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:	Kootenai Lodge/Lake County Water and Sewer District
Permit Number:	MTX000188
Permit Type:	Domestic wastewater
Application Type:	Renewal
Facility Name:	Kootenai Lodge Wastewater Treatment Facility
Facility Location:	Southwest ¼ of Section 1, Township 26 North, Range 19 West, Lake County Drainfield 01: Latitude: 48.038076° Longitude: -113.957355°
	Drainfield 02: Latitude: 48.03796° Longitude: -113.955018°
Facility Address:	Broken Leg Road Big Fork, Montana
Facility Contact:	Scott Goninan
Treatment Type:	Level 2
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Outfall / Type:	Underground pressure dosed drainfields
Effluent Type:	Domestic strength wastewater
Mixing Zone:	Standard
Effluent Limit Type:	DBEL
Effluent Limits:	Total nitrogen: 4.6 lbs/day
Flow Rate:	Design maximum: 23,050 gpd Design average: 15,100 gpd
Effluent sampling:	EFF 01, Quarterly
Ground water sampling:	Suspended
Fact Sheet Date:	March, 2020
Prepared By:	Rich Morse

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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 Kootenai Lodge/Lake County Water and Sewer District for the Kootenai Lodge Wastewater Facility wastewater treatment system.

1.1 APPLICATION

DEQ received an application for renewal of the permit on December 24, 2018. Renewal fees accompanied the application. DEQ reviewed the submittal and issued a completeness letter on January 16, 2019.

1.2 PERMIT HISTORY

The Kootenai Lodge Wastewater facility discharges treated effluent into Class I ground water. The site was originally permitted in 2007. The 2007 permit authorized a standard 500 foot mixing zone for nitrate (as N). DEQ determined Kootenai Lodge was a new source because the discharge changed existing water quality on or after April 29, 1993. DEQ completed a significance determination for the 2007 permit and concluded the discharge, within the defined limits, causes nonsignificant changes in ground water quality.

The current MGWPCS permit MTX000188 was issued November 22, 2013 and expired December 31, 2018. The 2013 renewal included limits for nitrogen and phosphorus. The 2013 permit applied a nitrogen limit of 7.2 pounds per day (lbs/day), or 60% removal of nitrogen. This limit is an expression of the definition-based effluent limit (DBEL) for a Level 2 treatment system. It is based on a 24 milligrams per liter (mg/L) maximum nitrogen concentration in the discharge. This system includes two drainfields located in close proximity and for purposes of permitting are considered to be a single outfall.

1.3 CHANGES TO THIS PERMIT

This permit renewal includes a recalculated definition based effluent limit (DBEL) expressed as a load. The limit changes from 7.2 lbs/d to 4.6 lbs/day Total Nitrogen. This limit is calculated using the 24 mg/L definition of a Level 2 treatment system. Down gradient sampling from monitoring well MW1A will be suspended for this permit cycle. When discharge flow increases DEQ may require down gradient monitoring to resume.

2.0 FACILITY INFORMATION

2.1 LOCATION

The Kootenai Lodge Wastewater Facility is locate on Broken Leg Road off of Highway 83, eight miles southeast of Big Fork. **Figures 1 and 2** show the site location.

Figure 1. Location of the Kootenai Lodge.

