Montana Department of Environmental Quality

Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

PERMIT FACT SHEET

MONTANA GROUND WATER POLLUTION CONTROL SYSTEM (MGWPCS)

Permittee:	Glacier National Park
Permit Number:	MTX000171
Permit Type:	Domestic wastewater
Application Type:	Renewal
Facility Name:	St. Mary Wastewater Facility
Facility Location:	Southwest ¼ Section 34, Township 35 North, Range 14 West. Glacier County. Latitude: 48.74091° Longitude: -113.43199°
Facility Address:	St. Mary, MT 59417
Facility Contact:	James E. Foster II, PE, Chief of Facility Management PO Box 128 West Glacier, MT 59936
Treatment Type:	Advanced, Mechanical Plant
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Outfall / Type:	001 / Infiltration/Percolation Ponds (IP Ponds)
Effluent Type:	Domestic strength wastewater
Mixing Zone:	Standard
Effluent Limit Type:	WQBEL
Effluent Limits:	Total nitrogen: 55.88 lbs/day
Flow Rate:	Average daily flow: 46,000 gallons per day Maximum daily flow: 72,000 gallons per day Maximum design flow: 107,000 gallons per day
Effluent sampling:	Monthly, EFF-001 (during months of operation)
Ground water sampling:	Quarterly, MW-1A (2nd – 4th quarters)
Fact Sheet Date:	May 2019
Prepared By:	Darryl Barton

1.0 PERMIT INFORMATION

DEQ issues MGWPCS permits for a period of five years. The permit may be reissued at the end of the period, subject to reevaluation of the receiving water quality and permit limitations. This fact sheet provides the basis for DEQ's decision to renew a MGWPCS wastewater discharge permit to Glacier National Park (GNP) (applicant) for the St. Mary Wastewater Facility system.

1.1 APPLICATION

DEQ received an application for renewal of the permit on January 29, 2018. Renewal fees accompanied the application. DEQ reviewed the submittal and issued a completeness letter on February 8, 2018.

1.2 PERMIT HISTORY

The wastewater treatment plant (WWTP) was built in 1978 as three aerated lagoons. Since it was constructed prior to May 1, 1998 it was not subject to certain permitting requirements currently associated with the Montana Water Quality Act. Many improvements have been installed over the years and the WWTP is currently a mechanical plant.

GNP submitted a GW-1 ground water permit application that was received by the Department on October 6, 2005. Requests for supplemental information were made by the Department on November 15, 2005, followed by a second letter on January 4, 2006. The application was determined to be complete on March 19, 2007. The permit became effective on September 1, 2007. It contained effluent limits for Total Nitrogen (daily maximum concentration 55.6 mg/L, 90-day avg. load 49.7 lbs/day) and Total Phosphorus (90-day avg. load 9.46 lbs/day). It also set effluent limitations on concentration and removal of BOD and TSS. The previous permit (2013 – 2018) set effluent limits on Total Nitrogen of 64.4 lbs/day.

1.3 CHANGES TO THIS PERMIT

There is a change in the effluent limit for Total Nitrogen. Prior limit was 64.4 lbs/day. A new limit has been calculated using updated groundwater data. Effluent limit for Total Nitrogen is 55.88 lbs/day.

2.0 FACILITY INFORMATION

2.1 LOCATION

The St. Mary Wastewater Facility is located on the east side of GNP between Divide Creek and Saint Mary Lake **(Figure 1)** and serves the recreational areas around St. Mary Lake. The facility receives septage from the GNP facilities at St. Mary, Logan Pass, the nearby camp areas (Rising Sun and Saint Mary), the Rising Sun Motor Inn (including cabins and a restaurant), and the Hudson Bay housing area. In addition, septic tank and pit toilet wastes from the east side of the park are processed by the plant. The facility operates on a seasonal basis from May 1st until September 30th. During the winter months (October 1st to April 30th), the limited amount of wastewater generated from the year-round residences is rerouted from the facility into two community septic tanks (a 16,000-gallon primary tank and an 8,000-gallon secondary tank) prior to discharging into a subsurface drainfield. The discharge from the septic tanks is not addressed or covered under this permit.

2.2 OPERATIONS

Since the last permit renewal, the plant has made two upgrades:

1. 35,000-gallon flow equalization basin and flow controlled splitter box / scalper (2013) with influent and effluent meters and an automated SCADA system;
2. 15,000-gallon aeration basin (2015) (one of four aeration basins in use) and a mixed liquor suspended solids recycle system.

The St. Mary Wastewater Treatment Plant (WWTP) is a mechanical plant utilizing activated sludge, extended aeration, biological nutrient removal, a clarifier, and mixing in four 15,000-gallon aeration cells. The headworks consists of a wet well and a comminutor. The plant operation is controlled via SCADA system to achieve biological nutrient removal. The influent is diverted into one of the four aeration basins or the equalization basin. The discharge from the fourth aeration basin is to a final clarifier. The fourth aeration cell is equipped with a recirculation pump to return mixed liquor suspended solids (MLSS) high in nitrate to the first cell that is operated with low D.O. levels to promote denitrification. Cells 2, 3, and 4 are operated with high levels of D.O. to promote nitrification of the MLSS. The MLSS flows from the aeration cells to a 15,000-gallon circular clarifier. The effluent from the clarifier is disinfected using ultra violet (UV) treatment and flows out the V-notch weir to one of four infiltration and percolation ponds (IP ponds). Waste activated sludge is treated by using aerobic and anaerobic digestion (within the sludge digester) until stabilized and then pumped to sludge drying beds.

The collection system consists of gravity sewer lines that flow into three lift stations with force mains to either the facility or to the St. Mary Campground lift station. A diagram of the collection system is found in **Figure 3**.

The facility operates on a seasonal basis from May 1st to September 30th. During the winter months, wastewater from the residences is rerouted from the wastewater treatment facility into two community septic tanks: a primary tank 16,000 and secondary tank 8,000 gallons before discharging into a subsurface drainfield not associated with this permit.

A Compliance Evaluation Inspection (CEI) was completed on September 8, 2016. A facility site evaluation was conducted that focused on physical components and operation of the plant and records were reviewed. There were no findings identified by the facility site evaluation or the records review. There have been no violations noted during the prior permitting period, 2013 - 2018.

