



# Alaska Department of Environmental Conservation

## Large Cruise Ship 2011

### Wastewater Sampling Results

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## 1. INTRODUCTION

This report shows the results of sampling and laboratory testing of large cruise ship treated wastewater effluent during the 2011 cruise ship season.

Large cruise ships that chose to discharge treated wastewater into Alaskan waters in 2011 were required by the terms and conditions (Appendix 1) of the 2010 Large Commercial Passenger Vessel Wastewater General Permit (2010 General Permit) and Alaska Statutes to conduct wastewater sampling and analytical testing, and report the sample and analytical testing results to the Alaska Department of Environmental Conservation (DEC). No cruise ship may discharge untreated wastewater into Alaskan waters.

In order to comply with permit terms and Alaska Statutes, permittees must perform sampling events while discharging treated effluent into the marine waters of the state, follow the provisions of the ship's DEC approved vessel specific sampling plan (VSSP), and follow the provisions of the DEC approved quality assurance project plan (QAPP). The VSSP is designed to obtain a sample which is representative of a typical treated wastewater discharge. The QAPP includes approved sampling techniques and methods of analytical testing. Laboratory analysis of samples must also be in compliance with the VSSP and the QAPP.

A sampling event is an activity where a sampler collects enough treated wastewater effluent for laboratories to conduct analytical testing for all of the pollutants to be tested. A sample is a container of effluent collected for a specific analysis or set of analyses. DEC requires permittees to conduct two types of sampling events: sampling for pollutants with permit limits and sampling for pollutants that do not have permit limits but must be reported.

Permitted ships must conduct two sampling events during each month that they discharge into Alaskan waters. Reports from twice-per-month sampling events must include results for each pollutant with permit limits. Two sampling events each season must include analyses of the complete list of pollutants in the

permit, including those that do not have limits (i.e., pollutants listed as “report only.”) This is required in order for DEC to determine whether or not there is a basis of concern to establish limits in the future and to collect information on the performance of advanced wastewater treatment systems (AWTS) systems. Permittees are also required to report the results of sampling taken to meet federal requirements (i.e. US Coast Guard random sampling) to DEC.

In 2011, 27 large cruise ships operated in Alaskan waters; however, only 16 of the 27 large ships sought permit coverage to discharge, and 15 of those 16 permitted ships chose to actually discharge. Table 1 has a list of ships that visited Alaska in 2011 and their permit status. Appendix 2 contains a summary of vessel specific information for 2011. A list of 2011 authorized vessels and copies of authorization letters can be found at: [http://www.dec.state.ak.us/water/cruise\\_ships/gp/Auth\\_10.html](http://www.dec.state.ak.us/water/cruise_ships/gp/Auth_10.html)

**Table 1: 2011 Large Cruise Ship General Permit Authorizations**

<b>Vessel Operator</b>	<b>Vessel Name</b>	<b>Authorized Discharges</b>	<b>Discharged in 2011?</b>
Carnival CL	<i>Carnival Spirit</i>	Stationary and Underway for graywater only	Yes
Celebrity Cruises	<i>Celebrity Century</i>	None	No
Celebrity Cruises	<i>Celebrity Infinity</i>	None	No
Celebrity Cruises	<i>Celebrity Millennium</i>	None	No
Crystal Cruises	<i>Crystal Symphony</i>	None	No
Disney	<i>Disney Wonder</i>	Underway	Yes
Holland America	<i>Amsterdam</i>	None	No
Holland America	<i>Oosterdam</i>	None	No
Holland America	<i>Statendam</i>	Stationary and Underway	Yes
Holland America	<i>Volendam</i>	Stationary and Underway	Yes
Holland America	<i>Westerdam</i>	None	No
Holland America	<i>Zaandam</i>	Stationary and Underway	Yes
Holland America	<i>Zuiderdam</i>	None	No
Norwegian CL	<i>Norwegian Pearl</i>	Underway	Yes
Norwegian CL	<i>Norwegian Star</i>	Underway	Yes
Oceania	<i>Regatta</i>	Stationary and Underway	Yes
P&O	<i>Arcadia</i>	None	No
Princess CL	<i>Coral Princess</i>	Underway	Yes
Princess CL	<i>Diamond Princess</i>	Underway	Yes
Princess CL	<i>Golden Princess</i>	Stationary and Underway for graywater, Underway for mixed wastewater	Yes
Princess CL	<i>Island Princess</i>	Underway	Yes
Princess CL	<i>Sapphire Princess</i>	Stationary and Underway for graywater, Underway for mixed wastewater	Yes
Princess CL	<i>Sea Princess</i>		Yes
Prestige Cruises	<i>Seven Seas Navigator</i>	Underway	Yes
Royal Caribbean	<i>Radiance of the Seas</i>	None	No
Royal Caribbean	<i>Rhapsody of the Seas</i>	None	No
Silver Seas	<i>Silver Shadow</i>	Stationary and Underway	No

## 2. WASTEWATER SAMPLING RESULTS BY COMPANY

### 2.1. Large cruise ships that did not discharge

#### Celebrity Cruises

In 2011 Celebrity Cruises operated three ships in Alaska. All three ships did not discharge in Alaskan waters.

#### Royal Caribbean International (RCI)

Royal Caribbean International operated two ships in Alaskan waters in 2011. Neither ship discharged wastewater in Alaskan waters in 2011.

#### Silver Shadow (Silversea)

The Silver Shadow, operated by Silversea, was authorized to discharge under the General Permit but did not discharge in Alaskan waters in 2011 and was not required to sample.

### 2.2. Discharging large cruise ships

#### Guide to Sampling Results

Wastewater sampling results for pollutants with effluent limits are listed by company. Please see Appendix 3, Tables A-4 and A-5 for pollutant sampling results for which there are no effluent limits.

In the following tables, sampling results highlighted in red are exceedances of 2010 General Permit limits. Exceedances of Alaska Water Quality Criteria (WQC) are highlighted in yellow and are not exceedances of permitted limits. Dark blue highlights indicate no sample data was received or accepted. In some cases the parameter was not required to be sampled, and in other cases the sample did not meet sampling requirements; for example, the holding time was not met. Light blue highlights graywater-only sample events.

Samples taken twice per month or more frequently for the General Permit are identified as “GP.” Sampling events that include all parameters listed in the General Permit (two per season) are identified as “PP” for priority pollutants. In previous years’ reports, they have previously been identified as unannounced or “UA” because they are often also taken to meet US Coast Guard sampling requirements. The 2010 General Permit does not require unannounced sampling, but does allow samples taken for federal agencies to be accepted as meeting DEC requirements. Sample types labeled “USCG” are US Coast Guard random, unannounced, and unscheduled samples.

Explanation of color codes in sampling results tables	
	Exceedance of permitted limits
	Exceedance of Alaska Water Quality Standards
	Discharging only treated graywater
	Parameter not sampled or did not meet quality objectives
	No Discharge in Alaska
ND	Not detected

Two categories of permit limits exist in the 2010 General Permit: limits for underway discharge, and limits for continuous discharge. Cruise ships can be permitted to discharge only while underway at a speed of six knots or greater, or can be permitted for continuous discharge, which includes discharge underway and discharge while stationary (moored, stopped, and underway at a speed of less than six knots). The limits for continuous discharge are more stringent than those for underway discharge.

## Carnival Cruise Lines

Carnival operated one ship, the Carnival Spirit, in Alaska in 2011. The Carnival Spirit was authorized to and did discharge graywater continuously (underway and while docked or anchored). This ship only discharged accommodation graywater, which was treated through a Rochem low pressure reverse osmosis (LPRO) wastewater treatment system. All samples were taken while the Carnival Spirit was stationary. The Carnival Spirit had no exceedances of the 2010 General Permit limits in 2011.

**Carnival Spirit 2011 Sampling**

Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
5/15/2011	GP	0.83	7.28	0	36.3	6.5	ND	0.7	22.92	ND
5/22/2011	PP	0.63	1.43	0	3.73	7.15	ND	ND	6.14	ND
6/12/2011	GP	0.52	4.31	0	0	7.44	ND	ND	8.07	ND
6/19/2011	GP	0.63	2.08	0	0	8.02	ND	ND	5.57	ND
7/10/2011	GP	0.62	1.37	0	0	7.45	ND	ND	5.86	ND
7/17/2011	PP	1.2	1.43	0	3.73	6.75	ND	ND	4.63	ND
8/14/2011	GP	0.63	1.25	0	20.3	7.7	ND	ND	5.4	ND
8/28/2011	GP	0.49	0	0	0	7.46	ND	ND	6.24	ND
9/11/2011	GP	0.736	2.72	0	0	7.65	ND	ND	6.39	ND
9/18/2011	GP	0	1.28	0	0	7.66	ND	ND	3.95	ND
Average		0.63	2.32	0	6.41					
Max		1.20	7.28	0	36.3					
Min		0.00	0.00	0	0					
Median		0.63	1.43	0	0					
STD Dev		0.30	2.08	0	12.23					
Alaska WQC		1	3.1	8.2	81	<6.5, >8.5	43			0.0075
Permit Limits		12	10	10	118	<6.5, >8.5	43	150	60	0.01

## Disney Cruise Line

Disney Cruise Line operated one ship, the Disney Wonder, in Alaska in 2011. The Disney Wonder was authorized for and did have underway discharge of mixed blackwater and graywater treated by a Hamworthy AWTs. Discharges and sampling only occurred while the vessel was underway, at a speed of six knots or greater. The Disney Wonder had no exceedances of the general permit limits in 2011.



### Disney Wonder 2011 Sampling

Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
5/7/2011	GP	8.7	3.6	12	170	7.02	ND	ND	ND	ND
5/14/2011	PP	8.4	7.6	16	220	6.94	ND	ND	ND	ND
6/11/2011	GP	19	2.5	12	170	7.05	ND	ND	ND	ND
6/18/2011	GP	26	2.1	11	79	7.22	ND	ND	ND	ND
7/9/2011	GP	20	3.2	9.2	150	6.8	ND	ND	ND	ND
7/16/2011	PP	27	1.7	10	100	7.39	ND	ND	ND	ND
8/6/2011	GP	31	2.6	9	210	7.15	10	ND	ND	ND
8/13/2011	GP	18	0	9.4	150	7.14	ND	ND	ND	ND
9/3/2011	GP	25	3.8	8.2	180	7.28	ND	ND	ND	ND
Average		20.34	3.01	11	158.78					
Max		31.00	7.60	16	220					
Min		8.40	0	8	79					
Median		20.0	2.60	10	170					
STD Dev		7.88	2.06	2	46.16					
<b>Alaska WQC</b>		<b>1</b>	<b>3.1</b>	<b>8.2</b>	<b>81</b>	<b>&lt;6.5, &gt;8.5</b>	<b>43</b>			<b>0.0075</b>
<b>Permit Limits</b>		<b>143</b>	<b>133</b>	<b>63</b>	<b>395</b>	<b>&lt;6.5, &gt;8.5</b>	<b>43</b>	<b>150</b>	<b>60</b>	<b>0.01</b>

### Holland America Line (HAL)

Holland America operated seven cruise ships in Alaska in 2011; of these, three vessels discharged and were sampled. All three of these vessels were authorized for stationary discharge of treated wastewater. The Zaandam was authorized for and had underway discharges only from late June to mid-August, and was authorized for and had stationary and underway discharge the rest of the cruise season. All HAL ships used Zenon treatment systems. The Volendam was granted an exemption to being sampled twice in September 2011 due to the short time the ship was in Alaskan waters.

- The Statendam had no exceedances of the 2010 General Permit limits in 2011.
- The Zaandam had two exceedances of the stationary ammonia daily maximum limit.
- The Voldendam had one exceedance of dissolved zinc and one of the pH daily minimum. The pH exceedance was well within the allowable error of the instrument used to measure pH and was not a violation.

