



2018 Wastewater Sampling Results For Large Cruise Ships

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Alaska Department of
Environmental Conservation
Commercial Passenger Vessel Environmental Compliance Program

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1. SUMMARY

This is a summary of the 2018 onboard sampling and laboratory testing results of large cruise ship treated wastewater effluent in Alaska. This summary provides information on wastewater treatment sample results obtained under the requirements of the [2014 Large Commercial Passenger Vessel Wastewater Discharge General Permit](#) (General Permit). Tables of sample results are included in Appendix 1. Information on the sampling techniques and requirements can be found in the Methods section of this report.

Thirty two large cruise ships operated in Alaska in 2018, of those twenty ships were authorized to discharge treated wastewater in Alaska and eighteen ships discharged treated wastewater and conducted sampling. Table 1 lists large cruise ships in Alaska and their discharge status in 2018.

2. INTRODUCTION

Sampling of wastewater effluent is a requirement under the General Permit for all large cruise ships discharging in Alaska waters. Sampling is needed to:

- Check for compliance of permit effluent limits
- Obtain information on treatment system performance for future discharge permits
- Compile information on potential environmental effects

Sample result data for cruise ships has been collected by the Department of Environmental Conservation since 2000. Reports for prior years can be found on the cruise program's report webpage.

3. METHODS

Samples are grab wastewater samples taken from a sample port prior to discharge. The number of required samples and what parameters are required to be analyzed are listed in the 2014 General Permit and for the US Coast Guard in the Quality Assurance Project Plan (QAPP). Sampling may occur while underway or while the cruise ship is docked. All samples were obtained in Southeast Alaska in 2018, with the majority of samples obtained in or near Juneau. Sample results presented in this report only include data collected while a cruise ship was discharging in Alaska.

The samples were taken according to requirements in the [2018 Cruise Line International Association North West and Canada Quality Assurance Project Plan for Sampling and Analysis of Treated Sewage and Graywater from Commercial Passenger Vessels](#) (QAPP). The QAPP specifies minimum requirements for sampling and analysis of wastewater. It includes a list of approved methods, sample collection requirements, and laboratory analysis requirements. Samplers must follow the QAPP and the Vessel Specific Sampling Plan (VSSP) for each cruise ship when collecting a sample. The

Commercial Passenger Vessel Environmental Compliance (Cruise Ship) program spot checked results submitted by the cruise ship operators for compliance with the QAPP and checked all results for compliance with 2014 General Permit limits.

4. RESULTS

Wastewater sample results are listed in Appendix 1 with tables for parameters with General Permit limits, conventional and nutrient results with no limits, and metals. Full results of volatile organic compounds (VOCs) and base neutral acids (BNAs) sampling are available on request. This report does not include the results of receiving water or ambient water sampling taken in the harbors, as well as Whole Effluent Toxicity effluent testing.

In the tables of results those values highlighted in red are exceedances of the 2014 Wastewater Discharge General Permit limits. Orange highlighted results were below a daily maximum, but were an exceedance of a monthly average limit. Dark blue highlights indicate that either no sample analysis was required or no data was received. Results below the method detection limit (MDL) are recorded as zero. Full sample suites of all QAPP listed parameters are identified as “PP” for priority pollutants, and all other samples are identified as “GP” (General Permit).

Table 1: 2018 Large Cruise Ship Summary

2018 Large ¹ Commercial Passenger Vessel Discharge Status and Wastewater Treatment												
Vessel Operator	Vessel Name	Passenger Capacity ²	Voyages	Annual Passenger capacity ⁴	Crew Capacity	Wastewater Treatment System ⁶	Permitted to discharge in Alaska in 2018 ³		Skagway Docks discharge permitted?			
							Underway	Stationary	Railroad	Ore	Broadway	
1	Carnival Cruise Lines	<i>Carnival Legend</i>	2124	17	36,108	Unknown	Triton Type MSTP9	No	No	No	No	No
2	Carnival Cruise Lines	<i>Carnival Splendor</i>	3006	1	3,006	Unknown	Unknown	No	No	No	No	No
3	Celebrity Cruises	<i>Celebrity Infinity</i>	2170	14	30,380	Unknown	Zenon Zeesweed	No	No	No	No	No
4	Celebrity Cruises	<i>Celebrity Millennium</i>	2449	19	46,531	Unknown	Hydroxyl CB-100 MSD	No	No	No	No	No
5	Celebrity Cruises	<i>Celebrity Solstice</i>	3148	18	56,664	Unknown	Kruger WABAG MSD	No	No	No	No	No
6	Crystal	<i>Crystal Symphony</i>	975	4	3,900	Unknown	Unknown	No	No	No	No	No
7	Disney	<i>Disney Wonder</i>	2834	16	45,344	920	Hamworthy MBR AWTS	Yes	No	No	No	No
8	Holland America	<i>Amsterdam</i>	1380	17	23,460	Unknown	Hamworthy Super Trident MSD	No	No	No	No	No
9	Holland America	<i>Eurodam</i>	2106	20	42,120	929	2 Hamworthy MBR AWTS	Yes	No	No	No	No
10	Holland America	<i>Nieuw Amsterdam</i>	2106	21	44,226	929	2 Hamworthy MBR AWTS	Yes	No	No	No	No
11	Holland America	<i>Noordam</i>	1916	21	40,236	Unknown	Rochem UF MSD	No	No	No	No	No
12	Holland America	<i>Volendam</i>	1432	21	30,072	647	Zenon AWTS	Yes	Yes	Yes	Yes	Yes
13	Holland America	<i>Westerdam</i>	1916	22	42,152	Unknown	Unknown	No	No	No	No	No
14	Holland America	<i>Zaandam</i>	1432	10	14,320	647	Zenon AWTS	Yes	Yes	Yes	Yes	Yes
15	Norwegian Cruise Line	<i>Norwegian Bliss</i>	3500	17	59,500	1706	Scanship AWP 60 Type II AWTS	Yes	Yes	Yes	No	No
16	Norwegian Cruise Line	<i>Norwegian Jewel</i>	2376	18	42,768	1100	Scanship Type II AWTS	Yes	Yes	Yes	Yes	Yes
17	Norwegian Cruise Line	<i>Norwegian Pearl</i>	2394	22	52,668	1100	Scanship Type II AWTS	Yes	Yes	Yes	Yes	Yes
18	Oceania	<i>Regatta</i>	777	15	11,655	373	Triton Water MBR AWTS	Yes	Yes	Yes	Yes	Yes
19	Ponant	<i>Le Boreal</i>	264	1	264	136	Rochem Bio-filt AWTS	No	No	No	No	No
20	Ponant	<i>Le Soleal</i>	264	2	528	136	Rochem Bio-filt AWTS	Yes	Yes	Yes	Yes	Yes ⁵
21	Princess Cruise Line	<i>Coral Princess</i>	1986	18	35,748	900	Hamworthy MBR AWTS	Yes	No	No	No	No
22	Princess Cruise Line	<i>Emerald Princess</i>	3084	17	52,428	1127	DeNora Ozone AWWTP- Graywater Only	Yes	Yes	No	No	No
23	Princess Cruise Line	<i>Golden Princess</i>	2606	17	44,302	1060	Hamworthy MBR AWTS	Yes	Yes - Graywater only	Yes	No	No
24	Princess Cruise Line	<i>Grand Princess</i>	2606	14	36,484	1100	Hamworthy MBR 16 AWTS	Yes	Yes - Graywater only	Yes	No	No
25	Princess Cruise Line	<i>Island Princess</i>	1974	20	39,480	900	Hamworthy MBR AWTS	Yes	No	No	No	No
26	Princess Cruise Line	<i>Ruby Princess</i>	3084	21	64,764	1201	Hamworthy MBR 16 AWTS	Yes	Yes - Graywater only	No	No	No
27	Princess Cruise Line	<i>Star Princess</i>	2600	19	49,400	1150	Hamworthy MBR AWTS	Yes	Yes - Graywater only	No	No	No
28	Regent Seven Seas	<i>Seven Seas Mariner</i>	769	17	13,073	431	Hamworthy MBR 240C AWTS	Yes	No	No	No	No
29	Royal Caribbean Cruises	<i>Explorer of the Seas</i>	4000	17	68,000	Unknown	Two Scanship Mussel FA45	No	No	No	No	No
30	Royal Caribbean Cruises	<i>Radiance of the Seas</i>	2502	17	42,534	Unknown	Hamann MSD	No	No	No	No	No
31	Seabourn	<i>Soljour</i>	450	11	4,950	338	2 Hamworthy MBR AWTS	Yes	Yes	Yes	Yes	No
32	Silver Seas	<i>Silver Shadow</i>	435	18	7,830	305	Bio Epure/Marislan AWTS	Yes	No	No	No	No
		Totals		502	1,084,895							
							MBR is a Membrane Bioreactor					
							Vessels highlighted in gray in the above table did not discharge wastewater in Alaskan waters in 2018.					
							¹ A large vessel has overnight accommodations for 250 or more passengers.					
							² Capacity is the number of lower berths and is calculated from Registration, Vessel Specific Sampling Plan, or Notice of Intent. Actual number of passenger aboard varies.					
							³ Alaska water includes the Alexander Archipelago and extends 3 miles from the coastline. Only vessels that discharge into Alaska waters are required to sample for wastewater.					
							⁴ Assumes full capacity on every voyage					
							⁵ Discharge at Broadway Dock allowed unless another ship is discharging at the Ore Dock					
							⁶ Nondischarging vessels are not required to provide crew or treatment system information.					

