DEPARTMENT OF ENVIRONMENTAL QUALITY
MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM

Fact Sheet

Permittee:	TA Operating LLC
Permit No.:	MT0031879
Receiving Water:	Nutting Drain
Facility Information:	
Name:	Laurel Travel Center Wastewater Treatment Facility
Location:	11360 Interstate 90 Frontage Road Laurel MT 59044 Yellowstone County Latitude: 45° 40’ 53” N, Longitude: 108° 42’ 14” W
Facility Contact:	Kelly Gelske Environmental Associate 24601 Center Ridge Rd Westlake OH 44145-5639
Fee Information:	Minor privately owned treatment works
Number of Outfalls:	1
Outfall – Type:	001 – Treated domestic wastewater

I. Permit Status

This is a new permit issued to TA Operating LLC for discharges from a wastewater treatment system for the Laurel Travel Center. The permit application was received by the Montana Department of Environmental Quality (DEQ) on November 20, 2015. DEQ issued a notice of deficiency on December 16, 2015, and the applicant provided an updated application on January 12, 2016. The application was deemed complete on January 13, 2016.

II. Facility Information

A. Facility Description

The site is an existing truck stop, hotel, RV park, antique store and tavern. The site was recently purchased by Travel Centers of America (TA) and is located on approximately 15.3 acres of land in East Laurel. Since TA has taken ownership the tavern and RV park have been closed and/or demolished so all that remains on the property is the travel center, hotel, and antique store.

The travel center contains two public restrooms, pay shower facilities, laundry machines, a trucker lounge, convenience store, and a restaurant. The motel includes 16 units. Domestic wastewater from both of these facilities is treated in an existing activated sludge/aerobic digester wastewater treatment plant and a two cell lagoon. The existing wastewater treatment plant and lagoons were constructed in approximately 1975 (Ryan Casne, personal communication).

Wastewater from the antique store is treated in a septic system and drainfield. This discharge is not addressed in this permit.

The facility collection system consists of 6 inch diameter claytile and PVC sewer lines running from the motel and travel plaza buildings to a collection box or manhole just upstream of the existing treatment plant. The sewer main from the travel plaza flows into a 2,500 gallon grease interceptor prior to the collection box. All sewer lines are gravity flow. The entire collection system is privately owned by TA and serves an estimated total daily population of 532 people. No modifications to the collection system are proposed at this time.

TA proposes to replace the existing wastewater treatment system with a new membrane bioreactor (MBR) treatment system. Disinfection will be provided via ultraviolet (UV) light. The new treatment facility will discharge directly to the Nutting Drain via an effluent diffuser. The two existing lagoon cells will be abandoned.

Table 1 summarizes the design criteria of the proposed treatment system.

Table 1: Current Design Criteria Summary – Laurel Travel Center WWTF	
Facility Description: Membrane Bioreactor (MBR)	
Construction Date: 2016	Modification Date: NA
Design Population (summer/winter): 532	Current Population (summer/winter): 532
Design Flow, Average (mgd): 0.018	Design Flow, Maximum Day (mgd): 0.025
Primary Cells: NA	Secondary Cells: NA
Number Aerated Cells: None	Minimum Detention Time-System (days): Unknown
Design BOD_5 Removal (%): 97.5	Design BOD_5 Load (lb/day): Unknown
Design TSS Removal (%): 96	Design TSS Load (lb/day): Unknown
Collection System: Combined [ ]Separate [X]	Estimated I/I (mgd): Unknown
SSO Events (Y/N): Unknown	Bypass Events (Y/N): Unknown
Disinfection (Y/N): Y	Disinfection Type: UV
Discharge Method: Continuous direct	

B. Effluent Characteristics

Since the proposed MBR WWTF is not yet installed, effluent characteristics shown in Table 2 are estimates provided on the permit application.

Table 2: Outfall 001 Estimated Effluent Characteristics

Parameter	Units	Maximum Value	Average Value
Design Flow	mgd	0.025	0.018
5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	10	5
BOD_5 Percent Removal	%	--	97.5
Total Suspended Solids (TSS)	mg/L	30	10
TSS Percent Removal	%	--	96
Escherichia coli Bacteria	cfu/100 mL	0	0
Nitrogen, total as N	mg/L	--	10
Phosphorus, total as P	mg/L	--	2
Oil and Grease	mg/L		<10

Footnotes:
1. cfu = Colony Forming Units.

The Town of Wolf Creek, Montana is currently using an MBR package plant that is a similar size as the one TA proposes to use at the Laurel Travel Center. This facility treats domestic wastewater from a small community and has an average design flow of 0.016 MGD. Since the Wolf Creek treatment facility also treats domestic wastewater and utilizes similar treatment technology, its effluent characteristics can reasonably be expected to be similar to those at the Laurel Travel Center. Effluent discharge monitoring report (DMR) data for the Wolf Creek WWTF are summarized in Table 3.

Table 3: Town of Wolf Creek WWTF DMR Data

Parameter	Units	30-Day Average	7-Day Average	Maximum Daily	No. of Samples
5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	3.1	5.3	--	13
BOD_5 Percent Removal	%	97.5	--	--	13
Total Suspended Solids (TSS)	mg/L	1.2	1.6	--	13
TSS Percent Removal	%	99	--	--	13
Escherichia coli Bacteria	cfu/100 mL	6.5	--	--	3
pH	s.u.	7.5 (minimum)	7.9 (maximum)		13
Total Ammonia	mg/L	0.08	0.1	--	5
Nitrite plus Nitrate	mg/L	5.2	--	6.5	4
Total Kjeldahl Nitrogen	mg/L	1.1	--	1.2	4
Total Nitrogen	mg/L	6.2	--	6.6	4
Total Phosphorus	mg/L	0.36	--	0.76	4
Copper, total recoverable	mg/L	0.01	--	0.02	5
Lead, total recoverable	mg/L	<0.0005	--	<0.0005	5
Oil and Grease	mg/L	<1	--	<1	5

C. Compliance History

NA

III. Rationale for Proposed Technology-Based Effluent Limits

A. Scope and Authority

Technology-based Effluent Limits (TBELs) represent the minimum level of control that must be imposed by a permit issued under the MDPES program. DEQ must consider technology available to treat wastewater, and effluent limits that can be consistently achieved by that technology. TBELs are based on currently available treatment technologies and allow the permittee discretion to choose applicable controls to meet those standards.

