Fact Sheet

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Technical Contact: Brian Nickel
206-553-6251
800-424-4372, ext. 6251 (within Alaska, Idaho, Oregon and Washington)
Nickel.Brian@epa.gov

Proposed Revocation and Reissuance of a National Pollutant Discharge Elimination System (NPDES) Permit to Discharge Pollutants Pursuant to the Provisions of the Clean Water Act (CWA)

City and Borough of Juneau
Mendenhall Wastewater Treatment Plant

EPA Proposes To Revoke and Reissue NPDES Permit

EPA proposes to revoke and reissue the NPDES permit for the facility referenced above. The draft permit places conditions on the discharge of pollutants from the wastewater treatment plant to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility.

This Fact Sheet includes:

- information on public comment, public hearing, and appeal procedures
- a listing of proposed effluent limitations and other conditions for the facility
- a map and description of the discharge location
- technical material supporting the conditions in the permit

401 Certification

EPA is requesting that Alaska Department of Environmental Conservation (ADEC) certify the NPDES permit for this facility, under Section 401 of the Clean Water Act. Comments regarding the certification should be directed to:

Alaska Department of Environmental Conservation
410 Willoughby Ave. #303
Juneau, AK 99801

Public Comment
Persons wishing to comment on, or request a Public Hearing for the draft permit for this facility may do so in writing by the expiration date of the Public Comment period. A request for a Public Hearing must state the nature of the issues to be raised as well as the requester's name, address and telephone number. All comments and requests for Public Hearings must be in writing and should be submitted to EPA as described in the Public Comments Section of the attached Public Notice.

After the Public Notice expires, and all comments have been considered, EPA's regional Director for the Office of Water and Watersheds will make a final decision regarding permit issuance. If no substantive 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 comments and issue the permit. The permit will become effective 30 days after the issuance date, unless an appeal is submitted to the Environmental Appeals Board within 30 days.

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 at the address below. The draft permits, fact sheet, and other information can also be found by visiting the Region 10 NPDES website at "http://epa.gov/r10earth/waterpermits.htm."

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue, OW-130
Seattle, Washington 98101
(206) 553-6251 or
Toll Free 1-800-424-4372 (within Alaska, Idaho, Oregon and Washington)

The fact sheet and draft permits are also available at:

Alaska Department of Environmental Conservation
Division of Water
410 Willoughby Avenue #303
Juneau, Alaska, 99801-1795

Acronyms

1Q10	1 day, 10 year low flow
7Q10	7 day, 10 year low flow
30B3	Biologically-based design flow intended to ensure an excursion frequency of less than once every three years, for a 30-day average flow.
ADEC	Alaska Department of Environmental Conservation
AML	Average Monthly Limit
AWL	Average Weekly Limit
BOD_5	Biochemical oxygen demand, five-day
°C	Degrees Celsius
CBJ	City and Borough of Juneau, Alaska
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CV	Coefficient of Variation
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
HUC	Hydrologic Unit Code
lbs/day	Pounds per day
LTA	Long Term Average
mg/L	Milligrams per liter
ml	milliliters
ML	Minimum Level
μg/L	Micrograms per liter
mgd	Million gallons per day
MDL	Maximum Daily Limit or Method Detection Limit
N	Nitrogen
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System

OWW	Office of Water and Watersheds
O&M	Operations and maintenance
POTW	Publicly owned treatment works
QAP	Quality assurance plan
RP	Reasonable Potential
RPM	Reasonable Potential Multiplier
RWC	Receiving Water Concentration
s.u.	Standard Units
TMDL	Total Maximum Daily Load
TSD	Technical Support Document for Water Quality-based Toxics Control (EPA/505/2-90-001)
TSS	Total suspended solids
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UV	Ultraviolet
WLA	Wasteload allocation
WQBEL	Water quality-based effluent limit
WWTP	Wastewater treatment plant

I. Applicant

A. General Information

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

City and Borough of Juneau
Mendenhall Wastewater Treatment Plant
NPDES Permit # AK-002295-1

Physical Address:
2009 Radcliffe Road
Juneau, AK 99801

Mailing Address:
155 South Seward Street
Juneau, AK 99801

Contact:
Scott Jeffers, Superintendent

B. Cause for Revocation and Reissuance

On January 21, 2004, the City and Borough of Juneau (CBJ) requested a modification of their current NPDES permit (effective through March 6, 2006) pursuant to 40 CFR 122.62, which allows NPDES permits to be modified for cause. In this case, the causes for modification are:

- Material and substantial alterations to the permitted facility or activity (40 CFR 122.62(a)(1)), specifically the use of UV rather than chlorine for disinfection,
- new information that was not available at the time of the current permit's issuance and that would have justified the application of different permit conditions at the time of permit issuance if it had been available (40 CFR 122.62(a)(2)), specifically additional data on effluent and receiving water quality and flow rates, and
- a draft modified State certification (40 CFR 122.62(a)(3)(i)(A)(iii) and 40 CFR 124.55(b)).

Where cause exists to modify a permit, the permit may also be revoked and reissued, if the permittee requests or agrees to a revocation and reissuance, as opposed to a modification. In an e-mail message to EPA dated March 30, 2005, CBJ agreed that a revocation and reissuance would be preferable to a modification in this case. The federal regulation at 40 CFR 124.5(c) requires that, if a permit is to be revoked and reissued, the permittee must submit a new application. EPA received a new application from CBJ on July 7, 2005.

II. Facility Information

CBJ owns, operates, and maintains the Mendenhall wastewater treatment plant (WWTP) located in Juneau, Alaska. The sequential batch reactor (SBR) secondary treatment plant discharges treated municipal wastewater to the Mendenhall River. CBJ incinerates the sludge off site. The collection system has no combined sewers. The facility serves a resident population of 20,000, but the City and Borough of Juneau is a tourist area, therefore, the actual population is higher during the summer months. The design flow of the facility is 4.9 mgd. Details about the wastewater treatment process and a map showing the location of the treatment facility and discharge are included in Appendices A and B, respectively.

III. Receiving Water

This facility discharges to the Mendenhall River in the City and Borough of Juneau, Alaska. The outfall is located downstream of the Brotherhood Bridge.

A. Low Flow Conditions

The *Technical Support Document for Water Quality-Based Toxics Control* (hereafter referred to as the TSD) (EPA, 1991) and the Alaska Water Quality Standards (WQS) recommend the flow conditions for use in calculating water quality-based effluent limits (WQBELs) using steady-state modeling. The TSD and the Alaska WQS state that WQBELs intended to protect aquatic life uses should be based on the lowest seven-day average flow rate expected to occur once every ten years (7Q10) for chronic criteria and the lowest one-day average flow rate expected to occur once every ten years (1Q10) for acute criteria. However, because the chronic criterion for ammonia is a 30-day average concentration not to be exceeded more than once every three years, EPA has used the 30B3 for the chronic ammonia criterion instead of the 7Q10. The 30B3 is a biologically-based design flow intended to ensure an excursion frequency of once every three years for a 30-day average flow rate. Because there are significant seasonal variations in the flow rate of the Mendenhall River, EPA has elected to calculate the 1Q10, 7Q10 and 30B3 on a seasonal basis.

The USGS gauging station on the Mendenhall River with the most extensive flow data (#15052500) is located upstream of Montana Creek's confluence with the river, but the treatment plant outfall is located downstream from the confluence. Montana Creek is a major tributary to the Mendenhall River. Therefore, the river flow at station #15052500 is not representative of the flow at the treatment plant outfall. To address this problem, the City and Borough of Juneau was required to monitor the river flow rate immediately upstream from the treatment plant outfall as a condition of its current permit. EPA used the Maintenance of Variance Extension, Type 1 (MOVE.1) method described by Hirsch (1982) to correlate the limited river flow data at the treatment plant outfall to the more extensive data available from the USGS gauge. The period of record for the long term station was 1966-2003. The resulting seasonal low flows are as follows:

Table 1: Seasonal Low Flows in the Mendenhall River at the Point of Discharge

Season	1Q10 (CFS)	7Q10 (CFS)	30B3 (CFS)
November through May	31	33	42
June	209	249	549
July through September	781	1213	2021
October	352	593	1140

B. Water Quality Standards

Section 301(b)(1)(C) of the CWA requires the development of limitations in permits necessary to meet water quality standards by July 1, 1977. Federal regulations at 40 CFR 122.4(d) require that the conditions in NPDES permits ensure compliance with the water quality standards of all affected States. A State's water quality standards are composed of use classifications, numeric and/or narrative water quality criteria, and an anti-degradation policy. The use classification system designates the beneficial uses (such as drinking water supply, contact recreation, and aquatic life) that each water body is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the State to support the beneficial use classification of each water body. The anti-degradation policy represents a three-tiered approach to maintain and protect various levels of water quality and uses. No use designations are listed for the Mendenhall River in 18 AAC 70.230(e). The Alaska Water Quality Standards state, in 18 AAC 70.050, that, unless specifically designated for other uses in 18 AAC 70.230(e), all fresh waters of the State of Alaska are to be protected for the following uses:

- Water supply for:
  - Drinking, culinary and food processing
  - Agriculture, including stock watering
  - Aquaculture
  - Industrial
- Contact recreation
- Growth and propagation of fish, shellfish, other aquatic life, and wildlife

IV. Effluent Limitations

A. Basis for Effluent Limitations

In general, the CWA requires that the effluent limits for a particular pollutant be the more stringent of either technology-based limits or water quality-based limits. Technology-based limits are set according to the level of treatment that is achievable using available technology. A water quality-based effluent limit is designed to ensure that the water quality standards applicable to a waterbody are being met and may be more stringent than technology-based effluent limits. The basis for the effluent limits proposed in the draft permit is provided in Appendix C.

B. Proposed Effluent Limitations

Below are the proposed effluent limits that are in the draft permit. Please note that any tiered effluent limitations that are contingent upon the effluent dilution ratio (i.e. fecal coliform limits in effect from November through May) are determined by the minimum effluent dilution ratio for a calendar month. Only one effluent limit tier can be effective during a given calendar month.

1. The permittee must not discharge any floating solids, debris, sludge, deposits, foam, scum or other residues that cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.

2. The permittee must not discharge any petroleum hydrocarbons or oils and grease that cause a sheen, film or discoloration on the surface of the water or adjoining shorelines.
3. Removal Requirements for BOD_5 and TSS: The monthly average effluent concentration must not exceed 15 percent of the monthly average influent concentration. Percent removal of BOD_5 and TSS must be reported on the Discharge Monitoring Reports (DMRs). For each parameter, the monthly average percent removal must be calculated from the arithmetic mean of the influent values and the arithmetic mean of the effluent values for that month. Influent and effluent samples must be taken over approximately the same time period.

Table 2 (below) presents the proposed average monthly, average weekly, and maximum daily effluent limits.

