



**Alaska DEC 2009**  
**Small Commercial Passenger Vessel**  
**and Ferry**  
**Wastewater Sampling Results**

January 2011

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## Introduction

In 2001, Alaska Statute (AS) 46.03.460-46.03.490 established the Commercial Passenger Vessel Environmental Compliance Program (CPVEC), which is administered by the Alaska Department of Environmental Conservation (DEC). The CPVEC program applies to large<sup>1</sup> and small<sup>2</sup> commercial passenger vessels. The law requires small vessels to sample their wastewater discharges twice per season.

Small cruise ships are required to meet standard terms and conditions, or seek alternative terms and conditions in order to discharge blackwater<sup>3</sup> and graywater<sup>4</sup> in Alaska marine waters. Under standard terms and conditions blackwater, Graywater, and other wastewater must contain no more than 200 fecal coliform per 100 milliliters and no more than 150 milligrams per liter of total suspended solids. These are the US Coast Guard limits for approved Type II Marine Sanitation Devices (MSD) under test conditions. A MSD is required for discharge of blackwater in US waters. Some small cruise ships and ferries also treat their graywater with their MSD.

Alaska's original CPVEC law in 2001 established the standard terms and conditions and the alternative terms and conditions. Changes to Alaska's CPVEC law in 2004 (AS 46.03.462 (e)) established additional alternative terms and conditions allowing a Best Management Practices plan (BMP). As part of the 2004 law, the interim protective measures previously allowed under AS 46.03.463(b) and (c) are now the same as the alternative terms and conditions permitted under AS 46.03.462. The Best Management Practices regulations, 18 AC 69.046, became effective on May 18, 2006. For more information about best management practices please see the cruise ship web site at the following address:

[http://www.dec.state.ak.us/water/cruise\\_ships/small\\_vessel\\_dischargeoptions.htm](http://www.dec.state.ak.us/water/cruise_ships/small_vessel_dischargeoptions.htm)

Fifteen small ships registered with the CPVEC program in 2009, including five state ferries that operate in Alaska year-round. A list of registered small vessels can be found at: [http://www.dec.state.ak.us/water/cruise\\_ships/pdfs/Small\\_ship\\_Wastewater\\_table\\_2009\\_rev0.pdf](http://www.dec.state.ak.us/water/cruise_ships/pdfs/Small_ship_Wastewater_table_2009_rev0.pdf). All registered small vessels that discharged into Alaskan waters obtained approved Best Management Practices plans and operated under these plans. Two small cruise ships, the Bremen and the Hanseatic, did not discharge into Alaskan waters and was not sampled. Tables 1 and 2 summarize the 2009 small ship sampling results using the median<sup>5</sup> results for each pollutant. Data from the 13 ships were combined and results show that small-ship effluent generally had difficulty meeting water quality standards at the end of pipe for fecal coliform, chlorine, copper, and biological oxygen demand (BOD). Because of results seen in previous samples the BMPs minimize the discharge of wastewater while in port or in sensitive locations like herring spawning areas. This should maximize dilution of the wastewater, and minimize discharge in locations near shore.

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<sup>1</sup> A large vessel has >250 overnight passengers as defined in AS 46.03.490(13)

<sup>2</sup> A small vessel has 50-249 overnight passengers as defined in AS 46.03.490(7)

<sup>3</sup> Wastewater from toilets as defined in AS 46.03.490(12).

<sup>4</sup> As defined in AS 46.03.490(6). Wastewater from galley, dishwasher, bath and laundry.

<sup>5</sup> The median is the middle of a distribution: half the scores are above the median and half are below the median. The median is less sensitive to extreme scores than an average and is thus a better measure for skewed distributions.

