

The draft permit does not contain individual limitations for benzene, as the total aromatic hydrocarbon (TAH) criterion is significantly more protective than the benzene criterion. The benzene criterion of 710 µg/l is applicable for the protection of human health from potential carcinogenic effects due to benzene exposure through ingestion of contaminated aquatic organisms. This criterion represents an incremental increase of cancer risk of 10<sup>-5</sup> over a lifetime. Existing data indicates that this criterion is exceeded in the 36 CIDMS samples, and all samples of all discharges (except Tyonek-A) in the mixing zone application; benzene concentrations range from 15 µg/l at Tyonek-A to 53,000 µg/l at Bruce. As part of their mixing zone application to the State, the permittees performed a human health assessment to evaluate potential carcinogenic risks to humans who consume fish and shellfish that inhabit Cook Inlet.

The results of the human health assessment indicate that produced waters are not expected to pose significant risks to human health from the consumption of fish and shellfish in Cook Inlet at the edge of mixing zone.

*Whole Effluent Toxicity:* Whole effluent toxicity (WET) tests are used to

measure the acute and/or chronic toxicity of an effluent. Acute toxicity tests determine the effluent concentration that produces an adverse effect (i.e., death) on a group of test organisms during a short-term exposure. The LC<sub>50</sub> is the concentration of effluent that would cause death in 50 percent of the organisms exposed. Acute toxicity units (TU<sub>a</sub>) are defined as (100/LC<sub>50</sub>).

Chronic toxicity measures a sublethal effect (e.g., reduced growth, reproduction) in an effluent compared to that of the control organism. When conducting a chronic toxicity test, the highest concentration of an effluent at which no adverse effects are observed on the aquatic test organisms is defined as the no observed effect concentration (NOEC). Chronic toxicity units (TU<sub>c</sub>) are defined as (100/NOEC).

Alaska's water quality standard for toxicity is expressed as a measure of chronic, rather than acute toxicity. The Alaska standard states that substances must impart no chronic toxicity to aquatic organisms, expressed as 1.0 chronic toxic unit (TU<sub>c</sub>) at the edge of the mixing zone, or end of pipe if there is no mixing zone. The relationship between TU<sub>c</sub> and TU<sub>a</sub> is usually expressed as the acute-to-chronic ratio (ACR). In the absence of site-specific

data, the TSD recommends that an ACR of 10 be used.

Produced water toxicity was not limited in the 1986 general permit. Toxicity monitoring was, however, a requirement of the 1986 permit and was discussed in the CIDMS (Envirosphere 1990a). Produced water samples from three platforms and three shore-based facilities were tested for acute toxicity to the marine invertebrate *Mysidopsis bahia* using a 96-hour acute toxicity test. Chronic toxicity was measured at eight facilities currently discharging produced water to Cook Inlet as part of the mixing zone application (Parametrix 1995). For all locations, the mean TU<sub>c</sub> exceeds the state water quality standard of 1.0 TU<sub>c</sub>.

Mixing zones have been proposed for whole effluent toxicity at each of the eight discharge locations. The 1995 TU<sub>c</sub> data (based on NOEC growth and survival), mixing zones and dilution factors are summarized below. Note that while the proposed mixing zones are based on the NOEC (survival), it is anticipated that the mixing zones will be recalculated prior to issuance of the final permit based on the NOEC (growth).

Dilution factor	Location	TU <sub>c</sub> (growth)	TU <sub>c</sub> (survival)	Proposed chronic mixing zone (m)
	Granite Point PF .....	21.28	7	2026
	Trading Bay .....	> 22	10	3004,900
	East Foreland .....	> 18	11	2040
	Tyonek A .....	> 5	2	206.2
	Bruce .....	> 143	21	2082
	Baker .....	> 17	10	2036
	Dillon .....	> 28	16	2057
	Anna .....	77	29	20110

Based on the method for deriving permit limits recommended in the TSD (EPA 1991b), individual effluent limitations have been calculated for each of the dischargers. The following is a comparison of wasteload allocations

and effluent limits for each location. If the final mixing zone approved by the state is different from the one used to calculate the limits for the draft permit, the limits in the final permit will reflect these changes. Limitations have not

been calculated for the Trading Bay facility. In accordance with the TSD, limits are included only when there is a "reasonable potential" to exceed water quality criteria.

Location	Wasteload allocation (TU <sub>c</sub> )	Effluent limitations	
		Daily max (TU <sub>c</sub> )	Monthly avg (TU <sub>c</sub> )
Granite Point .....	26	43	29
East Forelands .....	40	66	45
Tyonek A .....	6	10	7
Bruce .....	82	135	92
Baker .....	36	59	40
Dillon .....	57	94	64
Anna .....	110	181	124