 8.06-9.06 | **8.1** | **8.3** | **8.3** | **8.3** |
| Specific Conductance | uS/cm | - | **1486** | **1231** | **887** | **625** |
| Temperature | C | - | **7.9** | **9.2** | **-** | **9.4** |
| Turbidity | NTU | - | **7.2** | **1.7** | **2.7** | **3.7** |
| Water Elevation | ft MSL | - | **1473** | **1475** | **1473** | **1473** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 9.6 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 8.6 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 56770 | **751** | **1560** | **1320** | **934** |
| Lead | ug/L | 15.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 17.4 | - | - | <10.0 | - |
| Manganese | ug/L | 673 | **74** | **70** | **62** | **57** |
| Mercury | ng/L | 14.2 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 44.2 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 157 | **84** | **90** | **92** | **96** |
| Alkalinity, Carbonate | mg/L | 64.2 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 61 | **348** | **254** | **174** | **93** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.30 | **0.14** | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.57 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.78 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 395 | **53** | **54** | **60** | **62** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 61 | **50** | **48** | **40** | **41** |
| Magnesium | mg/L | 26 | **15** | **15** | **12** | **13** |
| Potassium | mg/L | 16.9 | **6.0** | **6.0** | **5.5** | **5.0** |
| Sodium | mg/L | 134 | **183** | **136** | **100** | **64** |
| General | | | | | | |
| Hardness | mg/L | 171 | **185** | **181** | **146** | **157** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**HW-1U UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[D] | Q3 2021[D] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.59** | **1.58** | **0.68** | **0.79** |
| ORP | mV | - | -398 | -328 | -301 | -317 |
| pH | SU | 8.4-9.4 | **8.5** | **8.5** | **8.3** | **8.3** |
| Specific Conductance | uS/cm | - | **390** | **310** | **320** | **296** |
| Temperature | C | - | **7.6** | **8.7** | **9.5** | **9.0** |
| Turbidity | NTU | - | **5.6** | **18** | **8.4** | **6.2** |
| Water Elevation | ft MSL | - | **1532** | * | **1534** | **1535** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 9.3 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 1364 | **671** | **721** | **564** | **869** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 16.7 | - | - | <10.0 | - |
| Manganese | ug/L | 80 | **64** | **51** | <50.0 | **62** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 122 | **97** | **106** | **104** | **97** |
| Alkalinity, Carbonate | mg/L | 17.1 | **7.4** | **7.4** | **5.2** | **4.6** |
| Chloride | mg/L | 96 | **48** | **28** | **31** | **44** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.10 | **0.03** | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 72.3 | <1.0 | **2.0** | **2.9** | **4.3** |
| Sulfide | mg/L | 2.47 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 34 | **20** | **31** | **30** | **29** |
| Magnesium | mg/L | 15.6 | **6.3** | **6.1** | **6.1** | **6.7** |
| Potassium | mg/L | 20.9 | **3.9** | **4.4** | **4.6** | **5.1** |
| Sodium | mg/L | 68 | **42** | **20** | **22** | **27** |
| General | | | | | | |
| Hardness | mg/L | 147 | **75** | **103** | **99** | **101** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**HW-2 (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[D] | Q3 2021[D] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.82** | **0.78** | **0.96** | **0.62** |
| ORP | mV | - | **199** | -258 | -192 | -214 |
| pH | SU | 7.29-8.29 | **7.8** | **7.9** | **7.7** | **8.1** |
| Specific Conductance | uS/cm | - | **587** | **498** | **407** | **310** |
| Temperature | C | - | **6.6** | **8.2** | **8.6** | **9.2** |
| Turbidity | NTU | - | **134** | **76** | **15** | **13** |
| Water Elevation | ft MSL | - | **1533** | **1533** | **1533** | **1534** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 2595 | **577** | **1090** | **2010** | **1080** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 333 | **296** | **293** | **277** | **175** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 141 | **102** | **107** | **99** | **97** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 35 | **34** | **28** | **16** | **14** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.08 | <0.03 | <0.05 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 175 | **125** | **87** | **52** | **33** |
| Sulfide | mg/L | 0.52 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 72 | **40** | **36** | **31** | **27** |
| Magnesium | mg/L | 26 | **18** | **15** | **11** | **9.7** |
| Potassium | mg/L | 6 | **5.3** | **4.0** | **3.0** | **2.9** |
| Sodium | mg/L | 30 | **42** | **33** | **24** | **22** |
| General | | | | | | |
| Hardness | mg/L | 297 | **173** | **153** | **121** | **108** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**HW-8U (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[T] | Q3 2021[T] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.66** | **1.6** | **2.0** | **0.76** |
| ORP | mV | - | -167 | -149 | -107 | -156 |
| pH | SU | 6.4-7.4 | **7.0** | **7.1** | **7.0** | **7.0** |
| Specific Conductance | uS/cm | - | **378** | **355** | **437** | **479** |
| Temperature | C | - | **8.2** | **9.2** | **11** | **9.2** |
| Turbidity | NTU | - | **4.7** | **2.8** | **1.4** | **1.4** |
| Water Elevation | ft MSL | - | **1534** | **1534** | **1533** | **1533** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4 | - | - | <2.0 | - |
| Arsenic | ug/L | 8.8 | <5.0 | <5.0 | <5.0 | **5.2** |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 22049 | **13400** | **11200** | **16900** | **17200** |
| Lead | ug/L | 9 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 14.4 | - | - | <10.0 | - |
| Manganese | ug/L | 6268 | **4050** | **3940** | **4400** | **5140** |
| Mercury | ng/L | 4 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.8 | - | - | <0.20 | - |
| Thallium | ug/L | 2 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 26.7 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 214 | **147** | **138** | **141** | **142** |
| Alkalinity, Carbonate | mg/L | 8 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 18 | **12** | **15** | **24** | **42** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.04 | **0.03** | **0.03** | **0.04** | **0.04** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 12.3 | **8.5** | **7.7** | **6.7** | **5.8** |
| Sulfide | mg/L | 0.8 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 46 | **39** | **39** | **44** | **46** |
| Magnesium | mg/L | 19 | **13** | **12** | **13** | **13** |
| Potassium | mg/L | 3.6 | **4.2** | **4.4** | **4.2** | **4.4** |
| Sodium | mg/L | 4.3 | **4.4** | **5.5** | **5.5** | **6.9** |
| General | | | | | | |
| Hardness | mg/L | 203 | **150** | **149** | **161** | **169** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**HYG-1 (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[T] | Q3 2021[T] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.70** | **0.79** | **0.84** | **0.24** |
| ORP | mV | - | **29** | **103** | **26** | **52** |
| pH | SU | 6.29-7.29 | **6.3** | **6.1** | **6.5** | **6.5** |
| Specific Conductance | uS/cm | - | **614** | **564** | **736** | **589** |
| Temperature | C | - | **6.9** | **6.9** | **11** | **9.4** |
| Turbidity | NTU | - | **1.9** | **1.5** | **1.8** | **2.1** |
| Water Elevation | ft MSL | - | **1530** | **1531** | **1531** | **1531** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | **4.8** | **-** |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 9.2 | <4.0 | **4.8** | <4.0 | <4.0 |
| Iron | ug/L | 482 | <200 | <200 | **320** | **297** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 627 | **3820** | **3690** | **5850** | **5000** |
| Mercury | ng/L | 37.3 | **7.9** | **17** | **30** | **24** |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 25.3 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 373 | **230** | **222** | **313** | **235** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 22 | **12** | <10.0 | **17** | **11** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.56 | **0.70** | **0.67** | **1.1** | **0.85** |
| Nitrogen, Nitrate | mg/L | 0.08 | <0.10 | **0.14** | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.40 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 137 | **48** | **41** | **35** | **46** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 65 | **55** | **51** | **66** | **56** |
| Magnesium | mg/L | 34 | **22** | **20** | **25** | **23** |
| Potassium | mg/L | 13 | **9.5** | **8.7** | **10** | **10** |
| Sodium | mg/L | 80 | **25** | **25** | **37** | **34** |
| General | | | | | | |
| Hardness | mg/L | 322 | **227** | **211** | **271** | **233** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**KMW-5R (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[D] | Q3 2021[D] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **4.2** | **3.1** | **3.0** | **4.2** |
| ORP | mV | - | -5.6 | **150** | -22 | **51** |
| pH | SU | 6.67-7.67 | **6.7** | **7.0** | **7.1** | **6.8** |
| Specific Conductance | uS/cm | - | **814** | **763** | **807** | **769** |
| Temperature | C | - | **7.9** | **11.8** | **10.6** | **8.7** |
| Turbidity | NTU | - | **52** | **36** | **64** | **81** |
| Water Elevation | ft MSL | - | **1558** | **1559** | **1558** | **1559** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | **224** | **-** |
| Antimony | ug/L | 4 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 28 | <4.0 | **8.9** | **4.7** | **14** |
| Iron | ug/L | 52956 | **2630** | **8270** | **1130** | **11500** |
| Lead | ug/L | 9 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 31 | - | - | **16** | **-** |
| Manganese | ug/L | 2789 | **1910** | **1860** | **1650** | **1630** |
| Mercury | ng/L | 14.9 | <1.0 | **2.5** | <1.0 | **2.8** |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.8 | - | - | <0.20 | - |
| Thallium | ug/L | 2 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 23.7 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 481 | **361** | **366** | **364** | **371** |
| Alkalinity, Carbonate | mg/L | 8 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 192 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.06 | <0.03 | <0.03 | <0.03 | **0.03** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 139 | **57** | **58** | **55** | **54** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 166 | **99** | **103** | **104** | **101** |
| Magnesium | mg/L | 65 | **38** | **38** | **37** | **38** |
| Potassium | mg/L | 8.3 | **7.1** | **6.9** | **6.7** | **6.6** |
| Sodium | mg/L | 7.7 | **8.4** | **8.7** | **8.6** | **9.0** |
| General | | | | | | |
| Hardness | mg/L | 757 | **402** | **415** | **412** | **409** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-701 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[T] | Q3 2021[T] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.89** | **0.82** | **0.99** | **0.10** |
| ORP | mV | - | **132** | **291** | **127** | **154** |
| pH | SU | 5.46-6.46 | **5.3** | **5.5** | **5.6** | **5.7** |
| Specific Conductance | uS/cm | - | **2510** | **1463** | **1180** | **1006** |
| Temperature | C | - | **7.0** | **8.5** | **10** | **11** |
| Turbidity | NTU | - | **2.3** | **2.1** | **2.7** | **2.6** |
| Water Elevation | ft MSL | - | **1532** | **1532** | **1531** | **1532** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | **72** | **-** |
| Antimony | ug/L | 4 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | **5.2** | **6.8** | **5.6** |
| Iron | ug/L | 498 | **56000** | <200 | <200 | <200 |
| Lead | ug/L | 9 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 5263 | **916** | **10** | **3330** | **3520** |
| Mercury | ng/L | 8.4 | **15** | **12** | **6.2** | **6.9** |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | **22** | **38** | **45** |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | **13** | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 118 | **93** | **140** | **91** | **72** |
| Alkalinity, Carbonate | mg/L | 8 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 23 | **497** | **213** | **93** | **78** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.40 | **0.03** | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 1.9 | <0.10 | **2.3** | **1.5** | **0.98** |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 86 | **315** | **210** | **274** | **295** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 43 | **195** | **38** | **48** | **53** |
| Magnesium | mg/L | 19 | **22** | **10** | **15** | **18** |
| Potassium | mg/L | 9.0 | **6.0** | **6.8** | **5.9** | **7.3** |
| Sodium | mg/L | 12 | **125** | **243** | **155** | **139** |
| General | | | | | | |
| Hardness | mg/L | 199 | **579** | **137** | **181** | **204** |
| | | | | | | |
| Silica | mg/L | - | **32** | **13** | **17** | **19** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-701 UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[D] | Q3 2021[D] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.60** | **0.70** | **0.92** | **0.08** |
| ORP | mV | - | -217 | -123 | -126 | -171 |
| pH | SU | 6.71-7.71 | **7.0** | **6.6** | **6.7** | **7.2** |
| Specific Conductance | uS/cm | - | **2000** | **1382** | **993** | **859** |
| Temperature | C | - | **7.7** | **8.1** | **8.7** | **8.9** |
| Turbidity | NTU | - | **74** | **32** | **38** | **17** |
| Water Elevation | ft MSL | - | **1532** | **1532** | **1532** | **1532** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 157 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 45.4 | <4.0 | **6.7** | <4.0 | <4.0 |
| Iron | ug/L | 24958 | **77900** | **38800** | **33400** | **38100** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 12.9 | - | - | <10.0 | - |
| Manganese | ug/L | 4677 | **9050** | **6260** | **4770** | **4280** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 13.8 | <10.0 | **15** | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 162 | **160** | **118** | **112** | **124** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 49 | **270** | **94** | <50.0 | **53** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 1.75 | **0.10** | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 52 | **714** | **379** | **239** | **199** |
| Sulfide | mg/L | 1.86 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 39 | **212** | **101** | **75** | **69** |
| Magnesium | mg/L | 16 | **70** | **36** | **25** | **23** |
| Potassium | mg/L | 8.5 | **9.5** | **7.0** | **6.2** | **6.7** |
| Sodium | mg/L | 33 | **176** | **83** | **59** | **60** |
| General | | | | | | |
| Hardness | mg/L | 163 | **818** | **400** | **292** | **267** |
| | | | | | | |
| Silica | mg/L | - | **13** | **16** | **12** | **15** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-702 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[T] | Q3 2021[D] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.93** | **1.3** | **6.0** | **1.0** |
| ORP | mV | - | **3.6** | **218** | -46 | **200** |
| pH | SU | 8.81-9.91 | **7.0** | **8.9** | **11.1** | **7.7** |
| Specific Conductance | uS/cm | - | **457** | **428** | **967** | **354** |
| Temperature | C | - | **6.6** | **7.0** | **9.8** | **-** |
| Turbidity | NTU | - | **3.0** | **3.0** | **4.1** | **10** |
| Water Elevation | ft MSL | - | **1531** | **1530** | **1530** | **1531** |
| Metals | | | | | | |
| Aluminum | ug/L | 123 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 196 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 800 | <200 | <200 | <200 | <200 |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 546 | <50.0 | <50.0 | <50.0 | <50.0 |
| Mercury | ng/L | 3.6 | **3.0** | **3.2** | <1.0 | **3.7** |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 160 | **128** | **121** | <2.0 | 126 |
| Alkalinity, Carbonate | mg/L | 41 | <2.0 | **7.2** | **64** | <2.0 |
| Chloride | mg/L | 17.6 | <10.0 | <10.0 | **17** | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.04 | < 0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 1.2 | **0.50** | **0.69** | **2.0** | **0.22** |
| Nitrogen, Nitrite | mg/L | 0.18 | <0.10 | <0.10 | **0.74** | <0.10 |
| Sulfate | mg/L | 133 | **68** | **56** | **48** | **52** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 79 | **31** | **30** | **51** | **29** |
| Magnesium | mg/L | 14.1 | **8.2** | **6.2** | **2.4** | **7.5** |
| Potassium | mg/L | 22 | **6.0** | **7.2** | **17** | **5.8** |
| Sodium | mg/L | 60 | **43** | **43** | **43** | **37** |
| General | | | | | | |
| Hardness | mg/L | 251 | **111** | **99** | **136** | **103** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-702 UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[T] | Q3 2021[D] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.97** | **2.4** | **1.5** | **0.42** |
| ORP | mV | - | -216 | -178 | -167 | -205 |
| pH | SU | 7.11-8.11 | **7.8** | **7.9** | **7.8** | **7.9** |
| Specific Conductance | uS/cm | - | **281** | **268** | **263** | **257** |
| Temperature | C | - | **7.2** | **7.6** | **11** | **7.4** |
| Turbidity | NTU | - | **4.1** | **2.8** | **5.0** | **1.7** |
| Water Elevation | ft MSL | - | **-** | **-** | **1500** | **1514** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 1328 | **498** | **729** | **570** | **653** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 12.91 | - | - | <10.0 | - |
| Manganese | ug/L | 118 | **91** | **85** | **87** | **83** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 76 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 112 | **93** | **90** | **91** | **93** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.09 | < 0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 36 | **35** | **32** | **32** | **33** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 39 | **32** | **33** | **33** | **30** |
| Magnesium | mg/L | 11.7 | **9.4** | **9.8** | **9.4** | **8.8** |
| Potassium | mg/L | 11.2 | **3.1** | **3.0** | **3.1** | **3.1** |
| Sodium | mg/L | 5.2 | **3.3** | **3.1** | **3.2** | **3.1** |
| General | | | | | | |
| Hardness | mg/L | 140 | **119** | **122** | **121** | **111** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-703 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[T] | Q3 2021[T] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **4.7** | **4.4** | **4.9** | **5.3** |
| ORP | mV | - | **231** | **348** | **124** | **290** |
| pH | SU | 6.3-7.3 | **5.7** | **5.6** | **5.8** | **5.7** |
| Specific Conductance | uS/cm | - | **192** | **189** | **184** | **170** |
| Temperature | C | - | **5.4** | **6.4** | **6.9** | **6.5** |
| Turbidity | NTU | - | **1.9** | **1.6** | **2.0** | **1.5** |
| Water Elevation | ft MSL | - | **1533** | **1530** | **1533** | **1532** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 287 | <200 | <200 | <200 | <200 |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 107 | <50.0 | <50.0 | <50.0 | <50.0 |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 92 | **47** | **53** | **52** | **53** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.08 | < 0.03 | <0.05 | < 0.03 | < 0.03 |
| Nitrogen, Nitrate | mg/L | 1.8 | **2.3** | **2.2** | **2.3** | **2.1** |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <100 |
| Sulfate | mg/L | 41 | **24** | **23** | **23** | **21** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 31 | **19** | **20** | **18** | **18** |
| Magnesium | mg/L | 9.8 | **7.8** | **8.2** | **7.6** | **8.0** |
| Potassium | mg/L | 2.6 | **1.6** | **1.6** | **1.5** | **1.7** |
| Sodium | mg/L | 7.7 | **1.8** | **1.8** | **1.9** | **1.9** |
| General | | | | | | |
| Hardness | mg/L | 116 | **78** | **83** | **78** | **78** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-703 UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[T] | Q3 2021[T] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **1.2** | **2.4** | **0.80** | **0.80** |
| ORP | mV | - | -198 | -208 | -230 | -256 |
| pH | SU | 7.44-8.44 | **7.7** | **7.9** | **7.8** | **8.1** |
| Specific Conductance | uS/cm | - | **299** | **283** | **286** | **275** |
| Temperature | C | - | **4.0** | **6.9** | **8.1** | **7.2** |
| Turbidity | NTU | - | **2.9** | **1.6** | **2.8** | **1.6** |
| Water Elevation | ft MSL | - | **1530** | **1531** | **1532** | **1531** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 1903 | **1970** | **1500** | **1300** | **1290** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 200 | **203** | **195** | **190** | **194** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 111 | **87** | **77** | **80** | **78** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.75 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 49 | **45** | **44** | **41** | **45** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 43 | **33** | **34** | **32** | **32** |
| Magnesium | mg/L | 14 | **11** | **11** | **10** | **10** |
| Potassium | mg/L | 4.2 | **2.3** | **2.4** | **2.2** | **2.2** |
| Sodium | mg/L | 17.3 | **2.9** | **2.9** | **3.0** | **2.9** |
| General | | | | | | |
| Hardness | mg/L | 173 | **125** | **128** | **120** | **120** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-703 LLA (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[T] | Q3 2021[T] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **1.6** | **1.7** | **0.73** | **0.81** |
| ORP | mV | - | -221 | -254 | -244 | -254 |
| pH | SU | 8.08-9.08 | **8.1** | **8.4** | **8.2** | **8.4** |
| Specific Conductance | uS/cm | - | **279** | **260** | **263** | **252** |
| Temperature | C | - | **6.1** | **6.9** | **7.8** | **7.0** |
| Turbidity | NTU | - | **5.9** | **2.9** | **2.9** | **4.4** |
| Water Elevation | ft MSL | - | **1533** | **1533** | **1533** | **1534** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 2082 | **391** | **469** | **600** | **429** |
| Lead | ug/L | 9 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 28 | - | - | <10.0 | - |
| Manganese | ug/L | 95 | **61** | <50.0 | **54** | **60** |
| Mercury | ng/L | 4 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.8 | - | - | <0.20 | - |
| Thallium | ug/L | 2 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 92 | **76** | **68** | **72** | **71** |
| Alkalinity, Carbonate | mg/L | 10.4 | <2.0 | **6.4** | <2.0 | <2.0 |
| Chloride | mg/L | 97 | **13** | **16** | **12** | **11** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.08 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 43 | **30** | **23** | **30** | **32** |
| Sulfide | mg/L | 0.8 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 34 | **24** | **19** | **22** | **25** |
| Magnesium | mg/L | 12.3 | **9.6** | **8.5** | **8.8** | **9.7** |
| Potassium | mg/L | 7.7 | **4.4** | **5.2** | **4.1** | **3.7** |
| Sodium | mg/L | 51.1 | **8.8** | **13** | **9.1** | **8.1** |
| General | | | | | | |
| Hardness | mg/L | 135 | **100** | **83** | **92** | **101** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-703 DBA (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[T] | Q3 2021[T] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.67** | **1.6** | **0.73** | **0.83** |
| ORP | mV | - | -311 | -319 | -279 | -289 |
| pH | SU | 8.89-9.89 | **10.8** | **9.2** | **9.1** | **9.1** |
| Specific Conductance | uS/cm | - | **435** | **299** | **300** | **287** |
| Temperature | C | - | **6.3** | **6.8** | **7.8** | **6.8** |
| Turbidity | NTU | - | **1.8** | **1.3** | **1.9** | **1.7** |
| Water Elevation | ft MSL | - | **1531** | **1530** | **1530** | **1531** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 861 | <200 | <200 | <200 | <200 |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 20 | - | - | **15** | **-** |
| Manganese | ug/L | 200 | <50.0 | <50.0 | <50.0 | <50.0 |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | - | - | - | <4.0 | - |
| Zinc | ug/L | 26.2 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 88 | <2.0 | **63** | **70** | **59** |
| Alkalinity, Carbonate | mg/L | 39 | **83** | **12** | **5.0** | **18** |
| Chloride | mg/L | 20 | **15** | **15** | **15** | **16** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.12 | **0.12** | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.86 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 73 | **21** | **35** | **35** | **35** |
| Sulfide | mg/L | 1.27 | **0.34** | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 27 | **2.0** | **24** | **24** | **25** |
| Magnesium | mg/L | 17.3 | <1.0 | **9.1** | **8.7** | **9.2** |
| Potassium | mg/L | 30 | **57** | **14** | **15** | **13** |
| Sodium | mg/L | 16 | **23** | **9.7** | **10** | **9.2** |
| General | | | | | | |
| Hardness | mg/L | 140 | **6.0** | **98** | **95** | **100** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-704 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[D] | Q3 2021[T] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | | **0.89** | **0.77** | **0.74** | **0.04** |
| ORP | mV | | **71** | **76** | **144** | **141** |
| pH | SU | 5.43-6.43 | **5.6** | **5.4** | **5.6** | **5.9** |
| Specific Conductance | uS/cm | | **732** | **708** | **479** | **287** |
| Temperature | C | | **6.2** | **9.2** | **11** | **11** |
| Turbidity | NTU | | **2.3** | **10.0** | **2.1** | **13** |
| Water Elevation | ft MSL | | **1534** | **1534** | **1534** | **1534** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 84519 | **3420** | **9280** | <200 | <200 |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 8783 | **1660** | **2770** | **768** | **556** |
| Mercury | ng/L | 34.7 | **4.1** | **2.8** | **1.8** | **1.6** |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 37.8 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 264 | **138** | **118** | **76** | **58** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 24 | **119** | **123** | **74** | **42** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.19 | **0.10** | **0.51** | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 1.47 | **0.11** | **0.14** | **0.66** | **0.16** |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 45 | **29** | **24** | **24** | **20** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| | | | | | | |
| Calcium | mg/L | 47 | **59** | **54** | **35** | **24** |
| Magnesium | mg/L | 15 | **22** | **18** | **12** | **8.6** |
| Potassium | mg/L | 6.1 | **4.5** | **4.3** | **2.8** | **2.5** |
| Sodium | mg/L | 32 | **38** | **33** | **24** | **18** |
| General | | | | | | |
| Hardness | mg/L | 191 | **235** | **210** | **139** | **96** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-704 UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[T] | Q3 2021[T] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | | **0.74** | **0.76** | **0.72** | **0.04** |
| ORP | mV | | -157 | -122 | -97 | -126 |
| pH | SU | 6.4-7.4 | **6.6** | **6.3** | **6.4** | **6.8** |
| Specific Conductance | uS/cm | | **1521** | **1550** | **1105** | **718** |
| Temperature | C | | **7.4** | **7.9** | **9.6** | **9.3** |
| Turbidity | NTU | | **5.9** | **2.3** | **2.3** | **8.5** |
| Water Elevation | ft MSL | | **1534** | **-** | **1534** | **1534** |
| Metals | | | | | | |
| Aluminum | ug/L | 5824 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 44052 | **79800** | **76200** | **60400** | **43900** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 30 | - | - | <10.0 | - |
| Manganese | ug/L | 1384 | **2170** | **2020** | **1370** | **1000** |
| Mercury | ng/L | 1.4 | <1.0 | **1.4** | **1.4** | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 198 | **150** | **171** | **141** | **134** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 24 | **305** | **312** | **173** | **121** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.78 | <0.03 | <0.03 | **0.05** | **0.03** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.18 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 45 | **3.7** | **7.1** | **11** | **12** |
| Sulfide | mg/L | 0.49 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 67 | **109** | **104** | **70** | **50** |
| Magnesium | mg/L | 14 | **37** | **35** | **24** | **17** |
| Potassium | mg/L | 5.3 | **5.5** | **4.9** | **3.6** | **3.3** |
| Sodium | mg/L | 43 | **68** | **70** | **48** | **41** |
| General | | | | | | |
| Hardness | mg/L | 226 | **425** | **405** | **271** | **195** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-704 LLA (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[D] | Q3 2021[D] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.63** | **1.7** | **1.4** | **0.72** |
| ORP | mV | - | -255 | -245 | -220 | -249 |
| pH | SU | 8.2-9.2 | **7.8** | **8.0** | **7.9** | **7.9** |
| Specific Conductance | uS/cm | - | **466** | **440** | **510** | **538** |
| Temperature | C | - | **7.6** | **9.3** | **12** | **9.6** |
| Turbidity | NTU | - | **8.0** | **7.8** | **6.7** | **8.4** |
| Water Elevation | ft MSL | - | **1532** | **1532** | **1531** | **1531** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 3309 | **1900** | **1710** | **2280** | **2830** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 28 | - | - | **20.4** | **-** |
| Manganese | ug/L | 95 | **166** | **148** | **198** | **250** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 153 | **170** | **188** | **189** | **197** |
| Alkalinity, Carbonate | mg/L | 13 | **13** | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 40 | **22** | **26** | **34** | **51** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.1 | < 0.03 | < 0.03 | **0.03** | **0.03** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 21 | **13** | **10** | **12** | **12** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 33 | **51** | **50** | **55** | **63** |
| Magnesium | mg/L | 16 | **21** | **21** | **21** | **24** |
| Potassium | mg/L | 12 | **7.4** | **6.7** | **6.7** | **6.9** |
| Sodium | mg/L | 15.5 | **5.4** | **5.2** | **5.6** | **7.4** |
| General | | | | | | |
| Hardness | mg/L | 157 | **213** | **211** | **224** | **257** |

**Humbolt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-704 DBA (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[T] | Q3 2021[D] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.60** | **1.7** | **0.68** | **0.68** |
| ORP | mV | - | -225 | -261 | -258 | -278 |
| pH | SU | 8.13-9.13 | **7.9** | **8.2** | **8.1** | **8.3** |
| Specific Conductance | uS/cm | - | **217** | **254** | **261** | **245** |
| Temperature | C | - | **7.8** | **8.9** | **9.7** | **9.3** |
| Turbidity | NTU | - | **2.7** | **2.3** | **3.5** | **1.8** |
| Water Elevation | ft MSL | - | **1530** | **1540** | **1530** | **1529** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 8.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 20.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 4.0 | - | - | <1.0 | - |
| Boron | ug/L | 1480 | - | - | <300 | - |
| Cadmium | ug/L | 4.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 9645 | **535** | **713** | **863** | **737** |
| Lead | ug/L | 12.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | 14.5 | - |
| Manganese | ug/L | 58 | **67** | **60** | **56** | **54** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 8.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 11 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 129 | **144** | **126** | **126** | **127** |
| Alkalinity, Carbonate | mg/L | 32.0 | **5.0** | **7.6** | **2.2** | <2.0 |
| Chloride | mg/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.04 | <0.03 | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 6 | <1.0 | <1.0 | <1.0 | <1.0 |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 27 | **29** | **24** | **24** | **25** |
| Magnesium | mg/L | 14 | **14** | **12** | **11** | **12** |
| Potassium | mg/L | 4 | **3.0** | **2.9** | **2.9** | **3.0** |
| Sodium | mg/L | 14 | **12** | **11** | **11** | **11** |
| General | | | | | | |
| Hardness | mg/L | 111 | **127** | **109** | **107** | **110** |

* - Diver failed 9/6/17, replaced 3/15/18

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-705 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[T] | Q3 2021[T] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.75** | **0.81** | **0.79** | **0.06** |
| ORP | mV | - | -38 | -30 | -22 | -54 |
| pH | SU | 5.67-6.67 | **6.2** | **6.1** | **6.1** | **6.3** |
| Specific Conductance | uS/cm | - | **285** | **353** | **383** | **372** |
| Temperature | C | - | **5.5** | **8.1** | **12** | **11** |
| Turbidity | NTU | - | **1.9** | **1.8** | **1.9** | **2.0** |
| Water Elevation | ft MSL | - | **1536** | **1536** | **1534** | **1533** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 12957 | **7980** | **8580** | **9690** | **11800** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 1535 | **793** | **970** | **884** | **1010** |
| Mercury | ng/L | 1.8 | <1.0 | <1.0 | **1.1** | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 283 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 85 | **62** | **58** | **52** | **65** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 52 | **35** | **60** | **69** | **69** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.13 | **0.14** | **0.15** | **0.17** | **0.18** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 21.2 | **4.4** | **2.8** | **2.4** | **1.5** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 24 | **13** | **17** | **17** | **19** |
| Magnesium | mg/L | 10.9 | **5.5** | **7.1** | **7.2** | **8.1** |
| Potassium | mg/L | 3.0 | **2.2** | **2.5** | **2.8** | **3.2** |
| Sodium | mg/L | 17 | **23** | **28** | **31** | **36** |
| General | | | | | | |
| Hardness | mg/L | 110 | **55** | **71** | **73** | **81** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-705 UFB (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[D] | Q3 2021[T] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.64** | **1.6** | **1.5** | **0.83** |
| ORP | mV | - | -109 | -143 | -78 | -116 |
| pH | SU | 6.59-7.59 | **6.6** | **6.9** | **6.7** | **6.8** |
| Specific Conductance | uS/cm | - | **377** | **377** | **436** | **413** |
| Temperature | C | - | **7.6** | **8.7** | **11** | **10** |
| Turbidity | NTU | - | **25** | **5.4** | **1.5** | **1.5** |
| Water Elevation | ft MSL | - | **1537** | **1538** | **1536** | **1536** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 13309 | **8510** | **11500** | **13000** | **11400** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 13.19 | - | - | **12** | **-** |
| Manganese | ug/L | 973 | **1210** | **1120** | **1270** | **1240** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 34 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 118 | **76** | **81** | **75** | **79** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 36 | **53** | **59** | **65** | **66** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.1 | <0.03 | <0.03 | **0.04** | **0.03** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 14.2 | **4.7** | **3.2** | **3.9** | **4.3** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 26 | **31** | **33** | **35** | **33** |
| Magnesium | mg/L | 13 | **15** | **16** | **16** | **16** |
| Potassium | mg/L | 4.0 | **3.8** | **3.5** | **3.8** | **4.1** |
| Sodium | mg/L | 3.4 | **3.8** | **3.6** | **4.3** | **4.5** |
| General | | | | | | |
| Hardness | mg/L | 127 | **140** | **146** | **155** | **149** |

*Explanations of abbreviations are included on the final page of this table.*

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-706 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[T] | Q3 2021[T] | Q4 2021[D] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.88** | **0.84** | **0.81** | **1.7** |
| ORP | mV | - | **37** | **82** | **92** | **53** |
| pH | SU | 5.74-6.74 | **5.7** | **5.5** | **5.8** | **5.9** |
| Specific Conductance | uS/cm | - | **899** | **908** | **987** | **881** |
| Temperature | C | - | **7.6** | **12** | **11** | **9.3** |
| Turbidity | NTU | - | **2.0** | **1.4** | **2.6** | **3.2** |
| Water Elevation | ft MSL | - | **1560** | **1561** | **1559** | **1558** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 31 | - | - | **21** | **-** |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 8029 | **2260** | **2110** | **2430** | **1600** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 17.2 | - | - | <10.0 | - |
| Manganese | ug/L | 23484 | **10900** | **11200** | **11000** | **9370** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 27.0 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 4.8 | - | - | <4.0 | - |
| Zinc | ug/L | 77.1 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 131.8 | **81** | **79** | **76** | **83** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 165 | **139** | **151** | **153** | **146** |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.88 | **0.41** | **0.36** | **0.34** | **0.34** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 434 | **126** | **125** | **125** | **126** |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 133 | **62** | **62** | **65** | **62** |
| Magnesium | mg/L | 44 | **26** | **25** | **26** | **25** |
| Potassium | mg/L | 5.6 | **4.9** | **4.6** | **4.7** | **4.6** |
| Sodium | mg/L | 140 | **49** | **48** | **49** | **51** |
| General | | | | | | |
| Hardness | mg/L | 619 | **261** | **259** | **267** | **257** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-707 QAL (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[T] | Q2 2021[T] | Q3 2021[T] | Q4 2021[T] |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **0.93** | **0.83** | **0.82** | **1.0** |
| ORP | mV | - | -119 | -112 | -99 | -115 |
| pH | SU | 6.43-7.43 | **7.0** | **6.7** | **7.0** | **7.0** |
| Specific Conductance | uS/cm | - | **329** | **331** | **349** | **318** |
| Temperature | C | - | **7.0** | **9.9** | **11** | **9.6** |
| Turbidity | NTU | - | **2.6** | **1.9** | **2.0** | **1.4** |
| Water Elevation | ft MSL | - | **1581** | **1582** | **1581** | **1580** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | - |
| Antimony | ug/L | 4.0 | - | - | <2.0 | - |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | <5.0 |
| Barium | ug/L | 400 | - | - | <100 | - |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | - |
| Boron | ug/L | 1200 | - | - | <300 | - |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | - |
| Chromium | ug/L | 40 | - | - | <10.0 | - |
| Cobalt | ug/L | 80 | - | - | <20.0 | - |
| Copper | ug/L | 16 | <4.0 | <4.0 | <4.0 | <4.0 |
| Iron | ug/L | 7115 | **4270** | **4050** | **4140** | **3980** |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Lithium | ug/L | 40 | - | - | <10.0 | - |
| Manganese | ug/L | 1128 | **911** | **953** | **928** | **921** |
| Mercury | ng/L | 4.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Molybdenum | ug/L | 200 | - | - | <50.0 | - |
| Nickel | ug/L | 80 | <20.0 | <20.0 | <20.0 | <20.0 |
| Selenium | ug/L | 20 | - | - | <5.0 | - |
| Silver | ug/L | 0.80 | - | - | <0.20 | - |
| Thallium | ug/L | 2.0 | - | - | <2.0 | - |
| Vanadium | ug/L | 16 | - | - | <4.0 | - |
| Zinc | ug/L | 29.3 | <10.0 | <10.0 | <10.0 | <10.0 |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 168.3 | **145** | **153** | **153** | **151** |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 40 | <10.0 | <10.0 | <10.0 | <10.0 |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | <1.0 |
| Nitrogen, Ammonia | mg/L | 0.32 | **0.26** | **0.26** | **0.27** | **0.26** |
| Nitrogen, Nitrate | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 9.4 | **3.8** | <1.0 | <1.0 | <1.0 |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 46 | **42** | **41** | **42** | **42** |
| Magnesium | mg/L | 13 | **11** | **11** | **11** | **11** |
| Potassium | mg/L | 2.9 | **2.5** | **2.2** | **2.4** | **2.4** |
| Sodium | mg/L | 3.6 | **2.8** | **2.7** | **2.7** | **2.7** |
| General | | | | | | |
| Hardness | mg/L | 162 | **150** | **148** | **150** | **151** |