**Table 1.** Summary 2009 Small Vessels Median Sampling Results –Part 1 (13 vessels)

	Ammonia as N	pH	Biochemical O <sub>2</sub> Demand	Chemical Oxygen Demand	Total Suspended Solids	Total Chlorine, Residual	Fecal Coliform Bacteria by MPN
<b>Alaska Water Quality Standards</b>	<b>2.9 *</b>	<b>6.5-8.5</b>	<b>60</b>	<b>n/a</b>	<b>150**</b>	<b>0.0075</b>	<b>200 ***</b>
<b>Units</b>	<b>mg/L</b>	<b>s.u.</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>mg/L</b>	<b>fc/100 ml</b>
Graywater (14 samples)	2.1	7.09	206	400	50.4	0.2	1290
Blackwater (11 samples)	11.8	7.27	94	760	93	0.1	140
Mixed Blackwater & Graywater (13 Samples)	12	7.4	111	890	65	4.3	25

\* Ammonia standards are based on temperature, pH and salinity. This standard is from Table IX in the *Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances*.

\*\* Federal Marine Sanitation Device requirements are 150 mg/L for TSS and 200 fc/100 ml for fecal coliform.

\*\*\* \*The standard in receiving water for consumption of raw shellfish is 14 fecal coliform bacteria per 100 ml.

**Table 2.** Summary 2009 Small Vessels Median Sampling Results – Part 2 (13 vessels)

	Arsenic, dissolved	Copper, dissolved	Lead, dissolved	Nickel, dissolved	Selenium, dissolved	Zinc, dissolved
<b>Alaska Water Quality Standards</b>	36	3.1	8.1	8.2	71	81
<b>Units</b>	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
<b>Median (16 samples)</b>	32.4	105	0	16	72.35	83

### Wastewater results for individual ships

Tables 3 through 7 show the 2009 twice-per-season sampling results for each of the 13 ships that reported. Samples were analyzed for conventional and priority pollutants as listed in the [Quality Assurance/Quality Control Plan \(QAQCP\)](#). Results highlighted in yellow are outside the standard terms and conditions or appropriate water quality standard. Small cruise ships operating under Best Management Practice plans do not need to meet standard terms and conditions, so no enforcement action was required. DEC does look for progress on wastewater sample results, and requires improvements prior to issuing extensions to the Best Management Practices plans. When there was a non-detect for a parameter, the result was listed as zero.

#### ***Bacteria and chlorine***

Small ships continue to try to balance bacterial disinfection and chlorine use. Chlorine is used to disinfect bacteria, but it is toxic to marine organisms and high residuals must be avoided. The median total residual chlorine result for mixed black and graywater is 573 times the Alaska’s marine water quality standard (AMWQS). The maximum total residual chlorine results for small-ship graywater and blackwater were 3.2 mg/L and 35

mg/L, respectively. The maximum total residual chlorine for mixed graywater and blackwater was 7.4 mg/L—nearly 1000 times (AMWQS). The fecal coliform standard is 200 colonies per 100 ml for approved Type II Marine Sanitation Devices. The most stringent AMWQS is 14 colonies per 100 ml to collect shellfish for raw consumption, and is the standard used to protect all uses of all waters. Traditionally blackwater has had the highest median fecal coliform results. In 2009 the highest median was from graywater with 1,290 colonies per 100 ml. This is 92 times the AMWQS for raw consumption of shellfish. The maximum fecal coliform result for any sample was from the Spirit of Endeavor. With a blackwater result of 830,000 colonies per 100 ml, this is over 59,000 times AMWQS for raw shellfish consumption. Compared with prior years 2009 was the first year without a fecal result of over 1 million.

### ***Other Pollutants***

One of the two samples for each ship was analyzed for 167 “priority pollutants” 13 total metals, 12 dissolved metals; 72 volatile organic compounds (VOCs); 70 bases, neutral, acids (BNAs). These parameters are listed in the [QAQCP](#). Some small ships have separate graywater and blackwater discharges. The department allowed these ships to sample priority pollutants on only one of their wastewater discharges per season.

Most of the priority pollutants were not detected in small ship discharges. Table 7 includes only a selection of the priority results. Full priority results are available on request to DEC.

Alaska uses dissolved metal concentration (a subset of total recoverable metals) for its water quality standards, but Table 6 also includes the total recoverable metals results for informational purposes. There are Alaska Marine Water Quality Standards (AMWQS) for dissolved arsenic, chromium, copper, lead, selenium, nickel and zinc. All small cruise ships met the AMWQS for dissolved cadmium, silver, and lead. All but one small ship that was sampled exceeded the AMWQS for copper. Seven ships exceeded the AMWQS for selenium, six for arsenic, twelve for nickel, one for mercury, and seven for zinc.

