ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM
PERMIT FACT SHEET – PROPOSED FINAL
Permit Number: AK0062282
Kodiak Fisheries Research Center

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501

Public Comment Period Start Date: **October 3, 2023**
Public Comment Period Expiration Date: **November 3, 2023, at 11:59 AST**

Alaska Online Public Notice System

Technical Contact: Amber Bennett
Alaska Department of Environmental Conservation
Division of Water
Wastewater Discharge Authorization Program
610 University Ave
Fairbanks, AK 99709
907-451-2190
Fax: (907) 451-2187
amber.bennett@alaska.gov

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

KODIAK ISLAND BOROUGH

For wastewater discharges from:

Kodiak Fisheries Research Center
301 Research Ct
Kodiak, Alaska 99615

The Alaska Department of Environmental Conservation (the Department or DEC) has issued an APDES individual permit (permit) to the Kodiak Island Borough. 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 Kodiak Fisheries Research Center (KFRC) and outlines best management practices to which the facility must adhere.

This fact sheet explains the nature of potential discharges from the Kodiak Fisheries Research Center 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

Appeals Process

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 20 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://dec.alaska.gov/commish/review-guidance/informal-reviews 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
Mail: P.O. Box 11180
Juneau, AK 99811
In Person: 555 Cordova Street
Anchorage, AK 99501

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See http://dec.alaska.gov/commish/review-guidance/adjudicatory-hearing-guidance 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://dec.alaska.gov/water/wastewater.

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 **Mail**: P.O. Box 111800 **In Person**: 410 Willoughby Avenue, Suite 303 Juneau, AK 99811-1800 (907) 465-5180

TABLE OF CONTENTS

TABLES

FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 Applicant

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

Permittee:	Kodiak Island Borough
Facility:	Kodiak Fisheries Research Center
APDES Permit Number:	AK0062282
Facility Location:	301 Research Ct. Kodiak, AK 99615
Mailing Address:	710 Mill Bay Road, Kodiak, AK 99615
Facility Contact:	Mr. Dave Conrad

The map in Fact Sheet Part 2.1 shows the approximate locations of the Kodiak Fisheries Research Center (KFRC) and the location of the outfall.

1.2 Authority

Section 301(a) of the Clean Water Act (CWA) and Alaska Administrative Code (AAC) 18 AAC 83.015 provide that the discharge of pollutants to water of the U.S. is unlawful except in accordance with an APDES permit. The individual permit issuance is being developed per 18 AAC 83. A violation of a condition contained in the Permit constitutes a violation of the CWA and subjects the permittee of the facility with the permitted discharge to the penalties specified in Alaska Statutes (AS) 46.03.760 and AS 46.03.761.

1.3 Permit History

The Kodiak Island Borough submitted an application for a National Pollutant Discharge Elimination System (NPDES) permit on November 30, 2022. After initial review, The Department determined that a mixing zone application form 2M would be required. Follow up application materials were received through August 4, 2023. DEC determined the application administratively complete on August 10, 2023.

2.0 BACKGROUND

2.1 Facility Information

KFRC is an existing multi-agency laboratory and office building, housing fisheries research teams from the National Marine Fisheries Service, Alaska Department of Fish and Game, and the Kodiak Regional Aquaculture Association. The facility was originally developed in response to the 1989 Exxon-Valdez Oil Spill and construction was partially funded by settlements received from the spill from Exxon. KFRC was completed in 1998 and includes a display aquarium, touch tanks, and research aquariums, all of which use filtered and raw seawater from two intake structures located in Trident Basin, on the east side of Near Island in Kodiak. Effluent from these sources is routed to a wastewater sump and treated onsite before being discharged at a marine outfall to Trident Basin in Chiniak Bay. The effluent prior to treatment consists mainly of filtered seawater and potential fecal matter from the crab and fish in the touch tanks and aquaculture laboratories. The laboratories are regularly cleaned with a chlorinated solution, resulting in a low chlorine residual in the effluent. Domestic wastewater from KFRC is not included in this discharge permit, instead being routed to the sanitary sewer system. Figure 1 shows a map of KFRC and Figure 2 shows a diagram of the wastewater system flows and sources. Figure 3 shows a diagram of the treatment system with upgrades that are scheduled to be completed in 2024 identified.

Figure 1: Kodiak Fisheries Research Center Facility Vicinity Map

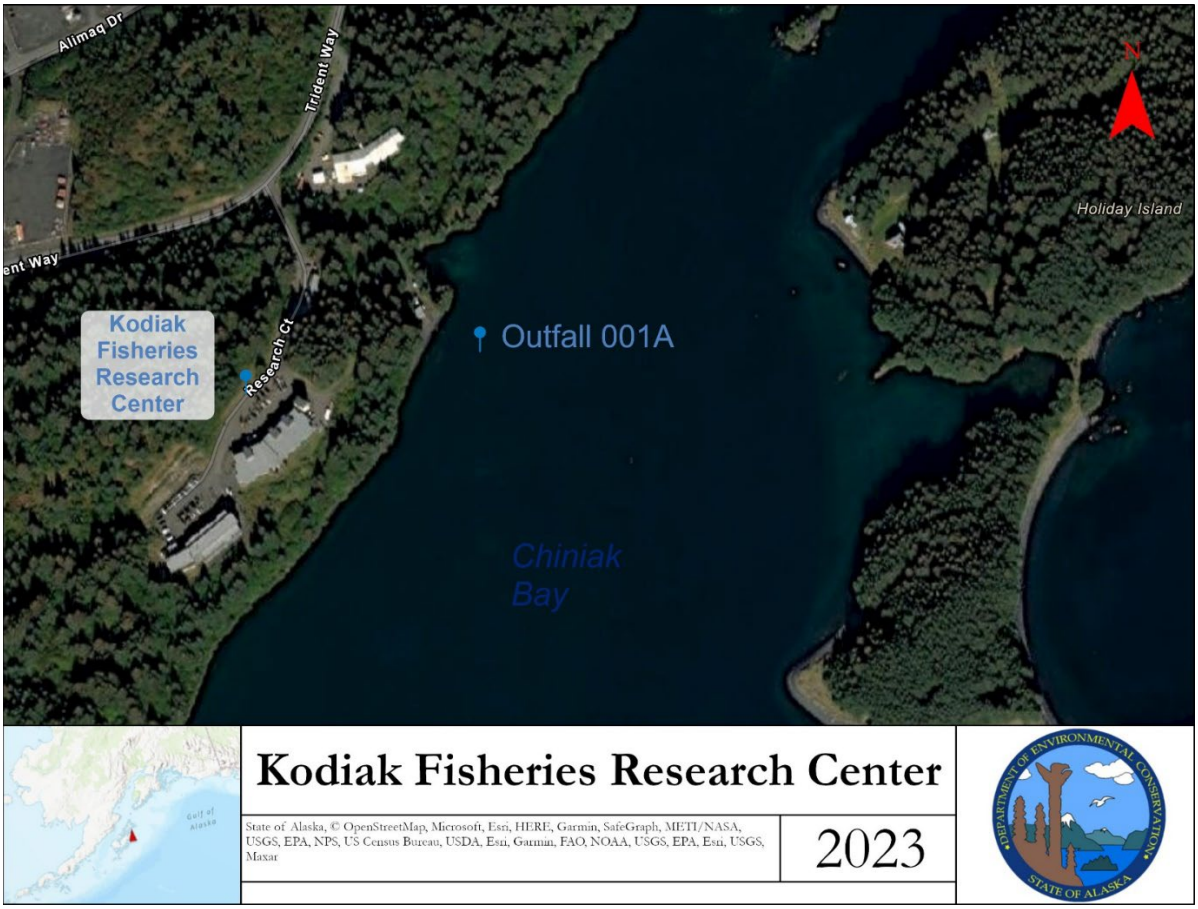


Figure 2: Kodiak Fisheries Research Center Process Flow Diagram

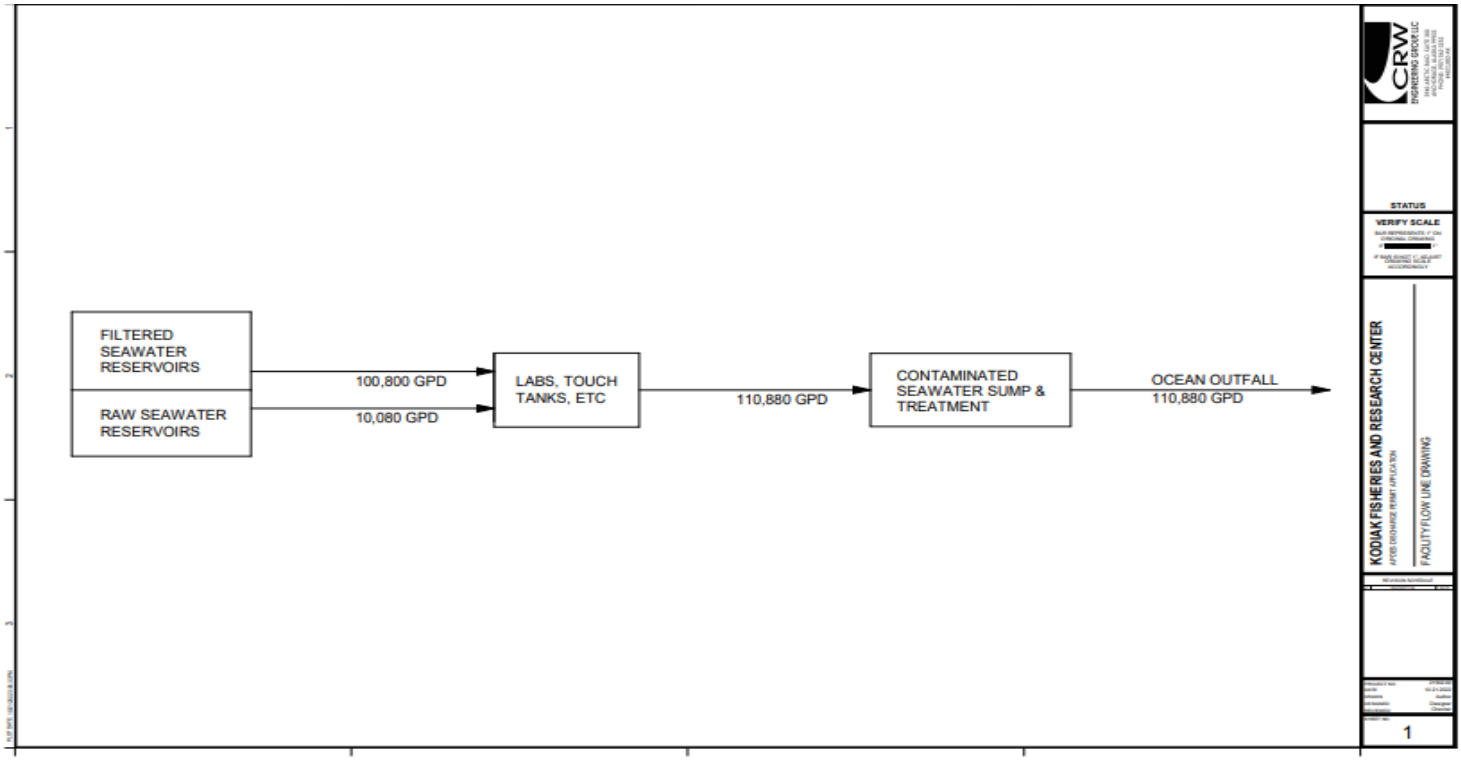
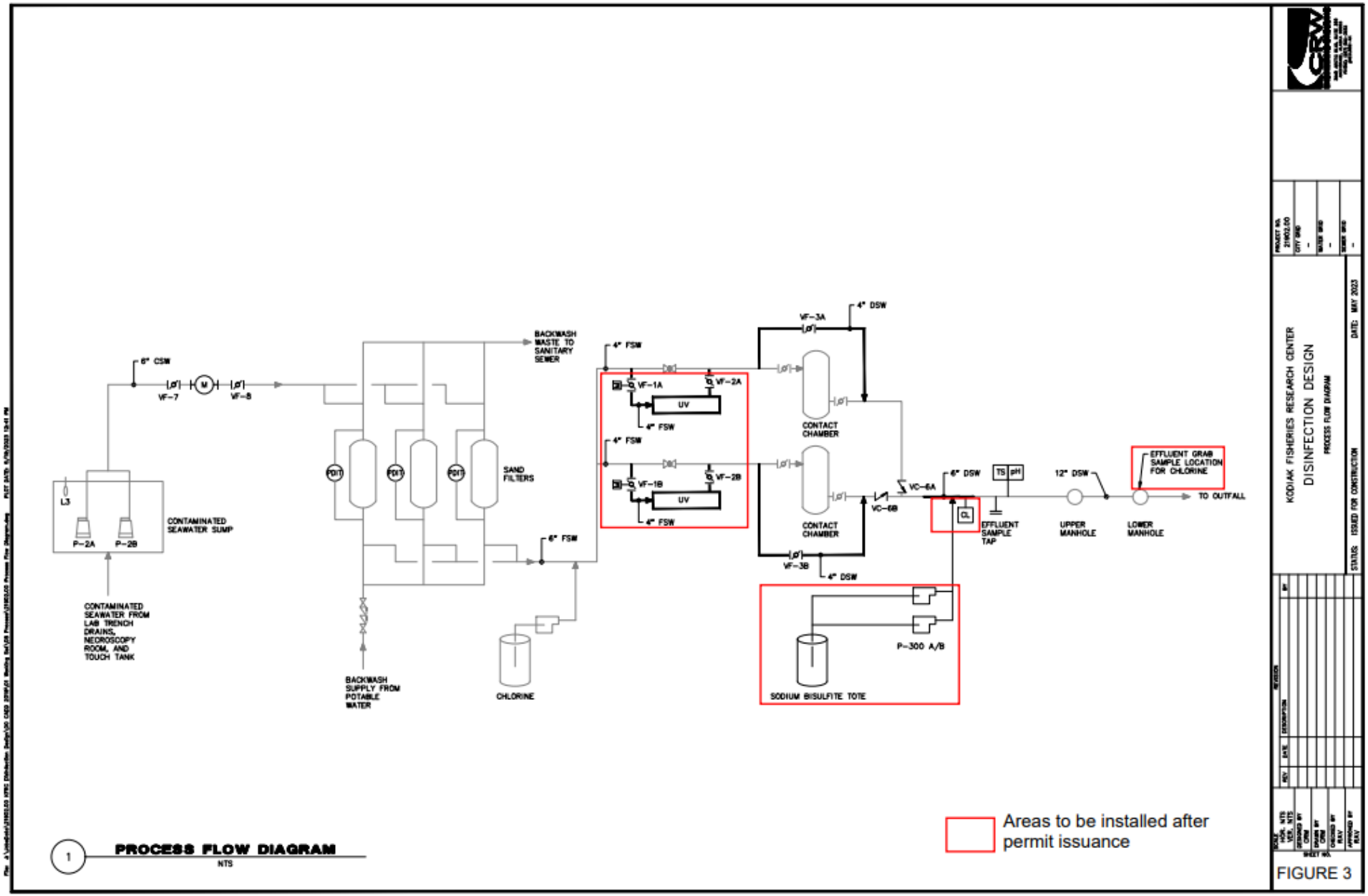


