Water Quality Division
Montana Pollutant Discharge Elimination System (MPDES) ▪ Fact Sheet

Permittee:	REC Advanced Silicon Materials LLC
Permit No.:	MT0030350
Receiving Water:	Outfalls 001 and 002 to Sheep Gulch Outfall 003 to Silver Bow Creek
Location:	T 3N, R 9W, Section 35, Silver Bow County
Contact:	Eileen Steilman, Environmental Engineer 119140 Rick Jones Way Silver Bow, MT 59750
Type of Facility:	Minor Privately-Owned Treatment Works
Number of Outfalls:	3 (For Fee Determination Only)
Type of Outfall:	001 – Minor Private 002 – Storm Water (Integrated) 003 - Minor Private
Fact Sheet Date:	April 2021

I. Summary

DEQ proposes to renew the Montana Pollutant Discharge Elimination System (MPDES) permit for the Renewable Energy Corporation Advanced Silicon Materials (REC, or REC Silicon) facility in Silver Bow, MT, MT0030350. This fact sheet documents the legal requirements and technical rationale that serve the decision-making process involved with developing effluent limits, monitoring and reporting requirements, and special conditions which are specific to REC.

A. Permit Status

The previous permit became effective on November 1, 2010 and expired on October 31, 2015. DEQ received the MPDES renewal permit application (Forms 1 and 2C) on April 10, 2015 and issued a notice of deficiency May 5, 2015. A revised application was received May 20, 2015. DEQ considered the application complete and administratively extended the permit on July 8, 2018.

B. Proposed Changes to Effluent Limits and Permit Conditions

For this permit renewal, DEQ proposes the following changes:

- New effluent limits for aluminum.
- New and revised effluent limits based on implementation of TMDL waste load allocations for total nitrogen, total phosphorus, arsenic, copper, mercury, and zinc.
- Revised effluent limits for dissolved oxygen and nickel.
- Effluent monitoring requirements for methylene chloride are removed.
- Revised effluent monitoring requirements for multiple parameters.

II. Facility Information

REC Silicon produces high purity poly crystalline silicon for the electronics industry by refining metallurgical grade silicon.

A. Outfalls and Waste Streams

Outfalls 001 to Sheep Gulch: Process wastewater from various sections of the facility are routed to an equalization (EQ) basin where it is continuously mixed (see block flow diagram, Attachment A). From the EQ basin, wastewater is metered to the treatment system where it receives physical treatment via flocculation, clarification and neutralization. Sludge is handled with a filter press and sent to the Rocker landfill.

Treated wastewater mixes with cooling tower blowdown water prior to discharge. The cooling tower blowdown is directed to the fire pond and is the major contributor to the overall discharge volume from the facility. The combined process wastewater and cooling tower water discharges to Sheep Gulch via outfall 001. See **Figure 1**.

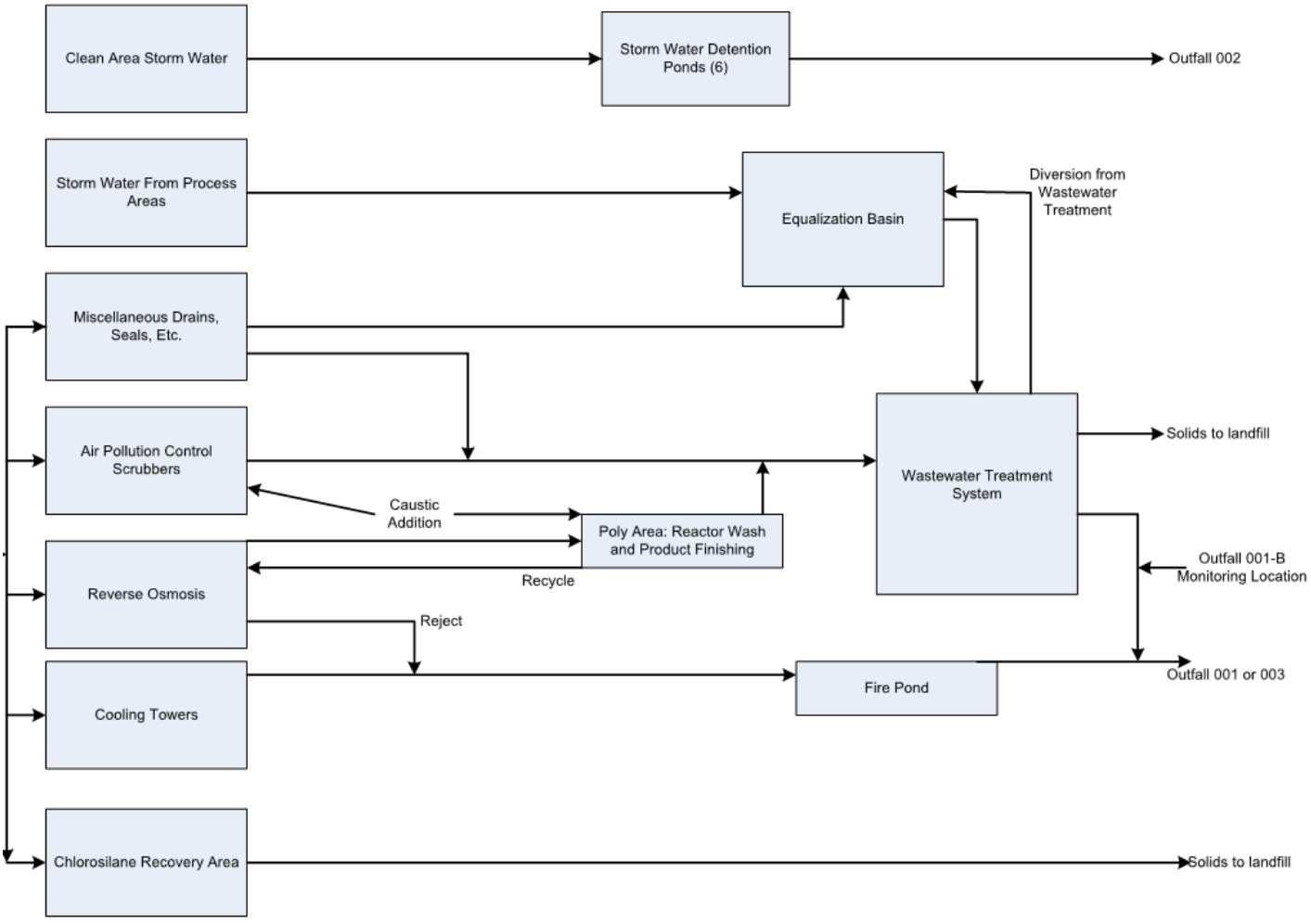
Storm water from industrial process areas is routed to the wastewater equalization basin and receives treatment in the wastewater treatment system prior to discharge into Sheep Gulch via Outfall 001.

- **Outfall 001B** is an internal outfall before treated process water combines with cooling tower blowdown water. Monitoring and effluent limits apply to total suspended solids, biochemical oxygen demand, and chemical oxygen demand at Outfall 0001B.
- **Outfall 001A** is the outfall where water quality based effluent limits apply, after treated (Outfall 001B) process wastewater combines with cooling tower blowdown wastewater. Outfall 001A is located at approximately 45.973N, -112.6898 W.

Outfall 003 to Silver Bow Creek: This is an alternate discharge location, directly to Silver Bow Creek, for effluent normally discharged at Outfall 001. Outfall 003 has not been constructed, and no discharge has occurred. However, REC wishes to retain this outfall as an alternate discharge location. The location for this outfall is at approximately 46.0041 N, -112.6934 W.

Outfall 002 to Sheep Gulch: Storm water runoff at the site is managed with stormwater detention ponds designed to contain all runoff from a 100 year-24 hour precipitation event. The detention ponds have constructed discharge structures to Sheep Gulch, designated as Outfall 002, but no discharge has occurred since issuance of the original permit. Outfall 002 is located at approximately 45.9992 N, -112.6842 W.