Table 2: Proposed Effluent Limits

Parameter	**Units**	**Effluent Limits**		
		Average Monthly Limit	**Average Weekly Limit**	**Maximum Daily Limit**
Flow	mgd	—	—	4.9
Five-Day Biochemical Oxygen Demand (BOD_5)	mg/L	30	45	60
	lb/day	1226	1839	2452
	% removal	85% (min)	—	—
Total Suspended Solids (TSS)	mg/L	30	45	60
	lb/day	1226	1839	2452
	% removal	85% (min)	—	—
Fecal Coliform Bacteria November 1 – May 31 when the minimum effluent dilution ratio for the calendar month is <15:1, regardless of method of disinfection.	#/100 ml	170[2]	—	See Footnote #3
Fecal Coliform Bacteria November 1 – May 31 when the inimum effluent dilution ratio for the calendar month is ≥15:1 and <30:1, regardless of the method of disinfection.	#/100 ml	200[2]	400[2]	800
Fecal Coliform Bacteria November 1 – May 31 when the minimum effluent dilution ratio for the calendar month is ≥30:1 and at all times during June 1 – October 31 **when chlorine is used** for total or partial disinfection.	#/100 ml	200[2]	400[2]	800
Fecal Coliform Bacteria November 1 – May 31 when the minimum effluent dilution ratio for the calendar month is ≥30:1 and at all times during June 1 – October 31 **when chlorine is not used** for total or partial disinfection.	#/100 ml	400[2]	800[2]	1200
pH (November 1 – May 31)	s.u.	6.5 – 9.0		
pH (June 1 – June 30)	s.u.	6.4 – 9.0		
pH (July 1 – October 30)	s.u.	6.3 – 9.0		

Table 2: Proposed Effluent Limits				
Parameter	**Units**	**Effluent Limits**		
		Average Monthly Limit	**Average Weekly Limit**	**Maximum Daily Limit**
Copper (November 1 – May 31)	µg/L	34.8	—	74.9
	lb/day	1.42	—	3.06
Copper (June 1 – June 30)	µg/L	37.4	—	80.5
	lb/day	1.53	—	3.29
Copper (July 1 – September 30)	µg/L	62.0	—	133
	lb/day	2.53	—	5.45
Lead (November 1 – May 31)	µg/L	11.4	—	29.9
	lb/day	0.47	—	1.22
Total Residual Chlorine[1,4] (November 1 – May 31)	µg/L	33.2	—	97.0
	lb/day	1.36	—	3.95
Total Residual Chlorine[1] (June 1 – June 30)	µg/L	186	—	543
	lb/day	7.61	—	22.2
Total Residual Chlorine[1] (July 1 – October 31)	µg/L	500	750	—
	lb/day	20.4	30.6	—
Total Ammonia as N November 1 – May 30	mg/L	21.6	—	36.4
	lb/day	882	—	1487

1. Effluent limits for total residual chlorine apply only if the permittee adds chlorine to the effluent for total or partial disinfection.
2. The permittee must report the geometric mean fecal coliform concentration. If any value used to calculate the geometric mean is less than 1, the permittee must round that value up to 1 for purposes of calculating the geometric mean.
3. No more than 10% of the fecal coliform samples analyzed during a calendar month may exceed 314 FC/100 ml.
4. These effluent limits are not quantifiable using EPA-approved analytical methods EPA will use the minimum level (ML) of 100 µg/L as the compliance evaluation level for this parameter. The permittee will be considered compliant with the total residual chlorine limitations if the average monthly and maximum daily chlorine concentrations are less than 100 µg/L and the average monthly and maximum daily mass discharges of chlorine are less than 4.09 lb/day.

C. Basis for Less-Stringent Effluent Limits

The draft permit eliminates the current permit's effluent limits for silver and zinc, and eliminates the effluent limits for copper, lead and ammonia for part of the year. The draft permit contains less stringent effluent limits for copper, lead, pH, fecal coliform, and total residual chlorine, compared to the current permit. Effluent limitations for all other pollutants are as stringent as or more stringent than those in the current permit.

Statutory Prohibitions on Backsliding

Section 402(o) of the Clean Water Act (CWA) prohibits "backsliding" in NPDES permits but provides limited exceptions to this prohibition. Section 402(o)(1) of the CWA states that a permit may not be reissued with less-stringent limits established based on Sections 301(b)(1)(C), 303(d) or 303(e) (i.e. water quality-based limits or limits established in accordance with State treatment standards) except in compliance with Section 303(d)(4). Section 402(o)(1) also prohibits backsliding on technology-based effluent limits established using best professional judgment (i.e. based on Section 402(a)(1)(B) of the

CWA), but in this case, the effluent limits being revised are all water quality-based effluent limits (WQBELs).

Section 303(d)(4) of the CWA states that, for water bodies where the water quality meets or exceeds the level necessary to support the water body's designated uses, WQBELs may be revised as long as the revision is consistent with the State's antidegradation policy. Additionally, Section 402(o)(2) contains exceptions to the general prohibition on backsliding in 402(o)(1). According to the *U.S. EPA NPDES Permit Writers' Manual* (EPA-833-B-96-003) the 402(o)(2) exceptions are applicable to WQBELs (except for 402(o)(2)(B)(ii) and 402(o)(2)(D)) and are independent of the requirements of 303(d)(4). Therefore, WQBELs may be relaxed as long as either the 402(o)(2) exceptions or the requirements of 303(d)(4) are satisfied. At a minimum, the 402(o) exceptions are met for all backsliding proposed in the draft permit.

Even if the requirements of Sections 303(d)(4) or 402(o)(2) are satisfied, Section 402(o)(3) prohibits backsliding which would result in violations of water quality standards or effluent limit guidelines.

Basis for Backsliding on Metals (Copper, Lead, Silver, Zinc)

Effluent limitations for metals in the current permit were calculated based on an effluent dilution factor of 10:1 and a receiving water hardness of 29 mg/L as $CaCO_3$. The permittee was required under the previous permit to monitor the receiving water for flow rate and hardness. The data show that the dilution factor of 10:1 is overly stringent (too low) for part of the year, however EPA found that the dilution factor could be less than (more stringent than) 10:1 under critical conditions from November through May.

However, the receiving water hardness monitoring shows that there is an inverse relationship between river flow and hardness in the Mendenhall River. That is, the receiving water is relatively “hard” when the river flows are low and relatively “soft” when the river flows are high. Because the metals of concern are less toxic in hard water than in soft water, the water quality criteria for these metals are less stringent when the water is hard. The fact that the receiving water is hard when the river flows are low therefore offsets the effect of the low dilution ratio from November through May, with respect to toxic effects of metals.

The additional river flow and hardness data are considered “new information” under Section 402(o)(2)(B)(i) of the CWA (anti-backsliding) and 40 CFR 122.62(a)(2) (cause for modification). Taking into account the seasonal variations in the flow rate and hardness in the Mendenhall River, and using effluent data collected under the previous permit, EPA determined that the Mendenhall WWTP discharge did not have the reasonable potential to cause or contribute to water quality standards violations for silver or zinc, nor did it have reasonable potential to cause or contribute to such violations for copper or lead for part of the year. The permittee is required to continue monitoring the effluent and receiving water for hardness, flow rate, and metals. Upon the next reissuance of the permit, EPA will use these data to re-evaluate the effluent limits in this permit and reasonable potential to exceed water quality criteria. See Appendices C, D, and F for further discussion on the determination of reasonable potential for and derivation of effluent metals limits.

For those times of the year when copper and lead effluent limits are necessary, EPA re-calculated the effluent limits using seasonal low-flow rates in the receiving water and the ambient hardness values expected to occur during those seasons. The resulting copper and lead effluent limits are less stringent than those in the previous permit.

Basis for Backsliding on Ammonia

The ammonia limits in effect from November through May are more stringent than those in the current permit and are therefore not subject to the anti-backsliding provisions of the Act. However, based on the new information regarding the river flow rates at the point of discharge, EPA has determined that the discharge does not have the reasonable potential to cause or contribute to a water quality standards violation for ammonia from June through October, therefore no ammonia effluent limits are in effect for this season. The elimination of the ammonia limits during this season is compliant with Section 402(o)(2)(B)(i) of the CWA and 40 CFR 122.62(a)(2). See Appendices C, D and F for further discussion on the determination of reasonable potential for and derivation of effluent ammonia limits.

Basis for Backsliding on pH

The previous permit had pH limits equal to Alaska's water quality criteria for pH (a range of 6.5 to 8.5 standard units). In other words, the effluent pH limits were not calculated using a mixing zone. Under the current permit, the permittee was required to monitor the effluent and receiving water for alkalinity (a measure of the water's "buffering capacity" or its resistance to pH changes) and pH.

The additional pH and alkalinity data are considered "new information" under Section 402(o)(2)(B)(i) of the CWA and 40 CFR 122.62(a). EPA was able to use this information to calculate the pH of the receiving water when mixed with the effluent. EPA believes that a mixing zone for pH is appropriate and has calculated seasonal limits that are protective of the pH criteria outside of the mixing zone. If ADEC does not certify a mixing zone for pH, EPA will retain the "criteria end-of-pipe" pH effluent limits from the previous permit. See appendix E for further discussion on the derivation of effluent pH limits.

Basis for Backsliding on Fecal Coliform

ADEC has indicated that its treatment requirements for facilities employing UV disinfection are a monthly average of 400 organisms/100 ml, a weekly average of 800 organisms/100 ml and a daily maximum of 1200 organisms/100 ml. These limits are less stringent than those used in the previous permit. The treatment plant used chlorine for disinfection at the time of that permit's issuance. The change from chlorine to UV disinfection represents a "material and substantial alteration" to the permitted facility under Section 402(o)(2)(A) of the CWA (anti-backsliding) and 122.62(a)(1) (cause for modification).

Taking into account the new information on river flows at the point of discharge (pursuant to Section 402(o)(2)(B)(i) of the CWA and 40 CFR and 122.62(a)(2)) EPA has determined that these limits will be protective of the applicable water quality criteria for fecal coliform bacteria at all times from June through October.

From November through May, EPA has determined that more stringent effluent limits are necessary during low river flows. For this season, the draft permit includes fecal coliform limits that are contingent upon the effluent dilution ratio. The "400/800/1200" limits apply whenever chlorine is not used for total or partial disinfection of the effluent at all times during June through October, and if the minimum effluent dilution ratio observed during a calendar month from November though May is greater than or equal to 30:1.

ADEC indicated in its draft certification that, if chlorine is used to disinfect the effluent, the fecal coliform effluent limits shall be a monthly average of 200 organisms/100 ml, a weekly average of 400 organisms/100 ml and a daily maximum of 800 organisms/100 ml. These effluent limits apply whenever chlorine is used for disinfection of the effluent and from November through May whenever the effluent dilution ratio is greater than or equal to 15:1 but less than 30:1.

If the minimum effluent dilution ratio observed during a calendar month from November through May is less than 15:1, the average monthly limit is a monthly geometric mean of 170 organisms/100 ml, and no more than 10% of the samples may exceed 314 organisms per 100 ml, regardless of the method of disinfection. These effluent limits are more stringent than those in the current permit, so the anti-backsliding provisions of the CWA do not apply to these limits.

As stated above, the fecal coliform effluent limitations that are contingent upon the effluent dilution ratio are determined by the minimum effluent dilution ratio for a calendar month. Only one effluent limit tier can be effective during a given calendar month.

Basis for Backsliding on Total Residual Chlorine

Alaska's water quality criteria for chlorine have changed since the previous permit was issued. At the time the previous permit was issued, the most stringent water quality criterion for total residual chlorine was 2.0 µg/L. Currently, the most stringent criteria for total residual chlorine are a chronic criterion of 11 µg/L and an acute criterion of 19 µg/L. While EPA must use the current water quality criteria to determine reasonable potential to exceed and to develop effluent limits, the change to the criteria, in and of itself, is not a basis for backsliding. According to Section 402(o)(2)(B)(i) of the CWA, "new information" does not include "revised regulations, guidance or test methods."

