Alaska DEC

Large Cruise Ship 2010

Wastewater Sampling Results

Draft- June 23 2011

Draft

TABLE OF CONTENTS

1. Executive Summary **3**
Table 1: 2010 Large Cruise Ship General Permit Exceedances 4

2. Introducton **4**

3. General Permit Requirements **5**

4. Wastewater Sample Results Summary **5**

5. Results by company **7**
Carnival Cruise Lines 7
Celebrity Cruises 8
Holland America Line (HAL) 8
Norwegian Cruise Line (NCL) 10
Princess Cruises 11
Royal Caribbean International (RCI) 14
Regent Seven Seas Navigator 14
Silver Shadow (Silversea) 15

Appendix 1. General Permit Limits **16**
Table 2: Effluent Limits and Discharge Reporting 16
Table 3: Effluent Limits for Ammonia and Dissolved Metals 17

Appendix 2: 2010 Large Cruise Ship Wastewater Sample data **18**
Table 4: Semi-monthly parameters 18
Table 5: Semi-seasonal conventional parameters 20
Table 6: Full Suite Semi-seasonal Metal Sample Results 21

Appendix 3: GP Boundaries Map for Southeast Alaska **22**

Appendix 4: Useful Websites **23**

Draft

1. EXECUTIVE SUMMARY

Ballot Measure 2 of 2006 (Cruise Ship Measure) required DEC to issue wastewater discharge permits to cruise ships. Before 2006, state law required cruise ships to meet only a small number of effluent limits. The new law required cruise ships to meet Alaska Water Quality Standards at the point of discharge (i.e. no mixing zone).

On March 25, 2008 the Alaska Department of Environmental Conservation (DEC) issued the 2008 Cruise Ship General Permit. The permit authorized cruise ships to discharge treated wastewater into Alaskan waters. The permit expanded reporting and sampling requirements and contained new limits for several wastewater parameters.

In 2010 DEC issued a General Permit with changed limits for ammonia and the dissolved metals of copper, nickel, and zinc. The limits on these new parameters were specific to the type of wastewater treatment system being used onboard each ship. The permit also distinguished between stationary and underway discharges. Comparisons between the 2010 and 2008 numbers of exceedances are difficult because of the differences in effluent limits. In 2010, underway discharge limits were reporting only (not enforced) for ammonia and dissolved metals.

Cruise ships reported 19 exceedances of permit limits in 2010; most of those exceedances were for ammonia (nine). DEC issued 14 Notices of Violation for exceedances and one for failure to sample according to the Quality Assurance Project Plan.

Table 1 lists discharge status, number of exceedances, and treatment system manufacturer information for each cruise ship.

Draft

Table 1: 2010 Large Cruise Ship General Permit Exceedances

Alaska Department of Environmental Conservation

2010 Large[1] Commercial Passenger Vessel General Permit Exceedances

	Vessel Operator	Vessel Name	Passenger Capacity	Voyages	Blackwater (BW) Treatment System Manufacturer	Permitted to discharge in Alaska[2]		Approval Discharge Type	Exceed-ances of GP Limits [4]	NOVs Issued [5]
						BW	Graywater			
1	Carnival Cruise Lines	*Carnival Spirit*	2400	19	Triton/Rochem	No	Yes [3]	Continuous	3	2
2	Celebrity Cruises	*Infinity*	2449	19	Zenon	No	No	No	0	
3	Celebrity Cruises	*Mercury*	1876	19	Biopure/Rochem	No	No	No	0	
4	Celebrity Cruises	*Millennium*	2449	19	Hydroxyl Cleansea	No	No	No	0	
5	Holland America	*Amsterdam*	1380	11	Unknown	No	No	No	0	
6	Holland America	Oosterdam	1916	20	Rochem Bio-filtration	No	No	No	0	
7	Holland America	*Rotterdam*	1404	18	Unknown	No	No	No	0	
8	Holland America	*Ryndam*	1260	19	Zenon	Yes	Yes	Continuous	2	2
9	Holland America	*Statendam*	1260	19	Zenon	Yes	Yes	Continuous	4	3
10	Holland America	*Volendam*	1432	19	Zenon	Yes	Yes	Continuous	3	2
11	Holland America	*Zaandam*	1432	20	Zenon	Yes	Yes	Continuous	3	2
12	Holland America	*Zuiderdam*	1916	20	Rochem Bio-filtration	No	No	No	0	
13	Japan Cruise Line	*Pacific Venus*	680	1	Unknown	No	No	No	0	
14	Mitsui OSK	*Nippon Maru*	539	1	Hamman MSD	No	No	No	0	
15	Norwegian Cruise Lines	*Norwegian Pearl*	2376	19	Scanship	Yes	Yes	Underway	2	2
16	Norwegian Cruise Lines	*Norwegian Star*	2240	21	Scanship	Yes	Yes	Underway	1	1
17	NYK	*Asuka II*	872	1	Unknown	No	No	No	0	
18	Princess Cruise Line	*Coral Princess*	1970	19	Hamworthy Bioreactor	Yes	Accommodations Only	Underway	0	
19	Princess Cruise Line	*Diamond Princess*	2678	20	Hamworthy Bioreactor	Yes	Accommodations Only	Underway	0	
20	Princess Cruise Line	*Golden Princess*	2598	19	Hamworthy Bioreactor	Yes	Accommodations Only	Continuous (GW)/Underway (BW and GW)	0	
21	Princess Cruise Line	*Island Princess*	1970	18	Hamworthy Bioreactor	Yes	Accommodations Only	Underway	0	1
22	Princess Cruise Line	*Royal Princess*	710	8	Hamworthy Bioreactor	Yes	Accommodations Only	Underway	0	
23	Princess Cruise Line	*Sapphire Princess*	2678	18	Hamworthy Bioreactor	Yes	Accommodations Only	Continuous (GW)/Underway (BW and GW)	0	
24	Princess Cruise Line	*Sea Princess*	2016	13	Hamworthy Bioreactor	Yes	Accommodations Only	Underway	1	
25	Prestige Cruises	*Seven Seas Navigator*	540	14	Scanship	Yes	Yes	Underway	0	0
26	Royal Caribbean Cruises Ltd.	*Radiance of the Seas*	2501	18	Hamman	Yes	Yes	No	0	
27	Royal Caribbean Cruises Ltd.	*Rhapsody of the Seas*	2435	19	Hamman	No	No	No	0	
28	Silver Seas	*Silver Shadow*	382	12	Bio Epure/Marisan	Yes	Yes	Continuous	0	
							TOTALS:		19	15

In Light Blue- Only discharged treated graywater

In Orange- These vessels were permitted by DEC to discharge but did not.

In Grey- These vessels registered to not discharge in Alaska waters during the 2010 season.

[1] A large vessel has overnight accommodations for 250 or more passengers.

[2] Alaska waters includes the Alexander Archipelago and extends 3 miles from the coastline. Only vessels that discharge into Alaska waters are required to meet wastewater sampling and reporting requirements.

[3] Galley graywater not discharged

[4] Underway exceedances of the GP limits for ammonia, copper, nickel, and zinc were reporting only limits and would not result in Notices of Violation

[5] Some NOVs are for multiple exceedances

Draft

2. INTRODUCTON

In August 2006, the voters passed Ballot Measure 2 (Cruise Ship Measure). It contained many provisions including environmental practices of commercial passenger vessels. DEC is responsible for implementing the resulting environmental statutes.

DEC developed a General Permit (GP) to satisfy the permitting requirement. On March 25th, 2008 DEC issued General Permit 2007DB0002. Owners and operators of large cruise ships (overnight accommodations for over 250 passengers) must get a permit authorization from DEC to discharge any treated sewage, graywater or other wastewater into marine waters of the state. www.dec.state.ak.us/water/cruise_ships/gp/08gp.html

House Bill 134 was signed into law on July 9th 2009. This new law authorized DEC to issue a permit based on economic and technological feasibility. It also created a Science Advisory Panel to evaluate wastewater treatment methods in use and those that could be used if economically feasible. DEC issued a 2010 General Permit on April 22nd 2010.

http://www.dec.state.ak.us/water/cruise_ships/gp/10gp.html

In 2010, 16 of the 28 large cruise ships that had a voyage to Alaska were authorized to discharge under the General Permit. A list of 2010 authorized vessels and copies of authorization letters can be found at: http://www.dec.state.ak.us/water/cruise_ships/gp/Auth_10.html

3. GENERAL PERMIT REQUIREMENTS

The 2010 Large Cruise Ship General Permit:

- Required that discharges meet effluent limits for listed parameters[1]. The limits are based on the stricter of the Water Quality Standard after initial dilution; or historical performance of the treatment system.
- Created limits for two types of discharge- underway (speed of over six knots) and stationary[2].
- 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 approval.
- 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, and several other parameters twice per season.
- Required Monthly submission of Discharge Monitoring Reports containing sample data.

4. WASTEWATER SAMPLE RESULTS SUMMARY

Cruise ship wastewater treatment systems have generally performed well at treating the effluent parameters that ADEC and the US Coast Guard have monitored since 2001. These parameters include fecal coliform bacteria counts (an indicator of potential pathogens), pH, chlorine, biochemical oxygen demand, and total suspended solids.