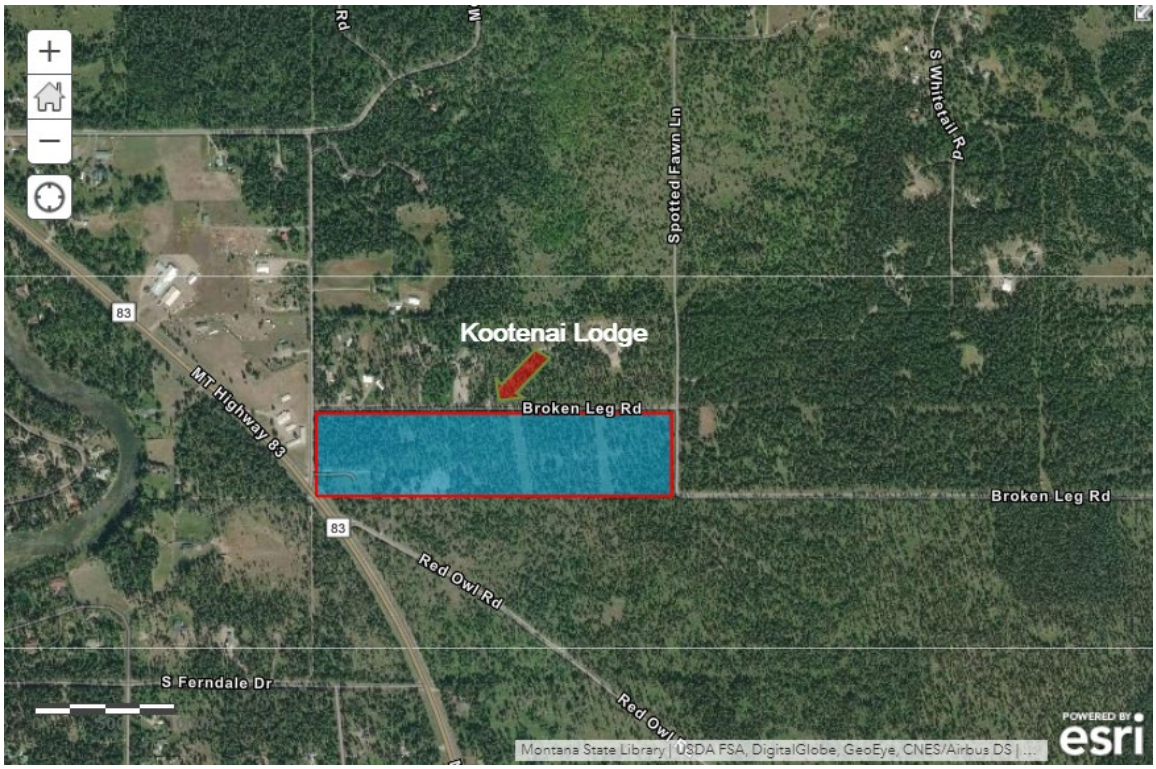


Figure 2. Site location, Kootenai Lodge/Lake County Water and Sewer System.

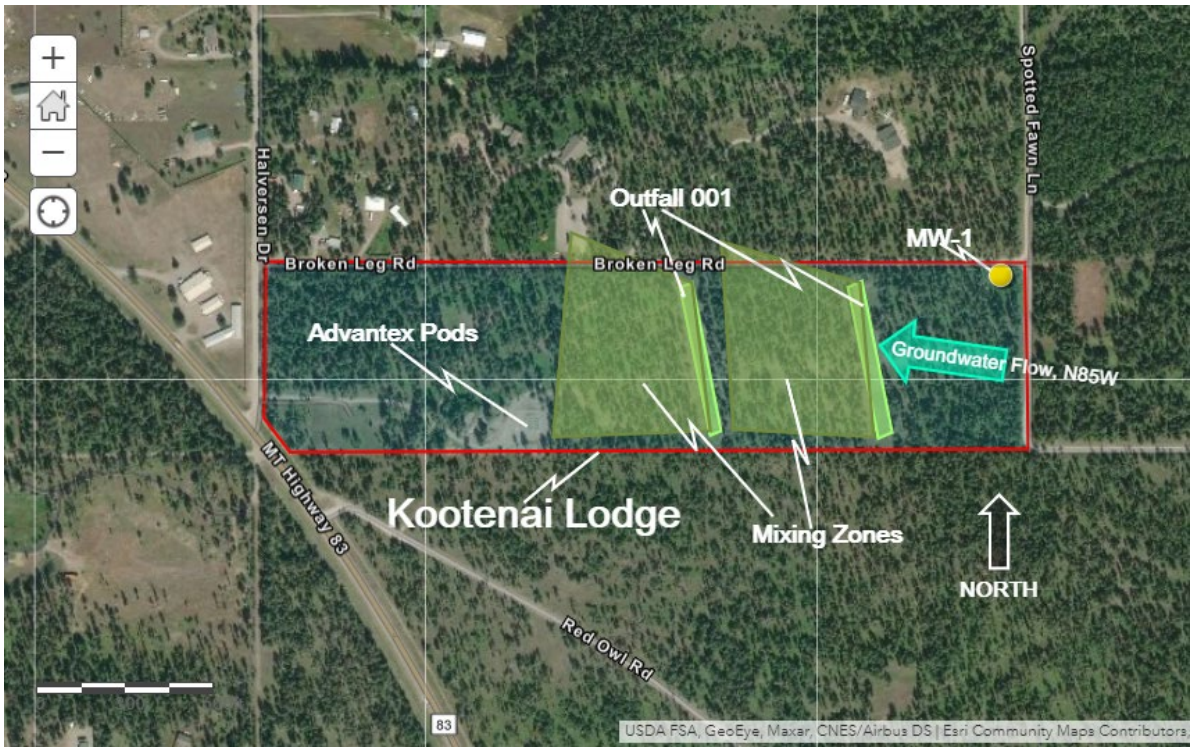


Figure 3. Site Map, Kootenai Lodge.

Kootenai Lodge is designed to serve approximately 53 homes. Currently there are only a few part time residences constructed and hooked up to the system, resulting in significant underutilization of the facility.

2.2 OPERATIONS

Wastewater generated by the Kootenai Lodge facility is directed through a collective treatment system. **Figure 3** provides a flow line diagram showing an overview of the treatment process. Gravity fed sewer lines collect the wastewater and route it through two (2) 35,000 gallon (gal) septic tanks in series for primary treatment. After primary treatment, the effluent enters a 25,000 gal denitrification tank. The wastewater flows from the denitrification tank to the recirculation tank. The recirculating tank delivers the wastewater to the Advantex AX100 recirculating trickling filters. From the recirculating trickling filter a portion of the wastewater is directed back to the recirculation tank while the remaining portion is diverted to the 10,000 gal dose tank. The dose tank distributes the effluent between two alternating drainfields. While the facility includes two drainfields, one wastewater treatment system delivers effluent to both drainfields; therefore the drainfields combined is considered one outfall. Each drainfield is subdivided into 8 sections and discharges the treated effluent into Class 1 ground water. A Tiger Mag EP FM656 flow meter measures wastewater flows into the treatment system immediately prior to the first septic tank. Action Septic Services pumps, transports, and disposes of the sewer sludge. System operations are summarized in **Table 1**.