The Mendenhall WWTP has not used chlorine in its treatment process since the installation of an ultraviolet (UV) disinfection system. As stated above, the change from chlorine to UV disinfection is considered a material and substantial alteration under Section 402(o)(2)(A) of the CWA and 40 CFR 122.62(a)(1). EPA has determined that the Mendenhall WWTP discharge does not have the reasonable potential to cause or contribute to a water quality standards violation for total residual chlorine if the permittee does not add chlorine to the wastewater for disinfection. Therefore, the proposed permit does not contain effluent limits for total residual chlorine when chlorine is not added to the wastewater.

However, in order to allow the City and Borough of Juneau to continue to disinfect its effluent should the UV system fail, the proposed permit authorizes the discharge of total residual chlorine. EPA has used the new information regarding receiving water flow rates (pursuant to 402(o)(2)(B)(i) of the CWA and 40 CFR 122.62) to determine reasonable potential to cause or contribute to water quality standards violations for chlorine and to develop appropriate effluent limits.

EPA has determined that technology-based effluent limits equal to an average monthly limit of 0.5 mg/L and an average weekly limit of 0.75 mg/L are stringent enough to protect water quality from July through October (i.e. a discharge of 0.75 mg/L total residual chlorine would not cause or contribute to a water quality standards violation).

For the balance of the year, more stringent water quality-based effluent limits apply, but those limits are less stringent than those in the previous permit due to the change in water quality criteria for chlorine and the consideration of seasonal variability of the flow rate in the Mendenhall River. The effluent limitations for total residual chlorine apply only if the permittee adds chlorine to the wastewater, and the sampling frequency for total residual chlorine is reduced when the permittee does not add chlorine for disinfection. See Appendices C, D and F for further discussion on the determination of reasonable potential for and derivation of effluent chlorine limits.

Clean Water Act Section 402(o)(3) Requirements

The Mendenhall River has not been listed on Alaska's "303(d) list" as not attaining, or not being expected to attain, water quality standards for any pollutants. EPA believes that the less stringent effluent limits will continue to be protective of Alaska's federally approved water quality criteria for the Mendenhall River.

Because the less-stringent effluent limits and the deletion of certain limits will continue to ensure that water quality standards are met and do not violate the "secondary treatment" effluent limits, the limits are consistent with Section 402(o)(3) of the CWA.

EPA is requesting that ADEC certify that the less stringent effluent limitations and the elimination of the silver and zinc limits are protective of Alaska's water quality standards under Section 401 of the CWA. The following discussion details the justifications for the less stringent effluent limits (or the elimination of limits) in the draft permit.

V. Monitoring Requirements

A. Basis for Effluent and Surface Water Monitoring

Section 308 of the CWA and federal regulation 40 CFR 122.44(i) require monitoring in permits to determine compliance with effluent limitations. Monitoring may also be required to gather effluent and surface water data to determine if additional effluent limitations are required and/or to monitor effluent impacts on receiving water quality. The permit also requires the pemittee to perform effluent monitoring required by the NPDES Form 2A application, so that these data will be available when the permittee applies for a renewal of its NPDES permit. The permittee is responsible for conducting the monitoring and for reporting results on Discharge Monitoring Reports (DMRs) or on the application for renewal, as appropriate, to the U.S. Environmental Protection Agency (EPA).

B. Effluent Monitoring

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. Permittees have the option of taking more frequent samples than are required under the permit. These samples can be used for averaging if they are conducted using EPA-approved test methods (generally found in 40 CFR 136) and if the Method Detection Limits are less than the effluent limits.

Table 3, below, presents the proposed effluent monitoring requirements for the CBJ Mendenhall WWTP. The sampling location must be after the last treatment unit and prior to discharge to the receiving water. If no discharge occurs during the reporting period, "no discharge" shall be reported on the DMR. The permittee must also report chlorine usage on the DMR.

Effluent monitoring frequencies for certain pollutants and seasons was reduced, either because previous effluent data had shown that the discharge did not have the reasonable potential to cause or contribute to water quality standards violations for those pollutants, or because of a good overall performance history. Any reductions in monitoring frequency are consistent with EPA's *Interim Guidance for Performance-Based Reduction of NPDES Permit Monitoring frequencies* (1996).

Table 3: Effluent Monitoring Requirements

Parameter	Units	Sample Location	Sample Frequency	Sample Type
Flow	mgd	Effluent	Continuous	recording
Effluent Dilution Ratio[3]	dimensionless	Effluent	Daily	calculation
Turbidity	NTU	Effluent	Continuous	recording
BOD_5	mg/L	Influent & Effluent	2/month	24-hour composite
	lb/day	Influent & Effluent		calculation[1]
	% Removal	--	1/month	calculation[2]
TSS	mg/L	Influent & Effluent	2/month	24-hour composite
	lb/day	Influent & Effluent		calculation[1]
	% Removal	--	1/month	calculation[2]
pH	standard units	Effluent	5/week	grab
Fecal Coliform (Nov. – May)	#/100 ml	Effluent	2/week	grab
Fecal Coliform (June – Oct.)	#/100 ml	Effluent	1/week	grab
Total Residual Chlorine (chlorine used for disinfection)	µg/L	Effluent	5/week	grab
	lb/day	Effluent		calculation[1]
Total Residual Chlorine (chlorine not used for disinfection)	µg/L	Effluent	3x/5 years	grab
Total Ammonia as N[4]	mg/L	Effluent	1/month	24-hour composite
	lb/day	Effluent		calculation[1]
Copper[4]	µg/L	Effluent	1/month	24-hour composite
	lb/day	Effluent		calculation[1]
Lead[4]	µg/L	Effluent	1/month	24-hour composite
	lb/day	Effluent		calculation[1]
Silver	µg/L	Effluent	1/quarter	24-hour composite

Table 3: Effluent Monitoring Requirements				
Parameter	**Units**	**Sample Location**	**Sample Frequency**	**Sample Type**
Zinc	µg/L	Effluent	1/quarter	24-hour composite
Hardness	mg/L as $CaCO_3$	Effluent	1/quarter	24-hour composite
Alkalinity	mg/L as $CaCO_3$	Effluent	1/quarter	24-hour composite
Oil and Grease	Visual	Effluent	1/month	Visual
Floating Solids or Visible Foam	Visual	Effluent	1/month	Visual
Oil and Grease	mg/L	Effluent	3x/5 years	grab
Total Dissolved Solids	mg/L	Effluent	3x/5 years	24-hour composite
Total Phosphorus	mg/L	Effluent	3x/5 years	24-hour composite
Total Kjeldahl Nitrogen	mg/L	Effluent	3x/5 years	24-hour composite
Nitrate plus Nitrite Nitrogen	mg/L	Effluent	3x/5 years	24-hour composite
Dissolved Oxygen	mg/L	Effluent	1/month	grab
NPDES Application Form 2A Expanded Effluent Testing	---	Effluent	3x/5 years	---
Whole Effluent Toxicity (WET)	TU_C	Effluent	2/year	24-hour composite

Notes:
1. Loading is calculated by multiplying the concentration in mg/L by the flow in mgd and a conversion factor of 8.34. If the concentration is measured in µg/L, the conversion factor is 0.00834.
2. Percent removal is calculated using the following equation:
(average monthly influent – average monthly effluent) ÷ average monthly influent.
3. The permittee must report the minimum effluent dilution ratio observed during the month.
4. Monitoring and reporting of mass for ammonia, copper and lead is required only when effluent limits are in effect. When effluent limits are not in effect, only concentration monitoring and reporting is required.

C. Surface Water Monitoring

Table 4 presents the proposed surface water monitoring requirements for the draft permit. The City and Borough of Juneau should continue receiving water monitoring at the established locations. The permittee must prepare a report in the fourth year of the permit, showing the correlation between river flow and ambient hardness. Surface water monitoring results must be submitted with the NPDES renewal application.

Table 4: Receiving Water Monitoring Requirements			
Parameter (units)	**Sample Locations**	**Sample Frequency**	**Sample Type**
pH (s.u.)	Upstream and Downstream	Monthly	Grab
Temperature, (ºC)	Upstream	Monthly[4]	Grab
Total Ammonia as N (mg/L)	Upstream	4/year[2]	Grab
Copper[1] (µg/L)	Upstream	4/year[2]	Grab
Lead[1] (µg/L)	Upstream	4/year[2]	Grab
Silver[1] (µg/L)	Upstream	2/year[3]	Grab
Zinc[1] (µg/L)	Upstream	2/year[3]	Grab
Fecal Coliform Bacteria	Upstream and Downstream	Monthly	Grab
Hardness (mg/L as $CaCO_3$)	Upstream and Downstream	Monthly	Grab
Dissolved Oxygen (mg/L)	Upstream and Downstream	Monthly	Grab
Alkalinity (mg/L as $CaCO_3$)	Upstream	Monthly	Grab
Turbidity	Upstream and Downstream	Quarterly[2]	Grab
Flow	USGS Station #15052900 (Brotherhood Bridge)	Daily	Discrete

Table 4: Receiving Water Monitoring Requirements			
Parameter (units)	**Sample Locations**	**Sample Frequency**	**Sample Type**
1. Monitoring for copper, lead, silver and zinc in the receiving water must be in dissolved metal. 2. Sampling for these pollutants must occur at least once during each of the following seasons: November through May, June, July through September, and October. 3. Monitoring for silver and zinc must occur at least once during the season of November through May and at least once during the season of October through June. 4. Receiving water monitoring for temperature is required during May, June, July, August, September and October only.			

VI. Sludge (Biosolids) Requirements

EPA Region 10 separates wastewater and sludge permitting. EPA has authority under the CWA to issue separate sludge-only permits for the purposes of regulating biosolids. EPA may issue a sludge-only permit to each facility at a later date, as appropriate.

Until future issuance of a sludge-only permit, sludge management and disposal activities at each facility continue to be subject to the national sewage sludge standards at 40 CFR Part 503 and any requirements of the State's biosolids program. The Part 503 regulations are self-implementing, which means that facilities must comply with them whether or not a permit has been issued.

VII. Other Permit Conditions

A. Quality Assurance Plan

The federal regulation at 40 CFR 122.41(e) requires the permittee to develop procedures to ensure that the monitoring data submitted is accurate and to explain data anomalies if they occur. The City and Borough of Juneau is required to update the Quality Assurance Plan for the Juneau Mendenhall WWTF within 90 days of the effective date of the final permit. The Quality Assurance Plan shall consist of standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples, laboratory analysis, and data reporting.

B. Operation and Maintenance Plan

The permit requires the City and Borough of Juneau to properly operate and maintain all facilities and systems of treatment and control. Proper operation and maintenance is essential to meeting discharge limits, monitoring requirements, and all other permit requirements at all times. The City and Borough of Juneau is required to develop and implement an operation and maintenance plan for their facility within 90 days of the effective date of the final permit. The plan shall be retained on site and made available to EPA and ADEC upon request.

C. Design Criteria

The permit retains the design criteria requirements from the previous permit. This provision requires the permittee to compare influent flow and loading to the facility's design flow and loading and prepare a facility plan for maintaining compliance with

NPDES permit effluent limits when the annual average flow or loading exceeds 85% of the design criteria values for three consecutive months.

D. Pretreatment Requirements

The previous permit required the permittee to complete an industrial survey, to submit its sewer use ordinance to EPA, and to sample the influent waste stream. The results of the industrial user survey showed that the Mendenhall wastewater treatment plant receives wastewater from only one significant industrial user (SIU), the Alaskan Brewing Company (Carson-Dorn, 2002). The design flow of the treatment plant is less than 5 mgd. As such, EPA does not believe it is necessary for the City and Borough of Juneau to develop a pretreatment program for EPA approval at this time. However, the permit contains conditions requiring that CBJ monitor and control industrial users.

