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:	Barretts Minerals Inc.
Permit Number:	MTX000094
Permit Type:	Industrial wastewater
Application Type:	Renewal
Facility Name:	Barretts Dillon Plant
Facility Location:	Section 17, Township 08 South, Range 09 West, Beaverhead County Latitude: 45.13641°, Longitude: -112.73431°
Facility Address:	8625 Highway 91 South Dillon, MT 59725
Facility Contacts:	Joshua Regan, Plant Manager
	Brad Watkins, Environmental Health and Safety Manager
Treatment Type:	Infiltration pond
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Outfall / Type:	001 / Industrial Wastewater from an Infiltration Pond
Effluent Type:	Industrial wastewater
Mixing Zone:	Standard
Flow Rate:	Design average: 558,352 gpd Design maximum: 1,677,876 gpd
Effluent sampling:	Quarterly, Outfall 001, EFF-001, Boiler Pond
Ground water sampling:	Quarterly, MW-1 and MW-7
Fact Sheet Date:	March 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 **Barretts Minerals, Inc. (BMI)** for the **Dillon Talc Plant** wastewater treatment system.

1.1 APPLICATION

DEQ received an application for renewal of the permit on October 18, 2017. Renewal fees accompanied the application. DEQ reviewed the submittal and issued a completeness letter on November 15, 2017.

1.2 PERMIT HISTORY

The Dillon Talc Plant has been in operation at the current location since the 1950s. It operated without a discharge permit. The BMI Plant facility was issued its current Montana Ground Water Pollution Control System (MGWPCS) permit on January 31, 1995. The MGWPCS permit contained groundwater compliance limits for dissolved lead, dissolved copper, sulfate (SO_4), total dissolved solids (TDS) and pH. Barretts was required to monitor effluent, as well as monitoring wells 1, 4 and 5.

The MGWPCS permit was modified in September 1996 and again in July 1997. The permits from 1997 – 2007 contained ground water compliance limits for SO_4, chloride (Cl), TDS and pH applicable at the boundary of the standard mixing zone as monitored quarterly at MW-7. The renewal permit went into effect December 1, 2012. Neither 2007 or 2012 permit established effluent limitations on any parameters. The purpose of the permit is to assure the quality of the wastewater discharged by reviewing data monitoring reports and laboratory data determining threat to groundwater and surface water.

In addition to the MGWPCS permit BMI Dillon Plant facility maintains a Montana Air Quality Permit, a Montana Air Quality Operating Permit, and a Montana Hard Rock Mines Permit.

2.0 FACILITY INFORMATION

2.1 LOCATION

The Talc Plant is located about seven miles south of Dillon, MT, near exit 56 of Interstate-15 (**Figure 1**). The facility is bordered by the Union Pacific Railroad right of way and the Beaverhead River (**Figure 2**).

Figure 1. Location of the Barretts Minerals Inc. Talc Mill, Dillon

Figure 2. Site Map of the Barretts Minerals Inc. Talc Mill

2.2 OPERATIONS

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

Table 1: Collection and Disposal System Summary	
Inflows	
Contributing Sources of Wastewater: Industrial In-Nature Standard Industrial Code(s) (SIC) of contributing sources: 3295 Minerals and Earth, ground	
Collection	
Collected in sump in the boiler room floor and pumped to boiler pond. Sedimentation settling in boiler pond	
Location: Section 17, Township 08 South, Range 09 West, Beaverhead County Latitude: 45.13641°, Longitude: -112.73431°	
Disposal System	
Disposal Structure: Outfall 001 (boiler pond)	
Method of Disposal: Infiltration via pond.	
Location: Section 17, Township 08 South, Range 09 West, Beaverhead County Latitude: 45.13592°, Longitude: -112.73220°	
Average Daily Design Flow (gpd): 558,352	Daily Maximum Design Flow (gpd): 1,677,876
Effluent Sampling Location: EFF-001, boiler pond: within 18-inches of pond bottom	
Flow Monitoring Equipment: FM-001: Tonkaflo 5SF504G flow meter, prior to discharge to boiler pond	

The MGWPCS permit authorizes discharge of boiler blow-down and miscellaneous laboratory type wastewaters. The facility operations generating wastewater effluent remain unchanged since the previous permit. A flow line diagram (**Figure 3)** describes the flow of water through the facility from well to discharge in the pond.

Boiler Water System

1. **Well** – A shallow well provides water for the boiler system. Well water is treated with a reverse osmosis (RO) system to reduce dissolved solids.
2. **Tanks** – Treated water is sent to a holding tank then to a blending tank where sodium hydroxide may be used as a buffer. From the blending tank, water is pumped to the heat exchanger where it is preheated to promote energy efficiency of water going to the boiler and to provide a source of cooling for water coming from the boiler.
3. **Chemical addition** – Water enters the de-aerator where a sodium sulfite based oxygen scavenger chemical is added. Oxygen scavengers are used to remove dissolved oxygen from the boiler feed water and boilers. Dissolved oxygen in the boiler is very corrosive at higher temperatures and pressures. This may lead to localized pitting and premature boiler tube failure or excessive feedwater leaks. Before being pumped to the boiler, water receives a second chemical addition consisting of a product primarily composed of caustic soda (NaOH) and ethylene-diamine tetra-acetic acid (EDTA-4NA). This product increases the functional life of internal boiler components by reducing boiler scale buildup.
4. **Post-Boiler** – Boiler blowdown water can then either be sent to the beneficiation plant, or it can be discharged to Outfall 001. (Boiler blowdown is water intentionally wasted from a boiler to avoid concentration of impurities during continuing evaporation of steam.)

