ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – DRAFT

Permit Number: AK0021377

City of Kenai Wastewater Treatment Facility

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wastewater Discharge Authorization Program

555 Cordova Street

Anchorage, AK 99501

Public Comment Period Start Date: May 4, 2015
Public Comment Period Expiration Date: June 3, 2015
Alaska Online Public Notice System

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

CITY OF KENAI

For wastewater discharges from

City of Kenai Wastewater Treatment Facility
600 S. Spruce Street
Kenai, AK, 99611

The Alaska Department of Environmental Conservation (the Department or DEC) proposes to reissue an APDES individual permit (AK0021377) to the City of Kenai. The permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility and outlines best management practices to which the facility must adhere.

This fact sheet explains the nature of potential discharges from the City of Kenai Wastewater Treatment Facility and the development of the permit including:

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

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.

Commenters are requested to submit a concise statement on the permit condition(s) and the relevant facts upon which the comments are based. Commenters are encouraged to cite specific permit requirements or conditions in their submittals.

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. The Department will hold a public hearing whenever the Department finds, on the basis of requests, a significant degree of public interest in a draft permit. The Department may also hold a public hearing if a hearing might clarify one or more issues involved in a permit decision or for other good reason, in the Department's discretion. A public hearing will be held at the closest practicable location to the site of the operation. If the Department holds a public hearing, the Director will appoint a designee to preside at the hearing. The public may also submit written testimony in lieu of or in addition to providing oral testimony at the hearing. A hearing will be tape recorded. If there is sufficient public interest in a hearing, the comment period will be extended to allow time to public notice the hearing. Details about the time and location of the hearing will be provided in a separate notice.

All comments and requests for public hearings must be in writing and should be submitted to the Department at the technical contact address, fax, or email identified above (see also the public comments section of the attached public notice). Mailed comments and requests must be postmarked on or before the expiration date of the public comment period.

After the close of the public comment period and after a public hearing, if applicable, the Department will review the comments received on the draft permit. The Department will respond to the comments received in a Response to Comments document that will be made available to the public. If no substantive comments are received, the tentative conditions in the draft permit will become the proposed final permit.

The proposed final permit will be made publicly available for a five-day applicant review. The applicant may waive this review period. After the close of the proposed final permit review period, the Department will make a final decision regarding permit issuance. A final permit will become effective 30 days after the Department's decision, in accordance with the state's appeals process at 18 AAC 15.185.

The Department will transmit the final permit, fact sheet (amended as appropriate), and the Response to Comments to anyone who provided comments during the public comment period or who requested to be notified of the Department's final decision.

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

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

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

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

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

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

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

Documents are Available

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

Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, AK 99501 (907) 269-6285	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 410 Willoughby Avenue, Suite 310 Juneau, AK 99801 (907) 465-5180
Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 43335 Kalifornsky Beach Rd. - Suite 11 Soldotna, AK 99669 (907) 262-5210	

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1.0 APPLICANT

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

Name of Facility:	City of Kenai Wastewater Treatment Facility (KWWTF)
APDES Permit Number:	AK0021377
Facility Location:	600 S. Spruce Street, Kenai, AK 99611
Mailing Address:	210 Fidalgo Avenue, Kenai, AK 99611
Facility Contact:	Mr. Jerry Potter

The map in Fact Sheet Appendix A shows the location of the treatment facility and the discharge location.

2.0 FACILITY INFORMATION

The City of Kenai (City) owns, operates, and maintains a complete mix modification of an activated sludge secondary treatment facility located in Kenai, Alaska. The facility discharges treated municipal wastewater to Cook Inlet and generated sludge is transported to the Kenai Peninsula Borough Landfill located in Soldotna, Alaska. The facility serves a resident population of 3600; however, the City is a tourist area and the actual population is higher during summer months. The facility receives no significant industrial discharge, and the system has no combined sewers.

Design flow for KWWTF is 1.3 million gallons per day (mgd). Untreated wastewater enters the facility thru an influent manhole. The wastewater receives preliminary treatment by being processed through a muffin monster to pulverize solids. The wastewater is then distributed to four aeration basins through a splitter box. Although all four aeration basins can be used only three are typically used at a time. From the aeration basins, the flow goes through another splitter box to two secondary clarifiers. Effluent from the clarifiers then enters chlorination chambers where it is chlorinated with sodium hypochlorite for disinfection. At the end of the chamber, effluent is dechlorinated with sodium bisulfite.

The treated effluent discharges through a 12-inch outfall pipe that runs from the facility to mean high water and then 1300 feet perpendicular from the shoreline into Cook Inlet. Due to the shallow receiving area, the end of the effluent line is exposed during negative low tides.

Table 1 compares the facility design criteria with averages collected from January 2010 through December 2014.

Table 1: Design Criteria for KWWTF

Design Flow Rate	1.3 mgd
Average Monthly Flow - 1/2010 through 12/2014	0.54 mgd
Design Average Biological Oxygen Demand, 5-day (BOD_5) Load	2097 lbs/day [a]
Average BOD_5 Load – 1/2010 through 12/2014	1140 lbs/day
Design Average Total Suspended Solids (TSS) Load	1980 lbs/day
Average TSS Load - 1/2010 through 12/2014	1111 lbs/day
Note: a. lbs/day = pounds per day	

2.1 Background

The City was first issued a National Pollutant Discharge Elimination System (NPDES) permit by the Environmental Protection Agency (EPA) for the discharge of treated wastewater from KWWTF in 1973. KWWTF has, to date, continued to be permitted to discharge treated wastewater. The most recent EPA-issued permit (2008 permit) was issued on September 1, 2008 and expired on August 31, 2013.

In October 2008, the Alaska Department of Environmental Conservation (the Department or DEC) received approval from EPA to administer the NPDES Program in the State of Alaska. Under state regulations at Alaska Administrative Code Title 18 (18 AAC) 83.155(c), a permit may be administratively extended provided that the permittee submits a timely and complete application for a new permit prior to the expiration of the current permit. A timely application for a new permit was submitted by the City on March 4, 2013. The application was returned to the City for additional information, which was supplied to DEC on August 8, 2013. KWWTF has therefore been operating under an administrative extension of the NPDES permit until an APDES permit can be issued.

3.0 COMPLIANCE HISTORY

Discharge Monitoring Reports (DMRs) from September 1, 2008 to December 31, 2014 were reviewed to determine the facility's compliance with effluent limits. Since the 2008 permit became effective, the City has submitted DMRs each month as required in the permit.

During the Department's review of submitted DMR data, it was discovered that the City has been reporting a monthly minimum for BOD_5, TSS, and fecal coliform bacteria instead of the required monthly average for BOD_5 and TSS and the monthly geometric mean for fecal coliform bacteria. At the request of DEC, the City submitted the operational data for the facility dating back to September 2008 and this data was used to determine the actual monthly averages for BOD_5 and TSS and the monthly geometric mean for fecal coliform bacteria. These calculations were then used to determine if BOD_5, TSS, and fecal coliform bacteria concentrations exceeded the monthly limits imposed in the 2008 permit. Based on the review of the operational data, two exceedances of the BOD_5 average monthly limit were identified that were not previously reported on the DMRs. Table 2 presents permit limit exceedances both reported on the DMRs and calculated from the supplied operational data.

A requirement of the 2008 permit was to review, update, and implement the facility's Operation and Maintenance (O&M) Plan and Quality Assurance Plan (QAP). Written notice that the updates had been completed for both Plans were to be sent to EPA and DEC within 180 days after the effective date of the permit. The 2008 permit also required that a sign or signs should be placed on the shoreline to notify the public that there was a mixing zone. An inspection by DEC in March of 2009 noted that the QAP was not on site, however, the City responded to the inspection report and said the QAP was on site but the operator was unable to locate it. In December 2010, the Alaska Compliance and Enforcement Program contacted the City saying that a review of KWWTF's files showed that the City had not submitted notification that the O&M Plan and the QAP had been updated and that shoreline signs had not been installed. Since December 2010, the above three violations have been resolved.

Table 2: Permit Limit Exceedances

Parameter	Year(s)	Month(s)	Effluent Limit	Value Reported	Reported or Calculated
Daily Maximum Flow (mgd)	2010	February	1.44	1.45	Reported
	2013	January	1.44	1.50	Reported
BOD_5 Minimum Percent (%) Removal	2011	October	85	79.6	Reported
	2012	November	85	82.5	Reported
	2012	December	85	82.8	Reported
	2013	May	85	79.1	Reported
	2013	June	85	80.3	Reported
	2013	July	85	76.7	Reported
	2013	October	85	75.2	Reported
	2013	November	85	81.9	Reported
BOD_5 Monthly Average milligrams per liter (mg/L)	2011	October	30	30.8	Calculated
	2013	May	30	40.3	Calculated

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Permit Effluent Limits

The Clean Water Act (CWA) requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits (TBEL) or water quality-based effluent limits (WQBEL). A TBEL is set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the water quality standards (WQS) of a water body are met. A WQBEL may be more stringent than TBEL.

The permit contains a combination of both TBELs and WQBELs. The Department first determines if TBELs are required to be incorporated into the permit. TBELs for publicly owned treatment works (POTWs), which apply to the publicly owned KWWTF, are derived from the secondary treatment standards found in Title 40 Code of Federal Regulations (40 CFR) § 133.102 and adopted by reference at 18 AAC 83.010(e). The effluent limits imposed in the permit for BOD_5, BOD_5 percent removal, TSS, and TSS percent removal, are based on the secondary treatment standards. For pollutants of concern identified from DMR and application data with no associated TBELs, but that have reasonable potential to cause or contribute to an exceedance of water quality criteria, WQBELs are established to be protective of the designated uses of the receiving water. In cases where both TBELs and WQBELs are applicable, as in the

case with pH in the permit, the more stringent limit is retained as the final permit effluent limit. The basis for the effluent limits in the permit is provided in Appendix B.

4.2 Basis for Effluent and Receiving Water Monitoring

In accordance with Alaska Statute (AS) 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. Monitoring in a permit is required to determine compliance with effluent limits. Monitoring may also be required to gather effluent and receiving water data to determine if additional effluent limits are required and/or to monitor effluent impact on the receiving water body quality.

The permit also requires the permittee to perform effluent monitoring required by the APDES Form 2A application, so that this data will be available when the permittee applies to reissue its APDES permit. The permittee is responsible to conduct the monitoring and report results on DMRs or on the application for reissuance, as appropriate, to the Department.

4.3 Effluent Limits and Monitoring Requirements

The effluent limit changes being made in the 2015 APDES permit from those imposed in the 2008 permit are as follows: more restrictive fecal coliform bacteria effluent limits, more restrictive total residual chlorine effluent limits, the addition of ammonia effluent limits, and the addition of copper effluent limits. Table 3 presents a comparison of effluent limits included in the 2008 permit to those in the 2015 permit.

Table 3: Effluent Limit Comparison

Parameter	Average Monthly Limit		Average Weekly Limit		Maximum Daily Limit	
	2008 Permit	**2015 Permit**	**2008 Permit**	**2015 Permit**	**2008 Permit**	**2015 Permit**
BOD_5	30 mg/L 325 lbs/day [a]	30 mg/L 325 lbs/day	45 mg/L 488 lbs/day	45 mg/L 488 lbs/day	60 mg/L 650 lbs/day	60 mg/L 650 lbs/day
TSS	30 mg/L 325 lbs/day	30 mg/L 325 lbs/day	45 mg/L 488 lbs/day	45 mg/L 488 lbs/day	60 mg/L 650 lbs/day	60 mg/L 650 lbs/day
pH					6.5 – 8.5 SU [b]	6.5 – 8.5 SU
Fecal Coliform (FC) Bacteria	200 FC/100 mL [c]	14 FC/100 mL	400 FC/100 mL	-----	774 FC/100 mL	43 FC/100 mL
Total Residual Chlorine	0.023 mg/L	0.0075 mg/L	----	----	0.059 mg/L	0.013 mg/L
Ammonia as N	-----	14 mg/L	-----	21mg/L	-----	29 mg/L
Copper	-----	18 µg/L [d]	-----	27 µg/L	-----	36 µg/L

Notes:
a. lbs/day = pounds per day

b. SU = pH standard units
c. FC/100 mL = fecal coliform bacteria per 100 milliliters
d. µg/L = microgram per liter

The 2008 permit required the monitoring of ammonia but no effluent limits were set because previous monitoring did not indicate that there was reasonable potential for ammonia to exceed water quality criterion. During the 2008 permit cycle, 262 ammonia samples were collected and evaluated. It has been determined that there is reasonable potential to exceed applicable water quality criterion at the boundary of the mixing zone. Also during the 2008 permit cycle, copper was monitored in the effluent 13 times. This data has been evaluated and it has been determined that there is reasonable potential for copper to exceed applicable water quality criterion at the boundary of the mixing zone. When reasonable potential to exceed criteria has been determined, WQBELs must be imposed.

