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:	MTX000221
Permit Type:	Domestic wastewater
Application Type:	Renewal
Facility Name:	Many Glacier Wastewater Treatment Plant
Facility Location:	Section 12, Township 35 North, Range 16 West, Glacier County Latitude: 48.80097°, Longitude: -113.64178°
Facility Address:	PO Box 128 West Glacier, MT 59936
Facility Contact:	James Foster, Chief of Facilities Management
Treatment Type:	Aerated lagoon
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Outfall / Type:	001 – Infiltration/Percolation Ponds
Effluent Type:	Domestic strength wastewater
Mixing Zone:	Standard
Groundwater Limits:	10.0 mg/L nitrogen (nitrate + nitrite) at MW-5 and MW-6
Flow Rate:	Average daily design flow: 85,000 gallons per day (gpd) Maximum daily design flow: 138,000 gpd
Effluent sampling:	Monthly, EFF-001 / V-notch weir (during operation, usually June – October)
Ground water sampling:	Monthly (during operation, usually June – October) Monitoring Wells (MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7)
Fact Sheet Date:	January 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 (applicant) for the MANY GLACIER WASTEWATER TREATMENT PLANT (WWTP).

1.1 APPLICATION

DEQ received an application for renewal of the permit on OCTOBER 31, 2018. Renewal fees were paid August 20, 2018. DEQ reviewed the submittal and issued a completeness letter on NOVEMBER 15, 2018.

1.2 PERMIT HISTORY

This is a renewal of a permit that went into effect May 1, 2014. The effluent limit was 231 lbs/day total nitrogen. A special condition of the permit was the production of a site-specific hydrogeological report. This report (Many Glacier Hydrogeologic Investigation Report, 2017) was submitted prior to the date due and used in the production of this fact sheet (**Appendix A**). The study better characterized groundwater in the area and established a more extensive groundwater monitoring network with the creation of three new monitoring wells. Two of these wells (MW-5 and MW-6) will be used in monitoring groundwater quality in relation to the system. Groundwater compliance limits have been set based on these wells: 10.0 mg/L nitrogen (nitrate + nitrite).

DEQ performed a compliance inspection of the facility in September of 2016. There were no findings or violations noted in the inspection report in regard to the facility or the records reviewed. DEQ conducted a site visit of the facility September 2018. The facility was built and put into use in 1975. Improvements provided the basis for a discharge permit: new lagoon liner, bio-domes, and UV disinfection system.

1.3 CHANGES TO THIS PERMIT

The prior permit set a total nitrogen effluent limit of 231 lbs/day. With the construction of an improved monitoring well network this permit focusses on monitoring and maintaining groundwater quality at the monitoring wells (MW-5 and MW-6) rather than setting an effluent limit. The groundwater limit for these wells will be 10.0 mg/L for nitrogen (nitrate + nitrite). Groundwater monitoring and reporting has changed from quarterly to monthly during the time of operation and when monitoring wells can be sampled (usually June through October).

2.0 FACILITY INFORMATION

2.1 LOCATION

The Many Glacier Wastewater Treatment Plant is located on the east side of Glacier National Park about one mile east of Many Glacier Hotel, 26-miles northeast of West Glacier, and 34-miles northwest of Browning (**Figure 1)**. It is situated on the Apikuni Flats between Many Glacier Road and Lake Sherburne.

The facility is a single-cell aerated lagoon (**Figure 2**) that receives domestic sewage from the Many Glacier Hotel, The Swiftcurrent Inn, NPS Housing Area, and the nearby camping and recreational vehicle areas. The facility operates on a seasonal basis from May until October. After lagoon draw down, the facility is shut down during the winter and the lagoon can freeze over.

