

Appendix B: Sample Results - Cruise Ships Approved for Discharge into MOU Waters

<b>SHIP: NORWEGIAN PEARL</b>											
		pH	BOD <sup>3</sup>	TSS <sup>4</sup>	Chlorine Residual <sup>5</sup>	Fecal Coliform <sup>6</sup>	Ammonia	Copper (dissolved)	Nickel (dissolved)	Zinc (dissolved)	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	mg/l	ug/l	ug/l	ug/l	
<b>MOU/Alaska Limits<sup>1</sup></b>		6-9	30/45	30/45	10 ug/l	20 / 40					
<b>WA State Water Quality Standards<sup>2</sup></b>		7.0-8.5	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
5/12/2010	Juneau/Admiralty/Microbac	6.81	ND	ND	ND	ND	0.52	21	3.5	83	
5/16/2010	Seattle/Spectra	7.1	6.2	6.4	ND	ND					
5/19/2010	Juneau/Admiralty/Microbac	6.77	2.9	ND	ND	2	11	5.3	4.9	100	unannounced
5/25/2010	Juneau/Admiralty/Microbac	6.56	3.1	11	ND	96	1.9	22	16	82	
6/2/2010	Juneau/Admiralty/Microbac	6.88	ND	ND	ND	15	12	5	4.6	64	
6/6/2010	Seattle/Spectra	6.76	ND	4.0	ND	ND					
6/9/2010	Juneau/Admiralty/Microbac	6.78	ND	ND	ND	ND	21	6.2	ND	200	
7/7/2010	Juneau/Admiralty/Microbac	6.79	2.1	ND	ND	2	22	7	1.9	45	
7/11/2010	Seattle/Spectra	6.74	2.7	4.0	ND	4					
7/14/2010	Juneau/Admiralty/Microbac	6.92	2.8	ND	ND	ND	26	7.8	4.8	54	
8/4/2010	Juneau/Admiralty/Microbac	7.14	6.6	10	ND	ND	14	5.7	6.5	35	
8/8/2010	Seattle/Spectra	6.75	4	10	ND	ND					
8/11/2010	Juneau/Admiralty/Microbac	6.86	4.3	5	ND	ND	26	9	5.2	25	
8/18/2010	Juneau/Admiralty/Microbac	6.94	3.3	11	ND	*	12	11	6.4	50	unannounced. Fecal coliform had invalid results and were re-sampled on 8/20 and 8/22
8/20/2010	Ketchikan/R&M	6.87	NA	NA	ND	ND					
8/22/2010	Seattle/Spectra	7.02	NA	NA	ND	ND					
9/8/2010	Juneau/Admiralty/Microbac	6.91	ND	ND	ND	ND	13	7.5	4.4	67	
9/12/2010	Seattle/Spectra	6.89	4	4.7	ND	10					
	<b>MINIMUM</b>	<b>6.56</b>	<b>ND</b>	<b>ND</b>	<b>ND (&lt;0.1)</b>	<b>ND</b>	<b>0.5</b>	<b>5.0</b>	<b>ND</b>	<b>25</b>	met Seattle sampling requirement
	<b>AVERAGE</b>		<b>3.3</b>	<b>5.9</b>			<b>14.5</b>	<b>9.8</b>	<b>5.8</b>	<b>73</b>	
	<b>MAXIMUM</b>	<b>7.14</b>	<b>6.6</b>	<b>11</b>	<b>ND (&lt;0.1)</b>	<b>96</b>	<b>26.0</b>	<b>22.0</b>	<b>16.0</b>	<b>200</b>	WA port calls: 5/9-9/12
	<b>GEOMETRIC MEAN</b>					<b>3.24</b>					

<b>SHIP: NORWEGIAN STAR</b>											
		pH	BOD <sup>3</sup>	TSS <sup>4</sup>	Chlorine Residual <sup>5</sup>	Fecal Coliform <sup>6</sup>	Ammonia	Copper (dissolved)	Nickel (dissolved)	Zinc (dissolved)	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	mg/l	ug/l	ug/l	ug/l	
<b>MOU/Alaska Limits<sup>1</sup></b>		6-9	30/45	30/45	10 ug/l	20 / 40					
<b>WA State Water Quality Standards<sup>2</sup></b>		7.0-8.5	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
5/11/2010	Ketchikan/Admiralty/Microbac	6.92	14	ND	ND	ND	1.7	2.5	12	220	
5/18/2010	Ketchikan/Admiralty/Microbac	6.92	6.4	ND	ND	4	9.6	3	12	46	Unannounced
5/22/2010	Seattle/Spectra	7.04	5.2	3.3	ND	7					
5/25/2010	Ketchikan/Admiralty/Microbac	7.03	10	ND	ND	ND	29	6.6	14	69	
6/5/2010	Seattle/Spectra	6.96	17	7.3	ND	ND					
6/8/2010	Ketchikan/Admiralty/Microbac	6.98	9.8	8	ND	2	23	3.5	10	190	
6/15/2010	Ketchikan/Admiralty/Microbac	7.02	12	ND	ND	ND	30	2.4	10	70	
7/6/2010	Ketchikan/Admiralty/Microbac	6.87	7.5	4	ND	50	16	1.4	9.5	39	
7/24/2010	Seattle/Spectra	6.97	10	3.5	ND	ND					