### Holland America 2011 Sampling

Ship Name	Sample Date	Discharge status	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
			Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
Statendam	5/25/2011	Underway	GP	42	3.1	20	40	7.47	ND	ND	4	ND
Statendam	5/26/2011	Underway	GP	41	2.3	26	75	7.63	ND	ND	ND	ND
Statendam	6/9/2011	Underway	GP	17	3.6	23	73	7.26	ND	ND	3.2	ND
Statendam	6/16/2011	Underway	PP	21	1.9	24	1.4	7.22	ND	ND	4.8	ND
Statendam	7/14/2011	Underway	GP	28	1.3	23	88	7.24	ND	ND	9.5	ND
Statendam	7/28/2011	Underway	GP	40	6.2	18	61	7.23	ND	ND	4.6	ND
Statendam	8/18/2011	Underway	GP	32	8.4	12	76	7.12	ND	ND	9.7	ND
Statendam	8/25/2011	Underway	GP	45	3.4	17	5.5	7.57	ND	ND	11	ND
Statendam	9/1/2011	Underway	PP	31	2.3	20	13	7.43	ND	ND	7.8	ND
Statendam	9/8/2011	Underway	GP	34	4.3	28	23	7.28	ND	ND	9.5	ND
Volendam	5/27/2011	Stationary	GP	0.24	45	15	220	6.64	ND	ND	ND	ND
Volendam	5/30/2011	Stationary	GP		24	14	170	6.95	ND	ND	ND	ND
Volendam	6/3/2011	Stationary	PP	4.6	12	13	93	7.04	ND	ND	ND	ND
Volendam	6/17/2011	Stationary	GP	1.5	45	12	110	6.57	ND	ND	ND	ND
Volendam	7/1/2011	Stationary	GP	1.4	29	16	100	6.79	ND	ND	ND	ND
Volendam	7/15/2011	Stationary	GP	2.4	19	14	180	6.49	ND	ND	ND	ND
Volendam	8/5/2011	Stationary	PP	4.7	9.6	8.4	77	6.97	ND	ND	ND	ND
Volendam	8/12/2011	Stationary	GP	10	3.1	7.2	64	7.17	ND	ND	ND	ND
Volendam	8/19/2011	Stationary	GP	8.7	6	7	51	6.99	ND	ND	ND	ND
Volendam	9/2/2011	Stationary	GP	3.7	8.5	9.8	99	7.03	ND	ND	ND	ND
Zaandam	5/18/2011	Stationary	GP	35	10	33	71	7.2	ND	ND	2.9	ND
Zaandam	5/26/2011	Stationary	GP	33	4.1	25	80	7.43	ND	ND	2.4	ND
Zaandam	6/1/2011	Stationary	UA		2.7	16	21	7.27	ND	ND	2.2	ND
Zaandam	6/23/2011	Underway	UA	16	2.8	5.4	63	7.26	ND	10	2	ND
Zaandam	6/29/2011	Underway	GP	18	3.8	8.9	56	7.15	ND	ND	ND	ND
Zaandam	7/21/2011	Underway	GP	18	3.6	11	75	7.12	ND	ND	ND	ND
Zaandam	7/27/2011	Underway	GP	13	2.8	8.9	76	6.99	ND	ND	ND	ND
Zaandam	8/10/2011	Underway	GP	21	1.5	9.6	35	7.17	ND	ND	ND	ND
Zaandam	8/18/2011	Underway	GP	20	6.8	11	67	7.33	ND	ND	2.8	ND
Zaandam	8/24/2011	Stationary	GP	19	4.9	10	24	7.2	ND	ND	2.7	ND
Zaandam	9/1/2011	Stationary	UA	15	4.5	8.2	44	7.32	ND	ND	ND	ND
Zaandam	9/15/2011	Stationary	GP	25	3.4	9.1	18	7.33	ND	ND	ND	ND

Average	20.04	9.03	15.11	70.31
Max	45.00	45.00	33.00	220.00
Min	0.24	1.30	5.40	1.40
Median	18.5	4.2	13.5	69.0
STD Dev	13.59	11.39	7.05	48.91

Alaska WQC	1	3.1	8.2	81	<6.5, >8.5	43			0.0075
Underway Permit Limits	51	50	40	188	<6.5, >8.5	43	150	60	0.01
Stationary Permit Limits	28	50	40	188	<6.5, >8.5	43	150	60	0.01

### Norwegian Cruise Line (NCL)

Norwegian Cruise Line operated two cruise ships in Alaska in 2011. Both ships were authorized to and did have underway discharges wastewater treated by a Scanship wastewater treatment system. All samples were taken while underway.

- The Norwegian Pearl had one exceedance of the fecal coliform daily maximum.
- The Norwegian Star had one exceedance of the fecal coliform daily maximum and one exceedance of the daily minimum for pH.



### Norwegian Cruise Line 2011 Sampling

Ship Name	Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
		Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
Pearl	5/11/2011	GP	14	8	16	220	6.75	7	ND	4.6	ND
Pearl	5/18/2011	PP	23	4.5	4.6	36	7.15	10	ND	11	ND
Pearl	6/8/2011	GP	17	3.4	4.4	83	6.96	30	ND	12	ND
Pearl	6/15/2011	GP	24	3.1	4	31	6.58	ND	ND	20	ND
Pearl	7/6/2011	PP	20	3.1	3.6	37	6.89	48	ND	9.8	ND
Pearl	7/20/2011	GP	28	5.3	4.2	83	6.84	ND	4	9	ND
Pearl	8/10/2011	GP	31	4.2	4.7	110	6.77	4	4	7.8	ND
Pearl	8/24/2011	GP	26	4.6	3.7	37	6.9	ND	4	8.8	ND
Pearl	9/7/2011	GP	31	4.2	4.5	31	6.95	ND	ND	6.3	ND
Pearl	9/14/2011	GP	29	3.9	4.2	45	6.85	ND	ND	4.6	ND
Star	5/12/2011	GP	9.5	5	4.6	88	6.6	1	ND	2	ND
Star	5/17/2011	GP	9.1	6.4	5.3	110	6.38	ND	ND	2.1	ND
Star	6/7/2011	PP	11	2.8	6.6	31	6.51	3	9	26	ND
Star	6/14/2011	GP	29	3	4.4	93	6.6	ND	ND	ND	ND
Star	7/6/2011	PP	18	12	5	39	7.4	ND	10	2.5	ND
Star	7/12/2011	GP	21	9.6	5.1	94	6.6	ND	ND	3.2	ND
Star	8/9/2011	GP	16	18	6.3	140	6.87	6	12	3.7	ND
Star	8/23/2011	GP	12	5.4	5	36	6.64	20	ND	2.5	ND
Star	9/6/2011	GP	9.6	3.6	7.6	27	6.65	62	6	8.6	ND
Star	9/14/2011	GP	15	2.7	5.7	37	6.68	ND	6	6.8	ND
Average			19.66	5.64	5.48	70.40					
Max			31	18	16	220					
Min			9.1	2.7	3.6	27					
Median			19.0	4.4	4.7	42.0					
STD Dev			7.61	3.78	2.67	49.17					
Alaska WQC			1	3.1	8.2	81	<6.5, >8.5	43	0.0075		
Underway Permit Limits			68	26	28	267	<6.5, >8.5	43	150	60	0.01

### Oceania Cruises

Oceania Cruises operated one ship, the Oceania Regatta, in Alaska in 2011. The Oceania Regatta was authorized to and did discharge treated wastewater while stationary and underway through a Triton wastewater treatment system. Since this was a newly installed treatment system that had not been previously used in Alaska, Table 7 (Other Wastewater Treatment Systems) of the 2010 General Permit was used to establish permitted effluent limits for the Regatta. This system had two independent wastewater treatment systems (port and starboard) and used ion exchange to reduce the concentration of specific dissolved metals. Both systems had some start up difficulties during 2011. The Regatta was granted an exemption to being sampled twice in September 2011 due to the short time the ship was in Alaskan waters.

- The Oceania Regatta had four exceedances of the stationary limit for ammonia.
- The Oceania Regatta had five exceedances for pH. One of the pH exceedances was within the error range of the instrument used to measure pH and was not a violation.

### Regatta 2011 Sampling

Regatta 2011 Sampling											
AWTS Unit	Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
		Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
Port	5/20/2011	GP	14	5.4	11	75	7.25	ND	ND	ND	ND
Port	5/31/2011	GP		9	12	88	6.94	ND	ND	ND	ND
Port	6/9/2011	GP	22	8.2	11	120	7.28	ND	ND	2.5	ND
Port	6/21/2011	PP	21	3.7	13	130	7.24	ND	ND	ND	ND
Port	7/15/2011	GP	5	6.9	7	90	6.91	ND	ND	ND	ND
Port	7/29/2011	PP	0.37	6.8	9	46	6.54	ND	ND	3.1	ND
Port	8/11/2011	GP	30	18	8.2	7.3	5.56	ND	ND	2.5	ND
Port	8/19/2011	GP	74	19	5.8	0	5.24	ND	ND	2	ND
Port	9/2/2011	GP	15	26	7.3	30	6.47	ND	ND	2.5	ND
Starboard	5/20/2011	GP	13	3.7	11	64	7.23	ND	ND	ND	ND
Starboard	5/31/2011	GP		20	13	170	7.15	ND	ND	ND	ND
Starboard	6/9/2011	GP	45	15	13	92	7.43	ND	ND	4.3	ND
Starboard	6/25/2011	PP	36	4.2	12	110	7.3	ND	ND	ND	ND
Starboard	7/15/2011	GP	0.15	11	7	110	7.09	ND	ND	2.4	ND
Starboard	7/29/2011	PP	0.47	4.1	7	77	6.84	ND	ND	ND	ND
Starboard	8/11/2011	GP	7.2	11	4.3	15	6.11	ND	ND	2.5	ND
Starboard	8/19/2011	GP	15	11	5	34	6.09	ND	ND	ND	ND
Starboard	9/2/2011	GP	8.2	6.9	7.8	130	6.9	ND	ND	ND	ND
Average			19.15	10.55	9.13	77.13					
Max			74	26	13	170					
Min			0.2	3.7	4.3	0					
Median			14.5	8.6	8.6	82.5					
STD Dev			19.52	6.54	2.90	47.67					
Alaska WQC			1	3.1	8.2	81	<6.5, >8.5	43	0.0075		
Stationary Permit Limits			28	87	43	360	<6.5, >8.5	43	150	60	0.01

## Princess Cruises

Princess Cruises operated six ships that visited Alaska in 2011. All six ships were authorized to and did discharge treated wastewater while underway in Alaska. Two ships (the Golden Princess and the Sapphire Princess) were permitted to discharge treated graywater-only continuously (stationary and while underway). Princess wastewater treatment systems were all manufactured by Hamworthy. The Sea Princess had no exceedances of the 2010 General Permit limits in 2011.

- The Coral and Island Princess each had one exceedance of the fecal coliform daily maximum.
- The Diamond Princess had one exceedance for ammonia.
- The Sapphire Princess had one exceedance for each ammonia, copper, and nickel while underway. The Sapphire Princess also had two exceedances of copper and one of zinc while stationary (less than 6 knots).
- The Golden Princess had two underway exceedances of the BOD monthly average, and two exceedances of the BOD daily maximum (with additional two exceedances of the monthly averages) while stationary and one exceedance of the pH daily minimum. The pH exceedances was within the error range of the instrument that was used to determine pH and was not a violation. Several ammonia sample results are not available due to holding time or temperature exceedances during shipping.