APPENDIX 1: 2018 LARGE CRUISE SHIP WASTEWATER SAMPLE DATA

Table 3: Semi-monthly parameters and general permit limits

Explanation of color codes	
	Exceedance General Permit Limits
	Exceedance of Alaska WQS
	Exceedance of monthly average
	Treated graywater
	Parameter not tested

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

Sample types:
 PP- Twice a year with priority pollutants
 GP- General Permit Twice Monthly Sample
 USCG- USCG random unannounced sample events

SemiMonthly General Permit Sample Results										Non-detects set to zero									
Company	Vessel	Treatment System	Waste-water Type	Sample taken white	Sample Date	Type	mg/L	ug/L	ug/L	S.U.	C	mg/L	mg/L	mg/L	mg/L	umhos/cm	mg/L	mg/L	
							Ammonia	Dissolved Copper	Dissolved Nickel	Dissolved Zinc	pH	Temp	Flow rate	Fecal Coliform	TSS	BOD	Hardness	Saefic Conductance	Free Chlorine
Disney	Wonder	Hamworthy	Mixed	Underway	5/25/2018	GP													
Disney	Wonder	Hamworthy	Mixed	Underway	6/9/2018	PP	88	1.9	20	270	7.21	26.7	14.04	0	0	3	78	1660	0
Disney	Wonder	Hamworthy	Mixed	Underway	6/22/2018	GP													
Disney	Wonder	Hamworthy	Mixed	Underway	7/6/2018	GP													
Disney	Wonder	Hamworthy	Mixed	Underway	7/13/2018	PP	29	8.8	12	230	7.28	29.1	14.4	0	0	2.4	39	843	0
Disney	Wonder	Hamworthy	Mixed	Underway	8/10/2018	GP													
Disney	Wonder	Hamworthy	Mixed	Underway	8/24/2018	GP													
Disney	Wonder	Hamworthy	Mixed	Underway	9/7/2018	GP													
Holland America	Eurodam	Hamworthy	Mixed	Underway	5/21/2018	GP													
Holland America	Eurodam	Hamworthy	Mixed	Underway	5/28/2018	GP													
Holland America	Eurodam	Hamworthy	Mixed	Underway	6/4/2018	PP	100	2	11	26	7.76	26	22.46	12	0	8.6	26	1100	0
Holland America	Eurodam	Hamworthy	Mixed	Underway	6/20/2018	GP													
Holland America	Eurodam	Hamworthy	Mixed	Underway	6/27/2018	GP													
Holland America	Eurodam	Hamworthy	Mixed	Underway	7/16/2018	GP													
Holland America	Eurodam	Hamworthy	Mixed	Underway	7/23/2018	GP													
Holland America	Eurodam	Hamworthy	Mixed	Underway	8/1/2018	GP													
Holland America	Eurodam	Hamworthy	Mixed	Underway	8/15/2018	GP	61	2.4	16	22	7.73	31.2	15.1	3	5.2	13	24	1130	0
Holland America	Eurodam	Hamworthy	Mixed	Underway	9/10/2018	GP													
Holland America	Eurodam	Hamworthy	Mixed	Underway	9/19/2018	GP													
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	5/15/2018	PP	130	1.2	16	7	7.92	17.7	3.84	0	0	4.1	37600	0	
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	5/22/2018	GP													
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	5/29/2018	PP	120	1.8	12	21	7.76	26.5	3.84	2	0	3.4	33	1280	0
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	6/12/2018	GP													
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	6/19/2018	GP													
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	7/10/2018	GP													
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	7/17/2018	GP													
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	8/14/2018	PP	110	3.7	11	41	7.66	31.5	11.76	0	4	0	36	15700	0
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	8/21/2018	GP													
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	8/28/2018	PP	100	6.1	10	34	7.56	29.3	8.16	2	0	11	41	1200	0
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	9/4/2018	GP													
Holland America	Nieuw Amsterdam	Hamworthy	Mixed	Underway	9/11/2018	GP													
Holland America	Volendam	Zenon	Mixed	Stationary	5/11/2018	GP	32	2.2			7.22	24.4	24.1	0	0	0	22	800	0
Holland America	Volendam	Zenon	Mixed	Stationary	5/18/2018	GP	26	2.8			7.21	27	28	0	0	0	25	774	0
Holland America	Volendam	Zenon	Mixed	Stationary	6/1/2018	PP	48	2	12	50	7.44	25.4	25.6	0	0	0	28	876	0
Holland America	Volendam	Zenon	Mixed	Stationary	6/15/2018	GP	29	1.5			7.36	26	17.8	0	0	0	34	795	0
