ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT FACT SHEET – FINAL

Permit Number: AK0053619

Nikiski Combined Cycle Plant

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

Public Comment Period Start Date: April 30, 2024
Public Comment Period Expiration Date: May 29, 2024
Alaska Online Public Notice System

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

ALASKA ELECTRIC AND ENERGY COOPERATIVE, INC.

For wastewater discharges from

Nikiski Combined Cycle Plant
48169 Kenai Spur Highway
Kenai, AK 99611

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

This fact sheet explains the nature of discharges from the Nikiski Combined Cycle (NCC) Plant and the development of the permit including:

- information on public comment, public hearing, and appeal procedures
- a listing of effluent limitations and other conditions
- technical material supporting the conditions in the permit
- 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
Mail: P.O. Box 11180
Juneau, AK 99811
In Person: 410 Willoughby Avenue, Suite 303
Juneau, AK 99811

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

See https://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 https://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: https://dec.alaska.gov/water/wastewater/ .

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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
Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 610 University Avenue Fairbanks, AK 99709 (907) 451-2183	

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

1.1 Applicant

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

Name of Facility:	Alaska Energy and Electric Cooperative, Inc.
APDES Permit Number:	AK0053619
Facility Location:	48169 Kenai Spur Highway, Kenai, AK 99611
Mailing Address:	280 Airport Way, Kenai, AK 99611
Facility Contact:	Mr. Bruce Linton, Environmental Compliance Officer

1.2 Authority

Section 301(a) of the Clean Water Act (CWA) and 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 reissuance 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

DEC first issued an APDES permit for the AEEC NCC Plant in 2012 with effective and expiration dates of June 1, 2012, and May 31, 2017. The permit was reissued in August 2018 with effective and expiration dates of October 1, 2018 and September 30, 2023.

Under the Administrative Procedures Act and state regulations at 18 AAC 83.155(c), an APDES permit may be administratively extended (i.e., continues in force and effect) provided that the permittee submits a timely and complete application prior to the expiration of the current permit. A timely and complete application for a new permit was submitted by AEEC in April 2023; therefore, the 2018 permit is administratively extended until such time a new permit is reissued.

2.0 BACKGROUND

2.1 Facility Information

The NCC Plant, a combined cycle electric generation facility, is owned and operated by AEEC. AEEC is a member-owned, non-profit electric cooperative with a single member, Homer Electric Association (HEA). HEA is also a member-owned, non-profit electric cooperative, but it has numerous members consisting of electricity consumers. The NCC Plant is located at 48169 Kenai Spur Highway in Kenai, Alaska, and supplies power to approximately 23,000 members located in the southern Kenai Peninsula. Figure 1 depicts the location of the NCC Plant.

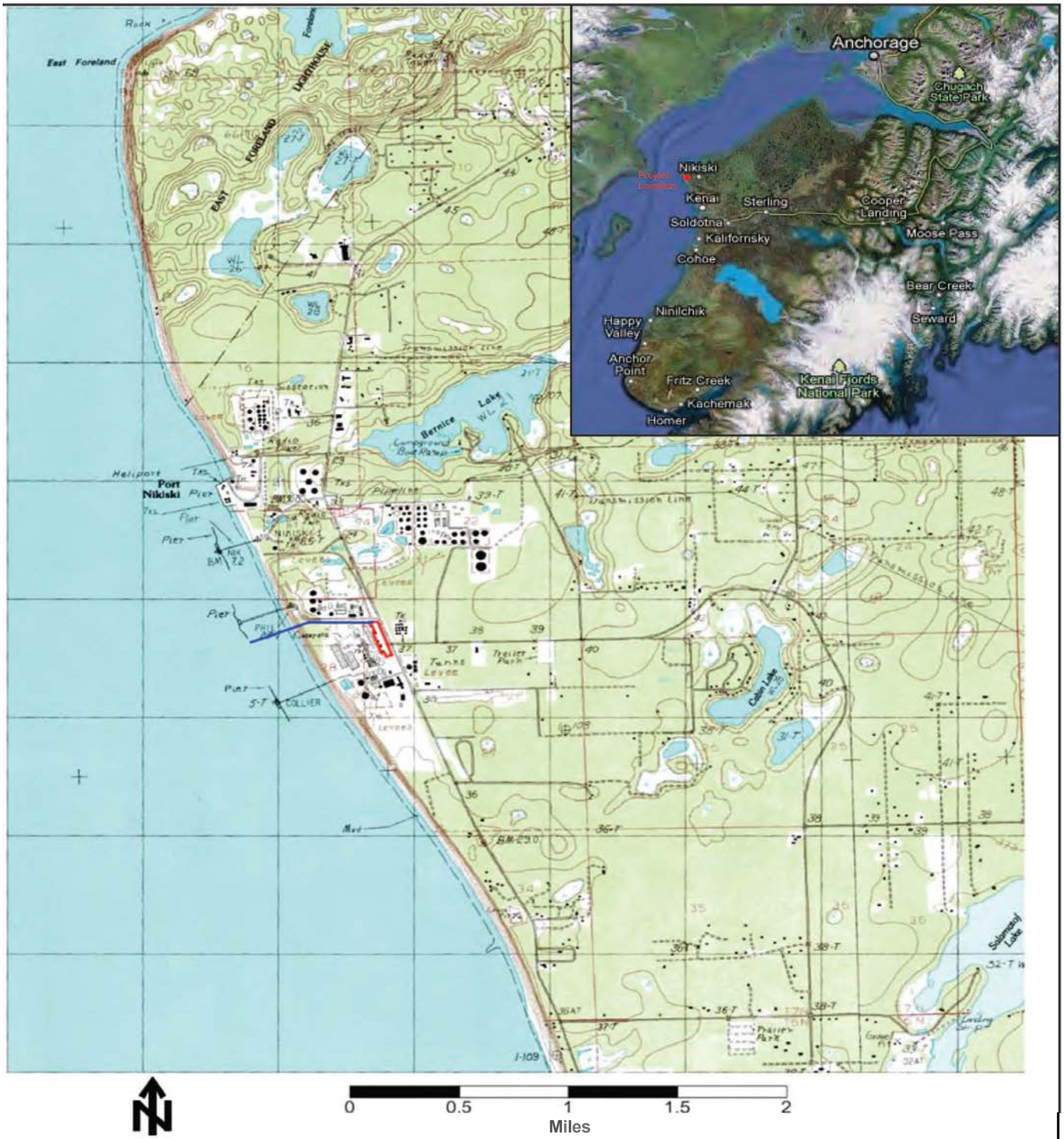
Agrium U.S. Inc. originally constructed the cogeneration portion of the NCC Plant in 1998. In 2008, HEA purchased the cogeneration equipment from Agrium and operated the facility independently as a simple cycle facility, using an underground injection system for wastewater disposal. Conversion of the NCC Plant from a simple to a combined cycle electric generation facility began in 2010 and was completed in December 2012. The conversion resulted in waste heat from the natural gas combustion turbine generator being routed to the heat recovery steam generator, where the heat is used to produce steam. The steam from the heat recovery steam generator is used to drive a steam turbine generator.

The combined cycle power generation process requires a continuous supply of demineralized water. Raw water, obtained from a groundwater well, contains arsenic and manganese. Groundwater as well as recycled heat recovery steam generator water is pumped to a 240,000-gallon service water tank. The facility's firewater is supplied from this service tank. Recycled heat recovery steam generator blowdown comprises approximately 25% of the total flow to the service water tanks. Corrosion inhibitors and boiler feedwater treatment chemicals are used in the heat recovery steam generator process. Treatment of the service water consists of two-stage filtration which is stored in a reverse osmosis (RO) feed water tank. The RO feed water is treated with an anti- scalant chemical injection and polished through a single-stage, 1-micron filter. Stage 1 permeate is adjusted to 9.0 pH standard units (S.U.) using sodium hydroxide and is then processed through Stage 2 RO membranes to produce the finished demineralized water. Stage 1 reject, which makes up more than 95% of the waste stream, is discharged to Cook Inlet. Stage 2 reject is recycled to the polished Stage 1 RO membrane feed. The facility no longer uses a clean in place process to clean RO membranes, instead, RO membranes are now discarded which eliminates the use of acid and caustic chemicals and the high solids waste stream that was associated with the clean in place process.

Wastewater consisting of pump seal leaks, condensate system pressure relief, and wash water from sumps in the steam turbine generator and combustion turbine generator buildings is collected and pumped to two 2,000 gallon holding tanks, transferred to a vacuum truck, and disposed of at a permitted industrial septic facility or at an oily water disposal facility. Water treatment building floor sump drainage, (less than 5% of the waste stream), is discharged to Cook Inlet.

Domestic wastewater from the NCC Plant is treated at the facility's approved subsurface onsite system. Figure 2 is a copy of NCC Plant's water balance schematic that was submitted with AEEC's application for permit reissuance.

Figure 1-Nikiski Combined Cycle Plant Location



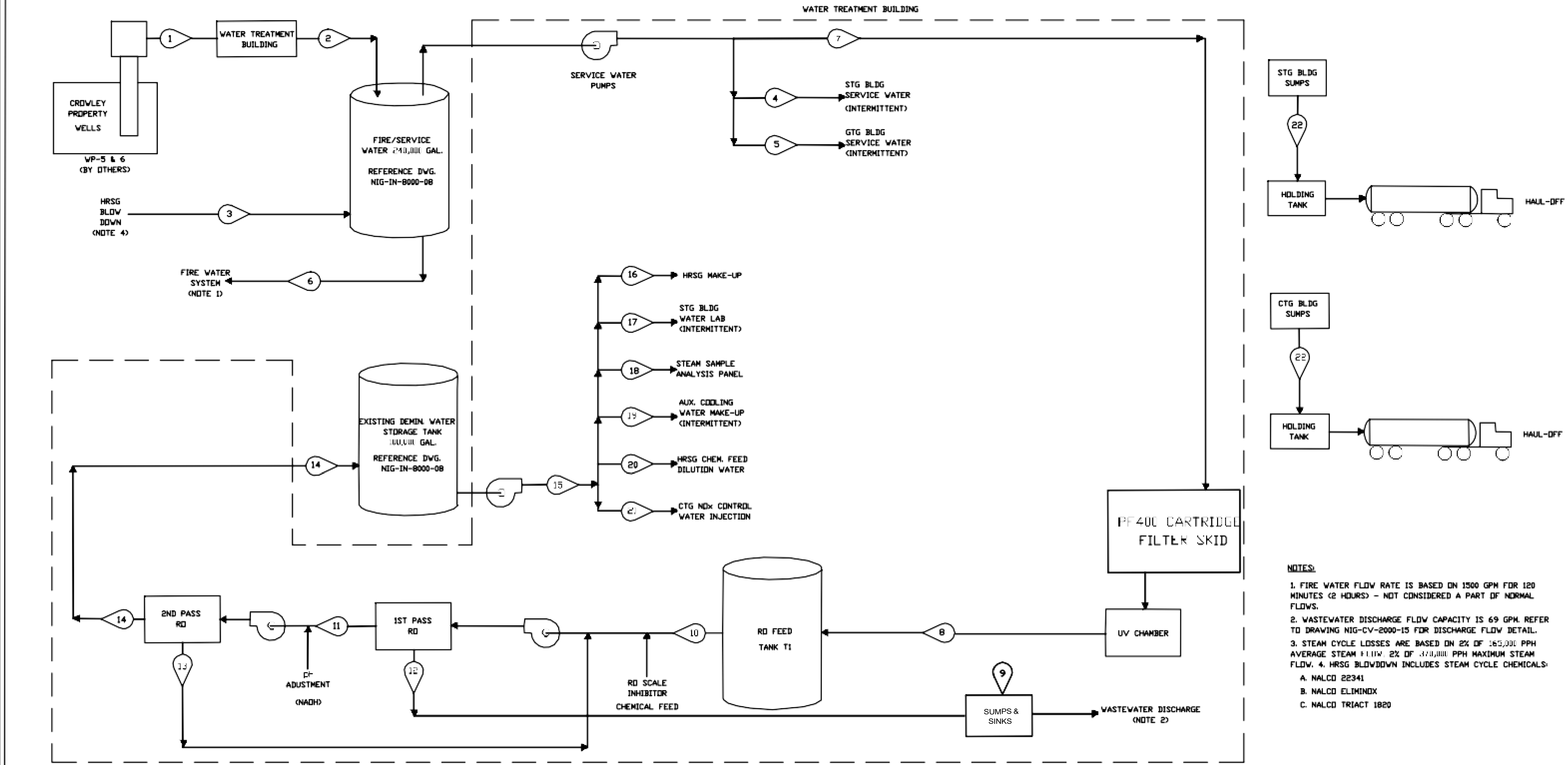
Title/Notes:

USGS Map Showing Location of the Project

(Facility boundary is outlined in red, the effluent discharge line is blue)

Figure:

1



STREAM NUMBER	1	2	3	4	5	6	7	8	9	10	11
STREAM NAME	WELL WATER	SERVICE WATER MAKEUP	HRSG BLOWDOWN RECYCLE	STG BLDG. SERVICE WATER	CTG BLDG. SERVICE WATER	FIRE WATER	SERVICE WATER TO CARTRIDGE FILTERS	FILTERED WATER	ONLINE METER WASTE	PASS 1 R.O. FEED	PASS 1 R.O. PERMEATE
AVE. FLOW (GPM)	48	31.4	3.8	0	0	0	72.1	72.1	4.7	56.9	22.0
MAX. FLOW (GPM)	48	63	15	10	10	2500	72.1	72.1	10	56.9	41
pH (avg)	8.4	8.4	>9.0	8.4	8.4	8.4					

STREAM NUMBER	12	13	14	15	16	17	18	19	20	21	22	23
STREAM NAME	PASS 1 R.O. REJECT	PASS 2 R.O. REJECT	DEMIN TO STORAGE TANK	DEMINERALIZED WATER SUPPLY	HRSG MAKEUP	LAB DEMIN SUPPLY	STEAM SAMPLE PANEL	AUX. COOLING WATER MAKEUP	HRSG CHEM FEED DILUTION WATER	CTG NOx CONTROL INECTION WATER	TURBINE FLOOR DRAINS	WASTEWATER DISCHARGE
AVE. FLOW (GPM)	15.0	39.9	39.9	25	7.0	2.0	1.0	0	1.0	0.3	0.02	50
MAX. FLOW (GPM)	15.0	39.9	39.9	40	15	2.0	1.0	2.0	1.0	17	10	69
pH (avg)	8.4											8.2

Figure 2 - Water Balance Diagram

REV#	DATE	REVISION DESCRIPTIONS	DRN BY	APP'D
5	3-26-23	AS-FOUND UPDATE	JMW	MW
4	7-10-13	RECORD DRAWING	RFT	KCH
3	10-04-11	GENERAL REVISION	RFT	DPS
2	06-01-11	ISSUED FOR CONSTRUCTION	RFT	DRS
1	01-14-11	ADDENDUM #2	RFT	DPS
0	12-20-10	ISSUED FOR BID	CLF	DPS

DRAWING NAME HISTORY, ALSO KNOWN AS:

ALASKA ELECTRIC & ENERGY COOPERATIVE, INC.

PROJECT: 22770
SCALE: NONE
DRAWN: RFT DATE: 12-20-10
CHECKED: JPS SHEET #: 1 OF 1
APPROVED: DPS

NIKISKI COMBINED CYCLE PLANT
WATER TREATMENT SYSTEM
WATER BALANCE DIAGRAM

DRAWING: NIG -IN-8000-C4-04 REV.# 5

R:\05-PROC\01-SHEET\RECORD\NIG-IN-8000-04-04.DWG

2.2 Pollutants of Concern

The pollutants of concern that could be found in the effluent of the NCC Plant are arsenic, copper, manganese, temperature, pH, total suspended solids (TSS), oil and grease, zinc, and Whole Effluent Toxicity (WET).

Pollutants of concern in the effluent were identified in 40 Code of Federal Regulations (CFR) §423.15 (Steam Electric Power Generating Point Source Category new source performance standards), NCC Plant discharge monitoring results, monitoring results contained in AEEC's application for permit reissuance and the facility's laboratory reports.

The *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide* states that data collected prior to changes in industrial operations, wastewater treatment systems, service areas, or plant expansions should not be included in the reasonable potential analysis (RPA). AEEC installed a permanent RO pre-filtration system in October 2021 and eliminated the granular activated filtration (GAC) filtration system. The removal of the GAC filtration system eliminated a high solids backwash stream that was required by the system. AEEC also now disposes of their RO membrane filters rather than cleaning in place. The clean in place procedure required acid and caustic chemicals that resulted in a high solids waste stream. DEC therefore determined to limit the RPA data set to monitoring data that occurred after the installation of the permanent RO pre-filtration system in October 2021 through December 2023. This data set represents current conditions at the facility and is the most relevant data set to use in the RPA.

Table 1 contains the maximum observed concentrations between October 2021 and December 2023 of parameters that were included in the permit, and a comparison with applicable water quality criteria or permit limits. Table 2 contains detected pollutants as reported by AEEC in Form 2C. Volatile and semi-volatile organic compounds were not detected in the NCC Plant effluent. Domestic wastewater is treated at the facility's approved subsurface onsite system.

Table 1- Pollutants of Concern

Parameter	Units	Maximum Observed Concentration	Water Quality Criteria or Permit Limit
pH	S.U.	7.3 minimum, 8.4 maximum	6.5 - 8.5 at all times
TSS	Milligrams per Liter (mg/L)	6.27	30 monthly average limit 100 daily maximum limit
Oil and Grease	mg/L	15	15 monthly average limit 20 daily maximum limit
Temperature	Degrees Celsius (ºC)	21.4	36.2
Arsenic	Micrograms per Liter (µg/L)	46	69 acute, 36 chronic
Copper	µg/L	34.3	17.09 acute, 8.28 chronic
Manganese	µg/L	249	100 human health criterion
Zinc	µg/L	19.7	95 acute, 86 chronic
Total Residual Chlorine (TRC)	µg/L	No discharge. Ultraviolet light installed. TRC is no longer considered a pollutant of concern.	75 acute, 13 chronic
Polychlorinated Biphenyl Compounds (PCBs)	µg/L	No Discharge	No Discharge

Table 2- Form 2C Detected Pollutants

Parameter	Units	Maximum Observed Concentration	Number of Analyses
Chemical Oxygen Demand	mg/L	33.4	2
Total Organic Carbon	mg/L	2.43	2
TSS	mg/L	139	60
Temperature	ºC	25.9 (winter) 24.0 (summer)	903 (winter) 537 (summer)
pH	S.U.	6.92 (minimum) 8.39 (maximum)	1074
Oil and Grease	mg/L	5.06	52
Phosphorus, Total	mg/L	1.22	2
Sulfate	mg/L	8.74	2
Barium	µg/L	14.1	2
Magnesium	mg/L	17.8	2
Manganese	µg/L	6,270	20
Arsenic	µg/L	46	18
Copper	µg/L	202	77
Zinc	µg/L	145	20

2.3 Compliance History

DEC reviewed Discharge Monitoring Reports (DMRs) submitted after the last permit became effective in October 2018 through December 2023 to determine the facility's compliance with effluent limits. Table 3 summarizes effluent limit violations and Table 4 summarizes DEC Compliance and Enforcement actions at the NCC Plant. Additional compliance information may be found at Enforcement and Compliance History Online | US EPA.

Table 3- Outfall 001A Effluent Limit Exceedances

Parameter	Units	Basis	Permit Limit	Number of Exceedances	Maximum Reported Value	Date of Maximum Reported Value
TSS	mg/L	Daily Maximum	100	1	139	August 2020
TSS	mg/L	Monthly Average	30	1	58	September 2020
Copper	µg/L	Daily Maximum	17.09	10	202	November 2020
Copper	µg/L	Monthly Average	8.28	22	105	November 2020

Table 4-Compliance and Enforcement Actions

Date	Activity	Summary
April 23, 2020	Routine Inspection	Fifteen copper limit exceedances and failure to report 14 of them were noted.
June 9, 2020	Notice of Violation (NOV)	Alleged violations included fifteen copper limit exceedances and the facility's failure to submit a written report of noncompliance for 12 of them.
July 22, 2020	NOV	Failure to report accurate copper daily maximum discharge concentrations in April and July 2019. Copper daily maximum effluent limit violations in April and July 2019.
July 27, 2020	NOVs Close-Out Letter	Deliverables from NOVs dated June 9 and July 22, 2020, received, and accepted by DEC.

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 – Water Quality Standards (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 TBELs or water quality-based effluent limits (WQBELs). TBELs are set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the WQS of a waterbody are met. WQBELs may be more stringent than TBELs.

Effluent Limit Guidelines (ELGs) for the Steam Electric Power Generating Point Source Category can be found at 40 CFR §423 (amended November 3, 2015), adopted by reference at 18 AAC 83.010(g)(3).

The ELGs applicable to a new source are sources that have commenced construction after the ELGs were promulgated (initially in 1974, revised on November 19, 1982, revised again 1995 and 2015). The NCC Plant is a combined cycle power station that routes exhaust heat from an existing natural gas combustion turbine generator to produce steam in an existing heat recovery steam generator, which propels a steam turbine generator. Since construction of the facility commenced after 40 CFR §423 was promulgated, the ELGs based on New Source Performance Standards in 40 CFR §423.15 apply.

A detailed discussion of the basis for the effluent limits contained in the permit is provided in 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 surface water data to determine if additional effluent limits are required and/or to monitor effluent impact on the receiving waterbody quality. The permittee is responsible for conducting monitoring and reporting results on NetDMR or with the application for reissuance, as appropriate, to the Department. DEC determined that the facility had submitted sufficient receiving waterbody monitoring results during the prior permit's term and is not requiring continued receiving waterbody monitoring in the reissued permit.

3.3 Effluent Limits and Monitoring Requirements

Monitoring is required to determine compliance with effluent limitations and/or for use in future RPA. The permit requires monitoring of wastewater that is discharged through Outfall 001A for flow, oil, and grease, TSS, pH, temperature, copper, PCBs, arsenic, manganese, zinc and WET. Flow, oil and grease, TSS, pH, temperature, and copper all have associated limits.

Monitoring frequencies are based on the nature and effect of a 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 are required under the permit. These samples must be used in calculations and used for averaging if they are conducted using Department-approved test methods (generally found in 18 AAC 70 and 40 CFR §136 [adopted by reference in 18 AAC 83.010]) and if the method detection limits are less than the effluent limits.

The *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide* recommends using the last three to five years of monitoring data to ensure that the data are timely and relevant to the current analysis; however, the guidance also advises that data that were collected prior to changes in industrial operations, wastewater treatment systems, or plant expansions should not be included in the analysis. AEEC installed a new service filtration system in October 2021 and eliminated the granular activated filtration (GAC) filtration system. Prior to October 2021, a temporary filtration system, installed in February 2021, had been in use at the facility. The removal of the GAC filtration system eliminated a high solids backwash stream that was required by the system. AEEC also now disposes of RO membrane filters rather than cleaning in place. The clean in place procedure required acid and caustic chemicals that resulted in a high solids waste stream. Therefore, DEC used data from after the installation of new service filtration system in October 2021 through December 2023 for determining reasonable potential to exceed water quality criteria and development of WQBELs.

The permit requires reporting arsenic, manganese, zinc, PCBs, and WET monitoring results. A summary of the monitoring requirements is contained below for arsenic, manganese, PCBs, and zinc. Fact Sheet Section 3.4 contains a summary of WET Monitoring.

