

Appendix C: Sample Results - Cruise Ships Approved for Discharge into Washington Waters

SHIP: NORWEGIAN PEARL											
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	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 ¹		6-9	30/45	30/45	10 ug/l	20 / 40					
WA State Water Quality Stan		7.0-8.5	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
5/13/08	Juneau/Admiralty	6.18	3.9	5	ND< 0.10	ND< 1	18	9.2	6.91	94.4	MIXED BLACK AND GRAY OVERBOARD
5/18/08	Seattle/Pace Analyt	6.1	14.0	ND< 2	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
6/3/08	Juneau/Admiralty	6.74	2.1	2.4	ND< 0.10	ND< 1	27	5.7	4	67	MIXED BLACK AND GRAY unannounced sampling (+ priority pollutants)
6/8/08	Seattle/Pace Analyt	6.2	11	8	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
6/17/08	Juneau/Admiralty	6.75	3.46	7	ND< 0.10	8	38	19.3	9.43	50.3	MIXED BLACK AND GRAY OVERBOARD
6/24/08	Juneau/Admiralty	6.8	13	6	ND< 0.10	ND< 1	23	4.84	5.74	105	MIXED BLACK AND GRAY OVERBOARD
7/13/08	Seattle/Pace Analyt	6.3	19	2	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
7/15/08	Juneau/Admiralty	6.76	3.2	ND< 1.0	ND< 0.10	ND< 1	26	9.43	6.06	54.7	MIXED BLACK AND GRAY OVERBOARD
7/22/08	Juneau/Admiralty	6.75	3.2	6	ND< 0.10	ND< 1	25	3.53	3.47	67.1	MIXED BLACK AND GRAY OVERBOARD
8/12/08	Juneau/Admiralty	6.67	2.9	ND< 1.0	ND< 0.10	ND< 1	34	6.9	5.1	110	MIXED BLACK AND GRAY OVERBOARD
8/17/08	Seattle/Pace Analyt	6.6	22	2	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
8/19/08	Juneau/Admiralty	6.53	3.0	ND< 1.0	ND< 0.10	ND< 1	41	12	4.9	110	MIXED BLACK AND GRAY OVERBOARD
9/2/08	Juneau/Admiralty	6.75	< 2.0	7	< 0.10	< 2	27	8.5	3.8	73	MIXED BLACK AND GRAY unannounced sampling (+ priority pollutants)
9/9/08	Juneau/Admiralty	6.77	ND< 0.5	6	ND< 0.10	ND< 1	36	8.8	5	62	MIXED BLACK AND GRAY OVERBOARD
9/14/08	Seattle/Pace Analyt	6.4	27	ND< 2	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
MINIMUM		6.1	ND	ND	ND	ND	18	3.53	3.47	50.3	met Seattle sampling requirement
AVERAGE			8.7	3.9	0.10		30	8.82	5.44	79.4	
MAXIMUM		6.8	27	8	0.10	8	41	19.3	9.43	110	
GEOMETRIC MEAN						1.5					