See Appendices B through D for more details on each of the changes. Table 4 summarizes the effluent limits and monitoring requirements.

Table 4: Effluent Limits and Monitoring Requirements

		Effluent Limits				Monitoring Requirements		
Parameter	**Units [a]**	**Minimum Daily**	**Average Monthly**	**Average Weekly**	**Maximum Daily**	**Sample Location**	**Sample Frequency**	**Sample Type**
Total Discharge Flow	mgd	…..	1.3	Report	1.44 [b]	Effluent	Continuous	Recorded
BOD_5	mg/L	…..	30	45	60	Effluent	2/Week	24-hour Composite [c]
	lbs/day	…..	325	488	650			
BOD_5	mg/L	…..	Report		Report	Influent	2/Week	24-hour Composite [c]
BOD_5 Percent Removal	%	…..	85 [d]	N/A	N/A	Influent and Effluent	1/Month	Calculated [e]
TSS	mg/L	…..	30	45	60	Effluent	3/Week	24-hour Composite [c]
	lbs/day	…..	325	488	650			
TSS	mg/L	…..	Report		Report	Influent	3/Week	24-hour Composite [c]
TSS Percent Removal	%	…..	85 [d]	…..	…..	Influent and Effluent	1/Month	Calculated [e]
Fecal Coliform Bacteria	FC/100 mL	…..	14 [f]	…..	43 [g]	Effluent	1/Week	Grab
Enterococci Bacteria	#/100 mL	…..	Report [f]		Report	Effluent	1/Week	Grab
pH	SU	6.5	…..	…..	8.5	Effluent	5/Week	Grab
Temperature	° C	…..	…..	…..	Report	Effluent	1/Month	Grab
Total Residual Chlorine	mg/L	…..	0.0075 [h]	…..	0.013 [h]	Effluent	6/Week	Grab
Total Ammonia, as Nitrogen (N)	mg/L	…..	14	21	29	Effluent	1/Month	24-hour Composite [b]
	lbs/day	…..	152	228	314			

		Effluent Limits				Monitoring Requirements		
Parameter	**Units [a]**	**Minimum Daily**	**Average Monthly**	**Average Weekly**	**Maximum Daily**	**Sample Location**	**Sample Frequency**	**Sample Type**
Total Recoverable Copper	µg/L	…..	18	27	36	Effluent	1/Quarter [i]	24-hour Composite [b]
	lbs/day	…..	195	293	390			
Total Recoverable Zinc	µg/L	…..	Report	…..	Report	Effluent	1/Quarter [i]	24-hour Composite [b]
Whole Effluent Toxicity (WET)	TUc	…..	…..	…..	Report	Effluent	See permit Section 1.5 for WET requirements	
APDES Application Form 2A Effluent Testing	varies	See Table 3 for a list of parameters and monitoring frequencies.						

Notes:

a. Units; mgd = million gallons per day, mg/L = milligrams per liter, lbs/day = pounds per day, % = percent, FC/100 ml = fecal coliform bacteria per 100 milliliters, #/100 mL = count per 100 milliliters, SU = pH standard units, ^{o}C = degree Celsius, µg/L = micrograms per liter, TUc = toxic units, chronic

b. Total discharge flow shall not exceed a maximum daily flow of 1.44 mgd.

c. Composite samples must consist of at least eight grab samples collected at equally spaced intervals and proportionate to flow so that composite samples reflect influent/effluent quality during the compositing period.

d. Average monthly % removal limits represent a monthly minimum.

e. Minimum percent removal = [(monthly average influent concentration in mg/L – monthly average effluent concentration in mg/L) / (monthly average influent concentration in mg/L)] X 100

f. All fecal coliform and enterococci bacteria average results must be reported as the geometric mean. When calculating the geometric mean, replace all results of zero, 0, with a one, 1. The geometric mean of "n" quantities is the "nth" root of the product of the quantities. For example the geometric mean of 100, 200, and 300 is $(100 \text{ X } 200 \text{ X } 300)^{1/3} = 181.7$

g. In a 30-day period, the geometric mean may not exceed 14 FC/100 mL and not more than 10 percent of samples may exceed 43 FC/100 mL.

h. Effluent limits for total residual chlorine are not quantifiable using EPA-approved analytical methods. The permittee will be in compliance with the effluent limits for chlorine provided the total residual chlorine levels are below the compliance evaluation level of 0.10 mg/L.

i. Quarter is defined as January-March, April-June, July-September, and October-December. Results for monitoring quarterly must be submitted with the DMR for the last month of the quarter: March, June, September, and December DMRs.

4.4 Effluent and Influent 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. The permittee has the option of taking more frequent samples than required under the permit. These additional samples shall be used for averaging if they are conducted using the Department – approved test methods (found in 18 AAC 70 and 40 CFR Part 136 [adopted by reference in 18 AAC 83.010]), and if the method detection limits (MDLs) are less than the effluent limits.

The permit requires monitoring of the effluent for BOD_5, TSS, fecal coliform bacteria, pH, ammonia, copper, flow, and total residual chlorine to determine compliance with the effluent limitations. The permit also requires monitoring of the influent for BOD_5 and TSS to calculate monthly removal rates for these parameters. In addition, the permit includes requirements to monitor the effluent for enterococci bacteria, zinc, and whole effluent toxicity (WET) in order to conduct future reasonable potential analysis to determine if discharges might cause an exceedance of applicable water quality criteria in the receiving water body. The permit requires

monitoring of the effluent temperature to help characterize the discharge. Table 4 presents the effluent and influent monitoring requirements.

Monitoring frequencies in the 2015 permit are the same as were required in the 2008 permit with the exception of the monitoring frequencies for the metals arsenic, cadmium, copper, silver, and zinc. Monitoring of copper and zinc has been increased to assure there is a significantly sized data set for the reasonable potential calculations for the next permit reissuance. The monitoring of effluent for arsenic, cadmium, and silver has been removed from the 2015 permit. Thirteen samples were taken during the 2008 permit cycle and analyzed for arsenic, cadmium, and silver. Results for all three metals were reported at concentrations well below the applicable water quality criteria. Expanded effluent testing requirements in APDES application Form 2A, requires three metals sampling events in the first four and one-half years of the permit term. The Department will use these three data results for arsenic, cadmium, and silver to verify continuation of concentrations below water quality criteria.

The permittee shall perform the additional effluent testing in the APDES application Form 2A for POTWs. The permittee shall submit the results of this additional testing with their application for reissuance of this APDES permit. The permittee shall consult and review Form 2A upon permit issuance to ensure that the required monitoring in the application will be completed prior to submitting a request for permit renewal. A copy of Form 2A can be found at: http://dec.alaska.gov/water/wwdp/index.htm.

4.5 Whole Effluent Toxicity Monitoring

18 AAC 83.435 requires that a permit contain limitations on WET when a discharge has reasonable potential to cause or contribute to an exceedance of a water quality criterion. Alaska water quality criteria at 18 AAC 70.023 states that effluents discharged to a water body may not impart chronic toxicity to organisms, expressed as 1.0 TUc, at the point of discharge, or if a mixing zone has been authorized, at or beyond the boundary of the mixing zone, based on the minimum effluent dilution achieved in the mixing zone.

WET tests are laboratory tests that measure total toxic effect of an effluent on living organisms. While quantities of individual pollutants can be analytically determined, these measurements alone may not be able to specifically identify observable toxic responses, biological availability, and complex interactions within the effluent. WET tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. The two different durations of toxicity tests are acute and chronic. Acute toxicity tests measure survival over a 96-hour exposure. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure.

The 2008 permit for KWWTF required chronic toxicity to be conducted twice per year, once during the month of June and once during the month of December. If test results exceed a no observed effluent concentration (NOEC) of 18.0 TUc, further WET testing requirements were triggered. The trigger of 18.0 TUc was based on an effluent dilution in the mixing zone of 18:1. Of the 11 chronic toxicity tests conducted since the issuance of the 2008 permit, all sample results were reported as having a NOEC at 11.2% effluent, which equates to a concentration of less than 8.9 TUc. The data confirms that water quality criterion has been met at the boundary of the mixing zone. Although 8.9 TUc may not be the actual effluent chronic toxicity concentration,

it is the concentration that was used to determine reasonable potential to exceed water quality criteria at the end of pipe but not at the boundary of the chronic mixing zone.

State regulation 18 AAC 83.335 recommends chronic toxicity testing for facilities with dilution factors less than 100:1 at the boundary of the mixing zone; therefore the City will continue to collect effluent samples from the KWWTF discharge for WET testing. WET monitoring frequency will continue as was required in the 2008 permit, twice per year, once during the month of June and once during the month of December. The effluent dilution factor for the authorized chronic mixing zone in the 2015 permit will continue to be 18 and therefore the WET trigger will continue to be 18.0 TUc.

If WET results exceed the 18 TUc trigger, accelerated testing requirements in Section 1.5.5 of the permit become effective. If WET tests continue to exceed the 18 TUc trigger during the accelerated testing, the permittee must initiate a Toxicity Reduction Evaluation (TRE) in accordance with Section 1.5.6 of the permit. A TRE work plan will include the actions to be taken to investigate and identify the cause of toxicity, mitigate the impact of the discharge, and prevent the recurrence of toxicity.

4.6 Receiving Water Body Limits and Monitoring Requirements

The 2008 permit required monitoring of the receiving water body for fecal coliform bacteria and enterococci bacteria, once per month for five months in 2009. Monitoring the receiving water body for bacteria has been removed from the 2015 permit. Effluent limits in the 2015 permit have been set at water quality criteria for fecal coliform bacteria, therefore when effluent limits are being met there is no possibility that the discharge will cause or contribute to an exceedance of water quality criteria. Although no effluent limits were imposed in the 2008 permit for enterococci bacteria, all reported effluent results were less than EPA promulgated criteria. There is no indication that enterococci bacteria in the discharge will cause or contribute to an exceedance of EPA promulgated criteria at the end of the pipe.

The 2015 permit has added monitoring of the ambient receiving water body, beyond the boundary and outside the mixing zone, for ammonia, temperature, pH, and salinity. The data will be used to calculate ammonia criteria and, if applicable, to determine effluent limits in the next permit. Ambient receiving water body monitoring results must be submitted to DEC with the application for permit reissuance. Table 5 summarizes the ambient receiving water body monitoring requirements.

Table 5: Ambient Receiving Water Body Monitoring Requirements

Parameter	Units	Sampling Frequency	Sample Type
Total Ammonia as Nitrogen	mg/L	Quarterly [a]	Grab
Temperature	°C	Quarterly	Grab
pH	SU	Quarterly	Grab
Salinity	Grams/kilogram	Quarterly	Grab
Note			

Parameter	Units	Sampling Frequency	Sample Type
a. Quarterly is defined as once in each quarter, January – March, April – June, July – September, and October – December.			

5.0 RECEIVING WATER BODY

KWWTF discharges treated effluent into Cook Inlet at latitude 60º 33' 8" north, longitude 151º 16' 40" west. Cook Inlet is located in south-central Alaska, stretching 180 miles from the Gulf of Alaska to Anchorage. Cook Inlet provides navigable access to Anchorage, smaller cities such as Homer and Kenai, and many villages and communities along Cook Inlet's shoreline. Tidal currents in Cook Inlet flow predominately northeast and southwest with very low cross-component flow. The tidal currents are semi-diurnal in nature with slightly stronger flood tides (northerly) as compared to the ebb tides (southerly), which is typical for the eastern side of Cook Inlet.

5.1 Water Quality Standards

Regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the Alaska Water Quality Standards (WQS). The state's WQS are composed of use classifications, numeric and/or narrative water quality criteria, and an antidegradation policy. The use classification system designates the beneficial uses that each 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 antidegradation policy ensures that the beneficial uses and existing water quality are maintained.