Table 1. Collection, Treatment, and Disposal Summary

Collection	
Contributing sources:	53 residences.
Standard industrial code(s) of sources:	SIC 4952
Collection method:	Gravity to STEP tanks.
Flow volume:	Maximum daily design flow: 23,050 gallons per day
Treatment	
Treatment level:	Level 2
Treatment technology:	Individual residential septic tanks gravity to lift station. Treatment is denitrification tank to recirculation tank and Advantex pods. Disposal to two alternating pressure-dosed drainfields.
Treatment location:	Latitude: 48.037286° ; Longitude: -113.959717°
Disposal	
Method of disposal:	Infiltration to ground water
Disposal structure:	Subsurface drainfield (Outfall 001)
Outfall location:	Latitude: 48.037944° ; Longitude: -113.956478°

Influent sampling is done in the STEP tank at the lower end of the system referred to in **Figure 3** as Septic Tank 1. Effluent sampling is done at the dose tank prior to discharge to the drainfields. Monitoring and sampling requirements are further discussed in **Section 6**. **Figure 3** is a line drawing of the collection, treatment, and disposal process.

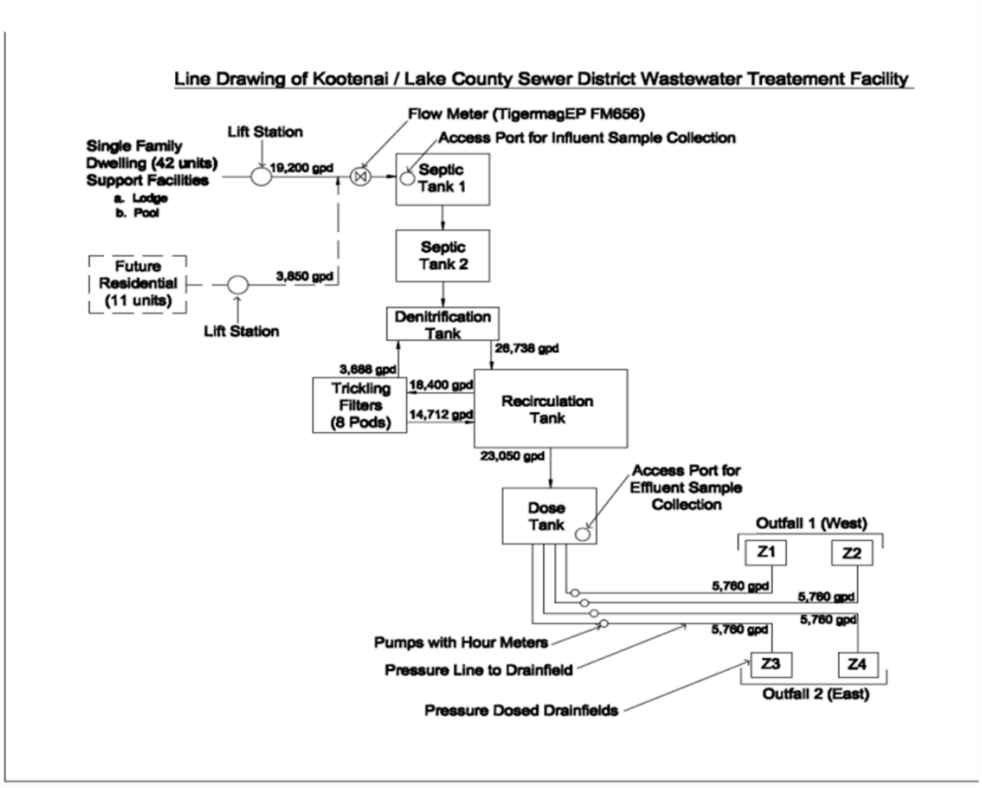


Figure 3. Line Diagram, Kootenai Lodge Wastewater System.

2.3 EFFLUENT CHARACTERISTICS

The Kootenai Lodge wastewater treatment system is significantly under-utilized and currently receives an average of only 2% of the Maximum Design Flow. As a result of the under-utilization, nitrogen is being created by the system. The 2015 through 2019 Discharge Monitoring Reports (DMRs) for this facility indicate that the facility is operating well within its load limits. The average daily maximum nitrogen load from the facility is 1.25% of the current load limit (average discharge = 0.09 lbs/d, 2015 load limit = 7.2 lbs/d).

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 influent and effluent quality criteria to DEQ in the form of discharge monitoring reports (DMRs). These data are summarized below in **Table 2**. The majority of the concentrations are reported in units of milligrams per liter (mg/L), which is equivalent to one part per million.

Table 2. Effluent Quality Data from Outfall 001

Parameter	Units	Reported DMR values			2013 Limit	# of Samples [1]
		Minimum	Maximum	Average		
Flow rate	Gallons/day	1.86	4911	1752	–	12
	Gallons/day (30 day average)	0.2	1796	467	–	12
Chloride (as Cl)	mg/L	0.5	48	7.36	–	19
Nitrogen, nitrate+nitrite	mg/L	9.73	47.7	23.9	–	12
Nitrogen, total ammonia	mg/L	0.1	34.2	8.56	–	12
Nitrogen, total Kjeldahl	mg/L	0.4	30.1	5.6	–	12
Nitrogen, total*	mg/L	10.1	48.0	23.8	--	12
	pounds/day	0.0	0.48	0.09	7.2	12
Phosphorus, total	mg/L	1.16	5.1	3.1	–	12
	pounds/day	0.0	2.2	0.19	--	12
Total suspended solids	mg/L	0.006	2	1.18	–	11

