

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Permitting and Compliance Division
Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

Permit Fact Sheet
Montana Ground Water Pollution Control System (MGWPCS)

Applicant: RAE Subdivision County Water and Sewer District #313

Permit Number: **MTX000117**

Facility Name: RAE Wastewater Treatment Facility

Facility Location: NW1/4, S.16, T.2S, R.5E
45.66888°N, -111.120833°W
Gallatin County

Facility Address: 129 Percival Path
Bozeman, MT 59718

Facility Contact: David King, Manager
129 Percival Path
Bozeman, MT 59718

Receiving Water: Class 1 Ground Water

Number of Outfalls: 2

Outfall/Type: Subsurface pressure dose drainfields – Domestic wastewater

I. PERMIT STATUS

The following fact sheet outlines the basis for renewing and modifying a MGWPCS wastewater discharge permit to RAE Subdivision County Water and Sewer District No. 313 for RAE Wastewater Treatment Facility west of Bozeman. 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 MTX000117 for RAE Subdivision wastewater facility. This permit adds a new outfall (Outfall 002), additional treatment capacity, and additional service area to the existing permit.

A. Application information

An application for renewal of the existing MTX000117 was received with the required fees on September 11, 2014, and deemed complete on September 17, 2014. An application for the modification of MTX000117 was received August 6, 2015, and deemed complete August 28, 2015. This permit is being processed as a combined renewal and modification of the existing permit. Additional information was requested and received from the applicant December 3rd and 30th, 2015.

B. Permit Changes

This permit authorizes increased capacity and service area at the RAE wastewater facility. It also authorizes the use of a second outfall for the facility. The effluent limit used in the previous permit has been updated to reflect new monitoring data. The old limit of 9.1 mg/L and 15.2 lbs/day for nitrogen is changed to 9.35 mg/L and 15.59 lbs/day nitrogen for the next permit cycle.

The permit renewal and modification of the existing permit authorizes the permittee to discharge residential strength wastewater from a sequencing batch reactor (SBR) wastewater treatment system to five infiltration galleries from two outfalls located on the property served by the RAE Subdivision County Water and Sewer District #313. This permit assumes that each of the two outfalls will receive two hundred thousand gallons of treated effluent per day, half of the four hundred thousand gallon per day design capacity for the facility. Effluent limits for this facility are based on these discharge rates.

II. FACILITY INFORMATION

A. Facility Location

The RAE Waste Water Facility is located off Huffine Lane, two miles west of Bozeman in Gallatin County. The legal description is located in Table 1.

B. Facility and Operations

The RAE Waste Water Facility is a publicly owned treatment facility designed to serve 924 residences with a population of 2190, and 14 commercial hookups. The facility design flow is an average daily flow of 400,000 gallons of effluent per day. The maximum design flow is 500,000 gallons per day. The system is a nutrient reduction system, sequencing batch reactor (SBR). Table 1 below summarizes the location and design of the facility and facility components.

Table 1: Collection, Treatment, and Disposal System Summary	
RAE Wastewater Facility, MTX000117	
Type of Discharge: Domestic and Commercial Wastewater/Sewage	
Method of Disposal: Infiltration to ground water	
Disposal Structure: Subsurface Drainfield	
Contributing Sources: Residential and commercial (924 residences and 14 commercial hookups)	
Average Daily Design Flow (gpd): 400,000	Daily Maximum Design Flow (gpd): 500,000
Contributing Sources: Residential and commercial (924 residences and 14 commercial hookups)	
Treatment: Nutrient Reduction Sytem, SBR, Biological Nutrient Removal	
Effluent Sampling Location: Sampling port EFF-001 is located between the UV disinfection unit and the dosing tank. This location is used for both Outfall 001 and Outfall 002 effluent sampling.	
Outfall 001	
Location: NW 1/4, Section 16, T2S, R5E Gallatin County; 45 degrees, 40 minutes, 8 seconds N, 111 degrees, 7 minutes, 15 seconds W	
Flow Monitoring Equipment: FM-001A McCrowmeter, MW500, FM-001B Badger Mag-meter	
Flow Monitoring Location: Existing flow meter FM-001A, located between UV disinfection unit and the dosing tank will be replaced by FM-001B when flow monitor FM-002 (for outfall 002) comes on line. FM-001B is located at dosing tank.	
Outfall 002 (to be constructed by November 1, 2019)	
Location: SE 1/4, NE 1/4, NW 1/4, Section 17, T2S, R5E, Gallatin County, 45 degrees, 39 minutes, 40 seconds N, 111 degrees, 8 minutes, 20 seconds W	
Flow Monitoring Equipment: Badger Mag-meter	
Flow Monitoriong Location: FM-002, Located at dosing tank	

The RAE Waste Water Facility has two outfalls as described above in Table 1. Outfall 001 is located near the treatment facility; Outfall 002 is located approximately 3/4 mile southwest of the treatment facility. Outfall 002 is not yet constructed at the time of this renewal. Outfall 002 will be installed by November 1, 2019.

C. Effluent Sampling Location

Sampling for both outfalls is taken at Eff-001 located between the UV disinfection unit and the dosing tank. Sampling requirements are further discussed in Appendix VII.

D. 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 applicant provided effluent quality data for Outfall 001 and 002 as summarized within Appendix I.

E. Geology

Sediments in this area consist of alluvial fan deposits approximately 200 feet thick that are composed of silt, sand, and gravel from the Gallatin Range to the south. Northward the alluvial fan deposits meet with the alluvium from the Gallatin and East Gallatin Rivers, which is approximately 100 feet thick. Less permeable, Tertiary-age deposits underlie the fan and alluvial deposits. These deposits consist of semi-consolidated clay, silt, sand and gravel (2007 application information, Hackett).

F. Hydrogeologic Characteristics

The shallow unconfined aquifer in this area is approximately 150 feet thick (Slagle, 1995). A summary of hydrogeologic characteristics and a table of existing monitoring wells is provided within Appendix II.

G. Ground Water Monitoring Wells

Outfall 001 has two upgradient and four downgradient wells. Outfall 002 has two upgradient wells. Outfall 002 is not yet constructed. Only upgradient monitoring is available for Outfall 002. For consistency, the Department has located all monitoring wells in Table 5 contained in Appendix II, and assigned new identification numbers to these wells. Table 5 lists the Well ID Numbers, the location of the well and previously used identification numbers for each well. Appendix II, Figure 5, contains a location map for all monitoring wells.

H. Ground Water Quality Characteristics

This permit authorizes discharge to Class I ground water. Ground water qualities, including ambient 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 be authorizing two mixing zones within this permit. The mixing zone rationale is further discussed in Appendix IV. The mixing zone for Outfall 001 is a Department modified mixing zone. The mixing zone for Outfall 002 is a standard mixing zone. A significance determination has been performed for Outfall 002 as part of this permit. A significance determination for Outfall 001 was done as part of a previous application (DEQ, 2009). See section VII for more information.

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 basis for deriving and establishing effluent limitations are further discussed in Appendix V.

Based on the information and analyses presented in Sections III and IV, and pursuant to ARM 17.30.1031, DEQ proposes numerical effluent limitations for the following parameter:

A. Nitrogen:

The nitrogen limit for this permit is calculated using a simple mass balance equation done for each of the two outfalls and mixing zones associated with this facility. These calculations can be found in Appendix V.

The nitrogen limit of 15.59 lbs/day is calculated for Outfall 001. The nitrogen limit for Outfall 002 is 17.61 lbs/day.

Based on the information and analyses presented in Appendix V and pursuant to 75-5-402, MCA; DEQ proposes the following numerical effluent limitation. The proposed final limitation is the most stringent applicable limitations.

