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

Permit Issuance Date: September 30, 2011
Permit Effective Date: November 1, 2011
Permit Expiration Date: October 31, 2016

Technical Contact: Tim Pilon
Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
610 University Avenue
Fairbanks, AK 99709-3643
(907) 451-2136
Fax: (907) 451- 2187
tim.pilon@alaska.gov

Issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to

HECLA GREENS CREEK MINING COMPANY

For wastewater discharges from

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

The Alaska Department of Environmental Conservation (Department or DEC) proposes to reissue an APDES individual permit (permit) 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 previously permitted discharges from Greens Creek Mine facilities to Hawk Inlet, Greens Creek, and Zinc Creek. The permit sets conditions on the discharge or release of pollutants from these mine related operations into waters of the United States. The fact sheet also outlines the development of the permit including:

- information on appeal procedures,
- a listing of effluent limitations and other conditions,
- technical material supporting the permit conditions, and
- monitoring requirements.

Appeals Process

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 15 days after receiving the Department's decision to the Director of Water at the following address:

Director of Water
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501

Interested persons can review 18 AAC 15.185 for the procedures and substantive requirements regarding a request for an informal Department review.

See http://www.dec.state.ak.us/commish/InformalReviews.htm for information regarding informal reviews of Department decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department within 30 days of the permit decision or a decision issued under the informal review process. An adjudicatory hearing will be conducted by an administrative law judge in the Office of Administrative Hearings within the Department of Administration. A written request for an adjudicatory hearing shall be delivered to the Commissioner at the following address:

Commissioner
Alaska Department of Environmental Conservation at
410 Willoughby Street, Suite 303
Juneau AK, 99811-1800

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://www.dec.state.ak.us/commish/ReviewGuidance.htm for information regarding appeals of Department decisions.

Documents are Available

The permit, fact sheet, response to comments, and related documents can be obtained by visiting or contacting DEC between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The permit, fact sheet, and other information are also located on the Department's Wastewater Discharge Authorization Program website: http://www.dec.state.ak.us/water/wwdp/index.htm.

Documents are Available

The permit, fact sheet, response to comments, and related documents can be obtained by visiting or contacting DEC between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The permit, fact sheet, and other information are located on the Department's Wastewater Discharge Authorization Program website: http://www.dec.state.ak.us/water/wwdp/index.htm.

Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, AK 99501 (907) 269-6285	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 410 Willoughby Avenue, Suite 310 Juneau, AK 99801 (907) 465-5180
Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 540 Water Street, Suite 203 Ketchikan, AK 99901 (907) 225-6200	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 610 University Avenue Fairbanks, AK 99709 (907) 451-2136

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 APPLICANT

This fact sheet provides information on the APDES permit for the following entity:

Name of Facility:	Hecla Greens Creek Mining Company
APDES Permit Number:	AK0043206
Facility Location:	18 miles southwest of Juneau, Alaska
Mailing Address:	P.O. Box 32199, Juneau, AK 99803
Facility Contact:	Jennifer Saran

The maps in Figures 1, 2, and 3 of the fact sheet show the locations of the mine, treatment plant, discharge, and monitoring locations.

2.0 FACILITY INFORMATION

The Greens Creek Mine is a lead, zinc, silver, and gold mine and mill located on the northwest portion of Admiralty Island approximately 18 miles southwest of Juneau, Alaska. The mine and mill are owned and operated by the Hecla Greens Creek Mining Company (HGCMC). The facility has been in operation since 1989 with a period of temporary shutdown between April 1993 and 1996. At an average production rate of 2,200 to 2,400 tons of ore per day, HGCMC predicts an additional 10 year mine life.

The mine facilities encompass approximately 273 acres in the Admiralty Island National Monument. The Admiralty Island National Monument is managed by the U.S. Forest Service. The mine facilities are 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, tailings facility, and 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 disposed of in permanent storage areas at waste rock site 23 and the tailings disposal facility. 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, and sodium isopropyl dithiophosphate. The flotation concentrates are thickened and filtered then trucked to the Hawk Inlet terminal for shipment off-site.

The tailings from the flotation process are thickened and filtered. Approximately half of the tailings are placed in the underground mine for mine backfill. The remainder are covered and transported to the dry tailings site for disposal.

The dry 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 tailings site consists of a dry tailings pile and runoff surge pond (tailings facility) situated adjacent to one another. 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. Currently, an EIS is being developed to evaluate the impacts of another expansion of the tailings facility.

2.2 Description of Discharges

Former NPDES permits authorized discharge of treated wastewater from outfall, 001 and outfall 002, into Hawk Inlet and discharge from ten storm water outfalls. Figure 1 shows 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 and mill wastewaters and storm water are treated and discharged through outfall 002 into Hawk Inlet. The specific sources of wastewater, waste streams, contributing to outfall 002 include:

1. Water from the underground mine - Wastewater from the underground mine is pumped to the tailings storage facility (TSF) wastewater treatment plant (WWTP) for treatment prior to discharge.
2. Process water from the mill - 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 wastewater is purged from the system to maintain water chemistry suitable for proper flotation performance. This purged wastewater is treated at the mill in an 800 gallon per minute (gpm) treatment plant. Treatment consists of hydrogen peroxide addition to destroy cyanide, ferric iron co-precipitation, flocculation, and settling of precipitates reducing metal concentrations in the wastewater. The treated mill process water is piped to the TSF WWTP for additional treatment prior to discharge.
3. Sanitary wastes from the mine, mill, and Hawk Inlet terminal areas - Sanitary wastes from the mine, mill, and Hawk Inlet terminal areas are treated to secondary standards and disinfected in a sequencing batch reactor (SBR) package plant then pumped through pipes to the TSF WWTP for additional treatment prior to discharge. The average flow is 5,000 gallons per day (gpd) with a maximum flow of 6,000 gpd.
4. Storm water from the mine and mill area - Storm water drainage from the mine and mill area are 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.
5. Storm water from the Hawk Inlet terminal area - Storm water from the Hawk Inlet terminal area is collected in a sediment pond and piped to the TSF WWTP for treatment prior to discharge.

6. Seepage and runoff from waste rock storage areas 23 and D, Pond C, and Pond D - Seepage and runoff from these waste rock storage areas are collected in ponds below the waste rock storage piles. These wastewaters are routed either back to the mill for use in mill processes or are pumped to the TSF WWTP for further treatment prior to discharge.
7. Tailings disposal facility seepage and runoff - Seepage from the dry tailings facility and runoff from the tailings basin watershed are collected in Pond 7 located below the TSF WWTP.

These seven wastewater streams are combined and treated in the TSF WWTP, a 3,200 gpm wastewater treatment plant, located near the dry tailings facility. The treatment process is the same as that used for the mill wastewaters (ferric iron co-precipitation, neutralization, and filtration). TSF WWTP effluent is discharged through outfall 002. Sludge from the treatment plant is thickened, filtered, and disposed in the dry tailings facility.

During the 2005 permit term, the total discharge rate from outfall 002 averaged 1.5 million gallons per day (mgd) with a maximum daily flow of 3.4 mgd. The effluent pipeline has a maximum capacity of 4.6 mgd. Pollutants present in the discharge include cadmium, copper, lead, mercury, zinc, cyanide, BOD, TSS, pH, and fecal coliform bacteria. Based on the maximum design capacities of the SBR package plant and the TSF WWTP, treated domestic wastewater comprises 0.13 percent of the discharge flow.

Outfall 002 extends from the dry tailings area to the Hawk Inlet discharge point at latitude 58° 06' 06" N and longitude 134° 46' 20" W. 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.

Storm Water: Storm water that is not discharged through outfall 002 may be discharged through the storm water outfalls listed in Table 1 and shown in Figure 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 (active rock quarry) off of A-road at mile 1.8	Runoff and drainage from rock extraction pit	Wetlands
005.2	Zinc Creek Bridge (west side) 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 4.5	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 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

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 most recent permit was effective July 1, 2005 and expired on July 1, 2010. A timely application for renewal of the permit was submitted to EPA in December 2009. Because HGCMC submitted a timely application for renewal, the 2005 permit has been administratively extended and remains fully effective and enforceable until reissuance, per 18 AAC 83.155(c).

3.0 COMPLIANCE HISTORY

On April 10, 2006, approximately 4,163 gallons of mine drainage discharged into Greens Creek due to a joint failure in a steel pipeline that normally transfers mine drainage from the mine to the TSF WWTP. This event resulted in DEC issuing a Notice of Violation (NOV) to Kennecott Greens Creek Mining Company on April 28, 2006 for discharging water with lead and zinc concentrations exceeding Alaska Water Quality Standards (WQS). This violation was addressed in an expedient manner and steps were taken to prevent recurrence of a similar problem.

On April 25, 2007, EPA issued an NOV to Kennecott Greens Creek Mining Company resulting from a July 7, 2006 inspection. The following three violations were cited in the NOV: 1) the 2005 storm water monitoring report showed numerous discharges from storm water outfalls exceeding WQS for lead and zinc; 2) on April 10, 2006, a broken pipe caused an unpermitted, 4,163 gallon, spill of mine drainage into Greens Creek; and 3) time composite sampling from outfall 002 did not satisfy the requirement for flow proportional composite sampling when flow was variable.