Figure 1. Block Flow Diagram



B. Existing Permit Requirements

Table 1: 2010-Permit Limits for Outfalls 001 and 003			
Parameter	Units	Average Monthly Limit	Maximum Daily Limit
Outfall 001A to Sheep Gulch			
Oil and Grease	mg/L	-	10
pH	s.u.	Within the range of 6.0 to 9.0 (instantaneous)	
Total Residual Chlorine	mg/L	0.011	0.019
Dissolved Oxygen	mg/L	Weekly Mean: 6.5	1-Day Minimum: 4.0
Nitrogen, Total	mg/L	2.4	-
Phosphorus, Total	mg/L	0.64	-
Total Dissolved Solids (TDS)	mg/L	1000	-
Copper, Total Recoverable	µg/L	30.5	47.5
Nickel, Total Recoverable	µg/L	63	183
Zinc, Total Recoverable	µg/L	144	389
Whole Effluent Toxicity	pass/fail	no chronic toxicity	no acute toxicity
Outfall 001B to Sheep Gulch			
Biochemical Oxygen Demand (BOD_5)	mg/L	30	45
Chemical Oxygen Demand (COD)	mg/L	120	180
Total Suspended Solids (TSS)	mg/L	30	100
Outfall 003 to Silver Bow Creek			
Oil and Grease	mg/L	-	10
pH	s.u.	Within the range of 6.9 to 9.0 (instantaneous)	
Total Residual Chlorine	mg/L	0.011	0.019
Dissolved Oxygen	mg/L	-	1-Day Minimum: 3.0
Nitrogen, Total	mg/L	2.4	-
Phosphorus, Total	mg/L	0.64	-
Total Dissolved Solids (TDS)	mg/L	1000	
Copper, Total Recoverable	µg/L	19.4	30.2
Nickel, Total Recoverable	µg/L	63	183
Zinc, Total Recoverable	µg/L	92	249
Whole Effluent Toxicity	pass/fail	No chronic toxicity	

C. Effluent Quality and Existing Permit Requirements

Effluent data from June 2014 through May 2019 were selected to represent the period of record (POR) for this facility. **Table 2** presents a summary of the effluent data for Outfalls 001A and 001B.

- Fluoride, sulfate, chloroform, and radium 226 did not have required permit monitoring, but single samples of these parameters were reported as above detection levels in the 2015-renewal application.
- Cadmium, lead, and mercury were not detected in effluent sampling, but detection limits for these parameters are included in with the effluent summary because they are associated with impairments addressed in a Total Maximum Daily Load (TMDL).

Table 2: Effluent Characteristics from June 2014 – May 2019

Parameter	Units	Minimum	Maximum	Average	Sample Size
Outfall 001A to Sheep Gulch					
Flow Rate, Outfall 001A	mgd	0.84	1.46	0.97	60
Conventional Pollutants:					
Oil and Grease	mg/L	1.00	1.00	1.00	60
pH	s.u.	6.60	10.10	8.13	60
Dissolved Oxygen	mg/L	6.10	9.00	7.08	60
Nonconventional Pollutants:					
Total Residual Chlorine	mg/L	0.01	0.08	0.02	60
Nitrite + Nitrate, as N	mg/L	0.01	0.12	0.04	60
Total Kjeldahl Nitrogen	mg/L	0.10	0.50	0.33	60
Total Nitrogen, July - September	mg/L	0.10	0.50	0.36	16
Total Phosphorus, July - September	mg/L	0.012	0.356	0.152	15
Fluoride	µg/L	0.5	0.5	0.5	1
Sulfate, as SO_4	µg/L	25	25	25	1
Total Dissolved Solids	mg/L	662	1,377	905	60
Toxic Pollutants					
Aluminum, Dissolved	µg/L	0.03	300.00	80.80	60
Arsenic, Total Recoverable	µg/L	5	5	5	1
Barium, Total Recoverable	µg/L	0.035	0.035	0.035	1
Cadmium, Total Recoverable	µg/L	<0.05	<0.05	<0.05	1
Copper, Total Recoverable	µg/L	2	74	9.44	259
Lead, Total Recoverable	µg/L	<0.3	<0.3	<0.3	1
Mercury, Total Recoverable	µg/L	<0.005	<0.005	<0.005	1
Nickel, Total Recoverable	µg/L	<5	92	<49	261
Zinc, Total Recoverable	µg/L	2.4	57	10.8	261
Di[2-ethylhexyl] phthalate [DEHP]	µg/L	<6.00	<10.00	<6.07	60
Methylene chloride	µg/L	<0.2	<0.60	<0.50	60
Chloroform	µg/L	0.41	0.41	0.41	1
Radium 226	pCi/l	0.2	0.2	0.2	1
Outfall 001B to Sheep Gulch					
Flow Rate	mgd	0.09	0.50	0.14	N/A
Conventional Pollutants:					
Biochemical Oxygen Demand (BOD_5)	mg/L	<1	46	3.4	257
Chemical Oxygen Demand (COD)	mg/L	5.0	158	34	259
Total Suspended Solids	mg/L	<3	84	10	259
Outfall 003 to Silver Bow Creek – No discharge.					

D. Compliance History

Two MPDES permit compliance evaluation inspections were conducted during the term of the permit, on February 3, 2011 and February 16, 2017. The 2011 inspection identified issues with lab analysis meeting the required RRVs, and missing elements of the storm water pollution prevention plan. The 2017 inspection did not find any violations.

The facility failed two acute WET tests during the POR, most recently in June, 2017. Additional exceedances during the period of record are summarized in **Table 3**.

Table 3: Permit Limit Exceedance History, June 2014 – May 2019

Pollutant	Number of Exceedances
Copper; Monthly Average, Daily Max	1, 2
pH, Maximum	2
Total Dissolved Solids	2
Biochemical Oxygen Demand, Daily Max	1
Total Suspended Solids, Monthly Average	1

III. Receiving Water Summary

Wastewater is discharged from Outfall 001 to Sheep Gulch. This effluent creates perennial flow that joins Sheep Gulch to Silver Bow Creek. Storm water from Outfall 002 would also discharge to Sheep Gulch, should a discharge ever occur. Outfall 003 is an alternative discharge location to send effluent directly Silver Bow Creek instead of Outfall 001.

A. Silver Bow Creek

Silver Bow Creek extends from Butte approximately 23 miles to the Warm Springs Ponds, a water treatment facility located at the headwaters of the Clark Fork River.

Outfall 003 has not been constructed, and no discharge has occurred to Silver Bow Creek. However, REC wishes to retain outfall 003 as an alternate discharge for effluent normally discharged at Outfall 001. Silver Bow Creek is a perennial stream that has been identified as impaired. A TMDL has been completed for this section of Silver Bow Creek.

- Water Use Classification: I
- Watershed: Clark Fork
- Waterbody Name/Location: Silver Bow Creek, Blacktail Creek to Warm Springs Creek
- Montana Stream Segment MT76G003_020
- USGS Hydrologic Unit Code: 17010201
- USGS Gauging Station: 12323250
- 7Q10: 7.63 mgd
- 14Q5: 8.34 mgd
- Identified as Impaired: 2018 303(d) List
- Total Maximum Daily Load (TMDL): Yes

This section of Silver Bow Creek is classified as I. The goal of the state of Montana is to have these waters fully support the following uses:

- drinking, culinary and food processing purposes after conventional treatment;
- bathing, swimming and recreation;
- growth and propagation of fishes and associated aquatic life, waterfowl and furbearers;
- and agricultural and industrial water supply.

Silver Bow Creek/Stream Side Tailings Cleanup

Since the late 1800s, tailings and other mine wastes containing elevated concentrations of metals have been discharged to or otherwise entered Silver Bow Creek. Tailings deposited in the floodplain resulted in a floodplain largely devoid of vegetation and generally incapable of supporting wildlife. In 1983, EPA listed the Silver Bow Creek/Butte area as one of multiple Superfund sites in the Upper Clark Fork River Basin. The agency later designated the approximately 23 stream miles of streamside tailings along Silver Bow Creek as an operable unit within this overall Superfund site. The Streamside Tailings Operable Unit has become one of the areas of focus for Superfund cleanup in the Butte area. Cleanup of Silver Bow Creek began in 1999 and reached completion in 2015.

Silver Bow Creek Impairments

The 2018 303(d) list of the Water Quality Integrated Report shows this segment of Silver Bow Creek as not fully supporting drinking water, primary contact recreation or aquatic life uses. A TMDL has been completed for each of the pollutant impairments.

- Pollutants identified as causing impairments:
  - Nonconventional pollutants: Nitrate, total nitrogen, total phosphorus
  - Metals: arsenic, cadmium, copper, lead, mercury, zinc
  - Sedimentation/siltation
- Probable sources of impairments:
  - Grazing in riparian or shoreline zones
  - Impacts from abandoned mine lands (inactive)
  - Livestock (grazing or feeding operations)
  - Municipal point source discharges
  - Site clearance (land development or redevelopment)

Total Maximum Daily Loads for Silver Bow Creek

Impairments in Silver Bow Creek are addressed in two Total Maximum Daily Load (TMDL) planning documents:

- *Silver Bow Creek and Clark Fork River Metals TMDLs (2014):* The TMDLs set wasteload allocations to meet water quality standards based on hardness values in Silver Bow Creek at the point of discharge for any outfall to Silver Bow Creek or Sheep Gulch.

