2005 Small Ship Wastewater Sampling Results

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 (ADEC) and applies to large[1] and small[2] commercial passenger vessels. The law requires small vessels to sample their wastewater discharges twice per season. Several key aspects of the CPVEC program, such as payment of environmental compliance fees and compliance with wastewater discharge standards, became effective for small commercial passenger vessels on January 1, 2004.

Small cruise ships are now required to meet standard terms and conditions, or seek alternative terms and conditions in order to discharge blackwater[3] and graywater[4] 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.

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 established additional alternative terms and conditions AS 46.03.462 (e) also known as a best management practices plan. As part of the 2004 law, the interim protective measures 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. 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

In 2005, most small vessels and ferries sought alternative terms and conditions under the best management practices plan because the effluent from the treatment systems on board does not meet standard terms and conditions and advanced treatment systems installed on large ships are not yet commercially available to small vessels.

Eighteen small ships registered with the CPVEC program in 2005, including five state ferries that operate in Alaska year-round. Three of the small ships did not report all of the required wastewater sampling results; one small ship operator did not sample their wastewater as required and received a notice of violation and subsequent fine from ADEC. The other two small vessels also did not sample their wastewater as required and because of other non compliance issues are currently working with ADEC to reach a resolution.

Table 1 (Parts 1 & 2) summarizes the 2005 small ship sampling results using the median[5] results for each pollutant. Data from the 18 ships were combined and results show that small-ship effluent does not meet water quality standards at the end of pipe for fecal coliform, chlorine residual, or arsenic, copper, nickel, selenium, and zinc.

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[1] A large vessel has >250 overnight passengers as defined in AS 46.03.490(13)
[2] A small vessel has 50-249 overnight passengers as defined in AS 46.03.490(7)
[3] Wastewater from toilets as defined in AS 46.03.490(12).
[4] As defined in AS 46.03.490(6). Wastewater from galley, dishwasher, bath and laundry.
[5] 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 2005 Small Vessels Median Sampling Results –Part 1 (18 vessels)

	Ammonia as N	pH	Biochemical O_2 Demand	Chemical Oxygen Demand	Total Suspended Solids	Free Chlorine, Residual	Fecal Coliform Bacteria by MPN
Alaska Water Quality Standards	**17** *	**6.5-8.5**	**n/a**	**n/a**	**150**	**0.0075**	**200 ****
Units	**mg/L**	**s.u.**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Graywater (18 samples)	1.47	7.33	353	480	58.4	0.0	2,900
Blackwater (17 samples)	20	7.95	72.4	380	93.9	0.13	51,000
Mixed Blackwater & Graywater (17 Samples)	14	7.42	187	490	115.5	0.0	3,650,000

* 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* using a ph of 7.0, salinity of 20 g/kg and temperature of 10-15 degrees Celsius. Large ships while stationary have a minimum dilution factor of 10. Ammonia levels greater than 20 mg/L exceed water quality standards in the receiving water.

** The standard in receiving water for consumption of raw shellfish is 14 fecal coliform bacteria per 100 ml. Effluent levels below 200 fc/100ml means that with dilution, the 14 fc/100ml standard will be meet in the receiving water.

Table 1. Summary 2005 Small Vessels Median Sampling Results – Part 2 (16 vessels)

	Arsenic, dissolved	Copper, dissolved	Lead, dissolved	Nickel, dissolved	Selenium, dissolved	Zinc, dissolved
Alaska Water Quality Standards	36	3.1	8.1	8.2	71	81
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Median (19 samples)	37	58	1.05	18.5	163	124

Wastewater results for individual ships

Tables 2 through 5 show the 2005 twice-per-season sampling results for each of the 18 ships that reported. Samples were analyzed for conventional and priority pollutants (see Table 6). Results highlighted in yellow are outside the standard terms and conditions or appropriate water quality standard. The small ships operating under best management practice plans do not need to meet standard terms and conditions, so no enforcement action was required.