Beneficiation Plant Water

1. Boiler blowdown water proceeds through the heat exchanger then to the effluent tank where it is used as make-up water for the beneficiation plant.
2. Rejected RO water (effluent) and potential back flush is then held in a holding tank. Current operation procedures dictate that the RO filters are sent off-site for cleaning; therefore, no back flush water is generated. The reject water from the holding tank flows to the Beneficiation Plant as make-up water. These sources are not a contributing factor to wastewater discharged at Outfall 001 (boiler pond).

Boiler Lab

Wastewater generated from the on-site laboratory is from QA/QC product testing. Wastewater produced is considered a small fraction of the overall design capacity flow.

Wastewater Generators

In summary, potential sources of wastewater include:

- Boiler blow-down
- Boiler lab wastewater

All wastewater is collected in a floor sump of the boiler room and pumped to Outfall 001 (boiler pond).

Effluent samples are collected within 18 inches of the pond bottom.

Monitoring and sampling requirements are further discussed in **Section 6**.

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

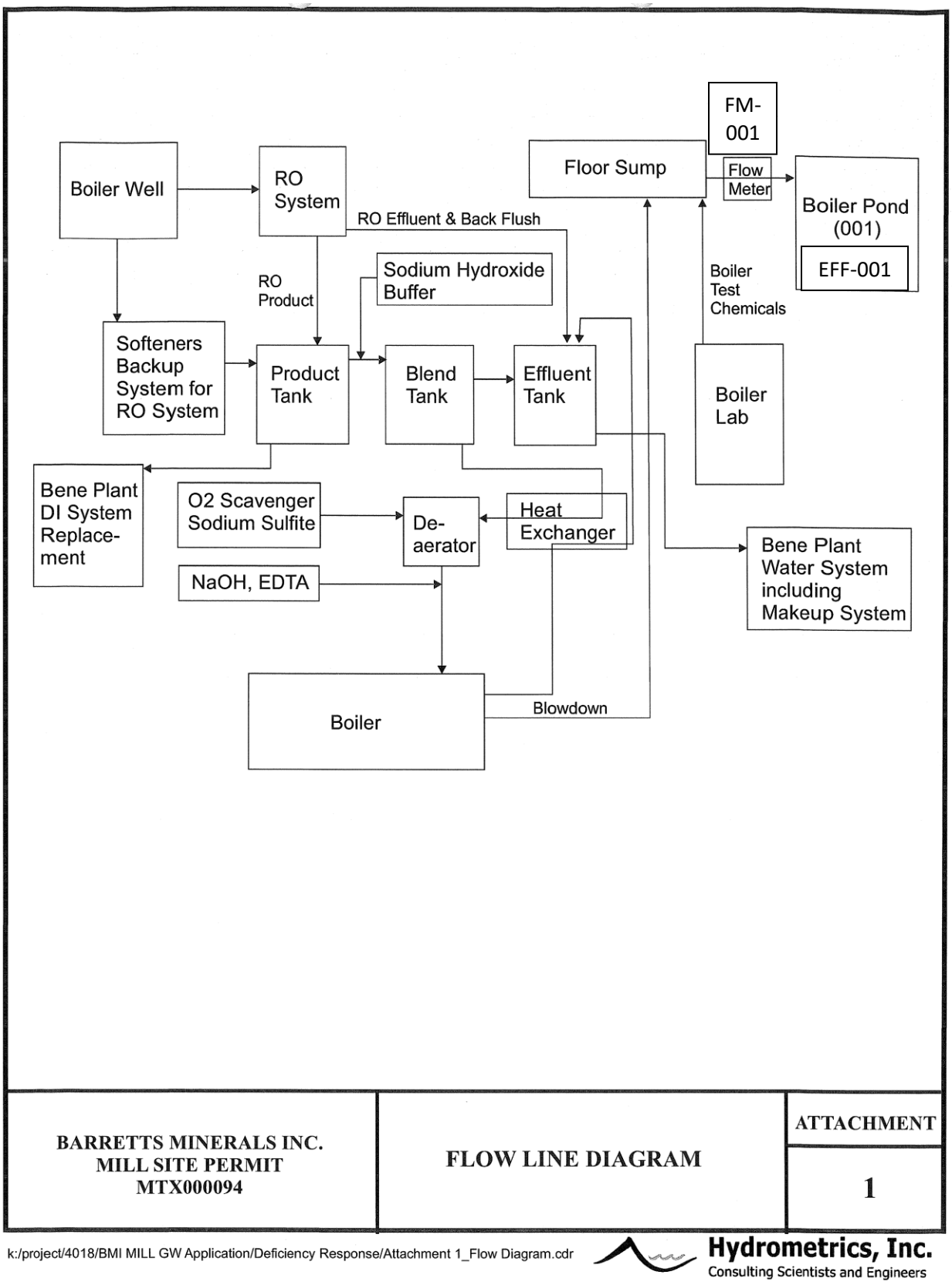


Figure 3. Wastewater Treatment System Line Diagram.

