ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET

Permit Number: AK0043206

Hecla Greens Creek Mining Company

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

Technical Contact: David Khan, PE
Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
P.O. Box 111800
Juneau, Alaska 99811-1800
(907) 465-6855
david.khan@alaska.gov

An Alaska Pollutant Discharge Elimination System (APDES) permit is reissued to

HECLA GREENS CREEK MINING COMPANY

For wastewater discharges from

Greens Creek Mine
P.O. Box 32199
Juneau, AK 99803

The Alaska Department of Environmental Conservation (Department or DEC) reissues APDES individual permit AK0043206 to Hecla Greens Creek Mining Company (HGCMC). The permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility and outlines best management practices to which the facility must adhere.

This fact sheet explains the nature of permitted discharges from Greens Creek Mine facilities to Hawk Inlet, Greens Creek, and Zinc Creek and the development of the permit including:

- information on public comment, public hearing, and appeal procedures,

- effluent limitations and other conditions,
- technical material supporting the permit conditions, and
- monitoring requirements.

Appeals Process

The Department will transmit the permit, final fact sheet, and the Response to Comments to anyone who provided comments during the public comment period.

A person authorized under a provision of 18 AAC 15 may request an informal review of a contested decision by the Division Director in accordance with 18 AAC 15.185 and/or an adjudicatory hearing in accordance with 18 AAC 15.195 – 18 AAC 15.340. See DEC's "Appeal a DEC Decision" web page https://dec.alaska.gov/commish/review-guidance/ for access to the required forms and guidance on the appeal process. Please provide a courtesy copy of the adjudicatory hearing request in an electronic format to the parties required to be served under 18 AAC 15.200.

Documents are Available

The permit, fact sheet, application, and related documents can be obtained by visiting or contacting the Department between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The permit, fact sheet, application, and other information are located on the Department's Wastewater Discharge Authorization Program website: http://dec.alaska.gov/water/wastewater/ .

Alaska Department of Environmental Conservation	Alaska Department of Environmental Conservation	Alaska Department of Environmental Conservation
Wastewater Discharge Authorization Program	Wastewater Discharge Authorization Program	Wastewater Discharge Authorization Program
610 University Avenue	555 Cordova Street	410 Willoughby Avenue, Suite 303
Fairbanks, AK 99709 (907) 451-2136	Anchorage, AK 99501 (907) 269-4028	Juneau, AK 99811 (907) 465-6855

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1.0 APPLICANT

This fact sheet provides information on the Alaska Pollutant Discharge Elimination System (APDES) permit for the following entity:

Permittee:	Hecla Greens Creek Mining Company (HGCMC)
Facility	Greens Creek Mine
APDES Permit Number:	AK0043206
Facility Location:	18 miles southwest of Juneau, Alaska
Mailing Address:	PO Box 32199, Juneau, AK 99803
Facility Contact:	Martin Stearns

The maps in Figure 1, Figure 2 , Figure 3, and Figure 4 of the fact sheet show the mine, treatment plant, discharge, monitoring locations, and proposed new outfalls 002A and SW-012.

2.0 FACILITY INFORMATION

Hecla Greens Creek Mine (HGCMC) is an underground polymetallic mine producing approximately 2,200 to 2,400 tons of ore per day. This ore is milled through an on-site grinding circuit and flotation concentrator, with some precious metal first extracted by gravity. Concentrates are then shipped internationally to smelters for refinement. Tailings from the concentrator and waste rock from mining are either returned to the underground workings or placed in a permitted storage area.

The HGCMC mine facilities encompass approximately 273 acres located in the Admiralty Island National Monument. The Admiralty Island National Monument is managed by the U.S. Forest Service and is located in the Greens Creek, Zinc Creek, Cannery Creek and Tributary Creek drainages. These creeks flow into Hawk Inlet. Major site facilities include the underground mine, waste rock storage areas, mill, dry tailings disposal site, port facilities (Hawk Inlet terminal facilities), and roads connecting these components. The location of the major facility components are shown in Figure 1.

2.1 Mining, Milling, and Tailings Disposal Processes

The ore is mined via underground methods. Waste rock removed from the mine is permanently disposed of in waste rock site 23 and dry tailings disposal site. At the mill, the ore is ground and processed by flotation to produce concentrates containing primarily lead and zinc with smaller portions of silver and gold. The following reagents are added to the flotation process: copper sulfate, alcohol-based frothers, xanthate, lime, sodium cyanide, zinc sulfate, sulfuric acid, sodium isopropyl dithiophosphate, 3418A promoter, SD200 depressant, metabisulfite, and carbon dioxide. The flotation concentrates are thickened, filter pressed, and then, trucked to the Hawk Inlet terminal for shipment off-site.

The tailings from the flotation process are thickened and filter pressed. Approximately half of the tailings are backfilled into the underground mine. The remainder are covered and transported to the dry stack tailings disposal site.

The dry stack tailings disposal site is located in the upper reaches of Tributary Creek drainage. Currently, the total area of the site is approximately 100 acres. The dry tailings disposal site consists of a dry stack tailings pile and runoff surge pond (tailings facility) adjacently situated. In 2003, an Environmental Impact Statement (EIS) for expansion of the tailings facility was finalized by the U.S. Forest Service and followed by approval to expand the tailings facility to approximately 85 acres, and on August 30, 2013, an EIS for another expansion of the tailings facility was completed. Afterward, the US Forest Service approved plans to expand the tailings disposal facility by about 18 acres.

2.2 Description of Discharges

Previous Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) permits issued to the permittee authorized the discharge of treated wastewater from outfalls 001 and 002 into Hawk Inlet and from ten storm water outfalls. Figure 1 depicts the locations of those outfalls. The sources of wastewater contributing to each outfall are described below.

Outfall 001: Previous permits allowed a discharge of treated domestic wastewater from outfall 001 to Hawk Inlet. In 2000, the Permittee directed the flows from outfall 001 to outfall 002 and abandoned outfall 001. Outfall 001 is no longer in use and excluded from this permit.

Outfall 002: Mine water and mill wastewaters and storm water are treated and discharged through outfall 002 into Hawk Inlet. The specific sources of wastewater and waste streams contributing to outfall 002 are listed below.

1. Mine water - Wastewater from the underground mine is (1) treated in the wastewater treatment plants (WWTP/400 gallon per minute (gpm) or 800 gpm) at the 920 Area and pumped to Tank 7 prior to discharge or (2) pumped to Pond 7/10 system and then to the Tailing Storage Facility (TSF) WWTP for treatment prior to discharge via Tank 7.
2. Mill wastewater - Most of the process water collected from the mill through tailings and concentrate thickening and filtration is recycled for reuse in the milling process. However, a portion of the process water is continually purged from the system to maintain water chemistry suitable for proper flotation performance. Prior to recycling the water is treated at the mill in the 920 Area WWTPs. The portion of treated water purged from the system is (1) pumped to Tank 7 prior to discharge or (2) pumped to Pond 7/10 system and then to TSF WWTP for treatment prior to discharge via Tank 7.
3. Sanitary wastes from the mine and mill area (920 Area) and Hawk Inlet terminal areas are treated and disinfected in a sequencing batch reactor (SBR) package plant in which the SBRs are designed to treat to secondary treatment standards. Treated sanitary wastewater from the Hawk Inlet terminal area is pumped to the TSF WWTP for additional treatment and then to Tank 7 and discharged through outfall 002. Treated

sanitary wastewater from the 920 Area will be (1) treated at the 920 Area WWTPs and pumped to Tank 7 prior to discharge or (2) pumped to Pond 7/10 system and sent to the TSF WWTP for treatment prior to discharge via Tank 7 and then outfall 002. The average effluent flow rate for the 920 Area and Hawk Inlet SBRs are about 7,200 and 5,800 gallon per day (gpd), respectively.

4. Storm water from the mine and mill area - Storm water drainage from the mine and mill area is collected through of a series of lined ditches, degritting basins, and ponds. These waters are piped to the TSF WWTP for treatment prior to discharge thru Tank 7.
5. Storm water from the Hawk Inlet terminal area - Storm water from the Hawk Inlet terminal area is collected in a degrit basin and piped to the Wheel Wash Sump and then to the TSF WWTP for treatment prior to discharge thru Tank 7.
6. Seepage and runoff from waste rock storage areas 23, 1350, D and E, Pond C, and Pond D - Seepage and runoff from these waste rock storage areas are collected and routed either back to the mill for use in the mill processes or are pumped to the TSF WWTP for treatment prior to discharge. Collection of runoff at Site E is seasonal and associated with waste rock removal activities is pumped to the TSF WWTP for treatment prior to discharge.
7. Tailings disposal facility seepage and runoff - Seepage and contact water from the dry tailings facility are collected in Pond 7/10 system located below the TSF WWTP. Also, runoff from a segment of the B-road, adjacent to the tailings facility is intercepted and piped to Pond 7/10 system.
8. Intercepted groundwater – Groundwater, including beneath Pond 7/10 system and the TSF, Site 1350, Site 23, the mill backslope, and Hawk Inlet terminal area are treated in either the 920 WWTPs or the TSF WWTP prior to discharge via Tank 7.

These eight wastewater streams are combined and treated in either the 920 Area WWTPs (1,200 gpm combined) or the TSF WWTP (3,200 gpm) located near the dry tailings facility. Water treatment in the WWTPs consists of ferric iron co-precipitation, flocculation, and settling of precipitates reducing metal concentrations in the wastewater. The 920 Area WWTP and TSF WWTP effluent is discharged through outfall 002 or outfall 002A (during periods of high precipitation). Sludge from the treatment plants is thickened, filtered, and disposed of in the dry tailings facility.

Outfall 002 extends from the dry tailings area to the Hawk Inlet discharge point at latitude 58° 06' 06" N and longitude 134° 46' 30" W. The effluent discharges through a 160 ft. long diffuser with a depth of 45 ft. at the near-shore end and 69 ft. at the far end. There are 15 discharge ports, “Tideflex” duckbill valves, spaced at 11.4 ft. intervals along the 14-inch diameter diffuser.

Outfall 002A: HGCMC plans to construct a new outfall (outfall 002A) approximately 1 mile to the north of outfall 002 to increase discharge flow capacity during heavy precipitation events. During routine operations, treated wastewater will be discharged via outfall 002. During high precipitation events, excess water over the outfall 002 WTP and discharge capacity will be discharged via outfall 002A at maximum discharge rate of 2000 gpm. The combined treatment capabilities of the three wastewater treatment plants (920 Area and Tailings Facilities Area) are 4,400 gpm. The total annual volume of water authorized for discharge will remain unchanged.

Storm Water: Storm water that is not discharged through outfall 002 may be discharged through the storm water outfalls listed in Table 1.

Table 1: Storm Water Outfalls

Outfall	Location*	Description of Discharge	Receiving Water
003	Southern part of Hawk Inlet facilities area near the cannery buildings	Runoff from parking and storage areas not otherwise captured and routed through outfall 002	Hawk Inlet
004	Pit 7 (inactive rock quarry and topsoil storage) off of A-road at mile 1.9	Runoff and drainage from inactive rock extraction pit and topsoil storage	Wetlands
005.2	Zinc Creek (east side of bridge) off of B-road at mile 3.0	Runoff from road cut and fill in known mineralized zone	Zinc Creek
005.3	Site E (inactive waste rock storage area) off of B-road at mile 4.7	Runoff from waste rock storage area and road runoff	Greens Creek
005.4	Pit 6 (inactive rock quarry and top soil storage) off of B-road at mile 4.6	Seepage and runoff from inactive quarry site and topsoil storage area	Greens Creek
005.5	Culvert at B-road mile 7.8	Road runoff	Greens Creek
006	Pond D (sediment pond from inactive waste rock storage area D) off of B-road at mile 8.0	Seepage and runoff from inactive waste rock storage area D	Greens Creek
007	Pond C (sediment pond from inactive waste rock storage area C) off of B-road at mile 8.2	Seepage and runoff from inactive waste rock Site C and mill backslope	Greens Creek
008	960 laydown site (initial portal development waste rock)	Seepage and runoff from inactive waste rock placement site	Greens Creek
009	Site 1350 adit inactive waste rock storage area	Runoff and seepage from inactive development rock placement site	Greens Creek
012	A-Road sandpit area	Precipitation that accumulates in sandpit area	Hawk Inlet
Note: See Figure 1 which shows storm water outfall locations.			

2.3 Permit Background

EPA issued an initial NPDES permit for Greens Creek Mine on March 31, 1987. The initial permit was reissued by EPA on October 15, 1998 and expired on November 17, 2003. Since Kennecott Greens Creek Mining Co. submitted a timely permit renewal application in a letter dated May 6, 2003, the 1998 permit was administratively extended until the effective date of a reissued permit. The current permit became effective on July 1, 2005 and expired on July 1, 2010. However, a timely application for reissuance of the permit was submitted to DEC in December 2009. Because HGCMC submitted a timely application for reissuance, the 2005 permit was administratively extended and effective and enforceable until it was superseded by the effective date of a new permit. The next permit became effective on October 1, 2015 and expired on September 30, 2020. Since, HGCMC submitted a timely permit renewal application in a letter dated April 8, 2020, the 2015 permit was administratively extended until the effective date of a reissued permit per 18 AAC 83.155(c)(1).

3.0 COMPLIANCE HISTORY

On February 2, 2017, the Department issued a Notice of Violation (NOV) to HGCMC resulting from an inspection conducted in November 2016. The following violations were cited in the NOV: 1) Failure to have a signed and certified QAPP; 2) failure to timely provide BMP plan to the Department upon request; 3) failure to manage runoff of sediments; 4) illicit storm water discharges; 5) failure to submit noncompliance notification; and 5) on May 6, 2016, 300,000 gallons of storm water was discharged into Greens Creek. The water exceeded the Alaska Water Quality Standards (WQS) for lead concentration.

On November 16, 2018, the Department issued an NOV to HGCMC resulting from an inspection conducted in October 2018. The following violations were cited in the NOV: 1) on April 23, 2017, a broken pipe caused an unpermitted release (166 gallons) of mine drainage to land; 2) on July 7, 2017, 4,600 gallons of recycled drill fluid was discharged into Upper Gallagher Creek; 3) on January 2, 2018, 16,350 gallons of storm water (lead 950.1 µg/L) was released through the permitted Pond C outfall to Greens Creek; 4) on January 4, 2018, a broken nipple on the outfall 002 discharge pipeline released 5,000 gallons of treated effluent to land; 5) HGCMC failed to report all outfall 002 parameters on the May 2018 discharge monitoring report (DMR); and 6) straw wattles for sediment control were not being maintained.