On December 21, 2009, EPA issued an NOV to Hecla Greens Creek Mining Company resulting from a June 8, 2009 inspection. The following four violations were cited in the NOV: 1) on August 11, 2009, Hecla Greens Creek Mining Company drillers observed an unpermitted discharge of mud entering Greens Creek; 2) plastic sheeting used as a best management practice to cover waste rock at Site E was not maintained as a storm water runoff control; 3) the refrigerator for the composite sampler at outfall 002 lacked a thermometer for indicating that samples are properly preserved; and 4) the Quality Assurance Plan failed to describe the practice of composite sampling for fecal coliform bacteria from outfall 002 and needed updating to include it.

Discharge Monitoring Reports (DMRs) from December 2005 through October 2010 were reviewed to determine the Permittee's compliance with effluent limits. Table 2 presents the permit limit exceedance.

Table 2: Permit Limit Exceedance

Parameter	Date	Monitoring		
		Basis	Permit Limit (mg/L)	Reported Value (mg/L)
Total Suspended Solids	9/31/08	Daily Maximum	30	50

4.0 RECEIVING WATERS

4.1 Water Quality Standards

Regulations in 18 AAC 70 require that the 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.

Waterbodies 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). Alaskan waterbodies may also have a site-specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). Hawk Inlet has not been reclassified nor has a site-specific criterion been approved.

The Greens Creek facility wastewaters are discharged to Hawk Inlet. Storm water may be discharged to Hawk Inlet, Greens Creek, and Zinc Creek.

Hawk Inlet is located adjacent to Chatham Strait. Hawk Inlet and Chatham Strait are classified for protection of all marine water uses: water supply (for aquaculture, seafood processing, and industrial uses); contact and secondary recreation; growth and propagation of fish, shellfish, other aquatic life and wildlife; and, harvesting for consumption of raw mollusks or other raw aquatic life (18 AAC 70.020).

Greens Creek and Zinc Creek are classified for protection of all fresh water uses: water supply (for drinking, agriculture, aquaculture, and industrial uses); contact and secondary recreation; and, growth and propagation of fish, shellfish, other aquatic life, and wildlife (18 AAC 70.020).

4.2 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. Hawk Inlet, Zinc Creek, and Greens Creek are not included on the list of Alaska's Clean Water Act Section 303(d) impaired waters as published in *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report,* July 15, 2010. Additionally, water quality data collected by Greens Creek Mine do not indicate impairment.

4.3 Mixing Zone Analysis

In accordance with state regulations at 18 AAC 70.240, as amended through June 23, 2003, the Department has authority to authorize a mixing zone in a permit. In Hawk Inlet at outfall 002, the Department authorizes a mixing zone with dilution of 79.4 parts receiving flow to 1 part effluent flow, equaling a dilution multiplier of 80.4. This dilution was determined by dividing the technology-based limit specified in 40 CFR Part 440 subpart J, by the most stringent applicable water quality standard. The technology-based limits for cadmium, copper, lead, mercury, zinc, and associated dilutions required to meet state water quality standards are shown in Table 3. If a waterbody provides insufficient dilution to meet technology-based effluent limits, then more stringent limits are determined by a water quality-based approach, whereby the amount of dilution available is used. Technology-based limits are specified for Greens Creek, because the discharge is to a waterbody with a dilution capacity far greater than that required to meet technology based limits.

The mixing zone is a rectangular box shape extending from the inlet floor to the water surface. It has a maximum width of 200 feet centered along the 160 feet long diffuser, and it extends 150 feet perpendicular to either side of the diffuser for a total length of 300 feet.

The mixing zone was modeled using the Department and EPA approved CORMIX modeling program. In 2005, the Department authorized a mixing zone that had a length of 50 feet to either side of the diffuser and 300 feet wide. This was modeled with the PLUMES software. Since 2005, the Department has relied more on the CORMIX modeling software. The mixing zone in the 2011 permit is longer than that in the 2005 permit for two main reasons. First, the

flow from the facility has increased, and second, the CORMIX program tends to "trap" and "flatten" plumes more than the PLUMES program, which models the plume with a rounder profile. The new mixing zone is longer but is still as small as practicable. CORMIX shows the plume traps about 1-3 meters from the ocean floor and is only about 1-2 meters thick by the time it reaches the mixing zone boundary where state water quality standards must be met.

Appendix C - Mixing Zone Analysis Checklist outlines 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 in order to authorize a mixing zone. A summary of this analysis follows.

Ambient Data – Calculations require input of the 10^{th} percentile and the 90^{th} percentile current velocities. The former was 0.1 meter per second and the later 1.4 meters per second. Water density inputs were 1018.63 kilograms per cubic meter (kg/m^3) for surface density and 1020.79 kg/m^3 for bottom density.

Effluent Data - Effluent flow rates modeled were 800, 2,000, and 3,200 gallons per minute. The plume was modeled at different flows to see whether plume characteristics would result in a larger mixing zone at the flow rates more frequently experienced. Effluent temperature was 16ºC.

The effluent limit requiring the greatest dilution to meet water quality standards, which for outfall 002 is copper with a concentration of 300 micrograms per liter (µg/L), was used to size the mixing zone. It should be noted that although the effluent could contain pollutants up to the values allowed by the permit limits, in reality the treatment plant has been discharging a far higher quality effluent. For example, the maximum recorded concentration for copper during the last five years was 45.8 µg/L, and the mean value was 5.7 µg/L.

Table 3: Effluent Data

Parameter	Permit Limits (total recoverable or total)	Acute Marine WQS (total recoverable)	Dilution required to meet acute WQS	Chronic Marine WQS (total recoverable)	Dilution required to meet chronic WQS
Cadmium	100 µg/L	40.2 µg/L	2.5	8.85 µg/L	11.3
Copper	300 µg/L	5.78 µg/L	51.9	3.73 µg/L	80.4
Lead	600 µg/L	217 µg/L	2.7	8.47 µg/L	70.9
Mercury	2 µg/L	2.1 µg/L	N/A	1.106 µg/L	1.81
Zinc	1,000 µg/L	95 µg/L	10.5	86.14 µg/L	11.6

Diffuser Data – Depth of water at the diffuser equals 15 meters.

Facility Upgrades - In addition to mill treatment plant effluent, contact storm water is treated and discharged through outfall 002. In 2007, back-to-back high rainfall events produced

storm water flows that stressed the facility's storage and discharge capabilities. Since then, the facility has been upgraded and increased its maximum discharge rate from 2,500 gpm (3.6 million gpd) to 3,200 gpm (4.6 million gpd).

Results - The greatest need for mixing zone length occurs in September when ambient stratification is greatest, and the mixing zone has the greatest length. Modeling provided an acute mixing zone 166 feet wide by 180 feet long and a chronic mixing zone of 170 feet wide by 272 feet long. See Table 4.

Table 4: Modeling Results

Current (meters per second)	Mixing Zone Width (feet)	Mixing Zone Length (feet)	
		Acute	Chronic
0.1	166	2 x 20 = 40	2 x 29 = 58
1.4	170	2 x 90 = 180	2 x 136 = 272

Size - For practical reasons, and because modeling is an inexact science, both the acute and chronic mixing zones are included in an approved mixing zone size of 200 feet wide by 300 feet long.

To comply with EPA's *Technical Support Document for Water Quality-based Toxics Control* recommendation for the maximum size of a mixing zone for acute criteria, a drifting organism may not be within an acute mixing zone for longer than 15 minutes, or one quarter of the one-hour basis for acute effects. At the 10^{th} percentile current a drifting organism is in the acute mixing zone for one minute, and at the 90^{th} percentile current for 20 seconds. The acute mixing zone size is not specified in the permit, but the Department checks to make sure there will be no acute effects from the discharge.

Technology - In accordance with 18 AAC 70.240(a)(3), 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 influent and produce an effluent with a much higher quality than specified by technology-based effluent limitation guidelines (ELGs). Additionally, state-of-the-art diffusers were installed in 2010.

Existing Use - In accordance with 18 AAC 70.245, the mixing zone has been appropriately sized to fully protect the existing uses of Hawk Inlet. The existing uses have been maintained and protected under the terms of the previous permit. The permit reissuance application does not propose any changes that would result in a lower quality effluent.

Human Consumption - In accordance with 18 AAC 70.250(b)(2) and (b)(3), the pollutants discharged have not produced objectionable color, taste, or odor in aquatic resources harvested for human consumption; nor has the discharge precluded or limited established

processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting.

Human Health - In accordance with 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the permit must be protective of human health. An analysis of the effluent testing data that was included with the HGCMC wastewater discharge application and the results of the reasonable potential analysis conducted on pollutants of concern indicate that the level of treatment at Greens Creek Mine is protective of human health. The quality of the effluent has met permit limits and maintained WQS criteria beyond the mixing zone. Further, the effluent quality is not expected to change and compliance with WQS is expected to continue.

