ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – FINAL

Permit Number: AK0050571

Kensington Gold Mine

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

Public Comment Period Start Date: April 12. 2024
Public Comment Period Expiration Date: May 14, 2024
Alaska Online Public Notice System

Technical Contact: David Khan, PE
Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501
(907) 269-4028
Fax: (907) 269-7650
david.khan@alaska.gov

Re-issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to

COEUR ALASKA, INC.

For wastewater discharges from

Kensington Gold Mine into Sherman Creek and East Fork Slate Creek

The Alaska Department of Environmental Conservation (Department or DEC) re-issued an APDES individual permit to Coeur Alaska, Inc. 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 potential discharges from the Kensington Gold Mine and the development of the permit including:

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

Appeals Process

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

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

Documents are Available

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

Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program	
Anchorage Office 555 Cordova Street Anchorage, AK 99501 (907) 269-6285	***Juneau Office*** 410 Willoughby Ave., Suite 310 Juneau, AK 99801 (907) 465-5180

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1.0 APPLICANT

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

Name of Facility:	Kensington Gold Mine
APDES Permit Number:	AK0050571
Facility Location:	45 miles north of Juneau, Alaska
Mailing Address:	3031 Clinton Drive, Suite 202, Juneau, AK 99801
Facility Contact:	Peter Strow, Environmental Manager

Figures in APPENDIX A of this fact sheet show the location of the Kensington Gold Mine along with discharge and monitoring locations and a line drawing of the water balance.

2.0 FACILITY INFORMATION

2.1 Background

The Kensington Gold Mine is an underground gold mine located 45 miles north of Juneau, Alaska on a peninsula between Berners Bay and Lynn Canal. Coeur Alaska, Inc. (Coeur) operates the mine. Kensington started production in 2010 with an estimated mine life of 10.5 years. The permit was originally issued as a National Pollutant Discharge Elimination System (NPDES) permit in 1998 and reissued in 2005. Two more reissuances occurred in 2011 and 2017 under the APDES Program.

The Facility is located at the southern end of the Kakuhan Range of the coastal mountains in the Tongass National Forest on the small peninsula formed between Lynn Canal and Berners Bay. The Site is currently accessible by floatplane, helicopter, or boat. The mine is within the administrative boundary of the City and Borough of Juneau.

The mine produces approximately 2,000 tons/day of ore. Milling began in 2010, and results of exploration activities or other factors could extend the life of the operation beyond the currently estimated 10.5 years. At the time of the permit renewal application, permitting is underway for a life of mine extension for 10 additional years of tailings and waste rock storage capacity with the approval of POA-1. The mill and mine operate 24 hours per day, 7 days a week. A gold concentrate is produced at the mill, packed in containers, and transported for off-site processing. Tailings from the mill are either sent to the Paste Backfill Plant, to be processed and placed in the underground mine, or are placed at the Tailings Treatment Facility (TTF),

Kensington lies within the Sherman, Johnson, and Slate Creek drainages. Mine infrastructure in the Sherman Creek drainage includes an adit, waste rock dump, warehouse, and water treatment plants. Here, drainage from the mine is treated and discharged to Sherman Creek at Outfall 001. Sherman Creek drains to Lynn Canal.

A mine portal, mill, waste rock dump, and man camp are located within the Johnson Creek Drainage. The TTF is located in Slate Creek. Water from the TTF is treated and discharged to East Fork Slate Creek at Outfall 002. Johnson and Slate Creeks drain to Berners Bay.

2.2 Facility and Wastewater Description

The Kensington facility consists of the following major elements:

- An underground mine that utilizes long-hole stoping and conventional mining methods with ramps for transferring ore and waste rock to the surface;
- A mill that concentrates gold bearing minerals from the ore through crushing and grinding, gravity concentration, and flotation;
- Two tailings management systems: An underground plant that produces cemented paste backfill that is placed underground and a TTF, with an engineered dam, located in Lower Slate Lake;
- Dumps for the disposal of non-acid generating waste rock;
- Water management systems that maximize recycling and treat all waters affected by the project in accordance with pertinent federal and state legislation;
- A wharf for transporting men and materials to and from the site;
- A network of private roads;
- On-site power generation and electrical distribution;
- A man camp with showers, lavatories, and recreation and dining facilities; and
- An assortment of shops, warehouses, and offices to support mine operations.

The permit continues authorization of the discharge of treated wastewater to Sherman Creek and East Fork Slate Creek from Outfall 001 and 002, respectively. With a mean annual precipitation of 85 inches, Kensington operates at a net positive water balance thus necessitating the need to discharge excess water.

Outfall 001

Outfall 001 discharges treated effluent from the Comet mine water treatment plant (MWTP) to Sherman Creek. This water is collected from the underground mine that includes workings on the Comet and Jualin sides of the hydrologic divide and conveyed to the Comet workings.

Influent flows vary on a seasonal basis with highest inflows during spring snowmelt and heavy precipitation (rainfall) events during the autumn. Lowest flows occur during mid-winter when there is deep snow cover and little, if any, infiltration and groundwater recharge. Previously, average monthly flows during the high-flow months are in the range of 1,600 to 2,500 gallons per minute (gpm). The permit application includes a request to increase the authorized discharge flow limit at Outfall 001 to accommodate the increasing trend in flows from the underground mine observed over the last five years. Design parameters the treatment system expansion will maintain the existing level of treatment as a minimum. This permit approves a maximum flow increase of 1,500 gpm over the previous permit. The maximum flow limit for Outfall 001 increases to 4,500 gpm.

Treatment at the Comet MWTP is a combination of coagulation, flocculation, clarification, and multimedia filtration. The Comet MWTP has two MWTPs: the original plant (Comet 1) and the plant expansion installed in late 2010 (Comet 2). Currently, each plant has a capacity to treat 1,500 gpm for a total of 3,000 gpm. Two separate mine water streams are treated and combined before discharge. With Department review and written approval, the current system may be upgraded to increase the total capacity to 4,500 gpm.

The Comet MWTP is designed to remove suspended solids from groundwater collected in the mine. The plant process incorporates several individual stages, including coagulation using ferric chloride, polymer addition, clarification, solids filtration, and hydrochloric acid addition for pH control. Ferric chloride and polymer are added to facilitate flocculation of solids for settling in the clarifier. Clarified water is further filtered to remove residual solids prior to final discharge. Hydrochloric acid is only added under unusual circumstances, such as when grouting is being done underground and the influent pH is greater than 8.5.

Most of the solids removed by clarification are recycled back to the clarifier to enhance solids settling. A portion of the solids are collected and dewatered in a filter press. The solids are disposed of in the Comet Development Rock Stockpile as approved by the Alaska Department of Environmental Conservation (DEC) (2013).

The proposed expansion would resemble the 2010 plant expansion (Comet 2) that added additional capacity to account for flows in a very wet month. Both system expansions are based on the same treatment processed as the original treatment system. These treatment processes use proven technology, and water quality data from the water treatment plants' effluent indicates that it performs effectively.

<u>Outfall 002</u>

At Outfall 002 the treatment system is designed to remove non-soluble metals and soluble aluminum, which precipitates at a circumneutral pH, from the TTF water. The maximum capacity of the TTF water treatment plant (WTP) is 2,000 gpm. Outfalls 002 and 003 are within the WTP system but each have separate monitoring locations and requirements based on whether the discharge includes flow augmentation treatment. The monitoring location for Outfall 002 is after the WTP and prior to flow augmentation treatment.

The basic treatment scheme is like the process used in the Comet MWTPs. Treatment begins with the addition of reagents to promote coagulation and flocculation, with the ability to add caustic or acid solutions for pH modification. The next major process is clarification. Clarified wastewater is forced through multi-media filters and, additionally, through carbon filters. The treatment process described uses proven technology, and water quality data from the water treatment plant effluent indicates that it performs effectively.

Treated effluent from Outfall 002 is discharged to East Fork Slate Creek. The discharge at Outfall 002 is necessary to maintain sufficient freeboard within the TTF, in accordance with the Alaska Department of Natural Resources *Certificate of Approval to Operate a Dam*. Inflows to the TTF include pumped tailings slurry from the mill, direct precipitation, undiverted runoff from adjacent drainage areas, and overflow from the Upper Slate Lake diversion structure (during periods of high flow). In addition, the TTF may receive seepage from graphitic phyllite (see Section 3.0.).

<u>Outfall 003</u>

Outfall 003 is a new outfall for the purpose of establishing compliance limits for sulfate after flow augmented treatment authorized to meet WQBELs for sulfate. Outfalls 002 and 003 discharge WTP effluent downstream of the final process unit. Each outfall provides a compliance monitoring location within the WTP system relative to the flow augmentation system (authorized later in this section). The monitoring location of Outfall 003 is after flow augmentation. The treated and flow augmented discharge is limited to maximum flow 4,000 gpm which establishes a dilution ratio of 1:1 based on the maximum flow rate established for Outfall 002. Sulfate limits are established in the permit based on WQS of 250 mg/L average monthly **limit** and 500 mg/L maximum daily limit.

Background: Questions regarding a previously unidentified flow augmentation treatment at the Lower Slate Lake WTP were raised in comment by EPA on the draft Environmental Impact Statement in early 2021. In response to the comments, DEC committed to addressing the concerns in the reissuance of this permit.

In August, 2021, the Department received a sulfate treatment evaluation report from Coeur, and approved plans for the construction of a reverse osmosis (RO) treatment system at the underground paste plant. Coeur reported that the flow augmentation connection valve was closed on May 11, 2022, and they have not augmented discharge flow since then. The report on the evaluation of the sulfate source concluded that the water cycle between the TTF, mill facility and underground paste plant has caused increasing sulfate levels in the TTF beyond the expected influent concentration in the original WTP design. Based on the findings, Coeur was authorized to install a reverse osmosis (RO) treatment system to the underground paste plant to remove sulfate from the mine water system and thus reducing the sulfate mass loading to the TTF. The treatment system is sized to accept 120 gallons per minute (gpm) of flow and is expected to remove 99% of sulfate. Reducing and maintaining the concentration of sulfate in the TTF to below 250 mg/L is the goal of the sulfate reduction plan to ensure compliance with the permit limit for sulfate. Mass balance calculations predicted the time required to reduce the current concentration of sulfate in Lower Slate Lake from 440 mg/L to below 250 mg/L is about 3.5 years of continuous RO treatment system operation.

\Although the reasonable potential analysis of the effluent sulfate concentration indicated that there is no reasonable potential of the discharge to exceed water quality standards based on the period of analysis, a review of the sulfate trend, a review of source control, water treatment options and future environmental concerns suggested by data, the department determined that maintaining the flow augmentation system in necessary to protect sulfate WQS. As the mine workings advance, sulfate concentrations within new orebodies vary and causing the influent quality to vary widely as evidenced in historical influent data. The RO treatment remains the primary treatment for underground sulfates with flow augmentation used, as necessary, for backup. Construction of a back dam between Upper and Lower Slate Lakes and a northern diversion channel diverting Upper Slate Lake water around Lower Slate Lake are expected to exacerbate the increasing sulfate trends. Once constructed these structures will cut off any natural hydrologic connections between Upper and Lower Slate Lakes, which will mean losing natural input of water that dilutes sulfates in the tailings facility. That will accelerate the already increasing sulfate concentration trend in the tailing facility. Since improvements to currently implemented treatment and source control options have been seemingly exhausted, the department finds flow augmentation necessary to protect Alaska's WQS for sulfate.

Flow Augmentation Regulation

This permit authorizes flow augmentation in Permit Part 1.4.6. Analysis and justification authorizing flow augmentation must be according to 40 CFR 125.3(f), which specifies that technology-based treatment requirements cannot be satisfied through the use of "non-treatment" techniques such as flow augmentation and does allow for flow augmentation as a method of achieving water quality-based standards on a case-by-case basis when:

1. The technology-based treatment requirements applicable to the discharge are not sufficient to achieve the standards;
2. The discharger agrees to waive any opportunity to request a variance under section 301 (c), (g) or (h) of the Act; and
3. The discharger demonstrates that such a technique is the preferred environmental and economic method to achieve the standards after consideration of alternatives such as advanced waste treatment, recycle and reuse, land disposal, changes in operating methods, and other available methods (source control).

Flow Augmentation Analysis

Under 40 CFR 125.3(f), it specifies that technology-based treatment requirements cannot be satisfied through the use of "non-treatment" techniques such as flow augmentation and does allow for flow augmentation as a method of achieving water quality-based standards on a case-by-case basis. Permit Part 1.4.6 authorizes flow augmentation. Since there are no technology-based effluent limits for the pollutant of concern sulfate, treatment through flow augmentation is permissible with further analysis.

For the first requirement, flow augmentation is permissible if technology-based treatment requirements applicable to the discharge are not sufficient to achieve the standards. As stated earlier, there are no technology-based treatment requirements for sulfate thus, further evaluation of this stipulation is unnecessary.

For the second requirement, the discharger must agree to waive any opportunity to request a variance under section 301 (c), (g) or (h) of the CWA. The discharger has submitted a request to the department waiving all requests for variance under section 301 (c), (g) or (h) of the CWA. The department accepted the request and added it to the administrative record of this permit.

For the third requirement, the discharger must demonstrate that flow augmentation is the preferred environmental and economic method to achieve the standards after consideration of alternatives such as advanced waste treatment, recycle and reuse, land disposal, changes in operating methods, and other available methods (source control). The permittee has conducted an analysis of preferred environmental and economic methods, which are provided below, as well as having recently performed a comprehensive Environmental Impact Statement for the project that also evaluated similar alternative analysis objectives. Further analysis of the third requirement is below.

Analysis of Environmentally and Economically Preferred Method for Sulfate Compliance

The flow augmentation strategy pursued at Kensington Mine involves mixing of the TTF WTP effluent with low sulfate receiving water in a pipe. This occurs at a point next to the TTF where the receiving water is already in another pipe for diversion around the TTF and release back to the natural channel of East Fork Slate Creek below the TTF dam at Outfall 003. The permittee has considered alternatives to flow augmentation. A discussion of alternatives in the categories of alternatives described in EPA FA policy and guidance are below:

Advanced Wastewater Treatment: The TTF WTP employs best available treatment technologies for mine water treatment. This treatment is not effective for removal of sulfate down to effluent concentrations below the WQS of 250 mg/L. Advanced treatment for sulfate involves membrane separation by either reverse osmosis (RO) or nanofiltration (NF) – to remove sulfate from the effluent of the current WTP in a brine stream. Coeur has studied use of RO on the TTF WTP effluent and determined the method successful for sulfate removal. However, the handling and final disposition of brine flow ranging up to several hundred gallons per minute represents a significantly greater level of complexity and cost that is not preferred environmentally or economically.

