



FACT SHEET

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NPDES Permit Number: AK-003865-2
Date: December 5, 2008
Public Notice Expiration Date: February 3, 2009
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The U.S. Environmental Protection Agency (EPA) Plans To Re-issue A Wastewater Discharge Permit To:

Teck Cominco Alaska, Inc.
Red Dog Mine

near
Kotzebue, Alaska

and the State of Alaska proposes to Certify the Permit

EPA Proposes NPDES Permit Re-issuance.

EPA proposes to re-issue a *National Pollutant Discharge Elimination System* (NPDES) permit to Teck Cominco's Red Dog Mine. The draft permit sets conditions on the discharges of pollutants from the mine to the Middle Fork of Red Dog Creek and various receiving waters as described for storm water outfalls. In order to ensure protection of water quality and human health, the permit places limits on the type and amount of pollutants that can be discharged.

This Fact Sheet includes:

- information on public comment, public hearing, and appeal procedures
- a description of the current discharge
- a description of the discharge locations and a map, and
- technical material supporting the conditions in the permit

Alaska State Certification.

EPA requests that the Alaska Department of Environmental Conservation (ADEC) certify the NPDES permit for Red Dog Mine under section 401 of the Clean Water Act. EPA may not issue the NPDES permit until the state has granted, denied, or waived certification. The state of Alaska has provided a draft certification for review with the draft permit (See Appendix B). For more information concerning this review, please contact Tim Pilon at (907) 451-2136 or 610 University Avenue, Fairbanks, Alaska 99709 or Tim.Pilon@alaska.gov

Alaska Coastal Management Program (ACMP)

Information on the project consistency review under the ACMP is available by contacting Jim Renkert at (907) 269-0029, by e-mail at jim.renkert@alaska.gov, or 550 W. 7th Ave, Suite 705, Anchorage, AK 99501-3568.

National Environmental Policy Act (NEPA)

In compliance with EPA headquarter guidance for re-issued NPDES permits, the EPA Region 10 NEPA Compliance Program has evaluated the proposed changes to the NPDES permit and prepared a draft Supplemental Environmental Impact Statement (DSEIS) that is also available at this time for public comment. EPA will issue a Record of Decision (ROD) after the final EIS is issued prior to reissuance of the permit.

Public Comment

EPA will consider all comments before issuing the final permit. Those wishing to comment on the draft permit or DSEIS may do so in writing by the expiration date of the Public Notice. All comments should include name, address, phone number, a concise statement of the basis for a comment and relevant facts upon which it is based. All written comments should be addressed to the Office of Water & Watersheds Director at U.S. EPA, Region 10, 1200 Sixth Avenue Suite 900, OWW-130, Seattle, WA 98101; submitted by facsimile to (206) 553-0165; or comments on the draft permit may be submitted via e-mail to godsey.cindi@epa.gov and comments on the DSEIS may be submitted via e-mail to shaw.hanh@epa.gov

After the Public Notice expires and all significant comments have been considered, EPA's regional Director for the Office of Water & Watersheds will make a final decision regarding permit re-issuance. If no comments requesting a change in the draft permit are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If significant comments are received, EPA will address the comments and issue the permit along with a response to comments. The permit will become effective 30 days after the issuance date, unless the permit is appealed to the Environmental Appeals Board (EAB) within 30 days.

Persons wishing to comment on State Certification should submit written comments by the public notice expiration date to the Alaska Department of Environmental Conservation c/o Tim Pilon, 610 University Avenue, Fairbanks, Alaska 99709 or Tim.Pilon@alaska.gov

Documents are Available for Review.

The draft NPDES permit and related documents can be reviewed or obtained by visiting or contacting EPA's Regional Office in Seattle between 8:30 a.m. and 4:00 p.m., Monday through Friday.

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue, Suite 900 OWW-130
Seattle, Washington 98101
(206) 553-0523 or
1-800-424-4372 (within Alaska, Idaho, Oregon and Washington)

Draft permits, Fact Sheets, and other information can also be found by visiting the Region 10 website at www.epa.gov/r10earth/water.htm. The DSEIS can be found at www.reddogseis.com.

The fact sheet and draft permit are also available at:

EPA Alaska Operations Office
222 W. 7th Avenue Room 537
Anchorage, Alaska 99513-7588
(800) 781-0983 toll free in Alaska only

Alaska Department of Environmental Conservation
610 University Avenue
Fairbanks, Alaska 99709

For technical questions regarding the draft permit or fact sheet, contact Cindi Godsey at (907) 271-6561 or godsey.cindi@epa.gov. Services can be made available to persons with disabilities by contacting Audrey Washington at (206) 553-0523.

TABLE OF CONTENTS

I. Applicant	5
II. Facility Activity.....	5
III. Background	6
IV. Receiving Waters	6
A. Outfall Location.....	6
B. Water Quality Standards.....	7
V. Description of Discharge	8
VI. Permit Requirements	9
A. Applicable Laws and Regulations.....	9
B. Effluent Limitations	9
C. Monitoring Requirements.....	12
D. Best Management Practices.....	13
E. Quality Assurance Plan	13
F. Other Requirements of Changes from the Current Permit.....	13
G. Additional Permit Provisions	16
VII. Other Legal Requirements	16
A. Endangered Species Act	16
B. Essential Fish Habitat	17
C. State Certification	17
D. Permit Expiration	17
VII. References.....	17
Appendix A – Red Dog Mine Location	19
Appendix B – Draft 401 Certification from ADEC.....	21
Appendix C – Development of Effluent Limitations.....	37
Appendix D – Example of WQBEL Calculation.....	50
Appendix E – Ammonia Criteria and Limit Determination	53

TECHNICAL INFORMATION

I. APPLICANT

Teck Cominco Alaska, Inc.
Red Dog Operations
3105 Lakeshore Dr. Bldg A Suite 101
Anchorage, AK 99507

Facility Contact: Robert Napier (907) 426-9145
Facility Location: foothills of the DeLong Mountains near Kotzebue, Alaska

II. FACILITY ACTIVITY

Teck Cominco Alaska Incorporated (TCAK), in partnership with the NANA Regional Corporation, operates the Red Dog zinc/lead mine in the Northwest Arctic Borough (NWAB) of Alaska, 90 miles north of Kotzebue and 47 miles inland from the coast of the Chukchi Sea. The mine site is located on a ridge between the Middle and South Forks of Red Dog Creek, in the DeLong Mountains of the Western Brooks Range. Red Dog is the world's largest zinc mine. NANA Management Services, Inc. provides camp management, housekeeping, catering and other services; and NANA/Lynden LLC, operates trucks carrying mineral concentrates from the mine to the Alaska Industrial Development and Export Authority's (AIDEA's) DeLong Mountain Transportation System port facility.

The Red Dog deposit consists of metal sulfides in a Mississippian shale. The orebody lies within the drainage basin of the Middle Fork of Red Dog Creek. Facilities at the mine site include an open pit zinc/lead mine, concentrator, tailings impoundment, concentrate storage building, maintenance facilities, power generation plant and an accommodations complex. The open pit mine is established on both sides of the valley of the Middle Fork of Red Dog Creek.

Mine production at Red Dog Mine involves the stripping and stockpiling of ore, waste (i.e., rock with sub-economic value), and overburden/topsoil. Mill production involves crushing, grinding and processing to produce mineral concentrates. Based on the approved mine plan, the Red Dog Mine main pit is expected to remain in production until 2012. The mine produces approximately 9,000 tonnes of ore per day. TCAK is currently in the process of obtaining approvals to expand the mine into a second pit, Aqqaluk, which would allow for continued mining through 2031.

The mill is located on a graded pad adjacent to, and northeast of, the tailings dam and requires a consistent feed of homogeneous ore material to optimize recovery. To accommodate this requirement, layered stockpiles, typically holding 280,000 tonnes, are built to combine the various types and grades of ore. The operation includes two crushing plants and grinding, flotation, reagent and dewatering facilities. Stockpiled ore is rehandled to a gyratory crusher where it is reduced to a size of less than six inches in one pass. The crusher product is conveyed to an enclosed, coarse ore stockpile. The building is capable of holding about 15,000 tonnes of mill feed in one large pile. Coarse ore is withdrawn from underneath the stockpile to feed three Semi-Autogenous Grinding (SAG) mills. The grinding circuit overflow is delivered to the

Exhibit 2
Page 5 of 53

prefloation circuit. Froth flotation processes separate materials into floating (particles attached to bubbles) and sinking components, which produce concentrate and tailings, respectively.

Final lead and zinc concentrates are thickened and dewatered to a final cake. These filtered concentrates are stored in the mill site concentrate storage building. From there, the concentrate is transferred by truck to the port site for shipment.

The concentrator tailings are pumped from the mill to the tailings facility and deposited either sub-aqueously or sub-aerially. The facility includes a rock fill dam and impoundment, a seepage collection and pumping system, a tailings discharge system (pumps and pipeline), and a water reclamation system.

The current dam crest is at elevation 955 feet. The pond elevation is at 950 feet. Upstream (south) of the dam, the impoundment is 8,000 feet long and 2,600 feet wide at its widest point. It is bounded on the south end by the Overburden Stockpile built on the divide between the South Fork of Red Dog Creek and Bons Creek. The impoundment has an ultimate capacity of approximately 39.3 million cubic yards (cy) of tailings, assuming that the tailings remain covered by water.

III. BACKGROUND

In the early 1980s, TCAK submitted several applications for federal authorizations for the project. The surface water discharge was a new source which required EPA to prepare an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA). The EIS was issued in 1984 and the first NPDES permit was issued in 1985 and expired in 1990.

The permit was administratively extended and reissued in 1998. EPA proposed to modify the permit in 2003 but the conditions were appealed and the changed conditions did not go into effect. TCAK re-applied for the NPDES permit in a timely manner so the permit has been administratively extended until it is reissued.

EPA reissued the NPDES permit in March 2007. The renewed permit was again appealed and EPA withdrew the reissued permit on September 27, 2007, citing the need to conduct additional NEPA analysis. EPA has prepared a DSEIS for permit reissuance which includes TCAK's request to develop the Aqqaluk Pit.

IV. RECEIVING WATERS

- A. Outfall Location. The facility proposes to discharge to the Middle Fork Red Dog Creek through outfall 001. Outfall 001, the discharge point for treated mine drainage and excess precipitation, is located at latitude 68° 04' 17" N, and longitude 162° 52' 05" W. Stormwater is also discharged through outfalls in the facility vicinity; and the outfall locations are defined in the Site Management Pollution Prevention Plan (SMPPP).

In previous permitting actions, Outfall 002 was included for the temporary camp domestic wastewater. On October 31, 2008, EPA authorized ADEC to administer the NPDES program for the state of Alaska. ADEC is phasing the Program with

Exhibit 2

Page 6 of 53

different categories of discharges being phased in over a 3 year period. The transfer of domestic wastewater permits occurred during the first phase (upon authorization) but mining permits will not transfer until the third phase which will occur 2 years later, October 2010.

To align this permit with the phasing sequence, ADEC has requested that EPA reissue the permit without the domestic/graywater components. The general permit, AKG-57-0000 (GP), for small domestic wastewater discharges, would be utilized instead. This aligns the treatment requirements for small discharges with similar discharges covered by the GP.

Although there is a discharge of domestic wastewater to the impoundment, these cannot be separated out for coverage under the GP. Instead, this discharge will have an internal wastestream monitoring point to determine compliance with the technology-based limits for domestic wastewater described in Appendix C.

- B. Water Quality Standards. The Alaska State Water Quality Standards (WQS) include use classifications, numeric and/or narrative water quality criteria, and the antidegradation policy. The use classification system designates the beneficial uses that each water body is expected to achieve (such as contact recreation, growth and propagation of fish, etc.). The criteria for each parameter are the criteria deemed necessary by the State to support the beneficial use classification of each water body.

The Middle Fork Red Dog Creek is protected in the WQS [18 AAC 70.230(e)(19)] for freshwater Class (1)(A)(iv) for industrial water supply use from the headwaters to the terminus of the Red Dog Mine Water Management System. Lower Middle Fork Red Dog Creek from the terminus of the Red Dog Mine Water Management System to the confluence with North Fork Red Dog Creek is protected in the WQS [18 AAC 70.230(e)(20)] for freshwater Classes (1)(A)(iv), (1)(B)(i) for contact recreation, wading only and (1)(B)(ii) for secondary recreation (except fishing). The main stem of Red Dog Creek from the confluence of the Middle and North Forks to Ikalukrok Creek is protected in the WQS [18 AAC 70.230(e)(18)] for freshwater Classes (1)(A)(iv), (1)(B)(i) for contact recreation, wading only, (1)(B)(ii) for secondary recreation, and (1)(C) for Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife. Ikalukrok Creek from its confluence with Red Dog Creek to the Wulik River is protected in the WQS [18 AAC 70.230(e)(8)] for freshwater Classes (1)(A)(iv), (1)(B)(i) for contact recreation, wading only, (1)(B)(ii) for secondary recreation, and (1)(C) for Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife.

The water quality parameters that could be affected by the discharge from the facility include metals, solids, cyanide, and pH. These are common potential water quality parameters of concern in treated mine water discharges.

ADEC has adopted, and EPA has approved, a site-specific criterion (SSC) for Total Dissolved Solids (TDS) that would result in effluent limitations different from those that would be required in the permit under the state-wide WQS.

ADEC contends in its § 401 Certification that the SSC for cadmium based on the natural condition is currently valid and has been approved by EPA. This type of SSC can be implemented in a permit and EPA used the SSC of 2 ug/L to develop permit limitations for cadmium.

V. DESCRIPTION OF DISCHARGE

The tailings pond at the Red Dog Mine receives water from a variety of sources. These sources potentially include: water associated with the tailings from the milling process which includes small amounts of the reagents used in the process; domestic wastewater, assay laboratory, filter press discharge, thickener overflows, and heavy equipment washing water carried by the gravity line from the mill/housing area; truck wash water; waste dump seepage; overburden pumpback; CSB air scrubber, natural gas produced water; filter cloths which are buried with the tailings; soil cement used on the exposed tailings beach; seepage pumpback; blasting agents; secondary containment water; water used as dust suppressant that may contain small amounts of methanol; snow dump; mine sump water; sand filter backwash and sand deposited on the tailings beach; and Port wastewaters hauled to the mine site such as regeneration solution from the ion exchange treatment process at the Port. These contributions to the Tailings Impoundment are described in the re-application package.

Tailings pond water, often called reclaim water, is pumped by floating barge pumps in the tailings pond to two different water treatment plants at the mill facility. Water treatment plant 1 (WTP-1) operates year-round at a nominal rate of 6,000 gallons per minute (gpm) and provides the mill with treated water for processing. Water treatment plant 2 (WTP-2) is seasonally operated and treats reclaim water for discharge at Outfall 001 at a maximum capacity of 14,500 gpm. WTP-2 also has the ability to provide water to the mill when needed.