3.3.1 Arsenic

Alaska WQS at 18 AAC 70.020(23) states that the concentration of substances in water may not exceed the numeric criteria for aquatic life for marine water in the Alaska Water Quality Criteria Manual. The concentration of arsenic may not exceed 69 µg/L (acute) or 36 µg/L (chronic) . DEC evaluated arsenic data from October 2021- December 2023. The highest reported arsenic concentration during this time period was 46 µg/L. The maximum expected concentration (MEC) as determined by the RPA, is 122 µg/L The RPA demonstrated that arsenic has reasonable potential to exceed water quality criteria at the end of pipe. The dilution (1.8 acute, 3.5 chronic) required to meet water quality criteria is less than that of the copper acute and temperature chronic mixing zones (10.5 acute, 24 chronic). Arsenic water quality criteria are expected to be met prior to the boundary of the acute mixing zone sized for copper and the boundary of the chronic mixing zone sized for temperature; therefore, WQBELs have not been developed, but quarterly monitoring shall continue to be required as in the prior permit in order to re-evaluate arsenic's reasonable potential in the next reissuance of the permit.

3.3.2 Manganese

Alaska WQS at 18 AAC 70.020(23) states that the concentration of substances in water may not exceed the numeric criteria for human health for consumption of aquatic organisms shown in the Alaska Water Quality Criteria Manual. Human health for consumption of aquatic organisms may not exceed 100 µg/L. DEC evaluated manganese data from October 2021- December 2023. The highest reported manganese concentration during this time period was 249 µg/L. The MEC as determined by the RPA, is 534 µg/L The RPA demonstrated that manganese has reasonable potential to exceed water quality criteria at the end of pipe. The dilution (5.4) required to meet water quality criterion is less than that of the temperature chronic mixing zone (24). The manganese water quality criterion is expected to be met prior to the boundary of the temperature mixing zone; therefore, WQBELs have not been developed, but quarterly monitoring shall continue to be required as in the prior permit in order to re-evaluate manganese's reasonable potential in the next reissuance of the permit.

3.3.3 Zinc

Alaska WQS at 18 AAC 70.020(23) states that the concentration of substances in water may not exceed the numeric criteria for aquatic life for marine water in the Alaska Water Quality Criteria Manual. The concentration of zinc may not exceed 95 µg/L (acute) or 86 µg/L (chronic). DEC evaluated zinc data from October 2021- December 2023. The highest reported zinc concentration during this time period was 20 µg/L. The MEC as determined by the RPA, is 48 µg/L. The RPA demonstrated that zinc does not have reasonable potential to exceed water quality criteria at the end of pipe; therefore, zinc is not authorized in the mixing zone. Water quality criteria will be met prior to discharge into Cook Inlet. Quarterly monitoring; however, shall continue to be required as in the prior permit in order to re-evaluate zinc's reasonable potential in the next reissuance of the permit.

3.3.4 PCBs

Effluent Limit Guidelines at 40 CFR 423.15(b) included the prohibition of the discharge of PCBs such as those commonly used for transformer fluid. The prior permit required annual monitoring for PCBs and no

PCBs were detected during the term of the permit. The reissued permit also prohibits the discharge of PCBs and annual monitoring, as in the prior permit, shall continue to be required.

Table 5 summarizes Outfall 001A limits and monitoring requirements. Table 6 summarizes effluent limits and monitoring requirement changes from the last permit issuance.

Table 5- Outfall 001A Effluent Limits and Monitoring Requirements

Parameter [a]	Effluent Limits			Monitoring Requirements	
	Units [b]	Monthly Average	Daily Maximum	Sample Frequency	Sample Type
Flow	gpd	30,000	42,000	Continuous [c, d]	Recorded
Oil and Grease	mg/L	15.0	20.0	1/Month	Grab
	lbs/day	3.8	7.0		Calculated [e]
TSS	mg/L	30.0	100.0	1/Month	24-hour Composite [f]
	lbs/day	7.5	35		Calculated
pH	S.U.	N/A	6.5 - 8.5 at all times	Continuous	Recorded
Temperature	ºC	23	28	Continuous	Recorded
PCBs	µg/L	No Discharge Permitted	1/Year	24-hour Composite	PCBs
Arsenic	µg/L	N/A	Report	1/Quarter	24-hour Composite
Copper	µg/L	19	47	1/Month	24-hour Composite
	lbs/day	0.0048	0.016		Calculated
Manganese	µg/L	N/A	Report	1/Quarter	24-hour Composite
Zinc	µg/L	N/A	Report	1/Quarter	24-hour Composite

Footnotes:

a. All metals shall be analyzed as total recoverable.
b. Units: gpd = gallons per day, mg/L = milligrams per liter, lbs/day = pounds per day, S.U.= standard units, °C= degrees Celsius, µg/L = micrograms per liter.
c. Continuous recording may be interrupted for infrequent shutdowns for maintenance, process changes, or similar activities.
d. For a continuously monitored parameter, a day is defined as a standard 24-hour calendar day beginning at 12:00 AM and ending at 11:59 PM. The highest daily maximum flow, pH, and temperature recording and the lowest daily minimum pH recording in a given month should be reported on the monthly DMR for that month.
e. lbs/day = concentration (mg/L) x flow (gpd) x 8.34 (conversion factor)/1,000,000
f. See Appendix C for a definition.

Table 6-Effluent and Monitoring Changes from Prior Permit

Parameter	Units	Monthly Average		Daily Maximum	
		2018 Permit	2024 Permit	2018 Permit	2024 Permit
Flow	gpd	Report	30,000	50,400	42,000
Oil and Grease	lbs/day	6.31	3.8	8.41	7.0
TSS	lbs/day	12.6	7.5	42	35
Copper	µg/L	8.28	19	17.09	47
Copper	lbs/day	3.48	0.0048	7.18	0.016
Temperature	ºC	27.9	23	36.2	28
Parameter	**Units**	**Sample Frequency**		**Sample Type**	
		2018 Permit	**2024 Permit**	**2018 Permit**	**2024 Permit**
pH	S.U.	5/Week	Continuous	Grab	Recorded
Temperature	ºC	5/Week	Continuous	Grab	Recorded

3.4 Whole Effluent Toxicity Monitoring

Alaska WQS at 18 AAC 70.030 require that an effluent discharged to a water may not impart chronic toxicity to aquatic organisms, expressed as 1.0 TUc at the point of discharge, or if the Department authorizes a mixing zone in a permit, approval, or certification, at or beyond the mixing zone boundary, based on the minimum effluent dilution achieved in the mixing zone.

WET tests are laboratory tests that measure the total toxic effect of an effluent on living organisms. WET tests use small vertebrate and invertebrate species and/or plants to measure the aggregate toxicity of an effluent. There are two different durations of toxicity test: acute and chronic. Acute toxicity tests measure survival over a 96-hour exposure. Chronic toxicity tests measure reductions in survival, growth, and reproduction over a 7-day exposure. State regulation 18 AAC 83.335 recommends chronic testing for facilities with dilution factors less than 100:1 at the boundary of the mixing zone, acute testing for facilities with dilution factors greater than 1000:1 at the boundary of the mixing zone, and either acute or chronic for dilution factors between 100:1 and 1000:1 at the boundary of the mixing zone.

The previous permit required WET monitoring twice per year, one test between April 1 and June 30 and the other between October 1 and December 31 which was reduced to once per year in December 2021. Testing (embryo development) was conducted using the mussel, *Mytilus galloprovincialis,* with an effluent dilution series consisting of 52%, 26%, 13%, 6.5%, 3.25% concentrations and a control. DEC evaluated toxicity monitoring results from December 2021- November 2023 for reasonable potential of the effluent to exceed WET water quality chronic criterion (1.0 TUc). All WET results (3 samples) were reported as no observable effects at 1.9 TUc. 1.9 TUc corresponds to 52% effluent, the highest effluent concentration tested. While there were no observable effects at 1.9 TUc, the results do not demonstrate compliance with the WET water quality criterion of 1.0 TUc. Therefore, DEC conservatively assumes that WET has reasonable potential to exceed 1.0 TUc and it is included in the chronic mixing zone.

Temperature, which drives the chronic mixing zone, is not a toxic pollutant. Therefore, DEC used copper's chronic dilution (20:1) as the instream waste concentration. The dilution series must include the instream waste concentration (IWC), two dilutions above the IWC, and two dilutions below the IWC. No concentration shall be greater than two times than that of the next lower concentration. The IWC is the concentration at the boundary of the mixing zone. The resultant effluent concentration dilution series including a control (0%), is 80%, 40%, 20%, 10%, 5.0%.

The prior permit stated that if no toxicity is detected at the maximum concentration (52% effluent) for four consecutive samples, then WET monitoring may be reduced or discontinued upon written approval by the Department. Upon request by AEEC, and confirmation that toxicity had not been detected at the maximum concentration for four consecutive samples, DEC reduced monitoring in December 2021 from twice per year to annual.

In order to reassess the toxicity of the effluent and to ensure compliance with 18 AAC 83.335, WET monitoring shall continue to be required, although the monitoring frequency has been modified from annual to monitoring during the second and fourth years of the permit. In the reissued permit, if toxicity is detected at the highest effluent concentration tested in the second year of the permit, the permittee must also conduct chronic toxicity testing during the third year of the permit. If toxicity is detected at the highest effluent concentration in the fourth year of the permit, the permittee must also conduct chronic toxicity testing during the fifth year of the permit.

The permit requires accelerated WET testing if toxicity is greater than 5.0 TUc in any test. If toxicity exceeds 5.0 TUc, six biweekly WET tests (every two weeks over a 12-week period) is required. If the permittee demonstrates through an evaluation of the facility operations that the cause of the exceedance is known and corrective actions have been implemented, only one accelerated test is required. If toxicity is greater than 5.0 TUc in any of the accelerated tests, the permittee must initiate a Toxicity Reduction Evaluation (TRE). A TRE is a site-specific process designed to identify the cause of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and confirm effluent toxicity reduction. The permittee may initiate a toxicity identification evaluation (TIE) as a part of the TRE. A TIE is a set of procedures that characterize, identify, and confirm the specific chemicals responsible for effluent toxicity. TREs and TIEs must be performed in accordance with Environmental Protection Agency (EPA) guidance manuals (see Permit Section 1.3 for further details).

4.0 RECEIVING WATERBODY

4.1 Description of Receiving Waterbody

Cook Inlet, a large tidal estuary, oriented south-southwest to north-northeast, extends approximately 192 miles from the Gulf of Alaska to Anchorage, Alaska. At the northern end it branches into the Knik and Turnagain Arms. To the south, Cook Inlet merges with Shelikof Strait, Stevenson and Kennedy Entrances, and Chugach Strait. Cook Inlet varies in width from about 62 miles near the entrance to less than 12 miles at its head.

The watershed encompasses approximately 39,000 square miles of Southcentral Alaska and includes drainage from the Chugach Mountains and Aleutian and Alaska Ranges that flows into Cook Inlet via its tributaries; the Knik, Little Susitna, Susitna, and Matanuska Rivers.

Mean tidal range varies from 10 feet at the entrance to 30 feet at the head. In the upper inlet, extreme spring tidal range is approximately 39 feet. Tidal currents at the entrance to Cook Inlet have an estimated velocity of 2 to 3 knots and generally increases up the inlet where currents may be in excess of 5 knots at full tidal flow. Tidal currents during a large tide may reach 8 to 9 knots between the East and West Forelands where Cook Inlet is approximately 10 miles wide and higher between Harriet Point and the South end of Kalgin Island.

When the current opposes winds over 12 knots, dangerous waves are created over shoals, which are generally strewn with boulders, some reaching more than 30 feet above the sea bottom. When a Southwest wind accompanies a flood current, significant ground swells occur at the Nikiski docks and in the Kenai River approach.

Cook Inlet waters are discolored by glacial silt. Discoloration may extend to Anchor Point at the end of an ebb tide and at the end of a spring flood current, the water may be comparatively clearer between East and West Forelands. With either an ebb or flood tide, the waters above Ninilchik frequently appears as liquid mud.

Tidal datums including mean lower low water (MLLW), the plane of reference used for depth soundings, have changed throughout the region due to forces such as post-seismic crustal rebound.