---

[1] Listed in Tables 1 through 7 of the 2010 ADEC wastewater General Permit

[2] See Appendix 1 for limits

Draft

Vessels normally stopped discharging when sample results indicated an exceedance unless it was for ammonia or dissolved metals. Exceedances may indicate malfunctioning equipment; therefore, the ship's crews would inspect, clean, and repair the equipment, and then take samples outside of Alaskan waters to verify that the system was functioning properly prior to further discharge in Alaska.

The new limits for ammonia, copper, nickel, and zinc were the focus of the 2008 permit. 28 large cruise ships operated in Alaska in 2010. 16 ships were permitted, and 15 ships discharged and conducted sampling. One of the 15, the Carnival Spirit, only discharged selected streams of accommodations graywater. Exceedances of the Alaska Water Quality Standards for ammonia and dissolved metals were not a violation of the 2008 permit.

Under the 2010 General Permit, ammonia and copper were the most difficult limits for cruise ships to meet. Every discharging ship had at least one exceedance of the Alaska Water Quality Standards for ammonia, copper and zinc. The Carnival Spirit and Island Princess were the only cruise ships that consistently met the Alaska Water Quality Standards for nickel (8.2 micrograms/L).

DEC determined that a number of Princess Cruises' samples did not comply with 2010 NWCA Quality Assurance Project Plan (QAPP) and Vessel Specific Sampling Plans as required by the permit. Upon examining the sample data, DEC has decided not to include results from Princess Cruises' sampling performed in May, June, and July 2010 in this report.

Draft

5. RESULTS BY COMPANY

Wastewater sample results for pollutants with effluent limits are listed by company. There are more pollutants for which ships that discharge must take samples but which have no effluent limits under the General Permit. For those sample results, please see Appendix 2 Tables 5 and 6.

Explanation of color codes	
	Exceedance of permitted limits
	Exceedance of permitted limits (reporting limit only for 2010)
	Exceedance of Alaska Water Qulaity Standards
	Discharging only treated graywater
	Parameter not sampled
	No Discharge in Alaska
ND	Not detected

Carnival Cruise Lines

Carnival operated one ship, the Carnival Spirit, in Alaska in 2010. The Carnival Spirit had three exceedances of permit limits- one each for copper, ammonia, and zinc. This ship only discharged accommodation graywater, which was treated through a Rochem wastewater treatment system.

2010 Semimonthly General Permit Sample Results for Carnival Cruise Lines

Company	Vessel	Sample Date	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
			mg/L	µg/L	µg/L	µg/L	S.U	col. per 100 ml	mg/L	mg/L	mg/L
Carnival	Spirit	5/15/2010	ND	2.85	0.448	16	7.1	ND	ND	8.71	ND
Carnival	Spirit	6/5/2010	0.55	1.71	0.414	9.42	6.9	ND	ND	6.87	ND
Carnival	Spirit	6/12/2010	0.72	1.89	ND	11.4	6.8	ND	ND	15.8	ND
Carnival	Spirit	7/10/2010	0.93	1.19	ND	8.39	7.4	ND	ND	6.46	ND
Carnival	Spirit	7/17/2010	0.59	3.1	ND	7.8	7.3	ND	ND	6.37	ND
Carnival	Spirit	8/7/2010	0.87	2.94	ND	17.2	7.1	ND	ND	21.9	ND
Carnival	Spirit	8/21/2010	25	213	5.01	22.7	7.2	ND	ND	3.1	ND
Carnival	Spirit	8/28/2010	0.53	7.88	ND	10.1	7.9	ND	ND	7.29	ND
Carnival	Spirit	9/4/2010	0.59	7.77	2.38	170	7.1	ND	ND	7.37	ND
Carnival	Spirit	9/9/2010	0.56	1.51	ND	7.73	7.2	ND	ND	8.05	ND
		Max	25	213	5.0	170	7.9	N	ND	21.9	ND
		Min	ND	1.19	ND	7.73	6.8	ND	ND	3.100	ND
		Median	0.59	2.90	ND	10.8	7.15	ND	ND	7.33	ND
		Std Dev	7.72	66.3	1.644	50.1	0.30	N/A	N/A	5.49	N/A
		2009 Median	ND	0.65	0.26	7.83	7.6	ND	ND	4.155	ND

Draft

Celebrity Cruises

In 2010 Celebrity Cruises operated three ships in Alaska. All three ships held their treated wastewater while in Alaskan waters and did not discharge.

Holland America Line (HAL)

Holland America operated 8 cruise ships in Alaska in 2010; of these, 4 vessels discharged and were sampled. The Statendam was permitted for stationary discharge until August when it began only discharging underway. All ships used Zenon treatment systems.

2010 Semimonthly General Permit Sample Results Holland America

Company	Vessel	Sample Date	Ammonia (mg/L)	Copper (µg/L)	Nickel (µg/L)	Zinc (µg/L)	pH (S.U.)	Fecal Coliform (col. per 100 ml)	TSS (mg/L)	BOD (mg/L)	Total Residual Chlorine (mg/L)
Holland America	Ryndam	5/12/2010	15	3.4	14	170	7.31	10	ND	6.2	ND
Holland America	Ryndam	5/20/2010	30	5.5	18	170	7.46	110	ND	ND	ND
Holland America	Ryndam	5/26/2010					7.32	ND			ND
Holland America	Ryndam	6/2/2010	6.6	9.7	12	160	7.62	ND	ND	2	ND
Holland America	Ryndam	6/3/2010	16	10	16	180	7.51	ND	ND	ND	ND
Holland America	Ryndam	7/1/2010	22	39	16	110	7.37	ND	ND	ND	ND
Holland America	Ryndam	7/7/2010	24	2.7	8.5	91	7.28	2	ND	ND	ND
Holland America	Ryndam	7/15/2010	18	3	13	92	7.34	2	6	2.4	ND
Holland America	Ryndam	8/4/2010	35	3.7	15	110	7.43	12	ND	ND	ND
Holland America	Ryndam	8/12/2010	10	5.3	15	120	7.13	ND	ND	ND	ND
Holland America	Ryndam	9/1/2010	12	4.6	21	150	7.48	18	ND	2.2	ND
Holland America	Ryndam	9/9/2010	6.8	3.6	26	110	7.79	22	ND	ND	ND
Holland America	Ryndam	9/14/2010					7.42	6			ND
Holland America	Statendam	5/19/2010		1.8	19	17	7.49	ND	34	14	ND
Holland America	Statendam	5/27/2010	20	2.3	23	30	7.43	ND	ND	8.9	ND
Holland America	Statendam	5/28/2010	30				7.64				ND
Holland America	Statendam	6/2/2010	37	2.3	17	12	7.74	ND	ND	5.7	ND
Holland America	Statendam	6/10/2010	24	1.9	18	73	7.36	ND	ND	ND	ND
Holland America	Statendam	6/16/2010	45	2	17	11	7.52	ND	ND	3.9	ND
Holland America	Statendam	7/8/2010	27	2	19	50	7.46	ND	ND	4.1	ND
Holland America	Statendam	7/14/2010	31	2.3	18	17	7.53	ND	ND	3.6	ND
Holland America	Statendam	8/5/2010	32	1.8	25	38	7.53	ND	ND	3.1	ND
Holland America	Statendam	8/11/2010	22	2.8	20	31	7.59	ND	ND	4.5	ND
Holland America	Statendam	8/25/2010	28	3.5	17	17	7.56	ND	ND	13	ND
Holland America	Statendam	9/2/2010	25	2.7	17	22	7.76	ND	ND	21	ND
Holland America	Statendam	9/8/2010	22	1.9	15	110	7.7	ND	ND	4.5	ND

Draft

2010 Semimonthly General Permit Sample Results Holland America

Company	Vessel	Sample Date	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	Chlorine
Holland America	Volendam	5/14/2010	0.65	69	20	120	6.81	ND	ND	ND	ND
Holland America	Volendam	5/21/2010	1.5	56	21	110	7.09	ND	ND	ND	ND
Holland America	Volendam	5/28/2010	4.3	43	16	110	6.91	ND	ND	ND	ND
Holland America	Volendam	6/4/2010	5.5	15	9.6	160	7.18	ND	ND	ND	ND
Holland America	Volendam	6/11/2010	6.1	18	12	160	7.33	ND	ND	ND	ND
Holland America	Volendam	6/25/2010	3.7	26	ND	88	7.16	ND	ND	ND	ND
Holland America	Volendam	7/2/2010	4.1	39	15	110	6.96	ND	ND	ND	ND
Holland America	Volendam	7/9/2010	9.9	44	22	250	7.46	ND	ND	2.8	ND
Holland America	Volendam	8/6/2010	18	5.2	7.7	130	7.47	ND	ND	ND	ND
Holland America	Volendam	8/13/2010	3.3	15	34	130	7.38	ND	ND	ND	ND
Holland America	Volendam	9/3/2010	17	20	8.8	93	7.4	15	ND	ND	ND
Holland America	Volendam	9/10/2010	11	27	10	120	7.29	ND	ND	ND	ND
Holland America	Zaandam	No Discharge in May or June									
Holland America	Zaandam	7/11/2010	3.6	6	9.5	85	7.09	ND	ND	ND	ND
Holland America	Zaandam	7/18/2010	6.1	9.8	11	80	7.17	ND	ND	4.54	ND
Holland America	Zaandam	8/1/2010	26	1.7	9.8	72	7.22	ND	ND	3.2	ND
Holland America	Zaandam	8/8/2010	37	0	9.2	57	7.45	ND	ND	2.4	ND
Holland America	Zaandam	8/22/2010	48	5.2	10	45	7.51	ND	ND	3.3	ND
Holland America	Zaandam	9/5/2010	44	5.3	10	49	7.71	ND	ND	2.3	ND
Holland America	Zaandam	9/28/2010	8.6	29	19	130	6.93	ND	ND	3.8	ND

Draft

2010 Semimonthly General Permit Sample Results Holland America

	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliorm	TSS	BOD	Total Residual Chlorine
Max	48	69	34	250	7.79	110	34.00	21	ND
Min	0.65	ND	ND	11	6.81	ND	ND	ND	ND
Median	18.0	5.2	16	101.5	7.43	ND	ND	2.10	ND
Std Dev	13.01	16.75	6.03	54.98	0.23	17.08	5.31	4.39	ND
2009 Medians	26.5	5.2	14	65.5	7.42	ND	ND	5	ND

The Ryndam had one exceedance of the fecal coliform daily maximum limit. In total for all the Holland America ships there were 5 violations of the ammonia limit, two violations of the copper limit, and one violation of the zinc limit.