E. Standard Permit Provisions

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

VIII. Other Legal Requirements

A. Endangered Species Act

The Endangered Species Act requires federal agencies to consult with National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) and the U.S. Fish and Wildlife Service (USFWS) if their actions could beneficially or adversely affect any threatened or endangered species. EPA has determined that issuance of this permit will not affect any of the threatened or endangered species in the vicinity of the discharge. In a telephone call on April 15, 2005, Ed Grossman of the USFWS field office in Juneau stated that USFWS has determined that no federally-listed species or critical habitat under its jurisdiction are found within the project area. The reference number for this determination is 05-12V. In a letter dated May 18, 2005, NOAA Fisheries stated that although the endangered humpback whale and the threatened Steller sea lion are known to occur in nearby Fritz Cove and Auke Bay, none are known to occur in the project area and no critical habitat has been designated in the vicinity. Therefore, consultation is not required under Section 7 of the Endangered Species Act.

B. Essential Fish Habitat

Essential fish habitat (EFH) is the waters and substrate (sediments, etc.) necessary for fish to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires EPA to consult with NOAA Fisheries when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. The EFH regulations define an adverse effect as any impact which reduces quality and/or quantity of EFH and may include direct (e.g.

contamination or physical disruption), indirect (e.g. loss of prey, reduction in species' fecundity), site specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. EPA has prepared an EFH assessment which appears in Appendix E.

In a letter dated May 18, 2005, NOAA Fisheries described the Mendenhall River as a migrational corridor for sockeye, coho, chum, and pink salmon. The mouth of the river supports spawning sand lance, resident sculpin species, and shallow water flatfish.

EPA has determined that issuance of this permit is not likely to adversely effect EFH in the vicinity of the discharge. EPA has provided NOAA Fisheries with copies of the draft permit and fact sheet during the public notice period. Any comments received from NOAA Fisheries regarding EFH will be considered prior to reissuance of this permit.

C. State Certification

Section 401 of the CWA requires EPA to seek State certification before issuing a final permit. As a result of the certification, the State may require more stringent permit conditions or additional monitoring requirements to ensure that the permit complies with water quality standards, or treatment standards established pursuant to any State law or regulation.

D. Alaska Coastal Management Program

According to the Alaska Department of Natural Resources, Office of Project Management and Permitting (OPMP), renewals of the NPDES permit for the Mendenhall Wastewater Treatment Plant were reviewed for consistency with the Alaska Coastal Management Program (ACMP) in 1993 under "AK 9308-13J" and in 2000 under "AK 0008-09J." In both cases, the project was found to be consistent with alternative measures.

In a letter dated August 26, 2005, OPMP informed EPA that it had determined that the modifications included in this revocation and reissuance action will not result in any new significant coastal effects. Additional ACMP review is therefore not required for this action.

E. Permit Expiration

The permit will expire five years from the effective date.

IX. References

Alaska Administrative Code. 2003. *Water Quality Standards.* Alaska Department of Environmental Conservation, Title 18, Chapter 70.

Alaska Administrative Code. 2003. *Wastewater Disposal.* Alaska Department of Environmental Conservation, Title 18, Chapter 72.

Alaska Department of Environmental Conservation. 2003. *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances.*

Carson-Dorn, Inc. *Industrial Users Survey Report.* Prepared for City and Borough of Juneau. June 2002.

EPA. 1991. *Technical Support Document for Water Quality-based Toxics Control.* US Environmental Protection Agency, Office of Water, EPA/505/2-90-001.

Hirsch, R. "A Comparison of Four Streamflow Record Extension Techniques." *Water Resources Research.* Volume 18, Number 4, Pages 1081-1088. August 1982.

Water Pollution Control Federation. Subcommittee on Chlorination of Wastewater. *Chlorination of Wastewater.* Water Pollution Control Federation. Washington, D.C. 1976.

Appendix A: Facility Information

General Information

NPDES ID Number:	AK-002295-1
Physical Address:	2009 Radcliffe Road Juneau, AK 99801
Mailing Address:	155 South Seward Street Juneau, AK 99801
Facility Background:	The Mendenhall wastewater treatment plant has been in operation since 1978. The last major revision to the plant was completed in 1996. The current permit became effective on March 6, 2001 and expires on March 6, 2006.

Facility Information

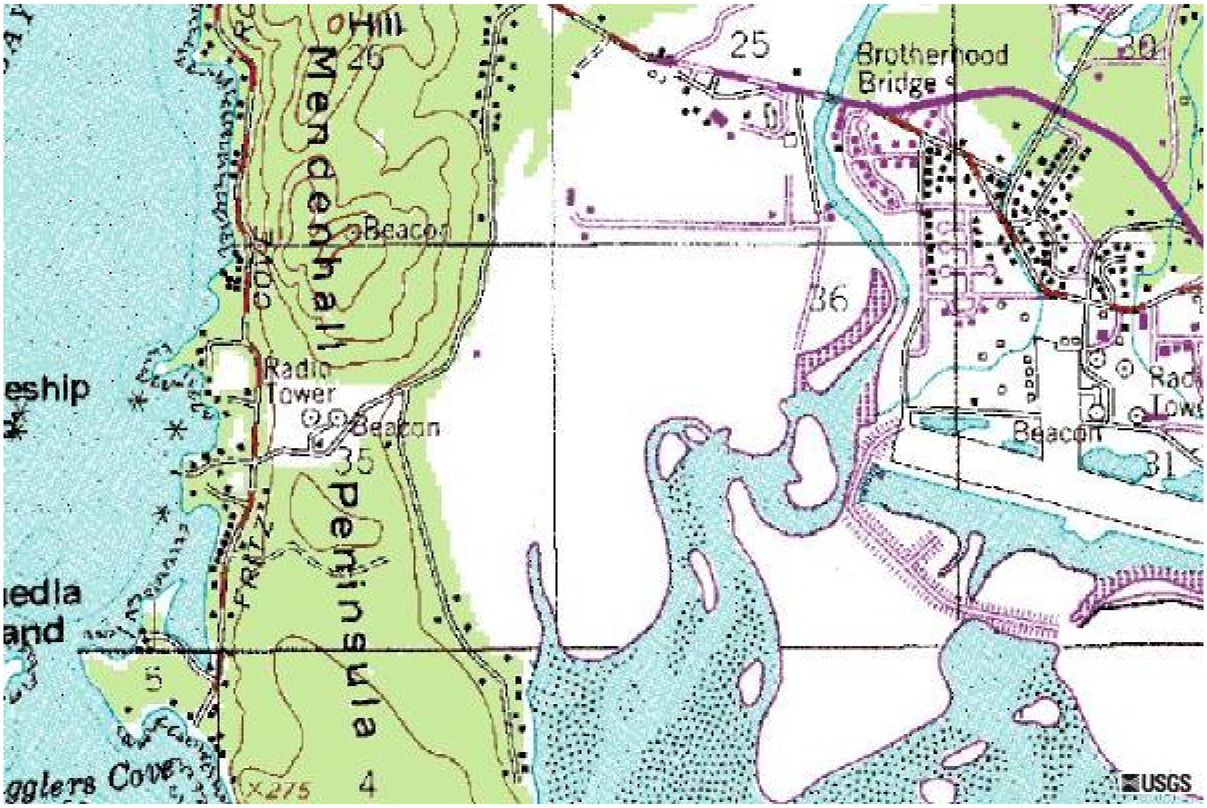
Type of Facility:	Publicly Owned Treatment Works (POTW)
Treatment Train:	Screening, grit removal, activated sludge process, SBR process, ultraviolet disinfection, sludge thickening, sludge dewatering. Sludge is transported to an off-site sludge incinerator for final processing.
Flow:	Design flow is 4.9 mgd. Long-term average flow is 2.1 mgd.
Outfall Location:	latitude 58° 21' 43" N; longitude 134° 35' 53" W

Receiving Water Information

Receiving Water:	Mendenhall River
Watershed:	Lynn Canal (HUC 19010301)
Beneficial Uses:	Water supply for: • Drinking, culinary and food processing • Agriculture, including stock watering • Aquaculture • Industrial Contact recreation Growth and propagation of fish, shellfish, other aquatic life, and wildlife

Appendix B: Facility Map

Map image courtesy of the USGS and http://terraserver.microsoft.com



Appendix C: Basis for Effluent Limits

The following discussion explains in more detail the statutory and regulatory basis for the technology and water quality-based effluent limits in the draft permit. Part A discusses technology-based effluent limits, Part B discusses water quality-based effluent limits in general, and Part C discusses facility specific water quality-based effluent limits.

A. Technology-Based Effluent Limits

Federal Secondary Treatment Effluent Limits

The CWA requires POTWs to meet requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as "secondary treatment," which all POTWs were required to meet by July 1, 1977. EPA has developed and promulgated "secondary treatment" effluent limitations, which are found in 40 CFR 133.102. These technology-based effluent limits apply to all municipal wastewater treatment plants, and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD_5, TSS, and pH. The federally promulgated secondary treatment effluent limits are listed in Table C-1.

Table C-1: Secondary Treatment Effluent Limits
(40 CFR 133.102)

Parameter	Average Monthly Limit	Average Weekly Limit	Range
BOD_5	30 mg/L	45 mg/L	---
TSS	30 mg/L	45 mg/L	---
Removal Rates for BOD_5 and TSS	85% (minimum)	---	---
pH	---	---	6.0 - 9.0 s.u.

State of Alaska Wastewater Disposal Regulations

In addition to the federal secondary treatment regulations in 40 CFR 133, the State of Alaska requires maximum daily limits of 60 mg/L for BOD_5 and TSS in its own secondary treatment regulations (18 AAC 72.990). Section 301(b)(1)(C) of the CWA requires that NPDES permits contain limits necessary to meet "treatment standards…established pursuant to any State law or regulations" in addition to water quality standards. Therefore, the 60 mg/L maximum daily limits for BOD and TSS are included in the draft permit.

Chlorine

Chlorine is often used to disinfect municipal wastewater prior to discharge. The CBJ Mendenhall Wastewater Treatment Plant uses ultraviolet (UV) disinfection, which does not add chlorine or any other pollutants to the wastewater. However, the draft permit authorizes the discharge of chlorine as an alternative method of disinfection, in case the UV disinfection system should fail.

A 0.5 mg/L average monthly limit for chlorine is derived from standard operating practices. The Water Pollution Control Federation's *Chlorination of Wastewater* (1976) states that a properly designed and maintained wastewater treatment plant can achieve adequate disinfection if a 0.5

mg/L chlorine residual is maintained after 15 minutes of contact time. Therefore, a wastewater treatment plant that provides adequate chlorine contact time can meet a 0.5 mg/L total residual chlorine limit on a monthly average basis. In addition to average monthly limits (AMLs), NPDES regulations require effluent limits for POTWs to be expressed as average weekly limits (AWLs) unless impracticable. The AWL is calculated to be 1.5 times the AML, consistent with the "secondary treatment" limits for BOD_5 and TSS. This results in an AWL for chlorine of 0.75 mg/L.

EPA has determined that these effluent limits are sufficiently stringent to meet water quality standards from July through October. For the balance of the year, more-stringent water quality-based limits apply. Effluent limits and monitoring requirements for chlorine are in effect whenever chlorine is being added to the waste stream.