4.2 Outfall Description

The NCC Plant discharges effluent into Cook Inlet at an approximate depth of 30 feet below MLLW and approximately 1,016 feet from the MLLW shoreline of Cook Inlet at 60.6759293’ N latitude, 151.3953853’ W longitude. The outfall is designated in the permit as Outfall 001A.

Outfall 001A consists of a four-inch diameter high-density polyethylene pipe with a vertically oriented diffuser that extends approximately 10 feet above the seafloor, with three discharge ports located at the two, three-, and four-feet elevation on the stem pipe. The diffuser diameter tapers from four to three inches prior to the diffuser ports. Ports are equipped with check valves to prevent inflow of seawater and provide protection from clogging. The diffuser assembly is anchored in place, embedded at least 20 feet into the hardpan of Cook Inlet and protected by a steel H-pile.

4.3 Water Quality Standards

Section 301(b)(1)(C) of the CWA required the development of limits in permits necessary to meet water WQS by July 1, 1977. Per 18 AAC 83.435, APDES permits must include conditions to ensure compliance with WQS. Additionally, regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the 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.

Waterbodies 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, Cook Inlet (near Port Nikiski), has not been reclassified, nor have site-specific water quality criteria been established. Therefore, Cook Inlet must be protected for all marine water designated uses listed in 18 AAC 70.020(a)(2). These marine water designated use classes consist of the following: aquaculture, seafood processing, and industrial water supply; contact and secondary water recreation; the growth and propagation of fish, shellfish, other aquatic life, and wildlife; and the 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, intrinsically meet applicable WQS is defined as a "water quality limited segment" and placed on the state's impaired waterbody list. For an impaired waterbody Section 303(d) of the CWA requires states to develop a total maximum daily load (TMDL) management plan for the waterbody. 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 source. Cook Inlet (near Port Nikiski) is not included in Alaska's 2022 Integrated Water Quality Monitoring and Assessment Report.

4.5 Mixing Zone Analysis

In accordance with 18 AAC 70.240, the Department may authorize a mixing zone in a permit. 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.

AEEC requested a mixing zone for arsenic, copper, manganese, zinc, and temperature and submitted documentation and modeling to support their request. DEC subsequently reviewed their submittal to verify that the requested mixing zone would meet regulatory criteria.

Appendix D outlines the regulatory criteria that must be met 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 DEC's mixing zone analysis:

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, AEEC and DEC used CORMIX version 12.0GTD to model the chronic and acute and mixing zones. CORMIX is a widely used and broadly accepted modeling tool for accurate and reliable point source mixing analysis and predicts the distance at which a modeled parameter meets water quality criteria as well as the corresponding dilution at that point.

18 AAC 70.240(b)(2) requires the Department to consider the characteristics of the effluent after treatment of the wastewater. The APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide states that data collected prior to changes in industrial operations, wastewater treatment systems, service areas, or plant expansions should not be included in the RPA. AEEC installed a permanent RO pre- filtration system in October 2021 and eliminated the GAC filtration system. The removal of the GAC filtration system eliminated a high solids backwash stream that was required by the system. AEEC also now disposes of their RO membrane filters rather than cleaning in place. The clean in place procedure required acid and caustic chemicals that resulted in a high solids waste stream. DEC therefore determined to limit the RPA data set to monitoring data that occurred after the installation of the permanent RO pre-filtration system in October 2021 through December 2023. This data set represents current conditions at the facility and is the most relevant data set to use in the RPA.

DEC reviewed the facility's effluent monitoring data from October 2021 through December 2023 to identify pollutants of concern and to determine which pollutants have reasonable potential to exceed water quality criteria and then which pollutant requires the most dilution to meet both chronic and acute water quality criteria.

DEC's dataset differs from that used by AEEC as AEEC used 5 years of data dating to the effective date of the prior permit, October 2018. This resulted in differences in DEC's and AEEC's MECs and dilution factors required to meet water quality criteria. As the MEC of a pollutant is a required mixing zone modeling input, the resultant mixing zone modeling conducted by AEEC and DEC also differed. AEEC's RPA, resulted in their request for a manganese chronic mixing zone with a dilution of 345 measuring 216 meters by 2.1 meters. The acute mixing zone for copper determined by AEEC, contains a dilution of 58.5 and measures 40 meters by 1.1 meters.

For the ambient receiving water concentrations, DEC used the 85th percentile of receiving water data that was sampled between March 2020 and May 2023 from the NCC Plant's wastewater discharge permit's approved ambient receiving waterbody monitoring location. AEEC used the 85th percentile of receiving water data associated with NCC Plant's wastewater discharge permit's approved ambient receiving waterbody monitoring location as well as locations at the Kenai Refinery and Kenai Liquified Natural Gas Plant docks.

Based on monitoring data and RPA results, DEC has determined that there is reasonable potential that arsenic, copper, manganese, temperature, and WET will exceed water quality criteria at the point of discharge into Cook the Inlet. The pollutant requiring the most dilution to meet chronic water quality criteria is temperature; therefore, temperature is the driver of the chronic mixing zone. Temperature is a non-toxic pollutant and does not have an acute water quality criterion. Copper, which also has reasonable potential to exceed water quality criteria, is a toxic pollutant that contains both acute and chronic water quality criteria and requires the most dilution to meet acute water quality criteria; therefore, it is the driver of the acute mixing zone.

For both the acute and chronic mixing zone modeling, DEC used the same basic assumptions such as the outfall and receiving water characteristics that were used in the prior permit but updated the MECs from the October 2021- December 2023 RPA. The effluent flow was also corrected from the previously used design flow of 50,400 gpd to the daily maximum production-based flow of 42,000 gpd for consistency with 18 AAC 83.520(a) which states that except for a publicly owned treatment works, effluent limitations, standards, or prohibitions that are based on production or other measure must be calculated on a reasonable measure of actual production of the facility, not on the designed production capacity (see Appendix A.5).

The distances (length and width) to where water quality criteria are encountered, as predicted by CORMIX, were applied to either side of the outfall to account for the reversal of the ebb and flood tides.

According to EPA's Technical Support Document for Water Quality-based Toxics Control, 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 criterion 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 acute criterion. DEC determined that the travel time of an organism drifting through the copper acute mixing zone to be approximately 3 seconds; therefore, there will be no lethality to organisms passing through the acute mixing zone.

Arsenic requires less dilution (1.8 acute, 3.5 chronic) than copper to meet water quality criteria and fits within the acute mixing zone sized for copper and also fits within the chronic mixing zone sized for temperature. Manganese (dilution 5.4) which does not have acute and chronic water quality criteria, but has human health-based criteria, fits within the chronic mixing zone sized for temperature.

WET is included in the mixing zone, and as described in Fact Sheet Section 3.4, if the 20 TUc WET toxicity trigger is not exceeded, the effluent, as per 18 AAC 70.030, will not impart chronic toxicity to aquatic organisms at or beyond the mixing zone boundary.

The smallest practicable chronic and acute mixing zones are defined as follows.

Outfall 001A

The chronic mixing zone has a dilution of 24:1 and is defined as a rectangle oriented parallel to the shoreline with a length of 9.3 meters and a width of 0.36 meters centered over the diffuser, extending from the seafloor to the sea surface.

The acute mixing zone has a dilution of 10.5 and is defined as a rectangle oriented parallel to the shoreline with a length of 2.9 meters long and a width of 0.04 meters centered over the diffuser, extending from the seafloor to the sea surface.

Table 7 summarizes CORMIX input data that was used to model temperature, the driving parameter of the chronic mixing zone and copper, the driving parameter of the acute mixing zone.

Table 7- Summary of CORMIX Version 12.0GTD Inputs

Parameter Modeled	Maximum Expected Temperature or Concentration	Ambient Temperature or Concentration	Water Quality Criteria
Temperature as ΔT (chronic)	24 ºC	0 ºC	1 ºC
Copper (acute)	47.44 µg/L (discharge concentration excess 46.01 µg/L)	1.428 µg/L	5.8 µg/L acute (discharge concentration excess: 4.4 µg/L) 3.7 µg/L chronic (discharge concentration excess: 2.3 µg/L)
Outfall and Receiving Waterbody Characteristics			
Outfall Type and Length	309.7 meters (from MLLW) long outfall with a submerged vertically oriented multiport diffuser modeled as a single port. Nearest bank on the right.		
Depth at Discharge	13.7 meters		
Number and Size of Ports	1 port 0.0879 meters		
Port Height above Seabed	2.5 meters		
Channel Depth	0.6096 meters		
Ambient Density	1019.84 kilograms per cubic meter		
Ambient Velocity	0.291 meters per second 10th percentile 1.68 meters per second 90th percentile		
Wind Velocity	3.3 meters per second		
Diffuser Configuration	submerged		
Port Diameter	0.70104 meters		
Port Height Above Channel Bottom	0.36 meters		
Effluent Flow Rate	0.00184 cubic meters per second		

4.5.2 Technology

In accordance with 18 AAC 70.240(c)(1), the most effective and technological and economical methods should be used to disperse, treat, remove, and reduce pollutants.

The water used in the steam electric process must be of high purity; therefore, source water is treated prior to use. Groundwater as well as recycled heat recovery steam generator water is pumped to a 240,000-gallon service water tank. Treatment of the service water consists of two-stage filtration which is stored in an RO feed water tank. The RO feed water is treated with an anti-scalant chemical injection and polished through a single-stage, 1-micron filter. Stage 1 permeate is adjusted to 9.0 pH S.U.s using sodium hydroxide and is processed through Stage 2 RO membranes to produce the finished demineralized water. Stage 1 reject is discharged to Cook Inlet. Stage 2 reject is recycled to the polished Stage 1 RO membrane feed. The facility no longer uses a clean in place process to clean RO membranes, instead, RO membranes are now discarded which eliminates the use of acid and caustic chemicals and the high solids waste stream that was associated with the clean in place process. With the installation of the new service water filtration system, AEEC removed the GAC filtration system which eliminated a high solids backwash wastewater stream.

Wastewater consisting of pump seal leaks, condensate system pressure relief, and wash water from sumps in the steam turbine generator and combustion turbine generator buildings is collected and pumped to two 2,000 gallon holding tanks, transferred to a vacuum truck, and disposed of at a permitted industrial septic facility or at an oily water disposal facility.

AEEC has eliminated GAC filtration membrane backwash and RO membrane clean in place wastewater from their discharge with alternate treatment methods and disposal. They have demonstrated that they are using the most effective and technological and economical methods and best management practices to disperse, treat, remove, and reduce pollutants.

4.5.3 Existing Use

In accordance with 18 AAC 70.240(c)(2) and (3) and 18 AAC 70.240(c)(4)(B)(C), the mixing zones have been appropriately sized to fully protect the existing uses of Cook Inlet. Cook Inlet's existing uses and biological integrity have been maintained and protected under the terms of the previous permit and shall continue to be maintained and protected under the terms of the reissued permit. Water quality criteria for pollutants that demonstrated reasonable potential to exceed water quality criteria will be met prior to or at the boundary of the mixing zones. Designated and existing uses in Cook Inlet that are beyond the boundary of the mixing zones will be maintained and protected.

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 an 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.

4.5.5 Spawning Areas

In accordance with 18 AAC 70.240(f), mixing zones are not authorized in spawning areas for Arctic grayling, northern pike, lake trout, brook trout, sheefish, burbot, landlocked coho salmon, chinook salmon, or sockeye salmon. Mixing zones are also not authorized for anadromous or resident rainbow trout, Arctic char, Dolly Varden, whitefish, or cutthroat trout.

Mixing zones are authorized in the marine waters of Cook Inlet. Discharges to fresh water is not authorized in the permit; therefore 18 AAC 70.240(f) does not apply.