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring Data**
**MW-9R (Monitoring)**

| Parameter | Unit | Recommended Benchmark 2018 | Q1 2021[D] | Q2 2021[D] | Q3 2021[D] | Q4 2021* |
|---|---|---|---|---|---|---|
| Field | | | | | | |
| D.O. | ppm | - | **7.5** | **1.7** | **0.83** | NM |
| ORP | mV | - | **224** | **144** | **134** | NM |
| pH | SU | 5.4-6.4 | **6.0** | **5.8** | **5.9** | NM |
| Specific Conductance | uS/cm | - | **395** | **187** | **364** | NM |
| Temperature | C | - | **7.1** | **12** | **15** | NM |
| Turbidity | NTU | - | **4.4** | **111** | **11** | NM |
| Water Elevation | ft MSL | - | **1597** | **1596** | **1595** | **1591** |
| Metals | | | | | | |
| Aluminum | ug/L | 200 | - | - | <50.0 | NM |
| Antimony | ug/L | 4.0 | - | - | <2.0 | NM |
| Arsenic | ug/L | 7.5 | <5.0 | <5.0 | <5.0 | NM |
| Barium | ug/L | 400 | - | - | <100 | NM |
| Beryllium | ug/L | 2.5 | - | - | <1.0 | NM |
| Boron | ug/L | 1200 | - | - | <300 | NM |
| Cadmium | ug/L | 3.0 | - | - | <1.0 | NM |
| Chromium | ug/L | 40 | - | - | <10.0 | NM |
| Cobalt | ug/L | 80 | - | - | <20.0 | NM |
| Copper | ug/L | 39 | <4.0 | <4.0 | <4.0 | NM |
| Iron | ug/L | 4099 | <200 | <200 | <200 | NM |
| Lead | ug/L | 9.0 | <3.0 | <3.0 | <3.0 | NM |
| Lithium | ug/L | 40 | - | - | <10.0 | NM |
| Manganese | ug/L | 1376 | <50.0 | <50.0 | <50.0 | NM |
| Mercury | ng/L | 10.1 | <1.0 | <1.0 | <1.0 | NM |
| Molybdenum | ug/L | 200 | - | - | <50.0 | NM |
| Nickel | ug/L | 186 | **138** | **172** | **246** | NM |
| Selenium | ug/L | 20 | - | - | <5.0 | NM |
| Silver | ug/L | 0.80 | - | - | <0.20 | NM |
| Thallium | ug/L | 2.0 | - | - | <2.0 | NM |
| Vanadium | ug/L | - | - | - | <4.0 | NM |
| Zinc | ug/L | 38 | **36** | **36** | **49** | NM |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 85 | **48** | **29** | **58** | NM |
| Alkalinity, Carbonate | mg/L | 8.0 | <2.0 | <2.0 | <2.0 | NM |
| Chloride | mg/L | 185 | **46** | **17** | **11** | NM |
| Fluoride | mg/L | 2.5 | <1.0 | <1.0 | <1.0 | NM |
| Nitrogen, Ammonia | mg/L | 0.22 | <0.03 | **0.05** | <0.03 | NM |
| Nitrogen, Nitrate | mg/L | 3.8 | **0.13** | **0.26** | **0.51** | NM |
| Nitrogen, Nitrite | mg/L | 0.4 | <0.10 | <0.10 | <100 | NM |
| Sulfate | mg/L | 335 | **50** | **27** | **75** | NM |
| Sulfide | mg/L | 0.80 | <0.20 | <0.20 | <0.20 | NM |
| Major Cations | | | | | | |
| Calcium | mg/L | 116 | **26** | **17** | **36** | NM |
| Magnesium | mg/L | 41 | **7.3** | **5.3** | **11** | NM |
| Potassium | mg/L | 5.2 | **2.7** | **1.5** | **2.6** | NM |
| Sodium | mg/L | 48 | **34** | **5.9** | **7.3** | NM |
| General | | | | | | |
| Hardness | mg/L | 479 | **96** | **65** | **135** | NM |

*- Inadequate groundwater volume available for monitoring or sampling

**Humboldt Mill 2021**
**Mine Permit Groundwater Quality Monitoring**
**Data Abbreviations and Data Qualifiers**

| Notes: |
|---|
| Benchmarks are calculated based on guidance from Eagles Mine's Development of Site Specific Benchmarks for Mine Permit Water Quality Monitoring. |
| Results in **bold** text indicate that the parameter was detected at a level greater than the laboratory reporting limit. |
| Highlighted Cell = Value is equal to or above site-specific benchmark.  An exceedance occurs if there are 2 consecutive sampling events with a value equal to or greater than the benchmark at a compliance monitoring location. |
| (p) = Due to less than two detections in baseline dataset, benchmark defaulted to four times the reporting limit. |
| --Denotes no benchmark required or parameter was not required to be collected during the sampling quarter. |
| e = estimated  value.  The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded. |
| NM = Not measured. |
| $^{T}$ = Samples not filtered and all values are total concentrations. |
| $^{D}$ = Sample for metal and major cation parameters was filtered and values are dissolved concentrations. |

# Appendix G

# Humboldt Mill

# Groundwater Trend Analysis Summary

## 2021 Groundwater Trend Analysis
## Humboldt Mill

| Location | Parameter | Number of Samples | Number of Detects | Percent Detected | Minimum | Maximum | Mean | Median | Standard Deviation | Coefficient of Variation | M-K Test Value (S) | Approximate p-value | Trend at 95% Confidence | Theil-Sen Slope | Theil-Sen Slope, yearly |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HW-1L | Alkalinity, bicarbonate | 35 | 35 | 100% | 58 | 87 | 78.27 | 80.4 | 7.02 | 0.09 | 68 | 0.341 | no trend | 5.50E-09 | 0.17 |
| HW-1L | Calcium | 33 | 33 | 100% | 15 | 31.7 | 25.72 | 26 | 3.04 | 0.12 | 251 | 0.000 | POSITIVE | 2.37E-08 | 0.75 |
| HW-1L | Chloride | 37 | 36 | 97% | 1 | 77.4 | 43.20 | 45.6 | 17.16 | 0.40 | 149 | 0.053 | no trend | 4.95E-08 | 1.56 |
| HW-1L | Hardness | 42 | 42 | 100% | 103 | 139 | 114.81 | 113 | 8.22 | 0.07 | 336 | 0.000 | POSITIVE | 3.74E-08 | 1.18 |
| HW-1L | Iron | 37 | 36 | 97% | 0.071 | 1.19 | 0.66 | 0.67 | 0.31 | 0.47 | 249 | 0.001 | POSITIVE | 2.36E-09 | 0.07 |
| HW-1L | Magnesium | 33 | 33 | 100% | 3.5 | 11.8 | 10.58 | 11 | 1.41 | 0.13 | 200 | 0.002 | POSITIVE | 3.78E-09 | 0.12 |
| HW-1L | Manganese | 36 | 1 | 3% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| HW-1L | pH, Field | 43 | 43 | 100% | 8.12 | 8.97 | 8.45 | 8.42 | 0.20 | 0.02 | -415 | 0.000 | NEGATIVE | -1.67E-09 | -0.05 |
| HW-1L | Potassium | 32 | 31 | 97% | 0.5 | 2.3 | 1.87 | 1.9 | 0.30 | 0.16 | 136 | 0.024 | POSITIVE | 8.46E-10 | 0.03 |
| HW-1L | Sodium | 37 | 37 | 100% | 7 | 40.5 | 23.96 | 24.3 | 7.02 | 0.29 | 161 | 0.036 | POSITIVE | 2.06E-08 | 0.65 |
| HW-1L | Sulfate | 35 | 35 | 100% | 4.8 | 30.7 | 22.65 | 25 | 7.28 | 0.32 | 487 | 0.000 | POSITIVE | 5.83E-08 | 1.84 |
| HW-1U LLA | Alkalinity, bicarbonate | 35 | 35 | 100% | 48.5 | 170 | 95.73 | 96.7 | 23.09 | 0.24 | -34 | 0.638 | no trend | -2.00E-08 | -0.63 |
| HW-1U LLA | Calcium | 32 | 32 | 100% | 2.6 | 64 | 30.55 | 25.7 | 16.72 | 0.55 | 185 | 0.003 | POSITIVE | 1.03E-07 | 3.24 |
| HW-1U LLA | Chloride | 35 | 34 | 97% | 1 | 408 | 81.68 | 25 | 116.55 | 1.43 | 238 | 0.001 | POSITIVE | 3.44E-07 | 10.84 |
| HW-1U LLA | Hardness | 48 | 48 | 100% | 9.8 | 197 | 99.70 | 101.5 | 45.90 | 0.46 | 100 | 0.378 | no trend | 1.31E-07 | 4.14 |
| HW-1U LLA | Iron | 35 | 23 | 66% | 0.013 | 45.2 | 3.81 | 0.293 | 10.86 | 2.85 | 320 | 0.000 | POSITIVE | 3.28E-09 | 0.10 |
| HW-1U LLA | Magnesium | 32 | 31 | 97% | 1 | 26.4 | 11.02 | 9.9 | 6.13 | 0.56 | 136 | 0.028 | POSITIVE | 2.49E-08 | 0.78 |
| HW-1U LLA | Manganese | 35 | 11 | 31% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| HW-1U LLA | pH, Field | 46 | 46 | 100% | 7.8 | 9.43 | 8.49 | 8.44 | 0.33 | 0.04 | -341 | 0.001 | NEGATIVE | -1.53E-09 | -0.05 |
| HW-1U LLA | Potassium | 31 | 30 | 97% | 0.5 | 6.7 | 3.90 | 3.6 | 1.82 | 0.47 | 110 | 0.064 | no trend | 8.97E-09 | 0.28 |
| HW-1U LLA | Sodium | 35 | 35 | 100% | 7 | 232 | 72.55 | 44 | 55.32 | 0.76 | 305 | 0.000 | POSITIVE | 4.12E-07 | 12.99 |
| HW-1U LLA | Sulfate | 35 | 35 | 100% | 4.8 | 434 | 81.48 | 56 | 94.92 | 1.16 | 208 | 0.003 | POSITIVE | 9.05E-08 | 2.86 |
| HW-1U UFB | Alkalinity, bicarbonate | 38 | 38 | 100% | 49.4 | 140 | 84.16 | 85.95 | 21.11 | 0.25 | -7 | 0.940 | no trend | -1.91E-09 | -0.06 |
| HW-1U UFB | Calcium | 36 | 36 | 100% | 9.1 | 89.8 | 26.22 | 19.25 | 19.32 | 0.74 | 231 | 0.002 | POSITIVE | 6.32E-08 | 1.99 |
| HW-1U UFB | Chloride | 39 | 23 | 59% | 0.72 | 1320 | 147.82 | 22 | 368.65 | 2.49 | 77 | 0.346 | no trend | 0 | 0.00 |
| HW-1U UFB | Hardness | 54 | 54 | 100% | 45 | 291 | 96.31 | 76 | 62.87 | 0.65 | 720 | 0.000 | POSITIVE | 2.50E-07 | 7.89 |
| HW-1U UFB | Iron | 38 | 21 | 55% | 0.071 | 2.11 | 0.40 | 0.2 | 0.41 | 1.00 | 477 | 0.000 | POSITIVE | 1.87E-09 | 0.06 |
| HW-1U UFB | Magnesium | 36 | 36 | 100% | 3.5 | 16.7 | 8.09 | 6.1 | 4.24 | 0.52 | 42 | 0.576 | no trend | 2.97E-09 | 0.09 |
| HW-1U UFB | Manganese | 39 | 14 | 36% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| HW-1U UFB | pH, Field | 48 | 48 | 100% | 8.3 | 9.3 | 8.72 | 8.7 | 0.24 | 0.03 | -481 | 0.000 | NEGATIVE | -2.17E-09 | -0.07 |
| HW-1U UFB | Potassium | 36 | 35 | 97% | 0.5 | 21 | 7.18 | 4.65 | 5.58 | 0.78 | -140 | 0.058 | no trend | -1.82E-08 | -0.57 |
| HW-1U UFB | Sodium | 39 | 39 | 100% | 4.8 | 717 | 81.25 | 19.8 | 174.85 | 2.15 | -74 | 0.377 | no trend | -1.53E-08 | -0.48 |
| HW-1U UFB | Sulfate | 39 | 35 | 90% | 0.86 | 73 | 16.39 | 5.6 | 19.37 | 1.18 | -210 | 0.011 | NEGATIVE | -4.83E-08 | -1.52 |
| HW-2 | Alkalinity, bicarbonate | 39 | 39 | 100% | 58 | 130 | 101.07 | 102 | 21.74 | 0.22 | -93 | 0.263 | no trend | -5.91E-08 | -1.86 |
| HW-2 | Calcium | 36 | 36 | 100% | 15 | 86.4 | 50.31 | 54.2 | 14.37 | 0.29 | -21 | 0.785 | no trend | -1.57E-08 | -0.50 |
| HW-2 | Chloride | 38 | 37 | 97% | 1 | 59.1 | 24.04 | 26.05 | 14.56 | 0.61 | 434 | 0.000 | POSITIVE | 1.31E-07 | 4.12 |
| HW-2 | Hardness | 60 | 60 | 100% | 108 | 374 | 224.07 | 238.5 | 60.07 | 0.27 | -376 | 0.017 | NEGATIVE | -3.77E-07 | -11.91 |
| HW-2 | Iron | 39 | 36 | 92% | 0.071 | 6.09 | 1.42 | 1.09 | 1.34 | 0.94 | 174 | 0.036 | POSITIVE | 3.71E-09 | 0.12 |
| HW-2 | Magnesium | 36 | 36 | 100% | 3.5 | 38.5 | 21.71 | 23 | 6.26 | 0.29 | -168 | 0.022 | NEGATIVE | -2.57E-08 | -0.81 |
| HW-2 | Manganese | 37 | 32 | 86% | 0.02 | 0.713 | 0.26 | 0.24 | 0.19 | 0.74 | 395 | 0.000 | POSITIVE | 1.47E-09 | 0.05 |
| HW-2 | pH, Field | 44 | 44 | 100% | 7.39 | 8.72 | 7.94 | 7.93 | 0.40 | 0.05 | -350 | 0.000 | NEGATIVE | -3.10E-09 | -0.10 |
| HW-2 | Potassium | 36 | 35 | 97% | 0.5 | 12 | 5.04 | 4.7 | 2.09 | 0.41 | 88 | 0.236 | no trend | 4.42E-09 | 0.14 |
| HW-2 | Sodium | 39 | 39 | 100% | 7 | 79 | 28.60 | 23.8 | 18.01 | 0.63 | 513 | 0.000 | POSITIVE | 1.64E-07 | 5.16 |
| HW-2 | Sulfate | 39 | 39 | 100% | 4.8 | 298 | 131.42 | 130 | 68.20 | 0.52 | 277 | 0.001 | POSITIVE | 3.76E-07 | 11.86 |
| HW-8U | Alkalinity, bicarbonate | 39 | 39 | 100% | 58 | 220 | 141.08 | 141 | 35.25 | 0.25 | -38 | 0.654 | no trend | -1.48E-08 | -0.47 |

## 2021 Groundwater Trend Analysis
## Humboldt Mill

| Location | Parameter | Number of Samples | Number of Detects | Percent Detected | Minimum | Maximum | Mean | Median | Standard Deviation | Coefficient of Variation | M-K Test Value (S) | Approximate p-value | Trend at 95% Confidence | Theil-Sen Slope | Theil-Sen Slope, yearly |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HW-8U | Calcium | 36 | 36 | 100% | 15 | 49 | 37.34 | 37.8 | 6.57 | 0.18 | 183 | 0.013 | POSITIVE | 3.19E-08 | 1.01 |
| HW-8U | Chloride | 39 | 26 | 67% | 1 | 41.6 | 12.91 | 11.4 | 7.08 | 0.55 | 430 | 0.000 | POSITIVE | 4.56E-08 | 1.44 |
| HW-8U | Hardness | 20 | 20 | 100% | 129 | 173 | 151.80 | 150 | 14.65 | 0.10 | 40 | 0.200 | no trend | 7.46E-08 | 2.35 |
| HW-8U | Iron | 39 | 39 | 100% | 0.071 | 23 | 10.82 | 10.2 | 5.31 | 0.49 | 40 | 0.637 | no trend | 5.74E-09 | 0.18 |
| HW-8U | Magnesium | 36 | 36 | 100% | 3.5 | 19 | 12.90 | 12.65 | 2.48 | 0.19 | -66 | 0.374 | no trend | -2.32E-09 | -0.07 |
| HW-8U | Manganese | 39 | 35 | 90% | 0.02 | 6.22 | 4.16 | 4.4 | 1.66 | 0.40 | 118 | 0.157 | no trend | 3.81E-09 | 0.12 |
| HW-8U | pH, Field | 47 | 47 | 100% | 6.6 | 8.7 | 7.03 | 6.89 | 0.48 | 0.07 | -56 | 0.614 | no trend | -1.96E-10 | -0.01 |
| HW-8U | Potassium | 36 | 35 | 97% | 0.5 | 4.4 | 3.25 | 3.2 | 0.72 | 0.22 | 344 | 0.000 | POSITIVE | 6.04E-09 | 0.19 |
| HW-8U | Sodium | 39 | 39 | 100% | 2.7 | 9.2 | 4.42 | 3.9 | 1.50 | 0.34 | 160 | 0.054 | no trend | 4.29E-09 | 0.14 |
| HW-8U | Sulfate | 39 | 35 | 90% | 1 | 15.7 | 7.70 | 7.7 | 4.11 | 0.53 | 321 | 0.000 | POSITIVE | 3.22E-08 | 1.01 |
| HYG-1 | Alkalinity, bicarbonate | 39 | 39 | 100% | 58 | 370 | 203.90 | 220 | 73.93 | 0.36 | 238 | 0.004 | POSITIVE | 4.47E-07 | 14.10 |
| HYG-1 | Calcium | 36 | 36 | 100% | 15 | 66.4 | 49.06 | 49.4 | 9.54 | 0.19 | 184 | 0.013 | POSITIVE | 4.37E-08 | 1.38 |
| HYG-1 | Chloride | 39 | 29 | 74% | 1 | 24 | 12.05 | 12 | 4.96 | 0.41 | -19 | 0.826 | no trend | 0 | 0.00 |
| HYG-1 | Hardness | 4 | 4 | 100% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| HYG-1 | Iron | 39 | 9 | 23% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| HYG-1 | Magnesium | 36 | 36 | 100% | 3.5 | 32.9 | 23.84 | 23.9 | 5.18 | 0.22 | -15 | 0.849 | no trend | -1.62E-09 | -0.05 |
| HYG-1 | Manganese | 38 | 33 | 87% | 0.02 | 5.85 | 1.06 | 0.525 | 1.47 | 1.39 | 612 | 0.000 | POSITIVE | 6.23E-09 | 0.20 |
| HYG-1 | pH, Field | 48 | 48 | 100% | 6.08 | 8.7 | 6.81 | 6.72 | 0.56 | 0.08 | -658 | 0.000 | NEGATIVE | -3.08E-09 | -0.10 |
| HYG-1 | Potassium | 36 | 35 | 97% | 0.5 | 13 | 9.24 | 9.6 | 2.12 | 0.23 | 193 | 0.009 | POSITIVE | 9.99E-09 | 0.32 |
| HYG-1 | Sodium | 39 | 39 | 100% | 7 | 78 | 32.57 | 30.3 | 17.92 | 0.55 | 148 | 0.075 | no trend | 6.25E-08 | 1.97 |
| HYG-1 | Sulfate | 39 | 39 | 100% | 4.8 | 133 | 71.61 | 78.3 | 34.98 | 0.49 | 8 | 0.933 | no trend | 4.08E-09 | 0.13 |
| KMW-5R | Alkalinity, bicarbonate | 38 | 38 | 100% | 58 | 400 | 334.97 | 365 | 96.98 | 0.29 | 251 | 0.002 | POSITIVE | 1.49E-07 | 4.72 |
| KMW-5R | Calcium | 35 | 35 | 100% | 15 | 160 | 118.87 | 115 | 26.12 | 0.22 | -382 | 0.000 | NEGATIVE | -1.79E-07 | -5.64 |
| KMW-5R | Chloride | 38 | 18 | 47% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| KMW-5R | Hardness | 52 | 52 | 100% | 402 | 634 | 506.81 | 487 | 74.50 | 0.15 | -1024 | 0.000 | NEGATIVE | -1.09E-06 | -34.43 |
| KMW-5R | Iron | 39 | 32 | 82% | 0.071 | 129 | 16.55 | 1.56 | 33.81 | 2.04 | 328 | 0.000 | POSITIVE | 2.20E-08 | 0.70 |
| KMW-5R | Magnesium | 36 | 36 | 100% | 3.5 | 65 | 48.07 | 48.6 | 11.70 | 0.24 | -268 | 0.000 | NEGATIVE | -7.09E-08 | -2.24 |
| KMW-5R | Manganese | 37 | 32 | 86% | 0.02 | 2.79 | 1.73 | 1.9 | 0.75 | 0.43 | -81 | 0.295 | no trend | -1.34E-09 | -0.04 |
| KMW-5R | pH, Field | 44 | 44 | 100% | 6.3 | 8.7 | 7.07 | 6.985 | 0.50 | 0.07 | -444 | 0.000 | NEGATIVE | -2.27E-09 | -0.07 |
| KMW-5R | Potassium | 36 | 35 | 97% | 0.5 | 8.3 | 7.20 | 7.25 | 1.25 | 0.17 | -224 | 0.002 | NEGATIVE | -3.63E-09 | -0.11 |
| KMW-5R | Sodium | 37 | 37 | 100% | 3.2 | 10.4 | 6.84 | 7.4 | 2.43 | 0.36 | 347 | 0.000 | POSITIVE | 2.42E-08 | 0.76 |
| KMW-5R | Sulfate | 38 | 38 | 100% | 4.8 | 130 | 73.53 | 75.1 | 31.76 | 0.43 | -88 | 0.274 | no trend | -6.19E-08 | -1.95 |
| MW-701 QAL | Alkalinity, bicarbonate | 37 | 37 | 100% | 29 | 140 | 65.15 | 60 | 31.87 | 0.49 | 148 | 0.054 | no trend | 1.30E-07 | 4.10 |
| MW-701 QAL | Calcium | 35 | 35 | 100% | 8.5 | 197 | 51.55 | 29.6 | 56.57 | 1.10 | 157 | 0.027 | POSITIVE | 1.90E-07 | 5.99 |
| MW-701 QAL | Chloride | 38 | 25 | 66% | 1 | 1100 | 181.42 | 14 | 305.58 | 1.68 | 366 | 0.000 | POSITIVE | 5.10E-07 | 16.09 |
| MW-701 QAL | Hardness | 8 | 8 | 100% | 42 | 232 | 108.50 | 80 | 81.67 | 0.75 | 0 | 1.000 | no trend | 4.70E-08 | 1.48 |
| MW-701 QAL | Iron | 38 | 7 | 18% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-701 QAL | Magnesium | 35 | 35 | 100% | 3.5 | 64.9 | 16.79 | 10.3 | 16.08 | 0.96 | 148 | 0.037 | POSITIVE | 4.15E-08 | 1.31 |
| MW-701 QAL | Manganese | 38 | 21 | 55% | 0.0011 | 9.99 | 1.35 | 0.0762 | 2.28 | 1.69 | 181 | 0.021 | POSITIVE | 3.67E-10 | 0.01 |
| MW-701 QAL | pH, Field | 47 | 47 | 100% | 5.28 | 8.7 | 5.95 | 5.68 | 0.85 | 0.14 | -712 | 0.000 | NEGATIVE | -4.54E-09 | -0.14 |
| MW-701 QAL | Potassium | 35 | 34 | 97% | 0.5 | 17.7 | 6.72 | 6 | 4.44 | 0.66 | 105 | 0.139 | no trend | 1.54E-08 | 0.49 |
| MW-701 QAL | Sodium | 38 | 38 | 100% | 5.1 | 590 | 95.59 | 9.45 | 153.73 | 1.61 | 238 | 0.003 | POSITIVE | 5.56E-07 | 17.55 |
| MW-701 QAL | Sulfate | 38 | 38 | 100% | 4.8 | 535 | 97.65 | 28 | 135.25 | 1.39 | 184 | 0.021 | POSITIVE | 1.97E-07 | 6.22 |
| MW-701 UFB | Alkalinity, bicarbonate | 39 | 39 | 100% | 58 | 259 | 141.26 | 140 | 41.06 | 0.29 | 150 | 0.069 | no trend | 9.96E-08 | 3.14 |
| MW-701 UFB | Calcium | 36 | 36 | 100% | 15 | 504 | 114.96 | 36 | 151.45 | 1.32 | 350 | 0.000 | POSITIVE | 2.14E-07 | 6.75 |

## 2021 Groundwater Trend Analysis
## Humboldt Mill

| Location | Parameter | Number of Samples | Number of Detects | Percent Detected | Minimum | Maximum | Mean | Median | Standard Deviation | Coefficient of Variation | M-K Test Value (S) | Approximate p-value | Trend at 95% Confidence | Theil-Sen Slope | Theil-Sen Slope, yearly |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-701 UFB | Chloride | 39 | 21 | 54% | 1 | 867 | 138.05 | 10 | 259.24 | 1.88 | 401 | 0.000 | POSITIVE | 1.71E-07 | 5.40 |
| MW-701 UFB | Hardness | 60 | 60 | 100% | 141 | 1930 | 525.47 | 158 | 608.17 | 1.16 | 716 | 0.000 | POSITIVE | 7.56E-07 | 23.85 |
| MW-701 UFB | Iron | 39 | 39 | 100% | 0.071 | 203 | 43.48 | 17.5 | 60.34 | 1.39 | 392 | 0.000 | POSITIVE | 1.44E-07 | 4.55 |
| MW-701 UFB | Magnesium | 36 | 36 | 100% | 3.5 | 162 | 40.56 | 15 | 49.23 | 1.21 | 235 | 0.001 | POSITIVE | 6.00E-08 | 1.89 |
| MW-701 UFB | Manganese | 39 | 34 | 87% | 0.02 | 19.3 | 4.67 | 2.4 | 5.36 | 1.15 | 239 | 0.004 | POSITIVE | 1.67E-08 | 0.53 |
| MW-701 UFB | pH, Field | 48 | 48 | 100% | 6.5 | 8.7 | 7.26 | 7.245 | 0.49 | 0.07 | -436 | 0.000 | NEGATIVE | -3.03E-09 | -0.10 |
| MW-701 UFB | Potassium | 36 | 35 | 97% | 0.5 | 20 | 6.92 | 4 | 5.75 | 0.83 | 159 | 0.031 | POSITIVE | 1.69E-08 | 0.53 |
| MW-701 UFB | Sodium | 39 | 39 | 100% | 4.3 | 530 | 85.00 | 7 | 150.51 | 1.77 | 117 | 0.160 | no trend | 2.30E-08 | 0.73 |
| MW-701 UFB | Sulfate | 39 | 39 | 100% | 2.9 | 1950 | 313.23 | 21.3 | 560.24 | 1.79 | 250 | 0.003 | POSITIVE | 2.93E-07 | 9.26 |
| MW-702 QAL | Alkalinity, bicarbonate | 38 | 36 | 95% | 2 | 160 | 90.79 | 105 | 37.69 | 0.42 | 298 | 0.000 | POSITIVE | 2.33E-07 | 7.35 |
| MW-702 QAL | Calcium | 35 | 35 | 100% | 15 | 93 | 38.14 | 34 | 14.61 | 0.38 | -214 | 0.002 | NEGATIVE | -9.31E-08 | -2.94 |
| MW-702 QAL | Chloride | 37 | 12 | 32% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-702 QAL | Hardness | 50 | 50 | 100% | 80 | 180 | 132.19 | 134 | 28.35 | 0.21 | -588 | 0.000 | NEGATIVE | -3.07E-07 | -9.67 |
| MW-702 QAL | Iron | 39 | 4 | 10% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-702 QAL | Magnesium | 36 | 36 | 100% | 2.4 | 14.3 | 9.19 | 9.05 | 3.17 | 0.34 | -39 | 0.604 | no trend | -3.47E-09 | -0.11 |
| MW-702 QAL | Manganese | 39 | 16 | 41% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-702 QAL | pH, Field | 48 | 48 | 100% | 6.53 | 11.4 | 8.24 | 7.93 | 1.44 | 0.18 | -496 | 0.000 | NEGATIVE | -1.06E-08 | -0.33 |
| MW-702 QAL | Potassium | 35 | 34 | 97% | 0.5 | 18 | 7.60 | 6.5 | 4.20 | 0.55 | -118 | 0.096 | no trend | -1.06E-08 | -0.34 |
| MW-702 QAL | Sodium | 39 | 39 | 100% | 7 | 60 | 33.18 | 36 | 13.73 | 0.41 | 334 | 0.000 | POSITIVE | 1.08E-07 | 3.41 |
| MW-702 QAL | Sulfate | 38 | 38 | 100% | 4.8 | 130 | 75.27 | 85 | 32.18 | 0.43 | -178 | 0.026 | NEGATIVE | -1.43E-07 | -4.51 |
| MW-702 UFB | Alkalinity, bicarbonate | 36 | 36 | 100% | 58 | 96.5 | 88.24 | 91 | 10.40 | 0.12 | 25 | 0.743 | no trend | 3.70E-09 | 0.12 |
| MW-702 UFB | Calcium | 34 | 34 | 100% | 15 | 34 | 29.94 | 30 | 3.32 | 0.11 | 169 | 0.013 | POSITIVE | 1.55E-08 | 0.49 |
| MW-702 UFB | Chloride | 38 | 3 | 8% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-702 UFB | Hardness | 46 | 46 | 100% | 107 | 125 | 116.57 | 117 | 4.58 | 0.04 | 220 | 0.037 | POSITIVE | 2.11E-08 | 0.66 |
| MW-702 UFB | Iron | 36 | 35 | 97% | 0.071 | 1.28 | 0.66 | 0.661 | 0.28 | 0.43 | 122 | 0.099 | no trend | 9.11E-10 | 0.03 |
| MW-702 UFB | Magnesium | 34 | 34 | 100% | 3.5 | 10.5 | 9.23 | 9.45 | 1.13 | 0.12 | 103 | 0.128 | no trend | 2.28E-09 | 0.07 |
| MW-702 UFB | Manganese | 38 | 33 | 87% | 0.02 | 0.13 | 0.08 | 0.0856 | 0.02 | 0.30 | 92 | 0.252 | no trend | 3.15E-11 | 0.00 |
| MW-702 UFB | pH, Field | 46 | 46 | 100% | 5.9 | 9.79 | 7.93 | 7.92 | 0.60 | 0.08 | -255 | 0.016 | NEGATIVE | -2.30E-09 | -0.07 |
| MW-702 UFB | Potassium | 34 | 33 | 97% | 0.5 | 3.8 | 3.01 | 3.1 | 0.51 | 0.17 | -11 | 0.880 | no trend | 0 | 0.00 |
| MW-702 UFB | Sodium | 36 | 36 | 100% | 2.7 | 9.2 | 3.63 | 3.1 | 1.58 | 0.44 | -24 | 0.752 | no trend | 0 | 0.00 |
| MW-702 UFB | Sulfate | 38 | 38 | 100% | 4.8 | 37.4 | 30.11 | 32.85 | 8.88 | 0.30 | 89 | 0.267 | no trend | 6.09E-09 | 0.19 |
| MW-703 DBA | Alkalinity, bicarbonate | 38 | 38 | 100% | 30 | 91 | 63.86 | 63.2 | 13.96 | 0.22 | 181 | 0.024 | POSITIVE | 6.94E-08 | 2.19 |
| MW-703 DBA | Calcium | 35 | 35 | 100% | 4.1 | 29.5 | 19.20 | 23 | 7.73 | 0.40 | 199 | 0.005 | POSITIVE | 4.91E-08 | 1.55 |
| MW-703 DBA | Chloride | 39 | 38 | 97% | 1 | 20 | 14.94 | 15.7 | 5.01 | 0.34 | -291 | 0.000 | NEGATIVE | -1.82E-08 | -0.57 |
| MW-703 DBA | Hardness | 12 | 12 | 100% | 29 | 96 | 64.25 | 63.5 | 21.85 | 0.34 | 28 | 0.057 | no trend | 4.11E-07 | 12.97 |
| MW-703 DBA | Iron | 39 | 12 | 31% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 DBA | Magnesium | 35 | 35 | 100% | 3.5 | 16 | 10.07 | 10.3 | 2.99 | 0.30 | -87 | 0.221 | no trend | -1.03E-08 | -0.32 |
| MW-703 DBA | Manganese | 39 | 1 | 3% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 DBA | pH, Field | 42 | 42 | 100% | 8.14 | 10.68 | 8.88 | 8.84 | 0.50 | 0.06 | -170 | 0.067 | no trend | -1.67E-09 | -0.05 |
| MW-703 DBA | Potassium | 35 | 34 | 97% | 0.5 | 29 | 13.98 | 14 | 7.32 | 0.52 | -109 | 0.125 | no trend | -3.22E-08 | -1.02 |
| MW-703 DBA | Sodium | 38 | 38 | 100% | 6.5 | 15 | 10.22 | 9.7 | 2.67 | 0.26 | -191 | 0.017 | NEGATIVE | -1.41E-08 | -0.45 |
| MW-703 DBA | Sulfate | 37 | 36 | 97% | 1 | 80 | 28.37 | 30.5 | 19.62 | 0.69 | 189 | 0.014 | POSITIVE | 1.14E-07 | 3.61 |
| MW-703 LLA | Alkalinity, bicarbonate | 38 | 38 | 100% | 58 | 87 | 75.20 | 76.7 | 7.93 | 0.11 | -31 | 0.706 | no trend | -9.06E-09 | -0.29 |
| MW-703 LLA | Calcium | 34 | 34 | 100% | 15 | 35 | 24.81 | 25.25 | 4.24 | 0.17 | -104 | 0.126 | no trend | -8.27E-09 | -0.26 |
| MW-703 LLA | Chloride | 37 | 36 | 97% | 1 | 75 | 21.49 | 12 | 20.53 | 0.95 | -59 | 0.448 | no trend | -1.11E-08 | -0.35 |