Mass-Based Limits

The federal regulation at 40 CFR 122.45(f) requires that effluent limits be expressed in terms of mass, if possible. The regulation at 40 CFR 122.45(b) requires that effluent limitations for POTWs be calculated based on the design flow of the facility. The mass based limits are expressed in pounds per day and are calculated as follows:

Mass based limit (lb/day) = concentration limit (mg/L) × design flow (mgd) × 8.34[1]

B. Water Quality-based Effluent Limits

Statutory and Regulatory Basis

Section 301(b)(1)(C) of the CWA requires the development of limitations in permits necessary to meet water quality standards by July 1, 1977. Discharges to State or Tribal waters must also comply with limitations imposed by the State or Tribe as part of its certification of NPDES permits under section 401 of the CWA. Federal regulations at 40 CFR 122.4(d) prohibit the issuance of an NPDES permit that does not ensure compliance with the water quality standards of all affected States. The NPDES regulation (40 CFR 122.44(d)(1)) implementing Section 301(b)(1)(C) of the CWA requires that permits include limits for all pollutants or parameters which are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State or Tribal water quality standard, including narrative criteria for water quality.

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

Reasonable Potential Analysis

When evaluating the effluent to determine if water quality-based effluent limits are needed based on numeric criteria, EPA projects the receiving water concentration (downstream of where the effluent enters the receiving water) for each pollutant of concern. EPA uses the concentration of

[1] 8.34 is a conversion factor with units (lb ×L)/(mg × gallon×10^6)

the pollutant in the effluent and receiving water and, if appropriate, the dilution available from the receiving water, to project the receiving water concentration. If the projected concentration of the pollutant in the receiving water exceeds the numeric criterion for that specific chemical, then the discharge has the reasonable potential to cause or contribute to an exceedance of the applicable water quality standard, and a water quality-based effluent limit is required.

Sometimes it is appropriate to allow a small area of the receiving water to provide dilution of the effluent. These areas are called mixing zones. Mixing zone allowances will increase the mass loadings of the pollutant to the water body, and decrease treatment requirements. Mixing zones can be used only when there is adequate receiving water flow volume and the receiving water meets the criteria necessary to protect the designated uses of the water body. Mixing zones must be authorized by the Alaska Department of Environmental Conservation. Based on the previous permit and the draft certification, the water quality-based effluent limits in this permit have been calculated using a mixing zone. If ADEC does not grant a mixing zone, the water quality-based effluent limits will be recalculated such that the criteria are met before the effluent is discharged to the receiving water.

Procedure for Deriving Water Quality-based Effluent Limits

The first step in developing a water quality-based effluent limit is to develop a wasteload allocation (WLA) for the pollutant. A wasteload allocation is the concentration or loading of a pollutant that the permittee may discharge without causing or contributing to an exceedance of water quality standards in the receiving water.

In cases where a mixing zone is not authorized, either because the receiving water already exceeds the criterion, the receiving water flow is too low to provide dilution, or the State does not authorize one, the criterion becomes the WLA. Establishing the criterion as the wasteload allocation ensures that the permittee will not cause or contribute to an exceedance of the criterion. The following discussion details the specific water quality-based effluent limits in the draft permit.

Once a WLA is developed, EPA calculates effluent limits which are protective of the WLA using statistical procedures described in Appendix F.

C. Facility-Specific Water Quality-based Effluent Limits

Hardness-Dependent Metals

The toxicities of some metals vary with the hardness of the water. Therefore, the water quality criteria for these metals also vary with hardness. EPA uses the hardness of the receiving water when mixed with the effluent to determine the water quality criteria for such metals. Since toxicity decreases (and numeric water quality criteria increase) as hardness increases, EPA has used the 5^{th} percentile as a worst-case assumption for effluent hardness.

Data collected by the permittee show that there is a strong correlation between flow rate and hardness in the Mendenhall River (see figure C-1, below). The ambient hardness in the Mendenhall River tends to be low (soft water) at high river flows and high (hard water) at low river flows. As discussed in section III.A. of this Fact Sheet, EPA has calculated the low flow rates (used to calculate dilution ratios in the receiving water) on a seasonal basis, since the flow rates of the Mendenhall River are highly variable with the seasons. Therefore, EPA has used different values for the upstream hardness for different seasons.

The seasonal hardness values used in calculating water quality criteria for metals are those predicted for the average receiving water flow rate during each of the four seasons. Because the receiving water is "softer" (and therefore water quality criteria for metals are more stringent) at higher flows, using the hardness values predicted for average river flow is a more conservative approach than using ambient hardness values predicted or observed during very low receiving water flow (e.g. 1Q10 or 7Q10 flow rates). This assumption, combined with a conservative dilution factor (i.e. one based on the 1Q10/7Q10 receiving water flow rates paired with the design flow of the treatment plant) ensures that a discharge in compliance with the effluent limits will have a low probability of causing or contributing to water quality standards violations for hardness-dependent metals. Table C-2, below, details the hardness values predicted for the Mendenhall River.

Figure C-1: Hardness vs. River Flow

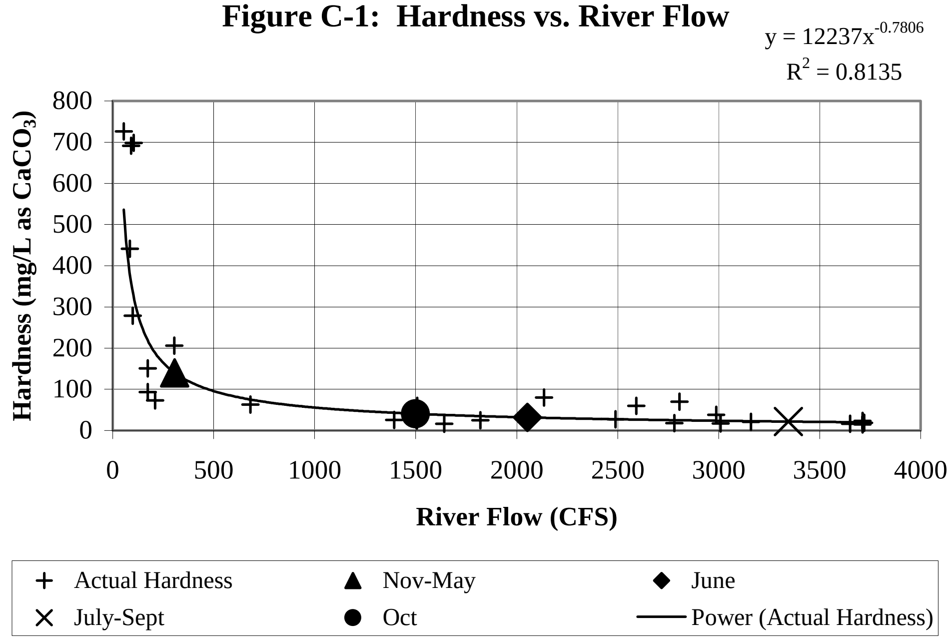


Table C-2: Seasonal Hardness in the Mendenhall River				
Season	**Hardness in units of mg/L as $CaCO_3$**			
	River Hardness[1]	**Effluent Hardness**[2]	**Acute Mixed Hardness**[3]	**Chronic Mixed Hardness**[3]
November – May	140	49.5	122	122
June	32		32	32
July – September	22		22	22
October	41		41	41

1. River hardness is the ambient hardness expected at the average Mendenhall River flow rate during each season.
2. Effluent hardness is the 5th percentile effluent hardness (no seasonal variation assumed)
3. Mixed hardness is the hardness of the mixture of the effluent and receiving water, based on the design flow of the treatment plant and the 1Q10 (acute) or 7Q10 (chronic) flow rates.

The hardness-dependent water quality criteria for the metals of concern are expressed as dissolved metal. The dissolved fraction of the metal is the fraction that will pass through a 0.45-micron filter. However, the federal regulation at 40 CFR 122.45(c) requires that NPDES permit effluent limits must be expressed as total recoverable metal. Total recoverable metal is the concentration of the metal in an unfiltered sample. To develop effluent limits for total recoverable metals which are protective of the dissolved metals criteria, "translators" are used in the equations to determine reasonable potential and derive effluent limits. Translators can either be site specific numbers or default numbers. EPA has published guidance related to the use of translators in NPDES permits 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 water quality criteria conversion factors as the default translators. Because site-specific translators were not available, EPA has used the conversion factors in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (ADEC, 2003) in the reasonable potential and effluent limit calculations for the Mendenhall WWTP discharge. Tables C-3 and C-4, below, detail the calculations for water quality criteria for hardness-dependent metals in the Mendenhall River downstream of the WWTP discharge.

Table C-3: Hardness-Dependent Metals Criteria Equations

Parameter	Equations for Metals Criteria (expressed as total recoverable)[1,2,3,4]		Equations or Values of Conversion Factors and Translators[5]	
	Acute	Chronic	Acute	Chronic
Copper	$e^{0.9422[\ln(hardness)]-1.7}$	$e^{0.8545[\ln(hardness)]-1.702}$	0.960	0.960
Lead	$e^{1.273[\ln(hardness)]-1.460}$	$e^{1.273[\ln(hardness)]-4.705}$	1.46203 - [ln(hardness) ×1.45702]	1.46203 - [ln(hardness) ×1.45702]
Silver	$e^{1.72[\ln(hardness)]-6.52}$	—	0.850	—
Zinc	$e^{0.8473[\ln(hardness)]+0.884}$	$e^{0.8473[\ln(hardness)]+0.884}$	0.978	0.986

Source: Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. ADEC, 2003.

Notes:
1. "e" is the exponential constant, approximately equal to 2.718
2. "ln" is the natural logarithm (log base "e")
3. hardness is measured in mg/L as $CaCO_3$
4. These equations compute the criteria as total recoverable metal
5. Multiplying the results of the equations by these conversion factors yields the dissolved criteria.

Table C-4: Hardness-Dependent Metals Criteria Values			
Parameter	**Season**	**Acute Criterion (µg/L)[1]**	**Chronic Criterion (µg/L)[1]**
Copper	November – May	16.2	10.6
	June	4.63	3.41
	July – September	3.21	2.44
	October	5.76	4.15
Lead	November – May	80.1	3.12
	June	18.5	0.720
	July – September	11.9	0.465
	October	24.0	0.934
Silver	November – May	4.85	–
	June	0.493	–
	July – September	0.252	–
	October	0.735	–
Zinc	November – May	139	140
	June	44.9	45.3
	July – September	32.3	32.6
	October	54.7	55.2
1. All metals criteria are expressed as dissolved metal.			

EPA has determined that the discharge does not have reasonable potential to cause or contribute to violations of Alaska's water quality criteria for silver or zinc. The discharge has reasonable potential to cause or contribute to water quality standards violations for copper except during the month of October and for lead from November through May. Therefore, the permit contains water quality-based effluent limits for copper and lead for those seasons. See Appendices D and F for reasonable potential and effluent limit calculations for metals.

pH

The most stringent water quality criteria for pH are for the protection of aquatic life and aquaculture water supply. The pH criteria for these uses state that the pH must be no less than 6.5 and no greater than 8.5 standard units, and may not vary more than 0.5 pH units from natural conditions.

The permittee has collected pH and alkalinity data for both the effluent and the receiving water. EPA has used these data to determine the discharge's effects on the pH of the receiving water. EPA believes that a mixing zone for pH is appropriate. The proposed pH limits are 6.5 to 9.0 from November through May, 6.4 to 9.0 during the month of June, and 6.3 to 9.0 from July through October. If ADEC does not grant a mixing zone for pH in its final CWA Section 401 certification, EPA will change the pH limits to a range of 6.5 to 8.5 standard units, thus requiring that the pH criteria be met before the effluent is discharged to the receiving water. See Appendix E for effluent limit calculations for pH.