Bacteria

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 chlorine residual result is almost 2 times the Alaska's marine water quality standard (AMWQS). The maximum chlorine residual results for small-ship graywater and blackwater were 26 mg/L and 8.8 mg/L, respectively—more than 1000 times (AMWQS). The fecal coliform standard is 200 colonies per 100 ml to meet AMWQS for secondary-contact recreation. 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. Mixed blackwater and graywater has the highest median fecal coliform results. At 3,650,000 colonies per 100 ml, the median is more than 100,000 times the AMWQS for raw consumption of shellfish. The maximum fecal coliform result for mixed blackwater and graywater was from the Wilderness Adventurer. At 27,200,000 colonies per 100 ml, this is almost 2 million times AMWQS for raw shellfish consumption.

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). Some small ships have separate graywater and blackwater discharges. The department allowed these ships to sample priority pollutants[6] on only one of their wastewater discharges per season.

Most of the priority pollutants were not detected in small ship discharges. Table 5 includes only priority pollutants with medians that exceeded the practical quantitation limit (PQL) or a pollutant with a maximum value 10 times the PQL. Alaska uses dissolved metal concentration (a subset of total recoverable metals) for its water quality standards, but Table 5 also includes the total recoverable metals results for informational purposes. The pollutants not listed here are considered not detected and the analysis of those pollutants is unnecessary.

Currently there are no AMWQS for 3&4-methylphenol, 2-cholorphenol, bromoform, chloroform, benzoic acid and phenol. However, there are Alaska Marine Water Quality Standards (AMWQS) for arsenic, chromium, copper, lead, selenium, nickel and zinc.

With one exception, all small ships met the AMWQS for dissolved chromium and lead. The Clipper Odyssey exceeded the AMWQS for lead by 7.6 microgram per liter (ug/L). Most small ships that operated in Alaska in 2005 exceeded the AMWQS for arsenic, copper, selenium, and zinc. All small ships exceeded the AMWQS for nickel.

[6] The priority pollutants analysis can be found in the Large Ship Unannounced Sampling Report.

Table 2. 2005 Small Ship Graywater Unannounced Sampling (not including priority pollutants)

		Ammonia as N	pH	Biochemical O_2 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		17	6.5-8.5	n/a	n/a	n/a	n/a	n/a	14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vessel Name	Sample Date																
Clipper Odyssey	7/20/05	2.56	5.80	1,100	4,400	335.0	3.4	3.6	1,000,000	1,290	249.0	450.0	70.0	0.19	12.00	18.80	1.43
Clipper Odyssey	7/20/05	403.00	8.90	1,360	4,100	1,780.0	25.0	6.0	0	6,520	94.4	830.0	1,700.0	1.50	57.00	531.00	415.00
Sea Bird	6/19/05	3.21	7.27	336	300	62.2	0.0	0.0	120	427	0.0	140.0	145.0	0.00	1.60	12.30	0.10
Sea Bird	7/31/05	1.92	7.81	165	230	29.5	0.2	0.0	110,000	391	0.0	13.0	132.0	0.00	1.40	6.86	0.00
Sea Lion	5/27/05	0.14	7.60	445	826	85.5	38.0	26.0	30	1,050	0.0	15.0	101.0	0.24	1.30	17.10	0.00
Sea Lion	6/18/05	1.87	6.40	423	1,400	42.1	0.0	0.0	290	570	0.0	370.0	139.0	0.00	0.64	2.41	0.00
Spirit of 98	6/2/05	0.36	9.82	151	120	5.3	0.2	0.0	0	380	0.0	64.0	102.0	0.24	2.00	4.95	0.00
Spirit of 98	7/14/05	0.00	7.77	606	140	99.6	1.4	0.1	0	332	0.0	120.0	71.4	0.55	0.91	0.00	0.00
Spirit of Alaska	5/29/05	0.92	4.75	547	470	61.8	0.0	0.0	270,000	366	0.0	160.0	9.3	0.00	0.00	14.70	0.50
Spirit of Alaska	7/31/05	1.54	5.10	370	520	55.0	0.0	0.0	170,000	234	0.0	150.0	0.0	0.00	1.40	6.48	0.10
Spirit of Columbia	5/17/05	1.40	6.57	277	955	134.0	0.0	0.0	4,200	376	0.0	71.0	63.5	0.00	9.70	12.40	1.60
Spirit of Columbia	9/2/05	0.00	4.60	723	1,100	356.0	1.1	1.1	1,600	452	7.5	340.0	0.0	0.00	2.90	11.00	0.00
Spirit of Discovery	6/5/05	0.45	7.03	93	490	36.6	0.0	0.0	12,000	135	0.0	28.0	48.8	0.21	14.00	2.27	0.00
Spirit of Discovery	8/6/05	1.94	8.54	4,050	4,200	2,570.0	0.0	0.0	4,200	700	0.0	3,300.0	0.0	0.00	23.00	15.00	2.50
Spirit of Endeavor	6/9/05	2.54	8.91	122	340	53.2	0.0	0.0	10,400	458	0.0	71.0	230.0	0.11	1.10	9.23	0.00
Spirit of Endeavor	8/4/05	0.91	7.38	145	250	23.3	0.0	0.0	1,100	301	0.0	52.0	112.0	0.00	0.65	5.18	0.00
Yorktown Clipper	8/9/05	0.52	8.12	0	180	24.0	0.3	0.0	10	1,010	0.0	83.0	144.0	0.00	0.89	2.59	0.00
Yorktown Clipper	9/4/05	2.62	7.08	117	140	38.4	0.0	0.0	21,000	219	0.0	69.0	58.7	0.00	0.63	4.97	0.00
	Minimum	**0.00**	**4.60**	**0**	**120**	**5.3**	**0.0**	**0.0**	**0**	**135**	**0.0**	**13.0**	**0.0**	**0.00**	**0.00**	**0.00**	**0.00**
	Maximum	**403.00**	**9.82**	**4,050**	**4,400**	**2,570.0**	**38.0**	**26.0**	**1,000,000**	**6,520**	**249.0**	**3,300.0**	**1,700.0**	**1.50**	**57.00**	**531.00**	**415.00**
	Median	**1.47**	**7.33**	**353**	**480**	**58.4**	**0.0**	**0.0**	**2,900**	**409**	**0.0**	**101.5**	**86.2**	**0.00**	**1.40**	**8.05**	**0.00**