**Princess 2011 Graywater Only Sampling**

Ship Name	Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
		Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
Golden	5/16/2011	GP	0.13	9.3	11	120	6.92	ND	ND	9.2	ND
Golden	5/23/2011	GP	0.22	9.4	14	120	6.93	ND	ND	3.1	ND
Golden	6/6/2011	PP	0	8.4	8.9	41	7.09	ND	ND	13	ND
Golden	6/13/2011	GP	0.13	3.7	6	69	7	ND	ND	24	ND
Golden	6/20/2011	USCG					6.53	ND	ND	83	ND
Golden	7/11/2011	GP	0.78	4.3	8.3	120	7.39	ND	ND	28	ND
Golden	7/18/2011	PP	0.19	6.8	11	93	7	ND	ND	ND	ND
Golden	8/1/2011	GP	0.51	3.3	14	100	6.72	ND	ND	8.3	ND
Golden	8/15/2011	GP	0	14	12	75	6.62	ND	ND	7	ND
Golden	9/5/2011	GP	6.5	6.5	11	69	7.21	ND	ND	2.5	ND
Golden	9/12/2011	GP	0.19	4.3	10	15	6.45	ND	ND	90	ND
Sapphire	5/18/2011	GP	2.7	100	45	200	7.2	ND	ND	ND	ND
Sapphire	5/25/2011	PP	1.7	90	44	64	6.83	ND	ND	2.5	ND
Sapphire	6/8/2011	GP	1.8	30	31	110	7.08	ND	ND	2.9	ND
Sapphire	6/15/2011	GP	2.3	43	27	60	6.98	ND	ND	5.7	ND
Sapphire	7/13/2011	GP	1.1	32	34	200	6.72	ND	ND	3.7	ND
Sapphire	7/20/2011	GP	1.3	22	34	170	6.7	ND	ND	8	ND
Sapphire	8/3/2011	PP	1	15	24	160	6.86	ND	ND	6.8	ND
Sapphire	8/10/2011	GP	1.3	27	38	400	6.73	ND	ND	ND	ND
Sapphire	9/7/2011	GP	2.6	37	25	190	6.67	ND	ND	ND	ND
Sapphire	9/14/2011	GP	0.42	40	24	220	6.63	ND	ND	2.2	ND
Average			1.24	25.30	21.61	129.80					
Max			7	100	45	400					
Min			ND	3.3	6.0	15.0					
Median			0.9	14.5	19.0	115.0					
STD Dev			1.51	27.21	12.62	86.07					
Alaska WQC			1	3.1	8.2	81	<6.5, >8.5	43			0.0075
Underway Permit Limits			51	50	40	188	<6.5, >8.5	43	150	60	0.01
Monthly Permit Limits								14		30	

Princess 2011 Sampling

Ship Name	Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
		Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
Coral	5/24/2011	GP	23	8.6	6.6	190	7.05	ND	ND	2.3	ND
Coral	5/25/2011	GP	21	11	6.4	170	7.05	ND	ND	ND	ND
Coral	6/1/2011	PP		6.6	14	75	7.34	ND	ND	ND	ND
Coral	6/14/2011	GP	65								
Coral	6/15/2011	GP	29	12	8.9	90	7.23	ND	ND	ND	ND
Coral	7/13/2011	GP	35	7.7	7.3	56	7.28	ND	ND	ND	ND
Coral	7/19/2011	GP	37	4.5	5.8	100	7.21	ND	ND	ND	ND
Coral	8/2/2011	GP	39	11	5.5	110	7.12	ND	ND	2.7	ND
Coral	8/11/2011	GP	13	4.8	8.1	67	6.82	85	ND	ND	ND
Coral	8/30/2011	GP									
Coral	9/7/2011	GP	25	13	10	110	6.99	ND	ND	3.9	ND
Coral	9/14/2011	GP	27	13	7.1	86	7.11	ND	ND	ND	ND
Diamond	5/25/2011	GP	52	6.6	16	180	7.55	ND	ND	ND	ND
Diamond	5/31/2011	GP		5.7	20	150	7.49	ND	ND	ND	ND
Diamond	6/8/2011	GP	52	3.5	15	160	7.55	ND	ND	2.9	ND
Diamond	6/15/2011	PP	86	9.3	14	100	7.74	ND	ND	2.6	ND
Diamond	7/6/2011	GP	68	6.3	14	160	7.54	ND	ND	ND	ND
Diamond	7/20/2011	GP	70	4.5	15	190	7.65	ND	ND	4.1	ND
Diamond	8/3/2011	PP	80	4.7	13	79	7.65	ND	ND	8.5	ND
Diamond	8/17/2011	GP	82	5.4	11	99	7.53	ND	ND	13	ND
Diamond	9/7/2011	GP	150	8.3	14	110	7.86	ND	ND	2.2	ND
Diamond	9/14/2011	GP	79	5.7	14	110	7.46	ND	ND	2.6	ND
Golden	5/17/2011	GP	0.37	5.7	10	140	6.97	33	ND	15	ND
Golden	5/24/2011	GP	1	5.5	14	130	7.03	ND	ND	7.9	ND
Golden	6/7/2011	PP	0.17	5.6	11	70	7.06	ND	ND	13	ND
Golden	6/14/2011	GP	1.9	2.3	10	6.8	6.92	ND	ND	19	ND
Golden	7/12/2011	GP	1	4.4	10	150	6.84	ND	ND	40	ND
Golden	7/19/2011	PP	0.63	5.2	11	98	8.06	ND	ND	39	ND
Golden	8/2/2011	GP	0.7	2.9	14	79	6.76	ND	ND	30	ND
Golden	8/16/2011	GP	1.5				6.87	ND	ND	7	ND
Golden	8/29/2011	GP		5.7	12	110					
Golden	9/6/2011	GP	24	10	12	70	7.61	ND	ND	5.3	ND
Golden	9/13/2011	GP	4.8	3.7	12	30	6.93	2	ND	58	ND
Island	5/21/2011	GP	87	60	6.5	100	7.4	ND	ND	ND	ND
Island	5/30/2011	GP		18	6	130	7.25	ND	ND	ND	ND
Island	6/4/2011	GP	28	45	8.2	150	7.05	ND	ND	ND	ND
Island	6/12/2011	PP	41	15	7.3	82	7.28	ND	ND	2.5	ND
Island	7/11/2011	GP	25	8.3	7.1	56	7.17	ND	ND	ND	ND
Island	7/24/2011	GP	65	3.2	7.4	98	7.83	ND	ND	3.4	ND
Island	8/8/2011	GP	26	4.3	6.8	120	7.11	45	ND	ND	ND
Island	8/27/2011	GP	32	21	9.2	72	7	ND	ND	ND	ND
Island	9/4/2011	PP	59	8	7.7	77	7.28	ND	ND	ND	ND
Island	9/10/2011	GP	91	8.8	8	45	7.4	ND	ND	ND	ND
Sapphire	5/18/2011	GP	12	77	33	140	8	ND	ND	14	ND
Sapphire	5/25/2011	UA	34	93	34	60	8.02	ND	ND	3.6	ND
Sapphire	6/2/2011	GP	52	61	44	140	7.9	8	ND	4	ND
Sapphire	6/9/2011	GP	160	370	75	130	8.23	ND	ND	8	ND
Sapphire	7/14/2011	GP	0	29	32	150	8	ND	ND	11	ND
Sapphire	7/21/2011	GP	66	15	31	170	7.72	5	ND	45	ND
Sapphire	8/11/2011	GP	71	14	26	140	8.04	ND	ND	49	ND
Sapphire	8/24/2011	GP	70	22	29	120	8.18	ND	ND	4.5	ND
Sapphire	9/8/2011	GP	61	29	28	120	7.77	ND	ND	15.9	ND
Sapphire	9/14/2011	GP	70	32	22	190	7.81	ND	ND	24	ND
Sea	5/14/2011	GP	59	28	4.7	90	7.52	ND	ND	ND	ND
Sea	5/24/2011	GP	45	39	5.8	99	7.1	ND	4	ND	ND
Sea	6/3/2011	UA	36	23	6.4	51	7.31	ND	ND	ND	ND
Sea	6/23/2011	GP	17	25	4.3	54	7.04	ND	ND	ND	ND
Sea	7/3/2011	GP	33	4.1	4.8	8.1	7.13	ND	ND	ND	ND
Sea	7/13/2011	GP	41	33	7.1	47	7.09	ND	ND	ND	ND
Sea	8/12/2011	GP	59	22	5.6	29	7.47	ND	ND	2	ND
Sea	8/24/2011	GP	67	28	28	43	7.15	ND	ND	4.6	ND
Sea	9/1/2011	UA	44	18	6.9	67	7.27	ND	ND	4	ND
Sea	9/2/2011	GP	110	13	5.8	62	7.56	ND	ND	4.8	ND
Average			45.35	22.83	14.16	101.93					
Max			160	370	75	190					
Min			ND	2.3	4.3	6.8					
Median			40.0	9.7	10.0	99.5					
STD Dev			35.03	49.12	11.96	45.73					
Alaska WQC			1	3.1	8.2	81	<6.5, >8.5	43			0.0075
Underway Permit Limits			51	50	40	188	<6.5, >8.5	43	150	60	0.01
Monthly Permit Limits								14		30	

## Regent Seven Seas Cruises

Regent operated one ship, the Seven Seas Navigator, in Alaska in 2011. The Seven Seas Navigator was authorized for and did have underway discharges treated by a Scanship treatment system. The Seven Seas Navigator was granted an exemption to being sampled twice in September 2011 due to the short time the ship was in Alaskan waters.

- The Seven Seas Navigator had one exceedance of the fecal coliform daily maximum.

**Seven Seas Navigator 2011 Sampling**

Sample Date	Units	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Type	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	TR Chlorine
5/19/2011	GP	6.6	5.2	10	130	6.6	40	9	9	ND
5/28/2011	PP	26	4.7	8.2	24	6.99	2	6	8.4	ND
6/11/2011	GP	24	1.7	5.4	27	6.69	5	11	4.5	ND
6/25/2011	GP	22	1.8	4.8	14	7	12	7	4.6	ND
7/2/2011	PP	21	2.7	4.8	7	6.99	4	6	5.1	ND
7/9/2011	GP	26	3.4	6.9	9.3	7.03	110	ND	39	ND
7/16/2011	GP						13			
8/6/2011	GP	18	2.9	6.1	20	6.68	ND	11	5.6	ND
8/13/2011	GP	22	8.9	8.6	7	6.61	2	46	9.7	ND
9/6/2011	GP	10	2.5	7	24	6.87	6	4	3.3	ND
Average		19.51	3.76	6.87	29.14					
Max		26	9	10	130					
Min		6.6	1.7	4.8	7					
Median		22.0	2.9	6.9	20.0					
STD Dev		6.88	2.27	1.80	38.60					
<b>Alaska WQC</b>		<b>1</b>	<b>3.1</b>	<b>8.2</b>	<b>81</b>	<b>&lt;6.5, &gt;8.5</b>	<b>43</b>			<b>0.0075</b>
<b>Underway Permit Limits</b>		<b>68</b>	<b>26</b>	<b>28</b>	<b>267</b>	<b>&lt;6.5, &gt;8.5</b>	<b>43</b>	<b>150</b>	<b>60</b>	<b>0.01</b>

## 3. 2011 SUMMARY

Large cruise ships have been required to meet federal secondary treatment standards (fecal coliform, pH, total residual chlorine, biochemical oxygen demand, and total suspended solids) for wastewater discharges since 2001. Treatment systems installed during or after the year 2001 were designed to meet these secondary treatment standards. Ballot Measure 2 of 2006 required DEC to issue wastewater discharge permits to cruise ships and required cruise ships to meet Alaska Water Quality Criteria at the point of discharge (i.e. no mixing zone). Cruise ships were able to meet this requirement for all constituents except ammonia and dissolved copper, nickel, and zinc. The 2008 and 2010 General Permit allowed interim limits more stringent than WQC while working towards meeting long-term limits of WQC at the point of discharge.