SHIP: NORWEGIAN STAR											
		pH	BOD <sup>3</sup>	TSS <sup>4</sup>	Chlorine Residual <sup>5</sup>	Fecal Coliform <sup>6</sup>	Ammonia	Copper (dissolved)	Nickel (dissolved)	Zinc (dissolved)	Comments
		St. Units	mg/l	mg/l	mg/l	#/100 ml	mg/l	ug/l	ug/l	ug/l	
MOU/Alaska Limits <sup>1</sup>		6-9	30/45	30/45	10 ug/l	20 / 40					
WA State Water Quality Standards <sup>2</sup>		7.0-8.5	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
7/27/2010	Ketchikan/Admiralty/Microbac	6.88	9.8	ND	ND	ND	23	3.0	11	81	
8/3/2010	Ketchikan/Admiralty/Microbac	6.6	9.8	12	ND	10	20	1.2	9.5	73	
8/7/2010	Seattle/Spectra	6.87	10	7	ND	ND					
8/10/2010	Ketchikan/Admiralty/Microbac	7.16	13	ND	ND	ND	28	2.1	8.9	30	
8/18/2010	Juneau/Admiralty/Microbac	7.15	10	4	ND	2	16	2.5	6.9	23	Unannounced
9/7/2010	Ketchikan/Admiralty/Microbac	7.13	5	ND	ND	ND	35	3.0	7.6	59	
9/11/2010	Seattle/Spectra	7.11	4.0	0.67	ND	ND					
9/14/2010	Ketchikan/Admiralty/Microbac	6.96	4.1	ND	ND	ND	30	ND	7.5	42	
*fecal coliform analysis demonstrated confluent growth, so results not quantifiable. Re-sample ordered.											
	<b>MINIMUM</b>	<b>6.6</b>	<b>4.0</b>	<b>ND</b>	<b>ND (&lt;0.1)</b>	<b>ND</b>	<b>1.7</b>	<b>ND</b>	<b>6.90</b>	<b>23</b>	met Seattle sampling requirement
	<b>AVERAGE</b>		<b>9.3</b>	<b>4.8</b>			<b>21.8</b>	<b>2.8</b>	<b>9.9</b>	<b>78.5</b>	
	<b>MAXIMUM</b>	<b>7.16</b>	<b>17</b>	<b>12</b>	<b>ND (&lt;0.1)</b>	<b>50</b>	<b>35</b>	<b>7</b>	<b>14</b>	<b>220</b>	
	<b>GEOMETRIC MEAN</b>					<b>3.05</b>					WA port calls: 5/15-9/25

ND = Non Detect, value in box is the detection level. Unannounced sampling includes other parameters not listed above.

BOD = Biochemical Oxygen Demand - or organics; TSS = Total Suspended Solids

mg/l = milligrams per liter; ug/l = micrograms per liter; #/100 ml = coliforms per 100 milliliters

<sup>1</sup>MOU/Alaska limits from Title XIV, Certain Alaska Cruise Ship Operations, Section 1404(c) /40CFR 133.102

BOD and TSS: 30-day average shall not exceed 30 mg/l, 7-day average shall not exceed 45 mg/l

Fecal Coliform: geometric mean of any 30-day period shall not exceed 20 fecal coliform/100 ml and not more than 10% of the samples exceed 40 fecal coliform/100 ml

<sup>2</sup>Washington State Water Quality Standards for Surface Waters of the State of Washington Chapter 173-201A WAC

Fecal Coliform: shall not exceed a geometric mean of 14 colonies/100 ml and not more than 10% of a samples shall exceed a geometric mean of 43 colonies/100 ml

pH: 7-8.5 with a human-caused variation within less than 0.2

chlorine: 13 ug/l is the acute limit (1-hour average); 7.5 ug/l is the chronic limit (4-day average)

<sup>3</sup>BOD detection level = 2 mg/l

<sup>3</sup>TSS detection level = 4 mg/l

<sup>3</sup>Chlorine Residual detection level = 0.1 mg/l

<sup>3</sup>Fecal Coliform detection level = 2 #/100 ml