At WTP-2, reclaim water is first treated in the pipeline with at least 6 mg/L of sodium sulfide and mixed in an in-line mixer. The sulfide reacts with the dissolved cadmium in the reclaim water to form insoluble cadmium sulfide, which is stable throughout the remainder of the treatment process. Reclaim water then flows into a 6,500 cubic-foot (ft³) rapid mix tank where reacted lime and recycled solids are added to adjust the pH to approximately 10.3 standard units (s.u.). From the rapid mix tank the solution gravity flows into a 50,000 ft³ lime reactor that provides a nominal 20 minute residence time for complete chemical reactions. Large amounts of compressed air are sparged in to the rapid mix tank to ensure full oxidation of all ions in solution.

The significant chemical reaction occurring in the lime reactor is precipitation, altering the form of an ion from a dissolved state to a solid state, of soluble metals as insoluble metal-hydroxides. TCAK has proposed using barium hydroxide rather than calcium hydroxide for this treatment step. The precipitated solids are maintained in suspension and flocculent is added, coalescing the smaller particles into larger solids. The flocculent is allowed to react in the agitated floc mix tank. From the floc mix tank, the solution gravity flows into a 200 foot diameter circular clarifier where the solids are allowed to settle under gravity and separate from the water. Settled solids are removed through the "underflow" and the treated water leaves the clarifier through the "overflow". The majority of the underflow solids are recycled back to the beginning to the treatment process to a 1,200 ft³ lime/sludge mix tank where the solids are mixed with lime.

Product in the lime/sludge mix tank is then fed into the rapid mix tank with the raw reclaim water.

Clarifier overflow water then gravity flows to three sand filters operated in parallel. The sand filters remove any residual solids not settled out of solution in the clarifier. From the sand filters, automated pH and turbidity meters take final measurements. If the pH is within permit limits and the range established which ensures effective treatment and the turbidity is within an established range which indicates that effective suspended solids removal has been accomplished, the water is discharged to Red Dog Creek. If the pH and turbidity are not within the prescribed range, the filtered water is discharged back into the tailings impoundment.

Water treatment plant 3 (WTP-3) was constructed during the winter/spring of 2004/2005 and began operating in 2006. The plant treats seepage and runoff from the Main Waste Stockpile and Mine Sump before it enters the tailings impoundment. Over time, the operation of WTP-3 is intended to help control TDS and sulfate levels in the tailings impoundment. Like WTPs-1 and 2, WTP-3 uses a lime precipitation process for metals removal.

VI. PERMIT REQUIREMENTS

A. Applicable Laws and Regulations

The Clean Water Act requires that the effluent limits for a particular pollutant be the more stringent of either technology-based effluent limits or water quality-based limits. A technology-based effluent limit requires a minimum level of treatment for industrial point sources based on currently available treatment technologies. A water quality-based effluent limit is designed to ensure that the water quality standards of a waterbody are being met. For more information on deriving water quality-based effluent limits, see Appendix C.

B. Effluent Limitations

1. Wastewater from Outfall 001

An evaluation for the discharge from Outfall 001 was done comparing the technology-based limitations in 40 CFR Part 440 Subpart J, plus other parameters of concern, with the WQ-based limitations discussed in Appendix C. For most parameters, the WQ-based limitation is more restrictive.

- a. The following table summarizes the effluent limitations that are in the draft permit as well as comparing the effluent limitations and monitoring requirements of the previous permit. The information for the previous permit is in parentheses. An N/A means that this parameter was either not limited or not monitored in the previous permit. No change is indicated by a lack of parentheses.

TABLE 1 – Effluent Limitations and Monitoring Requirements for Outfall 001

Parameter (in ug/L unless otherwise noted)	Daily Maximum	Monthly Average	Sample Frequency	Sample Type ¹
Barium ²	---	---	1/month (N/A)	24 hour composite
Cadmium ²	3.2 (3.4)	1.7 (2.0)	1/week	24 hour composite
Copper ²	34.4 (43.7)	12.6 (15.1)	1/week	24 hour composite
Chromium ²	---	---	1/week	24 hour composite
Cyanide, WAD ³	22.2 (9.0)	10.3 (4.0)	1/week	24 hour composite
Lead ²	18.3 (19.6)	8.5 (8.1)	1/month (week)	24 hour composite
Manganese ²	---	---	1/week	24 hour composite
Mercury, total	0.02	0.01	1/month	24 hour composite
Nickel ²	216.5 (N/A)	80.0 (N/A)	1/week	24 hour composite
Selenium ²	7.2 (5.6)	4.4 (4.9)	1/week	24 hour composite
Zinc ²	269.2	155.9 (119.6)	1/month (week)	24 hour composite
Total Suspended Solids (TSS), mg/L	30.0	20.0	1/week	24 hour composite
Total Dissolved Solids (TDS), mg/L	See Permit Part I.A.7.		1/week	24 hour composite
TDS Anions and Cations ⁴	---	---	1/month	24 hour composite
Aluminum ²	157.0 (N/A)	53.0 (N/A)	1/week (month)	24 hour composite
Iron ²	---	---	1/month	24 hour composite
Fecal Coliform, #/100 ml ⁵	400	200	1/ 2 months	Grab
Total Residual Chlorine, mg/L	---	---	1/month	Grab
Biochemical Oxygen Demand (BOD ₅), mg/L	---	---	1/month	24 hour composite
Total Ammonia as N, mg/L	8.8 (N/A)	5.7 (N/A)	1/week	24 hour composite
Organic Priority Pollutant Scan ⁶	---	---	1/year (3/yr)	24 hour composite
Turbidity, NTU	---	---	1/month (week)	Grab
Temperature, °C	---	---	Daily	Grab
Cumulative Volume, gallons	See Permit Part I.A.3.		Continuous	Recording
Whole Effluent Toxicity, TUc	12.2	9.7	1/month	See Permit Part I.H.
pH, standard units	6.5 to 10.5		1/week	Grab

1. Effluent samples collected shall be representative of the effluent discharged without dilution from or contact with any outside sources. Results of analyses conducted under Part I.A.1. of this permit shall be submitted monthly on the discharge monitoring report.
2. All metals shall be analyzed as total recoverable unless otherwise indicated.
3. Cyanide was previously measured as Total but the WQS is now WAD. ADEC has proposed a mixing zone for WAD cyanide where one had not been authorized for total cyanide.
4. This monitoring shall include carbonates, chlorides, sulfates, potassium, magnesium, calcium, and sodium. The carbonate analysis should be estimated based on direct measurement of alkalinity.
5. The previous permit contained a limit on fecal coliform of 400 for a weekly average but the WQS allows only a very limited number of samples to be more than 400 which would make it a maximum value rather than an average.
6. Volatile organics shall be monitored using EPA analytical method 624, semi-volatile organics shall be monitored using EPA analytical method 625.

2. Whole Effluent Toxicity (WET) Requirements

Chronic WET testing is included in the draft permit on a monthly basis. The testing will occur at Outfall 001 so that the full effects of the discharge into the Middle Fork Red Dog Creek will be determined. See Appendix C for further discussion.

3. Stormwater Outfalls

The discharge of pollutants to waters of the United States via stormwater is controlled in this permit by the establishment of a Site Management Pollution Prevention Plan (SMPPP). The basis for the SMPPP is described in Part VI.D. of this Fact Sheet and the requirements are found in Permit Part I.I.

4. Surface Water (Ambient) Monitoring

The following ambient monitoring shall be conducted:

TABLE 2 – Ambient Monitoring					
Parameter ¹	Station 160 ²	Station 150	Station 151 ²	Station 12 ²	Station 140 ²
Aluminum	2/month	---	2/month	2/month	2/month
Cadmium	2/month	---	2/month	2/month	2/month
Chromium	2/month	---	2/month	2/month	2/month
Copper	2/month	---	2/month	2/month	2/month
Cyanide ³ , WAD	---	---	2/month	---	---
Iron	2/month	---	2/month	2/month	2/month
Lead	2/month	---	2/month	2/month	2/month
Manganese	2/month	---	2/month	2/month	2/month
Mercury, total	2/month	---	2/month	2/month	2/month
Nickel	2/month	---	2/month	2/month	2/month
Selenium	2/month	---	2/month	2/month	2/month
Zinc	2/month	---	2/month	2/month	2/month
Total Ammonia as N, mg/L	2/month	---	2/month	2/month	2/month
Conductivity, umhos/cm	2/month	---	2/month	2/month	2/month
Hardness, mg/L CaCO ₃	2/month	---	2/month	2/month	2/month
Temperature, °Celsius	2/month	---	2/month	2/month	2/month
Total Dissolved Solids (TDS), mg/L	1/week	1/week	1/week	2/month	2/month

TABLE 2 – Ambient Monitoring					
Parameter ¹	Station 160 ²	Station 150	Station 151 ²	Station 12 ²	Station 140 ²
TDS Anions and Cations ⁴	1/month	1/month	1/month	---	---
pH, standard units	2/month	---	2/month	2/month	2/month
Turbidity, NTU	---	---	---	2/month	2/month
Whole Effluent Toxicity ⁵ , TU _c	---	---	---	1/month	---
<p>1. Monitoring for metals shall be in ug/L and total recoverable unless otherwise noted. For additional monitoring requirements for aluminum, cadmium, chromium, copper, cyanide, iron, lead, manganese, mercury, nickel, selenium, and zinc see section I.A.5.b.</p> <p>2. The permittee shall spread out the sample collection dates so that the samples collected are representative of the calendar month. To the extent practicable, ambient monitoring shall coincide with effluent monitoring. If weather, safety, shipping, and other environmental constraints prevent the permittee from collecting representative samples, the permittee shall document the condition which prevented the representative samples from being collected on the discharge monitoring reports.</p> <p>3. Since the permit includes limitations on WAD cyanide, the requirement for the permittee to notify the ADEC and the ADF&G immediately by telephone should WAD cyanide concentrations exceed the detection limit is being removed from the permit.</p> <p>4. This monitoring shall include a standard and complete suite of those cations and anions contributing to TDS including, but not limited to, carbonates, chlorides, sulfates, potassium, magnesium, calcium, and sodium. The carbonate analysis may be estimated based on direct measurement of alkalinity.</p> <p>5. See Permit Part I.G. for additional testing requirements.</p>					

EPA is proposing to discontinue ambient monitoring requirements at stations 2, 9, and 20 because the monitoring is unnecessary to determine whether effluent treatment and the size of the mixing zones are adequate to protect all existing uses in the receiving water.

C. Monitoring Requirements

40 CFR 122.48(b) requires that the permit contain monitoring requirements. Self-monitoring of effluent parameters is necessary for the permittee to demonstrate compliance with effluent limitations, to assure that state water quality standards are met, and to provide information for future permitting actions. Monitoring frequencies are based on the Agency's determination of the minimum sampling frequency required to adequately monitor the facility's performance. Required sample types are based on the Agency's determination of the potential for effluent variability. These determinations take into consideration several factors, of which the most important are the type of pollutants of concern and the type of treatment system. The Limitation Table, above, includes the monitoring frequency and sample type proposed in the draft permit.

EPA is proposing reduced monitoring for zinc, mercury, and lead at Outfall 001. These parameters did not show a reasonable potential to violate the WQS and are included solely on the basis of their inclusion in the Effluent Limitation Guidelines. As such, EPA is proposing to reduce the monitoring from weekly to monthly.

Reduced monitoring is also proposed for Organic Priority Pollutant Scans (OPPS). Monitoring results during the last permit cycle produced approximately 2000 non-detect results for the organic constituents in an OPPS. In addition, for all the OPPS conducted there have been two (2) values measured that were above the method reporting limits. Neither of these chemicals is used at Red Dog Mine and they are both extremely common laboratory cross-contaminants. Therefore, EPA proposes to reduce the monitoring frequency from 3 times per year to annually.

D. Best Management Practices

Section 304(e) of the CWA requires EPA to include conditions in the NPDES permit that require the permittee to develop a Best Management Practices (BMP) Plan and/or a Stormwater Pollution Prevention Plan (SWPPP) to control potential discharges such as runoff, spillage, and leaks. This permit requires a Site Management Pollution Prevention Plan (SMPPP) that combines general BMP Plan requirements with SWPPP requirements to control the discharge of toxics or hazardous pollutants by way of plant site runoff, spillage or leaks, sludge or waste disposal, and drainage from raw material storage at the mine site itself. Storm water for the road and port site is covered under another permit. On a mine site, not all precipitation related drainage is considered stormwater for regulatory purposes. Drainage from the mine site is regulated as "mine drainage" rather than "storm water."

The SMPPP should recognize the hazardous nature of various substances used and produced by the facility and the way such substances may be accidentally dispersed. The intent of the SMPPP is to cover the facility and any ancillary activities that would need to control storm water discharges. The SMPPP should incorporate elements of pollution prevention as set forth in the Pollution Prevention Act of 1990, 42 U.S.C. 13101.

The SMPPP must be amended whenever there is a change in the facility or in the operation of the facility which materially increases the potential for an increased discharge of pollutants.

E. Quality Assurance Plan

The permit requires the permittee to review and modify the existing Quality Assurance Plan, as necessary, then implement the Plan. The purpose of the Quality Assurance Plan is to establish appropriate sampling, handling and analytical procedures for all effluent and ambient water samples taken.

F. Other Requirements or Changes from the current Permit

1. This permit prohibits the use of untreated mine water for road watering, even inside the mine pit. This provision is included in the permit to prevent the transport of pollutants contained in the untreated wastewater to sites that are not sloped toward the tailings impoundment.

2. TCAK has indicated that they will not be discharging in the winter. This draft permit does not include any permit requirements that were related only to winter discharging.
3. The current permit contains biomonitoring included by EPA based on the State's CWA Section 1998 § 401 Certification.

Table 3A – Current Bioassessment Monitoring	
Sample Site	Factors Measured
Middle Fork Red Dog Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance
North Fork Red Dog Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use
Main Stem Red Dog Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use
Ikalukrok Creek, stations 9, 7, and upstream and downstream of Dudd Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use
Ikalukrok Creek	Fall aerial survey of returning chum salmon
Wulik River	Metals concentrations in Dolly Varden gill, liver, muscle, and kidney. Fall aerial survey of overwintering Dolly Varden
Anxiety Ridge	Fish presence and use
Evaingiknuk Creek	Fish presence and use
Buddy Creek	Fish presence and use

ADEC has proposed changes to the current biomonitoring program in its draft § 401 Certification for this draft permit because the previous conditions were determined to be redundant. The following table shows the monitoring that EPA is proposing to include in the permit:

Table 3B – Proposed Bioassessment Monitoring	
Sample Site	Factors Measured
North Fork Red Dog Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use
Main Stem Red Dog Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use
Ikalukrok Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use

In the alternative, ADEC is proposing that all biomonitoring be included in the State's Solid Waste permit that is being developed by ADEC. EPA is considering this proposal and is requesting comments on the proposed changes and as well as the removal of the monitoring if it becomes duplicative of the Solid Waste permit.

