East Helena Wastewater Treatment Plant

Facility Plan

November
2025

Prepared for:
The City of East Helena
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11-3-2025
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CHAPTER 1 – FLOW AND LOAD PROJECTIONS

1.1 Service Area

The City of East Helena owns, operates, and maintains the wastewater system that serves the community including gravity sewer mains, lift stations, force mains, and the wastewater treatment plant (WWTP). The City's wastewater system was first developed in the mid-1930's and has been expanded several times to accommodate growth. Significant expansions were completed in the 1950's, 1980's, early 2000's, and again in 2014. Along with the residential and commercial users within city limits, the City also collects and treats wastewater from areas outside current city limits including Pele Park Trailer Court, East Clark Street Water & Sewer District, and Red Fox Meadows Subdivision. Recent additions to the collection system within the city limits include East Helena High School, Vigilante Subdivision, and Highland Meadows Subdivision. Currently, there are two major subdivisions being designed south of Highway 12 on the previously owned Montana Environmental Trust Group (METG) property. **Figure 1.1** illustrates the extents of the existing wastewater system and the areas currently being served.

1.2 Wastewater Flows

1.2.1 Historic Influent Flows

Influent flows at the WWTP are monitored and recorded by a Parshall flume with an ultrasonic flow meter. Using influent wastewater flow data from 2019 through 2023, the average daily flow at the WWTP was 263,906 gallons per day (gpd). At the end of December 2023, the City of East Helena had approximately 3,084 wastewater users. The resulting per capita flow rate for this five-year period was 96 gallons per capita per day (gpcd). Using 2.3 people per equivalent dwelling unit (EDU) and 100 gpcd, this value confirms the 230 gpd per EDU that the City uses to allocate capacity for future development. During this same time, the estimated peak hour flow was roughly 916,841 gpd or 637 gallons per minute (gpm). The dry weather flow (excludes the wet weather flow months of May through October) during these years averaged 228,539 gpd and showed a 29.4% increase from 2021 to 2023. This is one indicator of the rapid growth occurring in the East Helena area. Influent wastewater flow data from 2019 through 2023 are shown in **Table 1.1**. Also, a graph of the daily wastewater flows during this period is shown in **Figure 1.2**.

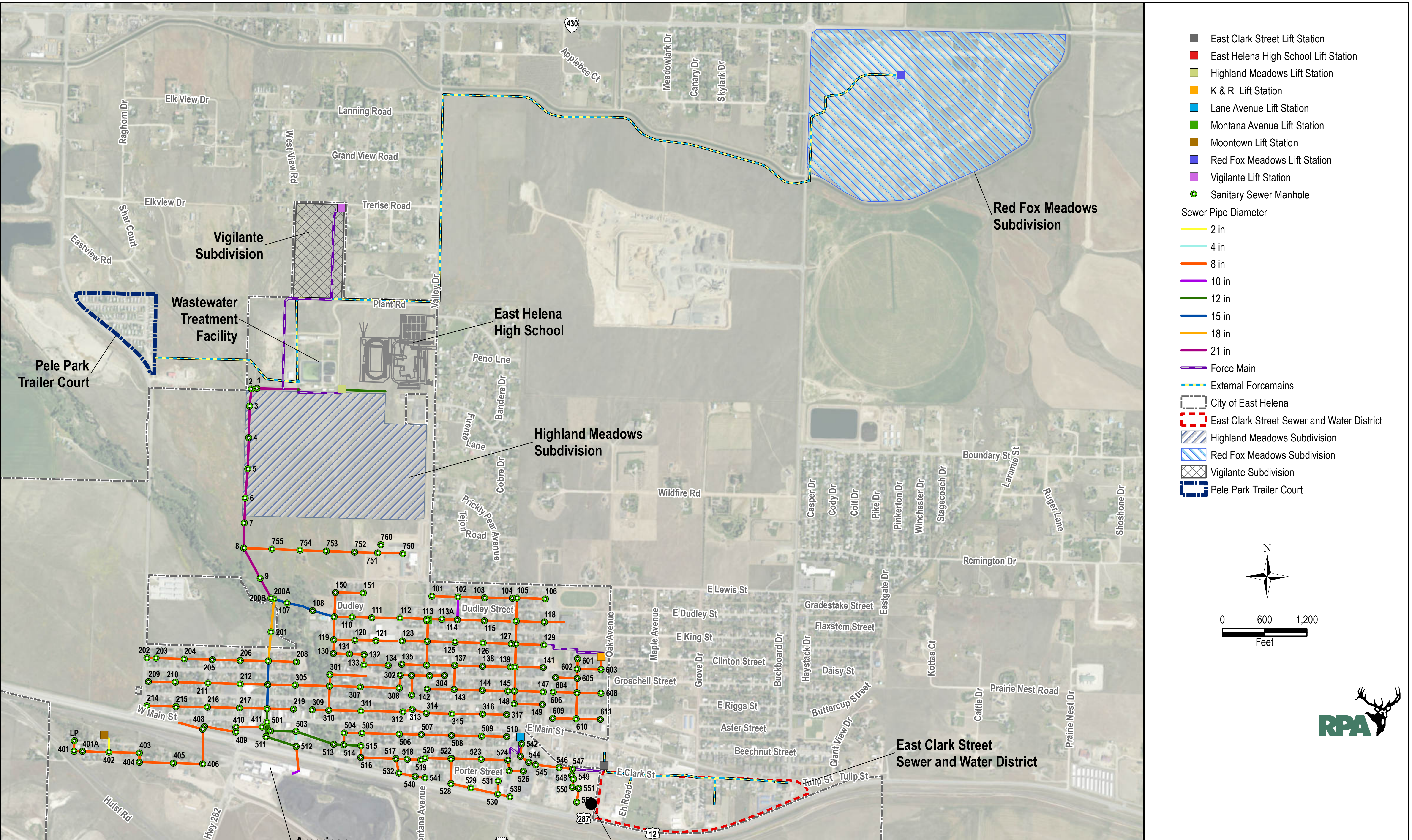


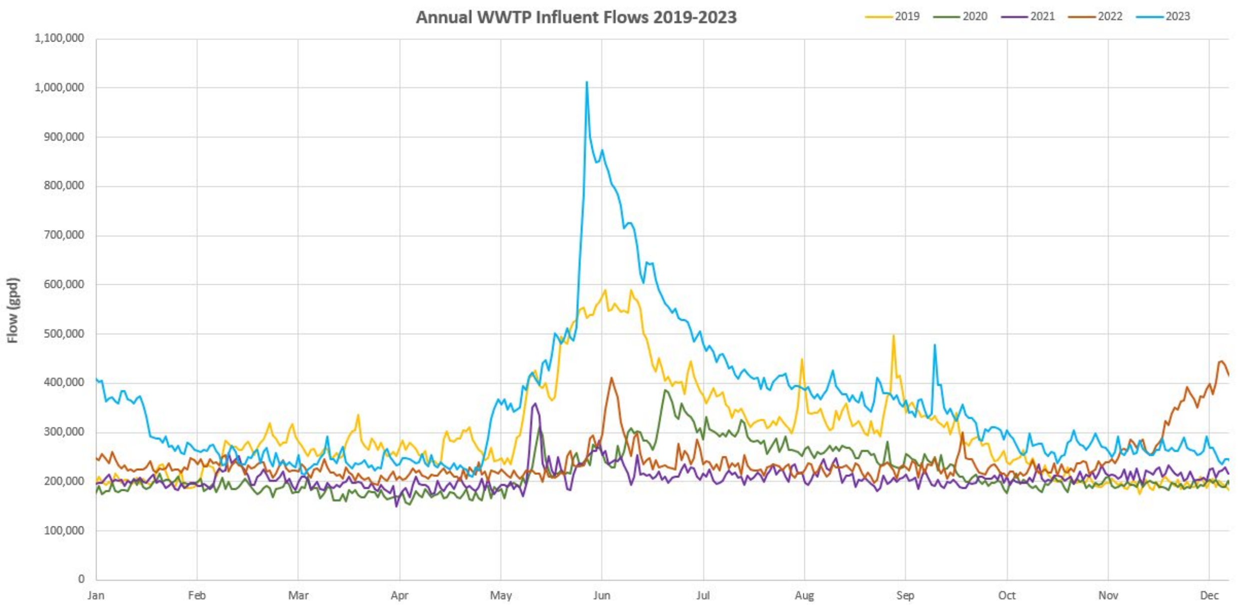
Figure 1.1
Wastewater Service Area

Date: 5/7/2020 Path: F:\waste\18801 - East Helena Wastewater Capacity Study\GIS\MasterPlan\ExistingServiceArea_Fig2A1.mxd

Table 1.1: East Helena Influent Wastewater Flows 2019 - 2023

Year	WW Users	Average Daily Flow (gpd)	Per Capita Flow (gpcd)	Max Month Flow (gpd)	Peak Hour Flow (gpd)	Dry Weather Flow (gpd)
2019	2,447	296,326	121	526,491	1,041,895	233,228
2020	2,523	218,570	87	311,503	766,131	187,198
2021	2,668	209,252	78	232,638	729,279	204,565
2022	2,969	244,677	82	375,183	843,214	252,947
2023	3,084	350,705	114	722,078	1,203,685	264,756
Averages		**263,906**	**96**	**433,578**	**916,841**	**228,539**

Figure 1.2: East Helena Influent Wastewater Flows 2019 - 2023



1.2.2 Inflow and Infiltration

Inflow is typically stormwater that enters the collection system from above-ground sources. Infiltration is excess water that enters the collection system by damaged and unsealed pipes and joints and is typically groundwater or water from saturated soils after snow melts or a storm event. Excessive inflow and infiltration (I & I) can significantly increase the operations and maintenance of a WWTP and decrease the hydraulic capacity. This "clean water" inhibits biological treatment, especially when the volume of clean water is not constant. As shown in **Figure 1.2**, flows to the WWTP increase dramatically in the wet weather months. These spikes in flow are mainly attributed to I & I. The *2020 Wastewater Master Plan* shows direct correlations between both the flow in Prickly Pear Creek and precipitation events increasing the flow received at the WWTP. A thorough I & I study was conducted as part of the *2020 Wastewater Master Plan* and showed that I & I was prominent in the collection system. Portions of the collection system are being slip lined in the spring of 2025 which will help both reduce and stabilize wastewater flow to the WWTP, increasing the treatment efficiency of the WWTP and reducing operation and maintenance costs.

1.2.3 Growth/Population Projections

Various developers have approached the City with plans for purchase and development of multiple properties south of Highway 12, previously owned by ASARCO and managed by METG. This includes 782 acres east of Highway 518 and 20 acres west of Highway 518 on the east side of Prickly Pear Creek. There are also plans to develop 220 total acres west of Prickly Pear Creek on either side of Highway 282. The METG parcels south of Highway 12 will add approximately 3,700 EDUs to the City's wastewater service area. Over the next three decades, the number of wastewater users is estimated to increase to 16,719. Assuming an average yearly population growth rate of 4.6% during this period, **Table 1.2** shows the increase of wastewater users. This population growth rate and number of wastewater users were approved by the City Council during a 2022 meeting.

Table 1.2: East Helena Wastewater User Growth

Year	Wastewater Users	Average Yearly Increase
December 2022	2,969	-
2027 – 5 Year	6,801	18.0%
2037 – 15 Year	11,608	5.5%
2052 – 30 Year	16,719	2.5%

1.2.4 Design Flows

Once population growth and land development areas were predicted, wastewater flow projections were made. For residential use areas, the estimated number of EDUs were based on typical housing densities and planning meetings with developers and the City. Totals were then generated within each planning area. Based on data within the East Helena wastewater service boundary, it was assumed that there would be an average of 230 gpd per EDU of wastewater flow. For commercial use areas, the acres of anticipated commercial development within each planning area were multiplied by a particular gallons/acre factor based on different types of commercial use. These values were determined by referencing *Table V-1: Wastewater Flow Rate for Zoned Undeveloped Areas in the City of Bozeman's Design Standards*. Having a daily flow from each planning area of residential and commercial growth allowed daily flows to be totaled for each of the planning periods noted above.

Using these daily flow values and peaking factors from the last five years, future design criteria were established for the collection system and WWTP for these time periods. **Table 1.3** below summarizes the design criteria that will be used in sizing collection system improvements and future upgrades at the WWTP.

Table 1.3: East Helena Wastewater Design Flows

Year	WW Users	Average Daily Flow (gpd)	Max Month Flow (gpd)	Peak Hour Flow (gpd)
2027	6,801	625,000	914,000	1,949,000
2037	11,608	1,200,000	1,754,000	3,468,000
2052	16,719	1,650,000	2,412,000	4,506,000

1.3 Wastewater Loads

1.3.1 Historic Influent Loads

Characterization of influent loads was based on influent data for BOD and TSS as reported on discharge monitoring report (DMR) forms from 2019 through 2023. Available DMR data reveals influent concentrations for BOD and TSS on par with communities that are primarily residential in nature. Average BOD and TSS concentrations were 221 mg/L and 202 mg/L, respectively. Using the average BOD and TSS concentrations and annual average flow rates for this period, average influent loads were calculated to be approximately 468 lb/d for BOD and 437 lb/d for TSS. This resulted in an average per capita loading of 0.17 pounds per capita per day (ppcd) for BOD and 0.16 ppcd for TSS. These values are slightly lower than the MDEQ standard values of 0.20 ppcd for BOD and 0.22 ppcd for TSS. However, when compared to industry values reported in *Metcalf and Eddy (Table 3-12)* these values are reasonable with BOD in the average range and TSS at the lower end of the range reported for residential wastewater.

1.3.2 Design Loads

The determination of the design values for influent loads was based on the available data and validated with values typically cited in engineering literature. The per capita loads were used with the wastewater users noted above to arrive at average design loading values. As discussed previously, per capita load values calculated for BOD and TSS based on these values fall in the typical range for domestic wastewater. However, the City of East Helena has limited influent data for nitrogen (represented as TKN) and phosphorous since their MPDES permit does not require influent sampling for these parameters. Therefore, the per capita design loads for total nitrogen (0.035 ppcd) and total phosphorous (0.005 ppcd) were based on literature values and validated with occasional sampling at the WWTP and data from other facilities in Montana. It should be noted that a detergent phosphate ban has successfully reduced influent TP loads to WWTPs throughout the region. Annual average influent wastewater design loads are presented in **Table 1.4** below.

Table 1.4: East Helena Annual Average Wastewater Design Loads

Year	WW Users	Average BOD Load (lb/day)	Average TSS Load (lb/day)	Average TKN Load (lb/day)	Average TP Load (lb/day)
2027	6,801	1,149	1,074	240	34
2037	11,608	1,961	1,833	409	57
2052	16,719	2,824	2,640	589	83

Peaking factors for maximum month loading were derived from available data for BOD and TSS, and typical values cited in the literature for TKN and TP. The resulting peaking factors are similar to known peaking factors from other Montana communities of comparable size. Maximum month influent wastewater design loads are presented in **Table 1.5** below.

Table 1.5: East Helena Maximum Month Wastewater Design Loads

Year	WW Users	Max Month BOD Load (lb/day)	Max Month TSS Load (lb/day)	Max Month TKN Load (lb/day)	Max Month TP Load (lb/day)
2027	6,801	1,458	1,593	277	47
2037	11,608	2,489	2,718	474	80
2052	16,719	3,585	3,915	682	116

1.4 Influent Design Criteria Summary

The following **Table 1.6** summarizes design criteria from the tables above and will be used for referencing throughout the remainder of the document.

Table 1.6: East Helena Influent Design Criteria Summary

Year 2037 WW Users	11,608		
Annual Average Day Values			
Parameter	*Per Capita*	*Concentration*	*Flow & Load*
Flow – Total	103 gpcd	--	1.20 mgd
BOD_5	0.17 ppcd	196 mg/L	1,961 lb/day
TSS	0.16 ppcd	183 mg/L	1,833 lb/day
TKN	0.035 ppcd	41 mg/L	409 lb/day
TP	0.005 ppcd	5.7 mg/L	57 lb/day
Maximum Month Values			
Flow – Total	151 gpcd	--	1.75 mgd
BOD_5	0.21 ppcd	170 mg/L	2,489 lb/day
TSS	0.23 ppcd	186 mg/L	2,718 lb/day
TKN	0.041 ppcd	32 mg/L	474 lb/day
TP	0.007 ppcd	5.5 mg/L	80 lb/day
Peak Hour Values			
Flow – Total	299 gpcd	--	3.47 mgd

Year 2052 WW Users	16,719		
Annual Average Day Values			
Parameter	*Per Capita*	*Concentration*	*Flow & Load*
Flow – Total	99 gpcd	--	1.65 mgd
BOD_5	0.17 ppcd	205 mg/L	2,824 lb/day
TSS	0.16 ppcd	192 mg/L	2,640 lb/day
TKN	0.035 ppcd	43 mg/L	589 lb/day
TP	0.005 ppcd	6.0 mg/L	83 lb/day
Maximum Month Values			
Flow – Total	144 gpcd	--	2.41 mgd
BOD_5	0.21 ppcd	178 mg/L	3,585 lb/day
TSS	0.23 ppcd	195 mg/L	3,915 lb/day
TKN	0.041 ppcd	34 mg/L	682 lb/day
TP	0.007 ppcd	5.8 mg/L	116 lb/day
Peak Hour Values			
Flow – Total	270 gpcd	--	4.51 mgd

CHAPTER 2 – EFFLUENT LIMITATIONS AND DISPOSAL EVALUATION

2.1 Surface Water Discharge Permit

Regulatory requirements for wastewater treatment plant (WWTP) discharges play a vital role in determining the most cost-effective treatment system. This chapter summarizes the current and projected effluent limitations applicable to the East Helena WWTP. Based on these regulatory requirements, effluent design criteria can be developed.

2.1.1 Historical Overview

The US Environmental Protection Agency (EPA) has been tasked with administering the 1972 Water Pollution Control Act and subsequent amendments. This Act established standards for water quality that are to be achieved across the nation. The National Pollutant Discharge Elimination System (NPDES) was authorized by Congress to allow EPA to issue permits to wastewater dischargers and control the quality and quantity of the effluent from these facilities.

Part of the Act was to decentralize the authority of the Federal Government. Therefore, the individual states are charged with establishing water quality parameters and issuing discharge permits to protect their state waters. The Water Protection Bureau at the Montana Department of Environmental Quality (MDEQ) has been tasked with maintaining water quality standards in agreement with Federal objectives and issuing Montana Pollutant Discharge Elimination System (MPDES) discharge permits.

2.1.2 MPDES Permit

East Helena is authorized to discharge treated effluent from the existing WWTP via MPDES Permit MT0022560, in effect from December 1, 2019 to November 30, 2024. Planning for future effluent discharge criteria is influenced by this Permit and the final 2006 Total Maximum Daily Load (TMDL) for Prickly Pear Creek which established waste load allocations (WLA) for point sources and incorporated a phased approach to reducing those loads. Compared to the City’s 2009 Permit, the 2019 Permit removed effluent limits for ammonia, residual chlorine, lead and zinc; removed monitoring requirements for dissolved oxygen, temperature, hardness, and whole effluent toxicity (WET) testing; and revised limits for copper, total nitrogen, and total phosphorous. A copy of the 2019 Permit and associated Fact Sheet are included in **Appendix A**.

A Permit renewal application was submitted to MDEQ on May 24, 2024, and the Department sent a response letter on June 24, 2024 outlining the application’s deficiencies. The City then sent a response letter to MDEQ on August 16, 2024 addressing the noted deficiencies. On August 23, 2024, MDEQ deemed the application complete and administratively extended the 2019-issued Permit until it is renewed by the Department. Copies of the Permit renewal information can be found in **Appendix A**.

2.1.3 Outfall And Receiving Stream

Treated effluent from the East Helena WWTP flows a little over a half mile in a 15-inch pipe to the outfall located on the east bank of Prickly Pear Creek roughly 1/3 mile downstream of the Wylie Drive bridge. Prickly Pear Creek is in the Upper Missouri River watershed and Middle Rockies eco-region. MDEQ, under the Montana Water Quality Act (75-5-701 MCA.), establishes water use classifications and related water quality standards for all drainages in the state. This reach of the creek from the bridge to the intersection with the Helena WWTP discharge is classified as “I” surface water. Waters classified as “I” are intended to fully support drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supplies [ARM 17.30.628(1)].

Section 303(d) of the Clean Water Act requires States to identify waters where quality is impaired or threatened. Every two years, the MDEQ prepares and submits a list of these impaired or threatened waters to the EPA as required under Section 303(d) of the Clean Water Act. The latest 303(d) list shows this reach of Prickly Pear Creek as not fully supporting aquatic life, primary contact recreation, drinking water, and agricultural uses. Probable causes of impairment include temperature, un-ionized ammonia, alteration in stream-side vegetative cover, flow regime modifications, and other habitat alterations. Municipal and industrial point source discharges as well as on-site treatment systems are listed as probable sources of impairment along with agriculture, grazing, urbanized development, and impacts from abandoned mine lands.

One key component in determining effluent discharge standards for WWTPs is the low-flow condition of the receiving stream. The effluent pollutant limits for current water quality-based standards use the 7-day, 10-year low flow (7Q10) in Prickly Pear Creek at the point of discharge which is estimated to be 8.34 cubic feet per second (cfs). Nutrient limits are developed using the 14-day, 5-year low flow (14Q5) at the discharge location which is estimated to be 12.7 cfs.

2.1.4 Mixing Zone

A mixing zone is an area where effluent mixes with the receiving stream and certain water quality standards may be exceeded. Pollutant concentrations in the effluent must meet the applicable water quality standards at the end of pipe unless a mixing zone is granted by MDEQ for that specific parameter. A standard mixing zone was given to East Helena which allows for 25% of the 7Q10 flow (2.1 cfs) for chronic aquatic life criteria and 100% of the 14Q5 flow (12.7 cfs) for nutrient water quality calculations. MDEQ and EPA guidance states that the mixing zone for acute criteria be no more than 10% of the available chronic criteria (0.22 cfs). A source specific mixing zone was granted for human health criteria since there are no drinking water intakes on Prickly Pear Creek which allows for dilution of 100% of the 7Q10 flow (8.34 cfs) for nitrate plus nitrite.

2.1.5 Current Effluent Limits

Until MDEQ renews the Permit all effluent limits, monitoring requirements, and other conditions of the 2019-issued MPDES Permit remain fully effective and enforceable. Therefore, the current discharge limits for the East Helena WWTP are summarized in **Table 2.1** below. Possible effluent limitations in a future surface water discharge permit are discussed later in this chapter.

Table 2.1: East Helena WWTP Effluent Limits

Parameter	Units	Avg. Monthly Limit [1]	Avg. Weekly Limit [1]	Max. Daily Limit [1]
5-day Biochemical Oxygen Demand (BOD_5)	mg/L	30	45	--
	lb/day	109	163	--
	% removal	85 [2]	--	--
Total Suspended Solids (TSS)	mg/L	30	45	--
	lb/day	109	163	--
	% removal	85 [2]	--	--
pH	S.U.	In the range of 6.0 – 9.0		
E. coli Bacteria, summer [3]	Orgs./100 mL	126	252	--
E. coli Bacteria, winter [4]	Orgs./100 mL	630	1,260	--
Total Nitrogen Load [5, 6]	lb/day	53.3	--	--
Total Phosphorous Load [7]	lb/day	11.2		
Total Phosphorous Load [8]	lb/day	5.5		
Copper, Total Recoverable	µg/L	11.7	--	17.5

There shall be no discharge of floating solids or visible foam in other than trace amounts.
There shall be no discharge which causes visible oil sheen in the receiving stream.

Footnotes:

1 See Definition section at end of permit for explanation of terms.
2 Average monthly minimum.
4 This limit applies during the period of April 1 through October 31.
5 This limit applies during the period of November 1 through March 31.
6 This limit applies year round.
7 This limit applies October – June.
8 This limit applies July – September.

2.1.6 Monitoring Requirements and Special Conditions

Monitoring Requirements. Parameters, location, frequency, and sample type are listed in the Outfall 001 Self-Monitoring Requirements table on page 6 of the MPDES Permit. According to this table, the following monitoring is required: effluent flow (continuous); pH (daily); influent and effluent BOD_5 and TSS (3/week); *E. coli* bacteria (3/week);

nitrate + nitrite, total Kjeldahl nitrogen, and phosphorous (weekly); ammonia, arsenic, and copper (monthly); oil and grease, lead, and zinc (quarterly). Requirements also include instream monitoring of pH, temperature, ammonia, total hardness, arsenic, copper, lead, and zinc in Prickly Pear Creek (1/quarter).

Sewage Sludge. The use or disposal of sewage sludge must comply with the EPA regulations outlined in 40 CFR 503. The permittee shall not allow disposal of sewage sludge to enter any state water, including groundwater. MDEQ must be notified at least 45 days prior to any changes in sludge management.

Pollutant Minimization Program. A pollutant minimization program (PMP) is a set of activities aimed at improving processes and pollutant controls that will prevent and reduce pollutant loading. The City is required to continue operating the existing WWTP under cyclical aeration to create periodic anoxic conditions to promote denitrification. In addition, the City must operate and maintain the tertiary filtration process for metals and phosphorous removal. The City must submit annual reports by January 28th of each year that describe nutrient reduction measures implemented in the previous year, the effectiveness of each measure, and proposed nutrient reduction modifications for the upcoming year.

Pretreatment Requirements. The pretreatment requirements listed in the current Permit are standard and apply to all non-domestic sources. The intent of the requirements is to prevent the introduction of harmful substances or create wastewater conditions that could adversely affect the treatment process. The City does not currently have any industrial dischargers that require pretreatment.

2.2 Groundwater Discharge Permit

2.2.1 Groundwater Discharge Permit Application

The City of East Helena has applied for a new Montana Ground Water Pollution Control System (MGWPCS) permit from MDEQ which would allow a portion of their treated effluent to be disposed of into the groundwater (GW) aquifer below the WWTP site. Ultimately, this disposal option would reduce the amount of pollutants, nutrients, and pathogens that are discharged to Prickly Pear Creek. In order to accept future wastewater flows and maintain compliance under their surface water discharge permit, the City will need to obtain the MGWPCS Permit and construct a future GW disposal facility. Details of this proposed compliance strategy are described below.

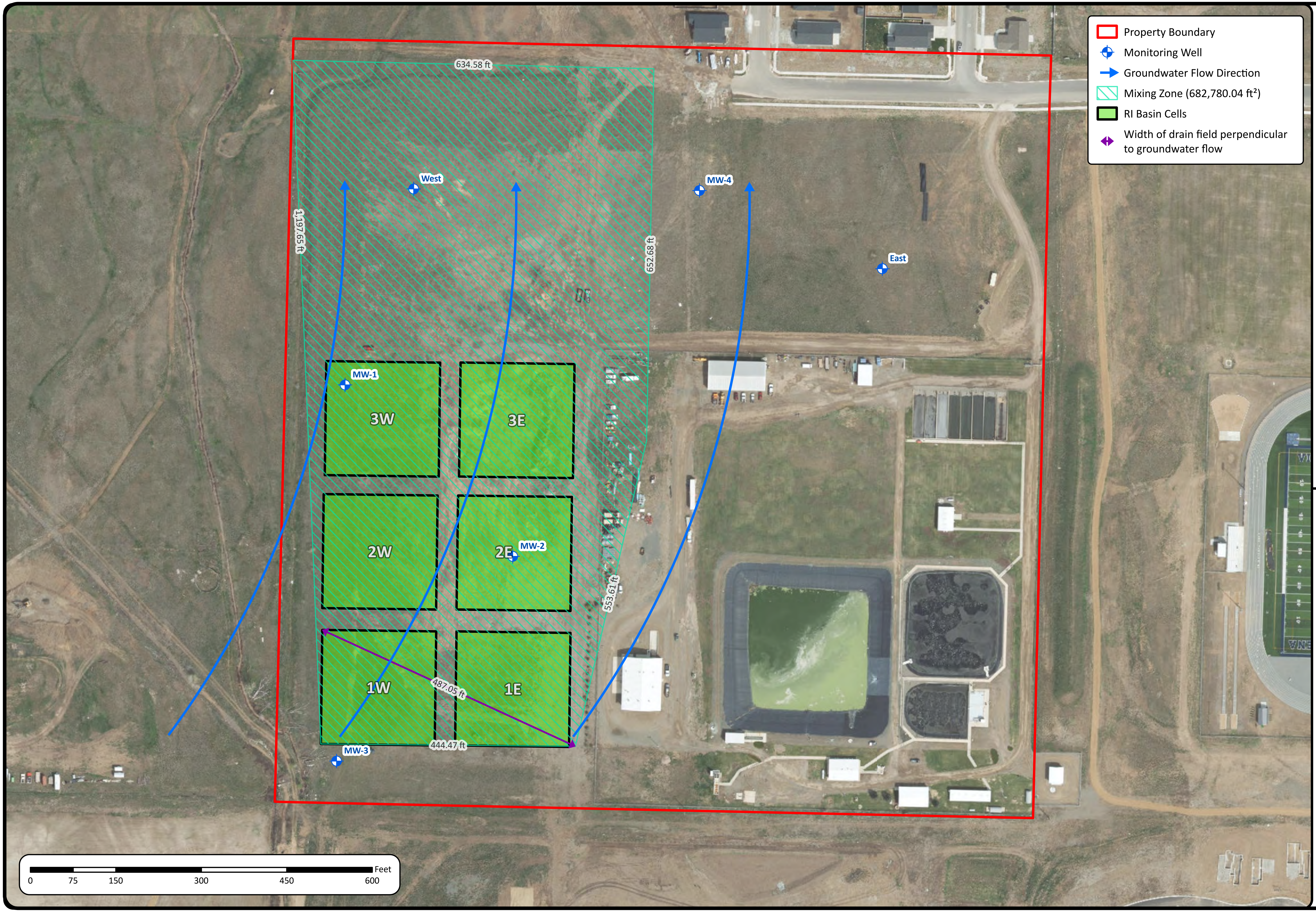
A MGWPCS Permit application was submitted to MDEQ on August 7, 2024, and the Department sent a response letter on September 6, 2024, outlining the application's deficiencies. An updated Permit application and supporting information were then submitted to the Department on October 7, 2024, addressing the noted deficiencies. In a letter dated November 19, 2024, MDEQ deemed the MGWPCS Permit application complete. It is anticipated that a draft Permit and water quality assessment will be completed during the first half of 2025. Copies of the MGWPCS Permit application and associated correspondence can be found in **Appendix B**.

2.2.2 Future Groundwater Disposal Facility

The City owns approximately 9 acres west of the existing WWTP site that can be utilized for a potential GW disposal facility. A geotechnical investigation was performed in November 2023 to determine the physical characteristics of the soil and the feasibility of constructing infiltration/percolation (I/P) cells on this property. The report prepared by Pioneer Technical Services examined the lithology, chemical properties, infiltration rate, and phosphorous adsorption capacity of the soil. The report included recommendations for berm stability, foundation design, seismic considerations, and underground utility construction. A copy of the geotechnical report can be found in **Appendix C**.

To supplement the MGWPCS Permit application, the City hired Water & Environmental Technologies (WET) to collect hydrogeologic data and perform modeling to evaluate the impacts of discharging treated effluent via proposed I/P cells. WET oversaw the drilling of four GW monitoring wells and gathered GW levels, collected water quality samples, and performed slug/pump testing. This data was used to verify the thickness, hydraulic gradient, hydraulic conductivity, and effective porosity of the GW aquifer. An analysis, including GW modeling, was performed by WET to determine pathogen removal, nitrate sensitivity, and phosphorous breakthrough given future effluent quality and the noted hydrogeologic conditions. Analysis details can be found in the technical memorandum included in **Appendix C**.

To maintain compliance with their current MPDES Permit, the City will need to discharge roughly 1,000,000 gallons per day (gpd) to the I/P cells based on estimated wastewater flows from future development. The preliminary I/P cell design includes six cells, each approximately 200 feet x 200 feet at the bottom with a depth that varies from 6.5 feet on the south end of the site to 3.5 feet on the north end. Each cell will contain multiple inlets and overflow pipes along with 3:1 side slopes. Given allowable infiltration rates and the proposed I/P cell layout shown in **Figure 2.1**, the City is able to discharge approximately 725,000 gpd per cell while satisfying MDEQ rules for phosphorous breakthrough to the nearest surface water and nitrate sensitivity at the end of the 500 foot mixing zone. Calculations showing these results can be found in Attachment M and Attachment N of the WET technical memorandum located in **Appendix C**.



NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	1/24/23	JH	CE
2		2/1/24	KK	GM
3	MIXING ZONE EDIT	3/8/24	LG	CE
4	MIXING ZONE EDIT	6/20/24	LG	CE
5				

NOTES:

Posposed I/P Cell Layout

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

Figure 2.1

JOB#: 1559-22

DATE:6/26/2024

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Water & Environmental TECHNOLOGIES

2.3 Biosolids Disposal Requirements

Current Federal regulations for sewage sludge or biosolids disposal (40 CFR, Part 503 and 40 CFR, Part 258) have been in effect for over 30 years without significant updates. EPA divides biosolids into various “classes” based on pathogen treatment methods, vector attraction reduction, and management practices. Class B biosolids undergo treatment processes to significantly reduce (but not eliminate) pathogens which is why there are additional requirements when it comes to land application of these solids. Class A biosolids are subjected to additional measures that further reduce the pathogens and allow for more flexibility in land application options. Although not listed in the Federal requirements, Class A “Exceptional Quality” or “EQ” biosolids are treated to the most stringent vector attraction, pollutant, and pathogen reduction limits in 40 CFR, Part 503. Therefore, Class A-EQ biosolids are often sold or given away directly to the public from the WWTP for use on home gardens and lawns.

Sewage sludge that does not meet the requirements of Class A or Class B biosolids can be disposed of at a permitted municipal solid waste landfill (MSWLF). The design and operation of MSWLFs is regulated by EPA under Subpart I of 40 CFR, Part 258 to address pollutant limits, management practices, operational standards for pathogens and vector attraction, and record keeping. As a general rule, MSWLFs will not accept materials with a solids content of less than 18 percent which can be verified using a paint filter test on the biosolids prior to allowing them to be deposited. In addition, a toxicity characterization leaching procedure (TCLP) must be performed on the biosolids to confirm they are non-hazardous. Typically, the biosolids must be mixed with the solid waste prior to placement in a permanent landfill cell.

While there has been discussion of major revisions to these biosolids regulations, no revisions have been specifically proposed. It is unlikely that a substantial change is coming in the foreseeable future because of the cumulative financial impact that it would have on communities around the country. Provided that MDEQ and EPA interpretation of current rules and regulations do not change, it is not anticipated that biosolids disposal requirements will change for the City within the current planning period. It will be critical to monitor the evolution of biosolids regulations, particularly as it pertains to sludge management practices for the new WWTP.

2.4 Future Discharge Limits

There are several issues of concern when trying to predict future discharge limits for the East Helena WWTP. The first involves MDEQ’s ongoing attempts to balance in-stream nutrient limits for Montana’s waters with potential economic impacts and feasibility for the State’s regulated communities. Improved water quality in Prickly Pear Creek with regard to metals may trigger more stringent effluent limits. Other developments which will impact future permit effluent limits include EPA’s research and recommendations on per- and polyfluoroalkyl substances (PFAS) for both effluent discharges and biosolids.

2.4.1 Nutrient Standards

Prior to the 2019 Permit, effluent limits for nitrogen and phosphorous were based on the 2006 TMDL waste load allocations (WLAs) assigned to the City's WWTP discharge. These values resulted in year-round MPDES Permit limits for the City of 53.3 lb/day of total nitrogen and 11.2 lb/day of total phosphorous. In 2014, MDEQ adopted numeric nutrient criteria (Circular DEQ-12A) and a nutrient variance process (Circular DEQ-12B) for wadable streams in Montana. The City requested a general variance in February 2018 for both nitrogen and phosphorous which was granted by the Department. Based on the facility's average design flow rate, the East Helena WWTP was granted the 10 mg/L total nitrogen and 1.0 mg/L total phosphorous variances.

The Fact Sheet developed for the 2019 Permit compared the previous TMDL values with nutrient limits based on the reasonable potential and water quality based effluent limits developed using the numeric nutrient and general variance processes. The calculated load limits, or highest attainable condition (HAC) the WWTP is required to achieve, for total nitrogen and total phosphorous from this analysis were 56.9 lb/day and 5.5 lb/day, respectively. The previous Permit limit for nitrogen was more stringent than the HAC determined in the analysis, so the 53.3 lb/day load limit for total nitrogen was included in the 2019 Permit on a year-round basis. On the other hand, the calculated HAC limit for total phosphorous is nearly half of the existing TMDL value of the previous Permit, so the 5.5 lb/day load limit was placed in the 2019 Permit for the months of July through September. To maintain protection of Lake Helena, the TMDL load limit of 11.2 lb/day was applied for the remainder of the year (October – June).

After EPA approved Montana's new and revised water quality standards for nutrients, the Upper Missouri Waterkeeper filed a lawsuit in May 2016 in the U.S. District Court in Great Falls stating EPA violated provisions of the Clean Water Act. After development of the Fact Sheet, the District Court issued a decision in March 2019 that the 20-year period for dischargers to meet the numeric nutrient criteria under the variance process was too long. The parties failed to agree on a revised timeline as requested by the Court, so the Court issued an order to MDEQ to amend its variance timeframe to require compliance with the numeric nutrient standards in the range proposed by the Waterkeeper. In February 2020, EPA rejected the proposed amended rules put forth by MDEQ which negates the entire variance process.

During the 2021 legislative session, the State adopted Senate Bill (SB) 358 which replaced numeric nutrient standards with more subjective narrative standards. One key component of the legislation is the ability for dischargers to develop Adaptive Management Plans that allow for more flexible implementation of nutrient limits based on existing and projected conditions of a specific watershed. MDEQ, with input from the Nutrient Work Group, held meetings and worked for three years to develop rulemaking that is amenable to all parties. EPA issued a letter to MDEQ in May 2022 stating that the repeal of numeric nutrient standards in SB 358 was not consistent with the Federal

Clean Water Act. Furthermore, EPA claims that implementation of narrative criteria alone does not protect Montana's waterbodies. Following a meeting in June 2024, MDEQ halted water quality rulemaking efforts in order to consider comments received from both dischargers and environmental groups. It is possible that the 2025 legislative session will produce new legislation that will allow MDEQ to move forward with revised nutrient standards.

2.4.2 Metals Limits

Copper is the only metal that is regulated under the 2019 Permit due to the reasonable potential (RP) to exceed human health standards in Prickly Pear Creek after using the allowable dilution flow. RP calculations for arsenic show the resulting concentration is below the human health standard, but monthly monitoring was still required in the 2019 Permit due to the presence of arsenic in the WWTP effluent. Similarly, the RP for lead and zinc does not exist but quarterly monitoring was added to the 2019 Permit in case metals concentrations in Prickly Pear Creek improve prior to issuing the permit renewal. It is likely that metals limits will not change considerably with the next MPDES Permit.

2.4.3 Per- and Polyfluoroalkyl Substances (PFAS)

The water sector has increased focus on PFAS and the impact it may have on the future of wastewater treatment. The Federal government has initiated steps to develop PFAS regulations including EPA's outline of key goals, objectives, and timelines in the October 2021 *PFAS Strategic Roadmap*. Additionally, EPA issued interim health advisory levels for various PFAS in drinking water in June 2022. In April 2024, EPA proposed PFAS maximum contaminant levels (MCLs) for six PFAS in drinking water and designated perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA). By April 2027, drinking water utilities will be required to report any known exceedances of these MCLs and be required to comply two years later.

The hazardous designation for PFOA and PFOS would require treatment plants to report discharges of 1 lb or more of either chemical in a 24-hr period to EPA. However, preliminary observations at WWTPs around the U.S. indicated that this would not likely be a concern given the concentrations gathered by the Water Research Foundation (WRF) in 2022. EPA recently completed a risk assessment for PFOA and PFOS in biosolids that will determine whether regulations are appropriate for these compounds. It is possible that a final rule could be implemented by 2025 or 2026. PFAS regulations for biosolids are different at the state level and vary from monitoring requirements in states like New Hampshire, Massachusetts, and California to interim strategies in Michigan and Vermont to complete prohibition of land application of biosolids in Maine. It should be noted that Montana does not have any monitoring or regulatory standards for PFAS compounds in effluent discharges or biosolids at this time.

The City should continue to monitor the evolving regulatory requirements for FPAS compounds and consider a timeline for beginning to sample influent, effluent, and biosolids for PFAS. One challenge facing communities is that conventional wastewater treatment processes are not effective at removing PFAS. However, WRF has initiated several research projects looking at cost-effective mitigation strategies for PFAS that are applicable for wastewater and biosolids. It is anticipated that it will take several permit cycles before the City has to consider compliance with future PFAS regulations.

2.4.4 Compliance Strategy

Given the uncertainty of future in-stream nutrient standards discussed above, obtaining a MGWPCS Permit is critical for the City to maintain compliance under their surface water discharge Permit. The ability to dispose of added nutrient loads to an alternate location provides operational flexibility for future wastewater flows. Receiving a GW discharge permit will allow the City to construct a WWTP upgrade capable of removing more nutrients than their current facility while also remaining within the City’s economic means and operational capabilities. The effluent nutrient design criteria proposed for the WWTP upgrade will be set at 8 mg/L total nitrogen and 1 mg/L total phosphorous.

The ability to meet these standards will allow the City to operate the WWTP in compliance with their MPDES Permit without capital improvements or operational changes for several years. During this time, strategies to meet future nutrient standards will be developed, including adaptive management plans, land application of a portion of the effluent, or the addition of new and affordable treatment processes that may become available. The proposed design criteria for nutrient reduction with this upgrade represent a prudent compromise that considers long-range planning, environmental stewardship, current financial capacity, and operational complexity.

2.5 Effluent Design Criteria Summary

Effluent design criteria are used to determine the scope of needed WWTP upgrades required to address the future discharge limits discussed above. Due to the uncertainty associated with future nutrient standards, metals limits, and PFAS requirements, a high degree of flexibility in treatment design and performance is necessary. The design criteria presented below in **Table 2.2** assume that GW discharge will be available as a means to reduce nutrient loading to Prickly Pear Creek.

Table 2.2: East Helena Effluent Design Criteria

Parameter	**Units**	**Prickly Pear Creek**	**GW Discharge**
Effluent Flow	gpd	<800,000	<1,000,000
Biochemical Oxygen Demand (BOD_5)	mg/L	<15	<30
	lb/day	<100	--
Total Suspended Solids (TSS)	mg/L	<15	<30
	lb/day	<100	--
E. coli Bacteria, year-round	Orgs./100 mL	<100	<100
Ammonia (NH_3)	mg/L	<1.0	--
Nitrate (NO_3)	mg/L	--	<5.5
Nitrogen (TN)	mg/L	<8.0	--
	lb/day	<50	--
Phosphorous (TP)	mg/L	<0.5	<2.0
	lb/day	<5	--
Copper, Total Recoverable	µg/L	<10	--

CHAPTER 3 – PRELIMINARY TREATMENT OVERVIEW

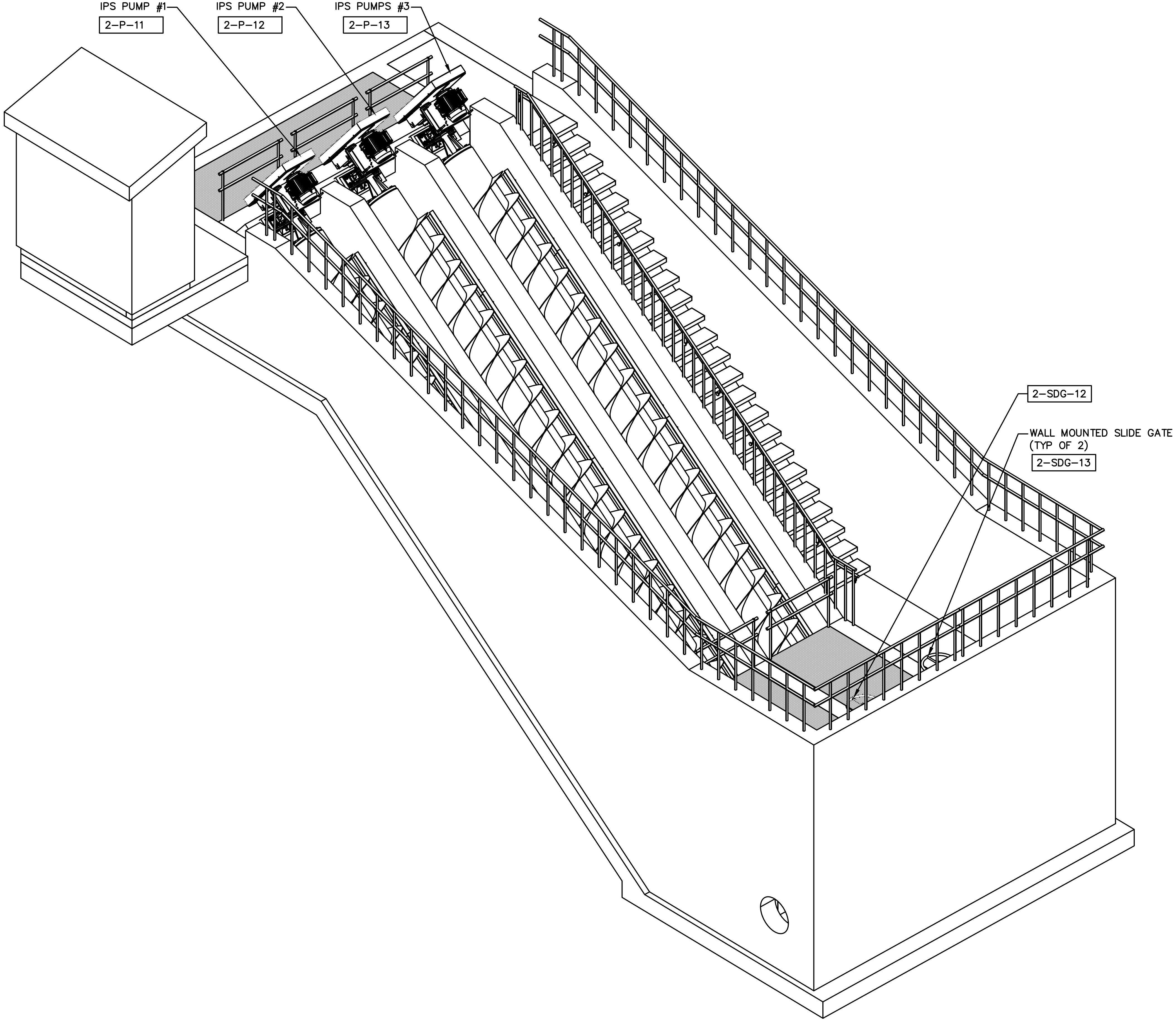
The City of East Helena recently awarded a capital improvements project that includes the construction of a new influent pump station, influent flow measurement, Headworks Building, and other minor upgrades at the WWTP. The Headworks Building will contain a new screening system, grit removal facilities, and ancillary equipment. Bids for the project were opened in October 2024, and construction is slated to begin in the spring of 2025. The details of the preliminary treatment facilities are described below.

3.1 Influent Pump Station

3.1.1 Process Summary

The influent pump station (IPS) conveys all the wastewater from the City's collection system and the two external lift stations (Red Fox Meadows and Pele Park) to the Headworks Building for treatment and disposal. Given the collection system invert elevations relative to the elevation of Prickly Pear Creek (surface water discharge), the hydraulic profile requires wastewater pumping at least once to create sufficient head to allow gravity flow through the treatment processes. The IPS consists of three screw pumps, isolation slide gates, grease lubrication pumps, and instrumentation. Wastewater from the 24-inch sewer main discharges into the IPS wet well where flow can be directed to each individual screw pump through a 3-foot square slide gate that can be closed to isolate that pump for maintenance or repair. Wet well level will be measured by a radar level sensor that is displayed on a remote readout in the electrical room of the new Headworks Building and is tied into the existing SCADA system and recorded.

Overall control of the IPS will be provided by a manufacturer (MFR) supplied control panel, located in the new Headworks Building electrical room, and local operator stations (LOSs) mounted on stands near the screw pump motors. The IPS control panel receives the wet well level signal and makes process decisions based on the current value. In addition, a high-level float will be installed in the wet well to alert operators of an alarm condition. Initially, only one screw pump will operate continuously with a second pump turning on when the level in the wet well increases above a specified set point. The pumps will be rotated every 24 hours to ensure even operation and wear. In the future, two screw pumps are anticipated to operate to handle the future wastewater flows. The third pump is completely redundant in case of pump failure or planned maintenance. During a power outage, the screw pumps will continue to operate on emergency power supplied by the standby generator at the new Headworks Building. An isometric view of the proposed IPS is shown in **Figure 3.1**.



INFLUENT PUMP STATION ISOMETRIC

SCALE: 3/8" = 1'-0"

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IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

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MARCH 2024
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21727
PROJECT NO.
M2-3
FILE

PROJECT TITLE

East Helena Headworks
& CIPP Lining - 2024
East Helena, Montana

SHEET TITLE

INFLUENT PUMP
STATION ISOMETRIC

SHEET

FIG 3.1

OF

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3.1.2 Screw Pumps

Three open-type Archimedes screw pumps with a design capacity of 1,750 gpm each will be installed in the IPS structure. The firm pumping capacity with one unit out of service is 3,500 gpm (5.0 mgd) which exceeds the 30-year design peak hour flow rate of 4.5 mgd listed previously in **Table 1.6**. The pumps will be set at an inclination of 38° from the horizontal and have a static lift of roughly 20 feet. Each screw pump will have a painted steel 20-inch diameter torque tube with dual 36-inch diameter flights. The screw pumps are designed for domestic wastewater and are capable of handling various solids that may enter the wet well. Each screw pump will be equipped with a 15-horsepower explosion-proof, constant speed motor rated for a Class I, Division 1, Group D area. The motor and gear box rotate the screw pumps at 55 rpm and over 20,500 in-lb of torque. The design criteria for the IPS screw pumps are listed in **Table 3.1** below.

Table 3.1: IPS Screw Pumps Design Criteria

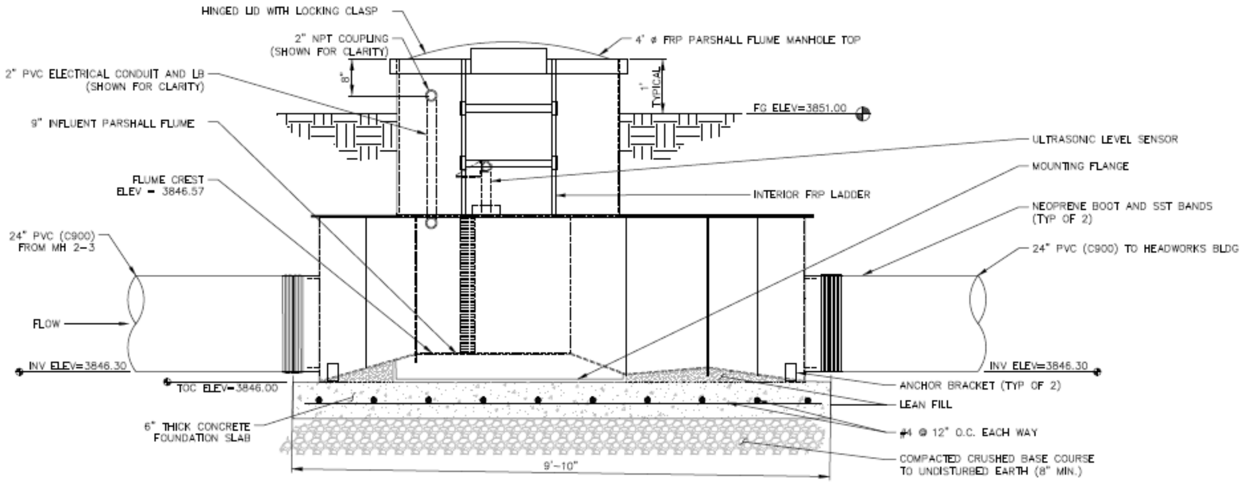
Parameter	Value
Number of Units	3
Type of Pumps	Archimedes Screw
Rated Capacity, each	1,750 gpm
Static Lift	~20 feet
Flight Diameter	36-inches
Rotational Speed	55 rpm
Motor Size, each	15 hp
Firm Pumping Capacity	3,500 gpm (5.0 mgd)

Each screw pump has an upper and lower bearing assembly that supports the shaft and keeps it lubricated during operation. The lower bearing includes a flow-through grease system where grease enters the lower part of the housing and will be discharged into a collection container to confirm the bottom bearing is receiving grease. A one-third horsepower piston pump for each screw pump provides grease through a 3/8-inch stainless steel line to the lower bearing. Each grease pump contains a centrifugal switch that energizes the screw pump drive motor upon closure and shuts down the screw pump if the grease pump motor stops and the switch opens. The automated grease pumps will be installed on a factory assembled base plate in the new Grease Pump Building just to the west of the screw pump discharge pool.

3.2 Influent Flow Measurement

MDEQ requires facilities to measure influent flow with equipment sized to function over the entire range of expected design flows. Parshall flumes are a common type of measuring device for open channel flow and have been used for many years for wastewater applications and deliver reliable flow measurement with an accuracy of plus or minus 5 percent when in the free-flow condition. A Parshall flume with an ultrasonic level sensor will be installed in a metering manhole upstream of the new Headworks Building. A Parshall flume with a 9-inch throat width will provide a measurable range of 58,600 to 5,730,000 gpd which covers the design flows listed previously in **Table 1.6.** The flow depth measured by the ultrasonic level sensor will be converted to a flow rate and displayed on the remote readout located in the electrical room of the new Headworks Building. The influent flow rate will be tied into the existing SCADA system and recorded. A section view of the Parshall flume manhole is shown in **Figure 3.2** below.

Figure 3.2: Parshall Flume Metering Manhole Section



3.3 Screening System

3.3.1 Process Summary

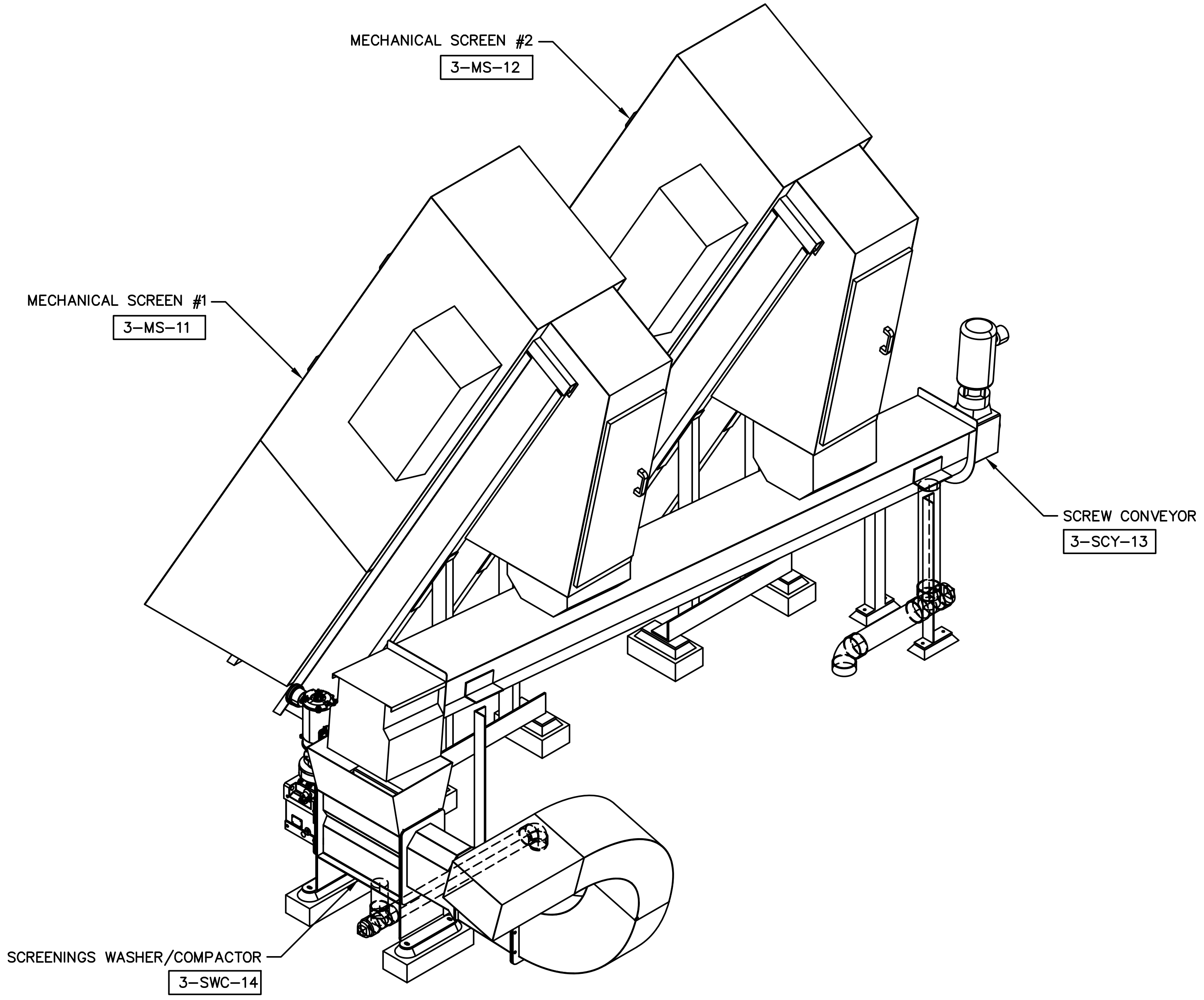
Raw wastewater will flow by gravity in a 24-inch pipe from the IPS discharge pool to the screening system located in the new Headworks Building. Two mechanical screens will be installed in concrete channels to remove large solids, rags, and floating debris to protect downstream processes. Captured screenings from both mechanical screens will drop into a screw conveyor and be transported to a single washer/compactor for cleaning and dewatering prior to being discharged into a trash receptacle. A bypass channel with a manual bar screen will be constructed to maintain screening of flows when the mechanical screens are taken out of service for maintenance or repair.

The ventilation system design for the new Headworks Building includes a heat recovery ventilator (HRV) sized to provide 12 complete air changes per hour which allows the electrical and control equipment associated with the screening system to be rated for a Class I, Division 2, Group D area. All metal components of the screening system (where practical) will be Type 316 stainless steel to provide robust material capable of resisting corrosion in the headworks environment. During a power outage, the screening system will continue to operate on emergency power supplied by a dedicated standby generator.

Overall process control for the screening system will be provided by a MFR supplied control panel, located in the new Headworks Building electrical room, and LOSs mounted on the wall near the equipment. The screening system control panel will receive level signals from radar sensors in each channel upstream and downstream of the screens and operate the screening equipment automatically based on differential level. The screen will run a cleaning cycle when the differential level reaches a set point, or a preset frequency time interval passes. A redundant high-level float in each channel will turn on the respective screen to full speed and alert operators to an alarm condition.

The screw conveyor and washer/compactor will run in cycles based on screen operation. Each mechanical screen has an operating capacity of 2.5 mgd, so only one screen will operate until the peak hour flow entering the WWTP exceeds this value. Initially, the operator will decide which screen needs to run by pressing a button on the control panel for the selected screen and manually opening or closing the slide gates associated with each screen. It is anticipated that the operator will alternate operation of the mechanical screens every month. Once the influent peak hour flows exceed 2.5 mgd, both screens will be operated by pressing a button on the control panel for each screen.

Channel depth for all radar sensors will be displayed on a remote readout in the electrical room of the new Headworks Building. Additionally, a high-high level float will be installed in the upstream headworks channel and tied directly into the existing SCADA system in case of an entire screening system failure. The values and operational information on the screening system will be tied into the existing SCADA system and recorded. An isometric view of the planned screening system is shown in **Figure 3.3**.



INFLUENT SCREEENING ISOMETRIC

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East Helena, Montana

SHEET TITLE

INFLUENT
SCREENING
ISOMETRIC

SHEET

FIG 3.3

OF

3.3.2 Multi-Rake Flex Screen

The multi-rake flex screens planned for the new Headworks Building consist of static bars spaced with 1/4-inch openings and a cleaning system consisting of a combination of penetrating rakes and scrapers mounted at intervals on a rotating chain/link system. As wastewater flows through the screen, floating debris is retained on the bars. The traveling rakes and scrapers remove the captured screenings from the bars to assure excessive buildup does not occur. This type of mechanical screen is better suited to manage large debris that may travel through the collection system because of the flexible chain/link rotating assembly. Removed screenings will be dumped at the top of the screen into a screw conveyor and washer/compactor prior to disposal at a landfill.

The multi-rake flex screens will be installed in parallel 2’-0” wide concrete channels. The screen has an inclination of 30° from vertical which aids the rakes and scrapers in moving the screenings up the backplate of the screen. The screen will not have a submerged lower bearing which lessens the routine maintenance and potential for failure or jamming of the screen. Removable grating will be installed over the channel to protect WWTP staff from the rotating assembly and open sections of the unit. The portion of the multi-rake flex screen above the top of the channel is completely enclosed, shielding the operator from any moving parts. The design criteria for the multi-rake flex screens are listed in **Table 3.2** below.

Table 3.2: Multi-Rake Flex Screens Design Criteria

Parameter	Value
Number of Units	2
Type of Screen	Multi-Rake Flex
Channel Width	2 feet
Bar Spacing	1/4-inch
Motor Size, each	0.5 hp
Rated Capacity, each	2.5 mgd

As mentioned previously, a manually cleaned bar screen with 1-inch spacing will be installed in a parallel third channel. Slide gates in the channels will allow for continued influent screening in the event the multi-rake flex screens have to be taken out of service for maintenance or repair.

3.3.3 Screw Conveyor

Once removed from the flow stream, screenings will drop through a discharge chute on the back of each multi-rake flex screen into a completely enclosed, shaftless screw conveyor. Screenings will be conveyed from both multi-rake flex screens to a single washer/compactor which is discussed below. The screw conveyor will run continuously while the multi-rake flex screen is operating. There is a threaded connection at the low end of the screw conveyor where liquid collected in the drainage area will be discharged back to the wastewater stream for further treatment. There is an E-stop pull cord located on the exterior of the screw conveyor that plant staff can use to stop the screw conveyor if an emergency situation arises. The design criteria for the screw conveyor are listed in **Table 3.3** below.

Table 3.3: Screw Conveyor Design Criteria

Parameter	Value
Number of Units	1
Type of Conveyor	Shaftless Spiral
Motor Size, each	2 hp
Rated Capacity	50 cu ft/hr

3.3.4 Washer/Compactor

The washer/compactor is designed to reduce organic content, minimize odors, and dewater the screenings to reduce weight and volume of waste that is hauled to the landfill. The biodegradable organic material washed from the screenings is returned to the headworks channel for treatment in the downstream processes. The washing is performed by a spray manifold in the main housing that uses non-potable water when the unit is operating. The washer/compactor has a drainage trough beneath the main housing with 1/4-inch perforations to keep screenings separate from wash water. Collected liquid is drained from the unit and returned to the headworks channel. Nonbiodegradable material, such as rags, flushable wipes, and other floating debris, are retained, dewatered, and compacted through the discharge tube and into a trash receptacle. The unit is designed to produce a material with a dry solids content of 40% and to reduce the volume of the screenings by 50%. The design criteria for the washer/compactor are listed in **Table 3.4** below.

Table 3.4: Washer/Compactor Design Criteria

Parameter	Value
Number of Units	1
Wash Water Demand	10 gpm @ 50 psi
Volume Reduction	50%
Organic Removal	70%
Motor Size, each	1 hp
Rated Capacity	30 cu ft/hr

3.4 Grit Removal System

3.4.1 Process Summary

Screened wastewater will flow by gravity through the headworks channels into the grit removal system. Grit includes sand, gravel, and other solid material that is heavier than the organic biodegradable solids in the wastewater. Removal of grit reduces wear on downstream equipment and accumulation of grit in process basins. One vortex grit chamber, one self-priming grit pump, and one grit washer will be installed to handle grit removal with a 4.0 mgd capacity. It should be noted that the grit chamber is sized hydraulically to handle the future peak hour flow of 4.5 mgd; however, the performance of the unit will decrease slightly from the designed 95% removal efficiency with this slightly higher flow. Upsizing the grit chamber to the MFR’s next standard size (7.0 mgd) would reduce performance at lower flows which will be more frequent initially and not as desirable.

Settled grit from the grit chamber is pumped to a grit washer where it will be washed and dewatered prior to being discharged into a trash receptacle. A bypass channel with manual slide gates will be provided to maintain flow when the grit removal system must be taken out of service for maintenance or repair. All metal components of the grit removal system (where practical) will be Type 316 stainless steel to provide robust material capable of resisting corrosion in the headworks environment. During a power outage, the grit removal system will continue to operate on emergency power from the dedicated standby generator.

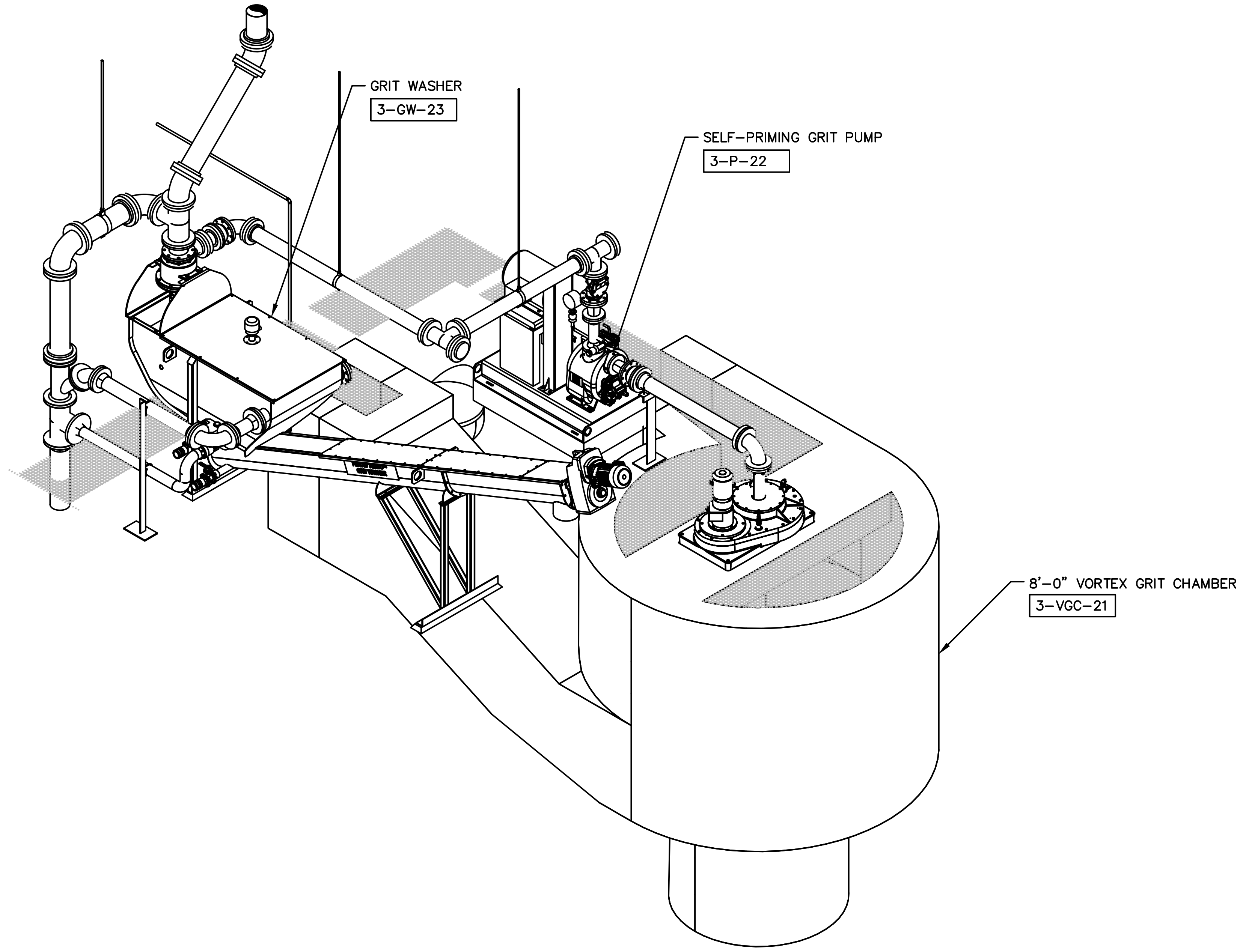
Overall process control for the grit removal system will be provided by a MFR supplied control panel, located in the new Headworks Building electrical room, and LOSs mounted on the wall near the equipment. In addition, a small air compressor control panel will be located in the electrical room to supply the grit washer with high-pressure air. The grit removal system control panel will automatically operate the equipment in cycles based on operator-adjustable inputs. The grit chamber paddle will run continuously by using a selector switch on the control panel. Shortly after the grit pump is called to run by the control panel, the grit washer will initiate an air scour and spray wash cycle. After a set time, the drain valve will open allowing degritted wastewater and organic material to flow into the headworks channel for further treatment. A sonic depth sensor in the grit washer detects the level of grit and activates the auger to transport the washed and dewatered grit into a trash receptacle. Additionally, the operator can initiate a complete cycle of the grit pump and grit washer by pressing a system start button on the control panel. Operational status from the grit removal system will be tied into the existing SCADA system and recorded. An isometric view of the proposed grit removal system is shown in **Figure 3.4**.

3.4.2 Vortex Grit Chamber

The vortex grit chamber consists of a cylindrical tank constructed of cast-in-place concrete inside the new Headworks Building. Flow enters the grit chamber in a tangential, downward direction. The flow path into the chamber along with the rotating paddle motor enables the grit to settle into the lower hopper while the remainder of the flow escapes out the top of the chamber. As mentioned above, the grit chamber paddle motor will run continuously by using a selector switch on the control panel. The grit that settles into the lower hopper is fluidized by a set of vanes attached to the rotating drive tube and then removed by a self-priming grit pump. The de-gritted wastewater will flow through the effluent channel to the downstream reaction basin. The design criteria for the vortex grit chamber are listed in **Table 3.5** below.

Table 3.5: Vortex Grit Chamber Design Criteria

Parameter	Value
Number of Units	1
Type	Vortex
Chamber Diameter	8 feet
Chamber Configuration	180 degree
Lower Hopper Diameter	3 feet
Rotational Speed	21 rpm
Motor Size, each	1 hp
Peak Capacity	4.0 mgd



GRIT REMOVAL ISOMETRIC
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MARCH 2024
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East Helena Headworks
& CIPP Lining - 2024
East Helena, Montana

SHEET TITLE
GRIT REMOVAL
ISOMETRIC

SHEET
FIG 3.4
OF

3.4.3 Self-Priming Grit Pump

Grit will be removed from the vortex grit chamber hopper by a self-priming grit pump. The hollow drive tube of the grit chamber extends to the bottom of the hopper. Vanes mounted on the drive tube stir the grit and keep it fluidized. The suction line of the self-priming grit pump, also routed through the drive tube, pumps grit from the bottom of the hopper to the grit washer at a constant flow in periodic cycles. The grit pump includes suction and discharge pressures gauges for observation during pump operation and also for troubleshooting. The design criteria for the self-priming grit pump are listed in **Table 3.6** below.

Table 3.6: Self-Priming Grit Pump Design Criteria

Parameter	Value
Number of Units	1
Type of Pump	Self-Priming Centrifugal
Rated Capacity	250 gpm
Static Suction Lift	6 feet
Total Head	27 feet
Operating Speed	1,185 rpm
Motor Size	5 hp

3.4.4 Grit Washer

Grit enters the grit washer through a grit concentrator that spins the pumped grit slurry. Similar to the vortex grit chamber, the concentrator drops the heavier grit into the washer while overflowing a portion of liquid back to the headworks channel. In the grit washer, the heavier grit particles will go through an air scour and wash cycle to remove organic material that flows back to the headworks channel. An auger moves the washed grit up a tube allowing it to dewater further prior to discharging into a trash receptacle. The design criteria for the grit washer are listed in **Table 3.7** below.

Table 3.7: Grit Washer Design Criteria

Parameter	Value
Number of Units	1
Type	Concentrator/Washer
Wash Water Demand	20 gpm @ 60 psi
Air Scour Supply	5 SCFH @ 70 psi
Hydraulic Feed Rate	250 to 275 gpm
Motor Size, each	3 hp
Minimum Solids Capacity	40 cu ft/hr

3.5 Headworks Building

The new Headworks Building will be constructed of insulated, pre-cast concrete wall panels set on a cast-in-place concrete foundation. The interior of the walls will be unfinished concrete. The roof system will be constructed of manufactured wood trusses, wood sheathing, continuous ice and water shield underlayment, and 24-gauge pre-finished metal roofing. The attic will contain R-48 blown-in insulation. The gable ends, soffit, and fascia will have pre-finished metal over wood framing. All exterior doors will be insulated and painted to match the metal roof and accessories. An isometric view of the new Headworks Building is shown in **Figure 3.5**.

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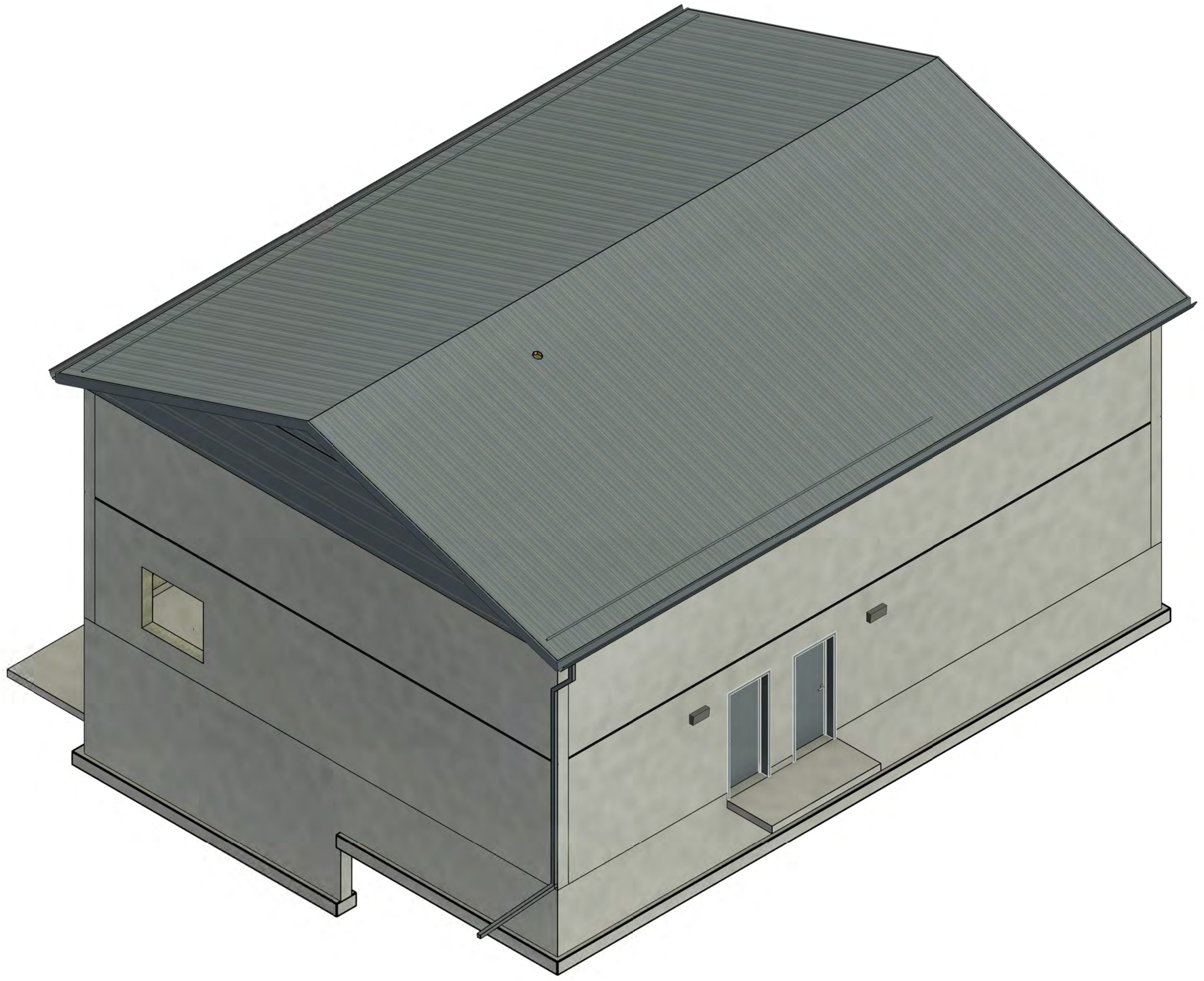

AXON VIEW LOOKING SOUTH WEST 2
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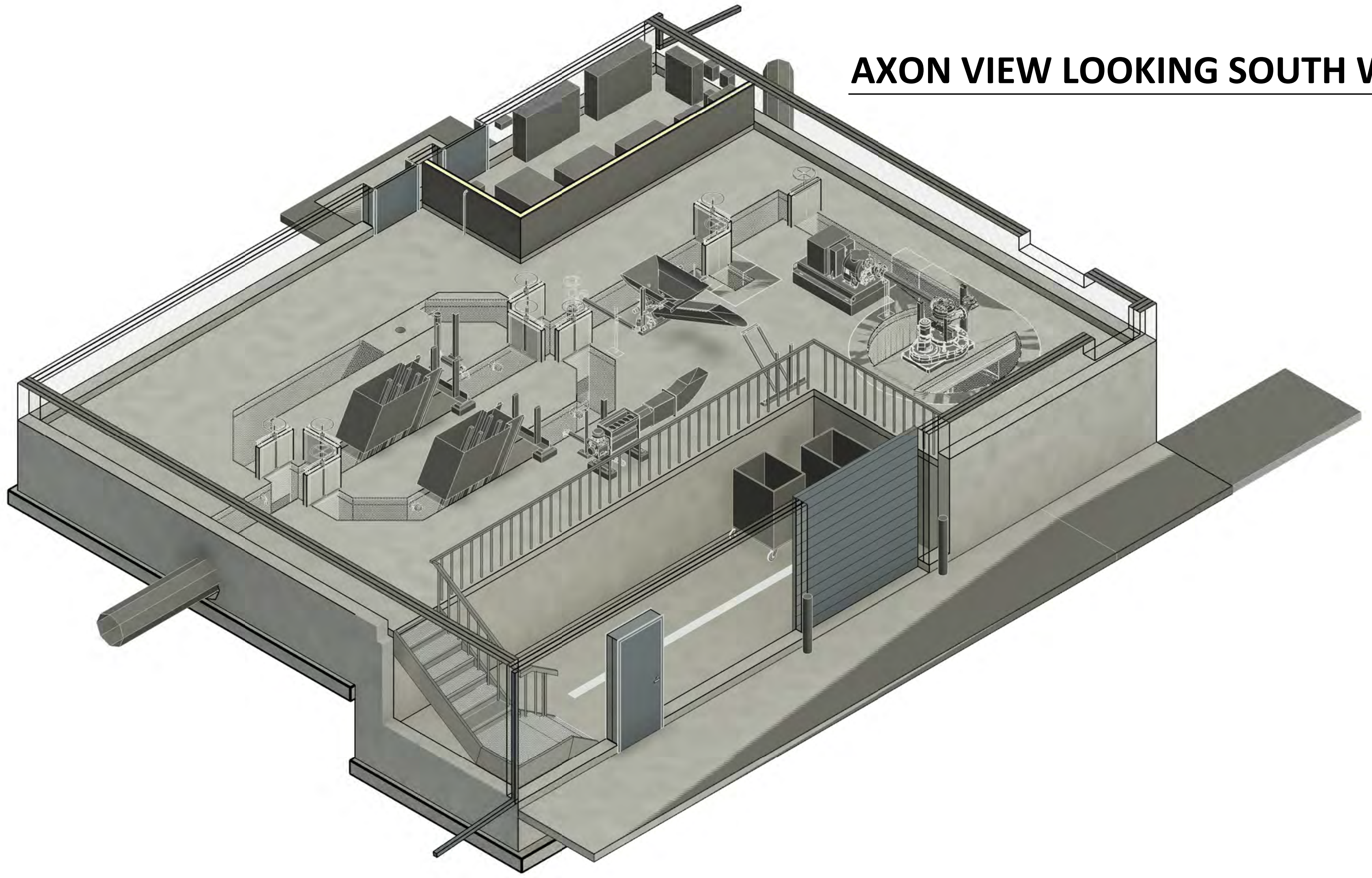

FOUNDATION AXON VIEW 3
SCALE:

AXON VIEW LOOKING NORTH EAST 1
SCALE:

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PROJECT TITLE
East Helena Headworks
& CIPP Lining - 2023
East Helena, Montana

SHEET TITLE
HEADWORKS BUILDING
AXON VIEWS

SHEET
FIG 3.5

CHAPTER 4 – SECONDARY TREATMENT AND TERTIARY FILTRATION EVALUATION

4.1 General Information and Treatment Requirements

4.1.1 Existing Secondary Treatment

In 2003, the City of East Helena upgraded their wastewater treatment plant (WWTP) from an aerated lagoon system to an extended aeration activated sludge treatment process. Wastewater is screened and goes through a simplistic grit removal system before it is treated in a synthetic-lined earthen aeration basin followed by an upflow clarifier. Treated effluent is drawn off the top of the clarifier and flows to an adjacent building, where it is disinfected with channel-mounted horizontal ultraviolet (UV) disinfection. Sludge is drawn off the bottom of the clarifier and flows to the sludge holding pond prior to thickening and dewatering in drying beds. Treated, disinfected effluent flows to the tertiary filtration facility and is either stored for non-potable water use or discharged to Prickly Pear Creek. The system was designed to remove biochemical oxygen demand (BOD), total suspended solids (TSS), and ammonia (NH_3).

In 2014, a new tertiary filtration process (for metals removal) was added to the WWTP in order for the City to meet very low Montana Pollutant Discharge Elimination System (MPDES) permit limits for a handful of metals. This metals removal process consists of four continuous upflow sand filters for the purpose of removing copper, lead, and zinc. With the addition of aluminum sulphate (alum), the City also gets phosphorus removal with the tertiary filters, but metals were the primary target for the filtration process. An analysis of the tertiary filtration process is included in **Section 4.8**. A layout of the existing WWTP is shown in **Figure 4.1**.

4.1.2 Preliminary Design Flows

As described in **Chapter 1**, the WWTP upgrade is based on two distinct design periods: a 15-year design period (2037) and a 30-year design period (2052). With the significant capital costs associated with the 30-year upgrade and the uncertainty surrounding long-term growth and development, <u>the secondary treatment alternative analysis will be based on the 15-year (2037) design period</u>. However, each section of this chapter will also address the additional capital improvements needed to accommodate the 2052 design flows.

4.1.3 Secondary Treatment Process Overview

Secondary treatment is the biological stage of wastewater treatment that follows preliminary (screening and grit removal) and primary (solids settling) treatment. The main goal of secondary treatment is to remove dissolved and suspended organic matter

East Helena WWTP Facility Plan

Figure 4.1
Existing WWTP Layout

Date: 4/28/2020 Path: F:\waste\18801 - East Helena Wastewater Capacity Study\GIS\MasterPlan\NormalFlowPath_Fig2C9.mxd that preliminary and primary treatment cannot capture. During secondary treatment, microorganisms consume organic pollutants in the wastewater as food, converting the pollutants into carbon dioxide, water, and additional biomass called sludge. This chapter evaluates typical secondary treatment alternatives that are best suited for Montana due to community size, costs, and proven effectiveness. The three secondary treatment options analyzed are as follows and discussed below:

- Oxidation Ditches with Secondary Clarifiers
- Sequencing Batch Reactors (SBR)
- Membrane Bioreactors (MBR)

4.2 Oxidation Ditches with Secondary Clarifiers

4.2.1 Process Overview

An oxidation ditch is a modified activated sludge biological treatment process that utilizes long solids retention times (SRTs) to remove biodegradable organics and nutrients (nitrogen and phosphorous). Oxidation ditches are typically oval or racetrack-shaped basins, and the long SRTs they create promote effective removal. They are often complete-mix systems and utilize surface aerators such as brush rotors or large slow-speed mixers to provide both aeration and circulation. The process is capable of biological nutrient removal, particularly nitrogen, by cycling between aerobic and anoxic zones. After wastewater undergoes biological treatment in an oxidation ditch, a mixture of both treated water and a large population of microorganisms leave the ditch and flow to secondary clarifiers. This mixture is called mixed liquor suspended solids (MLSS).

A secondary clarifier is a large settling tank that is used to separate the solid biomass (sludge) from the treated water. MLSS flows from the oxidation ditch into a splitter box where it is carried by a pipe into the bottom of the secondary clarifier. MLSS flows out of the influent feed well and solids settle to the bottom of the secondary clarifier due to gravity. Clear, settled effluent rises to the top and flows over a v-notch perimeter weir to disinfection. A portion of the settled sludge, called return activated sludge (RAS), is pumped back to the oxidation ditch to maintain a healthy biomass for biological treatment. Occasionally, waste activated sludge (WAS) is drawn off the bottom of the secondary clarifier and sent to solids handling for further stabilization and dewatering. Solids handling is discussed in **Chapter 5** of this document.

Performance evaluations of oxidation ditches and clarifiers have shown over 90% removal of BOD, TSS, and nitrogen, confirming the process's treatment effectiveness. Incorporating elements such as anoxic zones and recirculation loops can enhance biological nutrient removal. Sludge production is lower than in traditional activated sludge systems due to extended biological activity.

Oxidation ditches and secondary clarifiers are well-suited for small communities due to their simplicity and low operational costs, though it requires a larger land area than other secondary treatment methods. Advantages of oxidation ditches include energy efficiency, reliability, low sludge production, and strong resilience to shock loads.

While construction costs are generally higher due to the large volume of concrete required to build the ditches and clarifiers, operational savings from reduced energy and maintenance typically offset these expenses. Overall, oxidation ditches offer a robust, flexible, and efficient solution for secondary treatment where land availability permits.

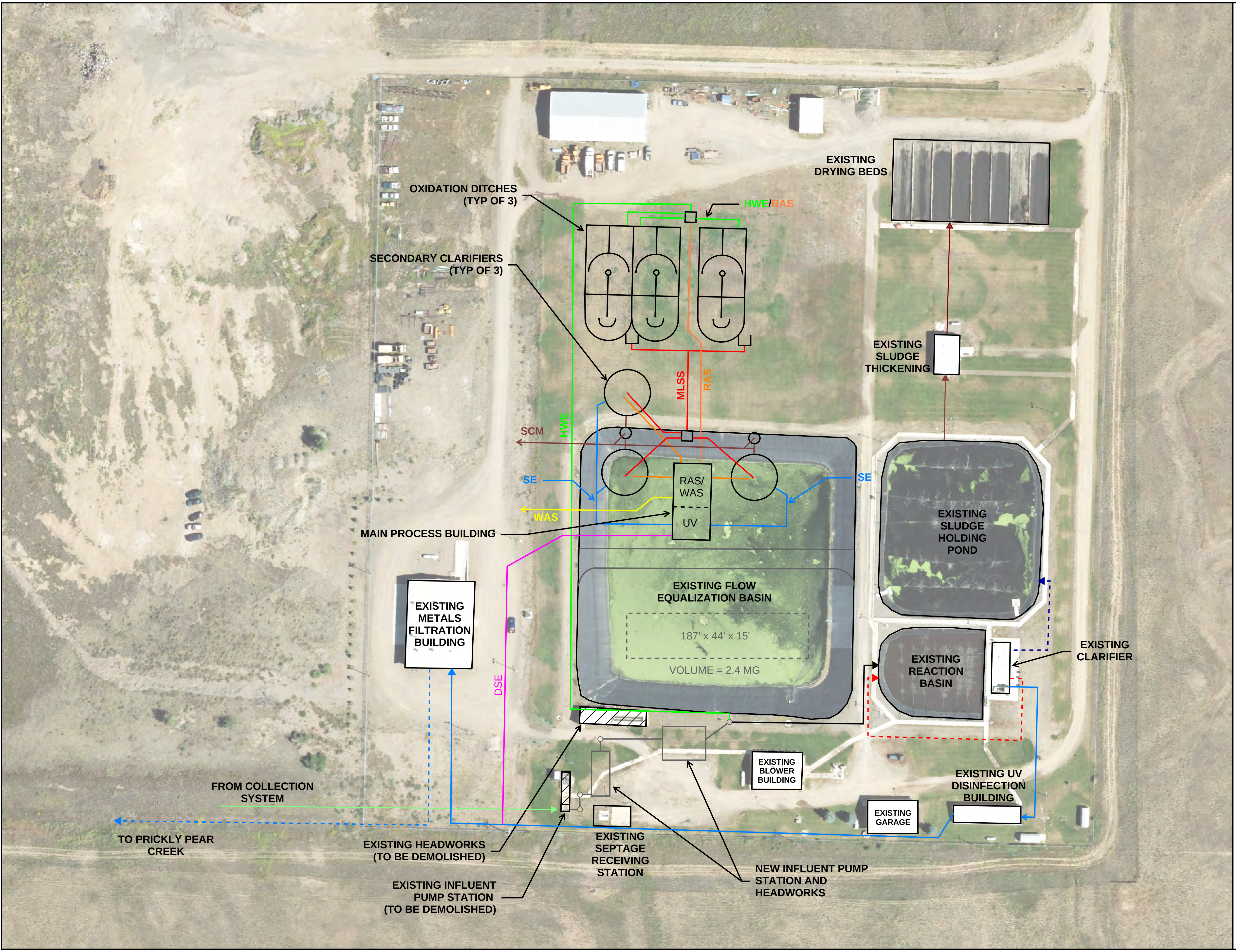
While the overall treatment process is generally the same for all oxidation ditches, various manufacturers differ in the way they design the shape of their ditch and aeration and mixing equipment. Proposals from multiple suppliers were requested to compare costs for the secondar treatment alternative. Ovivo's Carrousel DenitR and Lakeside's Cyclic Nitrification/Denitrification process were two options considered. Ovivo proposed an oxidation ditch that was less expensive, had a slightly smaller footprint, and utilized less energy. For these reasons, Ovivo was chosen as the basis for preliminary design and cost estimating.

4.2.2 Preliminary Design

East Helena has ample space at the current WWTP for an upgrade of significant size. This is advantageous as oxidation ditches and secondary clarifiers are large concrete structures as noted above. Generally, wastewater will flow by gravity from the new headworks facility on the south side of the WWTP to the proposed oxidation ditch location to the north. The WWTP currently has a 1.96-acre flow equalization basin just north of the headworks facility. Approximately half of this basin would be removed and filled to provide space for a new process building and clarifiers. From the ditches, MLSS would flow south to the secondary clarifiers.

Settled sludge will be drawn from the clarifiers and flow to the main process building. RAS will be pumped back to the oxidation ditches to maintain the biological process, while WAS will be pumped to the solids handling facility discussed in **Chapter 5**. Secondary effluent (treated water) from the top of the secondary clarifiers will flow by gravity to a UV disinfection system in the main process building. Channel-mounted (non-pressurized) UV disinfection alternatives will be discussed in **Sections 4.5** and **4.6** of this chapter. From UV disinfection, effluent would flow south to a tie in point upstream of the existing tertiary filtration system. The proposed oxidation ditch layout is shown in **Figure 4.2.**

Initially, three (3) oxidation ditches and three (3) secondary clarifiers will be constructed. Each ditch will be 118 feet long and 50 feet wide, with a side water depth of 11 feet. This equates to an approximate volume of 1.24 million gallons per ditch (3.72 million gallons



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LEGEND:

🟩	HWE (HEADWORKS EFFLUENT)
🟧	RAS (RETURN ACTIVATED SLUDGE)
🟥	MLSS (MIXED LIQUOR SUSPENDED SOLIDS)
🟦	SE (SECONDARY INFLUENT)
🟨	WAS (WASTE ACTIVATED SLUDGE)
🟪	DSE (DISINFECTED SECONDARY INFLUENT)
🟫	SCM (SCUM)

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Feet

RPA

East Helena WWTP Facility Plan

Figure 4.2
Proposed Oxidation Ditch Layout

total) and a hydraulic retention time of 17 hours at the 2037 average daily flow of 1.2 million gallons per day (MGD). Approximate sludge yield equates to 1,532 pounds per day based on an incoming BOD load of 1,961 pounds per day. Each ditch will utilize one surface-mounted paddle aerator to provide aeration and mixing. Preliminary design includes an inlet structure to direct flows to each oxidation ditch, and each ditch will have a weir gate to control the MLSS discharge rate and operating level in the ditch. Each ditch has a dedicated anoxic zone with two submersible mixers to promote denitrification. RAS pumps in the main process building will be used to return settled sludge from the clarifiers to the oxidation ditches to maintain an adequate MLSS concentration and SRT.

Each secondary clarifier will be 50 feet in diameter with a side water depth of 15 feet and a total depth of 17 feet. Each clarifier will have an effluent weir with scum baffles. A half bridge and platform will be constructed on each clarifier to allow access to the motor and gearbox for the scum skimmer and scraper arms.

30-Year Design Upgrades (2052 Flows)

To meet the 30-year average daily design flow of 1.65 MGD, one additional oxidation ditch and one additional 50-foot secondary clarifier would be constructed. The fourth ditch would be constructed east of the existing ditches and share a wall with one existing ditch. The fourth clarifier would be constructed to the northeast of the existing clarifiers. The fourth ditch and clarifier would have the same design criteria as the original three. MLSS, RAS, secondary effluent, and scum piping would all be installed to tie in the new ditch and secondary clarifier.

4.2.3 Design Criteria

Table 4.1 – Proposed Oxidation Ditch Design Criteria

Parameter	**Value**
Influent Flow (Average Daily Flow)	1.2 MGD
Number of Oxidation Ditches	3 (4 future)
Oxidation Ditch Dimensions	118.5 ft L x 50 ft W x 11 ft SWD
Oxidation Ditch Volume (per ditch)	1.24 MG
Design MLSS	4,000 mg/L
Hydraulic Retention Time	17 hours
Solids Retention Time	14 days
RAS Rate	50-100% of ADF
Sludge Yield (based on BOD)	1,532 lbs/day
Total Waste Sludge Volume	28,800 GPD
Anoxic Volume (per ditch)	100,000 gal
Standard Oxygen Requirement	6,152 lbs O2/day
Actual Oxygen Requirement	3,488 lbs O2/day
Number of Aerators (per ditch)	1 (surface-mounted paddle style)
Aerator Motor Size	50 HP
Number of Anoxic Mixers (per ditch)	2 (submersible)
Anoxic Mixer Size	2 HP
Basin Instruments	ORP, DO, Radar Level
Effluent Equipment	8’ Weir Gate with Electric Actuator

Table 4.2 – Proposed Secondary Clarifier Design Criteria

Parameter	Value
Number of Clarifiers	3 (4 future)
Diameter	50 ft
Side Water Depth	15 ft
Freeboard	2 ft
Total Depth	17 ft
Total Volume	220,300 gal
Bottom Slope	12:1 (H:V)
Motor Access	Half Bridge
Platform Dimensions	8 ft x 8 ft
Inlet	5 ft dia., Energy Dissipating
Feedwell	12 ft dia.
Effluent Weir	FRP
Scum Baffle	FRP

4.2.4 Operational and Energy Requirements

Operational Requirements

An oxidation ditch is extremely operator friendly; however, the large footprint leads to a significant increase in infrastructure at the facility. This will require at least one additional part-time operator (0.5 FTE) as there will be more instruments to check and calibrate, and process control and monitoring parameters such as dissolved oxygen (DO), MLSS, SRT, pH, and temperature will be required for each basin. Operators would be required to adjust aerator speeds or run times to respond to load changes; monitor and regularly waste sludge based on calculated SRTs; and perform routine maintenance on pumps, aerators, and mixers.

Energy Requirements

Mixers, aerators, and RAS/WAS pumping will be the main energy uses in the proposed oxidation ditch treatment system. The average estimated electrical consumption is between 1,500 and 2,000 kWh per day, dependent upon the ditch equipment supplier.

4.2.5 Area Requirements

As noted above, oxidation ditches are typically the largest of the secondary treatment options due to the inherent size of the ditches and clarifiers. These bigger area requirements can be an issue for many municipalities. However, East Helena owns a 40-acre parcel, with much of the property available for future upgrades. The oxidation ditches and clarifiers would require just under three acres of land. This will not be an issue as there is a large open area where the original lagoon was, and the existing flow equalization basin can be reduced in size to provide space for a process building and secondary clarifiers. This would keep the new secondary treatment process relatively close to the existing infrastructure, reducing piping and pumping costs.

4.2.6 Construction Considerations

The existing secondary treatment process would need to remain in service while the oxidation ditches, secondary clarifiers, and process building are constructed. The existing flow equalization basin will be reduced in size. This would mean storage volume is cut approximately in half, but this will not be an issue as the flow equalization pond is only used in emergency situations and would still have ample capacity. Proper inspection and leakage testing of the oxidation ditch and clarifiers is required per MDEQ standards. Once the new ditches, secondary clarifiers, and process building equipment are commissioned and properly treating effluent, the existing secondary treatment systems could be decommissioned.

There are no major construction problems anticipated for this alternative. However, construction projects can generate unforeseen difficulties that cannot be predicted prior to construction. Construction problems that may arise in the field would be promptly addressed and remedied.

4.2.7 Cost Estimate

Table 4.3 below summarizes the cost estimate for the oxidation ditch alternative. A detailed cost estimate for this alternative is presented in **Appendix D.**

Table 4.3 – Cost Summary for Oxidation Ditch with Secondary Clarifiers

Total Project Cost	$23,779,800
Total Annual Operation and Maintenance Cost	$237,150

4.3 Sequencing Batch Reactor (SBR)

4.3.1 Process Overview

Sequencing batch reactors (SBRs) are a type of fill and draw activated sludge system. Unlike conventional wastewater treatment systems that use separate tanks for different treatment stages, SBRs combine equalization, aeration, and clarification in a single tank called a reactor or basin. Typical SBR cycles include four general phases:

1. Fill: wastewater enters the basin until a design depth is reached
2. React: biological reactions are completed using aeration and mixing
3. Settle: air and mixing are turned off and solids settle to the bottom of the basin
4. Draw: treated water is drawn off the top of the basin using some type of weir

Due to combining processes in one basin, there is no need for separate clarifiers or activated sludge recycle pumps which allows SBRs to have a smaller footprint than most other types of secondary treatment. SBRs are capable of achieving greater than 85% removal of BOD, TSS, nitrogen, and phosphorus. However, SBR costs vary based on many factors, but smaller plants typically incur higher per-gallon treatment costs due to the lack of scale of economy. SBRs do require more sophisticated control systems, which can lead to higher maintenance demands compared to other technologies. A few other disadvantages include potential issues with sludge carryover during decanting, aeration system clogging and cleaning, and the need for post-treatment equalization in some situations.

Similar to oxidation ditches, various SBR manufacturers differ in the design of their aeration, mixing, and decanting equipment along with their control strategies. Multiple proposals were received for this technology, and Aqua-Aerobic and Parkson both provided detailed design information for the 2037 planning period. Aqua-Aerobic was chosen as a basis for preliminary design and cost-estimating.

4.3.2 Preliminary Design

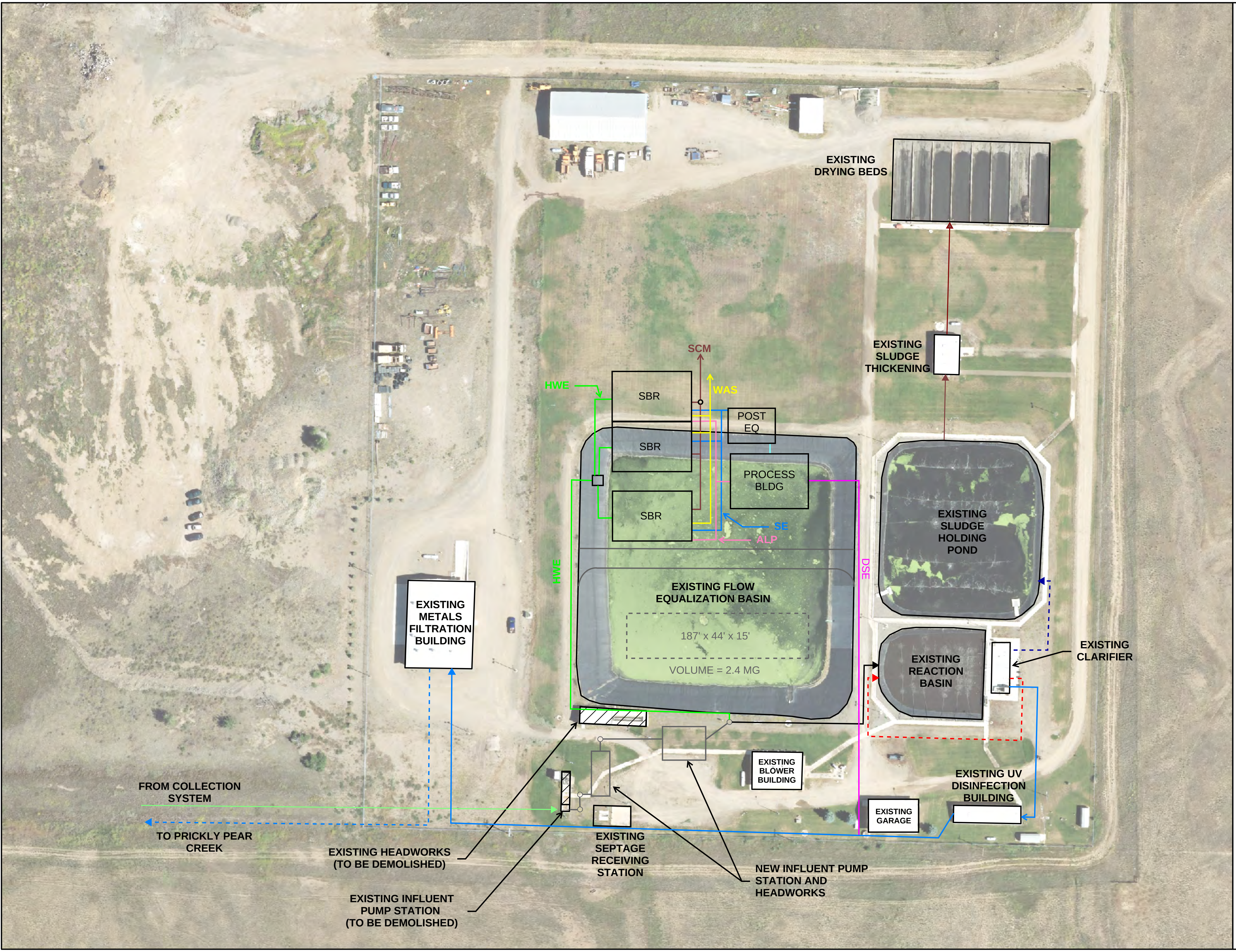
Screened wastewater will flow by gravity from the new screening and grit removal facility north around the existing 1.96-acre flow equalization basin. Approximately half of this basin would be removed and filled to provide space for the SBRs, a main process building, and a post-equalization basin. Wastewater would first enter the SBRs via a splitter box. Treated wastewater would be taken off the top of the SBR via a floating decanter and enter the post-equalization basin. After equalization, secondary effluent would be disinfected via a UV disinfection system in the main process building. Channel (non-pressurized) UV disinfection alternatives will be discussed in **Sections 4.5** and **4.6** of this chapter. From UV disinfection, effluent would flow south to a tie in point upstream of the existing tertiary filtration system.

The main process building will house blowers for low pressure air which would be supplied to the SBR basins during the react phase. Note that RAS pumps are not required because the settled sludge remains in the SBR basin. Settled biomass in the form of WAS would be pumped from the bottom of the basins after the settling phase to solids handling. Solids handling will be further discussed in **Chapter 5.** The proposed SBR layout is shown in **Figure 4.3.**

Initially, three (3) rectangular SBR basins would be constructed. Each basin will be 82 feet long x 55 feet wide x 25 feet deep with 2 feet of free board (23-foot max operating level). This equates to an approximate volume of 776,000 gallons in each basin (2.33 million gallons total). This would provide approximately 1.08 days of hydraulic retention time and 22.8 days of SRT. Sludge yield would be approximately 2,180 lbs/day and total waste sludge volume would be about 26,000 gallons per day. The complete SBR cycle time would be 5 hours, and each basin would complete four cycles per day. The proposed design includes a 100 HP positive displacement blower to provide 1,550 standard cubic feet per minute (scfm) to each basin via fixed membrane disc diffusers. Each basin would also utilize a 25 HP floating mixer.

30-Year Design Upgrades (2052 Flows)

To meet the 30-year average daily design flow of 1.65 MGD, one additional basin would be constructed. Headworks effluent and low-pressure air piping would need to be run to the fourth basin. Other than that, the process building equipment and post-equalization basin would be sized to accommodate the 2052 flows. The fourth basin would be the same size as the original three.



LEGEND:

- HWE (HEADWORKS EFFLUENT)
- ALP (AIR, LOW PRESSURE)
- SE (SECONDARY INFLUENT)
- WAS (WASTE ACTIVATED SLUDGE)
- DSE (DISINFECTED SECONDARY INFLUENT)
- SCM (SCUM)

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East Helena WWTP Facility Plan

Figure 4.3
Proposed SBR Layout

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4.3.3 Design Criteria

Table 4.4 – Proposed Sequencing Batch Reactor (SBR) Design Criteria

Parameter	Value
Influent Flow (Average Daily Flow)	1.2 MGD
Number of SBR Basins	3 (4 future)
SBR Basin Dimensions	82 ft L x 55 ft W x 23 ft SWD (max)
SBR Basin Volume (per basin)	766,000 gal
Design MLSS	4,500 mg/L
Hydraulic Retention Time	26 hours
Solids Retention Time	23 days
Sludge Yield (Based on BOD)	2,180 lbs/day
Total Waste Sludge Volume	26,133 GPD
Batches per Day	4 per basin
Complete Cycle Time	5 hours per basin
Standard Oxygen Requirement	6,328 lbs O2/day
Number of Blowers	1 per basin (positive displacement)
Blower Size	100 HP
Design Air Flow	1,552 scfm
Design Pressure	11.5 psi
Diffuser System	Fixed membrane discs (9” dia.)
Number of Mixers	1 per basin (floating)
Mixer Size	25 HP
Number of WAS Pumps	1 per basin (submersible)
WAS Pumps Size	2.5 HP
Decanter	10 ft x 9 ft fiberglass float with SST weir
Average Decanter Flow	4,819 gpm
Basin Instruments	DO, Level, Pressure

4.3.4 Operational And Energy Requirements

Operational Requirements

Operating an SBR is more involved than an oxidation ditch. Operators (with the help of the MFR supplied control system) would be required to configure and monitor cycle times, aeration periods, and decanting sequences based on influent characteristics. SBRs also include more instrumentation that would require frequent maintenance and cleaning along with regular process adjustments based on reported values. Operators would be required to manage time-based sequences according to influent flows rather than continuous flow processes where flow monitoring is less important. SBRs offer flexibility for variable flows and loads, but this also requires more active control, process tuning, and alarm management to prevent upsets. It is estimated that one additional full-time operator would be required to perform system operation and maintenance.

Energy Requirements

Aeration blowers, mixers, and waste sludge pumps will be the major energy uses in the SBR system. The average estimated power consumption is between 3,000 and 3,500 kWh per day based on the SBR equipment supplier.

4.3.5 Area Requirements

SBRs have a smaller footprint than oxidation ditches, mainly due to not utilizing separate clarifiers. It is estimated that a little over one acre would be required to construct the SBR basins, post-equalization basin, and main process building. As previously noted, the City has ample space on their 40-acre property to accommodate the SBR layout. The existing flow equalization basin would cut approximately in half for this design as well, and the SBR basins and structures would be built north of and adjacent to the “new” equalization basin.

4.3.6 Construction Considerations

The existing secondary treatment process would need to remain in service while the SBR basins, post-equalization basin, and main process building are constructed. The existing flow equalization basin will be reduced in size. This would mean storage volume is cut approximately in half, but this will not be an issue as the flow equalization pond is only used in emergency situations and would still have ample capacity. Proper inspection and leakage testing of the basins is required by MDEQ standards. Once the new basins and process building equipment are commissioned and properly treating effluent, the existing secondary treatment systems could be decommissioned.

There are no major construction problems anticipated for this alternative. However, construction projects can generate unforeseen difficulties that cannot be predicted prior to construction. Construction problems that may arise in the field would be promptly addressed and remedied.

4.3.7 Cost Estimate

Table 4.5 below summarizes the cost estimate for the SBR alternative. A detailed cost estimate for this alternative is presented in **Appendix D.**

Table 4.5 – Cost Summary for Sequencing Batch Reactor (SBR)

Total Project Cost	$21,030,500
Total Annual Operation and Maintenance Cost	$345,840

4.4 Membrane Bioreactor (MBR)

4.4.1 Process Overview

Membrane bioreactor (MBR) systems integrate a biological reactor with membrane filtration to separate solids and treat wastewater. Unlike traditional activated sludge systems which require secondary clarifiers to settle solids, MBRs use microfiltration membranes to remove suspended solids, bacteria, and nutrients such as nitrogen and phosphorus with high efficiency. This design allows for higher MLSS concentrations and compact installations, making MBRs ideal for areas with limited space or where high effluent quality is essential, such as in water reuse or aquifer injection applications.

MBRs perform very well and have been shown to remove over 90% of BOD, TSS, ammonia, and phosphorus, with effluent quality often surpassing discharge standards. MBR systems offer advantages such as better effluent quality, reduced footprint, and operational flexibility. However, elevated capital costs, high operation and maintenance costs, and operational complexities are drawbacks of these systems, especially for smaller communities. These costs are largely due to membrane maintenance, energy-intensive air scouring systems, and potential challenges with sludge characteristics.

Membrane fouling and premature membrane replacement are ongoing concerns, though strategies like regular cleaning and effective pretreatment (such as fine screening) can extend membrane life. It should be noted that the City’s current headworks project (1/4-inch mechanical screening) is not considered “fine screening”, and therefore an additional fine screening process would be required downstream of the new headworks facility.

There are numerous MBR designs in the market, and they are typically classified based on configuration and membrane material/type. Submerged membranes are placed directly in the aeration tank or a separate membrane tank. Membranes also vary based on pore size with ultrafiltration (pore sizes ranging from 0.01 to 0.1 microns) and microfiltration (pore sizes ranging from 0.1 to 0.4 microns) being the most common. The two main types of wastewater membranes are as follows:

- Hollow Fiber Membranes: composed of many fine, flexible fibers bundled together. These are typically operated in a submerged configuration within the membrane tank. Hollow fiber membranes have a high surface area to volume ratio and are compact and cost effective. However, these membranes are more prone to clogging and fouling and are harder to mechanically clean.
- Flat Sheet (Plate/Frame) Membranes: consist of flat membrane sheets arranged in a cassette or frame. Flat sheets are also commonly used in submerged MBR systems. They offer easier cleaning and maintenance due to lower fouling rates but have lower packing density than hollow fiber membranes.

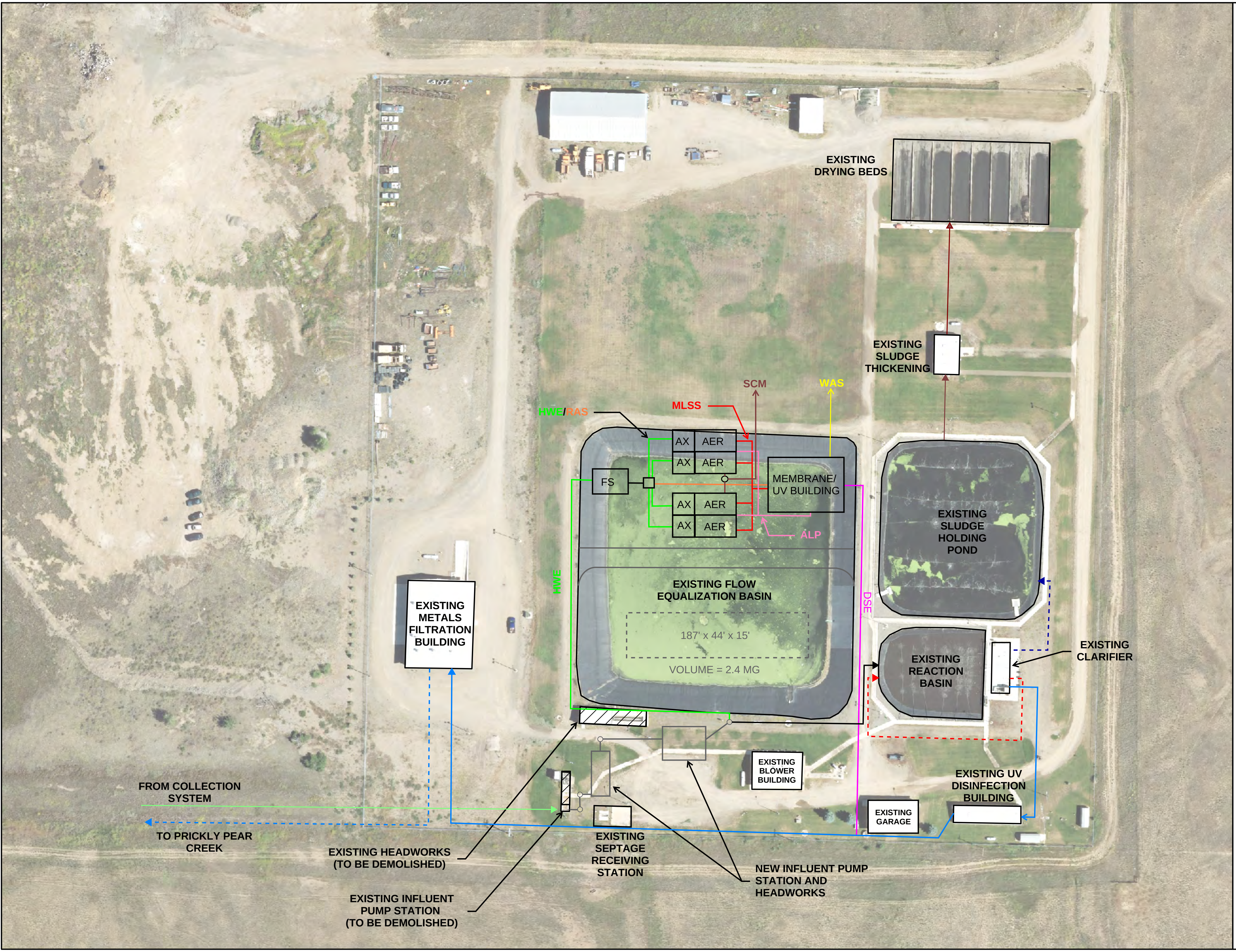
As with each secondary process alternative, multiple suppliers were contacted for MBR solutions. Veolia’s 64M reinforced hollow fiber cassettes were selected as the basis for preliminary design, but Kubota offered a flat plate membrane solution as well. Both require large amounts of air flow and chemicals for processes and cleaning.

4.4.2 Preliminary Design

Headworks effluent would flow from the new Headworks Building north along the edge of the existing flow equalization basin to a new fine screening facility. As mentioned above, redundant fine screens are mandatory to protect an MBR system; therefore, two parallel perforated plate screens with 2-mm opening (each designed to handle the peak hourly flow) would be constructed.

After fine screening, wastewater would flow by gravity to four separate biological reactors via a splitter box. Each reactor would be 68 feet long by 21 feet wide and have a maximum side water depth of 17 feet, providing approximately 800,000 gallons of working volume. Each basin would have an anoxic zone with a mixer and an aerobic zone with fine bubble diffusers for biological treatment (BOD and nitrogen removal). The bioreactors would also have an internal mixed liquor recycle pump to keep biomass in the basins for biological treatment.

MLSS would then flow to the main process building which would house four membrane trains with two cassettes per train, with a total of 464 modules in the system. Each membrane tank would be 16 feet long x 9 feet wide x 12 feet deep. The system uses permeate pumps to apply a vacuum to draw treated water through the hollow fiber membranes and back pulse the system for cleaning. Permeate (clean water) is then directed to UV disinfection after the membranes. Large air bubbles are introduced below the bottom of the membrane modules to produce turbulence which scours the outer surface of the membranes for cleaning. RAS is pumped back to the bioreactors at a substantial rate (400-500% of ADF) to maintain a proper MLSS concentration. The proposed MBR layout is shown in **Figure 4.4.**



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East Helena WWTP Facility Plan

Figure 4.4
Proposed MBR Layout

30-Year Design Upgrades (2052 Flows)

To meet the 30-year average daily design flow of 1.65 MGD, one additional biological reactor basin would be constructed, and one additional membrane train would be installed. This would also require the installation of an additional positive displacement blower for membrane air scour, one additional blower for process aeration, and additional permeate and RAS pumps.

4.4.3 Design Criteria

Table 4.6 – Proposed Membrane Bioreactor (MBR) Design Criteria

Parameter	Value
Influent Flow (Average Daily Flow)	1.2 MGD
Number of Bioreactors	4 (5 future)
Bioreactor Basin Dimensions	68 ft L x 21 ft W x 17 ft SWD
Anoxic Basin Volume (per basin)	70,000 gal
Aeration Basin Volume (per basin)	130,000 gal
Design MLSS	8,000 mg/L
Solids Retention Time	22 days
RAS Rate	400%-500% of ADF
Total Waste Sludge Volume	19,000 gpd
Number of Membrane Tanks	4 (5 future)
Membrane Tank Dimensions	16 ft L x 9 ft W x 12 ft SWD
Membrane Tank Volume (per tank)	12,925 gal
Membrane Type	Reinforced Hollow Fiber
Membrane Surface Area per Module	530 ft^2 (per module)
Total Number of Membrane Modules	464 (116 modules per train)
Anoxic Mixer	Submersible
Diffuser System	Fine bubble discs (9" dia.)
Aeration & Membrane Blowers	Positive Displacement (50 HP & 40 HP)
Instruments	DO, pH, Level, Flow Meter, Pressure
Cleaning Chemicals	Sodium Hypochlorite, Citric Acid

4.4.4 Operational And Energy Requirements

Operational Requirements

An MBR system is the most complex of the secondary treatment alternatives to operate as it involves managing biological treatment, membrane filtration, and various chemical dosing. Analytical monitoring in the biological reactors includes DO, MLSS, temperature, pH, and nutrients (primarily ammonia and nitrogen). Transmembrane pressure, flux rate, and cycle times would be monitored and adjusted to ensure the membranes are clean and operating correctly. These all include complex control strategies and a multitude of sensors and probes to monitor these parameters. For these reasons, it is assumed that an additional 1.5 FTE staff would be required to operate an MBR facility.

Energy Requirements

MBR systems also require large amounts of energy in the form of biological aeration and membrane air scour, significantly increasing operating costs. MBRs run at very high MLSS concentrations (+/- 8,000 mg/L), which requires high DO levels and increased levels of mixing. These higher DO levels require substantial aeration which accounts for an estimated 40-60% of the energy use in the system. The membrane air scouring systems also require continuous, high volume air delivery for cleaning. There are also more pumps involved in MBR systems for the numerous permeate and recycle flows. The average estimated power consumption is between 4,500 and 5,500 kWh per day based on the MBR equipment supplier.

4.4.5 Area Requirements

MBRs are the most efficient alternative in terms of footprint given their high MLSS concentration. Roughly 0.75 acres would be required for construction of the MBR facility. The City has ample room for this secondary treatment option on their existing 40-acre parcel. Although it is not necessary to reduce the size of the existing flow equalization basin to construct the MBR facility in the open space available, the basin would be cut in half similar to the other alternatives, with the north half backfilled for construction of the fine screen building, bioreactor basins, and membrane building.

4.4.6 Construction Considerations

The existing secondary treatment process would need to remain in place while the fine screening and MBR facilities are constructed. The existing flow equalization basin will be reduced in size. This would mean storage volume is cut approximately in half, but this will not be an issue as the flow equalization pond is only used in emergency situations and would still have ample capacity. Proper inspection and leakage testing of the basins is required by MDEQ standards. Once the new basins and process building equipment are commissioned and properly treating effluent, the existing secondary treatment systems could be decommissioned.

There are no major construction problems anticipated for this alternative. However, construction projects can generate unforeseen difficulties that cannot be predicted prior to construction. Construction problems that may arise in the field would be promptly addressed and remedied.

4.4.7 Cost Estimate

Table 4.7 below summarizes the cost estimate for the MBR alternative. A detailed cost estimate for this alternative is presented in **Appendix D.**

Table 4.7 – Cost Summary for Membrane Bioreactor (MBR)

Total Project Cost	$27,052,400
Total Annual Operation and Maintenance Cost	$630,950

4.5 UV Disinfection – Horizontal Lamp Design

4.5.1 Process Overview

Ultraviolet (UV) disinfection is a physical disinfection process involving electromagnetic radiation. UV light has a wavelength of 254 nanometers, which is in the optimum wavelength range for germicidal effect (250 – 270 nanometers). The UV disinfection process targets single celled microorganisms such as viruses, bacteria, and protozoa. UV light destroys single cell organism’s ability to reproduce by rearranging their DNA. UV disinfection eliminates the health and safety concerns associated with traditional chlorine disinfection. UV light also achieves pathogen inactivation without creating environmentally detrimental chlorination by-products.

Pathogen inactivation is directly linked to UV dose, which is the product of the average UV intensity and the duration of exposure (retention time). Factors that affect UV light intensity or retention time will also affect the disinfection capability. Some of the key parameters impacting UV performance are as follows:

- UV transmittance of effluent
- Suspended solids
- Dissolved organics
- Particle size distribution
- Lamp age
- Sleeve cleanliness
- Lamp configuration and hydraulic design

UV disinfection systems utilizing low pressure, high intensity lamps have become the most common type of system for wastewater facilities of this size. The City currently operates a similar horizontal UV disinfection system; however, the existing system is past its useful life and inadequately sized for anticipated flows.

There are two main arrangements for UV disinfection in open channels – horizontal and inclined. Inclined systems will be discussed in **Section 4.6** of this chapter. Horizontal orientation means the lamps are mounted horizontally and parallel to the flow stream. This provides lower head loss through the channel and uniform flow that is easier to maintain. Contact time in the channel depends on cross sectional area (width x depth), length of channel, and the design flow rate. Horizontal UV designs typically have a longer channel with shallower depths. Most designs have some form of automated cleaning system but still require the lamp modules to be completely removed from the channel for manual cleaning on a routine basis. Both systems offer simple increases in capacity by adding lamps as needed in the form of additional modules or banks.

Similar to the secondary process alternatives, multiple suppliers were contacted for UV disinfection solutions. Trojan and Wedeco both supply horizontal UV disinfection systems. The Trojan UV3000Plus was chosen as the basis of design for this document.

4.5.2 Preliminary Design

The horizontal UV disinfection system will be installed in the main process building, regardless of the secondary treatment option selected. UV disinfection would be the last step in the treatment process prior to treated effluent being sent to the existing tertiary filtration facility. The horizontal system would consist of one channel measuring 35 feet long by 2 feet wide, with a design water depth of 5’-2”. Two UV banks (in series) would be installed in the channel with five modules per bank and eight lamps per module, for a total of 80 low pressure, high intensity UV lamps. Each bank would have its own power distribution center, and one system control center would be installed to control the entire horizontal UV system. The system would include an integrated cleaning system and a fixed weir downstream of the UV lamps to control water level. A portable davit crane would be required to lift the individual UV modules out of the channel for cleaning, maintenance, and inspection.

30-Year Design Upgrades (2052 Flows)

To meet the 30-year average daily design flow of 1.65 MGD, one additional module would be added to each bank. These modules would still house eight UV lamps, and the total number of lamps would increase from 80 to 96. No channel modifications would be required as the initial design would include a baffle plate on one side of the channel that would be removed in the future to accommodate the additional lamps.

4.5.3 Design Criteria

Table 4.8 – Proposed Horizontal UV Disinfection Design Criteria

Parameter	Value
Average Design Flow	1.2 MGD
Peak Design Flow	3.47 MGD
Channel Width	2 ft
Channel Length	35 ft
Channel Depth	5.17 ft
Design UV Transmittance	65% (minimum)
UV Design Dose	30 mJ/cm^2
Lamp Type	Low Pressure, High Intensity
Number of Banks	2
Modules per Bank	5
Lamps per Module	8
Total Number of Lamps	80
Cleaning System	Mechanical Wiping and Chemical Cleaning
Number of Controllers	1
Number of Power Distribution Centers	2
Lamp Control	60 – 100% Lamp Turndown
Lamp Output	250 Watts
Total Power Consumption	20 kW
Weir	Fixed Trapezoidal
Lamp Replacement	12,000 Hours
Lamp Life Factor	0.98
Lamp Fouling Factor	0.95

4.5.4 Operational and Energy Requirements

Operational Requirements

Horizontal UV disinfection systems require consistent flow to avoid short-circuiting or the lamps from overheating. The UV controller monitors all UV functions and offers SCADA connectivity, dose pacing control, and data logging for parameters such as flow, power, UV transmissivity, UV intensity, and dose. Each bank includes a power distribution center to access module power cables and hoses for the cleaning system. The UV intensity sensor continuously monitors UV lamp output and activates the cleaning system automatically.

The horizontal UV system can also include a water level sensor. If effluent falls below the defined sensor parameter, an alarm is activated and sent to SCADA. The horizontal UV system includes a fixed trapezoidal weir at the end of the UV banks which helps maintain the appropriate water level over the lamps for disinfection and cooling. The largest maintenance item for a UV disinfection system is replacing the lamps. The horizontal UV system would require a portable davit crane to remove the UV banks from the channel to replace lamps and clean the sleeves manually. As mentioned above, the City currently operates a similar UV system. For this reason, it is assumed that no additional operators or labor would be required to operate the new UV system.

Energy Requirements

UV disinfection energy use is based on factors such as UV dose, transmittance, and system type. For the purpose of planning, UV dose is estimated to be 30 mJ/cm^2 with an estimated minimum transmittance of 65%. The horizontal UV disinfection system utilizes an estimated 10 kW per bank. This equates to an energy requirement of approximately 240 kWh per day.

4.5.5 Area Requirements

UV disinfection will be installed at the end of the secondary treatment process in the main process building. This building will be sized appropriately based on the selected secondary process and UV system design. Both the horizontal and incline UV systems require approximately 35 feet of channel length. The City has ample room to construct the main process building on their existing 40-acre parcel.

4.5.6 Construction Considerations

The existing UV disinfection system would need to remain in place while the new secondary process and UV system are constructed. Proper inspection and leakage testing of the UV channel is required per MDEQ standards. Once the new secondary treatment system and UV equipment are deemed operational, the existing UV disinfection system could be decommissioned.

There are no major construction problems anticipated for this alternative. However, construction projects can generate unforeseen difficulties that cannot be predicted prior to construction. Construction problems that may arise in the field would be promptly addressed and remedied.

4.5.7 Cost Estimate

Table 4.9 below summarizes the cost estimate for the horizontal UV disinfection system. A detailed cost estimate for this alternative is presented in **Appendix D.**

Table 4.9 – Cost Summary for Horizontal UV Disinfection

Total Cost	$877,100
Total Annual Operation and Maintenance Cost	$37,320

4.6 UV Disinfection – Inclined Lamp Design

4.6.1 Process Overview

Inclined UV disinfection has essentially the same operating principles and performance factors as the horizontal UV systems. With an inclined UV design, the lamps are angled at roughly 45-degrees and partially submerged in the channel. This results in water flowing up the inclined plane which increases contact time. However, head loss is greater in an inclined orientation, and flow could potentially short-circuit if the system is not well-designed. Inclined UV systems include an automated feature that raises the entire bank out of the channel for easier access to inspect and clean the lamps. Inclined UV typically requires a shorter footprint, but some structural support may be required.

Trojan and Wedeco both supply inclined UV disinfection systems. The Trojan UVSigna was chosen as the basis of design for this document.

4.6.2 Preliminary Design

The inclined UV disinfection system will be installed in the main process building, regardless of secondary treatment option selected. UV disinfection would be the last step in the treatment process prior to treated effluent being sent to the existing tertiary filtration facility. The inclined system would consist of one channel measuring 35 feet long by 2.5 feet wide, with a design water depth of 7’-8”. Three UV banks (in series) would be installed in the channel with eight lamps per bank, for a total of 24 low pressure, high intensity UV lamps. This system includes one power distribution center and one system control center. The system would include an integrated cleaning system and a fixed weir downstream of the UV lamps to control water level. With the automatic raising system, lamp replacements and other system maintenance can be done above the channel without the need for a davit crane to remove the UV banks.

30-Year Design Upgrades (2052 Flows)

This design includes a redundant bank of UV lamps, and therefore no additional equipment or channel modifications would be required to meet the 2052 design flows.