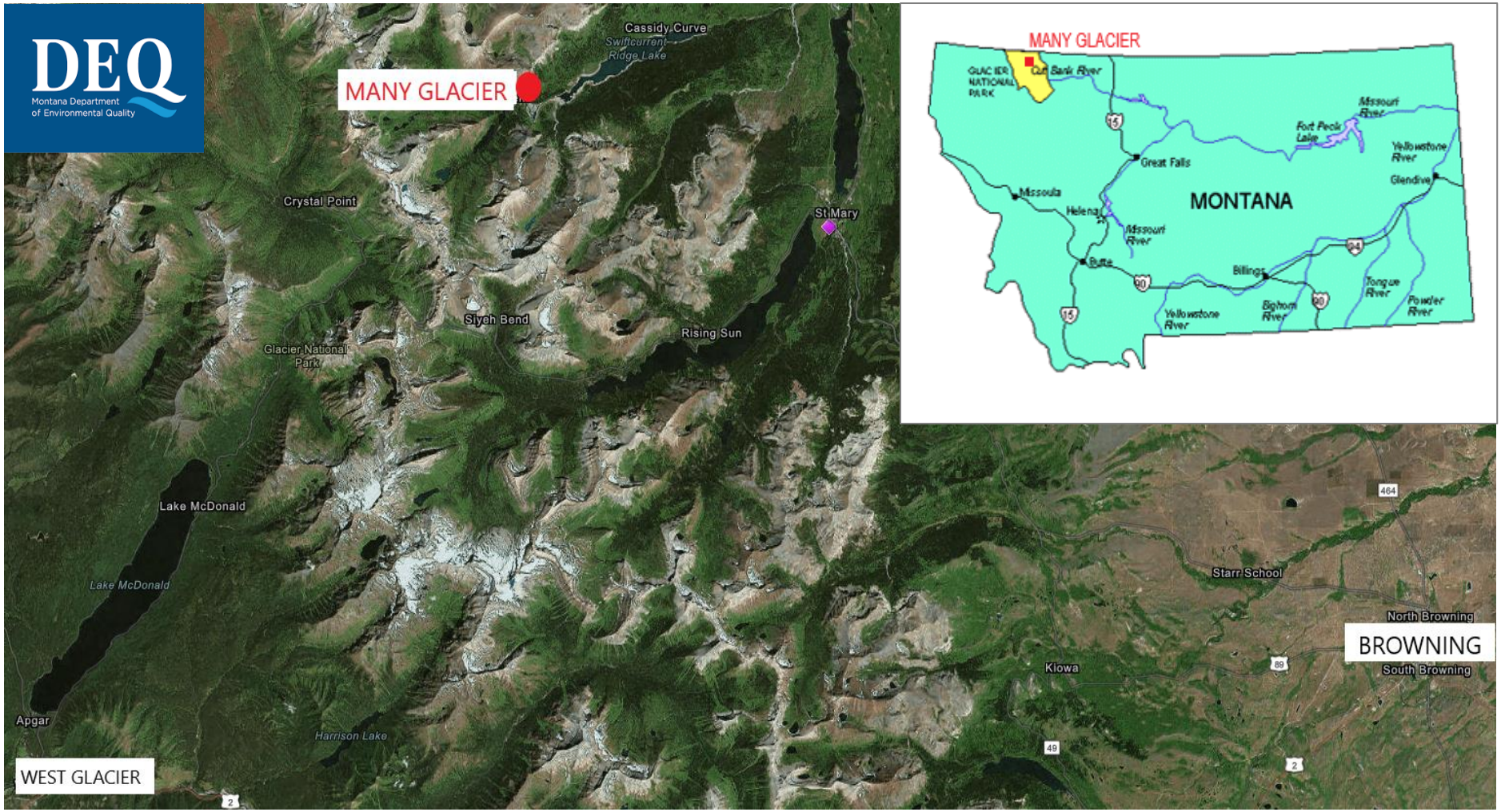


Figure 1. Location of the MANY GLACIER WASTEWATER SYSTEM

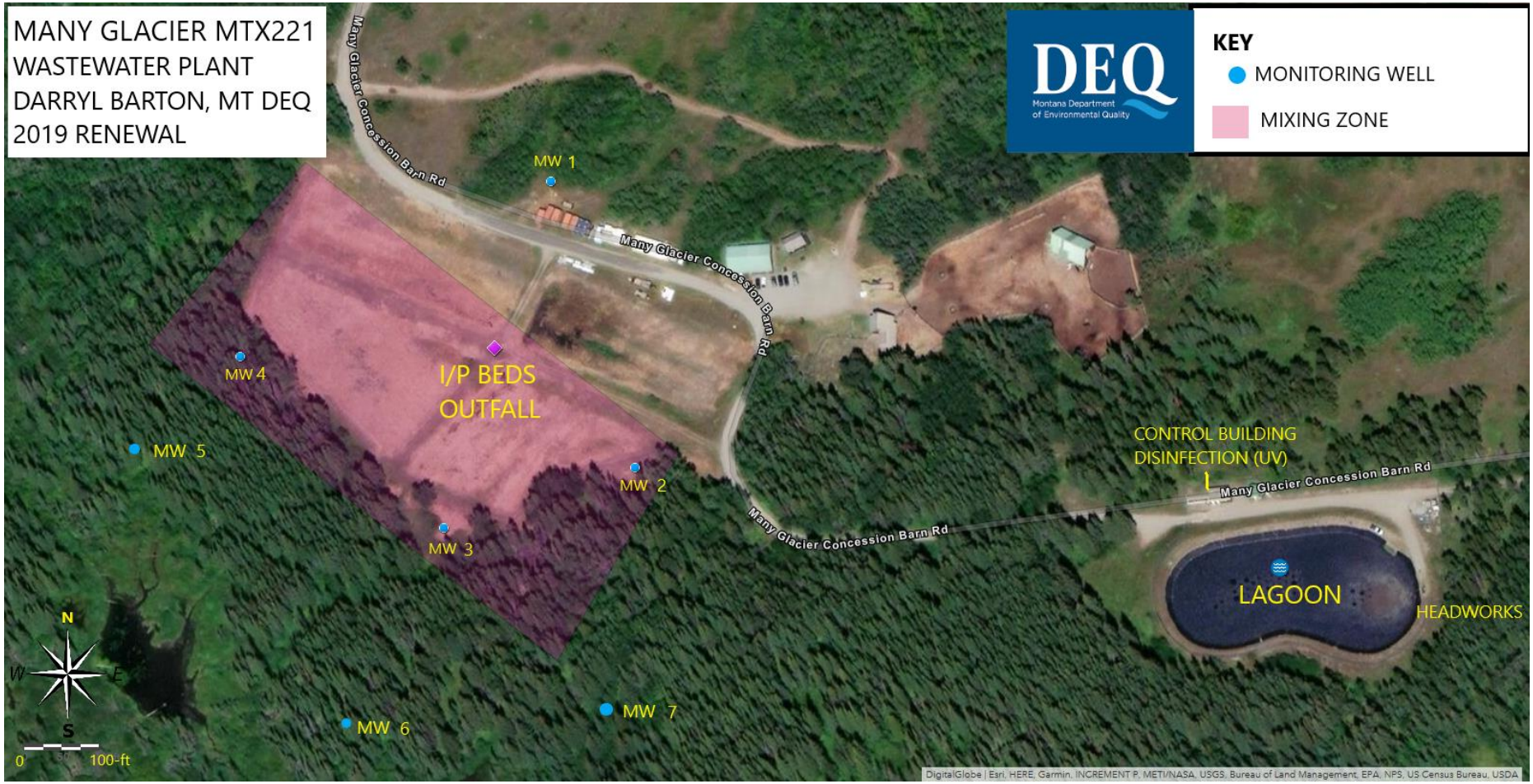


Figure 2. Many Glacier Wastewater System

2.2 OPERATIONS

System operations are summarized below in **Table 1.**

Table 1. Collection, Treatment, and Disposal Summary	
Collection	
Contributing sources:	Hotels / Motels (40%), RV parks / campgrounds (30%), dwellings other than apartment buildings (20%), and eating places (10%)
Standard industrial code(s) of sources:	7011, 7033, 6514, 5812
Collection method:	Mixture of gravity sanitary sewer lines and force mains with lift stations
Effluent Monitoring Location:	EFF-001: V-notch weir
Flow Monitoring Equipment:	FM-001: V-notch weir
Flow volume:	Average daily flow: 85,000 gallons per day (gpd) Maximum daily design flow: 138,000 gpd
Treatment	
Treatment level:	Aerated lagoon
Treatment technology:	Aerated single-cell lagoon with Bio Domes
Treatment location:	Latitude: 48.80072°, Longitude: -113.64140°
Disposal	
Method of disposal:	Infiltration to ground water
Disposal structure:	Four IP ponds (Outfall 001)
Outfall location:	Latitude: 48.80155°, Longitude: -113.64584°

The WWTP flow averaged 85,000 gpd in 2018. Raw wastes from the Swiftcurrent Motor Inn, NPS Housing, and the surrounding recreational areas gravity flow into the Swiftcurrent lift station. The raw wastes from the Many Glacier Lodge Hotel and the employee housing gravity flow into the Many Glacier lift station. 6-inch force mains deliver the raw waste from the lift stations to the common junction structure **(Figure 3)**. Effluent from the common junction flows into a single 6-inch ductile iron pipe that runs to the headworks of the WWTP. The raw wastewater flows under pressure into the headworks structure for preliminary treatment (a comminutor and/or a bar screen) prior to entering the lagoon. The lagoon is a single-cell aerated lagoon with a 2,750,000-gallon volume and a designed hydraulic retention time of 20 days. The lagoon is aerated via the use of 50 bio-domes. In addition to aerating the lagoon, the bio-domes also provide increased surface area for biofilm growth and enhanced nutrient removal.

After treatment in the lagoon, the effluent is piped to the control building for disinfection. The discharge rate from the lagoon to the control building is controlled by a telescopic butterfly valve. Prior to 2012, the effluent from the lagoon was chlorinated prior to discharge into the infiltration/percolation (IP) ponds; the chlorination system has been removed and replaced with an ultraviolet (UV) system as part of treatment system upgrades in 2012. After passing through the UV system, the effluent passes over a weir and gravity flows to the distribution box at the center of the four IP ponds. The effluent is typically discharged to only one pond at a time; however, it is possible to direct the discharge into one, two or all four IP ponds. The combined area of the ponds is about four acres; each pond is about four feet deep. The ponds discharge into Class I ground water (**Section 3.1**).