For non-POTWs, TBELs must be based on EPA promulgated effluent limitations guidelines (ELGs) for dischargers by category or subcategory. Where EPA has not promulgated ELGs, TBELs must be developed on a case by case basis, based on the best professional judgement of the permit writer. In developing TBELs on a case by case basis the permit writer shall apply the appropriate factors listed in ARM 17.30.1203(6).

B. TBELs – Concentration-Based Calculations

The Montana Board of Environmental Review (BER) has adopted by reference Title 40 of the Code of Federal Regulations part 133 (40 CFR 133) which defines minimum treatment requirements for secondary treatment for publicly owned treatment works (POTWs) [ARM 17.30.1203(14)(a)]. Secondary treatment is defined in terms of effluent quality as measured by BOD_5, TSS, percent removal of BOD_5 and TSS, and pH.

While the Laurel Travel Center (LTC) WWTF is not a POTW and not specifically subject to secondary treatment requirements, the LTC WWTF is a wastewater treatment facility that will treat similar pollutants, and with similar processes, as POTWs; therefore it is reasonable to impose secondary treatment standards for this facility based on best professional judgement (BPJ). Applying the secondary treatment standards as BPJ TBELs satisfies the requirements of ARM 17.30.1203(6).

C. TBELs

The proposed TBELs for LTC WWTF are presented in Table 4.

Table 4: Technology-based Effluent Limits

Parameter	Units	Average Monthly Limit	Average Weekly Limit
5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	30	45
BOD_5 Percent Removal	%	85 (2)	--
Total Suspended Solids (TSS)	mg/L	30	45
TSS Percent Removal	%	85 (2)	--
pH	s.u.	6.0 – 9.0	

Footnotes:
1. See Definitions section at end of permit for explanation of terms.
2. Minimum

D. Nondegradation Load Allocations

The provisions of ARM 17.30.701 *et seq.* (Nondegradation of Water Quality) apply to new or increased sources of pollution [ARM 17.30.702(17)]. The existing wastewater treatment facility was discharging prior to April 29, 1993, and as such is an existing source not subject to the provisions of ARM 17.30.701 *et seq.*

Because the facility was not previously permitted and the original design flow is unknown, nondegradation load allocations are calculated in this permit based on the proposed treatment system. These allocations define baseline allocated loads for the facility. Any increase above this amount is subject to the provisions of Montana's Nondegradation Policy 75-5-303, Montana Code Annotated (MCA) and ARM 17.30.705 *et seq.*

Baseline loads for BOD_5 and TSS are calculated using the following equation:

Load (lb/day) = Average design flow (mgd) x 30-day average limit (mg/L) x 8.34

BOD_5 and TSS Nondegradation Threshold Load Allocations:

TSS and BOD_5 load = 0.018 x 30 x 8.34 = 4.5 pounds TSS/day and BOD_5/day

IV. Rationale for Proposed Water Quality-Based Effluent Limits (WQBELs)

A. Scope and Authority

Permits are required to include WQBELs when TBELs are not adequate to protect state water quality standards (40 CFR 122.44 and ARM 17.30.1344). ARM 17.30.637(2) states that no wastes may be discharged that can reasonably be expected to violate any state water quality standards. Montana water quality standards (ARM 17.30.601-670) define both water use classifications for all state waters and numeric and narrative standards that protect those designated uses, including compliance with applicable standards in 2012 Circular DEQ-7 (DEQ-7) and 2014 Circular DEQ-12A (DEQ-12A).

B. Receiving Water

The Nutting Drain is classified as B-2 according to Montana Water Use Classifications, ARM 17.30.611(1)(b). Waters classified B-2 are to be maintained suitable for drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply [ARM 17.30.624(1)].

When mixing and dilution are allowed, DEQ uses statistically determined stream flow values during reasonable potential analysis and effluent limit development. The U.S. Geological Survey (USGS) has recently released a draft document which provides updated statistical summaries of stream flow; specifically the 7 day average, 10 year low flow (7Q10) and the seasonal (July – October) 14 day average, 5 year low flow (14Q5) (USGS, 2015-Draft). However, the Nutting Drain is currently an ungaged drainage, and streamflow records are insufficient to calculate a 7Q10 or 14Q5.

In the absence of sufficient data to calculate flows, DEQ shall determine an acceptable stream flow for disposal system design [ARM 17.30.635(2)]. The permit application states, “the Nutting Drain is an irrigation diversion ditch that originates from Big Ditch near the north end of Sixth Avenue within Laurel.” The applicant estimated that the drain had a flow of 6.5 to 8.5 cubic feet per second (cfs) in August of 2015. Anecdotal evidence indicates that the drain flows year round. Nonetheless, there is insufficient information at this time to determine the 7Q10 or 14Q5 flows of the Nutting Drain. As the basis for decisions in this permit, DEQ will use a low flow of zero in the Nutting Drain as stated in Part A.10.d of application form 2-A. The permit will require monitoring and a mixing zone assessment to develop a basis for establishing appropriate low flows and mixing zones in future permit cycles.