Table 2

Effluent Limits, RAE Sewer and Water District #313				
Parameter	Units	Effluent Limitations		Rationale
		Daily Maximum⁽¹⁾	30-Day Average Load (pounds per day)	
Nitrogen, Total (as N) Outfall 001	mg/L	9.35		Nondegradation Nonsignificance Criteria
	lbs/day		15.59	Nondegradation Nonsignificance Criteria
Nitrogen, Total (as N) Outfall 002	mg/L	10.61		Nondegradation Nonsignificance Criteria
	lbs/day		17.61	Nondegradation Nonsignificance Criteria
Footnotes:				
Beneficial Uses: ARM 17.30.1006				
Nitrogen limit based on outfall 001 parameters.				
(1) See definition in Part V of permit.				

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. Effluent monitoring and ground water monitoring requirements will be required as a condition of this permit. Monitoring requirements and rationale thereof is summarized in Appendix VII.

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.

A. Flow Meter Installation

By November 1, 2019 or prior to any discharge to Outfall 002, the operator will install flow monitoring equipment, FM001B and FM002 to allow Outfall 001 and Outfall 002 to be monitored for flow separately.

Installation and reporting requirements are further described in Appendix XI. The commencement date for monitoring well sampling and reporting is listed in Section VII.

VII. COMPLIANCE SCHEDULE

A compliance schedule (Table 3) 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 Table 3 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				
Authority	Action	Freq.	Scheduled Completion Date of Action⁽¹⁾	Scheduled Report Due Date.⁽²⁾⁽³⁾
ARM 17.30.1031	Install FM001B and FM002	Single event	<i>By November 1, 2019, or prior to any discharge to Outfall 002.</i>	<i>Due on or before the 28th day of the month following the completion date</i>
Footnotes:				
(1) The actions must be completed on or before the scheduled completion dates.				
(2) Reports must be received by DEQ on or before the scheduled report due dates. The reports must include all information as required for each applicable action as listed in Section VII.				
(3) The completed plan (action), in place of a written report, must be received by the DEQ on or before the scheduled "report" due date.				

VIII. NONSIGNIFICANT DETERMINATION

DEQ has determined (DEQ, 2014) that the discharge constitutes a new source and is subject to Montana Nondegradation Policy (75-5-303, MCA; ARM 17.30.702). The applicable water quality standards for Class I ground water and nondegradation significance criteria are summarized in Appendix V. Discharges in compliance with the limitations of this permit constitute nonsignificant degradation. 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/notices/WQnotices.mcp>.

Public comments on this proposal are invited any time prior to close of business on **April 12, 2015**. Comments may be directed to:

DEQWPBPublicComments@mt.gov

or,

DEQ
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 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) under ARM 17.30.1372. 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/notices/WQnotices.mcpX>.

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 Jenna Stamper at JStamper@mt.gov. All inquiries will need to include the following information: number of permit (MTX000117), name, address, and phone number.

During the public comment period provided by the notice, the Department 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 (ARM 17.30.1373).

