Figure 1- Mendenhall WWTP, Location Relative to Mendenhall River

CBJ responded to DEC with a description of their process control strategy and stated that the BOD_5 loading at the plant during the period in question was elevated. In the event of an organic overload, increased waste removal is required so that the food to pounds of biomass ratio is balanced and to ensure adequate treatment. During this same time period they were also having settleability concerns. In order to reduce the overall mass and improve settleability, waste removal was increased, which also reduced solids retention time.

CBJ also stated that the chemical containers stored at the back gate of the Mendenhall WWTP were placed there as a result of numerous construction projects and lack of available on-site storage space. They stated that the contents is a diluted mixture of old polymer and water. Containment was not available at the time of transfer to the location. The containers were subsequently moved to a secure indoor location at the Juneau Douglas treatment plant prior to final disposal. Containers remaining onsite are either on containment or empty and clean.

The September 2019 Inspection Report cited FC Bacteria, BOD_5, and TSS effluent violations, reporting of WET results that were inconsistent with sampling data, failure to have an annual O&M Plan review on file at the time of inspection, violation of Permit Section 2.4.2 whereby grease from a nearby restaurant was suspected to be the cause of a plugged sewer main that resulted in an approximate 50 gallon sewer overflow. (Permit Section 2.4.2 states that the permittee must not allow the introduction of solid or viscous pollutants in amounts that will cause obstruction to the flow in the POTW, including sewers, resulting in interference). DEC also cited CBJ as being in violation of Appendix A, Section 1.5, Duty to Mitigate, which states that a permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment. In addition, DEC stated that CBJ failed to provide 5-day written notification for violations documented in their December 2018 DMR and that documentation of the annual O&M Plan review was not available at the time of the inspection. DEC followed up this inspection with a NOV with the above inspection findings.

4.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

4.1 Basis for Permit Effluent Limits

The Clean Water Act (CWA) requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits (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 Water Quality Standards (WQS) of a waterbody are met and may be more stringent than TBELs. Both TBELs and WQBELs are included in the permit. A detailed discussion of the basis for the effluent limits contained in AK0022951 is provided in Appendix A.

4.2 Basis for Effluent and Receiving Water Monitoring

In accordance with Alaska Statute 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 the monitoring and for reporting results on NetDMR or with the application for reissuance, as appropriate, to the Department. Fact Sheet Sections 4.3 and 4.4 summarizes monitoring requirements DEC has determined necessary to implement in the permit.

4.3 Effluent Limits and Monitoring Requirements

Monitoring is required to determine compliance with effluent limitations and/or for use in future reasonable potential analyses (RPA). The permit requires monitoring of secondary treated domestic wastewater effluent that is discharged through Outfall 001A for flow, BOD_5, TSS, FC Bacteria, E. coli, ammonia, copper, zinc, pH, DO, temperature, WET, and floating solids or visible foam.

The prior permit used Mendenhall River low flow data to divide effluent limits and monitoring requirements for FC Bacteria, ammonia, copper and WET into two seasons: November 1-April 30 and May 1- October 31. (See Permit Section 5.3). Separate and distinct seasons were established for pH, from November 1- June 30 and July 1 – October 31. The fact sheet stated that the pH minimum limit of 6.3 SU for July 1- October and a year round maximum of 8.5 SU was based on plant performance. The minimum of 6.3 SU was a reduction from the NPDES 2006 permit in which EPA considered June a hydrologically unique month and required a minimum pH limit of 6.4 SU for June. CBJ has consistently met pH water quality criteria (minimum 6.5 SU, maximum 8.5 SU) at the end of the treatment process, prior to discharge to the Mendenhall River. Therefore, CBJ is required in this permit to meet pH water quality criteria at the end of the treatment process throughout the year.

The prior permit required silver and lead monitoring. Neither were detected in the effluent during the permit term; therefore, DEC has determined that monitoring for silver and lead in the permit is no longer necessary. Silver and lead monitoring will; however, continue to be monitored at least three times as a part of the permit reissuance application.

Zinc did not exceed water quality criteria in the November 1-April 30 season and is not required for this permit. Zinc will; however, be monitored as a part of the permit reissuance application. Zinc exceeded water quality criteria in the May 1- October 31 season. During this season zinc was only sampled four times which resulted in a high reasonable potential multiplier and maximum expected concentration in the RPA. This contributed to a reasonable potential determination for zinc to exceed water quality criteria. DEC is increasing zinc monitoring for May 1- October 31 in this permit so that a larger data set can be used in the next RPA.

Hardness dependent metals are dependent on the hardness of the receiving water; therefore, monitoring hardness of the effluent is not necessary and has been removed from the permit. Alkalinity was used in the prior permit to establish WQBELs for pH as pH had been included in the mixing zone. Water quality criteria for pH must be met year round, therefore, alkalinity monitoring for purposes of establishing pH WQBELs is no longer required.

In January 2017, DEC adopted EPA's 2012 recommended fresh water quality criteria for Escherichia coli (E. coli) and revised 18 AAC 70.020(a)(2)(B)(i) to adopt E. coli water quality criteria for contact recreation. Contact recreation includes activities where there is direct contact with the water such as swimming, bathing, water skiing, and similar water contact activities where immersion, and ingestion are likely. EPA approved DEC's revised bacteria water quality criteria on May 15, 2017. The Mendenhall WWTP has never monitored for E. coli. E. coli responds similarly to FC Bacteria when disinfected. FC Bacteria is included in the mixing zones sized for copper, the driving parameter in each season. The Department has determined that prior to establishing an E. coli limit in the permit, that E. coli will be included in the mixing zones. E. coli shall be monitored at the point of discharge during the months of May through September. May through September is the time period when primary contact recreation in which full immersion and ingestion of water is more likely to occur.

18 AAC 70.020(a)(8), Residues for Fresh Water Uses, states that residues are not allowed in surface waters of the state in concentrations or amounts that impair designated uses, cause nuisance or objectionable conditions, result in undesirable or nuisance species, or produce objectionable taste. As such, a monthly visual monitoring requirement for floating solids or visible foam is required in the permit to protect fresh water uses from potential residues discharge by the Mendenhall WWTP.

The permit requires continued monitoring of the Mendenhall WWTP's effluent for temperature. Temperature consistently exceeded the most stringent water quality criterion for the protection of spawning, egg and fry incubation areas (13° C) found at 18 AAC 70.020(a)(10). There is reasonable potential that temperature will continue to exceed water quality criteria. Temperature effluent limits are not included; however, temperature fits within the mixing zones sized for copper. DEC used CORMIX to determine that temperature water quality criteria will be met at approximately 0.07 meters downstream of the outfall between November 1 and April 30 and at approximately 0.03 meters downstream of the outfall between May 1 and October 31.

Alaska WQS at 18 AAC 70.020(a)(3)(C) states that DO must be greater than 7 mg/L in waters used by anadromous or resident fish. In no case may DO be greater than 17 mg/L. DEC reviewed Mendenhall WWTP effluent monitoring data between September 2014 and June 2019. During this time frame, effluent DO concentrations consistently fell below the minimum water quality criterion of 7 mg/L. It can be reasonably expected that DO will continue to not meet water quality criteria at the end of pipe; therefore, DO is included in both the November 1- April 30 and May 1-October 31 mixing zones. Monitoring of the effluent for DO shall continue in this permit; however, in order to better evaluate the concentration of DO in the effluent, monitoring has been increased from once per month to five per week.

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. Permittees have 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 Part 136 [adopted by reference in 18 AAC 83.010]) and if the method detection limits are less than the effluent limits.

Table 3 contains Outfall 001A effluent limits and monitoring requirements and Table 4 contains effluent limits and monitoring requirement changes from the last permit issuance. See Appendices A, B, and C for further details regarding the basis of effluent limits and monitoring in this permit.