## 2021 Groundwater Trend Analysis
## Humboldt Mill

| Location | Parameter | Number of Samples | Number of Detects | Percent Detected | Minimum | Maximum | Mean | Median | Standard Deviation | Coefficient of Variation | M-K Test Value (S) | Approximate p-value | Trend at 95% Confidence | Theil-Sen Slope | Theil-Sen Slope, yearly |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-703 LLA | Hardness | 40 | 40 | 100% | 74.2 | 120 | 105.59 | 107 | 10.73 | 0.10 | -72 | 0.405 | no trend | -2.19E-08 | -0.69 |
| MW-703 LLA | Iron | 36 | 33 | 92% | 0.071 | 1.2 | 0.53 | 0.57 | 0.27 | 0.50 | -59 | 0.429 | no trend | -5.85E-10 | -0.02 |
| MW-703 LLA | Magnesium | 34 | 34 | 100% | 3.5 | 12 | 9.88 | 10 | 1.48 | 0.15 | -73 | 0.283 | no trend | -2.65E-09 | -0.08 |
| MW-703 LLA | Manganese | 38 | 27 | 71% | 0.02 | 0.094 | 0.06 | 0.0619 | 0.02 | 0.32 | 40 | 0.622 | no trend | 0 | 0.00 |
| MW-703 LLA | pH, Field | 48 | 48 | 100% | 8 | 9.19 | 8.45 | 8.41 | 0.33 | 0.04 | -262 | 0.020 | NEGATIVE | -1.30E-09 | -0.04 |
| MW-703 LLA | Potassium | 34 | 33 | 97% | 0.5 | 7.6 | 4.27 | 3.75 | 1.52 | 0.36 | -85 | 0.212 | no trend | -4.89E-09 | -0.15 |
| MW-703 LLA | Sodium | 38 | 38 | 100% | 5.9 | 53 | 14.46 | 8.35 | 11.90 | 0.82 | -93 | 0.247 | no trend | -7.76E-09 | -0.24 |
| MW-703 LLA | Sulfate | 38 | 38 | 100% | 4.8 | 38 | 25.59 | 30 | 10.46 | 0.41 | 112 | 0.163 | no trend | 2.77E-08 | 0.88 |
| MW-703 QAL | Alkalinity, bicarbonate | 38 | 38 | 100% | 46.8 | 91 | 58.46 | 54.6 | 11.44 | 0.20 | -441 | 0.000 | NEGATIVE | -6.87E-08 | -2.17 |
| MW-703 QAL | Calcium | 35 | 35 | 100% | 13 | 33 | 19.38 | 18.7 | 4.09 | 0.21 | -58 | 0.418 | no trend | -3.47E-09 | -0.11 |
| MW-703 QAL | Chloride | 38 | 3 | 8% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 QAL | Hardness | 18 | 18 | 100% | 64 | 91 | 77.33 | 78 | 6.95 | 0.09 | -40 | 0.131 | no trend | -1.03E-07 | -3.24 |
| MW-703 QAL | Iron | 38 | 6 | 16% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 QAL | Magnesium | 35 | 35 | 100% | 3.5 | 9.7 | 7.70 | 7.9 | 1.13 | 0.15 | 87 | 0.220 | no trend | 2.57E-09 | 0.08 |
| MW-703 QAL | Manganese | 38 | 6 | 16% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 QAL | pH, Field | 48 | 48 | 100% | 5.54 | 8.7 | 6.38 | 6.1 | 0.88 | 0.14 | -772 | 0.000 | NEGATIVE | -7.46E-09 | -0.24 |
| MW-703 QAL | Potassium | 35 | 34 | 97% | 0.5 | 2.7 | 1.65 | 1.6 | 0.37 | 0.23 | -152 | 0.028 | NEGATIVE | -1.26E-09 | -0.04 |
| MW-703 QAL | Sodium | 38 | 38 | 100% | 1.7 | 9.2 | 3.44 | 2.3 | 2.25 | 0.66 | -559 | 0.000 | NEGATIVE | -1.55E-08 | -0.49 |
| MW-703 QAL | Sulfate | 38 | 38 | 100% | 4.8 | 40 | 22.82 | 23.9 | 8.56 | 0.38 | 80 | 0.320 | no trend | 1.75E-08 | 0.55 |
| MW-703 UFB | Alkalinity, bicarbonate | 37 | 37 | 100% | 58 | 91 | 78.54 | 80 | 7.32 | 0.09 | -46 | 0.555 | no trend | -6.67E-09 | -0.21 |
| MW-703 UFB | Calcium | 34 | 34 | 100% | 15 | 35 | 31.27 | 31.55 | 3.21 | 0.10 | 167 | 0.013 | POSITIVE | 7.33E-09 | 0.23 |
| MW-703 UFB | Chloride | 38 | 3 | 8% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-703 UFB | Hardness | 28 | 28 | 100% | 121 | 144 | 127.43 | 126.5 | 6.15 | 0.05 | 28 | 0.588 | no trend | 1.06E-08 | 0.34 |
| MW-703 UFB | Iron | 38 | 37 | 97% | 0.071 | 1.97 | 1.16 | 1.3 | 0.54 | 0.47 | 261 | 0.001 | POSITIVE | 3.75E-09 | 0.12 |
| MW-703 UFB | Magnesium | 34 | 34 | 100% | 3.5 | 11.1 | 10.29 | 10.5 | 1.28 | 0.12 | 38 | 0.579 | no trend | 0 | 0.00 |
| MW-703 UFB | Manganese | 35 | 30 | 86% | 0.02 | 0.25 | 0.16 | 0.17 | 0.06 | 0.35 | 395 | 0.000 | POSITIVE | 2.95E-10 | 0.01 |
| MW-703 UFB | pH, Field | 46 | 46 | 100% | 6.3 | 8.86 | 8.05 | 8.055 | 0.40 | 0.05 | -310 | 0.003 | NEGATIVE | -2.04E-09 | -0.06 |
| MW-703 UFB | Potassium | 34 | 33 | 97% | 0.5 | 3.4 | 2.36 | 2.35 | 0.44 | 0.19 | -259 | 0.000 | NEGATIVE | -1.50E-09 | -0.05 |
| MW-703 UFB | Sodium | 37 | 37 | 100% | 2.7 | 9.2 | 3.63 | 3 | 1.63 | 0.45 | -223 | 0.003 | NEGATIVE | -1.47E-09 | -0.05 |
| MW-703 UFB | Sulfate | 38 | 38 | 100% | 4.8 | 52 | 41.04 | 44.95 | 12.79 | 0.31 | 210 | 0.008 | POSITIVE | 1.82E-08 | 0.58 |
| MW-704 DBA | Alkalinity, bicarbonate | 38 | 38 | 100% | 58 | 144 | 115.76 | 125 | 23.72 | 0.20 | 408 | 0.000 | POSITIVE | 1.82E-07 | 5.73 |
| MW-704 DBA | Calcium | 35 | 35 | 100% | 15 | 28.6 | 22.04 | 22 | 3.13 | 0.14 | 379 | 0.000 | POSITIVE | 3.00E-08 | 0.95 |
| MW-704 DBA | Chloride | 39 | 3 | 8% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-704 DBA | Hardness | 28 | 28 | 100% | 100 | 129 | 109.64 | 108.5 | 7.82 | 0.07 | 136 | 0.007 | POSITIVE | 6.23E-08 | 1.97 |
| MW-704 DBA | Iron | 39 | 36 | 92% | 0.071 | 0.95 | 0.61 | 0.66 | 0.26 | 0.43 | 395 | 0.000 | POSITIVE | 2.25E-09 | 0.07 |
| MW-704 DBA | Magnesium | 35 | 35 | 100% | 3.5 | 14.2 | 11.12 | 11.3 | 1.72 | 0.15 | 279 | 0.000 | POSITIVE | 9.25E-09 | 0.29 |
| MW-704 DBA | Manganese | 39 | 17 | 44% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-704 DBA | pH, Field | 47 | 47 | 100% | 7.6 | 9.23 | 8.37 | 8.43 | 0.38 | 0.04 | -555 | 0.000 | NEGATIVE | -3.00E-09 | -0.09 |
| MW-704 DBA | Potassium | 36 | 35 | 97% | 0.5 | 3.5 | 2.67 | 2.7 | 0.45 | 0.17 | 26 | 0.730 | no trend | 0 | 0.00 |
| MW-704 DBA | Sodium | 39 | 39 | 100% | 7 | 13 | 10.62 | 11 | 1.25 | 0.12 | 161 | 0.051 | no trend | 3.76E-09 | 0.12 |
| MW-704 DBA | Sulfate | 39 | 14 | 36% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-704 LLA | Alkalinity, bicarbonate | 40 | 40 | 100% | 55 | 197 | 123.72 | 115 | 42.52 | 0.34 | 523 | 0.000 | POSITIVE | 4.25E-07 | 13.42 |
| MW-704 LLA | Calcium | 37 | 37 | 100% | 11 | 62.8 | 30.52 | 26.9 | 15.02 | 0.49 | 363 | 0.000 | POSITIVE | 1.50E-07 | 4.73 |
| MW-704 LLA | Chloride | 40 | 17 | 43% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-704 LLA | Hardness | 56 | 56 | 100% | 66 | 257 | 146.71 | 142.5 | 57.75 | 0.39 | 1144 | 0.000 | POSITIVE | 7.55E-07 | 23.84 |

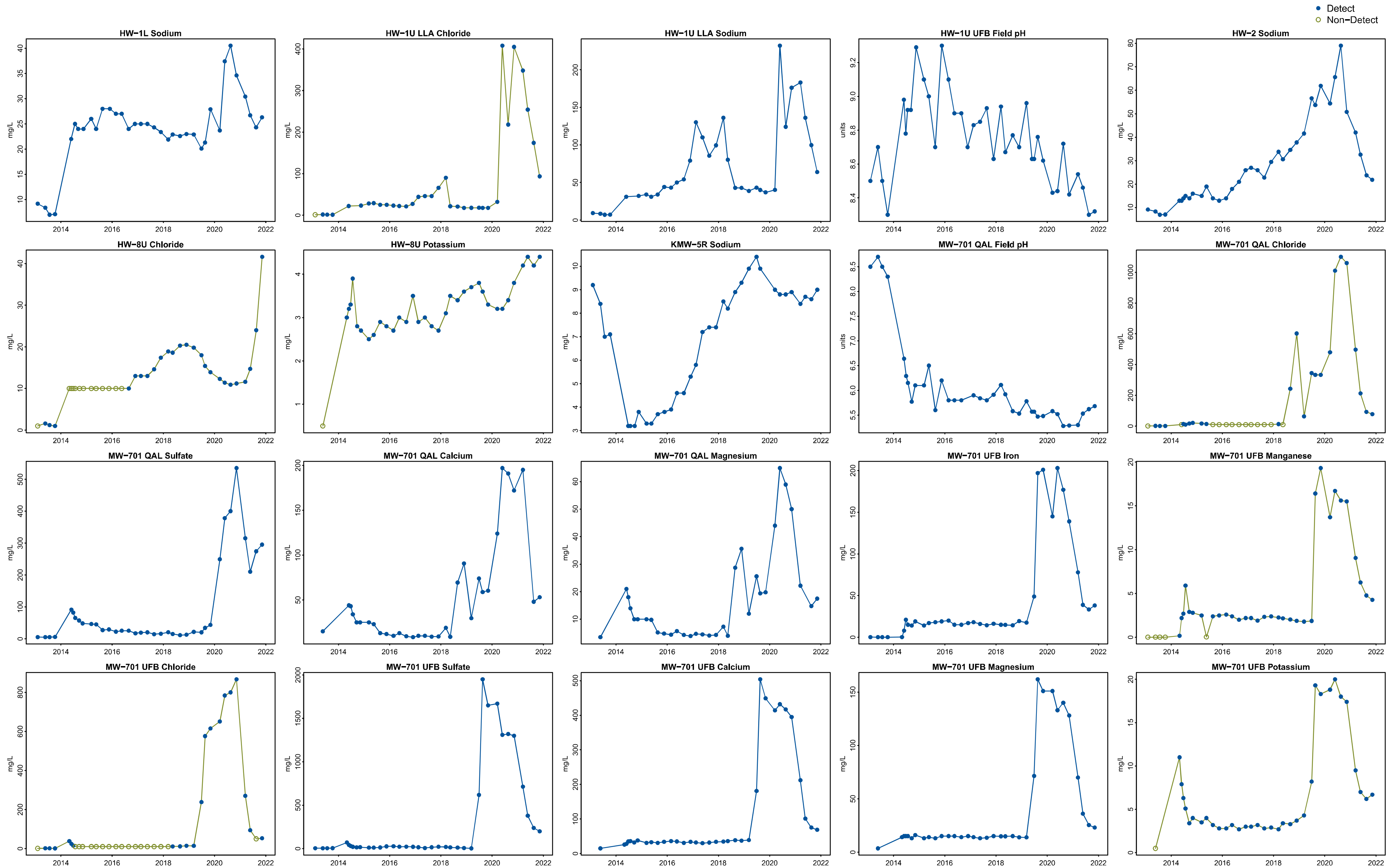
## 2021 Groundwater Trend Analysis
## Humboldt Mill

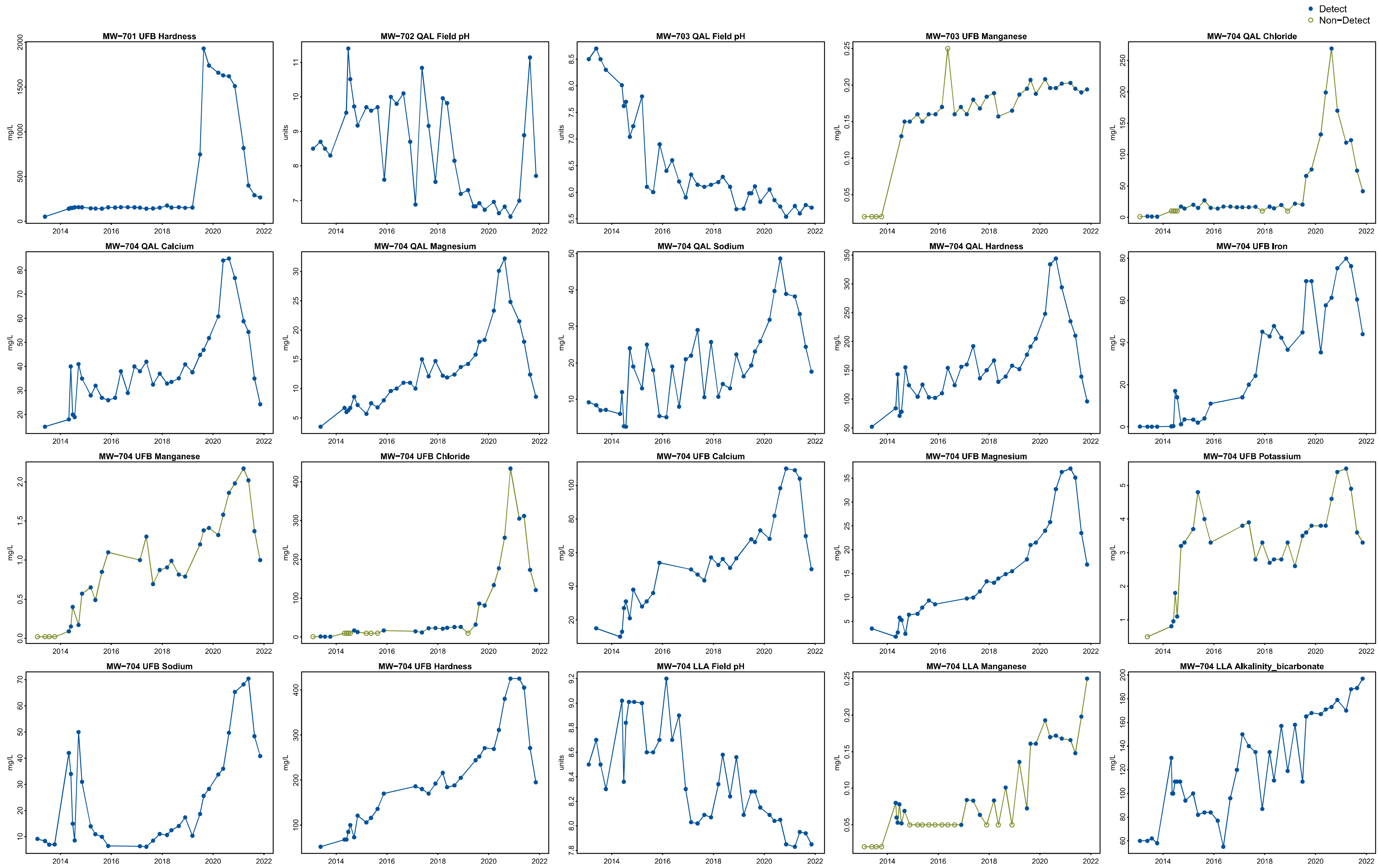
| Location | Parameter | Number of Samples | Number of Detects | Percent Detected | Minimum | Maximum | Mean | Median | Standard Deviation | Coefficient of Variation | M-K Test Value (S) | Approximate p-value | Trend at 95% Confidence | Theil-Sen Slope | Theil-Sen Slope, yearly |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-704 LLA | Iron | 39 | 35 | 90% | 0.071 | 2.83 | 0.91 | 0.771 | 0.71 | 0.77 | 509 | 0.000 | POSITIVE | 6.79E-09 | 0.21 |
| MW-704 LLA | Magnesium | 37 | 37 | 100% | 3.5 | 24.4 | 14.92 | 14 | 4.44 | 0.30 | 400 | 0.000 | POSITIVE | 4.92E-08 | 1.55 |
| MW-704 LLA | Manganese | 40 | 25 | 63% | 0.02 | 0.25 | 0.09 | 0.0663 | 0.06 | 0.65 | 444 | 0.000 | POSITIVE | 5.23E-10 | 0.02 |
| MW-704 LLA | pH, Field | 48 | 48 | 100% | 7.83 | 9.2 | 8.33 | 8.28 | 0.37 | 0.04 | -692 | 0.000 | NEGATIVE | -3.69E-09 | -0.12 |
| MW-704 LLA | Potassium | 37 | 36 | 97% | 0.5 | 11 | 6.30 | 6.2 | 2.14 | 0.34 | 188 | 0.014 | POSITIVE | 9.57E-09 | 0.30 |
| MW-704 LLA | Sodium | 38 | 38 | 100% | 3.6 | 9.2 | 5.22 | 5 | 1.21 | 0.23 | 81 | 0.314 | no trend | 1.99E-09 | 0.06 |
| MW-704 LLA | Sulfate | 40 | 40 | 100% | 2.2 | 22 | 10.11 | 10.15 | 4.43 | 0.44 | 94 | 0.278 | no trend | 1.15E-08 | 0.36 |
| MW-704 QAL | Alkalinity, bicarbonate | 39 | 39 | 100% | 58 | 283 | 113.89 | 97 | 55.18 | 0.48 | 43 | 0.611 | no trend | 1.97E-08 | 0.62 |
| MW-704 QAL | Calcium | 36 | 36 | 100% | 15 | 84.8 | 40.03 | 37.3 | 16.91 | 0.42 | 325 | 0.000 | POSITIVE | 1.37E-07 | 4.33 |
| MW-704 QAL | Chloride | 39 | 32 | 82% | 1 | 269 | 45.43 | 16.9 | 61.97 | 1.36 | 474 | 0.000 | POSITIVE | 2.13E-07 | 6.73 |
| MW-704 QAL | Hardness | 30 | 30 | 100% | 95.9 | 210 | 157.39 | 154 | 38.71 | 0.25 | 200 | 0.000 | POSITIVE | 4.35E-07 | 13.73 |
| MW-704 QAL | Iron | 39 | 29 | 74% | 0.013 | 103 | 14.42 | 3.59 | 24.44 | 1.69 | 22 | 0.798 | no trend | 0 | 0.00 |
| MW-704 QAL | Magnesium | 36 | 36 | 100% | 3.5 | 32.2 | 13.11 | 12 | 6.81 | 0.52 | 450 | 0.000 | POSITIVE | 6.03E-08 | 1.90 |
| MW-704 QAL | Manganese | 39 | 33 | 85% | 0.02 | 7.2 | 2.34 | 1.5 | 2.23 | 0.95 | 110 | 0.187 | no trend | 3.29E-09 | 0.10 |
| MW-704 QAL | pH, Field | 48 | 48 | 100% | 5.29 | 8.7 | 6.05 | 5.775 | 0.80 | 0.13 | -600 | 0.000 | NEGATIVE | -2.61E-09 | -0.08 |
| MW-704 QAL | Potassium | 34 | 33 | 97% | 0.5 | 6.3 | 2.98 | 2.7 | 1.14 | 0.38 | 303 | 0.000 | POSITIVE | 1.02E-08 | 0.32 |
| MW-704 QAL | Sodium | 39 | 39 | 100% | 2.5 | 48.6 | 19.24 | 19 | 11.43 | 0.59 | 382 | 0.000 | POSITIVE | 9.56E-08 | 3.02 |
| MW-704 QAL | Sulfate | 39 | 38 | 97% | 1 | 96.8 | 28.69 | 23.7 | 22.37 | 0.78 | 328 | 0.000 | POSITIVE | 1.10E-07 | 3.48 |
| MW-704 UFB | Alkalinity, bicarbonate | 35 | 35 | 100% | 58 | 190 | 139.03 | 146 | 37.05 | 0.27 | 194 | 0.006 | POSITIVE | 1.92E-07 | 6.05 |
| MW-704 UFB | Calcium | 31 | 31 | 100% | 10 | 110 | 55.52 | 52.7 | 28.57 | 0.51 | 357 | 0.000 | POSITIVE | 3.02E-07 | 9.55 |
| MW-704 UFB | Chloride | 35 | 26 | 74% | 1 | 434 | 77.91 | 21.6 | 114.21 | 1.47 | 470 | 0.000 | POSITIVE | 4.45E-07 | 14.04 |
| MW-704 UFB | Hardness | 44 | 44 | 100% | 106 | 425 | 224.64 | 193.5 | 90.59 | 0.40 | 740 | 0.000 | POSITIVE | 1.06E-06 | 33.51 |
| MW-704 UFB | Iron | 34 | 34 | 100% | 0.071 | 79.8 | 31.73 | 29.75 | 28.05 | 0.88 | 426 | 0.000 | POSITIVE | 2.82E-07 | 8.91 |
| MW-704 UFB | Magnesium | 31 | 31 | 100% | 1.8 | 37 | 15.78 | 13.4 | 10.86 | 0.69 | 402 | 0.000 | POSITIVE | 1.06E-07 | 3.33 |
| MW-704 UFB | Manganese | 33 | 29 | 88% | 0.02 | 2.17 | 0.95 | 0.906 | 0.65 | 0.68 | 404 | 0.000 | POSITIVE | 6.66E-09 | 0.21 |
| MW-704 UFB | pH, Field | 43 | 43 | 100% | 6.26 | 8.7 | 6.96 | 6.82 | 0.55 | 0.08 | -390 | 0.000 | NEGATIVE | -2.56E-09 | -0.08 |
| MW-704 UFB | Potassium | 32 | 31 | 97% | 0.5 | 5.5 | 3.32 | 3.4 | 1.25 | 0.38 | 231 | 0.000 | POSITIVE | 1.11E-08 | 0.35 |
| MW-704 UFB | Sodium | 35 | 35 | 100% | 6.2 | 70.4 | 25.91 | 15 | 20.73 | 0.80 | 278 | 0.000 | POSITIVE | 1.32E-07 | 4.15 |
| MW-704 UFB | Sulfate | 32 | 32 | 100% | 3.3 | 47.4 | 16.53 | 10.6 | 13.85 | 0.84 | 47 | 0.455 | no trend | 6.80E-09 | 0.21 |
| MW-705 QAL | Alkalinity, bicarbonate | 38 | 38 | 100% | 31.1 | 90 | 55.71 | 56.9 | 11.76 | 0.21 | -151 | 0.059 | no trend | -3.52E-08 | -1.11 |
| MW-705 QAL | Calcium | 36 | 36 | 100% | 11.7 | 24 | 16.73 | 16.8 | 3.24 | 0.19 | -120 | 0.104 | no trend | -1.40E-08 | -0.44 |
| MW-705 QAL | Chloride | 39 | 38 | 97% | 1 | 73.1 | 37.34 | 34 | 20.78 | 0.56 | 269 | 0.001 | POSITIVE | 1.53E-07 | 4.84 |
| MW-705 QAL | Hardness | 6 | 6 | 100% | 74 | 76 | 75.33 | 76 | 1.03 | 0.01 | -8 | 0.090 | no trend | -2.11E-08 | -0.67 |
| MW-705 QAL | Iron | 39 | 39 | 100% | 0.071 | 13.6 | 7.84 | 8.58 | 3.38 | 0.43 | 169 | 0.042 | POSITIVE | 1.08E-08 | 0.34 |
| MW-705 QAL | Magnesium | 36 | 36 | 100% | 3.5 | 11 | 7.26 | 7.15 | 1.65 | 0.23 | -133 | 0.072 | no trend | -7.34E-09 | -0.23 |
| MW-705 QAL | Manganese | 39 | 30 | 77% | 0.02 | 2.5 | 0.82 | 0.83 | 0.49 | 0.60 | 71 | 0.396 | no trend | 4.78E-10 | 0.02 |
| MW-705 QAL | pH, Field | 47 | 47 | 100% | 5.62 | 8.7 | 6.37 | 6.18 | 0.69 | 0.11 | -182 | 0.097 | no trend | -8.62E-10 | -0.03 |
| MW-705 QAL | Potassium | 36 | 35 | 97% | 0.5 | 3.2 | 2.46 | 2.5 | 0.46 | 0.19 | 43 | 0.564 | no trend | 0 | 0.00 |
| MW-705 QAL | Sodium | 39 | 39 | 100% | 4.3 | 35.5 | 15.78 | 13 | 7.79 | 0.49 | 533 | 0.000 | POSITIVE | 7.02E-08 | 2.21 |
| MW-705 QAL | Sulfate | 37 | 37 | 100% | 1.5 | 13 | 5.44 | 5 | 2.86 | 0.53 | 39 | 0.619 | no trend | 3.24E-09 | 0.10 |
| MW-705 UFB | Alkalinity, bicarbonate | 39 | 39 | 100% | 58 | 101 | 83.69 | 85 | 10.33 | 0.12 | -160 | 0.054 | no trend | -3.64E-08 | -1.15 |
| MW-705 UFB | Calcium | 37 | 37 | 100% | 15 | 35.1 | 25.25 | 24.7 | 4.94 | 0.20 | 489 | 0.000 | POSITIVE | 5.87E-08 | 1.85 |
| MW-705 UFB | Chloride | 40 | 30 | 75% | 1 | 65.7 | 26.93 | 26.5 | 18.40 | 0.68 | 725 | 0.000 | POSITIVE | 2.00E-07 | 6.30 |
| MW-705 UFB | Hardness | 46 | 46 | 100% | 92 | 146 | 117.61 | 120 | 16.12 | 0.14 | 808 | 0.000 | POSITIVE | 2.39E-07 | 7.53 |
| MW-705 UFB | Iron | 40 | 40 | 100% | 0.071 | 13 | 7.76 | 8.6 | 3.49 | 0.45 | 356 | 0.000 | POSITIVE | 2.19E-08 | 0.69 |

## 2021 Groundwater Trend Analysis
## Humboldt Mill

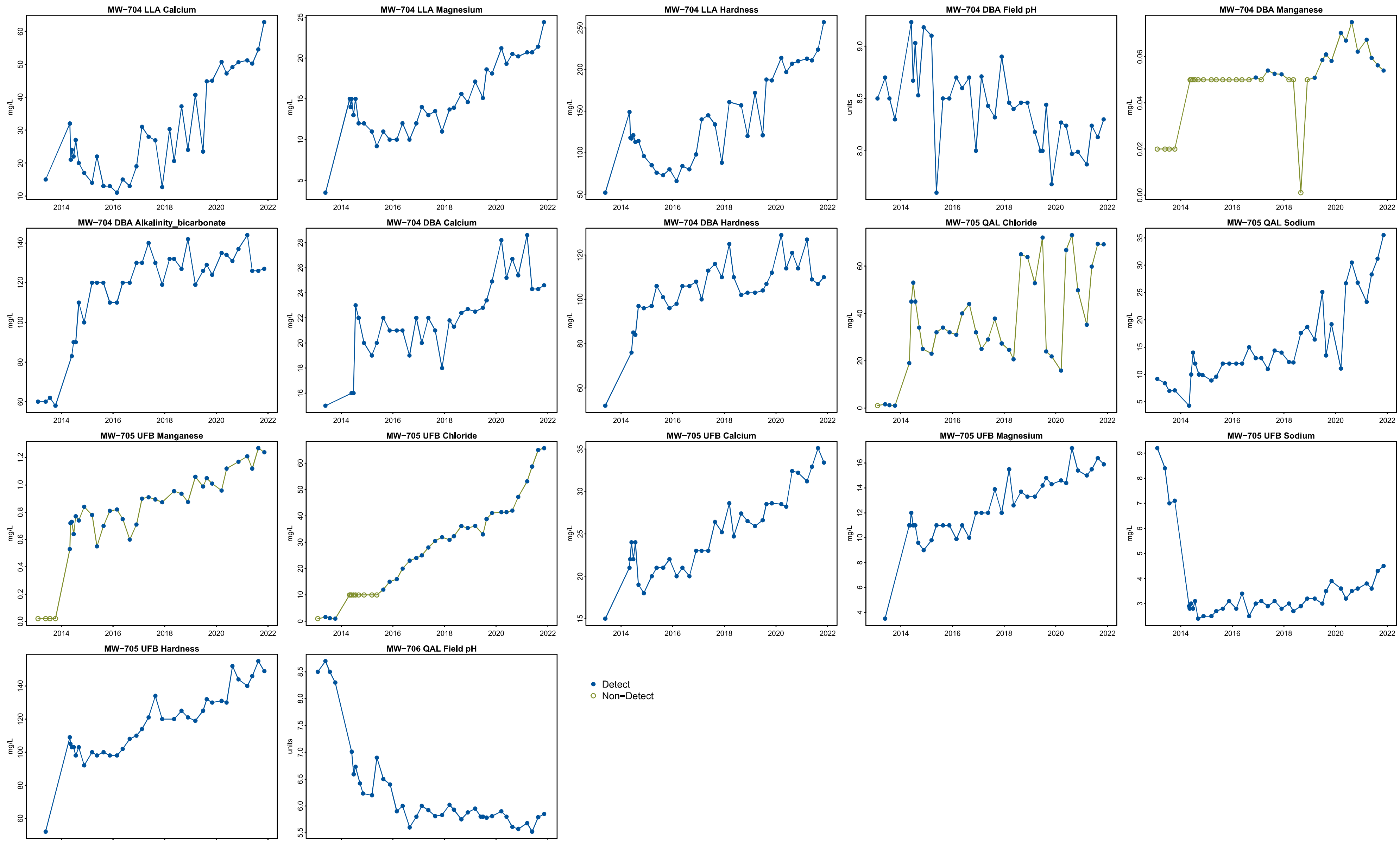
| Location | Parameter | Number of Samples | Number of Detects | Percent Detected | Minimum | Maximum | Mean | Median | Standard Deviation | Coefficient of Variation | M-K Test Value (S) | Approximate p-value | Trend at 95% Confidence | Theil-Sen Slope | Theil-Sen Slope, yearly |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-705 UFB | Magnesium | 37 | 37 | 100% | 3.5 | 17.2 | 12.58 | 12 | 2.66 | 0.21 | 486 | 0.000 | POSITIVE | 2.61E-08 | 0.82 |
| MW-705 UFB | Manganese | 38 | 34 | 89% | 0.02 | 1.27 | 0.80 | 0.8565 | 0.33 | 0.41 | 558 | 0.000 | POSITIVE | 2.57E-09 | 0.08 |
| MW-705 UFB | pH, Field | 47 | 47 | 100% | 6.5 | 8.8 | 7.18 | 7.02 | 0.56 | 0.08 | -339 | 0.002 | NEGATIVE | -2.66E-09 | -0.08 |
| MW-705 UFB | Potassium | 37 | 36 | 97% | 0.5 | 4.3 | 3.51 | 3.5 | 0.58 | 0.17 | 218 | 0.004 | POSITIVE | 1.58E-09 | 0.05 |
| MW-705 UFB | Sodium | 40 | 40 | 100% | 2.4 | 9.2 | 3.63 | 3.1 | 1.55 | 0.43 | 223 | 0.009 | POSITIVE | 3.14E-09 | 0.10 |
| MW-705 UFB | Sulfate | 40 | 40 | 100% | 2.4 | 13 | 5.56 | 4.5 | 3.18 | 0.57 | -410 | 0.000 | NEGATIVE | -1.48E-08 | -0.47 |
| MW-706 QAL | Alkalinity, bicarbonate | 36 | 36 | 100% | 58 | 120 | 79.53 | 75.85 | 14.55 | 0.18 | -63 | 0.398 | no trend | -3.54E-08 | -1.12 |
| MW-706 QAL | Calcium | 33 | 33 | 100% | 15 | 110 | 76.51 | 75.8 | 18.73 | 0.24 | -370 | 0.000 | NEGATIVE | -1.80E-07 | -5.67 |
| MW-706 QAL | Chloride | 38 | 37 | 97% | 1 | 153 | 110.55 | 119 | 43.14 | 0.39 | 406 | 0.000 | POSITIVE | 2.65E-07 | 8.38 |
| MW-706 QAL | Hardness | 20 | 20 | 100% | 6 | 285 | 191.00 | 255 | 112.49 | 0.59 | 52 | 0.095 | no trend | 9.48E-07 | 29.91 |
| MW-706 QAL | Iron | 36 | 36 | 100% | 0.071 | 7.8 | 3.50 | 3.135 | 1.98 | 0.57 | -327 | 0.000 | NEGATIVE | -1.66E-08 | -0.52 |
| MW-706 QAL | Magnesium | 33 | 33 | 100% | 3.5 | 37 | 28.69 | 28 | 5.90 | 0.21 | -292 | 0.000 | NEGATIVE | -4.05E-08 | -1.28 |
| MW-706 QAL | Manganese | 37 | 30 | 81% | 0.02 | 25 | 13.66 | 14 | 6.40 | 0.47 | -206 | 0.007 | NEGATIVE | -2.76E-08 | -0.87 |
| MW-706 QAL | pH, Field | 48 | 48 | 100% | 5.52 | 8.7 | 6.17 | 5.88 | 0.79 | 0.13 | -729 | 0.000 | NEGATIVE | -4.25E-09 | -0.13 |
| MW-706 QAL | Potassium | 34 | 33 | 97% | 0.5 | 5.2 | 4.46 | 4.6 | 0.74 | 0.17 | 43 | 0.527 | no trend | 0 | 0.00 |
| MW-706 QAL | Sodium | 35 | 35 | 100% | 7 | 54.7 | 37.10 | 42 | 13.47 | 0.36 | 411 | 0.000 | POSITIVE | 1.33E-07 | 4.20 |
| MW-706 QAL | Sulfate | 38 | 38 | 100% | 4.8 | 430 | 187.53 | 187.5 | 100.71 | 0.54 | -343 | 0.000 | NEGATIVE | -5.57E-07 | -17.59 |
| MW-707 QAL | Alkalinity, bicarbonate | 38 | 38 | 100% | 58 | 170 | 146.00 | 153.5 | 30.43 | 0.21 | 104 | 0.191 | no trend | 1.52E-08 | 0.48 |
| MW-707 QAL | Calcium | 35 | 35 | 100% | 15 | 45 | 40.73 | 41.6 | 5.01 | 0.12 | 200 | 0.005 | POSITIVE | 1.52E-08 | 0.48 |
| MW-707 QAL | Chloride | 38 | 3 | 8% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-707 QAL | Hardness | 6 | 6 | 100% | 150 | 154 | 151.33 | 150 | 2.07 | 0.01 | 8 | 0.090 | no trend | 2.86E-08 | 0.90 |
| MW-707 QAL | Iron | 38 | 38 | 100% | 0.071 | 7.2 | 4.38 | 4.395 | 1.74 | 0.40 | -290 | 0.000 | NEGATIVE | -8.70E-09 | -0.27 |
| MW-707 QAL | Magnesium | 35 | 35 | 100% | 3.5 | 14 | 11.38 | 11.6 | 1.52 | 0.13 | -162 | 0.021 | NEGATIVE | -3.13E-09 | -0.10 |
| MW-707 QAL | Manganese | 38 | 32 | 84% | 0.02 | 1.2 | 0.82 | 0.927 | 0.33 | 0.40 | 15 | 0.860 | no trend | 0 | 0.00 |
| MW-707 QAL | pH, Field | 48 | 48 | 100% | 6.55 | 8.7 | 7.10 | 6.98 | 0.46 | 0.07 | -101 | 0.373 | no trend | -3.31E-10 | -0.01 |
| MW-707 QAL | Potassium | 35 | 34 | 97% | 0.5 | 3.2 | 2.34 | 2.4 | 0.38 | 0.16 | -116 | 0.094 | no trend | -6.05E-10 | -0.02 |
| MW-707 QAL | Sodium | 37 | 37 | 100% | 2.7 | 9.2 | 3.50 | 3 | 1.61 | 0.46 | -368 | 0.000 | NEGATIVE | -2.41E-09 | -0.08 |
| MW-707 QAL | Sulfate | 38 | 25 | 66% | 0.86 | 9.8 | 4.20 | 4.9 | 2.79 | 0.66 | -364 | 0.000 | NEGATIVE | -2.42E-08 | -0.76 |
| MW-9R | Alkalinity, bicarbonate | 34 | 33 | 97% | 2 | 82 | 43.31 | 45.6 | 19.43 | 0.45 | -111 | 0.103 | no trend | -5.72E-08 | -1.81 |
| MW-9R | Calcium | 31 | 31 | 100% | 15 | 120 | 42.95 | 36.3 | 26.44 | 0.62 | -189 | 0.001 | NEGATIVE | -2.00E-07 | -6.30 |
| MW-9R | Chloride | 34 | 29 | 85% | 1 | 190 | 33.47 | 16.8 | 46.10 | 1.38 | -66 | 0.335 | no trend | -3.36E-08 | -1.06 |
| MW-9R | Hardness | 32 | 32 | 100% | 59 | 473 | 157.20 | 120.5 | 118.22 | 0.75 | -284 | 0.000 | NEGATIVE | -8.44E-07 | -26.62 |
| MW-9R | Iron | 34 | 15 | 44% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MW-9R | Magnesium | 31 | 31 | 100% | 3.5 | 42 | 15.25 | 12.5 | 9.80 | 0.64 | -210 | 0.000 | NEGATIVE | -8.68E-08 | -2.74 |
| MW-9R | Manganese | 34 | 19 | 56% | 0.02 | 1.4 | 0.24 | 0.0645 | 0.33 | 1.42 | -163 | 0.015 | NEGATIVE | -4.57E-10 | -0.01 |
| MW-9R | pH, Field | 44 | 44 | 100% | 5.4 | 8.7 | 6.21 | 6.03 | 0.76 | 0.12 | -198 | 0.046 | NEGATIVE | -7.63E-10 | -0.02 |
| MW-9R | Potassium | 31 | 30 | 97% | 0.5 | 4.6 | 2.68 | 2.6 | 1.03 | 0.39 | -202 | 0.001 | NEGATIVE | -9.53E-09 | -0.30 |
| MW-9R | Sodium | 34 | 34 | 100% | 5.3 | 47 | 14.45 | 9.25 | 11.52 | 0.80 | -217 | 0.001 | NEGATIVE | -3.67E-08 | -1.16 |
| MW-9R | Sulfate | 34 | 34 | 100% | 4.8 | 320 | 102.80 | 75.25 | 84.33 | 0.82 | -112 | 0.100 | no trend | -3.48E-07 | -10.97 |

--: Insufficient data for trend analysis (<50% detection frequency and/or <6 detected samples)


Detect
Non−Detect
HW−1L Sodium
HW−1U LLA Chloride
HW−1U LLA Sodium
HW−1U UFB Field pH
HW−2 Sodium
HW−8U Chloride
HW−8U Potassium
KMW−5R Sodium
MW−701 QAL Field pH
MW−701 QAL Chloride
MW−701 QAL Sulfate
MW−701 QAL Calcium
MW−701 QAL Magnesium
MW−701 UFB Iron
MW−701 UFB Manganese
MW−701 UFB Chloride
MW−701 UFB Sulfate
MW−701 UFB Calcium
MW−701 UFB Magnesium
MW−701 UFB Potassium
mg/L
units
2014
2016
2018
2020
2022



Detect
Non−Detect
MW−701 UFB Hardness
MW−702 QAL Field pH
MW−703 QAL Field pH
MW−703 UFB Manganese
MW−704 QAL Chloride
MW−704 QAL Calcium
MW−704 QAL Magnesium
MW−704 QAL Sodium
MW−704 QAL Hardness
MW−704 UFB Iron
MW−704 UFB Manganese
MW−704 UFB Chloride
MW−704 UFB Calcium
MW−704 UFB Magnesium
MW−704 UFB Potassium
MW−704 UFB Sodium
MW−704 UFB Hardness
MW−704 LLA Field pH
MW−704 LLA Manganese
MW−704 LLA Alkalinity_bicarbonate
mg/L
units
2014
2016
2018
2020
2022