FIGURE 1
Vicinity Map

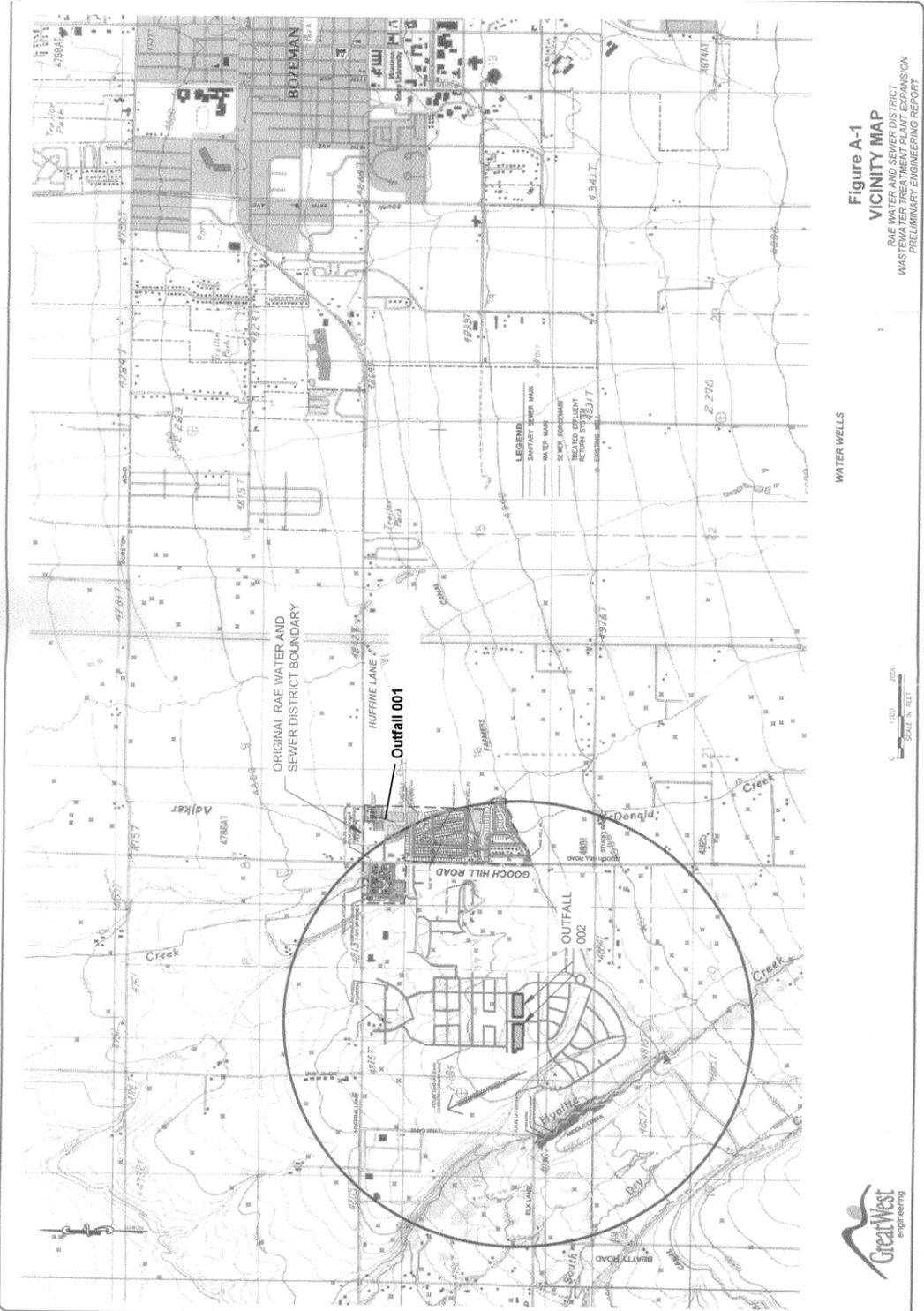


FIGURE 2

Vicinity Map and RAE Service Area

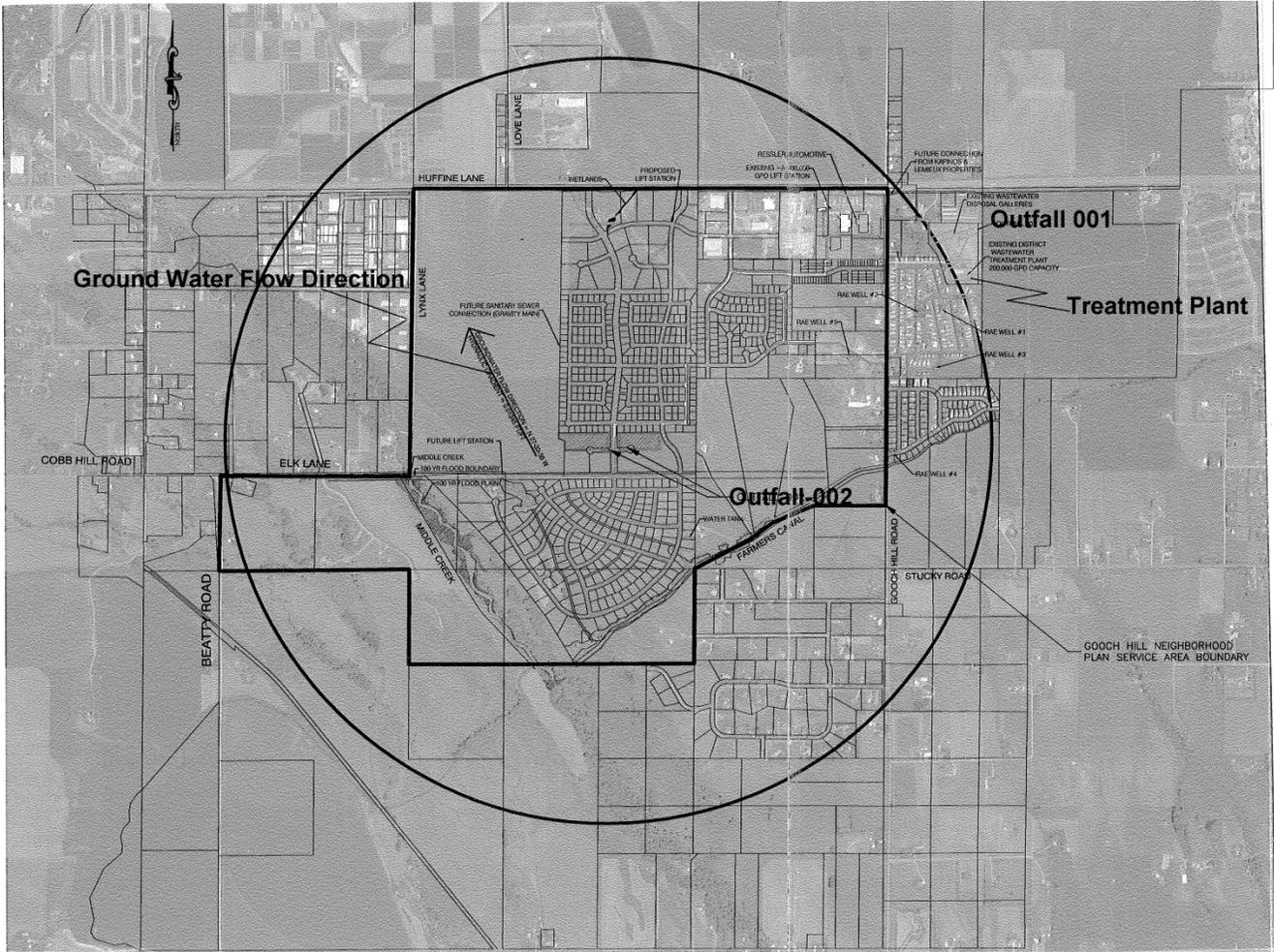
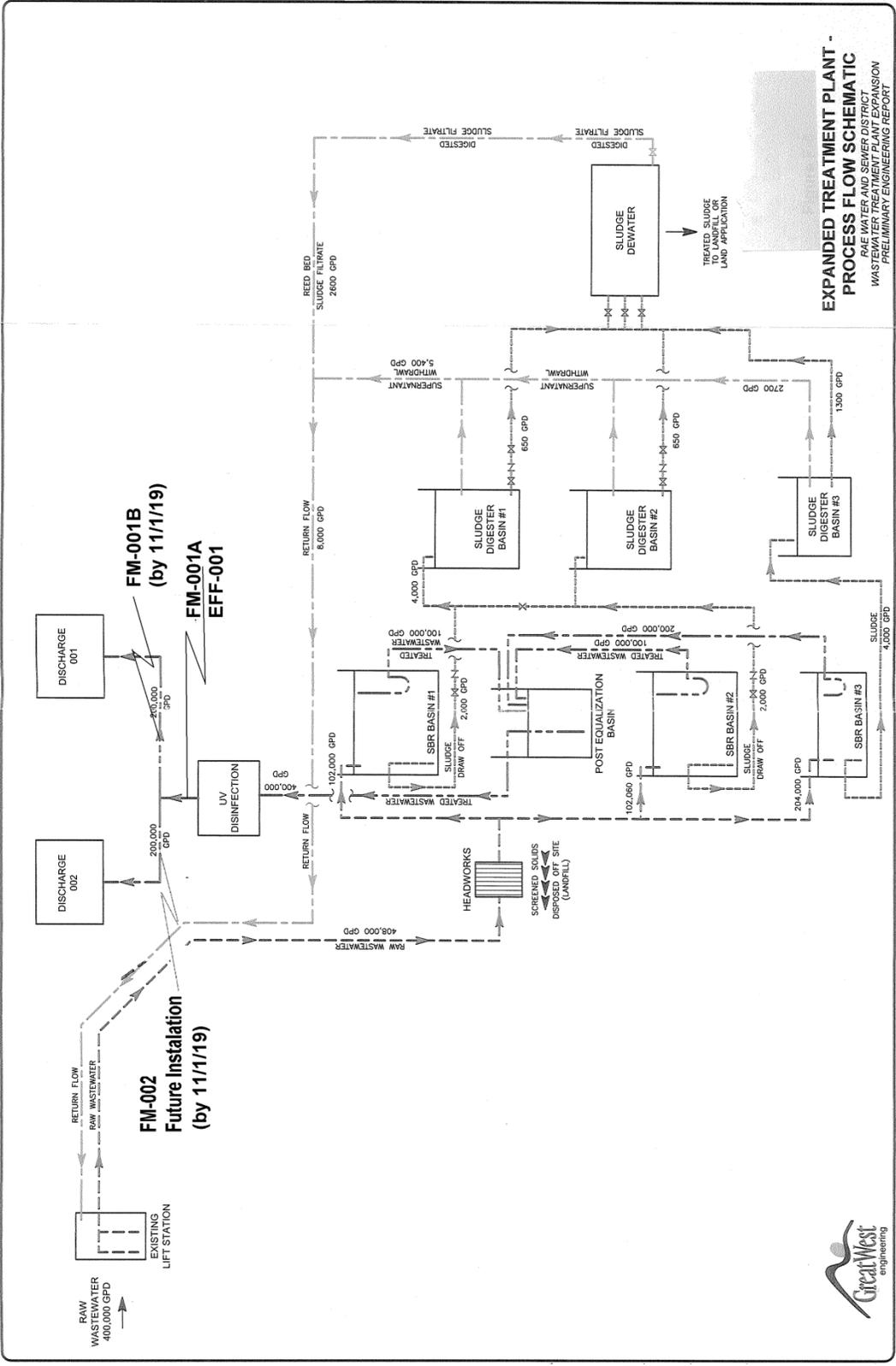