The effluent sampling / monitoring location (EFF-001) is located after the UV system prior to discharge to the IP ponds. Monitoring and sampling requirements are further discussed in **Section 6**.

Figure 3 is a line drawing of the collection, treatment, and disposal process.

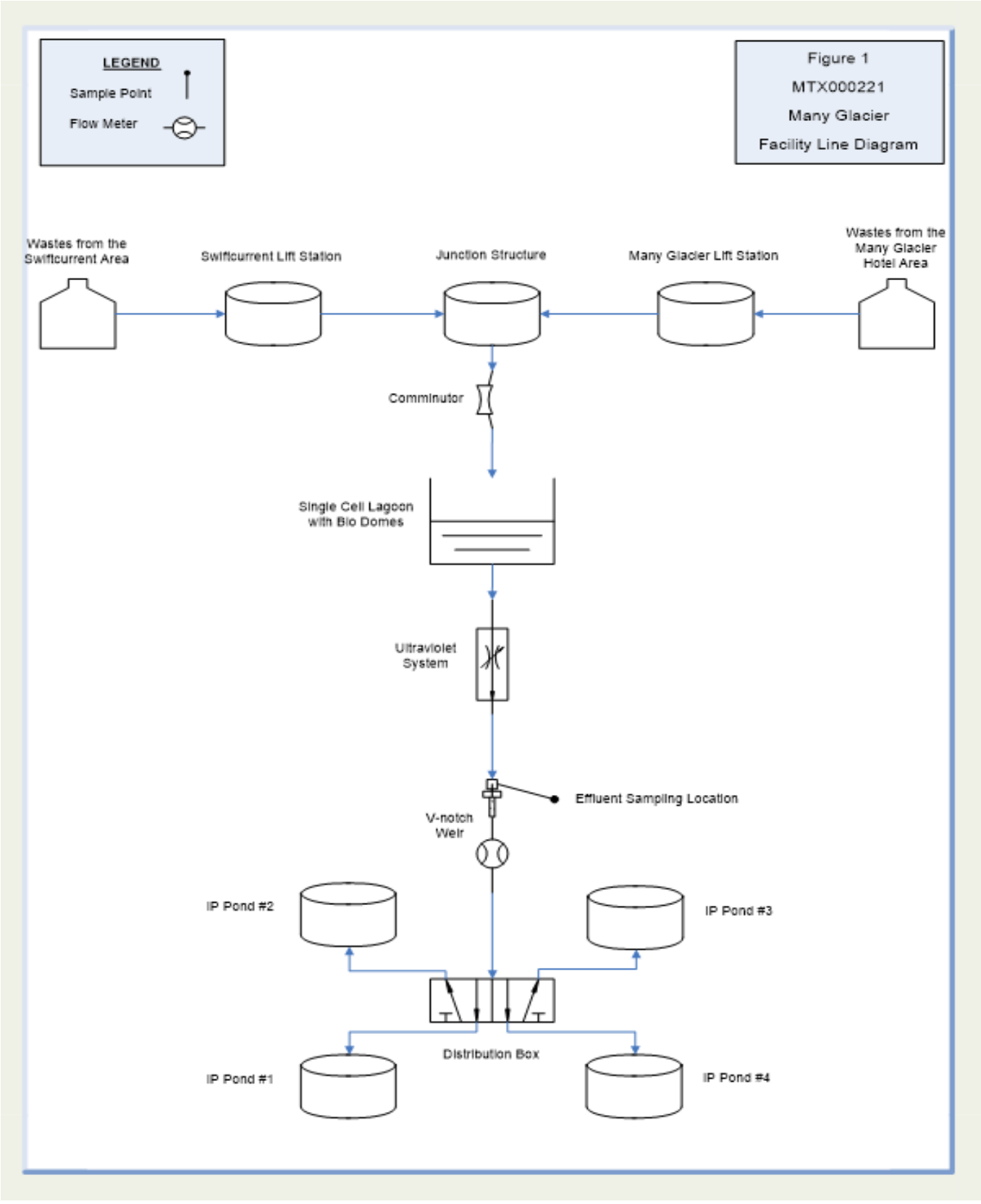


Figure 3. Wastewater Treatment System Line Diagram.

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**. Most 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	9.00	56.19	123.00	26	3
Nitrogen, Nitrate + Nitrite (as N)	mg/L	ND[4]	0.150	0.980	19	3
Nitrogen, Total Ammonia (as N)	mg/L	17.40	48.50	68.30	26	3
Nitrogen, Total Kjeldahl (as N)	mg/L	21.30	53.83	74.00	26	3
Nitrogen, Total (as N)	mg/L	21.30	53.98	74.03	26	3
	lbs/day	21.39	53.89	107.71	26	3
Phosphorus, Total (as P)	mg/L	3.320	6.849	9.140	26	3
	lbs/day	2.59	6.81	14.26	26	3
Total Suspended Solids (TSS)	mg/L	5.00	21.40	50.50	23	3
Flow rate, Discharge	gpd	43,020	82,695	205,000	24	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)

2.4 GEOLOGY

The Natural Resources Conservation Service (NRCS) Soil Survey classifies the soils in the I/P ponds as Ericson (282D) very stony and Leighcan family, 0 – 15% slopes, gravelly clay loam to 79 inches (NRCS, 2019). Parent material: till derived from metasedimentary rock. Alpine glacial deposits comprise the geology of the site. This information is consistent with soil borings. A soil profile in the area of the IP ponds was evaluated by NTL Engineering & Geoscience using soil borings and observation wells (NTL, 2005). Two borings (DH-1 and DH-2) examined the soil profile on the immediate downgradient side of IP ponds 3 and 4 while one boring (HA-1) examined the soil profile just upgradient of the beaver pond. Soil consisted of gravelly clay with sand to depths of 7 – 10-feet. Clay concentration decreased, and sand and gravel concentration increased with depth. Coarse-grained deposits of sand without silt or clay were reported from 20.5 to 38.5 feet in DH-1 and from 14.5 to 24 feet and 27 to 35.5 feet in DH-2. Glacial till comprised of silty-clayey gravel with sand is present below the poorly graded sand. Depth to water was from 7 – 7.5-feet bgs in DH-1 and DH-2, and 12-feet bgs for HA-1.

In October 2016 there were three new monitoring wells drilled downgradient of the IP ponds (MW-5, MW-6, MW-7). Soils include 1 to 2 feet of peat and topsoil underlain by 8 to 11 feet of alluvium consisting of poorly graded sand with gravel and clay seams, lean clay with sand interbedded with silty sand and peat, and clayey sand with gravel interbedded with sandy silt. Underlying the alluvium is glacial till consisting of stiff to hard gravelly lean clay with sand and scattered cobbles. The till was observed to begin at a depth of 9 to 13 feet bgs and extends to the bottom of each monitoring well boring (20 to 22 feet bgs). Boring logs are included in Appendix A.