The brine stream cannot be recycled to the mine/mill area because the sulfate diminishes milling efficacy and does not reduce sulfate from the overall treatment system – which is the objective in addressing sulfate reduction in the discharge. Further, the use of the WTP effluent RO brine in the paste backfill plant is a limited option for sequestering sulfate in the paste backfill underground and would not be an option for most of the brine flow. Pumping RO brine from the TTF to the mine area was considered and determined to be more costly and use more energy than by sequestering of sulfate on a flow stream in the mine area. The department concluded that advanced wastewater treatment to achieve compliance with the sulfate limits is not preferred environmentally or economically.

Recycle and Reuse: The Kensington mill is located on the mill bench in the mine area and takes feed water for ore milling (producing a concentrate for finish milling offsite) and ancillary uses mainly from TTF decant water. An average flow rate of 220 gpm is pumped back to the mill, comprising nearly 100 percent of feed to mill uses. Reuse of this portion of the TTF decant reduces the quantity of water that is discharged to the East Fork of Slate Creek after treatment at the TTF WTP. This recycling and reuse are different from the disposition of brine from advanced wastewater treatment (see above), because the TTF WTP brine recycle would contain several times higher sulfate than TTF decant. Water use strategies are a priority and Coeur Alaska pursues all means possible to maximum reuse and recycling. Demand for water to run the mill as well as the paste plant is limited by the mining rate and mineral concentrates production capacity at the Kensington Mine, and demand for water at the Mill is already supplied by the current recycle rate. Recycle and reuse are not viable as a way of achieving compliance with the sulfate WQS for East Fork Slate Creek.

Land Disposal: The Kensington Mine is situated on steep mountainous terrain, with no large tracts of land having shallow enough slope to accommodate land disposal of the TTF WTP effluent flow. Also, soil and bedrock conditions would not be conducive to retention of the effluent, leading to surfacing of the effluent. Finally, high annual precipitation and winter conditions with heavy snow cover would preclude land disposal for 5 to 6 months of the year and storage for up to 518 million gallons of effluent (1,590 acre-feet of storage for the design flow of 2,000 gpm for 6 months) would be required. Space for such an impoundment may not be available at all and, if available, not close to the TTF area. Construction and pumping costs would be high and energy use for pumping would not be preferred environmentally. Land disposal is infeasible at the Kensington Mine.

Changes in Operating Methods – Source Control: The original source of sulfate in mine water and tailings decant is oxidation of sulfide minerals. This source varies with the sulfide content as the mine workings are advanced and is not a controllable process. However, Coeur did find a way to achieve a degree of source control for sulfate by routing a stream from the mill to serve as feed water to the paste backfill plant. The feed is treated in a 120 gpm RO system to concentrate sulfate, which has a beneficial effect on the paste process, producing approximately 20 gpm of RO brine as a high sulfate feed water to the paste plant. The permeate from the RO is routed to the mill for use in ore processing and reduces the concentration of sulfate in the tailings slurry, the TTF decant, and the TTF WTP effluent (Outfall 002). At the time the RO system was being developed, a sulfate modeling exercise was conducted using historical and estimated future flows, TTF volume changes and sulfate data. The model projected that, over time, the sequestering of sulfate in the paste backfill would lower sulfate enough in the TTF decant and TTF WTP effluent so that flow augmentation would not be needed after about 3.5 years of RO system operation, as stated in the draft permit fact sheet.

The paste plant is limited in the feed flow of brine that can be used (20 gpm), although the concentration of sulfate in the feed flow can be increased, as sulfate is beneficial to the properties of the paste backfill produced. To do this would require supplemental technology added to the RO system or a complete replacement with technology that can achieve a higher water recovery efficiency, thus allowing the processing of higher feed flows and sequestering of more sulfate than the current RO system. The current RO system already achieves over 83 percent efficiency, so increases in flow and quantity of sulfate sequestered with greater efficiency would be limited. The achievable magnitude of this increase would be limited by the technology used, the flow rate of permeate that can be used in the mill, and the concentration of sulfate in the brine relative to saturation. This higher efficiency system would take time to develop, be more costly to implement, and potentially be subject to more operational challenges than the current RO system.

Additional Rationale:

- The potential for changes in sulfate input into the TTF and TTF decant to the WTP are unpredictable and dependent on the mineralogy of the ore as it changes as it is mined. Sulfate mineral concentrations and groundwater quality within new orebodies affect influent water quality. Sulfate data trend indicates that the facility will have difficulty maintaining sulfate limits as the concentration of sulfate increases within the treatment facilities. The primary WTP requires flow augmentation treatment to maintain long-term compliance with sulfate permit limits.
- The diversion channel and back dam construction are part of the planned and authorized activities. Once constructed, the two structures increase the tailing storage capacity of the TTF while ensuring an adequate 200-year storm event buffer for the facility. However, an unintended consequence of the construction of a northern diversion channel and the TTF back dam diversion inlet structure may be less natural meteoric water input to the TTF which could lead to increased sulfate concentrations.
- The reverse osmosis treatment system is the primary treatment for underground sulfates to ensure compliance with the WQS.

In summary, the Department determined that flow augmentation for sulfate at Outfall 003 meets the conditions of 40 CFR 125.3(f) for authorization in this permit.

3.0 COMPLIANCE HISTORY

Discharge Monitoring Reports (DMRs) from April 2017 to November 2023 were reviewed to determine the facility's compliance with effluent limits.

Table 1 presents permit limit exceedances for Outfall 001. For each exceedance, Coeur submitted an incident report with plans to prevent a recurrence.

Table 1: Outfall 001 Permit Limit Exceedances

Parameter	Date	Monitoring			
		Basis	Units	Permit Limit	Reported Value
pH	11/30/2017	pH Range	Standard Units	<=8.5	10
pH	11/30/2017	pH Range	Standard Units	>=6.5	6.3
Copper	3/31/2018	Daily Maximum	µg/L	7.5	10.8
Copper	10/31/2018	Daily Maximum	µg/L	7.5	8.5
Copper	4/30/2023	Daily Maximum	µg/L	7.5	8.3
Copper	4/30/2023	Monthly Avg.	µg/L	2.3	3.1

Table 2 presents permit limit exceedances for Outfall 002. For each exceedance, Coeur submitted an incident report with plans to prevent a recurrence.

Table 2: Outfall 002 Permit Limit Exceedances

Parameter	Date	Monitoring			
		Basis	Units	Permit Limit	Reported Value
TDS	12/31/2020	Daily Maximum	mg/L	500	512

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Permit Effluent Limits

18 AAC 83.015 prohibits the discharge of pollutants to waters of the U.S. without first obtaining a permit authorized by the APDES Program that meets the purposes of Alaska Statutes 46.03, in accordance with Clean Water Act (CWA) Section 402 and the requirements adopted by reference at 18 AAC 83.010.

The CWA requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits (TBELs) or water quality-based effluent limits (WQBELs). TBELs are set according to the level of treatment that is achievable using available technology. WQBELs are set as the permit limit if they are more stringent than TBELs to ensure that the receiving water quality is protected.

4.1.1 TBELs Based on ELGs

EPA promulgated effluent limitation guidelines (ELGs) for the ore mining and dressing point source category at 40 CFR Part 440, which include TBELs for this point source category. Subpart J is applicable to Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategories. New source ELGs are applicable for Kensington Gold Mine where construction commenced after these ELGs became effective on December 3, 1982.

Table 3 identifies the parameters and TBELs for Outfalls 001 and 002 found in 40 CFR Part 440.

Table 3: Technology-Based Effluent Limits for Outfalls 001 and 002

Parameter	Units	Daily Maximum	Monthly Average	Range
Cadmium	mg/L[a]	0.10	0.05	-
Copper	mg/L	0.30	0.15	-
Lead	mg/L	0.6	0.3	-
Mercury	mg/L	0.002	0.001	-
Zinc	mg/L	1.5	0.75	-
pH	s.u.[b]	-	-	6.0-9.0
Total Suspended Solids (TSS)	mg/L	30.0	20.0	-

a. Milligrams per liter.
b. Standard units.

4.2 Water Quality-Based Effluent Limit

CWA Section 301(b)(1) requires the establishment of effluent limits in permits necessary to meet water quality standards (WQS) by July 1, 1977. All discharges to state waters must comply with WQS, including the Antidegradation Policy. Per 18 AAC 83.435(a)(1), APDES permits must include conditions to meet any applicable requirement in addition to, or more stringent than, TBELs (e.g., WQBELs) that "achieve WQS established under CWA Section 303, including State narrative criteria for water quality."

4.3 Basis for Effluent and Receiving Water Monitoring

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.

4.4 Effluent Limits and Monitoring Requirements

The permit contains effluent limits that are the most stringent of either TBELs or WQBELs and a flow limit based on the design of the treatment systems. Monitoring frequencies are based on the nature and effect of a pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. Permittees have the option of taking more frequent samples than are required under the permit. These samples must be included in calculations and used for averaging if they are conducted using the Department-approved, significantly sensitive test methods (generally found in 18 AAC 70 and 40 CFR Part 136 [adopted by reference in 18 AAC 83.010]) and if the method detection limits (MDLs) are less than the effluent limits or the applicable compliance evaluation level.

Table 4 summarizes the effluent limits and monitoring requirements for Outfall 001 and monitoring frequencies for Outfall 001 and Outfall NPDES 001B and provides a comparison to the limits in the previous permit. Please see APPENDIX B for more details regarding the legal and technical basis surrounding the selection of effluent limits

Table 4: Effluent Limits and Monitoring Frequencies for Outfall 001 (Sherman Creek)

Parameter[b]	Units	Effluent Limits[a]					
		Daily Maximum		Monthly Average		Monitoring Frequency	
		2017 Permit	This Permit	2017 Permit	This Permit	2017 Permit	This Permit
Aluminum	µg/L[c]	155	X	66	X	1/Week	1/Week
Ammonia, Total	mg/L[d] as N	9.0	5.8	4.0	3.2	1/Week	1/Week
Cadmium	µg/L	0.21	0.24	0.15	0.20	1/Week	1/Week
Copper	µg/L	7.5	9.9	2.3	3.9	1/Week	1/Week
Iron	mg/L	1.8	1.8	0.705	0.73	1/Week	1/Week
Lead	µg/L	2.2	2.5	1.1	1.9	1/Week	1/Week
Manganese	µg/L	150	___	50	___	1/Week	___
Mercury	µg/L	0.02	0.02	0.01	0.01	1/Week	1/Week
Nitrate	mg/L as N	___	14	___	10	1/Week	—
Zinc	µg/L	68	88	23	54	1/Week	1/Week
Sulfate associated with Na & Mg	mg/L	200	X	200	X	1/Week	1/Week
TDS	mg/L	1,000	X	1,000	X	1/Week	1/Week
Turbidity, effluent	NTU[f]	See Permit	—	See Permit	—	1/Week	—
pH	s.u.[e]	See Permit	See Permit	See Permit	See Permit	Continuous	Continuous
TSS	mg/L	30	30	20	20	1/Week	1/Week
Flow	gpm	3,000	4,500	3,000	4,500	Continuous	Continuous

Parameter[b]	Units	Effluent Limits[a]					
		Daily Maximum		Monthly Average		Monitoring Frequency	
		2017 Permit	This Permit	2017 Permit	This Permit	2017 Permit	This Permit
Whole Effluent Toxicity (WET)	TU_c [g]	1.6	1.6	1.1	1.1	1/Month	1/Quarter

a. A line "—" indicates that no limit or monitoring required, and an "X" means no limit with monitoring only.
b. All metals shall be measured as total recoverable.
c. Micrograms per liter.
d. Milligrams per liter.
e. Standard units.
f. Nephelometric Turbidity Units.
g. Chronic toxic units.

As required under 18 AAC 83.435, a reasonable potential analysis was conducted on five years of monitoring data collected during the previous permit period to determine if effluent from Outfall 001 has reasonable potential to exceed Alaska Water Quality Standards (WQS).

Effluent limits must be developed for parameters that have a reasonable potential to exceed WQS. Analysis of recent data resulted in several changes to the effluent limits in the permit. Some limits have become more stringent, while other limits have become less stringent. For parameters that did not demonstrate reasonable potential, limits or monitoring requirements may have been revised or removed. To justify these less stringent limits in the permit, the Department is required to conduct an anti-backsliding analysis, which is provided in Permit Part 6.0.

Table 5 summarizes the effluent limits for Outfall 002 and provides a comparison to the limits in the previous permit.

Table 5: Effluent Limits and Monitoring Frequencies for Outfall 002 (East Fork Slate Creek)

Parameter[b]	Units	Effluent Limits[a]					
		Daily Maximum		Monthly Average		Monitoring Frequency	
		2017 Permit	This Permit	2017 Permit	This Permit	2017 Permit	This Permit
Aluminum	µg/L[c]	160	___	57	___	1/Week	1/Week
Ammonia, Total	mg/L[d] as N	X	4.6	X	2.8	1/Week	1/Week
Cadmium	µg/L	0.36	0.30	0.12	0.19	1/Week	1/Week
Copper	µg/L	10.5	11	5.6	5.8	1/Week	1/Week
Iron	mg/L	1.84	X	0.65	X	1/Week	1/Week
Lead	µg/L	3.6	2.8	1.8	2.0	1/Week	1/Week
Manganese	µg/L	145	___	50	___	1/Week	___
Mercury	µg/L	0.02	0.02	0.01	0.01	1/Week	1/Week
Nitrate	mg/L as N	—	14	—	10	1/Week	1/Week

Parameter[b]	Units	Effluent Limits[a]					
		Daily Maximum		Monthly Average		Monitoring Frequency	
		2017 Permit	This Permit	2017 Permit	This Permit	2017 Permit	This Permit
Zinc	µg/L	93	93	32	63	1/Week	1/Week
Sulfate	mg/L	250	X	250	X	1/Week	1/Week
TDS	mg/L	500	587	500	500	1/Week	1/Week
Turbidity, effluent	NTU[e]	See Permit	—	See Permit	—	1/Week	—
pH	s.u.[f]	See Permit	See Permit	See Permit	See Permit	Continuous	Continuous
TSS	mg/L	30	30	20	20	1/Week	1/Week
Flow	gpm	1,500	2,000	1,500	2,000	Continuous	Continuous
Whole Effluent Toxicity (WET)	TU_c[g]	1.6	1.6	1.1	1.1	1/Month	1/Quarter

a. A line "—" indicates no limit or monitoring required, and an "X" means no limit with monitoring only.
b. All metals shall be measured as total recoverable.
c. Micrograms per liter.
d. Milligrams per liter.
e. Nephelometric Turbidity Units.
f. Standard units.
g. Chronic toxic units.