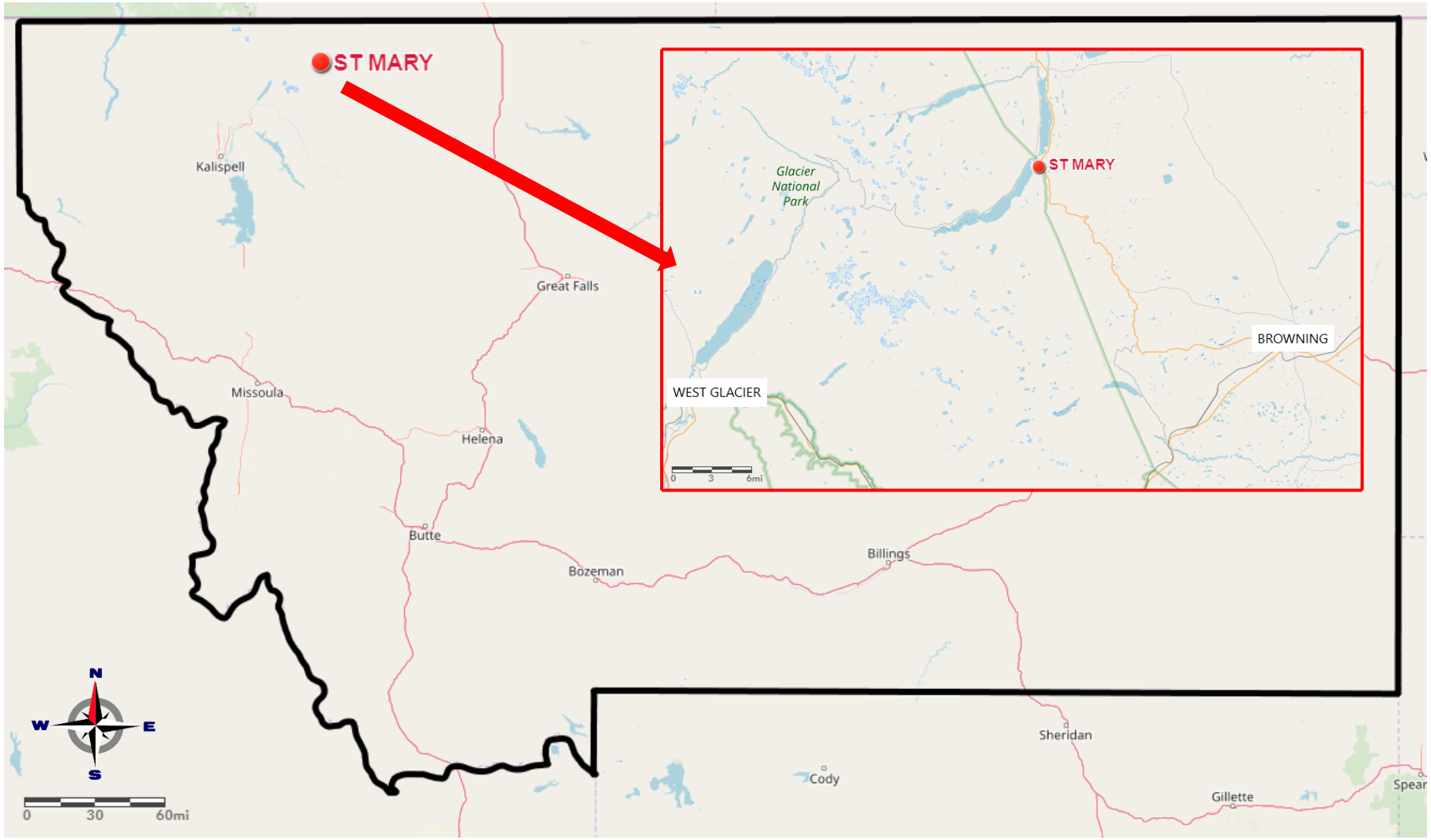


Figure 1. Location of the ST MARY WASTEWATER TREATMENT PLANT

Figure 2. ST MARY WASTEWATER TREATMENT COMPONENTS

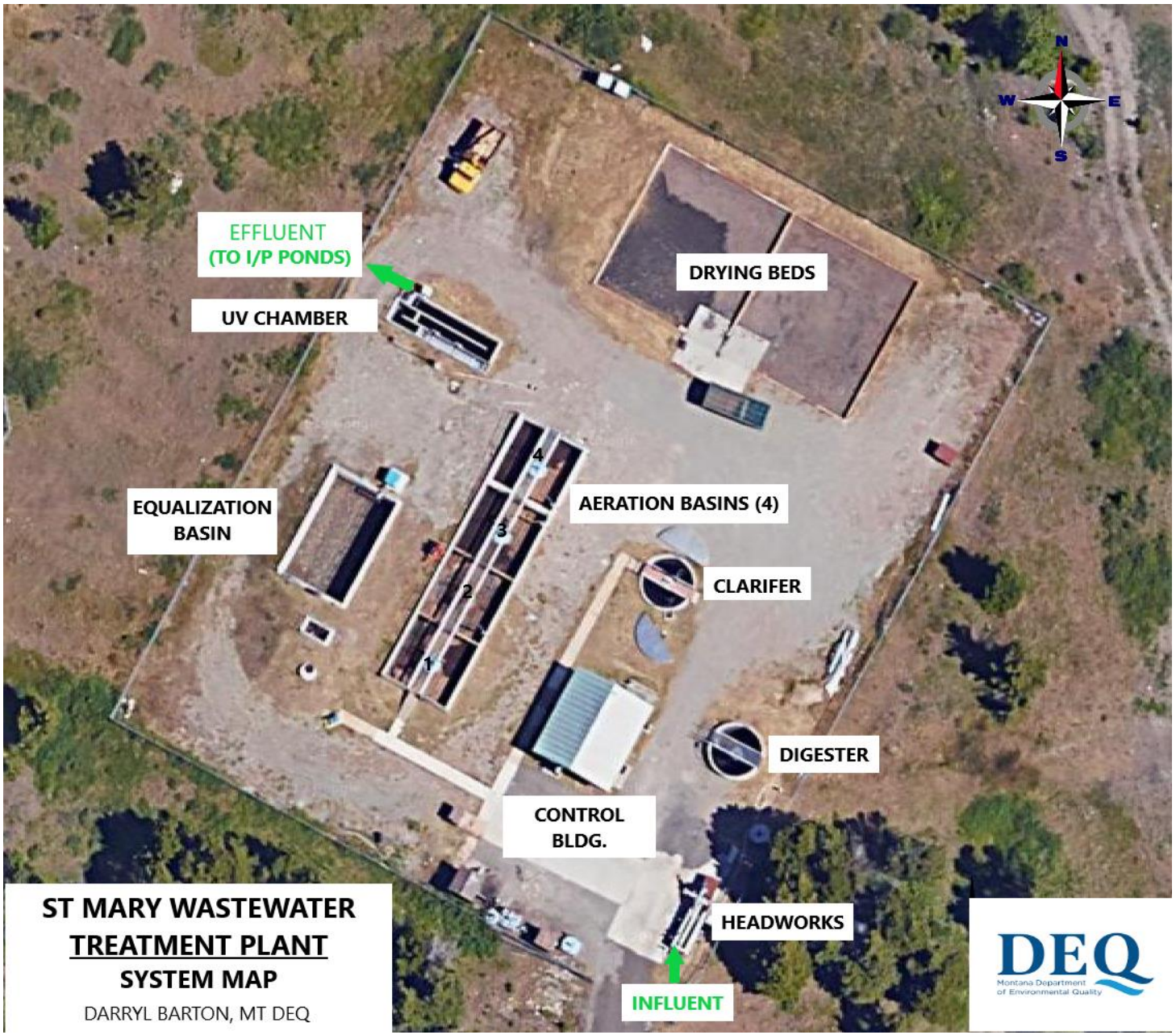


Figure 3. ST MARY WASTEWATER TREATMENT FACILITY

Table 1 summarizes the general characteristics of the facility.