Table 3- Outfall 001A Effluent Limits and Monitoring Requirements

Parameter	Effluent Limits					Monitoring Requirements		
	Units [a]	Daily Minimum	Monthly Average	Weekly Average	Daily Maximum	Sample Location	Sample Frequency	Sample Type
Total Discharge Flow	mgd	N/A	Report	N/A	4.9	Effluent	Continuous	Recorded
5-Day Biochemical Oxygen Demand (BOD_5)	mg/L	N/A	30	45	60	Influent and Effluent [b]	2/Month	24-hour Composite [c]
	lbs/day		1,226	1,839	2,452			Calculated [d]
Total Suspended Solids (TSS)	mg/L	N/A	30	45	60	Influent and Effluent	2/Month	24-hour Composite
	lbs/day		1,226	1,839	2,452			Calculated
BOD_5 & TSS Minimum Percent (%) Removal [e]	%	N/A	85	N/A	N/A	Influent and Effluent	1/Month	Calculated
pH	SU	6.5	N/A	N/A	8.5	Effluent	5/Week	Grab
Temperature	° C	N/A	N/A	N/A	Report	Effluent	5/Week	Grab
Dissolved Oxygen (DO)	mg/L	Report	N/A	N/A	Report	Effluent	5/Week	Grab
Total Ammonia, as Nitrogen	mg/L	N/A	N/A	N/A	Report	Effluent	1/Month	24-hour Composite
Fecal Coliform (FC) Bacteria	FC/ 100 mL	N/A	200 [f]	400	800	Effluent	2/week	Grab
Escherichia coli (E.coli) (May-September)	cfu/ 100 mL	N/A	N/A	N/A	Report [f]	Effluent	1/Month [g]	Grab
Copper, total recoverable (November 1- April 30)	µg/L	N/A	52	97	N/A	Effluent	1/Month	24-hour Composite
	lbs/day	N/A	2.1	4.0	N/A			Calculated
Copper, total recoverable (May 1- October 31)	µg/L	N/A	34	N/A	54	Effluent	1/Month	24-hour Composite
	lbs/day	N/A	1.4	N/A	2.2			Calculated
Zinc, total recoverable (May 1- October 31)	µg/L	N/A	N/A	N/A	Report	Effluent	2/Year	24-hour Composite
Floating Solids or Visible Foam	Visual	N/A	N/A	N/A	Report	Effluent	1/Month	Visual

Footnotes:

a. Units: mgd = million gallons per day, mg/L = milligrams per liter, lbs/day = pounds per day, SU= standard units, °C= degrees Celsius, FC/100 mL = Fecal Coliform per 100 milliliters, cfu/100 mL = colony forming units per 100 milliliters, µg/L = micrograms per liter.

b. Limits apply to effluent. Report average monthly influent concentration. Influent and effluent composite samples shall be collected during the same 24-hour period.

c. See APPENDIX C for a definition.

d. lbs/day = concentration (mg/L) x flow (mgd) x 8.34 (conversion factor)

e. Minimum % Removal = [(monthly average influent concentration in mg/L – monthly average effluent concentration in mg/L) / (monthly average influent concentration in mg/L x 100. The monthly average percent removal must be calculated using the arithmetic mean of the influent value and the arithmetic mean of the effluent value for that month.

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

g. Monitoring should be conducted at the same time as FC monitoring.

Table 4- Outfall 001A Effluent and Monitoring Changes from Prior Permit

Parameter	Units [a]	Monthly Average		Weekly Average		Daily Maximum		Daily Minimum	
		2014 Permit	2020 Permit	2014 Permit	2020 Permit	2014 Permit	2020 Permit	2014 Permit	2020 Permit
pH (July 1- October 31)	SU	N/A	N/A	N/A	N/A	8.5	No change	6.3	6.5
DO	mg/L	N/A	N/A	N/A	N/A	Report 1/Month	Report 5/Week	Report 1/Month	Report 5/Week
FC Bacteria (November 1- April 30)	FC/ 100 mL	112	200	168	400	224	800		
E.coli	cfu/ 100 mL	N/A	N/A	N/A	N/A	N/A	Report 1/Month May- September		
Total Ammonia, as Nitrogen (November 1- April 30)	mg/L	28.5	Report	N/A	N/A	40.5	Report		
	lbs/day	1,165	N/A	N/A	N/A	1,655	N/A		
Copper (November 1- April 30)	µg/L	86.7	52	N/A	N/A	187	97		
	lbs/day	3.54	2.1	N/A	N/A	7.63	4.0		
Copper (May 1- October 31)	µg/L	44.5	34	N/A	N/A	95.8	54		
	lbs/day	1.82	1.4	N/A	N/A	3.92	2.2		
Zinc	µg/L	Report	N/A	N/A	N/A	Report 3/year	Report 2/Year May 1- Oct 31		
Lead	µg/L	Report 3/year	N/A	N/A	N/A	Report 3/year	N/A		
Silver	µg/L	Report 3/year	N/A	N/A	N/A	Report 3/year	N/A		
Hardness as $CaCO_3$	mg/L	Report	N/A	N/A	N/A	Report	N/A		
Alkalinity as $CaCO_3$	mg/L	Report	N/A	N/A	N/A	Report	N/A		

Footnote:

a. Units: mg/L = milligrams per liter, lbs/day = pounds per day, SU= standard units, FC/100 mL = Fecal Coliform per 100 milliliters, cfu/100 mL = colony forming units per 100 milliliters, µg/L = micrograms per liter.

4.4 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 twice per year WET testing with the stipulation that one sample be conducted between May 1 and October 31, and the other sample between November 1 and April 30. *Ceriodaphnia dubia* (water flea) and *Pimpehales promelas* (fathead minnow) were required for the first three suites of tests. After this initial screening period, the more sensitive species was required for use in all subsequent tests. The organisms were tested at the following effluent concentrations: 5%, 9%, 18%, 36%, and 72% and a control (0%) for samples between November 1 and April 30, and 2%, 3%, 5%, 9%, and 18% and a control (0%) for samples between May 1 and October 31.

DEC conducted a RPA with the WET results submitted for each season. Not accounting for dilution provided in the mixing zone, WET has reasonable potential to exceed to exceed the water quality criteria of 1.0 TU_c defined as 100/No Observed Effect Concentration (NOEC), at the end of the pipe. The highest reported TUc between November 1 and April 30 was 1.4 TUc and the highest reported TUc between May 1 and October 31 was 5.6 TUc. Using the dilution provided by copper, the driver of the mixing zone in the reissued permit, the RPA indicates that WET does not have RP to exceed the water quality criteria of 1.0 TU_c, at the boundary of the mixing zone.

In order to provide ongoing assessment of the toxicity of the Mendenhall WWTP effluent, WET monitoring is required in the reissued permit. The test dilution series; however, as well as the TUc trigger has been adjusted for each season to reflect the new chronic mixing zone dilution factors.

The November 1-April 30 dilution series has been adjusted from 5%, 9%, 18%, 36%, and 72% and a control (0%) to 3.0%, 6.0%, 12%, 24%, and 48% and a control (0%). The WET trigger, whereby the permitted is required to conduct additional accelerated testing if any test exceeds the trigger, has been adjusted from 5.5 TUc to 8.1 TUc.

The May 1 - October 31 dilution series has been adjusted from 2%, 3%, 5%, 9%, and 18% and a control (0%) to 0.6%, 1.3%, 2.6%, 5.2%, and 10%. and a control (0%). The WET trigger, whereby the permitted is required to conduct additional accelerated testing if any test exceeds the trigger, has been adjusted from 20 TUc to 38 TUc.

The permit also requires accelerated WET testing if toxicity is greater than 8.1 TUc in any test between November 1 and April 30 or 38 TUc between May 1 and October 31. Four bi-weekly WET tests (every two weeks) over an eight-week period is required. If the permittees 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 8.1 TUc in any of the accelerated tests from November 1 through April 30, or if toxicity is greater than 38 TUc in any of the tests from May 1 through October 31, the permittees 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 EPA guidance manuals (see Permit Section 1.3.4 for further details).

4.5 Receiving Waterbody Monitoring Requirements

The permit requires upstream monitoring for pH, temperature, hardness, and copper. Copper demonstrated RPA to exceed water quality criteria during both seasons. It required the most dilution to meet water quality criteria; therefore, WQBELs that were established for copper ensures water quality criteria for copper will be met at the boundary of the mixing zone. Copper WQBELs ensure that the other pollutants that demonstrated reasonable potential to exceed water quality criteria and that require less dilution than copper to meet water quality criteria, will meet water quality criteria prior to the boundary of the mixing zone. Therefore, DEC is not requiring that the permittee monitor at the boundary of the mixing zones in this permit. Monitoring; however, shall occur at an upstream location in the Mendenhall River that is above the influence of Outfall 001A for copper, pH, temperature, and hardness.