Norwegian Cruise Line (NCL)

Norwegian Cruise Line operated two cruise ships in Alaska in 2010. Both ships use a Scanship wastewater treatment system and were authorized to discharge wastewater in Alaska.

2010 Semimonthly General Permit Sample Results for Norwegian Cruise Line											
			mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg /L	mg/ L	mg/L
Company	Vessel	Sample Date	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	Total Residual Chlorine
Norwegian	Pearl	5/12/2010	0.52	21	3.5	83	6.81	ND	ND	ND	ND
Norwegian	Pearl	5/19/2010	11	5.3	4.9	100	6.77	2	ND	2.9	ND
Norwegian	Pearl	5/25/2010	1.9	22	16	82	6.56	96	11	3.1	ND
Norwegian	Pearl	6/2/2010	12	5	4.6	64	6.88	15	ND	ND	ND
Norwegian	Pearl	6/9/2010	21	6.2	ND	200	6.78	ND	ND	ND	ND
Norwegian	Pearl	7/7/2010	22	7	1.9	45	6.79	ND	ND	2.1	ND
Norwegian	Pearl	7/14/2010	26	7.8	4.8	54	6.92	ND	ND	2.8	ND
Norwegian	Pearl	8/4/2010	14	5.7	6.5	35	7.14	ND	10	6.6	ND
Norwegian	Pearl	8/11/2010	26	9.4	5.2	25	6.86	ND	5	4.3	ND
Norwegian	Pearl	8/18/2010	12	11	6.4	50	6.94	Error[1]	11	3.3	ND
Norwegian	Pearl	9/8/2010	13	7.5	4.4	67	6.91	ND	ND	ND	ND
Norwegian	Pearl	9/15/2010	22	6.2	6	45	6.93	840	ND	6.1	ND
Norwegian	Star	5/11/2010	1.7	2.5	12	220	6.92	ND	ND	14	ND
Norwegian	Star	5/18/2010	9.6	3	12	46	6.92	4	ND	6.4	ND
Norwegian	Star	5/25/2010	29	6.6	14	69	7.03	ND	ND	10	ND
Norwegian	Star	6/8/2010	23	3.5	10	190	6.98	2	8	9.8	ND
Norwegian	Star	6/15/2010	30	2.4	10	70	7.02	ND	ND	12	ND
Norwegian	Star	7/6/2010	16	1.4	9.5	39	6.87	50	4	7.5	ND
Norwegian	Star	7/27/2010	23	3	11	81	6.88	ND	ND	9.8	ND
Norwegian	Star	8/3/2010	20	1.2	9.5	73	6.6	10	12	9.8	ND
Norwegian	Star	8/10/2010	28	2.1	8.9	30	7.16	ND	ND	13	ND
Norwegian	Star	8/18/2010	16	2.5	6.9	23	7.15	2	4	10	ND
Norwegian	Star	9/7/2010	35	3	7.6	59	7.13	ND	ND	5	ND
Norwegian	Star	9/14/2010	30	ND	7.5	42	6.96	ND	ND	4.1	ND

[1] Fecal coliform was resampled twice after lab analysis returned undetermined results while not discharging. Results were non-detects.

Draft

2010 Semimonthly General Permit Sample Results Norwegian Cruise Line									
	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	Total Residual Chlorine
Max	35	22	16	220	7.2	840	12	14	ND
Min	0.52	ND	ND	23	6.6	ND	ND	ND	ND
Median	20.5	5.15	7.2	61.5	6.9	ND	ND	5.6	ND
Std Dev	9.53	5.49	3.8	53.6	0.2	174.8	4.3	4.3	ND
2009 Medians	37	5.4	9.8	68	6.78	ND	ND	4.8	ND

The Norwegian Pearl had an exceedance of the fecal coliform daily maximum on May 25th. The Norwegian Star had a fecal coliform daily maximum exceedance on July 6th.

Princess Cruises

Princess operated seven ships that visited Alaska and discharged wastewater in 2010. All seven ships were authorized to discharge wastewater while underway in Alaska. Two ships (the Golden Princess and the Sapphire Princess) were permitted to discharge graywater continuously. Princess wastewater treatment systems are all manufactured by Hamworthy.

DEC reviewed the Princess sample results and discovered several items inconsistent with the methods specified in the 2010 NWCA Quality Assurance Project Plan (QAPP) on multiple samples. Those inconstancies were not present in samples taken in August and September. Only the August and September sample data is presented in this report. Princess received a Notice of Violation for not taking samples according to all listed requirements and prescribed sampling procedures of the General Permit and the QAPP. The May, June, and July 2010 sample data will also not be used for DEC evaluations of wastewater treatment technology performance for future wastewater permits.

2010 Semimonthly General Permit Sample Results Princess Cruises											
			mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
Company	Vessel	Sample Date	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	Total Residual Chlorine
Princess	Coral	8/4/2010	48	10.1	8.36	97.8	7.2	ND	ND	ND	ND
Princess	Coral	8/18/2010	11	10.7	8.1	74.4	7	ND	ND	ND	ND
Princess	Coral	8/24/2010	11	18.5	6.2	86	6.9	ND	ND	ND	ND
Princess	Coral	9/7/2010	6.9	14.1	8.63	103	7	ND	ND	5.7	ND
Princess	Coral	9/15/2010	25	19.8	8.72	113	7.5	ND	ND	ND	ND

Draft

2010 Semimonthly General Permit Sample Results Princess Cruises

Company	Vessel	Sample Date	Ammonia (mg/L)	Copper (µg/L)	Nickel (µg/L)	Zinc (µg/L)	pH (S.U.)	Fecal Coliform (col. per 100 ml)	TSS (mg/L)	BOD (mg/L)	Total Residual Chlorine (mg/L)
Princess	Diamond	8/11/2010	59	2.74	11.1	106	7.4	ND	ND	ND	ND
Princess	Diamond	8/17/2010	30	5.8	27.9	169	7.5	ND	ND	2	ND
Princess	Diamond	8/31/2010	25	7.08	28.5	111	7.4	ND	ND	ND	ND
Princess	Diamond	9/15/2010	55	7.72	9.06	139	7.5	ND	ND	ND	ND
Princess	Diamond	9/16/2010	46	6.04	8.19	111	7.5	ND	ND	5.88	ND
Princess	Golden	8/10/2010	0.56	3.15	9.79	120	7.6	ND	ND	6.13	ND
Princess	Golden	8/12/2010	0	3	7.06	95.5	7.1	ND	ND	3.89	ND
Princess	Golden	9/14/2010	0	6.28	8.12	88.1	7.8	ND	ND	4.35	ND
Princess	Golden	9/21/2010	7.5	7.31	6.28	86.1	7.6	ND	ND	3.99	ND
Princess	Island	8/6/2010	46	8.29	8.01	116	7.4	1	ND	ND	ND
Princess	Island	8/13/2010	61	14.6	7.08	101	7.4	ND	ND	2.43	ND
Princess	Island	8/20/2010	81	13.5	6.43	84.2	7.5	ND	ND	5.14	ND
Princess	Island	8/26/2010	61	17.2	4.95	95.1	7.2	ND	ND	ND	ND
Princess	Island	9/3/2010	67	18	6.75	109	7.4	ND	ND	2.6	ND
Princess	Island	9/30/2010	17	11.8	5.46	83.1	6.9	ND	ND	ND	ND
Princess	Royal	8/5/2010	130	3.48	21.8	11.4	7.8	ND	ND	23.4	ND
Princess	Royal	8/20/2010	84	13	18.1	40.1	7.6	ND	ND	5.65	ND
Princess	Royal	8/19/2010	68	20	18	71.7	7.5	ND	ND	ND	ND
Princess	Royal	9/2/2010	120	7.68	38.4	95.8	7.7	ND	ND	24.7	ND
Princess	Royal	9/3/2010	62	9.95	27.3	65.6	7.5	ND	ND	3.69	ND
Princess	Sapphire	8/12/2010	56	154	34.2	62.4	8	2	10	5.37	ND
Princess	Sapphire	9/2/2010	62	29.7	26.5	98.7	7.8	ND	ND	4.73	ND
Princess	Sapphire	9/8/2010	110	67.5	28.4	102	7.8	ND	ND	ND	ND
Princess	Sapphire	9/9/2010	81	24.9	28.2	99.1	8	ND	ND	3.44	ND
Princess	Sapphire	9/16/2010	91	8.66	15.7	93.3	8.2	ND	ND	7.93	ND
Princess	Sea	5/26/2010	64	3.28	16.9	16.9	7.4	ND	ND	9.06	ND
Princess	Sea	8/5/2010	53	6.1	7.82	29.9	7.3	ND	5	3.39	ND
Princess	Sea	8/15/2010	61	4.14	7	41.2	7.5	ND	6	4.1	ND
Princess	Sea	9/4/2010	32	4.41	9.43	9.43	7.2	ND	ND	2.7	ND
Princess	Sea	9/13/2010	49	40.7	7.35	57.9	7.2	ND	ND	22.6	ND
Princess	Sea	9/23/2010	71	3.45	11.4	36.4	7.3	ND	10	22.1	ND