Aquatic Life and Wildlife - In accordance with 18 AAC 70.250 and 18 AAC 70.255, the mixing zone authorized in the permit must be protective of aquatic life and wildlife. Whole effluent toxicity (WET) testing indicated that there are no toxic effects associated with effluent. The Hawk Inlet Monitoring Program, which evaluates if WQS are exceeded beyond the boundary of the mixing zone and assesses whether sediments or aquatic organisms are impacted by the facility's discharges, has been unable to demonstrate any negative impacts associated with the mixing zone.

Endangered Species - In accordance with 18 AAC 70.250(a)(2)(D), the authorized mixing zone will 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.

4.4 Receiving Water Limits and Monitoring Requirements

See Section 6.5, Hawk Inlet Monitoring

5.0 EFFLUENT LIMITATION

5.1 Basis

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

The permit contains technology-based effluent limits for outfall 002 and narrative limitations for the ten storm water outfalls. Sections 5.2 and 5.3 summarize the permit's effluent limitations. See APPENDIX - B for more details.

5.2 Outfall 002 Limits

The effluent limits for outfall 002 are the same as the previous permit limits except for flow. The mine-site storm water collection system has been expanded, the capture of mine runoff water conveyed to the TSF WWTP increased, and the TSF WWTP diffuser upgraded to accommodate more storm water treatment and throughput. The TSF WWTP increased its throughput capacity from 2,500 gpm to 3,200 gpm in order to maximize discharge during peak rainfall events and to prevent overflow from Pond 7. As a result, limits on daily maximum and monthly average flows increased proportionally to the increase of throughput capacity from 3.6 to 4.6 mgd and 2.4 to 3.0 mgd, respectively. See Table 5. The limits for metals, TSS, and pH are technology-based. See APPENDIX - B for a detailed discussion of how the permit limits were developed.

Table 5: Outfall 002 – Effluent Limits

Parameter	Units	Effluent Limits	
		Daily Maximum	Monthly Average
Flow	mgd	2005 permit – 3.6 this permit – 4.6	2005 permit – 2.4 this permit – 3.0
Cadmium, total recoverable	µg/L	100	50
Copper, total recoverable	µg/L	300	150
Lead, total recoverable	µg/L	600	300
Mercury, total	µg/L	2.0	1.0
Zinc, total recoverable	µg/L	1,000	500
TSS	mg/L	30	20
pH	s.u.	within the range of 6.0 to 9.0	

5.3 Storm Water Outfall Limitations

Monitoring data indicated that some of the storm water discharges exceeded WQS (see, APPENDIX - B Section III. C. for a discussion of the storm water discharges and concentrations compared to WQS). 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 extremely variable in flow and pollutant concentrations and the uncertainty regarding the effect of the storm water discharges on the receiving waters.

Rather than developing numeric effluent limits for each storm water outfall, the permit includes:

> An outfall-specific requirement that the discharges from storm water outfalls must not exceed receiving water concentrations for lead, zinc, TSS, pH, and oil and grease. This

permit requirement is more restrictive than the 2005 permit, which prohibited exceedance of WQS, because it prohibits any degradation of water quality.

Increased storm water monitoring by adding a sample site just upstream of each outfall. The 2005 permit required sampling from each outfall and downstream of each outfall, and this permit requires upstream, outfall, and downstream sampling.

Corrective action requirements were added to address any exceedances 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 7.2 for more information regarding the BMP requirements.

6.0 MONITORING REQUIREMENTS

6.1 Basis

In accordance with AS 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. Monitoring in a permit is required 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 and/or to monitor effluent impact on the receiving waterbody quality.

The Permittee is responsible to conduct the monitoring and report results on DMRs or on the application for permit reissuance, as appropriate.

6.2 Outfall 002 – Effluent Monitoring

The effluent monitoring requirements in the permit are summarized in Table 6. The monitoring requirements are the same as the 2005 permit with the following exceptions.

- pH monitoring frequency is increased to continuous from daily, and to accommodate the increase in frequency, the sample type has been changed from grab to recording.
- Cyanide monitoring frequency is reduced from weekly to monthly because any concentration of weak acid dissociable cyanide was not detected in more than 90 percent of the samples that were analyzed.
- Fecal coliform sample type is changed from composite to grab. This was done to accommodate requirements of the test method.
- Total residual chlorine (TRC) monitoring is removed. The 2005 permit contains a provision for discontinuing TRC monitoring if two consecutive years of sampling results in TRC levels below the method detection limit of 100 µg/L, and HGCMC discontinued TRC

monitoring under the terms of the 2005 permit. Since the characteristics of the effluent have not changed, TRC monitoring is discontinued as previously allowed by the 2005 permit.

Table 6: Outfall 002 - Effluent Monitoring Requirements

Parameter	Units	Monitoring Requirements	
		Minimum Frequency	Sample Type
Flow	mgd	continuous	recording
Cadmium [a]	µg/L	weekly	24-hour composite
Copper [a]	µg/L	weekly	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	recording
Cyanide [c]	µg/L	monthly	24-hour composite
Temperature	°C	weekly	grab
BOD_5	mg/L	monthly	24-hour composite
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. Cyanide shall be measured as weak acid dissociable (WAD).

6.3 Storm Water Monitoring

The 2005 permit requires 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 009 are monitored for lead, zinc, TSS, and pH.

DEC reviewed the monitoring data from 2005 through 2009 and determined that twice yearly storm water monitoring of the outfalls must continue, provided there is discharge. Since some of the storm water monitoring showed that the storm water exceeded WQS, monitoring of the receiving water upstream of each outfall has been added to the permit to determine whether the storm water is impacting receiving water quality. 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 Permit Table 3.

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.

6.4 Mixing Zone Monitoring

Permit Part 1.5.3 – Mixing Zone Monitoring is a new section. It introduces the requirement to conduct effluent sampling on days when mixing zone sampling occurs. This requirement was added to track the relationship between effluent and receiving water quality outside the mixing zone. For more than ten years, mixing zone monitoring has been performed at DEC-approved monitoring station 106 to assure that water quality outside the mixing zone is protected, and the permit maintains monitoring station 106 as the site for mixing zone monitoring.

6.5 Hawk Inlet Monitoring

This permit requires HGCMC to monitor seawater, sediments, and toxicity in Hawk Inlet. Based on recommendations from Alaska Department of Fish and Game, permit monitoring requirements are the same as those in the 2005 permit. The goal of the monitoring program is to demonstrate that WQS are not exceeded at the mixing zone boundary 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 only change from the 2005 permit relating to Hawk Inlet monitoring is contained in permit Part 1.5.1.5 where statistical evaluation was added to annual reporting requirements. 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 (locations 106, 107, and 108). Location 106 represents background conditions. Locations 107 and 108 are in the areas affected by the discharges from outfall 002. The samples must be analyzed for the following parameters: cadmium, copper, lead, mercury, zinc, TSS, pH, cyanide, temperature, conductivity, and turbidity. Metals, with the exception of 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 outfall 002 and 003 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. Therefore, Table 4 of the permit specifies method detection limits for metals and cyanide required for surface water monitoring.

Receiving water monitoring requirements are the same as required in the 2005 permit. As approved by EPA, the permit requires that the metals be monitored as dissolved.

Sediment Monitoring: The permit requires sediment monitoring in Hawk Inlet twice per year at four pre-existing sample locations (locations S-1, S-2, S-4, and S-5). Location S-2 represents background conditions. Locations S-1 and S-4 are in the areas affected by the discharges from outfall 002. Location S-5 is in the area potentially affected by the loading of

concentrates onto ships. Samples must be analyzed for the following parameters: cadmium, copper, lead, mercury, and zinc. The permit specifies method detection limits for these parameters. See permit Table 5. The sediment monitoring requirements are the same as required in the 2005 permit.

In-situ Bioassays: The permit requires analysis of tissues from organisms collected in Hawk Inlet twice per year at seven pre-existing sample locations. Polychaete sediment dwellers (marine worms), *Nepthys procera* and *Nereis sp*. must be collected from three pre-existing sample locations (locations S-1, S-2, and S-4). 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 edulus* (bay mussel) must be collected from four pre-existing sample locations (location Stn 1, Stn 2, Stn 3, and ESL). Location Stn 2 and Stn 3 represent background conditions. Location ESL and Stn 1 are in the area influenced by outfall 002. Tissue samples must be analyzed for the following parameters: cadmium, copper, lead, mercury, and zinc. The permit specifies the methods to be used for sample collection and analysis in Table 6. In-situ bioassay monitoring requirements are the same as required in the 2005 permit.

6.6 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 and/or WQS exceedances that could result 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.

6.7 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, regular monitoring for WET was removed from the 2005 permit. Since the characteristics of the effluent remain unchanged, this permit does not require WET monitoring.