### **Conclusion**

The wastewater sample results in this report were taken at the point of discharge with no mixing zone. A mixing zone is an area of water surrounding the point of discharge where the wastewater can be diluted by the receiving water. Most permitted wastewater facilities receive a mixing zone. For marine vessels it would be difficult to establish a mixing zone as they are mobile dischargers. DEC has addressed this issue in the Best Management Practices plans (BMPs) to minimize discharge in sensitive areas and near shore. The BMPs are renewed every three years, and DEC reviews the renewal applications for progress on wastewater sample results. The law that authorizes BMPs is set to expire by 2016. At that time the small commercial passenger vessels will be required to meet Alaska Marine Water Quality Standards (AMWQS) at the point of discharge or obtain an ADEC permit to discharge.

Small commercial passenger vessels and state ferries have made progress in terms of overall effluent quality. For example the medians for fecal coliform in 2005 and 2006 included median results over 1 million. In 2009 there were no results over 830,000. DEC believes further improvements can be made by small cruise ships and ferries, especially with regard to chlorine, fecal coliform, TSS, and biological oxygen demand (BOD).

**Table 3.** 2009 Small Ship Graywater Sampling (not including priority pollutants)

	Ammonia as N	pH	Biochemical O <sub>2</sub> Demand	Chemical Oxygen Demand	Total Suspended Solids	Total Chlorine	Free Chlorine	Fecal Coliform Bacteria by MPN	Conductivity	Oil & Grease	Total Organic Carbon	Alkalinity	Total Nitrate & Nitrite	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settleable Solids	
Reportable Limit (PQL)	0.1	0.1	2	10	4	0.1	0.1	2	2	5	1	2	1	0.05	1	0.1	
Units	mg/L	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100ml	umhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ml/L	
Alaska Marine Water Quality Standards or MSD Limits	2.9	6.5-8.5	60	n/a	150	0.0075	n/a	200	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vessel Name	Sample Date																
Clipper Odyssey	8/6/09	500.00	8.80	882	1,500	200	3.2	2.0	0	5,750	6.5	160	1,700.0	3.50	40.00	630.00	2.0
Spirit of Columbia	5/13/09	0.97	7.00	269	490	56	0.20	0.05	10,900	431	6.3	69	32.0	0	1.70	12.90	0
Spirit of Columbia	6/5/09	2.70	6.00	215	400	40	0.02	0.05	3,200	252	0	110	41.7	0.02	2.20	13.30	0
Spirit of Discovery	5/26/09	2.50	*	2,030	1,500	760	1.3	0.4	*	3,410	0	960	244.0	0.19	28.00	25.50	2.7
Spirit of Discovery	6/23/09	0.00	8.66	170	210	54	0	0.23	35,500	311	0	280	83.9	0.00	1.80	1.86	0
Spirit of Endeavor	5/21/09	3.70	9.60	197	400	76	0.80	0.40	261	1,250	24.0	120	254.0	0.23	1.70	12.50	0.5
Spirit of Yorktown	6/6/09	5.20	*	87.4	150	47	*	*	90	175	0	35	57.5	0	0.85	7.75	0
Spirit of Yorktown	8/15/09	5.20	5.00	86.5	130	33	0.80	*	1,290	157	0	30	46.6	0	1.80	6.18	0
Sea Bird <sup>1</sup>	7/18/09	0.21	7.18	92.3	200	23	0.20	0	200	393	8.6	51	64.0	0	0.62	6.50	0
Sea Bird <sup>1</sup>	8/29/09	1.70	6.80	549	940	36	0	0	580	1,180	16.0	520	0	0.15	1.90	17.00	0
Sea Lion <sup>1</sup>	6/21/09	1.20	7.25	414	710	106	0	0	8,700	494	0	220	32.0	0	1.70	15.00	6.9
Sea Lion	8/30/09	0.40	6.98	129.5	240	42	0	0	36,364	2,010	9.6	58	66.0	0	0.62	5.10	0
<b>Minimum</b>		<b>0</b>	<b>5.00</b>	<b>87</b>	<b>130</b>	<b>23.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>157</b>	<b>0.0</b>	<b>30.0</b>	<b>0.0</b>	<b>0.00</b>	<b>0.62</b>	<b>1.86</b>	<b>0.00</b>
<b>Maximum</b>		<b>500</b>	<b>9.60</b>	<b>2,030</b>	<b>1,500</b>	<b>760.0</b>	<b>3.2</b>	<b>2.0</b>	<b>36,364</b>	<b>5,750</b>	<b>24.0</b>	<b>960.0</b>	<b>1,700.0</b>	<b>3.50</b>	<b>40.00</b>	<b>630.00</b>	<b>6.90</b>
<b>Median</b>		<b>2.10</b>	<b>7.09</b>	<b>206</b>	<b>400</b>	<b>50.4</b>	<b>0.2</b>	<b>0.1</b>	<b>1,290</b>	<b>463</b>	<b>3.2</b>	<b>115.0</b>	<b>60.8</b>	<b>0.00</b>	<b>1.75</b>	<b>12.70</b>	<b>0.00</b>