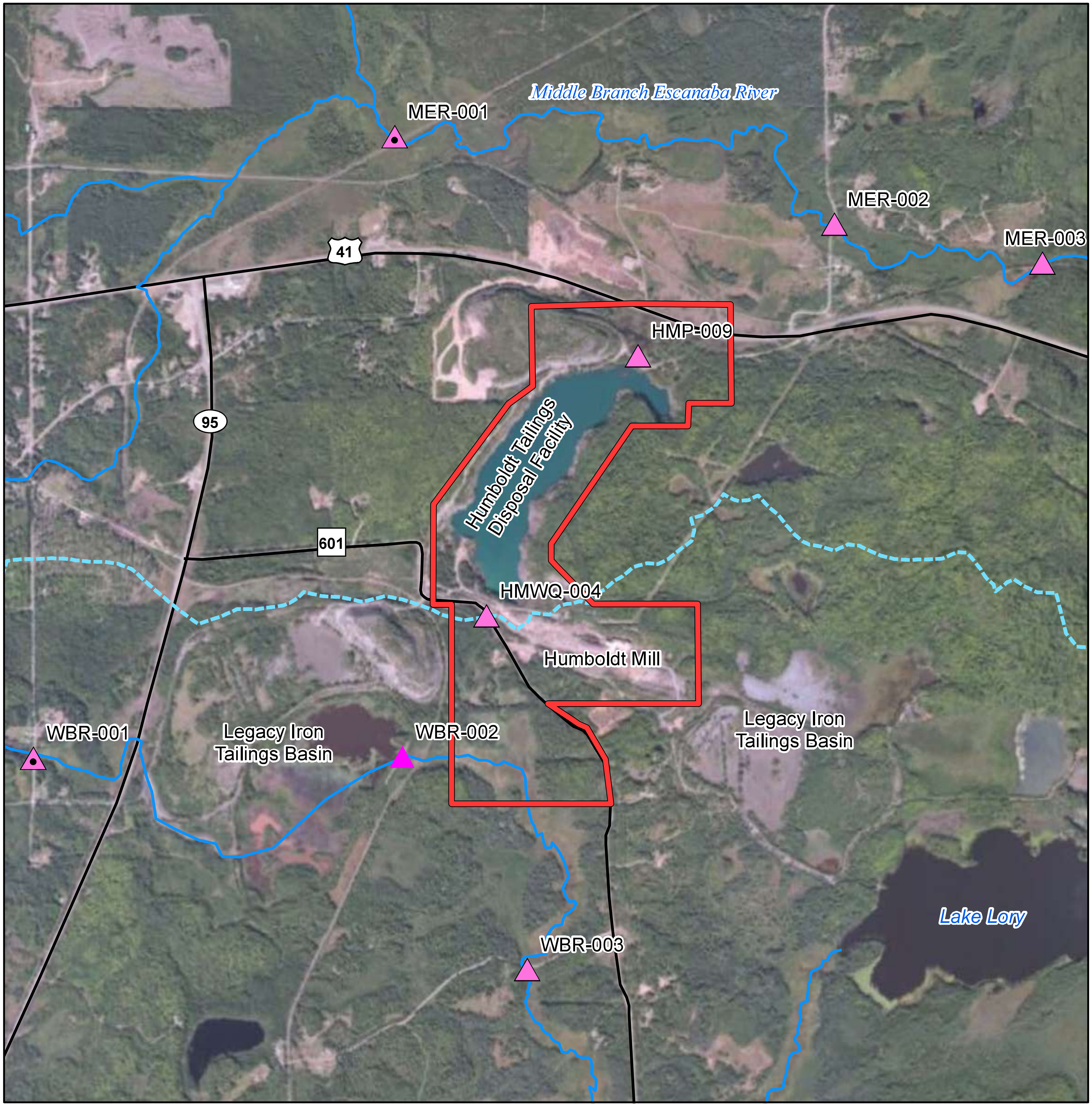

MW−704 LLA Calcium
MW−704 LLA Magnesium
MW−704 LLA Hardness
MW−704 DBA Field pH
MW−704 DBA Manganese
MW−704 DBA Alkalinity_bicarbonate
MW−704 DBA Calcium
MW−704 DBA Hardness
MW−705 QAL Chloride
MW−705 QAL Sodium
MW−705 UFB Manganese
MW−705 UFB Chloride
MW−705 UFB Calcium
MW−705 UFB Magnesium
MW−705 UFB Sodium
MW−705 UFB Hardness
MW−706 QAL Field pH
mg/L
units
Detect
Non−Detect

# Appendix H

# Humboldt Mill

# Surface Water Map

**HUMBOLDT MILL**
**PROPOSED SURFACE WATER AND SEDIMENT MONITORING LOCATIONS**




**Legend**

- • Reference Monitoring Station
- ▲ Surface Water and Sediment Monitoring Location
- Road
- River
- Watershed Boundary
- Humboldt Mill Property

Reference:

Data provided by: Eagle Mine, ESRI, and North Jackson Company

Projection & Datum: NAD 1927 UTM Zone 16N

Aerial Photo: 2010

0 2,000 4,000 Feet

**1:32,000**

Eagle Mine
a subsidiary of lundin mining

North Jackson Company
ENVIRONMENTAL SCIENCE & ENGINEERING

**Figure 1**

# Appendix I

# Humboldt Mill

# Surface Water Results

# &

# Benchmark Summary Table

**2021**
**Mine Permit Surface Water Quality Monitoring Data**
**Benchmark Summary Table**
**Humboldt Mill**

| Location | Location Classification | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|---|
| HMWQ-004 | Compliance - Mill Subwatershed | NM | NM | NM | NM |
| HMP-009 | Compliance - HTDF Subwatershed | NM | pH, mercury, TSS | **iron, TSS** | iron, mercury, TSS |
| MER-001 | Reference - HTDF Subwatershed | | alkalinity bicarbonate, **iron, manganese, calcium, magnesium, hardness** | selenium, alkalinity bicarbonate, calcium, magnesium, potassium, hardness, sulfate | pH, manganese, alkalinity bicarbonate, calcium, magnesium |
| MER-002 | Compliance - HTDF Subwatershed | | **pH**, arsenic, **manganese**, **alkalinity bicarbonate**, chloride, **calcium,** magnesium, hardness | cobalt, magnanese, zinc, alkalinity bicarbonate, calcium, hardness, potassium | **pH,** alkalinity bicarbonate, sulfate |
| MER-003 | Compliance - HTDF Subwatershed | | alkalinity bicarbonate, TDS, **hardness** | **pH, arsenic**, manganese, calcium | **pH, nickel,** alkalinity bicarbonate, chloride, **sulfate**, calcium, magnesium, potassium, **sodium,** hardness |
| MER-004* | Monitoring - HTDF Subwatershed | | | | |
| WBR-001 | Reference - Mill Subwatershed | pH | pH, arsenic, iron, **manganese,** alkalinity bicarbonate | aluminum, arsenic, barium, cobalt, iron, lead, manganese, vanadium, alkalinity bicarbonate, TSS | pH, **manganese** |
| WBR-002 | Compliance - Mill Subwatershed | TSS | alkalinity bicarbonate | arsenic, iron, manganese, zinc, barium, alkalinity bicarbonate, calcium, potassium, TSS | arsenic, **manganese**, **alkalinity bicarbonate**, potassium |
| WBR-003 | Compliance - Mill Subwatershed | | **arsenic**, **iron**, manganese, **alkalinity bicarbonate**, calcium, magnesium, **hardness, TSS** | pH**, arsenic**, **boron**, **TSS** | pH, **alkalinity bicarbonate**, **calcium, magnesium, hardness** |

Parameters listed in this table had values reported that were equal to or greater than a site-specific benchmark. Parameters in BOLD are instances in which the Department was notified because benchmarks deviations were identified at compliance monitoring locations for two consecutive seasonal (e.g. Q1 2020 and Q1 2021) sampling events. If the location is classified as background or reference, Department notification is not required for an exceedance.
Blank data cells indicate that no benchmark deviations occurred at the location during the specified sampling quarter.
NM = Not measured during the sampling event due to insufficient water volume or frozen conditions.
* Eagle added MER-004 as a monitoring location in 2020, however it is not considered a compliance monitoring location.  No benchmarks have been established due to insufficient data.

**Humboldt Mill 2021**
**Mine Permit Surface Water Quality Monitoring Data**
**MER-001 (Reference - HTDF Subwatershed)**

| Parameter | Unit | MER-001 Seasonal Benchmarks | | | | MER-001 2021 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2021[T] | Q2 2021[T] | Q3 2021[D] | Q4 2021[T] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | **13** | **9.5** | **8.0** | **10** |
| ORP | mV | - | - | - | - | **259** | **265** | **265** | **147** |
| pH | SU | 6.2-7.2 | 5.7-6.7 | 6.1-7.1 | 5.4-6.4 | **6.5** | **6.5** | **6.8** | **6.9** |
| Specific Conductance | uS/cm | - | - | - | - | **39** | **92** | **183** | **108** |
| Temperature | C | - | - | - | - | **0.55** | **11** | **15** | **2.8** |
| Turbidity | NTU | - | - | - | - | **3.0** | **1.5** | **6.0** | **2.7** |
| Flow | cfs | - | - | - | - | **133** | **32** | **32** | **7.2** |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 200 | - | - | - | <50.0 | - |
| Antimony | ug/L | - | - | 3.5 | - | - | - | <1.0 | - |
| Arsenic | ug/L | 3.6 | 4.0 | 2.8 | 1.8 | <1.0 | **1.3** | **2.0** | **1.4** |
| Barium | ug/L | - | - | 11 | - | - | - | **9.2** | - |
| Beryllium | ug/L | - | - | 2.5 | - | - | - | <1.0 | - |
| Boron | ug/L | - | - | 40 | - | - | - | **10** | - |
| Cadmium | ug/L | - | - | 0.08 | - | - | - | <0.030 | - |
| Chromium | ug/L | - | - | 1.1 | - | - | - | <1.0 | - |
| Cobalt | ug/L | - | - | 0.38 | - | - | - | **0.12** | - |
| Copper | ug/L | 0.62 | 0.98 | 0.68 | 1.6 | **0.52** | < 0.5 | < 0.5 | < 0.5 |
| Iron | ug/L | 2413 | 1206 | 3532 | 2136 | **1150** | **1410** | **1800** | **1700** |
| Lead | ug/L | 0.21 | 0.18 | 0.35 | 0.66 | **0.17** | **0.17** | **0.07** | **0.47** |
| Lithium | ug/L | - | - | 32 | - | - | - | <8.0 | - |
| Manganese | ug/L | 149 | 101 | 242 | 124 | **100** | **117** | **121** | **207** |
| Mercury | ng/L | 5.8 | 6.9 | 8.1 | 4.6 | **4.1** | **2.5** | **0.98** | **1.4** |
| Molybdenum | ug/L | - | - | 4 | - | - | - | <1.0 | - |
| Nickel | ug/L | 1.1 | 0.68 | 1.5 | 0.74 | < 0.5 | **0.58** | **0.35** | **0.44** |
| Selenium | ug/L | - | - | 0.13 | - | - | - | **0.18** | - |
| Silver | ug/L | - | - | 0.8 | - | - | - | <0.20 | - |
| Thallium | ug/L | - | - | 1.5 | - | - | - | <1.0 | - |
| Vanadium | ug/L | - | - | 4 | - | - | - | <1.0 | - |
| Zinc | ug/L | 39 | 9.3 | 5.5 | 6.3 | **2.0** | **2.2** | **0.93** | **1.3** |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 41 | 26 | 48 | 24 | **8.8** | **27** | **50** | **38** |
| Alkalinity, Carbonate | mg/L | 8 | 8 | 8 | 8 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 13 | 8.4 | 16 | 14 | **2.3** | **7.0** | **14** | **9.2** |
| Fluoride | mg/L | 0.4 | 0.4 | 0.4 | 0.4 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | **0.03** | <0.025 | <0.025 | **0.03** |
| Nitrogen, Nitrate | mg/L | 0.17 | 2.0 | 2.0 | 2.0 | **0.11** | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 9.0 | 4.0 | 4.0 | 6.4 | **1.6** | **3.5** | **4.7** | **3.8** |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 14 | 7.6 | 15 | 10 | **4.0** | **8.6** | **17** | **11** |
| Magnesium | mg/L | 3.8 | 2.4 | 4.1 | 3.0 | **1.1** | **2.4** | **4.3** | **3.0** |
| Potassium | mg/L | 0.93 | 0.69 | 1.1 | 1.4 | **0.71** | <0.50 | **1.1** | **0.83** |
| Sodium | mg/L | 6.7 | 5.1 | 8.5 | 6.7 | **1.9** | **3.9** | **7.8** | **4.9** |
| General | | | | | | | | | |
| Hardness | mg/L | 51 | 31 | 59 | 44 | **14** | **31** | **60** | **41** |
| Total Dissolved Solids | mg/L | 106 | 113 | 200 | 200 | **32** | **62** | **80** | **48** |
| Total Suspended Solids | mg/L | 3.4 | 7.6 | 13 | 20 | <2.5 | <2.5 | <2.5 | <2.5 |

**Humboldt Mill 2021**
**Mine Permit Surface Water Quality Monitoring Data**
**MER-002 (Compliance HTDF Subwatershed)**

| Parameter | Unit | MER-002 Seasonal Benchmarks | | | | MER-002 2021 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | Q1 2021[D] | Q2 2021[D] | Q3 2021[D] | Q4 2021[D] |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | | | | |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | 12 | 9.5 | 5.1 | 10 |
| ORP | mV | - | - | - | - | 255 | 231 | 72 | 116 |
| pH | SU | 6.2-7.2 | 5.7-6.7 | 5.9-6.9 | 5.3-6.3 | 6.7 | 6.7 | 6.8 | 6.4 |
| Specific Conductance | uS/cm | - | - | - | - | 45 | 100 | 208 | 131 |
| Temperature | C | - | - | - | - | 0.74 | 11 | 17 | 2.9 |
| Turbidity | NTU | - | - | - | - | 3.4 | 5.6 | 13 | 4.1 |
| Flow | cfs | - | - | - | - | 187 | 30 | - | - |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 461 | - | - | - | 195 | - |
| Antimony | ug/L | - | - | 3.5 | - | - | - | <1.0 | - |
| Arsenic | ug/L | 2.8 | 0.6 | 5.3 | 2.1 | <1.0 | 1.6 | 4.5 | 1.8 |
| Barium | ug/L | - | - | 21 | - | - | - | 19 | - |
| Beryllium | ug/L | - | - | 2.5 | - | - | - | <1.0 | - |
| Boron | ug/L | - | - | 40 | - | - | - | 13 | - |
| Cadmium | ug/L | - | - | 0.08 | - | - | - | 0.02 | - |
| Chromium | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Cobalt | ug/L | - | - | 0.4 | - | - | - | 0.79 | - |
| Copper | ug/L | 1.1 | 0.97 | 1.4 | 0.72 | 0.48 | < 0.5 | < 0.5 | < 0.5 |
| Iron | ug/L | 3081 | 1679 | 6901 | 2831 | 1030 | 1670 | 5460 | 2510 |
| Lead | ug/L | 0.34 | 0.19 | 0.34 | 0.15 | 0.15 | 0.16 | 0.21 | 0.09 |
| Lithium | ug/L | - | - | 1.4 | - | - | - | <8.0 | - |
| Manganese | ug/L | 212 | 134 | 628 | 347 | 99 | 146 | 1180 | 242 |
| Mercury | ng/L | 5.1 | 6.6 | 7.5 | 4.3 | 3.8 | 3.3 | 4.2 | 2.1 |
| Molybdenum | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Nickel | ug/L | 1.2 | 0.71 | 2.1 | 0.82 | < 0.5 | 0.61 | 0.65 | 0.60 |
| Selenium | ug/L | - | - | 0.80 | - | - | - | 0.23 | - |
| Silver | ug/L | - | - | 0.80 | - | - | - | <0.20 | - |
| Thallium | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Vanadium | ug/L | - | - | 4.7 | - | - | - | 1.9 | - |
| Zinc | ug/L | 6.3 | 7.6 | 2.0 | 5.3 | 2.1 | 1.3 | 3.1 | 1.0 |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 46 | 25 | 54 | 31 | 10 | 30 | 59 | 41 |
| Alkalinity, Carbonate | mg/L | 8.0 | 4.0 | 8.0 | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 14 | 7.4 | 17 | 18 | 3.1 | 8.0 | 13 | 11 |
| Fluoride | mg/L | 0.40 | 0.40 | 0.40 | 0.40 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | 0.04 | <0.025 | 0.05 | 0.05 |
| Nitrogen, Nitrate | mg/L | 0.52 | 0.21 | 2.0 | 2.0 | 0.11 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 14 | 7.9 | 16 | 4.0 | 1.9 | 5.2 | 7.5 | 6.7 |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 17 | 9.2 | 18 | 15 | 4.3 | 9.8 | 20 | 13 |
| Magnesium | mg/L | 4.6 | 2.7 | 5.2 | 4.1 | 1.2 | 2.7 | 5.1 | 3.5 |
| Potassium | mg/L | 1.3 | 0.68 | 1.4 | 1.6 | 0.78 | 0.54 | 1.4 | 0.98 |
| Sodium | mg/L | 8.5 | 5.1 | 9.9 | 9.1 | 2.4 | 4.7 | 8.9 | 6.2 |
| General | | | | | | | | | |
| Hardness | mg/L | 60 | 34 | 70 | 53 | 16 | 36 | 72 | 47 |
| Total Dissolved Solids | mg/L | 210 | 104 | 200 | 200 | 26 | 55 | 102 | 58 |
| Total Suspended Solids | mg/L | 5.6 | 7.8 | 21 | 123 | 3 | <10.6 | 15 | 3.4 |

**Humboldt Mill 2021**
**Mine Permit Surface Water Quality Monitoring Data**
**MER-003 (Compliance - HTDF Subwatershed)**

| Parameter | Unit | MER-003 Seasonal Benchmarks | | | | MER-003 2021 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2021[D] | Q2 2021[T] | Q3 2021[D] | Q4 2021[D] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | **12** | **9.3** | **6.8** | **11** |
| ORP | mV | - | - | - | - | **237** | **222** | **137** | **138** |
| pH | SU | 6.3-7.3 | 5.6-6.6 | 5.7-6.7 | 5.4-6.4 | **6.8** | **6.5** | **7.0** | **6.6** |
| Specific Conductance | uS/cm | - | - | - | - | **66** | **110** | **213** | **385** |
| Temperature | C | - | - | - | - | **0.89** | **10** | **17** | **4.4** |
| Turbidity | NTU | - | - | - | - | **3.6** | **2.1** | **7.5** | **3.9** |
| Flow | cfs | - | - | - | - | **184** | **29** | **5.0** | **13** |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 200 | - | - | - | <50.0 | - |
| Antimony | ug/L | - | - | 3.5 | - | - | - | <1.0 | - |
| Arsenic | ug/L | 2.6 | 1.8 | 2.6 | 2.7 | <1.0 | **1.6** | **2.9** | **1.6** |
| Barium | ug/L | - | - | 15 | - | - | - | **13** | - |
| Beryllium | ug/L | - | - | 2.5 | - | - | - | <1.0 | - |
| Boron | ug/L | - | - | 18 | - | - | - | **15** | - |
| Cadmium | ug/L | - | - | 0.08 | - | - | - | <0.03 | - |
| Chromium | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Cobalt | ug/L | - | - | 0.4 | - | - | - | **0.31** | - |
| Copper | ug/L | 2.9 | 0.97 | 0.65 | 0.67 | **0.40** | < 0.50 | < 0.50 | < 0.50 |
| Iron | ug/L | 3007 | 1873 | 3749 | 3493 | **1080** | **1810** | **3260** | **2090** |
| Lead | ug/L | 0.35 | 0.24 | 0.18 | 1.9 | **0.16** | **0.16** | **0.05** | **0.07** |
| Lithium | ug/L | - | - | 32 | - | - | - | <8.0 | - |
| Manganese | ug/L | 223 | 157 | 273 | 326 | **102** | **150** | **557** | **263** |
| Mercury | ng/L | 5.2 | 6.7 | 7.2 | 7.0 | **3.8** | **3.1** | **1.4** | **1.6** |
| Molybdenum | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Nickel | ug/L | 1.5 | 1.2 | 1.8 | 1.5 | **0.28** | **0.73** | **0.63** | **3.8** |
| Selenium | ug/L | - | - | 0.28 | - | - | - | **0.12** | - |
| Silver | ug/L | - | - | 0.80 | - | - | - | <0.20 | - |
| Thallium | ug/L | - | - | 1.5 | - | - | - | <1.0 | - |
| Vanadium | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Zinc | ug/L | 7.5 | 8.5 | 2.7 | 13 | **2.0** | **1.4** | <1.0 | <1.0 |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 50 | 31 | 58 | 33 | **11** | **32** | **57** | **47** |
| Alkalinity, Carbonate | mg/L | 8.0 | 8.0 | 8.0 | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 15 | 11 | 23 | 21 | **4.2** | **10** | **16** | **21** |
| Fluoride | mg/L | 0.20 | 0.50 | 0.40 | 0.40 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | **0.06** | <0.03 | **0.05** | **0.32** |
| Nitrogen, Nitrate | mg/L | 0.2 | 2.0 | 2.0 | 2.0 | **0.12** | <0.10 | <0.10 | **0.10** |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 17 | 15 | 21 | 26 | **7.0** | **5.1** | **9.4** | **84** |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 17 | 11 | 18 | 13 | **4.4** | **10** | **19** | **16** |
| Magnesium | mg/L | 4.7 | 3.3 | 5.8 | 4.2 | **1.3** | **2.9** | **4.9** | **5.6** |
| Potassium | mg/L | 1.3 | 0.94 | 1.7 | 1.7 | **0.83** | **0.58** | **1.3** | **2.7** |
| Sodium | mg/L | 8.8 | 7.4 | 12 | 9.3 | **5.5** | **6.2** | **10** | **45** |
| General | | | | | | | | | |
| Hardness | mg/L | 63 | 38 | 78 | 57 | **17** | **38** | **69** | **62** |
| Total Dissolved Solids | mg/L | 134 | 54 | 200 | 200 | **44** | **59** | **108** | **189** |
| Total Suspended Solids | mg/L | 4.0 | 9.8 | 13 | 20 | **3.0** | <2.5 | <2.7 | <2.5 |

**Humboldt Mill 2021**
**Mine Permit Surface Water Quality Monitoring Data**
**MER-004 (Monitoring - HTDF Subwatershed)**

| Parameter | Unit | MER-004 Seasonal Benchmark* | MER-004 2021 Quarterly Benchmark | | | |
|---|---|---|---|---|---|---|
| | | | Q1 2020[D] | Q2 2020[T] | Q3 2020[D] | Q4 2020[D] |
| Field | | | | | | |
| D.O. | ppm | - | **13** | **9.4** | **6.6** | **10** |
| ORP | mV | - | **244** | **191** | **98** | **138** |
| pH | SU | - | **6.5** | **6.4** | **7.4** | **6.5** |
| Specific Conductance | uS/m | - | **63** | **105** | **218** | **366** |
| Temperature | C | - | **0.90** | **11** | **20** | **3.9** |
| Turbidity | NTU | - | **3.6** | **2.0** | **12** | **4.2** |
| Flow | cfs | - | **-** | **29** | **5.8** | **9.2** |
| Metals | | | | | | |
| Aluminum | ug/L | - | - | - | **338** | **-** |
| Antimony | ug/L | - | - | - | <1.0 | - |
| Arsenic | ug/L | - | <1.0 | **1.6** | **4.5** | **1.6** |
| Barium | ug/L | - | - | - | **17** | **-** |
| Beryllium | ug/L | - | - | - | <1.0 | - |
| Boron | ug/L | - | - | - | **15** | **-** |
| Cadmium | ug/L | - | - | - | **0.03** | **-** |
| Chromium | ug/L | - | - | - | **1.2** | **-** |
| Cobalt | ug/L | - | - | - | **0.57** | **-** |
| Copper | ug/L | - | **0.46** | <0.50 | **0.45** | < 0.50 |
| Iron | ug/L | - | **1120** | **1760** | **5260** | **2030** |
| Lead | ug/L | - | **0.19** | **0.17** | **0.72** | **0.09** |
| Lithium | ug/L | - | - | - | <8.0 | - |
| Manganese | ug/L | - | **103** | **145** | **670** | **276** |
| Mercury | ng/L | - | **3.9** | **3.5** | **5.3** | **1.6** |
| Molybdenum | ug/L | - | - | - | <1.0 | - |
| Nickel | ug/L | - | **0.36** | **0.73** | **1.2** | **3.7** |
| Selenium | ug/L | - | - | - | **0.05** | **-** |
| Silver | ug/L | - | - | - | <0.20 | - |
| Thallium | ug/L | - | - | - | <1.0 | - |
| Vanadium | ug/L | - | - | - | **3.1** | **-** |
| Zinc | ug/L | - | **2.3** | **1.3** | **4.7** | **0.87** |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | - | **10** | **31** | **56** | **46** |
| Alkalinity, Carbonate | mg/L | - | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | - | **4.0** | **9.2** | **15** | **21** |
| Fluoride | mg/L | - | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Ammonia | mg/L | - | **0.06** | <0.03 | **0.04** | **0.32** |
| Nitrogen, Nitrate | mg/L | - | **0.11** | <0.10 | **0.12** | <0.10 |
| Nitrogen, Nitrite | mg/L | - | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | - | **6.8** | **5.1** | **7.7** | **83** |
| Sulfide | mg/L | - | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | - | **4.5** | **10** | **20** | **15** |
| Magnesium | mg/L | - | **1.4** | **2.9** | **5.1** | **5.6** |
| Potassium | mg/L | - | **0.84** | **0.59** | **1.4** | **2.8** |
| Sodium | mg/L | - | **5.2** | **5.4** | **9.9** | **45** |
| General | | | | | | |
| Hardness | mg/L | - | **17** | **38** | **71** | **61** |
| Total Dissolved Solids | mg/L | - | **46** | **63** | **109** | **196** |
| Total Suspended Solids | mg/L | - | **3.0** | <2.5 | **21** | <2.6 |

*Seasonal benchmarks are not calculated for this location due to insufficient data available.

**Humboldt Mill 2021**
**Mine Permit Surface Water Quality Monitoring Data**
**WBR-001 (Reference Mill Subwatershed)**

| Parameter | Unit | WBR-001 Seasonal Benchmarks | | | | WBR-001 2021 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2021[D] | Q2 2021[D] | Q3 2021[D] | Q4 2021[T] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | 10 | 7.6 | 3.2 | 8.6 |
| ORP | mV | - | - | - | - | 241 | 268 | 120 | 264 |
| pH | SU | 4.97-5.97 | 4.7-5.7 | 5.7-6.7 | 4.6-5.6 | 6.3 | 6.6 | 6.2 | 5.8 |
| Specific Conductance | uS/cm | - | - | - | - | 41 | 85 | 117 | 83 |
| Temperature | C | - | - | - | - | 1.3 | 8.8 | 15 | 2.9 |
| Turbidity | NTU | - | - | - | - | 6.2 | 6.4 | 12 | 0.36 |
| Flow | cfs | - | - | - | - | - | - | - | - |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 200 | - | - | - | 355 | - |
| Antimony | ug/L | - | - | 3.5 | - | - | - | <1.0 | - |
| Arsenic | ug/L | 6.6 | 1.8 | 3.2 | 1.5 | <1.0 | 2.3 | 5.1 | 1.0 |
| Barium | ug/L | - | - | 17 | - | - | - | 24 | - |
| Beryllium | ug/L | - | - | 2.5 | - | - | - | <1.0 | - |
| Boron | ug/L | - | - | 40 | - | - | - | <10.0 | - |
| Cadmium | ug/L | - | - | 0.08 | - | - | - | 0.04 | - |
| Chromium | ug/L | - | - | 1.6 | - | - | - | 1.3 | - |
| Cobalt | ug/L | - | - | 0.4 | - | - | - | 2.2 | - |
| Copper | ug/L | 3.3 | 1.1 | 1.4 | 0.66 | 0.40 | <0.5 | 0.97 | < 0.5 |
| Iron | ug/L | 11518 | 1759 | 4873 | 1900 | 1330 | 2490 | 6760 | 1200 |
| Lead | ug/L | 4.3 | 1.1 | 2.3 | 1.3 | 0.63 | 0.99 | 2.3 | 0.35 |
| Lithium | ug/L | - | - | 32 | - | - | - | <8.0 | - |
| Manganese | ug/L | 363 | 106 | 770 | 122 | 223 | 251 | 2690 | 172 |
| Mercury | ng/L | 15 | 11 | 16 | 11 | 2.8 | 4.0 | 9.7 | 3.1 |
| Molybdenum | ug/L | - | - | 4 | - | - | - | <1.0 | - |
| Nickel | ug/L | 3.1 | 0.97 | 3.0 | 0.98 | < 0.50 | 0.90 | 1.7 | 0.59 |
| Selenium | ug/L | - | - | 0.28 | - | - | - | 0.33 | - |
| Silver | ug/L | - | - | 0.8 | - | - | - | <0.20 | - |
| Thallium | ug/L | - | - | 1.5 | - | - | - | <1.0 | - |
| Vanadium | ug/L | - | - | 1.7 | - | - | - | 1.8 | - |
| Zinc | ug/L | 16 | 12 | 13 | 8.2 | 6.0 | 9.7 | 11 | 7.2 |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 9 | 5 | 16 | 6 | 2.4 | 6.6 | 24 | 4.8 |
| Alkalinity, Carbonate | mg/L | 8.0 | 8.0 | 8.0 | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 24 | 25 | 28 | 23 | 6.3 | 20 | 16 | 17 |
| Fluoride | mg/L | 0.40 | 0.40 | 0.40 | 0.40 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | 0.10 | 0.04 | 0.23 | 0.04 |
| Nitrogen, Nitrate | mg/L | 0.24 | 2.0 | 2.0 | 2.0 | 0.15 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 11 | 4.0 | 4.0 | 4.0 | 1.00 | <1.0 | <1.0 | <1.0 |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 7.6 | 4.8 | 7.9 | 5.6 | 2.4 | 4.5 | 7.8 | 4.3 |
| Magnesium | mg/L | 3.0 | 1.9 | 3.1 | 2.5 | <1.0 | 1.7 | 2.8 | 1.7 |
| Potassium | mg/L | 2.7 | 0.94 | 1.6 | 1.6 | 1.4 | 0.66 | 0.99 | 0.71 |
| Sodium | mg/L | 11 | 12 | 13 | 11 | 4.1 | 8.6 | 8.1 | 7.2 |
| General | | | | | | | | | |
| Hardness | mg/L | 37 | 21 | 39 | 39 | 0.99 | 19 | 31 | 18 |
| Total Dissolved Solids | mg/L | 211 | 211 | 200 | 200 | 50 | 66 | 155 | 59 |
| Total Suspended Solids | mg/L | 55 | 13 | 13 | 13 | <2.5 | 5.0 | 18 | <2.5 |

**Humboldt Mill 2021**
**Mine Permit Surface Water Quality Monitoring Data**
**WBR-002 (Compliance - Mill Subwatershed)**

| Parameter | Unit | WBR-002 Seasonal Benchmarks | | | | WBR-002 2021 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2021[D] | Q2 2021[D] | Q3 2021[D] | Q4 2021[D] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | **7.1** | **9.1** | **3.01** | **8.4** |
| ORP | mV | - | - | - | - | **55** | **250** | **-45.9** | **175** |
| pH | SU | 5.9-6.9 | 6.04-6.94 | 6.2-7.2 | 5.4-6.4 | **6.5** | **6.2** | **6.24** | **5.8** |
| Specific Conductance | uS/cm | - | - | - | - | **145** | **152** | **264.1** | **264** |
| Temperature | C | - | - | - | - | **2.7** | **16** | **16.12** | **4.3** |
| Turbidity | NTU | - | - | - | - | **28** | **7.1** | **55.76** | **13** |
| Flow | cfs | - | - | - | - | **4.0** | **0.60** | **0.03** | **-** |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 200 | - | - | - | **107** | - |
| Antimony | ug/L | - | - | 3.5 | - | - | - | <1.0 | - |
| Arsenic | ug/L | 7.1 | 3.0 | 7.2 | 4.6 | **3.9** | **2.6** | **21.9** | **7.5** |
| Barium | ug/L | - | - | 16 | - | - | - | **23.5** | - |
| Beryllium | ug/L | - | - | 2.5 | - | - | - | <1.0 | - |
| Boron | ug/L | - | - | 18 | - | - | - | **16.7** | - |
| Cadmium | ug/L | - | - | 0.08 | - | - | - | <0.030 | - |
| Chromium | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Cobalt | ug/L | - | - | 0.69 | - | - | - | **0.28** | - |
| Copper | ug/L | 1.4 | 2.5 | 1.9 | 2.0 | **0.72** | <0.5 | < 0.5 | < 0.5 |
| Iron | ug/L | 16421 | 4819 | 12928 | 9123 | **7440** | **4140** | **17200** | **7740** |
| Lead | ug/L | 0.44 | 0.55 | 0.49 | 0.61 | **0.35** | **0.16** | **0.199** | **0.19** |
| Lithium | ug/L | - | - | 32 | - | - | - | <8.0 | - |
| Manganese | ug/L | 1550 | 262 | 709 | 458 | **490** | **89** | **1360** | **555** |
| Mercury | ng/L | 4.5 | 3.6 | 3.0 | 4.7 | **1.0** | **1.7** | **0.8** | **0.67** |
| Molybdenum | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Nickel | ug/L | 3.3 | 2.5 | 2.6 | 3.2 | **0.77** | **1.1** | **0.55** | **0.71** |
| Selenium | ug/L | - | - | 0.28 | - | - | - | **0.2** | - |
| Silver | ug/L | - | - | 0.80 | - | - | - | <0.20 | - |
| Thallium | ug/L | - | - | 1.5 | - | - | - | <1.0 | - |
| Vanadium | ug/L | - | - | 4.0 | - | - | - | **2.1** | - |
| Zinc | ug/L | 20 | 25 | 2.5 | 4.8 | **2.7** | **2.0** | **103** | < 1.0 |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 105 | 18 | 38 | 20 | **15** | **21** | **41.2** | **34** |
| Alkalinity, Carbonate | mg/L | 8.0 | 8.0 | 8.0 | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 60 | 42 | 48 | 59 | **25** | **29** | **30.8** | **36** |
| Fluoride | mg/L | 0.29 | 0.40 | 0.40 | 0.40 | <0.10 | <0.10 | **0.15** | <0.10 |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | **0.17** | <0.03 | **0.63** | **0.24** |
| Nitrogen, Nitrate | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 10 | 9.1 | 4.0 | 4.0 | **1.7** | **2.0** | <1.0 | <1.0 |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 13 | 7.0 | 9.7 | 9.8 | **5.4** | **6.4** | **10.4** | **8.9** |
| Magnesium | mg/L | 5.9 | 3.5 | 4.5 | 5.1 | **2.5** | **3.1** | **3.9** | **3.9** |
| Potassium | mg/L | 2.6 | 2.0 | 1.4 | 2.1 | **1.6** | **1.9** | **2.1** | **2.1** |
| Sodium | mg/L | 28 | 22 | 25 | 27 | **15** | **17** | **18.6** | **20** |
| General | | | | | | | | | |
| Hardness | mg/L | 57 | 33 | 46 | 44 | **24** | **29** | **42** | **38** |
| Total Dissolved Solids | mg/L | 170 | 278 | 200 | 200 | **94** | **73** | **131** | **104** |
| Total Suspended Solids | mg/L | 13 | 13 | 32 | 16 | **18** | **6.0** | **37.0** | **7.2** |

al

**Humboldt Mill 2021**
**Mine Permit Surface Water Quality Monitoring Data**
**WBR-003 (Compliance - Mill Subwatershed)**

| Parameter | Unit | WBR-003 Seasonal Benchmarks | | | | WBR-003 2021 Quarterly Data | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q1 | Q2 | Q3 | Q4 | | | | |
| | | Winter Baseflow | Spring Snowmelt & Runoff | Summer Baseflow | Fall Rain | Q1 2021[D] | Q2 2021[D] | Q3 2021[D] | Q4 2021[D] |
| Field | | | | | | | | | |
| D.O. | ppm | - | - | - | - | **8.0** | **4.2** | **1.3** | **6.8** |
| ORP | mV | - | - | - | - | **266** | **236** | **16** | **46** |
| pH | SU | 5.8-6.8 | 5.8-6.8 | 6.2-7.2 | 4.9-5.9 | **6.0** | **5.9** | **6.2** | **6.3** |
| Specific Conductance | uS/m | - | - | - | - | **118** | **146** | **205** | **143** |
| Temperature | C | - | - | - | - | **0.79** | **12** | **15** | **2.6** |
| Turbidity | NTU | - | - | - | - | **13** | **9.0** | **167** | **10** |
| Flow | cfs | - | - | - | - | **10** | **0.36** | **-** | **-** |
| Metals | | | | | | | | | |
| Aluminum | ug/L | - | - | 200 | - | - | - | **110** | **-** |
| Antimony | ug/L | - | - | 3.5 | - | - | - | <1.0 | - |
| Arsenic | ug/L | 4.0 | 1.7 | 6.3 | 2.1 | **2.2** | **3.7** | **7.1** | <1.0 |
| Barium | ug/L | - | - | 27 | - | - | - | **21** | **-** |
| Beryllium | ug/L | - | - | 2.5 | - | - | - | <1.0 | - |
| Boron | ug/L | - | - | 13 | - | - | - | **16** | **-** |
| Cadmium | ug/L | - | - | 0.08 | - | - | - | <0.03 | - |
| Chromium | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Cobalt | ug/L | - | - | 2.6 | - | - | - | **0.79** | **-** |
| Copper | ug/L | 0.67 | 0.74 | 0.20 | 1.1 | **0.46** | <0.50 | < 0.50 | < 0.50 |
| Iron | ug/L | 12988 | 5033 | 19898 | 4248 | **5240** | **9140** | **19800** | **2920** |
| Lead | ug/L | 0.40 | 0.26 | 0.29 | 0.28 | **0.24** | **0.25** | **0.25** | **0.06** |
| Lithium | ug/L | - | - | 32 | - | - | - | <8.0 | - |
| Manganese | ug/L | 2261 | 374 | 2794 | 235 | **488** | **578** | **1360** | **150** |
| Mercury | ng/L | 6.1 | 3.4 | 5.7 | 6.9 | **2.0** | **1.9** | **1.1** | **0.72** |
| Molybdenum | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Nickel | ug/L | 3.5 | 1.8 | 2.4 | 1.7 | **0.47** | **1.6** | **0.78** | **0.54** |
| Selenium | ug/L | - | - | 0.28 | - | - | - | **0.13** | **-** |
| Silver | ug/L | - | - | 0.80 | - | - | - | <0.20 | - |
| Thallium | ug/L | - | - | 1.5 | - | - | - | <1.0 | - |
| Vanadium | ug/L | - | - | 4.0 | - | - | - | <1.0 | - |
| Zinc | ug/L | 17 | 15 | 4.5 | 18 | **2.7** | **5.3** | **3.3** | <1.0 |
| Major Anions | | | | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 51 | 34 | 88 | 22 | **22** | **42** | **64** | **43** |
| Alkalinity, Carbonate | mg/L | 8.0 | 8.0 | 8.0 | 8.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 43 | 32 | 42 | 37 | **17** | **16** | **14** | **14** |
| Fluoride | mg/L | 0.30 | 0.34 | 0.19 | 0.40 | <0.10 | **0.11** | **0.16** | **0.12** |
| Nitrogen, Ammonia | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | **0.15** | <0.03 | **0.25** | **0.05** |
| Nitrogen, Nitrate | mg/L | 0.26 | 2.0 | 2.0 | 2.0 | <0.10 | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 2.0 | 2.0 | 2.0 | 2.0 | <0.10 | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 17 | 20 | 4.0 | 4.0 | **1.4** | <1.0 | <1.0 | **3.4** |
| Sulfide | mg/L | 20 | 20 | 20 | 20 | <0.20 | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | | | | |
| Calcium | mg/L | 15 | 11 | 24 | 8.4 | **6.0** | **12** | **16** | **11** |
| Magnesium | mg/L | 6.1 | 4.5 | 9.6 | 3.9 | **2.6** | **4.8** | **5.4** | **4.6** |
| Potassium | mg/L | 2.2 | 1.7 | 2.3 | 2.7 | **1.7** | **1.0** | **0.85** | **1.2** |
| Sodium | mg/L | 20 | 15 | 22 | 20 | **11** | **10** | **9.8** | **8.2** |
| General | | | | | | | | | |
| Hardness | mg/L | 64 | 43 | 109 | 36 | **26** | **51** | **61** | **46** |
| Total Dissolved Solids | mg/L | 177 | 120 | 200 | 200 | **78** | **93** | **125** | **63** |
| Total Suspended Solids | mg/L | 19 | 9.8 | 27 | 13 | **8.0** | **22** | **38** | **3.5** |