4. TCAK requested Alternative Test Procedures (ATPs) for WAD cyanide, chlorides and metals. The ATPs for chlorides and metals were approved during the cycle of the current permit and will be included in this permit. The ATP for WAD cyanide was approved by EPA in a letter dated November 16, 2005.
5. TCAK requested that hardness be calculated rather than measured in the effluent. The monitoring for anions and cations in the draft permit makes this calculation possible.
6. Silver was monitored during the current permit cycle and has shown no reasonable potential to violate water quality criteria and has been removed from the permit.
7. The water balance modeling and water quality analysis in the draft SEIS provided information that indicated TCAK will need to perform additional water treatment or source control to achieve TDS limits and discharge enough wastewater to maintain a safe water level behind the tailings impoundment dam. TCAK has tested using barium hydroxide to lower TDS levels in the effluent and thereby increase the amount of wastewater that can be discharged. In order to ensure that TCAK is able to meet the TDS limits and discharge sufficient wastewater, a new condition is included in the draft permit that requires TCAK to develop and implement a TDS management plan. The TDS plan must describe the steps TCAK will take to ensure that TDS limits are met and sufficient volumes of wastewater will be discharged. EPA and ADEC will review the plan. In addition, TCAK is required to report the water level behind the dam in comparison to freeboard. The TDS management plan is a mitigation measure that resulted from the draft SEIS analysis.
8. TCAK may be using barium hydroxide rather than calcium hydroxide in water treatment during certain times of year. EPA has determined that this will not require a change to the permit limits. However, monthly barium monitoring has been added to the permit. The only other constituent that could be elevated is manganese and the permit already contains monitoring for this parameter.
9. EPA is proposing Minimum Levels (MLs) for the draft permit. An ML is the level at which the laboratory knows with certainty that a parameter is present in a sample at the level reported. The draft permit requires that in effluent monitoring for limited parameters, the ML be below the effluent limitation. All proposed MLs are below the effluent limitations in the draft permit except for selenium. The Minimum Level for selenium will be designated as the compliance level in the draft permit.

For parameters without limits, the draft permit requires MLs that will make it possible to assess compliance with the applicable WQS. The following table lists the proposed MLs:

Table 4 – Minimum Levels (MLs)	
Parameter ¹	Proposed MLs (in ug/L unless noted)
Aluminum	50
Barium	10
Cadmium	1.6
Chromium	10
Copper	10
Iron	100
Cyanide, WAD	10
Lead	5
Manganese	10
Mercury, total	0.5 ng/L
Selenium	5
Zinc	50
Total Ammonia as N	1.0 mg/L
BOD	8 mg/L
TRC	100
¹ All metals shall be measured in total recoverable unless otherwise noted.	

G. Additional Permit Provisions

Sections II, III, and IV of the draft permit contain standard regulatory language that must be included in all NPDES permits. Because they are regulations, they cannot be challenged in the context of an NPDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and other general requirements.

VII. **OTHER LEGAL REQUIREMENTS**

A. Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires federal agencies to request a consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) regarding potential effects an action may have on listed endangered species. EPA sent letters to the Services on November 19, 2008, requesting updated species lists for the project area.

In a letter dated September 21, 2005, for the 2007 permit issuance, USFWS determined that the reissuance of the NPDES permit is not likely to adversely impact listed species so further consultation under Section 7 of the ESA is not necessary.

Also for the 2007 permit issuance, a letter dated September 28, 2005, from NMFS stated that there are no threatened or endangered species listed under their jurisdiction in the project area.

Unless an updated list includes unexpected information on the site, EPA has determined that the re-issuance of this permit will have no effect on threatened or endangered species.

B. Essential Fish Habitat

Section 305(b) of the Magnuson-Stevens Act [16 USC 1855(b)] requires federal agencies to determine whether any activity proposed to be permitted, funded, or undertaken by a federal agency may have an adverse effect on designated Essential Fish Habitat (EFH) as defined by the Act. The EFH regulations define an adverse effect as any impact which reduces quality and/or quantity of EFH and may include direct (e.g. contamination or physical disruption), indirect (e.g. loss of prey, reduction in species' fecundity), site-specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

EPA has determined that issuance of this permit is not likely to have an adverse effect on EFH in the vicinity of the discharge. Effluent limitations have been incorporated into the draft permit based on criteria considered to be protective of overall water quality in Red Dog Creek based on the designated uses of the creek. There is also a barrier to fish passage that prevents fish from coming into contact with the discharge. EPA will provide NMFS with this determination for their review and possible recommendations. Any recommendations received from NMFS regarding EFH will be considered prior to final issuance of this permit.

C. State Certification

Section 401 of the Clean Water Act requires EPA to seek state certification before issuing a final permit. As a result of the certification, the state may require more stringent permit conditions to ensure that the permit complies with WQS. The certification may also require additional monitoring requirements and authorize a mixing zone. A draft 401 Certification is included as Appendix B in this Fact Sheet.

D. Permit Expiration

This permit will expire five years from the effective date of the permit. Permits may be administratively extended under 40 CFR 122.6 if all the requirements of that regulation are met.

VIII. **REFERENCES**

Application package dated February 25, 2003.

Red Dog Mine Extension Aqqaluk Project Draft Supplemental Environmental Impact Statement. December 2008.

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

EPA 1999. *1999 Update of Ambient Water Quality Criteria for Ammonia*. Office of Water, Washington, D.C., December 1999. EPA-822-R-99-014.

Water Quality Criteria; Notice of Availability; 1999 Update of Ambient Water Quality Criteria for Ammonia. 64 Federal Register 71974 – 71980, December 22, 1999.

18 AAC 70, the Alaska Department of Environmental Conservation's Water Quality Standards.

18 AAC 72, the Alaska Department of Environmental Conservation's regulations for Wastewater Disposal.

1998 Permit Package including the final permit, response to comments and 401 Certification.

2003 Permit Modification Package including the final permit, response to comments, fact sheet, Environmental Assessment, and 401 Certification.

2007 Permit Package including the fact sheet, final permit (withdrawn), response to comments and 401 certification.

Letter dated November 16, 2005, from William Riley, EPA, to R.G. Scott, TCAK, regarding Alternative Test Procedures (ATPs).

Letter dated June 16, 2005, from DNR/OPMP to TCAK regarding the ACMP review.

Letter dated December 10, 2005, from R.G. Scott, TCAK, to Luke Boles, ADEC, requesting that the SSC for zinc not be re-certified.

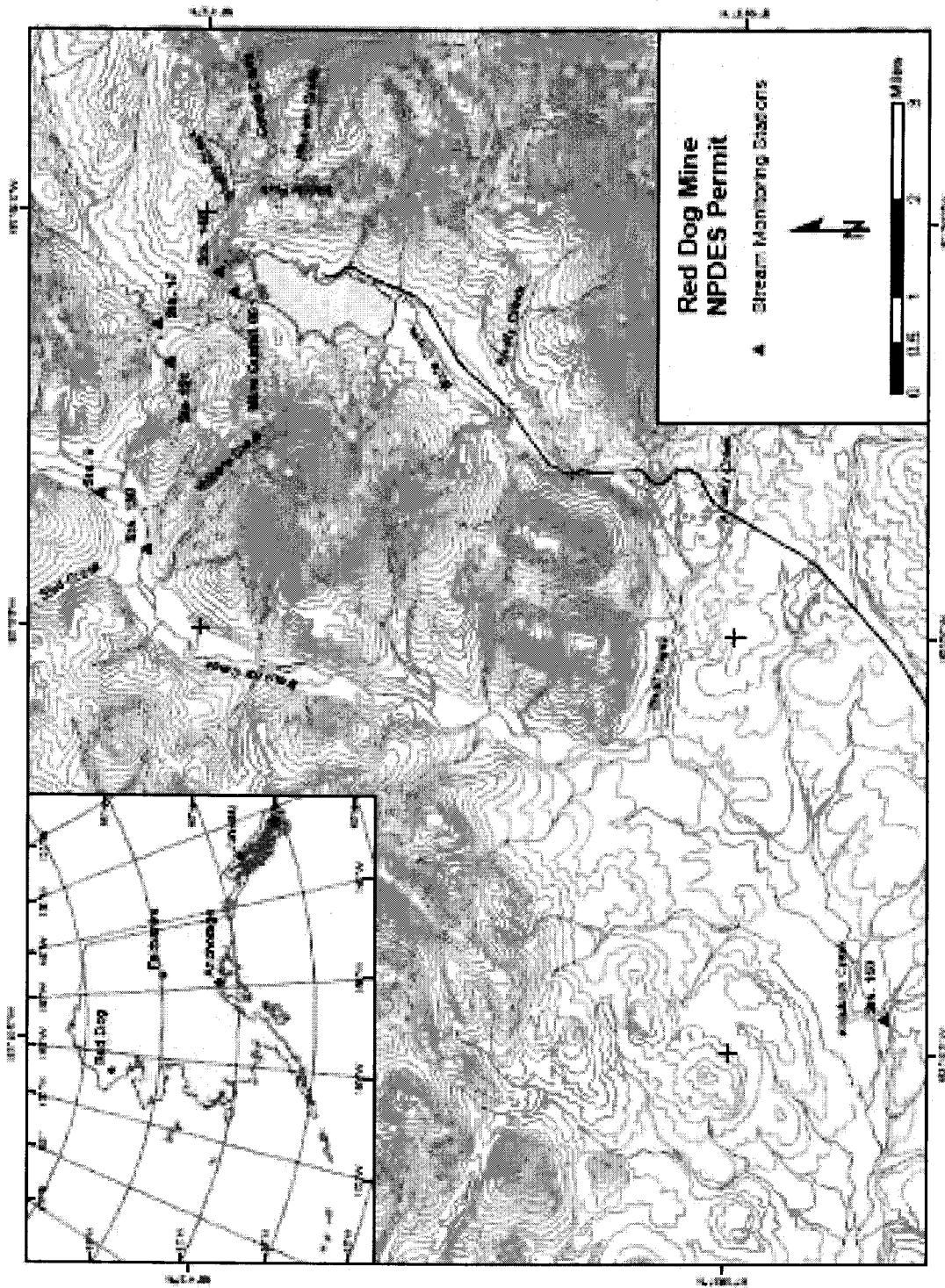
"WET Limit with Consideration to Updated Site-side Water Balance" submitted by TCAK to EPA on November 21, 2005.

EPA Water Quality Criteria for Water [63 FR 68354-68364, December 10, 1998].

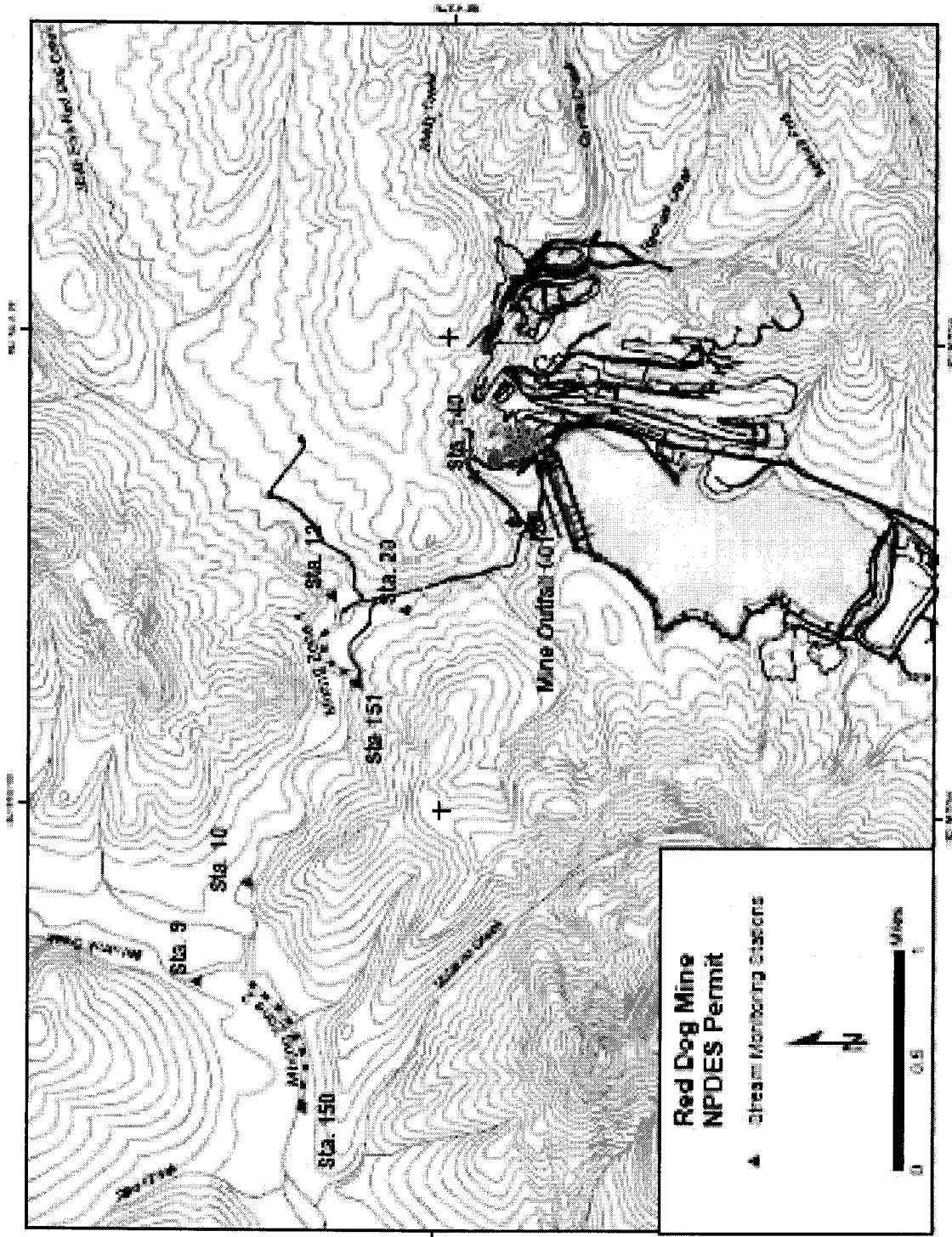
Letter dated March 26, 2006, from John B. Knapp, TCAK, to Michael F. Gearheard, EPA, providing an addendum to the renewal application.