Water bodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some water bodies in Alaska can also have site–specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). Cook Inlet has not been reclassified, nor have site-specific water quality criteria been established in the vicinity of the KWWTF discharge. Therefore, Cook Inlet must be protected for all marine designated use classes listed in 18 AAC 70.020(a).

5.2 Water Quality Status of Receiving Water

Any part of a water body for which the water quality does not or is not expected to meet applicable WQS is defined as a "water quality limited segment" and placed on the state's impaired water body list. Cook Inlet is not included on the *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report,* July 15, 2010.

5.3 Mixing Zone Analysis

In accordance with state regulations at 18 AAC 70.240, as amended through June 26, 2003, the Department may authorize a mixing zone in a permit.

The City submitted an APDES Mixing Zone Application Form 2M requesting a mixing zone be authorized in the reissued permit. The request was for a mixing zone size equal to that authorized in the 2008 permit, and for the pollutants; fecal coliform bacteria, dissolved oxygen, pH, total residual chlorine, metals, nutrients, and WET. Modeling inputs and outcomes used in making mixing zone determinations for the 2008 permit were submitted with Form 2M.

Submitted data from January 2010 through December 2014 for the pollutants that the permittee requested a mixing zone were reviewed to determine if a mixing zone was appropriate for these parameters. Mixing zone modeling was also reproduced to verify previous outcomes. As a result of the reviews, the discharge from KWWTF is assigned a chronic mixing zone for ammonia, copper, zinc, and WET and an acute mixing zone for ammonia, copper, and zinc. The Department determined that fecal coliform bacteria, dissolved oxygen, pH, total residual chlorine, nutrients (with the exception of ammonia), and metals (with the exception of copper and zinc) do not necessitate dilution from a mixing zone. Permit limits must be met at the end of the effluent pipe prior to discharge into Cook Inlet. Those pollutants that are authorized the mixing zone must meet water quality criteria at the boundary of the mixing zone.

Appendix E, Mixing Zone Analysis Checklist, outlines criteria that must be considered when the Department analyzes a permittee's request for a mixing zone. These criteria include the size of the mixing zone, treatment technology, existing uses of the water body, human consumption, spawning areas, human health, aquatic life, and endangered species. All criteria must be met in order to authorize a mixing zone. The following summarizes this analysis:

Size In accordance with 18 AAC 70.255, as amended through June 26, 2003, the Department determined that the size of the mixing zone for the KWWTF wastewater discharge is appropriate.

An acute mixing zone is sized to prevent lethality to passing organisms, while a chromic mixing zone is sized to protect the ecology of the water body as a whole. According to EPA (1991), lethality to passing organisms would not be expected if an organism passing through the plume along the path of maximum exposure is not exposed to concentrations exceeding the acute criteria when averaged over a one hour time period. Furthermore, the travel time of an organism drifting through the acute mixing zone must be less than approximately 15 minutes if a one-hour average exposure is not to exceed the acute criterion.

Information submitted by the permittee as well as DEC updated information was used to reproduce modeling runs conducted for the 2008 permit. Site and facility specific variables were entered into CORMIX, a conceptual modeling program, to determine the behavior of the effluent. Information used to determine a mixing zone size through CORMIX includes characteristics of the receiving water and the effluent discharge, as well as local geographical conditions and physical characteristics of the outfall.

Some modifications were made to the modeling inputs from those used for the 2008 permit mixing zone determinations. Changes were made to the effluent flow rate, the ambient density, and ambient flow velocity. The facility design flow rate was used in the current CORMIX modeling and the ambient density used was change to reflect updated ambient temperature and salinity. Four runs were conducted for each of the three pollutants using four ambient velocities (0.2 m/s, 0.6 m/s, 1.0 m/s, and 1.7 m/s). The varying ambient velocities were to simulate varying tidal velocities. The Department determined that, although there was a need to modify some of the modeling input values used in determining the 2008 authorized mixing zone, previous modeling conclusions are still accurate.

The chronic mixing zone size will continue to be defined as the area within a circle, 150 meter radius, centered on the end of the outfall pipe and extending from the marine bottom to the surface. The chronic mixing zone for this discharge at times when the end of the pipe is not under water due to tidal fluctuations, is defined as the area within a half circle of 150 meter

radius, centered on the point where the effluent enters marine water. The chronic mixing zone has a dilution factor of 18:1.

The 2008 permit did not authorize an acute mixing zone. Effluent data from January 2010 through December 2014 were analyzed and the Department determined that ammonia, copper, and zinc acute criteria will not be met at the end of the pipe and therefore an acute mixing zone in authorized in this permit based on available assimilative capacity and modeling. Of the three pollutants, copper requires the most dilution to meet applicable acute water quality criteria. Since issuance of the 2008 permit, the effluent monitoring for copper occurred 13 times. Sample results ranged from 6.9 µg/L to 35.8 µg/L with an average of 14.8 µg/L. Due to the high variability of the data and the small size of the data set, the statistically calculated maximum projected concentration was greater than twice the maximum reported concentration. The Department determined that sizing of the acute mixing zone based on the maximum reported concentration and not the maximum projected concentration, and imposing effluent limits based on the resulting dilution would more realistically reflect copper concentrations in the effluent.

The acute mixing zone for this discharge is defined as the area within a circle of seven meter radius, centered on the end of the outfall pipe and extending from the marine bottom to the surface. The acute mixing zone for this discharge at times when the end of the pipe is not under water due to tidal fluctuations, is defined as the area within a half circle of seven meter radius, centered on the point where the effluent enters marine water. The acute mixing zone has a dilution factor of 6.7:1.

Given the small size of the acute mixing zone, the high tidal velocities in Cook Inlet, and the short time interval between effluent leaving the end of the pipe and achieving compliance with acute water quality criteria for ammonia, copper, and zinc, (CORMIX modeling indicates that a drifting organism passing through the acute mixing zone will be exposed to acute concentrations for no longer than 31 seconds), it is improbable that any organism would be present in the acute mixing zone for 15 minutes or longer. Acute aquatic life criteria apply at and beyond the boundary of this smaller initial mixing zone surrounding the outfall.

Technology In accordance with 18 AAC 70.240(a)(3), as amended through June 26, 2003, the Department finds that available evidence reasonably demonstrates that the effluent from KWWTF will be treated to remove, reduce, and disperse pollutants using methods found by the Department to be the most effective and technologically and economically feasible, consistent with the highest statutory and regulatory treatment requirements.

Wastewater operations at KWWTF generally meet and occasionally exceed secondary treatment requirements. The system includes preliminary treatment of influent by removal of solids and grit followed by biological treatment in aeration basins, clarification and disinfection by chlorination/dechlorination. The treatment methods incorporated at KWWTF are commonly employed and accepted for treatment of similar discharges throughout the United States.

Existing Use In accordance with 18 AAC 70.245, as amended through June 26, 2003, the mixing zone has been appropriately sized to fully protect the existing uses of Cook Inlet. The WQS at 18 AAC 70.020(a) classifies Cook Inlet as protected for the following marine water uses: aquaculture, seafood processing, and industrial water supply; contact and secondary water recreation; growth and propagation of fish, shell fish, aquatic life and wildlife; and harvesting for the consumption of raw mollusks or other raw aquatic life. The existing uses have been

maintained and protected under the terms of the previous permit. The mixing zone authorization does not propose any modifications that would result in changes to existing uses.

Human Consumption Under the conditions of the permit, and in accordance with 18 AAC 70.250(b)(2) and (b)(3), as amended through June 26, 2003, the pollutants discharged cannot produce objectionable color, taste, or odor in aquatic resources harvested for human consumption; nor can the discharge preclude or limit established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. There has been no indication that established fishing or shellfish harvesting has been precluded by the discharge, and signs are required to be posted to inform the public that certain activities such as harvesting of aquatic life for raw consumption and primary contact recreation should not take place in the mixing zone. The Department finds that the permit requirements will be protective of the water body's uses.

Spawning Areas In accordance with 18 AAC 70.255(h), as amended through June 26, 2003, the mixing zone is not authorized in a known spawning area for anadromous fish or resident fish spawning redds for chum salmon, coho salmon, pink salmon, sockeye salmon, Dolly Varden, and steelhead trout. The Alaska Department of Fish and Game (ADF&G) interactive regulatory and interactive essential fish habitat (EFH) maps at http://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=maps.maps do not indicate any EFH, to include spawning areas, in the vicinity of KWWTF. The Department determines 18 AAC 70.255(h) to be met.

Human Health In accordance with 18 AAC 70.250 and 18 AAC 70.255, as amended through June 26, 2003, the mixing zone authorized in the permit shall be protective of human health and will not result in pollutants discharged at levels that will bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota, or at levels that otherwise will create a public health hazard through encroachment on a water supply or contact recreation uses. An analysis of the effluent testing data that was included with KWWTF wastewater discharge application and the results of the reasonable potential analysis conducted on pollutants of concern indicate that the level of treatment at KWWTF is protective of human health. The quality of the effluent is required to meet water quality criteria either at the end of pipe or the boundary of the authorized mixing zone. (See Appendix C)

Aquatic Life and Wildlife In accordance with 18 AAC 70.250 and 18 AAC 70.255, as amended through June 26, 2003, the mixing zone authorized in the permit shall be protective of aquatic life and wildlife. Pollutants for which the mixing zone will be authorized will not accumulate in concentrations outside of the mixing zone that are undesirable, present a nuisance to aquatic life, cause permanent or irreparable displacement of indigenous organisms, or result in a reduction in fish or shellfish population levels. Based on a review of effluent data (including WET testing results) and mixing zone modeling, the Department concludes that the discharge will meet all water quality criteria at the boundary of and outside the mixing zone.

Endangered Species In accordance with 18 AAC 70.250(a)(2)(D), as amended through June 26, 2003, the authorized mixing zone will not cause an adverse effect on threatened or endangered species. The National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) were contacted, as noted in Section 9.2 and Section 9.3. Some listed species do exist in the vicinity of the facility. DEC has determined that issuance of this permit is unlikely to affect any of the threatened or endangered species in the vicinity of the discharge. DEC will

provide a copy of the permit and fact sheet to NMFS and USFWS when it is public noticed. Any comments received from the agencies regarding ESA will be considered prior to issuance of the permit.

6.0 ANTIBACKSLIDING

18 AAC 83.480 requires that "effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit." 18 AAC 83.480(c) also states that a permit may not be reissued "to contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time the permit is renewed or reissued." The permit effluent limits in this permit reissuance are as stringent as in the previous permit and therefore consistent with 18 AAC 83.430.

Effluent limitations may be relaxed under two categories as allowed under 18 AAC 83.480 (CWA §402(o)) and CWA §303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation. CWA §303(d)(4)(A) states that, for water bodies where the water quality does not meet applicable water quality standards, effluent limitations may be revised under two conditions; the revised effluent limitation must ensure the attainment of the water quality standard (based on the water body's total maximum daily load or the waste load allocation) or the designated use which is not being attained is removed in accordance with the water quality standard regulations. CWA §303(d)(4)(B) states that, for water bodies where the water quality meets or exceeds the level necessary to support the water body's designated uses, water quality-based effluent limitations may be revised as long as the revision is consistent with the State's antidegradation policy. Even if the requirements of CWA §303(d)(4) or 18 AAC 83.480(b) are satisfied 18 AAC 83.480(c) prohibits relaxed limits that would result in violations of WQS or effluent limitation guidelines.

Monitoring the effluent for fecal coliform bacteria and enterococci bacteria will continue at the 2008 permit frequency; however, receiving water monitoring for bacteria has been removed. The 2008 permit required only five samples to be taken during the summer months of 2009. During the 2008 permit cycle, KWWTF has been disinfecting treated effluent prior to discharging and effluent fecal coliform bacteria concentrations have consistently been below the applicable water quality criteria. The Department determined that reducing the effluent limits for fecal coliform bacteria is appropriate. Effluent fecal coliform bacteria limits have been set equal to water quality criteria and a mixing zone for fecal coliform bacteria is no longer authorized. If the newly imposed effluent limits for fecal coliform bacteria are met, it is reasonable to assume the discharge will not cause or contribute to an exceedance of water quality criteria in the receiving water.