4.6.3 Design Criteria

Table 4.10 – Proposed Inclined UV Disinfection Design Criteria

Parameter	**Value**
Average Design Flow	1.2 MGD
Peak Design Flow	3.47 MGD
Channel Width	2.5 ft
Channel Length	35 ft
Channel Depth	7.67 ft
Design UV Transmittance	65% (minimum)
UV Design Dose	30 mJ/cm^2
Lamp Type	Low Pressure, High Intensity
Number of Banks	3
Lamps per Bank	8
Total Number of Lamps	24
Cleaning System	Mechanical Wiping and Chemical Cleaning
Number of Controllers	1
Number of Power Distribution Centers	1
Lamp Control	60 – 100% Lamp Turndown
Lamp Output	1,100 Watts
Total Power Consumption	26.5 kW
Weir	Fixed Trapezoidal
Lamp Replacement	15,000 Hours
Lamp Life Factor	0.98
Lamp Fouling Factor	0.95

4.6.4 Operational and Energy Requirements

Operational Requirements

Inclined UV disinfection systems require consistent flow to avoid short-circuiting or the lamps from overheating. The UV controller monitors all UV functions and offers SCADA connectivity, dose pacing control, and data logging for parameters such as flow, power, UV transmissivity, UV intensity, and dose. Each bank includes a power distribution center to access module power cables and hoses for the cleaning system. The UV intensity sensor continuously monitors UV lamp output and activates the cleaning system automatically.

The inclined UV system can also include a water level sensor. If effluent falls below the defined sensor parameter, an alarm is activated and sent to SCADA. Like the horizontal UV system, the inclined UV design includes a fixed trapezoidal weir at the end of the UV banks which helps maintain the appropriate water level over the lamps for disinfection and cooling. The largest maintenance item for a UV disinfection system is replacing the lamps. The inclined UV system allows for lamp and cleaning solution replacement while leaving the banks in the channel. A hydraulic arm raises the bank out of the channel to complete these tasks. As mentioned above, the City currently operates a similar UV system. For this reason, it is assumed that no additional operators or labor would be required to operate the new UV system.

Energy Requirements

UV disinfection energy use is based on factors such as UV dose, transmittance, and system type. For the purpose of planning, UV dose is estimated to be 30 mJ/cm^2 with an estimated minimum transmittance of 65%. The inclined UV disinfection system utilizes an estimated 8.83 kW per bank. This system has two duty banks and one redundant at any given time. This equates to an energy requirement of roughly 325 kWh per day.

4.6.5 Area Requirements

UV disinfection will be installed at the end of the secondary treatment process in the main process building. This building will be sized appropriately based on the selected secondary process and UV system design. Both the horizontal and incline UV systems require approximately 35 feet of channel length. The City has ample room to construct the main process building on their existing 40-acre parcel.

4.6.6 Construction Considerations

The existing UV disinfection system would need to remain in place while the new secondary process and UV system are constructed. Proper inspection and leakage testing of the UV channel is required per MDEQ standards. Once the new secondary treatment system and UV equipment are deemed operational, the existing UV disinfection system could be decommissioned.

There are no major construction problems anticipated for this alternative. However, construction projects can generate unforeseen difficulties that cannot be predicted prior to construction. Construction problems that may arise in the field would be promptly addressed and remedied.

4.6.7 Cost Estimate

Table 4.11 below summarizes the cost estimate for the inclined UV disinfection system. A detailed cost estimate for this alternative is presented in **Appendix D.**

Table 4.11 – Cost Summary for Inclined UV Disinfection

Total Cost	$982,500
Total Annual Operation and Maintenance Cost	$30,736

4.7 Secondary Treatment and Disinfection Evaluation

In this section, the alternatives described previously are compared in further detail using monetary and non-monetary analyses.

4.7.1 Cost Analysis

Life Cycle Cost Analysis

The life cycle cost analysis includes an economic comparison of the developed alternatives using the total project cost, annual operation and maintenance (O&M) costs, and the estimated salvage value of the infrastructure at the end of 20 years. This cost-effectiveness evaluation tool is considered one of the most important comparison parameters when multiple alternatives are being contemplated. Refer to **Appendix D** for detailed cost estimates (including total project cost, O&M costs, and salvage value) of each alternative. **Table 4.12** below shows the life cycle cost analysis for the secondary treatment alternatives. **Table 4.13** below shows the life cycle cost analysis for the UV disinfection alternatives.

Total Project Cost

For estimating project costs, actual material and equipment proposals and prices of comparable work were used whenever possible. Project capital costs contain labor and material costs to construct the anticipated facilities and include allowances general conditions such as contractor mobilization, bonds and insurance, and other general requirements such as submittal preparation. Installation costs are based on a percentage of equipment costs that vary on the complexity of the project. It should be noted that the costs for administration and engineering services are not included in the total project cost. A construction contingency and undefined scope cost is included due to the inherent uncertainty at the time the cost estimate was completed. Included in these estimates are a construction contingency and undefined scope cost of 30% and a general conditions cost of 15%.

Operation and Maintenance Costs

Economic evaluations of the alternatives require consideration of annual O&M costs as well as capital costs. O&M expenses include all costs for materials and supplies, equipment replacement funds for specific systems, energy, and labor requirements, if applicable. Material maintenance costs for new facilities are based on a percentage of the initial equipment costs, depending on the type of equipment and its use. Energy costs for new facilities are based on estimates of the average requirements for each unit process and typical rates for Montana communities.

Present Worth Analysis

A present worth analysis has been completed for each of the secondary treatment and UV disinfection alternatives. The present worth analysis includes the total project cost, annual O&M cost for each alternative, and a 20-year salvage value. The salvage value assumes a mechanical equipment life of 20 years, unless noted otherwise. The result is the amount that would have to be invested (in 2025 dollars) to pay for the total project cost and the annual O&M costs at an interest rate of 3% for 20 years, less the salvage value at the end of the 20-year planning period.

Table 4.12 – Secondary Treatment Alternatives Life Cycle Cost Analysis

Secondary Treatment Alternative	Total Project Cost	Annual O&M Cost	Salvage Value	Total Present Worth
Oxidation Ditch with Clarifiers	$23,779,800	$237,150	$4,224,900	$24,968,800
Sequencing Batch Reactor (SBR)	$21,030,500	$345,840	$4,048,500	$23,934,200
Membrane Bioreactor (MBR)	$27,052,400	$630,950	$4,404,700	$34,000,600

Table 4.13 – UV Disinfection Alternatives Life Cycle Cost Analysis

UV Disinfection Alternative	Total Project Cost	Annual O&M Cost	Salvage Value	Total Present Worth
Horizontal UV	$877,100	$37,320	$126,200	$1,362,500
Inclined UV	$982,500	$30,736	$166,600	$1,347,500

For the secondary treatment alternatives, the SBR alternative is the most cost-effective approach with a total present worth of $23,934,200. The SBR option has a higher O&M cost than the Oxidation Ditch with Clarifiers alternative, which is due to additional operator time and more power consumption. The MBR alternative has significantly higher capital and O&M costs due to equipment capital cost and the large increase in power and time required to operate an MBR.

For the open-channel UV disinfection alternatives, the inclined UV option is the most cost-effective approach with a total present worth of $1,347,500. The inclined UV alternative has a slightly higher capital cost but lower O&M cost, mostly due to significantly fewer lamp replacements over the life of the equipment.

4.7.2 Non-Economic Comparison

This section discusses the non-monetary factors that were considered when selecting the alternatives developed previously. These items include technical feasibility, longevity/reliability, regulatory compliance, constructability, environmental impacts, operation and maintenance, public health and safety, and land impact/availability.

Technical Feasibility

- **Secondary Treatment**
  All three secondary treatment alternatives have a multitude of technical requirements and coordination items, especially during construction. The Oxidation Ditch with Clarifiers is the least complex alternative followed by the SBR alternative. Equipment for all three alternatives will be supplied by a single manufacturer with sole source responsibility, which reduces the coordination and complexity significantly. The oxidation ditch has the least amount of equipment required, making it the easiest to design and coordinate. The MBR option has significantly more moving parts than the other alternatives.

- **UV Disinfection**
  Both UV disinfection alternatives are equal in terms of technical feasibility as the operating principles and components of the systems are essentially the same.

Longevity/Reliability

- **Secondary Treatment**
  The Oxidation Ditch and Clarifiers have the fewest mechanical components that have the potential to fail over the life of the system and need replacement. The SBR system has the next fewest pieces of equipment that may need replaced over its useful life. MBR systems have the most mechanical equipment, and the membranes only have a 10-year life expectancy.

  UV Disinfection
  The inclined UV disinfection alternative has better longevity and reliability as the lamp life is approximately 25-50% longer depending on the source. This means better lamps and less lamp replacements over the life of the equipment.

Regulatory Compliance

- **Secondary Treatment**
  All three secondary treatment alternatives have been adequately sized and preliminarily designed to meet the regulatory requirements in Circular DEQ-2. While the MBR alternative will produce a higher quality effluent, all three alternatives will meet the City's discharge permit for Prickly Pear Creek and potential groundwater discharge.

- **UV Disinfection**
  Both UV disinfection alternatives have been adequately sized and preliminarily designed to meet the regulatory requirements in Circular DEQ-2 and will meet proposed surface water or groundwater discharge limits.

Constructability

- **Secondary Treatment**
  The SBR alternative is likely the easiest to construct as the reactor basins require less concrete compared to oxidation ditches and clarifiers. The Oxidation Ditch and Clarifiers alternative has some difficult concrete pours with rounded walls and suspended slabs. The MBR option is the most complex to build as careful installation of membrane modules, more complex piping, and more mechanical equipment are all required.

- **UV Disinfection**
  A horizontal UV system is slightly better from a constructability standpoint as the concrete channel pours are not as complicated and require less concrete.

Environmental Impacts

- **Secondary Treatment**
  All three secondary treatment alternatives will have the same short-term impacts during construction, including noise and dust pollution and equipment emissions. While the MBR alternative will produce the highest effluent quality which can be reused for various purposes instead of discharge to Prickly Pear Creek, this type of process consumes large amounts of energy and chemicals.

- **UV Disinfection**
  Both UV disinfection alternatives have similar environmental impacts including energy consumption. However, neither requires the addition of chemicals, creating safer effluent streams.

Operation and Maintenance

- **Secondary Treatment**
  The Oxidation Ditch with Clarifiers alternative scores the best for operation and maintenance. Oxidation ditches are the easiest of the three technologies to operate and maintain due to minimal equipment and less operator interaction required. The SBR option is slightly more intricate to operate and includes more probes and mechanical equipment to maintain. The MBR alternative is the most complex process to operate and involves the most maintenance due to the numerous pieces of rotating equipment, extensive instrumentation calibration, and routine membrane cleaning.

  UV Disinfection
  Inclined UV disinfection scores the best for operation and maintenance. It has a hydraulic arm that removes the lamps from the channel without the need for a crane. Lamp replacement and cleaning solution filling can be achieved while the banks are in the channel. The inclined system also has less lamps and longer lamp life, meaning less time and money spent replacing lamps each year.

Public Health and Safety

- **Secondary Treatment**
  The MBR alternative will produce the highest quality effluent which means the best protection of public health and safety. However, the oxidation ditch and SBR will still produce high quality effluent that is significantly better and more reliable than the existing facility.

- **UV Disinfection**
  Both UV disinfection alternatives will provide the same level of protection for public health and safety.

Land Impact/Availability

- **Secondary Treatment**
  The MBR alternative has the least impact on land while the Oxidation Ditch with Clarifier alternative has the most land impact. However, East Helena has ample room at the WWTP for any of these upgrades on their existing 40-acre parcel.

- **UV Disinfection**
  Both UV disinfection alternatives require about the same amount of space for installation, including the concrete channel. However, the horizontal UV system requires one more power distribution center which would occupy more space in the main process building.

4.7.3 Selection of Preferred Alternatives

Using the life cycle cost analysis and non-monetary factors discussed above, a comparative summary evaluation and ranking of wastewater treatment alternatives is presented below. For the criteria presented above, each alternative is scored from one through five based on how well they meet the requirements of the selected criteria with a score of one being the lowest and five being the highest.

The weighting of the financial and non-economic criteria has a substantial effect on the final alternative ranking and is inherently open to differences in opinion. Therefore, the criteria were discussed with East Helena staff and given a weight between one and three based on their impact to the City, with three having the highest weight and therefore the most importance.

The scores and weights were then multiplied to produce a weighted rank for each criterion. The weighted rank scores are summed, resulting in a weighted rank total score with the highest value indicating the overall highest ranking.

Table 4.14 below ranks the secondary treatment alternatives according to their life cycle costs and non-monetary factors previously discussed. **Table 4.15** below ranks the UV disinfection alternatives according to their life cycle costs and non-monetary factors previously discussed.

Table 4.14 – Secondary Treatment Alternative Evaluation Summary

Criteria	Criteria Weight	Oxidation Ditch with Clarifiers	Sequencing Batch Reactor (SBR)	Membrane Bioreactor (MBR)
Financial Feasibility	**3**			
Alternative Rank		5	5	3
Weighted Rank		*15*	*15*	*9*
Technical Feasibility	**2**			
Alternative Rank		5	4	3
Weighted Rank		*10*	*8*	*6*
Longevity/Reliability	**2**			
Alternative Rank		5	4	3
Weighted Rank		*10*	*8*	*6*
Regulatory Compliance	**2**			
Alternative Rank		5	5	5
Weighted Rank		*10*	*10*	*10*
Constructability	**1**			
Alternative Rank		4	5	3
Weighted Rank		*4*	*5*	*3*
Environmental Impacts	**2**			
Alternative Rank		5	5	4
Weighted Rank		*10*	*10*	*8*
Operation & Maintenance	**3**			
Alternative Rank		5	4	2
Weighted Rank		*15*	*12*	*6*
Public Health & Safety	**3**			
Alternative Rank		4	4	5
Weighted Rank		*12*	*12*	*15*
Land Impact/Availability	**1**			
Alternative Rank		3	4	5
Weighted Rank		*3*	*4*	*5*
Total		**89**	**84**	**68**

Table 4.15 – UV Disinfection Alternative Evaluation Summary

Criteria	**Criteria Weight**	**Horizontal UV**	**Inclined UV**
Financial Feasibility	**3**		
Alternative Rank		5	5
Weighted Rank		*15*	*15*
Technical Feasibility	**2**		
Alternative Rank		5	5
Weighted Rank		*10*	*10*
Longevity/Reliability	**2**		
Alternative Rank		4	5
Weighted Rank		*8*	*10*
Regulatory Compliance	**2**		
Alternative Rank		5	5
Weighted Rank		*10*	*10*
Constructability	**1**		
Alternative Rank		5	4
Weighted Rank		*5*	*4*
Environmental Impacts	**2**		
Alternative Rank		5	5
Weighted Rank		*10*	*10*
Operation & Maintenance	**3**		
Alternative Rank		3	5
Weighted Rank		*9*	*15*
Public Health & Safety	**3**		
Alternative Rank		5	5
Weighted Rank		*15*	*15*
Land Impact/Availability	**1**		
Alternative Rank		4	5
Weighted Rank		*4*	*5*
Total		**86**	**94**

4.7.4 Secondary Treatment and Disinfection Preliminary Design

The recommended secondary treatment and UV disinfection alternatives consist of three oxidation ditches, three secondary clarifiers, and a main process building to house mechanical and electrical equipment and inclined UV disinfection at the City's existing WWTP site. The preliminary design consists of the following major components:

- Three oxidation ditches (600,000 gal capacity with 50 HP aerators each)
- Three clarifiers (50-ft diameter, 15-ft SWD)

- Main process building (40-ft x 80-ft, 16-ft wall height)
- Oxidation ditch and clarifier splitter boxes
- Three inclined UV banks (8 lamps per bank)
- RAS and WAS pump stations
- Scum gates and pump stations
- PVC and ductile iron process piping
- Mechanical and plumbing systems
- Electrical and instrumentation equipment
- Gravel surfacing and site restoration

4.7.5 Secondary Treatment and Disinfection Project Cost

The total cost for the proposed project is summarized in **Table 4.16.** The total project cost includes the costs for construction, a large buffer for undefined scope and contingency (30% of total project cost), and an estimated 15% of construction cost for general conditions. Detailed cost estimates for the two recommended alternatives included in the proposed project are included in **Appendix D.**

Table 4.16 – Proposed Total Project Cost

Total Project Cost	$24,762,300
Total Annual Operation and Maintenance Cost	$267,886

4.8 Tertiary Filtration (Metals Building) Evaluation

4.8.1 Existing Process Overview

The tertiary filtration process located in the existing Metals Building provides additional treatment of secondary effluent. The City currently operates continuous upflow sand filters as a tertiary process to remove copper, lead, and zinc which were metals limits imposed in East Helena’s MPDES discharge permit. The City also gets additional phosphorus removal from the tertiary filtration process.

Treated and disinfected effluent flows from the existing UV Building to a clear well located inside the lower level of the existing Metals Building. The clear well has a holding capacity of approximately 37,000 gallons. Six vertical turbine pumps lift the effluent from the clear well to the filter distribution trough. Gates located in the trough are opened to direct flow to the desired filter units. Filters are rotated frequently and brought online as needed to meet influent flow demands.

Effluent enters the center chamber of the sand filter and flows to the radial arms at the bottom. Aluminum sulfate, injected in the pump discharge piping, makes the sand “sticky,” allowing particles like metals and phosphorous to accumulate on the media surface. The process water continues to move upward through the sand media. The filtered effluent flows over a fixed weir into a common header where it is then stored for non-potable water usage around the WWTP or discharged to Prickly Pear Creek.

The sand media continuously moves from the top to the bottom of the filter at a rate of 0.3 inches per minute. An airlift pump at the bottom of the filter bed lifts the sand into a wash box, where waste particles are separated from the sand. The cleaned sand is then returned to the top of the bed to allow for continued filtration. The backwashing process generates a reject stream containing the removed particles. The reject stream exits the sand filter and flows over a fixed weir into the reject wet well. The waste is then pumped from the reject wet well to the sludge storage basin.

4.8.2 Existing Design Criteria

Table 4.17 – Existing Tertiary Filtration (Metals Building) Design Criteria

Parameter	Value
Filter Type	Continuous Upflow Sand Media
Number of Filters	4
Area Per Filter	64 sf
Design Filter Loading Rate	3 to 5 gpm/ft^2
Max Flow at 3 gpm/sf (3 filters)	576 gpm (829,440 gpd)
Max Flow at 3 gpm/sf (4 filters)	768 gpm (1,105,920 gpd)
Max Flow at 5 gpm/sf (3 filters)	960 gpm (1,382,400 gpd) – **firm capacity**
Max Flow at 5 gpm/sf (4 filters)	1,280 gpm (1,843,000 gpd)
Reject Flow Rate	15 gpm/filter
Driving Head Required	4 ft
Backwash Method	Air Lift Pump
Number of Air Lift Compressors	2 (1 duty, 1 standby)
Filter Supply Pump Type	Vertical Turbine
Number of Filter Supply Pumps	6 (5 to achieve 1,200 gpm)
Filter Supply Pump Motor Size	5 HP
Filter Supply Pump Flow Rate	125 gpm to 240 gpm (each)

Table 4.17 – Existing Metals Filtration Design Criteria (continued)

Parameter	Value
Chemical (Alum) Pump Type	Peristaltic Metering
Chemical (Alum) Design Dose	30 mg/L
Chemical (Alum) Pumping Rate	6.6 gpd (at average design flow)
Chemical Mixing Method	Injection Quill, In-Line Static Mixer
Reject Pump Type	Progressing Cavity
Number of Reject Pumps	2 (1 duty, 1 standby)
Reject Pump Flow Rate	44 to 88 gpm
Reject Pump Motor Size	7.5 HP

4.8.3 Existing Condition, Performance, and Capacity Analysis

Existing Condition

Currently, the existing tertiary filtration system is in good operating condition. The facility is approximately 11 years into its 20-year useful life. Over the last couple of years, the City has rebuilt all six filter supply pumps including new column piping. This premature overhaul of the pumps was due to corrosion from high concentrations of ferric chloride, which was the original chemical used in the filtration process. The ferric chloride was also thought to be coating the sand in the filters with iron bacteria and reducing the effectiveness of the filtration process. To remedy this issue, the City shock chlorinated the filters and switched to dosing aluminum sulfate (alum) in late 2024. Operations have appeared to improve after these actions.

The clearwell and chemical feed pumps are also in good condition, and replacement of the sand media in the filters has not been necessary to date. The City also had issues with the original double disc reject pumps. However, these pumps were replaced with progressing cavity pumps in the spring of 2021. Some issues continue with the progressing cavity pumps, but this is due to slight piping misalignment which the City is continuing to investigate.

Performance

Overall, the tertiary filtration system is performing better with the modifications noted above. As stated in **Chapter 2**, the City's 2019 MPDES permit has an effluent copper limit of 11.7 µg/L (monthly average). There are no effluent limits for lead and zinc in the City's latest discharge permit as the filtration system performed well in filtering these metals and no reasonable potential exists. **Table 4.18** below shows copper removal results from 2021 through July 2025.

Table 4.18 – Tertiary Filtration Copper Removal Data

Year	Annual Average Value	Minimum Value	Maximum Value	Number of Exceedances
2021	16.1 µg/L	7.0 µg/L	45.3 µg/L	7
2022	12.1 µg/L	6.0 µg/L	21.0 µg/L	5
2023	10.1 µg/L	5.0 µg/L	18.0 µg/L	4
2024	8.0 µg/L	3.0 µg/L	27.0 µg/L	1
2025	9.9 µg/L	4.0 µg/L	18.0 µg/L	2

As noted, the City also gets phosphorus removal from the tertiary filtration system. The City's current MPDES permit has a non-degradation phosphorus limit of 5.5 lbs/day in the summer (July thru September) and 11.2 lbs/day for the remaining non-summer months. **Table 4.19** below shows effluent phosphorus results from 2021 thru July 2025.

Table 4.19 – Tertiary Filtration Phosphorus Removal Data

Year	Annual Average Value	Minimum Value	Maximum Value	Number of Exceedances
2021	3.6 lbs/day	0.4 lbs/day	7.2 lbs/day	3
2022	4.9 lbs/day	1.6 lbs/day	10.2 lbs/day	3
2023	5.6 lbs/day	1.5 lbs/day	8.4 lbs/day	2
2024	4.8 lbs/day	1.2 lbs/day	8.3 lbs/day	1
2025	12.6 lbs/day	0.9 lbs/day	32.9 lbs/day	3

The tertiary filtration system, while in good operating condition, has had inconsistent performance. Most of the exceedances, especially for phosphorous, can be attributed to plant upsets that occur every spring. The tertiary filtration process effectiveness is directly influenced by the stability of the secondary treatment process. During biological upsets, increased solids loading and variability have negatively impacted filtration, leading to elevated effluent concentrations and permit exceedances. Phosphorus loads were consistently lower from 2021-2024, but the 2025 average has significantly jumped. This is a direct result of a major plant upset occurring in early summer 2025.

Upgrading the secondary treatment process would greatly improve tertiary filtration stability by providing longer solids retention time, better mixing, and enhanced nutrient removal. These operational improvements reduce the frequency and severity of process upsets and would lower the solids carryover to the tertiary filtration system, allowing it to operate under optimal conditions. This improved stability would likely reduce effluent variability and strengthen the overall performance of the tertiary filtration system.

Capacity Analysis

The 2037 average daily flow is 1.2 MGD while the maximum daily flow is 2.4 MGD. As shown above, each continuous upflow sand filter has an area of 64 ft^2 and can operate between 3 to 5 gpm/ft^2. At a flux rate of 3 gpm/ft^2, the tertiary filtration system has a firm capacity of roughly 829,000 gpd with three filters. At 5 gpm/ft^2, the firm capacity of the tertiary filtration system is approximately 1.4 MGD with three filters. The existing metals filtration facility has four continuous upflow sand filters, but “firm capacity” is considered the capacity of the system with the largest filter out of service, and therefore three filters are used for this analysis.

Based on the effluent disposal strategy outlined in **Chapter 2**, the maximum monthly flow that can be discharged to Prickly Pear Creek is 800,000 gpd. The proposed groundwater disposal system described in **Chapter 2** would allow for 1.0 MGD to be discharged to the I/P cells. Given the average daily and maximum daily flows noted above, that would leave 800,000 gpd to 1.4 MGD that would need to flow through the tertiary filtration facility prior to being discharged into Prickly Pear Creek. As shown above, the continuous upflow sand filters have the firm capacity to accommodate the planned 2037 design flows. However, future upgrades will likely be required to meet stated 2052 design flows.

CHAPTER 5 – SOLIDS HANDLING AND DISPOSAL EVALUATION

5.1 General Information and Disposal Requirements

As described in **Chapter 1**, the WWTP upgrade is based on two distinct design periods: a 15-year design period (2037) and a 30-year design period (2052). Due to the sizable capital costs associated with the 30-year improvements and the uncertainty of long-term growth and development, the initial solids handling upgrade will be designed to meet the 2037 conditions. However, each section of this chapter also identifies the additional capital improvements required to accommodate the 2052 design conditions.

5.1.1 Existing Solids Handling and Disposal Overview

The East Helena wastewater treatment process relies on an extended aeration activated sludge system to stabilize wastewater through microbial oxidation. The process begins in the reaction basin, where a microbial population is continuously regenerated and recirculated. Screened wastewater and return activated sludge (RAS) mix to form mixed liquor suspended solids (MLSS), which flows through the aerated basin, allowing bacteria to break down waste through oxidation and nitrification. Oxygen is supplied through fine bubble diffusers supplied by positive displacement blowers.

Following aeration, the MLSS enters the secondary clarifier, where solids settle to the bottom and clear effluent flows over a weir to the existing UV Building for disinfection. The solids collected on the bottom of the clarifier are either returned to the reaction basin as RAS or sent to the solids handling process as waste activated sludge (WAS).

Solids removed from the clarifier are stored in the existing sludge holding basin where they are stabilized via digestion processes. Aeration of the upper portion of the basin helps control nuisance odors and reduce the organic load in the return stream. Settled sludge is collected at the basin’s center and periodically transferred to the existing Sludge Thickening Building. Operators thicken the sludge by using a rotary drum thickener, which separates free liquid from the solids through polymer flocculation and a rotating wedge wire screen prior to sending them to the existing sludge drying beds. Once dewatered, the sludge is hauled to the Valley View Landfill in Jefferson County.

5.1.2 Biosolids Classifications

In selecting the appropriate methods for sludge processing, reuse, and disposal, it is essential to consider the applicable regulations. In the United States, the Code of Federal Regulations (40 CFR Part 503) was established in 1993 by EPA to set pollutant numerical limits, treatment standards, and management practices for the reuse and disposal of sludge generated from municipal wastewater treatment and septage processing. These regulations were designed to protect public health and environment from any reasonably anticipated adverse effects of pollutants contained in biosolids.

Biosolids are categorized based on the level of treatment they receive, specifically in terms of pathogen reduction and vector attraction. Class A biosolids undergo extensive treatment to eliminate pathogens to non-detectable levels. This is achieved through methods such as high-temperature thermal treatment, composting, lime stabilization, and advanced digestion processes. Because of the stringent treatment process, Class A biosolids can be safely used without restrictions for applications such as fertilizer for home gardens, parks, and agricultural lands.

Class B biosolids, while still treated to reduce pathogens, retain detectable levels of pathogens. These biosolids must be applied with site restrictions to minimize human and animal exposure. Regulations require specific waiting periods before crops can be harvested, or livestock can graze on land where Class B biosolids have been applied. This category is often used for large-scale agricultural operations, forestry, and land reclamation projects, where its nutrient content benefits soil fertility while ensuring controlled exposure of remaining pathogens and microorganisms.

Unclassified biosolids refer to untreated or insufficiently treated sewage sludge that does not meet the standards for Class A or Class B. Due to their high concentrations of pathogens, heavy metals, and other contaminants, these biosolids are not suitable for public use or land application. Instead, they are typically disposed of in landfills to prevent environmental contamination and public health risks. Hauling sludge to a landfill for disposal must comply with 40 CFR Part 258, which governs municipal solid waste landfills (MSWLF) and establishes criteria for waste acceptance, landfill design, operation, and environmental protection. Although 40 CFR Part 503 more broadly regulates the use and disposal of biosolids, Part 258 specifically applies when dewatered sludge is disposed of at a permitted MSWLF.

Before hauling to a MSWLF, the biosolids must be tested to ensure they do not exhibit hazardous waste characteristics. A Toxicity Characteristic Leaching Procedure (TCLP) test should be performed to determine if the sludge leaches contaminants above regulatory limits, which would classify it as hazardous waste and make it ineligible for disposal at a municipal landfill. In addition, a paint filter test must be conducted to verify that the sludge contains no free liquids that could generate leachate during transport or in the landfill. The sludge should be dewatered, typically achieving a solids content of at least 18 percent, to minimize leachate generation and meet landfill handling requirements. Sludge must be transported in leak-proof, covered vehicles or containers to prevent spills, leaks, and odor issues during transit.

5.1.3 Solids Dewatering

Dewatering biosolids is a critical step in the overall solids handling process. For thermal sludge drying (Class A), dewatering serves as the initial stage, reducing water content so the material can be effectively dried. In contrast, for aerobic digestion (Class B) and sludge storage (unclassified), dewatering occurs after treatment and storage, primarily to facilitate final disposal and minimize hauling costs.

5.2 Thermal Sludge Drying (Class A Biosolids)

As stated previously, there are various methods to achieve Class A biosolids. After evaluating multiple proposals based on cost and operational ease, thermal drying was selected for further evaluation as a potential sludge handling solution. A belt dryer option was considered but was estimated at $6.5 million and determined to be economically unfeasible. An Autothermal Thermophilic Aerobic Digestion (ATAD) system was also evaluated; while its capital cost was comparable to thermal drying, its significantly higher operational costs made it less favorable. As a result, thermal sludge drying was the only Class A biosolids alternative selected for detailed evaluation at the WWTP.

5.2.1 Process Overview

The thermal drying process involves applying heat to dewatered biosolids to increase solids content from 15–20% to greater than 90%, producing a dry, granular, or pelletized product. Thermal dryers operate at high temperatures, typically between 300°F and 600°F, and use either direct or indirect heating depending on the system design. These elevated temperatures evaporate residual moisture and destroy pathogens, meeting the time-temperature requirements for Class A biosolids. The resulting product is significantly reduced in volume, biologically stable, and suitable for unrestricted use such as land application, landscaping, or distribution to the public. While thermal drying systems require considerable energy and capital investment, they offer benefits such as eliminating hauling and disposal costs and producing a marketable, beneficial, and sustainable end product.

A proposal from BCR Solid Solutions was obtained to estimate the cost of implementing Class A biosolids treatment at the East Helena WWTP. BCR’s BIO-SCRU® IC series dryer was used as the basis for preliminary design and cost estimating. The BIO-SCRU® is an automated, indirectly heated, continuous-flow system that is modularly designed for easy installation. It includes PLC-based controls to maintain target dryness levels with minimal operator attention. The dryer accepts sludge with 13% to 30% total solids and produces material with less than 10% moisture and an exit temperature exceeding 176°F. The system includes compliance logging with temperature and date stamps and meets both pathogen and vector attraction reduction criteria for Class A biosolids.

5.2.2 Preliminary Design

The thermal sludge drying design would take WAS from the secondary treatment processes described in **Chapter 4** and direct it to intermediate sludge storage tanks. These tanks provide buffering capacity, ensuring consistent feed rates to downstream processes, accommodating flow fluctuations, and maintaining overall process stability. The sludge storage tanks would provide approximately 14 days of holding time based on waste sludge flow rates from the secondary treatment proposals. The storage basins would be equipped with coarse bubble diffusers and process blowers for aeration and mixing to help control odors and maintain solids in suspension. From the storage basins, the sludge would be pumped to one of the solids dewatering methods discussed in **Sections 5.5** thru **5.7**, where it would be dewatered to 15% to 20% dry solids.

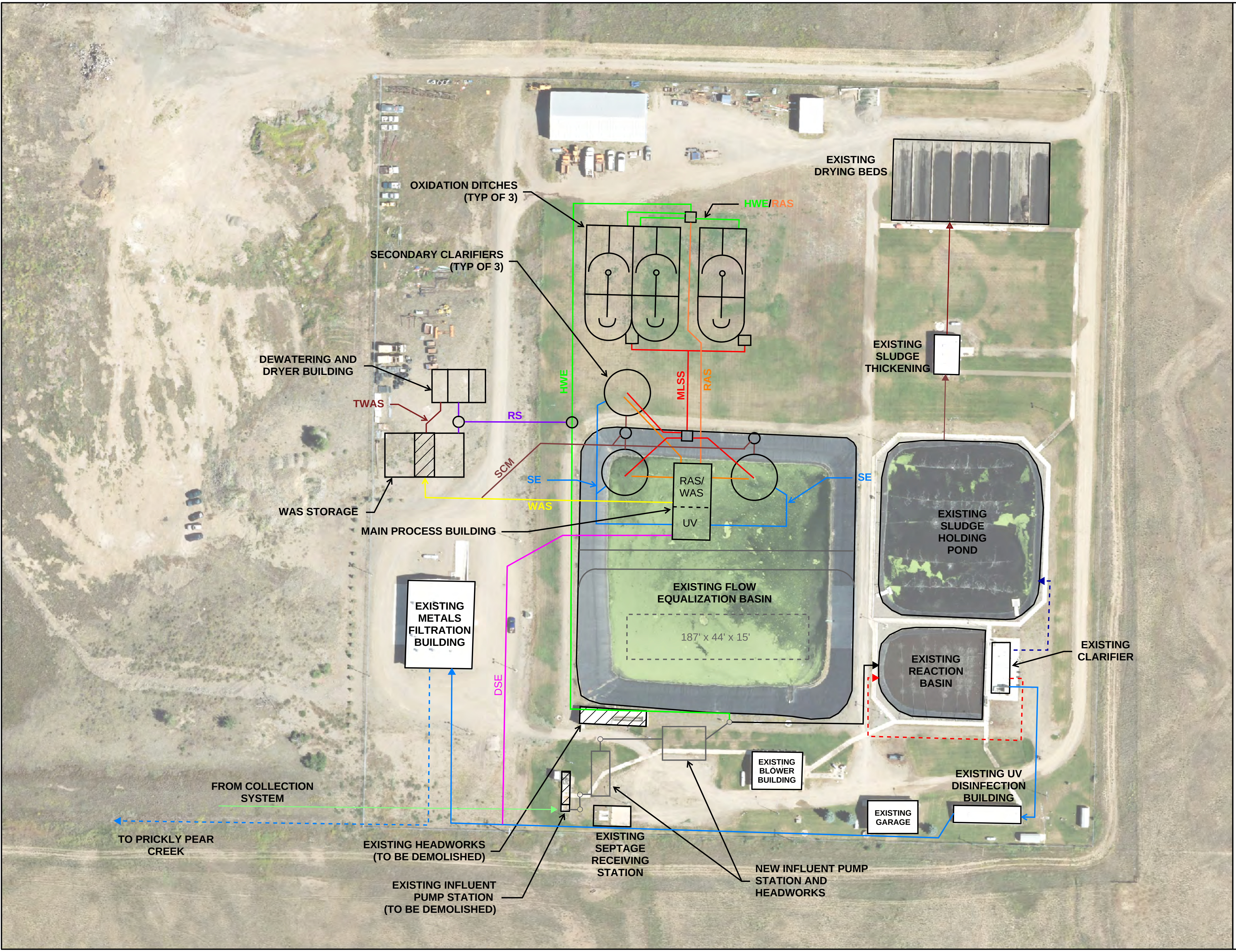
The dewatered cake would then be fed into the dryer by a positive displacement pump. Within the dryer, water would be removed by indirect heating, raising the sludge temperature above 212°F to convert water to steam. The dryer's heat transfer surfaces are heated via a closed-loop thermal fluid system using a natural gas-fired heater. Steam generated in the drying process would be removed under a slight vacuum and condensed in a multi-stage, direct-contact spray condenser. Particulates and steam condensate would be returned to the WWTP for treatment, while non-condensable gases would be treated in an odor control unit before release into the atmosphere.

The dried product, which exceeds 176°F and meets Class A biosolids requirements, would exit the dryer into a water-cooled screw conveyor. This cooling screw would reduce the product to a safe handling temperature. The final product would then be conveyed to a hopper using progressive cavity screws for storage or transport. The finished product would be suitable for beneficial use and may be distributed to the public at no cost.

The thermal sludge drying system is sized to operate 24 hours per day, 4–5 days per week. Startup and shutdown sequences would be fully automated and typically unmanned. Both the dewatering equipment and the BIO-SCRU® dryer would be housed in a new solids handling building, roughly 1,800 square feet in size. A manufacturer-supplied control panel, located in a dedicated electrical room, would operate the entire process. Utility connections required for operation of the equipment include natural gas and a 3-phase, 460 V electrical service. A potential layout for the thermal sludge drying system and sludge storage tanks at the East Helena WWTP is shown in **Figure 5.1**.

30-Year Design Upgrades (2052 Flows)

Under 2052 (30-year) design flows, the retention time in the sludge storage tanks would drop to about 7 days without constructing any new basins. The selected BIO-SCRU® IC-800 thermal sludge dryer can accommodate biosolids production through the 2052 planning horizon. Additional sludge dewatering equipment may be needed depending on the final alternative selected.



LEGEND:

🟩	HWE (HEADWORKS EFFLUENT)
🟧	RAS (RETURN ACTIVATED SLUDGE)
🟥	MLSS (MIXED LIQUOR SUSPENDED SOLIDS)
🟦	SE (SECONDARY INFLUENT)
🟨	WAS (WASTE ACTIVATED SLUDGE)
🟪	DSE (DISINFECTED SECONDARY INFLUENT)
🟫	SCM (SCUM)
🟫	TWAS (THICKENED WASTE ACTIVATED SLUDGE)
🟪	RS (RETURN STREAM)

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East Helena WWTP Facility Plan

Figure 5.1
Proposed Thermal Dryer Layout

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5.2.3 Design Criteria

Table 5.1 – Sludge Storage Design Criteria

Parameter	Value
Days of Storage (min.)	14
Solids Concentration	0.75% to 2.0%
Number of Basins	2
Basin Dimensions	48 ft x 30 ft
Side Water Depth (freeboard)	14 ft (3 ft)
Total Storage Volume	291,300 gal
Design Air Flow (30 scfm/1,000 ft^3)	1,210 scfm
Number of Blowers	1 per basin (positive displacement)
Blower Size	50 HP
Diffuser System	Coarse Bubble

Table 5.2 – Thermal Sludge Drying (Class A Biosolids) Design Criteria

Parameter	Value
Total Solids in Wet Cake	16%
Wet Cake Production	1,825 tons/year
Number of Units	1
Total Dry Solids	292 tons/year
Total Solids in Dried Product	90%
Machine Availability (%)	96%
Time of Operation	24 hours for 4 days
Feed Rate	784 lbs/hour
Evaporation Rate	645 lbs/hour
Solids Conveyance Rate (at dryer discharge)	139 lbs/hour
Heating Source	Natural Gas-Fired Heater
Plant Water Usage	35 gpm @ 45 psi

5.2.4 Operational and Energy Requirements

Operational Requirements

The BIO-SCRU® IC-800 thermal dryer is designed to operate 24 hours per day, 4 days per week, with a machine availability of 96%. The dryer will process approximately 1,825 wet tons of biosolids annually, producing about 292 dry tons per year. Operation of the sludge storage basins and thermal dryer will require an estimated 1.5 full-time operators, equating to 3,120 labor hours per year which includes process observation, routine servicing, and replacement of wear parts. The system requires approximately 35 gallons per minute (gpm) of plant reuse water at 45 psi. This water is primarily used for condenser cooling and occasional cleaning operations.

Energy Requirements

The system consists of sludge storage with blowers for mixing and aeration, along with the BIO-SCRU® thermal dryer, which requires significant electrical power. Energy consumption is estimated at 2,100 kWh per day. Thermal drying relies heavily on heat input. The system will consume about 23.5 MMBTU per day of natural gas.

5.2.5 Area Requirements

The East Helena WWTP is located on a 40-acre parcel, with much of the property remaining undeveloped or used for storage, providing ample space for future process upgrades. Implementation of the Class A biosolids option would require two primary site components: the sludge storage basins and the solids handling building housing the thermal sludge dryer and dewatering equipment.

The sludge storage component would consist of two concrete basins and equipment corridor between them, providing a combined footprint of approximately 4,000 square feet. These basins would be located to allow efficient piping connections from the secondary clarifiers to the downstream dewatering and thermal sludge drying equipment, while maintaining accessibility for maintenance.

The solids handling building would be designed to house the BIO-SCRU® thermal dryer, sludge dewatering equipment, and all ancillary components required for safe and efficient operation. The thermal dryer is roughly 23 feet long by 3 feet wide, with additional clearance required for access, maintenance, and system connections. The building would also include a separate electrical room for the control panel and instrumentation, as well as a designated area for short-term storage of the dried biosolids product. The total building footprint would be approximately 1,800 square feet.

5.2.6 Construction Considerations

Construction of the thermal sludge drying alternative is not expected to present significant challenges, and no existing operations at the plant will be impacted during installation. While no major construction issues are anticipated, unforeseen issues can arise in any project. Any problems encountered during construction would be promptly addressed and resolved.

5.2.7 Cost Estimate

Table 5.3 below summarizes the cost estimate for the thermal sludge drying alternative. These costs do not include the dewatering option required for thermal sludge drying which will be discussed later in this chapter. A detailed cost estimate for this alternative is provided in **Appendix D.**

Table 5.3 – Cost Summary for Thermal Sludge Drying (Class A Biosolids)

Total Project Capital Cost	$11,875,000
Total Annual Operation and Maintenance Cost	$471,050

5.3 Aerobic Digestion (Class B Biosolids)

Aerobic digestion is a biological treatment process used to stabilize waste sludge by promoting the microbial breakdown of organic material in the presence of oxygen. In this process, air is introduced into a digester where aerobic microorganisms metabolize the organic matter, resulting in the reduction of volatile solids and partial destruction of pathogens. The stabilized material typically meets the requirements for Class B biosolids in accordance with EPA 40 CFR Part 503, allowing for beneficial use with certain land application restrictions.

According to Circular DEQ-2, facilities with an average daily flow greater than 100,000 gallons per day are required to have multiple digesters capable of independent operation. Additionally, Chapter 85.32 of Circular DEQ-2 mandates that sludge be retained for at least 27 days at 15°C in aerobic digesters. EPA regulations also permit Class B status to be achieved without additional volatile solids reduction or pathogen testing if digestion is maintained for 40 days at 20°C or 60 days at 15°C.

Aerobic digestion is regularly used by smaller communities in Montana to stabilize waste sludge and typically operates at ambient temperatures (8-20°C). Normal solids retention times range from 40 to 60 days, depending on the operating temperature and available digester volume. With this scenario, performance testing is necessary to confirm that adequate pathogen destruction and volatile solids reduction has occurred.

There are two primary process configurations:

- **Conventional systems:** continuous aeration and mixing is provided by diffusers and process blowers.
- **Decoupled systems:** aeration and mixing are provided by separate equipment; creating anoxic conditions that support denitrification when aeration is cycled off.

While the basic digestion process is similar across systems, manufacturers differ in how aeration and mixing are provided. Design information and costs were solicited from multiple equipment suppliers as part of the solids handling evaluation. A conventional aerobic digestion (SSI Aeration) proposal and decoupled aerobic digestion (Invent Hyperclassic) proposal were identified as the most cost-effective and operationally suitable options. Although the conventional system has a lower initial capital cost, its higher operational costs make the overall life cycle cost comparable to the decoupled system. The decoupled system was selected for further evaluation due to its long-term costs savings, operational flexibility, and enhanced treatment performance.

5.3.1 Process Overview

Decoupled aerobic digestion is a strategy that alternates between mixing with aeration and mixing only to optimize treatment performance while reducing energy consumption. Unlike traditional systems that continuously aerate, a decoupled system intermittently switches between aerated and non-aerated (anoxic) phases. This cycling supports endogenous respiration, nitrification, and denitrification. During the aerated phase, ammonia is converted to nitrate through nitrification, while the anoxic phase allows denitrification to convert nitrate to nitrogen gas. By cycling the air on and off, decoupled aerobic digestion avoids over-aeration and restores alkalinity and lowers nitrogen levels in return flows, which further decreases the need for chemical addition.

In addition to enhanced nutrient removal, this process improves volatile solids reduction by allowing microorganisms to consume their own biomass during periods without aeration. It also improves sludge dewaterability, which reduces the polymer needed in subsequent solids handling processes. Decoupled systems such as the INVENT HYPERCLASSIC® system provide strong mechanical mixing even when the air is off, maintaining sludge conditions and preventing settling at higher solids concentrations.

5.3.2 Preliminary Design

The preliminary design for a decoupled aerobic digestion system would take WAS generated from the secondary treatment processes described in **Chapter 4** and pump it to two rectangular aerobic digesters, each measuring 80 feet by 45 feet with a 14 feet side water depth. Each digester basin would be equipped with HYPERCLASSIC® mixer/aerators, designed to provide complete mixing and efficient oxygen transfer, with the ability to operate in aeration or mixing-only modes to optimize biological performance and reduce energy use. Actuated telescoping valves or slide gates would be installed in each bason to allow for settling and decanting to increase the available digester volume.

Process air would be supplied by iTURBO® blowers, each powered by 30-horsepower motors, located in an equipment corridor between the two basins. Airflow demand is estimated at 248 scfm per digester, with a total of 498 scfm for the 2037 design flows. The blowers would be fitted with variable frequency drives (VFDs) to provide airflow based on process conditions and integration with the overall process control system.

Once stabilized to meet Class B biosolids standards, digested sludge would be pumped to a new solids handling building designed to house dewatering equipment described in **Sections 5.5** through **5.7**. This building, roughly 40 feet by 80 feet, would also provide long-term storage for dewatered biosolids until seasonal land application can occur. It would include a dedicated electrical room for control panels and instrumentation.

Class B biosolids produced at the East Helena WWTP could be beneficially reused through land application on agricultural fields. Although no specific parcels have been identified, it is assumed that a site within 30 miles could be located for disposal. Land application eliminates landfill hauling and tipping fees, provided a willing landowner is secured. Biosolids could be applied to cropland, pastures, or hay fields, where they would serve as a nutrient-rich soil amendment. This option would require the City of East Helena to establish an agreement with a local landowner willing to accept biosolids for beneficial reuse. The City would be responsible for coordinating biosolids testing, ensuring compliance with all applicable MDEQ and EPA regulations. A preliminary layout for the aerobic digestion alternative is shown in **Figure 5.2**.

30-Year Design Upgrades (2052 Flows)

To accommodate the 2052 (30-year) design flows, a third identical digester would be added to meet the anticipated waste sludge volumes. This would include the installation of an additional HYPERCLASSIC® mixer/aerator in the basin and iTURBO® blower in the equipment corridor. Additional sludge dewatering equipment may be needed depending on the final alternative selected.

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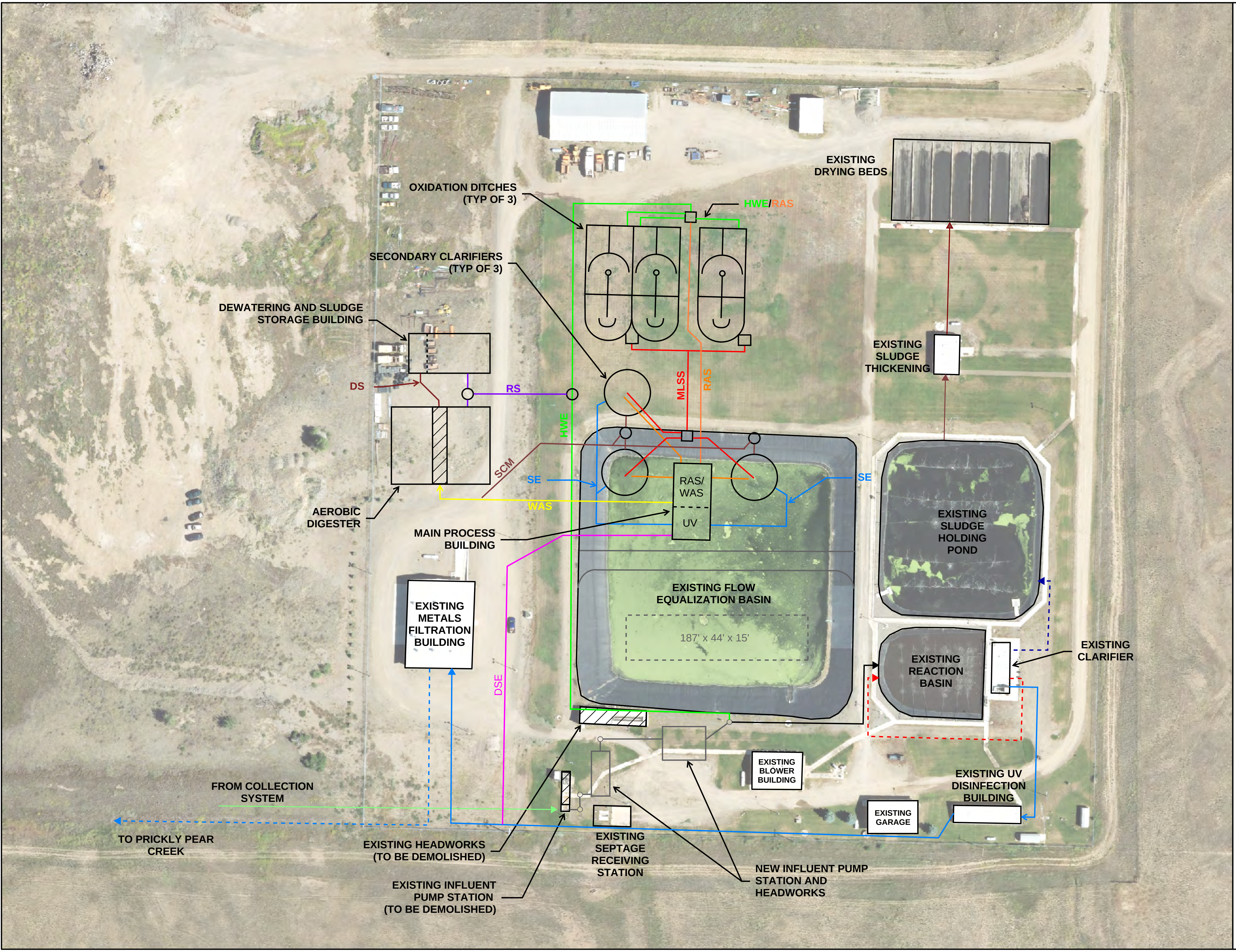

LEGEND:

🟩 HWE (HEADWORKS EFFLUENT)

🟧 RAS (RETURN ACTIVATED SLUDGE)

🟥 MLSS (MIXED LIQUOR SUSPENDED SOLIDS)

🟦 SE (SECONDARY INFLUENT)

🟨 WAS (WASTE ACTIVATED SLUDGE)

🟪 DSE (DISINFECTED SECONDARY INFLUENT)

🟫 SCM (SCUM)

🟫 DS (DIGESTED SLUDGE)

🟪 RS (RETURN STREAM)

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East Helena WWTP Facility Plan

Figure 5.2
Proposed Aerobic Digester Layout

5.3.3 Design Criteria

Table 5.4 – Aerobic Digestion (Class B Biosolids) Design Criteria

Parameter	**Value**
Days of Storage	28 days (summer) to 63 days (winter)
Waste Sludge Temperature	18°C (summer) & 8°C (winter)
Process Degree-Days	500°C-days
Volatile Solids Reduction	40%
Solids Concentration	0.75% to 2.0%
Number of Basins	2 (3 future)
Basin Dimensions	80 ft x 45 ft
Side Water Depth (freeboard)	14 ft (3 ft)
Total Digester Volume	753,980 gal
Standard Oxygen Requirements	957 lb O_2/day
Actual Oxygen Requirements	1,375 lb O_2/day
Design Air Flow (VSS reduction)	743 scfm
Number of Blowers	3 (2 duty + 1 common spare)
Blower Size	30 HP
Design Pressure	6.4 psi
Diffuser System	Ring Sparger (1 per basin)
Number of Mixers	2 (1 per basin)
Mixer Size	40 HP
Mixing Power	0.8 HP/1,000 ft^3
Basin Instruments	DO, Level

5.3.4 Operational and Energy Requirements

Operational Requirements

The aerobic digesters would operate continuously with aeration and mixing controlled by the manufacturer provided control panel. It is estimated that the digester will produce roughly 196 dry tons per year of biosolids that will need to be land applied seasonally. At an estimated 18% dry solids concentration, this results in nearly 1,400 cubic yards per year for disposal. Operation of the aerobic digesters, solids dewatering equipment, and coordination with land application of the biosolids will require an estimated 1.0 full-time operators, equating to 2,080 labor hours per year.

Energy Requirements

The system consists of blowers, mixers, and sludge pumps requiring significant energy consumption. Power usage is estimated at 2,050 kWh per day. This estimate does not include power required for the dewatering equipment discussed later in this chapter.

5.3.5 Area Requirements

The City owns a 40-acre parcel for the WWTP, with much of the property undeveloped or used for storage. For this alternative, two aerobic digester basins would be constructed, each measuring 80 feet in length by 45 feet in width. Including the equipment corridor between the two basins, the total footprint of this option is roughly 8,800 square feet. The concrete digesters would be sited adjacent to existing process infrastructure to minimize piping and site disruption, while maintaining access for maintenance and expansion.

In addition to the digester basins, a separate solids handling building will be constructed to house one of the dewatering methods discussed in **Sections 5.5** through **5.7**. This building, approximately 40 feet by 80 feet, would also provide covered storage for dewatered biosolids until seasonal land application in the spring. The building would be divided into two separate areas with the dewatering and electrical equipment in one room and a large semi-open area used for year-round storage of dewatered biosolids.

5.3.6 Construction Considerations

Construction of the aerobic digester alternative is not expected to present significant challenges. The work under this alternative is not anticipated to impact existing plant operations during construction. While no major construction issues are anticipated, unforeseen issues can arise in any project. Any problems encountered during construction would be promptly addressed and resolved.

5.3.7 Cost Estimate

Table 5.5 summarizes the cost estimate for the aerobic digester alternative. These costs do not include the needed dewatering facilities which will be discussed later in this chapter. A detailed cost estimate for this alternative is provided in **Appendix D.**

Table 5.5 – Cost Summary for Aerobic Digestion (Class B Biosolids)

Total Project Capital Cost	$10,598,900
Total Annual Operation and Maintenance Cost	$292,980

5.4 Sludge Storage (Unclassified Biosolids)

Unclassified biosolids, those that have not undergone sufficient treatment to meet Class A or Class B volatile solids or pathogen reduction standards, require controlled storage to minimize odors, prevent nuisance conditions, and reduce the potential for anaerobic degradation. One effective method of temporary storage is the use of aerated sludge tanks. Dewatered, unclassified biosolids are not suitable for public use or land application and must be disposed of at a permitted MSWLF.

Aerated tanks provide a means to store thickened WAS for extended periods while maintaining aerobic conditions within the basin. Continuous or intermittent aeration supplies oxygen to the stored sludge, helping to suppress anaerobic activity that can lead to hydrogen sulfide production and odor generation. Aeration also promotes limited biological stabilization and prevents solids from settling excessively, aiding in the suspension of solids when the sludge is withdrawn for dewatering and disposal.

Multiple suppliers were contacted for design information and to compare costs for potential implementation in the WWTP upgrade. Two quotes were received, and a traditional aeration and mixing system from SSI was identified as the most cost-effective option with favorable operational characteristics.

5.4.1 Process Overview

The sludge storage process begins when WAS from the secondary treatment process is pumped to the sludge storage tanks. These basins are equipped with coarse bubble diffusers that maintain aerobic conditions to minimize odors and keep solids in suspension, reducing the risk of settling and facilitating easier pumping during withdrawal. The stored sludge remains in these tanks until it is ready for dewatering, after which the resulting dewatered biosolids are transported for disposal in a landfill.

5.4.2 Preliminary Design

The preliminary design for the sludge storage alternative would take waste sludge generated from the secondary treatment process described in **Chapter 4** and pump it to two rectangular aerated tanks, each measuring 32 ft by 60 feet with a 14 feet side water depth. The basins are designed to provide 21 days of storage capacity under the 2037 design flows and loads, offering operational flexibility and the ability to accommodate process interruptions or seasonal variations in sludge production. Actuated telescoping valves or slide gates would be installed in each basin to allow for controlled settling and decanting to increase the available sludge storage volume.

These tanks will be equipped with aeration equipment to minimize odors and keep solids in suspension, preventing settling. Maintaining aerobic conditions also helps suppress the development of anaerobic byproducts such as hydrogen sulfide, which can lead to odor and corrosion issues. Process air would be supplied by positive displacement screw compressors, each powered by 40-horsepower motors, located in an equipment corridor between the two basins. Airflow based on mixing requirements is estimated at 806 scfm per digester, with a total of roughly 1,600 scfm for the 2037 design flows. The blowers would have VFDs to provide variable airflow based on basin depth, aerobic conditions, and be integrated with the overall process control system.

Operators will pump sludge from the storage tanks to a new building designed to house dewatering equipment described in **Sections 5.5** through **5.7**. This building, roughly 40 feet by 32 feet, would provide short-term storage for dewatered biosolids until hauled offsite to a permitted MSWLF for disposal in compliance with EPA regulations. A preliminary layout for the sludge storage alternative is shown in **Figure 5.3**.

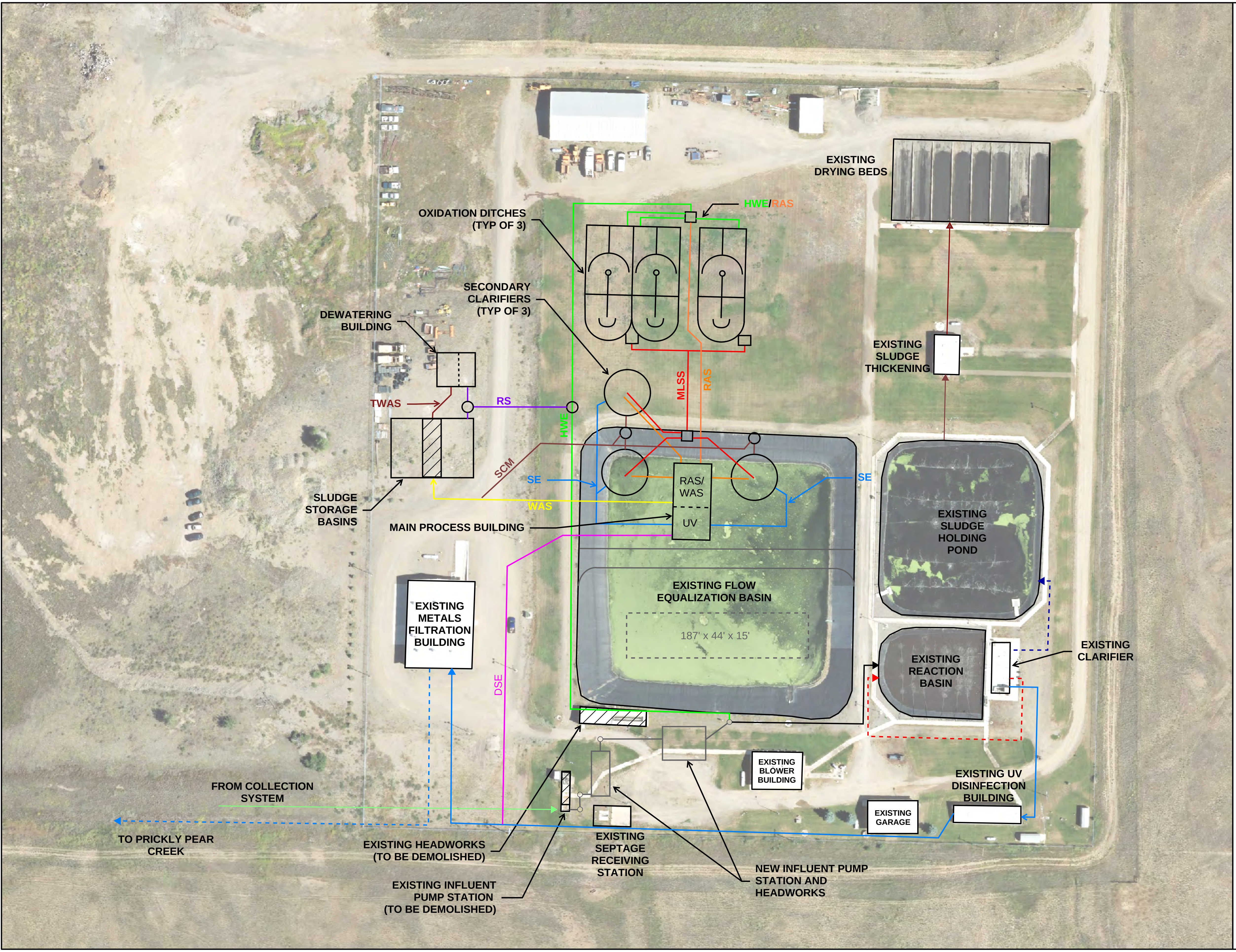
30-Year Design Upgrades (2052 Flows)

For the 2052 (30-year) planning horizon, the system will maintain the same number and configuration of tanks, which will result in 14 days of storage capacity at the higher projected sludge loading. This approach preserves the use of common components and infrastructure while meeting future capacity needs.

5.4.3 Design Criteria

Table 5.6 – Sludge Storage Design Criteria

Parameter	**Value**
Days of Storage	21 days (14 days future)
Solids Concentration	0.75% to 2.0%
Number of Basins	2
Basin Dimensions	60 ft x 32 ft
Side Water Depth (freeboard)	14 ft (3 ft)
Total Digester Volume	402,120 gal
Design Air Flow (30 scfm/1,000 ft^3)	1,610 scfm
Air Flow (VSS reduction)	658 scfm (summer) & 439 scfm (winter)
Number of Blowers	3 (2 duty + 1 common spare)
Blower Type	Positive Displacement Screw Compressor
Blower Size	40 HP
Design Pressure	7.1 psi
Diffuser System	Coarse Bubble
Basin Instruments	DO, Level



LEGEND:

- 🟩 HWE (HEADWORKS EFFLUENT)
- 🟧 RAS (RETURN ACTIVATED SLUDGE)
- 🟥 MLSS (MIXED LIQUOR SUSPENDED SOLIDS)
- 🟦 SE (SECONDARY INFLUENT)
- 🟨 WAS (WASTE ACTIVATED SLUDGE)
- DSE (DISINFECTED SECONDARY INFLUENT)
- SCM (SCUM)
- TWAS (THICKENED WASTE ACTIVATED SLUDGE)
- 🟪 RS (RETURN STREAM)

N

0 50 100
Feet

East Helena WWTP Facility Plan

Figure 5.3
Proposed Sludge Storage Layout

Date: 4/26/2019 Path: F:\waste\18801 - East Helena Wastewater Capacity Study\GIS\MasterPlan\NormalFlowPath.mxd

5.4.4 Operational and Energy Requirements

Operational Requirements

The sludge storage basins would operate continuously with aeration (and mixing) controlled by the SCADA system. Due to lower volatile solids reduction under this option, it is estimated that the sludge storage process will produce roughly 214 dry tons per year of biosolids that will need to be hauled to the landfill. At an estimated 18% dry solids concentration, this results in nearly 1,500 cubic yards per year for disposal based on 2037 flows and loads. Operation of the sludge storage tanks, solids dewatering equipment, and loading the dewatered sludge into roll-off containers will require an estimated 1.0 full-time operators, equating to 2,080 labor hours per year.

Energy Requirements

The sludge storage basins use blowers for mixing and aeration which require a significant amount of energy. Power usage is estimated at 1,450 kWh per day. This estimate does not include power required for the dewatering equipment discussed later in this chapter.

5.4.5 Area Requirements

The City owns a 40-acre parcel for the WWTP, with much of the property undeveloped or used for storage. For this alternative, two sludge storage basins would be constructed, each measuring 60 feet in length by 32 feet in width. Including the equipment corridor between the two basins, the total footprint of this option is roughly 5,000 square feet. The concrete basins would be sited adjacent to existing process infrastructure to minimize piping and site disruption, while maintaining access for maintenance and expansion.

In addition to the sludge storage basins, a separate solids handling building will be constructed to house one of the dewatering methods discussed in **Sections 5.5** through **5.7**. This building, approximately 40 feet by 32 feet, would also provide space for a 20 cubic yard roll-off container that would be hauled to the landfill a couple of times per week. The building would be divided into two separate areas with the dewatering and electrical equipment in one room and a slightly larger room with overhead doors on each end for storing the roll-off container.

5.4.6 Construction Considerations

Construction of the sludge storage alternative is not expected to present significant challenges. The work under this alternative is not anticipated to impact existing plant operations during construction. While no major construction issues are anticipated, unforeseen issues can arise in any project. Any problems encountered during construction would be promptly addressed and resolved.

5.4.7 Cost Estimate

Table 5.7 summarizes the cost estimate for the sludge storage alternative. These costs do not include the needed dewatering facilities which will be discussed later in this chapter. A detailed cost estimate for this alternative is provided in **Appendix D.**

Table 5.7 – Cost Summary for Sludge Storage (Unclassified Biosolids)

Total Project Capital Cost	$7,980,700
Total Annual Operation and Maintenance Cost	$238,580

5.5 Centrifuge Solids Dewatering

5.5.1 Process Overview

Centrifuge dewatering involves feeding sludge at a constant flow rate into a rotating bowl, where centrifugal forces separate the material into two streams: a dense sludge cake containing biosolids and a dilute liquid stream known as centrate. The centrate is typically returned to the headworks of the WWTP. The sludge cake is discharged from the bowl via a screw conveyor into a hopper or onto a conveyor, which then transfers it to a storage area or roll-off container prior to final disposal.

The solids concentration in the sludge cake generally ranges from 20% to 30% dry solids, depending on the characteristics of the sludge. Centrifuges are suitable for a wide range of dewatering applications. Chemical conditioning agents (such as polymer) are added either in the feed line or within the centrifuge bowl to enhance dewatering performance by improving cake solids concentration.

5.5.2 Preliminary Design

To support the solids handling alternatives described in **Sections 5.2** through **5.4**, a centrifuge dewatering system is one option that could be installed at the East Helena WWTP. Based on a review of equipment proposals, the Flottweg Model C4E was selected as the most suitable option due to its cost effectiveness, operational efficiency, and ability to meet both current and future capacity requirements.

The proposed centrifuge will receive WAS or digested sludge through a 3-inch feed connection at a flow rate of approximately 150 gallons per minute, with influent solids concentrations ranging from 0.75% to 2.0%. This operating range supports a wide variety of secondary treatment processes discussed in **Chapter 4** and solids handling alternatives described previously. Polymer would be injected to promote flocculation, typically dosed at 20 to 24 pounds per ton of dry solids. The dewatering process will produce a cake with approximately 20 to 25% solids, suitable for any disposal method or thermal heat drying. The centrate will be conveyed back to the front of the plant via an 8-inch drain line for further treatment.

The centrifuge will be housed in a dedicated dewatering building. The unit operates at high rotational speeds (~3,400+ RPM) using a 40-horsepower main drive motor and a secondary 10-horsepower motor for the internal scroll mechanism. The centrifuge unit measures roughly 12 feet in length and 4 feet in width, with sufficient space provided for access, maintenance, and auxiliary equipment. Dewatering operations are expected to occur for approximately six hours per day, three days per week, depending on solids loading rates. Flushing water from the plant non-potable water supply would be required intermittently at 40 to 50 gpm for 10 to 20 minutes per cycle to maintain clean operating conditions. The equipment would be controlled by a manufacturer-supplied control panel, located in a nearby electrical room.

30-Year Design Upgrades (2052 Flows)

The proposed Flottweg C4E centrifuge is capable of handling both the 2037 and 2052 design year solids loading rates, eliminating the need for additional units in the future. Hours of operation would have to increase to 4 days per week to handle the extra solids loading under 2052 design conditions. Frequency of polymer deliveries would likely have to increase to handle the additional solids produced or on-site storage of chemical totes would need to be added.

5.5.3 Design Criteria

Table 5.8 – Centrifuge Solids Dewatering Design Criteria

Parameter	Value
Waste Load	1,600 lb/day
Feed Solids Concentration	0.75% to 2.0%
Hours of Operation	6 hr/day, 3 days/week
Number of Units	1
Solids Feed Rate	500 lb/hour
Hydraulic Capacity	150 gpm @ 0.75%
Main Drive Motor Size	40 HP
Scroll Drive Motor Size	10 HP
Polymer Usage	20 – 24 lb/dry ton of solids
Dewatered Solids Concentration	20 – 25%
Solids Capture	> 95%

5.5.4 Operational and Energy Requirements

Operational Requirements

The centrifuge dewatering system is designed to operate 6 hours per day, 3 days per week based on 2037 waste sludge loads. It is estimated that the centrifuge would produce roughly 1,150 cubic yards of biosolids per year at an assumed 23% dry solids concentration. Polymer usage is projected to be 4,680 lbs per year based on a dosing rate of 20 lbs per dry ton of solids. Water is required for both polymer mixing and wash water. Wash water demand is intermittent at 50 gpm, while polymer mixing water is estimated at 3.3 gpm. The additional hours for operating the centrifuge are included in the various solids handling alternatives.

Energy Requirements

The centrifuge has two motors totaling 50 HP that operate constantly when the unit is operating. This results in an estimated energy demand of approximately 300 kWh per day of operation or 46,500 kWh annually.

5.5.5 Area Requirements

As described in the previous solids handling sections, each of the solids dewatering alternatives would be installed in a new building located on the west side of the WWTP. The new building would be sized to accommodate the centrifuge, ancillary components, and an area for short-term storage of dewatered biosolids prior to offsite hauling. The centrifuge unit measures approximately 12 feet in length and 4 feet in width, with added clearance required for access, maintenance, and polymer feed equipment. In addition to the centrifuge room, the building will include a separate electrical room to house the control panel and associated instrumentation.

5.5.6 Construction Considerations

Construction of the centrifuge dewatering facility at the East Helena WWTP is not expected to present significant challenges; however, efficient use of available space should be observed. The building footprint should be compact and carefully laid out to accommodate the centrifuge, electrical control room, and dewatered sludge storage area. Attention should be given to equipment access and service clearances. No existing operations at the plant will be impacted during the construction of the centrifuge.

5.5.7 Cost Estimate

Table 5.9 summarizes the cost estimate for the centrifuge dewatering alternative. These costs do not include the price for the new building included in the solids handling cost estimate. A detailed cost estimate for this alternative is provided in **Appendix D.**

Table 5.9 – Cost Summary for Centrifuge Solids Dewatering

Total Project Capital Cost	$813,800
Total Annual Operation and Maintenance Cost	$56,335

5.6 Screw Press Solids Dewatering

5.6.1 Process Overview

In a screw press dewatering system, waste sludge is first pumped through a magnetic flow meter to measure flow rate. Downstream of the meter, polymer is introduced into the sludge transfer pipe using a polymer blending unit. The conditioned sludge is then conveyed into a flash mixing tank and then a flocculation tank. The sludge enters a drum formed by stacked fixed and moving rings where a rotating screw moves the rings and pushes dewatered solids toward the outlet. As the sludge travels along the screw, water is separated and released through the gaps in the drum. The filtrate is returned to the headworks of the WWTP for further treatment.

As the sludge continues through the press, increasing back pressure is created by the screw's friction, forcing additional water out and forming a drier sludge cake with approximately 15 – 18% solids. Periodic wash water is used to clean the rings and remove accumulated material during normal operation. Screw press systems typically include a mixing and flocculation tank and are installed at an incline for improved performance. The dewatered cake is discharged via a screw conveyor into a storage area or roll-off container prior to final disposal.

5.6.2 Preliminary Design

To support the solids handling alternatives described in **Sections 5.2** through **5.4**, a screw press system is one option that could be installed at the East Helena WWTP. Based on a review of equipment proposals, the PW Tech Model ES-354 volute press was selected due to its cost effectiveness, operational reliability, and capacity to meet current and future solids handling demands.

The screw press will receive WAS or digested sludge through a 4-inch feed connection at a flow rate of up to 165 gpm with solids concentrations ranging from 0.75% to 2.0% This operating range supports a wide variety of secondary treatment processes discussed in **Chapter 4** and solids handling alternatives described previously. The sludge will first be treated in a flash mixing tank where polymer is introduced and rapidly blended. It will then pass into a flocculation tank for gentle mixing, allowing solids to aggregate into larger flocs. From the floc tank, the sludge will overflow into the volute dewatering drums for mechanical dewatering.

The ES-354 system includes three dewatering drums with capacity to add a fourth drum for future demands. The unit is constructed of stainless steel, with high-efficiency gear motors, and includes integrated controls housed in a manufacturer provided control panel. The biosolids will be discharged as a cake with solids concentrations between 15% and 18%, suitable for landfill disposal, land application, or thermal processing. Pressate from the dewatering process will be routed back to the front of the plant through an 8-inch drain line for further treatment.

Polymer will be dosed via a progressive cavity metering pump at a rate around 26 to 30 pounds per ton of dry solids, with dilution water provided by a staged hydro-mechanical mixing chamber. The polymer system is skid-mounted and pre-wired to a junction box for simple integration. All ancillary equipment such as the sludge feed pump, polymer preparation system, and flow meter are included and integrated within the control panel. The system is designed to operate for approximately 18 hours per week to meet the anticipated solids loading, with additional capacity available to accommodate future growth or process changes.

30-Year Design Upgrades (2052 Flows)

To handle the 2052 design criteria, the PW Tech Model ES-354 volute press will be designed to add a fourth drum in the existing unit. Hours of operation would have to increase to 3.5 days per week to handle the extra solids loading under the 2052 design conditions. Frequency of polymer deliveries would likely have to increase to handle the additional solids produced or on-site storage of chemical totes would need to be added.

5.6.3 Design Criteria

Table 5.10 – Screw Press Solids Dewatering Design Criteria

Parameter	Value
Waste Load	1,600 lb/day
Feed Solids Concentration	0.75% to 2.0%
Hours of Operation	6 hr/day, 3 days/week
Number of Units	3 (4 future)
Solids Feed Rate	190 lb/hour each (570 lb/hour total)
Hydraulic Capacity	165 gpm @ 0.75%
Main Drive Motor Size	3.4 HP each (10.2 HP total)
Dewatering Mechanism	Moving Rings
Polymer Usage	26 – 30 lb/dry ton of solids
Dewatered Solids Concentration	15 – 18%
Solids Capture	> 95%

5.6.4 Operational and Energy Requirements

Operational Requirements

The screw press dewatering system is designed to operate 6 hours per day, 3 days per week based on 2037 waste sludge loads. It is estimated that the screw press would produce roughly 1,700 cubic yards of biosolids per year at an assumed 16% dry solids concentration. Polymer usage is projected to be 6,090 lbs per year based on a dosing rate of 26 lbs per dry ton of solids. Water is required for both polymer mixing and wash water. Wash water demand is intermittent at 20 gpm, while polymer mixing water is estimated at 3.3 gpm. The additional hours for operating the screw press are included in the various solids handling alternatives.

Energy Requirements

The screw press has motors for the mixing chamber, polymer pump, flocculation tank, flash mixer, and 3 dewatering drums totaling 15 HP that operate constantly when the unit is operating. This results in an estimated energy demand of approximately 90 kWh per day of operation or 14,000 kWh annually.

5.6.5 Area Requirements

As described in the previous solids handling sections, each of the solids dewatering alternatives would be installed in a new building located on the west side of the WWTP. The new building would be sized to accommodate the screw press, conveyor, ancillary components, and an area for short-term storage of dewatered biosolids prior to offsite hauling. The screw press unit, including the flash mixer and flocculation tank, measures approximately 18 feet in length and 10 feet in width, with added clearance required for access, maintenance, and polymer feed equipment. In addition to the screw press room, the building will include a separate electrical room to house the control panel and associated instrumentation.

5.6.6 Construction Considerations

Construction of the screw press dewatering system at the East Helena WWTP is not expected to present significant challenges; however, efficient use of available space should be observed. The building footprint should be compact and carefully laid out to accommodate the press, electrical control room, and dewatered sludge storage area. Attention should be given to equipment access and service clearances. No existing operations at the plant will be impacted during the construction of the screw press.

5.6.7 Cost Estimate

Table 5.11 summarizes the cost estimate for the screw press dewatering alternative. These costs do not include the price for the new building included in the solids handling cost estimate. A detailed cost estimate for this alternative is provided in **Appendix D.**

Table 5.11 – Cost Summary for Screw Press Solids Dewatering

Total Project Capital Cost	$1,479,800
Total Annual Operation and Maintenance Cost	$58,500

5.7 Rotary Fan Press Solids Dewatering

5.7.1 Process Overview

The rotary fan press is a slow-speed, enclosed, modular dewatering unit that provides continuous operation with low energy consumption and minimal maintenance. Biosolids are conditioned with a polymer to promote flocculation and then fed into the unit at relatively low pressure. The sludge enters the press, where it is introduced into the space between two parallel rotating stainless steel screens or drums. A filter media belt stretched between these screens compresses the flocculated solids as they advance through the rotating channel.

As the sludge moves along the rotational path, filtrate is squeezed out through the porous surface and collected for return to the headworks of the treatment plant. The pressure within the system gradually increases due to the frictional force of the slow-moving screens and an adjustable outlet restriction, which generates back pressure for water removal. This results in the formation of a relatively dry sludge cake, typically containing 16 – 20% dry solids. The cake is discharged at the end of the channel into a hopper, conveyor, or bin for final disposal. Intermittent wash water is used to clean the screens and flush residual solids from the unit during shutdown.

5.7.2 Preliminary Design

To support the solids handling alternatives described in **Sections 5.2** through **5.4**, a rotary fan press system is one option that could be installed at the East Helena WWTP. After reviewing multiple proposals, the Fournier Model 8-900/8000CVH Rotary Fan Press was selected to evaluate further due to its cost effectiveness and ability to create a dry sludge cake with minimal operator involvement.

The rotary press is designed to handle sludge with a solids content of approximately 0.75% at a rate of 150 gallons per minute. The selected eight-channel unit provides a combined throughput of 520 lb/hour and is capable of producing a sludge cake with a minimum 16% solids content and a capture rate of 94%. This system includes a flocculator, sludge and polymer flow meters, air compressor, cake chutes, sensors, and automated wash solenoids for each channel, all configured for unattended operation.

Polymer is added upstream of the fan press at a rate around 16 to 20 pounds per ton of dry solids using a dedicated polymer feed system to condition the sludge and enhance solids separation. Sludge enters the dewatering channels where slow-rotating, chrome-plated screens gradually remove water from the solids. The pressate will be conveyed back to the front of the plant via an 8-inch drain for further treatment, while the cake is discharged through chutes for further processing or short-term storage prior to final disposal.

The primary drive motor is rated at 3 horsepower and operates at a maximum rotational speed of 3 RPM, contributing to the unit's low energy consumption. In addition to the main drive motor, auxiliary components such as an air compressor, polymer feed system, and automated wash solenoids are also powered from the same electrical service. Control and instrumentation circuits are managed through a centralized control panel. The system is designed to operate six hours per day, three days per week to meet the anticipated solids loading.

30-Year Design Upgrades (2052 Flows)

To accommodate the 2052 (30-year) design flows, a second identical rotary fan press would be added to meet the anticipated solids production. Hours of operation would have to increase to 4 days per week to handle the extra solids loading under the 2052 design conditions. Frequency of polymer deliveries would likely have to increase to handle the additional solids produced or on-site storage of chemical totes would need to be added.

5.7.3 Design Criteria

Table 5.12 – Rotary Fan Press Solids Dewatering Design Criteria

Parameter	Value
Waste Load	1,600 lb/day
Feed Solids Concentration	0.75% to 2.0%
Hours of Operation	6 hr/day, 3 days/week
Number of Units	1 (2 future)
Solids Feed Rate	520 lb/hour
Hydraulic Capacity	150 gpm @ 0.75%
Main Drive Motor Size	10 HP
Polymer Usage	16 – 20 lb/dry ton of solids
Dewatered Solids Concentration	16 – 20%
Solids Capture	> 94%

5.7.4 Operational and Energy Requirements

Operational Requirements

The rotary fan press unit is designed to operate 6 hours per day, 3 days per week based on 2037 waste sludge loads. It is estimated that the fan press would produce roughly 1,500 cubic yards of biosolids per year at an assumed 18% dry solids concentration. Polymer usage is projected to be 3,750 lbs per year based on a dosing rate of 16 lbs per dry ton of solids. Water is required for both polymer mixing and wash water. Minimal wash water is required for cleaning the dewatering channels, with an estimated use of 250 gallons per day per channel during operation. The additional hours for operating the centrifuge are included in the various solids handling alternatives.

Energy Requirements

The fan press has motors for the flocculator, air compressor, and rotary press totaling 14 HP that operate constantly when the unit is operating. This results in an estimated energy demand of approximately 84 kWh per day of operation or 13,100 kWh annually.

5.7.5 Area Requirements

As described in the previous solids handling sections, each of the solids dewatering alternatives would be installed in a new building located on the west side of the WWTP. The new building would be sized to accommodate the fan press, ancillary components, and an area for short-term storage of dewatered biosolids prior to offsite hauling. The rotary fan press unit measures approximately 15.5 feet in length and 13 feet in width, with added clearance required for access, maintenance, and polymer feed equipment. In addition to the fan press room, the building will include a separate electrical room to house the control panel and associated instrumentation.

5.7.6 Construction Considerations

Construction of the rotary press dewatering system at the East Helena WWTP is not expected to present significant challenges; however, efficient use of available space should be observed. The building footprint should be compact and carefully laid out to accommodate the press, electrical control room, and dewatered sludge storage area. Attention should be given to equipment access and service clearances. No existing operations at the plant will be impacted during the construction of the fan press.

5.7.7 Cost Estimate

Table 5.13 summarizes the cost estimate for the rotary fan press dewatering alternative. These costs do not include the price for the new building included in the solids handling cost estimate. A detailed cost estimate for this alternative is provided in **Appendix D.**

Table 5.13 – Cost Summary for Rotary Fan Press Solids Dewatering

Total Project Capital Cost	$1,253,100
Total Annual Operation and Maintenance Cost	$43,740

5.8 Solids Handling and Dewatering Evaluation

In this section, the solids handling and dewatering alternatives described previously are evaluated in greater detail through both monetary and non-monetary analyses. The monetary analysis focuses on capital, operational, and maintenance costs, while the non-monetary analysis considers factors such as regulatory compliance, site constraints, operational complexity, environmental impact, and long-term sustainability. Together, these evaluations provide a comprehensive comparison to assist in identifying the most feasible and cost-effective option for the East Helena WWTP.

5.8.1 Cost Analysis

Life Cycle Cost Analysis

The life cycle cost analysis provides an economic comparison of the developed alternatives by evaluating total project cost, annual operation and maintenance (O&M) costs, and the estimated salvage value of the infrastructure at the end of a 20-year period. This cost-effectiveness evaluation tool is considered one of the most important comparison parameters when multiple alternatives are being contemplated. Detailed cost estimates, including project costs, O&M, and salvage values for each option, are provided in **Appendix D**. **Table 5.14** below summarizes the life cycle cost analysis for the different solids handling alternatives, while **Table 5.15** presents the corresponding analysis for the dewatering alternatives.

Total Project Cost

For estimating project costs, actual material and equipment proposals and prices of comparable work were used whenever possible. Project capital costs contain labor and material costs to construct the anticipated facilities and include allowances general conditions such as contractor mobilization, bonds and insurance, and other general requirements such as submittal preparation. Installation costs are based on a percentage of equipment costs that vary on the complexity of the project.

It should be noted that the costs for administration and engineering services are not included in the total project cost. A construction contingency and undefined scope cost is included due to the inherent uncertainty at the time the cost estimate was completed. Included in these estimates are a construction contingency and undefined scope cost of 30% and a general conditions cost of 15%.

Operation and Maintenance Costs

Economic evaluations of the alternatives require consideration of annual O&M costs as well as capital costs. O&M expenses include all costs for materials and supplies, equipment replacement funds for specific systems, energy, and labor requirements, if applicable. Material maintenance costs for new facilities are based on a percentage of the initial equipment costs, depending on the type of equipment and its use. Energy costs for new facilities are based on estimates of the average requirements for each unit process and typical rates for Montana communities.

Present Worth Analysis

A present worth analysis was completed for each of the solids handling and dewatering alternatives. The analysis incorporates the total project cost, annual O&M costs for each alternative, and a 20-year salvage value. Unless otherwise noted, the salvage value assumes a 20-year service life for mechanical equipment. The result represents the amount that would need to be invested in 2025 dollars to cover the total project cost and annual O&M expenses, discounted at an interest rate of 3% over 20 years, less the projected salvage value at the end of the 20-year planning period.

Table 5.14 – Solids Handling Alternatives Life Cycle Cost Analysis

Solids Handling Alternatives	Total Project Cost	Annual O&M Cost	Salvage Value	Total Present Worth
Thermal Sludge Drying (Class A Biosolids)	$11,875,000	$471,050	$2,729,300	$17,371,900
Aerobic Digestion (Class B Biosolids)	$10,598,900	$292,980	$1,811,100	$13,954,900
Sludge Storage (Unclassified Biosolids)	$7,980,700	$238,580	$1,239,600	$10,843,800

Table 5.15 – Solids Dewatering Alternatives Life Cycle Cost Analysis

Solids Dewatering Alternatives	Total Project Cost	Annual O&M Cost	Salvage Value	Total Present Worth
Centrifuge	$813,800	$56,335	$38,600	$1,630,600
Screw Press	$1,479,800	$58,500	$39,500	$2,328,300
Rotary Fan Press	$1,253,100	$43,740	$44,600	$1,879,100

Among the evaluated solids handling options, sludge storage emerges as the most cost-effective solution, with a total present worth of $10,843,800. In contrast, thermal sludge drying and aerobic digestion require significantly higher capital and O&M costs. The primary drivers of these increased costs are more expensive equipment and substantially greater power consumption associated with those processes.

While thermal sludge drying and aerobic digestion could provide higher levels of biosolids treatment and more sustainable disposal options, their long-term financial burden is considerably greater. As a result, they are less favorable for East Helena given current and projected sludge management needs.

Regarding solids dewatering alternatives, the centrifuge option has the lowest total present worth due to a notably lower total project cost and second highest O&M cost. The rotary fan press alternative has the lowest annual O&M cost and the second lowest project cost. The screw press option has a significantly higher total present worth compared to the other alternatives due to having the highest total project and O&M costs. The centrifuge utilizes substantially more power than the other two alternatives, which makes it less attractive as a preferred alternative.

5.8.2 Non-Economic Comparison

This section discusses the non-monetary factors that were considered when selecting the alternatives developed previously. These items include technical feasibility, longevity/reliability, regulatory compliance, constructability, environmental impacts, operation and maintenance, public health and safety, and land impact/availability.

Technical Feasibility

- **Solids Handling**

  From a technical feasibility standpoint, thermal sludge drying is the most complex of the evaluated alternatives. The process requires specialized equipment, including a thermal dryer, odor control systems, heat exchangers, condensers, and dedicated storage and handling facilities. Operation demands greater technical expertise, automation, and more intensive monitoring compared to other alternatives. While technically feasible, the complexity of integrating a thermal drying system into the East Helena facility is significantly higher, both in terms of construction and day-to-day operation.

  In contrast, aerobic digestion and sludge storage are relatively straightforward to build and operate. Both systems rely on proven technologies such as blowers, mixers, and diffusers, which are common in municipal wastewater treatment. Their construction requirements are limited to excavation, concrete structures, and mechanical equipment, making them much easier to implement. Disposal of the resulting biosolids differentiates the alternatives further. Coordinating with landowners, managing timing for agricultural use, and complying with nutrient management requirements make land application more challenging. Landfilling, though less sustainable, is technically simpler and involves fewer operational uncertainties.

- **Solids Dewatering**

  All three dewatering technologies are technically feasible for implementation at the East Helena WWTP and have proven performance in producing a biosolids product suitable for land application, landfill disposal or further treatment. The centrifuge is the most mechanically complex, operating at high rotational speeds and requiring a more substantial foundation design along with careful vibration control. In comparison, the screw press and rotary fan press operate at lower speeds and generate less force, making them simpler to construct and maintain with less intensive anchoring requirements.

Longevity/Reliability

- **Solids Handling**

  Thermal sludge drying systems are more complex than the other alternatives because they incorporate heating equipment, conveyors, condensers, odor control units, and specialized controls. This added complexity increases the potential for mechanical issues compared to simpler systems. Although the components are designed for continuous industrial service, proper maintenance is critical for reliable long-term performance.

  In comparison, aerobic digestion and sludge storage are much simpler from a mechanical standpoint, which makes them easier to maintain and more predictable during their service lives. From a longevity perspective, these two options are essentially similar, with the main difference being the final disposal method for the biosolids. Aerobic digestion produces material intended for land application, which depends on ongoing access to agricultural property, while sludge storage produces solids that are landfilled, a disposal method generally considered more reliable over the long term.

- **Solids Dewatering**

  The centrifuge, while effective at producing a high-quality dewatered product, operates at very high rotational speeds. This causes increased wear of the internal scroll, a critical component of the system. Because the scroll is not typically repaired or serviced onsite, it must be shipped back to the manufacturer for repair or replacement, resulting in additional downtime and cost.

  In contrast, the screw press and rotary fan press operate at much lower speeds and generate less mechanical stress during operation. As a result, their components tend to last longer, require less intensive maintenance, and can generally be serviced onsite by plant staff or local technicians. These factors make them more durable and reliable over time compared to the centrifuge.

Regulatory Compliance

- **Solids Handling**

  From a regulatory view, thermal sludge drying achieves the highest standards by producing Class A biosolids, which must meet strict vector attraction and pathogen reduction requirements and can be distributed without site restrictions. This option also requires more frequent and rigorous testing to verify compliance with Class A criteria. Aerobic digestion produces Class B biosolids, which allow beneficial reuse but require site management practices, setbacks, and public access restrictions to protect human health and the environment. Class B biosolids also require routine testing for pathogens and vector attraction reduction to maintain compliance.

  In contrast, sludge storage produces unclassified solids that are disposed of in a landfill. For landfill acceptance, the only regulatory requirements are passing a paint filter test and the Toxicity Characteristic Leaching Procedure (TCLP) to confirm the sludge is non-hazardous. Class A and Class B biosolids both carry a greater regulatory burden than unclassified sludge, requiring more frequent monitoring, testing, and documentation to ensure compliance.

- **Solids Dewatering**

  All three dewatering alternatives would be designed to meet Montana DEQ requirements. Each system is capable of achieving high solids content and capture rates, ensuring that the dewatered product is suitable for either land application, landfill disposal, or further treatment. Since these technologies are well established and widely used, no regulatory concerns are anticipated with the implementation of any of the dewatering alternatives.

Constructability

- **Solids Handling**

  Regarding constructability, all three dewatering alternatives are considered feasible, and no significant construction issues have been identified for any of them. Each alternative involves similar components. Site access, available land, and existing infrastructure at the East Helena WWTP provide sufficient space and flexibility to accommodate any of the alternatives without major challenges.

  The main distinction lies in the complexity of the systems. Thermal sludge drying requires more advanced instrumentation and control systems. These elements increase the complexity of installation and integration with plant infrastructure but remain well within typical construction capabilities for wastewater treatment facilities.

- **Solids Dewatering**

  From a constructability standpoint, all three dewatering alternatives can be implemented without major challenges. The centrifuge, however, requires more attention during design and installation. Because it operates at very high rotational speeds, the centrifuge must be installed on a reinforced foundation that can withstand vibration forces. Additional sound dampening and vibration mitigation measures would also be required to minimize noise impacts.

  In contrast, the screw press and rotary fan press are mechanically simpler and operate at lower speeds, which reduces structural demands. Both presses can typically be installed on a standard equipment pad.

Environmental Impacts

- **Solids Handling**

  Thermal sludge drying provides the most beneficial environmental outcome because it produces Class A biosolids. These biosolids meet the highest regulatory standards, are pathogen-free, and can be distributed without restrictions. Class A biosolids can also be marketed as a sustainable soil amendment. Aerobic digestion, which produces Class B biosolids, supports sustainability through beneficial reuse, though with more limitations. Land application of Class B material can improve soil health, increase organic matter, and provide nutrients for crops, hay, or pasture.

  In contrast, sludge storage requires landfill disposal, which is the least environmentally responsible option. Although it provides a reliable and simple method of solids management, it does not contribute to beneficial reuse and places additional demand on landfill space.

- **Solids Dewatering**

  From an environmental perspective, all three dewatering alternatives would result in similar impacts during construction, as each requires a new building without notable differences in site disturbance. The key distinctions arise from an operation standpoint.

  The centrifuge has the highest energy demand due to its larger motors and greater power requirements. The screw press, while more energy efficient, typically requires higher polymer usage to achieve comparable dewatering concentrations, which increases chemical consumption and associated environmental impacts. The rotary fan press generally has lower energy requirements and lower polymer demands than the centrifuge and screw press.

Operation and Maintenance

- **Solids Handling**

  Thermal sludge drying is the most complex option to operate. It requires careful management of the numerous processes, all of which demand routine monitoring and preventative maintenance. In addition, Class A biosolids require the most frequent testing and documentation to demonstrate regulatory compliance. While this alternative produces the highest quality biosolids, its operational demands are significantly greater than those of aerobic digestion or sludge storage.

  Aerobic digestion, which produces Class B biosolids, operates similarly to sludge storage because both alternatives use comparable mechanical components. However, land application of biosolids adds an additional layer of complexity. This includes coordinating with landowners, scheduling field applications, and maintaining regulatory paperwork to ensure compliance. Overall, this alternative requires more planning and coordination than landfill disposal.

  Sludge storage and landfill disposal is the simplest of the alternatives from an operation and maintenance standpoint. Once sludge is stored and dewatered, routine monitoring and transportation to the landfill are the primary requirements. This option provides straightforward operations with predictable O&M needs.

- **Solids Dewatering**

  Operationally, the centrifuge is the most complex of the dewatering alternatives. It requires more operator attention during startup and shutdown, and its internal components wear at a faster rate due to high rotational speeds. Because the scroll cannot be serviced onsite, it must be shipped back to the manufacturer for repair or replacement, resulting in higher maintenance costs.

  By comparison, the screw press and rotary fan press are simpler to operate and maintain. Both operate at lower speeds, use less complex components, and can be serviced by plant operators without the need for factory repairs. Unlike the centrifuge, operators can check on a screw press and fan press intermittently once the systems have been started for the day.

Public Health and Safety

- **Solids Handling**

  Regarding public health and safety, all three solids handling alternatives are considered safe for the public when properly implemented and managed. Thermal sludge drying provides the highest level of treatment, producing Class A biosolids that meet stringent pathogen reduction standards and distribution without restrictions, thereby offering the greatest assurance of protection.

Aerobic digestion produces Class B biosolids, which are safe for beneficial reuse but require site management practices and restricted access to ensure public health protections are maintained. Sludge storage, followed by landfill disposal, receives the least amount of treatment but still ensures public safety through landfill containment.

- **Solids Dewatering**

  From a public health and safety perspective, all three dewatering alternatives are generally considered safe and effective. Each system produces biosolids with a solids content greater than 15 percent, which minimizes handling risks and ensures stable material for transport and disposal.

  However, the centrifuge operates at much higher rotational speeds than the screw press or rotary fan press. This introduces additional safety considerations for operational staff, as the moving parts present greater risks if not properly guarded. In addition, centrifuges generate significant noise levels during operation, making hearing protection necessary for staff and visitors.

Land Impact/Availability

- **Solids Handling**

  East Helena owns a 40-acre parcel for the WWTP, with much of the land currently unused or available for future expansion. While space is not a limiting factor, it is still important to remain mindful of long-term land availability when selecting solids handling alternatives. Among the options, aerobic digestion requires the largest land area due to the need for large concrete basins and a semi-enclosed building to provide year-round storage of dewatered biosolids prior to land application.

  Thermal sludge drying also requires a significant building footprint to house the dryer and dewatering systems, though the overall space requirement is smaller than that of aerobic digestion. Sludge storage has the smallest footprint of the three alternatives, requiring smaller concrete basins and a minimal solids handling building, making it the least demanding in terms of land use.

- **Solids Dewatering**

  All three dewatering alternatives are relatively similar in size and would not significantly change the footprint of the proposed dewatering building. Each system can be housed generally within the same structure. The centrifuge, however, requires the smallest equipment footprint, leaving slightly more usable space within the building for ancillary equipment or storage.

5.8.3 Selection of Preferred Alternatives

Using the life cycle cost analysis and non-monetary factors discussed above, a comparative summary evaluation and ranking of solids handling and dewatering alternatives is presented below. For the criteria presented above, each alternative is scored from one through five based on how well they meet the requirements of the selected criteria with a score of one being the lowest and five being the highest.

The weighting of the financial and non-economic criteria has a substantial effect on the final alternative ranking and is inherently open to differences in opinion. Therefore, the criteria were discussed with East Helena staff and given a weight between one and three based on their impact to the City, with three having the highest weight and therefore the most importance.

The scores and weights were then multiplied to produce a weighted rank for each criterion. The weighted rank scores are summed, resulting in a weighted rank total score with the highest value indicating the overall highest ranking.

Table 5.16 below ranks the solids handling alternatives according to their life cycle costs and non-monetary factors previously discussed. **Table 5.17** ranks the solids dewatering alternatives according to their life cycle costs and non-monetary factors previously discussed.

Table 5.16 – Solids Handling Alternatives Evaluation Summary

Criteria	Criteria Weight	Thermal Sludge Drying	Aerobic Digestion	Sludge Storage
Financial Feasibility	**3**			
Alternative Rank		2	4	5
Weighted Rank		*6*	*12*	*15*
Technical Feasibility	**2**			
Alternative Rank		2	4	5
Weighted Rank		*4*	*8*	*10*
Longevity/Reliability	**2**			
Alternative Rank		3	4	5
Weighted Rank		*6*	*8*	*10*
Regulatory Compliance	**2**			
Alternative Rank		4	4	5
Weighted Rank		*8*	*8*	*10*
Constructability	**1**			
Alternative Rank		4	5	5
Weighted Rank		*4*	*5*	*5*
Environmental Impacts	**2**			
Alternative Rank		5	4	3
Weighted Rank		*10*	*8*	*6*
Operation & Maintenance	**3**			
Alternative Rank		3	4	5
Weighted Rank		*9*	*12*	*15*
Public Health & Safety	**3**			
Alternative Rank		5	4	3
Weighted Rank		*15*	*12*	*9*
Land Impact/Availability	**1**			
Alternative Rank		4	3	5
Weighted Rank		*4*	*3*	*5*
Total		**66**	**76**	**85**

Table 5.17 – Solids Dewatering Alternatives Evaluation Summary

Criteria	Criteria Weight	Centrifuge	Screw Press	Rotary Fan Press
Financial Feasibility	**3**			
Alternative Rank		5	3	4
Weighted Rank		*15*	*9*	*12*
Technical Feasibility	**2**			
Alternative Rank		3	5	5
Weighted Rank		*6*	*10*	*10*
Longevity/Reliability	**2**			
Alternative Rank		3	5	5
Weighted Rank		*6*	*10*	*10*
Regulatory Compliance	**2**			
Alternative Rank		5	5	5
Weighted Rank		*10*	*10*	*10*
Constructability	**1**			
Alternative Rank		4	5	5
Weighted Rank		*4*	*5*	*5*
Environmental Impacts	**2**			
Alternative Rank		3	4	5
Weighted Rank		*6*	*8*	*10*
Operation & Maintenance	**3**			
Alternative Rank		4	5	5
Weighted Rank		*12*	*15*	*15*
Public Health & Safety	**3**			
Alternative Rank		4	5	5
Weighted Rank		*12*	*15*	*15*
Land Impact/Availability	**1**			
Alternative Rank		5	4	4
Weighted Rank		*5*	*4*	*4*
Total		**76**	**86**	**91**

5.8.4 Solids Handling Preliminary Design

The recommended solids handling and dewatering alternatives consist of two sludge storage basins, aeration equipment corridor, and a dewatering building to house the rotary fan press, electrical equipment, and ancillary items at the City's existing WWTP site. The preliminary design consists of the following major components:

- Two sludge storage basins (60 ft x 32 ft, 14 ft SWD) with coarse bubble diffusers and 21 days of storage
- Equipment corridor with three 40 HP screw compressors (blowers) and sludge transfer pumps
- Solids dewatering building (32 ft x 40 ft, 16 ft wall height) with roll-off container
- Rotary fan press with 8 channels capable of processing 520 lb/hour of solids
- Polymer feed system with mixing chamber and progressive cavity pump
- PVC and ductile iron process piping
- Mechanical and plumbing systems
- Electrical and instrumentation equipment
- Gravel surfacing and site restoration

5.8.5 Solids Handling and Dewatering Project Cost

The total cost for the proposed solids handling and dewatering project is summarized in **Table 5.18.** The total project cost includes the costs for construction, a large buffer for undefined scope and contingency (30% of total project cost), and an estimated 15% of construction cost for general conditions. Detailed cost estimates for the two alternatives included in the proposed project are included in **Appendix D.**

Table 5.18 – Proposed Total Project Cost

Total Project Cost	$9,233,800
Total Annual Operation and Maintenance Cost	$282,320

CHAPTER 6 – ANCILLARY PROCESS DISCUSSION

6.1 Electrical Service Requirements and Standby Power

6.1.1 Electrical Service Requirements

There are currently two existing electrical feeds at the East Helena WWTP: one to the existing blower building and one to the existing metals filtration facility. A new electrical service will be required to operate the recommended improvements identified in this document. Overhead power is available along the southern boundary of the site that is capable of providing the necessary electrical feed to the new process equipment. The simplest solution is to install a new service drop and underground electrical feeds from the existing overhead power line that will provide power to the main process building and solids dewatering building while leaving the existing electrical services in place.

Alternatively, a new electrical service would be run to a main transformer and outdoor rated switchgear located near the main process building with new feeds to the existing blower building, new headworks facility, existing metals filtration building, proposed main process building, and proposed solids dewatering building. This allows for a centralized power feed for the entire WWTP. The utility transformer would be sized for all future loads at the WWTP. The new switchgear would have circuit breakers to supply 480/277 VAC power throughout the site and contain spare breaker space for anticipated electrical needs.

The following secondary treatment process equipment will be powered from the main breaker panel located in the main process building electrical room:

- Oxidation Ditch Anoxic Mixers
- Oxidation Ditch Aerators
- Secondary Clarifier Rotating Equipment
- RAS/WAS Pumps
- Scum Pumps
- UV Disinfection System
- Non-Potable Water Pumps
- Air Compressor
- Actuated Weir Gates
- Miscellaneous Small Equipment
- Instrumentation
- HVAC System

- Lighting and Receptacles

The following solids handling process equipment will be powered from the main breaker panel located in the solids handling building electrical room:

- Sludge Storage Screw Compressors
- Sludge Transfer Pumps
- Rotary Fan Press Motors
- Polymer Feed Equipment
- Return Stream Pumps
- Actuated Telescoping Valves
- Miscellaneous Small Equipment
- Instrumentation
- HVAC System
- Lighting and Receptacles

6.1.2 Standby Power

Essential facilities at the WWTP, such as influent pumping and disinfection equipment, are required to have backup power in accordance with MDEQ requirements. A new natural gas standby generator is getting installed with the current headworks project. This generator will provide standby power to the mechanical screens, grit removal equipment, and influent pump station. During design of the headworks project, the decision was made to oversize the new standby generator so it would be capable of providing backup power for the proposed UV disinfection system. The need for future standby generators to power the proposed treatment equipment will be analyzed and coordinated with MDEQ during the design of those facilities.

6.2 Plant Control System

Currently, the City of East Helena controls and monitors WWTP operations through a plant control system (PCS) comprised of a main SCADA computer in the existing metals filtration building and manufacturer supplied control panels in the various treatment buildings. There are numerous instruments installed throughout the WWTP that are connected to the PCS and provide data for proper operation and alarms to alert staff.

With the proposed improvements, a second SCADA computer will be installed in the new main process building. The proposed secondary treatment and solids handling processes will also include a mixture of manufacturer and integrator supplied control panels and instruments. The SCADA computers will provide access to full monitoring capability of the PCS, as well as limited control over selected treatment processes as determined during detailed design of the system.

6.3 Non-Potable Water

Non-potable water (NPW) is currently provided to the existing metals filtration and UV buildings via self-priming centrifugal pumps downstream of the tertiary filters. As part of the current headworks project, the NPW system is being modified by installing two new vertical turbine pumps and two hydropneumatic tanks in the metals filtration building. A new connection is being made to the existing 4-inch NPW pipe to provide process water to the washer/compactor, grit washer, and hose bibs in the new headworks building.

It is anticipated that a second NPW system will be needed for the proposed upgrades given the location of the existing NPW infrastructure and limited capacity of the system. The future NPW system would be downstream of the proposed UV disinfection system in the new main process building. This system will provide reuse water to the proposed secondary treatment process and solids handling facility mainly for washdown water. The new NPW system could also be designed to provide effluent irrigation for the new and existing landscaping at the WWTP.

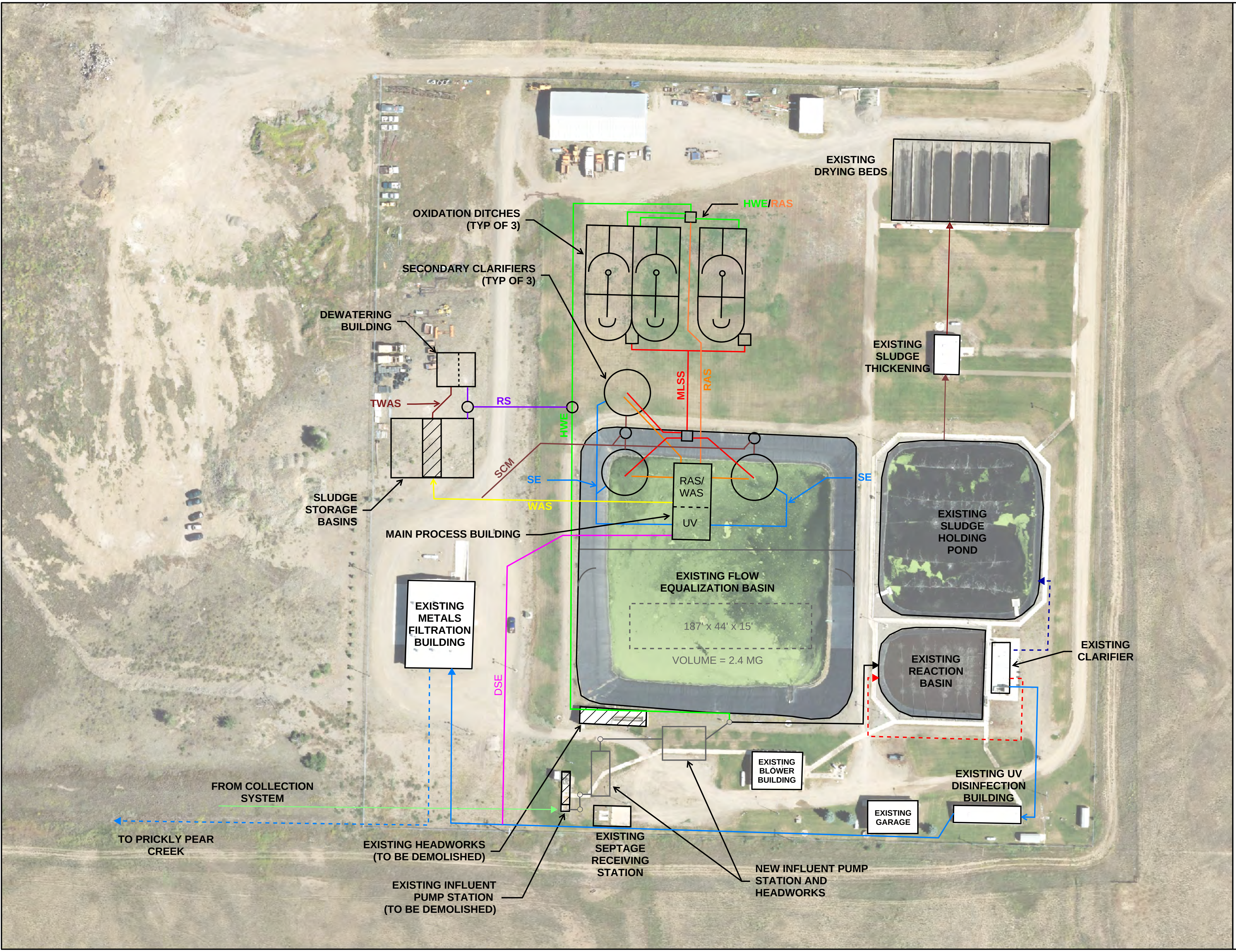
6.4 Site Layout and Civil Design

6.4.1 Existing Site Layout

The existing East Helena WWTP consists of a screw pump structure, screen building, grit chamber, flow equalization basin, aeration basin, secondary clarifier, sludge storage basin, drying beds, UV disinfection building, and a metals filtration facility. There are various other shops and outbuildings on the property as well. The existing infrastructure occupies approximately 8 acres on the City's 40-acre parcel. The existing screw pumps were built in the 1980s as part of an aerated lagoon upgrade. The existing headworks, grit removal, secondary treatment, UV disinfection, and solids handling facilities were constructed in 2002. The metals filtration building was constructed in 2013. **Figure 4.1** included in **Chapter 4** shows the existing WWTP prior to the influent pump station and headworks project that is currently under construction.

6.4.2 Proposed Site Layout

Figure 6.1 shows the proposed layout of the new secondary process and solids handling facility. To accommodate the construction of the clarifiers and new main process building, the northern half of the existing flow equalization basin will be filled. The new facilities will be built north and west of the existing WWTP infrastructure. Most of the secondary process will be constructed in an area that is currently unused. Sludge storage and dewatering facilities will be directly north of the existing metals filtration building and on the west side of the existing access road. Headworks effluent will be piped around the flow equalization basin to a splitter box prior to the oxidation ditches.



LEGEND:

🟩 HWE (HEADWORKS EFFLUENT)

🟧 RAS (RETURN ACTIVATED SLUDGE)

🟥 MLSS (MIXED LIQUOR SUSPENDED SOLIDS)

🟦 SE (SECONDARY INFLUENT)

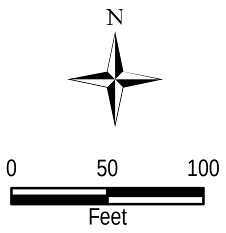
🟨 WAS (WASTE ACTIVATED SLUDGE)

🟪 DSE (DISINFECTED SECONDARY INFLUENT)

🟫 SCM (SCUM)

🟫 TWAS (THICKENED WASTE ACTIVATED SLUDGE)

🟪 RS (RETURN STREAM)



East Helena WWTP Facility Plan

Figure 6.1
Proposed Site Layout

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The new main process building will house the major equipment for the proposed upgrades including the RAS/WAS pump station, UV disinfection, NPW system for the new plant processes, and the second SCADA computer.

6.4.3 Site Grading and Drainage

Overall site grading will be from south to north, with design elevations around the new headworks building and existing treatment basins controlling the final elevations. The finished grade around the new headworks building is roughly 5 feet higher than the existing flow equalization basin berms. This differential will allow for sufficient grade to provide adequate site drainage for stormwater or snow melt. In addition, the in situ soil at the WWTP allows for significant infiltration to occur during large rain events. Floor elevations for the new buildings will be a minimum of 6 inches above finished grade. This will allow for grading away from the buildings and drainage away from structures.

6.4.4 Landscaping

Landscaping at the plant site will be limited to reseeding the areas disturbed during construction that do not receive gravel surfacing. The seeding will match the grass currently at the site. It is likely that vegetative cover, such as trees or shrubs, will be added to the final design to soften the viewshed from the proposed concrete structures and process buildings.

6.5 Construction Sequencing and Demolition

6.5.1 Construction Sequencing

Possible construction sequencing for the WWTP upgrades will generally be as follows:

- **Modify Flow Equalization Basin:** as previously mentioned, roughly half of the existing flow equalization basin will be utilized for construction of the secondary clarifiers and the main process building. The new basin will be graded to provide adequate volume and relined to meet MDEQ standards.
- **Construct Secondary Treatment Facilities:** excavation, subgrade preparation, and pouring concrete for the oxidation ditches can take place while the flow equalization basin is being modified. After the flow equalization basin is modified, construction of the clarifiers, main process building, and splitter structures can occur. Water retaining structures, including the oxidation ditches, secondary clarifiers, and UV channels will require leak testing.
- **Site Piping:** after the large structures and main process building have been constructed, site piping can be installed and connected to the new facilities. This includes headworks effluent, MLSS from the ditches to the clarifiers, secondary effluent, scum, and disinfected secondary effluent piping. Where tie-ins connect

new and existing facilities, site piping will be run near the tie-in locations but not connected until the new facilities have been tested and are placed into service.

- **Process Equipment:** once the structures, buildings, and piping are installed, various equipment such as mixers, aerators, pumps, and the UV disinfection system can then be installed. Wiring and the installation of instrumentation and SCADA equipment can also happen at this time.
- **Integration and Startup:** once the new facilities and equipment have been installed, tested, and have power running to them, equipment representatives and system integrators can begin setting up process parameters for the various instrumentation and controls necessary to operate the new WWTP. Startup will be conducted using clean water provided by the City to assess operation of the various components of the new treatment process prior to bringing the complete system online.
- **Facility Tie-In:** once the new facilities have been tested and approved for operation, the contractor can make tie-ins to the existing treatment process and allow wastewater flow through the new WWTP. This includes the headworks discharge manhole and the location where the disinfected effluent will be tied into the existing outfall line, downstream of the existing UV building and prior to the existing metals filtration facility. Bypass pumping will be required to make these tie-ins at the noted locations. A bypass pumping plan will be developed during the design phase but making these connections overnight or in the middle of the day will greatly reduce the amount of flow required to be bypassed.

6.5.2 Demolition

Demolition of the existing facilities at the WWTP can begin once the new treatment processes are started up and operating adequately for approximately 30 days. The only exception is the existing flow equalization basin which needs to be modified to provide the space for constructing the new main process building and secondary clarifiers. The basin will be dewatered and the existing liner totally removed prior to regrading and installing a new liner for the portion that is planned to remain.

Once the new secondary treatment process is operational, the existing aeration basin, secondary clarifier, UV disinfection, and blower equipment can all be decommissioned. The existing sludge storage pond, sludge thickening equipment, and sludge drying beds will remain in place until a new solids handling facility is constructed. Decommissioning of the existing facilities will not only involve the removal of equipment but the demolition of existing buildings, concrete structures, and plugging existing process piping. The disturbed area will be backfilled, topsoiled, and seeded to match the existing site.

CHAPTER 7 – ENVIRONMENTAL DISCUSSION

7.1 Environmental Impacts and Mitigation

Environmental impacts and mitigation measures related to the project implementation were reviewed with the development of the proposed Phase 2 project. As a result, an environmental checklist to review the impacts to the physical and human environment were evaluated to determine what, if any, impacts would be expected as a result of the project. Below is a summary of the impacts and mitigation measures that are anticipated as a result of the project.

7.1.1 Direct and Indirect Impacts

Direct environmental impacts occur immediately and are a result of project activity that typically can be quantified and directly linked to a specific project activity. Indirect impacts are not a direct result of a specific project activity and are considered a secondary consequence that can occur later and farther away from the project activity.

According to the completed environmental review, the proposed Phase 2 project would not cause any adverse direct or indirect impacts to the surrounding area. However, the proposed WWTP upgrades will result in some beneficial impacts on the community of East Helena. With the proposed improvements, East Helena’s WWTP will be capable of handling not only current wastewater flows but also a reasonable amount of expected growth. Below is a list of additional beneficial impacts as a result of the project.

Surface Water

East Helena has an MPDES permit to discharge treated effluent into Prickly Pear Creek. The City must follow all effluent limitations and monitoring requirements as stated in the permit and the improvements to the WWTP will allow the City to meet all effluent limits prior to discharge into the creek. Also, the proposed Phase 2 upgrades will greatly improve effluent quality compared to their existing system, thus improving the water quality of Prickly Pear Creek.

Businesses or Residents

The project will allow East Helena to continue providing a reliable wastewater system to area businesses and residents.

Public Health and Safety

The improvements to the WWTP would benefit public health and safety of area residents by providing improved treatment of the City’s wastewater that is discharged into Prickly Pear Creek.

Local and State Tax Base and Revenues

The improvements to the WWTP will allow the City's wastewater system to operate more efficiently and serve the City's current and future tax base.

Community, Government Services, Commercial, and Industrial Facilities

All community, government services, commercial, and industrial facilities in the area including the East Helena High School and Prickly Pear Elementary School located near the project area will continue to have a reliable wastewater system with the improvements to the WWTP.

Land Use Compatibility

The proposed Phase 2 project will allow East Helena to better accommodate new residential and commercial development to the community. Any new development within the community will be subject to existing land use plans and land use controls.

7.1.2 Mitigation Measures

To ensure there will be no negative impacts as a result of the project, mitigation measures should be followed during the construction of the improvements. These suggested mitigation measures include:

- Any work that occurs within the East Helena Superfund Area must follow regulations governing soils displacement and disposal. These regulations are necessary to prevent lead and arsenic contamination in uncontaminated areas, prevent recontamination of remediated areas, and prevent potential health risks.
- If previously unknown contaminants are encountered during construction, the appropriate regulatory agency would be notified, and the contaminated materials removed and disposed of properly.
- The application of water or chemicals to control dust in areas subject to heavy vehicle traffic can be used during the construction of the proposed project. Disturbed areas would be promptly reseeded or restored when construction activities are completed.
- Shallow groundwater is not anticipated to be a concern during construction, but dewatering may be required depending on specific construction activities.
- Best management practices (BMPs) to control runoff and erosion from disturbed areas will be required of the Contractor to minimize potential water quality impacts during construction.
- If active eagle nests are present within 0.5 miles of the project, seasonal restrictions and construction/development distance buffers specified in the 2010 ***Montana Bald Eagle Management Guidelines****: An Addendum to Montana Bald*

Eagle Management Plan (1994) should be followed in order to avoid/minimize the risk for eagle take.

- If existing structures need to be altered, or if cultural materials are inadvertently discovered, the Montana State Historic Preservation Office (SHPO) should be contacted, and the site investigated.
- The proposed Phase 2 improvements will include an asbestos inspection to determine if there are any asbestos-containing materials (ACMs) that will be encountered during the project. If ACMs are encountered, the materials would be removed and properly disposed of by a certified asbestos abatement contractor.

7.2 Regulatory Compliance Permits

Regulatory compliance permits are official approvals granted by government authorities or regulatory agencies that permit certain activities to proceed. They are essential for ensuring adherence to specific laws, regulations, or standards. Based on the proposed Phase 2 project components, below is a list of possible regulatory permits required for the project.

Lead Education and Abatement Program Permit

The WWTP site is located adjacent to the Administrative Boundary of the East Helena Superfund Area. Any work that occurs within the East Helena Superfund Area must follow regulations governing soils displacement and disposal. According to the regulations, all persons engaging in soil displacement in excess of one cubic yard within the Administrative Boundary must obtain a permit from the Lead Education and Abatement Program (LEAP) of the Lewis and Clark City-County Health Department.

General Permit for Storm Water Discharges Associated with Construction Activity

Since construction of the Phase 2 project will likely disturb more than 1 acre, a General Permit for Storm Water Discharges Associated with Construction Activity under the MPDES program must be obtained. As a requirement of the General Permit, a Notice of Intent (NOI) form including a Stormwater Pollution Prevention Plan (SWPPP) specifying the BMPs that would be employed during construction to control erosion and sediment transport by storm runoff must be prepared and submitted to MDEQ.

7.3 Agency Comments

To further evaluate the possible environmental impacts of the proposed Phase 2 project on the surrounding area, the following agencies were advised of the project and asked to provide any comment and permitting requirements that would be applicable to the improvements. These agencies included:

- Montana Department of Environmental Quality

- U.S. Fish and Wildlife Services
- U.S. Army Corps of Engineers
- Montana Department of Natural Resources and Conservation
- Montana State Historic Preservation Office
- Montana Department of Fish, Wildlife & Parks
- USDA Natural Resources Conservation Services

To date only one agency has provided comment on the proposed Phase 2 project. In correspondence dated August 28, 2025, SHPO stated that there have been a few previously recorded sites within the requested search locale that included the project area. SHPO also stated that any structure over fifty years of age is considered historic and is potentially eligible for listing on the National Register of Historic Places and if any structures are located within the Area of Potential Effect and are over fifty years of age, they should be recorded and a determination on their eligibility be made prior to any disturbance taking place.

SHPO also stated that as long as there will be no disturbance or alteration to structures over fifty years of age, they felt that there would be no cultural or historic properties affected by this project. SHPO, therefore, felt that a recommendation for a cultural resource inventory is unwarranted at this time.

Appendix E includes the completed environmental checklist, agency contact letters, and agency responses received to date. Additionally, other environmental information and reports that provided the necessary information to complete the checklist are included in the appendix.

CHAPTER 8 – PROJECT IMPLEMENTATION AND FUNDING

8.1 Proposed Project

8.1.1 Recommended Project

Based on the analysis presented in **Chapter 4**, the recommended secondary treatment upgrades at the East Helena WWTP are oxidation ditches with secondary clarifiers and inclined open channel UV disinfection. Given the comparison and rankings of the alternatives presented in **Chapter 5**, sludge storage and biosolids dewatering using a rotary fan press are the recommended solids handling processes at the WWTP. The major components of the recommended WWTP improvements are as follows:

- Three oxidation ditches and three secondary clarifiers
- Main process building including three inclined UV banks
- RAS, WAS, and SCUM pump stations
- Two sludge storage basins with coarse bubble diffusers
- Equipment corridor with three screw compressors and sludge transfer pumps
- Solids dewatering building with rotary fan press and polymer feed system

Using the costs presented in **Chapter 4** and **Chapter 5**, the total project cost for the recommended upgrades is presented in **Table 8.1**. The total project cost includes the costs for construction, engineering, administration of grants and loans, and contingency.

Table 8.1 – Recommended Total Project Cost

Oxidation Ditches, Clarifiers, Main Process Building	$23,779,800
Inclined UV Disinfection	$982,500
Sludge Storage	$7,980,700
Sludge Dewatering	$1,253,100
Engineering and Professional Services	$6,119,300
Total Project Cost	**$40,115,400**

8.1.2 Proposed Project Phasing

Due to the significant cost of the needed improvements at the East Helena WWTP, the proposed work will be divided into phases, with the most critical portions considered the top priorities. The ability of the City to fund these upgrades through rates and charges, along with the availability of potential grant funding, was also a strong consideration for developing the proposed project phasing. The phases are created so that East Helena may choose to implement them as separate construction projects or combine the latter phases into a single construction project depending on future growth, MPDES permit requirements, and availability of project funding.

Furthermore, the scope of the Phase 2 project was reduced to two oxidation ditches and two clarifiers, creating a secondary treatment upgrade capable of processing 600,000 gallons per day (gpd). This proposed project represents the minimum capacity the City needs to construct in order to treat existing wastewater flows from the City plus anticipated near-term development. This upgrade is critical to replacing the existing WWTP that is past its useful life and unable to reliably meet discharge limits for nutrients in Prickly Pear Creek. Additionally, the Phase 2 project allows the City to implement a more reasonable rate increase while continuing to work on long-term infrastructure funding.

One additional implementation issue is the final selection of the dewatering system. While the rotary fan press was the highest ranked solids dewatering alternative, there is constant development of new technologies and equipment that should be investigated. If and when the City decides to move forward with this phase of the overall project, it is recommended that the most recent information and studies be evaluated, and site specific pilot testing be performed to confirm the least cost alternative for the City.

The phases for the East Helena WWTP upgrades can generally be described as:

- Phase 1 – Influent Pump Station and Headworks (currently under construction).
- Phase 2 – Near-Term Secondary Treatment Upgrade (600,000 gpd capacity).
- Phase 3 – Solids Handling Improvements (sludge storage and dewatering).
- Phase 4 – Secondary Treatment Addition (extra 1,200,000 gpd capacity) plus Groundwater Disposal (1,000,000 gpd to I/P cells).

8.1.3 Proposed Project Design

The remainder of this chapter will focus on the Phase 2 project described above which consists of two oxidation ditches, two secondary clarifiers, UV disinfection, and a new main process building. The project will consist of the following major components:

- Two oxidation ditches (600,000 gpd capacity with 50 HP aerators each)
- Two clarifiers (50-ft diameter, 15-ft SWD)
- Main process building (40-ft x 80-ft, 16-ft wall height)
- Three inclined UV banks (8 lamps per bank)
- RAS, WAS, and SCUM pump stations

- PVC and ductile iron process piping
- Mechanical, electrical, and plumbing systems
- Gravel surfacing and site restoration

8.1.4 Proposed Project Cost

The total project cost for the proposed Phase 2 project is summarized in **Table 8.2**. The total project cost includes the costs for construction, engineering, administration of grants and loans, and contingency. A detailed cost estimate for the proposed Phase 2 project is included in **Appendix D**.

Table 8.2 – Proposed Phase 2 Total Project Cost

Oxidation Ditches, Clarifiers, Main Process Building	$19,003,700
Inclined UV Disinfection	$982,500
Engineering and Professional Services	$3,597,600
Proposed Phase 2 Total Project Cost	**$23,583,800**

8.2 Funding Strategy

A well-founded funding strategy will be pivotal for implementation of the proposed WWTP upgrades. The final funding strategy is still being developed and will require further dialogue with the City of East Helena and the noted funding agencies.

8.2.1 Funding Sources

Public facilities assistance programs are typically restricted to specific project types. This is partly due to the specific focus (and legislative mandate) of the respective programs and also to the enterprise fund origin of local monies typically used to match assistance dollars. Programs that have potential application for the East Helena WWTP improvements include the following:

Water Pollution Control State Revolving Fund Program (WPCSRF)

The Montana Department of Environmental Quality (MDEQ) administers a loan program to support public wastewater system improvements by offering below-market interest rate loans for health-related infrastructure projects. Projects must first be included on the program's Project Priority Listing (PPL), which ranks applications on a first-come, first-served basis. Loans are available at a 2.50% interest rate for a 20-year or 30-year term, with no current cap on loan amounts. If demands were to exceed available funds, individual project loan amounts may be limited, though this has not occurred to date.

The SRF loan application cycle is open, and both cities and county entities are eligible. Loans must be secured by a bond, repaid through wastewater user rates or tax-based revenues, with a 10% excess coverage requirement unless tax revenues are pledged. Additionally, a reserve equal to half of the annual payment must be provided or borrowed when funds are advanced. There are currently no loan fees. Communities meeting the disadvantaged status, defined by water and sewer rates exceeding 2.3% of Median Household Income (MHI), may qualify for principal forgiveness as a subsidy.

East Helena's target rate is currently $102.75. The addition of this project will increase the City's combined rate well over the target rate. Therefore, the City will be eligible for principal forgiveness for this project. Currently, principal forgiveness is 49% of the loan amount, up to a maximum of $850,000.

Montana Coal Endowment Program (MCEP)

The Montana Coal Endowment Program (MCEP), established in 1992 and managed by the Montana Department of Commerce (MDOC), provides state-funded grants, primarily from coal severance tax earnings, to help local governments finance public infrastructure projects that address serious health and safety issues. Eligible applicants include cities, counties, tribal governments, water and sewer districts, and regional authorities. The program supports projects such as drinking water systems, wastewater and storm sewer systems, solid waste facilities, and bridges. Applications are accepted every two years, in even-numbered years, and awards require legislative approval. Projects are evaluated competitively based on technical and financial feasibility, as well as alignment with seven statutory criteria, including health and safety threats, regulatory compliance, and economic development.

MCEP funds can be used for administration, engineering, and construction costs, and at least one public meeting is required prior to applying. Grants are typically combined with other funding sources, and a "target rate" analysis based on statewide average utility rates helps determine eligibility and funding levels. To qualify for the maximum $750,000 grant, post-project user rates must be at least 150% of the target rate (2.3% of median household income for combined water and sewer). Projects with rates between 125%–150% may receive up to $625,000, while those below 125% are capped at $500,000. Additionally, MCEP grants may not exceed 50% of total project costs.

Preliminary target rate analysis indicates that East Helena should meet the eligibility criterion for MCEP grant consideration. Based on MCEP requirements, the City's user rates upon completion of the proposed project and after grant assistance is over 150% of the target rate. Therefore, the City of East Helena is eligible to apply for $750,000 in assistance from the MCEP program.

Community Development Block Grant (CDBG)

The Community Development Block Grant (CDBG) program, administered by the MDOC and federally funded through the U.S. Department of Housing and Urban Development, aims to support communities in providing decent housing, a suitable living environment, and expanded economic opportunities for low- and moderate-income (LMI) residents. Under the “Community and Public Facilities” category, eligible projects include public infrastructure improvements such as water, wastewater, and solid waste systems. Cities, towns, and counties with populations under 50,000 may apply during the program’s typical spring and fall application cycles, provided funding is available. Applications are competitively ranked based on several criteria, including planning, community need, technical design, participation, benefit to LMI residents, and project management. Infrastructure projects compete with community facility projects like nursing homes, food banks, and childcare centers.