Holland America	Volendam	Zenon	Mixed	Stationary	7/6/2018	GP	36	2.4			7.24	27.8	19.6	0	0	0	26	793	0
Holland America	Volendam	Zenon	Mixed	Stationary	7/13/2018	GP	24	5.2			7.11	27.3	19.59	0	0	0	30	801	0
Holland America	Volendam	Zenon	Mixed	Stationary	8/10/2018	PP	26	1.6	12	56	7.34	27.9	23.02	0	0	0	33	741	0
Holland America	Volendam	Zenon	Mixed	Stationary	8/24/2018	GP	29	1.5			7.38	27.7	19.21	0	0	0	30	742	0
Holland America	Volendam	Zenon	Mixed	Stationary	9/7/2018	GP	21	2.1			7.28	27.6	25.89	0	0	0	29	698	0
Holland America	Volendam	Zenon	Mixed	Stationary	9/21/2018	GP	15	2.2			7.22	27.7	19.7	0	0	0	31	595	0
Holland America	Zaandam	Zenon	Mixed	Stationary	5/11/2018	GP	29	3.7			7.26	24.5	23.16	0	0	2.9	25	810	0
Holland America	Zaandam	Zenon	Mixed	Stationary	5/25/2018	GP	10	2.4			7.12	23.6	23.3	0	0	6.6	26	774	0
Holland America	Zaandam	Zenon	Mixed	Stationary	6/1/2018	PP	22	2.8	11	41	7.43	23.2	23	0	0	9.1	37	861	0
Holland America	Zaandam	Zenon	Mixed	Stationary	6/22/2018	GP	34	2.6			7.22	26.1	17.26	0	0	7.5	25	787	0
Holland America	Zaandam	Zenon	Mixed	Stationary	7/6/2018	GP	39	3.2			7.39	27.3	22.5	0	0	3.7	23	885	0
Holland America	Zaandam	Zenon	Mixed	Stationary	7/20/2018	GP	29	3.5			7.18	25.6	16.95	0	0	0	23	846	0
Holland America	Zaandam	Zenon	Mixed	Stationary	8/3/2018	PP	23	3.7	6.5	52	7.27	25.7	16.94	0	0	3.8	21	704	0
Holland America	Zaandam	Zenon	Mixed	Stationary	8/17/2018	GP	50	4			7.47	25.7	8.04	0	0	4	24	897	0
Holland America	Zaandam	Zenon	Mixed	Stationary	9/1/2018	GP	18	3.8			7.09	25.8	23.2	2	0	2.1	25	703	0
Holland America	Zaandam	Zenon	Mixed	Stationary	9/14/2018	GP	23	2.3			7.25	25.2	24.5	0	0	3.4	52	1110	0
Norwegian	Norwegian Bliss	Scanship	Mixed	Stationary	6/12/2018	GP	20	3.8			6.79	30	44	0	0	5.1	63	913	0
Norwegian	Norwegian Bliss	Scanship	Mixed	Stationary	6/19/2018	PP	18	2.7	3.4	330	6.69	31.1	51.1	0	7.2	4.2	64	849	0
Norwegian	Norwegian Bliss	Scanship	Mixed	Stationary	7/10/2018	GP	34	3.1			7.21	32.3	43	0	4.8	13	68	949	0
Norwegian	Norwegian Bliss	Scanship	Mixed	Stationary	7/24/2018	GP	31	6.4			7.12	30.6	41.68	0	21	8.6	52	938	0
Norwegian	Norwegian Bliss	Scanship	Mixed	Stationary	8/14/2018	PP	4.44	2.8	3.3	260	7.08	32.6	35.33	0	0	2.3	51	757	0
Norwegian	Norwegian Bliss	Scanship	Mixed	Stationary	8/21/2018	GP	13	2.6			6.81	31.7	125.28	0	0	2	49	804	0
Norwegian	Norwegian Bliss	Scanship	Mixed	Stationary	9/4/2018	GP	13	5.1			6.79	31.6	39.78	0	0	0	50	790	0
Norwegian	Norwegian Bliss	Scanship	Mixed	Stationary	9/18/2018	GP	21	2.1			7.05	30.5	47.7	0	0	2.3	57	854	0
Norwegian	Norwegian Jewel	Scanship	Mixed	Stationary	5/22/2018	GP	26	2.6			6.6	28.2	30.48	0	0	2.4	150	990	0
Norwegian	Norwegian Jewel	Scanship	Mixed	Stationary	5/29/2018	GP	41	1.4			6.81	30.7	37.8	0	8.7	3.9	77	1350	0
Norwegian	Norwegian Jewel	Scanship	Mixed	Stationary	6/6/2018	PP	46	0	7.4	48	6.6	27.8	35	0	6	3	300	3810	0
Norwegian	Norwegian Jewel	Scanship	Mixed	Stationary	6/21/2018	GP	32	1.2			6.75	29.9	37	0	4.8	4.5	84	1050	0
Norwegian	Norwegian Jewel	Scanship	Mixed	Stationary	7/5/2018	GP	42	0.78			6.71	31.5	27.96	0	4.8	3.2	84	1140	0
Norwegian	Norwegian Jewel	Scanship	Mixed	Stationary	7/12/2018	GP	75	0.7			6.74	30.5	30.36	0	4.4	3.8	76	1080	0
Norwegian	Norwegian Jewel	Scanship	Mixed	Stationary	8/2/2018	PP	26	1.5	7.3	83	6.73	30.7	32.4	8	4.8	5.5	84	983	0
Norwegian	Norwegian Jewel	Scanship	Mixed	Stationary	8/23/2018	GP	49	1.4			6.52	28.2	45.6	0	0	2.7	87	1190	0
Norwegian	Norwegian Jewel	Scanship	Mixed	Stationary	9/6/2018	GP	41	1.1			6.81	30.7	27.06	0	4.4	3.9	77	1350	0
Norwegian	Norwegian Jewel	Scanship	Mixed	Stationary	9/13/2018	GP	43	0.99			6.61	28.2	5.64	0	0	0	83	1150	0
Norwegian	Norwegian Pearl	Scanship	Mixed	Stationary	5/1/2018	GP	46	0.99			6.96	22.8	27	0	0	2.8	28	892	0
Norwegian	Norwegian Pearl	Scanship	Mixed	Stationary	5/8/2018	PP	48	0	8.3	29	6.79	26.1	26	0	0	2.3	24	892	0
Norwegian	Norwegian Pearl	Scanship	Mixed	Stationary	6/5/2018	GP	49	0.67			6.89								