Table 3. 2005 Small Ship Blackwater Unannounced Sampling (not including priority pollutants)

		Ammonia as N	pH	Biochemical O_2 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		17	6.5-8.5	n/a	n/a	n/a	n/a	n/a	14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vessel Name	Sample Date																
Clipper Odyssey	7/20/05	3.07	8.10	63.8	60	93.9	0.07	0.07	240	53,600	2.53	3.5	129.0	0.00	0.087	7.43	3.89
Sea Bird	6/19/05	1.87	7.97	12.3	340	26.2	1.00	0.80	51,000	27,400	0.00	16.0	84.2	0.11	0.26	5.88	2.00
Sea Bird	7/31/05	1.41	7.86	10.7	120	7.8	0.37	0.00	100,000	20,200	0.00	6.5	61.6	0.00	1.90	8.42	0.00
Sea Lion	5/27/05	11.00	7.64	52.2	726	59.8	8.90	2.10	0	33,300	0.00	34.0	121.0	5.70	0.00	32.20	0.00
Sea Lion	6/18/05	2.14	7.66	72.4	470	81.7	5.40	0.70	0	25,300	0.00	50.0	82.9	0.21	1.20	25.70	8.00
Spirit of 98	6/2/05	110.00	7.37	506.0	4,100	345.0	0.35	0.20	4,090,000	32,900	6.60	250.0	872.0	11.00	23.00	133.00	7.50
Spirit of 98	7/14/05	98.00	7.83	179.0	480	118.0	0.23	0.15	5,300,000	22,400	0.00	57.0	674.0	3.40	13.00	112.00	4.00
Spirit of Alaska	5/29/05	1.20	8.20	9.9	150	13.4	0.00	0.00	1,190,000	24,500	0.00	2.4	92.0	5.50	0.00	2.14	0.00
Spirit of Alaska	7/31/05	19.50	8.38	128.0	210	242.0	0.23	0.21	4,600,000	22,800	0.00	48.0	281.0	0.00	3.30	25.90	24.00
Spirit of Columbia	5/17/05	20.00	7.95	60.3	376	53.3	6.40	2.00	0	25,200	0.00	65.0	130.0	0.00	13.00	23.50	0.48
Spirit of Columbia	9/2/05	30.20	6.70	164.0	390	228.0	3.60	8.80	1,600	39,000	7.20	80.0	167.0	0.00	6.80	88.00	2.20
Spirit of Discovery	6/5/05	100.00	7.78	140.0	380	119.0	0.31	0.13	2,400,000	31,400	0.00	63.0	495.0	6.70	13.00	111.00	5.50
Spirit of Discovery	8/6/05	7.43	7.44	11.8	0	0.0	0.00	0.00	90	27,200	0.00	18.0	149.0	0.00	0.00	32.90	0.00
Spirit of Endeavor	6/9/05	49.80	8.46	290.0	600	380.0	0.17	0.00	8,800,000	24,800	0.00	160.0	596.0	0.46	19.00	154.00	39.00
Spirit of Endeavor	8/4/05	50.20	8.34	265.0	670	275.0	0.00	0.00	570,000	28,900	34.00	140.0	539.0	0.00	15.00	86.20	40.00
Yorktown Clipper	8/9/05	156.00	8.00	116.0	390	299.0	0.00	0.00	20	1,100	0.00	380.0	685.0	0.00	5.90	158.00	0.80
Yorktown Clipper	9/4/05	353.00	8.15	55.5	240	80.5	0.00	0.00	20,900	29,700	0.00	52.0	2070.0	5.60	11.00	380.00	0.30
	Minimum	**1.20**	**6.70**	**9.9**	**0**	**0.0**	**0.00**	**0.00**	**0**	**1,100**	**0.00**	**2.4**	**61.6**	**0.00**	**0.00**	**2.14**	**0.00**
	Maximum	**353.00**	**8.46**	**506.0**	**4,100**	**380.0**	**8.90**	**8.80**	**8,800,000**	**53,600**	**34.00**	**380.0**	**2070.0**	**11.00**	**23.00**	**380.00**	**40.00**
	Median	**20.00**	**7.95**	**72.4**	**380**	**93.9**	**0.23**	**0.13**	**51,000**	**27,200**	**0.00**	**52.0**	**167.0**	**0.11**	**5.90**	**32.90**	**2.20**