Monitoring of the receiving water during the last permit cycle, indicated the presence of copper at levels exceeding DEC's recommended 15th percentile of the most stringent criteria default when ambient data is not available. In order to have accurate data for use in the next RPA, upstream monitoring for copper is required in the permit.

Ammonia criteria is dependent upon pH and temperature; therefore, pH and temperature monitoring is required to determine appropriate water quality criteria for ammonia.

Hardness is required in the permit in order to calculate appropriate water quality criteria for hardness dependent metals in fresh water. This data will be used in the next RPA.

Table 5 contains Mendenhall River upstream monitoring requirements.

Table 5- Mendenhall River Upstream Monitoring Requirements

Parameter	Units [a]	Sampling Frequency [b]	Sample Type
pH	SU	2/Period [c] (May 1 - October 31) 2/Period [d] (November 1- April 30)	Grab
Temperature	˚ C	2/Period [c] (May 1 - October 31) 2/Period [d] (November 1- April 30)	Grab
Hardness as $CaCO_3$	mg/L	2/Period [c] (May 1 - October 31) 2/Period [d] (November 1- April 30)	Grab
Copper, total recoverable	mg/L	2/Period [c] (May 1 - October 31) 2/Period [d] (November 1- April 30)	Grab

Footnotes:

a. Units: mg/L = milligrams per liter, SU= standard units, °C= degrees Celsius
b. If practicable, upstream monitoring should occur on the same day as Outfall 001A ammonia and copper monitoring.
c. Monitoring to be conducted a minimum of 60 days apart.
d. Monitoring to be conducted a minimum of 120 days apart.

4.6 Additional Effluent Monitoring Requirements

The permittee must perform the additional effluent testing in the APDES application Form 2A, Section 11 as well as all applicable supplemental monitoring listed in Section 12. The permittee must submit the results of this additional testing with their application for renewal of this APDES permit. Monitoring results must be included with the application for permit reissuance and will be used as a screening tool to identify pollutants that may exceed State WQS.

5.0 RECEIVING WATERBODY

5.1 Description of Receiving Waterbody

Mendenhall Lake, at the base of the Mendenhall Glacier, forms the headwaters of the Mendenhall River. As such, melting snow and ice is the predominant source of streamflow to the river. The Mendenhall River flows approximately six miles to Gastineau Channel.

5.2 Outfall Location

The Mendenhall WWTP discharges secondary treated domestic wastewater through a 48-inch diameter HDPE pipe that is anchored into the Mendenhall River bottom at l58° 21’43” North latitude and 134° 35’ 53” West longitude.

5.3 Low Flow Conditions

The Technical Support Document for Water Quality-Based Toxics Control (TSD)(EPA, 1991) and the WQS recommend the flow conditions for use in calculating WQBELs using steady state modeling. The TSD and WQS state the WQBELs intended to protect aquatic life uses should be based on the lowest

seven-day average flow rate expected to occur once every ten years (7Q10) for chronic criteria and the lowest one-day average flow rate expected to occur once every ten years (1Q10) for acute criteria.

Flow data from United States Geological Survey (USGS) gage 15052500, located upstream of the Mendenhall WWTP's outfall in Mendenhall Lake, and gage 15052800, in Montana Creek, which flows into the Mendenhall River upstream of the Mendenhall WWTP, were used during the last permit cycle to derive low flow values for two seasons, November-April, and May-October. The November–April 7 Q10 flow is 35 cubic feet per second (cfs) while the1Q10 flow is 30 cfs. The May-October 7Q10 is 292 cfs while the1Q10 flow is183 cfs. The Department determined during the development of the previous permit that this seasonal division results in a permit that is best aligned with historical flow data. However; the Montana Creek gage was removed from service in 2012. The Brotherhood Bridge gage, a requirement of the NPDES 2006 permit, did not produce reliable data and was not required in the APDES 2014 permit. Solely using data from The Mendenhall River gage, which, as indicated above, is located upstream of the Mendenhall WWTP in Mendenhall Lake, will not provide representative flow data for the Mendenhall River at the location of the WWTP. Therefore, in the absence of representative low flow data, DEC is using the low flow data calculations from the previous permit for this permit reissuance. DEC recommends that CBJ obtain updated low flow data during this permit reissuance for the Mendenhall River that is representative of Mendenhall River flow conditions in the area of the WWTP outfall. Updated flow data will be used to determine the continued suitability of the two current permit seasons as well as in CORMIX which may result in more accurate mixing zone predictions and WQBELs.

5.4 Water Quality Standards

Regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the Alaska WQS. The State's WQS are composed of use classifications, numeric and/or narrative water quality criteria, and an Antidegradation Policy. The use classification system 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 water uses and the level of water quality necessary to protect the uses are maintained and protected.

Waterbodies in Alaska are protected 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 Mendenhall River has not been reclassified pursuant to 18 AAC 70.230, nor does it have site-specific water quality criteria pursuant to 18 AAC 70.235. Therefore, the Mendenhall River must be protected for all fresh water use classes listed in 18 AAC 70.020(a)(1). These fresh water use classes consist of the following: water supply for drinking, culinary, and food processing; water supply for agriculture, including irrigation and stock watering; water supply for aquaculture and industry; contact and secondary recreation, and growth and propagation of fish, shellfish, other aquatic life, and wildlife.

5.5 Water Quality Status of Receiving Water

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

The *State of Alaska 2014/2016 Final Integrated Water Quality Monitoring and Assessment Report, November 2, 2018,* includes the Mendenhall River on a list of waterbodies for which there is insufficient information to make an attainment or impairment determination. As such, the Integrated Report does not

list the Mendenhall River nor the subject segment of the Mendenhall River as impaired and subject to a proposed or approved TMDL.

5.6 Mixing Zone Analysis

In accordance with State regulations at 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. DEC modeled the chronic and acute mixing zones and calculated dilution factors for each season (November 1– April 30 and May 1– October 31) using Cornell Mixing Zone Expert System (CORMIX) modeling software. CORMIX is a widely used and broadly accepted modeling tool for accurate and reliable point source mixing analysis. Inputs to CORMIX included the maximum expected effluent concentration, acute and chronic water quality criteria, receiving water characteristics at the outfall such as depth of the receiving water at the outfall, river and wind velocity, and outfall and diffuser specifications, such as size, direction, and number of ports. Based on the inputs, CORMIX predicts the distance at which the modeled parameter meets water quality criteria as well as the corresponding dilution at that point.

Based on the maximum expected concentrations and chronic water quality criteria, copper required the most dilution of the parameters that demonstrated reasonable potential to exceed water quality criteria in both seasons; therefore copper determined the chronic mixing zone sizes. Ammonia, DO, E.coli, FC Bacteria, temperature, WET, and zinc also fit within the chronic mixing zones.

The chronic mixing zone between November 1 and April 30 has a dilution factor of 8.1and is described as extending approximately 73 meters downstream with a width of 40 meters. The chronic mixing zone between May 1 and October 31 has a dilution of 38 and is described as extending approximately 180 meters downstream with a width of 30 meters. Water quality criteria for ammonia, DO, E. coli, FC Bacteria, temperature, WET, and zinc may be exceeded within the authorized chronic mixing zone.

There is a smaller, initial, acute mixing zone surrounding the outfall and contained within the larger chronic mixing zone. Based on the maximum expected effluent concentrations and acute water quality criteria, copper required the most dilution of the parameters that demonstrated RP to exceed water quality criteria.

The acute mixing zone between November 1 and April 30 has a dilution factor of 4.8and is described as extending approximately 5.1 meters downstream with a width of 5.6 meters. The acute mixing zone between May 1 and October 31 has a dilution factor of 29 and is described as extending approximately77 meters downstream with a width of 29 meters.