- *Upper Clark Fork Phase 2 Sediment and Nutrients TMDLs and Framework Water Quality Improvement Plan (2014)*: The TMDLs apply the same wasteload allocations to both to both Outfalls 001A and 003 for nutrients and sediment.

Silver Bow Creek Ambient Conditions

Ambient (instream) water quality data for relevant parameters in Silver Bow Creek are summarized in **Table 4.** No ambient water quality data is available for Sheep Gulch.

Table 4. Silver Bow Creek Ambient Stream Conditions and Comparison to Water Quality Standards

Parameter	Receiving Water Quality (1)		Water Quality Standards (2)		
	Sample Size	75th Percentile	Aquatic Life Acute	Aquatic Life Chronic	Human Health
Dissolved Oxygen (mg/L)	35	11.6 (3)	Min Weekly Mean: 6.0	1-Day Minimum: 5.0	
Hardness, as $CaCO_3$ (mg/L)	129	163 (3)	No Standard		
Nitrate + Nitrite (mg/L)	32	1.26	-	-	10
Total Nitrogen (mg/L)	32	1.92	0.300 July - September		
Total Phosphorus (mg/L)	32	0.220	0.030 July - September		
pH (s.u.)	31	8.34	6.0 – 9.0		
Temperature (°C)	31	18.3	Varies		
Aluminum, Dissolved (µg/L)	126	100	750	87	-
Arsenic (µg/L)	132	8.75	340	150	10
Barium (µg/L)	80	48	-	-	1000
Cadmium (µg/L)	132	0.44	3.1	1.2	5
Copper (µg/L)	132	28.8	22.2	14.2	1300
Lead (µg/L)	130	3.60	152	5.9	15
Nickel (µg/L)	126	10.0	709	79	100
Selenium (µg/L)	126	5.0	20	5	50
Zinc (µg/L)	132	130	181	181	7400

(1) Monitoring was conducted 2017-2018 at sites MDEQ_REM_WQX-SS-11C, MDEQ_REM_WQX-SS-11D, MDEQ_REM_WQX-SS-13, MDEQ_REM_WQX-SS-14
(2) Circular DEQ-7
(3) 25th percentile

B. Sheep Gulch

REC discharges to Sheep Gulch via Outfalls 001A, 001B and 002. Sheep Gulch is a tributary of Silver Bow Creek located within the Upper Clark Fork watershed and is not identified as impaired on the 2018 303(d) list. Upstream of the facility discharge, Sheep Gulch is an ephemeral drainage with 7Q10 and 14Q5 low flow values of 0. Ambient data is not available.

- Water Use Classification: B-1
- Watershed: Clark Fork
- Montana Stream Segment NA
- USGS Hydrologic Unit Code: 17010201
- USGS Gauging Station: 12323250
- 7Q10 and 14Q5 0 mgd
- Identified as Impaired: No

Sheep Gulch is a naturally ephemeral drainage, but the REC discharge establishes a perennial condition, requiring the application of class B-1 water quality standards. The goal of the state of Montana is to maintain B-1 class waters suitable for:

- drinking, culinary, and food processing purposes after conventional treatment;
- bathing, swimming, and recreation;
- growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers;
- and agricultural and industrial water supply.

IV. Proposed Technology-Based Effluent Limits (TBELs)

A. Applicable Guidelines

For industrial discharges, TBELs are derived from federal effluent limitation guidelines (ELGs) or based on best professional judgement when ELGs have not been developed. ELGs have not yet been promulgated for this type of industry. The 2010-permit TBELs are based on best professional judgement for chemical oxygen demand (COD) and total suspended solid (TSS), and National Secondary Standards at 40 CFR 133 for biochemical oxygen demand (BOD_5). These limits will be retained in this renewal, as summarized in **Table 5**.

Monitoring for TBELs will be required at internal **Outfall 001B**, following the treatment process but prior to combining with the cooling tower blowdown water. Effluent limits also apply at this location.

Table 5. Technology-Based Effluent Limits for Outfall 001B

Parameter	Units	Effluent Limit	
		30-Day Average Concentration	Maximum Daily Concentration
Total Suspended Solids	mg/L	30	100
Biochemical Oxygen Demand	mg/L	30	45
Chemical Oxygen Demand	mg/L	120	180

B. Nondegradation Load Allocations

REC is an existing source and is not a new or increased discharge, nondegradation review does not apply.

V. Water Quality-Based Effluent Limits (WQBELs)

A. Applicable Guidelines

The Montana Water Quality Act states that a permit may only be issued if DEQ finds that it will not result in pollution of state waters. MPDES permits must include limits on all pollutants which will cause, or have reasonable potential to cause, an excursion of any water quality standard including narrative standards. Water quality-based effluent limits (WQBELs) are designed to protect water quality standards and are required when TBELs are not adequately protective. The purpose of this section is to provide a basis and rationale for establishing effluent limits that will protect designated uses of the receiving water based on Montana water quality standards and water use classifications.

B. Pollutants of Concern

Pollutants and parameters are identified as a pollutant of concern for the following reasons:

- Listed as TBELs
- Identified as needing WQBELs in the previously issued permit
- Identified as present in effluent monitoring or otherwise expected present in the discharge
- Associated with impairment which may or may not have a wasteload allocation (WLA) in a TMDL

Parameters typically present in wastewater that may cause or contribute to a violation of water quality standards include those found in **Table 6**. Identification of a pollutant of concern (POC) is not an indication that WQBELs are necessary, but an indication that further evaluation is required.

Table 6. Identification of Pollutants of Concern

Parameter	Basis for Pollutant of Concern
Conventional Pollutants:	
Biochemical oxygen demand, chemical oxygen demand, total suspended solids	TBEL, previous permit
pH, oil and grease	Previous permit
Nonconventional Pollutants:	
Total residual chlorine, dissolved oxygen, total dissolved solids, sediment, nitrate + nitrite, total nitrogen, total phosphorus	Previous permit
Toxic Pollutants:	
Aluminum, copper, nickel, zinc, DEHP, methylene chloride	Previous permit
Arsenic, cadmium, copper, lead, mercury, zinc	Wasteload allocation in TMDL
Barium, fluoride, sulphate, radium 226, chloroform	Known present

C. Mixing Zone

A mixing zone is an area where effluent mixes with the receiving water and certain water quality standards may be exceeded. Mixing zones are only available for waters where the 7Q10 and 14Q5 low flow values are above zero, and where the levels of the pollutant in the receiving water are below the water quality standard.

Sheep Gulch is an ephemeral drainage upstream of the discharge point, with 7Q10 and 14Q5 low flow values of zero. Based on the low flow values, discharges to Sheep Gulch are not eligible for a mixing zone.

Silver Bow Creek is impaired by numerous pollutants, including several proposed to be limited in this permit, so a mixing zone will not be granted. REC did not request a mixing zone.

D. Developing Water Quality Criteria for Impaired Waters

I classification standards require that limits for toxic, carcinogenic, or harmful parameters must be the larger of either the water quality standard in DEQ-7 or DEQ-12A, or one-half the mean in-stream concentration. **Table 7** summarizes Silver Bow Creek's water quality criteria development.

- The one-half mean values for Silver Bow Creek are all lower than the DEQ-7 standards for aluminum, barium, nickel, selenium, and nitrate + nitrite. WQBELs for these parameters will be based on the DEQ-7 standards.
- The one-half mean values for Phosphorus and Nitrogen are above the water quality standards in DEQ 12-A, and will be considered as the water quality standard for Silver Bow Creek.