SHIP: NORWEGIAN STAR											
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	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 ¹		6-9	30/45	30/45	10 ug/l	20 / 40					
WA State Water Quality Stan		7.0-8.5	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
5/13/08	Juneau/Admiralty	7.01	5.5	ND< 1.0	ND< 0.10	ND< 1	32	2.27	8.09	79.4	MIXED BLACK AND GRAY OVERBOARD
5/17/08	Seattle/Pace Analyt	6.8	38.0	2	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
6/3/08	Juneau/Admiralty	6.69	5.6	4	ND< 0.10	ND< 1	6.6	1.5	8.9	26	MIXED BLACK AND GRAY unannounced sampling (+ priority pollutants)
6/3/08	Juneau/Admiralty	6.69	5.4	3.2	ND< 0.10	ND< 1	6.6	1.3	8.2	23	MIXED BLACK AND GRAY unannounced sampling (BLIND DUPLICATES)
6/7/08	Seattle/Pace Analyt	6.9	13	4	ND< 0.10	8					MIXED BLACK AND GRAY OVERBOARD
6/17/08	Juneau/Admiralty	6.71	ND< 0.5	ND< 1.0	ND< 0.10	ND< 1	19	2.52	6.89	58.4	MIXED BLACK AND GRAY OVERBOARD
6/24/08	Juneau/Admiralty	6.63	8	8	ND< 0.10	ND< 1	22	1.99	8.73	111	MIXED BLACK AND GRAY OVERBOARD
7/12/08	Seattle/Pace Analyt	6.8	30	4	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
7/15/08	Juneau/Admiralty	6.79	7	ND< 1.0	ND< 0.10	ND< 1	29	1.38	9.6	63.6	MIXED BLACK AND GRAY OVERBOARD
7/29/08	Juneau/Admiralty	6.84	4.7	7	ND< 0.10	12	43	2.15	8.38	69.9	MIXED BLACK AND GRAY OVERBOARD
8/12/08	Juneau/Admiralty	6.66	8.5	ND< 1.0	ND< 0.10	ND< 1	20	3.7	13	100	MIXED BLACK AND GRAY OVERBOARD
8/16/08	Seattle/Pace Analyt	6.6	65	4	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
8/19/08	Juneau/Admiralty	6.71	9.1	ND< 1.0	ND< 0.10	2	26	2.3	13	110	MIXED BLACK AND GRAY OVERBOARD
8/26/08	Juneau/Admiralty	6.76	12.9	11	ND< 0.10	4	20	4.6	11	94	MIXED BLACK AND GRAY unannounced sampling (+ priority pollutants)
9/2/08	Juneau/Admiralty	6.60	8.1	4	ND< 0.10	*	11	2.2	11	160	MIXED BLACK AND GRAY OVERBOARD
9/6/08	Seattle/Pace Analyt	6.60	7	ND< 1.0	ND< 0.10	8					MIXED BLACK AND GRAY OVERBOARD
9/9/08	Juneau/Admiralty	6.5	8.3	ND< 1.0	ND< 0.10	ND< 1	17	12	14	140	MIXED BLACK AND GRAY OVERBOARD
9/16/08	Juneau/Admiralty	6.73	18.4	ND< 1.0	ND< 0.10	ND< 1					MIXED BLACK AND GRAY OVERBOARD
*fecal coliform analysis demonstrated confluent growth, so results not quantifiable. Re-sample ordered.											
MINIMUM		6.5	ND	ND	ND	ND	6.6	1.3	6.89	23	met Seattle sampling requirement
AVERAGE			14.2	3.3	0.10		21.0	3.16	10.07	86.3	
MAXIMUM		7.01	65	11	0.10	12	43	12	14	160	
GEOMETRIC MEAN						1.8					

SHIP: GOLDEN PRINCESS											
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	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 ¹		6-9	30/45	30/45	10 ug/l	20 / 40					
WA State Water Quality Stan		7.0-8.5	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
5/12/08	Juneau/Admiralty	8.16	ND< 0.5	ND< 1.0	ND< 0.10	12	21	9.26	6.92	179	MIXED BLACK AND GRAY OVERBOARD
5/15/08	Juneau/Admiralty	6.98	2.7	ND< 1.0	ND< 0.10	ND< 1	29	8.3	6	180	MIXED BLACK AND GRAY unannounced sampling (= priority pollutants)
5/19/08	Juneau/Admiralty	6.96	ND< 0.5	ND< 1.0	ND< 0.10	ND< 1	27	11.3	7.30	225	MIXED BLACK AND GRAY OVERBOARD
6/7/08	Seattle/Pace Analyt	7.3	12	2	ND< 0.10	2					MIXED BLACK AND GRAY OVERBOARD
6/9/08	Juneau/Admiralty	7.12	3.9	ND< 1.0	ND< 0.10	ND< 1	36	10.2	6.33	203	MIXED BLACK AND GRAY OVERBOARD
6/16/08	Juneau/Admiralty	7.44	ND< 0.5	ND< 1.0	ND< 0.10	ND< 1	51	10.7	4.89	106	MIXED BLACK AND GRAY OVERBOARD
6/30/08	Juneau/Admiralty	7.47	3.2	ND< 1.0	ND< 0.10	2	42	5.1	5.3	93	MIXED BLACK AND GRAY OVERBOARD
7/7/08	Juneau/Admiralty	7.34	2.3	ND< 1.0	ND< 0.10	ND< 1	22	14.5	7.36	156	MIXED BLACK AND GRAY OVERBOARD
7/12/08	Seattle/Pace Analyt	7.0	13	2	ND< 0.10	4					MIXED BLACK AND GRAY OVERBOARD
7/21/08	Juneau/Admiralty	7.34	2.8	ND< 1.0	ND< 0.10	4	21	6.72	6.47	269	MIXED BLACK AND GRAY OVERBOARD
8/11/08	Juneau/Admiralty	7.15	3.5	ND< 1.0	ND< 0.10	ND< 1	33	17	6.8	150	MIXED BLACK AND GRAY OVERBOARD
8/16/08	Seattle/Pace Analyt	7.3	14	2	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
8/18/08	Juneau/Admiralty	7.38	ND< 0.5	ND< 1.0	ND< 0.10	ND< 1	38	41	9.4	350	MIXED BLACK AND GRAY OVERBOARD
9/1/08	Juneau/Admiralty	7.62	20.2	ND< 1.0	ND< 0.10	ND< 1	63	11	5.7	130	MIXED BLACK AND GRAY OVERBOARD
9/8/08	Juneau/Admiralty	7.32	3.3	ND< 1.0	ND< 0.10	ND< 1	46	35	6.9	210	MIXED BLACK AND GRAY OVERBOARD
9/13/08	Seattle/Pace Analyt	7.2	24	ND< 2	ND< 0.10	4					MIXED BLACK AND GRAY OVERBOARD
	MINIMUM	6.96	ND	ND	ND	ND	21	5.10	4.89	93	met Seattle sampling requirement
	AVERAGE		6.7	1.1	0.10		36	15.01	6.61	188	
	MAXIMUM	8.16	24	2	0.10	12	63	41	9.4	350	
	GEOMETRIC MEAN					1.7					