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 in **Table 2a and Table 2b**. Most of the concentrations are reported in units of milligrams per liter (mg/L), which is equivalent to one part per million.

Barium was identified as a contaminant of concern during the previous permit cycle. Barium testing was required in the quarterly DMR parameters. Barium was not detected in 2018. Barium has not been detected in 7 of the past 12 quarterly sampling periods. The source of barium is not clearly understood.

A Reasonable Potential Analysis (RPA) was calculated for Barium, and is detailed in **Appendix C**. The projected concentration of Barium after dilution from the groundwater in the mixing zone is much lower that the water quality standard**.** Therefore, Barium present in the effluent is not considered a threat to water quality and there will be no effluent limitation regarding Barium.

Table 2a: Effluent Quality – Outfall 001 - Reported DMR Values

Parameter(1)	Location	Units	Minimum Value	Average Value	Maximum(2) Value	# of Samples
Barium, dissolved	EFF-001	mg/L	< 0.003	0.0091	0.015	24
Chloride (as Cl)	EFF-001	mg/L	6	19	114	24
Flow rate, Discharge	FM-001	gpd	1	4730	30,744	24
pH	EFF-001	s.u.	8.10	8.88	9.90	24
Sulfate	EFF-001	mg/L	40.0	72.5	169.0	24
Total Dissolved Solids (TDS)	EFF-001	mg/L	177	257	415	24

Footnotes:
DMR = Discharge Monitoring Reports (Self-reported)
Period of Record: 01/01/2013 through 12/31/2018.
EFF-001: Effluent sample site located at boiler pond
FM-001 = Effluent flow meter located after floor sump prior to pumping to boiler pond.
s.u. = standard units
(1) Conventional and nonconventional pollutants only, table does not include all possible toxics.
(2) Maximum value recorded of all quarterly reported Daily Maximum Values.

During this permit cycle in addition to DMR sampling effluent monitoring was completed targeting potential parameters of concern from this source. There were an extensive number of parameters analyzed to enhance protection of water quality. Samples were sent to independent labs. The samples were taken: 3/14/2017, 6/1/2017, 8/9/2017 (three consecutive quarters). None of the parameters were above human health standards according to Montana DEQ Circular- 7, Water Quality Standards.

The results of the samples are shown in **Table 2b**.

Table 2b: Effluent Quality – Outfall 001 - Water Quality Lab Results

Parameter[(1)]	**RRV**[(2)]	**Units**	**Minimum Value**	**Average Value**	**Maximum Value**	**# of Samples**
Microbiological						
Bacteria, *E. coli*	1.0 CFU	CFU	< 2	< 3	4	3
Physical / Commons / Inorganics						
Alkalinity asCaCO3		mg/L	98	104	110	3
Bicarbonate as HCO3		mg/L	ND	ND	ND	3
Carbonate as CO3		mg/L	ND	ND	ND	3
Hardness as CaCO3		mg/L	165	168	171	3
Solids TDS @ 180°C		mg/L	214	285	389	3
Solids Suspended TSS @ 105°C		mg/L	<10	28	48	3
Calcium		mg/L	39	41	42	3
Magnesium		mg/L	12	15	17	3
Sodium		mg/L	13	19	26	3
Chloride		mg/L	6.3	9.9	14.0	3
Sulfate		mg/L	52	81	113	3
Cyanide, Total	.003	mg/L	< 0	< 2	< 3	3
Organics						
Oxygen Demand, Biochemical (BOD)		mg/L	5	7	11	3
Phenolics (Distilled)		mg/L	0.02	0.03	0.04	3
Oil and Grease (HEM)		mg/L	< 1	< 1	< 1	3
Nutrients						
Phosphorus, Total as P	0.001	mg/L	0.057	0.066	0.072	3
Nitrogen, Ammonia as N		mg/L	< 0.05	< 0.05	< 0.05	3
Nitrogen, Kjeldahl, Total N		mg/L	< 0.5	0.9	1.1	3
Nitrogen, Nitrate + Nitrite as N		mg/L	< 0.01	< 0.01	< 0.01	3
Metals, Dissolved						
Barium, Dissolved	0.003	mg/L	0.009	0.010	0.012	3
Metals, TCLP Extractable						
Arsenic		mg/L	< 0.5	< 0.5	< 0.5	3
Barium		mg/L	< 10	< 10	< 10	3
Cadmium		mg/L	< 0.1	< 0.1	< 0.1	3
Chromium		mg/L	< 0.5	< 0.5	< 0.5	3
Lead		mg/L	< 0.5	< 0.5	< 0.5	3
Mercury		mg/L	<0.002	<0.002	<0.002	3
Selenium		mg/L	< 0.1	< 0.1	< 0.1	3
Silver		mg/L	< 0.5	< 0.5	< 0.5	3