Ammonia

The Alaska water quality standards contain criteria for the protection of aquatic life from the toxic effects of ammonia. Because the Mendenhall River is known to be a migrational corridor for salmonids, EPA has applied ammonia criteria which are protective of salmonids, including early life stages. The criteria are dependent on pH and temperature, because the fraction of ammonia present as the toxic, un-ionized form increases with increasing pH and temperature. Therefore, the criteria become more stringent as pH and temperature increase. The following table details the equations used to determine water quality criteria for ammonia, and the values of these equations at the 95th percentile pH (for the entire year), which is 7.6 standard units, and the maximum seasonal temperature observed in the Mendenhall River upstream from the discharge. A reasonable potential calculation showed that the Mendenhall WWTP discharge would have the reasonable potential to cause or contribute to a violation of the water quality criteria for ammonia from November through May. Therefore, the draft permit contains a water quality-based effluent limit for ammonia for this season. The draft permit requires that the permittee monitor the receiving water for ammonia, pH and temperature. See Appendices D and F for reasonable potential and effluent limit calculations for ammonia.

Table C-5: Water Quality Criteria for Ammonia

	Acute Criterion[1]	**Chronic Criterion**[2]
Equations:	$\frac{0.275}{1+10^{7.204-pH}}+\frac{39}{1+10^{pH-7.204}}$	$\left(\frac{0.0577}{1+10^{7.688-pH}}+\frac{2.487}{1+10^{pH-7.688}}\right)\times MIN\left(2.85, 1.45\times 10^{0.028\times(25-T)}\right)$
Results:	11.37	3.98

1. No seasonal variation was assumed for pH, therefore, there is no seasonal variation in the acute criterion (which is a function of pH only).
2. The chronic ammonia criterion for waters where early life stages is a function of both pH and temperature, but only for temperatures above 14.5ºC. For temperatures less than 14.5ºC, the chronic criterion is a function of pH only. Because the temperature of the Mendenhall River is consistently below 14.5ºC and EPA has not assumed any seasonal variation in the ambient pH, there is no seasonal variation in the chronic ammonia criterion.

Petroleum Hydrocarbons, Oil and Grease

The Alaska water quality standards require that surface waters and adjoining shorelines designated for aquaculture water supply or the growth and propagation of fish, shellfish, aquatic life and wildlife be virtually free from floating oil, film, sheen or discoloration. Waters designated for recreation and for drinking, culinary and food processing water supply have similar criteria. Therefore, EPA has included a narrative limitation prohibiting the discharge of petroleum hyrdrocarbons or oils and grease that cause a sheen, film or discoloration on the surface of the water or adjoining shorelines. The permittee must visually inspect the effluent for oil and grease once per month. In addition, the permittee must perform quantitative oil and grease analysis on grab samples of the effluent three times during the next permit cycle, and report all results to EPA. This quantitative sampling is required by part B.6. of NPDES application form 2A.

Residues

The Alaska water quality standards require that surface waters designated the growth and propagation of fish, shellfish, aquatic life and wildlife or for drinking, culinary and food processing water supply not contain residues that cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines. Therefore, EPA has included a narrative limitation prohibiting the discharge of such residues. The permittee must visually inspect the effluent for floating solids and visible foam once per month and report the results to EPA.

Fecal Coliform

Effluent limits for fecal coliform are based on the ADEC's draft Clean Water Act Section 401 certification and on a calculation of the fecal coliform concentrations downstream of the outfall. The effluent limits have been shown to be protective of the criteria for fecal coliform in the receiving water.

Appendix D: Reasonable Potential Calculations

The following describes the process EPA has used to determine if the discharge authorized in the draft permit has the reasonable potential to cause or contribute to a violation of Alaska's federally approved water quality standards. EPA uses the process described in the *Technical Support Document for Water Quality-based Toxics Control* (EPA, 1991) to determine reasonable potential.

To determine if there is reasonable potential for the discharge to cause or contribute to an exceedance of water quality criteria for a given pollutant, 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 water quality-based effluent limit must be included in the permit. This section discusses how the maximum projected receiving water concentration is determined.

A. Mass Balance

For discharges to flowing water bodies, the maximum projected receiving water concentration is determined using the following mass balance equation:

$$C_dQ_d = C_eQ_e + C_uQ_u \qquad \text{(Equation D-1)}$$

where,

C_d = Receiving water concentration downstream of the effluent discharge (that is, the concentration at the edge of the mixing zone)
C_e = Maximum projected effluent concentration
C_u = 95th percentile measured receiving water upstream concentration
Q_d = Receiving water flow rate downstream of the effluent discharge = $Q_e + Q_u$
Q_e = Effluent flow rate (set equal to the design flow of the WWTP)
Q_u = Receiving water low flow rate upstream of the discharge (1Q10, 7Q10 or 30B3)

When the mass balance equation is solved for C_d, it becomes:

$$C_d = \frac{C_eQ_e + C_uQ_u}{Q_e + Q_u} \qquad \text{(Equation D-2)}$$

The above form of the equation is based on the assumption that the discharge is rapidly and completely mixed with the receiving stream. If the mixing zone is based on less than complete mixing with the receiving water, the equation becomes:

$$C_d = \frac{C_eQ_e + C_u(Q_u \times MZ)}{Q_e + (Q_u \times MZ)} \qquad \text{(Equation D-3)}$$

where MZ is the fraction of the receiving water flow available for dilution. In this case, the mixing zone is based on complete mixing of the effluent and the receiving water, and MZ is equal to unity (1). Therefore, in this case, Equation D-3 is equal to Equation D-2.

If a mixing zone is not allowed, dilution is not considered when projecting the receiving water concentration and,

$$C_d = C_e \qquad \text{(Equation D-4)}$$

Equation D-2 can be simplified by introducing a "dilution factor,"

$$D = \frac{Q_e + Q_u}{Q_e} \qquad \text{(Equation D-5)}$$

For each season of the year, there are three values for the dilution factor: one based on the 1Q10 flow rate in the receiving stream and used to determine reasonable potential and wasteload allocations for acute aquatic life criteria, one based on the 7Q10 flow rate to determine reasonable potential and wasteload allocations chronic aquatic life criteria (except for ammonia) and conventional pollutants, and one based on the 30B3 flow rate to determine reasonable potential and wasteload allocations for the chronic ammonia criterion. All dilution factors are calculated with the effluent flow rate set equal to the design flow of 4.9 mgd. This results in a total of twelve different dilution factors under consideration. The dilution factors are listed in Table D-1, below.

Table D-1: Dilution Factors

Season	Acute Dilution Factor	Chronic Dilution Factor	Chronic Ammonia Criterion Dilution Factor
November through May	5.09	5.35	6.54
June	28.6	33.8	73.4
July through September	104	161	268
October	47.4	79.2	151

After the dilution factor simplification, Equation D-2 becomes:

$$C_d = \frac{C_e - C_u}{D} + C_u \qquad \text{(Equation D-6)}$$

If the criterion is expressed as dissolved metal, the effluent concentrations are measured in total recoverable metal and must be converted to dissolved metal as shown in Equation D-7.

$$C_d = \left[\frac{CF \times C_e - C_u}{D}\right] + C_u \qquad \text{(Equation D-7)}$$

Where C_e is expressed as total recoverable metal, C_u and C_d are expressed as dissolved metal, and CF is a conversion factor used to convert between dissolved and total recoverable metal.

Equations D-6 and D-7 are the forms of the mass balance equation which were used to determine reasonable potential and calculate wasteload allocations.

B. Maximum Projected Effluent Concentration

To calculate the maximum projected effluent concentration, EPA has used the procedure described in section 3.3 of the TSD, "Determining the Need for Permit Limits with Effluent

Monitoring Data." In this procedure, the 99th percentile of the effluent data is the maximum projected effluent concentration in the mass balance equation.

For chlorine, EPA has used the technology-based limit as the maximum projected effluent concentration. The technology-based effluent limit is used in this manner because water quality-based effluent limits are required only when a discharge of the pollutant at the technology-based limit has the reasonable potential to cause or contribute to water quality standards violations.

Since there are a limited number of data points available, the 99th percentile is calculated by multiplying the maximum reported effluent concentration by a "reasonable potential multiplier" (RPM). The RPM is the ratio of the 99th percentile concentration to the maximum reported effluent concentration. The RPM is calculated from the coefficient of variation (CV) of the data and the number of data points. The CV is defined as the ratio of the standard deviation of the data set to the mean, but when fewer than 10 data points are available, the TSD recommends making the assumption that the CV is equal to 0.6.

Using the equations in section 3.3.2 of the TSD, the reasonable potential multiplier (RPM) is calculated based on the CV and the number of samples in the data set as follows. The following discussion presents the equations used to calculate the RPM, and also works through the calculations for the RPM for copper as an example. Reasonable potential calculations for all pollutants can be found in Table D-2.

First, the percentile represented by the highest reported concentration is calculated.

$$p_n = (1 - \text{confidence level})^{1/n} \quad \text{(Equation D-8)}$$

where,
p_n = the percentile represented by the highest reported concentration
n = the number of samples
confidence level = 99% = 0.99

The data set contains 51 copper samples collected from the effluent, therefore:

$$p_n = (1-0.99)^{1/51}$$
$$p_n = 0.914$$

This means that we can say, with 99% confidence, that the maximum reported effluent copper concentration is greater than the 91st percentile.

The reasonable potential multiplier (RPM) is the ratio of the 99th percentile concentration (at the 99% confidence level) to the maximum reported effluent concentration. This is calculated as follows:

$$RPM = C_{99}/C_p \qquad \text{(Equation D-9)}$$

Where,

$$C = \exp(z\sigma - 0.5\sigma^2) \qquad \text{(Equation D-10)}$$

Where,

$$\sigma^2 = \ln(CV^2 + 1) \qquad \text{(Equation D-11)}$$
$$\sigma = \sqrt{\sigma^2}$$

CV = coefficient of variation = (standard deviation) ÷ (mean)
z = the inverse of the normal cumulative distribution function at a given percentile

In the case of copper:

CV = coefficient of variation = 0.699
$\sigma^2 = \ln(CV^2 + 1) = 0.398$
$\sigma = \sqrt{\sigma^2} = 0.631$
z = 2.326 for the 99th percentile = 1.364 for the 91st percentile

$C_{99} = \exp(2.326 \times 0.631 - 0.5 \times 0.398) = 3.554$
$C_{91} = \exp(1.364 \times 0.631 - 0.5 \times 0.398) = 1.937$

$RPM = C_{99}/C_{91} = 3.554/1.937$
RPM = 1.84

The maximum projected effluent concentration is determined by simply multiplying the maximum reported effluent concentration by the RPM:

$C_e = (RPM)(MRC)$ (Equation D-12)

where MRC = Maximum Reported Concentration

In the case of copper,

C_e = (1.84)(72.0 µg/L) = 132 µg/L

C. Maximum Projected Receiving Water Concentration

The discharge has reasonable potential to cause or contribute to an exceedance of water quality criteria if the maximum projected concentration of the pollutant at the edge of the mixing zone exceeds the most stringent criterion for that pollutant. The maximum projected receiving water concentration is calculated from Equation D-6:

$$C_d = \frac{C_e - C_u}{D} + C_u \qquad \text{(Equation D-6)}$$

Or, if the criterion is expressed as dissolved metal, the maximum projected receiving water concentration is calculated from Equation D-7:

$$C_d = \left[\frac{CF \times C_e - C_u}{D}\right] + C_u \qquad \text{(Equation D-7)}$$

Where C_e is expressed total recoverable metal, C_u and C_d are expressed as dissolved metal, and CF is the conversion factor.

