Fact Sheet

NPDES Permit Number:	ID-000017-5
Public Notice Start Date:	March 28, 2001
Public Hearing Date:	May 8, 2001
Public Notice Expiration Date:	May 14, 2001
Technical Contact:	Ben Cope, (206) 553-1442 1-800-424-4372 (within Region 10) cope.ben@epa.gov

The U.S. Environmental Protection Agency (EPA) Proposes to Reissue a Wastewater Discharge Permit To:

Hecla Mining Company
Lucky Friday Mine and Mill
P.O. Box 31
Mullan, Idaho 83846

and

the State of Idaho Proposes to Certify the Permit

EPA proposes NPDES permit reissuance.
EPA proposes to reissue the existing National Pollutant Discharge Elimination System (NPDES) permit to the Hecla Mining Company (Hecla). The draft permit sets conditions on the discharge of pollutants from the Lucky Friday Mine and Mill facilities to the South Fork Coeur d'Alene River. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged.

This Fact Sheet includes:
- information on public comment, public hearing, and appeal procedures
- a description of the current discharges
- a listing of proposed effluent limitations and other conditions
- a map and description of the discharge locations
- background information supporting the conditions in the draft permit

The State of Idaho proposes certification.
The Idaho Department of Environmental Quality (IDEQ) proposes to certify the NPDES permit for the Hecla Lucky Friday Mine and Mill under section 401 of the Clean Water Act. IDEQ submitted comments prior to the public notice that were incorporated in the draft permit.

Public comment on the draft permit.
EPA will consider all significant comments before issuing a final permit. Those wishing to comment on the draft permit may do so in writing by the expiration date of the public notice. All comments must be in writing and addressed to Office of Water Director at U.S. EPA, Region 10, 1200 Sixth Avenue, OW-130, Seattle, WA 98101. In addition, EPA has scheduled a public hearing on May 8, 2001, beginning at 6:00 p.m. and ending when all persons have been heard, at Silver Hills Middle School Gymnasium at east Mullan Avenue in Osburn, Idaho. A sign-in process will be used for persons wishing to make a statement or submit written comments at the hearing.

After the comment period closes, and all significant comments have been considered, EPA's regional Director for the Office of Water will make a final decision regarding permit reissuance. If no comments are received, the tentative conditions in the draft permit will become final, and the permit will become effective upon issuance. If comments are received, EPA will address the significant comments and issue the permit. The permit will become effective 33 days after the issuance date, unless an appeal is filed with the Environmental Appeals Board within 30 days.

Public comment on the State preliminary 401 certification
The IDEQ provides the public with the opportunity to review and comment on preliminary 401 certification decisions. Any person may request in writing, that IDEQ provide that person notice of IDEQ's preliminary 401 certification decision, including, where appropriate, the draft certification. Persons wishing to comment on the preliminary 401 certification should submit written comments by the public notice expiration date to the Idaho Department of Environmental Quality, Coeur d'Alene Regional Office, c/o David Stasney, 2110 Ironwood Parkway, Coeur d'Alene, Idaho 83814.

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 (see address below). .

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

The fact sheet and draft permit are also available at:

EPA Coeur d'Alene Field Office
1910 NW Boulevard
Coeur d'Alene, Idaho 83814
(208) 664-4588

Idaho Department of Environmental Quality
Coeur d'Alene Regional Office
2110 Ironwood Parkway
Coeur d'Alene, Idaho, 83814
(208) 769-1422

Wallace Public Library
415 River Street
Wallace, Idaho
(208) 752-4571

The draft permit and fact sheet can also be found by visiting the Region 10 website at www.epa.gov/r10earth/water.htm.

For technical questions regarding the permit or fact sheet, contact Ben Cope at the phone number or email address at the top of this fact sheet. Those with impaired hearing or speech may contact a TDD operator at 1-800-833-6384 (ask to be connected to Ben Cope at the above phone number). Additional services can be made available to person with disabilities by contacting Ben Cope.

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LIST OF ACRONYMS

AML	Average Monthly Limit
BAT	Best Available Technology Economically Achievable
BCT	Best Conventional Pollutant Control Technology
BMP	Best Management Practices
BPT	Best Practicable Control Technology
CFR	Code of Federal Regulations
cfs	cubic feet per second
CV	coefficient of variation
CWA	Clean Water Act
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
IDEQ	Idaho Department of Environmental Quality
LTA	Long-term Average
MDL	Maximum Daily Limit
mgd	million gallons per day
MZ	mixing zone
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NTR	National Toxics Rule
QAP	Quality Assurance Plan
RP	Reasonable Potential
RPM	Reasonable Potential Multiplier
SFCDA	South Fork Coeur d'Alene
s.u.	standard units
TMDL	Total Maximum Daily Load
tpd	tons per day
TSD	Technical Support Document (EPA 1991)
TSS	Total Suspended Solids
TU	Toxic Unit (TU_a = acute toxic unit, TU_c = chronic toxic unit)
USFWS	United States Fish and Wildlife Service
WET	Whole Effluent Toxicity
WLA	Wasteload Allocation

I. APPLICANT

Hecla Mining Company
NPDES Permit No.: ID-000017-5

Mailing Address:	P.O. Box 31 Mullan, Idaho 83846
Facility Location:	Approximately one mile east of Mullan.
Facility Contact:	Tim Arnold, General Manager

II. FACILITY ACTIVITY

The Lucky Friday Mine is a silver, lead, and zinc mine and mill located in Shoshone County, Idaho, just north of the South Fork Coeur d'Alene (SFCDA) River and approximately 1 mile east of Mullan. The mine and mill are owned and operated by the Hecla Mining Company (Hecla). Ore has been mined from the Lucky Friday deposit since 1942. The Lucky Friday mill has been in operation since 1959, with periods of temporary closure.

The ore is mined via underground methods and conveyed to the mill. Mill operations include crushing, grinding, and flotation to produce a silver-lead concentrate and a zinc concentrate. The concentrates are transported off-site for refining. Tailings (the residuals from the mill) are separated via hydrocyclones to produce a coarse and fine product. The coarse tailings are used to backfill the mine. The fine tailings are piped in a slurry from the mill to tailings pond no. 3.

Wastewater is discharged from the facility via the following outfalls (see Figure A-1 in Appendix A for a map of the outfall locations):

<u>outfall 001:</u> Outfall 001 is the overflow from tailings pond no. 1. The pond is located adjacent to the SFCDA River near Mullan. Tailings pond no. 1 receives groundwater, cooling water, sanitary wastewater, and mine water from the Lucky Friday Mine. Outfall 001 discharges continuously. Flows over the last five years have ranged from 0.43 to 2.88 million gallons per day (mgd).

<u>outfall 002:</u> Outfall 002 is the overflow from tailings pond no. 2. Tailings pond no. 2 is located adjacent to the SFCDA River, and would discharge to the river approximately 0.8 miles east of outfall 001. There has been no discharge from outfall 002 over at least the last five years. Even though there has been no discharge from outfall 002, Hecla applied to discharge from outfall 002 for emergency use when the flow from outfalls 001 or 003 need to be diverted.

<u>outfall 003:</u> Outfall 003 is the overflow from tailings pond no. 3. Tailings pond no. 3 is located adjacent to the SFCDA River and discharges to the river approximately 1.3 miles east of outfall 002. Pond no. 3 receives tailings from the Lucky Friday mill and stormwater. Stormwater that is not discharged through outfall 003 is regulated under the Multi-sector Storm Water General

Permit for Industrial Activities. Outfall 003 discharges continuously. Flows over the last five years have ranged from 0.23 to 2.28 mgd.

The parameters of concern in all the discharges include pH, total suspended solids (TSS), and metals.

III. FACILITY BACKGROUND

EPA first issued a National Pollutant Discharge Elimination System (NPDES) permit for the Lucky Friday Mine in 1973. The current permit was reissued by EPA on September 30, 1977 and expired on December 31, 1980. Until reissuance of a new permit, Hecla currently operates under the interim limits established in the 1977 permit. On September 28, 1990 a draft NPDES Permit for the Lucky Friday Mine was issued for public notice. The 1990 draft permit was never finalized.

Hecla submitted applications to discharge from outfalls 001, 002, and 003 and additional information related to the applications in 1982 and 1983 (Hecla 1982a., 1982b, and 1983). In response to a Clean Water Act (CWA) Section 308 information request from EPA, Hecla submitted updated information on August 2, 1999. Additional information was submitted on November 20, 2000.

IV. RECEIVING WATER

The Lucky Friday outfalls discharge to the SFCDA River between Daisy Gulch and Canyon Creek. The State of Idaho and EPA have designated beneficial uses for this portion of the SFCDA River. Specifically this portion of the SFCDA River is classified for protection of secondary contact recreation and cold water biota. The State water quality standards specify water quality criteria that is deemed necessary to support the use classifications. These criteria may be numerical or narrative. The water quality criteria applicable to the proposed permit are provided in Appendix B (Section III.B.1.). These criteria provide the basis for most of the effluent limits in the draft permit.

The SFCDA River below Canyon Creek is listed on Idaho’s 303(d) list (a list of impaired waters compiled under Section 303(d) of the CWA). The 303(d) list identifies water bodies that do not meet or are not expected to meet water quality standards. Specifically, the SFCDA River was listed as not meeting standards for metals. Section 303(d) of the CWA requires States to develop a Total Maximum Daily Load (TMDL) management plan for water bodies on the 303(d) list. A TMDL establishes loading capacities and allocates available loading capacities to point and nonpoint sources to the water body. Permit limits for point sources must be consistent with applicable TMDL allocations. A TMDL for the Coeur d’Alene Basin, which includes the SFCDA River, was issued by the State and EPA on August 18, 2000. The TMDL included wasteload allocations for cadmium, lead, and zinc for Lucky Friday outfalls 001 and 003 that are incorporated into the permit as effluent limits.

V. EFFLUENT LIMITATIONS

EPA followed the CWA, state and federal regulations, and EPA's 1991 *Technical Support Document for Water Quality-Based Toxics Control* (TSD) to develop the effluent limits in the draft permit. In general, the CWA requires that the effluent limit for a particular pollutant be the more stringent of either the technology-based limit or water quality-based limit. Appendix B provides discussion on the legal basis for the development of technology-based and water quality-based effluent limits.

EPA sets technology-based limits based on the effluent quality that is achievable using readily available technology. The Agency evaluates the technology-based limits to determine whether they are adequate to ensure that water quality standards are met in the receiving water. If the limits are not adequate, EPA must develop more stringent water quality-based limits. Water quality-based limits are designed to prevent exceedances of the Idaho water quality standards in the receiving waters. The proposed permit includes technology-based limits for TSS, water quality-based and technology-based limits for pH, and water quality-based limits for metals. The water quality-based limits for cadmium, lead, and zinc were based upon the TMDL. Appendix B describes in detail how the effluent limits were developed.

Hecla applied to discharge from outfall 002 if outfalls 001 or 003 are unusable and need to be diverted. Separate effluent limits were not developed for outfall 002, rather, the effluent limits for outfall 001 will apply when the discharge from outfall 002 consists of the outfall 001 waste stream and the effluent limits for outfall 003 will apply when the discharge from outfall 002 consists of the outfall 003 waste stream. Because the effluent limits follow the waste stream, this approach will comply with the TMDL allocation for the facility as a whole.

Four sets of limits (tiered limits) were developed for the outfalls to allow for seasonal variability of the flows in the receiving waters. The effluent limits that apply at a particular time depend upon the flow in the SFCDA River at the TMDL target site (for the cadmium, lead, and zinc effluent limits) and the flow upstream of the outfall (for copper, mercury, and silver in outfall 001 and mercury in outfall 003).

The effluent limits in the draft permit are provided in Table 2. For comparison, the effluent limits in the current permit are included in Table 1.

The effluent limits in the draft permit are more stringent than those in the current permit. The facility may not immediately be able to achieve the average monthly effluent limits for cadmium, lead, and zinc and the average monthly and maximum daily effluent limits for mercury. In comments on the permit, the IDEQ stated that IDEQ will establish a compliance schedule in for these parameters in the final 401 certification (see Section VIII.C.).