4.5.6 Human Health

In accordance with 18 AAC 70.240(d)(1), the mixing zone must not contain bioaccumulating, bioconcentrating, or persistent chemicals above natural or significantly adverse levels. 18 AAC 70.240(d)(2), states that the mixing zone must 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 and the results of the RPA conducted on pollutants of concern indicated that the NCC Plant is protective of human health. The effluent data was used in conjunction with applicable water quality criteria, which serve the purpose of protecting human and aquatic life, to size the mixing zones to ensure all water quality criteria are met in the waterbody at the boundary of the mixing zones.

Arsenic is a carcinogen and shows reasonable potential to exceed water quality criteria at the end of the pipe. Between October 2021 and December 2023, effluent concentrations ranged from 3.74 µg/L to 46 µg/L. The maximum expected concentration, as determined in the RPA is 122 µg/L. An acute dilution of 1.8 and a chronic dilution of 3.5 is required to meet aquatic life water quality criteria of 69 µg/L (acute) and 36 µg/L (chronic). Arsenic is projected to meet water quality criteria in less than one half meter. The receiving water is not used as a drinking water source and contact recreation or other potential sources of exposure to the effluent is highly unlikely due to the outfall location.

4.5.7 Aquatic Life and Wildlife

In accordance with 18 AAC 70.240, the mixing zones authorized in the permit shall be protective of aquatic life and wildlife. The mixing zones do not form a barrier to migratory fish species or fish passage, nor will it result in a reduction of fish population levels. A toxic effect will not occur in the water column, sediments, or biota outside the boundary of the mixing zones. The CORMIX mixing zone modeling conducted for this discharge incorporated the most stringent water quality criteria in the models for protection of the growth and propagation of fish, shellfish, other aquatic life, and wildlife, and all water quality criteria will be met at the boundary of the authorized mixing zones.

4.5.8 Endangered Species

In accordance with 18 AAC 70.240(c)(4)(F), the mixing zones will not cause an adverse effect on threatened or endangered species. The National Marine Fisheries Service (NMFS) has identified the Cook Inlet (Distinct Population Segment) Beluga Whale (Delphinapterus leucas) as an endangered species with critical habitat in Alaska, and the United States Fish and Wildlife Service (USFWS) has identified the short- tailed albatross (Phoebastria albatrus) as endangered throughout its range. Due to the small size and short residence times of pollutants in the mixing zones, DEC has determined that the mixing zones will 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 the USFWS and NMFS. Any comments received from these agencies regarding endangered species will be considered prior to issuance of the permit.

See Section 8.2 of the fact sheet for more information regarding endangered species.

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 (1) material and substantial alterations or additions to the permitted facility that justify the relaxation;

(2) information other than revised regulations, guidance, or test methods that would have justified the application of a less stringent effluent limitation is now available that was not available at the time of permit issuance, or, if the Department determines that technical mistakes or mistaken interpretations of the law were made in issuing the permit under 33 U.S.C. 1342(a)(1)(b); (3) a less stringent effluent limitation is necessary because of events over which the permittee has no control and for which there is no reasonably available remedy; (4) the permittee has received a permit modification under 33 U.S.C 1311(c),(g)-(i),(n), or 1326(a)

or (5) the permittee has installed the treatment facilities required to meet the effluent limitations in the previous permit and has properly operated and maintained the facilities but has nevertheless been unable to achieve the previous effluent limitations, in which case the limitations in the reviewed, reissued, or modified permit may reflect the level of pollutant control actually achieved, but shall not be less stringent than required by effluent guidelines in effect at the time the permit was renewed, reissued, or modified.

AEEC requested an exception to anti-backsliding for copper effluent limits based on the first and fifth above listed exceptions. The following summarizes information that they submitted to DEC to support their request.

AEEC installed a temporary service filtration system in February 2021, followed by the permanent installation in October 2021 and eliminated the GAC filtration system. The new filter skid consists of 5- micron bags followed by 1-micron cartridge filters. The removal of the GAC filtration system eliminated a high solids backwash stream and possibly some of copper in the discharge. Additionally, rather than cleaning the RO membrane filters in place, AEEC now disposes of RO membrane filters which eliminates a potential copper source.

AEEC has endeavored to determine the source of copper in their effluent. They have sampled water from multiple points throughout the facility as well as their process chemicals. AEEC has sought advice from engineers, consultants, chemical vendors, and public wastewater utilities; however, neither an obvious copper source nor a clear solution to the elevated copper concentrations have been identified. AEEC has diligently been attempting to reduce copper in the effluent. These efforts have included changing their anti- scalant to an ultra-low copper formulation when copper had been detected in the anti-scalant, flushing and cleaning water treatment building drains and effluent sumps, replacing copper in the plumbing materials of the water supply to the seal flushing system on the service water pumps with stainless steel tubing, replacing a backflow preventor on the downstream end of the service water tank that contained brass components, replacing bag and cartridge filter elements as needed, and as indicated previously, although indeterminate whether it has reduced copper in the effluent, disposing of RO membrane filters rather than cleaning them in place. Further efforts to identify sources of copper continues, and any pipes, fittings, or other items containing copper or brass are replaced.

AEEC hired a professional engineer who inspected the water treatment system and reviewed the system's installation, operation, and maintenance data. The engineer determined that the system is properly installed, operated, and maintained; however, despite this, random and unpredictable elevated copper concentrations above permit effluent limits continue.

DEC has determined that based on the information provided by AEEC, that an exception to anti-backsliding under 18 AAC 83.480(b)(1) and (5) is justified. WQBELs based on an RPA of effluent data after installation of the permanent service filter skid in October 2021 through December 2023 and that reflect the level of pollutant control actually achieved at the facility, have been applied in the reissued permit (47 µg/L daily maximum, 19 µg/L monthly average) rather than the effluent limits of the prior permit (17.09 µg/L daily maximum, 8.28 µg/L monthly average).

All other permit effluent limitations, standards, and conditions in AK0053619 are as stringent as in the previously issued permit (see Table 6 for a summary of effluent limit changes from the prior permit) and are consistent with 18 AAC 83.480. Accordingly, no further backsliding analysis is required for this permit reissuance.

EPA's Interim Guidance for Performance-Based Reduction of National Pollutant Discharge Elimination System Monitoring Frequencies (EPA, 1996), states that monitoring requirements are not considered effluent limitations under the CWA, and therefore Antibacksliding prohibitions would not be triggered by reductions in monitoring frequencies.

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 waterbody'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 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 CWA. 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).

Cook Inlet is not listed as impaired (Category 4 or 5) in Alaska's 2022 Integrated Water Quality Monitoring and Assessment Report; therefore, 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 met 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), 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;

(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).

The water quality criteria, upon which the permit effluent limits are based, serve the specific purpose of protecting the existing and designated uses of the receiving water. 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* (DEC 2022) 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 water quality 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 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;*

Permit Section 1.2.2 requires that the discharge shall not cause contamination of surface or ground waters or a violation of the WQS at 18 AAC 70 except if excursions are allowed in the permit and the excursions are authorized in accordance with applicable provisions in 18 AAC 70.200 – 70.240 (e.g., variance, mixing zone). As a result of the facility's reasonable potential to exceed water quality criteria for arsenic, copper, manganese, temperature, and WET, mixing zones are authorized in the NCC Plant permit in accordance with 18 AAC 70.240. The resulting effluent end-of pipe limitations and monitoring requirements in the permit (see Fact Sheet Table 5) protect WQS, and therefore, will not violate the water quality criteria found at 18 AAC 70.020.

Alaska WQS at 18 AAC 70.030 requires that an effluent discharged to a waterbody may not impart chronic toxicity to aquatic organisms, expressed as 1.0 TUc, at the point of discharge, or if the Department authorizes a mixing zone in a permit, approval, or certification, at or beyond the mixing zone boundary, based on the minimum effluent dilution achieved in the mixing zone.

Copper's WQBELs were developed using copper's acute dilution of 10.5 and temperature's chronic dilution of 24. However, temperature is not a toxic pollutant; therefore, DEC used copper's chronic dilution of 20 to establish 20 TUc as the chronic toxicity trigger. If the WET trigger is not exceeded, the NCC Plant will not violate the WET limit in 18 AAC 70.030. Should the WET trigger be exceeded, the permittee is required to initiate accelerated testing. If the permittee demonstrates through an evaluation of the facility operations that the cause of the exceedance is known and corrective actions have been implemented, only one accelerated test is required. Should any of test results exceed 20 TUc, the permittee must initiate a TRE which is designed to identify the cause of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and confirm effluent toxicity reduction as a part of a TRE (see Permit Section 1.3 for further details). These permit requirements shall ensure that the effluent will not impart toxicity at or beyond the mixing zone boundary.

There are no site-specific criteria associated with 18 AAC 70.236(b).The permit does not authorize short term variances or zones of deposit under 18 AAC 70.200 or 18 AAC 70.210.

DEC determined that the reduction in water quality will not violate the 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;

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;

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

(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, which includes 40 CFR §423. The permit implements 40 CFR §423 ELGs; therefore, this requirement is met.

The second part of the definition references the minimum treatment standards for domestic wastewater discharges found at 18 AAC 72.050. The NCC Plant treats and discharges domestic wastewater via a subsurface leachfield that is not authorized via the APDES permit; therefore, further analysis for this particular finding is not warranted.

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 WQBELS. WQBELs are designed to ensure that the 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 WQS established under CWA §303, including state narrative criteria for water quality."

After review of the applicable statutory and regulatory requirements, including 18 AAC 70, 18 AAC 72, and 18 AAC 83, the Department finds that the discharge from the NCC Plant meets the highest applicable statutory and regulatory requirements and that the 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;

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);*

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.*

A mixing zone, in accordance with 18 AAC 70.240, is authorized in the permit for temperature. Maximum temperature effluent limits are established in the permit to ensure the protection of temperature water quality criteria at and beyond the boundary of the mixing zone.

The below are excerpts from AEEC's Antidegradation Form 2G submittal and support the above regulatory requirements. The below excerpts contain some references to mixing zones. As per the above regulatory requirements, a mixing zone does not treat nor control a discharge and is not considered a practicable alternative for preventing or lessening degradation associated with a proposed discharge.

Form 2G Sections 1 and 2- Facility Information [18 AAC 70.16(a)(5)(A-G)]

Receiving Waterbody: Cook Inlet

Parameters of concern in the discharge: Copper

Respective maximum expected concentrations

34.3 µg/L Tier Protection Level: 2

Persistence:

Effluent copper concentrations are tested monthly at NCC Plant, owned and operated by AEEC. Analysis results range widely from non-detectable to 34.30 µg/L between October 2021 and May 2023. As discussed in the anti- backsliding exception request, spikes of copper have occurred at NCC that are over the Alaska WQS and the permitted effluent limit.

AEEC has taken measures to determine the source(s) of the copper, including sampling from different areas of the water system, removing copper and brass fittings and equipment, and changing treatment chemicals found to contain copper. However, spikes have continued. AEEC also installed a particulate filter skid with bag and cartridge filters upstream of the RO system. The RO membranes are also no longer cleaned-in-place, but rather replaced to try to decrease copper in the effluent.

Potential Impacts:

The NCC Plant would continue to discharge water with copper concentrations ranging from non-detectable to 34.3 µg/L. High copper concentrations have been known to impact aquatic organisms including causing damage to gills, kidneys, spleens, and other organs and can also impact the metabolic processes of the organism. However, criteria will not be exceeded outside of the mixing zone of this outfall.

Form 2G Section 3- Tier 1 Protection Level and Analysis [18 AAC 70.16(b)]

The discharge of a parameter identified in Section 1 (copper) does not occur to a Category 4 [305(b)] or Category 5 [3039d)] waterbody listed in the current Alaska's Integrated Water Quality Monitoring and Assessment Report.

Form 2G Section 4– (Questions 1-2) Tier 2 Protection Level and Analysis [18 AAC 70.016(c)]

Application is for an expanded discharge. The discharge of parameters identified in Section 1 (copper) requires Tier 2 analysis as defined under 18 AAC 70.016(c)(2)(A)-(E).