For copper, from November though May, the acute receiving water concentration is, in micrograms per liter:

$$C_d = \left[\frac{0.960 \times 132 - 2.58}{5.09}\right] + 2.58 = 27.0$$

For copper, from November through May, the chronic receiving water concentration is, in micrograms per liter:

$$C_d = \left[\frac{0.960 \times 132 - 2.58}{5.35}\right] + 2.58 = 25.8$$

The acute and chronic water quality criteria for this season are 16.2 and 10.6 µg/L, respectively. Because the projected receiving water concentrations are greater than the criteria, a water quality-based effluent limit is necessary for copper from November through may.

Table D-2, below, summarizes the reasonable potential calculations for copper, lead, silver, zinc, chlorine and ammonia.

Table D-2: Reasonable Potential Calculations - Juneau Mendenhall

Common to All Parameters			
Confidence Level	0.99		
Z-Score of Confidence Level	2.33		
Dilution Factors	**Acute**	**Chronic**	**Ammonia**
Nov-May	5.09	5.35	6.54
June	28.6	33.8	73.4
July-Sep	104	161	268
October	47.4	79.2	151

Calculation of Maximum Projected Effluent Concentration (Common to All Seasons)

All Concentrations in µg/L Unless Otherwise Noted

Parameter	**Copper**	**Lead**	**Silver**	**Zinc**	**Chlorine**	**Ammonia (mg/L)**
Data Source	**Effluent**	**Effluent**	**Effluent**	**Effluent**	**TBEL[1]**	**Effluent**
Maximum Reported Effluent Conc. (metals as TR)	72.0	8.17	3.11	149.00	N/A	36
Average Effluent Conc. (Metals as TR)	17.5	1.81	0.76	51.84	N/A	15.7
Standard Deviation of Effluent Conc. (Metals as TR)	12.2	2.02	0.64	29.39	N/A	6.39
Number of samples (n)	51	51	51	51	N/A	73
Coefficient of Variation (CV, assume 0.6 if n<10)	0.699	1.114	0.842	0.567	N/A	0.407
σ	0.631	0.898	0.73	0.53	N/A	0.39
σ^2	0.398	0.807	0.536	0.279	N/A	0.153
Percentile of Largest Value	0.914	0.914	0.914	0.914	N/A	0.939
Z-Score of Percentile of Largest Value	1.364	1.364	1.364	1.364	N/A	1.545
C_{99}	3.554	5.40	4.20	2.97	N/A	2.30
C_n	1.937	2.274	2.076	1.787	N/A	1.695
Reasonable Potential Multiplier (RPM)	1.835	2.375	2.024	1.662	N/A	1.357
Maximum Projected Effluent Conc. (Metals as TR)	**132**	**19.4**	**6.29**	**248**	**750**	**48.9**

1. For chlorine, EPA has used the technology-based effluent limit (TBEL) as a basis for the maximum projected effluent concentration.

Parameter	**Copper**	**Lead**	**Silver**	**Zinc**	**Chlorine**	**Ammonia (mg/L)**
Data Source	**Effluent**	**Effluent**	**Effluent**	**Effluent**	**TBEL[1]**	**Effluent**
November thru May						
Ambient Concentration (Metals as Dis)	2.58	1.00	0.54	9.30	0	0.228
Acute Conversion Factor	0.960	0.762	0.850	0.978	1	1
Chronic Conversion Factor	0.960	0.762	0.850	0.986	1	1
Maximum Acute RWC (Metals as Dis)	27.0	3.71	1.49	55.07	147	9.79
Maximum Chronic/Single Value RWC (Metals as Dis)	25.8	3.6	1.4	53.2	140	7.66
Acute Aquatic Life Criterion (Metals as Dis)	16.2	80.10	4.85	138.63	19	11.4
Chronic Aquatic Life Criterion (Metals as Dis)	10.6	3.12	N/A	139.76	11	3.98
Most Stringent Single-Value Criterion (Metals as TR)	200	50	N/A	2000	N/A	N/A
Reasonable Potential?	**YES**	**YES**	**NO**	**NO**	**YES**	**YES**
June						
Ambient Concentration (Metals as Dis)	1.99	0.05	0.05	21.00	0.00	0.228
Acute Conversion Factor	0.960	0.956	0.850	0.978	1.000	1
Chronic Conversion Factor	0.960	0.956	0.850	0.986	1.000	1
Maximum Acute RWC (Metals as Dis)	6.36	0.70	0.24	28.75	26.254	1.930
Maximum Chronic/Single Value RWC (Metals as Dis)	5.7	0.6	0.2	27.6	22.161	0.890
Acute Aquatic Life Criterion (Metals as Dis)	4.63	18.48	0.49	44.92	19	11.4
Chronic Aquatic Life Criterion (Metals as Dis)	3.41	0.72	N/A	45.29	11	3.98
Most Stringent Single-Value Criterion (Metals as TR)	200	50	N/A	2000	N/A	N/A
Reasonable Potential?	**YES**	**NO**	**NO**	**NO**	**YES**	**NO**
July thru September						
Ambient Concentration (Metals as Dis)	1.99	0.05	0.05	21.00	0	0.228
Acute Conversion Factor	0.960	1.013	0.850	0.978	1	1
Chronic Conversion Factor	0.960	1.013	0.850	0.986	1	1
Maximum Acute RWC (Metals as Dis)	3.19	0.24	0.10	23.1	7.21	0.695
Maximum Chronic/Single Value RWC (Metals as Dis)	2.8	0.2	0.1	22.4	4.66	0.409
Acute Aquatic Life Criterion (Metals as Dis)	3.21	11.94	0.25	32.3	19	11.4
Chronic Aquatic Life Criterion (Metals as Dis)	2.44	0.47	N/A	32.6	11	3.98
Most Stringent Single-Value Criterion (Metals as TR)	200	50	N/A	2000	N/A	N/A
Reasonable Potential?	**YES**	**NO**	**NO**	**NO**	**NO**	**NO**

October						
Parameter	**Copper**	**Lead**	**Silver**	**Zinc**	**Chlorine**	**Ammonia (mg/L)**
Data Source	**Effluent**	**Effluent**	**Effluent**	**Effluent**	**TBEL[1]**	**Effluent**
Ambient Concentration (Metals as Dis)	1.99	0.05	0.05	21.00	0	0.2275
Acute Conversion Factor	0.960	0.922	0.850	0.978	1	1
Chronic Conversion Factor	0.960	0.922	0.850	0.986	1	1
Maximum Acute RWC (Metals as Dis)	4.62	0.43	0.16	25.7	15.813	1.253
Maximum Chronic/Single Value RWC (Metals as Dis)	2.8	0.2	0.1	22.4	4.658	0.409
Acute Aquatic Life Criterion (Metals as Dis)	5.76	24.0	0.74	54.7	19	11.4
Chronic Aquatic Life Criterion (Metals as Dis)	4.15	0.93	N/A	55.2	11	3.98
Most Stringent Single-Value Criterion (Metals as TR)	200	50	N/A	2000	N/A	N/A
Reasonable Potential?	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

Appendix E: Effluent Limit Calculations for pH

The following tables demonstrate how appropriate effluent limitations were determined for pH.

The pH at the edge of the mixing zone is a function of effluent and ambient pH, temperature, and alkalinity. The critical alkalinity is the minimum for the ambient water and the maximum for the effluent. The critical pHs for the upper pH limit are the maximum effluent pH limit and the 95th percentile ambient pH. The critical pHs for the lower pH limit are the minimum effluent pH limit and the 5th percentile ambient pH. The critical temperatures are the minimum ambient temperature and 95th percentile effluent temperature for the high pH critical condition and the maximum ambient temperature and the 5th percentile effluent temperature for the low pH critical conditions. Once the ambient pH, temperature and alkalinity and effluent temperature and alkalinity were input into the spreadsheet, EPA adjusted the effluent pH in 0.1 standard unit intervals until the pH at the edge of the mixing zone was between 6.5 and 8.5 standard units, as required by the water quality standards. EPA did not evaluate effluent pHs above 9.0 standard units or below 6.0 standard units, because this is the range of the technology-based effluent limits for pH.

Table E-1: pH Effluent Limit Calculation for High pH Critical Condition				
Season	**Nov-May**	**June**	**Jul-Sep**	**Oct**
Input				
1. Dilution Factor at Mixing Zone Boundary	5.35	33.8	161	79.2
2. Upstream/Background Characteristics				
Temperature (deg C):	0.70	4.50	1.50	3.30
pH:	7.60	7.60	7.60	7.60
Alkalinity (mg CaCO3/L):	19.00	13.00	5.88	9.00
3. Effluent Characteristics				
Temperature (deg C):	19.10	19.10	19.10	19.10
pH:	**9.00**	**9.00**	**9.00**	**9.00**
Alkalinity (mg CaCO3/L):	160.00	160.00	160.00	160.00
Output				
1. Ionization Constants				
Upstream/Background pKa:	6.56	6.52	6.55	6.53
Effluent pKa:	6.39	6.39	6.39	6.39
2. Ionization Fractions				
Upstream/Background Ionization Fraction:	0.92	0.92	0.92	0.92
Effluent Ionization Fraction:	1.00	1.00	1.00	1.00
3. Total Inorganic Carbon				
Upstream/Background Total Inorganic Carbon (mg $CaCO_3$/L):	20.74	14.08	6.41	9.77
Effluent Total Inorganic Carbon (mg $CaCO_3$/L):	160.39	160.39	160.39	160.39
4. Conditions at Mixing Zone Boundary				
Temperature (deg C):	4.14	4.93	1.61	3.50
Alkalinity (mg CaCO3/L):	45.34	17.34	6.84	10.91
Total Inorganic Carbon (mg CaCO3/L):	46.83	18.40	7.36	11.67
pKa:	6.52	6.51	6.55	6.53
pH at Mixing Zone Boundary:	**8.0**	**7.7**	**7.7**	**7.7**

Table E-2: pH Effluent Limit Calculation for Low pH Critical Condition				
Season	**Nov-May**	**June**	**Jul-Sep**	**Oct**
Input				
1. Dilution Factor at Mixing Zone Boundary	5.35	33.8	161	79.2
2. Upstream/Background Characteristics				
Temperature (deg C):	5.26	8.20	10.10	7.40
pH:	6.545	6.545	6.545	6.545
Alkalinity (mg CaCO3/L):	19.0	13.0	5.88	9.00
3. Effluent Characteristics				
Temperature (deg C):	10.2	10.2	10.2	10.2
pH:	**6.50**	**6.40**	**6.30**	**6.30**
Alkalinity (mg CaCO3/L):	160	160	160	160
Output				
1. Ionization Constants				
Upstream/Background pKa:	6.51	6.48	6.46	6.49
Effluent pKa:	6.46	6.46	6.46	6.46
2. Ionization Fractions				
Upstream/Background Ionization Fraction:	0.52	0.54	0.55	0.53
Effluent Ionization Fraction:	0.52	0.46	0.41	0.41
3. Total Inorganic Carbon				
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	36.58	24.23	10.75	16.92
Effluent Total Inorganic Carbon (mg CaCO3/L):	306.64	344.61	392.40	392.40
4. Conditions at Mixing Zone Boundary				
Temperature (deg C):	6.18	8.26	10.10	7.44
Alkalinity (mg CaCO3/L):	45.34	17.34	6.84	10.91
Total Inorganic Carbon (mg CaCO3/L):	87.03	33.69	13.12	21.66
pKa:	6.50	6.48	6.46	6.49
pH at Mixing Zone Boundary:	**6.54**	**6.51**	**6.50**	**6.50**

Appendix F: WQBEL Calculations - Aquatic Life Criteria

The following calculations demonstrate how the water quality-based effluent limits (WQBELs) in the draft permit were calculated. The WQBELs for copper, lead, ammonia and chlorine are intended to protect aquatic life criteria. The following discussion presents the general equations used to calculate the water quality-based effluent limits, then works through the calculations for the November-May copper WQBEL as an example. The calculations for all WQBELs based on aquatic life criteria are summarized in Table F-1.