The Nutting Drain is located in the upper Yellowstone watershed as identified by the USGS Hydrological Unit Code (HUC) 10070004. The Nutting Drain does not have a Montana assessment unit ID and is not listed as impaired on the 2014 303(d) list. The Nutting Drain discharges into the Yellowstone River approximately 2 miles downstream of the proposed LTC WWTF discharge.

The Yellowstone River in this reach is identified as stream segment MT43F001_011. This segment is not fully supporting aquatic life and primary contact recreation uses. The probable causes of impairment are: chlorophyll-a, oil and grease, substrate and habitat alterations, nitrate plus nitrite, and other unknown causes. A TMDL is pending for this reach of the Yellowstone River.

Limited ambient data for the Nutting Drain upstream of the proposed discharge were submitted by the applicant. The results are presented in Table 5.

Table 5. Nutting Drain Ambient Data			
Parameter	Units	Result	Number of Samples
Ammonia	mg/L	<0.05	1
Nitrate + Nitrite	mg/L	1.19	1
Total Kjeldahl Nitrogen	mg/L	<0.5	1
Nitrogen, total as N	mg/L	1.20	1
Phosphorus, total as P	mg/L	0.07	1
5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	<4	1
Total Suspended Solids (TSS)	mg/L	17	1
Oil and Grease	mg/L	<1	1

C. Applicable Water Quality Standards

Discharges to surface waters classified B-2 are subject to the specific water quality standards of ARM 17.30.624, Circular DEQ-7, and Circular DEQ 12-A, as well as the general provision of ARM 17.30.635 through 637. Dischargers are also subject to ARM 17.30 Subchapter 5 (Mixing Zones) and Subchapter 7 (Nondegradation of Water Quality).

D. Mixing Zone

A mixing zone is an area where the effluent mixes with the receiving water and certain water quality standards may be exceeded [ARM 17.30.502(6)]. A mixing zone must be of the smallest practicable size, have a minimum effect on water uses, and have definable boundaries [75-5-301(4), MCA]. Acute standards for any parameter may not be exceeded in any portion of the mixing zone unless the DEQ specifically finds that allowing minimal initial dilution will not threaten or impair existing beneficial uses [ARM 17.30.507(1)(b)].

DEQ must determine the applicability of a mixing zone [ARM 17.30.505(1)]. Any previously allowed mixing zone will remain designated in a renewed permit, unless there is evidence that the previously allowed mixing zone will impair existing or anticipated uses [ARM 17.30.505(1)(c)].

No mixing zone will be granted that will impair beneficial uses [ARM 17.30.506(1)]. Aquatic life-chronic, aquatic life-acute, human health, and nutrient standards may not be exceeded outside of the mixing zone [ARM 17.30.507(1)(a)].

The discharge must also comply with the general prohibitions of ARM 17.30.637(1) which require that state waters, including mixing zones, must be free from substances which will:

- settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines;
- create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials;
- produce odors, colors or other conditions as to which create a nuisance or render undesirable tastes to fish flesh or make fish inedible;
- create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or aquatic life; and
- create conditions which produce undesirable aquatic life.

A permittee can request a source specific mixing zone and such mixing zone will only be granted by DEQ if the permittee demonstrates that it will be compliant with the requirements of ARM 17.30.506 and 17.30.507 and the provisions of 75-5-303 MCA.

A standard mixing zone may be granted for facilities which discharge less than one mgd or when mixing is nearly instantaneous [ARM 17.30.516(1)(d)]. Nearly instantaneous mixing is assumed if the discharge is through an effluent diffuser, when the mean daily flow exceeds the 7Q10 (dilution ratio <1) or the permittee demonstrates through a DEQ approved study plan that the discharge is nearly instantaneous. A nearly instantaneous mixing zone may not extend downstream more than two (2) stream widths. Effluent discharges which do not qualify for a standard mixing zone must apply for a source specific mixing zone in accordance with ARM 17.30.518 and must conform to the requirements of 75-5-301(4), MCA which states that mixing zones must be the smallest practicable size; have minimal effects on uses; and, have definable boundaries. ARM 17.30.515(2) states that a person applying for a mixing zone must indicate the type of mixing zone and provide sufficient detail for DEQ to make a determination regarding the authorization of the mixing zone under the rules of Subchapter 5.

Facilities that discharge a mean annual flow of less than 1 mgd to a stream segment with a dilution ratio less than 100:1 qualify for a standard mixing zone with 25% of the 7Q10.

The length of a mixing zone must not extend downstream more than one-half mixing width distance or ten times the stream width [ARM 17. 30.516(4)].

DEQ may also determine that an alternative mixing zone is appropriate [ARM 17.30.516(1)(d)]. DEQ frequently grants an alternative mixing zone for non-persistent parameters like ammonia that exhibit first order decay in the receiving water. A typical alternative mixing zone consists of dilution with some fraction of the 7Q10 flow of the receiving water. The amount of the 7Q10 allowed for dilution is dependent on the size of the discharge relative to the receiving water flow and the relevant factors listed in ARM 17.30.506.

As previously stated, given the lack of available flow and other relevant information, DEQ is not granting a mixing zone in this permit. The permit will provide the permittee the opportunity to provide data to determine the 7Q10 and 14Q5 flow, collect the information required by ARM 17.30.506, and present it for consideration in future permit iterations or a request for a permit modification may be submitted during the term of the permit.

E. Basis for Proposed WQBELs

Permits are required to include WQBELs when technology-based effluent limits are not adequate to protect water quality standards, and no wastes may be discharged that can reasonably be expected to violate any standard. The need for WQBELs is determined based on a reasonable potential (RP) analysis for certain pollutants to determine if numeric or narrative water quality standards may be exceeded.