Table Continued Next Page

Metals, Total Recoverable						
Antimony	0.0005	mg/L	< 0.0005	< 0.0005	< 0.0005	3
Arsenic	0.001	mg/L	0.002	0.002	0.002	3
Beryllium	0.0008	mg/L	< 0.0008	< 0.0008	< 0.0008	3
Cadmium	0.00003	mg/L	< 0.00003	< 0.00003	< 0.00003	3
Chromium	0.01	mg/L	< 0.005	< 0.008	< 0.01	3
Copper	0.002	mg/L	0.014	0.016	0.017	3
Iron	0.02	mg/L	0.09	0.09	0.09	3
Lead	0.0003	mg/L	< 0.00003	< 0.00003	< 0.00003	3
Manganese		mg/L	0.003	0.004	0.004	3
Mercury	5E-07	mg/L	< 0.000005	< 0.000005	< 0.000005	3
Nickel	0.002	mg/L	<0.002	<0.002	<0.002	3
Selenium	0.001	mg/L	< 0.01	< 0.01	< 0.01	3
Silver	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	3
Thallium	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	3
Zinc	0.008	mg/L	< 0.008	< 0.008	< 0.008	3
Volatile Organic Compounds, TCLP Extractable						
Benzene		mg/L	< 0.1	< 0.1	< 0.1	3
Carbon tetrachloride		mg/L	< 0.1	< 0.1	< 0.1	3
Chlorobenzene		mg/L	< 0.1	< 0.1	< 0.1	3
Chloroform		mg/L	< 0.1	< 0.1	< 0.1	3
1,1-Dichloroethene		mg/L	< 0.1	< 0.1	< 0.1	3
1,2-Dichloroehane		mg/L	< 0.1	< 0.1	< 0.1	3
1,4-Dichlorobenzene		mg/L	< 0.1	< 0.1	< 0.1	3
Methyl 1 ethyl ketone		mg/L	< 0.1	< 0.1	< 0.1	3
Tetrachloroethene		mg/L	< 0.1	< 0.1	< 0.1	3
Trichloroethene		mg/L	< 0.1	< 0.1	< 0.1	3
Vinyl Chloride		mg/L	< 0.1	< 0.1	< 0.1	3
Surr: 1,2-Dichloroethane-d4		mg/L	89.0	98.0	109.0	3
Surr: Dibromofluoromethane		mg/L	97.0	101.0	105.0	3
Surr: p-Bromofluorobenzene		mg/L	104.0	112.0	122.0	3
Surr: Toluene-c18		mg/L	93.0	104.0	114.0	3
Field Parameters						
Temperature		° C	8.6	16.4	22.9	3
SC		umhos/cm	346.0	390.0	451.0	3
DO		mg/L	10.1	10.9	12.3	3
pH		s. u.	8.7	9.5	9.9	3
ORP		mV	57.6	126.9	245.8	3
Free Chlorine, Total		mg/L	ND	ND	ND	3

Footnotes:
(1) Conventional and nonconventional pollutants only, table does not include all possible toxics.
(2) RRV = Required Reporting Value, per DEQ-7, if applicable. (mg/L)
CFU = colony forming units
ND = Not Detected
s.u. = standard units
Period of Record (Three sample dates): 3/14/2017, 6/1/2017, 8/9/2017.

2.4 GEOLOGY

According to the USDA soil survey, soils in the boiler pond area are of two different classifications. To the north and west of the pond soils are Thessvo-Scravo complex: alluvial fans and stream terraces, slope 0 – 4%, well-drained, 0 - 5-inches gravelly loam, 5 – 12-inches very gravelly loam, 12 – 60-inches extremely gravelly sand. To the south and east of the pond is the Riverrun - Beavrock complex: alluvial flood plains, slope 0 – 4%, 0 – 5-inches gravelly sandy loam, 5 – 19-inches very gravelly loamy sand, 19 – 60-inches extremely gravelly sand.

2.5 HYDROGEOLOGY

Ground water monitoring data (Section 2.7) show static water levels during the previous permit cycle have seasonally fluctuated from 8.33 to 21.60-feet at MW-1 with an average of 14.21-feet, and from 5.0 to 30.50-feet at MW-7 with an average of 19.72-feet below ground surface. Overall average depth to ground water is 17-feet.

Soil information from area well logs indicate that the vadose zone and underlying water bearing unit (receiving ground water) generally consists of coarse sandy gravel with sand concentration decreasing with depth to coarse gravel and cobbles. Based on the potentiometric maps submitted by BMI December 2016 and June 2017 the ground water flow direction at the facility has changed. Previous reports showed flow roughly parallel to the Beaverhead River, approximately N28°E to N43°E (DEQ, 2007). The 2016 and 2017 data suggest ground water flow at N12°W. It is appropriate to average the two estimates. The average of ground water flow is N23°E. Ground water flow gradient (I) was estimated by the Department to vary annually from 0.3% to 0.8% (0.55% avg.) based on data submitted in 1992, 2000, and 2002. Hydraulic conductivity (K) across the site was calculated in 2000 using data from three wells and the modified Jacob's equation. Hydraulic conductivities were estimated by the applicant to range from 60 ft/day to 469 ft/day with an average value of 288 ft/day (DEQ, 2007).