A. Calculate the Wasteload Allocations (WLAs)

Wasteload allocations (WLAs) are calculated using the same mass balance equations used to calculate the concentration of the pollutant at the edge of the mixing zone in the reasonable potential analysis (Equations D-6 and D-7). To calculate the wasteload allocations, C_d is set equal to the acute or chronic criterion and the equation is solved for C_e. The calculated C_e is the acute or chronic WLA. Equation D-6 is rearranged to solve for the WLA, becoming:

$$C_e = WLA = D \times (C_d - C_u) + C_u \qquad \text{(Equation F-1)}$$

Alaska's water quality criteria for some metals are expressed as the dissolved fraction, but the Federal regulation at 40 CFR 122.45(c) requires that effluent limits be expressed as total recoverable metal. Therefore, EPA must calculate a wasteload allocation in total recoverable metal that will be protective of the dissolved criterion. This is accomplished by dividing the WLA expressed as dissolved by the criteria translator, as shown in equation F-2. As discussed in Appendix C, the criteria translator (CT) is equal to the conversion factor, because site-specific translators are not available for this discharge.

$$C_e = WLA = \frac{D \times (C_d - C_u) + C_u}{CT} \qquad \text{(Equation F-2)}$$

In the case of copper, for the acute criterion,

$$WLA_a = [5.09 \times (16.2 - 2.58) + 2.58]/0.960$$
$$\mathbf{WLA_a = 74.9\ \mu g/l}$$

For the chronic criterion,

$$WLA_c = [5.35 \times (10.6 - 2.58) + 2.58]/0.960$$
$$\mathbf{WLA_c = 47.4\ \mu g/l}$$

The next step is to compute the "long term average" concentrations which will be protective of the WLAs. This is done using the following equations from EPA's *Technical Support Document for Water Quality-based Toxics Control* (TSD):

$$LTA_a = WLA_a \times \exp(0.5\sigma^2 - z\sigma) \qquad \text{(Equation F-3)}$$
$$LTA_c = WLA_c \times \exp(0.5\sigma_4^2 - z\sigma_4) \qquad \text{(Equation F-4)}$$

where,

$\sigma^2 = \ln(CV^2 + 1)$
$\sigma = \sqrt{\sigma^2}$
$\sigma_4^2 = \ln(CV^2/4 + 1)$
$\sigma = \sqrt{\sigma_4^2}$
z = 2.326 for 99th percentile probability basis

In the case of copper, for the season of November though May,

$\sigma^2 = \ln(0.699^2 + 1) = 0.398$
$\sigma = \sqrt{\sigma^2} = 0.631$
$\sigma_4^2 = \ln(0.699^2/4 + 1) = 0.115$
$\sigma = \sqrt{\sigma_4^2} = 0.339$
z = 2.326 for 99th percentile probability basis

Therefore,

$LTA_a = 74.9\ \mu g/L \times \exp(0.5 \times 0.398 - 2.326 \times 0.631)$
$LTA_a = 21.1\ \mu g/L$

$LTA_c = 47.4\ \mu g/L \times \exp(0.5 \times 0.115 - 2.326 \times 0.339)$
$LTA_c = 22.8\ \mu g/L$

The LTAs are compared and the more stringent is used to develop the daily maximum and monthly average permit limits as shown below. For copper, from November through May, the acute LTA of 21.1 µg/L is more stringent.

B. Derive the maximum daily and average monthly effluent limits

Using the TSD equations, the MDL and AML effluent limits are calculated as follows:

$MDL = LTA \times \exp(z_m\sigma - 0.5\sigma^2)$ (Equation F-5)
$AML = LTA \times \exp(z_a\sigma_n - 0.5\sigma_n^2)$ (Equation F-6)

where σ, and σ² are defined as they are for the LTA equations (F-2 and F-3) and,

$\sigma_n^2 = \ln(CV^2/n + 1)$
$\sigma = \sqrt{\sigma_n^2}$
z_a = 1.645 for 95th percentile probability basis
z_m = 2.326 for 99th percentile probability basis
n = number of sampling events required per month (minimum of 4)

In the case of copper,

$$MDL = 21.1\ \mu g/L \times \exp(2.326 \times 0.631 - 0.5 \times 0.398)$$
$$\mathbf{MDL = 74.9\ \mu g/L}$$

$$AML = 21.1\ \mu g/L \times \exp(1.645 \times 0.339 - 0.5 \times 0.115)$$
$$\mathbf{AML = 34.8\ \mu g/L}$$

Table F-1, below, details the calculations for water quality-based effluent limits based on two-value aquatic life criteria.

Table F-1: Calculation of Effluent Limits Based on 2-Value Aquatic Life Criteria

Statistical Variables for Permit Limit Calculation

Parameter	Season	AML Prob'y Basis	MDL Prob'y Basis	LTA Prob'y Basis	# of Samples per Month[1]	Acute Dil'n Factor	Chronic Dil'n Factor	Ammonia Dil'n Factor
All	Nov-May	0.95	0.99	0.99	4	5.09	5.35	6.54
	June					28.6	33.8	73.4
	July-Sep					104	161	268
	October					47.4	79.2	151

Wasteload Allocations and Long Term Averages

Parameter	**Season**	WLA Acute	WLA Chronic	LTA Acute	LTA Chronic	LTA Coeff. Var. (CV)	Limiting LTA
		µg/L	µg/L	µg/L	µg/L	decimal	µg/L
Copper	Nov-May	74.9	47.4	21.1	22.8	0.699	21.1
	June	80.5	52.0	22.7	25.0	0.699	22.7
	July-Sep	134	78.1	37.7	37.6	0.699	37.6
Lead	Nov-May	529	16.2	98.1	5.54	1.114	5.54
Chlorine	Nov-May	96.7	58.9	25.6	27.1	0.748	25.6
	June	543	372	144	171	0.748	144
Ammonia (mg/L)	Nov-May	57.0	24.7	24.8	15.8	0.407	15.8

Water Quality Criteria, Ambient Conditions, and Effluent Limits

Parameter	Season	Metal Criteria Translator		Ambient Conc.	Water Quality Criterion Acute	Water Quality Criterion Chronic	**Average Monthly Limit (AML)**	**Maximum Daily Limit (MDL)**
		Acute	Chronic	µg/L	µg/L	µg/L	**µg/L**	**µg/L**
Copper	Nov-May	0.960	0.960	2.584	16.20	10.61	**34.8**	**74.9**
	June	0.960	0.960	1.99	4.627	3.405	**37.4**	**80.5**
	July-Sep	0.960	0.960	1.99	3.209	2.443	**62.0**	**133**
Lead	Nov-May	0.762	0.762	1.00	80.10	3.121	**11.4**	**29.9**
Chlorine	Nov-May	1.000	1.000	0	19	11	**33.2**	**96.7**
	June	1.000	1.000	0	19	11	**186**	**543**
Ammonia (mg/L)	Nov-May	1.000	1.000	0.23	11.37	3.98	**21.6**	**36.4**

Notes:
1. There are 20 samples per month for chlorine, the default value of 4 applies for all others

Appendix G: Essential Fish Habitat Assessment

Pursuant to the requirements for Essential Fish Habitat (EFH) assessments, this appendix contains the following information:

- Listing of EFH Species in the Facility Area
- Description of the Facility and Discharge Location
- EPA's Evaluation of Potential Effects to EFH

A. Listing of EFH Species in the Facility Area

All waterbodies used by anadromous salmon throughout Alaska must be considered for EFH identification. According to NOAA Fisheries, the Mendenhall River is a migrational corridor for sockeye, coho, chum, and pink salmon.

B. Description of the Facility and Discharge Location

The activities and sources of wastewater at the Juneau-Mendenhall waste water treatment facility are described in detail in Part II and Appendix A of this fact sheet. The location of the outfall is described in Part III ("Receiving Water").

C. EPA's Evaluation of Potential Effects to EFH

Water quality is an important component of aquatic life habitat. NPDES permits are developed to protect water quality in accordance with State water quality standards. The standards protect the beneficial uses of the waterbody, including all life stages of aquatic life. The development of permit limits for an NPDES discharger includes the basic elements of ecological risk analysis. The underlying technical process leading to NPDES permit requirements incorporates the following elements of risk analysis:

Effluent Characterization

Characterization of Juneau-Mendenhall's effluent was accomplished using a variety of sources, including:

- Permit application monitoring
- Permit compliance monitoring
- Statistical evaluation of effluent variability
- Quality assurance plans and evaluations

Identification of Pollutants of Concern and Threshold Concentrations

The pollutants of concern include pollutants with aquatic life criteria in the Alaska Water Quality Standards. Threshold concentrations are equal to the numeric water quality criteria for the protection of aquatic life. No other pollutants of concern were identified by NMFS.

Exposure and Wasteload Allocation

Analysis of the transport of pollutants near the discharge point with respect to the following:

- Mixing zone policies in the Alaska Water Quality Standards
- Dilution modeling and analysis
- Exposure considerations (e.g., prevention of lethality to passing organisms)
- Consideration of multiple sources and background concentrations

Statistical Evaluation for Permit Limit Development

Calculation of permit limits using statistical procedures addressing the following:

- Effluent variability and non-continuous sampling
- Fate/transport variability
- Duration and frequency thresholds identified in the water quality criteria

Monitoring Programs

Development of monitoring requirements, including:

- Compliance monitoring of the effluent
- Ambient monitoring

Protection of Aquatic Life in NPDES Permitting

EPA's approach to aquatic life protection is outlined in detail in the *Technical Support Document for Water Quality-based Toxics Control* (EPA/505/2-90-001, March 1991). EPA and states evaluate toxicological information from a wide range of species and life stages in establishing water quality criteria for the protection of aquatic life.

The NPDES program evaluates a wide range of chemical constituents (as well as whole effluent toxicity testing results) to identify pollutants of concern with respect to the criteria values. When a facility discharges a pollutant at a level that has a "reasonable potential" to exceed, or to contribute to an exceedance of, the water quality criteria, permit limits are established to prevent exceedances of the criteria in the receiving water (outside any authorized mixing zone).

Effects Determination

Since the proposed permit has been developed to protect aquatic life species in the Mendenhall River in accordance with the Alaska water quality standards, EPA has determined that issuance of this permit is not likely to adversely affect any EFH in the vicinity of the discharge. EPA will provide NMFS with copies of the draft permit and fact sheet during the public notice period. Any recommendations received from NMFS regarding EFH will be considered prior to reissuance of this permit.