Table 7. Silver Bow Creek Water Quality Standards Development [1]

Parameter	Ambient Mean [1]	One-half Ambient Mean [1]	Silver Bow Creek Circular DEQ-7 Standard		
			Human Health	Aquatic Life	
				Acute	Chronic
Nitrate+Nitrite (mg/L)	0.94	0.47	10	-	-
Total Nitrogen (mg/L)	1.45	0.724	-	0.300 [3]	
Total Phosphorus (mg/L)	0.15	0.077	-	0.030 [3]	
Aluminum, total (µg/L)	38.7	19.4	-	750	87
Barium, total recoverable (µg/L)	43.6	21.8	1000	-	-
Nickel, total recoverable (µg/L)	4.9	2.45	100	709 [2]	78.9 [2]

[1] Monitoring was conducted 2017-2018 at sites MDEQ_REM_WQX-SS-11C, MDEQ_REM_WQX-SS-11D, MDEQ_REM_WQX-SS-13, MDEQ_REM_WQX-SS-14.
[2] Hardness based water quality standard - based on 25th percentile hardness.
[3] Circular DEQ-12A

E. Methods for Determining Reasonable Potential

DEQ uses a statistical approach outlined in Chapter 3 of EPA's *Technical Support Document for Water Quality-based Toxics Control* (TSD, 1991) to determine reasonable potential for individual pollutants to exceed water quality standards:

1. Critical Effluent Concentration (C_d) Calculation:

The facility's maximum reported effluent concentration (C_{max}) is converted into the projected critical effluent concentration (C_d) by applying a statistical multiplier (TSD 3-2 multiplier). This accounts for variation in effluent concentration. The TSD 3-2 multiplier is determined by the data set, coefficient of variation (CV), and sample size at the 95th percentile confidence interval. A default CV of 0.6 is used if there are less than 10 samples. See *Equation 1.*

Equation 1: $C_d = C_{max} \cdot$ TSD 3-2 multiplier

Where:

C_d = critical effluent concentration

C_{max} = maximum measured and quantified effluent pollutant concentration

$$\text{TSD 3-2 multiplier} = \frac{EXP\left[z_{0.95}\cdot\left(ln\left(1+CV^2\right)\right)^{0.5}-0.5\cdot ln\left(1+CV^2\right)\right]}{EXP\left[z_{(1-0.95)}\cdot\left(ln\left(1+CV^2\right)\right)^{0.5}-0.5\cdot ln\left(1+CV^2\right)\right]}$$

CV = coefficient of variation

n = number of effluent pollutant concentration measurements in the data set

z_x = the z-statistic for the x percentile

2. Comparing C_d to the Water Quality Standard

The calculated C_d values for each parameter and their comparison to applicable water quality standards are demonstrated in the pollutant analysis **Section VI.** If the projected critical effluent concentration is greater than the water quality standard (C_d > WQS), further analysis is needed on a pollutant-by-pollutant basis.

F. Methods for Developing Water Quality-Based Effluent Limits

WQBELs are expressed as **maximum daily limits (MDLs)** and **average monthly limits (AMLs)** unless impracticable.

- The maximum daily limit (MDL) is the highest allowable discharge measured during a calendar day or 24-hour period representing a calendar day.
- The average monthly limit (AML) is the highest allowable value for the average of daily discharges over a calendar month.

AMLs and MDLs are translated from wasteload allocations depending on the type of water quality standard. DEQ uses a statistical approach outlined in Chapter 5 of EPA's TSD Manual to develop WQBELs for each pollutant. This process is summarized below.

1. ***Determining Wasteload Allocations***

The individual wasteload allocation (WLA) is the concentration of a pollutant that the point source can discharge, conforming to DEQ implementation policies while still assuring applicable water quality standards are attained in the receiving water. WLAs are determined on a parameter-by-parameter basis as follows:

- If the waterbody is impaired, a WLA can be developed from a Total Maximum Daily Load.
- Where no mixing zone has been granted, the WLA is set equal to the numeric water quality standard or the numeric translation of the narrative standard.

2. ***Translating Aquatic Life Wasteload Allocations into Permit Limits***

Each WLA has a corresponding **long-term average (LTA)** that represents the performance the facility would need to maintain. The LTA is calculated by multiplying the WLA by a factor (WLA multiplier) to account for effluent variability. This WLA multiplier is dependent on whether the WLA is based on an acute or chronic water quality standard, the data set's coefficient of variation (CV), and the 99th percentile of the lognormal distribution for all parameters except nutrients, to which the 95th percentile is applied.

Equation 2: $LTA = WLA \bullet WLA\ multiplier$

Where:

$WLA\ multiplier_{acute99} = EXP\ (0.5\sigma^2 - z\sigma)$ $\quad LTA_{acute} = WLA_{acute} \bullet WLA_{acute99}\ multiplier$

$WLA\ multiplier_{chronic99} = EXP\ (0.5\sigma_4^2 - z\sigma_4)$ $\quad LTA_{chronic} = WLA_{chronic} \bullet WLA_{chronic99}\ multiplier$

$WLA\ multiplier_{nutrient95} = EXP\ (0.5\sigma_4^2 - z\sigma_4)$ $\quad LTA_{nutrient} = WLA_{nutrient} \bullet WLA_{nutrient95}\ multiplier$

σ = standard deviation

$\sigma = [ln(CV^2 + 1)]^{0.5}$

$\sigma^2 = ln(CV^2 + 1)$

$\sigma_4 = [ln(CV^2/4 + 1)]^{0.5}$

$\sigma_4^2 = ln(CV^2/4 + 1)$

z = 2.326 for 99th percentile probability basis

z = 1.645 for 95th percentile probability basis

The **most protective aquatic life LTA** is used to calculate WQBELs. This ensures that the average monthly limit (AML) and maximum daily limit (MDL) are based on a single performance level that will protect against both acute and chronic effects. Because the acute and chronic LTAs have the same averaging periods, they can be directly compared.

Equation 3: LTA_m = Minimum of LTA_a and LTA_c

Aquatic life MDLs and AMLs are calculated by multiplying the most protective aquatic life LTA by multipliers (AML and MDL multipliers), which are based on the lognormal distribution. Each multiplier reflects the relationship between the LTA and the effluent limits. The value of the multiplier for each effluent limit depends on several factors. The first is the probability basis of the effluent limit, which is the percentile value on the lognormal distribution of effluent pollutant concentrations where the limit will be set; DEQ sets the occurrence probabilities at the 95th percentile for AMLs and the 99th percentile for MDLs. The second is the monthly sampling frequency that will be averaged to measure compliance with the effluent limit. If the planned sampling frequency is one time per month or less (e.g. quarterly), DEQ uses a value for sampling frequency (n) that is greater than 1 to calculate the AML. This procedure assumes a sampling frequency of two to four times per month in order to ensure that the AML will not exceed any of the calculated WLAs. This permit uses n = 4 for all parameters because weekly monitoring is required for most. Lastly, DEQ uses the CV of the data set or a CV of 0.6 where data is estimated.

Equation 4: $MDL_{aquatic\ life} = LTA_m \times MDL_{multiplier99}$

Equation 5: $AML_{aquatic\ life} = LTA_m \times AML_{multiplier95}$

Where:

$\mathbf{AML_{multiplier95} = e^{(z\sigma_n - 0.5\sigma_n^2)}}$

$\sigma_n = [ln(CV^2/n + 1)]^{0.5}$

$\sigma_n^2 = ln(CV^2/n + 1)$

z = 1.645 for 95th percentile probability basis

n = number of required samples per month

$\mathbf{MDL_{multiplier99} = e^{(z\sigma - 0.5\sigma^2)}}$

$\sigma = [ln(CV^2 + 1)]^{0.5}$

$\sigma^2 = ln(CV^2 + 1)$

z = 2.326 for 99th percentile probability basis

Some **aquatic life water quality standards** are **expressed as a single numeric value** that defines a single acceptable level of effluent quality. Consequently, there will be only a single corresponding WLA. DEQ uses the TSD recommendations to apply the following procedure:

- Consider the single WLA to be $WLA_{chronic}$
- Calculate an LTA that will allow the effluent to meet $WLA_{chronic}$
- Derive an AML and MDL based on the LTA and CV with the equations above.

3. Developing Human Health Effluent Limits

Montana's numeric human health numeric standards are expressed as values that may not be exceeded in the receiving water. This makes it necessary to set human health effluent limits that meet a given WLA daily. DEQ uses the following approach to establish the effluent limits for protection of human health:

- DEQ sets the AML equal to the human health WLA.
- Because surface or groundwater concentrations may not exceed the human health water quality standard, the MDL is set equal to the AML.

4. Choosing the Most Protective Effluent Limits

DEQ compares human health limits to any other calculated WQBELs and antidegradation and anti-backsliding requirements to determine the final limits that meet all technology and water quality standards. The lowest AML and MDL are the final calculated WQBELs to assure attainment of all water quality standards and antidegradation criteria.