Table 1: Current Effluent Limits for Outfalls 001 and 002			
Parameter	units	daily average	daily maximum
flow	kg/day (mgd)	6624 (1.75)	10,636 (2.81)
suspended solids	mg/l	20	30
dissolved copper, cadmium, lead, mercury, silver, and zinc	mg/l	combined total not to exceed 1.0 mg/l	combined total not to exceed 1.5 mg/l
pH	standard units (s.u.)	within the range of 6 - 9	

Table 2: Effluent Limitations for Outfall 001 (and Outfall 002 when the discharge from outfall 002 consists of the outfall 001 waste stream)[1]

Parameter	Flow Tier		Proposed Effluent Limitations			
	Flow Tier Target Site[2]	Flow Value	Maximum Daily		Average Monthly	
			ug/l	lb/day	ug/l	lb/day
cadmium, total recoverable	SFCDA River at Wallace, downstream of Ninemile Creek confluence (URSG 233)	< 35 cfs	100	--	--	0.00152[3]
		≥ 35 to < 79 cfs	100	--	--	0.00240[3]
		≥ 79 to < 469 cfs	100	--	--	0.00472[3]
		≥ 469 cfs	100	--	--	0.0158[3]
lead, total recoverable	SFCDA River at Wallace, downstream of Ninemile Creek confluence (URSG 233)	< 35 cfs	600	--	--	0.00343[3]
		≥ 35 to < 79 cfs	600	--	--	0.00535[3]
		≥ 79 to < 469 cfs	600	--	--	0.00973[3]
		≥ 469 cfs	600	--	--	0.0214[3]
zinc, total recoverable	SFCDA River at Wallace, downstream of Ninemile Creek confluence (URSG 233)	< 35 cfs	1500	--	--	0.143[3]
		≥ 35 to < 79 cfs	1500	--	--	0.226[3]
		≥ 79 to < 469 cfs	1500	--	--	0.435[3]
		≥ 469 cfs	1500	--	--	1.32[3]

Parameter	Flow Tier		Proposed Effluent Limitations			
	Flow Tier Target Site[2]	Flow Value	Maximum Daily		Average Monthly	
			ug/l	lb/day	ug/l	lb/day
copper, total recoverable	SFCDA River directly upstream of the outfall	< 13 cfs	16	0.38	7.8	0.19
		≥ 13 to < 30 cfs	18	0.43	8.8	0.21
		≥ 30 to < 176 cfs	20	0.48	10	0.24
		≥ 176 cfs	13	0.31	6.7	0.16
mercury, total	SFCDA River directly upstream of the outfall	< 13 cfs	0.029[3]	0.00070[3]	0.015[3]	0.00036[3]
		≥ 13 to < 30 cfs	0.034[3]	0.00082[3]	0.017[3]	0.00041[3]
		≥ 30 to < 176 cfs	0.053[3]	0.0013[3]	0.027[3]	0.00065[3]
		≥ 176 cfs	0.22[3]	0.0053[3]	0.11[3]	0.0026[3]
silver, total recoverable	SFCDA River directly upstream of the outfall	< 13 cfs	2.5	0.060	1.4	0.034
		≥ 13 to < 30 cfs	2.7	0.065	1.5	0.036
		≥ 30 to < 176 cfs	2.5	0.060	1.4	0.034
		≥ 176 cfs	2.4	0.058	1.3	0.031
TSS	not dependent upon river flow		30 mg/l	--	20 mg/l	--
pH	not dependent upon river flow		within the range of 6.5 - 9.0 s.u.			

Footnotes:
1 - The permittee may discharge from either outfall 001 or 002, but not from both at the same time.
2 - The effluent limits will be determined by the average monthly flow in the SFCDA River at the target site.
3 - A compliance schedule will be included in the final permit to allow time to achieve these limitations (see Section VIII.C.)

Table 3: Effluent Limitations for Outfall 003 (and Outfall 002 when the discharge from outfall 002 consists of the outfall 003 waste stream)[1]

Parameter	Flow Tier		Proposed Effluent Limitations			
	Flow Tier Target Site[2]	Flow Value	Maximum Daily		Average Monthly	
			ug/l	lb/day	ug/l	lb/day
cadmium, total recoverable	SFCDA River at Wallace, downstream of Ninemile Creek confluence (URSG 233)	< 35 cfs	100	--	--	0.00102[3]
		≥ 35 to < 79 cfs	100	--	--	0.00161[3]
		≥ 79 to < 469 cfs	100	--	--	0.00316[3]
		≥ 469 cfs	100	--	--	0.0106[3]

Table 3: Effluent Limitations for Outfall 003 (and Outfall 002 when the discharge from outfall 002 consists of the outfall 003 waste stream)[1]						
Parameter	Flow Tier		Proposed Effluent Limitations			
	Flow Tier Target Site[2]	Flow Value	Maximum Daily		Average Monthly	
			ug/l	lb/day	ug/l	lb/day
lead, total recoverable	SFCDA River at Wallace, downstream of Ninemile Creek confluence (URSG 233)	< 35 cfs	600	--	--	0.00230[3]
		≥ 35 to < 79 cfs	600	--	--	0.00358[3]
		≥ 79 to < 469 cfs	600	--	--	0.00651[3]
		≥ 469 cfs	600	--	--	0.0143[3]
zinc, total recoverable	SFCDA River at Wallace, downstream of Ninemile Creek confluence (URSG 233)	< 35 cfs	1000	--	--	0.0959[3]
		≥ 35 to < 79 cfs	1000	--	--	0.151[3]
		≥ 79 to < 469 cfs	1000	--	--	0.291[3]
		≥ 469 cfs	1000	--	--	0.884[3]
mercury, total	SFCDA River directly upstream of the outfall	< 5.1 cfs	0.023[3]	0.00044[3]	0.011[3]	0.00021[3]
		≥ 5.1 to < 17 cfs	0.027[3]	0.00051[3]	0.013[3]	0.00025[3]
		≥ 17 to < 114 cfs	0.044[3]	0.00083[3]	0.022[3]	0.00042[3]
		≥ 114 cfs	0.18[3]	0.0034[3]	0.090[3]	0.0017[3]
copper, total recoverable	not dependent upon river flow		20	0.38	10	0.19
silver, total recoverable	not dependent upon river flow		5.1	0.097	2.8	0.053
TSS	not dependent upon river flow		30 mg/l	--	20 mg/l	--
pH	not dependent upon river flow		within the range of 6.5 - 9.0 s.u.			

Footnotes:
1 - The permittee may discharge from either outfall 003 or 002, but not from both at the same time.
2 - The effluent limits will be determined by the average monthly flow in the SFCDA River at the target site.
3 - A compliance schedule will be included in the final permit to allow time to achieve these limitations (see Section VIII.C.)

VI. MONITORING REQUIREMENTS

Section 308 of the Clean Water Act and federal regulation 40 CFR 122.44(i) require that monitoring be included in permits to determine compliance with effluent limitations. Monitoring may also be required to gather data for future effluent limitations or to monitor effluent impacts on receiving water quality. Hecla is responsible for conducting the monitoring and reporting the results to EPA on monthly Discharge Monitoring Reports (DMRs) and in annual reports. This section describes the monitoring requirements in the draft permit.

A. Effluent Monitoring

The current permit requires weekly monitoring of the parameters with effluent limits in Table 1 (except for pH, where monthly monitoring is required). The draft permit requires weekly monitoring of the effluent limited parameters, as well as monitoring the outfall flow, hardness, temperature, and whole effluent toxicity. The effluent monitoring requirements in the draft permit are summarized in Table 4.

Table 4: Outfall 001, 002 and 003 Effluent Monitoring Requirements

Parameter	frequency	sample type
outfall flow, cfs	continuous	recording
metals with effluent limits (cadmium, lead, zinc, copper, mercury, silver)[1], ug/l	weekly	24-hour composite
TSS, mg/l	weekly	24-hour composite
pH, standard units (su)	weekly	grab
hardness, as $CaCO_3$, mg/l	monthly	24-hour composite
E. coli (Escherichia coli) Bacteria[2], #/100 ml.	monthly	grab
temperature, ºC	weekly	grab
whole effluent toxicity (WET)[3], TU_c	quarterly	24-hour composite

Footnotes:
1 - River flow in the SFCDA River at Wallace, downstream of the Ninemile Creek confluence (at existing station URSG 233) is required to determine which flow tier of effluent limits apply for cadmium, lead, and zinc. River flow in the SFCDA River directly upstream of the outfall is required to determine which flow tier of effluent limits apply for copper, mercury, and silver for outfall 001 (and outfall 002 when the discharge consists of the outfall 001 waste stream) and mercury for outfall 003.(and outfall 002 when the discharge consists of the outfall 003 waste stream.
2 - E. coli. monitoring is only required for outfall 001 (and outfall 002 when the discharge consists of the outfall 001 waste steam), since sanitary waste water is a component of the outfall 001 waste stream.
3 - See Section VI.B., below for details regarding the whole effluent toxicity (WET) monitoring.

Some of the water quality-based effluent limits in the draft permit are close to the capability of current analytical technology to detect and/or quantify (close to method detection limits). To address this concern, the draft permit contains a provision requiring Hecla to use analytical methods that can achieve a method detection limit less than the effluent limitation. Method detection limits are the minimum levels that can be accurately detected by current analytical technology.

B. Whole Effluent Toxicity Testing

Whole effluent toxicity (WET) is defined as the aggregate toxic effect of an effluent measured directly by an aquatic toxicity test. WET tests are standardized laboratory tests that measure the total toxic effect of an effluent by exposing organisms to the effluent and noting the effects. There are two different durations of toxicity tests: acute and chronic. Acute toxicity tests measure the test organisms survival over a 96-hour test exposure period. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure.

EPA and Hecla have conducted WET testing on effluent from outfalls 001 and 003. Following is a summary of the WET data.

<u>Outfall 001:</u> Acute toxicity tests conducted in 1984 and 1988 resulted in no acute toxicity to the test species (*Daphnia pulex*) at 100% effluent. For chronic toxicity to *Ceriodaphnia sp.*, two different labs reported different results for the same sample tested in 1988 (one lab reported 100% mortality for all effluent dilutions tested, the other lab reported a no observed effect concentrations of 50% effluent). No chronic impacts to the alga *Selanastrum* was reported in a WET test conducted in 1988.

<u>Outfall 003:</u> Acute toxicity tests conducted in 1984 resulted in 85-100% survival of the test species (*Daphnia pulex*) at 10-100% effluent. Acute tests conducted in 1988 resulted in no acute toxicity to this test species. Acute toxicity tests conducted on rainbow trout (*Oncorhynchus mykiss*) and the midge (*Chironomus tentans*) in 1991 resulted in 90-100% survival at up to 100% effluent and 80% survival at 100% effluent. For chronic toxicity to *Ceriodaphnia sp.*, two different labs reported different results for the same sample tested in 1988 (one lab reported a no observed effect concentration of 50% effluent, the other lab reported a no observed effect concentration of 25% effluent). No chronic impacts to the alga *Selanastrum capricornutum* was reported in a WET test conducted in 1988. Chronic tests conducted in 1991 indicated no observed effect concentrations of 100% effluent for the *Ceriodaphnia dubia* and 12.5% effluent for the *Selanastrum capricornutum*.

Federal regulations at 40 CFR 122.44(d)(1) require that permits contain limits on WET when a discharge has reasonable potential to cause or contribute to an exceedence of a water quality standard. In Idaho, the relevant water quality standard states that surface waters of the State shall be free from toxic substances in concentrations that impair designated beneficial uses (see Appendix B, Table B-4). The TSD provides guidance on implementing WET testing in NPDES permits.

Because the limited amount of existing historical WET testing on the Lucky Friday effluents is not adequate to determine the need for WET effluent limits, WET testing has been incorporated into the draft permit. The draft permit requires Hecla to conduct chronic WET testing quarterly on effluent from each outfall. These tests will initially be conducted using two species, *Ceriodaphnia dubia* (water fleas) and *Pimephales promelas* (fathead minnow). After the first three suites of tests, WET testing will be conducted with the most sensitive species only.