* - Lowest achievable Reporting Limit by laboratory due to matrix interference

**Humboldt Mill 2021**
**Mine Permit Surface Water Quality Monitoring Data**
**HMWQ-004 (Compliance - Mill Subwatershed)**

| Parameter | Unit | HMWQ-004 Seasonal Benchmark* | HMWQ-004 2021 Quarterly Data | | | |
|---|---|---|---|---|---|---|
| | | | Q1 2021 | Q2 2021 | Q3 2021 | Q4 2021 |
| Field | | | | | | |
| D.O. | ppm | - | NM | NM | NM | NM |
| ORP | mV | - | NM | NM | NM | NM |
| pH | SU | 5.69-6.69 | NM | NM | NM | NM |
| Specific Conductance | uS/m | - | NM | NM | NM | NM |
| Temperature | C | - | NM | NM | NM | NM |
| Turbidity | NTU | - | NM | NM | NM | NM |
| Flow | cfs | - | - | - | - | - |
| Metals | | | | | | |
| Aluminum | ug/L | 200 (p) | NM | NM | NM | NM |
| Antimony | ug/L | 2.3 | NM | NM | NM | NM |
| Arsenic | ug/L | 35 | NM | NM | NM | NM |
| Barium | ug/L | 118 | NM | NM | NM | NM |
| Beryllium | ug/L | 4.0 (p) | NM | NM | NM | NM |
| Boron | ug/L | 36 | NM | NM | NM | NM |
| Cadmium | ug/L | 0.10 | NM | NM | NM | NM |
| Chromium | ug/L | 14 | NM | NM | NM | NM |
| Cobalt | ug/L | 3.0 | NM | NM | NM | NM |
| Copper | ug/L | 11 | NM | NM | NM | NM |
| Iron | ug/L | 73409 | NM | NM | NM | NM |
| Lead | ug/L | 2.1 | NM | NM | NM | NM |
| Lithium | ug/L | 16 | NM | NM | NM | NM |
| Manganese | ug/L | 2541 | NM | NM | NM | NM |
| Mercury | ng/L | 43 | NM | NM | NM | NM |
| Molybdenum | ug/L | 4.7 | NM | NM | NM | NM |
| Nickel | ug/L | 5.6 | NM | NM | NM | NM |
| Selenium | ug/L | 0.44 | NM | NM | NM | NM |
| Silver | ug/L | 0.35 | NM | NM | NM | NM |
| Thallium | ug/L | 4.0 (p) | NM | NM | NM | NM |
| Vanadium | ug/L | 39 | NM | NM | NM | NM |
| Zinc | ug/L | 44 | NM | NM | NM | NM |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 68 | NM | NM | NM | NM |
| Alkalinity, Carbonate | mg/L | 8.0 (p) | NM | NM | NM | NM |
| Chloride | mg/L | 68 | NM | NM | NM | NM |
| Fluoride | mg/L | 0.23 | NM | NM | NM | NM |
| Nitrogen, Ammonia | mg/L | 1.9 | NM | NM | NM | NM |
| Nitrogen, Nitrate | mg/L | 2.0 (p) | NM | NM | NM | NM |
| Nitrogen, Nitrite | mg/L | 2.0 (p) | NM | NM | NM | NM |
| Sulfate | mg/L | 4.0 (p) | NM | NM | NM | NM |
| Sulfide | mg/L | 20 (p) | NM | NM | NM | NM |
| Major Cations | | | | | | |
| Calcium | mg/L | 21 | NM | NM | NM | NM |
| Magnesium | mg/L | 8.1 | NM | NM | NM | NM |
| Potassium | mg/L | 3.3 | NM | NM | NM | NM |
| Sodium | mg/L | 49 | NM | NM | NM | NM |
| General | | | | | | |
| Hardness | mg/L | 88 | NM | NM | NM | NM |
| Total Dissolved Solids | mg/L | 209 | NM | NM | NM | NM |
| Total Suspended Solids | mg/L | 353 | NM | NM | NM | NM |

*Seasonal benchmarks are not calculated for this location due to insufficient data available.

**Humbold Mill 2021**
**Mine Permit Surface Water Quality Monitoring Data**
**HMP-009 (Compliance - HTDF Subwatershed - Wetland EE)**

| Parameter | Unit | HMP-009 Seasonal Benchmark* | HMP-009 2021 Quarterly Benchmark | | | |
|---|---|---|---|---|---|---|
| | | | Q1 2021 | Q2 2021[D] | Q3 2021[D] | Q4 2021[D] |
| Field | | | | | | |
| D.O. | ppm | - | NM | **7.5** | **2.6** | **7.7** |
| ORP | mV | - | NM | **198** | **-60** | **90** |
| pH | SU | 6.6-7.6 | NM | **6.5** | **7.0** | **6.4** |
| Specific Conductance | uS/m | - | NM | **148** | **238** | **142** |
| Temperature | C | - | NM | **7.3** | **17** | **2.8** |
| Turbidity | NTU | - | NM | **60** | **52** | **14** |
| Flow | cfs | - | - | - | - | - |
| Elevation | ft MSL | - | NM | **1534.18** | **1534.66** | **1534.53** |
| Metals | | | | | | |
| Aluminum | ug/L | - | NM | - | **233** | - |
| Antimony | ug/L | - | NM | - | **1.5** | - |
| Arsenic | ug/L | 6.0 | NM | **3.6** | **1.9** | **1.3** |
| Barium | ug/L | - | NM | - | **14** | - |
| Beryllium | ug/L | - | NM | - | <1.0 | - |
| Boron | ug/L | - | NM | - | **15** | - |
| Cadmium | ug/L | - | NM | - | <0.03 | - |
| Chromium | ug/L | - | NM | - | <1.0 | - |
| Cobalt | ug/L | - | NM | - | **0.35** | - |
| Copper | ug/L | 1300 | NM | **17** | **2.5** | |
| Iron | ug/L | 1759 | NM | **11** | **2960** | **1900** |
| Lead | ug/L | 6.4 | NM | **2.3** | **0.62** | |
| Lithium | ug/L | - | NM | - | <8.0 | - |
| Manganese | ug/L | 856 | NM | **220** | **75** | |
| Mercury | ng/L | 1.2 | NM | **3.7** | **1.1** | **4.5** |
| Molybdenum | ug/L | - | NM | - | **1.8** | - |
| Nickel | ug/L | 172 | NM | **26** | **6.5** | |
| Selenium | ug/L | - | NM | - | **0.15** | - |
| Silver | ug/L | - | NM | - | <0.20 | - |
| Thallium | ug/L | - | NM | - | <1.0 | - |
| Vanadium | ug/L | - | NM | - | **1.2** | - |
| Zinc | ug/L | 64 | NM | **10** | **2.5** | |
| Major Anions | | | | | | |
| Alkalinity, Bicarbonate | mg/L | 101 | NM | **63** | **63** | **41** |
| Alkalinity, Carbonate | mg/L | 8 | NM | <2.0 | <2.0 | <2.0 |
| Chloride | mg/L | 37 | NM | **5.5** | **13** | **12** |
| Fluoride | mg/L | 2.7 | NM | <0.10 | <0.10 | <0.10 |
| Nitrogen, Ammonia | mg/L | 2.0 | NM | <0.03 | <0.03 | <0.03 |
| Nitrogen, Nitrate | mg/L | 0.16 | NM | <0.10 | <0.10 | <0.10 |
| Nitrogen, Nitrite | mg/L | 2.0 | NM | <0.10 | <0.10 | <0.10 |
| Sulfate | mg/L | 207 | NM | **2.1** | **5.4** | **8.2** |
| Sulfide | mg/L | 20 | NM | <0.20 | <0.20 | <0.20 |
| Major Cations | | | | | | |
| Calcium | mg/L | 77 | NM | **18** | **20** | **14** |
| Magnesium | mg/L | 66 | NM | **6.4** | **5.4** | **4.0** |
| Potassium | mg/L | 87 | NM | **1.2** | **1.3** | **1.2** |
| Sodium | mg/L | 37 | NM | **5.2** | **8.6** | **6.7** |
| General | | | | | | |
| Hardness | mg/L | 342 | NM | **71** | **72** | **52** |
| Total Dissolved Solids | mg/L | 529 | NM | **88** | **115** | **69** |
| Total Suspended Solids | mg/L | 13 | NM | **346** | **52** | **15** |

* - Recommended Benchmarks are for Q2 - Insufficient Q4 Data to Develop Benchmarks

**Humboldt Mill 2021**
**Mine Permit Surface Water Quality Monitoring Data**
**Abbreviations and Data Qualifiers**

| **Notes:** |
|---|
| Benchmarks are calculated based on guidance from Eagles Mine's Development of Site Specific Benchmarks for Mine Permit Water Quality Monitoring. |
| Results in **bold** text indicate that the parameter was detected at a level greater than the laboratory reporting limit. |
| Highlighted Cell = Value is equal to or above site-specific benchmark. An exceedance occurs if there are 2 consecutive sampling events with a value equal to or greater than the benchmark at a compliance monitoring location. |
| (p) = Due to less than two detections in baseline dataset, benchmark defaulted to four times the reporting limit. |
| --Denotes no benchmark required or parameter was not required to be collected during the sampling quarter. |
| e = estimated value. The laboratory statement of data qualifications indicates that a quality control limit for this parameter was exceeded. |
| NM = Not measured. |
| T = Samples not filtered and all values are total concentrations. |
| D = Sample for metal and major cation parameters was filtered and values are dissolved concentrations. |

# Appendix J

# Humboldt Mill

# Surface Water Trend Analysis Summary

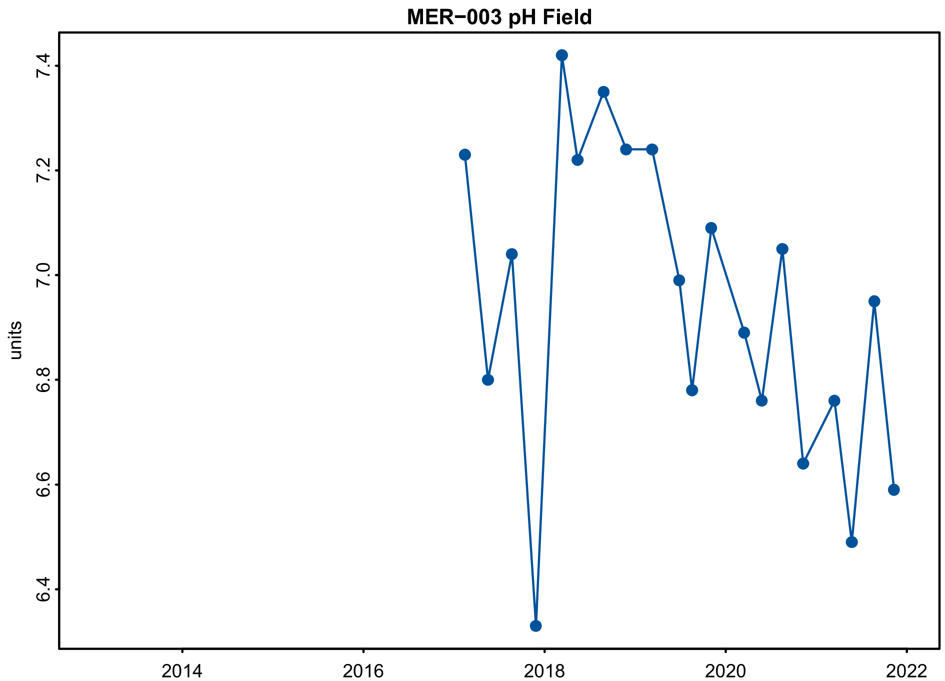
## 2021 Surface Water Trend Analysis
## Humboldt Mill

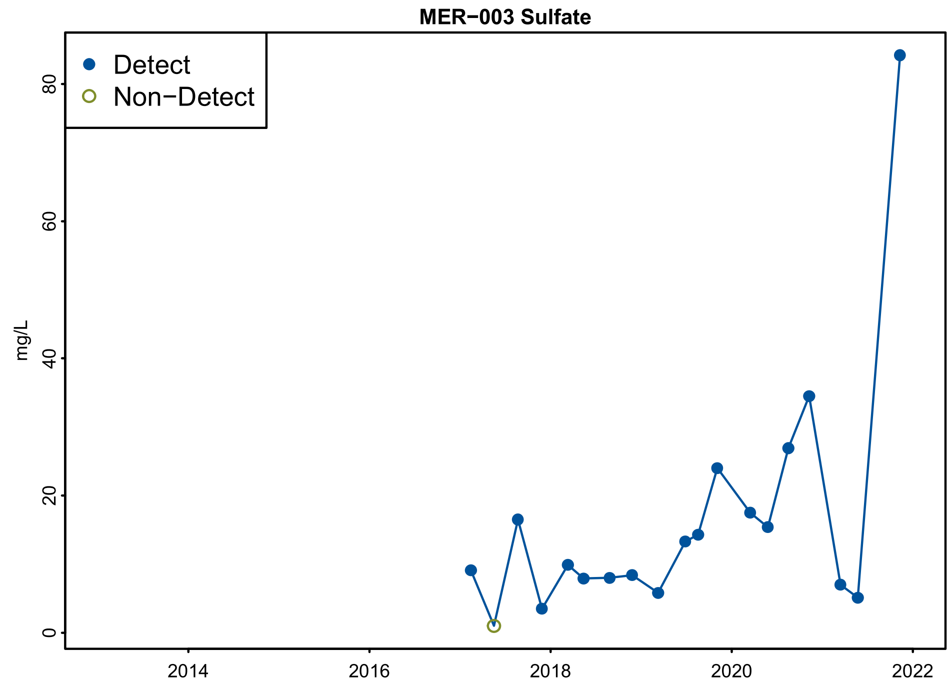
| Location | Parameter | Number of Samples | Number of Detects | Percent Detected | Minimum | Maximum | Mean | Median | Standard Deviation | Coefficient of Variation | M-K Test Value (S) | Approximate p-value | Trend at 95% Confidence | Theil-Sen Slope | Theil-Sen Slope, yearly |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HMP-009 | Alkalinity, bicarbonate | 7 | 7 | 100% | 21.3 | 63.2 | 45.9 | 52.7 | 17.37 | 0.38 | 5 | 0.548 | no trend | 9.54E-08 | 3.01 |
| HMP-009 | Calcium | 7 | 7 | 100% | 6.7 | 44.9 | 20.64 | 17.8 | 13.80 | 0.67 | -1 | 1.000 | no trend | -2.52E-08 | -0.79 |
| HMP-009 | Chloride | 7 | 7 | 100% | 5.5 | 32.4 | 12.7 | 10.4 | 9.41 | 0.74 | -5 | 0.548 | no trend | -4.83E-08 | -1.53 |
| HMP-009 | Hardness | 7 | 7 | 100% | 17.3 | 138 | 57.99 | 51.7 | 41.12 | 0.71 | -4 | 0.649 | no trend | -2.70E-07 | -8.53 |
| HMP-009 | Iron | 7 | 7 | 100% | 0.0109 | 163 | 24.52 | 1.28 | 61.07 | 2.49 | -3 | 0.764 | no trend | -2.25E-08 | -0.71 |
| HMP-009 | Magnesium | 7 | 7 | 100% | 2.2 | 14.9 | 7.157 | 5.5 | 5.36 | 0.75 | 1 | 1.000 | no trend | 4.66E-09 | 0.15 |
| HMP-009 | Manganese | 7 | 7 | 100% | 0.0149 | 0.22 | 0.078 | 0.0688 | 0.07 | 0.90 | -3 | 0.764 | no trend | -3.31E-10 | -0.01 |
| HMP-009 | pH, Field | 8 | 8 | 100% | 6.4 | 7.28 | 6.798 | 6.875 | 0.33 | 0.05 | -8 | 0.386 | no trend | -4.31E-09 | -0.14 |
| HMP-009 | Potassium | 7 | 7 | 100% | 0.7 | 7.9 | 2.131 | 1.2 | 2.57 | 1.21 | -2 | 0.879 | no trend | -2.84E-09 | -0.09 |
| HMP-009 | Sodium | 7 | 7 | 100% | 4.1 | 39.7 | 12.17 | 6.7 | 12.70 | 1.04 | -1 | 1.000 | no trend | -4.83E-08 | -1.53 |
| HMP-009 | Sulfate | 7 | 7 | 100% | 0.117 | 178 | 29.99 | 6.2 | 65.35 | 2.18 | -7 | 0.368 | no trend | -1.38E-07 | -4.37 |
| MER-001 | Alkalinity, bicarbonate | 19 | 19 | 100% | 8.8 | 45.5 | 23.24 | 21 | 9.98 | 0.43 | 22 | 0.462 | no trend | 4.28E-08 | 1.35 |
| MER-001 | Calcium | 19 | 19 | 100% | 4 | 15.1 | 7.979 | 6.9 | 3.08 | 0.39 | 31 | 0.293 | no trend | 1.48E-08 | 0.47 |
| MER-001 | Chloride | 19 | 18 | 95% | 2.3 | 13 | 6.395 | 5.9 | 2.77 | 0.43 | 6 | 0.861 | no trend | 2.97E-09 | 0.09 |
| MER-001 | Hardness | 17 | 17 | 100% | 14.4 | 55 | 32.51 | 28 | 12.35 | 0.38 | -5 | 0.869 | no trend | -7.10E-09 | -0.22 |
| MER-001 | Iron | 19 | 19 | 100% | 0.823 | 3.3 | 1.467 | 1.29 | 0.63 | 0.43 | 20 | 0.506 | no trend | 2.05E-09 | 0.06 |
| MER-001 | Magnesium | 19 | 19 | 100% | 1.1 | 4.2 | 2.247 | 2 | 0.79 | 0.35 | 31 | 0.292 | no trend | 4.14E-09 | 0.13 |
| MER-001 | Manganese | 19 | 19 | 100% | 0.0404 | 1.9 | 0.202 | 0.0951 | 0.41 | 2.05 | 25 | 0.401 | no trend | 2.70E-10 | 0.01 |
| MER-001 | pH, Field | 20 | 20 | 100% | 5.96 | 7.64 | 6.792 | 6.75 | 0.45 | 0.07 | 2 | 0.974 | no trend | 3.33E-10 | 0.01 |
| MER-001 | Potassium | 19 | 17 | 89% | 0.5 | 0.85 | 0.658 | 0.68 | 0.13 | 0.20 | 11 | 0.724 | no trend | 9.11E-11 | 0.00 |
| MER-001 | Sodium | 19 | 19 | 100% | 1.7 | 7.6 | 3.558 | 3.3 | 1.41 | 0.40 | 28 | 0.344 | no trend | 6.75E-09 | 0.21 |
| MER-001 | Sulfate | 19 | 12 | 63% | 1 | 5.4 | 2.647 | 2.5 | 1.34 | 0.51 | 79 | 0.006 | POSITIVE | 1.91E-08 | 0.60 |
| MER-002 | Alkalinity, bicarbonate | 19 | 19 | 100% | 10 | 51.4 | 25.99 | 24 | 11.12 | 0.43 | 19 | 0.529 | no trend | 4.96E-08 | 1.57 |
| MER-002 | Calcium | 19 | 19 | 100% | 4.3 | 17.7 | 9.174 | 8.5 | 3.62 | 0.39 | 30 | 0.309 | no trend | 2.31E-08 | 0.73 |
| MER-002 | Chloride | 19 | 18 | 95% | 3.1 | 14.5 | 7.742 | 7.2 | 2.72 | 0.35 | 15 | 0.624 | no trend | 5.91E-09 | 0.19 |
| MER-002 | Hardness | 17 | 17 | 100% | 15.7 | 64.4 | 35.18 | 33.6 | 13.64 | 0.39 | 20 | 0.434 | no trend | 7.60E-08 | 2.40 |
| MER-002 | Iron | 19 | 19 | 100% | 0.998 | 3.42 | 1.877 | 1.67 | 0.79 | 0.42 | 10 | 0.753 | no trend | 1.43E-09 | 0.05 |
| MER-002 | Magnesium | 19 | 19 | 100% | 1.2 | 4.9 | 2.626 | 2.4 | 0.97 | 0.37 | 23 | 0.440 | no trend | 5.19E-09 | 0.16 |
| MER-002 | Manganese | 19 | 19 | 100% | 0.0596 | 0.242 | 0.14 | 0.138 | 0.05 | 0.38 | 23 | 0.441 | no trend | 3.48E-10 | 0.01 |
| MER-002 | pH, Field | 20 | 20 | 100% | 6 | 7.49 | 6.833 | 6.84 | 0.41 | 0.06 | 1 | 1.000 | no trend | 5.23E-11 | 0.00 |
| MER-002 | Potassium | 19 | 19 | 100% | 0.51 | 1.2 | 0.772 | 0.76 | 0.20 | 0.26 | 16 | 0.599 | no trend | 3.16E-10 | 0.01 |
| MER-002 | Sodium | 19 | 19 | 100% | 2.4 | 9.6 | 4.779 | 4.3 | 1.73 | 0.36 | 23 | 0.440 | no trend | 7.40E-09 | 0.23 |
| MER-002 | Sulfate | 19 | 16 | 84% | 1 | 13.1 | 5.358 | 5.1 | 3.05 | 0.57 | 5 | 0.889 | no trend | 1.57E-09 | 0.05 |
| MER-003 | Alkalinity, bicarbonate | 19 | 19 | 100% | 10.7 | 105 | 31.95 | 25 | 21.10 | 0.66 | 16 | 0.600 | no trend | 5.60E-08 | 1.77 |
| MER-003 | Calcium | 19 | 19 | 100% | 4.4 | 16.7 | 9.611 | 9 | 3.72 | 0.39 | 38 | 0.195 | no trend | 2.32E-08 | 0.73 |
| MER-003 | Chloride | 19 | 18 | 95% | 4.2 | 20.8 | 10.32 | 9.7 | 3.98 | 0.39 | 39 | 0.183 | no trend | 1.91E-08 | 0.60 |
| MER-003 | Hardness | 17 | 17 | 100% | 12 | 62.7 | 37.15 | 36 | 16.50 | 0.44 | 29 | 0.248 | no trend | 1.55E-07 | 4.88 |
| MER-003 | Iron | 19 | 19 | 100% | 1.07 | 3.05 | 1.825 | 1.75 | 0.65 | 0.35 | -5 | 0.889 | no trend | -7.72E-10 | -0.02 |
| MER-003 | Magnesium | 19 | 19 | 100% | 1.3 | 5.6 | 3.011 | 2.8 | 1.18 | 0.39 | 41 | 0.159 | no trend | 8.61E-09 | 0.27 |
| MER-003 | Manganese | 19 | 19 | 100% | 0.0704 | 0.263 | 0.151 | 0.141 | 0.05 | 0.36 | 29 | 0.327 | no trend | 3.16E-10 | 0.01 |
| MER-003 | pH, Field | 20 | 20 | 100% | 6.33 | 7.42 | 6.943 | 6.97 | 0.30 | 0.04 | -76 | 0.015 | NEGATIVE | -4.14E-09 | -0.13 |
| MER-003 | Potassium | 19 | 19 | 100% | 0.57 | 2.7 | 1.016 | 0.89 | 0.48 | 0.47 | 43 | 0.141 | no trend | 2.53E-09 | 0.08 |
| MER-003 | Sodium | 19 | 19 | 100% | 4.2 | 45.1 | 10.83 | 7.3 | 9.44 | 0.87 | 84 | 0.004 | POSITIVE | 7.21E-08 | 2.28 |
| MER-003 | Sulfate | 19 | 18 | 95% | 1 | 84.2 | 16.44 | 9.9 | 18.47 | 1.12 | 65 | 0.025 | POSITIVE | 1.54E-07 | 4.85 |
| WBR-001 | Alkalinity, bicarbonate | 16 | 15 | 94% | 2 | 25.6 | 6.4 | 4.95 | 5.53 | 0.86 | 3 | 0.928 | no trend | 2.16E-09 | 0.07 |

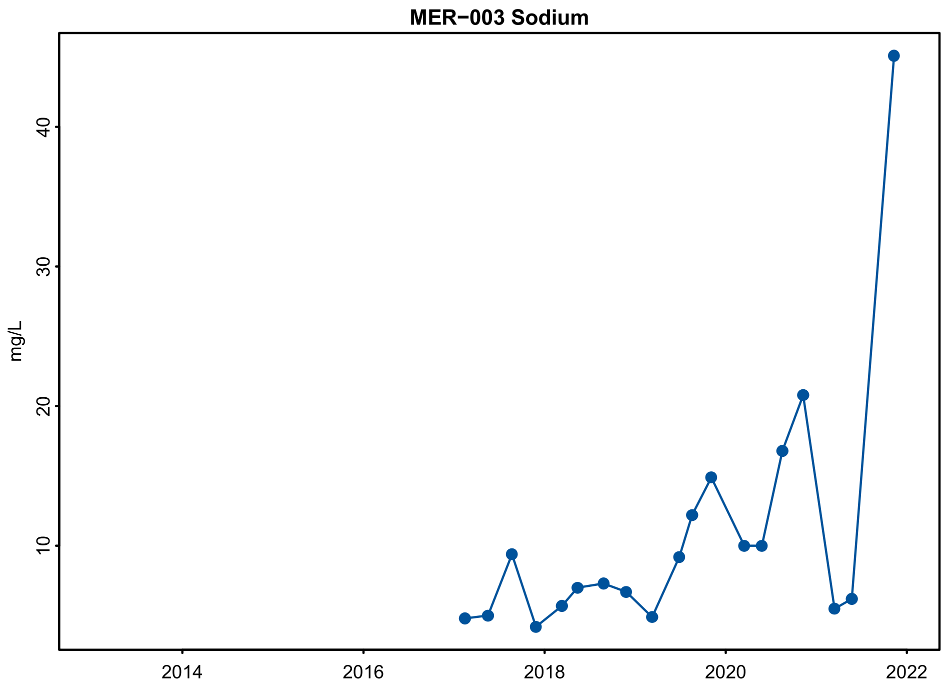
## 2021 Surface Water Trend Analysis
## Humboldt Mill

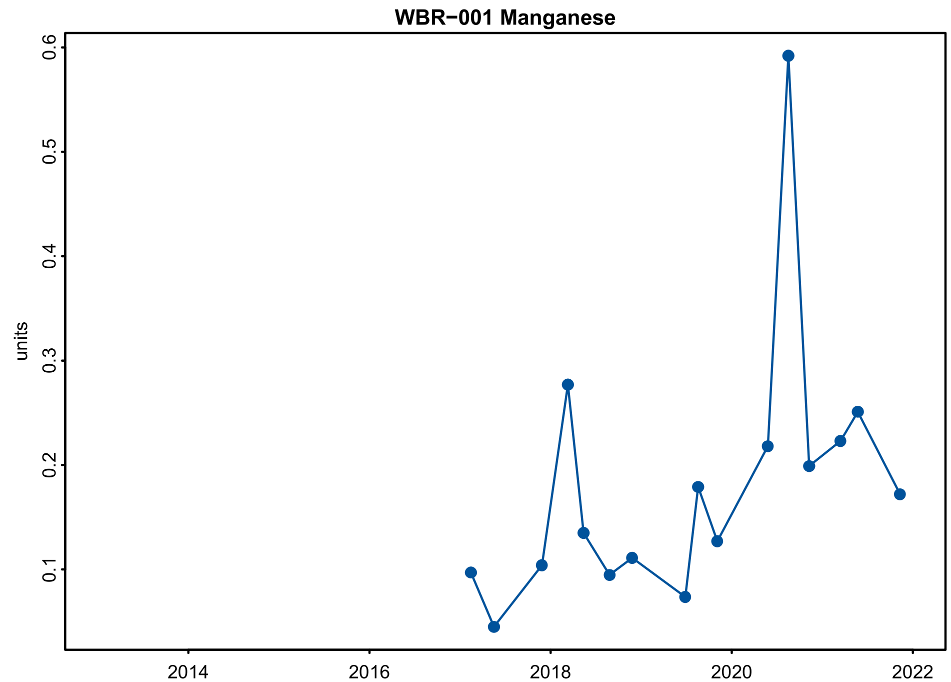
| Location | Parameter | Number of Samples | Number of Detects | Percent Detected | Minimum | Maximum | Mean | Median | Standard Deviation | Coefficient of Variation | M-K Test Value (S) | Approximate p-value | Trend at 95% Confidence | Theil-Sen Slope | Theil-Sen Slope, yearly |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WBR-001 | Calcium | 16 | 16 | 100% | 2.4 | 6.2 | 4.025 | 4.1 | 0.96 | 0.24 | 13 | 0.589 | no trend | 4.09E-09 | 0.13 |
| WBR-001 | Chloride | 16 | 16 | 100% | 6.3 | 27.3 | 16.47 | 16.7 | 5.84 | 0.35 | 13 | 0.589 | no trend | 1.35E-08 | 0.43 |
| WBR-001 | Hardness | 16 | 16 | 100% | 0.99 | 60 | 20.4 | 17.2 | 14.32 | 0.70 | -2 | 0.956 | no trend | -2.40E-09 | -0.08 |
| WBR-001 | Iron | 16 | 16 | 100% | 1 | 3.46 | 1.85 | 1.645 | 0.73 | 0.39 | 18 | 0.444 | no trend | 3.32E-09 | 0.10 |
| WBR-001 | Magnesium | 16 | 15 | 94% | 1 | 2.3 | 1.575 | 1.6 | 0.35 | 0.22 | 14 | 0.552 | no trend | 8.54E-10 | 0.03 |
| WBR-001 | Manganese | 16 | 16 | 100% | 0.045 | 0.592 | 0.181 | 0.1535 | 0.13 | 0.71 | 54 | 0.017 | POSITIVE | 1.08E-09 | 0.03 |
| WBR-001 | pH, Field | 17 | 17 | 100% | 5.05 | 7.36 | 5.862 | 5.77 | 0.65 | 0.11 | 49 | 0.047 | POSITIVE | 5.15E-09 | 0.16 |
| WBR-001 | Potassium | 16 | 16 | 100% | 0.55 | 1.4 | 0.789 | 0.735 | 0.22 | 0.28 | -6 | 0.822 | no trend | -4.16E-10 | -0.01 |
| WBR-001 | Sodium | 16 | 16 | 100% | 4.1 | 13.3 | 7.975 | 7.5 | 2.70 | 0.34 | 19 | 0.417 | no trend | 1.35E-08 | 0.42 |
| WBR-001 | Sulfate | 16 | 4 | 25% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| WBR-002 | Alkalinity, bicarbonate | 19 | 19 | 100% | 11.8 | 98 | 28.64 | 27.8 | 18.60 | 0.65 | -7 | 0.834 | no trend | -1.18E-08 | -0.37 |
| WBR-002 | Calcium | 19 | 19 | 100% | 4.7 | 10.8 | 7.832 | 8.3 | 1.90 | 0.24 | -7 | 0.833 | no trend | -1.07E-09 | -0.03 |
| WBR-002 | Chloride | 19 | 19 | 100% | 25.1 | 48 | 34.67 | 33.4 | 6.64 | 0.19 | -57 | 0.050 | no trend | -8.50E-08 | -2.68 |
| WBR-002 | Hardness | 19 | 19 | 100% | 21.6 | 44 | 34.17 | 37.3 | 7.58 | 0.22 | -7 | 0.834 | no trend | -1.14E-08 | -0.36 |
| WBR-002 | Iron | 19 | 19 | 100% | 2.3 | 21.8 | 7.959 | 7.3 | 4.67 | 0.59 | 7 | 0.834 | no trend | 2.94E-09 | 0.09 |
| WBR-002 | Magnesium | 19 | 19 | 100% | 2.2 | 5.2 | 3.647 | 3.8 | 0.85 | 0.23 | -21 | 0.483 | no trend | -4.47E-09 | -0.14 |
| WBR-002 | Manganese | 19 | 19 | 100% | 0.0893 | 1.18 | 0.483 | 0.337 | 0.36 | 0.75 | -3 | 0.944 | no trend | -4.50E-11 | 0.00 |
| WBR-002 | pH, Field | 20 | 20 | 100% | 5.8 | 7.4 | 6.317 | 6.235 | 0.39 | 0.06 | -22 | 0.496 | no trend | -1.19E-09 | -0.04 |
| WBR-002 | Potassium | 19 | 19 | 100% | 0.97 | 2.2 | 1.63 | 1.6 | 0.34 | 0.21 | 51 | 0.076 | no trend | 2.88E-09 | 0.09 |
| WBR-002 | Sodium | 19 | 19 | 100% | 14.6 | 24 | 18.89 | 18.2 | 2.96 | 0.16 | -16 | 0.600 | no trend | -1.58E-08 | -0.50 |
| WBR-002 | Sulfate | 19 | 9 | 47% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| WBR-003 | Alkalinity, bicarbonate | 18 | 18 | 100% | 11.8 | 90.7 | 33.96 | 29.45 | 18.12 | 0.53 | 26 | 0.343 | no trend | 9.00E-08 | 2.84 |
| WBR-003 | Calcium | 18 | 18 | 100% | 4.9 | 25.3 | 9.85 | 9 | 4.72 | 0.48 | 25 | 0.363 | no trend | 2.25E-08 | 0.71 |
| WBR-003 | Chloride | 18 | 18 | 100% | 14.2 | 38.3 | 25.77 | 24.75 | 7.72 | 0.30 | -63 | 0.019 | NEGATIVE | -1.22E-07 | -3.86 |
| WBR-003 | Hardness | 18 | 18 | 100% | 21.6 | 97.7 | 41.37 | 39.45 | 18.02 | 0.44 | 24 | 0.383 | no trend | 6.30E-08 | 1.99 |
| WBR-003 | Iron | 18 | 18 | 100% | 2.57 | 35.4 | 9.069 | 6.125 | 8.30 | 0.92 | -3 | 0.940 | no trend | -1.27E-09 | -0.04 |
| WBR-003 | Magnesium | 18 | 18 | 100% | 2.3 | 8.4 | 4.172 | 4.05 | 1.44 | 0.34 | 16 | 0.569 | no trend | 4.60E-09 | 0.15 |
| WBR-003 | Manganese | 18 | 18 | 100% | 0.0966 | 1.55 | 0.537 | 0.406 | 0.44 | 0.82 | -11 | 0.705 | no trend | -3.68E-10 | -0.01 |
| WBR-003 | pH, Field | 19 | 19 | 100% | 5.8 | 7.53 | 6.327 | 6.26 | 0.43 | 0.07 | -32 | 0.278 | no trend | -1.84E-09 | -0.06 |
| WBR-003 | Potassium | 18 | 18 | 100% | 1 | 1.9 | 1.378 | 1.3 | 0.29 | 0.21 | -43 | 0.107 | no trend | -2.14E-09 | -0.07 |
| WBR-003 | Sodium | 18 | 18 | 100% | 8 | 20 | 14.12 | 15.15 | 3.32 | 0.24 | -49 | 0.069 | no trend | -3.27E-08 | -1.03 |
| WBR-003 | Sulfate | 18 | 6 | 33% | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