VI. Final Pollutant Analysis

A. Conventional Pollutants Analysis

1. ***TSS, BOD_5, COD*****:** REC is subject to TBELs for TSS, BOD, and COD, which require significant control of these pollutants. None of these parameters have a numeric water quality standard. Additional limits are not necessary because TBELs adequately control these pollutants and protect the beneficial uses of the receiving waters.

- Effluent limits and monitoring requirements will apply at internal **Outfall 001B**, following the treatment process but prior to combining with the cooling tower blowdown water.

2. ***Oil and Grease:*** Montana regulations require state waters be free from substances attributable to discharges that will result in concentrations of oil and grease at or in excess of 10 mg/L. To remain protective of this standard, the effluent limit and monitoring requirements are retained from the 2010-permit for discharge to both Sheep Gulch and Silver Bow Creek.

- Effluent limits and monitoring requirements will apply to both Outfalls 001A and 003.

3. ***pH:*** The pH limit will be retained from the previous permit to be protective of both Sheep Gulch and Silver Bow Creek. The monitoring requirement will be reduced from daily to once a week.

- Monitoring requirements and effluent limits apply to both Outfalls 001A and 003.

B. Nonconventional Pollutants Analysis

1. Total Residual Chlorine (TRC): DEQ proposes to maintain the 2010-permit limit set equal to the TRC water quality standards. Because the effluent limits are below the DEQ-7 required reporting value (RRV), a non-detect analysis using an approved method at the required RRV will be considered in compliance with the limits.

- Average monthly limit: 0.011 mg/L; maximum daily limit: 0.019
- Effluent limits apply to both Outfalls 001A and 003, and monitoring will be required weekly.

2. Dissolved Oxygen: Dissolved oxygen is limited in the 2010-permit to be protective of both receiving water classifications without early life stages present. However, since 2010 Silver Bow Creek has changed significantly and is a developing fishery. Dissolved oxygen limits will be updated to reflect the present condition of Silver Bow Creek. The renewed permit limits will apply to Outfalls 001A and 003 separately to be protective of both receiving water classifications (B-1 and I):

- *Outfall 001A to Sheep Gulch:* monthly average: 6.5 mg/L 1-day minimum: 4.0 mg/L
- *Outfall 003 to Silver Bow Creek:* weekly average: 6.0 mg/L 1-day minimum: 5.0 mg/L
- Weekly monitoring will be required.

3. ***Total Dissolved Solids (TDS)*:** The previous permit included a limit for total dissolved solids, based on a level that had shown correlation with failed whole effluent toxicity testing. The average monthly limit of 1000 mg/L will be retained to protect against the general prohibition of discharges which create concentrations or combinations of materials which are toxic to human, animal, plant, or aquatic life.
   - Effluent limits apply to both Outfalls 001A and 003, and monitoring will be required weekly.

4. ***Sediment:*** The Upper Clark Fork Phase 2 Sediment and Nutrient TMDLs and Framework Water Quality Improvement Plan (2014) states that continuing to abide by TSS permit limits and design capacity discharge ensures the facility will meet its wasteload allocation (see **Section V.F.1.** above). The TMDL also addresses sediment at Outfall 002, and states that developing and implementing a Stormwater Pollution Prevention Plan (SWPPP) will meet the intent of the wasteload allocation and not result in sediment impairing the receiving waterbodies.

5. ***Nitrate + Nitrite (N+N):***
   Nitrate and nitrite are toxic components of total nitrogen. The effluent data set's large sample size (n = 60) yielded a 3-2 TSD multiplier of 1 and a projected critical effluent concentration (0.12 mg/L) are below the human health water quality standard (10 mg/L).
   - Reasonable potential does not exist, and this permit renewal will not include a limit.
   - Monthly effluent monitoring will be required at Outfalls 001A and 002 during summer months only.

6. ***Nutrients: Total Nitrogen (TN) and Total Phosphorus (TP):***
   Total nitrogen and total phosphorus will have average monthly limits only, which will be expressed as load.

   DEQ has adopted Base Numeric Nutrient Standards found in Circular DEQ-12A. Sheep Gulch and Silver Bow Creek are both considered wadable streams within the within the Middle Rockies ecoregion, which has the following seasonal numeric nutrient standards, applying from July 1st through September 30th:
   TN: 0.3 mg/L TP: 0.030 mg/L
   Silver Bow Creek is a Class I waterbody, and standards are based on one-half the average background value (See **Section V.D.)**:
   TN: 0.724 mg/L TP: 0.077 mg/L
   Total nitrogen and total phosphorus are also addressed within the Upper Clark Fork Phase 2 Sediment and Nutrient TMDLs and Framework Water Quality Improvement Plan (2014). The same WLAs are applied to both Outfalls 001A and 003 and used to develop permit limits that apply July 1 - September 30. Permit limits will be expressed as load and are determined by multiplying REC's average flow rate and each long-term average by a conversion factor:

   Equation 6: AML as load = mgd • mg/L • 8.34 $\frac{\text{lb} \bullet \text{L}}{\text{Mgal} \bullet \text{mg}}$ = lb/day

   Past effluent data demonstrates that REC may not be able to consistently comply with the revised total nitrogen nutrient limits. A compliance schedule will allow REC time to assess and implement source reductions and treatment for these parameters. Interim effluent limits are developed from the actual long-term average (from **Table 2**) based on current facility performance. See **Section VIII** for the compliance schedule. Weekly monitoring will be required for both Outfalls 001A and 003 during the summer months.

Table 8. WQBEL Development for Nutrients Addressed in the Upper Clark Fork Phase 2 Sediment and Nutrient TMDLs and Framework Water Quality Improvement Plan (July 1 – September 30)

	CV	WLA multiplier	WLA	LTA	MDL/AML Multiplier	AML	Flow Rate	Conv. Factor	**Final Load Limit**
Interim Permit Limit Development			(mg/L)	(mg/L)	-	(mg/L)	(mgd)	$\left(\frac{\text{lb} \bullet \text{L}}{\text{Mgal} \bullet \text{mg}}\right)$	**(lb/day)**
Total Nitrogen	0.43	-	-	0.360	1.39	0.50	0.97	8.34	**4.04**
Final Permit Limit Development									
Total Nitrogen	0.43	0.72	0.30	0.216	1.39	0.30	0.97	8.34	**2.43**
Total Phosphorus	0.8	0.57	0.030	0.0171	1.75	0.030	0.97	8.34	**0.243**

C. Toxic Pollutants Analysis:

DEQ assessed reasonable potential for toxic pollutants to exceed water quality standards for human health and aquatic life in both Sheep Gulch and Silver Bow Creek, as detailed in **Table 9**. All metals discussions below refer to the metals in their "total recoverable" fraction, except aluminum, which is dissolved. Water quality standards and wasteload allocations criteria for these pollutants are specified in Circular DEQ-7, Silver Bow Creek and Clark Fork River Metals TMDLs, and Classification Standards.

Table 9. Reasonable Potential Analysis for Toxic Pollutants

	Projected Critical Effluent Conc. (C_d)			Sheep Gulch WQS		Silver Bow C_r WQS		Human Health WQS	RP?
Parameter	3-2 TSD Multiplier	C_{max}	C_d	Acute	Chronic	Acute	Chronic		
	-	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(yes/no)
Fluoride	6.2	500	3100	-	-	-	-	4000	No
Aluminum	1.0	300	300	750	87	750	87	-	Yes
Barium	6.2	35	217	-	-	-	-	1000	No
Cadmium	6.2	0.05	0.31	1516	169	3.7	1.2	5	No
Lead	6.2	0.30	1.86	1516	169	152	5.9	15	No
Nickel	1.0	92	92	1516	169	709	79	100	Yes
Chloroform	6.2	0.41	2.54	-	-	-	-	60	No
Methylene chloride	1.0	0.6	0.6	-	-	-	-	5	No
	-	(pCi/L)	(pCi/L)	(pCi/L)	(pCi/L)	(pCi/L)	(pCi/L)	(pCi/L)	(yes/no)
Radium 226	6.2	0.2	1.24	-	-	-	-	5	No

1. ***Dissolved Aluminum:*** The 2010-permit required monthly monitoring, which yielded a large sample size (n=60) and resulting TSD multiplier of 1 for aluminum. Water quality standards are not based on receiving water hardness, so aluminum criteria is the same for both Sheep Gulch and Silver Bow Creek. There is no human health WQS for aluminum. Because C_d is greater than the chronic WQS, reasonable potential exists, and effluent limits are necessary for both receiving waters. **Table 10** details aluminum WQBEL development.
   - The renewed permit will have effluent limits and weekly monitoring requirements for aluminum.