### 3.1. 2010 Large Cruise Ship General Permit limit exceedances

Under the 2010 General Permit, ammonia and dissolved copper were expected to be the most difficult limits for cruise ships to meet. Cruise ships reported 33 exceedances of permit limits in 2011, as follows:

- 8 exceedances for pH (n=179 samples, 95.5% compliance);

- 8 exceedances for ammonia (n=172, 95.3% compliance);
- 3 exceedances for dissolved copper (n=178, 98.3% compliance);
- 1 exceedance for dissolved nickel (n=178, 99.4% compliance);
- 2 exceedances for dissolved zinc (n=178, 98.9% compliance);
- 6 exceedances for biochemical oxygen demand (including monthly average exceedances; n=179, 96.6%); and
- 5 exceedances for fecal coliform bacteria (n=181, 97.2% compliance.)
- There were no exceedances of total residual chlorine or total suspended solids.

In 2011, exceedances of the limits established before Ballot Measure 2 (BOD, fecal coliform, pH) was greater than the number of exceedances of ammonia and dissolved metals permit limits. The number of pH exceedances was greater in 2011 than any other prior year since the first general permit was issued.

### **3.2. Exceedances of Alaska water quality criteria at the point of discharge**

Every discharging ship had at least one exceedance of Water Quality criteria at the point of discharge for ammonia and dissolved copper. The Carnival Spirit and the Norwegian Star were the only cruise ships that met the Water Quality criteria for dissolved nickel 100% of the time (n=10 for each ship.) The Carnival Spirit and the Zaandam were the only ships that met Water Quality criteria for dissolved zinc 100% of the time (n=10 and n=12, respectively.)

### **3.3. Quality assurance of sample results**

The number of samples that did not comply with the Quality Assurance Project Plan (QAPP) was significantly reduced from the high number discovered in 2010. DEC is still concerned with sample quality assurance, representativeness, and avoidance of sampling errors. DEC will continue to carefully review and audit sampling events.

### **3.4. Additional information**

For a map of the 2010 Large Cruise Ship General Permit boundaries in Southeast, please see Appendix 4. For other useful websites, please see Appendix 5.

## APPENDIX 1. GENERAL PERMIT LIMITS

The 2010 Large Cruise Ship General Permit:

- Required that discharges meet effluent limits for listed sampled parameters<sup>1</sup>. The permitted limits are based on the stricter of either the Water Quality Criteria multiplied by the dilution factor used; or the historical (2004-2009) effluent performance of each treatment system.
- Created limits for two types of discharge- underway (speed of over six knots) and stationary<sup>2</sup>.
- Prohibited discharge into impaired waterways such as Skagway Harbor.
- Prohibited discharge of foam, oily wastes, garbage, or grease into State waters.
- Required owners/operators to submit signed Notice of Intent to Discharge that lists treatment, storage, and contact information. Discharge is prohibited until DEC authorization.
- Required companies to certify that they don't use tributyltin paints.
- Required sampling twice per month for: biological oxygen demand (BOD), fecal coliform bacteria, total residual chlorine, ammonia, dissolved metals (copper, nickel and zinc), pH, and total suspended solids (TSS). Samples must be taken while the ship is discharging in Alaskan waters.
- Required sampling for Volatile Organic Compounds, Base Neutral Acids, metals, and several other parameters twice per season.
- Required Monthly submission of Discharge Monitoring Reports containing sample data.

The effluent limits listed in the 2010 Wastewater General Permit are summarized in the table below. Limits for ammonia, copper, nickel, and zinc are listed in Table A-2.

**Table A-1: Effluent Limits and Discharge Reporting**

Effluent Characteristics	Minimum Value <sup>1</sup>	Monthly Average <sup>1</sup>	Daily Maximum <sup>1</sup>	Minimum Frequency	Sample Type
Total Flow (cubic meters per day of effluent)	N/A	Not to exceed design capacity Report	Not to exceed design capacity Report	Daily	Metered or estimated
Biochemical Oxygen Demand (5-day)	N/A	30 mg/L	60 mg/L	Twice Monthly	Grab
Fecal Coliform Bacteria	N/A	14 per 100 mL <sup>2</sup>	43 per 100 mL	Twice Monthly	Grab
Total Residual Chlorine	N/A	N/A	0.0075 mg/L <sup>3</sup>	Twice Monthly	Field test
Ammonia	N/A	N/A	Varies by treatment system	Twice Seasonally	Grab
Copper	N/A	N/A	Varies by treatment system	Twice Seasonally	Grab
Nickel	N/A	N/A	Varies by treatment system	Twice Seasonally	Grab
Zinc	N/A	N/A	Varies by treatment system	Twice Seasonally	Grab
pH	6.5 S.U.	N/A	8.5 S.U.	Twice Monthly	Field test, grab, or continuous

<sup>1</sup> Listed in Tables 1 through 7 of the 2010 ADEC wastewater General Permit

<sup>2</sup> Geometric mean



Effluent Characteristics	Minimum Value <sup>1</sup>	Monthly Average <sup>1</sup>	Daily Maximum <sup>1</sup>	Minimum Frequency	Sample Type
Total Suspended Solids	N/A	N/A	150 mg/L	Twice Monthly	Grab or Continuous
Conductivity	N/A	N/A	Report	Twice Seasonally	Field test, grab, or continuous
Chemical Oxygen Demand	N/A	N/A	Report	Twice Seasonally	Grab
Nitrate-Nitrogen (N-NO <sub>3</sub> )	N/A	N/A	Report	Twice Seasonally	Grab
Total phosphorus	N/A	N/A	Report	Twice Seasonally	Grab
Total Kjeldahl Nitrogen (TKN)	N/A	N/A	Report	Twice Seasonally	Grab
Total Organic Carbon	N/A	N/A	Report	Twice Seasonally	Grab
Base-Neutral Acid extractables (BNA)	N/A	N/A	Report	Twice Seasonally	Grab
Volatile Organic Compounds (VOCs)	N/A	N/A	Report	Twice Seasonally	Grab

**Notes:**

1. Milligrams per liter (mg/L); milliliter (mL); Standard Units (S.U.)
2. The “monthly average” is the average of all samples taken during the calendar month. If only one sample is collected, the result of that sample is the monthly average.
3. Analytical results below the method detection limit shall be deemed compliant with the effluent limits.

**Table A-2: 2010 Effluent Limits for Ammonia and Dissolved Metals**

Ammonia Limits as mg/L	2008 Long Term Limit	2008 Interim Limit	2010 Underway Limit	2010 Stationary Limit
Hamworthy	2.9	80.4	143	28
Marisan	2.9	80.4	20	20
Other	2.9	80.4	130	28
Rochem	2.9	80.4	12	12
Scanship	2.9	80.4	68	28
Zenon	2.9	80.4	51	28
Copper Limits as µg/L	2008 Long Term Limit	2008 Interim Limit	2010 Underway Limit	2010 Stationary Limit
Hamworthy	3.1	66	133	87
Marisan	3.1	66	157	87
Other	3.1	66	130	87
Rochem	3.1	66	10	10
Scanship	3.1	66	26	26
Zenon	3.1	66	50	50
Nickel Limits as µg/L	2008 Long Term Limit	2008 Interim Limit	2010 Underway Limit	2010 Stationary Limit
Hamworthy	8.2	180	63	63
Marisan	8.2	180	24	24
Other	8.2	180	43	43
Rochem	8.2	180	10	10
Scanship	8.2	180	28	28
Zenon	8.2	180	40	40
Zinc Limits as µg/L	2008 Long Term Limit	2008 Interim Limit	2010 Underway Limit	2010 Stationary Limit
Hamworthy	82	230	395	395
Marisan	82	230	112	112
Other	82	230	360	360
Rochem	82	230	118	118
Scanship	82	230	267	267
Zenon	82	230	188	188

## APPENDIX 2. VESSEL SPECIFIC INFORMATION

Company	Vessel Name	Passenger Capacity <sup>2</sup>	Voyage Count	Total Passengers <sup>5</sup>	Crew Capacity	Blackwater (BW) Treatment System	Graywater (GW) Treatment if different	Permitted to discharge in Alaska in 2011 <sup>3</sup>		Alaska DEC Approval Discharge Type	Exceedances of 2010 GP Limits <sup>7</sup>
								BW	GW		
1 Carnival CL	<i>Carnival Spirit</i>	2150	18	38,700	934	Rodem Bio-filtration	Rodem RO	No	Yes <sup>4</sup>	Continuous	0
2 Celebrity Cruises	<i>Century</i>	1812	18	32,616	Unknown	Unknown	Unknown	No	No	No	0
3 Celebrity Cruises	<i>Infinity</i>	2449	19	46,531	930	Zenon		No	No	No	0
4 Celebrity Cruises	<i>Millennium</i>	2449	17	41,633	1001	Hydroxyl Cleansea		No	No	No	0
5 Crystal Cruises	<i>Symphony</i>	940	9	8,460	Unknown	Unknown	Unknown	No	No	No	0
6 Disney	<i>Wonder</i>	2834	18	51,012	920	Hamworthy Bioreactor		Yes	Yes	Underway	0
7 Holland America	<i>Amsterdam</i>	1380	11	15,180	647	Unknown	Unknown	No	No	No	0
8 Holland America	<i>Oosterdam</i>	1916	20	38,320	800	Rodem Bio-filtration		No	No	No	0
9 Holland America	<i>Statendam</i>	1260	18	22,680	588	Zenon		Yes	Yes	Continuous	0
10 Holland America	<i>Volendam</i>	1432	17	24,344	647	Zenon		Yes	Yes	Continuous	2
11 Holland America	<i>Westerdam</i> <sup>6</sup>	1916	20	38,320	Unknown	Rodem Bio-filtration	Ovivo	No	No	No	0
12 Holland America	<i>Zaandam</i>	1432	19	27,208	647	Zenon		Yes	Yes	Continuous	2
13 Holland America	<i>Zuiderdam</i>	1916	19	36,404	Unknown	Rodem Bio-filtration		No	No	No	0
14 Norwegian CL	<i>Norwegian Pearl</i>	2394	20	47,880	1100	Scanship		Yes	Yes	Underway	1
15 Norwegian CL	<i>Norwegian Star</i>	2348	20	46,960	1100	Scanship		Yes	Yes	Underway	2
16 Oceania	<i>Regatta</i>	777	9	6,993	Unknown	Triton		Yes	Yes	Continuous	9
17 P&O	<i>Arcadia</i>	2019	1	2,019	Unknown	Unknown	Unknown	No	No	No	0
18 Princess CL	<i>Coral Princess</i>	1974	18	35,532	900	Hamworthy Bioreactor		Yes	Yes	Underway	1
19 Princess CL	<i>Diamond Princess</i>	2678	20	53,560	1238	Hamworthy Bioreactor		Yes	Yes	Underway	1
20 Princess CL	<i>Golden Princess</i>	2636	19	50,084	1060	Hamworthy Bioreactor		Yes	Yes	Continuous (GW)/ Underway (BW and GW)	7
21 Princess CL	<i>Island Princess</i>	1974	18	35,532	900	Hamworthy Bioreactor		Yes	Yes	Underway	1
22 Princess CL	<i>Sapphire Princess</i>	2678	18	48,204	1238	Hamworthy Bioreactor		Yes	Yes	Continuous (GW)/ Underway (BW and GW)	6
23 Princess CL	<i>Sea Princess</i>	2016	13	26,208	854	Hamworthy Bioreactor		Yes	Yes	Underway	0
24 Prestige Cruises	<i>Seven Seas Navigator</i>	540	16	8,640	350	Scanship		Yes	Yes	Underway	1
25 Royal Caribbean	<i>Radiance of the Seas</i>	2501	14	35,014	859	Hamman		No	No	No	0
26 Royal Caribbean	<i>Rhapsody of the Seas</i>	2435	17	41,395	Unknown	Hamman		No	No	No	0
27 Silver Seas	<i>Silver Shadow</i> <sup>6</sup>	382	16	6,112	305	Bio Epure/Marisan		Yes	Yes	Continuous	0
		<b>Totals</b>	<b>442</b>	<b>865,541</b>						<b>Totals</b>	<b>33</b>

In Grey- These vessels registered to not discharge in Alaska waters during the 2011 season.

