

## **1.0 Mixing Zone Analysis**

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

The Department (DEC) received Trident's application for a modified AKG521060 authorization (under the AKG521000 Onshore Seafood Processors in Alaska General Permit) on September 28, 2023. In the application, Trident requested a modified temperature effluent limit associated with the facility's mixing zone.

As a part of the mixing zone application and modeling review process, DEC also modeled the mixing zone using Cornell Mixing Zone Expert System (CORMIX) version 12.0 modeling software. CORMIX is a widely used and broadly accepted modeling tool for accurate and reliable point source mixing analysis. CORMIX predicts the distance at which a modeled parameter meets water quality criteria.

Inputs to CORMIX included the maximum expected effluent concentration, water quality criteria, receiving water characteristics (such as water depth and density) at the outfall, and outfall and diffuser specifications (such as port size, direction, and number).

The mixing zone for this discharge is defined as a circle with a 100-foot radius centered on the outfall terminus, extending from the sea surface to the seafloor. Water quality criteria for dissolved oxygen, pH, residues, temperature, color, turbidity, and total residual chlorine may be exceeded within the authorized mixing zone.

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

The following summarizes this analysis:

### **1.0.1 Size**

In accordance with 18 AAC 70.240, a mixing zone must be as small as practicable.

18 AAC 70.240(b)(2) requires the Department to consider the characteristics of the effluent after treatment of the wastewater. DEC reviewed the Trident Ketchikan effluent monitoring data from June 2022 through August 2023 and determined that temperature had reasonable potential to exceed water quality criteria. Therefore, the Department modeled temperature in CORMIX to determine the smallest practicable mixing zone.

Table 1 summarizes basic CORMIX inputs that DEC used to model the mixing zone for temperature.

**Table 1 - CORMIX Model Inputs**

<b>Parameter Modeled</b>	<b>Maximum Expected Concentration</b>	<b>Ambient Concentration</b>	<b>Water Quality Criterion</b>
Temperature	20.4 °C	10 °C	15 °C
<b>Outfall and Receiving Waterbody Characteristics</b>			
Outfall Type	Submerged Single Port Discharge		
Outfall Length	107 meters		
Port Diameter	12 inches		
Height of Port Centerline above Seafloor	3.0 feet		
Water Depth at Discharge	30 – 33 meters		
Ambient Velocity	21.3 – 117.7 millimeters per second		
Ambient Water Density	1,012.7 – 1,022.4 kilograms per cubic meter		
<b>Effluent Characteristics</b>			
Flow Rate	2.61 million gallons per day (mgd)		

### **1.02 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. Trident investigated several treatment options, including cooling towers and chilling technology, and concluded that, considering technical and economic constraints, those treatment methods were not practicable.

### **1.03 Existing Use**

In accordance with 18 AAC 70.240(c)(2) and (3) and 18 AAC 70.240(c)(4)(B) and (C), the mixing zone has been appropriately sized to fully protect the existing uses of Tongass Narrows. Tongass Narrows' existing uses and biological integrity have been maintained and protected under the terms of the previous authorization and shall continue to be maintained and protected under the terms of the modified authorization. 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 zone, designated and existing uses in Tongass Narrows that are beyond the boundary of the mixing zone will be maintained and protected.

### **1.04 Human Consumption**

In accordance with the conditions of the permit, and in accordance with 18 AAC 70.240(d)(6), the pollutants discharged cannot produce an objectionable color, taste, or odor in aquatic resources harvested for human consumption. There is no indication that the pollutants discharged have produced objectionable color, taste, or odor in aquatic resources harvested for human consumption.

### **1.05 Spawning Areas**

In accordance with 18 AAC 70.240(f), a mixing zone will not be authorized in flowing fresh waters that are spawning areas for certain species.

This authorization does not propose a mixing zone in any flowing fresh waters.

### **1.06 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. The effluent is not expected to contain toxic pollutants. The expected effluent temperature was used in conjunction with applicable water quality criteria, which serve the purpose of protecting human and aquatic life, to size the mixing zone to ensure all water quality criteria are met in the waterbody at the boundary of the mixing zone.

### **1.07 Aquatic Life and Wildlife**

In accordance with 18 AAC 70.240, the mixing zone authorized in the permit shall be protective of aquatic life and wildlife. The mixing zone does not form a barrier to migratory fish species or fish passage nor will it result in a reduction of fish population levels. A toxic effect will not occur in the water column, sediments, or biota outside the boundaries of the mixing zone. CORMIX modeling conducted for

this discharge to Tongass Narrows incorporated the most stringent water quality criteria for protection of the growth and propagation of fish, shellfish, other aquatic life, and wildlife. All water quality criteria will be met at the boundary of the authorized mixing zone.

### **1.0.8 Endangered Species**

In accordance with 18 AAC 70.240(c)(4)(F), the mixing zone will not cause an adverse effect on threatened or endangered species. Review of applicable endangered species mapping and databases identified that the endangered short-tailed albatross (*Phoebastria albatrus*) and the threatened northern sea otter (*Enhydra lutris kenyoni*) are present at the discharge area in Tongass Narrows. The General Permit includes specific monitoring applicable to seafood processing facilities located near critical habitat areas, requiring permittees to collect data regarding threatened and endangered species during sea surface and shoreline monitoring activities. DEC determined that considering the nature of the discharge, mixing zone size, and ambient conditions, these species would not be affected by discharge from the Trident Ketchikan Plant.

DEC will provide a copy of the permit 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 authorization under the AKG521000 General Permit.