Figure 3: Kodiak Fisheries Research Center Process Flow Diagram After 2024 Upgrades



Untreated influent seawater enters the KFRC via two ten-inch diameter intake pipes identified as intake line A and intake line B. Intake line A extends approximately 500 feet offshore into Trident Basin to a depth of 70 feet below Mean Lower Low Water (MLLW). Intake line B extends approximately 700 feet offshore into Trident Basin to a depth of approximately 35 feet below MLLW. The intake lines discharge influent seawater into an onshore pumphouse. Duplex vertical turbine pumps located in the sea water pumphouse above the wet well draw seawater from the well and discharge it through three sand filters to an 8,000-gallon filtered seawater reservoir. The building domestic water supply system enters the main facility on the north side of the building and in the mechanical room from where it is distributed throughout the building.

Spent seawater from tanks and lab trench drains is gravity feed to the contaminated spent seawater collection sump. Spent seawater from the sump is pumped through three high-rate sand filters that are periodically backwashed utilizing a potable water supply. Filter backwash is routed to the sanitary sewer. After filtration the current treatment system has a chorine injection system that is only used when chlorine residuals are not already present in the waste stream from cleaning operations. Upgrades scheduled to be completed in 2024 will replace the chlorine disinfection with 2 parallel ultraviolet (UV) treatment units each capable of treating 250 gpm with one unit functioning as a backup. Each UV treatment unit will be followed by a contact chamber. After disinfection, treated spent seawater flows past the final effluent sample port and through a 12-inch discharge line to Trident Basin.

2.2 Wastewater Treatment

The permit is limited to non-domestic wastewater discharges. Wastewater discharged from the KFRC is limited to spent seawater, filtered and treated from animal habitats and tanks. The seawater discharge treatment system consists of sand filters and a chlorine disinfection system, only used when the chlorine residual in the effluent is not present. Ozone disinfection was part of the original treatment design but does not function. Upgrades to the facility currently underway will replace the non-functional ozone equipment with a UV disinfection system and replace the existing media in the pressure sand filter vessels. Flow, temperature, UVT and pH will be monitored via online instruments. Construction is planned to be complete in the summer of 2024. The facility is also in the process of designing and installing a dechlorination system under a compliance schedule that must be completed within 2 years of the permit effective date. The installation of the dechlorination system must occur after the disinfection step and prior to final effluent sampling.

All domestic wastewater from the laboratories and the facility's public services discharges separately to the permitted Kodiak Wastewater Treatment Facility.

Wastewater discharges from operations at the KFRC to a catch basin located outside the building, the Seawater Vault, at a maximum rate of approximately 250 gpm. From the Seawater Vault, effluent flows through a diffuser at the end that consists of a 12-ft long section of 12-in diameter HDPE with 4 rows of 2-inch diameter holes, 6-inches on center, with a blind flange at the end of the pipe to force the water out of the holes extending approximately 160 feet into Trident Basin and terminating at a depth of 13 feet below MLLW at Outfall 001A, located between Near Island where the KFRC facility is located and Holiday Island around 2000 feet away to the East. Outfall 001A is a single port discharge unit without a diffuser. Design criteria for the KFRC is provided in Table 1.

Table 1: Design Criteria for the KFRC

Design Flow Rate	110,880 gallons per day (gpd)

2.3 Pollutants of Concern

The KFRC discharges spent seawater, filtered and treated from tanks containing live sea creatures, but no mammals or birds. Pollutants of concern in the effluent of the KFRC Facility are 5-day biological oxygen demand (BOD_5), total suspended solids (TSS), total settleable solids (settleable solids), fecal coliform (FC)

bacteria, temperature, enterococci bacteria (enterococci), total residual chlorine (TRC), dissolved oxygen (DO), and pH.

2.4 Compliance History

No compliance history exists because KFRC is a newly permitted facility.

3.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

3.1 Basis for Permit Effluent Limits

Per 18 AAC 83.015, the Department prohibits the discharge of pollutants to waters of the U.S. unless the permittee has first obtained a permit issued by the APDES Program that meet the purposes of AS 46.03 and is in accordance with the CWA Section 402. Per these statutory and regulatory provisions, the Permit includes effluent limits that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 –WQS, and (3) comply with other state requirements that may be more stringent.

The CWA requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits (TBELs) or WQBELs. TBELs are set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the Alaska Water Quality Standards (WQS) of a water body are met. WQBELs may be more stringent than TBELs. There are no applicable Effluent Limitation Guidelines (ELGs) mandating TBELs promulgated to control the facility's discharge, and the Department has not proposed to implement any case-by-case TBELs derived using Best Professional Judgment. The permit contains WQBELS for DO, pH, FC bacteria, chlorine, and enterococci.

The following section summarizes the proposed effluent limits. A more expansive technical and legal basis for the proposed effluent limits is provided in the Fact Sheet Appendix A.

3.2 Basis for Effluent and Receiving Water Monitoring

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

3.3 Effluent Limits and Monitoring Requirements

The following summarizes the proposed effluent limits. More expansive technical and legal basis for the proposed effluent limits is provided in Appendix A – Basis for Effluent Limitations.

The permit requires monitoring of the effluent for DO, pH, FC bacteria, total residual chlorine, and enterococci bacteria to determine compliance with the permit WQBELs. In addition, the permit includes requirements to monitor the effluent for temperature, BOD_5, total suspended solids, settleable solids, and total residual chlorine. Data will be used to conduct future reasonable potential analysis to determine if discharges of these parameters might cause an exceedance of the WQS in the receiving waterbody.

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 must be used for averaging (for pollutants results reported on a monthly or weekly average) if they are conducted using the Department – approved test methods (generally found in 18 AAC 70 and 40 CFR Part 136 [adopted by reference in 18 AAC 83.010]).

For all effluent monitoring, the permittee must use a sufficiently sensitive EPA approved test method that quantifies the pollutants to a level lower than applicable limits or water quality standards or use the most

sensitive test method available, per Title 40 Code of Federal Regulations (CFR) §136 (Guidelines Establishing Test Procedures for the Analysis of Pollutants), adopted by reference at 18 AAC 83.010(f).

The permit establishes WQBELs at Outfall 001A with effluent limits for pH, DO, FC bacteria, total residual chlorine, and enterococci bacteria.

The WQS-WQBEL pH limits are 6.5 Standard Units (S.U.) as the minimum daily limit and 8.5 S.U. as the maximum Daily limit. The monitoring frequency is established at once per week. More information about pH can be found in the Fact Sheet Appendix A.

The WQS-WQBEL for DO is 6.0 mg/L and the maximum daily limit for is 17.0 mg/L. The monitoring frequency of DO monitoring is established at once per week. More information about DO can be found in the Fact Sheet Appendix A.

The WQS-WQBEL for FC bacteria is 43 fecal coliform colonies per 100 milliliters (FC/100 mL) daily maximum limit and a 30-day geomean of 14 FC/100 mL as the Average Monthly Limit (AML). A monitoring frequency of once per month is established. More information about FC can be found in the Fact Sheet Appendix A.

The WQS-WQBEL for enterococci is included in the permit. Enterococci are indicator organisms of harmful pathogens in marine water and are a better indicator of acute gastrointestinal illness than FC. The Department has determined the maximum daily limit of 130 colony-forming units per 100 milliliters (cfu/100 mL) and a 30-day geomean of 35 cfu/100 mL AML are appropriate and consistent with WQS for enterococci. The permit requires monthly monitoring for enterococci during the summer season only. The summer season is defined as the period of May 1 to September 30, to be consistent with the recommended contact recreation Water Quality Criteria (WQC) for marine waters during the summer season when contact recreation is more likely to occur. Enterococci monitoring is required to be performed in conjunction with FC monitoring. More information about enterococci can be found in the Fact Sheet Appendix A.

Total residual chlorine is the driver of the chronic and acute mixing zones. A reasonable potential analysis (RPA) on 140 sample results determined that effluent cannot meet applicable WQS for chlorine in marine receiving water. Temporary limits have been established based on the mixing zone analysis. More information about the total residual chlorine RPA can be found in Fact Sheet Appendix B. A compliance schedule for installing a dechlorination system will result end of pipe WQS-WQBELs after completion. More information about the compliance schedule for disinfection can be found in Fact Sheet Section 7.4.

A monitoring requirement for temperature is included in the permit. Seawater discharged to receiving water after it has been circulated through a heated building has the potential to influence the ambient temperature of the receiving water. The Department has determined that temperature monitoring on a weekly frequency will provide information for a reasonable potential analysis during the next permit reissuance. More information about temperature can be found in the Fact Sheet Appendix A.

A monitoring requirement for total settleable solids is included in the permit. There is reasonable potential for increasing solids in the effluent above natural conditions through standard operations. The routing of filter backwashing to the sanitary sewer should mitigate potential for excess solids in the effluent. The permit requires the daily maximum to be reported for total settleable solids monitoring once per quarter to provide data to determine if continued monitoring or new effluent limits will be required in the next permit reissuance.

A monitoring requirement for TSS is included in the permit. TSS is a conventional pollutant found in wastewater. The permit requires the daily maximum for TSS to be reported to provide data to determine if continued monitoring or new effluent limits will be required in the next permit cycle. The permit requires TSS monitoring frequency to be once per quarter.