6.8 Sludge (Biosolids) Requirements

Sludge means any solid, semi-solid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. State and federal requirements regulate the management and disposal of sewage sludge (biosolids). The Permittee must consult both state and federal regulations to ensure proper management of the biosolids and compliance with applicable requirements.

6.8.1 State Requirements

The Department separates wastewater and biosolids permitting. The Permittee must manage sewage sludge as required in DEC Waste Management Permit 0211-BA001.

6.8.2 Federal Requirements

EPA is the permitting authority for the federal sewage sludge regulations at 40 CFR Part 503. Biosolids management and disposal activities are subject to the federal requirements in Part 503. The Part 503 regulations are self-implementing, which means that a Permittee must comply with the regulations even if no federal biosolids permit has been issued for the facility.

The permittee should ensure that a biosolids permit application has been submitted to EPA. In addition, the permittee is required to submit a biosolids permit application to EPA for the use or disposal of sewage sludge at least 180 days before this APDES permit expires in accordance with 40 CFR §§122.21(c)(2) and 122.21(q) [see also 18 AAC 83.110(c) and 18 AAC 83.310, respectively]. The application form is NPDES Form 2S and can be found on EPA's website, www.epa.gov, under NPDES forms. A completed NPDES Form 2S should be submitted to:

U.S. Environmental Protection Agency, Region 10, NPDES Permits Unit OWW-130, Attention: Biosolids Contact, 1200 Sixth Avenue, Suite 900, Seattle, WA 98101-3140. The EPA Region 10 telephone number is 1-800-424-4372.

Information about EPA's biosolids program and CWA Part 503 is available at www.epa.gov and either search for 'biosolids' or go to the EPA Region 10 website link and search for 'NPDES Permits.'

7.0 OTHER PERMIT CONDITIONS

7.1 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 update the Quality Assurance Project Plan (QAPP) and submit written notification to the Department within 60 days of the effective date of the final permit stating that the plan has been updated and is being implemented. The QAPP shall consist of standard operating procedures the

Permittee must follow for collecting, handling, storing and shipping samples; laboratory analysis; and data reporting. The plan shall be retained on site and made available to the Department upon request.

7.2 Best Management Practices Plan

In accordance with 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 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.

18 AAC 83.475 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 2005 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 APPENDIX – B Section III.C., 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 (AKR050000). The monitoring required in this permit (Section 6.3), 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.

7.3 Standard Conditions

Appendix A 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, and other general requirements.

8.0 PERMIT REISSUANCE (Antibacksliding)

18 AAC 83.480 requires that "effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the 2005 permit." 18 AAC 83.480(c) also states that a permit may not be reissued "to contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time the permit is renewed or reissued" unless the DEC can justifying relaxing limits in accordance with 18 AAC 83.480 (b). With the exception of permit limit adjustments allowed by 18 AAC 83.480(b)(2), this permit's effluent limitations, standards, and conditions are equal to or more stringent than those in the 2005 permit. Based on new information that was not available at the time the 2005 permit was issued, this permit contains two adjustments, which are less stringent than limitations contained in the 2005 permit. Those adjustments are 1) an increase in outfall 002 discharge rate from 2,500 gpm to 3,200 gpm, with an associated recalculation of the mixing zone size to accommodate the increased discharge rate and 2) a reduction of cyanide monitoring frequency in outfall 002 effluent from weekly to monthly.

Extreme storm events in 2007 produced new information about increased mine contact storm water flows, and in response to that information, the mine expanded its mine-site storm water collection, treatment, and discharge system. Upgrades included capture of runoff from the back slope at the mill and the mill road, improvements to Ponds C and D, increased pumping capacity to the TSF WWTP, and modification to the TSF WWTP diffuser, which relieved a bottleneck in the system allowing the discharge rate to match the TSF WWTP's throughput capacity. Changes in the permit's flow limit and mixing zone size result from upgrades necessary for managing water during storms like those experienced in 2007. These changes in the flow limit and mixing zone size are based on the collection and statistical analysis of this new information. The increased permit limits are based on new information; therefore, the increases comply with the antibacksliding regulations, 18 AAC 83.480(b)(2).

During development of the 2005 permit, cyanide data showed no reasonable potential to exceed water quality standards and consequently, it imposed no limits for cyanide. However, the 2005 permit required weekly monitoring as a precaution. Since the 2005 permit was issued, the concentration of cyanide in the effluent from outfall 002 has been consistent with more than 90 percent of 242 samples resulting in undetectable levels of cyanide. Cyanide monitoring frequency was reduced from weekly to monthly due to the consistency of undetectable measurements. Since new information indicates cyanide is consistently undetectable, reduction in cyanide monitoring frequency is merited and complies with the antibacksliding regulations, 18 AAC 83.480(b)(2).

Outfall 001 no longer exists and therefore all monitoring for that outfall from the previous permit no longer applies therefore antibacksliding regulations, 18 AAC 83.480(b)(2) no longer applies.

9.0 ANTIDEGRADATION

9.1 Receiving Waters

As described in Section 2.2 , outfall 002 discharges treated mine water, treated storm water, and treated domestic wastewater into Hawk Inlet. Ten storm water outfalls discharge to following receiving waters: one into Hawk Inlet, one to wetlands, one to Zinc Creek, and seven to Greens Creek.

9.2 Tier Determination

The Department's approach to implementing the antidegradation policy found in 18 AAC 70.015 is based on the requirements in 18 AAC 70 and *Interim Antidegradation Implementation Methods* dated July 14, 2010. Using these requirements and policies, the Department determines whether a waterbody or portion of a waterbody is classified as Tier 1, Tier 2, or Tier 3, where a larger number indicates a greater level of water quality protection. To qualify as a Tier 3, or "outstanding national resource" water, one of two criteria must be met. The water must either be 1) in a national or state park or wildlife refuge or 2) a waterbody with exceptional recreational or ecological significance. Greens Creek Mine is in Admiralty Island National Monument, which is managed by the U.S. Forest Service as part of the Tongass National Forest. Eight storm water outfalls are located in the federal monument: seven discharge into Greens Creek, and one discharges into Zinc Creek. All other treated wastewater and storm water discharges are outside the monument.

In 1980, the U.S. Congress established Admiralty Island National Monument and reserved the rights to mine the claims at the Greens Creek site. Section 503 of the Alaska Native Interest Land Conservation Act specifically allows mining at the Greens Creek claims unless otherwise revoked by the Secretary of Agriculture. Based on the intent of Congress and oversight authority assigned to the executive branch, the Department determined that the affected waters are not Tier 3 waters and conducted an antidegradation analysis assuming that the affected waters are Tier 2.

9.3 Analysis

In accordance with 18 AAC 70.015(a)(2), an antidegradation analysis was applied on a parameter-by-parameter basis to permit limits associated with reduction of water quality. The Antidegradation Policy of the Alaska WQS (18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing and designated uses must be maintained and protected. The Department may allow a reduction of water quality only after finding that five specific requirements of the antidegradation policy at 18 AAC 70.015(a)(2)(A)-(E) are met. The Department's findings follow.

(A) Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.

Rationale: Greens Creek Mine contributions to the socioeconomics of Southeast Alaska are important and highly significant. The mine is the largest private sector employer in Southeast Alaska directly providing employment for 330 fulltime equivalent positions and indirectly employing an additional 200 fulltime equivalent jobs. About 60% of the mine's employees live in Juneau, while an additional 20% live in Southeast Alaska. The mine provides over $32 million in pay and benefits annually. Greens Creek Mine pays more than $1 million annually in local property taxes and more than $5 million annually in State licensing taxes.

In 2009, Greens Creek Mine provided $50,000 in charitable contributions and $18,000 in scholarships. The mine has also instituted workforce development partnerships with University of Alaska and Alaska Department of Labor and has started a successful new miner training program geared toward training local people for employment at mine sites.

The operation of the Greens Creek Mine is important to the economy of Southeast Alaska. The Department finds that authorization of the mine's discharge accommodates important economic activity in the area and that this requirement is met.

(B) The reduced water quality will not violate applicable water quality criteria except as allowed under 18 AAC 70.015(a).

Rationale: Except within the mixing zone at outfall 002, the permit effluent limits prohibit violation of WQS in 18 AAC 70.020. Reduction of water quality in the mixing zone is specifically authorized in accordance with 18 AAC 70.240 to 18 AAC 70.270 (as amended June 26, 2003) and as allowed in 18 AAC 70.015(a)(2). The mixing zone has been sized to ensure that all applicable water quality criteria are met at all points outside of the mixing zone; therefore, reduction of water quality in the mixing zone is allowed under the antidegradation policy at 18 AAC 70.015(a)(2), and outside the mixing zone all applicable WQS are protected.

Storm water outfalls are prohibited from discharging water that is poorer quality than receiving water. This is imposed on a parameter-by-parameter basis for lead, zinc, total suspended solids, pH, and oil and grease. This permit requirement is more restrictive than the 2005 permit, which prohibited exceedance of WQS, because it prohibits any amount of degradation where the previous permit allowed degradation up to WQS.