2.5 HYDROGEOLOGY

The hydrogeology of the Many Glacier site is complex due to the extreme geologic and climatic events that occurred in the area. These include the Pinedale glaciation of the Pleistocene epoch and the Little Ice Age of the Holocene epoch. The highly variable glaciofluvial deposits found at the site are indicative of past glaciation and the post-glaciation depositional environments. During the advancement and ablation of the glaciers that covered the area the glaciofluvial outwash plain was deposited and reworked, initially via glacier meltwater and later via Swiftcurrent Creek and Apikuni Creek. The anisotropic, heterogeneous aquifer underlying the facility is a result of this depositional environment.

An evaluation of the shallow aquifer underlying the facility resulted in estimates of hydraulic conductivity values that differed by 2-3 orders of magnitude within a distance of about 1,000 feet. The hydraulic conductivity used in the previous permit was based on slug tests performed on monitoring wells MW-2 and MW-4 as well as an evaluation of the mass-balance equation with respect to the measured Nitrate + Nitrate (as N) and Total Phosphorus (as P) concentrations in the effluent discharged by the facility when compared to the measured concentrations of these parameters in monitoring well MW-3. Hydraulic conductivity was estimated at 1,309 ft/day. It was again estimated during the drilling of three new monitoring wells (MW-5, MW-6, MW-7). The high degree of variability was evident in a lower hydraulic conductivity. In the Many Glacier Hydrogeologic Report (2017) a hydraulic conductivity of 661 ft/day was calculated. This will be the accepted rate used in this permit. The new testing also calculated a hydraulic gradient of 0.035 ft/ft.

The closest surface water to the facility is a beaver pond bordering the facility site 325 feet to the southwest of the closest IP pond. This is also the closest surface water to the facility based on the direction of ground water flow, S40°W. Other surface waters listed include: Swiftcurrent Creek (650 feet southwest), Swiftcurrent Lake (2,400 feet west), and Lake Sherburne (1,600 feet south). DEQ will use the distance to the beaver pond in an evaluation of the mixing zone and the development of effluent limits for the facility.

Average depth to ground water is variable at the site. It ranges from 15 feet at MW-1 to about 2 feet at MW-5, MW-6 and MW-7. The ground water table is shallower towards the southwest to the pond.

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

Table 3. Hydrogeologic Summary	
Average depth to ground water	10.14 feet (MW-1 and MW-2 average, DMR 2014 – 2018)
General ground water flow direction	S40°W
Hydraulic conductivity	661 feet per day
Hydraulic gradient	0.035 feet/feet
Nearest downgradient surface water	Beaver pond (325-feet)

2.6 GROUND WATER MONITORING WELLS

There are 7 monitoring wells associated with this permit: MW-1 through MW-7. These wells are plotted on **Figure 2**. Monitoring well construction details are provided below in **Table 4**. Three new monitoring wells have been installed during the last permit cycle. Boring logs are attached as **Appendix B**.

Table 4. Monitoring Well Summary	
Monitoring Well MW-1	
MBMG GWIC ID:	NA
Location- latitude/longitude:	Latitude: 48.80219°, Longitude: -113.64512°
Location- narrative:	160-feet upgradient (north) of I/P beds
Representation:	Ambient receiving water quality
Depth; screened interval:	Total depth of 35 feet, screened depth unknown.
Status:	Constructed 1980 or 1981
Monitoring Well MW-2	
MBMG GWIC ID:	NA
Location- latitude/longitude:	Latitude: 48.80089°, Longitude: -113.64496°
Location- narrative:	80-feet downgradient of I/P beds
Representation:	Downgradient water quality
Depth; screened interval:	Total depth of 40 feet, screened from 10-40.
Status:	Constructed 1980 or 1981
Monitoring Well MW-3	
MBMG GWIC ID:	NA
Location- latitude/longitude:	Latitude: 48.80074°, Longitude: -113.64627°
Location- narrative:	120-feet downgradient of I/P beds
Representation:	Downgradient water quality
Depth; screened interval:	Total depth of 38 feet, screened from 10-38 feet.
Status:	Constructed 1980 or 1981
Monitoring Well MW-4	
MBMG GWIC ID:	NA
Location- latitude/longitude:	Latitude: 48.80132°, Longitude: -113.64709°
Location- narrative:	90-feet downgradient of I/P beds
Representation:	Downgradient water quality
Depth; screened interval:	Total depth of 30 feet, screened from 10-30 feet.
Status:	Constructed 1980 or 1981
Monitoring Well MW-5	
MBMG GWIC ID:	NA
Location- latitude/longitude:	Latitude: 48.80116°, Longitude: -113.64784°
Location- narrative:	247-feet downgradient of I/P beds
Representation:	Downgradient water quality
Depth; screened interval:	Total depth of 20 feet, screened from 2-10 feet.
Status:	Constructed on October 12 – 14, 2016
Monitoring Well MW-6	
MBMG GWIC ID:	NA
Location- latitude/longitude:	Latitude: 48.80016°, Longitude: -113.64640°
Location- narrative:	311-feet downgradient of I/P beds
Representation:	Downgradient water quality
Depth; screened interval:	Total depth of 20 feet, screened from 2-15 feet.
Status:	Constructed on October 12 – 14, 2016
Monitoring Well MW-7	
MBMG GWIC ID:	NA
Location- latitude/longitude:	Latitude: 48.80030°, Longitude: -113.64515°
Location- narrative:	290-feet downgradient of I/P beds
Representation:	Downgradient water quality
Depth; screened interval:	Total depth of 20 feet, screened from 2-20 feet.
Status:	Constructed on October 12 – 14, 2016

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 wells for downgradient groundwater are provided below in **Table 5**.

Table 5: Ground Water Monitoring Results - Reported DMR Values

Monitor Source[1]	Representation	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[2] Value	# of Samples
MW2	Downgradient Ground Water Quality Shallow ground water, 80- feet downgradient from Outfall 001	Chloride (as Cl)	mg/L	1.0	2.0	3.0	8
		Escherichia coli Bacteria	CFU/100 ml	<1	<1	<1	8
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	0.04	0.16	0.32	8
		Nitrogen, Ammonia (as N)	mg/L	ND	0.035	0.080	8
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	0.03	0.23	7
		Nitrogen, Total (as N)	mg/L	0.04	0.19	0.42	8
		Phosphorus, Total (as P)	mg/L	0.030	0.49	2.81	8
		Specific Conductivity (@ 25°C)	µS/cm	147	209	229	8
		Static Water Level (SWL)	ft-bgs	2.00	7.16	19.00	8
MW3	Downgradient Ground Water Quality Shallow ground water, 120- feet downgradient from Outfall 001	Chloride (as Cl)	mg/L	ND	7.0	25.0	7
		Escherichia coli Bacteria	CFU/100 ml	<1	<1	<1	6
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	0.10	2.01	10.90	8
		Nitrogen, Ammonia (as N)	mg/L	0.03	0.15	0.74	8
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	0.36	1.17	8
		Nitrogen, Total (as N)	mg/L	0.10	2.37	11.10	8
		Phosphorus, Total (as P)	mg/L	0.01	0.56	1.18	8
		Specific Conductivity (@ 25°C)	µS/cm	139	261	463	8
		Static Water Level (SWL)	ft-bgs	3.10	4.78	7.33	8
MW4	Downgradient Ground Water Quality Shallow ground water, 90- feet downgradient from Outfall 001	Chloride (as Cl)	mg/L	ND	1.63	6.00	8
		Escherichia coli Bacteria	CFU/100 ml	<1	1	2.5	8
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	0.02	0.23	0.58	8
		Nitrogen, Ammonia (as N)	mg/L	ND	0.18	1.2	8
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	0.29	1.3	8
		Nitrogen, Total (as N)	mg/L	0.02	0.52	1.77	8
		Phosphorus, Total (as P)	mg/L	0.01	0.19	1.02	8
		Specific Conductivity (@ 25°C)	µS/cm	112	159	250	8
		Static Water Level (SWL)	ft-bgs	2.75	4.89	7.20	8