DEQ uses a mass-balance equation (Equation 1) to determine RP and develop WQBELs for toxic parameters based on the U.S. Environmental Protection Agency (EPA) Technical Support Document for Water Quality-based Toxics Control (TSD) (EPA/505/2-90-001) and DEQ-7. Equation 1 is used to determine the concentration of a pollutant of concern after accounting for other sources of pollution in the receiving water and any dilution provided by a mixing zone.

$$Q_rC_r = Q_sC_s + Q_dC_d \text{ (Equation 1)}$$

Where:

Q_s	=	receiving water low flow rate above point of discharge (mgd)
C_s	=	upstream receiving water pollutant concentration (mg/L)
Q_d	=	effluent flow rate (mgd)
C_d	=	critical effluent pollutant concentration (mg/L)
Q_r	=	receiving water flow rate after discharge (Qr = Qs + Qd; mgd)
C_r	=	receiving water pollutant concentration (after dilution; mg/L)

Pollutants typically present in effluent from facilities treating domestic sewage include conventional pollutants such as BOD_5, TSS, pH, oil and grease, and *E. coli* bacteria; and non-conventional pollutants such as low dissolved oxygen (DO), total residual chlorine (TRC), nitrate/nitrite, nutrients, and total ammonia.

Also, no wastes may be discharged and no activities conducted such that the wastes or activities, either alone or in combination with other wastes or activities, will violate, or can reasonably be expected to violate, any water quality standards [ARM 17.30.637(2)].

RP analysis derives Equation 2 from Equation 1 to determine the receiving water pollutant concentration (C_r). C_r is compared to water quality standards to determine if numeric or narrative water quality standards are exceeded for human health and acute and chronic aquatic life standards.

$$C_r = [C_dQ_d + C_sQ_s] / [Q_s + Q_d] \text{ (Equation 2)}$$

Equation 2 Rationale:

$Q_rC_r = Q_sC_s + Q_dC_d$ (Equation 1)
$C_r = [C_dQ_d + C_sQ_s] / Q_r$
Note: $Q_r = Q_s + Q_d$

When the upstream receiving water flow rate is zero, then Equation 2 simplifies to:

$$C_r = C_d$$

Thus, when no mixing or dilution in the receiving water is available and the critical effluent concentration exceeds the water quality standard, RP exists and limits are developed based on achieving the water quality standard at the point of discharge.

RP calculations are shown in Appendix 1. Pollutants of concern are discussed below.

1. Conventional Pollutants

BOD_5 and TSS – The proposed treatment system will provide significant reduction in biological material and solids through the application of BPJ TBELs based on secondary treatment standards as addressed in Section III. These limits are sufficient to protect water quality and no additional WQBELs are necessary for these parameters.

Oil and Grease – The permit application indicates oil and grease concentrations are expected to be less than the water quality standard after treatment. However, given the nature of the facility and the possibility for elevated oil and grease from the restaurant, DEQ finds reasonable potential for oil and grease in the discharge. Water quality standards prohibit discharges that create a visible oil sheen, globules of grease or other floating materials, or oil and grease to be present in concentrations at or in excess of 10 mg/L [ARM 17.30.637(1)(b)]. Therefore, a daily maximum effluent limit requiring oil and grease concentrations less than 10 mg/L is included in the permit, and monthly monitoring is required.

Escherichia coli* (*E. coli*) –E. coli* is a parameter of concern at facilities treating domestic sewage. To protect human health, DEQ imposes WQBELs based on achieving the standard at the point of discharge at all such facilities. The standards applicable to the receiving surface water are:

a. April 1 through October 31, of each year, the geometric mean number of the microbial species *E. coli* must not exceed 126 colony

forming units (cfu) per 100 milliliters (ml), nor are 10% of the total samples during any 30-day period to exceed 252 cfu per 100 ml [ARM 17.30.623(2)(a)(i)]; and

b. November 1 through March 31, of each year, the geometric mean number of *E. coli* organisms should not exceed 630 cfu per 100 ml and 10% of the samples during any 30-day period may not exceed 1,260 cfu per 100 ml [ARM 17.30.623(2)(a)(ii)].

This permit incorporates the above water quality standards as average monthly and average weekly effluent limits, reported as geometric means when more than one sample is collected during the applicable period.

2. Non-conventional Pollutants

Dissolved Oxygen (DO) –Typically, facilities that provide significant removal of organic material, as measured by BOD_5, do not require effluent limits for DO. In addition, the Nutting Drain is not listed as impaired for DO. No limits or monitoring for DO are required in this permit.

Total Residual Chlorine (TRC) – The proposed facility will not utilize chlorine in the treatment process. Therefore, neither limits nor monitoring for TRC are required in this permit.

Nitrate + Nitrite, as N – The human health water quality standard is 10 mg/L. Estimated nitrate plus nitrite concentrations were not provided with the permit application. Reasonable potential was determined using effluent data from the Wolf Creek WWTF shown in Table 3. Based on this data DEQ finds the facility has reasonable potential to exceed the human health standard. WQBELs are shown in Table 7. The RP analysis and WQBEL calculations are shown in Appendix 1 and Appendix 2. Monitoring of both the effluent and the receiving water is required in the permit.

The permittee proposes to install an effluent diffuser in the receiving water, and DEQ proposes to require instream flow monitoring as a condition of this permit. If the permittee provides flow information sufficient to determine the required low flow values, then an instantaneous mixing zone may be granted when a properly designed diffuser is installed. If a mixing zone is granted, the RP analysis and effluent limits will be reassessed in the next permit renewal or modification.