As required under 18 AAC 83.435, a reasonable potential analysis was conducted on five years of sample data collected during the previous permit period to determine if effluent from Outfall 001 has reasonable potential to exceed Alaska Water Quality Standards (WQS).

Effluent limits must be developed for parameters that have a reasonable potential to exceed WQS. Analysis of recent data resulted in several changes to the effluent limits in the permit. Some limits have become more stringent, while other limits have become less stringent. For parameters that did not demonstrate reasonable potential, limits or monitoring requirements may have been revised or removed. To justify these less stringent limits in the permit, the Department is required to conduct an anti-backsliding analysis, which is provided in Permit Part 6.0.

4.5 Influent and Effluent Monitoring

The permit requires monitoring of the effluent to determine compliance with TBELs and WQBELs. None of the TBELs in 40 CFR § 440.104(a) require influent monitoring. The monitoring requirements for each outfall are summarized in Table 6.

Table 6: Influent and Effluent Monitoring

Outfall	Monitor Influent?	Monitor Effluent?	Sampled Parameters for TBEL Compliance						
			Copper	Zinc	Lead	Mercury	Cadmium	pH	TSS
001	No	Yes	✓	✓	✓	✓	✓	✓	✓
002	No	Yes	✓	✓	✓	✓	✓	✓	✓

At Outfall 001, effluent samples are collected from the effluent stream after the last treatment process and prior to discharge into Sherman Creek. At Outfall 002, samples are collected after the last treatment process and prior to discharge into East Fork Slate Creek.

The permittee shall also consult and review APDES Application Form 2C, which contains specific effluent monitoring requirements due to be submitted in the application for permit reissuance (180 days prior to the permit expiration date). A copy of Form 2C can be found at http://dec.alaska.gov/water/wwdp/index.htm.

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. The permittee has the option of taking more frequent samples than required under the permit. If additional samples are used for averaging, the permittee must use a sufficiently sensitive Environmental Protection Agency (EPA) approved test method that quantifies the pollutants to a level lower than applicable limits or water quality standards or use the most sensitive test method available, per Title 40 Code of Federal Regulations (CFR) § 136 (Guidelines Establishing Test Procedures for the Analysis of Pollutants), adopted by reference at 18 AAC 83.010(f). Whole Effluent Toxicity Monitoring

18 AAC 83.435 requires that a permit contain limitations on WET when a discharge has reasonable potential to cause or contribute to exceedances of WQS. The permit requires quarterly WET testing at Outfall 001 and Outfall 002 and have limits based on a reasonable potential to exceed WQS.

WET tests are laboratory tests that measure total toxic effect of an effluent on living organisms. The tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day or 48-hour exposure. Chronic toxicity monitoring shall be conducted by the permittee according to the methods and species approved by the EPA in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition* (October 2002).

4.6 Whole Effluent Toxicity Monitoring

The permit requires quarterly WET testing for Outfalls 001 and 002. WET tests are laboratory tests that measure total toxic effect of an effluent on living organisms. The tests use a small vertebrate species to measure the aggregate toxicity of an effluent. Chronic toxicity tests measure reductions in survival, growth, and biomass over a 7-day exposure. Chronic toxicity monitoring shall be conducted by the Permittee according to the methods and species approved by the EPA in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition (EPA/821-R-02-013, October 2002).

4.7 Water Column Monitoring

The permit requires water column monitoring in four waterbodies that receive discharges from point and non-point sources. These include Sherman Creek, Slate Creek, Johnson Creek, and Ophir Creek. Sherman Creek is the receiving water for discharges from Outfall 001, and East Fork Slate Creek is the receiving water for discharges from Outfall 002. Much of the infrastructure for the mine is located within the Johnson Creek drainage. Storm water runoff that discharges to Johnson Creek is managed under the MSGP, but receiving water monitoring in

Johnson Creek is required under APDES permit AK0050571. Finally, Ophir Creek, a tributary of Sherman Creek, receives runoff from a waste rock pile. Receiving water monitoring is required to verify that the designated uses for these four waterbodies are protected from the pollutants of concern.

Table 7 contains parameters that must be monitored in the receiving waters. Receiving water sampling must be conducted monthly (minimum). Monitoring locations are shown in the figures in APPENDIX A. Monitoring is conducted both upstream and downstream of any mining related disturbance.

Table 7: Receiving Water Monitoring Parameters

Parameter	Units	Minimum Sample Frequency	Sample Type
Aluminum [a]	µg/L	1/Month	Grab
Ammonia, Total	mg/L as N	1/Month	Grab
Arsenic [a]	µg/L	1/Month	Grab
Cadmium [a]	µg/L	1/Month	Grab
Chromium [a]	µg/L	1/Month	Grab
Copper [a]	µg/L	1/Month	Grab
Iron [a]	mg/L	1/Month	Grab
Lead [a]	µg/L	1/Month	Grab
Manganese [a]	µg/L	1/Month	Grab
Mercury [a]	µg/L	1/Month	Grab
Nickel [a]	µg/L	1/Month	Grab
Selenium [a]	µg/L	1/Month	Grab
Silver [a]	µg/L	1/Month	Grab
Zinc [a]	µg/L	1/Month	Grab
Sulfate [b]	mg/L	1/Month	Grab
Turbidity	NTU	1/Month	Grab
TDS	mg/L	1/Month	Grab
TSS	mg/L	1/Month	Grab
pH	s.u.	1/Month	Grab
Dissolved Oxygen	mg/L	1/Month	Grab
Temperature	°C	1/Month	Grab
Nitrate, as N	mg/L	1/Month	Grab
Conductivity	µS/cm [c]	1/Month	Grab

Parameter	Units	Minimum Sample Frequency	Sample Type
Hardness, as $CaCO_3$	mg/L	1/Month	Grab
Color	Color units	1/Month	Grab

Notes:

a. Must be measured as total recoverable.
b. Sulfates shall be Total Sulfates except for Sherman Creek which shall be sulfates associated with magnesium and sodium.
c. Microsiemens per centimeter

4.8 Sediment Monitoring

The permit also requires annual sediment monitoring and a multifaceted biomonitoring program to verify that the designated uses of the receiving waters have been protected. Three sediment samples are collected annually in lower Sherman Creek, the inlet creek to Upper Slate Lake, East Fork Slate Creek, lower Slate Creek, and lower Johnson Creek. New baseline biomonitoring sites will be established in Upper Slate Creek SP2 above the flooded TTF closure elevation and at Upper Sherman Creek above the Comet waste rock storage area sampling sediment, benthic macroinvertebrates and periphyton. With the addition of the new biomonitoring sites three sediment samples will be collected at Upper Slate Creek SP2 and Upper Sherman Creek, if possible, upon determining the sample reach.

These new biomonitoring sites will provide baseline data, as an above mine influence reach, for comparing potential mine influence related to Outfalls 001 and 002 and mine activity in Slate Creek and Sherman Creek. The existing biomonitoring site in Upper Slate Creek will be flooded when the TTF and Upper Slate Lake are combined at mine closure. Sherman Creek does not have a baseline biomonitoring site, with the potential for increased mine activity at Comet, a baseline biomonitoring site will provide data to compare potential mine influence on the existing Lower Sherman Creek biomonitoring sites.

Sediment samples are analyzed for physical and chemical parameters and for toxicity to aquatic life. Sediment is required to be monitored for the parameters in Table 8 at a frequency of once per year.

Table 8: Sediment Monitoring Parameters and Analytical Methods

Parameter	Units	Preparation Method	Analysis Method	Sediment MDL[a]
Aluminum	mg/kg	PSEP[b]	—	—
Arsenic	mg/kg	PSEP[b]	GFAA[c]	2.5
Cadmium	mg/kg	PSEP[b]	GFAA[c]	0.3
Chromium	mg/kg	PSEP[b]	—	—
Copper	mg/kg	PSEP[b]	ICP[d]	15.0
Lead	mg/kg	PSEP[b]	ICP[d]	0.5
Mercury	mg/kg	7471[e]	7471 [e]	0.02

Parameter	Units	Preparation Method	Analysis Method	Sediment MDL[a]
Nickel	mg/kg	PSEP[b]	ICP[d]	2.5
Selenium	mg/kg	PSEP[b]	—	—
Silver	mg/kg	PSEP[b]	GFAA[c]	0.2
Zinc	mg/kg	PSEP[b]	ICP[d]	15.0
Total Solids	%	—	PSEP[b], pg 17	0.1
Total Volatile Solids	%	—	PSEP[b], pg 20	0.1
Total Organic Carbon	%	—	PSEP[b,f], pg 23	0.1
Total Sulfides	mg/kg	—	PSEP[b], pg 32	1
Grain Size	—	—	Modified ASTM with Hydrometer	N/A

Notes:
a. Dry weight basis.
b. From *Recommended Protocols for Measuring Selected Environmental Variables*.
c. From *Graphite Furnace Atomic Absorption Spectrometry* (1986).
d. From *Inductively Coupled Plasma Emission Spectrometry* (1986).
e. From *Mercury Digestion and Cold Vapor Atomic Absorption Spectrometry* (1986).
f. From *Recommended Methods for Measuring TOC in Sediments* (1993).

4.9 Biomonitoring

The biomonitoring program at Kensington includes studies on benthic macroinvertebrate monitoring, periphyton biomass and community composition, and sediment sampling. New baseline biomonitoring sites will be established in Upper Slate Creek SP2 above the flooded TTF closure elevation and at Upper Sherman Creek above the Comet waste rock storage area sampling sediment, benthic macroinvertebrates and periphyton.

These new biomonitoring sites will provide baseline data, as an above mine influence reach, for comparing potential mine influence related to Outfalls 001 and 002 and mine activity in Slate Creek and Sherman Creek. The existing biomonitoring site in Upper Slate Creek will be flooded when the TTF and Upper Slate Lake are combined at mine closure. Sherman Creek does not have a baseline biomonitoring site, with the potential for increased mine activity at Comet, a baseline biomonitoring site will provide data to compare potential mine influence on the existing Lower Sherman Creek biomonitoring sites.

Six benthic macroinvertebrate samples are collected annually in lower Sherman Creek, the inlet creek to Upper Slate Lake, East Fork Slate Creek, Lower Slate Creek, West Fork Slate Creek, and upper Johnson Creek. With the addition of the new biomonitoring sites six benthic macroinvertebrate samples will also be collected at Upper Slate Creek SP2 and Upper Sherman Creek, if possible, upon determining the sample reach.

The abundance and diversity of benthic organisms is an indicator of stream health. Benthic macroinvertebrates will be identified to the lowest practicable level as follows: insects of the orders *Ephemeroptera, Plecoptera*, *Trichoptera*, and *Diptera* to genus, except nonbiting midges to family *Chironomidae*, and all others to class or order.

Periphyton biomass and community composition is monitored annually in the inlet creek to Upper Slate Lake, East Fork Slate Creek, West Fork Slate Creek, Lower Slate Creek, and Lower Sherman Creek. With the addition of the new biomonitoring sites ten periphyton samples will also be collected at Upper Slate Creek SP2 and Upper Sherman Creek, if possible, upon determining the sample reach. Ten samples are collected for each reach and analyzed for periphyton biomass densities and proportions of mean chlorophyll a, b, and c concentrations.

The sediment monitoring and biomonitoring programs are managed, through a contract with Coeur, by the Alaska Department of Fish & Game, Division of Habitat (ADF&G). ADF&G provided recommendations to improve the biomonitoring program during the permit reissuance, and DEC has incorporated these recommendations into the permit. Table 9 summarizes changes to the biomonitoring program from the previous permit.

Table 9: Changes to the Biomonitoring Program

Monitoring Program	2017 Permit Requirement	2024 Permit Requirement	Rationale
Sediment Monitoring	Collect one sediment samples at each site.	Collect three sediment samples at each site.	To improve sediment sample accuracy and reduce variability in the sample results.
Sediment Monitoring	Not previously required.	Collect 3 sediment samples at the new Upper Slate Creek SP2 biomonitoring site.	The existing biomonitoring site in Upper Slate Creek will be flooded when the TTF and Upper Slate Lake are combined at mine closure. A new Upper Slate Creek SP2 biomonitoring will be established above the closure lake elevation sampling sediment, periphyton, and macroinvertebrates.
Sediment Monitoring	Not previously required.	Collect 3 sediment samples at the new Upper Sherman Creek biomonitoring site.	Sherman Creek does not have a baseline biomonitoring site, with the potential for increased mine activity at Comet, a baseline biomonitoring site will provide data to compare potential mine influence on the existing Lower Sherman Creek biomonitoring sites.
Biomonitoring	Not previously required.	Collect 6 benthic macroinvertebrate samples and 10 periphyton samples at the new Upper	Sherman Creek does not have a baseline biomonitoring site, with the potential for increased mine activity at Comet, a baseline biomonitoring site will provide

Monitoring Program	2017 Permit Requirement	2024 Permit Requirement	Rationale
		Sherman Creek biomonitoring site.	data to compare potential mine influence on the existing Lower Sherman Creek biomonitoring sites.
Biomonitoring	Not previously required.	Collect 6 benthic macroinvertebrate samples and 10 periphyton samples at the new Upper Slate Creek SP2 biomonitoring site.	The existing biomonitoring site in Upper Slate Creek will be flooded when the TTF and Upper Slate Lake are combined at mine closure. A new Upper Slate Creek SP2 biomonitoring will be established above the closure lake elevation sampling sediment, periphyton, and macroinvertebrates.
Biomonitoring	A minimum of six periphyton samples are collected for each reach.	10 periphyton samples are collected for each reach.	Collecting 10 periphyton samples at each reach is consistent with current sampling methods and is feasible.
Biomonitoring	Annual monitoring of quality of spawning substrate at Lower Slate Creek SP1 and SP2.	Remove requirement for monitoring spawning substrate on Lower Slate Creek.	Spawning substrate size has minimal variability in Lower Slate Creek. Spawning substrate sampling was a requirement from the development of the TTF; construction activity and risk of sedimentation has since decreased.
Biomonitoring	Calculate Shannon Diversity and Evenness indices for BMI.	Remove requirement for calculating Shannon Diversity and Evenness indices for BMI.	Monitoring the number of BMI taxa over time adequately identifies taxonomic diversity and BMI identification and density per unit area accurately captures taxa abundance.