MW5	Downgradient Ground Water Quality Shallow ground water, 80- feet downgradient from Outfall 001	Chloride (as Cl)	mg/L	ND	0.75	3.00	4
		Escherichia coli Bacteria	CFU/100 ml	<1	8	16	4
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	ND	ND	ND	4
		Nitrogen, Ammonia (as N)	mg/L	ND	0.12	0.26	4
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	0.59	2.37	4
		Nitrogen, Total (as N)	mg/L	ND	0.59	2.37	4
		Phosphorus, Total (as P)	mg/L	ND	0.52	0.90	4
		Specific Conductivity (@ 25°C)	µS/cm	158	183	194	4
		Static Water Level (SWL)	ft-bgs	1.00	1.66	2.16	4
MW6	Downgradient Ground Water Quality Shallow ground water, 120- feet downgradient from Outfall 001	Chloride (as Cl)	mg/L	2.00	5.33	11.00	4
		Escherichia coli Bacteria	CFU/100 ml	<1	3	12	4
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	ND	ND	ND	4
		Nitrogen, Ammonia (as N)	mg/L	ND	0.018	0.07	4
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	ND	ND	4
		Nitrogen, Total (as N)	mg/L	ND	ND	ND	4
		Phosphorus, Total (as P)	mg/L	ND	0.04	0.05	4
		Specific Conductivity (@ 25°C)	µS/cm	189	207	250	4
		Static Water Level (SWL)	ft-bgs	1.00	2.28	3.50	4
MW7	Downgradient Ground Water Quality Shallow ground water, 90- feet downgradient from Outfall 001	Chloride (as Cl)	mg/L	ND	2.5	8.0	4
		Escherichia coli Bacteria	CFU/100 ml	<1	<1	<1	4
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	ND	ND	ND	4
		Nitrogen, Ammonia (as N)	mg/L	ND	0.035	0.14	4
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	0.54	2.14	4
		Nitrogen, Total (as N)	mg/L	ND	0.54	2.14	4
		Phosphorus, Total (as P)	mg/L	ND	0.22	0.48	4
		Specific Conductivity (@ 25°C)	µS/cm	192	215	266	4
		Static Water Level (SWL)	ft-bgs	0.70	2.05	3.00	4

Footnotes:

bgs = below ground surface

CFU = Colony Forming Units

DMR = Self-Reported Discharge Monitoring Reports

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

Period of Record: 04/01/2014 through 12/31/2018.

s.u. = standard units

(1) Refer to Section 2.6 of the Fact Sheet for the existing or proposed location of the monitoring wells.

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

Water sampling results from MW-1 (ambient groundwater) are provided below in **Table 6**.

Table 6: Ambient Ground Water Monitoring Results - Reported DMR Values

Monitor Source[1]	Representation	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[2] Value	# of Samples
MW1	Ambient Receiving Ground Water Quality Shallow ground water, 100- feet upgradient from Outfall 001	Chloride (as Cl)	mg/L	ND	1.14	2.00	7
		Escherichia coli Bacteria	CFU/100 ml	<1	<1	<1	11
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	ND	0.10	0.22	8
		Nitrogen, Ammonia (as N)	mg/L	ND	0.046	0.12	8
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	ND	ND	6
		Nitrogen, Total (as N)	mg/L	ND	0.10	0.22	7
		Phosphorus, Total (as P)	mg/L	ND	0.026	0.060	7
		Specific Conductivity (@ 25°C)	µS/cm	145	163	182	11
		Static Water Level (SWL)	ft-bgs	11.9	15.0	18.8	10

Footnotes:

bgs = below ground surface

CFU = Colony Forming Units

ND = Non Detect (below limits of laboratory detection)

DMR = Self-Reported Discharge Monitoring Reports

Period of Record: 04/01/2014 through 12/31/2018.

s.u. = standard units

(1) Refer to Section 2.6 of the Fact Sheet for the existing or proposed location of the monitoring wells.

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

3.0 WATER QUALITY STANDARDS AND NONDEGRADATION

Ground water is a water of the state. The State of Montana uses several water quality measures to protect, sustain, and improve the quality of state waters. These water quality limitations provide the basis for effluent limits that DEQ applies to discharge permits (**Section 5**). 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 BENEFICIAL USES

With a specific conductivity of 163 µS/cm (**Table 5** above), 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 STANDARDS

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**).

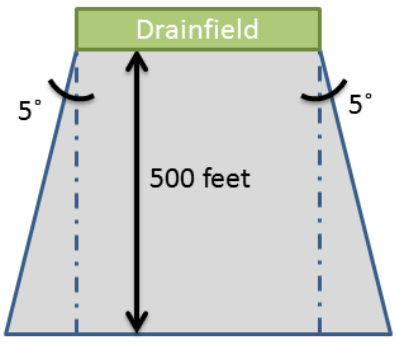
3.3 NONSIGNIFICANCE

DEQ determined that discharges in compliance with this permit result in nonsignificant changes in water quality. This discharge has not increased or changed in character since this determination, therefore DEQ did not perform a new significance determination for this permit renewal. DEQ determined that the discharge continues to meet ground water nonsignificance/nondegradation criteria at the end of the mixing zone (**Section 4**). 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 modified 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; this department modified mixing zone extends 325 feet. The upgradient boundary is equal to the width of the source (measured perpendicular to the of 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 002. These values are drawn from the previous fact sheet and the hydrogeologic investigation report conducted in 2017.

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.

Because the predicted concentration must satisfy the most stringent nonsignificance criterion (**Section 3**), DEQ can calculate water quality based effluent limits (WQBELs) by rearranging the equation and solving for the effluent concentration (**Section 5**). However, DEQ is proposing a ground water limit of 10.0 mg/L nitrogen (nitrate + nitrite) for this permit so effluent calculations are not necessary.

Table 7: Hydrogeologic and Mixing Zone Information - Outfall 001

Parameter	Units	Value
Mixing Zone Type	-	Modified
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations, Total Nitrogen	mg/L	0.10
Ground Water Flow Direction	azimuth/bearing	S40°W
Length of Mixing Zone	feet	325
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	640
Width of Mixing Zone at Down Gradient Boundary	feet	697
Cross Sectional Area of Mixing Zone (A)	ft^2	10455
Hydraulic Conductivity (K)	feet/day	661
Hydraulic Gradient (I)	ft/ft	0.035
Volume of Ground Water Available for Mixing (Q_{gw})	ft^3/day	241,876

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 ground water 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 ground water limits that will meet water quality standards and nondegradation criteria, thereby protecting beneficial uses and existing high-quality waters. The most restrictive criteria in **Table 8** provide the basis for ground water limits. Ground water limit is 10.0 mg/L nitrogen (nitrate + nitrite) at MW-5 and MW-6.