<sup>1</sup> Fecal sample taken from from holding tank

\* Parameter not sampled or not recorded, results not analyzed.



**Table 4.** 2009 Small Ship Blackwater Sampling (not including priority pollutants)

	Ammonia as N	pH	Biochemical O <sub>2</sub> Demand	Chemical Oxygen Demand	Total Suspended Solids	Total Chlorine	Free Chlorine	Fecal Coliform Bacteria by MPN	Conductivity	Oil & Grease	Total Organic Carbon	Alkalinity	Total Nitrate & Nitrite	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settleable Solids	
Reportable Limit (PQL)	0.1	0.1	2	10	4	0.1	0.1	2	2	5	1	2	1	0.05	1	0.1	
Units	mg/L	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100ml	umhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ml/L	
Alaska Marine Water Quality Standards or MSD Limits	2.9	6.5-8.5	60	n/a	150	0.0075	n/a	200	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vessel Name	Sample Date																
Clipper Odyssey	8/6/09	540	8.78	1,250	2,100	1,290	35.0	67.0	0	6,590	11.0	180.0	2,000.0	5.10	54.0	780	34
Spirit of Columbia	5/13/09	6.60	6.0	36.4	200	76.0	1.7	0.8	0	37,600	0.0	48.0	120.0	0.42	4.60	35.80	4
Spirit of Discovery	5/26/09	89	*	122	530	4090	1.48	0.67	25500	38100	6.9	87	507	0	17	105	0
Spirit of Discovery	6/23/09	*	6.98	*	*	*	0	0	*	*	*	*	*	*	*	*	*
Spirit of Endeavor	5/21/09	40	8.0	138	470	286	1.5	2.6	0	40,500	0	150.0	293.0	0	11.0	116	6
Spirit of Endeavor	7/16/09	17	7.0	153	380	110	0.1	0.1	830,000	29,300	7.4	88.0	219.0	0.39	7.0	45.30	7
Spirit of Yorktown	6/6/09	430	6.0	919	2,100	360	0.2	0	360	47,800	9.7	530.0	1,580.0	0.16	35.0	461	7
Sea Bird	7/18/09	0.97	6.74	66.6	990	32	0	0	2,200	16,700	0	45.0	50.0	0.10	0.73	7.20	0
Sea Bird	8/29/09	0.78	8.18	15.9	420	26	0	0	0	29,400	0	12.0	75.0	0.10	0.68	6.70	0
Sea Lion	6/21/09	0.17	8.25	30.5	1,000	20	0	0	0	25,300	54.0	6.9	71.0	0.0	0.21	1.50	0
Sea Lion	8/30/09	2.30	7.54	11.1	1,800	34	0	0	280	30,100	0	9.0	83.0	0.0	0.58	6.90	11.1
<b>Minimum</b>	<b>0.17</b>	<b>6.00</b>	<b>11</b>	<b>200</b>	<b>20.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>6,590</b>	<b>0.0</b>	<b>6.9</b>	<b>50.0</b>	<b>0.00</b>	<b>0.21</b>	<b>1.50</b>	<b>0.00</b>
<b>Maximum</b>	<b>540</b>	<b>8.78</b>	<b>1,250</b>	<b>2,100</b>	<b>4,090</b>	<b>35.0</b>	<b>67.0</b>	<b>830,000</b>	<b>47,800</b>	<b>54.0</b>	<b>530.0</b>	<b>2,000.0</b>	<b>5.10</b>	<b>54.00</b>	<b>780.00</b>	<b>34.00</b>	
<b>Median</b>	<b>11.80</b>	<b>7.27</b>	<b>94</b>	<b>760</b>	<b>93.0</b>	<b>0.1</b>	<b>0.0</b>	<b>140</b>	<b>29,750</b>	<b>3.5</b>	<b>67.5</b>	<b>169.5</b>	<b>0.10</b>	<b>5.80</b>	<b>40.55</b>	<b>5.00</b>	