Draft

2010 Semimonthly General Permit Sample Results Princess Cruises- underway only

	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	Total Residual Chlorine
	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
Max	130	154.0	38.4	169.0	8.2	2.0	10	24.7	ND
Min	ND	2.7	5.0	9.4	6.9	ND	ND	ND	ND
Median	55.0	10.0	8.7	95.1	7.5	ND	ND	3.4	ND
Std Dev	130	154.0	38.4	169.0	8.2	2.0	10	24.7	ND
2009 Medians	67	14	9.5	130	7.52	ND	ND	3.5	ND

2010 Semimonthly General Permit Sample Results Princess Cruises- Stationary (GW)

Company	Vessel	Sample Date	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	Total Residual Chlorine
			mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
Princess	Golden	8/9/2010	ND	3.58	8.72	131	7.2	ND	ND	10.4	ND
Princess	Golden	8/16/2010	ND	2.04	8.48	90.5	7.2	ND	ND	ND	ND
Princess	Golden	9/13/2010	0.44	9.3	12.2	37	7	ND	ND	5.95	ND
Princess	Golden	9/20/2010	0.46	1.86	8.85	39.8	7.4	ND	ND	9.83	ND
Princes	Sapphire	8/11/2010	2.1	14.7	17.7	102	7.1	ND	ND	ND	ND
Princess	Sapphire	8/18/2010	3.5	14.2	20.8	114	7.1	ND	ND	3.19	ND
Princess	Sapphire	9/8/2010	2.3	11.3	24.7	90.9	7.7	ND	ND	5.11	ND
Princess	Sapphire	9/15/2010	2.6	10.1	17.1	101	7.1	ND	ND	3.16	ND

Draft

2010 Semimonthly General Permit Sample Results Princess Cruises- stationary (GW)

	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	Total Residual Chlorine
	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
Max	3.50	14.7	24.7	131	7.7	ND	ND	10.4	ND
Min	ND	1.86	8.48	37	7.0	ND	ND	0	ND
Median	1.28	9.70	14.65	95.95	7.15	ND	ND	4.15	ND
Std Dev	1.36	5.24	6.17	33.44	0.23	ND	ND	3.95	ND
2009 Medians	NA	NA	NA	NA	NA	NA	NA	NA	NA

Princess Cruises had one wastewater parameter exceedance in 2010 for copper, but this was not a violation of the permit. Exceedances while underway for ammonia, copper, nickel, and zinc were reporting limits only for 2010 and were not violations of permit limits. In 2011 exceedances of the underway limits will be violations.

Royal Caribbean International (RCI)

Royal Caribbean International operated two ships in Alaskan waters in 2010. Neither ship discharged wastewater in Alaskan waters.

Regent Seven Seas Navigator

The Seven Seas Navigator, operated by Regent, uses a Scanship treatment system, and was authorized to discharge under the general permit. The Seven Seas Navigator was granted an exemption to being sampled twice in May 2010 due to the short time the ship was in Alaskan waters.

2010 Semimonthly General Permit Sample Results Regent

			mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg /L	mg/ L	mg/L
Company	Vessel	Sample Date	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	Total Residual Chlorine
Regent	Navigator	5/31/2010	21	3.6	12	200	6.75	ND	14	8.5	ND
Regent	Navigator	6/12/2010	29	5.4	15	150	6.79	4	10	12	ND
Regent	Navigator	6/19/2010	30	3.1	9.3	20	6.9	14	9	5	ND
Regent	Navigator	7/3/2010	42	3.4	14	17	6.98	14	10	6.8	ND
Regent	Navigator	7/10/2010	40	2.7	15	53	6.92	3	5	8.8	ND
Regent	Navigator	8/8/2010	4.7	ND	9.5	100	6.81	2	13	4.3	ND
Regent	Navigator	8/21/2010	34	8.9	9	64	6.93	ND	11	6.9	ND
Regent	Navigator	9/5/2010	8.6	7.6	8.4	33	7.02	ND	6	4.3	ND
Regent	Navigator	9/11/2010	0.45	10	11	110	6.75	8	15	12	ND

2010 Semimonthly General Permit Sample Results Regent

	mg/L	µg/L	µg/L	µg/L	S.U.	col. per 100 ml	mg/L	mg/L	mg/L
	Ammonia	Copper	Nickel	Zinc	pH	Fecal Coliform	TSS	BOD	Total Residual Chlorine
Max	42	10	15	200	7.0	14	15.0	12	ND
Min	0.45	ND	8.4	17	6.8	ND	5.0	4.3	ND
Median	29.00	3.60	11.0	64	6.9	3	10.0	6.9	ND
Std Dev	15.45	3.2699	2.64	62.53	0.1	5.70	3.391	2.97	ND

Draft

The Seven Seas Navigator had no exceedances of General Permit limits in 2010.

Silver Shadow (Silversea)

The Silver Shadow, operated by Silversea, is the smallest of the large cruise ships that is permitted to discharge in Alaskan waters. This vessel uses a unique wastewater treatment system manufactured by Marisan. The Silver Shadow did not discharge in Alaskan waters in 2010.

Draft

APPENDIX 1. GENERAL PERMIT LIMITS

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 3.

Table 2: Effluent Limits and Discharge Reporting

Effluent Characteristics	Minimum Value[1]	Monthly Average[1]	Daily Maximum[1]	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[2]	43 per 100 mL	Twice Monthly	Grab
Total Residual Chlorine	N/A	N/A	0.0075 mg/L[3]	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
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 ($N-NO_3$)	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

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.