Table 4. 2005 Small Ship Unannounced Sampling Blackwater and Graywater Mixed Results (not including priority pollutants)

		Ammonia as N	pH	Biochemical O_2 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		17	6.5-8.5	n/a	n/a	n/a	n/a	n/a	14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vessel Name	Sample Date																
Columbia	6/6/05	28.30	7.81	123.0	200	48.5	1.0	0.5	0	28,400	0.00	--	188.0	5.3	0.8	32.9	0.00
Columbia	8/9/05	10.60	7.63	116.0	270	57.4	--	--	22	824	0.00	4.0	125.0	1.7	3.1	15.8	0.00
Empress of the North	7/9/05	12.00	6.91	144.0	350	57.4	0.0	0.0	2,100,000	23,400	5.30	41.0	91.0	5.8	7.7	10.7	0.00
Kennecott	8/2/05	0.00	7.85	2.0	130	5.5	3.0	0.0	22	28,800	0.00	1.6	73.9	5.0	0.0	0.0	0.00
Kennecott	8/24/05	10.10	7.30	50.3	210	30.5	0.0	0.0	5,200,000	25,300	0.00	39.0	120.0	5.0	0.9	17.7	0.00
Malaspina	8/13/05	61.20	7.03	412.0	1,100	111.0	0.0	0.0	7,700,000	13,300	2.55	390.0	364.0	0.0	9.9	79.8	0.00
Matanuska	8/3/05	23.70	7.18	370.0	520	92.6	0.0	0.0	11,800,000	19,800	0.00	95.0	183.0	0.0	5.0	37.3	0.53
Matanuska	8/24/05	4.66	7.30	72.9	260	49.6	6.3	0.0	0	24,900	0.00	85.0	101.0	3.8	3.6	15.5	0.00
Spirit of Oceanus	5/19/05	16.00	6.47	526.0	915	120.0	0.0	0.0	6,600,000	845	0.00	210.0	117.0	0.0	27.0	32.4	1.00
Spirit of Oceanus	8/30/05	1.31	7.20	569.0	1,000	129.0	0.93	0.0	7,900,000	985	0.00	300.0	125.0	0.0	11.0	19.1	0.00
Taku	10/7/05	4.89	8.45	169.0	470	128.0	3.2	0.0	0	25,500	0.00	64.0	82.9	0.0	5.1	16.5	5.00
Taku	12/10/05	1.96	7.62	202.0	0	189.0	1.2	0.0	210	34,300	6.30	61.0	109.0	0.0	0.2	20.4	4.90
Wilderness Adventurer	6/4/05	38.20	7.31	894.0	920	629.0	0.0	0.0	27,200,000	24,000	8.80	200.0	407.0	8.0	7.1	93.6	19.00
Wilderness Adventurer	8/27/05	22.00	7.52	172.0	510	221.0	3.5	0.0	6,000	20,700	0.00	84.0	142.0	0.0	6.5	61.1	1.30
Wilderness Discoverer	6/18/05	161.00	8.19	407.0	740	132.0	0.0	0.0	7,600,000	14,800	0.00	230.0	663.0	0.0	20.0	177.0	0.00
Wilderness Discoverer	7/16/05	82.40	7.71	586.0	1,000	268.0	0.0	0.0	8,300,000	16,100	0.00	270.0	601.0	4.1	28.0	109.0	0.20
	Minimum	**0.00**	**6.47**	**2.0**	**0**	**5.5**	**0.0**	**0.0**	**0**	**824**	**0.00**	**1.6**	**73.9**	**0.0**	**0.0**	**0.0**	**0.00**
	Maximum	**161.00**	**8.45**	**894.0**	**1,100**	**629.0**	**6.3**	**0.5**	**27,200,000**	**34,300**	**8.80**	**390.0**	**663.0**	**8.0**	**28.0**	**177.0**	**19.00**