SemiMonthly General Permit Sample Results

SemiMonthly General Permit Sample Results										Non-detects set to zero											
Company	Vessel	Treatment System	Waste-water Type	Sample taken while	Sample Date	Type	mg/L	ug/L	ug/L	ug/L	S.U.	C	m3/hr	col-per 100ml	mg/L	mg/L	mg/L	umhos/cm	mg/L	mg/L	
							Ammonia	Dissolved Copper	Dissolved Nickel	Dissolved Zinc	pH	Temp	Flow rate	Fecal Coliform	TSS	BOD	Hardness	Specific Conductance	Free Chlorine	TB Chlorine	
Princess Princess	Emerald Princess	DeNora	Graywater	Stationary	5/16/2018	PP	0	0	0	0	6.55	19	5	46	0	4.7	0	62.4	0	0	
Princess Princess	Emerald Princess	DeNora	Graywater	Stationary	6/20/2018	GP	0	1.1			6.62	23.2	23	0	0	3.2	0	145	0	0	
Princess Princess	Emerald Princess	DeNora	Graywater	Stationary	6/27/2018	GP	0	5.2			2.93	22.1	1.1	0	0	3.5	0	684	0	0	
Princess Princess	Emerald Princess	DeNora	Graywater	Stationary	7/11/2018	GP	0	2.2			6.62	24.5	5.3	2	0	10	0	80.2	0	0	
Princess Princess	Emerald Princess	DeNora	Graywater	Stationary	7/18/2018	GP	0	0.64			6.54	21.9	3.3	0	0	4.1	0	87	0	0	
Princess Princess	Emerald Princess	DeNora	Graywater	Stationary	8/1/2018	PP	0	12	1.6	180	6.1	24.5	3.54	0	0	0	0	54.8	0	0	
Princess Princess	Emerald Princess	DeNora	Graywater	Stationary	8/29/2018	GP	0	1.7			6.29	23.4	7.1	0	4	3	0	67.8	0	0	
Princess Princess	Emerald Princess	DeNora	Graywater	Stationary	9/5/2018	GP	0	1.4			7.48	24.1	3.4	0	0	0	0	60.2	0	0	
Princess Princess	Emerald Princess	DeNora	Graywater	Stationary	9/12/2018	GP	1.1	0.41			6.85	22.9	4.4	0	0	2.6	0	69.7	0	0	
Princess Princess	Golden Princess	Hamworthy	Graywater	Stationary	5/16/2018	GP	27	1			6.98	26.4	24.96	0	0	13	42	768	0	0	
Princess Princess	Golden Princess	Hamworthy	Graywater	Stationary	5/22/2018	GP	6.1	2.2			7.01	30.3	26.94	0	0	3.1	25	409	0	0	
Princess Princess	Golden Princess	Hamworthy	Graywater	Stationary	6/5/2018	PP	37	1	13	23	6.96	26.7	20.58	130	0	61	67	847	0	0	
Princess Princess	Golden Princess	Hamworthy	Graywater	Stationary	7/17/2018	PP	7.4	9.2	12	85	7.06	22.8	8.52	8	0	0	34	519	0	0	
Princess Princess	Golden Princess	Hamworthy	Graywater	Stationary	7/25/2018	GP	13	2.2			7.16	33.5	4.98	0	0	13	55	529	0	0	
Princess Princess	Golden Princess	Hamworthy	Graywater	Stationary	8/8/2018	GP	3.6	5.5			6.78	30.2	25.98	110	0	11	180	1814	0	0	
Princess Princess	Golden Princess	Hamworthy	Graywater	Stationary	8/22/2018	GP	4.4	4.1			7.56	29.6	42.2	0	0	0	35	436	0	0	
Princess Princess	Golden Princess	Hamworthy	Graywater	Stationary	9/5/2018	GP	0	3.7			7.24	28.4	41	0	0	0	120	1160	0	0	
Princess Princess	Golden Princess	Hamworthy	Graywater	Stationary	9/16/2018	GP	1	10			6.45	29.1	40.5	0	0	0	37	489	0	0	
Princess Princess	Grand Princess	Hamworthy	Graywater	Stationary	5/9/2018	GP	1.7	1	13	11	7.44	28.4	9.2	0	0	0	270	3150	0	0	
Princess Princess	Grand Princess	Hamworthy	Graywater	Stationary	5/20/2018	PP	0	0			7.8	26.9	14.2	0	0	0	120	1480	0	0	
Princess Princess	Grand Princess	Hamworthy	Graywater	Stationary	6/8/2018	GP	3.3	1.2			7.38	27.9	12.4	0	0	3.4	110	1320	0	0	
Princess Princess	Grand Princess	Hamworthy	Graywater	Stationary	6/20/2018	GP	6	1.3			7.13	30.3	14.5	0	0	2.4	18	353	0	0	
Princess Princess	Grand Princess	Hamworthy	Graywater	Stationary	7/8/2018	GP	1	1.6			7.54	29.2	5.45	0	0	2.6	280	3400	0	0	
Princess Princess	Grand Princess	Hamworthy	Graywater	Stationary	7/20/2018	GP	0	0.87			7.73	27.2	11.88	0	0	0	330	2680	0	0	
Princess Princess	Grand Princess	Hamworthy	Graywater	Stationary	8/8/2018	PP	2.2	1.7	16	9.4	7.67	30.3	10.55	0	0	5.2	210	2640	0	0	
Princess Princess	Grand Princess	Hamworthy	Graywater	Stationary	8/17/2018	GP	0	2.3			7.52	29.6	8.29	0	0	0	670	6690	0	0	
Princess Princess	Grand Princess	Hamworthy	Graywater	Stationary	9/6/2018	GP	2.2	2.1			7.46	27.4	8.58	0	0	5.2	900	9390	0	0	