The 2008 permit required the monitoring, twice per year, of arsenic, cadmium, copper, silver, and zinc. Submitted effluent data from December 2009 through December 2014 were reviewed to identify which metals were pollutants of concern. Arsenic, cadmium, and silver consistently reported concentrations less than the most stringent applicable water quality criteria. Accordingly, these pollutants are no longer considered pollutants of concern. Based on the new information, DEC has determined that the discharge does not have reasonable potential to cause or contribute to a water quality criteria violation for arsenic, cadmium, and silver and therefore twice per year monitoring has been removed. See Table 6 for a summary of the reviewed metals data.

Table 6: Metals Data Summary

Pollutant	Unit	Number of Samples [a]	Maximum Reported [b]	Most Stringent Water Quality Criterion [b]
Arsenic	µg/L	12	12	36
Cadmium	µg/L	13	<0.5	8.9
Copper	µg/L	13	35.8	3.7
Silver	µg/L	13	<1.0	2.2
Zinc	µg/L	13	140	86.1

Note
a. Sample count is from December 1, 2009 through December 31, 2014.
b. Concentrations are as total recoverable metals. Criteria has been converted from dissolved metals using conversion factors, if applicable.

7.0 ANTIDEGRADATION

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. The Antidegradation Policy of the WQS (18 AAC 70.015) states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected. This section analyzes and provides rationale for the Department's decisions in the permit issuance with respect to the Antidegradation Policy.

The Department's approach to implementing the Antidegradation Policy, found in 18 AAC 70.015, is based on the requirements in 18 AAC 70 and the Department's *Policy and Procedure Guidance for Interim Antidegradation Implementation Methods*, dated July 14, 2010. Using these procedures and policy, the Department determines whether a water body, or portion of a water body, is classified as Tier 1, Tier 2, or Tier 3, where a higher numbered tier indicates a greater level of water quality protection. At this time, no Tier 3 waters have been designated in Alaska. Cook Inlet is not listed as impaired on DEC's most recent *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*; therefore, a Tier 1 designation is not warranted. Accordingly, this antidegradation analysis conservatively assumes that the discharge is to a Tier 2 water body.

The State's Antidegradation Policy in 18 AAC 70.015(a)(2) states that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water (i.e. Tier 2 waters), that quality must be maintained and protected. The Department may allow a reduction of water quality only after finding that five specific requirements of the antidegradation policy at 18 AAC 70.015(a)(2)(A)-(E) are met. The Department findings follow:

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

Based on the evaluation required under 18 AAC 70.015(a)(2)(D) below, the Department has determined that the most reasonable and effective polluting prevention, control, and treatment methods are being used and that the localized lowering of water quality is necessary.

KWWTF has been in operation since 1973 and presently provides collection and treatment of wastewater for a year round population of 3,600 residents. The tourist industry has been one of the fastest growing sectors in the Kenai area. Kenai's scenic setting amid diverse natural resources is an important economic and recreational asset. The Kenai River is a famous sport fishing destination and is one of the attractions that contributes to an increase in the City's population during the summer months. The commercial fishing, charter fishing, and the seafood processing industries, while cyclical, provide an important economic benefit to the community. These industries rely upon numerous local venders to supply and support their business and offer employment opportunities for the local population.

KWWTF provides collection and treatment services to individual homes and businesses that support the local population as well as businesses that support economically important industries. Continued operation of KWWTF is an essential part of maintaining an economically stable community and for protecting human health and the environment from the adverse effects of untreated domestic wastewater.

The Department concludes that the operation of KWWTF and the authorization of the discharge are necessary to accommodate the economic or social development of the City of Kenai and that the finding is met.

2. **18 AAC 70.015 (a)(2)(B).** Except as allowed under this subsection, reducing water quality will not violate the applicable criteria of 18 AAC 70.020 or 18 AAC 70.235 or the whole effluent toxicity limit in 18 AAC 70.030.

The permit reissuance application does not propose any changes that would likely result in wastewater of lower quality to be discharged from the KWWTF than has been discharged under the previously issued NPDES permits. The water quality criteria in 18 AAC 70.020 are the basis for the permit effluent limits and serve the specific purpose of protecting the existing and designated uses. Modeling results and the results of monitoring data submitted during the previous permit cycle indicate the discharge authorized by the permit conform to the requirements of 18 AAC 70.020.

The Department has not established or adopted site-specific criteria for Cook Inlet in the vicinity of the discharge. Therefore, criteria allowed by 18 AAC 70.235 have not been violated by issuance of this permit.

To ensure the applicable water quality criteria in 18 AAC 70.030 will be met at the boundary of the authorized mixing zone, WET testing will continue to be conducted twice per year as was required in the 2008 permit. The permit also requires accelerated testing be conducted if chronic toxicity in the effluent exceeds a trigger concentration. If the accelerated test also exceed the trigger concentration, the permit requires further action to investigate and identify the cause of toxicity.

The Department has determined that the reduction in water quality will not violate applicable criteria found in 18 AAC 70.020, 18 AAC 70.325, or 18 AAC 70.030 and that this requirement has been met.

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

   WQS, upon which the permit effluent limits are based, serve the specific purpose to protect existing and designated uses of the receiving water. The list of the uses Cook Inlet is protected for can be found in this fact sheet, Section 5.3, Existing Uses. Cook Inlet is protected for all designated uses; therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (2008) were selected for use in the reasonable potential analysis (RPA) of KWWTF effluent. This will ensure that the resulting water quality at and beyond the boundary of the authorized mixing zone will fully protect all designated uses of the receiving water body.

   The Department concludes the water quality of the receiving waters will be adequate to protect all existing uses and therefore this finding is satisfied.

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

   The methods of prevention, control, and treatment the Department finds to be most effective and reasonable are currently in use at the facility and include meeting federal (40 CFR 133) and State (18 AAC 72.050) secondary treatment requirements as well as disinfecting the effluent prior to discharge. The type of treatment employed at KWWTF is similar in nature to other like facilities and their discharges throughout the United States, including Alaska. The permit requires that KWWTF has both a Quality Assurance Project Plan (QAPP) and an Operations and Maintenance (O&M) Plan to ensure protocol for discharging adequately treated wastewater is followed to the extent feasible. Both plans are to be kept updated.

   The Department concludes that the finding to address pollution prevention, control, and treatment is met.

5. **18 AAC 70.015(a)(2)(E).** All wastes and other substances discharged will be treated and controlled to achieve (i) for new and existing point sources, the highest statutory and regulatory requirements; and (ii) for nonpoint sources, all cost-effective and reasonable best management practices.

   The applicable "highest statutory and regulatory treatment requirements" are defined in 18 AAC 70.990(30) (as amended June 26, 2003) and in the Department's *Policy and Procedure Guidance for Interim Antidegradation Implementation Methods*. Accordingly, there are three parts to the definition:

   (A) any federal technology-based effluent limitation guidelines identified in 40 CFR § 125.3 and 40 CFR § 122.29, as amended through August 15, 1997, both adopted by reference at 18 AAC 83.010;

   (B) minimum treatment standards in 18 AAC 72.040; and

   (C) any treatment requirement imposed under another state law that is more stringent than a requirement of this chapter.

The first part of the definition includes all federal technology-based effluent limit guidelines, including "For POTWs, effluent limitations based upon …..Secondary Treatment" at 40 CFR § 125.3(a)(1) defined at 40 CFR § 133.102, adopted by reference at 18 AAC 83.010(e), which are incorporated in this permit.

The second part of the definition 18 AAC 70.990(B) (2003) appears to be in error, as 18 AAC 72.040 describes discharges to sewers and not minimum treatment. The correct reference appears to be the minimum treatment standards found at 18 AAC 72.050, which refers to domestic wastewater discharges only. The authorized domestic wastewater discharge is in compliance with the minimum treatment standards found in 18 AAC 72.050 as reflected by the permit limits specifying secondary treatment standards.

The third part includes any more stringent treatment required by state law, including 18 AAC 70 and 18 AAC 72. The correct operation of equipment, water quality monitoring, and implementation of secondary treatment standards for the domestic wastewater discharge (40 CFR 133 and 18 AAC 72.050) will control the discharge and satisfy all applicable state requirements.

After review of the applicable statutory and regulatory requirements, including 18 AAC 70, 18 AAC 72, and 18 AAC 83, the Department finds that the discharge from KWWTF meets the highest applicable statutory and regulatory requirements and that the finding is met.

8.0 OTHER PERMIT CONDITIONS

8.1 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to update the QAPP within 120 days of the effective date of the final permit. Additionally, the permittee must submit a letter to the Department within 120 days of the effective date of the permit stating that the plan has been implemented within the required time frame. The QAPP shall consist of standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples; laboratory analysis; and data reporting. The permittee is required to amend the QAPP whenever any procedure addressed by the QAPP is modified. The plan shall be retained on site and made available to the Department upon request.

8.2 Operation and Maintenance Plan

The permit requires the permittee 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 permittee is required to submit written notice to DEC within 120 days of the effective date of the permit stating that an O&M plan for its facility has been developed or updated and implemented within 120 days of the effective date of the final permit. If an O&M plan has already been developed and implemented, the permittee need only to review the existing plan to make sure it is up to date and all necessary revisions are made. The plan shall be retained on site and made available to the Department upon request.

8.3 Compliance Schedule

In accordance with 18 AAC 83.435, APDES permits must include effluent limits as stringent as necessary to meet WQS. There are occasions when a permittee cannot immediately comply with a newly applied WQBEL upon the effective date of the permit because the permittee needs time to perform modifications to their facility or processes in order to meet the new WQBEL. In accordance with 18 AAC 70.910 and 18 AAC 83.560, APDES permits may include a series of required steps and deadlines (i.e., a compliance schedule), which upon completion, enables the permittee to meet the permit's WQBEL. The compliance schedule establishes remedial measures in a permit, including an enforceable sequence of interim requirements such as actions, operations, or milestone events leading to compliance with the CWA. In addition, if compliance with the WQBEL is not achievable in one year, the permittee must submit regular status reports on the progress of achieving compliance.

During the 2008 permit issuance process, EPA determined that there was no reasonable potential for ammonia to exceed water quality criteria at the boundary of the authorized mixing zone and therefore did not include effluent ammonia limits in the permit; however, effluent ammonia monitoring was required monthly. At the time of EPA's reasonable potential analysis, the maximum reported effluent concentration was 3.83 mg/L. In the five years of data reviewed for the APDES reasonable potential analysis, January 2010 through December 2014, the permittee elected to take ammonia samples more frequently than the required monthly sampling, which resulted in 262 effluent samples analyzed for ammonia. The maximum reported effluent ammonia concentration during this five year time period was 45.3 mg/L with an average concentration reported of 17.8 mg/L. Based on DEC's reasonable potential analysis, reasonable potential to exceed ammonia water quality criteria at the boundary of the chronic mixing zone has been demonstrated and an ammonia WQBEL must be imposed. See Appendices C and D for more information on the reasonable potential analysis and WQBEL process.

Compliance with the newly imposed ammonia effluent limits must be met as soon as possible; however, the permittee is not able to comply upon the effective date of the permit given existing treatment plant limitations. In order to meet the new ammonia WQBEL, the permittee will need to identify the cause of the increase in ammonia concentrations since 2008 and determine a feasible solution. At the time of permit issuance, the identification of the increase in ammonia concentrations and solution for reduction has not yet begun and may involve major or minor treatment facility upgrades. Major upgrades could require several lengthy stages to reach completion. Obtaining funding for upgrades is one particular stage that can be lengthy in duration. The permittee can apply for funding from the State's Revolving Fund, but if they are not granted funds that year, they must wait to reapply the following year. Therefore, a compliance schedule with a maximum timeline of ten years will provide an appropriate and reasonable timeframe to achieve compliance with the new ammonia WQBEL. For minor upgrades or changes in processes, the timeline could be less than the maximum of ten years. Regardless of the solution, the final ammonia WQBEL must be met as soon as possible.