5.0 RECEIVING WATERBODY

5.1 Description of Receiving Waterbodies

The permit authorizes the discharge of treated wastewater into Sherman Creek and East Fork Slate Creek from Outfall 001 and Outfall 002, respectively.

Sherman Creek drains about 4.2 square-miles to the east shore of Lynn Canal (Figure 2). A waterfall about 1,200 feet upstream of the mouth prevents anadromous fish passage to the middle and upper reaches. Middle Sherman Creek is the reach between the Lower Sherman Creek waterfall barrier and the Comet Road bridge, and Upper Sherman Creek is the reach between the Comet Road bridge and the headwaters. At Middle Sherman Creek, the treated effluent is discharged via Outfall 001. Upper Sherman Creek is upstream of the mine influence.

Slate Creek drains about four square miles into Slate Cove on the northwest side of Berners Bay (Figure 3). Two waterfalls about a half-a-mile upstream of the mouth prevent anadromous fish passage to the West and East Forks. There are two lakes in this drainage, Lower Slate and Upper Slate Lakes, both upstream of East Fork Slate Creek. Kensington operates the TTF in Lower Slate Lake and discharges treated effluent via Outfall 002 in East Fork Slate Creek. West Fork Slate Creek and Upper Slate Creek are upstream of the mine influence.

5.2 Water Quality Standards

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

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). Neither Sherman Creek nor East Fork Slate Creek have been reclassified under 18 AAC 70.235. Therefore, Sherman and East Fork Slate Creeks must be protected for all fresh water designated use classes listed in 18 AAC 70.020(a)(1). Some waterbodies in Alaska can also have site–specific water quality criteria per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). Site-specific water quality criteria have been established for Sherman Creek in 18 AAC 70.236(b)(3) but have not been established for East Fork Slate Creek. Table summarizes the site-specific criteria for Sherman Creek.

Table 10: Site-Specific Criteria for Sherman Creek [18 AAC 70.236(b)(3)]

Watershed	Reach of Water Affected	Water Quality Parameter	Designated Use Class Affected	Water Quality Standard in 18 AAC 70.020(b)(4)	Site-Specific Criteria
Sherman Creek	Sherman Creek below discharge of Kensington Mine adit drainage to tidewater (approximately 1.5 miles)	Dissolved inorganic substances	(1)(A)(i)	TDS from all sources may not exceed 500 mg/L. Neither chlorides nor sulfates may exceed 250 mg/L.	TDS from all sources may not exceed 1,000 mg/L. Chlorides may not exceed 200 mg/L. Sulfates

Watershed	Reach of Water Affected	Water Quality Parameter	Designated Use Class Affected	Water Quality Standard in 18 AAC 70.020(b)(4)	Site-Specific Criteria
					associated with magnesium and sodium may not exceed 200 mg/L.
Sherman Creek	Sherman Creek below discharge of Kensington Mine adit drainage to tidewater (approximately 1.5 miles)	Dissolved inorganic substances	(1)(A)(iii)	TDS may not exceed 1,000 mg/L. A concentration of TDS may not be present in water if that concentration causes or reasonably could be expected to cause an adverse effect to aquatic life (see note 12).	TDS may not exceed 1,000 mg/L
Sherman Creek	Sherman Creek below discharge of Kensington Mine adit drainage to tidewater (approximately 1.5 miles)	Dissolved inorganic substances	(1)(C)	TDS may not exceed 1,000 mg/L. A concentration of TDS may not be present in water if that concentration causes or reasonably could be expected to cause an adverse effect to aquatic life (see note 12).	TDS may not exceed 1,000 mg/L

5.3 Water Quality Status of Receiving Water

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. None of the receiving waters associated with Kensington are included on the *Alaska's Final 2022 Integrated Water Quality Monitoring and Assessment Report*, as impaired or listed as a CWA 303(d) waterbody requiring a Total Maximum Daily Load (TMDL). Accordingly, a TMDL has not been developed or approved for any of the applicable receiving waters.

5.4 Mixing Zone Analysis

No mixing zone is authorized under the permit.

6.0 ANTIBACKSLIDING

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

Effluent limitations may be relaxed as allowed under 18 AAC 83.480(b), CWA § 402(o) and CWA § 303(d)(4). 18 AAC 83.480(b)(2) allow less stringent effluent limitations in renewed, reissued, or modified permits if information other than revised regulations, guidance, or test methods that would have justified the application of a less stringent effluent limitation is now available but was not available at the time of permit issuance. Since the last permit was reissued, the facility has collected new information to characterize the effluent, and DEC has used that new information to determine that effluent's reasonable potential to cause or contribute to WQS exceedances and thereby calculate permit limits.

Applying CWA § 402(o)(2)(B)(i) and 18 AAC 83.480(b)(2), less stringent effluent limitations are authorized as described in Section 6.1. This new data was not available at the time of permit issuance or reissuance and has demonstrated the need for less stringent effluent limits. The same method of statistical analysis as used in previous permits was applied to the new water quality data. In some cases, it resulted in increases in the effluent limitations, or when no reasonable potential to cause or contribute to WQS exceedances was indicated, effluent limitations were removed as unnecessary. These changes are permissible under the antibacksliding exception for new information found in 18 AAC 83.135(b)(2), since the new less stringent limits are based on information unavailable at the time of prior permit issuance, will not result in WQS violations, and comply with the State's Antidegradation Policy.

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

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

Even if the requirements of CWA § 303(d)(4) or 18 AAC 83.480(b) are satisfied, 18 AAC 83.480(c) and CWA § 402(o)(3) prohibit relaxed limits that would result in violations of WQS or ELGs. Here, the receiving water meets WQS supporting existing and designated uses and ELGs are required by the permit, and so 18 AAC 83.480(c) and CWA § 402(o)(3) are met.

Since the previous permit was reissued, new information has been collected to characterize the effluent from the facility. DEC's analysis of its effluent water quality data resulted in changes to effluent limits. Effluent data indicated that the permit limits could be relaxed without violating WQS. In other words, DEC tailored effluent limits in the renewed permit according to new information that was not available at the time of original permit issuance. The new effluent limits will not result in a violation of WQS, and, as set forth below, do not violate the State's Antidegradation Policy. As such, the new effluent limits comply with the antibacksliding exception in 18 AAC 83.480(b)(2) and CWA § 402(o)(2)(B)(i), as well as the overarching WQS and antidegradation requirements in 18 AAC 83.480(c) and CWA § 303(d)(4)(B).

6.1 Relaxed Limits

6.1.1 Outfall 001

Since the last permit was issued, new information collected to characterizes effluent from Outfall 001. An analysis of five years of the most recent effluent and receiving water data resulted in changes to effluent limits. The Department determined that some parameters required more stringent limits, including: daily maximum limits for ammonia, cadmium, lead, and nitrate; and monthly averages for ammonia and nitrate. Data analyses also produced relaxation of daily maximum limits for aluminum, copper, iron, manganese, sulfate, total dissolved solids, and turbidity, and monthly averages for aluminum, cadmium, copper, iron, lead, manganese, zinc, and sulfate were relaxed.

6.1.2 Outfall 002

An analysis of five years of the most recent effluent and receiving water data resulted in changes to effluent limits. The Department determined that some parameters required more stringent limits, including: daily maximum limits for ammonia and nitrate and monthly averages for ammonia and nitrate. Analyses of water quality data produced relaxed daily maximum limits for aluminum, cadmium, copper, lead, zinc, sulfate, total dissolved solids, and turbidity; and monthly average limits for aluminum, cadmium, copper, iron, lead, zinc, sulfate, and total dissolved solids were relaxed.

7.0 ANTIDEGRADATION

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

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

In general, 18 AAC 70.015(a)(1) states that existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. This Tier 1 protection level applies to both East Fork Lower Slate Creek and Sherman Creek (receiving waters).

18 AAC 70.015(a)(2) states that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality must be maintained and

protected, unless the Department authorizes a reduction in water quality. The receiving waters are not listed as impaired (Category 4 or 5) in Alaska's 2022 Integrated Water Quality Monitoring and Assessment Report. The Tier 2 protection level applies to both receiving waters.

The Department may allow a reduction of water quality only after the specific analysis and requirements under 18 AAC 70.016(b)(5)(A)–(C) and 18 AAC 70.016(c)(7)(A)–(F) are met. The Department's findings under these provisions are as follows:

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

> ***(A)*** *existing uses and the water quality necessary for protection of existing uses have been identified based on available evidence, including water quality and use related data, information submitted by the applicant, and water quality and use related data and information received during public comment;*
>
> ***(B)*** *existing uses will be maintained and protected; and*
>
> ***(C)*** *the discharge will not cause water quality to be lowered further where the department finds that the parameter already exceeds applicable criteria in 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b).*

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

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

No parameter for a contaminant of concern in the receiving waters exceed applicable criteria in 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b). As such, 18 AAC 70.016(b)(5)(C) does not apply here.

The Department concludes the terms and conditions of the permit will be adequate to fully protect and maintain the designated and existing uses of the water and that the findings under 18 AAC 70.016(b)(5) are met to authorize a discharge based on a Tier 1 analysis.

As explained above, the Department will continue to a Tier 2 analysis because under 18 AAC 70.016(c)(1), Tier 2 is presumed for all water as the default protection level for all parameters unless an exception applies, and here no exception applies.

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

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

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

The permit requires that the discharge shall not cause or contribute to a violation of WQS, except if excursions are authorized within the permit in accordance with provisions in 18 AAC 70.200 – 70.240 (i.e., mixing zone, variance, etc.). As a result of Kensington Gold Mine's reasonable potential to exceed water quality criteria for ammonia, cadmium, copper, iron, and nitrate at Outfall 001, and ammonia, and TDS at Outfall 002. The more stringent of WQBEL or TBEL were applied as a limit for TBEL parameters. The resulting effluent end-of-pipe limits and monitoring requirements in the permit protect water quality criteria, and therefore, will not violate water quality criteria found at 18 AAC 70.020.

The WQS serve the specific purpose of protecting the existing uses of the receiving waterbody. The receiving waters are protected for all designated uses (see Fact Sheet Section 4.0); therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances (DEC 2022) were selected for use in the RPA for the wastewater discharge effluent. This will ensure that the resulting water quality at and beyond the boundary of the authorized mixing zone will fully protect all designated uses of the receiving waterbody. Analysis of effluent monitoring data from the past five years shows that discharges are controlled to protect existing waterbody uses. The effluent limits required by the permit will ensure that all uses are fully protected.

WQBELs are set equal to the most stringent water quality criteria available under 18 AAC 70.020(b) for all the protected water use classes. Because of the nature of the permitted discharges, other pollutants are not expected to be present in the discharges at levels that would cause, have the reasonable potential to cause, or contribute to an exceedance of any WQS. Basing the permit effluent limits on WQS serves to protect existing and designated uses.

Whole effluent toxicity testing is required monthly at Outfalls 001 and 002. WET tests reveal if the discharge has toxicity, and the Permittee is required to submit these results to DEC during the month in which the results are received. WET results will be used when the Permittee applies for reissuance of the permit to ensure the applicable criteria of 18 AAC 70.030 are met.

Site-specific criteria as allowed by 18 AAC 70.235 have not been established for East Fork Slate Creek and are therefore not applicable. However, Sherman Creek is listed in 18 AAC 70.236(b)(3) for TDS from all sources may not exceed 1,000 mg/L, chlorides may not exceed 200 mg/L, and sulfates associated with magnesium and sodium may not exceed 200 mg/L. Permit limits established for TDS and sulfate at Outfall 001 address the SSC at Sherman Creek. The permit does not authorize short term variances or zones of deposit under 18 AAC 70.200 or 18 AAC 70.210; therefore, these provisions do not apply.

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

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

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

> ***18 AAC 70.016(c)(7)(C)*** *[The department will not authorize a discharge unless it finds that] point source and state-regulated nonpoint source discharges to the receiving water will meet requirements under 18 AAC 70.015(a)(2)(D); to make this finding the department will*
>
> > *(i) identify point sources and state-regulated nonpoint sources that discharge to, or otherwise impact, the receiving water;*
> >
> > *(ii) consider whether there are outstanding noncompliance issues with point source permits or required state-regulated nonpoint source best management practices, consider whether receiving water quality has improved or degraded over time, and, if necessary and appropriate, take actions that will achieve the requirements of 18 AAC 70.015(a)(2)(D); and*
> >
> > *(iii) coordinate with other state or federal agencies as necessary to comply with (i) and (ii) of this subparagraph[.]*

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

> *(D) all wastes and other substances discharged will be treated and controlled to achieve*
>
> > *(i) for new and existing point sources, the highest statutory and regulatory requirements; and*
> >
> > *(ii) for nonpoint sources, all cost-effective and reasonable best management practices[.]*

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

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

The first part of the definition includes all applicable TBELs including 40 CFR § 440.104 – New source performance standards – Ore mining and dressing point source category, Subpart J – Copper, lead, zinc, gold, silver, and molybdenum ores subcategory, adopted by reference at 18 AAC 83.010(g). The TBELs set standards of performance for existing and new sources and are incorporated in the permit and apply to Outfalls 001 and 002.

The second part of the definition references the minimum treatment standards for domestic wastewater discharges found at 18 AAC 72.050. The federal technology based ELGs for secondary treatment of domestic wastewater are found in 40 CFR Part 133. These ELGs apply to POTWs and are not directly applicable to the treatment of domestic wastewater at Kensington. Because Kensington Mine does not discharge treated domestic wastewater to surface water, that necessarily satisfies this requirement. For both outfalls, all applicable federal and state technology based ELGs have been incorporated into the permit.

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

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

In summary, the highest statutory and regulatory requirements that apply to this point source are TBELs and WQBELs. The Department incorporates and requires compliance with both, as relevant to create standards of performance. After review of the methods of treatment and control and the applicable statutory and regulatory requirements, including 18 AAC 70, 18 AAC 72, and 18 AAC 83, the Department finds that the discharge authorized under this general permit meets the highest applicable statutory and regulatory requirements in applicable TBELs and WQBELs. Therefore, the 18 AAC 70.016(c)(7)(C) finding is met.

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

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

The BMP plan includes pollution prevention measures and controls appropriate for each facility and discharge. The design, construction, and performance of the water treatment plants have also been reviewed and approved by the Department, consistent with 18 AAC 72. There is proven water quality data from both treatment plants that indicate effective treatment of the systems.