On March 26, 2020, the Department issued an NOV to HGCMC resulting from an inspection conducted on February 13, 2020. The following violations were cited in the NOV: 1) on June 3, 2019, the facility potentially discharged an estimated 25 gallons of ethylene glycol to the water management system due to a leak in a heating system pipeline; and 2) During the period of this evaluation, the facility failed to attach to the DMR, the required excursion information as required by the permit.

HGCMC addressed each of the NOVs expeditiously and took steps to prevent the recurrence of a similar problem.

During the previous permit duration, several noncompliance notifications were issued to HGCMC. However, the company took acceptable remedial step to take care of the noncompliance issues.

DMRs from October 2015 through September 2022 were reviewed to determine the Permittee's compliance with effluent limits. After a DEC inspection completed on June 16, 2022, a Notice of Violation was issued on July 14, 2022 for unauthorized discharge which was caused by unexpected high rains and an unintentional puncturing of a water line.

Monitoring data indicated that some of the storm water discharges exceeded WQS (see, APPENDIX 2 for a discussion of the storm water discharges and concentrations compared to WQS).

4.0 EFFLUENT LIMITS

4.1 Basis

The Clean Water Act (CWA) requires that the limits for a particular pollutant be the more stringent of either technology-based or water quality-based effluent limits (WQBELs). Technology-based effluent limits (TBELs) are set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the WQS of a waterbody are met. WQBELs may be more stringent than TBELs. Additionally, narrative limitations designate qualitative restrictions and may also complement quantitative limits.

The permit contains both TBELs and WQBELs for outfall 002 and narrative limitations for the ten storm water outfalls. Sections 4.2 and 4.3 summarize the permit's effluent limitations. See APPENDIX 2 for more details.

4.2 Outfall 002 Limits

While the effluent flow limits for the existing outfall 002 have remained the same as the previous permit's limits, the added flow for the proposed outfall 002A has increased the combined effluent flow limits for this permit. The remaining parameters' effluent limits for the both outfalls are considered to be similar to the effluent limits of the existing outfall 002. For a side-by-side comparison of effluent limits in the preceding permit and this permit, see Table 2 below. For a detailed discussion of how the permit limits were developed, see APPENDIX 2.

Table 2: Outfall 002 and 002A - Effluent Limits

Parameter	Units	Effluent Limits			
		Daily Maximum		Monthly Average	
		2015 Permit	This Permit	2015 Permit	This Permit
Flow outfall 002	mgd	4.6	4.6	3.7	3.7
Flow outfall 002A	mgd	--	1.7	--	0.4
Flow (Combined)	mgd	4.6	6.3	3.7	4.1
Cadmium, total recoverable	µg/L	100	16	50	6
Copper, total recoverable	µg/L	99	32	39	13
Cyanide, weak acid dissociable	µg/L	19	5	NA	3
Lead, total recoverable	µg/L	327	196	123	87
Mercury, total	µg/L	1.9	0.9	1.0	0.7
Zinc, total recoverable	µg/L	1,000	514	500	201
TSS	mg/L	30	30	20	20
pH	s.u.	within the range of 6.0 to 9.0			

4.3 Storm Water Outfall Limitations

Numeric effluent limits were not developed for the individual storm water outfalls due to the extremely variable flow and pollutant concentrations of storm water discharges.

Rather than developing numeric effluent limits for each storm water outfall, the permit requires the permittee to implement corrective action if a storm water discharge exceeds a water quality criterion and results in a statistically significant reduction in receiving water quality. This limitation is imposed on a parameter-by-parameter basis for lead, zinc, TSS, pH, and oil and grease. This permit's sampling requirements are unchanged from the 2015 permit required sampling from each outfall, upstream, and downstream. Corrective action requirements are maintained to address any storm water exceedance in a prescribed, approved, timely, and comprehensive manner.

The Permittee currently has an approved best management practices plan (BMP Plan) aimed at achieving the objectives and specific requirements for developing outfall-specific BMPs. APDES regulations allow for the use of BMPs where development of numeric effluent limits is infeasible (18 AAC 83.475). See Section 10.3 for more information regarding the BMP requirements.

5.0 MONITORING REQUIREMENTS

5.1 Basis

Under AS 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. Permits require monitoring to determine compliance with effluent limits. Monitoring may also be required to gather effluent and receiving water data to determine if additional effluent limits are required or to monitor effluent impact on the receiving waterbody quality.

The Permittee is responsible to conduct the monitoring and report results on Discharge Monitoring Reports (DMRs) and on the application for permit reissuance, as appropriate.

5.2 Outfall 002 & 002A – Effluent Monitoring

As currently constructed, the discharge line from Tank 7 to outfall 002 can not accommodate excess water during wet weather conditions. Installing a new discharge line (outfall 002A) versus replacing the existing discharge line with a larger diameter line will result in less environmental impacts during construction and will allow HGCMC to continue discharge during the construction of the new discharge line. So rather than storing the treated water in Pond 7/Pond 10, HGCMC will have the option of pumping the treated water from the 920 Area Wastewater treatment plants directly to Tank 7 prior to discharge at outfall 002. Majority of the water from Tank 7 will continue to discharge to outfall 002, but during the wet weather conditions, excess water will be discharged though the new outfall 002A.

The effluent monitoring requirements in the permit are summarized in Table 3. With the exception of cadmium and copper, the monitoring requirements are the same as the 2015 permit including the requirement for an annual video and report on the condition of the outfall 002 diffuser and ports. Cadmium monitoring frequency was changed from weekly to monthly because over the last decade cadmium has not been detected greater than 2 ug/L (less than 4% of the monthly average effluent limit). Similarly, copper monitoring frequency was changed from weekly to monthly because since 2013 copper has not been detected above 5 ug/L (less than 13% of the monthly average effluent limit).

Table 3: Outfall 002 and Outfall 002A- Effluent Monitoring Requirements

Parameter	Units	Monitoring Requirements	
		Minimum Frequency	Sample Type
Flow	mgd	continuous	recording
Cadmium [a]	µg/L	monthly	24-hour composite
Copper [a]	µg/L	monthly	24-hour composite
Lead [a]	µg/L	weekly	24-hour composite
Mercury [b]	µg/L	weekly	24-hour composite
Zinc [a]	µg/L	weekly	24-hour composite
TSS	mg/L	weekly	24-hour composite
pH	s.u.	continuous [c]	recording
Cyanide [d]	µg/L	monthly	24-hour composite
Temperature	°C	weekly	grab
BOD_5	mg/L	monthly	grab
Fecal coliform bacteria	#/100 mL	monthly	grab

Notes:

a. Metals shall be measured as total recoverable. See EPA memo on total vs. total recoverable metals from W. Telliard dated August 19, 1998.

b. Mercury shall be measured as total. See EPA memo on total vs. total recoverable metals from W. Telliard dated August 19, 1998.

c. Permit Part 1.2.4 imposes continuous monitoring requirements as specified in 40 CFR Part 401.17 and adopted by reference in 18 AAC 83.010(g)(1).

d. Cyanide shall be measured as weak acid dissociable (WAD).

5.3 Storm Water Monitoring

The 2015 permit required HGCMC to monitor storm water outfalls twice per year (once during spring runoff/snowmelt and once during the fall "monsoon" months) at the locations shown in Figure 1. Outfalls 003 through 005 are monitored for oil and grease, lead, zinc, TSS, and pH. outfalls 006 through 012 are monitored for lead, zinc, TSS, and pH, as outlined in Table 4.

The Department has determined that twice yearly storm water monitoring of the outfalls must continue, provided there is discharge. The permit requires, for each storm water monitoring event, that HGCMC monitor the receiving water directly upstream and downstream of where the storm water enters the receiving water. The receiving water must be monitored at the same time as the storm water outfalls and for the same parameters. See Table 4.

The permit includes requirements specifying the method detection limits used for the storm water and associated receiving water monitoring. It also specifies that lead and zinc shall be measured as total recoverable.

Table 4: Storm Water Outfall Monitoring Requirements

Outfall	Location	Parameters [a]	Minimum Frequency [b]	Sample Type
003	Southern part of Hawk Inlet facilities area near the cannery buildings	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
004	Pit 7 (inactive rock quarry and topsoil storage) off of A-road at mile 1.8	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.2	Zinc Creek (east side of bridge) off of B-road at mile 3.0	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.3	Site E (inactive waste rock storage area) off of B-road at mile 4.7	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.4	Pit 6 (inactive rock quarry and top soil storage) off of B-road at mile 4.6	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
005.5	Culvert at B-road mile 7.8	Flow, oil & grease, lead, zinc, TSS, pH, hardness	twice per year	Grab
006	Pond D (sediment pond from inactive waste rock storage area D) off of B-road at mile 8.0	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab
007	Pond C (sediment pond from inactive waste rock storage area C) off of B-road at mile 8.2	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab
008	960 laydown site (initial portal development waste rock)	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab
009	Site 1350 adit inactive waste rock storage area	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab
012	A-Road sandpit area	Flow, lead, zinc, TSS, pH, hardness	twice per year	Grab

Notes:

a. Flow shall be reported in gpm, lead and zinc shall be measured as total recoverable in µg/L, oil & grease and TSS shall be measured in mg/L, pH shall be measured in s.u., and hardness shall be measured as mg/L of $CaCO_3$.

b. The samples must be collected once during the spring runoff or snow-melt and once during the fall rainfall events. Sampling is only required when an outfall is discharging.

5.4 Internal Monitoring Locations 010 and 011

The effluent monitoring requirements for internal monitoring locations 010 and 011 are summarized in Table 5. Internal monitoring location 010 is an effluent monitoring location for the Hawk Inlet SBR and internal monitoring location 011 is an effluent monitoring location for the 920 Area SBR. Both SBRs are designed to treat domestic wastewater to secondary treatment standards as well as provide disinfection before discharge. The monitoring locations are located between the respective SBR and the TSF WWTF pond.

Table 5: Internal Monitoring Locations 010 and 011 Requirements

Parameter	Units	Monitoring Requirements	
		Minimum Frequency	Sample Type
BOD_5	mg/L	monthly*	grab
* Samples must be taken on the same day as outfall 002 BOD_5 sampling.			

5.5 Hawk Inlet Monitoring

This permit requires HGCMC to monitor seawater, sediments, and toxicity in Hawk Inlet. Based on recommendations from the Alaska Department of Fish and Game (ADF&G), permit monitoring requirements have been updated since the 2015 permit. The goal of the monitoring program is to demonstrate that WQS are not exceeded outside the boundary of the mixing zone and to assess whether sediments or aquatic organisms may be affected by the facility's discharges. The sampling locations are shown in Figure 2 . The changes from the 2015 permit relating to Hawk Inlet monitoring are contained in Permit Parts 1.6.1.1, 1.6.1.2, 1.6.1.3, 1.6.1.4, and 1.6.1.5, where monitoring for the outfall 002A has been added. A summary of the Hawk Inlet Monitoring Program follows.

Water Column Monitoring: The permit requires quarterly receiving water monitoring in Hawk Inlet at three pre-existing sample locations (sites 106, 107, and 108). Sites 106, 107, and 108 are part of the Hawk Inlet ambient water quality monitoring program: 106 is nearest the mouth of the inlet, 107 is nearest the head of the inlet and adjacent to the mine's port facility, and 108 is nearest to the outfall 002. The permit also requires receiving water monitoring at a new location, site 111, during calendar quarters when effluent is released through 002A. Site 111 (Figure 2) is proximal to the outfall 002A.

The samples must be analyzed for the following parameters: cadmium, copper, lead, mercury, zinc, TSS, pH, cyanide, temperature, conductivity, and turbidity. Metals, except for mercury that is measured as total, must be measured as dissolved. Hawk Inlet water quality monitoring data is used to evaluate water quality impacts of outfalls 002 and 002A discharges. To perform this evaluation, it is necessary that the ambient monitoring use analytical methods that have method detection limits below the water quality criteria. Table 6 specifies method detection limits (MDLs) for metals and cyanide required for marine water monitoring.

Receiving water monitoring requirements are the same as required in the 2015 permit. The permit requires that the metals be monitored as dissolved.

Table 6: Receiving Water Monitoring Parameters and MDLs

Parameter	Units	Minimum Frequency	MDL
Cadmium, dissolved	µg/L	quarterly	0.1
Copper, dissolved	µg/L	quarterly	0.03
Lead, dissolved	µg/L	quarterly	0.05
Mercury, total	µg/L	quarterly	0.002
Zinc, dissolved	µg/L	quarterly	0.2
TSS	mg/L	quarterly	-
pH	s.u.	quarterly	-
Cyanide, WAD	µg/L	quarterly	5
Temperature	°C	quarterly	-
Turbidity	NTU	quarterly	-
Conductivity	µS/cm	quarterly	-

Permit Part 1.6.3 – Site 108 Monitoring requires effluent sampling on days when mixing zone sampling occurs. This requirement tracks the relationship between effluent and receiving water quality. Monitoring for water quality near the mixing zone has been performed at DEC-approved monitoring site 108, and the permit maintains monitoring site 108 as the site for sampling water quality adjacent to the mixing zone.

Site 111 is a new monitoring location for sampling the water quality adjacent to the mixing zone of outfall 002A. Monitoring at this site must occur during calendar quarters when effluent is released through 002A. The permit maintains monitoring site 111 as the site for sampling water quality adjacent to the outfall 002A mixing zone (Section 1.6.1.1 of APDES Permit).

Sediment Monitoring: The permit requires sediment monitoring in Hawk Inlet at least once per year at three pre-existing sample locations (locations S-1, S-2, and S-4) and at least once every three years at pre-existing sample locations S-5N and S-5S, and annually (to establish a baseline) at station S-7 until outfall 002A is constructed and then annually if outfall 002A is used for discharge other than for testing and maintenance. Location S-1 and S-7 are in the areas affected by the discharges from outfall 002 and outfall 002A, location S-2 represents background conditions, location S-4 is in the area of the ore loading dock, and locations S-5N and S-5S are in an area affected by the loading of concentrates onto ships that is listed as impaired (Figure 2). See Section 6.2 for more details about the impairment. Samples must be analyzed for the following parameters: cadmium, copper, lead, mercury, and zinc (Table 7). The permit specifies method detection limits for these parameters. The sediment monitoring requirements are the same as required in the 2015 permit.

