

APPENDIX B – REASONABLE POTENTIAL DETERMINATIONS

A water quality-based effluent limit (WQBEL) is necessary if the projected receiving water concentration (or technology-based limit concentration) exceeds the applicable water quality criteria. The following calculations determine whether limits are necessary based on Chapter 3 of EPA's *Technical Support Document for Water Quality-Based Toxics Control (TSD)*.

The spreadsheets following this document contain the calculations for determination of reasonable potential for aquatic life for the Red Dog Port Site Outfalls 001 and 005.

Step 1 – Determine the maximum projected effluent concentration

- Find the maximum reported effluent concentration for each parameter
- Determine the coefficient of variation for each parameter based on available monitoring data:
 - If < 10 data points, CV = 0.6
 - If > 10 data points, calculate the CV (standard deviation/mean)
- Calculate the reasonable potential multiplier, assuming 99% confidence level and 99% probability basis using equations from Section 3.3.2 of the TSD:

RP multiplier = C_{99}/C_x where,

$$\delta = \ln(CV^2 + 1)$$

$$C_{99} = \exp(2.326\delta - 0.5\delta^2)$$

C_x = percentile represented by highest concentration in the database

Step 2 – Determine the receiving water concentrations

The projected maximum receiving water concentration (RWC) for each parameter is calculated as follows:

RWC = $[C_e/\text{dilution}] + C_b$ where,

C_b = Background concentration of pollutant

C_e = Maximum projected effluent concentration
(maximum effluent concentration * reasonable potential multiplier)

Dilution = Designated mixing zone

Step 3 – Determine the Reasonable Potential

If the RWC exceeds the most stringent applicable state water quality criteria, then there is reasonable potential to exceed the criteria at the edge of the mixing zone, and WQBELs must be developed.

**APPENDIX B - OUTFALL 001
REASONABLE POTENTIAL CALCULATION**

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in <u>Technical Support Document for Water Quality-based Toxics Control</u> , U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)									CALCULATIONS									
Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) ug/L	State Water Quality Standard		Max concentration at edge of...			Effluent percentile value	Pn	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	COMMENTS
				Acute ug/L	Chronic ug/L	Acute Mixing Zone ug/L	Chronic Mixing Zone ug/L	LIMIT REQ'D?										
Cadmium	0.994	0.994	1.09	40.00	8.80	1.17	1.15	NO	0.99	0.631	2.80	0.60	0.55	10	3.02	92	140	Cadmium
Lead	0.951	0.951	3.90	210.00	8.10	6.54	5.63	NO	0.99	0.631	86.00	0.60	0.55	10	3.02	92	140	Lead
Zinc	0.946	0.946	56.75	90.00	81.00	71.86	66.68	NO	0.99	0.631	507.00	0.60	0.55	10	3.02	92	140	Zinc
Total Ammonia as NH ₃ -N				28460.00	4270.00	358.54	235.61	NO	0.99	0.010	2500.00	0.60	0.55	1	13.19	92	140	Ammonia
Chlorine				13.00	7.50	2.38	1.57	NO	0.99	0.819	100.00	0.60	0.55	23	2.19	92	140	Total Residual Chlorine
Whole Effluent Toxicity				TU _a 0.30		TU _a 0.06		NO	0.99	0.562	TU _a 1.73	0.60	0.55	8	3.33	92		WET

**APPENDIX B - OUTFALL 005
REASONABLE POTENTIAL CALCULATION**

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in <u>Technical Support Document for Water Quality-based Toxics Control</u> , U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)									CALCULATIONS									
Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) ug/L	State Water Quality Standard		Max concentration at edge of...			Effluent percentile value	Pn	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	COMMENTS
				Acute ug/L	Chronic ug/L	Acute Mixing Zone ug/L	Chronic Mixing Zone ug/L	LIMIT REQ'D?										
Cadmium	0.994	0.994	1.09	40.00	8.80	1.30	1.23	NO	0.99	0.903	9.50	0.90	0.77	45	2.21	92	140	Cadmium
Copper	0.830	0.830	33.30	4.80	3.10	33.08	33.15	YES	0.99	0.903	9.76	0.46	0.44	45	1.57	92	140	Copper
Mercury	0.850	0.850	0.17	1.80	0.94	0.18	0.18	NO	0.99	0.903	0.30	2.40	1.38	45	4.15	92	140	Mercury
Lead	0.951	0.951	4.04	210.00	8.10	8.52	6.99	NO	0.99	0.903	123.00	1.89	1.23	45	3.56	92	140	Lead
Zinc	0.946	0.946	56.75	90.00	81.00	67.31	63.69	NO	0.99	0.898	533.83	0.76	0.67	43	2.04	92	140	Zinc
Nickel	0.990	0.990		74.00	8.20	1.28	0.84	NO	0.99	0.010	8.99	0.60	0.55	1	13.19	92	140	Nickel
Selenium	0.998	0.998		290.00	71.00	0.26	0.17	NO	0.99	0.010	1.80	0.60	0.55	1	13.19	92	140	Selenium
Whole Effluent Toxicity				TU _a 0.30		TU _a 0.06		NO	0.99	0.518	TU _a 1.63	0.60	0.55	7	3.54	92		WET