--: Insufficient data for trend analysis (<50% detection frequency and/or <6 detected samples)


MER−003 pH Field
units
7.4
7.2
7.0
6.8
6.6
6.4
2014
2016
2018
2020
2022


MER−003 Sulfate
Detect
Non−Detect
mg/L
80
60
40
20
0
2014
2016
2018
2020
2022


MER−003 Sodium
mg/L
40
30
20
10
2014
2016
2018
2020
2022

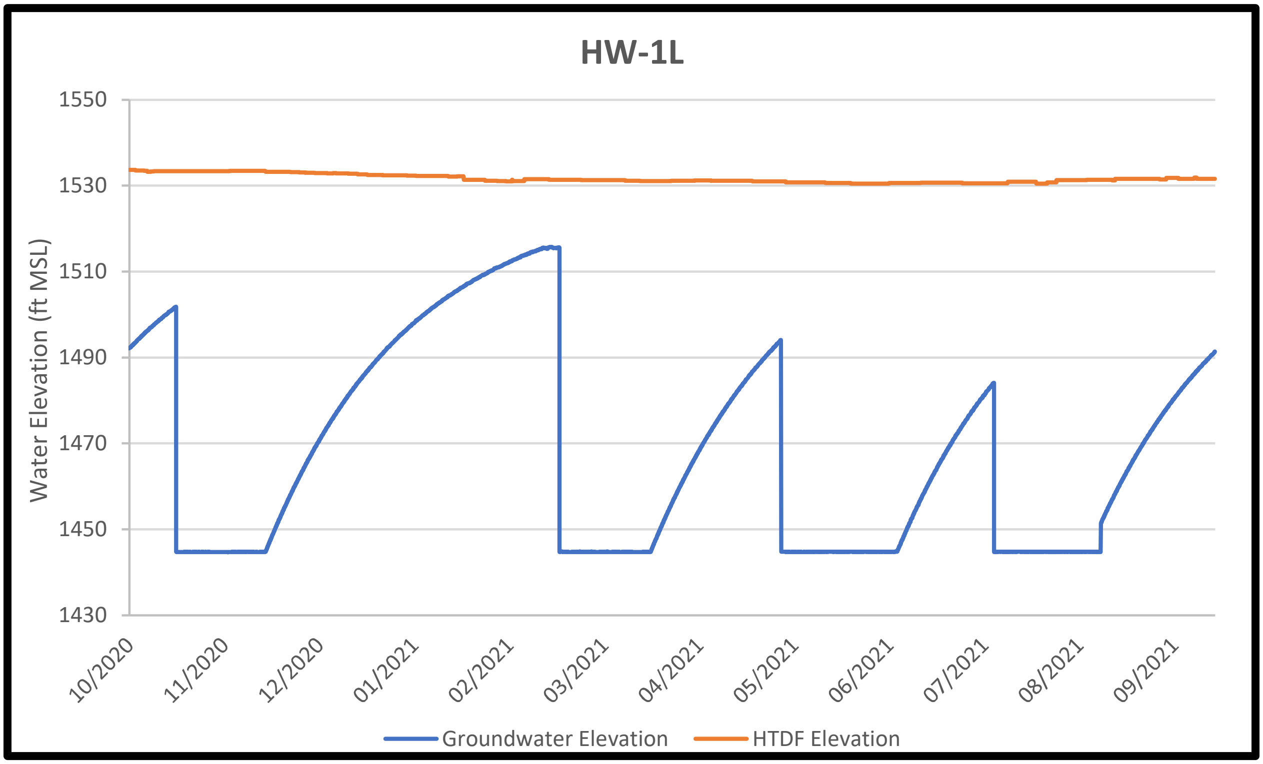

WBR−001 Manganese
units
0.6
0.5
0.4
0.3
0.2
0.1
2014
2016
2018
2020
2022

# Appendix K

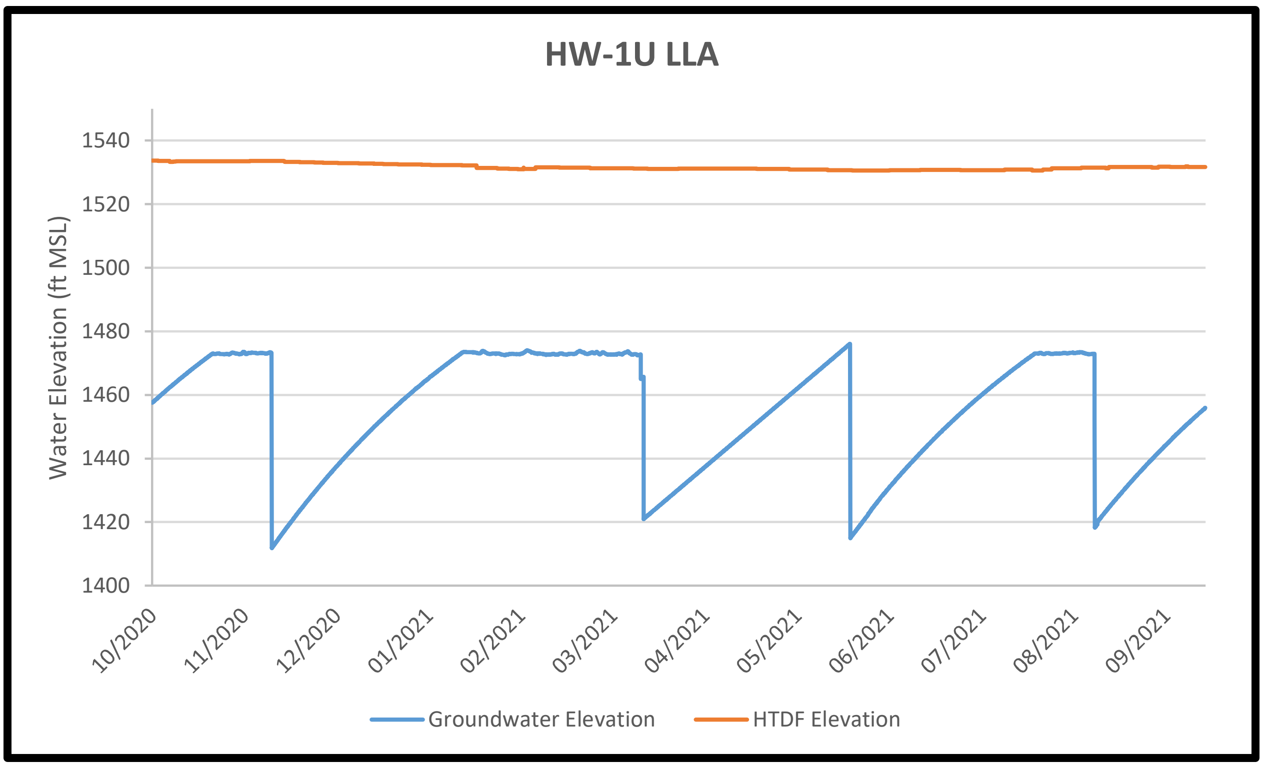
# Humboldt Mill

# Groundwater Hydrographs

# 2021 Groundwater Hydrographs
# Humboldt Mill

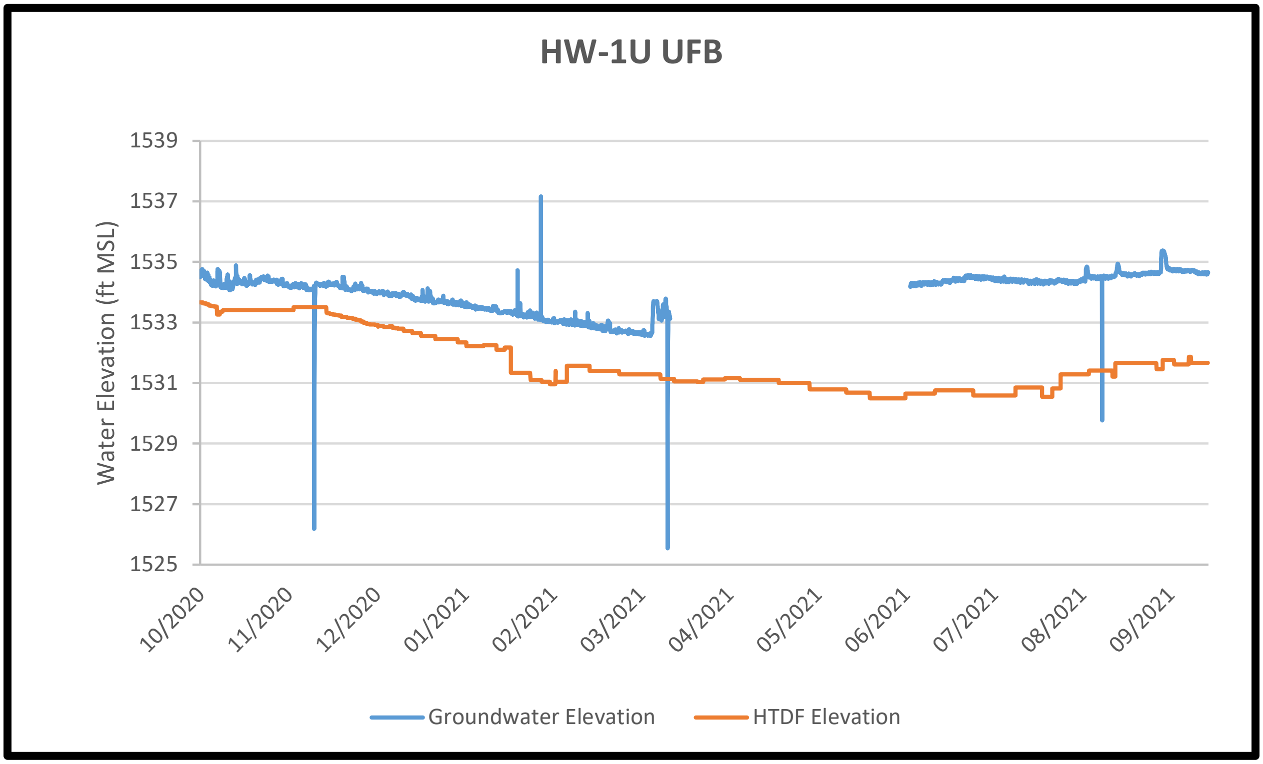



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

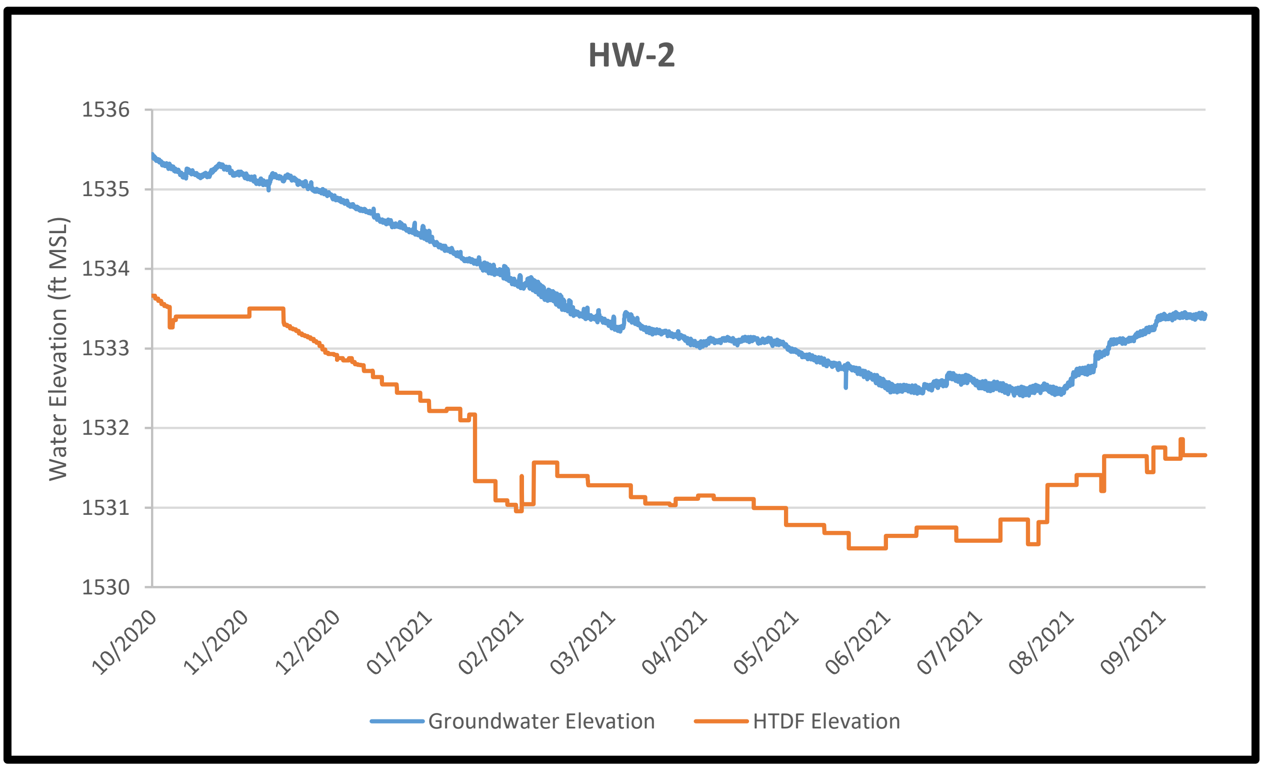



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2021 Groundwater Hydrographs**
**Humboldt Mill**

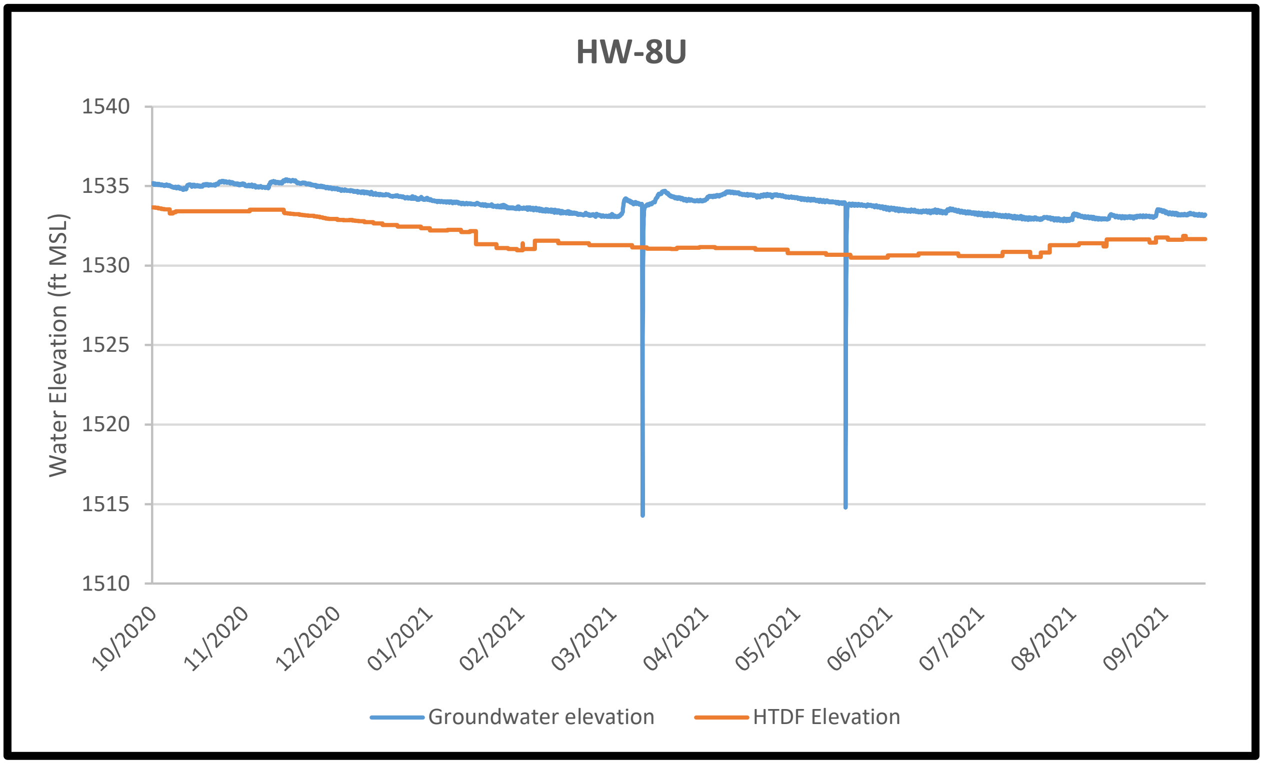



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.
Note: GW elevation data from 03-16-20 through 06-09-21 was unavailable due to equipment malfunction.

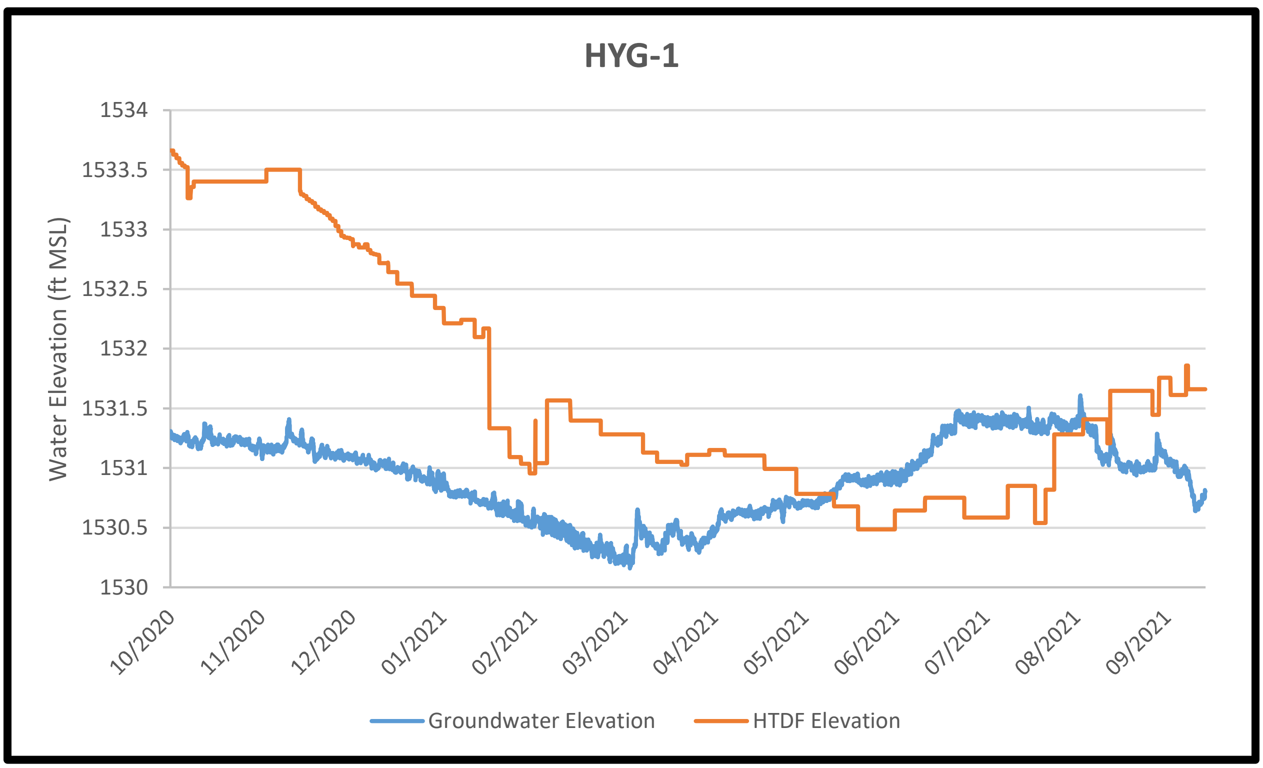



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2021 Groundwater Hydrographs**
**Humboldt Mill**

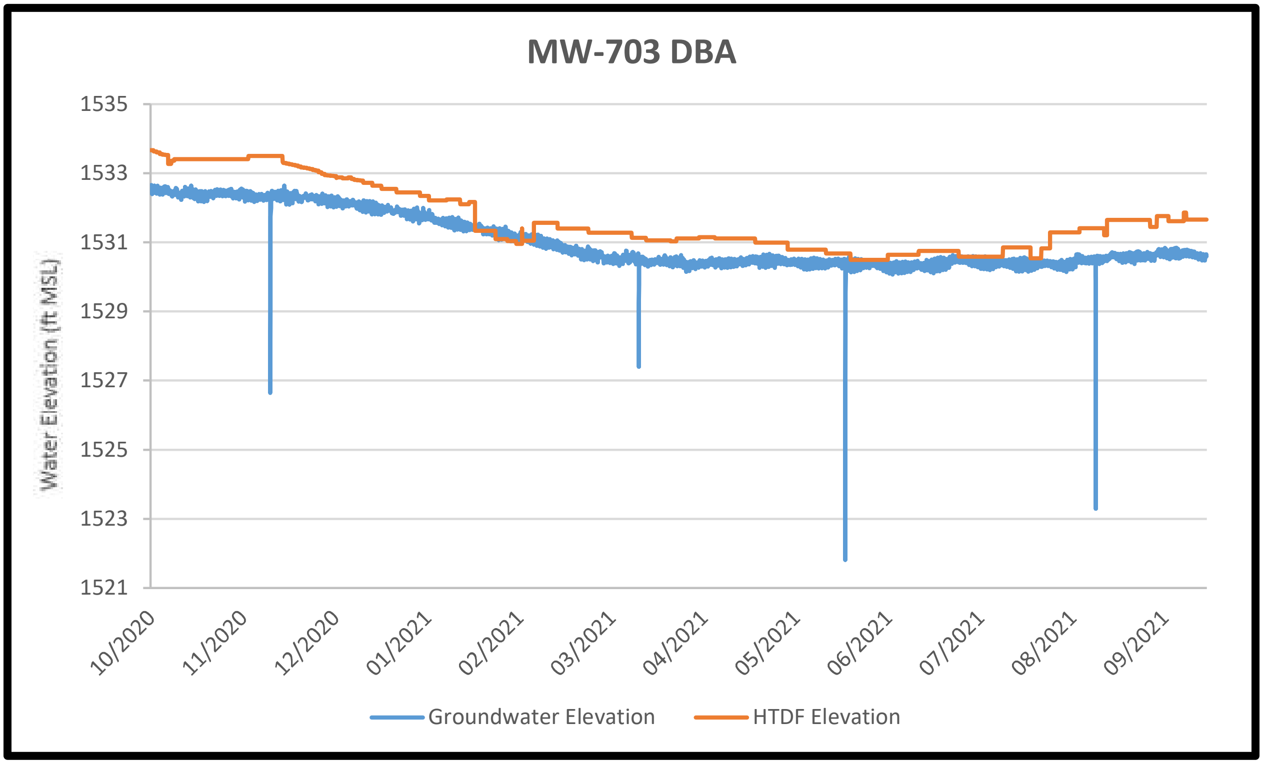



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

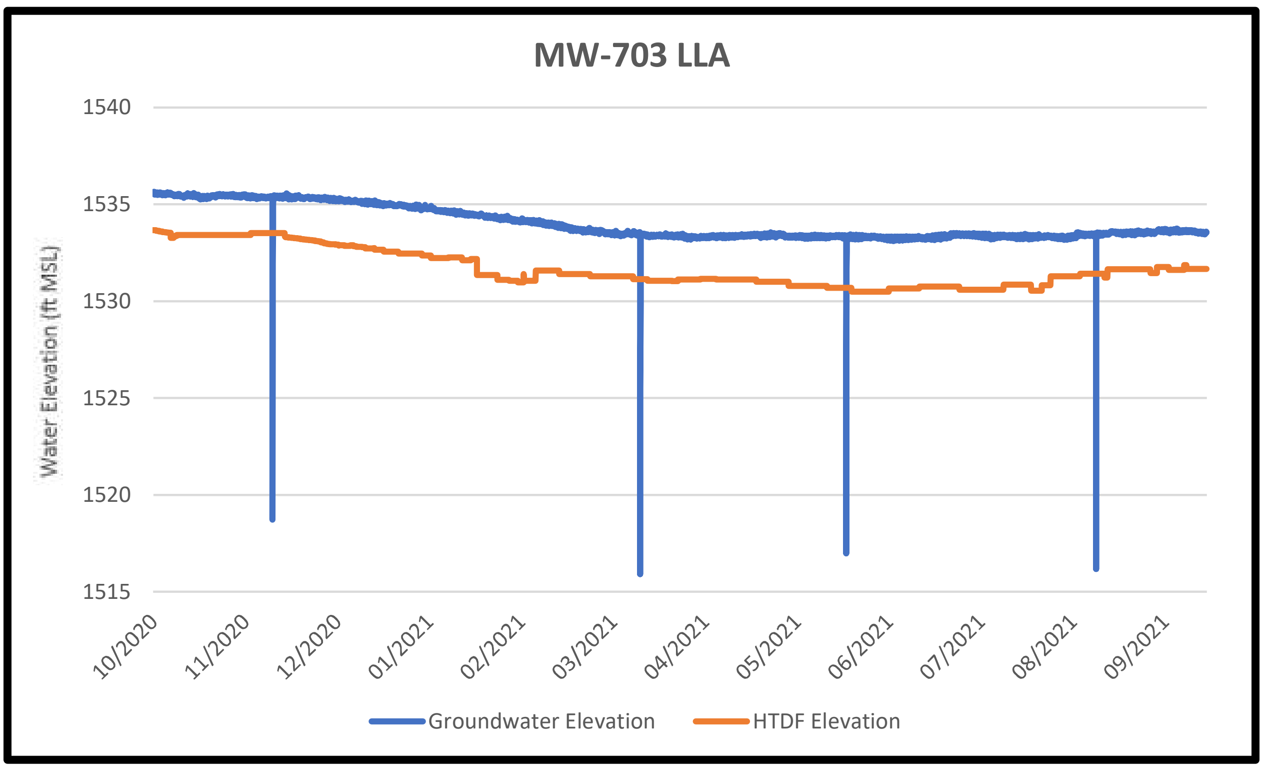



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2021 Groundwater Hydrographs**
**Humboldt Mill**

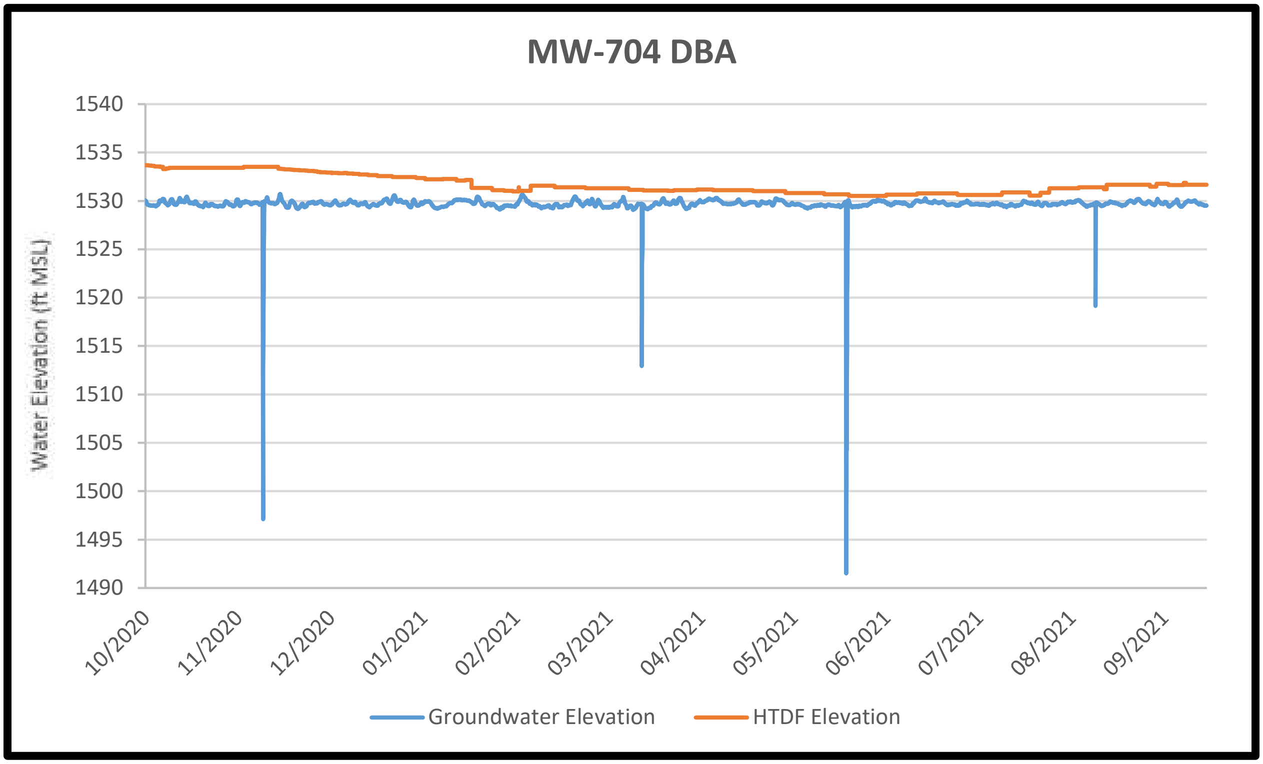



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

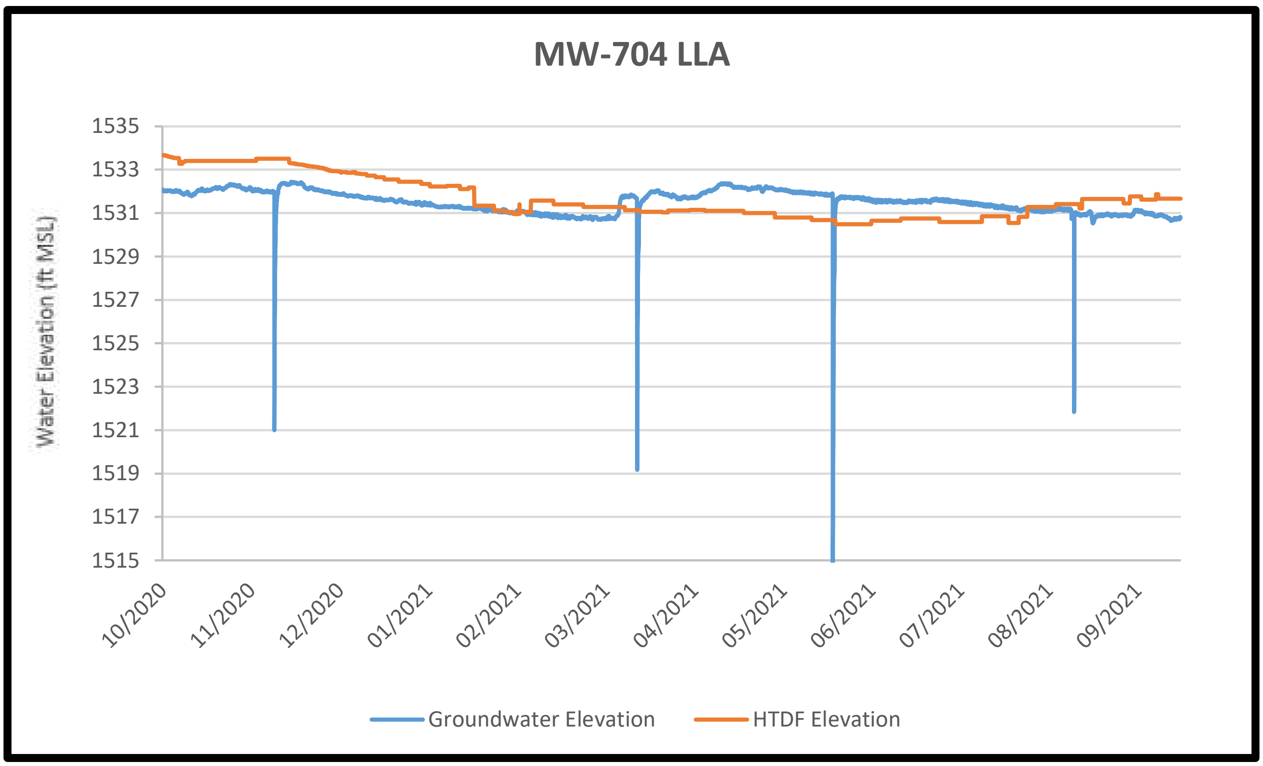



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2021 Groundwater Hydrographs**
**Humboldt Mill**

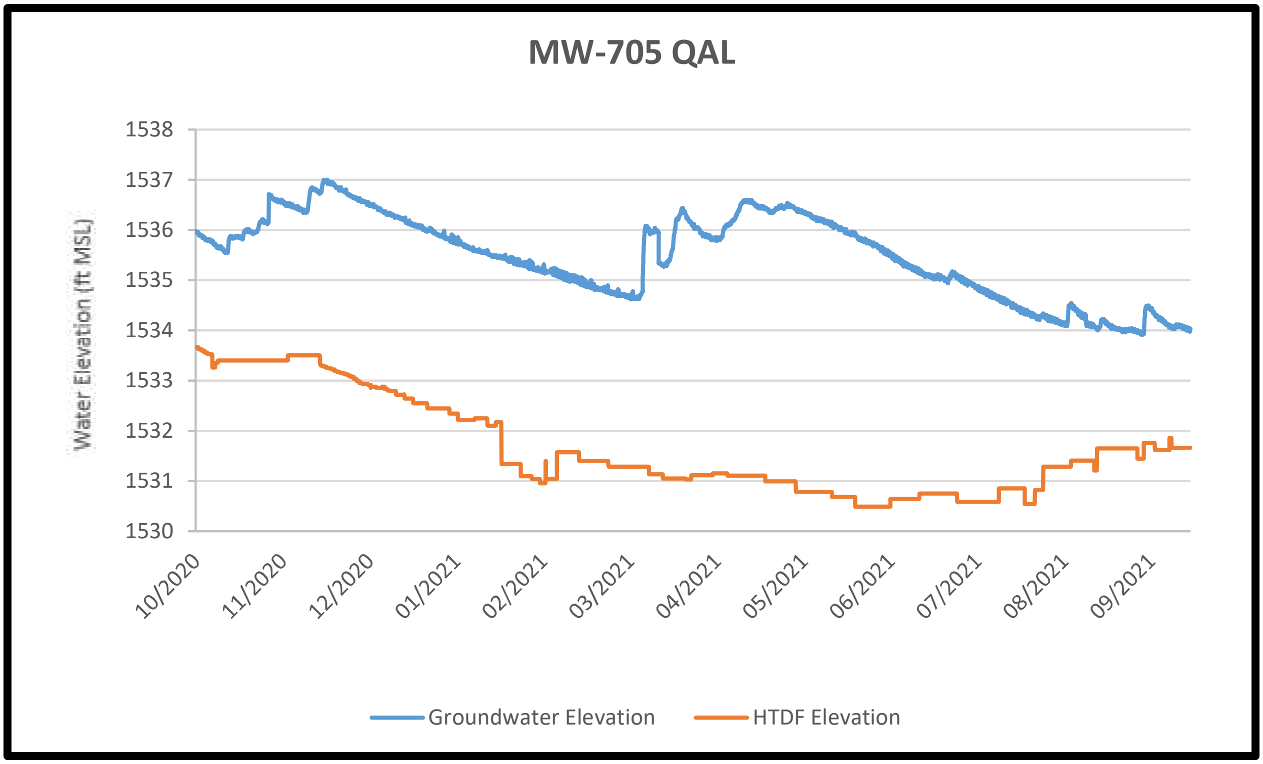



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

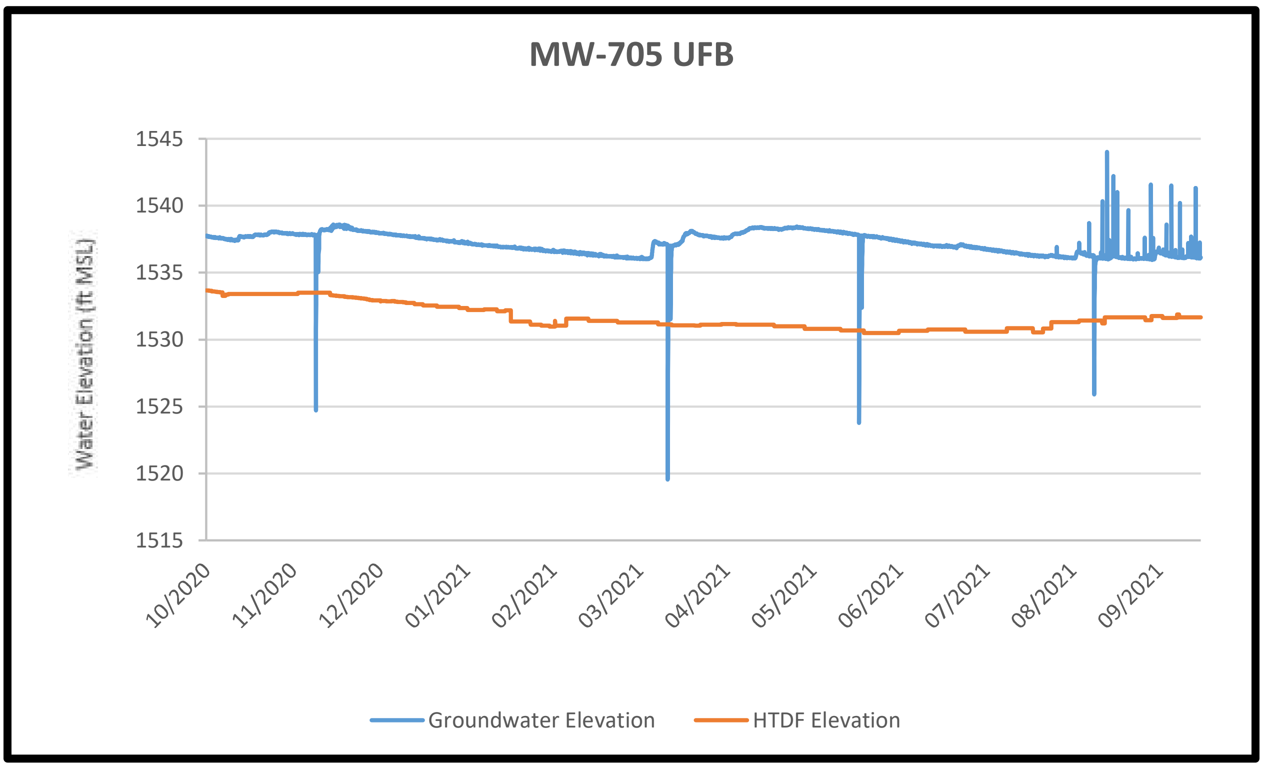



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2021 Groundwater Hydrographs**
**Humboldt Mill**