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

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

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

Kensington Mine contributes substantial economic benefit to local and state economies by providing employment opportunities, annual payments to the state, and business to supporting industries. The mining industry has been one of Juneau's fastest growing industries over the past decade. Since 2008, employment in the sector has more than doubled, from approximately 400 to 820 in 2017. Total annual payroll in 2017 was $85 million. The mining industry pays the highest monthly wages in Juneau at approximately $8,680, more than double the Juneau average of $4,253. The Kensington Mine employes 359 jobs with earnings totaling $36.4 million in 2017 dollars. Direct, indirect, and induced employment resulting from Kensington Mines operation includes 680 jobs with $50 million in annual wages in the Juneau economy in 2017. The jobs and income support a population of approximately 820 people in Juneau, including approximately 130 children enrolled in Juneau public schools (Kindergarten through grade 12).

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

The Department concludes that the operation of Kensington Mine and the operation of the wastewater treatment systems and the discharges authorized by the permit demonstrate that a lowering of water quality, specified by the permit, accommodates important economic development; therefore, the 18 AAC 70.016(c)(7)(E) finding is met.

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

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

8.0 OTHER PERMIT CONDITIONS

8.1 Electronic Reporting (E-Reporting) Rule

The Permittee is responsible for electronically submitting DMRs and other reports in accordance with 40 CFR §127.

8.2 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to update the Quality Assurance Project Plan (QAPP) within 60 days of the effective date of the final permit. Additionally, the permittee must submit a letter to the Department within 120 days of the effective date of the permit stating that the plan has been implemented within the required time frame. 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.

8.3 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 of. The permit requires the permittee to develop a Best Management Practices (BMP) Plan in order to prevent or minimize the potential for the release of pollutants to waters and lands of the State of Alaska through plant site runoff, spillage or leaks, or erosion. The permit contains certain BMP 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 Plan must be kept on site and made available to the Department upon request.

In addition, Sector G (Metal Mining) of Multi-Sector General Permit (MSGP) AKR060000 imposes best management practices (BMPs) specifically designed for the industrial activities at Kensington Gold Mine.

8.4 Schedules

8.4.1 Previous Compliance Schedule for Outfall 001

During the previous permit, a compliance schedule was introduced to address a white residue in the Sherman Creek substrate that sporadically occurred from Outfall 001 and ending near the mouth of the creek. An ADF&G biomonitoring study of Sherman Creek conducted in 2015 observed a lower abundance of sensitive taxa and lower proportions of sensitive aquatic insects in Lower Sherman Creek benthic macroinvertebrate samples in comparison to the previous year, which suggests that the residue may have a detrimental effect on the macroinvertebrate population. Accordingly, the following compliance schedule (as allowed per 18 AAC 70.910) was implemented for residue detection and documentation, additional studies to determine the source and cause of residue formation and, if necessary, possible modification to the effluent treatment system to prevent future residue formation from occurring in Sherman Creek.

Sulfate concentrations in the Outfall 002 effluent since flow augmentation stopped have demonstrated that sulfate is steadily lower than the 2017 permit effluent limit of 250 mg/L, and also lower than during flow augmentation. In the 2018 – 2022 data set that was used in the reasonable potential (RP) analysis, there are 40 data points for sulfate in the 002 effluent after flow augmentation ended on May 11, 2022. Inclusion of Outfall 002 sulfate data for January 2023 up to April 2024 gives a total of 126 post-flow augmentation data points over roughly a two-year period with a mean sulfate of 118.5 mg/L and a maximum sulfate of 167 mg/L. These statistics are much lower than the 314 data point effluent sulfate for the entire 5-year period (2018 – 2022), which had an average of 201 mg/L sulfate. Continuing operation of the RO plant will sequester sulfate in the paste backfill of mined out portions of the mine workings and will allow for compliant effluent sulfate quality in future discharges. Significant changes in the tailings decant and recycle water sulfate concentration due to advancement of the mine workings into new areas with higher sulfate mineralization.

The source of the white residue formation is believed to be caused by the generation of colloidal sulfur by acidification of thiosulfate following breakpoint chlorination in the underground ammonia treatment batch plants. Hydrated lime is now used to neutralize the pH in the ammonia treatment batching process, thus preventing the acidification of the thiosulfate. Based on the successful completion of the compliance schedule and infrequent events since the implementation of corrective actions, the department designates the compliance schedule from the 2017 issued permit as completed. The compliance schedule was completed, as specified in the previous permit. Visual monitoring and reporting of white residue to the Department is required in the permit to alert and mitigate future occurrences.

8.4.2 Compliance Schedule for Outfall 002 – Ammonia and Nitrate

According to EPA May 2007 memorandum from the Director of EPA's Office of Wastewater management, the department must make a reasonable finding, adequately supported by the administrative record that the discharger cannot immediately comply with the WQBEL upon the effective date of the permit before a compliance schedule may be authorized. According to 40 CFR 123.25(a), the permit may, when appropriate, specify a schedule of compliance leading to compliance with CWA and regulations. Additional stipulations for compliance schedule requirements including, requiring schedules to be completed as soon as possible, not later than required under the CWA, limiting a schedule only when necessary to allow a reasonable opportunity to attain compliance and interim dates must be followed.

The 2017 APDES permit did not designate limits for ammonia and nitrate and only monitoring of those parameters was required. A reasonable potential analysis of ammonia and nitrate data collected during the 2017 permit cycle indicated a reasonable potential to exceed WQS and thus, new limits were established for both parameters in the permit. The newly established permit limits in comparison to current discharge concentrations indicate that the permittee will chronically exceed monthly average limits and intermittently exceed daily maximum limits upon permit effectiveness.

Since the current water treatment system that discharges through Outfall 002 cannot treat for ammonia and nitrate and the cause(s) of the increasing pollutant concentration requires further investigation and understanding, a compliance schedule is introduced in Permit Section 2.3. The purpose of the compliance schedule is to identify the pollutant source(s), explore mitigation measures, and evaluate, design, construct and commission possible treatment plant revision(s) that will allow the permittee to maintain compliance with the current ammonia and nitrate limits into the future. An assessment of possible non-treatment or pretreatment measures for reduction of ammonia and nitrate occurs early in the schedule and if proven successful, the results may preclude further need to complete successive steps in the schedule and may allow for an earlier completion date, upon approval from the department.

8.4.3 Special Condition Schedule for Discharge(s) from the Comet Development Rock Stockpile into Ophir Creek

Ophir Creek runs directly adjacent to the Comet Development Rock Stockpile (CDRS). Water quality monitoring occurs at upstream and downstream surface water monitoring stations near the CDRS. Since 2006, annual monitoring shows that elevated pollutants assumed to be associated with the CDRS – including sulfate, nitrate, and TDS – routinely exceed WQS in the Ophir Creek monitoring station directly downstream of the CDRS, while no exceedances are observed directly upstream. In addition, ambient conductivity and hardness levels in Ophir Creek are relatively low and stable above the CDRS, while directly below the CDRS significantly elevated hardness and conductivity are observed on a recurring basis corresponding with the precipitation events and season.

A special condition schedule was developed to address concerns regarding discharge from the CDRS into Ophir Creek (Permit Part 2.4). The schedule includes data collection and analysis to evaluate the hydrogeology of the Ophir Creek drainage to better understand the mechanism and contribution of pollutants from the CDRS relative to groundwater quality in the area. An understanding of the hydrogeological conditions of the site is necessary to develop engineering plans addressing the discharge. From information gathered, engineering plans, which are economically feasible to the permittee, can be designed to satisfy regulatory requirements and. The special condition schedule requires the development of a monitoring plan determining pollutant sources, total pollutant loading under varying flow regimes, and management strategies to reduce water quality exceedances in Ophir Creek. As the site conditions are understood and engineering plans developed, the department will continuously provide oversight and technical support toward resolving pollutants from the CDRS affecting Ophir Creek.

9.0 OTHER CONSIDERATIONS

9.1 Endangered Species Act

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

As a state agency, DEC is not required to consult with these federal agencies regarding permitting actions; however, DEC voluntarily reviewed the USFWS species map at the IPaC Information for Planning and Consultation website: USFWS IPaC website at https://ecos.fws.gov/ipac/ indicated that there are no listed species or critical habitats expected to occur at the location of the project area.

9.2 Essential Fish Habitat

Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish from commercially fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when a discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. As a state agency, DEC is not required to consult with federal agencies regarding permitting action; however, DEC consulted with NOAA’s EFH online mapper and found the project is not in a NOAA designated EFH.

9.3 Permit Expiration

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

10.0 REFERENCES

Coeur Alaska, Inc. 2023. Renewal Application – Alaska Pollutant Discharge Elimination System Permit No. AK9959571, Kensington Gold Mine, December 2, 2023.

DEC. 2014. Alaska Pollutant Discharge Elimination System (APDES) Permits Reasonable Potential Analysis and Effluent Limits Development Guide.

DEC. 2017. 18 AAC 83, Alaska Pollutant Discharge Elimination System. State of Alaska, Department of Environmental Conservation. November 7, 2017.

DEC. 2022a. 18 AAC 70, Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. State of Alaska, Department of Environmental Conservation. September 8, 2022.

DEC. 2022b. 18 AAC 70, Water Quality Standards. State of Alaska, Department of Environmental Conservation. November 13, 2022.

DEC. 2022c. Alaska's Final 2022 Integrated Water Quality Monitoring and Assessment Report.

DEC. 2023. 18 AAC 72, Wastewater Disposal. State of Alaska, Department of Environmental Conservation. October 1, 2023.

EPA. 1991. Technical Support Document for Water Quality-based Toxics Control. 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. 1996b. The Metals Translator: Guidance for Calculation a Total Recoverable Permit Limit from a Dissolved Criterion. June 1996, EPA 823-B-96-007.

EPA. 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition. October 2002, EPA 821-F-02-013.

EPA. 2010. NPDES Permit Writer's Manual. EPA, Office of Water, Office of Wastewater Management, Permits Division. Washington, DC. September 2010. EPA 833-K-10-001.