FIGURE 4
Line Diagram



APPENDIX I

EFFLUENT QUALITY

Table 4

Effluent Quality – Outfall 001 and 002								
Parameter⁽¹⁾	Location	Units	Reported Minimum Value	Reported Average Value	Reported Maximum⁽²⁾ Value	# of Samples	Source of Data	2009 Permit Limit
Biochemical Oxygen Demand (BOD ₅)	EFF-001	mg/L	2	6	12	7	DMR	NA
Chloride (as Cl)	EFF-001	mg/L	45	86	146	7	DMR	NA
<i>Escherichia Coliform</i> Bacteria	EFF-001	CFU/100ml	1	24	1200	64	DMR	NA
Flow rate, Discharge	FM-001	gpd	48,000	72,077	146,000	65	DMR	200,000
Nitrogen, Nitrate + Nitrite (as N)	EFF-001	mg/L	0.05	1.5	4.6	72	DMR	NA
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	0.05	10.7	23.5	7	DMR	NA
Nitrogen, Total (as N)	EFF-001	mg/L	0.9	4.6	24.0	69	DMR	9.1
		lbs/day	0.76	2.40	12.60	65	DMR	15.2
Phosphorus, Total (as P)	EFF-001	mg/L	0.3	2.7	8.0	72	DMR	NA
		lbs/day	0.19	1.60	3.90	66	DMR	3

Footnotes:
CFU = Colony Forming Unit
DMR = Self Reported Discharge Monitoring Reports
EFF-001: Effluent sample tap located in the control building after UV disinfection
FM-001 = Effluent flow meter located in control building after UV disinfection.
Period of Record: 1/31/09 - 09/30/15.
NA = Not Analyzed
NR = Not Reported
(1) Conventional and nonconventional pollutants only, table does not include all possible toxics.
(2) Maximum value recorded of all quarterly reported Daily Maximum Values.

The RAE Subdivision Wastewater Facility, in addition to the 924 residential hookups, currently has 14 commercial hookups. The effluent from these businesses shall be domestic-in-nature. The respective contribution to flow, as provided to DEQ by the applicant, is included below. The commercial hookups contribute 1.5 percent of effluent (5900 gpd) of the total daily flow (400,000 gpd) to the RAE facility.

Commercial domestic-in-nature wastewater contributions to the RAE facility:

- Sentry Storage 33 gpd (gallons per day)
- Signs and Designs (closed) 0 gpd
- King Arthur club house 66 gpd
- King Arthur pool 66 gpd
- Ressler Auto Body 330gpd
- Ressler Chevrolet 443 gpd
- Ressler Toyota 666 gpd

- Ressler Express Lube 3,000 gpd
- (has car wash too)
- Big Sky RV 700 gpd
- Easton Commercial no data yet. 200 gpd estimate
- The Book Barn 33 gpd
- Northern Lights Barn 233 gpd
- Woodland Park... small office 133 gpd
- 6 other commercial lots in Woodland (undeveloped land now).
- They were planning a fire house for Falcon Hollow but that might be off for now.

APPENDIX II

Hydrogeologic Characteristics

Outfall 001

Depth to ground water fluctuates at least 4 feet seasonally. Average static water levels (SWLs) from the four ground water monitoring wells in the vicinity of the discharge (hydraulically downgradient of the Department Modified Mixing Zone) range from 6.84 to 10.48 feet below the top of the casing (TOC).

The hydraulic conductivity (K) is 43 ft/day (Hackett, 1960 and Slagle, 1995, Potts, 2009). The hydraulic gradient is 0.012 ft/ft, N20°W (Slagle, 1995, Potts, 2009). The nearest hydraulically downgradient receiving surface water is an unnamed gravel pit, which is 2,620 feet from the outfall.

Outfall 002

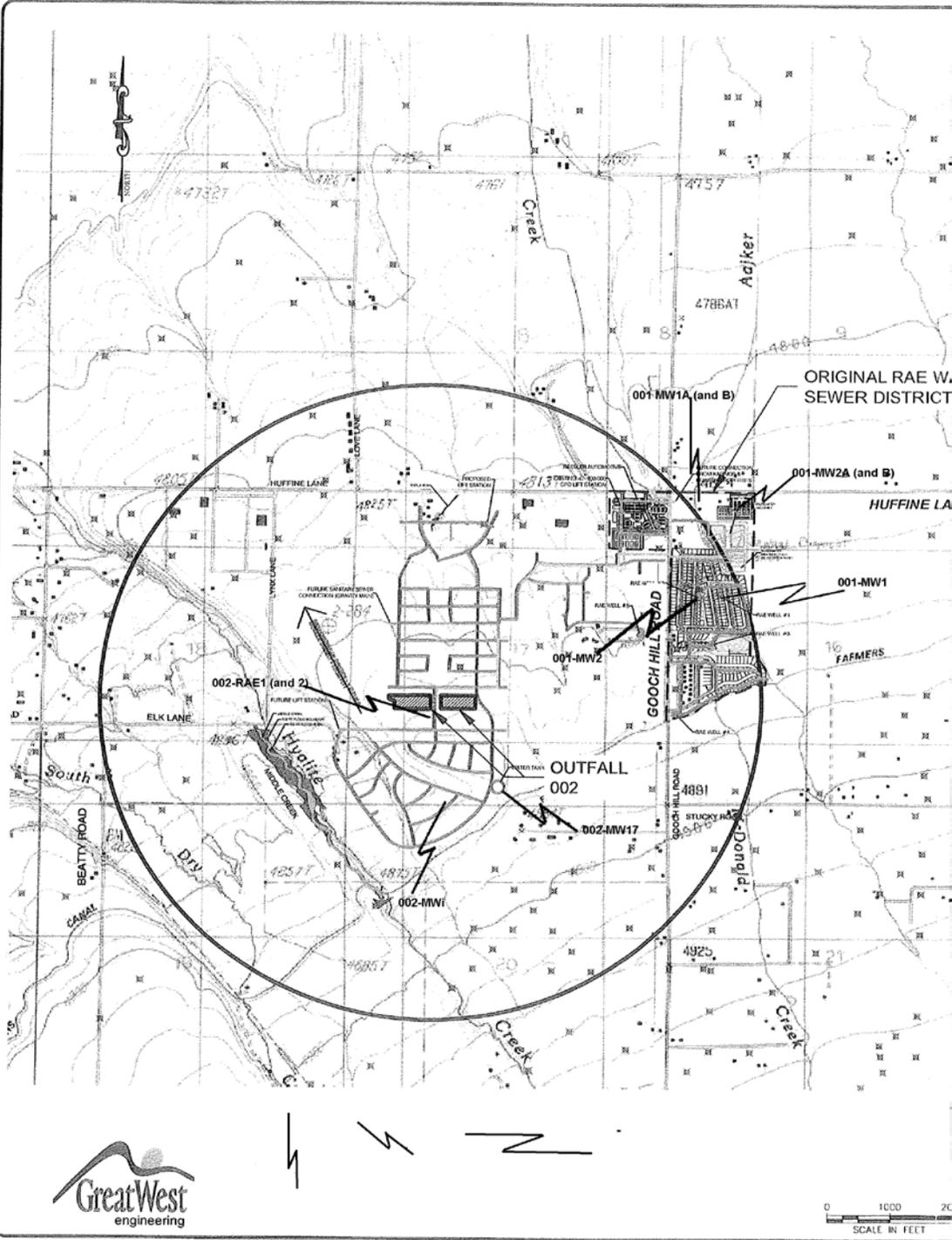
On October 22, 2010, monitoring wells 002-RAE1 and 002-RAE2 were drilled to 57 feet for aquifer pump testing (see monitoring well information Appendix II), the depth to ground water in these wells is 34 feet. Three shallow monitoring wells, upgradient of Outfall 002, were monitored for this application (Great West Engineering). Average depth to ground water in these wells was 20.35 feet. Hydraulic Conductivity for Outfall 002 is 58 ft/day (Great West Engineering, 2010). Hydraulic gradient for Outfall 002 is 0.0093 ft/ft (Great West Engineering 2009).