Form 2G Section 4– (Question 3.A) Tier 2 Protection Level and Analysis [18 AAC 70.016(c)]

3. For each parameter requiring a Tier 2 analysis, provide a description per discharge (e.g., parameter specific per outfall) and analysis of a range of practicable alternatives that have the potential to prevent or lessen the degradation associated with the proposed discharge [18 AAC 70.016(c)(4)].

A. Identification of receiving water quality and accompanying environmental impacts on the receiving water for each of the practicable alternatives.

There are two potentially practicable alternatives for decreasing copper in the effluent stream to a concentration below the permit limits.

<u>Alternative 1 – Precipitation/Clarification/Filtration</u>: This alternative would remove copper by coprecipitation with ferric chloride addition, sodium hydroxide addition for pH adjustment, ballasted clarification with polymer addition, copper sulfide precipitation with sodium hydrosulfide addition, and ultrafiltration (UF) membranes would be sent to a sludge thickener. Thickened sludge would be sent to a belt filter press to be dewatered with polymer addition.

Alternative 1 is an established approach for removal of heavy metals and would be expected to reliably and consistently meet the NCC plant effluent limit for copper.

Alternative 2 – Ion Exchange and Precipitation: This alternative would remove copper by ion exchange using resin that is specific to adsorption of metals such as copper. Resin would be periodically regenerated with hydrochloric acid followed by sodium hydroxide to neutralize the pH of the resin. Regenerant would be sent to a reaction tank in which pH would be raised above 8 using sodium hydroxide and then sodium hydrosulfide would be added to precipitate copper sulfide. Contents of the reaction tank would be sent to a sludge thickener. Thickened sludge would be sent to a plate and frame press or belt filter press to be dewatered, possibly with polymer addition.

Ion exchange has been used in the mining industry for economic recovery of copper as well as for mine wastewater treatment for copper. However, there is no literature that documents if ion exchange is capable of reliable and consistent removal of copper to a concentration that is below the effluent limit. HDR experience from bench-scale testing of ion exchange on another project for the mining industry indicated greater than 95% removal of copper, but with a much higher influent copper concentration. The testing that produced these results was done under acidic conditions and reflected improving copper removal with higher pH levels. Pilot testing would be necessary to determine if the process would reliably and consistently meet the NCC plant effluent limit for copper.

Two more alternatives for decreasing copper in the effluent stream were evaluated but determined to not be practicable:

One of these impracticable alternatives was cementation, a process developed in the early 20th century mining industry for production of metallic copper. Cementation was deemed impracticable because it will not achieve concentrations low enough to meet the NCC plant effluent limit for copper.

Another alternative considered but deemed impracticable was further concentration of all dissolved ions, including copper, in the effluent stream using additional stages of RO followed by mechanical vapor recompression to evaporate the RO brine and then crystallization of the brine to produce a dry copper-containing salt material that can be disposed of in a landfill. This alternative is impracticable because it would be extremely expensive to operate, extremely energy intensive, and would consume large amounts of natural gas. At a time when Cook Inlet natural gas supply is already facing a deficit situation, adding such a large new demand for natural gas makes this alternative impracticable.

During the previous permit cycle, sampling was required in the receiving waterbody twice a year to aid with the RPA in future permit renewals. Samples were collected between March 2020 and March 2023. Concentrations of dissolved copper ranged between 0.9 µg/L and 2 µg/L. Total copper concentrations ranged from 12.7 µg/L to 20.6 µg/L.

Impacts to the receiving waterbody for both practicable alternatives would be a decrease in the concentration of copper entering the waterbody. However, for Alternative 1, there is potential to slightly increase concentrations of iron, sodium, chloride, and sulfide in the effluent and Alternative 2 treatment could potentially cause a slight increase in sodium, chloride, and sulfide. Even with the potential for a slight increase in other parameters, environmental impacts to the receiving waterbody are expected to be none to minimal within the mixing zone and even less outside of the mixing zone.

Form 2G Section 4– (Question 3.B) Tier 2 Protection Level and Analysis [18 AAC 70.016(c)]

A. Evaluation of the cost for each of the practicable alternatives, relative to the degree of water quality degradation.

The cost of installing either practicable alternative for additional copper treatment at the NCC includes the cost of the equipment, shipping equipment to site, installation, construction of a building addition, piping, electrical, instrumentation and controls, and start up and commissioning. The rough order of probable capital cost of Alternative 1-Precipitation/Clarification/Filtration is provided in Table 1. The ROM opinion of probable capital cost of Alternative 2 – Ion Exchange and Precipitation is provided in Table 2.

It is assumed that the treatment building would need to be expanded to accommodate either practicable alternative. Since the existing treatment building does not have enough space to expand the treatment building additional land would need to be acquired. At this time, it is unlikely that additional land nearby is available for acquisition.

Both practicable alternatives would also create sludge that would need to be taken to the landfill for disposal.

Table 1. Opinion of Probable Cost, Alternative 1- Precipitation/Clarification/Filtration

Item	Quantity	Units*	Unit Cost	Cost
Equipment Purchase and Freight	1	LS	$2,500,000	$2,500,000
Equipment Install (% of Equipment Cost)	20%	%	$500,000	$500,000
Specialty concrete (thickener, sump, etc.)	1	LS	$250,000	$250,000
Process Piping	1	LS	$500,000	$500,000
Electrical , Instrumentation, & Controls	1	LS	$1,000,000	$1,000,000
Water Treatment Building Addition	2,500	SF	$500	$1,250,000
Site Work (excavation, grading, etc.)	1	LS	$500,000	$500,000
Startup & Commissioning	1	LS	$200,000	$200,000
		Construction Subtotal		**$6,700,000**
		Construction Contingency (25%)		$1,675,000
		Engineering (10%)		$670,000
		Construction Management (5%)		$335,000
		Property Acquisition		$100,000
		Administration and Legal (5%)		$335,000
		Total		**$9,815,000**

[* LS=lump sum, SF= square feet]

Table 2. Opinion of Probable Cost, Alternative 2- Ion Exchange and Precipitation

Equipment Purchase and Freight	1	LS	$1,100,000	$1,100,000
Equipment Install (% of Equipment Cost)	20%	%	$2200,000	$220,000
Specialty concrete (thickener, sump, etc.)	1	LS	$250,000	$250,000
Process Piping	1	LS	$400,000	$400,000
Electrical , Instrumentation, & Controls	1	LS	$500,000	$500,000
Water Treatment Building Addition	1,750	SF	$500	$875,000
Site Work (excavation, grading, etc.)	1	LS	$500,000	$500,000
Startup & Commissioning	1	LS	$150,000	$150,000
		Construction Subtotal		**$3,995,000**
		Construction Contingency (25%)		$998,750
		Bench/Pilot Testing		$100,000
		Engineering (10%)		$399,500
		Construction Management (5%)		$199,750
		Property Acquisition		$100,000
		Administration and Legal (5%)		$199,750
		Total		**$5,992,750**

[* LS=lump sum, SF= square feet]

Form 2G Section 4– (Question 3.C) Tier 2 Protection Level and Analysis [18 AAC 70.016(c)]

C. Identification of a proposed practicable alternative that prevents or lessens water quality degradation while also considering accompanying cross-media environmental impacts.

Two potentially practicable alternatives that can be considered for reducing copper in the effluent at NCC are described in the previous section. Overall cost of capital improvements range from $6 million for Alternative 2 to $10 million for Alternative 1. The additional treatment for copper would be very costly for AEEC and would not be cost-effective given that the amount of water treated and that the amount of copper removed is minimal. Additionally, the costs of chemicals, labor, sludge transport and disposal, and energy to operate the treatment system full time for the small effluent stream with often non-detectable levels of copper make both alternatives very expensive for the small incremental decrease in the effluent copper concentration. Thus, based on this analysis, neither alternative is actually practicable or cost-effective.

Form 2G Section 4– (Question 4) Social or Economic Importance [18 AAC 70.016(c)(5)]

Provide information that demonstrates the accommodation of important social or economic development. The applicant shall complete either a social OR economic importance analysis (or both) identifying each affected community in the area where the receiving water for the proposed discharge is located.

Social importance areas selected for analysis: community services provided, public health or safety improvements, infrastructure improvements, education, and training

Economic importance areas selected for analysis: employment, job availability, and salary impacts, tax base impacts, commercial activities

AEEC is a member-owned, non-profit electric cooperative with a single member. HEA is the single member and is also a member-owned, non-profit cooperative, but it has many members consisting of the consumers of the electricity it provides.

NCC is HEA's primary power generation plant and provides power to 23,000 Kenai Peninsula residents and businesses. NCC also provides power to industry and natural resource extraction activities that provide natural gas and essential products to Alaska homes and businesses. Operation of NCC is critical to maintaining the safety, infrastructure, and economy of the local community and Alaska.

Up to 81 megawatts (MW) of electricity are produced by NCC using a steam turbine in conjunction with a natural gas turbine. The steam turbine uses waste heat to produce 18 MW of power without using any additional natural gas. This efficiency measure reduces gas usage, air emissions, and reduces costs to customers, but also results in this wastewater discharge.

NCC has 34 full-time, long-term employees and employs numerous local contractors. These people support the local economy as nearly all live in the surrounding Kenai Peninsula communities. AEEC provides training and educational opportunities to its employees to maintain a qualified workforce and for workforce development and advancement.

The impact to the community, if an exception is not granted, should be considered. The copper effluent limits would remain as they are in the 2018 discharge permit. It is likely that AEEC would incur NOVs when copper concentrations spike unless copper treatment is added. This additional treatment is costly for the amount of copper that would be removed. At this time, it is unlikely that additional land nearby is available for acquisition for the water treatment building addition. If there is available land, then it could be potentially taking away from potential industrial growth in the area that could provide the state with necessary imported goods and natural resources.

With AEEC already exceeding best practices with the maintenance of the existing treatment system (i.e., replacing RO membranes versus cleaning), as a non-profit cooperative, the cost to build and operate additional copper treatment would place unnecessary upward pressure on the cooperative membership electric utility rates.

Form 2G Section 5– (Questions 1) Tier 3 Protection Level and Analysis [18 AAC 70.016(d)]

The discharge is not to a designated Tier 3 water

7.0 OTHER PERMIT CONDITIONS

7.1 Quality Assurance Project Plan

The permittee is required to update, implement, and maintain the facility 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 either electronically or physically at the facility's office of record and made available to DEC 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. This permit requires the permittee to review their current BMP Plan, update as necessary, and implement the updated 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 permit contains certain BMP conditions that must be included in the BMP Plan. The plan shall be retained either electronically or physically at the facility's office of record and made available to DEC 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 http://dec.alaska.gov/water/compliance/electronic-reporting-rule that contains general information about this new reporting format. Training materials and webinars for NetDMR can be found at https://netdmr.zendesk.com/home.

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 begin December 2020. Permittees should monitor DEC's E-Reporting Information website (http://dec.alaska.gov/water/compliance/electronic-reporting-rule) 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 Appendix A – Standard Conditions.

7.4 Standard Conditions

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

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). An interactive map depicting Alaska's baseline plus additional boundary lines is available at:

https://alaskafisheries.noaa.gov/mapping/arcgis/rest/services/NOAA_Baseline/MapServer

The map is provided for information purposes only. The U.S. Baseline committee makes the official determinations on baseline. A review of the baseline line maps revealed that a baseline has been established from the southern portion of Kalgin Island crossing Cook Inlet to Ninilchik, approximately 32 miles southwest from the NCC Plant discharge point. The NCC Plant discharges landward of this baseline. Therefore, Section 403 of the CWA does not apply to the permit, and an ODCE 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 Endangered Species Act (ESA) requires federal agencies to consult with the USFWS and NMFS (a division of the National Oceanic Atmospheric Administration (NOAA) to determine whether their actions could beneficially or adversely affect any threatened or endangered species or habitats. NMFS is responsible for administration of the 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 USFWS.

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 contacted USFWS and NMFS on August 3, 2023, to provide them an early opportunity to notify DEC of any concerns.