CFU = colony forming unit

*Total Nitrogen = Nitrate + Nitrite + Total Kjeldahl Nitrogen (as N)

1. Period of record: March 31,2015 – December 31, 2019 2 (No Discharge was reported 6/30/2017 to 12/31/2018)

2.4 GEOLOGY

The Kootenai Lodge site is between Flathead Lake and the mountain ranges east of the lake. Quaternary alluvium, lake and glacial deposits intermingle in this area. The site is located in the Swan Valley, a Tertiary fault-bounded intermountain valley situated between the Swan and Mission Mountain Ranges. Since formation, the valley has accumulated approximately 6,500 feet of sediment and sedimentary rock. The valley-fill typically is composed of moderately to well-sorted silt (re-worked), sand, and gravel derived from pre-Cambrian rocks and glacial deposits (till). These sources have provided a significant clay and silt content in the till. Interbedded layers of sand and gravel in the clay and silt are the result of migratory/meandering paleo-stream channels. The site hydrogeology is complex and ground water is unpredictable. The shallow perched aquifer on the site consists of multiple water-bearing zones with hydraulic connection. The layers of sand and gravel alternate with layers of clay and silt. The deeper aquifer is separated from the shallow aquifer by a confining clay layer. The deep aquifer consists of sorted alluvial sands and gravel and is found below 140 feet. Ground water in the lower aquifer is confined, and artesian in some areas.

2.5 HYDROGEOLOGY

The 2007 permit and renewal application materials supply information describing the hydrogeological conditions pertinent to the Kootenai Lodge/Lake County Water & Sewer District site and the mixing zone. The hydraulic gradient is estimated to be 0.048 ft./ft. Ground water is estimated to be moving N85°W based on observations in on-site monitoring wells.

The applicant identifies two (2) surface water bodies within one mile of Outfall 001. The 2007 permit identified The Swan River as the closest hydraulically downgradient surface water to Kootenai Lodge based on the ground water flow direction at 2,366 feet (DEQ, 2011e). Important hydrogeologic characteristics are summarized in **Table 4**.

Table 4. Hydrogeologic Summary (2013 Fact Sheet)

Average depth to ground water	10 to 36 feet
General ground water flow direction	N85°W
Hydraulic conductivity	35.3 feet per day
Hydraulic gradient	0.048 feet/feet
Nearest downgradient surface water	Swan River (2,366 feet)

2.6 GROUND WATER MONITORING WELLS

There has been one downgradient monitoring well associated with this permit. Downgradient monitoring of MW1A is suspended in this permit renewal due to the low discharge volume. MW1A is located at the downgradient edge of the lower mixing zone. Ambient ground water monitoring results for MW1 are included in the application material for this renewal.

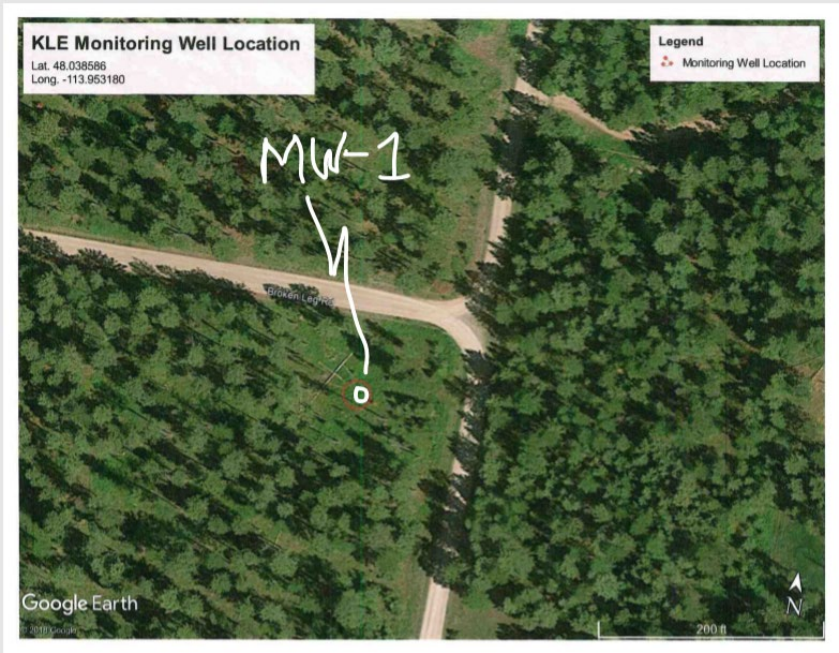


Figure 4. Upgradient ambient monitoring well location, MW1.

MW1 is the upgradient monitoring well associated with this permit. This well is plotted on **Figure 3**. Monitoring well construction details are provided below in **Table** 4. MW-1 is an upgradient well recently installed by the applicant in 2019 for the collection of ambient groundwater samples. This well is not included in the DMRs.

Table 4. W**ell Summary**

Monitoring Well MW-1	
MBMG GWIC ID:	298252
Location- latitude/longitude:	48.038666° Longitude: -113.95312°
Location- narrative:	Northeast corner of site
Rationale:	Ambient receiving water quality
Depth; screened interval:	Total depth of 49 feet, screened from 39-49 feet.
Notes:	Static Water Level not recorded

2.7 GROUND WATER QUALITY CHARACTERISTICS

Water sampling results from MW-1 are provided below in **Table 5**. Based on the 309 microsiemens per centimeter (µS/cm) specific conductance, the receiving water is Class I ground water. Data reported in the table is taken from October and December, 2019 from the newly established monitoring well.