Draft

Table 3: Effluent Limits for Ammonia and Dissolved Metals

2010 Limit Tables 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

Draft

APPENDIX 2: 2010 LARGE CRUISE SHIP WASTEWATER SAMPLE DATA

Table 4: Semi-monthly parameters

2010 Semimonthly General Permit Sample Results

Company	Vessel	Ship Class	Treatment System	Wastewater Type	Sample Date	Type	mg/L Ammonia	ug/L Copper	ug/L Nickel	ug/L Zinc	S.U. pH	col. per 100 ml Fecal Coliform	mg/L TSS	mg/L BOD	mg/L Chlorine Total Residual	
Carnival	Spirit	Spirit	Rochem BIP	Graywater	5/15/2010	UA	ND	2.85	0.448	16	7.1	ND	ND	8.71	ND	
Carnival	Spirit	Spirit	Rochem BIP	Graywater	6/5/2010	GP	0.55	1.71	0.414	9.42	6.9	ND	ND	6.87	ND	
Carnival	Spirit	Spirit	Rochem BIP	Graywater	6/12/2010	GP	0.72	1.89	ND	11.4	6.8	ND	ND	15.8	ND	
Carnival	Spirit	Spirit	Rochem BIP	Graywater	7/10/2010	GP	0.93	1.19	ND	8.39	7.4	ND	ND	6.46	ND	
Carnival	Spirit	Spirit	Rochem BIP	Graywater	7/17/2010	GP	0.59	3.1	ND	7.8	7.3	ND	ND	6.37	ND	
Carnival	Spirit	Spirit	Rochem BIP	Graywater	8/7/2010	UA	0.87	2.94	ND	17.2	7.1	ND	ND	21.9	ND	
Carnival	Spirit	Spirit	Rochem BIP	Graywater	8/21/2010	GP	35	213	5.01	22.7	7.2	ND	ND	3.1	ND	
Carnival	Spirit	Spirit	Rochem BIP	Graywater	8/28/2010	GP	0.53	7.88	ND	10.1	7.9	ND	ND	7.29	ND	
Carnival	Spirit	Spirit	Rochem BIP	Graywater	9/4/2010	GP	0.59	7.77	2.38	170	7.1	ND	ND	7.37	ND	
Carnival	Spirit	Spirit	Rochem BIP	Graywater	9/9/2010	GP	0.56	1.51	ND	7.73	7.2	ND	ND	8.05	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	5/12/2010	GP	15	3.4	14	170	7.3	10	ND	6.2	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	5/20/2010	GP	30	5.5	18	170	7.5	110	ND	ND	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	5/26/2010	GP					7.3	ND			ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	6/2/2010	UA	6.6	9.7	12	160	7.6	ND	ND	2	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	6/3/2010	GP	16	10	16	180	7.5	ND	ND	ND	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	7/1/2010	UA	22	39	16	110	7.4	ND	ND	ND	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	7/7/2010	GP	24	2.7	8.5	91	7.3	2	ND	ND	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	7/15/2010	GP	18	3	13	92	7.3	2	6	2.4	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	8/4/2010	GP	35	3.7	15	110	7.4	12	ND	ND	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	8/12/2010	GP	10	5.3	15	120	7.1	ND	ND	ND	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	9/1/2010	GP	12	4.6	21	150	7.5	18	ND	2.2	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	9/9/2010	GP	6.8	3.6	26	110	7.8	22	ND	ND	ND	
Holland America	Ryndam	S-Class	Zenon	Mixed	9/14/2010	GP					7.4	6			ND	
Holland America	Statendam	S-Class	Zenon	Mixed	5/19/2010	GP		1.8	19	17	7.5	ND	34	14	ND	
Holland America	Statendam	S-Class	Zenon	Mixed	5/27/2010	GP	20	2.3	23	30	7.4	ND	ND	8.9	ND	
Holland America	Statendam	S-Class	Zenon	Mixed	5/28/2010	GP	30				7.6				ND	
Holland America	Statendam	S-Class	Zenon	Mixed	6/2/2010	RU	37	2.3	17	12	7.7	ND	ND	5.7	ND	
Holland America	Statendam	S-Class	Zenon	Mixed	6/10/2010	GP	24	1.9	18	73	7.4	ND	ND	ND	ND	
Holland America	Statendam	S-Class	Zenon	Mixed	6/16/2010	GP	45	2	17	11	7.5	ND	ND	3.9	ND	
Holland America	Statendam	S-Class	Zenon	Mixed	7/8/2010	GP	27	2	19	50	7.5	ND	ND	4.1	ND	
Holland America	Statendam	S-Class	Zenon	Mixed	7/14/2010	GP	31	2.3	18	17	7.5	ND	ND	3.6	ND	
Holland America	Statendam	S-Class	Zenon	Mixed	8/5/2010	GP	32	1.8	25	38	7.5	ND	ND	3.1	ND	underway
Holland America	Statendam	S-Class	Zenon	Mixed	8/11/2010	GP	22	2.8	20	31	7.6	ND	ND	4.5	ND	underway
Holland America	Statendam	S-Class	Zenon	Mixed	8/25/2010	UA	28	3.5	17	17	7.6	ND	ND	13	ND	underway
Holland America	Statendam	S-Class	Zenon	Mixed	9/2/2010	GP	25	2.7	17	22	7.8	ND	ND	21	ND	underway
Holland America	Statendam	S-Class	Zenon	Mixed	9/8/2010	GP	22	1.9	15	110	7.7	ND	ND	4.5	ND	underway
Holland America	Volendam	R-Class	Zenon	Mixed	5/14/2010	GP	0.65	69	20	120	6.8	ND	ND	ND	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	5/21/2010	UA	1.5	56	21	110	7.1	ND	ND	ND	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	5/28/2010	GP	4.3	43	16	110	6.9	ND	ND	ND	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	6/4/2010	GP	5.5	15	9.6	160	7.2	ND	ND	ND	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	6/11/2010	GP	6.1	18	12	160	7.3	ND	ND	ND	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	6/25/2010	UA	3.7	26	ND	88	7.2	ND	ND	ND	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	7/2/2010	GP	4.1	39	15	110	7	ND	ND	ND	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	7/9/2010	GP	9.9	44	22	250	7.5	ND	ND	2.8	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	8/6/2010	GP	18	5.2	7.7	130	7.5	ND	ND	ND	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	8/13/2010	GP	3.3	15	34	130	7.4	ND	ND	ND	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	9/3/2010	GP	17	20	8.8	93	7.4	15	ND	ND	ND	
Holland America	Volendam	R-Class	Zenon	Mixed	9/10/2010	GP	11	27	10	120	7.3	ND	ND	ND	ND	
Holland America	Zaandam	R-Class	Zenon	Mixed	May	NDW										
Holland America	Zaandam	R-Class	Zenon	Mixed	June	NDW										
Holland America	Zaandam	R-Class	Zenon	Mixed	7/11/2010	GP	3.6	6	9.5	85	7.1	ND	ND	ND	ND	
Holland America	Zaandam	R-Class	Zenon	Mixed	7/18/2010	UA	6.1	9.8	11	80	7.2	ND	ND	4.54	ND	
Holland America	Zaandam	R-Class	Zenon	Mixed	8/1/2010	GP	26	1.7	9.8	72	7.2	ND	ND	3.2	ND	
Holland America	Zaandam	R-Class	Zenon	Mixed	8/8/2010	GP	37	ND	9.2	57	7.5	ND	ND	2.4	ND	
Holland America	Zaandam	R-Class	Zenon	Mixed	8/22/2010	UA	48	5.2	10	45	7.5	ND	ND	3.3	ND	
Holland America	Zaandam	R-Class	Zenon	Mixed	9/5/2010	GP	44	5.3	10	49	7.7	ND	ND	2.3	ND	
Holland America	Zaandam	R-Class	Zenon	Mixed	9/28/2010	GP	8.6	29	19	130	6.9	ND	ND	3.8	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	5/12/2010	GP	0.52	21	3.5	83	6.8	ND	ND	ND	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	5/19/2010	UA	11	5.3	4.9	100	6.8	2	ND	2.9	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	5/25/2010	GP	1.9	22	16	82	6.6	96	11	3.1	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	6/2/2010	GP	12	5	4.6	64	6.9	15	ND	ND	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	6/9/2010	GP	21	6.2	0	200	6.8	ND	ND	ND	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	7/7/2010	GP	22	7	1.9	45	6.8	ND	ND	2.1	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	7/14/2010	GP	26	7.8	4.8	54	6.9	ND	ND	2.8	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	8/4/2010	GP	14	5.7	6.5	35	7.1	ND	10	6.6	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	8/11/2010	GP	26	9.4	5.2	25	6.9	ND	5	4.3	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	8/18/2010	UA	12	11	6.4	50	6.9	Error	11	3.3	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	9/8/2010	GP	13	7.5	4.4	67	6.9	ND	ND	ND	ND	
Norwegian	Pearl	Jewel	Scanship	Mixed	9/15/2010	GP	22	6.2	6	45	6.9	840	ND	6.1	ND	
Norwegian	Star	Libra	Scanship	Mixed	5/11/2010	GP	1.7	2.5	12	220	6.9	ND	ND	14	ND	
Norwegian	Star	Libra	Scanship	Mixed	5/18/2010	UA	9.6	3	12	46	6.9	4	ND	6.4	ND	
Norwegian	Star	Libra	Scanship	Mixed	5/25/2010	GP	29	6.6	14	69	7	ND	ND	10	ND	
Norwegian	Star	Libra	Scanship	Mixed	6/8/2010	GP	23	3.5	10	190	7	2	8	9.8	ND	
Norwegian	Star	Libra	Scanship	Mixed	6/15/2010	GP	30	2.4	10	70	7	ND	ND	12	ND	
Norwegian	Star	Libra	Scanship	Mixed	7/6/2010	GP	16	1.4	9.5	39	6.9	50	4	7.5	ND	
Norwegian	Star	Libra	Scanship	Mixed	7/27/2010	GP	23	3	11	81	6.9	ND	ND	9.8	ND	
Norwegian	Star	Libra	Scanship	Mixed	8/3/2010	GP	20	1.2	9.5	73	6.6	10	12	9.8	ND	
Norwegian	Star	Libra	Scanship	Mixed	8/10/2010	GP	28	2.1	8.9	30	7.2	ND	ND	13	ND	
Norwegian	Star	Libra	Scanship	Mixed	8/18/2010	UA	16	2.5	6.9	23	7.2	2	4	10	ND	
Norwegian	Star	Libra	Scanship	Mixed	9/7/2010	GP	35	3	7.6	59	7.1	ND	ND	5	ND	
Norwegian	Star	Libra	Scanship	Mixed	9/14/2010	GP	30	ND	7.5	42	7	ND	ND	4.1	ND	
Princess	Coral	Sun	Hamworthy	Mixed acc. Gra	8/4/2010	GP	48	10.1	8.36	97.8	7.2	ND	ND	ND	ND	
Princess	Coral	Sun	Hamworthy	Mixed acc. Gra	8/18/2010	UA	11	10.7	8.1	74.4	7	ND	ND	ND	ND	
Princess	Coral	Sun	Hamworthy	Mixed acc. Gra	8/24/2010	GP	11	18.5	6.2	86	6.9	ND	ND	ND	ND	
Princess	Coral	Sun	Hamworthy	Mixed acc. Gra	9/7/2010	GP	6.9	14.1	8.63	103	7	ND	ND	5.7	ND	
Princess	Coral	Sun	Hamworthy	Mixed acc. Gra	9/15/2010	GP	25	19.8	8.72	113	7.5	ND	ND	ND	ND	
Princess	Diamond	Diamond	Hamworthy	Mixed acc. Gra	8/11/2010	GP	59	2.74	11.1	106	7.4	ND	ND	ND	ND	
Princess	Diamond	Diamond	Hamworthy	Mixed acc. Gra	8/17/2010	GP	30	5.8	27.9	169	7.5	ND	ND	2	ND	
Princess	Diamond	Diamond	Hamworthy	Mixed acc. Gra	8/31/2010	UA	25	7.08	28.5	111	7.4	ND	ND	ND	ND	
Princess	Diamond	Diamond	Hamworthy	Mixed acc. Gra	9/15/2010	GP	55	7.72	9.06	139	7.5	ND	ND	ND	ND	
Princess	Diamond	Diamond	Hamworthy	Mixed acc. Gra	9/16/2010	GP	46	6.04	8.19	111	7.5	ND	ND	5.88	ND	