DEC also accessed NOAA's website at https://www.fisheries.noaa.gov/alaska/endangered-species-conservation/endangered-threatened-and-candidate-species-alaska which identified the Cook Inlet (Distinct Population Segment) Beluga Whale (*Delphinapterus leucas*) as an endangered species with critical habitat in Alaska.

Additionally, DEC has determined that the short-tailed albatross (*Phoebastria albatrus*) listed as endangered throughout its range by the USFWS (https://www.fws.gov/species/short-tailed-albatross-phoebastria-albatrus), may be present in the area of the NCC Plant.

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

8.3 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) designates EFH in waters used by anadromous salmon and various life stages of marine fish under NMFS jurisdiction. EFH refers to those waters and associated river bottom substrates necessary for fish spawning, breeding, feeding, or growth to maturity—including aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish.

Spawning, breeding, feeding, or growth to maturity covers a species' full life cycle necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity. The EFH regulations define an adverse effect as any impact which reduces quality and/or quantity of EFH and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey, reduction in species' fecundity), site- specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

Section 305(b) of the Magnuson-Stevens Act 916 United States Code 1855(b)) requires federal agencies to consult NMFS when any activity proposed to be permitted, funded, or undertaken by a federal agency may have an adverse effect on designated EFH as defined by the Act. As a State agency, DEC is not required to consult with NMFS regarding permitting actions, but voluntarily contacts NMFS to notify them of the proposed permit issuance and to obtain listings of EFH in the area.

DEC contacted NMFS on August 3, 2023, to provide them the opportunity to share concerns with DEC regarding EFH. DEC also accessed the NOAA's online EFH Mapper at https://www.habitat.noaa.gov/apps/efhmapper/ which indicated that the area of Cook Inlet near the NCC Plant outfall may be EFH for all five species (Chinook, Chum, Coho, Pink, and Sockeye) of Pacific salmon.

This fact sheet and the permit will be submitted to NMFS for review during the public notice period and any comments received from NMFS 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), 2023. 18 AAC 72, Wastewater disposal, as amended through October 1, 2023.

ADEC, 2022. 18 AAC 70, Water quality standards, as amended through November 13, 2022.

ADEC, 2022. Alaska water quality criteria manual for toxic and other deleterious organic and inorganic substances, as amended through September 8, 2022.

ADEC, 2022. Integrated water quality monitoring and assessment report. https://dec.alaska.gov/water/water-quality/integrated-report/Accessed June 20, 2022.

ADEC, 2014. Alaska Pollutant Discharge Elimination System permits reasonable potential analysis and effluent limits development guide.

Doneker, Robert and Jirka, Gerhard. 2007. CORMIX user manual, U.S. Environmental Protection Agency, EPA-823-K-07-001, December 2007.

National Oceanic Atmospheric Administration (NOAA) Office of Coast Survey. https://www.nauticalcharts.noaa.gov/?_sm_au_=iVV64fWP3HVjW0Jrjk7tvK06K81Qp Accessed August 11, 2023.

U.S. Environmental Protection Agency. USEPA, 1991. Technical support document for water quality-based toxics control, EPA/505/2-90-001, USEPA Office of Water, Washington D.C., March 1991.

Whitney, J., 2002. Cook Inlet, Alaska oceanographic and ice conditions and NOAA's 18- year oil spill response history 1984-2001. HAZMAT Report 2003-01, Anchorage.

APPENDIX A. BASIS FOR EFFLUENT LIMITATIONS

A.1 Statutory and Regulatory Basis

18 Alaska Administrative Code (AAC) 70.010 prohibits conduct that causes or contributes to a violation of the water quality standards (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 waterbody. The limits must be stringent enough to ensure that WQS are met and must be consistent with any available wasteload allocation (WLA).

A.2 Effluent Limit Guidelines

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

Effluent limit guidelines (ELGs) are technology-based regulations that are national in scope and establish performance standards for all facilities within an industrial category or subcategory. They are intended to represent the greatest pollutant reductions that are economically achievable for an industry. Technology-based numeric limitations for industrial wastewater discharges are set at several levels of control. These include BAT, BCT, BPT, new source performance standards (NSPS), pretreatment standards for new sources (PSNS), and pretreatment standards for existing sources (PSES).

The CWA requires technology-based controls on effluent from steam electric generating power plants discharging to waters of the United States. The Steam Electric Power Generating Point Source Category ELGs regulate discharges from the operation of generation units by establishments primarily engaged in the generation of electricity for distribution and sale, which results primarily from utilizing fossil-type fuel in conjunction with a thermal cycle employing the steam water system as the thermodynamic medium.

ELGs for steam electric power generation facilities may not limit every parameter that may be present in the effluent. ELGs are often established only for those pollutants that are necessary to ensure that industrial facilities comply with the technology-based requirements of the CWA. When ELGs do not exist for a particular pollutant expected to be in the effluent, the Department must determine if the pollutant may cause or contribute to an exceedance of a water quality criterion for the waterbody. If a pollutant causes or contributes to an exceedance of a water quality criterion, a water quality-based effluent limit (WQBEL) for the pollutant must be established in the permit.

ELGs for the Steam Electric Power Generating Point Source Category can be found at 40 Code of Federal Regulations (CFR) §423, adopted by reference at 18 AAC 83.010(g)(3). NSPS at 40 CFR §423.15 apply to any new source as of November 19, 1982. The cogeneration portion of the Nikiski Combined Cycle (NCC) Plant was constructed in 1998. Conversion of the NCC Plant from a simple to a combined cycle electric generation facility began in 2010 and was completed in December 2012. Since construction of the facility commenced after 40 CFR §423 was promulgated, NSPS apply to the NCC Plant discharge.

A.3 Technology-Based Effluent Limits

A.3.1 Low Volume Waste Sources

The ELGs contained in 40 CFR §423.15 include effluent limits for the following waste streams: low volume wastes, chemical metal cleaning wastes, bottom ash transport water, fly ash transport water, once-through cooling water, cooling tower blow down, and coal pile runoff. The NCC Plant's discharge consists entirely of low volume wastes (first pass reverse osmosis reject water comprises greater than 95% of the waste stream and water treatment plant sump floor drainage comprises less than 5% of the waste stream).

40 CFR §423.15(a)(3) requires that the quantity of pollutants discharged in low volume waste sources shall not exceed the quantity determined by multiplying the flow of low volume waste sources by the total suspended solids (TSS) and oil and grease concentrations. The quantity of pollutants discharged in low volume waste sources is expressed as mass-based limits in pounds per day (lbs/day). Flow is based on the actual discharge flow associated with the production of power (See Appendix A.5). The mass-based limits for TSS and oil and grease are calculated as follows:

lbs/day = concentration (milligrams per liter (mg/L)) x flow (million gallons per day (mgd)) x 8.34(lbs/gallon)

Table A.1 contains a summary of low volume waste sources effluent limits that will be monitored at Outfall 001A.

Table A.1-Technology-Based Effluent Limits 40 CFR §423.15, NSPS

EFFLUENT PARAMETER	UNITS	EFFLUENT LIMITS	
		Monthly Average Limit	Daily Maximum Limit
Flow	gallons per day (gpd)	30,000	42,000
Oil and Grease	mg/L	15.0	20.0
	lbs/day	3.8	7.0
TSS	mg/L	30.0	100.0
	lbs/day	7.5	35
pH	Standard Units (S.U.)	6.5 - 8.5 at all times	

A.3.2 Polychlorinated biphenyl compounds (PCBs)

As per 40 CFR §423.15(a)(2), there shall be no discharge of PCBs such as those commonly used for transformer fluid. This prohibition is retained from the prior permit.

A.4 Water Quality-Based Effluent Limits

WQBELs included in Alaska Pollutant Discharge Elimination System (APDES) permits are derived from WQS. APDES regulation 18 AAC 83.435(a)(2) requires that permits include WQBELs that can achieve WQS established under CWA Section 303, including state narrative criteria for water quality. The State's WQS are composed of 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 designated and existing water uses and the level of water quality necessary to protect the uses are maintained and protected. Designated uses are those uses specified in WQS for each waterbody or segment whether or not they are being attained [40 CFR §131.3(f)]. Existing uses are those uses actually attained in a waterbody on or after November 28, 1975, whether or not they are included in the WQS [40 CFR §131.3]. Waterbodies in Alaska are designated for all uses unless the waterbody has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska may also have site–specific water quality criteria per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b).

The receiving water for the discharge, Cook Inlet, has not been reclassified, nor have specific water quality criteria been established. Therefore, Cook Inlet must be protected for all marine water designated uses listed in 18 AAC 70.020(a)(2). These marine water designated use classes consist of the following: aquaculture, seafood processing, and industrial water supply; contact and secondary water recreation; the growth and propagation of fish, shellfish, other aquatic life, and wildlife; and the harvesting for consumption of raw mollusks or other raw aquatic life.

Specific Water-Quality Based Effluent Limits in the Nikiski Combined Cycle Plant Permit

A.4.1 pH

40 CFR §423.15(a)(1) requires that pH of all discharges, except once through cooling water, shall be within the range of 6.0 – 9.0 S.U. Alaska WQS at 18 AAC 70.020(b)(18)(C), Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife, states that pH for marine water uses may not be less than 6.5 S.U. or greater than 8.5 S.U. Alaska Energy and Electric Cooperative (AEEC) did not report any excursions of pH water quality criteria between October 2021 and December 2023. The lowest reported pH was 7.25 S.U. and the highest was 8.37 S.U. AEEC has demonstrated that they can consistently meet pH water quality criteria; therefore, the pH water quality criteria of the prior permit (minimum 6.5 S.U and 8.5 S.U. maximum), are retained in the reissued permit as the pH effluent limits.

The prior permit required pH monitoring five times per week as grab samples. AEEC included a description of the NCC Plant wastewater collection and discharge system as a part of their wastewater discharge application. They indicated that the discharge sump has a fast-loop recirculating pump and piping that feeds the online continuous temperature and pH meters as well as the effluent sampling system. AEEC indicated to DEC they would like pH and temperature monitoring to be changed from five per week grab samples to continuous recorded samples. Since the NCC Plant is equipped with pH and temperature continuous monitoring meters that the facility is already using, and because AEEC requested the change, the reissued permit requires pH and temperature monitoring on a continuous basis and that the results must be recorded.

A.4.2 Copper

Alaska WQS at 18 AAC 70.20(b)(23) requires that copper concentrations for the protection of aquatic life may not exceed 5.8 micrograms per liter (µg/L) (acute) or 3.7 µg/L (chronic). Copper concentrations in the NCC Plant's effluent between October 2021 and December 2023 ranged from non-detect to 34.3 µg/L. Copper has reasonable potential to exceed water quality criteria, therefore WQBELs must be developed. The WQBELs that DEC developed, 47 µg/L (acute), 19 µg/L (chronic) are less stringent than the WQBELs in the prior permit.17.09 µg/L (acute), 8.28 µg/L (chronic). According to 18 AAC 83.480, Reissued Permits, a reissued permit may not contain effluent limits that are less stringent than the previous permit; however, 18 AAC 83.480(b) contains exceptions. AEEC requested an exception to anti-backsliding based on the first and third exceptions at 18 AAC 83.480(b): (1) material and substantial alteration or addition to the permitted facility and (3) despite properly operating and maintaining the facility, AEEC is unable to consistently meet the copper effluent limits of the current permit. DEC determined that the relaxation of the copper effluent limits is justified and therefore selected the less stringent copper WQBELs for the reissued permit. (see Fact Sheet Section 5.0, Antibacksliding).

In accordance with 18 AAC 83.520 and 18 AAC 83.540, the permit contains mass limitations (monthly average 0.0048 lbs/day, daily maximum 0.016 lbs/day) for Copper. The mass limitations are based on the actual discharge flow associated with the production of power (see Appendix A.5), monthly average and daily maximum effluent copper concentration limits, and a unit conversion factor using the following formula:

lbs/day = concentration (micrograms per liter (µg/L)) x flow (million gallons per day (mgd)) x 8.34(lbs/gallon)

A.4.3 Temperature

Alaska WQS at 18 AAC 70.20(b)(22) states that temperature for aquaculture, growth and propagation of fish, shellfish, other aquatic life, and wildlife and harvesting for consumption of raw mollusks or other aquatic life, "may not cause the weekly average temperature to increase more than 1 degree Celsius (°C). The maximum rate of change may not exceed 0.5 °C per hour. Normal daily temperature cycles may not be altered in amplitude or frequency."