Princess Princess	Grand Princess	Hamworthy	Graywater	Stationary	9/16/2018	GP	1.1	0			7.15	25.9	8.16	0	5.6	5.6	1500	14800	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	4/30/2018	GP	0.92	4.3			7.54	26.7	15	7	0	2.1	64	785	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	5/7/2018	PP	0	3.1	9.7	63	7.06	27.5	25	0	0	0	100	1250	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	5/21/2018	GP	0	12			7.52	29.2	20	2	0	3.2	160	1970	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	6/4/2018	GP	0	6.1			6.84	27.1	13	0	0	0	55	800	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	6/11/2018	GP	0.59	4.4			8.03	27.8	13	5	0	0	160	1970	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	7/9/2018	PP	0	3.6	12	51	7.25	30.4	0.9	0	0	0	17	324	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	7/23/2018	GP	0	3.4			7.42	30.8	20	0	0	0	20	316	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	8/13/2018	GP	0	3.9			7.45	30.8	0.924	0	0	0	43	635	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	8/20/2018	GP	0	4.3			7.22	28.5	1.2	0	0	6.4	7.4	211	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	9/3/2018	GP	0.63	5			7.63	28.9	2.1	0	0	0	12	238	0	0	
Princess Princess	Ruby Princess	Hamworthy	Graywater	Stationary	9/17/2018	GP	0	5.1			7.3	29.6	2.1	0	0	0	12	226	0	0	
Princess Princess	Star Princess	Hamworthy	Graywater	Stationary	5/9/2018	GP	1.2	2.6			7.13	29.8	24.0	0	0	2.8	35	303	0	0	
Princess Princess	Star Princess	Hamworthy	Graywater	Stationary	5/15/2018	PP	3.4	2.4	11	61	6.9	33	21.0	0	0	3.5	14	274	0	0	
Princess Princess	Star Princess	Hamworthy	Graywater	Stationary	6/6/2018	GP	0	3.4			7.25	26.7	18.0	2	0	2.2	89	941	0	0	
Princess Princess	Star Princess	Hamworthy	Graywater	Stationary	6/12/2018	GP	0	2			7.26	30.5	26.3	0	0	4	19	344	0	0	
Princess Princess	Star Princess	Hamworthy	Graywater	Stationary	7/10/2018	GP	2.4	1.2			7.14	34.3	25.98	0	0	2.4	75	1060	0	0	
Princess Princess	Star Princess	Hamworthy	Graywater	Stationary	7/18/2018	PP	0	1.4	8.6	8.6	6.92	32	26.1	2	0	8.2	150	1650	0	0	
Princess Princess	Star Princess	Hamworthy	Graywater	Stationary	8/7/2018	GP	1.9	1.1			7.06	35.1	15.9	0	0	0	8.9	281	0	0	
Princess Princess	Star Princess	Hamworthy	Graywater	Stationary	8/15/2018	GP	4	1.3			7.12	33.8	16.87	0	0	0	53	608	0	0	
Princess Princess	Star Princess	Hamworthy	Graywater	Stationary	9/4/2018	GP	0	1.9			7.07	34	22.9	0	0	0	15	244	0	0	
Princess Princess	Star Princess	Hamworthy	Graywater	Stationary	9/12/2018	GP	1.1	1.6			7.03	32.5	9.4	0	0	5.9	29	69.7	0	0	
Princess Princess	Coral Princess	Hamworthy	Mixed BW Accom GW	Underway	5/27/2018	GP					7.64	36.9	9.00	0	0	20			0	0	
Princess Princess	Coral Princess	Hamworthy	Mixed BW Accom GW	Underway	6/3/2018	GP					7.74	35.1	4.5	2	0	17			0	0	
Princess Princess	Coral Princess	Hamworthy	Mixed BW Accom GW	Underway	6/9/2018	PP	70	1.6	17	18	7.47	35.8	29.64	2	13	0	98	1680	0	0	
Princess Princess	Coral Princess	Hamworthy	Mixed BW Accom GW	Underway	7/1/2018	GP					7.01	39.6	12.72	0	0	3			0	0	
Princess Princess	Coral Princess	Hamworthy	Mixed BW Accom GW	Underway	7/21/2018	PP	38	2.1	7.5	13	7.3	38.8	12.6	0	0	5.4	150	2260	0	0	
Princess Princess	Coral Princess	Hamworthy	Mixed BW Accom GW	Underway	8/12/2018	GP	0	2			7.08	39.8	14.52	0	0	3.4	19	344	0	0	
Princess Princess	Coral Princess	Hamworthy	Mixed BW Accom GW	Underway	8/26/2018	GP					7.07	37.7	13.48	0	0	6.4			0	0	
Princess Princess	Coral Princess	Hamworthy	Mixed BW Accom GW	Underway	9/2/2018	GP					7.3	38.3	12.2	2	0	7.2			0	0	
Princess Princess	Coral Princess	Hamworthy	Mixed BW Accom GW	Underway	9/24/2018	GP					7.35	37.8	8.65	0	0	0			0	0	
Princess Princess	Golden Princess	Hamworthy	Mixed BW Accom GW	Underway	5/16/2018	GP					7.36	25.3	29.4	0	0	4.1			0	0	
Princess Princess	Golden Princess	Hamworthy	Mixed BW Accom GW	Underway	5/23/2018	GP					7.71	29.7	25.8	2	0	9.9			0	0	
Princess Princess	Golden Princess	Hamworthy	Mixed BW Accom GW	Underway	6/5/2018	PP	82	1.9	11	24	7.17	26.5	18.0	72	0	170	70	1362	0	0	
Princess Princess	Golden Princess	Hamworthy	Mixed BW Accom GW	Underway	7/17/2018	PP	71	5.9	9.6	43	7.55	30.2	0.43	0	0	0	47	40	1190	0	0
Princess Princess	Golden Princess	Hamworthy	Mixed BW Accom GW	Underway	7/25/2018	GP					7.46	32.1	24.0	0	0	5			0	0	
Princess Princess	Golden Princess	Hamworthy	Mixed BW Accom GW	Underway	8/8/2018	GP					7.41	30.2	38.16	25	0	9.1			0	0	
Princess Princess	Golden Princess	Hamworthy	Mixed BW Accom GW	Underway	8/28/2018	GP					7.8	29.4	38.5	0	0	0			0	0	
Princess Princess	Golden Princess	Hamworthy	Mixed BW Accom GW	Underway	9/5/2018	GP					7.72	30.3	41.2	0	0	0			0	0	
Princess Princess	Golden Princess	Hamworthy	Mixed BW Accom GW	Underway	9/18/2018	GP															