A monitoring requirement for BOD_5 is included in this permit. BOD_5 is a conventional pollutant found in wastewater. The permitted discharge has the potential to introduce components contributing to BOD_5 by housing various organisms in its flow-through research tanks. The permit requires the daily maximum to be

reported for BOD_5 once per quarter to provide data to determine if continued monitoring or new effluent limits will be required in the next permit reissuance.

Table 2 presents the effluent monitoring requirements for Outfall 001A.

Table 2: Outfall 001A - Effluent Limits and Monitoring Requirements

Parameter	Effluent Limits					Monitoring Requirements		
	Units [a]	Daily Minimum	Monthly Average	Weekly Average	Daily Maximum	Sample Location	Sample Frequency	Sample Type
Total Discharge Flow	gpd	N/A	Report	Report	110,880	Effluent	1/Week	Recorded
Biochemical Oxygen Demand (BOD_5)	mg/L	N/A	Report	Report	Report	Effluent	1/Quarter [b]	24-hour Composite [c] or Grab
Total Suspended Solids (TSS)	mg/L	N/A	N/A	N/A	Report	Effluent	1/Quarter	24-hour Composite or Grab
Total Settleable Solids	Volume %	N/A	N/A	N/A	Report [d]	Effluent	1/Quarter	24-hour Composite or Grab
Temperature	° C	N/A	N/A	N/A	Report	Effluent	1/Week	Grab
pH	S.U.	6.5	N/A	N/A	8.5	Effluent	1/Month	Grab
Dissolved Oxygen (DO)	mg/L	6.0	N/A	N/A	17.0	Effluent	1/Month	Grab
Total Residual Chlorine (TRC)[e]	mg/L	N/A	0.0075	N/A	0.013	Effluent	3/Week	Grab
Fecal Coliform Bacteria (FC)	FC/ 100 mL	N/A	14 [f]	N/A	43 [g]	Effluent	1/Quarter	Grab
Enterococci Bacteria	cfu/ 100 mL	N/A	35 [f]	N/A	130 [g]	Effluent	1/Quarter [h]	Grab

Footnotes:

a. Units: gpd = gallons per day, mg/L = milligrams per liter, Volume % = per cent of volume, S.U. = standard units, ° C = degrees Centigrade, FC/100 mL = Fecal Coliform per 100 milliliters, and cfu/100 mL = colony forming units per 100 milliliters.

b. Once per quarter means once every three months based on the calendar year beginning with January: Jan–March, April–June, July–Sept, and Oct–Dec.

c. See Appendix C for definition.

d. No measurable increase in concentration of settleable solids above natural conditions, as measured by the volumetric Imhoff cone method.

e. The TRC effluent limits are not quantifiable using EPA-approved analytical methods. DEC will use the minimum level (ML) of 0.1 mg/L as the compliance evaluation level for this parameter.

f. If more than one FC or enterococci bacteria sample is collected within the reporting period, the 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 quantities. For example, the geometric mean of 100, 200, and 300 is $(100 \times 200 \times 300)^{1/3} = 181.7$.

g. If fewer than ten samples are collected within a 30-day period, the effluent limit cannot be exceeded. If ten or more samples are collected within a 30-day period, not more than 10% of the samples may exceed the effluent limit.

h. One sample shall be collected for each of two quarters defined as May-June and July-September, on the same day as a fecal coliform bacteria sample is collected.

3.4 Priority Pollutant Scan

The permit establishes a requirement for a one-time Outfall 001A effluent Priority Pollutant Scan (for the 126 pollutants identified in Appendix A of 40 CFR Part 423 [adopted by reference at 18 AAC 83.010(g)(3)]). The

Priority Pollutant Scan requirement is included because of lab operations at KFRC and the potential for unknown contaminants. The Priority Pollutant Scan will allow for further evaluation of the discharge for pollutants of concern at the first permit reissuance. The Priority Pollutant Scan must be completed once during the permit period. The effluent sample for must be representative. The sample should be taken during normal operations at the facility when lab activities are occurring and resulting in contributions to the KFRC effluent. The results of the analysis must be submitted with the reapplication package due 180 days before permit expiration.

3.5 Receiving Waterbody Limits and Monitoring

Trident Basin in Chiniak Bay is protected for the following uses per 18 AAC 70.020(a)(2)(A) – (D): water supply for aquaculture, seafood processing, and industrial uses; water recreation, both contact and secondary recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife and harvesting for consumption of raw mollusks or other raw aquatic life. no receiving water monitoring is required in the permit.

4.0 RECEIVING WATER BODY

4.1 Description of Receiving Waterbody

Trident Basin in Chiniak Bay is a on the eastern side of Kodiak Island in Southeast Alaska, located South of the city of Kodiak. It is classified in Category 2 (as a water with water quality information that is insufficient to determine an appropriate decision recommendation) in *Alaska's Final 2022 Integrated Water Quality Monitoring and Assessment Report* (Alaska's 2022 Integrated Report), September 15, 2022. The bay has a maximum length of approximately 11 miles and a maximum width of approximately 8.5 miles. The seafloor of the bay is composed of glacial sediments overlying metamorphic bedrock of primarily Triassic age. Trident Basin is located between Near Island and Holiday and Crooked Islands within Chiniak Bay.

4.2 Outfall Description

The KFRC Facility intermittently discharges treated effluent from Outfall 001A into Trident Basin at a depth of approximately 13 feet below the surface of the water. The discharge pipe is a submerged 12 inch diameter pipe that has a diffuser at the end that consists of a 12-ft long section of 12-in diameter HDPE with 4 rows of 2-inch diameter holes, 6-inches on center, with a blind flange at the end of the pipe to force the water out of the holes extending approximate 160 feet from shore at the KFRC Facility to the outfall terminus at a maximum design flow rate of approximately 110,880 gpd. The outfall terminus is located between Near Island and Holiday Island at geographic coordinates 57.782219º North latitude and 152.392981° West longitude.

4.3 Water Quality Standards

Section 301(b)(1)(C) of the CWA required the development of limits in permits necessary to meet water quality standards by July 1, 1977. Per 18 AAC 83.435, APDES permits must include conditions to ensure compliance with WQS. The state's WQS are composed of waterbody use classifications, numeric and/or narrative water quality criteria, and an Antidegradation policy. The use classification system identifies the designated uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the designated use classification of each waterbody. The Antidegradation policy ensures that the existing uses and the level of water quality necessary to protect the uses are maintained and protected.

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 waterbodies 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). The receiving water for this discharge, Chiniak Bay, has not been reclassified, nor have site-specific water quality criteria been established. Therefore, existing uses and designated uses are the same and Chiniak Bay must be protected for all marine water use classes listed in 18 AAC 70.020(a)(2)(A-D): water supply for aquaculture, seafood processing, and

industrial uses; water recreation, both contact and secondary recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife and harvesting for consumption of raw mollusks or other raw aquatic life.

4.4 Water Quality Status of Receiving Water

Any part of a waterbody for which the water quality does not or is not expected to meet applicable WQS is defined as a "water quality limited segment" and placed on the State's impaired water body list. For an impaired waterbody, Section 303(d) of the CWA requires states to develop a Total Maximum Daily Load (TMDL) management plan. The TMDL documents the amount of a pollutant a waterbody can assimilate without violating a state's WQS and allocates that load to known point sources and nonpoint sources.

Chiniak Bay is not included on the *State of Alaska 2022 Final Integrated Water Quality Monitoring and Assessment Report.* The report is no longer published, findings are accessed through the EPA How's My Waterbody website at: https://mywaterway.epa.gov/state/AK/water-quality-overview. No TMDL has been prepared for Chiniak Bay.

4.5 Mixing Zone Analysis

In accordance with 18 AAC 70.240, the Department may authorize a mixing zone in a permit. Determination of the mixing zone requires an evaluation of critical conditions of the flow regimes of the receiving waterbody, effluent characterization and concentration projections, and discharge rates. These critical conditions are addressed in the permit application. A chronic mixing zone is sized to protect the ecology of the waterbody as a whole and an acute mixing zone is sized to prevent lethality to passing organisms.

The acute and chronic mixing zones and calculated dilution factors were calculated based on facility effluent data, the *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide,* and modeled using CORMIX modeling software. Inputs included the maximum expected effluent concentrations and the acute and chronic WQ criteria of parameters that demonstrated RP (see Appendix A for details on the RPA), as well as any site-specific discharge and ambient data. Chlorine was the parameter that required the most dilution and the determined the acute and chronic mixing zone sizes necessary to achieve chlorine WQS at the boundary of the mixing zone. The most stringent criterion for chlorine is the chronic criteria for the protection of aquatic life for marine water. The WQC for chlorine in the Toxics Manual are given as 7.5 µg/L for the 4-day average for chronic criterion and 13 µg/L for the 1-hour average acute criterion. No other parameters needed a chronic mixing zone to meet their respective water quality criterion.

For the critical upstream concentrations of chlorine present in the receiving water, it was assumed for the RPA there was no chlorine present in receiving water. Chlorine is unstable in the environment readily breaks down with exposure to organics and sunlight.

DEC received the Kodiak Island Boroughs mixing zone application on August 4, 2023. As part of the application, AWR Engineering on behalf of the Kodiak Island Borough prepared a data summary of the effluent data collected as well as the results of the expanded effluent monitoring. AWR Engineering used the Cornell Mixing Zone Expert System (CORMIX) modeling program, a widely used and broadly accepted modeling tool. To simulate reasonable worst-case conditions, the following were used in the mixing zone modeling: the facility's maximum effluent flow rate of 250 gallons per minute (gpm) based on pump size and calculated Maximum Projected Effluent Concentrations (MECs) for chlorine. AWR Engineering compiled an effluent data summary and subsequently performed a Reasonable Potential Analysis (RPA) following the DEC's recommended RPA procedures (DEC 2009 and Tetra Tech 2013). In the analysis, AWR Engineering determined that chlorine was the driving parameter for the chronic mixing zone dimensions. AWR Engineering modeled the discharge as a non-toxic discharge in CORMIX with a water quality standard of 0.0075 mg/L. This resulted in a single proposed chronic mixing zone which did not provide a mixing zone model for the marine water quality acute criterion. The Kodiak Island Borough requested the temporary authorization of a mixing zone for chlorine while the facility implements dechlorination.

In accordance with 18 AAC 70.240, DEC modeled the acute and chronic mixing zones and calculated dilution factors using the CORMIX version 12.0 modeling program. DEC's models yielded a different chronic mixing zone size than what was proposed by the Kodiak Island Borough, as well as an acute mixing zone also driven by total residual chlorine. DEC's analysis was based on inputs to CORMIX that included the MECs and the acute and chronic WQS numeric criteria of chlorine, the only parameter that demonstrated reasonable potential (RP) to exceed water quality criteria at the end of pipe prior to discharge, as well as site-specific discharge and ambient data, effluent total residual chlorine data gathered by KFRC and the peak flow rate of 250 gpm to represent peak flow to Trident Basin (See Appendix A for details on the RPA).

Differences between the Kodiak Island Borough and DEC's CORMIX models were due to DEC using a maximum expected concentration (MEC) of chlorine calculated using the RPA tool guidelines which incorporates a reasonable potential multiplier that increased the MEC above what was modeled by AWR Engineering. DEC also incorporated receiving water current data that in the place of presumed wind driven current data at slack tide used by AWR Engineering. DEC used a current study that was performed by the National Ocean and Atmospheric Association (NOAA) in 2009. Station "KOD0904" was placed at 57° 48.347' North latitude and at 152° 20.060' West longitude, placing it approximately 2.7 miles northeast of the outfall terminus. This study occurred May 29, 2009, through July 11, 2009 and currents were measured at six minutes intervals at multiple depths. The Department elected to use only data from the 6.1-10.1-meter (20-33 foot) depths as it was most representative of the depths that occur at the diffuser. Using the NOAA data the Department determined the 90th percentile current measured was 48.6 cm/s, the 50th percentile current measured was 22.1 cm/s and the 10th percentile current measured was 5.5 cm/s. The maximum current observed was 116.3 cm/s. These speeds were all used in the Department's CORMIX modelling effort. The final model selected the 10th percentile current as described in this fact sheet section.