CDBG grants can award up to $750,000 per project, with a cap of $20,000 per benefitted LMI household. A 25% local funding match is required unless a waiver is granted. To qualify, applicants must show that at least 51% of beneficiaries are LMI, verified through census data or an income survey. Financial need is also assessed by comparing a community's projected water and sewer rates to its target rate, and applicants must show that projected charges meet or exceed this threshold.

The City of East Helena has 54.0% of households that are Low and Moderate Income according to the MDOC website which exceeds the 51% threshold for CDBG eligibility. Therefore, an application will be submitted to request the full CDBG grant funding amount for the proposed project.

Renewable Resource Grant and Loan (RRGL)

The Renewable Resource Grant and Loan Program (RRGL), administered by the Montana Department of Natural Resources and Conservation (DNRC), is funded through earnings from natural resource-based taxes. Created by the Legislature, the program supports projects that enhance the state's renewable resources. Eligible projects must promote the conservation, development, or preservation of renewable resources that benefit Montanans. This includes efforts related to water conservation, air and water quality, forestry, and water use for public or agricultural purposes.

Governmental entities such as cities, towns, counties, and water districts may apply. Applications are competitive, submitted biennially (typically due in May of even-numbered years), and subject to approval by the Legislature. Unlike many other grant programs, RRGL does not require a local match, and funds can be used for both capital construction and project administration. RRGL grants are currently capped at $125,000 per project.

An application by the City for $125,000 to use towards this project is feasible, subject to competitive ranking and award. In order to meet the next RRGL grant funding deadline, an application is due in May of 2026.

Rural Development (RD) Water and Environmental Loan and Grant Program

The USDA’s Rural Development (RD) program provides funding packages, combining grants and loans, for eligible public water, wastewater, and solid waste projects. Available to municipalities, counties, tribes, and districts, grant eligibility and loan rates vary and are subject to agency discretion. RD uses the “Non-Metropolitan Median Household Income” index, with grant shares typically shown as maximums but often lower. Current RD funding thresholds include:

- Loan funds only for MHIs above $50,894 (loans currently at 3.50%)
- Grants up to 45% for MHIs between $40,715 and $50,894 (loan share at 2.75%)
- Grants up to 75% for MHIs below $40,715 and documented health or sanitation problems (loan share at 2.125%)

Grant share percentages for RD funding are calculated based on the funding package after deducting other grants, rather than the overall project cost, and are discretionary with the agency. Predicted user rates heavily influence the final grant share to ensure comparability with rates in similar systems. Grant and loan funds are released at the end of construction, so interim financing is required through either SRF or INTERCAP programs. Applications can be submitted anytime, are not competitive, but require agency approval and available funds. RD also requires water metering for water or sewer projects, except where private wells are used.

RD grant and loan funds can be combined with other funding sources, with priority given to projects that have secured funds and acquired all necessary rights of way or property. Loans typically have a 40-year term or match the facility's useful life and require a 10% excess coverage reserve collected monthly. Additionally, a reserve for short-lived assets is included in projected rates to cover replacement of mechanical system components.

Based on the guidelines above and a MHI of $55,051 according to RD sources, the City of East Helena would not be eligible for any grant funding but could use loan funds from RD.

8.2.2 Funding Recommendations

Applications to the MCEP, RRGL, and CDBG grant programs will all necessitate public meeting(s) and/or hearings once a completed preliminary engineering report is available and funding applications are prepared. Requirements are specific to each program, and the respective agencies should be consulted for exact stipulations on type and number of meetings or hearings, as well as advertising requirements.

The proposed funding strategy presented below in **Table 8.3** focuses on the best viable approach for the City based on current funds available. It should be noted that East Helena recently adopted Development Fees that are collected at Final Plat Approval for all new subdivisions within the City's annexed boundary. Depending on the timing of the Phase 2 project, it is possible that some Development Fees may be available to allocate to the proposed funding strategy.

Table 8.3 – Proposed Phase 2 Project Funding Strategy

MCEP Grant	$750,000
RRGL Grant	$125,000
CDBG Grant	$750,000
SRF Forgiveness (Grant)	$850,000
SRF Loan	$21,108,800
Proposed Phase 2 Total Project Cost	**$23,583,800**

8.2.3 Potential Rate Increase

The City intends to submit grant applications to MCEP, RRGL, and CDBG as well as request principal forgiveness from the SRF program for a total of $2,475,000 in grants. The remaining $21,108,800 balance for the Phase 2 project will be financed through a SRF loan. Assuming an interest rate of 2.50% on a 30-year SRF loan, the average monthly cost increase per equivalent dwelling unit (EDU) would be in the range of $60 per month as shown in **Table 8.4**. Depending on the final construction cost and required increase for operation and maintenance (O&M) expenses, this value could vary.

Table 8.4 – Estimated Phase 2 Project Rate Calculations

SRF Loan Amount (includes Loan Reserve)	$21,623,215
Annual Loan Payment	$1,028,830
Excess Coverage (10%)	$102,883
Annual O&M Increase	$160,486
Short Lived Assets	$44,450
Total Annual Revenue Required	**$1,336,649**
Estimated EDUs (June 2027)	1,820
Estimated Monthly Rate Increase	**$61.20**

8.3 Implementation Schedule

8.3.1 Proposed Project Schedule

The proposed project schedule is based on experience with similar projects and does not allow for any unusual delays. For Phase 2, the preliminary schedule shows project initiation in December 2025 with construction anticipated to be complete in the fall of 2029. Note that actual dates will depend on available funding, agency coordination, and other implementation issues. Major milestones and dates for the proposed Phase 2 project are shown below:

Oxidation Ditch Equipment Pre-Selection	Dec 2025 – Feb 2026
Pre-Design & MDEQ Coordination	Mar 2026 – May 2026
Design & Bidding	Mar 2026 – Jun 2027
Construction	Jul 2027 – Sep 2029
Start-up of Treatment Train #1	Oct 2028 – Dec 2028
Warranty Inspection & Closeout	Jan 2030 – Oct 2030

8.4 Public Involvement

Public involvement is a key element for any planning document and subsequent infrastructure project. Formal presentations regarding the proposed project were given at two regularly scheduled City Council meetings open to the public. These meetings were used to solicit citizen input on the wastewater improvements, any environmental concerns associated with the project, and information on the funding applications to be submitted. Documentation of this public process, including copies of the presentation materials, meeting agendas, and meeting minutes, are located in **Appendix F**.

8.4.1 First Public Meeting

The first public meeting to discuss the facility plan was held on August 19, 2025. The meeting was advertised on the City’s website and posted on the doors at City Hall. The presentation was aimed at updating the public on the need for a planning document, the condition of the existing WWTP facilities, the projected influent flows and loads, effluent limitations and disposal options, the current status of the Phase 1 project, and possible alternatives for secondary treatment and solids handling improvements. The talk ended with next steps and the opportunity for questions from the public.

8.4.2 Second Public Meeting

On September 16, 2025, a second public meeting was held to further discuss the facility plan. Again, the meeting was advertised on the City’s website and posted on the doors at City Hall. The agenda for the presentation included a discussion on the analysis that was performed for both the secondary treatment and solids handling alternatives, as well as project phasing, implementation and funding sources. Potential environmental concerns and mitigation measures were communicated during the meeting. The presentation ended with next steps and the opportunity for questions from the public.

8.4.3 Third Public Meeting

A third public meeting is scheduled for November 18, 2025 to present a preliminary funding strategy, potential user rates, and possible next steps for the Phase 2 project. Depending on input from the public, the Council will consider approving the facility plan and adopting the recommendations presented in the facility plan.

APPENDIX A

MPDES Permit, Fact Sheet, and Renewal Documentation

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RECEIVED
OCT 07 2019
CITY OF
EAST HELENA, MT

Minor POTW
Permit No.: MT0022560

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

AUTHORIZATION TO DISCHARGE UNDER THE MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with Montana Water Quality Act, Title 75, Chapter 5, Montana Code Annotated (MCA) and the Federal Water Pollution Control Act (the "Clean Water Act"), 33 U.S.C. § 1251 *et seq.*,

City of East Helena

is authorized to discharge from its **domestic wastewater treatment plant**

located at **3330 Plant Road,**

to receiving waters named **Prickly Pear Creek**

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein. Authorization for discharge is limited to those outfalls specifically listed in the permit.

This permit shall become effective **December 1, 2019**.

This permit and the authorization to discharge shall expire at midnight, **November 30, 2024**.

FOR THE MONTANA DEPARTMENT OF
ENVIRONMENTAL QUALITY

Jon Kenning, Chief
Water Protection Bureau
Water Quality Division

Issuance Date: October 4, 2019

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I. EFFLUENT LIMITATIONS, MONITORING REQUIREMENTS & OTHER CONDITIONS

A. Description of Discharge Points and Mixing Zone

The authorization to discharge provided under this permit is limited to those outfalls specially designated below as discharge locations. Discharges at any location not authorized under an MPDES permit is a violation of the Montana Water Quality Act and could subject the person(s) responsible for such discharge to penalties under the Act. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge within a reasonable time from first learning of an unauthorized discharge could subject such person to criminal penalties as provided under Section 75-5-632 of the Montana Water Quality Act.

Outfall	Description
001	Location: At the end of the pipe, discharging into Prickly Pear Creek, located at approximately 46°36'38" N latitude, 111°56'15" W longitude. Mixing Zone: 8.2 mgd for nutrients 1.35 mgd for copper, chronic aquatic life 0.14 mgd for copper, acute aquatic life Treatment Works: Minor, mechanical plant with metals removal UV disinfection, and aerobic sludge storage. Average daily design flow 0.44 million gallons per day.

B. Effluent Limitations

Outfall 001

Final Limitations

Beginning on the effective date of the permit and lasting through the term of the permit, the quality of effluent discharged by the facility shall, as a minimum, meet the limitations as set forth below:

Parameter	Units	Average Monthly Limitation (1)	Average Weekly Limitation (1)	Maximum Daily Limitation (1)
5-day Biochemical Oxygen Demand (BOD$_5$)	mg/L	30	45	--
	lb/day	109	163	--
	% removal	85 (2)	--	--
Total Suspended Solids (TSS)	mg/L	30	45	--
	lb/day	109	163	--
	% removal	85 (2)	--	--
pH	S.U.	In the range of 6.0 – 9.0		
E. coli Bacteria, summer (3)	Number of organisms /100 mL	126	252	--
E. coli Bacteria, winter (4)	Number of organisms /100 mL	630	1,260	--
Total Nitrogen Load (5) (6)	lb/day	53.3	--	--
Total Phosphorus as P Load (7)	lb/day	11.2	--	--
Total Phosphorus as P Load (8)	lb/day	5.5	--	--
Copper, Total Recoverable	µg/L	11.7	--	17.5

Footnotes:

(1) See Definition section at end of permit for explanation of terms.
(2) Average monthly minimum.
(3) This limit applies during the period April 1 through October 31.
(4) This limit applies during the period November 1 through March 31.
(5) Calculated from the sum of Nitrate + Nitrite as N and Total Kjeldahl Nitrogen (TKN) concentrations.
(6) This limit applies year round
(7) This limit applies October – June
(8) This limit applies July - September

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge which causes visible oil sheen in the receiving stream.

C. Monitoring Requirements

As a minimum, upon the effective date of this permit through the term of the permit, the following constituents shall be monitored at the frequency and with the type of measurement indicated.

The permittee must monitor the discharge from Outfall 001 at the last point of control following treatment (post metals treatment).

Samples shall be collected, preserved and analyzed in accordance with approved procedures listed in 40 CFR 136. Influent sample collection and flow monitoring must occur prior to the equalization basin or any recycle flow returns. Effluent flow monitoring must account for all draw-off and returns flows. Metals shall be analyzed as total recoverable.

If no discharge occurs during the entire monitoring period, it shall be stated on the Discharge Monitoring Report (DMR) Form that no discharge or overflow occurred.

The Required Reporting Value (RRV) is the detection level that must be achieved in reporting surface water monitoring or compliance data to the Department. The RRV is the Department's best determination of a level of analysis that can be achieved by the majority of the commercial, university, or governmental laboratories using EPA-approved methods or methods approved by the Department.

Outfall 001 Self-Monitoring Requirements

Parameter	Unit	Sample Location	Sample Frequency	Sample Type (1)	Reporting Requirements	Reporting Frequency	RRV
Flow	mgd	Effluent	Continuous	(2)	Average Monthly/Daily Maximum	Monthly	--
5-Day Biological Oxygen Demand (BOD_5)	mg/L	Influent	3/Week	Composite	Average Monthly/ Maximum Weekly		2
	mg/L	Effluent	3/Week	Composite			2
	lb/day	Effluent	1/Month	Calculated			--
	% Removal (3)	Effluent	1/Month	Calculated	Average Monthly		--
Total Suspended Solids (TSS)	mg/L	Influent	3/Week	Composite	Average Monthly/ Maximum Weekly		10
	mg/L	Effluent	3/Week	Composite			10
	lb/day	Effluent	1/Month	Calculated			--
	% Removal (3)	Effluent	1/Month	Calculated	Average Monthly		--
pH	s.u.	Effluent	Daily	Instantaneous	Minimum and Maximum		0.1
E. coli Bacteria (4)	Number of organisms/100 mL	Effluent	3/Week	Grab	Monthly/ Weekly Geo Mean		1
Total Ammonia as N	mg/L	Effluent	1/Month	Composite	Report		0.1
Nitrate + Nitrite as N	mg/L	Effluent	1/Week	Composite	Average Monthly		0.05
Total Kjeldahl Nitrogen	mg/L	Effluent	1/Week	Composite			0.1
Total Nitrogen (5)	mg/L	Effluent	1/Month	Calculated			--
	lb/day	Effluent	1/Month	Calculated			--
Total Phosphorus as P	mg/L	Effluent	1/Week	Composite			--
	lb/day	Effluent	1/Month	Calculated			--
Oil and Grease	mg/L	Effluent	1/Quarter	Grab	Report	Quarterly	1
Arsenic, Total Recoverable (2)	µg/L	Effluent	1/Month	Composite	Average Monthly / Daily Maximum	Monthly	3
Copper, Total	µg/L	Effluent	1/Month	Composite			1
Lead, Total Recoverable	µg/L	Effluent	1/Quarter	Composite	Report	Quarterly	0.5
Zinc, Total Recoverable	µg/L	Effluent	1/Quarter	Composite			10

Footnotes:
(1) See Definition section at end of permit for explanation of terms.
(2) Requires recording device or totalizer; permittee shall report daily maximum and daily average flow on DMR.
(3) Percent (%) Removal shall be calculated using the monthly average values.
(4) Report Geometric Mean if more than one sample is collected during reporting period.
(5) Calculated as the sum of Nitrate + Nitrite as N and Total Kjeldahl Nitrogen (TKN) concentrations.

2. Reporting Requirements

Load Calculations

In addition to reporting the concentration values, the monthly loads expressed in pounds per day (lb/day) must be calculated and reported for BOD_5, TSS, total phosphorus as P and total nitrogen. The monthly loads must be calculated using the average daily flow rate and daily average parameter concentration as shown in the following equations:

Load (lb/day)
Parameter concentration (mg/L) x Effluent Flow Rate (mgd) x (8.34)

Percent (%) Removal
The percent removal shall be calculated using the following formula:

$$\% \text{ Removal} = \frac{(\textit{Influent Concentration}) - (\textit{Effluent Concentration})}{(\textit{Influent Concentration})} \text{ X } 100$$

Where:

Influent Concentration = Corresponding 30-day average influent concentration based on the analytical results of the reporting period.

Effluent Concentration = Corresponding 30-day average effluent concentration based on the analytical results of the reporting period.

Average Monthly Limit (AML)

The AML or 30-day average is the Arithmetic Average or mean (except for *E. coli* bacteria) of all of the Daily Discharge samples collected during a calendar month, as defined in Part V of the permit. If only one sample is collected, then it is considered to be the 30-day average and reported on the DMR.

Average Weekly Limit (AWL)

The AWL or 7-day average is the Arithmetic Average or mean (except for *E. coli* bacteria) of all of the Daily Discharge samples collected during a calendar week, as defined in Part V of the permit. If only one sample is collected during the calendar week it is considered the 7-day average. The highest 7-day average of the monitoring period shall be reported on the 7-day average blank on the DMR. In cases where only one sample is collected during the entire monitoring period, that sample shall be reported as both the 30-day and 7-day averages.

D. Special Conditions

1. Sewage Sludge:

The use or disposal of sewage sludge must be in conformance with the Environmental Protection Agency (EPA) requirements at 40 CFR 503.

The permittee shall not dispose of sewage sludge such that any portion thereof enters any state water, including ground water. The permittee shall notify the Department in writing 45 days prior to any change in sludge management at the facility.

2. Instream Monitoring

The permittee shall monitor Prickly Pear Creek at the previously established CRK-A sample point, upstream of Outfall 001 and not under the influence of the discharge, for the parameters listed.

Ambient Water Quality Prickly Pear Creek Monitoring Requirements

Parameter	Units	Sample Location	Sample Frequency	Sample Type (1)	RRV
pH	s.u.	Instream	1/Quarter	Instantaneous	0.1
Temperature	°C	Instream	1/Quarter	Instantaneous	--
Total Ammonia as N	mg/L	Instream	1/Quarter	Grab	0.1
Total Hardness as $CaCO_3$	mg/L	Instream	1/Quarter	Grab	10
Arsenic, Total Recoverable	µg/L	Instream	1/Quarter	Grab	3
Copper, Total Recoverable	µg/L	Instream	1/Quarter	Grab	1
Lead, Total Recoverable	µg/L	Instream	1/Quarter	Grab	0.5
Zinc, Total Recoverable	µg/L	Instream	1/Quarter	Grab	10

Footnotes:
(1) See Definition section at end of permit for explanation of terms

3. East Helena's Pollutant Minimization Program (PMP)

A pollutant minimization program (PMP) is a structured set of activities designed to improve processes and pollutant controls that will prevent and reduce pollutant loadings. East Helena has met highest attainable condition for total nitrogen and total phosphorus and will adopt and implement a PMP reflecting the greatest pollutant reduction achievable. East Helena needs and is eligible for a General Variance from the Montana Base Numeric Nutrient Standards found in DEQ-12B.

East Helena is required to conduct the following PMP activities:

Action Item 1: Continue Current Advanced Operational Strategies throughout the Term of the Permit

a. Continue cycling aeration on and off in the bioreactor to create periodic anoxic conditions for denitrification.

b. Continue to operate and maintain the tertiary filtration process.

c. Throughout the permit term and in the operation and maintenance manual, continue to maintain in progress documentation of following operational strategies effective toward reducing nutrients, as applicable:

- identification of aerators and mixers used or taken offline
- aeration cycle times
- oxygen reduction potential (ORP) target points
- variable frequency drive set points
- target mixed liquor suspended solids (MLSS) concentration for summer and winter
- return and wasting strategies
- seasonal adjustments

Action Item 2: Evaluate Nutrient Reduction Measures

a. Submit annual reports addressing the following:

- Identify nutrient reduction measures implemented that year.
- Evaluate the effectiveness of each implemented nutrient reduction measure.
- Propose nutrient reduction measures for the upcoming year.

The annual reports will be due January 28th of each year, beginning January 28, 2020.

E. Pretreatment Requirements

1. The Permittee shall not allow any user to introduce into a POTW any pollutants which cause Pass Through or Interference. These general prohibitions, and the specific prohibitions in Part I.E.2 of this rule, apply to all non-domestic sources introducing pollutants into a POTW whether or not the source is subject to other national pretreatment standards or any national, state or local pretreatment requirements.

2. In addition, the following pollutants may not be introduced into a POTW:

   a. Pollutants which create a fire or explosion hazard in the POTW, including waste streams with a closed cup flashpoint of less than 60 degrees Celsius (140 degrees Fahrenheit) using the test methods specified in 40 CFR 261.21;

   b. Pollutants which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, unless the works is specifically designed to accommodate such discharges;

   c. Solid or viscous pollutants in amounts which will cause obstruction to the flow in the POTW resulting in interference;

d. Any pollutant, including oxygen-demanding pollutants (BOD_5, etc.), released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW;

e. Heat in amounts which will inhibit biological activity in the POTW resulting in interference, but in no case heat in such quantities that the temperature at the POTW treatment plant exceeds 40 degrees Celsius (104 degrees Fahrenheit) unless the department, upon request of the POTW, approves alternative temperature limits;

f. Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that will cause Interference or Pass Through;

g. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems; and

h. Any trucked or hauled pollutants, except at discharge points designated by the POTW.

3. Publicly-Owned Treatment Works. All POTWs must provide adequate notice to the Department of the following:

   a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to federal effluent guidelines and standards (40 CFR Subchapter N) if it were directly discharging those pollutants;

   b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit; and

   c. For the purposes of this paragraph, adequate notice shall include information on:

      (1) The quality and quantity of effluent introduced into the POTW, and

      (2) Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling
Samples taken in compliance with the monitoring requirements established under Part I shall be collected from the effluent stream prior to discharge into the receiving waters. Samples and measurements shall be representative of the volume and nature of the monitored discharge. Sludge samples shall be collected at a location representative of the quality of sludge immediately prior to use-disposal practice.

B. Monitoring Procedures
Monitoring must be conducted according to test procedures approved under Part 136, Title 40 of the Code of Federal Regulations, unless other test procedures have been specified in this permit. See Part I.C. for any applicable sludge monitoring procedures. All flow-measuring and flow-recording devices used in obtaining data submitted in self-monitoring reports must indicate values within 10 percent of the actual flow being measured.

C. Penalties for Tampering
The Montana Water Quality Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $25,000, or by imprisonment for not more than six months, or by both.

D. Reporting of Monitoring Results
Effluent monitoring results obtained during the previous month(s) shall be summarized for each month and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. If no discharge occurs during the reporting period, “no discharge” shall be reported. Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with the “Signatory Requirements” (see Part IV.G of this permit), and submitted to the Department at the following address:

Montana Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, Montana 59620- 0901

E. Compliance Schedules
Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Additional Monitoring by the Permittee
If the permittee monitors any pollutant more frequently than required by this permit, using approved analytical methods as specified in this permit, the results of this

monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

G. Records Contents

Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The initials or name(s) of the individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The time analyses were initiated;
5. The initials or name(s) of individual(s) who performed the analyses;
6. References and written procedures, when available, for the analytical techniques or methods used; and
7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results.

H. Retention of Records

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time. Data collected on site, copies of Discharge Monitoring Reports, and a copy of this MPDES permit must be maintained on site during the duration of activity at the permitted location.

I. Twenty-Four Hour Notice of Noncompliance Reporting

1. The permittee shall report any serious incident of noncompliance affecting the environment as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Water Quality Division at (406) 444-5546 or the Office of Disaster and Emergency Services at (406) 841-3911. The following examples are considered serious incidents:

   a. Any noncompliance which may seriously endanger health or the environment;

b. Any unanticipated bypass which exceeds any effluent limitation in the permit (See Part III.G of this permit, "Bypass of Treatment Facilities"); or

c. Any upset which exceeds any effluent limitation in the permit (See Part III.H of this permit, "Upset Conditions").

2. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

   c. The estimated time noncompliance is expected to continue if it has not been corrected; and

   d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

3. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Protection Bureau, by phone, (406) 444-5546.

4. Reports shall be submitted to the addresses in Part II.D of this permit, "Reporting of Monitoring Results".

J. Other Noncompliance Reporting
Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D of this permit are submitted. The reports shall contain the information listed in Part II.I.2 of this permit.

K. Inspection and Entry
The permittee shall allow the head of the Department or the Regional Administrator, or an authorized representative upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

4. Sample or monitor at reasonable times, for the purpose of assuring permit compliance, any substances or parameters at any location.

III. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give the Department advance notice of any planned changes at the permitted facility or of an activity which may result in permit noncompliance.

B. Penalties for Violations of Permit Conditions

The Montana Water Quality Act provides that any person who violates a permit condition of the Act is subject to civil or criminal penalties not to exceed $25,000 per day or one year in prison, or both, for the first conviction, and $50,000 per day of violation or by imprisonment for not more than two years, or both, for subsequent convictions. MCA 75-5-611(a) also provides for administrative penalties not to exceed $10,000 for each day of violation and up to a maximum not to exceed $100,000 for any related series of violations. Except as provided in permit conditions on Part III.G of this permit, "Bypass of Treatment Facilities" and Part III.H of this permit, "Upset Conditions", nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, as a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance.

F. Removed Substances

1. Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be disposed of in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge shall not be directly blended with or enter either the final plant discharge and/or waters of the United States.

2. Any sludges removed from the facility shall be disposed of in accordance with 40 CFR 503, 258 or other applicable rule. EPA and MDEQ shall be notified at least 180 days prior to such disposal taking place.

3. The permittee shall provide certification that all applicable provisions of 40 CFR Parts 503 and 258 have been met for the land application or landfill disposal of sewage sludge. Certification shall be submitted annually with the sludge reporting form and must contain the following statement:

> "I certify under penalty of law, that all of the applicable provisions of 40 CFR Part (503/258) have been met when municipal sewage sludge is (beneficially used/disposed of at a landfill). This determination has been made under my direction and supervision in accordance with the system designed to ensure that qualified personnel properly gather and evaluate the information used to determine that 40 CFR Part (503/258) have been met. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

G. Bypass of Treatment Facilities

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Parts III.G.2 and III.G.3 of this permit.

2. Notice:

   a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten (10) days before the date of the bypass.

   b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.I of this permit, "Twenty-Four Hour Reporting".

3. Prohibition of bypass:

   a. Bypass is prohibited, and the Department may take enforcement action against a permittee for a bypass, unless:

      (1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

      (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

      (3) The permittee submitted notices as required under Part III.G.2 of this permit.

   b. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in Part III.G.3.a of this permit.

H. Upset Conditions

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of Part III.H.2 of this permit are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review (i.e. Permittees will have the opportunity for a judicial determination on any claim of upset only in an enforcement action brought for noncompliance with technology-based permit effluent limitations).

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred, and that the permittee can identify the cause(s) of the upset;

   b. The permitted facility was at the time being properly operated;

   c. The permittee submitted notice of the upset as required under Part II.I of this permit, "Twenty-Four Hour Notice of Noncompliance Reporting"; and

d. The permittee complied with any remedial measures required under Part III.D of this permit, "Duty to Mitigate”.

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

IV. GENERAL REQUIREMENTS

A. Planned Changes

The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

1. The alteration or addition could significantly change the nature or increase the quantity of pollutant discharged. This notification applies to pollutants which are not subject to effluent limitations in the permit; or
2. There are any planned substantial changes to the existing sewage sludge management practices of storage and disposal. The permittee shall give the Department notice of any planned changes at least 180 days prior to their implementation.

B. Anticipated Noncompliance

The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

C. Permit Actions

This permit may be revoked, modified and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application must be submitted at least 180 days before the expiration date of this permit.

E. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for revoking, modifying and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

F. Other Information

When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information with a narrative explanation of the circumstances of the omission or incorrect submittal and why they weren't supplied earlier.

G. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified.

1. All permit applications shall be signed by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Department shall be signed by a person described above or by a duly authorized representative of that person. A person is considered a duly authorized representative only if:

   a. The authorization is made in writing by a person described above and submitted to the Department; and

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or an individual occupying a named position.)

3. Changes to authorization. If an authorization under Part IV.G.2 of this permit is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part IV.G.2 of this permit must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports

The Montana Water Quality Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more that $25,000 per violation, or by imprisonment for not more than six months per violation, or by both.

I. Availability of Reports
Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by the Clean Water Act, permit applications, permits and effluent data shall not be considered confidential.

J. Oil and Hazardous Substance Liability
Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

K. Property Rights
This permit does not convey any property rights of any sort, or any exclusive privilege.

L. Severability
The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers
This permit may be automatically transferred to a new permittee if:

1. The current permittee notifies the Department at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them;

3. The Department does not notify the existing permittee and the proposed new permittee of an intent to revoke or modify and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Part IV.M.2 of this permit; and

4. Required annual and application fees have been paid.

N. Fees
The permittee is required to submit payment of an annual fee as set forth in ARM 17.30.201. If the permittee fails to pay the annual fee within 90 days after the due date for the payment, the Department may:

1. Impose an additional assessment consisting of 15% of the fee plus interest on the required fee computed at the rate established under 15-31-510(3), MCA, or

2. Suspend the processing of the application for a permit or authorization or, if the nonpayment involves an annual permit fee, suspend the permit, certificate or authorization for which the fee is required. The Department may lift suspension at any time up to one year after the suspension occurs if the holder has paid all outstanding fees, including all penalties, assessments and interest imposed under this sub-section. Suspensions are limited to one year, after which the permit will be terminated.

O. Reopener Provisions

This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary), or other appropriate requirements if one or more of the following events occurs:

1. Water Quality Standards: The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.

2. Water Quality Standards are Exceeded: If it is found that water quality standards or trigger values in the receiving stream are exceeded either for parameters included in the permit or others, the department may modify the effluent limits or water management plan.

3. TMDL or Wasteload Allocation: TMDL requirements or a wasteload allocation is developed and approved by the Department and/or EPA for incorporation in this permit.

4. Water Quality Management Plan: A revision to the current water quality management plan is approved and adopted which calls for different effluent limitations than contained in this permit.

5. Sewage Sludge: There have been substantial changes (or such changes are planned) in sludge use or disposal practices; applicable management practices or numerical limitations for pollutants in sludge have been promulgated which are more stringent than the requirements in this permit; and/or it has been determined that the permittee's sludge use or disposal practices do not comply with existing applicable state or federal regulations.

V. DEFINITIONS

1. **"Act"** means the Montana Water Quality Act, Title 75, chapter 5, MCA.
2. **"Administrator"** means the administrator of the United States Environmental Protection Agency.
3. **"Acute Toxicity"** occurs when 50 percent or more mortality is observed for either species (See Part I.C of this permit) at any effluent concentration. Mortality in the control must simultaneously be 10 percent or less for the effluent results to be considered valid.
4. **"Annual Average Load"** means the arithmetic mean of all 30-day or monthly average loads reported during the calendar year for a monitored parameter.
5. **"Arithmetic Mean" or "Arithmetic Average"** for any set of related values means the summation of the individual values divided by the number of individual values.
6. **"Average Monthly Limitation"** means the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
7. **"Average Weekly Limitation"** means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.
8. **"BOD_5"** means the five-day measure of pollutant parameter biochemical oxygen demand.
9. **"Bypass"** means the intentional diversion of waste streams from any portion of a treatment facility.
10. **"$CBOD_5$"** means the five-day measure of pollutant parameter carbonaceous biochemical oxygen demand.
11. **"Composite Samples"** shall be flow proportioned. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sample shall not be less than six (6) hours nor more than 24 hours. Acceptable methods for preparation of composite samples are as follows:
    a. Constant time interval between samples, sample volume proportional to flow rate at time of sampling;

b. Constant time interval between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at the time the sample was collected may be used;

c. Constant sample volume, time interval between samples proportional to flow (i.e. sample taken every "X" gallons of flow); and,

d. Continuous collection of sample, with sample collection rate proportional to flow rate.

12. **"Daily Discharge"** means the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonable represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the average measurement of the pollutant over the day.

13. **"Daily Maximum Limit"** means the maximum allowable discharge of a pollutant during a calendar day. Expressed as units of mass, the daily discharge is cumulative mass discharged over the course of the day. Expressed as a concentration, it is the arithmetic average of all measurements taken that day.

14. **"Department"** means the Montana Department of Environmental Quality (MDEQ) established by 2-15-3501, MCA.

15. **"Director"** means the Director of the Montana Department of Environmental Quality.

16. **"EPA"** means the United States Environmental Protection Agency.

17. **"Federal Clean Water Act"** means the federal legislation at 33 USC 1251, *et seq.*

18. **"Geometric Mean"** means the value obtained by taking the N^{th} root of the product of the measured values.

19. **"Grab Sample"** means a sample which is taken from a waste stream on a one-time basis without consideration of flow rate of the effluent or without consideration for time.

20. **"Indirect Discharge"** means the introduction of pollutants into a POTW from any non-domestic source regulated under Section 307(b), (c) or (d) of the Federal Clean Water Act.

21. **"Industrial User"** means a source of Indirect Discharge.

22. **“Instantaneous Maximum Limit”** means the maximum allowable concentration of a pollutant determined from the analysis of any discrete or composite sample collected, independent of the flow rate and the duration of the sampling event.

23. **"Instantaneous Measurement”**, for monitoring requirements, means a single reading, observation, or measurement.

24. **"Interference"** means a discharge which, alone or in conjunction with other contributing discharges

    a. Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and

    b. Therefore causes a violation of any requirement of the POTW's MPDES permit (including an increase in the magnitude or duration of a violation) or causes the prevention of sewage sludge use or disposal in compliance with the following statutes and regulations: Section 405 of the Clean Water Act; 40 CFR Part 503 - Standards for the Use and Disposal of Sewage Sludge; Resource Conservation and Recovery Act (RCRA); 40 CFR Part 258 - Criteria for Municipal Solid Waste Landfills; and/or any State regulations regarding the disposal of sewage sludge.

24. **“Maximum Daily Discharge Limitation”** means the highest allowable daily discharge.

25. **"Mixing Zone"** means a limited area of a surface water body or aquifer where initial dilution of a discharge takes place and where certain water quality standards may be exceeded.

26. **"Nondegradation"** means the prevention of a significant change in water quality that lowers the quality of high-quality water for one or more parameters. Also, the prohibition of any increase in discharge that exceeds the limits established under or determined from a permit or approval issued by the Department prior to April 29, 1993.

27. **"Pass Through"** means a discharge which exits the POTW into waters of the State of Montana in quantities or concentrations which, alone or in conjunction with other discharges, is a cause of a violation of any requirement of the POTW's MPDES permit (including an increase in the magnitude or duration of a violation).

28. **"POTW"** means a publicly owned treatment works.

29. **“Regional Administrator”** means the administrator of Region VIII of EPA, which has jurisdiction over federal water pollution control activities in the state of Montana.

30. **"Severe Property Damage"** means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

31. **"Sewage Sludge"** means any solid, semi-solid or liquid residue generated during the treatment of domestic sewage and/or a combination of domestic sewage and industrial waste of a liquid nature in a treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the incineration of sewage sludge or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works.

32. **"TIE"** means a toxicity identification evaluation.

33. **"TMDL"** means the total maximum daily load limitation of a parameter, representing the estimated assimilative capacity for a water body before other designated uses are adversely affected. Mathematically, it is the sum of wasteload allocations for point sources, load allocations for non-point and natural background sources, and a margin of safety.

34. **"TRE"** means a toxicity reduction evaluation.

35. **"TSS"** means the pollutant parameter total suspended solids.

36. **"Upset"** means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY DIVISION
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM (MPDES)

Fact Sheet

PERMITTEE:	City of East Helena
PERMIT NUMBER:	MT0022560
RECEIVING WATER:	Prickly Pear Creek
FACILITY INFORMATION:	
Name:	City of East Helena Wastewater Treatment Plant
Location:	3330 Plant Drive East Helena, MT 59635
Contact:	Steve Leitzke, Wastewater Superintendent P.O. Box 1170 East Helena, MT 59635
FEE INFORMATION:	
Number of Outfalls:	1 (for fee determination purposes)
Type of Outfall:	001 – Minor, Publicly-Owned Treatment Works (POTW), aerated, activated sludge mechanical with UV disinfection, metals treatment and continuous discharge to surface water.

Summary of changes from the 2009 permit proposed in this Fact Sheet:

- Ammonia limits are removed
- Total residual chlorine limits are removed
- The limits for lead and zinc are removed
- Effluent and instream monitoring for several metals are removed
- Requirements to monitor dissolved oxygen, temperature and hardness in the effluent are removed
- The requirement to conduct whole effluent toxicity (WET) testing is removed
- The copper limit is relaxed
- Limits on total nitrogen and total phosphorus are revised to reflect nutrient variance regulations and to incorporate the requirement to implement a Pollutant Minimization Plan

I. Permit Status

The current Montana Pollutant Discharge Elimination System (MPDES) permit for the City of East Helena Wastewater Treatment Plant (WWTP) became effective on October 1, 2009. It expired September 30, 2014. The Montana Department of Environmental Quality (DEQ) received an application and fees for renewal of MT0022560 on June 25, 2014. DEQ deemed the application complete, and the 2009-issued permit was administratively extended in a letter dated June 25, 2014.

II. Facility Information

A. Facility Description

The East Helena WWTP serves the residents and businesses of the City of East Helena and surrounding area with service to an estimated population of 2,085 (2014 renewal application). The WWTP is an aerated, activated sludge, Biolac treatment system, with metals removal and seasonal UV disinfection. The facility discharges to Prickly Pear Creek via Outfall 001. The present facility design flow is 0.44 million gallons per day (mgd). Minimum detention time is 16.2 hours (Robert Peccia & Associates 1986 and HDR Engineering, Inc. 2002 Operation and Maintenance Manuals). The effluent is disinfected seasonally (April through October) using ultra-violet (UV) light.

Effluent flow monitoring occurs prior to the UV disinfection system (See Attachment A). Water for irrigation of facility grounds and plant non-potable water use are drawn off after the final effluent flow monitoring point. Table 1 is a summary of the East Helena WWTP design criteria from the Robert Peccia & Associates 1986 and HDR Engineering, Inc. 2002 Operation and Maintenance Manuals.

Table 1. Current Design Criteria Summary – East Helena WWTP

Facility Description: Continuous discharge, mechanical, Bio-Lac activated sludge treatment system with, metals removal, UV disinfection and aerobic sludge storage.	
Construction Date: 2002. Metals removal completed in 2014.	Modification Date: NA
Design Year: 2021	
Design Population: 3,578	Population Served: ~2,000
Design Flow, Average Daily (mgd): 0.44	Design Flow, Peak Daily (mgd): 1.48
Minimum Detention Time (Activated Sludge System): 16.2 hours	
Design BOD Removal (%): 94	Design Load (lb/day): 576 lb/day
Design TSS Removal (%): 91	Design Load (lb/day): 608 lb/day (192 mg/L)
Collection System: Combined [ ] Separate [X]	
SSO Events (Y/N): yes	Number: one
Bypass Events: none reported	Number: NA
Inflow and Infiltration contribution (mgd): 0.010	Source: Inflow from curbs and gutters during run-off events

Disinfection: Yes	Type: UV
Discharge Method: Continuous	
Effluent Flow Primary Device: v-notch weir and staff gauge installed prior to plant non-potable water and irrigation draw off points.	
Effluent Secondary Flow Device: TN Tech Ultrasonic meter	
Sludge Storage: aerobic digester/stabilization	

The City of East Helena does not have a pretreatment program.

Inflow and Infiltration (I/I) is estimated at 0.3 mgd during run-off events and when Prickly Pear Creek is frozen. The City continues to try to locate the source(s) of I/I, but has not found them (2014 renewal application).

Biosolids are land applied on agricultural fields.

B. Effluent Characteristics

DEQ used June 2014 through August 2017 as the Period of Record (POR) for effluent characterization. This time frame is selected because the City of East Helena added a metals removal facility and brought it online in June 2014. Effluent data prior to that date is no longer representative of the facility's effluent quality. Data from the facility Discharge Monitoring Reports (DMR) for the POR are summarized in Table 2.

Table 2. DMR Effluent Characteristics for POR June 2014 through August 2017.

Parameter	Location	Units	Previous Permit Limit	Minimum Value	Maximum Value	Average Value	Number of Samples
Flow, Daily Average	Effluent	mgd	(1)	0.13	0.78	0.25	39
Biochemical Oxygen Demand (BOD_5)	Influent	mg/L	(1)	50.6	334	168	39
	Effluent	mg/L	45/30 (2)	2.5	65	5.1	39
	Effluent	% removal	85	94	99	97	39
	Effluent	lb/day	163/109 (2)	3.1	33	9.9	39
Total Suspended Solids (TSS)	Influent	mg/L	(1)	56	821	163	39
	Effluent	mg/L	45/30 (2)	4.0	104	5.6	39
	Effluent	% removal	85	89	99	96	39
	Effluent	lb/day	163/109 (2)	4.1	45	11	39
E. coli Bacteria (5)	Effluent	#/100 mL	252/126 (7)	1	16.5	3.7	23
E. coli Bacteria (6)	Effluent	#/100 mL	1260/630 (7)	1.1	53	4.3	15
pH	Effluent	s.u.	6.5-9.0	6.5	8.9	8.0	39
Temperature	Effluent	°C	(1)	2.6	22	11.2	39
Total Ammonia as N	Effluent	mg/L	1.72 (4)	<0.05	0.13	1.32	39
Total Kjeldahl Nitrogen	Effluent	mg/L	(1)	0.4	2.8	1.0	39
Nitrate + Nitrite as N	Effluent	mg/L	(1)	5.5	29.4	13.0	39
Total Nitrogen (TN) (9)	Effluent	mg/L	(1)	4.5	45.1	13.5	39
		lb/day	75.8/53.3 (2)	10.4	62.6	26.2	39
Total Phosphorus as P (TP)	Effluent	mg/L	(1)	0.09	1.75	0.69	39
		lb/day	16.5/11.2 (2)	0.35	4.4	1.5	39
Dissolved Oxygen (10)	Effluent	mg/L	(1)	0.8	8.7	4.2	39
Aluminum, Dissolved	Effluent	mg/L	(1)	<0.03	<0.03	<0.03	13
Antimony, Total Recoverable	Effluent	mg/L	(1)	<0.001	<0.003	<0.025	13
Arsenic, Total Recoverable	Effluent	mg/L	(1)	0.004	0.019	0.0097	13
Cadmium, Total Recoverable	Effluent	mg/L	(1)	<0.00008	<0.001	<0.0001	13
Copper, Total Recoverable	Effluent	mg/L	0.014/0.009 (3)	<0.001	0.017	0.008	35
Lead, Total Recoverable	Effluent	mg/L	0.078/0.003 (3)	<0.0005	0.003	0.0006	35
Zinc, Total Recoverable	Effluent	mg/L	0.12/0.12(3)	0.01	0.04	0.02	35
Oil and Grease	Effluent	mg/L	10 (4)	<1	<1	<1	39
Hardness (as $CaCO_3$)	Effluent	mg/L	(1)	34	126	111	39

Footnotes:

(1) No effluent limit in previous permit, monitoring requirement only.
(2) Weekly Average/Monthly Average Value.
(3) Daily Maximum/Monthly Average Value.
(4) Daily Maximum
(5) Sample period is April 1 through October 31.
(6) Sample period is November 1 through March 31.
(7) Weekly Geometric Mean Value/Monthly Geometric Mean Value.
(8) Instantaneous/Daily Maximum Value.
(9) Calculated as the sum of Nitrate + Nitrite as N and Total Kjeldahl Nitrogen (TKN) concentrations.
(10) Daily Minimum

C. Compliance History

The City of East Helena was cited for multiple violations of effluent limitations and permit conditions from the 2009 permit issuance until mid-2011. Water Protection Bureau compliance staff referred the City to the DEQ Enforcement Division for formal enforcement in July 2011. On January 22, 2013 DEQ and the City entered into an Administrative Order on Consent (Consent Order). The City implemented corrective actions to return to compliance. DEQ determined the City had satisfied the terms of the Consent Order and terminated it on February 26, 2016.

The City was cited for failing to collect an effluent sample in March 2017. Except for this minor violation, the City has remained in compliance with the permit since the termination of the 2013 Consent Order.

III. Proposed Technology-based Effluent Limits (TBELs)

A. Applicability

The Board of Environmental Review has adopted by reference 40 CFR 133 which set minimum treatment requirements for secondary treatment or equivalent for POTW (ARM 17.30.1209).

Secondary treatment is defined in terms of effluent quality as measured by BOD_5, TSS, percent removal of BOD_5 and TSS, and pH [National Secondary Standards (NSS)]. National secondary treatment requirements are described in 40 CFR 133 and incorporated into all municipal permits. The 2009 permit includes NSS limitations for BOD_5, BOD_5 percent removal, TSS, TSS percent removal and pH. These limits are maintained in this permit renewal.

ARM 17.30.1345(8) requires that all effluent limitations be expressed in terms of mass except for pollutants which cannot be appropriately expressed in terms of mass.

The following equation was used to calculate mass-based loading limits in pounds per day (lb/day) using NSS limitations at the facility design flow of 0.434 mgd.

$$\text{Load (lb/day)} = \text{Design Flow} \times \text{Concentration Limit (mg/L)} \times 8.34\ (\text{lb}\cdot\text{L})/(\text{mg}\cdot\text{gal})$$

<u>BOD_5 and TSS Mass-based Load Limitations:</u>

30-day average load (lb/day) = (0.434 mgd)(30 mg/L)(8.34) = 109 lb/day
7-day average load (lb/day) = (0.434 mgd)(45 mg/L)(8.34) = 163 lb/day

Loading limits for technology-based parameters of concern (BOD_5 and TSS) will apply to the effluent and will be maintained at the more stringent of the nondegradation allocations or mass-based loading limits calculated in this Fact Sheet.

B. Nondegradation Load Allocations

The provisions of ARM 17.30.701 - 718 (Nondegradation of Water Quality) apply to new or increased sources of pollution [ARM 17.30.702(18)]. Sources that are in compliance with the conditions of their permit and do not exceed the limitations established in the permit or determined from a permit previously issued by the Department are not considered new or increased sources.

Nondegradation threshold values for the East Helena WWTP were calculated for BOD_5 and TSS as part of the permit issuance in 1997 for the previous lagoon facility (design flow of 0.635 mgd). These nondegradation load allocations are maintained to determine if the facility is a new or increased source. The actual average loads discharged from the facility for the POR are presented below in Table 3. Actual loads for BOD_5 and TSS indicate that the facility did not exceed the nondegradation load values and the facility is not a new or increased source.

Table 3. Nondegradation and Actual Loads for POR

		Nondegradation Allocated Load	Actual 30-Day Annual Average Load				
Parameter	Units	30-Day Annual Average Load	2012	2013	2014	2015	2016
BOD_5	lb/day	158	8.7	7.7	13.7	11.9	5.8
TSS	lb/day	526	15.8	12.6	17.0	11.1	6.4

C. Proposed TBELS

Table 4. Outfall 001 Proposed TBELS

Parameter	Concentration (mg/L)		Load (lb/day)	
	Weekly Average (1)	Monthly Average (1)	Weekly Average (1)	Monthly Average (1)
BOD_5	45	30	163	109
TSS	45	30	163	109
pH, s.u	Within the range of 6.0 to 9.0 (instantaneous)			
BOD_5 Percent Removal [1] (%)	85 %			
TSS Percent Removal [1] (%)	85 %			

Footnote:
(1) See Definition section at end of permit for explanation of terms

IV. Water Quality-based Effluent Limits (WQBELs)

A. Scope and Authority

The Montana Water Quality Act (Act) states that a permit may only be issued if the Department finds that the issuance or continuance of the permit will not result in pollution of any state waters. Montana water quality standards require that no wastes may be discharged such that the waste either alone or in combination with other wastes will violate or can reasonably be expected to violate any standard. MPDES permits must include limits on all pollutants which will cause, or have a reasonable potential to cause an excursion of any water quality standard, including narrative standards. The purpose of this section is to provide a basis and rationale for establishing effluent limits, based on Montana water quality standards, that will protect designated uses of the receiving stream.

B. Receiving Water

The East Helena WWTP discharges to Prickly Pear Creek (PPC) approximately 500 meters downstream of the crossing at Wylie Drive. PPC is in the Upper Missouri River watershed as identified by USGS Hydrologic Unit Code 10030101, and Montana stream segment MT41I006_030, PPC Highway 433 (Wylie Drive) Crossing to Helena WWTP Discharge.

PPC is classified "I". The goal of the state of Montana is for class I waters to fully support: drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supplies [ARM 17.30.628(1)].

The 2016 303(d) list shows this segment of the creek as not fully supporting aquatic life, primary contact recreation, drinking water, and agricultural uses. Probable causes of impairment are identified as metals (arsenic, cadmium, copper, lead, and zinc), un-ionized ammonia, temperature, sedimentation/siltation, low flow alterations, physical substrate habitat alterations, total nitrogen, total phosphorus, and alteration in stream-side or littoral vegetative covers. The probable sources of these impairments include grazing in riparian or shoreline zones, irrigated crop production, on-site treatment systems (septic and similar decentralized systems), acid mine drainage, contaminated sediments, industrial point source discharge, habitat modification (other than hydromodification), and impacts from abandoned mine lands (inactive).

In August 2006, DEQ completed the *Framework Water Quality Restoration Plan and Total Maximum Daily Loads (TMDLs) for the Lake Helena Watershed Planning Area: Volume II – Final Report* (TMDL). The TMDL established wasteload allocations (WLA) for point sources and where applicable, incorporated a phased approach and adaptive management strategy for achieving those WLA. Specifics of the TMDL, with respect to the East Helena WWTF discharge, are provided in subsequent sections of this fact sheet.

PPC, in the area of discharge, historically experienced severely depleted stream flows in summer. The 2009-issued permit established the 7-day, 10-year low flow condition (7Q10) as zero (0) cfs for the purposes of discharge limit development. In 2008 a re-watering agreement was put into effect that reduced irrigation diversions during low flow periods in this portion of the stream. This agreement has continued to the present and the Lewis and Clark Water Quality Protection District has collected flow data at the Wylie Drive bridge crossing for over ten years. DEQ used this data and compared it to the upstream USGS gage 06061500 (Prickly Pear Creek near Clancy MT) to develop 7Q10 and 14Q5 flows at the location of the East Helena WWTF discharge. For development of permit limits in this renewal, the 7Q10 is 8.34 cfs and the 14Q5 is 12.7 cfs.

Fish species present in PPC include the longnose and white suckers, rainbow and brown trout, mottled sculpin and longnose dace. Early life stages of these species can be present year-round (*Spawning Times of Montana Fishes* D.Skaar, MFWP, March 2001).

The permittee conducted permit-required upstream monitoring in PPC at a road crossing in East Helena. Data were reported on the facility DMRs.

Ambient water quality data for nutrients in PPC upstream of the WWTP discharge are minimal. The few data available were collected either at the Highway 12 or Wylie Drive road crossings. TN and TP data were obtained between 2012 and 2014.

Instream monitoring data is summarized in Table 5 below.

Table 5. Prickly Pear Creek Upstream of Outfall 001

Parameter	Units	Number of Samples	Minimum	Maximum	75th Percentile
Total Nitrogen	mg/L	1	0.25	0.25	0.25
Total Phosphorus as P	mg/L	5	0.019	0.049	0.038
pH	s.u.	22	6.25	8.59	7.5
Temperature	°C	22	1	21	12
Total Ammonia as N	mg/L	22	<0.003	0.15	0.05
Total Hardness, as $CaCO_3$	mg/L	22	60	142	102 [1]
Aluminum, Dissolved	mg/L	22	0.03	0.25	0.05
Antimony, Total Recoverable	mg/L	22	0.001	0.003	0.003
Arsenic, Total Recoverable	mg/L	22	0.003	0.01	0.007
Cadmium, Total Recoverable	mg/L	22	0.00012	0.00083	0.0003
Copper, Total Recoverable	mg/L	22	0.001	0.011	0.0038
Lead, Total Recoverable	mg/L	22	0.001	0.03	0.0051
Zinc, Total Recoverable	mg/L	22	0.004	0.11	0.06

Footnotes:
(1) 25th Percentile

C. Applicable Water Quality Standards

Discharges to "I" class waters may not violate the specific water quality standards listed under ARM 17.30.628(2)(a through k). In addition, discharges are subject to ARM 17.30.635 through 637, 641, 645, and 646.

D. Mixing Zone

A mixing zone is an area where the effluent mixes with the receiving water and certain water quality standards may be exceeded. The Department must determine the applicability of currently granted or proposed mixing zones. Pollutant concentrations in the effluent must meet the applicable water quality standards at the end of pipe unless a mixing zone is recognized by the Department for that specific parameter in the permit.

Acute water quality standards for aquatic life may not be exceeded in any portion of the mixing zone unless the Department finds that allowing minimal initial dilution will not threaten or impair existing uses. The discharge must also be free from substances which will:

a. settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;

b. create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;

c. produce odors, colors or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;

d. create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; and

e. create conditions which produce undesirable aquatic life.

Although certain standards may be exceeded in a mixing zone, an effluent in its mixing zone may not block passage of aquatic organisms nor may it cause acutely toxic conditions. No mixing zone will be granted that will impair beneficial uses. Aquatic life-chronic, aquatic life-acute and human health standards may not be exceeded outside of a designated mixing zone.

A standard mixing zone may be granted for facilities which discharge less than 1 mgd or when mixing is nearly instantaneous. Nearly instantaneous mixing is assumed if the discharge is through an effluent diffuser, when the mean daily flow exceeds the 7-day, 10-year low flow (dilution ratio <1) or when the permittee demonstrates through a DEQ approved study plan that the discharge is nearly instantaneous. A nearly instantaneous mixing zone may not extend downstream more than two (2) stream widths.

Effluent discharges which do not qualify for a standard mixing zone must apply for a source specific mixing zone and must be the smallest practicable size; have minimal effects on uses; and, have definable boundaries. A person applying for a mixing zone must indicate the type of mixing zone and provide sufficient detail for DEQ to make a determination regarding the authorization of the mixing zone under the rules of Subchapter 5.

The City of East Helena requested a mixing zone but did not specify whether the request was for a standard mixing zone or source specific. The request did not include the level of analysis DEQ typically requires for a source specific mixing zone, especially with respect to the aquatic life standards. The East Helena discharge is to a braided segment of Prickly Pear Creek. Based on observations during a site visit in autumn 2017, the immediate area of the discharge is to a channel that contains less than half of the flow of Prickly Pear Creek. This channel merges with the rest of the stream flow approximately 280 feet downstream of the discharge location.

DEQ proposes to grant a standard mixing zone for chronic aquatic life criteria and nutrients. DEQ finds that source specific mixing zones for acute aquatic life copper criteria and human health criteria are appropriate and will protect beneficial uses of Prickly Pear Creek.

Because the receiving water flow to discharge flow dilution ratio is less than 100:1 (approximately 16:1) a standard mixing zone allows dilution with 25% of the 7Q10 flow chronic aquatic life water quality criteria. A standard mixing zone for nutrients allows dilution with the entire 14Q5 flow of the receiving water. The standard mixing zone dilution flows used for reasonable potential assessment and limit development are:

25% of 7Q10 flow = 1.35 mgd (2.1 cfs); for chronic aquatic life criteria.
14Q5 flow = 8.2 mgd (12.7 cfs); for total nitrogen and total phosphorus.

A standard mixing zone does not provide a dilution allowance for acute aquatic life criteria. DEQ may allow minimal initial dilution for acute criteria only after determining that doing so will not threaten or impair beneficial uses. DEQ and EPA mixing zone guidance recommend that any mixing zone for acute criteria be no more than 10 percent of the mixing zone for chronic criteria. This 10 percent value is considered "minimal initial dilution." Ten percent of the available chronic dilution flow at the East Helena discharge location is 0.54 mgd. Because the discharge from the East Helena WWTF is so small, and the minimal initial dilution is so slight, DEQ finds that granting a source specific mixing zone for acute aquatic life criteria is appropriate and will not threaten or impair beneficial uses.

The dilution flow for acute criteria is 0.14 mgd (0.22 cfs).

A source specific mixing zone for human health criteria is granted based on DEQ's determination that there is not a drinking water intake on Prickly Pear Creek downstream of the East Helena discharge. Allowing dilution with 100% of the 7Q10 will not impair the drinking water beneficial use. The dilution flow for human health criteria is:

100% of the 7Q10 flow = 5.4 mgd (8.34 cfs)

The standard and source specific mixing zones described above result in the following dilution allowances for reasonable potential assessments and WQBEL development, where necessary:

25% of 7Q10 for chronic aquatic life standards for total recoverable copper, lead, zinc.

2.5% of 7Q10 for acute aquatic life standards for total recoverable copper, lead, and zinc.

100% of 14Q5 for total nitrogen and total phosphorus.

100% of 7Q10 for nitrate plus nitrite and total recoverable arsenic

E. Basis and Proposed WQBELs

DEQ develops WQBELs for any pollutant of concern (POC) for which there is reasonable potential (RP) to cause or contribute to exceedances of instream numeric or narrative water quality standards. Pollutants and parameters are identified as POC for one or more of the following reasons:

- they have listed TBELs;
- they were identified as needing limits in the previous permit;
- they are identified as present in the effluent through monitoring or otherwise expected present in the discharge; or
- they are pollutants associated with impairment which may or may not have a WLA in a TMDL.

For the East Helena WWTF, DEQ evaluated the POC in **Table 6**.

Table 6. Identification of POC and Need for RP Analysis

Parameter	Basis for POC Identification	RP Analysis
5-day biochemical oxygen demand	TBELs, previous permit	RP not required – no standard
Total Suspended Solids	TBELs, previous permit	RP not required – no standard
pH	TBELs, previous permit	RP not required – TBEL sufficient
Oil & Grease	Previous permit	Narrative RP – ARM 17.30.637(1)
E.coli bacteria	Previous permit, known present	ARM 17.30.623-629
Total Residual Chlorine	Previous permit	Circular DEQ-7
Ammonia, as N	Known present, impairments	Circular DEQ-7, TMDL
Nitrate+Nitrite, as N	Known present	Circular DEQ-7
Total Nitrogen, Total Phosphorus	Known present, impairments	Circular DEQ-12A, TMDL
Arsenic, Total Recoverable	Known present, impairments	Circular DEQ-7, TMDL
Cadmium, Total Recoverable	Known present, impairments	Circular DEQ-7, TMDL
Copper, Total Recoverable	Known present, impairments	Circular DEQ-7, TMDL
Lead, Total Recoverable	Known present, impairments	Circular DEQ-7, TMDL
Zinc, Total Recoverable	Known present, impairments	Circular DEQ-7, TMDL

WQBELs must be developed for any pollutant for which there is reasonable potential (RP) for discharges to cause or contribute to exceedances of instream numeric or narrative water quality standards. RP calculations utilize the receiving water concentration, the maximum projected effluent concentration, the design flow of the wastewater treatment facility, and the applicable receiving water flow.

DEQ uses a mass balance equation to determine RP (*Equation 1*).

$$C_{RP} = \frac{C_d Q_d + C_s Q_s}{Q_d + Q_s} \qquad \textit{Eq. 1}$$

Where:

C_{RP} = receiving water concentration (RWC) after mixing, mg/L
C_d = maximum projected effluent concentration, mg/L
C_r = RWC upstream of discharge, mg/L
Q_r = applicable receiving water flow, mgd
Q_d = facility design flow rate, mgd

1. Conventional Pollutants

TSS and BOD_5: The facility provides a significant reduction in biological material and solids through secondary treatment (Section III). No additional WQBELs will be required for these parameters.

Oil and Grease (O&G): The 2009-issued permit limit for O&G is an instantaneous maximum limit of 10 mg/L, with a once per month monitoring requirement. All effluent sample results over the POR were less than the laboratory detection limit of 1 mg/L. Therefore, there is no RP for this parameter. The limit is removed from the renewed permit, and monitoring is reduced to quarterly.

***Escherichia coli* Bacteria:** The 2009 permit incorporates limits based on the Montana state standards for *E. coli* bacteria at the end of the discharge pipe. The Department is not granting a mixing zone for *E. coli* based on the requirement that state waters must be free from substances that are harmful or toxic to humans. The existing permit limits and monitoring requirements are maintained in this renewal.

2. Nonconventional Pollutants

Total Ammonia as N: Total ammonia as N limits are developed based on standards that account for a combination of pH and temperature of the receiving stream, the presence or absence of salmonid species, and the presence or absence of fish in early life stages. DEQ uses the 75th percentile of ambient pH and temperature data to establish the ammonia criteria for discharge permits.

Table 7, presents the total ammonia as N water quality standards for PPC using the ambient water quality data in Table 5.

Table 7. Total Ammonia as N Water Quality Standards for PPC

Condition	Period	Salmonids Present	Early Life Stages Present	Ambient Condition		Water Quality Standard (mg/L)
				pH	Temperature °C	
Acute	Annual	Yes	NA	7.5	NA	13.3
Chronic	Annual	NA	Yes		12 (4)	4.36

The maximum reported total ammonia as N value is 1.32 mg/L. The projected maximum effluent concentration for total ammonia as N was found following the method recommended by the EPA *Technical Support Document for Water Quality-based Toxics Control* (TSD, 1991). A multiplier of 1.25 was determined using Table 3-2 in the TSD (given a coefficient of variation of 1.60 and a sample size of 39 at the 95% confidence interval.) The projected maximum effluent concentration, the multiplier times the maximum reported concentration (1.25 * 1.32 mg/L), is 1.65 mg/L. The projected effluent concentration does not exceed either the acute or chronic water quality standard. RP does not exist for this parameter. The ammonia limits in the 2009 permit are removed in this permit renewal. Because the permittee must continue to operate the treatment system to ensure that an acceptable level of treatment is maintained, monthly ammonia monitoring is continued. Instream monitoring of pH, temperature and ammonia is reduced to quarterly.

Nitrate plus Nitrite – The maximum reported nitrate plus nitrite value is 29.4 mg/L. The water quality standard for nitrate is 10 mg/L. RP calculations are shown in Attachment B. The resulting instream concentration for nitrate plus nitrite after available dilution is 2.4 mg/L, which is less than the water quality standard. WQBELs for nitrate plus nitrite are not necessary. Monthly monitoring is required.

Nutrients (TN and TP): The 2009 permit incorporated nutrient limitations required by Phase I of the 2006 *Framework Water Quality Restoration Plan and Total Maximum Daily Loads (TMDLs) for the Lake Helena Watershed Planning Area* (TMDL). The limits, shown in Table 2, are expressed as average monthly and average weekly loads based on plant performance at that time.

In 2014 DEQ adopted numeric nutrient criteria (circular DEQ-12A) and a nutrient variance process (circular DEQ-12B) for wadeable streams in Montana. DEQ-12B was updated in 2017. In this permit renewal DEQ evaluated the East Helena discharge's reasonable potential to exceed the numeric nutrient criteria, developed WQBELs, and followed the process for a general variance described in DEQ-12B. The effluent limitations and conditions developed following these new regulations were compared to the current TMDL-based effluent limits and requirements as discussed below.

Reasonable Potential and WQBEL Analysis

The East Helena WWTF is located in the Middle Rockies (17) ecoregion. The numeric criteria for total nitrogen and total phosphorus are 0.3 mg/L and 0.03 mg/L respectively. Ambient concentrations of TN and TP upstream of the discharge, shown in Table 5, are 0.25 mg/L and 0.038 mg/L respectively. The facility seasonal DMR data (June, July, August) includes maximum reported effluent concentrations of 24.8 mg/L TN and 2.82 mg/L TP. Applying the TSD yields critical effluent concentrations of 31 mg/L TN (CV = 0.38; n = 18), and 4.4 mg/L TP (CV = 0.81; n = 18).

Using *Equation 1,* the 14Q5, facility design flow, and the above values, the resulting instream concentration for TN is 1.82 mg/L. This value is greater than the water quality criteria. The facility exhibits reasonable potential to exceed the water quality criteria and WQBELs for TN are necessary. RP calculations are shown in Attachment B.

For TP, the average, median, and 75th percentile concentrations in PPC are all greater than or equal to the water quality criteria, so there is no assimilative capacity or available dilution instream. Reasonable potential for an exceedance of the TP criteria exists because the critical effluent concentration is greater than the water quality criteria. WQBELs for TP are necessary. RP calculations are shown in Attachment B.

DEQ uses *Equation 1*, rearranged to solve for the maximum effluent concentration (C_d), also called the wasteload allocation (WLA), the facility may discharge without exceeding the instream water quality criteria.

$$C_d = WLA = \frac{Q_r C_r - Q_s C_s}{Q_d} \qquad \textit{Equation 2}$$

Where:

WLA = Maximum effluent concentration; mg/L
C_r = Water quality criteria; 0.30 mg/L TN, 0.030 mg/L TP
Q_r = Receiving water flow downstream of the discharge; 8.6 mgd
Q_s = Critical upstream receiving water flow; 8.2 mgd
C_s = Receiving water concentration upstream of discharge; 0.25 mg/L TN, 0.038 mg/L TP
Q_d = WWTF design flow; 0.44 mgd

The resulting WLA for TN is 1.23 mg/L. The stream concentration for TP is greater than the water quality criteria, so the WLA for TP is set equal to the criteria, 0.030 mg/L.

From the WLA, long term average concentrations and WQBELs are calculated using the methods described in DEQ-12A and Chapter 5 of the TSD. For nutrients, DEQ calculates an average monthly limit (AML) only. The AML (concentration) is multiplied by the facility design flow and a conversion factor to develop an average monthly load limit. WQBELs for nutrients are expressed as both concentration and load limits. The WQBELs in Table 8 are applicable June, July, and August, each year.

Table 8. Nutrient WQBELs

Parameter	Average Monthly Limit, mg/L	Average Monthly Limit, lb/day
Total Nitrogen (1)	1.2	4.4
Total Phosphorus as P	0.03	0.1

Footnotes:
(1) Calculated from the sum of Nitrate + Nitrite as N and Total Kjeldahl Nitrogen (TKN) concentrations.

General Nutrient Standards Variance

In 2014 DEQ adopted a general variance for nutrients that permittees may request if required to comply with the base numeric nutrient standards. The variances are effective for up to 20 years from the date of adoption, at which time the effluent limits based on the water quality standard are effective.

As can be seen from the WWTF's TN and TP effluent concentrations shown in Table 2, the East Helena WWTF is unable to comply with the limits above. On February 26, 2018, the city requested a general variance for both nitrogen and phosphorus. The appropriate general variances that may apply to a facility are determined by the facility average design flow rate and are described in Department Circular DEQ-12B (2017). The East Helena WWTF is a mechanical treatment plant and the design flow is less than 1.0 mgd, which means the facility may be considered for the 10 mg/L TN and 1.0 mg/L TP variances.

The first step in determining the appropriate permit conditions based on DEQ-12B is to calculate the 95th percentile of the facility's representative effluent data prior to July 1, 2017. In 2014 East Helena completed a significant upgrade to add a metals removal treatment process to the WWTF. This process also significantly improved the removal of total phosphorus from the wastewater. Therefore, to evaluate the WWTF's nutrient treatment, DEQ calculated the 95th percentile of TN and TP concentrations between June 2014 and July 2017. Those values are 21 mg/L TN and 1.5 mg/L TP. DEQ also evaluated the facility's seasonal data (July - September) over the same timeframe; which results in 95th percentile concentrations of 12 mg/L TN and 1.4 mg/L TP. Since the 95th percentile in all cases is above the highest attainable condition treatment requirements (HAC) in DEQ-12B, effluent limits are based on the DEQ-12B, Table 12B-1 values of 10 mg/L TN and 1 mg/L TP.

Effluent limits are developed from the HAC values above, which are treated as long term average (LTA) concentrations (DEQ, *First Triennial Review of Base Numeric Nutrient Standards and Variances, April 2017*). DEQ uses the TSD to develop concentration-based effluent limits from the HAC values (LTA concentrations) using a default coefficient of variation (CV) of 0.6 and the appropriate LTA multiplier from TSD Table 5-2. This yields concentrations of 15.5 mg/L TN and 1.5 mg/L TP as average monthly values. DEQ-12B requires variance limits be expressed as loads only. So, the average monthly concentration values are multiplied by the facility design flow and a conversion factor to arrive at the average monthly load limits for the permit. The calculations are represented in the following equation:

(Table 12B-1 value)*(TSD Table 5-2 multiplier)*(Design flow)*(8.34 conversion) = load (lb/day)

The resulting load limits are 56.9 lb/day TN and 5.5 lb/day TP.

Comparing the HAC load limits to the existing permit limits shows that the existing load limit for TN (53.3 lb/day) is less than the HAC load limit above. East Helena has not exceeded this permit limit since January 2012. The existing TN limit is maintained in this permit renewal. This limit will continue to apply ~~year round~~year-round to maintain protection of Lake Helena.

The HAC limit for TP is less than half the existing load limit. However, given that the maximum reported TP load since June 2014 is 4.3 lb/day, it is apparent the facility is achieving the HAC load limit. DEQ proposes applying the 5.5 lb/day limit for TP during the growing season (July – September). To maintain protection of Lake Helena, the existing load limit of 11.2 lb/day will apply the rest of the year (October – June).

The City of East Helena WWTF discharge is achieving the HAC limits for both TN and TP. DEQ 12-B requires facilities achieving HAC-based effluent limits, but not achieving WQBELs, to develop a Pollutant Minimization Program (PMP), which must be incorporated into the permit. PMP requirements are discussed in Part VII of this Fact Sheet.

Lake Helena TMDL

The 2009 permit implemented Phase I of the TMDL, which required "no increase" in nutrient concentrations. Phase II of the TMDL requires optimization of the facility infrastructure as it currently exists. The goal of Phase III is to implement the necessary actions to reach the level of treatment to meet the TP and TN targets for Prickly Pear Creek (numeric criteria).

With this renewal, DEQ is incorporating the approved general variance for both TN and TP. The interim limits provided for under the variance apply, even if such limits differ from those that might otherwise apply based on a wasteload allocation derived in a TMDL (DEQ-12B, 2017).

Even though the variance requirements differ from Phase II of the TMDL, the overall approach and outcomes are similar. The variance establishes a reduced seasonal limit for TP and maintains the existing limit for TN, which is more stringent than the variance limit. These limits represent the "best attainable concentrations", as required by the TMDL. The variance also requires the Pollutant Minimization Plan, which aligns with the TMDL Phase II "Optimization" requirements.

Phase III of the TMDL is intended to implement WQBELs based on the numeric water quality criteria. These WQBELs are shown above in Table 7 and represent the target limits that would apply to the facility at the end of the variance term.

The approach taken above is consistent with the TMDL's Phase II requirements. The variance differs from the limits that would apply under the TMDL Phase III. However, the DEQ-12B HAC values are subject to review every three years. The HAC review process, together with the PMP requirement, provides a path toward establishing adaptive management strategies for implementing TMDL Phase III at the end of the variance term.

Total Residual Chlorine (TRC): The permittee utilizes UV disinfection rather than chlorination. The 2009-issued permit included WQBEL for TRC, in the event chlorination is employed at the facility. The facility has not used chlorine for disinfection during the current permit cycle and has no plans to do so. Chlorine is not stored on the site. The TRC limitations and monitoring are removed in this permit renewal.

pH: Pursuant to ARM 17.30.628(2)(c), the induced variation of hydrogen ion concentration within the range of 6.5 to 9.5 must be less than 0.5 pH units. Natural pH outside this range must be maintained without change. Natural pH above 7.0 must be maintained above 7.0. The 2009 permit limit for pH requires effluent pH to be maintained between 6.5 and 9.0 s.u. This limit and the daily monitoring requirement are maintained in this renewal.

3. Toxic Pollutants

Concentrations of carcinogenic, bio-concentrating, toxic, or harmful parameters which would remain in the water after conventional treatment may not exceed the applicable standards specified in Circular DEQ-7.

Metals - All metals discussions refer to the metals in their "total recoverable" fraction with the exception of aluminum which is regulated and monitored in the dissolved form.

For metals, the 2009 permit includes WQBELs and required monitoring for copper, lead, and zinc. Additional effluent monitoring is required for aluminum, antimony, arsenic, and cadmium. The permit also requires monitoring in PPC for aluminum, antimony, arsenic, cadmium, copper, lead, zinc, and hardness. These monitoring results are summarized in Tables 2 and 5.

Applicable surface water standards for aquatic life and human health for the ~~above mentioned~~above-mentioned metals are summarized in Table 9 for PPC. These standards are calculated using the 25th percentile value for the upstream total hardness data set obtained from the permittee's DMR forms. The 25th percentile, low hardness condition is used to be protective of the receiving water year-round.

Table 9. PPC Metals Surface Water Standards (Circular DEQ-7)

Parameter	Units	Required Reporting Value (RRV)	Human Health Standard	Aquatic Life Standard [(1)]	
				Acute	Chronic
Aluminum (Dissolved)	µg/L	30	--	750	87
Antimony, Total Recoverable	µg/L	3	5.6	--	--
Arsenic, Total Recoverable	µg/L	3	10	340	150
Cadmium, Total Recoverable	µg/L	0.08	5	2	0.3
Copper, Total Recoverable	µg/L	1	1,300	14.3	9.5
Lead, Total Recoverable	µg/L	0.5	15	84	3.3
Zinc, Total Recoverable	µg/L	10	2,000	120	120

Footnotes:
(1) Applicable metals standards calculated using the 25th percentile upstream total hardness value of 102.25 mg/L as $CaCO_3$

Aluminum – All analytical results for aluminum were below detection at the required reporting value (RRV). RP does not exist for this parameter. No limit is proposed and monitoring is not required in the renewed permit.

Antimony – All analytical results were below detection at the RRV. RP does not exist for this parameter. No limit is proposed and monitoring is not required in the renewed permit.

Cadmium – All analytical results were below detection. The RRV was achieved in 6 of the 13 samples. RP does not exist for this parameter. No limit is proposed and monitoring is not required in the renewed permit.

Arsenic – Arsenic was detected in all samples. Results ranged from 4 µg/L to 19 µg/L. DEQ used the TSD approach, as described previously, and *Equation 1* to assess RP to exceed the human health standard, where:

C_d = maximum projected effluent concentration; 27.7 µg/L (19 µg/L * TSD multiplier)
C_r = RWC upstream of discharge; 7 µg/L (75th percentile)
Q_r = applicable receiving water flow; 5.4 mgd (100% of 7Q10)
Q_d = facility design flow rate; 0.44 mgd

RP calculations are shown in Attachment B. The resulting concentration in PPC after available dilution is 9 µg/L, which is less than the human health standard for arsenic. RP does not exist and WQBELs are not necessary. Due to the presence of arsenic in the discharge, monthly monitoring is required.

Copper – Copper was detected in all but one sample over the POR. The results above detection ranged from 5 µg/L to 17 µg/L. As with arsenic, DEQ used *Equation 1* to assess RP to exceed the water quality standards, where:

C_d = maximum projected effluent concentration; 18.5 µg/L (17 µg/L * TSD multiplier)
C_r = RWC upstream of discharge; 4 µg/L (75th percentile)
Q_{rc} = receiving water flow for chronic; 1.35 mgd (25% of 7Q10)
Q_{ra} = receiving water flow for acute; 0.14 mgd (2.5% of 7Q10)
Q_d = facility design flow rate; 0.44 mgd

RP calculations are shown in Attachment B. The resulting concentrations in PPC are 7 µg/L for chronic copper, and 15 µg/L for acute. The acute concentration exceeds the 14.3 µg/L acute standard. RP exists for copper and WQBELs are necessary.

DEQ used *Equation 2* to establish a WLA for copper, where:

WLA = maximum concentration that may be discharged without exceeding the standard; µg/L
C_r = Aquatic life water quality criteria; 9.5 µg/L chronic, 14.3 µg/L acute
Q_r = Receiving water flow downstream of the discharge; 1.79 mgd chronic, 0.58 mgd acute
Q_s = Critical upstream receiving water flow; 1.35 mgd chronic, 0.14 mgd acute
C_s = Receiving water concentration upstream of discharge; 4 µg/L
Q_d = facility design flow; 0.44 mgd

Where there are both acute and chronic water quality standards, two WLA are calculated. The resulting WLA are 17.5 µg/L for acute and 27 µg/L for chronic. Long term average (LTA) concentrations that the facility should meet to ensure compliance with each WLA are calculated following the TSD. The minimum LTA is selected to calculate the WQBELs. In this case the chronic LTA is 19.3 µg/L and the acute is 9.2 µg/L. Limits are calculated from the acute LTA by applying the TSD Table 5-2 multiplier. The average monthly limit is 11.7 µg/L and the maximum daily limit is 17.5 µg/L. All calculations are summarized in Attachment C.

The limits above are less stringent than the limits in the 2009 permit. Relaxation (or "backsliding") of existing limits is only allowed under certain conditions, as described in the anti-backsliding provisions in the federal Clean Water Act and the Code of Federal Regulations. In this case, the new limits reflect changing conditions in the receiving water (available dilution) and significant new wastewater treatment technology installed by the permittee, both of which were not available at the time the 2009 permit was issued. These new conditions meet the requirements to allow the relaxation of effluent limits.

Lead – During the POR 31 lead analyses of the effluent were less than the detection limit of 0.5 µg/L. Lead was detected in four samples. Those four samples ranged from 0.8 µg/L to 3 µg/L, none of which are above the chronic aquatic life standard. The 75th percentile concentration of lead in PPC is 5 µg/L, which is above the chronic standard. After assessing RP, DEQ determined that the lead concentrations in the effluent, being lower than that in the receiving water, actually improve lead concentrations in PPC at critical conditions. Since the discharge is neither causing nor contributing to an exceedance of water quality standards, RP does not exist for lead. However, this outcome could change if lead concentrations in PPC improve. DEQ proposes to remove the WQBELs for lead from the permit, but continue to require quarterly monitoring.

Zinc – Zinc concentrations ranged from less than the detection limit of 10 µg/L up to 40 µg/L. The acute and chronic aquatic life standards for zinc are both 120 µg/L. RP to exceed the standard does not exist. The zinc limit is removed from the permit. Quarterly monitoring is required.

Table 10. Outfall 001 Final Effluent Metals Limitations

Parameter	Units	RRV	Limitations	
			Maximum Daily (1)	Average Monthly (1)
Copper, Total Recoverable	µg/L	1	17.5	11.7

Footnotes:
(1) See Definition section at end of permit for explanation of terms.

Monitoring of PPC upstream of Outfall 001 for arsenic, copper, lead, and zinc, will continue.

Monitoring of PPC for dissolved aluminum, antimony, and cadmium is discontinued.

Whole Effluent Toxicity (WET) Testing – The 2009 permit requires WET monitoring of the effluent by means of quarterly acute WET testing on two species. DMR data indicates the permittee reported two failed WET tests over the POR. A review of the WET laboratory reports indicates these two reported failures were the result of data entry errors. The facility has not failed any WET tests over the POR.

The East Helena WWTF does not have significant industrial contributors and no EPA required pretreatment program. WET monitoring was required in the past to screen for potential metals toxicity in the effluent. The facility passed all quarterly WET tests over the POR, and installed significant metals treatment. RP for metals and appropriate limits are incorporated into the permit. The requirement to conduct WET tests is no longer necessary, and is removed in this renewal.

V. Effluent Limitations

The proposed final effluent limits are a combination of the more stringent of the technology-based and water quality-based effluent limits as developed in Sections III and IV.

Final Limitations

The following final effluent limitations will be applied to the discharge at Outfall 001 beginning on the permit effective date and will remain in effect through the duration of the permit.

Table 11. Outfall 001 Final Limitations

Parameter	Units	Average Monthly Limit (1)	Average Weekly Limit (1)	Maximum Daily Limit (1)
BOD_5	mg/L	30	45	--
	lb/day	109	163	--
TSS	mg/L	30	45	--
	lb/day	109	163	--
pH	S.U.	In the range of 6.0 – 9.0		
E. coli Bacteria (2)	Number of organisms/100 mL	126	252	--
E. coli Bacteria (3)	Number of organisms/100 mL	630	1,260	--
Total Nitrogen Load (4, 5)	lb/day	53.3	--	--
Total Phosphorus as P Load (6)	lb/day	11.2	--	--
Total Phosphorus as P Load (7)	lb/day	5.5	--	--
Copper, Total Recoverable	µg/L	11.7	--	17.5

Footnotes:

(1) See Definition section at end of permit for explanation of terms.
(2) This limit applies during the period April 1 through October 31.
(3) This limit applies during the period November 1 through March 31.
(4) Calculated as the sum of Total Kjeldahl Nitrogen (TKN) and nitrate plus nitrite as N concentrations.
(5) This limit applies year round
(6) This limit applies October – June
(7) This limit applies July - September

85 Percent (%) Removal Requirement for TSS and BOD_5: The arithmetic mean of the BOD_5 and TSS and for effluent samples collected in a period of 30 consecutive days shall not exceed 15% of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85% removal). This is in addition to the concentration limitations on BOD_5 and TSS.

There shall be no discharge of floating solids or visible foam in other than trace amounts.

There shall be no discharge which causes visible oil sheen in the receiving stream.

VI. Self-Monitoring Requirements

A. Effluent Monitoring

The permittee shall monitor the discharge from Outfall 001 at the last point of control following treatment (post metals treatment).

Samples shall be collected, preserved and analyzed in accordance with approved procedures listed in 40 CFR 136. In order to be representative of the nature and volume of the flow being monitored, influent sample collection and flow monitoring must occur prior to the equalization basin or any recycle flow returns. Effluent flow measuring must account for all draw-off and return flows. Metals shall be analyzed as total recoverable, use EPA Method (Section) 4.1.4 [EPA 600/4-79-020, March 1983] or equivalent.

The RRV is the detection level that must be achieved in reporting surface water monitoring or compliance data to the Department (Circular DEQ-7). The RRV is the Department's best determination of a level of analysis that can be achieved by the majority of the commercial, university, or governmental laboratories using EPA-approved methods or methods approved by the Department.

Table 14. Outfall 001 Self-Monitoring Requirements

Parameter	Unit	Sample Location	Sample Frequency	Sample Type (1)	Reporting ~~Requirments~~Requirements	Reporting Frequency	RRV
Flow	mgd	Effluent	Continuous	(2)	Average Monthly/Daily Maximum	Monthly	--
5-Day Biological Oxygen Demand (BOD_5)	mg/L	Influent	3/Week	Composite	Average Monthly/ Maximum Weekly		2
	mg/L	Effluent	3/Week	Composite			2
	lb/day	Effluent	1/Month	Calculated			--
	% Removal (3)	Effluent	1/Month	Calculated	Average Monthly		--
Total Suspended Solids (TSS)	mg/L	Influent	3/Week	Composite	Average Monthly/ Maximum Weekly		10
	mg/L	Effluent	3/Week	Composite			10
	lb/day	Effluent	1/Month	Calculated			--
	% Removal (3)	Effluent	1/Month	Calculated	Average Monthly		--
pH	s.u.	Effluent	Daily	Instantaneous	Minimum and Maximum		0.1
E. coli Bacteria (4)	Number of organisms/100 mL	Effluent	3/Week	Grab	Monthly/ Weekly Geo Mean		1
Total Ammonia as N	mg/L	Effluent	1/Month	Composite	Report		0.1
Nitrate + Nitrite as N	mg/L	Effluent	1/Week	Composite	Average Monthly		0.05
Total Kjeldahl Nitrogen	mg/L	Effluent	1/Week	Composite			0.1
Total Nitrogen (5)	mg/L	Effluent	1/Month	Calculated			--
	lb/day	Effluent	1/Month	Calculated			--
Total Phosphorus as P	mg/L	Effluent	1/Week	Composite			--
	lb/day	Effluent	1/Month	Calculated			--
Oil and Grease	mg/L	Effluent	1/Quarter	Grab	Report	Quarterly	1
Arsenic, Total Recoverable (2)	µg/L	Effluent	1/Month	Composite	Average Monthly / Daily Maximum	Monthly	3
Copper, Total	µg/L	Effluent	1/Month	Composite			1
Lead, Total Recoverable	µg/L	Effluent	1/Quarter	Composite	Report	Quarterly	0.5
Zinc, Total Recoverable	µg/L	Effluent	1/Quarter	Composite			10

Footnotes:
(1) See Definition section at end of permit for explanation of terms.
(2) Requires recording device or totalizer; permittee shall report daily maximum and daily average flow on DMR.
(3) Percent (%) Removal shall be calculated using the monthly average values.
(4) Report Geometric Mean if more than one sample is collected during reporting period.
(5) Calculated as the sum of Nitrate + Nitrite as N and Total Kjeldahl Nitrogen (TKN) concentrations.

B. Instream Monitoring

The permittee is required to continue monitoring PPC upstream of the outfall at the previously established CRK-A sample point for the parameters listed in Table 16, below.

Table 16. Ambient Water Quality PPC Monitoring Requirements

Parameter	Units	Sample Location	Sample Frequency	Sample Type (1)	RRV
pH	s.u.	Instream	1/Quarter	Instantaneous	0.1
Temperature	°C	Instream	1/Quarter	Instantaneous	--
Total Ammonia as N	mg/L	Instream	1/Quarter	Grab	0.1
Total Hardness as $CaCO_3$	mg/L	Instream	1/Quarter	Grab	10
Arsenic, Total Recoverable	µg/L	Instream	1/Quarter	Grab	3
Copper, Total Recoverable	µg/L	Instream	1/Quarter	Grab	1
Lead, Total Recoverable	µg/L	Instream	1/Quarter	Grab	0.5
Zinc, Total Recoverable	µg/L	Instream	1/Quarter	Grab	10

Footnotes:
(1) See Definition section at end of permit for explanation of terms

VII. Special Conditions

A. East Helena's Pollutant Minimization Program (PMP)

A pollutant minimization program (PMP) is a structured set of activities designed to improve processes and pollutant controls that will prevent and reduce pollutant loadings. East Helena has met highest attainable condition for total nitrogen and total phosphorus and will adopt and implement a PMP reflecting the greatest pollutant reduction achievable. East Helena needs and is eligible for a General Variance from the Montana Base Numeric Nutrient Standards found in DEQ-12B.

East Helena is required to conduct the following PMP activities:

Action Item 1: Continue Current Advanced Operational Strategies throughout the Term of the Permit

1. Continue cycling aeration on and off in the bioreactor to create periodic anoxic conditions for denitrification.

2. Continue to operate and maintain the tertiary filtration process.

3. Throughout the permit term and in the operation and maintenance manual, continue to maintain in progress documentation of following operational strategies effective toward reducing nutrients, as applicable:
    - identification of aerators and mixers used or taken offline
    - aeration cycle times
    - oxygen reduction potential (ORP) target points
    - variable frequency drive set points
    - target mixed liquor suspended solids (MLSS) concentration for summer and winter

- return and wasting strategies
- seasonal adjustments

Action Item 2: Evaluate Nutrient Reduction Measures

a. Submit a brief (no more than one-page) annual report addressing the following:
   - Identify nutrient reduction measures implemented that year.
   - Evaluate the effectiveness of each implemented nutrient reduction measure.
   - Propose nutrient reduction measures for the upcoming year.

   The annual reports will be due January 28th of each year, beginning January 28, 2020.

VIII. Information Sources

1. Administrative Rules of Montana Title 17 Chapter 30 - Water Quality
    a. Sub-Chapter 2 - *Water Quality Permit and Application Fees*, 2014.
    b. Sub-Chapter 5 - *Mixing Zones in Surface and Ground Water*, 2014.
    c. Sub-Chapter 6 - *Montana Surface Water Quality Standards and Procedures*, 2014.
    d. Sub-Chapter 7- *Nondegradation of Water Quality*, 2014.
    e. Sub-Chapter 10 - *Montana Ground Water Pollution Control System,* 2014.
    f. Sub-Chapter 12 - *Montana Pollutant Discharge Elimination System (MPDES) Standards*, 2012.
    g. Sub-Chapter 13 - *Montana Pollutant Discharge Elimination System (MPDES) Permits*, 2013.

2. Clean Water Act § 303(d), 33 USC 1313(d) *Montana List of Waterbodies in Need of Total Maximum Daily Load Development*, 2016.

3. Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. §§ 1251-1387, October 18, 1972, as amended 1973-1983, 1987, 1988, 1990-1992, 1994, 1995 and 1996.

4. Montana Code Annotated Title 75 - Environmental Protection Chapter 5 - Water Quality, October 2011.

5. Montana Department of Fish Wildlife and Parks, *Spawning Times of Montana Fishes*, March 2001.

6. Montana Pollutant Discharge Elimination System (MPDES) Permit Number MT0022560
    a. Administrative Record.
    b. Renewal Application EPA Form 2A, June 2014.

7. US Code of Federal Regulations, 40 CFR Parts 122-125, 130-133, & 136.

8. US EPA *Technical Support Document for Water Quality-Based Toxics Control*, EPA/505/2-30-001, March 1991.

9. USEPA Region VIII *Mixing Zones and Dilution Policy*, September 1995.

10. US EPA NPDES *Permit Writers' Manual*, EPA 833-B-96-003, September 2010.

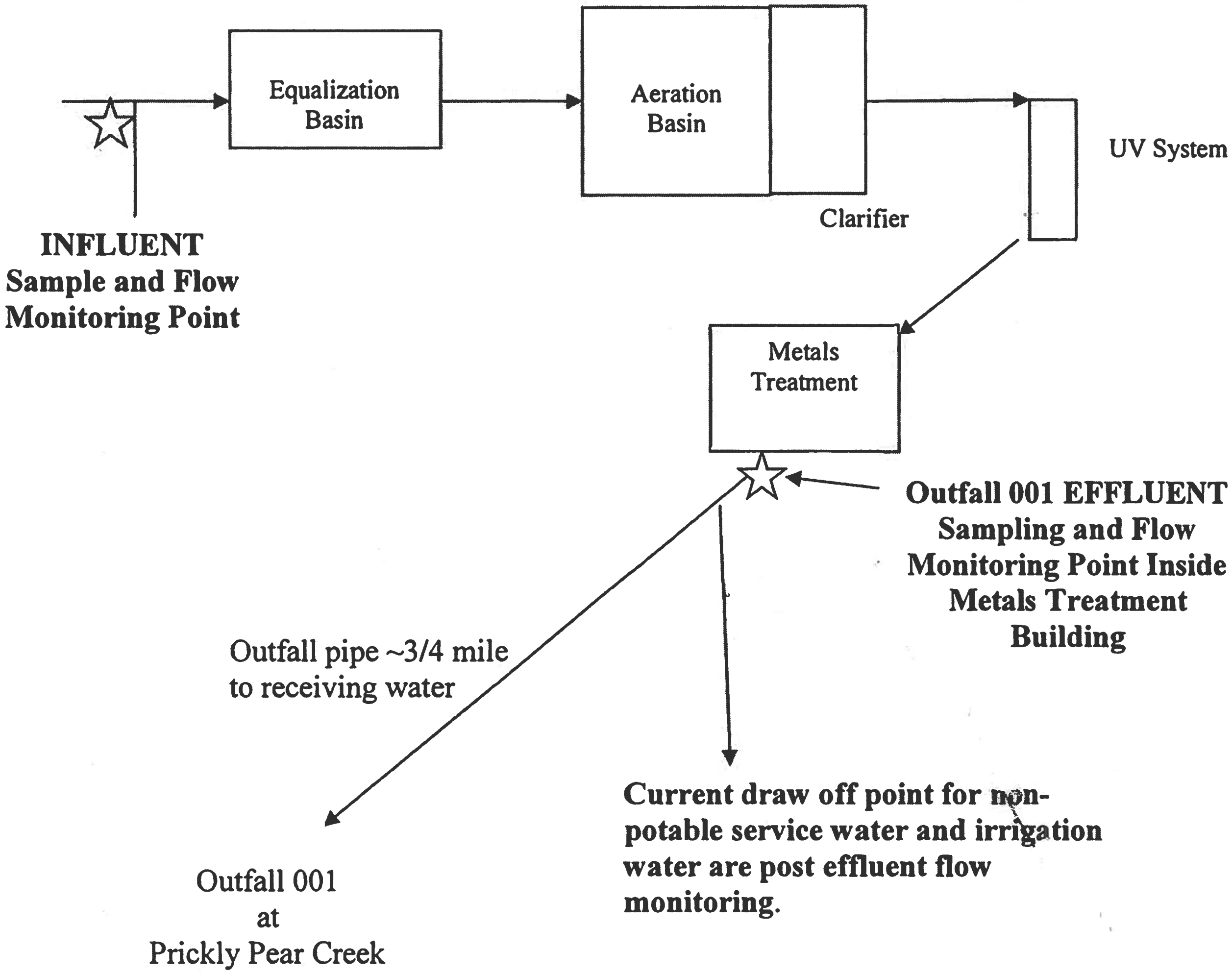
11. US EPA Region VIII NPDES *Whole Effluent Toxics Control Program*, August 1997.

12. US EPA for Montana Department of Environmental Quality *Framework Water Quality Restoration Plan and Total Maximum Daily Loads (TMDLs) for the Lake Helena Watershed Planning Area:*
    a. Volume I – Appendices, December 2004.
    b. Volume II – Final Report, August 2006.

13. US EPA Ref. 8-MO, TMDL Approvals, *Lake Helena Total Maximum Daily Load Planning Area* and Enclosures, September 27, 2006.

Attachment A

Schematic of Helena WWTP with Sample and Flow Monitoring Points



INFLUENT Sample and Flow Monitoring Point

Outfall 001 EFFLUENT Sampling and Flow Monitoring Point Inside Metals Treatment Building

Current draw off point for non-potable service water and irrigation water are post effluent flow monitoring.

Attachment B: East Helena WWTP Reasonable Potential Analysis (October 2017)

			Ammonia Acute	Ammonia Chronic	N+N	TN	TP	Arsenic HH	Copper Acute	Copper Chronic	Lead Acute	Lead Chronic	Zinc Acute	Zinc Chronic
Flow														
	critical stream flow (7Q10 or seasonal 14Q5)	mgd	5.4	5.4	5.4	8.2	8.2	5.4	5.4	5.4	5.4	5.4	5.4	5.4
	% of 7Q10 being provided (as decimal, e.g. - .10 for 10%)	%	0.0%	25.0%	100.0%	100.0%	100.0%	100.0%	2.5%	25.0%	2.5%	25.0%	2.5%	25.0%
Qs	**resulting critical stream flow (7Q10 * % dilution granted)**	mgd	0.00	1.35	5.40	8.20	8.20	5.40	0.14	1.35	0.14	1.35	0.14	1.35
Qd	**critical effluent flow (ave daily design flow)**	mgd	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44
Qr	downstream flow (Qs + Qd)	mgd	0.44	1.79	5.84	8.64	8.64	5.84	0.58	1.79	0.58	1.79	0.58	1.79
Concentrations														
Cmax	maximum effluent concentration for POR (from application or DMR data)	mg/L	1.32	1.32	29.4	24.8	1.7	0.0190	0.017	0.017	0.003	0.003	0.04	0.04
n	number of samples in effluent data set		39	39	68	11	11	13	35	35	35	35	64	64
CV	coefficient of variation for effluent data (if n<10, use 0.6)		1.60	1.60	0.31	0.50	0.60	0.48	0.34	0.34	0.68	0.68	0.38	0.38
TSD	calculated TSD multiplier (should be close to Table 3-2 value)		1.250	1.250	0.979	1.554	1.678	1.455	1.087	1.087	1.170	1.170	0.984	0.984
Cd	**critical effluent concentration - 95%tile (max. effluent concentration * TSD multiplier)**	mg/L	1.650	1.650	28.8	39	2.9	0.0277	0.0185	0.0185	0.0035	0.0035	0.04	0.04
Cs	**critical instream concentration (75%tile if n<=30, 95% UCL if n>30)**	mg/L	0.050	0.050	0.220	0.250	0.038	0.0070	0.004	0.004	0.005	0.005	0.060	0.060
Cr	resulting or downstream pollutant concentration (term to solve for)	mg/L	1.6	0.4	2.4	2.20	0.184	0.009	0.015	0.007	0.0039	0.0047	0.0442	0.0549
WQS	**water quality standard (from DEQ-7 or rule)**	mg/L	13.3	4.36	10	0.30	0.030	0.010	0.0143	0.0095	0.084	0.0033	0.1221	0.1221
	RP?		no	no	no	yes	yes	no	yes	no	no	No	no	no

Attachment C: WQBEL Development

			TN		TP			Copper		
								acute	chronic	
	7Q10 (= 491 mgd)	mgd	8.2		8.2		mgd	5.4		mgd
	% of 7Q10 to use for dilution		100		100			2.5	25	%
Qs	instream flow available for dilution	mgd	8.2		8.2		mgd	0.135	1.35	mgd
Qd	design flow (POTW)	mgd	0.44		0.44		mgd	0.44		mgd
Qr	downstream flow (Qs + Qd)	mgd	8.6		8.6		mgd	0.6	1.8	mgd
Cr	**water quality standard**	mg/L	0.30		0.03		µg/L	14.3	9.5	µg/L
Cs	instream concentration (75th percentile)	mg/L	0.25		0.038		µg/L	3.8		µg/L
Cd or WLA	effluent concentration or waste load allocation ((Qr*Cr) - (Qs*Cs))/Qd)	mg/L	1.2318		0.030		µg/L	17.5	27.0	µg/L
	* If background > standard, than WLA = standard									
	number of samples per month *(if = 1, enter 4)*		4		4			4		
	CV *(if sample set >= 10, then SD/mean, else 0.6)*		0.6		0.6			0.3		
LTA_a LTA_c	acute and chronic long term average (99 %tile); (95 %tile for nutrients)		0.7935		0.0193			9.2	19.3	
MIN (LTA_a, LTA_c)	most conservative LTA		0.7935		0.0193			9.2		
	maximum daily limit (99 %tile)	mg/L	**2.4713**		**0.0602**		µg/L	**17.5**		**µg/L**
	average monthly limit (95 %tile)	mg/L		**1.2318**		**0.0300**	µg/L		**11.7**	**µg/L**

DEQ
Montana Department
of Environmental Quality

August 23, 2024

Mayor Kelly Harris
City of East Helena
PO Box 1170
East Helena, MT 59635

RE: Completeness Determination for Montana Pollutant Discharge Elimination System permit number MT0022560, East Helena WWTF

Dear Mayor Harris:

On May 24, 2024, the Montana Department of Environmental Quality (DEQ) received a Montana Pollutant Discharge Elimination System (MPDES) permit renewal application Form 2A and applicable fees from the City of East Helena for the Wastewater Treatment Facility (WWTF). Within a letter dated June 24, 2024, DEQ outlined application deficiencies.

On August 16, 2024, DEQ received a response addressing the application deficiencies. DEQ reviewed the application, supplemental materials, and fees. DEQ determined the application is complete. Until DEQ renews the permit all effluent limits, monitoring requirements, and other conditions of the current permit remain fully effective and enforceable.

Thank you for your patience and cooperation during the permit process. If you have any questions or concerns, please contact me at (406) 444-3927 or at cweaver@mt.gov.

Sincerely,

Christine A Weaver
Montana Department of Environmental Quality
Water Protection Bureau

cc: Mr. Kevin Ore, Public Works Director, City of East Helena [kore@easthelenamt.us]
Mr. Jeremy Perlinski, Robert Peccia & Associates [jperlinski@rpa-hln.com]

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City of East Helena

www.easthelenamt.us

Mayor
Kelly Harris

Council Members
Don Dahl
Wesley Feist
Suzanne Ferguson
Judy Leland

City Attorney
Peter K. Elverum

City Clerk/Treasurer
Amy Thorngren

Deputy Clerk
Scott Ferguson

Public Works Director
Kevin Ore

Police Chief
Mike Sanders

Fire Chief
Roger Campbell

City Judge
Dennis Loveless

P.O. Box 1170
East Helena
Montana 59635

City Offices
406-227-5321

City Fax
406-227-5456

Police Admin.
406-227-8686

August 12, 2024

Christine Weaver
Montana DEQ Water Protection Bureau
PO Box 200901
Helena, MT 59620-0901

RE: Notice of Deficiency for MPDES Permit
Application MT0022560, East Helena WWTP

Dear Christine:

In response to your email dated August 5, 2024, enclosed is an original signature copy of Form 2A (page 9) for your files. I have also included a hard copy of the July 2, 2024 comment response letter from Jeremy Perlinski with Robert Peccia & Associates, as well as the noted attachments.

Also, our treatment plant staff will be collecting the additional information on the requested parameters to finalize the application including data for Table A (effluent temperature) and Table B (total dissolved solids and dissolved oxygen). Lastly, I have provided the certification statement from ARM 17.30.1323(4) below. Please contact me with any concerns you may have, or if you need additional information.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Sincerely,

CITY OF EAST HELENA

Kelly Harris
Mayor

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CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING

ROBERT PECCIA & ASSOCIATES

RPA

HELENA, MT
ALISPELL, MT
OZEMAN, MT

July 2, 2024

Christine Weaver
Montana DEQ Water Protection Bureau
PO Box 200901
Helena, MT 59620-0901

RE: Notice of Deficiency for MPDES Permit Application MT0022560, East Helena WWTP

Dear Christine:

As requested in your letter dated June 24, 2024, we have prepared responses to the comments you had on the Montana Pollutant Discharge Elimination System (MPDES) permit renewal application for the City of East Helena's Wastewater Treatment Plant (WWTP). We have included each of your comments below in ***bold, italicized text*** and prepared a response in regular text. Attached is the supporting documentation referenced in the responses below.

1. ***Section 1.1 – Contact Title: This was left blank, please provide title.***

   Kevin Ore is the Public Works Director for the City of East Helena. Attached is a revised Page 1 of Form 2A with the appropriate title.

2. ***Section 1.3 and Section 6 – Applicant Contact Name and Title, and Certification Statement: ARM 17.30.1323(1) requires that "all permit applications must be signed…(c) for a municipality, state, federal, or other public agency by either a principal executive officer or ranking elected official." Typically, a Mayor is the signatory for Form 2A. If Kevin Ore meets one of the signatory criteria, please provide a brief statement in your response.***

   The official Title is needed for both Section 1.3 and Section 6. (This is described in the form 2A hardcopy instructions but might have not been made clear in FACTS).

   Pages 1 and 9 of Form 2A has been modified to indicate Kelly Harris, Mayor of East Helena, as the ranking elected official. Attached are revised Pages 1 and 9 of Form 2A with the corrected information and signature of the Mayor.

3. ***Section 1.14 – Land Application: You indicated "no." Please confirm that East Helena will not land apply any treated wastewater during the upcoming permit period. The Operations and Maintenance Manual for the East Helena Effluent Metals Filtration Building, Robert Peccia and Associates, June 2015, discussed seasonal irrigation as part of the WWTF process.***

   Since publication of the referenced O&M Manual, East Helena has converted the irrigation of turf grass around the WWTP to a potable water source. The City recently installed a new water service and proper backflow prevention assembly in the existing UV Building that feeds the entire irrigation system at the WWTP. This new potable water supply is also used for washdown water around the WWTP and for process water in the Screen Building and Sludge Thickening Building. Treated effluent from the Metals Filtration Building is currently utilized at one hose bib in the UV Building and throughout the Metals Filtration Building. The proposed Headworks Building that is currently under design will utilize treated effluent from the Metals Filtration Building. It is anticipated that the future secondary treatment upgrade will include provisions to convert landscape irrigation back to a non-potable source (i.e. treated effluent). Any revisions to the City's MPDES Permit will occur at that time.

4. ***Section 2.3 – Topographic Map: Please include a depiction of the piping or other conveyance systems that takes the treated wastewater from the WWTF to the outfall at Prickly Pear Creek.***

   Attached is a figure showing the City's existing collection system and the approximate alignment of the 16-inch treated effluent pipeline from the Metals Filtration Building to Prickly Pear Creek.

5. ***Table A – Effluent Parameters for All POTWs and Table B – Effluent Parameters for All POTWs with a Flow Equal or Greater than 0.1 MGD: DEQ has noted the FACTS system has a glitch in preparing the Table A and Table B parameter summaries. It appears to transpose and omit data. Please either handwrite or prepare a Word or Excel table that presents your information. Note that you are required to provide all data except (a) BOD$_5$, carbonaceous since you monitor as BOD$_5$; and (b) Total Residual Chlorine if it is not in use at your facility.***

   As requested, attached are hard copies of the applicable Table A and Table B parameters.

6. ***Table C – Effluent Parameters for Selected POTWs: Please also provide an alternative table for Table C, in the same manner as above to ensure all data is present and in the correct column. In addition, please provide monitoring data for any other analytes (for samples taken within the past 4.5 years) as well as any treatment metals or chemicals such as, but not limited to, iron or aluminum. If there are no additional parameters, please indicate in your response.***

   As requested, attached is a hard copy of the applicable Table C parameters. There are no additional parameters to report during the noted monitoring period.

   DEQ notes that East Helena expects to have an increase in hydraulic loading capacity, increasing the average daily design flow from the current 0.434 MGD up to 0.63 MGD in 2027. Please be advised that increasing your capacity will require a permit modification unless the request is bundled with the renewal application.

   It is unlikely that the future secondary treatment upgrade will be completed by 2027 as noted above. A Wastewater Treatment Facility Plan is currently being written to identify deficiencies at the City's existing WWTP and potential process alternatives to solve them. The City understands that a permit modification will be required prior to completion of the new WWTP to incorporate the rated capacity of the new plant.

Please contact us with any questions you may still have, or if you need additional information to complete the review process.

Sincerely,

ROBERT PECCIA & ASSOCIATES

Jeremy Perlinski, PE
Assistant Group Manager

cc via email: Kevin Ore, East Helena PWD
Brad Koenig, PE, RPA
File

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DEQ Montana Department of Environmental Quality
Water Protection Bureau

Agency Use	
Permit No.	MT0022560
Date Rec'd	
Amount Rec'd	
Check No.	
Rec'd By	
Date Gen'd	05/24/2024
App Doc Version No.	3

Form 2A. New and Existing Publicly Owned Treatment Works

Section 1. Basic Application Information for All Applicants

Facility Information

1.1 Facility Name EAST HELENA WWTF
Mailing Address 3301 PLANT ROAD
Mailing City, State, Zip Code City East Helena State MT Zip Code 59635
Contact Name, Title Name KEVIN ORE Title Public Works Director
Contact Phone, Email Address Phone 406-459-3769 Email kore@easthelenamt.us
Location Address 3301 PLANT ROAD
Location City, State, Zip Code City East Helena State MT Zip Code 59635

1.2 Is this application for a facility that has yet to commence discharge?
☐ No. ☑ Yes. See instructions on data submission requirements for new dischargers.

Applicant Information

1.3 Applicant Name CITY OF EAST HELENA
Applicant Address PO BOX 1170
City, State, Zip Code City EAST HELENA State MT Zip Code 59635
Contact Name, Title Name KELLY HARRIS Title Mayor
Contact Phone Number, Email Phone 406-227-5321 Email kharris@easthelenamt.us .

1.4 Is the applicant the facility's owner, operator, or both? (Check only one response.)
☐ Owner ☐ Operator ☑ Both

1.5 To which entity should the MPDES permitting authority send correspondence? (Check only one response.)
☐ Facility ☐ Applicant ☑ Facility and applicant (they are one and the same)

Existing Environmental Permits

1.6 Indicate below any existing environmental permits and provide the corresponding permit number for each.

☑ MPDES/NPDES (discharges to surface water)
☐ RCRA (hazardous waste)
☐ UIC (underground injection control)
☐ PSD (air emissions)
☐ NESHAPs (CAA)
☐ Dredge or fill (Section 404)
☐ Nonattainment program (CAA)
☐ Other (specify)

Description/Permit Number MT0022560

Collection System and Population Served

Section 5. Combined Sewer Overflows

CSO Map and Diagram

5.1 Does the treatment works have a combined sewer system?
☑ No. Skip to Section 6. ☐ Yes. Continue below.

5.2 Have you attached a CSO system map to this application? (See instructions for map requirements.)
☑ No. ☐ Yes.

5.3 Have you attached a CSO system diagram to this application? (See instructions for diagram requirements.)
☑ No. ☐ Yes.

Section 6. Certification Statement

6.1 **Certification Statement**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information; including the possibility of fine and imprisonment for knowing violations. [75-5-633, MCA].

Name (print or type first and last name) KELLY HARRIS	Official Title Mayor
Signature	Date Signed July 1, 2024

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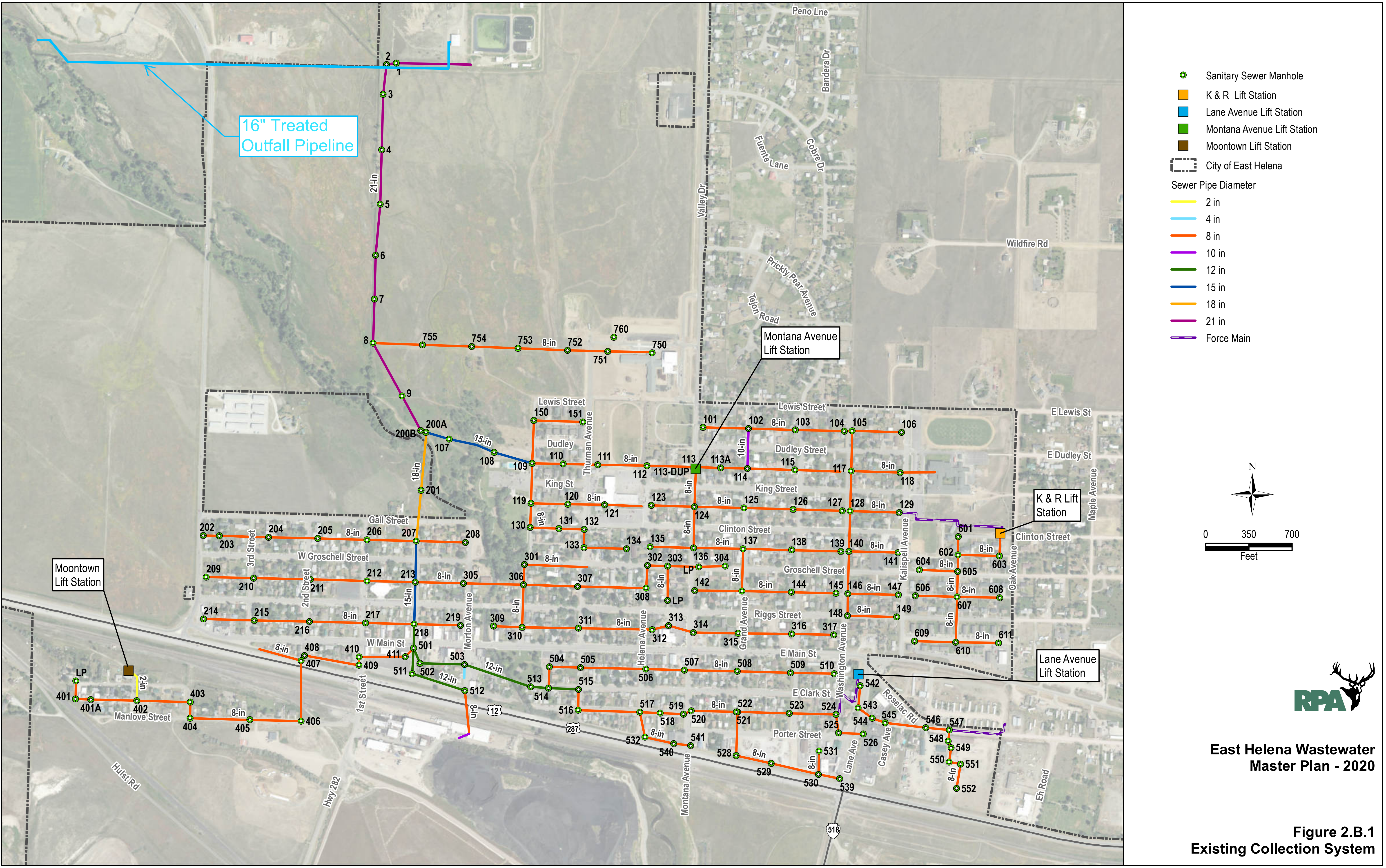

East Helena Wastewater Master Plan - 2020

Figure 2.B.1
Existing Collection System

Date: 4/28/2020 Path: F:\waste\18801 - East Helena Wastewater Capacity Study\GIS\MasterPlan\EXSTSewerCollSystem_Fig2B1.mxd

Table A. Effluent Parameters for All POTWs

	Maximum Daily Discharge		Average Daily Discharge			Analytical	ML or MDL
Pollutant	**Value**	**Units**	**Value**	**Units**	**Number of Samples**	**Method [1]**	**(include units)**
BOD 5-day, 20 deg. C	140	mg/L	8.0	mg/L	1095	A5210B	2 mg/L
BOD, carbonaceous, 5-day, 20 deg. C	N/A	N/A	N/A	N/A	N/A	N/A	N/A
E.coli bacteria	45069	#/100ml	10.2	#/100ml	1095	A9223B	1 #/100ml
Flow rate	1012543	gpd	268211	gpd	1095	N/A	N/A
pH Minimum	6.05	S.U.	7.13	S.U.	1095	N/A	6.0 - 9.0 S.U.
pH Maximum	8.27	S.U.				N/A	6.0 - 9.0 S.U.
Temperature (Winter)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Temperature (Summer)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Solids, total suspended	64	mg/L	7.5	mg/L	1095	A2540D	5 mg/L

[1] Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required under 40 CFR chapter I, subchapter N or O. See instructions and 40 CFR 122.21(e)(3).

Table B. Effluent Parameters for all POTWs with a Flow Equal to or Greater than 0.1 MGD.

Pollutant	Maximum Daily Discharge		Average Daily Discharge			Analytical Method [1]	ML or MDL (include units)
	Value	Units	Value	Units	Number of Samples		
Ammonia (as N)	22.8	mg/L	2.8	mg/L	34	E350.1	0.8 mg/L
Chlorine, (total residual, TRC)[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oxygen, dissolved (DO)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nitrite plus nitrate total (as N)	31.7	mg/L	15.0	mg/L	156	E353.2	0.02 mg/L
Nitrogen, Kjeldahl, total (as N)	31.3	mg/L	7.3	mg/L	156	E351.2	0.5 mg/L
Oil and Grease	5	mg/L	1.3	mg/L	12	E1664A	5.0 mg/L
Phosphorus, total (as P)	8.8	mg/L	2.9	mg/L	156	E365.1	0.01 mg/L
Total Dissolved Solids	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1] Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required under 40 CFR chapter I, subchapter N or O. See instructions and 40 CFR 122.21(e)(3).

[2] Facilities that do not use chlorine for disinfection, do not use chlorine elsewhere in the treatment process, and have no reasonable potential to discharge chlorine in their effluent are not required to report data for chlorine.

Table C. Effluent Parameters for Selected POTWs

Pollutant	Maximum Daily Discharge		Average Daily Discharge			Analytical Method [1]	ML or MDL (include units)
	Value	Units	Value	Units	Number of Samples		
Arsenic, total (as As)	59	ug/L	11	ug/L	34	E200.8	1 ug/L
Copper, total (as Cu)	61	ug/L	12.6	ug/L	63	E200.8	1 ug/L
Lead, total (as Pb)	4.1	ug/L	1.1	ug/L	12	E200.8	0.5 ug/L
Zinc, total (as Zn)	80	ug/L	30	ug/L	12	E200.8	10 ug/L

[1] Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required under 40 CFR chapter I, subchapter N or O. See instructions and 40 CFR 122.21(e)(3).

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DEQ
Montana Department
of Environmental Quality

June 24, 2024

Mr. Kevin Ore, Public Works Director
City of East Helena
PO Box 1170
East Helena, MT 59635

RE: Notice of Deficiency for Montana Pollutant Discharge Elimination System Permit Application MT0022560, East Helena Wastewater Treatment Facility

Dear Mr. Ore:

On May 24, 2024, the Montana Department of Environmental Quality (DEQ) received a Montana Pollutant Discharge Elimination System (MPDES) permit renewal application (Form 2A) and applicable fees for the East Helena Wastewater Treatment Facility (WWTF). DEQ has begun the application review process. However, the application and supplemental information is incomplete.

Please address the application deficiencies as listed below:

1. **Section 1.1 – Contact Title.** This was left blank, please provide title.
2. **Section 1.3 and Section 6 – Applicant Contact Name and Title, and Certification Statement.**

   ARM 17.30.1323(1) requires that "all permit applications must be signed …(c) for a municipality, state, federal, or other public agency, by either a principal executive officer or ranking elected official." Typically, a Mayor is the signatory for Form 2A. If Kevin Ore meets one of the signatory criteria, please provide a brief statement in your response.

   The official Title is needed for both Section 1.3 and Section 6. (This is described in the Form 2A hardcopy instructions but might have not been made clear in FACTS).
3. **Section 1.14 Land Application** – you indicated "no." Please confirm that East Helena will not land apply any treated wastewater during the upcoming permit period. The Operations & Maintenance Manual for the East Helena Effluent Metals Filtration Building, Robert Peccia and Associates, June 2015, discussed seasonal irrigation as part of the WWTF process.
4. **Section 2.3 Topographic Map** – please include a depiction of the piping or other conveyance systems that takes the treated wastewater from the WWTF to the outfall at Prickly Pear Creek.
5. **Table A – Effluent Parameters for All POTWs & Table B – Effluent Parameters for all POTWs with a Flow Equal or Greater than 0.1 MGD** – DEQ has noted the FACTS system has a glitch in preparing the Table A and Table B parameter summaries. It appears to transpose and omit data. Please either handwrite or prepare a Word or Excel table that presents your information. Note that you are required to provide all data except (a) BOD_5, carbonaceous since you monitor as BOD_5; and (b) Total Residual Chlorine if it is not in use at your facility.

6. **Table C Effluent Parameters for Selected POTWs** – please also provide an alternative table for Table C, in the same manner as above to ensure all data is present and in the correct column. In addition, please provide monitoring data for any other analytes (for samples taken within the past 4.5 years) as well as any treatment metals or chemicals such as, but not limited to, iron or aluminum. If there are no additional parameters, please indicate in your response.

DEQ notes that East Helena expects to have an increase in hydraulic loading capacity, increasing the average daily design flow from the current 0.434 MGD up to 0.63 MGD in 2027. Please be advised that increasing your capacity will require a permit modification unless the request is bundled with the renewal application.

Please submit the requested information to DEQ on or before **July 25, 2024**, so the application review process may continue. Thank you for your patience and cooperation during the permit process. If you have any questions or concerns, please contact me at (406) 444-3927 or at cweaver@mt.gov.

Sincerely,

Christine A. Weaver
Montana Department of Environmental Quality
Water Protection Bureau

Encl (Electr only):	Form 2A and Instructions
Cc w/encl:	Kevin Ore, City of East Helena at kore@easthelenamt.us

DEQ Montana Department of Environmental Quality
Water Protection Bureau

Agency Use	
Permit No.	MT0022560
Date Rec'd	
Amount Rec'd	
Check No.	
Rec'd By	
Date Gen'd	05/24/2024
App Doc Version No.	3

Form 2A. New and Existing Publicly Owned Treatment Works

Section 1. Basic Application Information for All Applicants

Facility Information

1.1 Facility Name EAST HELENA WWTF
Mailing Address 3301 PLANT ROAD
Mailing City, State, Zip Code City East Helena State MT Zip Code 59635
Contact Name, Title Name KEVIN ORE Title
Contact Phone, Email Address Phone 406-459-3769 Email kore@easthelenamt.us
Location Address 3301 PLANT ROAD
Location City, State, Zip Code City East Helena State MT Zip Code 59635

1.2 Is this application for a facility that has yet to commence discharge?
☐ No. ☑ Yes. See instructions on data submission requirements for new dischargers.

Applicant Information

1.3 Applicant Name CITY OF EAST HELENA
Applicant Address PO BOX 1170
City, State, Zip Code City EAST HELENA State MT Zip Code 59635
Contact Name, Title Name KEVIN ORE Title
Contact Phone Number, Email Phone 406-459-3769 Email kore@easthelenamt.us

1.4 Is the applicant the facility's owner, operator, or both? (Check only one response.)
☐ Owner ☐ Operator ☑ Both

1.5 To which entity should the MPDES permitting authority send correspondence? (Check only one response.)
☐ Facility ☐ Applicant ☑ Facility and applicant (they are one and the same)

Existing Environmental Permits

1.6 Indicate below any existing environmental permits and provide the corresponding permit number for each.

☑ MPDES/NPDES (discharges to surface water)
☐ RCRA (hazardous waste)
☐ UIC (underground injection control)
☐ PSD (air emissions)
☐ NESHAPs (CAA)
☐ Dredge or fill (Section 404)
☐ Nonattainment program (CAA)
☐ Other (specify)

Description/Permit Number MT0022560

Collection System and Population Served

1.7 Provide the collection system information requested below for the treatment works.

	Collection System Type (indicate percentage)	**Ownership Status**
Population Served 2680 Municipality City of East Helena	100.00 % separate sanitary sewer 0.00 % combined storm and sanitary sewer ☐ Unknown	☑ Own ☐ Maintain ☐ Own ☐ Maintain ☐ Own ☐ Maintain
	Collection System Type (indicate percentage)	**Ownership Status**
Population Served 85 Municipality Pele Park	100.00 % separate sanitary sewer 0.00 % combined storm and sanitary sewer ☐ Unknown	☐ Own ☐ Maintain ☐ Own ☐ Maintain ☐ Own ☐ Maintain
	Collection System Type (indicate percentage)	**Ownership Status**
Population Served 540 Municipality Red Fox Meadows Subdivision	100.00 % separate sanitary sewer 0.00 % combined storm and sanitary sewer ☐ Unknown	☐ Own ☐ Maintain ☐ Own ☐ Maintain ☐ Own ☐ Maintain
Total Population Served 3305	300.00 **Total Percentage of Sanitary Sewer System** 0.00 **Total Percentage of Combined Storm and Sanitary Sewer**	

Indian Country

1.8 Is the treatment works located in Indian Country?

☑ No. ☐ Yes.

1.9 Does the facility discharge to a receiving water that flows through Indian Country?

☑ No. ☐ Yes.

Design and Actual Flow Rates

1.10 Provide design and actual flow rates in the designated spaces.

	Two years ago	Last Year	This Year
Annual average daily flow rate (mgd)	0.209	0.245	0.351
Maximum daily flow rate (mgd)	0.358	0.454	1.013

Design Flow Rate (mgd) 0.4340000

Discharge Points by Type

1.11 Provide the total number of effluent discharge points to state waters by type.

Treated Effluent	1	Untreated Effluent	0
Combined Sewer Overflows	0	Constructed Emergency Overflows	0
Bypasses	0		

Outfalls and Other Discharge or Disposal Methods

1.12 Does the POTW discharge wastewater to basins, ponds, or other surface impoundments that do not have outlets for discharge to state waters?

☑ No. Skip to Item 1.14. ☐ Yes. Continue below.

1.13 Provide the location of each surface impoundment and associated discharge information in the table below.

Surface Impoundment Location and Discharge Data		
Location	**Average Daily Volume Discharged to Surface Impoundment**	**Continuous or Intermittent** (check one)
	0 gpd	☐ Continuous ☐ Intermittent

1.14 Is wastewater applied to land?

☑ No. Skip to Item 1.16. ☐ Yes. Continue below.

1.15 Provide the land application site and discharge data requested below.

Land Application Site and Discharge Data			
Location	**Size**	**Average Daily Volume Applied**	**Continuous or Intermittent** (check one)
	0 acres	0.0000000 mgd	☐ Continuous ☐ Intermittent

1.16 Is effluent transported to another facility for treatment prior to discharge?

☑ No. Skip to Item 1.21. ☐Yes. Continue below.

1.17 Describe the means by which the effluent is transported (e.g., tank truck, pipe).

1.18 Is the effluent transported by a party other than the applicant?

☐ No. Skip to Item 1.20. ☑Yes. Continue 1.19 below.

1.19 Provide information on the transporter below.

Entity Name (company name) ________________
Mailing Address ________________
City, State, Zip Code City ________ State ____ Zip Code ____
Contact Name, Title Name ________ Title ____
Contact Phone, Email Address Phone ________ Email ________

Outfalls and Other Discharge or Disposal Methods Continued

1.20 In the table below, indicate the name, address, contact information, MPDES number, and average daily flow rate of the receiving facility.

Facility Name ________________
Mailing Address ________________
City, State, Zip Code City ________ State ____ Zip Code ____
Contact Name, Title Name ________ Title ____
Contact Phone, Email Address Phone ________ Email ________
MPDES Number ________________
Average Daily Flow Rate 0.0000000 mgd

1.21 Is the wastewater disposed of in a manner other than those already mentioned in Items 1.14 through 1.21 that do not have outlets to state waters?

☑ No. Skip to Item 1.23. ☐ Yes. Complete 1.22 below.

1.22 Provide information in the table below on these other disposal methods.

Information on Other Disposal Methods				
Disposal Method Description	**Location of Disposal Site**	**Size of Disposal Site**	**Annual Average Daily Discharge Volume**	**Continuous or Intermittent** (check one)
		0 acres	0 gpd	☐ Continuous ☐Intermittent

Variance Requests

1.23 Do you intend to request or renew a variance at ARM 17.30.1322(14)?

☑ No. No additional information is required.

☐ Yes. Specify which ARM 17.30.1322(14) variance you intend to request. ____________________

Contractor Information

1.24 Are any operational or maintenance aspects (related to wastewater treatment and effluent quality) of the treatment works the responsibility of a contractor?

☑ No. Skip to Section 2. ☐ Yes. Continue below.

1.25 Provide location and contact information for each contractor in addition to a description of the contractor's operational and maintenance responsibilities. Attach additional sheets if necessary.

Section 2. Additional Information

Design Flow

2.1 Does the treatment works have a design flow greater than or equal to 0.1 mgd?

☐ No. Skip to Section 3. ☑ Yes. Continue below.

Inflow and Infiltration

2.2 Provide the treatment works' current average daily volume of inflow and infiltration. 54700.00 gpd

Indicate the steps the facility is taking to minimize inflow and infiltration.

The City continues to maintain and replace portions of its collection system. Areas near Prickly Pear Creek are of particular focus to reduce I&I. These efforts include CIPP lining, open dig replacement, as well as replacement or lining of manholes.

Topographic Map

2.3 Have you attached a topographic map to this application that contains all the required information? (See instructions for specific requirements.)

☐ No. ☑ Yes.

Flow Diagram

2.4 Have you attached a process flow diagram or schematic to this application that contains all the required information? (See instructions for specific requirements.)

☐ No. ☑ Yes.

Scheduled Improvements and Schedules of Implementation

2.5 Are improvements to the facility scheduled?

☐ No. Skip to Section 3. ☑ Yes.

Scheduled Improvements:

1. Headworks and collection system upgrades. Headworks upgrades includes replacing existing influent pump station, new headworks building with screening and grit removal, etc. See attached project description.

2.6 Provide scheduled or actual dates of completion for improvements.

Scheduled or Actual Dates of Completion for Improvements

Scheduled Improvement (from above)	**Affected Outfall Number**	**Begin Construction** (MM/DD/YYYY)	**End Construction** (MM/DD/YYYY)	**Begin Discharge** (MM/DD/YYYY)	**Attainment of Operational Level** (MM/DD/YYYY)
	001	09/01/2024	09/01/2025	09/01/2025	09/01/2025

2.7 Have appropriate permits/clearances concerning other federal/state requirements been obtained? Briefly explain your response.

☑ No. ☐ Yes. ☐ None required or applicable.

Explanation:

This project is currently under design and will be submitted to MDEQ in the following month. See attached project description.

Section 3. Information on Effluent Discharges

Description of Outfalls

3.1 Provide the following information for each outfall.

Outfall Number	**State**	**County**	**City or town**	**Distance from shore**	**Depth below surface**	**Average daily flow rate**	**Latitude**	**Longitude**
001	MT	Lewis and Clark	East Helena	1.00 ft.	0.50 ft.	0.3260000 mgd	46.6022220	-111.935833

Seasonal or Periodic Discharge Data

3.2 Do any of the outfalls described under Item 3.1 have seasonal or periodic discharges?

☑ No. Skip to Item 3.4. ☐ Yes. Continue below.

3.3 If so, provide the following information for each applicable outfall.

Outfall Number	**Number of times per year discharge occurs**	**Average duration of each discharge** (specify units)	**Average flow of each discharge**	**Months in which discharge occurs**
001			mgd	

Diffuser Type

3.4 Are any of the outfalls listed under Item 3.1 equipped with a diffuser?

☑ No. Skip to Item 3.6. ☐ Yes. Complete Item 3.5 below.

3.5 Briefly describe the diffuser type at each applicable outfall.

Outfall Number	**Diffuser Description**
001	

Waters of the State

3.6 Does the treatment works discharge or plan to discharge wastewater to state waters from one or more discharge points?

☐ No. Skip to Item 3.8. ☑ Yes. Complete Item 3.7 below.

Receiving Water Description

3.7 Provide the receiving water and related information (if known) for each outfall.

Outfall Number	001
Receiving water name	PRICKLY PEAR CREEK
Name of watershed, river, or stream system	Lower Prickley Pear Gulch
U.S. Soil Conservation Service 14-digit watershed code	100301011310
Name of state management/river basin	Upper Missouri
U.S. Geological Survey 8 digit hydrologic cataloging unit code	10030101
Critical low flow (acute)	
Critical low flow (chronic)	
Total hardness at critical low flow	

Treatment Description

3.8 Provide the following information describing the treatment provided for discharges from each outfall.

Outfall Number	001
Highest Level of Treatment (check all that apply per outfall)	☐ Primary ☐ Equivalent to secondary ☑ Secondary ☑ Advanced ☐ Other
Design Removal Rates by Outfall	
BOD_5 or $CBOD_5$	97.70 %
TSS	97.30 %
Phosphorus	
Nitrogen	
Other	

Treatment Description Continued

3.9 Describe the type of disinfection used for the effluent from each outfall in the table below. If disinfection varies by season, describe below.