MONITORING WELL SUMMARY

Table 5

RAE, MTX000117 Monitoring Wells, Locations and Identification Numbers						
Description	ID#	Lat/Long	Depth	GWIC #	PWS ID	DMR ID
Outfall 001						
Downgradient	001-MW1B	45.66992,-111.12310	50feet	208341	NA	MW1-B
	001-MW1A	45.66992,-111.12310	20feet	208345	NA	MW1-A
	001-MW2B	45.67042, -111.12122	50feet	208343	NA	MW2-B
	001-MW2A	45.67042, -111.12122	20feet	208342	NA	MW2-A
Upgradient	001-MW1 (alias RAE#1)	45.6667, -111.12201	133feet	95875	628002	NR
	001-MW2 (alias RAE#2)	45.6664, -111.1225	90feet	173092	628003	NR
Outfall 002						
Upgradient	002-MWi	approx. 45.65666,-111.13736	NR	NR	NA	NR
Upgradient	002-MW17	approx. 45.66727,-111.13590	24.7feet	NR	NA	NR
Pump test well	002-RAE1	45.660888,-111.138327	57feet	258739	NA	NR
Pump test well	002RAE2	45.660888,-111.138327	57feet	258740	NA	NR
Footnotes:						
NR= Not Reported						
NA= Not Applicable						
ID# = Newly assigned Well Identification Number clarifying previous numbering systems						
DMR ID= Well number appearing on DMR sampling reports						
PWS ID= Public Water Suply well ID number						
GWIC # = Montana Bureau of Mines and Geology Ground Water Information Center well ID#						

Figure 5
Location of Monitoring Wells



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APPENDIX III
Monitoring Data Outfall 001
Table 6

Ground Water Monitoring Results:									
Ground Water Monitoring Outfall 001									
Monitor Source⁽¹⁾	Representative	Parameter	Units	Min Value	Avg Value	Max Value	RL	# of Samples	Source of Data
001-MW1A	Shallow ground water 500 feet downgradient of Outfall 001, 20 feet deep	Chloride	mg/L	7	17	224	1	23	DMR
		Coliform, fecal	#/100	<1.0	<1.0	<1.0	1	2	DMR
		E. coli	#/100	<1.0	<1.0	<1.0	1	21	DMR
		N+N	mg/L	0.65	0.72	0.79	0.01	2	DMR
		Nitrogen, ammonia total	mg/L	0.1	0.1	0.1	0.1	2	DMR
		TN	mg/L	0.05	0.6714	0.98	0.5	21	DMR
		Specific Conductivity	umho/cm	347	456	497	5	21	DMR
001-MW1B	Shallow ground water 500 feet downgradient of Outfall 001, 50 feet deep.	Chloride	mg/L	4	9.7391	72.00	1	23	DMR
		Coliform, fecal	#/100	<1	<1	<1	1	2	DMR
		E. coli	#/100	<1	1.19	3	1	21	DMR
		N+N	mg/L	0.27	0.32	0.38	0.01	2	DMR
		Nitrogen, ammonia total	mg/L	0.1	0.1	0.1	0.1	2	DMR
		TN	mg/L	0.05	0.55	1.68	0.5	21	DMR
		Specific Conductivity	umho/cm	394	453	538	5	21	DMR
001-MW2A	Shallow ground water 500 feet downgradient of Outfall 001, 20 feet deep	Chloride	mg/L	10	46.56	332	1	23	DMR
		Coliform, fecal	#/100	<1	<1	<1	1	2	DMR
		E. coli	#/100	<1	<1	<1	1	21	DMR
		N+N	mg/L	0.7	0.72	0.75	0.01	2	DMR
		Nitrogen, ammonia total	mg/L	0.1	0.1	0.1	0.1	2	DMR
		TN	mg/L	0.05	0.5	0.7	0.5	21	DMR
		Specific Conductivity	umho/cm	467	582	648	5	21	DMR
001-MW2B	Shallow ground water 500 feet downgradient of Outfall 001, 50 feet deep	Chloride	mg/L	44	94.6	450	1	23	DMR
		Coliform, fecal	#/100	<1	<1	<1	1	2	DMR
		E. coli	#/100	<1	<1	<1	1	21	DMR
		N+N	mg/L	0.04	.045	0.05	0.01	2	DMR
		Nitrogen, ammonia total	mg/L	1.3	1.5	1.7	0.1	2	DMR
		TN	mg/L	0.001	0.0572	0.2	0.5	21	DMR
		Specific Conductivity	umho/cm	585	761	879	5	21	DMR
001-MW1	Upgradient ground water PWS well #628003 90 feet deep	Chloride	mg/L	7	7	7	1	1	APP
		E. coli	#/100	<10	<1	<1	1	1	APP
		N+N	mg/L	0.86	0.93	0.96	0.01	5	APP
		Specific Conductivity	umho/cm	438	438	438	5	1	APP
		pH	s.u.	7	7	7	0.1	1	APP
		Total Dissolved Solids	mg/L	349	349	349	20	1	APP

Monitoring Data Outfall 002
(Table 6 continued)

Ground Water Monitoring Outfall 002									
Monitor Source ⁽¹⁾	Representative	Parameter	Units	Min Value	Avg Value	Max Value	RL	# of Samples	Source of Data
002-MW 17	Upgradient shallow groundwater. 24 feet deep	Chloride	mg/L	1	3.2	6	1	5	APP
		E. coli	#/100	<1	4.76	22.8	1	5	APP
		N+N	mg/L	ND	0.086	0.26	0.01	5	APP
		Specific Conductivity	umho/cm	251	289.9	331	5	5	APP
		pH	s.u.	7.3	7.74	7.9	0.1	5	APP
		Total Dissolved Solids	mg/L	176	194.6	220	20	5	APP
002-MWi	Upgradient shallow groundwater	Chloride	mg/L	6	6	6	1	1	APP
		E. coli	#/100	<1	<1	<1	1	1	APP
		N+N	mg/L	ND	ND	ND	0.01	1	APP
		Specific Conductivity	umho/cm	496	496	496	5	1	APP
		pH	s.u.	7.4	7.4	7.4	0.1	1	APP
		Total Dissolved Solids	mg/L	276	276	276	20	1	APP
Footnotes:									
APP = Application Form GW-2 and supplemental materials.									
DMR = Self Reported Discharge Monitoring Reports									
NR = Not Reported									
ND= None Detected									
Period of Record: DMR= 01/31/09 -9/30/15, APP 001= 09/11/14, APP 002 = May 2010 to June 2015									
RL = Laboratory analyte reporting limit.									
s.u. = standard units									
(1) Refer to Section II of the Fact Sheet for the existing or proposed location of the monitoring wells.									