   Past effluent data demonstrates that REC may not be able to consistently comply with the dissolved aluminum limits. The permit will contain a compliance schedule to allow REC time to assess and implement source reductions and additional treatment for these parameters. Interim effluent limits are developed from the actual long-term average (from Table 2) based on current facility performance. See **Section VII** for the compliance schedule.

Table 10. WQBEL Development for Dissolved Aluminum at Outfalls 001A and 003

	Long Term Average (LTA) from the WLA				Final WQBEL Development		
	CV	WLA multiplier	$C_{d\text{-}WLA}$	LTA	MDL/AML Multiplier	LTA_m	**WQBEL**
Interim Permit Limit Development:			(µg/L)	(µg/L)	-	(µg/L)	**(µg/L)**
Aluminum Acute	0.78	-	-	81 [(1)]	3.92	39	**MDL = 317**
Aluminum, Chronic	0.78	-	-		1.73		**AML = 140**
Final Permit Limit Development:							
Aluminum Acute	0.78	0.26	750	195 [(2)]	3.92	39	**MDL = 153**
Aluminum, Chronic	0.78	0.45	87	39 [(2)]	1.73		**AML = 68**

[(1)] Long term average for interim permit limit is developed from REC's actual effluent data.
[(2)] Long term average for final permit limit is developed from TSD methods.

2. ***Total Recoverable Nickel:*** The 2010-permit included effluent limits as well as weekly monitoring requirements to account for effluent variability. The increased monitoring frequency provided a large sample size (n = 261), small CV (CV = 0.15), and resulting TSD 3-2 multiplier of 1.

   Aquatic life water quality standards are based on receiving waterbody hardness, so the reasonable potential analysis compared C_d to WQS in both Sheep Gulch and Silver Bow Creek, as well as human health. Reasonable potential to exceed chronic water quality standards in Silver Bow Creek exists, and an effluent limit is necessary. Through anti-backsliding rules, a permit must contain limits at least as stringent than those established in the previous permit. Therefore effluent limits will apply to both Sheep Gulch and Silver Bow Creek, consistent with the 2010-permit.
   - The renewed permit will contain effluent limits for Outfalls 001A and 003 as well as weekly monitoring requirements.

Table 11. WQBEL Development for Total Recoverable Nickel

	Long Term Average (LTA) from the WLA			Final WQBEL				
	WLA multiplier	WLA	LTA	MDL/AML Multiplier	LTA_m	Aquatic Life AML/MDL	Human Health AML/MDL	**Final WQBEL**
Outfall 001A:	-	(µg/L)	(µg/L)	-	(µg/L)	(µg/L)	(µg/L)	**(µg/L)**
Nickel, Acute	0.71	1516	1076	1.40	142	MDL = 199	100	**MDL = 100**
Nickel, Chronic	0.84	169	142	1.13		AML = 160		**AML = 100**
Outfall 003:	-	(µg/L)	(µg/L)	-	(µg/L)	(µg/L)	(µg/L)	**(µg/L)**
Nickel, Acute	0.71	709	503	1.40	66.4	MDL = 92.9	100	**MDL = 92.9**
Nickel, Chronic	0.84	79	66.4	1.13		AML = 75.0		**AML = 75.0**

3. ***Metals with TMDLs Requiring Effluent Limits - Total Recoverable Arsenic, Copper, Mercury, and Zinc:*** Arsenic, copper, and zinc were found in the effluent. Mercury was not detected but is included because it is also associated with the 2014 Silver Bow Creek and Clark Fork River Metals TMDLs. The TMDL document requires effluent limits and sets wasteload allocations for these parameters to meet water quality standards based on hardness values in Silver Bow Creek (25^{th} percentile $CaCO_3$:163 mg/L) at the point of discharge for any outfall to Silver Bow Creek or Sheep Gulch. Therefore, the same effluent limits and monitoring requirements will apply to both Outfalls 001A and 003 for these parameters. The WQBEL developments are detailed in in **Table 12** below.
   - Monthly monitoring will be required for arsenic, mercury, and zinc.
   - Weekly monitoring will be required for copper.

Table 12. WQBEL Development for Metals Addressed in Silver Bow Creek and Clark Fork River Metals TMDLs

	Long Term Average (LTA) from the WLA				Final WQBEL				
	CV	WLA multiplier	WLA	LTA	MDL/AML Multiplier	LTA_m	Aquatic Life AML/MDL	Human Health AML/MDL	**Final WQBEL**
Metals with a WLA in a TMDL			(µg/L)	(µg/L)		(µg/L)	(µg/L)	(µg/L)	**(µg/L)**
Arsenic, Acute	0.6	0.32	340	109	3.11	79.5	MDL = 247	10	**MDL = 10.0**
Arsenic, Chronic	0.6	0.53	150	79.5	1.55		AML = 123		**AML = 10.0**
Copper, Acute	0.81	0.25	22.2	5.55	4.05	5.55	MDL = 22.5	1300	**MDL = 22.5**
Copper, Chronic	0.81	0.44	14.2	6.25	1.76		AML = 9.8		**AML = 9.8**
Mercury, Acute	0.6	0.32	1.7	0.54	3.11	0.48	MDL = 1.5	0.050	**MDL = 0.050**
Mercury, Chronic	0.6	0.53	0.9	0.48	1.55		AML = 0.75		**AML = 0.050**
Zinc, Acute	0.45	0.40	181	72	2.48	72.4	MDL = 180	7400	**MDL = 180**
Zinc, Chronic	0.45	0.61	181	110	1.41		AML = 102		**AML = 102**

4. ***Metals with Wasteload Allocations Being Met in TMDLs: Total Recoverable Cadmium and Lead:*** The Silver Bow Creek and Clark Fork River Metals TMDL specifies that wasteload allocations are being met for cadmium and lead because the discharge concentrations are below target. The 2010-permit did not include monitoring requirements for these parameters, but REC submitted single sample results in 2015 as part of the renewal application requirements. The reporting limit is used as a maximum effluent concentration (C_{max}) because neither parameter was detected in the effluent. Reasonable potential does not exist and target concentrations are still being met.

   The TMDL also states that monitoring for these parameters is not necessary unless there are operational changes that could affect the discharge concentrations of these two metals.
   - The 2021 permit will not include effluent limits or monitoring requirements for cadmium and lead.

5. ***Methylene Chloride***: The 2010-permit required monthly monitoring for methylene chloride. Because the critical effluent concentration (C_d) is less than the human health water quality standard (WQS), reasonable potential does not exist.
   - The renewed permit will not contain effluent limits or monitoring requirements.

6. ***Di(2-Ethylhexyl)Phthalate (DEHP)***: Monitoring was required in the previous permit. During the term of the permit, REC investigated sources of the DEHP, and determined that elevated levels were being introduced through the new composite sampling system. REC corrected the contamination issue and monitoring since that time has not found and DEHP.

   However, REC conducted monitoring with required reporting values (RRVs = 6 µg/L and 10 µg/L) above the human health water quality standard (3.2 µg/L).
   - The renewed permit will require monthly monitoring at RRV in the most current Circular DEQ-7.

7. ***Fluoride, Total Recoverable Barium, Chloroform, and Radium 226:*** These parameters were detected in a single sample that REC reported in the 2015-permit renewal application. There are no aquatic life water quality standards, so the critical effluent concentrations (C_d) were compared to human health water quality standard (WQS). Reasonable potential does not exist.
   - The renewed permit will not contain effluent limits or monitoring requirements for fluoride, barium, chloroform, or radium 226.

D. Whole Effluent Toxicity (WET) Testing

Water quality standards require that state waters be free from substances attributable to municipal waste that create condition which are harmful or toxic to human, animal, plant or aquatic life, and provides the basis for WET requirements in MPDES permits. DEQ's procedures for determining the type of WET testing required (acute or chronic) are Based on EPA's recommendations in the *Technical Support Document for Water Quality-based Toxics Control, 1991.*

The facility effluent has failed multiple chronic toxicity tests and reasonable potential exists. The effluent must be free of chronic toxicity. Two-species chronic WET tests will be required quarterly. If the permittee chooses, chronic "screen" tests may be conducted rather than the typical 5 dilution tests. The screens must include at least 4 replicates of the effluent and control. A passing test will result in no statistically significant difference (using EPA chronic WET methods) in both lethal and sub lethal effects between the effluent and the control. Upon passing 4 consecutive two-species tests, REC may request a change to semi-annual WET testing.