<sup>1</sup> A large vessel has overnight accommodations for 250 or more passengers.

<sup>2</sup> Capacity is calculated from Registration, Vessel Specific Sampling Plan, or Notice of Intent. Actual number of passenger aboard varies dependent upon sales.

<sup>3</sup> Alaska water includes all waters in the Alexander Archipelago and extends 3 miles from the coastline.

<sup>4</sup> Galley graywater not discharged

<sup>5</sup> Assumes full capacity on every voyage

<sup>6</sup> Registered to discharge but did not report discharges in Alaskan waters.

<sup>7</sup> Some NOV's are issued for multiple exceedances. Some exceedances did not result in an NOV because they were within the allowable error of the sampling technique.

# APPENDIX 3: 2011 LARGE CRUISE SHIP WASTEWATER SAMPLE DATA

Table A-3: Semi-monthly parameters

2011 SemiMonthly General Permit Sample Results										ND= Non-detect						
Company	Vessel	Treatment System	Wastewater Type	Sample Date	Type	Ammonia	Copper	Nickel	Zinc	pH	S.U.	100 ml Coliform	mg/L TSS	mg/L BOD	mg/L Chlorine	Total Residual
Carnival	Spirit	Rochem BIP	Graywater	5/15/2011	GP	0.83	7.28	0	36.3	6.5	ND	0.7	22.92	ND		
Carnival	Spirit	Rochem BIP	Graywater	5/22/2011	UA	0.63	1.43	0	3.73	7.15	ND	ND	6.14	ND		
Carnival	Spirit	Rochem BIP	Graywater	6/12/2011	GP	0.52	4.31	0	0	7.44	ND	ND	8.07	ND		
Carnival	Spirit	Rochem BIP	Graywater	6/19/2011	GP	0.63	2.08	0	0	8.02	ND	ND	5.57	ND		
Carnival	Spirit	Rochem BIP	Graywater	7/10/2011	GP	0.62	1.37	0	0	7.45	ND	ND	5.86	ND		
Carnival	Spirit	Rochem BIP	Graywater	7/17/2011	UA	1.2	1.43	0	3.73	6.75	ND	ND	4.63	ND		
Carnival	Spirit	Rochem BIP	Graywater	8/14/2011	GP	0.63	1.25	0	20.3	7.7	ND	ND	5.4	ND		
Carnival	Spirit	Rochem BIP	Graywater	8/28/2011	GP	0.49	0	0	0	7.46	ND	ND	6.24	ND		
Carnival	Spirit	Rochem BIP	Graywater	9/11/2011	GP	0.736	2.72	0	0	7.65	ND	ND	6.39	ND		
Carnival	Spirit	Rochem BIP	Graywater	9/18/2011	GP	0	1.28	0	0	7.66	ND	ND	3.95	ND		
Disney	Wonder	Hamworthy	Mixed	5/7/2011	GP	8.7	3.6	12	170	7.02	ND	ND	ND	ND		
Disney	Wonder	Hamworthy	Mixed	5/14/2011	UA	8.4	7.6	16	220	6.94	ND	ND	ND	ND		
Disney	Wonder	Hamworthy	Mixed	6/11/2011	GP	19	2.5	12	170	7.05	ND	ND	ND	ND		
Disney	Wonder	Hamworthy	Mixed	6/18/2011	GP	26	2.1	11	79	7.22	ND	ND	ND	ND		
Disney	Wonder	Hamworthy	Mixed	7/9/2011	GP	20	3.2	9.2	150	6.8	ND	ND	ND	ND		
Disney	Wonder	Hamworthy	Mixed	7/16/2011	UA	27	1.7	10	100	7.39	ND	ND	ND	ND		
Disney	Wonder	Hamworthy	Mixed	8/6/2011	GP	31	2.6	9	210	7.15	10	ND	ND	ND		
Disney	Wonder	Hamworthy	Mixed	8/13/2011	GP	18	0	9.4	150	7.14	ND	ND	ND	ND		
Disney	Wonder	Hamworthy	Mixed	9/3/2011	GP	25	3.8	8.2	180	7.28	ND	ND	ND	ND		
Holland America	Statendam	Zenon	Mixed	5/25/2011	GP	42	3.1	20	40	7.47	ND	ND	4	ND		
Holland America	Statendam	Zenon	Mixed	5/26/2011	GP	41	2.3	26	75	7.63	ND	ND	ND	ND		
Holland America	Statendam	Zenon	Mixed	6/9/2011	GP	17	3.6	23	73	7.26	ND	ND	3.2	ND		
Holland America	Statendam	Zenon	Mixed	6/16/2011	UA	21	1.9	24	1.4	7.22	ND	ND	4.8	ND		
Holland America	Statendam	Zenon	Mixed	7/14/2011	GP	28	1.3	23	88	7.24	ND	ND	9.5	ND		
Holland America	Statendam	Zenon	Mixed	7/28/2011	GP	40	6.2	18	61	7.23	ND	ND	4.6	ND		
Holland America	Statendam	Zenon	Mixed	8/18/2011	GP	32	8.4	12	76	7.12	ND	ND	9.7	ND		
Holland America	Statendam	Zenon	Mixed	8/25/2011	GP	45	3.4	17	5.5	7.57	ND	ND	11	ND		
Holland America	Statendam	Zenon	Mixed	9/1/2011	UA	31	2.3	20	13	7.43	ND	ND	7.8	ND		
Holland America	Statendam	Zenon	Mixed	9/8/2011	GP	34	4.3	28	23	7.28	ND	ND	9.5	ND		
Holland America	Volendam	Zenon	Mixed	5/27/2011	GP	0.24	45	15	220	6.64	ND	ND	ND	ND		
Holland America	Volendam	Zenon	Mixed	5/30/2011	GP		24	14	170	6.95	ND	ND	ND	ND		
Holland America	Volendam	Zenon	Mixed	6/3/2011	UA	4.6	12	13	93	7.04	ND	ND	ND	ND		
Holland America	Volendam	Zenon	Mixed	6/17/2011	GP	1.5	45	12	110	6.57	ND	ND	ND	ND		
Holland America	Volendam	Zenon	Mixed	7/1/2011	GP	1.4	29	16	100	6.79	ND	ND	ND	ND		
Holland America	Volendam	Zenon	Mixed	7/15/2011	GP	2.4	19	14	180	6.89	ND	ND	ND	ND		
Holland America	Volendam	Zenon	Mixed	8/5/2011	UA	4.7	9.6	8.4	77	6.97	ND	ND	ND	ND		
Holland America	Volendam	Zenon	Mixed	8/12/2011	GP	10	3.1	7.2	64	7.17	ND	ND	ND	ND		
Holland America	Volendam	Zenon	Mixed	8/19/2011	GP	8.7	6	7	51	6.99	ND	ND	ND	ND		
Holland America	Volendam	Zenon	Mixed	9/2/2011	GP	3.7	8.5	9.8	99	7.03	ND	ND	ND	ND		
Holland America	Westerdam	Some GW mixed														
Holland America	Zaandam	Zenon	Mixed	5/18/2011	GP	35	10	33	71	7.2	ND	ND	2.9	ND		Stationary
Holland America	Zaandam	Zenon	Mixed	5/26/2011	GP	35	4.1	25	80	7.43	ND	ND	2.4	ND		Stationary
Holland America	Zaandam	Zenon	Mixed	6/1/2011	UA		2.7	16	21	7.27	ND	ND	2.2	ND		Underway
Holland America	Zaandam	Zenon	Mixed	6/23/2011	UA	16	2.8	5.4	63	7.26	ND	10	2	ND		Underway
Holland America	Zaandam	Zenon	Mixed	6/29/2011	GP	18	3.8	8.9	56	7.15	ND	ND	ND	ND		Underway
Holland America	Zaandam	Zenon	Mixed	7/21/2011	GP	18	3.6	11	75	7.12	ND	ND	ND	ND		Underway
Holland America	Zaandam	Zenon	Mixed	7/27/2011	GP	13	2.8	8.9	76	6.99	ND	ND	ND	ND		Underway
Holland America	Zaandam	Zenon	Mixed	8/10/2011	GP	21	1.5	9.6	35	7.17	ND	ND	ND	ND		Underway
Holland America	Zaandam	Zenon	Mixed	8/18/2011	GP	20	6.8	11	67	7.33	ND	ND	2.8	ND		Underway
Holland America	Zaandam	Zenon	Mixed	8/24/2011	GP	19	4.9	10	24	7.2	ND	ND	2.7	ND		Underway
Holland America	Zaandam	Zenon	Mixed	9/1/2011	UA	15	4.5	8.2	44	7.32	ND	ND	ND	ND		Underway
Holland America	Zaandam	Zenon	Mixed	9/15/2011	GP	25	3.4	9.1	18	7.33	ND	ND	ND	ND		Underway
Norwegian	Pearl	Scanship	Mixed	5/11/2011	GP	14	8	16	220	6.75	7	ND	4.6	ND		Stationary
Norwegian	Pearl	Scanship	Mixed	5/18/2011	UA	23	4.5	4.6	36	7.15	10	ND	11	ND		Stationary
Norwegian	Pearl	Scanship	Mixed	6/8/2011	GP	17	3.4	4.4	83	6.96	30	ND	12	ND		Stationary
Norwegian	Pearl	Scanship	Mixed	6/15/2011	GP	24	3.1	4	31	6.58	ND	ND	20	ND		Stationary
Norwegian	Pearl	Scanship	Mixed	7/6/2011	UA	20	3.1	3.6	37	6.89	38	ND	9.8	ND		Stationary
Norwegian	Pearl	Scanship	Mixed	7/20/2011	GP	28	5.3	4.2	83	6.84	ND	4	9	ND		Stationary
Norwegian	Pearl	Scanship	Mixed	8/10/2011	GP	31	4.2	4.7	110	6.77	4	4	7.8	ND		Stationary
Norwegian	Pearl	Scanship	Mixed	8/24/2011	GP	26	4.6	3.7	37	6.9	ND	4	8.8	ND		Stationary
Norwegian	Pearl	Scanship	Mixed	9/7/2011	GP	31	4.2	4.5	31	6.95	ND	ND	6.3	ND		Stationary
Norwegian	Pearl	Scanship	Mixed	9/14/2011	GP	29	3.9	4.2	45	6.85	ND	ND	4.6	ND		Stationary
Norwegian	Star	Scanship	Mixed	5/12/2011	GP	9.5	5	4.6	88	6.6	1	ND	2	ND		Stationary
Norwegian	Star	Scanship	Mixed	5/17/2011	GP	9.1	6.4	5.3	110	6.38	ND	ND	2.1	ND		Stationary
Norwegian	Star	Scanship	Mixed	6/7/2011	UA	11	2.8	6.6	31	6.51	3	9	26	ND		Stationary
Norwegian	Star	Scanship	Mixed	6/14/2011	GP	29	3	4.4	93	6.6	ND	ND	ND	ND		Stationary
Norwegian	Star	Scanship	Mixed	7/6/2011	UA	18	12	5	39	7.4	ND	10	2.5	ND		Stationary
Norwegian	Star	Scanship	Mixed	7/12/2011	GP	21	9.6	5.1	94	6.6	ND	ND	3.2	ND		Stationary
Norwegian	Star	Scanship	Mixed	8/9/2011	GP	16	18	6.3	140	6.87	6	12	3.7	ND		Stationary
Norwegian	Star	Scanship	Mixed acc. Gray	8/23/2011	GP	12	5.4	5	36	6.64	20	ND	2.5	ND		Stationary
Norwegian	Star	Scanship	Mixed	9/6/2011	GP	9.6	3.6	7.6	27	6.65	22	6	8.6	ND		Stationary
Norwegian	Star	Scanship	Mixed	9/14/2011	GP	15	2.7	5.7	37	6.68	ND	6	6.8	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	5/24/2011	GP	23	8.6	6.6	190	7.05	ND	ND	2.3	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	5/25/2011	GP	21	11	6.4	170	7.05	ND	ND	ND	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	6/1/2011	UA		6.6	14	75	7.34	ND	ND	ND	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	6/14/2011	GP	65					ND	ND	ND	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	6/15/2011	GP	29	12	8.9	90	7.23	ND	ND	ND	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	7/13/2011	GP	35	7.7	7.3	56	7.28	ND	ND	ND	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	7/19/2011	GP	37	4.5	5.8	100	7.21	ND	ND	ND	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	8/2/2011	GP	39	11	5.5	110	7.12	ND	ND	2.7	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	8/11/2011	GP	13	4.8	8.1	67	6.82	45	ND	ND	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	8/30/2011	GP						ND					Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	9/7/2011	GP	25	13	10	110	6.99	ND	ND	3.9	ND		Stationary
Princess	Coral	Hamworthy	Mixed acc. Gray	9/14/2011	GP	27	13	7.1	86	7.11	ND	ND	ND	ND		Stationary
Princess	Diamond	Hamworthy	Mixed acc. Gray	5/25/2011	GP	52	6.6	16	180	7.55	ND	ND	ND	ND		Stationary
Princess	Diamond	Hamworthy	Mixed acc. Gray	5/31/2011	GP		5.7	20	150	7.49	ND	ND	ND	ND		Stationary
Princess	Diamond	Hamworthy	Mixed acc. Gray	6/8/2011	GP	52	3.5	15	160	7.55	ND	ND	2.9	ND		Stationary
Princess	Diamond	Hamworthy	Mixed acc. Gray	6/15/2011	UA	86	9.3	14	100	7.74	ND	ND	2.6	ND		Stationary
Princess	Diamond	Hamworthy	Mixed acc. Gray	7/16/2011	GP	68	6.3	14	100	7.4	ND	ND	ND	ND		Stationary
Princess	Diamond	Hamworthy	Mixed acc. Gray	7/30/2011	GP	70	150	7.5	75	7.5	ND	ND	4.1	ND		Stationary
Princess	Diamond	Hamworthy	Mixed acc. Gray	8/3/2011	UA	80	4.7	13	79	7.65	ND	ND	8.5	ND		Stationary
Princess	Diamond	Hamworthy	Mixed acc. Gray	8/17/2011	GP	82	5.4	11	99	7.53	ND	ND	13	ND		Stationary
Princess	Diamond	Hamworthy	Mixed acc. Gray	9/7/2011	GP	150	8.3	14	110	7.86	ND	ND	2.2	ND		Stationary
Princess	Diamond	Hamworthy	Mixed acc. Gray	9/14/2011	GP	79	5.7	14	110	7.46	ND	ND	2.6	ND		Stationary