Table 8: Applicable Ground Water Quality Standards.

Parameter	Human Health Standard	Beneficial Use Support
Nitrate plus nitrite (as Nitrogen[N])	10 mg/L	-
Total Nitrogen	-	10 mg/L

6.0 MONITORING AND REPORTING REQUIREMENTS

DEQ requires effluent and ground water monitoring to assure compliance with the ground water limitations and therefore water quality standards. Effluent monitoring and ground water monitoring are 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

The permittee is required to monitor and report at a specified frequency to demonstrate effectiveness of the system. Effluent samples and discharge flow measurements must be representative of the nature and volume of the effluent. The effluent sample location (EFF-001) is located after the UV disinfection system at the v-notch weir as shown in **Figure 3**. 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 after the v-notch weir prior to discharge in the I/P ponds (**Figure 3**). The flow measuring device must be installed and in operating condition prior to discharge.

Effluent monitoring and reporting requirements are summarized in **Table 9**.

Table 9: Effluent Monitoring and Reporting Requirements – Outfall 001 (Months of Operation June – October)

Parameter	Monitoring Location	Units	Sample Type[1][2]	Minimum Sampling Frequency[3]	Reporting Requirements[1][4]	Reporting Frequency[3]	Rationale
Effluent Flow Rate[5][6]	Flow Meter (FM-001)	gpd	Continuous	Continuous	Daily Maximum and Monthly Average	Monthly	Permit Compliance/ Effluent Characterization
Biochemical Oxygen Demand (BOD_5)	EFF-001, V-notch weir	mg/L	Grab	1/Month	Monthly Average	Monthly	Proper O & M/ Effluent Characterization
Total Suspended Solids (TSS)	EFF-001, V-notch weir	mg/L	Grab	1/Month	Monthly Average	Monthly	Proper O & M/ Effluent Characterization
Nitrate + Nitrite (as N)	EFF-001, V-notch weir	mg/L	Grab	1/Month	Daily Maximum and Monthly Average	Monthly	Permit Compliance/ Proper O & M
Total Ammonia (as N)	EFF-001, V-notch weir	mg/L	Grab	1/Month	Daily Maximum and Monthly Average	Monthly	Permit Compliance/ Proper O & M
Total Kjeldahl Nitrogen (TKN)	EFF-001, V-notch weir	mg/L	Grab	1/Month	Daily Maximum and Monthly Average	Monthly	Permit Compliance/ Proper O & M
Total Nitrogen (as N)[7]	EFF-001, V-notch weir	mg/L	Calculated	1/Month	Daily Maximum and Monthly Average	Monthly	Permit Compliance/ Proper O & M
		lbs/day[8]					
Total Phosphorus (as P)	EFF-001, V-notch weir	mg/L	Grab	1/Month	Monthly Average	Monthly	Effluent Characterization
		lbs/day[8]	Calculated				

Footnotes:
(1) See definitions in Part V of the permit.
(2) Grab sample will represent concentration for a 24-hour period.
(3) Monitoring and Reporting is only required during months of operation (usually May – October).
(4) Daily Maximum: Report the highest measured daily value for the reporting period on Discharge Monitoring Report (DMR) form.
(5) If no discharge occurs during the reporting period then "No Discharge" shall be recorded on the DMR report form.
(6) Requires recording device or totalizing meter, must record daily effluent volume.
(7) Total Nitrogen is the sum of the Nitrate + Nitrite and Total Kjeldahl Nitrogen parameters.
(8) Load calculation: lbs/day = the average of all calculated individual daily loads (lbs/day) recorded during the reporting period.

6.2 GROUND WATER MONITORING

This permit requires ground water monitoring to provide long term ambient and downgradient characterization of the aquifer. Ground water monitoring will be required at monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5, MW-6 and MW-7. Data collected via ground water monitoring will be used for mixing zone evaluation, aquifer characterization in future permit renewals, and for compliance monitoring. Sampling and reporting requirements shall continue through the duration of the permit. The ground water limit is 10.0 mg/L nitrogen (nitrate + nitrite) at MW-5 and MW-6.

This system is located 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.

Ground water monitoring and reporting requirements are summarized in **Table 10**.

Table 10: Ground Water Monitoring and Reporting Requirements (Months of Operation June – Oct.)

Parameter	Monitoring Locations	Units	Sample Type[1]	Minimum Sampling Frequency[2]	Reporting Requirements	Reporting Frequency[3]
Chloride (as Cl)	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Nitrate + Nitrite (as N)	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7	mg/L	Grab	1/Quarter	Daily Maximum and Quarterly Average	Quarterly
Total Ammonia (as N)	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7	mg/L	Grab	1/Quarter	Daily Maximum and Quarterly Average	Quarterly
Total Kjeldahl Nitrogen (as N)	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7	mg/L	Grab	1/Quarter	Daily Maximum and Quarterly Average	Quarterly
Total Nitrogen (as N)	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7	mg/L	Calculated[4]	1/Quarter	Daily Maximum and Quarterly Average	Quarterly
Total Phosphorus (as P)	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Specific Conductivity @ 25°C	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7	µS/cm	Grab	1/Quarter	Quarterly Average	Quarterly
Static Water Level (SWL)[5]	MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7	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 during months of operation when wells are accessible

(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

SPECIFIC GROUND WATER COMPLIANCE LIMITS

Effective immediately and lasting through the term of the permit, the ground water shall not exceed the water quality compliance limits at monitoring wells MW-5 and MW-6 as shown in **Table 11**. If limits are exceeded, requirements as outlined the Special Conditions section of the permit shall be followed. Special Conditions are located in **Section 7.0** of this Fact Sheet.

Table 11: Ground Water Compliance Limits (Trigger Values) - MW-5 and MW-6.

Parameter	Trigger Value
Nitrate + Nitrite (as N), mg/L	10.0

7.0 SPECIAL CONDITIONS

The following special conditions will be included in the permit. The previous permit set forth groundwater monitoring as a special condition. This monitoring will remain a condition of the current permit. Groundwater monitoring requirements are discussed in detail in **Section 6.2** and **Table 10**.

SPECIAL CONDITIONS – GROUND WATER CONTINGENCY MEASURES

The permittee must perform contingency measures when a ground water analytical sample result from any monitoring well exceeds the respective limitation defined in **Table 11** for any listed parameter.

1. The contingency measures performed must at minimum include the following:
   a. Notify DEQ WPB, of ground water exceedance within 72 hours of the reporting date of the laboratory analysis report; and,
   b. Submit all respective laboratory analytical reports to DEQ WPB, within 60 calendar days from the laboratory report date of the original laboratory analysis report. Include a report summarizing the exceedance(s), all laboratory analysis reporting dates, DEQ notification dates, re-sampling procedures, and water quality.