Letter dated April 18, 2008, from John B. Knapp, TCAK, to Michael F. Gearheard, EPA, proposing an alternative waterwater treatment technology.

APPENDIX A
Red Dog Mine Location



APPENDIX A
Red Dog Mine Location



Draft CWA Section 401 Certification
Draft NPDES Permit No. AK-003865-2
Red Dog Mine

December 1, 2008

APPENDIX B
DRAFT § 401 STATE CERTIFICATION

STATE OF ALASKA

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF WATER
WASTEWATER DISCHARGE PROGRAM

SARAH PALIN, GOVERNOR

555 Cordova Street
Anchorage, AK 99501
Phone: (907) 269-3059
Fax: (907) 269-7508
www.dec.state.ak.us

December 1, 2008

John R. Egan, Acting General Manager
Teck Cominco Alaska, Inc.
3105 Lakeshore Drive, Bldg. A., Ste 101
Anchorage, AK 99517

Certified Mail #
Return Receipt Requested

Re: Draft NPDES AK-003865-2, Red Dog Mine Site

Dear Mr. Egan:

In accordance with Section 401 of the Clean Water Act of 1977 and provisions of the Alaska Water Quality Standards, the Department of Environmental Conservation is issuing the enclosed Certificate of Reasonable Assurance for NPDES Permit AK-003865-2 for the discharge of treated wastewater and stormwater from the Red Dog Mine in accordance with discharge points, effluent limitations, monitoring requirements, and other conditions set forth in the U.S. Environmental Protection Agency NPDES Permit No. AK-003865-2.

Outfall 002, as listed in the previous version of NPDES Permit No. AK-003865-2, is not covered by this renewal of the permit. See Part IV.A of the Fact Sheet. Consequently, discharge from Outfall 002 is not considered under this certification.

The proposed activity is located at the Red Dog Mine Site on Red Dog Creek, 82 miles north of Kotzebue, Alaska, Latitude 68° 04'17" N, Longitude 162° 52' 05" W.

This Department action represents only one element of the overall project level coastal management consistency determination, issued by the Office of Management and Budget under AS 44.19 and 6 AAC 50.070.

Department of Environmental Conservation regulations provide that any person who disagrees with this decision may request an adjudicatory hearing in accordance with 18 AAC 15.195 - 18 AAC 15.340 or an informal review by the Division Director in accordance with 18 AAC 15.185. Informal review requests must be delivered to the Division Director, 555 Cordova Street, Anchorage, Alaska 99501, within 15 days after receiving this permit decision. Adjudicatory hearing requests must be delivered to the Commissioner

Exhibit 2

Draft CWA Section 401 Certification
Draft NPDES Permit No. AK-003865-2
Red Dog Mine

December 1, 2008

of the Department of Environmental Conservation, 410 Willoughby Avenue, Suite 303, Juneau, Alaska 99801, within 30 days after the date of this permit decision. If a hearing is not requested within 30 days, the right to appeal is waived

By copy of this letter we are advising the U.S. Environmental Protection Agency and the Division of Governmental Coordination of our actions and enclosing a copy of the Certificate for their use.

Sincerely,

DRAFT

Sharmon Stambaugh
Wastewater Discharge Program Manager

Enclosures: Certificate of Reasonable Assurance

cc:

ADEC/Fairbanks
ADEC/Juneau
ADEC/Soldotna
ADF&G/Fairbanks
ADNR/Anchorage
ADNR/Fairbanks
Attorney General/Fairbanks
Center on Race, Poverty, & the Environment
City of Kivalina
DCED/Fairbanks
EPA/Anchorage

EPA/Seattle
Kivalina Water Resource Program
Michael Moran Associates, LLC.
NANA Corporation/Kotzebue
Northwest Arctic Borough/Kotzebue
NPS/Kotzebue
OMB/DGC/Juneau
Teck Cominco Mine Site
Trustees for Alaska/Anchorage
USFWS/Fairbanks
USCOE/Fairbanks

December 1, 2008

STATE OF ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DRAFT CERTIFICATE OF REASONABLE ASSURANCE

A Certificate of Reasonable Assurance, as required by Section 401 of the Clean Water Act (CWA) has been requested by Teck Cominco Alaska, Inc. (TCAK) for National Pollutant Discharge Elimination System (NPDES) Permit AK-003865-2 to discharge treated wastewater and stormwater from the Red Dog Mine.

Public Notice of the application for this certification has been made in accordance with 18 Alaska Administrative Code (AAC) 15.140.

Water Quality Certification is required because the activity is authorized by an Environmental Protection Agency (EPA) permit identified as NPDES Permit AK-003865-2 and discharges will result from the activity.

This NPDES Permit certification covers wastewater disposal from the following discharges:

1. Outfall 001 – Discharge of treated wastewater and excess precipitation to the Middle Fork of Red Dog Creek. Outfall 001 is located at Latitude 68° 04'17" N, Longitude 162° 52' 05" W.
2. Discharge of snowmelt and rainfall runoff from the site as indicated in the Stormwater Pollution Prevention Plan.

Appendix A is hereby incorporated by reference as part of this certification. Appendix A provides a copy of EPA's February 27, 2007 letter approving establishment of a natural condition-based site specific criterion (NCBSSC) for cadmium (2.0 micrograms per liter derived from total recoverable metal concentrations) for Main Stem Red Dog and Ikalukrok Creeks. Technical information submitted to EPA in support of this cadmium NCBSSC demonstrates that the cadmium NCBSSC is based on data that are representative of the natural condition. This cadmium NCBSSC will protect all designated and existing uses. While the department did withdraw its 2007 certification, to which the cadmium NCBSSC was attached, it has since clarified that the cadmium criterion, as approved by EPA, was not withdrawn, and remains in effect for purposes of this certification and permit.

The department reviewed TCAK's request to rescind the NCBSSC for zinc applied to the Main Stem that was approved in the 401 certification issued for the 1998 NPDES Permit. At the time of that certification, the zinc NCBSSC was less stringent than the applicable zinc Alaska Water Quality Standards (WQS) at 18 AAC 70.020(b). Since the approval of the NCBSSC for zinc in the 1998 NPDES Permit certification, the WQS for zinc has become less stringent resulting in the NCBSSC being more stringent than the currently applicable WQS for zinc listed in 18 AAC 70.020(b)(11). The department finds that the NCBSSC for zinc in the Main Stem is not required to protect existing uses of the waterbody and removal of the zinc NCBSSC is hereby approved. The applicable WQS for zinc in the Main Stem shall be determined as required in 18 AAC 70.020(b) and the *Alaska Water Quality Criteria Manual*. These are the criteria upon which the effluent limits in the NPDES Permit are based.

December 1, 2008

The department reviewed the application and this certification with respect to the WQS antidegradation policy and finds the reduction in water quality to be in compliance with the requirements of 18 AAC 70.015, provided that the terms and conditions of this certification are made part of the NPDES Permit. See Appendix B for the antidegradation analysis of decisions contained in this certification.

The department reviewed the discharges with respect to the Alaska Coastal Management Program (ACMP) under 11 AAC 110, and finds that there are no major modifications proposed from the previous ACMP consistency finding. This facility was previously found to be consistent with the ACMP, therefore, pursuant to 11 AAC 110.820(k)(3) and (4), consistency review is not required for this permit reissuance.

Having reviewed the draft permit, the department certifies that there is reasonable assurance that the proposed activity and any resulting discharge is in compliance with the requirements of CWA Section 401, which includes the WQS (18 AAC 70). Through this certification, in accordance with 18 AAC 15.120 ADOPTION OF NPDES PERMITS, the NPDES Permit will constitute the permit required under Alaska Statutes (AS) 46.03.100 Waste Disposal Permit, provided that the terms and conditions of this certification are made part of the final NPDES Permit. The department is specifying the following permit terms and conditions under authority of AS 46.03.110(d):

1. The department authorizes the following mixing zones in this certification (NPDES Permit parts I.A.1, I.A.7a, and I.C.1):

A mixing zone in the Main Stem of Red Dog Creek (Main Stem) extends from the confluence of the Middle Fork of Red Dog Creek with the North Fork of Red Dog Creek (North Fork) to Station 151. The Main Stem mixing zone is approximately 1,930 feet in length and provides mixing in the ratio of 1.5 parts receiving flow to 1 part inflow for a dilution factor of 2.5. This mixing zone is granted for the following parameters: total dissolved solids (TDS), ammonia, and cyanide measured as weak acid dissociable cyanide.

A mixing zone in Ikalukrok Creek extends downstream from the confluence of the Main Stem and Ikalukrok Creek to Station 150. The mixing zone is approximately 3,420 feet in length and provides mixing in the ratio of 1 part receiving flow to 1 part inflow for a dilution factor of 2. The Ikalukrok Creek mixing zone is granted for TDS.

A mixing zone in the Lower Middle Fork of Red Dog Creek extends from Outfall 001 downstream to the confluence with North Fork Red Dog Creek to address the recreational designated use, wading only, in this segment. This mixing zone is granted for pH and shall be monitored at Station 151.

See the map in Attachment A.

Rationale: In accordance with State Regulations 18 AAC 70.240, the department has authority to designate mixing zones in permits or certifications. The authorized mixing zones will ensure that the WQS are met at all points outside of the mixing zones.

December 1, 2008

The department considered all aspects required in 18 AAC 70.240 (Mixing Zones) including, but not limited to, the potential risk to aquatic life based on existing monitoring data of the effluent, and Ikalukrok Creek and Main Stem water quality.

The department finds that the sizes of the mixing zones authorized for discharge in this certification are appropriate and provide reasonable assurance that existing uses of Ikalukrok Creek and the Main Stem outside of the mixing zones are maintained and fully protected.

For TDS, the water quality within the mixing zone is unchanged from the 2003 permit except during arctic grayling spawning periods. During spawning periods, the levels of TDS in the stream will now be comparable to the levels observed during non-spawning periods, because no spawning occurs within the mixing zone. It is appropriate to look at the impacts that these increased TDS levels have had on other life stages. Aquatic monitoring conducted by the permittee has shown fish populations in Red Dog Creek increase and decrease with time. There are, however, no discernible differences between populations in areas affected by discharges from mine operations and the North Fork, which is not affected by mining operations. There also have been no effects on fish populations in the North Fork compared to pre-mining conditions indicating adverse impacts on fish passage through the watershed. The increased levels allowed during the spawning period, therefore, will not have adverse effects on aquatic life.

The treatment measures used by the discharger represent the most economically achievable and feasible techniques for controlling the quality of the mine effluent. This includes practices to minimize, to the extent practicable, TDS loadings to the tailings impoundment while ensuring effective pollutant removal for other constituents. While specialized treatment practices are available for TDS removal (e.g., reverse osmosis or other membrane removal), they are prohibitively expensive for the volume of water discharged at Red Dog Mine. As a result, they are not practicable given that the mixing zone for TDS will not adversely affect the aquatic life use or biological integrity of the Main Stem. The mixing zones for TDS are, therefore, justified under 18 AAC 70.240.

18 AAC 72.240(l) provides for determination of the flow available for dilution by either collecting actual flow data concurrent with the discharge or calculating the low flow of the receiving water. In this case, the permittee applied for the mixing zones for ammonia and cyanide based on actual data comparing the ratio of the average daily flows at Station 10 in the Main Stem and the outfall from the tailings impoundment. The dilution factor of 2.5 represents the 5th percentile of the ratios for the period May 2003 through September 2005.

Under the authorized mixing zones, the concentrations of ammonia and cyanide in the effluent and the Main Stem will not change. As noted above for TDS, monitoring of the Main Stem compared to the North Fork has not shown any adverse effects due to mining operations. The mixing zones, therefore, will not adversely affect aquatic life. Note specifically, the maximum effluent concentrations for ammonia and cyanide do not exceed the acute water quality criteria such that there will be no lethality to passing organisms, including aquatic life passing through the Main Stem to the North Fork. There are also no economically practicable and feasible methods to reduce cyanide or ammonia levels given that current levels do not adversely affect aquatic life. The mixing zones for ammonia and cyanide are, therefore, justified under 18 AAC 70.240.

December 1, 2008

Under 18 AAC 70.230(e), the Lower Middle Fork of Red Dog Creek has the designated use of contact recreation, wading only. As a result, the pH standard that applies is 6.5-8.5. The 6.5-8.5 standard also applies to the Main Stem below the confluence with the North Fork to protect aquatic life. The pH limit of 6.5-10.5 in the permit for Outfall 001 is more restrictive than in the 1998 permit. An optimum pH, approximately 9.5 to 10.5, precipitates metals from the effluent before it is discharged. Contact use of the Middle Fork of Red Dog Creek consists of mine and agency personnel conducting instream sampling or other necessary instream work performed by the permittee. These activities are not adversely affected by the authorized mixing zone.

In addition, the baseline pH at the station just above Outfall 001 ranged from 5.8 to 6.7. Data collected at the discharge and in the receiving waters since mine operations began, indicate that pH stabilizes shortly after the discharge into Red Dog Creek. The pH is above 6.5 at Station 20 and is approximately 7 at the mouth of the Main Stem; i.e., the mixing of basic discharge waters with acidic creek waters results in a slightly basic to neutral pH where fish occur and ensures protection of the downstream aquatic life use.

2. The department authorizes the effluent limits and monitoring requirements contained in the NPDES Permit Part I.A.1 – Table 1.

Rationale: In accordance with State Regulations, 18 AAC 15.090, the department may attach terms and conditions to a permit, variance, or approval, including operating, monitoring, inspection, sampling, access to records, reporting requirements, and the posting of a performance bond or other surety, that it considers necessary to ensure all applicable criteria will be met. The effluent limits included in the permit provide assurance that WQS are being met.

3. NPDES Permit part I.A.7.b shall maintain the following language:

After the commencement of discharge, the permittee shall limit the TDS load discharged from Outfall 001 so as to maintain in-stream TDS concentrations at or below:

- (1) 1500 mg/L at the edge of the mixing zone in the Main Stem of Red Dog Creek,
- (2) 1000 mg/L at the edge of the mixing zone in Ikalukrok Creek throughout the discharge season, and
- (3) 500 mg/L from July 25th through the end of the discharge season at Station 160.

Rationale: The TDS SSC allows TDS concentrations up to 1500 mg/L in the Main Stem without timing restrictions. The department finds that the in-stream TDS limits are required to ensure that existing uses are protected.

December 1, 2008

Rationale: In 1999, the department changed the WQC under 18 AAC 70.020(b)(Note 12) for inorganic dissolved solids, regulated as TDS. The following language was included in the June 25, 2003 Certification and this criterion is in effect in Ikalukrok Creek for the areas listed above:

Total Dissolved Solids (TDS) in concentrations up to 1000 mg/L in Ikalukrok Creek are in effect from the confluence of Ikalukrok Creek with the Main Stem to the Wulik River, except during chum salmon and/or Dolly Varden spawning in Ikalukrok Creek, when the aquatic life criterion of 500 mg/L will apply at Station 160.

