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)

Applicant:	Robert Alexander
Permit Number:	MTX000212
Facility Name:	Red Dog Ranch Subdivision Community Public Sewer System (CPSS)
Facility Location:	Corner of Frontage Road and Roman Creek Road SW1/4 of Section 27 and NW1/4 of Section 34, Township 15 North, Range 21 West; Latitude 47.02222, Longitude -114.24833; Missoula County
Facility Address:	P.O Box 376, Frenchtown, MT 59834
Facility Contact:	Robert Alexander
Receiving Water:	Class 1 Ground Water
Number of Outfalls:	1
Outfall/Type:	001 – Subsurface Drainfield – Domestic Wastewater

I. PERMIT STATUS

The following fact sheet outlines the basis for renewing the Montana Ground Water Pollution Control (MGWPCS) wastewater discharge permit to Robert Alexander (applicant) for the Red Dog Ranch Subdivision (Red Dog) Community Public Sewer System (CPSS); located near Frenchtown, MT. The MGWPCS permit application and supplemental materials provide the information that serves as the basis for the development of the effluent limits and the monitoring requirements outlined within this fact sheet. The scope of this permitting action is for the construction, operation, and maintenance of the wastewater treatment and disposal system.

This is a renewal and a modification of the existing MGWPCS Permit MTX000212 for Red Dog CPSS. The Red Dog CPSS was authorized by the April 1, 2010 permit to discharge from its subsurface drainfield into Class 1 ground water. Robert Alexander has been the permittee and the facility contact.

A. Application Information

Robert Alexander continues to be the permitee and the facility contact. On September 8, 2014, the Montana Department of Environmental Quality (DEQ) received a MGWPCS permit application from Territorial Landworks, Inc., the firm working on Robert Alexander's behalf, for the renewal of the Red Dog wastewater discharge permit pursuant to ARM 17.30.1023(3) and (4). The permit fee of $1,500 accompanied the permit renewal application. On September 15, 2014, the DEQ deemed the permit renewal application complete.

B. Permit Changes

The applicant's engineer requested that for the current permit renewal the requirement for monitoring well installation be removed. This request is based on the rationale that at this time the wastewater treatment system has not been built; and no residences are connected.

II. FACILITY INFORMATION

A. Facility Location

Red Dog Ranch Subdivision is located northwest of Frenchtown, MT, at the corner of Frontage Road and Roman Creek Road, just west of the Frenchtown High School (Figure1). The legal location for the wastewater treatment system is SW1/4 of Section 27 and NW1/4 of Section 34, Township 15 North, Range 21 West. All proposed infrastructure for the Red Dog CPSS is reported as being located south of the Roman Creek - Touchette Lane Special Management Area (SMA). Additional information for the SMA is located in Section II.B.

B. Facility and Operations

Red Dog CPSS will service a proposed subdivision that will include 82 single-family residences, eight (8) multi-family residences on one (1) lot, and one (1) commercial lot. The commercial lot will be limited to neighborhood commercial uses such as retail food, general merchandise, personal service, or hardware. Wastewater from the commercial lot will be limited to domestic wastewater. The population served will be approximately 260 people in 92 households.

The Red Dog CPSS has a proposed design capacity of 30,326 gallons per day (gpd). According to the permit renewal application, the proposed wastewater treatment system is an attached-growth reactor and aeration basin designed by Eliminite, Inc.

The wastewater treatment process begins with individual septic tanks with effluent filters, conveyance to the treatment plant, flow through an attached growth media filter, and final clarification via an aeration basin. The wastewater effluent will then be discharged to two (2) connected drainfields (Outfall 001). Each drainfield will consist of a pressurized drainfield split into hydraulically equivalent zones. The sampling ports and flow meter locations are located just prior to the drainfields (Figure 2).

According to the applicant, when completed, the Level II [ARM 17.30.702 (11)] wastewater treatment system will include an attached-growth reactor and an aeration basin. The treated wastewater will then be discharged into the drainfield and eventually into ground water. Pursuant to ARM 17.30.702(11) the proposed wastewater treatment system will meet Level II treatment requirements. This means that the wastewater treatment system removes at least 60 percent of the total nitrogen (TN) measured from the raw sewage load to the system; or the system discharges a TN effluent concentration of 24 milligrams per liter (mg/L) or less.

Table 1 provides a summary of the wastewater treatment and disposal system. A wastewater line diagram is included as Figure 3. Effluent characteristics as estimated by the applicant are further discussed in Section II.D.

Table 1. Outfall 001 Collection, Treatment, and Disposal System Summary

Red Dog Ranch Outfall 001 Collection, Treatment, and Disposal System Summary	
Outfall 001a - Domestic Wastewater/Sewerage	
Method of Disposal**:** Infiltration to ground water via a pressure dosed drainfield	
Disposal Structure: Subsurface Drainfield (Outfall 001a) Facility Location**:** Corner of Frontage Road and Roman Creek Road Latitude: 47.02222 Longitude: -114.24833	
Contributing Sources: Single family residences, multi-family residences, general merchandise	
Average Daily Design Flow (gpd): 8,400 (ft^3/day): 1,119	Daily Maximum Design Flow (gpd): 14028 (ft^3/day): 1,875
Effluent Sampling Location: EFF-001a: Effluent sampling ports/dose tanks located prior to the flow meters	
Flow Monitoring Equipment: FM-001a: Multi-Jet Meter (model to be determined)	
Flow Monitoring Location: Located after final clarification chamber but prior to flow meter FM-001a.	
Treatment: Level 2 via an attached growth reactor and aeration basin.	

Outfall 001b - Domestic Wastewater/Sewerage	
Method of Disposal: Infiltration to ground water via a pressure dosed drainfield	
Disposal Structure: Subsurface Drainfield (Outfall 001b) Facility Location: Corner of Frontage Road and Roman Creek Road Latitude: 47.02222 Longitude: -114.24833	
Contributing Sources: Single family residences, multi-family residences, general merchandise	
Average Daily Design Flow (gpd): 9,828 (ft^3/day): 1,314	Daily Maximum Design Flow (gpd): 16,298 (ft^3/day): 2,179
Effluent Sampling Location: EFF-001b: Effluent sampling ports/dose tanks located prior to the flow meters	
Flow Monitoring Equipment: FM-001b: Multi-Jet Meter (model to be determined)	
Flow Monitoring Location: located after final clarification chamber but prior to flow meter FM-001b	
Treatment: Level 2 via an attached growth reactor and aeration basin	

C. Roman Creek-Touchette Lane Special Management Area, Missoula County

The Roman Creek – Touchette Lane SMA is located within the East ½ of Section 29, West ½ of Section 27, Section 28, T. 15 N., R. 21 W., (Figure 1). The SMA is regulated by the Missoula City-County Health Department; and was developed in 1987 to study coliform bacteria contamination of groundwater which was discovered within Section 28. The coliform contamination study is currently ongoing (T. Ross, July 2016). The language from the Missoula City-County health code states:

(C) Roman Creek/Touchette Lane Special-Management Area. The following restrictions shall apply to all land included within the E 1/2 of Section 29, W 1/2 of Section 27, Section 28, T15N, R21W, bordered on the north by the Frenchtown Irrigation Canal and bordered on the south by U.S. Interstate 90.