Table 5. Ambient Water Quality Reported From Monitoring Well MW-1

MW-1 represents shallow ground water 450 feet upgradient of Outfall 001						
Parameter	**Units**	**Reported values**			**Reporting Limit**	**# of Samples**
		Minimum	**Maximum**	**Average**		
Chloride (as Cl)	mg/L	1.2	2.0	1.6	0.1	2
Total dissolved solids	mg/L	181	190	185	1.0	2
Escherichia coli bacteria	CFU/100mL	<1	<1	<1	1	2
Nitrogen, nitrate+nitrite (as N)	mg/L	0.04	0.05	0.045	0.1	2
Nitrogen, Total Persulfate	mg/L	0.11	0.18	0.145	0.01	2
Organic carbon	mg/L	1.08	1.35	1.21	0.1	2
pH	Standard units	8.43	8.45	8.44	0.1	2
Specific conductivity (@25°C)	µS/cm	300	318	309	0.1	2

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 309 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

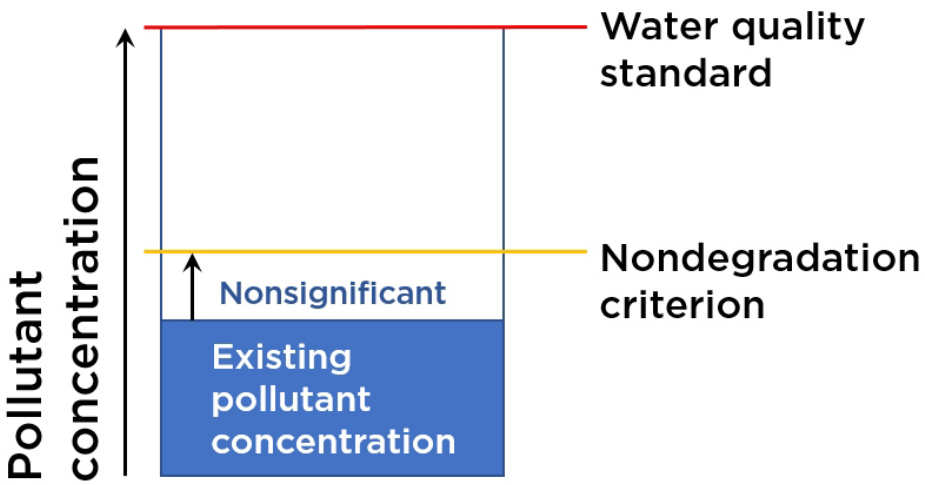
DEQ protects all the assigned beneficial uses by protecting the most sensitive. Drinking water is the most sensitive use of this receiving water.

3.2 Water Quality 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 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 Nondegradation

Montana's nondegradation policy is intended to preserve the existing condition of high-quality state waters. Any water whose existing condition is better than the water quality standards must be maintained in that high quality. Nondegradation policy allows discharges to cause only nonsignificant changes in water quality. Changes in water quality that are deemed significant require an authorization to degrade. An authorization to degrade is not an authorization to pollute; the water quality standard must not be exceeded.



DEQ must determine whether the proposed discharge will result in significant changes in water quality.

3.4 Nonsignificance

When developing the previous permits (2007, 2013), 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 (described below) at the end of the mixing zone (**Section 4**). DEQ used these criteria and updated ground water quality data to establish effluent limits (discussed below in **Section 5**).

3.4.1 Ground Water Nonsignificance Criteria

For this discharge to ground water, the following nonsignificance criteria are relevant:

Nitrogen

Under Montana statute, ground water total nitrogen at or below 7.5 mg/L at the downgradient end of the mixing zone (see **Section 4**) is a nonsignificant change in water quality, so long as the discharge does not cause degradation of surface water. Evaluation of the effects to surface water are discussed below. Using the nonsignificance criterion of 7.5 mg/L, DEQ established effluent limits that cause the discharge to comply with ground water nonsignificance/nondegradation criteria at the end of the mixing zone. This is discussed in detail in **Section 5.1**.

Phosphorus

A total phosphorus surface water breakthrough time of greater than 50 years is a nonsignificant change in water quality. The phosphorus criterion requires an analysis to determine a breakthrough time. Breakthrough occurs when the subsurface soils lose their capability to adsorb any more phosphorus, and it reaches surface water.

A phosphorus breakthrough analysis conducted by DEQ in 2007 (DEQ, 2007) estimated the phosphorus breakthrough to occur in 142 (*i.e.* >50) years. Phosphorus breakthrough time of greater than 50 years is considered nonsignificant.

Ground water discharges meeting these criteria are nonsignificant, so long as they do not cause degradation of surface waters.