Outfall Number	001
Disinfection type	Ultraviolet
Seasons used	All Year
Dechlorination used?	☐ Not applicable ☐ Yes ☑ No

Effluent Testing Data

3.10 Have you completed monitoring for all Table A parameters and attached the results to the application package?

☑ No. ☐ Yes.

3.11 Have you conducted any WET tests during the 4.5 years prior to the date of the application on any of the facility's discharges or on any receiving water near the discharge points?

☑ No. Skip to Item 3.13. ☐ Yes. Continue below.

3.12 Indicate the number of acute and chronic WET tests conducted since the last permit reissuance of the facility's discharges by outfall number or of the receiving water near the discharge points.

Outfall Number	001	
	Acute	**Chronic**
Number of tests of discharge water		
Number of tests of receiving water		

3.13 Does the treatment works have a design flow greater than or equal to 0.1 mgd?

☑ No. Skip to Item 3.16. ☐ Yes. Continue below.

3.14 Does the POTW use chlorine for disinfection, use chlorine elsewhere in the treatment process, or otherwise have reasonable potential to discharge chlorine in its effluent?

☐ No. Complete Table B, omitting chlorine. ☐ Yes. Complete Table B, including chlorine.

3.15 Have you completed monitoring for all applicable Table B pollutants and attached the results to this application package?

☑ No. ☐ Yes.

3.16 Does one or more of the following conditions apply?

- The facility has a design flow greater than or equal to 1 mgd.
- The POTW has an approved pretreatment program or is required to develop such a program.
- The MPDES permitting authority has informed the POTW that it must sample for the parameters in Table C, must sample other additional parameters (Table D), or submit the results of WET tests for acute or chronic toxicity for each of its discharge outfalls (Table E).

☐ No. Skip to Section 4. ☑ Yes. Complete Tables C, D, and E as applicable.

3.17 Have you completed monitoring for all applicable Table C pollutants and attached the results to this application package?

☑ No. ☐ Yes.

Effluent Testing Data Continued

3.18 Have you completed monitoring for all applicable Table D pollutants required by your MPDES permitting authority and attached the results to this application package?

☑ No additional sampling required by MPDES. ☐ Yes. Continue below.

3.19 Has the POTW conducted either (1) minimum of four quarterly WET tests for one year preceding this permit application or (2) at least four annual WET tests in the past 4.5 years?

☐ No. Complete Table E and skip to Item 3.26. ☑ Yes. Continue below.

3.20 Have you previously submitted the results of the above tests to your MPDES permitting authority?

☑ No. Complete Table E and skip to Item 3.26. ☐ Yes. Continue below.

3.21 Indicate the dates the data were submitted to your MPDES permitting authority and provide a summary of the results.

Dates Submitted (MM/DD/YYYY)	**Summary of Results**

3.22 Regardless of how you provided your WET testing data to the MPDES permitting authority, did any of the tests result in toxicity?

☑ No. Skip to Item 3.26. ☐ Yes. Continue below.

3.23 Describe the cause(s) of the toxicity:

3.24 Has the treatment works conducted a toxicity reduction evaluation?

☑ No. Skip to Item 3.26. ☐ Yes. Continue below.

3.25 Provide details of any toxicity reduction evaluations conducted:

3.26 Have you completed Table E for all applicable outfalls and attached the results to the application package?

☐ Not applicable. ☑ Yes.

Section 4. Industrial Discharges and Hazardous Wastes

4.1 Does the POTW receive discharges from SIUs or NSCIUs?

☑ No. Skip to Item 4.7. ☐ Yes. Continue below.

4.2 Indicate the number of SIUs and NSCIUs that discharge to the POTW.

Number of SIUs 0

Number of NSCIUs 0

4.3 Does the POTW have an approved pretreatment program?

☐ No. ☐ Yes.

4.4 Have you submitted either of the following to the MPDES permitting authority that contains information substantially identical to that required in Table F: (1) a pretreatment program annual report submitted within one year of the application or (2) a pretreatment program?

☑ No. Skip to Item 4.6. ☐ Yes. Continue below.

4.5 Identify the title and date of the annual report or pretreatment program referenced in Item 4.4. SKIP to 4.7.

4.6 Have you completed and attached Table F to this application package?

☑ No. ☐ Yes.

4.7 Does the POTW receive, or has it been notified that it will receive, by truck, rail, or dedicated pipe, any wastes that are regulated as RCRA hazardous wastes pursuant to 40 CFR 261?

☑ No. Skip to Section 4.9. ☐ Yes. Continue below.

4.8 Provide the following information:

Hazardous Waste Number	**Waste Transport Method** (check all that apply)	**Annual Amount of Waste Received**	**Units**
	☐ Truck ☐ Rail ☐ Dedicated pipe ☐ Other	0.00	

4.9 Does the POTW receive, or has it been notified that it will receive, wastewaters that originate from remedial activities, including those undertaken pursuant to CERCLA and Sections 3004(7) or 3008(h) of RCRA?

☑ No. Skip to Section 5. ☐ Yes.

4.10 Does the POTW receive (or expect to receive) less than 15 kilograms per month of non-acute hazardous wastes as specified in 40 CFR 261.30(d) and 261.33(e)?

☐ No. Skip to Section 5. ☐ Yes.

4.11 Have you reported the following information in an attachment to this application: identification and description of the site(s) or facility(ies) at which the wastewater originates; the identities of the wastewater's hazardous constituents; and the extent of treatment, if any, the wastewater receives or will receive before entering the POTW?

☐ No. ☐ Yes.

Section 5. Combined Sewer Overflows

CSO Map and Diagram

5.1 Does the treatment works have a combined sewer system?
☑ No. Skip to Section 6. ☐ Yes. Continue below.

5.2 Have you attached a CSO system map to this application? (See instructions for map requirements.)
☑ No. ☐ Yes.

5.3 Have you attached a CSO system diagram to this application? (See instructions for diagram requirements.)
☑ No. ☐ Yes.

Section 6. Certification Statement

6.1 **Certification Statement**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information; including the possibility of fine and imprisonment for knowing violations. [75-5-633, MCA].

Name (print or type first and last name) KEVIN ORE	Official Title
Signature Digitally Signed - CROMERR Compliant	Date Signed May 24, 2024

Table A. Effluent Parameters for All POTWs

Pollutant	**Maximum Daily Discharge**		**Average Daily Discharge**			**Analytical Method[1]**	**ML or MDL** (include units)
	Value	**Units**	**Value**	**Units**	**Number of Samples**		
BOD 5-day, 20 deg. C	140	mg/L			1095	A5210B	2 mg/L
BOD, carbonaceous, 5-day, 20 deg. C						Missing	
E.coli bacteria	45069	#/100mL			1095	A9223B	1 #/100mL
Flow rate			1.01254e+006	gpd	1095		
pH Minimum	6.05	SU					
pH Maximum	8.27	SU					
Temperature (Winter)						Missing	
Temperature (Summer)						Missing	
Solids, total suspended	64	mg/L			1095	A2540D	5 mg/L

[1] Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required under 40 CFR chapter I, subchapter N or O. See instructions and 40 CFR 122.21(e)(3).

Table B. Effluent Parameters for all POTWs with a Flow Equal to or Greater than 0.1 MGD.

Pollutant	**Maximum Daily Discharge**		**Average Daily Discharge**			**Analytical Method**[1]	**ML or MDL** (include units)
	Value	**Units**	**Value**	**Units**	**Number of Samples**		
Ammonia (as N)	22.8	mg/L			34	E350.1	0.8 mg/L
Chlorine, total residual						Missing	
Oxygen, dissolved (DO)						Missing	
Nitrite plus nitrate total (as N)	31.7	mg/L			156	E353.2	0.02 mg/L
Nitrogen, Kjeldahl, total (as N)	31.3	mg/L			156	E351.2	0.5 mg/L
Oil and Grease	5	mg/L			12	E1664A	5 mg/L
Phosphorus, total (as P)	8.84	mg/L			156	E365.1	0.01 mg/L
Total Dissolved Solids						Missing	

[1] Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required under 40 CFR chapter I, subchapter N or O. See instructions and 40 CFR 122.21(e)(3).

[2] Facilities that do not use chlorine for disinfection, do not use chlorine elsewhere in the treatment process, and have no reasonable potential to discharge chlorine in their effluent are not required to report data for chlorine.

Table C. Effluent Parameters for Selected POTWs

Metals, Cyanide, and Total Phenols

Pollutant	**Maximum Daily Discharge**		**Average Daily Discharge**			**Analytical Method**[1]	**ML or MDL** (include units)
	Value	**Units**	**Value**	**Units**	**Number of Samples**		
Hardness, total (as CaCO3)						Missing	
Antimony, total (as Sb)						Missing	
Arsenic, total (as As)	59	ug/L			34	E200.8	1 ug/L
Beryllium, total (as Be)						Missing	
Cadmium, total (as Cd)						Missing	
Chromium, total (as Cr)						Missing	
Copper, total (as Cu)	61	ug/L			63	E200.8	1 ug/L
Lead, total (as Pb)	4.1	ug/L			12	E200.8	0.5 ug/L
Mercury, total (as Hg)						Missing	
Nickel, total (as Ni)						Missing	
Selenium, total (as Se)						Missing	
Silver, total (as Ag)						Missing	
Thallium, total [as Tl]						Missing	
Zinc, total (as Zn)	80	ug/L			12	E200.8	10 ug/L
Cyanide, total (as CN)						Missing	
Total phenols						Missing	

Table C. Effluent Parameters for Selected POTWs

Volatile Organic Compounds

Pollutant	**Maximum Daily Discharge**		**Average Daily Discharge**			**Analytical Method**[1]	**ML or MDL** (include units)
	Value	**Units**	**Value**	**Units**	**Number of Samples**		

Table C. Effluent Parameters for Selected POTWs

Acid-Extractable Compounds

Pollutant	**Maximum Daily Discharge**		**Average Daily Discharge**			**Analytical Method**[1]	**ML or MDL** (include units)
	Value	**Units**	**Value**	**Units**	**Number of Samples**		

Table C. Effluent Parameters for Selected POTWs

Table C. Effluent Parameters for Selected POTWs

Base-Neutral Compounds

Pollutant	**Maximum Daily Discharge**		**Average Daily Discharge**			**Analytical Method**[1]	**ML or MDL** (include units)
	Value	**Units**	**Value**	**Units**	**Number of Samples**		

[1] Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required under 40 CFR Chapter I, Subchapter N or O. See instructions and 40 CFR 122.21(e)(3).

Table D. Additional Pollutants as Required by MPDES Permitting Authority

Pollutant (list)	**Maximum Daily Discharge**		**Average Daily Discharge**			**Analytical Method**[1]	**ML or MDL** (include units)
	Value	**Units**	**Value**	**Units**	**Number of Samples**		
☑ No additional sampling is required by MPDES permitting authority.							

[1] Sampling shall be conducted according to sufficiently sensitive test procedures (i.e., methods) approved under 40 CFR 136 for the analysis of pollutants or pollutant parameters or required under 40 CFR chapter I, subchapter N or O. See instructions and 40 CFR 122.21(e)(3).

Table E. Effluent Monitoring for Whole Effluent Toxicity	
Test Number	
Test species	
Age at initiation of test	
Outfall number	
Date sample collected	
Date test started	
Duration	
Toxicity Test Methods	
Test method number	
Manual title	
Edition number and year of publication	
Page number(s)	
Sample Type	
Check one:	☐ Grab ☐ 24-hour composite
Sample Location	
Check one:	☐ Before disinfection ☐ After disinfection ☐ After dechlorination
Point in Treatment Process	
Describe the point in the treatment process at which the sample was collected for each test.	
Toxicity Type	
Indicate for each test whether the test was performed to asses acute or chronic toxicity, or both. (Check one response.)	☐ Acute ☐ Chronic ☐ Both
Test Type	
Indicate the type of test performed. (Check one response.)	☐ Static ☐ Static renewal ☐ Flow-through
Source of Dilution Water	
Indicate the source of dilution water. (Check one response.)	☐ Laboratory ☐ Receiving water
If laboratory water, specify type.	
If receiving water, specify source.	

Table E. Effluent Monitoring for Whole Effluent Toxicity	
Type of Dilution Water	
Indicate the type of dilution water. If salt water, specify "natural" or type of artificial sea salts or brine used.	☐ Fresh water ☐ Salt water (specify)
Percentage Effluent Used	
Specify the percentage effluent used for all concentrations in the test series.	
Parameters Tested	
Check the parameters tested.	☐ pH ☐ Salinity ☐ Temperature ☐ Ammonia ☐ Dissolved oxygen
Acute Test Results	
Percent survival in 100% effluent	%
LC_{50}	
95% confidence interval	%
Control percent survival	%
Acute Test Results Continued	
Other (describe)	
Chronic Test Results	
NOEC	%
IC_{25}	%
Control percent survival	%
Other (describe)	
Quality Control/Quality Assurance	
Is reference toxicant data available?	☐ Yes ☐ No
Was reference toxicant test within acceptable bounds?	☐ Yes ☐ No
What date was reference toxicant test run (MM/DD/YYYY)?	
Other (describe)	

Table F. Industrial Discharge Information	
SIU	
Mailing address (street or P.O. box)	
City, state, and ZIP code	
Description of all industrial processes that affect or contribute to the discharge.	
List the principal products and raw materials that affect or contribute to the SIU's discharge.	
Indicate the average daily volume of wastewater discharged by the SIU.	
How much of the average daily volume is attributable to process flow?	
How much of the average daily volume is attributable to non-process flow?	
Is the SIU subject to local limits?	☐ Yes ☐ No
Is the SIU subject to categorical standards?	☐ Yes ☐ No
Under what categories and subcategories is the SIU subject?	
Has the POTW experienced problems (e.g., upsets, pass-through interferences) in the past 4.5 years that are attributable to the SIU?	☐ Yes ☐ No
If yes, describe.	

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APPENDIX B

MGWPCS Permit Information

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DEQ
Montana Department
of Environmental Quality

November 19, 2024

Kevin Ore, Public Works Director
City of East Helena
PO Box 1170
East Helena, MT 59635

RE: Completeness Letter - MGWPCS Permit Application
East Helena WWTF
Permit MTX000311 (pending)

Dear Mr. Ore:

On October 23, 2024, the Department of Environmental Quality (DEQ) received an updated application from City of East Helena to obtain a new Montana Ground Water Pollution Control System (MGWPCS) permit for the East Helena WWTF. The submittal provided adequate response and information to questions raised in a DEQ review letter dated September 6, 2024.

The MGWPCS application is complete. I will now begin assessing the water quality considerations of this potential discharge as required by the Montana Water Quality Act. I will contact you or your contractors at Water Environmental Services, Inc. or Robert Peccia & Associates, Inc. if questions arise during my analysis or development of a draft permit. If you have any questions regarding the permitting process, please feel free to contact me anytime at (406) 444-6747.

Sincerely,

Melinda Horne
Ground Water Discharge Permits Program
Water Protection Bureau

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Montana Department
of Environmental Quality

WATER

PROTECTION

BUREAU

Agency Use

Permit No.: **MTX000311**

Date Rec'd
Amount Rec'd
Check No.
Rec'd By
Date Gen'd **10/07/2024**

FORM
1

GENERAL INFORMATION

Section A – Montana Pollutant Discharge Elimination System (MPDES)

SPECIFIC QUESTIONS	Yes/No	SPECIFIC QUESTIONS	Yes/No
1. Is this facility a publicly owned treatment works which results in a discharge to state surface waters or waters of the U.S.? (FORM 2A)	**«potw»**	2. Does or will this facility (either existing or proposed) include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to state surface waters or waters of the U.S.? (FORM 2B)	**«form2b»**
3. Is this a facility which currently results in a discharge of industrial wastewater to state surface water other than those described in 1 or 2 above? (FORM 2C)	**«ewtw»**	4. Is this a proposed facility (other than those described in 1 or 2 above) which will result in a discharge of industrial wastewater to state surface waters? (FORM 2D)	**«pwtw»**
5. Does this facility discharge only non-process wastewater, not subject to federal effluent guidelines or new source performance standards to state surface waters? (FORM 2E)	**«npwt»**	6. Does this facility discharge or propose to discharge storm water associated with industrial activity either alone or in combination with non-storm water discharges? (FORM 2F)	**«istw»**

Montana Ground Water Pollution Control System (MGWPCS)

7. Does this facility discharge sewage to ground water through infiltration, percolation or other methods of subsurface disposal? (GW-1)	**Yes**	8. Does this facility discharge industrial wastes, or other wastes, to ground water through infiltration, percolation, or other methods of subsurface disposal? (GW-2)	**No**

Section B - Facility or Site Information *(See instruction sheet.):*

Site Name: EAST HELENA WWTF

Site physical address: 3301 PLANT DRIVE

City, State, Zip: East Helena, MT, 59635

County: Lewis and Clark

Township, Range, Section: 10N 3W 24SN

Latitude: 46.6036110 Longitude: -111.921111

Is this facility or site located on Indian Lands? **No**

Section C - Facility Contact:

Facility Contact: KEVIN ORE Title: Phone: 406-459-3769 Email: kore@easthelenamt.us

Mailing Address: PO BOX 1170

City: EAST HELENA State: MT Zip: 59635

Telephone: 406-459-3769 Email: kore@easthelenamt.us

Section D - Existing or Pending Permits, Certifications, or Approvals

MPDES Permit: Yes 404 Permit (dredge & fill): No

UIC #: MGWPCS #: No

Plat Approval EQ #: Other: No

Section E – Nature of Business (provide a brief description)
Domestic Wastewater Treatment Facility

SIC CODES (4-digit, in order of priority)

Code	Description
4952	Sewerage Systems

Section F - Applicant (Owner/Operator) Information

Applicant (Operator) Name: CITY OF EAST HELENA

Mailing Address: PO BOX 1170

City: EAST HELENA State: MT Zip: 59635

Applicant Type: Owner and Operator

Organization Type: Municipal or Water District

Supplemental Information

CERTIFICATION

Applicant Information: This form must be completed, signed, and certified as follows:

- For a corporation,
  - (i) a president, secretary, treasurer, or vice-president of the corporation.
  - (ii) the manager of one or more manufacturing, production, or operating facilities.
- For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
- For a municipality, state, federal, or other public facility, by either a principal executive officer or ranking elected official.

All Applicants Must Complete the Following Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information; including the possibility of fine and imprisonment for knowing violations. [75-5-633, MCA]

A. Name (Type or Print)
KEVIN ORE

B. Title (Type or Print)

C. Phone No.
406-459-3769

D. Signature
Digitally Signed - CROMERR Compliant

E. Date Signed
October 07, 2024

The Department will not process this form until all of the requested information is supplied, and the appropriate fees are paid. Return this form and the applicable fee to:

Department of Environmental Quality
Water Protection Bureau

PO Box 200901
Helena, MT 59620-0901
(406) 444-3080

Montana Department
of Environmental Quality

WATER PROTECTION BUREAU

Agency Use

Permit No.: **MTX000311**

Date Rec'd
Amount Rec'd
Check No.
Rec'd By
Date Gen'd **10/07/2024**
App. Doc. Version No.: **5**

FORM
GW-1

Ground Water Individual: Domestic Waste Water
MTX000000

This form must be accompanied by DEQ Form 1. Form GW-1 is to be used for facilities that discharge or propose to discharge domestic sewage to state ground water and fulfills the requirements of ARM 17.30.1023(4). Please read the attached instructions before completing this application. Do not leave blank spaces; if a question is not applicable put an 'NA' in the space provided. You must print or type legibly; applications that are not legible will be returned.

Section A - Status *(Check one):*

☐ New — No prior permit submitted for this site.

☐ Renewal — Permit Number:

Section B – Facility/Site Information *(Must be the same as Form 1)*

Facility Name EAST HELENA WWTF

Facility Location 3301 PLANT DRIVE

Facility Contact / Title KEVIN ORE Title: Phone: 406-459-3769 Email: kore@easthelenamt.us

Mailing Address PO BOX 1170

City, State, Zip EAST HELENA, MT, 59635

Telephone Number(s) 406-459-3769

Section C – Outfall Location

For each outfall, provide the latitude and longitude, and method of wastewater disposal system. *(See Section J)*

Outfall Number	Latitude	Longitude	Method of Disposal
001	46.6028698	-111.923304	Rapid Infiltration, infiltration/percolation basins

Section D – Collection System Information

Provide information on the collection system served by the wastewater treatment system.

Population Served 2969 Households Served 1109

Type of Collection System Gravity sewer with 5 lift stations that convey municipal wastewater, not a combined sewer system

Check all that apply and give the percentage of each contribution.

Sanitary Sewer Yes 85% Storm Water No 0% Floor Drains No 0%

Sump Collection System No 0% Other: Infiltration & Inflow Yes 15%

Business/Commercial or Industrial Connections:

Are businesses or industrial facilities connected to the proposed treatment system? Yes

If yes, number of industrial/business connections 42

Commercial or Industrial Operation(s) Contributing Flow

List name (if available) or Type of Operation		Average Daily Flow *(include units)*	Maximum Daily Flow *(include units)*	Average Annual % Contribution
Pure View East / Medical Clinic / 8011		40.0000000 Gallons per Day	73.0000000 Gallons per Day	0.02
Prickly Pear School / Public School / 8211		665.0000000 Gallons per Day	1217.0000000 Gallons per Day	0.27
Radley School / Public School / 8211		1656.0000000 Gallons per Day	3030.0000000 Gallons per Day	0.68
EH Foursquare Church / Church / 8661		189.0000000 Gallons per Day	346.0000000 Gallons per Day	0.08
East Valley Middle School / Public School / 8211		2133.0000000 Gallons per Day	3903.0000000 Gallons per Day	0.87
J4 Automotive / Automotive Repair Shop / 7538		67.0000000 Gallons per Day	123.0000000 Gallons per Day	0.03
Valley Bank / Bank / 6021		22.0000000 Gallons per Day	40.0000000 Gallons per Day	0.01
Town Pump #3 / Gas Station / 5541		1000.0000000 Gallons per Day	1830.0000000 Gallons per Day	0.41
MT Lil's / Casino / 7993		156.0000000 Gallons per Day	285.0000000 Gallons per Day	0.06

Brent Stoos / Video Store / 5999		29.0000000 Gallons per Day	53.0000000 Gallons per Day	0.01
Heritage Food Store / Grocery Store / 5411		789.0000000 Gallons per Day	1444.0000000 Gallons per Day	0.32
Draes / Casino / 7993		189.0000000 Gallons per Day	346.0000000 Gallons per Day	0.08
Smith's Place / Restaurant and Bar / 5813		406.0000000 Gallons per Day	742.0000000 Gallons per Day	0.17
East Helena City Office / Administration Building / 9111		200.0000000 Gallons per Day	366.0000000 Gallons per Day	0.08
Helena Farm Supply / Tractor Sales and Repair / 7699		156.0000000 Gallons per Day	285.0000000 Gallons per Day	0.06
Creative Stitches / Sewing Sales and Supplies / 5949		67.0000000 Gallons per Day	123.0000000 Gallons per Day	0.03
Leilani's Lattes / Coffee Kiosk / 5812		40.0000000 Gallons per Day	73.0000000 Gallons per Day	0.02
Vigilante Pizza / Restaurant / 5812		389.0000000 Gallons per Day	712.0000000 Gallons per Day	0.16
Shannon's Cupcakery / Bakery / 5461		44.0000000 Gallons per Day	81.0000000 Gallons per Day	0.02
Health & Rehab Solutions / Physical Therapy Clinic / 8049		56.0000000 Gallons per Day	102.0000000 Gallons per Day	0.02
Jeff's HD Service / Motorcycle Repair Shop / 7699		22.0000000 Gallons per Day	40.0000000 Gallons per Day	0.01
Eagles 4040 / Restaurant and Bar / 5813		322.0000000 Gallons per Day	589.0000000 Gallons per Day	0.13
Jeff Wong / Restaurant / 5812		167.0000000 Gallons per Day	306.0000000 Gallons per Day	0.07
Helen's BBQ / Restaurant / 5812		544.0000000 Gallons per Day	996.0000000 Gallons per Day	0.22

Blessed Hope Baptist Church / Church / 8661		211.0000000 Gallons per Day	386.0000000 Gallons per Day	0.09
International Brotherhood of Boilermakers / Union Office & Training / 8631		78.0000000 Gallons per Day	143.0000000 Gallons per Day	0.03
VFW Club / Restaurant and Bar / 5813		489.0000000 Gallons per Day	895.0000000 Gallons per Day	0.20
Queen City Offroad / Automotive Repair Shop / 7538		22.0000000 Gallons per Day	40.0000000 Gallons per Day	0.01
North Star Real Estate / Real Estate Office / 6531		20.0000000 Gallons per Day	37.0000000 Gallons per Day	0.01
Town Pump of Butte / Gas Station / 5541		1022.0000000 Gallons per Day	1870.0000000 Gallons per Day	0.42
Town Pump Car Wash / Car Wash / 7542		5156.0000000 Gallons per Day	9435.0000000 Gallons per Day	2.11
Merry Maids / Cleaning Service Office / 7349		56.0000000 Gallons per Day	102.0000000 Gallons per Day	0.02
The Man Store / Novelty Store / 5947		133.0000000 Gallons per Day	243.0000000 Gallons per Day	0.05
East Helena Pit Stop / Automotive Repair Shop / 7538		1722.0000000 Gallons per Day	3151.0000000 Gallons per Day	0.70
MET / Controls Contractor / 1731		33.0000000 Gallons per Day	60.0000000 Gallons per Day	0.01
Montana Iron Workers / Job Training Center / 8631		644.0000000 Gallons per Day	1179.0000000 Gallons per Day	0.26
EH Fire Hall / Community Rec Center / 9224		22.0000000 Gallons per Day	40.0000000 Gallons per Day	0.01
EH United Methodist Church / Church / 8661		22.0000000 Gallons per Day	40.0000000 Gallons per Day	0.01
Catholic Church / Church / 8661		221.0000000 Gallons per Day	404.0000000 Gallons per Day	0.09

American Chemet / Industrial Paint Additives / 2816		6642.0000000 Gallons per Day	12155.0000000 Gallons per Day	2.71
Missouri River Brewing / Brew Pub / 5813		1024.0000000 Gallons per Day	1874.0000000 Gallons per Day	0.42
Karmadillos / Restaurant / 5812		195.0000000 Gallons per Day	357.0000000 Gallons per Day	0.08

Section E – Treatment System Capacity

For *new* treatment works, provide hydraulic design capacity information; for *existing* systems, provide *both* design and measured information.

Parameter	Design Capacity	**Measured Flow**		
		Two Years Ago	Last Year	This Year
Annual average daily flow rate	434000.00 gpd	gpd	209000.0000000 gpd	245000.0000000 gpd
Maximum daily flow rate	434000.00 gpd	gpd	358000.0000000 gpd	454000.0000000 gpd

Flow Measurement Device(s): 6" Parshall Flume with Ultrasonic Level Sensor
Manufacturer: Plasti-Fab
Type: Parshall Flume

Section F - Treatment System Description

(Describe the treatment system(s) or best management practices (BMP's) used to reduce pollutants. Attach additional sheets if necessary.)

Current System: In 2003, the City of East Helena upgraded their WWTP to an extended aeration activated sludge process in an earthen-lined basin followed by an upflow clarifier and UV disinfection. The system was designed to remove BOD, TSS and ammonia. Preliminary treatment consists of a 1/4" mechanical screen followed by a flow-through grit removal system. In 2014, a new metals removal facility was constructed. The process consists of four (4) upflow sand filters, chemical addition, and several pump stations to remove copper,. lead, zinc and phosphorous. Treated effluent is discharged to Prickly Pear Creek. Waste sludge is held in a partially aerated sludge storage basin where it is stabilized through aerobic and anaerobic processes. Periodically, sludge from the basin is sent to drying beds for dewatering and final stabilization. Dry biosolids are hauled to the landfill.

New System: The WWTP shall utilize a series of sequence batch reactors (SBR) to treat their effluent. A portion of their treated effluent is designed to be discharged via Rapid Infiltration Basins (RIBs) throughout the year (up to 1.0 MGD). The use of RIBs will limit the volume discharged via land application and limit the volume of storage required to meet the demands of the growing community. Draft RIB design includes six separate cells located at the west of the current WWTP. A new lift station and associated piping will be installed that will transport effluent to the RIB system. The exact schedule of effluent discharge will be determined with DEQ concurrence. All RIBs will be designed to meet specifications outlined in DEQ-2.

What levels of treatment are provided? Check all that apply.
Conventional Yes Level II No Primary No Nutrient Reduction System Yes
Other (i.e., experimental) No

Indicate the method of treatment for wastewater:
Intermittent Sand Filter No Recirculating Sand Filter No Recirculating Trickling Filter No
Aerobic Sewage Treatment Unit No Chemical Nutrient Reduction No Passive Nutrient Reduction No
Other (specify) Yes mechanical screening, gravity grit removal, extended aeration activated sludge/clarification, UV, upflow sand filters

Indicate the following removal rates (as actual or estimated):

Design BOD_5 or $CBOD_5$ Removal Yes 97.00 %	Design TSS Removal Yes 97.00 %
Design Total Phosphorus Removal Yes 52.00 %	Design Total Nitrogen Removal Yes 61.00 %
Design Pathogen Removal Yes 100.00 %	Other: No 0.00 %

Has effluent testing information been collected for the wastewater treatment system proposed? Yes
If yes, submit effluent testing data for all parameters listed in Section M.
Method(s) of disinfection used for the effluent: UV

Line Drawing:

Attach a line drawing showing wastewater flow through the collection and treatment works. Indicate sources contributing wastewater to the system and treatment units. Construct a water balance on the line drawing showing design flow between treatment units, flow measurement location(s), sampling locations and outfalls. [See attached example]

Scheduled Improvements and Schedules of Implementation

Provide information on any uncompleted implementation schedule or uncompleted plans for improvements that will affect the wastewater treatment, effluent quality or design capacity of the treatment works.
Are planned improvements or implementation schedules required by local, state or federal agencies?
No

List the outfall number for each outfall that is affected by this implementation schedule:

Section G – Engineering Report(s)

A. If there is any technical evaluation concerning your wastewater collection and treatment system, including engineering reports or pilot plant studies, check the appropriate box below.

Report Available, copy attached Yes

B. Provide the name and location of any existing facilities which, to the best of your knowledge, resembles this production facility with respect to production processes, wastewater constituents, or wastewater collection & treatment.

Name: **Location:**

C. Other Information
(Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.)

Section H – Chemical Additions

List all chemical(s), product(s) used in facility maintenance. Attach additional pages where necessary. Submit a complete list of chemicals; include products used even on a temporary basis (Material Safety Data Sheets – MSDS –

may be submitted in addition to the list).

Name	Manufacturer
Aqua Hawk 530	Hawkins, inc.
Ferric Chloride 35%	Hawkins, Inc.
Sodium Hydroxide 50%	Hawkins, Inc.

Section I – Sewage Sludge

Indicate the method(s) used for disposal of sludge generated during wastewater treatment:

Composting Facility No

Land application No

Disposal at WWTP No

Landfill (Municipal, Hazardous Waste) No

Other No - Describe:

Transporter
Name
Address
Telephone

Treatment works facility
Name
Address
Telephone

Is this facility authorized to dispose of sewage sludge under an NPDES Permit? Yes Permit No. MT0022560

Section J – Disposal System

Outfall #: 001

Indicate the method of wastewater disposal for this outfall. *(Check one)*

Well injection No Drainfield No Rapid Infiltration Yes Evapotranspiration No Overland Flow No

Infiltration/Absorption Trenches No Slow Infiltration No Land Application (see form LA-1) No

Infiltration/Percolation No

Other(s) No Explain: infiltration/percolation basins

Depth below ground surface 4.00 ft Distance above ground level ft

Is discharge: continuous No intermittent Yes seasonal No

If seasonal indicate the month(s) the outfall discharges:

Is the operator of the wastewater treatment system requesting a mixing zone pursuant to the Administrative Rule of Montana (ARM) Title 17, chapter 30, subchapter 5? Yes

Standard Mixing Zone for Ground Water (ARM 17.30.517) Yes

Source Specific Mixing Zone (ARM 17.30.518) No

Does the treatment works discharge or transport treated or untreated wastewater to another treatment works? No

If yes, provide the following information regarding the transporter and treatment works receiving the wastewater.

Transporter

Treatment Works Facility

Name	Name
Address	Address
Telephone	Telephone

Section K – Ground Water Characteristics

Outfall	Test	Units	Minimum Value	Maximum Value	Average Value	No. of Samples	Source of Data
001	Conductivity	umho/cm	259	274	267	3	Monitoring
001	Nitrite plus nitrate total (as N)	mg/L	0.32	0.47	0.38	3	Monitoring
001	Nitrogen, Kjeldahl, total (as N)	mg/L	< 0.5	< 0.5	< 0.5	3	Monitoring
001	Carbon, tot organic (TOC)	mg/L	0.5	0.7	0.6	3	Monitoring
001	Chloride (as Cl)	mg/L	5	5	5	3	Monitoring
001	Coliform fecal general	CFU/100mL	< 100	< 100	< 100	3	Monitoring
001	pH	SU	7.1	7.2	7.16	3	Monitoring
001	Total Dissolved Solids	mg/L	158	168	162	3	Monitoring

Section K - Ground Water Characteristics

Outfall #: 001

Describe how the above estimates were obtained. Attach relevant supplemental information as necessary.

Sampling was conducted at monitoring well MW-1 which was installed in support of this permit application.

Section L – Local Hydrogeology and Mixing Zone Information

Outfall	Name of all surface waters within 1 mile	Distance[1]	Direction[1]
001	PRICKLY PEAR CREEK	1800.00 ft	S 45.00 W

[1] From Source (outfall)

Section L – Local Hydrogeology and Mixing Zone Information

Outfall #: 001

Depth to shallowest ground water 38.00 ft
Depth to shallowest bedrock 50.00 ft
Depth to shallowest impermeable geologic strata (if known) ft
Direction of ground water flow N 10.00 E

Describe how these values were obtained. Attach relevant supplemental information as necessary:

Shallowest groundwater was established based on 10 months of monitoring groundwater levels in the on-site monitoring wells. The hydraulic gradient was established based on 10-months of monitoring groundwater levels in the on-site monitoring wells. Depth to bedrock is estimated from the altitude of and depth to bedrock surface: Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana prepared by USGS. The groundwater flow direction is an average of flow directions over 10-months of monitoring data and preparation of monthly groundwater contours via triangulation.

Standard Mixing Zone - *(Required Information*)*

Hydraulic Gradient * (I) 0.01 ft/ft

Hydraulic Conductivity * (K) 149.00 ft/day

Maximum width of source perpendicular to the direction of ground water flow * 487.00 ft

Depth of Mixing Zone 15.00 ft

Width of Mixing Zone 634.58 ft

Length of Mixing Zone 500.00 ft

Distance from source to facility property boundary 560.00 ft

Volume of ground water in Mixing Zone 682780.04 ft3/d

Describe how these values were obtained. Attach relevant supplemental information as necessary:

The hydraulic gradient (0.0119 ft/day) has been estimated from groundwater monitoring over the period of 10 months (03/2023 to 11/2023). The hydraulic conductivity is based on the results of an aquifer pumping test performed on the 4-inch well owned by the city (GWIC Well 227753) . The value from the aquifer testing is 149 ft/day. The depth of the mixing zone (15 feet) is based on the standard mixing zone and does not exceed the thickness of the shallow aquifer (receiving water). A standard 500-ft mixing zone is proposed, and the infiltration basins have been located to maintain that setback from the property boundary. The volume of water is based on the thickness (15 ft) and area of the mixing zone (631,629.78 sq. ft) and an effective porosity of (0.315) which is estimated for gravelly sand.

Source Specific Mixing Zone ARM 17.30.518

If source specific mixing zone is being requested, provide justification in accordance with ARM 17.30.518. Submit all supplemental data documenting how hydraulic gradient, background concentrations, effluent concentrations and hydraulic conductivity were determined. This includes but is not limited to well logs, aquifer test methods and calculations, potentiometric maps and hydrogeologic reports of studies conducted in the area.

Section M – Effluent Characteristics

Outfall	Parameter	Maximum		Average		No. of Samples	Source of Estimate
		Concentration	Units	Concentration	Units		
001	BOD 5-day, 20 deg. C	34.4	mg/L	7.7	mg/L	36	Monitoring
001	Coliform fecal general	218.7	#/100 mL	10.5	#/100mL	36	Monitoring
001	Oil and Grease	5	mg/L	1.3	mg/L	12	Monitoring
001	pH Maximum	8.5	SU	7.25	SU	36	Monitoring
001	pH Minimum	6	SU	7.25	SU	36	Monitoring
001	Solids, total suspended	23.4	mg/L	7.5	mg/L	36	Monitoring
001	Ammonia (as N)	22.8	mg/L	2.3	mg/L	36	Monitoring
001	Nitrite plus nitrate total (as N)	28.9	mg/L	17.9	mg/L	36	Monitoring
001	Nitrogen, Kjeldahl, total (as N)	27.3	mg/L	4.5	mg/L	36	Monitoring
001	Phosphorus, total (as P)	6.8	mg/L	2.9	mg/L	36	Monitoring

Section N - Alternative Water Supply and Alternate Disposal Methods

In the space provided below describe proposed measues to be taken to provide alternative water supplies, treatment and alternative disposal practices in the event any domestic, municipal, agricultural, or commercial/industrial well is adversely affected by the operation of the source.

All treated effluent can be sent to the current surface water discharge location.

Section O – Operation/Maintenance Performed by Contractor(s)

Are any operational or maintenance aspects (related to wastewater treatment and effluent quality) of the treatment works the responsibility of a contractor? No
If yes, list the name, address, telephone number, and status of each contractor; describe the contractor's responsibilities.

Section P – Land Ownership

New sources or new applicants must submit a list of surface owners and leasees of land within 1 mile of the proposed source, as required by ARM 17.30.1023(4)(d).

Supplemental Information

CERTIFICATION

Applicant Information: This form must be completed, signed, and certified as follows:

- For a corporation,
  - (i) a president, secretary, treasurer, or vice-president of the corporation.
  - (ii) the manager of one or more manufacturing, production, or operating facilities.
- For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
- For a municipality, state, federal, or other public facility, by either a principal executive officer or ranking elected official.

All Applicants Must Complete the Following Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information; including the possibility of fine and imprisonment for knowing violations. [75-5-633, MCA]

A. Name (Type or Print)
KEVIN ORE

B. Title (Type or Print)

C. Phone No.
406-459-3769

D. Signature
Digitally Signed - CROMERR Compliant

E. Date Signed
October 07, 2024

The Department will not process this form until all of the requested information is supplied, and the appropriate fees are paid. Return this form and the applicable fee to:

Department of Environmental Quality

Water Protection Bureau
PO Box 200901
Helena, MT 59620-0901
(406) 444-3080

October 23, 2024

Melinda Horne
Montana DEQ
1520 E. 6th Ave.,
Helena, MT 59601

Subject: **RE: Notice of Deficiency – MGWPCS Permit Application East Helena WWTF Permit MTX000311 (pending)**

Dear Melinda,

The following letter and attachments are provided in response to the Montana Department of Environmental Quality (MDEQ) deficiency letter regarding Montana Groundwater Pollution Control System (MGWPCS) permit application MTX000311 submitted on behalf of the City of East Helena Wastewater Treatment Facility (WWTF). This letter addresses comments from the September 6, 2024, Notice of Deficiency (NOD) letter. For ease of cross-reference, the bold, italicized, underlined text below is taken directly from the letter.

Form GW-1 Section D: Provide the SIC codes of the contributing commercial/industrial sources.

The SIC code for each Commercial or Industrial Operation Contributing flow has been added to Section 5 of the online application.

Form GW-1 Section E: Confirm or correct the treatment system capacity.

The "Average Daily Flow" and "Maximum Daily Flow" have been adjusted to accurately represent the Design Capacity as well as measured "Average Daily Flow" and "Maximum Daily Flow" for two years ago and for last year.

Form GW-1 Section E: Input the nearest surface waters within one mile.

Prickly Pear Creek was added to Section 8 – Disposal and Mixing Zone, as surface water within 1 mile of the source outfall.

Evaluate the impacts the discharge may have on Prickly Pear Creek.

The hydrogeologic investigation performed at the project site in support of this permit application confirms that Prickly Pear Creek is located upgradient or cross-gradient from the proposed Rapid Infiltration Basins (RIBs), with respect to groundwater flow direction. Further, static water levels in the on-site monitoring wells were consistently measured at depths of 43.22 to 57.45 feet below ground surface (bgs), at an approximate elevation of 3,781 to 3,797 feet above mean sea level (amsl). At it's closest point, Prickly Pear Creek is located approximately 0.5 miles west (cross-gradient) of the proposed RIBs. At this location, the Prickly Pear Creek channel has an approximate elevation of 3,827 feet amsl, indicating that Prickly Pear Creek is perched above the source aquifer at the site.

Previous investigations of the Helena Valley-Fill aquifer system have identified the vertical gradient in various portions of the valley-fill aquifer, through the use of nested wells completed at various depths. As illustrated in Figure 7 of "Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana" (Briar and Madison, 1992), the proposed RIBs are located in an area with a downward vertical hydraulic gradient. In areas with a downward vertical gradient, surface waters typically lose water to the groundwater system or recharge the aquifer. Streamflow monitoring data collected at multiple locations along Prickly Pear Creek (Briar and Madison, 1992) identified losses from Prickly Pear Creek to the valley-fill aquifer at an estimated rate of 6 to 10 cubic feet per second (cfs).

Additionally, Figure 8 of "Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana" (Briar and Madison, 1992), illustrates losses from Prickly Pear Creek between measurement sites in Section 25, Township 10 North, Range 3 West and Section 10, Township 10 North, Range 3 West. This losing segment of Prickly Pear Creek is the section located in the vicinity of the proposed RIBs.

Given this portion of the valley-fill aquifer has a downward vertical gradient and Prickly Pear Creek is a losing stream in the vicinity of the proposed RIBs, no impact to Prickly Pear Creek is anticipated.

If you require any additional information to finalize your review, I may be reached at (406) 309-6083 or bbennett@waterenvtech.com.

Sincerely,

Brad Bennett, PG
Senior Hydrogeologist

Attachments
Attachment 1 – Figure 7 (page 17) "Areas of upward and downward vertical hydraulic gradients and location of wells at nested sites." *Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana*, David W. Briar and James P. Madison *(USGS, 1992)*

Attachment 2 – Figure 8 (page 19) "Measured discharge during low-flow investigations and location of surface water measurement sites." *Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana*, David W. Briar and James P. Madison *(USGS, 1992)*

Attachment 1

"Areas of upward and downward vertical hydraulic gradients and location of wells at nested sites."
Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana
David W. Briar and James P. Madison *(USGS, 1992)*

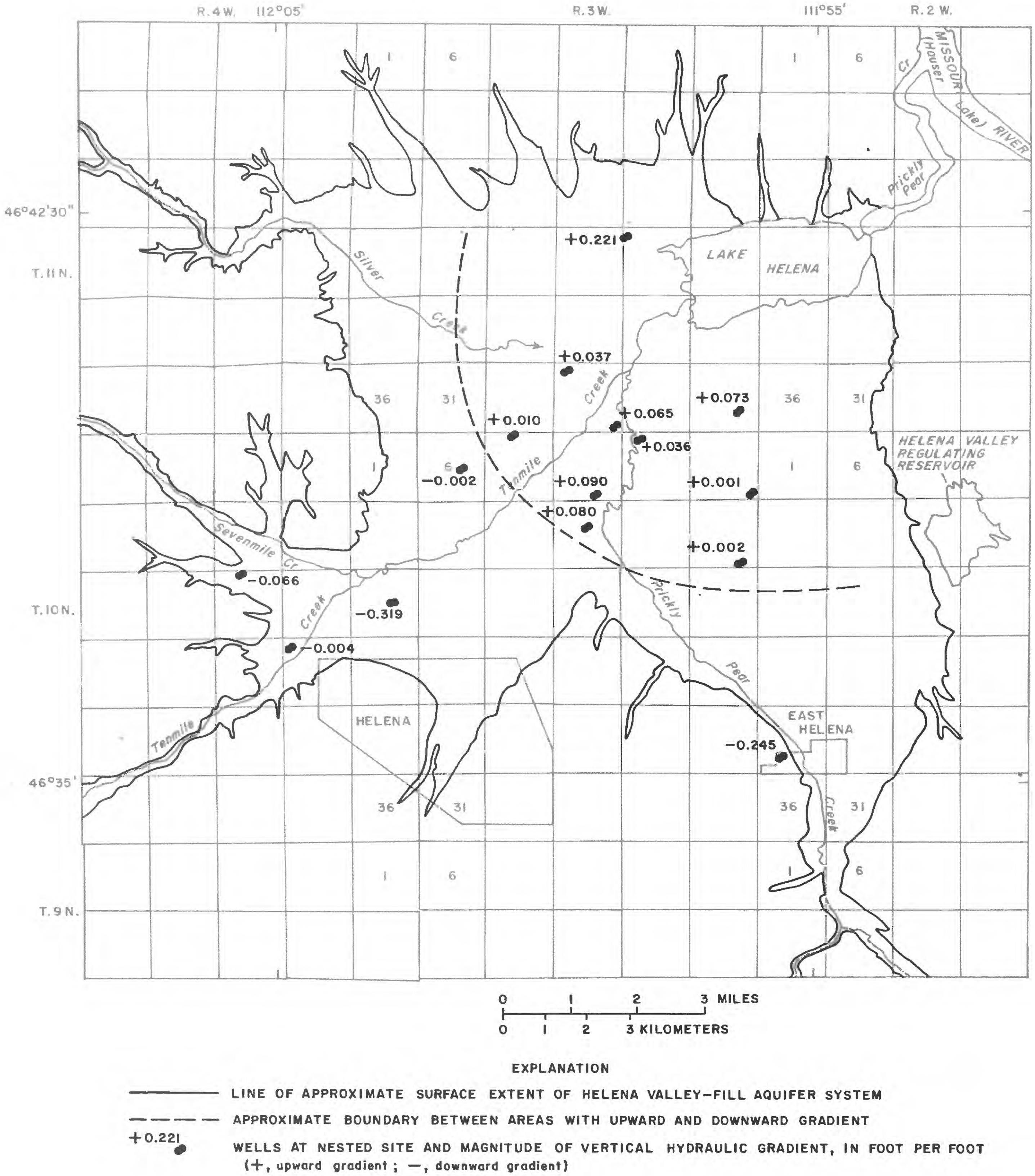

Figure 7.--Areas of upward and downward vertical hydraulic gradients and location of wells at nested sites.

Attachment 2

"Measured discharge during low-flow investigations and
location of surface water measurement sites."
Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana
David W. Briar and James P. Madison *(USGS, 1992)*

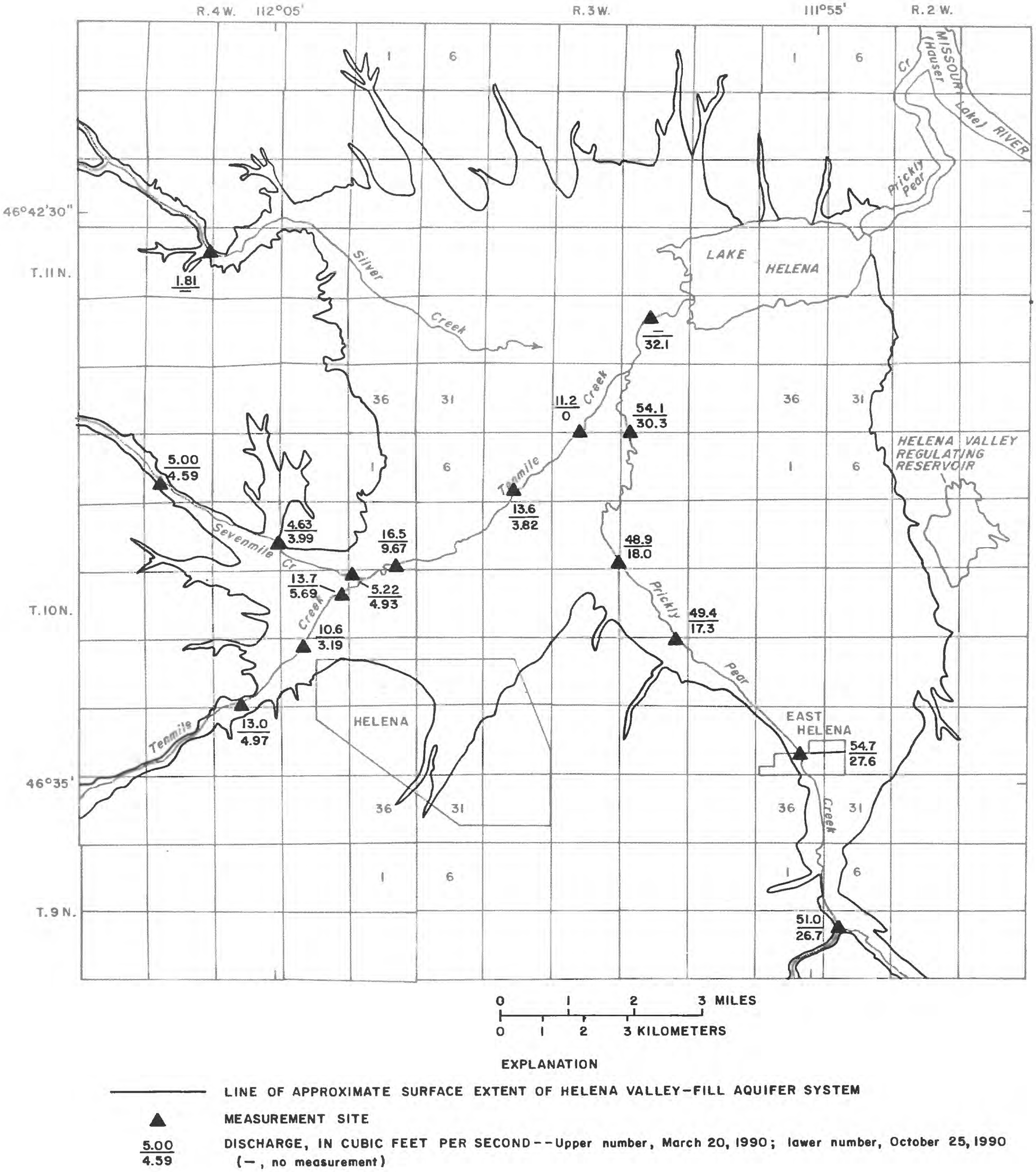

Figure 8.--Measured discharge during low-flow investigations and location of surface-water measurement sites.

September 6, 2024

Kevin Ore, Public Works Director
City of East Helena
PO Box 1170
East Helena, MT 59635

RE: Notification of Deficiency - MGWPCS Permit Application
East Helena WWTF
Permit MTX000311

Dear Mr. Ore.:

On August 7, 2024, the Montana Department of Environmental Quality (DEQ) received a Montana Ground Water Pollution Control System (MGWPCS) permit application and applicable fees from City of East Helena. DEQ noted several deficiencies during the application review process; therefore, the application is incomplete. In order for the application review process to recommence, please address the application deficiencies and additional inquiries as listed below:

- **Form GW-1 Section D:** Provide the SIC codes of the contributing commercial/industrial sources.
- **Form GW-1 Section E:** Confirm or correct the treatment system capacity.
- **Form GW-1 Section L:** Input the neatest surface waters within one mile.
- Evaluate the impacts the discharge may have on Prickly Pear Creek.

Please re-certify (sign) and submit an updated application Form GW-1 and any supplemental information to DEQ by October 7, 2024. Thank you for your patience and cooperation during the permitting process. If you would like to have a meeting regarding the topics listed above, or have any additional questions, please feel free to contact me at (406) 444-6747.

Sincerely,

Melinda Horne
Ground Water Discharge Permits Program
Water Protection Bureau

c: Brad Bennett, Christina Eggensperger, WET

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Montana Department of Environmental Quality

WATER PROTECTION BUREAU

Agency Use

Permit No.: **MTX000311**

Date Rec'd

Amount Rec'd

Check No.

Rec'd By

Date Gen'd **08/07/2024**

FORM
1

GENERAL INFORMATION

Section A – Montana Pollutant Discharge Elimination System (MPDES)

SPECIFIC QUESTIONS	Yes/No	SPECIFIC QUESTIONS	Yes/No
1. Is this facility a publicly owned treatment works which results in a discharge to state surface waters or waters of the U.S.? (FORM 2A)	**«potw»**	2. Does or will this facility (either existing or proposed) include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to state surface waters or waters of the U.S.? (FORM 2B)	**«form2b»**
3. Is this a facility which currently results in a discharge of industrial wastewater to state surface water other than those described in 1 or 2 above? (FORM 2C)	**«ewtw»**	4. Is this a proposed facility (other than those described in 1 or 2 above) which will result in a discharge of industrial wastewater to state surface waters? (FORM 2D)	**«pwtw»**
5. Does this facility discharge only non-process wastewater, not subject to federal effluent guidelines or new source performance standards to state surface waters? (FORM 2E)	**«npwt»**	6. Does this facility discharge or propose to discharge storm water associated with industrial activity either alone or in combination with non-storm water discharges? (FORM 2F)	**«istw»**

Montana Ground Water Pollution Control System (MGWPCS)

7. Does this facility discharge sewage to ground water through infiltration, percolation or other methods of subsurface disposal? (GW-1)	**Yes**	8. Does this facility discharge industrial wastes, or other wastes, to ground water through infiltration, percolation, or other methods of subsurface disposal? (GW-2)	**No**

Section B - Facility or Site Information *(See instruction sheet.):*

Site Name: EAST HELENA WWTF

Site physical address: 3301 PLANT DRIVE

City, State, Zip: East Helena, MT, 59635

County: Lewis and Clark

Township, Range, Section: 10N 3W 24SN

Latitude: 46.6036110 Longitude: -111.921111

Is this facility or site located on Indian Lands? **No**

Section C - Facility Contact:

Facility Contact: KEVIN ORE Title: Phone: 406-459-3769 Email: kore@easthelenamt.us

Mailing Address: PO BOX 1170

City: EAST HELENA State: MT Zip: 59635

Telephone: 406-459-3769 Email: kore@easthelenamt.us

Section D - Existing or Pending Permits, Certifications, or Approvals

MPDES Permit: Yes 404 Permit (dredge & fill): No

UIC #: MGWPCS #: No

Plat Approval EQ #: Other: No

Section E – Nature of Business (provide a brief description)
Domestic Wastewater Treatment Facility

SIC CODES (4-digit, in order of priority)

Code	Description
4952	Sewerage Systems

Section F - Applicant (Owner/Operator) Information

Applicant (Operator) Name: CITY OF EAST HELENA

Mailing Address: PO BOX 1170

City: EAST HELENA State: MT Zip: 59635

Applicant Type: Owner and Operator

Organization Type: Municipal or Water District

Supplemental Information

CERTIFICATION

Applicant Information: This form must be completed, signed, and certified as follows:

- For a corporation,
  - (i) a president, secretary, treasurer, or vice-president of the corporation.
  - (ii) the manager of one or more manufacturing, production, or operating facilities.
- For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
- For a municipality, state, federal, or other public facility, by either a principal executive officer or ranking elected official.

All Applicants Must Complete the Following Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information; including the possibility of fine and imprisonment for knowing violations. [75-5-633, MCA]

A. Name (Type or Print)

B. Title (Type or Print)

C. Phone No.

D. Signature

E. Date Signed

The Department will not process this form until all of the requested information is supplied, and the appropriate fees are paid. Return this form and the applicable fee to:

Department of Environmental Quality
Water Protection Bureau

PO Box 200901
Helena, MT 59620-0901
(406) 444-3080

Montana Department of Environmental Quality

WATER

PROTECTION

BUREAU

Agency Use

Permit No.: **MTX000311**

Date Rec'd
Amount Rec'd
Check No.
Rec'd By
Date Gen'd **08/07/2024**
App. Doc. Version No.: **2**

FORM
GW-1

Ground Water Individual: Domestic Waste Water MTX000000

This form must be accompanied by DEQ Form 1. Form GW-1 is to be used for facilities that discharge or propose to discharge domestic sewage to state ground water and fulfills the requirements of ARM 17.30.1023(4). Please read the attached instructions before completing this application. Do not leave blank spaces; if a question is not applicable put an 'NA' in the space provided. You must print or type legibly; applications that are not legible will be returned.

Section A - Status *(Check one)*:

☐ New No prior permit submitted for this site.

☐ Renewal Permit Number:

Section B – Facility/Site Information *(Must be the same as Form 1)*

Facility Name EAST HELENA WWTF

Facility Location 3301 PLANT DRIVE

Facility Contact / Title KEVIN ORE Title: Phone: 406-459-3769 Email: kore@easthelenamt.us

Mailing Address PO BOX 1170

City, State, Zip EAST HELENA, MT, 59635

Telephone Number(s) 406-459-3769

Section C – Outfall Location

For each outfall, provide the latitude and longitude, and method of wastewater disposal system. *(See Section J)*

Outfall Number	Latitude	Longitude	Method of Disposal
001	46.6028698	-111.923304	Rapid Infiltration, infiltration/percolation basins

Section D – Collection System Information

Provide information on the collection system served by the wastewater treatment system.

Population Served 2969

Households Served 1109

Type of Collection System Gravity sewer with 5 lift stations that convey municipal wastewater, not a combined sewer system

Check all that apply and give the percentage of each contribution.

Sanitary Sewer Yes 85%

Storm Water No 0%

Floor Drains No 0%

Sump Collection System No 0%

Other: Infiltration & Inflow Yes 15%

Business/Commercial or Industrial Connections:

Are businesses or industrial facilities connected to the proposed treatment system? Yes

If yes, number of industrial/business connections 42

Commercial or Industrial Operation(s) Contributing Flow

List name (if available) or Type of Operation		Average Daily Flow *(include units)*	Maximum Daily Flow *(include units)*	Average Annual % Contribution
Pure View East / Medical Clinic		40.0000000 Gallons per Day	73.0000000 Gallons per Day	0.02
Prickly Pear School / Public School		665.0000000 Gallons per Day	1217.0000000 Gallons per Day	0.27
Radley School / Public School		1656.0000000 Gallons per Day	3030.0000000 Gallons per Day	0.68
EH Foursquare Church / Church		189.0000000 Gallons per Day	346.0000000 Gallons per Day	0.08
East Valley Middle School / Public School		2133.0000000 Gallons per Day	3903.0000000 Gallons per Day	0.87
J4 Automotive / Automotive Repair Shop		67.0000000 Gallons per Day	123.0000000 Gallons per Day	0.03
Valley Bank / Bank		22.0000000 Gallons per Day	40.0000000 Gallons per Day	0.01
Town Pump #3 / Gas Station		1000.0000000 Gallons per Day	1830.0000000 Gallons per Day	0.41
MT Lil's / Casino		156.0000000 Gallons per Day	285.0000000 Gallons per Day	0.06

Brent Stoos / Video Store		29.0000000 Gallons per Day	53.0000000 Gallons per Day	0.01
Heritage Food Store / Grocery Store		789.0000000 Gallons per Day	1444.0000000 Gallons per Day	0.32
Draes / Casino		189.0000000 Gallons per Day	346.0000000 Gallons per Day	0.08
Smith's Place / Restaurant and Bar		406.0000000 Gallons per Day	742.0000000 Gallons per Day	0.17
East Helena City Office / Administration Building		200.0000000 Gallons per Day	366.0000000 Gallons per Day	0.08
Helena Farm Supply / Tractor Sales and Repair		156.0000000 Gallons per Day	285.0000000 Gallons per Day	0.06
Creative Stitches / Sewing Sales and Supplies		67.0000000 Gallons per Day	123.0000000 Gallons per Day	0.03
Leilani's Lattes / Coffee Kiosk		40.0000000 Gallons per Day	73.0000000 Gallons per Day	0.02
Vigilante Pizza / Restaurant		389.0000000 Gallons per Day	712.0000000 Gallons per Day	0.16
Shannon's Cupcakery / Bakery		44.0000000 Gallons per Day	81.0000000 Gallons per Day	0.02
Health & Rehab Solutions / Physical Therapy Clinic		56.0000000 Gallons per Day	102.0000000 Gallons per Day	0.02
Jeff's HD Service / Motorcycle Repair Shop		22.0000000 Gallons per Day	40.0000000 Gallons per Day	0.01
Eagles 4040 / Restaurant and Bar		322.0000000 Gallons per Day	589.0000000 Gallons per Day	0.13
Jeff Wong / Restaurant		167.0000000 Gallons per Day	306.0000000 Gallons per Day	0.07
Helen's BBQ / Restaurant		544.0000000 Gallons per Day	996.0000000 Gallons per Day	0.22

Blessed Hope Baptist Church / Church		211.0000000 Gallons per Day	386.0000000 Gallons per Day	0.09
International Brotherhood of Boilermakers / Union Office & Training		78.0000000 Gallons per Day	143.0000000 Gallons per Day	0.03
VFW Club / Restaurant and Bar		489.0000000 Gallons per Day	895.0000000 Gallons per Day	0.20
Queen City Offroad / Automotive Repair Shop		22.0000000 Gallons per Day	40.0000000 Gallons per Day	0.01
North Star Real Estate / Real Estate Office		20.0000000 Gallons per Day	37.0000000 Gallons per Day	0.01
Town Pump of Butte / Gas Station		1022.0000000 Gallons per Day	1870.0000000 Gallons per Day	0.42
Town Pump Car Wash / Car Wash		5156.0000000 Gallons per Day	9435.0000000 Gallons per Day	2.11
Merry Maids / Cleaning Service Office		56.0000000 Gallons per Day	102.0000000 Gallons per Day	0.02
The Man Store / Novelty Store		133.0000000 Gallons per Day	243.0000000 Gallons per Day	0.05
East Helena Pit Stop / Automotive Repair Shop		1722.0000000 Gallons per Day	3151.0000000 Gallons per Day	0.70
MET / Controls Contractor		33.0000000 Gallons per Day	60.0000000 Gallons per Day	0.01
Montana Iron Workers / Job Training Center		644.0000000 Gallons per Day	1179.0000000 Gallons per Day	0.26
EH Fire Hall / Community Rec Center		22.0000000 Gallons per Day	40.0000000 Gallons per Day	0.01
EH United Methodist Church / Church		22.0000000 Gallons per Day	40.0000000 Gallons per Day	0.01
Catholic Church / Church		221.0000000 Gallons per Day	404.0000000 Gallons per Day	0.09

American Chemet / Industrial Paint Additives		6642.0000000 Gallons per Day	12155.0000000 Gallons per Day	2.71
Missouri River Brewing / Brew Pub		1024.0000000 Gallons per Day	1874.0000000 Gallons per Day	0.42
Karmadillos / Restaurant		195.0000000 Gallons per Day	357.0000000 Gallons per Day	0.08

Section E – Treatment System Capacity

For *new* treatment works, provide hydraulic design capacity information; for *existing* systems, provide *both* design and measured information.

Parameter	Design Capacity	**Measured Flow**		
		Two Years Ago	Last Year	This Year
Annual average daily flow rate	800000.00 gpd	gpd	gpd	gpd
Maximum daily flow rate	800000.00 gpd	gpd	gpd	gpd

Flow Measurement Device(s): 6" Parshall Flume with Ultrasonic Level Sensor
Manufacturer: Plasti-Fab
Type: Parshall Flume

Section F - Treatment System Description

(Describe the treatment system(s) or best management practices (BMP's) used to reduce pollutants. Attach additional sheets if necessary.)

Current System: In 2003, the City of East Helena upgraded their WWTP to an extended aeration activated sludge process in an earthen-lined basin followed by an upflow clarifier and UV disinfection. The system was designed to remove BOD, TSS and ammonia. Preliminary treatment consists of a 1/4" mechanical screen followed by a flow-through grit removal system. In 2014, a new metals removal facility was constructed. The process consists of four (4) upflow sand filters, chemical addition, and several pump stations to remove copper,. lead, zinc and phosphorous. Treated effluent is discharged to Prickly Pear Creek. Waste sludge is held in a partially aerated sludge storage basin where it is stabilized through aerobic and anaerobic processes. Periodically, sludge from the basin is sent to drying beds for dewatering and final stabilization. Dry biosolids are hauled to the landfill.

New System: The WWTP shall utilize a series of sequence batch reactors (SBR) to treat their effluent. A portion of their treated effluent is designed to be discharged via Rapid Infiltration Basins (RIBs) throughout the year (up to 1.0 MGD). The use of RIBs will limit the volume discharged via land application and limit the volume of storage required to meet the demands of the growing community. Draft RIB design includes six separate cells located at the west of the current WWTP. A new lift station and associated piping will be installed that will transport effluent to the RIB system. The exact schedule of effluent discharge will be determined with DEQ concurrence. All RIBs will be designed to meet specifications outlined in DEQ-2.

What levels of treatment are provided? Check all that apply.
Conventional Yes Level II No Primary No Nutrient Reduction System Yes
Other (i.e., experimental) No

Indicate the method of treatment for wastewater:
Intermittent Sand Filter No Recirculating Sand Filter No Recirculating Trickling Filter No
Aerobic Sewage Treatment Unit No Chemical Nutrient Reduction No Passive Nutrient Reduction No
Other (specify) Yes mechanical screening, gravity grit removal, extended aeration activated sludge/clarification, UV, upflow sand filters

Indicate the following removal rates (as actual or estimated):

Design BOD_5 or $CBOD_5$ Removal Yes 97.00 %	Design TSS Removal Yes 97.00 %
Design Total Phosphorus Removal Yes 52.00 %	Design Total Nitrogen Removal Yes 61.00 %
Design Pathogen Removal Yes 100.00 %	Other: No 0.00 %

Has effluent testing information been collected for the wastewater treatment system proposed? Yes
If yes, submit effluent testing data for all parameters listed in Section M.
Method(s) of disinfection used for the effluent: UV

Line Drawing:

Attach a line drawing showing wastewater flow through the collection and treatment works. Indicate sources contributing wastewater to the system and treatment units. Construct a water balance on the line drawing showing design flow between treatment units, flow measurement location(s), sampling locations and outfalls. [See attached example]

Scheduled Improvements and Schedules of Implementation

Provide information on any uncompleted implementation schedule or uncompleted plans for improvements that will affect the wastewater treatment, effluent quality or design capacity of the treatment works.
Are planned improvements or implementation schedules required by local, state or federal agencies?
No

List the outfall number for each outfall that is affected by this implementation schedule:

Section G – Engineering Report(s)

A. If there is any technical evaluation concerning your wastewater collection and treatment system, including engineering reports or pilot plant studies, check the appropriate box below.

Report Available, copy attached Yes

B. Provide the name and location of any existing facilities which, to the best of your knowledge, resembles this production facility with respect to production processes, wastewater constituents, or wastewater collection & treatment.

Name: **Location:**

C. Other Information
(Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations for the proposed facility. Attach additional sheets if necessary.)

Section H – Chemical Additions

List all chemical(s), product(s) used in facility maintenance. Attach additional pages where necessary. Submit a complete list of chemicals; include products used even on a temporary basis (Material Safety Data Sheets – MSDS –

may be submitted in addition to the list).

Name	Manufacturer
Aqua Hawk 530	Hawkins, inc.
Ferric Chloride 35%	Hawkins, Inc.
Sodium Hydroxide 50%	Hawkins, Inc.

Section I – Sewage Sludge

Indicate the method(s) used for disposal of sludge generated during wastewater treatment:

Composting Facility No
Land application No
Disposal at WWTP No
Landfill (Municipal, Hazardous Waste) No

Other No - Describe:

Transporter
Name Tri-County Disposal
Address 3630 York Road; Helena, MT
Telephone 406-227-6300

Treatment works facility
Name Valley View Landfill
Address 17 Powertrain Road; East Helena, MT
Telephone 406-227-6300

Is this facility authorized to dispose of sewage sludge under an NPDES Permit? Yes Permit No. MT0022560

Section J – Disposal System

Outfall #: 001

Indicate the method of wastewater disposal for this outfall. *(Check one)*

Well injection No Drainfield No Rapid Infiltration Yes Evapotranspiration No Overland Flow No

Infiltration/Absorption Trenches No Slow Infiltration No Land Application (see form LA-1) No

Infiltration/Percolation No

Other(s) No Explain: infiltration/percolation basins

Depth below ground surface 4.00 ft Distance above ground level ft

Is discharge: continuous No intermittent Yes seasonal No

If seasonal indicate the month(s) the outfall discharges:

Is the operator of the wastewater treatment system requesting a mixing zone pursuant to the Administrative Rule of Montana (ARM) Title 17, chapter 30, subchapter 5? Yes
Standard Mixing Zone for Ground Water (ARM 17.30.517) Yes
Source Specific Mixing Zone (ARM 17.30.518) No

Does the treatment works discharge or transport treated or untreated wastewater to another treatment works? No

If yes, provide the following information regarding the transporter and treatment works receiving the wastewater.

Transporter

Treatment Works Facility

Name	Name
Address	Address
Telephone	Telephone

Section K – Ground Water Characteristics

Outfall	Test	Units	Minimum Value	Maximum Value	Average Value	No. of Samples	Source of Data
001	Conductivity	umho/cm	259	274	267	3	Monitoring
001	Nitrite plus nitrate total (as N)	mg/L	0.32	0.47	0.38	3	Monitoring
001	Nitrogen, Kjeldahl, total (as N)	mg/L	< 0.5	< 0.5	< 0.5	3	Monitoring
001	Carbon, tot organic (TOC)	mg/L	0.5	0.7	0.6	3	Monitoring
001	Chloride (as Cl)	mg/L	5	5	5	3	Monitoring
001	E.coli bacteria	CFU/100mL	< 100	< 100	< 100	3	Monitoring
001	pH	SU	7.1	7.2	7.16	3	Monitoring
001	Total Dissolved Solids	mg/L	158	168	162	3	Monitoring

Section K - Ground Water Characteristics

Outfall #: 001

Describe how the above estimates were obtained. Attach relevant supplemental information as necessary.

Sampling was conducted at monitoring well MW-1 which was installed in support of this permit application.

Section L – Local Hydrogeology and Mixing Zone Information

Outfall	Name of all surface waters within 1 mile	Distance[1]	Direction[1]
001			

[1] From Source (outfall)

Section L – Local Hydrogeology and Mixing Zone Information

Outfall #: 001

Depth to shallowest ground water 38.00 ft
Depth to shallowest bedrock 50.00 ft
Depth to shallowest impermeable geologic strata (if known) ft
Direction of ground water flow N 10.00 E

Describe how these values were obtained. Attach relevant supplemental information as necessary:

Shallowest groundwater was established based on 10 months of monitoring groundwater levels in the on-site monitoring wells. The hydraulic gradient was established based on 10-months of monitoring groundwater levels in the on-site monitoring wells. Depth to bedrock is estimated from the altitude of and depth to bedrock surface: Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana prepared by USGS. The groundwater flow direction is an average of flow directions over 10-months of monitoring data and preparation of monthly groundwater contours via triangulation.

Standard Mixing Zone - *(Required Information*)*

Hydraulic Gradient * (I) 0.01 ft/ft

Hydraulic Conductivity * (K) 149.00 ft/day

Maximum width of source perpendicular to the direction of ground water flow * 487.00 ft

Depth of Mixing Zone 15.00 ft

Width of Mixing Zone 634.58 ft

Length of Mixing Zone 500.00 ft

Distance from source to facility property boundary 560.00 ft

Volume of ground water in Mixing Zone 682780.04 ft3/d

Describe how these values were obtained. Attach relevant supplemental information as necessary:

The hydraulic gradient (0.0119 ft/day) has been estimated from groundwater monitoring over the period of 10 months (03/2023 to 11/2023). The hydraulic conductivity is based on the results of an aquifer pumping test performed on the 4-inch well owned by the city (GWIC Well 227753) . The value from the aquifer testing is 149 ft/day. The depth of the mixing zone (15 feet) is based on the standard mixing zone and does not exceed the thickness of the shallow aquifer (receiving water). A standard 500-ft mixing zone is proposed, and the infiltration basins have been located to maintain that setback from the property boundary. The volume of water is based on the thickness (15 ft) and area of the mixing zone (631,629.78 sq. ft) and an effective porosity of (0.315) which is estimated for gravelly sand.

Source Specific Mixing Zone ARM 17.30.518

If source specific mixing zone is being requested, provide justification in accordance with ARM 17.30.518. Submit all supplemental data documenting how hydraulic gradient, background concentrations, effluent concentrations and hydraulic conductivity were determined. This includes but is not limited to well logs, aquifer test methods and calculations, potentiometric maps and hydrogeologic reports of studies conducted in the area.

Section M – Effluent Characteristics

Outfall	Parameter	Maximum		Average		No. of Samples	Source of Estimate
		Concentration	Units	Concentration	Units		
001	Ammonia (as N)	22.8	mg/L	2.3	mg/L	36	Monitoring
001	Nitrite plus nitrate total (as N)	28.9	mg/L	17.9	mg/L	36	Monitoring
001	Nitrogen, Kjeldahl, total (as N)	27.3	mg/L	4.5	mg/L	36	Monitoring
001	Phosphorus, total (as P)	6.8	mg/L	2.9	mg/L	36	Monitoring
001	BOD 5-day, 20 deg. C	34.4	mg/L	7.7	mg/L	36	Monitoring
001	E.coli bacteria	218.7	#/100 mL	10.5	#/100mL	36	Monitoring
001	Oil and Grease	5	mg/L	1.3	mg/L	12	Monitoring
001	pH Maximum	8.5	SU	7.25	SU	36	Monitoring
001	pH Minimum	6	SU	7.25	SU	36	Monitoring
001	Solids, total suspended	23.4	mg/L	7.5	mg/L	36	Monitoring

Section N - Alternative Water Supply and Alternate Disposal Methods

In the space provided below describe proposed measues to be taken to provide alternative water supplies, treatment and alternative disposal practices in the event any domestic, municipal, agricultural, or commercial/industrial well is adversely affected by the operation of the source.

All treated effluent can be sent to the current surface water discharge location.

Section O – Operation/Maintenance Performed by Contractor(s)

Are any operational or maintenance aspects (related to wastewater treatment and effluent quality) of the treatment works the responsibility of a contractor? No
If yes, list the name, address, telephone number, and status of each contractor; describe the contractor's responsibilities.

Section P – Land Ownership

New sources or new applicants must submit a list of surface owners and leasees of land within 1 mile of the proposed source, as required by ARM 17.30.1023(4)(d).

Supplemental Information

CERTIFICATION

Applicant Information: This form must be completed, signed, and certified as follows:

- For a corporation,
  - (i) a president, secretary, treasurer, or vice-president of the corporation.
  - (ii) the manager of one or more manufacturing, production, or operating facilities.
- For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
- For a municipality, state, federal, or other public facility, by either a principal executive officer or ranking elected official.

All Applicants Must Complete the Following Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information; including the possibility of fine and imprisonment for knowing violations. [75-5-633, MCA]

A. Name (Type or Print)	
B. Title (Type or Print)	**C. Phone No.**
D. Signature	**E. Date Signed**

The Department will not process this form until all of the requested information is supplied, and the appropriate fees are paid. Return this form and the applicable fee to:

Department of Environmental Quality

Water Protection Bureau
PO Box 200901
Helena, MT 59620-0901
(406) 444-3080

APPENDIX C

Groundwater Investigation and Tech Memo

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RESTORING OUR ENVIRONMENT ● DESIGNING OUR FUTURE

East Helena WWTP I/P Cell Geotechnical Report

East Helena, Montana

Prepared for:

Robert Peccia and Associates
3147 Saddle Drive
Helena, Montana 59601

Prepared by:

Pioneer Technical Services, Inc.
3241 Colonial Drive
Helena, Montana 59601

March 2024

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Revision No.	Author	Version	Description	Date
Rev 0	Sean Harris	Draft	Internal Review	February 2024
Rev 1	Michael Browne	Final	Client Submittal	March 11, 2024

1 INTRODUCTION

Robert Peccia & Associates (RPA) contracted Pioneer Technical Services, Inc. (Pioneer) to complete a geotechnical investigation for the proposed Infiltration/Percolation (I/P) cell addition at the East Helena Wastewater Treatment Plant (WWTP). The purpose of the geotechnical investigation was to explore subsurface conditions at the site and provide information on soil characteristics, foundation recommendations, bearing capacity, lateral earth loads, soil corrosivity concerns, seismic zone, groundwater conditions, material specifications, and discussion of any unusual conditions. This report provides the conclusions of the investigation, results of laboratory testing and analyses, and design recommendations.

2 INVESTIGATION

2.1 Site Description

The project site is located at 3301 Plant Road in East Helena, Montana. The project site lies immediately to the west of the existing East Helena WWTP. The project site is a vacant field that formerly occupied a wastewater treatment lagoon that has since been regraded. A clay liner is still present in the soil lithology from the former treatment lagoon. The site is in the Southeast ¼ of the Southwest ¼ of Section 24, Township 10 North, Range 3 West.

2.2 Geotechnical Investigation

Six geotechnical test pits (TP-01 through TP-06) were excavated to depths between 6 feet and 10 feet within each of the six proposed I/P Cells on November 17, 2023. The test pit excavations were performed by Reisbeck Enterprise using a CAT 330C excavator. The approximate locations of the test pits are shown on the site map included as Figure 1. Pioneer logged the test pit lithology and collected bulk samples for laboratory testing. Samples were field classified in general accordance with ASTM International D2488 (Standard Practice for Description and Identification of Soils [Visual – Manual Procedure]).

2.2.1 Soil Lithology

Predominantly, fill associated with the former wastewater treatment lagoon was encountered across the site underlain by sand and gravel. Soil lithology is summarized in Table 1.

Table 1: Test Pit Lithology

TEST PIT NO.	DEPTH (feet)	LITHOLOGY
TP-01	0 – 0.5	TOPSOIL
	0.5 – 1.5	FILL; Silty Clayey Sand and Fat CLAY[1]
	1.5 – 2.5	Silty, Clayey SAND
	2.5 – 10.0	Well-Graded GRAVEL with Sand and Cobbles
TP-02	0 – 0.5	TOPSOIL
	0.5 – 2.5	FILL; Silty Clayey Sand and Fat CLAY[1]
	2.5 – 3.0	Silty, Clayey SAND
	3.0 – 7.0	Well-Graded GRAVEL with Sand and Cobbles
TP-03	0 – 0.3	TOPSOIL
	0.3 – 2.5	FILL; Silty SAND with Gravel and Fat CLAY[1]
	2.5 – 3.0	Silty SAND with Gravel
	3.0 – 7.0	Well-Graded GRAVEL with Sand and Cobbles
TP-04	0 – 0.5	TOPSOIL
	0.5 – 3.0	FILL; Silty SAND with Gravel and Fat CLAY[1]
	3.0 – 6.0	Well-Graded GRAVEL with Sand and Cobbles
TP-05	0 – 0.5	TOPSOIL
	0.5 – 4.5	FILL; Silty GRAVEL with Sand and Fat CLAY[1]
	4.5 – 8.0	Poorly-Graded GRAVEL with Sand
TP-06	0 – 0.5	TOPSOIL
	0.5 – 4.5	FILL; Silty SAND with Gravel and Fat CLAY[1]
	4.5 – 10.0	Poorly-Graded GRAVEL with Sand

Note: 1) Pioneer speculates that the fat clay, logged in the bottom one-half foot of the fill layer, may be a clay liner associated with the former wastewater treatment lagoon.

Geologically the site is in a Quaternary-aged alluvial-plain deposit (Q_{apo}). This deposit consists of "*moderately sorted cobble to pebble gravel in a light brown silt and sand matrix*" (MBMG, 2017). This was consistent with the exploration as native soils encountered during the investigation comprised of cobbles and gravels within a silty sand matrix.

Appendix A contains the detailed test pit while Appendix B presents photographs of the investigation. The stratification lines shown on the test pit logs represent the approximate boundary between soil types as observed within the test pits. The actual *in situ* transition is variable because of the nature and depositional characteristics of natural soil. Interpolation of subsurface conditions beyond the location of the test pits may be unreliable as soil conditions can change rapidly in both lateral and vertical directions.

2.2.2 Groundwater Conditions

Groundwater was not encountered below the ground surface during the investigation. Review of local well logs on the Montana Bureau of Mines and Geology (MBMG) Ground Water

Information Center website (MBMG GWIC, 2024) showed groundwater depth in nearby wells is approximately 40 feet below the ground surface.

2.3 Laboratory and Field Testing

Collected field samples were transported and analyzed at Pioneer's materials testing laboratory located in Helena, Montana. The samples were collected from select depths and were tested for their index (physical) and chemical properties.

2.3.1 Index Properties

A summary of the laboratory testing results is presented in Table 2. Appendix C provides the complete laboratory testing results.

Table 2: Laboratory Index Data

TEST PIT NO.	DEPTH (feet)	USCS SYMBOL	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	GRADATION ANALYSIS		
						GRAVEL (%)	SAND (%)	FINES (%)
TP-01	0-2	SC-SM	28	21	7	0	57	43
TP-03	0-2	SM	28	24	4	23	53	24
TP-05	0-4	GM	40	33	7	51	35	14
TP-06	5-10	GP	NV	NP	NP	62	34	4
INF-3E	4-7	GW-GM	NV	NP	NP	69	26	5

USCS: Unified Soil Classification System.

Moisture contents of fill ranged between 14% and 24% while moisture contents of underlying gravels ranged between 5% and 9%.

2.3.2 Chemical Properties

Corrosivity testing (soluble sulfate, pH, and resistivity) was conducted to determine if the on-site soil may potentially be corrosive to buried concrete or metal associated with the proposed construction. The pH and soluble sulfate testing were subcontracted to Alpine Analytical, Inc. located in Helena, Montana. A summary of corrosivity testing results is presented in Table 3.

Table 3: Corrosivity Testing

TEST PIT NO.	DEPTH (feet)	LITHOLOTY	pH (s.u.)	RESISTIVITY (ohm-cm)	SOLUBLE SULFATE (%)
TP-02	4 – 6	Native Gravel	3.83	1,600	0.1281
TP-06	1 – 4	Fill	4.19	1,000	0.1875

s.u.: Standard Unit. ohm-cm: ohm-centimeter.

Criteria from the American Water Works Association (AWWA, 2010) and by the Portland Cement Association (PCA) were used to evaluate soil corrosiveness (PCA, 2007). The native soil is considered corrosive to buried metallic elements. Cathodic protection should be used for on-site buried metal elements or piping. Alternatively, use of high-density polyethylene (HDPE) or polyvinyl chloride (PVC) utility pipes and culverts is recommended in lieu of metallic products. The sulfate testing results indicate the native soil has a moderate exposure to concrete sulfate attack. Type II cement should be used for all cast-in-place structural concrete exposed to the native soil.

2.3.3 Phosphorous Isotherm Adsorption Testing

Phosphorus Isotherm Adsorption testing was conducted by University of Idaho Analytical Sciences Laboratory. Pioneer collected samples from three locations coinciding with infiltration tests INF-1E, INF-2W, and INF-3E and shipped samples to Moscow, Idaho for testing. Test results are presented in Appendix D.

2.3.4 Infiltration Testing

Six double ring infiltration tests were performed in accordance with ASTM International D3385. One test was completed for each proposed I/P Cell adjacent to each of the six test pits. Double ring infiltration test results are summarized in Table 4.

Table 4: Infiltration Testing

INFILTRATION TEST NO.	DEPTH (feet)	AVERAGE INFILTRATION/ READING (cm/min)	FLOW VOLUME (cm^3)	FLOW RATE (gal/year*ft^2)
INF-1E	5.0	0.8	40	84,647
INF-2E	3.0	1.2	60	126,971
INF-3E	2.0	2.6	130	275,104
INF-1W	6.0	2.1	105	222,199
INF-2W	4.5	2.2	110	232,780
INF-3W	4.0	0.5	25	52,905

3 ANALYSES AND RECOMMENDATIONS

3.1 Proposed Construction

The project is in the preliminary design phase. It is anticipated the project will include up to six 200-foot by 200-foot wastewater treatment cells with berms built using on-site native soils. The I/P Cells will have a depth of 6.0 feet with the top of berms approximately 1.5 feet above existing grade and bottom of berms approximately 4.5 feet below existing grade. Maximum water depth within the treatment cells is anticipated to be 3.0 feet. Berm side slopes will be 3 horizontal to 1 vertical (3H:1V). TP-01 through TP-06 were excavated at anticipated locations of the treatment cells.

A proposed precast concrete pump house will be located south of the existing Metals Removal Building. The pump house will be approximately 24 feet by 32 feet in size, be founded on spread footings, and have a concrete slab-on-grade floor. Within the pumphouse there will be a 12-foot by 12-foot wet well that extends approximately 12 feet below grade. No test pits are located at the proposed pump house location.

3.2 Treatment Cells

3.2.1 Embankment Construction

The native granular soils, or imported structural fill, are suitable for use as embankment fill. Alternative materials may also be acceptable provided they are approved by the engineer through the submittal process.

To construct the lagoon embankments, Pioneer recommends the following earthwork sequence:

1. Excavate to design grade. Design grade to be established by RPA. At a minimum strip all topsoil, roots, and organic vegetation from embankment footprint.
2. Dewater, if warranted.
3. Scarify, moisture condition, and compact embankment footprint. Subgrade soils should be moisture conditioned to plus or minus 3 percentage points from optimum moisture content and compacted to a standard relative compaction of at least 95 percent (ASTM D698).
4. Proof roll compacted subgrade with loaded dump truck. Provide an opportunity for the engineer to inspect the bottom of the excavation and observe proof rolling. Excavate or recondition and compact soft spots or unsatisfactory materials that are observed.
5. Construct the embankment. Moisture condition and compact embankment materials:
    a. Moisture condition embankment soils to plus or minus 3 percentage points from optimum moisture content (ASTM D698).
    b. Place in 12-inch (maximum) loose lifts. If contractor's compactor weighs less than 15,000 pounds, the loose lift thickness should be reduced to 8 inches (maximum).
    c. Compact each lift to a standard relative compaction of at least 95 percent (ASTM D698). Use hand operated compactors in backfilled areas adjacent to structures.

3.2.2 Berm Stability

Pioneer conducted a steady-state stability analysis on anticipated berm typical section based on geometry described in Section 3.1 and soil strength properties associated with on-site granular soils. The calculated Factor of Safety (FS) for the berm is 3.5 which meets and exceeds the industry standard minimum FS of 1.5. If the berm geometry changes as the design progresses, the stability analysis should be reviewed and amended, if warranted. The results of the stability analysis are included on Figure 2.

3.3 Pumphouse Preliminary Recommendations

Preliminary recommendations have been provided for planning purposes and are based on past headworks building work (Pioneer, 2023), general site familiarity, and anticipated granular site soils. A geotechnical investigation has not been conducted at the pumphouse building location thus recommendations are considered preliminary. A geotechnical investigation must be conducted at the proposed pumphouse location as the project progresses to ensure recommendations provided herein are appropriate. Design values could change if soils other than native gravel soils are encountered at anticipated foundation locations.

3.3.1 Subsurface Materials Discussion

Fill soils (silty, clayey sands and clay liner) should be removed from building footprint. Native sands and gravels are suitable for founding the proposed building upon.

3.3.2 Spread Footings

For spread footings, Pioneer recommends the following:

1. Remove and excavate all fill from building footprint.
2. Locate bottom of exterior footings at least 42 inches below final grade to mitigate frost potential.
3. Exposed cobbles and boulders should be removed from the subgrade surface to minimize point loading on the foundation.
4. Compact subgrade soil to a standard relative compaction of at least 98% (ASTM D698).
5. If warranted, use structural fill or approved on-site granular soil to backfill voids associated with removal of fill and/or cobbles/boulders. Place structural fill in 8-inch loose lifts (maximum) and compact each lift to a standard relative compaction of 98%. Structural fill should meet the gradation requirements listed in Table 5.

Table 5: Structural Fill
(MPW 3-inch Minus Sub-Base Course)

SIEVE SIZE	PERCENT PASSING
3 -inch	100
No. 4	25 - 60
No. 40	10 - 30
No. 200	2 - 10

Provided recommendations listed above are performed, Pioneer recommends an allowable soil bearing capacity of 3,000 pounds per square foot (psf). The friction coefficient (μ) can be taken as 0.40 for sliding against structural fill. Based on theory of elasticity, total and differential settlement are anticipated to be less than 1 inch and ½ inch, respectively.

Ensure there is positive drainage away from the open footing excavations to keep all surface water from draining into the excavations. This also applies to final grading, where positive drainage must be incorporated around the entire structure perimeter.

3.3.3 Slab-On-Grade

For a slab-on-grade floor system, Pioneer recommends the following:

1. Excavate and remove all fill from building footprint.
2. Excavate to design elevations.
3. Compact subgrade soil to a standard relative compaction of at least 95%.
4. Place structural fill.
    d. A minimum of 12 inches (compacted) structural fill is required at all locations below the slab-on-grade footprint. Structural fill should meet gradation specifications listed in Table 5. Place in 8-inch (maximum) loose lifts and compact each lift to a standard relative compaction of at least 95%.
    e. Pending finish floor elevations, additional structural fill may be required to meet design grade, particularly if fill associated with former lagoons is encountered.
5. From a geotechnical perspective, a vapor barrier is not required. Vapor barriers are used to prevent moisture and gas vapors (typically radon) from migrating through the floor slab. The project design team should determine the need for a vapor barrier based on the floor coverings and moisture and gas vapor control requirements. If a vapor barrier is to be installed, Pioneer recommends placing a 15-mil polyolefin vapor barrier. Per PCA's *Concrete Floors on Ground* (PCA, 2008), the vapor barrier should be installed over the structural fill prior to pouring the concrete slab if the slab is being placed without a watertight roofing system in place. The vapor barrier can be installed under the structural fill if the slab is being placed with a watertight roofing system in place.

For structural design of the concrete slab, Pioneer recommends using a subgrade modulus of 300 pounds per square inch per inch (pci).

3.3.4 Foundation Walls

The on-site soil is suitable for backfill against foundation stem walls but should be screened to remove all plus 4-inch size cobbles and boulders prior to backfilling operations. Place the backfill in 8-inch (maximum) loose lifts and compact each lift to a standard relative compaction of at least 95%.

Reinforced concrete wall design can use the following list of lateral pressure loading values based on conservatively assumed strength values of the on-site soil for internal angle of friction (ϕ) equal to 32 degrees, a cohesion (c) value of 0 psf, a moist unit weight of 135 pounds per cubic foot (pcf), and an equivalent fluid weight of 41 pcf. Lateral earth coefficients (based on level backfill) are listed in Table 6. These values can also be used for any potential retaining walls planned for the project provided similar backfill is used and backfill is level with the top of the retaining wall.

Table 6: Lateral Earth Coefficients and Pressures

LATERAL EARTH PRESSURE	COEFFICIENT (K)
Active	0.31
Passive	3.25
At-Rest	0.47

3.3.5 Shrink/Swell Characteristics

The volume change potential of the subgrade soil is considered low based on the granular composition of the soil. Regardless, Pioneer recommends grades (minimum 2%) should be designed and constructed to promote positive drainage away from the structure perimeter.

3.4 Seismic Considerations

The seismic coefficients were estimated using ASCE7-22 and Risk Category II. The seismic coefficients values are presented in Table 7. The seismic coefficients data sheet is included in Appendix E.

Table 7: Seismic Coefficients

Site Class Definition	D
Seismic Design Category	D
Mapped Spectral Response Acceleration Parameter, S_S for 0.2 second	0.53g
Mapped Spectral Response Acceleration Parameter, S_1 for 1.0 second	0.14g
Adjusted Maximum Considered Earthquake Spectral Response Acceleration Parameter, S_{MS}	0.70g
Adjusted Maximum Considered Earthquake Spectral Response Acceleration Parameter, S_{M1}	0.39g
Design Spectral Response Acceleration Parameter, S_{DS}	0.46g
Design Spectral Response Acceleration Parameter, S_{D1}	0.26g

3.5 Underground Utilities and Trench Stability

For utility trench excavations, the trench soils meet the Occupational Safety and Health Administration’s 29 Code of Federal Regulations Part 1926 requirements for a Type C soil. The steepest unsupported slope within a Type C soil is set at 1.5 horizontal to 1 vertical.

Use Type I bedding soils beneath and up to 6 inches above the top of the pipe. Type I bedding soils are ¾-inch minus granular soils having a soluble sulfate content less than 0.1% and a resistivity greater than 3,000 ohm-centimeters. The on-site soils can be used as trench backfill above the bedding soils. Care must be taken to process native soils such that cobbles and boulders are not placed next to utilities. Place the trench soils in 8-inch (maximum) loose lifts and compact to a standard relative compaction of at least 95%.

4 EARTHWORK TESTING

Pioneer recommends that a qualified inspector perform compaction testing for subgrade, structural fill, base course, and backfill. Table 8 lists the suggested minimum compaction testing frequency.

Table 8: Compaction Testing Frequency

LOCATION	FREQUENCY
Beneath Strip Footings	1 test per 25 linear feet of footing per lift
Beneath Column Footings	1 test per footing per lift
Beneath Slab-On-Grade	1 test per 400 square feet per lift
Foundation Wall Backfill	1 test per 50 linear feet per lift
Embankment/Berm	1 test per 250 linear feet per lift

Table 9 summarizes the material compaction specifications presented in other sections of this report. Compaction testing should be performed on subgrade, structural fill, base course, and backfill. Frozen soil, ice particles, and soil with organics, debris, or deleterious materials are not suitable for use as fill. Appropriate winter construction techniques must be used, as warranted, to protect subgrade, fill, and cast concrete from frost. Fill cannot be placed on top of frozen soil. Maximum loose lift thickness is 8 inches.

Table 9: Required Relative Compaction

LOCATION	REQUIRED MINIMUM RELATIVE COMPACTION	STANDARD
Beneath Foundation Footings	98%	ASTM D698
Beneath Slab-On-Grade	95%	ASTM D698
Foundation Wall Backfill	95%	ASTM D698
Embankment/Berm	95%	ASTM D698

Concrete testing frequency should be performed according to project specifications and/or structural engineer requirements.

5 BASIS OF RECOMMENDATIONS

The analyses and recommendations submitted in this report are based upon the test pits completed during the subsurface investigation and with general site familiarity. Often, variations occur within the subgrade, the nature and extent of which do not become evident until additional exploration or construction is conducted. Pioneer recommends geotechnical involvement be continued throughout the project to ascertain the recommendations presented herein (Geotechnical Report) have been properly interpreted both during design and construction. These services will reduce potential for misinterpretation of geotechnical design recommendations. Pioneer also recommends a geotechnical engineer be notified during the foundation excavation construction phase to evaluate the foundation soil and verify its resemblance to those encountered during the site investigation.

This report is based on Pioneer's understanding of the preliminary design location associated with the proposed East Helena WWTP I/P Cell Project. If the location or proposed elevation profile changes, please consult Pioneer to verify that these recommendations are still applicable.

This report is for the exclusive use of RPA and their design team. In the absence of Pioneer's written approval, Pioneer makes no representation and assumes no responsibility to other parties regarding this report. The data, analyses, and recommendations may not be appropriate for other structures or purposes. Other parties contemplating other structures or purposes should contact Pioneer. If you are not a designated or authorized recipient, further review, dissemination, distribution, or copying of this report is strictly prohibited.

Services performed by Pioneer's personnel for this project have been conducted with the level of care and skill ordinarily exercised by members of the profession currently practicing in this area under similar budget and time restraints. No warranty, expressed or implied, is made.

Professional Certification
I hereby certify that this report was prepared
by me and that I am a duly Licensed Professional
Engineer under the laws of the State of Montana.

MICHAEL J.
BROWNE
No. 16782 PE

Sean Harris

Michael Browne, P.E.
Geotechnical Engineer

Sean Harris, E.I.
Staff Geotechnical Engineer

6 REFERENCES

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FIGURES

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🔴 TEST PIT LOCATION MARKER

🔵 INFILTRATION TEST LOCATION MARKER

N

DISPLAYED AS:
COORD SYS/ZONE: MSP
DATUM: NAD83
UNITS: International Feet
SOURCE: Pioneer

SCALE IN FEET
0 40 80

FIGURE 1

PIONEER
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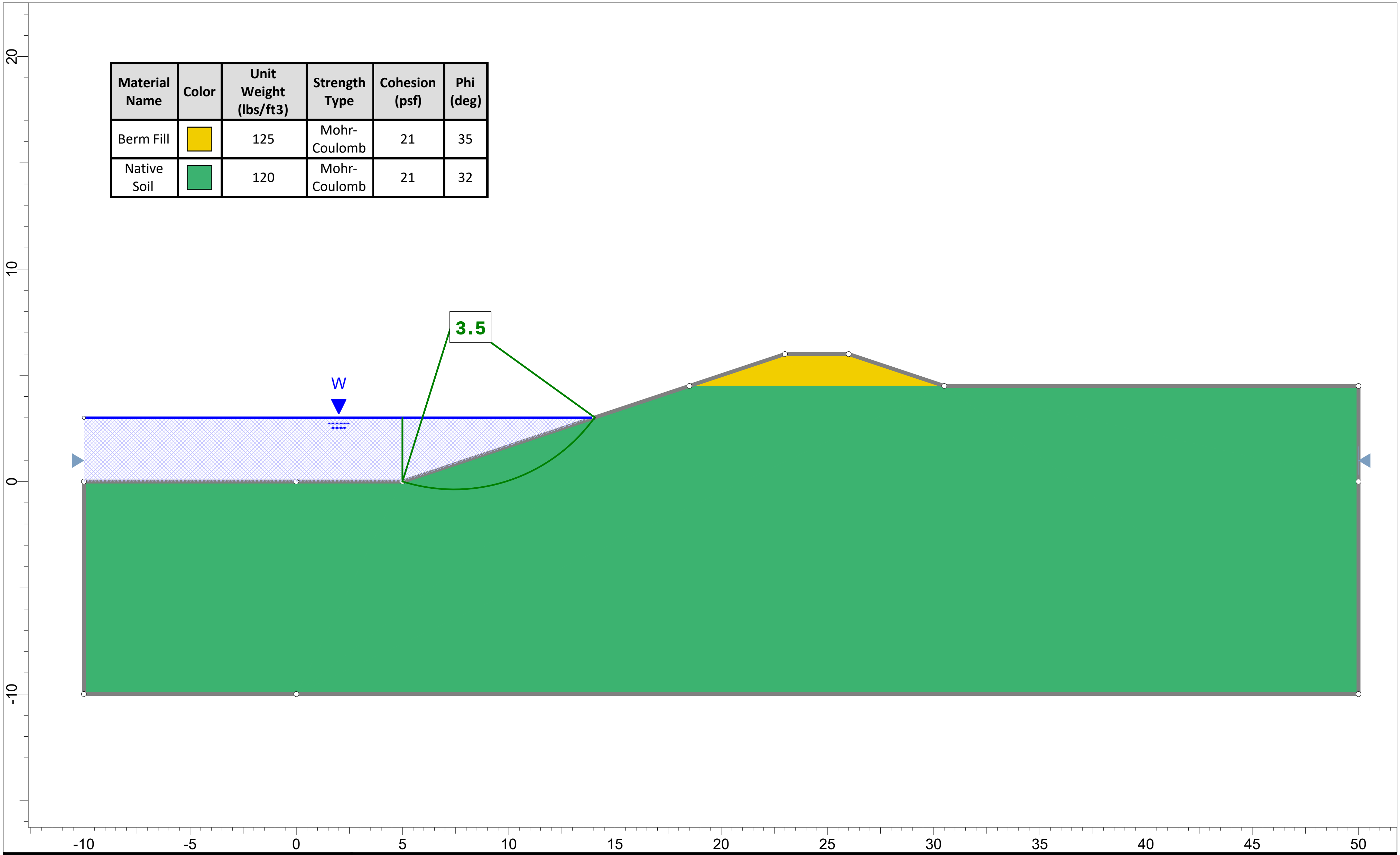
3241 COLONIAL DRIVE
HELENA, MT
(406) 457-8252

EH WWTP
I/P CELL
SITE PLAN

DATE: 2/10/2024

2/14/2024 2:02:38 PM Z:\SHARED\ACTIVE PROJECTS\GEOTECH\BH LOCATION FIGURES\EH WWTP I-P CELL.DWG



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Berm Fill	🟨	125	Mohr-Coulomb	21	35
Native Soil	🟩	120	Mohr-Coulomb	21	32

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SLIDEINTERPRET 9.022

Project	EH WWTP I/P Cell Berm

Group	Typical Section	*Scenario*	Stability Analysis
Drawn By	S. Harris	*Company*	Pioneer Technical Services
Date	2/13/2024 1:08:18 PM	1:75	Figure 2

Appendix A
Test Pit Logs

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	⊠	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	CA:	≋	Casing Advancer
ST:	■	Thin-Walled Tube - 3" O.D., unless otherwise noted	DA:	▮	Drill Auger
CB:	⧗	California Sampler - 2" I.D., 2.5" O.D., unless otherwise	HA:		Hand Auger
DB:	▯	noted Diamond Bit Coring - 4", NX, unless otherwise noted	RB:		Rock Bit
BS:	▨	Bulk Sample or Auger Sample	GS:	✋	Grab Sample

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value". The field blow counts are reported for each 6-inch interval, or portion thereof if greater than 50 blows are required to advance the full 6-inch interval. For over-sized split spoon samplers, non-standard hammers, or non-standard drop heights, the field penetration values are reported on the bore log. The values must be corrected to obtain the N-value.

WL:	Water Level	WS:		While Sampling	NE:	Not Encountered
WCl:	Wet Cave in	WD:	▽	While Drilling		
DCI:	Dry Cave in	BCR:		Before Casing Removal		
AB:	After Boring	ACR:	▼	After Casing Removal		

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Soil Classification System, Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: gravel or sand. Cobbles and boulders are not part of the USCS system but are included, when present, as percentages. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; depending on their plasticity, they are described as clays or silts. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	< 2	Very Soft
500 - 1,000	2 - 4	Soft
1,001 - 2,000	5 - 8	Medium Stiff
2,001 - 4,000	9 - 15	Stiff
4,001 - 8,000	16 - 30	Very Stiff
8,000 +	30 +	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	California Barrel (CB) Blows/Ft.	Relative Density
0 - 4	0 - 6	Very Loose
5 - 10	7 - 18	Loose
11 - 30	19 - 58	Medium Dense
31 - 50	59 - 98	Dense
50 +	99 +	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

USCS* GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

*For AASHTO grain size the #4 sieve is replaced with the #10 sieve

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity_Index
Non-Plastic	0
Slightly	1 - 5
Low	6 - 10
Medium	11 - 20
High	21 - 40
Very Highly	> 40

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UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines	$Cu \geq 4$ and $1 \leq Cc \leq 3$		GW	Well-graded Gravel [F]
			$Cu < $ and/or $1 > Cc > 3$		GP	Poorly graded gravel [F]
		Gravels with Fines More than 12% fines	Fines classify as ML or MH		GM	Silty Gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey Gravel [F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines	$Cu \geq 6$ and $1 \leq Cc \leq 3$		SW	Well-graded Sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$		SP	Poorly graded Sand [I]
		Sands with Fines More than 12% fines	Fines classify as ML or MH		SM	Silty Sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey Sand [G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	$PI > 7$ and plots on or above "A" line		CL	Lean Clay [K,L,M]
			$PI < 4$ or plots below "A" line		ML	Silt [K,L,M]
		organic	Liquid limit - oven dried	< 0.75	OL	Organic Clay [K,L,M,N]
			Liquid limit - not dried			Organic Silt [K,L,M,Q]
	Silts and Clays Liquid Limit 50 or more	inorganic	PI plots on or above "A" Line		CH	Fat Clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		organic	Liquid limit - oven dried	< 0.75	OH	Organic Clay [K,L,M,P]
			Liquid limit - not dried			Organic Silt [K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt. GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $$Cu = D_{60} / D_{10} \quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or " with gravel," whichever is predominant.

[L] If soil contains $\geq$ 30% plus No. 200, predominantly sand, add "sandy" to group name.

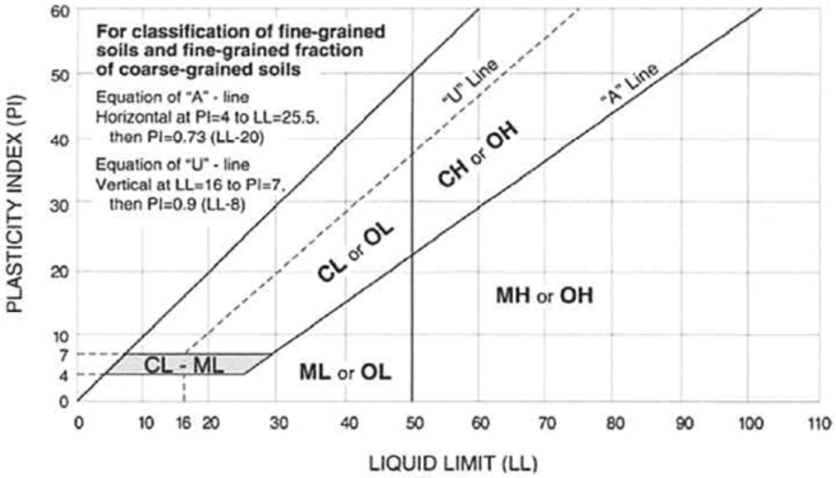
[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] $PI \geq 4$ and plots on or above "A" line.

[O] $PI < 4$ or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



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LOG OF BORING

Boring TP-01

PIONEER TECHNICAL SERVICES, INC.

Sheet 1 of 1

Project: EH WWTP I/P Cell
Rig: CAT 330C
Hammer: N/A
Boring Location Coordinates: N 867,669.2 ft E 1,359,781.1 ft
Station:
Offset:

Project Number:
UPN:
Boring Diameter: Test Pit
System: MT S.P. (E)
Datum: NAD83
Top of Boring Elevation: 3836 ft

Date Started: 11/17/23
Date Finished: 11/17/23
Drilling Fluid: None
Location Source: Handheld GPS, Uncorrected
Elevation Source: Estimate

Driller: Reisbeck
Logger: S. Harris
Abandonment Method: Backfilled with Cuttings
Township Range and Section:

Depth (ft) *Elev. (ft)*	Operation	Sample Type	Recovery (%)	RQD (%)	Blow Count	Lithology	Material Description	Depth (ft)	MC (%)	LL	PL	-200 (%)	DD	Remarks and Other Tests
							TOPSOIL.	0.5						
1 *3835.0*							FILL, Silty, Clayey SAND (SC-SM), moist, dark brown, fine to coarse grained. Low plasticity fines.	1.0	24	28	21	43		
							FILL, Fat CLAY (CH), moist, gray. Clay Liner, medium to high plasticity.	1.5						
2 *3834.0*							Silty, Clayey SAND (SC-SM), moist, dark brown, fine to coarse grained. Low plasticity fines.	2.5						
3 *3833.0* 4 *3832.0* 5 *3831.0* 6 *3830.0* 7 *3829.0* 8 *3828.0* 9 *3827.0*							Well-Graded GRAVEL with sand (GW), Cobbles, dry, brown, coarse grained, rounded.	10.0						
10 *3826.0*							Boring Depth: 10.0 ft, *Elevation: 3826.0 ft*							

Water Level Observations

▽ During Drilling: Not Encountered

▼ After Drilling:

▼ After Drilling:

Remarks:

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LOG OF BORING

Boring TP-02

PIONEER TECHNICAL SERVICES, INC.

Sheet 1 of 1

Project: EH WWTP I/P Cell
Rig: CAT 330C
Hammer: N/A
Boring Location Coordinates: N 867,691.3 ft E 1,359,538.0 ft
Station:
Offset:
Project Number:
UPN:
Boring Diameter: Test Pit
System: MT S.P. (E)
Datum: NAD83
Top of Boring Elevation: 3836 ft
Date Started: 11/17/23
Date Finished: 11/17/23
Drilling Fluid: None
Location Source: Handheld GPS, Uncorrected
Elevation Source: Estimate
Driller: Reisbeck
Logger: S. Harris
Abandonment Method: Backfilled with Cuttings
Township Range and Section:

Depth (ft) *Elev. (ft)*	Operation	Sample Type	Recovery (%)	RQD (%)	Blow Count	Lithology	Material Description	Depth (ft)	MC (%)	LL	PL	-200 (%)	DD	Remarks and Other Tests
						⁙	TOPSOIL.	0.5						
1 *3835.0*						▨	FILL, Silty, Clayey SAND (SC-SM), moist, dark brown, fine to coarse grained. Low plasticity fines.	2.0						
2 *3834.0*						▧	FILL, Fat CLAY (CH), moist, gray. Clay Liner, medium to high plasticity.	2.5						
						▨	Silty, Clayey SAND (SC-SM), moist, dark brown, fine to coarse grained. Low plasticity fines.	3.0						
3 *3833.0* 4 *3832.0* 5 *3831.0* 6 *3830.0* 7 *3829.0*		▨				○	Well-Graded GRAVEL with sand (GW), Cobbles, dry, brown, coarse grained, rounded.	7.0	4					

Boring Depth: 7.0 ft, *Elevation: 3829.0 ft*

Water Level Observations

▽ During Drilling: **Not Encountered**

▼ After Drilling:

▼ After Drilling:

Remarks:

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LOG OF BORING

Boring TP-03

PIONEER TECHNICAL SERVICES, INC.

Sheet 1 of 1

Project: EH WWTP I/P Cell		**Rig:** CAT 330C **Hammer:** N/A	**Boring Location Coordinates:** N 867,490.7 ft E 1,359,775.5 ft	**Station:** **Offset:**
Project Number:	**UPN:**	**Boring Diameter:** Test Pit	**System:** MT S.P. (E) **Datum:** NAD83	**Top of Boring Elevation:** 3837 ft
Date Started: 11/17/23	**Date Finished:** 11/17/23	**Drilling Fluid:** None	**Location Source:** Handheld GPS, Uncorrected	**Elevation Source:** Estimate
Driller: Reisbeck **Logger:** S. Harris		**Abandonment Method:** Backfilled with Cuttings		**Township Range and Section:**

Depth (ft) *Elev. (ft)*	Operation	Sample Type	Recovery (%)	RQD (%)	Blow Count	Lithology	Material Description	Depth (ft)	MC (%)	LL	PL	-200 (%)	DD	Remarks and Other Tests
		▨					TOPSOIL.	0.3						
1 *3836.0*		▨					FILL, Silty SAND with gravel (SM), moist, dark brown, fine to coarse grained, rounded. Low plasticity.	2.0	14	28	24	24		
2 *3835.0*							FILL, Fat CLAY (CH), moist, gray. Clay Liner, medium to high plasticity.	2.5						
							Silty SAND with gravel (SM), moist, dark brown, fine to coarse grained, rounded. Low plasticity.	3.0						
3 *3834.0* 4 *3833.0* 5 *3832.0* 6 *3831.0* 7 *3830.0*							Well-Graded GRAVEL with silt and sand (GW-GM), dry, brown, fine to coarse grained, rounded.	7.0						

Boring Depth: 7.0 ft, *Elevation: 3830.0 ft*

Water Level Observations	▽ **During Drilling: Not Encountered**	Remarks:
▼ **After Drilling:**	▼ **After Drilling:**	

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LOG OF BORING

Boring TP-04

PIONEER TECHNICAL SERVICES, INC.

Sheet 1 of 1

Project: EH WWTP I/P Cell

Rig: CAT 330C
Hammer: N/A

Boring Location Coordinates: N 867,479.8 ft E 1,359,536.4 ft

Station:
Offset:

Project Number:

UPN:

Boring Diameter: Test Pit

System: MT S.P. (E)
Datum: NAD83

Top of Boring Elevation: 3837 ft

Date Started: 11/17/23

Date Finished: 11/17/23

Drilling Fluid: None

Location Source: Handheld GPS, Uncorrected

Elevation Source: Estimate

Driller: Reisbeck
Logger: S. Harris

Abandonment Method: Backfilled with Cuttings

Township Range and Section:

Depth (ft) *Elev. (ft)*	Operation	Sample Type	Recovery (%)	RQD (%)	Blow Count	Lithology	Material Description	Depth (ft)	MC (%)	LL	PL	-200 (%)	DD	Remarks and Other Tests
							TOPSOIL.	0.5						
1 *3836.0* 2 *3835.0*							FILL, Silty SAND with gravel (SM), moist, dark brown, fine to coarse grained, rounded. Low plasticity.	2.5	9					
3 *3834.0*							FILL, Fat CLAY (CH), moist, gray. Clay Liner, medium to high plasticity.	3.0						
4 *3833.0* 5 *3832.0* 6 *3831.0*							Well-Graded GRAVEL with silt and sand (GW-GM), dry, brown, fine to coarse grained, rounded.	6.0						

Boring Depth: 6.0 ft, *Elevation: 3831.0 ft*

Water Level Observations

▽ During Drilling: **Not Encountered**

▼ After Drilling:

▼ After Drilling:

Remarks:

(2) MDT LOG OF BORING - MDT_REVISED_2009+(CPT_IMPORT).GDT - 2/14/24 12:00 - C:\USERS\SHARRIS\PIONEER TECHNICAL SERVICES\PIONEER GEOTECH - EASTHELENA\WWTP IP CELL_2023\LOGS\EH WWTP I-P CELL.GPJ

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LOG OF BORING

Boring TP-05

PIONEER TECHNICAL SERVICES, INC.

Sheet 1 of 1

Project: EH WWTP I/P Cell		**Rig:** CAT 330C **Hammer:** N/A	**Boring Location Coordinates:** N 867,203.1 ft E 1,359,759.1 ft	**Station:** **Offset:**
Project Number:	**UPN:**	**Boring Diameter:** Test Pit	**System:** MT S.P. (E) **Datum:** NAD83	**Top of Boring Elevation:** 3838 ft
Date Started: 11/17/23	**Date Finished:** 11/17/23	**Drilling Fluid:** None	**Location Source:** Handheld GPS, Uncorrected	**Elevation Source:** Estimate
Driller: Reisbeck **Logger:** S. Harris		**Abandonment Method:** Backfilled with Cuttings	**Township Range and Section:**	

Depth (ft) / Elev. (ft)	Operation	Sample Type	Recovery (%)	RQD (%)	Blow Count	Lithology	Material Description	Depth (ft)	MC (%)	LL	PL	-200 (%)	DD	Remarks and Other Tests
							TOPSOIL.	0.5						
1 3837.0 2 3836.0 3 3835.0							FILL, Silty GRAVEL with sand (GM), moist, dark brown, fine to coarse grained, rounded. Low plasticity.	4.0	20					
4 3834.0							FILL, Fat CLAY (CH), moist, gray. Clay Liner, medium to high plasticity.	4.5						
5 3833.0 6 3832.0 7 3831.0 8 3830.0							Poorly-Graded GRAVEL with sand (GP), dry, brown, fine to coarse grained, rounded.	8.0						

Boring Depth: 8.0 ft, *Elevation: 3830.0 ft*

Water Level Observations		
	▽ During Drilling: Not Encountered	Remarks:
▼ After Drilling:	▼ After Drilling:	

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LOG OF BORING

Boring TP-06

PIONEER TECHNICAL SERVICES, INC.

Sheet 1 of 1

Project: EH WWTP I/P Cell
Rig: CAT 330C
Hammer: N/A
Boring Location Coordinates: N 867,192.2 ft E 1,359,520.0 ft
Station:
Offset:
Project Number:
UPN:
Boring Diameter: Test Pit
System: MT S.P. (E)
Datum: NAD83
Top of Boring Elevation: 3838 ft
Date Started: 11/17/23
Date Finished: 11/17/23
Drilling Fluid: None
Location Source: Handheld GPS, Uncorrected
Elevation Source: Estimate
Driller: Reisbeck
Logger: S. Harris
Abandonment Method: Backfilled with Cuttings
Township Range and Section:

Depth (ft) *Elev. (ft)*	Operation	Sample Type	Recovery (%)	RQD (%)	Blow Count	Lithology	Material Description	Depth (ft)	MC (%)	LL	PL	-200 (%)	DD	Remarks and Other Tests
							TOPSOIL.							
1 *3837.0* 2 *3836.0* 3 *3835.0*							FILL, Silty SAND with gravel (SM), moist, dark brown, fine to coarse grained, rounded. Low plasticity.	0.5						
4 *3834.0*							FILL, Fat CLAY (CH), moist, gray. Clay Liner, medium to high plasticity.	4.0						
5 *3833.0* 6 *3832.0* 7 *3831.0* 8 *3830.0* 9 *3829.0*							Poorly-Graded GRAVEL with sand (GP), dry, brown, fine to coarse grained, rounded.	4.5		0	0	4		
10 *3828.0*							Boring Depth: 10.0 ft, *Elevation: 3828.0 ft*	10.0						

Water Level Observations

▽ During Drilling: Not Encountered

▼ After Drilling:

▼ After Drilling:

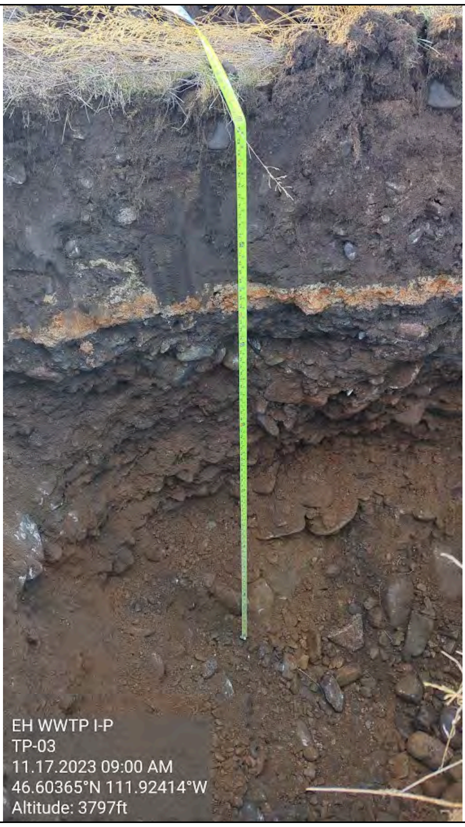
Remarks:

Appendix B
Photograph Log

Picture # 1: CAT 330C Excavator

Picture # 2: TP-01 Overview

Picture # 3: TP-02 Overview



Picture # 4: TP-03 Overview

Picture # 5: TP-03 Overview (from above)

Picture # 6: TP-04 Overview

Picture # 7: TP-05 Overview

Picture # 8: TP-06 Overview

	
Picture # 9: Infiltration test location	Picture # 10: Infiltration test setup

Appendix C
Laboratory Data

PIONEER
TECHNICAL SERVICES, INC.

201 East Broadway, Suite C
Helena, Montana 59601
Phone (406)457-8252 Fax (406)442-1158
www.pioneer-technical.com

Moisture Analysis - AASHTO T265; ASTM D2216

Project Name: ______

Project Number: ______

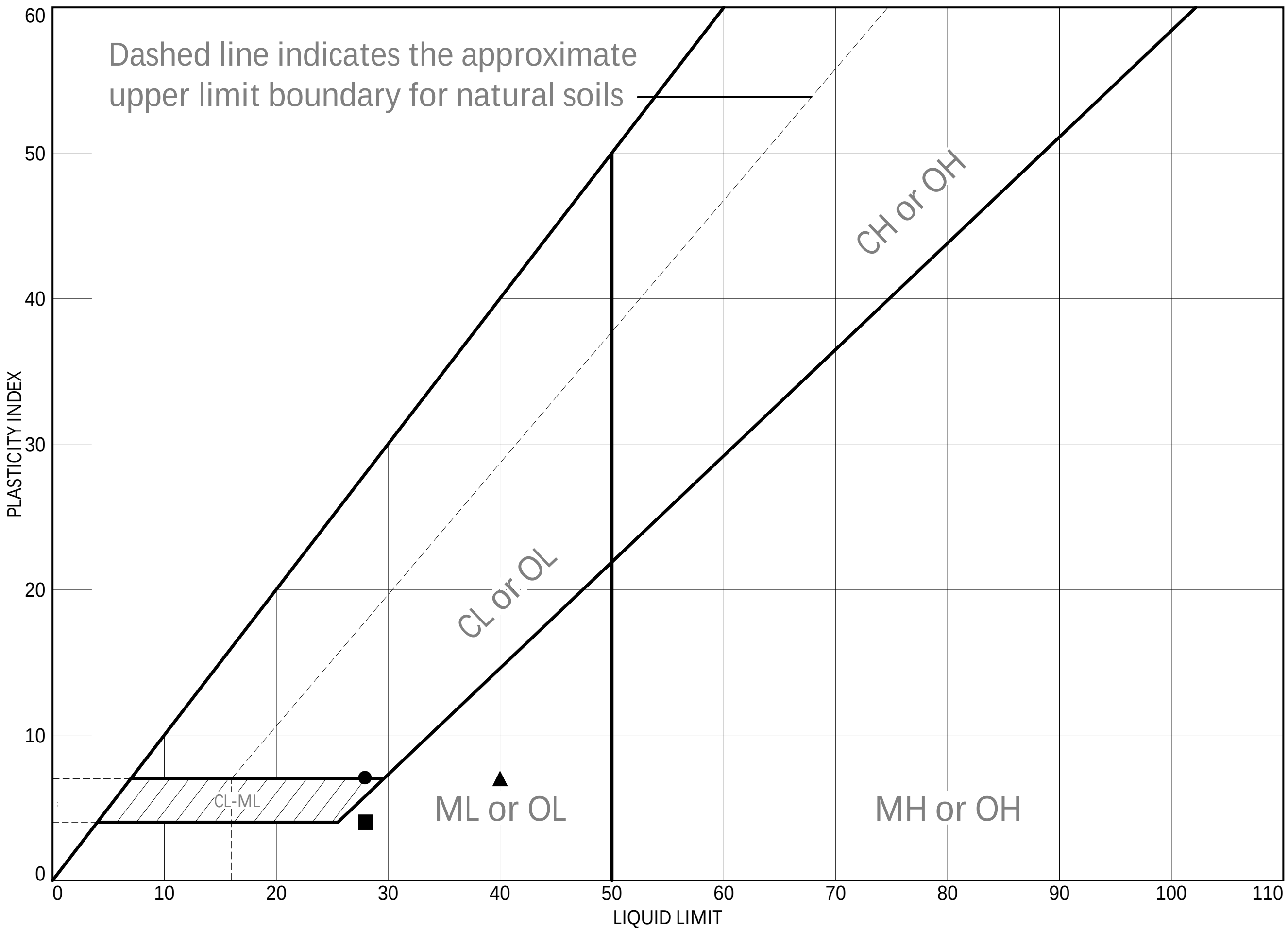
Lab No:	29687	29688	29689	29690	29691	29695				
BH or Loc:	TP-01	TP-02	TP-03	TP-04	TP-05	TP-08				
Depth:	0-2'	4-6'	0-2'	4-6'	0-4'	3-7'				
Date Tested:	1/18/2024	1/18/2024	1/18/2024	1/18/2024	1/18/2024	1/18/2024				

Pan No:										
Wet Wt, & Pan (g):	503.9	537.1	452.5	493.7	483.9	630.9				
Dry Wt, & Pan (g):	422.6	518.3	406.7	459.3	417.5	608				
Loss of Moisture	81.3	18.8	45.8	34.4	66.4	22.9				
Wt. of Pan (g):	82.4	81.4	81.6	82.4	82.6	81.3				
Wt. of Dry Soil (g):	340.2	436.9	325.1	376.9	334.9	526.7				
M. Content (%):	**24**	**4**	**14**	**9**	**20**	**4**				

Lab No:										
BH or Loc:										
Depth:										
Date Tested:										

Pan No:										
Wet Wt, & Pan (g):										
Dry Wt, & Pan (g):										
Loss of Moisture										
Wt. of Pan (g):										
Wt. of Dry Soil (g):										
M. Content (%):										

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	silty, clayey sand	28	21	7	78	43	SC-SM
■	silty sand with gravel	28	24	4	43	24	SM
▲	silty gravel with sand	40	33	7	25	14	GM
◆	poorly graded gravel with sand	NV	NP	NP	10	3.7	GP
▼	well-graded gravel with silt and sand	NV	NP	NP	13	5.0	GW-GM

Project No. 2301135 Client: RPA

Project: East Helena Wastewater Treatment Plant

●Source of Sample: TP-01 Depth: 0-2' Sample Number: 29687
■Source of Sample: TP-03 Depth: 0-2' Sample Number: 29689
▲Source of Sample: TP-05 Depth: 0-4' Sample Number: 29691
◆Source of Sample: TP-06 Depth: 5-10' Sample Number: 29693
▼Source of Sample: INF-3E Depth: 4-7' Sample Number: 29694

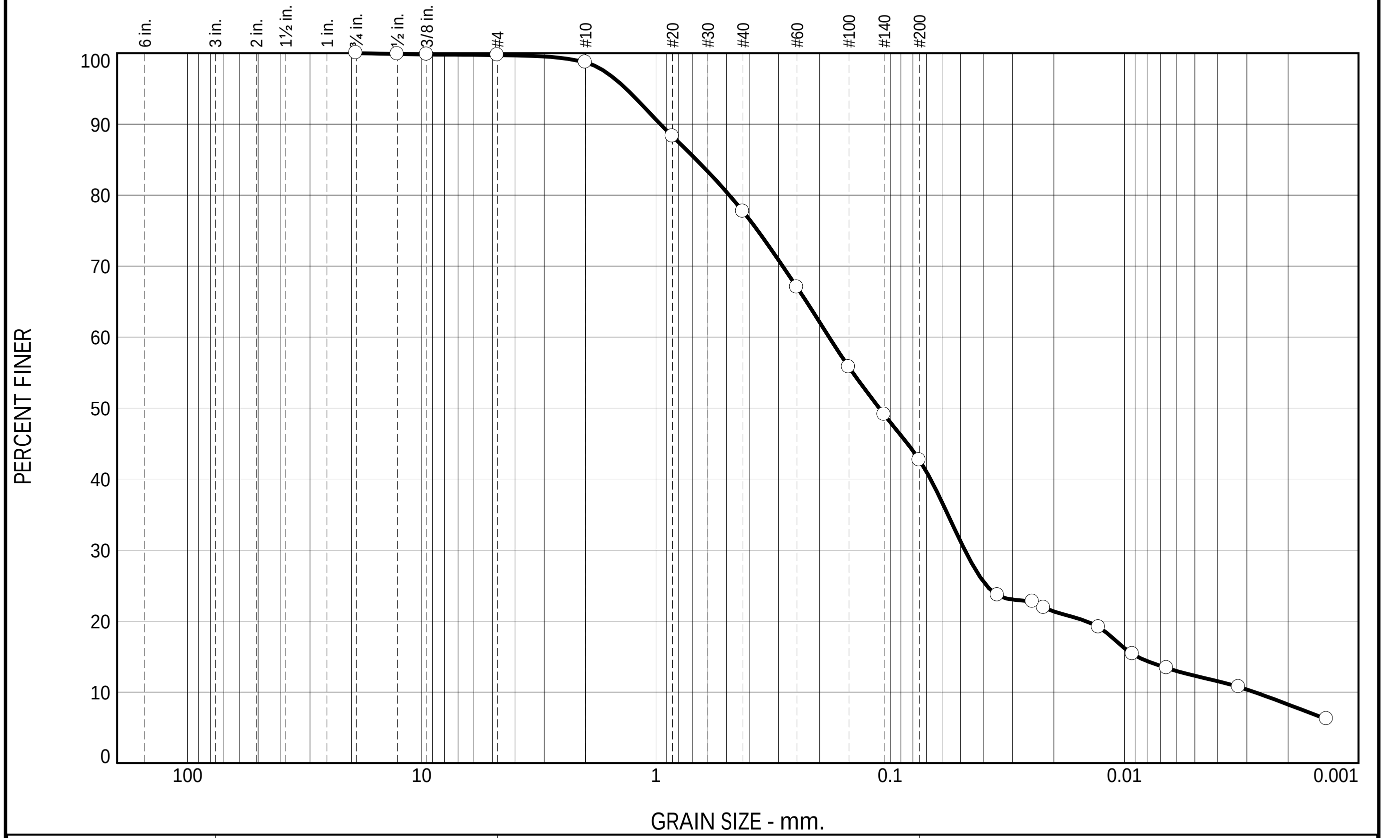
PIONEER
TECHNICAL SERVICES, INC.