Different species are used for testing to represent different aquatic phyla (invertebrate and fish) and because different species have different sensitivities. The tests will be conducted at a range of dilutions that mimic the effluent-receiving water mixing conditions. Results of these tests will be used to ensure that toxics in the effluent are controlled and to determine the need for future WET limits. In addition, the permit establishes toxicity trigger levels for each outfall (see Appendix B, Section IV.B.), that, if exceeded, trigger additional WET testing and, potentially, investigations to reduce toxicity.

C. Ambient Water Monitoring

The current permit does not require monitoring of the receiving waters. The draft permit requires surface water quality monitoring and bioassessment monitoring as discussed below.

<u>Water quality monitoring:</u> The draft permit requires Hecla to monitor the SFCDA River upstream of each outfall four times per year for dissolved copper, total mercury, dissolved silver, hardness (required both upstream and downstream), temperature, and pH. The monitoring data will be used during the next permitting cycle to determine the need for incorporating and retaining water quality-based effluent limits into the permit. In order to perform these evaluations, it is necessary that the ambient monitoring use analytical methods that have method detection limits below the water quality criteria. Therefore, the draft permit specifies method detection limits required for surface water monitoring. Upstream concentrations of cadmium, lead, and zinc are not necessary since the effluent limits are based upon an established TMDL wasteload allocation.

<u>Bioassessment monitoring:</u> The draft permit requires Hecla to conduct annual instream bioassessment monitoring of macroinvertebrates and fish. The purpose of the monitoring is to determine if the composition of macroinvertebrate and fish species in the receiving waters are impacted by the facility discharges.

D. Representative Sampling

The draft permit has expanded the requirement in the federal regulations regarding representative sampling (40 CFR 122.41[j]). This provision now specifically requires representative sampling whenever a bypass, spill, or non-routine discharge of pollutants occurs, if the discharge may reasonably be expected to cause or contribute to a violation of an effluent limit under the permit. This provision is included in the draft permit because routine monitoring could miss permit violations and/or water quality standards exceedences that could result from bypasses, spills, or non-routine discharges. This requirement directs Hecla to conduct additional, targeted monitoring to quantify the effects of these occurrences on the final effluent discharge.

VII. OTHER PERMIT CONDITIONS

A. Quality Assurance Plan

Federal regulations at 40 CFR 122.41(e) require permittees to properly operate and maintain their facilities, including “adequate laboratory controls and appropriate quality assurance procedures.” To implement this requirement, the draft permit requires that Hecla develop a Quality Assurance Plan (QAP) to ensure that the monitoring data submitted is accurate and to explain data anomalies if they occur. The QAP must include standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples, laboratory analysis, and data reporting. The draft permit requires Hecla to submit the QAP to EPA within 60 days of the effective date of the permit and implement the QAP within 120 days of the effective date.

B. Seepage Study

The tailings ponds that receive waste water from the Lucky Friday facility are unlined. The draft permit requires Hecla to conduct a seepage study to determine if there are discharges of pollutants from the tailings ponds into the SFCDA River. The permit requires specifically that a water balance be conducted to determine if seepage is occurring. Hecla must submit the results of the seepage study for tailings pond nos. 1 and 3 to EPA and IDEQ within 18 months of the effective data of the permit. A seepage study is only required for tailings pond no. 2 if there is a discharge from outfall 002 that lasts for more than six months. In this situation, Hecla must complete a seepage study within 18 months following the first six months of continual discharge.

C. Best Management Practices Plan

Section 402 of the Clean Water Act and federal regulations at 40 CFR 122.44(k)(2) and (3) authorize EPA to require best management practices (BMPs) in NPDES permits. BMPs are measures that are intended to prevent or minimize the generation and the potential for release of pollutants from industrial facilities to waters of the U.S. These measures are important tools for waste minimization and pollution prevention.

The draft permit requires Hecla to prepare and implement a BMP Plan within 120 days and 180 days, respectively, of permit issuance. Any existing BMP Plan may be modified to meet the requirements in the permit. The BMP Plan is intended to achieve the following objectives: Minimize the quantity of pollutants discharged from the facility; reduce the toxicity of discharges to the extent practicable; prevent the entry of pollutants into waste streams; and minimize storm water contamination that contributes to the outfalls. The draft permit requires that the BMP Plan be maintained and that any modifications to the facility are made with consideration to the effect the modification could have on the generation or potential release of pollutants. The BMP Plan must be revised if the facility is modified and as new pollution prevention practices are developed.

D. Additional Permit Provisions

In addition to facility-specific requirements, most of sections III, IV, and V of the draft permit contain standard regulatory language. Standard regulatory language must be included in NPDES permits. Because it is based on regulations, the standard regulatory language 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 general requirements.

VIII. OTHER LEGAL REQUIREMENTS

A. Endangered Species Act

Section 7 of the Endangered Species Act requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) regarding potential affects a federal action may have on threatened and endangered species. In response to a request for a list of threatened and endangered species in the vicinity of the discharge, the USFWS identified the following federally-listed species in a letter dated December 20, 2000 (USFWS 2000).

Endangered Species:
Gray Wolf (*Canis lupus*) - experimental

Threatened Species:
Ute' ladies-tresses (*Spiranthes diluvialis*)

In addition to these species, the USFWS listed the following species of concern: California myotis (bat) (*Myotis californicus*), Fringed myotis (bat) (*Myotis thysanodes*), Westslope cutthroat trout (*Oncorhynchus clarki lewisi*), Wolverine (*Gulo gulo luscus*) and Yuma myotis (bat) (*Myotis yumanensis*). NMFS did not identify any species under their jurisdiction.

EPA has determined that the requirements contained in the draft permit will not have an impact on the gray wolf or on the Ute' ladies tresses. Gray wolves consume prey that are primarily vegetarian. Therefore, the gray wolf should not be exposed to harmful concentrations as a result of exposure to contaminated aquatic habitats since they do not consume fish.

The Ute ladies' tresses is a terrestrial orchid species that is only periodically exposed to surface waters. This species generally inhabits riverbanks where inundation occurs infrequently. Because of the lack of exposure to contaminants in aquatic systems, EPA has determined that the discharges authorized via issuance of the draft permit will not affect the Ute ladies' tresses.

B. Essential Fish Habitat

Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1855(b)) requires federal agencies to consult with NMFS when any activity proposed to by, permitted, funded, or undertaken by a federal agency may have an adverse effect on designated Essential Fish Habitat (EFH). To date, federal management plans have been developed by NMFS for groundfish, coastal pelagics, and pacific coast salmon. EPA reviewed these management plans and found that none of these plans specified EFH in the discharge area (the South Fork Coeur d'Alene River).

C. State Certification

Section 401 of the CWA requires EPA to seek certification from the State that the permit is adequate to meet State water quality standards before issuing a final permit. The regulations allow for the state to stipulate more stringent conditions in the permit, if the certification cites the CWA or State law references upon which that condition is based. In addition, the regulations require a certification to include statements of the extent to which each condition of the permit can be made less stringent without violating the requirements of State law.

The State provided comments to EPA on this permit (IDEQ 2001). The following comments were incorporated into the draft permit:

- bioassessment monitoring of the SFCDA River should be conducted (see Section VI.C.)
- WET testing should not include the green alga species
- a mixing zone is appropriate, however, specific mixing zones sizes were not recommended (see Appendix B, Section III.B.2., mixing zone discussion)
- a compliance schedule for cadmium, lead, mercury, and zinc is needed, although specific dates and interim requirements were not provided (see Section V. and Tables 2 and 3)

The above comments were incorporated into the draft permit. After the public comment period, a preliminary final permit will be sent to the State for final certification. If the State authorizes different requirements in its final certification, EPA will incorporate those requirements into the permit. For example, if the State authorizes specific mixing zones in its final certification, EPA will recalculate the effluent limitations in the final permit based on the dilution available in the final mixing zones.

The state also recommended that six additional flow tiers be added (see Appendix B, sections III.A. and III.B.2., upstream flow discussion). This was not incorporated into the permit at this time. Rather EPA will evaluate comments on the permit related to the need for additional flow tiers and base any changes to the flow tiers on the response to comments and final state certification.

D. Antidegradation

In setting permit limitations, EPA must consider the State's antidegradation policy. This policy is designed to protect existing water quality when the existing quality is better than that required to meet the standard and to prevent water quality from being degraded below the standard when existing quality just meets the standard. For high quality waters, antidegradation requires that the State find that allowing lower water quality is necessary to accommodate important economic or social development before any degradation is authorized. This means that, if water quality is better than necessary to meet the water quality standards, increased permit limits can be authorized only if they do not cause degradation or if the State makes the determination that it is necessary.

Because the effluent limits in the draft permit are based on an approved TMDL and current water quality criteria, the discharges as authorized in the draft permit will not result in degradation of the receiving water. In addition, the proposed effluent limits are more stringent than those in the current permit. Therefore, the conditions in the permit will comply with the State's antidegradation requirements.

E. Permit Expiration

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

APPENDIX A - LUCKY FRIDAY OUTFALL LOCATION MAP

Please see the file titled ID-000017-5 App A. for a scanned copy of the outfall map.

APPENDIX B - DEVELOPMENT OF EFFLUENT LIMITATIONS

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

I. Statutory and Regulatory Basis for Limits

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

In general, the EPA first determines which technology-based limits must be incorporated into the permit. EPA then evaluates the effluent quality expected to result from these controls, to see if it could result in any exceedances of the water quality standards in the receiving water. If exceedances could occur, EPA must include water quality-based limits in the permit. The proposed permit limits will reflect whichever requirements (technology-based or water quality-based) are more stringent.

II. Technology-based Evaluation

Section 301(b) of the CWA requires technology-based controls on effluents. This section of the CWA requires that, by March 31, 1989, all permits contain effluent limitations which: (1) control toxic pollutants and nonconventional pollutants through the use of "best available technology economically achievable" (BAT), and (2) represent "best conventional pollutant control technology" (BCT) for conventional pollutants by March 31, 1989. In no case may BCT or BAT be less stringent than "best practical control technology currently achievable" (BPT), which is the minimum level of control required by section 301(b)(1)(A) of the CWA.

In many cases, BPT, BCT, and BAT limitations are based on effluent guidelines developed by EPA for specific industries. On December 3, 1982, EPA published effluent guidelines for the mining industry. These guidelines are found in 40 CFR 440. Effluent guidelines applicable to the Lucky Friday Mine are found in the Copper, Lead, Zinc, Gold, Silver, and Molybdenum Ores Subcategory (Subpart J) of Part 440. The BAT(40 CFR 440.103) and BPT(40 CFR 440.102) effluent limitation guidelines that apply to the Lucky Friday discharges are shown in the following table.

Table B-1: Technology-Based Effluent Limitations for the Lucky Friday Mine				
Effluent Characteristic	Effluent Limitations for Mine Drainage (applies to outfall 001 and outfall 002 when 001 discharges from 002)		Effluent Limitations for Mill Process Waters (applies to outfall 003 and outfall 002 when 003 discharges from 002)	
	daily maximum	monthly average	daily maximum	monthly average
cadmium, ug/l	100	50	100	50
copper, ug/l	300	150	300	150
lead, ug/l	600	300	600	300
mercury, ug/l	2	1	2	1
zinc, ug/l	1500	750	1000	500
TSS, mg/l	30	20	30	20
pH, su	within the range 6.0 -9.0		within the range 6.0 - 9.0	

III. Water Quality-based Evaluation

In addition to the technology-based limits discussed above, EPA evaluated the Lucky Friday discharges to determine compliance with Section 301(b)(1)(C) of the CWA. This section requires the establishment of limitations in permits necessary to meet water quality standards by July 1, 1977.