APPENDIX A. FACILITY INFORMATION

Figure 1: Kensington Gold Mine Location Map

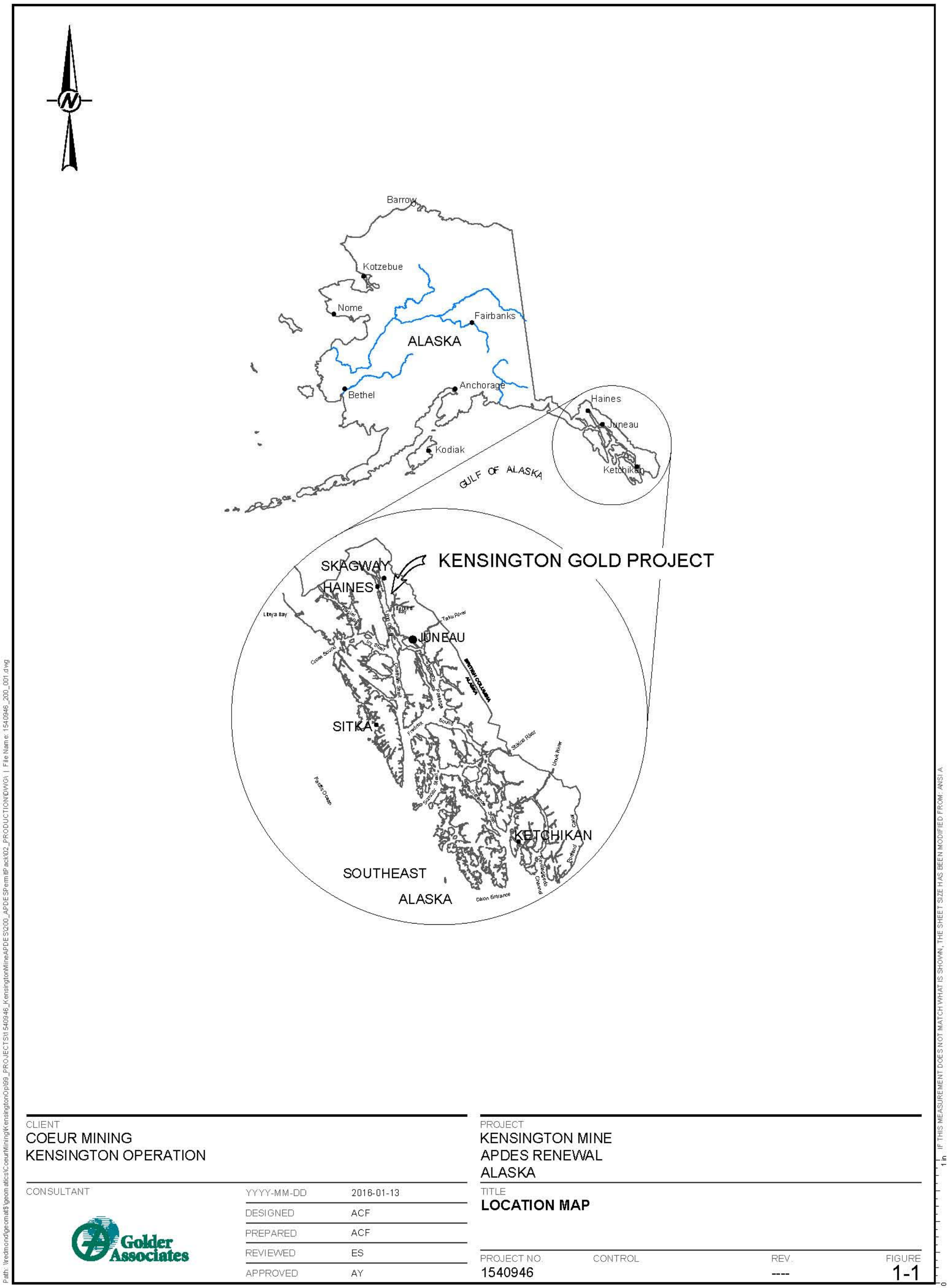


Figure 2: Site Map—Outfall 001

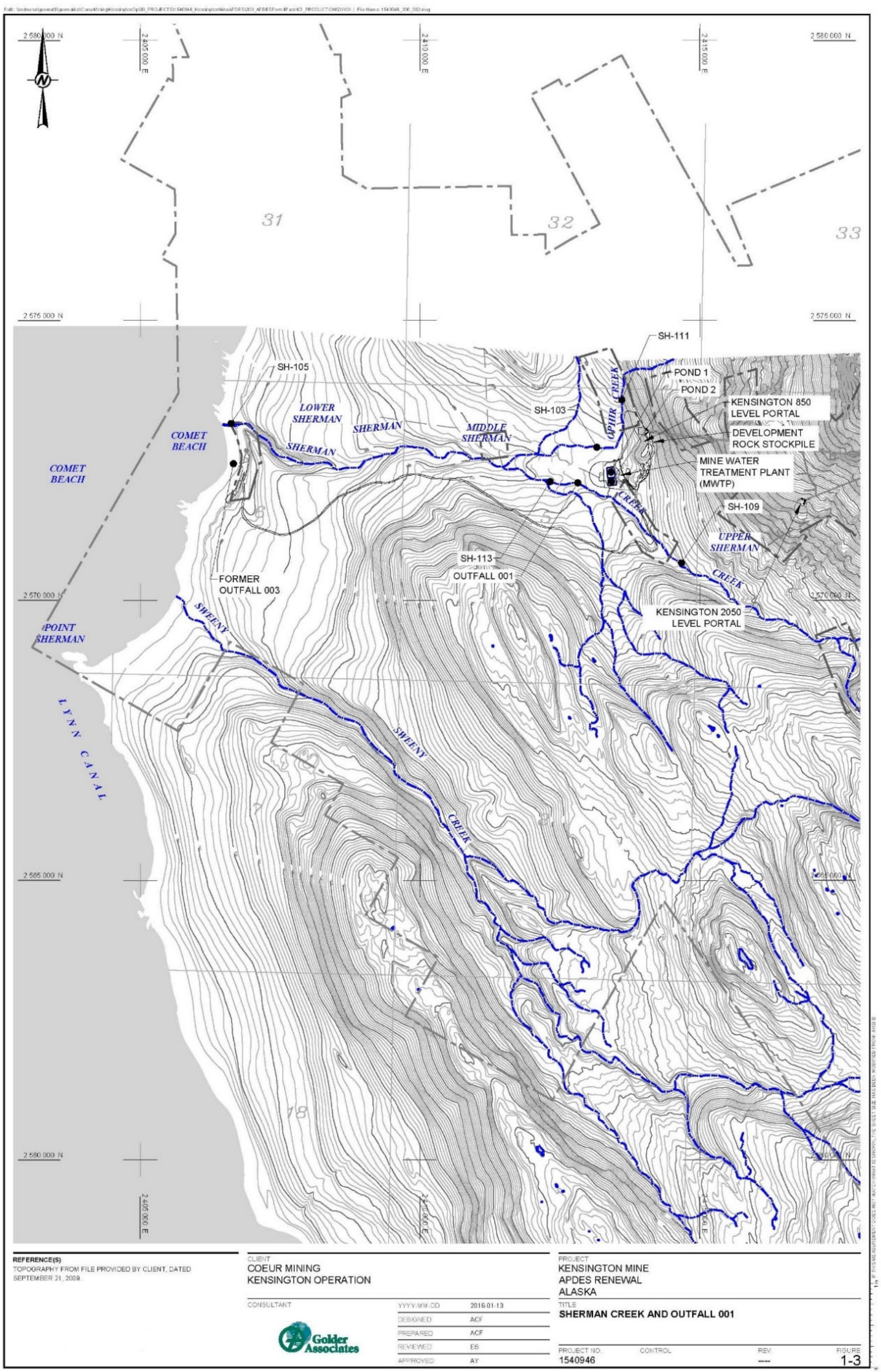


Figure 3: Site Map—Outfall 002

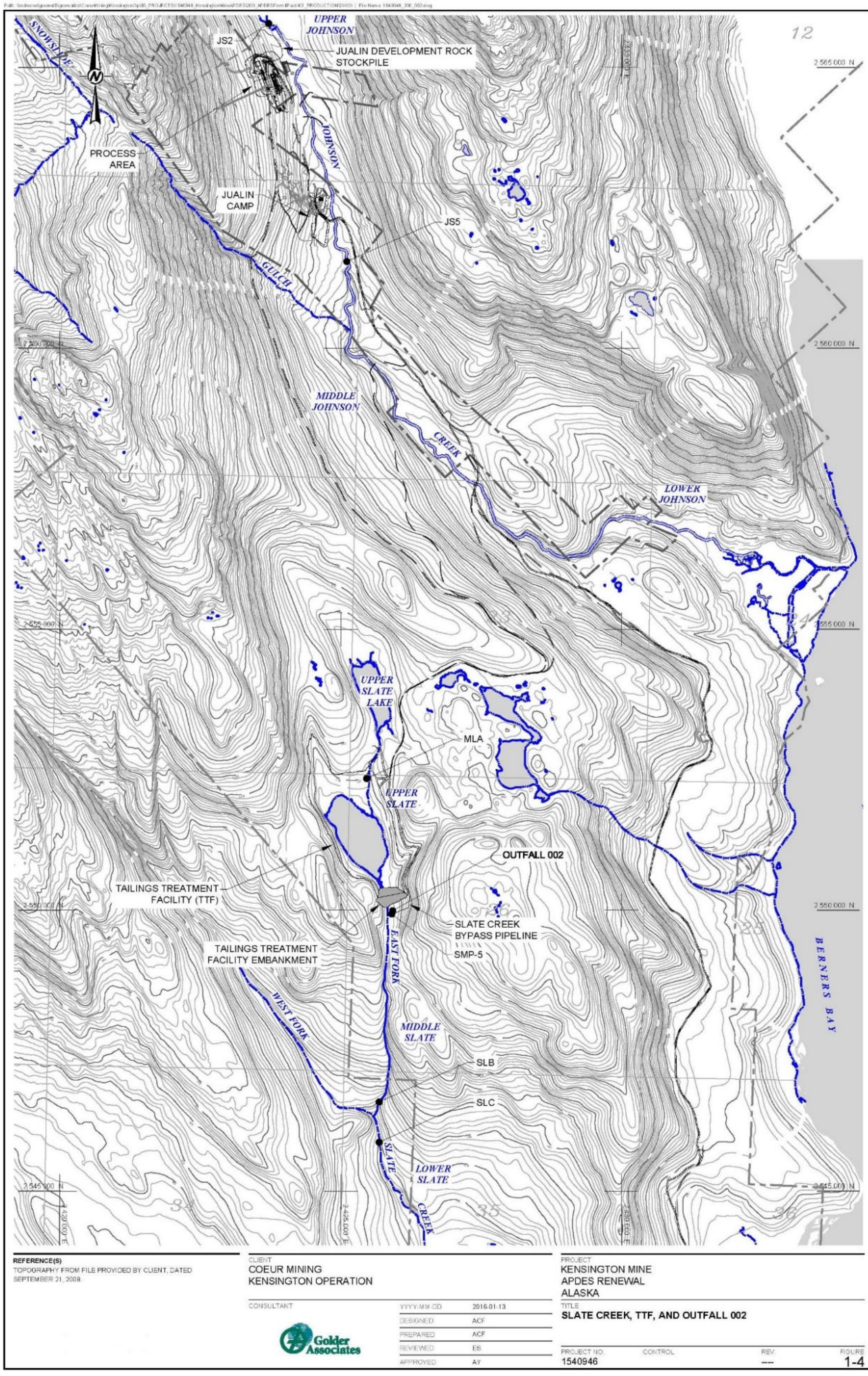
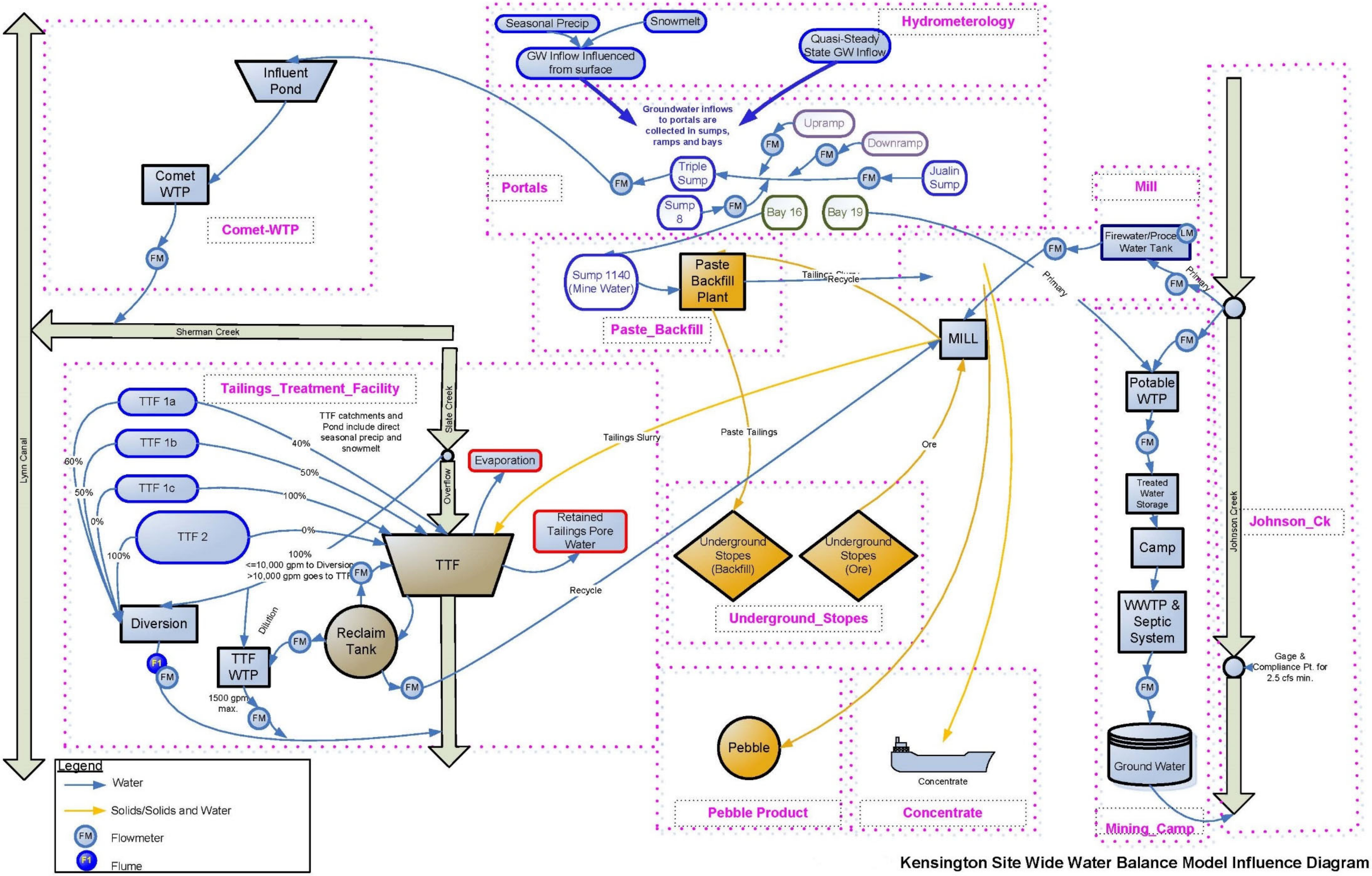


Figure 4: Line Drawing



APPENDIX B. BASIS FOR EFFLUENT LIMITS

The Clean Water Act (CWA) requires facilities to meet effluent limits based on available wastewater treatment technology, specifically, technology-based effluent limits (TBELs). TBELs are promulgated nationally by the Environmental Protection Agency (EPA) via Effluent Limitation Guideline (ELG) rulemakings and establish performance standards for all facilities within an industrial category or subcategory. The Alaska Department of Environmental Conservation (DEC or the Department) may find, by analyzing the effect of an effluent discharge on the receiving water body, that TBELs are not sufficiently stringent to meet State water quality standards (WQS). In such cases, the Department is required to develop more stringent water quality-based effluent limits (WQBEL), which are designed to ensure that the WQS of the receiving water body are met.

TBELs for facilities do not limit every parameter that may be present in the effluent. Depending on where the facility draws its water and how it handles its wastewater, the effluent may contain other pollutants not regulated by TBELs. When TBELs do not exist for a particular pollutant expected to be in the effluent, the Department must determine if the pollutant may cause or contribute to an exceedance of a WQS for the water body. If a pollutant causes or contributes to an exceedance of a WQS, a WQBEL for the pollutant must be established in the permit.

B-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 legal basis for the effluent limitations and other conditions in the permit. The Department evaluates the discharges with respect to these sections of the CWA and the relevant Alaska Pollutant Discharge Elimination System (APDES) regulations to determine which conditions to include in the permit.

In general, the Department first determines if any federally promulgated TBELs have been developed that must be considered as minimum permit limits. The Department then evaluates the effluent quality expected to result from these controls to see if the discharge could result in any exceedances of the WQS in the receiving water. If reasonable potential exists that exceedances could or will occur, the Department must include WQBELs in the permit. The final selected permit limits reflect whichever requirements (technology-based or water quality-based) are more stringent.

B-II Outfalls 001 and 002 - Technology-Based Evaluation

Section 301(b) of the CWA requires industrial dischargers to meet technology based ELGs established by EPA. These are enforceable through their incorporation into an APDES permit. Direct dischargers that are new sources must meet New Source Performance Standards (NSPS), which are based on the best available demonstrated control technology. These NSPS apply to a source that has commenced construction after the ELGs were established and, as such, are directly applicable to the discharge of treated mine drainage and contact water from Outfalls 001 and 002 at Kensington.

In 40 CFR Part 440 Subpart J EPA established ELGs for the Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores point source category. These ELGs apply NSPS to a new source mine, which is a source that has commenced construction after the ELGs were established on December 3, 1982. The NSPS that apply to Kensington are shown in Table B-1.

Table B-1: Technology-Based Effluent Limits for Outfalls 001 and 002

Parameter	Units	Maximum for any 1 day	Average of daily values for 30 consecutive days	Range
Cadmium	mg/L[a]	0.10	0.05	-
Copper	mg/L	0.30	0.15	-
Lead	mg/L	0.6	0.3	-
Mercury	mg/L	0.002	0.001	-
Zinc	mg/L	1.5	0.75	-
pH	s.u.[b]	-	-	6.0-9.0
Total Suspended Solids (TSS)	mg/L	30.0	20.0	-

a. Milligrams per liter.
b. Standard units.

B-III Water Quality-Based Evaluation

In addition to the TBELs discussed above, the Department evaluated the Kensington discharges to determine compliance with Section 301(b)(1)(C) of the CWA. This section requires permit limits necessary to meet WQS.