Table 1. Collection, Treatment, and Disposal Summary

Collection			
Contributing sources:	53 seasonal residences, 12-year-round. 5 commercial connections		
Influent Monitoring: INF-001, After the headworks prior to the equalization basin			
Standard industrial code(s) of sources:	Rising Sun Motor Inn & Restaurant	7011	Commercial establishments
	Rising Sun Campground	7033	Campsites and recreational vehicle parks
	Saint Mary Campground	7033	Campsites and recreational vehicle parks
	Saint Mary Visitor Center	9999	Non-classifiable establishments
	Logan Pass Visitor Center	9999	Non-classifiable establishments
Collection method:	Gravity-driven sewer lines and lift stations		
Flow volume:	Average daily flow: 46,000 gallons per day (2018)		
	Maximum daily flow: 72,000 gallons per day (2018)		
Treatment			
Treatment level:	Advanced, Mechanical Plant		
Treatment technology:	Mechanical Plant: Aeration basins, clarifier, activated sludge, UV disinfection		
Treatment location:	Latitude: 48.74105, Longitude: -113.43212		
Disposal			
Method of disposal:	Infiltration to ground water		
Disposal structure:	Infiltration & Percolation Beds (IP beds) (4) (Outfall 001)		
Outfall location:	Latitude: 48.74184, Longitude: - 113.43359		
Effluent Sampling Location: EFF-001, Upstream of the V-notch weir			
Flow Monitoring Equipment: FM-001, Endress-Hausser ultrasonic level sensor with a 60-degree v-notch weir			

The design maximum daily flow for the facility is 107,000 gpd. The average daily flow 46,000 gpd (gallons per day) (2018) and is broken down as follows:

- 8,500 gpd from the Rising Sun Motor Inn & Restaurant area;
- 4,000 gpd from the Rising Sun Campground;
- 5,500 gpd from St. Mary Campground;
- 7,500 gpd from the St. Mary Visitor Center;
- 8,500 gpd from Logan Pass Visitor Center and
- 12,000 gpd from the Hudson Bay Housing Area.

These flows are variable and depend on the number of visitors using the GNP facilities.

A flow diagram for the collection system that flows to the WWTP is in **Figure 3**. The flow line diagram for wastewater flow in the WWTP is found in **Figure 4**.

The influent flow meter location (INF-001) is after the headworks. Effluent flow meter (FM-001) is at the v-notch weir. The effluent sampling location (EFF-001) for the facility is upstream of the v-notch weir prior to discharge into the IP ponds. This sampling point is representative of the last point of control and is used to determine compliance with the final numeric effluent limitations. Monitoring and sampling requirements are further discussed in **Section 6**.