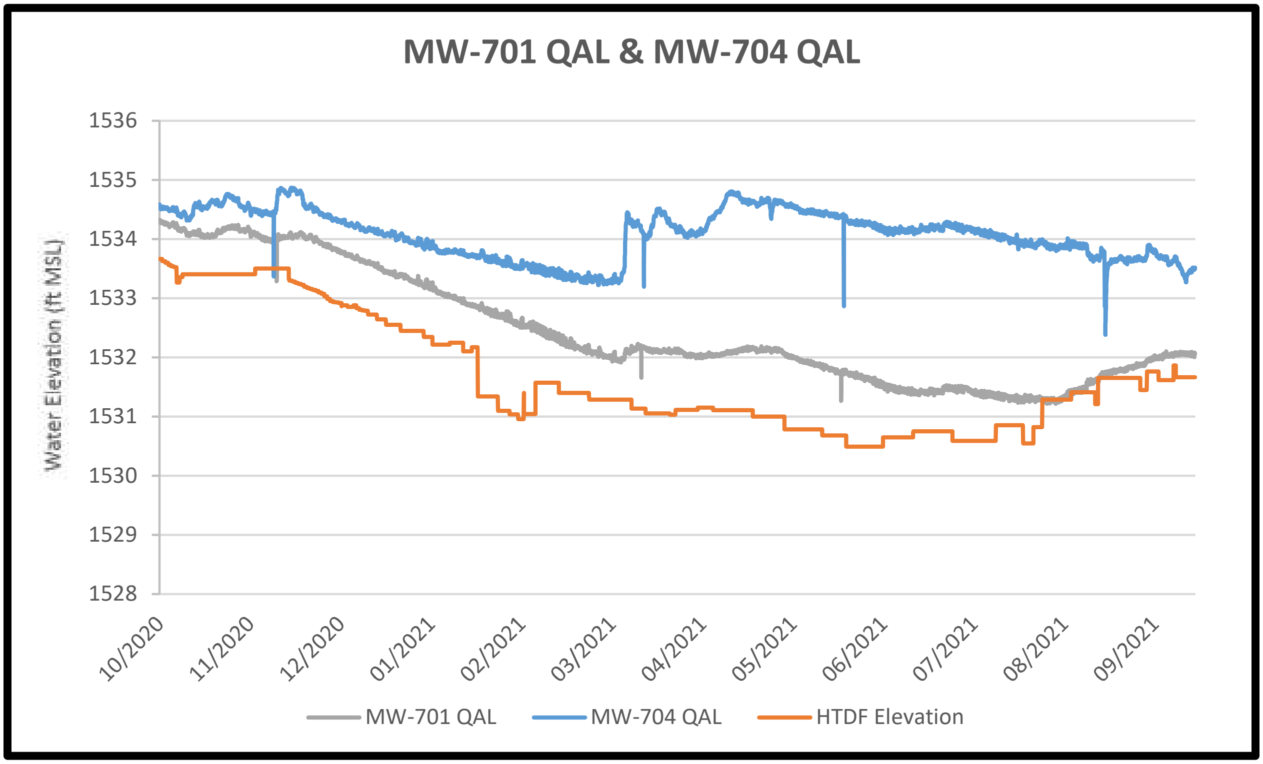



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

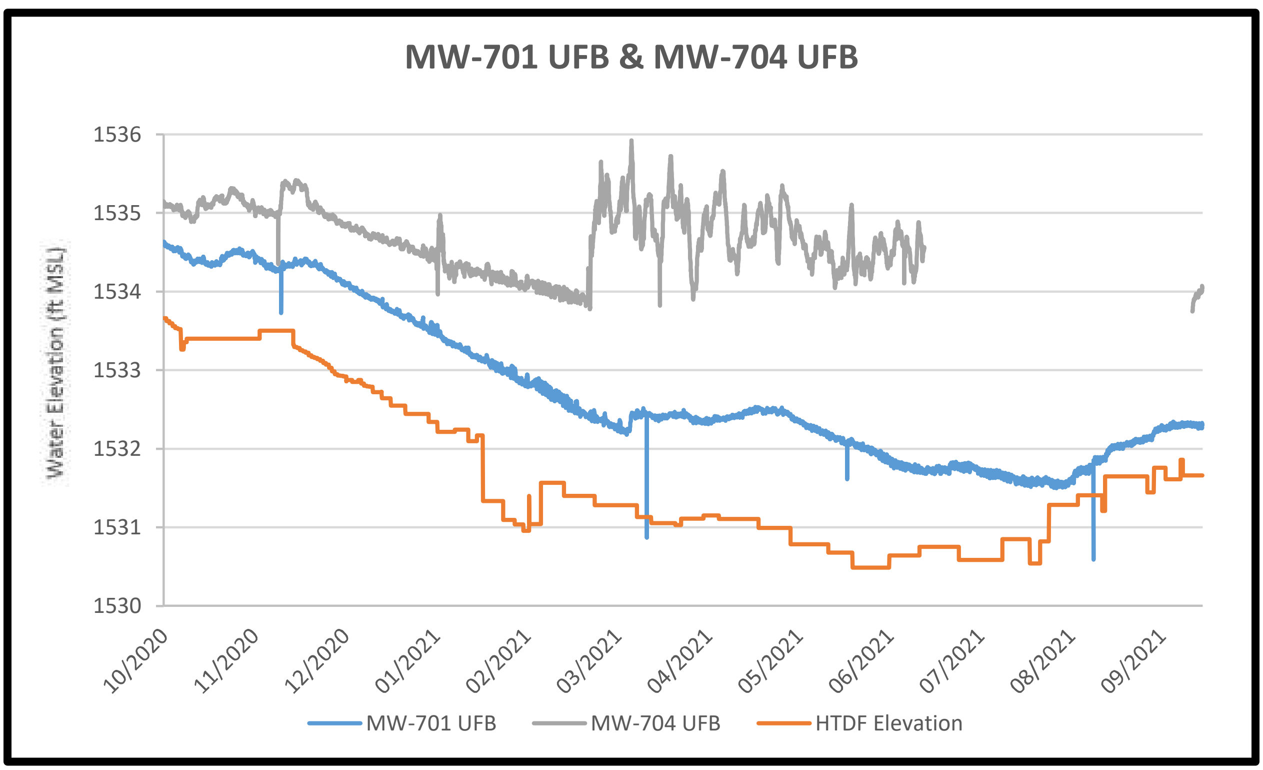



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

**2021 Groundwater Hydrographs**
**Humboldt Mill**

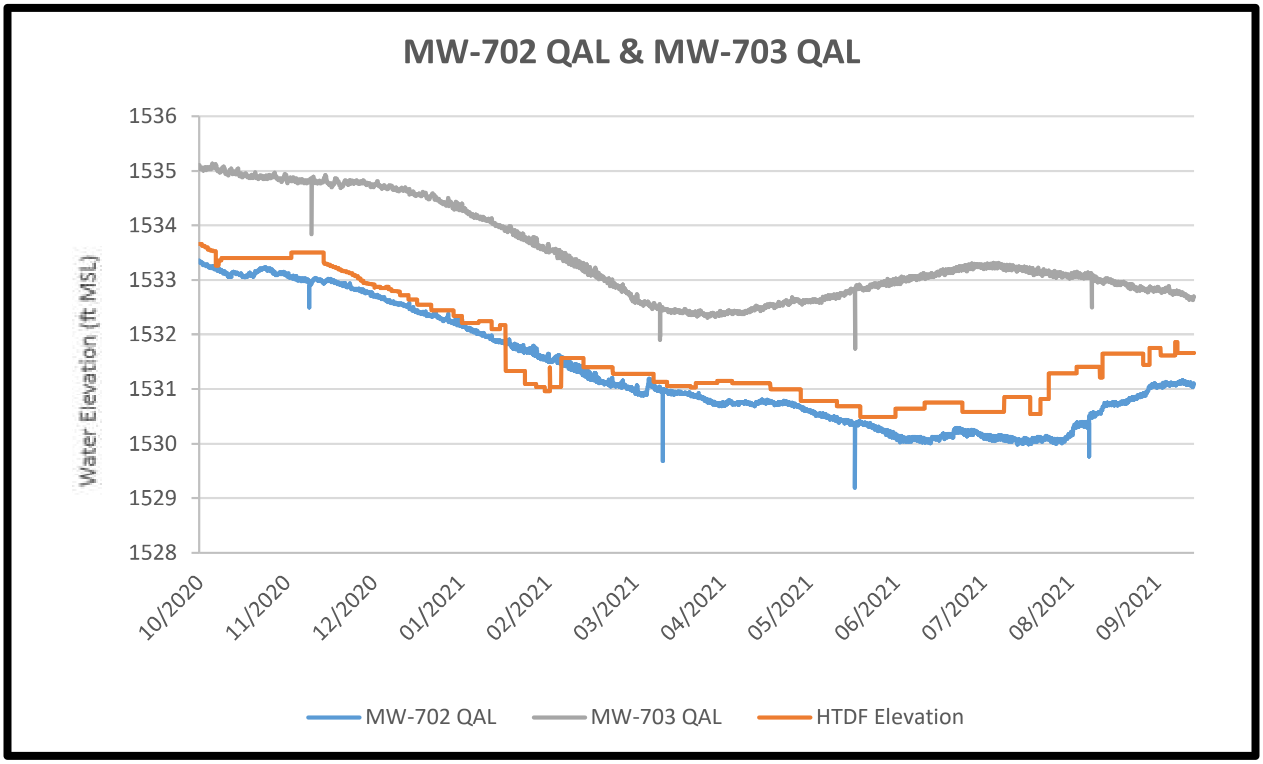



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.

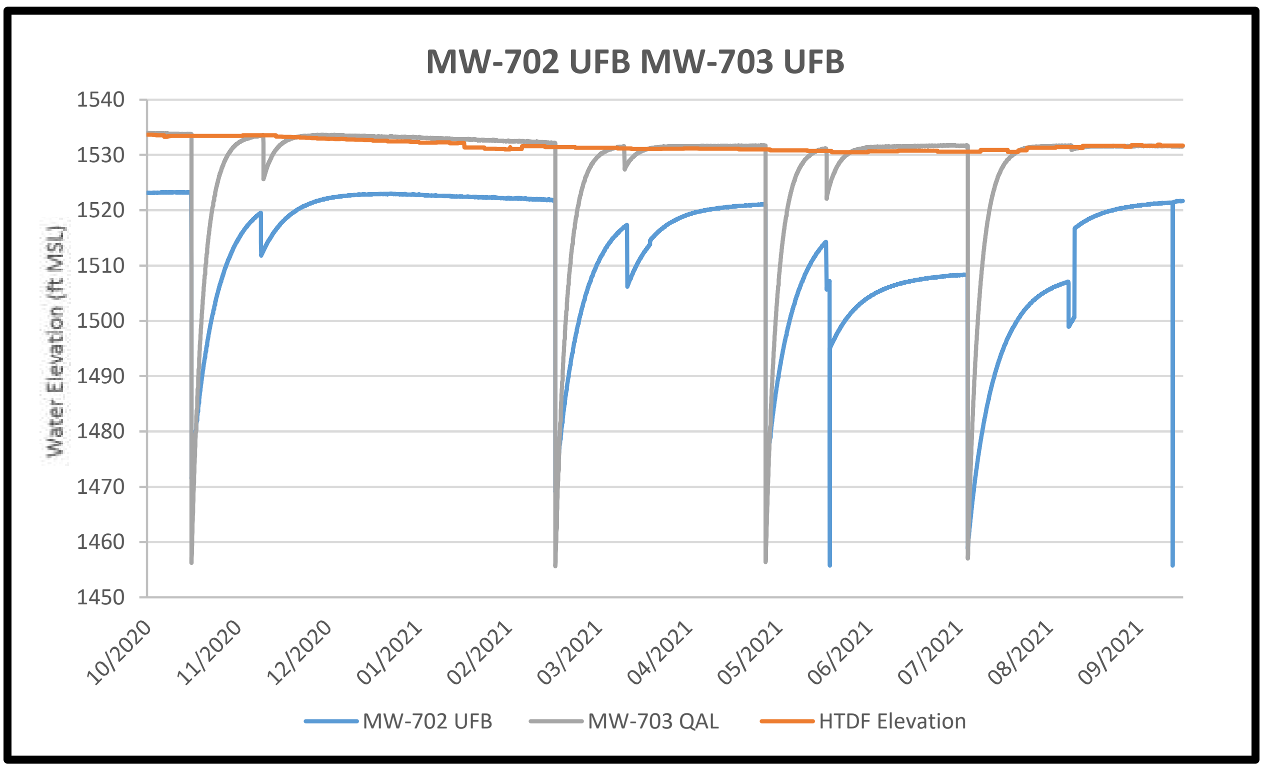



Note: The large drops in water level are associated with the location being pumped down in preparation of sampling
Note: GW elevation data from 06-20-21 through 09-27-21 was unavailable due to equipment malfunction.

**2021 Groundwater Hydrographs**
**Humboldt Mill**




Note: The large drops in water level are associated with the location being pumped down in preparation of sampling.




Note: The large drops in water level are associated with the location being pumped down in preparation of sampling

# Appendix L

# Humboldt Mill

# Cut-off Wall Monitoring Well

# Tabular Summary

# 2021 Cut-off Wall Monitoring Well Tabular Summary

| Monitoring Well | Location | Quarter | Groundwater Level (ft MSL) | Commentary | Sulfate mg/L |
|---|---|---|---|---|---|
| HTDF | | Q1 | 1531.42 | Sulfate measured at approx. 1500 ft MSL. | 350.0 |
| | | Q2 | 1530.73 | | 350.0 |
| | | Q3 | 1531.32 | | 280.0 |
| | | Q4 | 1531.62 | | 320.0 |
| HW-1L | Outside Cut-off Wall | Q1 | 1444.69 | Sulfate concentrations are lower in this well than in the HTDF. | 28.4 |
| | | Q2 | 1444.90 | | 28.7 |
| | | Q3 | 1444.73 | | 29.4 |
| | | Q4 | 1444.69 | | 30.7 |
| HW-1U LLA | Outside Cut-off Wall | Q1 | 1472.82 | Sulfate concentrations are similar to other wells outside of the cut off wall, and are lower than concentrations within the HTDF. | 53.4 |
| | | Q2 | 1475.10 | | 54.3 |
| | | Q3 | 1472.82 | | 60.1 |
| | | Q4 | 1473.01 | | 61.9 |
| HW-1U UFB | Outside Cut-off Wall, Compared to HW-2 | Q1 | 1532.16 | Low or nondetect sulfate concentrations at this well do not correlate with those found in HW-2 demonstrating the effectiveness of the cut-off wall.<br>*Diver discovered in failed state during 2021 Q2 monitoring event, replaced on 6/9/2021. | <1.0 |
| | | Q2 | * | | 2.0 |
| | | Q3 | 1534.47 | | 2.9 |
| | | Q4 | 1534.78 | | 4.3 |
| HW-2 | Inside Cut-off Wall | Q1 | 1533.33 | The sulfate in this well is lower than concentrations in the HTDF, but it is higher than MW-703 QAL. These changes in the leachate monitoring pair are expected given it's close proximity to the HTDF and location south of the cut-off wall. | 125.0 |
| | | Q2 | 1532.77 | | 86.6 |
| | | Q3 | 1532.77 | | 51.5 |
| | | Q4 | 1533.52 | | 33.4 |
| HW-8U | Outside Cut off Wall, Compared to HW-2 | Q1 | 1533.88 | Sulfate concentrations are much lower at this well then observed in the HTDF, showing the effectiveness of the cut off wall. | 8.5 |
| | | Q2 | 1533.96 | | 7.7 |
| | | Q3 | 1532.93 | | 6.7 |
| | | Q4 | 1533.03 | | 5.8 |
| HYG-1 | Outside Cut off Wall, Compared to HW-2 | Q1 | 1530.43 | After the cut off wall was installed the head difference between HW-2 and HYG-1 increased by approximately 5 feet. A 2-3 foot head difference remains between the two wells indicating similar conditions with seasonal impacts. | 48.4 |
| | | Q2 | 1530.91 | | 41.1 |
| | | Q3 | 1531.30 | | 34.5 |
| | | Q4 | 1531.27 | | 46.1 |
| MW-701 QAL | Inside-Cut off Wall | Q1 | 1532.17 | Sulfate at this well has remained elevated indicating influence of water from the HTDF as predicted. The magnitude and changes in water level in MW-701 QAL closely follow the magnitude and changes in water level of the HTDF as expected given it's close proximity to the HTDF and location south of the cut-off wall. | 315.0 |
| | | Q2 | 1531.74 | | 210.0 |
| | | Q3 | 1531.46 | | 274.0 |
| | | Q4 | 1532.06 | | 295.0 |
| MW-701 UFB | Bedrock, Inside-Cut off Wall | Q1 | 1533.83 | Due to the sulfuric acid spill that occurred in 2019, sulfate concentrations in this well are significantly higher than those observed at the 1500 msl Level of the HTDF. | 1670.0 |
| | | Q2 | 1532.03 | | 1310.0 |
| | | Q3 | 1534.27 | | 1320.0 |
| | | Q4 | 1534.28 | | 1300.0 |
| MW-702 QAL | Inside Cut-off Wall | Q1 | 1531.11 | The sulfate in this well is lower than it is in the HTDF, but it is higher than the concentration occuring in its paired leachate monitoring well MW-703 QAL This is expected given its close proximity to the HTDF and location south of the cut-off wall. | 68.0 |
| | | Q2 | 1530.34 | | 55.5 |
| | | Q3 | 1530.31 | | 48.2 |
| | | Q4 | 1531.11 | | 51.6 |
| MW-702 UFB | Inside Cut-off Wall | Q1 | 1506.47 | The behavior of MW-702 UFB and MW-703 UFB have had no apparent changes for the years of facility operations, which show that the wall is behaving similarly to its performance in the past despite water level changes in the basin over the years. | 31.2 |
| | | Q2 | 1505.63 | | 32.5 |
| | | Q3 | 1499.77 | | 31.5 |
| | | Q4 | 1513.61 | | 33.7 |
| MW-703 QAL | Outside Cut-off Wall | Q1 | 1532.51 | Sulfate in MW-703 QAL is lower than inside of the cut off wall and is similar to levels observed in other wells outside of the cut off wall. This shows the effectiveness of the wall. With the exception of Q2, the water level in MW-703 QAL was approximately 1-2 feet higher than the elevation of the HTDF, indicating cut-off wall effectivness. | 23.8 |
| | | Q2 | 1530.39 | | 23.1 |
| | | Q3 | 1533.06 | | 23.2 |
| | | Q4 | 1532.37 | | 21.0 |
| MW-703 UFB | Outside Cut-off Wall | Q1 | 1530.43 | The behavior of MW-702 UFB and MW-703 UFB have no apparent changes for the years of facility operations, which show that the wall is behaving similarly to its performance in the past despite water level changes in the basin over the years. | 44.9 |
| | | Q2 | 1531.14 | | 44.4 |
| | | Q3 | 1531.61 | | 41.0 |
| | | Q4 | 1531.48 | | 45.4 |

# 2021 Cut-off Wall Monitoring Well Tabular Summary

| | | | | | |
|---|---|---|---|---|---|
| MW-703 LLA | Outside Cut-off Wall | Q1 | 1533.45 | Sulfate concentrations in this well are lower than in the HTDF which evidences the cut-off wall effectiveness. | 29.8 |
| | | Q2 | 1533.35 | | 23.0 |
| | | Q3 | 1533.38 | | 30.0 |
| | | Q4 | 1533.54 | | 31.7 |
| MW-703 DBA | Outside Cut-off Wall | Q1 | 1531.33 | Sulfate concentrations in this well are lower than in the HTDF which evidences the cut-off wall effectiveness. | 21.1 |
| | | Q2 | 1530.18 | | 35.1 |
| | | Q3 | 1530.40 | | 34.9 |
| | | Q4 | 1530.68 | | 35.4 |
| MW-704 QAL | Leachate Monitoring Well for MW-701 QAL<br>Outside Cut-off Wall | Q1 | 1534.22 | Sulfate levels in this well do not correlate with those found in its leachate monitoring pair, indicating overall that water quality of the HTDF is not communicating with this well. Water quality in MW-704 QAL may be locally under the influence of discharges of Escanaba River irrigation water to Outfall 003 at Wetland EE. The water level in MW-704 QAL was approximately 2-3 feet higher than the elevation of the HTDF throughout 2021, indicating the cut-off wall was effective at limiting communication between wells. | 28.6 |
| | | Q2 | 1534.39 | | 23.8 |
| | | Q3 | 1533.85 | | 23.5 |
| | | Q4 | 1533.76 | | 20.2 |
| MW-704 UFB | Leachate Monitoring Well for MW-701 QAL<br>Outside Cut-off Wall | Q1 | 1533.83 | The magnitude and changes in water level in MW-704 UFB vary from levels observed in the HTDF. Sulfate levels in this well do not correlate with those found in its leachate monitoring pair MW-701 UFB, and are also lower than concentrations at the 1500 msl level of the HTDF, indicating overall that water quality of the HTDF is not communicating with this well.<br><br>*Diver discovered in failed state during 2021 Q3 monitoring event, replaced on 9/27/2021 | 3.7 |
| | | Q2 | * | | 7.1 |
| | | Q3 | 1534.27 | | 10.6 |
| | | Q4 | 1534.28 | | 11.9 |
| MW-704 LLA | Outside Cut-off Wall | Q1 | 1531.77 | Sulfate concentrations in this well are lower than in the HTDF which evidences the cut-off wall effectiveness. | 12.6 |
| | | Q2 | 1531.84 | | 10.4 |
| | | Q3 | 1531.12 | | 11.9 |
| | | Q4 | 1530.54 | | 12.3 |
| MW-704 DBA | Outside Cut-off Wall | Q1 | 1529.52 | Lack of sulfate found shows no communication with the HTDF at this groundwater depth. | <1.0 |
| | | Q2 | 1539.66 | | <1.0 |
| | | Q3 | 1529.58 | | <1.0 |
| | | Q4 | 1529.50 | | <1.0 |

# Appendix M

# Humboldt Mill

# Flora & Fauna Survey Location Maps

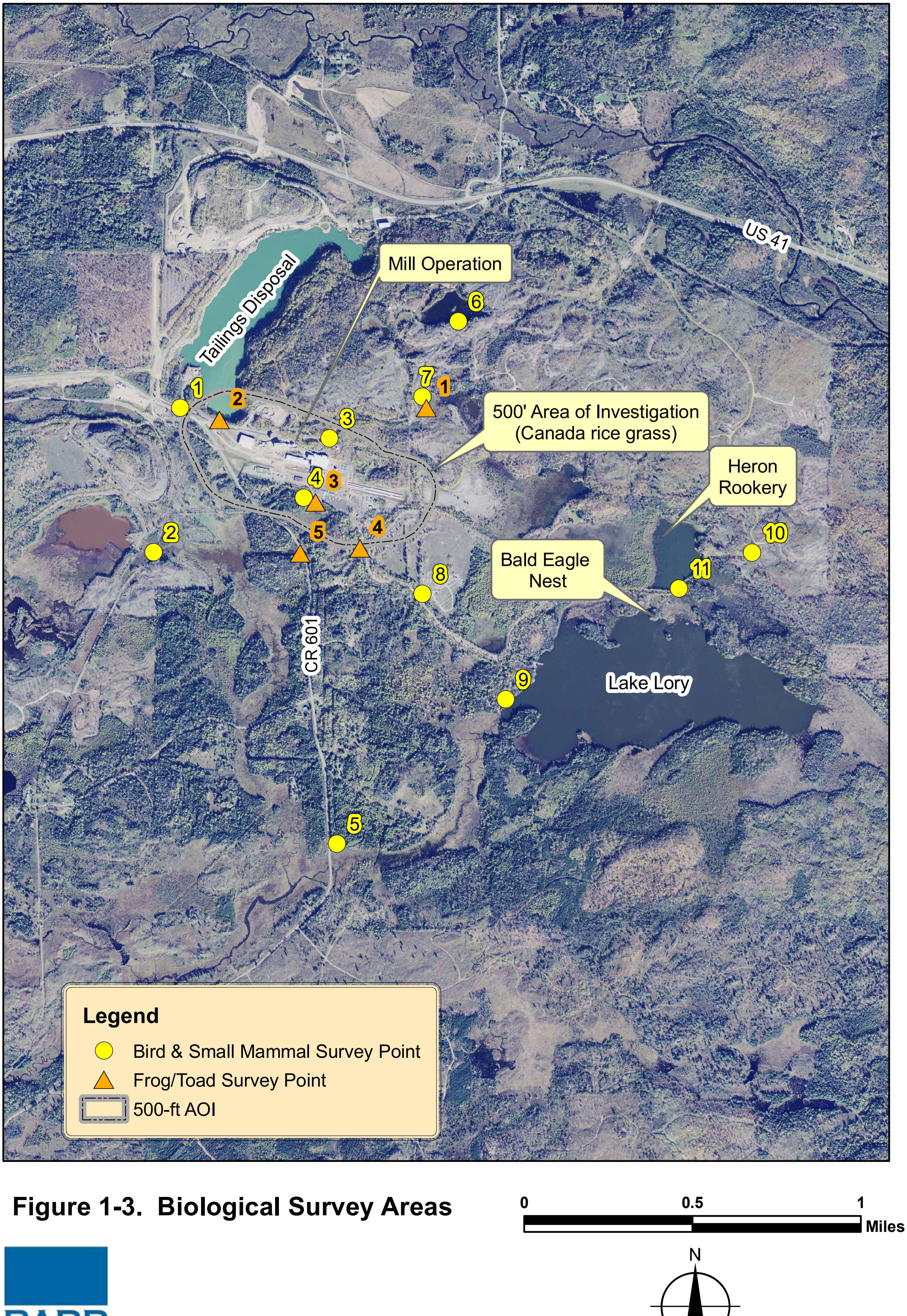



**Figure 1-3. Biological Survey Areas**

BARR

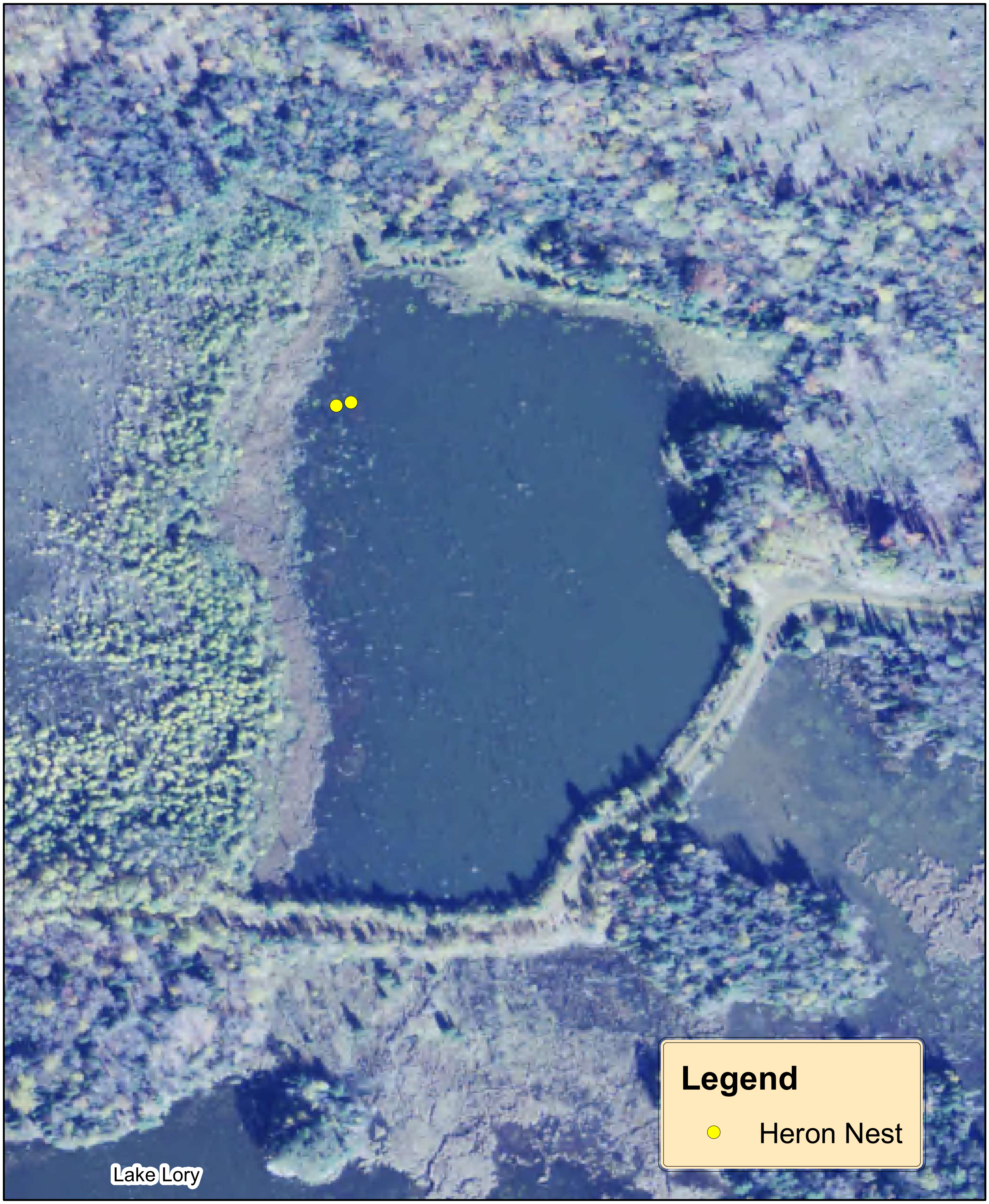
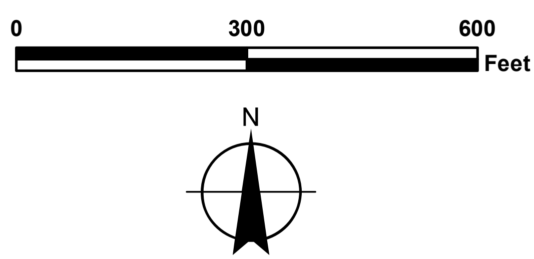


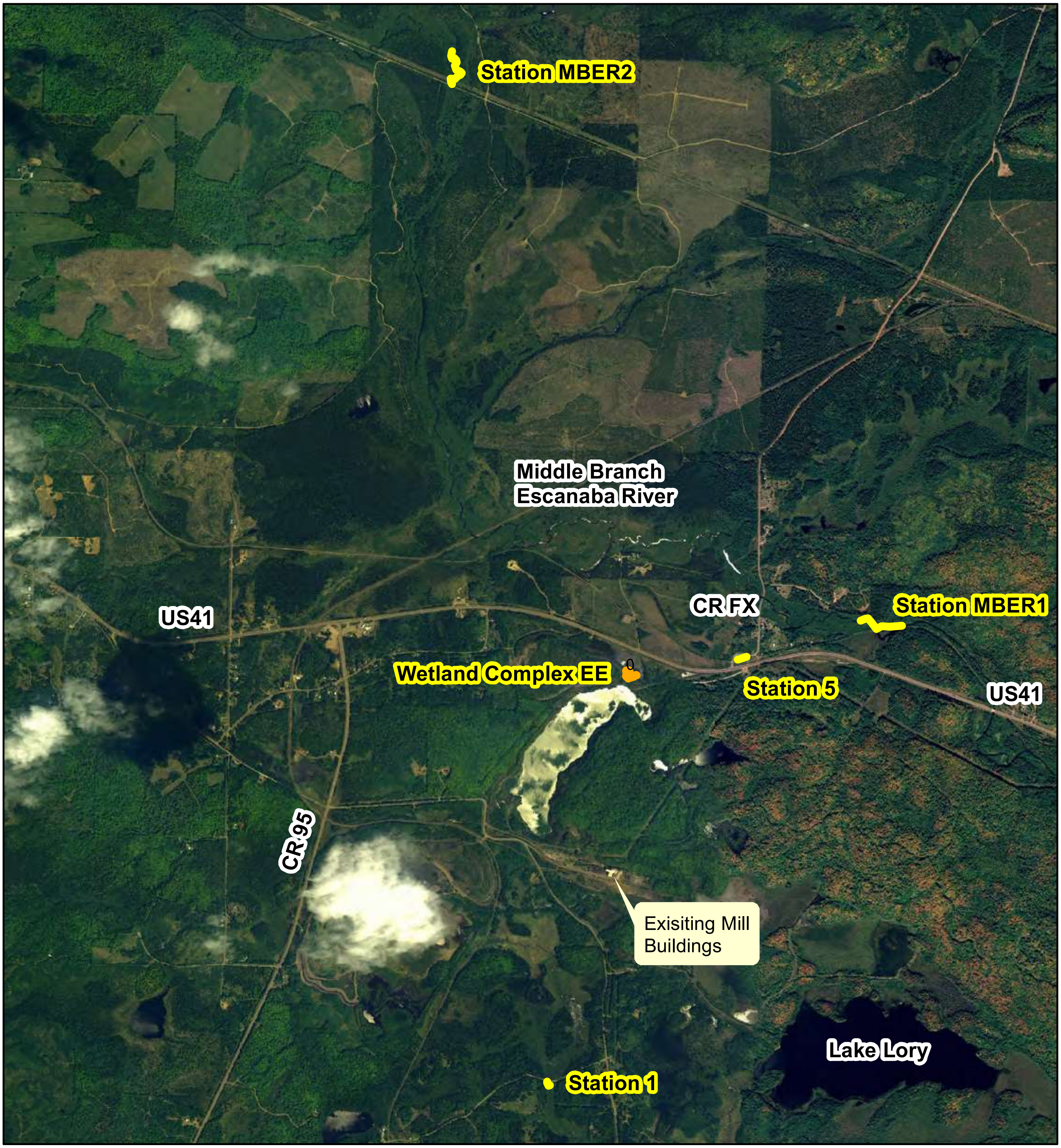

**Figure 5-1. Great Blue Heron Rookery**



# Appendix N

# Humboldt Mill

# Aquatic Survey Location Maps




**Legend**

Wetland Complex EE Station

Stream Sample Station Locations

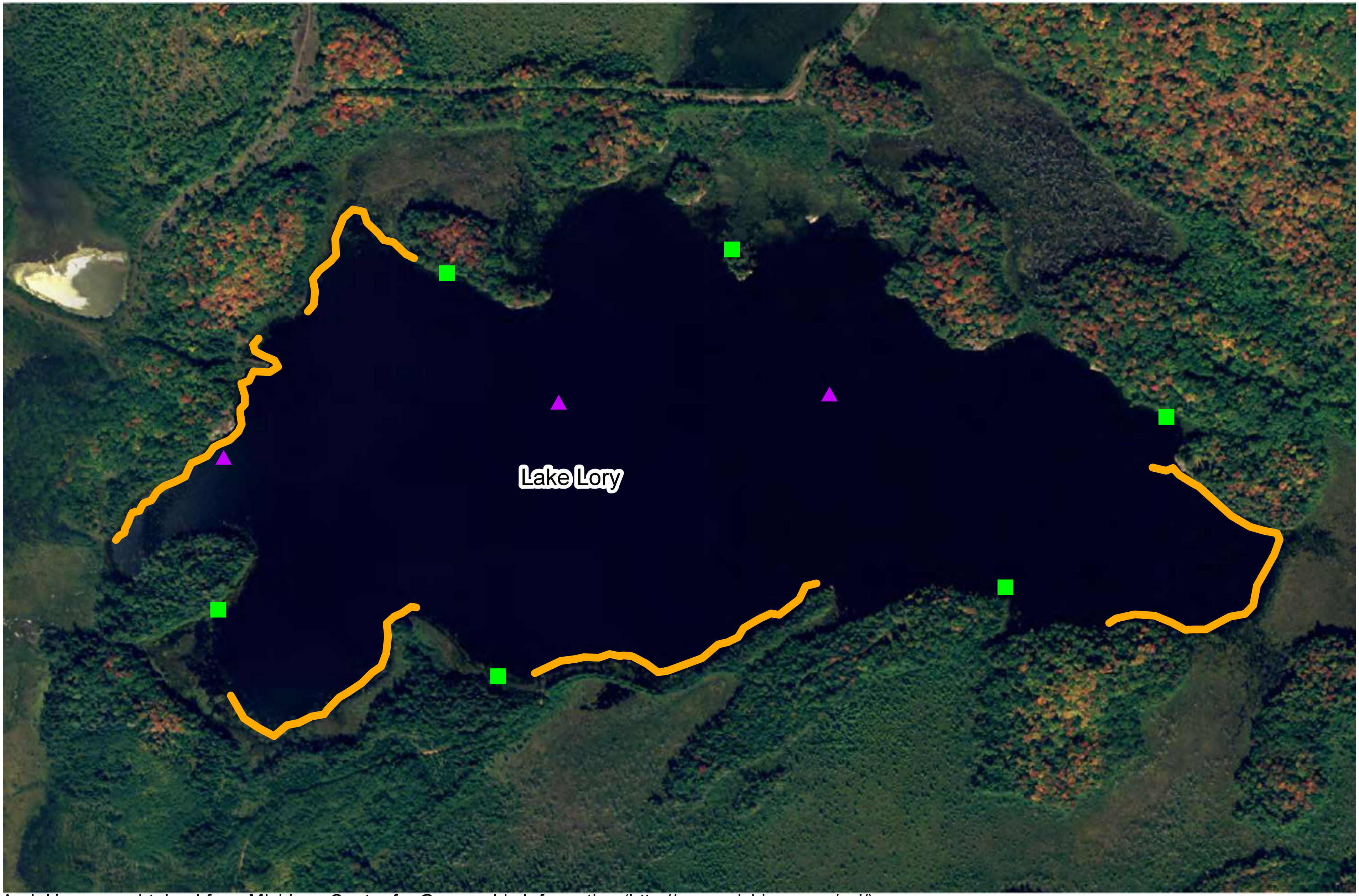
Feet
0 875 1,750 3,500 5,250 7,000

N

Aerial imagery obtained from Michigan Center for Geographic Information (http://www.michigan.gov/cgi/)

AEM ADVANCED ECOLOGICAL MANAGEMENT

| | |
|---|---|
| **PROJECT** | Humboldt Mill - Eagle Mine |
| **TITLE** | Sample Station Locations |
| **FIGURE** | 1-2 |




Aerial imagery obtained from Michigan Center for Geographic Information (http://www.michigan.gov/cgi/)

**Legend**

- Fyke Net Locations
- Gill Net Locations
- Electroshocker Transect Locations

0 275 550 1,100 1,650 2,200 Feet

N

AeM ADVANCED ECOLOGICAL MANAGEMENT

| | |
|---|---|
| PROJECT | Humboldt Mill - Eagle Mine |
| TITLE | Lake Lory Gear Locations |
| FIGURE | 1-3 |

# Appendix O

# Humboldt Mill

# Mill Contingency Plan

# 1. Contingency Plan – Humboldt Mill

This contingency plan addresses requirements defined in R 425.205. This includes a qualitative assessment of the risk to public health and safety or the environment (HSE risks) associated with potential accidents or failures involving activities at the Humboldt Mill. Engineering or operational controls to protect human health and the environment are discussed in Section 4 and Section 5 of this document. The focus of this contingency plan is on possible HSE risks and contingency measures. Possible HSE risks to on-site workers will be addressed by Eagle Mine through HSE procedures in accordance with Mine Safety and Health Administration (MSHA) requirements.