The Department finds that the reduced water quality will not violate applicable water quality criteria and that the requirement is met.

(C) Resulting water quality will fully protect existing uses.

Rationale: Data and performance of TSF WWTP indicate that the water quality of discharges can and have fully protected designated and existing designated uses.

Regardless of the changes to the permit, these facilities are required and expected to continue protecting all designated and existing uses throughout the mine site and surrounding area. Additionally, the Hawk Inlet Monitoring Program, as required by the permit, ensures that all limits remain protective by analyzing the relationships between the chemical composition of local water, sediment, and aquatic organisms.

At outfall 002, the permit restricts flow and imposes technology-based ELGs for cadmium, copper, lead, mercury, TSS, and zinc. With the exception of flow, the permit imposes the same effluent limits for outfall 002 as contained in the 2005 permit. Upgrades to the contact storm water collection and treatment systems produced a 700 gpm increase in discharge capacity from 2,500 to 3,200 gpm. This change increases the mine's ability to treat and discharge water that may have been discharged without treatment. The design and impact of this change is to reduce the discharge of metals from untreated contact water and to benefit the local aquatic environment. With only one exception during the past five years of weekly sampling and analysis, all effluent limits have been met and a large margin of compliance maintained.

The Fresh Water Monitoring Program began in 1995 as a part of the mine's General Plan of Operations, which requires the U.S. Forest Service (USFS), land manager, approval. The Fresh Water Monitoring Program has remained unchanged since 2000 and is independent of the Waste Management Permit. When the mine received its first Waste Management Permit in 2001, DEC adopted the program as a permit requirement. Therefore, it's required primarily by the General Plan of Operations, secondarily by the USFS, and thirdly by the Waste Management Permit.

The Fresh Water Monitoring Program and the Hawk Inlet Monitoring Program have been in effect for a decade or more. They are designed to detect impacts of the mine's discharges on local fresh and marine water ecosystems. To date, no negative impacts from the mine's discharges on the local aquatic ecosystems have been documented. During the past five years, receiving water from Hawk Inlet locations 106, 107, and 108 have been sampled and analyzed four times per year for an array of constituents including those for which there is a mixing zone. Those receiving water quality data indicate that WQS have been met and all uses protected outside the mixing zone.

The Department finds that the resulting water quality will be adequate to fully protect existing and designated uses and that the requirement is met.

(D) The most effective and reasonable methods of pollution prevention control and treatment will be applied to all wastes and other substances to be discharged.

Rationale: As required in the 2005 permit, the permittee must continue to implement an approved BMP Plan. The BMP Plan includes pollution prevention measures and controls appropriate for each facility and discharge. The permittee is required to prepare a BMP Plan Annual Report (Permit Part 2.2.6.1) summarizing the site evaluations and inspections

performed during the year. Any modifications to the BMP Plan must also be noted in the Annual Report. The BMP Plan and Annual Report must be provided to DEC upon request. The design, construction, and performance of the TSF WWTP has also been reviewed and approved by the Department.

The Department finds the most effective methods of prevention, control, and treatment are the practices and requirements set out in this permit and currently in use at this mine.

(E) Wastes and other substances discharged will be treated and controlled to achieve the highest statutory and regulatory requirements.

Rationale: The "highest statutory and regulatory requirements" defined in 18 AAC 70.990(30) (as amended June 26, 2003) have been applied to outfall 002 and storm water outfalls 003 through 009. Accordingly, there are three parts to the definition. The first part of the definition includes all federal technology-based ELGs.

For outfall 002, the permit imposes the technology-based 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)).

For the ten storm water outfalls, the permit requires developing and implementing an approved BMP Plan including requirements of a storm water pollution prevention plan. Further, the permit prohibits storm water outfall discharges that increase the concentration of oil & grease, lead, zinc, or TSS, or reduces water quality for pH in the receiving waters.

The second part of the definition of "highest statutory and regulatory requirements" references 18 AAC 72.040, considers discharge of sewage to sewers, and is not applicable to this facility. Furthermore, 18 AAC 72.050, Minimum Treatment, establishes minimum treatment requirements for domestic wastewater. The SBR package plant handles all the mine's domestic wastewater and the effluent meets secondary treatment standards and is consistent with the minimum treatment requirements of 18 AAC 72.050.

The third part of "highest statutory and regulatory requirements" considers any more stringent treatment required by state law including 18 AAC 70 and 18 AAC 72. The permit requires the Permittee to develop and implement pollution prevention plans and a BMP Plan, which will control the discharges to satisfy all applicable state and federal limitations.

The Department finds that the treatment required in this permit achieves the highest statutory and regulatory requirements and that the requirement is met.

10.0 OTHER LEGAL REQUIREMENTS

10.1 Endangered Species Act

The Endangered Species Act requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and the USFWS (collectively referred to as the Services) if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult with NMFS or USFWS regarding permitting actions. However, the Department values input from the Services and solicited comments from them on reissuance of this permit.

In an email dated August 6, 2010, USFWS reported there are no endangered or threatened terrestrial species in the area of Greens Creek Mine. The NMFS identified the humpback whale and eastern Steller sea lion as threatened and endangered species in the vicinity of Greens Creek Mine discharges in a letter dated August 14, 2003. During permit development, DEC sent an email to NMFS requesting updates to the threatened and endangered species list on October 8, 2010.

In 1998, EPA prepared a Biological Evaluation (BE) to evaluate the potential impacts of the NPDES discharges authorized in the 1998 permit on the listed species. The BE concluded that issuance of the NPDES permit was not likely to adversely affect any of the threatened and endangered species. Because the effluent limits and most of the other permit conditions did not change from the 2005 permit conditions, DEC determined that reissuance of the permit is not likely to adversely affect any of the species.

DEC provided the Services with copies of the draft permit and fact sheet during the public notice period, and DEC also requested updates of the species lists. On May 2, 2011 USFWS and on May 3, 2011 NMFS commented on the draft permit. Comments received from the Services were considered prior to reissuance of this permit.

10.2 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 NMFS when a proposed 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 NMFS regarding permitting actions. However, the Department values input NMFS input and on October 8, 2010 solicited NMFS comments regarding EFH and reissuance of this permit. DEC provided NMFS with copies of the draft permit and fact sheet during the public notice period. On May 3, 2011, NMFS commented on the draft permit.

The Alaska Department of Fish and Game (ADF&G) has statutory authority at AS 16.05.841 and AS 16.05.871 to protect resident and anadromous fishes from development proposals that

will occur below the ordinary high water line in fish-bearing waters. DEC provided ADF&G with copies of the draft permit and fact sheet during the public notice period. On November 11, 2010 and April 28, 2011, ADF&G commented on the draft permit, and those comments are incorporated.

In the 1998 BE prepared by EPA, EPA determined that issuance of the current permit was not likely to adversely affect the threatened and endangered species. DEC believes that this same determination is appropriate for EFH for the reasons laid out in the BE. Therefore, DEC has determined that reissuance of the Greens Creek Mine permit is not likely to adversely affect EFH in the vicinity of the discharge.

10.3 Permit Expiration

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

11.0 References

ADF&G (Alaska Department of Fish and Game). 2010a. Greens Creek Mine APDES Recommendations. State of Alaska, Department of Fish and Game, November 17, 2010.

ADF&G. 2010b. Aquatic Biomonitoring at Greens Creek Mine, 2009. State of Alaska, Department of Fish and Game, May 2010, Technical Report No. 10-03.

DEC (Alaska Department of Environmental Conservation). 2003a. 18 AAC 70, Water Quality Standards. State of Alaska, Department of Environmental Conservation, June 26, 2003.

DEC. 2003b. Waste Management Permit 0211-BA001. State of Alaska, Department of Environmental Conservation, November 7, 2003.

DEC. 2008a. 18 AAC 83, Alaska Pollutant Discharge Elimination System. State of Alaska, Department of Environmental Conservation, October 31, 2008.

DEC. 2008b. 18 AAC 70, Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. State of Alaska, Department of Environmental Conservation, December 12, 2008.

DEC. 2009a. 18 AAC 70, Water Quality Standards. State of Alaska, Department of Environmental Conservation, September 19, 2009.

DEC. 2009b. 18 AAC 72, Wastewater Disposal. State of Alaska, Department of Environmental Conservation, December 23, 2009.

DEC. 2010. Interim Antidegradation Implementation Methods, Effective July 14, 2010. State of Alaska, Department of Environmental Conservation, Policy and Procedure No. 05.03.103.

EPA (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 1991, EPA/505/2-90-001.

EPA. 1993. Guidance Manual for Developing Best Management Practices (BMP). Office of Water, October 1993, EPA 833-B-93-004.

EPA. 1996a. NPDES Permit Writer's Manual. EPA, Office of Water, Office of Wastewater Management, Permits Division. Washington, DC. December 1996. EPA-833-B-96-003.

EPA. 1996b. The Metals Translator: Guidance for Calculation a Total Recoverable Permit Limit from a Dissolved Criterion. June 1996, EPA 823-B-96-007.