Because the compliance schedule will extend beyond one year, 18 AAC 83.560(b) states that interim requirements and dates for their achievement must be established. If the time to complete an interim requirement is more than one year and cannot easily be divided into stages for completion, a schedule for the submittal of annual progress reports must be included in the permit. Taking into account regulatory requirements and the fact that a timeline for completing

any possible upgrades would depend on when funding could be obtained, the following deadlines have been included in the permit:

- By six months after the effective date of the final permit, the permittee must provide a preliminary report to DEC evaluating the possible causes of the increased ammonia concentrations and outlining possible solutions with estimated costs and an estimate schedule for achieving final ammonia WQBEL for each possible solution.
- By one year after the effective date of the final permit, the permittee must submit a draft plan of action to DEC for review and approval. The draft plan must identify the chosen solution and the funding needed to enable the permittee to meet final ammonia WQBEL.
- As soon as possible but not to exceed four years after the effective date of the final permit, the permittee must obtain funding to complete the chosen alternative identified in the final DEC-approved plan of action. August 1 of the year funding is obtained will hereafter be referred to as the "funding date".
- By one year after the funding date, the permittee must submit a proposed construction schedule with dates for commencement and completion of major construction milestones leading to compliance with final ammonia effluent limits, (i.e., submitting engineered plans to DEC for review, executing contracts, commencing construction, completing construction, begin operating facility after upgrades). The construction schedule:
    - Must not have any single incremental milestone exceed one year,
    - Must be approved by DEC, and
    - Once approved, will become an enforceable part of this compliance schedule.
- The permittee must achieve compliance with the final ammonia WQBEL as soon as possible but no later than August 1, 2025.

While the compliance schedule is in effect, the permittee must comply with interim ammonia effluent limits and monitoring requirements as specified in Table 7. Interim ammonia effluent limits are based on facility performance. The 99th percentile of five years of data from January 2010 through December 2014 was used to set the average monthly and maximum daily limits. The weekly average limit is set equal to the daily maximum limit because, unless more than one sample is taken within a week, the maximum daily and average weekly concentrations will be reported as the same.

Table 7: Interim Ammonia Effluent Limits

Parameter	Units	Effluent Limits [a]			Monitoring Frequency		
		Average Monthly	Average Weekly	Maximum Daily	Sample Location	Sample Frequency	Sample Type
Total Ammonia, as Nitrogen (N)	mg/L	34	38	38	Effluent	1/Month	24-hour Composite
	lbs/day	369	412	412			

Note:
a. Final ammonia effluent limits are found in Section 4.3, Table 4.

Each year that the compliance schedule is in effect, the permittee must submit a progress report assessing the progress during the previous year towards meeting the incremental milestones and discuss actions targeted for the upcoming year.

8.4 Standard Conditions

Appendix A of the permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on the regulations and cannot be challenged in the context of an individual APDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and other general requirements.

9.0 OTHER LEGAL REQUIREMENTS

9.1 Ocean Discharge Criteria

Section 403(a) of the CWA, Ocean Discharge Criteria, prohibits the issuance of a permit under Section 402 of the CWA for a discharge into the territorial sea, the water of the contiguous zone, or the oceans except in compliance with Section 403. Permits for discharge seaward of the baseline of the territorial seas must comply with the requirements of Section 403, which include development of an Ocean Discharge Criteria Evaluation (ODCE).

An interactive map depicting Alaska's baseline plus additional boundary lines is available at http://www.charts.noaa.gov/OnLineViewer/AlaskaViewerTable.shtml. The map is provided for information purposes only. The U.S. Baseline committee makes the official determinations on baselines.

A review of the map's baselines revealed that KWWTF outfall terminus is positioned landward of the baseline of the territorial sea; therefore, an ODCE analysis is not required to be completed for this permit reissuance.

9.2 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the National Oceanic and Atmospheric Administration (NOAA) NMFS and the USFWS if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult with these federal agencies regarding permitting actions. However, the Department values input from these agencies and has voluntarily contacted the agencies to notify them of the development of the permit and to obtain a list of threatened and endangered species near the point of discharge.

NMFS is responsible for administration of the ESA for listed cetaceans, seals, sea lion, sea turtles, anadromous fish, marine fish, marine plants, and corals. All other species, including polar bears, walrus, and sea otters, are administered by the USFWS. On January 12, 2015 DEC contacted USFWS and NMFS requesting identification of any threatened or endangered species under their jurisdiction in the vicinity of the KWWTF outfall. No response was received from either agency; however this fact sheet and permit will be submitted to USFWS and NMFS for review during the public notice period and any comments received from these agencies will be considered prior to issuance of the permit.

The NMFS maintains an interactive endangered species map at http://alaskafisheries.noaa.gov/mapping/esa/. DEC reviewed this map for threatened and endangered species near KWWTF outfall. The NMFS map identifies the endangered Cook Inlet beluga whale (*Delphinapterus leucas*) as occurring within the range of Cook Inlet near the KWWTF discharge outfall. The map also identified the endangered Steller sea lion (*Eumetopias jubatus*) as being in Cook Inlet near the KWWTF facility; however, the Steller sea lion is not likely to occur near the discharge outfall.

USFWS web site, found at http://www.fws.gov/alaska/fisheries/endangered/, was reviewed by DEC and found no indication that there are ESA-listed, proposed, or candidate species under USFWS jurisdiction recorded in Cook Inlet near the KWWTF discharge outfall.

9.3 Essential Fish Habitat

Essential fish habitat (EFH) includes the waters and substrate (sediments, etc.) necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity. The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) requires federal agencies to consult with NOAA when a proposed discharge has the potential to adversely affect (reduce quality and/or quantity of) EFH. As a state agency, DEC is not required to consult with federal agencies regarding permitting actions; however, on January 12, 2015 DEC contacted NMFS to notify them of the issuance of this permit and to obtain listings of EFH near the subject discharge; however, no response was received from NMFS.

DEC will provide NMFS with copies of the permit and fact sheet during the public notice period. Any comments received from NMFS regarding EFH will be considered prior to issuance of the permit.

9.4 Sludge (Biosolids) Requirements

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

9.4.1 State Requirements

The Department separates wastewater and biosolids permitting. The permittee should contact the Department's Solid Waste Program for information regarding state regulations for biosolids. The permittee can access the Department's Solid Waste Program web page for more information and who to contact.

9.4.2 Federal Requirements

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

A POTW is required to apply for an EPA biosolids permit. The permittee should ensure that a biosolids permit application has been submitted to EPA. In addition, the permittee

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

U.S. Environmental Protection Agency
Region 10, NPDES Permits Unit OWW-130
Attention: Biosolids Contact
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

The EPA Region 10 telephone number is 1-800-424-4372. Information about EPA's biosolids program and CWA Part 503 is available at www.epa.gov and either search for 'biosolids' or go to the EPA Region 10 website link and search for 'NPDES Permits'.

9.5 Permit Expiration

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

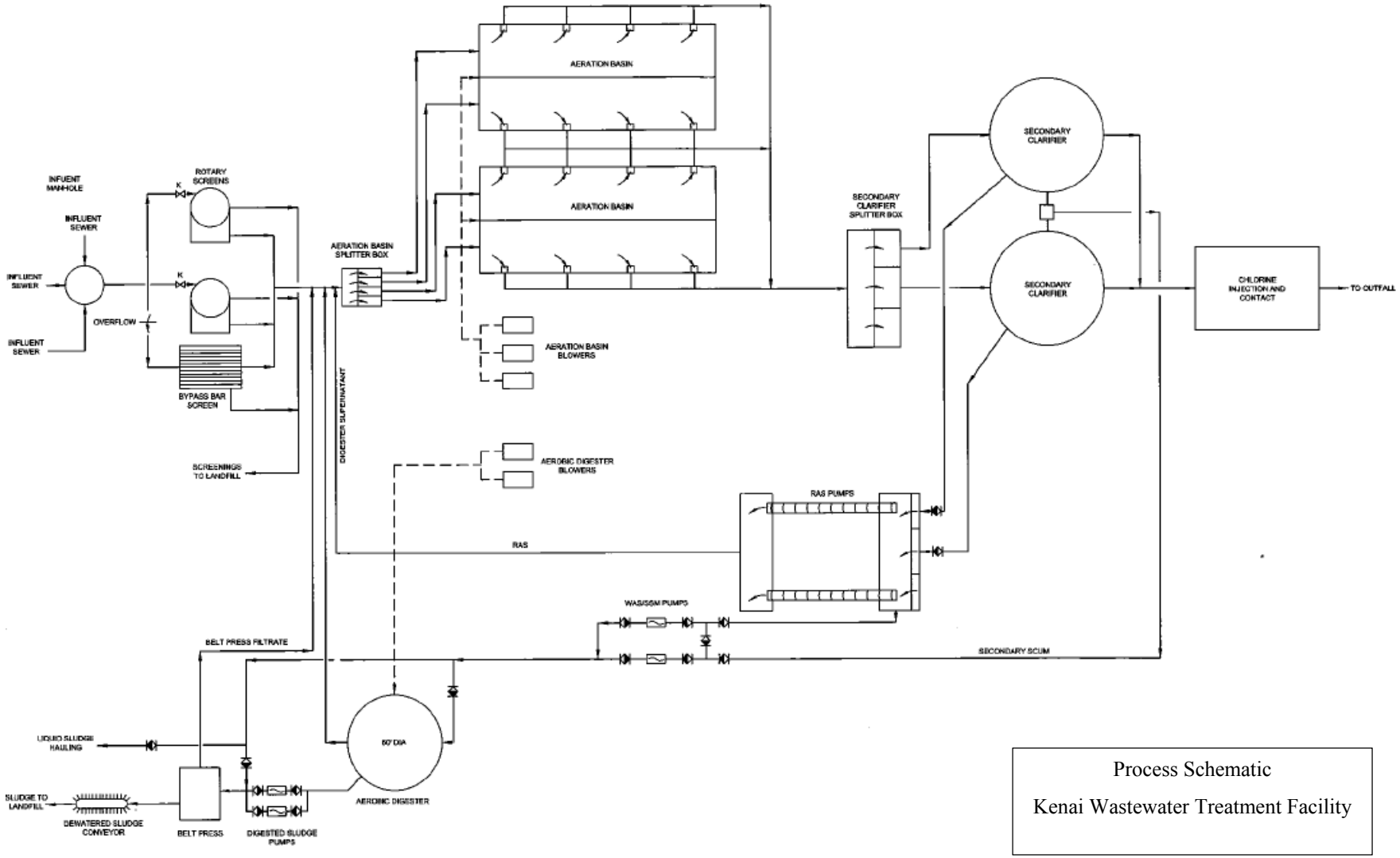
10.0 References

- Alaska Department of Environmental Conservation, *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through December 12, 2008.
- Alaska Department of Environmental Conservation, *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through June 26, 2003.
- Alaska Department of Environmental Conservation, 18 AAC 70 Water Quality Standards, as amended June 26, 2003.
- Alaska Department of Environmental Conservation, 18 AAC 70 Water Quality Standards, as amended April 8, 2012.
- Alaska Department of Environmental Conservation, *Interim Antidegradation Implementation Methods*, Policy and Procedure 05.03.103, July 14 2010.
- Alaska Department of Environmental Conservation, *Alaska's Final 2010 Integrated Water Quality Monitoring and Assessment Report*, July 15, 2010.
- Alaska Department of Environmental Conservation, *Alaska Pollutant Discharge Elimination System (APDES) Permits Reasonable Potential Analysis and Effluent Limits Development Guide,* June 30, 2014.
- Environmental Protection Agency, *Technical Support Document for Water Quality-Based Toxics Control*, 1991, EPA/505/2-90-001.
- Environmental Protection Agency, *Short-term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to West Coast marine and Estuarine Organisms*, 1995, EPA/600/R-95-136.

APPENDIX A. FACILITY INFORMATION

Figure 1: City of Kenai Wastewater Treatment Facility Map

Figure 2: City of Kenai Wastewater Treatment Facility Process Flow Diagram



APPENDIX B. BASIS FOR EFFLUENT LIMITATIONS

The Clean Water Act (CWA) requires a Publicly Owned Treatment Works (POTWs) to meet effluent limits based on available wastewater treatment technology, specifically, secondary treatment standards found in Title 40 Code of Federal Regulations (40 CFR) 133, adopted by reference in Alaska Administrative Code (AAC) 18 AAC 83.010(e). The Alaska Department of Environmental Conservation (the Department or DEC) may find, by analyzing the effect of an effluent discharge on the receiving water body, that secondary treatment effluent limits are not sufficiently stringent to meet water quality standards (WQS). In such cases, the Department is required to develop more stringent water quality-based effluent limits (WQBEL), which are designed to ensure that the WQS of the receiving water body are met.