Rationale: In accordance with 18 AAC 70.020(b)(4) and note 12, the TDS concentration at Station 160 shall remain at or below 500 mg/L from July 25th through the end of the discharge season to ensure no adverse effect.

In accordance with State Regulations 18 AAC 15.090, the department may attach terms and conditions to a permit, variance, or approval, including operating, monitoring, inspection, sampling, access to records and reporting requirements, and the posting of a performance bond or other surety, that it considers necessary to ensure that all applicable criteria will be met.

4. Draft Permit part I.E – Bioassessment Program Requirements could be removed. The bioassessment program in Red Dog Creek is part of a larger monitoring program that requires aquatic and biomonitoring in Red Dog and Bons Creek drainages. To keep that larger program consistent and intact, it is being incorporated into the department's Waste Management Permit, and duplication here could lead to future inconsistencies. However in the event that issuance of the NPDES Permit precedes the Waste Management Permit, the following table could be inserted into the NPDES Permit.

Bioassessment Sites	
Sample Site	Factors Measured
North Fork Red Dog Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use
Main Stem Red Dog Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use
Ikalukrok Creek	Periphyton (as chlorophyll-a concentrations) Aquatic invertebrates: taxonomic richness and abundance Fish presence and use

Rationale: In accordance with State Regulations 18 AAC 70.240, the department has authority to ensure that existing uses of the waterbody outside the mixing zone are maintained and fully protected.

December 1, 2008

The specified monitoring will provide evidence to the department that the effluent treatment and mixing zone sizes are adequate to protect all existing uses in the receiving water. The Draft Permit required more monitoring than is required to reasonably demonstrate compliance with WQS (18 AAC 70). The remaining biomonitoring program contained in the current NPDES permit will be required in the Monitoring Plan associated with the Waste Management Permit issued by the department for the management of tailings, waste rock and other wastes at the facility.

In accordance with State Regulations 18 AAC 15.090, the department may attach terms and conditions to a permit, variance, or approval, including operating, monitoring, inspection, sampling, access to records and reporting requirements, and the posting of a performance bond or other surety, that it considers necessary to ensure that all applicable criteria will be met.

In accordance with Federal Regulation 40 CFR 124.53(e)(3) the department shall include a statement of the extent to which each condition of the Draft Permit may be made less stringent without violating the requirements of State law. These statements are included above where it states that a change to the Draft Permit "could" be made in the Final Permit.

5. The NPDES Permit shall be updated to include the following permit part I.H.2.i.(vi):
Ensure that best blasting practices are used in any wet blast holes to minimize the amount of blasting agent that dissolves into the groundwater in the vicinity of the blast hole.

Rationale: In accordance with State Regulations, 18 AAC 15.090, the department may attach terms and conditions to a permit, variance, or approval, including operating, monitoring, inspection, sampling, access to records, reporting requirements, and the posting of a performance bond or other surety, that it considers necessary to ensure all applicable criteria will be met. The department considers this requirement necessary to ensure that appropriate source control measures are undertaken to minimize the amount of ammonia in the effluent.

December 1, 2008

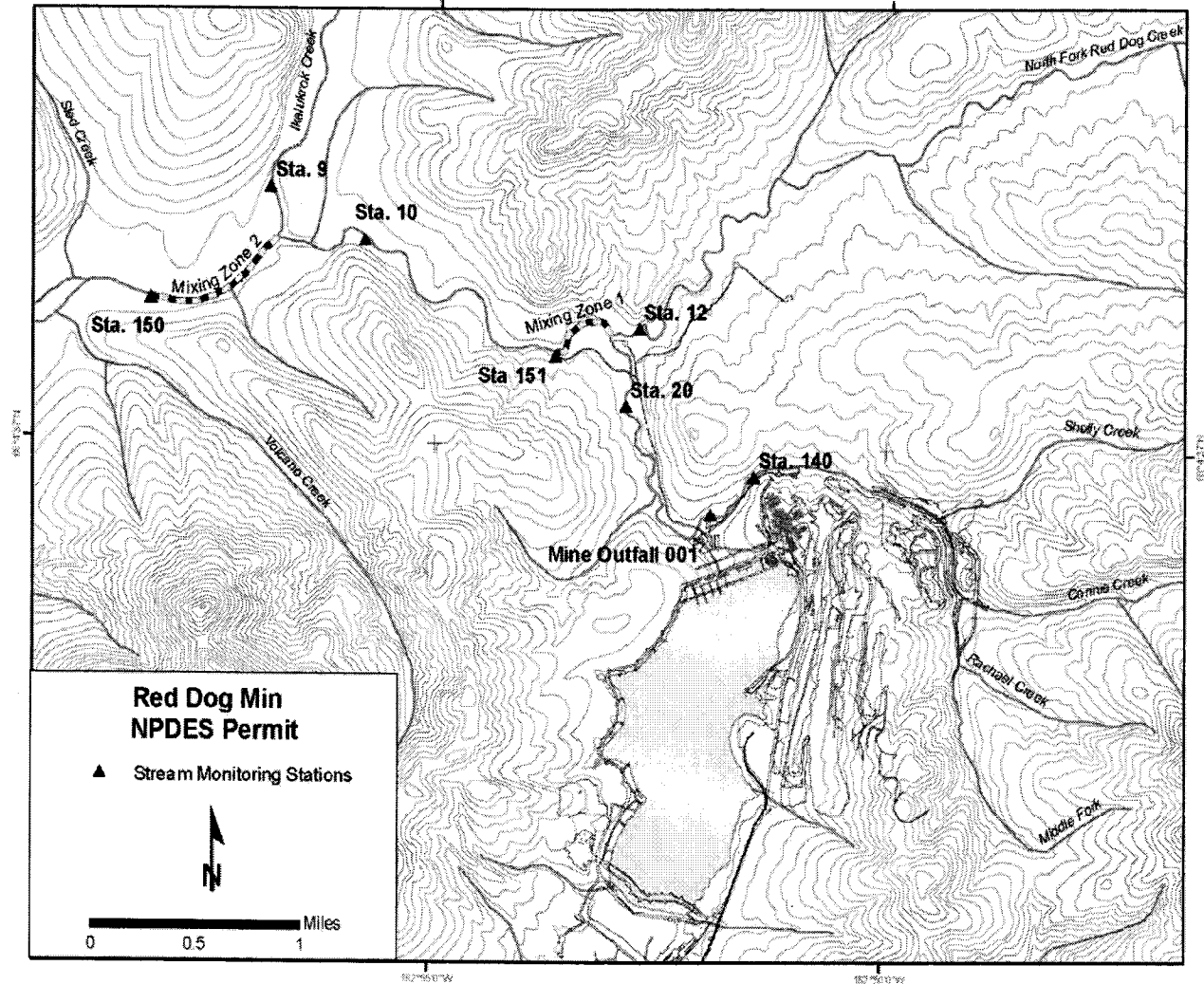
Date

DRAFT

Sharmon Stambaugh
Program Manager
Wastewater Discharge Program

Attachment A

Red Dog Mine Mixing Zones



December 1, 2008

APPENDIX A
EPA APPROVAL OF CADMIUM NATURAL CONDITION-BASED SITE-SPECIFIC
CRITERION FOR MAIN STEM RED DOG AND IKLAUKROK CREEKS
CERTIFICATE OF REASONABLE ASSURANCE
FOR NPDES PERMIT AK-003865-2



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

Reply to
Attn Of: OWW-131

FEB 27 2008

Lynn J. Tomich Kent, Director
Division of Water
Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501

Re: EPA Review of the Cadmium Natural Condition-Based Site-Specific Criterion
for Main Stem Red Dog and Ikalukrok Creeks

Dear Ms. Kent:

The Environmental Protection Agency (EPA) has completed our review of the technical justification of the *Cadmium - Natural Condition Site-Specific Criterion (SSC)* for Main Stem Red Dog and Ikalukrok Creeks. The SSC justification has been submitted to EPA by the state of Alaska in support of the establishment of a cadmium SSC based on the natural condition of these drainages. The SSC information was submitted by the Alaska Department of Environmental Conservation (ADEC) in the 401 certification for the Red Dog Mine NPDES permit AK-003865-2, and received by EPA on February 16, 2007. Our review is conducted pursuant to our authority under Section 303(c) of the Clean Water Act (CWA) and implementing regulations at 40 CFR 131.5 and 131.21.

Modification of numeric criteria for toxic pollutants to reflect site-specific conditions is allowed by Federal regulation at 40 CFR 131.11(b)(1)(ii). The Alaska Water Quality Standards (WQS) regulations at 18 AAC 70.235 allow the development of SSC. This cadmium SSC is established in accordance with 18 AAC 70.235(b) which identifies the process that Alaska must follow to establish a SSC that is based on the natural condition of a water body.

The technical information submitted to EPA in support of this cadmium SSC demonstrates that the cadmium SSC is based on data that are representative of the natural condition, the cadmium SSC will protect all designated and existing uses, and Alaska has followed the procedure in the SSC policy [18 AAC 70.235(b)] which includes public participation. Therefore, in accordance with our authorities under Section 303(c) of the CWA and the requirements in our implementing regulations at 40 CFR 131.5(a), EPA approves the establishment of a natural condition based SSC for cadmium (2.0 ug/l derived from total recoverable metal concentrations) for Main Stem Red Dog and Ikalukrok Creeks.

Section 7 of the Endangered Species Act (ESA) requires Federal agencies to consult with the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NOAA-Fisheries) regarding potential effects that an action may have on

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December 1, 2008

2

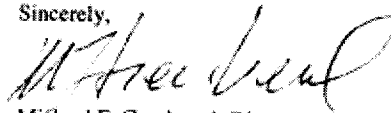
proposed and listed threatened and endangered species. EPA requested a listing of threatened and endangered species in the vicinity of the Red Dog Mine site from the FWS (EPA letter dated August 26, 2005) and from NOAA-Fisheries (EPA letter dated August 26, 2005) for the re-issuance of the National Pollutant Discharge Elimination System permit (which includes this cadmium SSC). The FWS responded on September 21, 2005, and stated that there are no threatened or endangered species under their jurisdiction in the vicinity of the mine site, and further consultation was not necessary. NOAA-Fisheries responded on September 28, 2005, stating that there are no threatened or endangered species under their jurisdiction in the area. Therefore, this action will not affect listed threatened or endangered species, and no additional consultation under ESA is required.

Similarly, the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires Federal agencies to consult with NOAA-Fisheries on any actions authorized, funded, or undertaken by the agency that may adversely affect essential fish habitat (EFH) identified by Regional Fishery Management Councils. NOAA-Fisheries stated, in their September 28, 2005 letter, that "the described action will not result in any adverse effect to Essential Fish Habitat (EFH)" and NOAA-Fisheries did not offer any EFH Conservation Recommendations. In an email dated March 27, 2006, NOAA-Fisheries stated that they "have no objection to the project." Therefore, no EFH assessment or further EFH consultation is required.

Finally, in accordance with our tribal trust responsibilities, EPA engaged in a dialog with tribes in the vicinity of the mine. In December 2005, EPA met with tribal representatives from Kivalina and Kotzebue to discuss this site-specific criterion as well as the issuance of the NPDES permit for the Red Dog Mine facility.

We greatly appreciate the efforts of your staff to coordinate this action with EPA throughout the SSC development process. Please feel free to contact me at (206) 553-7151, or if you have any questions concerning this letter please contact Sally Brough, Water Quality Standards Coordinator at (206) 553-1295.

Sincerely,



Michael F. Gearheard, Director
Office of Water and Watersheds

cc Cameron Leonard, Office of the Attorney General
Sharmon Stambaugh, Alaska DEC
Nancy Sonafrank, Alaska DEC
Jim Powell, Alaska DEC
John Knapp, Cominco Alaska
James Kulas, Cominco Alaska

December 1, 2008

APPENDIX B
ANTIDEGRADATION ANALYSIS OF THE
CERTIFICATE OF REASONABLE ASSURANCE
FOR NPDES PERMIT AK-003865-2

The antidegradation policy of the Alaska Water Quality Standards (18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. This appendix analyzes the department's decisions in this certification with respect to the Antidegradation Policy.

The waters of Red Dog Creek are atypical of most undeveloped Arctic streams because of the high concentrations of cadmium, lead, and zinc that enter the Middle Fork of Red Dog Creek (Middle Fork) as it flows through a highly mineralized orebody. The unique character of the Red Dog mineralization and its interaction with ground and surface waters was recognized in scientific studies of the area in the late 1970s and early 1980s (e.g. Ward and Olson 1980). Natural levels of metals were known to be unusually high, and fish kills in the Main Stem of Red Dog Creek (Main Stem) were documented. From 1981 through 1984, Cominco Alaska funded a series of baseline studies to document water quality and biological conditions in Red Dog Creek, Ikalukrok Creek, and the Wulik River (Houghton 1983, Petersen and Nichols 1983). In 1982, the department funded a detailed toxicological, biophysical, and chemical assessment of Red Dog Creek (E.V.S. Consultants, Ltd. 1983). These studies formed the basis for addressing aquatic and water quality impacts associated with the development of the Red Dog Mine Project in the 1984 Environmental Impact Statement.

Water in the Middle Fork, beginning adjacent to the highly mineralized orebody, was naturally degraded and remained in this condition downstream to the confluence with the South Fork of Red Dog Creek (South Fork) (L. A. Peterson & Associates, Inc. 1983). The Middle Fork flowed directly over heavily mineralized rock, and the creek received surface and groundwater draining from the orebody, which contained high metal and sulfide concentrations (U.S. Environmental Protection Agency and U.S. Department of the Interior. 1984). Recovery of water quality began at the confluence of the Middle Fork and the South Fork, but was not particularly significant until flow from the North Fork diluted the Middle Fork to form the Main Stem.

As discussed above, Red Dog and Ikalukrok Creeks have been documented to have naturally occurring water quality conditions that precluded some designated uses, which have been removed (see 18 AAC 70.230(e)(8) and (18-20)). Specifically, the Lower Middle Fork of Red Dog Creek is only classified for industrial water supply and contact, wading only, and non-contact recreation uses. This segment is considered a "tier I" waterbody under 18 AAC 70.015(a)(1), therefore protection of existing uses is the threshold for compliance with Alaska's antidegradation policy. All of the requirements in the permit will ensure protection of these uses. This includes the mixing zone for pH, which will not affect either the instream levels or the existing recreational/contact uses of the segment. The actual contact uses generally only include sampling by mine and agency personnel that will not be impacted by the elevated pH in the immediate vicinity of the discharge.