SemiMonthly General Permit Sample Results										Non-detects set to zero																
Company	Vessel	Treatment System	Waste-water Type	Sample taken while	Sample Date	Type	mg/L		ug/L		S.U.	C	m3/hr	col. per 100 ml		mg/L	mg/L	mg/L	umhos/cm	mg/L	mg/L					
							Ammonia	Dissolved Copper	Dissolved Nickel	Dissolved Zinc				pH	Temp							Fecal Coliform	TSS	BOD	Hardness	Specific Conductance
Princess	Star Princess	Hamworthy	Mixed BW Accom GW	Underway	5/9/2018	GP					7.12	32.8	23.85	0	0	2.3										
Princess	Star Princess	Hamworthy	Mixed BW Accom GW	Underway	5/16/2018	PP	3.3	2.2	10	59	7.4	31.7	24.03	0	0	4.5	40	414	0	0	0	0				
Princess	Star Princess	Hamworthy	Mixed BW Accom GW	Underway	6/6/2018	GP					7.55	29.8	28.82	0	0	4.1										
Princess	Star Princess	Hamworthy	Mixed BW Accom GW	Underway	6/13/2018	GP					8.05	35	27.8	0	0	21.0										
Princess	Star Princess	Hamworthy	Mixed BW Accom GW	Underway	7/1/2018	GP					7.01	33	26.1	0	0	3.4										
Princess	Star Princess	Hamworthy	Mixed BW Accom GW	Underway	7/18/2018	PP	0	1.3	11	4.1	6.62	28.5	25.28	2	0	39	140	2330	0	0	0	0				
Princess	Star Princess	Hamworthy	Mixed BW Accom GW	Underway	8/7/2018	GP					7.75	33	21.58	3	0	11										
Princess	Star Princess	Hamworthy	Mixed BW Accom GW	Underway	8/15/2018	GP					6.9	33.2	21.64	0	0	0										
Princess	Star Princess	Hamworthy	Mixed BW Accom GW	Underway	9/5/2018	GP					6.99	30.6	24.18	0	0	2.7										
Princess	Star Princess	Hamworthy	Mixed BW Accom GW	Underway	9/12/2018	GP					6.81	32.2	26.07	0	0	2.8										
Oceania	Regatta	Triton	Mixed	Underway	5/27/2018	GP					6.24	17.6	4	2	25	12										
Oceania	Regatta	Triton	Mixed	Underway	6/8/2018	PP	0	37	9.9	36	7.92	20.5	4	0	12	5.9	97	2400	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Underway	6/22/2018	GP					7.7	24	8.0	0	0	12	11									
Oceania	Regatta	Triton	Mixed	Underway	7/10/2018	GP					7.37	22.9	7	0	9.6	9.1										
Oceania	Regatta	Triton	Mixed	Underway	7/16/2018	GP					7.25	21.9	5	0	0	11										
Oceania	Regatta	Triton	Mixed	Stationary	7/26/2018	GP	5.8	39			7.88	23.9	4.0	0	8.8	4.6	140	2260	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Stationary	7/28/2018	GP	0	18			7.51	21.5	4.0	0	21	6.4	350	4460	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Stationary	8/22/2018	PP	6.8	23	10	15	7.22	20.3	3.0	0	68	17	290	3590	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Stationary	8/23/2018	GP	3.3	25			7.61	21.2	3.0	0	14	8.8	63	1370	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Stationary	8/31/2018	GP					7.72	18.7	8.6		31	14										
Oceania	Regatta	Triton	Mixed	Stationary	9/12/2018	GP	0	31			8.31	21.2	9.0	0	18	4.7	4.4	757	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Stationary	9/20/2018	GP	17	32			6.76	21	8.7	0	20	7.5	32	1000	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Underway	5/21/2018	GP					7.95	19.5	4	2	17	13										
Oceania	Regatta	Triton	Mixed	Underway	6/8/2018	PP	0	6.7	11	13	7.58	23.3	4	0	50	14	65	1380	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Underway	6/22/2018	GP					7.53	24	8.0	0	29	19										
Oceania	Regatta	Triton	Mixed	Underway	7/10/2018	GP					7.63	23.5	7	0	43	18										
Oceania	Regatta	Triton	Mixed	Underway	7/16/2018	GP					7.11	33.8	5	3	5.2	8.3										
Oceania	Regatta	Triton	Mixed	Stationary	7/26/2018	GP	5.8	23			7.24	24.2	4	0	19	11	86	2020	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Stationary	7/29/2018	GP	1.4	9.6			7.8	23	4	0	11	5.8	300	3950	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Stationary	8/13/2018	PP	0	5.5			7.4	22.7	3.84	0	18	3.9	410	4690	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Stationary	8/23/2018	GP	7.6	18	12	15	7.22	24.3	3.0	0	26	11	65	2010	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Stationary	9/12/2018	GP	0	18			8.27	22.5	9.0	0	33	7	9.1	823	0	0	0	0				
Oceania	Regatta	Triton	Mixed	Stationary	9/20/2018	GP	18	15			7.07	21.9	8.69	0	16	4.3	26	958	0	0	0	0				
Seabourn	Sojourn	Hamworthy	Mixed	Stationary	5/31/2018	GP	8.9	19			6.49	32.2	7.5	0	0	7.6	22	1560	0	0	0	0				
Seabourn	Sojourn	Hamworthy	Mixed	Stationary	6/9/2018	GP	36	16			6.79	33.8	6.5	0	0	4.4	37	1280	0	0	0	0				
Seabourn	Sojourn	Hamworthy	Mixed	Stationary	6/24/2018	GP	16	8.9			7.68	34.9	3.03	0	0	0	31	999	0	0	0	0				
Seabourn	Sojourn	Hamworthy	Mixed	Stationary	7/2/2018	GP	23	14			7.37	33.6	7.13	0	0	0	29	1160	0	0	0	0				
Seabourn	Sojourn	Hamworthy	Mixed	Stationary	7/20/2018	GP	5.8	16			6.76	35.2	7.03	0	0	0	28	911	0	0	0	0				
Seabourn	Sojourn	Hamworthy	Mixed	Stationary	8/14/2018	GP	13	12			7.29	36.1	7.5	0	0	0	40	1120	0	0	0	0				
Seabourn	Sojourn	Hamworthy	Mixed	Stationary	8/22/2018	GP	13	16			7.43	35.3	8.3	0	0	0	37	1040	0	0	0	0				
Seabourn	Sojourn	Hamworthy	Mixed	Stationary	9/8/2018	GP	9.8	11			6.85	37.2	4.19	0	0	0	24	859	0	0	0	0				
Seabourn	Sojourn	Hamworthy	Mixed	Stationary	9/15/2018	GP	2.9	14			7.03	37.2	7.09	0	0	4.3	31	898	0	0	0	0				
Seabourn	Sojourn	Hamworthy	Mixed	Stationary	10/2/2018	GP	2.1	5.6			7.4	33.5	4.89	0	0	0	65	1220	0	0	0	0				
Seven Seas	Mariner	Hamworthy	Mixed	Underway	5/11/2018	GP					7.09	37.5	9	0	0	0										
Seven Seas	Mariner	Hamworthy	Mixed	Underway	5/19/2018	GP					7.78	39.7	9	0	0	9.6										
Seven Seas	Mariner	Hamworthy	Mixed	Underway	6/2/2018	PP	11	14	7.4	87	7.16	39.7	9	0	0	0	39	866	0	0	0	0				
Seven Seas	Mariner	Hamworthy	Mixed	Underway	6/18/2018	GP					7.13	41.2	9	0	0	2.9										
Seven Seas	Mariner	Hamworthy	Mixed	Underway	7/14/2018	GP					6.9	37.2	9	0	0	0										
Seven Seas	Mariner	Hamworthy	Mixed	Underway	7/22/2018	GP					7.17	38.6	9	0	0	0										
Seven Seas	Mariner	Hamworthy	Mixed	Underway	8/5/2018	GP					7.24	36.6	9	0	0	0										
Seven Seas	Mariner	Hamworthy	Mixed	Underway	8/11/2018	PP	20	89	8.7	110	6.29	32.3	9	0	0	0	82	1310	0	0	0	0				
Seven Seas	Mariner	Hamworthy	Mixed	Underway	9/5/2018	GP					7.39	33.9	9	0	0	0										
Seven Seas	Mariner	Hamworthy	Mixed	Underway	9/7/2018	GP					7.3	30.8	9	2	0	0										
Average							23.00	5.94	10.05	62.02	7.27	29.37	18.06	2.68	3.69	6.84	85.32	1658.15	0.000	0.002						
Max							140	89	20	330	8	41	140	130	190	210	1500	37600	0	0						
Min							0.00	0.00	0.00	0.00	2.93	17.60	0.30	0.00	0.00	0.00	0.00	54.80	0.0	0.0						
Median							13.00	2.50	11.00	38.50	7.26	29.70	14.40	0.00	0.00	3.40	38.00	897.50	0.0	0.0						
Count of samples							144	144	46	46	232	232	232	230	230	230	144	144	232	232						