Secondary treatment effluent limits for POTWs do not limit every parameter that may be present in the effluent. Secondary treatment effluent limits only have been developed for five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH. Effluent from a POTW may contain other pollutants, such as bacteria, chlorine, ammonia, or metals depending on the type of treatment system used and the quality of the influent to the POTW (e.g., industrial facilities, as well as residential areas may discharge into the POTW). When technology-based effluent limits (TBEL) do not exist for a particular pollutant expected to be in the effluent, the Department must determine if the pollutant may cause or contribute to an exceedance of a water quality criteria for the water body. If a pollutant causes or contributes to an exceedance of a water quality criteria, a WQBEL for the pollutant must be established in the permit.

B.1 Secondary Treatment Effluent Limits

The CWA requires a POTW 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. The Department has adopted the secondary treatment effluent limits, 18 AAC 83.010(e), which are found in 40 CFR §133.102. The secondary treatment TBEL apply to all municipal wastewater treatment facilities and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD_5, TSS, and pH. In addition to the federal secondary treatment regulations in 40 CFR Part 133, the State of Alaska requires maximum daily limits of 60 mg/L for BOD_5 and TSS in its definition of secondary treatment found in its waste disposal regulations (18 AAC 72.990); however, the waste disposal regulations do not specify the percent removal requirements that are required by 40 CFR 133, so the more stringent 40 CFR 133 requirements as adopted by reference are applied. The secondary treatment effluent limits are listed in Table B-1.

Table B-1: Secondary Treatment Effluent Limits

Parameter	Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Range
BOD_5	30 mg/L [a]	45 mg/L	60 mg/L	---
TSS	30 mg/L	45 mg/L	60 mg/L	---
Removal Rates for BOD_5 and TSS	85% (minimum)	---	---	---
pH	---	---	---	6.0 – 9.0 SU [b]

Note: a. mg/L = milligram per liter
b. SU = pH standard unit

B.1.1 Mass-Based Limitations

The regulation at 18 AAC 83.540 requires that effluent limits be expressed in terms of mass, if possible. The regulation at 18 AAC 83.520 requires that effluent limits for a POTW be calculated based on the design flow of the facility in million gallons per day (mgd). The mass based limits are expressed in pounds per day (lbs/day) and are calculated as follows:

Mass based limit (lbs/day) = concentration limit (mg/L) × design flow (mgd) × 8.341[1]

The BOD_5 and TSS mass based limits for the permit are:

Average Monthly Limit = 30 mg/L X 1.3 mgd X 8.34 = 325 lbs/day

Average Weekly Limit = 45 mg/L X 1.3 mgd X 8.34 = 488 lbs/day

Maximum Daily Limit = 60 mg/L X 1.3 mgd X 8.34 = 385 lbs/day

B.2 Water Quality – Based Effluent Limitations

B.2.1 Statutory and Regulatory Basis

18 AAC 70.010 prohibits conduct that causes or contributes to a violation of the WQS.
18 AAC 70.090 requires that permits include terms and conditions to ensure water quality criteria are met, including operating, monitoring, and reporting requirements.

The regulations require the permitting authority to make this evaluation using procedures that 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 body. The limits must be stringent enough to ensure that water quality criteria are met and must be consistent with any available wasteload allocation (WLA).

B.2.2 Reasonable Potential Analysis

When evaluating the effluent to determine if WQBEL based on chemical-specific numeric criteria are needed, the Department projects the receiving water body concentration for each pollutant of concern down current of where the effluent enters the receiving water body. The chemical-specific concentration of the effluent and receiving water body and, if appropriate, the dilution available from the receiving water body, are factors used to project the receiving water body concentration. If the projected concentration of the receiving water body exceeds the numeric criterion for a limited parameter, then there is a reasonable potential that the discharge may cause or contribute to an excursion above the applicable WQS, and a WQBEL must be developed.

According to 18 AAC 70.990(38), a mixing zone is an area in a water body surrounding, or down current of, a discharge where the effluent plume is diluted by the receiving water within which specified water quality criteria may be exceeded. Water quality criteria may be exceeded within a mixing zone. A mixing zone can be authorized only when adequate receiving water body flow

[1] 8.341 is a conversion factor with units (lbs x L) / (mg x gallon x 10^6)

exists, and the concentration of the pollutant of concern in the receiving water body is below the numeric criterion necessary to protect the designated uses of the water body.

The Department reviewed submitted Kenai Wastewater Treatment Facility (KWWTF) effluent data collected January 2010 through December 2014 and determined that the pollutants of concern are ammonia, copper, zinc, and whole effluent toxicity (WET). Other pollutants, for which monitoring data was submitted, were not considered to be of concern because data showed that effluent concentrations were consistently below applicable water quality criteria. The Department evaluated the pollutants of concern for reasonable potential using *the Alaska Pollutant Discharge Elimination System (APDES) Permits Reasonable Potential Analysis and Effluent Limits Development Guide*, June 2014, (APDES, RPA Guide). See Appendix C for more details on the reasonable potential analysis procedure.

B.2.3 Procedure for Deriving Water Quality-Based Effluent Limits

The first step in developing a WQBEL is to develop a WLA for the pollutant. A WLA is the concentration or loading of a pollutant that the permittee may discharge without causing or contributing to an exceedance of water quality criteria or a total maximum daily load in the receiving water body. If a mixing zone is authorized in the permit, the WQBEL must be met at the end of the pipe and water quality criteria must be met at the boundary of the mixing zone.

In cases where a mixing zone is not authorized, either because the receiving water body already exceeds the criterion, the receiving water body flow is too low to provide dilution, or for some other reason one is not authorized, water quality criterion must be met at the end of the pipe. Establishing the water quality criterion at the end of the pipe ensures that the permittee will not cause or contribute to an exceedance of the criterion. See Appendix D for more details on calculating WQBEL.

B.2.4 Specific Water Quality-Based Effluent Limits

B.2.4.1 *Toxic Substances*

The WQS for toxic and other deleterious organic and inorganic substances for marine water uses are codified in 18 AAC 70.020(b)(23). Individual criteria are summarized in the Department's, *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*, as amended through December 12, 2008. In the WQS, the most stringent criteria for metals, other than arsenic, is the chronic criteria for the protection of aquatic life.

As discussed in Section B.2.2 of the fact sheet, the Department evaluated five years of ammonia, copper, and zinc data to determine if there was reasonable potential for the pollutant to cause or contribute to an excursion of water quality criteria in the receiving water body.

B.2.4.2 *Total Ammonia (as Nitrogen)*

Total ammonia is the sum of ionized and un-ionized ammonia. The un-ionized form of ammonia is more toxic to aquatic organisms than the ionized form and is more predominate with higher pH and temperature and lower salinity. Because the toxicity of ammonia in marine water is dependent on pH, temperature, and salinity, the criteria are also pH, temperature, and salinity-dependent. The 85th percentile for pH (8.2 SU), the 85th percentile

for temperature (11°C), the 5th percentile salinity (20 g/kg) were used to represent reasonable worst case conditions. As a result, the acute and chronic criteria for total ammonia are 7.3 mg/L and 1.1 mg/L, respectively. Data collected by the permittee from January 2010 through December 2014 were evaluated and it was determined there is reasonable potential to cause or contribute to an exceedance of ammonia chronic criterion at the boundary of the chronic mixing zone; however there is not reasonable potential to cause or contribute to an exceedance of ammonia acute criterion at the boundary of the acute mixing zone.

The 2008 permit did not impose ammonia limits; however because there is reasonable potential for ammonia to exceed water quality criteria, WQBEL have been developed for ammonia. The permit continues to require monthly monitoring of ammonia throughout the life of the permit.

B.2.4.3 *Metals – Copper and Zinc*

The 2008 permit required that arsenic, cadmium, copper, silver, and zinc be monitored twice a year, once in June and once in December. Submitted effluent data from January 2010 through December 2014 were reviewed to identify which metals were pollutants of concern. Arsenic, cadmium, and silver were not considered pollutants of concern because concentrations were consistently reported as less than the most stringent applicable water quality criterion; therefore, a reasonable potential analysis was not conducted on these three metals. As pollutants of concern, reasonable potential analysis was conducted on copper and zinc and both metals were found to have reasonable potential to cause or contribute to an exceedance of applicable water quality criteria at the end of the pipe.

Acute and chronic mixing zones are authorized in this permit, therefore the dilution associated with each mixing zone was then considered in the reasonable potential analysis for both metals to determine if copper and zinc have reasonable potential to cause or contribute to an exceedance of applicable water quality criteria at the boundary of the mixing zone.

Zinc did not demonstrate reasonable potential at the boundary of either the acute or chronic mixing zone, therefore WQBEL were not developed for zinc. The monitoring frequency for zinc will be increased from twice per year to once per quarter to develop a more robust data set for the next permit issuance.

The reasonable potential analysis on copper data demonstrated that there is reasonable potential at the boundary of both the acute and chronic mixing zone. Therefore, WQBELs were developed for copper and the frequency of monitoring is increased from twice per year to once per quarter to develop a more robust data set for the next permit issuance.

B.2.4.4 *Chlorine*

The KWWTF disinfects effluent wastewater by using chlorine to disinfect followed by dechlorination prior to discharge.

The total residual chlorine limits imposed in the 2008 permit were based on the pollutant receiving dilution in the mixing zone. The five years (January 2010 through December 2014) of submitted total residual chlorine effluent data was consistently reported as a concentration of 0 mg/L. The removal of total residual chlorine by means of dechlorination

prior to discharging demonstrates that a mixing zone for total residual chlorine is unnecessary and therefore water quality criteria must be meet at the end of the pipe. The most stringent water quality criteria for total residual chlorine to protect designated uses requires that concentrations may not exceed 0.013 mg/L for acute aquatic life and 0.0075 mg/L for chronic aquatic life. The 2015 permit has set total residual chlorine WQBELs of 0.013 mg/L as the maximum daily limit and 0.0075 mg/L as the average monthly limit.

Effluent limits for total residual chlorine falls below the capability of current analytical technology to detect and/or quantify the parameter. In order to determine compliance with the limit for total residual chlorine, DEC is establishing the minimum level (ML) as the quantification level for use in laboratory analysis. DEC believes that the use of the ML as an analytical chemistry performance standard provides an unambiguous and rational means to demonstrate that the best chemistry available at the time of permit issuance is being used.

The ML is defined as the lowest concentration that gives recognizable signals and an acceptable calibration point. It is the equivalent concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed. MLs are analyte- and method-specific and are established during the development and validation of the method. The ML for total residual chlorine is 0.100 mg/L. DEC will use 0.100 mg/L as the compliance level for total residual chlorine.

B.2.4.5 *Floating, Suspended or Submerged Matter*

The water quality criteria for floating solids, debris, sludge, deposits, foam, scum, or other residues suspended or submerged are narrative. The most stringent standard, found at 18 AAC 70.020(b)(20)(A)(ii), as amended through June 26, 2003, requires that marine waters "May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use; cause a film, sheen, or discoloration on the receiving 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 receiving of the water, within the water column, on the bottom, or upon adjoining shorelines." This narrative criteria is included in the permit.

B.2.4.6 *pH*

The criteria found at 18 AAC 70.020(b)(18)(A)(i) for water supply for aquaculture and the growth and propagation of fish, shellfish, other aquatic life, and wildlife are the most stringent pH standards for marine waters. These standards state that marine waters, "May not be less than 6.5 or greater than 8.5, and may not vary more than 0.2 pH unit outside of the naturally occurring range." Effluent pH data submitted from January 2010 through December 2014 indicated that the discharge from KWWTF has consistently been within the range of 6.5 SU and 8.5 SU. Meeting water quality criteria for pH at the end of the pipe will be continued in the 2015 as was imposed in the 2008 permit.

The current pH limits between 6.5 SU and 8.5 SU are identical to the more stringent WQBEL and shall apply at the end-of-pipe.

Table B-2: Selection of pH Permit Limits

	Minimum Daily (SU)	Maximum Daily (SU)
Technology Based Limits	6.0	9.0
Water Quality-Based Limits	6.5	8.5
Selected Limits	6.5	8.5

B.2.4.7 *Fecal Coliform Bacteria*

The criteria at 18 AAC 70.020(b)(14) for marine waters designated for use as harvesting for consumption of raw mollusks or other raw aquatic life are the most stringent standards for fecal coliform bacteria. The criteria requires that the fecal coliform bacteria median most probable number may not exceed 14 fecal coliforms (FC)/100 mL, and not more than 10% of the total samples may exceed 43 FC/100 mL.