In DEC's analysis, total residual chlorine required the most dilution as the only parameter that demonstrated RP to exceed water quality criteria, and therefore determined the final chronic mixing zone size. The chronic chlorine mixing zone has a dilution factor of 131.9. The chronic mixing zone has a length of 254.4 meters, parallel to the prevailing currents centered at Outfall 001A to account for tidal reversal, and a width of 7.0 meters. The WQC may be exceeded within the authorized chronic mixing zones. All WQC will be met and apply at the boundary of the chronic mixing zone.

There is a smaller, initial, acute mixing zone surrounding the outfall and contained within the larger chronic mixing zone with total residual chlorine as the driving parameter. The acute mixing zone has a dilution factor of 76.1, with a length of 52.4 meters and a width of 5.7 meters. Acute aquatic life criteria will be met and apply at and beyond the boundary of this smaller initial mixing zone surrounding the outfall.

According to EPA (1991) and 18 AAC 70.240, 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 exposure is not to exceed the acute criterion. DEC determined that the travel time of an organism drifting through the acute mixing zone to be approximately 6.4 minutes; therefore, there will be no lethality to organisms passing through the acute mixing zone.

Other data required for the mixing zone modeling included: the input of receiving water characteristics at the outfall, such as the depth of the receiving water at the outfall, the ambient velocity, wind velocity, bank configuration and distance of the outfall from the bank, and other features. Based on the inputs, CORMIX predicted the distance at which the parameters would meet WQC as well as the corresponding dilution at the point. Table 9 provides a list of inputs used in the CORMIX modeling program. Figure 4 shows a map view of the chronic and acute mixing zones.

Fact Sheet Appendix D outlines criteria that must be met in order for the Department to authorize a mixing zone. These criteria include the size of the mixing zone, treatment technology, existing uses of the waterbody,

human consumption, spawning areas, human health, aquatic life, and endangered species. The following summarizes the Department's mixing zone analysis.

Figure 3: Kodiak Fisheries Research Center Chronic and Acute Mixing Zone

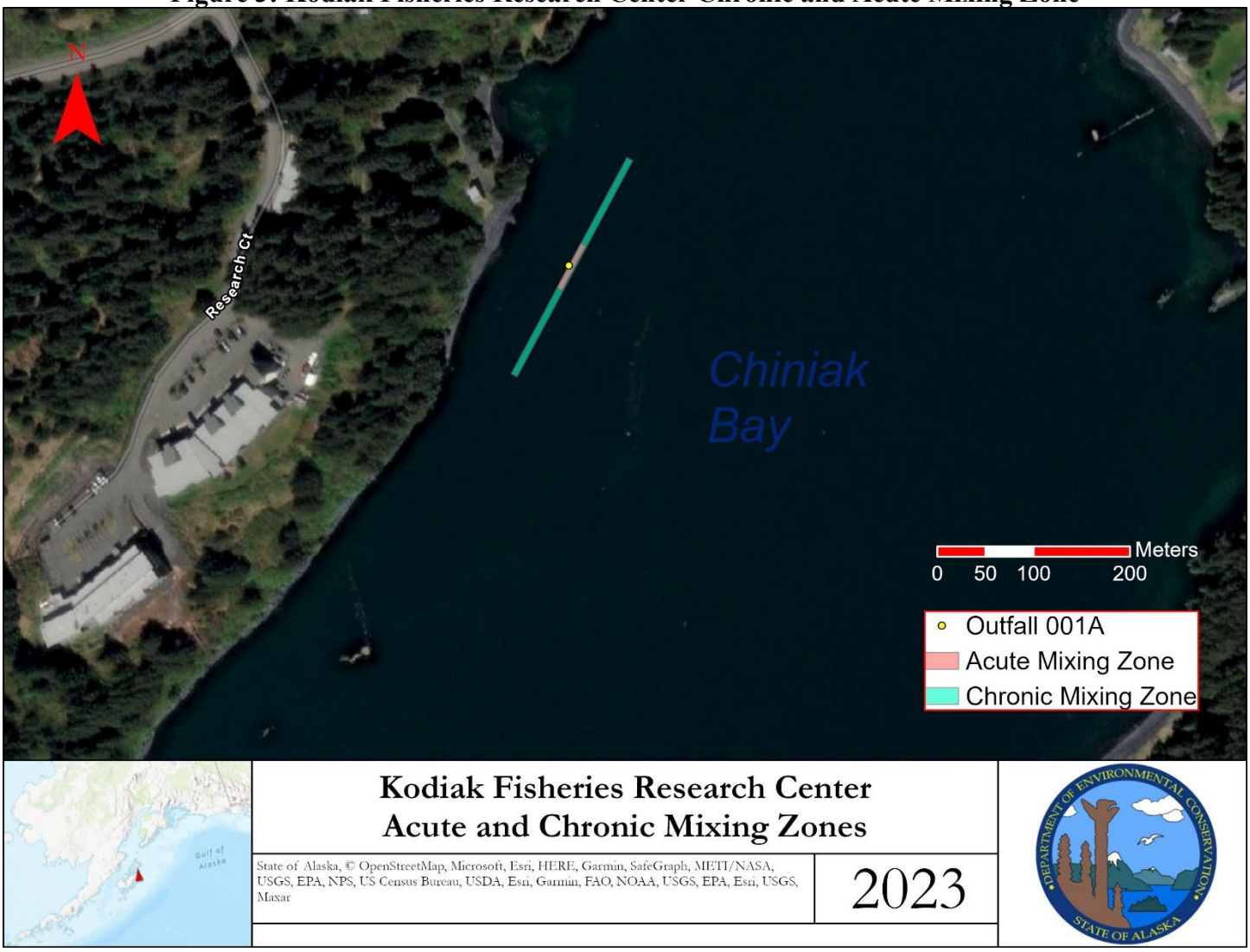


Table 3. Summary of DEC CORMIX Inputs

Parameter Modeled	**Maximum Expected Concentration**	**Ambient Concentration**	**Chronic Water Quality Criterion**	**Acute Water Quality Criterion**
Total Residual Chlorine	0.989 mg/L	0.0 mg/L	0.0075 mg/L	0.013 mg/L
Outfall Characteristics				
Outfall Type & Length	Single 12-inch pipe extending approximately 45 meters from shore, pipe opening orientated perpendicularly to prevalent tidal currents.			
Port Height above Streambed	0.16 meters (m)			
Effluent Characteristics				
Flow Rate	0.250 mgd peak flow			
Effluent Velocity	0.22 meters per second (m/s)			
Density	1023.26 kilograms per cubic meter (kg/m^3)			

Ambient Receiving Water Conditions	
Discharge Depth	6.4 m
Wind Speed	2.0 m/s
Receiving water current velocity	0.0557 m/s
Manning's n	0.02
Density (Uniform)	1023.62 kg/m^3

4.5.1 Size

In accordance with 18 AAC 70.240(k), the mixing zone must be as small as practicable. In order to ensure that the mixing zone is as small as practicable, DEC used CORMIX to model the chronic and acute mixing zones for seasonal flow rates, effluent temperatures, effluent flow rates and ambient density profiles. 18 AAC 70.240(b)(2) requires the Department to consider the characteristics of the effluent after treatment of the wastewater. DEC reviewed effluent data from total residual chlorine monitoring from 2/17/2022 through 11/22/2022 and Kodiak Island Borough's wastewater discharge application, Form 2C, to determine which parameters had RP to exceed WQ criteria at the end of pipe, and then which of the parameters required the most dilution to meet WQ criteria for the chronic and acute mixing zones. Total residual chlorine the only pollutant that requires dilution in the chronic mixing zone and therefore is the driving parameter. Chlorine required the most dilution in the chronic mixing zone to meet WQ criteria for aquatic life for marine water. Total residual chlorine was modeled in CORMIX to determine the smallest practicable chronic mixing zone size.

The maximum expected concentrations for Total residual chlorine, corresponding chlorine aquatic life for marine water WQ criteria were entered into CORMIX. The Department assumed the ambient concentration of total residual chlorine was zero because of the reactive nature of chlorine in the environment.
In accordance with 18 AAC 70.240, the Department determined that the size of the mixing zone for the KFRC discharge is appropriate. This is the first permit issued to KRFC and the compliance schedule for implementing dechlorination will eliminate the mixing zone for chlorine during the permit effective period. The relationship between dilution, discharge factors, and mixing zone sizes is predicted by CORMIX modeling.

Per 18 AAC 83.135 (b)(2), the Department has cause to modify a permit when the Department receives new information that was not available at the time of permit issuance, and the new information would have justified the imposition of different permit conditions at the time of issuance.

The acute mixing zone, driven by chlorine, is sized according to the dilution required by chlorine to meet acute marine aquatic life WQ criteria. The acute mixing zone is based data from three times per week effluent sampling of total residual chlorine submitted by the permittee from February 2022 to November 2022. The CORMIX model indicates that the water quality criteria would be met relatively rapidly, approximately parallel to the direction of the ambient currents. The mixing zone is sized to ensure: 1) the water quality criteria found in 18 AAC 70 are met at the boundary of the mixing zones, 2) the mixing zone is as small as practicable, and 3) compliance with all other applicable mixing zone regulations.

4.5.2 Technology

In accordance with 18 AAC 70.240(c)(1), the Department finds that available evidence reasonably demonstrates that the wastewater at KFRC will be treated to remove, reduce, and disperse pollutants using methods found by the Department to be the most effective and technological and economical feasible, consistent with the highest statutory and regulatory treatment requirements.

The KFRC treatment system includes filtration, disinfection, and monitoring systems that are comparable to similar permitted seawater systems. After facility upgrades and the permit compliance schedule for dechlorination are completed the facility will no longer need a mixing zone for chlorine.

4.5.3 Existing Use

In accordance with 18 AAC 70.240(c)(2) and (3) and 18 AAC 70.240(c)(4)(B) and (C), the mixing zone has been appropriately sized to fully protect the existing uses of Trident Basin. Water quality criteria are developed to specifically protect the uses of the waterbody as a whole. Therefore, if the water quality criteria are met in the waterbody, then the existing uses are protected. Given that water quality criteria will be met at, and beyond, the boundary of the chronic mixing zone, the designated and existing uses beyond the boundary of the chronic mixing zone will be maintained and fully protected under the terms of the permit as required in 18 AAC 70.240(c).

Monitoring submitted with the permit application indicate that the discharge neither partially nor completely eliminates an existing use of the water body outside of the mixing zone boundary. Exposure to acute concentrations of chlorine from the effluent in the acute mixing zone would be no more than 6.4 minutes at critical conditions. Mixing zone modeling suggests that mixing is adequate to ensure full protection of uses of the water body outside of the mixing zone. Additionally, the permittee is required to implement dechlorination that will eliminate the mixing zone for chlorine under a compliance schedule during the first two years of permit. Therefore, the Department considers a mixing zone appropriate.

DEC has determined that the existing uses and biological integrity of the waterbody will be maintained and fully protected under the terms of the permit as required at 18 AAC 70.240(c)(2) and (3) .and 18 AAC 70.240(c)(4)(B) and (C).

4.5.4 Human Consumption

In accordance with the conditions of the permit, and in accordance with 18 AAC 70.240(d)(6) the pollutants discharged cannot produce objectionable color, taste, or odor in aquatic resources harvested for human consumption.

There is no indication that the pollutants discharged have produced objectionable color, taste, or odor in aquatic resources harvested for human consumption. Additionally, the discharge has not precluded or limited established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting.

DEC has determined that application data and available mixing zone modeling suggests that pollutants discharged will neither produce objectionable color, taste, or odor in harvested aquatic resources for human consumption, per 18 AAC 70.240(d)(6)

4.5.5 Spawning Areas

In accordance with 18 AAC 70.240(f), in lakes, streams, rivers, or other flowing fresh waters, a mixing zone will not be authorized in a spawning area for Arctic grayling northern pike lake trout, brook trout, sheefish, burbot, landlocked coho salmon, chinook salmon, sockeye salmon, or anadromous or resident rainbow trout, Arctic char, Dolly Varden, whitefish, or cutthroat trout. Discharges to fresh waters are not authorized under the permit, therefore this condition is met.