Ambient Ground Water Data
Table 7

Ambient Ground Water Quality:									
Outfall 001									
Parameter	Analysis	Units	Location⁽¹⁾	Minimum Value	Average Value	Maximum Value	RL	# of Samples	Source of Data
Chloride (as Cl)		mg/L	001-MW1	7.0	7.0	7.0	1.0	1	App
<i>Escherichia coli</i> Bacteria		CFU/100 ml	001-MW1	<1	<1	<1	1	1	App
Nitrogen, Nitrite+Nitrate (as N)	Total	mg/L	001-MW1	0.86	0.93	0.96	0.05	5	App
pH		s.u.	001-MW1	7.0	7.00	7.0	0.1	1	App
Specific Conductivity @ 25°C		µS/cm	001-MW1	438	438	438	1.0	1	App
Total Dissolved Solids	Diss	mg/L	001-MW1	349	349	349	10	1	App
Outfall 002									
Chloride (as Cl)		mg/L	002-MW17	1.0	3.2	6.0	1.0	5	App
		mg/L	002-MWi		6.0			1	App
<i>Escherichia coli</i> Bacteria		CFU/100 ml	002-MW17	<1	4.76	22.8	1	5	App
			002-MWi		<1		1	1	App
Nitrogen, Nitrite+Nitrate (as N)	Total	mg/L	002-MW17	ND	0.086	0.26	0.05	5	App
			002-MWi		ND		0.05	1	App
Total Kjeldahl Nitrogen		mg/L	002-MW17	1.00	1.88	2.8	1.00		App
pH		s.u.	002-MW17	7.3	7.74	7.9	0.1	5	App
			002-MWi		7.40		0.0	1	App
Specific Conductivity @ 25°C		µS/cm	002-MW17	251	289	326	1.0	5	App
			002-MWi		496		1.0	1	App
Total Dissolved Solids	Diss	mg/L	002-MW17	176	195	220	10	5	App
			002-MWi		276		10	1	App
Footnotes:									
App = Application Form GW-2 and supplemental materials.									
CFU = Colony Forming Units									
MW17-002 is representative of ambient shallow ground water quality (24 feet)									
Period of Record: Outfall 001=May 2010 through June 2011, Outfall 002=June 2015									
ND = None Detected									
RL = Laboratory analyte reporting limit.									
s.u. = standard units									
(1) Refer to Table 4 of the Fact Sheet for the existing or proposed location of the monitoring wells.									

APPENDIX IV – MIXING ZONE RATIONALE

The applicant has requested the reauthorization of a Department modified mixing zone for Outfall 001, and the authorization of a new standard ground water mixing zone for Outfall 002. 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).

A mixing zone may be denied if it will threaten or impair existing uses (Section IV) in accordance with ARM 17.30.505. In making this determination DEQ will consider whether current available data can accurately predict ground water or pollutant movement, or whether there is sufficient unpredictability that might result in adverse impacts due to a particular concentration of a parameter within the mixing zone [ARM 17.30.506; and 517].

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 (500-foot) ground water mixing zone or a Department modified mixing zone. After an assessment of the application information (ARM 17.30.505), DEQ will authorize a mixing zone for the parameters listed within Table 2 as the potential impact to beneficial uses may be minimal (Section IV).

For purposes of determining the mixing zone area, DEQ will reference the following rules listed below for the mixing zones. 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, 2007a). ARM 17.30.517 states that a specific depth and width are necessary to determine the aquifer cross-section area (A) for a mixing zone. The width of the outfall structures perpendicular to ground water flow direction are reported within Table 9. ARM 17.30.517 states that the depth of a ground water mixing zone extends from the top of the water table beneath the source down to 15 feet below the water table.

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 within Table 9.

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):

$$QGW=KIA$$

Where:

QGW = ground water flow volume (ft³/day)

K = hydraulic conductivity (ft/day)

I = hydraulic gradient (ft/ft)

A = cross-sectional area (ft²) of flow at the downgradient boundary of the mixing zone.

Table 9 lists the volume of ground water available to mix at Outfall 001 and Outfall 002.

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).

Outfall 001 has a previously permitted, Department modified, standard mixing zone that is already in use. The applicant has requested an additional standard mixing zone for Outfall 002. DEQ has reviewed the request for this standard mixing zone. A significance determination was performed for both outfalls (see calculations below), and both mixing zones meet the requirements put forth in ARM 17.30.515. Therefore, pursuant to DEQ procedures (ARM 17.30.515), DEQ will be establishing a standard mixing zone for Outfall 002 and will reauthorize the Department Modified Mixing Zone for Outfall 001 for this permit cycle.

The more restrictive nitrogen limits applied to Outfall 001 will be applied to this permit. Nitrate sensitivity analysis calculations are contained in Appendix V.

Table 8
Mixing Zone Data

Mixing Zone Information - RAE County Sewer District #313		
Outfall 001		
Parameter	Units	Value
Mixing Zone Type	feet	Department Modified Mixing Zone
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations (2001 Application info) N+N	mg/L	0.93
Ground Water Flow Direction	azimuth/bearing	N18W
Length of Mixing Zone	feet	365
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	770
Width of Mixing Zone at Down Gradient Boundary	feet	833
Cross Sectional Area of Mixing Zone (A)	ft ²	12,495.0
Hydraulic Conductivity (K)	feet/day	43
Hydraulic Gradient (I)	ft/ft	0.014
Volume of Ground Water Available for Mixing (Q _{gw})	ft ³ /day	7,522
Outfall 002		
Parameter	Units	Value
Mixing Zone Type	-	Standard
Authorized Parameters	-	Total Nitrogen
Ambient Ground Water Concentrations (2014 Application info) Nitrate + Nitrite	mg/L	0.086
Ground Water Flow Direction	azimuth/bearing	N18°W
Length of Mixing Zone	feet	500
Thickness of Mixing Zone	feet	15
Outfall Width, Perpendicular to Ground Water Flow Direction	feet	1300
Width of Mixing Zone at Down Gradient Boundary	feet	1388
Cross Sectional Area of Mixing Zone (A)	ft ²	20,805
Hydraulic Conductivity (K)	feet/day	58
Hydraulic Gradient (I)	ft/ft	0.0093
Volume of Ground Water Available for Mixing (Q _{gw})	ft ³ /day	11,222

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 receiving water is Class 1 ground water and high quality waters of the state (75-5-103, MCA). The quality of Class 1 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 1 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 nondegradation provisions of 75-5-303, MCA.

The nondegradation rules (ARM 17.30.701, et seq.) implement Montana's nondegradation 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, the department 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. It established the proposed discharge as a new or increased source 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 nondegradation significance criteria established within this permit, constitute nonsignificant degradation.

The applicable ground water standards pursuant to ARM 17.30.1006 and the nondegradation nonsignificance criteria at ARM 17.30.715 for the identified parameters are summarized in the table below and will be used as the basis for developing effluent limitations.

**Table 9
Water Quality Standards**

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⁽³⁾	17.30.715 Nondegradation - Nonsignificance Criteria⁽³⁾
Nitrogen, Nitrate + Nitrite (as N)	mg/L	10.0		T	7.5
Nitrogen, Total (TN)	mg/L	-	10.0		7.5
Phosphorus, Total Inorganic	-	-	-	H	Surface water breakthrough time greater than 50 years ⁽⁴⁾
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 pollutants and 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.					
(4) 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)

DEQ has identified pollutants and parameters of interest (POI's) for the proposed discharge based on the following:

- Reported effluent characteristics (Section II.D.),
- Water quality standards (Appendix V.),
- Water use classification of the receiving ground water (Appendix V), and ,
- United States Environmental Protection Agency (USEPA) reference documents (Appendix VIII).
- DEQ 2009 determination

Each individual POI is further discussed below. Each Outfall associated with this permit will have its own Effluent Limit.

C. Development of Effluent Limits

ARM 17.30.1006 and 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

Prior to discharge, effluent is passed through an Ultra Violet disinfection process. The system discharges treated wastewater through five subsurface discharge structures. The discharge structures are systematically pressure-dosed (or aerated) which minimizes saturated conditions and maximize bacteria die-off rate in the natural sediments. If properly operated, the drainfield should remove most, if not all, of the pathogenic bacterial indicators beneath the drainfield's infiltrative surface (Woessner, 1998). Therefore, an effluent limit will not be established in this permit 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 been authorized for mixing (Section III).