- *(1) All parcels with existing plat approvals may install systems if the site meets the four (4) foot separation required from the bottom of the disposal trench to high seasonal groundwater. High groundwater testing may be required to satisfy this requirement.*

- *(2) All parcels without existing plat approvals may only install one single family system if all other requirements of this regulation are met. Missoula City-County Health Code Wastewater Treatment and Disposal Systems 1-30 12/01/2015*

- *(3) The Department shall perform a preliminary inspection of the site with the excavator at the start of construction to ensure that: (a) maximum depth is maintained; and (b) the absorption system is located properly.*

- *(4) Wells must be grouted to a minimum twenty (20) feet. Bacterial samples are recommended and disinfection may be necessary to ensure a potable water supply. A copy of the well log shall be submitted to the Department showing adequate compliance with the plat approval and Montana DNRC Well Drilling Requirements.*

• *(5) The Department may not approve further subdivisions which create lots that generate wastewater or require wastewater facilities in the area until the cause of water contamination is discovered and the problem corrected.*

The applicant has indicated that no Red Dog CPSS infrastructure will be located within the SMA. The CPSS drainfields are located just south of the SMA within the NW 1/4 of Section 34, T. 15 N., R. 21 W. Effluent discharged to ground water is anticipated to flow away from the SMA as discussed in Section III.

D. Effluent Discharge Structures

The permit authorizes the applicant to discharge treated domestic wastewater to ground water from Outfall (OF) - 001. Outfall-001 is comprised of two pressure dosed subsurface drainfields, OF-1a and OF-1b which are designed to be of similar size and orientation with a combined width of 990 feet. The drainfields are located in the northern portion of the Red Dog Ranch Subdivision bordering the SMA.

E. Effluent Monitoring Location

Two (2) effluent (EFF) monitoring points EFF-1a and EFF-1b are located after the final clarifier and prior to flow meters FM-1a and FM-1b. Sampling requirements are further discussed in Section V.

F. Effluent Characteristics

Pursuant to ARM 17.30.1023, DEQ requires the applicant to disclose the quality of the effluent to be discharged such that the potential pollutants can be identified and the proposed discharge can be examined to determine if it will cause pollution of state water, 75-5-605, Montana Code Annotated (MCA).

The Red Dog Ranch Subdivision CPSS is still not built; therefore, no actual effluent quality data is available for this facility. Instead, the applicant has submitted effluent characteristics based on actual data from pilot plants, data collected from similar plants, and best professional estimates. The estimated effluent quality data for Outfall 001 is listed in Appendix I.

G. Geology

The Missoula Valley is part of a structural basin that began to open about 65 million years ago, during the early Tertiary crustal movement that created the Rocky Mountains. Precambrian metasedimentary rocks of the Belt Supergroup and a few interspersed Paleozoic sedimentary rocks surround the valley, with peaks of 5000 to 7000 feet elevation. This relatively impermeable and deeply eroded landscape was partially filled with Tertiary and Quaternary alluvium, and Glacial Lake Missoula clays and silts. Portions of the Tertiary sediments were scoured from the valley during the repeated draining of Glacial Lake Missoula approximately 12,000 to 15,000 years ago, during the Wisconsin glacial stage, and were replaced with layers of sand, gravel and cobbles, deposited during these catastrophic events and more recent alluvium deposited along the river channel and flood plain. The sediments generally become finer to the southwest in the valley as a result of dissipating energy after sediment-carrying water flowed out of Hellgate Canyon and across

the broader Missoula Valley, depositing coarser sediments first and then gradually allowing deposition of finer sediments.

The Missoula Aquifer is semi-confined in the area of the Red Dog Ranch Subdivision. In this area, the aquifer is composed mainly of unconsolidated Quaternary alluvial fan deposits and Glacial Lake Missoula clay and silt. Layers of clay and silt deposited in the lake are inter-fingered with sand and gravel layers that were deposited between the multiple episodes of draining and refilling the Lake. Tertiary deposits (mostly Renova and Sixmile-Creek Equivalents) flank and underlie the Quaternary alluvium but are generally fine-grained and much less productive than the alluvium. The lateral extent of the Missoula Valley Aquifer varies from about 0.25 miles wide at the mouth of Hellgate Canyon, to 6.25 miles wide between Maclay Flats and the mouth of Grant Creek; the overall length is approximately 20 miles. The Missoula Valley Aquifer is designated as a "Sole Source Aquifer" by the U.S. EPA.

The Alberton soil unit has been identified as the major soil component located at the drainfield site. The parent material for this soil is alluvium that is typically formed on stream terraces having 0 to 2 percent slope. The soil is classified as somewhat excessively drained, with a moderate water capacity, and having a typical profile of sandy loam to loamy sand from 16 to 60 inches below ground surface (NRCS, 2009). The physical soils properties estimates agree with test pits dug on site. Thirteen (120-inch deep) test pits primarily indicate a soil profile having a sandy loam texture with underlying horizons containing coarse and gravelly sands.

H. Hydrogeologic Characteristics

A study of shallow groundwater, east at the Frenchtown High School (Lauerman, 1997), indicates a ground water flow direction to the southwest. Water-level monitoring data collected from five monitoring wells on the Red Dog Ranch Property also indicate a southwesterly groundwater flow direction.

Depth to the water table ranges from approximately 6 to 70 feet below land surface, depending on distance from rivers and tributary streams. The seasonal fluctuation of the groundwater table ranges from approximately 2 to 13 feet (Woessner, 1988) and depends upon proximity to the recharge source and hydraulic conductivity of the surrounding aquifer sediments.

Receiving water for Outfall 001 is Class 1 ground water. Static water levels recorded from shallow ground water wells located throughout the proposed subdivision range from 9.69 to 16.25 feet-below ground surface, as reported within supplemental materials associated with the application. These static water levels were used to create multiple potentiometric surface maps showing static water levels at times of seasonal high and low ground water. These maps were used to estimate an average ground water flow direction of S37°W and a hydraulic gradient of 0.0012 ft/ft.

Hydraulic conductivity (K) of the alluvium was estimated by using a pressure transducer data logger which recorded drawdown and recovery data. The analyzed data produced an average hydraulic conductivity rate of 1,043 feet per day (AMEC Geomatrix, 2008). Similar hydraulic conductivity rates were established in a pumping test and tracer test performed by the University of Montana at the adjacent Frenchtown High School property (Lauerman, 1997). A summary of the hydrogeologic characteristics is provided in Appendix IV-Mixing Zone Rationale.