Standard WET and TIE/TRE language will be included in the permit. WET limits and monitoring requirements shall apply to both Outfall 001A and Outfall 003.

E. Stormwater Management

Stormwater from process areas is routed through the wastewater treatment system and is subject to the limits imposed at Outfalls 001A and 003.

Stormwater runoff from the rest of the site is directed to detention ponds which have constructed discharge structures designated as Outfall 002. Outfall 002 has not discharged over the life of the facility, and REC manages stormwater through a Stormwater Pollution Prevention Plan (SWPPP), Best Management Practices (BMPs), and effluent monitoring requirements.

Standard stormwater language will require REC to development and maintain an updated SWPPP, implement and maintain stormwater BMPs, and submit annual stormwater reports. The permit will maintain monitoring requirements for Outfall 002 at each detention basin once during each event that causes a discharge. Monitoring will continue to be required for flow, TSS, COD, oil and grease, arsenic, copper, lead, and zinc as these are parameters with requirements for stormwater discharges at other facilities on SIC Code Major Group 33.

VII. Proposed Effluent Limits and Monitoring Requirements

A. Effluent Limits

Table 13. Final Effluent Limits for Outfalls 001A, 001B, and 003 (1)

Outfall 001-A to Sheep Gulch	Units	Average Monthly Limit	Maximum Daily Limit
Oil and Grease	mg/L	-	10
pH	s.u.	Within the range of 6.0 to 9.0 (instantaneous)	
Total Residual Chlorine (2)	mg/L	0.011	0.019
Dissolved Oxygen (3)	mg/L	Monthly Mean 6.5	Daily Minimum 4.0
Total Nitrogen, Interim Summer (4)	lb/day	4.04	-
Total Nitrogen, Final Summer (5)	lb/day	2.15	-
Total Phosphorus, Summer	lb/day	0.243	-
Total Dissolved Solids (TDS)	mg/L	1000	-
Dissolved Aluminum, Interim (4)	µg/L	140	317
Dissolved Aluminum, Final (5)	µg/L	68	153
Total Recoverable Arsenic	µg/L	10.0	10.0
Total Recoverable Copper	µg/L	9.8	22.5
Total Recoverable Mercury	µg/L	0.050	0.050
Total Recoverable Nickel	µg/L	100	100
Total Recoverable Zinc	µg/L	102	180
Whole Effluent Toxicity	pass/fail	No chronic toxicity	
Outfall 001-B to Sheep Gulch	Units	Average Monthly Limit	Maximum Daily Limit
Biochemical Oxygen Demand (BOD_5)	mg/L	30	45
Chemical Oxygen Demand (COD)	mg/L	120	180
Total Suspended Solids (TSS)	mg/L	30	100
Outfall 003 to Silver Bow Creek	Units	Average Monthly Limit	Maximum Daily Limit
Oil and Grease	mg/L	-	10
pH	s.u.	Within the range of 6.9 to 9.0 (instantaneous)	
Total Residual Chlorine (2)	mg/L	0.011	0.019
Dissolved Oxygen (3)	mg/L	Weekly Mean 6.0	Daily Minimum 5.0
Total Nitrogen, Interim (4)	lb/day	4.04	-
Total Nitrogen, Final (5)	lb/day	2.15	-
Total Phosphorus	lb/day	0.243	-
Total Dissolved Solids (TDS)	mg/L	1000	-
Dissolved Aluminum, Interim (4)	µg/L	140	317
Dissolved Aluminum, Final (5)	µg/L	68	153
Total Recoverable Arsenic	µg/L	10.0	10.0
Total Recoverable Copper	µg/L	9.8	22.5
Total Recoverable Mercury	µg/L	0.050	0.050
Total Recoverable Nickel	µg/L	75	93
Total Recoverable Zinc	µg/L	102	180
Whole Effluent Toxicity	pass/fail	No chronic toxicity	

(1) See Definitions section at the end of the permit for explanation of terms.
(2) Analytical results less than 0.1 mg/L will be in compliance with the total residual chlorine limit.
(3) Daily minimum is an instantaneous concentration to be achieved at all times.
(4) Interim limits begin on the effective date of the permit and last through 58 months after the permit's effective date.
(5) Final limits begin 58 months after the permit's effective date and last throughout the permit term.

- There shall be no chronic or acute toxicity in the effluent discharged by the facility.
- There shall be no discharge of floating solids or visible foam other than in trace amounts.
- There shall be no discharge which causes visible oil sheen in the receiving stream.
- There shall be no discharge that settles to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines.

B. Monitoring and Reporting Requirements

Monitoring requirements are based on the type of treatment facility and the method of discharge. The samples collected and analyzed must be representative of the volume and nature of the facility's discharge.

- Monitoring will start with the effective date of the permit and last for the duration of the permit cycle.
- All analytical procedures must comply with the specifications of 40 CFR Part 136.
- REC must submit NetDMR results for each month by the 28th of the following month.
- Lab analyses must comply with the required Reporting Value (RRV) specified in DEQ-7 unless an alternate test method or RRV is specified in the table below. The RRV is DEQ's best determination of a level of analysis that can be achieved using EPA-approved methods or methods approved by DEQ.

Outfall 001A monitoring must be conducted at the composite sampling building discharge pipe in the WWTP building, after all treatment processes, unless another location is requested and approved by DEQ, in writing. This location is approximately latitude 45.9726, longitude -112.6898 W. Flow must be monitored continuously.

Outfall 001B monitoring must be conducted after final treatment in the treatment system and prior to the treated wastewater mixing with fire pond water. Wastewater flow from the treatment system must be monitored continuously. Should the continuous monitoring system temporarily fail, wastewater flow must be monitored a minimum of daily until continuous monitoring is restored.

Outfall 002 must be monitored at the constructed discharge point for each storm water detention pond. If more than one detention pond discharges during a storm event a separate grab sample shall be collected at each location. As required by 40 CFR 122.21(g), the permittee must collect a grab sample within the first 30 minutes of discharge for any outfall which results in precipitation events, at minimum. As an alternative to a single grab sample, the permittee may take a flow-weighted composite of either the entire discharge or the first 3 hours of the discharge. For flow-weighted composite, only one analysis of the composited aliquots is required. Sample results shall be summarized and reported annually through NetDMR.

Outfall 003 must be monitored at a representative location, prior to discharge into Silver Bow Creek. Flow must be monitored continuously.

Table 14. Self-Monitoring Requirements for Outfalls 001A, 001B, 002, and 003

Outfalls 001A to Sheep Gulch and 003 to Silver Bow Creek	Unit [1]	Sample Frequency	Sample Type [2]	Reporting Requirement	Required Reporting Value [3]
Effluent Flow	Mgd	Continuous	Continuous	Monthly Average Daily Maximum	0.01
Oil and Grease [4]	mg/L	1/Month	Grab	Daily Maximum	1
pH	s.u.	1/Week	Instantaneous	Inst. Minimum Inst. Maximum	0.1
Total Residual Chlorine	mg/L	1/Week	Composite	Monthly Average Daily Maximum	0.1
Kjeldahl Nitrogen, Summer [5][6]	mg/L	1/Month	Composite	Monthly Average	0.225
Nitrate + Nitrite, Summer [5][6]	mg/L	1/Month	Composite	Monthly Average	0.02
Total Nitrogen, Summer [5][6]	mg/L	1/Week	Composite	Monthly Average	0.01
	lb/day	1/Month	Calculated		0.1
Total Phosphorus, Summer [5]	mg/L	1/Week	Composite	Monthly Average	0.001
	lb/day	1/Month	Calculated		0.1
Dissolved Oxygen	mg/L	1/Week	Grab	[7]	0.3
Total Dissolved Solids	mg/L	1/Week	Composite	Monthly Average	20
Dissolved Aluminum	µg/L	1/Week	Composite	Monthly Average Daily Maximum	9
Total Recoverable Arsenic	µg/L	1/Month	Composite	Monthly Average Daily Maximum	1
Total Recoverable Copper	µg/L	1/Week	Composite	Monthly Average Daily Maximum	2
Total Recoverable Mercury	µg/L	1/Month	Composite	Monthly Average Daily Maximum	0.005
Total Recoverable Nickel	µg/L	1/Week	Composite	Monthly Average Daily Maximum	2
Total Recoverable Zinc	µg/L	1/Month	Composite	Monthly Average Daily Maximum	8
Di(2-Ethylhexyl)Phthalate (DEHP):	µg/L	1/Month	Composite	Monthly Average	2
Chronic WET	% Effluent	1/Quarter	Composite	Pass/Fail	NA
Outfall 001B to Sheep Gulch	**Unit [1]**	**Sample Frequency**	**Sample Type [2]**	**Reporting Requirement**	**Required Reporting**
Effluent Flow	mgd	Continuous	Continuous	Monthly Average Daily Maximum	0.01
Biochemical Oxygen Demand (BOD_5)	mg/L	1/Week	Composite	Monthly Average Daily Maximum	5
Chemical Oxygen Demand (COD)	mg/L	1/Week	Composite	Monthly Average Daily Maximum	5
Total Suspended Solids (TSS)	mg/L	1/Week	Composite	Monthly Average Daily Maximum	5