Equation 2:

$$C_{\text{lim}} = C_{\text{std}} + D(C_{\text{std}} - C_{\text{gw}})$$

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

MASS BALANCE EQUATION ALLOWABLE DISCHARGE CONCENTRATION DETERMINATION		
Outfall 001		
$C_2 = \frac{C_3(Q_1 + Q_2) - C_1 Q_1}{Q_2}$		
C1	Ambient ground water (background) concentration (mg/L)	0.93
C2	Allowable discharge concentration (mg/L)	9.35
C3	Ground water concentration limit for pollutant (from Circular WQB-7) at the end of the mixing zone.	7.50
Q1	Ground water volume (ft ³ / day)	7522
Q2	Maximum flow of discharge (design capacity of system in ft ³ / day)	26736
The volume of ground water that will mix with the discharge (Q_2) is estimated using Darcy's equation: $Q_1 = K I A$		
Q1	Ground water flow volume (ft³ / day)	7522
K	hydraulic conductivity (ft/day)	43
I	hydraulic gradient (ft/ft)	0.0140
A	cross-sectional area (ft ²) of flow at the down-gradient boundary of a standard 500-foot mixing zone.	12495
Outfall 001 - RAE Water and Sewer, 12/30/2015		

MASS BALANCE EQUATION ALLOWABLE DISCHARGE CONCENTRATION DETERMINATION		
Outfall 002		
$C_2 = \frac{C_3(Q_1 + Q_2) - C_1 Q_1}{Q_2}$		
C1	Ambient ground water (background) concentration (mg/L)	0.086
C2	Allowable discharge concentration (mg/L)	10.61
C3	Ground water concentration limit for pollutant (from Circular WQB-7) at the end of the mixing zone.	7.50
Q1	Ground water volume (ft ³ / day)	11222
Q2	Maximum flow of discharge (design capacity of system in ft ³ / day)	26736
<p>The volume of ground water that will mix with the discharge (Q_s) is estimated using Darcy's equation: Q₁=K I A</p>		
Q1	Ground water flow volume (ft³ / day)	11222
K	hydraulic conductivity (ft/day)	58
I	hydraulic gradient (ft/ft)	0.0093
A	cross-sectional area (ft ²) of flow at the down-gradient boundary of a standard 500-foot mixing zone.	20805
<p>Outfall 002 - RAE Water and Sewer, 12/30/2015</p>		

i. Outfall 001-Nitrogen Load Limit

A mass-balance approach is used to calculate the effluent quality of the discharge that meets the most restrictive water quality standard at the end of the mixing zone. Numeric effluent limitations are expressed as loads since this type of limitation inherently regulates both volume and strength of the effluent as prescribed by 75-5-402(3), MCA. Load limits ensure compliance with the ground water standards at the end of the mixing zone. Based on the proposed design capacity, the respective load effluent limitation for Outfall 001 is:

15.59 lb/day
 $[(8.34 \times 10^{-6}) * 9.35 \text{ mg/L} * 200,000 \text{ gpd}]$
(See Equation 3)

Equation 3:

$$L_{\text{limt}} = \text{CON} * C_{\text{eff}} * \text{DC}_{\text{eff}}$$

Where:

L_{limt} = effluent limitation-load

C_{eff} = allowable effluent concentration

DC_{eff} = design capacity of wastewater treatment system (gpd)

CON = conversion factor [$8.34 * 10^{-6}$]

ii. Outfall 002- Nitrogen Load Limit

Based on the proposed design capacity, the respective load effluent limitation for Outfall 002 is:

$$\begin{aligned} & \mathbf{17.6 \text{ lb/day}} \\ & [(8.34 * 10^{-6}) * 10.61 \text{ mg/L} * 200,000 \text{ gpd}] \\ & \text{(See Equation 3)} \end{aligned}$$

c. Phosphorus

The nondegradation significance criteria set forth in ARM 17.30.715 state that the phosphorus concentration must be removed for a period of 50 years prior to discharge to any surface water. Phosphorus in wastewater is removed mainly through soil sorption processes, which vary based on soil composition. The 50-year breakthrough nondegradation criterion is based on the amount of soil available to adsorb the load of phosphorus from the wastewater source between the discharge points and the closest downgradient surface water. The implementation of a limitation, if needed, ensures that the quality of the effluent meets the nondegradation significance criteria developed to prevent the discharge of phosphorus to surface water.

A phosphorus breakthrough analysis was conducted by DEQ for Outfall 001 using information provided by the applicant (DEQ, 2000). A second phosphorus breakthrough analysis was conducted by DEQ, using applicant provided information for Outfall 002 (Appendix VI, DEQ, 2016).

No effluent limit is being proposed for phosphorus. Using the effluent characteristics for Outfall 001, and averaging a phosphorus concentration of 2.7mg/L (RAE Subdivision Discharge Monitoring Reports), the phosphorus adsorption capacity for Outfall 002 is 68 years. See Appendix II and Appendix VI for analysis details. DEQ considers anything over 50 years to be a non-significant discharge. Outfall 001 had no phosphorus limit in the previous permit. No phosphorus limit will be applied to Outfall 001 for this permit cycle.

D. 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 the following numerical effluent limitation. Nitrogen effluent limit for this facility is **15.59 lbs/day**. This limit applies to all discharge to Outfall 001 and Outfall 002.

The proposed final limitations are the most stringent applicable limitations for each individual parameter as developed in the previous sections. 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 – PHOSPHORUS BREAKTHROUGH ANALYSIS Outfall 002

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

PHOSPHOROUS BREAKTHROUGH ANALYSIS

SITE NAME: RAE Subdivision, Outfall 002
COUNTY: Gallatin County
Permit #: MTX000117
NOTES: Variables used are based on information provided in the application
Design Capacity = 200,000gpd

VARIABLES	DESCRIPTION	VALUE	UNITS
Lg	Length of Primary Drainfield as Measured Perpendicular to Ground Water Flow	1300	ft
L	Length of Primary Drainfield's Long Axis	1231	ft
W	Width of Primary Drainfield's Short Axis	80	ft
B	Depth to Limiting Layer from Bottom of Drainfield Laterals*	18	ft
D	Distance from Drainfield to Surface Water	2500	ft
T	Phosphorous Mixing Depth in Ground Water (0.5 ft for coarse soils, 1.0 ft for fine soils)**	1.0	ft
Ne			
Sw	Soil Weight (usually constant)	100	lb/ft ³
Pa	Phosphorous Adsorption Capacity of Soil (usually constant)	200	ppm
#	Number of proposed wastewater treatment systems	1	

CONSTANTS

PI	Phosphorous Load per proposed wastewater treatment system	1642	lbs/yr
X	Conversion Factor for ppm to percentage (constant)	1.0E+06	

EQUATIONS

Pt	Total Phosphorous Load = (PI)(#)	1642	lbs/yr
W1	Soil Weight under Drainfield = (L)(W)(B)(Sw)	177264000	lbs
W2	Soil Weight from Drainfield to Surface Water = [(Lg)(D) + (0.0875)(D)(D)] (T)(Sw)	379687500	lbs
P1	Total Phosphorous Adsorption by Soils = (W1 + W2)[(Pa)/(X)]	111390	lbs

SOLUTION

BT	Breakthrough Time to Surface Water = P / Pt	68	years
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BY: R. Morse
DATE: January 2016

NOTES: * Depth to limiting layer is typically based on depth to water in a test pit or bottom of a dry test pit minus two feet to account for burial depth of standard drainfield laterals.

APPENDIX VII – 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 required as a condition of this permit.

A. Effluent Monitoring - Compliance

Final numeric effluent limitations are developed in this document with specific magnitudes and durations based on site-specific conditions that ensure the discharge does 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 effluent quality at a specified frequency in order to demonstrate compliance with the applicable effluent limitations. Effluent monitoring and reporting requirements are summarized in the table 11. All parameter analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136.