I. Ground Water Monitoring Well

As of the date of this fact sheet, there are no residences connected to the wastewater treatment system. Background ground water quality monitoring data has been obtained from the "Rental Well" (GWIC ID# 706524) located upgradient of the proposed drainfield. Because no effluent has been discharged to date; only the rental well has been sampled and represents both up-gradient and down-gradient water quality (Territorial-Landworks, Inc., September 8, 2014). A summary of the well information; and a copy of the well log are included in Appendix II. Additional monitoring well installation requirements are described in Section VI "Special Conditions".

J. Ground Water Quality Characteristics

Ambient water quality is currently based on water quality monitoring using the existing well identified as "Rental Well". The Rental Well has been designated as permit monitoring well MW1-D. The receiving water for Outfall 001 is Class 1 ground water. Ground water quality results are summarized in Appendix III.

III. MIXING ZONE

The Montana Water Quality Act [75-5-103, Montana Code Annotated (MCA)] states that a mixing zone is an area of the receiving water, established in a permit, where the water quality standards may be exceeded. DEQ will maintain the existing 500-foot standard mixing zone authorized by DEQ in 2011. The mixing zone rationale are further discussed in Appendix IV.

IV. RATIONALE FOR PROPOSED DISCHARGE LIMITATIONS AND CONDITIONS

DEQ has a statutory duty to develop effluent limits and issue permits consistent with the Montana Water Quality Act, §75-5-101, MCA et seq. and rules adopted under that Act. Section IV presents the basis for discharge limitations in accordance with the requirements at ARM 17.30.1006, ARM 17.30.1031 and ARM 17.30.715. The bases for deriving and establishing effluent limitations are further discussed in Appendix V. Based on the information and analyses presented in Sections III and IV, pursuant to ARM 17.30.1031, Table 2 identifies DEQ's proposed final numerical effluent limitations.

Table 2. Proposed Final Numeric Effluent Limits – Outfall 001

Red Dog Ranch Proposed Final Numeric Effluent Limits – Outfall 001.		
Parameter	**Daily Maximum**(1)	**Annual Maximum**(1)
Total Nitrogen - Concentration (mg/L)	24	**NA**
Total Nitrogen - Load(2) (lbs/day)	9.40	NA
Total Phosphorus - Load(2) (lbs/year)	NA	565

Footnotes:
(1) See definitions, Part I.A of the permit
(2) Load calculation: lb/d = [(mg/L) x flow (gpd) x (8.34×10^{-6})]

V. RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

DEQ has a statutory duty to develop effluent limits and issue permits consistent with the Montana Water Quality Act, §75-5-101, MCA et seq. and rules adopted under that Act. ARM 17.30.1031 requires that all issued MGWPCS permits contain monitoring requirements that assure compliance with the developed numeric effluent limitations and therefore water quality standards. Applicable Ground Water Quality Standards are identified in Appendix V. Effluent monitoring and ground water monitoring requirements will be required as a condition of this permit. Monitoring requirements and respective rationale are summarized in Appendix VI.

VI. SPECIAL CONDITIONS

In accordance with ARM 17.30.1031 this section contains the basis for special permit conditions that are necessary to assure compliance with the ground water quality standards and the Montana Water Quality Act. The following special condition(s) will be included in the permit.

1. Monitoring Well Installation Plan

As of the drafting of this statement of basis, the applicant does not have an anticipated start or completion date for construction of the wastewater treatment system. The applicant has requested monitoring well installation to take place at the time construction of the wastewater treatment system drainfields is completed. The applicant has also stated that the current design of the CPSS, including drainfield location, is not expected to change. The Department has reviewed the request and will require the following:

Within 180 days of the effective date of the permit, the permittee shall submit to the Department for approval a plan for installation of the ground water monitoring wells as discussed in Section V.B. The plan is to include the location, conceptual design and construction methods of the planned ground water monitoring wells; and also a brief summary of the monitoring, sampling and analysis methods that will be used to meet the monitoring required in the permit.

2. Monitoring Well Installation

Prior to installation of the Red Dog Ranch CPSS drainfields, three (3) monitoring wells in addition to MW1-D shall be installed. Two (2) monitoring wells (MW1-A and MW1-B) will be located at the end of the standard 500-foot mixing zone and shall serve as ground water quality monitoring points. The permittee shall also install an additional monitoring well (MW1-C), down gradient and within 100 feet of the drainfields, that will represent pathogens, as discussed in Section V.B.

3. Monitoring Well Installation Report

Prior to installation of the CPSS drainfields, the permittee shall submit to the Department a brief report or letter documenting the results of the monitoring well installation including

the final location of the installed monitoring wells, construction details and borehole lithologic logs for the monitoring wells, and sample laboratory analytical reports. Ground water quality analytical reports shall include baseline water quality for each monitoring well using the associated parameters listed in Appendix V.

4. Ground Water Quality Monitoring

Ground water quality monitoring shall begin upon installation of the monitoring wells MW1-A, MW1-B, and MW1-C. Monitoring for well MW1-D will commence upon the effective date of the permit. Monitoring of wells MW1A through MW1-D will continue through the duration of the permit.

VII. COMPLIANCE SCHEDULE

The following compliance schedule is included to allow a reasonable opportunity for the permittee to attain compliance with permit requirements and to stay in compliance with the Water Quality Act and the Administrative Rules of Montana. The actions listed in the table below must be completed on or before the respective scheduled completion date. A report documenting each respective action must be received by DEQ on or before the scheduled reporting date. Completion of all actions or deliverables must be reported to DEQ in accordance with Part II.D and Part IV.G of the permit.

Table 3. Compliance Schedule

Red Dog Ranch Compliance Schedule

Authority	Action (1)	Freq.	Scheduled Completion Date of Action	Scheduled Report (2) Due Date
ARM 17.30.1031	Complete plan for installation of monitoring wells MW1-A, MW1-B, and MW1-C (3)	Single Event	Within six months of the effective date of the permit	Due on or before the 28th day of the month following the completion date
ARM 17.30.1031	Install monitoring wells MW1-A, MW1-B, and MW1-C	Single Event	Prior to installation of the drainfields	Due on or before the 28th day of the month following the completion date
ARM 17.30.1031	Submit monitoring well installation report to DEQ (4)	Single Event	Prior to installation of the drainfields	Prior to waste water treatment plant start-up
ARM 17.30.1031	Commence Sampling and reporting of monitoring for wells MW1-A, MW1-B, MW1-C (5)	Single Event	Upon completion of these monitoring wells	In respective Net DMR forms, see Ground Water Monitoring and Reporting Table
ARM 17.30.1031	Commence Sampling and reporting of monitoring well MW1-D	Single Event	Upon the effective date of the permit	In respective Net DMR forms, see Ground Water Monitoring and Reporting Table

(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 due dates. The Reports must include all information as required for each applicable action as listed in Section VI and Appendix IX.

(3) The completed plan (action), in place of a written report must be received by DEQ on or before the scheduled "report" due date.