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

Table 3. Hydrogeologic Summary

Average depth to ground water	17 feet (MW-1 and MW-7, 2013-2018)
General ground water flow direction	N23°E
Hydraulic conductivity	288 feet per day
Hydraulic gradient	0.0055 feet/feet
Nearest downgradient surface water	Beaverhead River (700 feet, if measured NE of pond)

2.6 GROUND WATER MONITORING WELLS

There are 2 monitoring wells associated with this permit: MW-1 and MW-7. Both wells are plotted on **Figure 2**. Monitoring well construction details are provided in **Table 4**. MW-1 is upgradient of the outfall and measures ambient ground water quality. MW-7 is downgradient and measures groundwater quality after the outfall's mixing zone. Driller's logs for each monitoring well are attached as **Appendix A**.

Table 4: Monitoring Well Summary
Monitoring Well: MW-1
MBMG GWIC #: 109922
Constructed on April 18, 1990
Location: Grassy field about 300-feet SW from main entrance Latitude: 45.13522° Longitude: -112.73635°
Representation: Ambient quality of the shallow receiving ground water, upgradient of Outfall 001.

Monitoring Well: MW-7
MBMG GWIC #: 154824
Constructed on September 7, 1995
Location: About 500-feet northeast of the boiler pond Latitude: 45.13742° Longitude: -112.73056°
Representation: Shallow ground water downgradient of the boiler pond

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 MW-1 and MW-7 are provided in **Table 5a**. Data reported in the table is taken from Discharge Monitoring Reports (DMR) that are reported by the applicant. There has been a problem with MW-7 in sampling. In 8 of the 24 quarters during the permit cycle the well does not contain enough water to sample. With one third of the sampling periods unable to be sampled it will be important to remedy the situation. MW-7 will need to be deepened or have a new well constructed that will be a more reliable source of ground water monitoring downstream of the outfall.

Table 5a: Ground Water Monitoring DMR Results

Monitor Source[1]	Representation	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[2] Value	# of Samples
MW-1	Ambient Ground Water Quality Shallow ground water, upgradient of Outfall 001	Chloride (as Cl)	mg/L	9.00	11.21	14.00	24
		pH	s.u.	7.60	7.75	8.44	24
		Static Water Level (SWL)	ft-bgs	8.33	14.21	21.60	24
		Sulfate	mg/L	41	102	122	24
		Total Dissolved Solids (TDS)	mg/L	321	387	446	24
MW-7	Shallow ground water, 500 feet downgradient from Outfall 001	Chloride (as Cl)	mg/L	8.00	11.69	14.00	16
		pH	s.u.	7.10	7.73	8.73	16
		Static Water Level (SWL)	ft-bgs	5.00	19.72	30.50	16
		Sulfate	mg/L	51.00	89.88	118.00	16
		Total Dissolved Solids (TDS)	mg/L	279.00	361.63	418.00	16

Footnotes:
bgs = below ground surface
DMR = Discharge Monitoring Reports (Self-Reported)
Period of Record: 01/01/2013 through 12/31/2018.
s.u. = standard units
(1) Refer to Section 2 of the Fact Sheet for the existing location of the monitoring wells.
(2) Maximum value recorded of all monthly or quarterly reported values.

Water sampling results from MW-1 are provided in **Table 5b**. Data reported in the table is taken from lab results of 3 samples that were taken by the applicant. The information was submitted with the renewal application.

Table 5b: Ground Water Monitoring - Water Quality Lab Results - 3 samples[1]

Monitor Source[2]	Representation	Parameter[3]	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[4] Value
MW-1	Ambient Ground Water Quality Shallow ground water, upgradient of Outfall 001	Specific conductivity	µS/cm	558.00	648.00	733.00
		Total Dissolved Solids (TDS)	mg/L	365.00	385.00	400.00
		pH	s.u.	6.30	7.06	7.67
		Chloride	mg/L	10	10	11
		Escherichia Coli	CFU/100ml	<5	<8	<10
		Kjeldahl Nitrogen, Total, as N	mg/L	<.3	1.80	4.60
		Nitrate + Nitrite, as N	mg/L	0.01	0.17	0.26
		Total Organic Carbon (TOC)	mg/L	1.50	3.20	4.20
		Other:				
		Sodium (dissolved)	mg/L	23.00	34.00	54.00
		Calcium (dissolved)	mg/L	60.00	981.00	2810.00
		Magnesium (dissolved)	mg/L	20.00	154.00	418.00

Footnotes:

bgs = below ground surface

CFU = colony forming units

s.u. = standard units

(1) Period of Record, 3 samples taken: 03/14/17,06/01/17, and 08/09/17.