The 2008 permit set fecal coliform bacteria effluent limits based on an authorized mixing zone with an available dilution factor of 18. Although the authorized mixing zone in the 2015 permit remains the same size and offers the same dilution, 375 fecal coliform bacteria samples were taken between January 2010 and December 2014 and the maximum reported concentration was 30 FC/100 mL and the average concentration was 6.8 FC/100 mL. During this same time period the maximum monthly geometric mean was 12.3 FC/100 mL and the average monthly geometric mean was 5.1 FC/100 mL.

DEC determined that water quality criteria for fecal coliform bacteria can be achieved by KWWTF at the end of the pipe and does not require dilution within a mixing zone. Therefore, the fecal coliform bacteria effluent monthly geometric mean limit is 14 FC/100 mL and effluent maximum daily limit is 43 FC/100 mL.

B.2.4.8 *BOD_5 and Total Suspended Solids*

The permit includes TBELs for BOD_5 and TSS.

APPENDIX C. REASONABLE POTENTIAL DETERMINATION

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

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, the Department compares the maximum projected receiving water body concentration to the criteria for that pollutant. Reasonable potential to exceed exists if the projected receiving water body concentration exceeds the criteria, and a water quality-based effluent limit must be included in the permit (18 AAC 83.435).

The ambient concentration in the mass balance equation is based on a reasonable worst-case estimate of the pollutant concentration up current from the discharge. For criteria that are expressed as maxima (such as ammonia), the 85th percentile of the ambient data is generally used as an estimated of the worst-case. If ambient data is not available, DEC uses 15% of the most stringent given pollutant's criteria as a worst case estimate.

This section discusses how the maximum projected receiving water body concentration is determined.

C.1 Mass Balance

For a discharge to a flowing water body, the maximum projected receiving water body concentration is determined using a steady state model represented by the following mass balance equation:

$$C_d Q_d = C_e Q_e + C_u Q_u \qquad \text{(Equation C-1)}$$

where,

C_d = Receiving water body concentration down current of the effluent discharge

C_e = Maximum projected effluent concentration

C_u = 85th percentile measured receiving water body ambient concentration

Q_d = Receiving water body flow rate = $Q_e + Q_u$

Q_e = Effluent flow rate (set equal to the design flow of the wastewater treatment facility)

Q_u = Receiving water body flow

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

$$C_d = \frac{C_e Q_e + C_u Q_u}{Q_e + Q_u} \qquad \text{(Equation C-2)}$$

The above form of the equation is based on the assumption that the discharge is rapidly and completely mixed with the receiving water. If a mixing zone based on a percentage of the critical flow in the receiving water body is authorized based on the assumption of incomplete mixing with the receiving water body, the equation becomes:

$$C_d = \frac{C_e Q_e + C_u(Q_U \times MZ)}{Q_e + (Q_u \times MZ)} \quad \text{(Equation C-3)}$$

where

MZ = the fraction of the receiving water body flow available for dilution.

Where mixing is rapid and complete, MZ is equal to 1 and equation C-2 is equal to equation C-3 (i.e., all of the critical low flow volume is available for mixing).

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

$$C_d = C_e \quad \text{(Equation C-4)}$$

In other words, if a mixing zone is not authorized (either because the receiving water body already exceeds water quality criteria or the Department does not allow one), the Department considers only the concentration of the pollutant in the effluent regardless of the up current flow and concentration. If the concentration of the pollutant in the effluent is less than the water quality criteria, the discharge cannot cause or contribute to a water quality violation for that pollutant. In this case, the mixing or dilution factor (% MZ) is equal to zero and the mass balance equation is simplified to $C_d = C_e$.

Equation C-2 can be simplified by introducing a "dilution factor":

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

After the dilution factor simplification, this becomes:

$$C_d = \frac{(C_e - C_U)}{D} + C_U \quad \text{(Equation C-6)}$$

C.2 Maximum Projected Effluent Concentration

To calculate the maximum projected effluent concentration, the Department used DEC's guidance, *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide*. In this procedure, the 99th percentile of the effluent data is the maximum projected effluent concentration which is used in the calculation of the maximum projected receiving water body concentration.

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 and accounts for the statistical uncertainty in the effluent data. 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. When fewer than 10 data points are available, the TSD recommends making the assumption that the CV is equal to 0.6. A CV value of 0.6 is a conservative estimate that assumes a relatively high variability.

DEC used ProUCL, a statistical software program, to determine that the monitoring data submitted for ammonia follows a normal distribution. Therefore, the RPM equation in Section 2.4.2.1 of the *APDES Permit Reasonable Potential Analysis and Effluent Limits Development Guide* is used to determine the reasonable potential for ammonia. Using ProUCL, it was determined that copper and zinc monitoring data follows a lognormal distribution. The equation in Section 2.4.2.2 of the *APDES Permit Reasonable*

Potential Analysis and Effluent Limits Development Guide is used to determine the RPM for copper and zinc. Examples of both calculations are presented below.

RPM determination for a data set with a normal distribution.

$$\text{RPM} = \frac{\mu_n + z_{99}\,\sigma}{\mu_n + p_n\,\sigma} \qquad \text{(Equation C-7)}$$

Where,

μ_n =mean of the data set
Z_{99} = the z-statistic at the 99th percentile
σ = the standard deviation of a data set
p_n = the z-statistic at the 95th percentile level of $(1 - 0.95)^{1/n}$
n = the number of valid data samples

For ammonia the data set contained 262 samples, therefore:

μ_n =mean of the data set = 17.81
Z_{99} = the z-statistic at the 99th percentile = 2.326
σ = the standard deviation of a data set = 11.98
p_{262} = the z-statistic at the 95th percentile level of $(1 - 0.95)^{1/262}$ = z-statistic of 0.9886 = 2.278
n = the number of valid data samples = 262
maximum reported effluent concentration (MRC) for ammonia = 45.3 mg/L

$$\text{RPM} = \frac{17.81 + 2.326 * 11.98}{17.81 + 2.278 * 11.98} = 1.013 \qquad \text{(Equation C-7)}$$

The maximum projected effluent concentration (C_e) is determined by multiplying the MRC by the RPM.

$$C_e = \text{MRC X RPM} = 45.3 \text{ mg/L X } 1.013 = 45.9 \text{ mg/L} \qquad \text{(Equation C-8)}$$

RPM determination for a data set with a lognormal distribution.

$$\text{RPM} = \frac{\exp(Z_{99}\,\sigma_y - 0.5\,\sigma_y^2}{\exp(\,p_n\,\sigma_y - 0.5\,\sigma_y^2} \qquad \text{(Equation C-9)}$$

Where,

Z_{99} = the z-statistic at the 99th percentile
σ_y = the lognormal standard deviation
σ_y^2 = the lognormal variance (square of the lognormal standard deviation)
p_n = the z-statistic at the 95th percentile level of $(1 - 0.95)^{1/n}$
n = the number of valid data samples

For copper the data set contained 13 samples, therefore:

Z_{99} = the z-statistic at the 99th percentile = 2.326
σ_y = the lognormal standard deviation =0.494
σ_y^2 = the lognormal variance (square of the lognormal standard deviation) = 0.244
P_{13} = the z-statistic at the 95th percentile level of $(1 - 0.95)^{1/13}$ = z-statistic 0.7942 = 0.821
n = the number of valid data samples = 13
MRC for copper = 35.8 µg/L

$$\text{RPM} = \frac{\exp(2.326 * 0.494 - 0.5 * 0.244)}{\exp(0.821 * 0.494 - 0.5 * 0.244)} = 2.103 \qquad \text{(Equation C-9)}$$

The maximum projected effluent concentration (C_e) is determined by multiplying the MRC by the RPM.

$$C_e = \text{MRC X RPM} = 35.8 \text{ X } 2.103 = 75.3 \text{ µg/L} \qquad \text{(Equation C-8)}$$

To determine the receiving water body concentrations down current of the effluent discharge (C_d), Equation C-6 is used. As discussed above in Section 5.3, Mixing Zone Analysis, acute and chronic mixing zones have been authorized for ammonia, copper, zinc and whole effluent toxicity (WET).

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

Using ammonia as an example:

C_e = 45.9 mg/L

C_u = 0.165 mg/L (in this case ambient data for ammonia is not available so C_u becomes 15% the most stringent ammonia criteria; chronic criteria = 1.1 mg/L therefore 0.15 * 1.1 mg/L = 0.165 mg/L)

$D_{(acute)}$ = 6.7

$D_{(chronic)}$ = 18

Acute C_d = ((45.9 mg/L – 0.165 mg/L) / 6.7) + 0.165 = 6.99 mg/L

Chronic C_d = ((45.9 mg/L – 0.165 mg/L) / 18) + 0.165 = 2.71 mg/L

Comparison with ambient criteria

In order to determine if reasonable potential exists for this discharge to violate the ambient criteria, the highest projected concentrations at the boundary of the mixing zone are compared with the ambient criteria. Using ammonia as an example:

Acute 6.99 mg/L < 7.3 mg/L (acute criteria) **NO**, there is not a reasonable potential to violate

Chronic: 2.71 mg/L > 1.1 mg/L (chronic criteria) **YES**, there is a reasonable potential to violate

Since there is a reasonable potential for the effluent to cause an exceedance of chronic water quality criteria for protection of aquatic life, a water quality-based effluent limit for ammonia is required. See Appendix D for that calculation. See Tables C-1 and C-2 for reasonable potential calculations for pollutants of concern.

C.3 Up Current (Ambient) Concentration of Pollutant

Accurate ammonia, copper, zinc, and WET concentrations were not available for the ambient receiving water. Thus, it was assumed that ambient concentrations were 15% of the most stringent water quality criteria. These values were used in the reasonable potential analyses.

Table C-1 summarizes the data, multipliers, and variables used to determine reasonable potential to exceed criteria. Table C-2 shows the comparison of the maximum projected effluent concentrations for the acute and chronic mixing zones to their respective criteria. The most stringent criterion is the lower of the acute and the chronic criteria.

Table C- 1: Maximum Projected Effluent Concentration Calculations

Parameter	Max. Reported Effluent Conc.	Number of Samples	Goodness-of-fit	CV	Standard Deviation [a]	Mean / Lognormal Variance [b]	RPM	Max Projected Effluent Conc. (C_e)
Ammonia as Nitrogen (mg/L)	45.3	262	Normal	0.673	11.98	17.81	1.013	45.9
Copper (µg/L)	35.8	13	Lognormal	0.526	0.494	0.244	2.103	75.3
Zinc (µg/L)	140	13	Lognormal	1.907	0.429	0.184	1.907	267
WET	< 8.92	11	NA	0 [c]	0 [c]	8.92	1	8.92

Note:

a. The standard deviation for copper and zinc is the lognormal standard deviation calculated by ProUCL.
b. This column gives the mean for ammonia and the lognormal variance for copper and zinc calculated by ProUCL.
c. All values were the same, therefore the CV and standard deviation are zero (0).

Table C-1: Reasonable Potential Determination

Parameter	Max Projected Effluent Conc. (C_e)	Effluent Flow (Q_e), mgd	Up Current Conc. (C_u) [a]	Dilution Ratio (D)	Maximum Conc. at Boundary of Mixing Zone (C_d)	Criterion (Metals total recoverable)	Does C_d exceed criteria?
Total Ammonia as N (chronic), mg/L	45.9	1.3	0.165	18	2.71	1.1	Yes
Total Ammonia as N, (acute), mg/L	45.9	1.3	0.165	6.7	6.99	7.3	No
Copper (chronic), µg/L	75.3	1.3	0.560	18	4.71	3.7	Yes
Copper (acute), µg/L	75.3	1.3	0.560	6.7	11.7	5.8	Yes
Zinc (chronic), µg/L	267	1.3	12.92	18	27	86	No
Zinc (acute), µg/L	267	1.3	12.92	6.7	51	95	No
WET (chronic) TUc	8.92	1.3	0	18	0.50	1	No

Note:

a. Ambient concentration used is 15% of the most stringent water quality criteria.

APPENDIX D. EFFLUENT LIMIT CALCULATION

Once the Alaska Department of Environmental Conservation (the Department or DEC) determines that the effluent has a reasonable potential to exceed a water quality criterion, a water quality-based effluent limit (WQBEL) for the pollutant is developed. The first step in calculating a permit limit is development of a waste load allocation (WLA) for the pollutant.