	Median	**14.00**	**7.42**	**187.0**	**490**	**115.5**	**0.0**	**0.0**	**3,650,000**	**22,050**	**0.00**	**85.0**	**125.0**	**0.9**	**5.8**	**26.4**	**0.00**

Table 5. 2005 Small Ship Sampling Priority Pollutants

			3&4-Methylphenol	2-cholorophenol	chloroform	bromoform	Benzoic Acid	Phenol	Arsenic, dissolved	Arsenic, total	Chromium, dissolved	Chromium, total
Reportable Limit (PQL)			5	5	2	2	130	5	2.5	2.5	2.5	2.5
Units			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Alaska Marine Water Quality Standards			N/A	N/A	N/A	N/A	N/A	N/A	36	N/A	50	N/A
Vessel Name	Sample Date	Sample Name										
Clipper Odyssey	7/20/2005	Gray water Aft	3.6	0	4.2	0	125	0	0	0	3.92	7.57
Clipper Odyssey	7/20/2005	Graywater Fwd	360	52	130	0	0	150	10.3	10.9	6.62	11.6
Clipper Odyssey	7/20/2005	Blackwater (BW)	2.7	0	66	0	190	8.4	50.4	38.8	0	2.6
Columbia	6/6/2005	Mixed BW&GW	N/A	N/A	4.1	54	N/A	N/A	21.9	30.2	0	0
Columbia	8/9/2005	Mixed BW&GW	N/A	0	5	170	N/A	0	79.3	80.7	15.4	14.8
Kennicott	8/2/2005	Mixed BW&GW	0	0	0	35	35	2.5	66.5	83.9	14.2	13.8
Malaspina	8/13/2005	Mixed BW&GW	N/A	0	33	0	N/A	0	19.6	34.7	34.1	107
Sea Bird	7/31/2005	Graywater (GW)	11	0	0	5.1	250	0	37	32	14.7	18.1
Sea Lion	6/18/2005	Blackwater (BW)	0	0	100	0	0	0	0	0	0	2.82
Spirit of 98	7/14/2005	Graywater (GW)	240	0	0	0	0	0	20.3	19.2	0	0
Spirit of Alaska	7/30/2005	Graywater (GW)	11	0	0	0	0	0	39.5	22.6	12.4	11.2
Spirit of Columbia	9/2/2005	Blackwater (BW)	N/A	0	6.1	3.8	N/A	0	0	0	11	12.7
Spirit of Discovery	8/6/2005	Blackwater (BW)	N/A	0	0	0	N/A	0	58.6	62.7	28.5	27.4
Spirit of Endeavor	8/4/2005	Blackwater (BW)	N/A	0	0	0	N/A	0	77.4	70.4	28.7	38.2
Spirit of Oceanus	8/30/2005	Mixed BW&GW	N/A	0	93	0	N/A	0	0	0	8.02	13.3
Taku	10/7/2005	Mixed BW&GW	N/A	0	6.4	260	N/A	0	81.3	68.2	15.7	16.4
Wilderness Adventurer	8/27/2005	Mixed BW&GW	N/A	0	13	43	N/A	0	56.6	55.5	8.06	19.9
Wilderness Discoverer	7/16/2005	Mixed BW&GW	520	0	10	0	1,900	94	12.8	12.5	8.36	14.1
Yorktown Clipper	9/4/2005	Blackwater (BW)	N/A	0	2.8	0	N/A	0	64.9	67.4	7.82	27
		Minimum	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		Maximum	**520**	**52**	**130**	**260**	**1,900**	**150**	**81.3**	**83.9**	**34.1**	**107**
		Median	**11**	**0**	**5**	**0**	**35**	**0**	**37**	**32**	**8.36**	**13.8**