Table 7: Sediment Monitoring Parameters and Methods

Parameter	Preparation Method	Analysis Method	MDL [a] (mg/Kg)
Cadmium	PSEP [b]	GFAA [c]	0.3
Copper	PSEP [b]	ICP [d]	15.0
Lead	PSEP [b]	ICP [d]	0.5
Mercury	7471 [e]	7471 [e]	0.02
Zinc	PSEP [b]	ICP [d]	15.0

Notes:

a. Dry weight basis.
b. Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound. Puget Sound Estuary Program (PSEP), EPA 910/9-86-157, as updated by Washington Department of Ecology. Subsection: Metals in Puget Sound Water, Sediment, and Tissue Samples, PSEP.
c. Graphite Furnace Atomic Absorption (GFAA) Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods. EPA 1986.
d. Inductively Coupled Plasma (ICP) Emission Spectrometry - SW-846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods. EPA 1986.
e. Mercury Digestion and Cold Vapor Atomic Absorption (CVAA) Spectrometry - Method 7471, SW846, Test Methods for Evaluating Solid Waste Physical/Chemical Methods. EPA 1986.

In-situ Bioassays: The permit requires analysis of tissues from organisms collected in Hawk Inlet at least once per year at seven pre-existing sample locations. Polychaete sediment dwellers (marine worms), *Nephthys procera,* and *Nereis sp.*, must be collected from three pre-existing sample locations (locations S-1, S-2, and S-4) and a new location, S-7 (Figure 2). These locations are the same as required for the sediment sampling, except bioassays are not required at location S-5 since the polychaete test organisms do not occur at location S-5.

The filter feeder, *Mytilus edulis* (blue mussel) must be collected from four pre-existing sample locations (location Stn 1, Stn 2, Stn 3, and Stn 4 (ESL)) and two new locations (location Stn 6, and Stn 7 – Figure 2). Sites Stn 2 and Stn 3 represent background conditions. Locations Stn 4 (ESL) and Stn 1 are in the area influenced by outfall 002, and locations Stn 5 and Stn 6 are in the area influenced by outfall 002A.

Tissue samples must be analyzed for the following parameters: cadmium, copper, lead, mercury, and zinc. The methods used for sample collection and analysis are in Table 8. The in-situ bioassay monitoring requirements have been modified since the 2015 permit to incorporate the new outfall 002A. The in-situ bioassay monitoring requirements include a requirement to collect six samples at each site annually with a minimum monitoring frequency of once per year. Section 8.0 *Anti-backsliding* provides the basis for the sample size and frequency.

Table 8: In-situ Bioassay Monitoring Organisms and Parameters

Sample Location	In-situ Test Organism [a]	Parameters (total in mg/kg)
S-1 S-2 S-4 S-7	*Nephthys procera* (polychaete) and/or *Nereis sp.* (polychaete) [b]	Cadmium, Copper, Lead, Mercury, Zinc
Stn 1 Stn 2 Stn 3 Stn 4 (ESL) Stn 5 Stn 6	*Mytilus edulis* (blue mussel)	

Notes:

a. The organisms must be collected from each of the locations identified.
b. *Nereis sp*. may be replaced with other local species if *Nereis sp.* is not available. Only one species will be included in each sample.

5.6 Non-Routine Discharge Monitoring

The permit requires representative sampling per 18 AAC 83.405(k). This provision specifically requires representative sampling whenever a bypass, spill, or non-routine discharge of pollutants occurs, if the discharge may reasonably be expected to cause or contribute to a violation of an effluent limit under the permit. This provision is included in the permit because routine monitoring could miss permit violations or WQS exceedances resulting from bypasses, spills, or non-routine discharges. This requirement directs HGCMC to conduct additional, targeted monitoring to quantify the effects of these occurrences on the final effluent discharge.

5.7 Whole Effluent Toxicity (WET) Monitoring

18 AAC 83.435 requires that a permit contain limitations on WET when a discharge has reasonable potential to cause or contribute to an exceedance of a WQS.

During development of the 2005 permit, EPA reviewed the WET data. The data showed that the effluent from outfall 002 had no reasonable potential to contribute to an exceedance of the WQS for toxicity. Adequate data determined that WET limits were not needed, and there was no reason to believe that the characteristics of the discharge would change over the term of the next permit; therefore, monitoring for WET was removed from the 2005 permit and continued through the 2015 permit and this permit.

6.0 RECEIVING WATERS

6.1 Water Quality Standards

Section 301(b)(1)(C) of the CWA requires the development of limits in permits necessary to meet water quality standards by July 1, 1977. Per 18 AAC 83.435, APDES permits must include conditions to ensure compliance with 18 AAC 70 – Alaska Water Quality Standards (WQS). Regulations in 18 AAC 70 require that conditions in permits ensure compliance with the WQS. The state's WQS are composed of use classifications, numeric and/or narrative water quality criteria, and an Antidegradation Policy. The use classification system designates the beneficial uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the beneficial use classification of each waterbody. The antidegradation policy ensures that the beneficial uses and existing water quality are maintained.

Water bodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some water bodies in Alaska can also have site–specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). The receiving water for the discharge, Hawk Inlet, has not been reclassified, nor have site-specific water quality criteria been established. Therefore, Hawk Inlet must be protected for all marine water designated use classes listed in 18 AAC 70.020(a)(2).

6.2 Water Quality Status of Receiving Waterbody

Any part of a waterbody for which the water quality does not or is not expected to meet applicable WQS is defined as a "water quality limited segment" and placed on the state's impaired waterbody list. Zinc Creek and Greens Creek are not included on the list of Alaska's CWA 303(d) impaired waters as published in Alaska's Final 2020 Integrated Water Quality Monitoring and Assessment Report. However, the 2020 Integrated Water Quality Monitoring and Assessment Report lists a small portion of Hawk Inlet (150' by 350') for listing as impaired due to cadmium, copper, lead, mercury, and zinc in sediments where a spill occurred in 1989, even though all samples indicate that the water column meets Alaska Water Quality Standards. The marine sediments, which are confined to a less than one acre area, do not negatively impact water quality in the locations affected by permitted discharges. In 2015, a Restoration Plan was began for the area. In 2016, the plan was reviewed by the stakeholders and the plan was completed in 2017.

6.3 Mixing Zone Analysis For Outfalls 002 & 002A

Outfall 002:

Under 18 AAC 70.240, excluding 18 AAC 240(g)(2) and (4) as amended through March 23, 2006, the Department may authorize a mixing zone in a permit. Determination of mixing zones requires an evaluation of critical characteristics of the receiving water, effluent

discharges, and other pertinent factors, combined with use of an approved mixing zone modeling program such as the Cornell Mixing Zone Model (CORMIX). The Department authorizes a mixing zone for the following parameters: copper, lead, mercury, and zinc with a chronic dilution factor of 15.4. The dilution factor was derived from the chronic WQBEL for lead and applicable water quality criteria, and other relevant site-specific discharge and ambient data using DEC's RPA tool, then entered into the CORMIX 12.0 modeling program to obtain mixing zone sizes.

As per 18 AAC 70.240(c)(4)(A) and (d)(8), the mixing zones will not result in an acute or chronic toxic effects in the water column, sediments, or biota outside the boundaries of the mixing zones. At and beyond the boundary of the chronic mixing zone, all chronic aquatic life WQS apply. Based on the acute WQBEL, cyanide required the most dilution with an acute dilution factor of 6.1, lead concentration determined the acute mixing zone size. Chronic WQBEL for lead required the most dilution with a chronic dilution factor of 15.4 to determine the chronic mixing zone size. Other parameters addressed in the Permit meet their respective water quality criteria well within the acute and chronic mixing zones sized for lead. CORMIX modeling incorporated both high and low flow ambient water velocities to determine the mixing zone size necessary to meet ambient flow conditions.

The acute mixing zone is a rectangular box shape extending from the ocean floor to the water surface. It has a maximum width of 162 feet centered along the 160 feet long diffuser and a length of 37.5 feet. For practical reasons, the acute mixing zone size was set at 165 feet by 40 feet. The chronic mixing zone is a rectangular box shape extending from the ocean floor to the water surface. It has a maximum length of 51 feet multiplied by two to account for ebb and flood tide resulting in a total length of 102 feet. The chronic mixing zone is centered along a 160 foot diffuser and has a total width of 162 feet. For practical reasons, the chronic mixing zone dimensions are set at 165 feet by 100 feet. These results were modeled using the multiport diffuser option in CORMIX.

To comply with 18 AAC 70.240, as amended November 13, 2022, regarding the maximum size of an acute mixing zone, that a drifting organism was not to be within an acute mixing zone for longer than 15 minutes. Based on both the 10^{th}, 0.1 meters/second (m/s), and 90^{th}, 0.28 m/s, percentile receiving water current velocity, a drifting organism passed through the acute mixing zone in less than two minutes and was consistent with *EPA's Technical Support Document for Water Quality-based Toxics Control.* As a result, the Department confirmed that there would be no lethality to organisms passing through the mixing zone.

<u>Outfall 002A</u>:

The effluent limits and effluent monitoring requirements for the outfall 002A are same as they are for the outfall 002.

Under 18 AAC 70.240, excluding 18 AAC 240(g)(2) and (4) as amended through March 23, 2006, the Department may authorize a mixing zone in a permit. Determination of mixing

zones requires an evaluation of critical characteristics of the receiving water, effluent discharges, and other pertinent factors, combined with use of an approved mixing zone modeling program such as the CORMIX. The Department authorizes a chronic mixing zone for the following parameters: copper, cyanide, lead, mercury , and zinc with a dilution factor of 15.4. The dilution factor was derived from the chronic WQBEL for lead and applicable water quality criteria, and other relevant site-specific discharge and ambient data using DEC's RPA tool, then entered into the CORMIX 12.0 modeling program to obtain mixing zone sizes.

As per 18 AAC 70.240(c)(4)(A) and (d)(8), the mixing zones will not result in an acute or chronic toxic effects in the water column, sediments, or biota outside the boundaries of the mixing zones. At and beyond the boundary of the acute mixing zone, all chronic aquatic life WQS apply. Based on the and acute WQBEL, cyanide required the most dilution with an acute dilution factor of 6.1 in determining the acute mixing zone size. Chronic WQBEL for lead required the most dilution with a chronic dilution factor of 15.4 to determine the chronic mixing zone size. Other parameters addressed in the Permit meet their respective water quality criteria well within the acute and chronic mixing zones sized for lead. CORMIX modeling incorporated both high and low flow ambient water velocities to determine the mixing zone size necessary to meet ambient flow conditions.

The acute mixing zone is a rectangular box shape extending from the ocean floor to the water surface. It has a maximum length of 30 and a width of 90 feet. The chronic mixing zone is a rectangular box shape extending from the ocean floor to the water surface. It has a maximum length of 70 feet and a total width of 90 feet.

To comply with 18 AAC 70.240, as amended November 13, 2022, regarding the maximum size of an acute mixing zone, a drifting organism was not to be within an acute mixing zone for longer than 15 minutes. Based on both the 10^{th}, 0.07 meters/second (m/s), and 90^{th}, 0.2 m/s, percentile receiving water current velocity, a drifting organism passed through the acute mixing zone in less than 2 minutes and was consistent with *EPA's Technical Support Document for Water Quality-based Toxics Control* indicating a residence time of less than 15 minutes. As a result, the Department confirmed that there would be no lethality to organisms passing through the mixing zone.

Modeling and Methodology:

Under 18 AAC 70.240, it outlines regulatory criteria that must be considered when the Department analyzes a permittee's request for a mixing zone. These criteria include the size of the mixing zone, treatment technology, designated and existing uses of the waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species. All criteria must be met to authorize a mixing zone. A summary of this analysis follows.

Ambient Data – To determine the width and length of the mixing zone under critical receiving water conditions, calculations normally use the 10^{th} percentile and 90^{th} percentile current

velocities. However, since the CORMIX model did not work properly at 10th percentile and 90th percentile current velocities, the lowest and the highest current velocities values closer to 10th percentile and 90th percentile respectively were used. For the existing outfall 002, the lowest current velocity used in the modeling was 0.1 meter per second and the highest current velocity used was 0.28 meter per second. Similarly, for the new proposed outfall 002A, the lowest current velocity used was 0.068 meter per second and the highest current velocity used was 0.206 meter per second. Water density inputs were 1018.63 kilograms per cubic meter (kg/m^3) for the surface and 1020.79 kg/m^3 for the bottom of the water column.

Effluent Data – The mixing zone plume was modeled using the maximum permitted flow limit equal to 3,200 gallons per minute and an effluent temperature of 16º C. The effluent parameter requiring the greatest dilution to meet WQS at outfall 002 is lead, with a maximum expected effluent concentration of 112.21 micrograms per liter (µg/L); therefore, lead determined the chronic mixing zone size. All other parameters needing a chronic mixing zone to meet their respective water quality criteria fit within the chronic mixing zone sized for lead. Consequently, this parameter determined the smallest practicable the mixing zone.

Discharge Data – The average depth of water at the 002 diffuser is 15 meters. The average depth of water at the 002A diffuser is 35 meters.

Size – For outfall 002, both the acute and chronic mixing zones are included in an approved mixing zone size of 165 feet wide by 100 feet length. For outfall 002A, both the acute and chronic mixing zones are included in an approved mixing zone size of 90 feet wide by 70 feet length. CORMIX model simulations based on critical receiving water and effluent conditions along with the Department's knowledge of the water body's existing uses were used to determine the appropriate size of the mixing zone.

Technology – 18 AAC 70.240(c)(1) requires the Department to determine if "an effluent or substance will be treated to remove, reduce, and disperse pollutants, using methods found by the Department to be the most effective and technologically and economically feasible, consistent with the highest statutory and regulatory treatment requirements" before authorizing a mixing zone. Applicable "highest statutory and regulatory requirements" are defined in 18 AAC 70.240(c)(A), (B), and (C) as follows:

A) Any federal TBEL identified in 40 CFR 125.3 and 40 CFR 122.29, as revised as of July1, 2005 and adopted by reference;

B) Minimum treatment standards in 18 AAC 72.050; and

C) Any treatment requirement imposed under another state law that is more stringent than the requirement of this chapter.

In accordance with 18 AAC 70.240(c)(1), the most effective technologically and economically feasible methods are used to disperse, treat, remove, and reduce pollutants. Ferric iron co-precipitation, neutralization, filtration, and secondary treatment with an SBR

are used to treat wastewater influent and produce an effluent with a much higher quality than specified by technology-based effluent limitation guidelines (ELGs) for the subcategory of mines that produce copper, lead, zinc, silver, gold, or molybdenum mines as found in 40 CFR Part 440, Subpart J (adopted by reference at 18 AAC 83.010(g)(3)). Additionally, state-of-the-art diffusers were installed in 2010 to help disperse the high quality effluent upon mixing with the receiving water.