December 1, 2008

The Main Stem is classified for growth and propagation of fish, shellfish, and other aquatic life. Aquatic biomonitoring at the Red Dog Mine began in 1990 and has continued annually since then. As noted above, monitoring conducted prior to mining activities showed water quality and aquatic life impacts extending into the Main Stem. Aquatic biomonitoring and ambient water quality monitoring conducted during mine operations demonstrates that the effluent from the facility does not negatively affect existing aquatic life uses in the Main Stem or Ikalukrok Creeks. These results are summarized in the Comparison of Mainstem Red Dog Creek, Pre-Mining and Current Conditions (Scannell, 2005) and the Environmental Assessment associated with the 2007 NPDES Permit renewal.

As a conservative approach, the department is assuming that the Main Stem and Ikalukrok Creek are Tier II waterbodies. This certification demonstrates that the permit is in accordance with 18 AAC 70.015(a)(2), which states that the department may allow reduction of water quality only after finding that five specific criteria are met. This certification only considers changes made in effluent limits and other requirements in the permit compared to the 1998 permit. The 1998 permit requirements were previously found to be consistent with the State's antidegradation policy.

The specific changes that have been made in effluent limits and other requirements subject to antidegradation analysis include:

- The permit includes more stringent limits for cadmium, copper, and pH than the 1998 permit and the permit includes new limits for nickel and aluminum without a mixing zone. For these pollutants, the permit is more stringent than the previous permit and no antidegradation analysis is required.
- The permit's selenium average monthly effluent limit (AMEL) is more stringent than the 1998 permit, i.e. 4.4 compared to 4.9 µg/L, and the selenium maximum daily effluent limit (MDEL) is less stringent than the 1998 permit, i.e. 7.2 compared to 5.6 µg/L. These minor and offsetting changes are the result of statistical variability in data sets used to determine effluent limits. It is the department's judgment that these changes will not affect the levels of these pollutants in the discharge, and no antidegradation analysis is required.
- The permit's lead AMEL is less stringent than the 1998 permit, i.e. 8.5 compared to 8.1 µg/L, and the lead MDEL is more stringent than the 1998 permit, 18.3 µg/L compared to 19.6 µg/L. These minor and offsetting changes are the result of statistical variability in data sets used to determine effluent limits. It is the department's judgment that these changes will not affect the levels of these pollutants in the discharge, and no antidegradation analysis is required.
- For cyanide, the permit includes a less stringent AMEL, i.e. 10.3 versus 4.0 µg/L, and MDEL, i.e. 22.2 versus 9.0 µg/L, than the 1998 permit. Cyanide was previously measured as total cyanide but the Alaska Water Quality Standard is now measured as weak acid dissociable (WAD) cyanide. The department certifies that a mixing zone for WAD cyanide with a dilution ratio of 1.5 parts receiving flow to 1.0 part inflow, for a dilution factor of 2.5, protects water quality.
- For zinc, the permit includes a less stringent AMEL and MDEL based on the application of the state-wide criteria instead of the natural condition-based site-specific criterion.
- The permit includes new effluent limits for ammonia based on a mixing zone that provides a dilution ratio of 1.5 parts receiving flow to 1 part inflow for a dilution factor of 2.5.

December 1, 2008

- This permit includes a total dissolved solids (TDS) 1,500 mg/L site-specific criterion (SSC) in the Main Stem Red Dog Creek. The SSC was adopted in 18 AAC 70.236(b)5 and approved by EPA.

Accordingly, the following antidegradation analysis will focus on these parameters based on the theoretical possibility for water quality degradation: cyanide, zinc, and ammonia.

1. *18 AAC 70.015(a)(2)(A). Allowing lower water quality is necessary to accommodate important economic or social development in the area where the water is located.*

The following was excerpted from a report studying the impact of the mining industry in Alaska (McDowell Group).

- Including contract employment, the Red Dog Mine (with 465 full-time workers) is the third largest employer (after the school district and Maniilaq Association) in the Northwest Arctic Borough. In terms of payroll, the mine is the largest employer in the borough. The mine generated \$46 million in total wages in 2007.
- In 2006, Red Dog accounted for more than 35 percent of all wage and salary employment in the Northwest Arctic Borough, and about 50 percent of all private sector employment.
- Prior to Red Dog Mine's opening, average income in the Borough was well below the statewide average. However, the median household income in the Northwest Arctic Borough grew by about 87 percent from 1979 to 1989 (\$17,756 to \$33,313) and by 38 percent from 1989 to 1999 (\$33,313 to \$45,976), largely as a result of new jobs associated with the mine. Annual wages at the mine are typically from \$45,000 to \$85,000 per year, plus benefits.
- According to a 2002 study, Red Dog accounted for one-third of the private sector jobs held by the residents of Buckland (33 percent), Kiana (36 percent), Kivalina (38 percent), Noorvik (33 percent), Selawik (34 percent), and Shungnak (32 percent). It accounted for 63 percent of the private sector jobs held by the residents of Noatak.

As noted above, the operation of Red Dog Mine is important to the economy of the Northwest Arctic Borough. The department finds that authorization of the mine's discharge accommodates important economic activity in the Northwest Arctic Borough.

2. *18 AAC 70.015(a)(2)(B). Except as allowed under this subsection, reducing water quality will not violate the applicable criteria of 18 AAC 70.020 or 18 AAC 70.235, or 18 AAC 70.236.*

The permit limits will not violate water quality criteria. The mixing zones are specifically authorized in accordance with 18 AAC 70.240. The authorized mixing zones have been sized to ensure that all applicable water quality criteria are met at all points outside of the mixing zone.

3. *18 AAC 70.015(a)(2)(C). The resulting water quality will be adequate to fully protect existing uses of the water.*

December 1, 2008

The permit renewal application does not propose any changes that would likely result in wastewater of lower quality to be discharged than has been discharged since issuance of the 1998 permit. Aquatic biomonitoring and ambient water quality monitoring conducted during mine operations demonstrates that the effluent from the facility does not negatively affect existing uses in the Main Stem or Ikalukrok Creek. The department finds that the resulting water quality will be adequate to fully protect existing uses.

The rationale for condition 1 of the certification describes why the mixing zones for TDS, cyanide and ammonia will have no adverse effects on aquatic life. Similarly, the state-wide water quality criterion for zinc, which is the basis for the effluent limits in this permit, is protective of the aquatic life designated use.

The TDS SSC demonstrated that the 1,500 mg/L is scientifically defensible and protective of all designated water uses. The TDS SSC was approved by EPA on April 21, 2006.

4. *18 AAC 70.015(a)(2)(D). The methods of pollution prevention, control, and treatment found by the department to be most effective and reasonable will be applied to all wastes and other substances to be discharged.*

The mine wastewater treatment uses a lime precipitation process to treat for metals in the wastewater. This process replaces the dissolved metal ions with calcium ions in the wastewater, leaving the overall TDS concentration essentially unchanged. However, the nature of the TDS changes from primarily metal sulfates to calcium sulfates. Water treatment methods for reducing TDS (distillation, membrane filtration, etc.) are not practicable for the nature and volume of the effluent from the mine. The most effective and reasonable method for reduction of TDS in the mine's effluent is source control. The mine has implemented a TDS source control program to reduce the amount of TDS contained in the tailings pond water (the wastewater influent source). Source control measures include operation of a third water treatment plant to treat high TDS influent wastewater prior to entering the tailings pond and testing of waste rock management practices to reduce the amount of TDS entering the tailings pond from waste rock runoff.

Water treatment methods for reducing the ammonia concentrations (air stripping, biological treatment, chlorination, etc.) in the effluent are not practicable given the volumes and concentrations present. Source control is the most effective and reasonable method for reducing the ammonia concentrations in the effluent. The primary source of ammonia in the effluent results from blasting with an ammonium nitrate/fuel oil mixture in wet blast holes in the mine pit. When placed in wet holes the ammonium nitrate dissolves into the groundwater in the vicinity of the blast hole. Mine drainage water, including the groundwater encountered in blast holes, is collected in the mine drainage sump which is then pumped into the tailings pond. Since 1999 the mine has implemented the use of an emulsified blasting agent that results in minimal ammonium nitrate dissolving into the groundwater and subsequently entering the mine drainage sump. This source control technique has resulted in decreasing effluent ammonia concentrations since 1999. Through the certification (see condition 5) the department has included a specific best management practice (BMP) requirement to section I.H.2.i.(vi) of the Permit requiring the permittee to develop a BMP to ensure that best blasting practices are used in any wet blast holes that minimize the amount of blasting agent that dissolves in the groundwater in the vicinity of the blast hole.

December 1, 2008

Cyanide is used in the lead extraction process as a pyrite depressant. Teck Cominco Alaska, Inc. has investigated alternatives to the use of cyanide in the mill with marginal results. Concentrations of WAD cyanide found in the effluent are at levels that are not considered to be treatable with available water treatment technology (less than 1 ppm). Some degradation of cyanide occurs in the tailings pond through oxidation. The following is excerpted from the Environmental Assessment of the 2007 NPDES permit renewal:

From August 1998 through September 2005, 97 WAD cyanide analyses were conducted on samples collected at Station 10. All 97 samples were reported at levels below the minimum level of quantification (ML) for the WAD cyanide analytical method and 74 of the samples were reported as less than the method detection limit (MDL) for the WAD cyanide analytical method. Identical results have been documented in Ikalukrok Creek and the Wulik River. A combined 217 samples have been collected and analyzed by the WAD cyanide method at Stations 150, 160 and 2 since August 1998. Results from all samples were reported at levels below the minimum level of quantification (ML) and 189 of the samples were reported as less than the method detection limit (MDL). (EPA, 2006)

As demonstrated by the monitoring mentioned above the department finds that the amount of treatment for WAD cyanide that occurs in the tailings pond is effective and reasonable for the concentrations present.

Zinc is associated with the ore and, therefore, is found in the tailings and the impoundment discharge. The lime precipitation process represents the most commonly used, reasonable, and effective method for metals removal at mines such as Red Dog.

5. *18 AAC 70.015(a)(2)(E). 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.*

After review of the applicable statutory and regulatory requirements, including 18 AAC 70 and 18 AAC 72 the department finds that the discharge from the existing point source meets the highest applicable statutory and regulatory requirements.

APPENDIX C

Development of Effluent Limitations

This section discusses the basis for and the development of metals, cyanide, ammonia, pH, total dissolved solids, and total suspended solids limitations in the draft permit. The discussions include the development of technology-based effluent limitations (Section A.) and water quality-based effluents limitations (Section B.) and a summary of the effluent limitations developed for the draft permit.

I. Outfall 001

A. Technology-based Evaluation

Section 301(b) of the CWA requires technology-based controls on effluents. Red Dog Mine is considered a new source. The term "*new source*" means any source, the construction of which is commenced after the publication of proposed regulations prescribing a standard of performance under this section (Section 306 of the CWA) which will be applicable to such source, if such standard is thereafter promulgated in accordance with this section. On December 3, 1982, EPA published effluent limitation guidelines (ELGs) for the mining industry which are found in 40 CFR Part 440. Within these ELGs, Subpart J, titled *Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory*, applies to the mine discharges from Red Dog. The New Source Performance Standards (40 CFR 440.104) are used to provide the technology-based effluent limitations for copper, zinc, lead, mercury, cadmium, pH and total suspended solids (TSS).

40 CFR 440.104(a) states that the concentration of pollutants discharged in mine drainage from mines that produce copper, lead, zinc, gold, silver or molybdenum bearing ores or any combination of these ores from open-pit or underground operations other than placer deposits shall not exceed the following concentrations:

Parameter (in ug/L unless otherwise noted)	Average Daily	Daily Maximum
Copper	150	300
Zinc	750	1500
Lead	300	600
Mercury	1	2
Cadmium	50	100
TSS, mg/L	20	30
pH, standard units	Within the range of 6.0 to 9.0	

40 CFR 440.130(d)(1) allows for a pH adjustment above 9.0 where the application of neutralization and sedimentation technology to comply with relevant metal limitations results in an inability to comply with the pH range of 6 to 9. This is the case for Red Dog where metals precipitate out of solution better at higher pH. The previous permit

contained a pH range of 6.0 to 10.5 and EPA has included this range in the draft permit.

40 CFR 440.104(b) states that there shall be no discharge of process wastewater to navigable waters from mills that use the froth-flotation process alone or in conjunction with other processes for the beneficiation of gold ore. In the event that the annual precipitation falling on the treatment facility and the drainage area contributing surface runoff to the treatment facility exceed the annual evaporation (net precipitation), a volume of water equal to the difference may be discharged subject to the limitations set forth in Table C-1, above. The current NPDES permit includes an annual discharge limit of 2.418 billion gallons per year which represents the maximum estimated difference between precipitation and evaporation. The limit is retained in this draft permit. Because precipitation and evaporation are variable, the draft permit that requires TCAK to measure and report annual precipitation and evaporation data in comparison to the discharge volume to demonstrate compliance with the net precipitation provision of 40 CFR 440.104(b).

B. Water Quality-based Evaluation

Section 301(b)(1)(C) of the CWA requires the development of limitations in permits necessary to meet water quality standards (WQS). Discharges to state waters must also comply with limitations imposed by the state as part of its certification of NPDES permits under section 401 of the CWA. The NPDES regulation [40 CFR 122.44(d)(1)] implementing section 301(b)(1)(C) of the CWA requires that permits include limits for all pollutants or parameters which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality."

The regulations require that this evaluation be made using procedures which account for existing controls on point and non-point sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving water. The limits must be stringent enough to ensure that WQS are met, and must be consistent with any available wasteload allocation.

When evaluating the effluent to determine if water quality-based effluent limits are needed based on chemical-specific numeric criteria, a projection of the effluent water concentration for each pollutant of concern is made. If a mixing zone is authorized, then dilution is considered. The chemical-specific concentration of the effluent and ambient water and, if appropriate, the dilution available from the ambient water are factors used to project the receiving water concentration. If the projected concentration of the effluent exceeds the numeric criterion for a specific chemical, then there is a reasonable potential that the discharge may cause or contribute to an excursion above the applicable water quality standard, and a water quality-based effluent limit is required.

The water quality parameters that may be affected by the discharge are metals, cyanide, ammonia, pH, dissolved solids, and turbidity.

1. Toxics

Water quality-based effluent limitations for toxics were developed based upon guidance in EPA's Technical Support Document for Water Quality-based Toxics Control (TSD). The water quality-based analysis consists of four steps:

- ▶ Determine the appropriate water quality standard,
- ▶ Determine if there is "reasonable potential" for the discharge to exceed the standard in the receiving water,
- ▶ If there is "reasonable potential", develop a wasteload allocation (WLA), and a long term average (LTA), then
- ▶ Develop effluent limitations based on the LTA.