The Humboldt Mill involves processing ore, as well as storing and treating by-products of that process. The milling, storage, and treatment facilities have been designed, constructed, and are operated in a manner that is protective of the environment through the use of proven technologies and engineering practices.

## 1.1 Contingency Items

This contingency plan addresses the items listed below in this Section in accordance with R 425.205 (1)(a)(i) - (xii).

- Release or threat of release of toxic or acid-forming materials
- Storage, transportation, and handling of explosives
- Fuel storage and distribution
- Fires
- Wastewater collection and treatment system
- Air emissions
- Spills of hazardous substances
- Other natural risks defined in the EIA
- Power disruption, and
- Leaks from containment systems for stockpiles or disposal and storage facilities.

For each contingency item, a description of the risk is provided, followed by a qualitative assessment of the risk(s) to the environment or public health and safety. Next, the response measures to be taken in the event of an accident or failure are described.

### 1.1.1 Release of Toxic or Acid-Forming Materials

Potentially reactive materials generated as a result of processing operations include ore concentrate and tailings. Both materials have the potential to leach metals constituents when exposed to air and water. As described in the following sub-sections, handling, and temporary storage of both the ore concentrate and tailings have been carefully considered in the design of the Humboldt Mill so as to prevent the uncontrolled release of acid rock drainage (ARD).

#### 1.1.1.1 Coarse Ore Storage Area (COSA) and Concentrate Load-Out (CLO) Areas

Potential environmental risks associated with the COSA is the release of contact water to the environment via cracks in the floor areas or collection sumps. The COSA is a steel sided building with a full roof that is used for temporary storage of stockpiled coarse ore that has been transported from the mine and is awaiting crushing. The COSA has a concrete floor that is sloped to keep any water associated with the ore inside the facility. The lower level of the facility is equipped with an epoxy lined sump and any water collected is pumped to the Humboldt Tailings Disposal Facility (HTDF) for eventual treatment by the water treatment plant.

Contingency planning for this facility includes timely repair of cracks in the floors and walls that could allow the release of material into the environment. An impermeable surface inspection plan has been developed and describes procedures for routine impermeable surface inspections, preventative and remedial actions as well as documentation procedures. Also, in accordance with Air Permit (No. 405-08) all overhead doors must be closed during loading or unloading of ore and a sweeping program is in place to minimize the generation of dust.

#### 1.1.1.2 Concentrate Load-Out (CLO)

Potential environmental risks associated with the CLO is the release of acid generating material via track out and fugitive emissions. The CLO is a steel sided building with a full roof that is used for temporary storage of stockpiled nickel and copper concentrate prior to loading the material into railcars destined for customers. The CLO has concrete floors and does not contain any floor drains as water use is discouraged in this area.

Contingency planning for this facility includes timely repair of cracks in the floors and walls that could allow the release of material into the environment. An impermeable surface inspection plan has been developed and describes procedures for routine impermeable surface inspections, preventative and remedial actions as well as documentation procedures. Also, in accordance with Air Permit (No. 405-08) all overhead doors must be closed during loading operations and a sweeping program in place to minimize the generation of dust and track out of material. Track out is also managed in accordance with procedures outlined in the facilities standard operating procedures and includes inspecting and removing any residual concentrate from the exterior of the railcars prior to leaving the facility.

#### 1.1.1.3 Humboldt Tailings Disposal Facility (HTDF)

Potential contaminant release from the HTDF could be waters having elevated metal concentrations that impact surface water or groundwater quality. The HTDF is a former open pit mine that was allowed to fill with water. Process tailings are sub-aqueously disposed which is industry best practice for materials that could be potentially acid generating. The anoxic environment minimizes the potential for generation of ARD.

The HTDF was originally comprised of bedrock walls on three sides and alluvial soils on the north end in which water was allowed to naturally flow into the nearby wetland. A cut-off wall has been installed on the north end to prevent the release of water from the HTDF through the alluvial soils and into groundwater. Therefore, groundwater quality surrounding the HTDF should not be influenced by HTDF operations. Any water that leaves the HTDF must now pass through the water treatment plant prior to discharge into the environment. Surface water discharge from the HTDF will be treated through the water treatment plant prior to discharge to the Escanaba River and/or nearby wetland.

Groundwater seeps from the HTDF are not expected to occur due to the low permeability of the surrounding Precambrian geologic formation. Furthermore, groundwater and surface water quality and elevations/flow are routinely monitored in accordance with the Part 632 Mining and NPDES permits and will quickly identify changes to surrounding water quality that would be indicative of groundwater release from the HTDF. Contingency planning from an unlikely groundwater release from the HTDF includes:

- Identify the nature and extent of the release,
- Implement additional monitoring to ascertain extent of release,
- Develop a remedial action plan to bring facility back into compliance,
- Implement remedial action plan.

Specific details of the remedial action plan would be developed based upon the nature of the release and with agreements with the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

Eagle will monitor water quality in the HTDF during operations and post-closure. The WTP and associated infrastructure will remain in place after tailings disposal has ceased until water quality meets applicable standards. If future monitoring indicates there are elevated metals in the HTDF that could impact surface water one of the following treatment options may be implemented:

- Continue the treatment of the HTDF water through the WTP until water quality conditions in the HTDF meet surface water standards; and/or
- Amend the HTDF with appropriate reagents to reduce elevated metal parameters in order to meet surface water standards.

Specific reagents and application rate(s) would be identified upon determination of elevated metal parameters of concern. Past phosphate seeding of HTDF by previous owners was shown to be effective for nickel concentration reduction.

#### 1.1.1.4 **Tailings Transport System**

Tailings are transported to the HTDF via slurry contained within a double-cased HDPE pipe conveyance system. The pipe conveyance system consists of a 4-in diameter carrier pipe within an 8-in outer containment pipe. Two tailings lines are available for use, but only one is utilized at a time. In addition, the tailings lines are equipped with a leak detection system; any water released into the outer piping would drain to the shore vault and trigger an alarm, notifying operations of a potential system breach. The shore vault is also visually inspected twice per day (once per shift) by operators and the Environmental Department checks the tailings lines for signs of leakage once per week.

If a breach is identified, the slurry pumps will be shut down until the source of breach is identified and repaired. The contingency plan for moving tailings to the HTDF facility is to use the second set of tailings lines that are already in place. In the event both lines were down, they could either be pumped into a truck with a sealed cargo area or the tailings will be held within the plant thickener vessel until the pipeline is repaired.

### 1.1.2 Storage, Transportation and Handling of Chemicals

Potential risks associated with chemical use include surface and groundwater quality impacts. Chemicals are brought to the site by certified chemical haulers, meeting Michigan Department of Transportation (MDOT) transportation requirements. Storage of these chemicals is in secure locations within building(s) or outdoor bulk storage silos designed for that application. Transferring chemicals is conducted by qualified site personnel. Bulk granular products are conveyed pneumatically to the storage silos. Specific procedures for chemical storage and emergency response procedures are included in the facilities Pollution Incident Prevention Plan (PIPP).

Because chemicals will be stored in secure areas, the potential for release into the environment is very remote. If a breach of contaminant vessel does occur, the chemical will be contained within the secondary containment area. The spill or release will be immediately cleaned using appropriate methods specified in the Safety Data Sheets (SDS). SDS are maintained on-site for all chemicals.

### 1.1.3 Fuel Storage and Distribution

There is currently one 3,000 gallon stationary bulk diesel tank located onsite. This tank is used to fuel all mobile equipment onsite. A fuel provider refills the tank on an as needed basis. The stationary tank is located on an asphalt surface in which any spills or leaks would be captured in a catch basin and routed to the HTDF.

In addition to the above, additional equipment containing fuel include a back-up diesel generator (2,000 gallon capacity) located at the northeast corner of the concentrate loadout facility, a back-up diesel generator (1,335 gallons capacity) located by the shore vault, and two refueling tanks located in the beds of pickup trucks (38 and 96 gallon capacities).

In general, fuel spills and leaks will be minimized by the following measures:

- A Spill Prevention Control and Countermeasures Plan (SPCC) has been written and implemented.
- Training of personnel responsible for handling fuel in proper procedures and emergency response.
- Regular equipment inspections and documentation of findings.
- Staging of on-site emergency response equipment to quickly respond to unanticipated spills or leaks.

Specific procedures have been prepared as part of the project's SPCC Plan. In addition, a Pollution Incident Prevention Plan (PIPP) has been prepared which addresses potential spillage of fuels and other polluting materials such as water treatment chemicals and mill processing reagents.

Diesel fuel and propane (fuels) are transported to the Humboldt Mill by tanker truck from local distributors. The probability of an accidental release during transportation will be dependent on the location of the supplier(s) and the frequency of shipment. A fuel release resulting from a vehicular accident during transportation is judged to be a low probability event. Transport of fuel in tanker trucks does not pose an unusual risk to the region since tanker trucks currently travel to the region on a regular basis to deliver fuels to gasoline stations located in the communities surrounding the Humboldt Mill.

Three potential release events associated with the surface-stored fuels are a bulk tank failure, mishandling/leaking hoses, and a construction/reclamation phase release.

<u>Bulk Tank Failure</u> – A release may result from a failure of the stationary diesel tank. This type of release is judged to be low probability as it is a double-walled (i.e., secondary containment) fireproof tank that is inspected on a daily basis prior to use for signs of leakage or potential failure. In addition, as stated above the tank is located and utilized in an area where asphalt is present, and any spills would be directed to the HTDF and not to an offsite or unprotected surface location. In addition, a spill response trailer is located onsite and contains spill containment and clean-up equipment in the event of a spill. Eagle also has a spill response contractor on call to immediately respond to situations that cannot be handled by onsite personnel.

<u>Mishandling/Leaking Hoses</u> - A release might result from leaking hoses or valves, or from operator mishandling. This type of release is likely to be small in volume and is judged to be a low probability event given that operators will be trained to manage these types of potential releases. Mitigation measures include, fueling on an asphalt surface and using secondary containment under connection/fill points. In addition, these small spills will be cleaned up using on-site spill response equipment such as absorbent materials and/or by removing impacted soils.

<u>Construction/Reclamation Phase Release</u> - A major fuel spill during the construction or reclamation phases could occur from a mobile storage tank failure or mishandling of fuels. Such a release is also considered to be a low probability event given that operators will be trained to manage these types of potential releases and all tanks are required to have secondary containment. As with mishandling or leaking hoses, these small spills will be cleaned up by using on-site spill response equipment such as absorbent materials and/or removing impacted soils.

Absorptive materials may be used initially to contain a potential spill. After the initial response, soil impacted with residual fuel would be addressed. Remedial efforts could include, if necessary, the removal of soil to preclude migration of fuel to groundwater or surface water. The project's PIPP and SPCC plans addresses fueling operations, fuel spill prevention measures, inspections, training, security, spill reporting, and equipment needs. In addition, standard operating procedures have been developed which cover fueling operations and spill response activities. All responses to a fuel spill, both large and small, will follow the guidelines dictated by the spill response plan and be reported internally. The tanks will be inspected regularly, and records of spills will be kept and reported to EGLE or other agencies as required.

Contingency plans for responding to fuel spills from tanker trucks are required of all mobile transport owners as dictated by MDOT regulation 49 CFR 130. These response plans require appropriate personnel training and the development of procedures for timely response to spills. The plan must identify who will respond to the spill and describe the response actions to potential releases, including the complete loss of cargo. The plan must also list the names and addresses of regulatory contacts to be notified in the event of a release.

### 1.1.4 Fires

Surface fires can be started by a variety of causes including vehicular incidents, accidental ignition of fuels or flammable chemical reagents, and lightning strikes. Smoking is only allowed in designated areas on the site. Contingency measures include having the required safety equipment, appropriate personnel training and standard operating procedures. In addition, muster points have been established and all employees and visitors are trained on their location. Given these measures, uncontrolled or large surface fires are considered a low probability event with negligible risk.

Because the Humboldt Mill is situated in a forested region, forest fires started off-site could potentially impact the mill site. The cleared area in the vicinity of the surface facilities serves as a fire break to protect surface facilities. Contingency measures discussed below can be implemented in the event of an off-site forest fire.

In order to minimize the risk of a fire on-site, stringent safety standards are being followed. All vehicles/equipment are required to be equipped with fire extinguishers and all personnel trained in their use. Fire extinguishers are also located near each building exit door and personnel are required to complete a “hot work” permit for tasks involving open flames, heat, and/or sparks. A network of fire hydrants is installed throughout the site and the Mill Emergency Response Team is trained in defensive firefighting techniques to help stop the spread of a fire if it was safe to do so.

On-site firefighting equipment includes:

- An above ground water storage tank and distribution system for fire suppression
- Five stocked and maintained fire equipment cabinets
- 29 occupant-use fire hose stations throughout the facility
- Dry chemical fire extinguishers located throughout the site
- FireWorks system with multiple heat and smoke detectors that notifies site Security immediately of any fire.

In addition, a Wildfire Response Guideline has been developed in conjunction with Michigan DNR Fire Division to ensure the best possible response to a wildland fire.

Contingency planning for managing materials that oxidize includes training equipment operators on the material characteristics. The temperature of the material is routinely measured and any material exhibiting signs of self-heating is immediately compacted or exposed and spread out depending on the situation. Both methods are proven to mitigate the risks associated with self-heating.

### 1.1.5 Wastewater Collection and Treatment

The major source of water from the facility requiring treatment includes process water and tailings, groundwater infiltration into the HTDF, precipitation, and storm water runoff. The HTDF is sized to provide wastewater storage and equalization capacity. Water from the HTDF is conveyed to the WTP which is comprised of several unit processes, including: oxidation, metals precipitation, ultra-filtration, and reverse-osmosis filtration. The final product water is discharged to the Escanaba River and/or nearby wetland area. This discharge is authorized by the State of Michigan under a National Pollutant Discharge Elimination System (NPDES) permit (MI0058649).

The water treatment system is designed to handle various process upset conditions such as power disruption (Section 1.1.9) or maintenance of the various process units. The effluent is continually monitored for key indicator parameters to verify the proper operation. Effluent not meeting treatment requirements is pumped back to the HTDF for re-treatment. The water level of the HTDF is maintained at a level that provides ample storage capacity that would allow for sufficient time to correct a process upset condition. Potential hazards and chemical reagents associated with the WTP are discussed in Section 1.1.7.

### 1.1.6 Air Emissions

The operation and reclamation phases of the project will be performed in a manner to minimize the potential for accidents or failures that could result in off-site air quality impacts. All phases of the project will incorporate a combination of operating and work practices, maintenance practices, emission controls and engineering design to minimize potential accidents or failures. Below is a description of identified areas of risk and associated contingency measures that may be required. As part of a comprehensive environmental control plan, these contingency measures will assist in minimizing air impacts to the surrounding area.

#### 1.1.6.1 Air Emissions during Operations

During operation of the mill, potential emissions from the facility will be controlled as detailed in the Mill's current Michigan Air Use Permit (No. 405-08). These controls include use of building enclosures for material handling, installation of dust collection or suppression systems to control dust during ore crushing and transfer operations and following prescribed preventive maintenance procedures for the facility. Tailings generated during the milling process are transported to the HTDF via slurry and therefore will not generate particulate matter. Ore brought from off-site is transported in covered trucks to minimize dust emissions. Below is a more detailed discussion of potential airborne risks associated with proposed operations at the facility.

To minimize dust emissions from the COSA and concentrate load-out building, these areas are fully enclosed. Ore transported from the mine site may only be dumped in the COSA when the doors are closed to minimize dust emissions from the building. A sweeping and housekeeping program is in place in the COSA and throughout the crushing circuit including the primary crusher, rock breaker, and conveyor transfer points located in the conveyor transfer station and mill building.

Fabric filter baghouses are used throughout the facility to minimize emissions of dust. Bag houses are located in the Secondary Crusher building and the Fine Ore Bins. Two insertable filter systems are installed in the transfer building. Baghouse malfunction is a possibility and can include a bag break or offset and excessive dust loading. These potential malfunctions are addressed in the malfunction prevention and abatement plan. The plan includes regular inspections and maintenance activities of dust collection and suppression systems which is accomplished through monitoring of pressure drop across the bags, monitoring of gas flow, and visual observations of stack emissions to assess opacity per permit conditions. In the event the monitoring program indicates a malfunction, a thorough investigation of the cause will occur. If necessary, ore processing operations will be shut down until the problem is corrected.

During facility operations, Eagle Mine will utilize certain pieces of mobile equipment to move material about the site. Equipment includes front end loaders, product haul trucks, and miscellaneous delivery trucks. Although the movement of most vehicles across the site is on asphalt surfaces, a comprehensive on-site sweeping and watering program has been developed to control potential fugitive sources of dust. If excessive dust emissions should occur, the facility will take appropriate corrective action, which may include intensifying and/or adjusting the sweeping/watering program to properly address the problem.

#### 1.1.6.2 Air Emissions during Reclamation

Once milling operations are completed at the site, reclamation will commence in accordance with R425.204. Similar to construction activities, there is a moderate risk that fugitive dust emissions could be released during certain re-vegetation activities and during temporary storage of materials in stockpiles.

Similar to controls employed during the construction phase, areas that are reclaimed will be re-vegetated to stabilize soil and reduce dust emissions. If severe wind or an excessive rain event reduces the effectiveness of these protective measures, appropriate action will take place as soon as possible to restore vegetated areas to their previous effectiveness and replace covers as necessary.

To the extent necessary, areas being reclaimed will be kept in a wet state by continuing the watering program. It is anticipated this program should minimize the possibility of excessive dust associated with mobile equipment. In the event fugitive dust is identified as an issue, corrective action will determine the cause of the problem and appropriate action will occur.

### 1.1.7 Spills of Hazardous Substances

Chemical reagents onsite are primarily used for the ore flotation and water treatment plant processes. Table 1.1.7 includes a list of reagents reported under the SARA Tier II Emergency and Hazardous Chemical Inventory that are being used onsite along with the approximate storage volumes and storage location. The storage volume is the calculated volume of chemical within each solution based on percentage.

**Table 1.1.7 Chemical Reagents Used at the Water Treatment Plant & Mill Building**

| Item No. | Chemical Name | Trade Name | CAS No. | Storage Volumes | Storage Areas |
|---|---|---|---|---|---|
| 1 | Hydrochloric Acid/Hydrogen Chloride 31.5% | Muriatic Acid | 7647-01-0 | 900 gal | WTP chemical storage |
| 2 | Sodium Bisulfite 40% | Sodium Bisulfite | 7631-90-5 | 900 gal | WTP chemical storage |
| 3 | Sodium Hydroxide 25% | Sodium Hydroxide/ Caustic Soda | 1310-73-2 | 900 gal | WTP chemical storage |
| 4 | Sodium Hypochlorite 12.5% | Chlorine/Bleach | 7681-52-9 | 900 gal | WTP chemical storage |
| 5 | 1) Ferric Chloride 35%<br>2) Hydrochloric Acid 1% | Ferric Chloride | 1) 7705-08-0<br>2) 7647-01-0 | 7,500 gal | WTP Reactor Area (West of WTP) |
| 6 | 1) Sodium Hydroxide 50%<br>2) Sodium Chloride 5% | Sodium Hydroxide/ Caustic Soda | 1) 1310-73-2<br>2) 7647-14-5 | 8,400 gal | WTP chemical storage |
| 7 | Sulfuric Acid 93.19% | Sulfuric Acid, 66 Deg | 7664-93-9 | 7,600 gal | WTP sulfuric bulk tank |
| 8 | Aluminum chloride hydroxide sulphate | Nalco 8136/PAC | 39290-78-3 | 2,200 gal | WTP chemical storage |
| 9 | 1) Sodium Chloride<br>2) Sodium Sulphide,<br>3) Sodium Hydroxide | Nalmet 1689 | 1) 7647-14-5<br>2) 1313-82-2<br>3) 1310-73-2 | 550 gal | WTP chemical storage |
| 10 | Hydrotreated Light Distillate | Nalclear 7766 Plus/Flocculant | 64742-47-8 | 110 gal | WTP chemical storage |
| 11 | Hydrogen Peroxide 50% | Hydrogen Peroxide | 7722-84-1 | 7,000 gal | WTP reactor Area |

| | | | | | |
|---|---|---|---|---|---|
| 12 | Low pH RO cleaner | Citric Acid | 77-92-9 | 4,000 lbs | WTP chemical storage |
| 13 | High pH RO cleaner | Hydrex 4501 | Unknown | 1,600 lbs | WTP chemical storage |
| 14 | PERMACLEAN-56 | Biocide PC-56 | 10377-60-3<br>26172-55-4<br>2682-20-4 | 550 gal | WTP chemical storage |
| 15 | Sodium carboxymethyl cellulose | CMC/Finnfix 300 | 9004-32-4 | 20 tons | Reagent storage area |
| 16 | Calcium Hydroxide | Hydrated Lime | 1305-62-0 | 29 tons | Lime silo |
| 17 | Optimer 83949 | Flocculant | Unknown | 2 tons | Reagent storage area |
| 18 | Methyl isobutyl carbinol (MIBC) | MIBC/Frother | 108-11-2 | 2.2 tons | MIBC tank |
| 19 | Sodium isopropyl xanthane (SIPX) | SIPX | 140-93-2 | 15 tons | Reagent storage area |
| 20 | Sodium carbonate | Soda Ash | 497-19-8 | 54 tons | Soda ash silo |
| 21 | Carbon Dioxide | Carbon Dioxide/$CO_2$ | 124-38-9 | 6,000 lbs | $CO_2$ Tank |
| 22 | Graymont High Calcium Hydrated Lime | Hydrated Lime | 1305-62-0<br>14808-60-7 | 25 tons | WTP lime storage connex |
| 23 | Depositrol BL5400 | Anti-Scalant | 2809-21-4<br>13598-36-2 | 3,150 lbs | Concentrator Building – Pump Alley |

Chemical storage and delivery systems follow current standards that are designed to prevent and to contain spills. All areas in which chemicals are used or stored have been designed and constructed with environmental protection in mind. This includes development of secondary containment areas for liquids. The secondary containment area is constructed of materials that are compatible with and impervious to the liquids that are being stored. A release in the WTP or concentrator building from the associated piping would be contained within the plant area, neutralized, and sent to the HTDF for disposal. Absorbent materials are available to contain acid or caustic spills. Eagle Mine has an emergency response contractor on call to immediately respond to environmental incidents, assist with clean-up efforts, and conduct environmental monitoring associated with any spills.

Spill containment measures for chemical storage and handling will reduce the risk of a spill from impacting the environment. Due to the low volatility of these chemicals, fugitive emissions from the WTP or concentrator building to the atmosphere during a spill incident are likely to be negligible. Off-site exposures are not expected. It is therefore anticipated that management and handling of WTP and processing reagents will not pose a significant risk to human health or the environment.

### 1.1.8 Other Natural Risks

Earthquakes – The Upper Peninsula of Michigan is in a seismically stable area. The USGS seismic impact zone maps show the maximum horizontal acceleration to be less than 0.1 g in 250 years at 90% probability. Therefore, the mine site is not located in a seismic impact zone and the risk of an earthquake is minimal. Therefore, no contingency measures are discussed in this section.

Floods - High precipitation events have been discussed previously in the section that describes the HTDF. High precipitation could also lead to the failure of erosion control structures. The impacts of such an event would be localized erosion. Contingency measures to control erosion include sandbag barriers and temporary diversion berms. Long term or off-site impacts would not be expected. Failed erosion control structures would be repaired or rebuilt. Impacts from high precipitation are reversible and off-site impacts are not expected to occur. Given the considerable planning and engineering efforts to manage high precipitation events, the risk posed by high precipitation is considered negligible.

Severe Thunderstorms or Tornadoes – Severe thunderstorms or tornadoes are addressed in the emergency procedures developed for the Eagle Mine and Humboldt Mill. Storm shelters have been designated and evacuation procedures practiced on an annual basis.

Blizzard – The mill site is designed to accommodate the winter conditions anticipated in the Upper Peninsula of Michigan. The Marquette County Road Commission is responsible for maintaining roadways near the Humboldt Mill. If road conditions deteriorate beyond the capability of the county or township maintenance equipment, employees can be housed onsite in the administrative offices and conference rooms as needed.

Forest Fires – Forest fires were discussed in Section 1.1.4.

### 1.1.9 Power Disruption

Electrical power for the Humboldt Mill is provided by two utility power companies: Wisconsin Electric (WE) Energies and Upper Peninsula Power Company (UPPCO). The mill facility and production buildings are presently served by a 69 kV overhead electric feeder to an on-site UPPCO electrical substation. The substation supplies three underground 13.8 kV feeders: two to our main mill switchgear and one to our fire water system.

The production support buildings and Water Treatment Plant infrastructure for the mill are fed from a WE Energies 25 kV overhead line. These buildings include the Security Building, Administration Building, Mill Services Building, Water Treatment Plant Building which includes Water Treatment Plant Intake Pump Building.

In the event that power is disrupted, backup generators are installed to ensure mill critical loads remain energized. The buildings where "critical loads" have been identified and generators have been installed is the Concentrator Building, which powers essential loads in the Concentrator and Concentrate Load Out Building, Coarse Ore Storage Area, Tailings Vault/Reclaim Pump Structure, Administration Building, Mill Services Building, Security Building and Water Treatment Plant.

In the event the WTP would need to be temporarily shut down during power disruptions, the water level of the HTDF is maintained at a level that provides enough capacity to store water for an extended period of time if necessary.

## 1.2 Emergency Procedures

This section includes the emergency notification procedures and contacts for the Humboldt Mill Site. In accordance with R 425.205(2), a copy of this contingency plan will be provided to each emergency management coordinator having jurisdiction over the affected area (i.e., Marquette County).

Emergency Notification Procedures – An emergency will be defined as any unusual event or circumstance that endangers life, health, property, or the environment. If an incident were to occur, all employees are instructed to contact Security via radio or phone. Security then makes the proper notifications to the facility managers and activates the Eagle Mine Emergency Response Guideline as needed. If personnel on site need to be notified of such an event an emergency toned broadcast via radio and all-call speakers will be made with instructions.

Eagle Mine has adopted an emergency response structure that allows key individuals to take immediate responsibility and control of the situation and ensures appropriate public authorities, safety agencies and the general public are notified, depending on the nature of the emergency. A brief description of the key individuals is as follows:

- Health & Safety Officer: The facility H&S manager and H&S staff are responsible for monitoring activities in response to any emergencies. During an emergency, H&S representatives will manage special situations that expose responders to hazards, coordinate emergency response personnel, mine rescue teams, fire response, and ensure relevant emergency equipment is available for emergency service. This individual will also ensure appropriate personnel are made available to respond to the situation.

- Environmental Officer: The facility environmental manager will be responsible for managing any environmental aspects of an emergency situation. This individual will coordinate with personnel to ensure environmental impact is minimized, determine the type of response that is needed and act as a liaison between environmental agencies and mine site personnel.
- Public Relations Officer: The facility external relations manager will be responsible for managing all contacts with the public and will coordinate with the safety and environmental officers to provide appropriate information to the general public.

In addition to the emergency response structure cited above, Eagle Mine has a Crisis Management Team (CMT) and Plan developed to manage situations that may result in multiple injuries, loss of life, environmental damage, property or asset loss, or business interruption. If a situation is deemed a "crisis" the CMT immediately convenes to actively manage the situation. The CMT meets on a quarterly basis to review and practice plan implementation and annually a third party develops a desktop exercise to challenge and ensure preparedness of the CMT. The following is a description of the core members and their roles:

**Crisis Management Team – Core Members and Roles**

| Core Members | Role |
|---|---|
| Team Leader | Responsible for strategy and decision making by the CMT during a crisis and maintaining a strategic overview. |
| Coordinator | Ensures a plan is followed and all logistical/administrative support required is provided. |
| Administrator | Records key decisions and actions and provides appropriate administrative supports to the CMT. |
| Information Lead | Gathers, shares, and updates facts on a regular basis. |
| Emergency Services and Security | Liaises with external response agencies and oversees requests for resources. Maintains a link between the ERT and CMT and oversees and necessary evacuations. |
| Communications Coordinator | Develops and implements the communications plan with support from an external resource. |
| Spokesperson | Conducts media interviews and stakeholder briefings. |

Evacuation Procedures – While the immediate surrounding area is sparsely populated, if it is necessary to evacuate the general public, this activity will be handled in conjunction with emergency response agencies. The Public Relations Officer will be responsible for this notification, working with other site personnel, including the H&S and environmental officers.

In the event evacuation of mill personnel is required, Eagle Mine has developed emergency response procedures for all surface facilities. All evacuation procedures were developed in compliance with MSHA regulations. In addition, the Mill Emergency Response Team (ERT) was formed to assist in emergency response situations should they arise. This team is not required by MSHA but was established to help ensure the safety of employees while at work. The focus of the team is to act as the liaison with first responders as well as the Eagle CMT, providing assistance where needed as they are considered the site experts. ERT trainings occur once per month. Training focuses on emergency management, with topics including scene safety, basic rope rescue knots and techniques, medical and trauma treatment, patient packaging and moving, site evacuation, basic firefighting, lock out tag out safety for emergency responders, and site emergency equipment and locations.

In addition to the ERT, security personnel are EMTs and paramedics who are trained in accordance with state and federal regulations. This allows for immediate response to medical emergency situations.

COVID-19 - In order to reduce the risk of onsite spread of Covid-19, several policies, procedures, and onsite controls are in place which include daily health screening, required mask use, quarantine requirements, occupancy limits in shared spaces, and vaccine incentives to increase participation. A Covid-19 Trigger Action Response Plan (TARP) and risk register are also in place to help determine when additional action may be necessary to further reduce risk.

Emergency Equipment – Emergency equipment includes but is not limited to the following:

- ABC Rechargeable fire extinguishers
- Fire cabinets located throughout the site containing hose, nozzles, hydrant wrenches, etc.
- Radios
- First aid kits, stretchers, backboards, and appropriate medical supplies
- Gas detection monitors that detect five gases and LEL
- High angle rescue ropes
- Self-Contained Breathing Apparatus (SCBA)
- Spill Kits (hydrocarbon and chemical)
- Certified EMT's Basic and Paramedics are on site at all times to respond in the event of an emergency.
- A trained Emergency Response Team.

This equipment is located throughout the surface facilities. Fire extinguishers are located at appropriate locations throughout the facility, in accordance with MSHA requirements. Surface facility personnel are also equipped with radios for general communications and emergencies. Other emergency response equipment is located at appropriate and convenient locations for easy access for response personnel.

Emergency Telephone Numbers – Emergency telephone numbers are included for site and emergency response agencies, as required by R 425.205(1)(c). They are as follows:

- Mill Security: (906) 339-7017
- Local Ambulance Services: UP Health Systems Bell. Contact Security at Extension 7017, or by radio using the Emergency Channel, or by dialing 911.
- Hospitals: Marquette General Hospital – (906) 225-3560
  Bell Hospital – (906) 485-2200
- Local Fire Departments: Humboldt Township, Ishpeming Township – 911
- Local Police: Marquette County Central Dispatch – 911
  Marquette County Sheriff Department – (906) 225-8435
  Michigan State Police – (906) 475-9922
- TriMedia 24-hr emergency spill response: (906) 360-1545
- EGLE Marquette Office: (906) 228-4853
- Michigan Pollution Emergency Alerting System: (800) 292-4706
- Federal Agencies: EPA Region 5 Environmental Hotline: (800) 621-8431
  EPA National Response Center: (800) 424-8802

MSHA North Central District: (218) 720-5448

- MDNR Marquette Field Office: (906) 228-6561
- Humboldt Township Supervisor: (906) 339-4477

### 1.3 Testing of Contingency Plan

During the course of each year, the facility will test the effectiveness of the Contingency Plan. Conducting an effective test will be comprised of two components. The first component will include participation in adequate training programs on emergency response procedures for those individuals that will be involved in responding to emergencies and the second component is completion of a mock field or desktop exercise.

Training will include participation of the Safety Officer, Environmental Officer, Public Relations Officer, and other individuals designated to respond to emergencies including the Mill ERT. Individuals will receive appropriate training and information with respect to their specific roles, including emergency response procedures and use of applicable emergency response equipment.

The second component of an effective Contingency Plan is to conduct desktop exercises or mock field tests. At least one desktop exercise or mock field test will be performed each year which will test the emergency response measures of the contingency plan and crisis management plan in place at Eagle Mine. The Safety Officer will work with the Environmental Officer and Emergency Response Coordinator to first define the situation that will be tested. The types of test situations may include responding to a release of a hazardous substance, fire, or natural disaster such as a tornado. A list of objectives will be developed for planning and evaluating each identified test situation. A date and time will then be established to carry out the test. Local emergency response officials may be involved, depending on the type of situation selected.

Once the test is completed, members of the crisis management team and emergency response team will evaluate the effectiveness of the response and make recommendations to improve the system. These recommendations will then be incorporated into a revision of the facility Contingency Plan and Crisis Management Plan.

# Appendix P

# Humboldt Mill

# Organizational Chart

Eagle Mine
a subsidiary of lundin mining

**Eagle Mine**
4547 County Road 601
Champion, MI 49814, USA
Phone: (906) 339-7000
Fax: (906) 339-7005
www.eaglemine.com

**Organizational Information**

**Eagle Mine LLC**

January 03, 2022

**Registered Address:**
Eagle Mine, LLC
1209 Orange Street
Wilmington, DE 19801

**Business Address:**
Eagle Mine, LLC
4547 County Road 601
Champion, MI 49814

**Board of Directors**

| | |
|---|---|
| Darby Stacey | 4547 County Road 601<br>Champion, MI 49814 |
| Peter Richardson | 4547 County Road 601<br>Champion, MI 49814 |
| Scott Manninen, CFO | 4547 County Road 601<br>Champion, MI 49814 |

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Phone: (906) 339-7000
Fax: (906) 339-7005
www.eaglemine.com

**Officers**

| | | |
|---|---|---|
| Jinhee Magie | Treasurer | 4547 County Road 601<br>Champion, MI 49814 |
| Annie Laurenson | Secretary | 4547 County Road 601<br>Champion, MI 49814 |
| Darby Stacey | President/Managing Director | 4547 County Road 601<br>Champion, MI 49814 |
| Scott Manninen | CFO | 4547 County Road 601<br>Champion, MI 49814 |