(4) The written report documenting monitoring well installation, must include final location, drilling methods used, borehole lithologic log, well construction details, elevation of measuring point, and the depth to the top contact of the first ground water bearing zone. This

information must be included for each installed monitoring well.
(5) Monitoring and reporting requirements are listed in the Ground Water Monitoring Reporting table.

VIII. NONSIGNIFICANT DETERMINATION

DEQ has determined (DEQ, 2016) that the discharge constitutes a new source and is subject to the Montana Nondegradation Policy (75-5-303, MCA; ARM 17.30.702). The applicable water quality standards for Class I ground water and non-degradation non-significance criteria are summarized in Appendix V. Discharges in compliance with the limitations of this permit are considered nonsignificant. The permit includes monitoring, reporting and corrective action requirements to establish, confirm, and maintain compliance with the permit limits.

IX. 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 **April 25, 2017**. Comments may be directed to:

DEQWPBPublicComments@mt.gov

or at:

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 were 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.

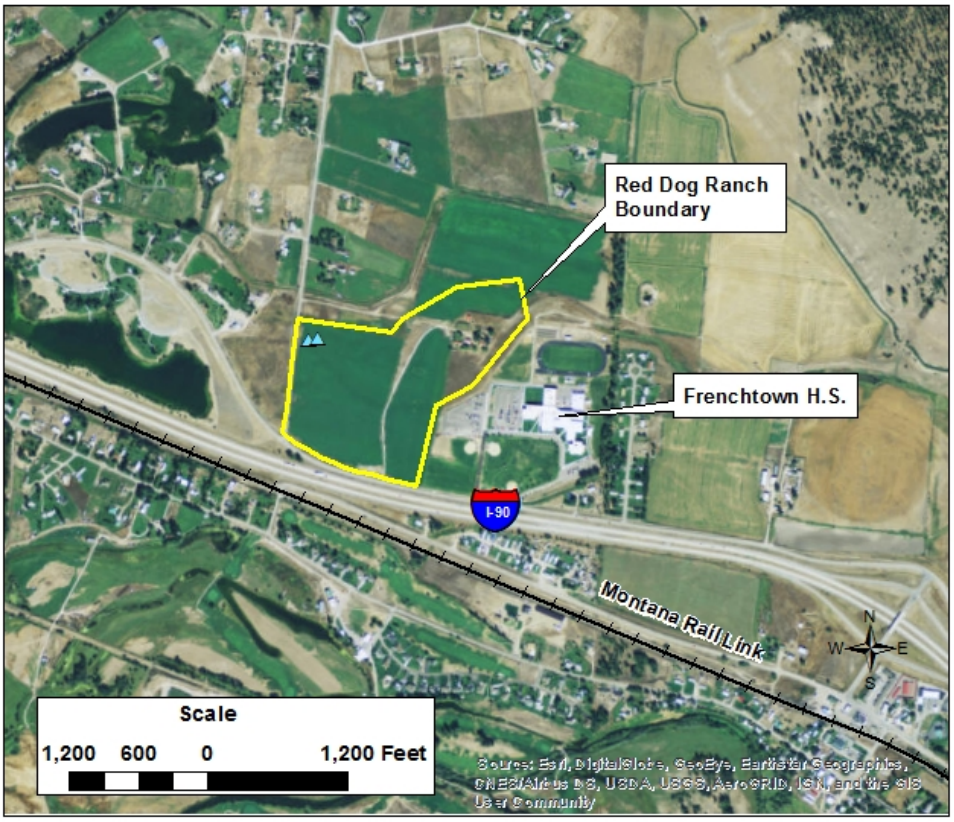
Any person interested in being placed on the mailing list for information regarding this permit may contact the DEQ Water Protection Bureau at (406) 444-3080 or email

DEQWPBPublicComments@mt.gov. All inquiries will need to reference the permit number **(MTX000212)**, 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.