Remarks:

Figure

Tested By: ○ DZ □ DZ △ TP ◇ TP ▽ TP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	21	35	31	12

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
1/2"	100		
3/8"	100		
#4	100		
#10	99		
#20	88		
#40	78		
#60	67		
#100	56		
#140	49		
#200	43		
0.0348 mm.	24		
0.0247 mm.	23		
0.0221 mm.	22		
0.0129 mm.	19		
0.0092 mm.	15		
0.0066 mm.	13		
0.0032 mm.	11		
0.0014 mm.	6.2		

* (no specification provided)

Soil Description

silty, clayey sand

Atterberg Limits

PL= 21 LL= 28 PI= 7

Coefficients

D_{90}= 0.9584	D_{85}= 0.6731	D_{60}= 0.1822
D_{50}= 0.1113	D_{30}= 0.0480	D_{15}= 0.0088
D_{10}= 0.0028	C_u= 65.22	C_c= 4.52

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

F.M.=0.98

Source of Sample: TP-01 Depth: 0-2'
Sample Number: 29687

Date:

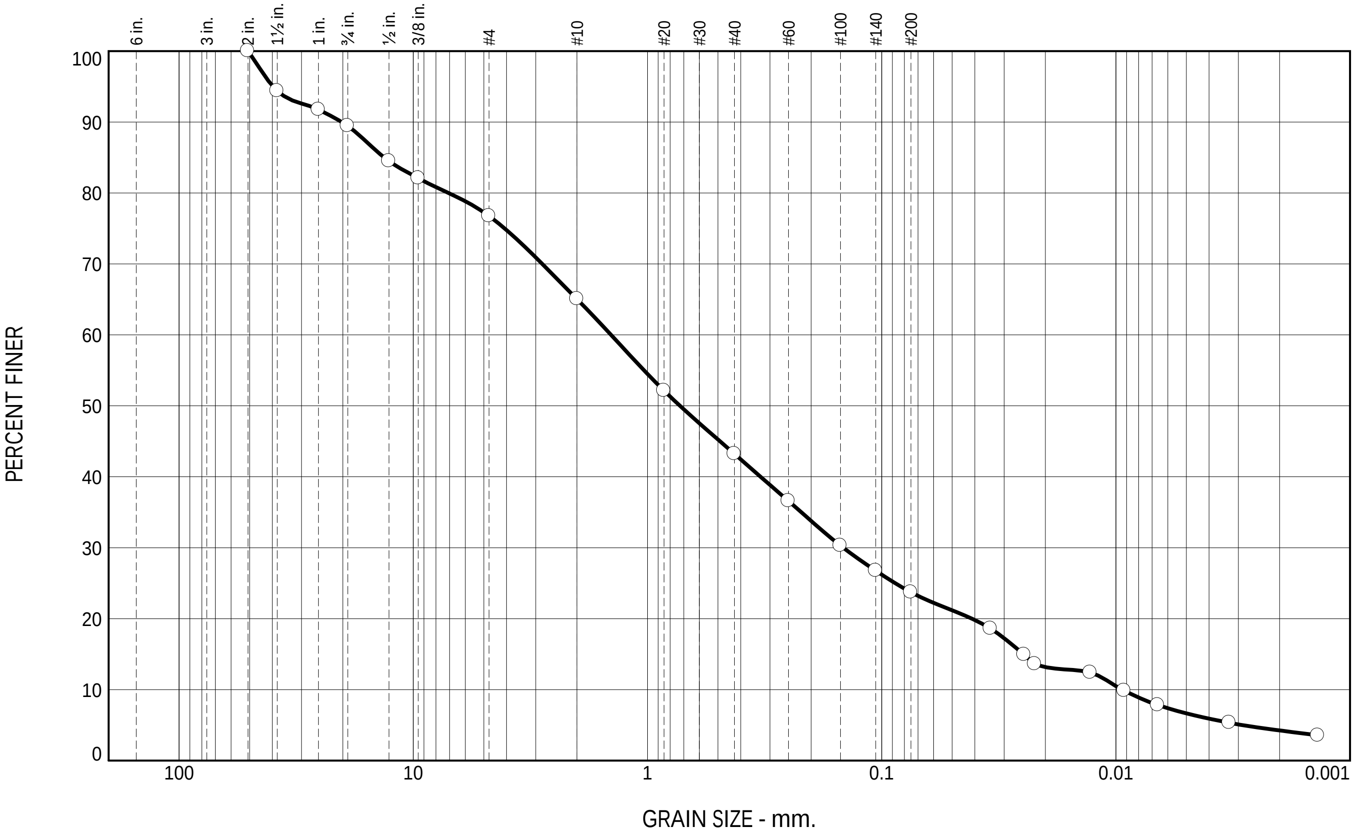
PIONEER
TECHNICAL SERVICES, INC.

Client: RPA
Project: East Helena Wastewater Treatment Plant

Project No: 2301135 Figure

Tested By: TP / DZ

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	11	12	12	22	19	17	7

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2"	100		
1.5"	94		
1"	92		
3/4"	89		
1/2"	84		
3/8"	82		
#4	77		
#10	65		
#20	52		
#40	43		
#60	37		
#100	30		
#140	27		
#200	24		
0.0343 mm.	19		
0.0246 mm.	15		
0.0222 mm.	14		
0.0129 mm.	12		
0.0092 mm.	9.8		
0.0066 mm.	7.8		
0.0033 mm.	5.3		
0.0014 mm.	3.5		

* (no specification provided)

Soil Description

TP-03
silty sand with gravel

Atterberg Limits

PL= 24 LL= 28 PI= 4

Coefficients

D_{90}= 20.2148 D_{85}= 13.3098 D_{60}= 1.4308
D_{50}= 0.7261 D_{30}= 0.1459 D_{15}= 0.0248
D_{10}= 0.0094 C_u= 151.91 C_c= 1.58

Classification

USCS= SM AASHTO= A-1-b

Remarks

F.M.=3.16

Source of Sample: TP-03 Depth: 0-2'
Sample Number: 29689

Date:

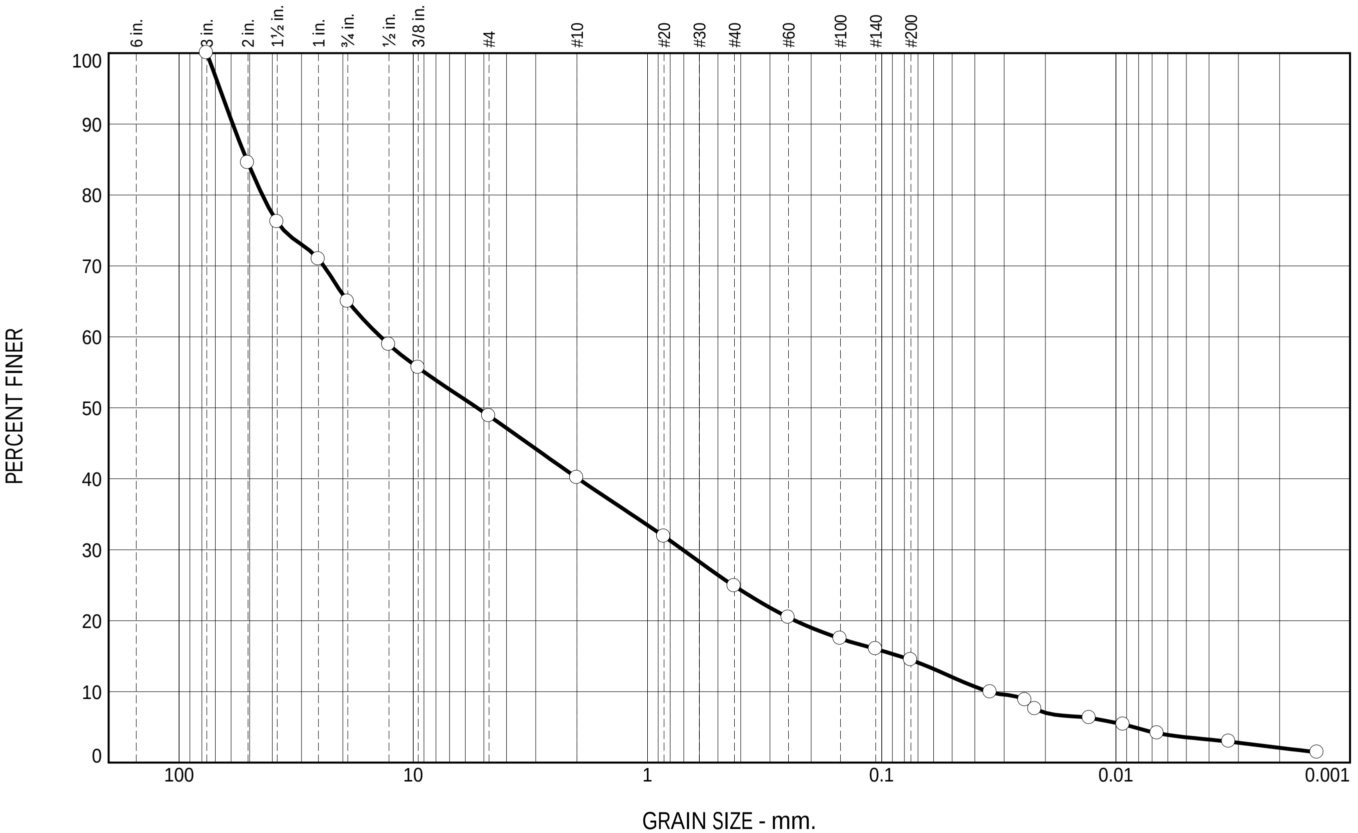
PIONEER TECHNICAL SERVICES, INC.

Client: RPA
Project: East Helena Wastewater Treatment Plant

Project No: 2301135 Figure

Tested By: TP / DZ

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	35	16	9	15	11	10	4

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100		
2"	85		
1.5"	76		
1"	71		
3/4"	65		
1/2"	59		
3/8"	56		
#4	49		
#10	40		
#20	32		
#40	25		
#60	20		
#100	17		
#140	16		
#200	14		
0.0343 mm.	9.9		
0.0244 mm.	8.8		
0.0221 mm.	7.5		
0.0129 mm.	6.3		
0.0093 mm.	5.4		
0.0066 mm.	4.1		
0.0033 mm.	2.9		
0.0014 mm.	1.4		

* (no specification provided)

Soil Description

TP-05
silty gravel with sand

Atterberg Limits

PL= 33 LL= 40 PI= 7

Coefficients

D_{90}= 59.0469 D_{85}= 51.5018 D_{60}= 13.7773
D_{50}= 5.3350 D_{30}= 0.7066 D_{15}= 0.0838
D_{10}= 0.0349 C_u= 394.63 C_c= 1.04

Classification

USCS= GM AASHTO= A-2-4(0)

Remarks

F.M.=5.10

Source of Sample: **TP-05** Depth: 0-4'
Sample Number: 29691

Date:

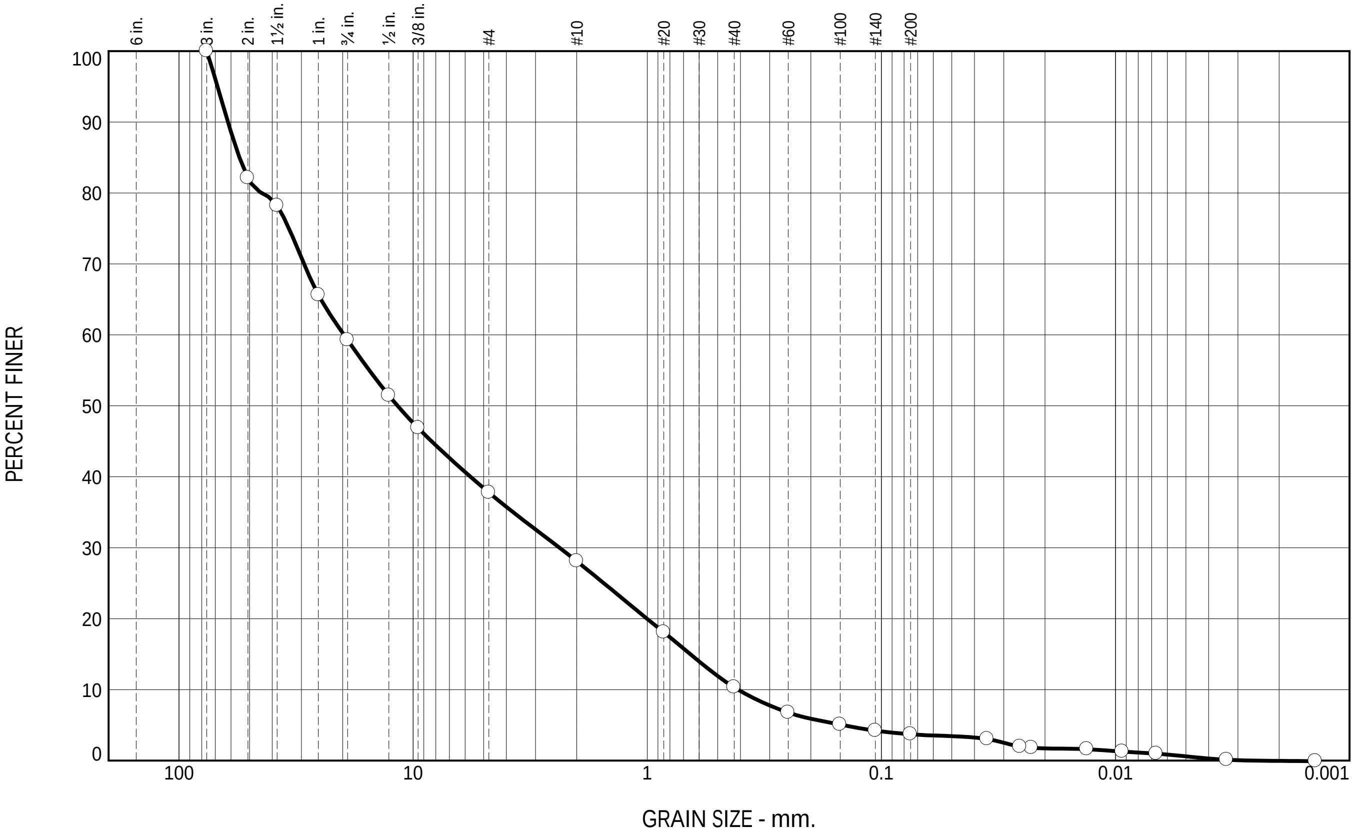
PIONEER
TECHNICAL SERVICES, INC.

Client: RPA
Project: East Helena Wastewater Treatment Plant

Project No: 2301135 Figure

Tested By: TP / DZ

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	41	21	10	18	6	3	1

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100		
2"	82		
1.5"	78		
1"	66		
3/4"	59		
1/2"	51		
3/8"	47		
#4	38		
#10	28		
#20	18		
#40	10		
#60	7		
#100	5		
#140	4		
#200	3.7		
0.0353 mm.	3.0		
0.0256 mm.	2.0		
0.0228 mm.	1.8		
0.0132 mm.	1.6		
0.0093 mm.	1.3		
0.0067 mm.	1.0		
0.0033 mm.	0.1		
0.0014 mm.			

* (no specification provided)

Soil Description

TP-06
poorly graded gravel with sand

Atterberg Limits

PL= NP
LL= NV
PI= NP

Coefficients

D_{90}= 61.8345	D_{85}= 55.2098	D_{60}= 19.7370
D_{50}= 11.6558	D_{30}= 2.3694	D_{15}= 0.6550
D_{10}= 0.4097	C_u= 48.17	C_c= 0.69

Classification

USCS= GP
AASHTO= A-1-a

Remarks

F.M.=5.99

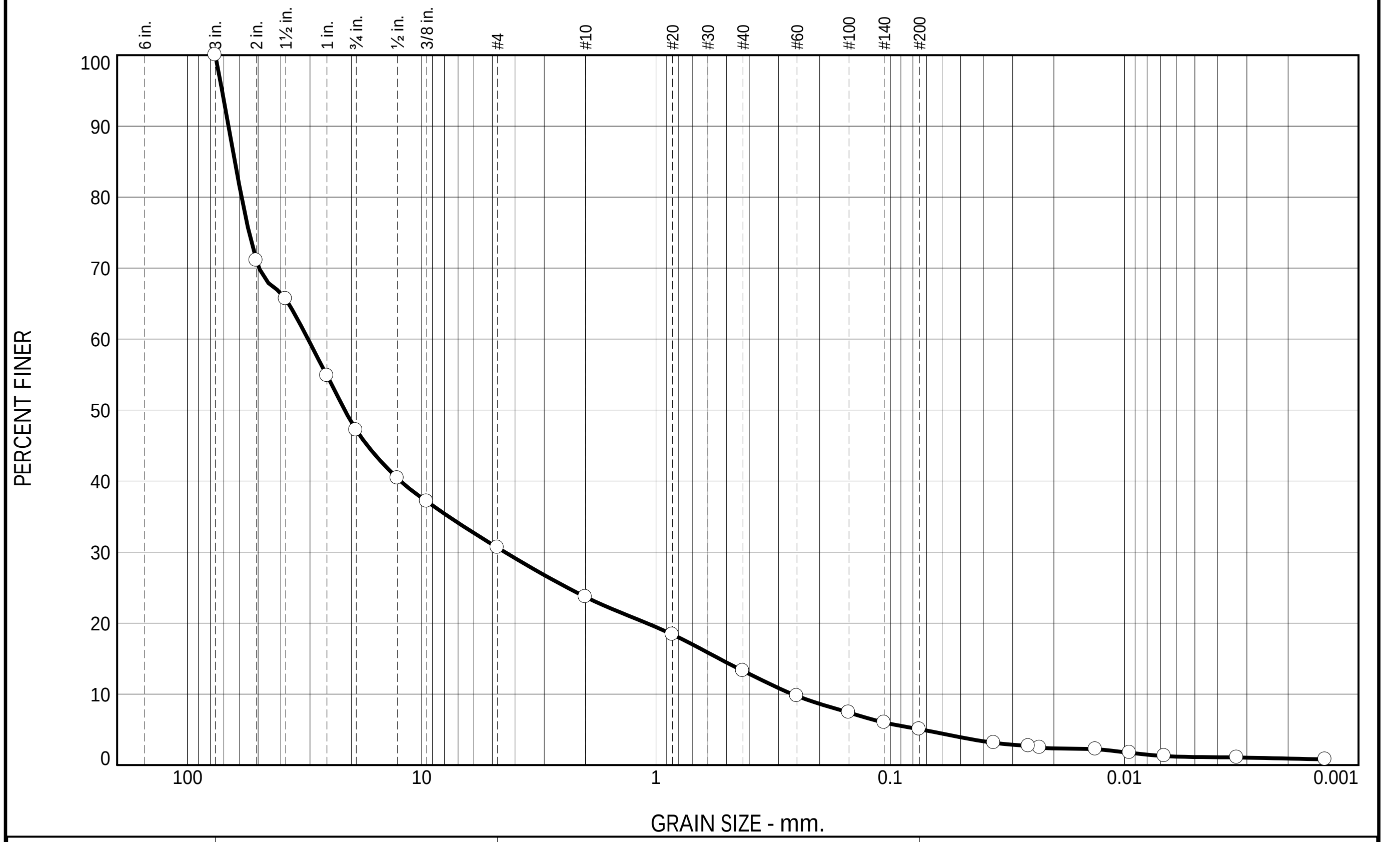
Source of Sample: TP-06
Depth: 5-10'
Sample Number: 29693
Date:

PIONEER
TECHNICAL SERVICES, INC.

Client: RPA
Project: East Helena Wastewater Treatment Plant
Project No: 2301135
Figure

Tested By: TP / DZ

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	53	16	7	11	8	4	1

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3"	100		
2"	71		
1.5"	66		
1"	55		
3/4"	47		
1/2"	40		
3/8"	37		
#4	31		
#10	24		
#20	18		
#40	13		
#60	10		
#100	7		
#140	6		
#200	5.0		
0.0360 mm.	3.2		
0.0256 mm.	2.7		
0.0230 mm.	2.5		
0.0133 mm.	2.2		
0.0095 mm.	1.8		
0.0067 mm.	1.3		
0.0033 mm.	1.1		
0.0014 mm.	0.8		

* (no specification provided)

Soil Description

TP-07
well-graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 66.9316 D_{85}= 62.8604 D_{60}= 30.6025
D_{50}= 21.3409 D_{30}= 4.4207 D_{15}= 0.5377
D_{10}= 0.2622 C_u= 116.73 C_c= 2.44

Classification

USCS= GW-GM AASHTO= A-1-a

Remarks

F.M.=6.40

Source of Sample: INF-3E Depth: 4-7'
Sample Number: 29694

Date:

PIONEER TECHNICAL SERVICES, INC.

Client: RPA
Project: East Helena Wastewater Treatment Plant

Project No: 2301135 Figure

Tested By: DZ

Alpine Analytical Laboratory

1315 Cherry, Helena, MT 59601
(406)449-6282

Client: Pioneer Technical Services

Date Reported: 24-Jan-24

Sample ID: TP-02, 4-6'
Project ID: EH WWTP 1/P Cell

Chain of Custody #: 83

Laboratory ID: 06A211
Sample Matrix: Soil

Date / Time Sampled: None Given
Date / Time Received: 22-Jan-24 @ 10:10

			Analyzed		Method
Parameter	**Result**	**PQL**	**Date/Time**	**By**	**Reference**
Soluble Sulfate, %	0.1281	0.00005	23-Jan-24 @ 14:24	CE	EPA 300.0
pH, s.u.	3.83	0.01	23-Jan-24 @ 12:40	CE	MT 232-04

Comments:

PQL - Practical Quantitation Limit

References:
Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020
Method of Sampling and Testing MT232-04, *Soil Corrosion Test* (Montana Method).

Reviewed CE

Alpine Analytical Laboratory

1315 Cherry, Helena, MT 59601
(406)449-6282

Client: Pioneer Technical Services

Date Reported: 24-Jan-24

Sample ID: TP-06, 1-4'
Project ID: EH WWTP 1/P Cell

Chain of Custody #: 84

Laboratory ID: 06A212
Sample Matrix: Soil

Date / Time Sampled: None Given
Date / Time Received: 22-Jan-24 @ 10:10

			Analyzed		Method
Parameter	**Result**	**PQL**	**Date/Time**	**By**	**Reference**
Soluble Sulfate, %	0.1875	0.00005	23-Jan-24 @ 15:18	CE	EPA 300.0
pH, s.u.	4.19	0.01	23-Jan-24 @ 12:40	CE	MT 232-04

Comments:

PQL - Practical Quantitation Limit

References:
Methods for Chemical Analysis of Water and Wastes, US EPA, 600/4-79-020
Method of Sampling and Testing MT232-04, *Soil Corrosion Test* (Montana Method).

Reviewed CE

Appendix D
Phosphorus Adsorption Isotherm Testing

Analytical Sciences Laboratory
University of Idaho

Holm Research Center
875 Perimeter Dr.   MS 2203
Moscow, Idaho   83844-2203
Phone: (208) 885-7466   Email: asl@uidaho.edu
http://www.uidaho.edu/cals/analytical-sciences-laboratory

Certificate of Analysis

Prepared For: Michael Browne
Pioneer Technical Services - Helena
3241 Colonial Drive

Helena, MT   59601

Case ID: **SDEC23-004**
Report Date: 22-Jan-24
Date Received: 26-Dec-23
Client Ref.: Bill
Project ID:

1st Level QC:		Date:	1/22/24
2nd Level QC:	NP	Date:	1-22-24

Case Comments:

ND = Not Detected   NA = Not Applicable   RL = Reporting Limit   QNS = Quantity Not Sufficient

Client ID: INF-IE
ASL Sample ID: S2300966

Site:
Ref/Loc.:
Matrix: Solid - Dry Weight

Collected by:
Collect Date: 26-Dec-23 10:21 AM

Phosphorus Isotherm

Method: ICP
Prep: N/A
Pres: None
Filter: N/A
Prep Date: N/A
Analysis Date: 17-Jan-24

	Results	RL
Phosphorus	**See Attached Sheets**	—

Client ID: INF-2W
ASL Sample ID: S2300967

Site:
Ref/Loc.:
Matrix: Solid - Dry Weight

Collected by:
Collect Date: 26-Dec-23 10:21 AM

Phosphorus Isotherm

Method: ICP
Prep: N/A
Pres: None
Filter: N/A
Prep Date: N/A
Analysis Date: 17-Jan-24

	Results	RL
Phosphorus	**See Attached Sheets**	—

Client ID: INF 3E
ASL Sample ID: S2300968

Site:
Ref/Loc.:
Matrix: Solid - Dry Weight

Collected by:
Collect Date: 26-Dec-23 10:21 AM

Phosphorus Isotherm

Method: ICP
Prep: N/A
Pres: None
Filter: N/A
Prep Date: N/A
Analysis Date: 17-Jan-24

	Results	RL
Phosphorus	**See Attached Sheets**	—

Samples will be discarded one month after date of final report unless otherwise requested.

ND = Not Detected NA = Not Applicable RL = Reporting Limit QNS = Quantity Not Sufficient

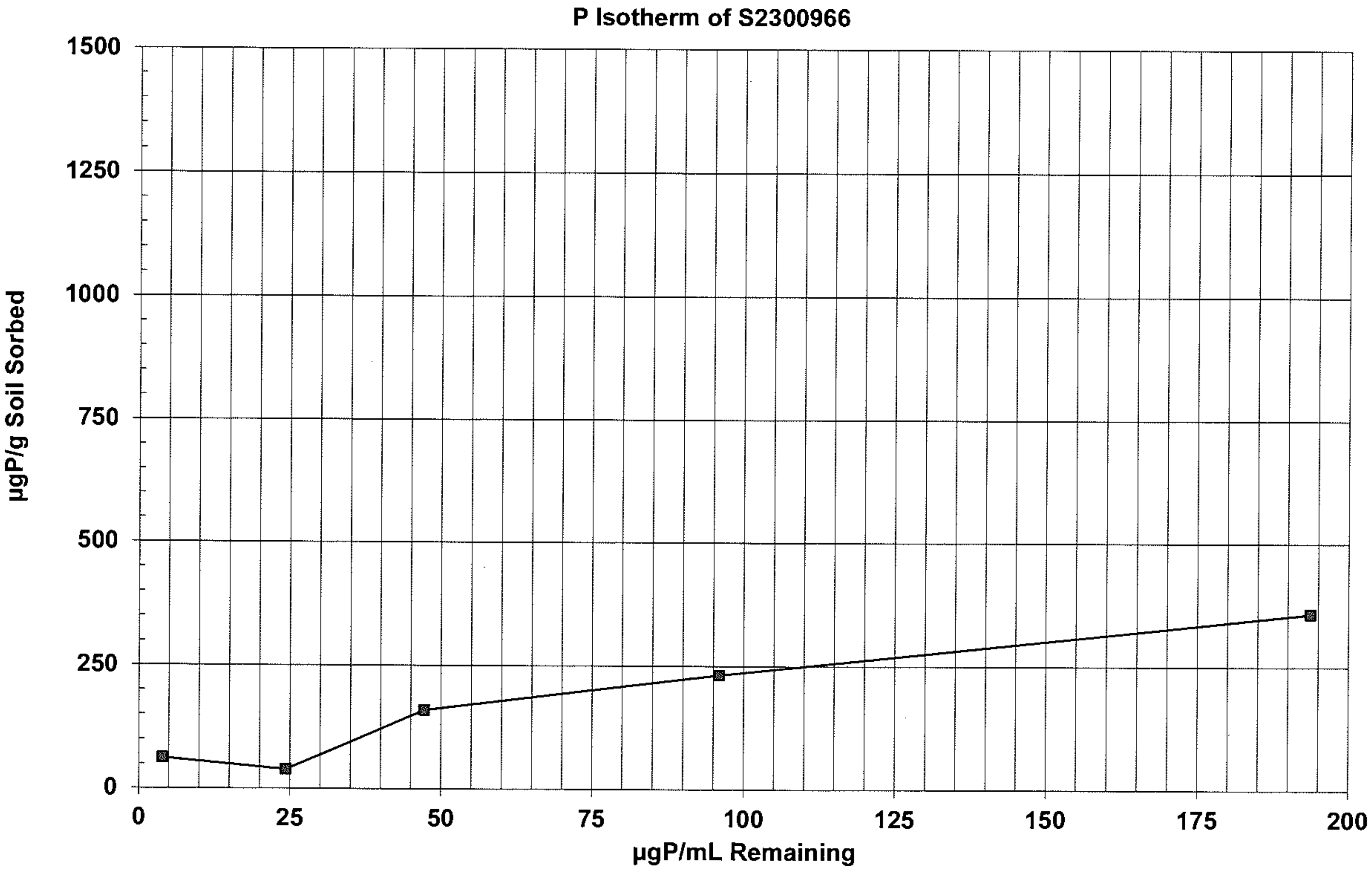
Soil Phosphorus Isotherm

SOP: SMM.85.120.07

Form Verified By/Date: 1-22-24

Sample ID	Sample Code	Wt.(g)	Conc. µg	Conc. Dup. µg	Multiplier	Solution µg P/mL	Soil Sorbed	CHART
						X	Y	
S2300966	**A5**	0.441	3.822	3.976	1	3.90	62.4	A
	A25	0.441	24.350	24.260	1	24.3	39	
	A50	0.441	47.100	47.290	1	47.2	159	
	A100	0.441	97.200	94.630	1	95.9	232	
	A200	0.441	193.600	193.800	1	194	357	
						X	Y	
S230967	**B5**	0.363	3.554	3.381	1	3.4675	105.5	B
	B25	0.363	23.800	23.680	1	23.74	87	
	B50	0.363	48.340	47.090	1	47.7	157	
	B100	0.363	96.180	97.750	1	97.0	209	
	B200	0.363	202.800	189.900	1	196	251	
						X	Y	
S230968	**C5**	0.338	3.597	3.649	1	3.6230	101.8	C
	C25	0.338	24.600	24.470	1	24.54	34	
	C50	0.338	48.290	48.950	1	48.6	102	
	C100	0.338	100.000	95.800	1	97.9	155	
	C200	0.338	188.800	192.100	1	190	706	

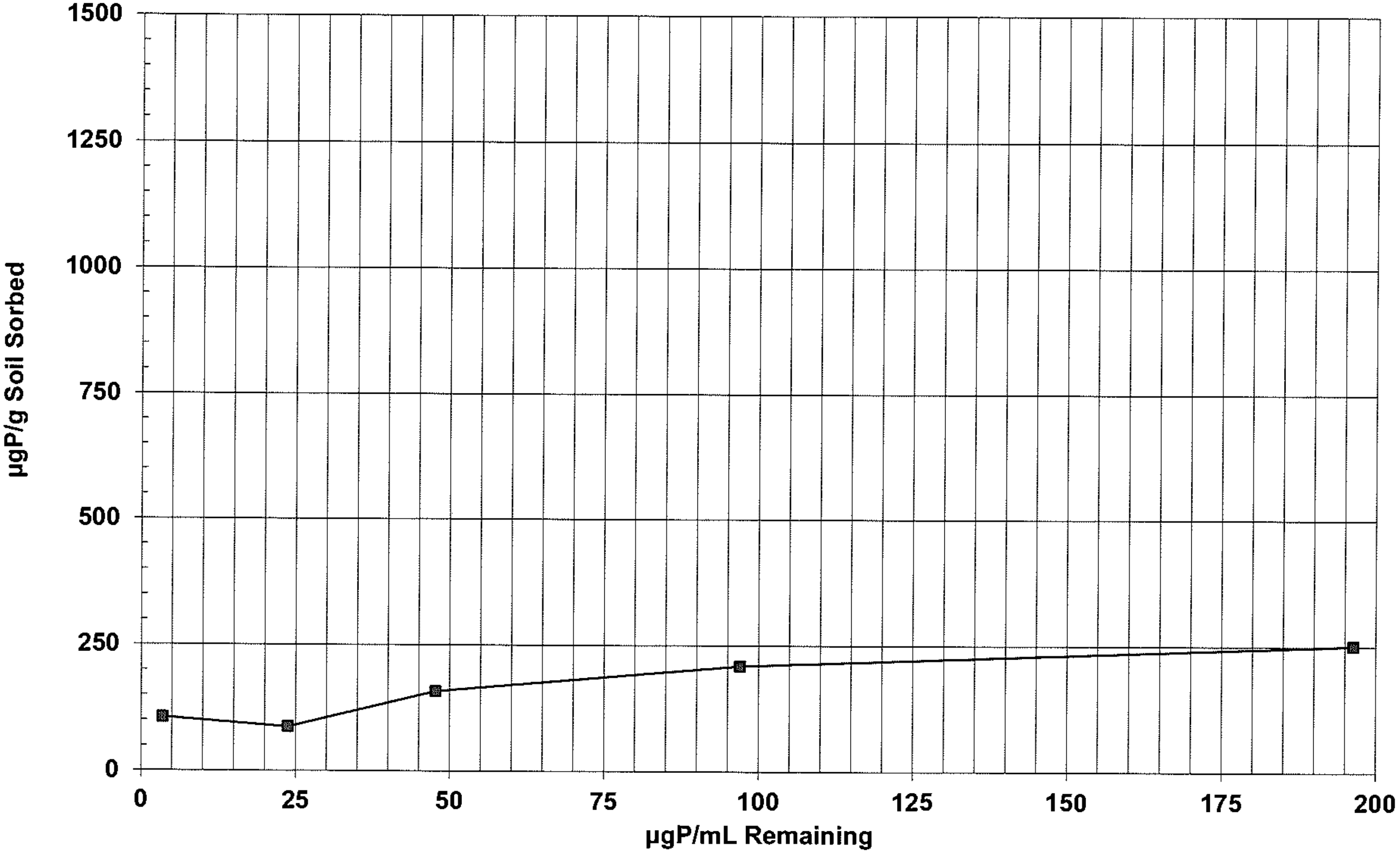
Form Verified By/Date: 1-22-24



Soil Phosphorus Isotherm
SOP: SMM.85.120.07

Form Verified By/Date: 1-22-24

P Isotherm of S2300967

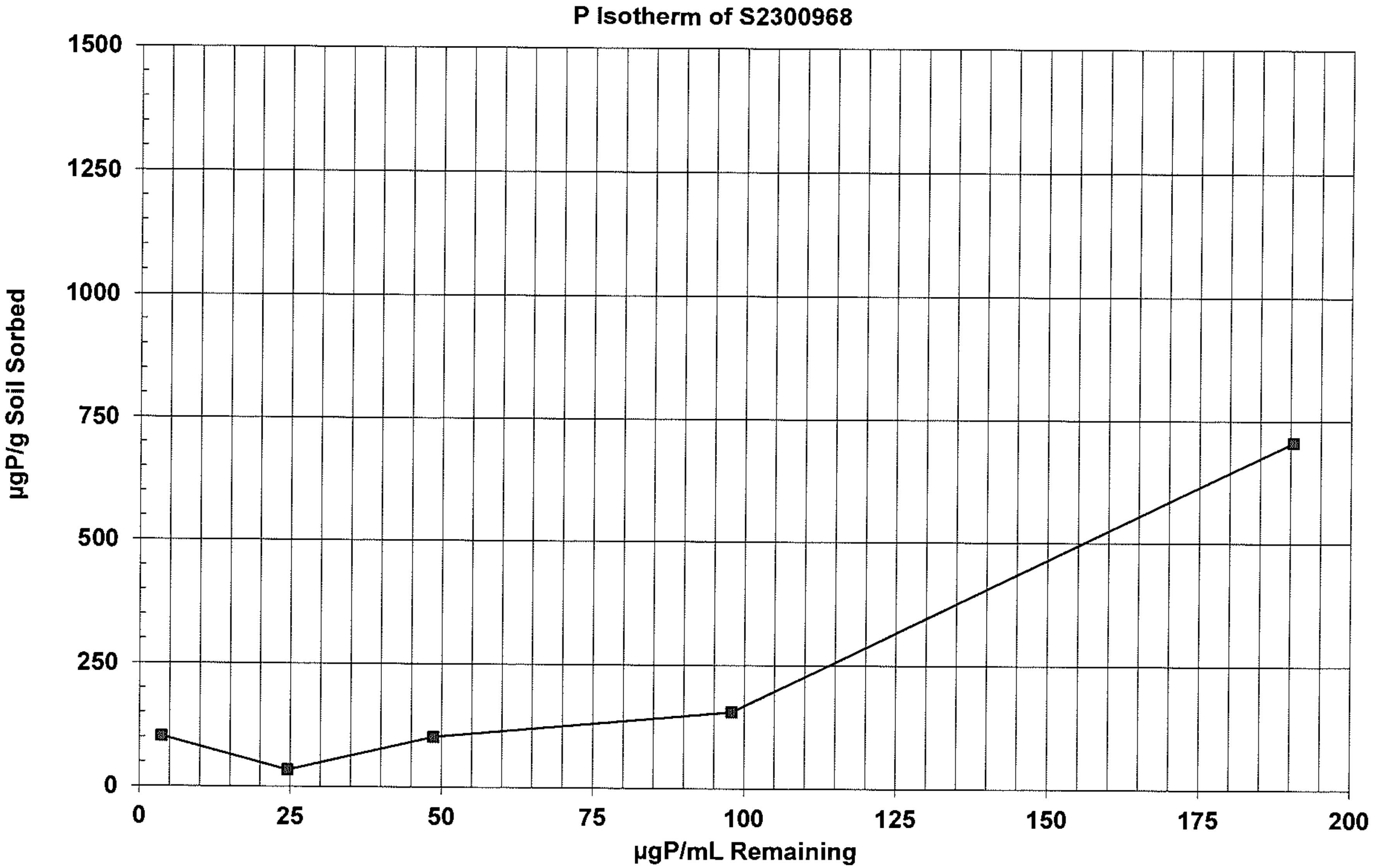


University of Idaho Analytical Sciences Laboratory

C:\Users\jgriswold\Desktop\SDEC23-004 Isotherm ReportB

Soil Phosphorus Isotherm
SOP: SMM.85.120.07

Form Verified By/Date: 1-22-24



University of Idaho Analytical Sciences Laboratory

C:\Users\jgriswold\Desktop\SDEC23-004 Isotherm ReportC

Soil Phosphorus Isotherm
SOP: SMM.85.120.07
https://vandalsuidaho.sharepoint.com/sites/Storage-CALS/Documents/ASL/P/Soil/SPDSHTS/[PISOWT.XLS]mult trays

Form Verified By/Date: 1-22-24

Phosphorus Isotherm Weights

Sample #	Tray & Sample Before Grinding (g)	After Grinding (g)	Before Tray Weight (g)	After Tray Weight (g)	Sample Soil & Rock (g)	Sample Soil (g)	Amount to be weighed (g)	% coarse fragment (>2 mm)
S2300966	1426.7	828.8	109.8	109.8	---	---	---	---
	1797	701	115.3	115.3	---	---	---	---
	1624.6	800	121	121	---	---	---	---
					---	---	---	---
total	4848.3	2329.8	346.1	346.1	4502.2	1983.7	0.441	55.939
S2300967	2054.2	677.1	118.2	118.2	---	---	---	---
	2146.6	839.4	121.2	121.2	---	---	---	---
	2225.6	1039.6	115.8	115.8	---	---	---	---
					---	---	---	---
total	6426.4	2556.1	355.2	355.2	6071.2	2200.9	0.363	63.749
S2300968	2240.7	690	124.6	124.6	---	---	---	---
	1945.9	663.3	109.9	109.9	---	---	---	---
	2040.1	982.5	111.4	111.4	---	---	---	---
					---	---	---	---
total	6226.7	2335.8	345.9	345.9	5880.8	1989.9	0.338	66.163

Appendix E
Seismic Coefficient

ASCE Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-22	**Latitude:**	46.603674
Risk Category:	II	**Longitude:**	-111.923094
Soil Class:	D - Stiff Soil	**Elevation:**	0 ft (NAVD 88)

Seismic

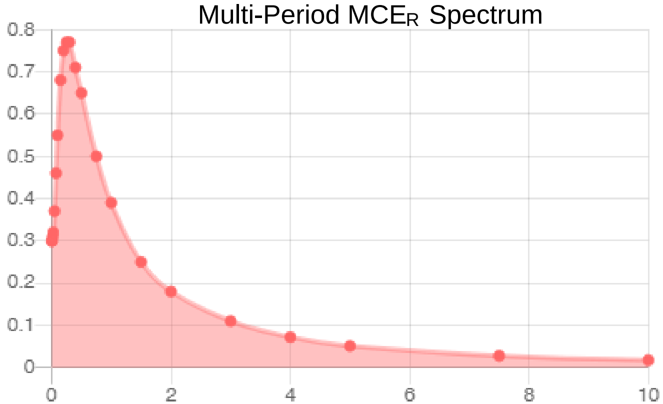
Site Soil Class: D - Stiff Soil

Results:

PGA_M :	0.28	T_L :	6
S_{MS} :	0.7	S_S :	0.53
S_{M1} :	0.39	S_1 :	0.14
S_{DS} :	0.46	V_{S30} :	260
S_{D1} :	0.26		

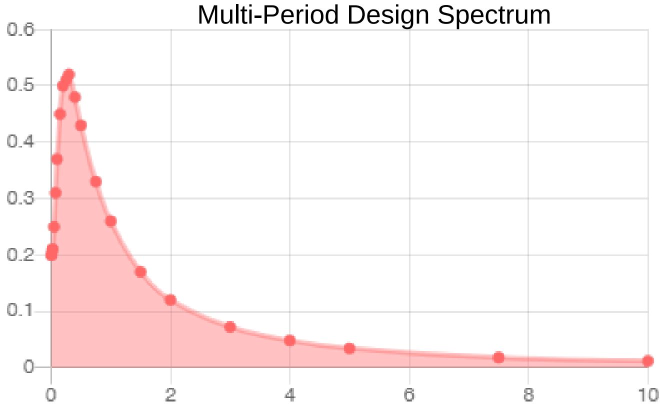
Seismic Design Category: D

Multi-Period MCE_R Spectrum



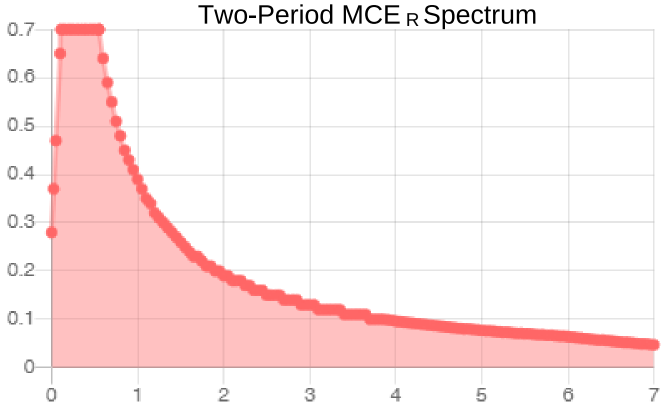
S_a(g) vs T(s)

Multi-Period Design Spectrum



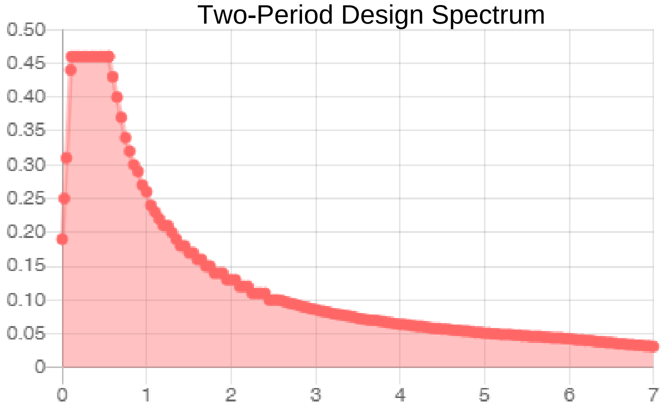
S_a(g) vs T(s)

Two-Period MCE_R Spectrum



S_a(g) vs T(s)

Two-Period Design Spectrum



S_a(g) vs T(s)

MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: **Wed Feb 07 2024**

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

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TECHNICAL MEMORANDUM

To:	Melinda Horne, Montana DEQ Chris Boe, Montana DEQ
From:	Brad Bennett, PG – Senior Hydrogeologist, Water & Environmental Technologies Christina Eggensperger, MS – Project Engineer, Water & Environmental Technologies
Copy:	Jeremy Perlinski, PE – Robert Peccia & Associates Kevin Ore, Public Works Director, City of East Helena
Date:	August 5, 2024
Re:	Non-Degradation Assessment – MGWPCS Permit Application City of East Helena Rapid Infiltration System Permit MTX000311 (pending)

Introduction

The City of East Helena (East Helena) is in the process of designing and implementing wastewater treatment facility (WWTF) upgrades to increase the current systems overall capacity. As part of the facility upgrades, East Helena seeks to obtain a Montana Groundwater Pollution Control System (MGWPCS) permit from the Montana Department of Environmental Quality (DEQ) to allow for utilization of rapid infiltration (RI) basins discharging up to one million gallons per day (MGD) of treated wastewater. The current WWTF utilizes a minor, mechanical treatment plant equipped with ultraviolet disinfection and aerobic sludge storage; East Helena is currently permitted to discharge treated wastewater to Prickly Pear Creek under a Montana Pollution Discharge Elimination System (MPDES) permit number MT0022560. To increase their treatment capacity for future growth, East Helena proposes to utilize RI basins, which would allow for increased treatment capacity without an increase in their surface water discharge permit.

East Helena is working with Robert Peccia and Associates (RPA) to complete design of the system upgrades. Water and Environmental Technologies (WET) has been retained to evaluate the hydrogeologic significance of discharging treated wastewater via the proposed RI basins. East Helena identified portions of their property in Tract A of the SWSE¼ , Section 24, Township 10 North, Range 3 West, Lewis & Clark County (Site) as potentially suitable for the proposed RI basins. **Figure 1** illustrates the current WWTF site relative to the general features of the area.

Hydrogeologic Setting

The proposed RI basin area is located on the Quaternary alluvial-plain deposits of Prickly Pear Creek, which flows north from the mountains and enters the Helena Valley about 3.5 miles south of the proposed RI basin area. Prickly Pear creek flows northwest into the Helena Valley; at its closest point the creek is approximately 2,000 feet southwest of the WWTF.

Subsurface geology in the vicinity of the proposed RI basin area consists of Quaternary alluvial-plain deposits and older alluvial-plain deposits. Older alluvial-plain deposits occur both adjacent to and beneath the more modern alluvial-plain deposits at the RI basin area. Alluvial-plain deposits consist primarily of moderately sorted cobble to pebble gravel in a silt and/or sand matrix. Discontinuous deposits of silt and sand are also commonly found within the alluvial-plain deposits. The subsurface lithology encountered during this assessment confirmed the occurrence of well graded, silty-sand and gravel with silty-sand, with trace local cobbles and trace local clay, from the land surface to the water table.

The aquifer material is mostly well-graded sand with some silt, sand with gravel, or gravel with sand. The alluvial-plain material appears to be thinly layered with slight depositional changes recorded every one to five feet. Differences in the logged intervals in each well show the depositional variability within the alluvial-plain.

A map illustrating the surficial geology in the vicinity of the proposed RI basin area and the location of the East Helena WWTF is provided in **Attachment A**. Groundwater flow in the Helena Valley is toward Lake Helena, at this site the groundwater flow direction is generally north to north-northeast.

Hydrogeologic Investigation

Soil Boring Advancement

Four soil borings were drilled and completed as monitoring wells at the site between February 27 and March 2, 2023. Soil boring and monitoring well locations, including the two existing site wells, are illustrated on **Figure 2**. Soil borings were drilled by O'Keefe Drilling with a GeoProbe 8150 Sonic drill rig. Sediment samples were collected at five-foot intervals as drilling proceeded to characterize subsurface conditions. Sediment types were identified and described using the Unified Soil Classification System in accordance with the American Society for Testing Materials (ASTM) procedure D2487. Copies of the boring and well construction logs are provided as **Attachment B**. The boring logs for MW-1 and MW-2 identify a silty clay layer between 3 ft and 5 feet bgs. Below this layer, borings MW-1 and MW-2, along with the lithology observed in boring MW-3 and MW-4, indicate that the subsurface generally consists of gravelly sand with cobbles.

Monitoring Well Installation

Monitoring wells were completed with two-inch schedule 40 PVC well casing and well screen. Sections of 0.020-slot manufactured well screen were set a minimum of 10-15 feet below the depth groundwater was encountered. Monitoring wells are completed to depths between 69 feet and 70 feet. The borehole filter pack consists of 10-20 Colorado® silica sand extending a minimum of five feet above the screen. A surface seal was installed using $^3/_8$-inch bentonite "hole plug" from the top of the filter-pack extending to ground surface. Well construction details are documented on the soil and well construction logs provided as **Attachment B**.

Groundwater Monitoring

After construction, the monitoring wells were developed by bailing and surging utilizing a stainless-steel bailer. Well development via surging and bailing serves to agitate the water column, establish the hydraulic connection between the well and aquifer, and remove silt and fine sand from the well and filter pack. All wells were developed for a minimum of one hour. Static water levels (SWLs) in the four onsite monitoring wells were measured and recorded by WET personnel or WWTP personnel a minimum of biweekly between March 13, 2023, and November 29, 2023. Results of the water-level data are presented in **Attachment C,** in the form of a facility MW hydrograph chart.

WET personnel monitored water levels in the two on-site wells over the period of investigation. The East well (GWIC 227753) is drilled to 75 feet and is completed in the same unconfined aquifer as the four monitoring wells installed during this investigation. The West well (GWIC 304015) is completed in a deeper zone with a total depth of 356 feet. As illustrated in **Attachment C**, water level trends observed in the East well are consistent with the four on-site monitoring wells, while the water levels collected in the west well do not appear to correlate strongly over the period of assessment. Montana Well Log Reports for the two existing on-site wells are included in **Attachment D** and the location of the wells are illustrated on **Figure 2**.

Water levels from the wells completed in the shallow unconfined alluvial aquifer show a strong seasonal recharge trend, beginning in late May and continuing through June. After that time, water levels begin to decline gradually through the fall. Interestingly, water levels in the three wells closest to Prickly Pear Creek (MW-1, MW-2, and MW-3) display a slightly more pronounced recharge pulse relative to the two wells located more distal to Prickly Pear Creek (MW-4 and East well).

Water Quality Sampling

Quarterly water quality samples were collected from well MW-1 and a table summarizing the data is included in **Attachment E**, along with analytical data summary reports from each sampling event. Additionally, a sample was collected from the existing East well and the analytical data from that sample is also included in **Attachment E**. The existing well is completed in the same unconfined alluvial aquifer as MW-1 and at similar depths; however, the East well is located further from Prickly Pear Creek.

Slug Testing

Rising-head slug tests were conducted in the four monitoring wells (MW-1, MW-2, MW-3, and MW-4) on May 10, 2023. A pressure transducer was utilized to record the change in recovering water levels at one-second intervals during the tests. Groundwater data from the slug tests were analyzed using AQTESOLV© software (Duffield, 2007). Individual hydraulic conductivity estimated from the slug tests ranged from 16.4 ft/day to 289.6 ft/day (**Table 1**). The mean hydraulic conductivity estimated from slug testing the five on-site monitoring wells is 122.4 ft^2/day.

AQTESOLV© plots depicting the type-curve matches and resulting hydraulic parameters derived from for each of the slug tests are provided **Attachment F**.

Table 1. Estimated Hydrologic Parameters from Slug Tests

Well ID	Hydraulic Conductivity (ft/day) Derived from Type-Curve Match Utilizing Bouwer-Rice (1976)
MW-1	28.45
MW-2	183.4
MW-3	251.5
MW-4	26.33
Average	**122.4**
Median	**104.5**

Pump Testing

WET personnel completed a pumping test on the East well at the site. The test was completed utilizing a 3.5-inch diameter test pump powered by a generator. The pump intake was set at 61.5 feet bgs to remain 1.5 feet above the slotted interval noted on the well log (63 to 73 feet bgs). The static-water level prior to the test was 54.37 feet, leaving only 7.1 feet of water above the pump.

During the pumping test, water levels were measured with an electronic water-level meter at time intervals specified in the Montana Department of Natural Resources (DNRC) Form 633 for aquifer tests and the pumping rate (discharge) was measured using a Macnaught digital flowmeter and checked with bucket and stopwatch.

The pumping test started at 15:55 on July 17, 2023, with the pumping rate set at 16 gpm. During the pumping test the generator failed three times, the first two times for less than 5-minutes. However, the test ended when the generator shut down and could not be restarted on July 18, 2023, at 14:35, 22 hours, 40 minutes into the pumping test. After the first restart the pump could only maintain 15 gpm, after the second restart the pump maintained 14 gpm to the end of the test. At 14 gpm the pumping rate is 12.5-percent below the designed 16 gpm pumping rate. Maximum drawdown in the well during the pumping test reached 4.38 feet.

Monitoring well MW-4 is located 350 feet west of the pumping well and is the closest to the pumping well. After completing an evaluation of water level trends, no definitive response to pumping of the East well (drawdown) was identified in MW-4.

Drawdown at the pumping well was analyzed using AQTESOLV© software. The Theis (1935) solution single well analysis estimated transmissivity at 2,902 feet^2/day. At 19.3-feet saturated thickness the hydraulic conductivity is estimated at 149 feet/day. Data collected during the aquifer test are provided as **Attachment G**. The AQTESOLV© plot depicting the type-curve match and resulting hydraulic parameters derived from the pump test is provided in **Attachment H**. Aquifer test analysis yield values of hydraulic conductivity that are consistent with those obtained from slug testing.

Site Specific Hydrogeologic Conditions

The proposed RI basin discharge system for East Helena shall be keyed approximately 3.5 to 7.0 feet into the subsurface. The depth of the key will allow the infiltrative surface to penetrate the upper sand and gravel observed in the RI basin areas. Water discharged to the RI basins will seep into subsurface and migrate vertically through the vadose zone before reaching the water table. Upon reaching the water table, it will migrate horizontally in a downgradient direction (north-northeast). The following aquifer characteristics, provided in **Table 2**, were utilized to assess impacts to the aquifer in this area. Specifically, these parameters were utilized to evaluate the fate and transport of nitrates and phosphorous.

Table 2. Aquifer Characteristics

Estimated Aquifer Properties of the Shallow Alluvial Aquifer Somers, Montana	
Confinement:	Unconfined *****
Groundwater Flow Direction:	North-Northeast (Approximately 70°) ^
Aquifer Thickness:	19.3 feet ^
Hydraulic Gradient:	0.0119 feet/feet ^
Hydraulic Conductivity:	149 feet/day ^
Effective Porosity:	31.5 percent *****

** indicates referenced value, ^ indicates measured value*

Aquifer Thickness

Aquifer saturation (aquifer thickness) was approximated from the four (4) on-site monitoring wells. The on-site wells vary in completion depth from 69 to 70 feet bgs. Water levels were monitored a minimum of biweekly between March 13, 2023, and November 29, 2023. In this calculation, each of the monitoring wells is assumed to be completed at the base of the aquifer at the contact with the underlying confining unit. Well logs for the monitoring wells utilized in estimating the aquifer thickness are listed in **Table 3** and boring and well construction logs are provided as **Attachment B**. Water level data collected in the on-site monitoring wells is provided as **Attachment C**. As shown in Table 3, the average saturated thickness of the aquifer is 19.29 feet.

Table 3. Well Log Summary

Assessment of Aquifer Saturation			
Well ID	**TD (ft)**	**Average SWL (ft)**	**Average Aquifer Thickness (ft)**
MW-1	69	51.32	17.68
MW-2	69	48.04	20.96
MW-3	69	43.22	25.78
MW-4	70	57.45	12.55
Average	**69.3**	**50.01**	**19.29**

Hydraulic Gradient

Near the proposed RI basins, the groundwater flow direction is generally to the north-northeast, varying slightly during the entire monitoring period. The hydraulic gradient varies slightly over the year as groundwater recharges the shallow aquifer. Monthly groundwater contour maps from March 2023 to November 2023 are included as **Attachment I**. The hydraulic gradient varied from 0.0119 to 0.0182 and was flattest (0.0119) in November 2023. This gradient (0.0119) was utilized to model potential impacts of the proposed RI basins. **Figure 3** illustrates the water table observed on November 14, 2023, which is the hydraulic gradient utilized in this evaluation.

Hydraulic Conductivity

Hydraulic conductivity is estimated from a pumping test completed on the City of East Helena's existing shallow well (East well) and slug tests completed on the on-site monitoring wells. Estimates of aquifer hydraulic conductivity from the slug tests ranged from 16.38 to 289.6 feet/day. The hydraulic conductivity estimate obtained from the pumping test was 149 feet/day, which was the value of that was selected for utilization in this assessment. Type-curve matches for the slug test analyses are provided as **Attachment F** and for the pump test in **Attachment H**. This value is less than the 569 feet/day allowed for a medium sand aquifer and is closer to the 51 feet/day allowed for a fine sand aquifer and 45 feet/day allowed for a silty sand aquifer per ARM 17.30.1702(6)(a)(i).

Effective Porosity

An effective porosity of 0.315 (31.5-percent) is assumed for the assessment, which is a referenced value for a sand and gravel aquifer. This value is consistent with the default value for gravelly sand in DEQ's *Draft – Pathogen Reduction Model for Setbacks between Sewage Lagoons and Water Wells* spreadsheet. Per the spreadsheet, the values represent the 90th percentile of published values from numerous reference sources. A copy of DEQ's spreadsheet is provided as **Attachment J**. Note that the lagoon leakage rate has been modified to reflect the proposed infiltrative rate of the planned RI basin areas.

Infiltration

Pioneer Technical excavated six test pits on November 16, 2023, one test pit in each proposed RIB Cell location. Personnel observed the presence of a low permeability clay layer in each test pit, the location of the layer ranging from 1.5-4.5 ft bgs. Information pertaining to historical WWTF design indicates this low permeability layer is a remnant of former treatment lagoons located west of the current mechanical treatment plant.

Double ring infiltrometer tests were conducted at each of the test pits beginning on November 29, 2023. Pioneer Technical determined an allowable infiltration rate of 1.2 inches/hour (in/hr) or 29.1 in/day. This equates to 726,560 gal/day per cell. Information collected by Pioneer Technical during the infiltrometer testing is included as **Attachment K**.

Nearby Drinking Water Wells

After completion of groundwater monitoring, the proposed placement and design of the RI basins were evaluated. As further analysis regarding the fate and transport of the proposed discharge has been completed, the proposed size, location, and volume of discharge has been refined. The location of the proposed RI basins is illustrated in **Figure 4**. The Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center (GWIC) database was queried to identify potential wells located within ¼-mile of the proposed RI basin areas. A setback analysis is depicted on **Figure 5**, along with an inventory of wells within ¼-mile of the proposed discharge. The nearest downgradient surface water body is Lake Helena, located approximately 5.8 miles north-northeast of the Site. Initially, one downgradient well (GWIC ID 198229) plotted with in the ¼-mile buffer in the direction of groundwater flow. Further research indicated that the well is located on a property in a subdivision over ¼-mile west-northwest of the Site. The correct well placement is indicated on **Figure 5** and **Figure 6**. There were no other drinking water wells located within 500 feet of the proposed RI basin area locations nor are there any wells located within ¼-mile of the proposed RI basin areas in the downgradient direction. The approximate location of the wells is identified on **Figure 5** and **Figure 6**.

Phosphorous Breakthrough

Phosphorous breakthrough to surface water was evaluated utilizing the proposed discharge volume of 1,000,000 GPD. The amount of discharge with the potential to be intercepted by various surface water bodies is variable depending upon the direction of flow.

Lake Helena

WET modeled the phosphorous breakthrough to Lake Helena, assuming all discharges will flow toward the lake. The proposed phosphorous concentration of 2.0 mg/L was utilized in the calculations, resulting in 6,100 pounds per year of phosphorous load. As noted above, a conservative four-foot unsaturated zone was assumed beneath the RI basins and a flow path of 30,000 feet. A standard dispersion angle of five degrees was assumed.

Pioneer Technical collected three soil samples from the proposed RI basin areas on December 26, 2023. Samples were submitted to the University of Idaho's College of Agricultural and Life Sciences Analytical Sciences Laboratory for analysis. Information from the analysis is included in

Attachment M. The analysis indicated a phosphorous adsorption capacity of 89.9 mg/L. This value was used in the phosphorous breakthrough analysis rather than the Montana DEQ standard value of 200 mg/L as they are more representative of site conditions.

The calculated phosphorous breakthrough to Lake Helena is 70.7 years. The resulting calculations indicate that phosphorous breakthrough to the adjacent surface water bodies will not occur within 50 years and impacts to surface water bodies are not anticipated. The results of year-round discharge are summarized below in **Table 4;** phosphorus breakthrough calculations can be found in **Attachment L**.

Table 4. Phosphorus Breakthrough Calculation Summary

Surface Water Body	Discharge at 2.0 mg/L (GPD)	Phosphorous Breakthrough (years)
Lake Helena	1,000,000	70.7

Pathogen Removal

An assessment of potential pathogen impacts to downgradient drinking water wells was completed as part of this assessment. Pathogen removal was estimated utilizing the same aquifer characteristics as the previous assessment. A conservative four-foot unsaturated zone was assumed beneath the RI basin areas. A volumetric soil moisture content of 0.045 mL/cm^3 was assumed for the unsaturated soil. This value (0.05 mL/cm^3) is consistent with the default value for gravelly sand in DEQ's *Draft – Pathogen Reduction Model for Setbacks between Sewage Lagoons and Water Wells* spreadsheet. Per the spreadsheet, the values represent the 90th percentile of published values from numerous reference sources. A copy of DEQ's Pathogen Transport Model spreadsheet is provided as **Attachment J**. Nearby drinking water wells were assigned a conservative demand of 3,000 GPD in the model.

DEQ's Pathogen Transport Model spreadsheet utilizes both vertical and horizontal travel to calculate pathogen removal. 4-log microbiological attenuation typically occurs within 200 days. A small amount of virus inactivation occurs in the short travel time (0.17 days) between the bottom of the RI basin areas and the top of the water table mound (0.003 logs). As noted above, no wells are within 500 feet of the proposed RI basin areas and none are located within ¼-mile, in the direction of groundwater flow.

Nitrate Loading Sensitivity Analysis

Nitrate Loading to Groundwater

Nitrate loading to groundwater was evaluated using the modified Bauman-Schafer analytical model. The modified Bauman-Schafer model was used to evaluate the nitrate concentration in groundwater downgradient from the proposed RIB locations. The following site-specific variables that were input into the model include:

- Hydraulic conductivity = 149 ft/day

- Hydraulic gradient = 0.0119 as measured through on-site monitoring wells
- Mixing zone length = 500 feet
- Drainfield width perpendicular to groundwater flow = 487 feet (see **Figure 4**)
- Background nitrate concentration = 0.38 mg/L (laboratory analyses of samples collected from well MW-1)
- Number of Single Family Drainfields = 5,000 (equivalent to one MGD)
- Precipitation = 14.2 inches from the Canyon Ferry Dam Weather Station

The background nitrate concentration of 0.38 mg/L was the average of (3) quarters of analytical data from monitoring well MW-1. The nitrate sensitivity was evaluated using the peak flow rate of one (1) MGD and the standard nitrate quantity of effluent (26.70 ft^3/day per single family home). The single-family equivalent for the municipal wastewater system was calculated by dividing the total flow rate by the average single-family wastewater flow of 200 gpd for a total single-family equivalent of 5,000. The result is summarized in **Table 5**.

Table 5. Nitrate Sensitivity Calculation Summary

Constituent	Concentration at End of Proposed Mixing Zone (mg/L)	EPA MCL
Nitrate (Assuming Daily Peak Flow)	4.97	<10.0

A printout of the computations showing the nitrate sensitivity analysis is provided in **Attachment N.**

References

Duffield, G.M., 2007. AQTESOLV for Windows Version 4.5 User's Guide, HydroSOLVE, Inc. Reston, VA.

Kirkland, S.L., 2001. Coupling site-scale fate and transport with watershed-scale modeling to assess the cumulative effects of nutrients from decentralized onsite wastewater systems. M.S. thesis, Department of Geology and Geological Engineering: Colorado School of Mines.

Montana Bureau of Mines and Geology (*Montana Groundwater Information Center Water Well Data).* Retrieved from https://mbmggwic.mtech.edu/.

Montana Department of Environmental Quality*, Pathogen Reduction Model for Setbacks between Sewage Lagoons and Water Wells*. Microsoft Excel file. Email (Regensburger, E.). January 2024

Montana Department of Environmental Quality*, Single Scenario – Time of Travel Calculation*. Microsoft Excel file.

Figures

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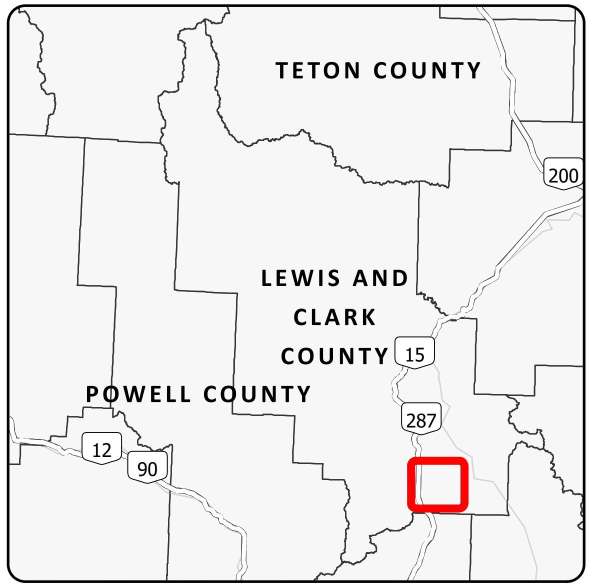


🟥 Property Boundary

NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	1/23/23	KK	CE
2				
3				
4				
5				

NOTES

VICINITY MAP

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

JOB#: 1559-22

DATE:6/26/2024

FIGURE 1

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author:

Water & Environmental
TECHNOLOGIES

NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	5/15/24	LG	CE
2				
3				
4				
5				

NOTES:

SITE WELLS

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

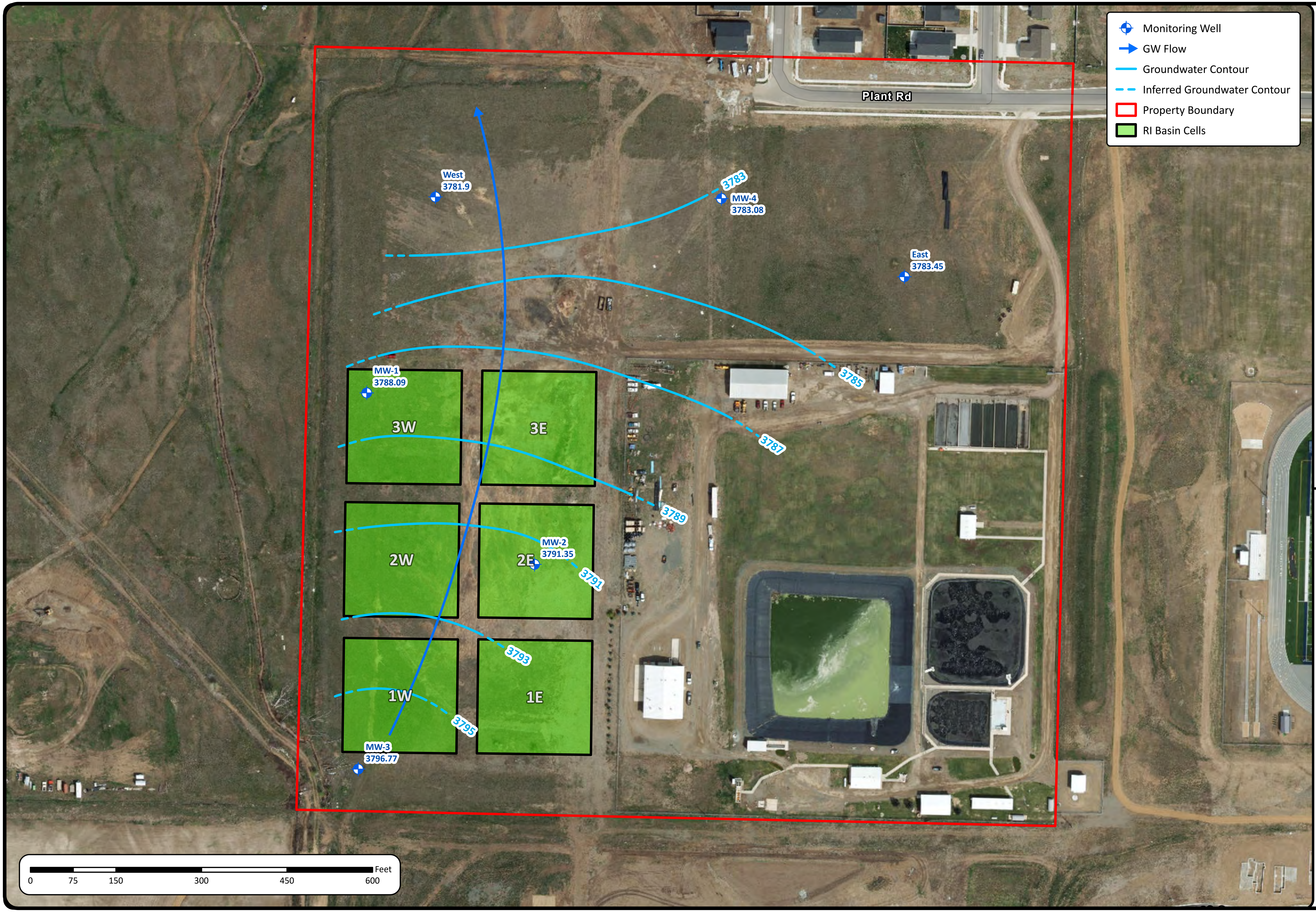
FIGURE 2

JOB#: 1559-22

DATE:6/26/2024

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author:

Water & Environmental TECHNOLOGIES



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2	ADD CONTOURS	2/12/24	LG	GM
3				
4				
5				

NOTES:

GROUNDWATER ELEVATION - 11/14/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

FIGURE 3

JOB#: 1559-22

DATE:6/26/2024

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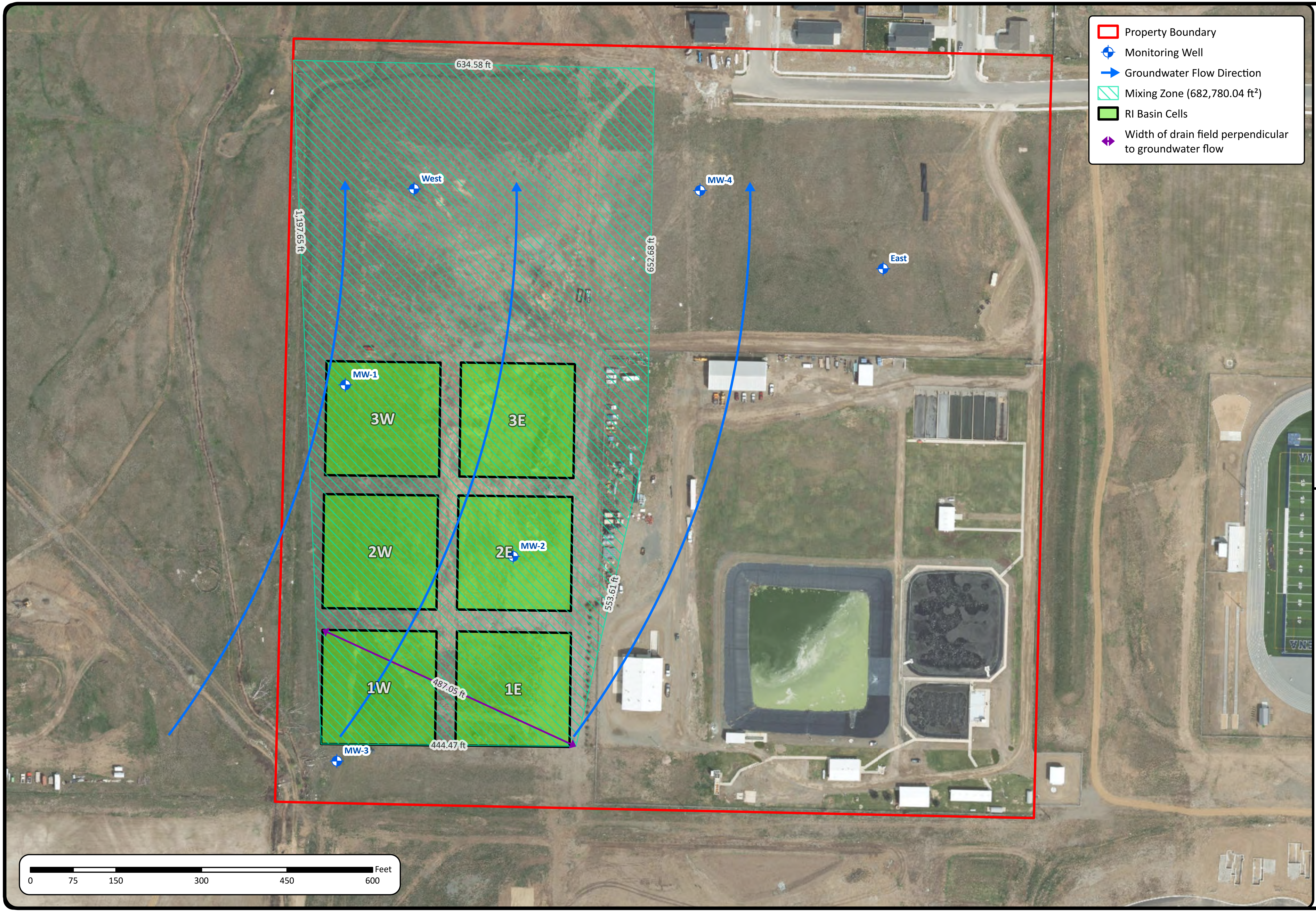
Water & Environmental TECHNOLOGIES



NO.	DESCRIPTION	DATE	DRAFT	REVIEW
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2		2/1/24	KK	GM
3	MIXING ZONE EDIT	3/8/24	LG	CE
4	MIXING ZONE EDIT	6/20/24	LG	CE
5				

NOTES:

FACILITY SITE PLAN

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

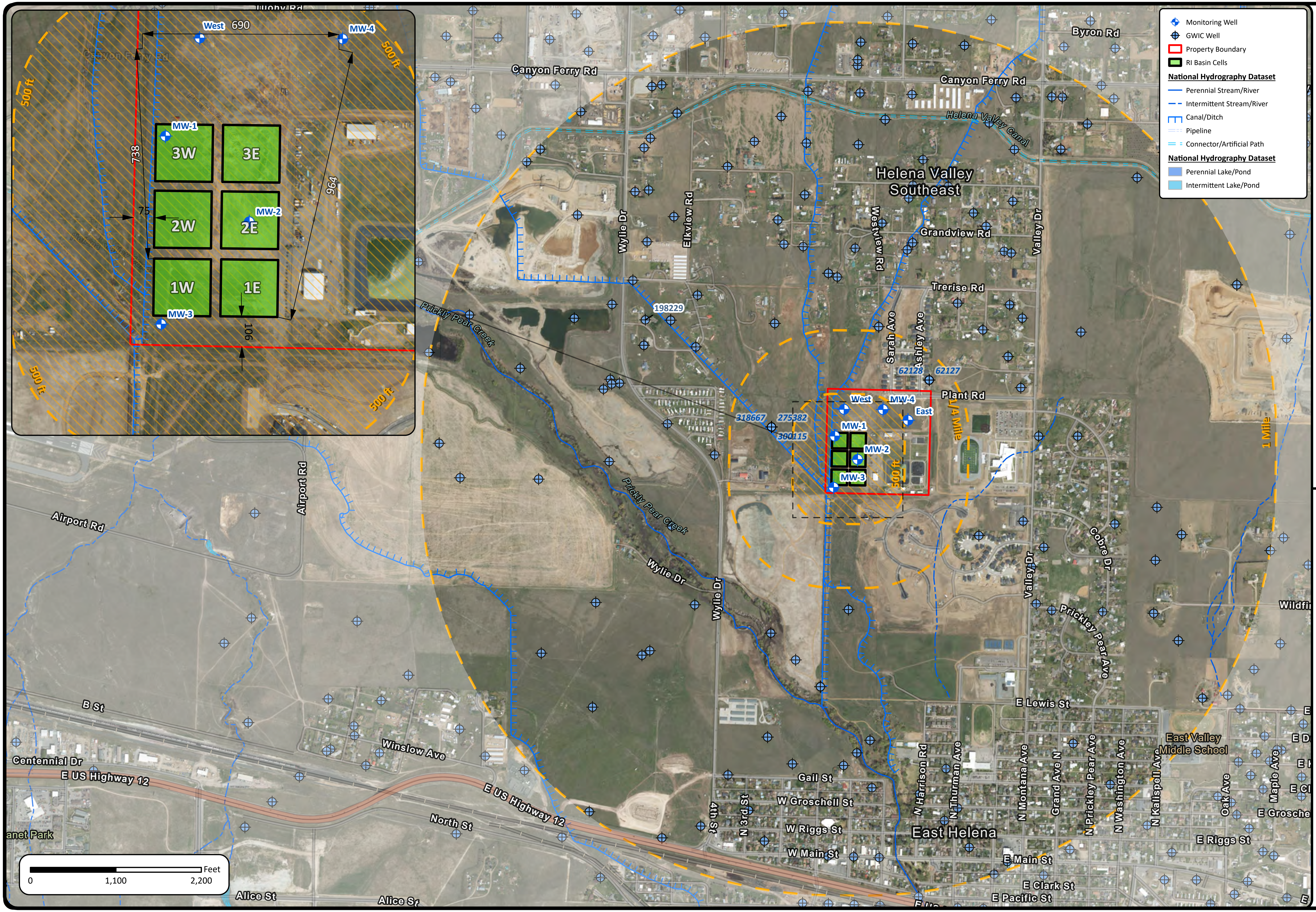
JOB#: 1559-22

DATE:6/26/2024

FIGURE 4

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author:

Water & Environmental TECHNOLOGIES



NOTES:

NO.	DESCRIPTION	DATE	DRAFT	REVIEW
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2	SYMBOLOGY	5/16/24	EL	CE
3				
4				
5				

SETBACK INVENTORY

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

FIGURE 5

JOB#: 1559-22

DATE:8/2/2024

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Water & Environmental
TECHNOLOGIES

NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	5/15/24	LG	CE
2	IB CELLS	5/16/24	EL	CE
3	UPDATE WELL LOCATIONS	6/27/24	LG	CE
4				
5				

NOTES:

VICINITY WELLS

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

FIGURE 6

JOB#: 1559-22

DATE:8/2/2024

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author:

Water & Environmental TECHNOLOGIES

Attachment A

Map of Surficial Geology of East Helena

(from Stickney, et al, 2017)

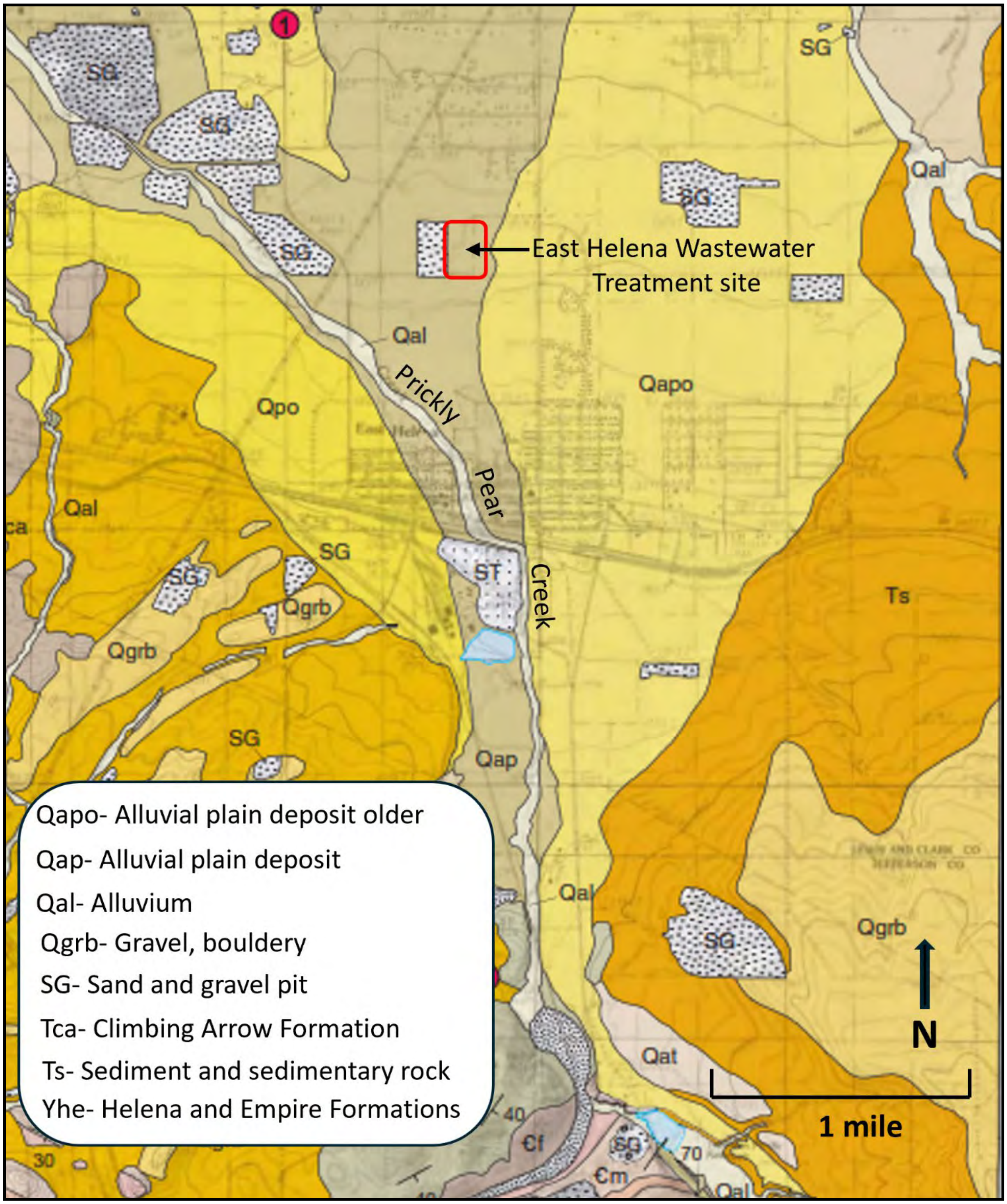


Figure 2. Map showing the Surficial Geology at East Helena and the location of the East Helena Wastewater Treatment Site (From Stickney, et al, 2017).

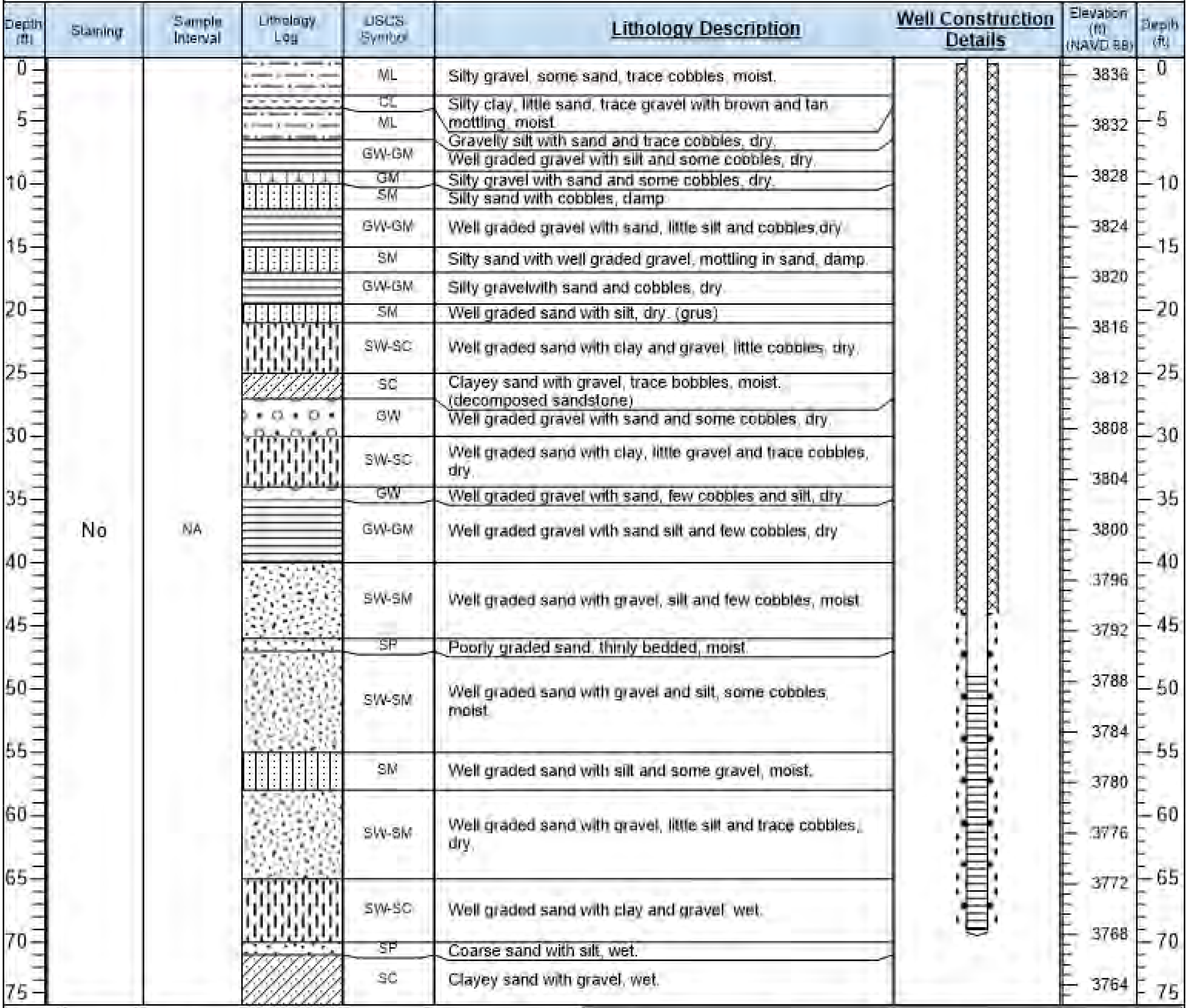
Attachment B

Site Boring and Well Construction Logs

BORING AND WELL CONSTRUCTION LOG

Boring/Well # : MW-1
Project Name: East Helena Groundwate Discharge Permit
Project No: 2022.1555

DRILL METHOD: ROTO-SONIC	LOGGED BY: IRIS SMITH					DATE STARTED: 2/27/2023	
DRILLED BY: CASCADE DRILLING	SURFACE COMPLETION: STICK UP					DATE COMPLETED: 2/28/2023	
CASING TYPE: SCH 40 PVC/2"	FROM	0	TO	49	FT.	TOC ELEV: 3839.073	amsl (NAVD 88)
SCREEN TYPE: SCH 40 PVC 0.020" SLOT	FROM	49	TO	69	FT.	NORTHING: 67778.088	(MT SP-N83 IF)
SEAL: BENTONITE CHIPS 3/8"	FROM	0.5	TO	44	FT.	EASTING: 59491.14	(MT SP-N83 IF)
FILTER PACK: 10-20 SILICA SAND	FROM	49	TO	69	FT.		
TD WELL: 69 FT	TD BORING: 75 FT					DTW: 55.88 FT	



Staining	Sample Interval	USCS Symbol	Lithology Description
		ML	Silty gravel, some sand, trace cobbles, moist.
		CL	Silty clay, little sand, trace gravel with brown and tan mottling, moist.
		ML	Gravelly silt with sand and trace cobbles, dry.
		GW-GM	Well graded gravel with silt and some cobbles, dry.
		GM	Silty gravel with sand and some cobbles, dry.
		SM	Silty sand with cobbles, damp.
		GW-GM	Well graded gravel with sand, little silt and cobbles,dry.
		SM	Silty sand with well graded gravel, mottling in sand, damp.
		GW-GM	Silty gravelwith sand and cobbles, dry.
		SM	Well graded sand with silt, dry. (grus)
		SW-SC	Well graded sand with clay and gravel, little cobbles, dry.
		SC	Clayey sand with gravel, trace bobbles, moist. (decomposed sandstone)
		GW	Well graded gravel with sand and some cobbles, dry.
		SW-SC	Well graded sand with clay, little gravel and trace cobbles, dry.
		GW	Well graded gravel with sand, few cobbles and silt, dry.
No	NA	GW-GM	Well graded gravel with sand silt and few cobbles, dry.
		SW-SM	Well graded sand with gravel, silt and few cobbles, moist.
		SP	Poorly graded sand, thinly bedded, moist.
		SW-SM	Well graded sand with gravel and silt, some cobbles, moist.
		SM	Well graded sand with silt and some gravel, moist.
		SW-SM	Well graded sand with gravel, little silt and trace cobbles, dry.
		SW-SC	Well graded sand with clay and gravel, wet.
		SP	Coarse sand with silt, wet.
		SC	Clayey sand with gravel, wet.

Lithology Key

▥	GM
▦	CL
▣	GW
▥	SM
▦	SP
▨	SC
▤	GW-GM
▦	SW-SM
▦	ML
▥	SW-SC

Well Construction Key

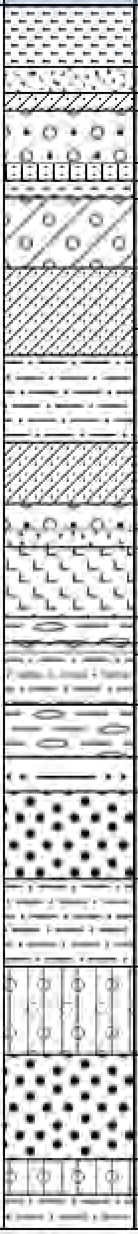
⁛	10-20 Sand
▩	Bentonite Chip 3/8"
☐	SCH-40 Casing
▤	20-Slot Screen
▽	End Cap

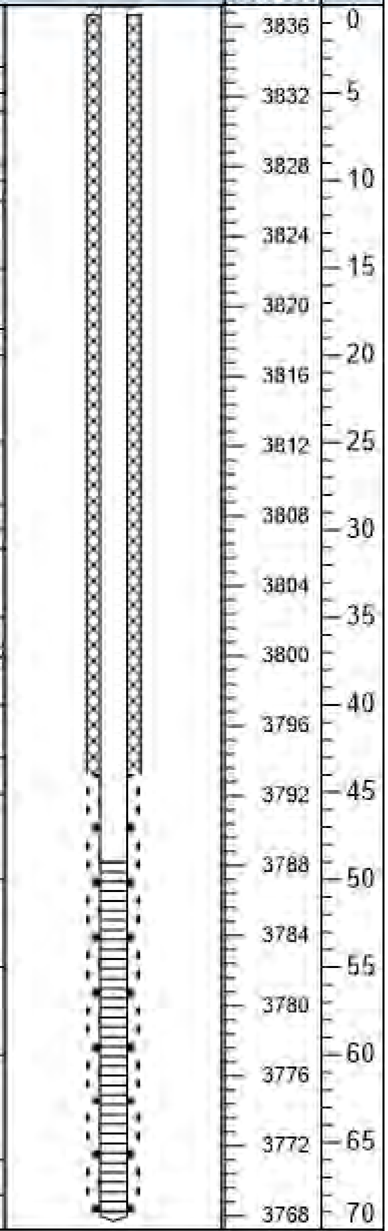
*Drill casing was advanced with water, moisture notes may not be representitive of soil moisture

BORING AND WELL CONSTRUCTION LOG

Boring/Well # : MW-2
Project Name: East Helena Groundwater Discharge Permit
Project No: 2022.1555

DRILL METHOD: ROTO-SONIC	LOGGED BY: IRIS SMTITH				DATE STARTED: 2/28/2023	
DRILLED BY: CASCADE DRILLING	SURFACE COMPLETION: STICK UP				DATE COMPLETED: 3/1/2023	
CASING TYPE: SCH 40 PVC/2"	FROM 0	TO 49	FT		TOC ELEV.: 3838.867	amsl (NAVD 88)
SCREEN TYPE: SCH 40 PVC 0.020" SLOT	FROM 49	TO 69	FT		NORTHING: 67485.805	(MT SP-N83 IF)
SEAL: BENTONITE CHIPS 3/8"	FROM 0.5	TO 44	FT		EASTING: 59794.894	(MT SP-N83 IF)
FILTER PACK: 10-20 SILICA SAND	FROM 49	TO 69	FT			
TD WELL: 69 FT.	TD BORING: 70 FT.				DTW: 52.31 FT	





Depth (ft)	Staining	Sample Interval	USCS Symbol	Lithology Description
0			CL	Gravely lean clay with sand, moist
5			SW-SM	Well graded sand with silt and gravel, dry.
			SC	Clayey sand with gravel and cobbles, dry.
			GW	Well graded gravel with sand, few boulders and trace fines, dry.
10			SM	Silty sand with gravel and few cobbles, dry.
			CL	Sandy lean clay with little cobbles, moist.
			GC	Clayey gravel with sand, cobbles and few boulders, dry.
15			SC	Clayey sand with gravel and trace cobbles, moist.
			SC	Clayey sand with gravel trace cobbles, dry
20			ML	Silt with sand, little gravel and trace cobbles, moist.
25			SC	Clayey sand with trace gravel, moist
30			GW	Large gravel and cobbles with trace silt, dry.
			SP	Fine sand with silt, moist
			SP-SC	Poorly sorted sand with gravel, few cobbles and trace fines
35	No	NA	GP-GM	Poorly graded gravel with silt and fine sand, trace cobbles, moist.
			GW	Boulder
			ML	Silt with sand, little gravel and trace cobbles, moist.
40			GP-GM	Poorly graded gravel with silt, some fine sand, and trace cobbles, moist. Orange and brown mottling.
			SP-SM	Poorly graded sand with silt, some gravel and trace cobbles, moist. Orange and brown mottling.
45			SW	Well graded sand with some silt, trace gravel and cobbles, moist.
50			ML	Gravely silt with some well graded sand, little cobbles, moist. Orange and brown mottling.
55			GM	Silty gravel, trace cobbles, moist.
60			SW	Well graded sand with gravel and trace cobbles, moist.
65			GM	Silty gravel with sand, moist.
70			ML	Sandy silt with trace gravel, moist.

Lithology Key

GM	SW	SW-SM
CL	SP	ML
GW	SC	GP-GM
GC	SP-SM	SP-SC
SM		

Well Construction Key

10-20 Sand	SCH-40 Casing	End Cap
Bentonite Chip 3/8"	20-Slot Screen	Clean Fill

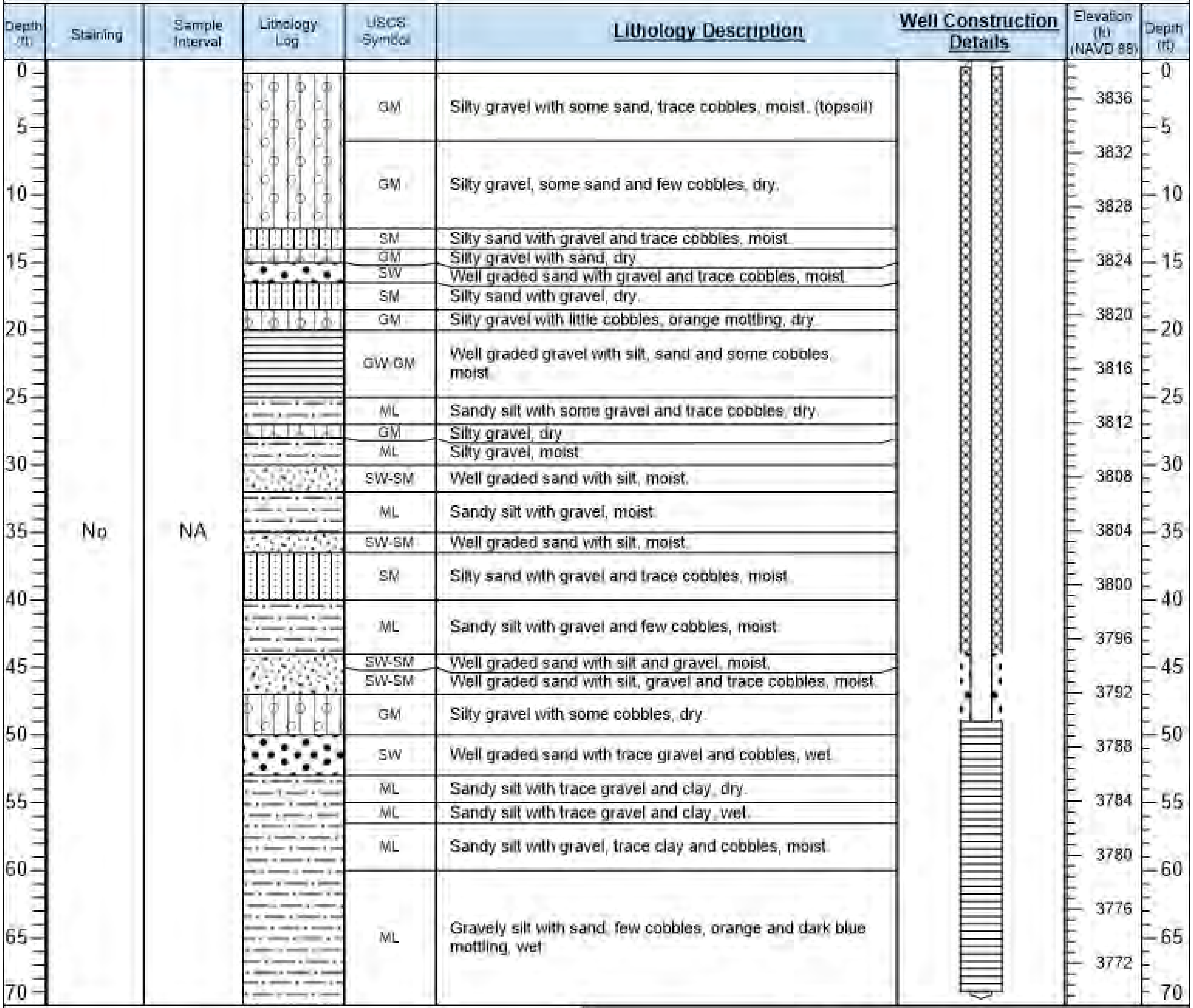
*Drill casing was advanced with water, moisture notes may not be representitive of soil moisture

Sheet 1 of 1

BORING AND WELL CONSTRUCTION LOG

Boring/Well # : MW-3
Project Name: East Helena Groundwate Discharge Permit
Project No: 2022.1555

DRILL METHOD: ROTO-SONIC	LOGGED BY: CHRISTINA EGGENSPERGER				DATE STARTED: 3/1/2023	
DRILLED BY: CASCADE DRILLING	SURFACE COMPLETION: STICK UP				DATE COMPLETED: 3/2/2023	
CASING TYPE: SCH 40 PVC/2"	FROM 0	TO 49	FT.		TOC ELEV.: 3840.807	ams (NAVD 88)
SCREEN TYPE: SCH 40 PVC 0.020" SLOT	FROM 49	TO 69	FT.		NORTHING: 67116.81	(MT SP-N83 IF)
SEAL: BENTONITE CHIPS 3/8"	FROM 0.5	TO 44	FT.		EASTING: 59497.313	(MT SP-N83 IF)
FILTER PACK: 10-20 SILICA SAND	FROM 49	TO 69	FT.			
TD WELL: 69 FT.	TD BORING: 70 FT.				DTW: 48.31 FT	



Staining	Sample Interval	USCS Symbol	Lithology Description
No	NA	GM	Silty gravel with some sand, trace cobbles, moist. (topsoil)
		GM	Silty gravel, some sand and few cobbles, dry.
		SM	Silty sand with gravel and trace cobbles, moist.
		GM	Silty gravel with sand, dry
		SW	Well graded sand with gravel and trace cobbles, moist
		SM	Silty sand with gravel, dry.
		GM	Silty gravel with little cobbles, orange mottling, dry.
		GW-GM	Well graded gravel with silt, sand and some cobbles, moist
		ML	Sandy silt with some gravel and trace cobbles, dry.
		GM	Silty gravel, dry
		ML	Silty gravel, moist
		SW-SM	Well graded sand with silt, moist.
		ML	Sandy silt with gravel, moist.
		SW-SM	Well graded sand with silt, moist.
		SM	Silty sand with gravel and trace cobbles, moist.
		ML	Sandy silt with gravel and few cobbles, moist.
		SW-SM	Well graded sand with silt and gravel, moist.
		SW-SM	Well graded sand with silt, gravel and trace cobbles, moist.
		GM	Silty gravel with some cobbles, dry.
		SW	Well graded sand with trace gravel and cobbles, wet.
		ML	Sandy silt with trace gravel and clay, dry.
		ML	Sandy silt with trace gravel and clay, wet.
		ML	Sandy silt with gravel, trace clay and cobbles, moist.
		ML	Gravely silt with sand, few cobbles, orange and dark blue mottling, wet

Lithology Key

◫ GM	⁘ SW	⁙ SW-SM
⋮ SM	☰ GW-GM	┄ ML

Well Construction Key

⁘ 10-20 Sand	☐ SCH-40 Casing	▽ End Cap
▩ Bentonite Chip 3/8"	☰ 20-Slot Screen	▨ Clean Fill

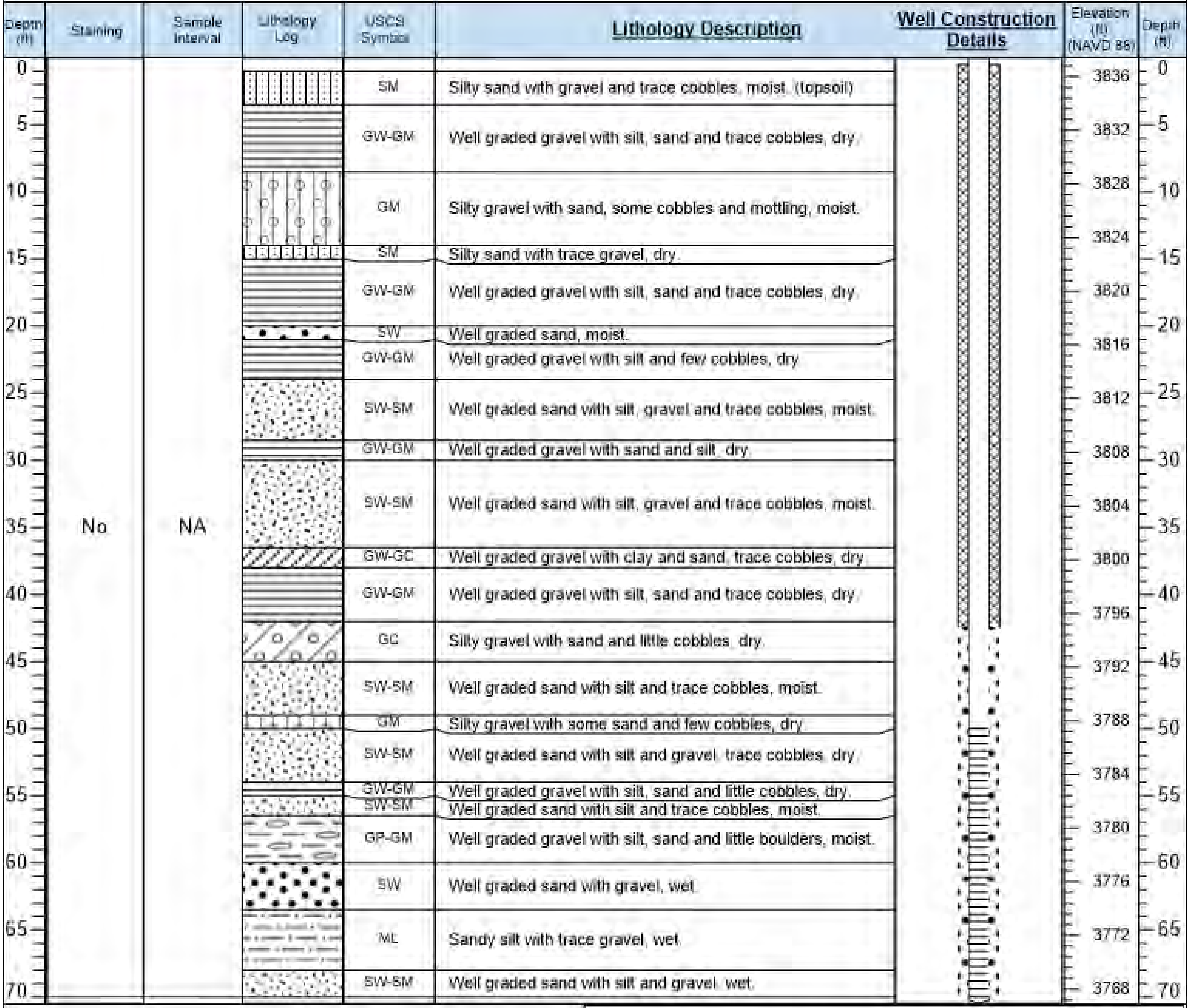
*Drill casing was advanced with water, moisture notes may not be representitive of soil moisture

Sheet 1 of 1

BORING AND WELL CONSTRUCTION LOG

Boring/Well # : MW-4
Project Name: East Helena Groundwate Discharge Permit
Project No: 2022.1555

DRILL METHOD: ROTO-SONIC	LOGGED BY: CHRISTINA EGGENSPERGER					DATE STARTED: 3/2/2023
DRILLED BY: CASCADE DRILLING	SURFACE COMPLETION: STICK UP					DATE COMPLETED: 3/2/2023
CASING TYPE: SCH 40 PVC/2"	FROM	0	TO	50	FT	TOC ELEV: 3839.082 amsl (NAVD 88)
SCREEN TYPE: SCH 40 PVC 0.020" SLOT	FROM	50	TO	70	FT	NORTHING: 68138.207 (MT SP-N83 F)
SEAL: BENTONITE CHIPS 3/8"	FROM	0.5	TO	42.5	FT	EASTING: 60103.485 (MT SP-N83 F)
FILTER PACK: 10-20 SILICA SAND	FROM	50	TO	70	FT	
TD WELL: 70 FT.	TD BORING: 70 FT.					DTW: 61.03 FT.



Staining	Sample Interval	USCS Symbol	Lithology Description
No	NA	SM	Silty sand with gravel and trace cobbles, moist. (topsoil)
		GW-GM	Well graded gravel with silt, sand and trace cobbles, dry.
		GM	Silty gravel with sand, some cobbles and mottling, moist.
		SM	Silty sand with trace gravel, dry.
		GW-GM	Well graded gravel with silt, sand and trace cobbles, dry.
		SW	Well graded sand, moist.
		GW-GM	Well graded gravel with silt and few cobbles, dry.
		SW-SM	Well graded sand with silt, gravel and trace cobbles, moist.
		GW-GM	Well graded gravel with sand and silt, dry.
		SW-SM	Well graded sand with silt, gravel and trace cobbles, moist.
		GW-GC	Well graded gravel with clay and sand, trace cobbles, dry.
		GW-GM	Well graded gravel with silt, sand and trace cobbles, dry.
		GC	Silty gravel with sand and little cobbles, dry.
		SW-SM	Well graded sand with silt and trace cobbles, moist.
		GM	Silty gravel with some sand and few cobbles, dry.
		SW-SM	Well graded sand with silt and gravel, trace cobbles, dry.
		GW-GM	Well graded gravel with silt, sand and little cobbles, dry.
		SW-SM	Well graded sand with silt and trace cobbles, moist.
		GP-GM	Well graded gravel with silt, sand and little boulders, moist.
		SW	Well graded sand with gravel, wet.
		ML	Sandy silt with trace gravel, wet.
		SW-SM	Well graded sand with silt and gravel, wet.

Lithology Key

GM	SW	SW-SM
GC	GW-GC	ML
SM	GW-GM	GP-GM

Well Construction Key

10-20 Sand	SCH-40 Casing	End Cap
Bentonite Chip 3/8"	20-Slot Screen	

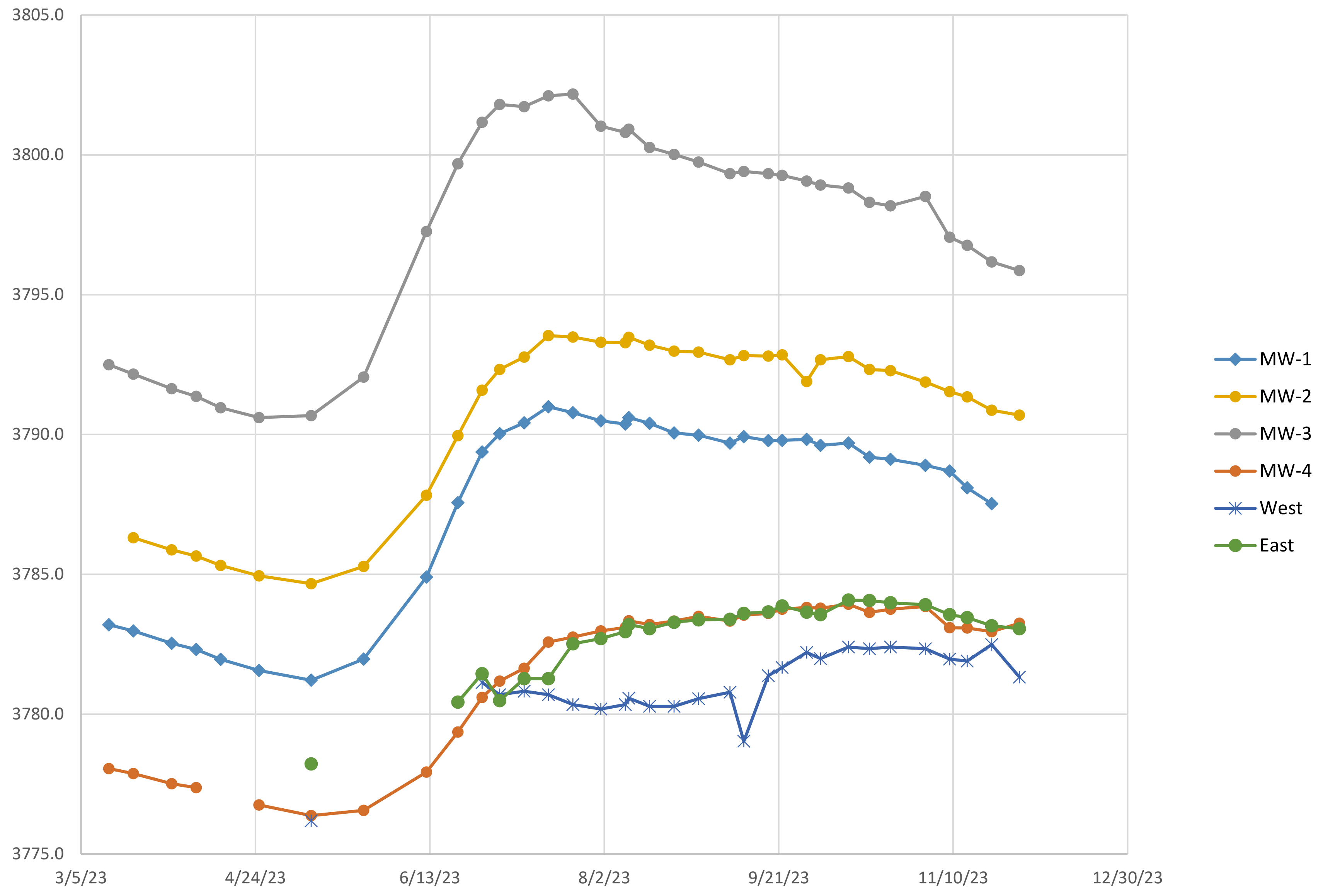
*Drill casing was advanced with water, moisture notes may not be representitive of soil moisture

Sheet 1 of 1

Attachment C

Monitoring Well Hydrographs

Groundwater Elevation (ft)



Attachment D

Existing Site Well Logs

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Go to GWIC website
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (8/17/2006 3:48:54 PM)

Site Name: CITY OF EAST HELENA
GWIC Id: 227753
DNRC Water Right: 44698

Section 1: Well Owner(s)

1) EAST HELENA (MAIL)
P.O. BOX 1170
HELENA MT 59635-1170 [04/15/1982]

Section 2: Location

Township	Range	Section	Quarter Sections
10N	03W	24	SE¼ SW¼ SE¼

County	Geocode
LEWIS AND CLARK	

Latitude	Longitude	Geomethod	Datum
46.60361678775	-111.9213257195	TRS-SEC	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot
LAGOON WELL		

Section 3: Proposed Use of Water

OTHER (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Thursday, April 15, 1982

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	75	7

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	75	6			WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
63	73	6		1/4X2.5	SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	CEMENT	

Section 7: Well Test Data

Total Depth: 75
Static Water Level: 40
Water Temperature:

Air Test *

40 gpm with drill stem set at 70 feet for 4 hours.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	5	GRAVEL, BOULDERS AND SAND
5	10	GRAVEL, BOULDERS AND SAND
10	20	SANDY BROWN GRAVEL
20	25	BROWN CLAY AND GRAVEL
25	45	BROWN CLAY AND GRAVEL
45	50	BROWN SAND GRAVEL, WATER
50	55	BROWN SAND GRAVEL
55	60	SAND GRAVEL AND WATER
60	65	SAND GRAVEL AND WATER
65	70	SAND GRAVEL AND WATER
70	75	GRAVEL AND WATER

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:	FRANK CRICK
Company:	GRIZZLY DRILLING
License No:	WWC-365
Date Completed:	4/15/1982

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned update/correction (1/2/2020 11:45:44 AM)

Site Name: CITY OF EAST HELENA
GWIC Id: 304015

Section 1: Well Owner(s)

1) CITY OF EAST HELENA (MAIL)
306 EAST MAIN
EAST HELENA MT 59635 [12/30/2019]

Section 2: Location

Township	Range	Section	Quarter Sections
10N	03W	24	NW¼ SE¼

County	Geocode
LEWIS AND CLARK	

Latitude	Longitude	Geomethod	Datum
46.60818678775	-111.9226592195	TRS-SEC	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot
CITY OF EAST HELENA TEST WELL		

Section 3: Proposed Use of Water

TEST WELL (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Monday, October 28, 2019

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	400	10

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	274	10	0.25		WELDED	A53B STEEL
256	356	4		200.00	SPLINE	PVC-SDR 17

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
217	255	10	2090	1"X5/16"	MILLS KNIFE
346	356	4		20 SLOT	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	200	BENTONITE	Y
260	260	SHALE PACKER	

Section 7: Well Test Data

Total Depth: 356
Static Water Level: 141
Water Temperature:

Air Test *

150 gpm with drill stem set at 400 feet for 1 hours.
Time of recovery 0.04 hours.
Recovery water level 131 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	10	COBBLES/GRAVEL/SAND/CLAY
10	15	GRAVEL/SAND/CLAY
15	18	SMALL COBBLES
18	20	SANDY CLAY
20	42	GRAVEL/SAND/CLAY
42	52	COBBLES/GRAVEL/SAND
52	65	GRAVEL/SAND
65	67	SANDY CLAY
67	75	GRAVEL/SAND
75	77	CLAY
77	82	SMALL COBBLES/GRAVEL/SAND
82	100	SILT/GRAVEL/SAND
100	110	GRAVEL/SAND
110	114	HARD PACK GRAVEL
114	117	GRAVEL

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:	SHAWN TONEY
Company:	H & L DRILLING INC
License No:	WWC-447
Date Completed:	10/28/2019

Site Name: CITY OF EAST HELENA
GWIC Id: 304015
Additional Lithology Records

From	To	Description
117	120	CLAY
120	125	GRAVEL/SAND
125	128	HARD CLAY
128	132	MED FINE GRAVEL/SAND
132	218	HARD SILTY CLAY/ CRS SAND/FINE GRAVEL
218	234	MED FINE GRAVEL/MED CRS SAND
234	239	CLAY/GRAVEL
239	255	GRAVEL/SAND
255	258	HARD SILTY CLAY
258	259	CEMENTED SAND
259	274	HARD SILTY CLAY
274	283	HARD TAN CLAY AND SAND
283	291	GRAVEL
291	294	CLAY
294	297	GRAVEL/CLAY
297	300	CLAY
300	302	SOFT CLAY/SAND
302	304	GRAVEL
304	322	CLAY/SAND/GRAVEL
322	326	CLAY
326	344	CLAY/SAND/GRAVEL
344	356	CLAY
356	360	CLAY/FINE SAND/GRAVEL
360	370	GRAVEL/CLAY
370	400	CLAY/FINE GRAVEL

Attachment E

Groundwater Analytical Data Table and Laboratory Analytical Summary Reports

Groundwater Analytical Results Summary Table
East Helena Growundwater Discharge Permit - Lewis and Clark County, Montana
Project #: 1559-22 *Water & Environmental Technologies*

Table 1.

			Ground Water Characterisitics										
			pH	**pH Temp**	**Conductivity**	**Total Disolved Solids (TDS)**	**Chloride**	**Total Organic Carbon (TOC)**	**Nitrate + Nitrite, as N**	**Kjeldahl Nitrogen, Total as N**	**Total Nitrogen**	**Coliform Bacteria**	**Coliform, Escherichia**
Units			**s.u.**	**°C**	**umhos/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**P/A**	**P/A**
Sample ID	**Sample Date**	**Lab Work Order**											
GWIC 227753	12/15/2022	H22120514	6.9	20.2	316	205	8	0.6	1.05	<0.5	N/A	Present	<1
MW-1	3/23/2023	H23030552	7.2	14.1	268	168	5	0.5	0.32	<0.5	N/A	<1	Absent
	6/28/2023	H23061148	7.2	14.9	274	160	5	0.6	0.36	<0.5	0.5	Present	Absent
	9/22/2023	H23090683	7.1	17.4	259	158	5	0.7	0.47	<0.5	0.6	Absent	Absent

Notes:
RBSL denotes Risk Based Screening Level, Montana DEQ, May 2018
HHS denotes Human Health Standard, Circular DEQ-7, June 2019
N indicates Nitrogen
P indicates Present
A indicates absent
N/A denotes Not Applicable
< denotes analyte was not detected at the indicated method reporting limit

ANALYTICAL SUMMARY REPORT

April 04, 2023

Water and Environmental Technologies
480 E Park St Ste 200
Butte, MT 59701-1923

Work Order: H23030552

Project Name: Not Indicated

Energy Laboratories Inc Helena MT received the following 1 sample for Water and Environmental Technologies on 3/23/2023 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H23030552-001	MW-1	03/23/23 14:15	03/23/23	Aqueous	Bacteria, Total and E-Coli Coliforms Conductivity Carbon, Total Organic Anions by Ion Chromatography Nitrogen, Nitrate + Nitrite Nitrogen, Total Kjeldahl pH TKN Prep Solids, Total Dissolved

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager.

Report Approved By:

CLIENT: Water and Environmental Technologies

Project: Not Indicated

Work Order: H23030552

Report Date: 04/04/23

CASE NARRATIVE

Tests associated with analyst identified as ELI-CA were subcontracted to Energy Laboratories, 2393 Salt Creek Hwy., Casper, WY, EPA Number WY00002.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client:	Water and Environmental Technologies	**Report Date:**	04/04/23
Project:	Not Indicated	**Collection Date:**	03/23/23 14:15
Lab ID:	H23030552-001	**DateReceived:**	03/23/23
Client Sample ID:	MW-1	**Matrix:**	Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MICROBIOLOGICAL							
Bacteria, E-Coli Coliform	<1	mpn/100ml		1.0		A9223 B	03/23/23 16:15 / rrs
PHYSICAL PROPERTIES							
pH	7.2	s.u.	H	0.1		A4500-H B	03/24/23 10:55 / ams
pH Measurement Temp	14.1	°C				A4500-H B	03/24/23 10:55 / ams
Conductivity @ 25 C	268	umhos/cm		5		A2510 B	03/24/23 10:55 / ams
Solids, Total Dissolved TDS @ 180 C	168	mg/L	D	20		A2540 C	03/24/23 11:07 / ams
INORGANICS							
Chloride	5	mg/L		1		E300.0	03/24/23 19:34 / ljs
AGGREGATE ORGANICS							
Organic Carbon, Total (TOC)	0.5	mg/L		0.5		A5310 C	03/30/23 14:25 / eli-ca
NUTRIENTS							
Nitrogen, Kjeldahl, Total as N	ND	mg/L		0.5		E351.2	04/03/23 12:28 / JAR
Nitrogen, Nitrate+Nitrite as N	0.32	mg/L		0.01		E353.2	04/01/23 14:38 / JAR

Report Definitions:	RL - Analyte Reporting Limit	MCL - Maximum Contaminant Level
	QCL - Quality Control Limit	ND - Not detected at the Reporting Limit (RL)
	D - Reporting Limit (RL) increased due to sample matrix	H - Analysis performed past the method holding time

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23030552 **Report Date:** 04/04/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2510 B										Analytical Run: PHSC_101-H_230324A
Lab ID: SC 150		Initial Calibration Verification Standard								03/24/23 09:13
Conductivity @ 25 C		153	umhos/cm	5.0	102	90	110			
Lab ID: SC 20000		Initial Calibration Verification Standard								03/24/23 09:15
Conductivity @ 25 C		19000	umhos/cm	5.0	95	90	110			
Lab ID: SC 5000		Initial Calibration Verification Standard								03/24/23 09:17
Conductivity @ 25 C		4920	umhos/cm	5.0	98	90	110			
Method: A2510 B										Batch: R183156
Lab ID: SC 1000		Laboratory Control Sample				Run: PHSC_101-H_230324A				03/24/23 09:19
Conductivity @ 25 C		1010	umhos/cm	5.0	101	90	110			
Lab ID: MBLK		Method Blank				Run: PHSC_101-H_230324A				03/24/23 10:16
Conductivity @ 25 C		ND	umhos/cm	5						
Lab ID: H23030539-003ADUP		Sample Duplicate				Run: PHSC_101-H_230324A				03/24/23 10:44
Conductivity @ 25 C		1710	umhos/cm	5.0				1.5	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23030552 **Report Date:** 04/04/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2540 C									Batch: TDS230324A	
Lab ID: MB-1_230324	Method Blank					Run: ACCU-124 (14410200)_23032			03/24/23 10:59	
Solids, Total Dissolved TDS @ 180 C		ND	mg/L	7						
Lab ID: LCS-2_230324	Laboratory Control Sample					Run: ACCU-124 (14410200)_23032			03/24/23 10:59	
Solids, Total Dissolved TDS @ 180 C		1940	mg/L	50	97	90	110			
Lab ID: H23030552-001A DUP	Sample Duplicate					Run: ACCU-124 (14410200)_23032			03/24/23 11:07	
Solids, Total Dissolved TDS @ 180 C		168	mg/L	25				0	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23030552 **Report Date:** 04/04/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-H B						Analytical Run: PHSC_101-H_230324A				
Lab ID: pH 7	2	Initial Calibration Verification Standard								03/24/23 09:08
pH		7.0	s.u.	0.1	100	98	102			
pH Measurement Temp		20.3	°C			0	0			
Method: A4500-H B									Batch: R183156	
Lab ID: H23030539-003ADUP	2	Sample Duplicate				Run: PHSC_101-H_230324A				03/24/23 10:44
pH		7.5	s.u.	0.1				0.0	3	
pH Measurement Temp		12.7	°C							

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23030552 **Report Date:** 04/04/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **A5310 C**										Analytical Run: SUB-C293259
Lab ID: **CCV-11940**	Continuing Calibration Verification Standard									03/30/23 12:28
Organic Carbon, Total (TOC)		4.92	mg/L	0.50	98	90	110			
Method: **A5310 C**										Batch: C_R293259
Lab ID: **MBLK**	Method Blank					Run: SUB-C293259				03/30/23 11:54
Organic Carbon, Total (TOC)		ND	mg/L	0.1						
Lab ID: **LCS-11923**	Laboratory Control Sample					Run: SUB-C293259				03/30/23 12:13
Organic Carbon, Total (TOC)		4.75	mg/L	0.50	95	90	111			
Lab ID: **C23030716-002HMS**	Sample Matrix Spike					Run: SUB-C293259				03/30/23 13:34
Organic Carbon, Total (TOC)		118	mg/L	4.0	107	90	111			
Lab ID: **C23030716-002HMSD**	Sample Matrix Spike Duplicate					Run: SUB-C293259				03/30/23 13:51
Organic Carbon, Total (TOC)		120	mg/L	4.0	112	90	111	1.9	20	S

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

S - Spike recovery outside of advisory limits

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23030552 **Report Date:** 04/04/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E300.0									Analytical Run: IC METROHM_230324A	
Lab ID: ICV		Initial Calibration Verification Standard							03/24/23 13:33	
Chloride		100	mg/L	1.0	100	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard							03/24/23 17:53	
Chloride		50.8	mg/L	1.0	102	90	110			
Method: E300.0									Batch: R183206	
Lab ID: ICB		Method Blank				Run: IC METROHM_230324A			03/24/23 14:01	
Chloride		ND	mg/L	0.02						
Lab ID: LFB		Laboratory Fortified Blank				Run: IC METROHM_230324A			03/24/23 14:16	
Chloride		25.0	mg/L	1.0	100	90	110			
Lab ID: H23030539-004AMS		Sample Matrix Spike				Run: IC METROHM_230324A			03/24/23 18:50	
Chloride		152	mg/L	1.0		90	110			A
Lab ID: H23030539-004AMSD		Sample Matrix Spike Duplicate				Run: IC METROHM_230324A			03/24/23 19:05	
Chloride		153	mg/L	1.0		90	110	0.6	20	A

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

A - Analyte level was greater than four times the spike level - in accordance with the method, percent recovery is not calculated

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23030552 **Report Date:** 04/04/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E351.2						Analytical Run: SEAL AA500_230403A				
Lab ID: ICV		Initial Calibration Verification Standard								04/03/23 12:21
Nitrogen, Kjeldahl, Total as N		10.0	mg/L	0.50	100	90	110			
Lab ID: ICV		Initial Calibration Verification Standard								04/03/23 16:20
Nitrogen, Kjeldahl, Total as N		10.1	mg/L	0.50	101	90	110			
Method: E351.2										Batch: 65906
Lab ID: MB-65906		Method Blank				Run: SEAL AA500_230403A				04/03/23 12:24
Nitrogen, Kjeldahl, Total as N		ND	mg/L	0.1						
Lab ID: LCS-65906		Laboratory Control Sample				Run: SEAL AA500_230403A				04/03/23 12:25
Nitrogen, Kjeldahl, Total as N		9.19	mg/L	0.50	92	90	110			
Lab ID: H23030552-001Bms		Sample Matrix Spike				Run: SEAL AA500_230403A				04/03/23 12:30
Nitrogen, Kjeldahl, Total as N		9.48	mg/L	0.50	93	90	110			
Lab ID: H23030552-001Bmsd		Sample Matrix Spike Duplicate				Run: SEAL AA500_230403A				04/03/23 12:31
Nitrogen, Kjeldahl, Total as N		9.41	mg/L	0.50	92	90	110	0.7	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23030552 **Report Date:** 04/04/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E353.2										Analytical Run: FIA203-HE_230401A
Lab ID: ICV		Initial Calibration Verification Standard								04/01/23 13:50
Nitrogen, Nitrate+Nitrite as N		1.04	mg/L	0.010	104	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard								04/01/23 14:08
Nitrogen, Nitrate+Nitrite as N		0.547	mg/L	0.010	109	90	110			
Lab ID: ICV		Initial Calibration Verification Standard								04/01/23 14:27
Nitrogen, Nitrate+Nitrite as N		0.977	mg/L	0.010	98	90	110			
Method: E353.2										Batch: R183381
Lab ID: MBLK		Method Blank				Run: FIA203-HE_230401A				04/01/23 13:51
Nitrogen, Nitrate+Nitrite as N		ND	mg/L	0.008						
Lab ID: LFB		Laboratory Fortified Blank				Run: FIA203-HE_230401A				04/01/23 13:52
Nitrogen, Nitrate+Nitrite as N		1.02	mg/L	0.011	102	90	110			
Lab ID: LFB		Laboratory Fortified Blank				Run: FIA203-HE_230401A				04/01/23 14:29
Nitrogen, Nitrate+Nitrite as N		0.962	mg/L	0.011	96	90	110			
Lab ID: H23030539-003CMSD		Sample Matrix Spike Duplicate				Run: FIA203-HE_230401A				04/01/23 14:31
Nitrogen, Nitrate+Nitrite as N		1.05	mg/L	0.011	96	90	110	2.5	10	
Lab ID: H23030539-003CMS		Sample Matrix Spike				Run: FIA203-HE_230401A				04/01/23 14:33
Nitrogen, Nitrate+Nitrite as N		1.08	mg/L	0.011	99	90	110			

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

Work Order Receipt Checklist

Water and Environmental Technologies H23030552

Login completed by: Rebecca A. Tooke
Reviewed by: wjohnson
Reviewed Date: 3/24/2023

Date Received: 3/23/2023
Received by: wjj
Carrier name: Hand Deliver

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☐	No ☑	Not Applicable ☐
Container/Temp Blank temperature:	10.6°C No Ice - From Field		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

Bottle Order written on bottels is 171137 which indicates bacterias is a drinking water. Emailed Christina to confirm analysis as COC indicates fecal/ecoli. 3/23/23 rt

ENERGY LABORATORIES
Trust our People. Trust our Data.