4.5.6 Human Health

In accordance with 18 AAC 70.240(d)(1), the mixing zone will not result in pollutants discharged at levels that will bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota to significantly adverse levels, based on consideration of bioaccumulation and bioconcentration factors, toxicity, and exposure. 18 AAC 70.240(d)(2) states that the mixing zone may not present an unacceptable risk to human health from carcinogenic, mutagenic, teratogenic, or other effects as determined using risk assessment methods approved by DEC and consistent with 18 AAC 70.025. An analysis of the effluent data that was included with the Kodiak

Island Borough application for a permit and the results of the RPA conducted on pollutants of concern indicated that the level of treatment is protective of human health. The effluent data was then used in conjunction with applicable WQC, which serve the purpose of protecting human and aquatic life, to size the mixing zone to ensure all WQC are met in the waterbody at the boundary of the mixing zone.

The only parameter included in the mixing zone is total residual chlorine (TRC). TRC is not known to bioaccumulate and does not have human health criteria under the Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances as amended through September 8, 2022. Therefore, the mixing zone sized to be protective of the most stringent WQ criteria for marine aquatic life is also protective of human health.

DEC has determined that the permit satisfied 18 AAC 70.240(d)(1) and 18 AAC 70.240(d)(2), and that the level of treatment at the KFRC is protective of human health.

4.5.7 Aquatic Life and Wildlife

In accordance with 18 AAC 70.240, pollutants for which the mixing zone will be authorized will not result in concentrations that result in undesirable or nuisance to aquatic life, cause permanent or irreparable displacement of indigenous organisms, or a reduction in fish or shellfish population levels. Nor will the discharge form a barrier to migration or prevent zone of passage in the receiving water. CORMIX modeling conducted for this discharge to Trident Basin incorporated the most stringent WQ criteria in the model for protection of the growth and propagation of fish, shellfish, other aquatic life, and wildlife, and all WQ criteria will be met at the boundary of the authorized mixing zone. CORMIX models of the outfall indicate that high dilution occurs relatively rapidly, and pollutants discharged will have a relatively short residence time in the mixing zones prior to mixing to WQ criteria levels occurs.

DEC determined that the mixing zones will not create a significant adverse effect to fish spawning or rearing, form a barrier to migratory species, fail to provide a zone of passage, result in undesirable or nuisance aquatic life, result in permanent or irreparable displacement of indigenous organism, or result in reduction in fish population levels and that 18 AAC 70.240 are met.

4.5.8 Endangered Species

In accordance with 18 AAC 70.240(c)(4)(F), the mixing zone will not cause an adverse effect on threatened or endangered species. DEC consulted the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) websites to identify any threatened or endangered species under their jurisdiction in the vicinity of the KFRC Outfall. See Fact Sheet Section 8.2 for summary information regarding critical habitat and endangered species.

No detrimental effects to fauna in the area have been documented for the facility, nor does the mixing zone appear to pose an undesirable nuisance to aquatic life. The RPA and CORMIX modeling resulted in a mixing zone that meets WQ criteria for chlorine relatively rapidly, reducing the possibility for any threatened or endangered species potentially in the area to come into contact with the treated wastewater. Additionally, implementation of dechlorination under the permits compliance schedule will result in the elimination of the mixing zone during the permit period.

Due to the short residence time of pollutants in the mixing zone, DEC has concluded that the mixing zones are sized to not cause an adverse effect on threatened or endangered species in the vicinity of the discharge. DEC will provide a copy of the permit and fact sheet to NMFS and USF&WS when it is publicly noticed. Any comments received from the agencies regarding endangered species will be considered prior to issuance of the permit.

5.0 ANTIBACKSLIDING

18 AAC 83.480 requires that "interim effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit, unless the circumstances on which the previous permit was based have materially and substantially changed since the permit was issued, and the change in circumstances would cause for permit modification or revocation and reissuance under 18 AAC 83.135." 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."

Effluent limitations may be relaxed 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, or, if the Department determines that technical mistakes were made.

This is the first permit issued for the KFRC. Accordingly, no further backsliding analysis is required for this permit issuance.

6.0 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 State's Antidegradation policy is found in the 18 AAC 70 Water Quality Standards (WQS) regulations at 18 AAC 70.015. The Department's approach to implementing the Antidegradation policy is found in 18 AAC 70.016 *Antidegradation implementation methods for discharges authorized under the federal Clean Water Act*. Both the Antidegradation policy and the implementation methods are consistent with 40 CFR 131.12 and approved by EPA. This section analyzes and provides rationale for the Department's decisions in the permit issuance with respect to the Antidegradation policy and implementation methods.

Using the policy and corresponding implementation methods, the Department determines a Tier 1 or Tier 2 classification and protection level on a parameter-by-parameter basis. A Tier 3 protection level applies to a designated water. At this time, no Tier 3 waters have been designated in Alaska.

18 AAC 70.015(a)(1) states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected (Tier 1 protection level).

There are no marine waters (and specifically Trident Basin or Chiniak Bay) on DEC's most recent Integrated Report (Alaska's 2022 Integrated Report); therefore, no parameters have been identified where only the Tier 1 protection level applies. Accordingly, this antidegradation analysis conservatively assumes that the Tier 2 protection level applies to all parameters, consistent with 18 AAC 70.016(c)(1).

18 AAC 70.015(a)(2) states that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality must be maintained and protected, unless the Department authorizes a reduction in water quality (Tier 2 protection level).

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

18 AAC 70.016(b)(5)

(A) *existing uses and the water quality necessary for protection of existing uses have been identified based on available evidence, including water quality and use related data, information submitted by the applicant, and water quality and use related data and information received during public comment; and*

(B) *existing uses will be maintained and protected; and*

(C) *the discharge will not cause water quality to be lowered further where the department finds that the parameter already exceeds applicable criteria in 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b).*

Per 18 AAC 70.020 and 18 AAC 70.050 all marine waters are protected for all 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* (Toxics manual) apply and were evaluated. This will ensure existing uses and the water quality necessary for protection of existing uses of the receiving waterbody are fully maintained and protected.

The permit places limits and conditions on the discharge of pollutants. The limits and conditions are established after comparing TBELs and WQBELs and applying the more restrictive of these limits. The WQ criteria, upon which the permit effluent limits are based, serve the specific purpose of protecting the existing and designated uses of the receiving water. WQBELs are set equal to the most stringent water quality criteria available for any of the protected water use classes.

The conventional pollutants of concern in wastewater in a seawater system are BOD_5, TSS, and pH. Additional wastewater pollutants of concern at the KFRC Facility are chlorine, FC bacterial, enterococci, settleable solids, temperature, and DO. The permit includes numeric effluent limits or continued monitoring addressing each of these pollutants of concern. The permit requires facilities to implement BMPs to minimize the production of waste and the discharge of pollutants to waters of the U.S., to ensure that non-process wastewater facilities provide for the protection or attainment of existing and designated uses.

Section 1.2.2 of the permit requires that the discharge shall not cause or contribute to a violation of the Alaska WQS at 18 AAC 70. As previously stated, there are no marine waters that are listed as impaired; therefore, no parameters were identified as already exceeding the applicable criteria in 18 AAC 70.020(b) or 18 AAC 70.030. Marine waters covered under the permit are not listed under 18 AAC 70.236(b) as subject to site-specific criteria and therefore does not apply.

The Department concludes the terms and conditions of the permit will be adequate to fully protect and maintain the existing uses of the water and that the findings under 18 AAC 70.016(b)(5) are met.

18 AAC 70.016(c)(7)(A –F) *if, after review of available evidence, the department finds that the proposed discharge will lower water quality in the receiving water, the department will not authorize a discharge unless the department finds that*

> ***18 AAC 70.016(c)(7)(A)*** *the reduction of water quality meets the applicable criteria of 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b), unless allowed under 18 AAC 70.200, 18 AAC 70.210, or 18 AAC 70.240;*

As previously stated, Section 1.2.2 of the permit requires that the discharge shall not cause or contribute to a violation of the WQS at 18 AAC 70. WQBELs are set equal to the most stringent water quality criteria available under 18 AAC 70.020(b) for any of the protected water use classes. Because of the nature of the permitted discharges, other pollutants are not expected to be present in the discharges at levels that would cause, have the reasonable potential to cause, or contribute to an exceedance of any Alaska WQS.

Fact Sheet Part 4.5: Mixing Zone Analysis of the permit requires that the discharge shall not cause a violation of the WQS except if excursions are authorized in accordance with provisions in 18 AAC 70.200 – 70.240 (i.e., mixing zone, variance, etc.).

As a result of the KFRC's reasonable potential to exceed water quality criteria chlorine, and available assimilative capacity in the receiving water, a mixing zone is authorized in the wastewater discharge permit in accordance with 18 AAC 70.240. More information about the KFRC mixing zone can be found in Fact Sheet Part 4.5. The permit implements a compliance schedule to install a dechlorination system as detailed in Permit Section 2.2 that will result in achieving end of pipe WQS for chlorine in marine water within two years. The resulting interim effluent end-of-pipe limits prior to completion of the compliance schedule and monitoring requirements in the permit protect water quality criteria, and therefore, will not violate the water quality criteria

found at 18 AAC 70.020 beyond the boundary of the authorized mixing zone. A smaller acute mixing zone for has been authorized in the permit, consistent with 18 AAC 70.240(d)(7), to ensure no lethality to passing organisms occurs.

Site-specific criteria as allowed by 18 AAC 70.235 have not been established for Chiniak Bay, as listed in 18 AAC 70.236(b), and are therefore not applicable. The permit does not authorize short term variance or zones of deposit under 18 AAC 70.200 or 18 AAC 70.210; therefore, does not apply.

The Department has determined the reduction of water quality meets the applicable criteria of 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b), and that the finding is met.

18 AAC 70.016(c)(7)(B) *each requirement under (b)(5) of this section for a discharge to a Tier 1 water is met;*

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

18 AAC 70.016(c)(7)(C) *point source and state-regulated nonpoint source discharges to the receiving water will meet requirements under 18 AAC 70.015(a)(2)(D); to make this finding the department will (i) identify point sources and state-regulated nonpoint sources that discharge to, or otherwise impact, the receiving water;* and *(ii) consider whether there are outstanding noncompliance issues with point source permits or required state-regulated nonpoint source best management practices, consider whether receiving water quality has improved or degraded over time, and, if necessary and appropriate, take actions that will achieve the requirements of 18 AAC 70.015(a)(2)(D); and (iii) coordinate with other state or federal agencies as necessary to comply with (i) and (ii) of this subparagraph;*

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

(D) all wastes and other substances discharged will be treated and controlled to achieve

(i) for new and existing point sources, the highest statutory and regulatory requirements; and

(ii) for nonpoint sources, all cost-effective and reasonable best management practices; and

The highest statutory and regulatory requirements are defined at 18 AAC 70.015(d):

(d) For purposes of (a) of this section, the highest statutory and regulatory requirements are

(1) any federal technology-based effluent limitation identified in 40 C.F.R. 122.29 and 125.3, revised as of July 1, 2017 and adopted by reference; and

(2) any minimum treatment standards identified in 18 AAC 72.050; and

(3) any treatment requirements imposed under another state law that is more stringent than a requirement of this chapter; and

(4) any water quality-based effluent limitations established in accordance with 33 U.S.C. 1311(b)(1)(C) (Clean Water Act, sec. 301(b)(1)(C)).

The first part of the definition includes all federal technology based ELGs. Upon Department review, no federal technology based ELGs directly apply to these types of discharges. The ELGs set standards of performance for existing and new sources and are incorporated in the permit.

The second part of the definition references the minimum treatment standards found at 18 AAC 72.050, which refers to domestic wastewater discharges only. The permit does not authorize the discharge of domestic wastewater (Permit Section 1.1.1). Therefore, a finding under this section is not applicable.

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

The fourth part of the definition refers to water quality-based effluent limitations (WQBELS). A WQBEL is designed to ensure that the Water Quality Standards (WQS) of a waterbody are met and may be more stringent than TBELs. Section 301(b)(1)(C) of the CWA requires the development of limits in permits necessary to meet WQS by July 1, 1977. WQBELs included in APDES permits are derived from EPA-approved 18 AAC 70 WQS. APDES regulation 18 AAC 83.435(a)(1) requires that permits include WQBELs that can "achieve water quality standard established under CWA §303, including state narrative criteria for water quality." The permit requires compliance with the 18 AAC 70 WQS, includes effluent limits for DO, pH, total residual chlorine, temperature, enterococci and FC.