The following sections provide a detailed discussion of each step. Appendix D provides an example calculation to illustrate how these steps are implemented.

a. Water Quality Standards

The first step in developing water quality-based limitations is to determine the applicable water quality standard. For Alaska, the current Water Quality Standards (WQS) are found in 18 AAC 70.020. The applicable standards are based on the designated uses of the receiving water, the Middle Fork Red Dog Creek, which is protected for the uses described in Section IV.B. of this Fact Sheet. The applicable WQS are used to calculate water quality-based effluent limitations. EPA has determined that the appropriate standards to use are those protecting for the downstream use of Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife (aquatic life standards).

Under the anti-backsliding provisions of the Act, any limit in a reissued permit must be at least as stringent as the current limit unless a change meets one of the exceptions listed in CWA § 402(o)(2) or in CWA § 303(d)(4)(B). These are listed below:

402(o)(2) EXCEPTIONS — A permit with respect to which paragraph (1) applies may be renewed, reissued, or modified to contain a less stringent effluent limitation applicable to a pollutant if —

(A) material and substantial alterations or addition to the permitted facility occurred after permit issuance which justify the application of a less stringent effluent limitation;

(B)(i) information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time of permit issuance; or

(ii) the Administrator determines that technical mistakes or mistaken interpretations of law were made in issuing the permit under subsection (a)(1)(B).

(C) a less stringent effluent limitation is necessary because of events over which the permittee has no control and for which there is no reasonably available remedy;

(D) the permittee has received a permit modification under section 301(c), 301(g), 301(h), 301(i), 301(k), 301(n), or 316(a); or

(E) the permittee has installed the treatment facilities required to meet the effluent limitations in the current permit and has properly operated and maintained the facilities but has nevertheless been unable to achieve the current effluent limitation, in which case the limitation in the reviewed, reissued, or modified permit may reflect the level of pollutant control actually achieved (but shall not be less stringent than required by effluent guidelines in effect at the time of permit renewal, reissuance, or modification).

303(d)(4) LIMITATIONS ON REVISION OF CERTAIN EFFLUENT LIMITATIONS —

(B) STANDARD ATTAINED — For waters identified under paragraph (1)(A) where the quality of such water equals or exceeds levels necessary to protect the designated use for such waters or otherwise required by applicable water quality standards, any effluent limitation based on a total maximum daily load or other waste load allocation established under this section, or any other permitting standards may be revised only if such revision is subject to and consistent with the antidegradation policy established under this section.

Some of the metals standards are hardness-based. In calculating these standards, an increase in hardness results in higher criteria. This is because at a higher hardness, these metals are less toxic. The current permit used a hardness of 260 mg/L CaCO₃ to calculate the effluent limitations. This hardness was calculated as the 5th-percentile hardness of the receiving water at Station 10, the downstream edge of the mixing zone where aquatic life uses are to be protected. EPA believes this location is appropriate to determine the hardness level for use in the draft permit.

The standards are provided in Table C-2.

Table C-2
Water Quality Standards

Parameter, (in ug/L unless noted)	Acute	Chronic
Aluminum	750	87
Ammonia ¹ , mg/L	5.38	2.36
Cadmium	--	2.0
Chromium, III	3943	188
Chromium, VI	16	11
Copper	34.4	21.1
Cyanide ²	22	5.2
Iron	—	1000
Lead	275.5	10.7
Manganese	—	—
Mercury	2.4	0.012
Nickel	1053	117
Selenium	20	5
Silver	21	—
Zinc	269	269 ³

1 – Ammonia criteria are based on the pH and temperature data collected at Station 10 in the main stem of Red Dog Creek – dilution not applied at this step.

2 – The cyanide standards is free cyanide measured as weak acid dissociable (WAD) – dilution not applied at this step.

3 - TCAK requested, in their application package, that EPA retain the SSC developed for zinc during the current permit issuance but in a letter to ADEC dated December 10, 2005, TCAK requested that ADEC not re-certify the SSC for zinc. The SSC was 210.

Prior to mining, the waters of Red Dog Creek were atypical of most undeveloped Arctic streams because of the high concentrations of cadmium, lead, and zinc that enter the Middle Fork as it flows through a highly mineralized ore body. Metals levels were reduced with dilution in the Main Stem Creek and further downstream in Ikalukrok Creek. On February 27, 2007, EPA approved a site-specific criterion (SSC) of 2 µg/L for cadmium in the Main Stem. This criterion was based on the 5th percentile of the pre-mining dissolved cadmium data at Station 8 in Ikalukrok Creek in order to be protective of the downstream uses. See Appendix B for the justification for the use of this criterion.

The WQS for ammonia are dependent on the pH and temperature of the receiving water. Since these two parameters can vary, EPA determined the pH and temperature based on data collected from 2003 through 2007 at the edge of the mixing zone, previously represented by Station 10. EPA calculated the 95th percentile of the data set to

determine the criteria to be applied. The 95th percentile of temperature is 15.02°C and of pH is 8.00 standard units which results in a 30-day chronic criteria of 2.36 mg/L. See Appendix E.

b. Reasonable Potential Evaluation

A reasonable potential analysis was performed to determine the need for limits. This analysis compares the maximum projected effluent concentration (C_e) to the criteria for that pollutant. If the projected effluent concentration exceeds the criteria, there is "reasonable potential" (RP) and a limit must be included in the permit. EPA uses the recommendations in Chapter 3 of the TSD to conduct this analysis.

C_e is defined by the TSD as the 99th percentile of the effluent data. This is calculated by multiplying the maximum reported effluent concentration by a reasonable potential multiplier (RPM).

For parameters with technology-based ELGs, the maximum effluent concentration used to determine the RP is the technology-based maximum daily limitation. The technology-based limit is used since water quality-based limits are only required if discharges at the technology-based limits have the RP to exceed water quality standards in the receiving water. The RPM accounts for uncertainty in the effluent data and statistically depends upon the amount of effluent data and variability of the data as measured by the coefficient of variation (CV) of the data. The RPM decreases as the number of data points increases and the variability of the data decreases. If the maximum projected effluent concentration is greater than an applicable water quality standard then a water quality-based effluent limit is required.

**Table C-3
Reasonable Potential Determination**

Parameter (in ug/L unless otherwise noted)	Effluent Concentration	CV ¹	N= # of Samples	RPM	Maximum Projected Effluent Concentration	Reasonable Potential when compared with standards in Table C-2
Aluminum	210	1.69	74	2.5	516	Yes
Ammonia ^{2,4}	10.7	0.23	105	1.1	4.9	Yes
Cadmium ³	100			1.0	100	Yes
Cadmium ⁵	1.8	0.53	100	1.4	2.5	Yes
Copper ³	300			1.0	300	Yes
Copper ⁵	22	1.25	108	1.8	39	Yes
Cyanide ⁴	12.4	0.70	205	1.2	6.1	Yes
Iron	90	1.01	74	1.9	172	No
Lead ³	600			1.0	600	Yes
Lead ⁵	2.9	0.69	103	1.5	4.3	No
Mercury ³	2			1.0	2	Yes
Mercury ⁵	0.0051	0.98	43	2.4	0.012	No
Nickel	77.6	1.21	102	1.8	140	Yes
Selenium	4.6	0.38	103	1.3	5.8	Yes
Silver	0.5	1.88	77	2.5	1.3	No
Zinc ³	1500			1.0	1500	Yes
Zinc ⁵	158	0.43	101	1.3	204	No

1 - CV is defined as the Standard Deviation ÷ the Mean of a data set.

2 - See Section 3.E., below.

3 - Metals with technology-based effluent guidelines.

4 - TCAK has requested mixing zones for these parameters. The effluent would be diluted to 40% at the edge of the requested mixing zone.

5 - Reasonable potential if based only on water quality standards.

c. Water Quality-Based Permit Limitation Derivation

Once EPA has determined that a water quality-based limitation is required for a parameter, the first step in developing the permit limitation is development of a Wasteload Allocation (WLA). A WLA is the concentration (or loading) of a pollutant that the permittee may discharge without causing or contributing to an exceedence of water quality standards in the receiving water. WLAs and permit limitations are derived based on guidance in the TSD. WLAs for this permit were

Exhibit 2

established based on meeting aquatic life standards or site specific criteria at the Alaska WQS, with dilution considered as proposed in the § 401 Certification.

The acute and chronic WLAs are converted to long term average concentrations (LTAs) and compared. The most stringent LTA concentration for each parameter is statistically converted to effluent limitations. This section describes each of these steps.

Calculations of WLAs:

Where no mixing zone is allowed, the standard becomes the WLA. Establishing the standard as the WLA ensures that the permittee does not contribute to an exceedence of the standard.

ADEC has authorized Mixing Zones in their draft § 401 Certification of the draft permit for WAD cyanide, ammonia, and pH. The dilution factor for WAD cyanide and ammonia is 2.5. The size of the mixing zones are described in the draft § 401 Certification found in Appendix B.

The NPDES regulations require that metals limits be expressed as total recoverable (TR) metals [40 CFR 122.45(c)]. Changes in water chemistry as the effluent and receiving water mix could cause some of the particulate metal in the effluent to dissolve and become bioavailable. Since the proposed WQS are expressed as dissolved, a translator is used in the WLA equation to convert the dissolved criteria to total recoverable. Since the State has not proposed translators in the recent revision to the WQS and there are no site-specific translators, the default translator is 1/CF where CF is the conversion factor in the WQS.

$$\text{the WLA (TR)} = \text{the standard (diss)} * \text{the translator.}$$

The standards are expressed as a total recoverable number or equation multiplied by a conversion factor (CF). Since the default translator is 1/CF, the equation becomes:

$$\begin{aligned} \text{WLA (TR)} &= \text{CF} * \text{standard (TR)} * 1/\text{CF} \\ \text{WLA (TR)} &= \text{standard (TR)}. \end{aligned}$$

Appendix D provides an example of how the WLAs for lead in Outfall 001 were developed.

Calculations of Long-term Average (LTA) Concentrations:

As discussed above, WLAs are calculated for each parameter for each standard (acute, chronic). Because standards are based on different criteria which apply over different time frames, it is not possible to compare them or the WLAs directly to determine which results in the

most stringent limits. For example, acute criteria are applied as a one-hour average and chronic criteria are applied as a four-day average (30 day for ammonia).

To allow for comparison, the acute and chronic WLAs are statistically converted to LTA concentrations. The conversion is dependent upon the coefficient of variation (CV) of the effluent data and the probability basis used. The probability basis corresponds to the percentile of the estimated concentration. EPA uses a 99th percentile for calculating the LTA, as recommended in the TSD. The following equations from Chapter 5 of the TSD are used to calculate the LTA concentrations (Table 5-1 of the TSD may also be used).

$$\text{LTA} = \text{WLA} * \exp[0.5\sigma^2 - z\sigma]$$

Where:

$$\sigma^2 = \ln(\text{CV}^2 + 1) \text{ for acute WLA, and}$$

$$\sigma^2 = \ln(\text{CV}^2/4 + 1) \text{ for chronic WLA}$$

$$\sigma^2 = \ln(\text{CV}^2/30 + 1) \text{ for ammonia}$$

$$\text{CV} = \text{coefficient of variation (standard deviation/mean)}$$

$$Z = 2.326 \text{ for the 99}^{\text{th}} \text{ percentile probability basis (TSD)}$$

Calculation of Effluent Limitations:

The LTA concentration is calculated for each WLA and compared. The most stringent LTA concentration is then used to develop the maximum daily limitation (MDL) and the average monthly limitation (AML) to be used in the permit. The MDL is based on the CV of the data and the probability basis while the AML is dependent upon these two variables and the monitoring frequency. As recommended in the TSD, EPA uses a probability basis of 95 percent for the AML calculation and 99 percent for the MDL calculation. The MDL and AML are calculated using the following equations from the TSD (Table 5-2 of the TSD may also be used).

$$\text{MDL or AML} = \text{LTA} * \exp[z\sigma - 0.5\sigma^2]$$

For the MDL: $\sigma^2 = \ln(\text{CV}^2 + 1)$
 $z = 2.326$ for the 99th percentile probability basis

For the AML: $\sigma^2 = \ln(\text{CV}^2/4 + 1)$
 $\ln(\text{CV}^2/30 + 1)$ for ammonia
 $z = 1.645$ for the 95th percentile probability basis

Where there is only one standard specified, such as the site specific criteria for cadmium, it is used as the chronic WLA and the permit limitations are calculated as above except using just the chronic LTA.

Appendix D shows an example of the permit limitation calculation for lead in Outfall 001.

2. **Total Dissolved Solids (TDS):** TDS consists of inorganic salts and small amounts of organic matter dissolved in water. The principal constituents are: carbonates, chlorides, sulfates, potassium, magnesium, calcium, and sodium. TDS is typically introduced into surface waters by geologic formations underlying an area, groundwater (via seeps and springs into a freshwater system), wind-borne sea spray, and human activities (mining and other surface excavation, water treatment chemicals, road salting, residential and urban runoff, agricultural chemicals, and irrigation). The levels of TDS proposed in this permit reissuance are designed to prevent adverse affects to aquatic life.

The following summarizes the proposed effluent limitations that are in the draft permit for the facility:

- a. Effluent may be discharged so as to maintain the in-stream TDS concentrations at the approved site specific criteria (SSC) of 1500 mg/L at the edge of the mixing zone in Main Stem Red Dog (Station 151). Effluent may be discharged so as to maintain the in-stream TDS concentrations at the approved site specific criteria (SSC) of 1500 mg/L at the edge of the mixing zone in Main Stem Red Dog (Station 151). The SSC is a promulgated standard under the Alaska Water Quality Standards and has been approved by EPA as a WQS change for this waterbody. The mixing zone is described in the draft § 401 Certification found in Appendix B. The discharge may start after the free flow of water in the Main Stem Red Dog Creek begins. The SSC has been approved by EPA so there is no need to determine the start of spawning or notify the agencies since the limit is the same before, during and after spawning.
- b. In Ikalukrok Creek, the effluent from the mine site must be regulated at the discharge point so that the TDS concentration outside the mixing zone (Station 150) in Ikalukrok Creek does not exceed 1000 mg/L.
- c. When salmon and Dolly Varden are spawning in Ikalukrok Creek (July 25 through the end of the discharge season), effluent from the mine site must be regulated so that the TDS concentration in Ikalukrok Creek where spawning occurs does not exceed 500 mg/L (Station 160).
- d. In the current permit, an end-of-pipe limit of 3900 mg/L was included for TDS. The primary reason for including this limit was to make assumptions to determine the flow that the facility could discharge and still remain in compliance with in-stream limits. The limit of 3900 mg/L was not a water quality-based effluent limitation but the best professional judgment at the time the permit was modified. During this reissuance, EPA is removing this end-of-pipe limit from the permit based on new information showing that the control of flow is more of a

Exhibit 2

determining factor in controlling the downstream concentration of TDS than is the TDS concentration in the effluent. EPA is replacing the 3900 mg/L in the equations with 110% of the highest measured effluent value. Review of the equations in Permit Part I.A.7.d. indicates that this will be more conservative than relying on an absolute value of 3900 mg/L because the equations will assume higher effluent concentrations and therefore will not underestimate the downstream impact of the effluent.