Explanation of color codes
Exceedance General Permit Limits
Exceedance of Alaska WQS
Exceedance of monthly average
Discharging only treated graywater

Results from 2010 Discharge monitoring reports and attached sample results, all sample results taken while discharging and in Alaska

Sample types:
- UA- Unannounced with priority pollutants
- GP- General Permit Twice Monthly Sample
- NDW- Not discharging, no sample taken
- Parameters not tested

General Permit Limits for all Systems

pH		Biological oxygen demand (BOD)	
Minimum	Maximum	Maximum	Monthly Average
6.5	8.5	60 mg/L	30 mg/L

Fecal Coliform	
Maximum	Monthly Average
43/ 100 ml	14/ 100 ml

Total Suspended Solids (TSS)	Total Residual Chlorine
Maximum	Maximum
150 mg/L	0.0075 mg/L

Rochem GP Limits

Ammonia		Dissolved Copper	
Underway (mg/L)	WQS (mg/L)	Underway (µg/L)	WQS (µg/L)
12	1	10	3.1

Dissolved Nickel		Dissolved Zinc	
Underway (µg/L)	WQS (µg/L)	Underway (µg/L)	WQS (µg/L)
10	8.2	118	81

Zenon GP Limits

Ammonia		Dissolved Copper	
Stationary (mg/L)	WQS (mg/L)	Stationary (µg/L)	WQS (µg/L)
28	1	50	3.1

Dissolved Nickel		Dissolved Zinc	
Stationary (µg/L)	WQS (µg/L)	Stationary (µg/L)	WQS (µg/L)
40	8.2	188	81

Scanship GP Limits

Ammonia		Dissolved Copper	
Underway (mg/L)	WQS (mg/L)	Underway (µg/L)	WQS (µg/L)
68	1	26	3.1

Dissolved Nickel		Dissolved Zinc	
Underway (µg/L)	WQS (µg/L)	Underway (µg/L)	WQS (µg/L)
28	8.2	267	81

Hamworthy GP Limits

Ammonia		Dissolved Copper	
Stationary (mg/L)	WQS (mg/L)	Stationary (µg/L)	WQS (µg/L)
28	1	87	3.1

Dissolved Nickel		Dissolved Zinc	
Stationary (µg/L)	WQS (µg/L)	Stationary (µg/L)	WQS (µg/L)
63	8.2	395	81

2010 Semimonthly General Permit Sample Results

Company	Vessel	Treatment System	Wastewater Type	Sample Date	Type	mg/L Ammonia	ug/L Copper	ug/L Nickel	ug/L Zinc	S.U. pH	col. per 100 ml Fecal Coliform	mg/L TSS	mg/L BOD	mg/L Chlorine Total Residual
Princess	Golden	Hamworthy	Graywater	8/9/2010	GP	ND	3.58	8.72	131	7.2	ND	ND	10.4	ND
Princess	Golden	Hamworthy	Graywater	8/16/2010	UA	ND	2.04	8.48	90.5	7.2	ND	ND	ND	ND
Princess	Golden	Hamworthy	Graywater	9/13/2010	GP	0.44	9.3	12.2	37	7	ND	ND	5.95	ND
Princess	Golden	Hamworthy	Graywater	9/20/2010	GP	0.46	1.86	8.85	39.8	7.4	ND	ND	9.83	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	8/10/2010	UA	0.56	3.15	9.79	120	7.6	ND	ND	6.13	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	8/12/2010	GP	ND	3	7.06	95.5	7.1	ND	ND	3.89	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	9/14/2010	GP	ND	6.28	8.12	88.1	7.8	ND	ND	4.35	ND
Princess	Golden	Hamworthy	Mixed acc. Gray	9/21/2010	GP	7.5	7.31	6.28	86.1	7.6	ND	ND	3.99	ND
Princess	Island	Hamworthy	Mixed acc. Gray	5/28/2010	UA	79	24.2	8.98	187	7.4	ND	ND	17.4	ND
Princess	Island	Hamworthy	Mixed acc. Gray	6/4/2010	GP	54	10	6.49	82.5	7.4	ND	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	6/25/2010	GP	37	5.7	3.14	42.2	7.2	ND	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	7/15/2010	GP	62	10.9	3.83	56.9	7.3	ND	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	8/6/2010	UA	46	8.29	8.01	116	7.4	1	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	8/13/2010	GP	61	14.6	7.08	101	7.4	ND	ND	2.43	ND
Princess	Island	Hamworthy	Mixed acc. Gray	8/20/2010	GP	81	13.5	6.43	84.2	7.5	ND	ND	5.14	ND
Princess	Island	Hamworthy	Mixed acc. Gray	8/26/2010	GP	61	17.2	4.95	95.1	7.2	ND	ND	ND	ND
Princess	Island	Hamworthy	Mixed acc. Gray	9/3/2010	GP	67	18	6.75	109	7.4	ND	ND	2.6	ND
Princess	Island	Hamworthy	Mixed acc. Gray	9/30/2010	GP	17	11.8	5.46	83.1	6.9	ND	ND	ND	ND
Princess	Royal	Hamworthy	Mixed acc. Gray	8/5/2010	GP	130	3.48	21.8	11.4	7.8	ND	ND	23.4	ND
Princess	Royal	Hamworthy	Mixed acc. Gray	8/20/2010	GP	84	13	18.1	40.1	7.6	ND	ND	5.65	ND
Princess	Royal	Hamworthy	Mixed acc. Gray	8/19/2010	UA	68	20	18	71.7	7.5	ND	ND	ND	ND
Princess	Royal	Hamworthy	Mixed acc. Gray	9/2/2010	GP	120	7.68	38.4	95.8	7.7	ND	ND	24.7	ND
Princess	Royal	Hamworthy	Mixed acc. Gray	9/3/2010	GP	62	9.95	27.3	65.6	7.5	ND	ND	3.69	ND
Princess	Sapphire	Hamworthy	Graywater	8/11/2010	UA	2.1	14.7	17.7	102	7.1	ND	ND	ND	ND
Princess	Sapphire	Hamworthy	Graywater	8/18/2010	GP	3.5	14.2	20.8	114	7.1	ND	ND	3.19	ND
Princess	Sapphire	Hamworthy	Graywater	9/8/2010	GP	2.3	11.3	24.7	90.9	7.7	ND	ND	5.11	ND
Princess	Sapphire	Hamworthy	Graywater	9/15/2010	GP	2.6	10.1	17.1	101	7.1	ND	ND	3.16	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	8/12/2010	GP	56	154	34.2	62.4	8	2	ND	5.37	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	9/2/2010	GP	62	29.7	26.5	98.7	7.8	ND	ND	4.73	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	9/8/2010	UA	110	67.5	28.4	102	7.8	ND	ND	ND	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	9/9/2010	GP	81	24.9	28.2	99.1	8	ND	ND	3.44	ND
Princess	Sapphire	Hamworthy	Mixed acc. Gray	9/16/2010	GP	91	8.66	15.7	93.3	8.2	ND	ND	7.93	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	8/5/2010	GP	53	6.1	7.82	29.9	7.3	ND	5	3.39	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	8/15/2010	UA	61	4.14	7	41.2	7.5	ND	6	4.1	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	9/4/2010	GP	32	4.41	9.43	9.43	7.2	ND	ND	2.7	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	9/13/2010	GP	49	40.7	7.35	57.9	7.2	ND	ND	22.6	ND
Princess	Sea	Hamworthy	Mixed acc. Gray	9/23/2010	GP	71	3.45	11.4	36.4	7.3	ND	10	22.1	ND
Regent	Seven Seas Navigator	Scanship	Mixed	5/31/2010	GP	21	3.6	12	200	6.75	ND	14	8.5	ND
Regent	Seven Seas Navigator	Scanship	Mixed	6/12/2010	GP	29	5.4	15	150	6.79	4	10	12	ND
Regent	Seven Seas Navigator	Scanship	Mixed	6/19/2010	UA	30	3.1	9.3	20	6.9	14	9	5	ND
Regent	Seven Seas Navigator	Scanship	Mixed	7/3/2010	GP	42	3.4	14	17	6.98	14	10	6.8	ND
Regent	Seven Seas Navigator	Scanship	Mixed	7/10/2010	GP	40	2.7	15	53	6.92	3	5	8.8	ND
Regent	Seven Seas Navigator	Scanship	Mixed	8/8/2010	UA	4.7	ND	9.5	100	6.81	2	13	4.3	ND
Regent	Seven Seas Navigator	Scanship	Mixed	8/21/2010	GP	34	8.9	9	64	6.93	ND	11	6.9	ND
Regent	Seven Seas Navigator	Scanship	Mixed	9/5/2010	GP	8.6	7.6	8.4	33	7.02	ND	6	4.3	ND
Regent	Seven Seas Navigator	Scanship	Mixed	9/11/2010	GP	0.45	10	11	110	6.75	8	15	12	ND
					Average	25.62	12.94	12.2	82.18	7.26	9.83	1.71	4.99	ND
					Max	130	213	38.4	250	8.20	840	34	24.7	ND
					Min	ND	ND	ND	7.73	6.56	ND	ND	ND	ND
					Median	21	6.0	10.00	84	7.2	ND	ND	3.85	ND