The Department reviewed available information on known point source discharges to receiving waters covered under the permit and found no outstanding noncompliance issues. The KFRC Facility will be able to meet marine WQS for FC bacteria, enterococci, temperature, DO, and pH in the facility effluent at the point of discharge, therefore these pollutants of concern will not exceed WQBELs. Chlorine WQBELs will be met at the edge of the regulatory mixing zone until the compliance schedule is complete for dechlorination. After completion of the compliance schedule the WQBELs for chlorine will be implemented at the end of pipe. There are no state regulated nonpoint sources that discharge to, or otherwise impact, the receiving waters covered under the permit.

After review of the methods of treatment and control and the applicable statutory and regulatory requirements, including 18 AAC 70, 18 AAC 72, and 18 AAC 83, the Department finds that the discharge authorized under this general permit meets the highest applicable statutory and regulatory requirements; therefore, 18 AAC 70.016(c)(7)(C) finding is met.

18 AAC 70.016(c)(7)(D)(i-ii) *the alternatives analysis provided under (4)(C-F) of this subsection demonstrates that*

(i) a lowering of water quality under 18 AAC 70.015(a)(2)(A) is necessary; when one or more practicable alternatives that would prevent or lessen the degradation associated with the proposed discharge are identified, the department will select one of the alternatives for implementation; and

(ii) the methods of pollution prevention, control, and treatment applied to all waste and other substances to be discharged are found by the department to be the most effective and practicable.

New discharges are required to meet all permit requirements prior to discharge.

(i) KFRC's alternatives analysis found that the discharge requires a Tier 2 analysis as defined under 18 AAC 70.016(c)(2)(A) – (E). As part of the analysis, chlorine was determined to be the only pollutant of concern that the current treatment system is not able to meet water quality criteria at the point of discharge. The analysis of a range of practicable alternatives that have the potential to prevent or lessen the degradation associated with the proposed chlorine discharge, per 18 AAC 70.015(c)(4) is provided below:

a. Utilizing a mixing zone as allowed by 18 AAC 70.240 would result in no additional costs to the facility while allowing only limited water quality degradation within a mixing zone sized for chlorine. Permit limitations that restrict the effluent discharge will ensure that water quality criteria will not be exceeded at the boundary of, or beyond, the mixing zone. In addition, Trident Basin in Chiniak Bay has assimilative capacity and there has been no observed evidence of toxicity in the receiving water in the vicinity of the outfall. Also, there are no known beneficial uses of the waterbody that would be impacted by the discharge and the area downstream of the outfall is not part of a DEC Drinking Water Protection Area.

b. Installation of a dechorination system, consisting of a liquid sodium bisulfite tank, metering pumps, and a chlorine analyzer. The system would be designed and constructed during the first permit and would allow for the removal of free chlorine and meeting water quality criteria for chlorine at the point of discharge without a mixing zone. The estimated capital cost would be $78,000 dollars with an annual operations and maintenance cost of $1,500.

c. KFRC selected alternative (b) as the most practicable alternative.

The Department concurs that alternative (b) is the preferred alternative as it is the option that lessens water quality degradation and eliminates the need for a regulatory mixing zone. The Department is implementing a compliance schedule to allow for design and completion of a dechlorination system during the first two years of the permit The alternative selected prevents degradation from the discharge; therefore 18 AAC 70.016(c)(7)(D)(i) finding is met.

(ii) Permit requirements include implementing BMPs, estimation of flow, and effluent monitoring to ensure compliance and for evaluation of future permit limits. Appropriate wastewater effluent treatment has been applied. The methods of pollution prevention, control, and treatment applied to all waste and other substances to be discharged are found by the Department to be the most effective and practicable; therefore 18 AAC 70.016(c)(7)(D)(ii) finding is met.

18 AAC 70.016(c)(7*)(E) except if not required under (4)(F) of this subsection, the social or economic importance analysis provided under (4)(G) and (5) of this subsection demonstrates that a lowering of water quality accommodates important social or economic development under 18 AAC 70.015(a)(2)(A);*

The KFRC Facility has been discharging spent seawater as wastewater to Trident Basin since the 1998. The KFRC Facility is an important part of the research and educational programs at UAS. To support the research conducted by the facility, a large volume of seawater is constantly required, which requires the facility to be located within close proximity to the ocean. Wastewater discharged from the KFRC Facility meets WQS at the end of the pipe for DO, pH, temperature, enterococci and FC. The facility will be implementing dechlorination to meet chlorine WQBELs during the permit. This is the non-degrading alternative and will result in the facility not requiring a mixing zone and producing effluent that meets the most stringent marine water quality standards at the point of discharge. KFRC generates and shares scientific knowledge that promotes understanding and stewardship of Alaska's marine ecosystems. KFRCs continued operation is important to the regional economy, as well as the overall economic and social development of the State of Alaska.

The Department has determined that the operation of the KFRC Facility and the discharges authorized by the permit demonstrates that a lowering of water quality accommodates important social or economic development; therefore, 18 AAC 70.016(c)(7)(E) finding is met.

18 AAC 70.016(c)(7)(F) *18 AAC 70.015 and this section have been applied consistent with 33 U.S.C. 1326 (Clean Water Act, sec. 316) with regard to potential thermal discharge impairments.*

Discharges authorized under the permit are not associated with a potential thermal discharge impairment; therefore, the finding is not applicable.

7.0 OTHER PERMIT CONDITIONS

7.1 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, implement and/or maintain the Quality Assurance Project Plan (QAPP). The QAPP shall consist of standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples; laboratory analysis; precision and accuracy requirements; data reporting, including method detection/reporting limits; and quality assurance/quality control criteria. 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.

7.2 Best Management Practices Plan

In accordance with AS 46.03.110 (d), the Department may specify in a permit the terms and conditions under which waste material may be disposed of. The permit requires the permittee to develop and implement a BMP plan in order to prevent or minimize the potential for the release of pollutants to waters and lands of the State of

Alaska through plant site runoff, spillage or leaks, or erosion. The permittee must review the BMP plan annually and certify the review was completed. These annual statements will be kept on file with the BMP and made available to the Department upon request.

7.3 Electronic Discharge Monitoring Report

The permittee must submit DMR data electronically through NetDMR per Phase I of the E-Reporting Rule (40 CFR 127) upon the effective date of the permit. Authorized persons may access permit information by logging into the NetDMR Portal (https://cdxnodengn.epa.gov/oeca-netdmr-web/action/login). DMRs submitted in compliance with the E-Reporting Rule are not required to be submitted as described in permit APPENDIX A – Standard Conditions unless requested or approved by the Department. Any DMR data required by the Permit that cannot be reported in a NetDMR field (e.g., mixing zone receiving water data, etc.), shall be included as an attachment to the NetDMR submittal. DEC has established an e-Reporting Information website at https://dec.alaska.gov/water/compliance/electronic-reporting-rule/ that contains general information about this new reporting format.

Phase II of the E-Reporting rule will integrate electronic reporting for all other reports required by the Permit (e.g., Annual Reports and Certifications) and implementation is expected to occur during the term of the permit. Permittees should monitor DEC's E-Reporting Information website for updates on Phase II of the E-Reporting Rule and will be notified when they must begin submitting all other reports electronically. Until such time, other reports required by the Permit may be submitted in accordance with permit APPENDIX A – Standard Conditions.

7.4 Compliance Schedule

In accordance with 18 AAC 70.910 and 18 AAC 83.560, when appropriate, 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. A 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. Compliance schedules authorized under 18 AAC 83.560 require that if a permit establishes a schedule of compliance that exceeds one year, the schedule must set out interim requirements and dates for their achievement. If the time necessary to complete any interim requirement is more than one year, the schedule shall require reports on progress towards completion of the interim requirements.

The Kodiak Fisheries Research Center (KFRC) performed effluent sampling for the facility's application for an APDES permit. A reasonable potential analysis of the monitoring results found the facility is unable to meet water quality criteria for chlorine in marine water. As a result of discussions with the Department and the alternatives analysis as required by the antidegradation analysis, the facility agreed to install and operate a dechlorination system as part of the treatment program. The Department will implement a compliance schedule for installing dechlorination during the first two years of the permit period that will allow for a temporary mixing zone with associated interim limits for chlorine that the current treatment system can achieve with proper operation and maintenance.

KRFC submitted a mixing zone application in August 2023 requesting a mixing zone for chlorine based on 140 effluent samples and CORMIX mixing zone modeling. After review and modifications, the Department determined the mixing zone was appropriate and an interim mixing zone could be implemented for chlorine. The interim chlorine limits are based critical conditions and the smallest possible mixing zone based on CORMIX modeling and the reasonable potential analysis of the dataset.

The Department is implementing a compliance schedule to allow the time necessary for the facility to come into full compliance with WQS for chlorine, as allowed in 18 AAC 70.910 and 18 AAC 83.560. Federal regulations at 40 CFR 122.47(1) and state regulations at 18 AAC 83.560(a) mandate that schedules of compliance require compliance with final effluent limits as soon as possible. This is reiterated in the 2003 state WQS regulations at

18 AAC 70.910(b)(3) which state that compliance schedules must require compliance in "as brief a time as is feasible."

When evaluating whether a compliance schedule is requiring compliance "as soon as possible," EPA recommends consulting a May 2007 memo (Hanlon Memo) written by James Hanlon, then Director of EPA's Office of Wastewater Management. The Hanlon Memo provides a framework for the review of permits consistent with the Clean Water Act (CWA) and its implementing regulations. The Hanlon Memo suggests that in order to determine if a compliance schedule requires compliance "as soon as possible" that the permitting authority take into consideration the steps needed to modify or install treatment facilities, operations, or other measures and the time those steps would take. The Hanlon Memo states that the permitting authority should not simply presume that a compliance schedule be based on the maximum time period allowed.

When considering the compliance schedule timeline for KFRC the Department reviewed the steps needed to implement disinfection. The facility will require engineering and design to be completed for the project with plan review and approval from the DEC Engineering Support and Plan Review Section. After plan review materials estimated to cost $78,000 will need to be purchased and shipped to the site for installation. Based on delays seen in other projects around the state from supply chain issues and labor shortages the Department determined two-years after permit issuance as the deadline for compliance. This will allow the facility two summer seasons that are traditionally when construction occurs to achieve compliance.

Permit Section 2.2 further describes how the permittee will achieve compliance with the final chlorine effluent limits prior to the conclusion of the two-year compliance schedule. The Department defined "achieve compliance" to mean installation and operation of a dechlorination system. Additionally, not exceeding the monthly average total residual chlorine effluent limit (7.5 µL) for three consecutive months and not exceeding the daily maximum total residual chlorine effluent limit (13 µL) for four consecutive samples. The Department has a compliance level of 0.1 mg/L for total residual chlorine based on most sensitive test methods. Regardless of compliance status, the final chlorine effluent limits go into effect at the conclusion of the two- year period.

While the dechlorination schedule of compliance is in effect, the interim chlorine effluent limits derived from the authorized mixing zone for total residual chlorine are depicted in Table 4.

Table 4. Interim Total Residual Chlorine Effluent Limits

Parameter	Units	Effluent Limits			Monitoring Frequency	
		Monthly Average	Daily Maximum	Sample Location	Sample Frequency	Sample Type
Total Residual Chlorine	mg/L	0.384	0.989	Effluent	3/Week	Grab

7.5 Standard Conditions

Appendix A of the permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on 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.

8.0 OTHER LEGAL REQUIREMENTS

8.1 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 discharges 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).

Interactive nautical charts depicting Alaska's baseline plus additional boundary lines are available at https://nauticalcharts.noaa.gov/data/us-maritime-limits-and-boundaries.html and interactive maps at https://alaskafisheries.noaa.gov/mapping/arcgis/rest/services/NOAA_Baseline/MapServer. The maps and charts are provided for information purposes only. The U.S. Baseline committee makes the official determinations on baseline. Ocean Discharge Criteria are not applicable for marine discharges to areas located landward of the baseline of the territorial sea.

A review of the baseline line maps revealed that the KFRC Outfall 001A terminus is positioned landward of the baseline of the territorial sea; therefore, Section 403 of the CWA does not apply to the permit, and an ODCE analysis is not required to be completed for this permit reissuance. Further, the permit requires compliance with WQS such that 40 CFR 125.122(b) is met and therefore the discharge is presumed not to cause unreasonable degradation of the marine environment.