\* Parameter not sampled or not recorded, results not analyzed.

**Table 5.** 2009 Small Ship Sampling Mixed Blackwater and Graywater Mixed Results (not including priority pollutants)

	Ammonia as N	pH	Biochemical O <sub>2</sub> Demand	Chemical Oxygen Demand	Total Suspended Solids	Total Chlorine	Free Chlorine	Fecal Coliform Bacteria by MPN	Conductivity	Oil & Grease	Total Organic Carbon	Alkalinity	Total Nitrate & Nitrite	Total Phosphorus	Total Kjeldahl Nitrogen	Total Settleable Solids	
Reportable Limit (PQL)	0.1	0.1	2	10	4	0.1	0.1	2	2	5	1	2	1	0.05	1	0.1	
Units	mg/L	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	MPN/100 ml	umhos/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Alaska Marine Water Quality Standards or MSD Limits	2.9	6.5-8.5	60	n/a	150	0.0075	n/a	200	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Vessel Name	Sample Date																
Columbia	6/22/09	16.0	7.48	107.3	1,000	68	6.7	2.5	30	28,200	1100 <sup>1</sup>	16	140	0.34	4.40	46.00	1.0
Columbia	7/27/09	10.0	7.25	165.6	600	134	5.2	2.1	40	30,000	42.0	310	140	*	2.80	24.00	3.5
Columbia	8/3/09	13.0	7.40	158.5	930	60	6.4	3.0	10	33,200	9.5	15	150	0	2.70	26.00	2.5
Kennicott	6/5/09	0.18	8.18	0	780	30	4.8	4.0	0	38,700	0	0.5	100	0	0.21	0.91	0
Kennicott	7/21/09	0.76	8.10	58.0	390	12	3.9	1.5	0	32,600	0	0	0	0	0.29	1.90	0
Malaspina	6/16/09	20.0	6.75	165.8	1,200	48	0.0	0	230,000	18,900	16.0	17	150	0.14	4.30	38.00	0
Malaspina	7/27/09	8.2	6.66	113.4	990	65	0.0	0	310	19,500	17.0	470	110	0.00	2.80	21.00	0
Malaspina	11/9/09	12.0	6.54	77.0	610	53	0.0	0	0	35,700	5.5	29	0	12.00	3.10	24.00	0
Matanuska	6/28/09	18.0	7.57	136.1	1,400	55	7.4	3.0	600,000	21,800	19.0	9.5	130	0.28	3.40	28.00	0
Matanuska	7/19/09	14.0	7.18	134.4	480	88	3.1	0.7	280,000	24,000	32.0	35	120	0	3.40	59.00	0
Taku	5/15/09	2.40	8.69	109.5	890	83	4.7	3.5	20	34,600	15.0	7.3	130	0.16	2.70	18.00	5.0
Taku	6/26/09	6.50	7.64	102.6	850	640	0.0	0	0	27,200	23.0	15	96	0.51	3.40	32.00	19.0
Spirit of Oceanus	5/22/09	34.0	6.80	<60	1,400	560	*	*	>200	10,500	10.0	380	249.0	0.66	8.80	62.20	1.25
<b>Minimum</b>	<b>0.18</b>	<b>6.54</b>	<b>0</b>	<b>390</b>	<b>12.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0</b>	<b>10,500</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.00</b>	<b>0.21</b>	<b>0.91</b>	<b>0.00</b>
<b>Maximum</b>	<b>34.00</b>	<b>8.69</b>	<b>166</b>	<b>1,400</b>	<b>640.0</b>	<b>7.4</b>	<b>4.0</b>	<b>600,000</b>	<b>38,700</b>	<b>42.0</b>	<b>470.0</b>	<b>249</b>	<b>12.00</b>	<b>8.80</b>	<b>62.20</b>	<b>19.00</b>	
<b>Median</b>	<b>12.00</b>	<b>7.40</b>	<b>111</b>	<b>890</b>	<b>65.0</b>	<b>4.3</b>	<b>1.8</b>	<b>25</b>	<b>28,200</b>	<b>15.5</b>	<b>16.0</b>	<b>130</b>	<b>0.15</b>	<b>3.10</b>	<b>26.00</b>	<b>0.00</b>	