Table 5. 2005 Small Ship Sampling Priority Pollutants continued

			Copper, dissolved	Copper, total	Lead, dissolved	Lead, total	Nickel, dissolved	Nickel, total	Selenium, dissolved	Selenium, total	Zinc, dissolved	Zinc, total
Reportable Limit (PQL)			1	1	1	1	1	1	2.5	2.5	2.5	2.5
Units			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Alaska Marine Water Quality Standards			3.1	N/A	8.1	N/A	8.2	N/A	71	N/A	81	N/A
Vessel Name	Sample Date	Sample Name										
Clipper Odyssey	7/20/2005	Gray water	120	191	15.7	5.24	8.36	11.4	0	2.69	470	417
Clipper Odyssey	7/20/2005	Graywater	274	374	6.83	6.09	23.1	37.2	0	6.84	462	1,110
Clipper Odyssey	7/20/2005	Blackwater	10.3	22.1	1.05	2.9	10.4	13.1	210	228	50.2	204
Columbia	6/6/2005	Mixed BW&GW	33.2	35.5	0	0	12.2	10.4	130	115	84.4	86.8
Columbia	8/9/2005	Mixed BW&GW	72.2	103	7.62	9.03	21.2	22.2	421	472	130	153
Kennicott	8/2/2005	Mixed BW&GW	168	229	0.286	1.42	22.6	24.9	328	368	92.7	96.6
Malaspina	8/13/2005	Mixed BW&GW	26.4	156	0	341	26	33.6	183	212	112	441
Sea Bird	7/31/2005	Graywater	49.2	52.5	0	1.6	6.92	8.79	235	229	30.3	57.2
Sea Lion	6/18/2005	Blackwater	58	159	6.24	9.98	4.62	5.51	0	0	180	217
Spirit of 98	7/14/2005	Graywater	0	41.6	0	3.75	7.3	37	87	85.8	0	191
Spirit of Alaska	7/30/2005	Graywater (GW)	43.9	210	0	0.845	5.21	6.05	163	112	22.6	60.1
Spirit of Columbia	9/2/2005	Blackwater (BW)	54.6	412	0	39.3	39.7	261	0	0	1,150	3,340
Spirit of Discovery	8/6/2005	Blackwater (BW)	273	307	0.3	0.437	65	67.6	218	239	137	140
Spirit of Endeavor	8/4/2005	Blackwater (BW)	70.9	161	4	10.9	16.8	20.8	366	291	124	1,200
Spirit of Oceanus	8/30/2005	Mixed BW&GW	269	358	4.67	10.5	18.5	34.2	0	6.44	528	473
Taku	10/7/2005	Mixed BW&GW	148	570	5.76	118	24.1	33.6	264	282	136	622
Wilderness Adventurer	8/27/2005	Mixed BW&GW	85.2	502	1.59	12.4	69	63	155	247	3,750	5,510
Wilderness Discoverer	7/16/2005	Mixed BW&GW	0	246	0	6.93	12.1	18.3	62.1	53.9	73.1	310
Yorktown Clipper	9/4/2005	Blackwater (BW)	42.8	203	1.4	2.26	29.7	35.3	239	290	41.3	48.6
		Minimum	**0**	**22.1**	**0**	**0**	**4.62**	**5.51**	**0**	**0**	**0**	**48.6**
		Maximum	**274**	**570**	**15.7**	**341**	**69**	**261**	**421**	**472**	**3750**	**5510**
		Median	**58**	**203**	**1.05**	**6.09**	**18.5**	**24.9**	**163**	**212**	**124**	**217**