FIGURES

Figure1. Red Dog Ranch Subdivision (MTX000212) Vicinity Map



Legend

- Red Dog Ranch Boundary
- Red Dog Ranch PWS Wells
- Railroad

Mapping by Carolyn DeMartino, DEQ WQD
February 2017

Figure 2. Red Dog Ranch Subdivision (MTX000212) Ground Water Monitoring Wells

Scale
500 250 0 500 Feet

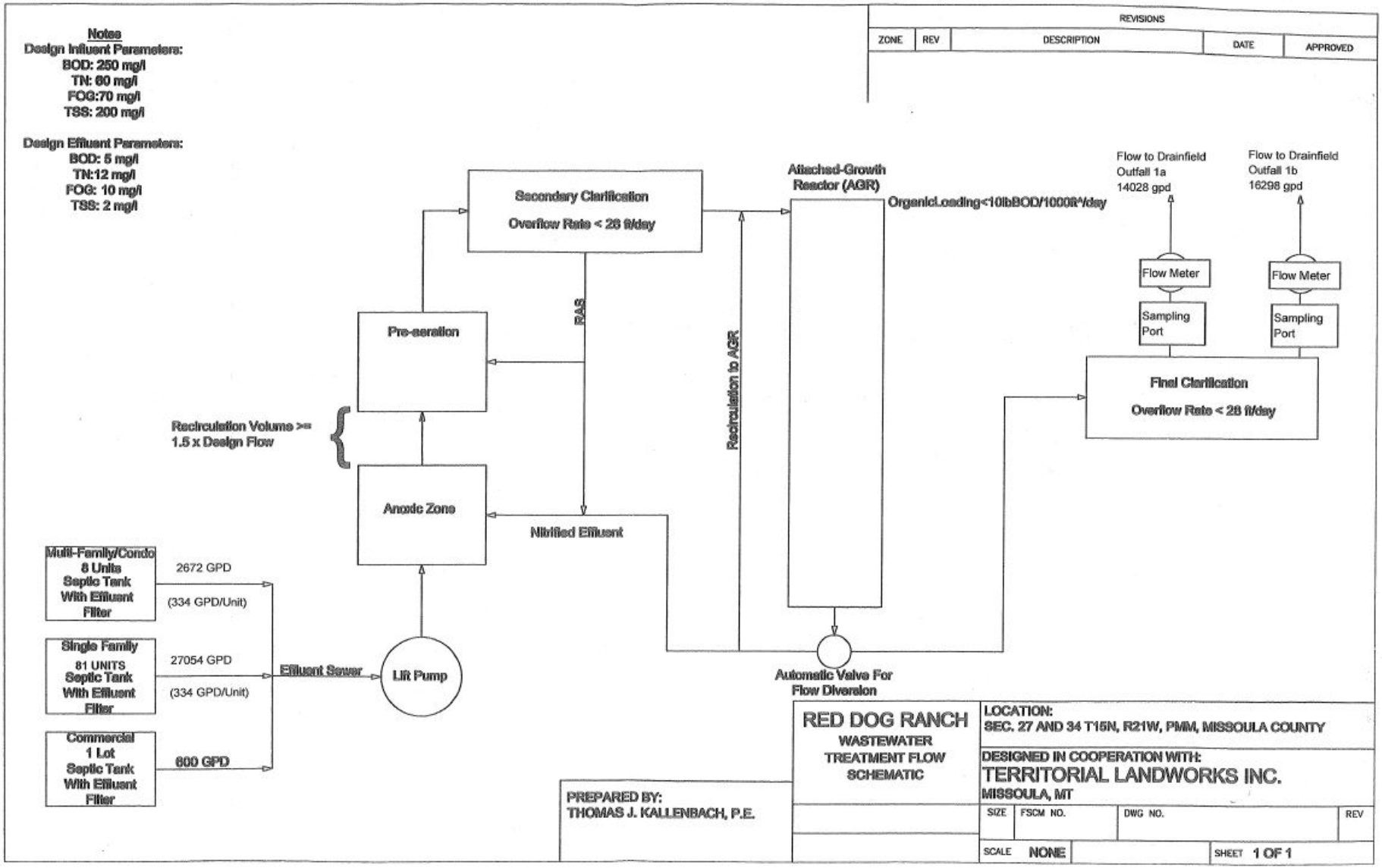
N
W E
S

Legend

- Red Dog Ranch Boundary
- Red Dog Ranch PWS Wells
- Permit Monitoring Wells
- Application Monitoring Wells
- Drainfield
- Mixing Zone
- Railroad

Mapping by Carolyn DeMartino, DEQ WQD
February 2017

Figure 3. Red Dog Ranch Subdivision Wastewater Treatment System Site Layout



APPENDICES

APPENDIX I - ESTIMATED EFFLUENT QUALITY

Red Dog Ranch Estimated Effluent Quality – Outfall 001.

Parameter[8]	Location	Units	Maximum[6] Value	Average Value	Source of Data	Number of Samples
Biochemical Oxygen Demand (BOD_5)	Effluent	mg/L	400	150	[4]	---[5]
Total Suspended Solids (TSS)	Effluent	mg/L	110	60	[3]	3
Escherichia Coliform	Effluent	MPN	2420	2420	[4]	---
pH (Maximum)	Effluent	s.u.	9.0	NA	[1]	---
pH (Minimum)	Effluent	s.u	7.0	NA	[1]	---
Chlorine, Total Residual (TRC)	Effluent	mg/L	2	2	[4]	---
Chloride (as Cl)	Effluent	mg/L	104	118	[3]	4
Total Ammonia (as N)	Effluent	mg/L	8	3	[3]	10
Total Kjeldahl Nitrogen (as N)	Effluent	mg/L	20	10	[3]	6
Nitrate + Nitrite (as N)	Effluent	mg/L	8	2	[3]	7
Total Phosphorus (as P)	Effluent	mg/L	3	2.3	[3]	3

Footnotes:

ND = Not Detected

NA = Not Analyzed

(1) Data from pilot plants.

(3) Data from other similar plants.

(4) Best professional estimate.

(5) --- Data not available or applicable.

(6) Value of "pH (Minimum)" is the estimated minimum instead of maximum value.

(8) Conventional and nonconventional pollutants only, table does not include toxics.

APPENDIX II – MONITORING WELL SUMMARY

Monitoring well MW1-D (formerly called "Rental Well") was used to determine the ambient ground water quality for the permit application. Well MW1-D is located immediately upgradient from the two drainfield zones as shown on Figure 2. A copy of the well log for monitoring well MW1-D is located on the following page**.** Information regarding monitoring well MW1-D is summarized in the following table.

Monitoring Well Summary

Red Dog Ranch Monitoring Well Summary
Monitoring Well: Rental Well
MBMG GWIC ID#: 706524
Status: Constructed on January 1, 1945
Location: T. 15 N., R. 21 W., Sec. 34 SE1/4NE1/4 (DA) Latitude: 47.02345 Longitude: -114.24539
Representation: Ambient quality of the shallow receiving ground water, upgradient of Outfall 001.

Note, prior to installation of the Red Dog Ranch CPSS drainfields, three (3) monitoring wells in addition to MW1-D shall be installed. Monitoring wells MW1-A and MW1-B will be located at the end of the standard 500-foot mixing zone and shall serve as ground water quality monitoring points. Monitoring well MW1-C shall be installed down gradient, within 100 feet of the drainfields; and will serve as the monitoring point for pathogens. The target monitoring zone of the monitoring well shall be 20 feet below the low water table (Section VI, Special Conditions).

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: HAMEL EDMUND MW1-D (Rental Well)
GWIC Id: 706524

Section 1: Well Owner(s)

Section 2: Location

Township	Range	Section	Quarter Sections
15N	21W	34	SE¼ NE¼

County	Geocode
MISSOULA	

Latitude	Longitude	Geomethod	Datum
47.0177	-114.2311	MAP	NAD27

Ground Surface Altitude	Ground Surface Method	Datum Date
3038		

Addition	Block	Lot

Section 3: Proposed Use of Water
DOMESTIC (1)

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

Section 5: Well Completion Date
Date well completed: Monday, January 01, 1945

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	18	12				

There are no completion records assigned to this well.

Annular Space (Seal/Grout/Packer)

There are no annular space records assigned to this well.

Section 7: Well Test Data

Total Depth: 18
Static Water Level:
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)
Lithology Data

There are no lithologic details assigned to this well.

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:	
Company:	
License No:	-
Date Completed:	1/1/1945

APPENDIX III - GROUND WATER QUALITY MONITORING RESULTS

Red Dog Ranch Ground Water Monitoring Results

Monitor Source[1]	Representation	Parameter	Units	Reported Minimum Value	Reported Average Value	Reported Maximum[2] Value	# of Samples	Source of Data
MW1-D	Ambient Ground Water Quality Ground water, upgradient from proposed Outfall 001	Chloride (as Cl)	mg/L	2.20	2.50	3.40	3	APP
		Escherichia coli Bacteria	CFU/100 ml	ND	ND	ND	2	APP
		Nitrogen, Nitrate + Nitrite (as N)	mg/L	0.27	0.49	0.61	3	APP
		Nitrogen, Total Kjeldahl (as N)	mg/L	ND	ND	ND	2	APP
		Organic Carbon	mg/L	1.02	1.19	1.29	3	APP
		pH	s.u.	7.68	7.66	7.75	3	APP
		Specific Conductivity (@ 25°C)	µS/cm	309.00	337.00	362.00	3	APP
		Total Dissolved Solids (TDS)	mg/L	203.00	212.00	221.00	3	APP

Footnotes:

APP = Application Form GW-2 and supplemental materials.

BASE = Baseline ground water quality report submitted on September 10, 2014 and October 28, 2014.

CFU = Colony Forming Units

ND = Non Detect

Period of Record: 09/10/2014 through 09/10/2019.

s.u. = standard units

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

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

APPENDIX IV – MIXING ZONE RATIONALE

The Montana Water Quality Act (75-5-103, Montana Code Annotated (MCA)) states that a mixing zone is an area of the receiving water, established in a permit, where the water quality standards may be exceeded. Mixing zones are subject to the conditions imposed by DEQ and consistent with the rules adopted by the Board of Environmental Review (Board).