B. Effluent Monitoring - Sampling Location

Samples shall be representative of the nature of the monitored discharge (Permit Part II.A.). As discussed in Section II.C, the effluent sample port (EFF-001) is located after the flow monitor (FM-001A) and ultraviolet disinfection, inside the control facility (Figure 4).

C. Discharge Monitoring

Measurements shall be representative of the volume of the monitored discharge (Permit Part II.A.). The applicant will be required to maintain and report flow measurements for each operational Outfall using a flow-measuring device capable of measurements that are within 10 percent of the actual flow being measured (Permit Part II.B.). Effluent Flow monitoring and reporting requirements are summarized in the table below. A special condition of this permit (Section VI) includes the installation of FM-001B and FM-002 flow monitoring equipment to meet reporting requirements.

**Table 10
Effluent and Flow Monitoring for Outfall 001 and Outfall 002 Separately**

Effluent Monitoring and Reporting Requirements – RAE Subdivision MTX000117							
Parameter/Method	Monitor Location	Units	Sample Type⁽¹⁾	Minimum Sample Frequency	Reporting Requirements⁽¹⁾⁽²⁾	Report Freq	Rationale
Outfall 001							
<i>Escherichia coli</i> Bacteria	EFF-001	CFU/100mL	Grab	1/Quarter	Daily Maximum Quarterly Average ⁽⁴⁾	Quarterly	Effluent Characterization
Nitrogen, Nitrite+Nitrate (as N)	EFF-001	mg/L	Grab or Composite	Monthly	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	Grab or Composite	Monthly	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Nitrogen, Total Kjeldahl (TKN)	EFF-001	mg/L	Grab or Composite	Monthly	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Nitrogen, Total (as N) ⁽⁷⁾	EFF-001	mg/L	Grab or Composite	Monthly	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
		lbs/day ⁽⁸⁾	Calculate	Monthly	Daily Maximum Quarterly Average	Quarterly	
Phosphorus, Total (as P)	EFF-001	mg/L	Grab or Composite	Monthly	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Flow Rate, Effluent ⁽⁶⁾	FM-001A	gpd	Continuous	Continuous	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Flow Rate, Effluent ⁽⁶⁾	FM-001B	gpd	Continuous	Continuous	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Outfall 002							
<i>Escherichia coli</i> Bacteria	EFF-001	CFU/100mL	Grab	1/Quarter	Daily Maximum Quarterly Average ⁽⁴⁾	Quarterly	Effluent Characterization
Nitrogen, Nitrite+Nitrate (as N)	EFF-001	mg/L	Grab or Composite	Monthly	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	Grab or Composite	Monthly	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Nitrogen, Total Kjeldahl (TKN)	EFF-001	mg/L	Grab or Composite	Monthly	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Nitrogen, Total (as N) ⁽⁷⁾	EFF-001	mg/L	Grab or Composite	Monthly	Daily Maximum Quarterly Average	Quarterly	Permit Compliance
		lbs/day ⁽⁸⁾	Calculate	Monthly	Daily Maximum Quarterly Average	Quarterly	
Phosphorus, Total (as P)	EFF-001	mg/L	Grab or Composite	Monthly	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
Flow Rate, Effluent ⁽⁶⁾	FM-002	gpd	Continuous	Continuous	Daily Maximum Quarterly Average	Quarterly	Effluent Characterization
FM-001B: located after UV disinfection							
FM-002: located after UV disinfection							
If no discharge occurs during the reporting period, "no discharge" shall be recorded on the effluent 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.							
(4) The geometric mean must be reported if multiple samples are taken during a reporting period.							
(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) Quarterly Average Load calculation: lbs/day = the average of all calculated individual daily average loads (lbs/day) recorded during the reporting period.							
(10) 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).							

D. Ground Water Quality Monitoring

Ground water monitoring and reporting requirements are summarized in the table below. All parameter analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136.

Table 11
Ground Water Monitoring
Six Wells Monitored Separately For the Parameters Listed Below
(The following wells will be monitored; 001-MW1A, MW1B, MW2A, MW2B, MW1 and 002-MWi)

Ground Water Monitoring and Reporting Requirements, RAE Subdivision MTX000117							
Parameter/Method, These monit	Monitor Location ⁽¹⁾	Units	Sample Type ⁽²⁾	Minimum Sampling Frequency	Reporting ^{(2),(3),(5)} Requirements	Reporting Frequency	Rationale
Chloride (as Cl)	Monitor Location(1)	mg/L	Grab	1/Quarter	Quarterly Average/ Separately	Quarterly	Current Permit Requirement
<i>Escherichia coli</i> Bacteria	Monitor Location(1)	CFU/100 ml	Grab	1/Quarter	Quarterly Average ⁽⁶⁾ Separately	Quarterly	Permit Compliance
Nitrogen, Nitrate + Nitrite (as N)	Monitor Location(1)	mg/L	Grab	1/Quarter	Quarterly Average/ Separately	Quarterly	Current Permit Requirement
Nitrogen, Total Kjeldahl (TKN)	Monitor Location(1)	mg/L	Grab	1/Quarter	Quarterly Average/ Separately	Quarterly	Current Permit Requirement
Specific Conductivity @ 25°C	Monitor Location(1)	µS/cm	Grab or Instant-aneous	1/Quarter	Quarterly Average/ Separately	Quarterly	Permit Compliance
Static Water Level (SWL) ⁽⁷⁾	Monitor Location(1)	ft-bmp	Instant-aneous	1/Quarter	Quarterly Average/ Separately	Quarterly	Site Characterization
Footnotes:							
CFU = Colony Forming Units							
ft-bmp = feet below measuring point							
At no time shall the permittee mark or state "no discharge" on any monitoring well DMR form.							
Submittal of discharge monitoring report forms (DMRs) will be required, regardless of the operational status of the facility or of each individual monitoring well.							
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.							
(1) Refer to Figure 5 of the Fact Sheet for the location of the monitoring wells. Wells to be monitored include the following: 001-MW1A, 001-MW1B, 001-MW2A, 001-MW2B, 001-MW1, 002-MWi							
(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 VIII - 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.

Department of Environmental Quality, Water Quality Circulars:

- Circular DEQ-2 – Design Standards for Wastewater Facilities.
- Circular DEQ-4 – Montana Standards for On-Site Subsurface Sewage Treatment Systems.
- Circular DEQ-7 – Montana Numeric Water Quality Standards.

Department of Environmental Quality. 2009. E. Regensburger. How to Perform a Nondegradation Analysis for Subsurface Wastewater Treatment Systems. Revised February 2009.

Department of Environmental Quality. 2015 Administrative Record of Montana Ground Water Pollution Control System (MGWPCS) permit application and supplemental materials, RAE Subdivision County Water and Sewer District #313, MTX000117.

Department of Environmental Quality, Compliance Inspection, RAE, MTX000117. August 25, 2011

Department of Environmental Quality Administrative Record (2009)

Ground-Water Information Center (GWIC), Montana Bureau of Mines and Geology. GWIC database, <http://mbmgwic.mtech.edu>.

Montana Code Annotated, Title 75, Chapter 5, *Montana Water Quality Act*, 2011.

U.S. Environmental Protection Agency, Effluent Limitation Guidelines, <http://water.epa.gov/scitech/wastetech/guide/>, 2013.

Woessner, W., Troy, T., Ball, P. and D.C. DeBorde. 1998. Virus Transport in the Capture Zone of a Well Penetrating a High Hydraulic Conductivity Aquifer Containing a Preferential Flow Zone: Challenges to Natural Disinfection. In Proc. Source Water Protection Int., Dallas, TX. 28–30 Apr. 1998. National Water Research Inst., Fountain Valley, CA.

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