WW Flow Diagram

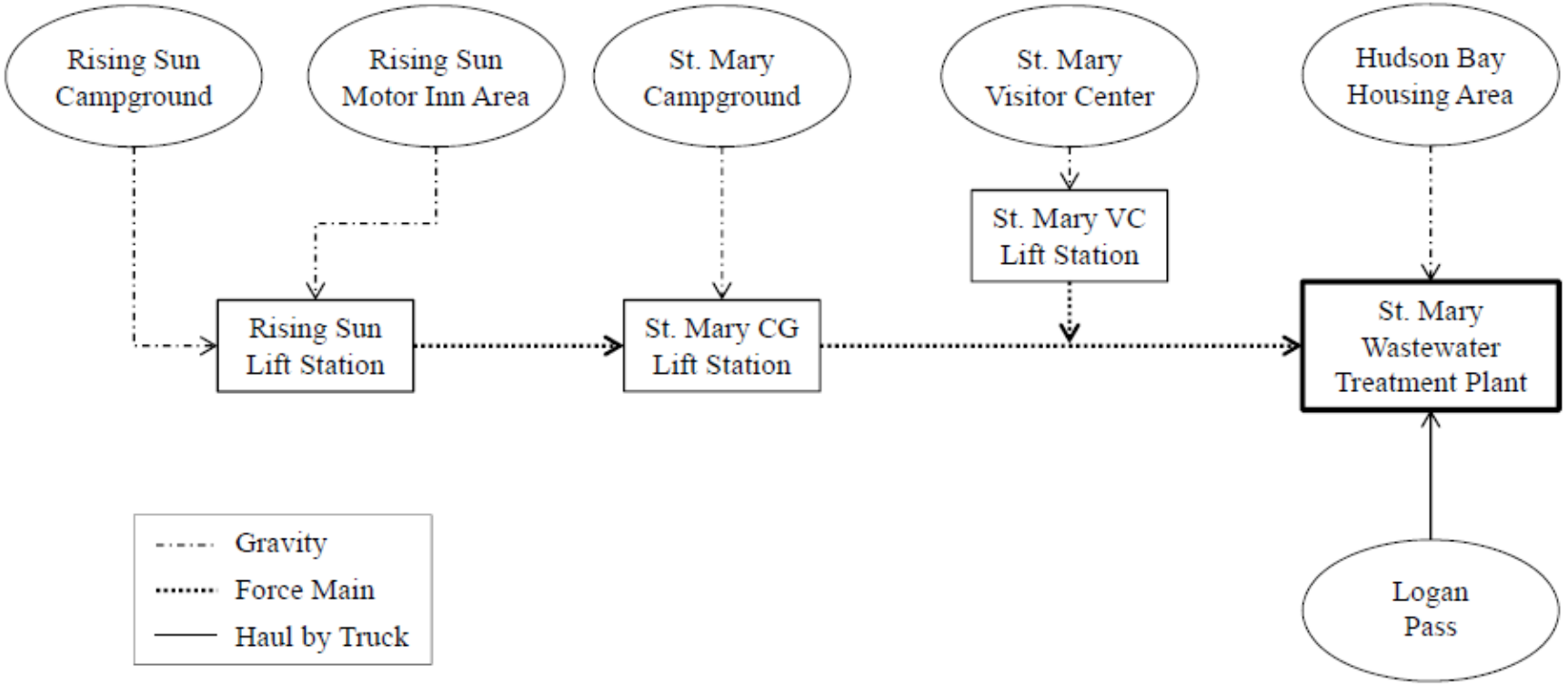


Figure 3. Collection System St. Mary Wastewater

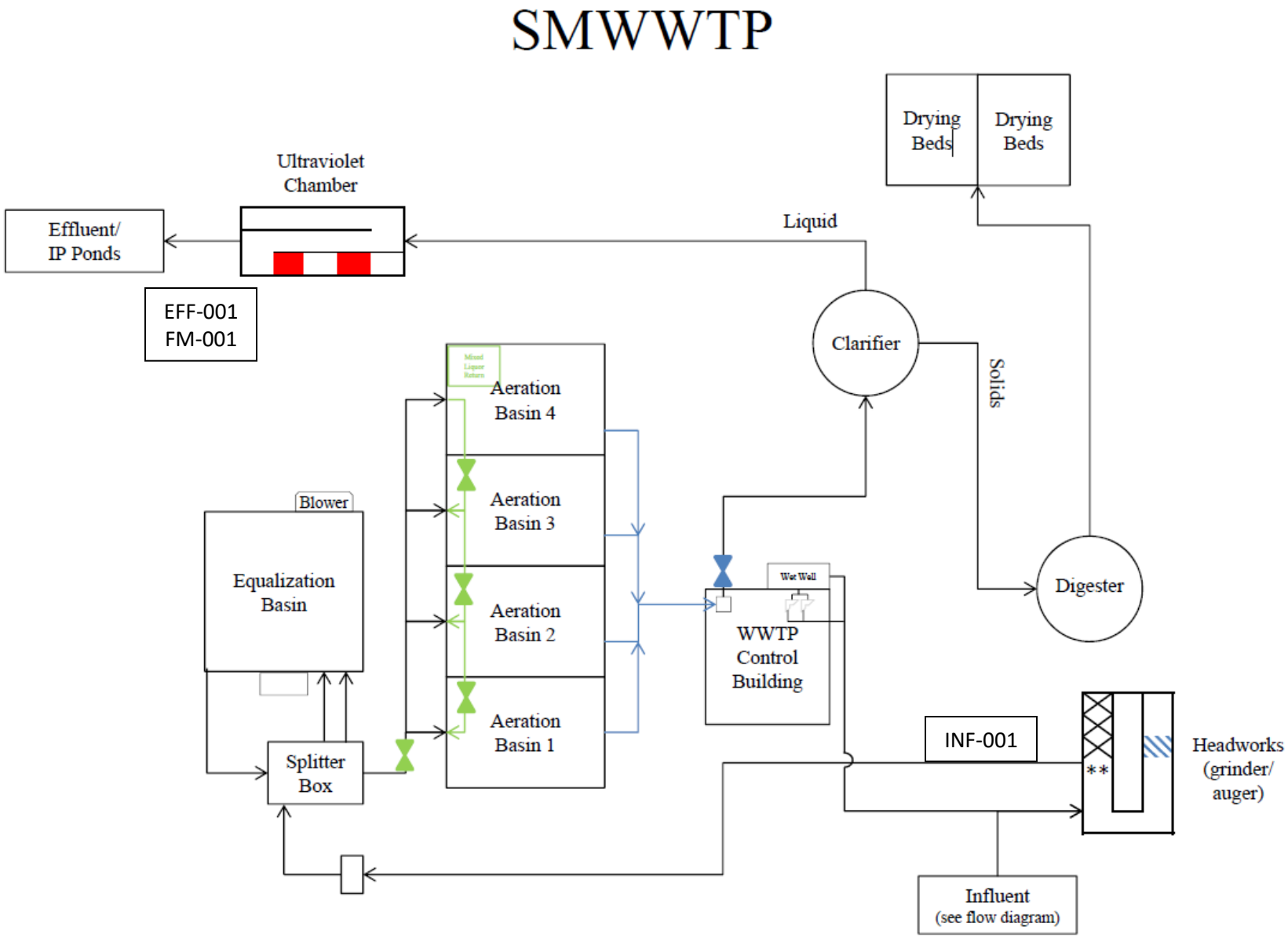


Figure 4. Wastewater Treatment System Line Diagram

2.3 EFFLUENT CHARACTERISTICS

DEQ requires a permit applicant to disclose the quality of the effluent so that DEQ may evaluate the potential for pollution of state water. During the previous permit cycle, the facility sampled and reported effluent quality criteria to DEQ in the form of discharge monitoring reports (DMRs). These data are summarized below in **Table 2**. The majority of the concentrations are reported in units of milligrams per liter (mg/L), which is equivalent to one part per million.

Table 2: Effluent Quality - Sample location EFF-001 - Outfall 001

Parameter[1]	Units	Minimum Value	Average Value	Maximum[2] Value	Number of Samples	Source of Data[3]
Biochemical Oxygen Demand (BOD_5)	mg/L	3.00	17.65	57.00	23	3
Flow rate, Discharge	gpd	2209	28013	68431	23	3
Nitrogen, Nitrate + Nitrite (as N)	mg/L	6.04	39.83	132.00	23	3
Nitrogen, Total Kjeldahl (as N)	mg/L	1.00	10.70	36.00	23	3
Nitrogen, Total (as N)	mg/L	11.20	50.88	143	23	3
	lbs/day	0.17	14.52	61.32	23	3
Oil and grease	mg/L	ND	0.52	2	23	3
Phosphorus, Total (as P)	mg/L	2.07	7.08	12.10	23	3
	lbs/day	0.05	1.87	5.13	23	3
Total Suspended Solids (TSS)	mg/L	4.00	18.05	57.00	23	3

Footnotes:

(1) Conventional and nonconventional pollutants only, table does not include all possible pollutants.

(2) Maximum value recorded of all reported Daily Maximum Values.

(3) Source of data: Self-Reported Discharge Monitoring Reports (DMR)

(4) ND = Non-Detect (below limits of laboratory detection)

Period of Record: 2013 - 2018 seasons of operation

2.4 GEOLOGY

The soils in the area of the IP ponds are classified as a cobbly loam from the Bearmouth series. The characteristics of the Bearmouth soils are summarized as follows:

- Taxonomically classified as sandy-skeletal, mixed Ustic Haplocryolls;
- Are very deep and excessively drained soils;
- Formed in alluviums, colluviums, outwash or till from mixed sources;
- Typically found on flood plains, stream terraces, outwash plains, moraines, fan remnants, alluvial fans and mountain slopes; and
- Slopes are 0 to 40 percent.

2.5 HYDROGEOLOGY

The area is an alluvial fan deposited by Divide Creek as it flows into St. Mary Lake. The alluvial fan consists of coarse sand, gravel and boulders with an underlying aquifer that is an unconfined sand and gravel aquifer. Divide Creek recharges the ground water of the alluvial aquifer as the creek enters St. Mary Lake. The changes in static water levels indicate that the spring runoff from Divide Creek plays a significant role in the fluctuations of ground water levels. The level of the water table recedes back to the level of St. Mary Lake once the spring runoff ends.

The hydraulic conductivity and hydraulic gradient for the facility were determined from a ground water investigation conducted by the United States Geological Survey (USGS) in 1982 and by Western Groundwater Services, LLC in 2006. The current permit application indicates a value for hydraulic conductivity (K) of 1,825 ft/day. This is the average hydraulic conductivity of the aquifer estimated from the results of the constant rate (63 gpm) 12-hour aquifer pump test by Western Groundwater Services, in 2006. This test indicated an average aquifer transmissivity (T) of 36,500 ft^2/day. The saturated thickness (b) of the aquifer used only the screened interval (20-feet) of the observation well since this is the portion of the aquifer that contributed to the test results. These values for the transmissivity and saturated thickness of the aquifer were used to determine the hydraulic conductivity of the aquifer at the facility.