2011 SemiMonthly General Permit Sample Results										ND= Non-detect					
Company	Vessel	Treatment System	Wastewater Type	Sample Date	Type	mg/L	ug/L	ug/L	ug/L	S.U.	100 ml fecal Coliform	mg/L	mg/L	mg/L	Chlorine Residual
						Ammonia	Copper	Nickel	Zinc	pH					
Princess	Golden	Hamworthy	Mixed acc. Gray	5/17/2011	GP	0.37	5.7	10	140	6.97	33	ND	15	ND	
Princess	Golden	Hamworthy	Mixed acc. Gray	5/24/2011	GP	1	5.5	14	130	7.03	ND	ND	7.9	ND	
Princess	Golden	Hamworthy	Mixed acc. Gray	6/7/2011	UA	0.17	5.6	11	70	7.06	ND	ND	13	ND	
Princess	Golden	Hamworthy	Mixed acc. Gray	6/14/2011	GP	1.9	2.3	10	6.8	6.92	ND	ND	19	ND	
Princess	Golden	Hamworthy	Mixed acc. Gray	7/12/2011	GP	1	4.4	10	150	6.84	ND	ND	40	ND	
Princess	Golden	Hamworthy	Mixed acc. Gray	7/19/2011	UA	0.63	5.2	11	98	8.06	ND	ND	39	ND	
Princess	Golden	Hamworthy	Mixed acc. Gray	8/2/2011	GP	0.7	2.9	14	79	6.76	ND	ND	30	ND	
Princess	Golden	Hamworthy	Mixed acc. Gray	8/16/2011	GP	1.5				6.87	ND	ND	7	ND	
Princess	Golden	Hamworthy	Mixed acc. Gray	8/29/2011	GP		5.7	12	110						
Princess	Golden	Hamworthy	Mixed acc. Gray	9/6/2011	GP	24	10	12	70	7.61	ND	ND	5.3	ND	
Princess	Golden	Hamworthy	Mixed acc. Gray	9/13/2011	GP	4.8	3.7	12	30	6.93	2	ND	58	ND	
Princess	Golden	Hamworthy	Graywater	5/16/2011	GP	0.13	9.3	11	120	6.92	ND	ND	9.2	ND	
Princess	Golden	Hamworthy	Graywater	5/23/2011	GP	0.22	9.4	14	120	6.93	ND	ND	3.1	ND	
Princess	Golden	Hamworthy	Graywater	6/6/2011	UA	0	8.4	8.9	41	7.09	ND	ND	13	ND	
Princess	Golden	Hamworthy	Graywater	6/13/2011	GP	0.13	3.7	6	69	7	ND	ND	24	ND	
Princess	Golden	Hamworthy	Graywater	6/20/2011	USCG					6.53	ND	ND	83	ND	
Princess	Golden	Hamworthy	Graywater	7/11/2011	GP	0.78	4.3	8.3	120	7.39	ND	ND	28	ND	
Princess	Golden	Hamworthy	Graywater	7/18/2011	UA	0.19	6.8	11	93	7	ND	ND	ND	ND	
Princess	Golden	Hamworthy	Graywater	8/1/2011	GP	0.51	3.3	14	100	6.72	ND	ND	8.3	ND	
Princess	Golden	Hamworthy	Graywater	8/15/2011	GP	0	14	12	75	6.62	ND	ND	7	ND	
Princess	Golden	Hamworthy	Graywater	9/5/2011	GP	6.5	6.5	11	69	7.21	ND	ND	2.5	ND	
Princess	Golden	Hamworthy	Graywater	9/12/2011	GP	0.19	4.3	10	15	6.45	ND	ND	90	ND	
Princess	Island	Hamworthy	Mixed acc. Gray	5/21/2011	GP	87	60	6.5	100	7.4	ND	ND	ND	ND	
Princess	Island	Hamworthy	Mixed acc. Gray	5/30/2011	GP		18	6	130	7.25	ND	ND	ND	ND	
Princess	Island	Hamworthy	Mixed acc. Gray	6/4/2011	GP	28	45	8.2	150	7.05	ND	ND	ND	ND	
Princess	Island	Hamworthy	Mixed acc. Gray	6/12/2011	UA	41	15	7.3	82	7.28	ND	ND	2.5	ND	
Princess	Island	Hamworthy	Mixed acc. Gray	7/11/2011	GP	25	8.3	7.1	56	7.17	ND	ND	ND	ND	
Princess	Island	Hamworthy	Mixed acc. Gray	7/24/2011	GP	65	3.2	7.4	98	7.83	ND	ND	3.4	ND	
Princess	Island	Hamworthy	Mixed acc. Gray	8/8/2011	GP	26	4.3	6.8	120	7.11	45	ND	ND	ND	
Princess	Island	Hamworthy	Mixed acc. Gray	8/27/2011	GP	32	21	9.2	72	7	ND	ND	ND	ND	
Princess	Island	Hamworthy	Mixed acc. Gray	9/4/2011	UA	59	8	7.7	77	7.28	ND	ND	ND	ND	
Princess	Island	Hamworthy	Mixed acc. Gray	9/10/2011	GP	91	8.8	8	45	7.4	ND	ND	ND	ND	
Princess	Sapphire	Hamworthy	Mixed acc. Gray	5/18/2011	GP	12	77	33	140	8	ND	ND	14	ND	
Princess	Sapphire	Hamworthy	Mixed acc. Gray	5/25/2011	UA	34	93	34	60	8.02	ND	ND	3.6	ND	
Princess	Sapphire	Hamworthy	Mixed acc. Gray	6/2/2011	GP	52	61	44	140	7.9	8	ND	4	ND	
Princess	Sapphire	Hamworthy	Mixed acc. Gray	6/9/2011	GP	160	370	75	130	8.23	ND	ND	8	ND	
Princess	Sapphire	Hamworthy	Mixed acc. Gray	7/14/2011	GP	0	29	32	150	8	ND	ND	11	ND	
Princess	Sapphire	Hamworthy	Mixed acc. Gray	7/21/2011	GP	66	15	31	170	7.72	5	ND	45	ND	
Princess	Sapphire	Hamworthy	Mixed acc. Gray	8/11/2011	GP	71	14	26	140	8.04	ND	ND	49	ND	
Princess	Sapphire	Hamworthy	Mixed acc. Gray	8/24/2011	GP	70	22	29	120	8.18	ND	ND	4.5	ND	
Princess	Sapphire	Hamworthy	Mixed acc. Gray	9/8/2011	GP	61	29	28	120	7.77	ND	ND	15.9	ND	
Princess	Sapphire	Hamworthy	Mixed acc. Gray	9/14/2011	GP	70	32	22	190	7.81	ND	ND	24	ND	
Princess	Sapphire	Hamworthy	Graywater	5/18/2011	GP	2.7	100	45	200	7.2	ND	ND	ND	ND	
Princess	Sapphire	Hamworthy	Graywater	5/25/2011	UA	1.7	90	44	64	6.83	ND	ND	2.5	ND	
Princess	Sapphire	Hamworthy	Graywater	6/8/2011	GP	1.8	30	31	110	7.08	ND	ND	2.9	ND	
Princess	Sapphire	Hamworthy	Graywater	6/15/2011	GP	2.3	43	27	60	6.98	ND	ND	5.7	ND	
Princess	Sapphire	Hamworthy	Graywater	7/13/2011	GP	1.1	32	34	200	6.72	ND	ND	3.7	ND	
Princess	Sapphire	Hamworthy	Graywater	7/20/2011	GP	1.3	22	34	170	6.7	ND	ND	8	ND	
Princess	Sapphire	Hamworthy	Graywater	8/3/2011	UA	1	15	24	160	6.86	ND	ND	6.8	ND	
Princess	Sapphire	Hamworthy	Graywater	8/10/2011	GP	1.3	27	38	408	6.73	ND	ND	ND	ND	
Princess	Sapphire	Hamworthy	Graywater	9/7/2011	GP	2.6	37	25	190	6.67	ND	ND	ND	ND	
Princess	Sapphire	Hamworthy	Graywater	9/14/2011	GP	0.42	40	24	220	6.63	ND	ND	2.2	ND	
Princess	Sea	Hamworthy	Mixed acc. Gray	5/14/2011	GP	59	28	4.7	90	7.52	ND	ND	ND	ND	
Princess	Sea	Hamworthy	Mixed acc. Gray	5/24/2011	GP	45	39	5.8	99	7.1	ND	ND	4	ND	
Princess	Sea	Hamworthy	Mixed acc. Gray	6/3/2011	UA	36	23	6.4	51	7.31	ND	ND	ND	ND	
Princess	Sea	Hamworthy	Mixed acc. Gray	6/23/2011	GP	17	25	4.3	54	7.04	ND	ND	ND	ND	
Princess	Sea	Hamworthy	Mixed acc. Gray	7/3/2011	GP	33	41	4.8	81	7.13	ND	ND	ND	ND	
Princess	Sea	Hamworthy	Mixed acc. Gray	7/13/2011	GP	41	33	7.1	47	7.09	ND	ND	ND	ND	
Princess	Sea	Hamworthy	Mixed acc. Gray	8/12/2011	GP	59	22	5.6	29	7.47	ND	ND	2	ND	
Princess	Sea	Hamworthy	Mixed acc. Gray	8/24/2011	GP	67	28	28	43	7.15	ND	ND	4.6	ND	
Princess	Sea	Hamworthy	Mixed acc. Gray	9/1/2011	UA	44	18	6.9	67	7.27	ND	ND	4	ND	
Princess	Sea	Hamworthy	Mixed acc. Gray	9/2/2011	GP	110	13	5.8	62	7.56	ND	ND	4.8	ND	
Oceania	Regatta	Triton	Mixed-Port	5/20/2011	GP	14	5.4	11	75	7.25	ND	ND	ND	ND	
Oceania	Regatta	Triton	Mixed-Port	5/31/2011	GP		9	12	88	6.94	ND	ND	ND	ND	
Oceania	Regatta	Triton	Mixed-Port	6/9/2011	GP	22	8.2	11	120	7.28	ND	ND	2.5	ND	
Oceania	Regatta	Triton	Mixed-Port	6/21/2011	UA	21	3.7	13	130	7.24	ND	ND	ND	ND	
Oceania	Regatta	Triton	Mixed-Port	7/15/2011	GP	5	6.9	7	90	6.91	ND	ND	ND	ND	
Oceania	Regatta	Triton	Mixed-Port	7/29/2011	UA	0.37	6.8	9	46	6.54	ND	ND	3.1	ND	
Oceania	Regatta	Triton	Mixed-Port	8/11/2011	GP	30	18	8.2	7.3	5.96	ND	ND	2.5	ND	
Oceania	Regatta	Triton	Mixed-Port	8/19/2011	GP	34	19	5.8	0	5.24	ND	ND	2	ND	
Oceania	Regatta	Triton	Mixed-Port	9/2/2011	GP	15	26	7.3	30	6.47	ND	ND	2.5	ND	
Oceania	Regatta	Triton	Mixed-Starboard	5/20/2011	GP	13	3.7	11	64	7.23	ND	ND	ND	ND	
Oceania	Regatta	Triton	Mixed-Starboard	5/31/2011	GP		13	12	170	7.15	ND	ND	ND	ND	
Oceania	Regatta	Triton	Mixed-Starboard	6/9/2011	GP	45	15	13	92	7.43	ND	ND	4.3	ND	
Oceania	Regatta	Triton	Mixed-Starboard	6/25/2011	UA	36	4.2	12	110	7.3	ND	ND	ND	ND	
Oceania	Regatta	Triton	Mixed-Starboard	7/15/2011	GP	0.15	11	7	110	7.09	ND	ND	2.4	ND	
Oceania	Regatta	Triton	Mixed-Starboard	7/29/2011	UA	0.47	4.1	7	77	6.84	ND	ND	ND	ND	
Oceania	Regatta	Triton	Mixed-Starboard	8/11/2011	GP	7.2	11	4.3	15	6.31	ND	ND	2.5	ND	
Oceania	Regatta	Triton	Mixed-Starboard	8/19/2011	GP	15	11	5	34	6.09	ND	ND	ND	ND	
Oceania	Regatta	Triton	Mixed-Starboard	9/2/2011	GP	8.2	6.9	7.8	130	6.9	ND	ND	ND	ND	
Seven Seas	Navigator	Scanship	Mixed	5/19/2011	GP	6.6	5.2	10	130	6.6	40	9	9	ND	
Seven Seas	Navigator	Scanship	Mixed	5/28/2011	UA	26	4.7	8.2	24	6.99	2	6	8.4	ND	
Seven Seas	Navigator	Scanship	Mixed	6/11/2011	GP	24	1.7	5.4	27	6.69	5	11	4.5	ND	
Seven Seas	Navigator	Scanship	Mixed	6/25/2011	GP	22	1.8	4.8	14	7	12	7	4.6	ND	
Seven Seas	Navigator	Scanship	Mixed	7/2/2011	UA	21	2.7	4.8	7	6.99	4	6	5.1	ND	
Seven Seas	Navigator	Scanship	Mixed	7/9/2011	GP	26	3.4	6.9	9.3	7.03	13	ND	39	ND	
Seven Seas	Navigator	Scanship	Mixed	7/16/2011	GP										
Seven Seas	Navigator	Scanship	Mixed	8/6/2011	GP	18	2.9	6.1	20	6.68	ND	11	5.6	ND	
Seven Seas	Navigator	Scanship	Mixed	8/13/2011	GP	22	8.9	8.6	7	6.61	2	46	9.7	ND	
Seven Seas	Navigator	Scanship	Mixed	9/6/2011	GP	10	2.5	7	24	6.87	6	4	3.3	ND	
Silver	Silver Shadow	Marican	Mixed												