According to EPA (1991) lethality to passing organisms would not be expected if an organism passing through the plume along the path of maximum exposure is not exposed to concentrations exceeding the acute criteria when averaged over a one hour time period. Furthermore, the travel time of an organism drifting through the acute mixing zone must be less than approximately 15 minutes if a one hour exposure is not to exceed the acute criterion. The Department determined that the travel time of an organism drifting through the acute mixing zone between November 1 and April 30 as approximately 8 minutes, an organism drifting through the acute mixing zone between May 1 and October 31 is approximately 6 minutes; therefore, in accordance with18 AAC 70.240(d)(7), there will be no lethality to organisms passing through the acute mixing zones.

Appendix E outlines regulatory criteria that must be met in order for the Department to authorize a mixing zone. These criteria include the size of the mixing zone, treatment technology, existing uses of the waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species.

The following summarizes this analysis:

Size

In accordance with 18 AAC 70.240(k) the mixing zone must be as small as practicable. In order to ensure that the mixing zone is as small as practicable, DEC used CORMIX to model the chronic and acute mixing zones.

18 AAC 70.240(b)(2) requires the Department to consider the characteristics of the effluent after treatment of the wastewater. DEC reviewed effluent water quality data from January 2016 to June 2019. As indicated above, copper required the most dilution in both seasons for both the chronic and acute mixing zones. Therefore, copper was modeled in CORMIX to determine the smallest practicable mixing zone sizes. Table 6 summarizes basic CORMIX inputs that were used to model the chronic and acute mixing zones for copper.

The prior permit authorized a year-round mixing zone that extended 100 meters upstream, 100 meters downstream with a width of 30 meters. The current permit; however, contains seasonal monitoring requirements. DEC determined that because of the variation in the water quality criteria, such as for hardness dependent metals, ambient conditions such as river flow and temperature, that it would be more appropriate to authorize seasonal mixing zones.

The Mendenhall River is tidally influenced; however, the Mendenhall WWTP is located approximately 1.5 miles upstream of Gastineau Channel; therefore, tidal action in the area of the discharge is likely not significant. Data is not available to support the authorization of an upstream mixing zone area. Additional flow statistics would be required to evaluate tidal action influence at the point of discharge.

The chronic mixing zone between November 1 and April 30 has a dilution of 8:1 and is described as extending approximately 73 meters downstream with a width of 40 meters. The chronic mixing zone between May 1 and October 31 has a dilution of 38:1 is described as extending approximately 180 meters downstream with a width of 30 meters. The prior mixing zone was based on ammonia, which, at the time of the last permit reissuance, required more dilution than the other parameters to meet water quality criteria. DEC used the effluent and receiving water monitoring results collected during the last permit cycle to determine ammonia and metals criteria that are protective of the receiving water. Based on the updated monitoring results, DEC determined that copper required the most dilution to meet water quality criteria and modeled the mixing zones in CORMIX. The resulting mixing zones differ from the mixing zone authorized in 2014; however, they are based on new information that reflects receiving waterbody conditions and current operations at the Mendenhall WWTP.

Table 3- CORMIX Model Inputs

Parameter Modeled	Discharge Excess Concentration	Ambient Concentration	Water Quality Criterion
Copper (November –April)	95.9 µg/L	2.1 µg/L	22 µg/L (acute) 14 µg/L (chronic)
Copper (May- October)	51.7 µg/L	0.24 µg/L	2.0 µg/L (acute) 1.6 µg/L (chronic)
Outfall and Receiving Waterbody Characteristics			
Discharge Geometry	55 foot multiport diffuser		
Discharge Location	left bank		
Number & Size of Ports	12 openings, 9.6 inch diameter		
Nozzle Direction	Same direction		
Depth at Discharge	5 feet		
Ambient Velocity	35 cfs (November – April), 292 cfs (May - October)		
Wind Velocity	2 meters per second		
Effluent Characteristics			
Flow Rate	4.9 million gallons per day		
Average Temperature	14°C (November – April), 17°C (May - October)		

Technology

In accordance with 18 AAC 70.240(c)(1), the most effective technological and economical methods should be used to disperse, treat, remove, and reduce pollutants. Wastewater operations at the Mendenhall WWTP generally meet and occasionally exceed secondary treatment requirements. The wastewater treatment system includes preliminary treatment of influent by fine screening and grit removal followed by clarification, treatment by one of eight SBRs where it is treated using aeration blowers, jet circulation pumps and UV disinfection. The treatment methods incorporated at the Mendenhall WWTP are commonly employed and accepted for treatment of similar discharges throughout the United States.

Low Flow Design In accordance with 18 AAC 70.240(l), DEC incorporated low flow data from USGS Mendenhall River gage 150525000 and USGS Montana Creek gage 150552800 into the CORMIX mixing zone models. The November–April 7Q10 flow is 35 cfs while the1Q10 flow is 30 cfs. The May-October 7Q10 is 292 cfs while the1Q10 flow is183 cfs.

Existing Use

In accordance with 18 AAC 70.240(c)(2)and (3) and18 AAC 70.240(c)(4)(B) and (C), the mixing zones are appropriately sized to fully protect the existing uses of the Mendenhall River listed in Fact Sheet Section 5.4. The Mendenhall River'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 are developed to specifically protect the uses of the waterbody as a whole. Because 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 the Mendenhall River that are beyond the boundary of the mixing zones will be maintained and protected.

Human Consumption

In accordance with the conditions of the permit, and in accordance with 18 AAC 240(d)(6),the pollutants discharged cannot produce objectionable color, taste, or odor in aquatic resources harvested for human consumption. There is no indication that the pollutants discharged have produced objectionable color, taste, or odor in aquatic resources harvested for human consumption. Signs are required to be posted to inform the public that certain activities such as harvesting of aquatic life for raw consumption should not take place in the mixing zone.

Spawning Areas

In accordance with 18 AAC 70.240(f), the mixing zone may not be authorized in a known spawning area for anadromous fish or resident fish spawning redds for Arctic grayling, northern pike, rainbow trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon. The Alaska Department of Fish and Game's (ADF&G) Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes-Southeastern Region, Effective June 1, 2019, indicates that chum, coho, chinook, pink, sockeye, cutthroat trout, Dolly Varden, and steelhead trout are present at the mouth of the Mendenhall River. All of these fish species with the exception of chinook are also present at the outlet of Mendenhall Lake into the Mendenhall River. The catalog; however, does not show any spawning or rearing areas in the Mendenhall River nor in the vicinity of the Mendenhall WWTP wastewater discharge outfall.

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 that was included with the Mendenhall WWTP wastewater discharge application, DMRs, and the results of the RPA conducted on pollutants of concern indicate that the level of treatment at the Mendenhall WWTP 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.

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 they result in a reduction of fish population levels. A toxic effect will not occur in the water column, sediments, or biota outside the boundaries of the mixing zones. CORMIX modeling conducted for this discharge to the Mendenhall River 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.

Endangered Species

In accordance with 18 AAC 70.240(c)(4)(F), the authorized mixing zone will not cause an adverse effect on threatened or endangered species. On October 8, 2019, DEC contacted the United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) and requested them to identify any threatened or endangered species under their jurisdiction in the vicinity of the Mendenhall WWTP wastewater discharge outfall. USFWS did not identify any threatened or endangered species. NMFS stated that the Steller sea lion, Western Distinct Population Segment (DPS) and the humpback whale may be present in the vicinity of the Mendenhall WWTP and discharge location. NMFS clarified that although most sea lions in this area are from the delisted eastern population, some animals from the

western population may be present in this area and that similarly, most humpbacks in this area are from the delisted Hawaii DPS, but that approximately 6% are from the threatened Mexico DPS.

See Fact Sheet Section 8.1 for more information regarding endangered species.

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

6.0 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."
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."

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

Effluent limitations may be relaxed under 18 AAC 83.480, CWA Section 402(o) and CWA Section 303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation, or where new information is available that justifies the relaxation, or if the Department determines that technical mistakes or mistaken interpretations of the law were made. Since the last permit was reissued, new information has been collected to characterize the effluent that justifies changes to the ammonia November 1-April 30 effluent limits. In addition, a technical mistake occurred to the November 1- April 30 FC Bacteria effluent limits.