<sup>1</sup> High oil and grease result. Vessel changed protocol for disposing of used cooking oils. Vessel conducted an additional compliance sample

\* Parameter not sampled or not recorded, results not analyzed.

**Table 6. 2009 Small Ship Sampling Metal Results**

Parameter			Antimony (TR)	Antimony, (Dissolved)	Arsenic (TR)	Arsenic, dissolved	Beryllium (TR)	Beryllium Dissoved	Cadmium (TR)	Cadmium Dissolved	Chromium (TR)	Chromium dissolved	Copper (TR)	Copper, dissolved
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Water Quality Standards					36					8.8				3.1
Vessel Name	Sample Date	Sample Type												
Columbia	8/3/09	Mixed	0	0	85	33	0	0	0	0	5.7	2.8	150	110
Kennicott	7/21/09	Mixed	0	0	61	24	0	0	0	0	2.6	2.8	99	100
Malaspina	7/27/09	Mixed	0.27	0.66	38	30	0	0	0	0	4.5	2.4	130	82
Malaspina	11/9/09	Mixed	0	0	74	49	0	0	0	0	2.8	2.5	120	110
Matanuska	7/19/09	Mixed	0	0	49	32	0	0	0	0	8.2	4.7	290	160
Taku	6/26/09	Mixed	0	0.15	36	25	0	0	0	0	1.1	1.7	260	140
Clipper Odyssey	8/6/09	BW	0	0	13	15	0	0	0	0	7.8	2.6	410	410
Clipper Odyssey	8/6/09	GW	0	3.1	11	11	0	0	0	0	4.7	4.3	170	150
Spirit of Columbia	6/5/09	BW	0	0	141	152	0	0	0	0	28.1	25.5	26.2	10.7
Spirit of Discovery	6/23/09	BW	0	1.58	87.3	73.4	0	2.05	0	0	18.7	12.2	308	6.18
Spirit of Endeavor	8/27/09	BW	0	0	122	121	0	0	0	0	27	15.8	77.4	29.8
Spirit of Oceanus	6/13/09	Mixed	0	0	12.8	13.4	0	0	0	0	4.59	3.96	603	186
Spirit of Oceanus	8/20/09	Mixed	0	0	40.5	32.8	0	0	0	0	12.6	8.89	950	229
Spirit of Yorktown	8/15/09	BW	0	0	54.7	73.8	0	0	0	0	19.5	13.6	51.1	0
Sea Bird	8/29/09	BW	0	0	61	55	0	0	0	0	0	0	54	54
Sea Lion	8/30/09	GW	0	0	2.8	3.9	0	0	0	0	0	0	250	17
<b>MIN</b>			<b>0.00</b>	<b>0.00</b>	<b>2.80</b>	<b>3.90</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>26.20</b>	<b>0.00</b>
<b>MAX</b>			<b>0.27</b>	<b>3.10</b>	<b>141.00</b>	<b>152.00</b>	<b>0.00</b>	<b>2.05</b>	<b>0.00</b>	<b>0.00</b>	<b>28.10</b>	<b>25.50</b>	<b>950.00</b>	<b>410.00</b>
<b>MEDIAN</b>			<b>0.00</b>	<b>0.00</b>	<b>51.85</b>	<b>32.40</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>5.20</b>	<b>3.38</b>	<b>160.00</b>	<b>105.00</b>

Non-detects set to zero.