8.2 Endangered Species Act

The National Marine Fisheries Service (NMFS) is responsible for administration of the Endangered Species Act (ESA) for listed cetaceans, seals, sea lions, sea turtles, anadromous fish, marine fish, marine plants, and corals. All other species (including polar bears, walrus, and sea otters) are administered by the United States Fish & Wildlife Service (USFWS).

The Endangered Species Act (ESA) requires federal agencies to consult with 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, DEC voluntarily contacted the agencies to notify them of the proposed permit issuance and to obtain listings of threatened and endangered species near the discharge.

DEC provided notice and request for any ESA related concerns to the USFWS and the NMFS on August 4, 2023, about the intent to issue the KFRC permit and the location of Outfall 001A. The Department did not receive any concerns from the USFWS or the NMFS.

The Department also accessed the USFWS online Information for Planning Consultation (IPaC) tool at https://ecos.fws.gov/ipac/location/index on August 4, 2023. The IPaC tool identified the endangered Short-tailed Albatross (Phoebastria albatrus) and Steller's Eider (Polysticta stelleri) as possibly occurring at the location. The IPaC tool also identified habitat for the Northern Sea Otter (Enhydra lutis kenyoni) in the location of the City of Kodiak WWTF Outfall 001A which is protected under the Marine Mammal Protection Act.

The Department accessed the NMFS Endangered Species Act Critical Habitat Mapper on August 4, 2023. The mapping application identified critical habitat at Outfall 001A for the endangered Stellar Sea Lion (Eumetopias jubatus), the Mexico Distinct Population Segment of Humpback Whale (Megaptera novaeangliae), the Fin Whale (Balaenoptera physalus), the North Pacific Right Whale (Eubalaena japonica), and the Sperm Whale (Physeter macrocephalus).

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

8.3 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 NOAA on EFH; however, DEC voluntarily contacts agencies to notify them of the proposed permit issuance and to obtain listings of EFH in the area.

DEC contacted NOAA on August 4, 2023 to provide them with early notification of DEC's intent to issue AK0062282 and to provide them the opportunity to share concerns with DEC regarding EFH. Additionally, on August 4, 2023, DEC accessed the NMFS Endangered Species Act Critical Habitat Mapper on the NMFS website at https://www.fisheries.noaa.gov/alaska/habitat-conservation/essential-fish-habitat-efh-alaska. The EFH mapper and found that Outfall 001A KFRC is in the area identified as EFH for Sockeye, Chinook, Chum, Coho, and Pink Salmon. Also, EFH for fish species found in the Gulf of Alaska including skate species, pollock species, sole species, rockfish species, pacific cod, octopus, and rockfish species among others.

This fact sheet and the permit will be submitted to the agencies for review during the public notice period and any comments received from these agencies will be considered prior to issuance of the permit.

8.4 Permit Expiration

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

9.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC) 2020, *18 AAC 70 Water Quality Standards*, as amended through March 5, 2020.

ADEC 2008, *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances*, as amended through September 8, 2022.

ADEC 2014. *Alaska Pollutant Discharge Elimination System (ADPES) Permits Reasonable Potential Analysis and Effluent Limits Development Guide*, as amended June 30, 2014.

ADEC 2022, *Alaska's Final 2022 Integrated Water Quality Monitoring and Assessment Report*, https://dec.alaska.gov/water/water-quality/integrated-report/. Approved September 15, 2022.

National Ocean and Atmospheric Administration, Kodiak, AK Station ID KOD0904. Data retrieved from https://tidesandcurrents.noaa.gov/cdata/StationInfo?id=KOD0904 on February 22, 2017.

Robert Doneker and Gerhard Jirka, 2007. *CORMIX User Manual*, U.S. Environmental Protection Agency, EPA-823-K-07-001, December 2007, Updated July 2021.

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

USEPA, *Water Quality Standards Handbook: Second Edition*, EPA-823-B-94-005a, USEPA, Washington, DC, August 1994.

USEPA, *Alaska DEC NPDES Permit Writer's Course*, Reference Manual. May 2019.

APPENDIX A: BASIS FOR EFFLUENT LIMITS

The Clean Water Act (CWA) requires that the effluent limit for a particular pollutant be the more stringent of either technology-based effluent limits (TBELs) or water quality-based effluent limits (WQBELs). TBELs are established by the Environmental Protection Agency (EPA) for many industries in the form of Effluent Limitation Guidelines (ELGs), are based on available pollution control technology and are adopted by reference in 18 AAC 83. The Department adopts the subject ELGs by reference in 18 AAC 83.010. There are no TBELs or Effluent Limit Guidelines (ELGs) that apply to this permit. The permit contains WQBELS designed to ensure that the WQS of the receiving water body are met.

In accordance with Alaska Pollutant Discharge Elimination System regulations at 18 AAC 83.475, best management practices (BMPs) can be used to control or abate the discharge of pollutants in several circumstances, including, when numeric effluent limits are infeasible. BMPs are defined at 18 AAC 83.990(9) as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States (U.S.). CWA Section 304 (e) authorizes the inclusion of BMPs as requirements in discharge permits.

A.1 Water Quality Based Effluent Limits for Outfall 001A

A.1.1 Statutory and Regulatory Basis

18 AAC 70.010 prohibits conduct that causes or contributes to a violation of the WQS. 18 AAC 15.090 requires that permits include terms and conditions to ensure 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 WQS are met and must be consistent with any available wasteload allocation (WLA).

A.1.2 Specific Water Quality-Based Effluent Limits

A.1.2.1 Floating, Suspended or Submerged Matter, including Oil and Grease

The WQS for floating, suspended or submerged matter, including oil and grease, are narrative. The most stringent standard, found at 18 AAC 70.020(b)(8)(A)(i), requires that fresh 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."

A.1.2.2 pH

Alaska WQS at 18 AAC 70.020(b)(18)(A)(i), (Water Supply – aquaculture) and 18 AAC 70.020(b)(18)(C) (Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife) states that the pH water quality criteria may not be less than 6.5 or greater than 8.5. Standard Units (S.U.). This WQS-WQBEL requirement is established with a monthly monitoring frequency.

A.1.2.3 Fecal Coliform Bacteria

Alaska WQS at 18 AAC 70.020(b)(14)(D) states that the fecal coliform bacteria criteria for the harvesting for consumption of raw mollusks or other raw aquatic life the geometric mean of samples may not exceed 14 FC/100 mL, and not more than 10% of the samples may exceed a FC most probable number (MPN) of 43 FC/100 mL.

DEC establishes monitoring only requirements for this parameter to provide data to be analyzed at the next permit issuance. Effluent monitoring for FC bacteria is required on a monthly basis, year-round.

A.1.2.4 Enterococci Bacteria

The criteria at 18 AAC 70.020(b)(14)(B)(i), Water Recreation – contact recreation criteria require that within a 30-day period, the geometric mean of samples may not exceed 35 enterococci colony-forming units per 100 mL (cfu/100 mL), and not more than 10% of the samples may exceed a statistical threshold value (STV) of 130 enterococci cfu/100 mL. Enterococci monitoring only limits are established to provide data for the next permit issuance. Effluent monitoring for enterococci is required on a quarterly basis from May through September, when primary contact recreation in which full immersion and ingestion of water is more likely to occur. The enterococci monitoring will be performed in conjunction with FC bacteria monitoring.

A.1.2.5 Dissolved Oxygen

The criteria for water supply/aquaculture are the most stringent standards for dissolved oxygen (DO). The standards at 18 AAC 70.020(b)(15)(A)(i) require that "Surface DO concentration in coastal water may not be less than 6.0 mg/l for a depth of one meter except when natural conditions cause this value to be depressed. In no case may DO levels exceed 17 mg/L. The concentration of total dissolved gas may not exceed 110% of saturation at any point of sample collection. Monitoring only limits are established for DO. Data collected will be used for analysis under the next permit issuance. The monitoring frequency will be monthly.

A.1.2.6 Temperature

The WQS at 18 AAC 70.020(b)(22)(A)(i) Water Supply: aquaculture and (ii) seafood processing and 18 AAC 70.020(b)(22)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife and (D) Harvesting for Consumption of Raw Mollusks or Other Raw Aquatic Life state that temperature may not exceed 15 degrees Celsius (^{o} C). The permit requires the applicant to monitor effluent temperature one time per month. Temperature data will be used to perform a reasonable potential analysis under the next permit term to determine whether continued monitoring or WQBELs are appropriate.

A.1.2.7 Total Residual Chlorine

The most stringent state water quality standards for total residual chlorine (TRC) to protect aquatic life for marine water requires that concentrations may not exceed 13 micrograms per liter (µg/L) for acute marine aquatic life and 7.5 µg/L for chronic marine aquatic life [18 AAC 70.020(b)(23)(c)].

KFRC application data monitoring results indicated exceedances for both acute and chronic water quality criteria for chlorine. Therefore, chlorine was selected for a RPA which demonstrated that there is reasonable potential for chlorine to exceed water quality criteria at the end of pipe. Since there is reasonable potential for chlorine to exceed water quality criteria at the end of the pipe, WQBELs were developed for total residual chlorine (daily maximum 0.989 mg/L, average monthly 0.384 mg/L) that are protective of water quality criteria at the boundary of the mixing zone. See Fact Sheet APPENDIX B details on reasonable potential determination and APPENDIX C for details on permit limit derivation.

A compliance schedule to install and operate a dichlorination system is required to be completed within 2 years of the permit effective date. Once the compliance schedule is completed, chlorine limits will become most stringent state water quality standards of 0.0075 mg/L for chronic marine aquatic life and 0.013 mg/L for acute marine aquatic life. The compliance level of 0.1 mg/L is based on detection limits of EPA approved monitoring under 40 CFR 136. The mixing zone for chlorine will cease to be authorized upon completion of the permit compliance schedule.

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

To determine if there is RP for the discharge to cause or contribute to an exceedance of WQ numeric criteria for a given pollutant, the Department compares the maximum projected receiving waterbody concentration to the criteria for that pollutant. RP to exceed exists if the projected receiving waterbody concentration exceeds WQS numeric criteria, and a water quality-based effluent limit (WQBEL) must be included in the permit (18 AAC 83.435).

Total residual chlorine (TRC) is used as an example to demonstrate the RP determination process. The most stringent WQS numeric criterion for TRC is the chronic aquatic life criterion at 7.5 µg/L. The Department's *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide* directs permit writers to use an assumed 15% of the most stringent WQ numeric criterion in cases where a site-specific ambient concentration of a pollutant if data is not otherwise available. However, in the case of TRC in this permit the Department determined the guidance is not appropriate. TRC readily reacts in waterbodies and can be assumed to be zero in background seawater.

This section discusses how the maximum projected receiving waterbody concentration is determined and presents the RP analysis done for all pollutants examined in Table B-1.

B.1 Mass Balance

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

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

Where,

C_d = Receiving water body concentration downstream of the effluent discharge

C_e = Maximum projected effluent concentration

C_u = Assumed receiving waterbody 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 (WWTF))

Q_u = Receiving waterbody flow rate

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

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

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

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

Where, MZ = the fraction of the receiving waterbody 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 waterbody concentration, and

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

In other words, if a mixing zone is not authorized, the Department considers only the concentration of the pollutant in the effluent regardless of the upstream flow and concentration. If the concentration of the pollutant in the effluent is less than the WQS numeric criteria, the discharge cannot cause or contribute to a WQ 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):

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

After the D simplification, this becomes:

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

B.2 Maximum Projected Effluent Concentration

To calculate the maximum projected effluent concentration, the Department used the procedure described in Section 3.3 of the *TSD*, "*Determining the Need for Permit Limits with Effluent Monitoring Data*" and the process described in section 2.4 of 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 waterbody concentration.

Since there are a limited number of data points available, the 99th percentile is calculated by multiplying the maximum observed effluent concentration (MOC) by a reasonable potential multiplier (RPM). The RPM is the ratio of the 99th percentile concentration to the MOC 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* and DEC's *APDES Permits RPA and Effluent Limits Development Guide* 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.