Existing Use – Per 18 AAC 70.240(c)(2), when authorizing mixing zones, the Department must ensure that the existing uses of the waterbody outside the mixing zone are not partially nor completely eliminated, and the overall biological integrity of the waterbody as whole is not impaired. The Department has authorized a 165 feet long and 100 feet wide chronic mixing zone for outfall 002 and a 70 feet long and 90 feet wide chronic mixing zone for outfall 002A to ensure water-quality criteria beyond the boundary of the mixing zone are not exceeded. Because water quality criteria are met at the boundary of the chronic mixing zone and the criteria are established to protect the existing uses and biological integrity of the waterbody, the mixing zones are appropriately sized and protective of the existing uses of the waterbody as a whole.

Human Consumption – Per 18 AAC 70.240(c)(4)(B), the mixing zone must not create a public health hazard that would preclude existing uses of the waterbody for water supply or contact recreation. Per 18 AAC 70.240(c)(4)(C), the mixing zone must not preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. Lastly, per 18 AAC 70.240(d)(6), the pollutants discharged cannot produce objectionable color, taste, or odor in aquatic resources harvested for human consumption; nor can the discharge. The neither the mixing zones for outfalls 002 or 002A are authorized in a location where aquatic resources are harvested or that could result in precluding or limiting established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. Nor is there any indication that the pollutants discharged would produce objectionable color, taste or odor in aquatic resources harvested for human consumption if such activity occurred near the outfall. Any human consumption of marine water would require a level of treatment that would remove all constituents contained within salt water (e.g., desalination or reverse osmosis). Therefore, human consumption of the marine water is undrinkable in its natural state and the discharge authorized under the Permit is compliant with 18 AAC 70.240(c)(4)(B)–(C) and 18 AAC 70.240(d)(6).

Human Health – Per 18 AAC 70.240(d)(1), the mixing zones for outfalls 002 and 002A must not result in pollutants discharged at levels that will bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota, or at levels that otherwise will create a public health hazard through encroachment on a water supply or contact recreation uses. The Department has reviewed available data provided by the applicant and has determined there are no bioaccumulating or bioconcentrating parameters associated with the discharges. Per 18 AAC 70.250(a)(1)(A), available evidence must reasonably demonstrate that the pollutants

discharged in an authorized mixing zone will not bioaccumulate. None of the discharges are expected to contain bioaccumulative chemicals.

Per 18 AAC 70.240(d)(2) pollutants discharged must not present an unacceptable risk to human health from carcinogenic, mutagenic, teratogenic, or other effects as determined using a risk assessment method approved by the Department and consistent with 18 AAC 70.025, which indicates the lifetime incremental cancer risk level is 1 in 100,000 for exposed individuals. There are no cancer-causing pollutants being discharged at concentrations that present unacceptable risks.

Aquatic Life and Wildlife – Per 18 AAC 70.240(c)(4)(A),(D), and (E), pollutants for which the mixing zones for outfalls 002 and 002A will be authorized will not result in an acute or chronic toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone; a reduction in fish or shellfish population levels; or in permanent or irreparable displacement of indigenous organisms. In addition, the mixing zone must not result in undesirable or nuisance aquatic life per 18 AAC 70.240(d)(5). Because all criteria are met at the respective acute and chronic mixing zone boundaries, toxic effects in the water column, sediments, or biota will not occur outside these boundaries; existing water quality criteria protect from these occurrences. In addition, there are no anticipated displacement of indigenous species nor promotion of undesirable or nuisance aquatic life.

Endangered Species – Under 18 AAC 70.240(c)(4)(F), the authorized mixing zone must not cause an adverse effect on threatened or endangered species. The United States Fish and Wildlife Service (USFWS) indicated that there are no concerns regarding harm to endangered species. The Humpback Whale and Eastern Stellar Sea Lion are endangered species potentially affected by Greens Creek Mine discharges. However, EPA conducted a Biological Evaluation (BE) in 1998, which determined that negative impacts on endangered species from the permit's discharges is unlikely. Currently, there is no information to refute the findings of the BE.

7.0 ANTIBACKSLIDING

Per 18 AAC 83.480(a), "Except as provided in (b) of this section, when a permit is renewed or reissued, interim effluent limitations, standards or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit, unless the circumstances on which the previous permit was based have materially and substantially changed since the permit was issued, and the change in circumstances would constitute cause for permit modification or revocation and reissuance under 18 AAC 83.135."

Effluent limitations may be relaxed as allowed under 18 AAC 83.480(b), CWA § 402(o) and CWA § 303(d)(4). CWA § 402(o)(2)(B)(i) and 18 AAC 83.480(b)(2) allow less stringent effluent limitations in renewed, reissued, or modified permits if information other than revised regulations, guidance, or test methods that would have justified the application of a less stringent effluent limitation is now available

but was not available at the time of permit issuance. Since the last permit was reissued, the discharger has collected new information to characterize the effluent, and DEC has used that new information to determine that effluent's reasonable potential to cause or contribute to WQS exceedances and thereby calculate permit limits.

Applying CWA § 402(o)(2)(B)(i) and 18 AAC 83.480(b)(2), outfalls 002 and outfall 002A effluent limitations are at least as stringent or more stringent than the effluent limitations of the previous permit. These new effluent limitations are based on the collection and statistical analysis of the effluent data collected during the previous permit cycle. The addition of outfall 002A increases the total authorized flow of treated effluent from 4.6 mgd to 6.3 mgd for daily maximum and from 3.7 mgd to 4.1 mgd for monthly average. However, the mass balance of the metal pollutants discharged is decreased due to the greater proportional reduction of the effluent limits for all metal parameters. The previous permit noted the intent to reduced WAD cyanide monitoring to monthly monitoring if WAD cyanide concentrations remained below the detection level of 5 ug/L for consecutive 16 weeks, which was met. Accordingly, monitoring of WAD cyanide was reduced to monthly sampling.

CWA §303(d)(4)(A) states that, for waterbodies where the water quality does not meet applicable WQS, effluent limitations may be revised under two conditions: the revised effluent limitation must ensure the attainment of the WQS (based on the waterbody TMDL or the waste load allocation), or the designated use which is not being attained must be removed in accordance with WQS regulations. Since Hawk Inlet in the discharge area is not impaired and does not have a TMDL, evaluation under this provision is not required.

CWA § 303(d)(4)(B) states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, permitting standards like WQBELs may be revised if the revision is consistent with the State's Antidegradation Policy. This provision allows DEC to establish less stringent WQBELs in a permit for discharge so long as the revised permit limit is consistent with the State's Antidegradation Policy and continues to assure compliance with applicable water quality standards. Permitting authorities may use this provision to issue permits reflecting new data.

Even if the requirements of CWA § 303(d)(4) or 18 AAC 83.480(b) are satisfied, 18 AAC 83.480(c) and CWA § 402(o)(3) prohibit relaxed limits that would result in violations of WQS or ELGs. Here, the receiving water meets WQS supporting existing and designated uses and ELGs are required by the permit, and so 18 AAC 83.480(c) and CWA § 402(o)(3) are met. While effluent limits are not relaxed for this permit; however, permitting authorities may use this provision to issue permits reflecting new data.

Since the previous permit was reissued, new information has been collected to characterize the effluent from the facility. DEC's analysis of its effluent water quality data resulted in changes to effluent limits. The reasonable potential analysis demonstrated that some parameters required more stringent limits to ensure compliance with WQS and ELGs. Limits that are more stringent in this permit, in comparison to the previous permit, include: the daily maximum and monthly average limit for cadmium, copper,

cyanide, lead, mercury, and zinc. The daily maximum and monthly average limit for TSS, and pH are unchanged. Flow limit is increased primarily due to the proposed construction of an additional outfall 002A (See Table 2 in the APDES permit AK0043206). In other words, DEC tailored effluent limits in the renewed permit according to new information that was not available at the time of original permit issuance. The new effluent limits will not result in a violation of WQS, and, as set forth below, do not violate the State's Antidegradation Policy. As such, the new effluent limits comply with the antibacksliding exception in 18 AAC 83.480(b)(2) and CWA § 402(o)(2)(B)(i), as well as the overarching WQS and antidegradation requirements in 18 AAC 83.480(c) and CWA § 303(d)(4)(B).

8.0 ANTIDEGRADATION

Section 303(d)(4)(B) of the CWA states that, for waterbodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised if the revision is consistent with the State's Antidegradation policy. The State's Antidegradation policy is found in the 18 AAC 70 WQS regulations at 18 AAC 70.015. The Department's approach to implementing the Antidegradation policy is found in 18 AAC 70.016, Antidegradation implementation methods for discharges authorized under the federal Clean Water Act. Both the Antidegradation policy and the implementation methods are consistent with 40 CFR 131.12 and approved by EPA. This section analyzes and provides rationale for the Department's decisions in the permit issuance with respect to the Antidegradation policy and implementation methods.

Using the policy and corresponding implementation methods, the Department determines a tier protection level, whereby a higher numbered tier indicates a greater level of water quality protection. Tier 1 and Tier 2 classifications protect on a parameter-by-parameter basis. A Tier 3 protection level applies to a designated water. At this time, no Tier 3 waters have been designated in Alaska.

In general, 18 AAC 70.015(a)(1) states that existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. This Tier 1 protection level applies to Hawk Inlet.

18 AAC 70.015(a)(2) states that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality must be maintained and protected, unless the Department authorizes a reduction in water quality. Hawk Inlet is not listed as impaired (Category 4 or 5) in Alaska's 2020 Integrated Water Quality Monitoring and Assessment Report. The Tier 2 protection level applies to Hawk Inlet.

As a result, both Tier 1 and Tier 2 protection levels apply to Hawk Inlet. The Department may allow a reduction of water quality only after the specific analysis and requirements under 18 AAC 70.016(b)(5)(A)–(C) and 18 AAC 70.016(c)(7)(A)–(F) are met. The Department's findings under these provisions are as follows:

Tier 1 Analysis: 18 AAC 70.016(b)(5) *the department will not authorize a discharge to a Tier 1 water unless the department finds that*

(A) *existing uses and the water quality necessary for protection of existing uses have been identified based on available evidence, including water quality and use related data, information submitted by the applicant, and water quality and use related data and information received during public comment;*

(B) *existing uses will be maintained and protected; and*

(C) *the discharge will not cause water quality to be lowered further where the department finds that the parameter already exceeds applicable criteria in 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b).*

The water quality criteria on which the permit effluent limits are based serve the specific purpose of protecting the existing and designated uses of the receiving water. Per 18 AAC 70.020 and 18 AAC 70.050, all waters are protected for all uses; therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the DEC Toxics manual apply and were evaluated here. This ensures protection of water quality necessary to fully maintain designated and existing uses of the receiving waterbody. As such, existing uses and the water quality necessary for protecting them have been identified in accordance with 18 AAC 70.016(b)(5)(A), because existing uses for Hawk Inlet include all uses.

The permit places limits and conditions on the discharge of pollutants. The Department established the effluent limits after comparing TBELs and WQBELs and applying the more restrictive of these limits. Water quality criteria serve the specific purpose of protecting the existing and designated uses of the receiving water. WQBELs are set equal to the most stringent water quality criteria available for any of the protected water use classes. In accordance with 18 AAC 70.016(b)(5)(B), the new permit ensures that existing uses (i.e. all uses) outside the mixing zone for Hawk Inlet will be maintained and protected because the permit includes numeric effluent limits or continued monitoring, addressing each pollutant of concern.

No parameter for a contaminant of concern in Hawk Inlet exceeds applicable criteria in 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b). As such, 18 AAC 70.016(b)(5)(C) does not apply.

The Department concludes the terms and conditions of the permit will be adequate to fully protect and maintain the designated and existing uses of the water and that the findings under 18 AAC 70.016(b)(5) are met to authorize a discharge based on a Tier 1 analysis. As explained above, the Department will continue to a Tier 2 analysis because under 18 AAC 70.016(c)(1), Tier 2 is presumed for all water as the default protection level for all parameters unless an exception applies, and here no exception applies.

Tier 2 Analysis: 18 AAC 70.016(c)(7) *[I]f, after review of available evidence, the department finds that the proposed discharge will lower water quality in the receiving water, the department will not authorize a discharge unless the department finds that [the conditions of 18 AAC 70.016(c)(7)(A)–(F) are met].*

Here, the proposed discharge from the facility may lower water quality in Hawk Inlet. Therefore, the Department cannot authorize a discharge unless it makes the following findings. Its analysis of 18 AAC 70.016(c)(7)(A)–(F) follows.

> ***18 AAC 70.016(c)(7)(A)*** *[The department will not authorize a discharge unless it finds that] the reduction of water quality meets the applicable criteria of 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b), unless allowed under 18 AAC 70.200, 18 AAC 70.210, or 18 AAC 70.240[.]*

The permit requires that the discharge shall not cause or contribute to a violation of WQS, except if excursions are authorized within the permit in accordance with provisions in 18 AAC 70.200 – 70.240 (i.e., mixing zone, variance, etc.). WQBELs are set equal to the most stringent water quality criteria available under 18 AAC 70.020(b) for all of the protected water use classes. Because of the nature of the permitted discharges, other pollutants are not expected to be present in the discharges at levels that would cause, have the reasonable potential to cause, or contribute to an exceedance of any WQS. Basing the permit effluent limits on WQS serves to protect existing and designated uses.

As a result of the reasonable potential analysis summarized in APPENDIX 2 of the Fact Sheet, copper, cyanide, lead, mercury, and zinc have reasonable potential to exceed water quality criteria. The mixing zones authorized in the wastewater discharge permit, according to 18 AAC 70.240, utilize the available assimilative capacity in the receiving water. Reduction of water quality within the mixing zones is specifically authorized according to 18 AAC 70.240 and as allowed in 18 AAC 70.015(a)(2).

More information about the authorized mixing zone can be found in Part 6.3 of the Fact Sheet. The resulting effluent end-of-pipe limits and monitoring requirements in the permit, listed in Table 2 of the Fact Sheet, result from applying water quality criteria using conservative statistical methods and assumptions to ensure that water quality criteria found at 18 AAC 70.020 will not be exceeded beyond the boundary of the authorized chronic mixing zone. A smaller acute mixing zone has been authorized in the permit, consistent with 18 AAC 70.240(d)(7), to ensure no lethality to passing organisms occurs.

The permit authorizes a chronic mixing zone for outfall 002 sized for cadmium, copper, cyanide, lead, mercury, zinc, and pH with a dilution factor of 13.3 and a rectangular shape, having a length of 165 feet centered on the diffuser and a width of 100 feet and extending from the marine bottom to the surface. The permit also authorizes a chronic mixing zone for outfall 002A sized for cadmium, copper, cyanide, lead, mercury, zinc, and pH with a dilution factor of 13.3 and a rectangular shape, having a length of 70 feet centered on the diffuser and a width of 90 feet and extending from the marine bottom to the surface. WQS will be met at and beyond the boundary of the authorized chronic mixing zones.