The current permit application indicates a value for the hydraulic gradient (I) of 0.005 ft/ft and a local ground water flow direction of N45°W at the facility, determined from the 1982 and 2006 ground water investigations. The hydraulic gradient becomes steeper moving to the east due to the lower transmissivity of the aquifer and/or a higher rate of ground water recharge from Divide Creek. Ground water flow direction is based on the static water level measurements from four monitoring wells. The direction of ground water flow moves from N45°W in the area of the facility to a more northern flow as it gets farther from the I/P ponds. Ground water flow direction was confirmed by the permittee in 2006. If ground water flow direction does not change, there is very little threat to surface water.

The nearest surface water to the facility is Divide Creek. Divide Creek is hydraulically upgradient of the facility and is located 400 feet to the east of the IP ponds. If ground water flow were to change to the NE there would become a water quality threat to Divide Creek. The closest surface water to the facility, based on the ground water flow direction, is St. Mary Lake. St. Mary Lake is 2,670 feet west of the IP ponds and is hydraulically downgradient from the facility.

St. Mary Lake is located entirely within the boundary of GNP and is designated as an “outstanding resource water” due to its environmental, economic, and ecological value (75-5-315 and 316, MCA). According to ARM 17.30.617(1): “All state surface waters located wholly within the boundaries of designated national parks or wilderness areas as of October 1, 1995, are outstanding resource waters (ORWs).”

The water quality of St. Mary Lake is extremely good to nearly pristine. Water from the melting snowpack is the dominant source of water flowing into the lake. Extensive exposure to resistant bedrock with minimal amounts of unconsolidated materials keeps the values for total dissolved solids and specific conductivity low in St. Mary Lake.

The low solute concentrations found in the alpine lakes of GNP results in lakes that have very little capacity to produce plant biomass; these alpine lakes are very sensitive to changes in nutrient inputs. Alpine lakes in GNP are classified as oligotrophic (lakes with low nutrient concentrations) to ultraoligotrophic (lakes with extremely low nutrient concentrations) due to low inputs of bioavailable phosphorous. Thus, alpine lakes, including St. Mary Lake, are extremely sensitive to phosphorous loading as result of human activity. Downgradient monitoring for Total Phosphorus will be required. Additionally, atmospheric inputs have been identified as one probable source for nitrate in this area. DEQ will limit Total Nitrogen in this permit.

Important hydrogeologic characteristics are summarized below in **Table 3**.

Table 3. Hydrogeologic Summary	
Average depth to ground water	42 feet
General ground water flow direction	N45°W
Hydraulic conductivity	1,825 feet per day
Hydraulic gradient	0.005 feet/feet
Nearest downgradient surface water	St. Mary Lake (2,670 feet)

2.6 GROUND WATER MONITORING WELLS

There are two active monitoring wells associated with this permit: MW-1A and MW-UG. Both wells are plotted on **Figure 2**. Monitoring well construction details are provided in **Table 4**. Driller's logs for each monitoring well are attached as **Appendix A**.

Table 4: Monitoring Well Summary
Monitoring Well: **MW-1A**
MBMG GWIC #:
Construction date:
Location: 500-feet northwest of the I/P beds at the end of the mixing zone Latitude: 48.74296° Longitude: -113.43591°
Representation: Water quality at the downgradient end of the 500-foot mixing zone
Monitoring Well: **MW-UG**
MBMG GWIC #: 6786
Construction date:
Location: Latitude: 48.74082° Longitude: -113.43002°
Representation: Ambient upgradient receiving water quality

If a DEQ-approved monitoring well is abandoned, destroyed or decommissioned, or is no longer able to be sampled due to fluctuations in the ground water table, the permittee must install or designate a new well to replace the abandoned, destroyed, decommissioned, or non-viable well.

2.7 GROUND WATER QUALITY CHARACTERISTICS

Water sampling results from monitoring well MW-UG are provided in **Table 5**. MW-UG is used to measure ambient water quality upgradient of the facility. Based on the 365 microsiemens per centimeter (µS/cm) specific conductance, the receiving water is Class I ground water. Data reported in the table is taken from the renewal application.

Monitoring well MW-1A represents water quality at the downgradient end of the 500-foot mixing zone. Water sampling results from MW-1A are provided in **Table 6**. Data in the table comes from self-reported discharge monitoring reports (DMR).

Table 5: Ambient Ground Water Monitoring Results

Monitor Source[1]	Representation	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[2] Value	# of Samples	Source of Data
MW-UG	Ambient Ground Water Quality Shallow ground water, 900 feet upgradient from Outfall 001	Chloride (as Cl)	mg/L	ND	2.7	6.0	3	APP
		Escherichia coli Bacteria	CFU/100 ml	ND	ND	ND	3	APP
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	ND	1.7	3.8	3	APP
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	ND	ND	3	APP
		Nitrogen, Total (as N)	mg/L	ND	1.7	3.8	3	APP
		Phosphorus, Total (as P)	mg/L	ND	ND	ND	3	APP
		Specific Conductivity (@ 25°C)	µS/cm	297.0	365.0	400.0	3	APP
		Static Water Level (SWL)	ft-bgs	32.0	42.0	47.0	3	APP

Footnotes:

APP = Application Form GW-1 and supplemental materials.

bgs = below ground surface

CFU = Colony Forming Units

ND = Not Detected

Period of Record: July 2013 through December 2018.

(1) Refer to Figure 2 and Table 4 of the Fact Sheet for the existing location of the monitoring wells.

(2) Maximum value recorded of all monthly or quarterly reported values.

Table 6: Downgradient Ground Water Monitoring Results

Monitor Source[1]	Representation	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[2] Value	# of Samples	Source of Data
MW-1A	Downgradient Ground Water Quality Shallow ground water, 500 feet downgradient from Outfall 001 (post mixing zone)	Chloride (as Cl)	mg/L	1.6	5.0	11.0	17	DMR
		Escherichia coli Bacteria	CFU/100 ml	ND	ND	ND	17	DMR
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	ND	1.0	3.6	17	DMR
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	0.1	1.0	17	DMR
		Nitrogen, Total (as N)	mg/L	ND	1.1	3.6	17	DMR
		Phosphorus, Total (as P)	mg/L	ND	0.01	0.02	17	DMR
		Specific Conductivity (@ 25°C)	µS/cm	122	346	466	17	DMR
		Static Water Level (SWL)	ft-bgs	25	42	48	17	DMR

Footnotes:

DMR = Self-Reported Discharge Monitoring Reports

bgs = below ground surface

CFU = Colony Forming Units

ND = Not Detected

Period of Record: July 2013 through December 2018.

(1) Refer to Figure 2 and Table 4 of the Fact Sheet for the existing location of the monitoring wells.

(2) Maximum value recorded of all monthly or quarterly reported values.