(2) Refer to Section 2 of the Fact Sheet for the existing or proposed location of the monitoring wells.

(3) The list only includes identified parameters of interest.

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

Based on the 648 microsiemens per centimeter (µS/cm) specific conductance, the receiving water is Class I ground water.

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 648 µS/cm (**Table 5b**), 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

Montana has water quality standards for both surface water and ground water. The numeric criteria for each are different because they must support different uses. DEQ writes permits to protect the most sensitive, thereby protecting all uses. DEQ's ground water standard for barium is 1.0 mg/L. 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 1.0 mg/L for barium. These water quality standards may not be exceeded outside a designated mixing zone (**Section 4**). A Reasonable Potential Analysis (RPA) was conducted for Barium and is found in **Appendix C**.

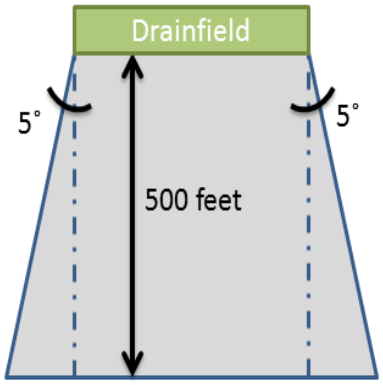
3.3 NONSIGNIFICANCE

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. This permit includes monitoring, reporting, and corrective action requirements to establish, confirm, and maintain compliance with water quality standards established by the Montana Water Quality Act and outlined in Montana Numeric Water Quality Standards, Circular DEQ-7.

4.0 MIXING ZONE

DEQ authorizes a standard mixing zone for discharge 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. The applicant requested a standard mixing zone for this discharge, consistent with previous permit cycles.

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 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 (ft^2) at downgradient boundary of the mixing zone

Table 6 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.

Table 6: Hydrogeologic and Mixing Zone Information - Outfall 001

Parameter	Units	Value
Mixing Zone Type	-	Standard
Ground Water Flow Direction	azimuth/bearing	N35°E
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	180
Width of Mixing Zone at Down Gradient Boundary	feet	267.5
Cross Sectional Area of Mixing Zone (A)	ft^2	4012.5
Hydraulic Conductivity (K)	feet/day	288
Hydraulic Gradient (I)	ft/ft	0.0055
Volume of Ground Water Available for Mixing (Q_{gw})	ft^3/day	6,356

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 water quality criterion (**Section 3**), DEQ can calculate water quality based effluent limits (WQBELs) by rearranging the equation and solving for the effluent concentration (**Section 5**).

5.0 SPECIAL CONDITIONS

The following special condition will be included in the permit.

There has been a problem with MW-7 in sampling. In 8 of the 24 quarters during the permit cycle the well does not contain enough water to sample. With one third of the sampling periods unable to be sampled it will be important to remedy the situation. MW-7 will need to be deepened or have a new well constructed that will be a more reliable source of ground water monitoring downstream of the outfall.

Currently MW-7 has a total depth of 26-feet with perforations from 18 to 24-feet (well log found In Appendix A). Depth should be increased 15 – 20- feet. The improved or new well should be 40 to 45- foot total depth with perforations beginning at 18-feet to about 2 feet from bottom of well (38 to 43-feet depth).

A monitoring well improvement plan will need to be completed and submitted to DEQ within 180 days of the effective date of the permit. Following DEQ review and approval, the well improvement will be installed within one year of the effective date of the permit. Then commence monitoring and reporting of water quality in the improved well.

A compliance schedule is found in **Table 10**.

6.0 MONITORING AND REPORTING REQUIREMENTS

DEQ requires effluent and ground water monitoring to assure compliance with 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.

6.1 EFFLUENT MONITORING

The permittee is required to monitor and report at a specified frequency to ensure the discharge will not cause or contribute to an exceedance of an applicable water quality standard (see **Section 3**).

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 at the boiler pond (Outfall 001) 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 floor sump prior to discharge to the boiler pond (**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 8**. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

Table 8: Effluent Monitoring and Reporting Requirements – Outfall 001

Parameter	Monitoring Location	Units	Sample Type[1][2]	Minimum Sampling Frequency	Reporting Requirements[1][3]	Reporting Frequency	Rationale
Effluent Flow Rate[4][5]	Flow Meter (FM-001)	gpd	Continuous	Continuous	Daily Maximum and Quarterly Average	Quarterly	Effluent Characterization
Chloride, (as Cl)	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Effluent Characterization
pH	EFF-001	s.u.	Instantaneous	1/Quarter	Quarterly Average	Quarterly	Effluent Characterization
Sulfate	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Effluent Characterization
Total Dissolved Solids (TDS)	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly	Effluent Characterization

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

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

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

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 and MW-7. Data collected via ground water monitoring will be used for mixing zone evaluation and aquifer characterization in future permit renewals and to determine if any water parameters are exceeding water quality standards.

Installation of a new well or deepening of MW-7 will be required. One third of the quarterly sampling was incomplete due to water table below the sampling depth of MW-7.