Tables 6 Conventional and Priority Pollutants

Conventional Pollutants	**Method**	**Reportable Limit (PQL) mg/L**
Ammonia- Total	350.3	0.10
Biochemical Oxygen Demand	405.1	2.0
Chemical Oxygen Demand	410.4	10
Chlorine, residual	SM 4500	0.1
Chlorine, free	SM 4500	0.1
Alkalinity	SM 2320 B	2.0
Settable Solids	160.5	0.10 (ml/L)
Total Suspended Solids	160.2	4.0
Fecal Coliform	SM 9221E or SM 9222 D	2 (FC/100 ml)
Specific Conductance-Conductivity	120.1	2 (µmHos/cm)
Total Organic Carbon	SM 5310 B	1.0
Oil and Grease	1664	5.0
Total Kjeldahl Nitrogen	EPA various	1.0
Total Phosphorus	EPA 365.2	0.050
pH	150.1	0.10 standard units
Priority Pollutants	**Method**	**Reportable Limit (PQL)**
Total Recoverable Metals		**Ug/l**
Antimony	200.8	2.5
Arsenic	200.8	2.5
Beryllium	200.8	1.0
Cadmium	200.8	1.0
Chromium	200.8	2.5
Copper	200.8	1.0
Lead	200.8	1.0
Mercury (Total)	245.1	1.0
Nickel	200.8	1.0
Selenium	200.8	2.5
Silver	200.8	1.0
Thallium	200.8	1.0
Zinc	200.8	2.5
Dissolved Metals		
Antimony	200.8	2.5
Arsenic	200.8	2.5
Beryllium	200.8	1.0
Cadmium	200.8	0.5

Chromium	200.8	2.5
Copper	200.8	1.0
Lead	200.8	1.0
Nickel	200.8	1.0
Selenium	200.8	2.5
Silver	200.8	1.0
Thallium	200.8	1.0
Zinc	200.8	2.5
VOCs		
1,1,1,2-Tetrachloroethane	624	2
1,1,1-Trichloroethane	624	2
1,1,2,2-Tetrachloroethane	624	2
1,1,2-Trichloroethane	624	2
1,1-Dichloroethane	624	2
1,1-Dichloroethene	624	2
1,1-Dichloropropene	624	2.5
1,2,3-Trichlorobenzene	624	2.8
1,2,3-Trichloropropane	624	2.5
1,2,4-Trichlorobenzene	624	2.8
1,2,4-Trimethylbenzene	624	2.7
1,2-Dibromo-3-Chloropropane	624	10
1,2-Dichlorobenzene	624	2
1,2-Dichloroethane	624	2
1,2-Dichloroethane	624	2
1,2-Dichloropropane	624	2
1,3,5-Trimethylbenzene	624	2
1,3-Dichlorobenzene	624	2
1,3-Dichloropropane	624	2
1,4-Dichlorobenzene	624	2
2,2-Dichloropropane	624	2
2-Butanone	624	50
2-Chloroethyl Vinyl Ether	624	10
2-Chlorotoluene	624	2.1
2-Hexanone	624	20
4-Chlorotoluene	624	2
4-Isopropyltoluene	624	2.8
4-Methyl-2-Pentanone	624	20
Acetone	624	50
Acrolein	624	100
Acrylonitrile	624	10