SHIP: STAR PRINCESS											
		pH	BOD	TSS	Chlorine Residual	Fecal Coliform	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 ¹		6-9	30/45	30/45	10 ug/l	20 / 40					
WA State Water Quality Stan		7.0-8.5	NA	NA	13 / 7.5 ug/l	14 / 43					
Sample Date	Location/ Lab										
5/14/08	Juneau/Admiralty	6.98	6.4	ND< 1.0	ND< 0.10	ND< 1	21	135	15.7	110	MIXED BLACK AND GRAY OVERBOARD
5/28/08	Juneau/Admiralty	7.11	4	ND< 1.0	ND< 0.10	ND< 1	34	100	12	130	MIXED BLACK AND GRAY unannounced sampling (= priority pollutants)
6/8/08	Seattle/Pace Analyt	6.9	15	6	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
6/18/08	Juneau/Admiralty	6.88	ND< 0.5	ND< 1.0	ND< 0.10	ND< 1	27	59.2	13.6	123	MIXED BLACK AND GRAY OVERBOARD
6/25/08	Juneau/Admiralty	6.67	6.8	ND< 1.0	ND< 0.10	ND< 1	32	55.5	15.7	119	MIXED BLACK AND GRAY OVERBOARD
7/13/08	Seattle/Pace Analytical	6.7	15	2	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
7/16/08	Juneau/Admiralty	6.61	ND< 0.5	ND< 1.0	ND< 0.10	ND< 1	42	30.1	18.4	113	MIXED BLACK AND GRAY OVERBOARD
7/17/08	Juneau/Admiralty	6.76	3.4	ND< 1	ND< 0.10	< 2	30	19	8.5	87	MIXED BLACK AND GRAY unannounced sampling (= priority pollutants)
8/13/08	Juneau/Admiralty	7.25	4	ND< 1.0	ND< 0.10	ND< 1	64	100	19	81	MIXED BLACK AND GRAY OVERBOARD
8/17/08	Seattle/Pace Analyt	7.1	29	ND< 2	ND< 0.10	2					MIXED BLACK AND GRAY OVERBOARD
8/20/08	Juneau/Admiralty	7.15	3.7	ND< 1.0	ND< 0.10	ND< 1	65	79	20	100	MIXED BLACK AND GRAY OVERBOARD
9/3/08	Juneau/Admiralty	7.35	ND< 0.5	ND< 1.0	ND< 0.10	ND< 1	56	35	9.3	120	MIXED BLACK AND GRAY OVERBOARD
9/10/08	Juneau/Admiralty	7.43	ND< 0.5	ND< 1.0	ND< 0.10	ND< 1	71	60	11	49	MIXED BLACK AND GRAY OVERBOARD
9/14/08	Seattle/Pace Analyt	7.4	29	ND< 2	ND< 0.10	< 2					MIXED BLACK AND GRAY OVERBOARD
	MINIMUM	6.61	ND	ND	ND	ND	21	19	8.5	49	met Seattle sampling requirement
	AVERAGE		8.5	1.6	0.10		44	67.3	14.3	103	
	MAXIMUM	7.4	29	6	0.10	2	71	135	20	130	
	GEOMETRIC MEAN					1.2					

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

¹MOU/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
²Washington 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)