Ground water monitoring and reporting requirements are summarized in **Table 9**.

Table 9: Ground Water Monitoring and Reporting Requirements, MW- 1 & MW-7

Analyte/Measurement	Monitor Location[1]	Units	Sample Type[2]	Minimum Sampling Frequency	Reporting[2][3][4] Requirements	Reporting Frequency
Chloride (as Cl)	MW-1 MW-7	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
pH	MW-1 MW-7	s.u.	Instant-aneous	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Static Water Level (SWL)[5]	MW-1 MW-7	ft-bmp	Measured	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Sulfate	MW-1 MW-7	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Total Dissolved Solids (TDS)	MW-1 MW-7	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly

Footnotes:

ft-bmp = feet below measuring point

s.u. = standard units

At no time shall the permittee mark or state "no discharge" on any monitoring well DMR form.

Each monitor well to be individually sampled and analyzed for each respective parameter listed above.

(1) Refer to Section 2.6 and Figure 2 of the Fact Sheet for the existing location of the monitoring wells.

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

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

(4) The geometric mean must be reported if more than one sample is taken during a reporting period.

(5) Measuring point for SWL measurements shall be from top of casing and measured to within 1/100th of one foot.

COMPLIANCE SCHEDULE

The actions listed in **Table 10** must be completed on or before the scheduled completion date. A report documenting each respective action must be received by DEQ on or before the scheduled reporting date.

Table 10: Compliance Schedule

Action	Freq.	Scheduled Completion Date of Action[1]	Scheduled Report Due Date.[2]
Complete a **Monitoring Well Improvement Plan**.[3]	Single event	*Within 180 days of the effective date of the permit.*	*Due on or before the 28th day of the month following the completion date.*
Complete the improvement or installation of the monitoring well. Provide as-built drawings to DEQ.	Single event	*Within one (1) year of the effective date of the permit.*	*Due on or before the 28th day of the month following the completion date.*
Commence monitoring and reporting of the improved or newly installed monitoring well.	Single event	*Within fifteen (15) months of the effective date of the permit.*	*Due on or before the 28th day of the month following the completion date.*

Footnotes:

(1) The actions must be completed on or before the scheduled completion dates.

(2) Reports must be received by DEQ on or before the scheduled report due dates.

(3) Groundwater monitoring at the downgradient monitoring well must be improved. Either MW-7 must be deepened or there must be the installation of a new monitoring well downgradient of the boiler pond (Outfall 001).

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 July 3, 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 (MTX000094), 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

Site Name: PFIZER BARRET MILL M1
GWIC Id: 109922

Section 1: Well Owner(s)
1) PFIZER BARRET MILL (MAIL)
BOX 1147
DILLON MT 59725 [04/18/1990]

Section 2: Location

Township	Range	Section	Quarter Sections
08S	09W	17	NE¼ SW¼

County	Geocode
BEAVERHEAD	

Latitude	Longitude	Geomethod	Datum
45.135391	-112.735904	TRS-SEC	NAD83

Ground Surface Altitude	Ground Surface Method	Datum Date

Addition	Block	Lot

Section 3: Proposed Use of Water
MONITORING (1)

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

Section 5: Well Completion Date
Date well completed: Wednesday, April 18, 1990

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

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0.5	11.2	2				PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
11.2	21.2	2		0.010	.01 MONOFLEX SN

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0.5	9.2	BENTONITE	

Section 7: Well Test Data

Total Depth: 22
Static Water Level: 15.5
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
111ALVM - ALLUVIUM (HOLOCENE)

From	To	Description
0	22	SANDY GRAVELS- TO BOULDER SIZE.UNCONSOLIDATED BRN

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: OLYMPUS
License No: MWC-9
Date Completed: 4/18/1990

Site Name: BARRETTS MINERAL INC.
GWIC Id: 154824
DNRC Water Right: C096243-00

Section 1: Well Owner(s)
1) BARRETTS MINERALS INC. (MAIL)
BOX 1147
DILLON MT 59725 [09/07/1995]

Section 2: Location

Township	Range	Section	Quarter Sections
08S	09W	17	NW¼ NW¼ SE¼

County	Geocode
BEAVERHEAD	

Latitude	Longitude	Geomethod	Datum
45.136319	-112.732077	TRS-SEC	NAD83

Ground Surface Altitude	Ground Surface Method	Datum Date

Addition	Block	Lot

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

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

Section 5: Well Completion Date
Date well completed: Thursday, September 07, 1995

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	26	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	26	6				STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
18	24	6		1/8X3	TORCH CUTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	18	BENTONITE	

Section 7: Well Test Data

Total Depth: 26
Static Water Level: 12.4
Water Temperature:

Bailer Test *

18 gpm with _ feet of drawdown after 1 hours.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	5	FILL GRAVEL COBBLE
5	8	TALE FINES
8	14	COBBLE GRAVEL SOME BOULDERS
14	23	COBBLE GRAVEL WATER AT 12 FT
23	26	GRAVELS

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: GRAHAM DRILLING INC
License No: WWC-529
Date Completed: 9/7/1995