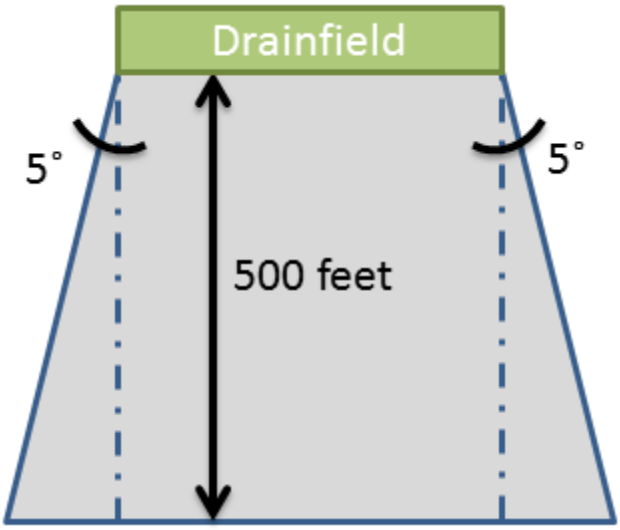
4.0 MIXING ZONE

DEQ authorizes a standard mixing zone for total nitrogen discharged from Outfall 001. A mixing zone is a specifically defined area of the receiving water where water quality standards may be exceeded. DEQ evaluates the suitability according to criteria established in the Administrative Rules of Montana. The mixing zone is then defined in the permit. The applicant requested two standard mixing zone for this discharge, consistent with previous permit cycles. Standard mixing zones extend 15 feet below the ground water table.

Mixing zones for the existing discharge structures for this facility overlap. According to ARM 17.30.506(2)(f), multiple drainfields and/or replacement areas aligned in the direction of ground water flow will have the potential to create cumulative impacts (nitrate, as N, and phosphorous) in the shallow ground water. The cumulative effects of the two overlapping drainfields associated with Outfall 001 were examined in the initial discharge permit issued in 2007. Cumulative effects were recalculated for this permit renewal. In using conservative assumptions, DEQ analyzed the assimilative capacity of the aquifer that is available for the proposed outfall. The derived effluent limitation takes into account any potential cumulative effects and therefore maintains the beneficial uses of all downgradient ground water. The basis for deriving and establishing effluent limitations is further discussed in Appendix B.

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.



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 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, and permit application information.

Table 6. Standard Mixing Zone for Total Nitrogen Discharged from Outfall 001.

Parameter	Units	Value
Receiving water nitrogen concentration (1)	0.15	mg/L
Ground water flow direction (2)	N85W	Bearing
Length of mixing zone (3)	500	Feet
Thickness/depth of mixing zone	15	Feet
Upgradient width of mixing zone (3)	510	Feet
Downgradient width of mixing zone (3)	597	Feet
Cross-sectional area of mixing zone (A) (3)	8,961	Square feet
Hydraulic conductivity (K) (2)	35.3	Feet per day
Hydraulic gradient (I) (2)	0.048	Feet per feet
Volume of ground water available for mixing (Q_{GW})	15,184	Cubic feet per day

(1) 2018 sampling of newly installed MW1.
(2) 2007 Fact Sheet and application material and pump test data.
(3) 2018 application material.

In order 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) and solve for the allowable effluent concentration (**Section 5**).

5.0 PERMIT CONDITIONS

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

Montana's numeric water quality standards are published in Circular DEQ-7. Water quality criteria applicable to this permit are summarized below in **Table 7**. The permit establishes effluent 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 7** provide the basis for the effluent limits.

Table 7. Applicable Ground Water Quality Criteria

Parameter	Human Health Standard	Beneficial Use Support	Nondegradation Criteria
Nitrate plus nitrite (as Nitrogen[N])	10 mg/L	-	-
Total Nitrogen	-	10 mg/L	**7.5 mg/L**
Total Phosphorus	-	-	**>50 year breakthrough**

This discharge permit includes numeric effluent limits that restrict the strength and volume of the discharge. The ground water nonsignificance criteria (**Section 3.4.1**) provide the basis for the WQBEL. DEQ calculates WQBELs by rearranging the mixing zone equation (**Section 4**) and solving for the effluent concentration that satisfies the water quality criteria. DEQ evaluates and recalculates the limits using updated water quality data as part of every permit renewal cycle. In this way, DEQ protects the receiving water quality by continually assessing cumulative impacts to the receiving water.

5.1 TOTAL NITROGEN EFFLUENT LIMIT

The nonsignificance criterion of 7.5 mg/L is the most restrictive of the water quality criteria applicable to this permit; therefore it is the water quality target for the WQBEL. DEQ determined the WQBEL for this discharge by back-calculating the effluent concentration that results in 7.5 mg/L at the end of the down gradient mixing zone, given the available dilution. Available dilution is determined by recent ground water quality sampling of the receiving water. Ambient total nitrogen averaged 0.15 mg/L (**Section 2**). DEQ calculates an effluent limit that protects receiving water quality and beneficial uses according to the following equation:

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

Where:

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

Using the values provided above in **Table 6** and the cumulative effects analysis required by the overlapping mixing zones, the result for C_{lmt} is 39 mg/L. This is the WQBEL expressed as a concentration.

This WQBEL is greater than the DBEL of 24 mg/L. Therefore this permit assigns the more restrictive DBEL. DEQ expresses this limit as an annual load. Load limits are more appropriate for discharges to ground water since the long-term loading is the greater concern in absence of aquatic life considerations. Additionally, load limits inherently control both the strength and volume of the discharge. A discharge of 23,050 gallons per day containing 24 mg/L total nitrogen is equivalent to 4.6 pounds per day. The limit calculations are provided in detail in **Appendix A.**

5.2 TOTAL PHOSPHORUS EFFLUENT LIMIT

A phosphorus breakthrough time of less than 50 years is considered significant. DEQ previously determined (2007) that phosphorous discharged to ground water would reach the surface water (Swan River) in 142 years. DEQ does not assign phosphorus limits for nonsignificant parameters.