EPA. 1998. Memo on total vs. total recoverable metals from W. Telliard dated August 19, 1998.

EPA. 2005. Permit No. AK-004320-6, fact sheet, and response to comments. Seattle, WA, May 20, 2005.

HGCMC (Hecla Greens Creek Mining Company). 2009. Re-application package, Dated December 29, 2009, and Supplemental information.

HGCMC. 2010. Hawk Inlet Monitoring Program 2009 Annual Report. January 2010.

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

Figure 1: Facility Map

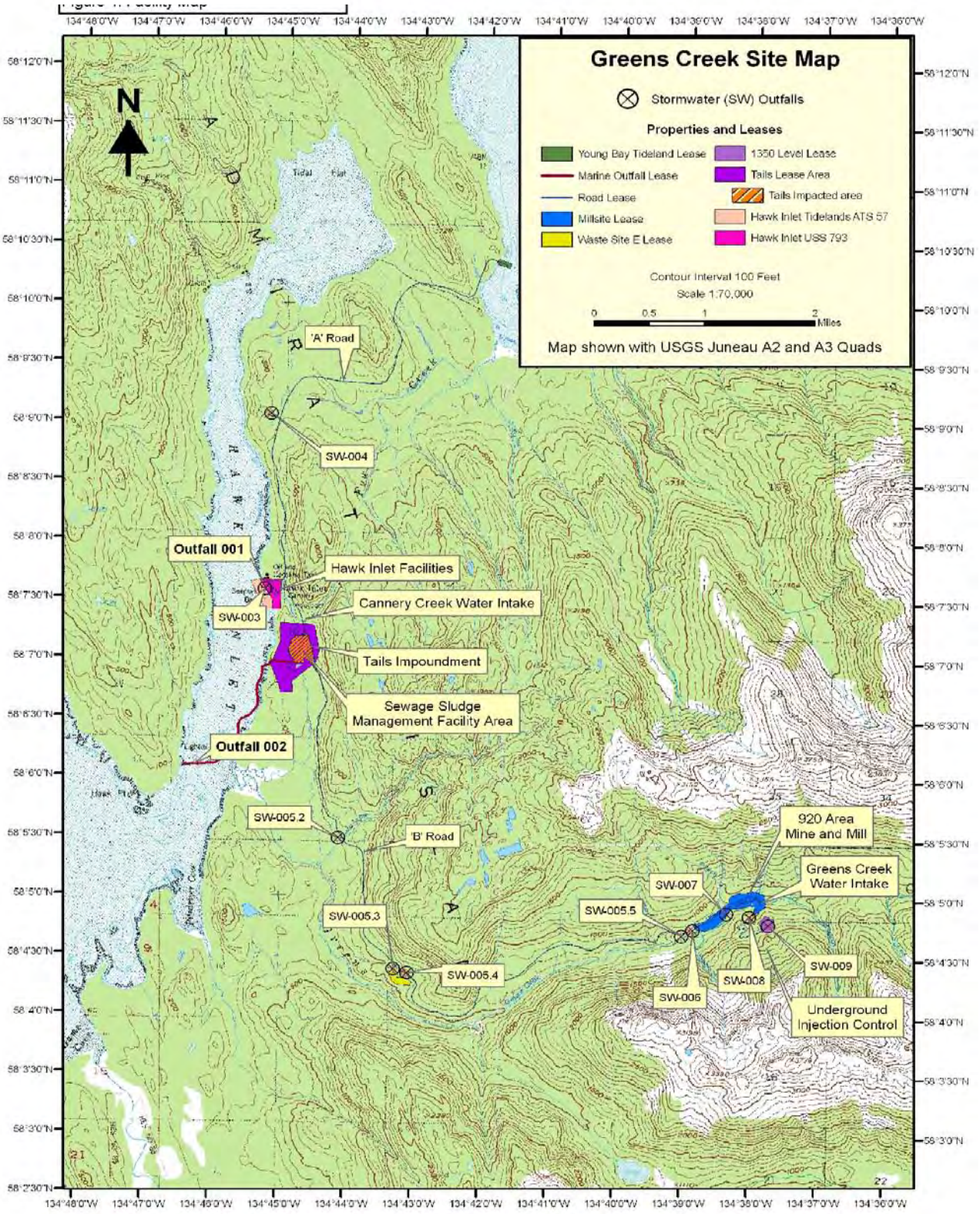
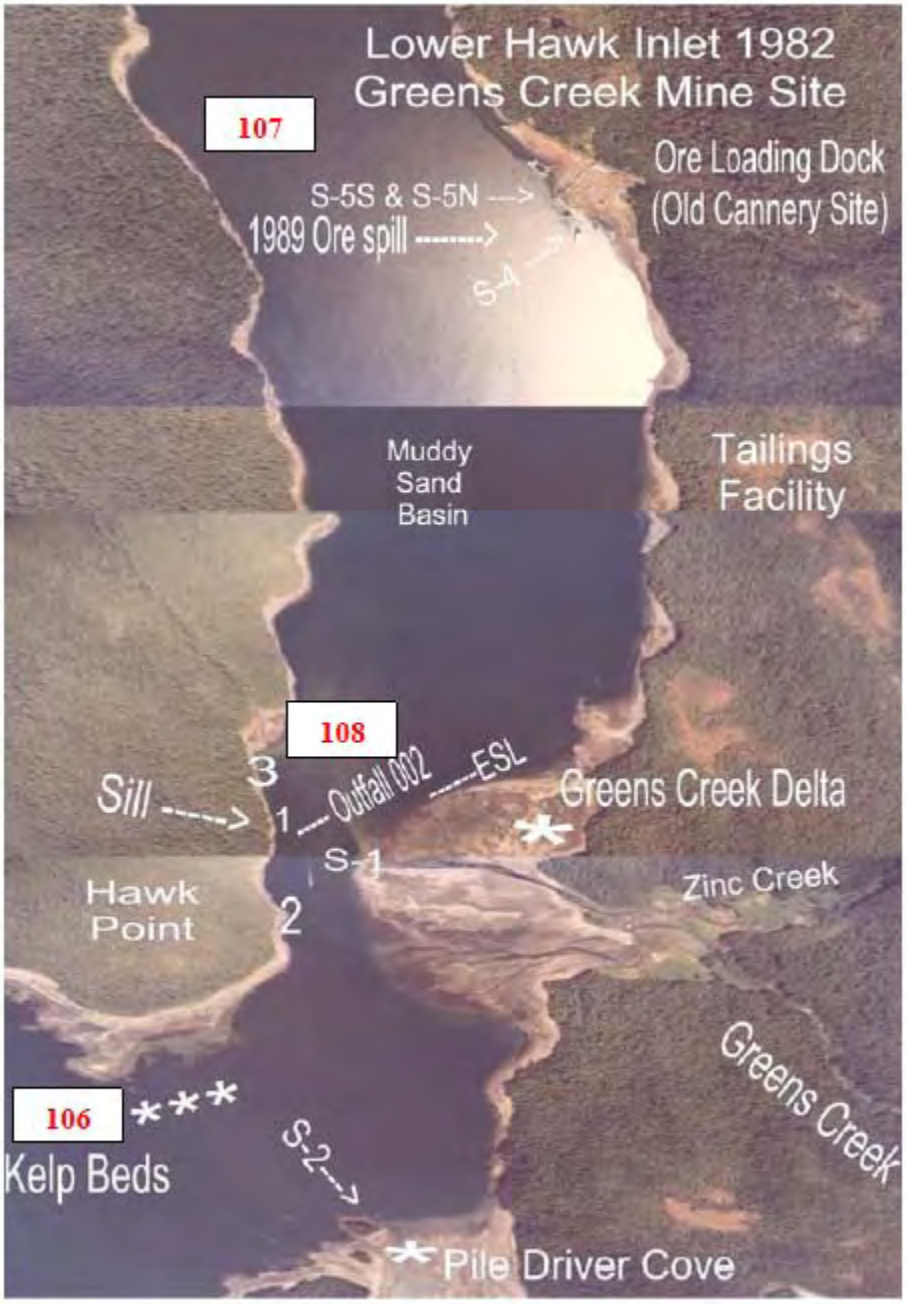