3.0 WATER QUALITY STANDARDS AND NONDEGRADATION

Part of DEQ's mission is to protect, sustain, and improve the quality of state waters. Water quality standards provide the basis for effluent limits that DEQ applies to discharge permits (**Section 5**). These standards include three components: designated uses, water quality criteria, and nondegradation policy. DEQ protects all designated uses of state water by basing effluent limits on the most restrictive water quality limitations, intended to protect the most sensitive uses.

3.1 DESIGNATED USES

With a specific conductivity of 365 µS/cm (**Table 5**), the receiving water is Class I ground water and therefore a high-quality water of the State. Class I ground waters must be maintained suitable for the following uses with little or no treatment:

- Public and private drinking water supplies
- Culinary and food processing purposes
- Irrigation
- Drinking water for livestock and wildlife
- Commercial and industrial purposes

DEQ protects all the assigned beneficial uses by protecting the most sensitive. Drinking water is the most sensitive use of this receiving water.

3.2 WATER QUALITY CRITERIA

DEQ writes permits to protect the most sensitive, thereby protecting all uses. DEQ's ground water standard for nitrate is 10.0 mg/L, as is the standard for nitrate + nitrite (as nitrogen). Class I ground water must be maintained suitable for use as a drinking water supply with little or no treatment, and therefore must meet the corresponding human health standard of 10.0 mg/L total nitrogen. These water quality standards may not be exceeded outside a designated mixing zone (**Section 4**).

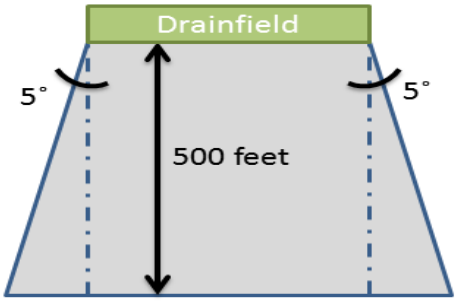
3.3 NONSIGNIFICANCE

DEQ has determined that the activity is not considered to be a new or increased source resulting in a change of existing water quality occurring on or after April 29, 1993. DEQ is therefore not required to perform a significance determination. The applicable water quality standards for Class I ground water are summarized in **Table 8**. This permit includes monitoring, reporting, and corrective action requirements to establish, confirm, and maintain compliance with permit limitations.

4.0 MIXING ZONE

DEQ authorizes a standard mixing zone for total nitrogen discharged from Outfall 001. A mixing zone is a specifically defined area of the receiving water where water quality standards may be exceeded. DEQ evaluates the suitability according to criteria established in the Administrative Rules of Montana. The mixing zone is then defined in the permit.

A standard mixing zone extends 500 feet downgradient from the source. The upgradient boundary is equal to the width of the source (measured perpendicular to ground water flow direction). The mixing zone widens in the downgradient direction by 5° on either side. The width of the downgradient boundary is calculated by adding the increased width for each side (the tangent of 5° (0.0875) times the mixing zone length) to the width of the upgradient boundary. Standard mixing zones extend 15 feet below the ground water table.



The volume of ground water (Q_{GW}) available to mix with the effluent is calculated using Darcy's Equation: $Q_{GW} = KIA$

Where:
Q_{GW} = ground water flow volume (feet^3/day)
K = hydraulic conductivity (feet/day)
I = hydraulic gradient (feet/feet)
A = cross-sectional area (feet^2) at the downgradient boundary of the mixing zone.

Table 7 summarizes the variables used in Darcy's equation and the resulting volume of ground water available to mix at Outfall 001. These values are drawn from the previous fact sheet and DMR results.

Table 7: Hydrogeologic and Mixing Zone Information - Outfall 001

Parameter	Units	Value
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations, Nitrate + Nitrite	mg/L	1.7
Ground Water Flow Direction	azimuth/bearing	N45°W
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	575
Width of Mixing Zone at Down Gradient Boundary	feet	662.5
Cross Sectional Area of Mixing Zone (A)	ft^2	9937.5
Hydraulic Conductivity (K)	feet/day	1,825
Hydraulic Gradient (I)	ft/ft	0.005
Volume of Ground Water Available for Mixing (Q_{gw})	ft^3/day	90,680

To determine whether a mixing zone is allowable, DEQ calculates a predicted concentration at the downgradient end of the mixing zone. This mixing calculation follows the following procedure:

- Volume of ground water times the concentration of the parameter = existing load;
- Volume of discharge times the concentration of the parameter = waste load; and
- (Existing load + waste load) / total volume = predicted concentration.

DEQ calculates water quality based effluent limits (WQBELs) by rearranging the equation and solving for the effluent concentration or load limit (**Section 5**).

5.0 PERMIT CONDITIONS

Discharge permits include conditions that ensure compliance with the Montana Water Quality Act and the regulations used to implement it. These conditions include effluent limits as well as any special conditions that DEQ deems necessary to protect the quality of the receiving water.

Montana's numeric water quality standards are published in Circular DEQ-7. Water quality criteria applicable to this permit are summarized below in **Table 8**. The permit establishes effluent limits that will meet water quality standards, thereby protecting beneficial uses and existing high-quality waters.

Table 8: Applicable Ground Water Quality Standards

Parameter(1)	**Human Health Standard**(2)
Nitrate + Nitrite (as N)	10.0 mg/L

Footnotes:
(1) Includes parameters of concern only.
(2) Circular DEQ-7 states the concentration of no single sample may exceed the listed values.

This discharge permit includes numeric WQBELs that restrict the strength and volume of the discharge. DEQ calculates WQBELs by rearranging the mixing zone equation (**Section 4**) and solving for the effluent concentration that satisfies the water quality criteria. DEQ evaluates and recalculates the limits using updated water quality data as part of every permit renewal cycle. In this way, DEQ protects the receiving water quality by continually assessing cumulative impacts to the receiving water.

DEQ calculated the effluent limits using the same method as for the previous permit. DEQ uses updated ambient ground water quality data to re-evaluate the receiving water quality and the assimilative capacity for dilution.

5.1 TOTAL NITROGEN EFFLUENT LIMIT

10.0 mg/L is the water quality criteria applicable to this permit. DEQ established the final WQBEL for this discharge by back-calculating the effluent concentration that results in 10.0 mg/L at the end of the mixing zone, given the available dilution. Available dilution is determined by recent ground water quality sampling of the receiving water. Ambient total nitrogen averaged 1.7 mg/L (**Section 2**). DEQ calculates an effluent limit that protects receiving water quality and beneficial uses according to the following equation:

$$\underline{\text{Equation 1:}}\ C_{lmt} = C_{std} + D(C_{std} - C_{gw})$$

Where:

C_{lmt} = effluent limitation concentration
C_{std} = limiting water quality criterion
C_{gw} = ambient receiving ground water concentration
D = dilution ratio (Q_{gw} / Q_{eff})
Q_{gw} =ground water flux at the end of the mixing zone
Q_{eff} = average maximum daily discharge

Using the values provided in **Table 7**, the result for C_{lmt} is 62.62 mg/L. This is the final WQBEL expressed as a concentration. Load limits are more appropriate for discharges to ground water since the long-term loading is the greater concern in absence of aquatic life considerations. Additionally, load limits inherently control both the strength and volume of the discharge. A discharge of 107,000 gallons per day containing 62.62 mg/L total nitrogen is equivalent to 55.88 pounds per day. The limit calculations are provided in detail in **Appendix B**.