Explanation of color codes
Exceedance General Permit Limits
Exceedance of Alaska WQS
Exceedance of monthly average
Discharging only treated graywater

Results from 2010 Discharge monitoring reports and attached sample results, all sample results taken while discharging and in Alaska

Sample types:
- UA- Unannounced with priority pollutants
- GP- General Permit Twice Monthly Sample
- NDW- Not discharging, no sample taken
- Parameters not tested

General Permit Limits for all Systems

pH		Biological oxygen demand (BOD)	
Minimum	Maximum	Maximum	Monthly Average
6.5	8.5	60 mg/L	30 mg/L

Fecal Coliform	
Maximum	Monthly Average
43/ 100 ml	14/ 100 ml

Total Suspended Solids (TSS)	Total Residual Chlorine
Maximum	Maximum
150 mg/L	0.0075 mg/L

Hamworthy GP Limits

Ammonia		Dissolved Copper
Stationary (mg/L)	WQS (mg/L)	Stationary (µg/L)
28	1	87

Dissolved Nickel		Dissolved Zinc
Stationary (µg/L)	WQS (µg/L)	Stationary (µg/L)
63	8.2	395

Scanship GP Limits

Ammonia		Dissolved Copper
Underway (mg/L)	WQS (mg/L)	Underway (µg/L)
68	1	26

Dissolved Nickel		Dissolved Zinc
Underway (µg/L)	WQS (µg/L)	Underway (µg/L)
28	8.2	267

Draft

Table 5: Semi-seasonal conventional parameters

Vessel	Sample Date	Chemical O^2 Demand	Free Chlorine	Residual Chlorine	Conductivity	Hexane Extractable Material	Total Organic Carbon	Alkalinity	Nitrate as N	Total Nitrogen (as N)	Total Phosphorus	Total Kjedahl Nitrogen	Total Settable Solids
	Detection Limit	10.00	0.10	0.10	2.00	5.00	1.00	2.00	1.00	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	mg/l
Alaska Water Quality Standards		None	None	0.0075	None	None	None	None	None	None	None	None	None
Carnival Spirit	5/15/10	14	ND	ND	65.1	ND	4.5	30	ND	ND	ND	1.63	ND
Carnival Spirit	8/7/10	19	ND	ND	73.3	ND	4.6	32	ND	1.4	ND	1.42	ND
Ryndam	6/2/10	32	ND	ND	1210	ND	12	340	6	6.7	6	9.2	ND
Ryndam	7/1/10	20	ND	ND	636	ND	12	180	0.1		1.2	26	ND
Statendam	6/2/10	88	ND	ND	901	ND	23	300	ND		1.5	46	ND
Statendam	8/25/10	72	ND	ND	1620	ND	230	250	ND		0.41	32	ND
Volendam	5/21/10	18	ND	ND	631	3.9	9	64	35		6.5	ND	ND
Volendam	6/25/10	55	ND	ND	582	ND	8.1	57	30		6.5	ND	ND
Zaandam	7/18/10	51	ND	ND	1260	ND	7.19	120	15		2.6	7.2	ND
Zaandam	8/22/10	34	ND	ND	874	ND	13	250	0.23		ND	59	ND
Coral Princess	8/18/10	47	ND	ND	460	ND	15	92	ND	14.3	11	14.3	ND
Vessel	**Sample Date**	Chemical O^2 Demand	Free Chlorine	Residual Chlorine	Conductivity	Hexane Extractable Material	Total Organic Carbon	Alkalinity	Nitrate as N	Total Nitrogen (as N)	Total Phosphorus	Total Kjedahl Nitrogen	Total Settable Solids
	Limit	10.00	0.10	0.10	2.00	5.00	1.00	2.00	1.00	1.00	0.05	1.00	
	Units	mg/l	mg/l	mg/l	cm	mg/l	mg/l	mg/l	mg/L	mg/l	mg/l	mg/l	mg/l
Alaska Water Quality Standards		None	None	0.0075	None	None	None	None	None	None	None	None	None
Diamond Princess	8/31/10	32	ND	ND	587	ND	10.9	119	0.103	25.7	6.1	25.6	ND
Golden Princess- GW	8/16/10	28	ND	ND	1810	ND	5.9	39	ND	1.6	0.075	1.61	ND
Golden Princess	8/10/10	26	ND	ND	757	ND	11	63	ND	ND	1.5	0.638	ND
Island Princess	8/6/10	45	ND	ND	923	ND	16	216	ND	46	10	45.7	ND
Royal Princess	8/19/10	39	ND	ND	1480	ND	14.4	297	ND	69.6	6.6	69.5	ND
Sapphire Princess- GW	8/11/10	16	ND	ND	219	ND	6.8	45	0.0515	2.43	0.32	2.38	ND
Sapphire Princess	9/8/10	47	ND	ND	1380	ND		530	0.0967	110	7.1	110	ND
Vessel	**Sample Date**	Chemical O^2 Demand	Free Chlorine	Residual Chlorine	Conductivity	Hexane Extractable Material	Total Organic Carbon	Alkalinity	Nitrate as N	Total Nitrogen (as N)	Total Phosphorus	Total Kjedahl Nitrogen	Total Settable Solids
	Limit	10.00	0.10	0.10	2.00	5.00	1.00	2.00	1.00	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	mg/l
Alaska Water Quality Standards		None	None	0.0075	None	None	None	None	None	None	None	None	None
Sea Princess	8/15/10	62	ND	ND	8670	ND	11	277	ND	60	4	60	ND
Norwegian Pearl	5/19/10	39	ND	ND	780	ND	14	87	11		ND	12	ND
Norwegian Pearl	8/18/10	52	ND	ND	3160	ND	14	130	5.6		0.3	18	ND
Norwegian Star	5/18/10	43	ND	ND	649	ND	17	110	ND		ND	14	ND
Norwegian Star	8/18/10	37	ND	ND	868	ND	270	110	0.23		ND	21	ND
Seven Seas Mariner	6/19/10	160	ND	ND	4960	ND	24	130	ND		0.39	34	ND
Seven Seas Mariner	8/8/10	54	ND	ND	2210	ND	10.2	66	0.24		0.46	7.1	ND
	MAX	160	ND	ND	8670	3.9	270	530	35	110	11	110	ND
	MIN	14	ND	ND	65.1	ND	4.5	30	ND	1.4	ND	ND	ND
This table has ND=0	**MEDIAN**	39	ND	ND	874	ND	12	119	ND	20	1.5	18.7	ND