DEC analyzed the reasonable potential for temperature to exceed water quality criteria as the difference in temperature or Delta T (ΔT) between the effluent and boundary of the mixing zone. Zero and negative temperature values do not result in lowering of water quality of the receiving water per application of the State's temperature water quality standard. Therefore, DEC used only positive receiving water temperature values in the reasonable potential analysis and mixing zone modelling. This resulted in the assumption of a critical receiving water temperature of 0 °C and 1 °C as the water quality standard numeric criteria that must be met at the boundary of the mixing zone (0 °C + 1 °C = 1 °C). DEC used the monthly daily maximum reported temperature values between October 2021 and December 2023 to reflect the worst-case scenario for ΔT. Monthly daily maximum temperatures during this monitoring period ranged from 12.32 °C to 21.38 °C. DEC determined that temperature has reasonable potential to exceed water quality standards; therefore, DEC developed WQBELs (daily maximum 28 °C, monthly average 23 °C). These WQBELs are more stringent than the temperature limits in the prior permit (daily maximum 36.2 °C, monthly average 27.9 °C), therefore, DEC selected the more stringent temperature limits for the reissued permit.

The prior permit required temperature monitoring five times per week as grab samples. AEEC included a description of the NCC Plant wastewater collection and discharge system as a part of their wastewater discharge application. They indicated that the discharge sump has a fast-loop recirculating pump and piping that feeds the online continuous temperature and pH meters as well as the effluent sampling system. AEEC indicated to DEC they would like pH and temperature monitoring to be changed from five per week grab samples to continuous recorded samples. Since the NCC Plant is equipped with pH and temperature continuous monitoring meters that the facility is already using, and because AEEC requested the change, the reissued permit requires pH and temperature monitoring on a continuous basis and that the results must be recorded.

A.5 Production-based Limitations

Alaska Pollutant Discharge Elimination System regulations at 18 AAC 83.520(a) states that except for a publicly owned treatment works, effluent limitations, standards, or prohibitions that are based on production or other measure must be calculated on a reasonable measure of actual production of the facility, not on the designed production capacity. The discharge of wastewater from the NCC Plant, is correlated to the production of power. Production-based limitations, therefore, should be based on the actual wastewater flow associated with the production of power, rather than on the design capacity. The prior permit was based on a design flow of 35 gallons per minute, or 50,400 gpd. This flow was used in the mass-based effluent limit calculations for TSS, Oil and Grease, and Copper. The use of the design capacity rather than the actual flow associated with the production of power was in error. DEC reviewed the NCC Plant's effluent flow data from the effective date of the last permit, October 2018 - December 2023. The average of the monthly averages during this period of record was 18,944 gpd and the average of the daily maximum flows was 25,074 gpd. The highest monthly average flow during this time period was reported as 29,316 gpd and the highest daily maximum flow reported during this time period was 41,342 gpd. DEC has determined that a monthly average flow of 30,000 gpd and a daily maximum flow of 42,000 gpd are reasonable flow measures of actual production at the facility. Therefore, DEC calculated the TSS and Oil and Grease TBEL mass-based limits and the Copper WQBEL mass-based limits using an average monthly flow of 30,000 gpd and a daily maximum flow of 42,000 gpd. The flow limitations in the permit have therefore, been modified from reporting the monthly average flow in the prior permit to a monthly average 30,000 gpd limit in the reissued permit and from a daily maximum flow limit of 50,400 gpd in the prior permit to a daily maximum flow limit of 42,000 gpd in the reissued permit. The resultant TSS, Oil and Grease, and Copper mass-based limits have therefore also been reduced in the reissued permit. The Copper mass-based limits have also been corrected due to an error in the previous permit's mass-based limits whereby mg/L rather than µg/L had been used in the calculations.

Table A.2 summarizes these modifications.

Table A.2-Production-Based Effluent Limit Modifications

EFFLUENT PARAMETER	UNITS	PRODUCTION-BASED EFFLUENT LIMITS			
		2018 Monthly Average Limit	2024 Monthly Average Limit	2018 Daily Maximum Limit	2024 Daily Maximum Limit
Flow	gpd	Report	30,000	50,400	42,000
Oil and Grease	lbs/day	6.31	3.8	8.41	7.0
TSS	lbs/day	12.6	7.5	42	35
Copper	lbs/day	3.48	0.0048	7.18	0.016

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 to cause or contribute to a violation of Alaska Water Quality Standards. 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 and Effluent Limits Development Guide* (June 30, 2014) to determine the reasonable potential for any pollutant to exceed a water quality criterion.

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

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

This section discusses how the maximum projected receiving waterbody concentration is determined. Copper is provided as an example.

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 waterbody concentration downstream of the effluent discharge

C_e = Maximum projected effluent concentration

C_u = 85th percentile measured receiving waterbody ambient concentration

Q_e = Effluent flow rate

Q_u = Receiving waterbody flow

Q_d = Receiving waterbody flow rate = Qe + Qu

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 assumes that the discharge is rapidly and completely mixed with the receiving waterbody. If a mixing zone (MZ) 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:

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

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 B-2 is equal to equation B-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

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

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

Equation B-5 can be simplified by introducing a dilution factor (D):

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

After the D simplification, this becomes:

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

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*." 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 recommends assuming 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 copper, the Department used ProUCL Version 5.2, a statistical software program, to establish a CV of 1.0041. ProUCL indicated that the data set follows a Non-Parametric (Kaplan-Meir) distribution. Therefore, the RPM equation in section 2.4.2.1 of the RPA Guide is used to determine the RPM for copper.

$$RPM = \frac{\hat{\mu}_n + z_{99}\,\hat{\sigma}}{\hat{\mu}_n + p_n\,\hat{\sigma}} \qquad \text{(Equation B-7)}$$

Where,

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

$\hat{\mu}_n$ = mean calculated by ProUCL = 6.029

$\hat{\sigma}$ = the standard deviation calculated by ProUCL = 6.054

p_n = the z statistic at the 95th percent confidence level of $(1 - 0.95)^{\frac{1}{n}} = 0.920$

n = number of valid data samples = 36

$RPM = 1.4$

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

$$\text{MEC} = (\text{MOC})(\text{RPM})$$

MOC = 34.3 micrograms per liter (µg/L)

In the case of copper,

MEC = (34.3)(1.4) = 48 µg/L*

* The RPM in the above MEC calculation was rounded. The RPA tool calculates the MEC prior to rounding. The actual MEC in the RPA tool is 47 µg/L.

Comparison with copper water quality criteria

In order to determine if reasonable potential exists for this discharge to violate water quality criteria, the MEC is compared with acute and chronic water quality criteria. For example:

Acute: 47 µg/L > 5.8 µg/L

Chronic: 47 µg/L > 3.7 µg/L

YES, there is reasonable potential for copper to exceed water quality criteria. Therefore, a WQBEL for copper is required. Appendix C describes the process DEC used to calculate copper WQBELs.

Table B.1 summarizes the data, multipliers, and criteria used to determine reasonable potential to exceed water quality criteria for copper, arsenic, manganese, zinc, and temperature, as Delta T (ΔT) which also have reasonable potential to exceed water quality criteria.

Table B.1 Reasonable Potential Calculation Summary

Parameter	Units	MOC	Number of Samples	Ambient Concentration	CV	RPM	MEC	Water Quality Criteria
Copper	µg/L	34.3	36	1.428	1.004	1.4	47	5.8 (acute) 3.7 (chronic)
Arsenic	µg/L	46	9	1.622	0.6	2.6	122	69 (acute) 36 (chronic)
Manganese	µg/L	249	11	1.583	0.1065	2.1	534	100 (human health)
Zinc	µg/L	19.7	11	6.872	0.6	2.4	48	95 (acute) 86 (chronic)
ΔT	ºC	21.38	27	0	0.1360	1.1	24	1

APPENDIX C. EFFLUENT LIMIT CALCULATION

If the Alaska Department of Environmental Conservation (the Department or DEC) does not authorize a mixing zone, water quality criteria 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 criteria. If there are TBELs for an identified parameter in the mixing zone, TBELs apply at the end of the pipe, and water quality 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 absence of water quality criteria for a particular pollutant, TBELs are applied as end-of pipe effluent limits.

C.1 Effluent Limit Calculation

Once the Department determines that the effluent has a reasonable potential to exceed a water quality criterion, 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 and Effluent Limits Development Guide* (June 30, 2014) to calculate WQBELs. The first step in calculating WQBELs is the development of a waste load allocation (WLA) for the pollutant.

C.1.1 Mixing Zone-based WLA

When the state authorizes a mixing zone for the discharge, the WLA is calculated using the available dilution, background concentrations and water quality criteria of the pollutant. Since acute aquatic life and chronic aquatic life standards apply over different time frames and may have different mixing zones, it is not possible to compare the WLAs directly to determine which standard is the most stringent. 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.1.2 "End-of-Pipe" WLAs

In many cases, there is no dilution available, either because the receiving waterbody exceeds the criteria or because the state 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.1.3 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 daily maximum limit (DML) and average monthly limit (AML). This approach considers effluent variability (using the coefficient of variation (CV)), sampling frequency, and the difference in time frames between the AML and DML.

The DML is based on the CV of the data and the probability basis, while the AML 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 AML calculation and 99% for the DML calculation.

The following is a summary of the steps to derive WQBELs from water quality criteria for pollutants that have reasonable potential to exceed water quality criteria. Copper is illustrated as an example.

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:

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

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

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 copper,

$Da = 10.5$

$D_c = 24$

$C_s = 1.428\ \mu g/L$

$WLA_a = 47.16\ \mu g/L$

$WLA_c = 56.79\ \mu g/L$

Step 2 - Determine the 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:

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

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

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

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

$CV = coefficient\ of variation$

For copper:

$$LTA_a = 9.58\ \mu g/L$$

$$LTA_c = 21.09\ \mu g/L$$

Step 3 – Choosing the More 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. In the case of copper, the LTA_a is more limiting.

Step 4 - Calculate the Permit Limits

The DML and AML are calculated using the following equations that are found in Table 5-2 of the TSD:

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

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:

$$z_{95} = the\ z - statistic\ at\ the\ 95^{th} percentile = 0.950$$

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

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

$$CV = coefficient\ of variation$$

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

For copper:

$$DML = 47\ \mu g/L$$

$$AML = 19\ \mu g/L$$

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 4.5 for the Nikiski Combined Cycle Plant mixing zone analysis.

Criteria	Description	Resources	Regulation
Size	Is the mixing zone as small as practicable?	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?		**18 AAC 70.240(c)(1)**
Low Flow Design	**For streams, rivers, or 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)**

Criteria	Description	Resources	Regulation
	(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)**
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 be approved as proposed or authorized with conditions.**		**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, chinook, and sockeye salmon? **If yes, mixing zone prohibited.**		**18 AAC 70.240(f)**
Human Health	Does the mixing zone… (1) contain bioaccumulating, bioconcentrating, or persistent chemical above natural or significantly adverse levels? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(d)(1)**
	2) contain chemicals expected to present an 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 be approved as proposed or authorized with conditions.**		**18 AAC 70.240(d)(2)**
	(5) 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)**

Criteria	Description	Resources	Regulation
Aquatic Life	Does the mixing zone… (1) 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)**
	(2) 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)**
	(3) result in undesirable or nuisance aquatic life? **If yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(d)(5)**
	(4) 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)**
	(5) 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)**
	(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 yes, mixing zone may be approved as proposed or authorized with conditions.**		**18 AAC 70.240(d)(7)** **18 AAC 70.240(d)(8)**
	(7) 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
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)**