The regulations at 40 CFR 122.44(d) implement section 301(b)(1)(C) of the CWA. These regulations require that permits include limits for all pollutants or parameters which "are or may be discharged at a level which will cause, have the "reasonable potential to cause, or contribute to an excursion above any state water quality standard", including state narrative criteria for water quality." The limits must be stringent enough to ensure that water quality standards are met, and must be consistent with any available wasteload allocation (WLA).

Water quality-based effluent limits were determined in two ways:

- Effluent limits for cadmium, lead, and zinc were developed based upon the Total Maximum Daily Load (TMDL) for the Coeur d'Alene Basin. This is discussed in Section III.A.

- Effluent limits for other parameters were developed based upon a "reasonable potential analysis" and guidance in EPA's *Technical Support Document for Water Quality-based Toxics Control*. This is discussed in Section III.B.

A. Effluent Limits Based on the TMDL

The regulations at 40 CFR 122.44(d)(1)(vii)(B) require that effluent limits be consistent with the assumptions and requirements of any available wasteload allocation (WLA) for the discharge in an approved total maximum daily load (TMDL). A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety, that may be discharged to a water body without causing the water body to exceed the criterion for that pollutant. On August 18, 2000, EPA and the State of Idaho issued a final TMDL for cadmium, lead, and zinc for the surface waters in the Coeur d'Alene basin, including the SFCDA River (EPA, IDEQ 2000).

The TMDL specified that the WLA for an individual source in the Coeur d'Alene River and tributaries is the more stringent of either the WLAs calculated in the TMDL or the current average monthly performance at the facility. The current average monthly performance for outfalls 001 and 003 is shown in Table B-2.

Table B-2: Current Average Monthly Performance[1]

Parameter	Outfall 001	Outfall 003
Cadmium, lb/day	0.0258	0.0188
Lead, lb/day	2.32	2.20
Zinc, lb/day	3.36	1.28

footnote 1: Current average monthly performance was estimated as the 95th percentile of monthly average loadings based on the last five years of monitoring data.

The WLAs calculated in the TMDL (from Table 9 in the TMDL) for Lucky Friday outfalls 001 and 002 are shown in Table B-3. The TMDL did not include WLAs for outfall 002, since there has been no discharge from this outfall.

Table B-3: Wasteload Allocations for the Lucky Friday Discharges

Flow Tier (based on flow in SFCDA River at Wallace)	Parameter (expressed as total recoverable)	Wasteload Allocation (lb/day)	
		Outfall 001	Outfall 003
< 10th percentile (< 35 cfs)	Cadmium	0.00152	0.00102
	Lead	0.00343	0.00230
	Zinc	0.143	0.0959
≥ 10th to < 50th percentile (≥ 35 to < 79 cfs)	Cadmium	0.00240	0.00161
	Lead	0.00535	0.00358
	Zinc	0.226	0.151

Table B-3: Wasteload Allocations for the Lucky Friday Discharges			
Flow Tier (based on flow in SFCDA River at Wallace)	Parameter (expressed as total recoverable)	Wasteload Allocation (lb/day)	
		Outfall 001	Outfall 003
≥ 50th to < 90th percentile (≥ 79 to < 469 cfs)	Cadmium	0.00472	0.00316
	Lead	0.00973	0.00651
	Zinc	0.435	0.291
≥ 90th percentile (≥ 469 cfs)	Cadmium	0.0158	0.0106
	Lead	0.0214	0.0143
	Zinc	1.32	0.884

Since the WLAs calculated in the TMDL are more stringent than the current average monthly performance, the TMDL wasteload allocations apply to outfalls 001 and 003. Since the outfall 002 discharge may consist of either the outfall 001 waste stream or the outfall 003 waste stream, the determination that the TMDL WLAs are more stringent also applies to outfall 002.

The TMDL specified WLAs for the SFCDA River sources that are dependent upon flow in the SFCDA River at the TMDL "target" site. The TMDL target site for the Lucky Friday discharges is the SFCDA River at Wallace (described as downstream from the Ninemile Creek confluence, the same location as URS Greiner Station No. 233). Four flow "tiers" were established in the TMDL. The TMDL stated that, in its discretion, the NPDES permitting authority may develop additional flow tiers (and associated permit limits). The need for additional flow tiers will be based upon the response to comments on this permit and the final state certification.

The TMDL specified that the wasteload allocations be applied to the monthly average discharge. Therefore, the wasteload allocations in Table B-3 are expressed as the monthly average effluent limits for cadmium, lead, and zinc in the draft permit.

B. Water Quality-based Effluent Limits (Non-TMDL Parameters)

For parameters other than the TMDL parameters, EPA followed guidance in the *Technical Support Document for Water Quality-based Toxics Control* (TSD, EPA 1991) to determine whether water quality-based limits are needed and in developing the limits. The water quality-based analysis consists of four steps:

1. Determine the appropriate water quality criteria (see Section III.B.1., below)
2. Determine if there is "reasonable potential" for the discharge to exceed the criteria in the receiving water (see Section III.B.2.)
3. If there is "reasonable potential", develop a WLA (see Section III.B.3)
4. Develop effluent limitations based on the WLA (see Section III.B.3)

These steps were followed to develop effluent limits for outfalls 001 and 003. As discussed previously, the effluent limits for outfall 002 will be either the outfall 001 limits or the outfall 003 limits, depending upon the waste stream that is being discharged. The following sections provide a detailed discussion of each of the above steps. Appendix C provides an example calculation to illustrate how these steps are implemented.

1. Water Quality Criteria

The first step in developing water quality-based limits is to determine the applicable water quality criteria. For Idaho, the State water quality standards are found at IDAPA 58, Title 1, Chapter 2 (IDAPA 58.01.02). The applicable criteria are determined based on the beneficial uses of the receiving water. As discussed in Section IV. of the Fact Sheet, the beneficial uses for the SFCDA River are as follows:

- secondary contact recreation (IDAPA 58.01.02110.09.)
- cold water biota (promulgated by EPA on July 31, 1997, 62 FR 41162)

For any given pollutant, different uses may have different criteria. To protect all beneficial uses, the permit limits are based on the most stringent of the water quality criteria applicable to those uses. The applicable criteria used to calculate effluent limits are provided in Tables B-4 and B-5. The criteria included in Tables B-4 and B-5 are only for those parameters where reasonable potential was evaluated, where non-TMDL effluent limits were developed, or where monitoring was required. For example, cadmium, lead, and zinc are not included in the tables since the water quality-based effluent limits for these parameters was based on a TMDL (see Section III.A). Arsenic and selenium were not included in the tables since monitoring by Hecla and EPA (compliance inspection data) indicated that these parameters were always reported as not detected in the discharges, at detection limits lower than the water quality criteria.

Idaho's aquatic life criteria for copper and silver are calculated as a function of hardness measured in mg/l of calcium carbonate ($CaCO_3$). As the hardness of the receiving water increases, the toxicity decreases and the numerical value of the criteria increases. Where a mixing zone is allowed, the hardness used to calculate the criteria is the hardness in the receiving water after mixing with the effluent. Where no mixing zone is allowed, effluent hardness is used to calculate the criteria. The numerical values of the hardness-based criteria for outfalls 001 and 003 is provided in Table B-5.

In addition to the calculation for hardness, Idaho's criteria for some metals include a "conversion factor" to convert from total recoverable to dissolved criteria. Conversion factors address the relationship between the total amount of metal in the water column (total recoverable metal) and the fraction of that metal that causes toxicity (bioavailable metal). Conversion factors for copper, nickel, and silver are provided in Table B-4.

Table B-4: Applicable Idaho Water Quality Criteria			
Parameter	Cold Water Biota - Aquatic Life Criteria[1]		Secondary Contact Recreation Criteria[2]
	Acute Criteria	Chronic Criteria	
Copper, dissolved, ug/l	conversion factor x total criterion = 0.960 x exp [(0.9422)lnH - 1.464]	conversion factor x total criterion = 0.960 x exp [(0.8545)lnH -1.465]	NA
Mercury, ug/l	2.1	0.012	0.15
Nickel, dissolved, ug/l	conversion factor x total criterion = 0.998 x exp[(0.846)lnH + 3.3612]	conversion factor x total criterion = 0.997 x exp[(0.846)lnH + 1.1645]	4600 (total)
Silver, dissolved, ug/l	conversion factor x total criterion = 0.85 x exp [1.72(lnH) - 6.52]	NA	NA
E. coli, #/100ml	NA	NA	a single sample of 576/100 ml, or a geometric mean of 126/100 ml[3]
pH, s.u.	within the range of 6.5 - 9.5[4]		NA
WET (TU)	surface waters shall be free from toxic substances in concentrations that impair designated beneficial uses[5]		
Floating, Suspended or Submerged Matter	surface waters shall be free from floating, suspended, or submerged matter of any kind in concentrations causing nuisance or objectionable conditions or that may impair designated beneficial uses[6]		

Footnotes:

1 - The aquatic life criteria for toxics (metals) are based on IDAPA 58.01.02210. This section cites the National Toxics Rule (NTR), 40 CFR 131.36(b)(1), and the NTR subparts. The aquatic life criteria for copper, nickel, and silver are calculated as a function of hardness (H) - see Table B-5 for the numerical values.

2 - The recreation criteria for metals are based on IDAPA 58.01.02210., which cites the NTR (consumption of organisms only).

3 - The E.coli recreation criteria is based on IDAPA 58.01.02251.02.

4 - The aquatic life pH criteria is based on IDAPA 58.01.02250.01.a.

5 - The whole effluent toxicity (WET) criterion is based on IDAPA 58.01.02200.02. EPA's recommended values for this narrative criterion are 0.3 TU_a for the acute and 1 TU_c for the chronic criteria (EPA 1991). TU means toxicity unit, where TU_a is equal to the reciprocal of the effluent concentration that causes 50% mortality in an acute toxicity test and TU_c is the reciprocal of the effluent concentration that causes no observable effect in a chronic toxicity test.

6 - This narrative criterion is based on IDAPA 58.01.02200.05.

Table B-5: Copper, Nickel, and Silver Criteria Applicable to Lucky Friday Discharges							
Outfall	Flow Tier[1]	Hardness, mg/l $CaCO_3$	Copper, dissolved, ug/l		Nickel, dissolved, ug/l		Silver, dissolved, ug/l
			Acute	Chronic	Acute	Chronic	Acute
001	< 13 cfs	68[2]	12	8.2	1020	110	1.8
	≥ 13 to < 30 cfs	67[2]	12	8.1	1010	110	1.7
	≥ 30 to < 176 cfs	59[2]	10	7.2	910	100	1.4
	≥ 176 cfs	26[2]	4.8	3.6	450	50	0.34
	no mixing zone	74[3]	13	8.8	1100	120	2.1
003	< 5.1 cfs	91 (1Q10 - acute)[2] 85 (7Q10 - chronic)	16	9.9	1300	140	2.9
	≥ 5.1 to < 17 cfs	73[2]	13	8.7	1100	120	2.0
	≥ 17 to < 114 cfs	54[2]	9.5	6.7	840	93	1.2
	≥ 114 cfs	22 (25)[2,4]	4.6	3.6	440	49	0.32
	no mixing zone	114[3]	19	13	1600	180	4.3

Footnotes:
1 - See Pages B-11 through B-13 and Table B-9 for discussion of flow tiers.