Table 4: Semi-seasonal nutrients and other conventional parameters with no General Permit Limits

Vessel	Sample Date	E. coli	Chemical O ₂ Demand	Hexane Extractable Material	Total Organic Carbon	Alkalinity (Total)	Hardness	Nitrite/Nitrate as N	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit	1	5.00	5.00	1.00	5.00	5.00	0.50	0.05	1.00	0.10
	Units	/100ml	mg/l	mg/l	mg/l	mg/l	mg/L	mg/L	mg/l	mg/l	ml/l
Disney Wonder	6/8/18	0	67	0	19.7	450	78	0	9.52	110	0
Disney Wonder	7/13/18	0	39	0	13.8	200	39	0.35	5.81	32	0
Eurodam	6/4/18	0	64	0	22	400	26	0	4.51	110	0
Eurodam	8/6/18	0	220	0	26.8	250	24	0	0	37	0
Nieuw Amsterdam	5/15/18	0	68	0	23	180	41	0	12.6	120	0
Nieuw Amsterdam	5/29/18	0	62	0	17	400	33	0.54	8.81	120	0
Nieuw Amsterdam	8/14/18	4	53	0	30.3	150	36	0	9.75	100	0
Nieuw Amsterdam	8/28/18		72	0	25.4	450	41	0	22.2	110	0
Volendam	6/1/18	0	41	0	13.4	250	28	0	5.29	25	0
Volendam	8/10/18	0	35	0	13.6	170	33	0	3.54	28	0
Zaandam	6/1/18	0	81	0	51.1	250	37	0	0.242	58	0
Zaandam	8/3/18	0	45	0	12.5	190	21	0.5	0	20	0
Norwegian Bliss	6/19/18	0	69	0	23.8	120	64	0	0	18.2	0
Norwegian Bliss	8/14/18	0	49	0	19.5	110	51	2.3	0	7.2	0
Norwegian Jewel	6/6/18	0	130	0	12.1	170	300	2.5	0	58	0
Norwegian Jewel	8/2/18	25	60	0	17.2	160	84	0.27	0	24	0
Norwegian Pearl	5/8/18	0	45	0	9	170	24	0	0	47.7	0
Norwegian Pearl	8/7/18	1	57	0	19.7	120	30	0	0	28	0
Norwegian Pearl	10/2/18	3					22	0	0.2	54	
Vessel	Sample Date	E. coli	Chemical O ₂ Demand	Hexane Extractable Material	Total Organic Carbon	Alkalinity (total)	Hardness	Nitrite/Nitrate as N	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit		5.00	5.00	1.00	5.00	5.00	0.50	0.05	1.00	0.10
	Units	/100ml	mg/l	mg/l	mg/l	mg/l	mg/L	mg/L	mg/l	mg/l	ml/l
Coral Princess	6/9/18	14	97	0	26.3	300	98	0	1.92	79	0
Coral Princess	7/21/18	0	84	0	38.4	190	150	0	11.4	37	0
Emerald Princess-GW	5/16/18	15	11	0	3.7	21	0	0	0	0.52	0
Emerald Princess- GW	8/1/18	1	0	0	2.15	0	0	0.28	0	0.57	0
Golden Princess-GW	6/5/18	11	170	0	38	160	67	0	7.39	37	0
Golden Princess-GW	7/17/18	1	26	0	7.36	66	34	6.3	1.74	8.8	0
Golden Princess	6/5/18	86	350	0	66	250	70	0	15	71	0
Golden Princess	7/18/18	4	52	0	17.8	250	40	6.5	11.6	72	0
Grand Princess-GW	5/20/18	1	39	0	5.4	46	120	0	0	0	0
Grand Princess-GW	8/8/18	47	44	0	4.2	45	210	0	0	2.2	0
Grand Princess	5/20/18	360	79	0	9.3	200	130	0	3.68	64	0
Grand Princess	8/8/18	0	120	0	13	800	150	0	9.66	76	0
Island Princess	5/12/18	0	100	0	28	160	64	0	5.33	35.5	0
Island Princess	8/11/18	0	43	0	13.4	65	55	0	8.53	6.1	0
Ruby Princess-GW	5/7/18	0	31	0	3.9	48	100	0	0	0	0
Ruby Princess-GW	7/9/18	0	0	0	4.41	54	17	0	0	0	0
Ruby Princess	5/8/18	1	42	0	8.4	67	50	6.8	4.17	9.52	0
Ruby Princess	7/10/18		35	0	15.4	250	28	0.51	8.12	68	0
Vessel	Sample Date	E. coli	Chemical O ₂ Demand	Hexane Extractable Material	Total Organic Carbon	Alkalinity (Total)	Hardness	Nitrite/Nitrate as N	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settable Solids
	Detection Limit		5.00	5.00	1.00	5.00	5.00	0.50	0.05	1.00	0.10
	Units	/100ml	mg/l	mg/l	mg/l	mg/l	mg/L	mg/L	mg/l	mg/l	ml/l
Star Princess-GW	5/15/18	0	28	0	6.5	73	14	0	0	4.1	0
Star Princess-GW	7/18/18	0	47	0	12.3	61	150	0	0	0.52	0
Star Princess	5/16/18	0	34	0	9.4	90	40	0	0.344	1.4	0
Star Princess	7/18/18	0	43	0	18.6	54	140	0	0	0.88	0
Regatta-Port	6/8/18	0	48	0	13.9	300	97	82	3.41	2.2	0
Regatta-Port	8/22/18	0	110	0	7.05	41	290	44	1.68	6.8	0.2
Regatta-Starboard	6/8/18	700	79	0	11.5	250	65	28	1.64	1.51	0
Regatta-Starboard	8/13/18	0	86	0	7.56	49	410	37	1.75	0	0
Seabourn Sojourn	7/20/18	0					28	34	7.64	6.9	
Seabourn Sojourn	10/2/18	0					65	1.2	8.36	5.7	
Seven Seas Mariner	6/2/18	0	110	0	24.7	130	39	0	8.39	10	0
Seven Seas Mariner	8/11/18	0	56	0	18.1	0	82	36	8.06	20	0
	MAX	700	350	0	66	800	410	82	22.2	120	0
	MIN	0	0	0	2.15	0	0	0	0	0	0
	MEDIAN	0	62	0	13.9	180	41	0	3.54	20	0
	Number:										
	Parameter not sampled										
	Not discharging										
	Non-detects set to zero or ND										