Nitrogen, total as N –The Department Circular DEQ-12A base numeric nutrient standard for total nitrogen in the Nutting Drain is 1.3 mg/L (Level IV ecoregion 43n – Montana Central Grasslands). Given the lack of available

mixing in this permit cycle, both the projected effluent quality provided in the permit application and data shown in Table 3 exceed the water quality standard and a WQBEL for total nitrogen is necessary. WQBEL development methods and calculations are shown in Appendix 2. The final WQBEL for total nitrogen is 1.3 mg/L as an average monthly limit (AML). The corresponding final load limit is 0.2 lb/day. These limits apply from July 1 through September 30, and are shown in Table 7 below.

DEQ has adopted a statewide water quality standard variance process for nutrients which is found in Department Circular DEQ-12B (DEQ-12B). A nutrient standard variance is not subject to the requirements of ARM 17.30.1322(13-14). A nutrient variance is granted when the facility cannot achieve the water quality-based effluent limits that are calculated using the numeric criteria. Variance-based limits replace the calculated WQBELs and are in effect for 20 years from the adoption of the base numeric criteria. Variances are subject to periodic review and variance-based limits are re-evaluated and adjusted as necessary.

The applicant requested a nutrient standards variance in the permit application. Given that the WQBELs calculated above are not achievable by the facility, a variance is appropriate. As a discharger proposing to discharge less than 1 MGD from a treatment system that is not a lagoon, the applicable variance for total nitrogen is 15 mg/L. Lacking any effluent data with which to consider effluent variability, DEQ is applying 15 mg/L as the variance limit. The AML in the permit is expressed as the load corresponding to this effluent concentration and is 2.25 lb/day. This limit applies from July 1 through September 30. This limit replaces the WQBEL above (shown in Table 7) and is the final effluent limit in the permit.

In granting a variance, DEQ-12B requires the permittee to conduct a Wastewater Facility Optimization Study. This requirement is included in the permit as a Special Condition.

Phosphorus, total as P – The Department Circular DEQ-12A base numeric nutrient standard for total phosphorus in the Nutting Drain is 0.15 mg/L (Level IV ecoregion 43n – Montana Central Grasslands). Given the lack of available mixing in this permit cycle, both the projected effluent quality provided in the permit application and data shown in Table 3 exceed the water quality standard and a WQBEL for total phosphorus is necessary. WQBEL development methods and calculations are shown in Appendix 2. The final WQBEL for total phosphorus is 0.15 mg/L as an average monthly limit (AML). The corresponding final load limit is 0.02 lb/day. These limits apply from July 1 through September 30.

DEQ has adopted a statewide water quality standard variance process for nutrients which is found in Department Circular DEQ-12B (DEQ-12B). A nutrient standard variance is not subject to the requirements of ARM 17.30.1322(13-14). A nutrient variance is granted when the facility cannot achieve the water quality-based effluent limits that are calculated using the numeric criteria. Variance-based limits replace the calculated WQBELs and are in effect for 20 years from the adoption of the base numeric criteria. Variances are subject to periodic review and variance-based limits are re-evaluated and adjusted as necessary.

The applicant requested a nutrient standards variance in the permit application. Given that the WQBELs calculated above are not achievable by the facility, a variance is appropriate. As a discharger proposing to discharge less than 1 MGD from treatment system that is not a lagoon, the applicable variance for total phosphorus is 2 mg/L. Lacking any effluent data with which to consider effluent variability, DEQ is applying 2 mg/L as the variance limit. The AML in the permit is expressed as the load corresponding to this effluent concentration and is 0.3 lb/day. This limit applies from July 1 through September 30. This limit replaces the WQBEL above and is the final effluent limit in the permit (shown in Table 6).

In granting a variance, DEQ-12B requires the permittee to conduct a Wastewater Facility Optimization Study. This requirement is included in the permit as a Special Condition.

Total Ammonia, as N – Water quality standards for ammonia are based on receiving water temperature and pH, the presence or absence of salmonid fishes, and the presence or absence of fish in early life stages. Water temperature and pH data for the Nutting Drain are not available. Chronic ammonia standards in Montana typically range from 0.765 mg/L to 5.9 mg/L. Acute standards are usually between 3.2 mg/L and 36 mg/L when salmonids are absent, as is likely the case in the Nutting Drain. The permit application did not include an estimated ammonia concentration for the proposed treatment facility. Reasonable potential to exceed the standard cannot be determined at this time. However, the data in Table 3, from a similar facility utilizing an MBR indicates that ammonia concentrations may be well below all of the possible water quality standards shown above. Therefore, DEQ is not proposing WQBEL for ammonia in this permit cycle. The permit requires monitoring of total ammonia in both the effluent and the receiving water, as well as monitoring for pH and temperature in the receiving water. Reasonable potential will be determined at the next permit renewal.

Whole Effluent Toxicity (WET) – The proposed facility is a small wastewater treatment system discharging less than 0.1 mgd. The project is not

an industry listed in 40 CFR 122 Appendix A and the facility will not receive discharge from significant industrial users subject to pretreatment requirements. WET testing is not required.

Table 6: Outfall 001 Proposed WQBELs(1)

Parameter	Units	Average Monthly	Average Weekly	Maximum Daily
Escherichia coli Bacteria, April- October	cfu/100 mL	126(2)	252	--
Escherichia coli Bacteria, November - March	cfu/100 mL	630(2)	1,260	--
Oil and Grease	mg/L	--	--	10
Nitrate plus Nitrite	mg/L	10	--	10
Nitrogen, total as N (3)	mg/L	1.3	--	--
	lb/day	0.2	--	--
Phosphorus, total as P (3)	mg/L	0.15	--	--
	lb/day	0.02	--	--

Footnotes:
1. See Definition section at end of permit for explanation of terms.
2. Report Geometric Mean if more than one sample is collected in the reporting period.
3. Effective July 1 through September 30.