[1] See narrative discussion in this section of permit for additional details on calculating load.
[2] See Definition section at end of permit for explanation of terms.
[3] See Circular DEQ-7 for minimum RRVs. If permittee is reporting non-detects, the analysis must meet these RRVs.
[4] Oil and grease analysis must be conducted once per quarter, at a minimum. Additionally, if visual monitoring indicates the presence of oil and grease, an additional grab sample must be submitted for analysis.
[5] Required June 1 - September 30.
[6] Calculated as the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen concentrations.
[7] Outfall 001A to Sheep Gulch: monthly mean and daily minimum; Outfall 003 to Silver Bow Creek: weekly mean and daily minimum.

Table 14. Continued. Self-Monitoring Requirements for Outfalls 001A, 001B, 002, and 003

Outfall 002 to Sheep Gulch	Unit [1]	Sample Frequency	Sample Type [2]	Reporting Requirement	Required Reporting
Effluent Flow	mgd	1/Event	Estimate	Daily Maximum	0.01
Chemical Oxygen Demand	mg/L	1/Event	Grab	Daily Maximum	5
Total Suspended Solids (TSS)	mg/L	1/Event	Grab	Daily Maximum	5
Oil and Grease (visual)	Presence/ Absence	1/Event	Visual	Daily Maximum	1
Total Recoverable Arsenic	µg/L	1/Event	Grab	Daily Maximum	1
Total Recoverable Copper	µg/L	1/Event	Grab	Daily Maximum	2
Total Recoverable Lead	µg/L	1/Event	Grab	Daily Maximum	0.3
Total Recoverable Zinc	µg/L	1/Event	Grab	Daily Maximum	8

(8) See narrative discussion in this section of permit for additional details on calculating load.
(9) See Definition section at end of permit for explanation of terms.
(10) See Circular DEQ-7 for minimum RRVs. If permittee is reporting non-detects, the analysis must meet these RRVs.
(11) Oil and grease analysis must be conducted once per quarter, at a minimum. Additionally, if visual monitoring indicates the presence of oil and grease, an additional grab sample must be submitted for analysis.
(12) Required June 1 - September 30.
(13) Calculated as the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen concentrations.
(14) Outfall 001A to Sheep Gulch: monthly mean and daily minimum; Outfall 003 to Silver Bow Creek: weekly mean and daily minimum.

VIII. Special Conditions

A. Storm Water Pollution Prevention

REC must implement and maintain best management practices for industrial storm water facilities as listed in Part 2 of the 2018 version of the Multi Sector General Permit for Industrial Storm Water Discharges (MSGP), MTR000000. Also, REC must develop and maintain a storm water pollution prevention plan, which contains all elements required in Part 3.1 of the 2018 version of the MSGP.

B. Compliance Schedule

REC shall meet the new and revised effluent limits for total nitrogen and dissolved aluminum by no later than {**58 months from the effective date of the permit}** in accordance with the following schedule:

- By {**24 months after the effective date of this permit},** REC shall submit the proposed actions the facility commits to take to ensure compliance with new limits.
- By **{58 months after the effective date of the permit}**, REC shall comply with the new limits.

REC shall submit an annual report documenting what progress has been made during the previous year and what actions are planned for the upcoming year by January 28th of each year until REC complies with these limits.

Table 15. Compliance Schedule for Total Nitrogen and Dissolved Aluminum

Action	Frequency	Scheduled Completion Date of Action [1]	Report Due Date [2]
Submit proposed actions for final limit compliance	Once	24 months after effective Date of Permit	14 days after Completion Date
Comply with final effluent limits	Once	58 months after effective Date of Permit	14 days after Completion Date
Annual Report	Annually until January 2025	January 28th of each year	January 28th of each year

(1) The actions must be completed on or before the scheduled completion dates.
(2) This notification must be received by the DEQ on or before the scheduled due date.

IX. Public Participation

A. Public Notice

DEQ issued a public notice stating that a tentative decision has been made to issue an MPDES permit to REC Silicon and that a draft permit, fact sheet, and environmental assessment (EA) have been prepared. Details are below:

- Public Notice No. MT-21-08 dated April 19, 2021
- Public comments are invited any time prior to the close of business May 19, 2021
- Comments may be directed to:

  Department of Environmental Quality
  Water Protection Bureau — DEQWPBPublicComments@mt.gov
  PO Box 200901 — or
  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 and issue a final decision within sixty days of the close of the public comment period or as soon as possible thereafter.

All persons, including the applicant, who believe any condition of the 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.

B. Notification of Interested Parties

Copies of the public notice were mailed to the discharger, state and federal agencies, and persons who have expressed an interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this permit.

In addition to mailing the public notice, a copy of the notice and applicable draft permit, fact sheet and EA were posted on DEQ's website for 30 days. Any person interested in being placed on the mailing list for information regarding the MPDES permit should contact DEQ, reference this facility, and provide a name, address, and email address.

C. Public Hearing

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.

D. Permit Appeal

After the close of the public comment period DEQ will issue a final permit decision, which is a final decision to issue, deny, modify, revoke and reissue, or terminate a permit. A permit decision is effective 30 days after the date of issuance unless a later date is specified in the decision, a stay is granted, or the applicant files an appeal.

REC Silicon may file an appeal within 30 days of DEQ's action to the following address:

Secretary, Board of Environmental Review
Department of Environmental Quality
1520 East Sixth Avenue
PO Box 200901
Helena, Montana 59620-0901

E. Additional Information

Requests for additional information or questions regarding this permit should be directed to the Water Protection Bureau at 406-444-5546

X. Information Sources

Administrative Rules of Montana Title 17 Chapter 30 – Water Quality

- Subchapter 2 – *Water Quality Permit and Application Fees*
- Subchapter 5 – *Mixing Zones in Surface and Ground Water*
- Subchapter 6 – *Montana Surface Water Quality Standards and Procedures*
- Subchapter 7 – *Nondegredation of Water Quality*
- Subchapter 12 – *Montana Pollutant Discharge Elimination (MPDES) Standards*
- Subchapter 13 – *Montana Pollutant Discharge Elimination (MPDES) Permits*

CWAIC: Clean Water Act Information Center, Department of Environmental Quality. 2018. Accessed August 2019.

Federal Water Pollution Control Act (Clean Water Act), 33 U.S.C. §§ 1251-1387, October 18, 1972, as amended 1973-1983, 1987, 1988, 1990-1992, 1994, 1995 and 1996.

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

Montana DEQ. *Montana 2016 Integrated Report and 303(d) List. A Compilation of Impaired and Threatened Water bodies in Need of Water Quality Restoration. Part A. Water Quality Assessment Results.* 2018.

Montana DEQ. *Department Circular DEQ-12A, Montana Base Numeric Nutrient Standards.* 2014.

Montana DEQ. *Department Circular DEQ-7, Montana Numeric Water Quality Standards.* 2017.

Montana DEQ. Montana Pollutant Discharge Elimination System (MPDES) Permit Number MT0030350

- Administrative Record
- Renewal Application Forms DEQ-1 and EPA Forms 2C and 2F, 2015

Montana DEQ. *Silver Bow Creek and Clark Fork River Metals TMDL.* 2014.

Montana DEQ. *Upper Clark Fork Phase 2 Sediment and Nutrients TMDLs and Framework Water Quality Improvement Plan.* 2014.

National Water Quality Monitoring Council: Water Quality Data for the Silver Bow Creek. February 3, 2011 and February 16, 2017.

US Code of Federal Regulations, 40 CFR Parts 122-125, 130-133, 136 and 442.

US EPA NPDES *Permit Writers' Manual*, EPA 833-B-96-003, September 2010.

US EPA. *EPA Region VIII Mixing Zones and Dilution Policy*. December 1994 (Updated September 1995)

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

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