Table A-4: Semi-seasonal conventional parameters

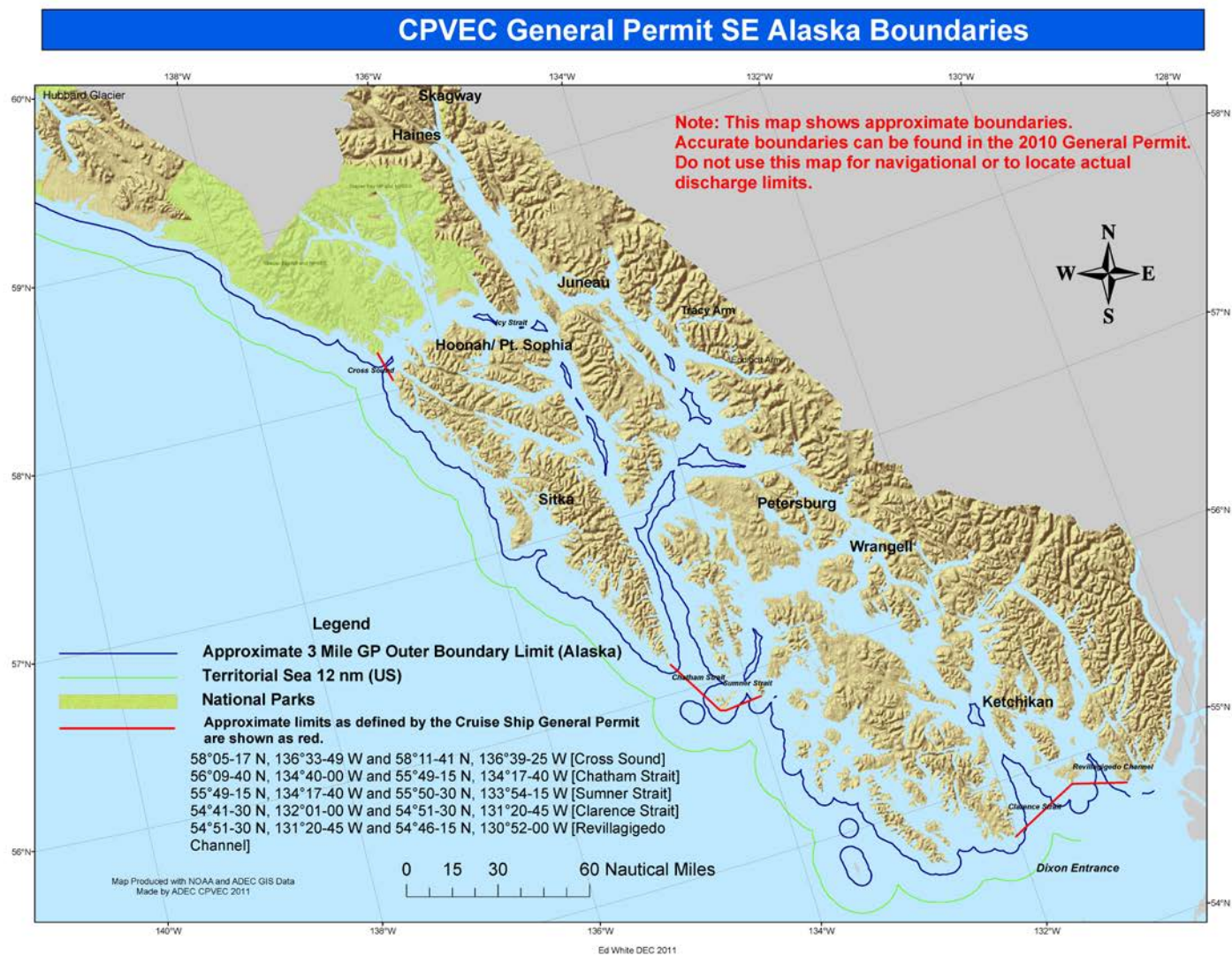
Vessel	Sample Date	Chemical O <sub>2</sub> Demand	Free Chlorine	Residual Chlorine	Conductivity	Hexane Extractable Material	Total Organic Carbon	Alkalinity	Nitrate as N	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit	10.00	0.10	0.10	2.00	5.00	1.00	2.00	1.00	0.05	1.00	
	Units	mg/l	mg/l	mg/l	umhos/cm	mg/l	mg/l	mg/l	mg/L	mg/l	mg/l	mg/l
<b>Alaska Water Quality Standards</b>		None	None	0.0075	None	None	None	None	None	None	None	None
Carnival Spirit	5/22/11	16	0	0	47.5	0	4	31	0	0	2.47	0.1
Carnival Spirit	6/17/11	25	0	0	72.9	0	5.9	35		0.16	1.8	
Disney Wonder	5/14/11	55	0	0	1300	0	330	84	3.54	5.8	11	0
Disney Wonder	7/16/11	20	0	0	558	0	9	160	0	4.1	41	0
Statendam	6/16/11	18	0	0	731	0	35	180	0	0.23	25	0
Statendam	9/1/11	48	0	0	694	0	20	210	0	0.81	47	0
Volendam	6/3/11	0	0	0	431	0	9.2	70	6.4	3.9	5.3	0
Volendam	8/5/11	13	0	0	510	0	8.6	95	4.7	3.6	7.1	0
Zaandam	6/23/11	18	0	0	1190		13	140	0.3	0	19	0
Zaandam	9/1/11	13	0	0	749	0	9.8	160	0	0	24	0
Norwegian Pearl	5/18/11	93	0	0	760	0	280	150	7.95	0.32	32	0
Norwegian Pearl	7/6/11	57	0	0	690	0	15	130	0	0.38	30	0
Vessel	Sample Date	Chemical O <sub>2</sub> Demand	Free Chlorine	Residual Chlorine	Conductivity	Hexane Extractable Material	Total Organic Carbon	Alkalinity	Nitrate as N	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit	10.00	0.10	0.10	2.00	5.00	1.00	2.00	1.00	0.05	1.00	
	Units	mg/l	mg/l	mg/l	umhos/cm	mg/l	mg/l	mg/l	mg/L	mg/l	mg/l	mg/l
<b>Alaska Water Quality Standards</b>		None	None	0.0075	None	None	None	None	None	None	None	None
Norwegian Star	6/7/11	61	0	0	594	5.5	12	80	0.3	0.32	20	0
Norwegian Star	7/6/11	42	0	0	554	0	13	98	3.63	1.5	24	0
Coral Princess	6/15/11	27	0	0	2070	0	16	150	0.11	8.3	29	0
Coral Princess	8/11/11	34	0	0	550	0	12	110	0	8.3	9.4	0
Diamond Princess	6/15/11	45	0	0	1260	0	23	400	0.16	16	99	0
Diamond Princess	8/3/11	33	0	0	1300	0	16	380	0	5.2	100	0
Golden Princess- GW	6/6/11	38	0	0	2600	0	23	85	0	0.3	0.82	0
Golden Princess- GW	7/18/11	16	0	0	918	0	9.1	73	0	0	1.1	0
Golden Princess	6/7/11	0	0	0	931	0	6.8	45	1.2	0.29	0.57	0
Golden Princess	7/19/11	27	0	0	562	0	7.1	46	0	0.25	1.4	0
Island Princess	6/12/11	49	0	0	1510	0	17	180	5.7	13	49	0
Island Princess	9/4/11	40	0	0	1360	0	16	270	0	9.2	94	0
Sapphire Princess- GW	5/25/11	33	0	0	1020	0	7.9	38	0.7	0	2.8	0
Sapphire Princess- GW	8/3/11	14	0	0	232	0	3.7	28	0.34	0.37	1.6	0
Vessel	Sample Date	Chemical O <sub>2</sub> Demand	Free Chlorine	Residual Chlorine	Conductivity	Hexane Extractable Material	Total Organic Carbon	Alkalinity	Nitrate as N	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit	10.00	0.10	0.10	2.00	5.00	1.00	2.00	1.00	0.05	1.00	
	Units	mg/l	mg/l	mg/l	umhos/cm	mg/l	mg/l	mg/l	mg/L	mg/l	mg/l	mg/l
<b>Alaska Water Quality Standards</b>		None	None	0.0075	None	None	None	None	None	None	None	None
Sapphire Princess	5/25/11	63	0	0	1280	0	19	370	0.36	1.7	75	0
Sapphire Princess	8/24/11	63	0	0	287	0	17	64	0.11	7.3	78	0
Sea Princess	6/3/11	0	0	0	9250	0	9	190	1.3	4.2	38	0
Sea Princess	9/1/11	69	0	0	6060	0	7.3	220	0	0.48	70	0
Regatta-Port	6/21/11	73	0	0	1310	0	23	140	0	0.87	26	0
Regatta-Port	7/29/11	24	0	0	1420	0	13	25	11	5.4	2.6	0
Regatta- Starboard	6/21/11	43	0	0	1510	0	17	190	0.62	0.35	40	0
Regatta- Starboard	7/29/11	12	0	0	1070	0	12	55	7.8	5.6	2.7	0
Seven Seas Mariner	5/28/11	45	0	0	605	0	210	120	0.17	0.3	0.78	0
Seven Seas Mariner	7/2/11	27	0	0	676	0	11	120	0	0.2	25	0
	MAX	93	ND	ND	9250	5.5	330	400	11	16	100	ND
	MIN	0	ND	ND	47.5	ND	3.7	25	ND	ND	ND	ND
This table has ND=0	MEDIAN	33	ND	ND	839	ND	13	120	ND	1.5	18.7	ND