V. Final Effluent Limits

Outfall 001 – Beginning on the effective date of this permit and lasting through the term of the permit, the discharge from Outfall 001 shall, at a minimum, meet the effluent limits presented in Table 7.

Table 7: Outfall 001 Final Effluent Limits[1]				
Parameter	Units	Average Monthly	Average Weekly	Maximum Daily
5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	30	45	--
	lb/day	4.5	--	--
BOD_5 Percent Removal	%	85 [2]		
Total Suspended Solids (TSS)	mg/L	30	45	--
	lb/day	4.5	--	--
TSS Percent Removal	%	85 [2]		
pH	s.u.	6.0 – 9.0		
Escherichia coli Bacteria [3, 4]	cfu/ 100 mL	126	252	--
Escherichia coli Bacteria [3, 5]	cfu/ 100 mL	630	1,260	--
Oil and Grease[6]	mg/L	--	--	10
Nitrate plus Nitrate, as N	mg/L	10	--	10
Nitrogen, total as N [7]	lb/day	2.25	--	--
Phosphorus, total as P [7]	lb/day	0.30	--	--

Footnotes:
1. See Definition section at end of permit for explanation of terms.
2. Minimum
3. Report the Geometric Mean if mor than one sample is collected in the reporting period.
4. This limit applies during the period April 1 through October 31.
5. This limit applies during the period November 1 through March 31.
6. Use EPA Method 1664, Revision A: N-Hexane Extractable Material (HEM).
7. Effective July 1 through September 30.

VI. Monitoring Requirements

All analytical procedures must comply with the specifications of 40 CFR Part 136 and the analysis must meet any RRVs listed in Circular DEQ-7 unless otherwise specified.

Samples shall be collected, preserved and analyzed in accordance with approved procedures listed in 40 CFR 136. Monitoring of the effluent must be representative of the volume and nature of the discharge. Monitoring location for influent must be after the last sewer connection and before discharge into the treatment facility. Monitoring and effluent limitations for Outfall 001 apply at the outlet pipe after all treatment processes and prior to discharge into the Nutting Drain. Effluent and influent monitoring requirements are presented in Table 8.

Monitoring results must be reported within a Discharge Monitoring Report (DMR). Monitoring results must be submitted electronically (NetDMR web-based application) no later than the 28th day of the month following the end of the

monitoring period. If no discharge occurs during the entire reporting period, "No Discharge" must be reported within the respective DMR.

Table 8: Outfall 001 Monitoring Requirements

Parameter	Units	Sample Location	Minimum Sample Frequency	Sample Type[1]	Reporting Requirements
Effluent Flow	mgd	Effluent	1/Week	Instantaneous	Max Daily & Monthly Average
5-Day Biochemical Oxygen Demand (BOD_5)	mgL	Influent	1/Month	Grab	Monthly Average
	mg/L	Effluent	1/Month	Composite	Weekly & Monthly Average
	lb/day	NA	1/Month	Calculated	Monthly Average
BOD_5 Percent Removal	%	NA	1/Month	Calculated	Monthly Average
Total Suspended Solids (TSS)	mg/L	Influent	1/Month	Grab	Monthly Average
	mg/L	Effluent	1/Month	Composite	Weekly & Monthly Average
	lb/day	NA	1/Month	Calculated	Monthly Average
TSS Percent Removal	%	NA	1/Month	Calculated	Monthly Average
pH	s.u.	Effluent	1/Week	Instantaneous	Monthly Max & Min
Escherichia coli Bacteria[2]	cfu/ 100 ml	Effluent	1/Month	Grab	Weekly & Monthly Average
Oil and Grease[3]	mg/L	Effluent	1/Month	Grab	Max Daily
Total Ammonia, as N	mg/L	Effluent	1/Month	Composite	Weekly & Monthly Average
Nitrate + Nitrite, as N	mg/L	Effluent	1/Month	Composite	Average Monthly & Daily Maximum
Total Kjeldahl Nitrogen, as N	mg/L	Effluent	1/Month[4]	Composite	Average Monthly
Total Nitrogen, as N[5]	mg/L	NA	1/Month[4]	Calculated	Average Monthly
	lb/day	NA	1/Month[4]	Calculated	
Total Phosphorus, as P	mg/L	Effluent	1/Month[4]	Composite	Average Monthly
	lb/day	NA	1/Month[4]	Calculated	

Footnotes:
NA = Not applicable. No required reporting limit.
cfu = colony forming unit.
1. See Definition section at end of permit for explanation of terms.
2. Report Geometric Mean if more than one sample is collected in the reporting period.
3. Use EPA Method 1664, Revision A: N-Hexane Extractable Material (HEM).
4. Nutrient monitoring only required monthly from July 1 – September 30.
5. Calculated as the sum of Nitrate + Nitrite (as N) and Total Kjeldahl Nitrogen concentrations.

VII. Special Conditions

Facility Optimization Study

Facilities that receive a nutrient variance must evaluate current facility operations to optimize nutrient reduction with existing infrastructure and analyze other cost-effective methods of nutrient load reductions. DEQ-12B allows for flexibility regarding the scope and content of the study but requires that the optimization study includes, but is not limited to, an assessment of nutrient trading feasibility within the watershed without substantial investment in new infrastructure. DEQ may request the permittee provide the results of the optimization study/nutrient reduction analysis within two years of receiving the variance.

This permit requires the completion of an optimization study/nutrient reduction analysis including an assessment of trading with a two year compliance schedule, as summarized in Table 9 below.