Figure 2: Hawk Inlet Monitoring Sites



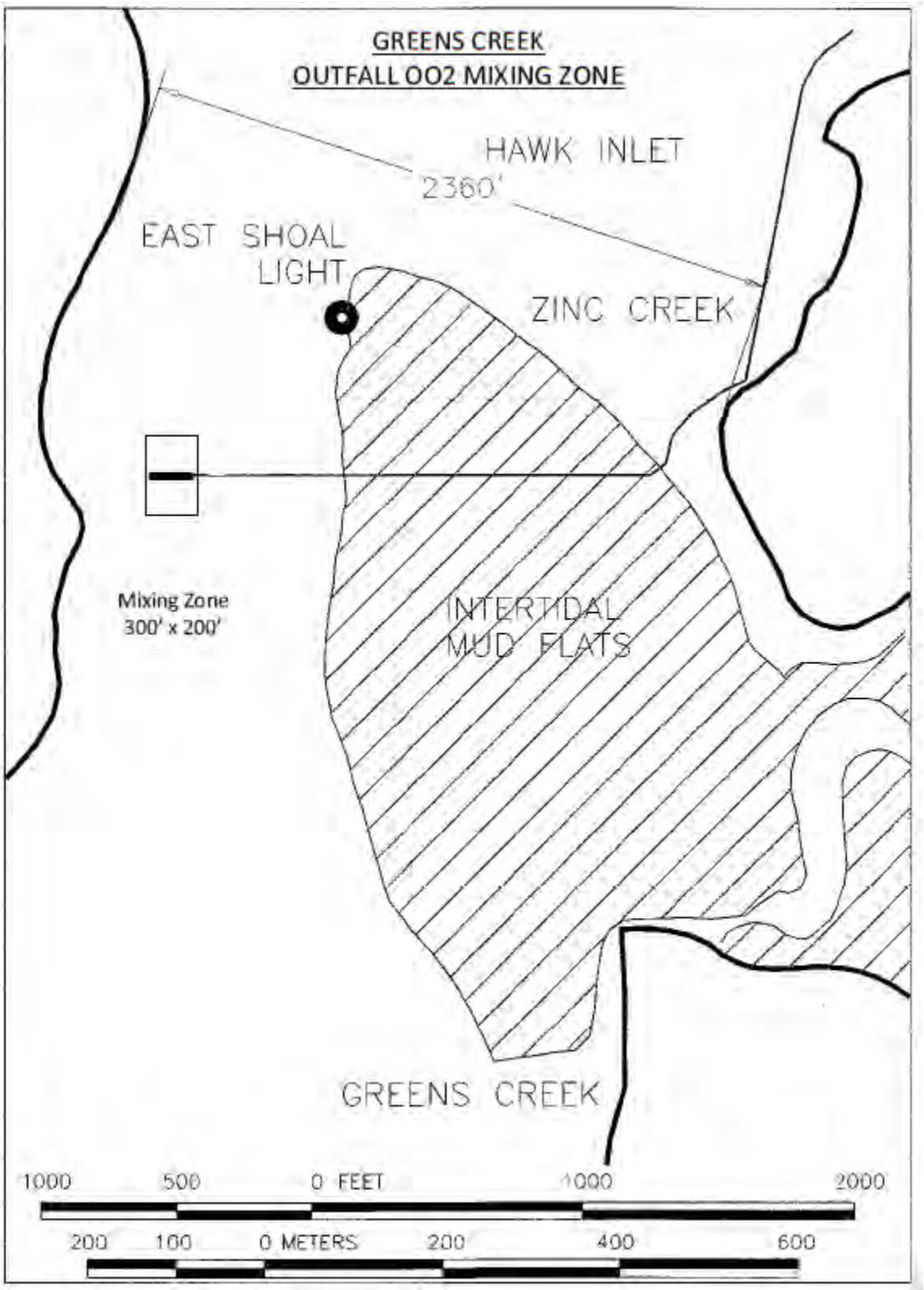
Notes:

a. Water column sampling locations are found at sites 106, 107, and 108.

b. Sediment sampling locations are found at sites S-1, S-2, S-4, and S-5(S-5S and S-5N are south and north sites, respectively.

c. In-situ bioassay sampling locations for marine worms are found at S-1, S-2, S-4 and for bay mussels at Stn1, Stn 2, Stn 3, and ESL.

Figure 3: Mixing Zone Diagram



APPENDIX - A FACILITY INFORMATION

Facility Name and Location		
Name:	Hecla Greens Creek Mine	
APDES ID Number:	AK0043206	
Location: Mailing Address:	18 miles southwest of Juneau on Admiralty Island P.O. Box 32199 Juneau, AK 99803	
Facility Background:	The facility's previous permit was effective July 1, 2005. The current permit application was received December 29, 2009.	
Non-Domestic System Information		
Treatment Train:	Degrit basins, settling pond, chemical precipitation, and pressure filtration	
Design Flow:	4.6 million gallons per day	
Existing Flow:	3.0 million gallons per day	
Months when Discharge Occurs:	Year round	
Outfall 002 Location:	Latitude: 58° 06' 06" North	Longitude: 134° 46' 20" West
Receiving Waterbody Information		
Receiving Waterbody:	Hawk Inlet	

APPENDIX - B 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. DEC 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, DEC first determines which technology-based effluent limits must be incorporated into the permit. DEC 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, DEC must include water quality-based effluent limits in the permit. The permit limits will reflect whichever requirements (technology-based or water quality-based) are more stringent. For outfall 002, since there is adequate dilution water available in Hawk Inlet for a mixing zone sized to dilute technology-based metals permit limits down to the state water quality standards, there is no need to conduct a water quality based analysis to determine if it is more stringent. The water quality-based analysis would have been required if there was insufficient dilution water available, or if the mixing zone size had to be restricted, with an associated reduction in dilution capability. This analysis would have resulted in more restrictive effluent limits.

II. Outfall 002 - Technology-Based Evaluation

Section 301(b) of the CWA requires industrial dischargers to meet technology-based effluent limitation guidelines (ELG's) established by EPA. These 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. The ELG is 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 New Source Performance Standards (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 B-1.

Table B-1: Outfall 002 - 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	1000	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, DEC 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.

Regulations at 18 AAC 83.435 implement section 301(b)(1)(C) of the CWA. These regulations require that 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).

In determining whether water quality-based limits are needed and developing those limits when necessary, DEC 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. Determine the applicable water quality criteria (see Section III.A).

2. Determine if there is "reasonable potential" for the discharge to exceed water quality criterion in the receiving water (see Section III.B).
3. If there is "reasonable potential", develop a WLA (see Section III.C).
4. Develop effluent limits based on the WLA (see Section III.C).

The following sections provide a detailed discussion of each step.

A. Water Quality Criteria

The first step in determining the need for and/or developing water quality-based limits is to determine 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 outfall 002 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 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)
- agricultural water supply - 18 AAC 70.020(b)(1)(A)(ii)
- aquacultural 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 any 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 of the water quality criteria applicable to those uses. For parameters with technology-based limits, cadmium, copper, lead, mercury, zinc, total suspended solids, and pH, the most stringent

criteria are for protection of aquatic life. For Hawk Inlet, the most stringent aquatic life criteria are summarized in Table B-2. The most stringent aquatic life criteria for wetlands, Greens Creek, and Zinc Creek are summarized in Table B-3.

Table B-2: Most Stringent of the Water Quality Criteria Applicable to Greens Creek Mine Discharges into Hawk Inlet (outfalls 002 and 003)

Parameter (µg/L unless otherwise noted)	Acute Aquatic Life Criterion	Chronic Aquatic Life Criterion
Cadmium (TR) [a, b]	40	8.85
Copper (TR) [a, b]	5.8	3.73
Lead (TR) [a, b]	217	8.47
Mercury (total) [b]	2.1	1.11
Zinc (TR) [a, b]	95	86.1
WAD cyanide	1.0	1.00
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 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.

Table B-3: Most Stringent of the Water Quality Criteria Applicable to Greens Creek Mine Discharges into wetlands, Greens Creek, and Zinc Creek (outfalls 004 through 009)

Parameter [a] (µg/L unless otherwise noted)	Acute Aquatic Life Criterion [b]	Chronic Aquatic Life Criterion [b]
Lead [c] (TR)	24	0.93
Zinc [c] (TR)	53	53
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 5^{th} percentile hardness of the receiving water is used to calculate the criteria since it is a reasonably conservative value protective under most conditions. The 5^{th} percentile hardness at Greens Creek background Site 48 is 38 mg/L $CaCO_3$ based on data collected from January 2005 through September 2010. Hardness data was not available for Zinc Creek.

B. Outfall 002 - Reasonable Potential Analysis

DEC 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 (and therefore whether a water quality-based effluent limit is needed). If the projected receiving water concentration exceeds the criterion, there is "reasonable potential", and a limit must be included in the permit. DEC 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 projected 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 projected effluent concentration): Per the TSD, the maximum projected 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 reported effluent concentration by a reasonable potential multiplier (RPM):

C_e = (maximum measured 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. See Table

B-4 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 95th percentile of the ambient data is generally used as an estimate of worst-case. The C_u's used for each parameter are provided in Table B-4.

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. Water quality criteria 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 water body are not impaired as a result of the mixing zone. A mixing zone is authorized at the discretion of DEC based on the WQS regulations.

The WQS allow for the use of mixing zones. Section 18 AAC 70.250 of the standards provides general conditions for mixing zones and 18 AAC 70.255 provides quality and size specifications 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: DEC authorized a mixing zone for metals representing a 1 part effluent to 79.4 parts receiving water for a dilution factor of 80.4.

Reasonable Potential Summary: Results of the reasonable potential analysis for outfall 002 are provided in Table B-4. Water quality-based limits were not needed for metals, cyanide, or fecal coliform bacteria in outfall 002.