5.3 Final Effluent Limits

Based on the information and analyses presented in Sections 2 and 3, pursuant to ARM 17.30.1031, DEQ proposes the following numerical effluent limitation. These limits are presented in **Table 8.**

Table 8.

Proposed Final Effluent Limits – Outfall 001, Kootenai Lodge, MTX000188			
Parameter	**Units**	**Effluent Limitations**	**Rationale**
		Daily Maximum (1)	
Total Nitrogen	lbs/day	4.6	DBEL Load
Footnotes: Beneficial Uses: ARM 17.30.1006 (1) See definition in Part V of permit.			

6.0 MONITORING AND REPORTING REQUIREMENTS

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

6.1 EFFLUENT MONITORING

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

Effluent samples and discharge flow measurements must be representative of the nature and volume of the effluent. The effluent sample location (EFF-001) is located at the dose tank prior to discharge to drainfields 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 before Septic tank #1 as shown in **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** below. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

6.2 Ground Water Monitoring

Ground Water Monitoring has been suspended due to low discharge flows. DEQ may establish monitoring from MW1A in the future when discharge flows increase.

Table 9.

Effluent Monitoring and Reporting Requirements – Outfall 001, Kootenai Lodge MTX000188

Analyte/Measurement/Method	Monitor Location	Units	Sample Type[1]	Minimum Sample Frequency	Reporting Requirements[1][2]	Report Freq
Count of Daily Samples Collected During Reporting Period	EFF-001	-	-	-	Count	Quarterly
Water Level	EFF-001	Feet Below Ground	Instantaneous	1/Quarter		Quarterly
Flow Rate, Effluent[3]	FM-001	gpd	Contin-uous	Contin-uous	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Nitrite+Nitrate (as N)	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Kjeldahl (TKN)(as N)	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total (as N)[4]	EFF-001	lbs/day[5]	Calculate	1/Quarter	Daily Maximum [6] Quarterly Average	Quarterly
Total Suspended Solids	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Chloride	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Conductivity	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Phosphorus, Total (as P)	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
		lbs/day[5]	Calculate	1/Quarter	Quarterly Average[7]	Quarterly
		lbs/year[8]	Calculate	1/Year	Annual Maximum[9]	Annually[10]

Footnotes:
EFF-001: Description provided Section 6.1 and Figure 3.
FM-001: Description provided in Figure 3.
If no discharge occurs through out the reporting period, "no discharge" shall be recorded on the effluent Discharge Monitoring Report (DMR) report forms.
Grab sample will represent concentration for a 24 hour period.
Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR Part 136, unless specified above.
(1) See definitions in Part V of the permit.
(2) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR) form.
(3) Requires recording device or totalizing meter, must be capable of recording daily effluent volume.
(4) Total Nitrogen is the sum of Nitrate + Nitrite and Total Kjeldahl Nitrogen.
(5) Load calculation: lbs/day = (mg/L) x flow (gpd) x [8.34 x 10^{-6}].
(6) Daily Maximum Load calculation: lbs/day = the maximum of all calculated individual daily average loads (lbs/day) recorded during the reporting period.
(7) Quarterly Average Load calculation: lbs/day = the average of all calculated individual daily average loads (lbs/day) recorded during the reporting period.
(8) Annual Load calculation: lbs/year = (mg/L) x flow (gpd) x [8.34 x 10-6] x 365 (days/year).
(9) Annual Load calculation: lbs/year = the total average of all calculated individual daily average loads (lbs/day) recorded during the calendar year, multiplied by 365 (days/year).
(10) Annual maximum load shall be reported (DMR) on an annual basis (due January 28 each year of the permit cycle).

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 June 1, 2020. 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 (MTX000188), 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 – EFFLUENT LIMIT CALCULATIONS

One set of effluent limits will be developed representing effluent discharged to both drainfields. Two standard 500-foot ground water mixing zone will be granted for Outfall 001 [ARM 17.30.505(1)(a)].

The analysis of cumulative effects assumes that the daily flow of 23,050 gpd will be split between the two drainfields. It also assumes that the upgradient mixing zone will totally overlap the down gradient mixing zone and that the nonsignificance standard of 7.5 mg/L must be maintained at the end of the down gradient mixing zone. Two standard mixing zones were used for the modeling. The concentration of the effluent in the DBEL model is 24 mg/L for both drainfields. The concentration of the effluent in the WQBEL model is 39 mg/L for both drainfields.

The 2007 permit and fact sheet considered the cumulative impacts of both drainfields and developed conservative limits using both water quality based effluent limits and technology based effluent limits. A cumulative effects analysis was done for this permit renewal. Cumulative effects were calculated for both WQBELs and DBELs. The DBEL for a Level II treatment system is 24 mg/L or 60% removal of TN. The WQBEL for this system was 39 mg/L TN. This renewal will be using the more restrictive DBEL limit expressed as a load limit. Cumulative effects calculations for WQBEL and DBEL analysis is included in **Appendix B**.