APPENDIX B – WATER TREATMENT PLANT LABORATORY - CHEMICALS, COMPOUNDS AND ADDITIVES

Water Treatment Plant Laboratory - Chemicals, Compounds and Additives		
Name	**Use**	**Composition Ingredient of Interest**
Nalco 1720	Oxygen Scavenger	Sodium Bisulfate Potassium Bisulfate
Nalco 8735	pH Stabilizer	Sodium Hydroxide Potassium Hydroxide
NexGuard 22310	Boiler Water Internal Treatment	Sodium Hydroxide
Permatreat(R) PC-191T	Reverse Osmosis Antiscalant	Sodium Hexa Meta Potassium (SHMP) or Organo Phosphonate or 1-Hydroxy Ethylidene-1,1-Diphosphonic Acid (HEDP)

APPENDIX C – REASONABLE POTENTIAL ANALYSIS (RPA)

Prior permits have identified Barium as a Parameter of Interest (POI). Barium has been monitored throughout the permit cycle. **Table 11** outlines the ground water standards applicable to Barium.

Table 11: Applicable Ground Water Quality Standards.

Parameter	Units	Human Health Standards - Ground Water
Barium	mg/L	1.0

Footnotes:

These standards establish the allowable changes in groundwater quality and are the basis for limiting discharges to groundwater, ARM 17.30.1006.

A RPA is used to determine whether a discharge to ground water, either alone or in combination with other sources, could lead to an excursion above an applicable water quality standard. DEQ will conduct a RPA for barium. Pending the outcome of the assessment, development of an effluent limitation or mitigation through best management practices (BMPs) may be established.

The RPA is based on statistical procedures outlined in the United States Environmental Protection Agency (USEPA) Technical Support Document (TSD) document (USEPA, 1991). This includes use of a mass-balance equation, which is a simple steady-state model, used to determine the POI concentration after accounting for other sources of pollutants in the receiving water and any dilution as provided by the 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} = design capacity of wastewater system
- C_{eff} = adjusted critical effluent pollutant concentration (Table 12)
- Q_{comb} = combined ground water and effluent ($Q_{comb} = Q_{gw} + Q_{eff}$)
- C_{proj} = projected pollutant concentration (after available mixing)

The critical effluent concentration (C_{eff}) is adjusted by the TSD multiplier factor which considers the variability of the effluent data set (95% confidence level).

The mass-balance equation can be expressed in terms of the dilution ratio at the downgradient edge of the mixing zone when authorized. The dilution ratio is the volume of ground water available for mixing to the volume

of effluent. Below is the mass-balance equation (Equation 2) arranged to solve for the projected pollutant concentration receiving water concentration:

Equation 2:

$$C_{proj} = \frac{C_{eff} + (D \times C_{gw})}{(1 + D)}$$

Where:
D = dilution ratio (Q_{gw} / Q_{eff})

After available dilution, if the projected pollutant concentration (C_{proj}) exceeds an applicable water quality standard then an effluent limit or BMP must be developed. **Table 12** provides a summary of the reasonable potential analysis.

Table 12: Reasonable Potential Analysis Summary - Outfall 001.

Parameter	Units	Observed Effluent Conc. Value	# of Samples	TSD Multiplier	Adjusted Effluent Conc. Value (C_{eff})	Dilution Authorized ?	Projected Pollutant Conc.(1) (C_{proj})	Water Quality Standard(2)	Effluent Limit Needed?	Reason
Barium	mg/L	0.0091	24	1.22	0.0111	Y	0.0109	1.00	No	C_{proj} < WQS

Footnotes:

TSD = USEPA Technical Support Document For Water Quality-Based Toxics Control, EPA/505/2-90-001.

WQS = Water Quality Standard

(1) Projected pollutant (effluent) concentration includes dilution when mixing has been authorized.

(2) See Table 11 for Ground Water Quality Standards.

Development of Effluent Limits

Effluent limitations for Barium will not be established within the 2019 permit. The RPA found that it is not likely there will be exceedance of the respective standards.

REASONABLE POTENTIAL ANALYSIS (RPA)

Worksheet:

Barium

Number of Samples	24
Mean	0.0091 mg/L
Standard Deviation	0.0044
Coefficient of Variation	0.48
TSD Multiplier	1.22
Adjusted Effluent Concentration (C_{eff})	0.0111 mg/L
C_{proj}	0.0109 mg/L
Water Quality Standard (Barium)	1.0 mg/L

Projected Pollutant Concentration (0.0118 mg/L) is less than the Water Quality Standard (1.0 mg/L) so an effluent limit is not needed.

$$C_{proj} = \frac{C_{eff} + (D \times C_{gw})}{(1 + D)}$$

D = dilution ratio (Q_{gw} / Q_{eff})

$$C_{proj} = \frac{0.0111 + ((47{,}546 / 1{,}677{,}876) \times 0.0029)}{1 + (47{,}546 / 1{,}677{,}876)}$$

C_{proj} = 0.0109 mg/L

APPENDIX D – 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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