2 - Where a mixing zone is allowed, the hardness value used is the hardness calculated after the effluent is mixed with the receiving water. The hardness is calculated via the following equation:

Hmixed = [(He X Qe) + MZ(Hu x Qu)]/ [Qe + MZ(Qu)]

He = hardness of the effluent and He = hardness of the SFCDA River upstream of the outfall
Qe = effluent flow and Qu = flow in the SFCDA River upstream of the outfall
MZ = mixing zone volume = 0.25 (see pages B-13 to B-14)

For Outfall 001:
He = 74 mg/l $CaCO_3$ (5th percentile of hardness data collected by Hecla from Jan. 1999 - Oct. 2000)
Qe = 0.93 cfs (5th percentile of average daily flow data reported by Hecla on DMRs from Jan. 1996 - Sep. 2000)
Hu = 65 mg/l $CaCO_3$, 65 mg/l $CaCO_3$, 57 mg/l $CaCO_3$, and 25 mg/l $CaCO_3$ for the low through high flow tiers, respectively (5th percentile of hardness data collected by Hecla Jan. 1999 - Sept. 2000 from location AB#1)
Qu = 7.3 cfs (1Q10) and 8.4 cfs (7Q10) for the lowest flow tier, and 13 cfs, 30 cfs, and 176 cfs for each of the next higher flow tiers (see Table B-9)

For Outfall 003:
He = 114 mg/l $CaCO_3$ (5th percentile of hardness data collected by Hecla from Jan. 1999 - Oct. 2000)
Qe = 0.56 cfs (5th percentile of average daily flow data reported by Hecla on DMRs from Jan. 1996 - Sep. 2000)
Hu = 55 mg/l $CaCO_3$, 55 mg/l $CaCO_3$, 46 mg/l $CaCO_3$, and 20 mg/l $CaCO_3$ for the low through high flow tiers, respectively (5th percentile of hardness data collected by Hecla Jan. 1999 - Sept. 2000 from location AB#3)
Qu = 1.4 cfs (1Q10) and 2.1 cfs (7Q10) for the lowest flow tier, and 5.1 cfs, 17 cfs, and 114 cfs for each of the next higher flow tiers (see Table B-9)

3 - Where no mixing zone is applied, the hardness value used is the effluent hardness. Effluent hardness (He) are provided in footnote 2.

4 - Where the hardness is less than 25 mg/l $CaCO_3$, then 25 mg/l $CaCO_3$ is used as the hardness, per the National Toxics Rule (NTR).

2. Reasonable Potential Evaluation

To determine if there is "reasonable potential" to cause or contribute to an exceedence of water quality criteria for a given pollutant (and therefore whether a water quality-based effluent limit is needed), for each pollutant present in a discharge, EPA compares the maximum projected receiving water concentration to the criteria for that pollutant. If the projected receiving water concentration exceeds the criteria, there is "reasonable potential", and a limit must be included in the permit. EPA uses the recommendations in Chapter 3 of the TSD to conduct this "reasonable potential" analysis. This section discusses how reasonable potential is evaluated.

The maximum projected receiving water concentration (C_d) is determined using the following mass balance equation.

$$C_d \times Q_d = (C_e \times Q_e) + (C_u \times Q_u)$$

where, C_d = receiving water concentration downstream of the discharge (at mixing zone edge)
C_e = maximum projected effluent concentration
C_u = receiving water upstream concentration of pollutant
Q_e = effluent flow
Q_u = receiving water upstream flow
Q_d = receiving water flow downstream of the effluent discharge = ($Q_e + Q_u$)

If a mixing zone is allowed and solving for C_d, the mass balance equation becomes :

$$C_d = \frac{(C_e \times Q_e) + [C_u \times (Q_u \times MZ)]}{Q_e + (Q_u \times MZ)} \qquad \text{(Equation 1)}$$

where, MZ = the percent mixing zone based on receiving water flow

Where no mixing zone is allowed, $C_d = C_e$ (Equation 2)

For the metals of concern the aquatic life water quality criteria are expressed as dissolved. Effluent concentrations and NPDES permit limits must be expressed as total recoverable metals. The dissolved metal is the concentration of an analyte that will pass through a 0.45 micron filter. Total metal is the concentration of an analyte in an unfiltered sample. To account for the difference between total effluent concentrations and dissolved criteria, "translators" are used in the reasonable potential (and permit limit derivation) equations. Translators can either be site-specific numbers or default numbers. EPA guidance related to the use of translators in NPDES permits is found in *The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion* (EPA 823-B-96-007, June 1996). In the absence of site-specific translators, this guidance recommends the use of the water quality criteria conversion factors as the default translators. Because site-specific translators were not available, the conversion factors were used as default translators in the reasonable potential and permit calculations for the Lucky Friday discharges. Therefore, for those metals with criteria expressed as dissolved, Equations 1 and 2 become:

where a mixing zone is allowed:

$$C_d = \frac{\text{translator} \times (C_e \times Q_e) + [C_u \times (Q_u \times MZ)]}{Q_e + (Q_u \times MZ)} \qquad \text{(Equation 3)}$$

where no mixing zone is allowed: $C_d = \text{translator} \times C_e$ (Equation 4)

After C_d is determined, it is compared to the applicable water quality criterion. If it is greater than the criterion, a water quality-based effluent limit is developed for that parameter. The following discusses each of the factors used in the mass balance equation to calculate C_d. Many of these same factors are used to also calculate the effluent limits in Section III.B.3.

<u>C_e (maximum projected effluent concentration)</u>: Per the TSD, the maximum projected effluent concentration in the mass balance equation is represented by the 99th percentile of the effluent data. The 99th percentile is calculated using the statistical approach recommended in the TSD, i.e., by multiplying the maximum reported effluent concentration by a reasonable potential multiplier (RPM):

$$C_e = (\text{maximum measured effluent concentration}) \times \text{RPM} \qquad \text{(Equation 5)}$$

The RPM accounts for uncertainty in the effluent data. The RPM depends upon the amount of effluent data and variability of the data as measured by the coefficient of variation (CV) of the data. When there are not enough data to reliably determine a CV, the TSD recommends using 0.6 as the default CV. Once the CV of the data is determined, the RPM is determined using the statistical methodology discussed in Section 3.3 of the TSD.

Maximum reported effluent concentrations, CVs, and RPMs used in the reasonable potential calculations were based on data collected by Hecla (DMR data and other monitoring) and EPA (compliance inspection data) since January 1996. The last five years of data was used since it was determined to be most representative of current and future conditions. See Tables B-6 and B-7 for a summary of the effluent concentrations, CVs, and RPMs used in the reasonable potential analysis.

<u>C_u (upstream concentration of pollutant)</u>: The ambient concentration in the mass balance equation is based on a reasonable worst-case estimate of the pollutant concentration upstream from the discharge point. Where sufficient data exists, the 95^{th} percentile of the ambient data is generally used as an estimate of worst-case. The C_u's are provided in Tables B-6 and B-7.

Table B-6: Summary of Data Used to Determine Reasonable Potential and Develop Effluent Limits for Outfall 001

Parameter[1] ug/l	Effluent Data[2]				Receiving Water Upstream Concentration (C_u)[7]	
	Maximum Effluent Concentration[3] (total)	Coefficient of Variation (CV)[4]	Number of Samples[5]	Reasonable Potential Multiplier (RPM)[6]	total	dissolved
Copper	300	0.6	na	1	na	4.5
Mercury	2	0.6	na	1	0	0
Nickel	6	0.5	10	2.6	na	0.2
Silver	2	0.5	11	2.5	na	0.95

Footnotes:

1 - Reasonable potential (RP) was determined only for parameters with an adequate amount of data of adequate quality for pollutants present in the discharge. For example, RP was not determined for arsenic and selenium since all effluent data was reported at less than the detection limits where the detection limits were less than the most stringent water quality criteria. RP was not determined for cadmium, lead, and zinc, since the effluent limits are based upon the TMDL.

2 - The effluent data is based on sampling of Outfall 001 conducted by Hecla and EPA (compliance inspection data) since Jan. 1996.

3 - For parameters with technology-based effluent limitation guidelines (copper and mercury), the maximum effluent concentration used to determine RP is the technology-based maximum daily limitation (see Table B-1). The technology-based limit is used since water quality-based limits are only required if discharge at the technology-based limits have reasonable potential to exceed water quality standards in the receiving water. For nickel and silver, the maximum effluent concentration used is the maximum detected concentration.

4- The CV is calculated as the standard deviation of the data divided by the mean. Where the majority of the effluent data was reported at less then detection limits, effluent-specific variability cannot be determined, so a default CV of 0.6 was used. This was the case for copper and mercury.

5 - The number of samples is used to develop the RPM. For parameters with technology-based effluent limitation guidelines (copper and mercury) the RPM is 1 therefore the number of samples is not important (na). For nickel and silver, the number of samples collected since Jan. 1996 is reported.

6 - For parameters with technology-based effluent limitation guidelines (copper and mercury), the RPM is 1. For nickel and silver, the RPM is based on the CV and the number of samples.

7 - The receiving water concentrations are based on samples collected by Hecla from Jan. 1999 through Sept. 2000 from monitoring location AB#1, upstream of Outfall 001. The concentrations represent the 95th percentile of the data, where ½ the method detection limit was used for values reported at less than the detection limit. Where all the data was reported at less than method detection limits (i.e., mercury), zero was used as C_u. The receiving water concentrations are only reported for the form in which the criterion is expressed.

Table B-7: Summary of Data Used to Determine Reasonable Potential and Develop Effluent Limits for Outfall 003						
Parameter[1] ug/l	Effluent Data[2]				Receiving Water Upstream Concentration (C_u)[7]	
	Maximum Effluent Concentration[3] (total)	Coefficient of Variation (CV)[4]	Number of Samples[5]	Reasonable Potential Multiplier (RPM)[6]	total	dissolved
Copper	300	0.6	na	1	na	4.5
Mercury	2	0.6	na	1	0	0
Nickel	9	0.3	10	1.8	na	0.2
Silver	2	0.5	11	2.5	na	1

Footnotes:
1 - see footnote 1, Table B-6.
2 - The effluent data is based on sampling of Outfall 003 conducted by Hecla and EPA.
3, 4, 5, and 6 - same as footnotes 3, 4, 5, and 6 of Table B-6.
7 - The receiving water concentrations are based on samples collected by Hecla from Jan. 1999 through Sept. 2000 from monitoring location AB#3, upstream of Outfall 003. The concentrations represent the 95th percentile of the data, where ½ the detection limit was used for values reported at less than the detection limit. Where all the data was reported at less than detection limits (i.e., mercury), zero was used as C_u. The receiving water concentrations are only reported for the form in which the criterion is expressed.

Q_u (upstream flow): The upstream flow used in the mass balance equation depends upon the criterion and flow tier that is being evaluated. The critical low flows used to evaluate compliance with the water quality criteria are:

- The 1-day, 10-year low flow (1Q10) is used for the protection of aquatic life from acute effects. It represents the lowest daily flow that is expected to occur once in 10 years.

- The 7-day, 10-year low flow (7Q10) is used for protection of aquatic life from chronic effects. It represents the lowest 7-day average flow expected to occur once in 10 years.

- The 30-day, 5-year low flow (30Q5) is used for the protection of human health uses from non-carcinogens (e.g., mercury and nickel). It represents the 30-day average flow expected to occur once in 5 years.

Flow in the SFCDA River varies with precipitation and snow melt. Therefore, the reasonable potential analysis was conducted and effluent limits were developed for four separate ranges or tiers of flow. The flow tiers represent the 10th, 50th, and 90th percentile river flows. These flow tier percentiles are consistent with the percentiles used in the TMDL, however the target site where the percentiles is applied is different (downstream for the TMDL parameters and upstream for the non-TMDL parameters). The upstream flow values are used for the non-TMDL parameters since the water quality-based analysis embodied in Equations 1, 3, 6, and 7 are based upon upstream flow.

Long-term flow data for locations upstream of the outfalls is limited. Therefore, statistical flows upstream of the outfalls were obtained by calculating linear regressions between the available flow data and the USGS station at Silverton (for which long term flow data is available). Table B-8 identifies how flows upstream of the outfalls were determined.