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

To determine if WQBELs are needed and to develop those limits, the Department follows guidance in the *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (RPA Guidance, 2014). The water quality-based analysis consists of the following three step sequence:

1. Identify the applicable water quality criteria (see Section B-III.A);
2. Determine if there is "reasonable potential" for the discharge to exceed a water quality criterion in the receiving water (see APPENDIX C);
3. If there is "reasonable potential" or where a parameter has a technology-based limit and it requires dilution to meet WQS, develop effluent limits based on the WLA (see Section APPENDIX D).

The following sections provide a detailed discussion of each step.

B-III.A Water Quality Criteria

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

The beneficial uses for Sherman Creek, the receiving water of Outfall 001, and the regulatory citation for the water quality criteria applicable to the uses are as follows:

1. domestic water supply – 18 AAC 70.236(b)(3)
2. agriculture water supply – 18 AAC 70.020(b)(1)(A)(ii)
3. aquaculture water supply – 18 AAC 70.236(b)(3)
4. industrial uses – 18 AAC 70.020(b)(1)(A)(iv)
5. contact recreation – 18 AAC 70.020(b)(1)(B)(i)
6. secondary recreation – 18 AAC 70.020(b)(1)(B)(ii)
7. growth and propagation of fish, shellfish, other aquatic life, and wildlife – 18 AAC 70.236(b)(3)

In accordance with 18 AAC 70.235, Sherman Creek has site-specific water quality criteria for domestic water supply [18 AAC 70.020(b)(1)(A)(i)], aquaculture water supply [18 AAC 70.020(b)(1)(A)(iii)], and growth and propagation of fish, shellfish, other aquatic life, and wildlife [18 AAC 70.020(b)(1)(C)].

The beneficial uses for East Fork Slate Creek, the receiving water of Outfall 002, and the regulatory citation for the water quality criteria applicable to the uses are as follows:

1. domestic water supply – 18 AAC 70.020(b)(1)(A)(i)
2. agriculture water supply – 18 AAC 70.020(b)(1)(A)(ii)
3. aquaculture water supply – 18 AAC 70.020(b)(1)(A)(iii)
4. industrial uses – 18 AAC 70.020(b)(1)(A)(iv)
5. contact recreation – 18 AAC 70.020(b)(1)(B)(i)
6. secondary recreation – 18 AAC 70.020(b)(1)(B)(ii)
7. growth and propagation of fish, shellfish, other aquatic life, and wildlife – 18 AAC 70.020(b)(1)(C)

For a given pollutant, different uses may have different criteria. To protect all beneficial uses, the reasonable potential analysis and permit limits are based on the most stringent water quality criteria for protecting those uses. For Sherman Creek, the most stringent applicable criteria are summarized in Table B-2.

Table B-2: Most Stringent of the Water Quality Criteria Applicable to Kensington Discharges into Sherman Creek (Outfall 001)

Parameter[a] (µg/L unless otherwise noted)	Acute	Chronic	
	Aquatic Life Criterion	Aquatic Life Criterion	Human Health Criterion
Aluminum[b]	750	N/A	N/A
Ammonia as N	8.5	3.4	N/A
Cadmium[b]	1.5	2.1	N/A
Copper[b]	9.9	6.8	1,300
Iron	N/A	1,000	N/A
Lead[b]	51	2.0	N/A
Manganese	N/A	N/A	300
Mercury	2.4	0.012	0.050
Nitrate as N (mg/L)	N/A	N/A	10
Zinc	88	88	9100
Sulfate (mg/L)[c]	N/A	200	250
Total Dissolved Solids (TDS, mg/L)	N/A	N/A	1,000
pH (s.u.)	within the range of 6.5 - 8.5		
a. Criteria for metals have been converted to total recoverable.			

Parameter[a] (µg/L unless otherwise noted)	Acute Aquatic Life Criterion	Chronic Aquatic Life Criterion	Chronic Human Health Criterion

b. Hardness-based limits used a hardness of 69.36 mg/L $CaCO_3$ and a pH for aluminum of 7.61 s.u., the 15th percentile of receiving water data.
c. Sulfates may not exceed 250 mg/L. However, the site–specific criteria for Sherman Creek at 18 AAC 70.236(b) limit sulfates associated with magnesium and sodium to 200 mg/L in Sherman Creek.

For East Fork Slate Creek, the most stringent applicable criteria are summarized in Table B-3.

Table B-3: Most Stringent of the Water Quality Criteria Applicable to Kensington Discharges into East Fork Slate Creek (Outfall 002)

Parameter[a] (µg/L unless otherwise noted)	Acute Aquatic Life Criterion	Chronic Aquatic Life Criterion	Chronic Human Health Criterion
Aluminum[b]	750	87	N/A
Ammonia as N	7.0	2.9	N/A
Cadmium[b]	1.6	0.22	5
Copper[b]	11	7.2	1,300
Iron	N/A	1,000	N/A
Lead[b]	24	0.93	N/A
Manganese	N/A	N/A	300
Mercury	2.4	0.012	0.05
Zinc[b]	93	93	9100
Sulfate (mg/L)	N/A	N/A	250
Total Dissolved Solids (TDS, mg/L)	N/A	N/A	500
pH (s.u.)	within the range of 6.5 - 8.5		

a. Criteria for metals have been converted to total recoverable.
b. Hardness-based limits used a hardness of 73.75 mg/L $CaCO_3$ and pH for aluminum of 7.56 s.u., the 15th percentile of receiving water data.

APPENDIX C. REASONABLE POTENTIAL DETERMINATION

The following describes the process the Department used to determine if the discharge authorized in the permit has the reasonable potential (RP) to cause or contribute to a violation of State Water Quality Standards (WQS). The Department used the basic process described in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA, 1991) and DEC's guidance, *Alaska Pollutant Discharge Elimination System (APDES) Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (June 30, 2014) (*RPA Guidance)* to determine RP for any pollutant to exceed a water quality criterion (WQC).

To determine if there is reasonable potential for the discharge to cause or contribute to an exceedance of WQC for a given pollutant, the Department compares the maximum projected receiving water body concentration to the criteria for that pollutant. RP to exceed exists if the projected receiving water body concentration exceeds the criteria, and a WQBEL must be included in the permit (18 AAC 83.435).

The ambient concentration in the mass balance equation is based on a reasonable worst-case estimate of the pollutant concentration upstream from the discharge. For criteria that are expressed as maxima, the 85th percentile of the ambient data is used as an estimate of the worst-case. If ambient data are not available, DEC uses 15% of the most stringent pollutant's criteria as a worst-case estimate. This section discusses how the maximum projected receiving waterbody concentration is determined.

Reasonable Potential Analysis

Reasonable potential was evaluated for Outfalls 001 and 002. For each parameter, the Department compared the maximum projected concentration to the criteria for that pollutant to determine if there is "reasonable potential" to cause or contribute to an exceedance of a water quality criterion for each pollutant present in the discharge. If the projected concentration exceeds a criterion, there is "reasonable potential," and a limit must be included in the permit. The Department used the *RPA Guidance* to conduct the reasonable potential analysis. When a mixing zone is authorized, RP is evaluated at the boundary of an authorized mixing zone. However, this permitting action does not authorize a mixing zone, so RP is evaluated at the end of pipe prior to the effluent mixing with receiving waters.

<u>Outfall 001</u>

For Outfall 001, the maximum expected effluent concentrations were compared directly to the most stringent water quality criteria.

<u>C_e (Maximum expected effluent concentration or MEC</u>): The maximum expected effluent concentration was calculated using the statistical approach recommended in Section 2.4 of the *RPA Guidance*. In this approach, a maximum expected effluent concentration is derived by multiplying the maximum observed effluent concentration by a reasonable potential multiplier (RPM):

C_e = MEC = (maximum observed effluent concentration) x RPM

The RPM accounts for uncertainty in the effluent data. The RPM depends upon the amount of effluent data, the statistical distribution assigned to the data, and the variability of the data as measured by the coefficient of variation (CV). Effluent data for each pollutant of concern was analyzed in ProUCL—a statistical software package developed under the direction of EPA—and the statistical distributions and corresponding CVs that best fit the data were selected.

There are three equations in the *RPA Guidance* for calculating the RPM. Each equation is valid for certain statistical distributions or sample populations. These three equations—with the citation to the Section in the *RPA Guidance* in which they appear are:

Equation 2.4.1.1 (RPM for Small or Insufficient Data Sets)

$$\text{RPM} = \frac{\exp\,(z_{99}\hat{\sigma} - 0.5\hat{\sigma}^2)}{\exp\,(p_n\hat{\sigma} - 0.5\hat{\sigma}^2)}$$

Where,

$z_{99} =$ the z-statistic at the 99th percentile = 2.326

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

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

$\text{CV} =$ coefficient of variation (generally assumed to be 0.6 for small data sets)

$p_n =$ the z-statistic at the 95 percent confidence level = $(1\text{-}0.95)^{(1/n)}$

$n =$ the number of valid samples

Equation 2.4.2.1 (RPM for Non-Parametric, Normal, or Gamma Statistical Distributions)

$$\text{RPM} = \frac{\exp\,(\hat{\mu}_n + z_{99}\hat{\sigma})}{\exp\,(\hat{\mu}_n + p_n\hat{\sigma})}$$

Where,

$\hat{\mu}_n =$ the mean calculated by ProUCL

$\hat{\sigma} =$ the standard deviation calculated by ProUCL

Equation 2.4.2.2 (RPM for Lognormal or Log-ROS Statistical Distributions)

$$\text{RPM} = \frac{\exp\,(z_{99}\hat{\sigma}_y - 0.5\hat{\sigma}_y{}^2)}{\exp\,(p_n\hat{\sigma}_y - 0.5\hat{\sigma}_y{}^2)}$$

Where,

$\hat{\sigma}_y =$ the lognormal standard deviation calculated by ProUCL

$\hat{\sigma}_y{}^2 =$ the lognormal variance (square of the standard deviation calculated by ProUCL)

Table C- 1 shows the assigned statistical distribution, references the equation used to calculate the RPM, and lists the calculated RPM for each parameter at Outfall 001.

Table C- 1: RPM Calculation for Outfall 001

Parameter	Statistical Distribution	Equation	RPM
Aluminum	Normal	2.4.2.2	1.0
Ammonia as N	Normal	2.4.2.2	1.0
Cadmium	Normal	2.4.2.2	1.0
Chlorine	Normal	2.4.2.2	1.0
Copper	Normal	2.4.2.2	1.0
Iron	Normal	2.4.2.2	1.0
Lead	Normal	2.4.2.2	1.0
Manganese	Normal	2.4.2.2	1.0
Mercury	Normal	2.4.2.2	1.0
Nitrate as N	Normal	2.4.2.2	1.0
Zinc	Normal	2.4.2.2	1.0
Sulfate	Normal	2.4.2.2	1.0
TDS	Normal	2.4.2.2	1.0

Reasonable Potential Summary: Results of the reasonable potential analysis for Outfall 001 are provided in Table C- 2.

Table C- 2: Reasonable Potential Determination for Outfall 001

Parameter[a] (µg/L unless otherwise noted)	Effluent Data						Most Stringent Water Quality Criterion	Reasonable Potential (yes or no)
	Max Observed Effluent Conc.	Standard Deviation	Mean	Number of Samples	Reasonable Potential Multiplier (RPM)	Max Expected Effluent Conc. (MEC)[b]		
Aluminum	71.1	6.42	10.6	321	1.0	71.1	750	No
Ammonia as N (mg/L)	5.55	0.706	2.23	1,115	1.0	5.55	3.4	Yes
Cadmium[c]	0.190	0.0124	0.0925	321	1.0	0.19	0.21	No
Copper[c]	11.0	0.983	0.945	321	1.0	11.0	6.8	Yes
Iron (mg/L)	1.31	0.155	0.158	323	1.0	1.31	1.0	Yes
Lead[c]	0.610	0.654	0.327	321	1.0	0.610	2.0	No
Manganese	103	11.8	14.1	327	1.0	103	300	No
Mercury	0.0112	0.001	0.0006	242	1.0	0.0112	0.012	No
Nitrate as N (mg/L)	13.2	1.88	7.18	321	1.0	13.2	10	Yes
Zinc[c]	21.4	1.88	5.04	321	1.0	21.4	88	No
Sulfate (mg/L)	116	15.0	61.9	321	1.0	116	200	No
TDS (mg/L)	527	58.6	329	319	1.0	527	1,000	No

a. Criteria for metals have been converted to total recoverable.
b. For each parameter, the MEC equals the maximum observed effluent concentration times the RPM producing a number based on water treatment plant performance, which was used to determine if there is a reasonable potential for the effluent to exceed WQS.
c. Hardness-based limits using a hardness of 69.36 mg/L $CaCO_3$, the 15th percentile of receiving water data.

Outfall 002

For Outfall 002, the maximum expected effluent concentrations were compared directly to the most stringent water quality criteria.

C_e (maximum expected effluent concentration or MEC): The method used to determine the MEC for Outfall 002 is identical to the method previously described for Outfall 001. Table C- 3shows the assigned statistical distribution, references the equation used to calculate the RPM, and lists the calculated RPM for each parameter at Outfall 002.

Table C- 3: RPM Calculation for Outfall 002

Parameter	Statistical Distribution	Equation	RPM
Aluminum	Normal	2.4.2.2	1.0
Ammonia as N	Normal	2.4.2.2	1.0
Cadmium	Normal	2.4.2.2	1.0
Copper	Normal	2.4.2.2	1.0
Iron	Normal	2.4.2.2	1.0
Lead	Normal	2.4.2.2	1.0
Manganese	Normal	2.4.2.2	1.0
Mercury	Normal	2.4.2.2	1.0
Zinc	Normal	2.4.2.2	1.0
Sulfate	Normal	2.4.2.2	1.0
TDS	Normal	2.4.2.2	1.0

Reasonable Potential Summary: Results of the reasonable potential analysis for Outfall 002 are provided in Table C- 4.