Chain of Custody & Analytical Request Record

www.energylab.com

Page 1 of 1

Account Information *(Billing information)*

Company/Name WET
Contact Janet Downey
Phone 406 782 5220
Mailing Address 480 E Park St
City, State, Zip Butte MT 59701
Email jdowney@waterenvtech.com
Receive Invoice ☐Hard Copy ☒Email | Receive Report ☐Hard Copy ☒Email
Purchase Order | Quote | Bottle Order

Report Information *(if different than Account Information)*

Company/Name WET
Contact Christina Eggensperger
Phone 406 531 9486
Mailing Address 480 E Park St
City, State, Zip Butte MT 59701
Email ceggensperger@waterenvtech.com
Receive Report ☐Hard Copy ☒Email
Special Report/Formats:
☐ LEVEL IV ☐ NELAC ☐ EDD/EDT *(contact laboratory)* ☐ Other______

Comments

also email report to @ismith@waterenvtech.com

Project Information

Project Name, PWSID, Permit, etc.
Sampler Name Iris Smith | Sampler Phone 5035776472
Sample Origin State MT | EPA/State Compliance ☒Yes ☒ No
Lab provided preservatives were used ☒Yes ☐ No
MINING CLIENTS, please indicate sample type.
*If ore has been processed or refined, call before sending.
☐ Byproduct 11 (e)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

All turnaround times are standard unless marked as RUSH

Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	Specific Conductivity	TDS	pH	Chloride	E Coli / Fecal Bac	Kjeldahl Nitrogen Total as N	Nitrate + Nitrite as N	TOC		See Attached	RUSH TAT	ELI LAB ID Laboratory Use Only
1	MW-1	3/23/23	14:15	4	W	X	X	X	X	X	X	X	X				H23030552
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Iris Smith	3:07 3/23/23				
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time 3-23-23 15	Signature

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp	Temp Blank	On Ice	Payment Type	Amount	Receipt Number (cash/check only)
handdel	y	Y [✓ N] C B	Y N	10.6 °C	Y [✓ N]	Y [✓ N]	CC Cash Check______	$	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested
This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

ELI-COC-06/08 v.2

ANALYTICAL SUMMARY REPORT

July 13, 2023

Water and Environmental Technologies
480 E Park St Ste 200
Butte, MT 59701-1923

Work Order: H23061148

Project Name: 1559-22

Energy Laboratories Inc Helena MT received the following 1 sample for Water and Environmental Technologies on 6/28/2023 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H23061148-001	MW-1	06/28/23 13:38	06/28/23	Aqueous	Bacteria, Private Water Supply Conductivity Carbon, Total Organic Anions by Ion Chromatography Nitrogen, Nitrate + Nitrite Nitrogen, Total Kjeldahl Nitrogen, Total (TKN+NO3+NO2) pH TKN Prep Solids, Total Dissolved

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager.

Report Approved By:

CLIENT: Water and Environmental Technologies
Project: 1559-22
Work Order: H23061148

Report Date: 07/13/23

CASE NARRATIVE

Tests associated with analyst identified as ELI-CA were subcontracted to Energy Laboratories, 2393 Salt Creek Hwy., Casper, WY, EPA Number WY00002.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies
Project: 1559-22
Client Sample ID: MW-1
Sampled By: Christina Eggensperger
Lab ID: H23061148-001D

Report Date: 07/13/23
Collection Date: 06/28/23 13:38
Received Date: 06/28/23 15:12
Matrix: Aqueous

Analyses	Result	Units	Safe/Unsafe	Qualifier	Method	Analysis Date / By
MICROBIOLOGICAL						
Coliform, Total	Present	per 100ml	**UNSAFE**		A9223 B	06/28/23 16:30 / rrs
Coliform, E-Coli	Absent	per 100ml			A9223 B	06/28/23 16:30 / rrs

Comments: The notation "SAFE" indicates that the water was bacteriologically SAFE when sampled.

The notation "UNSAFE" indicates that the water was bacteriologically UNSAFE when sampled.

Qualifiers:

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client:	Water and Environmental Technologies	**Report Date:**	07/13/23
Project:	1559-22	**Collection Date:**	06/28/23 13:38
Lab ID:	H23061148-001	**DateReceived:**	06/28/23
Client Sample ID:	MW-1	**Matrix:**	Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL PROPERTIES							
pH	7.2	s.u.	H	0.1		A4500-H B	06/29/23 10:12 / SRW
pH Measurement Temp	14.9	°C				A4500-H B	06/29/23 10:12 / SRW
Conductivity @ 25 C	274	umhos/cm		5		A2510 B	06/29/23 10:12 / SRW
Solids, Total Dissolved TDS @ 180 C	160	mg/L		20		A2540 C	06/29/23 12:55 / ams
INORGANICS							
Chloride	5	mg/L		1		E300.0	07/07/23 21:13 / SRW
Sulfate	44	mg/L		1		E300.0	07/07/23 21:13 / SRW
AGGREGATE ORGANICS							
Organic Carbon, Total (TOC)	0.6	mg/L		0.5		A5310 C	07/03/23 19:42 / eli-ca
NUTRIENTS							
Nitrogen, Kjeldahl, Total as N	ND	mg/L		0.5		E351.2	07/12/23 14:11 / JAR
Nitrogen, Nitrate+Nitrite as N	0.36	mg/L		0.01		E353.2	07/06/23 17:52 / SRW
Nitrogen, Total	0.5	mg/L		0.5		Calculation	07/13/23 08:48 / rrs

Report Definitions:

RL - Analyte Reporting Limit
QCL - Quality Control Limit
H - Analysis performed past the method holding time
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23061148 **Report Date:** 07/13/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2510 B										Analytical Run: PHSC_101-H_230629A
Lab ID: SC 150		Initial Calibration Verification Standard								06/29/23 08:51
Conductivity @ 25 C		154	umhos/cm	5.0	102	90	110			
Lab ID: SC 20000		Initial Calibration Verification Standard								06/29/23 08:53
Conductivity @ 25 C		19700	umhos/cm	5.0	99	90	110			
Lab ID: SC 5000		Initial Calibration Verification Standard								06/29/23 08:55
Conductivity @ 25 C		5010	umhos/cm	5.0	100	90	110			
Lab ID: CCV - SC 1413		Continuing Calibration Verification Standard								06/29/23 09:49
Conductivity @ 25 C		1420	umhos/cm	5.0	100	90	110			
Method: A2510 B										Batch: R185821
Lab ID: SC 1000		Laboratory Control Sample				Run: PHSC_101-H_230629A				06/29/23 08:57
Conductivity @ 25 C		1010	umhos/cm	5.0	101	90	110			
Lab ID: MBLK		Method Blank				Run: PHSC_101-H_230629A				06/29/23 09:02
Conductivity @ 25 C		ND	umhos/cm	5						
Lab ID: H23061129-004ADUP		Sample Duplicate				Run: PHSC_101-H_230629A				06/29/23 09:57
Conductivity @ 25 C		2480	umhos/cm	5.0				0.2	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23061148 **Report Date:** 07/13/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **A2540 C**									Batch: TDS230629A	
Lab ID: **MB-1_230629**	Method Blank					Run: ACCU-124 (14410200)_23062			06/29/23 12:53	
Solids, Total Dissolved TDS @ 180 C		ND	mg/L	7						
Lab ID: **LCS-2_230629**	Laboratory Control Sample					Run: ACCU-124 (14410200)_23062			06/29/23 12:53	
Solids, Total Dissolved TDS @ 180 C		2000	mg/L	50	100	90	110			
Lab ID: **H23061081-001A DUP**	Sample Duplicate					Run: ACCU-124 (14410200)_23062			06/29/23 12:53	
Solids, Total Dissolved TDS @ 180 C		240	mg/L	25				2.1	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23061148 **Report Date:** 07/13/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-H B							Analytical Run: PHSC_101-H_230629A			
Lab ID: pH 7	2	Initial Calibration Verification Standard							06/29/23 08:47	
pH		7.0	s.u.	0.1	100	98	102			
pH Measurement Temp		21.5	°C			0	0			
Lab ID: CCV - pH 7	2	Continuing Calibration Verification Standard							06/29/23 09:46	
pH		7.0	s.u.	0.1	100	98	102			
pH Measurement Temp		19.4	°C			0	0			
Method: A4500-H B									Batch: R185821	
Lab ID: H23061129-004ADUP	2	Sample Duplicate				Run: PHSC_101-H_230629A			06/29/23 09:57	
pH		7.2	s.u.	0.1				0.0	3	H
pH Measurement Temp		14.2	°C							

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

H - Analysis performed past the method holding time

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23061148 **Report Date:** 07/13/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A5310 C										Analytical Run: SUB-C296250
Lab ID: CCV-11940		Continuing Calibration Verification Standard								07/03/23 16:13
Organic Carbon, Total (TOC)		4.76	mg/L	0.50	95	90	110			
Method: A5310 C										Batch: C_R296250
Lab ID: MBLK		Method Blank				Run: SUB-C296250				07/03/23 11:54
Organic Carbon, Total (TOC)		ND	mg/L	0.1						
Lab ID: LCS		Laboratory Control Sample				Run: SUB-C296250				07/03/23 12:14
Organic Carbon, Total (TOC)		4.68	mg/L	0.50	94	90	111			
Lab ID: C23061089-002CMS		Sample Matrix Spike				Run: SUB-C296250				07/03/23 17:07
Organic Carbon, Total (TOC)		4.56	mg/L	0.50	91	90	111			
Lab ID: C23061089-002CMSD		Sample Matrix Spike Duplicate				Run: SUB-C296250				07/03/23 17:23
Organic Carbon, Total (TOC)		4.60	mg/L	0.50	92	90	111	0.9	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23061148 **Report Date:** 07/13/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E300.0**						Analytical Run: IC METROHM_230705A				
Lab ID: **ICV**	2	Initial Calibration Verification Standard								07/05/23 14:30
Chloride		100	mg/L	1.0	100	90	110			
Sulfate		386	mg/L	1.0	96	90	110			
Lab ID: **CCV**	2	Continuing Calibration Verification Standard								07/07/23 18:21
Chloride		52.9	mg/L	1.0	106	90	110			
Sulfate		213	mg/L	1.0	106	90	110			
Method: **E300.0**										Batch: R186000
Lab ID: **ICB**	2	Method Blank				Run: IC METROHM_230705A				07/05/23 14:16
Chloride		ND	mg/L	0.02						
Sulfate		ND	mg/L	0.03						
Lab ID: **LFB**	2	Laboratory Fortified Blank				Run: IC METROHM_230705A				07/05/23 14:44
Chloride		25.2	mg/L	1.0	101	90	110			
Sulfate		104	mg/L	1.0	104	90	110			
Lab ID: **LFBD**	2	Laboratory Fortified Blank				Run: IC METROHM_230705A				07/05/23 14:59
Chloride		25.0	mg/L	1.0	100	90	110			
Sulfate		102	mg/L	1.0	102	90	110			
Lab ID: **H23061148-001AMS**	2	Sample Matrix Spike				Run: IC METROHM_230705A				07/07/23 21:28
Chloride		30.7	mg/L	1.0	101	90	110			
Sulfate		145	mg/L	1.0	101	90	110			
Lab ID: **H23061148-001AMSD**	2	Sample Matrix Spike Duplicate				Run: IC METROHM_230705A				07/07/23 21:42
Chloride		30.4	mg/L	1.0	100	90	110	1.2	20	
Sulfate		144	mg/L	1.0	100	90	110	0.4	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23061148 **Report Date:** 07/13/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E351.2							Analytical Run: SEAL AA500_230712A			
Lab ID: ICV		Initial Calibration Verification Standard							07/12/23 13:53	
Nitrogen, Kjeldahl, Total as N		9.68	mg/L	0.50	97	90	110			
Method: E351.2									Batch: 67285	
Lab ID: MB-67285		Method Blank				Run: SEAL AA500_230712A			07/12/23 13:56	
Nitrogen, Kjeldahl, Total as N		ND	mg/L	0.1						
Lab ID: LCS-67285		Laboratory Control Sample				Run: SEAL AA500_230712A			07/12/23 13:59	
Nitrogen, Kjeldahl, Total as N		9.83	mg/L	0.50	98	90	110			
Lab ID: H23061096-001Bms		Sample Matrix Spike				Run: SEAL AA500_230712A			07/12/23 14:03	
Nitrogen, Kjeldahl, Total as N		10.5	mg/L	0.50	105	90	110			
Lab ID: H23061096-001Bmsd		Sample Matrix Spike Duplicate				Run: SEAL AA500_230712A			07/12/23 14:05	
Nitrogen, Kjeldahl, Total as N		10.6	mg/L	0.50	106	90	110	1.2	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23061148 **Report Date:** 07/13/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E353.2										Analytical Run: SEAL AA500_230706B
Lab ID: ICV		Initial Calibration Verification Standard								07/06/23 13:05
Nitrogen, Nitrate+Nitrite as N		1.05	mg/L	0.010	105	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard								07/06/23 17:47
Nitrogen, Nitrate+Nitrite as N		0.999	mg/L	0.010	100	90	110			
Method: E353.2										Batch: R186043
Lab ID: ICB		Method Blank				Run: SEAL AA500_230706B				07/06/23 13:03
Nitrogen, Nitrate+Nitrite as N		ND	mg/L	0.01						
Lab ID: LFB		Laboratory Fortified Blank				Run: SEAL AA500_230706B				07/06/23 13:06
Nitrogen, Nitrate+Nitrite as N		1.00	mg/L	0.011	100	90	110			
Lab ID: H23061129-001BMS		Sample Matrix Spike				Run: SEAL AA500_230706B				07/06/23 17:38
Nitrogen, Nitrate+Nitrite as N		1.06	mg/L	0.011	104	90	110			
Lab ID: H23061129-001BMSD		Sample Matrix Spike Duplicate				Run: SEAL AA500_230706B				07/06/23 17:39
Nitrogen, Nitrate+Nitrite as N		1.07	mg/L	0.011	105	90	110	1.0	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

Work Order Receipt Checklist

Water and Environmental Technologies H23061148

Login completed by: Rebecca A. Tooke
Reviewed by: wjohnson
Reviewed Date: 7/3/2023

Date Received: 6/28/2023
Received by: rrs
Carrier name: Hand Deliver

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	20.6°C On Ice		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

None

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Chain of Custody & Analytical Request Record

www.energylab.com

Page 1 of 1

Account Information (Billing information)

Company/Name WET
Contact Janet Downey
Phone 406 782 5220
Mailing Address 480 E Park St
City, State, Zip Butte, MT 59701
Email accounting@waterenvtech.com
Receive Invoice ☐Hard Copy ☒Email
Receive Report ☐Hard Copy ☒Email
Purchase Order
Quote
Bottle Order

Report Information (if different than Account Information)

Company/Name WET
Contact christina eggensperger
Phone same
Mailing Address same
City, State, Zip same
Email ceggensperger@waterenvtech.com
Receive Report ☐Hard Copy ☐Email
Special Report/Formats:
☐ LEVEL IV ☐ NELAC ☒ EDD/EDT (contact laboratory) ☐ Other

Comments

Project Information

Project Name, PWSID, Permit, etc. 1559-22
Sampler Name christina eggensperger
Sampler Phone 4065319486
Sample Origin State MT
EPA/State Compliance ☒Yes ☐No

URANIUM MINING CLIENTS MUST Indicate sample type
☐ NOT Source or Byproduct Material
☐ Source/Processed Ore (Ground or Refined) **CALL BEFORE SENDING
☐ 11e.(2) Byproduct Material (Can ONLY be Submitted to ELI Casper Location)

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

Analysis Requested

All turnaround times are standard unless marked as RUSH

Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	pH	conductivity	TOC	TDS	BacT/ecoli	TKN, total N, Nitrate + Nitrite	chloride	Sulfate		See Attached	RUSH TAT	ELI LAB ID Laboratory Use Only
1	MW-1	6-28-23	1338	4	W	X	X	X	X	X	X	X	X				H23061148
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Christina eggensperger	6-28-23/1512				
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time	Signature
				K SPONHOLZ	062923 1512	

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp	Temp Blank	On Ice	Payment Type	Amount	Receipt Number (cash/check only)
HAND	Y	Y [✓ N] C B	Y N	20.6 °C	[✓ Y] N	[✓ Y] N	CC Cash Check	$	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

ELI-COC-10/18 v 3

ENERGY LABORATORIES

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Billings, MT 800.735.4489 • Casper, WY 888.235.0515 • Gillette, WY 866.686.7175 • Helena, MT 877.472.0711

BOTTLE ORDER 44659

@44659

SHIPPED TO: **Water and Environmental Technologies**

To report an issue with this order, view Safety Data Sheets, or let us know how we are doing, scan here or go to energylab.com/contact-us

Contact: Christina Eggensperger

Phone: (406) 531-9486
Project: Supplies

Order Created by: Rebecca A. Tooke
Shipped From: Helena, MT
Ship Date: 6/28/2023
VIA: PickUp

Bottle Size/Type	Bottles Per Samp	Method	Tests	Critical Hold Time	Preservative	Notes	Num of Samp
1 Liter Plastic	1	A2540 C A2510 B E300.0	Solids, Total Dissolved Conductivity Anions by Ion Chromatography				1
250 mL Plastic	1	E353.2	Nitrogen, Nitrate + Nitrite		☐ H2SO4		1
250 mL Amber Glass	1	A5310 C	Carbon, Total Organic		☐ H3PO4		1
100 mL Plastic Sterile	1	A9223 B	Bacteria, Private Water Supply	30.00 hrs			1

Comments

☐ HNO3 - Nitric Acid ☐ H2SO4 - Sulfuric Acid ☐ NaOH - Sodium Hydroxide
■ ZnAc - Zinc Acetate ☐ HCl - Hydrochloric Acid ☐ H3PO4 - Phosphoric Acid

We strongly suggest that the samples are shipped the same day as they are collected.

Material Safety Data Sheets(MSDS) Available @ EnergyLab.com ->Services -> MSDS Sheets
Corrosive Chemicals: Nitric, Sulfuric, Phosphoric, Hydrochloric Acids and Sodium Hydroxide. Zinc Acetate is a skin irritant.

BO#: 44659

Subcontracting of sample analyses to an outside laboratory may be required. If so, Energy Laboratories will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

ANALYTICAL SUMMARY REPORT

October 09, 2023

Water and Environmental Technologies
480 E Park St Ste 200
Butte, MT 59701-1923

Work Order: H23090683

Project Name: 1559-22

Energy Laboratories Inc Helena MT received the following 1 sample for Water and Environmental Technologies on 9/22/2023 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H23090683-001	MW-1	09/22/23 10:40	09/22/23	Aqueous	Bacteria, Private Water Supply Conductivity Carbon, Total Organic Anions by Ion Chromatography Nitrogen, Nitrate + Nitrite Nitrogen, Total Kjeldahl Nitrogen, Total (TKN+NO3+NO2) pH TKN Prep Solids, Total Dissolved

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager.

Report Approved By:

CLIENT: Water and Environmental Technologies
Project: 1559-22
Work Order: H23090683

Report Date: 10/09/23

CASE NARRATIVE

Tests associated with analyst identified as ELI-CA were subcontracted to Energy Laboratories, 2393 Salt Creek Hwy., Casper, WY, EPA Number WY00002.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies
Project: 1559-22
Client Sample ID: MW-1
Sampled By: Christina Eggensperger
Lab ID: H23090683-001D

Report Date: 10/09/23
Collection Date: 09/22/23 10:40
Received Date: 09/22/23 11:38
Matrix: Aqueous

Analyses	Result	Units	Safe/Unsafe	Qualifier	Method	Analysis Date / By
MICROBIOLOGICAL						
Coliform, Total	Absent	per 100ml	SAFE		A9223 B	09/22/23 14:15 / rrs
Coliform, E-Coli	Absent	per 100ml			A9223 B	09/22/23 14:15 / rrs

Comments: The notation "SAFE" indicates that the water was bacteriologically SAFE when sampled.

The notation "UNSAFE" indicates that the water was bacteriologically UNSAFE when sampled.

Qualifiers:

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies
Project: 1559-22
Lab ID: H23090683-001
Client Sample ID: MW-1

Report Date: 10/09/23
Collection Date: 09/22/23 10:40
DateReceived: 09/22/23
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL PROPERTIES							
pH	7.1	s.u.	H	0.1		A4500-H B	09/22/23 14:08 / SRW
pH Measurement Temp	17.4	°C				A4500-H B	09/22/23 14:08 / SRW
Conductivity @ 25 C	259	umhos/cm		5		A2510 B	09/22/23 14:08 / SRW
Solids, Total Dissolved TDS @ 180 C	158	mg/L		20		A2540 C	09/22/23 15:05 / SRW
INORGANICS							
Chloride	5	mg/L		1		E300.0	09/26/23 02:52 / SRW
Sulfate	44	mg/L		1		E300.0	09/26/23 02:52 / SRW
AGGREGATE ORGANICS							
Organic Carbon, Total (TOC)	0.7	mg/L		0.5		A5310 C	09/28/23 17:57 / eli-ca
NUTRIENTS							
Nitrogen, Kjeldahl, Total as N	ND	mg/L		0.50		E351.2	10/06/23 13:43 / JAR
Nitrogen, Nitrate+Nitrite as N	0.47	mg/L		0.01		E353.2	10/05/23 17:07 / JAR
Nitrogen, Total	0.6	mg/L		0.50		Calculation	10/09/23 10:32 / rrs

Report Definitions:

RL - Analyte Reporting Limit
QCL - Quality Control Limit
H - Analysis performed past the method holding time
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Water and Environmental Technologies **Work Order:** H23090683 **Report Date:** 10/03/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **A5310 C**										Analytical Run: TOC3-C_230928A
Lab ID: **CCV**		Continuing Calibration Verification Standard								09/28/23 15:46
Organic Carbon, Total (TOC)		5.00	mg/L	0.50	100	90	110			
Method: **A5310 C**										Batch: R299309
Lab ID: **MBLK**		Method Blank				Run: TOC3-C_230928A				09/28/23 13:10
Organic Carbon, Total (TOC)		ND	mg/L	0.1						
Lab ID: **LCS**		Laboratory Control Sample				Run: TOC3-C_230928A				09/28/23 13:30
Organic Carbon, Total (TOC)		4.99	mg/L	0.50	100	90	111			
Lab ID: **C23090905-001AMS**		Sample Matrix Spike				Run: TOC3-C_230928A				09/28/23 16:48
Organic Carbon, Total (TOC)		5.83	mg/L	0.50	100	90	111			
Lab ID: **C23090905-001AMSD**		Sample Matrix Spike Duplicate				Run: TOC3-C_230928A				09/28/23 17:04
Organic Carbon, Total (TOC)		5.87	mg/L	0.50	100	90	111	0.8	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23090683 **Report Date:** 10/09/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2510 B										Analytical Run: PHSC_101-H_230922A
Lab ID: SC 150		Initial Calibration Verification Standard								09/22/23 08:54
Conductivity @ 25 C		153	umhos/cm	5.0	102	90	110			
Lab ID: SC 20000		Initial Calibration Verification Standard								09/22/23 08:56
Conductivity @ 25 C		19500	umhos/cm	5.0	98	90	110			
Lab ID: SC 5000		Initial Calibration Verification Standard								09/22/23 08:58
Conductivity @ 25 C		4960	umhos/cm	5.0	99	90	110			
Lab ID: CCV - SC 1413		Continuing Calibration Verification Standard								09/22/23 14:00
Conductivity @ 25 C		1400	umhos/cm	5.0	99	90	110			
Method: A2510 B										Batch: R188416
Lab ID: SC 1000		Laboratory Control Sample				Run: PHSC_101-H_230922A				09/22/23 09:00
Conductivity @ 25 C		1000	umhos/cm	5.0	100	90	110			
Lab ID: MBLK		Method Blank				Run: PHSC_101-H_230922A				09/22/23 12:18
Conductivity @ 25 C		ND	umhos/cm	5						
Lab ID: H23090682-001ADUP		Sample Duplicate				Run: PHSC_101-H_230922A				09/22/23 14:06
Conductivity @ 25 C		9.40	umhos/cm	5.0				2.1	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23090683 **Report Date:** 10/09/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2540 C										Batch: TDS230922B
Lab ID: MB-1_230922		Method Blank				Run: ACCU-124 (14410200)_23092				09/22/23 14:59
Solids, Total Dissolved TDS @ 180 C		ND	mg/L	7						
Lab ID: LCS-2_230922		Laboratory Control Sample				Run: ACCU-124 (14410200)_23092				09/22/23 14:59
Solids, Total Dissolved TDS @ 180 C		1980	mg/L	50	99	90	110			
Lab ID: H23090690-031B DUP		Sample Duplicate				Run: ACCU-124 (14410200)_23092				09/22/23 15:04
Solids, Total Dissolved TDS @ 180 C		220	mg/L	25				0.9	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23090683 **Report Date:** 10/09/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **A4500-H B**										Analytical Run: PHSC_101-H_230922A
Lab ID: **pH 7**	2	Initial Calibration Verification Standard								09/22/23 08:49
pH		7.0	s.u.	0.1	100	98	102			
pH Measurement Temp		21.1	°C			0	0			
Lab ID: **CCV - pH 7**	2	Continuing Calibration Verification Standard								09/22/23 13:57
pH		7.0	s.u.	0.1	100	98	102			
pH Measurement Temp		20.2	°C			0	0			
Method: **A4500-H B**										Batch: R188416
Lab ID: **H23090682-001ADUP**	2	Sample Duplicate				Run: PHSC_101-H_230922A				09/22/23 14:06
pH		6.3	s.u.	0.1				1.6	3	H
pH Measurement Temp		17.6	°C							

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

H - Analysis performed past the method holding time

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23090683 **Report Date:** 10/09/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E300.0										Analytical Run: IC METROHM_230925A
Lab ID: ICV	2	Initial Calibration Verification Standard								09/25/23 09:36
Chloride		102	mg/L	1.0	102	90	110			
Sulfate		401	mg/L	1.0	100	90	110			
Lab ID: CCV	2	Continuing Calibration Verification Standard								09/26/23 00:57
Chloride		51.7	mg/L	1.0	103	90	110			
Sulfate		206	mg/L	1.0	103	90	110			
Method: E300.0										Batch: R188476
Lab ID: ICB	2	Method Blank				Run: IC METROHM_230925A				09/25/23 09:21
Chloride		ND	mg/L	0.02						
Sulfate		ND	mg/L	0.03						
Lab ID: LFB	2	Laboratory Fortified Blank				Run: IC METROHM_230925A				09/25/23 09:50
Chloride		25.4	mg/L	1.0	102	90	110			
Sulfate		104	mg/L	1.0	104	90	110			
Lab ID: H23090690-003CMS	2	Sample Matrix Spike				Run: IC METROHM_230925A				09/26/23 03:49
Chloride		34.6	mg/L	1.0	109	90	110			
Sulfate		137	mg/L	1.0	105	90	110			
Lab ID: H23090690-003CMSD	2	Sample Matrix Spike Duplicate				Run: IC METROHM_230925A				09/26/23 04:04
Chloride		34.7	mg/L	1.0	109	90	110	0.3	20	
Sulfate		139	mg/L	1.0	108	90	110	1.7	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23090683 **Report Date:** 10/09/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E351.2							Analytical Run: SEAL AA500_231006B			
Lab ID: ICV		Initial Calibration Verification Standard								10/06/23 13:21
Nitrogen, Kjeldahl, Total as N		9.83	mg/L	0.50	98	90	110			
Method: E351.2										Batch: 68632
Lab ID: MB-68632		Method Blank				Run: SEAL AA500_231006B				10/06/23 13:24
Nitrogen, Kjeldahl, Total as N		ND	mg/L	0.1						
Lab ID: LCS-68632		Laboratory Control Sample				Run: SEAL AA500_231006B				10/06/23 13:27
Nitrogen, Kjeldahl, Total as N		9.15	mg/L	0.50	91	90	110			
Lab ID: H23090668-001Dms		Sample Matrix Spike				Run: SEAL AA500_231006B				10/06/23 13:39
Nitrogen, Kjeldahl, Total as N		9.45	mg/L	0.50	93	90	110			
Lab ID: H23090668-001Dmsd		Sample Matrix Spike Duplicate				Run: SEAL AA500_231006B				10/06/23 13:40
Nitrogen, Kjeldahl, Total as N		9.61	mg/L	0.50	94	90	110	1.6	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H23090683 **Report Date:** 10/09/23

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **E353.2**										Analytical Run: SEAL AA500_231005A
Lab ID: **ICV**	Initial Calibration Verification Standard									10/05/23 15:25
Nitrogen, Nitrate+Nitrite as N		1.02	mg/L	0.010	102	90	110			
Lab ID: **CCV**	Continuing Calibration Verification Standard									10/05/23 17:04
Nitrogen, Nitrate+Nitrite as N		0.922	mg/L	0.010	92	90	110			
Method: **E353.2**										Batch: R188863
Lab ID: **ICB**	Method Blank					Run: SEAL AA500_231005A				10/05/23 15:23
Nitrogen, Nitrate+Nitrite as N		ND	mg/L	0.01						
Lab ID: **LFB**	Laboratory Fortified Blank					Run: SEAL AA500_231005A				10/05/23 15:26
Nitrogen, Nitrate+Nitrite as N		1.01	mg/L	0.011	101	90	110			
Lab ID: **H23090686-001DMS**	Sample Matrix Spike					Run: SEAL AA500_231005A				10/05/23 17:09
Nitrogen, Nitrate+Nitrite as N		1.33	mg/L	0.011	92	90	110			
Lab ID: **H23090686-001DMSD**	Sample Matrix Spike Duplicate					Run: SEAL AA500_231005A				10/05/23 17:10
Nitrogen, Nitrate+Nitrite as N		1.33	mg/L	0.011	93	90	110	0.7	10	
Lab ID: **H23090698-001CMS**	Sample Matrix Spike					Run: SEAL AA500_231005A				10/05/23 18:18
Nitrogen, Nitrate+Nitrite as N		0.953	mg/L	0.011	90	90	110			
Lab ID: **H23090698-001CMSD**	Sample Matrix Spike Duplicate					Run: SEAL AA500_231005A				10/05/23 18:19
Nitrogen, Nitrate+Nitrite as N		0.950	mg/L	0.011	89	90	110	0.4	10	S

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

S - Spike recovery outside of advisory limits

Work Order Receipt Checklist

Water and Environmental Technologies H23090683

Login completed by: Taylor K. Jones
Reviewed by: wjohnson
Reviewed Date: 9/25/2023

Date Received: 9/22/2023
Received by: WJ
Carrier name: Hand Deliver

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☐	No ☑	Not Applicable ☐
Container/Temp Blank temperature:	10.3°C On Ice		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

Analyze Bacteria for Present/Absent per conversation with Christina Eggensperger on 9/22/23. tj 9/22/23

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Chain of Custody & Analytical Request Record

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Page 1 of 1

Account Information (Billing information)

Company/Name WET
Contact Accounting
Phone 406 782 5220
Mailing Address 480 E. Park St.
City, State, Zip Butte, MT 59701
Email accounting@waterenvtech.com
Receive Invoice ☐Hard Copy ☒Email
Receive Report ☐Hard Copy ☒Email
Purchase Order
Quote
Bottle Order

Report Information (if different than Account Information)

Company/Name WET
Contact christina eggensperger
Phone 406 5319486
Mailing Address Same
City, State, Zip Same
Email ceggensperger@waterenvtech.com
Receive Report ☒Hard Copy ☒Email
Special Report/Formats:
☐ LEVEL IV ☐ NELAC ☒ EDD/EDT (contact laboratory) ☐ Other

Comments

Project Information

Project Name, PWSID, Permit, etc. 1559-22
Sampler Name christina eggensperger
Sampler Phone 4065319486
Sample Origin State MT
EPA/State Compliance ☒ Yes ☐ No
Lab provided preservatives were used ☒ Yes ☐ No
MINING CLIENTS, please indicate sample type.
*If ore has been processed or refined, call before sending.
☐ Byproduct 11 (e)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.

Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

Analysis Requested

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	Bac-T/E coli	TKN, total N, Nitrate, Nitrite	Conductivity	TOC	pH	TDS	Chloride	Sulfate		See Attached	RUSH TAT	ELI LAB ID Laboratory Use Only
1	MW-1	9-22-23	1040	4	W	X	X	X	X	X	X	X	X				H23090683
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Custody Record MUST be signed

Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
christina eggensperger	9-22-23/1138				
Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print) Wade	Date/Time 9-22-23 11 38	Signature

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp	Temp Blank	On Ice	Payment Type	Amount	Receipt Number (cash/check only)
handdel	y	Y [✓ N] C B	Y N	10.3 °C	Y [✓ N]	[✓ Y] N	CC Cash Check	$	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

ANALYTICAL SUMMARY REPORT

December 29, 2022

Water and Environmental Technologies
480 E Park St Ste 200
Butte, MT 59701-1923

Work Order: H22120514

Project Name: 1559-22

Energy Laboratories Inc Helena MT received the following 1 sample for Water and Environmental Technologies on 12/15/2022 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H22120514-001	GWIC 227753	12/15/22 13:30	12/15/22	Aqueous	Bacteria, Total and E-Coli Coliforms Conductivity Carbon, Total Organic Anions by Ion Chromatography Nitrogen, Nitrate + Nitrite Nitrogen, Total Kjeldahl pH TKN Prep Solids, Total Dissolved

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager.

Report Approved By:

CLIENT: Water and Environmental Technologies
Project: 1559-22
Work Order: H22120514

Report Date: 12/29/22

CASE NARRATIVE

Tests associated with analyst identified as ELI-CA were subcontracted to Energy Laboratories, 2393 Salt Creek Hwy., Casper, WY, EPA Number WY00002.

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client:	Water and Environmental Technologies	**Report Date:**	12/29/22
Project:	1559-22	**Collection Date:**	12/15/22 13:30
Lab ID:	H22120514-001	**DateReceived:**	12/15/22
Client Sample ID:	GWIC 227753	**Matrix:**	Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
MICROBIOLOGICAL							
Bacteria, E-Coli Coliform	<1	mpn/100ml		1.0		A9223 B	12/15/22 16:25 / rrs
Bacteria, Total Coliform	>2419.6	mpn/100ml		1.0		A9223 B	12/15/22 16:25 / rrs
PHYSICAL PROPERTIES							
pH	6.9	s.u.	H	0.1		A4500-H B	12/16/22 10:32 / ljs
pH Measurement Temp	20.2	°C				A4500-H B	12/16/22 10:32 / ljs
Conductivity @ 25 C	316	umhos/cm		5		A2510 B	12/19/22 12:38 / ljs
Solids, Total Dissolved TDS @ 180 C	205	mg/L	D	20		A2540 C	12/18/22 09:55 / ams
INORGANICS							
Chloride	8	mg/L		1		E300.0	12/17/22 04:15 / ljs
AGGREGATE ORGANICS							
Organic Carbon, Total (TOC)	0.6	mg/L		0.5		A5310 C	12/22/22 12:05 / eli-ca
NUTRIENTS							
Nitrogen, Kjeldahl, Total as N	ND	mg/L		0.5		E351.2	12/20/22 12:20 / JAR
Nitrogen, Nitrate+Nitrite as N	1.05	mg/L		0.01		E353.2	12/22/22 15:29 / JAR

Report Definitions:

RL - Analyte Reporting Limit
QCL - Quality Control Limit
D - Reporting Limit (RL) increased due to sample matrix
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)
H - Analysis performed past the method holding time

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H22120514 **Report Date:** 12/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **A2510 B**										Batch: R180928
Lab ID: **SC 1000**		Laboratory Control Sample				Run: PHSC_101-H_221219A				12/19/22 10:48
Conductivity @ 25 C		957	umhos/cm	5.0	96	90	110			
Lab ID: **MBLK**		Method Blank				Run: PHSC_101-H_221219A				12/19/22 12:33
Conductivity @ 25 C		ND	umhos/cm	5						
Lab ID: **H22120517-001BDUP**		Sample Duplicate				Run: PHSC_101-H_221219A				12/19/22 12:43
Conductivity @ 25 C		2280	umhos/cm	5.0				5.0	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H22120514 **Report Date:** 12/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A2540 C									Batch: TDS221218A	
Lab ID: MB-1_221218	Method Blank					Run: ACCU-124 (14410200)_22121			12/18/22 09:52	
Solids, Total Dissolved TDS @ 180 C		ND	mg/L	7						
Lab ID: LCS-2_221218	Laboratory Control Sample					Run: ACCU-124 (14410200)_22121			12/18/22 09:53	
Solids, Total Dissolved TDS @ 180 C		1970	mg/L	50	99	90	110			
Lab ID: H22120494-017A DUP	Sample Duplicate					Run: ACCU-124 (14410200)_22121			12/18/22 09:53	
Solids, Total Dissolved TDS @ 180 C		234	mg/L	25				1.7	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H22120514 **Report Date:** 12/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A4500-H B									Batch: R180874	
Lab ID: H22120514-001ADUP	2	Sample Duplicate				Run: PHSC_101-H_221216A			12/16/22 10:34	
pH		6.9	s.u.	0.1				0.0	3	
pH Measurement Temp		19.9	°C							

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H22120514 **Report Date:** 12/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: A5310 C										Analytical Run: SUB-C290696
Lab ID: CCV-11940		Continuing Calibration Verification Standard								12/21/22 13:40
Organic Carbon, Total (TOC)		5.09	mg/L	0.50	102	90	110			
Method: A5310 C										Batch: C_R290696
Lab ID: MBLK		Method Blank				Run: SUB-C290696				12/21/22 13:05
Organic Carbon, Total (TOC)		ND	mg/L	0.2						
Lab ID: LCS-11923		Laboratory Control Sample				Run: SUB-C290696				12/21/22 13:25
Organic Carbon, Total (TOC)		5.08	mg/L	0.50	102	91	111			
Lab ID: C22120560-001AMS		Sample Matrix Spike				Run: SUB-C290696				12/21/22 14:11
Organic Carbon, Total (TOC)		6.06	mg/L	0.50	99	91	111			
Lab ID: C22120560-001AMSD		Sample Matrix Spike Duplicate				Run: SUB-C290696				12/21/22 14:27
Organic Carbon, Total (TOC)		6.01	mg/L	0.50	98	91	111	0.8	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H22120514 **Report Date:** 12/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E300.0						Analytical Run: IC METROHM_221215A				
Lab ID: ICV		Initial Calibration Verification Standard								12/15/22 12:10
Chloride		99.1	mg/L	1.0	99	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard								12/17/22 01:50
Chloride		51.4	mg/L	1.0	103	90	110			
Method: E300.0										Batch: R180905
Lab ID: ICB		Method Blank				Run: IC METROHM_221215A				12/15/22 12:38
Chloride		0.03	mg/L	0.02						
Lab ID: LFB		Laboratory Fortified Blank				Run: IC METROHM_221215A				12/15/22 13:17
Chloride		24.7	mg/L	1.0	99	90	110			
Lab ID: H22120511-001AMS		Sample Matrix Spike				Run: IC METROHM_221215A				12/17/22 03:02
Chloride		31.7	mg/L	1.0	105	90	110			
Lab ID: H22120511-001AMSD		Sample Matrix Spike Duplicate				Run: IC METROHM_221215A				12/17/22 03:17
Chloride		31.8	mg/L	1.0	105	90	110	0.2	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H22120514 **Report Date:** 12/29/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E351.2						Analytical Run: SEAL AA500_221220A				
Lab ID: ICV		Initial Calibration Verification Standard								12/20/22 11:14
Nitrogen, Kjeldahl, Total as N		10.2	mg/L	0.50	102	90	110			
Lab ID: CCV		Continuing Calibration Verification Standard								12/20/22 12:06
Nitrogen, Kjeldahl, Total as N		10.2	mg/L	0.50	102	90	110			
Method: E351.2										Batch: 64820
Lab ID: MB-64820		Method Blank				Run: SEAL AA500_221220A				12/20/22 11:18
Nitrogen, Kjeldahl, Total as N		ND	mg/L	0.1						
Lab ID: LCS-64820		Laboratory Control Sample				Run: SEAL AA500_221220A				12/20/22 11:21
Nitrogen, Kjeldahl, Total as N		10.1	mg/L	0.50	101	90	110			
Lab ID: H22120514-001BMS		Sample Matrix Spike				Run: SEAL AA500_221220A				12/20/22 12:21
Nitrogen, Kjeldahl, Total as N		10.1	mg/L	0.50	99	90	110			
Lab ID: H22120514-001BMSD		Sample Matrix Spike Duplicate				Run: SEAL AA500_221220A				12/20/22 12:23
Nitrogen, Kjeldahl, Total as N		10.1	mg/L	0.50	99	90	110	0.2	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Helena, MT Branch

Client: Water and Environmental Technologies **Work Order:** H22120514 **Report Date:** 12/29/22

Method: **E353.2** Analytical Run: FIA203-HE_221222B

Lab ID: **ICV** Initial Calibration Verification Standard 12/22/22 14:06

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Nitrogen, Nitrate+Nitrite as N		1.06	mg/L	0.010	106	90	110			

Lab ID: **CCV** Continuing Calibration Verification Standard 12/22/22 15:16

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Nitrogen, Nitrate+Nitrite as N		0.481	mg/L	0.010	96	90	110			

Method: **E353.2** Batch: R181082

Lab ID: **MBLK** Method Blank Run: FIA203-HE_221222B 12/22/22 14:08

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Nitrogen, Nitrate+Nitrite as N		ND	mg/L	0.008						

Lab ID: **LFB** Laboratory Fortified Blank Run: FIA203-HE_221222B 12/22/22 14:09

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Nitrogen, Nitrate+Nitrite as N		0.989	mg/L	0.011	99	90	110			

Lab ID: **H22120517-008CMS** Sample Matrix Spike Run: FIA203-HE_221222B 12/22/22 15:38

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Nitrogen, Nitrate+Nitrite as N		0.979	mg/L	0.011	98	90	110			

Lab ID: **H22120517-008CMSD** Sample Matrix Spike Duplicate Run: FIA203-HE_221222B 12/22/22 15:39

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Nitrogen, Nitrate+Nitrite as N		0.958	mg/L	0.011	96	90	110	2.2	10	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

Work Order Receipt Checklist

Water and Environmental Technologies H22120514

Login completed by: Wanda Johnson
Reviewed by: rtooke
Reviewed Date: 12/16/2022

Date Received: 12/15/2022
Received by: RAT
Carrier name: Hand Deliver

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☑	No ☐	Not Applicable ☐
Container/Temp Blank temperature:	10.0°C On Ice - From Field		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

None

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Page 1 of 1

Account Information *(Billing information)*

Company/Name WET
Contact Janet Dawney
Phone 4067825220
Mailing Address 480 E Park St.
City, State, Zip Butte, MT 59701
Email accounting@waterenvtech.com
Receive Invoice ☐Hard Copy ☒Email
Receive Report ☐Hard Copy ☒Email
Purchase Order
Quote
Bottle Order 42801

Report Information *(if different than Account Information)*

Company/Name WET
Contact christina eggensperger
Phone same
Mailing Address same
City, State, Zip same
Email ceggensperger@waterenvtech.com
Receive Report ☐Hard Copy ☒Email
Special Report/Formats:
☐ LEVEL IV ☐ NELAC ☒ EDD/EDT *(contact laboratory)* ☐ Other

Comments

Project Information

Project Name, PWSID, Permit, etc. 1559-22
Sampler Name c.eggensperger
Sampler Phone 4065319486
Sample Origin State MT
EPA/State Compliance ☒ Yes ☐ No
Lab provided preservatives were used ☒Yes ☐ No
MINING CLIENTS, please indicate sample type.
*If ore has been processed or refined, call before sending.
☐ Byproduct 11 (e)2 material ☐ Unprocessed ore (NOT ground or refined)*

Matrix Codes

A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Other
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.

Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

Analysis Requested

	Sample Identification *(Name, Location, Interval, etc.)*	Collection Date	Collection Time	Number of Containers	Matrix *(See Codes Above)*	TDS	Sp. Cond	pH	Chloride	TKN, Nitrate+Nitrite	BacT & E.Coli	TOC			See Attached	RUSH TAT	ELI LAB ID *Laboratory Use Only*
1	GWIC 227753	12-15-22	1330	4	W	X	X	X	X	X	X	X					H22120514
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Custody Record MUST be signed

Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
Christina eggensperger	12-15-22/1410				
Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print) Rebecca Hoke	Date/Time 12-15-22 1410	Signature

LABORATORY USE ONLY

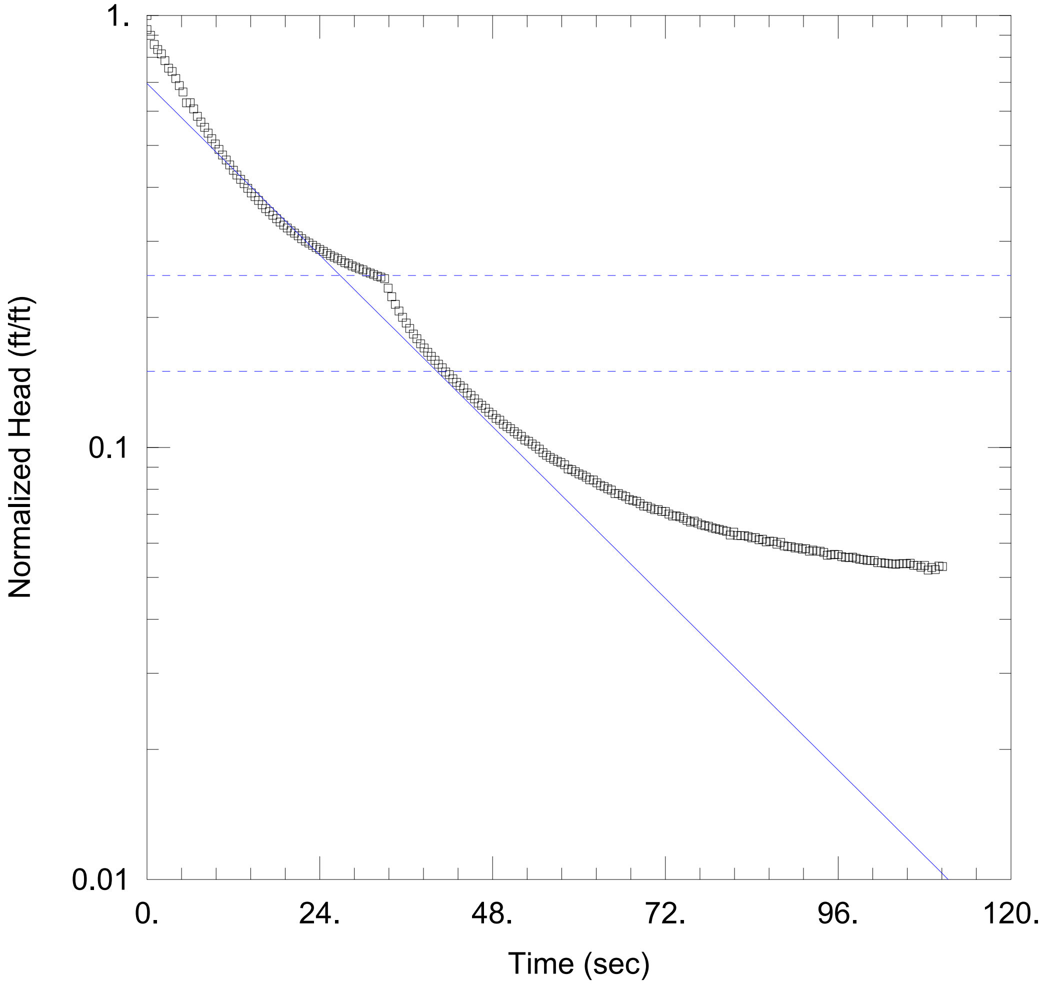
Shipped By	Cooler ID(s)	Custody Seals	Intact	Receipt Temp	Temp Blank	On Ice	Payment Type	Amount	Receipt Number *(cash/check only)*
hand	Y	Y [✓ N] C B	Y N	10-field °C	[✓ Y] N	[✓ Y] N	CC Cash Check	$	

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

ELI-COC-06/08 v.2

Attachment F

AQTESOLV© Slug Test Solutions



WELL TEST ANALYSIS

Data Set: K:\...\MW-1 EH Slug Test 1 test_JCR.aqt
Date: 06/06/24 Time: 11:03:56

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

Saturated Thickness: 17.14 ft
Anisotropy Ratio (Kz/Kr): 1.

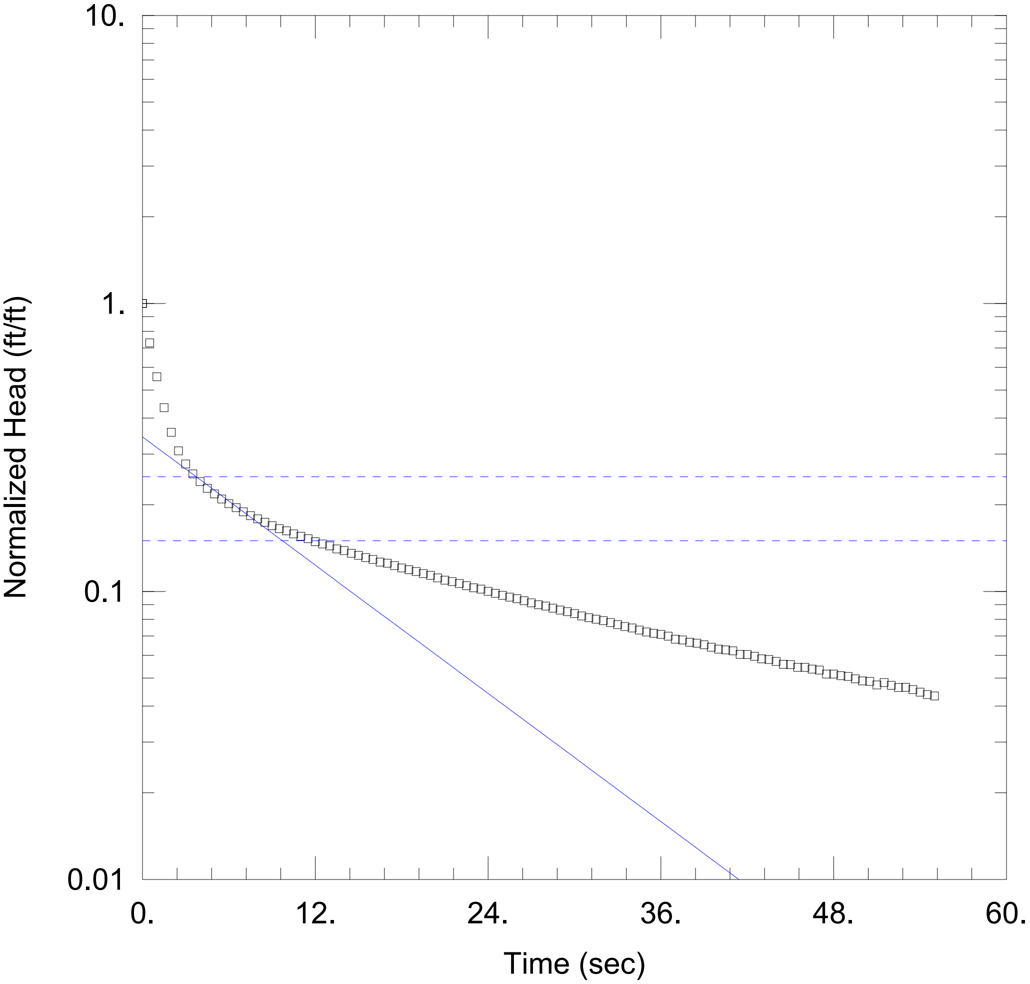
WELL DATA (MW-1)

Initial Displacement: 1.233 ft
Total Well Penetration Depth: 9.86 ft
Casing Radius: 0.083 ft
Static Water Column Height: 17.14 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 16.38 ft/day
y0 = 0.8578 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-1 EH Slug Test 2_JCR.aqt
Date: 06/07/24 Time: 10:14:44

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

Saturated Thickness: 17.14 ft
Anisotropy Ratio (Kz/Kr): 1.

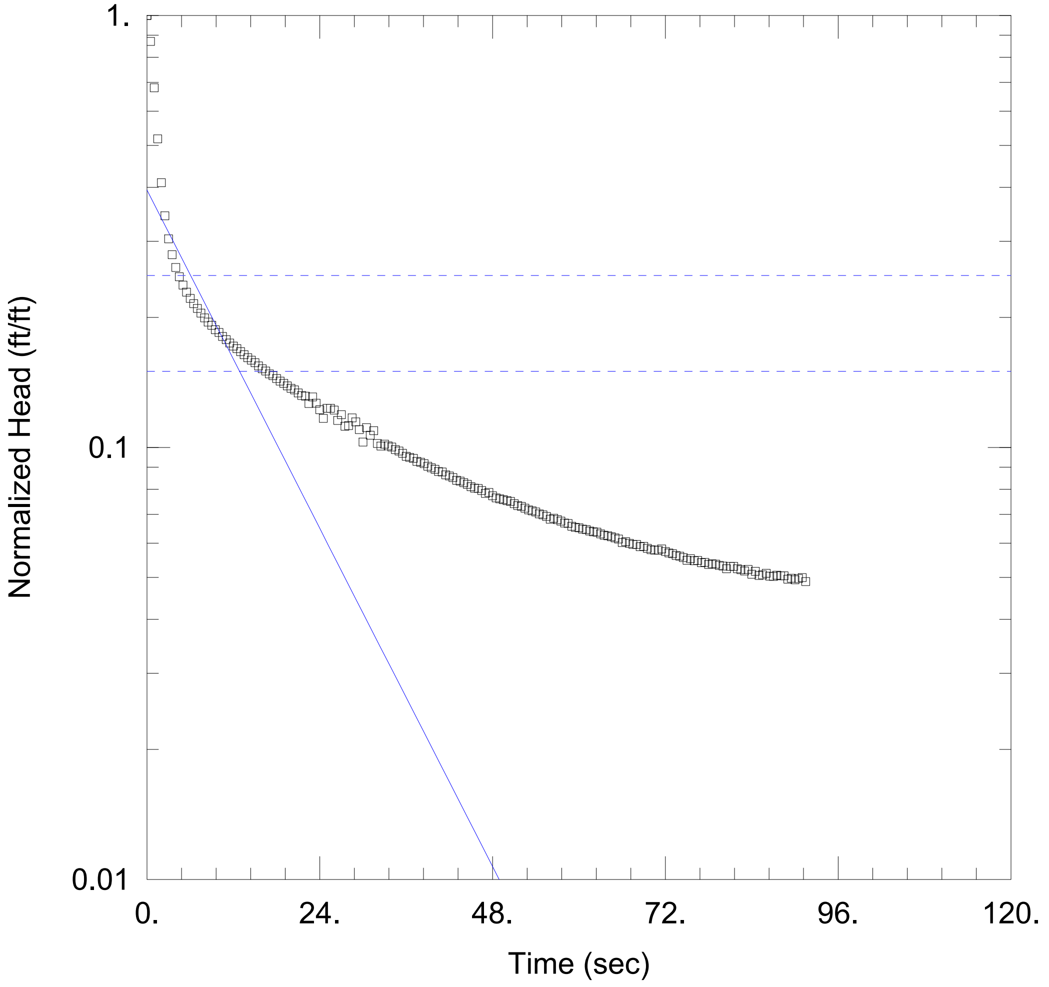
WELL DATA (MW-1)

Initial Displacement: 1.193 ft
Total Well Penetration Depth: 9.86 ft
Casing Radius: 0.083 ft
Static Water Column Height: 17.14 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 36.71 ft/day
y0 = 0.4102 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-1 EH Slug Test 3_JCR.aqt
Date: 06/06/24 Time: 10:59:43

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

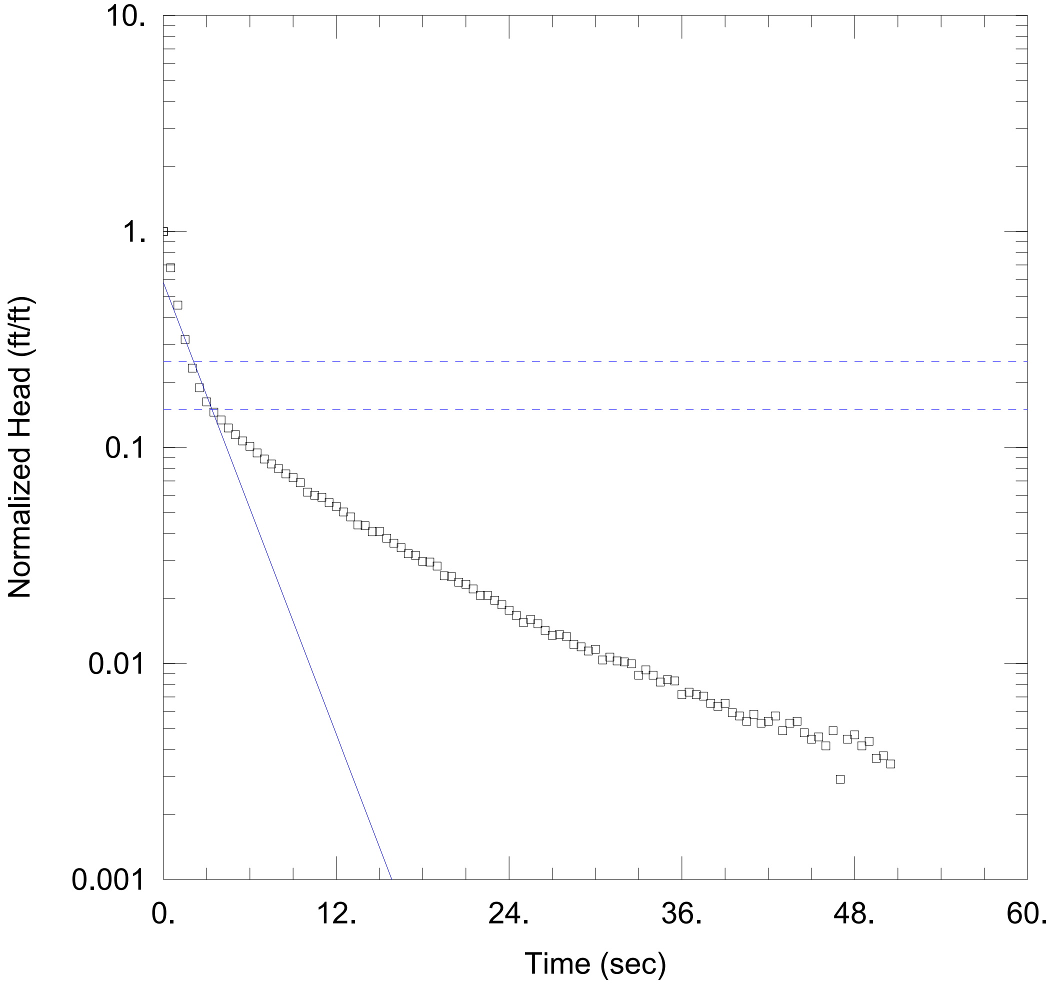
Saturated Thickness: 17.14 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-1)

Initial Displacement: 1.14 ft
Total Well Penetration Depth: 9.86 ft
Casing Radius: 0.083 ft
Static Water Column Height: 17.14 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 32.27 ft/day
y0 = 0.4495 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-2 EH Slug Test 1_JCR.aqt
Date: 06/06/24 Time: 12:40:44

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

Saturated Thickness: 20.96 ft
Anisotropy Ratio (Kz/Kr): 1.

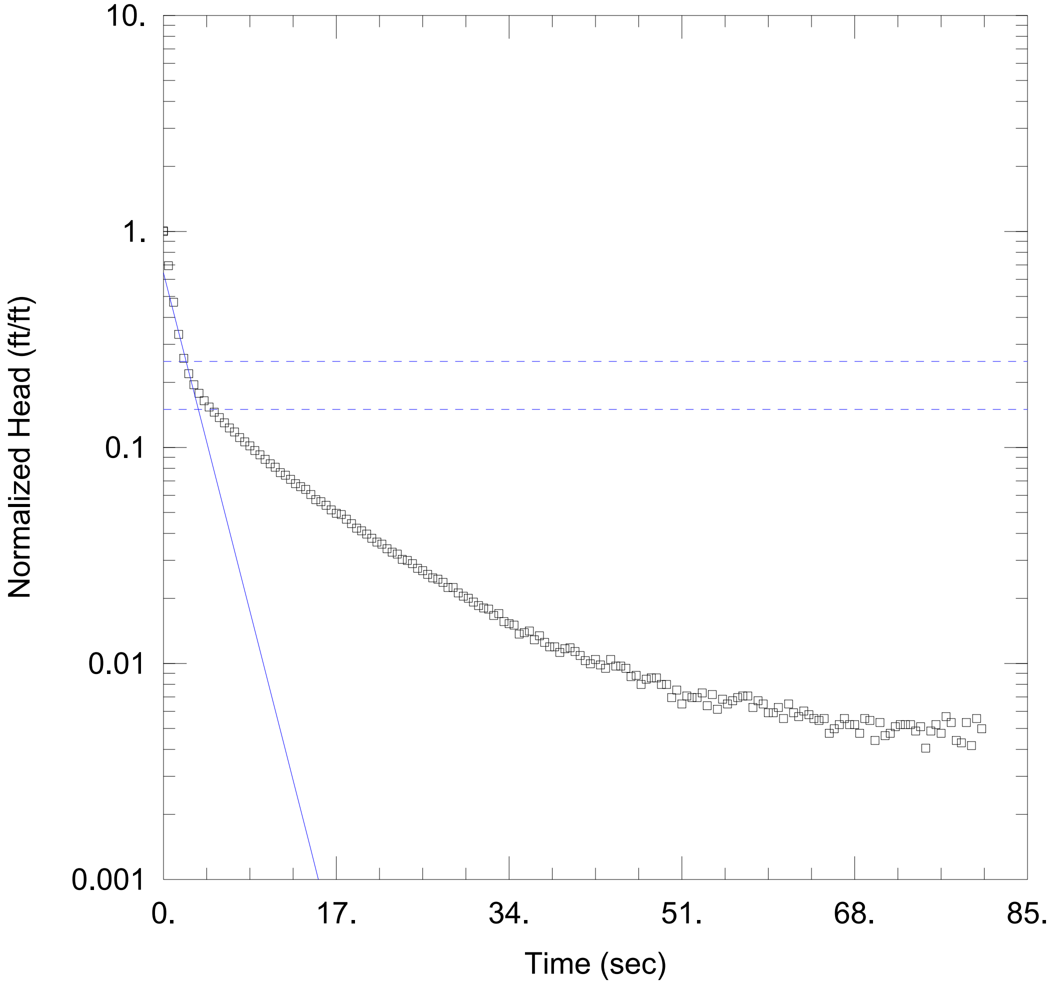
WELL DATA (MW-2)

Initial Displacement: 0.9636 ft
Total Well Penetration Depth: 6.2 ft
Casing Radius: 0.083 ft
Static Water Column Height: 20.96 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 172.2 ft/day
y0 = 0.557 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-2 EH Slug Test 2_JCR.aqt
Date: 06/06/24 Time: 12:49:20

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

Saturated Thickness: 20.96 ft
Anisotropy Ratio (Kz/Kr): 1.

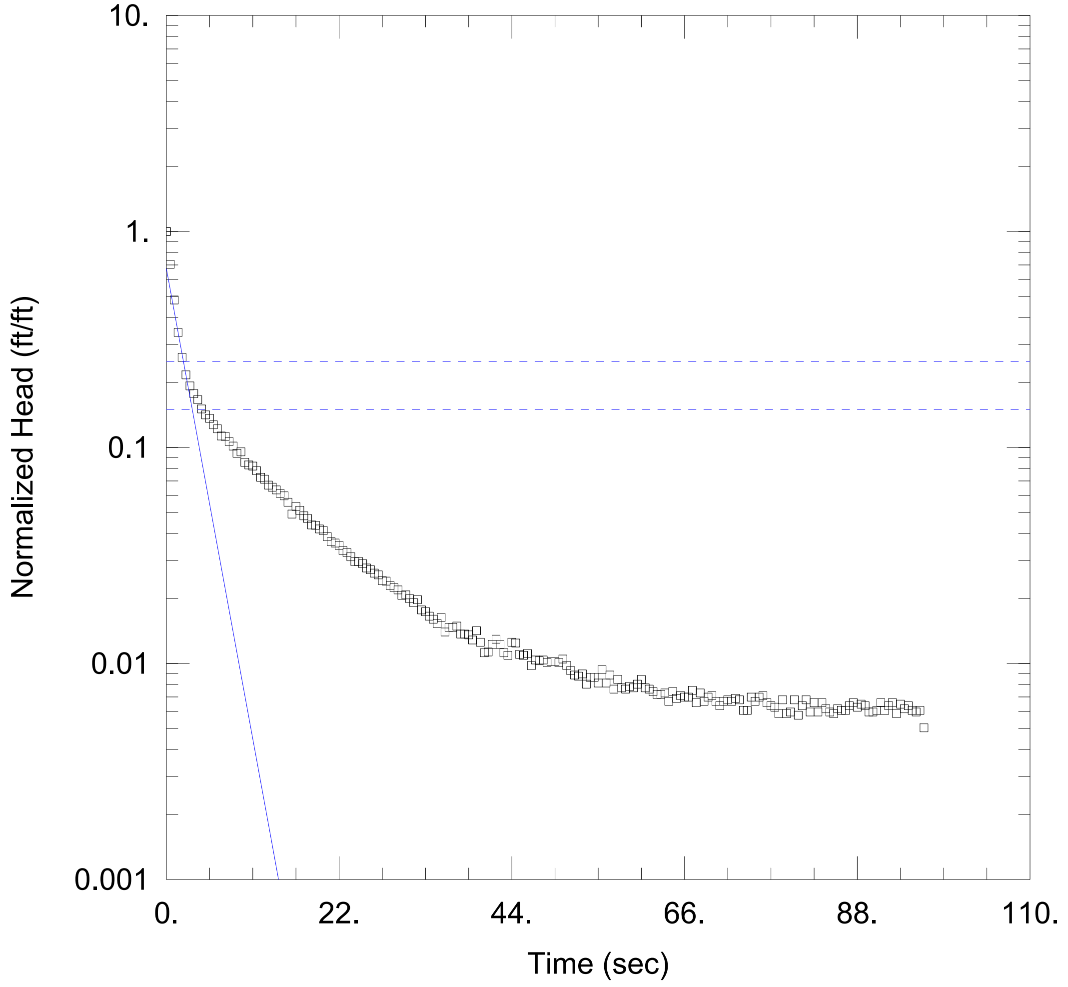
WELL DATA (MW-2)

Initial Displacement: 0.8636 ft
Total Well Penetration Depth: 6.2 ft
Casing Radius: 0.083 ft
Static Water Column Height: 20.96 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 182.2 ft/day
y0 = 0.5552 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-2 EH Slug Test 3_JCR.aqt
Date: 06/06/24 Time: 13:00:12

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

Saturated Thickness: 20.96 ft
Anisotropy Ratio (Kz/Kr): 1.

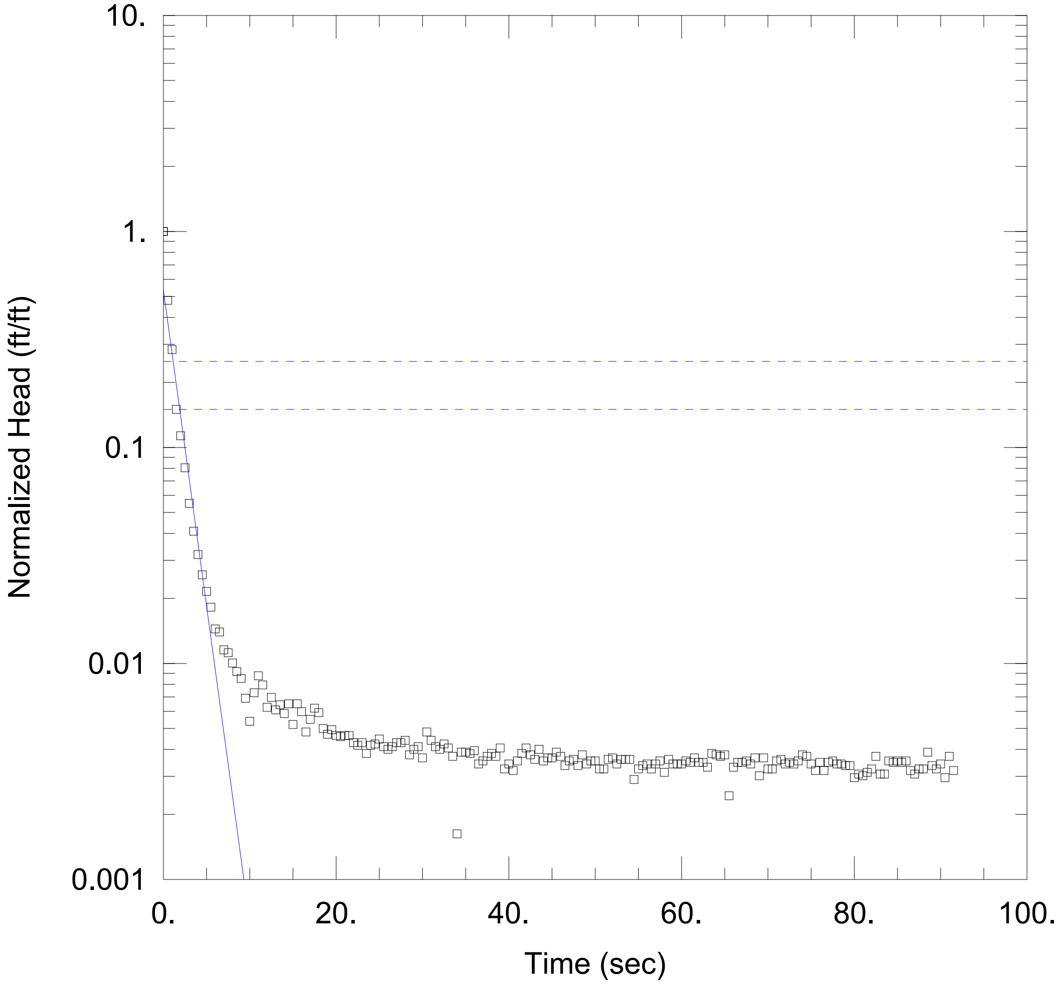
WELL DATA (MW-2)

Initial Displacement: 0.9729 ft
Static Water Column Height: 20.96 ft
Total Well Penetration Depth: 6.2 ft
Screen Length: 1. ft
Casing Radius: 0.083 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 195.7 ft/day
y0 = 0.6535 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-3 EH Slug Test 1_jcr.aqt
Date: 06/07/24 Time: 09:36:21

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

Saturated Thickness: 25.78 ft
Anisotropy Ratio (Kz/Kr): 1.

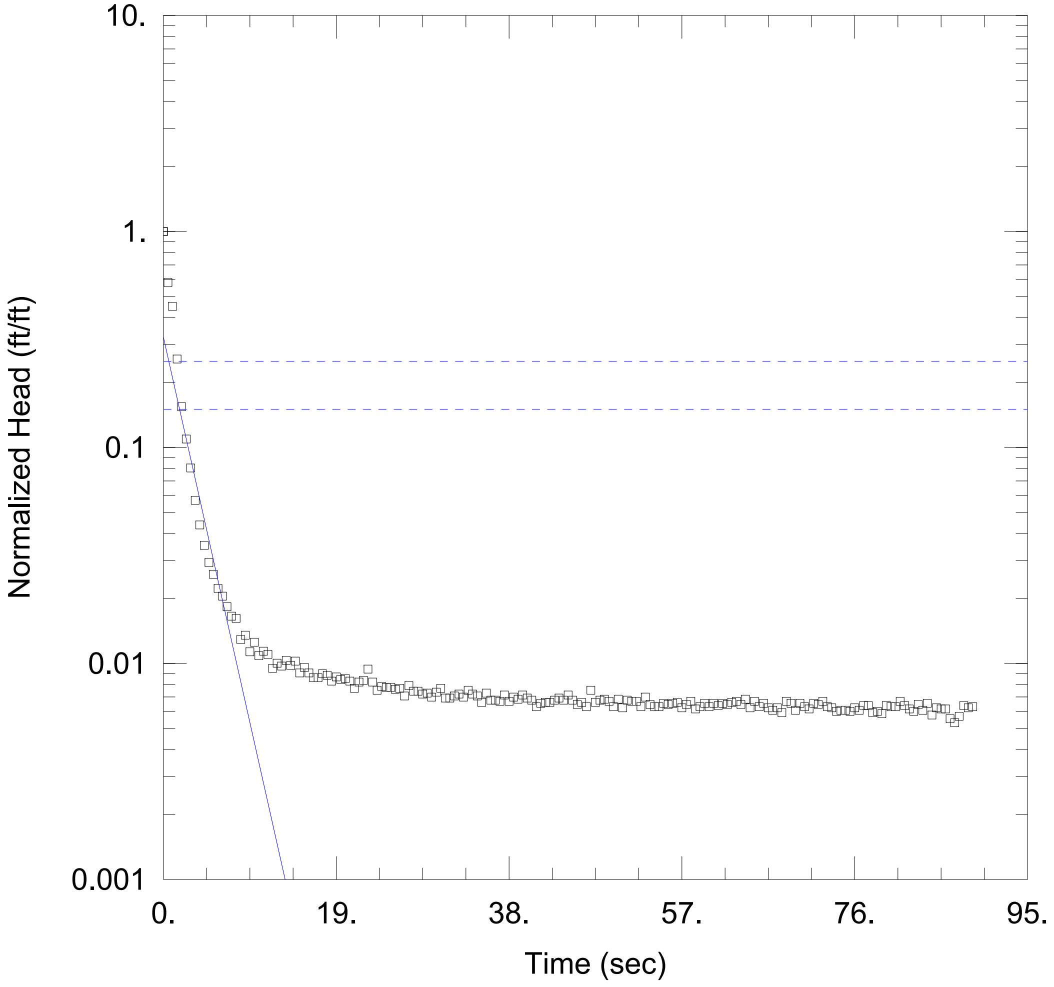
WELL DATA (MW-3)

Initial Displacement: 1.724 ft
Total Well Penetration Depth: 2.13 ft
Casing Radius: 0.083 ft
Static Water Column Height: 25.78 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 289.6 ft/day
y0 = 0.9215 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-3 EH Slug Test 2_jcr.aqt
Date: 06/07/24 Time: 09:49:33

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

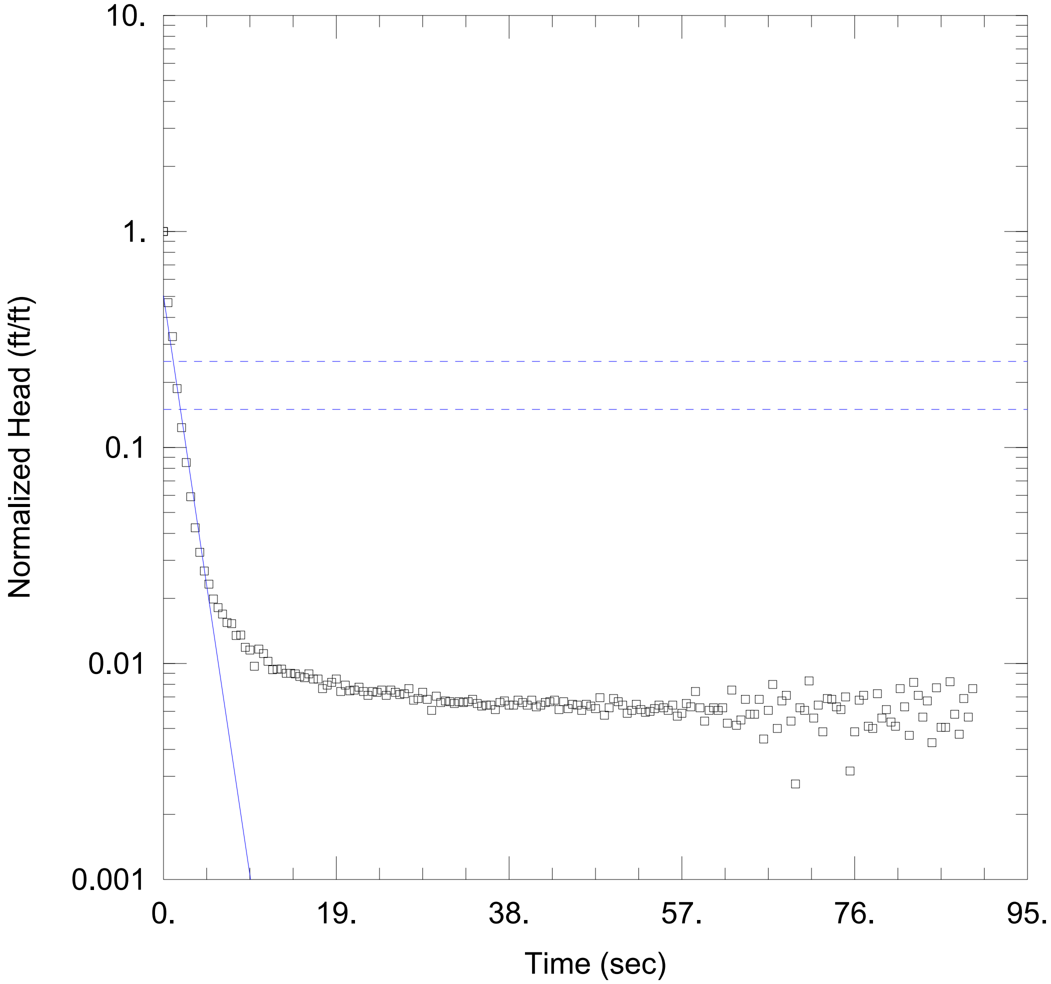
Saturated Thickness: 25.78 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-3)

Initial Displacement: 1.317 ft
Total Well Penetration Depth: 2.13 ft
Casing Radius: 0.083 ft
Static Water Column Height: 25.78 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 185.6 ft/day
y0 = 0.4246 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-3 EH Slug Test 3_jcr.aqt
Date: 06/07/24 Time: 09:56:50

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

Saturated Thickness: 25.78 ft
Anisotropy Ratio (Kz/Kr): 1.

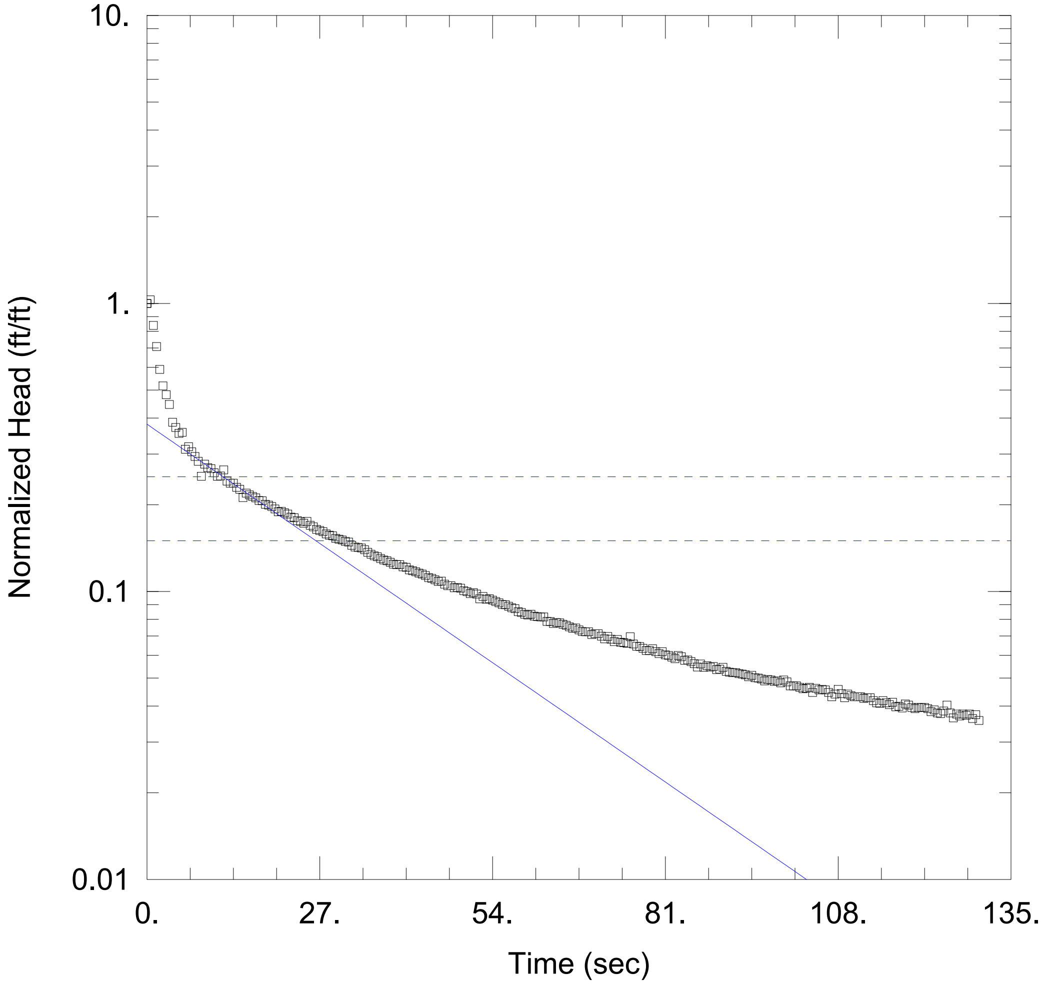
WELL DATA (MW-3)

Initial Displacement: 1.7 ft
Total Well Penetration Depth: 2.13 ft
Casing Radius: 0.083 ft
Static Water Column Height: 25.78 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 279.3 ft/day
y0 = 0.8559 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-4 EH Slug Test 1_JCR.aqt
Date: 06/07/24 Time: 10:02:13

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

Saturated Thickness: 12.55 ft
Anisotropy Ratio (Kz/Kr): 1.

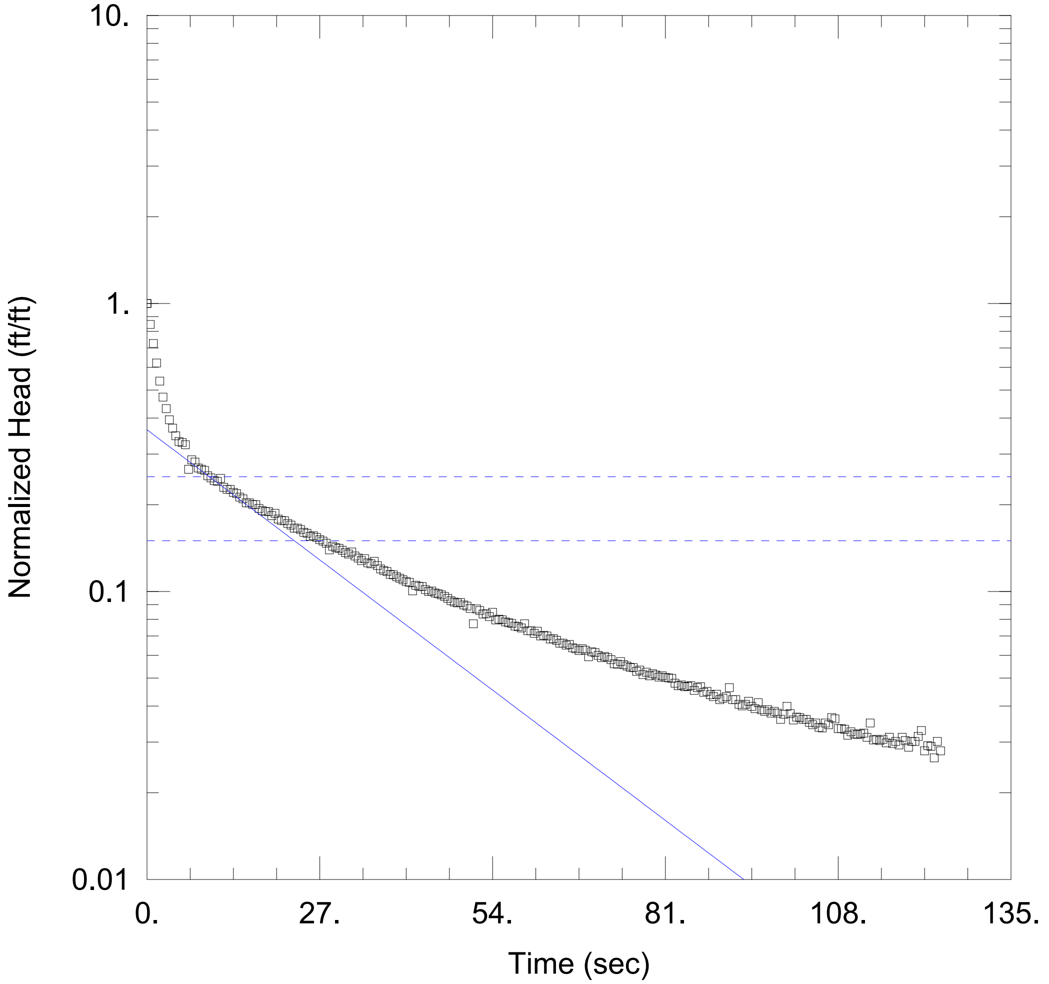
WELL DATA (MW-4)

Initial Displacement: 0.5361 ft
Total Well Penetration Depth: 13.71 ft
Casing Radius: 0.083 ft
Static Water Column Height: 12.55 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 22.01 ft/day
y0 = 0.2041 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-4 EH Slug Test 2_jcr.aqt
Date: 06/07/24 Time: 10:03:14

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

Saturated Thickness: 12.55 ft
Anisotropy Ratio (Kz/Kr): 1.

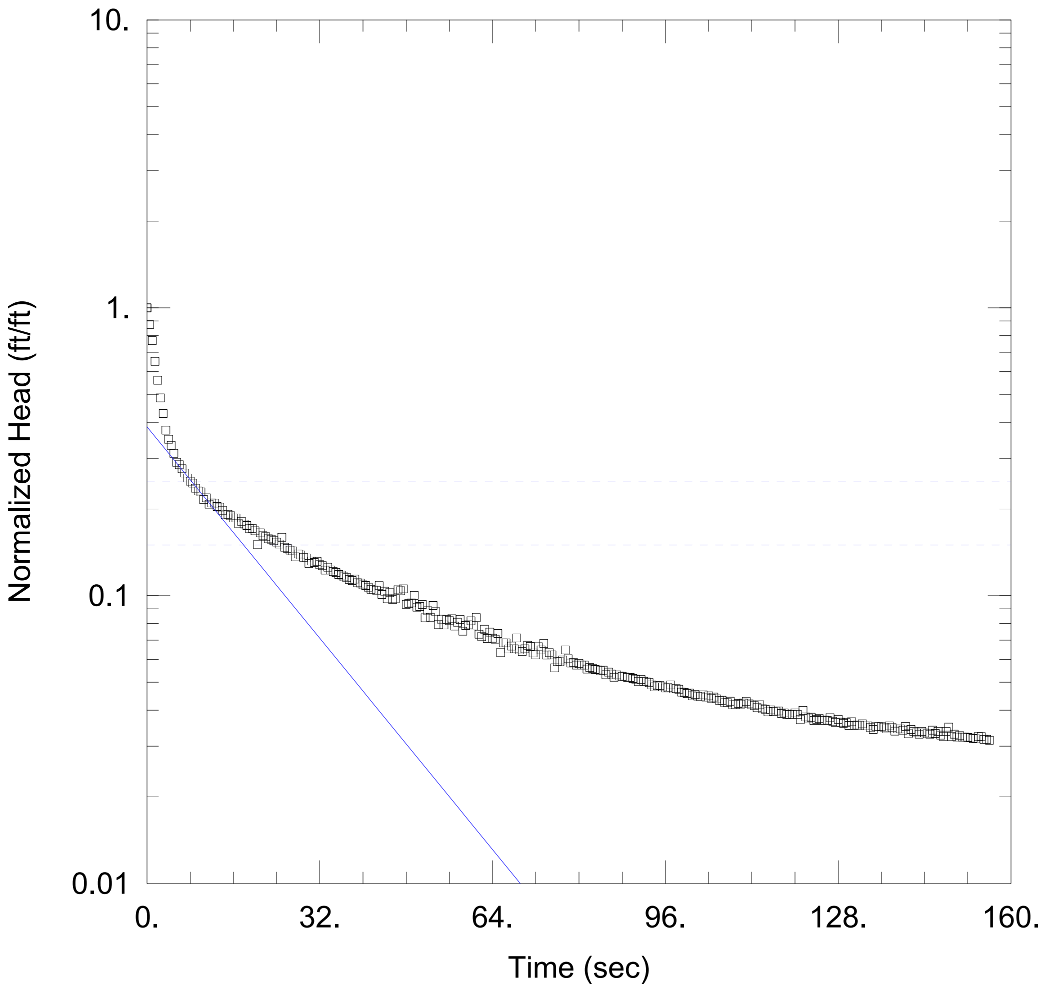
WELL DATA (MW-4)

Initial Displacement: 0.587 ft
Total Well Penetration Depth: 13.71 ft
Casing Radius: 0.083 ft
Static Water Column Height: 12.55 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 24.03 ft/day
y0 = 0.2138 ft



WELL TEST ANALYSIS

Data Set: K:\...\MW-4 EH Slug Test 3_jcr.aqt
Date: 06/07/24 Time: 10:04:33

PROJECT INFORMATION

Company: WET
Client: RPA
Project: 1559-22
Location: East Helena
Test Date: 5-10-23

AQUIFER DATA

Saturated Thickness: 12.55 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-4)

Initial Displacement: 0.8335 ft
Total Well Penetration Depth: 13.71 ft
Casing Radius: 0.083 ft
Static Water Column Height: 12.55 ft
Screen Length: 1. ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

K = 32.94 ft/day
y0 = 0.3215 ft

Attachment G

Aquifer Test Data

DNRC/DEQ Form 633 Revised 04/2008

AQUIFER TEST DATA

Shaded Cells Require User Input

Water-Right Applicant: City of East Helena
DNRC Applic.#:
DEQ Applic. #:
Address: Watse water Treatment Plant 3330 Plant Road
County: Lewis and Clark
Test Site Location: SW SE Section: 24 Twnshp (N/S): 10N Range (E/W): 3W
Date Test Conducted: 7/17/2023
Person **and** Company Conducting Test: James Rose - Water and Environmental Technologies
Type of Test: constant pumping rate drawdown.
Pumping Well ID: East Helen WWTP east well
Pumping Rates (gpm): 16
Pumping Well GWIC ID #: 227753
Depth (feet): 75
Diameter (inches): 4
Perf. Zone(s): 63-73
Pumping Well GPS Coordinates: Select Datum of NAD 27 or 83: NAD 83
Latitude: 46.60523
Longitude: -111.9204
Author of Technical Report: James Rose WET

Observation Well ID(s)	GWIC ID#	GPS Coordinates Latitude	GPS Coordinates Longitude	Depth **(feet)**	Diameter **(inches)**	Perforated Zone(s) **(feet)**	Distance from Test Well **(feet)**	Bearing from Test Well **(degrees)**
MW4	n/a	46.60558	-111.9217	70	2	50-70	350	291
2)								
3)								
4)								
5)								
6)								

Specify Water-Level Monitoring Equipment: Geotech water level measuring tape with sensor.

Production Well Water-Level Data

Static Water Level (swl) to 0.01 ft: 54.79
Date/Time Measured: 7/17/2023 15:54
How swl Measured: waater level tape
Measuring Point ID: top of PVC casing
Measuring Point Elevation (mp) (feet): 3839.08
How mp Measured: surveyed

Time Data

Pump On: Date 7/17/2023
Time 15:55
Pump Off: Date 7/18/2023
Time 14:35
Recovery End: Date 7/18/2023
Time 15:23
Aquifer-Test Duration:
Pumping (hrs): 22:40
Recovery (hrs): 0:48

Discharge Data

Discharge to be measured several times per hour during the first 3 hours of pumping and thereafter several times per hour if discharge fluctuates and requires frequent adjustment; otherwise, hourly measurements if discharge remains constant and requires little or no adjustment.
Discharge must be reported in gallons per minute (gpm) if using flow meter; in cumulative gallons if using totalizing meter; or 0.01 foot if using flume/weir.

Specify Discharge Measurement Equipment: Macnaught digital flowmeter. Bucket and stopwatch checked.

Background Water Levels

Production Well				Observation Well 1				Observation Well 2			
Date	Clock Time	Elapsed Time **(minutes)**	Depth to Water from m.p. (to **0.01 foot**)	Date	Clock Time	Elapsed Time **(minutes)**	Depth OF Water from m.p. (to **0.01 foot**)	Date	Clock Time	Elapsed Time **(minutes)**	Depth to Water from m.p. (to **0.01 foot**)
05/10/23	10:00:00		62.34	07/10/23	12:04:23	0	57.44				
06/28/23	14:00:00		57.4	07/10/23	12:34:23	30	57.44				
07/03/23	12:00:00		57.83	07/10/23	13:04:23	60	57.44				
07/10/23	12:00:00		57.71	07/10/23	13:34:23	90	57.44				
07/17/23	9:00:00		57.83	07/10/23	14:04:23	120	57.44				
7/17/2023	15:55	0	54.79	07/10/23	14:34:23	150	57.44				
				07/10/23	15:04:23	180	57.44				
				07/10/23	15:34:23	210	57.45				
				07/10/23	16:04:23	240	57.44				
				07/10/23	16:34:23	270	57.44				
				07/10/23	17:04:23	300	57.43				
				07/10/23	17:34:23	330	57.44				
				07/10/23	18:04:23	360	57.43				
				07/10/23	18:34:23	390	57.43				
				07/10/23	19:04:23	420	57.42				
				07/10/23	19:34:23	450	57.42				
				07/10/23	20:04:23	480	57.41				
				07/10/23	20:34:23	510	57.41				
				07/10/23	21:04:23	540	57.41				
				07/10/23	21:34:23	570	57.41				
				07/10/23	22:04:23	600	57.41				
				07/10/23	22:34:23	630	57.40				
				07/10/23	23:04:23	660	57.39				
				07/10/23	23:34:23	690	57.40				
				07/11/23	0:04:23	720	57.39				
				07/11/23	0:34:23	750	57.38				
				07/11/23	1:04:23	780	57.38				
				07/11/23	1:34:23	810	57.38				
				07/11/23	2:04:23	840	57.38				
				07/11/23	2:34:23	870	57.37				
				07/11/23	3:04:23	900	57.37				
				07/11/23	3:34:23	930	57.36				
				07/11/23	4:04:23	960	57.36				
				07/11/23	4:34:23	990	57.36				
				07/11/23	5:04:23	1020	57.35				
				07/11/23	5:34:23	1050	57.35				
				07/11/23	6:04:23	1080	57.35				
				07/11/23	6:34:23	1110	57.35				
				07/11/23	7:04:23	1140	57.34				
				07/11/23	7:34:23	1170	57.33				
				07/11/23	8:04:23	1200	57.34				
				07/11/23	8:34:23	1230	57.33				
				07/11/23	9:04:23	1260	57.33				
				07/11/23	9:34:23	1290	57.33				
				07/11/23	10:04:23	1320	57.32				
				07/11/23	10:34:23	1350	57.32				
				07/11/23	11:04:23	1380	57.33				
				07/11/23	11:34:23	1410	57.32				
				07/11/23	12:04:23	1440	57.32				
				07/11/23	12:34:23	1470	57.32				
				07/11/23	13:04:23	1500	57.32				
				07/11/23	13:34:23	1530	57.32				
				07/11/23	14:04:23	1560	57.32				
				07/11/23	14:34:23	1590	57.32				
				07/11/23	15:04:23	1620	57.32				
				07/11/23	15:34:23	1650	57.32				
				07/11/23	16:04:23	1680	57.32				
				07/11/23	16:34:23	1710	57.32				
				07/11/23	17:04:23	1740	57.31				
				07/11/23	17:34:23	1770	57.32				
				07/11/23	18:04:23	1800	57.31				
				07/11/23	18:34:23	1830	57.31				
				07/11/23	19:04:23	1860	57.31				
				07/11/23	19:34:23	1890	57.32				
				07/11/23	20:04:23	1920	57.31				
				07/11/23	20:34:23	1950	57.31				
				07/11/23	21:04:23	1980	57.31				
				07/11/23	21:34:23	2010	57.30				
				07/11/23	22:04:23	2040	57.30				
				07/11/23	22:34:23	2070	57.29				
				07/11/23	23:04:23	2100	57.29				
				07/11/23	23:34:23	2130	57.28				
				07/12/23	0:04:23	2160	57.28				
				07/12/23	0:34:23	2190	57.27				
				07/12/23	1:04:23	2220	57.27				
				07/12/23	1:34:23	2250	57.26				
				07/12/23	2:04:23	2280	57.26				
				07/12/23	2:34:23	2310	57.25				
				07/12/23	3:04:23	2340	57.25				
				07/12/23	3:34:23	2370	57.24				

07/12/23	4:04:23	2400	57.24
07/12/23	4:34:23	2430	57.24
07/12/23	5:04:23	2460	57.23
07/12/23	5:34:23	2490	57.23
07/12/23	6:04:23	2520	57.22
07/12/23	6:34:23	2550	57.23
07/12/23	7:04:23	2580	57.22
07/12/23	7:34:23	2610	57.21
07/12/23	8:04:23	2640	57.21
07/12/23	8:34:23	2670	57.21
07/12/23	9:04:23	2700	57.20
07/12/23	9:34:23	2730	57.20
07/12/23	10:04:23	2760	57.20
07/12/23	10:34:23	2790	57.20
07/12/23	11:04:23	2820	57.19
07/12/23	11:34:23	2850	57.19
07/12/23	12:04:23	2880	57.19
07/12/23	12:34:23	2910	57.19
07/12/23	13:04:23	2940	57.20
07/12/23	13:34:23	2970	57.19
07/12/23	14:04:23	3000	57.19
07/12/23	14:34:23	3030	57.19
07/12/23	15:04:23	3060	57.20
07/12/23	15:34:23	3090	57.19
07/12/23	16:04:23	3120	57.19
07/12/23	16:34:23	3150	57.20
07/12/23	17:04:23	3180	57.20
07/12/23	17:34:23	3210	57.20
07/12/23	18:04:23	3240	57.20
07/12/23	18:34:23	3270	57.20
07/12/23	19:04:23	3300	57.21
07/12/23	19:34:23	3330	57.21
07/12/23	20:04:23	3360	57.21
07/12/23	20:34:23	3390	57.21
07/12/23	21:04:23	3420	57.21
07/12/23	21:34:23	3450	57.21
07/12/23	22:04:23	3480	57.20
07/12/23	22:34:23	3510	57.20
07/12/23	23:04:23	3540	57.21
07/12/23	23:34:23	3570	57.20
07/13/23	0:04:23	3600	57.20
07/13/23	0:34:23	3630	57.20
07/13/23	1:04:23	3660	57.19
07/13/23	1:34:23	3690	57.19
07/13/23	2:04:23	3720	57.20
07/13/23	2:34:23	3750	57.18
07/13/23	3:04:23	3780	57.18
07/13/23	3:34:23	3810	57.18
07/13/23	4:04:23	3840	57.18
07/13/23	4:34:23	3870	57.17
07/13/23	5:04:23	3900	57.16
07/13/23	5:34:23	3930	57.16
07/13/23	6:04:23	3960	57.16
07/13/23	6:34:23	3990	57.16
07/13/23	7:04:23	4020	57.15
07/13/23	7:34:23	4050	57.14
07/13/23	8:04:23	4080	57.14
07/13/23	8:34:23	4110	57.14
07/13/23	9:04:23	4140	57.13
07/13/23	9:34:23	4170	57.13
07/13/23	10:04:23	4200	57.13
07/13/23	10:34:23	4230	57.13
07/13/23	11:04:23	4260	57.12
07/13/23	11:34:23	4290	57.12
07/13/23	12:04:23	4320	57.12
07/13/23	12:34:23	4350	57.12
07/13/23	13:04:23	4380	57.12
07/13/23	13:34:23	4410	57.12
07/13/23	14:04:23	4440	57.11
07/13/23	14:34:23	4470	57.11
07/13/23	15:04:23	4500	57.12
07/13/23	15:34:23	4530	57.11
07/13/23	16:04:23	4560	57.11
07/13/23	16:34:23	4590	57.11
07/13/23	17:04:23	4620	57.12
07/13/23	17:34:23	4650	57.11
07/13/23	18:04:23	4680	57.11
07/13/23	18:34:23	4710	57.12
07/13/23	19:04:23	4740	57.12
07/13/23	19:34:23	4770	57.12
07/13/23	20:04:23	4800	57.12
07/13/23	20:34:23	4830	57.11
07/13/23	21:04:23	4860	57.11
07/13/23	21:34:23	4890	57.12
07/13/23	22:04:23	4920	57.10
07/13/23	22:34:23	4950	57.10
07/13/23	23:04:23	4980	57.10

07/13/23	23:34:23	5010	57.10
07/14/23	0:04:23	5040	57.08
07/14/23	0:34:23	5070	57.08
07/14/23	1:04:23	5100	57.08
07/14/23	1:34:23	5130	57.07
07/14/23	2:04:23	5160	57.07
07/14/23	2:34:23	5190	57.06
07/14/23	3:04:23	5220	57.05
07/14/23	3:34:23	5250	57.05
07/14/23	4:04:23	5280	57.05
07/14/23	4:34:23	5310	57.04
07/14/23	5:04:23	5340	57.03
07/14/23	5:34:23	5370	57.03
07/14/23	6:04:23	5400	57.03
07/14/23	6:34:23	5430	57.02
07/14/23	7:04:23	5460	57.02
07/14/23	7:34:23	5490	57.01
07/14/23	8:04:23	5520	57.01
07/14/23	8:34:23	5550	57.01
07/14/23	9:04:23	5580	57.00
07/14/23	9:34:23	5610	57.00
07/14/23	10:04:23	5640	56.99
07/14/23	10:34:23	5670	57.00
07/14/23	11:04:23	5700	56.99
07/14/23	11:34:23	5730	56.99
07/14/23	12:04:23	5760	56.98
07/14/23	12:34:23	5790	56.99
07/14/23	13:04:23	5820	56.98
07/14/23	13:34:23	5850	56.98
07/14/23	14:04:23	5880	56.98
07/14/23	14:34:23	5910	56.98
07/14/23	15:04:23	5940	56.98
07/14/23	15:34:23	5970	56.98
07/14/23	16:04:23	6000	56.98
07/14/23	16:34:23	6030	56.98
07/14/23	17:04:23	6060	56.98
07/14/23	17:34:23	6090	56.98
07/14/23	18:04:23	6120	56.98
07/14/23	18:34:23	6150	56.98
07/14/23	19:04:23	6180	56.98
07/14/23	19:34:23	6210	56.98
07/14/23	20:04:23	6240	56.98
07/14/23	20:34:23	6270	56.98
07/14/23	21:04:23	6300	56.98
07/14/23	21:34:23	6330	56.98
07/14/23	22:04:23	6360	56.97
07/14/23	22:34:23	6390	56.97
07/14/23	23:04:23	6420	56.97
07/14/23	23:34:23	6450	56.97
07/15/23	0:04:23	6480	56.96
07/15/23	0:34:23	6510	56.96
07/15/23	1:04:23	6540	56.95
07/15/23	1:34:23	6570	56.96
07/15/23	2:04:23	6600	56.95
07/15/23	2:34:23	6630	56.94
07/15/23	3:04:23	6660	56.94
07/15/23	3:34:23	6690	56.94
07/15/23	4:04:23	6720	56.94
07/15/23	4:34:23	6750	56.93
07/15/23	5:04:23	6780	56.93
07/15/23	5:34:23	6810	56.93
07/15/23	6:04:23	6840	56.93
07/15/23	6:34:23	6870	56.92
07/15/23	7:04:23	6900	56.92
07/15/23	7:34:23	6930	56.91
07/15/23	8:04:23	6960	56.92
07/15/23	8:34:23	6990	56.91
07/15/23	9:04:23	7020	56.90
07/15/23	9:34:23	7050	56.90
07/15/23	10:04:23	7080	56.90
07/15/23	10:34:23	7110	56.90
07/15/23	11:04:23	7140	56.90
07/15/23	11:34:23	7170	56.90
07/15/23	12:04:23	7200	56.90
07/15/23	12:34:23	7230	56.91
07/15/23	13:04:23	7260	56.90
07/15/23	13:34:23	7290	56.90
07/15/23	14:04:23	7320	56.90
07/15/23	14:34:23	7350	56.91
07/15/23	15:04:23	7380	56.90
07/15/23	15:34:23	7410	56.90
07/15/23	16:04:23	7440	56.91
07/15/23	16:34:23	7470	56.91
07/15/23	17:04:23	7500	56.91
07/15/23	17:34:23	7530	56.91
07/15/23	18:04:23	7560	56.92
07/15/23	18:34:23	7590	56.92
07/15/23	19:04:23	7620	56.93

07/15/23	19:34:23	7650	56.92
07/15/23	20:04:23	7680	56.92
07/15/23	20:34:23	7710	56.92
07/15/23	21:04:23	7740	56.93
07/15/23	21:34:23	7770	56.92
07/15/23	22:04:23	7800	56.93
07/15/23	22:34:23	7830	56.93
07/15/23	23:04:23	7860	56.93
07/15/23	23:34:23	7890	56.93
07/16/23	0:04:23	7920	56.93
07/16/23	0:34:23	7950	56.92
07/16/23	1:04:23	7980	56.92
07/16/23	1:34:23	8010	56.92
07/16/23	2:04:23	8040	56.91
07/16/23	2:34:23	8070	56.91
07/16/23	3:04:23	8100	56.91
07/16/23	3:34:23	8130	56.91
07/16/23	4:04:23	8160	56.90
07/16/23	4:34:23	8190	56.90
07/16/23	5:04:23	8220	56.90
07/16/23	5:34:23	8250	56.90
07/16/23	6:04:23	8280	56.90
07/16/23	6:34:23	8310	56.90
07/16/23	7:04:23	8340	56.89
07/16/23	7:34:23	8370	56.89
07/16/23	8:04:23	8400	56.89
07/16/23	8:34:23	8430	56.88
07/16/23	9:04:23	8460	56.88
07/16/23	9:34:23	8490	56.88
07/16/23	10:04:23	8520	56.88
07/16/23	10:34:23	8550	56.88
07/16/23	11:04:23	8580	56.87
07/16/23	11:34:23	8610	56.88
07/16/23	12:04:23	8640	56.88
07/16/23	12:34:23	8670	56.88
07/16/23	13:04:23	8700	56.88
07/16/23	13:34:23	8730	56.88
07/16/23	14:04:23	8760	56.88
07/16/23	14:34:23	8790	56.88
07/16/23	15:04:23	8820	56.88
07/16/23	15:34:23	8850	56.88
07/16/23	16:04:23	8880	56.88
07/16/23	16:34:23	8910	56.89
07/16/23	17:04:23	8940	56.89
07/16/23	17:34:23	8970	56.89
07/16/23	18:04:23	9000	56.90
07/16/23	18:34:23	9030	56.90
07/16/23	19:04:23	9060	56.91
07/16/23	19:34:23	9090	56.91
07/16/23	20:04:23	9120	56.91
07/16/23	20:34:23	9150	56.91
07/16/23	21:04:23	9180	56.92
07/16/23	21:34:23	9210	56.92
07/16/23	22:04:23	9240	56.92
07/16/23	22:34:23	9270	56.92
07/16/23	23:04:23	9300	56.93
07/16/23	23:34:23	9330	56.92
07/17/23	0:04:23	9360	56.92
07/17/23	0:34:23	9390	56.92
07/17/23	1:04:23	9420	56.93
07/17/23	1:34:23	9450	56.92
07/17/23	2:04:23	9480	56.92
07/17/23	2:34:23	9510	56.92
07/17/23	3:04:23	9540	56.92
07/17/23	3:34:23	9570	56.93
07/17/23	4:04:23	9600	56.92
07/17/23	4:34:23	9630	56.92
07/17/23	5:04:23	9660	56.92
07/17/23	5:34:23	9690	56.93
07/17/23	6:04:23	9720	56.92
07/17/23	6:34:23	9750	56.92
07/17/23	7:04:23	9780	56.93
07/17/23	7:34:23	9810	56.93
07/17/23	8:04:23	9840	56.93
07/17/23	8:34:23	9870	56.93
07/17/23	9:04:23	9900	56.93
07/17/23	9:34:23	9930	56.94
07/17/23	10:04:23	9960	56.94
07/17/23	10:34:23	9990	56.93
07/17/23	11:04:23	10020	56.93
07/17/23	11:34:23	10050	56.93
07/17/23	12:04:23	10080	56.94
07/17/23	12:34:23	10110	56.93
07/17/23	13:04:23	10140	56.93
07/17/23	13:34:23	10170	56.93
07/17/23	14:04:23	10200	56.94
07/17/23	14:34:23	10230	56.94
07/17/23	15:04:23	10260	56.95

07/17/23	15:34:23	10290	56.95
07/17/23	15:55:00	10320	

Measured Discharge

Date	Clock Time	Elapsed Time **(minutes)**	Measured Discharge **(gallons per minute)**	Comments
7/17/2023	15:55:00	0	0	
	15:56:30	1.5	16	
	16:00:30	5.5	13.3	
	16:02:30	7.5	16	
	23:30:00	455	15	generator quit/restart
7/18/2023	9:25:00	1050	14	
	14:35:00	1360	0	generator quit

Drawdown Phase of Aquifer Test

Drawdown Data for Production Well

Note: Drawdown is the difference between the pumping water level at a specified time after pumping starts and the static water level observed at time = 0. Drawdown values are reported as positive numbers unless the pumping water level rises above the initial static water level.

Date	Clock Time	Time since Pump Started **(minutes)**	Depth to Water from m.p. (to **0.01 foot**)	Drawdown (to **0.01 foot**)	Discharge Measurement (when applicable)	Test Comments
7/17/2023	15:55:30	0.5	58.77	4.01	17.3	
7/17/2023	15:56:00	1	58.80	3.93	17.3	
7/17/2023	15:56:30	1.5	58.72	3.89		
7/17/2023	15:57:00	2	58.68	3.89		
7/17/2023	15:57:30	2.5	58.68	3.89	16.1	
7/17/2023	15:58:00	3	58.68	3.93		
7/17/2023	15:58:30	3.5	58.72	3.96	16.3	
7/17/2023	15:59:00	4	58.75	3.97	16.4	
7/17/2023	15:59:30	4.5	58.76	3.98	16.4	
7/17/2023	16:00:00	5	58.77	3.99		
7/17/2023	16:00:30	5.5	58.78	4.00	16.4	
7/17/2023	16:01:00	6	58.79	4.03		
7/17/2023	16:01:30	6.5	58.82	3.61		
7/17/2023	16:02:00	7	58.40		13.3	
7/17/2023	16:02:30	7.5	58.63	3.84		reset pumping rate
7/17/2023	16:03:00	8	58.74	3.95	16.3	
7/17/2023	16:03:30	8.5	58.80	4.01	16.3	
7/17/2023	16:04:00	9	58.82	4.03		
7/17/2023	16:04:30	9.5			16.2	
7/17/2023	16:05:00	10	58.83	4.04	16.2	
7/17/2023	16:07:00	12	58.87	4.08	16.3	
7/17/2023	16:09:00	14	58.89	4.10	16.3	
7/17/2023	16:11:00	16	58.92	4.13	16.3	
7/17/2023	16:13:00	18				
7/17/2023	16:15:00	20	58.94	4.15	16.3	
7/17/2023	16:20:00	25	58.97	4.18	16.3	
7/17/2023	16:25:00	30	58.97	4.18	16.2	
7/17/2023	16:30:00	35	58.99	4.20	16.1	
7/17/2023	16:35:00	40	59.00	4.21	16.3	
7/17/2023	16:40:00	45	58.99	4.20	16.0	
7/17/2023	16:45:00	50	59.01	4.22	16.1	
7/17/2023	16:50:00	55	59.01	4.22	16.0	
7/17/2023	16:55:00	60	59.01	4.22	16.0	
7/17/2023	17:05:00	70	59.00	4.21	16.0	
7/17/2023	17:15:00	80				
7/17/2023	17:25:00	90	59.08	4.29	16.0	
7/17/2023	17:35:00	100	59.08	4.29	16.0	
7/17/2023	17:45:00	110	59.06	4.27	16.0	
7/17/2023	17:55:00	120 (2 hrs)				
7/17/2023	18:05:00	130	59.07	4.28	16.0	
7/17/2023	18:15:00	140				
7/17/2023	18:25:00	150	59.08	4.29	15.9	
7/17/2023	18:35:00	160				
7/17/2023	18:45:00	170	59.07	4.28	15.9	
7/17/2023	18:55:00	180 (3 hrs)				
7/17/2023	19:25:00	210	59.08	4.29	15.8	
7/17/2023	19:55:00	240 (4 hrs)	59.09	4.30	15.8	
7/17/2023	20:25:00	270	59.10	4.31	15.7	
7/17/2023	20:55:00	300 (5 hrs)	59.10	4.31	15.7	
7/17/2023	21:55:00	360 (6 hrs)	59.15	4.36	15.7	
7/17/2023	22:55:00	420 (7 hrs)	59.14	4.35	15.6	
7/17/2023	23:55:00	480 (8 hrs)	58.87	4.08	14.9	
7/18/2023	0:55:00	540 (9 hrs)	58.91	4.12	14.9	
7/18/2023	1:55:00	600 (10 hrs)	58.93	4.14	14.9	
7/18/2023	2:55:00	660 (11 hrs)	58.93	4.14	14.8	
7/18/2023	3:55:00	720 (12 hrs)	58.94	4.15	14.8	
7/18/2023	4:55:00	780 (13 hrs)	58.92	4.13	14.8	

7/18/2023	5:55:00	840 (14 hrs)	58.94	4.15	14.8	
7/18/2023	6:55:00	900 (15 hrs)	58.93	4.14	14.7	
7/18/2023	7:55:00	960 (16 hrs)	58.92	4.13	14.7	
7/18/2023	8:55:00	1020 (17 hrs)	58.90	4.11	14.6	
7/18/2023	9:55:00	1080 (18 hrs)	58.85	4.06	14.5	
7/18/2023	10:55:00	1140 (19 hrs)	58.80	4.01	14.4	
7/18/2023	11:55:00	1200 (20 hrs)	58.53	3.74	13.7	
7/18/2023	12:55:00	1260 (21 hrs)	58.72	3.93	14.1	
7/18/2023	13:55:00	1320 (22 hrs)	58.72	3.93	14.1	
7/18/2023	14:25:00	1350	58.71	3.92	14.0	
7/18/2023	14:35:00	1360				stop pump
		1620 (27 hrs)				
		1800 (30 hrs)				
		1980 (33 hrs)				
		2160 (36 hrs)				
		2340 (39 hrs)				
		2520 (42 hrs)				
		2700 (45 hrs)				
		2880 (48 hrs)				
		3060 (51 hrs)				
		3240 (54 hrs)				
		3420 (57 hrs)				
		3600 (60 hrs)				
		3780 (63 hrs)				
		3960 (66 hrs)				
		4140 (69 hrs)				
		4320 (72 hrs)				

Recovery Phase of Aquifer Test

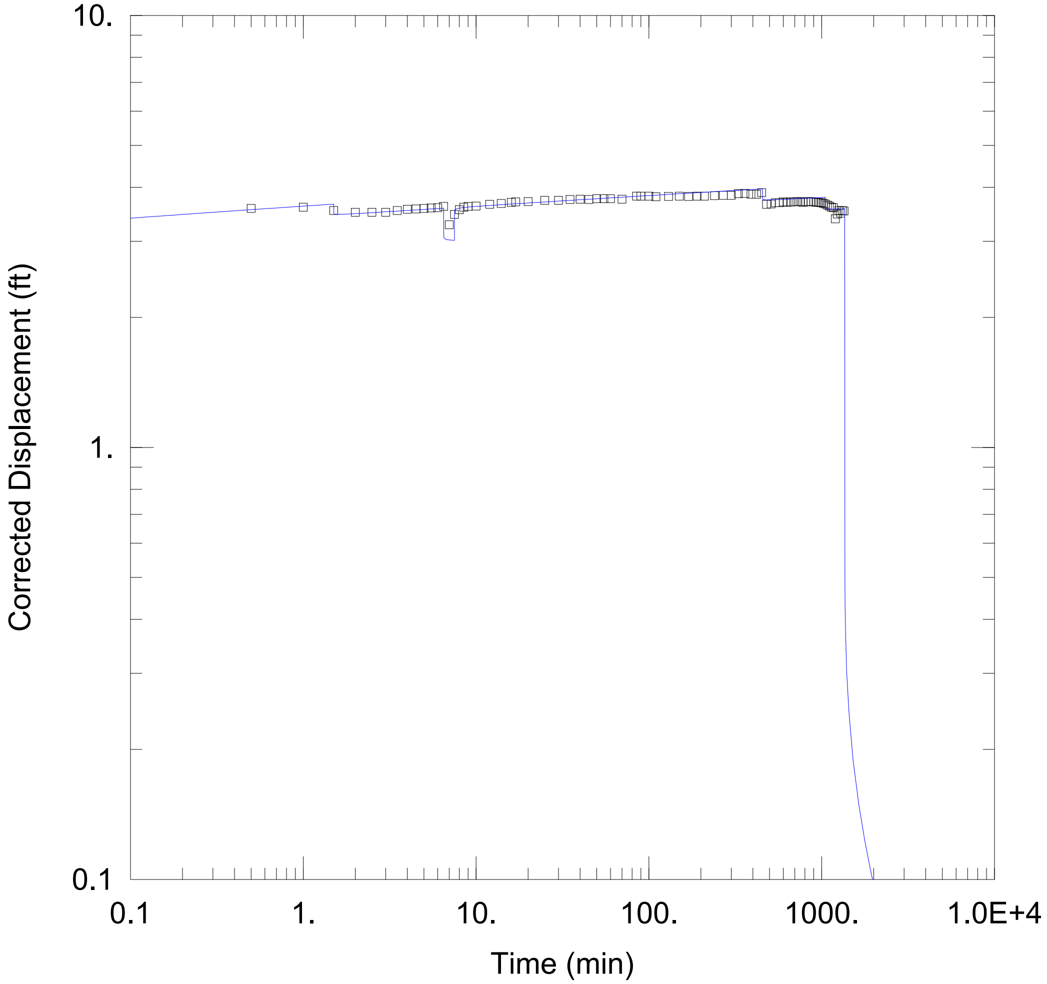
Note: Residual drawdown is the difference between the recovering water level at a specified time after pumping stopped and the static water level prior to pumping at time = 0. Residual drawdown values are reported as positive numbers.