Table B-8: Receiving Water Flow Data

Flow Parameter	SFCDA River at Silverton (USGS #12413150)	SFCDA River at Deadman Gulch[1] (USGS #12413040)	Flow Upstream of Outfall 003[2]	Flow Upstream of Outfall 001[3]
period of record	1967 - 1986 and 10/98 - 9/99	10/98 - 9/99	na	na
1Q10, cfs	27	4.9	1.4	7.3
7Q10, cfs	31	5.6	2.1	8.4
30Q5, cfs	42	7.6	4.1	11
10th percentile, cfs	48	8.6	5.1	13
50th percentile, cfs	109	20	17	30
90th percentile, cfs	649	117	114	176

footnotes:
1 - Flow data obtained by multiplying the SFCDA at Silverton flows by 0.18. This is the ratio of (SFCDA at Deadman flow)/(SFCDA at Silverton flow) calculated from regression analysis of 10/98 - 9/99 USGS data (R-squared value of 0.97).
2 - Flow values obtained by subtracting the maximum Outfall 003 flow (3.5 cfs - see the next section) from the SFCDA at Deadman Gulch flows (since the Deadman Gulch station is downstream of Outfall 003).
3 - Flow values obtained by multiplying the SFCDA at Deadman Gulch flows by 1.5. This is the ratio of (flow at SFCDA location 215, which is upstream of Outfall 001) to (flow in SFCDA at Deadman) calculated from synoptic sampling of these stations by McCulley, Frick, and Gillman (MFG) in October of 1991.

Based upon the above table, the flow tiers and corresponding upstream flows (Q_u) for each tier are shown in Table B-9.

Table B-9: Flow Tiers and Upstream Flows

Flow Tier (percentile of upstream flow)	Outfall 001		Outfall 003	
	Flow Tier	Q_u	Flow Tier	Q_u
< 10th	< 13 cfs	7.3 cfs for compliance with acute criteria 8.4 cfs for compliance with chronic criteria 11 cfs for compliance with human health criteria	< 5.1 cfs	1.4 cfs for compliance with acute criteria 2.1 cfs for compliance with chronic criteria 4.1 cfs for compliance with human health criteria
≥ 10th to < 50th	≥ 13 to < 30 cfs	13 cfs	≥ 5.1 to < 17 cfs	5.1 cfs
≥ 50th to < 90th	≥ 30 to < 176 cfs	30 cfs	≥17 to < 114 cfs	17 cfs
≥ 90th	≥ 176 cfs	176 cfs	≥ 114 cfs	114 cfs

Q_e (effluent flow): The effluent flow used in the mass balance equations is the maximum effluent flow. The maximum effluent flows reported by Hecla on DMRs since 1996 are as follows:

- Outfall 001: 2.884 mgd (4.4 cfs)
- Outfall 003: 2.275 mgd (3.5 cfs)

MZ (the percent mixing zone based on receiving water flow): Mixing zones are defined as a limited area or volume of water where the discharge plume is progressively diluted by the receiving water. Water quality criteria may be exceeded in the mixing zone as long as acutely toxic conditions are prevented from occurring and the applicable existing designated uses of the water body are not impaired as a result of the mixing zone. Mixing zones are allowed at the discretion of the State, based on the State water quality standards regulations.

The Idaho water quality standards at IDAPA 58.01.02060 allow for the use of mixing zones. The Idaho water quality standards recommend that the mixing zone should not be more than 25% of the volume of stream flow, therefore, mixing zone volumes of up to 25% were used to determine reasonable potential and develop effluent limits for copper, mercury, and silver.

When first evaluating reasonable potential, no mixing zone was not initially considered. These results indicated that with no mixing zone, there was no reasonable potential for nickel in the discharges to exceed the water quality criteria. Therefore, effluent limits were not developed for nickel. Reasonable potential did exist for copper, mercury, and silver for all the outfalls. Following are the mixing zones used for these parameters:

> Outfall 001: A mixing zone of 25% was assumed for the 10th through 90th percentile flow tiers. The upstream levels of copper and silver exceeded the criteria at the highest flow tier (> 176 cfs), therefore no mixing zone was allowed for copper and silver for this flow tier.
>
> Outfall 003: A mixing zone of 25% was originally assumed for the 10th through 90th percentile flow tiers. The upstream levels of copper and silver exceeded the criteria at the highest flow tier (> 114 cfs), therefore no mixing zone was allowed for copper and silver for this flow tier.

In accordance with state water quality standards, only IDEQ may authorize mixing zones. IDEQ commented on the permit, that mixing zones are appropriate, but did not provide specific mixing zone volumes (see Section VIII.C. of the Fact Sheet). If IDEQ authorizes a different size mixing zone in its final 401 certification, EPA will recalculate the reasonable potential and effluent limits based on the final mixing zones. If the State does not authorize a mixing zone in its 401 certification, EPA will recalculate the limits based on meeting water quality criteria at the point of discharge (i.e., “end-of-pipe” limits).

<u>Reasonable Potential Summary:</u> Results of the reasonable potential analysis is provided in Tables B-10 and B-11. Based on the reasonable potential analysis, water quality-based effluent limits were developed for copper, mercury, and silver for both outfalls. To demonstrate the reasonable potential analysis, an example of the reasonable potential determination for copper in Outfall 001 is provided in Appendix C (see Steps 1 and 2).

Table B-10: Summary of Reasonable Potential Determination for Outfall 001

Parameter	Reasonable Potential Evaluation[1]	Flow Tiers				
		no mixing zone	< 13 cfs	≥ 13 to < 30 cfs	≥30 to <176 cfs	≥176 cfs[2]
Copper	aquatic life acute maximum projected receiving water concentration (C_d), dissolved, ug/l	**290**	**205**	**170**	**110**	**290**
	aquatic life chronic C_d, dissolved, ug/l	**290**	**200**	**170**	**110**	**290**
	Reasonable Potential (Yes or No)	Yes	Yes	Yes	Yes	Yes
Mercury	aquatic life acute C_d, dissolved, ug/l	1.7	1.2	0.98	0.63	0.16
	aquatic life chronic C_d, dissolved, ug/l	**2.0**	**1.4**	**1.2**	**0.74**	**0.18**
	recreational C_d, total, ug/l	**2.0**	**0.57**	**0.51**	**0.26**	0.049
	Reasonable Potential (Yes or No)	Yes	Yes	Yes	Yes	Yes
Nickel	aquatic life acute C_d, dissolved, ug/l	16	na	na	na	na
	aquatic life chronic C_d, dissolved, ug/l	16	na	na	na	na
	recreational C_d, total, ug/l	16	na	na	na	na
	Reasonable Potential (Yes or No)	No[3]	na	na	na	na
Silver	aquatic life acute C_d, dissolved, ug/l	**4.3**	**3.3**	**2.8**	**2.2**	**4.3**
	Reasonable Potential (Yes or No)	Yes	Yes	Yes	Yes	Yes

<u>Footnotes</u>:
1- Reasonable Potential exists if the maximum projected receiving water concentration (C_d) exceeds the applicable criterion (see Tables B-4 and B-5 for the criteria). The C_d's in bold are those that exceed criteria.

2 - The reasonable potential calculations for the >176 cfs flow tier assumed no mixing zone for copper and silver since background concentrations exceed the criteria.

3- Since there was no reasonable potential for nickel without a mixing zone, reasonable potential with a mixing zone does not need to be determined and water quality-based effluent limits are not needed (na).

Table B-11: Summary of Reasonable Potential Determination for Outfall 003						
Parameter	Reasonable Potential Evaluation[1]	Flow Tiers				
		no mixing zone	< 5.1 cfs	≥ 5.1 to < 17 cfs	≥17 to <114 cfs	≥114 cfs[2]
Copper	aquatic life acute maximum projected receiving water concentration (C_d), dissolved, ug/l	**290**	**260**	**210**	**130**	**290**
	aquatic life chronic C_d, dissolved, ug/l	**290**	**250**	**210**	**130**	**290**
	Reasonable Potential (Yes or No)	Yes	Yes	Yes	Yes	Yes
Mercury	aquatic life acute C_d, dissolved, ug/l	1.7	1.6	1.3	0.77	0.19
	aquatic life chronic C_d, dissolved, ug/l	**2.0**	**1.7**	**1.5**	**0.90**	**0.22**
	recreational C_d, total, ug/l	**2.0**	**0.92**	**0.82**	**0.34**	0.060
	Reasonable Potential (Yes or No)	Yes	Yes	Yes	Yes	Yes
Nickel	aquatic life acute C_d, dissolved, ug/l	16	na	na	na	na
	aquatic life chronic C_d, dissolved, ug/l	16	na	na	na	na
	recreational C_d, total, ug/l	16	na	na	na	na
	Reasonable Potential (Yes or No)	No[3]	na	na	na	na
Silver	aquatic life acute C_d, dissolved, ug/l	**4.3**	**4.0**	**3.4**	**2.5**	**4.3**
	Reasonable Potential (Yes or No)	Yes	Yes	Yes	Yes	Yes
Footnotes 1, 2, and 3: The same as footnotes 1, 2, and 3 of Table B-10.						

3. Water Quality-Based Permit Limit Derivation

Once EPA has determined that a water quality-based limit is required for a pollutant, the first step in developing the permit limit is development of a wasteload allocation (WLA) for the pollutant. 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. The WLAs are then converted to long-term average concentrations (LTAs) and compared. The most stringent LTA concentration for each parameter is converted to effluent limits. The procedures for deriving WLAs, LTA concentrations, and effluent limits are based upon guidance in the TSD. This section describes each of these steps.

Calculation of WLAs. Where the state authorizes a mixing zone for the discharge, the WLA is calculated as a mass balance, based on the available dilution, background concentration of the pollutant, and the water quality criterion. WLAs are calculated using the same mass balance equation used in the reasonable potential evaluation (see Equation 1). However, C_d becomes the criterion and C_e the WLA. Making these substitutions, Equation 1 is rearranged to solve for the WLA, becoming:

$$WLA = \frac{\text{criterion} \times [Q_e + (Q_u \times MZ)] - (C_u \times Q_u \times MZ)}{Q_e} \quad \text{(Equation 6)}$$

As discussed previously the aquatic life criteria for some metals is expressed as dissolved. However, the NPDES regulations require that metals limits be based on total recoverable metals (40 CFR 122.45(c)). This is because changes in water chemistry as the effluent and receiving water mix could cause some of the particulate metal in the effluent to dissolve. Therefore, a translator is used in the WLA equation to convert the dissolved criteria to total. The translator is the same translator discussed in the reasonable potential evaluation in the previous section (the criteria conversion factors are used as the default translators). For criteria expressed as dissolved a translator is added to Equation 6 and the WLA is calculated as:

$$WLA = \frac{\text{criterion} \times [Q_e + (Q_u \times MZ)] - (C_u \times Q_u \times MZ)}{Q_e \times \text{translator}} \quad \text{(Equation 7)}$$

Where no mixing zone is allowed, the criterion becomes the WLA (see Equations 8 and 9). Establishing the criterion as the WLA ensures that the permittee does not contribute to an exceedence of the criteria.

no mixing zone: WLA = criterion (Equation 8)

WLA = criterion/translator (for criteria expressed as dissolved) (Equation 9)

Calculation of Long-term Average Concentrations (LTAs): As discussed above, WLAs are calculated for each parameter and each criterion (acute aquatic life, chronic aquatic life, human health). Because the different criteria apply over different time frames and may have different mixing zones, it is not possible to compare the criteria or the WLAs directly to determine which criterion results in the most stringent limits. For example, the acute criteria are applied as a one-hour average and may have a smaller (or no) mixing zone, while the chronic criteria are applied as a four-day average and may have a larger mixing zone.

To allow for comparison, the acute and chronic aquatic life criteria are statistically converted to LTA concentrations. This conversion is dependent upon the 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 a LTA, as recommended in the TSD. The following equation from Chapter 5 of the TSD is used to calculate the LTA concentrations (alternately, Table 5-1 of the TSD may be used):

$$LTA = WLA \times \exp[0.5\sigma^2 - z\sigma] \quad \text{(Equation 10)}$$

where: σ^2 = $\ln(CV^2 + 1)$ for acute aquatic life criteria
= $\ln(CV^2/4 + 1)$ for chronic aquatic life criteria
CV = coefficient of variation
z = 2.326 for 99^{th} percentile probability basis, per the TSD

<u>Calculation of Effluent Limits:</u> The LTA concentration is calculated for each criterion and compared. The most stringent LTA concentration is then used to develop the maximum daily (MDL) and average monthly (AML) permit limits. 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 used 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 (alternately, Table 5-2 of the TSD may be used):

$$\text{MDL or AML} = \text{LTA} \times \exp[z\sigma - 0.5\sigma^2] \qquad \text{(Equation 11)}$$

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

for the AML: $\sigma^2 = \ln(CV^2/n + 1)$
n = number of sampling events required per month
z = 1.645 for 95^{th} percentile probability basis, per the TSD

For setting water quality-based limits for protection of human health uses, the TSD recommends setting the AML equal to the WLA, and then calculating the MDL (i.e., no calculation of LTAs). The human health MDL is calculated based on the ratio of the AML and MDL as expressed by Equation 11. The MDL, therefore, is based on effluent variability and the number of samples per month. AML/MDL ratios are provided in Table 5-3 of the TSD.