Table 5: Full Suite Semi-seasonal Metal Sample Results

		Semi seasonal Metal Samples																									
Vessel	Date	Antimony (TR)	Antimony dissolved	Arsenic (TR)	Arsenic dissolved	Beryllium (TR)	Beryllium dissolved	Cadmium (TR)	Cadmium dissolved	Chromium (TR)	Chromium diss	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	
Disney Wonder	6/8/18	0	0	1.9	1.8	0	0	0	0	1.8	1.5	1.7	1.9	2.4	2.5	0	19	20	0	0	0	0	0	0	270	270	
Disney Wonder	7/13/18	2.4	2.7	1.6	1.6	0	0	0	0	1.5	1.6	9.1	8.8	3.7	3.4	0	13	12	0	0	0	0	0	0	230	230	
Eurodam	6/4/18	0	0	0	0	0	0	0	0	0	0	1.8	2	0	0	0	11	11	0	0	0	0	0	0	22	26	
Eurodam	8/6/18	0	0	0	0	0	0	0	0	0	0	2.8	2.4	0	0	0	16	16	0	0	0	0	0	0	20	22	
Nieuw Amsterdam	5/15/18	0	1.6	0	0	0	0	0	0	0	0	1.4	1.2	0	0	0	17	16	0	0	0	0	0	0	9.3	7	
Nieuw Amsterdam	5/29/18	0	0	0	0	0	0	0	0	0	0	1.8	1.8	0	0	0	12	12	0	0	0	0	0	0	20	21	
Nieuw Amsterdam	8/14/18	0	0	0	1	0	0	0	0	0	0	3.7	3.6	0	0	0	11	11	0	0	0	0	0	0	41	41	
Nieuw Amsterdam	8/28/18	0	0	0	0	0	0	0	0	1.1	0	41	6.1	9.4	0	0	10	10	0	0	0	0	0	0	42	34	
Volendam	6/1/18	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	13	12	0	0	0	0	0	0	60	50	
Volendam	8/10/18	2.6	2.6	0	0	0	0	0	0	0	0	1.4	1.6	0	0	0	12	12	0	0	0	0	0	0	59	56	
Zaandam	6/1/18	0	0	0	0	0	0	0	0	1.1	0	3.1	2.8	0	0	0	12	11	0	0	0	0	0	0	56	41	
Zaandam	8/3/18	0	0	0	0	0	0	0	0	0	1.2	4	3.7	0	0	0	6.8	6.5	0	0	0	0	0	0	50	52	
Norwegian Bliss	6/19/18	0	0	2.3	2.3	0	0	0	0	0	0	3.1	2.7	0	0	0	3.3	3.4	0	0	0	0	0	0	320	330	
Norwegian Bliss	8/14/18	0	0	0	0	0	0	0	0	0	0	3.1	2.8	0	0	0	3.3	3.3	0	0	0	0	0	0	260	260	
Norwegian Jewel	6/6/18	0	0	0	0	0	0	0	0	0	0	2.3	0	0	0	0	6.9	7.4	0	0	0	0	0	0	48	48	
Norwegian Jewel	8/2/18	0	0	0	0	0	0	0	0	0	0	1.6	1.5	0	0	0	7.2	7.3	0	0	0	0	0	0	84	83	
Norwegian Pearl	5/8/18	0	0	0	0	0	0	0	0	0	0	1.6	0	0	0	0	8.5	8.3	0	0	0	0	0	0	32	29	
Norwegian Pearl	8/7/18	0	0	0	0	0	0	0	0	0	0	1.9	1.1	0	0	0	4.7	4.5	0	0	0	0	0	0	21	19	
Coral Princess	6/9/18	0	0	1.1	0	0	0	0	0	1.3	1.2	1.7	1.6	0	0	0	17	17	0	0	0	0	0	0	20	18	
Coral Princess	7/21/18	0	0	1.1	0	0	0	0	0	1.1	1.2	2.8	2.1	0	0	0	7.8	7.5	0	0	0	0	0	0	16	13	
Emerald Princess- GW	5/16/18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emerald Princess-GW	8/1/18	0	0	0	0	0	0	0	0	0	0	1.6	1.2	0	0	0	0	1.6	0	0	0	0	0	0	13	180	
Golden Princess- GW	6/5/18	0	0	0	0	0	0	0	0	1.5	1.8	1.1	1	0	0	0	12	13	0	0	0	0	0	0	23	23	
Golden Princess- GW	7/17/18	0	0	0	0	0	0	0	0	0	1.1	10	9.2	0	0	0	13	12	0	0	0	0	0	0	96	85	
Golden Princess	6/5/18	1.5	0	0	0	0	0	0	0	1.5	1.7	1.9	1.9	0	0	0	12	11	0	0	0	0	0	0	48	24	
Golden Princess	7/18/18	0	0	0	0	0	0	0	0	1.2	1.2	7.2	5.9	0	0	0	9.9	9.6	0	0	0	0	0	0	46	43	
Grand Princess-GW	5/20/18	0	0	0	0	0	0	0	0	1.5	1.4	0	0	0	0	0	14	13	0	0	0	0	0	0	11	11	
Grand Princess-GW	8/8/18	0	0	0	0	0	0	0	0	0	1.7	1.7	0	0	0	0	17	16	0	0	0	0	0	0	11	9.4	
Grand Princess	5/20/18	0	0	0	0	0	0	0	0	1.7	1.6	0	0	0	0	0	13	12	0	0	0	0	0	0	24	25	
Grand Princess	8/8/18	0	0	0	0	0	0	0	0	1.7	1.6	0	0	0	0	0	14	14	0	0	0	0	0	0	9.9	10	
Island Princess	5/12/18	0	2.6	0	0	0	0	0	0	1.3	1.3	2.4	3.6	0	0	0	5	5.1	0	0	0	0	0	0	20	23	
Island Princess	8/11/18	0	0	0	0	0	0	0	0	0	0	4.3	3.9	0	0	0	4.4	4.4	0	0	0	0	0	0	71	66	
Ruby Princess-GW	5/7/18	0	0	0	0	0	0	0	0	1	1.2	3.7	3.1	0	0	0	9.7	9.7	0	0	0	0	0	0	87	63	
Ruby Princess-GW	7/9/18	0	0	0	0	0	0	0	0	1.2	1.3	3.9	3.6	0	0	0	13	12	0	0	0	0	0	0	49	51	
Ruby Princess	5/8/18	0	0	0	0	0	0	0	0	1.1	1.3	6.3	7.7	0	0	0	10	10	0	0	0	0	0	0	97	110	
Ruby Princess	7/10/18	0	0	1.1	1	0	0	0	0	1.3	1.3	6.3	6.5	0	0	0	12	11	0	0	0	0	0	0	77	71	
Star Princess-GW	5/15/18	0	1.3	0	0	0	0	0	0	0	0	2.5	2.4	0	0	0	11	11	0	0	0	0	0	0	62	61	
Star Princess-GW	7/18/18	0	0	0	0	0	0	0	0	1.3	1.3	1.5	1.4	0	0	0	9	8.6	0	0	0	0	0	0	9.5	6.8	
Star Princess	5/16/18	0	0	0	0	0	0	0	0	1.1	1.2	2.5	2.2	0	0	0	10	10	0	0	0	0	0	0	52	59	
Star Princess	7/18/18	0	0	0	0	0	0	0	0	1.2	1.5	1.5	1.3	0	0	0	11	11	11	0	0	0	0	0	5.2	4.1	
Regatta-Port	6/8/18	0	0	2.7	2.7	0	0	0	0	1	0	36	37	0	0	0	9.2	9.9	0	0	0	0	0	0	12	36	
Regatta-Port	8/22/18	0	0	0	0	0	0	0	0	5	0	92	23	0	0	0	13	10	0	0	0	0	0	0	66	15	
Regatta-Starboard	6/8/18	0	0	1.6	1.2	0	0	0	0	2.1	0	81	6.7	0	0	0	13	11	0	0	0	0	0	0	50	13	
Regatta-Starboard	8/13/18	0	0	0	0	0	0	0	0	1.2	0	17	5.5	0	0	0	13	12	1.1	0	0	0	0	0	25	15	
Seabourn Sojourn		Not required in 2018																									
Seven Seas Mariner	6/2/18	0	0	4.1	3.5	0	0	0	0	0	0	5	14	0	0	0	7.4	7.4	0	0	0	0	0	0	41	87	
Seven Seas Mariner	8/11/18	0	0	2.4	2.8	0	0	0	0	0	0	98	89	0	0	0	8.1	8.7	0	0	0	0	0	0	100	110	
	MAX	2.6	2.7	4.1	3.5	0	0	0	0	5	1.8	98	89	9.4	3.4	0	19	20	11	0	0	0	0	0	320	330	

All results in micrograms/L (ug/L)
 Non detects recorded as zero

APPENDIX 2: REFERENCES

Alaska Department of Environmental Conservation (ADEC) Cruise Ship Program

<http://dec.alaska.gov/water/cruise-ships/>

2014 Large Cruise Ship General Permit

<http://dec.alaska.gov/water/cruise-ships/cruise-general-permit/>

Quality Assurance Project Plan

<http://dec.alaska.gov/media/5198/2018-clia-qapp.pdf>

Alaska Cruise Ship Laws and Regulations

<http://dec.alaska.gov/water/cruise-ships/laws-regs/>

Sample reports from prior years

<http://dec.alaska.gov/water/cruise-ships/cruise-reports/>