The RPA that DEC conducted for this permit reissuance incorporated effluent and receiving waterbody monitoring that was collected during the term of the permit and reflects more recent receiving waterbody conditions and operations at the Mendenhall WWTP. The RPA demonstrated that copper, rather than ammonia, is the driving parameter of the mixing zones in this permit reissuance for both the November- April and May-October seasons. Copper WQBELs are protective of the waterbody at the boundary of the mixing zones. While ammonia continues to have reasonable potential to exceed water quality criteria at the end of the pipe, ammonia requires less dilution than copper to meet water quality criteria. Therefore, water quality criteria for ammonia will be met within the mixing zones sized for copper. Based on the new information whereby copper drives the mixing zones and whereby the WQBELs developed for copper are protective of water quality criteria of other pollutants that require less dilution to meet water quality criteria, ammonia effluent limits between November 1 and April 30 have been replaced with a report monitoring results only for this permit reissuance. The prior permit only required monitoring for ammonia between May 1 and October 31; therefore, no changes were made to this time period.

The FC Bacteria effluent limits between November 1 and April 30 (AML 112 FC/100 mL, AWL 168 FC/100 mL, MDL 224 FC/100 mL) were based on historic monthly river conditions

18 AAC 72.990(21) defines disinfect as "to treat by means of a chemical, physical, or other process, such as chlorination, ozonation, application of ultraviolet light, or sterilization, designed to eliminate pathogenic organisms, and to produce an effluent with the following characteristics: (A) an arithmetic mean of the values for a minimum of five samples collected in 30 consecutive days that does not exceed 200 FC/100 mL; and (B) an arithmetic mean of the values for effluent samples collected in seven consecutive days that does not exceed 400 FC/100 mL." Since these limits are dependent of the use of

specific technological processes and the capability of similar facilities, under best professional judgment, DEC considers these technology-based limits.

In order to ensure the attainment of the mean FC Bacteria concentrations at 18 AAC 72.990(21), DEC derived a MDL of 800 FC/100 mL. Establishing a maximum limit creates an upper boundary whereby, if FC Bacteria concentrations do not exceed the maximum limit, there will be an increased likelihood, that the FC Bacteria concentrations, when used for averaging, will meet the weekly and monthly average FC Bacteria concentration limits. These limits are consistent with a number of similarly permitted domestic wastewater treatment plants in Alaska that disinfect and that are authorized a mixing zone for FC Bacteria.

DEC, in the 2014 permit, failed to acknowledge 18 AAC 72.990(21), and in doing so, required the Mendenhall WWTP to disinfect to levels that surpass the definition of disinfect at 18 AAC 72.990(21). The definition of disinfect in 18 AAC 72 is not expressed in terms of effluent that has obtained a minimum level of treatment, but rather as effluent with specific characteristics. Therefore, in order to correct DEC's technical mistake, DEC is revising the FC Bacteria limits in this permit to realign with 18 AAC 72.990(21).

All other permit effluent limits, standards, and conditions are as stringent as in the previously issued permit and are consistent with 18 AAC 83.480. Accordingly, no further backsliding analysis is required for this permit reissuance.

7.0 ANTIDEGRADATION

Section 303(d)(4) of the CWA states that, for waterbodies 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 protection level, whereby a higher numbered tier indicates a greater level of water quality protection. Tier 1 and 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).

The Mendenhall River is not listed as impaired (Category 4 or 5) in Alaska's 2014/2016 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 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).*

18 AAC 70.020 and 18 AAC 70.050 specify the protected water use classes for the State; 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 2008) 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. This also ensures that the resulting water quality at and beyond the boundary of any authorized mixing zone will fully protect all existing and designated uses of the receiving waterbody as a whole. The permit also requires receiving waterbody monitoring to evaluate possible impacts to the receiving waters and existing uses, as well as to evaluate facility-specific WQBELs and hardness dependent metals that shall protect existing uses. .

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)

(c) ***Tier 2 analysis for the lowering or potential lowering of water quality not exceeding applicable criteria.*** *Tier 2 applies when the water quality for a parameter in a water of the United States within this state does not exceed the applicable criteria under 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b) and receives the protection under 18 AAC 70.015(a)(2).*

(3) *the department will not conduct a Tier 2 antidegradation analysis for*

(A) *reissuance of a license or general or individual permit for a discharge that the applicant is not proposing to expand;*

In 2014, DEC conservatively assumed that the discharge from the Mendenhall WWTP was a discharge to a Tier 2 waterbody and accordingly conducted a Tier 2 antidegradation analysis. DEC determined that the Mendenhall WWTP permit would meet the Antidegradation Policy and the Department's July 14, 2010, *Policy and Procedure Guidance for Interim Antidegradation Implementation Methods* requirements. The *Interim Guidance* has been superseded by the 18 AAC 70.016 regulations.

18 AAC 70.016(c)(2)(A) states that when evaluating development of a license or general or individual permit for a discharge, the department will conduct a Tier 2 antidegradation analysis for a proposed new or expanded discharge. 18 AAC 70.990(75) states that new or expanded with respect to discharges means discharges that are regulated for the first time or discharges that are expanded such that they could result in an increase in a permitted parameter load or concentration or other changes in discharge characteristics that could lower water quality or have other adverse environmental impacts. Discharge is further defined in 18 AAC 83.990(22) as a discharge of a pollutant.

All pollutants regulated under the permit were also regulated under the prior permit, therefore, not considered a new discharge. The discharge covered under AK0022951 is not expanded from the

previous permit. There will not be an increase in a permitted parameter load, concentration, or other change in discharge characteristics that could lower water quality of have other adverse environmental impacts.

Any changes to parameter requirements in the permit are either more stringent, or are corrections to erroneously applied permit requirements. See Fact Sheet Table 4 for effluent limit changes that have occurred since the previous permit and Section 6 for corrections to FC Bacteria concentration limits.

18 AAC 70.016(c)(3)(A) states that the Department will not conduct a Tier 2 antidegradation analysis for reissuance of a license or general or individual permit for a discharge that the applicant is not proposing to expand. Therefore, consistent with 18 AAC 70.016(c)(2)(A) and 18 AAC 70.16(c)(3)(A), DEC is not conducting a Tier 2 antidegradation analysis for this permit reissuance.

8.0 OTHER PERMIT CONDITIONS

8.1 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to develop a Quality Assurance Project Plan (QAPP) within 180 days of the effective date of the final permit. 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 QAPP shall be retained electronically or physically at the facility's office of record, and made available to the Department upon request.

8.2 Operation and Maintenance Plan

The permit requires the permittee to properly operate and maintain all facilities and systems of treatment and control. Proper operation and maintenance is essential to meeting discharge limits, monitoring requirements, and all other permit requirements at all times. The permittee is required to develop or update and implement an O&M Plan for its facility within 180 days of the effective date of the permit. If an O&M Plan has already been developed and implemented, the permittee need only to review the existing plan to make sure it is up to date and all necessary revisions are made. The plan must be reviewed annually and retained electronically or physically on site and made available to the Department upon request.

8.3 Industrial User Survey

18 AAC 83.340 requires POTWs to identify and locate all SIUs that discharge process wastewaters and associated pollutants to their wastewater treatment system. General and specific pretreatment prohibitions at 40 CFR 403.5, adopted by reference at 18 AAC 83.010(g)(2), contain prohibitions that apply to each industrial user introducing pollutants into a POTW whether or not the industrial user is subject to other National Pretreatment Standards, or any national, State, or local pretreatment requirements. Therefore, in order to assess whether an industry or business has the potential to violate any general or specific pretreatment prohibition, and to determine if a pretreatment program should be developed and/or if pretreatment requirements should be included in the Mendenhall WWTP wastewater discharge permit. The permittee is required to submit with their permit reissuance application, Form 2A, a list of those industries or businesses that discharge and/or have the potential to discharge non-domestic wastewater to the Mendenhall WWTP's collection system. DEC may request further information on specific industries or business to assist in this evaluation.

8.4 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.