Previous permit data determined that WET limits were not needed, and there was no reason to believe that the characteristics of the discharge would change over the term of the next permit; therefore, monitoring for WET was removed since the previous permit. Since the DEC determined that aquatic life will be adequately protected, the applicable criteria of 18 AAC 70.030 are met.

Friends of Admiralty released a report titled, "*Evaluation of Stable Isotope Ratios and Lead Concentrations in Clam Shells Over Time in Hawk Inlet*", that compared lead and isotope concentrations

in clam shells taken from Hawk inlet and Young Bay. The report attributes lead concentrations in the butter clams have increased over time due to global increases in lead and more recent lead increases from fugitive dust from the Greens Creek Mine. The report evaluated if discharge authorized under this permit was a contributing factor to lead concentrations in the clam shells and concluded that the discharge from outfall 002 was not a contributing factor.

Site-specific criteria as allowed by 18 AAC 70.235 have not been established for Hawk Inlet, as would be listed in 18 AAC 70.236(b), and are therefore not applicable. The permit does not authorize short term variances or zones of deposit under 18 AAC 70.200 or 18 AAC 70.210; therefore, these provisions do not apply.

The Department concludes that the reduction of water quality meets applicable criteria of both 18 AAC 70.020(b) and 18 AAC 70.030 and is allowable under 18 AAC 70.240. Thus, the finding required under 18 AAC 70.016(c)(7)(A) is met.

18 AAC 70.016(c)(7)(B) *[The department will not authorize a discharge unless it finds that] each requirement under (b)(5) of this section for a discharge to a Tier 1 water is met[.]*

See 18 AAC 70.016(b)(5) analysis and findings above.

18 AAC 70.016(c)(7)(C) *[The department will not authorize a discharge unless it finds that] point source and state-regulated nonpoint source discharges to the receiving water will meet requirements under 18 AAC 70.015(a)(2)(D); to make this finding the department will*

(i) identify point sources and state-regulated nonpoint sources that discharge to, or otherwise impact, the receiving water;

(ii) consider whether there are outstanding noncompliance issues with point source permits or required state-regulated nonpoint source best management practices, consider whether receiving water quality has improved or degraded over time, and, if necessary and appropriate, take actions that will achieve the requirements of 18 AAC 70.015(a)(2)(D); and

(iii) coordinate with other state or federal agencies as necessary to comply with (i) and (ii) of this subparagraph[.]

The requirements under 18 AAC 70.015(a)(2)(D) state:

(D) all wastes and other substances discharged will be treated and controlled to achieve

(i) for new and existing point sources, the highest statutory and regulatory requirements; and

(ii) for nonpoint sources, all cost-effective and reasonable best management practices[.]

Here, 18 AAC 70.015(a)(2)(D)(i) applies because the discharge is a point source. As such, the highest statutory and regulatory requirements for this point source are defined at 18 AAC 70.015(d):

> *(d) For purposes of (a) of this section, the highest statutory and regulatory requirements are*
>
> *(1) any federal technology-based effluent limitation identified in 40 C.F.R. 122.29 and 125.3, revised as of July 1, 2017 and adopted by reference;*
>
> *(2) any minimum treatment standards identified in 18 AAC 72.050;*
>
> *(3) any treatment requirements imposed under another state law that is more stringent than a requirement of this chapter; and*
>
> *(4) any water quality-based effluent limitations established in accordance with 33 U.S.C. 1311(b)(1)(C) (Clean Water Act, sec. 301(b)(1)(C)).*

The first part of the definition includes all applicable TBELs including 40 CFR § 440.104 – New source performance standards – Ore mining and dressing point source category, Subpart J – Copper, lead, zinc, gold, silver and molybdenum ores subcategory, adopted by reference at 18 AAC 83.010(g). The TBELs set standards of performance for existing and new sources and are incorporated in the permit.

The second part of the definition references the minimum treatment standards for domestic wastewater discharges found at 18 AAC 72.050. Since the discharge does not include domestic wastewater, this aspect is irrelevant.

The third part of the definition refers to treatment requirements imposed under another state law that are more stringent than 18 AAC 70. Other regulations beyond 18 AAC 70 that apply to this permitting action include 18 AAC 15 and 18 AAC 72. Neither 18 AAC 15 nor 18 AAC 72, nor any other state law that the Department is aware of, impose more stringent requirements than those found in 18 AAC 70.

The fourth part of the definition refers to WQBELs, which are designed to ensure that the WQS of a waterbody are protected and may be more stringent than TBELs. Section 301(b)(1)(C) of the CWA requires the development of limits in permits necessary to meet WQS by July 1, 1977. WQBELs included in APDES permits are derived from EPA-approved WQS. APDES regulation 18 AAC 83.435(a)(1) requires that permits include WQBELs that can achieve water quality standards established under CWA § 303, including state narrative criteria for water quality. The permit requires compliance with the WQS by imposing WQBELs for cadmium, copper, cyanide, lead, mercury, and zinc, and monitoring for other constituents of concern.

In summary, the highest statutory and regulatory requirements that apply to this point source are TBELs and WQBELs. The Department incorporates and requires compliance with both, as relevant to create standards of performance. After review of the methods of treatment and control and the applicable statutory and regulatory requirements, including 18 AAC 70, 18 AAC 72, and 18 AAC 83, the Department finds that the discharge authorized under this general permit meets the highest applicable

statutory and regulatory requirements in applicable TBELs and WQBELs. Therefore, the 18 AAC 70.016(c)(7)(C) finding is met.

> ***18 AAC 70.016(c)(7)(D)*** *[The department will not authorize a discharge unless it finds that] the alternatives analysis provided under (4)(C)–(F) of this subsection demonstrates that*
>
> *(i) a lowering of water quality under 18 AAC 70.015(a)(2)(A) is necessary; when one or more practicable alternatives that would prevent or lessen the degradation associated with the proposed discharge are identified, the department will select one of the alternatives for implementation; and*
> *(ii) the methods of pollution prevention, control, and treatment applied to all waste and other substances to be discharged are found by the department to be the most effective and practicable[.]*

The Department finds that a lowering of water quality under 18 AAC 70.015(a)(2)(A) is necessary because the current permitted method of treating discharge is the only practical method in the current state of the project, per the analysis under 18 AAC 70.016(c)(7)(D). The Department considered the most effective and practicable methods of prevention, control, and treatment, which in this case are the practices and requirements set out in the permit that will be applied to all wastes and other substances to be discharged. These findings, discussed further here, satisfy 18 AAC 70.016(c)(7)(D)(i) and (ii).

Water from the underground mine and process water from the mill is treated in the wastewater treatment plants (WWTP) at the 920 Area and pumped to Tank 7 prior to discharge through outfall 002 and 002A or pumped to Pond7/Pond 10 and then to the Tailings Storage Facility (TSF) WWTP for treatment prior to discharge. This design allows water to be discharged via outfalls without the redundant treatment at the TSF WWTP. The design, construction, and operations of the treatment systems has been reviewed and approved by the Department.

Seepage and runoff from waste rock storage areas 23 and 1350, D and E, Pond C, and Pond D are collected and routed either back to mill for use in mill processed or pumped to the TSF WWTP for treatment prior to discharge. Runoff from B-road and dry tailings disposal facility seepage is collected in Pond 7/Pond 10 then treated at TSF WWTP prior to discharge. The design, construction, and operations of the treatment systems has been reviewed and approved by the Department.

The intercepted groundwater including beneath Pond 7, Pond 10, the TSF, Site 1350, Site 23, the mill backslope, and Hawk Inlet terminal are treated in either the 920 WWTPs or the TSF WWTP prior to discharge. The design, construction, and operations of the treatment systems has been reviewed and approved by the Department.

Sanitary wastes from the mine and mill area (920 Area) and Hawk Inlet terminal area are treated to secondary standards and disinfected in a sequencing batch reactor (SBR) package plant. Treated sanitary wastewater from the Hawk Inlet terminal area will be pumped to the TSF WWTP for additional treatment prior to discharge via Tank 7 or pumped to Pond7/Pond 10 and then to TST WWTP prior to

discharge. The design, construction, and operations of the treatment systems has been reviewed and approved by the Department.

The Department concludes that the lowering of water quality is necessary under 18 AAC 70.015(a)(2)(A) and determines that the methods of pollution prevention, control, and treatment applied to all waste and other substances to be discharged are the most effective and practicable methods. Therefore, the 18 AAC 70.016(c)(7)(D) finding is met.

> ***18 AAC 70.016(c)(7)(E)*** *[The department will not authorize a discharge unless it finds that] except if not required under (4)(F) of this subsection, the social or economic importance analysis provided under (4)(G) and (5) of this subsection demonstrates that a lowering of water quality accommodates important social or economic development under 18 AAC 70.015(a)(2)(A)[.]*

The permit applicant provided the Department with economic information to demonstrate that a lowering of water quality accommodates important economic development where the receiving water is located, per 18 AAC 70.016(c)(4)(G) and (5)(B).

Based on a 2017 economic impact report by the McDowell Group, Greens Creek Mine employs an average of 414 workers with total annual wages of $50.9 million. Juneau residents comprised 47 percent of employees and earned $24 million in wages. Overall, Alaska residents comprised 66 percent of the workforce and earned $34 million in wages. Greens Creek employees earned average annual wages of $122,800 which is more than double the Juneau average of $51,700. Mine is Juneau's largest private sector employer in terms of annual average, full time employment, and total annual wages. Goods and services spending totaled $75 million statewide with businesses located in Juneau. Mine property and sales tax generated $2.4 million in payment to the City and Borough of Juneau. Additionally, Greens Creek Mine pays about $1.1 million per year to the State of Alaska, predominantly for the Mining License Tax. Mine contributes to Alaska charities and non-profit organizations. Moreover, interruptible power purchase from Alaska Electric Light & Power company helps keep electricity rates low for all Juneau customers. Communities near Juneau also potentially benefit from mine operation in the form of employment, skilled labor education, and training. Moreover, this project offers benefits to the State of Alaska in the form of statewide employment and contracting, as well as revenue generated from mineral royalty and taxes.

The effluent limits in the permit will meet WQS, provide for water quality adequate to protect designated and existing uses, and treat and control discharges by the most effective and reasonable means and to the highest statutory and regulatory requirements. Allowing the discharge is economically important for the City & Borough of Juneau and the State of Alaska.

> ***18 AAC 70.016(c)(7)(F)*** *[The department will not authorize a discharge unless it finds that] 18 AAC 70.015 and this section have been applied consistent with 33 U.S.C. 1326 (Clean Water Act, sec. 316) with regard to potential thermal discharge impairments.*

Discharges authorized under the permit are not associated with a potential thermal discharge impairment: therefore, further analysis here is not applicable.

9.0 ELECTRONIC DISCHARGE MONITORING REPORTS

E-Reporting Rule - Phase I. The permittee must submit a DMR for each month by the 28th day of the following month. DMRs shall be submitted electronically through NetDMR per Phase I of the E Reporting Rule (40 CFR 127). For access to the NetDMR Portal, go to https://cdxnodengn.epa.gov/oeca-netdmr-web/action/ login. DMRs submitted in compliance with the E-Reporting Rule are not required to be submitted as described in APPENDIX 1 - Standard Conditions unless requested or approved by the Department. Any DMR data required by the Permit that cannot be reported in a NetDMR field (e.g., full WET Reports, mixing zone receiving water data, etc.…), shall be included as an attachment to the NetDMR submittal. DEC has established an e-Reporting Information website at http://dec.alaska.gov/water/compliance/electronic-reporting-rule/ which contains general information about this new reporting format.

E-Reporting Rule - Phase II (Other Reports). Phase II of the E-Reporting rule will integrate electronic reporting for all other reports required by the Permit (e.g., Annual Reports and Certifications) and implementation is expected to begin during the permit cycle. Permittees should monitor DEC's E-Reporting website at http://dec.alaska.gov/water/compliance/electronic-reporting-rule/ for updates on Phase II of the E-Reporting Rule and will be notified when they must begin submitting all other reports electronically. Until such time, other reports required by the Permit may be submitted in accordance with APPENDIX 1 Standard Conditions..

10.0 OTHER PERMIT CONDITIONS

10.1 Standard Permit Provisions

Permit APPENDIX 1 of the Permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on the regulations and cannot be challenged in the context of an individual APDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, signatory authority, and other general requirements.

10.2 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to develop and implement procedures in a QAPP that documents standard operating procedures the permittee must follow for collecting (e.g., sample collection), handling, storing, and shipping samples; laboratory analysis (e.g., most sensitive methods); and data reporting. If a QAPP has already been developed and implemented, the permittee must review and revise the existing QAPP to ensure it includes the necessary content. The permittee must submit a letter to the Department prior to discharging or within 120 days of the effective date of the Permit

certifying that the QAPP has been revised and implemented. The QAPP shall be retained onsite and made available to the Department upon request.

10.3 Best Management Practices Plan

Under AS 46.03.110 (d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. This permit requires the Permittee to develop a Best Management Practices (BMP) Plan to prevent or minimize the potential for the release of pollutants to waters and lands of the United States through plant-site runoff, spillage or leaks, or erosion. The permit contains conditions that must be included in the BMP Plan. The permit requires the Permittee to develop or update and implement a BMP Plan within 60 days of the effective date of the final permit. The BMP Plan must be kept on site and made available to the Department upon request.

Under 18 AAC 83.475, it authorizes the Department to require Best Management Practices (BMPs) in APDES permits. BMPs are measures that are intended to prevent or minimize the generation and the potential for release of pollutants from industrial facilities to waters of the U.S. These measures are important tools for waste minimization and pollution prevention. HGCMC's 2015 permit required preparation of a BMP Plan. This permit contains general BMP Plan requirements, similar to what is required for most major industrial facilities in Alaska. The permit requires that the BMP Plan be updated as discussed below.

Where BMPs are used in lieu of numeric effluent limits for storm water discharges, the BMPs must demonstrate adequate water quality protection. It is not apparent from the past storm water monitoring that the BMPs currently utilized by HGCMC are protecting the receiving water quality. See Table 13 (Summary of Storm Water Monitoring Data) in APPENDIX 2 , which shows that the storm water discharges have exceeded WQS. Therefore, the permit includes a requirement that HGCMC develop BMPs for each storm water outfall to protect the receiving water quality. The permit includes BMP Plan requirements that are based on the storm water pollution prevention plan (SWPPP) requirements for metal mining facilities (Sector G) in DEC's APDES Storm Water Multi-Sector General Permit (AKR060000). The monitoring required in this permit (Section 5.3), along with periodic inspections, are required to evaluate the effectiveness of BMPs and to provide sufficient information to determine if the storm water discharges cause or contribute to degradation of water quality.