In the example of TRC below, the Department used ProUCL, a statistical software program, to calculate a CV specific to the dataset of 0.5452 using a non-parametric statistical distribution. Therefore, the RPM equation in Section 2.4.2.1 of the *APDES Permits RPA and Effluent Limits Development Guide* is used to determine the RPM for ammonia.

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

Where,

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

μ_n = mean calculated by ProUCL = 4.551

σ = the standard deviation calculated by ProUCL = 83.79

p_n = the z − statistic at the 95th percent confidence level of $(1 - 0.95)^{\frac{1}{n}} = 0.95$

n = number of valid data samples = 140

RPM = 1.1 (rounded)

The maximum expected concentration (MEC) is determined by multiplying the MOC by the RPM:

$$\text{MEC} = (\text{RPM})(\text{MOC}) \qquad \text{(Equation C-8)}$$

MOC = 900 micrograms per liter (µg/L)

In the case of chlorine,

MEC = (1.1)(900) = 990 µg/L*

* The above MEC calculation is simplified for illustrative purposes. The MEC is calculated in the RPA tool with an RPM prior to rounding. The actual MEC as calculated in the Department's RPA tool is 989.41 µg/L.

Comparison with WQS numeric criteria for chlorine

In order to determine if RP exists for this discharge to violate WQC, numeric criteria, the highest projected concentrations at the boundary of the mixing zone is compared with acute and chronic marine water WQC.

Acute: 13.03 µg/L > 13 µg/L (acute criterion) **YES,** there is RP to violate acute criterion

Chronic: 7.5 µg/L = 7.5 µg/L (chronic criterion) **YES**, there is RP to violate chronic criterion

Table B-1 summarizes the data, multipliers, and criteria used to determine RP to exceed WQC at the end of the pipe and at the boundary of the mixing zone. Since there is a reasonable potential for the effluent to cause an exceedance of acute and chronic WQC numeric criteria for chlorine, water quality based effluent limits (WQBELs) for ammonia are required. See APPENDIX C for the calculations.

Table B- 1: Reasonable Potential Analysis Results

Parameter	MOC	N[a]	C_s[b]	CV	RPM	MEC (C_e)	Water Quality Criteria	End of Pipe RP?	D[c]	C_d[d]	Boundary of Mixing Zone RP?
Total Residual Chlorine (chronic)	900 µg/L	140	0.0 µg/L	1.05	1.1	989.41 µg/L	7.5 µg/L	Yes	131.9	7.5 µg/L	Yes
Total Residual Chlorine (acute)							13 µg/L	Yes	76.1	13 µg/L	Yes

Footnotes:

a. N = Number of valid samples

b. C_s = Assumed waterbody ambient concentration

c. D = Dilution factor

d. C_d = Calculated receiving water concentration (RWC) at mixing zone boundary

APPENDIX C. EFFLUENT LIMIT CALCULATION

If the Alaska Department of Environmental Conservation (the Department or DEC) does not authorize a mixing zone, Alaska water quality standards (AWQS) are applied at the end of the pipe, and technology-based effluent limits (TBELs) are selected for those parameters that are solely technology based.

When DEC authorizes a mixing zone, parameters are identified in the mixing zone that will require dilution to meet water quality standards (WQS) numeric criteria. If there are TBELs for an identified parameter in the mixing zone, TBELs apply at the end of the pipe, and WQS numeric criteria for that parameter, apply at the boundary of the mixing zone. If the reasonable potential analysis (RPA) requires the development of water-quality based effluent limits (WQBELs) for specific parameters in order to protect aquatic life at the boundary of the mixing zone, WQBELs are applied as end-of-pipe effluent limits. Those parameters that are not identified in the authorized mixing zone, must meet applicable water quality criteria at the end of pipe.

In the case of the Kodiak Fisheries Research Center (KFRC), chlorine demonstrated reasonable potential (RP) to exceed at the end of pipe. Chlorine as the only parameter with RP requires the most dilution to meet water quality numeric criteria at the boundary of the authorized chronic and acute mixing zones. Therefore, the Department developed WQBELs for total residual chlorine. An example of the total residual chlorine limit calculations is depicted below.

C.1 Effluent Limit Calculation

Once the Department determines that the effluent has a reasonable potential to exceed an Alaska Water Quality Criteria (AWQC), a WQBEL for the pollutant is developed. The Department used the process described in the *Technical Support Document (TSD) for Water Quality-Based Toxics Control* (Environmental Protection Agency, 1991) and DEC's guidance, *Alaska Pollutant Discharge Elimination System (APDES) Permits Reasonable Potential Analysis (RPA) and Effluent Limits Development Guide* (June 30, 2014) to calculate WQBELs for NO_3/NO_2 and copper. The first step in calculating WQBELs is the development of wasteload allocations (WLAs) for the pollutant.

C.2 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 WQS. 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.

C.3 "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.

C.4 Permit Limit Derivation

Once the appropriate LTA has been calculated, the Department applies the statistical approach described in Chapter 5 of the TSD to calculate the maximum daily limit (MDL) and average monthly limit (AML). This approach takes into account effluent variability (using the coefficient of variation (CV)), sampling frequency, and the difference in time frames between the Monthly Average and Daily Maximum effluent limits.

The Daily Maximum effluent limit (Daily Maximum) is based on the CV of the data and the probability basis, while the Monthly Average is dependent on these two variables and the monitoring frequency. As recommended in the TSD, the Department used a probability basis of 95% for the Monthly Average effluent limit (Monthly average) calculation and 99% for the Daily Maximum calculation.

The following is a summary of the steps to derive WQBELs from WQS numeric criteria for pollutants that have RP to exceed AWQC. These steps are found in the Department's Reasonable Potential Analysis (RPA) and Effluent Limitation Guidance and the guidance's accompanying Microsoft Excel RPA Tool. The guidance and tool were used to calculate the Daily Maximum and Monthly Average for total residual chlorine in the KFRC permit.

Step 1- Determine the WLA

The acute and chronic aquatic life criteria are converted to acute and chronic waste load allocations using the following equations:

$$WLA_{a,c,hh} = \left(WQC_{a,c,hh}\right)\left(D_{a,c,hh}\right) + C_s\left(1 - D_{a,c,hh}\right)$$

$$WLA_{a,c,hh} = WQC_{a,c,hh}\left(\frac{Q_d + Q_s}{Q_d}\right) + C_s\left(1 - \left[\frac{Q_d + Q_s}{Q_d}\right]\right)$$

Where: $D_{a,c} = Dilution = \frac{(Q_d + Q_s)}{Q_d}$

$D_{hh}(Dilution\ [Human\ Health]) = D_c\ (Dilution[Chronic\ Aquatic\ Life])$

$Q_s = Critical\ Upstream\ Flow$

$Q_d = Critical\ Discharge\ Flow$

$C_s = Critical\ Upstream\ Concentration$

$WLA_{a,c} = Wasteload\ Allocation\ (acute, chronic, or\ human\ health)$

$WQC_{a,c} = C_r = Water\ Quality\ Criterion(acute, chronic, or\ human\ health)$

For total residual chlorine,

$D_a = 76.1$

$D_c = 131.9$

$C_s = 0.0\ micrograms\ per\ liter$ (µg/L)

$WLA_a = 989.30\ \mu g/L$

$WLA_c = 989.25\ \mu g/L$

$WQC_a = 13\ \mu g/L$

$WQC_c = 7.5\ \mu g/L$

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

The WLAs are converted to LTAs using multipliers that are derived from equations in section 5.4 of the TSD:

$$LTA_a = WLA_a * exp(0.5\sigma^2 - z_{99}\sigma)$$

$$LTA_c = WLA_c * exp(0.5\sigma_4^2 - z_{99}\sigma_4)$$

Where:

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

$$LTA_a\ only: \sigma = ln[CV^2 + 1]^{1/2}$$

$$LTA_a\ only: \sigma^2 = ln[CV^2 + 1]$$

$$LTA_c\ only: \sigma_4 = ln\left[\left(\frac{CV^2}{4}\right) + 1\right]^{1/2}$$

$$LTA_c\ only: \sigma_4^2 = ln\left[\left(\frac{CV^2}{4}\right) + 1\right]$$

$$CV = coefficient\ of variation$$

For total residual chlorine:

$$LTA_a = 192.35\ \mu g/L$$

$$LTA_c = 353.29\ \mu g/L$$

Step 3 - Most Limiting LTA

To protect a waterbody from both acute and chronic effects, the more limiting of the two LTAs is used to derive the effluent limits. The TSD recommends using the 95th percentile for the Average Monthly Limit (AML) and the 99th percentile for the Maximum Daily Limit (MDL).

In the case of total residual chlorine, the LTA_a is more limiting.

Step 4 - Calculate the Permit Limits

The Daily Maximum and Monthly Average are calculated using the following equations that are found in table 5-2 of the TSD:

$$MDL_{aquatic\ life} = LTA * exp(z_{99}\sigma - 0.5\sigma^2)$$

Where:

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

$$\sigma_n = ln[CV^2 + 1]^{1/2}$$

$$\sigma_n^2 = ln[CV^2 + 1]$$

$$CV = coefficient\ of variation$$

$$AML_{aquatic\ life} = LTA * exp(z_{95}\sigma_n - 0.5\sigma_n^2)$$

Where:

$$z_{95} = the\ z - statistic\ at\ the\ 95^{th} percentile = 1.645$$

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

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

$CV = coefficient\ of variation$

$n = number\ of\ samples\ per\ month$

For total residual chlorine:

$\boldsymbol{MDL = 989\ \mu g/L}$

$\boldsymbol{AML = 384\ \mu g/L}$

APPENDIX D. MIXING ZONE ANALYSIS CHECKLIST

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 are satisfied, as well as provide justification to authorize a mixing zone in an Alaska Pollutant Discharge Elimination System permit. See Fact Sheet Section 4.7 for the XXXXX Wastewater Treatment Facility mixing zone analysis.

Criteria	Description	Resources	Regulation
Size	Is the mixing zone as small as practicable? **If yes, mixing zone may be approved as proposed or authorized with conditions.**	Technical Support Document for Water Quality-Based Toxics Control DEC's Reasonable Potential Analysis Guidance Environmental Protection Agency's Permit Writers' Manual CORMIX	**18 AAC 70.240 (k)**
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240 (c)(1)**
Low Flow Design	**For river, streams, and other flowing fresh waters.** - Determine low flow calculations or documentation for the applicable parameters.		**18 AAC 70.240(l)**
Existing Use	Does the mixing zone… (1) maintain and protect designated and existing uses of the waterbody as a whole? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(2)**
	(2) impair overall biological integrity of the waterbody? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(3)**
	(3) create a public health hazard that would preclude or limit existing uses of the waterbody for water supply or contact recreation? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(B)**
	(4) preclude or limit established processing activities or established commercial, sport, personal use, or subsistence fish and shellfish harvesting? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(C)**

Criteria	Description	Resources	Regulation
Human consumption	Does the mixing zone… (1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption? **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(6)**
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 may not be approved.**		**18 AAC 70.240(f)**
Human Health	Does the mixing zone… (1) contain bioaccumulating, bioconcentrating, or persistent chemicals above natural levels to significantly adverse levels? **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(1)**
	(2) contain chemicals expected to present a unacceptable risk to human health from carcinogenic, mutagenic, teratogenic, or other effects as determined using risk assessment methods approved by the Department? **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(2)**
	(3) occur in a location where the department determines that a public health hazard reasonably could be expected? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(k)(4)**
Aquatic Life	Does the mixing zone… (1) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(A)**

Criteria	Description	Resources	Regulation
	(2) result in a reduction in fish or shellfish population levels? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(D)**
	(3) result in permanent or irreparable displacement of indigenous organisms? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(E)**
	(4) form a barrier to migratory species or fish passage? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(G)**
	(5) result in undesirable or nuisance aquatic life? **If yes, mixing zone may not be approved.**		**18 AAC 70.240(d)(5)**
	(6) prevent lethality to passing organisms; or exceed acute aquatic life criteria at and beyond the boundaries of a smaller initial mixing zone surrounding the outfall, the size of which shall be determined using methods approved by the Department? **If no, mixing zone may not be approved.**		**18 AAC 70.240(d)(7)** **18 AAC 70.240(d)(8)**
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 the United States Fish and Wildlife Service or National Oceanic and Atmospheric Association. If yes, will conservation measures be included in the permit to avoid adverse effects? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(c)(4)(F)**