8.5 Standard Conditions

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

9.0 OTHER LEGAL REQUIREMENTS

9.1 Endangered Species Act

The Endangered Species Act (ESA) requires federal agencies to consult with the USFWS and NMFS to determine whether their authorized actions could beneficially or adversely affect any threatened and 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 contacts the agencies to notify them of the proposed permit issuance and to obtain listings of threatened and endangered species near the discharge.

On October 8, 2019, DEC contacted USFWS and NMFS to provide them early notification of DEC's intent to reissue AK0022951 and to provide them the opportunity to share concerns with DEC regarding listed species.

On October 8, 2019, USFWS replied with a statement that there are no federally species listed or designated critical habitat under USFWS jurisdiction in the vicinity of Juneau, AK and for future reference, directed DEC to an USFWS online planning tool at https://ecos.fws.gov/ipac/ .

On October 9, 2019 NMFS provided DEC the following list of ESA-listed species that may be present in the vicinity of the Mendenhall WWTP discharge location:

Steller sea lion, Western DPS (although most sea lions in this area are from the delisted eastern population, some animals from the western population may be present in this area), Humpback whale, Mexico DPS (similarly, most humpbacks in this area are from the delisted Hawaii DPS, but approximately 6% are from the threatened Mexico DPS)

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

9.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) designates Essential Fish Habitat (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 USC 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.

On October 8, 2019, DEC contacted NMFS to provide them early notification of DEC's intent to reissue AK0022951 and to provide them the opportunity to share concerns with DEC regarding EFH.

On October 9, 2019, NMFS provided DEC the following list of EFH species and life stages that may be present in the vicinity of the Mendenhall WWTP discharge location:

Salmon:

Chinook salmon (immature)

Coho salmon (juvenile and mature)

Chum salmon (immature, juvenile, and mature)

Pink salmon (juvenile and mature)

Sockeye salmon (immature, juvenile, and mature)

Groundfish:

Kamchatka flounder (adult)	Walleye pollock (egg and larvae)	Pacific ocean perch (larvae)
Alaska plaice (egg and larvae)	Arrowtooth flounder (larvae)	Sablefish (larvae)
Dover sole (egg and larvae)	Northern rock sole (larvae)	Southern rock sole (larvae)
Flathead sole (egg and larvae)	Pacific cod (larvae)	Yellowfin sole (egg)
Rex sole (egg and larvae)		

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

9.3 Sludge (Biosolids) Requirements

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

State Requirements

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

Federal Requirements

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

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

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

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

9.4 Permit Expiration

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

10.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2018. State of Alaska 2014/2016 final integrated water quality monitoring and assessment report. November 2, 2018.

ADEC, 2018. 18 AAC 70, Water quality standards, as amended through April 6, 2018.

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

ADEC, 2008. Alaska water quality criteria manual for toxic and other deleterious organic and inorganic substances, as amended through December 12, 2008.

Alaska Department of Fish and Game, 2019. Catalog of waters important for spawning, rearing, or migration of anadromous fishes-southeastern region, effective June 1, 2019.

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

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.

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).

The Clean Water Act (CWA) requires a Publicly Owned Treatment Works (POTWs) to meet effluent limits based on available wastewater treatment technology, specifically, secondary treatment effluent limits. The Alaska Department of Environmental Conservation (the Department or DEC) may find, by analyzing the effect of an effluent discharge on the receiving waterbody, that secondary treatment effluent limits are not sufficiently stringent to meet water quality WQS. In such cases, the Department is required to develop more stringent water quality-based effluent limits (WQBELs), which are designed to ensure that the WQS of the receiving waterbody are met.

Secondary treatment effluent limits for POTWs do not limit every parameter that may be present in the effluent. Limits have only been developed for five-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH. Effluent from a POTW may contain other pollutants, such as bacteria, chlorine, ammonia, or metals, depending on the type of treatment system used and the quality of the influent to the POTW (e.g., industrial facilities, as well as residential areas discharging into the POTW). When technology-based effluent limits (TBELs) 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 WQBEL for the pollutant must be established in the permit. Table A-1 summarizes the basis for effluent limits contained in the permit. Further details for each effluent limit follows in this section.

Table A-1- Basis for Effluent Limits

Parameter	Units [a]	EFFLUENT LIMITS				
		Daily Minimum	Monthly Average	Weekly Average	Daily Maximum	Basis for Limit
Flow	mgd	---	---	---	4.9	18 AAC 72.245
BOD_5	mg/L	---	30	45	60	18 AAC 83.010(e) 18 AAC 83.540
	lbs/day	---	1,266	1,839	2,452	
TSS	mg/L	---	30	45	60	18 AAC 83.010(e) 18 AAC 83.540
	lbs/day	---	1,266	1,839	2,452	
BOD_5 & TSS Minimum Percent (%) Removal	%	85				18 AAC 83.010(e)
Fecal Coliform Bacteria	FC/100 mL	---	200	400	800	18 AAC 72.990(21) 18 AAC 83.435(b) 18 AAC 83.480
Copper, total recoverable (November 1-April 30)	µg/L	---	52	N/A	97	18 AAC 83.435(b) 18 AAC 83.540
	lbs/day	---	2.1	N/A	4.0	
Copper, total recoverable (May 1- October 31)	µg/L	---	34	N/A	54	18 AAC 83.435(b) 18 AAC 83.540
	lbs/day	---	1.4	N/A	2.2	
pH	SU	6.5	---	---	8.5	18 AAC 70.020(b)(6)

Footnote:

a. Units: mgd = million gallons per day, mg/L = milligrams per liter, lbs/day = pounds per day, FC/100 mL = Fecal Coliform per 100 milliliters, µg/L = micrograms per liter.

A.2 Secondary Treatment Effluent Limitations

The CWA requires a POTW to meet requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as "secondary treatment," that all POTWs were required to meet by July 1, 1977. The Department has adopted the "secondary treatment" effluent limits, 18 AAC 83.010(e), which are found in Title 40 Code of Federal Regulations (CFR) §133.102. The TBELs apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD_5, TSS, and pH. In addition to the federal secondary treatment regulations in 40 CFR Part 133.102, the State of Alaska requires maximum daily limitations of 60 mg/L for BOD_5 and TSS in its definition of secondary treatment found in its waste disposal regulations (18 AAC 72.990); however, the waste disposal regulations do not specify the percent removal requirements that are required by 40 CFR 133, so the more stringent 40 CFR 133 requirements are applied. The secondary treatment effluent limits are listed in Table A-2.

Table A-2- Secondary Treatment Effluent Limits

Parameter	Units	Monthly Average	Weekly Average	Daily Maximum	Monthly Average Minimum Removal
BOD_5	mg/L	30	45	60	85%
TSS	mg/L	30	45	60	85%
pH	SU	Between 6.0 – 9.0 SU at all times			

A.3 Water Quality – Based Effluent Limitations

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. Designated uses are those uses specified in WQS for each waterbody or segment whether or not they are being attained [40 CFR Section 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 Section 131.3].

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 criteria per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b).

Permit AK0022951 authorizes discharges of secondary treated domestic wastewater to fresh water. The designated uses for fresh water, that have not been reclassified are: water supply for drinking, culinary, and food processing; water supply for agriculture, including irrigation and stock watering; water supply for aquaculture and industry; contact and secondary recreation, and growth and propagation of fish, shellfish, other aquatic life, and wildlife.

A.4 Reasonable Potential Analysis

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, APDES *Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (June 30, 2014) to evaluate the Mendenhall Wastewater Treatment Plant (WWTP) effluent. Discharge monitoring reports (DMRs) from January 2016 to June 2019 and Form 2A Application to Discharge Effluent and Expanded Effluent Testing Data were reviewed to identify pollutants of concern. Pollutants of concern are those pollutants that already have a TBEL or WQBEL for a particular pollutant, pollutants with a total maximum load waste load allocation or watershed analysis, pollutants identified as present in the effluent through monitoring, or those pollutants that are likely to be present in the effluent based on the nature of the operation. The monitoring of the Mendenhall WWTP's effluent as reported in the above documents, revealed the presence of ammonia, copper, WET, and zinc at levels above water quality criteria; therefore, these pollutants are pollutants of concern and were selected for further reasonable potential analysis (RPA).