**Table 6 (continued) 2009 Small Ship Sampling Metal Results**

Parameter			Lead (TR)	Lead, dissolved	Mercury (Total)	Nickel (TR)	Nickel, dissolved	Selenium (TR)	Selenium, dissolved	Silver (TR)	Silver, Dissolved	Thallium (TR)	Thallium, dissolved	Zinc (TR)	Zinc, dissolved
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Water Quality Standards				8	0.94				71	2					81
Vessel Name	Sample Date	Sample Type													
Columbia	8/3/09	Mixed	2.8	0	0	21	16	300	120	0	0	0	1.5	94	61
Kennicott	7/21/09	Mixed	0	0	0	17	16	240	96	0	0	96	0	85	83
Malaspina	7/27/09	Mixed	1.9	0.32	0	19	19	140	110	0.049	0.01	0.079	0.3	240	140
Malaspina	11/9/09	Mixed	0	0	0	25	26	270	170	0	0	0	1.4	61	64
Matanuska	7/19/09	Mixed	4.1	0	0	30	28	190	130	0	0	0	0	210	46
Taku	6/26/09	Mixed	9.9	0	0	25	22	130	85	0	0	0	2.2	180	57
Clipper Odyssey	8/6/09	BW	5.5	5.5	1.2	16	17	12	14	0	0	0	2.1	740	770
Clipper Odyssey	8/6/09	GW	3.4	2	0.28	13	15	11	10	0	0	0	0	1100	710
Spirit of Columbia	6/5/09	BW	0	2.74	0	22.3	20.3	56.3	47.3	0	0	0	0	101	49.8
Spirit of Discovery	6/23/09	BW	14.4	0	0	16.9	13.9	269	59.7	0	0	0	0	17.1	323
Spirit of Endeavor	8/27/09	BW	12.4	0	0	18.7	13.9	0	0	0	0	0	0	318	172
Spirit of Oceanus	6/13/09	Mixed	4.83	1.33	0	7.67	5.75	20.5	21.2	0	0	0	0	322	167
Spirit of Oceanus	8/20/09	Mixed	3.88	0	0	28.2	24	38.6	0	0	0	0	0	221	130
Spirit of Yorktown	8/15/09	BW	3.32	0	0	11.1	9.66	17.7	87.9	0	0	0	0	477	6.47
Sea Bird	8/29/09	BW	0	0	0	14	13	210	190	0	0	0	0	12	15
Sea Lion	8/30/09	GW	4.1	0	0	5.4	4.4	9.4	13	0	0	0	0	200	83
<b>MIN</b>			<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>5.40</b>	<b>4.40</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>12.00</b>	<b>6.47</b>
<b>MAX</b>			<b>14.40</b>	<b>5.50</b>	<b>1.20</b>	<b>30.00</b>	<b>28.00</b>	<b>300.00</b>	<b>190.00</b>	<b>0.05</b>	<b>0.01</b>	<b>96.00</b>	<b>2.20</b>	<b>1100.00</b>	<b>770.00</b>
<b>MEDIAN</b>			<b>3.64</b>	<b>0.00</b>	<b>0.00</b>	<b>17.85</b>	<b>16.00</b>	<b>93.15</b>	<b>72.35</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>205.00</b>	<b>83.00</b>

Non-detects set to zero.