Since the SSC during spawning has been approved, less stringent limitations appear in the draft permit than in the previous permit. An exception to the anti-backsliding provision of the CWA is that a reissued permit may contain a higher limitation in light of new information [CWA § 401(o)(2)(B)(i)]. The studies that TCAK conducted provide new information specific to the site that was not available at the time the current permit limitations were imposed. As such, EPA is proposing to use the less stringent limitations.

3. **Turbidity:** The aquatic life standard for turbidity is that turbidity may not exceed 25 nephelometric turbidity units (NTU) above natural conditions. Natural condition, as defined in 18 AAC 70.990(42), means any physical, chemical, biological, or radiological condition existing in a waterbody before any human-caused influence on, discharge to, or addition of material to the waterbody.

The highest value for turbidity that was found in the effluent was 2.1 NTU. It is not expected that the maximum projected effluent would reach 25 NTU so this parameter is not limited in the permit although monitoring will continue.

4. **pH:** The WQS require a pH range of 6.5 - 8.5 standard units for waters protected for contact recreation. The draft 401 Certification includes a justification for the limits of the current permit which were 6.5 – 10.5. EPA retained these limits in the draft permit.
5. **Ammonia:** The ammonia criteria are dependent on the pH and temperature of the receiving water. Since these two parameters can vary, EPA determined the pH and temperature based on data collected from 2003 – 2007 at the edge of the mixing zone, previously represented by Station 10. EPA utilized the procedure outlined in Water Quality Criteria; Notice of Availability; 1999 Update of Ambient Water Quality Criteria for Ammonia (64 Federal Register 71974 – 71980, December 22, 1999). EPA calculated the 95th percentile of the data set (15.02°C for temperature and 8.00 standard units for pH) to determine the applicable criteria (2.36 mg/L). EPA multiplied this criterion by the dilution factor (2.5) authorized by ADEC in the § 401 Certification to determine the effluent goal (5.89 mg/L). EPA then compares this goal to the maximum projected effluent value (11.77 mg/L). This value is calculated by multiplying the maximum effluent value (10.7 mg/L) by the reasonable potential multiplier (1.1). Since 11.77 mg/L is greater than 5.89 mg/L, there is

reasonable potential for the effluent to exceed the standard and a limit is necessary.

6. **Cyanide:** ADEC has proposed a mixing zone for cyanide with a dilution factor of 2.5. EPA determined the most stringent criteria to be applied (5.2 chronic). EPA multiplied this criterion by the dilution factor (2.5) to determine the effluent goal (13.0). EPA then compares this goal to the maximum projected effluent value (14.9). This value is calculated by multiplying the maximum effluent value (12.4) by the reasonable potential multiplier (1.2). Since 14.9 is greater than 13.0, there is reasonable potential for the effluent to exceed the applicable criteria, and limits are necessary. Ambient monitoring for WAD cyanide has also been added to Station 151.

ADEC has stated in its draft § 401 Certification that the use of a mixing zone for WAD cyanide does not violate the State's Antidegradation Policy. The above analysis indicates that the effluent, in compliance with permit limits, should not cause exceedences of the criteria at the edge of the mixing zone so it should be protective of the designated and existing uses downstream as required by 18 AAC 70.015(a)(1) Antidegradation Policy. As such, the permit may allow backsliding based on the CWA § 303(d)(4)(B) exception outlined above.

7. **Zinc:** The State has not re-certified the site specific criterion (SSC) used for zinc in the current permit, which contained a zinc limit based on the natural condition SSC of 210 ug/L provided in the State's 1998 § 401 Certification of the permit. This means that the state-wide criteria of 269 ug/L (both acute and chronic at a hardness of 260 mg/L CaCO₃) would be utilized to calculate the permit effluent limit. ADEC has determined that the use of these criteria would not violate their Antidegradation Policy. Also, EPA believes that the adoption by ADEC of the EPA Water Quality Criteria for Water [63 FR 68354-68364, December 10, 1998] for this parameter is protective of existing uses downstream of the outfall as required by 18 AAC 70.015(a)(1) Antidegradation Policy, so the permit may allow backsliding based on the 303(d)(4)(B) exception outlined above.
8. **Whole Effluent Toxicity (WET):** The WET limits proposed in the draft permit for this facility fully account for the ambient toxicity of the receiving system that naturally occurs. These limits have been tailored to allow the mine to discharge effluent that contains toxic concentrations of various compounds, but at limits that will not increase the background toxicity. Although aquatic life is not a designated use at the point of discharge, the state water quality criterion for toxicity applies downstream of the discharge point, and the permit must ensure that the discharge does not cause or contribute to exceedences of that criterion when it does apply downstream. The draft permit contains the limitations developed during the 1998 permit reissuance. EPA cannot justify a change in these limits based on antibacksliding.
9. **Fecal Coliform:** For discharges to Red Dog Creek, the most protective applicable standard for fecal coliform is for Water Recreation - Secondary, 18

AAC 70.020(b)(2)(B)(ii) states, "In a 30-day period, the geometric mean may not exceed 200 FC/100 ml, and not more than 10% of the total samples may exceed 400 FC/100 ml." An average of 200 FC/100ml and a maximum of 400 FC/100ml are included as limits in the draft permit.

C. Summary of Draft Permit Effluent Limitations – Outfall 001

As discussed in Section V.A. of the fact sheet, the draft permit contains the more stringent of technology and water quality-based effluent limitations. The water quality-based limits are more stringent than the technology-based limits for the metals and have therefore been included in the permit. The draft permit contains those limits based on the latest version of the EPA-approved WQS. EPA believes that the adoption by ADEC of the EPA Water Quality Criteria for Water [63 FR 68354-68364, December 10, 1998] for these parameters is protective of existing uses downstream of the outfall as required by 18 AAC 70.015(a)(1) Antidegradation Policy so the permit may allow backsliding based on the CWA 303(d)(4)(B) exception outlined above. Also, some limits may have changed slightly (higher or lower) based on the statistical information gathered from the current data set. Any change resulting in higher limits is considered new information and is allowed under the exception in CWA 401(o)(2)(B)(i). Any lower limits have been incorporated into the permit.

Table C-4 shows a comparison between the technology-based and water quality-based effluent limitations and which limitations are in the draft permit.

Parameter ¹	Technology-based		WQ-based		Draft Permit Limits	
	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly	Maximum Daily	Average Monthly
Aluminum	-	-	157	53	157	53
Ammonia, mg/L N	-	-	8.8	5.7	8.8	5.7
Cadmium	100	50	3.2	1.7	3.2	1.7
Copper ²	300	150	34.4	12.6	34.4	12.6
Cyanide, WAD	-	-	22.2	10.3	22.2	10.3
Lead ²	600	300	18.3	8.5	18.3	8.5
Mercury	2	1	0.02	0.01	0.02	0.01
Nickel	-	-	216.5	80.0	216.5	80.0
Selenium	-	-	7.2	4.4	7.2	4.4
Zinc	1500	750	269.2	155.9	269.2	155.9
TSS, mg/L	30	20	-	-	30	20
pH, S.U.	6.0 to 9.0 ³		6.5 to 10.5		6.5 to 10.5	
WET, TU _c	-		12.2	9.7	12.2	9.7

1 - Units are ug/L unless otherwise noted.
2 - Hardness based metals criteria used a hardness of 260 mg/L CaCO₃
3 - The Effluent Limitation Guidelines allow this to exceed 9 in certain circumstances, see Fact Sheet Appendix C Part I.

APPENDIX D

Example Water Quality-based Effluent Limitation Calculation

This appendix demonstrates how the water quality-based analysis (reasonable potential determination and development of effluent limitations) was performed using lead in Outfall 001 as an example.

Step 1: Determine the applicable water quality standard.

The current Alaska water quality standards for lead are provided below at a hardness value of 260 mg/L CaCO₃.

Table D-1 Lead criteria		
Parameter	Acute standard	Chronic standard
Lead, ug/L	275.5	10.7
* these standards are already translated from the proposed dissolved standard to a total recoverable standard		

Step 2: Determine if there is reasonable potential for the discharge to exceed the standard.

To determine reasonable potential, the maximum projected effluent concentration, when no mixing zone is authorized, is compared to the applicable water quality standards. If this exceeds the standard, then a reasonable potential exists and a water quality-based effluent limit is established.

Since lead is a technology-based effluent limit, the following equation applies:

$$300 * RPM \text{ (reasonable potential multiplier)} = 300 * 1 = 300$$

If this had been based on a water quality-based limit, the statistics discussed in the previous Appendix would have been applied to determine the RPM:

The tables in the TSD used to determine reasonable potential multipliers are not broad enough for parameters with more than 20 data points. EPA utilized the equations on page 52 of the TSD to determine the multiplier for lead. The maximum effluent measure for lead was 2.9 ug/L, the CV is 0.69, the number of effluent samples is 103 and the RPM is 1.5. The maximum projected effluent value for lead would be 4.3 ug/L and is less than the chronic criteria of 10.7 ug/L. So if the RP was determine strictly on a WQ basis, there would be no reasonable potential for lead to violate the criteria.

The effluent from outfall 001 has the reasonable potential to exceed the lead aquatic life standard based on the analysis of the technology-based limitation. Therefore, water quality-based limitations are required.

Step 3: Determine the wasteload allocation.

The wasteload allocations (WLAs) for lead are equal to the standards:

	<u>WLA</u>
Acute	275.5
Chronic	10.7

Step 4: Develop long-term average (LTA) concentrations.

Effluent limitations are developed by converting the aquatic WLAs to LTAs. The most stringent of the acute or chronic LTA is then used to develop the effluent limitations.

$$LTA = WLA * \exp[0.5\sigma^2 - z\sigma]$$

where,

$z = 2.326$ for 99th percentile probability basis (per the TSD)

$CV = 0.69$

For acute: $\sigma^2 = \ln(CV^2 + 1) = \ln[(0.69)^2 + 1] = 0.39$ $\sigma = 0.62$

For chronic: $\sigma^2 = \ln(CV^2/4 + 1) = \ln[(0.69)^2/4 + 1] = 0.11$ $\sigma = 0.34$

LTA

Acute	78.4
Chronic	5.2 ←

The most stringent LTA concentration will be used to derive the effluent limitations for lead. In this case, the chronic LTA is used.

Step 5: Develop effluent limitations

The LTA concentration is converted to a maximum daily limit (MDL) and an average monthly limit (AML).

$$MDL, AML = LTA * \exp[z\sigma - 0.5 \sigma^2]$$

where, for the MDL:

$z = 2.326$ for 99th percentile probability basis (per the TSD)

$\sigma^2 = \ln(CV^2 + 1) = \ln[(0.69)^2 + 1] = 0.39$

$\sigma = 0.62$

for the AML:

$z = 1.645$ for the 95th percentile probability basis (per the TSD)

$\sigma^2 = \ln(CV^2/n + 1) = \ln[(0.69)^2/4 + 1] = 0.11$

since $n =$ number of samples per month $= 4$

(4 is the minimum recommended by the TSD)

$\sigma_4 = 0.34$

$$MDL = 5.2 * \exp[z\sigma - 0.5 \sigma^2] = 5.2 * \exp[2.326*0.62 - 0.5*0.39] = 18.3$$

$$\text{AML} = 5.2 * \exp[z\sigma_4 - 0.5 \sigma^2] = 5.2 * \exp[1.645*0.34 - 0.5*0.11] = 8.5$$

$$\text{MDL} = 18.3 \text{ ug/L}$$

$$\text{AML} = 8.5 \text{ ug/L}$$

Appendix E
Ammonia Criteria and Limit Determination

Calculate Criteria & Wasteload Allocation (WLA)

P = 95th percentile of the pH dataset at Station 151 (10) = 8.00 s.u.
 T = 95th percentile of the temperature dataset at Station 151(10) = 15.02°C
 M = MIN(2.85, 1.45*10^(0.028*(25-T))) = Multiplier from Criteria Calculation

Acute (A) = (0.275/(1+10^(7.204+P)))+(39/(1+10^(P-7.2045))) = 5.38
 Chronic -30 (C₃₀) = ((0.0577/(1+10^(7.688-P)))+(2.487/(1+10^(P-7.688))))*M = 2.36
 Chronic -4 (C₄) = 2.5*C₃₀ = 5.89
 WLA-a (Wa) = 2.5*A = 13.46
 WLA-c30 (Wc) = 2.5* C₃₀ = 5.89
 WLA-c4 (W4) = 2.5* C₄ = 14.73

Determine most restrictive Long Term Average (LTA)

CV = the coefficient of variation of the ammonia dataset at Outfall 001 = 0.23
 σ^2 = Variance
 σ = Standard Deviation
 z = 2.326 for the 99th percentile probability basis

Acute (A)	$\sigma^2 = \text{LN}((\text{CV}^2)+1) = 0.052$	$\sigma = \text{SQRT}(\sigma^2) = 0.227$
Chronic -30 (C ₃₀)	$\sigma^2 = \text{LN}(((\text{CV}^2)/30)+1) = 0.002$	$\sigma = \text{SQRT}(\sigma^2) = 0.042$
Chronic -4 (C ₄)	$\sigma^2 = \text{LN}(((\text{CV}^2)/4)+1) = 0.013$	$\sigma = \text{SQRT}(\sigma^2) = 0.115$

LTA-a = Wa * EXP((0.5* σ^2)-(2.326* σ)) = 8.14
 LTA-c = Wc * EXP((0.5* σ^2)-(2.326* σ)) = 5.35
 LTA-c4 = W4 * EXP((0.5* σ^2)-(2.326* σ)) = 11.35

Calculate Effluent Limitations

LTA = Most stringent LTA = 5.35
 MDL is Maximum Daily Limit
 AML is Average Monthly Limit
 Z = 1.645 for 95th percentile probability basis

MDL	$\sigma^2 = \text{LN}((\text{CV}^2)+1) = 0.052$	$\sigma = \text{SQRT}(\sigma^2) = 0.227$
AML	$\sigma^2 = \text{LN}(((\text{CV}^2)/30)+1) = 0.002$	$\sigma = \text{SQRT}(\sigma^2) = 0.042$

MDL = LTA * EXP((2.326* σ)-(0.5* σ^2)) = 8.84
 AML = LTA * EXP((1.645* σ)-(0.5* σ^2)) = 5.72