Parameter not sampled

Table A-5: Full Suite Semi-seasonal Metal Sample Results

Semiseasonal Metal Samples																											
Vessel	Date	Antimony (TR)	Antimony dissolved	Arsenic (TR)	Arsenic dissolved	Beryllium (TR)	Beryllium dissolved	Cadmium (TR)	Cadmium dissolved	Chromium (TR)	Chromium dissolved	Copper (TR)	Copper diss	Lead (TR)	Lead, diss	Mercury (Total)	Nickel (TR)	Nickel, diss	Selenium (TR)	Selenium, dissolved	Silver (TR)	Silver, diss	Thallium (TR)	Thallium, dissolved	Zinc (TR)	Zinc, diss	
Carnival Spirit	5/22/11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.43	1.46	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.73	28.5
Carnival Spirit	6/17/11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.37	1.37	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Disney Wonder	5/14/11	1.6	1.7	ND	ND	ND	ND	ND	ND	ND	ND	7	7.6	ND	ND	ND	16	16	ND	ND	ND	ND	ND	ND	210	220	
Disney Wonder	7/16/11	ND	1.4	ND	ND	ND	ND	ND	ND	ND	ND	2.7	2.1	1.7	ND	ND	10	10	ND	ND	ND	ND	ND	ND	120	100	
Statendam	6/16/11	ND	ND	3.6	ND	ND	ND	ND	ND	3.2	4	2.7	1.9	ND	ND	ND	25	24	7.6	8.4	ND	ND	ND	ND	5.1	1.4	
Statendam	9/1/11	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.1	2.1	2.3	ND	ND	ND	20	20	ND	6.9	ND	ND	ND	ND	28	13	
Volendam	6/3/11	ND	ND	ND	3.1	ND	ND	ND	ND	6.4	5.9	10	12	ND	ND	ND	11	13	9	8.1	ND	ND	ND	ND	100	93	
Volendam	8/5/11	ND	ND	ND	ND	ND	ND	ND	ND	1.2	1.6	10	9.6	ND	ND	ND	8.6	8.4	6.5	7.8	ND	ND	ND	ND	86	77	
Zaandam	6/23/11	ND	ND	ND	14	ND	ND	ND	ND	ND	ND	8.6	2.8	ND	ND	ND	13	5.4	16	83	ND	ND	ND	ND	63	63	
Zaandam	9/1/11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.5	4.3	ND	ND	ND	8	8.2	ND	6.3	ND	ND	ND	ND	43	44	
Norwegian Pearl	5/18/11	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	6.4	4.5	1.8	ND	ND	5	4.6	ND	ND	ND	ND	ND	ND	49	36	
Norwegian Pearl	7/6/11	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.6	4.3	3.1	ND	ND	ND	3.9	3.6	ND	ND	ND	ND	ND	ND	37	37	
Norwegian Star	6/7/11	ND	ND	1.5	ND	ND	ND	ND	ND	ND	3.6	2.3	2.8	ND	ND	ND	7	6.6	ND	ND	ND	ND	ND	ND	25	31	
Norwegian Star	7/6/11	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.1	13	12	ND	ND	ND	5	5	ND	ND	ND	ND	ND	ND	34	39	
Coral Princess	6/15/11	ND	ND	4.6	4.7	ND	ND	ND	ND	ND	ND	13	12	ND	ND	ND	9.1	8.9	10	14	ND	ND	ND	ND	92	90	
Coral Princess	8/11/11	ND	ND	ND	ND	ND	ND	ND	ND	1.7	2.8	4.6	4.8	ND	ND	ND	7.6	8.1	15	ND	ND	ND	ND	ND	63	67	
Diamond Princess	6/15/11	1.2	ND	7.8	2.6	ND	ND	ND	ND	ND	ND	9.6	9.3	ND	ND	ND	14	14	16	ND	ND	ND	ND	ND	100	100	
Diamond Princess	8/3/11	ND	1	ND	ND	ND	ND	ND	ND	ND	1.2	6.8	4.7	ND	ND	ND	13	13	6.1	11	ND	ND	ND	ND	80	79	
Golden Princess- GW	6/6/11	1.5	ND	3.6	ND	ND	ND	ND	ND	ND	3.6	8.2	8.4	ND	ND	ND	9	8.9	12	17	ND	ND	ND	ND	1.7	46	41
Golden Princess- GW	7/18/11	1.4	1.8	ND	ND	ND	ND	ND	ND	ND	1.4	7.1	6.8	ND	ND	ND	11	11	8.2	9	ND	ND	ND	ND	91	93	
Golden Princess	6/7/11	1.1	3	3.1	4.5	ND	ND	ND	ND	ND	2.7	5.2	5.6	ND	ND	ND	11	11	8.9	25	ND	ND	ND	ND	6.4	84	70
Golden Princess	7/19/11	ND	1.5	ND	ND	ND	ND	ND	ND	ND	1.9	4.4	5.2	ND	ND	ND	10	11	8.6	9	ND	ND	ND	ND	91	98	
Island Princess	6/12/11	ND	1.3	ND	4.1	ND	ND	ND	ND	ND	2.4	15	15	ND	ND	ND	7.5	7.3	7.3	19	ND	ND	ND	ND	94	82	
Island Princess	9/4/11	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	8.6	8	ND	ND	ND	7.3	7.3	5.4	8.5	ND	ND	ND	ND	77	77	
Sapphire Princess- GW	5/25/11	1.3	ND	2.1	ND	ND	ND	ND	ND	3.7	ND	100	90	ND	ND	ND	43	44	23	10	ND	ND	ND	ND	70	64	
Sapphire Princess-GW	8/3/11	ND	1.1	ND	ND	ND	ND	ND	ND	1	ND	18	15	ND	ND	ND	25	24	8.3	12	ND	ND	ND	ND	160	160	
Sapphire Princess	5/25/11	ND	ND	ND	2.9	ND	ND	ND	ND	3.5	1.5	80	93	ND	ND	ND	28	34	11	10	ND	ND	ND	ND	60	60	
Sapphire Princess	8/24/11	ND	2.4	4.4	3.9	ND	ND	ND	ND	ND	3.4	30	22	ND	ND	ND	29	29	10	20	ND	ND	ND	ND	120	120	
Sea Princess	6/3/11	ND	ND	7.2	14	ND	ND	ND	ND	2.6	3.2	21	23	ND	1.7	ND	5.5	6.4	45	54	ND	ND	ND	ND	99	51	
Sea Princess	9/1/11	ND	ND	2.5	4.4	ND	ND	ND	ND	ND	2	17	18	ND	ND	ND	6.5	6.9	27	35	ND	ND	ND	ND	70	70	
Regatta-Port	6/21/11	ND	ND	6.1	ND	ND	ND	ND	ND	ND	1.6	4.1	3.7	ND	ND	ND	14	13	15	6.3	ND	ND	ND	1.2	130	130	
Regatta-Port	7/29/11	ND	ND	ND	2.2	ND	ND	ND	ND	1.4	ND	8.3	6.8	ND	ND	ND	6.7	9	6	7.4	ND	ND	ND	ND	54	46	
Regatta- Starboard	6/21/11	ND	ND	2.7	2.8	ND	ND	ND	ND	ND	1.4	4.6	4.2	ND	ND	ND	12	12	7.2	6.2	ND	ND	ND	ND	39	110	
Regatta- Starboard	7/29/11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	6	4.1	ND	ND	ND	6.7	7	ND	5.9	ND	ND	ND	ND	74	77	
Seven Seas Navigator	5/28/11	1.1	ND	ND	ND	ND	ND	ND	ND	ND	1.8	5.9	4.7	ND	ND	ND	8.4	8.2	11	ND	ND	ND	ND	1.1	24	24	
Seven Seas Navigator	7/2/11	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	3.3	2.7	ND	ND	ND	4.9	4.8	5.9	ND	ND	ND	ND	ND	7.8	7	
All results in micrograms/L (ug/L)																											
ND= Non-detect																											

## APPENDIX 4: GENERAL PERMIT BOUNDARIES MAP FOR SOUTHEAST ALASKA





## **APPENDIX 5: USEFUL WEBSITES**

Alaska Department of Environmental Conservation (ADEC) Cruise Ship Home Page

[http://www.dec.state.ak.us/water/cruise\\_ships/index.htm](http://www.dec.state.ak.us/water/cruise_ships/index.htm)

2010 Large Cruise Ship General Permit

[http://www.dec.state.ak.us/water/cruise\\_ships/gp/10gp.html](http://www.dec.state.ak.us/water/cruise_ships/gp/10gp.html)

General Permit Authorizations by ADEC

[http://www.dec.state.ak.us/water/cruise\\_ships/gp/Auth\\_10.html](http://www.dec.state.ak.us/water/cruise_ships/gp/Auth_10.html)

2008 Large Cruise Ship General Permit

[http://www.dec.state.ak.us/water/cruise\\_ships/gp/2008GP\\_Mod\\_CPVEC.pdf](http://www.dec.state.ak.us/water/cruise_ships/gp/2008GP_Mod_CPVEC.pdf)

Alaska Cruise Ship Laws and Regulations

[http://www.dec.state.ak.us/water/cruise\\_ships/Law\\_and\\_Regs/index.htm](http://www.dec.state.ak.us/water/cruise_ships/Law_and_Regs/index.htm)

Sample reports from prior years

[http://www.dec.state.ak.us/water/cruise\\_ships/reports.htm](http://www.dec.state.ak.us/water/cruise_ships/reports.htm)

EPA NPDES Vessel Discharges Page

[http://cfpub.epa.gov/npdes/home.cfm?program\\_id=350](http://cfpub.epa.gov/npdes/home.cfm?program_id=350)