When evaluating the effluent to determine if WQBELs based on chemical-specific numeric criteria are needed, the Department projects the receiving waterbody concentration downstream of where the effluent enters the receiving waterbody for each pollutant of concern. The chemical-specific concentration of the effluent and receiving waterbody and, if appropriate, the dilution available from the receiving waterbody, are factors used to project the receiving waterbody concentration. If the projected concentration of the receiving waterbody exceeds the numeric criterion for a limited parameter, then there is reasonable potential that the discharge may cause or contribute to an excursion above the applicable water quality criterion. DEC assesses reasonable potential to exceed both acute and chronic criterion. Appendix B contains more details on the RPA conducted for this permit.

The Department may authorize a small volume of receiving water to provide dilution of the effluent; this volume is called a mixing zone. Mixing zone allowances will increase the allowable mass loadings of the pollutant to the waterbody. A mixing zone can be used only when there is adequate receiving waterbody flow volume, and the concentration of the pollutant of concern in the receiving waterbody is below the numeric water quality criterion necessary to protect the designated uses of the waterbody.

A.4.1 Specific Effluent Limits in the Mendenhall WWTP Permit

A.4.1.1 Fecal Coliform Bacteria

FC Bacteria can be reasonably expected to exceed water quality criteria at a WWTP treating domestic wastewater. 18 AAC 72.990(21) defines disinfect as "to treat by means of a chemical, physical, or other process, such as chlorination, ozonation, application of ultraviolet light, or sterilization, designed to eliminate pathogenic organisms, and to produce an effluent with the following characteristics: (A) an arithmetic mean of the values for a minimum of five samples collected in 30 consecutive days that does not exceed 200 FC/100 mL; and (B) an arithmetic mean of the values for effluent samples collected in seven consecutive days that does not exceed 400 FC/100 mL."

Alaska WQS at 18 AAC 70.020(a)(2)(A) states that the FC Bacteria geometric mean may not exceed 20 FC/100 mL and that not more than 10% of the samples may exceed 40 FC/100 mL.

During the development of this permit, the Department reviewed FC Bacteria monitoring results from September 2014 to June 2019. The facility's performance demonstrated that between May 1 and October 31, the Mendenhall WWTP consistently met the FC Bacteria limits in the permit (AML 200 FC/100 mL, AWL 400 FC/100 mL, MDL 800 FC/100 mL) but they did not meet FC Bacteria water quality criteria at the end of the pipe. There were two exceedances of the maximum daily permit limit and one exceedance of the average weekly permit limit. Therefore, because the Mendenhall WWTP requires a mixing zone for FC Bacteria, and because they have demonstrated that they can consistently meet the permit limits stated above, the FC Bacteria limits of the prior permit for May 1-October 31, which are also are required at many other publicly owned treatment works statewide that disinfect and which have authorized mixing zones for FC Bacteria, are carried over in the reissued permit. Carrying over the FC Bacteria limits from the prior permit is also consistent with 18 AAC 83.480, whereby unless circumstances have materially and substantially changed since the permit was issued, or new information warrants a less stringent effluent limitation, the effluent limits in the reissued permit must be at least as stringent as the prior permit.

Between November 1 and April 30, the Mendenhall WWTP exceeded the MDL of 224 FC/100 mL ten times, the AML of 112 FC/100 mL one time, and the AWL of 168 FC/100 mL five times. The November 1- April 30 FC Bacteria effluent limits in the 2014 permit were more stringent than the 2006 NPDES FC Bacteria effluent limits. They were a technical mistake as DEC had failed to acknowledge the definition of disinfection at 18 AAC 72.990(21). These limits, as well as a MDL of 800 FC/100 mL, which was derived from the them, are consistent with a number of similar domestic wastewater treatment plants in Alaska that disinfect and that are authorized a mixing zone for FC Bacteria. Since these limits are dependent of the use of specific technological processes and the capability of similar facilities, under best professional judgment, DEC applies these limits as technology-based limits. See Section 6 for more details on the November 1- April 30 FC Bacteria concentration corrections.

A.4.1.2 pH

Alaska WQS at 18 AAC 70.020(b)(6) for freshwater uses provide protection for the growth of fish, shellfish, other aquatic life, and wildlife. The WQS for freshwater pH may not be less than 6.5 SU or greater than 8.5 SU. DEC reviewed effluent monitoring results from September 2014 and June 2019. CBJ consistently met pH water quality criteria. Therefore, pH is not included in the mixing zones and CBJ must meet pH water quality criteria at the point of discharge from the facility.

A.4.1.3 Copper

Alaska WQS at 18 AAC 70.020(11) states that the concentration of substances in water may not exceed the numeric criteria for drinking water and human health for consumption of drinking water and aquatic organisms shown in the Alaska Water Quality Criteria Manual. Between November 1 and April 30, the acute aquatic life copper concentration (total recoverable) may not exceed 22 µg/L and the chronic aquatic life copper concentration (total recoverable) may not exceed 14 µg/L. Between May 1 and October 31, the acute aquatic life copper concentration (total recoverable) may not exceed 2.0 µg/L and the chronic aquatic life copper concentration (total recoverable) may not exceed 1.6 µg/L

DEC conducted RPAs for copper using effluent and receiving water data results from January 2016-June 2019. The 15th percentile of the receiving water hardness was used to determine acute and chronic copper water quality criteria. RPAs were conducted for November 1-April 30 and May 1- October 31. During both seasons, copper demonstrated reasonable potential to exceed water quality criteria; therefore, WQBELs were developed that incorporated the available dilution in the mixing zones. Between November 1 and April 30, the AML was calculated with a chronic dilution as 52 µg/L and the MDL was calculated as 97µg/L. Between May 1 and October 31, the AML was as 34 µg/L and the MDL was as 54 µg/L. See Appendices B and C for RPA and WQBEL copper calculations.

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 (WQS). The Department used the process described in the *Technical Support Document* (TSD) *for Water Quality-Based Toxics Control* (Environmental Protection Agency, 1991) and DEC's guidance, *Alaska Pollutant Discharge Elimination System Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (June 30, 2014) (RPA Guide) to determine the reasonable potential for any pollutant to exceed a water quality numeric 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 (18 Alaska Administrative Code 83.435).

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 example. Copper in the November 1- April 30 season is used as an example to demonstrate the reasonable potential determination process.

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 = Assumed receiving waterbody ambient concentration

Q_d = Receiving waterbody flow rate = $Q_e + Q_u$

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

Q_u = Receiving waterbody flow rate

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

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

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

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

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 C-2 is equal to equation C-3 (i.e., all of the critical low flow volume is available for mixing). If a mixing zone is not authorized, dilution is not considered when projecting the receiving waterbody concentration, and

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

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

Equation C-2 can be simplified by introducing a dilution factor (D):

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

After the D simplification, this becomes:

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

B.2 Maximum Projected Effluent Concentration

To calculate the maximum projected effluent concentration, the Department used the procedure described in section 3.3 of the TSD, "*Determining the Need for Permit Limits with Effluent Monitoring Data*" and the process described in section 2.4 of DEC's RPA Guide. In this procedure, the 99th percentile of the effluent data is the maximum projected effluent concentration which is used in the calculation of the maximum projected receiving waterbody concentration.

Since there are a limited number of data points available, the 99th percentile is calculated by multiplying the maximum observed effluent concentration (MOC) by a reasonable potential multiplier (RPM). The RPM is the ratio of the 99th percentile concentration to the MOC and accounts for the statistical uncertainty in the effluent data. The RPM is calculated from the coefficient of variation (CV) of the data and the number of data points. The CV is defined as the ratio of the standard deviation of the data set to the mean. When fewer than 10 data points are available, the TSD and DEC's RPA Guide recommends making the assumption that the CV is equal to 0.6. A CV value of 0.6 is a conservative estimate that assumes a relatively high variability. In the example of copper, the Department used ProUCL, a statistical software program, to determine a CV of 0.5. ProUCL indicated that the data set follows a normal statistical distribution. Therefore, the RPM equation in section 2.4.2.1 of the RPA Guide is used to determine the RPM for copper.