The applicant requested reauthorization of one 500-foot standard Department mixing zone. DEQ determines whether a mixing zone is appropriate pursuant to the requirements and procedures of ARM 17.30.501 et seq. DEQ must conduct a water quality assessment in accordance with ARM 17.30.506 to determine if and what type of mixing zone may be authorized. A person applying to DEQ for a mixing zone must indicate the type of mixing zone requested and supply information of sufficient detail for DEQ to make a determination regarding the authorization of the mixing zone (ARM 17.30.515).

For purposes of authorization determination, DEQ will reference the following rules listed below for water quality assessment of the mixing zone. A mixing zone may be granted for individual parameters in a discharge (ARM 17.30.505). As part of the water quality assessment described above, the concentration of pollutants at the downgradient boundary of the mixing zone must be estimated in accordance with ARM 17.30.517 to determine if the discharge qualifies for a ground water mixing zone. After review of the permit renewal application (ARM 17.30.505), DEQ will reauthorize the standard Department mixing zone established in the previous permit (DEQ, 2010) for the parameters listed within Table 7 as the potential impact to beneficial uses may be minimal (Section II and Section IV).

Pursuant to ARM 17.30.502 a “Mixing Zone" is defined as a limited area of a portion of an aquifer where initial dilution of a discharge takes place, where water quality changes may occur, and where certain water quality standards may be exceeded. DEQ will reauthorize the mixing zone based on the hydrogeologic and mixing zone information as previously established (DEQ, 2009). ARM 17.30.517 states for a mixing zone, a specific depth and width are necessary to determine the aquifer cross-section area (A). The width of the outfall structures perpendicular to ground water flow direction are reported within the table below. The depth of this ground water mixing zone extends from the top of the water table beneath the source down to 15 feet below the water table (DEQ, 2009).

The cross sectional area (A) is the area of the ground water flux boundary at the terminus of the mixing zone (ARM 17.30.517). The down gradient boundary mixing zone width is the width of the source (drainfield width perpendicular to ground water flow direction), plus the distance determined by the tangent of 5° (0.0875) times the length of the mixing zone times two (2) (ARM 17.30.517). The calculated widths and respective cross section areas (A) are listed in the following table.

Based on the dimensions of the standard mixing zones, and the hydrogeologic characteristics (Section II), the volume of ground water (QGW) available to mix with the effluent is calculated using Darcy's Equation (ARM 17.30.517):

$$Q_{GW}=KIA$$

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

Table 7 displays the respective mixing zone parameters used in the above equation. The table also lists the resulting volume of ground water available to mix at Outfall 001.

Based on the description of the mixing zone above; and analysis presented in Section IV, DEQ has determined pursuant to ARM 17.30.505 that a standard mixing zone is applicable and will be authorized for the parameters listed in the table below for Outfall 001.

Mixing Zone Information

Red Dog Ranch Mixing Zone Information - Outfall 001		
Parameter	**Units**	**Value**
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations, Nitrate + Nitrite	mg/L	0.61
Ground Water Flow Direction	azimuth/bearing	S37°W
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	851
Width of Mixing Zone at Down Gradient Boundary	feet	938.5
Cross Sectional Area of Mixing Zone (A)	ft^2	14077.5
Hydraulic Conductivity (K)	feet/day	1,043
Hydraulic Gradient (I)	ft/ft	0.0012
Volume of Ground Water Available for Mixing (Q_{gw})	ft^3/day	17,620

APPENDIX V - RATIONALE FOR PROPOSED DISCHARGE LIMITATIONS AND CONDITIONS

DEQ has a statutory duty to develop effluent limits and issue permits consistent with the Montana Water Quality Act, §75-5-101, MCA et seq. and rules adopted under that Act. Section IV presents the basis for discharge limitations in accordance with the requirements at ARM 17.30.1006, ARM 17.30.1031 and ARM 17.30.715.

A. Water Use Classification & Applicable Water Quality Standards

The shallow alluvial receiving water for Outfall 001 is Class I ground water and high quality waters of the state (75-5-103, MCA). The quality of Class I ground water must be maintained so that these waters are suitable for the following beneficial uses with little or no treatment (ARM 17.30.1006):

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

Persons may not cause a violation of the following specific water quality standards in Class I ground water, pursuant to ARM 17.30.1006, except within a DEQ approved mixing zone as provided in ARM 17.30.1005:

- The human health standards for ground water listed in Circular DEQ-7;
- For concentrations of parameters for which human health standards are not listed in DEQ-7, no increase of a parameter to a level that renders the waters harmful, detrimental, or injurious to the beneficial uses listed for Class I water. DEQ may use any pertinent credible information to determine these levels; and,
- No increase of a parameter that causes a violation of the non-degradation provisions of 75-5-303, MCA.

The non-degradation rules (ARM 17.30.701, et seq.) implement Montana's non-degradation policy, which applies to any activity of man resulting in a new or increased source which may cause degradation (ARM 17.30.705). In accordance with ARM 17.30.706, DEQ is required to determine whether a new or increased source may cause degradation or whether it is nonsignificant according to ARM 17.30.715.

DEQ performed a significance determination for the proposed activity as part of permit development (DEQ, 2009). The determination established that the proposed discharge is a new or increased source (ARM 17.30.702) because it is an activity resulting in a change of existing water quality occurring on or after April 29, 1993. Discharges in compliance with the non-degradation non-significance criteria established within this permit, do not constitute a significant activity.

The applicable ground water standards pursuant to ARM 17.30.1006 and the non-degradation, non-significance criteria at ARM 17.30.715 for the identified parameters are summarized in the

following table. The standards will be used as the basis for developing effluent limitations in the permit.

Applicable Ground Water Quality Standards

Red Dog Ranch Applicable Ground Water Quality Standards.

Parameter[1]	Units	17.30.1006(1)(b)(i) Human Health Standards - Ground Water	17.30.1006(1)(b)(ii) Beneficial Uses - Ground Water	Pollutant Category[2]	17.30.715 Nondegradation - Nonsignificance Criteria[3][4]
Nitrogen, Nitrate + Nitrite (as N)	mg/L	10.0	-	T	7.5
Nitrogen, Total (TN)	mg/L	-	10.0	T	7.5
Phosphorus, Total Inorganic	lbs/day	-	-	H	Surface water breakthrough time greater than 50 years[5]

Footnotes:

These standards establish the maximum allowable changes in ground water quality and are the basis for limiting discharges to ground water, ARM 17.30.1005(1); Circular DEQ-7 (2012), Footnote 16; and ARM 17.30.715(1)(d).

(1) Includes known parameters of concern only.

(2) Circular DEQ-7 (2012): Carcinogen (C), Harmful (H), and Toxic (T) parameter. Toxic pollutant with a Bioconcentrator (B) factor.

(3) Discharges in compliance with the nondegradation significance criteria constitute nonsignificant degradation.