5.2 TOTAL PHOSPHORUS EFFLUENT LIMIT

DEQ determined (2007) that phosphorous discharged to ground water would reach the surface water St. Mary Lake in 137.4 years. A phosphorous breakthrough time of more than 50 years is considered nonsignificant. DEQ has determined that the activity is not considered to be a new or increased source resulting in a change of existing water quality occurring on or after April 29, 1993. DEQ is therefore not required to perform a significance determination. The applicable water quality standards for Class I ground water are summarized in **Table 8**. This permit includes monitoring, reporting, and corrective action requirements to establish, confirm, and maintain compliance with permit limitations.

Based on the information presented, DEQ proposes the following numerical effluent limitations in **Table 9**.

Table 9: Effluent Limit - Outfall 001

Parameter	Units	Daily Maximum(1)
Total Nitrogen (as N)	lbs/day	55.88

Footnotes:

(1) See definition in Part V of permit.

6.0 MONITORING AND REPORTING REQUIREMENTS

DEQ requires effluent and ground water monitoring to assure compliance with the effluent limitations and therefore water quality standards. Effluent monitoring and ground water monitoring is required as a condition of this permit. All monitoring and sampling required by this permit must be representative; therefore, the permit identifies specific monitoring locations. Monitoring requirements and rationale are summarized below.

6.1 EFFLUENT MONITORING

This permit includes numeric effluent limitations with specific magnitudes and durations to ensure the discharge will not cause or contribute to an exceedance of an applicable water quality standard (see **Section 3**). Accordingly, the permittee is required to monitor and report at a specified frequency to demonstrate compliance with these limitations.

Effluent samples and discharge flow measurements must be representative of the nature and volume of the effluent. The effluent sampling location for the facility is upstream of the V-notch weir prior to discharge into the IP ponds (**Figure 4)**. The permittee is required to install, maintain and report flow measurements using a flow-measuring device capable of measurements that are within 10 percent of the actual flow. The flow measuring device (FM-001) is located prior to the V-notch weir and before discharge into the IP ponds. The flow measuring device must be installed and in operating condition prior to discharge.

Effluent monitoring and reporting requirements are summarized in **Table 10**. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

Table 10: Effluent Monitoring and Reporting Requirements – Outfall 001 (Months of Operation May – September)

Parameter	Monitor Location	Units	Sample Type[1][2]	Minimum Sample Frequency	Reporting Requirements[1][3]	Report Freq	Rationale
Effluent Flow Rate [4] [5] [6]	FM-001	CFU/ 100mL	Continuous	Continuous	Daily Maximum Monthly Average[5]	Monthly	Permit Compliance / Effluent Characterization
Biochemical Oxygen Demand (BOD_5)	EFF-001	gpd	Grab	1/Month	Daily Maximum Monthly Average	Monthly	Proper O & M / Effluent Characterization
Total Suspended Solids (TSS)	EFF-001	mg/L	Grab	1/Month	Daily Maximum Monthly Average	Monthly	Proper O & M / Effluent Characterization
Oil & Grease [7]	EFF-001	mg/L	Grab	1/Month	Daily Maximum Monthly Average	Monthly	Proper O & M / Effluent Characterization
Nitrate + Nitrite (as N)[4]	EFF-001	mg/L	Grab	1/Month	Daily Maximum Monthly Average	Monthly	Proper O & M / Effluent Characterization
Total Kjeldahl Nitrogen (TKN) [4]	EFF-001	mg/L	Grab	1/Month	Daily Maximum Monthly Average	Monthly	Proper O & M / Effluent Characterization
Total Nitrogen (as N) [4][5]	EFF-001	mg/L	Calculate [8]	1/Month	Daily Maximum Monthly Average	Monthly	Permit Compliance / Effluent Characterization
		lbs/day	Calculate	1/Month	Daily Maximum Monthly Average	Monthly	
Total Phosphorus (as P) [4]	EFF-001	mg/L	Grab	1/Month	Daily Maximum Monthly Average	Monthly	Proper O & M / Effluent Characterization
		lbs/day	Calculate [9]	1/Month	Daily Maximum Monthly Average	Monthly	

Footnotes:

(1) See definitions in Part V of the permit.

(2) Grab sample will represent concentration for a 24-hour period.

(3) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR) form.

(4) Permittee is to report the daily maximum and monthly average.

(5) If no discharge occurs during the reporting period, "No Discharge" shall be recorded on the DMR report form.

(6) Requires recording device or totalizing meter, must record daily effluent volume.

(7) Hexane extraction method.

(8) Total Nitrogen is the sum of Nitrate + Nitrite and Total Kjeldahl Nitrogen.

(9) Load calculation: lbs/day = concentration (mg/L) x flow (gpd) x (8.34×10^{-6}).

Monthly samples and reporting are required for any month that experiences water flows.
During the period when no flows occur the whole month, the operator shall report "No Discharge".

6.2 GROUND WATER MONITORING

Ground water monitoring provides long term ambient and downgradient characterization of the aquifer. Ground water monitoring will be required at monitoring well MW-1A (**Figure 2 and Table 4**). Data collected via ground water monitoring will be used for mixing zone evaluation and aquifer characterization in future permit renewals. Sampling and reporting requirements shall commence upon the effective date of the permit.

This system is in a national park with monitoring limitations created by extreme weather conditions and wildlife activity. Monitoring wells do not need to be sampled when it is determined that they are inaccessible or unsafe due to snow and / or bears in the area. The circumstances preventing sampling must be reported.

Months of operation are typically May – September. First quarter sampling is not required. To get the best representation of ground water quality throughout the year it is best to sample as early during the second quarter (early May) and as late in the fourth quarter as possible (October). Due to multiple wells in this location it is important that the well be discernable. Mark the well in a durable way that makes it easy to identify.