**Table 7** 2009 Small Ship Selected Priority Results

Parameter			3/4-Methylphenol	Acetone	Bromoform	Benzyl Alcohol	Chloroform	Carbon disulfide	Benzoic Acid	Toulene	Phenol	Benzene
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Water Quality Standards												
Vessel Name	Sample Date	Sample Type										
Columbia	8/3/09	Mixed	0	0	86	0	0	0	84	0	0	0
Kennicott	7/21/09	Mixed	0	0	31	0	0	0	0	0	0	0
Malaspina	7/27/09	Mixed	4.4	22	98	70	1.2	0	160	0	0	0
Malaspina	11/9/09	Mixed	18	0	72	0	0	0	310	0	0	0
Matanuska	7/19/09	Mixed	0	0	20	0	0	0	200	0	0	0
Taku	6/26/09	Mixed	0	28	460	0	4.2	1.9	14	0	0	1.1
Clipper Odyssey	8/6/09	BW	0	110	0	0	14	0	0	0	0	0
Clipper Odyssey	8/6/09	GW	0	140	0	0	24	0	0	0	0	0
Spirit of Columbia	6/5/09	BW	0	0	260	0	0	0	0	0	0	0
Spirit of Discovery	6/23/09	BW	58	50	7.9	4.1	230	11	67	0	4.3	0
Spirit of Endeavor	8/27/09	BW	3.5	27	390	0.81	30	5.1	190	0	0	0
Spirit of Oceanus	6/13/09	Mixed	15	35	2.8	33	43	6.4	260	0.67	6.3	0
Spirit of Oceanus	8/20/09	Mixed	3.7	28	4.8	15	32	0	260	1.2	4.4	0
Spirit of Yorktown	8/15/09	BW	3000	280	0	0	210	28	7700	0	970	0
Sea Bird	8/29/09	BW	0	0	42	0	0	0	0	0	0	0
Sea Lion	8/30/09	GW	0	0	17	58	26	0	0	0	0	0
<b>MIN</b>			<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>MAX</b>			<b>3000</b>	<b>280</b>	<b>460</b>	<b>70</b>	<b>230</b>	<b>28</b>	<b>7700</b>	<b>1.2</b>	<b>970</b>	<b>1.1</b>
<b>MEDIAN</b>			<b>0.00</b>	<b>24.50</b>	<b>25.50</b>	<b>0.00</b>	<b>9.10</b>	<b>0.00</b>	<b>75.50</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>

2009 Small<sup>1</sup> Commercial Passenger Vessels Wastewater Treatment

	Vessel Operator	Vessel Name	Passenger Capacity (lower berth)	Crew Capacity	Voyages	Maximum Total Passengers	Blackwater Treatment System Manufacturer	Discharging in Alaska <sup>2</sup> & Subject to sampling program	
								BW	GW
1	Alaska Marine Highway System	<i>Columbia</i>	157	66	Year Rd.	N/A	Omnipure	Yes	Yes
2	Alaska Marine Highway System	<i>Kennicott</i>	162	42	Year Rd.	N/A	Orca	Yes	Yes
3	Alaska Marine Highway System	<i>Malaspina</i>	138	50	Year Rd.	N/A	Omnipure	Yes	Yes
4	Alaska Marine Highway System	<i>Matanuska</i>	136	50	Year Rd.	N/A	Omnipure	Yes	Yes
5	Alaska Marine Highway System	<i>Taku</i>	55	42	Year Rd.	N/A	Effluent Technology	Yes	Yes
6	Cruise West	<i>Spirit of Columbia</i>	80	21	31	2480	Omnipure	Yes	Yes
7	Cruise West	<i>Spirit of Discovery</i>	95	21	29	2755	Red Fox	Yes	Yes
8	Cruise West	<i>Spirit of Endeavour</i>	109	28	18	1962	Omnipure	Yes	Yes
9	Cruise West	<i>Spirit of Oceanus</i>	114	64	7	798	Hamworthy	Yes	Yes
10	Cruise West	<i>Spirit of Yorktown</i>	138	37	16	2208	Omnipure 12MX824-27	Yes	Yes
11	Hapag-Lloyd	<i>Bremen</i>	188	100	2	376	Unknown	No	No
12	Hapag-Lloyd	<i>Hanseatic</i>	188	120	4	752	Unknown	No	No
13	National Geographic	<i>Sea Bird</i>	63	28	19	1197	Omnipure 12M	Yes	Yes
14	National Geographic	<i>Sea Lion</i>	63	28	18	1134	Omnipure 12M	Yes	Yes
15	ISP	<i>Clipper Odyssey</i>	128	76	4	512	Consillium Neptumatic	Yes	Yes
				Totals	148	14174			
<sup>1</sup> A small vessel has overnight accommodations for 50-249 passengers. A large vessel has overnight accommodations for 250 or more passengers.									
<sup>2</sup> Alaska water extends 3 miles from the coastline and includes the Alexander Archipelago. Vessels discharging in Alaska water must sample their wastewater twice per season.									
Not Discharging in AK waters									