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

Where,

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

μ_n = mean calculated by ProUCL = 24.7

σ = the standard deviation calculated by ProUCL = 12.8

p_n = the z − statistic at the 95th percent confidence level of $(1 - 0.95)^{\frac{1}{n}} = 0.887$

n = number of valid data samples = 25

RPM = 1.354

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

$$\text{MEC} = (\text{RPM})(\text{MOC}) \quad \text{(Equation B-8)}$$

MOC = 72 micrograms per liter (µg/L)

In the case of copper,

MEC = (1.354)(72) = 97.5 µg/L

Comparison with copper water quality criteria

In order to determine if RP exists for this discharge to exceed water quality criteria, the highest projected concentration is compared with the most stringent water quality criteria.

MEC = 97.5 µg/L > 14 µg/L (most stringent copper criterion)

YES, there is RP for copper to violate water quality criteria

Since there is RP for the effluent to cause an exceedance of water quality criteria for protection of aquatic life, and because copper is the parameter requiring the most dilution of pollutants that demonstrate reasonable potential to exceed water quality criteria, a WQBEL for copper is required. See Appendix C for that calculation.

Table B-1 summarizes the data, multipliers, and criteria used to determine reasonable potential to exceed water quality criteria. For each parameter, the MEC equals the maximum observed effluent concentration times the RPM producing a number based on wastewater treatment plant performance, which was used to determine if there is a reasonable potential for the effluent to exceed WQS.

Table B-1- Reasonable Potential Determination at the End of Pipe

Parameter (µg/L unless otherwise noted)	Max Observed Effluent Conc.	Number of Samples	Coefficient of Variation (CV)	Reasonable Potential Multiplier (RPM)	Max Expected Effluent Conc. (MEC)	Most Stringent Water Quality Criterion	Reasonable Potential (yes or no)
Ammonia as N (mg/L) (Nov-April)	20	18	0.011	1.01	20.3	5.7	yes
Copper (Nov-April)	72	25	0.157	1.35	97.5	14	yes
WET (TUc) (Nov-April)	1.4	5	0.6	3.4	4.76	1.0	yes
Ammonia as N (mg/L) (May-Oct)	26	20	0.17	1.18	30.6	4.7	yes
Copper (May-Oct)	41	28	0.366	1.26	51.8	1.6	yes
WET (TUc) (May-Oct)	5.6	4	0.6	4.7	26	1.0	yes
Zinc (May-Oct)	73	4	0.6	3.8	275	21	yes

APPENDIX C- SELECTION OF EFFLUENT LIMITS

If the Alaska Department of Environmental Conservation (the Department or DEC) does not authorize a mixing zone, water quality standards (WQS) numeric 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 WQS numeric criteria. If there are TBELs for an identified parameter in the mixing zone, TBELs apply at the end of the pipe, and WQS numeric criteria for that parameter, apply at the boundary of the mixing zone. If the reasonable potential analysis (RPA) requires the development of water-quality based effluent limits (WQBELs) for specific parameters in order to protect human health criteria 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 numeric criteria at the end of pipe. In the absence of water quality criteria for a particular pollutant, such as for 5-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS), TBELs are applied as end-of pipe effluent limits.

In the case of the Mendenhall Wastewater Treatment Plant (WWTP), copper demonstrated reasonable potential to exceed at the end of pipe and required the most dilution to meet water quality criteria at the boundary of the authorized mixing zone; therefore, the Department developed WQBELs for copper.

C.1 Effluent Limit Calculation

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

C.2 Mixing Zone-based WLA

When the Department authorizes a mixing zone for the discharge, the WLA is calculated using the available dilution, background concentrations of the pollutant, and the WQS. For human health criteria, the WLA is applied directly as an average monthly limit (AML). The maximum daily limit (MDL) is then calculated from the AML by applying a multiplier.

C.3 "End-of-Pipe" WLAs

In many cases, there is no dilution available, either because the receiving waterbody exceeds the criteria or because the Department does not authorize a mixing zone for a particular pollutant. When there is no dilution available, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the permittee's discharge does not contribute to an exceedance of the criterion. When a human health criteria applies to a pollutant, the chronic dilution factor is used to calculate a WLA.

C.4 Permit Limit Derivation

The Department applies the statistical approach described in Chapter 5 of the TSD to calculate the maximum daily limit (MDL) and average monthly limit (AML). This approach takes into account effluent variability (using the coefficient of variation (CV)) and sampling frequency.

The MDL 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 MDL calculation.

The following is a summary of the steps to derive WQBELs from WQS numeric criteria for pollutants that have reasonable potential to exceed water quality numeric criteria. These steps are found in the RPA Guide and the guidance's accompanying Microsoft Excel RPA Tool. The guidance and tool were used to calculate the MDL and AML for copper in the Mendenhall WWTP permit. Copper in the November to April season is illustrated below as an example.

Step 1- Determine the WLA

The first step in developing a WQBEL is to develop a wasteload allocation (WLA) for the pollutant. A WLA is the concentration or loading of a pollutant that the permittee may discharge without causing or contributing to an exceedance of water quality criteria or a total maximum daily load in the receiving waterbody.

In cases where a mixing zone is not authorized, either because the receiving waterbody already exceeds the criterion, the receiving waterbody flow is too low to provide dilution, or for some other reason one is not authorized, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the permittee will not cause or contribute to an exceedance of the criterion.

The acute and chronic aquatic life criteria are converted to WLAs using the following equation:

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

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

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

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

$Q_d = Critical\ Discharge\ Flow$

$C_s = Critical\ Upstream\ Concentration$

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

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

For copper,

$D_a = 4.8$

$D_c = 8.1$

$C_s = 2.1\ micrograms\ per\ liter$ (µg/L)

$WLA = 97.3\ \mu g/L$

$WQC = 98.6\ \mu g/L$

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

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

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

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

Where:

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

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

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

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

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

$$CV = coefficient\ of variation$$

For copper:

$$LTA_a = \ 35.3\ \mu g/L$$

$$LTA_c = \ 56.4\ \mu g/L$$

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

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

Where:

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

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

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

$$CV = coefficient\ of variation$$

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

Where:

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

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

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

$$CV = coefficient\ of variation$$

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

For copper:

$$MDL = 97\ \mu g/L$$

$$AML = 52\ \mu g/L$$

C.5 Mass-Based Limits

Alaska Pollutant Discharge Elimination System regulations at 18 Alaska Administrative Code (AAC) 83.540 require that effluent limits be expressed in terms of mass unless they cannot appropriately be expressed by mass, if it is infeasible, or if the limits can be expressed in terms of other units of measurement. In addition, 18 AAC 83.520 requires that effluent limits for a publicly owned treatment works be calculated based on the design flow of the facility. Expressing limitations in terms of concentration as well as mass encourages the proper operation of a facility at all times. The mass based limits are expressed in pounds per day and are calculated as follows:

mass-based limit (pounds (lbs)/day) = concentration limit (milligrams per liter) × design flow (million gallons per day (mgd)) × 8.34 (lbs/gallon)

C.6 Flow

Flow is based on the hydraulic design capacity of the WWTP (flow rate as gallons or mgd) and is determined by a professional engineer and approved by the Department during the WWTP plan review process conducted per 18 AAC 72. A flow limit based on the design capacity ensures that the WWTP operates within its capabilities to receive and properly treat sustained average flow quantities and specific pollutants.

C.7 Effluent Limit Summary

Table C-1 provides a summary and reference to those parameters in the Mendenhall WWTP that contain effluent limits at the point of discharge.

Table C-1- Summary of Effluent Limitations

Parameter	Fact Sheet Reference
BOD_5	Appendix A-Section A.2
TSS	Appendix A- Section A.2
pH	Appendix A- Section A.4.1.2
Copper	Appendix A- Section A.4.1.3

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 5.6 for the Mendenhall Wastewater Treatment 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 a unacceptable risk to human health from carcinogenic, mutagenic, teratogenic, or other effects as determined using risk assessment methods approved by the Department? **If yes, mixing zone may 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?		**18 AAC 70.240(k)(4)**

Criteria	Description	Resources	Regulation
	If yes, mixing zone may be approved as proposed or authorized with conditions.		
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)**

Criteria	Description	Resources	Regulation
	(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)**
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?		**18 AAC 70.240(c)(4)(F)**