The permit requires that the BMP Plan be maintained and that any modifications to the facility are made with consideration to the effect the modification could have on the generation or potential release of pollutants. The BMP Plan must be revised if the facility is modified or as new pollution prevention practices are developed.

11.0 OTHER LEGAL REQUIREMENTS

11.1 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) if their actions could beneficially or adversely affect any threatened or endangered species.

As a state agency, DEC is not required to consult with these federal agencies regarding permitting actions; however, DEC voluntarily contacted the agencies to notify them of the issuance of this permit and to obtain listings of threatened and endangered species near the discharge. The following responses and information are from USFWS and the NOAA NMFS ESA/Marine Mammal Protection Act (MMPA) species map at the IPaC Information for Planning and Consultation website:

- DEC reviewed the USFWS IPaC website at https://ecos.fws.gov/ipac/. The website indicated that the Short-Tailed albatross (Phoebastria (=diomedea) albatrus) is found in the project area.
- DEC reviewed the NOAA NMFS MMPA species map https://www.fisheries.noaa.gov/resource/data/alaska-endangered-species-and-critical-habitat-mapper-web-application which indicated that the Fin Whale (Balaenoptera physalus) is found in the project area.

The antidegradation analysis, found in Section 70, determined that the existing water uses and the level of water quality necessary to protect existing uses will be maintained and protected. In addition, the mixing zone analysis found in section 6.3, the Department confirmed that there will be no lethality to organisms passing through the mixing zone..

11.2 Essential Fish Habitat

Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish from commercially fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when a discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. As a state agency, DEC is not required to consult with federal agencies regarding permitting action; however, DEC consulted with NOAA's EFH online mapper and found the project zone was EFH for Chinook, Chum, Pink, Sockeye, and Coho Salmon but no Habitat Areas of Particular Concern for Hawk Inlet. The Alaska Department of Fish and Game's Fish Passage website at http://www.adfg.alaska.gov/index.cfm?adfg=fishpassage.database revealed that Hawk Inlet is an EFH.

Dr. James Balsiger of the National Marine Fisheries Services provided a scoping comment letter dated November 24, 2022, on the HGCMC North Extension Project Supplemental Environmental Impact Statement (SEIS) which identified Hawk Inlet as EFH for twelve federally-managed Gulf of Alaska fish, including Pacific cod, Walleye pollock, Sablefish, Pacific ocean perch, Yellowfin sole, Northern rock sole, Southern rock sole, Alaska plaice, Dover sole, Flathead sole, Rex sole, and Arrowtooth flounder.

12.0 Permit Expiration

The permit will expire five years from the effective date of the permit.

13.0 References

Alaska Department of Environmental Conservation, 2003. Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances, as amended through December 12, 2008.

Alaska Department of Environmental Conservation, 2020. Alaska's Final 2020 Integrated Water Quality Monitoring and Assessment Report, May 17, 2020.

Alaska Department of Environmental Conservation, 2020 Water Quality Standards, Amended March 5, 2020.

Alaska Department of Fish and Game, 2021. Fish Passage Website, http://www.adfg.alaska.gov/index.cfm?adfg=fishpassage.database

HDR Consulting, 2019. Final Environmental Audit of the Greens Creek Mine. January 2019.

HGCMC, 2017. Hawk Inlet Monitoring Program 2011 Annual Report. March 2018

HGCMC, 2020. Hawk Inlet Monitoring Program 2011 Annual Report. March 2021

NMFS, Office of Habitat Conservation, 2013. Essential Fish Habitat Mapper v3.0. Retrieved from http://www.habitat.noaa.gov/protection/efh/habitatmapper.html.

NOAA, Bathymetric Data Viewer at https://www.ncei.noaa.gov/maps/bathymetry/

SRK Consulting, 2009. Environmental Audit of the Greens Creek Mine. March 2009.

U.S. Environmental Protection Agency. 1991. Technical Support Document for Water Quality-based Toxics Control. Office of Water Enforcement and Permits, Office of Water Regulations and Standards. Washington DC, March 191. EPA/505/2-90-001.

U.S. Fish and Wildlife Service IPaC website, 2021. https://ecos.fws.gov/ipac/.

Figure 1: Facility Map

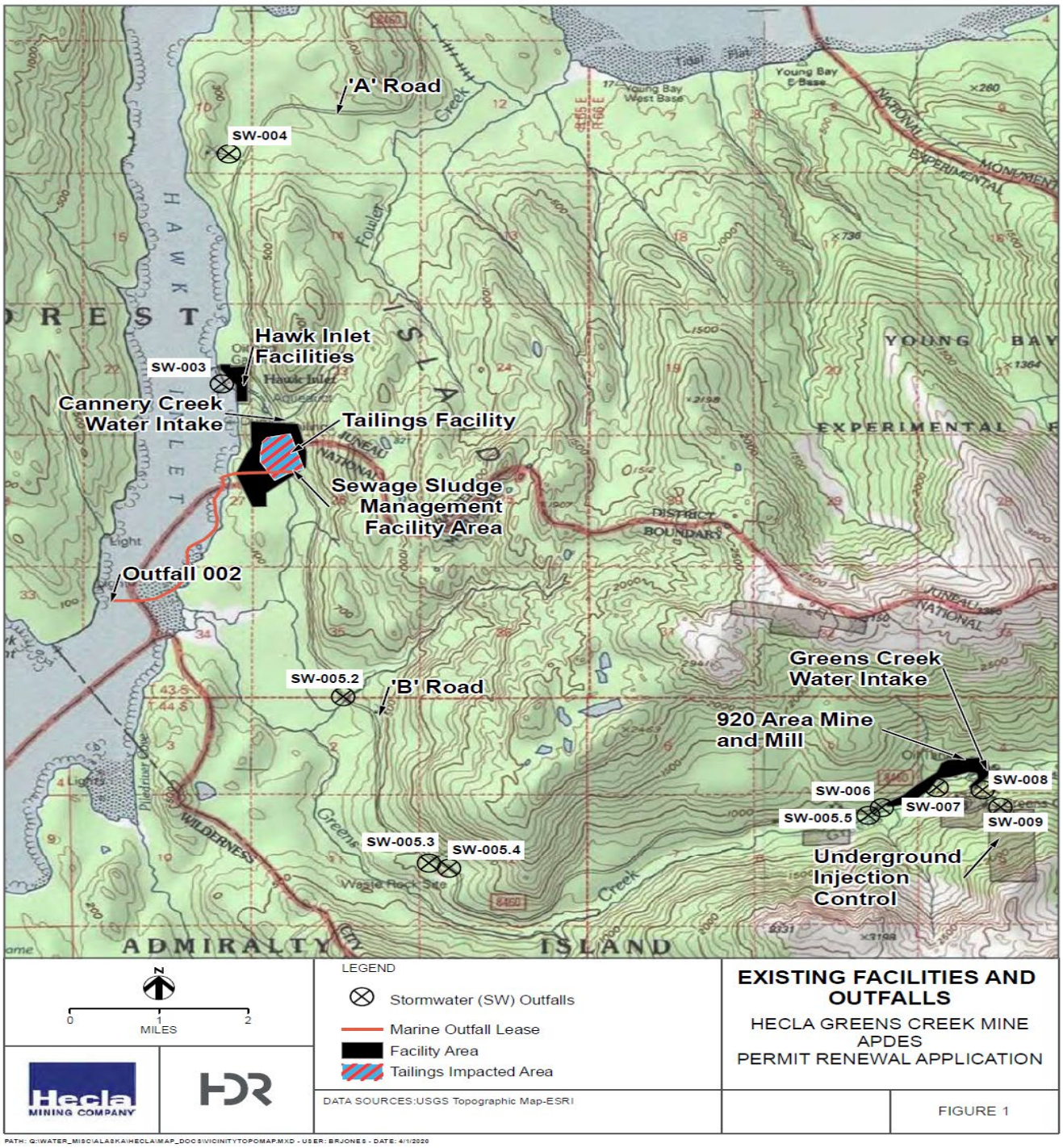


Figure 2: Hawk Inlet Monitoring Sites

Figure 3: Mixing Zone for Outfall 002

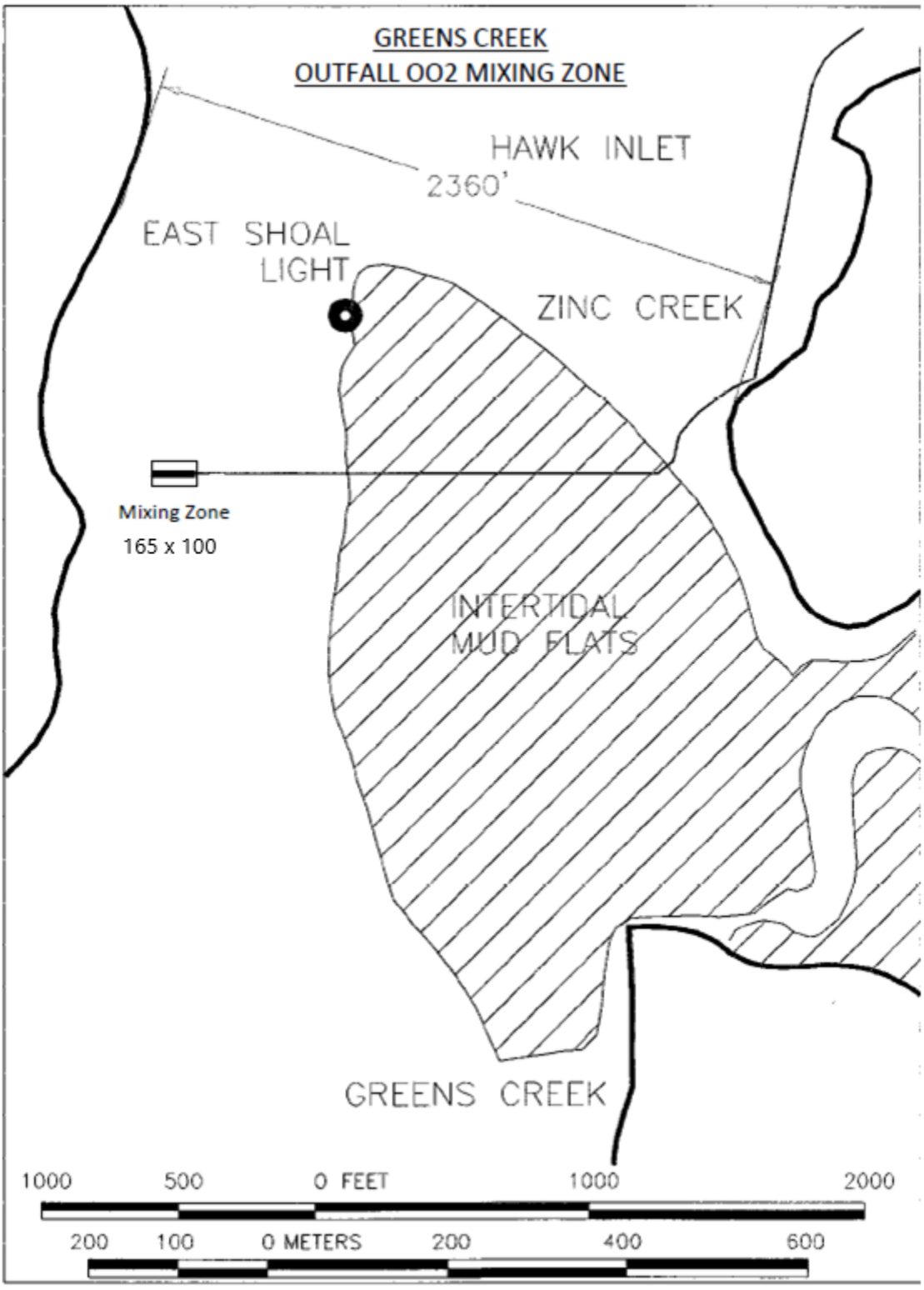
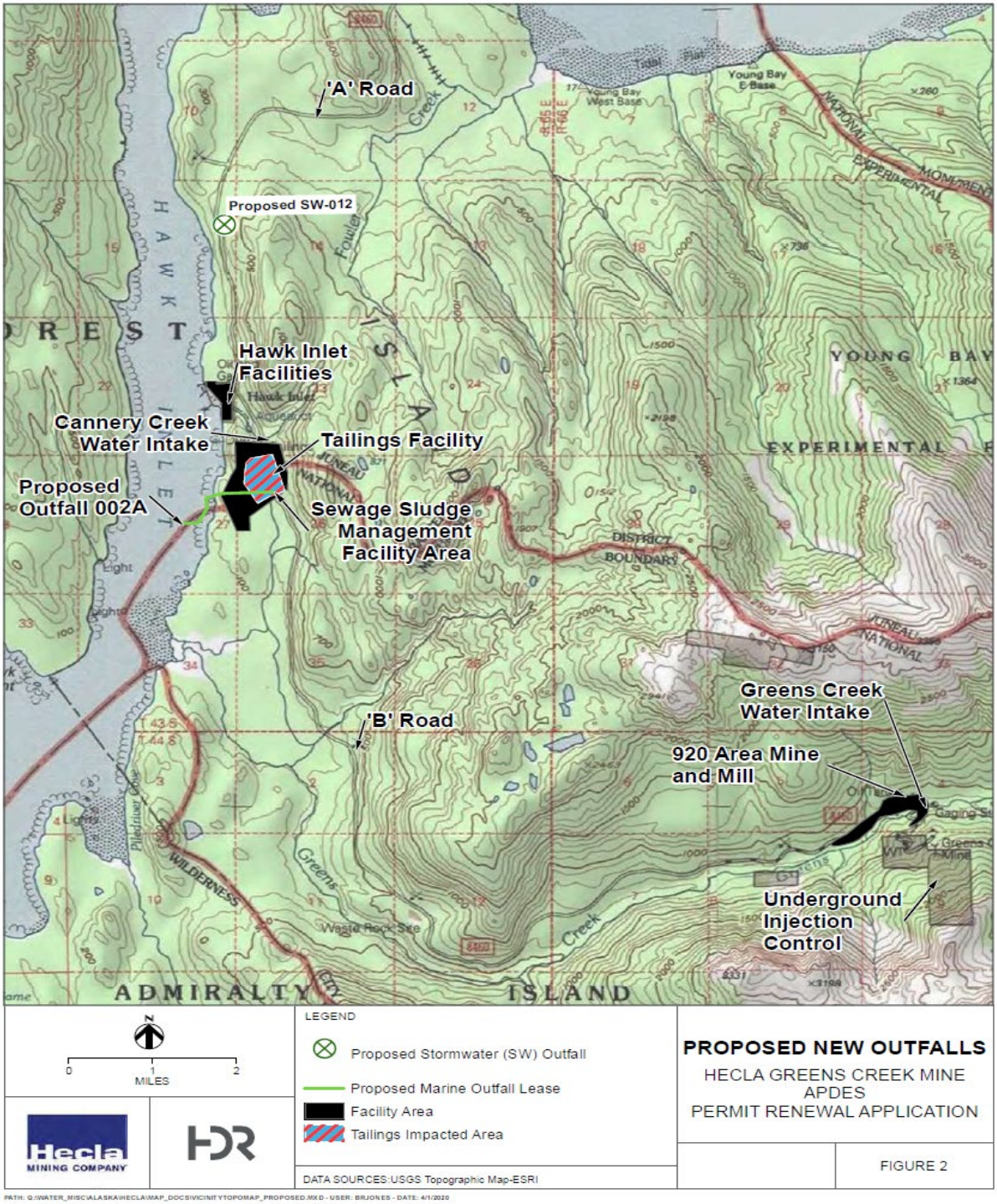