Ground water monitoring and reporting requirements are summarized in **Table 11**. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

Table 11: Ground Water Monitoring and Reporting Requirements (2nd through 4th quarter)

Parameter	Monitoring Location	Units	Sample Type(1)	Minimum Sampling Frequency(2)	Reporting Requirements	Reporting Frequency(3)
Chloride (as Cl)	MW1A	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Escherichia coli Bacteria	MW1A	CFU/100mL	Grab	1/Quarter	Daily Maximum & Quarterly Average	Quarterly
Nitrate + Nitrite (as N)	MW1A	mg/L	Grab	1/Quarter	Daily Maximum & Quarterly Average	Quarterly
Total Kjeldahl Nitrogen (TKN)	MW1A	mg/L	Grab	1/Quarter	Daily Maximum & Quarterly Average	Quarterly
Total Nitrogen (as N)	MW1A	mg/L	Calculated(4)	1/Quarter	Daily Maximum & Quarterly Average	Quarterly
Total Phosphorus (as P)	MW1A	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Specific Conductivity @ 25°C	MW1A	µS/cm	Instantaneous	1/Quarter	Quarterly Average	Quarterly
Static Water Level (SWL)(5)	MW1A	Ft-bgs(6)	Instantaneous	1/Quarter	Quarterly Average	Quarterly

Footnotes:

(1) See definitions in Part V of the permit.
(2) Monitoring and Reporting is only required 2nd, 3rd and 4th quarters (during months of operation)
(3) The geometric mean must be reported if more than one sample is taken during a reporting period.
(4) Total Nitrogen is the sum of the Nitrate + Nitrite and Total Kjeldahl Nitrogen parameters.
(5) Measuring point (point of reference) for measurements shall be from top of casing and measured to within 1/100th of one foot.
(6) bgs = below ground surface

PUBLIC NOTICE

Legal notice information for water quality discharge permits are listed at the following website: http://deq.mt.gov/Public/notices/wqnotices. Public comments on this proposal are invited any time prior to close of business on **August 14, 2019**. Comments may be directed to:

DEQWPBPublicComments@mt.gov

or to:

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

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments pertinent to this permitting action and may issue a final decision within thirty days of the close of the public comment period.

All persons, including the applicant, who believe any condition of the draft permit is inappropriate, or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing). All public comments received for this draft permit will be included in the administrative record and will be available for public viewing during normal business hours.

Copies of the public notice are mailed to the applicant, state and federal agencies, and interested persons who have expressed interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this draft permit. Electronic copies of the public notice, draft permit, fact sheet, and draft environmental assessment are available at the following website: http://deq.mt.gov/Public/notices/wqnotices.

Any person interested in being placed on the mailing list for information regarding this permit may contact the DEQ Water Protection Bureau at (406) 444-5546 or email DEQWPBPublicComments@mt.gov . All inquiries will need to reference the permit number (MTX000171), and include the following information: name, address, and phone number.

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing.

APPENDIX A – MONITORING 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

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View field visits for this site
View water quality for this site

Site Name: USGS RESEARCH WELL *
GWIC Id: 6786

Section 1: Well Owner(s)

Section 2: Location

Township	Range	Section	Quarter Sections
35N	14W	34	NE¼ SW¼ SW¼ SW¼

County	Geocode
GLACIER	

Latitude	Longitude	Geomethod	Datum
48.7408	-113.43	MAP	NAD27

Ground Surface Altitude	Ground Surface Method	Datum Date
4562.1		

Addition	Block	Lot

Section 3: Proposed Use of Water
UNUSED (1)

Section 4: Type of Work
Drilling Method:
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: N/A

Section 6: Well Construction Details
There are no borehole dimensions assigned to this well.

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	0	6				STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
10	44	0			PERFORATED CASING

Annular Space (Seal/Grout/Packer)

There are no annular space records assigned to this well.

Section 7: Well Test Data

Total Depth: 44
Static Water Level: 28.92
Water Temperature:

Unknown Test Method *

Yield _ gpm.
Pumping water level _ feet.
Time of recovery _ hours.
Recovery 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
Lithology Data

There are no lithologic details assigned to this well.

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:
Company:
License No:-
Date Completed:

APPENDIX B – EFFLUENT LIMIT CALCULATIONS

To protect beneficial uses [ARM 17.30.1006(1)(b)(ii)], there shall be no increase of a parameter to a level that renders the waters harmful, detrimental, or injurious to the beneficial uses. Therefore, 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. DEQ establishes the effluent limitations for nitrogen based on the projection that the entire nitrogen load in the wastewater stream may ultimately be converted to nitrate (USEPA, 2002a).

The allowable discharge concentrations are derived from a mass-balance equation (ARM 17.30.517) which is a simple steady-state model, used to determine concentration after accounting for other sources of pollution in the receiving water and any dilution as provided by a mixing zone. The mass-balance equation (Equation 1) derived for ground water is as follows:

Equation 1:

$$Q_{gw}C_{gw} + Q_{eff}C_{eff} = Q_{comb}C_{proj}$$

Where:

Q_{gw}	=	ground water available for mixing
C_{gw}	=	ambient receiving ground water concentration
Q_{eff}	=	maximum design capacity of wastewater system
C_{eff}	=	effluent pollutant concentration
Q_{comb}	=	combined ground water and effluent ($Q_{comb} = Q_{gw} + Q_{eff}$)
C_{proj}	=	projected pollutant concentration (after available mixing)

The mass-balance equation has been arranged to calculate effluent limits so that the discharge does not cause or contribute to an exceedance of the most restrictive water quality standard. This equation can be applied to any effluent and receiving water where the applicable dilution ratio is known. This equation will only be used for nitrogen which has been authorized for mixing (Section 4).

Equation 2:

$$Clmt = Cstd + D(Cstd - Cgw)$$

Where:

Clmt =	effluent limitation concentration
Cstd =	water quality standard concentration = 10.0 mg/L
Cgw =	ambient receiving ground water concentration = 1.7 mg/L
D =	dilution ratio (Qgw ⁄ Qeff) = 678,333 / 107,000 = 6.34

$C_{lmt} = 10 + (6.34)(10 – 1.7)$ **= 62.62 mg/L**

A mass-balance approach is used to calculate the effluent quality of the discharge that meets the most restrictive water quality standard at the end of the mixing zone. Numeric effluent limitations are expressed as loads since this type of limitation inherently regulates both volume and strength of the effluent as prescribed by 75-5-402(3),

MCA. Load limits ensure compliance with the ground water standards at the end of the mixing zone. Based on the proposed design capacity, the respective load effluent limitation is:

55.88 lb/day
[(8.34*10-6)* 62.62 mg/L*107,000 gpd]
as based on the following equation:

Equation 3:

$L_{lmt} = CON * C_{eff} * DC_{eff}$

Where:
L_{lmt} = effluent limitation-load
C_{eff} = allowable effluent concentration
DC_{eff} = design capacity of wastewater treatment system (gpd)
CON = conversion factor [$8.34*10^{-6}$]

The Final Effluent Limits are summarized in Table 8 for Outfall 001.

APPENDIX C – REFERENCES

40 CFR § 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants. 2017.

Administrative Rules of Montana, Title 17, Chapter 30, Water Quality:

- Subchapter 2 – Water Quality Permit Fees.
- Subchapter 5 – Mixing Zones in Surface and Ground Water.
- Subchapter 6 – Surface Water Quality Standards and Procedures.
- Subchapter 7 – Nondegradation of Water Quality.
- Subchapter 10 – Montana Ground Water Pollution Control System.
- Subchapter 13 – Montana Pollutant Discharge Elimination System.

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Department of Environmental Quality, Water Quality Circulars:

- Circular DEQ-2 – Design Standards for Wastewater Facilities.
- Circular DEQ-4 – Montana Standards for On-Site Subsurface Sewage Treatment Systems.
- Circular DEQ-7 – Montana Numeric Water Quality Standards, Required Reporting Values, and Trigger Values.

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