Table B-4: Reasonable Potential Determination for Outfall 002

Parameter [a] (µg/L unless otherwise noted)	Effluent Data				Background Receiving Water Conc. (C_u) [f]	Maximum Projected Receiving Water Conc. (C_d)	Reasonable Potential [g] (yes or no)
	Maximum Effluent Conc. [b]	Coefficient of Variation (CV) [c]	Number of Samples [d]	Reasonable Potential Multiplier (RPM) [e]			
Cadmium	100	0.630	NA	1	0.0794	1.24	no
Copper	300	1.115	NA	1	0.726	3.73	no
Lead	600	1.029	NA	1	0.260	7.46	no
Mercury	2	0.762	NA	1	0.00120	0.0249	no
Zinc	1,000	0.753	NA	1	2.19	12.4	no
Cyanide	18	0.6	242	1.15	0	0.257	no
Fecal coliform, FC/100 mL	71	0.6	57	1.65	0	1.46	no

Notes:

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

b. For parameters with technology-based ELGs (cadmium, copper, lead, mercury, zinc), the maximum effluent concentration used to determine reasonable potential is the technology-based maximum daily limit (see Table B-1). The technology-based limit is used since water quality-based limits are only required if discharge at the technology-based limits has the reasonable potential to exceed WQS in the receiving water. For cyanide and fecal coliform the maximum effluent concentration used is the maximum detected concentration based on effluent samples collected by HGCMC from July 2005 through February 2010.

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 Jul. 2005 through Feb. 2010. The vast majority of the effluent data available for cyanide and fecal coliform 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. For parameters with technology-based ELGs, the RPM is 1, and the number of samples is not needed. For other parameters the RPM is based on the CV and the number of data points.

f. The receiving water concentrations are based on samples collected from Hawk Inlet monitoring location 106 representing background data of outfall 002 from 2006 through 2010. The concentrations are the 95th percentile of the data, except for cyanide and fecal coliform. The background fecal coliform was assumed to be zero and cyanide data at location 106 was reported at less than the method detection limit, or it was suspect due to huge discrepancies between labs (therefore zero was used as background).

g. Reasonable potential exists if C_d exceeds the most stringent applicable water quality criterion in Table B-2.

C. 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 B-5.

Table B-5: Summary of Storm Water Monitoring Data

Outfall	Receiving Water	Range of Data from Storm Water Monitoring							
		Flow (gpm)		Lead (µg/L)		Zinc (µg/L)		pH (s.u.)	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
003	Hawk Inlet	10	150	<1	86.4	98.1	368	7.0	7.6
004	Wetlands	0.5	60	<0.5	110	18.1	304	6.2	7.6
005.2	Zinc Creek	4	48	1.85	90.4	34.6	272	3.7	4.86
005.3	Greens Creek	3	3,140	1.74	124	426	1,180	6.8	7.4
005.4	Greens Creek	0.5	60	0.23	32.2	1.92	72.2	6.7	7.2
005.5	Greens Creek	0.5	6	546	15,300	813	19,400	7.6	8.9
006	Greens Creek	na	na	10.3	194	526	694	6.8	7
007	Greens Creek	2	100	279	2,220	390	2,990	6.8	7.5
008	Greens Creek	7	75	<1	18.6	54.4	490	6.8	7.5
009	Greens Creek	5	27	1.13	3.89	56.2	136	7.6	7.7

Storm water monitoring data is based on samples collected by the Permittee twice per year during storm events from March 2005 through September 2009.

Comparing the lead and zinc data in Table B-5 with the water quality criteria in Tables B-2 and B-3 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 includes an outfall-specific requirement that storm water discharge must not degrade the quality of the receiving waters. 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.

IV. Summary of Permit Effluent Limitations

As discussed in Section I of this appendix, technology-based limits were applied to each discharge and evaluated (via the reasonable potential evaluation discussed in Section III) 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 technology-based effluent limits for metals would not cause or contribute to an exceedance of WQS in Hawk Inlet. Therefore, water quality-based limits are not needed for metals, and the effluent limits for metals and pH in the permit are the technology-based limits shown in Table B-1. In addition, the reasonable potential analysis showed that the discharge of cyanide and fecal coliform bacteria would not cause or contribute to an exceedance of WQS. Therefore, water quality-based limits were not needed for these parameters.

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.

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 is sampled support the requirement that storm water outfall discharges must not degrade the quality of receiving waters. The permit also includes the requirement to develop outfall-specific BMPs.

APPENDIX - C MIXING ZONE ANALYSIS CHECKLIST - APPLIED AT OUTFALL 002

Mixing Zone Authorization Checklist

based on Alaska Water Quality Standards (2003)

The purpose of the Mixing Zone Checklist is to guide the permit writer through the mixing zone regulatory requirements to determine if all the mixing zone criteria at 18 AAC 70.240 through 18 AAC 70.270 are satisfied, as well as provide justification to authorize a mixing zone in an APDES permit. In order to authorize a mixing zone, all criteria must be met. The permit writer must document all conclusions in the permit fact sheet; however, if the permit writer determines that one criterion cannot be met, then a mixing zone is prohibited, and the permit writer need not include in the fact sheet the conclusions for when other criteria were met. See Section4.3 of the fact sheet for facility specific mixing zone analysis details.

Criterion	Description	Resources	Regulation	MZ Approved Y/N
Size	Is the mixing zone as small as practicable? Yes - Applicant collects and submits water quality ambient data for the discharge and receiving waterbody (e.g. flow and flushing rates) - Permit writer performs modeling exercise and documents analysis in fact sheet at: ►Appendix B, Table B-4: Reasonable Potential ►Section 4.3 Mixing Zone Analysis	•*Technical Support Document for Water Quality-based Toxics Control* •fact sheet, Appendix C •fact sheet, Appendix D • DEC's RPA Guidance • EPA Permit Writers' Manual	18 AAC 70.240 (a)(2) 18 AAC 70.245 (b)(1) - (b)(7) 18 AAC 70.255(e) (3) 18 AAC 70.255 (d)	Y

Criterion	Description	Resources	Regulation	MZ Approved Y/N
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? Yes		18 AAC 70.240 (a)(3)	Y
Low Flow Design	**For river, streams, and other flowing fresh waters.** NA - Determine low flow calculations or documentation for the applicable parameters. Justify in fact sheet	• fact sheet Section	18 AAC 70.255(f)	NA
Existing use	Does the mixing zone…			
	(1) partially or completely eliminate an existing use of the waterbody outside the mixing zone? No		18 AAC 70.245(a)(1)	Y
	(2) impair overall biological integrity of the waterbody? No		18 AAC 70.245(a)(2)	Y
	(3) provide for adequate flushing of the waterbody to ensure full protection of uses of the waterbody outside the proposed mixing zone? Yes		18 AAC 70.250(a)(3)	Y

Criterion	Description	Resources	Regulation	MZ Approved Y/N
	(4) cause an environmental effect or damage to the ecosystem that the Department considers being so adverse that a mixing zone is not appropriate? No		18 AAC 70.250(a)(4)	Y
Human consumption	Does the mixing zone…			
	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? No		18 AAC 70.250(b)(2)	Y
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? No		18 AAC 70.250(b)(3)	Y
Human Health	Does the mixing zone…			
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? No		18 AAC 70.250 (a)(1)	Y
	(2) contain chemicals expected to cause carcinogenic, mutagenic, tetragenic, or otherwise harmful effects to human			Y

Criterion	Description	Resources	Regulation	MZ Approved Y/N
	health? No			
	(3) create a public health hazard through encroachment on water supply or through contact recreation? No		18 AAC 70.250(a)(1)(C)	Y
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? Yes		18 AAC 70.255 (b),(c)	Y
	(5) occur in a location where the Department determines that a public health hazard reasonably could be expected? No		18 AAC 70.255(e)(3)(B)	Y
Aquatic Life	Does the mixing zone…			
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? No		18 AAC 70.250(a)(2)(A-C)	Y
	(2) form a barrier to migratory species? No			Y
	(3) fail to provide a zone of passage? No			Y

Criterion	Description	Resources	Regulation	MZ Approved Y/N
	(4) result in undesirable or nuisance aquatic life? No		18 AAC 70.250(b)(1)	Y
	(5) result in permanent or irreparable displacement of indigenous organisms? No		18 AAC 70.255(g)(1)	Y
	(6) result in a reduction in fish or shellfish population levels? No		18 AAC 70.255(g)(2)	Y
	(7) cause or create a reasonable expectation of lethality to organisms passing through it? No		18 AAC 70.255(b)(1)	Y
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? No		18 AAC 70.255(b)(2)	Y
Endangered Species	Are there threatened or endangered species (T/E spp) at the location of the mixing zone? Yes, Eastern Stellar Sea Lions and Humpback Whales. Are there likely to be adverse effects to T/E spp based on comments received from USFWS or NOAA. No		Program Description, 6.4.1 #5 18 AAC 70.250(a)(2)(D)	Y