Figure 4: Outfall 002a



APPENDIX 1 FACILITY INFORMATION

Facility Name and Location		
Name:	Hecla Greens Creek Mine	
APDES ID Number:	AK0043206	
Location:	18 miles southwest of Juneau on Admiralty Island	
Mailing Address:	P.O. Box 32199 Juneau, AK 99803	
Facility Background:	The facility's previous permit was effective October 1, 2015. The current permit application was received April 8, 2020.	
Non-Domestic System Information		
Treatment Train:	Degrit basins, settling pond, chemical precipitation, and pressure filtration	
Design Flow:	6.33 million gallons per day	
Existing Flow:	4.6 million gallons per day	
Months when Discharge Occurs:	Year round	
Outfall 002 Location:	Latitude: 58° 06' 06" North	Longitude: 134° 46' 30" West
Outfall 002A Location:	Latitude: 58° 07' 23" North	Longitude: 134° 45' 35" West
Receiving Waterbody Information		
Receiving Waterbody:	Hawk Inlet	

APPENDIX 2: BASIS FOR EFFLUENT LIMITS

This section discusses the basis for and the development of effluent limits in the permit. This section includes: an overall discussion of the statutory and regulatory basis for development of effluent limitations (Section I); discussions of the development of technology-based effluent limits (Section II) and water quality-based effluent limits (Section III); and a summary of the effluent limits developed for this permit (Section IV).

I. Statutory and Regulatory Basis for Limits

Sections 101, 301(b), 304, 308, 401, 402, and 405 of the Clean Water Act (CWA) provide the basis for the effluent limitations and other conditions in the permit. The Department evaluates the discharges with respect to these sections of the CWA and the relevant Alaska Pollutant Discharge Elimination System (APDES) regulations to determine which conditions to include in the permit.

In general, the Department first determines if any federally-promulgated technology-based effluent limits have been developed that must be considered as the base or floor for permit limits. The Department then evaluates the effluent quality expected to result from these controls to see if the discharge could result in any exceedances of the water quality standards (WQS) in the receiving water. If reasonable potential exists that exceedances could occur, the Department must include water quality-based effluent limits in the permit. The permit limits reflect whichever requirements (technology-based or water quality-based) are more stringent. For outfalls 002 and 002A, a mixing zone was requested. In authorizing a mixing zone for outfalls 002 and 002A, the Department considered "the characteristics of the effluent, including volume, flow rate, dispersion, and quality after treatment," as required by 18 AAC 70.240(b)(2). Water quality-based and technology-based analyses were performed to determine the most stringent limits. In conducting the water quality-based analysis, the tailings storage facility's wastewater treatment plant performance in conjunction with CORMIX modeling were used to determine dilution necessary and available to meet all WQS at and beyond the mixing zone's boundary.

II. Outfalls 002 and 002A- Technology-Based Evaluation

Section 301(b) of the CWA requires industrial dischargers to meet technology-based effluent limitation guidelines (ELGs) established by EPA. ELGs are enforceable through their incorporation into an APDES permit. For dischargers in industrial categories for which EPA has not yet issued an ELG, and for types of discharges not covered by an applicable ELG, best professional judgment is used to establish technology-based effluent limits. The 1972 amendments to the CWA established a two-step approach for imposing technology-based controls. In the first phase, industrial dischargers were required to meet a level of pollutant control based on the best practicable control technology currently available (BPT). The second level of pollutant control was based on the best available technology economically achievable (BAT). In 1977, enactment of Section 301(b)(2)(E) of the CWA allowed the application of best conventional pollutant control technology (BCT) to supplement BPT standards for conventional pollutants with cost effectiveness constraints on incremental technology requirements that exceed BPT. The BPT/BAT/BCT system of standards does not apply to a new source, which is defined by EPA as a source, the construction of which is commenced after the publication of proposed regulations

prescribing a standard of performance, which will be applicable to the source. Direct dischargers that are new sources must meet New Source Performance Standards (NSPS), which are based on the best available demonstrated control technology.

At 40 CFR Part 440, EPA has established ELGs for the Ore Mining and Dressing Point Source Category. Subpart J of these guidelines, titled *Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory*, became effective on December 3, 1982. ELGs are applicable to mines that produce gold bearing ores from open-pit or underground operations and to mills that use the froth-flotation process, alone or in conjunction with other processes, for the beneficiation of gold. At 40 CFR §440.104 NSPS are used to provide the technology-based effluent limitations for cadmium, copper, lead, mercury, zinc, total suspended solids (TSS) and pH. The BAT (40 CFR 440.103) and BPT (40 CFR 440.102) ELGs that apply to the Greens Creek Mine discharges are shown in the Table 9.

Table 9: Outfalls 002 & 002A - Technology Based Effluent Limits

Parameter	Daily Maximum	Monthly Average
Cadmium, µg/L	100	50
Copper, µg/L	300	150
Lead, µg/L	600	300
Mercury, µg/L	2	1
Zinc, µg/L	1,000	500
TSS, mg/L	30	20
pH, s.u.	within the range 6.0 - 9.0	

III. Water Quality-Based Evaluation

In addition to the technology-based limits discussed above, the Department evaluated the Greens Creek Mine discharges to determine compliance with Section 301(b)(1)(C) of the CWA. This section requires permit limits necessary to meet WQS by July 1, 1977.

Under 18 AAC 83.435, the Department must implement section 301(b)(1)(C) of the CWA. Under 18 AAC 83.435(b), it requires that APDES permits include limits for all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality." The limits must be stringent enough to ensure that WQS are met and must be consistent with any available wasteload allocation (WLA).

To determine if water quality-based limits are needed and develop those limits when necessary, the Department follows guidance in the *Technical Support Document for Water Quality-based Toxics Control* (TSD, EPA 1991). The water quality-based analysis consists of the following four step sequence:

1. Identify the applicable water quality criteria (see Section III.A);
2. Determine if there is "reasonable potential" for the discharge to exceed a water quality criterion in the receiving water (see Section III.B);

3. If there is "reasonable potential" or where a parameter has a technology-based limit and it requires dilution to meet WQS, develop effluent limits based on the waste load allocation (WLA) (see Section III.C).

The following sections provide a detailed discussion of each step.

A. Water Quality Criteria

The first step in determining if water quality-based limits are needed is to identify the applicable water quality criteria. Alaska's WQS are found at 18 AAC 70. The applicable criteria are determined based on the beneficial uses of the receiving water.

The beneficial uses for Hawk Inlet, the receiving waters of outfalls 002 and 002A and storm water outfall 003, and the regulatory citation of the water quality criteria applicable to the uses are as follows:

- aquaculture water supply - 18 AAC 70.020(b)(2)(A)(i)
- seafood processing - 18 AAC 70.020(b)(2)(A)(ii)
- industrial uses - 18 AAC 70.020(b)(2)(A)(iii)
- contact recreation - 18 AAC 70.020(b)(2)(B)(i)
- secondary recreation - 18 AAC 70.020(b)(2)(B)(ii)
- growth and propagation of fish, shellfish, other aquatic life and wildlife - 18 AAC 70.020(b)(2)(C)
- harvesting for consumption of raw mollusks or other raw aquatic life - 18 AAC 70.020(b)(2)(D)

The beneficial uses for wetlands, Zinc Creek and Greens Creek, the receiving waters of storm water outfalls 004 through 009 and 012, and the regulatory citation for the water quality criteria applicable to the uses are as follows:

- domestic water supply - 18 AAC 70.020(b)(1)(A)(i)
- agriculture water supply - 18 AAC 70.020(b)(1)(A)(ii)
- aquaculture water supply - 18 AAC 70.020(b)(1)(A)(iii)
- industrial uses - 18 AAC 70.020(b)(1)(A)(iv)
- contact recreation - 18 AAC 70.020(b)(1)(B)(i)
- secondary recreation - 18 AAC 70.020(b)(1)(B)(ii)
- growth and propagation of fish, shellfish, other aquatic life, and wildlife - 18 AAC 70.020(b)(1)(C)

For a given pollutant, different uses may have different criteria. To protect all beneficial uses, the reasonable potential analysis and permit limits are based on the most stringent water quality criteria for protecting those uses. For Hawk Inlet, the most stringent applicable WQS are summarized in Table 10. The most stringent applicable WQS for wetlands, Greens Creek, and Zinc Creek are summarized in Table 11.

Table 10: Most Stringent of the Water Quality Criteria Applicable to Greens Creek Mine Discharges into Hawk Inlet (outfalls 002, 002A, 003, & 012)

Parameter (µg/L unless otherwise noted)	Acute Aquatic Life Criterion	Chronic Aquatic Life Criterion	Human Health Criterion [c]
Cadmium (TR) [a, b]	40.28	8.85	na
Copper (TR) [a, b]	5.8	3.7	na
Lead (TR) [a, b]	217.16	8.47	na
Mercury (total) [b]	2.062	1.106	0.051
Zinc (TR) [a, b]	95.1	86.14	69,000
WAD cyanide	1.0	1.0	220,000
pH (s.u.)	within the range of 6.5 - 8.5		
Fecal coliform bacteria (FC)	the FC median Most Probably Number (MPN) may not exceed 14 FC/100 mL and not more than 10% of the samples may exceed a MPN of 43 FC/100 mL		

Notes:

a. TR = total recoverable

b. Standards for metals have been converted from dissolved to total recoverable by dividing the dissolved criterion by the conversion factor identified in regulation.

c. Human health criterion for consumption of aquatic organisms

Table 11: Most Stringent of the Water Quality Criteria Applicable to Greens Creek Mine Discharges into wetlands, Greens Creek, & Zinc Creek (outfall 004 through 009)

Parameter [a] (µg/L unless otherwise noted)	Acute Aquatic Life Criterion [b]	Chronic Aquatic Life Criterion [b]
Lead [c] (TR)	26	1.0
Zinc [c] (TR)	56	56
pH (s.u.)	within the range of 6.5 - 8.5	

Notes:

a. TR = total recoverable. Lead, zinc, and pH were included in this table since these are the only parameters for which there are storm water monitoring data.

b. The standards for metals have been converted from dissolved to total recoverable by dividing the dissolved criteria by the conversion factor identified in regulation.

c. The lead and zinc criteria depend upon hardness, measured as mg/L $CaCO_3$. The 15th percentile hardness of the receiving water is used to calculate the criteria since it is a reasonably conservative value protective under most conditions. The 15th percentile hardness at Greens Creek background Site 48 is 41 mg/L $CaCO_3$ based on data collected from October 2006 through September 2011. Hardness data was not available for Zinc Creek.

B. Reasonable Potential Analysis

1. Outfalls 002 and 002A

The Department compared the maximum projected receiving water concentration to the criteria for that pollutant to determine if there is "reasonable potential" to cause or contribute to an exceedance of water quality criteria for each pollutant present in the discharge. If the projected receiving water concentration exceeds the criterion, there is "reasonable potential", and a limit must be included in the permit. The Department used the recommendations in Chapter 3 of the TSD to conduct the reasonable potential analysis.

This section discusses how reasonable potential was evaluated for outfall 002. Because of the extreme variability of the data from the storm water outfalls, the need for effluent limits for storm water was determined separately. The storm water analysis is provided in Section III.C.

The maximum projected receiving water concentration was determined using the following mass balance equation, for discharge to the mixing zone in marine waters:

$$C_d = C_u + ((C_e - C_u)/D)$$

where, C_d = maximum projected receiving water concentration at the edge of the mixing zone

C_e = maximum expected effluent concentration

C_u = background concentration of pollutant

D = dilution in mixing zone

Where no mixing zone is allowed: $C_d = C_e$

After C_d is determined, it is compared to the applicable water quality criterion. If it is greater than the criterion, a water quality-based effluent limit is developed for that parameter. The following discusses each of the factors used in the mass balance equation to calculate C_d.

C_e (maximum expected effluent concentration or MEC): Per the TSD, the maximum expected effluent concentration in the mass balance equation was represented by the 99th percentile of the effluent data. The 99th percentile was calculated using the statistical approach recommended in the TSD, i.e., by multiplying the maximum observed effluent concentration by a reasonable potential multiplier (RPM):

C_e = (maximum observed effluent concentration) x RPM

The RPM accounts for uncertainty in the effluent data. The RPM depends upon the amount of effluent data and variability of the data as measured by the coefficient of variation (CV) of the data. When there are not enough data to reliably determine a CV, the TSD recommends using 0.6 as a default value. Once the CV of the data was determined, the RPM was determined using the statistical methodology discussed in section 3.3 of the TSD. In this procedure, RPMs with a 95% confidence level and a 99% probability were calculated. See Table 12 for a summary of the maximum reported effluent concentrations, CVs, and RPMs used in the reasonable potential analysis.

C_u (background concentration of pollutant): The ambient concentration in the mass balance equation is based on a reasonable worst-case estimate of the background pollutant concentration. Where sufficient data exists, the 85th percentile of the ambient data is generally used as an estimate of worst-case. The C_u used for each parameter is provided in Table 12.

D (dilution): A mixing zone is defined as a limited area or volume of water where the discharge plume is progressively diluted by the receiving water. WQS may be exceeded in the mixing zone as long as acutely toxic effects are prevented from occurring and the applicable existing designated uses of the waterbody are not impaired as a result of the mixing zone. A mixing zone is authorized at the discretion of the Department based on the WQS regulations.