2. Following submittal of the resample results, DEQ may also require the permittee to perform the following measures:
   a. In coordination with DEQ, review water quality trends, discharge data, and other site activities to identify the probable cause and extent of the water quality changes;
   b. Problems in the function of the system in treating wastewater may necessitate the production of a fate and transport study;
   c. Increase sampling (frequency and/or constituents);
   d. Installation of additional ground water monitoring wells;
   e. Installation of additional treatment or the installation of treatment system components that are capable of collecting post treatment wastewater samples;
   f. Supply drinking water to residences, business and irrigation districts located downgradient of the wastewater system;
   g. Invoke the reopener provisions of the permit.

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 **May 6, 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 (MTX000221), 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 – HYDROGEOLOGIC STUDY

APPENDIX B – MONITORING WELL LOGS

BORING LOG NO. MW-5

Page 1 of 1

PROJECT: Many Glacier Wastewater Treatment Plant
CLIENT: DJ&A Missoula

SITE: Many Glacier Babb, MT
Matt Ulberg, P.E. Missoula, MT

LOCATION: See Exhibit A-2
Latitude: 48.80116° Longitude: -113.64784°
Surface Elev.: 4827.17 (Ft.)

DEPTH	ELEVATION (Ft.)	INSTALLATION DETAILS	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS
PEAT/TOPSOIL, dark brown to black, organics, wood, roots		0.0-2.0' Bentonite Plug			1-0-1 N=1
1.5	4825.5				
POORLY GRADED SAND WITH GRAVEL (SP), brown, very loose to medium dense, subround to subangular gravel, smaller gravels, interbedded lean clay seams		2.0-10.0' Screen/sand			grab
			5		1-4-7 N=11
		10.0-20.0' Solid pipe	10		1-2-3 N=5
12.0	4815				
GRAVELLY LEAN CLAY WITH SAND (CL), brown/grey, soft to stiff, subround to subangular gravel, scattered cobbles			15		1-1-2 N=3
six inches of slough/heave in augers, drove sample 2.0'			20		1-3-8-8 N=11
22.0	4805				
Boring Terminated at 22 Feet					

WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead
Logged by B. Evans

Advancement Method:
4 1/4" Hollowstem Augers

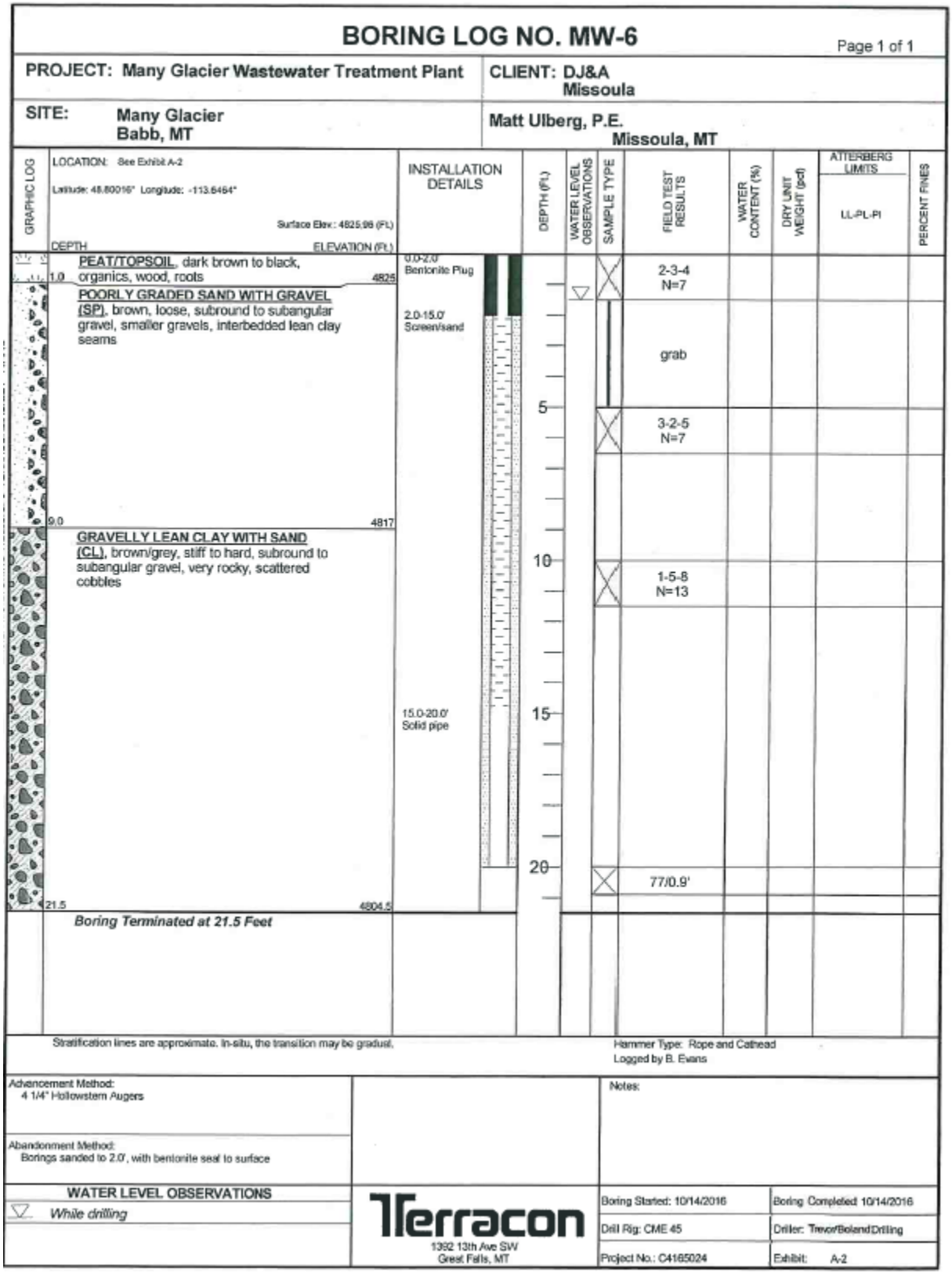
Abandonment Method:
Borings sanded to 2.0', with bentonite seal to surface

Notes:

WATER LEVEL OBSERVATIONS
▽ *While drilling*

Terracon
1392 13th Ave SW
Great Falls, MT

Boring Started: 10/14/2016 | Boring Completed: 10/14/2016
Drill Rig: CME 45 | Driller: Trevor Boland Drilling
Project No.: C4169024 | Exhibit: A-1



BORING LOG NO. MW-6

Page 1 of 1

PROJECT: Many Glacier Wastewater Treatment Plant

CLIENT: DJ&A Missoula

SITE: Many Glacier Babb, MT

Matt Ulberg, P.E. Missoula, MT

LOCATION: See Exhibit A-2

Latitude: 48.80016° Longitude: -113.6464°

Surface Elev.: 4825.98 (Ft.)

DEPTH / ELEVATION (Ft.)

GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	INSTALLATION DETAILS	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	1.0	4825	0.0-2.0' Bentonite Plug		▽		2-3-4 N=7				
			2.0-15.0' Screen/sand				grab				
				5			3-2-5 N=7				
	9.0	4817									
				10			1-5-8 N=13				
			15.0-20.0' Solid pipe	15							
				20			77/0.9'				
	21.5	4804.5									

PEAT/TOPSOIL, dark brown to black, organics, wood, roots

POORLY GRADED SAND WITH GRAVEL (SP), brown, loose, subround to subangular gravel, smaller gravels, interbedded lean clay seams

GRAVELLY LEAN CLAY WITH SAND (CL), brown/grey, stiff to hard, subround to subangular gravel, very rocky, scattered cobbles

Boring Terminated at 21.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead
Logged by B. Evans

Advancement Method:
4 1/4" Hollowstem Augers

Abandonment Method:
Borings sanded to 2.0', with bentonite seal to surface

Notes:

WATER LEVEL OBSERVATIONS

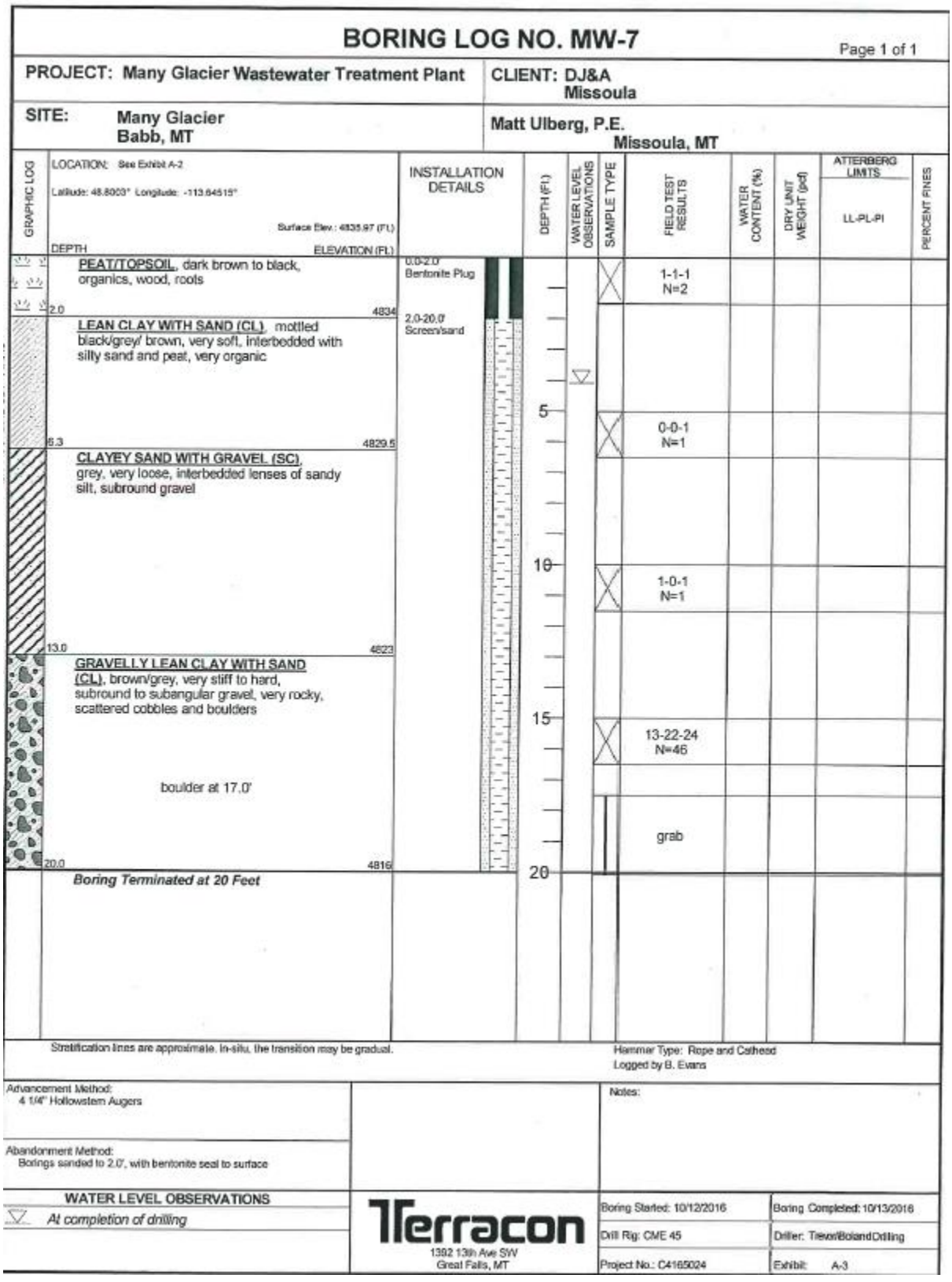
▽ *While drilling*

Terracon
1392 13th Ave SW
Great Falls, MT

Boring Started: 10/14/2016 | Boring Completed: 10/14/2016

Drill Rig: CME 45 | Driller: Trevor/Boland Drilling

Project No.: C4165024 | Exhibit: A-2



BORING LOG NO. MW-7

Page 1 of 1

PROJECT: Many Glacier Wastewater Treatment Plant

CLIENT: DJ&A
Missoula

SITE: Many Glacier
Babb, MT

Matt Ulberg, P.E.
Missoula, MT

LOCATION: See Exhibit A-2

Latitude: 48.8003° Longitude: -113.64515°

Surface Elev.: 4835.97 (FL)

DEPTH	ELEVATION (FL)	INSTALLATION DETAILS	DEPTH (FL)	SAMPLE TYPE	FIELD TEST RESULTS
PEAT/TOPSOIL, dark brown to black, organics, wood, roots		0.0-2.0 Bentonite Plug			1-1-1 N=2
2.0	4834	2.0-20.0' Screen/sand			
LEAN CLAY WITH SAND (CL), mottled black/grey/ brown, very soft, interbedded with silty sand and peat, very organic			5		0-0-1 N=1
6.3	4829.5				
CLAYEY SAND WITH GRAVEL (SC), grey, very loose, interbedded lenses of sandy silt, subround gravel			10		1-0-1 N=1
13.0	4823				
GRAVELLY LEAN CLAY WITH SAND (CL), brown/grey, very stiff to hard, subround to subangular gravel, very rocky, scattered cobbles and boulders			15		13-22-24 N=46
boulder at 17.0'					grab
20.0	4816		20		
Boring Terminated at 20 Feet					

GRAPHIC LOG	WATER LEVEL OBSERVATIONS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead
Logged by B. Evans

Advancement Method:
4 1/4" Hollowstem Augers

Abandonment Method:
Borings sanded to 2.0', with bentonite seal to surface

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
1392 13th Ave SW
Great Falls, MT

Boring Started: 10/12/2016 | Boring Completed: 10/13/2016

Drill Rig: CME 45 | Driller: Tiew/BolandDrilling

Project No.: C4165024 | Exhibit: A-3

APPENDIX C – REFERENCES

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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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- 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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