(5) Changes in receiving ground water quality are not significant if water quality protection practices approved by the DEQ have been fully implemented and if the listed nonsignificance criteria is met.

B. Pollutants and Parameters of Interest (POI)

In the 2009, and in this current fact sheet, DEQ identified pollutants and parameters of interest (POI's) for the proposed discharge based on the following:

- Reported effluent characteristics (Section II, D and Appendix V of this Fact Sheet);
- Water quality standards (Appendix V);
- Water use classification of the receiving ground water (Appendix III, IV, and VI); and
- US EPA reference documents (Appendix V).

Individual POIs are further discussed under Section C. "Development of Effluent Limits".

C. Development of Effluent Limits

ARM 17.30.1006 and ARM 17.30.715 set forth the basis for developing effluent limitations that will protect water quality. The ground water quality standards establish the maximum allowable changes

to ground water quality; are the basis for limiting discharges to ground water; and may only be exceeded within a mixing zone authorized by DEQ.

1) Water Quality Based Effluent Limitations

a) Escherichia coliform Bacteria

The applicant has applied for; and received plan and specification review by DEQ's Public Engineering Bureau. The Red Dog Ranch WWTP has not been built to date; therefore no discharges to ground water have occurred. Monitoring Well MW1-D (formerly known as the Rental Well & Well GW-1) will be monitored in the future for bacteria.

b) Nitrogen

Application materials indicate that nitrogen will be present in the proposed wastewater stream (Section II.D.). 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 will establish 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 will be derived from a mass-balance equation (ARM 17.30.517) which is a simple steady-state model, used to determine the POI concentration after accounting for other sources of pollution in the receiving water and any dilution as provided by a mixing zone. The equation factors in cumulative impacts of existing upgradient discharges and will limit the discharger to the assimilative capacity currently available in the receiving aquifer. 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 an authorized mixing zone (Section III).

Equation 2:

$$C_{lmt} = C_{std} + D(C_{std} - C_{gw})$$

Where:
C_{lmt} = effluent limitation concentration
C_{std} = water quality standard concentration
C_{gw} = ambient receiving ground water concentration
D = dilution ratio (Q_{gw} / Q_{eff})

Red Dog Ranch Outfall 001

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. 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:

9.40 lbs/day
[(8.34*10-6)*37.17 mg/L*30,326gpd]
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 [$8.34*10^{-6}$]

c) Phosphorus

Phosphorus levels in surface waters are measured as total phosphorus (as P). As such, any permit condition regarding phosphorus and its potential effect on surface water will be measured as total phosphorus. Phosphorus in wastewater discharged to the subsurface is removed mainly through soil sorption processes, which vary based on soil composition. The 50-year breakthrough non-

degradation criterion is based on the amount of soil available to adsorb the load of phosphorus from the wastewater source between the discharge point and the closest downgradient surface water.

Phosphorus is removed mainly through soil sorption processes, which vary based on soil composition. The 50-year breakthrough non-degradation criterion is based on the amount of soil available to adsorb the average load of phosphorus from the wastewater source between the discharge point and the closest downgradient surface water. The total phosphorus (as P) limitations are imposed to ensure that the quality of the effluent meets the non-degradation limit prior to discharge into any surface water [ARM 17.30.715(1)(e)]. Phosphorous breakthrough analysis calculations are mass-based; therefore, the limit will be load based.

A phosphorous breakthrough analysis was conducted by the Department (DEQ, 2009) using information provided by the applicant, submitted as part of permit application materials. The limiting layer depth was based on depth to shallow ground water in wells near the proposed drainfield site. The shallowest static water level was recorded at 9.69 feet below ground surface. Department guidance on how to conduct the phosphorous breakthrough analysis (DEQ, 2009) indicate that a limiting layer can be the seasonal ground water level.

As of the drafting of the 2016 statement of basis, the permittee has not obtained approval from DEQ's Subdivision Section for the CPSS treatment system. The permitted design capacity will therefore be based on the reported maximum daily flow of the treatment system's design capacity of 30,326 gpd, as submitted by the permittee within form GW-1. This will be the flow in which this system will be permitted to discharge for this MGWPCS permit. The total phosphorus concentration representing this treatment system will be 10.6 mg/L as based on the Department's document, "Nondegradation Analysis for Subsurface Wastewater Treatment Systems" (DEQ, 2009).

The Department estimates that phosphorous discharged to ground water would reach the first surface water (oxbow of Clark Fork River) from outfall 001 in a significant amount of time. At the design capacity flow of 30,326 gpd along with an anticipated total phosphorus concentration of 10.6 mg/L, this provides a phosphorus load of 2.68 lb/day (979 lb/year). The Department estimates a total phosphorous adsorption by soils (P) of 28,255 lbs. The resulting phosphorous breakthrough is expected to occur in 28.9 years.

Breakthrough time to surface water (BT) for outfall 001 is:

(28,255 lbs)/(979 lbs/yr) = 28.9 years

A phosphorous breakthrough that would occur in 50 years or less is considered significant [ARM 17.30.715(1)(e)]. Therefore an effluent limit for total phosphorous load shall be established in this fact sheet. The total phosphorous load limit will be derived by calculating the annual load needed to maintain the breakthrough non-degradation criteria of 50 years.

The resulting phosphorous load limit using a breakthrough of 50 years is:
(28,255 lbs)/(50 yr) = 565 lbs/yr

TP load limit = 565 lbs/yr

E. Final Effluent Limitations

Based on the information and analyses presented in Sections III and IV and pursuant to 75-5-402, MCA and ARM 17.30.1031, DEQ proposes to renew the following numerical effluent limitations.

The proposed final limitations are the most stringent applicable limitations for each individual parameter as developed above. Effluent limits based on water quality standards are expressed as a daily maximum concentration. The proposed final effluent limits are listed in Section IV.

APPENDIX VI – RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

ARM 17.30.1031 requires that all issued MGWPCS permits contain monitoring requirements that assure compliance with the developed numeric effluent limitations and the water quality standards. Effluent monitoring and ground water monitoring requirements will be maintained as conditions of this permit renewal.

A. Effluent Monitoring - Compliance

Final numeric effluent limitations are maintained in this permit with specific magnitudes and durations based on site-specific conditions that ensure the discharge will not cause or contribute to an exceedance of an applicable water quality standard (see Sections III and IV). Accordingly, the permittee will be required to monitor and report monitoring results at a specified frequency in order to demonstrate compliance with the applicable effluent limitations. Effluent monitoring and reporting requirements are summarized in the table below. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

B. Effluent Monitoring - Sampling Location

Samples shall be representative of the nature of the monitored discharge (Permit Part II.A.). For reporting purposes, the composited samples from EFF-001a and EFF-001b will equal one sample OF-001 (EFF-001a +EFF-001b = OF-001). The permittee shall report the average results of samples collected from both EFF-001a and EFF-001b. The permittee shall collect a sample from EFF-001a and Eff-001b each and composite the sample in the field; or they can collect a sample from each and request the laboratory to composite the samples. As discussed in Section II.C, the effluent sample locations (EFF-001a and EFF-001b) have been established and are located after the final clarifier but prior to the flow measuring devices FM-001a and FM-001b (Figure 3).