Recovery Data for Production Well			54.79			**14:35**	**pump off**
Date	Clock Time	Time (t) since Pump Started **(minutes)**	Time (t') since Pump Stopped **(minutes)**	t/t'	Depth to Water from m.p. (to **0.01 foot**)	Residual Drawdown (to **0.01 foot**)	Test Comments
7/18/2023	14:35:30	1360.5	0.5				pump off 1360 minutes
7/18/2023	14:36:00	1361.0	1				
7/18/2023	14:36:30	1361.5	1.5				
7/18/2023	14:37:00	1362.0	2				
7/18/2023	14:37:30	1362.5	2.5				
7/18/2023	14:38:00	1363.0	3				
7/18/2023	14:38:30	1363.5	3.5				
7/18/2023	14:39:00	1364.0	4				
7/18/2023	14:39:30	1364.5	4.5				
7/18/2023	14:40:00	1365.0	5				
7/18/2023	14:40:30	1365.5	5.5				
7/18/2023	14:41:00	1366.0	6				
7/18/2023	14:41:30	1366.5	6.5				
7/18/2023	14:42:00	1367.0	7				
7/18/2023	14:42:30	1367.5	7.5				
7/18/2023	14:43:00	1368.0	8				
7/18/2023	14:43:30	1368.5	8.5				
7/18/2023	14:44:00	1369.0	9				
7/18/2023	14:44:30	1369.5	9.5				
7/18/2023	14:45:00	1370.0	10				
7/18/2023	14:47:00	1372.0	12				
7/18/2023	14:48:00	1373.0	13		55.15	0.36	
7/18/2023	14:49:00	1374.0	14		55.15	0.36	
7/18/2023	14:51:00	1376.0	16		55.12	0.33	
7/18/2023	14:52:00	1377.0	17		55.1	0.31	
7/18/2023	14:53:00	1378.0	18		55.1	0.31	
7/18/2023	14:54:00	1379.0	19		55.09	0.3	
7/18/2023	14:55:00	1380.0	20		55.09	0.3	
7/18/2023	14:57:00	1382.0	22		55.08	0.29	
7/18/2023	14:58:00	1383.0	23		55.08	0.29	
7/18/2023	15:00:00	1385.0	25		55.06	0.27	
7/18/2023	15:02:00	1387.0	27		55.05	0.26	
7/18/2023	15:04:00	1389.0	29		55.04	0.25	
7/18/2023	15:05:00	1390.0	30				
7/18/2023	15:06:00	1391.0	31		55.03	0.24	
7/18/2023	15:08:00	1393.0	33		55.02	0.23	
7/18/2023	15:10:00	1395.0	35				
7/18/2023	15:13:00	1398.0	38		55.02	0.23	
7/18/2023	15:15:00	1400.0	40				
7/18/2023	15:18:00	1403.0	43		55.01	0.22	
7/18/2023	15:20:00	1405.0	45				
7/18/2023	15:23:00	1408.0	48		54.99	0.2	end of monitoring
7/18/2023	15:25:00	1410.0	50				
			55				
			60				
			70				
			80				
			90				
			100				
			110				
			120 (2 hrs)				
			140				
			160				
			180 (3 hrs)				
			210				
			240 (4 hrs)				
			270				
			300 (5 hrs)				
			360 (6 hrs)				
			420 (7 hrs)				
			480 (8 hrs)				

			540 (9 hrs)				
			600 (10 hrs)				
			660 (11 hrs)				
			720 (12 hrs)				
			780 (13 hrs)				
			840 (14 hrs)				
			900 (15 hrs)				
			960 (16 hrs)				
			1020 (17 hrs)				
			1080 (18 hrs)				
			1140 (19 hrs)				
			1200 (20 hrs)				
			1260 (21 hrs)				
			1320 (22 hrs)				
			1380 (23 hrs)				
			1440 (24 hrs)				
			1620 (27 hrs)				
			1800 (30 hrs)				
			1980 (33 hrs)				
			2160 (36 hrs)				
			2340 (39 hrs)				
			2520 (42 hrs)				
			2700 (45 hrs)				
			2880 (48 hrs)				
			3060 (51 hrs)				
			3240 (54 hrs)				
			3420 (57 hrs)				
			3600 (60 hrs)				
			3780 (63 hrs)				
			3960 (66 hrs)				
			4140 (69 hrs)				
			4320 (72 hrs)				

Attachment H

AQTESOLV© Pumping Test Solutions



WELL TEST ANALYSIS

Data Set: K:\...\East Helena pumping test PW BB.aqt
Date: 06/07/24 Time: 10:56:25

PROJECT INFORMATION

Company: WET
Client: City of East Helena
Project: 1559-22
Location: East HElena WWTP
Test Well: 227753

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
227753	0	0

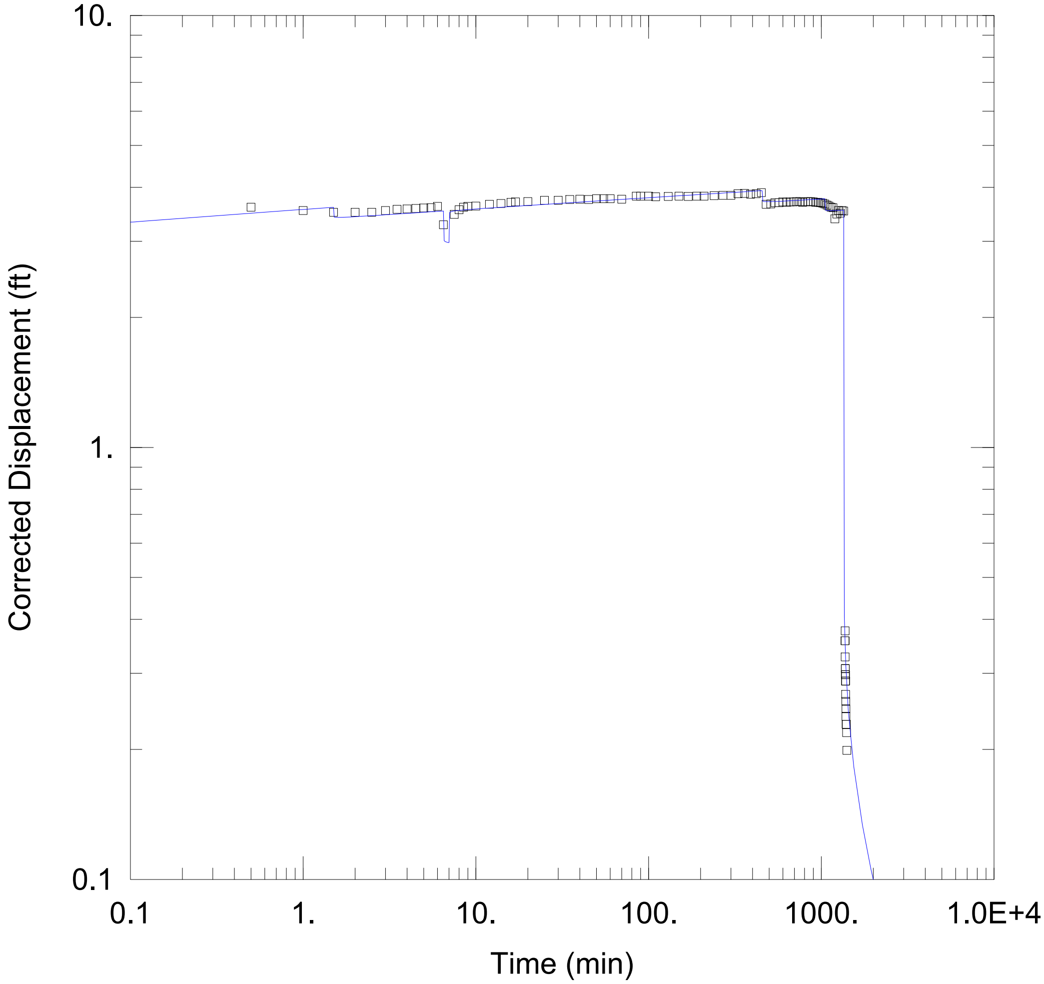
Observation Wells

Well Name	X (ft)	Y (ft)
□ 227753	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 2671. ft^2/day
S = 7.579E-12
Kz/Kr = 1.
b = 19.5 ft



WELL TEST ANALYSIS

Data Set: K:\...\Other solutions East Helena pumping test RECOVERY_BB.aqt
Date: 06/07/24 Time: 10:57:03

PROJECT INFORMATION

Company: WET
Client: City of East Helena
Project: 1559-22
Location: East HElena WWTP
Test Well: 227753

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
227753	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ 227753	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 2571.4 ft^2/day
Kz/Kr = 0.1
S = 5.192E-10
b = 19.5 ft

Attachment I

Monthly Groundwater Contour Maps

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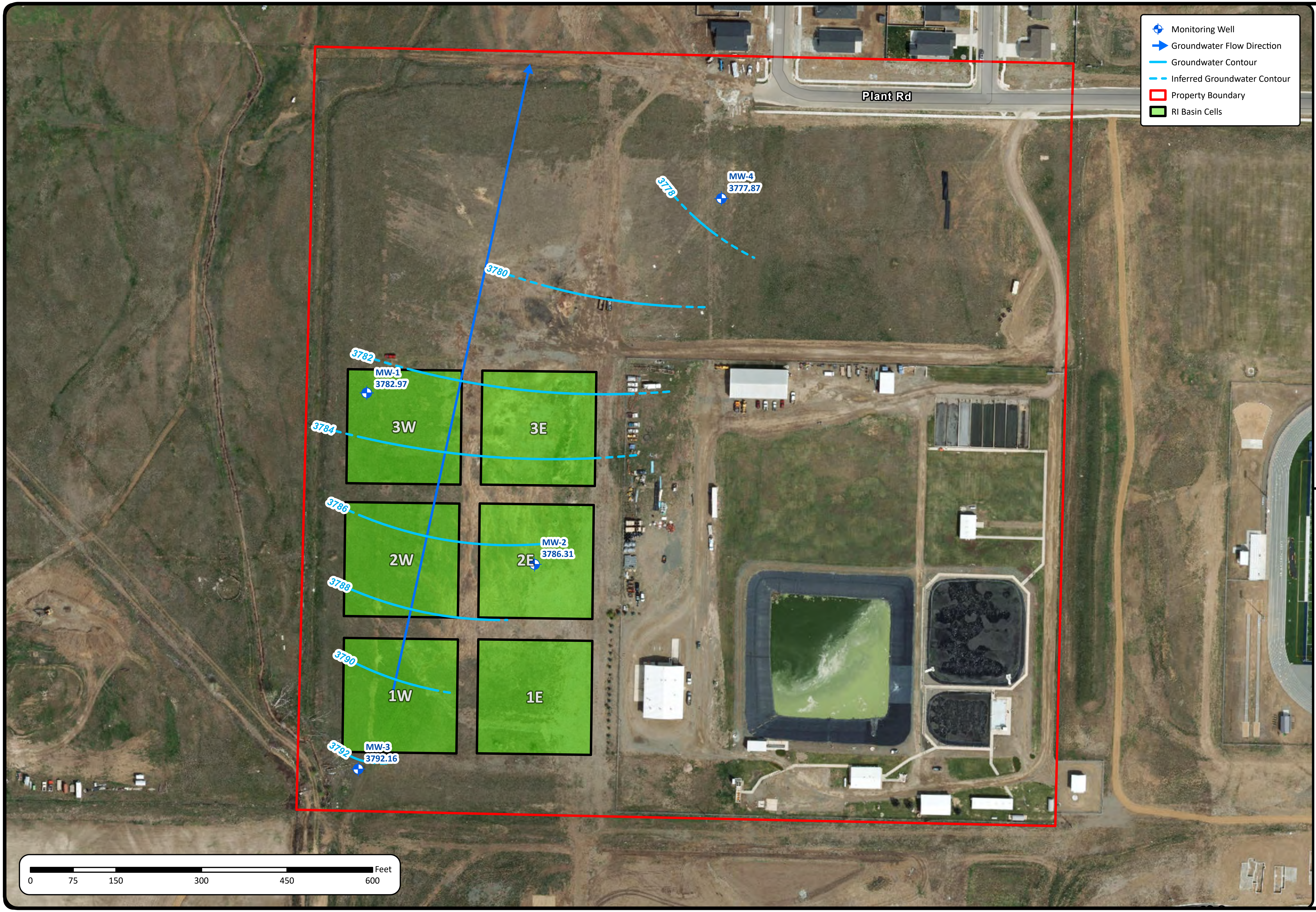

NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	5/5/23	KK	CE
2	SHIFT WELLS AND CONTOURS SOUTHWEST	9/13/23	KK	CE
3	UPDATED CONTOURS	3/5/24	KK	CE
4				
5				

NOTES:

GROUNDWATER ELEVATION - 3/20/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

FIGURE 7

JOB#: 1559-22

DATE:6/27/2024

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author: lgeorge

Water & Environmental TECHNOLOGIES

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NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	5/5/23	KK	CE
2	SHIFT WELLS AND CONTOURS SOUTHWEST	9/13/23	KK	CE
3	ADD GW CONTOURS	9/15/23	CC	CE
4				
5				

NOTES:

GROUNDWATER ELEVATION - 4/25/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

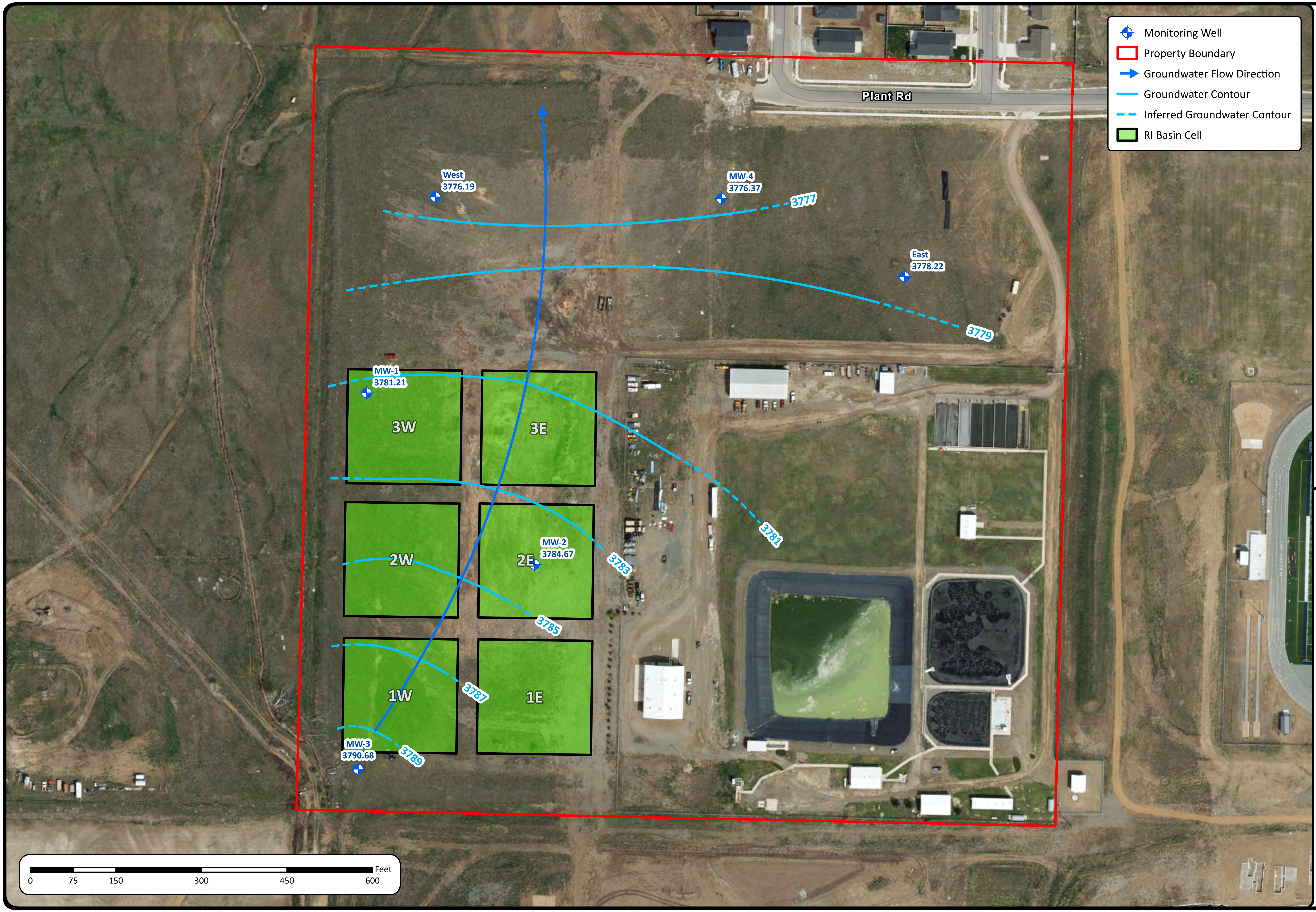
JOB#: 1559-22

DATE:6/27/2024

FIGURE 8

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author: lgeorge

Water & Environmental TECHNOLOGIES



NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	7/27/23	KK	CE
2	CONTOURS	7/28/23	EK	CE
3	SHIFT WELLS AND CONTOURS SOUTHWEST	9/13/23	KK	CE
4				
5				

NOTES:

GROUNDWATER ELEVATION - 5/10/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

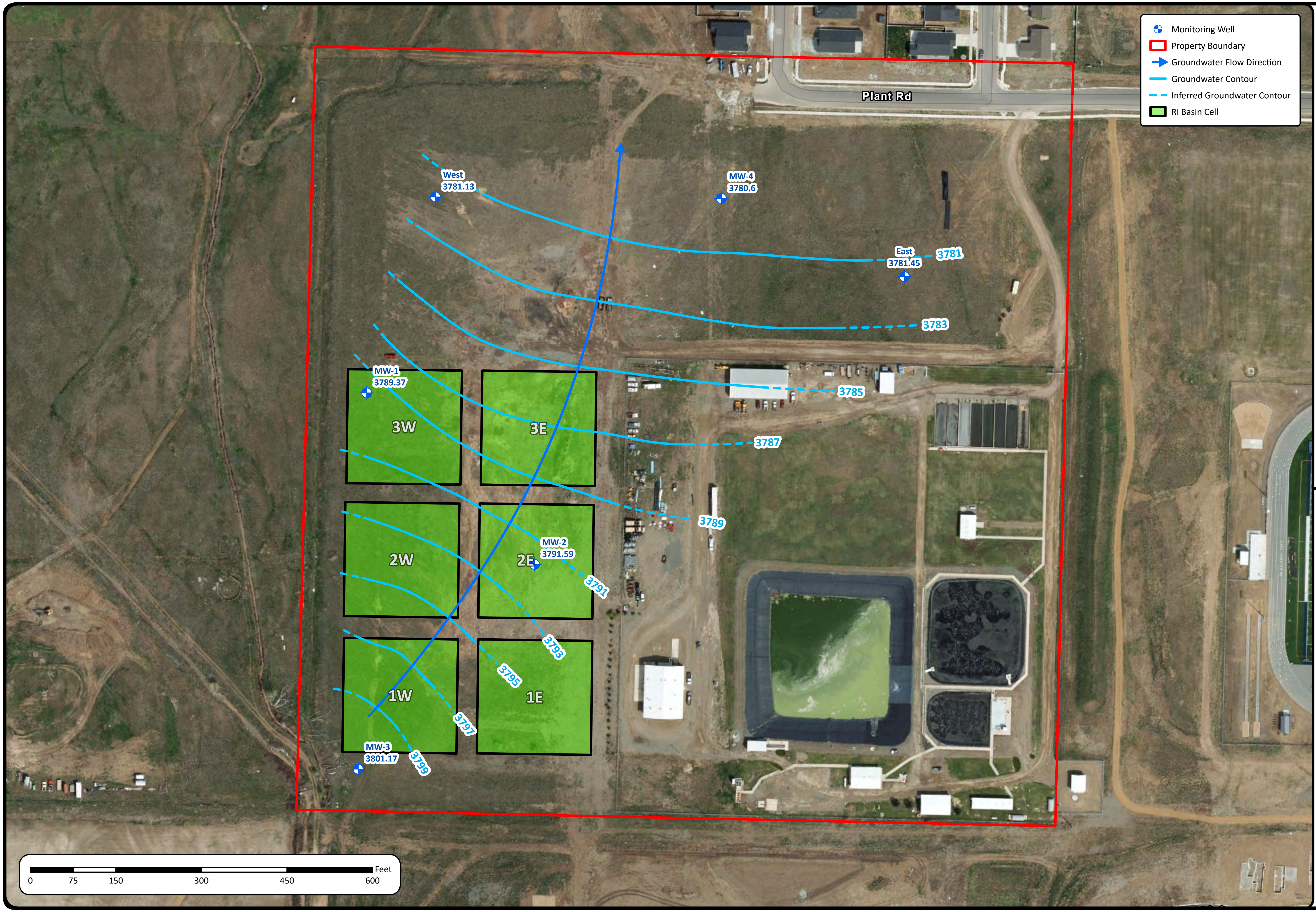
FIGURE 9

JOB#: 1559-22

DATE:6/27/2024

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author: lgeorge

Water & Environmental TECHNOLOGIES



NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	7/27/23	KK	CE
2	CONTOURS	7/28/23	EK	CE
3	SHIFT WELLS AND CONTOURS SOUTHWEST	9/13/23	KK	CE
4				
5				

NOTES:

GROUNDWATER ELEVATION - 6/28/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

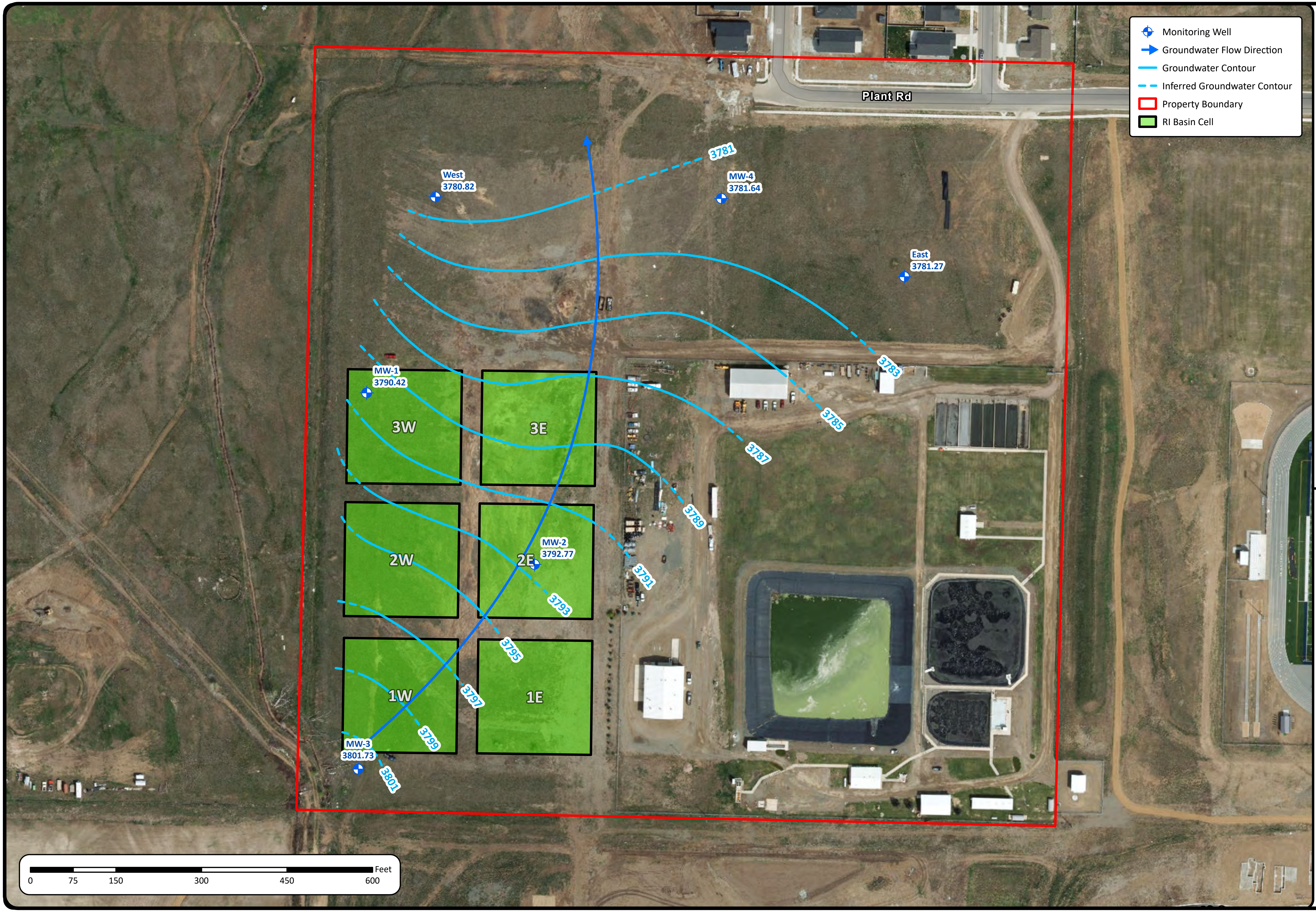
FIGURE 10

JOB#: 1559-22

DATE:6/27/2024

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author: lgeorge

Water & Environmental TECHNOLOGIES



NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	8/9/23	KK	CE
2	SHIFT WELLS AND CONTOURS SOUTHWEST	9/13/23	KK	CE
3	ADD GW CONTOURS	9/15/23	CC	CE
4	CONTOUR UPDATES - EAST/WEST SWITCH	9/22/23	KK	CE
5	CONTOUR ADJUSTMENT	9/25/23	KK	CE

NOTES:

GROUNDWATER ELEVATION - 7/10/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

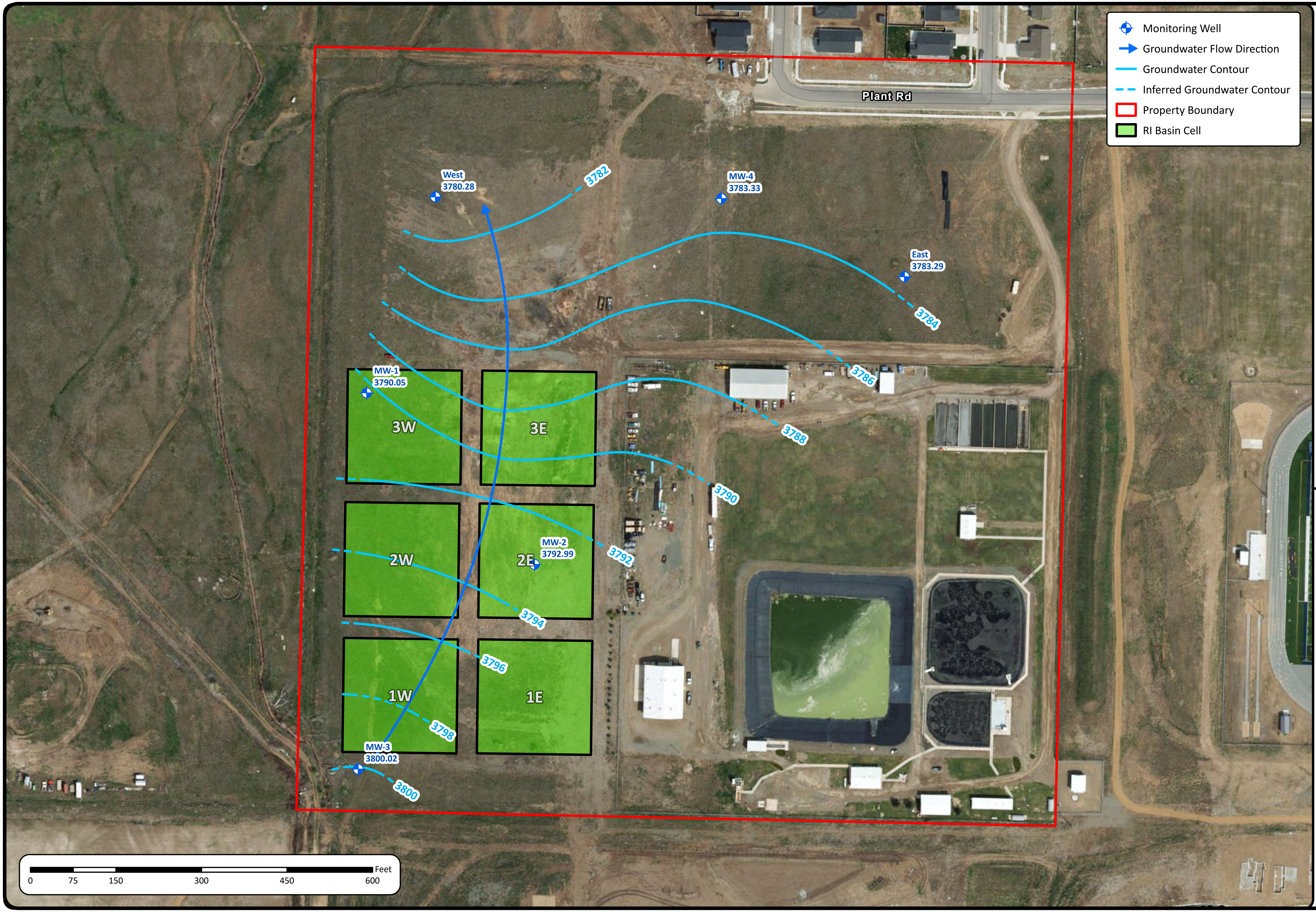
FIGURE 11

JOB#: 1559-22

DATE:6/27/2024

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author: lgeorge

Water & Environmental TECHNOLOGIES



NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	9/18/23	KK	CE
2				
3				
4				
5				

NOTES:

GROUNDWATER ELEVATION - 8/22/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

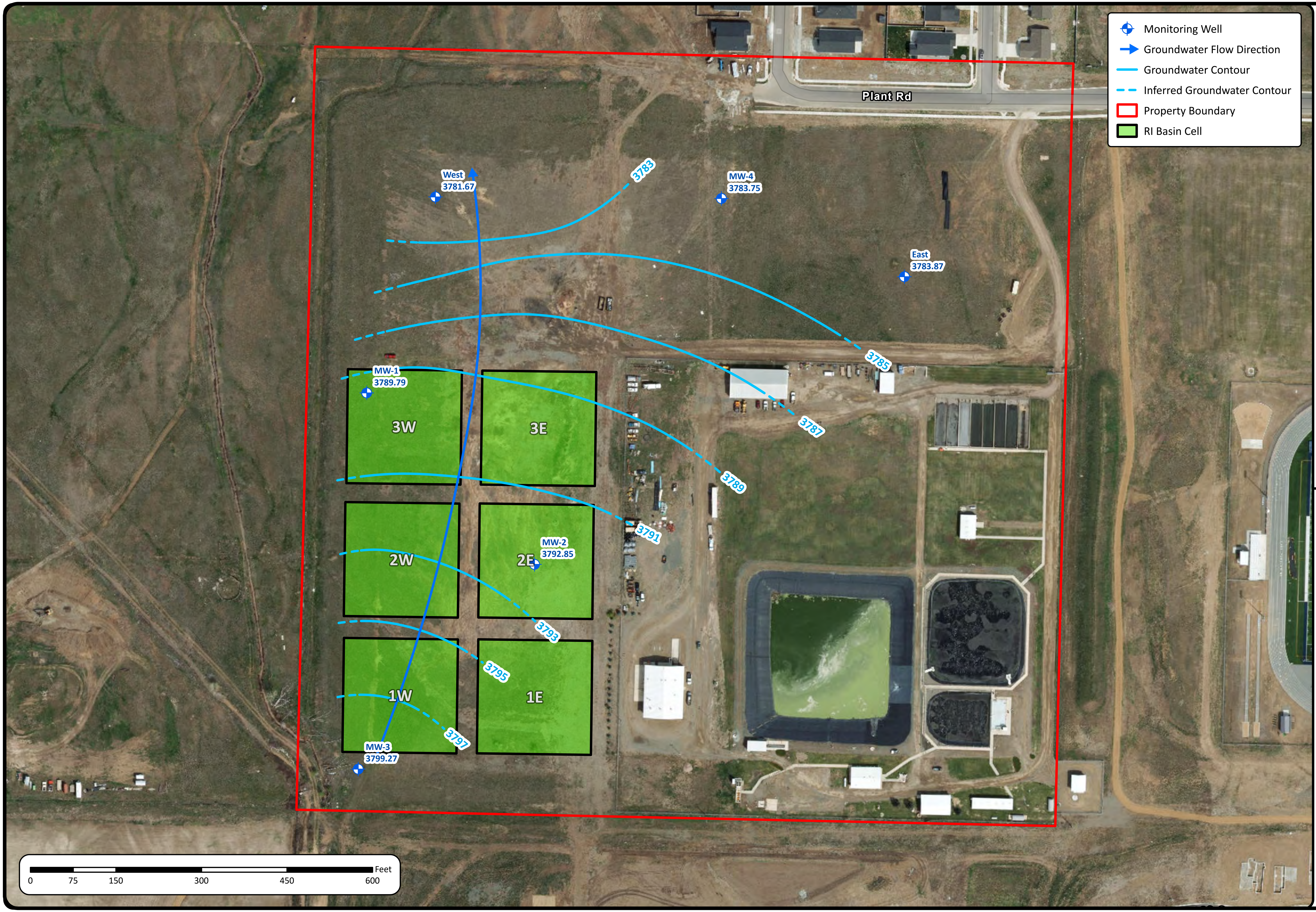
FIGURE 12

JOB#: 1559-22

DATE:6/27/2024

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author: lgeorge

Water & Environmental TECHNOLOGIES



NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	2/1/24	KK	GM
2	ADD CONTOURS	2/12/24	LG	GM
3				
4				
5				

NOTES:

GROUNDWATER ELEVATION - 9/22/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

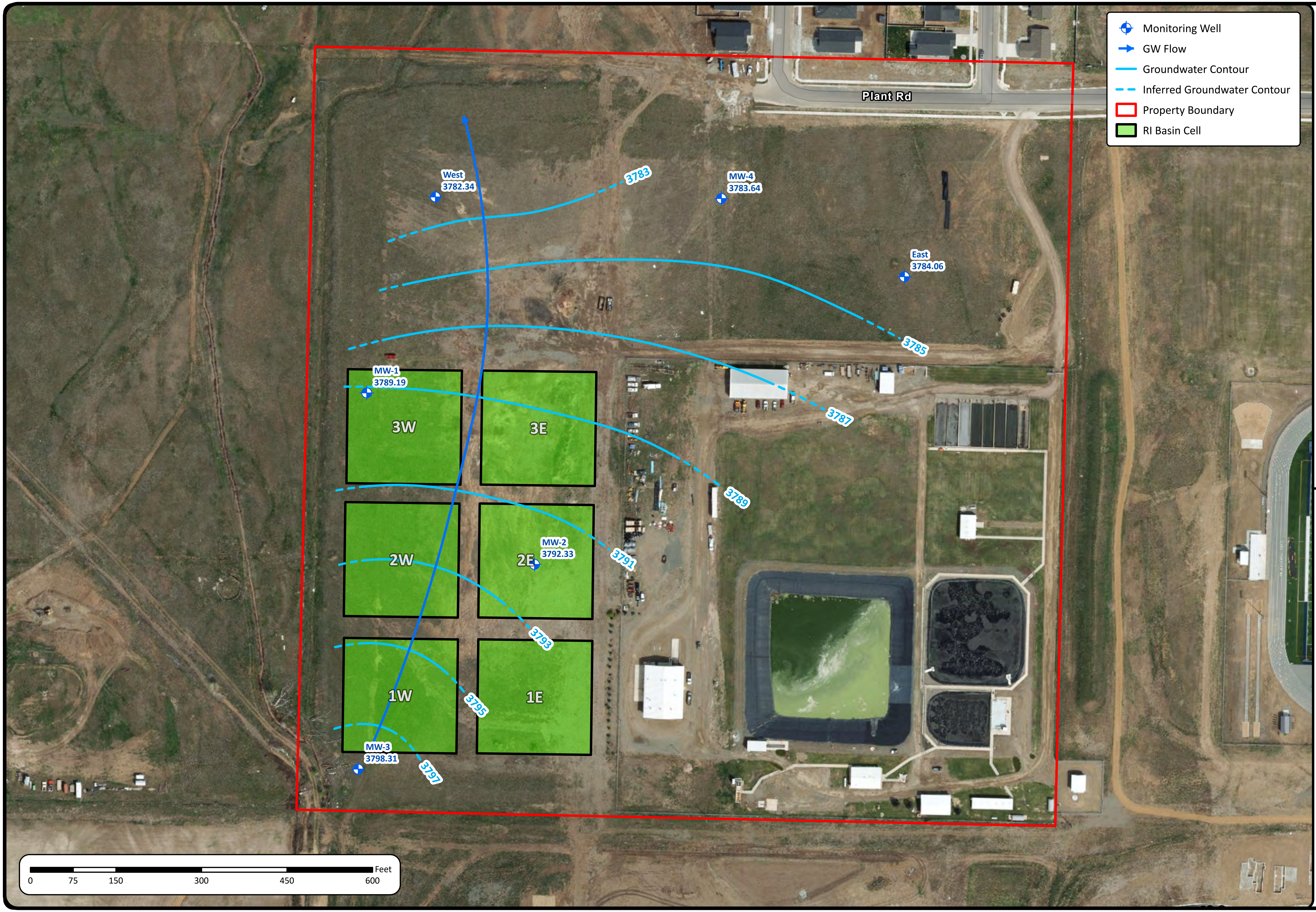
FIGURE 13

JOB#: 1559-22

DATE:6/27/2024

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author: lgeorge

Water & Environmental
TECHNOLOGIES



NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	2/1/24	KK	GM
2	ADD CONTOURS	2/12/24	LG	GM
3				
4				
5				

NOTES:

GROUNDWATER ELEVATION - 10/17/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

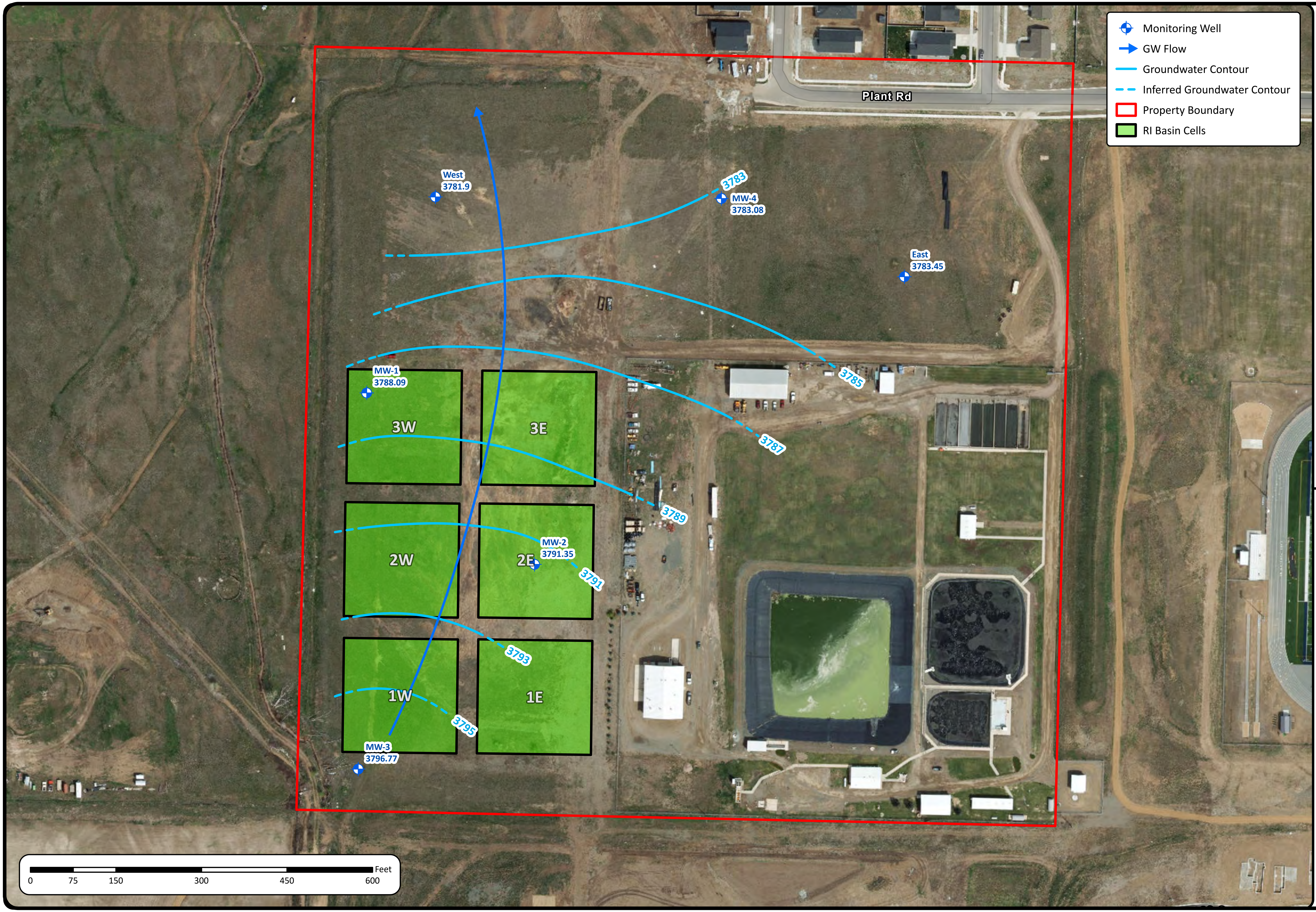
FIGURE 14

JOB#: 1559-22

DATE:6/27/2024

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author: lgeorge

Water & Environmental TECHNOLOGIES



NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	2/1/24	KK	GM
2	ADD CONTOURS	2/12/24	LG	GM
3				
4				
5				

NOTES:

GROUNDWATER ELEVATION - 11/14/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

FIGURE 15

JOB#: 1559-22

DATE:6/27/2024

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author: lgeorge

Water & Environmental
TECHNOLOGIES

Attachment J

DEQ Pathogen Analyses

Appendix J

Pathegen Transport Model

Input Parameters		units			converted	
K	hydraulic conductivity	ft/day	149			from pumping test
i	groundwater gradient	ft/ft	0.0119			from GWE measured data
b	aquifer saturated thickness	ft	19.39			from GWE measured data
d	depth to groundwater	feet	4	cm	121.92	depth to RIB cell
dw	distance to drinking water well	ft	1320			from lot layout - shortest distance from RIB cell to property line
Q	drinking water well pumping rate	gpd	3000	ft3/day	401.0159	total discharge to cell divided by 250gpm
p	annual precipitation	in/year	14.2	cm/year	36.068	local rainfall from NOAA (https://www.ncdc.noaa.gov/cdo-web/datatools/normals)
e	effluent application rate	gpd/sf	4.167	cm/year	6196.329	from discharge divided by RIB area
	soil type		sand and gravel			
n	effective soil porosity	%	0.315			
	volumetric soil moisture content	mL/cm3	0.045			
	virulo soil type					
	soil depth	m				
	virulo virus					
	number of runs					
	highest # of exceedances					
	log equivalent		#NUM!			

Results w/o Virulo:		
Horizontal travel time	4.646768	logs
Vertical travel time - Wyoming	0.012852	logs
Total	**4.65962**	**logs**

Results with Virulo:		
Horizontal travel time	4.646768	logs
Vertical travel time - virulo	#NUM!	
Total	**#NUM!**	**logs**

Attachment K

Infiltration Testing Data Collection

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NO.	DESCRIPTION	DATE	DRAFT	REVIEW
1	MAP CREATION	4/6/23	KK	GE
2	SHIFT WELLS AND CONTOURS SOUTHWEST	9/13/23	KK	GE
3				
4				
5				

NOTES:

GROUNDWATER ELEVATION - 3/20/2023

3301 PLANT RD, EAST HELENA, MT 59635 - LEWIS & CLARK COUNTY

FIGURE 5

JOB#: 1559-22

DATE:9/19/2023

Path: M:\0 Kalispell\1559-22 East Helena Discharge Permit\GIS\ProjectFigures\ProjectFigures.aprx, Author: kkrasen

Water & Environmental
TECHNOLOGIES

EAST HELENA WWTP - GW DISPOSAL PERMITTING

DOUBLE RING INFILTROMETER TEST RESULTS

Test #	Northing (ft)	Easting (ft)	Infiltration (cm)	Flow Volume (cm^3)	Area Inner ring (cm^2)	Time (hr)	cm/hr	in/min	min/in	feet/year	gal (yr*ft^2)
INF-3E	867,711.502	1,359,847.427	2.6	130.0	30.48	0.03	128.0	0.8	1.2	36,773.6	275,103.5
INF-2E	867,532.983	1,359,841.882	1.2	60.0	30.48	0.03	59.1	0.4	2.6	16,972.4	126,970.8
INF-1E	876,620.500	1,108,765.621	0.8	40.0	30.48	0.03	39.4	0.3	3.9	11,315.0	84,647.2
INF-3W	867,733.616	1,359,604.305	0.5	25.0	30.48	0.03	24.6	0.2	6.2	7,071.9	52,904.5
INF-2W	867,522.156	1,359,602.763	2.2	110.0	30.48	0.03	108.3	0.7	1.4	31,116.1	232,779.9
INF-1W	867,234.543	1,359,586.325	2.1	105.0	30.48	0.03	103.3	0.7	1.5	29,701.8	222,199.0

	in/hr	2% of rate (in/hr)	2% of rate (in/day)	2% of rate gpd/cell	4% of rate (in/hr)	4% of rate (in/day)	4% of rate gpd/cell
	50.4	1.0	24.2	602,889	2.0	48.4	1,205,778
	23.3	0.5	11.2	278,257	0.9	22.3	556,513
	15.5	0.3	7.4	185,504	0.6	14.9	371,009
	9.7	0.2	4.7	115,940	0.4	9.3	231,880
	42.6	0.9	20.5	510,137	1.7	40.9	1,020,274
	40.7	0.8	19.5	486,949	1.6	39.1	973,898
avg	**30.4**	**0.6**	**14.6**	**363,279**	**1.2**	**29.1**	**726,559**
mean	**25.9**	**0.5**	**12.5**	**310,509**	**1.0**	**24.9**	**621,017**
median	**32.0**	**0.6**	**15.3**	**382,603**	**1.3**	**30.7**	**765,206**
min	**9.7**	**0.2**	**4.7**	**115,940**	**0.4**	**9.3**	**231,880**
max	**50.4**	**1.0**	**24.2**	**602,889**	**2.0**	**48.4**	**1,205,778**

East Helena WWTP - I/P Cell Site Investigation

Test Pit & Infiltration Test Elevations

Description	ID	Point #	Ground Elev.	Depth (ft) to Sand & Gravel	Elevation of Sand & Gravel
I/P Cell 1E Test Pit	TP1E	31011	3839.84	4.0	3835.84
I/P Cell 1E Infiltration Test	IT1E	31010	3839.35		
I/P Cell 1W Test Pit	TP1W	31008	3839.46	4.0	3835.46
I/P Cell 1W Infiltration Test	IT1W	31007	3837.95		
I/P Cell 2E Test Pit	TP2E	31012	3836.73	3.0	3833.73
I/P Cell 2E Infiltration Test	IT2E	31015	3836.56		
I/P Cell 2W Test Pit	TP2W	31005	3836.63	3.0	3833.63
I/P Cell 2W Infiltration Test	IT2W	31006	3837.60		
I/P Cell 3E Test Pit	TP3E	31017	3836.10	3.0	3833.10
I/P Cell 3E Infiltration Test	IT3E	31016	3835.83		
I/P Cell 3W Test Pit	TP3W	31003	3835.50	3.0	3832.50
I/P Cell 3W Infiltration Test	IT3W	31004	3836.82		

From: Sean Harris
To: Michael Browne; Jeremy Perlinski
Subject: RE: EH WWTP - I/P cell site investigation
Date: Monday, November 20, 2023 9:33:33 AM
Attachments: image003.png
image006.png

Good Morning,

I will be available to meet tomorrow as well.

Test pit investigation in summary (note depths are approximate):

A very thin layer of topsoil (generally less than 3 inches) was noted site wide.

Northmost BHs (BH-01 and BH-02)

Clayey sand with gravel and cobbles	~ 0-1.5 feet
Clay liner (white with reddish oxidized zones)	~ 1.5-2 feet (this varies slightly but the liner is between 4 and 6 inches thick)
Clayey sand with gravel and cobbles	~ 2-3 feet (looks like the material above the liner)
Poorly-graded sand with gravel and cobbles	~ 3-10 feet

Middle BHs (BH-03 and BH-04)

Clayey sand with gravel and cobbles	~ 0-2.5 or 3 feet
Clay liner	~ 2.5-3 feet
Poorly-graded sand with gravel and cobbles	~ 3-10 feet

Southmost BHs (BH-05 and BH-06)

Clayey sand with gravel and cobbles	~ 0-4 feet
Clay liner	~ 4-4.5 feet
Poorly-graded sand with gravel and cobbles	~ 4-10 feet

The most restrictive soil for hydraulic conductivity (other than the liner) would be the clayey sands found above the liner. The soils below the liner are coarse grained and are anticipated to be free draining.

Please let me know if you have any questions or if I can clarify anything further.

Sean,

PIONEER TECHNICAL SERVICES, INC.

Sean Harris, E.I. | Geotechnical Engineer
Pioneer Technical Services Inc. | 3241 Colonial Drive | Helena, MT 59601
(406)-723-1908 Ext 8318|Cell: (406) 465-4802 | sharris@pioneer-technical.com

Attachment L

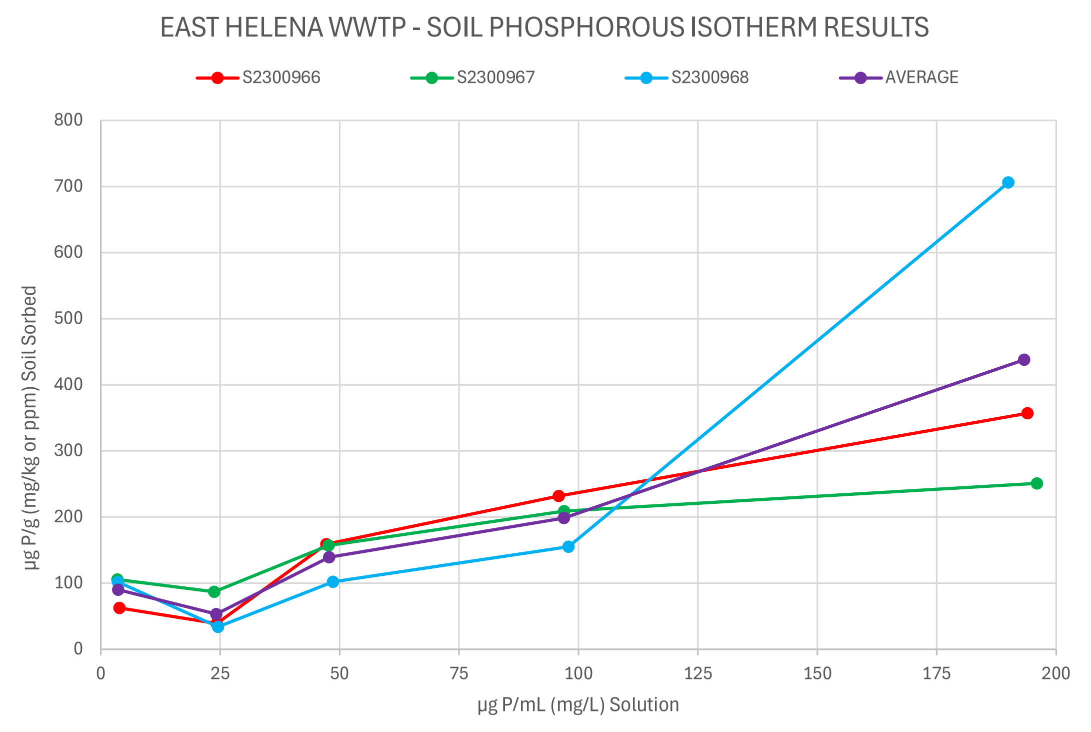
Phosphorous Adsorption Testing Analyses

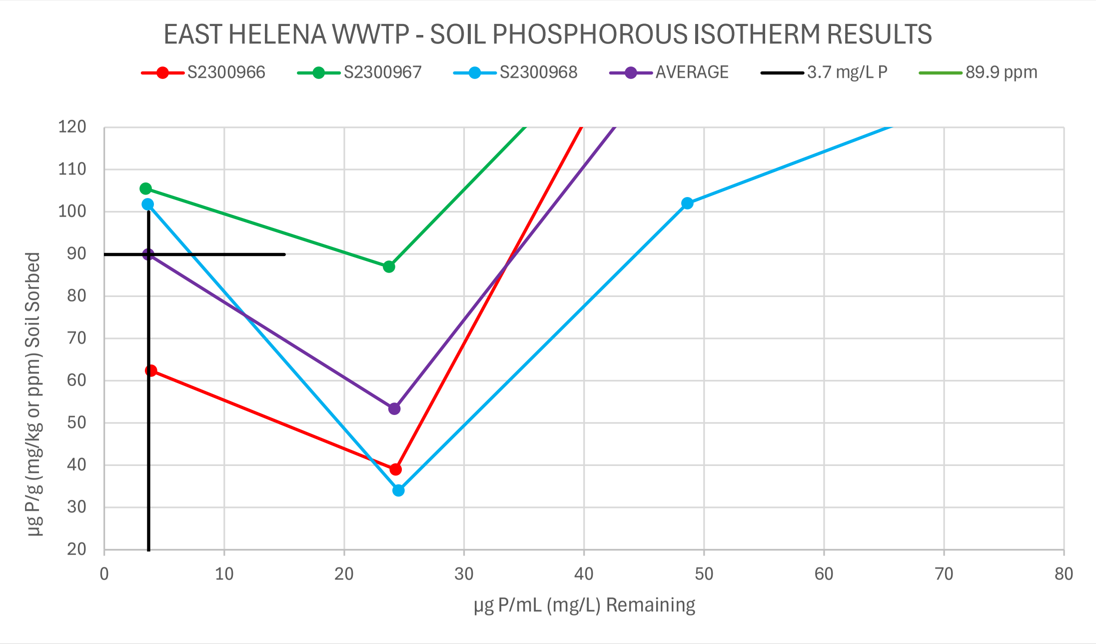
EAST HELENA WWTP - GW DISPOSAL PERMITTING

SOIL PHOSPHOROUS ISOTHERM

Sample Code	Solution (µg P/mL)	Soil Sorbed (µg P/g)
S2300966		
A5	3.9	62.4
A25	24.3	39.0
A50	47.2	159.0
A100	95.9	232.0
A200	194.0	357.0
S2300967		
B5	3.5	105.5
B25	23.7	87.0
B50	47.7	157.0
B100	97.0	209.0
B200	196.0	251.0
S2300968		
C5	3.6	101.8
C25	24.5	34.0
C50	48.6	102.0
C100	97.9	155.0
C200	190.0	706.0
AVERAGE		
AVG5	3.7	89.9
AVG25	24.2	53.3
AVG50	47.8	139.3
AVG100	96.9	198.7
AVG200	193.3	438.0

WWTP Secondary Effluent TP	2.7 mg/L P	(Aug-Nov 2023)
Minimum TP Testing Value	3.7 mg/L P	
Average TP Adsorption	89.9 ppm	





Analytical Sciences Laboratory
University of Idaho
Holm Research Center
875 Perimeter Dr. MS 2203
Moscow, Idaho 83844-2203
Phone: (208) 885-7466 Email: asl@uidaho.edu
http://www.uidaho.edu/cals/analytical-sciences-laboratory

Certificate of Analysis

Prepared For: Michael Browne
Pioneer Technical Services - Helena
3241 Colonial Drive

Helena, MT 59601

Case ID: **SDEC23-004**
Report Date: 22-Jan-24
Date Received: 26-Dec-23
Client Ref.: Bill
Project ID:

1st Level QC: Date: 1/22/24
2nd Level QC: Date: 1-22-24

Case Comments:

ND = Not Detected NA = Not Applicable RL = Reporting Limit QNS = Quantity Not Sufficient

Client ID: INF-IE
ASL Sample ID: S2300966

Site:
Ref/Loc.:
Matrix: Solid - Dry Weight

Collected by:
Collect Date: 26-Dec-23 10:21 AM

Phosphorus Isotherm

Method: ICP
Prep: N/A
Pres: None
Filter: N/A
Prep Date: N/A
Analysis Date: 17-Jan-24

	Results	RL
Phosphorus	**See Attached Sheets**	—

Client ID: INF-2W
ASL Sample ID: S2300967

Site:
Ref/Loc.:
Matrix: Solid - Dry Weight

Collected by:
Collect Date: 26-Dec-23 10:21 AM

Phosphorus Isotherm

Method: ICP
Prep: N/A
Pres: None
Filter: N/A
Prep Date: N/A
Analysis Date: 17-Jan-24

	Results	RL
Phosphorus	**See Attached Sheets**	—

Client ID: INF 3E
ASL Sample ID: S2300968

Site:
Ref/Loc.:
Matrix: Solid - Dry Weight

Collected by:
Collect Date: 26-Dec-23 10:21 AM

Phosphorus Isotherm

Method: ICP
Prep: N/A
Pres: None
Filter: N/A
Prep Date: N/A
Analysis Date: 17-Jan-24

	Results	RL
Phosphorus	**See Attached Sheets**	—

Samples will be discarded one month after date of final report unless otherwise requested.

ND = Not Detected NA = Not Applicable RL = Reporting Limit QNS = Quantity Not Sufficient

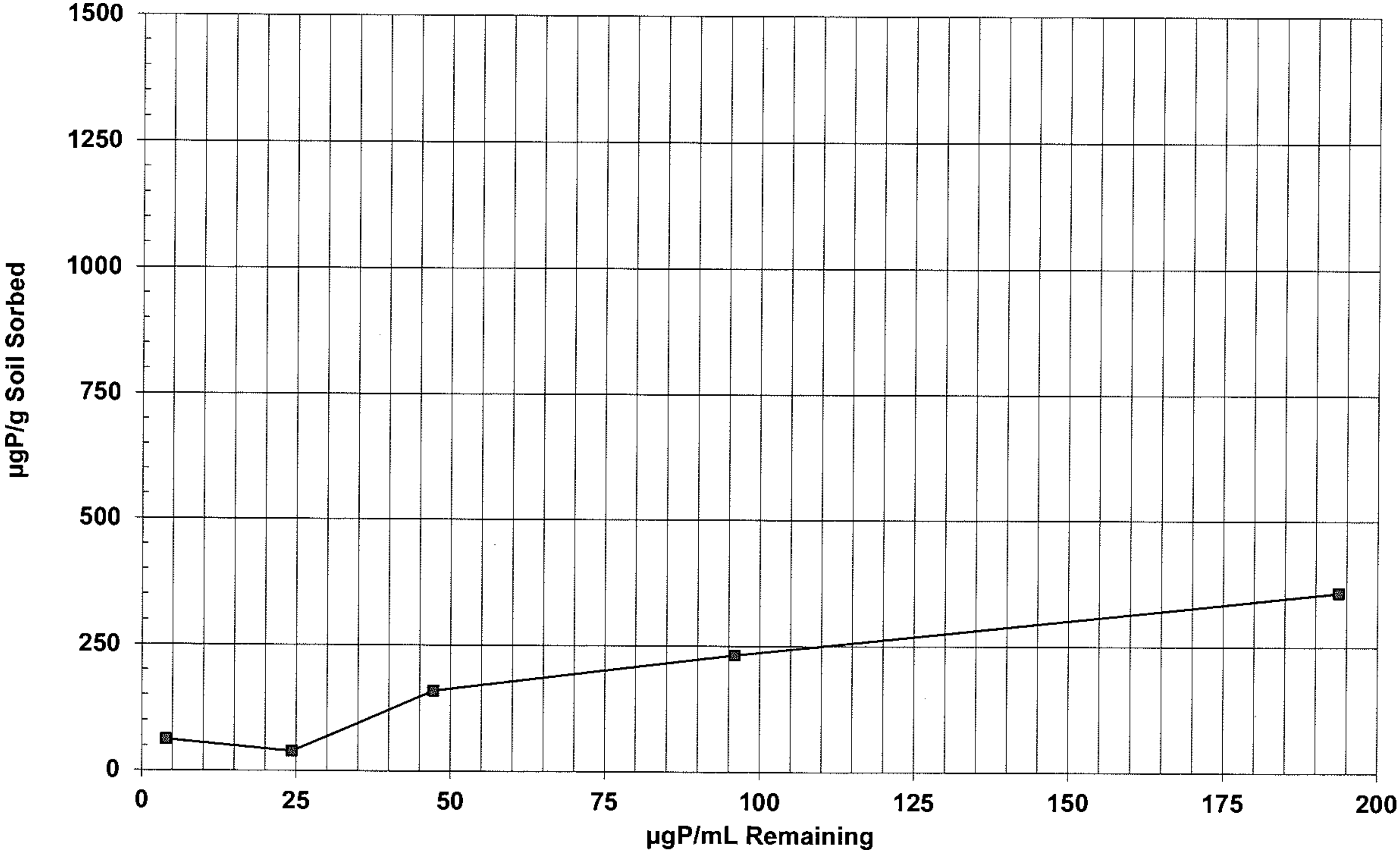
Soil Phosphorus Isotherm
SOP: SMM.85.120.07

Form Verified By/Date: 1-22-24

Sample ID	Sample Code	Wt.(g)	Conc. µg	Conc. Dup. µg	Multiplier	Solution µg P/mL	Soil Sorbed	CHART
						X	Y	
S2300966	**A5**	0.441	3.822	3.976	1	3.90	62.4	A
	A25	0.441	24.350	24.260	1	24.3	39	
	A50	0.441	47.100	47.290	1	47.2	159	
	A100	0.441	97.200	94.630	1	95.9	232	
	A200	0.441	193.600	193.800	1	194	357	
						X	Y	
S230967	**B5**	0.363	3.554	3.381	1	3.4675	105.5	B
	B25	0.363	23.800	23.680	1	23.74	87	
	B50	0.363	48.340	47.090	1	47.7	157	
	B100	0.363	96.180	97.750	1	97.0	209	
	B200	0.363	202.800	189.900	1	196	251	
						X	Y	
S230968	**C5**	0.338	3.597	3.649	1	3.6230	101.8	C
	C25	0.338	24.600	24.470	1	24.54	34	
	C50	0.338	48.290	48.950	1	48.6	102	
	C100	0.338	100.000	95.800	1	97.9	155	
	C200	0.338	188.800	192.100	1	190	706	

Form Verified By/Date: 1-22-24

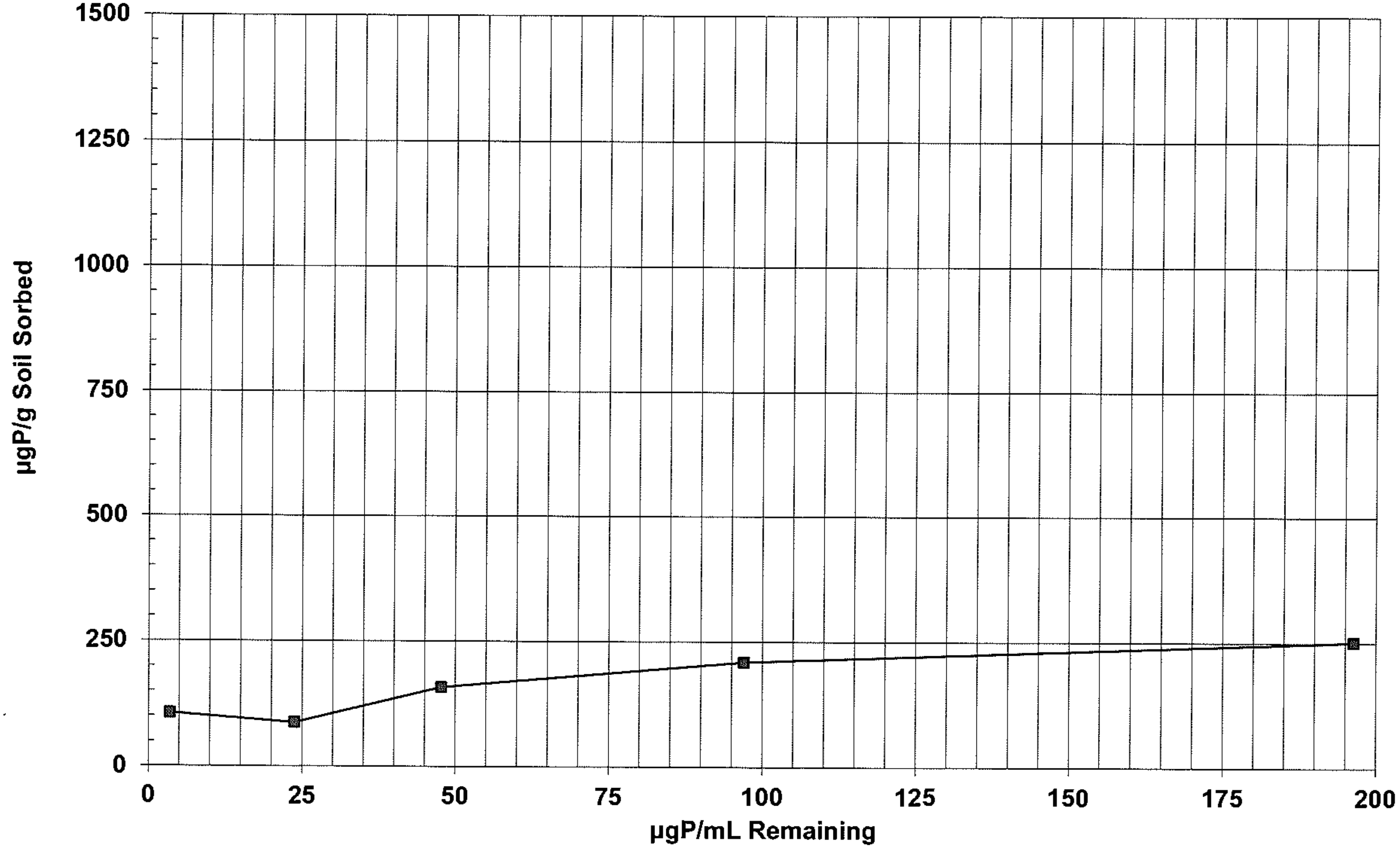
P Isotherm of S2300966



Soil Phosphorus Isotherm
SOP: SMM.85.120.07

Form Verified By/Date: NK 1-22-24

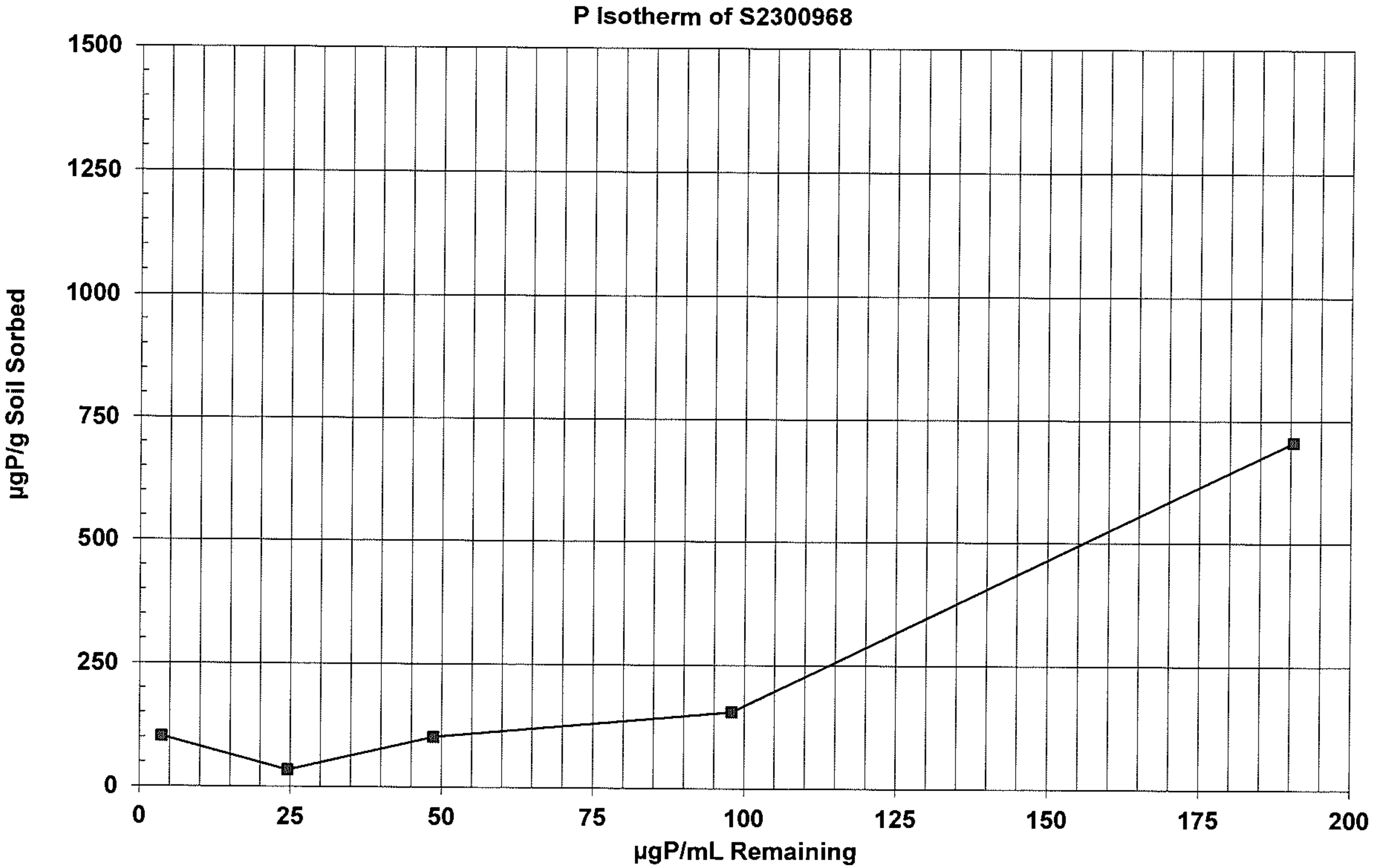
P Isotherm of S2300967



Soil Phosphorus Isotherm
SOP: SMM.85.120.07

Form Verified By/Date: 1-22-24

P Isotherm of S2300968



Soil Phosphorus Isotherm
SOP: SMM.85.120.07
https://vandalsuidaho.sharepoint.com/sites/Storage-CALS/Documents/ASL/P/Soil/SPDSHTS/[PISOWT.XLS]mult trays

Form Verified By/Date: 1-22-24

Phosphorus Isotherm Weights

Sample #	Tray & Sample Before Grinding (g)	After Grinding (g)	Before Tray Weight (g)	After Tray Weight (g)	Sample Soil & Rock (g)	Sample Soil (g)	Amount to be weighed (g)	% coarse fragment (>2 mm)
S2300966	1426.7	828.8	109.8	109.8	---	---	---	---
	1797	701	115.3	115.3	---	---	---	---
	1624.6	800	121	121	---	---	---	---
					---	---	---	---
total	4848.3	2329.8	346.1	346.1	4502.2	1983.7	0.441	55.939
S2300967	2054.2	677.1	118.2	118.2	---	---	---	---
	2146.6	839.4	121.2	121.2	---	---	---	---
	2225.6	1039.6	115.8	115.8	---	---	---	---
					---	---	---	---
total	6426.4	2556.1	355.2	355.2	6071.2	2200.9	0.363	63.749
S2300968	2240.7	690	124.6	124.6	---	---	---	---
	1945.9	663.3	109.9	109.9	---	---	---	---
	2040.1	982.5	111.4	111.4	---	---	---	---
					---	---	---	---
total	6226.7	2335.8	345.9	345.9	5880.8	1989.9	0.338	66.163

From: Foster, Ryan (rfoster@uidaho.edu)
To: Jeremy Perlinski
Cc: asl; Michael Browne; Sean Harris
Subject: RE: Phosphorus Adsorption Isotherm Testing
Date: Wednesday, February 7, 2024 5:18:38 PM
Attachments: image001.png
image002.png
image003.png
image004.png
image005.png
image008.png

Jeremy,

Sorry for the delay in getting back to you. I was out with covid and am just getting caught back up.

To answer the second part of your email, the values have been adjusted to account for the course fraction %. If you look at the last page of the packet you received the 2nd column from the right shows the amount of soil that was tested. If there is no course fraction removed, we would analyze 1g of soil. In the case of your samples, we ran 0.441, 0.363, and 0.338g. The course fraction adjustment was done on the front end instead of the back.

For the first part of your email, I have not been able to get any good information for you on course soils. Internally, we have not run this analysis enough to have a good library of data.

It is good to know the way Montana DEQ has the calculation determined though. In the future for Montana DEQ based work, we can possibly add an additional point around 10mg/L with the typical range that we run.

Is there any benefit for us to do a particle size analysis for you and determine the soil classification? We typically charge $38 +8 for dry/grind.

Thanks,

RYAN FOSTER
Laboratory Services Manager

College of Agricultural and Life Sciences
Analytical Sciences Laboratory
Office: Holm 22
rfoster@uidaho.edu
https://www.uidaho.edu/cals/analytical-sciences-laboratory
(208)885-5647
875 Perimeter Drive MS 2203 | Moscow Idaho 83844-2203 | United States

University of Idaho

From: Jeremy Perlinski <jperlinski@rpa-hln.com>
Sent: Wednesday, January 31, 2024 8:58 AM
To: Foster, Ryan (rfoster@uidaho.edu) <rfoster@uidaho.edu>

Cc: asl <asl@uidaho.edu>; Michael Browne <mbrowne@pioneer-technical.com>; Sean Harris <sharris@pioneer-technical.com>
Subject: RE: Phosphorus Adsorption Isotherm Testing

That sounds great. Thanks Ryan!

Jeremy

From: Foster, Ryan (rfoster@uidaho.edu) <rfoster@uidaho.edu>
Sent: Wednesday, January 31, 2024 8:47 AM
To: Jeremy Perlinski <jperlinski@rpa-hln.com>
Cc: asl <asl@uidaho.edu>; Michael Browne <mbrowne@pioneer-technical.com>; Sean Harris <sharris@pioneer-technical.com>
Subject: RE: Phosphorus Adsorption Isotherm Testing

Jeremy,

Let me reach out to a few people regarding your email. Hope to get back to you early next week if that is ok.

Thanks!
-Ryan

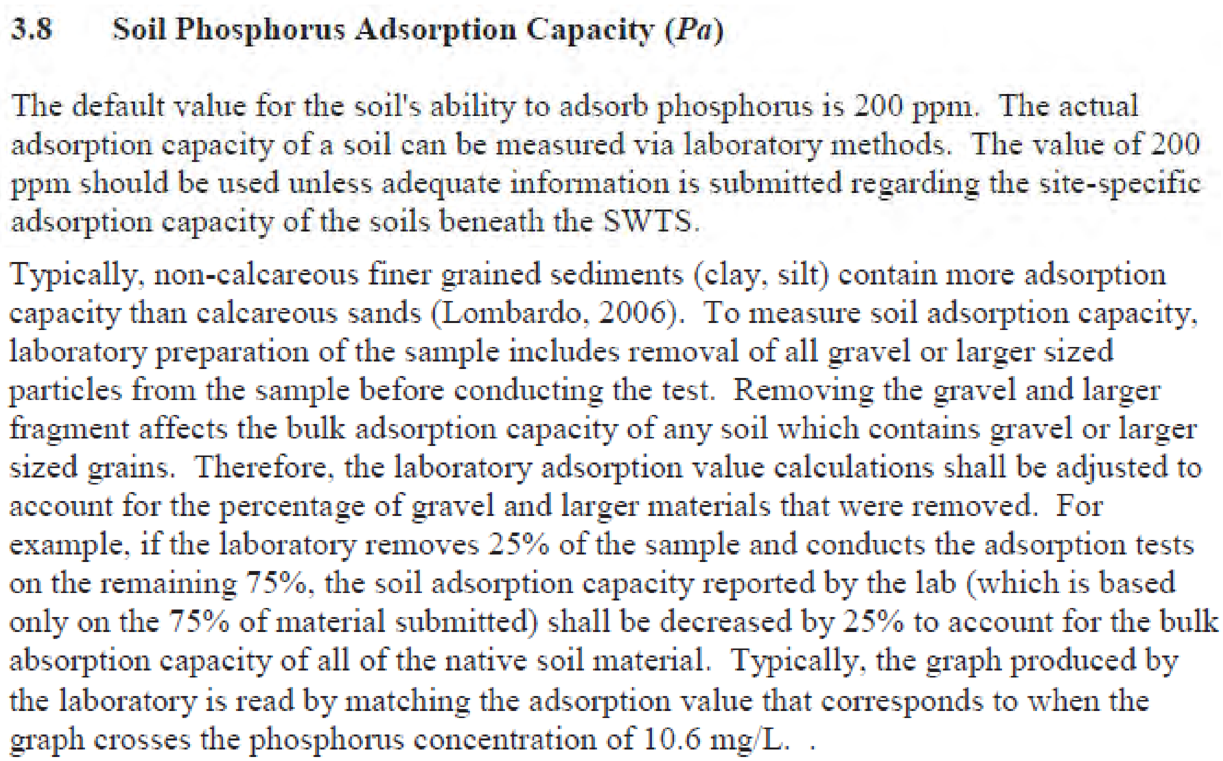
From: Jeremy Perlinski <jperlinski@rpa-hln.com>
Sent: Wednesday, January 31, 2024 7:44 AM
To: Foster, Ryan (rfoster@uidaho.edu) <rfoster@uidaho.edu>
Cc: asl <asl@uidaho.edu>; Michael Browne <mbrowne@pioneer-technical.com>; Sean Harris <sharris@pioneer-technical.com>
Subject: Phosphorus Adsorption Isotherm Testing

Hey Ryan,

We received the results for the phosphorous adsorption isotherm testing for our project in East Helena, MT and I had a few follow up questions that I was hoping you could answer. Montana DEQ uses a standard phosphorous adsorption capacity of 200 ppm (equivalent to 200 µg P/g) for soils at a concentration of 10.6 mg/L when calculating phosphorous breakthrough in their non-deg analysis (see below). Looking at some literature on this topic, this seems like a reasonable assumption for fine grained soils. However, I did not find much information on standard values for coarse grained soils such as we have in East Helena. Based on your lab's experience, do the isotherm values for our sample (which are significantly lower than fine grained soils) seem representative of rockier soils?

DEQ's non-deg manual also requires the laboratory adsorption values to be adjusted to account for the percentage of gravel or larger material that were removed from the sample prior to testing (see below). When looking at the results you submitted, it appears that the percentage of coarse fragments in the three samples varied from roughly 56% to 66%. Using DEQ's guidance, we intend to reduce the isotherm values provided by 62% which is the average of the three samples. Can you please confirm that you have not already reduced the values shown on the isotherms to account for the percentage of soil that was removed prior to running the tests? Let me know if this doesn't make sense. Thanks,

Jeremy



3.8 Soil Phosphorus Adsorption Capacity (*Pa*)

The default value for the soil's ability to adsorb phosphorus is 200 ppm. The actual adsorption capacity of a soil can be measured via laboratory methods. The value of 200 ppm should be used unless adequate information is submitted regarding the site-specific adsorption capacity of the soils beneath the SWTS.

Typically, non-calcareous finer grained sediments (clay, silt) contain more adsorption capacity than calcareous sands (Lombardo, 2006). To measure soil adsorption capacity, laboratory preparation of the sample includes removal of all gravel or larger sized particles from the sample before conducting the test. Removing the gravel and larger fragment affects the bulk adsorption capacity of any soil which contains gravel or larger sized grains. Therefore, the laboratory adsorption value calculations shall be adjusted to account for the percentage of gravel and larger materials that were removed. For example, if the laboratory removes 25% of the sample and conducts the adsorption tests on the remaining 75%, the soil adsorption capacity reported by the lab (which is based only on the 75% of material submitted) shall be decreased by 25% to account for the bulk absorption capacity of all of the native soil material. Typically, the graph produced by the laboratory is read by matching the adsorption value that corresponds to when the graph crosses the phosphorus concentration of 10.6 mg/L. .

Jeremy Perlinski, PE | Assistant Group Manager
p: 406-447-5054 **| c:** 406-594-3493 **| e:** jperlinski@rpa-hln.com

www.rpa-hln.com

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Attachment M

DEQ Phosphorous Breakthrough Analysis Spreadsheet

Appendix J

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

PHOSPHOROUS BREAKTHROUGH ANALYSIS

SITE NAME: East Helena
COUNTY: Lewis & Clark
LOT #:
NOTES: RI Basin - Phosphorous Breakthrough to Lake Helena

VARIABLES	DESCRIPTION	VALUE	UNITS
Lg	Length of Primary Drainfield as Measured Perpendicular to Ground Water Flow	487.0	ft
L	Length of Primary Drainfield's Long Axis	700.0	ft
W	Width of Primary Drainfield's Short Axis	450.0	ft
B	Depth to Limiting Layer from Bottom of Drainfield Laterals*	4.0	ft
D	Distance from Drainfield to Surface Water	30000.0	ft
T ~~Ne~~	Phosphorous Mixing Depth in Ground Water (0.5 ft for coarse soils, 1.0 ft for fine soils)**	0.5	ft
Sw	Soil Weight (usually constant)	100.0	lb/ft3
Pa	Phosphorous Adsorption Capacity of Soil (usually constant)	89.9	ppm
#l	Volume of Contributing Discharge	1,000,000.0	gpd
	Phosphorous Concentration in Discharge	2.00	mg/L
CONSTANTS			
Pl	Phosphorous Load	6100.00	lbs/yr
X	Conversion Factor for ppm to percentage (constant)	1.0E+06	
EQUATIONS			
Pt	Total Phosphorous Load = (Pl)(#l)	6100.00	lbs/yr
W1	Soil Weight under Drainfield = (L)(W)(B)(Sw)	126000000.0	lbs
Da	Dispersion Angle	5.0	degrees
W2	Soil Weight from Drainfield to Surface Water = [(Lg)(D) + (0.0875)(D)(D)] (T)(Sw)	4668000000.0	lbs
P	Total Phosphorous Adsorption by Soils = (W1 + W2)[(Pa)/(X)]	430980.6	lbs
SOLUTION			
BT	**Breakthrough Time to Surface Water = P / Pt**	70.7	years

---

BY: B. Bennett
DATE: June 28, 2024

NOTES: ** Depth to limiting layer is typically based on depth to a limiting layer (such as clay, bedrock or water) in a test pit or bottom of a dry test pit minus two feet to account for burial depth of standard drainfield laterals.*
*** Material type is usually based on test pit. A soil that can be described as loam (e.g. gravelly loam, sandy loam, etc.) or finer according to the USDA soil texture classification system is considered a "fine" soil.*

REV. 12/2007

Attachment N

Nitrate Sensitivity Analysis Spreadsheet

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

NITRATE SENSITIVITY ANALYSIS

SITE NAME: East Helena WWTP
COUNTY: Lewis & Clark
LOT #:
NOTES: Nitrate Sensitivity Analysis in pursuit of MGWPCS Permit

VARIABLES	DESCRIPTION	VALUE	UNITS
K	Hydraulic Conductivity	149.00	ft/day
I	Hydraulic Gradient	0.0119	ft/ft
D	Mixing Zone Thickness (usually constant)	15.0	ft
L	Mixing Zone Length (see ARM 17.30.517(1)(d)(viii)	500	ft
Y	Width of Drainfield Perpendicular to Ground Water Flow	487	ft
Ng	Background Nitrate (as Nitrogen) Concentration	0.380	mg/L
Nr	Nitrate (as Nitrogen) Concentration in Precipitation (usually constant)	1.0	mg/L
Ne	Nitrate (as Nitrogen) Concentration in Effluent	5.50	mg/L
#l	Number of Single Family Homes on the Drainfield	5000.0	
Ql	Quantity of Effluent per Single Family Home	26.70	ft3/day
P	Precipitation	14.20	in/year
V	Percent of Precipitation Recharging Ground Water (usually constant)	0.20	
EQUATIONS			
W	Width of Mixing Zone Perpendicular to Ground Water Flow = (0.175)(L)+(Y)	574.50	ft
Am	Cross Sectional Area of Aquifer Mixing Zone = (D)(W)	8617.50	ft2
As	Surface Area of Mixing Zone = (L)(W)	287250.00	ft2
Qg	Ground Water Flow Rate = (K)(I)(Am)	15279.69	ft3/day
Qr	Recharge Flow Rate = (As)(P/12/365)(V)	186.25	ft3/day
Qe	Effluent Flow Rate = (#l)(Ql)	133500.00	ft3/day
SOLUTION			
Nt	**Nitrate (as Nitrogen) Concentration at End of Mixing Zone =((Ng)(Qg)+(Nr)(Qr)+(Ne)(Qe)) / ((Qg)+(Qr)+(Qe))**	**4.97**	**mg/L**

BY: Christina Eggensperger
DATE: July 15, 2024

REV. 03/2005

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APPENDIX D

Cost Estimates

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EAST HELENA WWTP FACILITY PLAN

Phase 2 Project Loan Calculations

Oxidation Ditches & Clarifiers	$19,003,700
Inclined UV Disinfection	$982,500
Estimated Construction Cost	**$19,986,200**
Estimated Engineering Fees	$3,597,600
Estimated Total Project Cost	**$23,583,800**
Grant Funding	
MCEP	($750,000)
RRGL	($125,000)
CDBG	($750,000)
SRF Foregiveness	($850,000)
Loan Reserve (1/2 ann. payment)	$514,415
SRF Loan Amount	$21,623,215
Annual Loan Payment (30 yrs)	$1,028,830
Excess Coverage (10%)	$102,883
Estimated Annual O&M Increase	$160,486
Short Lived Assets	$44,450
Total Annual Revenue Required	**$1,336,649**
Estimated EDUs in June 2027	**1,820**
Estimated Monthly Rate Increase	**$61.20**

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EAST HELENA WWTP FACILITY PLAN

Short Lived Assets Calculation

Equipment	Years to Replacement	Cost to Replace	Annual Contribution
Oxidation Ditch Weir Gates	30	$26,600	$890
Oxidation Ditch Anoxic Mixers	25	$143,000	$5,720
Oxidation Ditch Mechanical Aerators	30	$312,000	$10,400
Oxidation Ditch Effluent Gates	30	$78,000	$2,600
Scum Pumps	20	$10,000	$500
Clarifier Weir Gates	30	$26,600	$890
Clarifier Equipment	25	$406,550	$16,260
RAS/WAS Pumps	20	$14,000	$700
UV Slide Gates	30	$13,300	$440
UV Equipment	30	$181,350	$6,050
Total			$44,450

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EAST HELENA WWTP FACILITY PLAN
PHASE 2 UPGRADE - TWO OXIDATION DITCHES WITH 50 FT CLARIFIERS
September 2025
COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
SITE CIVIL				
Excavation	12,810	CY	$ 40	$ 512,400
Subgrade Preparation	1,320	CY	$ 225	$ 297,000
Backfill	2,130	CY	$ 125	$ 266,250
Site Piping	1	LS	$ 785,300	$ 785,300
Gravel Surfacing	2,550	SY	$ 40	$ 102,000
Surface Restoration	1	LS	$ 20,000	$ 20,000
			SUBTOTAL	**$ 1,982,950**
OXIDATION DITCHES (2 UNITS)				
Splitter Box	44	CY	$ 2,250	$ 99,000
Aluminum Weir Gates	4	EA	$ 13,300	$ 53,200
Process Piping	1	LS	$ 25,000	$ 25,000
Oxidation Ditches Concrete (50' W x 118' L x 14' D)	1,870	CY	$ 2,250	$ 4,207,500
Anoxic Submersible Mixers	1	LS	$ 286,000	$ 286,000
Anoxic Weir Gates	1	LS	$ 130,000	$ 130,000
Low-Speed Mechanical Aerator	1	LS	$ 624,000	$ 624,000
Effluent Weir Gates	1	LS	$ 156,000	$ 156,000
Safety Railing	1,030	LF	$ 165	$ 169,950
Aluminum Grating	240	SF	$ 120	$ 28,800
Aluminum Stairs	1	LS	$ 45,000	$ 45,000
Scum Gates & Pump Station	1	LS	$ 47,250	$ 47,250
Electrical and Instrumentation & Control	1	LS	$ 539,200	$ 539,200
			SUBTOTAL	**$ 6,410,900**
SECONDARY CLARIFIERS (2 UNITS)				
Splitter Box	44	CY	$ 2,250	$ 99,000
Aluminum Weir Gates	4	EA	$ 13,300	$ 53,200
Secondary Clarifiers Concrete (50' Dia. x 17' D)	620	CY	$ 2,250	$ 1,395,000
Process Piping	1	LS	$ 66,200	$ 66,200
Clarifier Equipment	1	LS	$ 813,100	$ 813,100
FRP Weirs and Baffles	1	LS	$ 42,800	$ 42,800
Clarifier Equipment Coatings	1	LS	$ 94,000	$ 94,000
Safety Railing	320	LF	$ 165	$ 52,800
Aluminum Stairs	1	LS	$ 45,000	$ 45,000
Scum Pump Stations	1	LS	$ 47,250	$ 47,250
Electrical and Instrumentation & Control	1	LS	$ 284,600	$ 284,600
			SUBTOTAL	**$ 2,992,950**
PROCESS BUILDING				
Building Costs	1	LS	$ 1,207,000	$ 1,207,000
UV Disinfection System (see separate analysis)	1	LS	$ -	$ -
RAS/WAS Pumps and Valves	1	LS	$ 105,000	$ 105,000
Monorail Beam & Hoist/Trolley	1	LS	$ 33,100	$ 33,100
Process Piping	1	LS	$ 58,500	$ 58,500
Pipe Coatings	1	LS	$ 17,000	$ 17,000
Mechanical	1	LS	$ 121,000	$ 121,000
Plumbing	1	LS	$ 61,000	$ 61,000
Electrical and Instrumentation & Control	1	LS	$ 116,600	$ 116,600
			SUBTOTAL	**$ 1,719,200**

EAST HELENA WWTP FACILITY PLAN

PHASE 2 UPGRADE - TWO OXIDATION DITCHES WITH 50 FT CLARIFIERS

September 2025

COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Construction Subtotal Cost				$ 13,106,000
General Conditions @ 15%				$ 1,965,900
Undefined Scope/Contingency @ 30%				$ 3,931,800
Total Estimated Cost				**$ 19,003,700**

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (assumes 0.5 additional operators)	1,040	HRS	$ 60.00	$ 62,400
Power	725,000	KWH	$ 0.11	$ 79,750
Equipment Replacement	1	LS	$ 79,200	$ 79,200
Total Annual Cost				**$ 221,350**

PRESENT WORTH ANALYSIS

DESCRIPTON		TOTAL
Capital Cost		$ 19,003,700
Annual O&M		$ 221,350
Salvage Value in 20 years (estimate)		$ 3,446,100
Interest Rate		3.0%
Number of payments		20
	TOTAL PRESENT WORTH	**$20,388,800**

Estimate is a Planning Level Estimate Based on Limited Information

EAST HELENA WWTP FACILITY PLAN
OXIDATION DITCH WITH 50 FT CLARIFIERS OPTION
JULY 2025
COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
SITE CIVIL				
Excavation	18,940	CY	$ 40	$ 757,600
Subgrade Preparation	1,940	CY	$ 225	$ 436,500
Backfill	3,070	CY	$ 125	$ 383,750
Site Piping	1	LS	$ 902,500	$ 902,500
Gravel Surfacing	3,350	SY	$ 40	$ 134,000
Surface Restoration	1	LS	$ 30,000	$ 30,000
			SUBTOTAL	**$ 2,644,350**
OXIDATION DITCHES (3 UNITS)				
Splitter Box	44	CY	$ 2,000	$ 88,000
Aluminum Weir Gates	4	EA	$ 13,300	$ 53,200
Process Piping	1	LS	$ 25,000	$ 25,000
Oxidation Ditches Concrete (50' W x 118' L x 14' D)	2,800	CY	$ 2,000	$ 5,600,000
Anoxic Submersible Mixers	1	LS	$ 343,200	$ 343,200
Anoxic Weir Gates	1	LS	$ 156,000	$ 156,000
Low-Speed Mechanical Aerator	1	LS	$ 748,800	$ 748,800
Effluent Weir Gates	1	LS	$ 187,200	$ 187,200
Safety Railing	1,310	LF	$ 165	$ 216,150
Aluminum Grating	360	SF	$ 120	$ 43,200
Aluminum Stairs	1	LS	$ 75,000	$ 75,000
Scum Gates & Pump Station	1	LS	$ 63,000	$ 63,000
Electrical and Instrumentation & Control	1	LS	$ 649,200	$ 649,200
			SUBTOTAL	**$ 8,247,950**
SECONDARY CLARIFIERS (3 UNITS)				
Splitter Box	44	CY	$ 2,000	$ 88,000
Aluminum Weir Gates	4	EA	$ 13,300	$ 53,200
Secondary Clarifiers Concrete (50' Dia. x 17' D)	930	CY	$ 2,000	$ 1,860,000
Process Piping	1	LS	$ 86,800	$ 86,800
Clarifier Equipment	1	LS	$ 975,700	$ 975,700
FRP Weirs and Baffles	1	LS	$ 51,400	$ 51,400
Clarifier Equipment Coatings	1	LS	$ 113,000	$ 113,000
Safety Railing	480	LF	$ 165	$ 79,200
Aluminum Stairs	1	LS	$ 45,000	$ 45,000
Scum Pump Stations	1	LS	$ 94,500	$ 94,500
Electrical and Instrumentation & Control	1	LS	$ 341,500	$ 341,500
			SUBTOTAL	**$ 3,788,300**
PROCESS BUILDING				
Building Costs	1	LS	$ 1,207,000	$ 1,207,000
UV Disinfection System (see separate analysis)	1	LS	$ -	$ -
RAS/WAS Pumps and Valves	1	LS	$ 105,000	$ 105,000
Monorail Beam & Hoist/Trolley	1	LS	$ 33,100	$ 33,100
Process Piping	1	LS	$ 58,500	$ 58,500
Pipe Coatings	1	LS	$ 17,000	$ 17,000
Mechanical	1	LS	$ 121,000	$ 121,000
Plumbing	1	LS	$ 61,000	$ 61,000
Electrical and Instrumentation & Control	1	LS	$ 116,600	$ 116,600
			SUBTOTAL	**$ 1,719,200**

EAST HELENA WWTP FACILITY PLAN

OXIDATION DITCH WITH 50 FT CLARIFIERS OPTION

JULY 2025

COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Construction Subtotal Cost				$ 16,399,800
General Conditions @ 15%				$ 2,460,000
Undefined Scope/Contingency @ 30%				$ 4,920,000
Total Estimated Cost				**$ 23,779,800**

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (assumes 0.5 additional operators)	1,040	HRS	$ 60.00	$ 62,400
Power	725,000	KWH	$ 0.11	$ 79,750
Equipment Replacement	1	LS	$ 95,000	$ 95,000
Total Annual Cost				**$ 237,150**

PRESENT WORTH ANALYSIS

DESCRIPTON		TOTAL
Capital Cost		$ 23,779,800
Annual O&M		$ 237,150
Salvage Value in 20 years (estimate)		$ 4,224,900
Interest Rate		3.0%
Number of payments		20
	TOTAL PRESENT WORTH	**$24,968,800**

Estimate is a Planning Level Estimate Based on Limited Information

EAST HELENA WWTP FACILITY PLAN

SEQUENCING BATCH REACTOR (SBR) OPTION

JULY 2025

COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
SITE CIVIL				
Excavation	17,450	CY	$ 40	$ 698,000
Subgrade Preparation	1,210	CY	$ 225	$ 272,250
Backfill	2,170	CY	$ 125	$ 271,250
Site Piping	1	LS	$ 599,000	$ 599,000
Gravel Surfacing	2,440	SY	$ 40	$ 97,600
Surface Restoration	1	LS	$ 25,000	$ 25,000
			SUBTOTAL	**$ 1,963,100**
REACTOR BASINS				
Splitter Box	44	CY	$ 2,000	$ 88,000
Aluminum Weir Gates	4	EA	$ 13,300	$ 53,200
Process Piping & Valves	1	LS	$ 126,000	$ 126,000
Reactor Basins Concrete (55' W x 85' L x 25' D)	2,570	CY	$ 2,000	$ 5,140,000
Basin Mixers & Mooring Assemblies	1	LS	$ 311,100	$ 311,100
Submersible Transfer Pumps & Valves	1	LS	$ 207,400	$ 207,400
Aeration Piping & Valves	1	LS	$ 245,000	$ 245,000
Aeration Drop Pipes, Headers & Diffusers	1	LS	$ 248,900	$ 248,900
Aeration Blowers & Valves	1	LS	$ 518,400	$ 518,400
Effluent Decanters	1	LS	$ 373,300	$ 373,300
Pipe Coatings	1	LS	$ 36,000	$ 36,000
Safety Railing	700	LF	$ 165	$ 115,500
Aluminum Grating	260	SF	$ 120	$ 31,200
Aluminum Stairs	1	LS	$ 60,000	$ 60,000
Scum Gates & Pump Station	1	LS	$ 63,000	$ 63,000
Electrical and Instrumentation & Control	1	LS	$ 789,400	$ 789,400
			SUBTOTAL	**$ 8,406,400**
POST-EQ BASIN				
Post-EQ Basin Concrete (36' W x 48' L x 15' D)	300	CY	$ 2,000	$ 600,000
Aeration Piping & Valves	1	LS	$ 72,000	$ 72,000
Aeration Drop Pipes, Headers & Diffusers	1	LS	$ 82,200	$ 82,200
Pipe Coatings	1	LS	$ 12,000	$ 12,000
Safety Railing	170	LF	$ 165	$ 28,050
Aluminum Covers	1,730	SF	$ 180	$ 311,400
Aluminum Stairs	1	LS	$ 15,000	$ 15,000
Electrical and Instrumentation & Control	1	LS	$ 198,300	$ 198,300
			SUBTOTAL	**$ 1,318,950**
PROCESS BUILDING				
Building Costs	1	LS	$ 1,468,000	$ 1,468,000
Effluent Pump Station Wet Well Concrete (16' W x 24' L x 15' D)	90	CY	$ 2,000	$ 180,000
Effluent Pump Station	1	LS	$ 276,000	$ 276,000
UV Disinfection System (see separate analysis)	1	LS	$ -	$ -
Monorail Beam & Hoist/Trolley	1	LS	$ 33,100	$ 33,100
Process Piping	1	LS	$ 399,800	$ 399,800
Pipe Coatings	1	LS	$ 32,000	$ 32,000
Mechanical	1	LS	$ 147,000	$ 147,000
Plumbing	1	LS	$ 74,000	$ 74,000
Electrical and Instrumentation & Control	1	LS	$ 205,300	$ 205,300
			SUBTOTAL	**$ 2,815,200**

EAST HELENA WWTP FACILITY PLAN

SEQUENCING BATCH REACTOR (SBR) OPTION

JULY 2025

COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Construction Subtotal Cost				$ 14,503,700
General Conditions @ 15%				$ 2,175,600
Undefined Scope/Contingency @ 30%				$ 4,351,200
Total Estimated Cost				**$ 21,030,500**

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (assumes 1 additional operator)	2,080	HRS	$ 60.00	$ 124,800
Power	1,264,000	KWH	$ 0.11	$ 139,040
Equipment Replacement	1	LS	$ 82,000	$ 82,000
Total Annual Cost				**$ 345,840**

PRESENT WORTH ANALYSIS

DESCRIPTON		TOTAL
Capital Cost		$ 21,030,500
Annual O&M		$ 345,840
Salvage Value in 20 years (estimate)		$ 4,048,500
Interest Rate		3.0%
Number of payments		20
	TOTAL PRESENT WORTH	**$23,934,200**

Estimate is a Planning Level Estimate Based on Limited Information

EAST HELENA WWTP FACILITY PLAN

MEMBRANE BIOREACTOR (MBR) OPTION

JULY 2025

COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
SITE CIVIL				
Excavation	8,610	CY	$ 40	$ 344,400
Subgrade Preparation	860	CY	$ 225	$ 193,500
Backfill	1,940	CY	$ 125	$ 242,500
Site Piping	1	LS	$ 652,800	$ 652,800
Gravel Surfacing	1,970	SY	$ 40	$ 78,800
Surface Restoration	1	LS	$ 20,000	$ 20,000
			SUBTOTAL	**$ 1,532,000**
FINE SCREENS				
Building Costs	1	LS	$ 546,000	$ 546,000
Concrete Channels	20	CY	$ 2,000	$ 40,000
Monorail Beams & Hoist/Trolleys	1	LS	$ 44,200	$ 44,200
Aluminum Grating	210	SF	$ 120	$ 25,200
Aluminum Slide Gates	4	EA	$ 11,500	$ 46,000
Process Piping	1	LS	$ 13,600	$ 13,600
Fine Screen Equipment	1	LS	$ 880,100	$ 880,100
Mechanical & ERV	1	LS	$ 362,000	$ 362,000
Plumbing	1	LS	$ 58,000	$ 58,000
Electrical and Instrumentation & Control	1	LS	$ 341,000	$ 341,000
			SUBTOTAL	**$ 2,356,100**
BIOREACTORS				
Splitter Box	44	CY	$ 2,000	$ 88,000
Aluminum Weir Gates	4	EA	$ 13,300	$ 53,200
Process Piping	1	LS	$ 48,800	$ 48,800
Anoxic Basins Concrete (24' W x 24' L x 20' D)	620	CY	$ 2,000	$ 1,240,000
Submersible Mixers & Davit Cranes	1	LS	$ 136,500	$ 136,500
Aerobic Basins Concrete (24' W x 46' L x 20' D)	1,050	CY	$ 2,000	$ 2,100,000
Mixed Liquor Recycle Pumps	1	LS	$ 182,000	$ 182,000
Aeration Piping & Valves	1	LS	$ 220,000	$ 220,000
Aeration Drop Pipes, Headers & Diffusers	1	LS	$ 204,800	$ 204,800
Aeration Blowers & Valves	1	LS	$ 364,000	$ 364,000
Pipe Coatings	1	LS	$ 48,000	$ 48,000
Safety Railing	340	LF	$ 165	$ 56,100
Aluminum Grating	450	SF	$ 120	$ 54,000
Aluminum Stairs	1	LS	$ 45,000	$ 45,000
Scum Gates & Pump Station	1	LS	$ 63,000	$ 63,000
Electrical and Instrumentation & Control	1	LS	$ 380,700	$ 380,700
			SUBTOTAL	**$ 5,284,100**

EAST HELENA WWTP FACILITY PLAN
MEMBRANE BIOREACTOR (MBR) OPTION
JULY 2025
COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
MEMBRANE BUILDING				
Building Costs	1	LS	$ 1,724,000	$ 1,724,000
Membrane Tanks & Splitter Concrete (42' W x 30' L x 14' D)	260	CY	$ 2,000	$ 520,000
Aluminum Covers	1,260	SF	$ 150	$ 189,000
Aluminum Weir Gates	4	EA	$ 13,300	$ 53,200
Membrane Deflector Plates	4	EA	$ 10,000	$ 40,000
Membrane Units & Supports	1	LS	$ 1,820,000	$ 1,820,000
Air Scour Headers & Valves	1	LS	$ 159,300	$ 159,300
Membrane Blowers & Valves	1	LS	$ 455,000	$ 455,000
Permeate Headers & Valves	1	LS	$ 204,800	$ 204,800
Permeate Pumps and Valves	1	LS	$ 295,800	$ 295,800
RAS/WAS Pumps and Valves	1	LS	$ 318,500	$ 318,500
Compressed Air System	1	LS	$ 68,300	$ 68,300
Chemical Feed System	1	LS	$ 113,800	$ 113,800
UV Disinfection System (see separate analysis)	1	LS	$ -	$ -
Process Piping	1	LS	$ 1,341,600	$ 1,341,600
Pipe Coatings	1	LS	$ 108,000	$ 108,000
Overhead Traveling Crane	1	LS	$ 120,000	$ 120,000
Mechanical & ERVs	1	LS	$ 862,000	$ 862,000
Plumbing	1	LS	$ 173,000	$ 173,000
Electrical and Instrumentation & Control	1	LS	$ 918,200	$ 918,200
			SUBTOTAL	**$ 9,484,500**

Construction Subtotal Cost	$ 18,656,700
General Conditions @ 15%	$ 2,798,600
Undefined Scope/Contingency @ 30%	$ 5,597,100
Total Estimated Cost	**$ 27,052,400**

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (assumes 1.5 additional operators)	3,120	HRS	$ 60.00	$ 187,200
Power	1,865,000	KWH	$ 0.11	$ 205,150
Chemicals	1	LS	$ 24,100	$ 24,100
Equipment Replacement	1	LS	$ 214,500	$ 214,500
Total Annual Cost				**$ 630,950**

PRESENT WORTH ANALYSIS

DESCRIPTON	TOTAL
Capital Cost	$ 27,052,400
Annual O&M	$ 630,950
Salvage Value in 20 years (estimate)	$ 4,404,700
Interest Rate	3.0%
Number of payments	20
TOTAL PRESENT WORTH	**$34,000,600**

Estimate is a Planning Level Estimate Based on Limited Information

EAST HELENA WWTP FACILITY PLAN

HORIZONTAL OPEN CHANNEL UV DISINFECTION OPTION

JULY 2025

COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
UV DISINFECTION				
Concrete Channels	37	CY	$ 2,000	$ 74,000
UV Disinfection Equipment	1	LS	$ 321,800	$ 321,800
Davit Crane & Pedestals	1	LS	$ 18,000	$ 18,000
Process Piping	1	LS	$ 55,000	$ 55,000
Aluminum Grating	130	SF	$ 120	$ 15,600
Aluminum Slide Gates	2	EA	$ 13,300	$ 26,600
Electrical and Instrumentation & Control	1	LS	$ 93,800	$ 93,800
Construction Subtotal Cost				$ 604,800
General Conditions @ 15%				$ 90,800
Undefined Scope/Contingency @ 30%				$ 181,500
Total Estimated Cost				**$ 877,100**

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (assumes NO additional operators)	0	HRS	$ 60.00	$ -
Power	88,000	KWH	$ 0.11	$ 9,680
Lamp Replacement	32	EA	$ 520.00	$ 16,640
Equipment Replacement	1	LS	$ 11,000	$ 11,000
Total Annual Cost				**$ 37,320**

PRESENT WORTH ANALYSIS

DESCRIPTON		TOTAL
Capital Cost		$ 877,100
Annual O&M		$ 37,320
Salvage Value in 20 years (estimate)		$ 126,200
Interest Rate		3.0%
Number of payments		20
	TOTAL PRESENT WORTH	**$1,362,500**

Estimate is a Planning Level Estimate Based on Limited Information

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EAST HELENA WWTP FACILITY PLAN

INCLINED OPEN CHANNEL UV DISINFECTION OPTION
JULY 2025
COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
UV DISINFECTION				
Concrete Channels	59	CY	$ 2,000	$ 118,000
UV Disinfection Equipment	1	LS	$ 362,700	$ 362,700
Process Piping	1	LS	$ 55,000	$ 55,000
Aluminum Grating	170	SF	$ 120	$ 20,400
Aluminum Slide Gates	2	EA	$ 13,300	$ 26,600
Electrical and Instrumentation & Control	1	LS	$ 94,800	$ 94,800
Construction Subtotal Cost				$ 677,500
General Conditions @ 15%				$ 101,700
Undefined Scope/Contingency @ 30%				$ 203,300
Total Estimated Cost				**$ 982,500**

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (assumes NO additional operators)	0	HRS	$ 60.00	$ -
Power	120,000	KWH	$ 0.11	$ 13,200
Lamp Replacement	5	EA	$ 1,070.00	$ 5,136
Equipment Replacement	1	LS	$ 12,400	$ 12,400
Total Annual Cost				**$ 30,736**

PRESENT WORTH ANALYSIS

DESCRIPTON	TOTAL
Capital Cost	$ 982,500
Annual O&M	$ 30,736
Salvage Value in 20 years (estimate)	$ 166,600
Interest Rate	3.0%
Number of payments	20
TOTAL PRESENT WORTH	**$1,347,500**

Estimate is a Planning Level Estimate Based on Limited Information

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EAST HELENA WWTP FACILITY PLAN THERMAL SLUDGE DRYING (CLASS A BIOSOLIDS) OPTION AUGUST 2025 COST ESTIMATE ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
SITE CIVIL				
Excavation	3,600	CY	$ 40	$ 144,000
Subgrade Preparation	400	CY	$ 225	$ 90,000
Backfill	770	CY	$ 125	$ 96,250
Site Piping	1	LS	$ 25,300	$ 25,300
Gravel Surfacing	580	SY	$ 40	$ 23,200
Surface Restoration	1	LS	$ 25,000	$ 25,000
			SUBTOTAL	**$ 403,750**
WAS STORAGE BASINS				
Process Piping	1	LS	$ 80,000	$ 80,000
WAS Storage Basins Concrete (30' W x 48' L x 17' D)	420	CY	$ 2,000	$ 840,000
Blower Corridor Concrete (20' W x 48' L x 17' D)	190	CY	$ 2,000	$ 380,000
Blower Corridor Building Costs	1	LS	$ 257,000	$ 257,000
Aeration Drop Pipes, Headers & Diffusers	1	LS	$ 217,000	$ 217,000
Aeration Blowers	1	LS	$ 198,000	$ 198,000
Sludge Transfer Pumps	1	LS	$ 52,500	$ 52,500
Telescoping Valves	2	EA	$ 18,000	$ 36,000
Pipe Coatings	1	LS	$ 32,000	$ 32,000
Safety Railing	160	LF	$ 165	$ 26,400
Aluminum Grating	480	SF	$ 120	$ 57,600
Aluminum Stairs	1	LS	$ 75,000	$ 75,000
Return Stream Pump Station	1	LS	$ 120,000	$ 120,000
Mechanical & ERV	1	LS	$ 255,000	$ 255,000
Plumbing	1	LS	$ 52,000	$ 52,000
Electrical and Instrumentation & Control	1	LS	$ 312,800	$ 312,800
			SUBTOTAL	**$ 2,991,300**
DEWATERING AND DRYER BUILDING				
Building Costs	1	LS	$ 866,000	$ 866,000
Dewatering System (see separate analysis)	1	LS	$ -	$ -
Thermal Dryer System	1	LS	$ 2,526,600	$ 2,526,600
Conveyor System	1	LS	$ 473,800	$ 473,800
Mechanical & ERV	1	LS	$ 383,000	$ 383,000
Plumbing	1	LS	$ 87,000	$ 87,000
Electrical and Instrumentation & Control	1	LS	$ 458,100	$ 458,100
			SUBTOTAL	**$ 4,794,500**
Construction Subtotal Cost				$ 8,189,600
General Conditions @ 15%				$ 1,228,500
Undefined Scope/Contingency @ 30%				$ 2,456,900
Total Estimated Cost				**$ 11,875,000**

EAST HELENA WWTP FACILITY PLAN
THERMAL SLUDGE DRYING (CLASS A BIOSOLIDS) OPTION
AUGUST 2025
COST ESTIMATE

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (assumes 1.5 additional operators)	3,120	HRS	$ 60.00	$ 187,200
Power	761,000	KWH	$ 0.11	$ 83,710
Natural Gas	4,880	mmBTU	$ 8.00	$ 39,040
Sludge Dispoal (assumes Class A biosolids are given away)	1	LS	$ -	$ -
Equipment Replacement	1	LS	$ 161,100	$ 161,100
Total Annual Cost				**$ 471,050**

PRESENT WORTH ANALYSIS

DESCRIPTON	TOTAL
Capital Cost	$ 11,875,000
Annual O&M	$ 471,050
Salvage Value in 20 years (estimate)	$ 2,729,300
Interest Rate	3.0%
Number of payments	20
TOTAL PRESENT WORTH	**$17,371,900**

Estimate is a Planning Level Estimate Based on Limited Information

EAST HELENA WWTP FACILITY PLAN
AEROBIC DIGESTION (CLASS B BIOSOLIDS) OPTION
AUGUST 2025
COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
SITE CIVIL				
Excavation	7,490	CY	$ 40	$ 299,600
Subgrade Preparation	810	CY	$ 225	$ 182,250
Backfill	1,110	CY	$ 125	$ 138,750
Site Piping	1	LS	$ 25,300	$ 25,300
Gravel Surfacing	540	SY	$ 40	$ 21,600
Surface Restoration	1	LS	$ 30,000	$ 30,000
			SUBTOTAL	**$ 697,500**
DIGESTER BASINS				
Process Piping	1	LS	$ 80,000	$ 80,000
Digester Basins Concrete (45' W x 80' L x 17' D)	850	CY	$ 2,000	$ 1,700,000
Blower Corridor Concrete (20' W x 80' L x 17' D)	280	CY	$ 2,000	$ 560,000
Blower Corridor Building Costs	1	LS	$ 388,000	$ 388,000
Hyperboloid Mixer & Ring Sparger	1	LS	$ 271,000	$ 271,000
Aeration Turbo Blowers	1	LS	$ 406,000	$ 406,000
Sludge Transfer Pumps	1	LS	$ 52,500	$ 52,500
Telescoping Valves	2	EA	$ 18,000	$ 36,000
Pipe Coatings	1	LS	$ 32,000	$ 32,000
Safety Railing	220	LF	$ 165	$ 36,300
Aluminum Grating	740	SF	$ 120	$ 88,800
Aluminum Stairs	1	LS	$ 75,000	$ 75,000
Return Stream Pump Station	1	LS	$ 120,000	$ 120,000
Mechanical & ERV	1	LS	$ 319,000	$ 319,000
Plumbing	1	LS	$ 59,000	$ 59,000
Electrical and Instrumentation & Control	1	LS	$ 418,200	$ 418,200
			SUBTOTAL	**$ 4,641,800**
DEWATERING AND SLUDGE STORAGE BUILDING				
Building Costs	1	LS	$ 1,169,000	$ 1,169,000
Dewatering System (see separate analysis)	1	LS	$ -	$ -
Conveyor System	1	LS	$ 208,000	$ 208,000
Mechanical & ERV	1	LS	$ 234,000	$ 234,000
Plumbing	1	LS	$ 94,000	$ 94,000
Electrical and Instrumentation & Control	1	LS	$ 265,200	$ 265,200
			SUBTOTAL	**$ 1,970,200**
Construction Subtotal Cost				$ 7,309,500
General Conditions @ 15%				$ 1,096,500
Undefined Scope/Contingency @ 30%				$ 2,192,900
Total Estimated Cost				**$ 10,598,900**

EAST HELENA WWTP FACILITY PLAN

AEROBIC DIGESTION (CLASS B BIOSOLIDS) OPTION

AUGUST 2025

COST ESTIMATE

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (assumes 1.0 additional operators)	2,080	HRS	$ 60.00	$ 124,800
Power	758,000	KWH	$ 0.11	$ 83,380
Sludge Disposal (via land application)	1	LS	$ 27,900	$ 27,900
Equipment Replacement	1	LS	$ 56,900	$ 56,900
Total Annual Cost				**$ 292,980**

PRESENT WORTH ANALYSIS

DESCRIPTON		TOTAL
Capital Cost		$ 10,598,900
Annual O&M		$ 292,980
Salvage Value in 20 years (estimate)		$ 1,811,100
Interest Rate		3.0%
Number of payments		20
	TOTAL PRESENT WORTH	**$13,954,900**

Estimate is a Planning Level Estimate Based on Limited Information

EAST HELENA WWTP FACILITY PLAN
SLUDGE STORAGE (UNCLASSIFIED BIOSOLIDS) OPTION
AUGUST 2025
COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
SITE CIVIL				
Excavation	4,510	CY	$ 40	$ 180,400
Subgrade Preparation	490	CY	$ 225	$ 110,250
Backfill	840	CY	$ 125	$ 105,000
Site Piping	1	LS	$ 25,300	$ 25,300
Gravel Surfacing	540	SY	$ 40	$ 21,600
Surface Restoration	1	LS	$ 30,000	$ 30,000
			SUBTOTAL	**$ 472,550**
SLUDGE STORAGE BASINS				
Process Piping	1	LS	$ 80,000	$ 80,000
Sludge Storage Basins Concrete (32' W x 60' L x 17' D)	510	CY	$ 2,000	$ 1,020,000
Blower Corridor Concrete (20' W x 60' L x 17' D)	220	CY	$ 2,000	$ 440,000
Blower Corridor Building Costs	1	LS	$ 306,000	$ 306,000
Aeration Drop Pipes, Headers & Diffusers	1	LS	$ 255,000	$ 255,000
Aeration Blowers	1	LS	$ 403,000	$ 403,000
Sludge Transfer Pumps	1	LS	$ 52,500	$ 52,500
Telescoping Valves	2	EA	$ 18,000	$ 36,000
Pipe Coatings	1	LS	$ 32,000	$ 32,000
Safety Railing	180	LF	$ 165	$ 29,700
Aluminum Grating	580	SF	$ 120	$ 69,600
Aluminum Stairs	1	LS	$ 75,000	$ 75,000
Return Stream Pump Station	1	LS	$ 120,000	$ 120,000
Mechanical & ERV	1	LS	$ 277,000	$ 277,000
Plumbing	1	LS	$ 46,000	$ 46,000
Electrical and Instrumentation & Control	1	LS	$ 332,300	$ 332,300
			SUBTOTAL	**$ 3,574,100**
DEWATERING AND CONTAINER BUILDING				
Building Costs	1	LS	$ 694,000	$ 694,000
Dewatering System (see separate analysis)	1	LS	$ -	$ -
Conveyor System	1	LS	$ 208,000	$ 208,000
Mechanical & ERV	1	LS	$ 234,000	$ 234,000
Plumbing	1	LS	$ 56,000	$ 56,000
Electrical and Instrumentation & Control	1	LS	$ 265,200	$ 265,200
			SUBTOTAL	**$ 1,457,200**
Construction Subtotal Cost				$ 5,503,900
General Conditions @ 15%				$ 825,600
Undefined Scope/Contingency @ 30%				$ 1,651,200
Total Estimated Cost				**$ 7,980,700**

EAST HELENA WWTP FACILITY PLAN

SLUDGE STORAGE (UNCLASSIFIED BIOSOLIDS) OPTION

AUGUST 2025

COST ESTIMATE

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (assumes 1.0 additional operators)	2,080	HRS	$ 60.00	$ 124,800
Power	528,000	KWH	$ 0.11	$ 58,080
Sludge Disposal (hauled to landfill)	230	TONS	$ 50	$ 11,500
Equipment Replacement	1	LS	$ 44,200	$ 44,200
Total Annual Cost				**$ 238,580**

PRESENT WORTH ANALYSIS

DESCRIPTON		TOTAL
Capital Cost		$ 7,980,700
Annual O&M		$ 238,580
Salvage Value in 20 years (estimate)		$ 1,239,600
Interest Rate		3.0%
Number of payments		20
	TOTAL PRESENT WORTH	**$10,843,800**

Estimate is a Planning Level Estimate Based on Limited Information

EAST HELENA WWTP FACILITY PLAN

CENTRIFUGE SOLIDS DEWATERING OPTION

AUGUST 2025

COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
CENTRIFUGE DEWATERING				
Concrete Equipment Pad	1	LS	$ 13,500	$ 13,500
Dewatering Equipment	1	LS	$ 359,200	$ 359,200
Polymer Feed System	1	LS	$ 47,000	$ 47,000
Containment Pallets	2	EA	$ 2,000	$ 4,000
Safety Equipment	1	LS	$ 5,000	$ 5,000
Process Piping	1	LS	$ 18,900	$ 18,900
Pipe Coatings	1	LS	$ 9,500	$ 9,500
Electrical and Instrumentation & Control	1	LS	$ 104,100	$ 104,100
Construction Subtotal Cost				$ 561,200
General Conditions @ 15%				$ 84,200
Undefined Scope/Contingency @ 30%				$ 168,400
Total Estimated Cost				**$ 813,800**

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (operator time included in solids handling)	0	HRS	$ 60.00	$ -
Power	46,500	KWH	$ 0.11	$ 5,115
Polymer	4,680	LB	$ 4.00	$ 18,720
Equipment Replacement	1	LS	$ 32,500	$ 32,500
Total Annual Cost				**$ 56,335**

PRESENT WORTH ANALYSIS

DESCRIPTON	TOTAL
Capital Cost	$ 813,800
Annual O&M	$ 56,335
Salvage Value in 20 years (estimate)	$ 38,600
Interest Rate	3.0%
Number of payments	20
TOTAL PRESENT WORTH	**$1,630,600**

Estimate is a Planning Level Estimate Based on Limited Information

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EAST HELENA WWTP FACILITY PLAN
SCREW PRESS SOLIDS DEWATERING OPTION
AUGUST 2025
COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
SCREW PRESS DEWATERING				
Concrete Equipment Pad	1	LS	$ 14,400	$ 14,400
Dewatering Equipment	1	LS	$ 768,000	$ 768,000
Polymer Feed System	1	LS	$ 45,200	$ 45,200
Containment Pallets	2	EA	$ 2,000	$ 4,000
Safety Equipment	1	LS	$ 5,000	$ 5,000
Process Piping	1	LS	$ 18,900	$ 18,900
Pipe Coatings	1	LS	$ 9,500	$ 9,500
Electrical and Instrumentation & Control	1	LS	$ 155,500	$ 155,500
Construction Subtotal Cost				$ 1,020,500
General Conditions @ 15%				$ 153,100
Undefined Scope/Contingency @ 30%				$ 306,200
Total Estimated Cost				**$ 1,479,800**

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (operator time included in solids handling)	0	HRS	$ 60.00	$ -
Power	14,000	KWH	$ 0.11	$ 1,540
Polymer	6,090	LB	$ 4.00	$ 24,360
Equipment Replacement	1	LS	$ 32,600	$ 32,600
Total Annual Cost				**$ 58,500**

PRESENT WORTH ANALYSIS

DESCRIPTON	TOTAL
Capital Cost	$ 1,479,800
Annual O&M	$ 58,500
Salvage Value in 20 years (estimate)	$ 39,500
Interest Rate	3.0%
Number of payments	20
TOTAL PRESENT WORTH	**$2,328,300**

Estimate is a Planning Level Estimate Based on Limited Information

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EAST HELENA WWTP FACILITY PLAN
ROTARY FAN PRESS SOLIDS DEWATERING OPTION
AUGUST 2025
COST ESTIMATE

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
FAN PRESS DEWATERING				
Concrete Equipment Pad	1	LS	$ 19,500	$ 19,500
Dewatering Equipment	1	LS	$ 628,600	$ 628,600
Polymer Feed System	1	LS	$ 49,000	$ 49,000
Containment Pallets	2	EA	$ 2,000	$ 4,000
Safety Equipment	1	LS	$ 5,000	$ 5,000
Process Piping	1	LS	$ 18,900	$ 18,900
Pipe Coatings	1	LS	$ 9,500	$ 9,500
Electrical and Instrumentation & Control	1	LS	$ 129,600	$ 129,600
Construction Subtotal Cost				$ 864,100
General Conditions @ 15%				$ 129,700
Undefined Scope/Contingency @ 30%				$ 259,300
Total Estimated Cost				**$ 1,253,100**

ANNUAL OPERATING AND MAINTENANCE COSTS

ITEM	QUAN.	UNIT	UNIT PRICE	TOTAL PRICE
Labor (operator time included in solids handling)	0	HRS	$ 60.00	$ -
Power	13,100	KWH	$ 0.11	$ 1,441
Polymer	3,750	LB	$ 4.00	$ 15,000
Equipment Replacement	1	LS	$ 27,200	$ 27,200
Total Annual Cost				**$ 43,641**

PRESENT WORTH ANALYSIS

DESCRIPTON	TOTAL
Capital Cost	$ 1,253,100
Annual O&M	$ 43,641
Salvage Value in 20 years (estimate)	$ 44,600
Interest Rate	3.0%
Number of payments	20
TOTAL PRESENT WORTH	**$1,877,700**

Estimate is a Planning Level Estimate Based on Limited Information

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APPENDIX E

Environmental Checklist, Agency Letters, and Responses

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Environmental Checklist

East Helena Wastewater Treatment Facility Project

Environmental Checklist Prepared by: On: September 15, 2025

Trisha Bodlovic
Name of Person 1

Robert Peccia & Associates
Organization

406-447-5000
Phone Number

tbodlovic@rpa-eng.com
Email

Jeremy Perlinski
Name of Person 2

Robert Peccia & Associates
Organization

406-447-5000
Phone Number

jperlinski@rpa-eng.com
Email

N/A
List additional people above. Include organization, phone number and email for all.

As the engineer that prepared the preliminary engineering report, I Jeremy Perlinski, P.E. , have reviewed the information presented in this checklist and believe that it accurately identifies the environmental resources in the area and the potential impacts that the project could have on those resources. In addition, the required state and federal agencies were provided with the required information about the project and requested to provide comments on the proposed public facility project. Their comments have been incorporated into and attached to the Facility Plan.

Engineer's Signature:

Date: 9/15/2025

MONTANA
JEREMY A. PERLINSKI
13950 PE
LICENSED
PROFESSIONAL ENGINEER

Physical Environment

Impact Code	Impact Type	Permits/ Mitigation Required?	Explanation of Impact to Resource
1. Soil Suitability, Topographic and/or Geologic Constraints (example: soil slump, steep slopes, subsidence, seismic activity)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☒ Permit ☒ Mitigation ☐ NA	Current Conditions: No topographic, or geological conditions are likely to affect the recommended East Helena Wastewater Treatment Plant Project. Preferred Alternative Environmental Narrative: The East Helena Wastewater Treatment Plant Project is located adjacent to the Administrative Boundary of the East Helena Superfund Area. At this time, any soil excavated at the Wastewater Treatment Plant (WWTP) can be used as backfill at the site and excess soil can be stockpiled onsite in a specified location.

<table>
<tr><td></td><td></td><td></td><td><u>Mitigation:</u>
If any work occurs within the East Helena Superfund Area, regulations governing soils displacement and disposal in the East Helena Superfund in Lewis and Clark County, Montana must be followed. These regulations are necessary to prevent lead and arsenic contamination of uncontaminated areas, prevent recontamination of remediated areas, and prevent potential health risks to humans.

<u>Permit:</u>
According to the Regulations, all persons engaging in soil displacement in excess of one cubic yard within the Administrative Boundary of the East Helena Superfund Area must obtain a permit from the Lead Education and Abatement Program (LEAP) of the Lewis and Clark City-County Health Department.</td></tr>
<tr><td colspan="4">2. Hazardous Facilities (example: power lines, hazardous waste sites, acceptable distance from explosive and flammable hazards including chemical/petrochemical storage tanks, underground fuel storage tanks, and related facilities such as natural gas storage facilities and propane storage tanks)</td></tr>
<tr><td>☒ No Impact
☐ Beneficial
☐ Adverse</td><td>☒ Direct
☒ Indirect
☒ Cumulative</td><td>☒ Permit
☒ Mitigation
☐ NA</td><td><u>Current Conditions:</u>
The City of East Helena, the old smelter site, nearby residential subdivisions, numerous rural developments, and the surrounding undeveloped and rural agricultural lands are all part of the East Helena Superfund Site. This site was proposed for addition to the EPA's Superfund National Priorities List (NPL) in September 1983 and the listing became final one year later.

Under the direction of the EPA and MDEQ, ASARCO has excavated and replaced numerous residential yards, the surface material from sections of adjacent alleys, road aprons, public parks, day-care centers, schools, gas stations, parking lots, an irrigation ditch and a field planned for development. In addition to this clean-up, a long-term monitoring program has been put into effect.

In 1995, the Resource Conservation and Recovery Act (RCRA) Program, became responsible for the disposal of process ponds cleanup residue, process ponds, ground and surface water, the slag pile and former ore storage areas.

According to the Montana Department of Environmental Quality's <i>Discover DEQ</i> web mapping (<u>https://gis.mtdeq.us/portal/apps/webappviewer/index.html?id =f554f421c3e64f5599e76b5cb8dd3391</u>), the City's WWTP is not located within the boundaries of the superfund site. However, contaminated soil may exist in this area.

<u>Preferred Alternative Environmental Narrative:</u>
The proposed project will result in significant disturbance of soil. It is possible that contaminated soil may exist in some areas of the improvements. If contamination exists, it is likely that the top 12-inches of soil will be removed and disposed of</td></tr>
</table>

			off-site in an area approved for such waste. The City of East Helena has and will continue to coordinate plans for wastewater infrastructure improvements with MDEQ and EPA to identify areas where soil contamination may exist and the requirements pertaining to its removal and disposal. Permit: As stated above, all persons engaging in soil displacement in excess of one cubic yard within the Administrative Boundary of the East Helena Superfund Area must obtain a permit from the Lead Education and Abatement Program (LEAP) of the Lewis and Clark City-County Health Department. Mitigation: If previously unknown contaminants are encountered during construction, MDEQ would be notified, and the materials would be removed and disposed of properly. The project will have no involvement with main electrical transmission lines.
3. Surrounding Air Quality (example: dust, odors, emissions)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☒ Mitigation ☐ NA	Current Conditions: The proposed project is located within the East Helena Lead Nonattainment Area. Preferred Alternative Environmental Narrative: The proposed project would not create any new violations of the Federal air quality standards, increase the frequency or severity of existing violations of the standards, or delay attainment of the standards in the East Helena area. The recommended East Helena WWTP Project may result in a temporary decrease in air quality in construction zones. This impact will be short-term and generally confined to the area where construction equipment is operating. Mitigation: The application of water or chemicals to control dust in areas subject to heavy vehicle traffic can be included, if deemed necessary, during the construction of the proposed project. Newly disturbed areas would be promptly reseeded or restored when construction activities are completed.
4. Groundwater Resources and Aquifers (example: quantity, quality, distribution, depth to groundwater, sole source aquifers)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☒ Mitigation ☐ NA	Current Conditions: The City of East Helena utilizes two groundwater sources. The first source is a set of four wells known as the "Wylie source". These wells have been drilled to depths ranging from 90 feet to more than 150 feet and each well produces at least 450 gallons per minute or more. These wells utilize the Helena Valley aquifer comprised of discontinuous and variable

			alluvium that is continuously saturated from the water table to a depth of at least 500 feet. The second source is a pair of infiltration galleries that draw water from below McClellan Creek known as the "McClellan source". Groundwater depths at the WWTP are greater than 40 ft below the surface based on static water levels in the four monitoring wells drilled as part of a groundwater discharge permit application. The groundwater permit application is still under review by MDEQ. Preferred Alternative Environmental Narrative: The proposed WWTP improvements will have no adverse effects on groundwater resources or aquifers in the area. Mitigation: It is not anticipated that groundwater will be a concern during construction, but dewatering may be required depending on the timing of construction activities.
5. Surface Water/Water Quality, Quantity and Distribution (example: streams, lakes, storm runoff, irrigation systems, canals)			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☒ Cumulative	☒ Permit ☒ Mitigation ☐ NA	Current Conditions: The surface water resources in the East Helena area include Prickly Pear Creek and its tributaries. Prickly Pear Creek originates in the Elkhorn Mountains several miles south of the City and flows in a northwesterly direction through the City. Prickly Pear discharges into Lake Helena which is located north of the City. The City is anticipating growth over the next several years. The existing WWTP is not equipped to handle the increased wastewater flows and properly treat the effluent that is discharged into Prickly Pear Creek to the levels required in the City's Montana Pollutant Discharge Elimination System (MPDES) permit. Preferred Alternative Environmental Narrative: The proposed WWTP upgrades would provide improved treatment of the City's wastewater that is discharged into Prickly Pear Creek. The City of East Helena has an MPDES permit to discharge treated effluent into Prickly Pear Creek. The City must follow all effluent limitations and monitoring requirements as stated in the permit. These improvements will allow the City to meet all effluent limits prior to discharge into the creek. Construction activities will temporarily disturb soil and could increase the potential for erosion and transport of sediments to surface waters. Permitting: If construction disturbs more than 1 acre, a General Permit for

			Storm Water Discharges Associated with Construction Activity under the MPDES program must be obtained. As a requirement of the General Permit, a Notice of Intent (NOI) form including a Stormwater Pollution Prevention Plan (SWPPP) specifying the best management practices (BMPs) that would be employed during construction to control erosion and sediment transport by storm runoff must be prepared and submitted to MDEQ. A storm water General Permit would be obtained by the contractor. Mitigation: BMP measures to control runoff and erosion from disturbed areas will be required of the Contractor to minimize potential water quality impacts during construction.
6. Floodplains and Floodplain Management (Identify any floodplains within one mile of the boundary of the project.)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Flood Insurance Rate Mapping (FIRM) for Lewis and Clark County and Incorporated Areas map #30049C2331E, effective September 19, 2012, shows the proposed project is not located within special flood hazard areas. Preferred Alternative Environmental Narrative: The Montana Department of Natural Resources and Conservation (DNRC) Regional Manager Jenn Daly was contacted on August 22, 2025. No response has been received as of this writing.
7. Wetlands (Identify any wetlands within one mile of the boundary of the project and state potential impacts.)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: According to the National Wetlands Inventory Wetlands Mapper (https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/), freshwater forested/shrub wetlands, riverine, freshwater pond, and freshwater emergent wetlands are located within 1 mile of the proposed project. Preferred Alternative Environmental Narrative: It is not anticipated that any designated wetlands will be impacted as part of this project.
8. Agricultural Lands, Production, and Farmland Protection (example: grazing, forestry, cropland, primeor unique agricultural lands) Identify any prime or important farm ground or forest lands within one mile of the boundary of the project.			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The project is located in an area that is classified as Prime Farmland of local Importance. Preferred Alternative Environmental Narrative: The USDA Natural Resources Conservation Service (NRCS) was advised of this project by letter dated August 22, 2025. There has been no response as of this writing.

			The project is located on property that has been previously disturbed and is not expected to result in the direct conversion of prime farmland.
9. Vegetation and Wildlife Species and Habitats, Including Fish (example: terrestrial, avian and aquatic life and habitats)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☒ Mitigation ☐ NA	Current Conditions: Typical wildlife species in the East Helena area includes mule deer, white-tailed deer, eastern fox squirrel, mountain cottontail, white-tailed jack rabbit, muskrat, red fox and meadow vole, and numerous nesting and migrant bird species. There are a variety of fish species listed in Prickly Pear Creek including brook trout, brown trout, longnose dace, and rainbow trout. Preferred Alternative Environmental Narrative: The proposed WWTP project would provide improved treatment of the City's wastewater that is discharged into Prickly Pear Creek and protect the aquatic resources of the creek. This project would not cause any long-term adverse impacts to wildlife and their habitat. Short-term impacts on small mammals and bird species may occur during construction. Temporary displacement due to noise or construction activities could affect such species. The Montana Department of Fish, Wildlife and Parks (MFWP) was contacted on August 22, 2025, regarding potential impacts on wildlife and fisheries resources. There has been no response as of this writing. Mitigation: The Contractor will be required to implement erosion control measures and surface areas disturbed by construction will be promptly re-vegetated where needed.
10. Unique, Endangered, Fragile, or Limited Environmental Resources, Including Endangered Species (example: plants, fish or wildlife)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☒ Mitigation ☐ NA	Current Conditions: The following paragraphs discuss unique, endangered, fragile, or limited environmental resources in the project area: ○ Threatened or Endangered Wildlife and Plants - The U.S. Fish and Wildlife Service (USFWS) was contacted on August 22, 2025, regarding the presence of threatened or endangered species in the project area. No response has been received as of this writing. In addition, the Department's online Information for Planning and Consultation (IPaC) website was consulted for information on the planning area. According to IPaC, there are 3

			threatened, endangered, or proposed species (the Canada Lynx, the Monarch Butterfly, and the Suckley's Cuckoo Bumble Bee) that may exist in the project area as well as migratory birds. There is no designated critical habitat in the project area. ○ Species of Special Interest or Concern - The Montana Natural Heritage Program lists plant and animal species of concern and potential species of concern that have been observed within the project area. ○ Sage Grouse - According to the Montana Sage Grouse Habitat Conservation Map, the project is not located in sage grouse habitat designated as core, general, connectivity habitats or BLM priority areas. Therefore, no further coordination regarding sage grouse is required. Preferred Alternative Environmental Narrative: Based on the nature, scope, and location of the recommended improvements, no adverse impacts to unique, endangered, fragile, or limited environmental resources are expected. Mitigation: If active eagle nests are present within 0.5 miles of the project during construction, seasonal restrictions and construction / development distance buffers specified in the 2010 Montana Bald Eagle Management Guidelines: An Addendum to Montana Bald Eagle Management Plan (1994) should be followed in order to avoid/minimize the risk for eagle take.
11. Unique Natural Features (example: geologic features)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: There are no known unique natural features located in the project area. Preferred Alternative Environmental Narrative: There are no known unique natural features that are anticipated to be impacted as a result of this project.
12. Access to, and Quality of, Recreational and Wilderness Activities, Public Lands and Waterways (including Federally Designated Wild & Scenic Rivers), and Public Open Space			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Access to recreational and wilderness activities, public land and waterways, or public open space do not occur in the project area. Preferred Alternative Environmental Narrative: The project will not affect access to and quality of recreational and wilderness activities, public lands and waterways, and public open spaces.

Human Environment			
Impact Code	**Impact Type**	**Permits/ Mitigation Required?**	**Explanation of Impact to Resource**
1. Visual Quality – Coherence, Diversity, Compatibility of Use and Scale, Aesthetics			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The project would have no long-term adverse effects on the visual quality of the area. Preferred Alternative Environmental Narrative: Land surfaces would be temporarily disturbed during construction but will be returned to pre-project conditions after construction.
2. Nuisances (example: glare, fumes)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: There are currently no nuisances in the project area. Preferred Alternative Environmental Narrative: There are no anticipated long-term nuisances associated with the project. Short-term nuisances associated with construction activities may be present but can be minimized by the contractor.
3. Noise – Suitable Separation Between Housing and Other Noise Sensitive Activities and Major Noise Sources (example: aircraft, highways and railroads.)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: There is currently suitable separation between housing and other noise sensitive activities within the project area. Preferred Alternative Environmental Narrative: Temporary increases in noise would be expected during the construction of the project. Such impacts would be localized to the area of construction and short-term in nature.
4. Historic Properties, Cultural, and Archaeological Resources			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☒ Mitigation ☐ NA	Current Conditions: The proposed improvements to the WWTP will occur in an area that has been previously disturbed. The Montana State Historic Preservation Office was contacted on August 22, 2025, for information regarding previous cultural resource surveys completed and for a listing of previously recorded historical and archaeological sites in the project area. Preferred Alternative Environmental Narrative: In correspondence dated August 28, 2025, SHPO stated that there have been a few previously recorded sites within the requested search locale that included the project area. SHPO also stated that any structure over fifty years of age is considered historic and is potentially eligible for listing on the National Register of Historic Places and if any structures are

			located within the Area of Potential Effect and are over fifty years of age, they should be recorded and a determination on their eligibility be made prior to any disturbance taking place. SHPO also stated that as long as there will be no disturbance or alteration to structures over fifty years of age, they felt that there will be no cultural or historic properties affected by this undertaking. SHPO, therefore, felt that a recommendation for a cultural resource inventory is unwarranted at this time. Mitigation: If structures need to be altered or if cultural materials are inadvertently discovered, SHPO will be contacted, and the site investigated.
5. Changes in Demographic (Population) Characteristics (example: quantity, distribution, density)			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The City is anticipating growth over the next several years. The existing WWTP is not equipped to handle the increased wastewater flows and properly treat the effluent that is discharged into Prickly Pear Creek. Preferred Alternative Environmental Narrative: While the recommended East Helena WWTP improvements will not increase the population of East Helena, the proposed project will allow for adequate treatment of the additional wastewater flow that is anticipated in the near future. The recommended improvements would not adversely affect any social or ethnic groups and would not isolate or divide existing residential areas.
6. General Housing Conditions – Quality, Quantity, Affordability			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Housing conditions vary in the vicinity of the project. Preferred Alternative Environmental Narrative: The project will not have any impact on general housing conditions in the project area including quality, quantity, and affordability.
7. Businesses or Residents (example: loss of, displacement, or relocation)			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The project is located in a residential area of East Helena. Preferred Alternative Environmental Narrative: The project would not displace or relocate any businesses or residents in the East Helena area. City residents will continue to have a reliable wastewater system with the improvements that are proposed.