The water quality-based effluent limits developed for outfalls 001 and 003 for each parameter that exhibited reasonable potential are shown in Tables B-12 and B-13. These tables also show intermediate calculations (i.e., WLAs, LTAs) used to derive the effluent limits. Appendix C shows an example of the permit limit calculation for copper in Outfall 001 (see Steps 3 and 4).

IV. Summary of Draft Permit Effluent Limitations and WET Triggers

A. Summary of Draft Permit Effluent Limitations

The following summarizes the final proposed effluent limits developed for each outfall. Effluent limits were developed for outfalls 001 and 003. The effluent limits for outfall 002 will be either the effluent limits for outfall 001 (when the outfall 001 waste stream is diverted through outfall 002) or the effluent limits for outfall 003 (when the outfall 003 waste stream is diverted through outfall 002).

TMDL Parameters (cadmium, lead, zinc): As discussed in Section III.A., the average monthly effluent limits for cadmium, lead, and zinc are based on the wasteload allocations in the TMDL (Table B-3). As discussed in Section II., technology-based limits also apply. The water quality-based average monthly limits based on the TMDL are more stringent than the average monthly technology- based limits, therefore, only the TMDL limits were necessary for the average monthly limit. The TMDL did not specify a maximum daily limit for cadmium, lead, and zinc, therefore the maximum daily technology-based effluent limits in Table B-1 apply as the maximum daily effluent limits.

Other Metals (copper, mercury, and silver): The technology-based effluent limits for copper and mercury are shown in Table B-1. The water quality-based limits are shown in Tables B-12 and B-13. Since they are more stringent, the water-quality based effluent limits, were used in the draft permit.

For outfall 001, the copper, mercury, and silver effluent limits were based upon a 25% mixing zone for the three lowest flow tiers. For the high flow tier, a mixing zone was not allowed for copper and silver since upstream concentrations exceeded the criteria, therefore the copper and silver effluent limits are based upon meeting the criteria at the end-of-pipe.

For outfall 003, the mercury effluent limits were based upon a 25% mixing zone. The copper and silver effluent limits were based upon no mixing zone. Although a mixing zone may be allowed for the three lower flow tiers, the calculations in Table B-13 show that the effluent limits based upon a 25% mixing zone are more stringent than those based upon no mixing zone (since the influence of using effluent hardness is greater than the influence of allowing 25% dilution). Therefore the copper and silver effluent limits based upon no mixing zone were used in the draft permit. Since the copper and silver effluent limits are not based on a mixing zone, they are the same for all flow tiers (not dependent upon receiving water flow).

The effluent limits have thus far been expressed in terms of concentration. However, with a few exceptions, the NPDES regulations (40 CFR 122.45(f)) require that water quality-based effluent limits also be expressed in terms of mass. The following equation was used to convert the copper, mercury, and silver concentration-based limits into mass-based limits:

mass limit (lb/day) = concentration limit (ug/l) x effluent flow rate x conversion factor (Equation 12)

where,

conversion factor = 0.005379 (to convert units on the right side of the equation to lb/day)
effluent flow rate = maximum discharge rate in cfs (see Page B-13)

TSS: The State does not have a water quality standard for TSS. Therefore, the TSS limits included in the draft permit are the technology-based limits shown in Table B-1.

pH: The State water quality standard for pH is 6.5 - 9.5 standard units for the protection of aquatic life (see Table B-4). The technology-based effluent limits specify a pH of 6.0 - 9.0 (see Table B-1). The draft permit incorporates the more stringent water quality-based minimum of 6.5 and the technology-based maximum of 9.0 standard units.

B. Whole Effluent Toxicity (WET) Triggers

As discussed in Section VI.B. of the fact sheet, there was not an adequate amount of WET data to determine the need for effluent limits in the draft permit. The draft permit includes WET monitoring and establishes trigger levels for each outfall, that, if exceeded would trigger additional WET testing and, potentially, investigations to reduce toxicity. The trigger levels were calculated based on the WET criteria, receiving water flow, effluent flow, and available dilution. The trigger levels were calculated using the following mass-balance equation (this is basically the same as Equation 6):

$$\text{WET toxicity trigger} = \frac{\text{criterion} \times [Q_e + (Q_u \times MZ)] - (C_u \times Q_u \times MZ)}{Q_e} \qquad \text{(Equation 13)}$$

where,

criterion = 1 TU_c for compliance with the chronic criterion (see Table B-4)
Q_e = effluent flow (see page B-13)
Q_u = upstream flow (see Table B-9)
C_u = upstream concentration = 0 for WET (assuming no upstream toxicity)
MZ = mixing zone = 0.25 for compliance with chronic criteria (see mixing zone discussion)

Solving equation 13 resulted in the chronic trigger values in Table 3 of the draft permit.

Table B-12: Summary of Water Quality-based Effluent Limit Derivation for Outfall 001											
Flow Tier	Parameter[1] ug/l	Mixing Zone % Volume[2]	Aquatic Life Criteria Wasteload Allocations (WLA)		Aquatic Life Criteria Long Term Average (LTA) Concentration		Limits Based on Recreational Criteria		Water Quality-based Effluent Limits		
			acute WLA	chronic WLA	acute LTA	chronic LTA	WLA = AML	MDL	Basis[3]	maximum daily limit (MDL)	average monthly limit (AML)
< 13 cfs	Copper	25	15.7	10.4	5.04	5.48	na	na	acute	16	7.8
	Mercury	25/100	3.4	0.0177	1.09	0.00935	0.525	1.1	chronic	0.029	0.015
	Silver	25	3.28	na	2.49	na	na	na	acute	2.5	1.4
≥ 13 to < 30 cfs	Copper	25	17.6	11.2	5.65	5.90	na	na	acute	18	8.8
	Mercury	25/100	4.17	0.0209	1.34	0.011	0.59	1.2	chronic	0.034	0.017
	Silver	25	2.72	na	1.01	na	na	na	acute	2.7	1.5
≥ 30 to < 176 cfs	Copper	25	20.2	12.2	6.49	6.43	na	na	chronic	20	10
	Mercury	25/100	6.49	0.0325	2.08	0.0171	1.17	2.35	chronic	0.053	0.027
	Silver	25	2.52	na	0.941	na	na	na	acute	2.5	1.4
≥ 176 cfs	Copper	0	13.5	9.16	4.33	4.83	na	na	acute	13	6.7
	Mercury	25/100	26.4	0.132	8.48	0.0696	6.15	12.3	chronic	0.22	0.11
	Silver	0	2.42	na	0.901	na	na	na	acute	2.4	1.3

na = not applicable (no criterion for comparison)

Footnotes:
1- Parameters which exhibited reasonable potential (see Table B-10).
2- Mixing zones for copper and silver are either 25% or no mixing zone is allowed (because concentrations up stream exceed the criteria). Mixing zones for mercury are 25% for compliance with the aquatic life criteria and 100% for compliance with the recreational criteria (see pages B-13 to B-14).
3- Effluent limits based on the most stringent aquatic life criteria (lowest LTA) or recreational use.

Table B-13: Summary of Water Quality-based Effluent Limit Derivation for Outfall 003

Flow Tier	Parameter[1] ug/l	Mixing Zone % Volumn[2]	Aquatic Life Criteria Wasteload Allocations (WLA)		Aquatic Life Criteria Long Term Average (LTA) Concentration		Limits Based on Recreational Criteria		Water Quality-based Effluent Limits		
			acute WLA	chronic WLA	acute LTA	chronic LTA	WLA = AML	MDL	Basis[3]	maximum daily limit (MDL)	average monthly limit (AML)
< 5.1 cfs	Copper	25	17.4	11.1	5.58	5.87	na	na	acute	17	8.7
	Mercury	25/100	2.64	0.0138	0.848	0.00728	0.33	0.65	chronic	0.023	0.011
	Silver	25	3.68	na	1.37	na	na	na	acute	3.7	2.0
≥ 5.1 to < 17 cfs	Copper	25	16.3	10.6	5.22	5.60	na	na	acute	16	8.1
	Mercury	25/100	3.27	0.0164	1.05	0.00863	0.37	0.74	chronic	0.027	0.013
	Silver	25	2.79	na	1.04	na	na	na	acute	2.8	1.5
≥ 17 to < 114 cfs	Copper	25	16.3	9.77	5.22	5.15	na	na	chronic	16	8.0
	Mercury	25/100	5.31	0.0266	1.71	0.014	0.88	1.8	chronic	0.044	0.022
	Silver	25	1.69	na	0.628	na	na	na	acute	1.7	0.91
≥ 114 cfs	Copper	0	20.1	13.2	6.44	6.98	na	na	acute	20	10
	Mercury	25/100	21.9	0.11	7.05	0.0579	5.0	10	chronic	0.18	0.090
	Silver	0	5.08	na	1.89	na	an	na	acute	5.1	2.8

na = not applicable (no criterion for comparison)

Footnotes:
1- Parameters which exhibited reasonable potential (see Table B-11).
2- Mixing zones for copper and silver are either 25% or no mixing zone was allowed (because concentrations upstream exceed the criteria). Mixing zones for mercury are 25% for compliance with the aquatic life criteria and 100% for compliance with the recreational criteria (see pages B-13 to B-14).
3- Effluent limits based on the most stringent aquatic life criteria (lowest LTA) or recreational use.

APPENDIX C -
EXAMPLE WATER QUALITY-BASED EFFLUENT LIMIT CALCULATION

This appendix demonstrates how the water quality-based analysis (reasonable potential determination and development of effluent limits) that was described in Section B. of Appendix B was performed using copper in Outfall 001 as an example.

Step 1: Determine the applicable water quality criteria.

Applicable water quality criteria for copper in Outfall 001 are proved in Tables B-4 and B-5. Based on Table B-5, the applicable copper criteria are:

Flow Tier	Copper Acute Aquatic Life Criteria, dissolved, ug/l	Copper Chronic Aquatic Life Criteria, dissolved, ug/l
< 13 cfs	12	8.2
≥ 13 to < 30 cfs	12	8.1
≥ 30 to < 176 cfs	10	7.2
≥ 176 cfs[1]	13	8.8
footnote 1 - The criteria for no mixing zone are applicable to this flow tier, see discussion of mixing zone, below.		

Step 2: Determine if there is reasonable potential for the discharge to exceed the criteria in the receiving water.

To determine reasonable potential, the maximum projected receiving water concentration (C_d) is compared to the applicable water quality criterion. If C_d exceeds the criterion, then reasonable potential exists and a water quality-based effluent limit is established. Since the copper criteria is expressed as dissolved, C_d is determined with Equations 3 and 4.

Where a mixing zone is allowed (all the flow tiers, except the ≥ 176 cfs tier):

$$C_d = \frac{\text{translator} \times (C_e \times Q_e) + [C_u \times (Q_u \times MZ)]}{Q_e + (Q_u \times MZ)} \qquad \text{(Equation 3)}$$

Where no mixing zone is allowed (for the ≥ 176 cfs tier):

$$C_d = \text{translator} \times C_e \qquad \text{(Equation 4)}$$

The values for the parameters in the above equation are:

translator = the water quality criteria conversion factor is used as the default translator (see page B-8). The conversion factor for copper is 0.960 (see Table B-4).