The WQS allow for the use of mixing zones and the 18 AAC 70.240 provides conditions for mixing zones The standards allow water quality within a mixing zone to exceed chronic water quality criteria so long as chronic water quality criteria are met at the boundary of the mixing zone. Acute water quality criteria may be exceeded within a zone of initial dilution inside the chronic mixing zone.

Outfall 002 and outfall 002A: The Department authorized a mixing zone for outfall 002 representing 1 part effluent to 13.27 parts receiving water for a dilution factor of 14.27.

Reasonable Potential Summary: Results of the reasonable potential analysis for outfall 002 are provided in Table 12. Water quality-based limits were not needed for mercury (monthly average), cyanide, or fecal coliform bacteria in outfall 002.

Table 12: Reasonable Potential Determination for Outfall 002

Parameter [a] (µg/L unless otherwise noted)	Effluent Data					Background Receiving Water Conc. (C_u) [g]	Max Projected Receiving Water Conc. (C_d)	Reasonable Potential [h] (yes or no)
	Max Observed Effluent Conc. [b]	Coefficient of Variation (CV) [c]	Number of Samples [d]	Reasonable Potential Multiplier (RPM) [e]	Max Expected Effluent Conc. (MEC) [f]			
Cadmium	1.88	1.4783	269	1.0	1.90	1.327	1.36	no
Copper	6.89	1.0763	269	1.0	6.97	0.560	0.98	yes
Lead	110.80	0.7724	269	1.0	111.98	1.270	8.46	yes
Cyanide as WAD CN	5.00	0.6000	222	1.1	5.32	0.150	0.49	yes
Mercury	0.30	0.1717	269	1.0	0.30	0.008	0.03	yes
Zinc	362	1.0342	269	1.0	366.25	12.921	35.84	yes

Notes:

a. Parameters where there are applicable water quality criteria and effluent monitoring data available.

b. The maximum observed effluent concentrations are based on effluent samples collected by HGCMC from May 2016 through April 2021.

c. The CV is calculated as the standard deviation of the data divided by the mean. The CVs for cadmium, copper, lead, mercury, and zinc were calculated based on outfall 002 effluent samples collected by HGCMC from May 2016 through April 2021. The vast majority of the effluent data available for cyanide during the same period was reported at less than method detection limits; therefore effluent-specific variability cannot be determined, so a default CV of 0.6 was used.

d. The number of samples is used to develop the RPM.

e. The RPM is based on the CV and the number of data points.

f. For each parameter, the MEC equals the maximum observed effluent concentration times the RPM producing a number based on water treatment plant performance for determining if there is a reasonable potential to exceed WQS in the receiving water outside the mixing zone.

g. According to Section 2.5.3 of RPA Guidance (2014), the receiving water concentrations are assigned as 15% of the most stringent applicable water quality criterion. Cadmium is an exception because its MEC is less than the most stringent applicable water quality criterion. Consequently, there is no reasonable potential for cadmium to exceed WQS at the end-of-pipe and no mixing zone dilution needed.

h. Reasonable potential is evaluated at the mixing boundary, and it exists if C_d exceeds the most stringent applicable water quality criterion in Table 10.

2. Water Quality Analysis for Storm Water Outfalls

HGCMC monitors the storm water twice per year during storm events. The results of storm water monitoring are summarized in Table 13.

Table 13: Summary of Storm Water Monitoring Data

Outfall	Receiving Water	n	Flow (gpm)		pH (s.u.)		TSS (mg/L)		Hardness (mg/L as $CaCO_3$)		Oil & Grease (mg/L)		Lead (µg/L)		Zinc (µg/L)	
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
003	Hawk Inlet	9	0.2	4.5	7.04	7.98	<5	283	101	207	<2.0	<1.8	1.8	302.0	40	580
004[2]	Wetlands															
005.2	Zinc Creek	7	0.3	5.0	3.76	4.69	<5	17	26	78	<2.1	<1.9	3.9	9.1	28	168
005.3	Greens Creek	9	10.0	400.0	6.83	7.78	<5	218	114	360	<2.3	3.0	2.6	151.5	231	976
005.4	Greens Creek	9	0.1	3.0	6.55	7.51	<5	<5	36	90	<2.0	<1.9	<0.1	1.3	<6	14
005.5	Greens Creek	6	0.3	11.0	7.43	8.51	<5	3,010	67	509	<2.0	4.3	777.0	4,860.0	952	5,750
006	Greens Creek	1	500.0	500.0	7.41	7.41	201	201	352	352	NA	NA	373.2	373.2	1,040	1,040
007[2]	Greens Creek															
008	Greens Creek	9	2.0	24.0	6.81	7.86	<5	6	159	234	NA	NA	<0.1	2.0	18	58
009	Greens Creek	9	1.0	10.0	7.10	7.59	<5	5	67	119	NA	NA	<0.1	2.0	125	936

Notes:
[1] This table is based on samples collected by the Permittee biannually during storm events from October 2015 through September 2020.
[2] No discharge was occurred during the storm events monitored.

Comparing the lead and zinc data in Table 13 with the water quality criteria in Table 10 and Table 11 shows that the discharges from outfalls 003 through 009 have exceeded the water quality criteria at some time. However, numeric effluent limits were not developed for the individual storm water outfalls. This is due to the difficulty in developing numeric limits for storm water discharges that are intermittent and extremely variable in flow and variable in pollutant concentrations as well as the uncertainty regarding the effect of the storm water outfalls on the receiving waters.

Rather than develop numeric effluent limits for each storm water outfall, the permit requires the permittee to implement corrective action if a storm water discharge exceeds a water quality criterion and results in a statistically significant reduction in receiving water quality. Also, the permit requires development of outfall-specific best management practices (BMPs). APDES regulations, 18 AAC 83.475, require the use of BMPs where development of numeric effluent limits is infeasible.

C. Water Quality–Based Effluent Limit Calculation

Once the Department determines that the effluent has a reasonable potential to exceed WQS at the end-of-pipe (comparing the MEC in Table 12 to the WQS in Table 10) or a parameter has a technology-based limit that exceeds WQS, a water quality-based effluent limit for the pollutant is developed. The first step in calculating a permit limit is development of a WLA for the pollutant.

Mixing Zone Based WLA

When the Department authorizes a mixing zone for the discharge, the WLA is calculated using the available dilution, background concentrations of the pollutant, and the WQS.

Acute and chronic aquatic life standards apply over different time frames and may have different mixing zones; therefore it is not possible to compare the WLAs directly to determine which standard results in the most stringent limits. The acute criteria are applied as a one-hour average and may have a smaller mixing zone, while the chronic criteria are applied as a four-day average and may have a larger mixing zone. To allow for comparison, long-term average (LTA) loads are calculated from both the acute and chronic WLAs. The most stringent LTA is used to calculate the permit limits.

End-of-Pipe WLAs

In many cases, there is no dilution available, either because the receiving waterbody exceeds the criteria or because the Department does not authorize a mixing zone for a particular pollutant. When there is no dilution available, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the Permittee's discharge does not contribute to an exceedance of the criterion. As with the mixing-zone based WLA, the acute and chronic criteria must be converted to LTAs and compared to determine which one is more stringent. The more stringent LTA is then used to develop permit limits.

Permit Limit Derivation

Once the appropriate LTA has been calculated, the Department applies the statistical approach described in Chapter 5 of the *TSD* to calculate maximum daily and average monthly permit limits. This approach takes into account effluent variability [using the Coefficient Variation (CV)], sampling frequency, and the difference in time frames between the average monthly and maximum daily limits.

The maximum daily limit is based on the CV of the data and the probability basis, while the average monthly limit is dependent on these two variables and the monitoring frequency. As recommended in the *TSD*, the Department used a probability basis of 95 percent for average monthly limit calculation and 99 percent for the maximum daily limit calculation.

The following is a summary of the steps to derive water quality-based effluent limits. Lead is used as an example.

Step 1- Determine the WLA

The acute and chronic aquatic life criteria are converted to acute and chronic WLAs (WLA_{acute} or $WLA_{chronic}$) using the following equation:

1. $Q_d C_d = Q_e C_e + Q_u C_u$

   Q_d = total flow = $Q_u + Q_e$
   C_d = most stringent WQS that cannot be exceeded outside the mixing zone
   Q_e = effluent flow

C_e = concentration of pollutant in effluent = WLA_{acute} or $WLA_{chronic}$
Q_u = background flow
C_u = background concentration of pollutant

Rearranging the above equation to determine the effluent concentration (C_e) or WLA results in the following:

2. $$C_e = WLA = \frac{Q_d C_d - Q_u C_u}{Q_e} = \frac{C_d(Q_u + Q_e) - Q_u C_u}{Q_e}$$

With a 14.4: 1 chronic dilution ratio and C_u equal to 1.2705, this equation becomes:

3. $$C_e = WLA = \frac{C_d(14.4 + 1) - (14.4 * 1.2705)}{1}$$

4. $WLA = (C_d * 15.4) - 18.3$

For example, the lead chronic WLA, the calculation is:

$C_e = WLA_{chronic} = (8.47 * 15.4) - 18.3 = 112$

For lead, the acute WLA with an acute dilution ratio equal to 5.1: 1, the calculation is:

$C_e = WLA_{acute} = (217.16 * (5.1 + 1)) - (5.1 * 1.2705) = 1318.2$

Step 2 - Determine the Long-Term Average (LTA)

$$LTA_{acute} = WLA_{acute} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

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

$$\sigma^2 = \ln(0.7724^2 + 1)$$

$$\sigma^2 = 0.4679$$

$$z = 2.326 \; for \; 99^{th} \; percentile \; probability \; basis$$

$LTA_{acute} = 339.3$

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$$\sigma^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

$$\sigma^2 = \ln\left(\frac{0.7724^2}{4} + 1\right)$$

$$\sigma^2 = 0.139$$

$z = 2.326\ for\ 99^{th}\ percentile\ probability\ basis$

$LTA_{chronic} = 50.4$

Step 3 - Most Limiting LTA

To protect a waterbody from both acute and chronic effects, the more limiting of the calculated LTA_{acute} and $LTA_{chronic}$ is used to derive the effluent limitations. $LTA_{chronic}$ is the most limiting LTA.

Step 4 - Calculate the Permit Limits

The *TSD* recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL). The maximum daily limit (MDL) and the average monthly limit (AML) are calculated as follows:

$$MDL = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

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

$$\sigma^2 = \ln(0.7724^2 + 1)$$

$$\sigma^2 = 0.4679$$

$z = 2.326\ for\ 99^{th}\ percentile\ probability\ basis$

CV = coefficient of variation

MDL = 196 ug/L

$$AML = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

$$\sigma^2 = \ln\left(\frac{CV^2}{n} + 1\right)$$

$$\sigma^2 = \ln\left(\frac{0.7724^2}{4} + 1\right)$$

$$\sigma^2 = 0.139$$

$z = 1.645\ for\ 95^{th}\ percentile\ probability\ basis$

$$CV = coefficient\ of\ variation = \frac{standard\ deviation}{mean}$$

n = number of sampling events required per month for lead = 4 (based on weekly sampling as required in the previous permit)

AML = 87 ug/L

IV. Summary of Permit Effluent Limitations

As discussed in Section I of this APPENDIX, technology-based limits were applied to each discharge and evaluated to determine whether these limits may result in any exceedances of WQS in the receiving water. If exceedances could occur, then water quality-based effluent limits were developed. The following summarizes the effluent limits developed for each outfall.

Outfall 002: The reasonable potential analysis in Section III.B. demonstrates that discharge at the water quality-based effluent limits for metals will not cause or contribute to an exceedance of WQS at or beyond the boundary of the mixing zone in Hawk Inlet. However, effluent discharge at the technology-based effluent limits will in most cases result in an exceedance of WQS at the boundary of the authorized mixing zone. Consequently, water quality-based effluent limits are implemented to ensure protection of WQS. Technology-based effluents limits are assigned to TSS, and no limits are assigned to Temperature, BOD_5, and Fecal coliform bacteria.

In a few cases, the total suspended solids (TSS), chronic mercury, and cadmium limits, technology-based effluent limits, which are more stringent than water quality-based effluent limits, have been imposed by the permit. Additionally, the reasonable potential analysis showed that the discharge of fecal coliform bacteria would not cause or contribute to an exceedance of their applicable water quality criterion. Therefore, water quality-based effluents limits were not needed for this parameter, and in addition, there are no technology-based limits associated with this parameter.

The permit also includes flow limits to ensure that the volume discharged does not exceed the flow assumptions used to develop the allowable dilution (mixing zone). Since flow and concentration limits are included in the permit, mass limits are not needed. Controlling flow and concentration is the same as controlling mass. See Table 14 for a summary of outfall 002 effluent limits. These effluent limits also apply to the proposed outfall 002A.

Table 14: Outfall 002 & Outfall 002A Effluent Limits

Parameter	Units	Daily Maximum		Monthly Average	
		Effluent Limit	Basis for Limit	Effluent Limit	Basis for Limit
Flow (002)	mgd	4.6	Design capacity	3.7	catchment area and precipitation
Flow (002A)	mgd	1.7	Design Capacity	0.4	catchment area and precipitation
Flow (Combined)	mgd	6.3	Design Capacity	4.1	catchment area and precipitation
Cadmium [a]	µg/L	16	ELG	6	ELG
Copper [a]	µg/L	32	Acute Aquatic WQS	13	Acute Aquatic WQS
Cyanide [b]	µg/L	5	Acute WQS	3	Chronic WQS
Lead [a]	µg/L	196	Chronic Aquatic WQS	87	Chronic Aquatic WQS
Mercury [c]	µg/L	0.9	Human Health WQS [d]	0.7	HH WQS
Zinc [a]	µg/L	514	Acute WQS	201	Acute WQS
TSS	mg/L	30	ELG	20	ELG
pH [e]	s.u.	6 to 9	ELG	6 to 9	ELG

Notes:

a. Metals shall be measured as total recoverable.
b. Cyanide shall be measured as weak acid dissociable
c. Mercury shall be measured as total.
d. First, the average monthly limit (AML) was set equal to the wasteload allocation of 1.11 µg/L. Then, the daily maximum limit was calculated as a ratio of the AML as prescribed section 5.4.4 of the *Technical Support Document For Water Quality-based Toxics Control*.
e. The limit reflects that there is a pH mixing zone, covers a range, and does not offer specific daily and monthly limits.

Storm Water Outfalls: Based on the discussion in Section III.C., numeric effluent limits were not developed for the storm water outfalls. Rather, requirements to sample the receiving waters upstream and downstream of each outfall when the outfall discharge is sampled support the permit requiring the permittee to implement corrective action if a storm water discharge exceeds a water quality criterion and results in a statistically significant reduction in receiving water quality. The permit also includes the requirement to develop outfall-specific BMPs.