Table C- 4: Reasonable Potential Determination for Outfall 002

Parameter[a] (µg/L unless otherwise noted)	Effluent Data						Most Stringent Water Quality Criterion	Reasonable Potential (yes or no)
	Max Observed Effluent Conc.	Standard Deviation	Mean	Number of Samples	Reasonable Potential Multiplier (RPM)	Max Expected Effluent Conc. (MEC)[b]		
Aluminum	45.1	5.04	8.24	314	1.0	45.1	750	No
Ammonia as N (mg/L)	4.02	0.705	2.55	314	1.0	4.02	2.9	Yes
Cadmium[c]	0.0315	0.00875	0.0263	314	1.0	0.0315	0.22	No
Copper[c]	3.35	0.276	0.579	314	1.0	3.35	7.2	No
Iron (mg/L)	0.725	0.117	0.133	314	1.0	0.725	1.0	No
Lead[c]	0.250	0.0187	0.0745	314	1.0	0.25	2.2	No
Manganese	73.1	9.10	15.6	314	1.0	73.1	300	No
Mercury	0.00718	0.406	0.0006	314	1.0	0.00718	0.012	No
Zinc[c]	12.9	1.29	4.60	314	1.0	12.9	93	No
Sulfate (mg/L)	249	31.7	201	314	1.0	249	250	No
TDS (mg/L)	512	47.0	400.19	314	1.0	512	500	Yes

a. Criteria for metals have been converted to total recoverable.
b. For each parameter, the MEC equals the maximum observed effluent concentration times the RPM producing a number based on water treatment plant performance, which was used to determine if there is a reasonable potential for the effluent to exceed WQS.
c. Hardness-based limits using a hardness of 73.75 mg/L $CaCO_3$, the 15[th] percentile of receiving water data.

APPENDIX D. EFFLUENT LIMITS CALCULATION

Once the Alaska Department of Environmental Conservation (the Department or DEC) determines that the effluent has a reasonable potential to exceed State Water Quality Standards (WQS) or a parameter has a technology-based effluent limit (WQBEL) that exceeds WQS, a water quality-based effluent limit for the pollutant is developed. Outfalls 001 and 002 were shown to have reasonable potential to exceed WQS so WQBELs were developed.

The first step in calculating a permit limit is development of a wasteload allocation (WLA) for the pollutant. The WLA is the concentration of the pollutant that may be discharged while still ensuring that the downstream water quality criterion is met.

Outfall 001

The derivation of WQBELs for Outfall 001 is described below.

End-of-Pipe WLAs

In the absence of dilution, the applicable water quality criterion becomes the WLA. Establishing the criterion as the WLA ensures that the Permittee's discharge does not contribute to an exceedance of the criterion. There may be up to three different WLAs for a given pollutant if there are acute, chronic, and human health water quality criteria for the pollutant. These WLAs include the acute WLA (WLA_{acute}), chronic WLA ($WLA_{chronic}$), and the human health WLA (WLA_{hheath}).

Long Term Averages (LTAs)

Acute, chronic, and human health standards apply over different time frames; therefore, it is not possible to compare the WLAs directly to determine which standard results in the most stringent limits. The acute criteria are applied as a one-hour average, the chronic criteria are applied as a four-day average, and human health criteria generally apply over a lifetime of exposure. To allow for comparison, long term average (LTA) loads are calculated from the acute and chronic WLAs. The most stringent LTA is used to calculate the permit limits.

Permit Limit Derivation

Once the appropriate LTA has been calculated, the Department applies the statistical approach described in Chapter 3 of the *RPA Guidance* to calculate maximum daily and average monthly permit limits. This approach takes into account effluent variability [using the Coefficient of Variation (CV)], sampling frequency, and the difference in time frames between the average monthly and maximum daily limits.

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

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

Step 1- Determine the WLA

In this case, where there is no dilution, the acute, chronic, and human health criteria become the WLAs. As shown in Table B-2, the acute, chronic, and human health water quality criteria for copper are 9.9, 6.8, and 1,300 µg/L, respectively. Accordingly, the respective WLAs are:

WLA_{acute} = 9.9 µg/L

$WLA_{chronic}$ = 6.8 µg/L

$WLA_{hhealth}$ = 1,300 µg/L

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

From Section 3.3 in the *RPA Guidance*,

$$LTA_{acute} = WLA_{acute} * e^{(0.5\sigma^2 - z_{99}\sigma)}$$

Where,

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

$\sigma^2 = \ln(1.01^2 + 1)$

$\sigma^2 = 0.733$

z_{99} = 2.326 for 99th percentile probability basis

$\boldsymbol{LTA_{acute} = 2.0}$ **µg/L**

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma_4{}^2 - z_{99}\sigma_4)}$$

Where,

$$\sigma_4{}^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

$$\sigma_4{}^2 = \ln\left(\frac{1.04^2}{4} + 1\right)$$

$\sigma_4{}^2 = 0.239$

$\boldsymbol{LTA_{chronic} = 2.5}$ **µg/L**

Step 3 - Most Limiting LTA

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

Step 4 - Calculate the Permit Limits

The *RPA Guidance* recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL). The MDL and the AML for aquatic life are calculated as follows:

$$\text{MDL}_{aquatic} = LTA_{acute} * e^{(z_{99}\sigma - 0.5\sigma^2)}$$

Where,

$\sigma^2 = 0.733$ (as previously calculated)

$\boldsymbol{MDL_{aquatic} = 9.9}$ **µg/L**

$$\text{AML}_{aquatic} = LTA_{acute} * e^{(z_{95}\sigma_n - 0.5\sigma_n{}^2)}$$

Where,

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

$$\sigma_n{}^2 = \ln\left(\frac{1.04^2}{4} + 1\right)$$

$$\sigma_n{}^2 = 0.239$$

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

n = number of sampling events per month for copper = 4

$$\boldsymbol{AML_{aquatic} = 3.9\ \mu g/L}$$

The procedure for developing effluent limits for human health effects is different than for acute and chronic effects to aquatic life. The Department uses the procedure in Section 3.4.2 of the *RPA Guidance*. For copper,

$$\text{AML}_{hhealth} = WLA_{hhealth} = \mathbf{1,300\ \mu g/L}$$

$$\text{MDL}_{hhealth} = AML_{hhealth} \cdot \frac{e^{(z_{99}\sigma - 0.5\sigma^2)}}{e^{(z_{95}\sigma_n - 0.5\sigma_n{}^2)}}$$

Where,

σ^2 = 0.733(as previously calculated)

$\sigma_n{}^2$ = 0.239 (as previously calculated)

$$\mathbf{MDL_{hhealth} = 3,329\ \mu g/L}$$

In this case, the MDL and AML for human health are less protective than the corresponding limits for acute and chronic effects to aquatic life. Consequently, the human health-based limits were rejected in favor of the more stringent limits based on acute and chronic effects.

Table D- 1: Water Quality-Based Effluent Limit Calculations for Outfall 001summarizes the water quality-based effluent limit calculations for Outfall 001.

Table D- 1: Water Quality-Based Effluent Limit Calculations for Outfall 001

Parameter (µg/L unless otherwise noted)	**Most Stringent Water Quality Criterion**	**CV**	**WLA_{acute}**	**$WLA_{chronic}$**	**$WLA_{hhealth}$**	**$LTA_{limiting}$**	**MDL**	**AML**
Ammonia as N (mg/L)	3.4	0.316	8.52	3.37	N/A	2.95	5.8	3.2
Cadmium	0.21	0.134	1.47	0.206	N/A	0.177	0.24	0.20
Copper	6.8	1.04	9.92	6.82	1,300	1.95	9.9	3.9
Iron (mg/L)	1.0	0.987	N/A	1.0	N/A	0.376	1.8	0.73
Lead	2.0	0.200	51.2	2.00	N/A	1.59	2.5	1.9
Mercury	0.012	1.67	2.40	0.0120	0.0500	0.00288	0.02	0.01
Nitrate as N (mg/L)	10	0.262	N/A	N/A	10.0	N/A	14	10
Zinc	88	0.373	87.9	87.9	9,100	40.5	88	54

Outfall 002

The following is a summary of the steps to derive water quality-based effluent limits for Outfall 002. Copper is used as an example.

Step 1- Determine the WLA

In this case, where there is no dilution, the acute, chronic, and human health criteria become the WLAs. As shown in Table B-3, the acute, chronic, and human health water quality criteria for copper are 10.5, 7.2, and 1,300 µg/L, respectively. Accordingly, the respective WLAs are:

$$WLA_{acute} = 10.5 \text{ µg/L}$$

$$WLA_{chronic} = 7.2 \text{ µg/L}$$

$$WLA_{hhealth} = 1{,}300 \text{ µg/L}$$

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

From Section 3.3 in the *RPA Guidance*,

$$LTA_{acute} = WLA_{acute} * e^{(0.5\sigma^2 - z_{99}\sigma)}$$

Where,

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

$$\sigma^2 = \ln(0.4767^2 + 1)$$

$$\sigma^2 = 0.2048$$

z_{99} = 2.326 for 99th percentile probability basis

$\boldsymbol{LTA_{acute} = 4.06\ \mu g/L}$

$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma_4{}^2 - z_{99}\sigma_4)}$

Where,

$$\sigma_4{}^2 = \ln\left(\frac{CV^2}{4} + 1\right)$$

$$\sigma_4{}^2 = \ln\left(\frac{0.4767^2}{4} + 1\right)$$

$\sigma_4{}^2 = 0.0553$

$\boldsymbol{LTA_{chronic} = 4.28\ \mu g/L}$

Step 3 - Most Limiting LTA

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

Step 4 - Calculate the Permit Limits

The *RPA Guidance* recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL). The MDL and the AML for aquatic life are calculated as follows:

$\mathrm{MDL}_{aquatic} = LTA_{acute} * e^{(z_{99}\sigma - 0.5\sigma^2)}$

Where,

$\sigma^2 = 0.2048$ (as previously calculated)

$\boldsymbol{MDL_{aquatic} = 11\ \mu g/L}$

$\mathrm{AML}_{aquatic} = LTA_{acute} * e^{(z_{95}\sigma_n - 0.5\sigma_n{}^2)}$

Where,

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

$$\sigma_n{}^2 = \ln\left(\frac{0.4767^2}{4} + 1\right)$$

$\sigma_n{}^2 = 0.0553$

z_{95} = 1.645 for 95th percentile probability basis

n = number of sampling events per month for copper = 4

$\boldsymbol{AML_{aquatic} = 5.8\ \mu g/L}$

The procedure for developing effluent limits for human health effects is different than for acute and chronic effects to aquatic life. The Department uses the procedure in Section 3.4.2 of the *RPA Guidance*. For copper,

$$\text{AML}_{hhealth} = WLA_{hhealth} = \mathbf{1,300\ \mu g/L}$$

$$\text{MDL}_{hhealth} = AML_{hhealth} \cdot \frac{e^{(z_{99}\sigma - 0.5\sigma^2)}}{e^{(z_{95}\sigma_n - 0.5\sigma_n{}^2)}}$$

Where,

$\sigma^2 = 0.2048$ (as previously calculated)

$\sigma_n{}^2 = 0.0241$ (as previously calculated)

$$\mathbf{MDL}_{\boldsymbol{hhealth}} = \mathbf{2,348\ \mu g/L}$$

In this case, the MDL and AML for human health are less protective than the corresponding limits for acute and chronic effects to aquatic life. Consequently, the human health-based limits were rejected in favor of the more stringent limits based on acute and chronic effects.

Table D-2 summarizes the water quality-based effluent limit calculations for Outfall 002.

Table D-2: Water Quality-Based Effluent Limit Calculations for Outfall 002

Parameter (µg/L unless otherwise noted)	**Most Stringent Water Quality Criterion**	**CV**	**WLA$_{acute}$**	**WLA$_{chronic}$**	**WLA$_{hhealth}$**	**LTA$_{limiting}$**	**MDL**	**AML**
Ammonia	2.9	0.276	6.96	2.86	N/A	2.54	4.6	2.8
Cadmium	0.22	0.333	1.57	0.216	5.00	0.149	0.30	0.19
Copper	7.2	0.477	10.5	7.19	1,300	4.06	11	5.8
Lead	2.2	0.251	55.4	2.16	N/A	1.63	2.8	2.0
Mercury	0.012	1.03	2.40	0.0120	0.0500	0.00363	0.02	0.01
Zinc	93	0.280	92.6	92.6	9,100	50.7	93	63
TDS	500	0.110	N/A	N/A	500	N/A	587	500

Summary of Permit Effluent Limitations

As discussed in APPENDIX B, technology-based and water quality-based limits have been applied to the outfall discharges. The following tables summarize the permit limits and the basis for each limit for Outfalls 001 and 002, respectively.

Table D-3: Outfall 001 Effluent Limits

Parameter	Units	Daily Maximum		Monthly Average	
		Effluent Limit	Basis for Limit	Effluent Limit	Basis for Limit
Total Ammonia, as N	mg/L	5.8	Chronic WQS	3.2	Chronic WQS
Cadmium	µg/L	0.24	Chronic WQS	0.20	Chronic WQS
Copper	µg/L	9.9	Acute WQS	3.9	Acute WQS
Iron	mg/L	1.8	Chronic WQS	0.73	Chronic WQS
Lead	µg/L	2.5	Chronic WQS	1.9	Chronic WQS
Mercury	µg/L	0.02	Chronic WQS	0.01	Chronic WQS
Nitrate, as N	mg/L	14	Human Health WQS	10	Human Health WQS
Zinc	µg/L	88	Acute WQS	54	Acute WQS
Sulfate	mg/L	X[a]	Acute WQS	X	Acute WQS
pH	mg/L	See Permit	WQS	See Permit	WQS
TSS	mg/L	30	TBEL	20	TBEL
Outfall Flow	gpd	4,500	Flow Capacity	4,500	Flow Capacity
WET	TU_c	1.6	Toxicity	1.1	Toxicity

a. X means no effluent limit but continue monitoring.

Table D-4: Outfall 002 Effluent Limits

Parameter	Units	Daily Maximum		Monthly Average	
		Effluent Limit	Basis for Limit	Effluent Limit	Basis for Limit
Ammonia, as N	mg/L	4.6	Chronic WQS	2.8	Chronic WQS
Cadmium	µg/L	0.30	Chronic WQS	0.19	Chronic WQS
Copper	µg/L	11	Acute WQS	5.8	Acute WQS
Iron	mg/L	X	Chronic WQS	X	Chronic WQS
Lead	µg/L	2..8	Chronic WQS	2.0	Chronic WQS
Mercury	µg/L	0.02	Chronic WQS	0.01	Chronic WQS
Nitrate, as N	mg/L	14	Human Health WQS	10	Human Health WQS
Zinc	µg/L	93	Acute WQS	63	Acute WQS
Sulfate	mg/L	X	Human Health WQS	X	Human Health WQS
TDS	mg/L	587	Human Health WQS	500	Human Health WQS
pH[a]	mg/L	See Permit	WQS	See Permit	WQS
TSS	mg/L	30	TBEL	20	TBEL
Outfall Flow	gpd	2,000	Flow Capacity	X	Flow Capacity
WET	TU_c	1.6	Toxicity	1.1	Toxicity

a. X means no effluent limit but continue monitoring.