C_e = maximum projected effluent concentration. This is determined via Equation 5:

C_e = (max. measured effluent concentration) x RPM (Equation 5)
C_e = (300 ug/l) x 1 = 300 ug/l

Since copper has a technology-based effluent limitation, the maximum technology-based effluent limitation (300 ug/l) is used as the maximum effluent concentration and the RPM is 1 (see Table B-6 and footnotes 3 and 6 of that table).

C_u = upstream receiving water concentration = 4.5 ug/l, dissolved (see Table B-6).

Q_u = upstream receiving water flow (see Table B-9)

for the < 13 cfs tier	= 7.3 cfs for comparison to acute aquatic life criterion
	= 8.4 cfs for comparison to chronic aquatic life criterion
for the 13 - 30 cfs tier	= 13 cfs for all criteria
for the 30 - 176 cfs tier	= 30 cfs for all criteria
for the > 176 cfs tier	= 176 cfs for all criteria

Q_e = effluent flow (see page B-13) = 4.4 cfs

MZ = mixing zone (see page B-13) = 0.25 for the < 13 cfs, 13-30 cfs, and 30-176 cfs tiers
= 0 for the > 176 cfs tier

Now plug the above values into Equations 3 and 4 and solve:

<u>For the < 13 cfs flow tier:</u>

Determine the reasonable potential to exceed acute aquatic life criterion (use Equation 3):

$$C_d = \frac{(0.960)(300)(4.4) + (4.5)(7.3)(0.25)}{4.4 + (7.3)(0.25)} = 205 \text{ ug/l}$$

Since the maximum projected receiving water concentration (C_d = 205 ug/l) exceeds the acute aquatic life criterion (12 ug/l), there is reasonable potential for the effluent to cause an exceedence to the water quality standard, and a water quality-based effluent limit is required (see Table B-10).

Determination of reasonable potential to exceed chronic aquatic life criterion (solve Equation 3):

$$C_d = \frac{(0.960)(300)(4.4) + (4.5)(8.4)(0.25)}{4.4 + (8.4)(0.25)} = 200 \text{ ug/l}$$

Since C_d exceeds the chronic aquatic life criterion (8.2 ug/l), there is reasonable potential for the effluent to cause an exceedence to the water quality standard, and a water quality-based effluent limit is required (see Table B-10).

For the ≥13 to < 30 cfs tier:

Determine the reasonable potential to exceed acute and chronic aquatic life criterion (solve Equation 3):

$$C_d = \frac{(0.960)(300)(4.4) + (4.5)(13)(0.25)}{4.4 + (13)(0.25)} = 170 \text{ ug/l}$$

Since the C_d exceeds the acute and chronic aquatic life criterion (12 ug/l and 8.1 ug/l), there is reasonable potential for the effluent to cause an exceedence to the water quality standard, and a water quality-based effluent limit is required (see Table B-10).

Note: Equation 3 is the same for both the acute and chronic criteria for all the flow tiers > 13 cfs. This is the case since all equation parameters are the same for both the acute and chronic criteria.

For the ≥30 to < 176 cfs tier:

Determine the reasonable potential to exceed acute and chronic aquatic life criterion (solve Equation 3):

$$C_d = \frac{(0.960)(300)(4.4) + (4.5)(30)(0.25)}{4.4 + (30)(0.25)} = 110 \text{ ug/l}$$

Since the C_d exceeds the acute and chronic aquatic life criterion (10 ug/l and 7.2 ug/l), there is reasonable potential for the effluent to cause an exceedence to the water quality standard, and a water quality-based effluent limit is required (see Table B-10).

For the ≥176 cfs tier:

Determine the reasonable potential to exceed acute and chronic aquatic life criterion (since no mixing zone is allowed for copper for this flow tier, Equation 4 applies):

$$C_d = 0.960 \times 300 = 290 \text{ ug/l}$$

Since the C_d exceeds the acute and chronic aquatic life criterion (13 ug/l and 8.8 ug/l), there is reasonable potential for the effluent to cause an exceedence to the water quality standard, and a water quality-based effluent limit is required (see Table B-10).

Step 3: Since there is reasonable potential, determine the wasteload allocation (WLA).

Since the applicable criteria are expressed as dissolved, the WLAs for copper in Outfall 001 are calculated using Equations 7 and 9:

Where a mixing zone is allowed (all the flow tiers, except the $\geq$ 176 cfs tier):

$$WLA = \frac{\text{criterion} \times [Q_e + (Q_u \times MZ)] - (C_u \times Q_u \times MZ)}{Q_e \times \text{translator}} \qquad \text{(Equation 7)}$$

Where no mixing zone is allowed ($\geq$ 176 cfs tier):

$$WLA = \text{criterion/translator} \qquad \text{(Equation 9)}$$

The variables in the WLA equation have already been defined in Steps 1 and 2. Plugging these into Equations 7 and 9 and solving:

For the < 13 cfs flow tier:

Determination of the WLA for protection of acute aquatic life (solve Equation 7):

$$WLA_{acute} = \frac{(12)[4.4 + (7.3)(0.25)] - (4.5)(7.3)(0.25)}{(4.4)(0.960)} = 15.7 \text{ ug/l}$$

Determination of the WLA for protection of chronic aquatic life:

$$WLA_{chronic} = \frac{(8.2)[4.4 + (8.4)(0.25)] - (4.5)(8.4)(0.25)}{(4.4)(0.960)} = 10.4 \text{ ug/l}$$

These WLAs are shown in Table B-12.

For the $\geq$ 13 to < 30 cfs flow tier:

Determination of the WLA for protection of acute aquatic life (solve Equation 7):

$$WLA_{acute} = \frac{(12)[4.4 + (13)(0.25)] - (4.5)(13)(0.25)}{(4.4)(0.960)} = 17.6 \text{ ug/l}$$

Determination of the WLA for protection of chronic aquatic life:

$$WLA_{chronic} = \frac{(8.1)[4.4 + (13)(0.25)] - (4.5)(13)(0.25)}{(4.4)(0.960)} = 11.2 \text{ ug/l}$$

These WLAs are shown in Table B-12.

For the ≥ 30 to < 176 cfs flow tier:
Determination of the WLA for protection of acute aquatic life (solve Equation 7):

$$WLA_{acute} = \frac{(10)[4.4 + (30)(0.25)] - (4.5)(30)(0.25)}{(4.4)(0.960)} = 20.2 \text{ ug/l}$$

Determination of the WLA for protection of chronic aquatic life:

$$WLA_{chronic} = \frac{(7.2)[4.4 + (30)(0.25)] - (4.5)(30)(0.25)}{(4.4)(0.960)} = 12.2 \text{ ug/l}$$

These WLAs are shown in Table B-12.

For the ≥ 176 cfs flow tier:
Determine the WLA for protection of acute aquatic life (since no mixing zone is allowed for copper for this flow tier, Equation 9 applies):

$$WLA_{acute} = 13/0.960 = 13.5 \text{ ug/l}$$

Determination of the WLA for protection of chronic aquatic life (solve Equation 9):

$$WLA_{chronic} = 8.8/0.960 = 9.16 \text{ ug/l}$$

These WLAs are shown in Table B-12.

Step 4a: Develop Long-term Average (LTA) Concentrations based on the WLAs.

Effluent limits are developed by converting the aquatic life WLAs to LTA concentrations. The most stringent of the acute or chronic LTA concentration is then used to develop the effluent limits. The aquatic life WLAs are converted to LTA concentrations using Equation 10:

$$LTA = WLA \times \exp[0.5\sigma^2 - z\sigma] \qquad \text{(Equation 10)}$$

where,

$z = 2.326$ for 99th percentile probability basis (per the TSD)
$CV = 0.6$ (see Table B-6)
for acute criteria, $\sigma^2 = \ln(CV^2 + 1) = \ln(0.6^2 + 1) = 0.3075$
for chronic criteria, $\sigma^2 = \ln(CV^2/4 + 1) = \ln(0.6^2/4 + 1) = 0.0862$

Plugging the above values and the WLAs from step 3 into Equation 10 and solving:

For the < 13 cfs flow tier:

$$LTA_{acute} = (15.7) \times \exp[0.5(0.3075) - (2.326)(0.5545)] = 5.04 \text{ ug/l}$$

$LTA_{chronic}$ = (10.4) x exp [0.5(0.0862) - (2.326)(0.2936)] = 5.48 ug/l

These LTA concentrations are also shown in Table B-12. Since the LTA concentration based on the acute criterion is more stringent than the LTA based on the chronic criterion, the acute LTA is used to derive the aquatic life effluent limits for copper (see Step 4b, below).

For the ≥ 13 to < 30 flow tier:

LTA_{acute} = (17.6) x exp [0.5(0.3075) - (2.326)(0.5545)] = 5.65 ug/l

$LTA_{chronic}$ = (11.2) x exp [0.5(0.0862) - (2.326)(0.2936)] = 5.90 ug/l

These LTA concentrations are also shown in Table B-12. Since the LTA concentration based on the acute criterion is more stringent than the LTA based on the chronic criterion, the acute LTA is used to derive the aquatic life effluent limits for copper (see Step 4b, below).

For the ≥ 30 to < 176 flow tier:

LTA_{acute} = (20.2) x exp [0.5(0.3075) - (2.326)(0.5545)] = 6.49 ug/l

$LTA_{chronic}$ = (12.2) x exp [0.5(0.0862) - (2.326)(0.2936)] = 6.43 ug/l

These LTA concentrations are also shown in Table B-12. Since the LTA concentration based on the chronic criterion is more stringent than the LTA based on the acute criterion, the chronic LTA is used to derive the aquatic life effluent limits for copper (see Step 4b, below).

For the ≥ 176 flow tier:

LTA_{acute} = (13.5) x exp [0.5(0.3075) - (2.326)(0.5545)] = 4.33 ug/l

$LTA_{chronic}$ = (9.16) x exp [0.5(0.0862) - (2.326)(0.2936)] = 4.83 ug/l

These LTA concentrations are also shown in Table B-12. Since the LTA concentration based on the acute criterion is more stringent than the LTA based on the chronic criterion, the acute LTA is used to derive the aquatic life effluent limits for copper (see Step 4b, below).

Step 4b: Develop Effluent Limits Based on the LTA.

The most stringent LTA concentration for each flow condition is converted to a maximum daily limit (MDL) and an average monthly limit (AML) via Equation 11:

MDL, AML = LTA x $\exp[z\sigma - 0.5\sigma^2]$ (Equation 11) where,

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

$\sigma^2 = \ln(CV^2 + 1) = \ln(0.6^2 + 1) = 0.3075$

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

$\sigma^2 = \ln(CV^2/n + 1) = \ln(0.6^2/4 + 1) = 0.08618$

since, n = number of samples per month = 4

(weekly monitoring for copper in Outfall 001)

Substituting the above values and the lowest LTA concentrations from Step 4a into Equation 11 and solving:

<u>For the < 13 cfs flow tier:</u>

MDL = (5.04) exp [(2.326)(0.5545) - 0.5 (0.3075)] = 16 ug/l

AML = (5.04) exp [(1.645)(0.2936) - 0.5 (0.08618)] = 7.8 ug/l

<u>For the ≥ 13 to < 30 flow tier:</u>

MDL = (5.65) exp [(2.326)(0.5545) - 0.5 (0.3075)] = 18 ug/l

AML = (5.65) exp [(1.645)(0.2936) - 0.5 (0.08618)] = 4.7 ug/l

<u>For the ≥ 30 to < 176 flow tier:</u>

MDL = (6.43) exp [(2.326)(0.5545) - 0.5 (0.3075)] = 20 ug/l

AML = (6.43) exp [(1.645)(0.2936) - 0.5 (0.08618)] = 10 ug/l

<u>For the ≥ 176 flow tier:</u>

MDL = (4.33) exp [(2.326)(0.5545) - 0.5 (0.3075)] = 13 ug/l

AML = (4.33) exp [(1.645)(0.2936) - 0.5 (0.08618)] = 6.7 ug/l

These are the copper effluent limits for Outfall 001 in the draft permit (see also Table B-12).

APPENDIX D - REFERENCES

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