D.1 Mixing Zone-based WLA

When the Department authorizes a mixing zone for the discharge, the WLA is calculated using the available dilution, background concentrations of the pollutant, and the water quality criteria.

Acute and chronic aquatic life standards apply over different time frames and may have different mixing zones; therefore it is not possible to compare the WLAs directly to determine which standard results in the most stringent limits. The acute criteria are applied as a one-hour average and may have a smaller mixing zone, while the chronic criteria are applied as a four-day average and may have a larger mixing zone. To allow for comparison, long-term average (LTA) loads are calculated from both the acute and chronic WLAs. The most stringent LTA is used to calculate the permit limits.

D.2 "End-of-Pipe" WLAs

In many cases, there is no dilution available, either because the receiving water body exceeds the criteria or because the Department does not authorize a mixing zone for a particular pollutant. When there is no dilution available, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the permittee's discharge does not contribute to an exceedance of the criterion. As with the mixing-zone based WLA, the acute and chronic criteria must be converted to LTAs and compared to determine which one is more stringent. The more stringent LTA is then used to develop permit limits.

D.3 Permit Limit Derivation

Once the appropriate LTA has been calculated, the Department applies the statistical approach described in DEC's guidance, *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide*, to calculate maximum daily and average monthly permit limits. This approach takes into account effluent variability using the coefficient variation (CV), sampling frequency, and the difference in time frames between the average monthly and maximum daily limits.
The maximum daily limit is based on the CV of the data and the probability basis, while the average monthly limit is dependent on these two variables and the monitoring frequency. As recommended in the TSD, the Department used a probability basis of 95 percent for average monthly limit calculation and 99 percent for the maximum daily limit calculation.

The following is a summary of the steps to derive WQBEL for pollutants that have a reasonable potential to exceed water quality criteria. Ammonia is used as an example.

Step 1- Determine the WLA

The acute and chronic aquatic life criteria are converted to acute and chronic WLAs (WLA_{acute} or $WLA_{chronic}$) using the following equation:

1. $Q_d C_d = Q_e C_e + Q_u C_u$

   Q_d = down current flow = $Q_u + Q_e$
   C_d = aquatic life criteria that cannot be exceeded down current
   Q_e = effluent flow

C_e = concentration of pollutant in effluent = WLA_{acute} or $WLA_{chronic}$
Q_u = up current flow
C_u = up current background concentration of pollutant

Rearranging the above equation to determine the effluent concentration (C_e) or WLA results in the following:

2. $$C_e = WLA = \frac{Q_d C_d - Q_u C_u}{Q_e} = \frac{C_d(Q_u + Q_e) - Q_u C_u}{Q_e}$$

When C_u is zero, this equation becomes:

3. $$C_e = WLA = \frac{Q_d C_d}{Q_e}$$

When C_e is not zero and a mixing zone has been authorized, the equation becomes:

4. $$C_e = WLA = D\,(Cd - Cu) + Cu$$

where D is a dilution factor = $\frac{Q_e + Q_u}{Q_e}$

In this permit, using ammonia as the example, there is a chronic dilution factor of 18 and an acute dilution factor of 6.7, therefore the WLA calculations become:

$C_e = WLA_{chronic} = 18 * (1.1 - 0.165) + 0.165 = 16.995$

$C_e = WLA_{acute} = 6.7 * (7.3 - 0.165) + 0.165 = 47.970$

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

LTA_{acute} and $LTA_{chronic}$ concentrations are calculated from the acute and chronic WLAs using the following equations:

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

where,

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

z = 2.326 for 99th percentile probability basis

CV = coefficitent of variation = $\frac{\text{standard deviation}}{\text{mean}}$

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

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

z = 2.326 for 99th percentile probability basis

$$\text{CV} = \text{coefficitent of variation} = \frac{\text{standard deviation}}{\text{mean}}$$

Again using ammonia as the example:

$$\text{LTA}_{acute} = \text{WLA}_{acute} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$\sigma^2 = \ln(\text{CV}^2 + 1) = \ln(0.6727^2 + 1) = 0.3733$

z = 2.326 for 99th percentile probability basis

$\text{CV} = \text{coefficitent of variation} = \frac{\text{standard deviation}}{\text{mean}} = 0.6727$

$\text{LTA}_{acute} = 47.97 * e^{(0.5 * 0.3733 - 2.326 * 0.6110)} = 13.96$

$$\text{LTA}_{chronic} = \text{WLA}_{chronic} * e^{(0.5\sigma^2 - z\sigma)}$$

where,

$\sigma^2 = \ln\left(\frac{CV^2}{4} + 1\right) = \ln(0.6727^2/4 + 1) = 0.1072$

z = 2.326 for 99th percentile probability basis

$\text{CV} = \text{coefficitent of variation} = \frac{\text{standard deviation}}{\text{mean}} = 0.6727$

$\text{LTA}_{chronic} = 16.995 * e^{(0.5*0.1072 - 2.326*0.3274)} = 8.37$

Step 3 - Most Limiting LTA

To protect a water body from both acute and chronic effects, the more limiting of the calculated LTA_{acute} and $\text{LTA}_{chronic}$ is used to derive the effluent limitations. $\text{LTA}_{chronic}$ (8.37) is the most limiting LTA for ammonia. The TSD recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL).

Step 4 - Calculate the Permit Limits

The maximum daily limit (MDL) and the average monthly limit (AML) are calculated as follows:

$$\text{MDL} = \text{LTA}_{limiting} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

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

z = 2.326 for 99th percentile probability basis

CV= coefficient of variation

$$AML = LTA_{limiting} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

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

z = 1.538 for 95th percentile probability basis

$$\text{CV} = \text{coefficitent of variation} = \frac{\text{standard deviation}}{\text{mean}}$$

n = number of sampling events required per month

In this permit the ammonia MDL and AML are calculated as following:

$$\text{MDL} = \text{LTA}_{chronic} * \text{e}^{(z\sigma - 0.5\sigma^2)}$$

where,

$\sigma^2 = \ln(CV^2 + 1) = \ln(0.6727^2 + 1) = 0.3733$

z = 2.326 for 99th percentile probability basis

CV= coefficient of variation = 0.6727

$\text{MDL} = 8.37 * \text{e}^{(2.326*0.6110 - 0.5*0.3733)} = 28.77 = 29$ mg/L

$$AML = LTA_{chronic} * e^{(z\sigma - 0.5\sigma^2)}$$

where,

$\sigma^2 = \ln\left(\frac{CV^2}{n} + 1\right) = \ln\left(\frac{0.6727^2}{4} + 1\right) = 0.1072$

z = 1.538 for 95th percentile probability basis

$\text{CV} = \text{coefficitent of variation} = 0.6727$

n = number of sampling events required per month (minimum to be used is four)

$\text{AML} = 8.37 * \text{e}^{(1.538*0.3274 - 0.5*0.1072)} = 13.13 = 13$ mg/L

Table D- 1: Water Quality-Based Effluent Limit Calculations

Parameter	Units	Most Stringent water quality criterion	Dilution	CV	WLA_{acute}	$WLA_{chronic}$	$LTA_{limiting}$	MDL	AML
Ammonia	mg/L	1.1	18	0.6727	47.970	16.995	8.37	29	13
Copper	µg/L	3.7	18	0.5257	35.697	57.165	12.78	36	18

APPENDIX E. MIXING ZONE ANALYSIS CHECKLIST

Mixing Zone Authorization Checklist

based on Alaska Water Quality Standards (2003)

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

Criteria	Description	Resources	Regulation	MZ Approved Y/N
Size	Is the mixing zone as small as practicable? - Applicant collects and submits water quality ambient data for the discharge and receiving water body (e.g. flow and flushing rates) - Permit writer performs modeling exercise and documents analysis in Fact Sheet at: ►APPENDIX C Table C-1: Reasonable Potential Determination ►Section 5.3 Mixing Zone Analysis - describe what was done to reduce size.	•Technical Support Document for Water Quality Based Toxics Control •Fact Sheet, Appendix C •Fact Sheet, Appendix D • DEC's RPA Guidance • EPA Permit Writers' Manual	18 AAC 70.240 (a)(2) 18 AAC 70.245 (b)(1) - (b)(7) 18 AAC 70.255(e) (3) 18 AAC 70.255 (d)	Y
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes**, describe methods used in Fact Sheet at Section 5.3 Mixing Zone Analysis. Attach additional documents if necessary.		18 AAC 70.240 (a)(3)	Y

Criteria	Description	Resources	Regulation	MZ Approved Y/N
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters. Justify in Fact Sheet	N/A	18 AAC 70.255(f)	
Existing use	Does the mixing zone…			
	(1) partially or completely eliminate an existing use of the water body outside the mixing zone? **If yes, mixing zone prohibited.**		18 AAC 70.245(a)(1)	Y
	(2) impair overall biological integrity of the water body? **If yes, mixing zone prohibited.**		18 AAC 70.245(a)(2)	Y
	(3) provide for adequate flushing of the water body to ensure full protection of uses of the water body outside the proposed mixing zone? **If no, then mixing zone prohibited.**		18 AAC 70.250(a)(3)	Y
	(4) cause an environmental effect or damage to the ecosystem that the department considers to be so adverse that a mixing zone is not appropriate? **If yes, then mixing zone prohibited.**		18 AAC 70.250(a)(4)	Y
	Does the mixing zone…			

Criteria	Description	Resources	Regulation	MZ Approved Y/N
Human consumption	(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? **If yes, mixing zone may be reduced in size or prohibited.**		18 AAC 70.250(b)(2)	Y
	(2) preclude or limit established processing activities of commercial, sport, personal use, or subsistence shellfish harvesting? **If yes, mixing zone may be reduced in size or prohibited.**		18 AAC 70.250(b)(3)	Y
Spawning Areas	Does the mixing zone…			
	(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon? **If yes, mixing zone prohibited.**		18 AAC 70.255 (h)	Y
Human Health	Does the mixing zone…			
	(1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone prohibited.**		18 AAC 70.250 (a)(1)	Y

Criteria	Description	Resources	Regulation	MZ Approved Y/N
	(2) contain chemicals expected to cause carcinogenic, mutagenic, tetragenic, or otherwise harmful effects to human health? **If yes, mixing zone prohibited.**			Y
	(3) Create a public health hazard through encroachment on water supply or through contact recreation? **If yes, mixing zone prohibited.**		18 AAC 70.250(a)(1)(C)	Y
	(4) meet human health and aquatic life quality criteria at the boundary of the mixing zone? **If no, mixing zone prohibited.**		18 AAC 70.255 (b),(c)	Y
	(5) occur in a location where the department determines that a public health hazard reasonably could be expected? **If yes, mixing zone prohibited.**		18 AAC 70.255(e)(3)(B)	Y
Aquatic Life	Does the mixing zone…			
	(1) create a significant adverse effect to anadromous, resident, or shellfish spawning or rearing? **If yes, mixing zone prohibited.**		18 AAC 70.250(a)(2)(A-C)	Y
	(2) form a barrier to migratory species? **If yes, mixing zone prohibited.**			Y
	(3) fail to provide a zone of passage? **If yes, mixing zone prohibited.**			Y

Criteria	Description	Resources	Regulation	MZ Approved Y/N
	(4) result in undesirable or nuisance aquatic life? **If yes, mixing zone prohibited.**		18 AAC 70.250(b)(1)	Y
	(5) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone prohibited.**		18 AAC 70.255(g)(1)	Y
	(6) result in a reduction in fish or shellfish population levels? **If yes, mixing zone prohibited.**		18 AAC 70.255(g)(2)	Y
	(7) prevent lethality to passing organisms by reducing the size of the acute zone? **If yes, mixing zone prohibited.**		18 AAC 70.255(b)(1)	Y
	(8) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone prohibited.**		18 AAC 70.255(b)(2)	Y
Endangered Species	Are there threatened or endangered species (T/E spp) at the location of the mixing zone?If yes, are there likely to be adverse effects to T/E spp based on comments received from USFWS or NOAA. If yes, will conservation measures be included in the permit to avoid adverse effects? **If yes, explain conservation measures in Fact Sheet. If no, mixing zone prohibited.**		Program Description, 6.4.1 #5 18 AAC 70.250(a)(2)(D)	Y