Table 9: Compliance Schedule

Action	Frequency	Scheduled Completion Date of Action(1)	Report Due Date(2)
Complete a Facility Optimization Study	Single Event	No Later than Two Years from the Effective Date of the Permit	NA
Submit Notification that the Facility Optimization Study is Complete	Single Event	No Later than Two Years from the Effective Date of the Permit	The 28th of the Following Month Two Years from the Effective Date of the Permit

Footnotes:
NA = Not Applicable
1. The actions must be completed on or before the scheduled completion dates.
2. This notification must be postmarked or electronically submitted to DEQ on or before the scheduled due date.

DEQ-12B encourages optimization studies include, but not be limited to, facility operations and maintenance, reuse, recharge, and land application. However, DEQ-12B clarifies that the changes to facility operations resulting from the analysis carried out are only intended to be refinements to the wastewater treatment system already in place, addressing changes to facility operation and maintenance. Optimizations are not intended to include changes to the facility resulting in structural modification, user rate increases, or substantial capital investment.

Instream Monitoring

The following monitoring requirements apply to the Nutting Drain. The monitoring location must be upstream of, and uninfluenced by, the discharge. The monitoring location must be marked and used consistently. Monitoring results must be submitted electronically (NetDMR web-based application) no later than the 28th day of the month following the end of the monitoring period.

Table 10: Instream Monitoring Requirements in Nutting Drain

Parameter	Units	Sample Location	Minimum Sample Frequency	Sample Type(1)	Reporting Requirements
Flow	mgd	Upstream	1/Month	Estimate	Report Only
pH	s.u.	Upstream	1/Month	Instantaneous	Report Only
Temperature	° C	Upstream	1/Month	Instantaneous	Report Only
Total Ammonia, as N	mg/L	Upstream	1/Month	Composite	Report Only
Nitrate + Nitrite, as N	mg/L	Upstream	1/Month	Composite	Report Only
Total Kjeldahl Nitrogen, as N	mg/L	Upstream	1/Month(2)	Composite	Report Only
Total Nitrogen, as N(3)	mg/L	Upstream	1/Month(2)	Calculated	Report Only
Total Phosphorus, as P	mg/L	Upstream	1/Month(2)	Composite	Report Only

Footnotes:
1. See Definition section at end of permit for explanation of terms.
2. Nutrient monitoring only required monthly from July 1 – September 30.
3. Calculated as the sum of Nitrate + Nitrite (as N) and Total Kjeldahl Nitrogen concentrations.

VIII. Nonsignificance Determination

The facility is not a new or increased source as defined in ARM 17.30.702(17), and is therefore not subject to a nonsignificance determination (ARM 17.30.715).

IX. Information Sources

Administrative Rules of Montana Title 17 Chapter 30 - Water Quality
- Subchapter 2 – Permit Application, Degradation Authorization, and Annual 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 12 – MPDES-Effluent Limitations and Standards, Standards of Performance, and Treatment Requirements.

Subchapter 13 – MPDES Permits.

Montana Code Annotated (MCA), Title 75-5-101 *et seq*., "Montana Water Quality Act"

Montana Department of Environmental Quality. Circular DEQ-7: Montana Numeric Water Quality Standards, October 2012.

Montana Department of Environmental Quality. Circular DEQ-12A: Montana Base Numeric Nutrient Standards. July 2014.

Montana Department of Environmental Quality. Circular DEQ-12B: Nutrient Standards Variance. July 2014.

US EPA *Technical Support Document for Water Quality-Based Toxics Control*, EPA/505/2-30-001, March 1991.

US EPA NPDES Permit Writers' Manual, EPA 833-K-10-001, September 2010.

Appendix 1. Critical Pollutant Concentration and Reasonable Potential Analysis

Critical Pollutant Concentration						
Parameter	Units	Maximum[1]	Number of Samples (n)	Coefficient of Variation (CV)	TSD Multiplier	Critical Effluent Concentration (C_d)[2]
Ammonia, total as N	mg/L	0.1	5	0.6	2.3	0.23
Nitrate + Nitrite, as N	mg/L	6.5	4	0.6	2.6	13
Nitrogen, total as N	mg/L	10	1[3]	0.6	6.2	62
Nitrogen, total as N	mg/L	6.2	4	0.6	2.6	16.1
Phosphorus, total as P	mg/L	2	1[3]	0.6	6.2	12.4
Phosphorus, total as P	mg/L	0.36	4	0.6	2.6	0.9

Footnotes:
1. Value reported on application or taken from data for Wolf Creek WWTF.
2. C_d determined using standard procedures as defined by the TSD.
3. Estimate only. No samples collected

Reasonable Potential Analysis

Parameter	Units	Water Quality Standard			Critical Effluent Conc. (C_d)[1]	Critical Background Receiving Water Conc. (C_s)	Acute Dilution Flow (cfs)	Chronic Dilution Flow (cfs)	Projected Receiving Water Conc. Acute (C_r)	Projected Receiving Water Conc. Chronic (C_r)	RP
		Acute	Chronic	Human Health							
Ammonia	mg/L	3.2	0.765	--	0.23	<0.05	0	0	0.23	0.23	No [2]
Nitrate + Nitrite	mg/L	--	--	10	13	1.19	0	0	13	13	Yes
Nitrogen, total as N	mg/L	--	1.3	--	16.1	1.2	--	0	--	16.1	Yes
Phosphorus, total as P	mg/L	--	0.15	--	0.9	0.07	--	0	--	0.9	Yes

Footnotes:
1. C_d determined using standard procedures as defined by the TSD.
2. Estimated

Appendix 2. WQBELs Calculations

Acute and Chronic Waste Load Allocations

The amount of pollutant in the discharge that the receiving water can assimilate and not exceed the applicable water quality standard is referred to as the waste load allocation (WLA). A WLA is not a WQBEL. The WLA is the basis for calculating effluent limitations that protect aquatic life and human health from both acute and chronic effects.