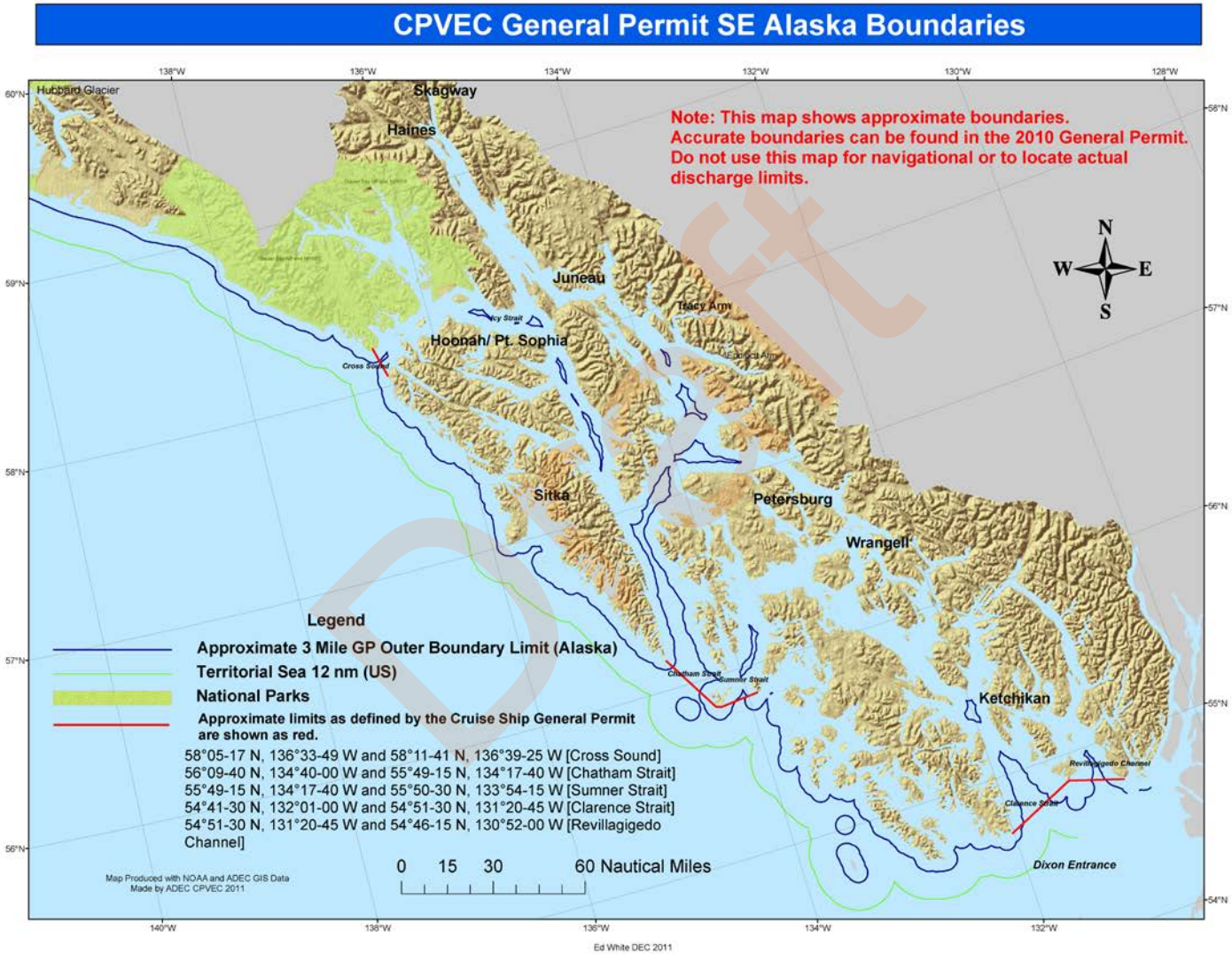
Parameter not sampled

Table 6: 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	5/15/10	ND	ND	ND	ND	ND	ND	ND	ND	0.292	0.447	1.97	2.85	0.411	0.638	ND	0.193	0.448	8.65	8.14	ND	ND	ND	ND	10.5	16
Carnival Spirit	8/7/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.89	2.94	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.1	17.2
Ryndam	6/2/10	0.11	0.96	2	3.1	ND	ND	ND	ND	0.51	1.1	9	9.7	0.23	0.33	ND	11	12	5.1	7.6	ND	ND	0.18	0.86	140	160
Ryndam	7/1/10	ND	1	ND	2.6	ND	ND	ND	ND	ND	ND	2.5	39	ND	ND	ND	9.9	16	ND	4.4	ND	ND	ND	3.2	81	110
Statendam	6/2/10	ND	ND	3.4	3.7	ND	ND	ND	ND	1.1	ND	2.1	2.3	ND	ND	ND	17	17	6.2	8.6	ND	ND	ND	3.7	4.4	12
Statendam	8/25/10	ND	ND	3.4	6.7	ND	ND	ND	ND	ND	ND	3.7	3.5	ND	ND	ND		17	9.1	9	ND	ND	ND	ND	ND	17
Volendam	5/21/10	1.1	1	2.2	0.72	ND	ND	0.048	0.029	ND	2.2	79	56	0.28	0.048	ND	23	21	4.9	2.7	0.019	0.012	0.75	0.47	100	110
Volendam	6/25/10	1.1	ND	2.3	2.2	ND	ND	ND	ND	ND	2.9	24	26	ND	ND	ND	10	ND	ND	5.7	ND	ND	ND	ND	81	88
Zaandam	7/18/10	ND	ND	4	4.4	ND	ND	ND	ND	ND	ND	3.5	9.8	1.2	ND	ND	13	11	12	14	ND	ND	1.2	2.1	83	80
Zaandam	8/22/10	1.3	1.9	8.3	12	ND	ND	ND	ND	ND	3.9	5.3	5.2	ND	ND	ND	9.8	10	20	21	ND	ND	ND	3.1	38	45
Coral Princess	6/9/10	ND	ND	2.06	1.94	ND	ND	ND	ND	4.63	3.79	13.3	11.4	ND	ND	ND	9.29	9.75	5.35	ND	ND	ND	ND	ND	102	103
Coral Princess	8/18/10	ND	ND	ND	1.6	ND	ND	ND	ND	3.41	4.25	12.1	10.7	ND	ND	ND	7.79	8.07	ND	ND	ND	ND	ND	ND	76.2	74.4
Diamond Princess	6/2/10	ND	ND	1.55	ND	ND	ND	ND	ND	2.33	4.35	4.76	4.86	ND	ND	ND	9.31	9.9	ND	ND	ND	ND	ND	ND	111	114
Diamond Princess	8/31/10	ND	ND	ND	1.51	ND	ND	ND	ND	ND	2.73	6.3	7.08	ND	ND	ND	12.8	28.5	ND	ND	ND	ND	ND	ND	112	111
Golden Princess- GW	5/24/10	ND	ND	ND	ND	ND	ND	ND	ND	8.03	10.8	3.45	3.32	ND	ND	ND	7.55	8.47	ND	6.11	ND	ND	ND	ND	95.3	97.3
Golden Princess- GW	8/16/10	ND	ND	ND	1.76	ND	ND	ND	ND	11.9	14.1	2.7	2.04	1.84	2.18	ND	7.02	8.48	5.86	7.18	ND	ND	ND	ND	77.7	90.5
Golden Princess	5/25/10	ND	1.25	ND	ND	ND	ND	ND	ND	3.79	4.76	2.57	3.03	ND	ND	ND	6.13	6.65	ND	ND	ND	ND	ND	ND	77.4	84.9
Golden Princess	8/10/10	ND	ND	ND	ND	ND	ND	ND	ND	6.73	6.14	6.13	3.15	ND	ND	ND	11	9.79	5.52	ND	ND	ND	ND	ND	136	120
Island Princess	5/28/10	ND	ND	5.33	5.87	ND	ND	ND	ND	2.1	3.32	26.5	24.2	ND	1.02	ND	8.32	8.98	15.4	16.7	ND	ND	ND	ND	179	187
Island Princess	8/6/10	ND	ND	1.67	1.64	ND	ND	ND	ND	6.57	7.51	9.22	8.29	ND	1.71	ND	8.08	8.01	ND	ND	ND	ND	0.772	0.99	119	116
Royal Princess	6/10/10	ND	ND	2.29	2.22	ND	ND	ND	ND	10.5	9.04	11	7.65	2.68	1.88	ND	11.4	10.7	ND	ND	ND	ND	0.583	ND	66.9	67.8
Royal Princess	8/19/10	ND	ND	ND	ND	ND	ND	ND	ND	5.83	5.43	17	20	1.77	1.94	ND	16.9	18	ND	ND	ND	ND	ND	ND	60.4	71.7
Sapphire Princess- GW	6/9/10	0.583	0.661	0.343	0.624	ND	ND	ND	ND	0.959	0.887	71.2	64	0.397	0.723	ND	24.9	24.4	2.5	2.61	ND	ND	ND	ND	130	131
Sapphire Princess-GW	8/11/10	ND	ND	ND	ND	ND	ND	ND	ND	3.45	4.05	17	14.7	ND	ND	ND	17.9	17.7	ND	7.89	ND	ND	ND	ND	103	102
Sapphire Princess	5/27/10	0.522	0.62	0.798	0.833	ND	ND	ND	ND	3.71	4.45	36.1	31	0.543	0.623	ND	39.6	38.9	4.81	4.78	ND	ND	ND	ND	106	106
Sapphire Princess	9/8/10	ND	ND	1.15	ND	ND	ND	ND	ND	3.23	3.66	76.5	67.5	1.15	1.34	ND	29.5	28.4	ND	ND	ND	ND	0.616	0.727	100	102
Sea Princess	5/26/10	ND	ND	8.63	10.1	ND	ND	ND	ND	4.01	3.54	3.84	3.28	ND	ND	ND	14.6	16.9	34.6	44	ND	ND	ND	ND	10.9	16.9
Sea Princess	8/15/10	ND	ND	15.1	11.8	ND	ND	ND	ND	2.42	ND	6.68	4.14	3.51	4.15	ND	7.45	6.96	36.1	32.2	ND	ND	ND	ND	46.4	41.2
Norwegian Pearl	5/19/10	ND	ND	1.2	ND	ND	ND	ND	ND	ND	ND	5.6	5.3	ND	ND	ND	5.3	4.9	2.2	ND	ND	ND	ND	ND	32	100
Norwegian Pearl	8/18/10	1.2	ND	10	2.6	ND	ND	ND	ND	1	2.5	13	11	ND	ND	ND	5.8	6.4	23	11	ND	ND	ND	ND	22	50
Norwegian Star	5/18/10	ND	ND	1.9	ND	ND	ND	ND	ND	ND	1.3	2.3	3	ND	ND	ND	15	12	2.1	1.7	ND	ND	ND	1.2	68	46
Norwegian Star	8/18/10	ND	ND	ND	7.9	ND	ND	ND	ND	ND	ND	2.9	2.5	ND	ND	ND	6.7	6.9	5.1	18	ND	ND	ND	2	21	23
Seven Seas Navigator	6/19/10	ND	ND	8.9	12	ND	ND	ND	ND	ND	1.6	5.9	3.1	ND	ND	ND	ND	9.3	22	37	ND	ND	ND	ND	ND	20
Seven Seas Navigator	8/8/10	ND	1.6	2.3	3.5	ND	ND	ND	ND	ND	ND	3.9	ND	ND	ND	ND	7.7	9.5	13	14	ND	ND	ND	3	14	100

All results in micrograms/L
ND= Non-detect

APPENDIX 3: GP BOUNDARIES MAP FOR SOUTHEAST ALASKA



APPENDIX 4: USEFUL WEBSITES

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

General Permit Authorizations by ADEC
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

Alaska Cruise Ship Laws and Regulations
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

EPA NPDES Vessel Discharges Page
http://cfpub.epa.gov/npdes/home.cfm?program_id=350

Draft