8. Public Health and Safety			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: East Helena's treated effluent is discharged into Prickly Pear Creek that is utilized by the public for recreational purposes. The City is anticipating growth over the next several years and the existing WWTP is not equipped to handle the increased wastewater flows and properly treat the effluent that is discharged into the creek. Preferred Alternative Environmental Narrative: The proposed wastewater improvements project would benefit public health and safety by providing improved treatment of the City's wastewater that is discharged into Prickly Pear Creek.
9. Local Employment – Quantity or Distribution of Employment, Economic Impact			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Construction of the project will temporarily create jobs and the need for local goods and services. Preferred Alternative Environmental Narrative: Completion of the project will not cause any long-term changes in local employment.
10. Income Patterns – Economic Impact			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Construction of the project will result in short-term economic benefits to the City of East Helena. Preferred Alternative Environmental Narrative: Completion of the project will not cause any long-term changes in income pattern in the area.
11. Local and State Tax Base and Revenues			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The project will benefit the City's and the State's local tax base and revenues. Preferred Alternative Environmental Narrative: The project will allow the City's wastewater system to continue to operate efficiently and serve the City's current and future tax base.
12. Community and Government Services and Facilities (example: educational facilities; health and medical services and facilities; police; emergency medical services; and parks, playgrounds and open space)			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The proposed project is located near community facilities that serve the City. Preferred Alternative Environmental Narrative: The East Helena High School and Prickly Pear Elementary School will continue to have a reliable wastewater system with

			the improvements that are proposed.
13. Commercial and Industrial Facilities – Production and Activity, Growth or Decline			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: There are commercial and industrial facilities within the City of East Helena that rely on the City's wastewater system. Preferred Alternative Environmental Narrative: The project will allow the City's wastewater system to continue to operate efficiently and serve the City's commercial and industrial facilities.
14. Social Structures and Mores (example: standards of social conduct/social conventions)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Social structures can include culture, social class, social status, roles, groups, and social institutions. Preferred Alternative Environmental Narrative: The project will not affect social structures or community moral codes.
15. Land Use Compatibility (example: growth, land use change, development activity, adjacent land uses and potential conflicts)			
☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Existing land use in the project area is a mix of residential and community services. Preferred Alternative Environmental Narrative: The recommended WWTP improvements will allow the City of East Helena to better accommodate new residential and commercial development to the community. Any new development within the community will be subject to existing land use plans and land use controls.
16. Energy Resources – Consumption and Conservation			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The project is not expected to adversely impact energy resources. Preferred Alternative Environmental Narrative: Energy use is expected to increase for a short time during construction of the project due to the need for construction equipment. Long-term energy use will increase slightly with the addition of larger process equipment.
17. Solid Waste Management			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: Solid waste management occurs within the City of East Helena. Preferred Alternative Environmental Narrative: The project would not affect the generation or management of solid waste within the community.

18. Wastewater Treatment – Sewage System

☐ No Impact ☒ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: East Helena owns and operates the wastewater system that serves the community which includes the gravity collection mains, force mains, lift stations, and the WWTP. The City is anticipating growth over the next several years. The existing WWTP is not equipped to handle the increased wastewater flows and properly treat the effluent that is discharged into the creek. Preferred Alternative Environmental Narrative: The WWTP upgrades will result in beneficial impacts on the community. With the implementation of these improvements, East Helena's WWTP will be capable of handling the additional flow anticipated by not only the City but additional growth that is expected.

19. Storm Water – Surface Drainage

☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The City's stormwater conveyance system includes a few underground pipe systems, gutters, and ditches. Preferred Alternative Environmental Narrative: The project will have no long-term effects on storm water and surface drainage in the area.

20. Community Water Supply

☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: East Helena's water system is comprised of two water sources, the McClellan source consisting of radial wells near McClellan Creek and the Wylie source consisting of 4 drilled wells along Wylie Drive, two concrete water storage reservoirs, two transmission mains, and a distribution system consisting of 4-inch to 12-inch mains. Preferred Alternative Environmental Narrative: The proposed project would not affect municipal or private water supplies.

21. Fire Protection – Hazards

☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☐ Mitigation ☒ NA	Current Conditions: The City of East Helena provides fire protection to local residents. Preferred Alternative Environmental Narrative: The proposed project would not affect the City of East Helena's fire protection system or limit the community's fire-fighting capabilities.

22. Cultural Facilities, Cultural Uniqueness and Diversity

<table>
<tr><td>☒ No Impact
☐ Beneficial
☐ Adverse</td><td>☒ Direct
☒ Indirect
☒ Cumulative</td><td>☐ Permit
☐ Mitigation
☒ NA</td><td>Current Conditions:
There are no cultural facilities within the project area.

Preferred Alternative Environmental Narrative:
The project would not affect cultural facilities or the cultural uniqueness and diversity of East Helena or Lewis and Clark County.</td></tr>
<tr><td colspan="4">23. Transportation Networks and Traffic Flow Conflicts (example: rail; auto including local traffic; airport runway clear zones – avoidance of incompatible land use in airport runway clear zones)</td></tr>
<tr><td>☒ No Impact
☐ Beneficial
☐ Adverse</td><td>☒ Direct
☒ Indirect
☒ Cumulative</td><td>☐ Permit
☐ Mitigation
☒ NA</td><td>Current Conditions:
Construction of the recommended improvements will not likely cause temporary disturbances to vehicle traffic on local streets and roads in the area.

Preferred Alternative Environmental Narrative:
If necessary, traffic control plans will be implemented to ensure that alternate routes within the community are available and that work areas are marked to ensure that local traffic is safely accommodated during construction.</td></tr>
<tr><td colspan="4">24. Consistency with Local Ordinances, Resolutions, or Plans (example: conformance with local comprehensive plans, zoning, or capital improvement plans.)</td></tr>
<tr><td>☒ No Impact
☐ Beneficial
☐ Adverse</td><td>☒ Direct
☒ Indirect
☒ Cumulative</td><td>☐ Permit
☐ Mitigation
☒ NA</td><td>Current Conditions:
The project is consistent with the City of East Helena’s local ordinances, resolutions, and plans.

Preferred Alternative Environmental Narrative:
The project would not conflict with any other local ordinances, resolutions, or plans.</td></tr>
<tr><td colspan="4">25. Private Property Rights (example: a regulatory action or project activity that reduces, minimizes, or eliminates the use of private property.)</td></tr>
<tr><td>☒ No Impact
☐ Beneficial
☐ Adverse</td><td>☒ Direct
☒ Indirect
☒ Cumulative</td><td>☐ Permit
☐ Mitigation
☒ NA</td><td>Current Conditions:
The project would not involve the use of private property.

Preferred Alternative Environmental Narrative:
The project will not involve any regulatory actions that would affect private property rights.</td></tr>
<tr><td colspan="4">26. Environmental Justice (example: does the project avoid placing lower income households in areas where environmental degradation has occurred, such as adjacent to brownfield sites?)</td></tr>
<tr><td>☒ No Impact
☐ Beneficial
☐ Adverse</td><td>☒ Direct
☒ Indirect
☒ Cumulative</td><td>☐ Permit
☐ Mitigation
☒ NA</td><td>Current Conditions:
The proposed project will not be located in an area where environmental degradation occurs.

Preferred Alternative Environmental Narrative:
The project will not involve any regulatory actions that would affect private property rights.</td></tr>
<tr><td colspan="4">27. Lead Based Paint and/or Asbestos (example: does the project replace asbestos-lined pipes? Do any structures qualify as containing lead-based paint?)</td></tr>
</table>

☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☒ Indirect ☒ Cumulative	☐ Permit ☒ Mitigation ☐ NA	Current Conditions: Asbestos-containing materials are any materials such as buildings, vaults, structures, manholes, water and sewer mains, etc. that contains more than 1 percent asbestos. Lead-based paint is not known to occur in the project area. Preferred Alternative Environmental Narrative: The proposed WWTP project will likely include an asbestos identification inspection to determine if there are any asbestos-containing materials that will be encountered during the project. Lead-based paint will not be included in the project components. Mitigation: If asbestos-containing materials are encountered, the materials would be removed and properly disposed of by a certified asbestos abatement contractor.

Additional Information

****If no cultural survey has been performed, or is not expected to be needed, applicant must agree to the following statement:**

☒ I hereby agree that, to my knowledge, there are no cultural or paleontological materials in the proposed project site. If previously unknown cultural or paleontological materials are identified during project related activities, the DNRC grant manager will be notified, and all work will cease until a professional assessment of such resources can be made.

List all sources of information used to complete the Environmental Checklist. Sources may include studies, plans, documents, or the individuals, organizations, or agencies contacted for assistance. For individuals, groups, or agencies, please include a contact person and phone number. List any scoping documents or meetings and/or public meetings during project development.

The following agencies were contacted about the recommended improvements and for any comments and permitting requirements they may have regarding the improvements:

- Montana Department of Environmental Quality
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Services
- Montana Department of Natural Resources and Conservation
- State Historic Preservation Office
- Montana Department of Fish, Wildlife & Parks
- USDA Natural Resources Conservation Service

- National Wetlands Inventory https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/
- Discover DEQ https://gis.mtdeq.us/portal/apps/webappviewer/index.html?id=f554f421c3e64f5599e76b5cb8dd3391
- Web Soil Survey https://websoilsurvey.nrcs.usda.gov/app/
- FEMA Flood Map Service Center https://msc.fema.gov/portal/home
- Montana Natural Heritage Program https://mtnhp.org/
- IPaC https://ipac.ecosphere.fws.gov/
- MT Sage Grouse Habitat Conservation Program https://sagegrouse.mt.gov/

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RPA
CIVIL ENGINEERING / PLANNING / SURVEYING

August 22, 2025

Sandy Moisey Scherer, Executive Assistant
Montana Department of Environmental Quality
Director’s Office
P.O. Box 200901
Helena, MT 59620-0901

SUBJECT: **East Helena Wastewater Treatment Plant Facility Plan**
East Helena, MT

Dear Ms. Scherer:

Our firm was retained by the City of East Helena to complete the *East Helena Wastewater Treatment Plant (WWTP) Facility Plan.* As part of our work for the City, we are compiling information for an environmental checklist to be included in the document for this project. Guidelines for the checklist require us to advise appropriate agencies of the scope of the project and request their comments.

The City of East Helena currently operates an extended aeration activated sludge treatment process that was constructed in 2002. Wastewater undergoes preliminary treatment in the form of screening and grit removal. The existing screening and grit removal systems are well past their useful life, so the City is currently managing a project to replace those facilities. From preliminary treatment, wastewater flows to an earthen basin with a synthetic liner where it undergoes biological treatment via aeration and mixing. The mixed liquor flows to an up-flow clarifier and treated water is taken off the top and flows by gravity to ultraviolet (UV) disinfection.

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The existing WWTP is over 20 years old and inadequately sized for growth that the City is expecting over the next 20 to 30 years. Much of the equipment and basins are aged and worn out, often causing maintenance issues or plant upsets.

The proposed upgrade to the WWTP includes replacing the secondary treatment process, UV disinfection system, and solids handling facilities. Oxidation ditches with secondary clarifiers will provide biological nutrient removal solids settling. An incline channel-mounted UV system is proposed for disinfection. The solids handling facility will be replaced with a new concrete sludge storage basin and biosolids dewatering facility.

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To satisfy our requirements, please identify any environmental permitting requirements or other issues of interest to your agency we should consider in the development of this project. Any other statements you may have on this project will help us determine the need for further coordination and for more detailed evaluation of the potential project impacts. If we do not receive a reply within 30 days, we will assume that your agency has no comments on this project.

If you have any questions, please contact me at 406-447-5000 or tbodlovic@rpa-eng.com.

Sincerely,
Robert Peccia & Associates

Trisha Bodlovic

Trisha Bodlovic
Environmental Specialist

Enclosures: Project Location Figures

Cc via email: Kevin Ore, East Helena PWD
Jeremy Perlinski, PE, RPA
File

RPA
CIVIL ENGINEERING / PLANNING / SURVEYING

August 22, 2025

Amity Bass
Field Supervisor
U.S. Fish and Wildlife Services
Ecological Services
Montana Field Office
585 Shepard Way, Suite 1
Helena, MT 59601

SUBJECT: **East Helena Wastewater Treatment Plant Facility Plan**
East Helena, MT

Dear Ms. Bass:

Our firm was retained by the City of East Helena to complete the *East Helena Wastewater Treatment Plant (WWTP) Facility Plan.* As part of our work for the City, we are compiling information for an environmental checklist to be included in the document for this project. Guidelines for the checklist require us to advise appropriate agencies of the scope of the project and request their comments.

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To satisfy our requirements, please identify any federally-listed threatened or endangered species or critical habitat for such species that occur or may occur in the project area. Any other statements you may have on this project will help us determine the need for further coordination and for more detailed evaluation of the potential project impacts. If we do not receive a reply within 30 days, we will assume that your agency has no comments on this project.

If you have any questions, please contact me at 406-447-5000 or tbodlovic@rpa-eng.com.

Sincerely,
Robert Peccia & Associates

Trisha Bodlovic

Trisha Bodlovic
Environmental Specialist

Enclosures: Project Location Figures

Cc via email: Kevin Ore, East Helena PWD
Jeremy Perlinski, PE, RPA
File

RPA
CIVIL ENGINEERING / PLANNING / SURVEYING

August 22, 2025

Sage Joyce, P.E.
Montana Program Manager
U.S. Army Corps of Engineers
10 West 15th Street, Suite 2200
Helena, MT 59626

SUBJECT: **East Helena Wastewater Treatment Plant Facility Plan**
East Helena, MT

Dear Ms. Joyce:

Our firm was retained by the City of East Helena to complete the *East Helena Wastewater Treatment Plant (WWTP) Facility Plan.* As part of our work for the City, we are compiling information for an environmental checklist to be included in the document for this project. Guidelines for the checklist require us to advise appropriate agencies of the scope of the project and request their comments.

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If you have any questions, please contact me at 406-447-5000 or tbodlovic@rpa-eng.com.

Sincerely,
Robert Peccia & Associates

Trisha Bodlovic

Trisha Bodlovic
Environmental Specialist

Enclosures: Project Location Figures

Cc via email: Kevin Ore, East Helena PWD
Jeremy Perlinski, PE, RPA
File

RPA
CIVIL ENGINEERING / PLANNING / SURVEYING

August 22, 2025

Jennifer Daly
Regional Manager
Montana Department of Natural Resources and Conservation
Water Resources Bureau
1424 Ninth Avenue
P.O. Box 201601
Helena, MT 59620-1601

SUBJECT: **East Helena Wastewater Treatment Plant Facility Plan**
East Helena, MT

Dear Ms. Daly:

Our firm was retained by the City of East Helena to complete the *East Helena Wastewater Treatment Plant (WWTP) Facility Plan.* As part of our work for the City, we are compiling information for an environmental checklist to be included in the document for this project. Guidelines for the checklist require us to advise appropriate agencies of the scope of the project and request their comments.

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To satisfy our requirements, please identify any environmental permitting requirements or other issues of interest to your agency we should consider in the development of this project. Any other statements you may have on this project will help us determine the need for further coordination and for more detailed evaluation of the potential project impacts. We are working closely with Kevin Ore, the City of East Helena's Floodplain Administrator on this project. If we do not receive a reply within 30 days, we will assume that your agency has no comments on this project.

If you have any questions, please contact me at 406-447-5000 or tbodlovic@rpa-eng.com.

Sincerely,
Robert Peccia & Associates

Trisha Bodlovic

Trisha Bodlovic
Environmental Specialist

Enclosures: Project Location Figures

Cc via email: Kevin Ore, East Helena PWD
Jeremy Perlinski, PE, RPA
File

RPA
CIVIL ENGINEERING / PLANNING / SURVEYING

August 22, 2025

Damon Murdo, Cultural Records Manager
State Historic Preservation Office
Montana Historical Society
P.O. Box 201802
Helena, MT 59620-1202

SUBJECT: **East Helena Wastewater Treatment Plant Facility Plan**
East Helena, MT

Dear Mr. Murdo:

Our firm was retained by the City of East Helena to complete the *East Helena Wastewater Treatment Plant (WWTP) Facility Plan.* As part of our work for the City, we are compiling information for an environmental checklist to be included in the document for this project. Guidelines for the checklist require us to advise appropriate agencies of the scope of the project and request their comments.

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(406) 447-5000
3147 Saddle Dr. Helena, MT 59601
www.rpa-eng.com
HELENA / KALISPELL / BOZEMAN

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In an effort to help us identify any historical or archaeological resources that may be affected by the proposed project, we would like to request a cultural resource file search for the following areas:

T-10-N, R-3-W, Section 24

Any other statements you may have on this project will help us determine the need for further coordination and for more detailed evaluation of the potential project impacts. If we do not receive a reply within 30 days, we will assume that your agency has no comments on this project.

If you have any questions, please contact me at 406-447-5000 or tbodlovic@rpa-eng.com.

Sincerely,
Robert Peccia & Associates

Trisha Bodlovic

Trisha Bodlovic
Environmental Specialist

Enclosures: Project Location Figures

Cc via email: Kevin Ore, East Helena PWD
Jeremy Perlinski, PE, RPA
File

RPA
CIVIL ENGINEERING / PLANNING / SURVEYING

August 22, 2025

Montana Department of Fish, Wildlife & Parks
Region 3
1400 South 19th
Bozeman, MT 59718

SUBJECT: **East Helena Wastewater Treatment Plant Facility Plan**
East Helena, MT

To Whom it May Concern:

Our firm was retained by the City of East Helena to complete the *East Helena Wastewater Treatment Plant (WWTP) Facility Plan.* As part of our work for the City, we are compiling information for an environmental checklist to be included in the document for this project. Guidelines for the checklist require us to advise appropriate agencies of the scope of the project and request their comments.

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To satisfy our requirements, please identify any wildlife or fisheries concerns or other issues important to your agency we should consider in the development of this project. Any other statements you may have on this project will help us determine the need for further coordination and for more detailed evaluation of the potential project impacts. If we do not receive a reply within 30 days, we will assume that your agency has no comments on this project.

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Sincerely,
Robert Peccia & Associates

Trisha Bodlovic

Trisha Bodlovic
Environmental Specialist

Enclosures: Project Location Figures

Cc via email: Kevin Ore, East Helena PWD
Jeremy Perlinski, PE, RPA
File

RPA
CIVIL ENGINEERING / PLANNING / SURVEYING

August 22, 2025

Rebecka Ayre
District Conservationist
USDA Natural Resources Conservation Services
Helena Field Office
790 Colleen Street
Helena, MT 59601-9713

SUBJECT: **East Helena Wastewater Treatment Plant Facility Plan**
East Helena, MT

Dear Ms. Ayre:

Our firm was retained by the City of East Helena to complete the *East Helena Wastewater Treatment Plant (WWTP) Facility Plan.* As part of our work for the City, we are compiling information for an environmental checklist to be included in the document for this project. Guidelines for the checklist require us to advise appropriate agencies of the scope of the project and request their comments.

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Sincerely,
Robert Peccia & Associates

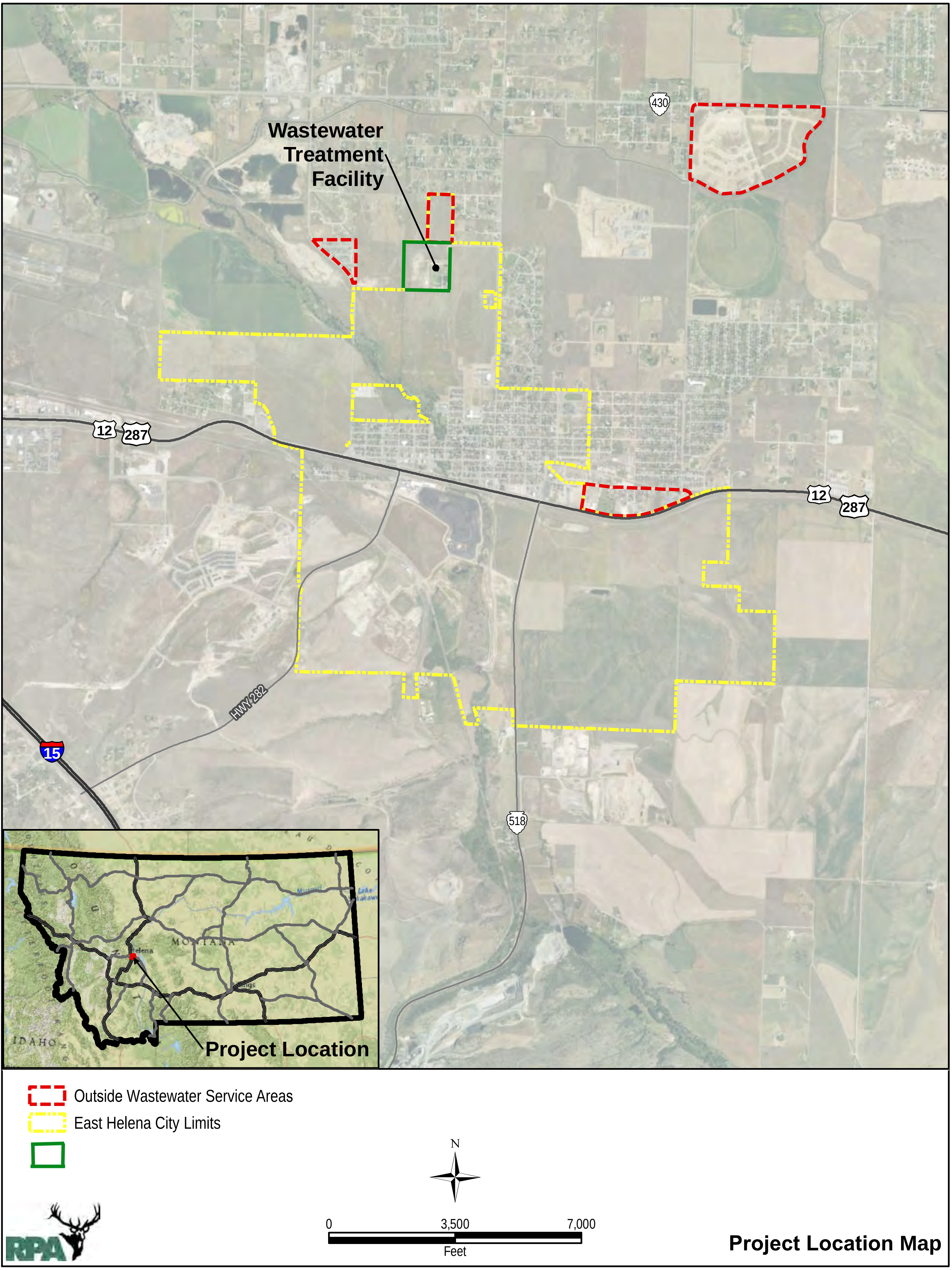
Trisha Bodlovic

Trisha Bodlovic
Environmental Specialist

Enclosures: Project Location Figures

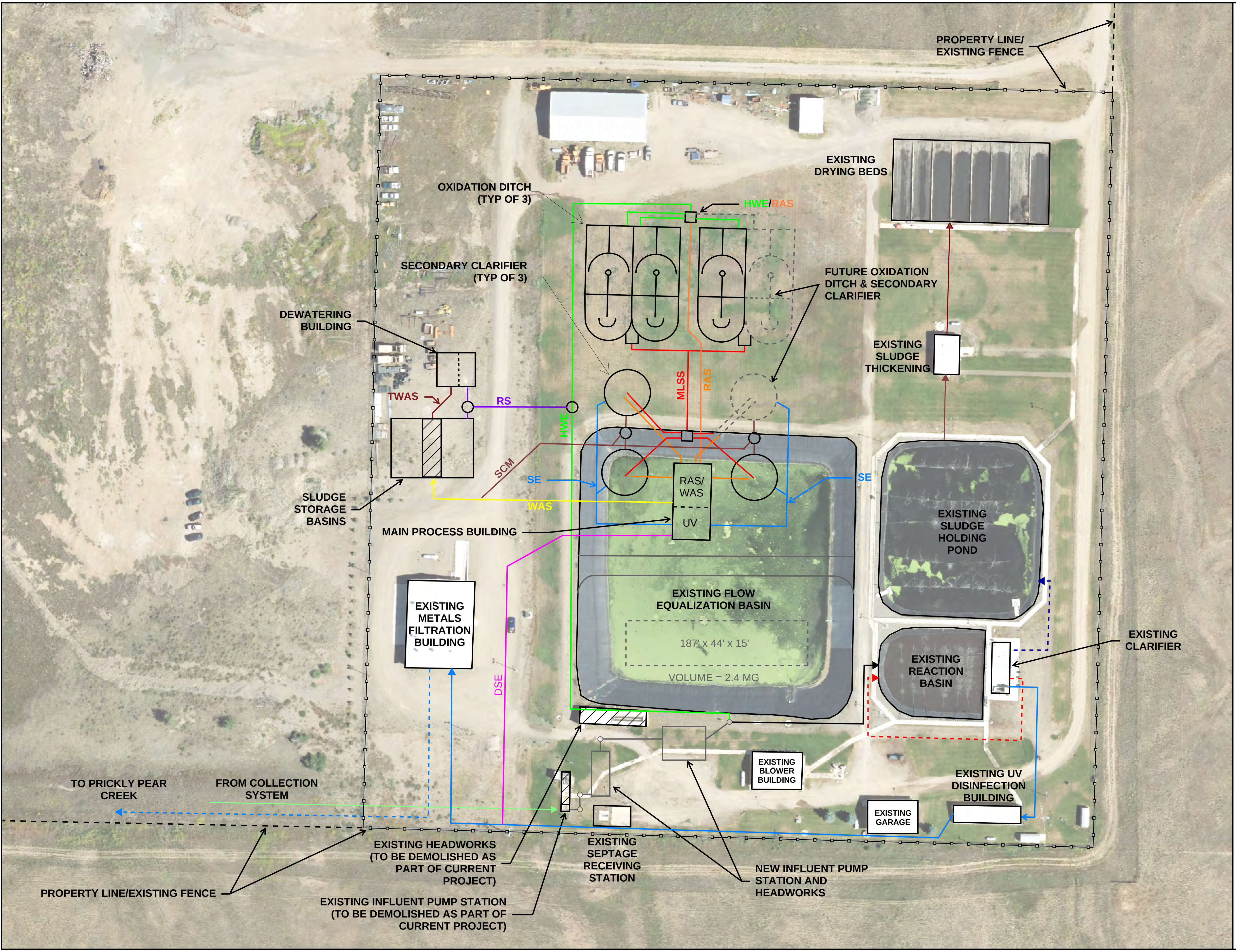
Cc via email: Kevin Ore, East Helena PWD
Jeremy Perlinski, PE, RPA
File

Date: 4/2/2020 Path: F:\waste\18801 - East Helena Wastewater Capacity Study\GIS\MasterPlan\PlanningAreaMap.mxd



Project Location Map

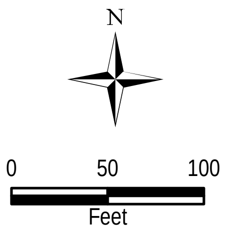
Intentionally Left Blank



Date: 4/26/2019 Path: F:\waste\18801 - East Helena Wastewater Capacity Study\GIS\MasterPlan\NormalFlowPath.mxd

LEGEND:

- 🟩 HWE (HEADWORKS EFFLUENT)
- 🟧 RAS (RETURN ACTIVATED SLUDGE)
- 🟥 MLSS (MIXED LIQUOR SUSPENDED SOLIDS)
- 🟦 SE (SECONDARY INFLUENT)
- 🟨 WAS (WASTE ACTIVATED SLUDGE)
- 🟪 DSE (DISINFECTED SECONDARY INFLUENT)
- 🟫 SCM (SCUM)
- 🟫 TWAS (THICKENED WASTE ACTIVATED SLUDGE)
- 🟪 RS (RETURN STREAM)



East Helena WWTP Facility Plan

Proposed WWTP Project

From: Murdo, Damon
To: Trisha Bodlovic
Subject: EAST HELENA WASTEWATER TREATMENT PLANT FACILITY PLAN
Date: Thursday, August 28, 2025 12:02:04 PM
Attachments: image004.png
image003.png
Sites.pdf
20250825004.pdf
Reports.pdf

M T H S
MONTANA
HISTORICAL SOCIETY

August 28, 2025

Trisha Bodlovic
RPA
PO Box 5653
Helena MT 59604

RE: EAST HELENA WASTEWATER TREATMENT PLANT FACILITY PLAN. SHPO Project #: 20250825004

Dear Trisha:

I have conducted a cultural resource file search for the above-cited project located in Section 24 T10N R3W. According to our records there have been a few previously recorded sites within the designated search locales. None of these sites are located within the proposed project area. In addition to the sites there have been a few previously conducted cultural resource inventories done in the areas. I've attached a list of these sites and reports. If you would like any further information regarding these sites or reports, you may contact me at the number listed below.

It is SHPO's position that any structure over fifty years of age is considered historic and is potentially eligible for listing on the National Register of Historic Places. If any structures are within the Area of Potential Effect, and are over fifty years old, we would recommend that they be recorded, and a determination of their eligibility be made prior to any disturbance taking place.

As long as there will be no disturbance or alteration to structures over fifty years of age, we feel that there will be no cultural or historic properties affected by this undertaking. We, therefore, feel that a recommendation for a cultural resource inventory is unwarranted at this time. However, should structures need to be altered or if cultural materials are inadvertently discovered during this project, we would ask that our office be contacted, and the site investigated.

If you have any further questions or comments, you may contact me at (406) 444-7767 or by e-mail at dmurdo@mt.gov. I have attached an invoice for the file search. Thank you for consulting with us.

Sincerely,

Damon Murdo
Cultural Records/Data Manager
State Historic Preservation Office

M T H S
MONTANA
HISTORICAL SOCIETY

STATE HISTORIC PRESERVATION OFFICE
Montana Cultural Resource Database
Report Township,Range,Section Results
Report Date:8/28/2025

Township:10 N Range:3 W Section: 24

BROWNELL JOAN, ET AL.

7/1/1994 HELENA CITY GATE/EAST HELENA GAS LINE

Report Document Number: LC 6 16161 Agency Document Number: HV-94-24

Township:10 N Range:3 W Section: 24

ROSSILLON MITZI

10/9/2001 A CULTURAL RESOURCE INVENTORY OF CANYON FERRY ROAD HIGHWAY PROJECT STPS 430-1(5)1 IN LEWIS AND CLARK COUNTY MONTANA

Report Document Number: LC 4 24429 Agency Document Number: STPS 430-1(5)1

Township:10 N Range:3 W Section: 24

AXLINE JON

11/29/2004 CULTURAL RESOURCE SURVEY OF THE WYLIE DRIVE - NORTH OF EAST HELENA IN LEWIS AND CLARK COUNTY, MONTANA

Report Document Number: LC 4 27579 Agency Document Number: STPHS 25(37)

Township:10 N Range:3 W Section: 24

LEE JENNIFER

7/3/2018 DARTMAN FIELD MINOR SUBDIVISION PROJECT IN EAST HELENA

Report Document Number: LC 6 39599 Agency Document Number:

STATE HISTORIC PRESERVATION OFFICE Montana Cultural Resource Database

Township, Range, Section Report

Report Date:8/28/2025

Site #	Twp	Rng	Sec	Qs	Site Type 1	Site Type 2	Time Period	Owner	NR Status
24LC1062	10N	3W	24	comb	Historic Irrigation System		1950-1959	Combination	Ineligible
24LC1688	10N	3W	24	NW	Historic Residence		Historic More Than One Decade	Private	Ineligible
24LC1693	10N	3W	24	Comb	Historic Irrigation System		Historic More Than One Decade	Private	Unresolved
24LC1694	10N	3W	24	NW	Historic Irrigation System		Historic More Than One Decade	Private	Unresolved
24LC1695	10N	3W	24	NW	Historic Irrigation System		Historic More Than One Decade	Private	Unresolved
24LC2604	10N	3W	24	SE	Precontact Lithic Material Concentration		Prehistoric More Than One Period	Private	Undetermined*
24LC2606	10N	3W	24	SE	Historic Irrigation System		Historic Period	Private	Undetermined*
24LC2607	10N	3W	24	SE	Historic Irrigation System		Historic Period	Private	Undetermined*
24LC2608	10N	3W	24	SE	Historic Irrigation System		Historic Period	Private	Undetermined*
24LC2867	10N	3W	24	Comb	Historic Pipeline		1960-1969	Forest Service	Undetermined*
24LC2869	10N	3W	24	Comb	Historic Transmission Line		1910-1919	Forest Service	Eligible

IPaC resource list

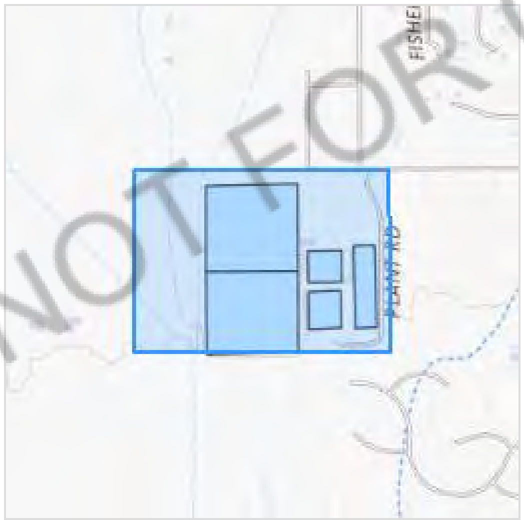
This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Lewis and Clark County, Montana



Local office

Montana Ecological Services Field Office

☎ (406) 449-5225
📠 (406) 449-5339

585 Shephard Way, Suite 1

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

NOT FOR CONSULTATION

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Canada Lynx Lynx canadensis There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/9743	Proposed Threatened
Suckley's Cuckoo Bumble Bee Bombus suckleyi No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10885	Proposed Endangered

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Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete
If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

NOT FOR CONSULTATION

Review the FAQs

The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (🟩)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the

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maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (🟨)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

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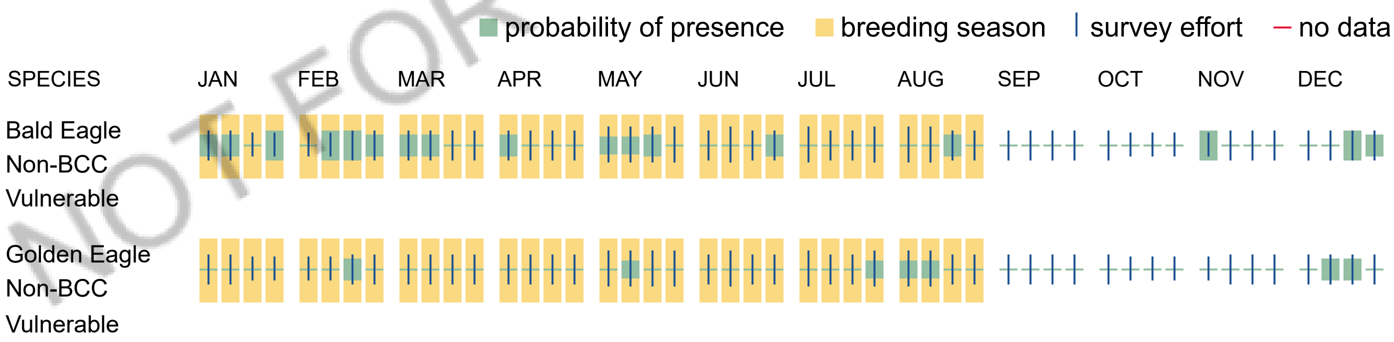

Bald & Golden Eagles FAQs

What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are an eagle (Bald and Golden Eagle Protection Act requirements may apply).

Proper interpretation and use of your eagle report

On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort line or no data line (red horizontal) means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list and associated information help you know what to look for to confirm presence and helps guide you in knowing when to implement avoidance and minimization measures to eliminate or reduce potential impacts from your project activities or get the appropriate permits should presence be confirmed.

How do I know if eagles are breeding, wintering, or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating, or resident), you may query your location using the RAIL Tool and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If an eagle on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your “IPaC PROBABILITY OF PRESENCE SUMMARY” at the top of your results list), there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

Interpreting the Probability of Presence Graphs

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. A taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:
The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season ()
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ()
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data ()
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

NOT FOR CONSULTATION

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Migratory birds

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

Measures for Proactively Minimizing Migratory Bird Impacts

Your IPaC Migratory Bird list showcases birds of concern, including Birds of Conservation Concern (BCC), in your project location. This is not a comprehensive list of all birds found in your project area. However, you can help proactively minimize significant impacts to all birds at your project location by implementing the measures in the Nationwide avoidance and minimization measures for birds document, and any other project-specific avoidance and minimization measures suggested at the link Measures for avoiding and minimizing impacts to birds for the birds of concern on your list below.

Ensure Your Migratory Bird List is Accurate and Complete

If your project area is in a poorly surveyed area, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles document, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NOT FOR CONSULTATION

Review the FAQs

The FAQs below provide important additional information and resources.

NAME	BREEDING SEASON
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Jan 1 to Aug 31
Bobolink Dolichonyx oryzivorus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Broad-tailed Hummingbird Selasphorus platycercus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 25 to Aug 21
California Gull Larus californicus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 1 to Jul 31
Calliope Hummingbird Selasphorus calliope This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9526	Breeds May 1 to Aug 15
Cassin's Finch Haemorhous cassinii This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9462	Breeds May 15 to Jul 15
Evening Grosbeak Coccothraustes vespertinus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Aug 10
Franklin's Gull Leucophaeus pipixcan This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31

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Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Lesser Yellowlegs Tringa flavipes — Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9679

Lewis's Woodpecker Melanerpes lewis — Breeds Apr 20 to Sep 30

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9408

Long-eared Owl asio otus — Breeds Mar 1 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3631

Olive-sided Flycatcher Contopus cooperi — Breeds May 20 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Pinyon Jay Gymnorhinus cyanocephalus — Breeds Feb 15 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9420

Rufous Hummingbird Selasphorus rufus — Breeds Apr 15 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Thick-billed Longspur Rhynchophanes mccownii — Breeds May 1 to Aug 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

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Western Grebe aechmophorus occidentalis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/6743	Breeds Jun 1 to Aug 31
Willet Tringa semipalmata This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (🟩)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (🟨)

NOT FOR CONSULTATION

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

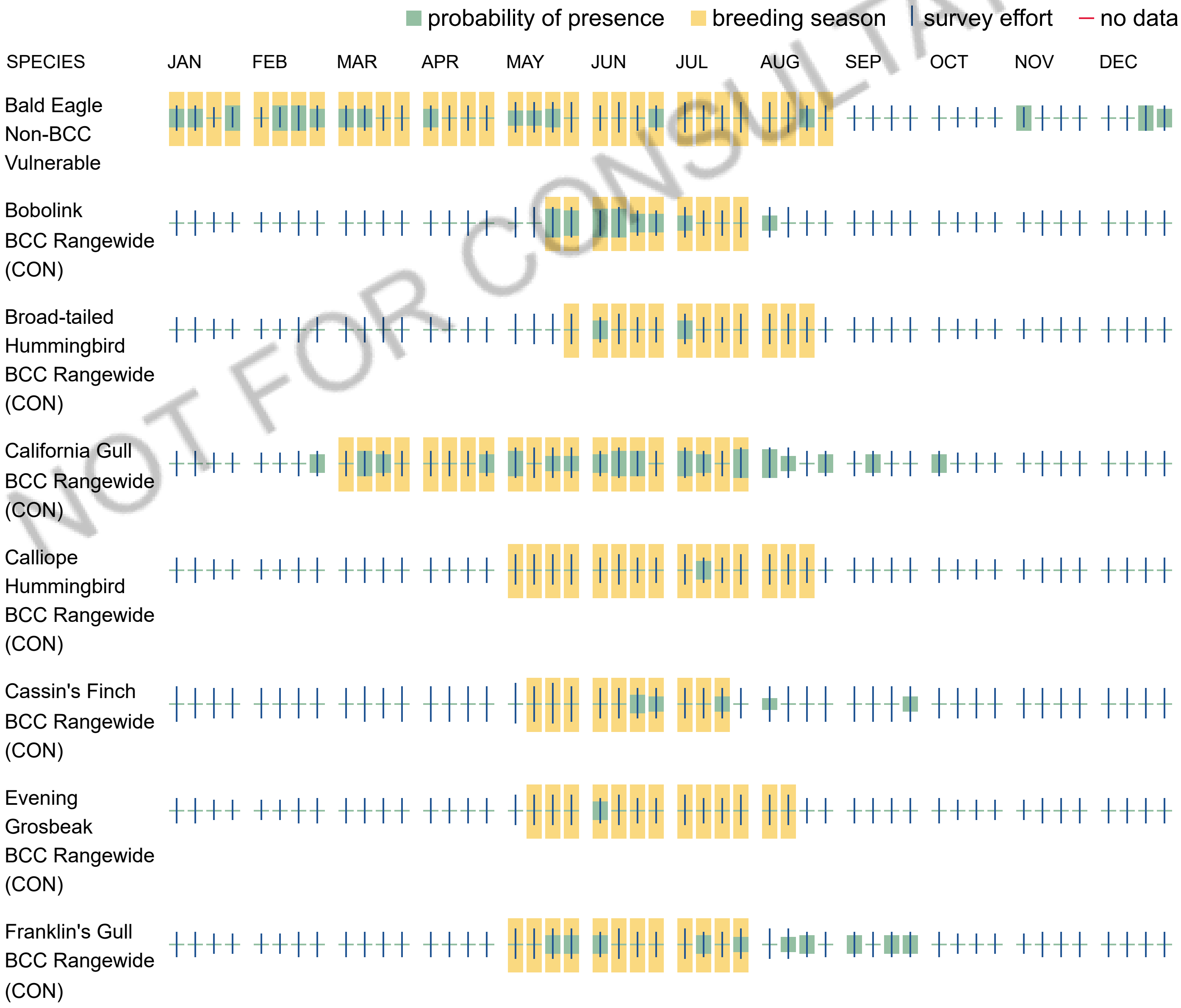
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



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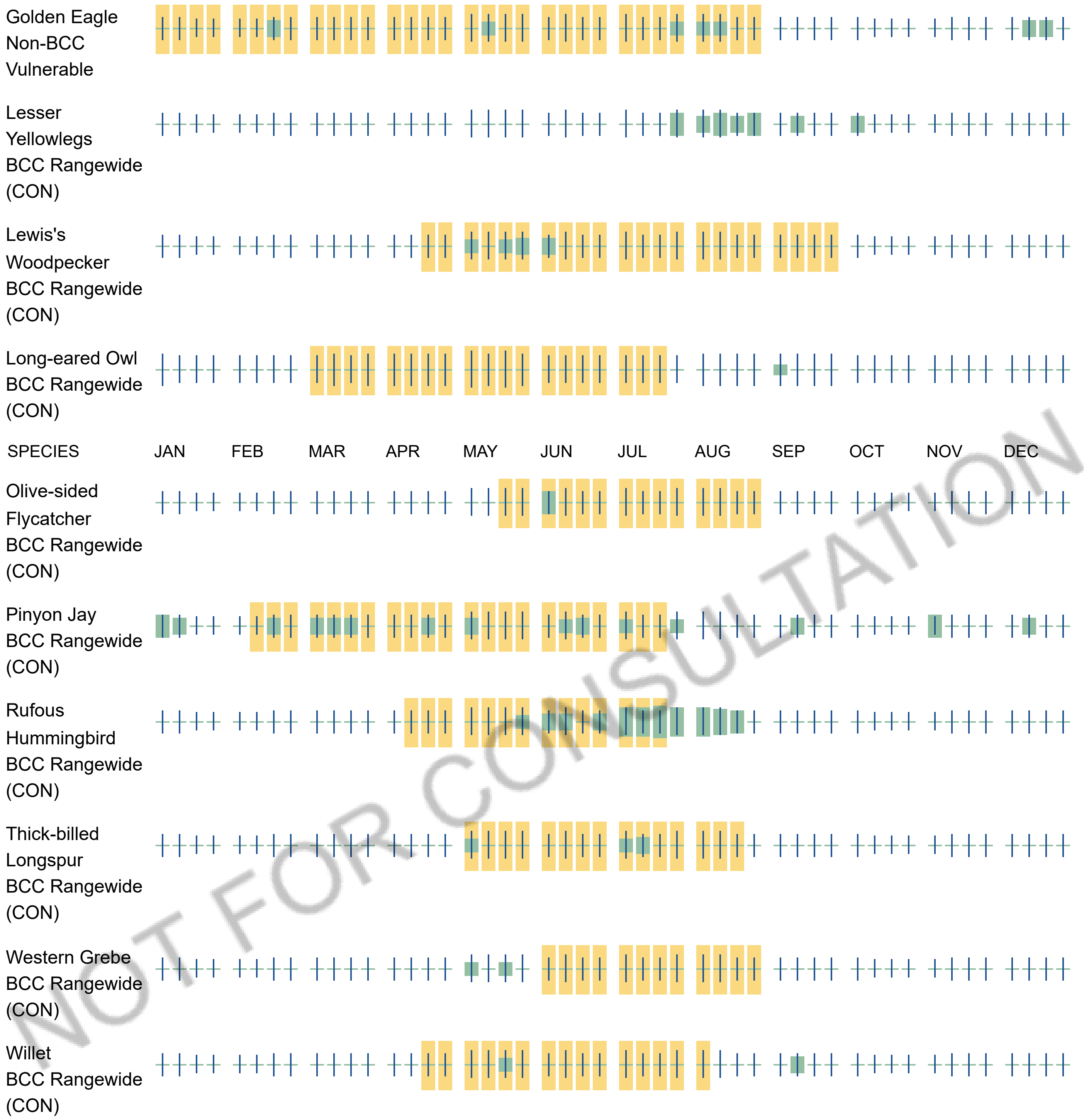

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Migratory Bird FAQs

Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Avoidance & Minimization Measures for Birds describes measures that can help avoid and minimize impacts to all birds at any location year-round. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is one of the most effective ways to minimize impacts. To see when birds are most likely to occur and breed in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location, such as those listed under the Endangered Species Act or the Bald and Golden Eagle Protection Act and those species marked as “Vulnerable”. See the FAQ “What are the levels of concern for migratory birds?” for more information on the levels of concern covered in the IPaC migratory bird species list.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) with which your project intersects. These species have been identified as warranting special attention because they are BCC species in that area, an eagle (Bald and Golden Eagle Protection Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, and to verify survey effort when no results present, please visit the Rapid Avian Information Locator (RAIL) Tool.

NOT FOR CONSULTATION

Why are subspecies showing up on my list?

Subspecies profiles are included on the list of species present in your project area because observations in the AKN for **the species** are being detected. If the species are present, that means that the subspecies may also be present. If a subspecies shows up on your list, you may need to rely on other resources to determine if that subspecies may be present (e.g. your local FWS field office, state surveys, your own surveys).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go to the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating, or resident), you may query your location using the RAIL Tool and view the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your IPaC migratory bird species list has a breeding season associated with it (indicated by yellow vertical bars on the phenology graph in your “IPaC PROBABILITY OF PRESENCE SUMMARY” at the top of your results list), there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Bald and Golden Eagle Protection Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially BCC species. For more information on avoidance and minimization measures you can implement to help avoid and minimize migratory bird impacts, please see the FAQ “Tell me more about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds”.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Proper interpretation and use of your migratory bird report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please look carefully at the survey effort (indicated by the black vertical line) and for the existence of the "no data" indicator (a red horizontal line). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list does not represent all birds present in your project area. It is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list and associated information help you know what to look for to confirm presence and helps guide implementation of avoidance and minimization measures to eliminate or reduce potential impacts from your project activities, should presence be confirmed. To learn more about avoidance and minimization measures, visit the FAQ "Tell me about avoidance and minimization measures I can implement to avoid or minimize impacts to migratory birds".

Interpreting the Probability of Presence Graphs

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. A taller bar indicates a higher probability of species presence. The survey effort can be used to establish a level of confidence in the presence score.

How is the probability of presence score calculated? The calculation is done in three steps:

NOT FOR CONSULTATION

The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season ()
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort ()
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data ()
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

NOT FOR CONSULTATION

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND
- PEM1Ax
- PEM1Cx

FRESHWATER POND
- PABKx

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

NOT FOR CONSULTATION

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

U.S. Fish and Wildlife Service

National Wetlands Inventory

Wetlands

U.S. Fish and Wildlife Service, National Standards and Support Team,
wetlands_team@fws.gov

September 10, 2025

Wetlands

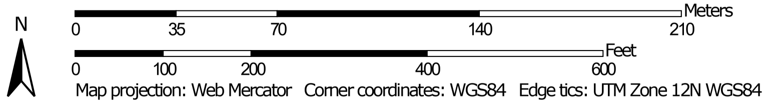
- 🟦 Estuarine and Marine Deepwater
- 🟦 Estuarine and Marine Wetland
- 🟩 Freshwater Emergent Wetland
- 🟩 Freshwater Forested/Shrub Wetland
- 🟦 Freshwater Pond
- 🟪 Lake
- 🟫 Other
- 🟦 Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Farmland Classification—Lewis and Clark County Area, Montana

Map Scale: 1:2,620 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

MAP LEGEND

Area of Interest (AOI)

- ▭ Area of Interest (AOI)

Soils

Soil Rating Polygons

- 🟥 Not prime farmland
- 🟩 All areas are prime farmland
- ■ Prime farmland if drained
- ■ Prime farmland if protected from flooding or not frequently flooded during the growing season
- 🟨 Prime farmland if irrigated
- ■ Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- ■ Prime farmland if irrigated and drained
- ■ Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- ■ Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- ■ Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- ■ Prime farmland if irrigated and reclaimed of excess salts and sodium
- ■ Farmland of statewide importance
- ■ Farmland of statewide importance, if drained
- ■ Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- ■ Farmland of statewide importance, if irrigated
- ■ Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- ■ Farmland of statewide importance, if irrigated and drained
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- ■ Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- ■ Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- ■ Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- ■ Farmland of statewide importance, if warm enough
- ■ Farmland of statewide importance, if thawed
- ■ Farmland of local importance
- 🟧 Farmland of local importance, if irrigated
- 🟦 Farmland of unique importance
- ⬜ Not rated or not available

Soil Rating Lines

- 〰 Not prime farmland
- 〰 All areas are prime farmland
- 〰 Prime farmland if drained
- 〰 Prime farmland if protected from flooding or not frequently flooded during the growing season
- 〰 Prime farmland if irrigated
- 〰 Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- 〰 Prime farmland if irrigated and drained
- 〰 Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

- 〰 Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- 〰 Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
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- 〰 Farmland of statewide importance
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- 〰 Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- 〰 Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- 〰 Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- 〰 Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- 〰 Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- 〰 Farmland of statewide importance, if warm enough
- 〰 Farmland of statewide importance, if thawed
- 〰 Farmland of local importance
- 〰 Farmland of local importance, if irrigated
- 〰 Farmland of unique importance
- 〰 Not rated or not available

Soil Rating Points

- 🟥 Not prime farmland
- 🟩 All areas are prime farmland
- 🟩 Prime farmland if drained
- 🟩 Prime farmland if protected from flooding or not frequently flooded during the growing season
- 🟨 Prime farmland if irrigated
- 🟨 Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- 🟫 Prime farmland if irrigated and drained
- ■ Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- ■ Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- ■ Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- ■ Prime farmland if irrigated and reclaimed of excess salts and sodium
- ■ Farmland of statewide importance
- 🟦 Farmland of statewide importance, if drained
- 🟪 Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- 🟧 Farmland of statewide importance, if irrigated

- 🟩 Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- 🟩 Farmland of statewide importance, if irrigated and drained
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- 🟪 Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
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- 🟦 Farmland of unique importance
- ⬜ Not rated or not available

Water Features

- ~ Streams and Canals

Transportation

- ┼┼┼ Rails
- ~ Interstate Highways
- ~ US Routes
- ~ Major Roads
- ~ Local Roads

Background

- ▨ Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Lewis and Clark County Area, Montana
Survey Area Data: Version 19, Aug 22, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 6, 2021—Sep 30, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
206A	Nippt very cobbly loam, 0 to 4 percent slopes	Not prime farmland	0.0	0.0%
406A	Nippt gravelly loam, 0 to 2 percent slopes	Not prime farmland	9.4	36.1%
513A	Attewan-Nippt complex, 0 to 2 percent slopes	Farmland of local importance	16.6	63.9%
Totals for Area of Interest			**25.9**	**100.0%**

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

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APPENDIX F

Council Meeting Documentation

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MEETING AGENDA
CITY OF EAST HELENA
CITY HALL – 306 EAST MAIN - ROOM 110
COUNCIL MEETING: 6:30 PM
DATE: TUESDAY, AUGUST 19, 2025
JOIN ZOOM MEETING: https://us06web.zoom.us/j/3787705872
CONFERENCE CALL-IN: 1-253-205-0468 MEETING ID: 378 770 5872

MEETING CALLED TO ORDER: Mayor Harris

PLEDGE OF ALLEGIANCE: Councilmember Ferguson

EAST HELENA HIGH SCHOOL ACTIVITIES UPDATE: Activities Director Shaun Murgel, East Helena Public Schools
Action: Information only

WASTEWATER TREATMENT PLANT UPGRADE PRESENTATION: Jeremy Perlinski, Robert Peccia & Associates
Action: Information only

PUBLIC COMMENTS: Note: This time is set aside for comments from the public on matters that are not on the meeting agenda. Public comments will be taken on agenda items prior to a motion. All public comments will be limited to a reasonable duration. Prior to your comments, please state your name and address in an audible tone of voice for the record.

APPROVAL OF MINUTES: August 5, 2025

CITY COURT REPORT: City Judge Dennis Loveless

DEPARTMENTAL REPORTS:
Administration – Clerk/Treasurer Amy Thorngren
Police Department – Police Chief Mike Sanders
Public Works - Public Works Director Kevin Ore
Volunteer Fire Department - Fire Chief Roger Campbell

UNFINISHED BUSINESS:

1. East Helena Christmas Stroll – Stacia Winslow
   Action: Approve/Deny/Table

NEW BUSINESS:

1. J4 Automotive Request to Use Main Street Park for the Halloween and Christmas Strolls – Kit Johnson
   Action: Approve/Deny/Table
2. Valley Bank Request to Use City Facilities for the East Helena Christmas Stroll December 4th – Stephanie Chambers

Action: Approve/Deny/Table

3. Appointment of Jennifer Opie to the East Helena Police Commission – Mayor Harris
   Action: Approve/Deny/Table
4. City of East Helena Western Montana Hazard Mitigation Plan Adoption Resolution – Mayor Harris
   Action: Approve/Deny/Table
5. Resolution of Respect and Esteem for Isabelle Pistelak – Mayor Harris
   Action: Approve/Deny/Table
6. Resolution to Hold the November 4th General Election – Mayor Harris
   Action: Approve/Deny/Table
7. Prickly Pear Estates Regional Lift Station Grant of Easement – Mayor Harris
   Action: Approve/Deny/Table

MAYOR'S REPORT: Mayor Harris

COUNCILMEMBERS' REPORTS:

Don Dahl
Judy Leland
Wesley Feist
Suzanne Ferguson

LEGAL REPORT: City Attorney Elverum

PAYMENT OF BILLS: Action: Approve/Deny/Table

MEETING SCHEDULE:

1. East Helena Zoning Commission Meeting & Public Hearing, Wednesday, August 20, 6:00 p.m., City Hall Rm 110
2. East Helena City Council Meeting, Tuesday, September 2, 6:30 p.m., City Hall Rm 110
3. East Helena Planning Board Meeting, Wednesday, September 10, 6:00 p.m., City Hall Rm 110
4. East Helena City Council Meeting, Tuesday, September 16, 6:30 p.m., City Hall Rm 110

ADJOURNMENT: Mayor Harris

ADA NOTICE

The City of East Helena is committed to providing access to persons with disabilities for its meetings, in compliance with Title II of the Americans with Disabilities Act and the Montana Human Rights Act. The city will not exclude people with disabilities from participating in its meetings, or otherwise deny them the City's services, programs, or activities. Persons with disabilities requiring accommodations to participate in the City's meetings, services, programs, or activities should contact the City Clerk as soon as possible to allow sufficient time to arrange for the requested accommodation, at any of the following:

(406) 227-5321 or TTY Relay Service 1-800-253-4091 or 711
cityclerk@easthelenamt.us - 306 East Main Street, P.O. Box 1170, East Helena, MT 59635

MEETING MINUTES
CITY OF EAST HELENA
CITY HALL – 306 EAST MAIN - ROOM 110
COUNCIL MEETING: 6:30 PM
DATE: TUESDAY, AUGUST 19, 2025
JOIN ZOOM MEETING: https://us06web.zoom.us/j/3787705872
CONFERENCE CALL-IN: 1-253-205-0468 MEETING ID: 378 770 5872

MEETING CALLED TO ORDER: Mayor Harris called the meeting to order at 6:30 p.m. Councilmember Ferguson led the Pledge of Allegiance.

CITY OFFICIALS & STAFF PRESENT: Mayor Kelly Harris, Council President Don Dahl, Councilmember Judy Leland, Councilmember Wesley Feist, Councilmember Suzanne Ferguson, Clerk/Treasurer Amy Thorngren, City Attorney Pete Elverum, Public Works Director Kevin Ore, Fire Chief Roger Campbell, Patrol Officer Chris Kirkekaard, and City Engineer Jeremy Perlinski

PUBLIC PRESENT: Shaun Murgel, Kyle Sturgill-Simon, Stephanie Chambers, Andrea Eckerson, and Chris Pratt

ABSENT/EXCUSED: City Judge Dennis Loveless and Police Chief Mike Sanders

(0:00:30) EAST HELENA HIGH SCHOOL ACTIVITIES UPDATE: Activities Director Shaun Murgel updated Council on EHHS fall sports and events.

(0:04:10) WASTEWATER TREATMENT PLANT UPGRADE PRESENTATION: A printed copy of the presentation was included in the council packet. Jeremy Perlinski of Robert Peccia & Associates discussed the need for an upgrade to the wastewater treatment plant. This was an information-only item.

PUBLIC COMMENTS: There was no public comment on any non-agenda items.

(0:55:45) APPROVAL OF MINUTES: The draft minutes of the August 5th meeting were included in the council packet. There was no public comment. Councilmember Feist made a motion to approve the minutes as presented. Councilmember Leland seconded the motion. The motion passed unanimously.

CITY COURT REPORT: City Judge Dennis Loveless was excused.

DEPARTMENTAL REPORTS:
(0:56:15) Administration – Clerk/Treasurer Amy Thorngren reported that she attended the Montana Department of Commerce on-site pre-monitoring visit for the wastewater system

improvement projects, that the pool was closed for the season, and that facility rentals were at a record high.

Police Department – A written report was on the council room table. Police Chief Mike Sanders was excused.

(0:57:15) Public Works – A written report was included in the council packet. Public Works Director Kevin Ore reported that a transformer failed at the wastewater treatment plan, he attended the DEQ groundwater permit application meeting, and that he was working with Helena Sand & Gravel on pavement repairs. He discussed the unpaved block of Clinton Street.

(1:02:00) Volunteer Fire Department - Fire Chief Roger Campbell reported that a few new members were joining the department.

UNFINISHED BUSINESS:

1. **(1:02:50) East Helena Christmas Stroll** – Council discussed the need for Valley Bank to coordinate all the vendors at the Christmas Stroll. (1:03:45) Chris Pratt noted that vendors next to J4's tent were not a problem. Councilmember Dahl made a motion to refer the request to Valley Bank. Councilmember Leland seconded the motion. The motion passed unanimously.

NEW BUSINESS:

1. **(1:06:10) J4 Automotive Request to Use Main Street Park for the Halloween and Christmas Strolls** – Chris Pratt requested Council's approval to use Main Street Park for the Halloween and Christmas Strolls and close off Lane Avenue for the East Helena Block Party. There was no public comment. Councilmember Feist made a motion to approve the request. Councilmember Ferguson seconded the motion. The motion passed unanimously.
2. **(1:11:35) Valley Bank Request to Use City Facilities for the East Helena Christmas Stroll December 4th** – Stephanie Chambers requested Council's approval to use City Hall and the Recreation Hall for the annual stroll. Fire Chief Roger Cambell discussed his safety concerns about overcrowding during the event. There was no public comment. Councilmember Feist made a motion to approve the request with fire department coordination. Councilmember Leland seconded the motion. The motion passed unanimously.
3. **(1:20:00) Appointment of Jennifer Opie to the East Helena Police Commission** – Relevant MCA was included in the council packet. Mayor Harris requested Council's approval to appoint Jennifer Opie to the police commission. There was no public comment. Councilmember Dahl made a motion to approve. Councilmember Ferguson seconded the motion. The motion passed unanimously.
4. **(1:20:50) City of East Helena Western Montana Hazard Mitigation Plan Adoption Resolution** – A letter from Lewis and Clark Emergency Management and Draft Resolution 629 were included in the council packet. Emergency Manager Kyle Sturgill-Simon was present to discuss the mitigation plan and answer questions. There

was no public comment. Councilmember Dahl made a motion to approve Resolution 629. Councilmember Leland seconded the motion. The motion passed unanimously.

5. **(1:26:35) Resolution of Respect and Esteem for Isabelle Pistelak** – A copy of the resolution was included in the council packet. Mayor Harris spoke about Isabelle Pistelak's accomplishments and shared memories of her. There was no public comment. Councilmember Leland made a motion to approve the Resolution. Councilmember Feist seconded the motion. The motion passed unanimously.
6. **(1:28:10) Resolution to Hold the November 4th General Election** – A letter from the county elections supervisor and the draft resolution were included in the council packet. Mayor Harris requested to hold the election in the interest of democracy even though it is uncontested. There was no public comment. Councilmember Ferguson made a motion to approve Resolution 631. Councilmember Dahl seconded the motion. The motion passed unanimously.
7. **(1:29:15) Prickly Pear Estates Regional Lift Station Grant of Easement** – A copy of the agreement was included in the council packet. Public Works Director Ore discussed the proposed easement. There was no public comment. Councilmember Feist made a motion to approve the agreement. Councilmember Dahl seconded the motion. The motion passed unanimously.

(1:31:40) MAYOR'S REPORT: Mayor Harris reported that he attended the Joe Mitchell State Farm Food Truck Festival, attended the DEQ groundwater permit application meeting, and that the Brownsfield Conference in Chicago where the Phoenix Award was presented was a great experience. He thanked Public Works Director Ore for his work on the budget and set a budget meeting for Monday, August 25th at 6:00 p.m.

COUNCILMEMBERS' REPORTS:
Don Dahl had nothing to report.
(1:39:25) Judy Leland reported that she attended the Joe Mitchell State Farm Food Truck Festival.
(1:39:40) Wesley Feist reported that he attended the Joe Mitchell State Farm Food Truck Festival, attended Coffee with the Chamber that morning, will attend the MBAC board meeting that evening, and that he had received several calls regarding the old mobile homes accumulating on the east end of Main Street and had referred them to the county health department.
Suzanne Ferguson had nothing to report.

(1:42:50) LEGAL REPORT: City Attorney Elverum updated Council on the status of the East Clark Street Sewer District. He reported that he received a phone call from an attorney regarding the limited capacity of the wastewater treatment plant and that he will be attending the DEQ meeting regarding stormwater.

(1:52:35) PAYMENT OF BILLS: Claims 299083 through 299138 were presented for Council's review. Councilmember Leland made a motion to pay the bills. Councilmember Feist seconded the motion. The motion passed unanimously.

MEETING SCHEDULE:

1. East Helena Zoning Commission Meeting & Public Hearing, Wednesday, August 20, 6:00 p.m., City Hall Room 110
2. East Helena City Council Meeting, Tuesday, September 2, 6:30 p.m., City Hall Room 110
3. East Helena Planning Board Meeting, Wednesday, September 10, 6:00 p.m., City Hall Room 110
4. East Helena City Council Meeting, Tuesday, September 16, 6:30 p.m., City Hall Room 110

ADJOURNMENT: Mayor Harris adjourned the meeting at 8:22 p.m.

ATTEST:

____
Clerk/Treasurer

____
Mayor

City of East Helena
Wastewater System Update

WWTP Facility Plan – Meeting No. 1

Council Meeting – August 19, 2025

ROBERT PECCIA & ASSOCIATES

Previous Council Meeting Presentation

- Where have we been?
  - MPDES renewal, GW permit application, rate increase, WWTP optimization
- Where are we now?
  - Headworks & CIPP project (latter completed in June)
  - GW permit application complete – under DEQ review
- Where are we headed?
  - WWTP Facility Plan and Development Plan
  - Overall treatment plant upgrade

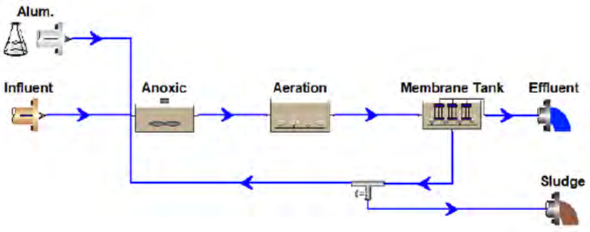
Robert Peccia & Associates

Why Do We Need a WWTP Facility Plan?

- Identify treatment alternatives
- Analyze capital and lifecycle (O&M) costs
- Finalize design criteria for future upgrades
- Table of Contents…

Why is a WWTP Upgrade Necessary?

- ***Required to replace existing WWTP (regardless of growth)***
- Designed to handle increased flows and improve effluent quality
- New secondary treatment process + disinfection
- Upgrade solids stabilization and dewatering capabilities
- Initiate design in 1Q 2026
- Operational by January 2029



Chapter 1 – Flow & Load Projections

- Wastewater Service Area

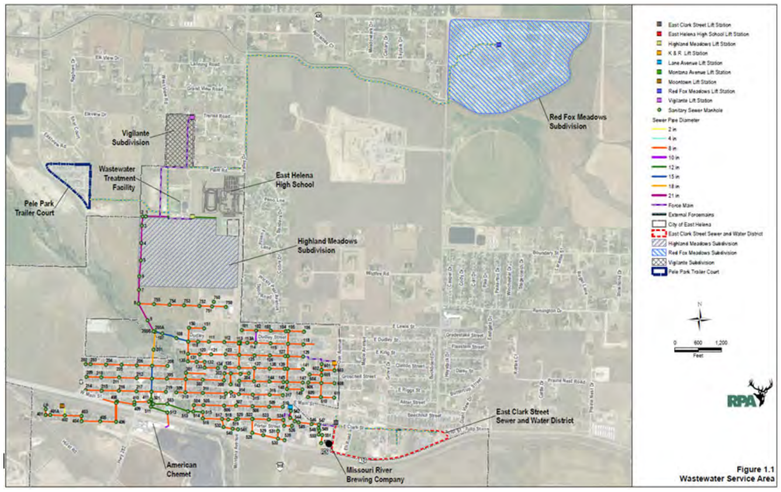


Figure 1.1
Wastewater Service Area

Chapter 1 – Flow & Load Projections

- Historical Wastewater Flows

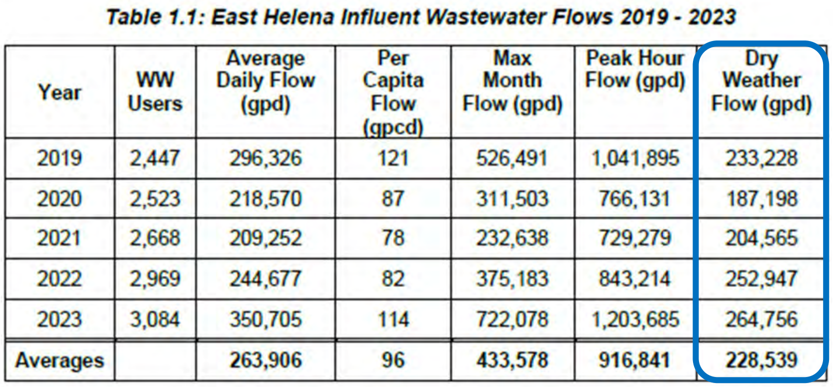


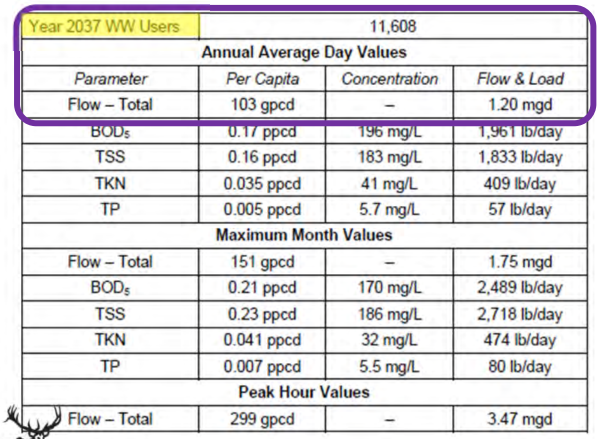
Table 1.1: East Helena Influent Wastewater Flows 2019 - 2023

Year	WW Users	Average Daily Flow (gpd)	Per Capita Flow (gpcd)	Max Month Flow (gpd)	Peak Hour Flow (gpd)	Dry Weather Flow (gpd)
2019	2,447	296,326	121	526,491	1,041,895	233,228
2020	2,523	218,570	87	311,503	766,131	187,198
2021	2,668	209,252	78	232,638	729,279	204,565
2022	2,969	244,677	82	375,183	843,214	252,947
2023	3,084	350,705	114	722,078	1,203,685	264,756
Averages		**263,906**	**96**	**433,578**	**916,841**	**228,539**

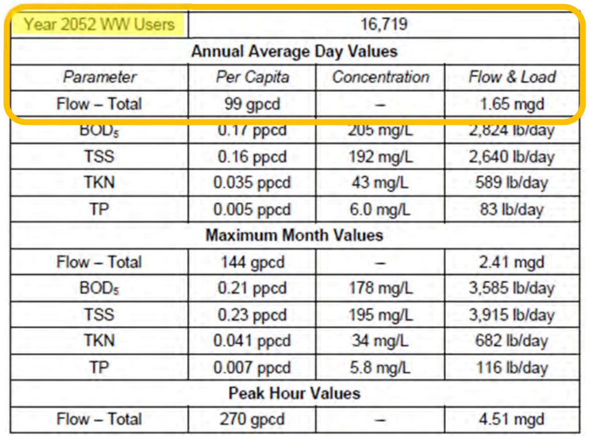
Robert Peccia & Associates

Chapter 1 – Flow & Load Projections

- Influent Design Criteria



Year 2037 WW Users	11,608		
Annual Average Day Values			
Parameter	*Per Capita*	*Concentration*	*Flow & Load*
Flow – Total	103 gpcd	–	1.20 mgd
BOD_5	0.17 ppcd	196 mg/L	1,961 lb/day
TSS	0.16 ppcd	183 mg/L	1,833 lb/day
TKN	0.035 ppcd	41 mg/L	409 lb/day
TP	0.005 ppcd	5.7 mg/L	57 lb/day
Maximum Month Values			
Flow – Total	151 gpcd	–	1.75 mgd
BOD_5	0.21 ppcd	170 mg/L	2,489 lb/day
TSS	0.23 ppcd	186 mg/L	2,718 lb/day
TKN	0.041 ppcd	32 mg/L	474 lb/day
TP	0.007 ppcd	5.5 mg/L	80 lb/day
Peak Hour Values			
Flow – Total	299 gpcd	–	3.47 mgd



Year 2052 WW Users	16,719		
Annual Average Day Values			
Parameter	*Per Capita*	*Concentration*	*Flow & Load*
Flow – Total	99 gpcd	–	1.65 mgd
BOD_5	0.17 ppcd	205 mg/L	2,824 lb/day
TSS	0.16 ppcd	192 mg/L	2,640 lb/day
TKN	0.035 ppcd	43 mg/L	589 lb/day
TP	0.005 ppcd	6.0 mg/L	83 lb/day
Maximum Month Values			
Flow – Total	144 gpcd	–	2.41 mgd
BOD_5	0.21 ppcd	178 mg/L	3,585 lb/day
TSS	0.23 ppcd	195 mg/L	3,915 lb/day
TKN	0.041 ppcd	34 mg/L	682 lb/day
TP	0.007 ppcd	5.8 mg/L	116 lb/day
Peak Hour Values			
Flow – Total	270 gpcd	–	4.51 mgd

Chapter 2 – Effluent Limitations & Disposal Evaluation

- Surface Water Discharge
  - MPDES Permit renewal completed in Aug 2024
  - 2019-issued permit administratively extended (same limits & sampling for now)
  - Continued discharge to Prickly Pear Creek
- Groundwater Discharge
  - Needed for <u>future</u> effluent compliance
  - No timeline for permit issuance…additional sampling required
  - Infiltration/percolation (I/P) facility sized for 1 MG/day of effluent

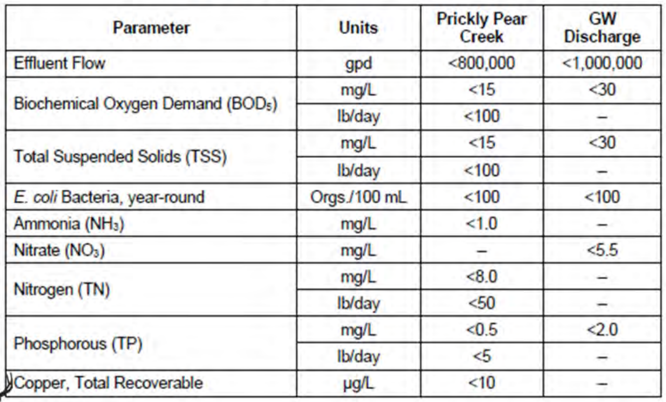
Chapter 2 – Effluent Limitations & Disposal Evaluation

- Biosolids Disposal
  - Class A: treatment to “exceptional quality” – give to the public or PW projects
  - Class B: treatment to significantly reduce pathogens – apply to farmland
  - Unclassified: pass paint filter & TCLP tests – haul to municipal solid waste landfill
- Future Regulatory Hurdles
  - Decreasing nutrient (nitrogen & phosphorous) waste load allocations
  - Changes to metals limits
  - Per- and polyfluoroalkyl substances (PFAS)

Chapter 2 – Effluent Limitations & Disposal Evaluation

- Effluent Design Criteria

Table 2.2: East Helena Effluent Design Criteria



Parameter	Units	Prickly Pear Creek	GW Discharge
Effluent Flow	gpd	<800,000	<1,000,000
Biochemical Oxygen Demand (BOD_5)	mg/L	<15	<30
	lb/day	<100	–
Total Suspended Solids (TSS)	mg/L	<15	<30
	lb/day	<100	–
E. coli Bacteria, year-round	Orgs./100 mL	<100	<100
Ammonia (NH_3)	mg/L	<1.0	–
Nitrate (NO_3)	mg/L	–	<5.5
Nitrogen (TN)	mg/L	<8.0	–
	lb/day	<50	–
Phosphorous (TP)	mg/L	<0.5	<2.0
	lb/day	<5	–
Copper, Total Recoverable	µg/L	<10	–

95% removal

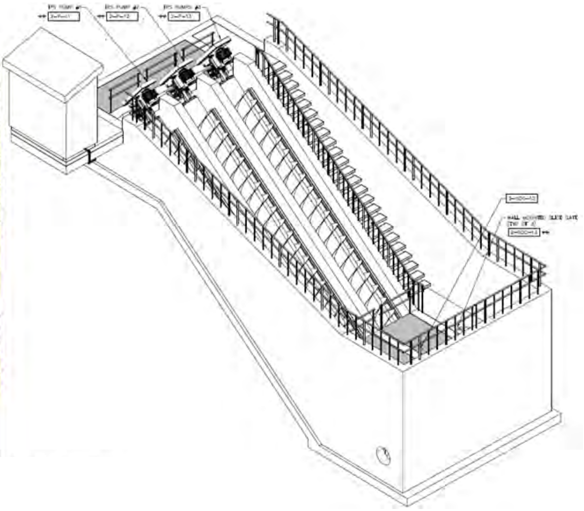
95% removal

88% removal

91% removal

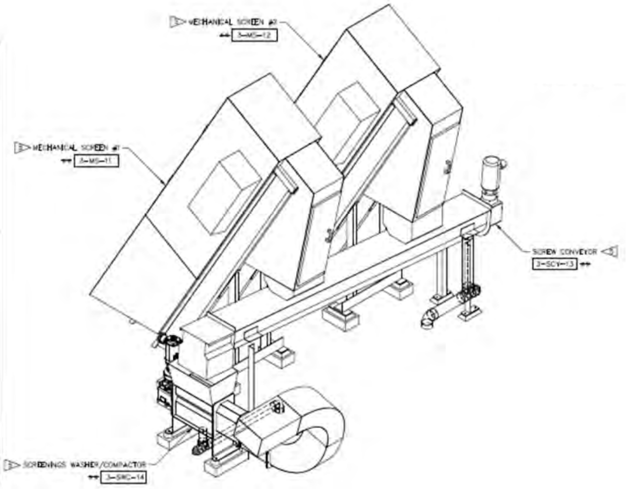
Chapter 3 – Preliminary Treatment Overview

- Influent Pump Station



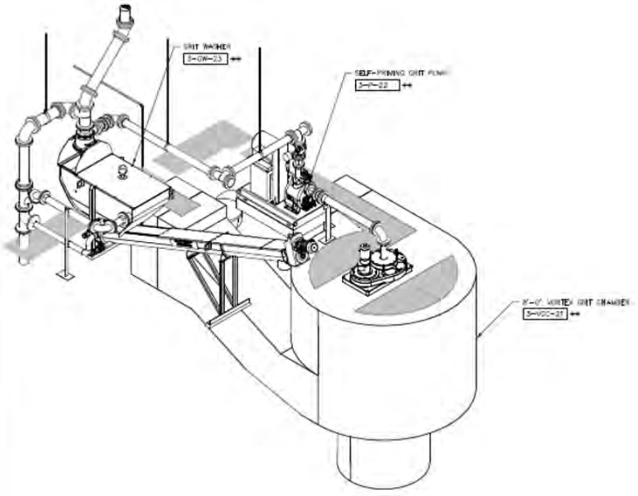
Chapter 3 – Preliminary Treatment Overview

- Screening System



Chapter 3 – Preliminary Treatment Overview

- Grit Removal System



Chapter 4 – Secondary Treatment & UV Disinfection

- Oxidation Ditch
  - Version of activated sludge in large oval or racetrack-shaped basins
  - Long SRT minimizes process upsets and promotes biological nutrient removal
  - Ideal for limited staffing, low O&M costs and exceptional effluent quality
  - Utilizes brush rotors or slow-speed mixers for aeration and mixing
- Secondary Clarifier
  - Circular basin used to settle solids (MLSS) from the oxidation ditch
  - Solids are returned (RAS) or wasted (WAS) and scum is “scraped” from the surface

Chapter 4 – Secondary Treatment & UV Disinfection

Chapter 4 – Secondary Treatment & UV Disinfection

- Sequencing Batch Reactor (SBR)
  - Type of fill and draw activated sludge system in a single reactor
  - Four general phases occur during programmed time intervals:
    - ✓ Fill – wastewater enters to a defined depth
    - ✓ React – aeration and mixing for biological processes
    - ✓ Settle – solids are settled to the bottom of the basin
    - ✓ Draw – treated effluent is discharged through a decanter
  - No need for secondary clarifiers – smaller footprint and cost savings
  - More complex to operate but still produce high-quality effluent
  - Utilize blowers, submerged diffusers, and surface mixers

Chapter 4 – Secondary Treatment & UV Disinfection

Chapter 4 – Secondary Treatment & UV Disinfection

- Membrane Bioreactor (MBR)
  - Advanced activated sludge process that utilizes membranes for solids removal
  - Design includes various reactor basins for biological treatment
  - Submerged membranes can be hollow fiber or flat sheet
  - Higher MLSS concentration allows for smaller footprint and less concrete
  - Significant operational complexity but produces first-class reclaimed water
  - Operational costs are typically high due to increased energy and chemicals
  - Equipment includes blowers, mixers, pumps, and actuated valves

Chapter 4 – Secondary Treatment & UV Disinfection

Chapter 5 – Solids Handling & Disposal

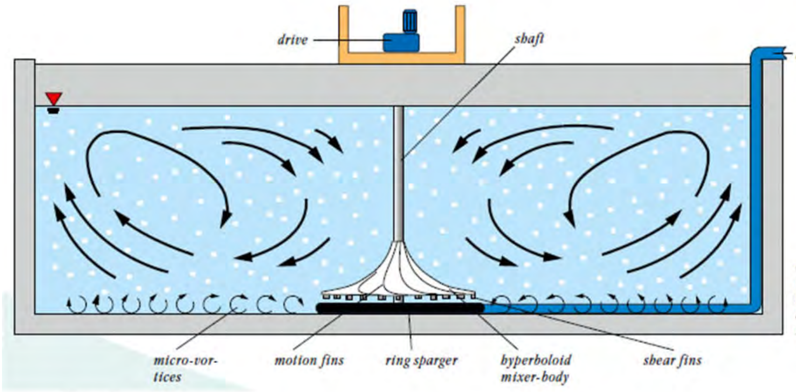
- Thermal Sludge Drying (Class A Biosolids)
  - Automated, continuous flow system
  - Requires dewatered (15-30%) biosolids
  - High temperatures (between 300-600ºF) to reduce pathogens
  - Produces material with less than 10% moisture
  - Suitable for landscaping or distribution to the public
  - Includes odor control facilities
  - Complex operation with high capital and operating costs

Chapter 5 – Solids Handling & Disposal

Chapter 5 – Solids Handling & Disposal

- Aerobic Digestion (Class B Biosolids)
  - Basins sized for 40 to 60 days of SRT to stabilize waste sludge
  - Air (oxygen) breaks down organic material and minimize odors
  - Mixing accomplished with aeration/diffusers or mechanical equipment
  - Decoupled systems allow for operational flexibility and cost savings
  - Settling and decanting can increase solids concentration and reduce volume
  - Aeration provided by blowers and diffusers or ring spargers

Chapter 5 – Solids Handling & Disposal



Schematical representation of the **HYPERCLASSIC®**-Mixing & Aeration System

The **iTURBO®**-Blower **iTB** 50 with an Input Power of 50 hp/42 kW

Chapter 5 – Solids Handling & Disposal

- Sludge Storage (Unclassified Biosolids)
  - Aerated basins minimize odors and reduce organic material
  - Concrete basins allow for increased depths and smaller footprint
  - Provides volume for dewatering equipment maintenance or repair
  - Settling and decanting can increase solids concentration and reduce volume
  - Mixing and aeration provided by blowers and submerged diffusers
  - ***Similar process to current plant operations for waste sludge***

Chapter 5 – Solids Handling & Disposal

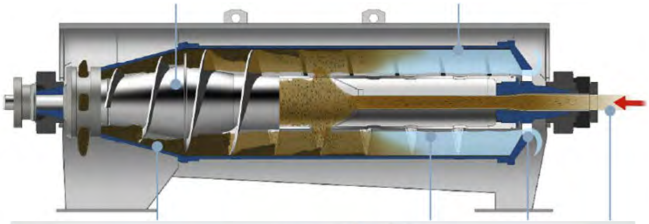
Robert Peccia & Associates

Chapter 5 – Solids Handling & Disposal

- Solids Dewatering Alternatives
  - Centrifuge
    - ✓ Single piece of equipment; small footprint; two large motors rotating at very high speeds
    - ✓ Produces cake up to 20% solids with reasonable polymer dosing rates (20-24 lb/dry ton)
  - Rotary Fan Press
    - ✓ Multiple units on a single shaft/motor; largest footprint; small motor at slow speeds
    - ✓ Produces cake up to 18% solids with low polymer dosing rates (15-20 lb/dry ton)
  - Screw Press
    - ✓ Multiple units; integral flocculation tank; medium footprint; small motors at slow speeds
    - ✓ Produces cake up to 18% solids with higher polymer dosing rates (26-30 lb/dry ton)

Robert Peccia & Associates

Chapter 5 – Solids Handling & Disposal



Next Steps

- Complete WWTP Facility Plan
  - Draft submitted to City in October; Council adoption scheduled for 4Q 2025
- Prepare Development Plan
  - Begin work in November; submittal and approval from DEQ in 1Q 2026
- Secondary Treatment Equipment Pre-Selection
  - Needed prior to beginning design; completion scheduled for 1Q 2026
- Complete IPS & Headworks Construction
  - Structures finished by December 2025; equipment install & startup in March 2026

QUESTIONS?

Intentionally Left Blank

MEETING AGENDA
CITY OF EAST HELENA
CITY HALL – 306 EAST MAIN - ROOM 110
COUNCIL MEETING: 6:30 PM
DATE: TUESDAY, SEPTEMBER 16, 2025
JOIN ZOOM MEETING: https://us06web.zoom.us/j/3787705872
CONFERENCE CALL-IN: 1-253-205-0468 MEETING ID: 378 770 5872

MEETING CALLED TO ORDER: Mayor Harris

PLEDGE OF ALLEGIANCE: Councilmember Feist

PUBLIC HEARING:

1. Conditional Use Permit for Multi-Family Development to Include 12 Four-Plex Buildings on the North Side of East Helena – Zoning Officer Fadness
   Action: Information Only
2. Conditional Use Permit for Multi-Family Development to Include 12 Four-Plex Buildings on the North Side of East Helena – Mayor Harris
   Action: Hear the Public
3. Conditional Use Permit for Multi-Family Development to Include 12 Four-Plex Buildings on the North Side of East Helena – Mayor Harris
   Action: Approve/Deny/Table

WASTEWATER TREATMENT PLANT UPGRADE PRESENTATION: Jeremy Perlinski, Robert Peccia & Associates
Action: Information Only

PUBLIC COMMENTS: Note: This time is set aside for comments from the public on matters that are not on the meeting agenda. Public comments will be taken on agenda items prior to a motion. All public comments will be limited to a reasonable duration. Prior to your comments, please state your name and address in an audible tone of voice for the record.

APPROVAL OF MINUTES: September 2, 2025

CITY COURT REPORT: City Judge Dennis Loveless

DEPARTMENTAL REPORTS:

Administration – Clerk/Treasurer Amy Thorngren
Police Department – Police Chief Mike Sanders
Public Works - Public Works Director Kevin Ore
Volunteer Fire Department - Fire Chief Roger Campbell

NEW BUSINESS:

1. Resolution No. 633 to Authorize Submittal of MCEP Infrastructure Planning Grant – Mayor Harris
   Action: Approve/Deny/Table
2. Request to Close City Hall Administration Office Friday, November 28, 2025 and Allow Staff to Use Vacation Time – Clerk/Treasurer Thorngren
   Action: Approve/Deny/Table

MAYOR'S REPORT: Mayor Harris

COUNCILMEMBERS' REPORTS:

Don Dahl
Judy Leland
Wesley Feist
Suzanne Ferguson

LEGAL REPORT: City Attorney Elverum

PAYMENT OF BILLS: Action: Approve/Deny/Table

MEETING SCHEDULE:

1. East Helena Planning Board Meeting, Wednesday, September 24, 6:00 p.m., City Hall Rm 110
2. East Helena City Council Meeting, Tuesday, October 7, 6:30 p.m., City Hall Rm 110
3. East Helena City Council Meeting, Tuesday, October 21, 6:30 p.m., City Hall Rm 110

ADJOURNMENT: Mayor Harris

ADA NOTICE

The City of East Helena is committed to providing access to persons with disabilities for its meetings, in compliance with Title II of the Americans with Disabilities Act and the Montana Human Rights Act. The city will not exclude people with disabilities from participating in its meetings, or otherwise deny them the City's services, programs, or activities. Persons with disabilities requiring accommodations to participate in the City's meetings, services, programs, or activities should contact the City Clerk as soon as possible to allow sufficient time to arrange for the requested accommodation, at any of the following:

(406) 227-5321 or TTY Relay Service 1-800-253-4091 or 711
cityclerk@easthelenamt.us - 306 East Main Street, P.O. Box 1170, East Helena, MT 59635

MEETING MINUTES
CITY OF EAST HELENA
CITY HALL – 306 EAST MAIN - ROOM 110
COUNCIL MEETING: 6:30 PM
DATE: TUESDAY, SEPTEMBER 16, 2025
JOIN ZOOM MEETING: https://us06web.zoom.us/j/3787705872
CONFERENCE CALL-IN: 1-253-205-0468 MEETING ID: 378 770 5872

MEETING CALLED TO ORDER: Mayor Harris called the meeting to order at 6:30 p.m. Councilmember Feist led the Pledge of Allegiance.

CITY OFFICIALS & STAFF PRESENT: Mayor Kelly Harris, Council President Don Dahl, Councilmember Judy Leland, Councilmember Wesley Feist, Councilmember Suzanne Ferguson, Clerk/Treasurer Amy Thorngren, City Attorney Pete Elverum, Public Works Director Kevin Ore, Fire Chief Roger Campbell, City Engineer Jeremy Perlinski, Zoning Officer Jeremy Fadness, and City Engineer Trevor Larson

PUBLIC PRESENT: Joe Nistler, Landy Leep (via Zoom), Julie Stoner, Jacob Kuntz (via Zoom), Josh French (via Zoom), and Jeff Larson

ABSENT/EXCUSED: City Judge Dennis Loveless and Police Chief Mike Sanders

(0:00:30) PUBLIC HEARING:

1. **Conditional Use Permit for Multi-Family Development to Include 12 Four-Plex Buildings on the North Side of East Helena** – A copy of the staff report was included in the council packet. Zoning Officer Fadness discussed the report and conditions of approval. He recommended approval of the conditional use permit. Jeremy Perlinski of Robert Peccia & Associates answered questions regarding wastewater treatment plant capacity. This was an information-only item.
2. **Conditional Use Permit for Multi-Family Development to Include 12 Four-Plex Buildings on the North Side of East Helena** – Written public comment in opposition to the conditional use permit had been received from Julie Stoner and Prickly Pear Estates. Mayor Harris called for public comment. (0:08:40) Joe Nistler commented in favor of the conditional use permit. (0:09:45) Landy Leep commented on wastewater treatment plant capacity regarding the conditional use permit. (0:11:10) Jeff Larson commented in support of the conditional use permit. (0:12:05) Julie Stoner commented in opposition to the conditional use permit. (0:14:50) Jacob Kuntz commented on wastewater treatment plant capacity regarding the conditional use permit.
3. **Conditional Use Permit for Multi-Family Development to Include 12 Four-Plex Buildings on the North Side of East Helena** – Joe Nistler, Jeff Larsen, Jeremy Fadness, and Jeremy Perlinski answered questions from Council. Councilmember Feist made a motion to approve the conditional use permit with consideration for

amendment to the seventh condition. Councilmember Dahl seconded the motion. The motion passed unanimously.

(0:30:45) WASTEWATER TREATMENT PLANT UPGRADE PRESENTATION: Jeremy Perlinski of Robert Peccia & Associates presented the second part of his presentation on upgrades to the wastewater treatment plant. He answered questions from Council. This was an information-only item.

PUBLIC COMMENTS: There was no public comment on any non-agenda items.

(1:15:50) APPROVAL OF MINUTES: A copy of the draft minutes of the September 2, 2025 meeting was included in the council packet. There was no public comment. Councilmember Leland made a motion to approve the minutes as presented. Councilmember Feist seconded the motion. The motion passed unanimously.

CITY COURT REPORT: City Judge Dennis Loveless was excused.

(1:16:10) DEPARTMENTAL REPORTS:
Administration – A copy of the Planning Board & Zoning Commission Roster was included in the council packet. Clerk/Treasurer Amy Thorngren reported that the FitLot classes at Kennedy Park had concluded another successful season.
Police Department – A written report was on the council room table. Police Chief Mike Sanders was excused.
Public Works – A written report was included in the council packet. Public Works Director Kevin Ore reported that a request for proposals for a garbage truck would be published soon, a meeting with Federal Highways regarding the BUILD grant was upcoming, pavement repairs on Montana Avenue are scheduled for October 16th and 17th, and that the front door of city hall would be replaced on Friday.
Volunteer Fire Department - Fire Chief Roger Campbell had left by this time.

NEW BUSINESS:

1. **(1:21:50) Resolution No. 633 to Authorize Submittal of MCEP Infrastructure Planning Grant** – A copy of the draft resolution was included in the council packet. There was no public comment. Councilmember Feist made a motion to approve Resolution 633. Councilmember Leland seconded the motion. The motion passed unanimously.
2. **(1:22:30) Request to Close City Hall Administration Office Friday, November 28, 2025 and Allow Staff to Use Vacation Time** – Mayor Harris presented the admin office staff's annual request to close the office the day after Thanksgiving. There was no public comment. Councilmember Leland made a motion to approve the request. Councilmember Feist seconded the motion. The motion passed unanimously.

(1:23:25) MAYOR'S REPORT: Mayor Harris reported that he had been in discussions regarding budgeted personnel and meetings regarding the reconstruction of Montana Avenue/Valley Drive. He noted that METG's custodial appointment was still in limbo and that a letter had been received from Lieutenant Governor Juras regarding water rights for the city.

(1:25:30) COUNCILMEMBERS' REPORTS:
Don Dahl had nothing to report.
Judy Leland had nothing to report.
Wesley Feist reported that a former resident wants to put a bench along Prickly Pear Creek, he attended the Chamber of Commerce awards breakfast, met with members of Helena Regional Sports Association, attended the Montana Jewish Project's window dedication, attended a Rose Hills Subdivision community listening session, attended Coffee with the Chamber, and accepted the Community Relations position for NorthWestern Energy.
Suzanne Ferguson had nothing to report.

(1:27:50) LEGAL REPORT: City Attorney Elverum advised that a meeting be held to discuss Lieutenant Governor Juras' letter regarding water rights before the October 1st deadline.

(1:30:30) PAYMENT OF BILLS: Claims 299170 through 299238 were presented for Council's review. Councilmember Leland made a motion to pay the bills. Councilmember Ferguson seconded the motion. The motion passed unanimously.

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ADJOURNMENT: Mayor Harris adjourned the meeting at 8:02 p.m.

ATTEST:

______________________________ ______________________________

Clerk/Treasurer Mayor

City of East Helena
Wastewater System Update

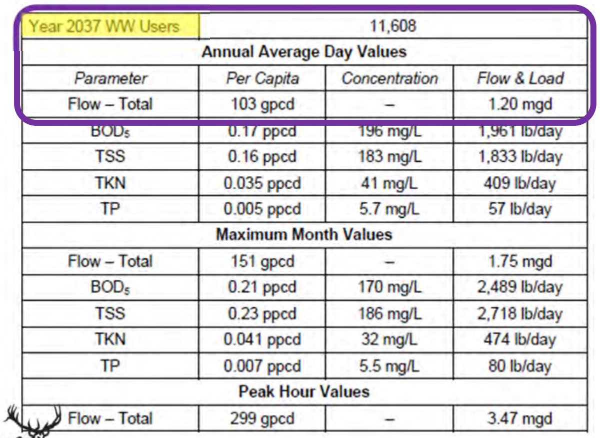
WWTP Facility Plan – Meeting No. 2

Council Meeting – September 16, 2025

ROBERT PECCIA & ASSOCIATES

Previous Council Meeting Presentation

- Design flows and loads



Year 2037 WW Users	11,608		
Annual Average Day Values			
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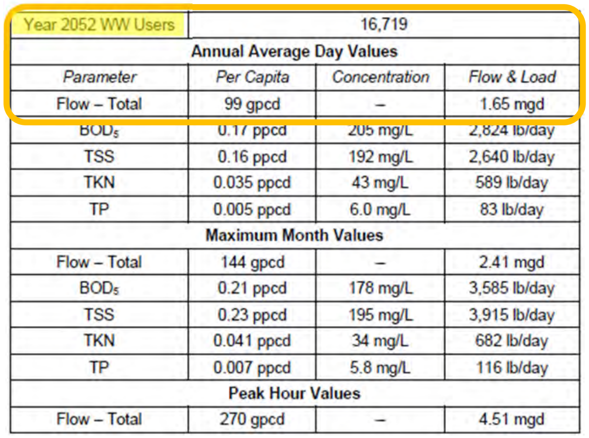

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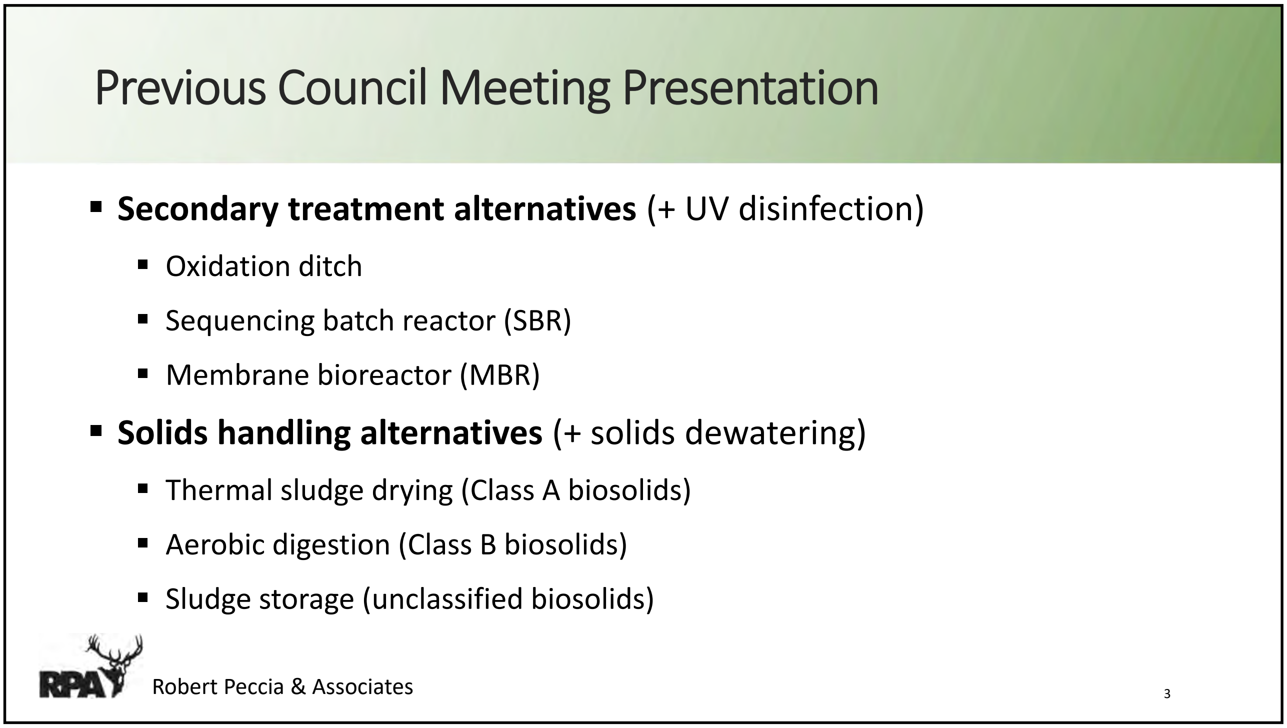
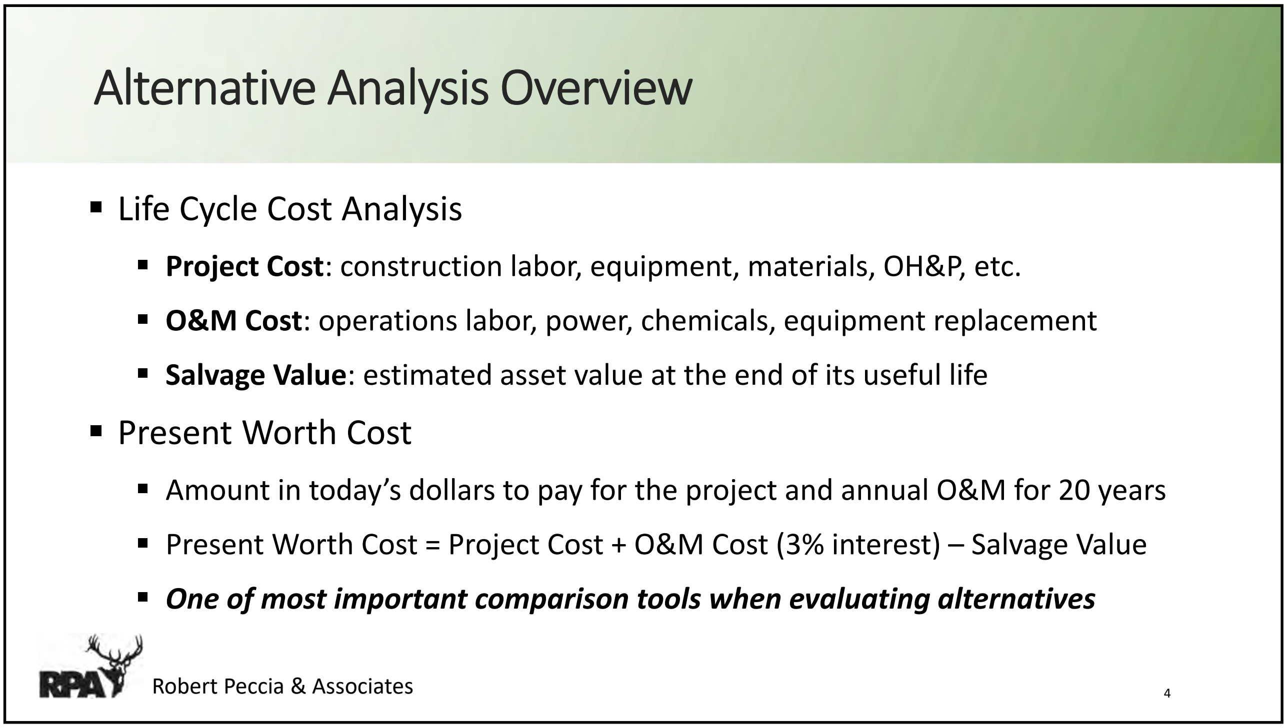
Robert Peccia & Associates



Previous Council Meeting Presentation

- **Secondary treatment alternatives** (+ UV disinfection)
  - Oxidation ditch
  - Sequencing batch reactor (SBR)
  - Membrane bioreactor (MBR)
- **Solids handling alternatives** (+ solids dewatering)
  - Thermal sludge drying (Class A biosolids)
  - Aerobic digestion (Class B biosolids)
  - Sludge storage (unclassified biosolids)

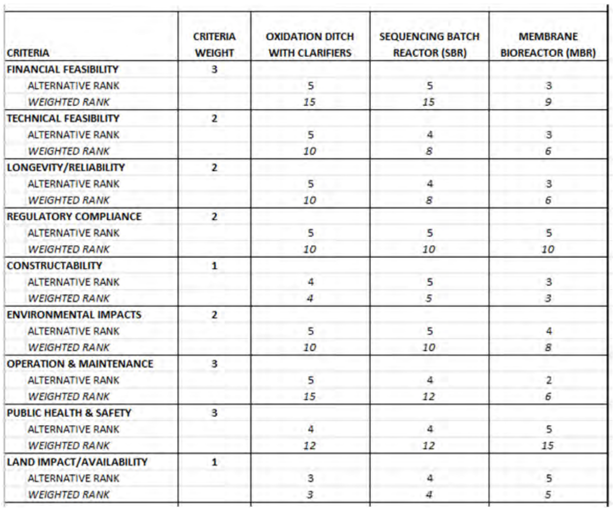


Alternative Analysis Overview

- Life Cycle Cost Analysis
  - **Project Cost**: construction labor, equipment, materials, OH&P, etc.
  - **O&M Cost**: operations labor, power, chemicals, equipment replacement
  - **Salvage Value**: estimated asset value at the end of its useful life
- Present Worth Cost
  - Amount in today’s dollars to pay for the project and annual O&M for 20 years
  - Present Worth Cost = Project Cost + O&M Cost (3% interest) – Salvage Value
  - ***One of most important comparison tools when evaluating alternatives***

Alternative Analysis Overview

- Non-Economic Comparison
  - Technical feasibility
  - Longevity/reliability
  - Regulatory compliance
  - Constructability
  - Environmental impacts
  - Operation & maintenance
  - Public health & safety
  - Land impact/availability

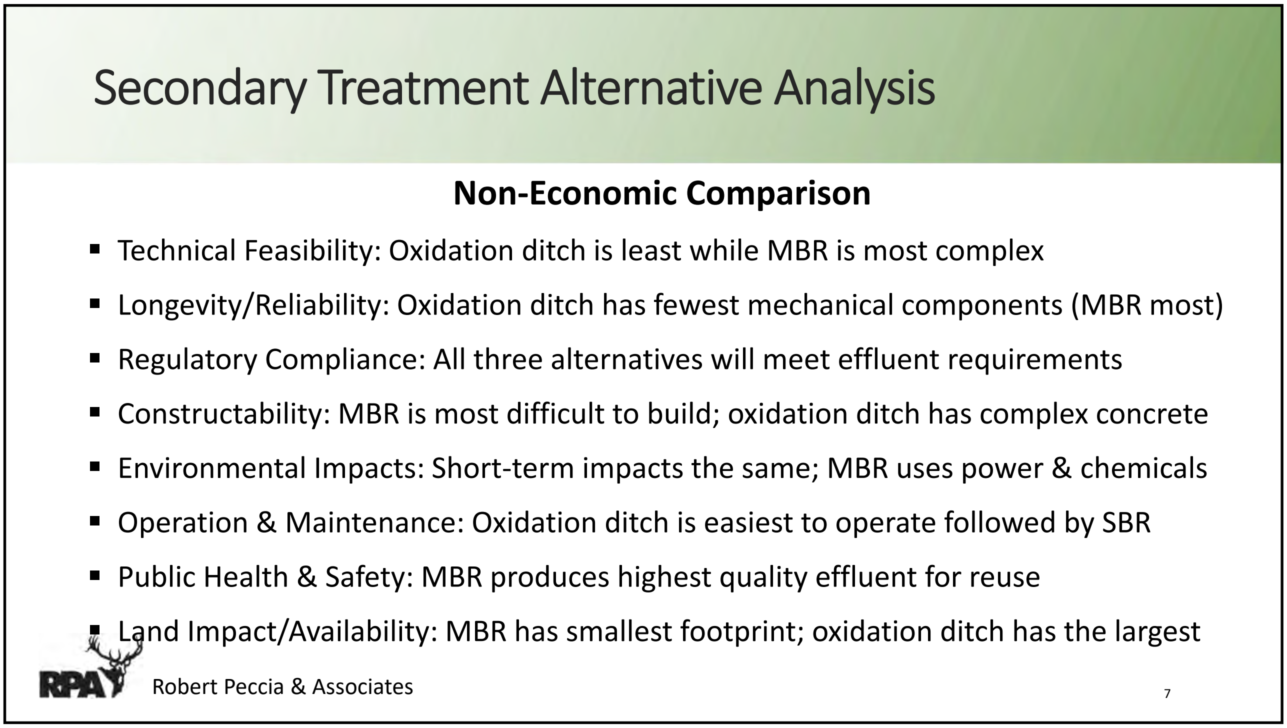


CRITERIA	CRITERIA WEIGHT	OXIDATION DITCH WITH CLARIFIERS	SEQUENCING BATCH REACTOR (SBR)	MEMBRANE BIOREACTOR (MBR)
FINANCIAL FEASIBILITY	**3**			
ALTERNATIVE RANK		5	5	3
WEIGHTED RANK		*15*	*15*	*9*
TECHNICAL FEASIBILITY	**2**			
ALTERNATIVE RANK		5	4	3
WEIGHTED RANK		*10*	*8*	*6*
LONGEVITY/RELIABILITY	**2**			
ALTERNATIVE RANK		5	4	3
WEIGHTED RANK		*10*	*8*	*6*
REGULATORY COMPLIANCE	**2**			
ALTERNATIVE RANK		5	5	5
WEIGHTED RANK		*10*	*10*	*10*
CONSTRUCTABILITY	**1**			
ALTERNATIVE RANK		4	5	3
WEIGHTED RANK		*4*	*5*	*3*
ENVIRONMENTAL IMPACTS	**2**			
ALTERNATIVE RANK		5	5	4
WEIGHTED RANK		*10*	*10*	*8*
OPERATION & MAINTENANCE	**3**			
ALTERNATIVE RANK		5	4	2
WEIGHTED RANK		*15*	*12*	*6*
PUBLIC HEALTH & SAFETY	**3**			
ALTERNATIVE RANK		4	4	5
WEIGHTED RANK		*12*	*12*	*15*
LAND IMPACT/AVAILABILITY	**1**			
ALTERNATIVE RANK		3	4	5
WEIGHTED RANK		*3*	*4*	*5*

Secondary Treatment Alternative Analysis

Life Cycle Cost Analysis

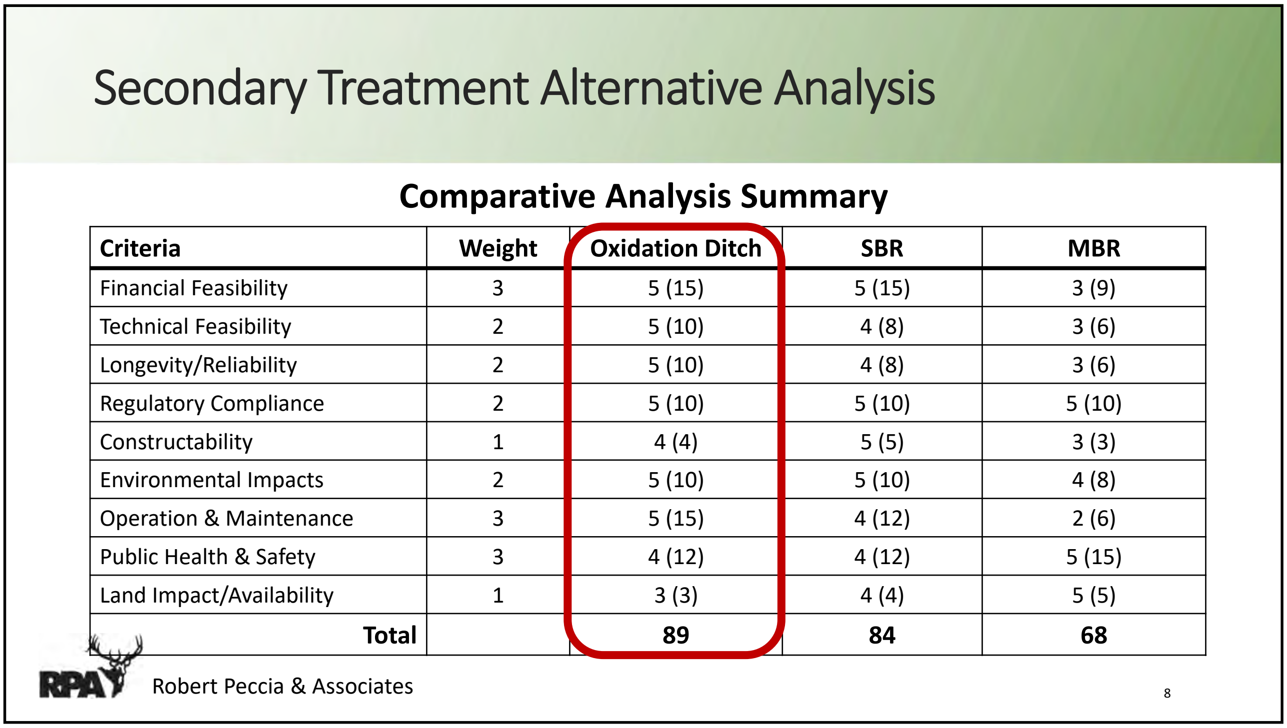
Secondary Treatment Alternative	Project Cost	Annual O&M Cost	Salvage Value	Total Present Worth
Oxidation Ditch w/ Clarifiers	$23,779,800	$237,150	$4,224,900	$24,968,800
Sequencing Batch Reactor (SBR)	$21,030,500	$345,840	$4,048,500	$23,934,200
Membrane Bioreactor (MBR)	$27,052,400	$630,950	$4,404,700	$34,000,600



Secondary Treatment Alternative Analysis

Non-Economic Comparison

- Technical Feasibility: Oxidation ditch is least while MBR is most complex
- Longevity/Reliability: Oxidation ditch has fewest mechanical components (MBR most)
- Regulatory Compliance: All three alternatives will meet effluent requirements
- Constructability: MBR is most difficult to build; oxidation ditch has complex concrete
- Environmental Impacts: Short-term impacts the same; MBR uses power & chemicals
- Operation & Maintenance: Oxidation ditch is easiest to operate followed by SBR
- Public Health & Safety: MBR produces highest quality effluent for reuse
- Land Impact/Availability: MBR has smallest footprint; oxidation ditch has the largest

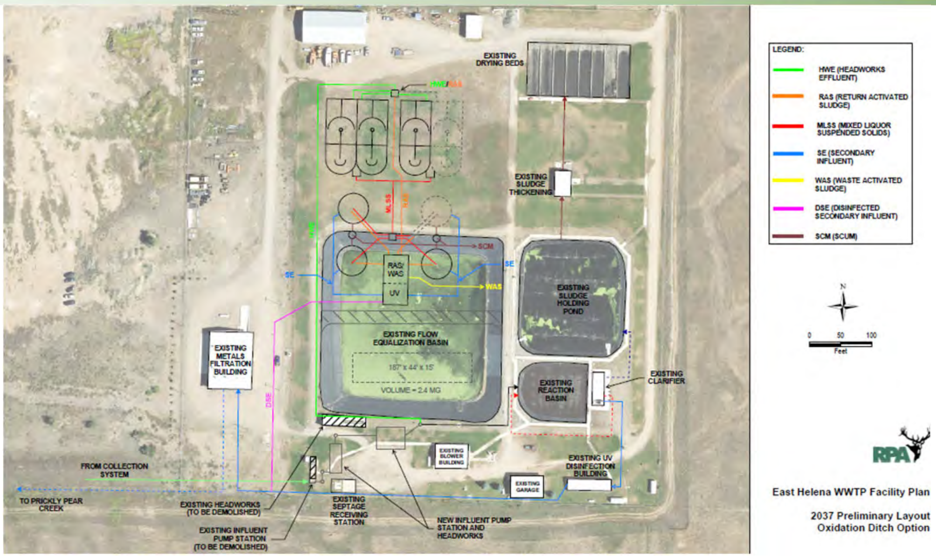


Secondary Treatment Alternative Analysis

Comparative Analysis Summary

Criteria	**Weight**	**Oxidation Ditch**	**SBR**	**MBR**
Financial Feasibility	3	5 (15)	5 (15)	3 (9)
Technical Feasibility	2	5 (10)	4 (8)	3 (6)
Longevity/Reliability	2	5 (10)	4 (8)	3 (6)
Regulatory Compliance	2	5 (10)	5 (10)	5 (10)
Constructability	1	4 (4)	5 (5)	3 (3)
Environmental Impacts	2	5 (10)	5 (10)	4 (8)
Operation & Maintenance	3	5 (15)	4 (12)	2 (6)
Public Health & Safety	3	4 (12)	4 (12)	5 (15)
Land Impact/Availability	1	3 (3)	4 (4)	5 (5)
Total		**89**	**84**	**68**

Secondary Treatment Alternative Analysis



UV Disinfection Alternative Analysis

Life Cycle Cost Analysis

UV Disinfection Alternative	Project Cost	Annual O&M Cost	Salvage Value	Total Present Worth
Horizontal Open Channel	$877,100	$37,320	$126,200	$1,362,500
Inclined Open Channel	$982,500	$30,736	$166,600	$1,347,500

UV Disinfection Alternative Analysis

Non-Economic Comparison

- Technical Feasibility: Both alternatives operate on the same principles
- Longevity/Reliability: Inclined has longer lamp life (25% more hours)
- Regulatory Compliance: Both alternatives will meet regulatory requirements
- Constructability: Concrete channel for inclined alternative is slightly more complex
- Environmental Impacts: Short-term impacts and power consumption roughly the same
- Operation & Maintenance: Inclined is easier to access and fewer lamp replacements
- Public Health & Safety: Both alternatives provide safe disinfection
- Land Impact/Availability: Horizontal has slightly larger footprint

UV Disinfection Alternative Analysis

Comparative Analysis Summary

Criteria	**Weight**	**Horizontal**	**Inclined**
Financial Feasibility	3	5 (15)	5 (15)
Technical Feasibility	2	5 (10)	5 (10)
Longevity/Reliability	2	4 (8)	5 (10)
Regulatory Compliance	2	5 (10)	5 (10)
Constructability	1	5 (5)	4 (4)
Environmental Impacts	2	5 (10)	5 (10)
Operation & Maintenance	3	3 (9)	5 (15)
Public Health & Safety	3	5 (15)	5 (15)
Land Impact/Availability	1	4 (4)	5 (5)
Total		**86**	**94**

Tertiary Filtration (Metals Building) Evaluation

- Existing Process Overview
  - Clear well w/ six vertical turbine feed pumps (125-240 gpm w/ 5 HP motors)
  - Four continuous upflow sand filters (64 sf each at 3-5 gpm/sf = 1,280 gpm)
  - Chemical feed pumps, air compressors, and filter reject pumps
- Existing Condition, Performance, and Capacity Analysis
  - Good operating condition; all six feed pumps replaced; new PC reject pumps
  - Effluent copper exceedances trending down; phosphorous removal inconsistent
  - Additional capacity for future growth; ***WWTP upgrade will improve performance***

Solids Handling Alternative Analysis

Life Cycle Cost Analysis

Solids Handling Alternative	Project Cost	Annual O&M Cost	Salvage Value	Total Present Worth
Thermal Sludge Drying (Class A)	$11,875,000	$471,050	$2,729,300	$17,371,900
Aerobic Digestion (Class B)	$10,598,900	$292,980	$1,811,100	$13,954,900
Sludge Storage (Unclassified)	$7,980,700	$238,580	$1,239,600	$10,843,800

Solids Handling Alternative Analysis

Non-Economic Comparison

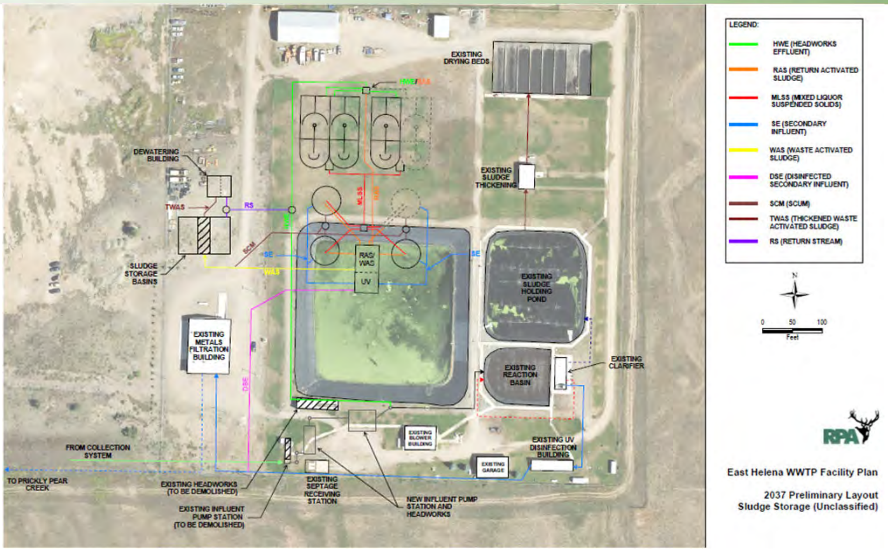
- Technical Feasibility: Thermal drying is complex; land application requires coordination
- Longevity/Reliability: Thermal drying has lots of moving parts; land may not be available
- Regulatory Compliance: Class A and Class B biosolids require significantly more testing
- Constructability: All three alternatives are similar; more I&C for thermal drying
- Environmental Impacts: Class A reuse; Class B is beneficial; landfilling is not sustainable
- Operation & Maintenance: sludge storage is easiest; thermal drying is complicated
- Public Health & Safety: Class A is highest level of treatment and safe to give to public
- Land Impact/Availability: Aerobic digestion has largest basins and storage building

Solids Handling Alternative Analysis

Comparative Analysis Summary

Criteria	Weight	Thermal Drying	Aerobic Digestion	Sludge Storage
Financial Feasibility	3	2 (6)	4 (12)	5 (15)
Technical Feasibility	2	2 (4)	4 (8)	5 (10)
Longevity/Reliability	2	3 (6)	4 (8)	5 (10)
Regulatory Compliance	2	4 (8)	4 (8)	5 (10)
Constructability	1	4 (4)	5 (5)	5 (5)
Environmental Impacts	2	5 (10)	4 (8)	3 (6)
Operation & Maintenance	3	3 (9)	4 (12)	5 (15)
Public Health & Safety	3	5 (15)	4 (12)	3 (9)
Land Impact/Availability	1	4 (4)	3 (3)	5 (5)
Total		**66**	**76**	**85**

Solids Handling Alternative Analysis



Solids Dewatering Alternative Analysis

Life Cycle Cost Analysis

Solids Dewatering Alternative	Project Cost	Annual O&M Cost	Salvage Value	Total Present Worth
Decanter Centrifuge	$813,800	$56,335	$38,600	$1,630,600
Screw Press	$1,479,800	$58,500	$39,500	$2,328,300
Rotary Fan Press	$1,253,100	$43,740	$44,600	$1,879,100

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Solids Dewatering Alternative Analysis

Non-Economic Comparison

- Technical Feasibility: Centrifuge is complex piece of rotating equipment
- Longevity/Reliability: Centrifuge wears out faster at high speeds; other two similar
- Regulatory Compliance: All three alternatives achieve high-solids content
- Constructability: Centrifuge requires sound dampening and vibration isolation
- Environmental Impacts: Centrifuge consumes more energy
- Operation & Maintenance: Centrifuge requires MFR's assistance; other two are similar
- Public Health & Safety: Centrifuge requires constant hearing protection
- Land Impact/Availability: Equipment sizing is relatively the same; centrifuge smallest

Solids Dewatering Alternative Analysis

Comparative Analysis Summary

Criteria	Weight	Centrifuge	Screw Press	Rotary Fan Press
Financial Feasibility	3	5 (15)	3 (9)	4 (12)
Technical Feasibility	2	3 (6)	5 (10)	5 (10)
Longevity/Reliability	2	3 (6)	5 (10)	5 (10)
Regulatory Compliance	2	5 (10)	5 (10)	5 (10)
Constructability	1	4 (4)	5 (5)	5 (5)
Environmental Impacts	2	3 (6)	4 (8)	5 (10)
Operation & Maintenance	3	4 (12)	5 (15)	5 (15)
Public Health & Safety	3	4 (12)	5 (15)	5 (15)
Land Impact/Availability	1	5 (5)	4 (4)	4 (4)
Total		**76**	**86**	**91**

Ancillary Processes & Considerations

- Possible modifications to electrical service and standby power
- Additional non-potable water system likely for plant use & irrigation
- Changes to plant control system (MFR control panels + SCADA computer)
- Construction sequencing
    - Build secondary treatment and solids handling concurrently
    - Only requires bypass pumping at start-up to connect new facilities
    - Demolition of existing facilities can only occur after successful process results

Environmental Discussion

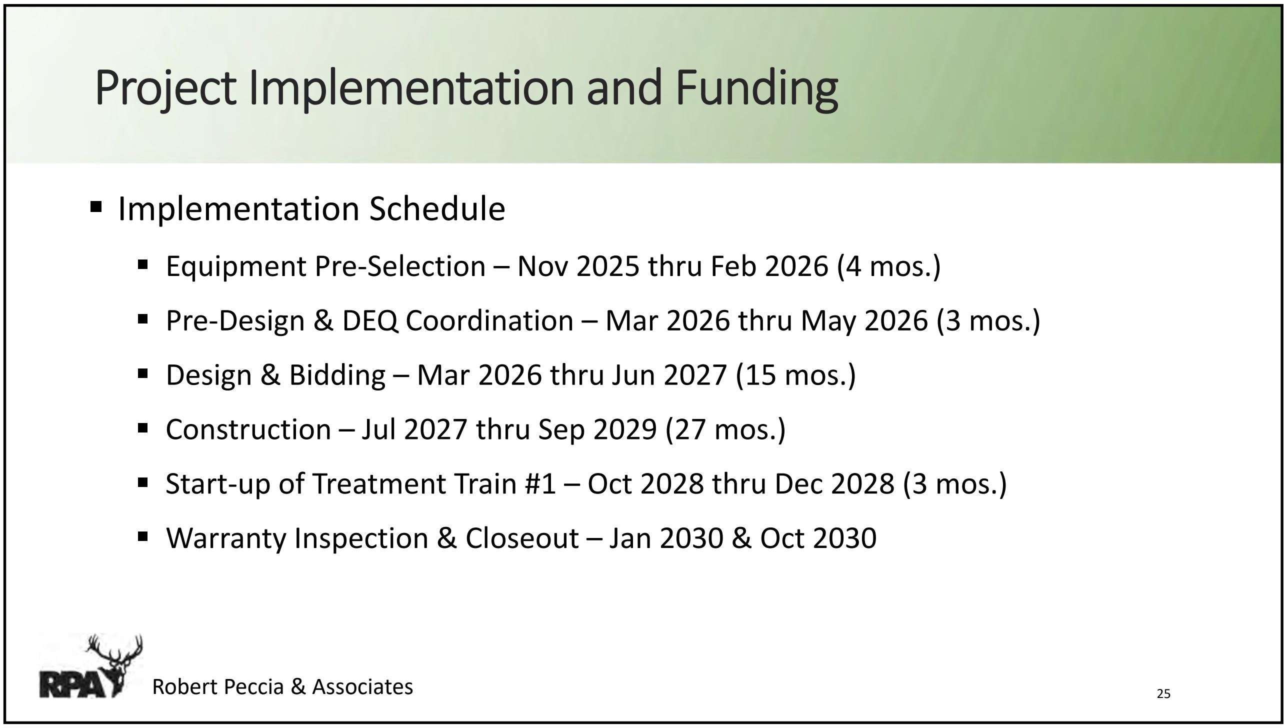
- Direct & Indirect Impacts
    - Short-term impacts during construction (noise, dust, emissions, etc.)
    - Long-term improvement to water quality and nuisance odors
- Regulatory Permits
    - Stormwater during construction (SWPPP by contractor)
- Agency Comments
    - State Historic Preservation Office: cultural resource inventory unwarranted
    - ***Waiting on additional agency responses***

Project Implementation and Funding

- Proposed Project Phasing
  - *Phase 1: IPS and Headworks Facility (completion in May 2026)*
  - Phase 2: Near-Term Secondary Treatment Upgrade
    - ✓ Two oxidation ditches and two secondary clarifiers sized for 600,000 gpd firm capacity
    - ✓ UV disinfection, new Process Building, ancillary upgrades (use existing solids handling)
  - Phase 3: Solids Handling Improvements
    - ✓ Sludge storage and dewatering sized for 2052 flows and loads
  - Phase 4: Secondary Treatment Addition + Groundwater Disposal
    - ✓ Two oxidation ditches and secondary clarifiers – additional 1,200,000 gpd firm capacity
    - ✓ I/P cells and new pumping station rated for 1,000,000 gpd

Project Implementation and Funding

- Funding Strategy
  - Finalizing phasing costs with equipment suppliers
  - Looking for additional grant funding
  - Analyzing wastewater system Development Fees
  - Working on EDU projections to assist with rate calculations



Project Implementation and Funding

- Implementation Schedule
  - Equipment Pre-Selection – Nov 2025 thru Feb 2026 (4 mos.)
  - Pre-Design & DEQ Coordination – Mar 2026 thru May 2026 (3 mos.)
  - Design & Bidding – Mar 2026 thru Jun 2027 (15 mos.)
  - Construction – Jul 2027 thru Sep 2029 (27 mos.)
  - Start-up of Treatment Train #1 – Oct 2028 thru Dec 2028 (3 mos.)
  - Warranty Inspection & Closeout – Jan 2030 & Oct 2030

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Next Steps

- Complete WWTP Facility Plan
  - Council adoption scheduled for November 2025
- Secondary Treatment Equipment Pre-Selection
  - Scope and fee to City in early November 2025
- Complete IPS & Headworks Construction
  - Start-up in May 2026
- Rate study/process in 2Q 2026

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QUESTIONS?

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