C. Discharge Monitoring

Measurements shall be representative of the volume of the monitored discharge (Permit Part II.A.). The applicant 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 (Permit Part II.B.). The flow measuring devices FM-001a and FM-001b are located after effluent sample locations but prior to Outfall 1 (Figure 3). The flow measuring devices must be installed and in operating condition prior to discharge. For reporting purposes, the composited flow measurements from FM-001a and FM-001b will equal one measurement, FM-001 (FM-001a +FM-001b = FM-001). The permittee shall report the average results of measurements collected from both FM-001a and FM-001b. The permittee shall collect a sample measurement from FM-001a and FM-001b each and composite the measurements in the field. For the Flow monitoring and reporting requirements are summarized in Appendix V on the following page.

Effluent Monitoring – Outfall 001

Red Dog Ranch Effluent Monitoring and Reporting Requirements – Outfall 001

Parameter/Method	Monitor Location	Units	Sample Type[1]	Minimum Sample Frequency	Reporting Requirements[1][2]	Report Freq	Rationale
Flow Rate, Effluent[6]	OF-001	gpd	Continuous	Continuous	Daily Maximum Quarterly Average	Continuous	Permit Compliance
Chloride (as Cl)	OF-001	mg/L	Composite	1/Month	Daily Maximum Quarterly Average	Quarterly	Effluent Characteristics
Nitrate +Nitrite (as N)	OF-001	mg/L	Composite	1/Month	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Total Ammonia (as N)	OF-001	mg/L	Composite	1/Month	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Total Kjeldahl Nitrogen (TKN) as N	OF-001	mg/L	Composite	1/Month	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
Nitrogen, Total(as N)[7]	OF-001	mg/L	Composite	1/Month	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
		lbs/day[8]	Calculate	1/Month	Daily Maximum[9] Quarterly Average[10]	Quarterly	
Phosphorus, Total (as P)	OF-001	mg/L	Composite	1/Month	Quarterly Average	Quarterly	Permit Compliance
		lbs/day[8]	Calculated	1/Month	Quarterly Average[10]	Quarterly	
		lbs/year[11]	Calculated	1/Year	Annual Maximum[12]	Annually[13]	

Footnotes:
OF - Outfall
Footnotes Continued:
EFF - Effluent
FM – Flow Meter
OF-001 =EFF-1a + EFF-1b: the combined effluent collection is located at the effluent collection tank just prior to release of wastewater into the drainfield.
FM-001= FM-001a + FM-001b: the combined flow measurement is located between wastewater sumps and prior to release into the collection tank.
If no discharge occurs during 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.
(6) Requires recording device or totalizing meter, must record daily effluent volume.
(7) Total Nitrogen is the sum of Nitrate + Nitrite and Total Kjeldahl Nitrogen.
(8) Load calculation: lbs/day = (mg/L) x flow (gpd) x [8.34 x 10^{-6}].
(9) Daily Maximum Load calculation: lbs/day = the maximum of all calculated individual daily average loads (lbs/day) recorded during the reporting period.
(10) Quarterly Average Load calculation: lbs/day = the average of all calculated individual daily average loads (lbs/day) recorded during the reporting period.
(11) Annual Load calculation: lbs/year = (mg/L) x flow (gpd) x [8.34 x 10-6] x 365 (days/year).
(12) 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).
(13) Annual maximum load shall be reported (DMR) on an annual basis (due January 28 each year of the permit cycle).

D. Ground Water Quality Monitoring

Ground water monitoring will be required. Ground water monitoring will be used for aquifer characterization, and in the collection of data that is required for future permit renewal (Part III.A., Duty to Re-apply). Ground water monitoring and reporting requirements are summarized in the Table 10. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter. The existing permit monitoring Well MW1-D along with the three (3) additional monitoring wells shall be maintained and monitored during the term of the upcoming permit cycle. Sampling and reporting requirements shall commence upon the effective date of the permit.

Ground water reporting requirements for permit monitoring wells MW1-A, MW1-B, MW1-C, and MW1-D are discussed in Section V. Ground water monitoring and reporting requirements are summarized in the following table. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

Ground Water Monitoring and Reporting Requirements, Separately

Red Dog Ranch Ground Water Monitoring and Reporting Requirements, Separately

Parameter/Method	Monitor Location[1]	Units	Sample Type[2]	Minimum Sampling Frequency	Reporting[2][3][5][6] Requirements	Reporting Frequency	Rationale
Chloride (as Cl)	MW1-A MW1-B	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Current Permit Requirement
Escherichia coli Bacteria	MW1-C	CFU/100 ml	Grab	1/Quarter	Daily Maximum Quarterly Average[6]	Quarterly	Current Permit Requirement
Nitrogen, Nitrate + Nitrite (as N)	MW1-A, MW1-B, MW1-D	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Current Permit Requirement
Nitrogen, Total Ammonia (as N)	MW1-A, MW1-B, MW1-D	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Current Permit Requirement
Nitrogen, Total Kjeldahl (TKN)(as N)	MW1-A, MW1-B, MW1-D	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Current Permit Requirement
Specific Conductivity @ 25°C	MW1-A, MW1-B, MW1-D	µS/cm	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly	Current Permit Requirement
Static Water Level (SWL)[7]	MW1-A, MW1-B, MW1-C, MW1-D	ft-bmp	Measured	1/Quarter	Quarterly Average	Quarterly	Current Permit Requirement

Footnotes:

MW1-D sampling and reporting shall commence upon the effective date of the permit.

Sampling and reporting for the proposed monitoring wells MW1-A, MW1-B, and MW1-C shall commence upon their installation (See Special Conditions).

CFU = Colony Forming Units

s.u. = standard units

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

All monitoring wells shall be individually sampled and analyzed for each respective parameter listed above.

If any monitoring well(s) are abandoned, destroyed or decommissioned, or are no longer able to be sampled due to fluctuations in the ground water table; the permittee shall install a new well to replace the abandoned, destroyed, decommissioned, or non-viable well(s).

Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR Part 136, unless specified above.

Submittal of discharge monitoring report forms (DMRs) will be required, regardless of the operational status of the facility or of each individual monitoring well.

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

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

(3) Submittal of DMRs will be required, regardless of the installation status of each individual monitoring well. If the monitoring well(s) is not installed for an individual monitoring period, the following shall be stated upon each applicable DMR: "monitoring well has not been installed".

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

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

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

APPENDIX VII - REFERENCES CITED

40 CFR § 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants. 2011.

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 7 – Nondegradation of Water Quality.
- Subchapter 10 – Montana Ground Water Pollution Control System.
- Subchapter 13 – Montana Pollutant Discharge Elimination System.

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- Circular DEQ-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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