The development of a WLA follows the federal guidance procedures (EPA, 1984; EPA, 1986; EPA, 1991), the Surface Water Quality Standards and Procedures (ARM 17.30.601 et seq.) and DEQ-7 and DEQ-12A.

Equation 3 can be used to calculate WLAs for the same point source discharge and pollutants of concern. Equation 3 is derived directly from Equation 1 to determine the effluent pollutant concentration. C_r will be equal to the applicable water quality standard as listed in DEQ-7 to determine the maximum allowable concentration of pollutants of concern in the effluent. The WLA calculation will take into account all applicable water quality standards, regulations, and implementation policies, such as dilution and mixing zone policies. A separate WLA will be calculated for each pollutant of concern with reasonable potential for each applicable numeric standard or numeric interpretation of a narrative standard.

$WLA = C_d = [Q_rC_r-Q_sC_s] / Q_d$ (Equation 3)

C_r = Water quality standard
Q_r = Flow in the receiving water downstream of the discharge
C_d = Maximum allowable effluent concentration in the discharge
C_s = Instream concentration of POC upstream of the discharge
Q_s = Applicable low flow available for dilution or mixing (upstream of discharge)
Q_d = Design flow of discharge

Equation 3 Rationale:

$Q_rC_r = Q_sC_s + Q_dC_d$ (Equation 1)
$Q_dC_d = Q_rC_r - Q_sC_s$
$C_d = [Q_rC_r-Q_sC_s] / Q_d$
Note: $Q_r = Q_s + Q_d$

When dilution is not available for a given parameter, then the WLA is set equal to the water quality standard:

$WLA = C_d = C_r$

For toxic parameters, WLAs are characterized as a level of effluent quality that can never be exceeded. However, for nutrients, WLAs represent the *average* level of effluent quality that cannot be exceeded. The LTA is a back calculation of the WLA based on water quality standards and is calculated by multiplying the WLA by the TSD WLA multiplier. The WLA multiplier is a

statistically-based factor derived from the ratio of the WLA, set at a specific percentile value, to the LTA. The value of the multiplier varies depending on the coefficient of variation (CV) of the data set (calculated from the permittee's DMRs or assumed according to TSD standards as 0.6), the percentile value for the WLA (e.g., 99th percentile), and whether the WLA is based on an acute (1-hour average) or chronic (typically, 4-day average) water quality standard.

DEQ sets the WLA at the 99th percentile (95th percentile for nutrients) on the lognormal distribution and uses *Equation 4* to determine the LTA for each pollutant of concern. The EPA's TSD procedures provide reference Table 5-1 for the WLA multipliers.

LTA=WLA x WLA multiplier (Equation 4)

The acute and chronic LTAs for a pollutant of concern may be directly compared to each other to select the most protective of aquatic life. Both WLAs are ensured to be met with the selection of the most protective LTA (attains both acute and chronic criteria) and sets one basis for facility performance. Only one LTA is calculated for nutrients, which is considered a chronic value.

The process of deriving permit limits for toxic parameters must consider effluent variability with the assumptions that effluent discharge is continuous and the WLA value will never be exceeded. The lowest LTAs are used to calculate a Maximum Daily Limit (MDL) and Average Monthly Limit (AML). Both MDL and AML are calculated from Equation 5a and Equation 5b. The TSD provides reference Table 5-2 for the LTA multipliers that are based on a lognormal distribution and reflect a statistical relationship (MDL-99th percentile occurrence probability; AML-95th percentile occurrence probability). The EPA's TSD verifies this method of deriving permit limits as protective of aquatic life because the MDL and AML consider effluent variability. The MDL and AML are proposed as the final effluent limits.

MDL=LTA x MDL Multiplier (Equation 5a)

AML=LTA x AML Multiplier (Equation 5b)

For human health parameters, the AML is set equal to the WLA. Because human health standards are expressed as a concentration that may not be exceeded in the receiving water (DEQ-7 footnote 16), the MDL is also set equal to the WLA.

A requirement of the DEQ 12-B general variance is that nutrient limits be expressed only as a monthly average mass-based load. Therefore, no Maximum Daily Limit (MDL) is calculated for nutrients and the AML is converted to a mass-based value using the facility's design flow and a conversion factor. Proposed WQBELs are presented in the table below.

Parameter	Units	Acute Wasteload Allocation	Chronic/HH Wasteload Allocation	Coefficient of Variation (CV)	Acute Long Term Average	Chronic/HH Long Term Average	Minimum Long Term Average	AML Multiplier	AML	MDL
Nitrite plus nitrate	mg/L	--	10	0.6	--	--	--	--	10 (1)	10 (1)
Nitrogen, total as N	mg/L	--	1.3	0.6	--	0.84	0.84	1.55	1.3 (2)	--
Phosphorus, total as P	mg/L	--	0.15	0.6	--	0.1	0.1	1.55	0.15 (2)	--

Footnotes:
1. For human health limits the final AML and MDL are set equal to WLA.
2. These limits are based on the base numeric criteria and apply at the end of the variance period, subject to revision on receipt of new information regarding the receiving water and potential mixing.

For facilities covered under the general variance for nutrients (DEQ-12B), nutrient limits are expressed as a monthly average, mass-based limit. Mass-based calculations are shown below.

AML Mass-based limit (lb/day) = Design Flow mgd) x Final AML (mg/L) x Conversion Factor (8.34)

Nitrogen, total as N:

AML Limit = 0.018 mgd x 15 mg/L x 8.34 = 2.25 lb/day

Phosphorus, total as P:

AML Limit = 0.018 mgd x 2 mg/L x 8.34 = 0.3 lb/day