To protect beneficial uses [ARM 17.30.1006(1)(b)(ii)], there shall be no increase of a parameter to a level that renders the waters harmful, detrimental, or injurious to the beneficial uses. Therefore, no wastes may be discharged such that the waste either alone or in combination with other wastes will violate or can reasonably be expected to violate any standard. DEQ establishes the effluent limitations for nitrogen based on the projection that the entire nitrogen load in the wastewater stream may ultimately be converted to nitrate (USEPA, 2002a).

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

Equation 1:

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

Where:

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

The mass-balance equation has been arranged to calculate effluent limits so that the discharge does not cause or contribute to an exceedance of the most restrictive water quality standard. This equation can be applied to any

effluent and receiving water where the applicable dilution ratio is known. This equation will only be used for nitrogen which has been authorized mixing.

A mass-balance approach is used to calculate the effluent quality of the discharge that meets the most restrictive water quality standard at the end of the mixing zone. Numeric effluent limitations are expressed as loads since this type of limitation inherently regulates both volume and strength of the effluent as prescribed by 75-5-402(3), MCA. Load limits ensure compliance with the ground water standards at the end of the mixing zone. Based on the proposed design capacity, the respective load effluent limitation is:

4.6 lbs/day
[(8.34*10-6)* 24 mg/L*23,050 gpd]
as based on the following equation:

Equation 3:

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

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

Appendix B- Cumulative Effects Calculations.

WQBEL vs. DBEL Calculation Sheet

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Comparison of WQBEL and DBEL Effluent Limitations and Cumulative Effects

SITE NAME: Kootenai Lodge MTX000188
COUNTY: Lake
Permit #: MTX000188
NOTES: Water quality based effluent limitations have been developed to maintain all downgradient beneficial uses.
Includes potential cumulative effects with existing domestic downgradient dischargers.
The most restrictive of the developed effluent limitations will be used as the final permit limit.

Source	(K)	(I)	(D)	(L)	(Ng)	(Y)	(W)	(Am)	(Qg)	(Qe)	Nt	(Ne)
	Hydraulic Conductivity (ft/day)	Hydraulic Gradient (ft/ft)	Mixing Zone Thickness (feet)	Mizing Zone Length (feet)	Background Nitrate (mg/L)	Drainfield Width (feet)	Downgradient width of drainfield	Crossectional Area of Mixing Zone (ft^2)	Available Groundwater Flow (ft^3/day)	Effluent Flow (ft^3/day	Nitrate at End of Mixing Zone	Effluent Concentration TN (mg/L)
DBEL Cumulative Effects												
Upper Mixing Zone Outfall 001	35	0.0480	15	500	0.13	512	600	9000	15184	1336.00	2.06	**24.0**
Lower Mixing Zone with Cumulative Effects Outfall 001	35	0.0480	15	500	2.06	512	600	9000	15184	1336.00	**3.83**	24.0
WQBEL Cumulative Effects												
Upper Mixing Zone Outfall 001	35	0.0480	15	500	0.13	512	600	9000	15184	1336.00	3.27	**39.0**
Lower Mixing Zone with Cumulative Effects Outfall 001	35	0.0480	15	500	3.27	512	600	9000	15250	1336.00	**6.15**	39.0

NOTES:
= Water quality based effluent limitation
= Defition Based Effluent Limits

Upper and Lower Mixing Zone Cumulative Effects

	DBEL Upper Drainfield Kootenai Lodge: Upper drainfield using DBEL of 24 mg/L	
	DBEL Calculation for Kootenai Lodge #188, Upper Mixing	
C1	Ambient ground water (background) concentration (mg/L)	0.15
C2	**Discharge concentration (mg/L)**	**24.04**
C3	Lower End of Mixing Zone Concentration, mg/L	2.35
Q1	Ground water volume (ft^3 / day)	15184
Q2	Maximum flow of discharge (design capacity of system in ft^3 / day)	1540
	The volume of ground water that will mix with the discharge (Q_s) is estimated using Darcy's equation: Q1=K I A	
Q1	**Ground water flow volume (ft^3 / day)**	**15184**
K	hydraulic conductivity (ft/day)	35.3
I	hydraulic gradient (ft/ft)	0.0480
A	cross-sectional area (ft^2) of flow at the down-gradient boundary of a standard 500-foot mixing zone.	8961
	Outfall 001 - Kootenai Lodge #188, upper mixing zone, RCM 4/15/20.	

	DBEL Lower Mixing Zone with Cumulative Effects Kootenai Lodge DBEL Discharge,	
	Kootenai Lodge #188, Lower Mixing Zone With Cumulative Effects	
C1	Receiving Water Concentration (mg/L) for Lower Mixing Zone	2.35
C2	**Discharge concentration (mg/L)**	**24.01**
C3	End of Lower Mixing Zone Concentration mg/L (less than 7.5 is nonsignificant).	4.10
Q1	Ground water volume (ft^3 / day)	15184
Q2	Maximum flow of discharge (design capacity of system in ft^3 / day)	1336
	The volume of ground water that will mix with the discharge (Q_s) is estimated using Darcy's equation: Q1=K I A	
Q1	Ground water flow volume (ft^3 / day)	**15184**
K	hydraulic conductivity (ft/day)	35.3
I	hydraulic gradient (ft/ft)	0.0480
A	cross-sectional area (ft^2) of flow at the down-gradient boundary of a standard 500-foot mixing zone.	8961
	(Outfall 001 - Bryant No. 3,02/10/20, RCM)	