VOCs continued		
Benzene	624	2
Bromobenzene	624	2
Bromochloromethane	624	2
Bromodichloromethane	624	2
Bromoform	624	2
Bromomethane	624	5
Carbon Disulfide	624	2
Carbon Tetrachloride	624	2
Chlorobenzene	624	2
Chloroethane	624	5
Chloroform	624	2
Chloromethane	624	5
Cis-1,2-Dichloroethene	624	2
Cis-1,3-Dichloropropene	624	2.3
Dibromochloromethane	624	2
Dibromomethane	624	2
Dichlorodifluoromethane	624	5
Ethylbenzene	624	2
Hexachlorobutadiene	624	2
Iodomethane	624	5
Isopropylbenzene	624	2.6
m&p Xylenes	624	2
Methylene Chloride	624	5
Naphthalene	624	2.8
n-Butylbenzene	624	2.8
n-Propylbenzene	624	2
O-Xylene	624	2.3
sec-Butylbenzene	624	2.3
Styrene	624	2.6
tert-Butyl Methyl Ether	624	2
tert-Butylbenzene	624	3.0
Tetrachloroethene	624	2
Toluene	624	2
Trans 1,2-Dichloroethene	624	2
trans-1,3-Dichloropropene	624	2.1
trans-1,4-Dichloro-2 Buten	624	10
Trichloroethene	624	2
Trichlorofluoromethane	624	2
Trichlorotrifluoroethane	624	2

Vinyl Acetate	624	5
Vinyl Chloride	624	2
BNAs		
1,2,4-Trichlorobenzene	625	5
1,2-Dichlorobenzene	625	5
1,2-Diphenylhydrazine	625	5
1,3-Dichlorobenzene	625	5
1,4-Dichlorobenzene	625	5
2,4,5-Trichlorophenol	625	5
2,4,6-Trichlorophenol	625	5
2,4-Dichlorophenol	625	5
2,4-Dimethylphenol	625	25
2,4-Dinitrophenol	625	100
2,4-Dinitrotoluene	625	5
2,6-Dinitrotoluene	625	5
2-Chloronaphthalene	625	10
2-Chloronapthalene	625	10
2-Chlorophenol	625	5
2-Methylnaphthalene	625	5
2-Methylphenol	625	5
2-Nitroaniline	625	100
2-Nitrophenol	625	5
3&4-Methylphenol	625	5
3,3’-Dichlorobenzidine	625	20
3-Nitroaniline	625	50
4,6-Dinitro-2-methylphenol	625	25
4-Bromophenyl Phenyl ether	625	5
4-chloro-3-methylphenol	625	5
4-Chloroaniline	625	5
4-Chlorophenyl methylsulfone	625	20
4-Chlorophenyl Phenyl ether	625	5
4-Nitroaniline	625	50
4-Nitrophenol	625	100
Acenaphthene	625	5
Acenaphthylene	625	5
Anthracene	625	5
Benzidine	625	200
Benzo (A) Anthracene	625	5
Benzo (A) Pyrene	625	5
Benzo (B) Fluoranthene	625	5

BNAs continued		
Benzo (g,h,i) Perylene	625	5
Benzo (K) Fluoranthene	625	5
Benzoic Acid	625	130
Benzyl Alcohol	625	10
Bis (2-Chloroethoxy) methane	625	5
Bis (2-chloroethyl) ether	625	5
Bis (2-Chloroisopropyl) ether	625	5
Bis (2-Ethylhexyl) Phthalate	625	2.5
Butyl Benzyl Phthalate	625	5
Chrysene	625	5
Dibenzo (a,h) Anthracene	625	5
Dibenzofuran	625	5
Diethyl Phthalate	625	5
Dimethyl Phthalate	625	5
Di-N-Butyl Phthalate	625	5
Di-N-Octyl Phthalate	625	5
Fluoranthene	625	5
Fluorene	625	5
Hexachlorobenzene	625	5
Hexachlorobutadiene	625	5
Hexachlorocyclopentadiene	625	10
Hexachloroethane	625	5
Indeno (1,2,3-CD) Pyrene	625	5
Isophorone	625	5
Napthalene	625	10
Nitrobenzene	625	5
N-Nitrosodimethylamine	625	5
N-Nitrosodi-N-Propylamine	625	5
N-Nitrosodiphenylamine	625	10
Pentachlorophenol	625	5
Phenanthrene	625	5
Phenol	625	5
Pyrene	625	5